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Anodontoceras in Malaysia with the description of a new species (Insecta: Diptera: Cecidomyiidae: Lestremiinae)

With 2 Figures

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Abstract. Two gall midge species of the genus *Anodontoceras* (Cecidomyiidae, Lestremiinae) were found to occur on the Malayan Peninsula: *A. saigusai* YUK. known from the Palaearctic, and *A. yukawai* spec. nov. described here. Both species were collected simultaneously in primary rain forest between 800 and 3360 ft. In light of new information on the morphology of males, the author discusses the diagnostic characters of *Anodontoceras*. The pattern of abdominal plaques on the tergites is shown to be a character of taxonomic significance, at least in *Anodontoceras* species.

Introduction

Until now *Anodontoceras* was a monotypic genus established for a remarkable species, *A. saigusai* (YUKAWA 1967), known from Kyushu, Japan, and the Far East of Russia (YUKAWA 1971, JASCHHOF 1998). Formerly placed in the Micromyini sensu PRITCHARD (1947) (YUKAWA 1967, 1971) and later in the Peromyiini (KLEESATTEL 1979, SKUHRAVÁ 1986, 1997, MAMAEV 1996), it was recently shown to belong to the Micromyini sensu JASCHHOF (1998) with *Pseudoperomyia* as its sister group (JASCHHOF & HIPPA 1999).

While studying gall midges of the subfamily Lestremiinae from Peninsular Malaysia, numerous *A. saigusai* were found among the samples, as well as another *Anodontoceras* species described here as *A. yukawai* spec. nov. Further, the material enables me to complete the description of *A. saigusai* and to discuss the generic characters in light of new information on the morphology of *Anodontoceras* males.

All specimens used in this study were collected by Malaise traps, sweeping net and exhaustor during a field trip to Peninsular Malaysia in February/March 1997 and mounted in Canada balsam on microscopic slides. Types and additional material are deposited in the Natural History Museum in Stockholm. The terminology follows usage in JASCHHOF (1998) or as discussed below.

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Species of *Anodontoceras* YUKAWA, 1967

Anodontoceras yukawai spec. nov. (Figs. 1A–F, 2C)

Description:

Male. Body size: 1.0–1.1 mm.

Head: postfrons bilobed, prominent, covered with setae. Postcranium densely covered with scales and setae except along a stripe posterior to eye bridge. Postocular bristles in 2 rows. Ocelli 3, the lateral 2 little larger than the anterior. Eye bridge 3 facets long. Scapus little larger than pedicel. Antennae with 12 flagellomeres; 12th very small, pear-shaped and without sensory hairs. Neck of flagellomere 4 (Fig. 1F) longer than node (distal flagellomeral necks increasingly slenderer and longer); transition of neck to node irregularly wrinkled; node sometimes appearing darker pigmented than neck, globular, longer dorsally than ventrally. Node with irregularly arranged setae of various length reduced to 1 row dorsally, with a few sensory spines, and 4 strong sensory hairs with ringed surface sculpture (Fig. 1F′) each inserting basally and as long to longer than neck, with a remainder of crenulate row dorsodistally. Palpus 3-segmented (distal segments occasionally fused); segment 3 as long or little longer than 2; with short sensory hairs on segment 1 and proximally on 2; all segments with setae (and scales?, lost), segments 2 and 3 additionally with spine-like setae.

Thorax: scutum densely covered with setae laterally and along parapsidal sutures, and anteriorly between parapsidal sutures. Claws crescent-shaped, with 2–3 small teeth near midlength. Empodia as long as claws. Wing: R_1 = 1–1 $^1/_2$ *rs*; *r-m* $^1/_2$ to $^3/_4$ as long as *rs*; M_{1+2} obsolete distally; *CuA*-fork rather obtuse; CuA_2 not reaching wing margin; macrotrichia on *R*, R_1 and *CuA*-stem; pattern of sensory pores: R_1 3, *rs* 1, *r-m* 1, R_5 1 medially.

Abdomen: segment 1 without setae. Tergites 2–6 with long and wide sclerotized portions, covered with setae (and scales?, lost), laterally somewhat darker pigmented; tergites 7–8 appearing as very short, strongly sclerotized ribs, without setae. Pattern of plaques on tergites 1–8 (Fig. 2C): 0-2-2-2-2-1-0-0; pleural plaques lacking. Sternites densely covered with setae (and scales?, lost). Pleural membrane without setae.

