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**Morphological variability in *Streptanus aemulans* (KBM.)  
(Homoptera, Cicadellidae)**

[With 1 Table and 7 Text-figures]

## INTRODUCTION

In Poland there can be found three species of *Streptanus* RIB.: *S. sordidus* (ZETT.), *S. aemulans* (KBM.) and *S. marginatus* (KBM.). They differ as to their environment and morphology. *S. sordidus* inhabits damp meadows, *S. aemulans* inhabits dry meadows and lawns, and *S. marginatus* inhabits light coniferous forests. The species also differ in size (*S. sordidus* 3.2–5 mm, *S. aemulans* 4.5–5.6 mm and *S. marginatus* 3.2–4 mm, after RIBAUT 1952), coloration and male genital organs.

While studying *Cicadellidae* in Warsaw an abundant comparative material of specimens of *S. sordidus* and *S. aemulans* was collected. No relevant differences were observed among the specimens of *S. sordidus*. All of them presented morphological features characteristic of the species. However, *S. aemulans* demonstrated a considerable morphological variability which determined the further studies. The material for analysing the variability consisted of 50 male *S. aemulans* collected at random from different areas in Warsaw, as well as specimens which had been collected in the vicinity of Warsaw and in central Poland. A detailed study was concerned with identification of external characteristics, i.e., the size of specimen, morphology of its head, and male genital organs.

## SIZE OF SPECIMENS

The body length of the studied male specimens ranged between 3.69 mm and 4.99 mm. All of them were grouped into six classes of size with 2 mm intervals. Class 1 consisted of 9 specimens ranging 3.69–3.81 mm in length. They

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had been collected in Warsaw and its suburban areas. Class 2 had 8 specimens with 3.88–4.06 mm in length. Those had been collected Warsaw and the Mazovian Lowlands. Class 3 contained 9 specimens with body lengths between 4.13–4.31 mm. Class 4 included 10 specimens from 4.38–4.5 mm long; class 5 had 7 specimens with lengths 4.63–4.69 mm and in class 6 there were 7 specimens from 4.71–4.99 mm in length. Fig. 1 demonstrates dependence of the num-

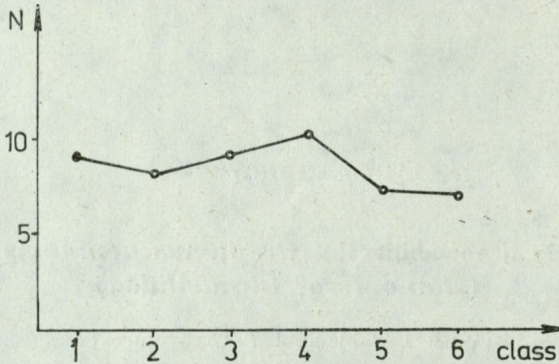


Fig. 1. *Streptanus aemulans* (KBM.). Number of specimens belonging to particular classes of size.

ber of specimens on the class of the size. The quantitative structure of particular intervals up to the length of 4.5 mm is similar (the curve is approximately linear) and covers about 85% of the specimens under study. The remaining 15% comprises specimens with body length exceeding 4.5 mm. It appears pertinent to consider the range of 3.75–4.5 mm as the dominant characteristic of the male population of the species.

The size of a specimen is an individual feature and, as proved experimentally, it is in no relation with its collecting time. And so the specimens from class 1 were collected in July, August, September and October; those from class 2 were collected from June till October, and the ones from class 3 and class 4 were collected from June till September.

#### MORPHOLOGICAL VARIABILITY OF THE HEAD

The shape of the head of male *S. aemulans* was the second external characteristic under investigation. The material included specimens with short and wide heads, and long and narrow ones; however, the majority of them possessed heads with a definite ratio of length and width i.e. 0.38 mm, and 1.5 mm, respectively. On this basis the width-to-length ratio was accepted as the comparative value. All the values of the ratio were compared and divided in nine classes with 0.35 mm intervals. It turned out that in 85% of cases the ratio ranges between 3.2 and 4.8, which may be considered distinctive for the male *S. aemu-*

*lans* (fig. 2). The ratio does not depend on the size of a specimen, e.g., a specimen 4.06 mm long (class 2 of size) was found in class 9 in respect to the width-to-length ratio of its head; a specimen 3.69 mm long (class 1) was in class 4

