

**MAYFLIES OF THE SUBGENUS Euthraulius BARN.  
(EPHEMEROPTERA, LEPTOPHLEBIIDAE,  
GENUS Choroterpes) OF THE USSR\***

N. Yu. KLYUGE (KLUGE)

Leningrad State University, Leningrad

At present 16 species are known in the subgenus *Euthraulius*. Of these, five species have been described on the basis of adult ♂s and one species on the basis of subadult ♂s from Africa. Five species were described on the basis of adult ♂s and one species on the basis of subadult ♂s from the Oriental region and New Guinea. The larvae have been identified only in 3 African species, but the differences between the larva of these species have not been well described. The description of the African species *Choroterpes* (*E.*) *magniculeata* Kopelka is not known to us. *Ch.* (*E.*) *quadricus* ali, 1967, was described from Pakistan on the basis of a larva but this description is so unsatisfactory that it cannot be used for any comparison. The only species described from Europe (Yugoslavia) on the basis of a larva and adult ♀ is *Ch.* (*E.*) *balcanicus* Ikonomov, 1961. Finally, *Ch.* (*E.*) *trifurcatus* Ueno, 1928 was described from Taiwan on the basis of larvae. Various authors (Imanishi, 1940; Chernova, 1952; Sukatskene, 1962; Kazlauskas, 1963; Gose, 1963) indicated one species for the Eastern Palearctic, and identified as *Ch. trifurcatus*; adult ♂s of this Palearctic species have been described. In all probability, the identification of the East Palearctic species as *Ch. trifurcatus* is erroneous, and we now describe it as a new species. Chernova (1952 : 267) mentioned larvae of an undescribed species from Turkmenia and tributaries of the Kuban River. The description of adults and larvae of a new species of the subgenus *Euthraulius* from Turkmenia is given below.

The types or new species are preserved in the Zoological Institute of the Academy of Sciences of the USSR, Leningrad.

---

\*Originally published in Entomologicheskoye Obozreniye, No. 4, 1984, pp. 722-728.

