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THRIPS ATRATUS HALIDAY, 1836 AND *T. MONTANUS* PRIESNER, 1920 (THYSANOPTERA: THRIPIDAE) – ONE OR TWO SPECIES? COMPARATIVE MORPHOLOGICAL STUDIES

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The paper discusses some doubts concerning the taxonomic rank of *Thrips atratus* HALIDAY, 1836 and *Thrips montanus* PRIESNER, 1920 (*T. atratus* f. *montana* according to ZUR STRASSEN 2003). For these purposes morphological characters of adults and second stage larva of some populations coming from various regions of Poland were compared. They were studied using cluster analysis and principal component analysis for selecting the significant features separately for females and males. For adults the differences most useful for taxa separation include previously described features, such as the colour of the third antennal segment, the number of distal setae on the first vein of the forewing (for females and males) and new features: the shape of the microtrichial comb on the posterior margin of tergum VIII, and the number of discal setae on abdominal sterna V and VII (females); the length of antennal stylus, the sculpture of the tenth sternum, and the width of pore plates on abdominal sterna V and VII (males). For larvae, the main differences pertain to the number and fusion of sclerotized plates on the pronotum, the degree of developing microtrichia on plaques of tergum and sternum VIII and the differences in sclerotisation of abdominal terga IX and X. The earlier known and the new morphological characteristics of females, males and larvae supported by statistic analyses lead us to believe that the previous taxonomic status – as separate species (*T. atratus* HALIDAY and *T. montanus* PRIESNER) was correct.

Key words: *Thrips atratus*, *T. montanus*, *T. atratus v. montanus*, comparative morphology, adults, larvae

INTRODUCTION

Thrips atratus was described by HALIDAY in 1836. After its first description it was classified to such genera as *Taeniothrips* AMAYOT et SERVILLE, 1843, *Physopus* UZEL, 1895, *Similothrips* SCHLIEPHAKE, 1972 (JACOT-GUILLARMOD 1975, PRIESNER 1964, SCHLIEPHAKE, KLIMT 1979, SCHLIEPHAKE 2001). This is a very frequent, polyphagous species distributed in Europe, North America, and eastern Asia – Cyprus and Turkey (NAKAHARA 1994, ZUR STRASSEN 2003).

In 1920, PRIESNER described *Taeniothrips atratus v. montanus* on the basis of female specimens collected on carnation flowers from Tirol (Austria). These

specimens differed from *T. atratus* HALIDAY in the colour of the third antennal segment and a lower number of distal setae on the first vein of forewings. From 1937 the author used the species rank (*T. montanus*) for described earlier materials (JACOT-GUILLARMOD 1975). Hitherto this species was noted mostly from central and southern Europe, more often from the mountain regions.

Up to 1945 different rank, both as subspecies – *T. atratus v. montanus* and species – *T. montanus*, was used for specimens morphologically alike to these described by PRIESNER (JACOT-GUILLARMOD 1975). Later, in accordance with the most popular keys for European Thysanoptera of PRIESNER (1964) and SCHLIEPHAKE & KLIMT (1979), most authors used the species rank *T. montanus* (JACOT-GUILLARMOD 1975, RASPUDIĆ *et al.* 2003, VASILIU-OROMULU 1998). After revision of *Thrips* and *Taeniothrips* genera, both of the analyzed taxa were classified to *Thrips* genus. The latter encompasses species which are defined by a significant feature – the presence of ctenidia on the lateral parts of their abdominal terga (MOUND *et al.* 1976, MOUND 2002, ZUR STRASSEN 1997).

After checking the probably original type specimens from PRIESNER's collection, ZUR STRASSEN (1996, 2003) decided to synonymise *T. montanus* with *T. atratus*. As a result, in his new key we can find the former as a *montana* form of the latter. In accordance with the place of its collecting and earlier data in PRIESNER's (1964) and SCHLIEPHAKE & KLIMT (1979) keys, ZUR STRASSEN (2003) added the comment about the mountain character of *T. atratus* f. *montana* too.

During research on the Thysanoptera fauna of Poland some morphological differences amongst specimens collected in flowers of different plants (especially Caryophyllaceae) and in flowers of *Rhinanthus* sp. (Scrophulariaceae) were observed. Using the characteristics found in the older keys (PRIESNER 1964, SCHLIEPHAKE & KLIMT 1979) we identified the former as *T. atratus* and the latter as *T. montanus* but using the new key (ZUR STRASSEN 2003) – as two forms of *T. atratus*. In the face of taxonomy difficulties we decided to undertake the task of a detailed morphological analysis of collected specimens.

The aim of the study was to find more qualitative and quantitative features of adults and larvae which would help to solve the taxonomic question and allow taxonomists to distinguish exactly the collected specimens as members of two separate species: *Thrips atratus* or *T. montanus*, or to confirm the present classification used by ZUR STRASSEN – as two forms of one species. Moreover, we decided to examine the information about the mountain character of *T. montanus*.

For the sake of clarity, in this article we use the species ranks of the analyzed taxa.

MATERIALS AND METHODS

During this study we examined 150 slide-mounted specimens: 100 adults (60 females and 40 males) and 50 larvae. They were collected by I. ZAWIRSKA and H. KUCHARCZYK and are deposited in the collection of the Department of Zoology, Maria Curie-Skłodowska University in Lublin (Poland).