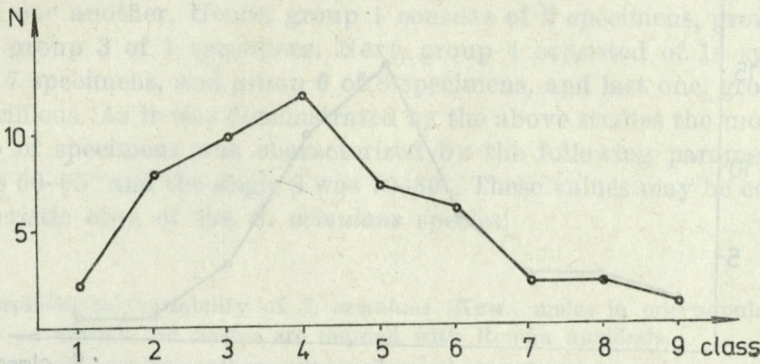


Fig. 2. *Streptanus aemulans* (KBM.). Number of specimens belonging to particular classes of head proportions.

(the width-to-length ratio being 3.83–4.0); a specimen from class 5 (its size 4.69 mm) was in class 6 where the ratio was 4.6–4.8.

#### VARIABILITY OF MALE GENITAL ORGANS

The most relevant taxonomic characteristics of *Streptanus* are genital organs of males i.e. genital plates, parameres and penis. On studying *S. aemulans* specimens no differences were observed in the structure of parameres, or the ending of penis<sup>1</sup>. Nevertheless a considerable variability was noted in the shape of the genital plates and penis in particular specimens. In order to classify the plates the width-to-length ratio was adopted. Fig. 3 presents all the studied specimens in nine characteristic classes where the interval of variability of the width-to-length ratio of the genital plate is 0.06. The same figure also shows that the dominant number of specimens is included in classes 4 to 6, with a definite ratio ranging from 0.87 to 1.05. It may be assumed that for the majority of specimens the shape of the genital plate expressed by the above ratio takes the value 1.0 which may be considered as typical for the species. To note the morphological variability of the plate in cases of Fig. 4–6 there have been shown two extreme of the shape against the shape which is assumed as the dominant one among *S. aemulans*.

Whereas it was possible to give parameters of the shape of the genital plate, considerable difficulties were encountered in classifying the shape of

<sup>1</sup> Cf. RIBAUT, 1952, fig. 150.

penis in particular specimens. The shape and the size of the penis demonstrated a great morphological variability hindering comparison.

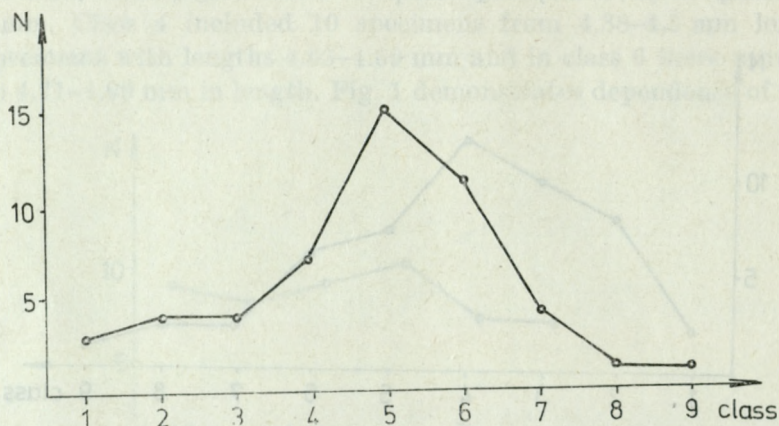


Fig. 3. *Streptanus aemulans* (KBM.). Number of specimens belonging to particular classes of subgenital plates proportions.

At the same time some specimens were noticed to possess a more or less developed process at the lower part of penis. Since there is no definite connection between such parameters as the size of a specimen, the shape of its genital plate, its environment and the size of the process, this may be assumed as an individual feature. The same population consisted of specimens with more or less developed process or completely devoid of it.

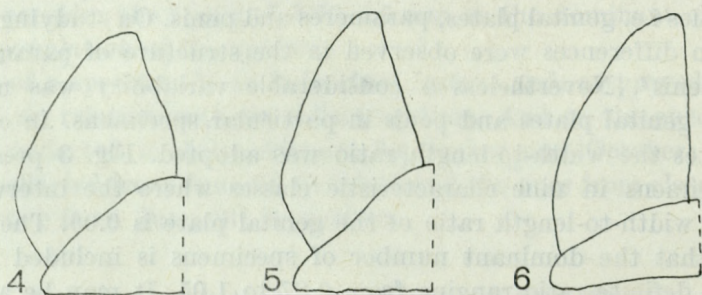


Fig. 4-6. *Streptanus aemulans* (KBM.). Examples of the shape of subgenital plates.

