

**Fulgoromorpha and Cicadomorpha (Hemiptera) infesting bracken
(*Pteridium aquilinum*)**

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ABSTRACT. The abundance of six species of leafhoppers and planthoppers infesting bracken *Pteridium aquilinum* was determined in SW Poland. The paper describes the insects associated with the plant on the basis of their ecological characteristics. The population dynamics of the dominant species *Ditropis pteridis* SPINOLA (Delphacidae) is plotted.

KEY WORDS: leafhoppers, planthoppers, *Ditropis pteridis*, *Pteridium aquilinum*.

INTRODUCTION

Among the scarce insect fauna infesting ferns (Pteropsida), the most frequently listed species are from Homoptera, Coleoptera and Lepidoptera. In most cases, they are specialist herbivores (COOPER-DRIVER 1978). According to HENDRIX (1980), the species of the families Aphididae and Coccidae (suborder Sternorrhyncha) make up the dominant (45%) group within Homoptera and are generally found on ferns worldwide. Among planthoppers and leafhoppers, earlier considered as one group – Auchenorrhyncha, the family Delphacidae is the one most abundantly represented on ferns (HENDRIX 1980). Based on the currently available results of morphological and molecular analyses, Auchenorrhyncha has been separated into two infraorders: Fulgoromorpha and Cicadomorpha (CAMPBELL et al. 1995, BOURGOIN & CAMPBELL 2002, SZWEDO et al. 2004). These insects are an important component of the trophic webs in terrestrial ecosystems, in which they form typical assemblages with a rather complex species composition structure and complicated

incidence dynamics (ANDRZEJEWSKA 1979, CURRY 1994, ŚWIERCZEWSKI & WOJCIECHOWSKI 2008).

The list of leafhoppers and planthoppers feeding on the ubiquitous bracken *Pteridium aquilinum* (L.) KUHN in the British Isles consists of just two species: *Philaenus spumarius* L. (Aphrophoridae) and *Ditropis pteridis* SPINOLA [syn. *Criomorpha pteridis* SPIN. in LAWTON (1976)] (Delphacidae) (LAWTON 1982). The spread of *D. pteridis* is closely related to the vertical distribution of its host plant. Nevertheless, even though in its normal range this planthopper can reproduce in summer while feeding on bracken, its attempts to overwinter on this plant, above the standard altitude, usually fail (LAWTON et al. 1987). As for the other species, the feeding of *Philaenus spumarius* on *Pteridium aquilinum* is considered dubious by German authors, who instead curtail the list of this insect's host plants to dicotyledonous plants alone (NICKEL et al. 2002).

The aim of this study was to determine the proportion of leafhopper and planthopper species in the insect assemblages infesting bracken in its natural habitat in the Ślęza Massif (Lower Silesia, Poland). Because of its particular geomorphological structure (the presence of serpentinite marble) as well as the unique microclimatic conditions, the region can be described as faunistically highly diverse. The insects sampled, representing Fulgoromorpha and Cicadomorpha, were taxonomically identified and the population dynamics of the most abundant species was plotted.

MATERIALS AND METHODS

The observations were carried out in the plant growth seasons 2003-2005, from the beginning of May until the end of September in each year, in the Ślęza Massif. They focused on one particular population of *Pteridium aquilinum* sub. *aquilinum*, located in a spruce monoculture growing in a human-transformed habitat of acidophilic mountainous beech forest (*Luzulo luzuloidis*-*Fagetum*).

In order to define the species composition of the insects infesting bracken, the above-ground parts of 20 randomly chosen plants were carefully inspected on each date. The number of insects belonging to particular orders was recorded for each plant. The adult specimens were collected using a small aspirator. The observations were always carried out before noon, on sunny days with a relatively low wind and air temperatures > 20°C. The adult leafhoppers and planthoppers were identified by the author with the aid of the keys by OSSIANILSSON (1978, 1981, 1983). The larval instars of *Ditropis pteridis* were identified by Dipl.-Biol. Marlies Stockmann (Institut für Biologie und Umweltwissenschaften, Carl-von-Ossietzky-Universität, Oldenburg). The ecological classification of the species was based on CZECHOWSKI & MIKOLAJCZYK (1991).

