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A review of the Neuropteroidea of the Mediterranean islands of Malta, Gozo and Comino (the Maltese Islands)

(Neuroptera: Coniopterygidae, Hemerobiidae, Chrysopidae, Myrmeleontidae)

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Abstract

A Literature search prior to a collecting trip to Malta by one of the authors (CWP) in April 1994 revealed that only 10 species of Neuropteroidea had been formally recorded from the Maltese islands. One new species (*Semidalis vicina* (HAGEN, 1861)) was added to the list during the April 1994 trip. Subsequently, further literature searches were conducted and the collections of other entomologists examined, resulting in a final tally of 29 confirmed species of Neuropteroidea, and a further two that could not be positively identified to specific level. This gives an overall total of at least 30 distinct species now recorded for the Maltese islands. This paper draws together all available records and provides the first comprehensive review of the Neuropteroidea of the Maltese Islands, drawing on the extensive personal knowledge of the islands on the part of second author (SS) to provide an ecological overview.

Zusammenfassung

Es werden die Neuropteroidea von Malta (Inseln Malta, Gozo und Comino) systematisch und ökologisch bearbeitet. Die Zahl der nachgewiesenen Arten kann damit von bisher 10 auf 29 erhöht werden.

Introduction

The position of the Maltese Islands in the central Mediterranean suggests, superficially, a potential for species of Neuropteroidea from both Europe and North Africa to be present, both as resistents and as transitory migrants. It was, therefore, something of a surprise to one of us (CWP) when, during research for a planned entomological

collecting trip to the islands in April 1994, it became clear that only 10 species were formally listed in the literature. The April 1994 trip only added one species new (*Semidalis vicina*) perhaps because the visit, which was principally aimed at collecting Diptera: Syrphidae, was too early in the season. However, whilst staying on Malta, CWP was afforded the opportunity to examine the Neuroptera in the insect collections of the islands' principal entomologists, Dr Martin EBEJER, Dr Paul GATT and Mr David MIFSUD, consequently adding several species new to the formal list. This led to an attempt to collate all existing records, both from the literature and from the collections of other neuropterologists, including a large number made from the (then unnamed) specimens collected over several years by SS. This latter group produced a number of unrecorded species. Particularly useful data were also kindly provided in advance of publication by Peter DUELLI, who visited the Maltese Islands during 1990 and recorded a total of twelve species, of which seven were at that time new records for the area (DUELLI 1994).

The end result of this exercise was a total list of 29 species of Neuropteroidea confirmed for the Maltese Islands, together with a further two species (*Semidalis ?pseudouncinata* and *Conwentzia ?psociformis*) that could not be identified to species level since they are only recorded as female specimens. This provides an overall total of at least 30 species, including the unidentified *Conwentzia*; if the determination of *S. pseudouncinata* is correct then the total must rise to 31. Additionally, there are two examples of female *Coniopteryx* sp. and one female *Semidalis* sp. that could not be determined; these may or may not add to the overall species total depending on whether or not they represent species in these genera that have not already been recorded. There is thus a theoretical total of 34 species now recorded for the Maltese Islands.

Factors affecting the species of Neuropteroidea present in the Maltese Islands

A number of differing factors may affect both the diversity of species and numerical abundance of Neuropteroidea on the Maltese islands. These may be summarised as follows:

1 Position and size

The Maltese Islands lie at latitude 35°48'28" North and longitude 14°11'04" East in the central Mediterranean Sea and are approximately 96 kilometres from Sicily (Italy) and 290 kilometres from North Africa. They are a group of small, low islands comprising three which are inhabited: Malta (245.7 km^2), Gozo (67.1 km^2) and Comino (2.8 km^2) and a number which are uninhabited: Cominotto (2.8 hectares), Filfla (2.0 hectatres), St Paul's Islands (10.1 hectares), Fungus Rock (0.7 hectares) and a few other minor rocks. Geophysically, the Maltese Islands and the Ragusa peninsula of Sicily are regarded as forming part of the African continental plate, though the evolutionary history of Maltese Neuropteroidea is obscure and it is unlikely that the origins of the present day winged invertebrate fauna are influenced by this historical theorem since the islands are scarcely isolated from invasion either from Europe or the African continent. A detailed account of Maltese geography is given in BOWEN-JONES et al (1961).

2 Climate

The climate of the islands is typical for Mediterranean lands with characteristic mild, wet winters and hot, dry summers. The mean average annual precipitation for the years from 1951 to 1990 is 530 mm, but is highly variable from year to year, some years being excessively wet while others are extremely dry (extreme minimum 191.3 mm; extreme maximum 1031.2 mm, for the period 1854 to 1990). The seasonal distribution of rainfall defines a wet period (October to March) with about 85 % of the total annual rainfall and a dry period (April to September). During the latter period, practically all of the herbaceous flora becomes desiccated quite rapidly, thus presumably reducing the potential of aphidiphagous insects.