Similarities in the shape of penes allowed systematization of specimens into classes. The criteria were the angle of inclination of penis to the base ( $\alpha$ ) and the obtuse angle of penis ( $\beta$ ). The criterion for comparison and classification was variability of the angle  $\alpha$  and the order of the specimens in particular groups was determined by the angle  $\beta$ . This was one of possible variants and the choice was conditioned by fluctuating variability of the shape of penis due to varying angle  $\alpha$ .

The angle  $\alpha$  varied in the interval 56–90°, and the angle  $\beta$  varied in the interval 50–95°. On the above basis an attempt was made to systematize specimens with similar shapes of penis. The specimens were classified in seven groups and Fig. 7 shows that penes are similar in particular groups, however the groups differ from one another. Hence, group 1 consists of 5 specimens, group 2 of 5 specimens, group 3 of 7 specimens. Next, group 4 consisted of 14 specimens, group 5 of 7 specimens, and group 6 of 8 specimens, and last one, group 7 had only 4 specimens. As it was demonstrated by the above studies the most numerous group of specimens was characterized by the following parameters: the angle  $\alpha$  was 60–65° and the angle  $\beta$  was 70–80°. These values may be considered as characteristic ones of the *S. aemulans* species.

Table 1. Morphological variability of *S. aemulans* (КВМ.) males in one population. For clarity the classes are marked with Roman numerals.

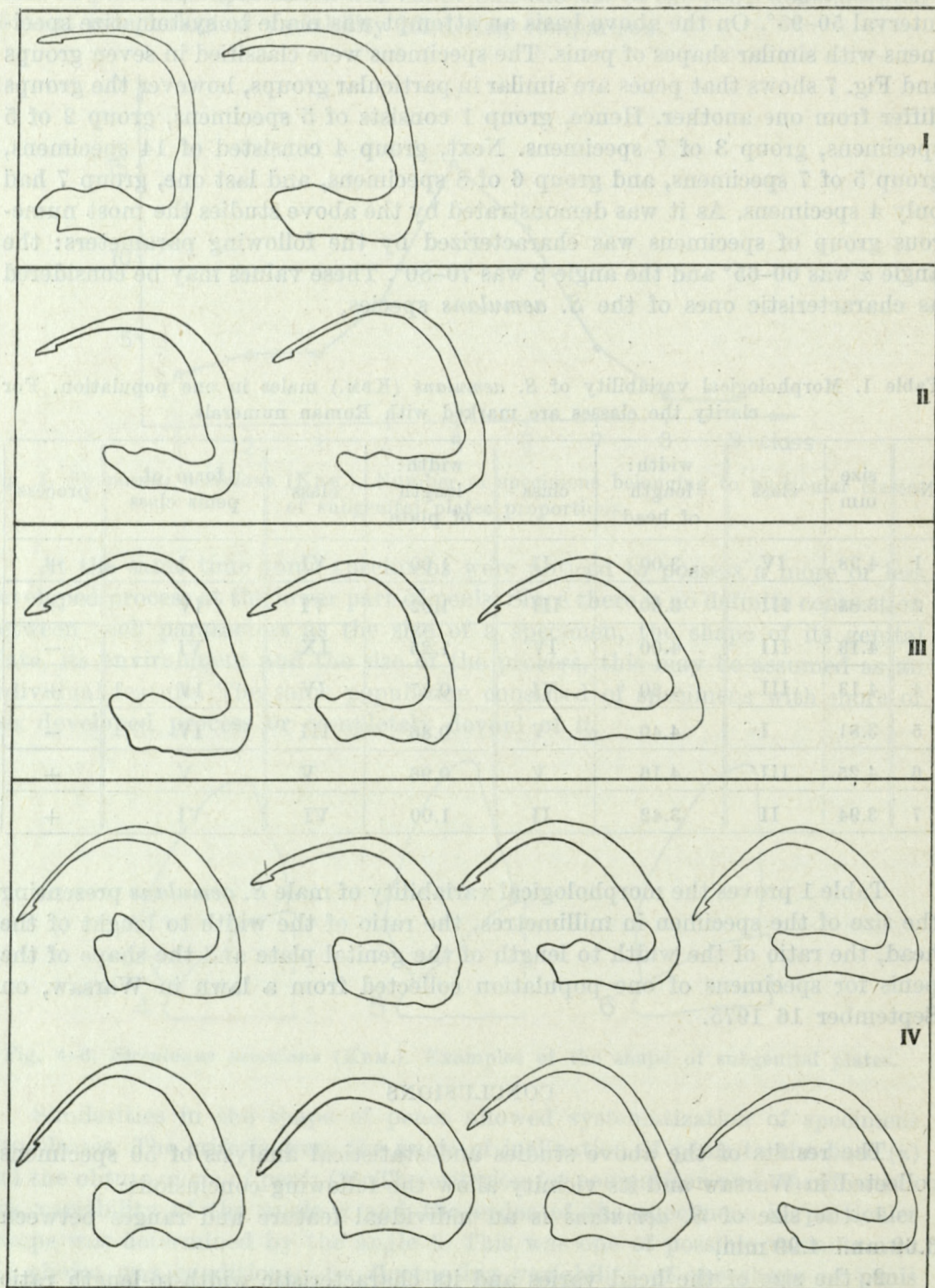
No.	size mm	class	width: length of head	class	width: length of plate	class	form of penis class	process
1	4.38	IV	3.00	II	1.00	VI	I	+
2	3.88	III	3.60	III	1.02	VI	IV	+
3	4.13	III	4.00	IV	1.25	IX	VI	–
4	4.13	III	4.60	VI	0.87	IV	IV	+
5	3.81	I	4.40	V	0.86	III	IV	–
6	4.25	III	4.16	V	0.96	V	V	+
7	3.94	II	3.42	II	1.00	VI	VI	+

