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Pneumia mladeni sp. nov. (Diptera: Psychodidae: Psychodinae) from Bulgaria

Pneumia mladeni sp. nov. (Diptera: Psychodidae: Psychodinae) z Bulharska

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Abstract. The type material of the moth fly *Pneumia mladeni* sp. nov. (males) was collected in Bulgaria (Pirin and Rila National Parks, Vitosha Nature Park). The species is described, a differential diagnosis is provided, and diagnostic characters illustrated.

INTRODUCTION

The fauna of Psychodinae has received much attention in the past four decades. Approximately twenty extant species have been described in the genus *Pneumia* Enderlein, 1935 (Omelková & Ježek 2012) and the systematic position of all taxa discussed on the basis of morphological characters (e.g. Vaillant 1979, 1981, Krek 1982, 1983, 1985, 1990, 1999, Salamanna 1983, Vaillant & Joost 1983, Ježek 1990, 2004, Wagner 1981, 1986, 1994, Wagner & Schrankel 2005, Wagner et al. 2013, Afzan & Belquat 2016). Many of these species were originally described in *Satchelliella* Vaillant, 1979. The genus *Pneumia* has been placed in the tribe Pericomani on the basis of both molecular and morphological studies, although the precise limits of this tribe are controversial (Kvifte 2018).

The following study proposes one new species (based only on males) from subalpine parts of Bulgaria, collected in the past (1981 and 1990) and deposited in the National Museum in Prague. Omelková & Ježek (2012) discussed the history of synonymy in this genus and published a summary check-list of Holarctic species of *Pneumia,* but unfortunately *P. reghayana* Boumezzough et Vaillant, 1986 from Morocco was overlooked. We must also add *P. pellucida* Wagner, 2013, recently described from Turkey (Wagner et al. 2013). The genus *Pneumia* Enderlein, 1935 is now represented by 60 taxa in the Holarctic and Oriental Regions (including four recognized subspecies, and the species *P. reghayana*, *P. pellucida* and *P. mladeni* sp. nov.). 57 taxa occur in the Palaearctic Region.

MATERIAL AND METHODS

Specimens of *Pneumia mladeni* sp. nov. were collected around Demjanica montane chalet (Pirin Mountains) near Bansko, in the vicinity of waterfalls near Borovec settlement (Rila Mts) near Samokov, and on wet slopes of the

Vitosha Mountains near Sofia (all 1981, sweep netting, by the first author). Some additional material was collected later near Razlog in the Pirin Mountains (valley of the Bela Reka River, 1990, sweep netting, P. Chvojka leg.).
The captured moth flies were preserved in 70% ethanol in the field and subsequently cleared in chloralphenol, treated in xylol and mounted on glass slides in Canada balsam in Prague. The specimens are deposited in the National Museum, Praha, Czech Republic (NMPC). Observations were made using Carl Zeiss Jena (Germany) and Reichert (Austria) microscopes, with a mirror arm used as a drawing aid (by the first author). Slides were numbered in the NMPC with two separate series of numbers: Inv. No. = Inventory Slide Number of the family Psychodidae and Cat. No. = Catalogue Number of Slide. The latter series is used for type material included in the NMPC Diptera collection (see Tkoč et al. 2014). Maximum wing length is (approximately) equal to the distance from a line connecting the bases of the basal costal node to neala and the wing apex. Fore, middle and hind leg ratios are indicated by P1, P2 and P3, respectively. Wing indices in the taxonomic part are based on the distances between the following points: A = tip of wing, B = radial fork, C = medial fork, D = tip of CuA_2; the distances are indicated by both extreme points. Morphological terminology in this paper mainly follows Cumming & Wood (2009, 2017). The terms ventral epandrial plate or sclerite are used as in Duckhouse (1990). The very reduced sensory filaments inserted on various antennal flagellomeres are termed "ascoids", following Wagner & Ibáñez-Bernal (2009).