Terminalia: gonocoxites ventrobasally fused only by an unpigmented faint membrane; with setae ventrally and dorsodistally (Fig. 1A). Gonostylus (Figs. 1B and C), when the hypopygium is mounted flat on slide, appears slightly flattened with a dorsodistal lobe with 1 apical tooth; from a different angle of display gonostylus appears curved, evenly tapered to tip and without a lobe-like break in distal third; outside without setae (only hairs), with 1 subapical spine. Tegmen (Fig. 1D) membranous except parameral apodemes, pyramid-shaped with rounded apex. Genital rod (Fig. 1D) narrow, well sclerotized, longer than tegmen, with opening near apex and vaguely membranous beyond opening. Tergite 9 (Fig. 1E) with straight to broadly rounded distal margin and 1 irregular distal row of setae; laterally more broadly sclerotized than dorsally. Tergite 10 (Figs. 1A and E) bilobed, densely covered with hairs and with some short setae. Sternite 10 bilobed, pubescent.

Female: unknown.

Types. Holotype: male, Malaysia, Selangor, Ulu Gombak, near University of Malaya Field Studies Centre, 800 ft., primary forest, 02.–08. 03. 1997, by Malaise trap, leg. H. HIPPA, M. JASCHHOF, B. VIKLUND. Paratypes: 21 males, same data as holotype.

Other material studied: 37 males, same data, but 22.–25. 02. 1997; 1 male, same data, but 25. 02.–01. 03. 1997; 19 males, same data, but 08.–21. 03. 1997; 14 males, Pahang, Genting Highlands, Awana, 3360 ft., primary forest, 09.–22. 03. 1997, by Malaise trap, leg. H. HIPPA, M. JASCHHOF, B. VIKLUND.

Discussion: *A. yukawai* is easily distinguished from *A. saigusai* by the arrangement and size of the flagellomeral sensory hairs (Figs. 1F and 2B, respectively), and by the structure of gonostylus and genital rod (Figs. 1B, C and D in this paper and 91d in JASCHHOF [1998], respectively). The number and arrangement of the plaques on tergites 1–8 in *A. yukawai* (Fig. 2C) was found to be a constant feature within the specimens studied, differing from that in *A. saigusai* (Fig. 2A). The pattern of plaques is used here as a diagnostic character within the Lestremiinae for the first time (see below).

Both species share the lack of a sclerotized gonocoxal bridge ventrobasally (synapomorphy, see below), the same basic structure of the flagellum (globular shape of node, lack of crenulate whorls) and the same type of large sensory hairs with ringed surface sculpture (synapomorphy, see below). The

