

## Preliminary studies of the Mymaridae (Hym., Chalcidoidea) from Neamț county, Romania, species distribution, vascular flora/vegetation, an ecological approach

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**Abstract.** In this paper we present 14 species of the family Mymaridae which had been collected and identified from some areas of Neamț county, the species are: *Anagrus atomus* (Linnaeus 1767), *Anagrus breviphragma* (Soyka 1955), *Litus cynipseus* (Haliday 1833), *Anaphes (A.) fuscipennis* (Haliday 1833), *Anaphes (P.) diana* (Girault 1911), *Erythmelus (P.) rex* (Girault 1911), *Gonatocerus near litoralis* (Haliday 1833), *Gonatocerus longicornis* (Nees 1834), *Gonatocerus pictus* (Haliday 1833), *Gonatocerus sulphuripes* (Förster 1847), *Ooctonus vulgatus* (Haliday 1833), *Mymar pulchellum* (Curtis 1832), *Stepahnodes similis* (Förster 1847) and *Polynema vakenburgense* (Soyka 1931).

**Key Words:** Mymaridae, fauna, taxonomy, environment, distribution, flora/vegetation, new species record, Romania.

**Resumen.** En este trabajo se presentan 14 especies de la familia Mymaridae que se había recaudado y se determinaron a partir de algunas zonas del condado de Neamț, las especies son: *Anagrus atomus* (Linnaeus 1767), *Anagrus breviphragma* (Soyka 1955), *Litus cynipseus* (Haliday 1833), *Anaphes (A.) fuscipennis* (Haliday 1833), *Anaphes (P.) diana* (Girault 1911), *Erythmelus (P.) rex* (Girault 1911), *Gonatocerus near litoralis* (Haliday 1833), *Gonatocerus longicornis* (Nees 1834), *Gonatocerus pictus* (Haliday 1833), *Gonatocerus sulphuripes* (Förster 1847), *Ooctonus vulgatus* (Haliday 1833), *Mymar pulchellum* (Curtis 1832), *Stepahnodes similis* (Förster 1847) y *Polynema vakenburgense* (Soyka 1931).

**Palabras claves:** Mymaridae, la fauna, la taxonomía, el medio ambiente, la distribución, la flora y la vegetación, Rumanía.

**Rezumat.** În această lucrare am prezent 14 de specii de familie Mymaridae care au fost colectate și identificate din unele zone ale județului Neamț, speciile sunt: *Anagrus atomus* (Linnaeus 1767), *Anagrus breviphragma* (Soyka 1955), *Litus cynipseus* (Haliday 1833), *Anaphes (A.) fuscipennis* (Haliday 1833), *Anaphes (P.) diana* (Girault 1911), *Erythmelus (P.) rex* (Girault 1911), *Gonatocerus near litoralis* (Haliday 1833), *Gonatocerus longicornis* (Nees 1834), *Gonatocerus pictus* (Haliday 1833), *Gonatocerus sulphuripes* (Förster 1847), *Ooctonus vulgatus* (Haliday 1833), *Mymar pulchellum* (Curtis 1832), *Stepahnodes similis* (Förster 1847) and *Polynema vakenburgense* (Soyka 1931).

**Cuvinte cheie:** Mymaridae, faună, taxonomie, mediu înconjurator, distribuție, floră/vegetație, Romania.

**Introduction.** The family *Mymaridae* is one of the most distinctive of all taxa included in the Superfamily *Chalcidoidea*, characteristic to this Family are the antennal toruli which are quite far apart (3-5 times their own diameter) which is not found in most other chalcidoids (normally at most 1-2 diameter apart), also the mymarid larvae are similar to scelionid larvae (Nikol'skaya 1952); the wing veins are also very reduced. Burks (1979) stated that they were derived from the same stem that produced *Eulophidae*. Yoshimoto (1975, 1990) reviewed the placement of this family by earlier authors who placed it "mid-way in the *Proctotrupoidea*," at "the beginning of the *Proctotrupoidea*," and "after the primitive *Chalcididae*, *Torymidae*, and *Pteromalidae*." Yoshimoto placed the mymarids as evolving "independently from the primitive eurytomid-torymid-like ancestral group before the branching of the chalcid-pteromalid and tetracampid-eulophid lines." Recent

work on the evolutionary relationships (Schauff 1984; Gibson 1986) indicate the mymarids branched off early from the primitive chalcidoid ancestor and they represent a lineage independent of the other chalcidoids. Huber (1986) wrote a complete review of the taxonomic history of the family along with information on their biology and hosts. As in *Trichogrammatidae*, these wasps are egg parasites and are very small (usually less than 1 mm). One genus (*Alaptus*), parasitic on *Psocoptera* eggs, approaches 0.18 mm. The genera have been divided into subfamilies based upon either tarsal number or gastral attachment. Depending upon which character is used first, the placement of higher taxa will be subject to some confusion. Annecke & Doutt (1961) provided the most current world review of the *Mymaridae*, but their system of classification is now regarded as highly artificial and in some cases misleading, but this system has been generally accepted since its publication. The system used by Debauche (1948) and several earlier authors, although far from perfect, provides a better approximation of the true relationships of the family. These authors simply split the family on the basis of tarsal segment number (the *Gonatocerinae* - 5 tarsi and *Mymarinae* - 4 tarsi). Schauff (1984) revised the Holarctic Genera of the *Mymaridae*. Noyes & Valentine (1989) revised the mymarids of New Zealand. Yoshimoto (1990) reviewed the New World genera. A large part of North American *Gonatocerus* and *Anaphes* was revised by Huber (1988, 1992). Huber (in Gibson et al 1997) keyed all the genera for North America.

The Hosts of the *Mymaridae* include eggs of *Hemiptera*, *Homoptera*, *Psocoptera*, *Coleoptera*, *Orthoptera* and *Diptera*. As in the *Trichogrammatidae*, several mymarids attack aquatic insect eggs. Huber (1986) published a comprehensive review of the host of the mymarids. The *Mymaridae* are all believed to be internal, primary parasites of insect eggs (Huber 1986). The *Mymaridae* group is considered rare by many collectors, but this is an artifact of collecting techniques. Only when properly collected the mymarids are among the most abundant of chalcidoids (mymarids and trichogrammatids may often be collected together because of their size and biology). A net may be used for sweeping (the sweepings are dumped directly into alcohol and then the collected material is sorted under a microscope). Egg material will sometimes produce specimens of this family also. The yellow, red and blue pan-traps are very good for collecting both trichogrammatids, eulophids and mymarids (Pricop 2007). The malaise trap works also very well (Noyes 2003).

