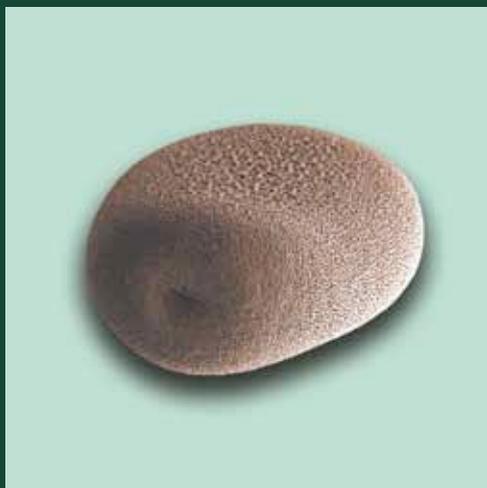


The Sesiidae (Lepidoptera) of Poland

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1. Abstract

The book presents an exhaustive review of clearwing moths (Sesiidae) of Poland. Thirty-two species are examined in detail. Although the number of species hitherto confirmed in Poland is only 31, *Chamaesphecia annellata*, as one of the erroneously recorded species, is also redescribed.

Adults of all the species, their genitalia, pupae, and larvae of 27 species are described and comparatively illustrated with drawings, photographs and scanning electron micrographs.

Keys based on morphology of adults and their genitalia as well as keys to the pupae are included. Additionally, a key to larvae of 27 species is presented for the first time. Descriptions of larval stages of 14 species are presented for the first time, their setal maps are also provided.

The number and arrangement of crochets on the larval prolegs were studied in detail, and were found to be of taxonomic significance. The results of the studies demonstrate that the division of crochets into anterior and posterior bands can differ significantly, and that the number of crochets in the anterior bands is usually higher than that in the posterior bands. Measurements of eggs of 31 species and egg morphology of selected species are given.

Many new observations on various aspects of biology of clearwing moths are provided. Information on the overall and temporal effectiveness of male attractants are given.

In addition to morphological and biological aspects, this work analyses faunistic data and includes a synthesis of more than 20-year long investigation of this family of moths in different parts of Poland. Distribution records in Poland are shown on maps based on the UTM-grid system, they contain both literature information and unpublished data, new records are given for 26 species of Sesiidae.

Molecular (COI) data of *Synanthedon spuleri* and closely related species indicate that *S. spuleri* is more closely related to *S. cephiiformis* than *S. tipuliformis*.

The latest taxonomical changes, such as the proposal to include Sesiidae in the superfamily Cossoidea, are discussed.

13. Systematic review of Polish Sesiidae

Pennisetiini Naumann, 1971

Diagnosis. Antenna setiform, in male bipectinate; M3 and Cu1 of hindwing long stalked; valve with simple hairs; uncus large, tegumen small; antrum strongly sclerotized ductus bursae long.

***Pennisetia* Dehne, 1850**

Diagnosis. **Adult.** Antenna setiform or bipectinate; labial palpus relatively long, tufted, proboscis reduced; transparent area present, veins R4 and R5 and M3 and Cu1 stalked.

Male genitalia. Valve angular, tuba analis large, aedeagus with minute spines apically.

Female genitalia. Lamella postvaginalis broad sclerotized, ductus bursae twisted spirally.

Pupa. Proboscis does not reach mesothoracic legs and ends of antennae. Labium and labial palpi short, length of labium shorter than distance between their bases and base of head projection. Prothoracic coxae distinct. One pair of frontal setae.

Larva. Seta P2 on head not reduced and almost as long as A2, crochets on A6 absent. The genus *Pennisetia* is represented in Europe by two species. In Poland has been recorded one species only. The host plant family is Rosaceae.

***Pennisetia hylaeiformis* (Laspeyres, 1801)**

Adult. Wingspan 18-25 mm. **Male** (Fig. 37b). Antenna black with red-brown scales; vertex black, yellow ventrolaterally; frons dark fuscous, grey ventrally; labial palpus black, tip of terminal segment yellow; pericephalic hairs white.

Thorax black with a narrow, white yellow or orange stripe dorsally; patagia black; tegula black with orange or white-yellow stripe medially; metathorax with a grey, hairy tuft of scales laterally. Fore coxa black with a few yellow scales; hind tibia black with yellow band medially; tibial tuft orange; tarsus orange with black bands.