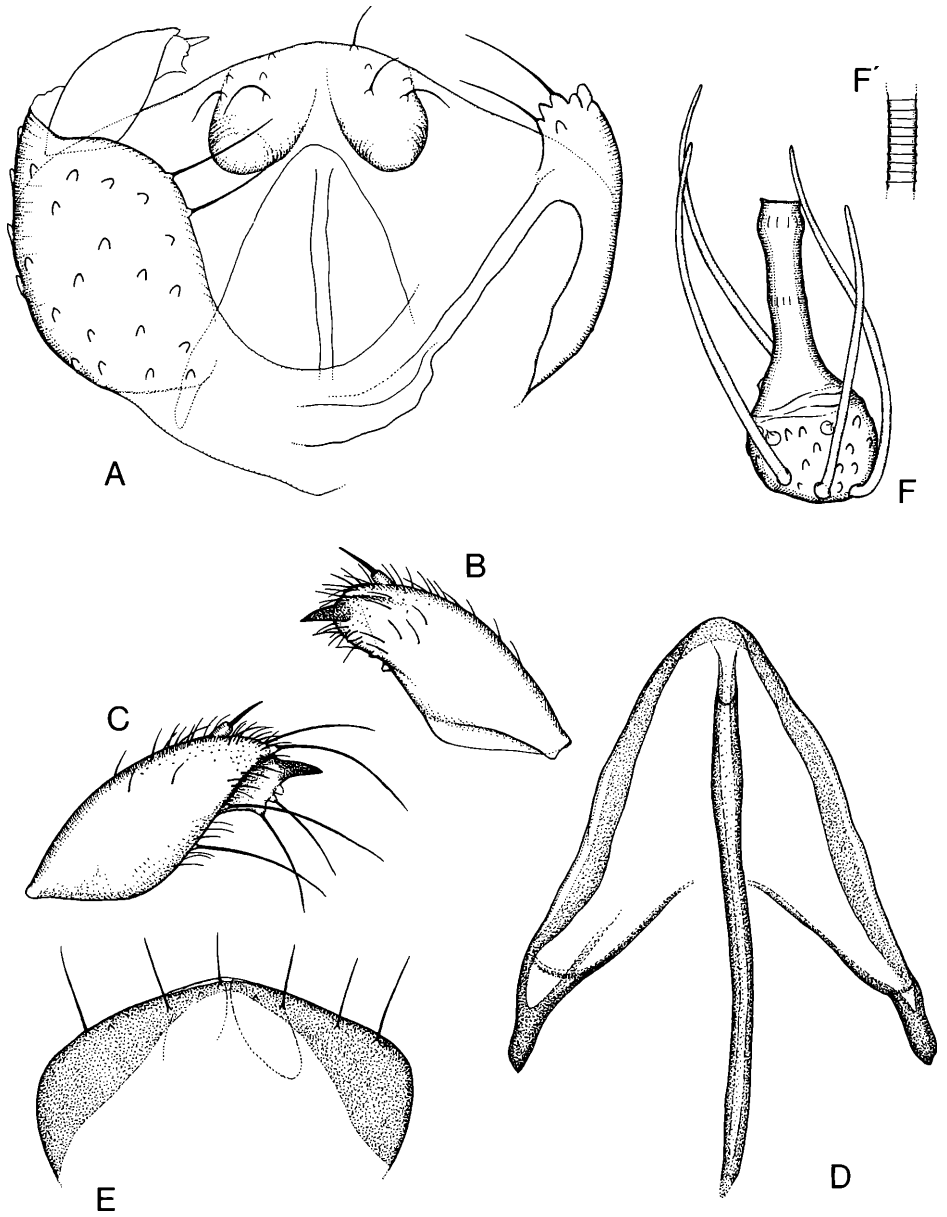

Fig. 1A–F: *Anodontoceras yukawai* spec. nov.; male. – A: genitalia in ventral (left side) and dorsal (right side) view; – B: gonostylus in dorsal view; – C: gonostylus in ventral view; – D: tegmen and genital rod in ventral view; – E: tergites 9 and 10 in dorsal view; – F: flagellomere 4; – F´: ringed surface structure of sensory hairs. A–D and F: holotype; E: paratype.

lack of macrotrichia on *r-m* and R_5 in *A. yukawai* differs from the situation in *A. saigusai* as well as from that usually found within the Micromyini sensu JASCHHOF (1998).

Biology: unknown. The specimens were collected in primary rain forest between 800 and 3360 ft. above sea level, sometimes simultaneously present in Malaise samples together with *A. saigusai*. None

of the *Anodontoceras* species was present in samples from mountainous forest (4000 and 5700 ft., respectively).

Distribution: Peninsular Malaysia (Pahang, Selangor).

Etymology: The species is named to honour Dr. Junichi Yukawa, Professor of Entomology at the University of Kyushu/Japan and an authority in cecidology who described *Anodontoceras* and first revised the Japanese Lestremiinae.

Anodontoceras saigusai YUKAWA, 1967 (Figs. 2A, B)

Supplementation to description (in YUKAWA 1967, 1971; JASCHHOF 1998):
Head: ocelli 3, the lateral 2 slightly larger than the anterior. Flagellomere 12 small, pear-shaped, without sensory hairs. Flagellomere 4 (Fig. 2B) with basal $^3/_4$ of flagellomeral node (the portion covered with setae) darker pigmented and separated from distal $^1/_4$ (portion with sensory spines and sensory hairs) by dark line; with, as a rule, 4 distal sensory hairs with ringed surface sculpture sharply bent somewhat beyond insertion, the 2 posterior sensory hairs with very large basal pores and reaching beyond tip of the following segment.
Wing: *r-m* just shorter than *rs*.
Abdomen: segment 1 without setae. Sclerotized portion of tergites 2–6 as long as entire dorsal surface, covered with setae and scales, laterally with darker pigmented portions; tergites 7–8 appearing as a short, strongly sclerotized rib without setae. Pattern of plaques on tergites 1–8: 0-2-2-2-1-1-0-0 (Fig. 2A); pleural plaques lacking. Pleural membrane without setae.

