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Ecdyonurus samalorum sp. n. from Czechoslovakia (Ephemeroptera, Heptageniidae)

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Taxonomy, key, bionomy, Palaearctic

Abstract. *Ecdyonurus samalorum* sp. n. (larva, subimago, adult ♂ and ♀) is described from highland habitats of the Elbe and Danube basins in Czechoslovakia. Critical characters distinguishing adult and larval stages from those of other European species of the *E. lateralis*-group are keyed. Biology of larvae and life cycle are discussed.

The genus *Ecdyonurus* EATON is represented by 34 species in Europe, comprising three distinct species-groups (BOGOESCU & TABACARU, 1962; SOWA, 1974; BRAASCH, 1978, and others). Of these, the *E. venosus* species-group, which includes the type-species, and the *E. helveticus* species-group (*E. helveticus* complex of KIMMINS, 1958) are apparently restricted distributionally to Europe or ranging at most the Middle East. The *E. lateralis* species-group, formerly classified as a part of the genus *Heptagenia* (cf. BOGOESCU & TABACARU, 1962), is widely distributed throughout the Palaearctic (and probably also Oriental) region. Species belonging to this group are characterized by not having the posterolateral portions of penis lobes of the males produced, and the posterolateral margins of pronotum fused with metanotum in the larvae, besides other characters.

During the extensive faunistic research of mayfly fauna with respect to bioindication of water quality in Czechoslovakia over the past 20 years, a new species belonging to the *E. lateralis* species-group was discovered (LANDA, 1970). The present paper now deals with the description of another new species of this group found at numerous localities in the Labe (Elbe) and Dunaj (Danube) basins in Czechoslovakia. This species is named for Drs Milada and Jaromír Šámal who contributed greatly to our knowledge of aquatic insects in this region.

Ecdyonurus samalorum LANDA sp. n.

(Figs. 1—4, Plate I)*

Adult male (holotype, in alcohol): Head brown, ocelli whitish; eyes whitish grey, dorsal surface darker without rings; antennae whitish, scape and pedicle with inconspicuous light brown stippling. Thorax dark brown. Abdominal terga I—VII light or yellowish brown, unicolorous, with a pair of dark brown diffuse spots near the anterolateral margins; terga VI—VII darker, tergum X dark brown. Sterna yellowish brown, with inconspicuous

* Plate I will be found at the end of this issue.

pair of divergent darker strips and a pair of spots in middle; these markings may be lacking in some specimens. Wings translucent or slightly milky, pterostigma and c and sc fields greyish; longitudinal as well as transversal veins light brown, veins r and m darker; 8—10 not forked, bent cross veins in pterostigma. Fore legs brown, tarsi paler, middle and hind legs whitish yellow, unicolorous. Ratio femur: tibia: tarsus 4.6 : 5.2 : 6.8 (ratio of tarsal segments 1 : 2 : 3 : 4 : 5 : 1.1 : 1.8 : 1.7 : 1.5 : 0.7) for fore legs, 4.0 : 3.2 : 2.3 for middle legs, and 4.2 : 3.5 : 2.3 for hind legs. Forceps brownish, paler at apex; segment 3 longer by 1/3 than segment 4; forceps base with a pair of low rounded projections, straight or slightly convex in the middle. Penis lobes with rounded inner and outer margins, slightly extended laterally, not contiguous, v-shaped divided; titilators straight without spines, asymmetrical at apex and pointed. Cerci brownish, not ringed, paler in apical half.