Abdomen black dorsally; tergites 1, 2 and 3 with very narrow, yellow or orange anterior margins, tergites 4-7 with narrow, lemon or orange posterior margins; anal tuft dark yellow or orange, mixed with brown scales. Forewing narrow and elongate; PTA and ATA short and narrow, PTA very short, costal and anal margins black covered with orange scales; veins and discal spot black; apical area ochreous; cilia dark fuscous. Hindwing hyaline; outer margin narrow, cilia dark fuscous, veins black.

Female (Fig. 37a). Similar to male, but usually larger and more robust. Frons white-yellow.

Variation. Length of pectination in male antennae and coloration of the anal tuft is quite variable.

Male genitalia (Figs 44cde). Tegumen with long, slender pedunculi, tuba analis long; vinculum slender; uncus long and slender, with two apical lobes; saccus broad, saccular process long; anellus long and slender; valve broad and slightly expanded apically, covered with short hairs, apical corner rounded; apical margin curved; ventral margin almost straight; aedeagus long and straight, vesica with many small granules.

Female genitalia (Figs 44ab). Papilla analis short; apophysis posterior long, similar as long as apophysis anterior; lamella postvaginalis and antrum well sclerotized, antrum very large and broad, curved medially, ductus bursae short and broad, corpus bursae ovoid; signum absent.

Pupa (Figs 76a-d). 13-16 mm long, red-brown. Blade of head projection elongated to point in dorsal view. Labrum almost rectangular. Postclypeus with one projection. Frontal setae small, situated close to frons sides. Maxillary palpi without frontal projection.

Mature larva (Figs 106, 107). Body on average 15 mm in length, head 1.9 mm in width.

Head (Figs 106ab). A2 slightly dorsal than line joining A3 and A1, A2 distinctly closer to A1 than A3, S1 lies within square arranged by ocelli I-IV, S1 distinctly closer to ocellus III than to ocellus II. P2 almost as long as A2. Frontoclypeus triangular in shape. AF2 slightly posterior to frons apex. Mandibulae (Fig. 106c). Teeth I-III distinctly developed, blunted, IV tooth undeveloped, rounded, V absent.

Body (Fig. 106d). **T1.** L2 appears consistently anterodorsal to L1, L3 posterodorsal to L1. **T2-3.** D1 and D2 on common medium large pinaculum. **A1.** SV1 and SV3 on common pinaculum, SV2 absent. **A2.** SV1-2 on common pinaculum, SV3 dorsally more remote and on own pinacula. **A1-2.** L3 smaller than SV1, L3 short, almost as long as V1. **A3-6.** SV1-3 each on its own pinacula, but arrangement of SV1-3 variable, on A4 seta SV3 absent, on A5 seta SV3 present but laterally remote, SD2 undeveloped. **A7.** SV2 present, SV1-3 on common pinaculum, SV1 distinctly longer than L3. **A8.** SD1 located anterior to spiracle, at same height as SD2. L2 and L1 partly separate pinaculum. **A9.** L2 distinctly closer to L1 than SD1, L2 somewhat smaller than V1, D1 longer than L2, SD1 as long as L1. **A1-8.** D1 and D2 on medium pinaculum, D1 on segments A1-6 somewhat anterodorsal to D2, on A7-8, especially on A8 D1 anteroventral to D2.

Crochets on prolegs poorly developed. Average number of crochets on single ventral proleg 10.14, average number per one row on all ventral and anal prolegs 4.67.

Note: The number of crochets in the anterior and posterior bands on ventral prolegs is similar ($t = 0.08$, $p > 0.05$)(Tab. 3).

Biology. The life cycle is biennial. The caterpillar lives in the roots of *Rubus* spp. mainly *R. idaeus* L. (Rosaceae) during the first year, and in the stems during the second. In spring it further extends the tunnel to the dry part of the stem, where it pupates

between May and July without forming a cocoon. The emergence hole, covered by a thin lid, may be located 0-25 cm above ground level. Adults occur from June to August.

Pheromone behaviour. According to Priesner *et al.* (1986b) a mixture of two compounds E3, Z13-18: Ac and E3, Z13-18: OH in the ratio 1:1 is highly attractive to males of *P. hylaeiformis*. Males of this species are attracted to the pheromones between 9 am and 8 pm, and their peak of daily activity is between 3 and 6 pm (Tab. 4).

