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## SAWFLIES (HYMENOPTERA, SYMPHYTA) IN THE BIOTOPES OF KOPAČKI RIT

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During 2003, entomological investigations were carried out into the sawflies (Hymenoptera, Symphyta) of Kopački rit Nature Park, supported by the Ministry of Culture, project Insect Research, and by the Ministry of Science, Education and Sports project Entomofauna of Kopački rit. At three groups of stations: inundated, forest and open ground (a total of 8 stations) a total of 220 individuals were sampled selectively with a net and with sticky tablets. From this material, 73 species of sawfly were determined. There is a clear differentiation of the inundated area at which the presence of only 15 species was recorded, but with great abundance, 7 species being recorded only in such kind of habitat (they were recorded only in the inundated area). This investigation also demonstrated that the borderline area between forest and meadow was the best habitat for the sawfly. At this kind of station in Tikveš, the presence of 35 species was recorded.

**Key words:** sawflies, Kopački rit, biotic diversity

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Tijekom 2003. obavljena su entomološka istraživanja osa biljarica (Hymenoptera, Symphyta) na području Parka Prirode Kopački rit uz financijsku potporu Ministarstva kulture (projekt Istraživanje kukaca) i Ministarstva znanosti, obrazovanja i športa (projekt Entomofauna Kopačkog rita). Na tri skupine postaja: poplavnom, šumskom i otvorenom prostoru (ukupno 8 postaja) selektivno mrežicom i ljepljivim pločama uzorkovano je 220 jedinki. Iz tog materijala determinirane su 73 (taksona) vrste osa biljarica. Jasno se razlikuje poplavni prostor na kojemu je zabilježeno prisustvo samo 15 vrsta velike brojnosti, od kojih je 7 vrsta karakteristično za takvo stanište (zabilježene su samo na poplavnom prostoru). I ovim istraživanjem je dokazano da je granično područje šume i livade najbolje stanište za ose biljarice. Na takvoj postaji u Tikvešu zabilježeno je 35 vrsta.

**Ključne riječi:** ose biljarice, Kopački rit, biotska raznolikost

## INTRODUCTION

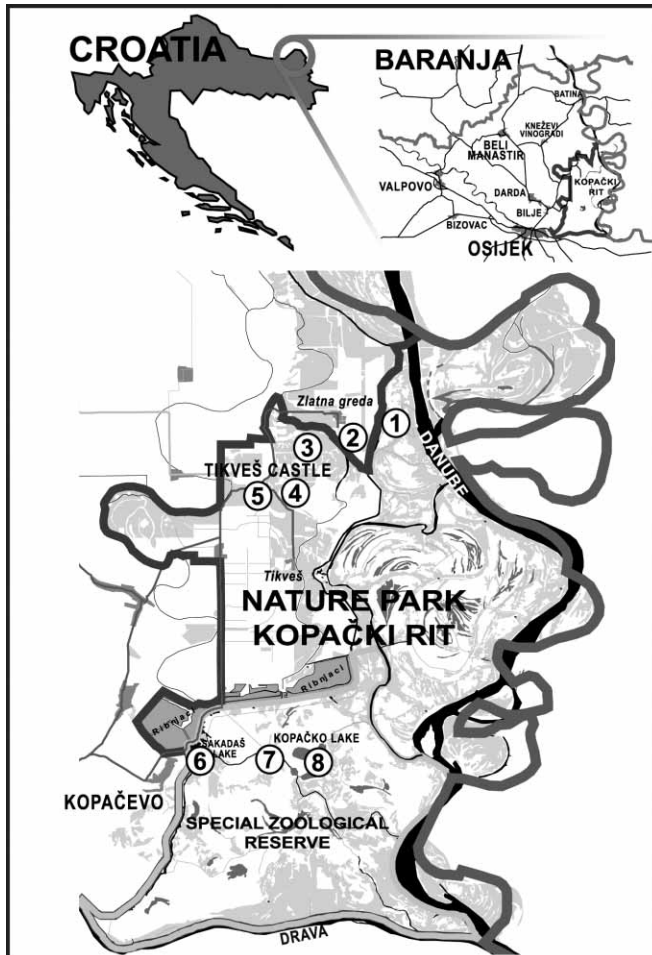
The fauna and ecology of birds in Kopački rit is well known (MIKUSKA, 1979); the fauna of other vertebrates has been relatively well treated (MIKUSKA, 1981) but the insect fauna is still fairly unknown. Research into insects has been carried out unsystematically and sporadically. Thus the more up-to-date papers speak of the fauna and ecology of the mosquitoes (MERDIĆ, 1993; MERDIĆ & LOVAKOVIĆ, 1999), butterflies (KRČMAR *et al.*, 1996; KRČMAR, 2002), the horseflies (KRČMAR, 2004), dragonflies (BOGDANOVIĆ *et al.*, 2002) and somewhat older works discuss species of order Psocoptera (KALINOVIĆ *et al.*, 1980) as do some more recent papers (KALINOVIĆ & IVEZIĆ, 1996).

Kopački rit is an unusually well conserved floodplain area of lowland rivers in which the main characteristic is its periodical inundation. In a habitat that is so variable because of the effects of the water, diverse types of vegetation are to be encountered. On the one hand there are diverse types of forest communities (*Galio-Salicetum albae*, *Salici-Populetum nigrae*, *Populetum nigro-albae*, *Genisto elatae-Quercetum roboris*), and on the other well-developed wetland/marsh vegetation (7 communities of reeds and tall rushes from the class *Phragmiti-Magnocaricetea*) and aquatic vegetation (16 communities from the classes *Lemnetea* and *Potametea*). The Nature Park can easily be divided into two parts: the lower and regularly flooded southern part (protected as a Special Zoological Reserve) and a somewhat higher part, the less frequently flooded northern part, which is more diverse in terms of habitats.

