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**TWO NEW SPECIES OF BAETOPUS (EPHEMEROPTERA, BAETIDAE)
FROM MONGOLIA WITH A SPECIAL REFERENCE TO RELATED GENERA**

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Received February 8, 1977

Abstract: *Baetopus montanus* sp. n. (adult male and female, subimago) and *B. asiaticus* sp. n. (adult male and female) which form a special species-group within the genus *Baetopus* Keffermüller, 1960 are described. The relationships of this group to other *Baetopus* spp. and related genera *Centroptilum* Eaton, 1869 and *Pseudocentroptilum* Bogoescu, 1947 are discussed.

Several new species of mayflies were found during the expeditions of Dr. Z. Kaszab to Mongolia in 1965–1968. However, this material consists mainly of adults usually caught in the light traps. Two new species of the genus *Baetopus* so far known only from Europe are described.

Baetopus montanus sp. n.

(Figs. 1–7)

Adult male (Holotype): Head dark brown, slightly opisthognathous. Antennae brown, flagellum whitish. Pedicellus of the same length as scapus, slightly dorsoventrally flattened. Scapus cylindrical. Eyes light grey, ocelli whitish. Turban-shaped eyes whitish yellow (in alcohol), not ringed round the margin, elliptic in dorsal view. Inner margin of them slightly concave. Shaft of turban-shaped eyes very low, of the same colour as the faceted surface. Thorax dark brown. Forewings translucent. The first three longitudinal veins yellowish brown. Further longitudinal and cross veins translucent. Intercalary veins single, reduced in several fields. Pterostigma light grey, its veins not forked, forming the regular fields. 7–9 cross veins connected at vein c in pterostigma. Dissolved brown spots near the basis of forewings. Hind-wings oval, about three times as long as wide, with only two longitudinal veins. Cross veins present in the first two fields. In the first field cross veins often not even reaching to the anterior margin of the wing. The second longitudinal vein usually branched. Legs light brown, fore tarsi paler. Abdomen unicolorous, yellowish brown. A pair of inconspicuous pale spots in the middle of abdominal terga. The posterior margin of terga darker. Abdominal sterna II–VI with markings formed two dark brown diverged stripes and a pair of spots. Sterna VIII–IX paler, without markings. Forceps and subgenital plate light brown. The posterior margin of the subgenital plate straight or slightly convex. Basal segment of forceps rhomb-shaped, as long as wide. Segment 1 of the same shape with a round-shaped projection. Segment 2 slightly bent, longer by 2/3 than segment 3. Segment 3 approximately as wide as segment 2. Penis lobes fused, covered with short setae, protruding

beyond the contour of the forceps base. The anterior margin of the lateral penis lobes projections bow-shaped, approximately as wide as penis lobes. Cerci whitish, not ringed.

Adult female (paratype No. 1): Head whitish yellow, eyes light grey. Ocelli whitish with a dark border. Antennae dark brown, the apical portion of flagellum paler. The distance between eyes 2,5 times longer than the width of eye. Forewings translucent, pterostigma light grey. Longitudinal and cross veins whitish. Abdomen yellowish brown. Abdominal terga I—IV with dark yellow dissolved spot in the middle. Dark smudges on the sides of these terga. Abdominal sterna II—IV with a pair of diverged stripes and two spots. Sterna V, VI with two pairs of dark spots in the middle. Sterna VIII and IX without markings. Cerci whitish.

Body length: male 6.0 (5.0—6.5) mm, female 5.5 (5.0—6.0) mm. Length of cerci: male 11.0 (10.5—12.0) mm, female 9.5 (8.0—10.0) mm.

Subimago male (paratype No. 2): Head yellow, eyes blackish, ocelli whitish. Turban-shaped eyes pale yellowish. Antennae brown. Thorax brown, wings dark grey, unicolorous. Legs whitish yellow, tarsi light brownish. Abdomen light brown. A pair of pale spots in the middle of abdominal sterna and terga I—VIII. The posterior margin of terga dark brown, tergum X paler. Forceps and cerci light brown.