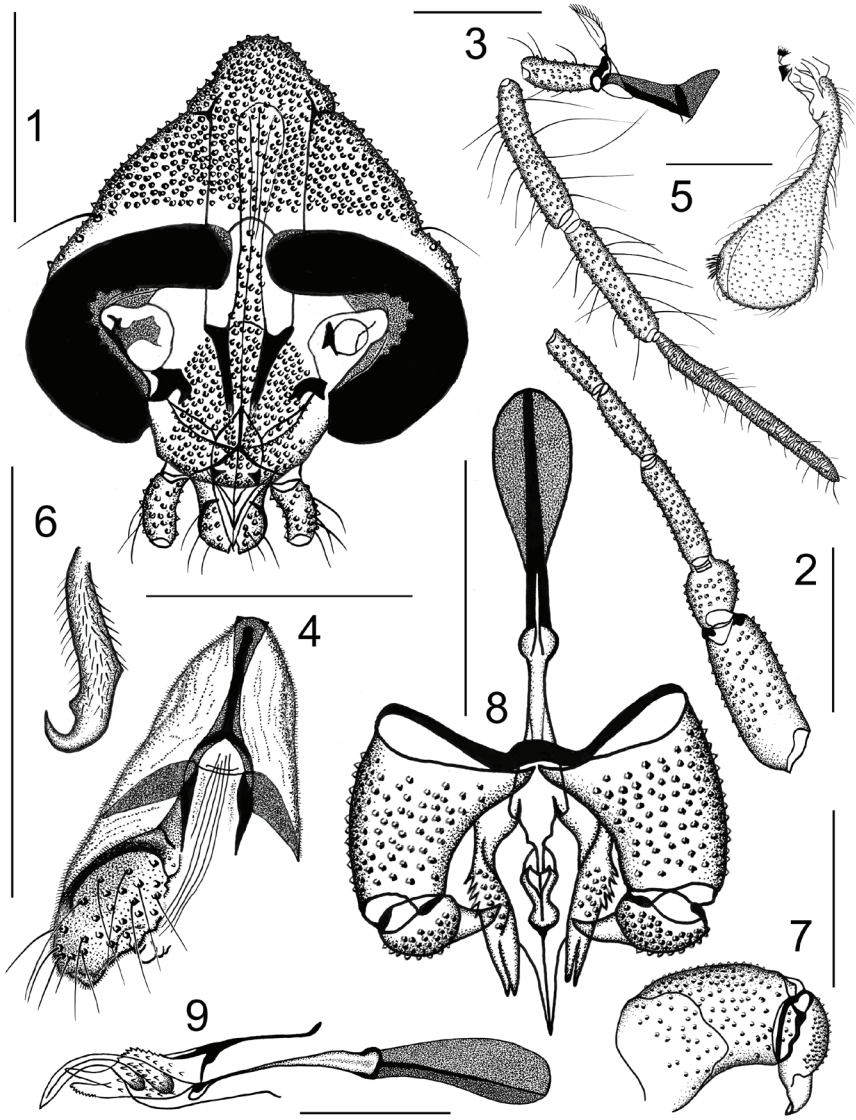
RESULTS

Pneumia mladeni sp. nov.
(Figs 1–18)

Type locality. Bulgaria, Pirin Mts, vicinity of Demjanica (montane chalet, 1895 m a.s.l.) near Bansko.