Within the framework of the *Entomofauna of Kopački rit* Project (MSES) and *Insect Research* of the Ministry of Culture, approved in 2002, research into sawflies (Hymenoptera, Symphyta) was carried out. For the whole or part of their lives, sawflies are connected to their food plants, and the sawfly fauna is thus dictated by the composition of plants. Depending on the way in which they feed, they can be divided into wood, grass, leaf and gall sawflies. To date, the presence of 435 species of sawflies has been confirmed (PEROVIĆ & LEINER, 1996; PEROVIĆ & PEROVIĆ, 2002). From research into the collection kept in the Croatian Natural History Museum in Zagreb and literature data, it was observed that there was no information at all concerning sawflies in the Baranya area. Written information dates from the end of the 19th and the beginning of the 20th century and is related to Osijek and the immediate vicinity (MOCSARY, 1897; FINK, 1923).

## MATERIAL AND METHODS

Material was collected with with an entomological net, the galls by hand, and the method using sticky yellow traps, dimensions 30x30 cm. The traps were placed on trees at a height of about 1.5 m, and were left for three weeks. Individuals that were trapped were unstuck with F-thinner for oil-based paints and varnishes, then cleaned in 75% alcohol, dried, and prepared by being placed on an entomological pin. Determination of the sawflies was performed according to the following keys: ENSLIN, 1918; BENSON, 1951-1958, 1962, 1968; BERLAND, 1947 and TAEGER, 1985;



**Fig. 1.** Map of the area investigated. Circled numbers indicate the stations: 1. Zlatna Greda – Willow Grove, 2. Zlatna Greda – Bushes, 3. Zlatna Greda – Channel, 4. Tikveš – Castle, 5. Tikveš – Forest/Meadow, 6. Sakadaš, 7. Hordovanj, 8. Kopačko jezero.

LISTON, 1995; MUCHE, 1977; TAEGER & BLANK, 1998. The collections are kept in the Croatian Natural History Museum in Zagreb and in the entomological collection of the Biology Department of J. J. Strossmayer, University in Osijek.

The research was carried out from May to October 2003 at 8 stations (Fig. 1), very diverse in their plant composition. Five stations were in the general area of the Nature Park, and three stations were in the Special Zoology Reserve. At all stations a transect of about 200 m was selected and regularly checked. At Zlatna Greda (Bush) Station material was collected alongside bushes in which the prevailing species were hawthorn (*Crataegus* sp.), blackthorn or sloe (*Prunus spinosa*), dogberry

**Tab. 1.** Material collected from sticky traps and galls in the area investigated.

| LOCALITIES INVESTIGATED   | GALLS            |                            | STICKY TRAPS |                             |
|---------------------------|------------------|----------------------------|--------------|-----------------------------|
|                           | FINDING OF GALLS | NUMBER OF SPECIES PER GALL | STICKY TRAP  | NUMBER OF SPECIES ON A TRAP |
| Zlatna Greda-bushes       | +                | 2                          | +            | 1                           |
| Zlatna Greda-willow grove | +                | 2                          | -            | -                           |
| Zlatna Greda-channel      | +                | 1                          | -            | -                           |
| Tikveš castle             | -                | -                          | -            | -                           |
| Tikveš forest/meadow      | -                | -                          | +            | 9                           |
| Sakadaš and island        | -                | -                          | +            | 2                           |
| Kopačko jezero            | +                | 1                          | +            | 5                           |
| Hordovanj                 | +                | 1                          | +            | 2                           |

(*Cornus sanguinea*), wild rose (*Rosa* spp.), privet (*Ligustrum vulgare*), buckthorn (*Rhamnus* sp.), guelder rose (*Viburnum opulus*), elder (*Sambucus nigra* and *S. ebulus*), lower ash trees (*Fraxinus* sp), common oak (*Quercus robur*), hornbeam (*Carpinus* sp.), crab apple (*Malus* sp.) and in the more humid parts, willows (*Salix* spp.) and poplars (*Populus* sp.). In some parts of this station there are ridges, and at the edges of it are sloping meadows. The Zlatna Greda (Willow Grove) Station is divided by a high embankment from the previous station and is typical of old willow beds (*Salix alba*) with a high undergrowth of rushes (*Carex* sp.), and there is also branched burr-reed (*Sparganium erectum*) and the sweet flag (*Acorus calamus*). In this area, which is actually unsafe because of mines, sticky traps were set, but by the time of the first inspection tour they had vanished. The Zlatna Greda (Channel) Station is actually a transitional area from Zlatna Greda, the place, towards the forest of Tikveš. Here special features are marsh vegetation with the common reed (*Phragmites australis*), some tall trees of poplar and oak, and the previously described shrub types inside the sloping meadows. Tikveš-Castle Station was dealt with in the centre of a forest of common oak (*Quercus robur*) on a transect of 200m. Tikveš (Forest/Meadow) Station was a borderline area of the Tikveš common oak forest, overgrowth with the previously described bushes and meadows on one hand, and with forest clearings on the other.

The following three stations are inside the protected area of the Special Zoology Reserve, the basic feature of which is a region greatly subjected to flooding. The stations are very similar to each other in terms of plant composition. Jezero Sakadas Station, with its appertaining island, is a willow bed, with oases of brambles (*Rubus* sp.), and on the island itself, in conjunction with herbaceous plants, among which the cress *Rorippa amphibia* (association *Oenantho-Rorippetum*) dominates with the poplar, willow and wild vine (*Vitis sylvestris*), while ash and elm can also be found. Hordovanj Station is on a somewhat higher ridge, and the poplar appears together with willow. Low willows in conjunction with a lot of open ground dominated by *Rorippa amphibia* are characteristic of Kopačko Lake Station.