Table 1 proves the morphological variability of male *S. aemulans* presenting the size of the specimen in millimetres, the ratio of the width to length of the head, the ratio of the width to length of the genital plate and the shape of the penis for specimens of one population collected from a lawn in Warsaw, on September 16 1975.

#### CONCLUSIONS

The results of the above studies and statistical analysis of 50 specimens collected in Warsaw and its vicinity allow the following conclusions:

1. the size of *S. aemulans* is an individual feature and ranges between 3.69 and 4.99 mm,
2. the size of the head varies and its characteristic width-to-length ratio is from 2.75 to 6.0,



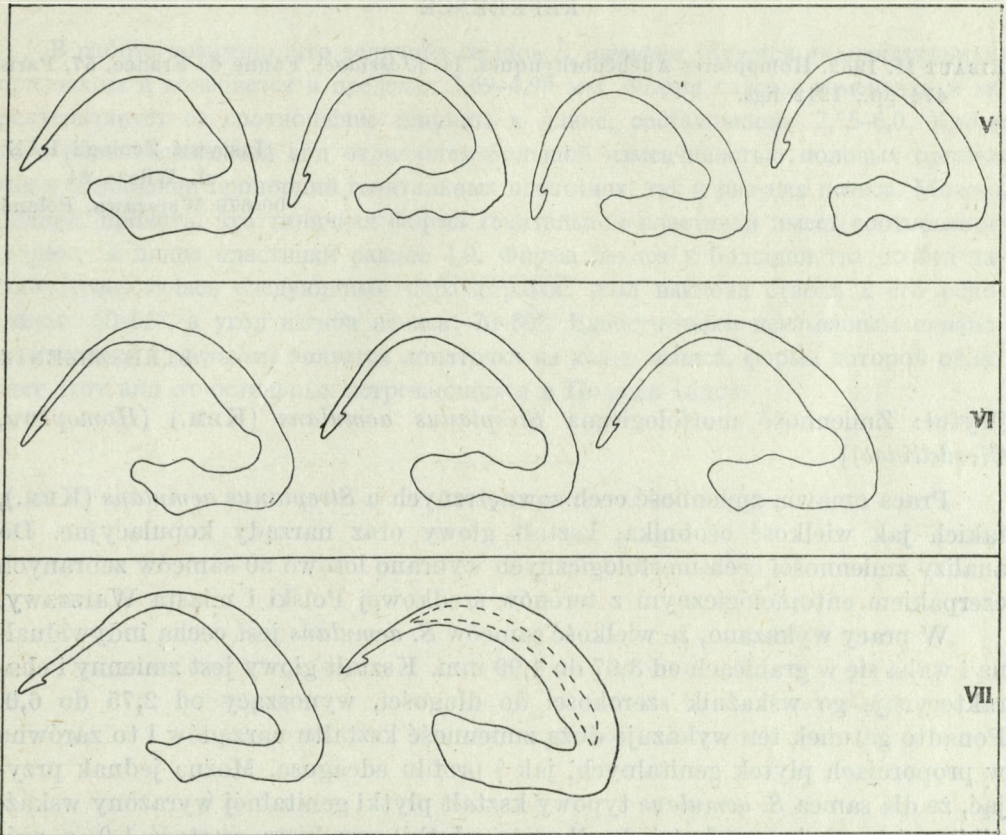


Fig. 7. *Streptanus aemulans* (KBM.). Variability of penis shape in particular classes. The classes are marked with Roman numerals.