Their family *Mymaridae* includes *Alaptus magnimius* (0.21 mm, male), one of the smallest discovered species in the class Insecta. The smallest species from this class is *Dicopomorpha echmepterygis* - Fam. *Mymaridae*, males of this species are blind and wingless and measure only 0.139 mm in length. This newly described species replaced *Megaphragma caribea* (Hymenoptera: Trichogrammatidae), which measures 0.170 mm (Gahlhoff 1998). The mymarid females are larger than male and are also much better at flying than the males. Many species swim submerged under the water using their wings as paddles. Mating and egg laying may also occur underwater. An individual of these genera of *Mymaridae* can stay underwater for up to 15 days. To exit the water, they climb onto a stem of an aquatic plant. There are about 1400 species of fairyfly and 100 genera (Huber 1986). Cicada eggs are the most common hosts. Pupation takes place inside the host egg shell. Successful bio-control programs have been launched to parasitise insects feeding on *Eucalyptus* species. Notable programs have occurred in southern Europe, South Africa, South America and New Zealand.

The *Mymaridae* could be a common and helpful parasite in many ecosystems, they are difficult to collect and little is known about them. The *Mymaridae* species like other chalcid families (*Eulophidae*, *Trichogrammatidae*) are the most commonly encountered parasitoids of pest species and have potential as biological control agents against different pests belonging to *Cicadellidae*, *Miridae*, *Membracidae* and *Chrysomelidae* families in different crops or in their natural environment, being also an environmental friendly method (Noyes 2003). These parasitoids attack different eggs in a variety of habitats and crops, but its efficacy appears to vary with host plant species (Graham et al 1986). Field studies in Arizona showed that only *Anaphes iole* successfully parasitized *Lygus* eggs in various plant species sampled, and rates of parasitism ranged from 0-100% (Jackson & Graham 1983; Graham et al 1986). Weekly releases of *A. iole* in

strawberry fields in California resulted in nearly 80% parasitism of *L. hesperus* eggs, and nymphs were suppressed by 43-64% (Norton et al 1992; Udayagiri et al 2000). In addition, *A. iole* attacks eggs of other *Miridae* and *Membracidae*, all of which are embedded in plant tissue (Stoner & Surber 1969; Huber & Rajakulendran 1988). *A. iole* successfully parasitized also eggs of *Nabis americanoferus* Carayon and *N. alternatus* Parshley in the laboratory conditions (Manrique 2003). Many studies reveal the importance of this parasitic wasps, the host management, the fight against the pest species and biology aspects in general; regarding this matter we have to mention the studies of Sahad (1982), Virla (2001), Macgill (1934), Miura (1979), Anderson & Paschke (1968), Conti et al (1996), De Moraes & Mescher (1999), Doult (1959), Stoner & Surber (1969), Sahad (1982), Norton et al (1992), Huber & Rajakulendran (1988), Graham et al (1986), Forster (1847), Enock (1909), Jones (2001).

The *Mymaridae* species are very important for the environment and human population health, because strategies for controlling pests and diseases have tended to focus on short-term, single-technology interventions, particularly chemical pesticides, but in the future we can use chalcids, like the mymarids which are exclusively egg parasitoids, to control the population growth of some pest-species. The distribution of this species is important for future studies on pest control, for a better management of the productivity and the biodiversity and also as an environmental bio-indicator method.

The Family *Mymaridae* was studied in Romania by: Radu & Boțoc (1958, 1960); Boțoc (1959, 1962, 1963a, 1963b, 1964, 1965, 1972, 1974, 1975); Andriescu (1993, 1996); Dimitriu (2001), Pricop (2007, 2008abc). All the *Mymaridae*, are exclusively egg parasitoids (Huber 1986).

**Material and Method.** The species were collected with an entomological sweep-net in the grass-land vegetation, between 2005 and 2006, from some areas of the North-East of Romania, Neamț county.

The material, collected in the sweep-net, was examined with a stereomicroscope, we also use the insect potter (aspirator) to collect in the field the insects from the sweep-net Noyes (2003). The specimens were mounted in *Faure's medium*, or pointed on cardboards (*dry mounted*) and examined with the stereomicroscope and an optical microscope. We have illustrated the morphology of the specimens utilizing microphotography's obtained with a camera attached to the optical microscope (Figure 2 and 3). For the identification we had use papers published by Bakkendorf (1934), Baquero & Jordana (1999), Chiappini (1989, 2002), Debauche (1948), Donev (1998), Hincks (1952, 1959), Huber (1988, 1992), Noyes (2003), Soyka (1956), Triapitsyn (2003), Triapitsyn & Berezovskiy (2004), Mathot (1969), Haliday (1833), Girault (1911), Viggiani (1988), Viggiani & Jesu (1988).

The studied area is in the center of Neamț county, near the city Piatra Neamț. For a better interpretation of the data we also have used maps (Figure 1) and a table (see Table 1) to illustrate the specific areas of investigation and the biodiversity aspects. The sites are: 1 - Batca Doamnei-Doamna area, 2 - Sărata area, 3 - Cârlomanu hill, 4 - Cozla hill, 5 - Pietricica hill (Figure 1 and 2).

In some cases the vegetal material, collected in the sweep - net, was examined with a stereomicroscope (a time consuming method), in other cases I use the insect potter (aspirator) to collect the insects from the sweep - net, in the field (a less time consuming method).

The Northern Goșmani Mountains represent also an area of special interest for the herpetofauna through the presence of several species of community interest which are strictly protected at a national level which are present in the area in a very high abundance. This is especially important in the case of *Lissotriton montandoni*, and endemic species of the Carpathian basin (Gherghel et al 2008).

