

**SPECIES OF THE GENUS *SPHENOPTERA* DEJEAN, 1833
(COLEOPTERA: BUPRESTIDAE),
OF THE SLOVAK REPUBLIC AND CZECH REPUBLIC**

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Abstrakt: Druhy rodu *Sphenoptera Dejean, 1833* (Coleoptera: Buprestidae), *Slovenské republiky a České republiky*. V práci autor shrnuje dosavadní znalosti o rozšíření, stanovištích, etologii imag, rozpětí výskytu a o nalezištích v těchto republikách pravidelně zastoupených druhů rodu *Sphenoptera* /*Sphenoptera* (*Sphenoptera*) *antiqua antiqua* (Illiger, 1803), *Sphenoptera* (*Chilostetha*) *substriata* (Krynicky, 1834) a *Sphenoptera* (*Chilostetha*) *cauta cauta* Jakovlev, 1904 (ml. syn. *petriceki* Obenberger, 1949)/ včetně poznámek k unikátnímu nálezu *Sphenoptera* (*Deudora*) *rauca rauca* (Fabricius, 1787), jednak poukazuje na několik publikovaných omylů a na další prameny k této problematice. Všechny v těchto republikách sledované druhy žijí nejvýš lokálně pouze v jižních oblastech Slovenska a Moravy, kde na plošně nepatrných, roztroušených biotopech dosahují severních hranic svých rozšíření.

Key words: Ethology, distribution, *Coleoptera*, *Buprestidae*, *Sphenoptera*, Slovakia and Czech Republic, Palaearctic region

Introduction

In the entomological literature, there are only few brief notes about species of the genus *Sphenoptera* from the territories of the Slovak Republic and Czech Republic except works by Gottwald (1968), Laibner (1968, 1969), Kaděra (1983, 1986) and Bílý (1992, 2002). In comparison with species of other genera of the family, the species of this genus have mostly inconspicuous colours and they are very closely associated with their characteristic biotopes. Thus, they frequently escape the attention of coleopterologists and sometimes, in the course of irregular and rather generally aimed faunistic research excursions, they are typically not found even at localities where they occur in rather strong populations.

About 1200 species of this genus have still been described from the Old World. A great majority of relevant data are, however, of systematic nature, so that there is a lack of most data concerning bionomy of the species. The same applies to several Central-European species.

The present work on the one hand summarizes the still existing knowledge (except for taxonomy) and, on the other hand, it brings new information on species of the genus *Sphenoptera*, occurring in both republics with pointing out certain published mistakes and literature sources comprising different partial findings of other authors that will not be detailed in the present work.

The tribe *Sphenopterini* Lacordaire, 1857, includes several genera, however, out of them, species of only one genus, the *Sphenoptera*, occur in the territory of interest,

provided that only the following three species that fall into two subgenera show their marginal, however, regularly confirmed occurrence there: the *Sphenoptera* (*Sphenoptera*) *antiqua antiqua* (Illiger, 1803), *Sphenoptera* (*Chilostetha*) *substriata* (Krynicky, 1834) and *Sphenoptera* (*Chilostetha*) *cauta cauta* Jakovlev, 1904 (jun. syn. *petriceki* Obenberger, 1949). The *Sphenoptera* (*Deudora*) *rauca rauca* (Fabricius, 1787) was also reported from the Czech Republic; however, its finding at the half of the 20th century is probably the last reliable record.

None of the species with regular occurrence in the Slovak Republic or Czech Republic is distributed throughout the territories of these countries; however, some of them always occur in particular southernmost areas of Slovakia and Moravia. They are living – or better still surviving – there, at sunny localities with prevalence of rather thin growths of herb coenoses – in the complex of most properly preserved biochores that have not yet been considerably hit by the human activity, and that offer habitats with specific biological and climatic conditions. These are exclusively most thermophilic species and, with few exemptions (some species occurring in southern countries), they do not tolerate the cultivation of their original environment. Thus, all the mentioned species belong to insects having top requirements for the environment not only in both republics but throughout the Central Europe.

Arrangement and source materials

Data on particular species will be presented below in regular order, concerning the distribution, characteristics of biotopes, ethological or other observations, period of the occurrence of imagines and sites of finding particular species, exclusively under conditions of the Slovak Republic and Czech Republic. A certain exception from this will be the discussion concerning the occurrence of the *S. rauca rauca*, about which only few notes will be presented.

I will omit data on the global distribution of the species discussed, since they were recently completely presented e.g. by Muskovits & Hegyessy (2002).

I will consider plants, with which the studied species of the genus *Sphenoptera* are associated, with making differences between so called **larval host plants**, i.e. plants, in which the larvae are also developed, and **adult host plants**, in which the larval development is impossible, however, that are desirable for imagines that occasionally enhance the diversity of their feed on them.

In lists of localities of particular species, I first present (after numbers of mapping network squares) the literature including *inter alia* findings at the given locality, followed by certain names of collectors in the oldest and still unpublished summarized findings, mainly from the second half of the 20th century. As far as names of collectors are presented directly after names of localities, these are localities yet not announced in association with the given species of the genus *Sphenoptera*. Thus, when disregarding the today hardly demonstrable possible findings at these localities in the distant past, these are names of undoubted or very probable first finders. This also applies to almost all the cases of findings from the second half of the 20th century.

In addition to data from the literature, all the basic material concerning localities of the occurrence were obtained based on the inspection of material in collections of large museums having departments of entomology (Bratislava, Brno, Praha) and on written communications with coleopterologists. However, I never present accurate data of

finders that are not quite justified, and also the number and sex of specimens found except for few exemptions.

I do not deal with problems of biology of developmental stages in the present work.