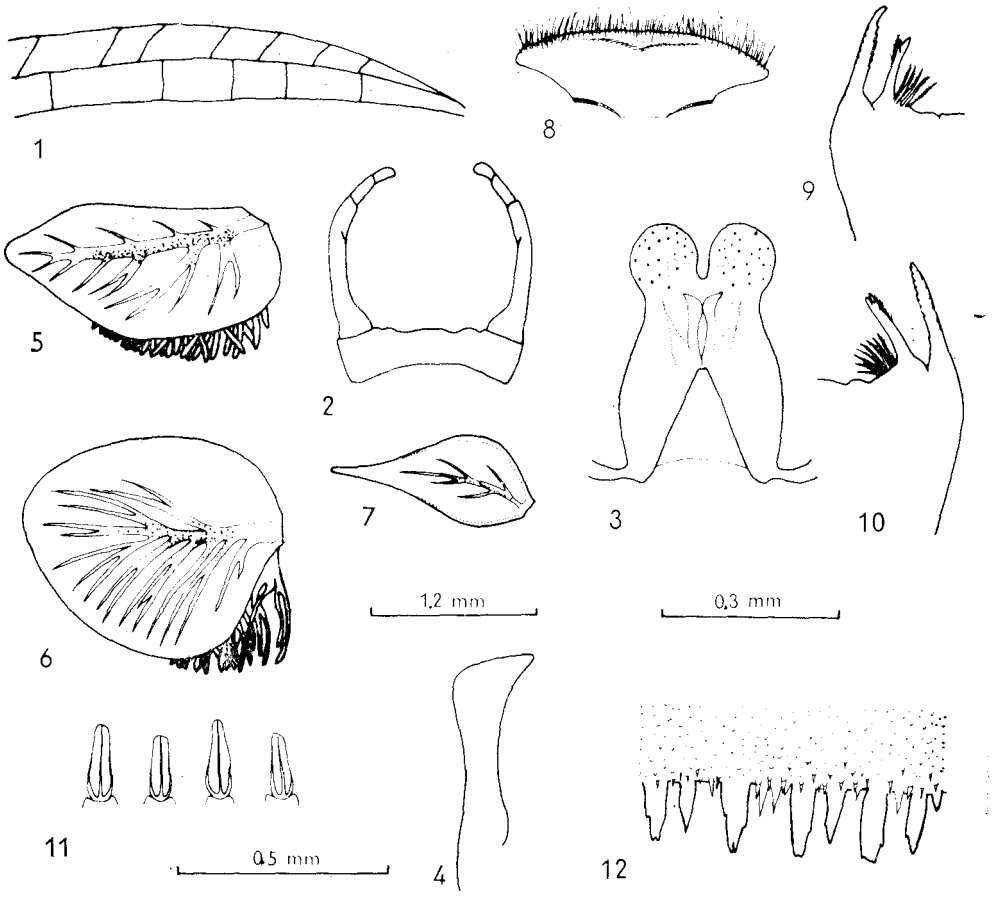
Adult female (paratype No. 1, in alcohol): Head and thorax brown, eyes grey, antennae brownish. Abdominal terga and sterna as in male, sterna usually without markings. Wings translucent, veins yellowish brown, pterostigma slightly milky. Legs brownish yellow, unicolorous. Cerci yellowish brown. Eggs oval, relatively short, measuring 175—195 × 130—145 μm, with numerous adhesive structures; adhesive discs about twice longer on one pole than those on another. Micropyle 3—4, irregularly placed in equatorial area, rounded, without distinct sperm guide.

Body length: ♂ 8—12 mm, ♀ 8—11 mm; length of cerci ♂ 20—25 mm; ♀ 19—22 mm; length of fore wing: ♂ 11—13 mm.

Subimago male (living): Head and thorax greyish brown, eyes black grey, ocelli paler; antennae whitish grey. Abdominal terga and sterna greyish brown, unicolorous, markings indistinguishable. Wings dark grey, unicolorous, longitudinal veins slightly darker. Legs grey, fore legs darker. Cerci yellowish grey.