The collected specimens of *Mymaridae* were mounted in *Faure's medium*, or pointed on cardboards (*dry mounted*) and examined with the stereomicroscope or an optical microscope. The examination of all the vegetal material (in alcohol - 70<sup>0</sup>), with the stereomicroscope, collected in the sweep - net is a better method, compared with the insect potter method (aspirator), because the smaller specimens (< 1 mm) are not

escaping in case we decide to collect all the vegetal material. All the material was collected by the authors. We have illustrated the morphology of the wings, veins and female antennas of some species, utilizing microphotography techniques (Figure 3 and 4).

**Results and Discussion.** The aim of our investigation was to identify the species of *Mymaridae* present in the grass land vegetation near the city Piatra Neamț – Batca Doamnei-Doamna, Sărata, Cârlomanu, Cozla and Pietricica hills (Figure 1, and 2).

In this paper we assume that between the *Mymaridae* species and the flora/vegetation are some links seen as trophic interactions, not only as parasitoid-host-plant interaction complex, (is well known that the different host are plant eaters), but also as parasitoid-plant interactions, is also known that the mature parasitoids are feeding with nectar produced by the different plant species (Lewis et al 1998), also is known that the demography (growth, survival, sex ratio etc.) and also the behavior of the parasitoids is directly influenced by the plants on which their hosts feed (Fox et al 1996). Is also known that the plant fertilisation regime is influencing the trophic interaction between plants, hosts and parasitoids (Jansson 2003). Studying insect-plant interactions, not only can this help improve ecological understanding but it may enable us to improve the biological control (Poppy 1997). The release of volatile compounds by plants is influencing the foraging behavior of parasitoids (de Moraes et al 2000). Different plant-parasitoid interactions are also revealed by Van Loon et al (2000) and Godfray (1994).

We had studied the flora and vegetation in order to correlate the different species of plants and the vegetation with the presence of certain *Mymaridae* species. The studied material was collected from areas predominated by plant species - grasses (*Fam. Poaceae* (=Gramineae)), in general vascular plants, species that are found in abundance, depending on area, altitude and climate, the common ones, from which we had collected the material, Piatra Neamț region (Gosmani and Stânișoarei mountains including Cozla and Pietricica) are: *Alopecurus pratensis* L., *Agrostis capilaris* L., *Agrostis stolonifera* L., *Agropyron cristatum* (L.) Gaertn., *Agropyron repens* (L.) Beauv., *Bothriochloa ischaemum* (L.) Keng., *Briza media* L., *Bromus* spp., *Calamagrostis* spp., *Chrysopogon gryllus* (L.) Trin., *Cynodon dactylon* (L.) Pers., *Dactylis glomerata* L., *Digitaria sanguinalis* (L.) Scop., *Fesuca rubra* L., *Festuca valesiaca* Schleich., *Lolium perenne* L., *Melica* spp., *Poa* spp. and *Phragmites australis* (Cov.); we have to mention other non - woody species of plants, very rarely woody plants, associated with many species from above: *Achillea millefolium* L., *Achillea distans* Waldst. & Kit. ex Willd., *Alchemilla* spp., *Agimonia eupatoria* L., *Ajuga genevensis* L., *Alliaria officinalis* L., *Alliums* spp., *Amaranthus* spp., *Anemone* spp., *Arabis* spp., *Arctium lappa* L., *Aristolochia clematidis* L., *Arnica montana* L., *Artemisia* spp., *Asarum europaeum* L., *Asperula* spp., *Atriplex* spp., *Bellis perennis* L., *Betonica officinalis* (L.), *Borago* spp., Trev., *Bunias* spp., *Caltha palustris* L., *Campanula* spp., *Capsella bursa-pastoris* L., *Cardaria draba* (L.) Desv., *Carduus acanthoides* L., *Carduus* spp., *Carex* spp., *Carum carvi* L., *Centaurea cyanus* L., *Centaurea* spp., *Centaureum* spp., *Chelidonium majus* L., *Cichorium intybus* L., *Cicuta virosa* L., *Cirsium arvense*, *Clematis* spp., *Conium maculatum* L., *Crataegus monogyna* Jacq., *Crepis* spp., *Cypripedium calceolus* L., *Datura* spp., *Daucus carota* L., *Dianthus* spp., *Dipsacus sylvestris* Hudson, *Dryopteris* spp., *Echium vulgare* L., *Erodium cicutarium* (L.) L'Her., *Eryngium campestre* L., *Equisetum* spp., *Epilobium* sp., *Euphorbia* spp., *Filipendula vulgaris* Moench., *Fragaria vesca* L., *Galeopsis* spp., *Galium aparine* L., *Galium verum* L., *Galium mollugo* L., *Geranium pratense* L., *Geum urbanum* L., *Geum aleppicum* Jacq., *Gentiana asclepiadea* L., *Glechoma hederacea* L., *Hepatica trassilvanica* Fuss., *Heracleum* spp., *Hieracium lactucella* Wallr., *Hieracium bauhini* Besser, *Hieracium bifidum* Kit. ex Hornem., *Hieracium cymosum* L., *Hieracium echioides* Lumn., *Hieracium hoppeanum* Schultes, *Hieracium lachenalii* Gmelin, *Hieracium murorum* L., *Hieracium pilosella* L., *Hieracium sabaudum* L., *Hieracium umbellatum* L., *Hieracium transsylvanicum* Heuffel (this species of *Hieracium* are found on Gosmani mount. except *H. pilosella* and *H. transsylvanicum* which are present also on Cârlomanu hill), *Hordeum murinum* L., *Homogyne alpina* (L.) Cass., *Hypericum maculatum* Cr., *Hypericum perforatum* L., *Hypericum hirsutum* L.,