All specimens previously identified as *Thrips montanus* were collected in flowers of *Rhinanthus* sp. or in the case of taking net samples – on plots where this plant was present. The specimens of *T. atratus* were collected in flowers of different plant species (e.g. *Melandrium album*, *Gypsophila fastigiata*, *Dianthus* sp. and others) and caught in Moericke and Malaise traps. As a rule, larvae were found together with adults on their host plants and on this basis we can be sure that the larvae are developmental stages of the compared taxa. The specimens were collected in various localities in Poland (*T. atratus*: Lublin – the Lublin Upland, Częstochowa – the Małopolska Upland, Krzyżanowice – the Nida Basin, Buda Stalowska, Rozwadów – the Sandomierz Basin, Lesko near the Bieszczady Mts and *T. montanus*: Łagów near the Świętokrzyskie Mts, Krzyżanowice – the Nida Basin, Słowiński National Park – the Baltic coast, Dębinki – the Słonne Mts, Lipnica – the foothill of the Babia Góra massif, Warsaw).

When comparing the adults, nine morphological features for females (colour of third antennal segment and eight quantitative features) and fourteen for males (colour of third antennal segment, sculpture of X abdominal sternum and twelve quantitative features) were used (Table 1).

According to an earlier paper on the comparative morphology of *Thrips* genus larvae (KUCHARCZYK 2004), 26 binary and multistate discontinuous characteristics were used for comparing larvae of *T. atratus* and *T. montanus*. Because twenty of them were the same for both species, only six were compared in this study (Table 5). Except qualitative ones, nearly 100 quantitative (e.g. length of the body, antennal segments, setae of head, thorax and abdomen segments, distances between setae on head, pronotum and abdomen segments) features were compared. Their values were similar for both species and appear to be insignificant in distinguishing the larvae but it requires further study on more varied material. The morphological terminology was used after NAKAHARA's (1994), NAKAHARA & VIERBERGEN's (1998), and MIYAZAKI & KUDO's (1986) articles.

All the analyzed specimens were observed using an optic microscope in the light field and the larvae additionally in phase contrast. The quantitative features of adults were studied using statistic analyses.

1. Cluster analysis (SNEATH & SOKAL 1973) was performed using Ward's minimum variance cluster method, and Euclidian distances for all quantitative features. Features were standarized. The aim of the cluster analysis was to have some preliminary segregation of specimens and to generate hypothesis suggesting the existence of such grouping of studied populations, using as operational taxonomic units (OTUs).

2. Principal component analysis (PCA) was initially performed on all quantitative features and based on correlation matrices (SNEATH & SOKAL 1973) for specimens as operational taxonomic units (OTUs). The PCA was applied as a method for ordination and reducing the number of variables. In the next step the features which had the highest loadings to PC1 were extracted.

3. *A priori* grouping of populations into species was based on the PCA and cluster analysis results. For the purpose of testing the hypothesis that medians for selected features in the PCA are significantly different between species as groups, the Mann–Whitney *U*-test was applied (CONOVER 1998). Non-parametric statistic was used due to the small number of animals used in the analysis. Differences were considered statistically significant at the $P < 0.05$ level.

4. Univariate statistics were computed for expected species, including the median, mean, standard error of mean, minimum, maximum values, and standard deviation.

Analyses were performed using Statistica PL, version 6 (StatSoft Inc. 1984–2001) and Canoco for Windows, version 4.52 (Biometris 1997–2003).

RESULTS

Detailed analysis of morphological features of specimens classified as *Thrips atratus* and *Thrips montanus* shows some distinct differences among them. The qualitative differences are better visible in females and larvae of the taxa but less between males. The latter can be distinguished by using a combination of qualitative and quantitative characters.

Cluster analysis of 60 female specimens was based on the 8 quantitative features (Table 1). This analysis preliminarily divided specimens into two main groups: 40 determined as *T. atratus*, and 20 – as *T. montanus*. For all specimens contained in the right cluster (*T. montanus*) the yellow colour of antennal segment III is characteristic (Fig. 1). Two principal components sequentially accounted for cumulatively 76.0% (62.7 and 13.3% respectively). The distribution of specimens along PC1 and PC2 shows distinct separation of the two groups, the same as in the cluster analysis (Fig. 2). Eigenvectors showed that the first component was controlled primarily by the length of pronotal posteromarginal median setae (C), the maximum length of median microtrichia on tergum VIII (O), and the number of discal setae on sternum VII (E) (Table 2).

Classification of 40 male specimens was based on the 12 quantitative characters (Table 1). All specimens have their own distinct branches (Fig. 3). The dendrogram shows two main clusters. The first one comprises 26 specimens determined as *T. atratus* and collected from different plant species, the second one – 14 determined as *T. montanus* collected from *Rhinanthus sp.* mainly.

Two principal components sequentially accounted for cumulatively 63.6% (41.6 and 22.0% respectively), of the variance within the system of 12 variables. Eigenvectors showed that the first component was controlled primarily by the width of pore plates on sterna V and VII (H, I), the length of pronotal posteromarginal median setae (C), the number of discal setae on sternum V (D), the length of antennal segment VII (K) and the maximum number of distal setae on first vine of forewing (G) (Table 3). The ordination shows a general separation of the same groups of specimens as cluster analysis (Fig. 4).