Larva (paratype No. 2): Head light brown or greenish brown, without spots, epicranial suture pale, antennae yellowish. Pronotum and metanotum brownish with diffuse paler spots (near wing pad bases) and smudges. Pronotal anterolateral teeth obtuse and bluntly pointed. Abdominal terga with two inconspicuous pairs of paler spots; one pair in middle, second pair near posterior margin of tergum; sometimes additional diffuse spot present in the middle of tergum. Terga VIII and IX pale, spots fused, hind margin of terga with irregularly alternating large and by 1/2 smaller teeth (large teeth sometimes bluntly pointed) and numerous pointed microtrichia. Ventral side of thorax pale; abdominal sterna dark brownish, with large, diffuse, paler smudge in middle. Labrum about 2.5 times broader than long, with numerous bristles on fore margin and submarginal row of stout setae. Incisors of mandible slender, equal in width and nearly equal in length (outer incisor longer by 1/6 than inner one), inner incisor with row of bristles on its outer margin; 8—9 branched stout setae near base of inner incisor, shorter by 1/3 than incisor. Maxillae with 17—20 scrapes, segment 3 of maxillary palp about twice longer than wide, pointed. Lingua of hypopharynx rounded at apex, lateral projections of superlinguae moderately bent backward (outer margin of superlingua bent at right angle). Glossae nearly circular, paraglossae about twice broader than long. Femora yellowish brown with a pair of large, dark v-shaped spots, tibiae yellowish, tarsi

yellowish brown. Ratio length: width of femur 6.2 : 2.6 (fore legs), 6.7 : 2.7 (middle legs) and 7.2 : 2.5 (hind legs); scales on femora spatulate, not pointed. Claws with 2 teeth. Gill 1 tongue-shaped, asymmetrical, about twice as long as wide, bluntly pointed; gills 2—4 large, rounded, nearly as long as wide; gills 5—6 usually pointed or bluntly pointed at apex; gill 7 produced into a point with concave margins, as long as 3/4 of gill 3, without bundle of filaments. Gills pale with inconspicuous tracheation, bundle of concolorous filaments, only slightly overlapping gill plate. Cerci whitish brown, unicolorous.



Figs. 1—12: Distinguishing characters of adult (Figs. 1—4) and larva (Figs. 5—12) of *Ecdyonurus samalorum* sp. n. 1 — pterostigma of fore wing, 2 — forceps. 3 — penis in ventral view. 4 — titilator. 5, 6, 7 — gills 1, 3, 7. 8 — labrum. 9, 10 — incisors of left and right mandible. 11 — scales on femora. 12 — spines on posterior margin of abdominal terga.

Body length: 10 (7—10) mm; length of cerci 12 (10—13) mm.

Holotype (adult male, reared): Czechoslovakia, East Slovakia, Podhorský brook, Podhorod, 16. vii. 1975 leg. T. Soldán. Paratype No. 1 (adult female): Czechoslovakia, West Bohemia, brook, Valeč 12. 7. 1956 leg. V. Landa. Paratype No. 2 (larva): same data as holotype. Further paratypes: 13 larvae, 3 adults ♂♂ (for localities see paragraph "Distribution"). All type material is deposited in the collection of the Institute of Entomology, Czechoslovak Academy of Sciences, Praha.

Differential diagnosis: Adults of *Ecdyonurus samalorum* sp. n. can be distinguished from other European species of the *E. lateralis*-group by the following combination of characters:

(a) terga without markings, eyes not ringed, (b) veins brownish, darker than wing, (c) pterostigma with simple cross-veins, (d) projection of forceps base low, (e) penis lobes rounded with v-shaped division, (f) titilators asymmetrical, pointed. Critical adult characters are apparent from the following key to males*:

1 (6) Abdominal terga unicolorus, brownish or yellowish at most with diffuse darker posterolateral spots.
2 (3) Abdominal terga brown or brownish, posterior margins darker. Penis lobes with slightly produced posteromedial portions, titilators rounded at apex ..... *E. lateralis* (CURTIS, 1834)
3 (2) Abdominal terga yellowish or yellowish brown, posterior margins concolorous, with or without posterolateral diffuse spots. Penis lobes rounded, titilators pointed at apex.
4 (5) Veins in pterostigma connected, forked. Forceps base apparently convex, titilators symmetrical ..... *E. concii* (GRANDI, 1953)
5 (4) Veins in pterostigma simple. Forceps base nearly straight, titilators clearly asymmetrical at apex ..... *E. samalorum* sp. n.
6 (1) Abdominal terga with conspicuous brown or rusty red markings and pale spots.
7 (10) Veins of fore wing transparent, concolorous with wing. Projections of forceps base well developed, as long as 1/3 of penis length.
8 (9) Eyes conspicuously rounded and ringed. Cerci ringed only in basal half ..... *E. fascioculatus* SOWA, 1974
9 (8) Eyes flat, without conspicuous ring at base. Cerci ringed also in distal half ..... *E. affinis* (EATON, 1885)
10 (7) Veins of fore wing brownish, darker than wings. Projections of forceps base low, shorter than 1/3 of penis length.
11 (12) Penis lobes with v-shaped division, titilators without teeth. Penis broader at apex than at base ..... *E. gridellii* (GRANDI, 1953)
12 (11) Penis lobes contiguous, with narrow inner margins; titilators with teeth. Penis broader at base than at apex.
13 (14) Veins in pterostigma connected, forked. Titilators asymmetrical, posteromedial of penis lobes bluntly pointed ..... *E. quadrilineatus* (LANDA, 1970)
14 (13) Veins in pterostigma simple, not forked. Titilator symmetrical, posteromedial projections of penis lobes rounded ..... *E. ozrensis* (TANASIEVIČ, 1975)

Larvae of *E. samalorum* sp. n. can be distinguished from those of other European species of the *E. lateralis*-group by the following combination of characters: (a) body without conspicuous pale spots, (b) mandibular incisor nearly equal in length, (c) branched setae near inner incisors shorter only by 1/3 than incisor, (d) hypopharyngeal superlinguae only moderately bent backward, (e) femora with spatulate scales, (f) gills pale, last gill as long as 3/4 of gill 3, gill 1 bluntly pointed. Critical distinguishing characters are apparent from the following key to larvae**:

* Adults of *E. macedonicus* IKONOMOV unknown.
** Larvae of *E. gridellii* (GRANDI) and *E. ozrensis* (TANASIEVIČ) unknown.

1 (4) Scales on femora acutely pointed, gills marked with large dark spot in middle, tracheation conspicuous.
2 (3) Maxillae with 12—15 scrapes, lateral projections of labrum more pointed. Outer margins of gills 2—6 concave ..... *E. fascioculatus* SOWA, 1974
3 (2) Maxillae with 15—18 scrapes, lateral projections of labrum bluntly pointed. Outer margins of gills 2—6 straight or convex ..... *E. affinis* (EATON, 1885)
4 (1) Scales on femora bluntly pointed or spatulate, gills unicolorous, tracheization inconspicuous.
5 (10) Gills 2—4 pointed or bluntly pointed at apex.
6 (7) Gills 1 and 7 as long as or longer than gill 3, gills 3—6 acutely pointed at apex, gill 1 rounded. Scales on femora spatulate ..... *E. quadrilineatus* (LANDA, 1970)
7 (6) Gills 1 and 7 shorter than gill 3, gills 3—6 bluntly pointed at apex, gill 1 bluntly pointed. Scales on femora bluntly pointed.
8 (9) Lateral lobes of labrum bent backward. Gill 6 longer by 1/3—1/4 than wide, gill 7 asymmetrical ..... *E. macedonicus* (IKONOMOV, 1954)
9 (8) Lateral lobes of labrum short and straight. Gill 6 twice longer than wide, gill 7 symmetrical ..... *E. concii* (GRANDI, 1953)
10 (5) Gills 2—4 rounded at apex.
11 (12) Head without pale spots. Gill 1 bluntly pointed, gills 5, 6 pointed, scales on femora spatulate ..... *E. samalorum* sp. n.
12 (11) Head with pale spots. Gills 1, 5, 6 rounded. Scales on femora bluntly pointed ..... *E. lateralis* (CURTIS, 1834)

Bionomy: Similar to that of *E. quadrilineatus* and *E. lateralis*. Larvae live in larger brooks and streams with permanent water where rapids alternate with pools, preferring habitats with weak to moderate currents. They are found under stones as well as on submerged tree branches and roots. Having one generation a year and a typical "winter" species (cf. LANDA, 1968). Older larvae develop from October or September to June, but to a lesser degree during the winter months. Adults fly in June and July; development of larvae of the same population is probably irregular.