Air temperatures are moderate (mean annual temperature 18.6°C, mean monthly range 12.3 - 26.3°C) and never falls too low for adequate plant growth (HASLAM et al 1977). The islands are windy, and only some 8 % of days in a year are calm; the predominant wind is from the north-west which would tend to minimise the number of immigrations of winged insects from the African sub-continent and may in fact explain the two isolated records of the typically African antlion *Creoleon aegyptiacus*, which is present to the north-west on the islands of Corsica and Sardinia.

3 Ecology

The islands harbour a very diverse array of plants and animals, especially in consideration of the relatively small land area, the limited number of habitat types and the intense human pressure. A number of endemic species are present, though not amongst the Neuropteroidea.

The terrestrial ecosystems fall into two principal categories: (1) major communities that form part of the successional sequence towards the climatic climax; and (2) minor communities which either are specialised to occupy particular habitats, or occupy habitats that are rare in the islands, or are relicts from a previous ecological regime, now surviving in a few refugia. A systematic classification of Maltese ecosystems based mainly on vegetation can be found in SCHEMBRI (1991, 1992).

The once extensive native sclerophyll forests that are thought to have covered most of the islands prior to colonisation by man (>7000 years B.P), are now all but extinct. In the central Mediterranean this forest is characterised by Holm Oak (*Quercus ilex*) and Aleppo Pine (*Pinus halepensis*) with an undergrowth of smaller trees, shrubs and climbers. Local forest remnants are presently confined to just four localities, all on mainland Malta. These take the form of small copses of Holm Oak, where the total number of trees is less than thirty. Some of these are esimated to be between 500 and 900 years old (SCHEMBRI 1993).

Present day Buskett can perhaps best be described as semi-natural wood, originally planted by man but now self-regenerating. This wood has the character of the natural climax community; it is dominated by Aleppo Pine with various other trees being subdominant (Olive *Olea europaea*, Carob *Ceratomia siliqua* and Holm Oak *Quercus ilex*) and there is an extensive undergrowth of shrubs (eg., *Pistacia*, *Rhamnus* and *Crataegus*), herbs and climbers. This semi-natural wood represents the only woodland ecosystem of any size in the islands (with its associated woodland plants and animals) and is thus both ecologically important and potentially the best available habitat for Neuropteroidea. In spite of this, we have recorded an apparent total absence of the typically arboreal Raphidioptera, and rather few of both the Hemerobiidae and the Chrysopidae.

A semi-natural maquis develops in relatively inaccessible sites such as the sides of stepp valleys (Widien) and at the foot if inland cliffs (rdum), while an artificial maquis develops around trees, mainly olive and carob planted by man.

The garigue is the most common natural vegetation type. Some garigue communities are native; others result from degradation of forest and maquis. Garigues are typical of rocky ground, mainly karstland.

Steppic grasslands are dominated by grasses (Graminea), Umbelliferae, thistles (Compositae) and geophytes. Steppic grasslands are widespread and result from degradation of the garigue and the maquis, mainly due to grazing. Other steppic communities are, however, edaphically controlled.

Communities of disturbed ground within the Maltese Islands cover a large area as is to be expected owing to their high human population density and its considerable land use. This includes urban areas, buildings and building sites, rubbish dumps, quarries, harbours, footpaths, roadsides and others, where the natural vegetation cover has been disturbed.

One type of coastal community is the saline marshlands, which can be regarded as forming an interface between the marine, freshwater and terrestrial environments. In the Maltese Islands, saline marshlands are maintained by seasonal fluctuations in precipitation, run-off, evaporation and seepage, rather than by tidal cycles. These marshes are characterised by a central brackish pool which collects during the wet season and which progressively diminishes until it completely dries up during the summer months. Specialised flora and fauna inhabit these marsh environments, although we have found no Neuropteroidea specifically restricted to them. Maltese marshlands are heavily degraded and much endangered due to human interference.

Many of the local sandy beaches were backed by a dune system. Ramla, on Gozo, supports a large sandy beach and there is a succession from bare sand through stabilised dunes to *Tamarix* shrub. Elsewhere in the Maltese Islands sandy beaches suffer much from human activities connected with beach development for tourist purposes (ANDERSON & SCHEMBRI 1989), allowing only fragments of these environments to develop. Sand dune ecosystems are thus amongst the rarest and most threatened of local ecosystems: they also support around one third of the Maltese neuropterous fauna, in the family Myrmeleontidae.

The Maltese coasline is made up mostly of exposed rock ground. Rocky shores vary from gentle slopes, such as in the north and east of Malta, to high cliffs and steep slopes, as in the south-west of Malta. Vertical cliffs arising from the sea reach heights of c. 70 - 130 metres. Sloping ground is terraced and partly under cultivation. Inland cliffs (rdum) occur. Because of the shelter and inaccessibility of both sea- and inland-cliffs, these areas provide important refugia for many species of flora and fauna, including several endemics. However, the only neuropteroid species we have found associated with these areas has been the ubiquitous *Chrysoperla carnea* agg..

During the wet season, rainwater collects in natural depressions and hollows on Coralline Limestone karstland to form temporary freshwater pools. These pools are usually very transient and rapidly dry up, especially with the onset of the dry season. Many freswater species inhabit these freshwater pools, but there are no neuropteroids amongst them. Other pools are more or less permanent, either because of their physical size or because they receive water from sources other than rainwater, usually from springs. Additionally, there are a number of natural drainage channels (widien) that are filled with water during the wet season but dry out during the summer. Apart from

freshwater species, these widien also support a luxuriant terrestrial flora and fauna (LANFRANCO & SCHEMBRI 1986); to date, however, we have been unable to find any neuropteroid species associated with any of the aquatic habitats of the Maltese Islands.