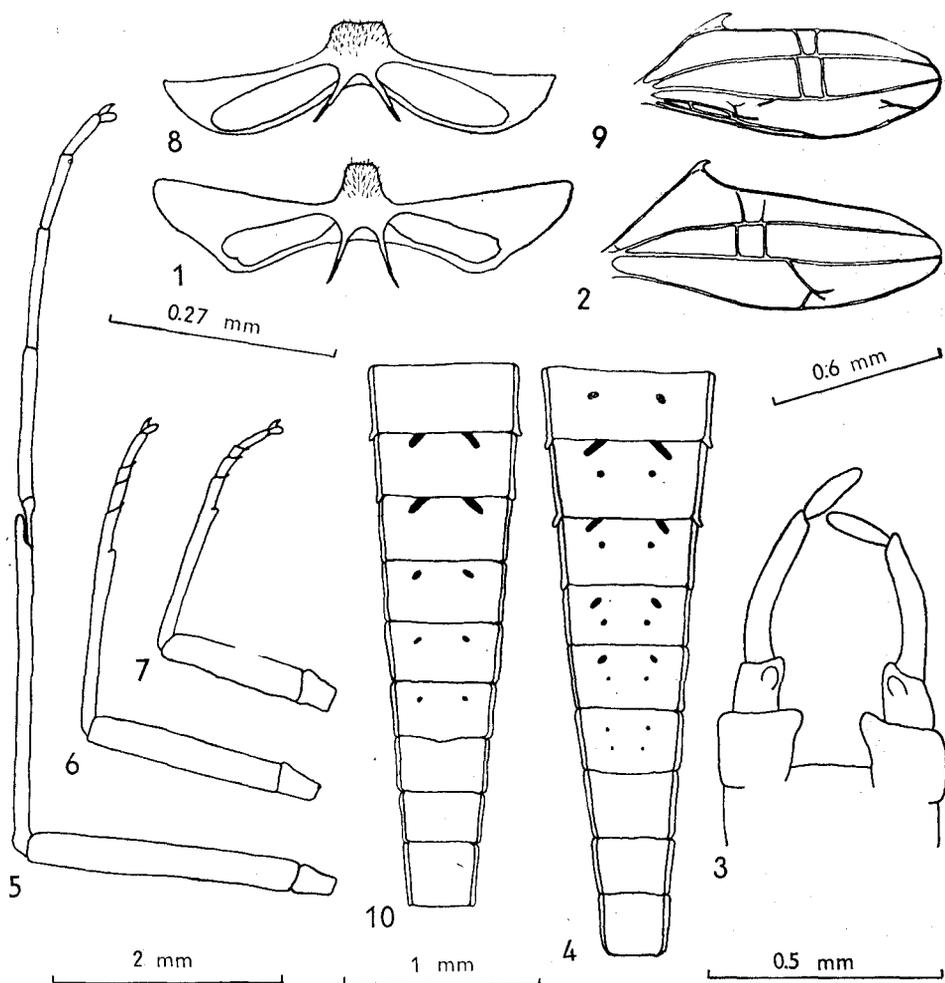
Larva unknown.

Holotype (adult male), paratype No. 1 (adult female): Mongolia, Chövsgöl district, Tesinj gol Riv., Alag Mort, 42 km NE of Pass Chaldzan Sogotyndavaa, 1900 m, 14. 8. 1968 leg. Z. Kaszab, paratype No. 2 (subimago male): Mongolia, Bajan Olgij district, Chavcalyn gol Riv., 25 km E of Somon Cagannuur, 1850 m, leg. Z. Kaszab, further paratypes (10 ♂, 9 ♀), the locality of the holotypus, coll. Soldán. Institute of Entomology, Czechoslovak Academy of Sciences, Prague.

Baetopus asiaticus sp. n.