## RESULTS

During 2003, 633 specimens of insects were collected selectively together with 12 sawfly galls. Of these 378 were hymenopterans, within which there were 220 specimens of sawfly (Symphyta), which together with the samples of the galls encompassed 73 taxa. At all 8 stations, sampling was done with a net, but galls were found only in 5 stations, and the sticky traps were also placed at 5 stations. Tab. 1 displays the methods used at various stations.

These 73 species were classified into four families: Pamphiliidae, Cephidae, Argeidae and Tenthredinidae. The family Tenthredinidae is the most abundant in taxa (59) and belonging to 5 sub-families: Selandriinae (17), Dolerinae (4), Blennocampinae (6), Tenthredininae (22) and Nematinae (10). A list of species and finding sites at given stations is given in Tab. 2.

**Tab. 2.** List of species of sawfly and their presence in the stations investigated in Kopački rit Nature Park.

| No. | Species (taxon)                                                                  | ZG-b | ZG-w | ZG-ch | T-c | T-f/m | S | Kj | H |
|-----|----------------------------------------------------------------------------------|------|------|-------|-----|-------|---|----|---|
| 1   | <i>Pamphilius alternans</i> (A. Costa, 1860)                                     |      |      |       | x   | x     |   |    |   |
| 2   | <i>P. aurantiacus</i> (Giraud, 1857)                                             |      |      |       | x   | x     |   |    |   |
| 3   | <i>Hartigia nigra</i> (Harris, 1776)                                             |      |      | x     |     |       |   |    |   |
| 4   | <i>Cephus spinipes</i> (Panzer (1800))                                           | x    |      | x     |     |       |   |    |   |
| 5   | <i>C. nigrinus</i> C.G. Thomson, 1871                                            | x    |      |       |     |       |   |    |   |
| 6   | <i>C. pygmaeus</i> (Linnaeus, 1767)                                              |      | x    |       |     | x     |   |    |   |
| 7   | <i>Trachelus tabidus</i> (Fabricius, 1775)                                       |      | x    |       |     |       |   |    |   |
| 8   | <i>Calameuta filiformis</i> (Eversmann, 1847)                                    | x    | x    |       |     |       |   |    |   |
| 9   | <i>C. haemorrhoidalis</i> (Fabricius, 1781)                                      | x    |      |       |     |       |   |    |   |
| 10  | <i>Arge melanochoea</i> (Gmelin, 1790)                                           |      |      |       | x   | x     |   |    |   |
| 11  | <i>A. cyanocrocea</i> (Förster, 1771)                                            |      |      |       |     | x     |   |    |   |
| 12  | <i>A. ochropus</i> (= <i>rosae</i> ) (Gmelin, 1790)                              |      |      | x     |     |       |   |    |   |
| 13  | <i>A. enodis</i> (Linnaeus, 1767)                                                |      |      |       |     |       |   | x  |   |
| 14  | <i>Sterictiphora furcata</i> (Villers, 1789)                                     |      |      | x     |     |       |   |    |   |
| 15  | <i>Allantus melanarius</i> (Klug, 1818)                                          | x    |      |       |     | x     |   |    |   |
| 16  | <i>A. togatus</i> (Panzer, 1801)                                                 |      |      |       |     | x     |   |    |   |
| 17  | <i>Taxonus agrorum</i> (Fallen, 1808)                                            | x    | x    |       |     |       | x |    |   |
| 18  | <i>Nesoselandria morio</i> (Fabricius, 1781)                                     |      | x    |       |     | x     |   |    |   |
| 19  | <i>Athalia bicolor</i> Serville, 1823                                            | x    |      | x     |     | x     |   |    |   |
| 20  | <i>A. circularis</i> (Klug, 1815)                                                |      | x    |       |     |       |   |    |   |
| 21  | <i>A. cordata</i> Serville, 1823                                                 | x    |      |       | x   | x     |   |    |   |
| 22  | <i>A. ancilla</i> C.G. Thomson, 1870<br>(= <i>A. glabricollis</i> Thomson, 1871) | x    |      |       |     |       |   |    |   |
| 23  | <i>A. rosae</i> (= <i>colibri</i> ) (Linnaeus, 1758)                             | x    | x    | x     |     | x     |   | x  | x |