4 Human impact

The Maltese Islands have been settled since Neolithic times, around 7000 years B.P. (BLOUET 1984). The current human population is in the order of 0.4 million, giving a population density of around 1.333 persons per square kilometre. Malta itself is the third most densely populated country in the world, after Hong Kong and Singapore. This residential population is augmented by substantial tourist arrivals which exceeded 1 million persons in 1992 and have increased every year since. Human influence is thus a key feature in the ecology of the islands. The intense human pressure on the islands' ecology, especially along the accessible coastlines, has resulted in the loss of habitats and a number of indigenous (non-neuropteroid) species of wildlife have become extinct, whilst others are under considerable threat (SCHEMBRI & SULTANA 1989).

List of the known records of Neuropteroidea from the Maltese Islands

Presentation of the list: Records are presented in chronological order according to date of collection. Collectors' names are suffixed to each record (in parantheses).

Location of voucher material: Unless stated to the contrary, specimens are retained in the private collections of the named collector. Exceptions are as follows: A single asterisk (*) placed after the date of the record indicates that the specimens are in the collection of C.W. PLANT (England); a double asterisk (**) in this position indicates material retained in the collection of Horst and Ulrike ASPÖCK (Austria). Coniopterygidae collected by Peter DUELLI are in the collection of Victor MONSERRAT (Spain); specimens referred to in BORG (1932) and HEPPLE (1954) have not been traced whilst material cited by VALLETTA (1984 & 1985) is evidently missing. 2 ♂♂ and 2 ♀♀ *Creoleon lugdunensis* and 1 ♂ *Macronemurus appendiculatus* collected by VALLETTA are in the collections of the British Museum (Natural History) in London; these are indicated by the suffix + in the list. Curiously, these records were omitted by VALLETTA from his own list (VALLETTA 1984).

Validation of records: Records cited in VALLETTA (1984) were, in part, determined by Dr Peter BARNARD at the British Museum (Natural History); remaining material is assumed to have been determined by VALLETTA himself. Records cited in VALLETTA (1985) were identified by Stephen BROOKS, also at the BM (NH). The specimens which form the basis of the records cited by BORG (1932) and HEPPLE (1954) have not been seen by us and the identity of the determiner is assumed to be the author in each case. Specimens collected by SS and shown as being in the collection of the ASPÖCKs were determined by the ASPÖCKs and material collected by DUELLI was determined by the collector. All remaining material has been examined by C.W. PLANT.

Nomenclature: Family and species names follow those given in ASPÖCK et al (1980) with the following exceptions: We use Myrmeleontidae in place of Myrmeleonidae in accordance with CANARD et al (1991). The recorded species of *Anisochrysa*, we place in *Dichochrysa* in accordance with YANG & YANG (1900) and YANG (1991) and

we use *Chrysopa pallens* (RAMBUR, 1838) in place of *C. septempunctata* (WESMAEL, 1841) in accordance with LERAUT (1981).

The higher taxonomic sequence also follows ASPÖCK et al (1980) and we have arranged species alphabetically within the families.

NEUROPTERA

Coniopterygidae

Aleuropteryx juniperi OHM, 1968. Gozo: north-east of Victoria, 1 ♂ 14.ix.1990 (DUELLI).

Coniopteryx (Xeroconiopteryx) loipetsederi ASPÖCK, 1963. Malta: Tarxien, 2 ♀♀ 11.ix.1990 (DUELLI). Gozo: Victoria, 1 ♀ 14.ix.1990 (DUELLI).

***Coniopteryx* sp.** indet. Malta: Balzan, 1 ♀ 6.x.1992 (EBEJER); Buskett, 1 ♀ beaten from *Fraxinus angustifolia*, 3.vii.1994* (MIFSUD).

Conwentzia ?psociformis (CURTIS, 1834). Malta: Zebbug, 1 ♀ at light on 8.x.1990 (SCHEMBRI). Females of the two known European species of *Conwentzia* are traditionally impossible to separate, safe determination of the species calling for examination of the male genitalia. However, the majority of the generally darker coloured *C. pineticola* ENDERLEIN females have less than 36 antennal segments, whilst those of *C. psociformis* usually have considerably more. The present specimen, which is snow white with no hint of darkening, has 42 segments on each antenna and we are reasonably confined that it is referrable to *psociformis*.

Semidalis vicina (HAGEN, 1861). Malta: Buskett, 4 ♂♂ 3 ♀♀ beaten from *Hedera helix*, 11.iv.1994 (PLANT).

Semidalis* sp. *?pseudouncinata MEINANDER, 1963. Gozo: Mgarr, on domesticated fig tree, 1 ♀ 13.ix.1990 (DUELLI).