Material studied: 26 males, Malaysia, Selangor, Ulu Gombak, near University of Malaya Field Studies Centre, 800 ft., primary forest, 02.–08.03.1997, by Malaise trap, leg. H. HIPPA, M. JASCHHOF, B. VIKLUND; 9 males, same data, but 25.02.–01.03.1997; 9 males, same data, but 24.02. bis 14.03.1997; 2 males, same data, but 08.–21.03.1997; 4 males, same data, but 22.–25.02.1997.

Discussion: The specimens from Malaysia conform fully with earlier known specimens from southern Japan (Kyushu) and Far East Russia.

Discussion of diagnostic characters of *Anodontoceras* and its species

Within the Micromyini sensu JASCHHOF (1998) (micromyid species with male terminalia with shield-shaped, more or less triangular tegmen and presence of a sclerotized genital rod), *Anodontoceras* is characterized by two autapomorphies: the lack of a sclerotized ventrobasal gonocoxite bridge and the presence of very strong and long sensory hairs with ringed surface sculpture on the flagellomeres except the last one. Possibly the surface sculpture is not ringed but spiral what could not be decided under light microscope in 1000 times magnification.
With respect to the flagellomeres, the sharply bent sensory hairs in *A. saigusai* were supposed to be characteristic for the genus (YUKAWA 1967, 1971; JASCHHOF 1998), they are not as shown by the straight to evenly curved form in *A. yukawai.* The ringed surface structure that is found in both species is unique among the hair-like sensillae of lestremiines.
The globular/subglobular flagellomeral nodes lacking crenulate whorls of setae were recently interpreted as a synapomorphic character supporting the sister group relationship between *Anodontoceras* and *Pseudoperomyia* (JASCHHOF & HIPPA 1998). The lack of entire, distinct crenulate whorls on the flagellomeres is supposedly a result of reduction indicated by the presence of the remainder of a crenulate row in *A. yukawai.* A similar observation can be made in the sister group of *Anodontoceras,* at least in *Pseudoperomyia humilis* (JASCHHOF & HIPPA 1998), in which traces of a crenulate whorl are also present.
The presence of pleural setae on the abdomen, mentioned for *Anodontoceras* and considered a synapomorphy of the species of Micromyini (JASCHHOF & HIPPA 1998), is in fact not present in *Anodonto-*