Type material. Holotype, ♂: Bulgaria, Pirin Mts, vicinity of Demjanica (montane chalet, 41°44′34.511N, 23°28′3.218″E, 1895 m a.s.l.) near Bansko, 9.-10.viii.1981, stream, sweep netting, J. Ježek leg. Slide with a dissected specimen Cat. No. 34805, Inv. No. 24902 (NMPC). Paratypes 53 ♂♂ altogether (slides). 29 ♂ ♂ (slides): same locality, collector, method and date, Cat. No. 34806–34834, Inv. No. 24903–24931 (NMPC). 3 ♂♂ (slides): Bulgaria, Rila Mts, between the Zavrachica montane chalet and the settlement Borovec near Samokov, 13.viii.1981, waterfalls, 42°14′18.333″N, 23°37′2.901″E, 1850 m a.s.l., same collector and method, Cat. No. 34835–34837, Inv. No. 24932–24934 (NMPC). 1 ♂ (slide): Bulgaria, Vitosha Mts near Sofia, a vicinity of Goli Vrch Mt., 42°35′14.963″N, 23°17′25.697″E, approximately 1830 m a.s.l., 19.viii.1981, small brook, the same collector and method, Cat. No. 34838, Inv. No. 24935 (NMPC). 20 ♂♂ (slides): Bulgaria, Pirin Mts, Bjala reka river, 11 km SW of Razlog, a vicinity of the Javorov montane chalet, 41°49′30.000″N, 23°21′12.000″E, 1800 – 1900 m a.s.l., 13 km NW of the Demjanica chalet, 19.ix.1990, left tributary of flow, sweeping, P. Chvojka leg., Cat. No. 34839–34858, Inv. No. 24936–24955 (NMPC). The above mentioned slides are mainly dissected or partially dissected specimens.

Description. Male. Vertex conspicuously elevated (Fig. 1) with 3–4 supraocular bristles on dorsal margins of eyes on extreme lateral sides of head. Horizontal border of setae above the upper apices of eyes present, slightly convex in the middle. Eye bridge with 5 facet rows (Fig. 10), divided by approximately width of 3 facet diameters. Ratio of distance of apices of eyes (tangential points) to minimum width of frons approximately 5.5 : 1. Interocular suture arched, simple. Frontoclypeus (Fig. 1) with a large circular central patch of insertions of setae with a narrow medial lobe prolonged almost to interocular suture. Antennae (Figs 2, 11) 16-partite and haired. Scape cylindrical, 3.3 times as long as ovoid pedicel. First three flagellomeres cylindrical with reduced lengths (1.6, 1.2, 1.0), medial flagellomeres spindle-shaped. Last