***Semidalis* sp.** indet. Malta: Rabat, 1 ♀ at light on 5.xi.1994* (GATT). This specimen is very probably *S. vicina*.

Hemerobiidae

Micromus (Nesomicromus) angulatus (STEPHENS, 1836). Malta: Girgenti Valley, 1 ♀ 17.iii.1990* (MIFSUD); Fiddien, 1 ♂ 17.vi.1992 (EBEJER); Ghadira, 1 ♂ 11.v.1993 (EBEJER); Balzan, 1 ♂ 10.vi.1994*, indoors at light, (ISMAY).

Sympherobius (Sympherobius) fallax NAVAS, 1908. Malta: Birkirkara, to light on 30.viii.1977* (SCHEMBRI); Hal Far, in light trap, 24-29.vi.1979 (SCHEMBRI); Sliema, to light, 9.x.1979 (LANFRANCO, specimen in coll. SCHEMBRI); Birkirkara, to light, 2.xi.1980, 1 ♀ 20.viii.1983** and 30.viii.1981 (SCHEMBRI); Tarxien, 1 ♀ 11.ix.1990 (DUELLI); Balzan, 1 ♀ 10.ix.1991, 1 ♀ 6.x.1992 (EBEJER); Buskett, 1 ♂ 9.vii.1993 (EBEJER); Rabat, 1 ♀ 5.v.1994* and 1 ♂ 2.ix.1994*, both at light (GATT). Gozo: Victoria, 1 ♀ 13.ix.1990 and 1 ♂ 1 ♀ 14.ix.1990 (DUELLI).

Sympherobius (Sympherobius) pygmaeus (RAMBUR, 1842). Malta: Birkirkara, 29.v.1979** (SCHEMBRI).

Wesmaelius (Kimminsia) navasi (ANDREU, 1911). Malta: Fort St. Lucian, Marsaxlokk, at light on 17.ix.1976 (SCHEMBRI); Attard, to light on 23.ix.1976 (SCHEMBRI).

Chrysopidae

Brinckochrysa michaelseni (ESPEN-PETERSEN, 1928). Gozo: Victoria, 3 kilometres towards Marsalforn, 4 ♀♀ 14.ix.1990, from which males were bred to confirm identification (DUELLI).

Chrysopa formosa BRAUER, 1850. Malta: Wied il-Qlejgha (Chadwick Lakes), 1 ♂ 23.viii.1976 (EBEJER); Birkirkara, 6.ix.1976 (SCHEMBRI); Buskett, 25.vii.1977 (SCHEMBRI); Hal Far, in light trap between 24-29.vi.1979 (SCHEMBRI); Wardija, 13.viii.1979 (VALLETTA 1985); Birkirkara, 1 ♀ 25.v.1983* (SCHEMBRI). Gozo: Victoria, on ornamentals, 1 ♂ 2 ♀♀ 13.ix.1990 (DUELLI); Victoria, 3 kilometres towards Marsalforn, 1 ♀ 14.ix.1990 (DUELLI).

Chrysopa pallens (RAMBUR, 1838). Malta: Gwardamangia, 1.vi.1983 (GAUCI, specimen in coll. SCHEMBRI); Buskett, 1 ♀ on *Hedera* 10.v.1981 (SCHEMBRI).

Chrysopa perla (LINNAEUS, 1758). Malta: BORG (1932) states that this species (as *Chrysopa chrysopa* L.) was to be "frequently met with flitting in the Orange-groves". Whilst we are unable to locate any specimen we consider it unlikely that an identification error could have been made over such a distinctive species; Mizieb, 3.iv.1985 (VALLETTA, det. S.J. BROOKS).

The genus *Chrysoperla*

The precise taxonomic status of species within this genus is currently unclear. LERAUT (1991) considered that the widespread and abundant *Ch. carnea* (STEPHENS) atually comprised four morphologically distinct species, namely *Ch. renoni* (LACROIX, 1933), *Ch. lucasina* (LACROIX, 1912), *Ch. carnea* sensu stricto and a fourth species which he later (LERAUT 1992), concluded conformed to *Ch. kolthoffi* (NAVAS, 1927) though according to BROOKS (1994) this name is not correct. Whether or not these taxa, as defined by LERAUT, all merit specific status is a matter which currently occupies the time of a number of prominent neuropterologists. Sonographic data obtained from the courtship "song" of males enables the segregation of examples into a number of taxa but these groupings do not in all cases coincide with the morphological groupings. In Britain, segregation is also possible into two groups according to whether or not the overwintering adult remains green or adopts a brown colouration. It would be important to examine the DNA profile of samples from all the groupings in order to further elucidate the genetic links between them, and afterwards attempt to relate these to morphological and song groupings.

For the Maltese Islands, the taxa *kolthoffi*, *lucasina* and *carnea* sensu stricto have all been identified. We have based this segregation on the following morphological key:

1 All hairs on dorsal surface of pronotum pale . . . . . ***carnea***
- Some dark hairs on dorsal surface of pronotum 2
2 Most hairs on pronotum black. Wing tips acute . . . . . ***lucasina***
- Pronotal hairs mixed pale and dark, Wing tips rounded . . . . . ***kolthoffi***

Chrysoperla kolthoffi (NAVAS, 1927). Gozo: Ir-Ramla, 1 ♂ 15.iv.1994 (PLANT). Malta: Bahrija, 2 ♀♀ 16.iv.1994 swept from garigue vegetation (PLANT).