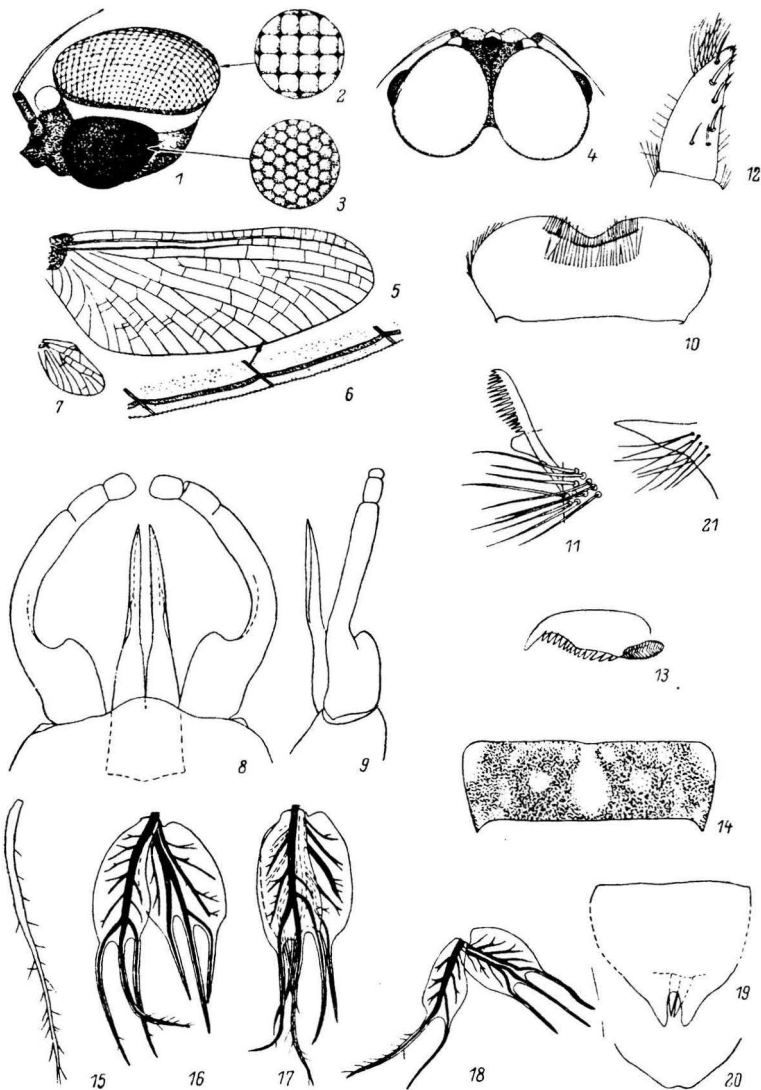


Fig. 1-21. *Choroterpes (Euthraulius)* spp. 1-20) *Ch. (E.) altioculus* sp. n.: 1-9) adult male: 1) head in lateral view; 2) facets of upper eye; 3) facets of lower eye; 4) head in dorsal view; 5) forewing; 6) hind margin of wing; 7) hindwing; 8) genitalia in ventral view; 9) genitalia in lateral view; 10-21) larva: 10) labrum; 11) inner apical corner of maxilla in dorsal view; 12) third segment of labial palpus; 13) claw; 14) pattern of abdominal tergite VII (one of variants); 15-18) gills of pairs I, II, III, and VII; 19) IX sternite of male larva; 20) same of female larva; 21) *Ch. (E.) trifurcatus*, inner apical corner of maxilla (after Ueno, 1928).

*Choroterpes (Euthraulius) altioculus* Kluge, sp. n. (Fig. 1-20).

*Choroterpes trifurcatus* (non Ueno, 1928): Kazlauskas, 1963: 583-584; Gose, 1963: 140-141.

Male, adult. Described by R. S. Kazlauskas and K. Gose. Head, thorax, and abdomen brown. Dorsal eyes raised above ocelli, yellowish orange, with dark brown border along faceted surface; facets square. Lateral eyes dark gray, with hexagonal facets.

Ratio of femoral length to length of tibia and tarsal segments of forelegs 53 : 100: 30 : 31 : 21 : 8, middle legs 48 : 44 : 2.5 : 2.5 : 2 : 7, and hindlegs 56 : 50 : 2.5 : 2.5 : 2 : 7. All femora light brown, with dark brown irregular spot at apex and similar spot proximal to apex. Tibias and tarsi light ochreous. Wings transparent, brown at base, longitudinal veins yellowish, and crossveins white.

Abdominal tergites brown, darker than sternites with narrow light colored middle longitudinal stripe and indistinct light colored spot near anterior margin of tergite. Sternite IX dark at anterior and lateral margin, styliger light brown. Forceps and penis whitish or brown. Penis lobes narrow, long and pointed. Caudal filaments whitish, with dark brown joints.

Larva. Body brown, with indistinct light pattern. Labrum strongly narrowed at base. Inner apical corner of maxilla with small process and large cristate process, teeth of cristate process reduced toward base and apex. Hypopharynx with bent lateral processes of middle lobe. Last segment of labial palpus elongated, with 4-6 strong bent bristles on dorsal surface and bundle of thin bristles in distal 1/4 of outer margin.

Ratio of femoral length to length of tibia and tarsus in foreleg 37 : 37 : 19, in middle leg 37 : 34 : 13, and in hindleg 44 : 40 : 15. Shape of bristles on legs similar to that for *Ch. (E.) balcanicus* Ikonomov, 1961, dorsal surface of femora and tibiae with long obtuse bristles, ventral surface of hind tibiae with large number of pointed pinnate bristles. Claws strong and greatly bent. Dark spot on femur similar to adult (these spots absent on exuvium).

