



Use of sex pheromones in faunistic research on *Synanthedon scoliaeformis* (Lepidoptera, Sesiidae) in Poland

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Abstract: Studies on the distribution of *Synanthedon scoliaeformis* were carried out in western, south-western and south-eastern Poland by means of synthetic sex attractants. Funnel traps baited mainly with one component E2,Z13-18:Ac, were used. This study confirms that the use of sex attractant is highly efficient in faunistic studies and pheromone trapping may offer a user friendly and reliable method for monitoring this rare clearwing moth species which otherwise are hard to detect. New records and all the literature data on *S. scoliaeformis*, caught in Poland with the help of sex pheromone are presented.

Key words: *Synanthedon scoliaeformis*, Sesiidae, sex attractants, distribution, faunistic, Poland

INTRODUCTION

The Welsh clearwing *Synanthedon scoliaeformis* (Borkhausen 1789) is one of the most beautiful and largest species of clearwing moths in Europe. The characteristic feature of this moth is the usually rusty anal tuft. The larva lives two or three years between bark and wood of sunlit birch tree trunks (*Betula* spp., Betulaceae).

S. scoliaeformis has a Eurasian distribution (Laštůvka & Laštůvka 2001). It occurs in northern and central Europe, in Ireland, Britain, Scandinavia and northern Russia extending beyond the Arctic Circle (Špatenka et al. 1999). The southern range limit runs through northern Spain and northern Italy and coincides with the distribution of the host plant. The species also occurs in southern Romania, Bulgaria, the temperate zone of European Russia, Ukraine, the central Caucasus, the Urals, throughout western Siberia, the Altai Mountains, Transbaikalia, Georgia, Uzbekistan, northern and western Kazakhstan, central Mongolia, the Russian Far East, China and Japan (Špatenka et al. 1999).

In Poland *S. scoliaeformis* has been reported from the most provinces (Bąkowski 2000). Probably, it is widespread, but usually rare and mainly recorded individually (Schnaider et al. 1961). Despite several studies on clearwing moths in various regions of Poland in the past 20 years, the species has been reported mainly on the basis of old exit holes (Bąkowski 1992) or single reared adults (Bąkowski 2001, Bąkowski et al. 2003, Śliwiński & Kowalczyk 1995). Most of larvae and pupae of this species have been collected only in Polesie Lubelskie region (Bąkowski & Holowiński 1997).

The objective of this studies was to show how sex pheromones can be used in faunistic studies on *S. scoliaeformis* and other clearwing species in Poland and Europe.

METHODS

Funnel traps (Uni-Trap) were used and loaded with commercial insects poison, a plate saturated with dichlorvos. The traps were baited with either one of two commercial lures prepared at the Plant Research International (PRI) in Wageningen (the Netherlands). One of

them designed for *Synanthedon scoliaeformis* (SCOLIA-PRI) and the second one was intended for *Synanthedon tipuliformis* Cl. (TIP-PRI). Some traps were baited with a mixture of E2,Z13-18:Ac (TIP-UAS) prepared in University of Agricultural Science (UAS) in Alnarp, Sweden, supplied by Dr M. Larsson (UAS).

In the field the traps were fixed to tree branches (most often birch trees), approximately 1.5 m. above the ground in sunny places (Bąkowski 2002 a). In each locality one or two traps were placed. They were inspected once per 1 week. In several cases males of *S. scoliaeformis* were observed and caught flying near the attractant. All pheromones used in this study contained the compound E2,Z13-18:Ac. As expected all collected specimens were males. In the case where names of collector were not given, the moths were recorded by the author.

RESULTS

Records of *S. scoliaeformis* caught in Poland with help of sex pheromone

Dolny Śląsk Province

Literature data: Tomisław (UTM: WS28) and Ołotok (WS28) – the Bory Dolnośląskie, in total 60 exx. on pheromone (SCOLIA-PRI), in 2005–2006, mainly 25 VI – 15 VII leg. A. Hyjek, between 10 a.m. and 5 p.m., peak of the activity 10 a.m. – 2 p.m. (Kokot 2007); Piekielna Góra ad Polanica Zdrój (XR08), 8–9 VI 2007, 8 exx., pheromone (TIP-UAS), 8 VI 2007. 3 exx., pheromone (TIP-UAS), 1 ex. pheromone (SCOLIA-PRI); Szczeliniec (WR99), 10 VI 2007, the visual observations of 5 males flight to pheromone (TIP-UAS), 11.30–12 a.m.; Polanica Zdrój-Park, (XR08), 9–10 VI 2007, 1 ex., pheromone (TIP-UAS) (Bąkowski 2009).

New data: Grodziec Śląski (CA41), 4 VII 2009, 4 exx. collected flying near pheromone (SCOLIA-PRI); Tomisław (WS28), 24–26 VI 2008, 6 exx. collected near pheromone (SCOLIA-PRI), leg. X. Dobrzański.

Wielkopolska Province

Literature data: Rogalin (XT38), 20–27 V 2007, 15 exx., pheromone (TIP-UAS); 25 V – 15 VI 2009, 14 exx., pheromone (SCOLIA-PRI); 30 VI – 20 VII 2009, 17 exx., pheromone (TIP-UAS) (Bąkowski 2011).