Distribution: Rare but probably generally distributed in highlands throughout Czechoslovakia (does not occur in lowlands). So far found at the following localities: brook Valeč; brook, Stachy (Elbe basin); Poprad riv., Podolines, Štrba; Javorinka stream, Podspády; Bielá, Tatranská Kotlina (Vistula basin); brook, Makov; brook, Lendak; brook, Brusnica; brook, Kastanie; brook, Lopušná; brook, Podhorod. Central European species, probably occurring also in Poland and Germany but as yet not distinguished from *E. quadrilineatus* found in those countries (cf. SOWA, 1975; MÜLLER-LIEBENAU, 1973).

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Ecdyonurus samalorum sp. n. из Чехословакии (Ephemeroptera, Heptageniidae)

Таксономия, определитель, биономия, Палеаркт

Резюме. *Ecdyonurus samalorum* sp. n. (личинка, субимаго, взрослый ♂ и ♀) описан из 13 местонахождений в бассейнах рек Лабы и Дуная в Чехословакии. Признаки, по которым новый вид отличается от других европейских видов из группы *E. lateralis*, приведены в виде определительной таблицы. Обсуждается биология личинок и жизненный цикл нового вида.

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REVIEW

Gupta A. P. (ed.): **Arthropod Phylogeny.** XX + 762 pp., Van Nostrand Reinhold Co., New York, etc. 1979. Price $ 32.50.

The nucleus of this multiauthored book is formed by several papers presented at a symposium at the 15th International Congress of Entomology, 1976, in Washington D. C.; other authors have been invited to contribute. The ensuing volume consists of 13 chapters which freely and unevenly, but always profoundly cover the chosen topic, and each provides an original contribution, review and bibliography. The individual sections have been written by J. Bergström (fossil anthropods), D. T. Anderson (embryos and fate maps), P. Weygoldt (late embryonic stages and head development), R. Matsuda (abnormal metamorphosis), P. S. Callahan (evolution of antennae), H. F. Paulus (eye structure), S. M. Manton (basic functional morphology of hexapod classes), K. U. Clarke (visceral anatomy), H. B. Boudreaux (intersegmental tendons and reclassification of arthropods), F. Schaller (sperm transfer and spermatophores), B. Bacetti (ultrastructure of sperm), A. S. Tombes (neuroendocrine organs) and A. P. Gupta (hemocytes).

Most of the papers (with the exception of anagenetically oriented contributions by Matsuda and Callahan) deal with the interrelationships of the major groups of arthropods. Since the views of Anderson, Manton and Boudreaux have been published in book form, the reader will probably consider most significant the articles by Weygoldt, Paulus & Bacetti. Weygoldt re-appreciates the available embryological evidence in favour of the monophyly of Arthropods and clearly refutes Anderson's arguments to the contrary. Paulus provides an instructive review and evolutionary interpretation of the structure of eyes supplemented by excellent diagrams and extensive bibliography, and Bacetti concisely surveys the phylogenetic implications of comparative studies of the sperm ultrastructure. Both latter papers are the only available summaries of copious recent research on structures which are rarely used for the interpretation of arthropod phylogeny but which provide a number of useful data. Only Manton and Anderson, whose conclusions are based on faulty methodology, argue explicity for polyphyly of the phylum Arthropoda and its various subgroups. However, an unexpected consensus appears in major contributions based on appreciation of unorthodox characters: Weygoldt, Boudreaux, Paulus and Bacetti bring forward convincing evidence for the monophyly of Arthropoda (Boudreaux lists 17 ancestral synapomorphies), Mandibulata, Tracheata, and Hexapoda.

The "Arthropod Phylogeny" is an important source of ideas and information as well as fascinating and stimulating reading in a handsomely produced and richly illustrated book. Its publication clearly shows that a unified opinion on the major features of macroevolution of the most diversified group of organisms is emerging.