Posterior abdominal tergites with short posterolateral processes, large and complex on tergites VIII-IX (Fig. 34). Hindmargin of tergite with thin sharp spines, small sharp spines near hindmargin. Abdominal tergites II-IX with uniform light pattern, not developed in some specimens. Gill leaflet I thin and long, trachea undeveloped, lower leaflet of gill pairs II-VII broader than the upper one, with posterior process near base. Apical processes of gill leaflets almost equal in length to undivided part of leaflet, these sometimes in the lower leaflet. Both leaflets in gill pairs II-VI with 3 apical processes, upper leaflet of gill VII with 2 and lower leaflet with 3 processes. Paracercus longer than cercus. Each 2nd or 4th segment in distal part of caudal filaments with dark basal ring.

	♂ adult	♀ adult	Larva
Body length	7 mm	6.5 mm	Up to 8 mm
Length of forewing	7 mm	8 mm	-
Length of paracercus	16 mm	-	Up to 7 mm

Note. The specimens described by K. Gose from Japan have the body length of 3.6-3.8 mm. Possibly, the difference in the shape of wings in these specimens is also related to the small body size (Gose, 1963, Fig. 1-3).

Material. Maritime Territory, 1980, collected by N. Klyuge; Kedrovaya Pad' (Cedar Bottoms) Reserve, Barabashevka River, 1.VII--1 ♂ adult (developed from larva)--holotype; same place, 24.VI-10.VII--10 larvae; Narva River, 14-26.VII--1 ♂ adult (reared from larvae), 8 larvae; Lazovskiy Reserve, Kievka River near "Zvezdochka" cordon--3 larvae; Ussuri River near Novo-Chuguevka. 25.VIII-1 ♀ adult (reared from larva).

Distribution. The adults of this species described by R. S. Kazlauskas and K. Gose originated from the Irkutsk Province and Southern Japan, respectively.

Chernova (1952) reported the discovery of *Choroterpes* larvae (identified by her as *Ch. trifurcatus*) in the Yenisey River and the Amur basin. Thus, it can be concluded that the area of distribution of *Ch. (E.) altioculus* sp. n. covers entire Eastern Siberia, the Far East and Japan.

Comparison. The adult ♂s of the new species differ well from the other species of this suborder in genital structure. The larva of *Ch. (E.) altioculus* sp. n. differs from *Ch. (E.) balcanicus* Ikon., known only on the basis of a larva and an adult female, by the shape of the cristate process of the maxilla, lateral processes of the middle lobe of hypopharynx, the claws, and also in that the paracercus is longer than the cercus.

In the Soviet and Japanese literature, the species described here is mentioned as *Dhoroterpes trifurcatus* Ueno, 1928. *Ch. trifurcatus* was described from Taiwan on the basis of the larval stage, and the author had no knowledge of other larvae with similar gills; therefore, the shape of the gill filaments is indicated as a unique character of the species. In the diagram published with the original description, special attention was paid to the inner apical corner of the maxilla with a large projection and bundle of bristles under it, but without cristate process (Fig. 21). Therefore, *Ch. (E.) altioculus* sp. n. described here differs strongly from *Ch. (E.) trifurcatus* in the structure of the maxilla. Later, Ulmer (1939) described larvae from the Zond Islands, which were included under *Ch. trifurcatus*. He also mentioned the difference of these larvae from the description of Ueno and, in particular, emphasized the apical corner of maxilla without the large projection and with a cristate process. Since 5 species are already known from the Oriental Region, and included under subgenus *Euthraululus*, there is sufficient reason to assume that the larvae described by Ulmer do not belong to *Ch. (E.) trifurcatus*, but to some other species. Peters and Edmunds (1970) described larvae of *Cryptopellenella facialis* Gillies, 1951, which were identified after rearing adults from them. These larvae have a similar large projection on the inner apical corner of the maxilla as in the diagram of the original description of *Ch. (E.) trifurcatus*. It is not clear from the description of *C. facialis* larvae how they differ from *Ch. (E.) trifurcatus*. It is possible that *C. facialis* is a junior synonym of *Ch. (E.) trifurcatus*, more so because *C. facialis* was described from places relatively closer to Taiwan: from Hongkong and Thailand. The adult male of the new species *Ch. (E.) altioculus* differs well from *C. facialis* in the shape of the genitalia.

*Choroterpes (Euthraululus) sumbarensis* Kluge, sp. n. (Fig. 22-40).