RESULTS AND DISCUSSION

During the three-year study of the insect fauna of *Pteridium aquilinum*, homopteran species made up the most numerous insect group, comprising mostly leafhoppers and planthoppers. More than 50% of the specimens (564 insects) recorded in 2003 belonged to Auchenorrhyncha. The corresponding proportion in 2004 was ca 80% of the recorded individuals (925 insects), and in 2005 it was nearly 68% (669 insects).

Five species of Cicadomorpha and one species of Fulgoromorpha were identified in the material collected from the bracken leaves. They are either the taxa known to infest bracken permanently, or taxa visiting the plant temporarily or landing on it accidentally during short-distance migration, but known to be associated with entirely different hosts. The most abundant species recorded on *P. aquilinum* was the monophagous *Ditropis pteridis* SPINOLA (Delphacidae). The insect developed colonies on the abaxial side of the leaf blade. In July and August each year single males or females of *Empoasca vitis* GOTHE (Cicadellidae) were found within the colonies of *Ditropis pteridis*. These are thought to have been migrating in search of deciduous trees, according to NICKEL et al. (2002). The presence of *Iassus lanio* L. (Cicadellidae) appears to be accidental, too, as the species is trophically closely associated with oak leaves. The remaining species are common, polyphagous insects. Occasionally, at the end of June, single adults of *Philaenus spumarius* L. (Aphrophoridae) were observed on the adaxial side of the bracken leaves. A number of nymphs of another species of Aphrophoridae, *Aphrophora alni* FALLEN, were collected as well, while they were feeding on the leaves of *P. aquilinum* at the end of September. The polyphagous species *Centrotus cornutus* L. was also found. It is one of the three species of Membracidae recorded in Poland, the one most frequently feeding on poplar (*Populus* spp.) leaves (ŚWIERCZEWSKI & STROIŃSKI 2011). Single adults were found on the adaxial side of the bracken leaves towards the end of the plant's growth period.

Among all the leafhopper and planthopper species collected during three seasons of bracken fern vegetation, the mesohigrophyllous taxa predominated, making up 97% of all the sampled material, whereas the only higrophyllous species was *Aphrophora alni*. At the same time, all the collected taxa were also mesoheliophyllous species.

The population dynamics of *Ditropis pteridis*, the predominant species in the insect assemblage analysed (81% of individuals in 2003 to 94% in 2005), is shown. The first adults of the species typically appeared at the site at the beginning of May, infesting individually the newly developing fronds (Fig.). The majority of Delphacidae overwinter as nymphs, which makes them the most abundant among insects at the start of the plant growth season. Females and males of *D. pteridis* were always recorded on bracken until the end of May, although in 2004 they were still there at the beginning of June. Their incidence was rather low, as the count on 20 plants typically ranged between 5 and 20 insects.