| No. | Species (taxon)                                 | ZG-b | ZG-w | ZG-ch | T-c | T-f/m | S | Kj | H |
|-----|-------------------------------------------------|------|------|-------|-----|-------|---|----|---|
| 24  | <i>A. rufoscutellata</i> Mocsáry, 1879          |      | x    |       | x   | x     |   |    |   |
| 25  | <i>Athalia</i> sp.                              |      |      |       |     | x     |   |    | x |
| 26  | <i>Ametastegia equiseti</i> (Fallen, 1808)      |      | x    |       |     |       |   | x  |   |
| 27  | <i>A. glabrata</i> (Fallen, 1808)               |      |      |       |     |       | x | x  |   |
| 28  | <i>A. pallipes</i> (Spinola, 1808)              |      |      |       |     | x     |   | x  |   |
| 29  | <i>Empria tridens</i> (Konow, 1896)             |      | x    |       |     |       |   |    |   |
| 30  | <i>Selandria serva</i> (Fabricius, 1793)        |      | x    |       |     |       |   |    |   |
| 31  | <i>Birka cinereipes</i> (Klug, 1816)            |      |      |       |     |       |   | x  |   |
| 32  | <i>Dolerus eversmanni</i> (W.F. Kirby, 1882)    |      | x    |       |     | x     |   |    |   |
| 33  | <i>D. vestigialis</i> (Klug, 1818)              | x    |      |       |     | x     |   |    |   |
| 34  | <i>D. gibbosus</i> Hatig, 1837                  |      |      |       |     | x     |   |    |   |
| 35  | <i>D. haematodes</i> (Schrank, 1781)            |      | x    |       |     |       |   |    |   |
| 36  | <i>Claremontia brevicornis</i> (Brischke, 1883) |      |      |       |     | x     |   |    |   |
| 37  | <i>Monophadnoides ruficuris</i> (Brulle, 1832)  | x    |      |       |     |       |   |    |   |
| 38  | <i>Monophadnus spinolae</i> (Klug, 1816)        |      |      |       |     | x     |   |    |   |
| 39  | <i>Metallus pumilus</i> (Klug, 1816)            |      |      |       | x   |       |   |    |   |
| 40  | <i>Phymatocera aterrima</i> (Klug, 1816)        |      |      |       | x   |       |   |    |   |
| 41  | <i>Eutomostethus gagathinus</i> (Klug, 1816)    | x    |      |       |     | x     |   |    |   |
| 42  | <i>Aglaostigma aucupariae</i> (Klug, 1817)      |      | x    |       |     | x     |   |    |   |
| 43  | <i>A fulvipes</i> (Scopoli, 1763)               |      |      | x     |     |       |   |    |   |
| 44  | <i>Tenthredopsis friesei</i> (Konow, 1884)      | x    |      |       |     |       |   |    |   |
| 45  | <i>T. litterata</i> (Geoffroy, 1785)            | x    |      |       |     | x     |   |    |   |
| 46  | <i>T. nassata</i> (Linnaeus, 1767)              | x    |      | x     |     |       |   |    |   |
| 47  | <i>T. sordida</i> (Klug, 1814)                  | x    |      |       | x   |       |   |    |   |
| 48  | <i>Rhogogaster viridis</i> (Linnaeus, 1758)     |      |      | x     |     |       |   |    |   |
| 49  | <i>Tenthredo atra scopoli</i> Lepeletier, 1823  |      | x    |       | x   | x     |   |    |   |
| 50  | <i>T. livida</i> Linnaeus, 1758                 | x    |      |       |     |       |   |    |   |
| 51  | <i>T. bifasciata rossii</i> (Panzer, 1804)      | x    |      | x     |     |       |   |    |   |
| 52  | <i>T. scrophulariae</i> Linnaeus, 1758          |      |      | x     |     |       |   |    |   |
| 53  | <i>T. temula</i> Scopoli, 1763                  | x    |      | x     | x   | x     |   |    |   |
| 54  | <i>Macrophya annulata</i> (Geoffroy, 1785)      | x    |      |       |     | x     |   |    |   |
| 55  | <i>M. albicincta</i> (Schrank, 1776)            | x    |      |       | x   | x     |   |    |   |
| 56  | <i>M. blanda</i> (Fabricius, 1775)              |      |      |       |     | x     |   |    |   |
| 57  | <i>M. diversipes</i> (Schrank, 1782)            | x    |      |       |     |       |   |    |   |
| 58  | <i>M. duodecimpunctata</i> (Linnaeus, 1758)     | x    |      |       |     | x     | x |    |   |
| 59  | <i>M. militaris</i> (Klug, 1817)                |      |      |       |     | x     |   |    |   |
| 60  | <i>M. montana</i> (Scopoli, 1763)               |      |      | x     |     | x     |   |    |   |
| 61  | <i>M. postica</i> (Brulle, 1832)                |      |      |       |     |       | x |    |   |
| 62  | <i>M. ribis</i> (Schrank, 1781)                 |      |      |       |     | x     |   |    |   |

| No.          | Species (taxon)                                            | ZG-b      | ZG-w      | ZG-ch     | T-c       | T-f/m     | S        | Kj        | H        |
|--------------|------------------------------------------------------------|-----------|-----------|-----------|-----------|-----------|----------|-----------|----------|
| 63           | <i>Pachyprotasis rapae</i> (Linnaeus, 1767)                |           |           |           |           | x         |          |           |          |
| 64           | <i>Nematus bergmanni</i> Dahlbom, 1835                     |           |           |           |           |           |          | x         | x        |
| 65           | <i>N. hypoxanthus</i> Förster, 1854                        |           |           |           |           |           |          | x         | x        |
| 66           | <i>N. myosotidis</i> (Fabricius, 1804)                     |           |           |           |           | x         |          |           |          |
| 67           | <i>N. wahlbergi</i> C.G. Thomson, 1871                     |           | x         |           |           |           |          |           |          |
| 68           | <i>Pontania proxima</i> (Serville, 1823)                   |           | x         |           |           |           |          |           | x        |
| 69           | <i>P. viminalis</i> (Linnaeus, 1758)                       | x         | x         | x         |           |           |          | x         |          |
| 70           | <i>Trichiocampus ulmi</i> (Linnaeus, 1758)                 |           |           |           |           | x         |          |           |          |
| 71           | <i>Cladius difformis</i> (Panzer, 1799)                    |           |           |           | x         |           |          |           |          |
| 72           | <i>Pristiphora ruficornis</i> (Olivier, 1811)              | x         |           |           |           | x         |          |           |          |
| 73           | <i>P. aphantoneura</i> (=fulvipes =vicina) (Förster, 1854) |           |           |           |           |           |          | x         |          |
| <b>TOTAL</b> |                                                            | <b>25</b> | <b>19</b> | <b>14</b> | <b>12</b> | <b>35</b> | <b>4</b> | <b>10</b> | <b>5</b> |