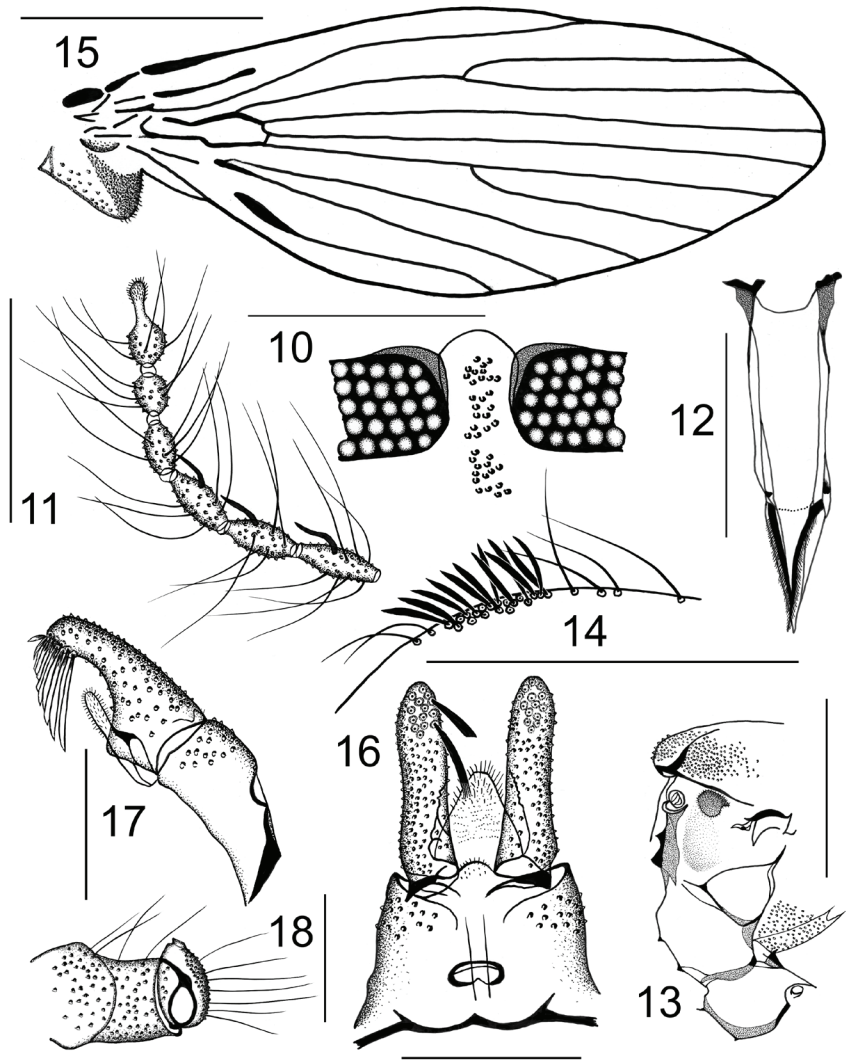


Figs 1–9. *Pneumia mladeni* sp. nov. (male): 1 – head, frontal view, scale = 0.2 mm; 2 – basal antennomeres, scale = 0.2 mm; 3 – maxilla and palpus maxillaris, scale = 0.2 mm; 4 – left terminal lobe of labium, scale = 0.2 mm; 5 – haltere, lateral view, scale = 0.2 mm; 6 – tarsal claw of P_1, scale = 0.1 mm; 7 – right gonopod, lateral view, scale = 0.2 mm; 8 – aedeagal complex and gonopods, dorsal view, scale = 0.3 mm; 9 – aedeagal complex, lateral view, scale = 0.2 mm.
Obr. 1–9. *Pneumia mladeni* sp. nov. (samec): 1 – hlava, čelní pohled, měřítko = 0,2 mm; 2 – bazální tykadlové články, měřítko = 0,2 mm; 3 – maxila a maxilární palpus, měřítko = 0,2 mm; 4 – levý terminální lalok labia, měřítko = 0,2 mm; 5 – haltera, laterální pohled, měřítko = 0,2 mm; 6 – tarzální drápek P_1, měřítko = 0,1 mm; 7 – pravý gonopod, laterální pohled, měřítko = 0,2 mm; 8 – aedeagální komplex a gonopody, dorzální pohled, měřítko = 0,3 mm; 9 – aedeagální komplex, laterální pohled, měřítko = 0,2 mm.