Habitat. Gardens, ruderal spaces, forest edges, raspberry cultures, from lowlands to high mountains.

Distribution. Euroasiatic. Widely distributed throughout almost whole Europe, except for the British Isles. In Poland is known from all provinces, sometimes very common (Fig. 6).



Fig. 6. Distribution of *Pennisetia hylaeiformis* in Poland

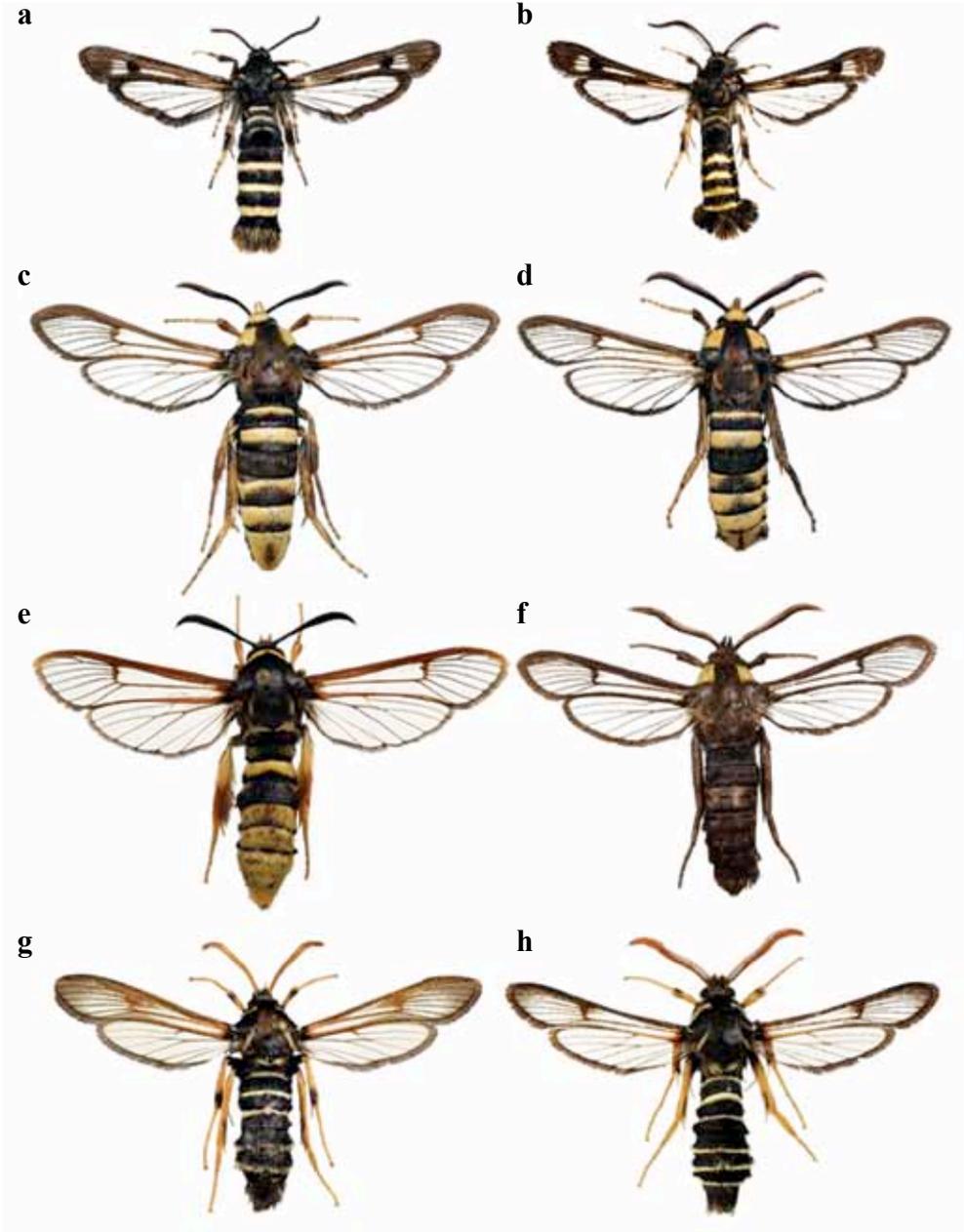


Fig. 37. *Pennisetia hylaeiformis* – **a:** female, **b:** male; *Sesia apiformis* – **c:** female, **d:** male, **f:** male (black form); *S. bembeciformis* – **e:** female; *Eusphacia melanocephala* – **g:** female, **h:** male