Sphenoptera (Sphenoptera) antiqua antiqua (Illiger, 1803)

Distribution in Slovak Republic and Czech Republik

It occurs only sporadically and very locally in southern areas of Slovakia and Moravia. It was formerly undoubtedly more frequent on steppe slopes that are currently mostly covered by vineyards, orchards or gardens after the destruction of autochthonous phytocoenoses.

All the oldest generally known findings from Moravia (Müller 1863, Reitter 1870) come from the surroundings of the city of Brno, latter works from the surrounding of towns Prostějov (Schubert 1904 - 1905, Zoufal 1922) and Kroměříž (Hudeček 1930). Only Hudeček (1930) informs in a small note that these were specimens collected (in the 19th century, in surroundings of Kroměříž) by K. Všeticka, however, unfortunately without more detailed locality data; however, with respect to certain associations in the further wording of the Hudeček work, these were most likely not surroundings of Kroměříž, but repeated (?) findings at Velký Kosíř near Prostějov. The other works mentioned present solely the specific name. It is of interest that Pichler (1886), in spite of presenting more data than the latter and conceptually almost analogous work by Schubert (1904 – 1905) presents no finding of the *S. antiqua antiqua* from the surroundings of Prostějov. A note by Kliment (1899), that describes a finding of one specimen of the *S. gemellata* Mannh. /synonym of *S. barbarica* (Gmel.)/ in Slatinky near Prostějov (V. Chytil leg.), certainly concerns the species *S. antiqua antiqua* and the locality Velký Kosíř. The only available material documenting the occurrence of the *S. antiqua antiqua* in the surroundings of Prostějov is one specimen (female) kept in the Moravian Museum in Brno.

The former as well as currently existing infiltration of the thermophilic fauna, including species of the family Buprestidae, across southernmost Moravia through the gorge of the valley basin Dolnomoravský úval furthermore in northward direction is, however, generally known /e.g. findings of the *Anthaxia hungarica* (Scop.) in the surroundings of Přerov (Hudeček 1930) or at the south foot of the hills Hostýnské vrchy (Fiala 1939)/, and when adding considerably well preserved parts of landscape areas (particularly of those with not cultivated and not forested land) several tens years ago, these old reports can be considered as reliable. It is, however, hard to expect a rediscovery of Moravian findings of the *S. antiqua antiqua* at these more northern localities with a possibility that the species was able to survive there, due to the almost complete anthropogenic destruction of the “wild terrain” and, with few exceptions, absence of nature reserves that could provide satisfactory conditions for this.

Data on its finding in Bohemia (most recently Gottwald 1968) are almost certainly erroneous. In all the cases, there is a confusion of localities or, as I checked personally, non-expert approach, where several old specimens in collections, identified as this species with locality of Bohemia, were associated with errors of identification. By the way, even two basic lists of Coleoptera from Bohemia that include most findings from the whole 19th century, i.e. Lokaj (1869) and Klima (1902), do not report *S. antiqua antiqua* from there at all.

Characteristics of biotopes

Typical habitats of the *S. antiqua antiqua* are semi-open to open steppe slopes, usually arid at the end of spring and in summer, oriented southward, with thin growth of thermo- and xerophilic herbs on very shallow and locally even bare soil layer, i.e. in the space of partially naked outcrops of the gravel, stony or compact rock subsoil. These conditions restrict continuous cover of plant storeys and, if shrubs and trees are still present, sometimes even to the extent corresponding to the nature of forest steppe, their growth is usually suppressed due to lack of water and nutrients. Thus, just at these localities, it is possible to meet many forms of nanism, particularly of shrubs and most thermophilic species of Central-European fauna, not only of arthropods but also of reptiles, etc.

However, this beetle also inhabits sunny fallow sites on deeper soil, as e.g. pastures, military training grounds, terrain breakages, margins and slopes of gorges, etc., i.e. places, where the herb growth is not subjected to mowing, however, in spite of this, only individual shrubs or trees are able to survive there. However, under conditions of Central-Europe, most sites of this type are stepwise covered by storeys of woody plants in the course of the succession process and then, populations of the *S. antiqua antiqua* recede from there. This mainly concerns sites, particularly in Slovakia, where the local propagation of woody plants was restricted by pasture of herbivorous animals till recently, and this provided conditions for saving the existence of untrue (not cultivated) Central-European steppe areas of the landscape on deeper soils. Thus, it is very likely that some of biotopes of the *S. antiqua antiqua* vanished or that their vanishing is not avertable.

The participation of man in the conservation of biotopes of the *S. antiqua antiqua* is thus quite necessary under vegetation conditions of Central Europe. Thus, for saving populations of the *S. antiqua antiqua* at biotopes with considerable succession, it is necessary to monitor these biotopes (particularly at places where the pasture of herbivorous animals is absent) and to destroy natural growths of vital woody plants rapidly covering the area, including their roots.

Observations and results

In both republics, there are prevalently individual and more or less random findings obtained in the course of collecting imagines of other groups of the order or possibly of further insects (e.g. on flight, from under stones, by sweeping) and thus, in general, it is considered as one of most rarely occurring members of the family *Buprestidae*.

In 1948, this species was first caught rather frequently by the entomologist from Plzeň J. Brožík junior (personal communication 1961) in the hills Kováčovské kopce near Štúrovo, where imagines were flying on small, sloping to very steep open forest steppe areas (immediately under the ridge) onto the *Trifolium* sp.

Obenberger (1949) reported that this was the *Trifolium pannonicum* Jacq., and Havelka (1964) later reported the plant from the same locality as the *T. montanum* L. However, in the course of my excursion to this biotope (in 1978) I checked that none of these species of the genus *Trifolium* occurred there. Of more robust species of the clover that could come in question with respect to the mass of their roots as possible larval host plants of the *S. antiqua antiqua*, there was only the *T. rubens* L. that was a quite prevalent herb at this locality. J. Brožík jr. alleged that this was the clover, onto which the imagines

were flying. There was possibly an erroneous identification of the *T. rubens* in the above mentioned works, however, other possibilities cannot be excluded. Thus, I can specify only the *Trifolium* sp.