The differences between characters selected in the PCA were analyzed using the Mann–Whitney *U*-test. The values of Z statistic indicate significant (at the $P < 0.05$ level) differences among medians in most of the examined characters except the length of pronotal posteroangular setae (females and males) and the number of discal setae on sterna VII and VIII (males). Highly significant for females are the

Table 1. Features of adult females and males used in quantitative analyses

Features	Female	Male
Length of pronotal posteroangular seta interna	A	A
Length of pronotal posteroangular seta externa	B	B
Length of pronotal posteromarginal median seta	C	C
Number of discal setae on sternum V	D	D
Number of discal setae on sternum VII	E	E
Number of discal setae on sternum VIII	–	F
Max. number of distal setae on first vine of forewing	G	G
Width of pore plate on sternum V	–	H
Width of pore plate on sternum VII	–	I
Length of antennal segment VII	–	J
Length of antennal segment VIII	–	K
Length of antennal segment III	M	M
Max. length of median microtrichia on tergum VIII	O	–

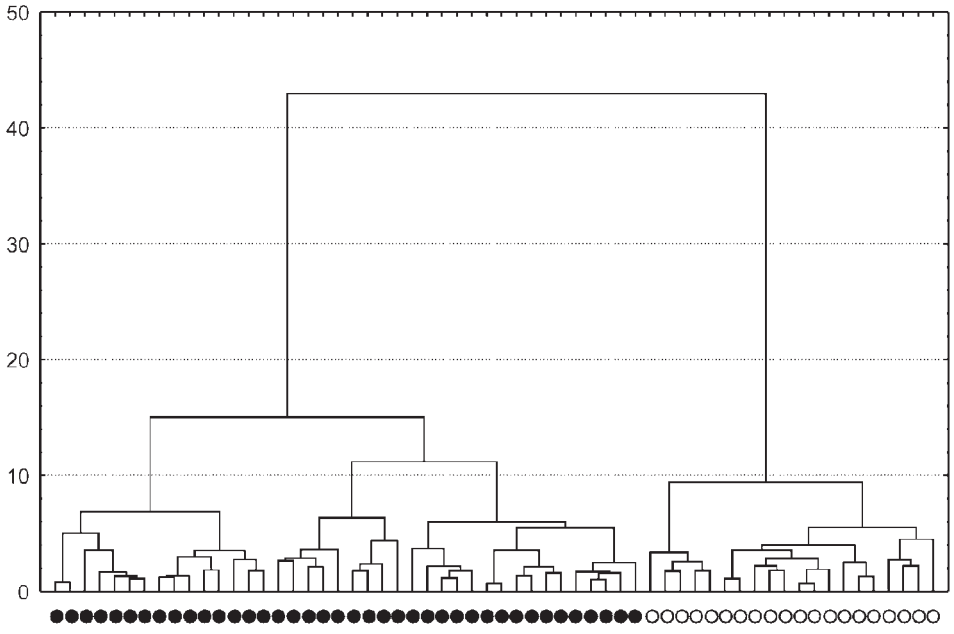


Fig. 1. Results of the cluster analysis (Ward's method, with Euclidian distances) for female specimens made on the basis of 8 quantitative features (Table 1), the feature of 3rd antennal segment colour was added: white circles – yellow, black circles – brown.

Table 2. Results of the principal component analysis (PCA) for the female specimens of *Thrips atratus* and *T. montanus* as OTUs – loadings of quantitative features for the first and second principal component (PC1, PC2).

Features	Symbol	PC1	PC2
Length of posteroangular seta interna	A	0.3310	0.4777
Length of posteroangular seta externa	B	0.1923	0.6095
Length of posteromarginal median setae	C	0.8132	0.8418
Number of discal setae on sternum V	D	0.2836	0.5728
Number of discal setae on sternum VII	E	0.4990	0.8358
Max. number of distal setae on first vine of forewing	G	0.3728	0.5347
Length of antennal segment III	M	0.2500	0.3568
Max. length of median microtrichia on tergum VIII	O	0.8535	0.8605