Male, adult. Head and thorax dark brown, membranous part ochreous with whitish coating. Dorsal eyes inferior, brownish orange, with dark brown border along margin of faceted surface; facets square. Lateral eyes dark, grayish, with hexagonal facets.

Ratio of femoral length to length of tibia and tarsal segments of forelegs 37 : 67 : 16 : 11 : 7 : 5, middle legs 37 : 34 : 2 : 2 : 2 : 5, and hindlegs 44 : 44 : 2 : 2 : 1 : 5. All femora light ocher, indistinctly darkened with brownish at base and apex, and with diffused grayish spot in middle. Tibiae and tarsi light ocher. Wings transparent, brown at base, longitudinal veins yellowish. Sc and R of forewing brownish in basal half, crossveins white.  $MP_2$  of forewing not connected with MP and with appearance of intercalary vein.

Abdominal segments II-VII shining; tergites grayish, lateral, anterior, and posterior margins whitish and transparent. Each tergite with narrow light colored longitudinal middle stripe disrupted by 2 narrow dark longitudinal stripes. Sternites II-VII whitish and transparent. Tergite X darkest, brown. Sternite VIII light colored, opaque, sternite IX brown at base and along sides, remainder light colored; forceps whitish. Penis lobes brownish, with lobate middle and dorsal widening; margins of these widenings slightly serrated. Caudal filaments whitish, almost unicolored.