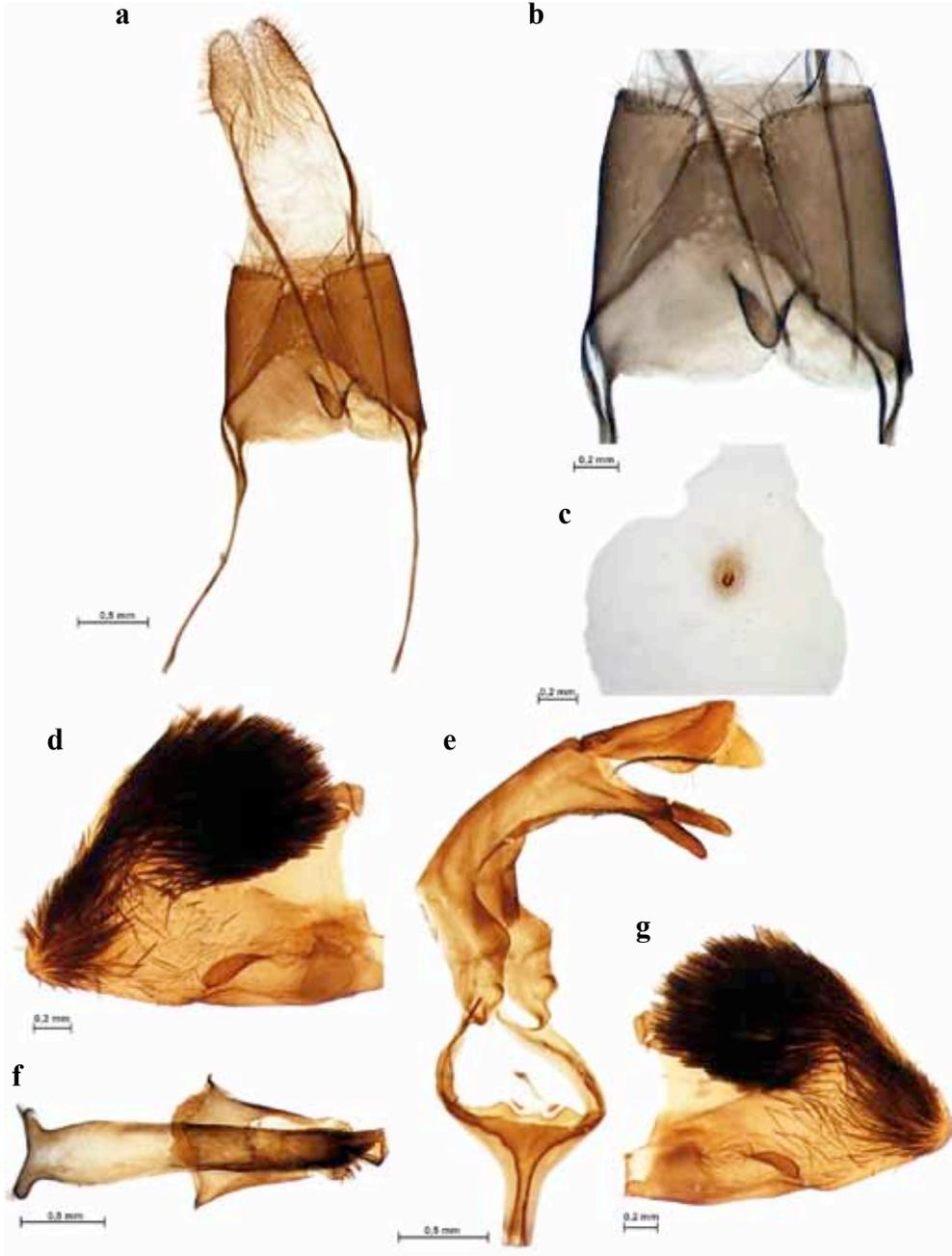


Fig. 47. Genitalia of *Eusphecia melanocephala*. Female – **a**: general view, **b**: antrum, **c**: corpus bursae with signum. Male – **d**: right valva, **e**: uncus-tegumen complex, **f**: aedeagus, **g**: left valva