New data: Bolechowo (XU32), 9–10 VI 2009, 5 exx., pheromone (TIP-UAS); 16–20 VI 2009, 11 exx., pheromone (TIP-UAS); 2–5 VII 2009, 7 exx., pheromone (TIP-UAS), leg. W. Śliwa; Res. Morasko (XU22), 18–19 VI 2008, 5 exx., pheromone (TIP-UAS); Suchy Las – the buffer zone of the military area (XU21), 3–9 VII 2009, 2 exx., pheromone (TIP-UAS); 10 VI – 2 VII 2010, 6 exx., pheromone (TIP-UAS), Wielkopolski National Park, on route from Trzebaw to Puszczykówko (XT29), 20 VI – 6 VII 2009, 5 exx., pheromone (SCOLIA-PRI); Poznań – Koszalińska (XU21), 13–21 VI 2010, 33 exx., pheromone (TIP-UAS), Poznań – Biskupińska (XU21), 13–21 VI 2010, 5 exx., pheromone (TIP-UAS); 1 ex., pheromone (TIP-PRI); Poznań – Marcein (XU20), 20 VI – 6 VII 2010, 24 exx., pheromone (TIP-UAS); Rogalin (XT38), 20 VI – 6 VII 2010, 25 exx., pheromone (TIP-UAS).

Lublin Province

New data: Macoszyn (FB79), 6–10 VI 2009, 30 exx., pheromone (SCOLIA-PRI).

DISCUSSION

Voerman et al. (1984) found that the compound E2,Z13-18:Ac attracted males of currant borer (*S. tipuliformis*). Field screening has shown that this compound attracts also males of *S. scoliaeformis* (Buda et al. 1993; Pühringer 1998). This study has confirmed that a mixture of

the two compounds: A (E2,Z13-18:Ac) and B (Z3,Z13-18:Ac) in a ratio 100:1 is highly attractive to males of *S. scoliaeformis*. This blend was identified by Priesner and Ryrholm and since then it has been known as the Priesner's pheromone 19 (Pühlinger 1996, Pühlinger & Ryrholm 2000). The blend of the commercial lure designed for *S. scoliaeformis* in Wageningen (SCOL-PRI) is based of Priesner's pheromone 19 (Pherobank-PRI). The study of sex pheromones of Sesiidae showed that, apart from identification of the chemical composition of pheromones of individual species, the study of ethology, in particular related to daily sexual activity, has become a new stage in investigation of the speciation process of these clearwing moths.

Kokot (2007) indicated that the males of *S. scoliaeformis* coming to pheromones between 10 a.m. and 5 p.m., and the peak of daily activity was between 10 a.m. and 2 p.m. The author's field studies were based mainly on using traps, but a few direct observations of flying males suggested that the peak of daily sexual activity was between 10 and 12 a.m., what corroborates the observations by Kokot. It remains in accordance with data published by Pühlinger & Ryrholm (2000) and Bąkowski (2002 b).

This study confirms that the use of more or less species specific sex attractants is an effective method of monitoring of this rare and local clearwing species. In many cases the males of *S. scoliaeformis* were attracted to pheromones traps in great numbers. Previously, the species has been reported in the study areas, mainly on the basis of old exit holes or single reared adults.

Since the sex pheromones attracts only males, it does not cause any damage to the populations of the target species – the females will be mated by other males. This method is thus well suited for faunistic studies and enables recording of species which have low densities and which cannot be easily detected by others methods.

The clearwing moths includes a number of bigger and more mobile xylophagous species as: *Paranthrene insolita* (Sobczyk 1995; Bąkowski et al. 2009), *Synanthedon conopiformis* (Bąkowski 1998), *S. andrenaeformis* (Bąkowski et al. 2008), *S. mesiaeformis* (Bąkowski & Ryrholm 2003, Karalius & Buda 2006), *S. soffneri* (Priesner 1993, Pühlinger & Scheuchenpflug 1995) which all can be surveyed by the aid of sexual attractants. However, the best results are obtained when using the combination of both method – the use of sex pheromones and the search of preimaginal stages. In the case of *S. scoliaeformis* it is possible to detect the presence of the species based on their characteristic old exit holes with the rests of cocoons. The sun parts of birches should be carefully inspected for the presence of ca. 5 mm round old exit holes typical of that species, usually with the remains of characteristic long and prim cocoons inside the burrows. These old exit holes remain for several years as a sign of previous infestation by the species (Predovnik 2008).

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STRESZCZENIE

[Wykorzystanie feromonów płciowych w badaniach faunistycznych *Synanthedon scoliaeformis* (Lepidoptera, Sesiidae) w Polsce]

Dzięki zastosowaniu pułapek feromonowych stwierdzono nowe stanowiska *Synanthedon scoliaeformis* w zachodniej, południowo-zachodniej i wschodniej części kraju. Zastosowano głównie pułapki typu uni-trap zaopatrzone w związek E2,Z13-18:Ac. Badania terenowe potwierdziły dużą skuteczność pułapek feromonowych w badaniach faunistycznych. Jest to skuteczna i mało inwazyjna metoda stwierdzania wielu gatunków Sesiidae, których pozyskiwanie innymi metodami jest trudne.

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