(Figs. 8—10)

Adult male (holotype): Head pitch-brown, eyes grey, ocelli whitish. Antennae dark brown, flagellum paler. Pedicellus slightly longer than scapus. Turban-shaped eyes yellowish orange (in alcohol), without a lighter ring, oval in dorsal view. Shaft of which very low, of the same colour. Prothorax blackish brown, meso- and metathorax pitch-brown. Forewings transparent. Pterostigma and partly also fields c and sc clouded grey. About 4 cross veins in pterostigma. These veins whitish, reduced. The first three longitudinal veins yellowish brown, other veins transparent. Pointed triangular process on the anterior margin of hind wing. Cross veins present in the first two fields. Cross veins in the field reaching to the anterior margin of wings. Intercalary vein usually present in the third field. A few small fields near the posterior margin of the wing. Legs yellowish brown. The hind femora shorter by 1/3 than the middle ones. Abdominal terga light brown, dark brown on the sides, without markings. Terga IX and X paler. Ventral side of body yellowish. A pair of diverged stripes and another pair of spots in the middle of abdominal sterna. I—IV. Sterna VI—IX without markings. Forceps and subgenital plate brown. Basal segment and segment 1 of forceps rhomb-shaped. Segment 1 with round-shaped process as in *B. montanus* sp. n. Fused penis lobes narrow, as wide as 1/3 of the width of penis lobes projections,



Figs. 1-10. Figs. 1, 2, 3, 5, 6, 7 - *Baetopus montanus* sp. n. (holotype). Fig. 4 - *B. montanus* sp. n. (paratype No. 1). Figs. 8, 9 - *B. asiaticus* sp. n. (holotype). Fig. 10 - *B. asiaticus* sp. n. (paratype No. 1). Figs. 1, 8 - penis, dorsal view. Figs. 2, 9 - hindwings. Figs. 3 - forceps. Figs. 4, 10 - abdominal sterna of females. Figs. 5, 6, 7 - fore, middle and hind legs.

covered with sparse setae. Penis lobes projections triangular. Lateral margins of projections projected into a rounded protuberance. Cerci whitish, not annulated.

Adult female (paratype No. 1): Head light brown, eyes grey with a dark border. Near the eyes dark dissolved spots. The distance between eyes twice longer than the width of eye. Antennae yellowish brown. Prothorax brown, meso- and metathorax dark yellow. Forewings translucent, pterostigma grey with not forked cross veins. The first three longitudinal veins yellowish brown, other veins translucent. Hindwings as in males. Legs yellowish, tarsi slightly darker. Abdominal terga light brown, dark

brown on the sides. Dissolved dark spots on terga I—IV, terga VIII—X paler. Sterna yellowish brown. Sterna II—IV with a pair of dark diverged strips. A pair of dark spots in the middle of sterna V and VI. Cerci whitish.

Length of body: male 6.0 (6.2) mm, female 5.5 (4.8) mm, length of cerci: male 9.0 (10.0) mm, female 8.0 mm.

Subimago and larva unknown.

Holotype (Adult male), paratype No. 1 (Adult female), further paratype (1 ♂): Mongolia, Chövsgöl district, Tesinj gol Riv., Alag Mort 42 NE of Pass Chaldzan Sogoyndavaa, 1900 m, 14. 8. 1968 leg. Z. Kaszab, further paratype (1 ♀): Mongolia, Cojbalsan district, Buir nuur Lake, 585 m, 11. 8. 1965 leg Z. Kaszab, coll. Soldán, Institute of Entomology Czechoslovak Academy of Sciences, Prague.

Differential diagnosis

Both the described species, *Baetopus montanus* sp. n. and *B. asiaticus* sp. n., are in the comparatively independent position. They form a special species group within the genus *Baetopus*. Critical characters distinguishing this group from the other *Baetopus* spp. are following: venation of hind-wings (cross veins present), round-shaped process on the surface of the segment 2 of forceps, the ratio middle femur: hind femur (3 : 2). Different adult characters of these species are apparent from the following key:

- 1 (2) The anterior margin of lateral penis lobes projections bow-shaped, fused penis lobes approximately as wide as projections. No fields near the posterior margin of hind wings. 7—9 cross veins in pterostigma *B. montanus* sp. n.
- 2 (1) The anterior margin of lateral penis lobes projections with a rounded protuberance, triangular. Fused penis lobes narrow as wide as 1/3 of the width of projections. A few small fields near the posterior margin of hindwings. About 4 cross veins in pterostigma *B. asiaticus* sp. n.