P. Štys

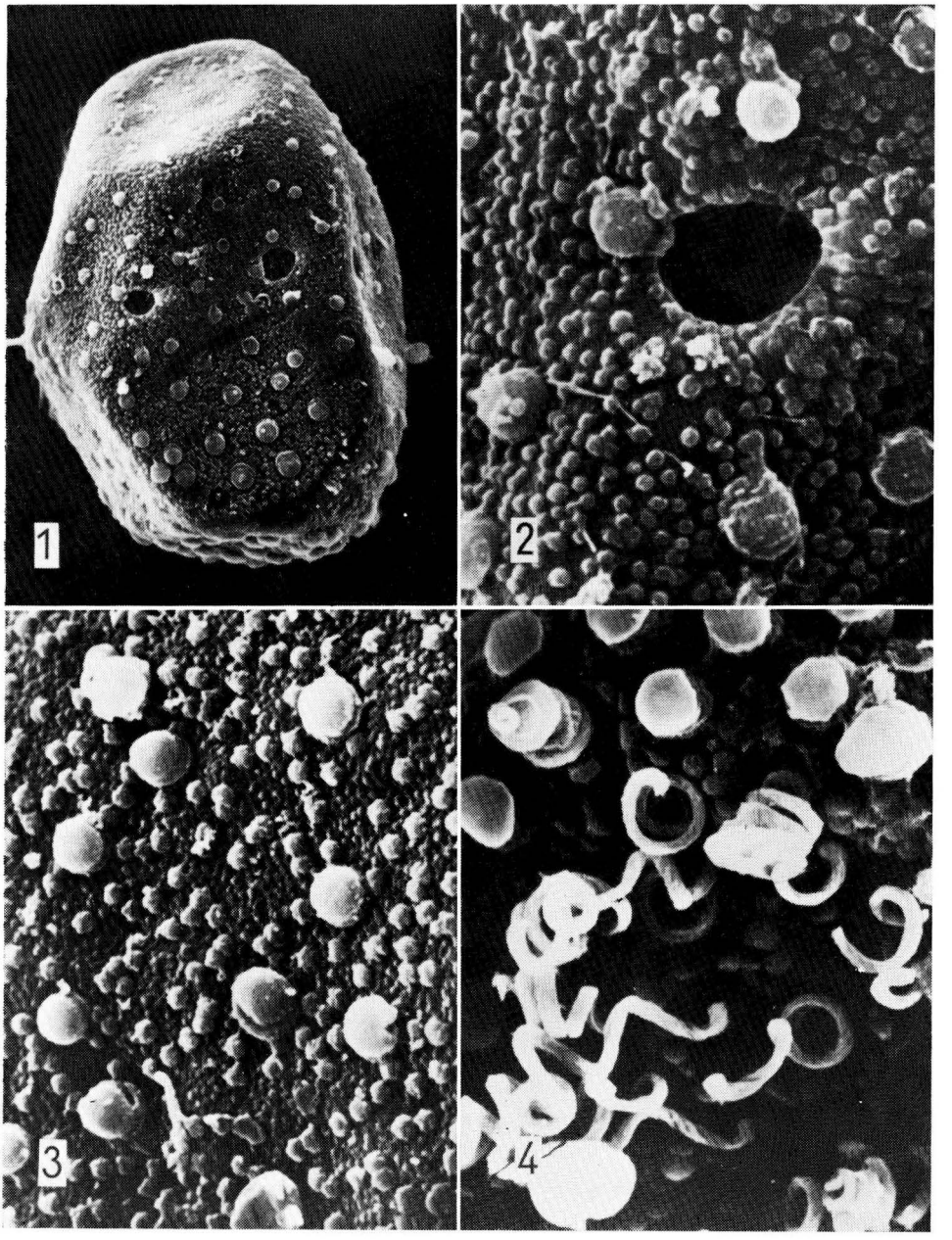

PLATE I, Figs. 1–4: Egg od *Ecdyonurus samalorum* sp. n. (critical point dried, gold coated, 15 kV electronmicrograms). 1 — egg, general view. 2 — micropyle. 3 — detail of chorion with tubercles. 4 — uncoiled tubercles on chorion.