*Hypochoeris* spp., *Inula* spp., *Juncus* spp., *Juniperus communis* L., *Knautia arvensis* (L.) Coulter, *Lamium* spp., *Leontodeon* spp., *Leonurus* spp., *Linaria vulgaris* Mil., *Linum* spp., *Luzula* spp., *Lycopus europaeus* L., *Lythrum salicaria* L., *Malva* spp., *Marrubium vulgare* L., *Matricaria* spp., *Medicago sativa*, *Melampyrum bihariense* Cern., *Melampyrum* spp., *Melilotus officinalis* (L.) Medik., *Mentha longifolia* (L.) Nath., *Mentha aquatica*, *M. x verticillata*, *Nepeta cataria* L., *Nepeta* spp., *Nigritella rubra* (Wettst.) Richter, *Ononis* spp., *Origanum vulgare* L., *Petasites* spp., *Phlomis* spp., *Plantago* spp., *Polygonum* spp., *Potentilla anserina* L., *Potentilla* spp., *Prunella vulgaris* L., *Pulmonaria mollis* Wulfen ex Hornem., *Ranunculus* spp., *Ranunculus acris* L., *Rumex* spp., *Salvia glutinosa* L., *Salvia nemorosa* L., *Salvia nemorosa* L., *Salvia* spp., *Sanicula europaea* L., *Sedum maximum* (L.) Hoffm., *Sedum* spp., *Silene* spp., *Sinapis* sp., *Sonchus oleraceus* (L.), *Stachys* spp., *Stellaria media* (L.) Vill., *Stelaria* spp., *Symphytum* spp., *Tanacetum vulgare* L., *Thymus longicaulis* Presl, *Thymus* spp., *Teucrium* spp., *Tragopogon pratensis* L., *Trifolium pretense* L., *Trifolium repens* L., *Telekia speciosa* Schreb., *Trifolium* spp., *Tussilago farfara* L., *Urtica dioica* L., *Veratrum* spp., *Verbascum* spp., *Veronica chamaedrys* L., *Veronica austriaca* L., *Veronica officinalis* L., *Vicia* spp., *Viola alba* Besser., *Viola hirta* L., *Xanthium* spp.; we have to mention also the common woody plant species, present in this region (Piatra Neamț area, Gosman and Stânișoarei mountains): – *Abies alba* Millar., *Acer pseudoplatanus* L., *Acer platinoides* L., *Betula pendula* Roth, *Carpinus betulus* L., *Fagus sylvatica* L., *Juniperus communis* L. (introduced on Cernegura Mountain; natural dissemination on Cârlomanu hill), *Quercus petraea* L., *Picea abies* (L.) Karsten, *Pinus sylvestris* L., *Pinus strobus* L., (*P. strobes* - introduced on the Cernegura Mountains-Gosman), *Salix* spp., *Ulmus minor* Mill.; this plant species was identified with the help of the scientific literature published by Ciocârlan (2000); some species from above are important medicinal plants, cultivated also *ex situ*. The flora and the vegetation of this region was studied by Mititelu et al (1985, 1986).

The North of Gosmani Mountains has an important flora, in a previous paper (Gherghel et al 2008), we presented the aquatic habitats from Gosmani Mountains that have a rich floristic composition, comprising of species such as: *Alisma plantago-aquatica*, *Caltha palustris*, *Carex appropinquata*, *C. acutiformis*, *C. cariophyllea*, *C. digitata*, *C. distans*, *C. divulsa*, *C. hirta*, *C. humilis*, *C. ovalis*, *C. michelii*, *C. pairaei*, *C. pendula*, *C. pilosa*, *C. praecox*, *C. remota*, *C. riparia*, *C. sylvatica*, *C. tomentosa*, *C. vulparia*, *Lysimachia nummularia*, *Cladophora* sp., *Epilobium* sp., *Galium palustre*, *Juncus thomasi*, *Juncus* sp., *Lythrum salicaria*, *Lycopus europaeus*, *Mentha aquatica*, *M. x verticillata*, *M. longifolia*, *M. pulegium*, *Pedicularis palustris*, *Phragmites australis*, *Spyrogira* sp., *Veronica anagalis-aquatica*, *V. beccabunga*, *Typha angustifolia*, *T. Latifolia* (Mititelu et al 1985, 1986; Ciocârlan 2000; Gherghel et al 2008). A few plant species were given as new to the North of Gosmani Mountains: *Gymnodenia conopsea*, *Hepatica transsilvanica*, *Lythrum salicaria*, *Lycopus europaeus*, *Mentha x verticillata*, *Nigritella rubra*, *Epilobium* sp. and *Hieracium pojoritense* (Pricop, unpublished data in Gherghel et al 2008). After the re-examination of the vegetal material from the *Herbarium*, we have to mention that *Hieracium pojoritense* Woloszczah has not been yet found in the Northern Gosmani Mountains and *Hepatica transsilvanica* was mentioned before from Gosmani Mountains by Mititelu et al (1985).

The plant species *Juniperus communis* subsp. *communis* and *Homogyne alpina* from Cârlomanu hill (growing from 350 to 500m elevation), are identified for the first time from Piatra Neamț area; this species reflect the harsh climate from Cârlomanu hill and reflect also the low temperatures registered in the winter time. Also the plant species *Hypericum hirsutum* from Pietricica hill and *Pinus strobus* from Cernegura-Gosmani were identified for the first time in those areas.

The plant species: *Arnica montana*, *Cypripedium calceolus* from Northern Gosmani Mountains and the *Coleoptera* species: *Lucanus cervus* found on June – 2008 from Cârlomanu hill are strictly protected by the Berne Convention and OUG no 57-20/06/2007.

We have also identified a few plant associations from the areas where the material was collected:

- *Andropogonetum ischaemi* (Krist.) I. Pop: Batca Doamnei-Doamna, Cârlomanu

- *Agrostidetum tenuis-Festucetum rupicolae* Puşcaru et al: Sărata
- *Agrostidetum tenuis* Szafer, Pawl. & Kulez: Batca Doamnei-Doamna, Cârlomanu, Cozla
- *Medicagini - Festucetum valesiaca*e Wagner: Pietricica
- *Pruno spinosae - Crataegetum* Soó: Cozla and Pietricica
- *Calthetum palustris* Borza: Cozla
- *Trifolio - Lolietum* Krippelova: Cârlomanu
- *Sambucetum ebuli* Kaiser: Sărata

In this paper we reveal the status and the distribution of 14 identified species of Mymaridae from the studied areas, except the *Polynema (Polynema) spp.*:

### Tribe Anagrini

#### Genus *Anagrus* Haliday

##### 1) *Anagrus atomus* (Linnaeus 1767)

**Material examined:** 1♀ collected on 13.08.2006, from Batca Doamnei and 1♀ collected on 24.08.2005 from Sărata (Table 1, Figure 1).