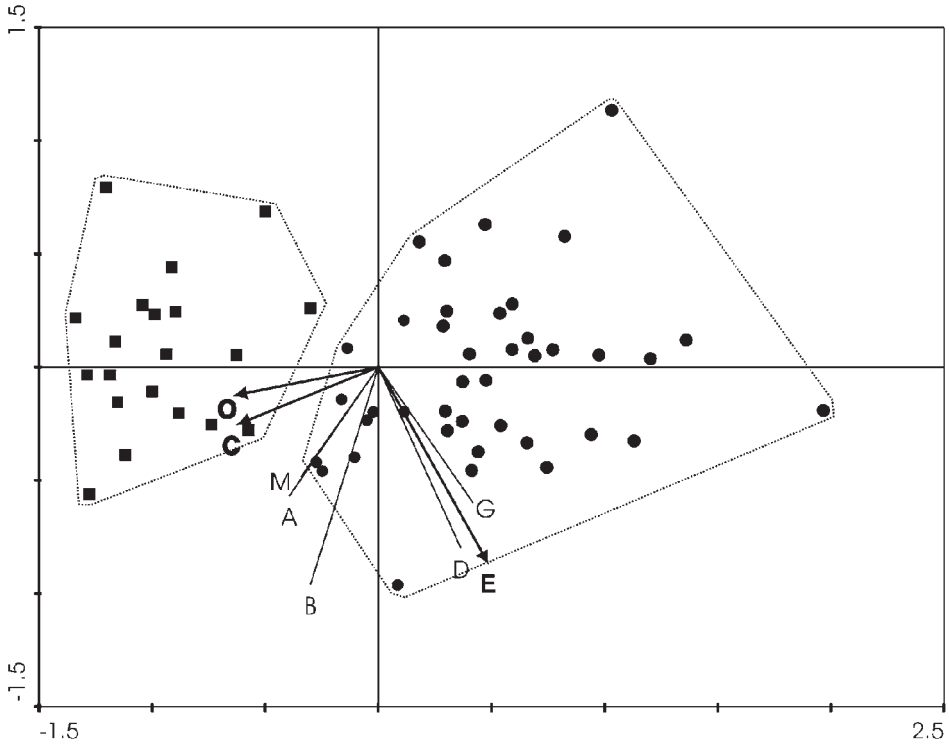


Fig. 2. Principal component analysis (PCA) – scatter diagram of individual female specimens of *Thrips atratus* and *T. montanus* as OTUs along PC1 and PC2, based on 8 quantitative features (Table 1). Abbreviations: squares – *T. montanus*, circles – *T. atratus*, A-O – features (bold and arrow – features with high loadings to the first principal component)

Table 3. Results of the principal component analysis (PCA) for the male specimens of *Thrips atratus* and *T. montanus* as OTUs – loadings of quantitative features for the first and second principal component (PC1, PC2).

Feature	Symbol	PC1	PC2
Length of posteroangular seta interna	A	0.1981	0.2196
Length of posteroangular seta externa	B	0.2597	0.2949
Length of posteromarginal median setae	C	0.7130	0.7130
Number of discal setae on sternum V	D	0.5072	0.7189
Number of discal setae on sternum VII	E	0.2124	0.6831
Number of discal setae on sternum VIII	F	0.1604	0.6354
Max. number of distal setae on first vine of forewing	G	0.4058	0.4233
Width of pore plate on sternum V	H	0.7246	0.7919
Width of pore plate on sternum VII	I	0.7129	0.7753
Length of antennal segment VIII	J	0.2234	0.3887
Length of antennal segment VII	K	0.5074	0.7729
Length of antennal segment III	M	0.3857	0.4669

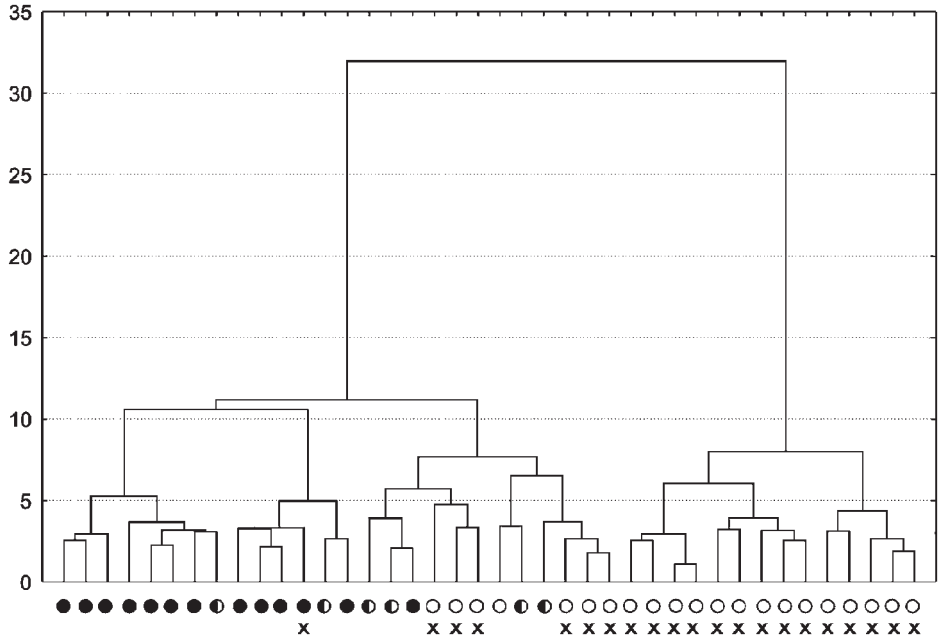


Fig. 3. Results of the cluster analysis (Ward's method, with Euclidian distances) for male specimens made on the basis of 12 quantitative features (Table 1). Two qualitative features were added: 3rd antennal segment colour: white circles – yellow, black and white circles – yellowish brown, black circles – brown; cross – strong microtrichichia on sternum X

length of pronotal posteromarginal median setae, the number of discal setae on sterna V and VII, the maximum length of median microtrichia on tergum VIII and the maximum number of distal setae on first vine of forewing (Table 4).

Five characters which are most useful in differentiating between the species (statistically highly significant at the $p < 0.001$) in males are the length of pronotal posteromarginal median setae, the number of discal setae on sternum V, the maximum number of distal setae on first vine of forewing and the width of pore plates on sterna V and VII. (Table 4).

Judging from the analysis of quantitative and qualitative characters, the females of *T. atratus* are characterized by the brown colour of antennal segment III, a higher number of distal setae on forewings (more than 7), an interrupted posteromarginal comb on tergum VIII (the length of median microtrichia of the comb ranges from 2.5 μm to max. 10 μm), a shorter median posteromarginal setae on pronotum (their length ranged from 30 to 60 μm, most often 50 μm) (Table 4).