Chrysoperla lucasina (LACROIX, 1912). Malta: Wied Qannotta, 1 ♀ 10.iv.1994 (PLANT); Ghajn Rihana, 1 ♂ 10.iv.1994 (PLANT); Wied Il-Qlejgha (Chadwick Lakes), 1 ♂ 12.iv.1994 (PLANT); Fiddien, 2 ♀♀ 12.iv.1994 (PLANT); Ghadira, 1 ♀

13.iv.1994 (PLANT); Bahrija, 1 ♀ 16.iv.1994, swept from garigue vegetation (PLANT).

Chrysoperla carnea (STEPHENS, 1836) sensu LERAUT 1991. Malta: Buskett, ex stream-side vegetation, 4 ♂♂ 7 ♀♀ 11.iv.1994 (PLANT); Bahrija, 1 ♂ swept from garigue vegetation, 12.iv.1994 (PLANT); Fiddien, 1 ♂ 12.iv.1994 (PLANT); Balzan, 1 ♀ 31.vii.1994*, at light (EBEJER).

Chrysoperla carnea agg. Malta: Listed for unspecified localities (as *Chrysopa vulgaris* SCHNEIDER), in BORG (1932); Buskett, 16.ix.1976 and 7.iv.1977 (SCHEMBRI); Wied Babu, 26.ii.1978 (SCHEMBRI); Wardija and Mizeib, iv.1983 (VALLETTA 1985); Birkirkara, 1 ♀ 6.x.1982** (SCHEMBRI); Ghajn Hadid, 1 ♀ 8.v.1983** (SCHEMBRI). Gozo: Victoria, 2 ♀♀ 14.ix.1990 (DUELLI). Comino: at light, 2 ♀♀ 12.ix.1990 (DUELLI).

Chrysoperla mediterranea (HÖLZEL, 1972). Gozo: Victoria, on planted *Pinus halepensis*, 1 ♀ 10.ix.1990, from which male offspring were bred to confirm identification (DUELLI).

Dichochrysa clathratus (SCHNEIDER, 1845). Malta: Benghisa, ix.1976 (VALLETTA 1983); Balzan, 1 ♀ 2.vii.1994*, 2 ♀♀ 16.vii.1994*, 1 ♀ 31.vii.1994*, all at light (EBEJER). Gozo: Victoria, 8 ♂♂ 3 ♀♀ 12.ix.1990 (DUELLI); north of Victoria, on *Tamarix*, 2 ♂♂ 6 ♀♀ 13.ix.1990 (DUELLI). Of these specimens, two males and 1 female were of a yellowish-grey mutant form, the remainder being the normal blue-green colour. The single yellow female, kept in isolation after capture deposited fertile eggs which developed into normal green F1-generation adults. Crossing the progeny of that yellow female inbreeding (12 females, 15 males) yielded an F2 of 42 adults, 32 green and 10 yellow, suggesting a mutation is a recessive allele. Accordingly, offspring of the mutants crossed in the absence of green individuals led to a purely yellow F3 population (DUELLI 1992); 3 ♂♂ 4 ♀♀ 14.ix.1990 (DUELLI). Comino: at light 8 ♂♂ 3 ♀♀ 12.ix.1990 (DUELLI).

Dichochrysa flavifrons (BRAUER, 1850). Malta: Fleur de lys, to light on 23.ix.1976 (SCHEMBRI); Wied il-Qlejgha (Chadwick Lakes), 26.vi.1977 (SCHEMBRI); Buskett, 25.vii.1977 (SCHEMBRI); Tarxien, 1 ♂ 2 ♀♀ 11.ix.1990 (DUELLI); Buskett, 9.vii.1993 (EBEJER); Bahrija, 1 ♀ 12.vi.1994* (EBEJER). Gozo: North of Victoria, 1 ♂ 2 ♀♀ 13.ix.1990 (DUELLI) and 3 kilometres towards Marsalforn, 1 ♂ 2 ♀♀ 14.ix.1990 (DUELLI).

Dichochrysa genei (RAMBUR, 1842). Comino: at light, 1 ♀ on 8.ix.1990, 12 ♂♂ 27 ♀♀ 19.ix.1990, 1 ♂ 2 ♀♀ 12.ix.1990 (DUELLI).

Italochrysa italica (ROSSI, 1790). Malta: Buskett, 27.viii.1984 (VALLETTA 1985) and 1 ♀ 9.vii.1993 (EBEJER).

Myrmeleontidae

Acanthaclisis baetica RAMBUR, 1842. Gozo: Ramla dunes, one larva collected 29.v.1988 produced a ♀ during viii.1988 (SCHEMBRI).