three flagellomeres anomalous, of which two are barrel-shaped, progressively decreasing in size, and terminator has a pestle-shaped apiculus (digit) as long as width of basal, almost globular, part of flagellomere. Sensory filaments (ascoids) needle-shaped (Fig. 11), bent, paired, rather short, more than half as long again as the flagellomeres bearing them (1 : 1.6). Mouthparts hardly extend beyond basal palp segment. Length ratios of maxillary palps 1.0 : 1.9 : 1.7 : 2.9, last palp segment annulate (Fig. 3). For the terminal lobes of labium, as shown in Fig. 4, lines of spines between both lobes not developed in contrast to tongue protuberances in between distally. Ratio of maximum length of cibarium to length of epipharynx 1.8 : 1 (Fig. 12), labrum pointed. Thorax: Anepisternum setae patch formed by minute seta alveoli, restricted to a small slightly elevated circular area between spiracle and wing insertion (Fig. 13), and penetrating to a large rough elliptical patch with inconspicuous soft microseta alveoli in vertical axis. Spiracles set high on mesothorax. No thoracic allurement organs, anepimeron with trapezoid setose patch. Wings (Fig. 15) lanceolate, 3.2 mm long – holotype, paratypes 2.8–3.5 mm, rounded distally, inconspicuously expanded at posterior margin, a little narrowed in the end of R_1. Membrane of wing generally clear. Strengthened parts of veins: Sc (weakened in middle), basal cell, CuA_1 basally as well as CuA_2 (here conspicuously). Radial fork arises basal to medial one; both complete forks and end of CuA_2 in one line. R_5 ends beyond wing apex. Bases of M_3 and CuA_1 connected in contrast to CuA_2. Halteres (Fig. 5) stick-shaped, asymmetrical in longitudinal axis, bent and haired, with mass of sensory scales subapically (Fig. 14). Ratio of maximum length of halteres to their maximum width 3 : 1. Length ratios of femora, tibiae and first tarsomeres: P_1 1.3 : 1.8 : 1.1, P_2 1.5 : 2.0 : 1.0, P_3 1.7 : 2.3 : 1.1. Paired tarsal claws of P_1 conspicuously hooked, haired in basal part (Fig. 6), with slightly developed dorsal and ventral teeth. Ejaculatory apodeme of male aedeagal complex (Figs 8, 9) straight from dorsal view, little arched from lateral one, proximally spoon-shaped, elliptical, narrowed distally, with longitudinal rib and constricted sclerotized circle in the middle. Spatula modified from broad basis to step-like or gradate structures, later reduced to stick-shaped and narrow apex, bluntly cut. Central chamber of aedeagal complex with complicated oblong or ovoid structure, constricted in middle (see Fig. 8). Distiphallus long triangular, pointed, bent from lateral view (Fig. 9), conspicuously extending beyond parameres, which are ornamented by many spikes medially and split distally, subapically serrate (only inner pair of protuberances). Ratio of length of gonocoxites to length of aedeagal complex (incl. ejaculatory apodeme) 1 : 2.9. Gonocoxites thick basally (Figs 7, 8, 18), 1.5 times as long as gonostyli from lateral view. Gonostyli with hemispherical basis and pointed bent protuberance towards aedeagal complex (Figs 7, 8). Epandrium (Figs 16, 17) approximately quadrilateral, almost bare, only some setae caudally on both sides. Basal aperture oval, constricted in the middle, conspicuously bordered by sclerotized folds. Remainders of ventral epandrial sclerite not observed. Hypandrium broad, with two swellings in middle (Fig. 8). Epiproct relatively small, with almost semicircular caudal ending, covered with short setae, hypoproct large, tongue-shaped, 0.5 times as long as surstylus, longly haired caudally (Figs 16, 17). Surstyli (Figs 16, 17) about 1.3 times as long as epandrium, sagging slightly in the middle, and tenacula (numbers 14–18 are stable) restricted to clusters near rounded apex and gradually become shorter towards top of surstylus. Endings of tenacula fringed, one in a good position (see Fig. 16).

Female unknown.

Differential diagnosis. *Pneumia mladeni* sp. nov. resembles *P. vandeli* Mirouse, 1960 in body size, as well as wings, and less distinctly visible characters such as the shape of the gonopods and the aedeagal complex. It clearly differs by the split parameres with many spikes (cf. Figs



Figs 10–18. *Pneumia mladeni* sp. nov. (male): 10 – frons and eye facets in detail, scale = 0.2 mm; 11 – apical flagellomeres, scale = 0.2 mm; 12 – cibarium, labrum and epipharynx, scale = 0.2 mm; 13 – thoracic sclerites, lateral view, scale = 0.5 mm; 14 – mass of haltere sensory scales in detail, lateral view, scale = 0.1 mm; 15 – wing, scale = 1 mm; 16 – epandrium and surstyli, dorsal view, scale = 0.2 mm; 17 – epandrium and surstylus, lateral view, scale = 0.2 mm; 18 – left gonopod, diagonal view, scale = 0.2 mm.

Obr. 10–18. *Pneumia mladeni* sp. nov. (samec): 10 – čelo a oční facety v detailu, měřítko = 0,2 mm; 11 – koncové tykadlové články, měřítko = 0,2 mm; 12 – cibarium, labrum a epipharynx, měřítko = 0,2 mm; 13 – hrudní sklerity, laterální pohled, měřítko = 0,5 mm; 14 – nakupení smyslových šupinek haltery v detailu, laterální pohled, měřítko = ;0,1 mm; 15 – křídlo, měřítko = 1 mm; 16 – epandrium a surstyli, dorzální pohled, měřítko = 0,2 mm; 17 – epandrium a surstylus, laterální pohled, měřítko = 0,2 mm; 18 – levý gonopod, diagonální pohled, měřítko = 0,2 mm.