The females of *Thrips montanus* are distinguished by the yellow colour of antennal segment III, a lower number of distal setae on forewings (5 to 7), a com-

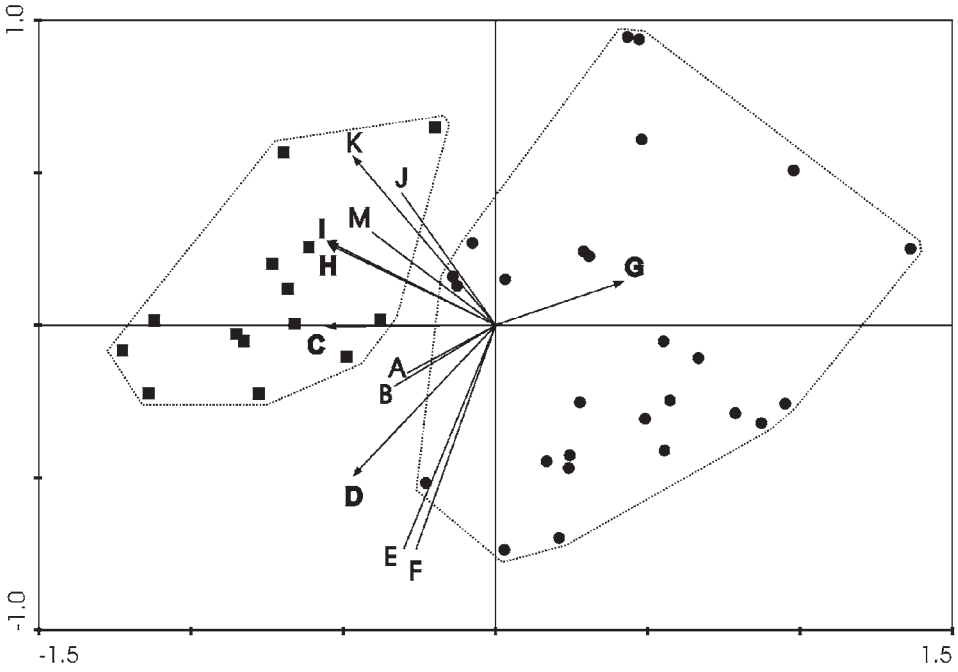


Fig. 4. Principal component analysis (PCA) – scatter diagram of individual male specimens of *Thrips atratus* and *T. montanus* as OTUs along PC1 and PC2, based on 12 quantitative features (Table 1). For abbreviations see Figure 2

Table 4. Comparision of features of and *T. montanus* specimens (mean, standard deviation, range); Mann-Whitney U/Z-statistics. **p < 0.001; *0.05 > p > 0.001; ns p > 0.05.

	Thrips atratus x±SD (range)	*Thrips montanus* x±SD (range)	U/Z	p
Females	N = 40	N = 20		
Length of antennal segment III [µm]	67.5±2.77 (60.0–70.0)	70.0±3.63 (65.0–75.0)	255.0	*
Length of posteroangular seta interna [µm]	99.1±4.79 (85.0–110.0)	102.7±4.13 (95.0–110.0)	226.5	*
Length of posteroangular seta externa [µm]	102.6±5.43 (90.0–115.0)	106.0±5.52 (95.0–120.0)	251.0	*
Length of posteromarginal median setae [µm]	50.4±5.82 (30.0–60.0)	62.5±4.73 (55.0–70.0)	58.5	**
Number of discal setae on sternum V	16.5±2.49 (12–23)	14.3±1.52 (11–17)	163.0	**
Number of discal setae on sternum VII	19.3±3.06 (14–27)	14.5±2.19 (11–19)	75.5	**
Max. length of median microtrichia on tergum VIII [µm]	7.19±1.81 (2.5–10.0)	13.7±1.52 (12.5–17.5)	0.0	**
Max. number of distal setae on first vine of forewing	8.5±0.88 (7–11)	6.5±0.83 (4–8)	27.5	**
Males	N = 26	N = 14		
Length of posteroangular seta interna [µm]	80.2±6.70 (65.0–90.0)	85.0±5.54 (75.0–95.0)	113.5	ns
Length of posteroangular seta externa [µm]	82.3±7.24 (70.0–100.0)	88.6±8.64 (75.0–100.0)	111.5	*
Length of posteromarginal median setae [µm]	40.0±6.16 (30.0–50.0)	53.9±4.87 (45.0–60.0)	18.5	**
Number of discal setae on sternum V	8.5±1.39 (6–11)	10.3±0.91 (9–12)	58.0	**
Number of discal setae on sternum VII	8.5±1.14 (6–11)	9.3±1.54 (6–11)	115.0	ns
Number of discal setae on sternum VIII	8.7±2.13 (5–13)	9.3±1.32 (6–11)	147.5	ns
Max. number of distal setae on first vine of forewing	7.3±1.09 (5–9)	5.9±0.73 (4–7)	60.5	**
Width of pore plate on sternum V [µm]	76.1±7.78 (60.0–90.0)	94.6±5.36 (90.0–105.0)	3.5	**
Width of pore plate on sternum VII [µm]	62.9±4.93 (55.0–70.0)	75.4±4.99 (70.0–85.0)	12.5	**
Length of antennal segment VIII [µm]	13.6±2.15 (10.0–17.5)	15.0±1.39 (12.5–17.5)	108.0	*
Length of antennal segment VII [µm]	8.36±1.21 (7.5–10.0)	10.4±0.91 (10.0–12.5)	54.0	**
Length of antennal segment III [µm]	61.7±3.98 (55.0–70.0)	66.8±2.48 (65.0–70.0)	57.0	**

plete comb of slender microtrichia on the posterior margin of abdominal tergum VIII (the length of microtrichia was the same along the comb and ranged from 12.5 to 17.5 μm), a longer median posteromarginal setae on pronotum (their length was more than 55 μm, most often 65 μm) (Table 4).