According to J. Brožík jr., this beetle occurred regularly, however, stepwise less frequently at this biotope, where his father (J. Brožík senior) reportedly successfully tried to obtain larvae from the roots of the *Trifolium* sp. (pers. comm. 1961). He excluded the possibility of weakening of the population due to careless catching (these small biotopes were known only to him, J. Brožík senior and A. Sobota), however, he observed no imagine there since 1963 in spite of several further excursions in the course of next years.

Some further more detailed circumstances, concerning the observation of the *S. antiqua antiqua* by J. Brožík jr. there, were taken over based on his personal communication by Havelka (1964).

At the beginning of June 1978, I decided to explain the reason for the recession of this beetle from all these open areas exposed to sunlight. Thus, I inspected relevant growths of the *T. rubens* for several days (under conditions of permanently sunny, very hot and almost windless weather). I achieved no positive result in spite of the fact that everything seemed to be visually intact.

Only recently, I was informed by a forester there that several (?) years ago, an intervention with insecticides was implemented in a part of the hills Kováčovské kopce against a *Tortrix viridana* L. calamity. Thus, it is possible to assume that when the chemical agent also hit the biotopes of the *S. antiqua antiqua*, the whole population either extinguished or, due to other effects, possibly also climatic anomalies, it was considerably suppressed under so called perceptibility limit, so that it was impossible to demonstrate the presence of the species in spite of thorough examination and in spite of the fact that this is a rather large and relatively conspicuous species.

In spring and summer 2005, these small neighbouring rock biotopes were inspected by the entomologist V. Kubáň from Brno (personal comm. 2005), however, he found no plant of the *T. rubens*, in spite of the fact that vertical conditions of plant storeys were not considerably altered. This species of the clover that was the possible larval host plant of the *S. antiqua antiqua* receded from there and, in contrast, two species, the *Trifolium medium* L. and *T. ochroleucon* Huds., expanded. After the examination of roots of these two species, I checked that only the *T. ochroleucon* had sufficiently robust roots that could be newly satisfactory for larvae of the *S. antiqua antiqua*. However, in spite of a very beneficial weather at which imagines of the *S. antiqua antiqua* typically exert their highest activity, he observed no beetle and, based on his opinion, it completely disappeared from there. His observations, however, concerned only the mentioned small and today already former biotopes of the *S. antiqua antiqua* in the National Nature Reserve Kováčovské Kopce - South and not the whole locality.

Havelka (1964) also informs about observations of imagines by B. Rektóřík at the other distant biotope of this locality, during their flight onto the *Coronilla varia* L. In addition, as I was informed by B. Rektóřík (personal comm. 1979), there was also their flight onto a thin growth of old sowing of the *Medicago sativa* L. in the space of abandoned vineyards at the south foot of the hills Kováčovské kopce.

In the course of the first half of the last century, some Czech entomologists reportedly observed the flight of this beetle (as I derived from the description of the plant appearance in old written records) most probably onto the *T. ochroleucon*, at loess margins of an extensive steppe slope above the village Kamenica nad Hronom. According to V. Kubáň,

roots of this clover are satisfactory for the development of *S. antiqua antiqua* larvae and thus, the *T. ochroleucon* could be its possible larval host plant.

The still obviously strongest population of this beetle within both republics was found after 1980 on sun-exposed rich growths of the *Trifolium* spp. near the village Modrý Kameň in a south area of Central Slovakia. At the beginning, it had optimum conditions there for foundation of new generations and it occurred frequently. In the course of years, in association with covering the terrain mainly with shrubs, its population was ever more weakened and thus, in the late 1990's, it became rare there and the demonstration of its occurrence was already more tedious and time-consuming.

At the time, when the population of the *S. antiqua antiqua* was still successful there, S. Bílý and V. Kubáň found its larvae in roots of the *T. montanum* (Bílý 2002). V. Kubáň was interested in more details in the larval development of this species at these localities, and his work concerning this theme should soon appear (personal comm. 2005).

Thus, imagines of the *S. antiqua antiqua* were observed in Slovakia only in association with plants of the family *Fabaceae* – with several (?) species of the genus *Trifolium* on the one hand and with the *C. varia* and *M. sativa*, on the other. Thus, it was still definitely found that even at the same locality, the plants associated with imagines of the *S. antiqua antiqua* can belong to different genera, however, to the same family.

At a locality in the hills Kováčovské kopce at Štúrovo, as larval host plants of the *S. antiqua antiqua*, it is possible to consider with a certain probability the *T. rubens* and *T. ochroleucon*, and in the area of Modrý Kameň, this is quite definitely the *T. montanum*. However, as far as the *C. varia* and *M. sativa* are concerned, they can be still considered at least as adult host plants.

Unfortunately, also with respect to this very local and also in other countries sporadic species, among entomologists, solely collecting attempts are prevalent, aimed at acquiring imagines without any considerable intentions to provide accurate determination of plants associated with the specimens caught, to observe feeding of imagines, to find larvae, etc. Thus, for the other areas in more distant foreign countries, where the *S. antiqua antiqua* also occurs, plants that belong to different genera and even to quite different families (e.g. *Echium*, *Astragalus*, *Genista*, *Centaurea*) are reported as those serving for the development of larvae, however, these data are rather fragmentary, and they seem to be based on deductive or inductive considerations that need not be necessarily correct. Thus, it is frequently difficult to decide, whether larval host plants are not confused with adult host plants or even whether the data do not concern plants, on which the imagines were only randomly found.