8, 9) as well as short protuberance of the hemispherical gonostylus and pointed distiphallus longer than parameres. Differences in details are as follows: length ratios of palpal segments 1.0 : 1.9 : 1.7 : 2.9 (Fig. 3); flagellomere 131.3 times as long as wide (Fig. 11); wing slightly narrowed at apex of R_1 (Fig. 15); radial fork arising basad of medial one and both forks aligned with apex of CuA_2 (Fig. 15); CuA_2 conspicuously strengthened basally (Fig. 15); hypandrium broad, with two swellings in the middle (Fig. 8); ejaculatory apodeme spoon-shaped proximally in dorsal view, elliptical, narrowed distally, with a constricted sclerotized circle in the middle (Fig. 8); spatula modified from broad basis to step-like or gradate structures, later reduced to a stick-shaped, narrow apex, bluntly cut (Fig. 8); central chamber of aedeagal complex developed, with complicated oblong or ovoid structure, constricted medially (Fig. 8); distiphallus long triangular, pointed, conspicuously extending beyond ending of parameres (Figs 8, 9); parameres ornamented by many spikes medially and split distally, subapically serrated (only inner pair of protuberances) (Figs 8, 9); gonostyli with hemispherical basis and pointed bent protuberance towards the aedeagal complex (Figs 7, 8, 18); surstylus: number of tenacula 14–18 (Fig. 16). *Pneumia vandeli* is readily distinguishable by the length ratios of the palpal segments 1.0 : 3.3 : 3.0 : 4.3; antennomere 15 2.5 times as long as wide; wing not narrowed at apex of R_1; radial and medial forks aligned but basad of CuA_2 whose base is not strengthened; hypandrium narrow, without swellings; ejaculatory apodeme stick-shaped in dorsal view, without a constricted sclerotized circle in the middle; spatula very short, hemispherical, with a median cleft; central chamber of aedeagal complex not developed; distiphallus tongue-shaped, rounded apically, ending on the same level as parameres; parameres bare, simple, dibble-shaped; gonostyli spherical, with a lateral protuberance that is long, narrow, bent and tapers to the end; number of tenacula 10–12.

Distribution. Currently known only from Bulgaria.

Etymology. This species is named in honour of the late Mladen Živkov (Academy of Sciences, Sofia, Bulgaria), not only a school-friend and colleague of the first author during their study of biology at Charles University in Prague, but also an invaluable supporter of moth-fly research in Bulgaria.

Bionomics. Unknown. Adults (males) were collected in montane habitats, specifically a swampy area with nearby rills, brooklets, streams and waterfalls (approximately 1800–1900 m a.s.l.). Vegetation: *Abies*, *Picea*, *Pinus*, *Fagus*, *Betula*, *Populus*, *Sorbus*, *Alnus*, *Rubus*, *Vaccinium*, *Cirsium*, Daucaceae, *Veratrum*, *Orchis*, *Pulmonaria*, *Caltha* etc. Mixed deciduous forest at lower altitudes (e.g. Vitosha National Park).

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SOUHRN

V práci je popsán a vyobrazen nový druh pro vědu *Pneumia mladeni* sp. nov. (samci) z Bulharska. Typový materiál (celkem 54 exemplářů včetně holotypu v preparátech) pochází z horských Národních parků Pirin a Rila, a Přírodního parku Vitoša. Mikropreparáty jsou deponovány v entomologickém oddělení Národního muzea v Praze. Druh je v rámci diferenciální diagnózy morfologicky porovnán se zástupcem stejného rodu *P. vandeli* Mirouse, 1960 z Pyrenejí.