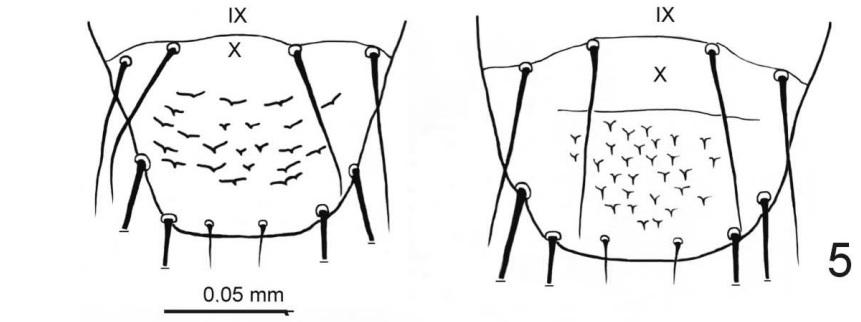
Males of both of the analyzed species are similar in most characters and colour to females. They differ from females by having discal setae on sternum VIII and pore plates (glandular areas) on sterna III–VII. The posteromarginal comb on tergum VIII is absent in males. For comparing the males of both of the taxa some of the same features as in females were used, but the differences between them were not so well visible. The colour of antennal segment III was yellow, yellowish brown or dark brown, mainly it was paler in *T. montanus* and darker in *T. atratus*. A few specimens classified as *T. atratus* had a yellowish brown colour of antennal segment III (Fig. 3). The differences in the length of antennal segments III, VII and VIII were observed. In *T. montanus* segment III is longer than 65 μm, whereas in *T. atratus* it is shorter (about 60 μm). The stylus (segments VII + VIII) is longer in *T. montanus* (25 μm and longer) than in *T. atratus* (about 20 μm). In males the number of distal setae on the main vein of forewings is not a valuable feature distinguishing the taxa because very often it is different on the right and left wing, and numbers from 4 to 9. In specimens classified as *T. montanus* the number of setae was most often 6 and in *T. atratus* – more than 7. Just like in females, the length of median posteromarginal setae on pronotum was compared in males of both species. In *T. montanus* the setae ranged from 45 to 60 μm (most often 55 μm), whereas in *T. atratus* it ranged from 30 to 50 μm (most often 40 μm). The width of pore plates on sterna V and VII is significant too (Table 4). They are wider in specimens of *T. montanus* than in *T. atratus.*

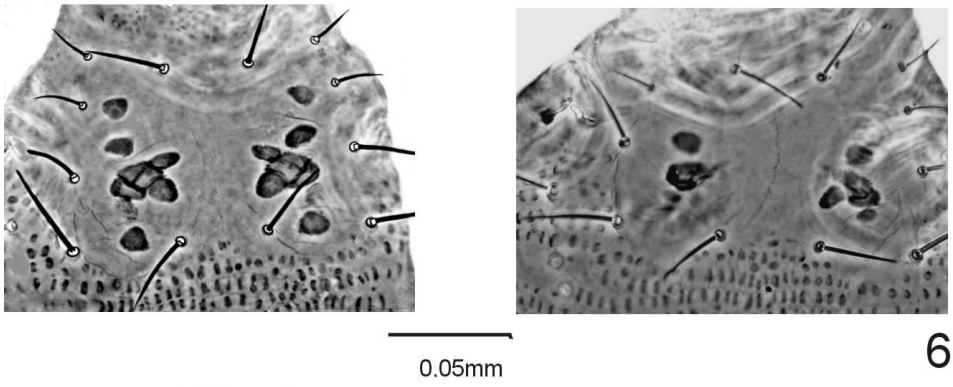
The well visible feature which distinguishes the males is the sculpture of sternum X, it consists of a few rows of long and strong microtrichial processes in males of *T. montanus*. The processes are not visible or are very short and delicate in *T. atratus* males (Fig. 5). The qualitative features were corelated with the quantitative ones (Fig. 3).

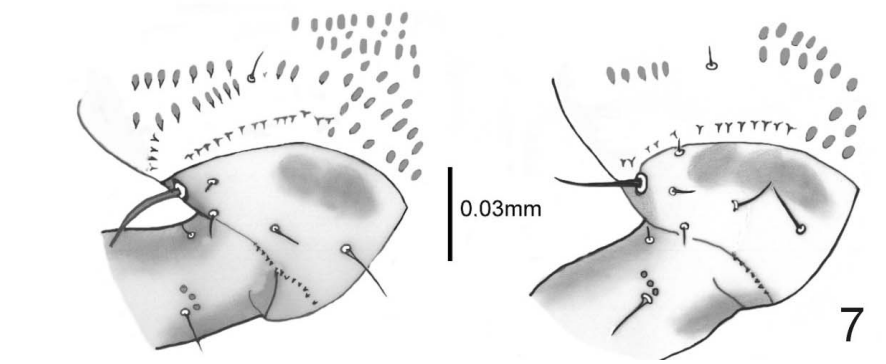
As in many other groups of Thysanoptera, the immature of *Thrips* genus are poorly known. Comparing 26 qualitative features (KUCHARCZYK 2004) we found six which distinguish larvae of both taxa, among them the best visible are: the pigmentation of pronotum and abdominal segments IX, X, and the sculpture of abdominal segment VIII (Table 5).