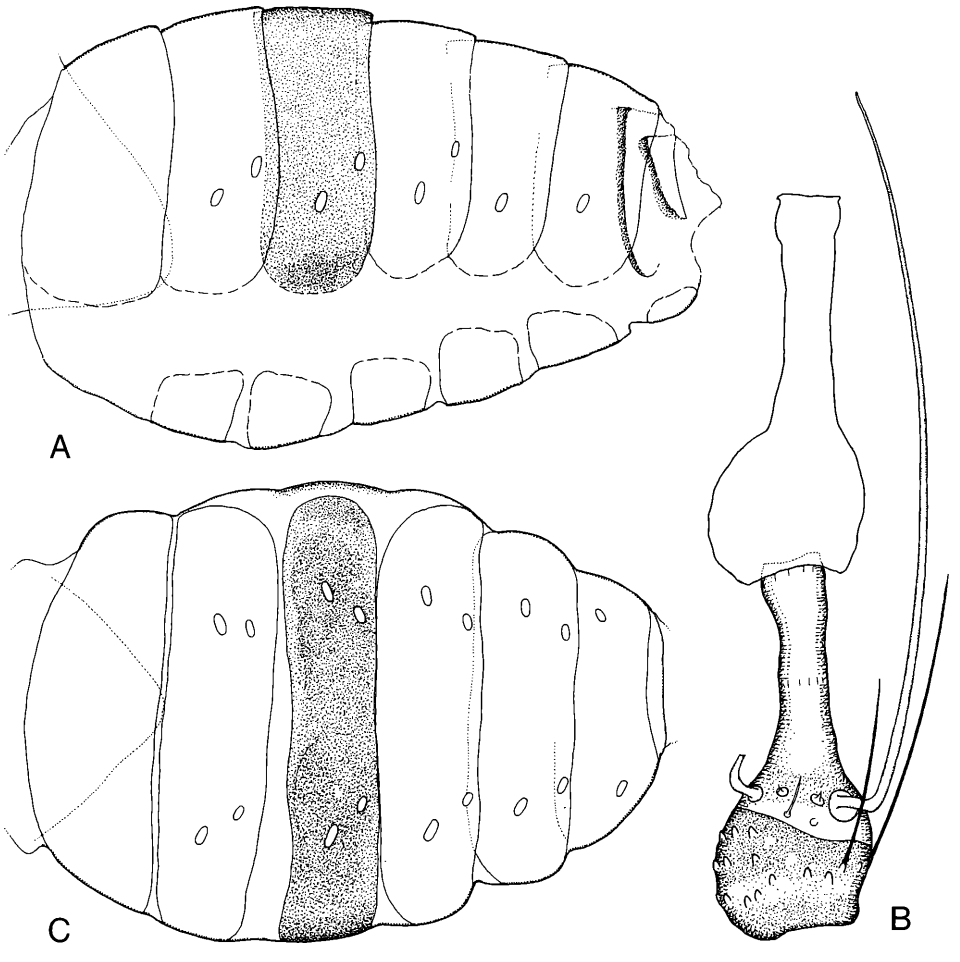

Fig. 2A–B: *Anodontoceras saigusai* YUK.; male. – A: abdomen in lateral view to show pattern of tergal plaques, setae and pigmentation, except for tergites 3, 7 and 8, omitted; – B: flagellomeres 4 and 5; – C: *A. yukawai* spec. nov., paratype, abdominal tergites 1–6 in dorsal view, setae and pigmentation, except for tergite 3, omitted.

ceras species. The misinterpretation was due to the lateral portions of the tergites being darker pigmented and more densely covered with setae than the dorsal portions so that they appeared separated from the tergites in distorted or shrivelled abdominal segments in slide-mounted specimens.

The pattern of abdominal plaques on the tergites is a character so far ignored in the descriptive work and taxonomic studies on lestremiine gall midges. These tergal plaques appear as light, bare scars of ovoid shape contrasting conspicuously with the dark pigmentation of the tergites, but they are not at all easily noticeable when located in unpigmented membraneous portions. HIRVENOJA (1973 : 17) in Chironomidae called them „Fensterflecken" (= window spots) appropriately describing its appearance. There are none, one or two in number on each lateral portion of the tergite, and in the case of two the anterior is slightly to clearly larger than the posterior. At present it appears that the presence (or absence, respectively) and the number per tergite 1–8 characterize what is termed here the pattern of tergal plaques. Sometimes additional abdominal plaques, in greater number and rather irregular in size and shape, are located in rows on the pleural membrane (pleural plaques), but regarding to those only the presence or absence is considered. – STOFFOLANO et al. (1988) examined the occurrence of abdo-

minal plaques in several groups of Diptera and discussed them from a functional point of view. They proposed these plaques to be „regions of cuticle above tendinous epidermal cells that once possessed special muscle sets used by the pupa for abdominal movements and for eclosion of the pharate adult" These authors observed the plaques „in all seven infraorders of Nematocera" (except eight families as, for example, the bibionomorphous Bibionidae and Mycetophilidae) and „in all families of the brachycerous infraorders Tabanomorpha and Asilomorpha" (except one family), but they noted its lack in „all 66 families of the infraorder Muscomorpha (= Cyclorrhapha)" – A rough skim through various representatives of Lestremiinae resulted in the impression that abdominal plaques are always present in both sexes, and that the pattern of tergal plaques provides a constant feature in many, but not in all species, and often being characteristic for supraspecific taxa. Within the Cecidomyiinae it was found to be infraspecifically rather variable resulting in a neglect for taxonomic purposes (GAGNÉ, pers. comm.). I propose to note this character in future taxonomic studies on Lestremiinae, at least until its taxonomic value is definitely clarified.

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