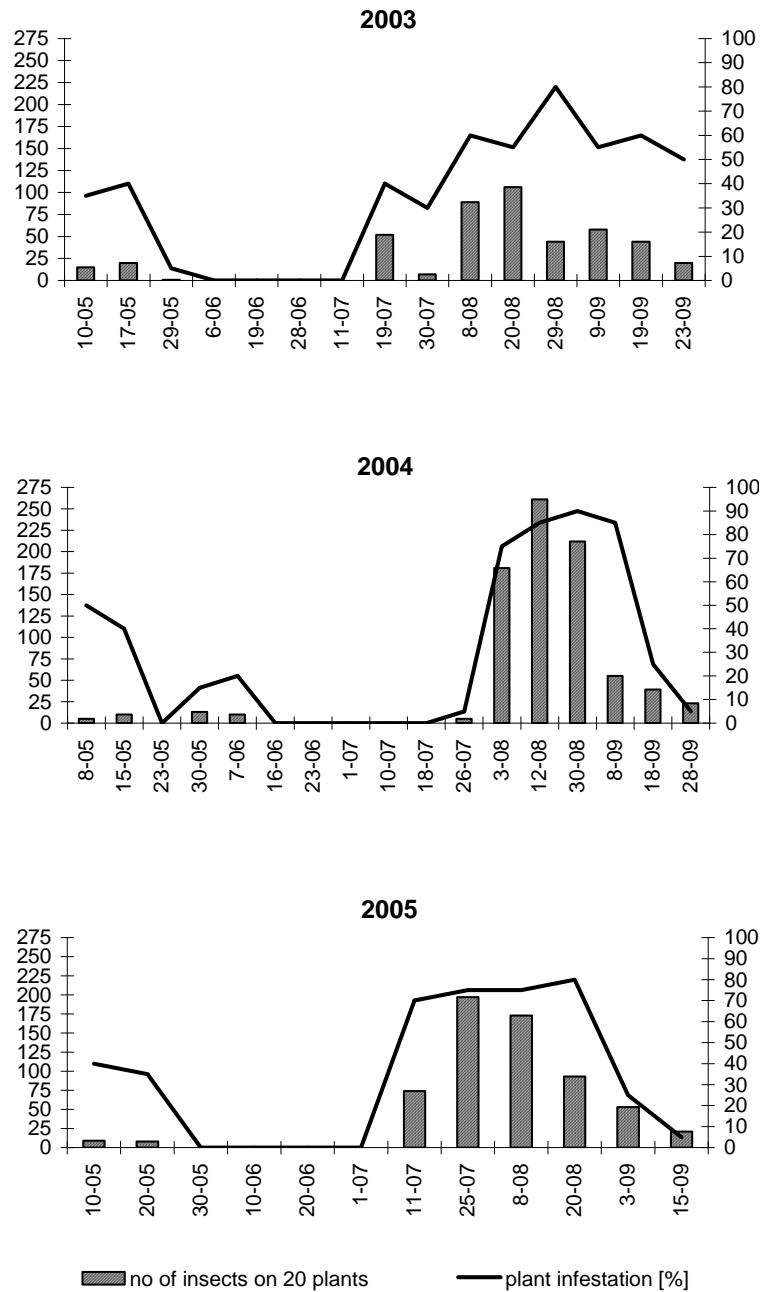


Fig. Population dynamics of *Ditropis pteridis*.

The total proportion of *Ditropis pteridis* in the assemblage infesting the bracken was highest in the second year of the study (2004). First instar larvae appeared in the second ten days of July in 2003 and 2005, whereas in 2004 they were observed for the first time one week later. The population maximum was recorded in the second ten days of August in 2003 and 2004, or and in the third ten days of July in 2005. The maximum planthopper count from 20 plants, as recorded in the second ten days of August 2004, was 261 insects. Torrential rains lasting several days in late July 2003 caused a short-term population decline. The highest percentage of plants infested by the larval instars of planthoppers was recorded in the third ten days of August in every year of the study. During that period, *D. pteridis* larvae were found on 80-90% of the inspected plants. From September onwards in each year, the abundance of the species on the bracken plants usually declined gradually.

The results can be summarized as follows:

1. The predominant insects infesting the monitored population of bracken during the three-year study were leafhoppers and planthoppers.
2. Six species belonging to either of the groups were recorded, all of them with moderate requirements as to habitat humidity and insolation.
3. The presence of *Iassus lanio* and *Empoasca vitis* (Cicadellidae), being specialists, was purely accidental.
4. *Philaenus spumarius* (Aphrophoridae) was occasionally found feeding on *Pteridium aquilinum* at the beginning of the plant growth period.
5. *Aphrophora alni* (Aphrophoridae) and *Centrotus cornutus* (Membracidae) used bracken as a supplementary food resource during the autumnal part of the plant growth season.
6. *Ditropis pteridis* (Delphacidae) was the only one of the observed planthoppers to complete its life cycle on *P. aquilinum*. It also appeared on the host plant as its most abundant herbivore.
7. The first adult individuals of *D. pteridis* were collected from *P. aquilinum* in late spring each year. Larval instars of the species, typically recorded from July onwards, were usually infesting up to 90% of the inspected plants by the end of summer.

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