As reported by Muskovits & Gegyessy (2002), the most frequent larval host plant of the *S. antiqua antiqua* in Hungary is the *T. pannonicum*, even at localities that are in a close vicinity of the Slovak borderline. As I mentioned above, an association of Slovak findings with this clover was already reported by Obenberger as soon as in 1949, however, this was probably an erroneous identification.

As far as the behaviour of imagines of the *S. antiqua antiqua* is concerned, their most typical feature is that after their seemingly uncoordinated flight and incidence onto the inflorescence or leafy stems, they fall down to the ground to disappear in bottom parts of the growth. However, if the growth is thinner, the beetles frequently run from its shade and they either try to dig into the soil or they search for the sunshine and for beetles of the other sex and they copulate. Mating always occurs on the ground surface, as suggested by all the entomologists, who had a chance to observe the beetles in the course of their full activity under conditions of sunny and hot weather.

The entomologist A. Rudolf from Ostrava observed a particularly interesting behaviour in July in the 1930's at the locality Plešivec. As he reported (personal comm. 1959), the beetles in the terrain of a steppe slope and under extreme hot conditions after the noon, very frequently flew onto a bare, dusty path and, after clumsy landing, they exposed themselves to the sunshine without mating.

In spite of all the findings of rather frequent abundance of the *S. antiqua antiqua* in Slovakia, it is impossible to consider that the species is propagating and that it starts to be more prosperous there. Its populations are only kept there with difficulties or they are rather receding. In both republics, this is undoubtedly the rarest species of the genus.

Occurrence: Half of April to October. – More detailed data on the seasonal dynamics will be summarized in a work by V. Kubáň aimed at the *S. antiqua antiqua* only (personal comm. 2005).

Localities

Slovak Republic: Trenčín (7174) (Roubal 1937 – 1941); R. Čepelák leg., teste V. Kubáň. – Horné Vestenice (7276) (S. Benedikt observ., teste V. Kubáň). – Rožňava area (7389?) (Geyer 1880). – Kameňany (7487) (A. Pfeffer leg.). – Plešivec (7488) (Roubal 1936, 1938, Horion 1955, Muskovits & Hegyessy 2002); A. Rudolf, M. Kocourek leg. – Oremov laz (7581) (M. Kocourek leg.). – Seleška, now Viničky (7596) (K. Prokš leg., teste V. Kubáň). – Nitra (7674) (J. Obenberger leg.?, teste V. Kubáň). – Lučenec (7683) (Roubal 1938). – Somotor (7696) (Roubal 1938); M. Kocourek leg. – Čajkov (7777) (M. Kocourek leg.). – Modrý Kameň (7781) (Bílý 2002). – Veľký Krtíš (7782) (Bílý 1992, Muskovits & Hegyessy 2002). – Horné Strháre-Koprovica (7782) (M. Kovařík leg.). – Devínska Kobyla Hill (7867) (Lukáš & Majzlan 1997, Lukáš 1998, Majzlan et al. 2005). – Šahy (7979) (Bílý 1992); J. Macek leg. – Štúrovo, before Parkán (8178) (Roubal 1933, 1936, 1938, Horion 1955, Bílý 1992, Muskovits & Hegyessy 2002). – Kováčovské kopce Hills (8178) (Obenberger 1949, Havelka 1964, Kaděra 1983, 1986); M. Dvořák, J. Krupka, M. Kocourek leg.

Czech Republic – Moravia: Slatinky (6468) (Kliment 1899 /under the name *S. gemellata* Mann./). – Prostějov area (6568?) (Schubert 1904 – 1905, Zoufal 1922); 1 female in the Mor. Museum Brno, V. Zoufal /1923 – 1932?/ leg.?, teste V. Kubáň. – Kroměříž area (6670 – 6770?) (Hudeček 1930). – Brno (6765) (Müller 1863 /recorded as *S. dianthi* Stev./, Reitter 1870 /as *S. dianthi* and *S. antiqua*/, Kliment 1899, Obenberger 1919, Fleischer A. 1927 – 1930, Horion 1955, Bílý 1992). – Brno-Řečkovice (6765) (Hoffer 1932, 1936). – Brno-Kamenný vrch Hill (6865) (Lauterer & Fleischer 1954). – Mohelno Serpentine Steppe (6863) (Havelka et al. 1964, Bílý 1992); R. Obrtel, M. Kybal leg. – Pouzdřany Steppe (7065) (Hoffer 1936, Roubal 1942, Bílý 1992); J. Krupka, L. Heyrovský leg. – Kobylí (7067) (J. Roubal leg., teste V. Kubáň). – Brumovice (7067) (S. Pokorný leg.). – Pálava Hills (7165 – 7166) (Bílý 1992).

Sphenoptera (Deudora) rauca rauca (Fabricius, 1787)

It is currently hardly possible to consider accurately the reliability of location of old findings of the *S. rauca rauca* from Southeast Slovakia at the locality Seleška (Roubal 1936; there are even doubts concerning the identification) and from south Moravia at the

locality Brno (2 specimens), that I have seen (in Moravian Museum, Brno) and that are also mentioned by Bílý (1977, 1989) and in older works under the synonym *S. geminata* (Ill.), Kliment (1899) and Klapálek (1903). As to my knowledge, these were quite unique findings that have not been re-confirmed since the beginning of the 20th century.

Thus, the finding of one female of this species at the South-Moravian locality Šardice (7068) (July 1954, Dr. B. Pokorný leg.) can be considered as extraordinarily noteworthy. I revised the specimen and as I was convinced by a son of the collector (also entomologist), who was present when the beetle was found, that any confusion of the locality is quite excluded. Thus, this finding of the *S. rauca rauca* can be considered as an only demonstrated record from the territory of former Czechoslovakia, of course, if the locality data are actually associated with the specimen mentioned.