**Host:** *Tettigella viridis* L. (Hem. Jassidae), *Conomelus anceps* Germ., *Delphacodes fairmairei* Perr., *Megamelus notula* Germ., (Hem. Delphacidae), *Tettigonia viridis* L. (Orthopt., Tettigoniidae), *Cicadula sexnotata* Fal. (Hem. Cicadellidae), and (Odonata, Agrionidae) (Chiappini 1989; Noyes 2002).

**Distribution:** Austria, England, Belgium, Denmark, Italy, Romania, Bulgaria, Russia, Argentina, Canada, Chile, China, Croatia, Egypt, Finland, France, Germany, Greece, Iran, Israel, Kyrgyzstan, Macedonia, Moldova, New Zealand, Pakistan, Poland, Korea, Serbia, Spain, Sweden, Switzerland, Turkey, Turkmenistan and USA (Triapitsyn 1978; Triapitsyn & Berezovskiy 2004; Triapitsyn & Berezovskiy 2004). *A. atomus* it is a common species in Romania.

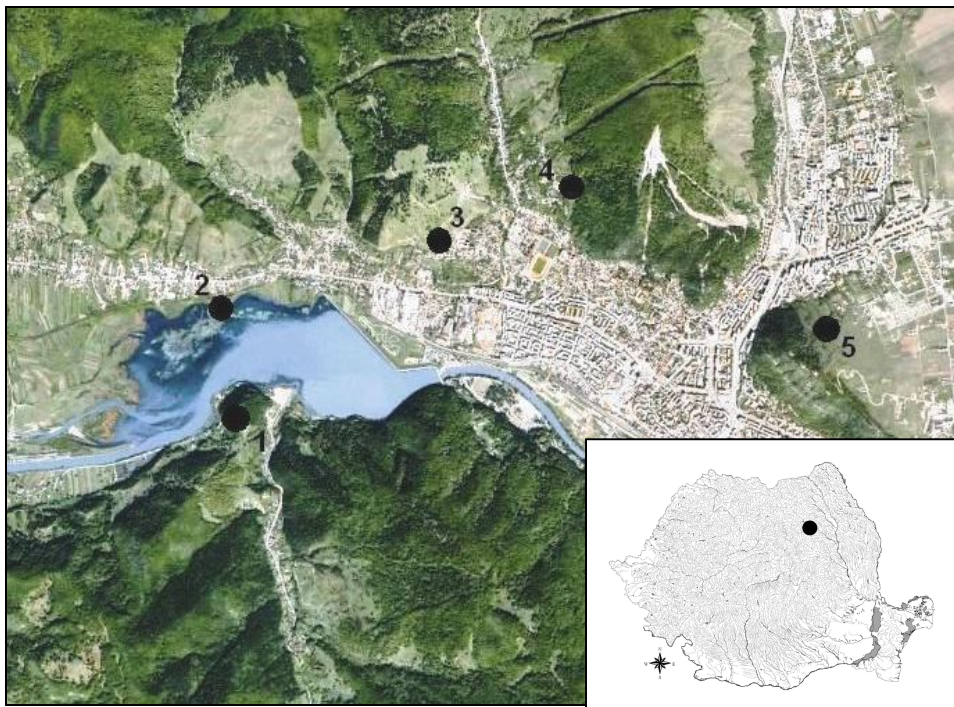


Figure 1. The general map of Romania and the map with the sites of the species distribution; 1- Batca Doamnei – Doamna area, 2 - Sărata area, 3 - Cârlomanu hill, 4 - Cozla hill, 5 - Pietricica hill.

## 2) *Anagrus breviphragma* (Soyka 1955)

**Material examined:** 1♀ and 2♂ collected on 16.09.2006 from the Pietricica hill, (Table 1; Figure 1, 2 and 3) (Piatra Neamț district).

**Host:** *Cicadella viridis* L. (Hem. Cicadellidae), (Chiappini 1989, 2002; Moratorio & Chiappini 1995); *Dalbulus maidis* De Long (Hem. Cicadellidae); *Conomelus anceps* Germar, *Delphacodes kuscheli* Fennah, *Peregrinus maidis* Ashmead, *Dicranotropis hamata* Boheman, *Muellerianella fairmairei* Perris (Hem. Delphacidae); *Orthotylus virescens* Douglas & Scott (Hem. Miridae), *Tettigella viridis* L. (Hem. Cicadellidae), (Moratorio & Chiappini 1995; Oliveira & Lopez 2000; Triapitsyn & Berezovskiy 2004).

**Distribution:** Argentina, Austria, Belgium, Brazil, Bulgaria, Colombia, France, Germany, Greece, Guadeloupe, Guyana, Hungary, Italy, Japan, Kirgizia, Peoples' Republic of China, Russia, Sweden, United Kingdom and Romania (Donev 1998; Soyka 1956; Triapitsyn & Berezovskiy 2004). *A. breviphragma* it is a common species.



A – Pietricica hill



B - Sărata area, Batca Doamnei Lake and Cernegura Mountain



C – The West Cozla hill



D – Cârlomanu hill on the right and Batca Doamnei – Doamna area (Gosmani) left

Figure 2. The areas of study and the city Piatra Neamț (original)

## Genus *Litus* Haliday

### 3) *Litus cynipseus* (Haliday 1833)

**Material examined:** 1♀ collected on 15.08.2006, from Cozla hill (Table 1; Figure 1, 2, 3 and 4).

**Host:** *Ocypus* sp., *Staphylinus* sp., *Staphylinus olens* (Col., Staphylinidae); *Limnobates* sp. (Col., Hydrometridae) (Hincks 1950).

**Distribution:** Austria, Belgium, England, Czech Republic, Germany, Italy, Bulgaria, Denmark, Finland, France, Greece, Hungary, Slovenia, Spain, Sweden, Switzerland, Turkey, Yugoslavia, Romania, Morocco, Netherlands, Russia, Japan, Korea, Kirgizia, Mexico, Nepal, USA (Trjapitzin 1978; Noyes 2002). *Litus cynipseus* is rare in Romania.