Larvae of both species have rather long and pale bodies (1.3–1.65 mm) with setae pointed at apex. Developmental stages of males are smaller than those of females. The pigmentation of the head is similar and consists of a grey area on the apex between the antennae and one or two pairs of small pale plates along the cheeks.

The pronotum of both species is rather smooth, only in the distal part its area is granulated with plaques which are devoid of microtrichia. Pronotal pigmentation is a feature which well distinguishes both of the species. In *T. atratus* it con-



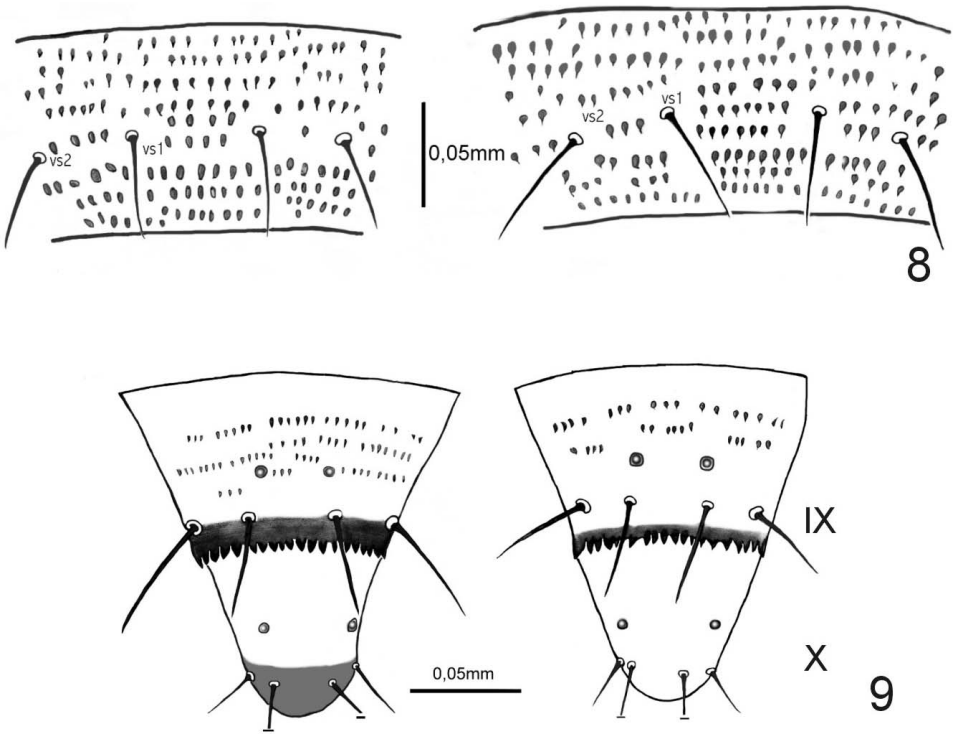




Figs 5–7. *Thrips atratus* (left), *Thrips montanus* (right): 5 = Sculpture of abdominal sternum X in males (IX, X – sterna); 6 = Pigmentation of larval pronotum; 7 = Coxa and sculpture of lateral part of larval metasternum

Table 5. Qualitative features significant in distinguishing larvae of *Thrips atratus* and *T. montanus*

Qualitative features	*Thrips atratus*	*Thrips montanus*
Pronotum pigmentation	one bigger and a few small plates (together 7–9 plates on one side)	one bigger and a few small plates (together 5–6 plates on one side)
Tergum IX pigmentation	to the level of median setae	in the area of comb only
Tergum X pigmentation	less than half area below to campaniform sensilla	without
Tergum VIII sculpture	plaques with microtrichia in anterior rows to dorsal setae	plaques with microtrichia in anterior and in 1–2 rows posterior to dorsal setae
Sternum VIII sculpture	plaques with microtrichia in anterior rows to ventral setae	plaques with microtrichia in anterior and in 2 rows posterior to ventral setae
Additional microtrichial comb near coxa III	present	absent



Figs 8–9. *Thrips atratus* (left), *Thrips montanus* (right): 8 = Sculpture of abdominal sternum VIII in larvae (vs1 – ventral seta 1, vs2 – ventral seta 2); 9 = Larvae – pigmentation of abdominal terga IX and X

sists of three (sometimes four) pairs of separate sclerotized plates and in the middle of them one bigger pair of plates fused of 4–5 smaller ones. In *T. montanus* the sclerotized structures consist of one or two pairs of separate plates and one bigger pair of plates fused of 2–3 smaller ones (Fig. 6).

Two pairs of grey sclerotized plates are present on the mesonotum: the smaller anterior to the setae and the bigger in the central part. The first one may be absent. Only one pair of small rounded plates is present on the metanotum. On the metasternum of both species, a short microtrichial comb is developed at the base of the third pair of legs. In *T. atratus* above this comb there are well developed plaques with long microtrichia which look like a parallel comb. The row of plaques with microtrichia is not observed in *T. montanus* larvae (Fig. 7).