Because of the differing ecological conditions at the given stations, referring above all to the diversity of feeding plans, at some stations only 4 species were recorded, while at others there were as many as 35 species of sawfly. The greatest number of species (35) was recorded at Tikveš Forest/Meadow Station, and the smallest (4) at Jezero Sakadaš Island Station. The number of species at stations in areas highly subject to flooding was much smaller than at stations in the drier part of the Nature Park. Of the 73 species recorded, only 15 species were recorded in the inundated area, and of these 7 species (*Arge enodis*, *Ametastegia glabrata*, *Birka cine-ripes*, *Macrophya postica*, *Nematus bergmanni*, *N. hypoxanthus*, *Pristiphora aphantoneura* (=fulvipes =vicina)) were characteristic only of this area. The number of species of sawfly in the stations investigated is shown in Fig. 2.

Since sawflies are connected with plants, a greater diversity of plants at a given station produces a greater diversity of sawfly species, as is clearly indicated. As has already been stated, the most species-abundant station is Tikveš (Forest/Meadow), differentiated from the others by the greatest diversity of plants, resulting in a great diversity of sawfly species, including 10 species that were not found at the other stations at all. Species that were sampled only at one station are given in Tab. 3.

In the next part of this work, unpublished material from the collection of the Croatian Natural History Museum was reviewed. The material was collected in the period from 1899 to 1933, the label on the collection site bearing the caption Osijek. It can be hypothesised that this actually means the area around Osijek, which implies an environment identical to that in Kopački rit (and was perhaps even in the Baranya area.). In this material 46 individuals were dealt with, and 13 species were identified: *Arge ochropus* (=rosae), *A. pagana*, *Athalia rosae* (=colibri), *Allantus viennensis*, *Dolerus anthracinus*, *D. asper*, *D. gonager*, *Hoplocampa minuta*, *Nematus simulator* (=eurysternus), *Tenthredopsis stigma*, *T. nassata* (=inornata), *Macrophya crassula*, and *M. vitta*.

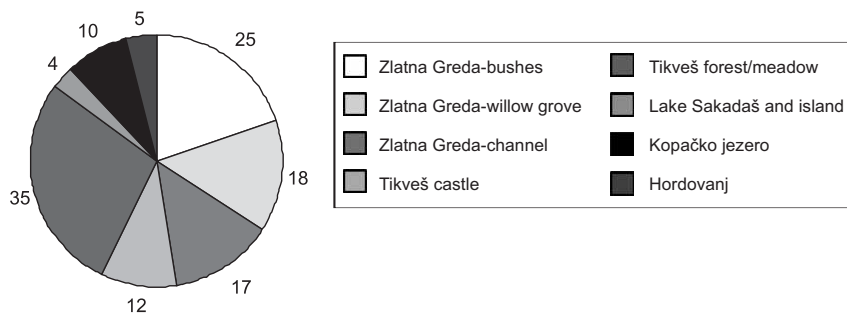


Fig. 2. Number of species of sawfly in the habitats investigated in Kopački rit Nature Park.

Tab. 3. List of species of sawfly recorded only at a single station

| STATION                   | SAWFLY SPECIES                                                                                                                                                                                                                                            |
|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Zlatna greda-bushes       | <i>Calameuta haemorrhoidalis</i><br><i>Athalia ancilla</i><br><i>Monophadnoides ruficuris</i><br><i>Tenthredo livida</i><br><i>Macrophya diversipes</i>                                                                                                   |
| Zlatna greda-willow grove | <i>Trachelus tabidus</i><br><i>Athalia circularis</i><br><i>Empria tridens</i><br><i>Dolerus haematodes</i><br><i>Nematus wahlbergi</i>                                                                                                                   |
| Zlatna greda-channel      | <i>Aglaostigma fulvipes</i><br><i>Rhogogaster viridis</i><br><i>Tenthredo scrophulariae</i><br><i>Hartigia nigra</i><br><i>Arge ochropus</i><br><i>Sterictiphora furcata</i>                                                                              |
| Tikveš castle             | <i>Metallus pumilus</i><br><i>Phymatocera aterrima</i><br><i>Cladius difformis</i>                                                                                                                                                                        |
| Tikveš forest/meadow      | <i>Dolerus gibbosus</i><br><i>Claremontia brevicornis</i><br><i>Macrophya blanda</i><br><i>M. militaris</i><br><i>Pachyprotasis rapae</i><br><i>Trichiocampus ulmi</i><br><i>Nematus myosotidis</i><br><i>Allantus togatus</i><br><i>Arge cyanocrocea</i> |
| Kopačko jezero            | <i>Arge enodis</i><br><i>Pristiphora aphantoneura</i> (= <i>fulvipes</i> = <i>vicina</i> )<br><i>Birka cinereipes</i>                                                                                                                                     |



## DISCUSSION

An inundated area provides specific conditions for life, the main characteristic being periodic flooding. The average flood in the area of Kopački rit lasts about 90 days, and hence a specific kind of vegetation develops. Since sawflies are bound to the plants specific to this kind of area, naturally the sawfly fauna in this part of the marsh is connected with these plants. As can be seen from Tab. 2, the number of species in the stations in the marsh itself is quite modest, no more than 15, but they are quite specific, for 7 of the 15 are connected only to this area and to the plants growing in it. Above all this refers to the group of sawflies that are characteristic only of willows and cresses (in our case, the species *Rorippa amphibia*). It turned out that the southern part of the marsh was much poorer in terms of number of sawfly species than the northern part, only 20.5% of the fauna of the whole area of Kopački rit Nature Park being recorded there.