## Subfamily *Mymarinae*

### Tribe *Anaphini*

#### Genus *Anaphes* Haliday

##### Subgenus *Anaphes* Haliday

#### 4) *Anaphes (A.) fuscipennis* (Haliday) (= *A. pratensis* Forster)

**Material examined:** 1♀ collected on 14.08.2005 from Batca Doamnei-Doamna; 2♀ - 2.09.2005 from Cârlomanu hill; 1♀ - 11.08.2005 from Batca Doamnei-Doamna (Table 1; Figure 1, 2 and 4).

**Host:** *Leptinotarsa decemlineata* (Col., Chrysomelidae); *Hypera* sp., *Hypera postica*, *Hypera punctata*, *Sitona humeralis* (Col., Curculionidae); *Lygus* sp., *Lygus pratensis*, *Lygus rugulipennis* (Hem., Miridae) (Noyes 2002).

**Distribution:** Austria, England, Czech Republic, Germany, France, Italy, Poland, Romania, Netherlands, USA (Trjapitzin 1978; Noyes 2002). *A. fuscipennis* is a common species in Romania.

##### Subgenus *Patasson* Walker

#### 5) *Anaphes (P.) near diana* (Girault)

**Material examined:** 1♀ collected on 22.05.2006, Pietricica hill (Table 1; Figure 1 and 2).

**Host:** *Sitona hispidulus* Fabricius, *S. humeralis* Stephens, *S. lineatus* L. (Col., Curculionidae) (Aeschlimann 1980).

**Distribution:** Europe, southwestern Asia, Canada and SUA (Noyes 2002). *Anaphes (P.) diana* it is a common species found also in *Medicago sativa* fields (Pricop 2008c). *A. diana* is a common species in Romania.

#### Genus *Erythmelus* Enock

##### Subgenus *Paralleaptera*

#### 6) *Erythmelus (P.) rex* (Girault 1911)

**Material examined:** 1♀ and 1♂ collected on 16.09.2006 from the Cârlomanu hill (Table 1; Figure 1 and 2) (Piatra Neamț district).

**Host:** *Adelphocoris* sp., *Lygus hesperus* Knight (Hem., Miridae); *Circulifer* sp., *Circulifer tenellus* Baker, *Eutettix* sp., *Eutettix tenellus* Baker (Hem., Cicadellidae); *Corythaica venusta* Cha., *Dictyla nassata* Put., *Derephysia foliacea* Fall., *Nealiturus tenellus* Bak. (Hem., Tingidae) - (Triapitsyn 2003).

**Distribution:** Austria, Canada, France, Greece, Iran, Kirgizia, Mexico, Russia, Spain, Turkmenistan, United Kingdom, Romania and USA (Girault 1911; Triapitsyn 2003). *Erythmelus rex* it is a very rare species, the Cârlomanu hill it is the only place where it was found in Romania.

### Tribe *Ooctonini*

#### Genus *Gonatocerus* Nees

#### 7) *Gonatocerus near litoralis* (Haliday 1833)

**Material examined:** 3♀ and 2♂ collected by Pricop on 16.09.2006 from the Cârlomanu hill – 350 m elevation (Piatra Neamț district), (Table 1; Figure 1 and 2).

**Host:** *Cicadula sexnotata* Fallen and *Acocephalus* sp. (Hom., Cicadellidae) (Matthews 1986)

**Distribution:** England (Haliday 1833), Germany, Austria, Belgium (Debauche 1948), Iberian Peninsula, Romania, Australia and Japan (Sahad & Hirashima 1984, in Noyes 2002). The *litoralis* group of the genus *Gonatocerus* it is complex and further work is needed to elucidate the taxonomy of this "complex of species".



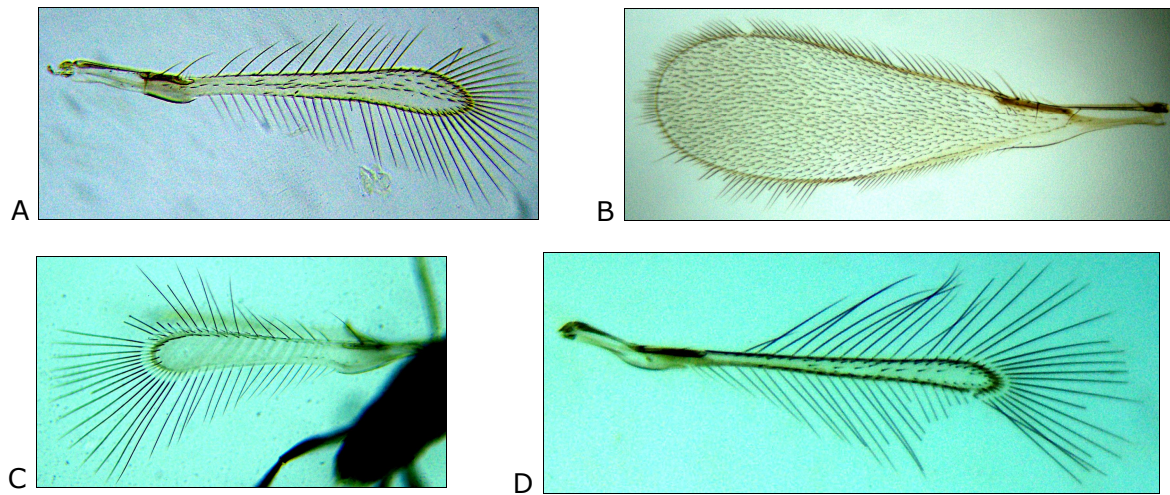


Figure 3. Wings: A - *Anagrus breviphragma* (Soyka 1955); B - *Gonatocerus longicornis* (Nees 1834); C - *Erythmelus (P.) rex* (Girault 1911); D - *Litus cynipseus* (Haliday 1833) (original)

### 8) *Gonatocerus longicornis* (Nees 1834)

**Material examined:** 2♀ collected 21.08.2005 from Cozla hill; 2♀ - 24.08.2005 from Sărata; 2♂ - 2.09.2005 from Cârlomanu hill; 2♀ - 3.08.2006 from Cârlomanu hill; 1♀ - 6.08.2006 from Cozla hill (Table 1; Figure 1, 2 and 3).