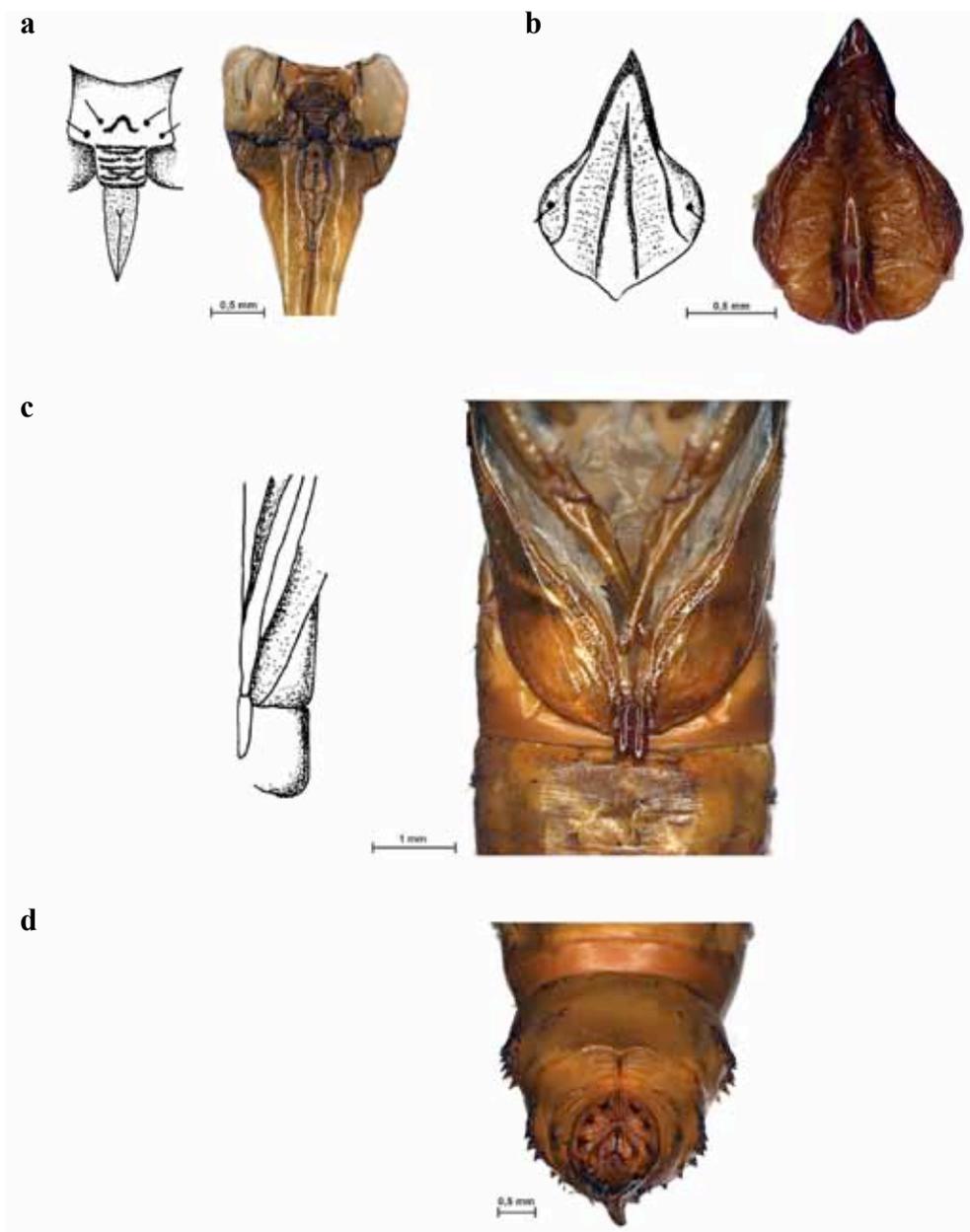


Fig. 76. Pupa of *Pennisetia hylaeiformis* – **a:** labrum and vicinity, **b:** frons dorsally, **c:** proboscis, antennae and leg ends, **d:** abdominal end ventrally