The 73 species identified were classified into 4 families: Pamphiliidae (webspinning sawfly, 2 species), Cephidae (stem sawfly, 7 species), Argidae (4 species) and Tenthredinidae (60 species).

Pamphiliidae (webspinning sawflies), *Pampilius alternans* and *P. aurantiacus*, are in the larval stage bound to the sycamore maple (*Acer pseudoplatanus*). In the fauna of Germany they are very much under threat, being the second in Saxony facing extinction. In Croatia they have been recorded for regions I and IV, or I, IV and V (regions of Croatia adopted from CRKVENČIĆ *et al.*, 1974, Regions I, II, III, IV and V representing the Eastern, Central, Upland, North Coast and South Coast regions respectively). All data concerning threat level and food plants are taken from TAEGER & BLANK (1998), and for distribution in Croatia from PEROVIĆ & LEINER (1996). The Cephidae (stem sawflies) derive from the Zlatna Greda site. On the border between forest and bush is *Cephus nigrinus*, which is found on grasses of the species *Milium effusum* and *Poa pratensis*, in the colder and more humid forest habitats. In this country it is known only from the localities Kraljičin zdenac on Mt Medvednica and from Virovitica (Regions I and II). *Cephus pygmaeus* and *C. spinipes* (= *cultratus*) as adult forms are common on the yellow flowers of the buttercup (*Ranunculus* sp.). The first is mainly found in grain crops and can cause considerable damage (KOVAČEVIĆ, 1952; MACELJSKI, 1999) but also comes to grasses of the genera (*Bromus*, *Avena*, *Agropyron* and *Phleum*). The second is known only from the grasses *Phleum pratense* and *Dactylis glomerata*. Both species are common and widely distributed species in this country. The species *Calameuta haemorrhoidalis* has not been found in Germany since the beginning of the last century, but is widely distributed in Croatia. The species *Calameuta filiformis* is on the whole typical in willow communities, but of the 6 specimens of the species, one was collected in a stand with bushes (Zlatna Greda (Bushes) Station). In the centre of this site there is a pool with rushes, the food plant of this species of sawfly. Food plants are: *Phragmites australis*, *Calamagrostis epigejos*, *Phalaris arudinacea*, *Elytrigia repens* and *Arrhenaterum elatium*. In Croatia it has been recorded only in Regions I and II. One specimen of the species *Hartigia nigra* was collected along the path from the embankment to the channel alongside some dog-rose plants. According to the literature, the species inhabits roses and

brambles (*Rosa* spp., *Rubus idaeus* and *Rubus fruticosus*). It is widely distributed in Croatia in regions II and V. And from the same family, the species *Trachelus tabidus* (PEROVIĆ, 1977, 1992; ZOMBORI, 1974) was recorded for the first time in the Croatian fauna. Individuals of this species are linked with *Avena* sp. grass, and are also found in cereals. In European terms it is highly endangered, not having been mentioned once in Germany, for example, where it has practically vanished.

The Argidae family has only one species specific to willow habitats (*Arge enodis*), the larvae of this species feeding only willows. The species was caught only on the sticky traps on the Kopački rit willows. It is widely distributed in Croatia.

In terms of numbers of species, the family Tenthredinidae is the most numerous. In Tab. 2, numbers 14-29 are members of the sub-family Selandriinae. *Taxonus agrorum* is one of the most frequent species in the area of the bushy habitats (the larvae on *Rubus* sp.). The species *Ametastegia equiseti* and *A. glabrata* are according to these finds particular inhabitants of the willow beds, although they are polyphagous (TAEGER & BLANK, 1998). The species *Ametastegia pallipes*, which according to TAEGER & BLANK (1998) comes to *Viola* spp., was found at Tikveš (Forest-Meadow) Station, where these plants are found, as well as at the Kopačko Jezero Station, where there are no *Viola* spp. There are willows (*Salix* sp.) however, which the same authors mention as unproven food plants. The find of this species at Kopačko Jezero would suggest however that the willow is a food plant for the species. The species *Selandria serva*, although a polyphagous species of water meadows, according to the literature, was found in the area investigated only in the willow groves of Zlatna Greda. The species *Birka cinereipes* comes to plants of the *Myosotis* genus only at Kopačko Jezero, and the polyphagous *Nesoselandria morio* (TAEGER & BLANK, 1998, suggest the name *Dulophanes morio*) is found at Tikveš (Forest-Meadow) Station. These cases are consistent with research carried out in Međimurje, where *Selandria serva* and *Birka cinereipes* are also found close by water, while *Nesoselandria morio* is at the border of oak groves and meadows at some distance from the Mura River (PEROVIĆ & PEROVIĆ, 2002). All three species are widely distributed in Regions I, II and III.

Dolerinae of the genus *Dolerus* come much earlier in the spring, and so for the moment we have found only 4 species in the area of Kopački rit. The species *Dolerus eversmanni* and *D. vestigialis* were previously classified into the genus *Loderus*, and come to horsetails (*Equisetum* spp.). The Nematinae (Tab. 3 from 59 to the end) are individual and most of them were caught on sticky traps. Characteristic of the willow groves are *Nematus bergmanni* and *N. hypoxanthus*, found only on the willows of Kopačko Jezero and Hordovanj Station. All other species are from Tikveš Forest-Meadow, except for the species *Cladius difformis*, recorded at Tikveš Castle. Species of the genus *Pontania* were found as galls in the willow groves and on individual willow bushes.