As I am convinced, it is impossible to consider the former reports of the *S. rauca rauca* from south parts of Slovakia and Moravia as quite unreliable also due to the fact that there are considerable differences between the *S. rauca rauca* and *S. antiqua antiqua* already at the first sight and, on the other hand, considerable movements (stepwise penetration or even intensive expansion or, in contrast, slow recession or even sudden extinction) in populations of certain species in rather distant protrusions from centres of their distribution are well known in many animals and plants.

For these reasons I believe that very old Slovak as well as Moravian localities of the *S. rauca rauca* could correspond to the true reality, in spite of the fact that Muskovits & Hegyessy (2002), most probably with unjustified scepticism, consider as unsure the undocumented old reports of the occurrence of this species even in Hungary, from the southernmost area at the locality Pécs that is long distanced from south borders of Slovakia and Moravia. An argument that should not be neglected and that can be probably considered in connection with varying pressures of populations of certain species aimed at northward distribution, can also be the fact that the *S. rauca rauca* belongs to most frequent species of the genus *Sphenoptera* throughout South Europe and North Africa.

Sphenoptera (Chilostetha) substriata (Krynicky, 1834)

Distribution in Slovak Republic and Czech Republic

South Moravia (up to the close vicinity of the municipal area of Brno) and south areas of the West Slovakia and East Slovakia; except for its findings near Domaníky, no further data on the occurrence in the south part of Central Slovakia are known to me in spite of the fact that it certainly occurs at more localities there.

The considerable vitality of this species is suggested by its remarkable ability to keep its populations at all the today already very small, most typically of only several ares, residues of original phytocoenoses and growths of its host plants in southern areas. This is quite obviously the case in the lowland Záhorská nížina, particularly at its margins, where it is possible to see the end of pine plantations and thus also of almost continuous disturbance of the land by the forest management activities.

From this, it is possible to unambiguously consider the former frequent occurrence of the *S. substriata* not only on most area of the lowland Záhorská nížina (with prevalent sandy land) but also on many sites with host plants of the *S. substriata* that grew in further south areas of Slovakia, till they were destroyed by the agricultural or building activity.

This also applies for south parts of Moravia.

Characteristics of biotopes

Sphenoptera substriata is a species of steppe or forest steppe, flat or undulating land, at most with small groups of shrubs and trees that almost do not shade the prevalent original grass or flower heliophilic growths. For these phytocoenoses, their long-term horizontal as well as vertical balance is characteristic; thus, these are relatively permanent azonal coenoses with an only slowly and locally expressed competition of higher plant storeys and somewhere with regulating effects by the pasture of herbivorous animals.

The most frequent types of subsoil in the more or less flat terrain are drifted sands and alluvial gravel sands with a rather thin cover of smaller herbs. Mostly on slopes, there are, however, also loess and further types of loamy soils with dense, continuous, high and profusely growing herb cover, where a certain unfavourable compactness of the growths is probably equilibrated by enhanced light and thermal effects.

This species is, however, very severely endangered by aggressive woody plants growing directly between its host plants. Proportionally to the ever growing shading of the herb growths, the populations of the *S. substriata* are ever being reduced, as is also the case in the other insect species having requirements for considerable exposure of their host plants to the sunshine.

Observation and results

In the last decades, after finding the most frequent larval host plants under Slovak conditions, the *Dianthus serotinus* Walds. et Kit., it is being found more frequently, particularly in natural reserves of xerophytes, however, also at other localities with growing *D. serotinus*.

Its biology was outlined by Laibner (1968, 1969), who described his own observations from the steppe natural reserve Čenkovská step, where this species perhaps still occurs in a strong population. However, in both works, the *D. plumarius* L. is erroneously reported as the larval host plant instead of the proper species *D. serotinus*.

In spite of this, in any of the two republics, the *D. serotinus* is not its only larval host plant, since it was several times found even at localities, where the occurrence of the *D. serotinus* is excluded (Znojmo, Brno, the steppe Pouzdřanská step, the hill Devínska Kobyla, the hills Belanské kopce). As reported by entomologists, there are other species of the genus *Dianthus*; for example on slopes of the hill Tarbucka at Streda nad Bodrogom, it can be regularly found on a higher, unfortunately yet not precisely determined clove-pink with red flowers. Thus, in association with the *S. substriata* it is possible to expect further larval host plants of the genus *Dianthus* or possibly of the other plants of *Caryophyllaceae*.

Similarly as is the case with other larval host plants of the *S. substriata*, larvae feed on subterranean parts of the *D. serotinus*. Imagines feed on their leaves and they sit on them astride and bite them transversely from the tip of the blade; the gallery on the leaf is moderately concave from both margins to the central vein, so that it reminds of a twice bent arc of bow. I observed them feeding during full sunshine and weak wind to windless sultriness, when temperatures in shade were between 28 and 35 °C.

According to my several-year experience, the beetles are strongly active at the most hot time of the day, when they collectively very rapidly run on stems of the host plants or fly to surrounding clove-pinks of the same species and they considerably decrease in

number with advanced afternoon. Thus, the experience of entomologists V. Kubáň and M. Kocourek with evening observation is of interest (at steppe localities Čenkovská step and Somotor). As I was informed in details by V. Kubáň (personal comm. 1989), after almost hopeless noon and afternoon work with sweeping net on the growth of the *D. serotinus* (on hot days of 29 and 30 July 1975 on the steppe Čenkovská step), the beetles occurred ever more frequently only in the evening, when he collected them by sweeping between 18.30 and 19.15 of the Central European Time.