**Host:** *Hom.*, *Cicadellidae* (Matthews 1986)

**Distribution:** West and Central Europe (Trjapitzin 1978; Noyes 2002). *Gonatocerus longicornis* it is a common species in Moldova.

### 9) *Gonatocerus pictus* (Haliday 1833)

**Material examined:** 1♀ collected on 9.08.2005, from Cozla hill (Table 1; Figure 1 and 2), Piatra Neamț district.

**Host:** Unknown

**Distribution:** England, Belgium, Austria, Iberian Peninsula and Romania (Trjapitzin 1978; Noyes 2002). *Gonatocerus pictus* is a rare species in Romania.

### 10) *Gonatocerus sulphuripes* (Förster 1847)

**Material examined:** 1♀ collected on 11.08.2005 from Batca Doamnei-Doamna; 2♀ - 14.08.2005 from Batca Doamnei-Doamna; 1♀ - 21.08.2005 from Cozla hill; 1♀ and 3♂ - 2.09.2005 from Cârlomanu hill; 2♀ and 1♂ - 3.08.2006 from Cârlomanu hill; 1♂ - 9.08.2006 from Cozla hill; 1♀ - 21.09.2006 from Cozla hill (Table 1; Figure 1 and 2).

**Host:** Unknown.

**Distribution:** England (Forster 1847), Denmark (Bakkendorf 1934), Belgium (Debauche 1948), Poland and Germany (Soyka 1956), Iberian Peninsula (Baquero & Jordana 2002), Romania and Japan (Noyes 2002); probably Palaearctica. *Gonatocerus sulphuripes* it is one of the most common species and also is very variable in Romania and in Europe. I have collected also 2♀ - 24.08.2008 of *G. sulphuripes* from the experimental fields of "Stejarul" Biological Research Center, Piatra Neamț - 6. Alexandru Cel Bun Str.; fields cultivated with medicinal plants: *Ajuga spp.*, *Aquilegia sp.*, *Angelica archangelica*, *Aralia manshurica*, *Asclepias sp.*, *Atropa belladonna*, *Calendula officinalis*, *Corydalis solida*, *Cynara scolymus*, *Datura innoxia*, *Digitalis spp.*, *Echinacea angustifolia*, *Echinacea purpurea*, *Foeniculum vulgare*, *Geum aleppicum*, *Geum rivale*, *Geum urbanum*, *Hypericum perforatum*, *Hyssopus officinalis*, *Lavanda angustifolia*, *Mahonia aquifolium*, *Mentha x piperita*, *Mentha viridis*, *Mycelis muralis*, *Ocimum basilicum*, *Origanum vulgare*, *Rhodiola rosea*, *Sanguisorba minor*, *Sedum hybridum*, *Sedum fabaria*, *Tagetes spp.*, *Thymus vulgare*, *Vinca minor* and some ruderal species that are also present in Piatra Neamț: *Achillea millefolium*, *Agropyron repens*, *Alopecurus spp.*, *Arabidopsis thaliana*,

*Capsella bursa-pastoris*, *Chelidonium majus*, *Dactylis glomerata*, *Glecoma hederacea*, *Lamium album*, *Lamium maculatum*, *Lolium perene*, *Malva neglecta*, *Onopordon acantium*, *Polygonum aviculare*, *Stellaria media*, *Veronica hederifolia*, *Veronica polita*, *Taraxacum officinalis*.

### **Genus *Ooctonus* Haliday**

#### **11) *Ooctonus vulgatus* (Haliday 1833)**

**Material examined:** 1♀ collected on 24.08.2005 from Sărata and 1♀ - 11.08.2005 from Batca Doamnei (Table 1; Figure 1, 2 and 4) (Piatra Neamț district).

**Host:** *Sciara analis*, (Dipt., Sciaridae).

**Distribution:** Austria, Belgium, Czech Republic, Denmark, Germany, Italy, Norway, Sweden, United Kingdom and Romania (Bakkendorf 1934; Walker 1846; Förster 1847; Viggiani & Jesu 1988; Noyes 2002). *O. vulgatus* it is a rare species in Romania, is found for the first time in Moldova.

### **Tribe *Mymarini***

#### **Genus *Mymar* Curtis**

#### **12) *Mymar pulchellum* (Curtis 1832)**

**Material examined:** 1♀ collected on 5.08.2006 from Cârlomanu hill (Table 1; Figure 1, 2 and 4), Piatra Neamț district.

**Host:** Unknown

**Distribution:** Belgium, England, Czech Republic, Danish mainland, Germany, Sweden, France, Moldova, Russia, Romania, Ukraine, Netherlands, USA and New Zealand (Bakkendorf 1934; Walker 1846; Förster 1847; Viggiani & Jesu 1988; Noyes 2002). *Mymar pulchellum* it is a rare species in Romania.

### **Genus *Stepahnodes* Förster**

#### **13) *Stepahnodes similis* (Förster 1847)**

**Material examined:** 1♀ and 1♂ coll. on 20.08.2005, from Cozla (Table 1; Figure 1, 2 and 4).

**Host:** Unknown

**Distribution:** Austria, Belgium, Croatia, Cyprus, Czech Republic, Denmark, Danish mainland, Finland, France, Germany, Hungary, Italy, Macedonia, Norway, Poland, Romania, Sweden, Spain, Switzerland, Ukraine, United Kingdom and USA (Bakkendorf 1934; Walker 1846; Förster 1847; Viggiani & Jesu 1988; Noyes 2002). *Stepahnodes similis* it is a common species in Moldova.

### **Genus *Polynema* Haliday**

#### **14) *Polynema (Maidliella) vakenburgense* (Soyka 1931)**

**Material examined:** 1♀ collected on 21.08.2006 from Cozla hill (Table 1; Figure 1 and 2), Piatra Neamț district.

**Host:** Unknown

**Distribution:** Belgium, Netherland, Romania, Sweden, Switzerland and United Kingdom (Bakkenthdorf 1934; Walker 1846; Förster 1847; Viggiani & Jesu 1988; Noyes 2002). *Polynema vakenburgense* it is a very rare species in Romania, the species is found for the first time in Moldova.