Creoleon lugdunensis (VILLERS, 1789). Malta: Birkirkara, 1 ♀ on 7.ix.1969+ and 1 ♂ on 28.ix.1969+ (VALLETTA); Attard, 1 ♂ 10.ix.1969+ (VALLETTA); Dingli Cliffs, one larva 21.vii.1974** (SCHEMBRI); FLEUR DE LYS, BIRKIRKARA, 1 ♀ 20.VIII.1974 (EBEJER); Wied is-Sewda, 1 ♀ 21.viii.1974 (EBEJER); Wied Qirda, 2 ♂♂ 2 ♀♀ 6.vii.1977** (SCHEMBRI); Cirkewwa, 1 ♀ 7.vii.1976 (EBEJER); Marsa, 17.ix.1976

(SCHEMBRI); Mistra, 7.vii.1977 (SCHEMBRI); Ghajn Rihana, ♂♂ ♀♀ 24.vi.1977, 25.vi.1977 and 16.ix.1977 (SCHEMBRI); Ghadira (dunes) 19.vii.1977 and 9.viii.1977 (SCHEMBRI); Bahrija, 25.vii.1977 (SCHEMBRI); Wied Gerzuma, 1 ♀ 10.vii.1982** (SCHEMBRI); Rabat, 1 ♀ 5.v.1994* (GATT); Tal-Qroqq University, 1 ♀ 10.vii.1994* (MIFSUD). There is also a female lacking locality data from Malta on 27.vii.1969+ (VALLETTA). Additionally, the records listed below under *C. plubeus* are almost certainly referrable to *C. lugdunensis*. Gozo: It-Ramla, a larva collected in open, unvegetated sand on 15.iv.1994 produced an adult indoors in England on 31.x.1994 (PLANT). Comino: Santa Marija, 18.viii.1977 (SCHEMBRI).

[***Creoleon plumbeus*** (OLIVIER, 1811). Erroneously recorded. The following earlier published records are considered to relate to *C. lugdunensis*. Malta: Recorded at light on an unspecified date between August 1953 and June 1954 (HEPPLE 1954). This specimen was shown to VALLETTA by HEPPLE during 1978. The specimen cannot be traced, but correspondence between Peter BARNARD at BM (NH) and VALLETTA during 1983 makes it clear that the record certainly relates to *C. lugdunensis* not *C. plumbeus*. The following are listed by VALLETTA (1984): Wied il-Ghasel, Mosta 22.v.1947; Mriehel, Birkirkara, at light on 24.v.1948 and 3.vi.1949; Pembroke, viii.1950 and ix.1950; Wardija, 7.ix.1970, 8.vii.1971 and 7.x.1980. VALLETT's own material was also seen by Dr Peter BARNARD, who does not recall ever seeing a specimen of *plubeus* amongst the VALLETTA material that he examined. Indeed, in a letter to VALLETTA dated 31.i.1983 he cautions that the specimens are probably referrable to *C. lugdunensis*.]

Creoleon aegyptiacus (RAMBUR, 1842). Gozo: Ramla l-Hamra' specimens disturbed from *Tamarix* on 19.viii.1975 and 19.vii.1978 (VALLETTA 1984).

Distoleon annulatus (KLUG, 1834). Malta: Xrobb il-Ghagin, 1 ♀ 2.vii.1989 (MIFSUD).

Gymnocnemia variegata (SCHNEIDER, 1845). Malta: Wied il-Ghasel, Mosta, 29.vi.1948 and in the Pembroke area, viii. & ix.1950 (VALLETTA 1984); Birkirkara, 1 ♀ 17.viii.1975** (SCHEMBRI); Mtahleb, 20.ix.1982 (G. BONETT vide VALLETTA 1984); Balzan, 1 ♀ on 2.vii.1994*, 1 ♀ on 6.vii.1994*, both at light* (EBEJER); Qrendi, 1 ♀ on 20.vii.1994* (MIFSUD).

Macronemurus appendiculatus (LATREILLE, 1807). Malta: Wied Qannotta, during vi.-vii.1950 (VALLETTA 1984); Attard, 1 ♂ 10.vi.1969+ (VALLETTA); Salina, 21.ix.1970 and Buskett, 15.vii.1972 (VALLETTA 1984); Wied il-Qlejgha (Chadwick Lakes), 1 ♀ 2.vi.1977** (SCHEMBRI); Wied Qannotta, 1 ♀ 23.vi.1977** (SCHEMBRI); Ghajn Rihana, 25.vi.1977 (including 2 ♂♂ 1 ♀**) (SCHEMBRI); Ta' Qali, 1 ♂ 6.vii.1977 (EBEJER) and 1 ♂ 1 ♀ (**) on same date (SCHEMBRI); Wied Qirda, 1 ♀ 6.vii.1977 (EBEJER) and 1 ♂ (*) on same date (SCHEMBRI); Mistra, 1 ♀ 10.vii.1974 (EBEJER); Fiddien, 1 ♀ 21.vii.1977** (SCHEMBRI); Bahrija, 1 ♀ 25.vii.1977 (EBEJER); Bahrija, 25.vii.1977 (SCHEMBRI); Marsascala, 26.vii.1977, Bahar ic-Caghaq, 29.vii.1977 and Wied Incita, 4.viii.1977 (SCHEMBRI); Marsaxlokk, 1 ♂ 1 ♀ 9.vii.1993 (EBEJER); Rabat, 1 ♀ at light 10.vi.1994 (GATT). Gozo: Xlendi, 13.viii.1948 (VALLETTA 1984); Qolla s-Safra, 27.vii.1978 (SCHEMBRI); Dwejra, 6.viii.1983** (SCHEMBRI); Ramla, 2 ♂♂ on 9.viii.1983** (SCHEMBRI). Comino: Tamarisk Grove, Santa Marija, 1 ♀ 12.vii.1976, 1 ♂ 1 ♀ 13.vii.1976 (EBEJER); Santa Maria, 18.viii.1977 (SCHEMBRI).