V. Kubáň (personal comm. 2005) also observed this species in late evening several times during further years, at other localities, where he considered about 19.30 of the Central European Time to be the optimum time for the occurrence of the beetles. That time, as he mentioned, the beetles are sitting without movement immediately under flower calices and they perhaps move to bases of stalks later to stand the night there. It is, however possible, that they remain on the stalks for the whole night, similarly as many herbivorous insects. However, I believe, that this behaviour of the beetles is possible only in a certain period of their life, since in accordance with my frequent observations I have never seen a similar pause in the course of their noon or afternoon occurrence.

An interesting phenomenon in biology of the *S. substriata* that is, however, also known in many other organisms, is also a certain considerable capability of forming specific differences in the body size of the beetles, particularly of females in populations present at separated biotopes. For example, in the strong population living in the steppe Čenkovská step, other than average-sized beetles can be only seldom found, whereas large specimens from the localities Borský Mikuláš or Tarbucka are by no means rare. In the species *S. cauta cauta*, that belongs to the same subgenus, I have not yet noticed this effect in spite of the fact that the two species are very similar in many respects by the general way of life and long existing isolation of biotopes.

Occurrence: Beginning of June to October. - Bílý (1989) erroneously reports “end of May and June”, probably based on not verified data that can concern populations in more southern areas of countries in which the *S. substriata* also occurs, however, not in Slovakia and Moravia.

The typical maximum occurrence in the surroundings of Štúrovo: the second decade of July.

Localities

Slovak Republic: Gbely-Farské (7268) (J. Sikora leg.). – Borský Mikuláš (7368) (M. Kaděra leg.). – Závod (7467) (M. Kaděra leg.). – Lakšárska Nová Ves (7469) (J. Plecháč leg.). – Moľva (7497) (V. Benedikt leg.). – Viničky (7596) (Muskovits & Hegyessy 2002). – Kráľovský Chlmec (7597) (Obenberger 1949, Balthasar 1957). – Malý Horeš (7597) (V. Zavadil leg.). – Leles (7598) (A. Hozák leg.). – Streda nad Bodrogom (7696) (V. Balthasar, V. Zavadil leg.). – Tarbucka Hill (7696) (M. Kocourek, V. Balthasar leg.). – Somotor (7696) (Roubal 1937 – 1941 /under the name *S. laportei* Saund./, 1938 /recorded as *S. substriata* and *S. laportei*/, Obenberger 1949, Horion 1955, Balthasar 1957, Havelka 1964); J. Palásek, M. Kocourek leg. – Domaníky (7779) (J. Soustružník sr. et jr. leg.). – Devínska Kobyla Hill (7867) (Hoffer 1936, Obenberger 1949, Balthasar 1957, Lukáš & Majzlan 1997, Lukáš 1998, Majzlan et al. 2005). – Devínska Kobyla Hill-Sandberg (7867) (J. Lukáš leg.). – Nesvady (8074) (S. Benedikt

leg.). – Belanské kopce Hills (8177) (Z. Černý leg.). – Štúrovo (8178) (Roubal 1933 /under the name *S. laportei*/, 1934, Balthasar 1957, Muskovits & Hegyessy 2002). – Helemba, now Chľaba (8178) (Roubal 1936 and 1938: *S. cauta cauta* Jak. /1 female/ ! – V. Kubáň rev.). – Čenkov Steppe (8277) (Roubal 1938 /as Mužla/, Strejček 1965, Laibner 1968, 1969); A. Sobota, M. Kocourek leg.

Czech Republic – Moravia: Senorady (6863) (J. Matoušek leg., teste V. Kubáň). – Biskoupský kopec Hill (6863) (J. Stehlík leg., teste V. Kubáň). – Brno-Kamenný vrch Hill (6865) (Farkač & Farkačová 2002); V. Kubáň leg. – Nebovidy (6865) (J. Stehlík leg., teste V. Kubáň). – Mikulovice (7062) (J. Roubal leg., teste V. Kubáň). – Popice (7065 – 7066) (J. Gottwald leg.). – Pouzdřany Steppe (7065) (Fleischer J. 1914 – 1919 /under the name *S. laportei* v. *metallica* Lap./, Fleischer A. 1927 – 1930 /given as *S. laportei*/, Hoffer 1932, 1933, Roubal 1942, Obenberger 1949, Horion 1955, Balthasar 1957); P. Lauterer, J. Gottwald leg. – Znojmo-Cínová hora Hill (7162) (V. Vláčil, Z. Kraus leg.). – Pavlovské vrchy Hills (7165 – 7166) (J. Gottwald leg.).

Sphenoptera (Chilostetha) cauta cauta Jakovlev, 1904

[Only Gottwald (1968), who studied and compared material of the *S. (C.) petriceki* Obenberger, 1949, and *S. (C.) danubiana* Obenberger, 1949, deposited in the collection of J. Obenberger in the National Museum in Prague and in other collections, and revised the holotype of the *S. petriceki*, found that the beetles are conspecific and thus, the name *S. danubiana* is a junior synonym. However, Kalashian et al. (2005) consider the taxon *S. petriceki* as identical with the nominotypical subspecies *S. cauta cauta*, which was established in association with taxonomic studies of the species *S. cauta* B. Jakovlev, 1904 (described based on a finding of one female specimen from Syria).]

Distribution in Slovak Republic and Czech Republic

It is still being found only in southernmost areas of the West, Central and East Slovakia. With respect to its unusual local distribution and unknown potential of propagation, it is hard to consider possible future findings in the southeast part of Moravia since its still known westernmost distribution area is the closest surroundings of Bratislava and nearby Hungarian Mosonmagyaróvár.

Characteristics of biotopes

Biotopes of the *S. cauta cauta* have features very similar to those with the preceding species. However, in accordance with my experience it seems that this beetle particularly prefers localities, where the larval host plant is sparingly distributed on almost bare soil (e.g. small falls or landslips of lower terrain cuts or even soil considerably compacted by wheels of vehicles sometimes passing there) and, in addition on not very steep terrain with distinct southward orientation.