Table 1

The distribution of the mymarids species in the studied areas, with the map sites

No	Species	Sarata area, (site - 2)	Batca Doamnei area, (site - 1)	Cârlomanu hill, (site - 3)	Cozla hill, (site - 4)	Pietricica hill, (site - 5)
1	<i>Anagrus atomus</i> (Linnaeus)	+	+	-	-	-
2	<i>Anagrus breviphragma</i> (Soyka)	-	-	-	-	+
3	<i>Litus cynipseus</i> (Haliday)	-	-	-	+	-
4	<i>Anaphes (A.) fuscipennis</i> (Haliday)	-	+	+	-	-
5	<i>Anaphes (P.) near diana</i> (Girault)	-	-	-	-	+
6	<i>Erythmelus (P.) rex</i> (Girault)	-	-	+	-	-
7	<i>Gonatocerus near litoralis</i> (Haliday 1833)	-	-	+	-	-
8	<i>Gonatocerus longicornis</i> (Nees)	+	-	+	+	-
9	<i>Gonatocerus pictus</i> (Haliday)	-	-	-	+	-
10	<i>Gonatocerus sulphuripes</i> (Förster)	-	+	+	+	-
11	<i>Ooctonus vulgatus</i> (Haliday)	+	+	-	-	-
12	<i>Mymar pulchellum</i> (Curtis)	-	-	+	-	-
13	<i>Stepahnodes similis</i> (Förster)	-	-	-	+	-
14	<i>Polynema vakenburgense</i> (Soyka)	-	-	-	+	-

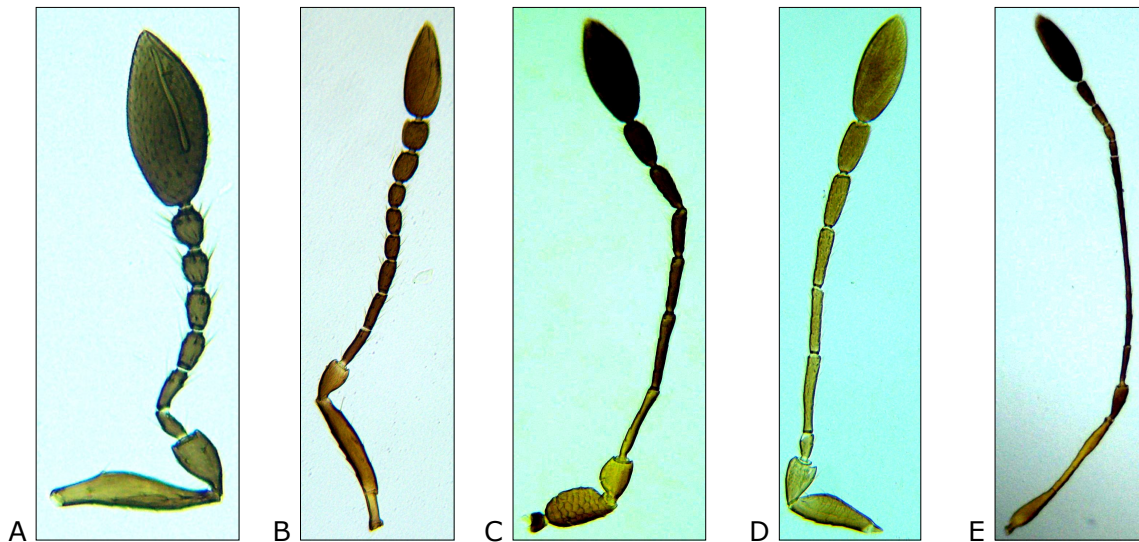


Figure 4. Antennas: A - *Litus cynipseus* (Haliday 1833); B - *Ooctonus vulgatus* (Haliday 1833); C - *Stepahnodes similis* (Förster 1847); D - *Anaphes (A.) fuscipennis* (Haliday), E - *Mymar pulchellum* (Curtis 1832) (original)

**Conclusions.** We had presented 14 species of *Mymaridae*, present in the Romanian fauna: *Anagrus atomus* (Linnaeus 1767), *Anagrus breviphragma* (Soyka 1955), *Litus cynipseus* (Haliday 1833), *Anaphes (A.) fuscipennis* (Haliday 1833), *Anaphes (P.) diana* (Girault 1911), *Erythmelus (P.) rex* (Girault 1911), *Gonatocerus litoralis* (Haliday 1833), *Gonatocerus longicornis* (Nees 1834), *Gonatocerus pictus* (Haliday 1833), *Gonatocerus sulphuripes* (Förster 1847), *Ooctonus vulgatus* (Haliday 1833), *Mymar pulchellum* (Curtis 1832), *Stepahnodes similis* (Förster 1847) and *Polynema vakenburgense* (Soyka 1931) collected from grass-land vegetation, areas of Neamț county. In the grass-land, from the studied areas the most abundant species are from the genera *Gonatocerus* Nees and *Anaphes* Haliday. The species *Erythmelus (P.) rex* (Girault 1911) was found in Romania only on the grass-land vegetation of the Cârlomanu hill - site 3 (Fig. 1) (Pricop 2008abc). From this data we see that *A. breviphragma* and *A. diana* are species that prefer a stepic habitat, *A. fuscipennis* appears to be related with the *Bothriochloa ischaemum* vegetation and *O. vulgatus* probably prefers a habitat related to Batca Doamnei Lake. Future studies are needed to elucidate the species distribution.

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- \*\*\*LEGEA nr. 13 din 11 martie 1993 pentru aderarea Romaniei la Conventia privind conservarea vietii salbatice si a habitatelor naturale din Europa, adoptata la Berna la 19 septembrie 1979. Anexa nr. 2: Specii de faună strict protejate.
- \*\*\*OUG nr. 57 din 20/06/2007, privind regimul ariilor naturale protejate, conservarea habitatelor naturale, a florei și faunei sălbatice, Anexa Nr. 4A, Specii de Interes Comunitar. Specii de animale și de plante care necesită o protecție strictă.



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