Myrmeleon (Morter) hyalinus OLIVIER, 1811. Malta: Sta Venera, vii.1948 (VALLETTA 1984); One recorded at light on an unspecified date between August 1953 and June 1954 (HEPPLE 1954); Torri l-Abjad, 20.viii.1970 (VALLETTA 1984); Benghisa,

10.vii.1972 (VALLETTA 1984); Wied Qannotta, 18.vi.1977 and 1 ♂ 15.vii.1977* (SCHEMBRI); Armier, 1 ♀ 18.vi.1989 (MIFSUD); Ghadira Nature Reserve, several occupied larval pits adjecent to boundary fence next to the road on 13.iv.1994. Four larvae collected yielded 1 ♂ and 3 ♀♀ adults indoors in the somewhat cooler climate of southern England during mid-August 1994 (PLANT). Gozo: Ramla l-Hamra, 19.vii.1977 (VALLETTA 1984); Ramla, 1♀ 16.vii.1989 (MIFSUD); Ramla, 15.iv.1994, numerous larval pits on tops of dunes where these were sparsely vegetated with the grasses *Elymus farctus* and *Sporoborus arenarius*. Pits were absent from the hollows and sides of the dunes and from both areas with densely growing grass and from areas without grass. Twelve larvae collected yielded adults indoors in the cooler climate of southern England throughout August 1994 (PLANT); Ramla, 6 ♀♀ netted on dunes, 11.vi.1994* (ISMAY). Comino: at light, 3 ♂♂ 13.ix.1990 (DUELLI).

Neuroleon arenarius (NAVAS, 1904). Malta: Ghajn Rihana, 1 ♀ 25.vi.1977** (SCHEMBRI); Ghadira, 3 ♀♀ 4.viii.1993 (EBEJER).

Neuroleon egenus (NAVAS, 1915). Malta: Gwardamangia, 20.vi.1983 (leg. M. GAUCI, in coll. SCHEMBRI); Pawla, 1 ♀ 4.viii.1983 (leg. M. ZAMMIT, in coll. SCHEMBRI); Zebbug, 1 ♀ in garden, 12.viii.1993 (SCHEMBRI).

Neuroleon nemausiensis (BORKHAUSEN, 1791). Malta: Fort St. Lucian, Marsaxlokk, 2 ♀♀ 25.viii.1977 (SCHEMBRI, including 1 ♀**).

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References

ANDERSON, E.W. & SCHEMBRI, P.J. - 1989. Coastal zone survey of the Maltese Islands Report. - Planning Services Division, Works Department, Floriana.

ASPÖCK, H., ASPÖCK, U. & HÖLZEL, H. - 1980. Die Neuropteren Europas. - Goecke & Evers, Krefeld.

BLOUET, B. - 1984. The Story of Malta. - VALLETTA: Progress Press.

BORG, J. - 1932. Scale insects of the Maltese Islands. - Government Printing Press.

BOWEN-JONES, H., DEWDNEY, J.C. & FISHER, W.B. (Eds.) - 1961. Malta: A Background for Development. - Durham University Press.

BROOKS, S.J. - 1994. A taxonomic review of the common green lacewing genus *Chrysoperla* (Neuroptera: Chrysopidae). - Bull. Nat. Hist. Mus., Ent. 63 (2): 137-210.

CARNARD, M., ASPÖCK, H. & MANSELL, M.W. - 1991. Nomenclatural note: Myrmeleontidae vs Myrmeleonidae. Current Research in Neuropterology. - Proc. Fourth Int. Symp. Neuropterology: 253-254.

DUELLI, P. - 1992. Body colouration and colour change in green lacewings (Insecta: Neuroptera: Chrysopidae). In CANARD, M., ASPÖCK, H. & MANSELL, M.W. (Eds.): Current Research in Neuropterology. - Proc. Fourth Int. Symp. Neuropterology, France: 119-123.

DUELLI, P. - 1994. Neuroptera from the Mediterranean islands of Malta. - Entomofauna 15: 125-128.

HASLAM, S.M., SELL, P.D. & WOLSELEY, P.A. - 1977. A Flora of the Maltese Islands. - Malta University Press.

HEPPLE, D. - 1954. "Other" insects at light: 1. Malta. - Bull. Amateur Ent. Soc. 13 (162): 65.

LANFRANCO, E. & SCHEMBRI, P.J. - 1986. Maltese wetlands and wetland biota. - Potamon, Mag. Soc. Study Conserv. Nature 15: 122-125.

LERAUT, P. - 1981 [1980]. Liste des Planipennes de France. - Bull. Soc. Ent. France 85: 237-253.