It obviously avoids sites with denser and profuse bunches of the host plants. Thus, the occurrence of this herb itself need not be and frequently also is not an indicator of the original occurrence of the *S. cauta cauta*, even in areas of the occurrence of the beetle.

The *S. cauta cauta* also does not stand shading of its host plants and thus, it rapidly recedes from sites on which woody plants with dense leaves start to propagate.

Observation and results

It was still not frequently and only randomly collected by sweeping on arid grassy steppe slopes, prevalently in forest steppe nature reserves up to the half of the 1960's, when the *Petrorhagia prolifera* (L.), formerly referred to as a synonym *Tunica prolifera* (L.), was found to be its only larval host plant (Laibner 1969, Bílý 1979, Kubáň 1979).

At certain, particularly suitable "home" biotopes, the *S. cauta cauta* also forms rather large populations, e.g. in the hills Kováčovské kopce near Štúrovo. However, it does not occur everywhere even in this area, in spite of the fact that the growths of the *P. prolifera* are scattered in the forest steppe biome on many sites that are very close to each other and they are present under visually identical conditions. From this it is obvious that the species has extreme requirements for the quality of the environment in the narrowest sense of word and thus, it is very local even within one biome. Among all the species of the genus *Sphenoptera* studied, it seems to be the most thermophilic and particularly strictly specialized one.

Imagines can be most frequently found on stalks of the host plant under conditions of windless hot weather and sunshine and, in accordance with my observations, within a narrower day time interval in comparison with the *S. antiqua antiqua* or *S. substriata*. Considerable differences in the mobility of the beetles on stalks can be observed only during short temporary clouding over the sun, when they rapidly move downward to bases of their "home" plants and, in contrast, they move upward, again, after renewal of the sunshine. This species was, however, observed on above-ground parts of host plants not only in the late afternoon and in twilight, but also for a short time after that (I. Jeniš, personal comm. 2003). It is possible that even beetles of this species do not behave in this manner for the whole period of their occurrence however this was not confirmed even there.

Thus, there are only few data on the life and behaviour of the *S. cauta cauta*. In spite of this, I will mention one feature still not observed with the *S. substriata* in spite of studying the behaviour of its imagines for many hours.

I collected specimens of the *S. substriata* for several years, almost any time in the course of the period of their occurrence (at biotopes with growths of the *D. serotinus*) in about constant number, whereas in the *S. cauta cauta*, these were at most two to three individuals daily (as determined with the help of the sweeping net) at localities of their occurrence, even in the case of the most favourable weather. On July 12, 1974 (approximately between 13.00 and 13.30 of the Central European Time) I once collected tens of individuals on these sites, on area of only several m², in about 20 min. The next day, there were only few imagines at this place and on some of further days, frequently none specimen, in spite of the fact that the weather was not essentially altered.

This means that I have obviously observed them in the course of their swarming and mating that most probably occurs in this species, similarly as with some other insects, most considerably on one, particularly suitable, day. Unfortunately, the small size of the beetles and their colour blending with the surroundings as well as extreme thin growth of the *P. prolifera* considerably complicated my attempts to observe their behaviour continuously. I did not see individuals of the *S. cauta cauta* running on the ground or sitting and mating on the ground, as is the case e.g. with the *S. antiqua antiqua*. The question whether mating occurs on stalks of the host plant or on the ground should be refined by further observations. The same concerns the *S. substriata*.

The knowledge resulting from this observation could lead to an inductive conclusion that swarming and mating of the *S. substriata* also occurs under the same conditions. Certain differences, possibly of only local nature, can be probably attributed to effects of a common level of stronger concentration or, in contrast, to a more considerable spread of the beetles at the biotope, since the growths of the *P. prolifera* are typically not as dominant as those of the *D. serotinus*. Thus, even possibilities of mutual contacts of the two genders are not equivalent in the two species and the whole population of *S. cauta cauta* imagines can face this problem, as I believe, by enhanced motion and release of odours with simultaneous gathering on a certain smaller area of the biotope.

Occurrence: June to August. – Bílý (1989) also reports incorrect information for the territory of former Czechoslovakia - “end of May and June”.

The typical maximum occurrence in the surroundings of Štúrovo: beginning of the second decade of July.

Localities

Slovak Republic: Brehov (7596) (Gottwald 1968 /under the name *S. petriceki*); A. Hoffer leg. – Viničky (7596) (J. Soustružník jr. leg.). – Kráľovský Chlmec (7597) (O. Zimmermann leg.). – Plešany (7597) (J. Pávek, V. Benedikt leg.). – Nitra (7674) (Obenberger 1949, Balthasar 1957 /as *S. danubiana*). – Nitra-Kalvária Hill (7674) (A. Hoffer leg.). – Somotor (7696) (J. Palásek leg.). – Bratislava (7768?) (Obenberger 1949, Balthasar 1957 /as *S. petriceki*). – Hajnáčka (7785) (I. Jeniš leg.). – Feledince, nowadays Jesenské (7786) (Obenberger 1949, Balthasar 1957, Gottwald 1968 /as *S. petriceki*). – Devínska Kobyla Hill (7867) (Lukáš & Majzlan 1997, Lukáš 1998, Majzlan et al. 2005 /as *S. petriceki*). – Kamenica nad Hronom (8178) (Strejček 1965 /under the name *S. danubiana*, Gottwald 1968, Kubáň 1979 /as *S. petriceki*). – Kováčovské kopce Hills (8178) (Obenberger 1949 /as *S. petriceki* and *S. danubiana*, Balthasar 1957 /recorded as *S. petriceki* and *S. danubiana* /, Gottwald 1962 /under the name *S. danubiana*, Laibner 1969 /as *S. petriceki*); M Kocourek, J. Krupka leg. – Malá nad Hronom (8178) (M. Kocourek leg.). – Štúrovo (8178) (Hoffer 1936, Obenberger 1949, Balthasar 1957 /recorded as *S. danubiana* and *S. petriceki*, Gottwald 1968, Muskovits & Hegyessy 2002 /as *S. petriceki*). – Okoličná na Ostrove (8273) (M. Mantič leg.). – Zlatná na Ostrove (8273) (S. Benedikt leg.).