3. a considerable variability in shape of the genital organs is demonstrated both in proportions of the genital plates and in the outline of the penis. The size of the genital plate is in no relation to the size of a specimen. The typical width-to-length ratio is expressed by the coefficient 1.0 but variations from 1.25 to 0.69 were also noted,

4. the  $\alpha$  and  $\beta$  angles of inclination of the penis also reveal an individual variability but with a predominance of typical ones within  $60^{\circ}$ – $65^{\circ}$  of the angle  $\alpha$  and  $70^{\circ}$ – $80^{\circ}$  of the angle  $\beta$ ,

5. processes are an individual feature. Specimens with all the parameters typical for the species but possessing no process were observed,

6. one population consisted of specimens with different parameters and different shapes of the genital plates and penis, and

7. the apex of the penis is the only invariable characteristic of the male *S. aemulans*.

## REFERENCE

RIBAUT H. 1952. Homoptères Auchénorhynques. II. (*Jassidae*). Faune de France, 57, Paris 474 pp., 1212 figs.

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## STRESZCZENIE

[Tytuł: Zmienność morfologiczna *Streptanus aemulans* (KBM.) (*Homoptera*, *Cicadellidae*)]

Praca omawia zmienność cech zewnętrznych u *Streptanus aemulans* (KBM.), takich jak wielkość osobnika, kształt głowy oraz narządy kopulacyjne. Do analizy zmienności cech morfologicznych wybrano losowo 50 samców zebranych czerpakiem entomologicznym z terenów środkowej Polski i miasta Warszawy.

W pracy wykazano, że wielkość samców *S. aemulans* jest cechą indywidualną i waha się w granicach od 3,67 do 4,99 mm. Kształt głowy jest zmienny i charakteryzuje go wskaźnik szerokości do długości, wynoszący od 2,75 do 6,0. Ponadto gatunek ten wykazuje dużą zmienność kształtu narządów i to zarówno w proporcjach płytek genitalnych, jak i profilu edeagusa. Można jednak przyjąć, że dla samca *S. aemulans* typowy kształt płytki genitalnej wyrażony wskaźnikiem (stosunek szerokości do długości płytki) przybiera wartość 1,0, a najliczniejsza grupa badanych osobników charakteryzuje się następującymi parametrami określającymi kształt edeagusa: kąt nachylenia trzonu do jego podstawy: 60–65° i kąt rozwarcia edeagusa: 70–80°. Jediną niezmienną cechą samców *S. aemulans* jest łopatką na końcu edeagusa, której kształt wyróżnia ten gatunek od pozostałych gatunków krajowych rodzaju *Streptanus* RIB.

## РЕЗЮМЕ

[Заглавие: Морфологическая изменчивость *Streptanus aemulans* (КВМ.) (*Homoptera*, *Cicadellidae*)]

В работе обсуждена изменчивость внешних признаков у *Streptanus aemulans* (КВМ.) таких, как величина особи, форма головы и копуляционные органы. С целью анализа изменчивости морфологических признаков взяли по методу средней выборки 50 самцов собранных энтомологическим сачком в разных районах центральной Польши и Варшавы.



В работе показано, что величина самцов *S. aemulans* является индивидуальным признаком и колеблется в пределах 3,69–4,99 мм. Форма головы изменчива и характеризует ее соотношение ширины к длине, составляющее 2,75–6,0. Кроме того рассматриваемый вид отличается большой изменчивостью половых органов как в отношении пропорций генитальных пластинок, так и рисунка пениса. Можно, однако, принять, что типичная форма генитальной пластинки имеет соотношение ширины к длине пластинки равное 1,0. Форма пениса у большинства особей характеризовалась следующими параметрами: угол наклона ствола к его основанию: 60–65°, а угол изгиба пениса: 70–80°. Единственным неизменным признаком самцов *S. aemulans* является лопаточка на конце пениса, форма которой отличает этот вид от остальных встречающихся в Польше видов.

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