LERAUT, P. - 1991. Les *Chrysoperla* de la faune de France (Neur. Chrysopidae). - Ent. gallica 2: 75-82.

LERAUT, P. - 1992. Névroptères des Alpes centrales Françaises (Neur.). - Ent. gallica 3: 59-65.

SCHEMBRI, P.J. - 1991. Ecology of the Maltese Islands: a general overview. In Aspects of the Maltese Culture (Ed. CORTIS, T.). - Ministry of Education and the Interior, Floriana. [In Maltese].

SCHEMBRI, P.J. - 1992. Report of survey: natural resources. - Malta Structure Plan Technical Report. Planning Services Division, Floriana.

SCHEMBRI, P.J. - 1993. Physical geography and ecology of the Maltese Islands. Malta: Food, Agriculture, Fisheries and the Environments. - Options Mediterranées Ser. B (7).

SCHEMBRI, P.J. & SULTANA, J. (Eds). - 1989. Red Data Book for the Maltese Islands. - Department of Information, Valletta.

VALLETTA, A. - 1984. Ant-lions. - Potamon, Mag. Soc. Study Conserv. Nature 12: 46-47.

VALLETTA, A. - 1985. Lacewings. - Potamon, Mag. Soc. Study Conserv. Nature 14: 97.

YANG, X.K. & YANG, C.K. - 1990. *Navasius*, a new genus of Chrysopinae (Neuroptera: Chrysopidae). - Acta Zootaxonomica Sinica 15 (3): 327-338.

YANG, X.K. - 1991. *Dichochrysa* nom. nov. for *Navasius* YANG & YANG, 1900 (Neuroptera: Chrysopidae) nec ESBEN-PETERSEN (Neuroptera: Myrmeleonidae). - Scient. Treatise Syst. Evol. Zool. 1: 50.

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GURAVICH, D., MATTHEWS, D.: Eisbären. Wanderer im ewigen Eis der Arktis. - BLV Verlagsgesellschaft, München, 1995. 104 S.

Der Fotograf und Biologe Dan Guravich und sein Teamkollege, der Tierbuchautor Downs Matthews lebten monatelang mit diesen imposanten Tieren in der Arktis; sie haben diese faszinierende Tierart genauestens beobachtet und untersucht, und versuchen etwas von dem Respekt und der Zuneigung, die sie für die Eisbären empfinden, dem Leser zu vermitteln. So entstand nicht nur eine fundierte, sondern auch sehr lebendige Geschichte dieser friedliebenden, intelligenten und äußerst neugierigen "Weißpelze". Viele spannende Fragen werden beantwortet: Wie schafft es ein bis zu 600 kg schwerer Eisbär eine hauchdünne Eisdecke zu überqueren, die nicht einmal das Gewicht eines Kindes tragen würde? Warum wandern sie tausende von Kilometer über das arktische Packeis? Wie überhaupt überleben die Polarbären in dieser feindlichen arktischen Packeisgegend? Viele gute Fotos illustrieren die Welt der Eisbären, Mütter mit ihren Jungen, das Spiel mit Artgenossen, die Wanderschaft und die Jagd.

Eine ebenso gelungene wie liebenswerte Darstellung.

R. GERSTMEIER

WILSON, E.O.: Der Wert der Vielfalt. Die Bedrohung des Artenreichtums und das Überleben des Menschen. - Piper Verlag, München, 1995. 512 S.

Der berühmte Harvard-Professor, Begründer der Soziobiologie und der zur Zeit führende Ameisenforscher, schildert in diesem Buch, wie die Vielfalt der Arten entstanden ist, warum sie immer wieder von Katastrophen reduziert wurde, weshalb ihre Erhaltung für den Menschen lebenswichtig ist, und was getan werden muß, um die Artenvielfalt und das ökologische Gleichgewicht zu sichern. Seine lebendige Sprache, die Fülle an plastischen Beispielen, zahlreiche Grafiken und Farbfotos lassen dieses Buch zu einem Lesegenuß ersten Ranges werden, nicht zuletzt auch deshalb, weil es Wilson gelingt, auch beim Laien die ökologischen Zusammenhänge anschaulich zu machen und Verständnis zu wecken für eine Versöhnung von Ökonomie und Ökologie. Dafür bürgt schon ein klarer, logischer Aufbau, gegliedert in die drei Hauptkapitel "Gewalttätige Natur, unverwüstliches Leben", Die Entfaltung der Biodiversität" und "Der Einfluß des Menschen". Zu den einzelnen Kapitel gibt es am Ende des Buches ausführliche Anmerkungen mit entsprechenden Literaturangaben, die zu einem vertieften Weiterstudium anregen. Ein Glossar enthält ein Verzeichnis wichtiger Begriffe und biographische Angaben über die im Text erwähnten Wissenschaftler; in einem umfangreichen Register findet man alle möglichen Stichwörter.

Ein überaus empfehlenswertes Buch zu einer aktuellen und für uns Menschen immens wichtigen Problematik, aus dessen Fundus nicht nur Wissenschaftler, Lehrer und Schüler, sondern auch naturinteressierte Laien schöpfen können.

R. GERSTMEIER

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