The number of species recorded in Kopački rit during this investigation came to 73, and it is realistic to expect that the number of species living here is considerably larger. Research ought to be carried out throughout the whole season from the early spring to the late autumn, in order to cover the early spring and late autumn species as well. Also within the context of this work, the following species were

found in the immediate neighbourhood of Kopački rit: *Dolerus aeneus*, *D. anthracinus*, *D. nigratus*, *D. picipes*, *D. pratensis*, *D. puncticollis*, and *Sciapteryx costalis* (FINK, 1923), as well as *Dolerus gonager* and *Nematus similator* (= *eurysternus*) from the collection of the CNHM, which come only in the early spring, and must certainly exist in greater numbers. Furthermore, there was no record of the species *Apethymus abdominalis*, which is widely distributed in the oak groves of Slavonia (SPAIC, 1966), and which can realistically be expected in the oak groves of Baranja.

In his paper of 1923, Fink adduces the presence of 20 species of sawfly in the area of Osijek and surrounds, collected in the period from 1896 to 1926. In the collection of the Natural History Museum, 13 species were recorded from 1899 to 1933 from the same area, but by other collectors. In an analysis of this material, it was determined that during this period, the presence of 30 species of sawfly were recorded for the wider area of Osijek. We compared this material with our own data and determined that 12 species (*Sterictiphora furcata*, *Arge enodis*, *A. melanochroa*, *A. ochropus* (= *rosae*), *Dolerus gibbosus*, *D. haematodes*, *Athalia circularis*, *A. cordata*, *A. rosae* (= *colibri*), *Selandria seroa*, *Phymatocera aterrima* and *T. nassata* (= *inornata*) were recorded both then and now, and that 18 species were recorded only at the beginning of the 20th century (these were: *Arge pagana*, *Allantus viennensis*, *Dolerus aeneus*, *D. anthracinus*, *D. asper*, *D. gonager*, *D. nigratus*, *D. picipes*, *D. pratensis*, *D. puncticollis*, *Hoplocampa minuta*, *Macrophya crassula*, *M. vitta*, *Nematus simulator* (= *eurysternus*), *Sciapteryx costalis*, *Tenthredopsis hungarica*, *T. stigma* and *Cladius pectinicornis*).

## CONCLUSIONS

- In the Kopački rit area, the presence of 73 species of sawfly was determined.
- The species *Trachelus tabidus* was recorded for the fauna of Croatia for the first time.
- The species *Ametastegia pallipes* was recorded at Kopačko Jezero, where its food plant *Viola* spp. is not to be found, but where there are willows (*Salix* sp.), confirming the hypothesis that the willow too is a food plant.
- The northern part of Kopački rit Nature park is considerably richer in species than the southern part, the inundated Special Zoology Reserve).
- Seven species, *Arge enodis*, *Ametastegia glabrata*, *Birka cinereipes*, *Macrophya postica*, *Nematus bergmanni*, *N. hypoxanthus*, and *Pristiphora aphantoneura* (= *fulvipes*=*vicina*) were found only in the inundated area at the locations investigated.

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## REFERENCES

- BENSON, R. B., 1951–1958: Hymenoptera Symphyta. Handbooks for the identification of British insects. London. Vol. VI, part 2 (a,b,c). 258. pp.
- BENSON, R. B., 1962: A revision of the Athaliini (Hymenoptera: Tenthredinidae). – Bull. Brit. Mus. (Natural History), Entomology **11** (7), 333–382.