Dorsal (larger) and ventral (smaller) plaques on the abdomen are similar in both species, they are with more or less distinct microtrichia in anterior rows, better developed in lateral parts of terga than in central parts. On sterna the microtrichia are developed on all plaques anterior to setae. The differences are distinct in the sculpture of sternum VIII. In *T. atratus* the plaques with microtrichia reach the setae level, sometimes they are present in one row below them. In *T. montanus* the plaques with well developed microtrichia are present in anterior rows and in two posterior rows of setae; also, the plaques are wider than in *T. atratus* (Fig. 8).

In *T. atratus* terga IX and X are distinctly pigmented posteriorly, on tergum IX the sclerotisation reaches the setae level and is darker near the comb. On tergum X the sclerotisation does not reach the campaniform sensilla. In *T. montanus* the pigmentation is indistinct on tergum IX (visible in contrast phase only) and is absent on tergum X. In both of species the teeth on distal rand of tergum IX are of medium size (about 5 μm) and the lateral ones are longer (about 7 μm) (Fig. 9). Very well developed comb is arranged on ventral side too, but it is shorter and consists of a greater number of teeth.

The studies revised the knowledge about the occurrence of *Thrips montanus* too. Poland, with its situation on the border between two large physiographical regions: the Eastern European Plain and the Central European Plain and with its transitional character of vegetation, may be recognized as a model territory for faunistic research. Collecting materials in various regions of this country we took into consideration the different biotic and abiotic factors which may have an influence on the variability of organisms. According to observations of habitats, where the researched specimens of both taxa were collected, *T. montanus* seems to be a monophagous species not connected with mountain regions but with host plants (*Rhinanthus* sp.) only. In spite of finding the adults on different plants, the larvae were collected only from this plant, which confirms the host role of *Rhinanthus* sp. for this thrips.

DISCUSSION

Prior to synonymizing *T. montanus* to *T. atratus* by ZUR STRASSEN (2003), both of the taxa were classified at the rank of species or the former was considered as subspecies of the latter. Both of the taxa could be distinguished using the keys of PRIESNER (1964) or SCHLIEPHAKE and KLIMT (1979). For distinguishing females of both species (PRIESNER did not include the description of males) the authors recommend the following features: the colour of the third antennal segment – yellow (*T. montanus*) or dark brown (*T. atratus*), the number of distal setae on the first vein on forewing 5–7 (*T. montanus*) or 7–9 (*T. atratus*); the distribution – very frequent, holarctic species (*T. atratus*) or an European species limited to mountain regions (*T. montanus*). In accordance with ZUR STRASSEN's key (2003), the same features are characteristic of *T. atratus* and *T. atratus* f. *montana* but the latter differs in the yellow colour of antennal segment III and is most often met in mountain regions. One of the characters which distinguish *T. atratus* from *T. linariae* (PRIESNER, 1928), included in ZUR STRASSEN's key, is the presence of a complete distal comb on tergum VIII with median microtrichia 11–14 μm long. This character is one of the most significant features which distinguish females of *T. atratus* from *T. montanus* found during our study: for the former the length of median microtrichia is 2,5–10 μm and the comb is interrupted in the middle, and for the latter microtrichia are in equal length and measure 11–17,5 μm.

The differences between taxa based on the colour and distribution characters have no distinct taxonomical value, which may confirm the changes proposed by ZUR STRASSEN (1996, 1997, 2003). However, in accordance with the results of our studies, the colour of antennal segment III was strongly correlated with the other features presented above and together with them allows one to distinguish females of *T. atratus* and *T. montanus* and confirm the previous taxonomical rank of both taxa. The detailed morphological research on adults (females and males) and larvae supplied the new significant characters, especially the length of pronotal posteromarginal median setae (for both sexes), the length of microtrichia of the distal comb (for females) and the structure of sternum X (for males). The importance of these features in the taxonomy of both taxa was confirmed by statistic analyses.

So far, larvae of European *Thrips* and *Taeniothrips* genera have been identified using SPEYER and PARR (1941) and PRIESNER's (1964) keys. Some data can be found in KIRK's (1987) and MIYAZAKI and KUDO's (1986) works. The second stage larva of *Thrips (Taeniothrips) atratus* was described by SPEYER and PARR (1941), we can find the inherent characters of this species in the key of PRIESNER (1964), too. For description the authors used both the qualitative and quantitative

features. The most significant feature in distinguishing larvae is the sclerotisation of the prothorax and the end of the abdomen; these features allow us to differentiate larvae of *T. atratus* from *T. vulgatisimus* and *Taeniothrips picipes*. The second stage larva of *T. montanus* has not been described hitherto. Both the *T. atratus* and *T. montanus* larvae are morphologically alike. The result of detailed morphological analysis was finding the features which allows one to distinguish the larvae of both these species. Besides the features used by SPEYER and PARR, and PRIESNER, new ones (the sculpture of sternum VIII and the presence of an additional row of plaques with long microtrichia in lateral parts of metasternum near coxa in *T. atratus*) have been added.

The earlier known and the new morphological characters of females and males supported by statistic analyses and finding new characters for immatures lead us to believe that the previous taxonomic ranks – as separate species – *T. atratus* and *T. montanus* – are more correct. It seems clear that the species are very closely related taxa and the latter has specialized as a monophagous insect with *Rhinanthus* spp. as a host.

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