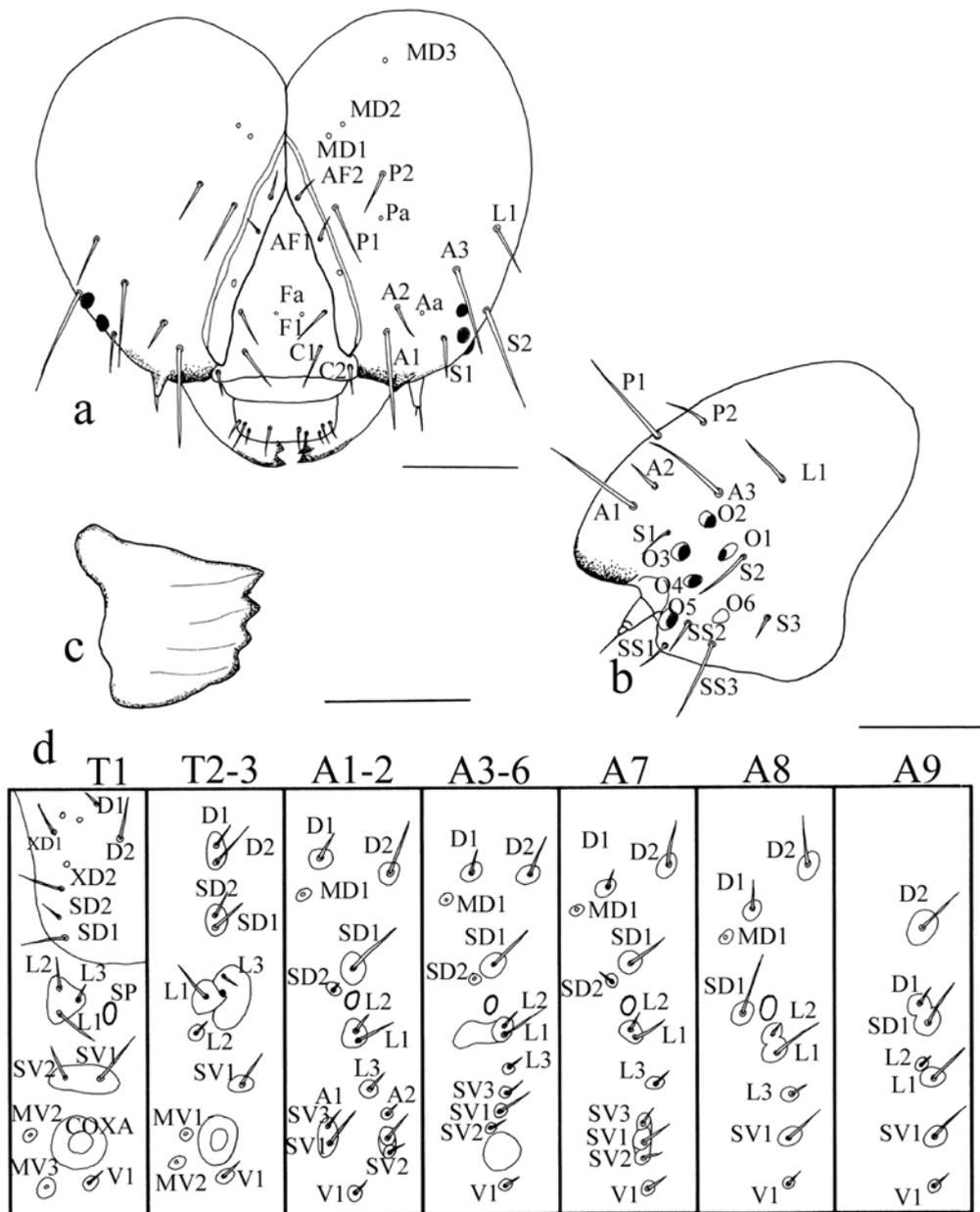


Fig. 106. Larva of *Pennisetia hylaeiformis*. Head capsule – **a**: frontal view, **b**: lateral view, **c**: mandible, **d**: setal map of thorax (T₁-T₃) and abdomen (A₁-A₉) segments. Scale bar: abc = 0.5 mm