- BENSON, R. B., 1968: Hymenoptera from Turkey-Symphyta. Bull. Brit. Mus. (Natural History), Entomology **22** (4), 109–207.
- BERLAND, L., 1947: Faune de France 47 – Hyménoptères Tenthredinoides. Paris. 496 pp.
- BOGDANOVIĆ, T, DURBEŠIĆ, P. & MIKUSKA J., 2002: Dragonfly Fauna of the Kopački rit. Wetlands. – Internat. Assoc. Danube Res. Proceedings **34**, 741–749.
- CRKVENČIĆ, I., DUGAČKI, Z., JELEN, I., MALIĆ, A., RIĐANOVIĆ, J., ROGLIĆ, J., ŠEGOTA, T. & ŽULJIĆ, S., 1974: Geografija SR Hrvatske. Vol. 1, Školska knjiga, Zagreb. 215 pp.
- ENSLIN, E., 1918: Die Tenthredinoidea Mitteleuropas. Berlin. 790 pp.
- FINK, N., 1923: Ose pilarice, Tenthredinoidea u hrvatskoj i slavonskoj fauni. – Glasnik Hrvatskog prirodoslovnog društva **35** (1/2), 118–137 pp.
- HEIDEMAA, M., NUORTEVA, M., HANTULA, J. & SAARMA, U., 2004: *Dolerus asper* Zaddach, 1859 and *Dolerus brevicornis* Zaddach, 1859 (Hymenoptera; Tenthredinidae), with notes on their phylogeny. Eur. J. Entomol. **101**, 637–650.
- KALINOVIĆ, I., PIVAR, G., & GÜNTHER, K. K., 1980: Prilog istraživanju Psocoptera u Specijalnom zoološkom rezervatu Kopački rit u Baranji. Acta entomologica Jugoslavica **16** (1–2), 111–119.
- KALINOVIĆ, I. & IVEZIĆ, M., 1996: Psocoptera Fauna (Insecta) of East Slavonia and Baranya, Croatia. Natura Croatica **5** (4), 291–297.
- KOVAČEVIĆ, Ž., 1952: Primjenjena entomologija, II knjiga, Poljoprivredni štetnici, Školska knjiga Zagreb. 479 pp.
- KRČMAR, S., MERDIĆ, E. & VIDOVIĆ, S. 1996: Danji leptiri Baranje (Lepidoptera, Rhopalocera) prilog poznavanju leptira Hrvatske. – Poljoprivreda **2** (1–2), 33–44.
- KRČMAR, S., 2002: Data on the butterfly fauna of the Croatian part of Baranja (Lepidoptera, Rhopalocera). – Bulletin de la Societe Royale Belge d Entomologie, **138** (2), 151–153.
- KRČMAR, S., 2004: Ecological notes on *Tabanus bromius* L., and *Haematopota pluvialis* (L.), (Diptera: Tabanidae) of some flood areas in Croatian sections of the river Danube. – Journal of Vector Ecology **29** (2), 376–378.
- LACOURT, 1999: Répertoire des Tenthredinidae ouest-paléartiques (Hymenoptera, Symphyta). Mémoires de la SEF, no. 3, 1–432 pp.
- LISTON, A. D., 1995: Compendium of European Sawflies. Chalastos Forestry. Daibersdorf. pp. 190.
- MACELJSKI, M., 1999: Poljoprivredna entomologija. Zrinski Čakovec. 464 pp.
- MERDIĆ, E., 1993: Mosquitoes (Diptera, Culicidae) of the Special zoological reserve Kopački rit (NE Croatia). – Natura Croatica **2** (1), 47–54.
- MERDIĆ, E. & LOVAKOVIĆ, T., 1999: Comparison of mosquito fauna in Kopački rit in the period 1990–1998. – Natura Croatica **8** (4), 431–438.
- MOCSARY, A., 1897: Fauna regni Hungariae. Hymenoptera III. Regia Societas Scientiarum Naturalium Hungarica. Budapest. p. 1–28.
- MUCHE, H., 1977: Die Argidae von Europa, Vorderasien und Nordafrika (mit Ausnahme der Gattung Aprosthema) (Hymenoptera – Symphyta). – Entomol. Abh., Dresden, **41** (Supplement), 23–59.
- PEROVIĆ, F., 1977: Novoevidentirane vrste iz podreda Symphyta (Hymenoptera) za faunu Jugoslavije. – Arhiv bioloških nauka, **29** (3–4), 1–2.
- PEROVIĆ, F., 1992: Die Ersten Untersuchungen der Sägewespen (Hymenoptera, Symphyta) im Biokovo – Gebirge (Dalmatien, Kroatien). – Natura Croatica **1** (1), 93–104.
- PEROVIĆ, F. & LEINER, S., 1996: Index of the Sawflies Sensu Lato (Hymenoptera, Symphyta) of Croatia, Natura Croatica **5** (4), 359–381.

- PEROVIĆ, F. & PEROVIĆ, G., 2002: Početna istraživanja osa biljarica (Hymenoptera, Symphyta) Međimurja. *Entomologia Croatica* **6** (1–2), 57–73.
- SPAIĆ, I., 1966: Hrastova osa listarica *Apethymus abdominalis* (Lepelletier, 1823). – Glasnik za šumske pokuse. Poslovno udruženje šumsko-privrednih organizacija, Zagreb. 109 pp.
- TAEGER, A., 1985: Zur Systematik der Blattwespengattung *Tenthredo* (s.str.) L. (Hymenoptera, Symphyta, Tenthredinidae). – Ent. Abh. Staat. Mus. fur Tierkunde **48** (8), 83–148.
- TAEGER, A. & BLANK (Hrsg.), S. M., 1998: Pflanzenwespen Deutschlands (Hymenoptera, Symphyta) Kommentierte Bestandsaufnahme. Verlag Goecke & Evers, Kelttern. 364 pp.
- TOPIĆ, J. 1989: Vegetation of the Special Zoological Reserve of Kopački rit. *Hydrobiologia* **182**, 149–160.
- ZOMBORI, L., 1974: Data to the Sawfly fauna of Yugoslavia (Hymenoptera: Symphyta). – *Fragmenta balcanica* **18** 218, 173–185.

## SAŽETAK

### Ose biljarice (Hymenoptera, Symphyta) u biotopima Kopačkog rita

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Od svibnja do listopada 2003. obavljena su entomološka istraživanja osa biljarica (Hymenoptera, Symphyta) na području Parka Prirode Kopački rit. Na tri skupine postaja: poplavnom, šumskom i otvorenom prostoru (ukupno 8 postaja) selektivno mrežicom i ljepljivim pločama uzorkovano je 220 jedinki. Determinacijom je utvrđeno prisustvo 73 vrste osa biljarica. Među njima je vrsta *Trachelus tabidus* po prvi put registrirana za faunu Hrvatske. Uočeno je da je vrsta *Ametastegia pallipes* zabilježena na postaji Kopačko jezero gdje nema njezine biljke hraniteljice (*Viola* spp.); TAEGER & BLANK (1998) iznose hipotezu da je vrba (*Salix* sp.) potencijalna biljka hraniteljica, a ovaj nalaz to potvrđuje. Sjeverni dio Parka prirode Kopački rit znatno je bogatiji biljnim vrstama što uzročno povlači za sobom raznolikost osa biljarica. Južni, poplavni dio, zaštićen kao Posebni zoološki rezervat, znatno je siromašniji vrstama. Tu je zabilježeno samo 15 vrsta, ali sastav vrsta je karakterističan samo za poplavna područja. Među njima posebno treba istaknuti sedam vrsta: *Arge enodis*, *Ametastegia glabrata*, *Birka cinereipes*, *Macrophya postica*, *Nematus bergmanni*, *N. hypoxanthus*, i *Pristiphora aphantoneura* (=fulvipes =vicina), jer su zabilježene samo u poplavnom prostoru.