Bionomy: All specimens were collected at localities near the mountain streams and together with *Ephemerella ignita* (Poda), *Baetis fuscatus* (L.) and *Rhithrogena lepnevae* Brodskij at altitudes of 1450—1900 m (*B. montanus* sp. n.) or 585—1900 m (*B. asiaticus* sp. n.). It is nearly sure that the larvae live in mountain running waters and probably also in the lakes (*B. asiaticus* sp. n.).

DISCUSSION

Both the species described in the present paper are closely related to the genus *Baetopus* Keffermüller, 1960. Ratio of tarsal segments of fore legs in males, arrangement of penis and forceps are the characters in which these species are only slightly different from the type-species of this genus, *Baetopus wartensis* Keffermüller, 1960. On the other hand, these both the described species differ markedly from the type-species in several characters which are usually considered as characters of the generic level (venation of hind-wings, the ratio middle femur: hind femur). These characters give evidence for certain relationship to genera *Centroptilum*, Eaton, 1869 and particularly *Pseudocentroptilum* Bogoescu, 1947. The comparison of critical characters is apparent from the following table.

Apart from certain differences, *B. montanus* sp. n. and *B. asiaticus* sp. n. evidently belong to the genus *Baetopus*. Dr. Kaszab's material contains the larvae undoubtedly belonging to this genus collected, however, at another locality than the adults of the described species. Judging from the comparison of eggs dissected from mature female larvae and adult

	<i>Baetopus wartensis</i>	<i>Baetopus montanus</i> sp. n. <i>asiaticus</i> sp. n.	<i>Centroptilum</i>	<i>Pseudo- centroptilum</i>
hindwings: shape	oval	oval	lancet-shaped	lancet-shaped
apical part	rounded	rounded	rounded or pointed	rounded
cross veins	absent	present	absent or present	present
longitudinal veins	2	2; 3	2	3
penis lobes	produced	produced	rounded	unknown
ratio of tars. segment of fore legs	1 = 2/3 of 2+3+4	1 = 2/3 of 2+3+4	1 = 2+3+4	unknown
ratio middle femur :				
: hind femur	1 : 1	3 : 2	1 : 1	1 : 1
markings on sterna ♀	present	present	usually absent	present

females, this larvae are closely related to *B. montanus* sp. n. (Landa & Soldán, in prep.). Formation of cross veins and the number of longitudinal veins of the hindwings are variable even within one genus and therefore they cannot be considered as the characters of genera. Cross veins of hindwings are not present in Palaearctic species of *Centroptilum* but they can be found in several Nearctic species (Needham, Traver & Hsu, 1935). There are similar situation in the genus *Baetis*. Most of the European species lacks the cross veins (Müller-Liebenau, 1970). The presence of cross veins together with presence of the third longitudinal veins were the main characters for establishing of the genus *Pseudocentroptilum*. Larvae and adult male remain still unknown. Larva described by Bogoescu (1947) belongs to the genus *Baetis* and larva described by Ikonomov (1962) is probably related to *Centroptilum*. Kazluskas (1964) described larvae of *Centroptilum nanum* Bogoescu as larvae related to *Pseudocentroptilum* (Keffermüller, 1967). It is probably that *Pseudocentroptilum* Bogoescu, 1947 is a junior synonym of *Centroptilum* Eaton, 1869. But it is necessary to wait with final judgement as long as the males and larvae of *P. motasi* Bogoescu (type-species of the genus) are known.

Bionomy of *B. montanus* sp. n. and *B. asiaticus* sp. n. is quite different from the bionomy of the other European species especially as to vertical distribution. Average altitude of Mongolian localities being 1400–1900 m i. e. much higher than the average altitude of localities at which the European species were collected. The European species live in large lowland rivers. On the contrary, the Mongolian species live in mountain streams, rivers and perhaps also in lakes. The life cycles are probably the same.

Taking into a consideration zoogeographical point of view, the occurrence of *Baetopus* is very remarkable in Mongolia. The species of *Baetopus* have been hitherto known only from Europe (Poland, USSR-Lithuania). *Baetopus* seems to be a genus of wide transpalaearctic distribution. Another species of *Baetopus* are supposed to be found in North America, too. Most of holoarctic genera are usually spread in Eastern Asia (Tschernova, 1958).

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