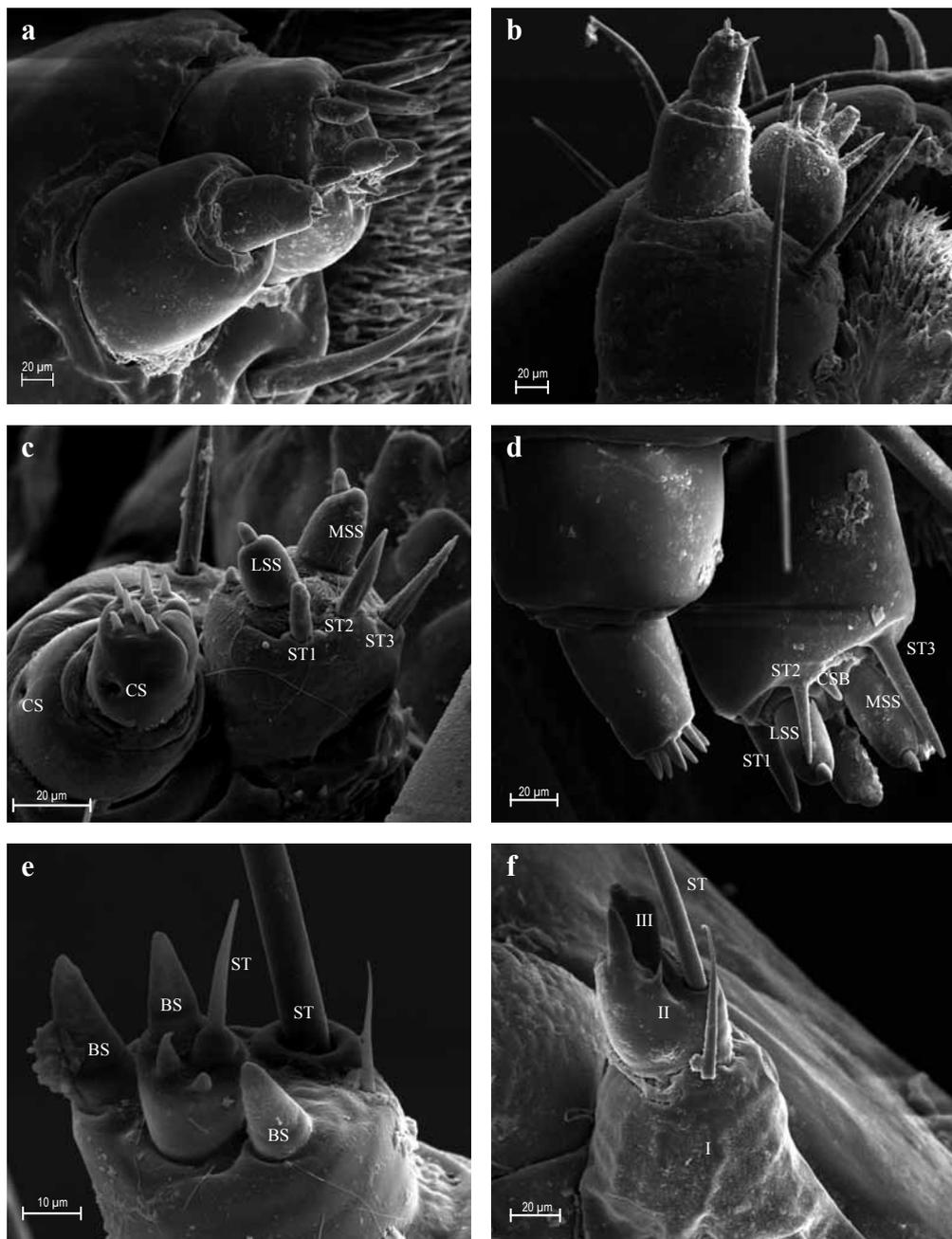


Fig. 142. Maxilla and antenna of larvae – **a:** maxilla of *S. apiformis*, **b:** maxilla of *S. mesiaeformis*, **c:** maxilla of *P. muscaeformis*, **d:** maxilla of *S. stomoxiformis*, **e:** apex of antenna of *P. muscaeformis*, **f:** antenna of *C. nigrifrons*. CS – campaniform sensilla, LSS and MSS (styloconica sensilla), BS and CSB – basiconica sensilla, ST – trichodea sensilla, I-III articles

The publication “The Sesiidae (Lepidoptera) of Poland” by Marek Bąkowski is an example of a perfectly prepared monograph. It is not only an exhaustive summary of the published data, but it is primarily a presentation of the results of the author’s long-term research. It provides new insights concerning the morphology of adult and preadult stages, the phylogeny, biology and distribution of clearwing species. Thus, the work constitutes an important source of information for further studies of this family in Poland and elsewhere in Europe.

Prof. Zdeněk Laštůvka

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