Discussion

The populations of the studied species of the genus *Sphenoptera* occur in the Slovak Republic as well as in the Czech Republic at biotopes having very small areas that represent quite minor fragments of geographically delimited localities. Thus, they are characterized by their close local dependence on the “home nutritive environment” in which they sensitively react on qualitative changes in phytocoenoses, particularly on adverse utilitarian interventions of man into the landscape or possibly on other changes, most probably those of the climate.

All the species considered are obviously endangered in both republics, and they are only surviving and not prospering under their current natural conditions. Unique refuges with regular and sometimes even frequent occurrence belong to the last ones that adhere

to biological requirements of these beetles thanks to their relative preservation. Thus, it is hardly possible to objectively assume their future slow infiltration into further neighbouring areas (as is frequently the case in other, more tolerant animal and plant species); in contrast, their population will be soon restricted exclusively to the last residues of suitable habitats in areas of nature reserves, from which most recent findings have been reported.

The occurrence of all the three species at restricted biotopes of a rather small area (27.97 ha) of the National Nature Reserve Devínska Kobyla (Lukáš & Majzlan 1997) should be considered as particularly interesting and very important, and it probably has no analogy anywhere else in the territory of Slovakia. Thus, just on the model of the occurrence of Central-European species of the genus *Sphenoptera*, it is possible to document in a definitely convincing way the importance of protection of certain natural areas for saving the biodiversity, where all the organisms can live much more easily or almost without disturbance, in contrast to anthropogenic, more or less devastating load to the current Central-European landscape. Thus, the work by Majzlan & Korbel (1990) is of interest in a direct relation to the protection of the genetic resources of sporadic species of beetles in Slovakia.

The list of localities of particular species of the genus *Sphenoptera* is necessarily characterized by a certain lack of completeness. The inventory is definite neither of Slovak nor of Czech localities, also with respect to the fact that about in the course of the last twenty years, entomologists discovered a number of yet unknown localities, particularly in Slovakia. They are, however, not widely known, since typical collectors are not involved in the publication activity at all, and many of them are not willing to offer their own collections or experience for publishing, which holds mainly for cases of random findings of generally sporadic species on small-area biotopes in entomologically little known and omitted parts of the landscape. In spite of this, numerous further localities with the occurrence of species of the genus *Sphenoptera* will certainly be stepwise discovered in less comfortably accessible arid areas of the steppe zone of Southwest, Central and East Slovakia – particularly in areas of Krupinská planina, Jihoslovenská kotlina, Cerová vrchovina and Zemplín – as well as in south areas of Moravia.

However, a possibility cannot be excluded that further species of this genus occur in areas of South Slovakia adjacent to the border. It is possible to assume a considerable probability of the occurrence of the *Sphenoptera (Chilostetha) parvula* (Fabricius, 1798) and *S. (C.) basalis* Morawitz, 1861, there, as could suggest their findings from wider surroundings of Budapest (Muskovits & Hegyessy 2002). There is yet no published record supporting this possibility, in spite of the fact that some specimens of these species from Slovakia can be deposited in collections of Slovak and/or Czech entomologists as erroneously determined or still undetermined material.

Conclusion

The species of the genus *Sphenoptera* undoubtedly belong to considerably ecologically narrowly specialized attractive insects and noteworthy natural objects of the Central-European fauna. Their occurrence anywhere in naturally rich areas is a reliable parameter of the biological quality of the given environment, where it is also possible to expect the other faunistically or floristically important species that should be conserved for the future. Thus, all their biotopes should enjoy the strictest protection, most properly within wider areas, to prevent sudden contact of the “wild terrain” with cultivated

landscape. In Central-European species of this genus, the translocation to biotopes completely altered by considerable cultivation (e.g. by ploughing) has never been observed, in spite of the fact that certain larval host plants or adult host plants by the species of interest do not show these requirements for the quality of biotopes.

As it unambiguously follows from currently known ecological requirements of the studied species of the genus *Sphenoptera*, they all belong to extremely not adaptable animals. Due to the fact that their populations in the currently existing landscape of Central-European countries are characterized by an islet-type distribution, they should be considered as faunistic elements most susceptible to extinction within large areas. This probably happened in Austria (Horion 1955, Harde 1979), from which no data have been reported except for a rather recent finding of the *S. substriata* (Horion 1970); this particularly concerns the *S. antiqua antiqua* that probably extinguished there as early as at the end of the 19th century.

As far as the *S. antiqua antiqua* is concerned, its last Central-European refuges that are not situated in already protected areas should be immediately incorporated into protected habitats with potential requirements for regulation of the natural propagation of woody plants.

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[The list includes only works considering territories of the Slovak Republic and Czech Republic in association with species of the genus *Sphenoptera*, and not those, whose authors (e.g. Alexejev, Caillol, Curlletti, Fagniez, Jakovlev, Marseul, Obenberger, Ogloblin, Richter, Schaefer, Théry, Xambeu) deal with the occurrence of the species in other countries, provided that they report the relationships with certain plants mostly in fragmentary and imprecise way. In addition, many of these data concern genera of plants (e.g. *Echium*, *Carduus*, *Centaurea*, *Eryngium*, *Cytisus*, *Genista*, *Astragalus*, *Onobrychis*) on which species of the genus *Sphenoptera* have not been observed in any of the two republics and they most likely do not live on these plants there.]

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