Larva. Cuticle without pattern, gray or brownish pattern on larval body caused

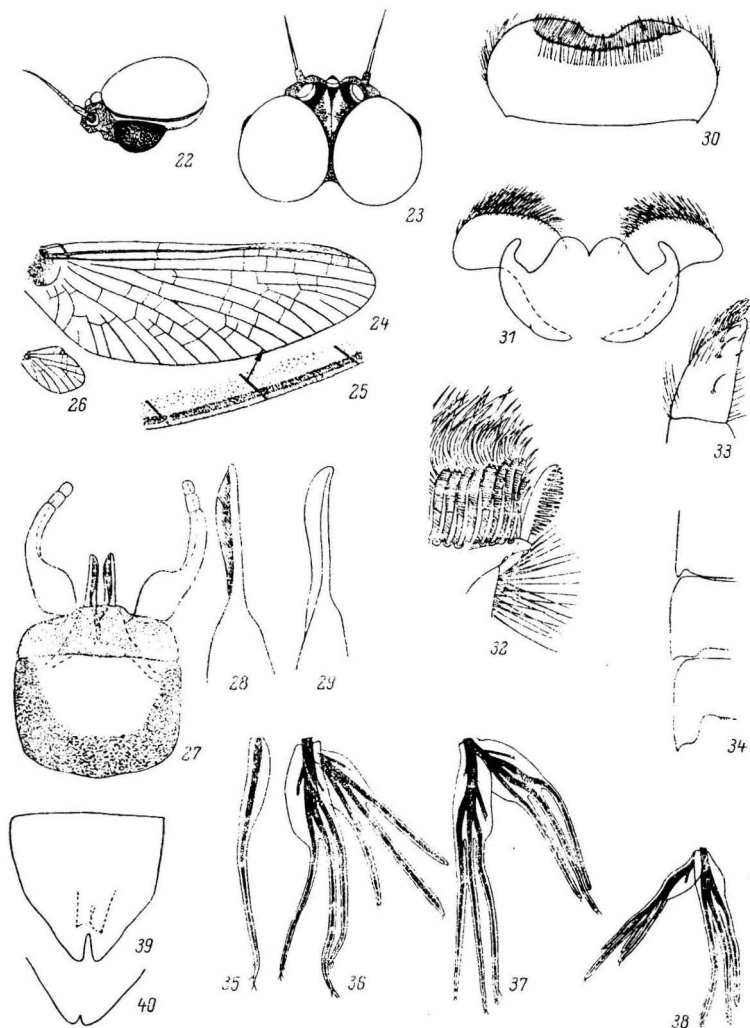


Fig. 22-40. *Choroterpes (Euthraulius) sumbarensis* sp. n. 22-29) ♂ adult; 22) head in lateral view; 23) head in dorsal view; 24) forewing; 25) hindmargin of wing; 26) hindwing; 27) genitalia in ventral view; 28) right lobe of penis, ventral view; 29) left lobe of penis, lateral view; 30-40) larva; 30) labrum; 31) hypopharynx; 32) inner apical corner of maxilla, ventral view; 33) 3rd segment of labial palpus; 34) postero-lateral projections of abdominal tergites VII-IX; 35-38) gill pairs I, II, III and VII; 39) sternite IX of ♂ larva; 40) same of ♀.

only by pigment of live tissues. Discarded exuvium pale yellowish, almost colorless.

Labrum slightly narrowed at base. Maxillae and hypopharynx similar to those of preceding species. Last segment of labial palpus almost triangular, with 3 strong bristles on dorsal surface and numerous thin bristles in distal 1/2 of upper margin.

Structure of legs similar to that of preceding species.

Hind abdominal tergites with short and pointed posterolateral projections, these large and complex on tergites VIII-IX. Hind margin of tergite with thin sharp spines, and minute sharp spines near hindmargin. Gill leaflet I broad basally, trachea may be branched. Lower leaflet less developed than upper one in gill pairs II-VII, apical processes of both leaflets much longer than undivided part of leaflets. Both leaflets with 3 apical processes, additional processes may also be present, as in Fig. 38. Paracercus longer than cercus. Each 4th segment in distal part of caudal filaments with dark basal ring.

	♂ adult	♀ adult	Larva
Body length	4.5-6 mm	4-6 mm	Up to 7 mm
Length of forewing	5-5.6 mm	5-6 mm	-
Length of paracercus	5.5 mm	5-6 mm	Up to 9 mm

**Material.** Turkmenian SSR, 1981, collected by N. Klyuge: Sumbar River near Ay-Dere, 6.VII--1 ♂, adult (reared from larva)--holotype; same place, 5-10.VII--9 ♂ and 1 ♀, adult, 2 ♂ and 1 ♀, subimage (all reared from larvae), 12 larvae; Sumbar River near Kara-Kala, 23-30.VI--1 ♀, adult, 2 ♀, subimago (all reared from larvae), 8 larvae; Ay-Dere River, 1-5.VII--3 ♀, adult (reared from larvae), 28 larvae.

**Comparison.** The adult male of the new species differs well from all known species of the subgenus *Euthraulus* in that the penis lobes are divergent in the apical part. The larva of *Ch. (E.) sumbarensis* sp. n. differs from *Ch. (E.) balcanicus* Ikonomov, 1961 and *Ch. (E.) trifurcatus* Ueno, 1928, whose adult males have not been described, as well as from *Ch. (E.) altioculus* sp. n. by the shape of the gill filaments and absence of cuticular pattern. Besides, it differs from the larva of *Ch. (E.) trifurcatus* by the absence of a large projection at the inner apical corner of the maxilla. The larva of the new species differs from that of *Ch. (E.) balcanicus* by the shape of the cristate maxillar process, lateral projections of the middle lobe of hypopharynx, claws, and also in that the paracercus is longer than the cercus. The larva of *Ch. (E.) sumbarensis* also differs from that of *Ch. (E.) altioculus* sp. n. by the position of bristles on the last segment of the labial palpus.

#### DIAGNOSTICS OF SUBGENUS *Euthraulus*

BARNARD, 1932

The most complete revision of the Leptophlebiidae genera from the Eastern Hemisphere has been done by Peters and Edmunds (1970). The two new species described in the present article do not completely correspond to the diagnosis of the subgenus *Euthraulus* of the genus *Choroterpes* given in this revision. The difference between genus *Cryptopenella* Gillies, 1951 with the single species, *C. facialis* Gillies, 1951, and subgenus *Euthraulus* is not clear. A more distal branching of MP in *Cryptopenella* than in *Choroterpes* s. l. is indicated as the imaginal generic character. However, branching of MP in *Ch. (E.) altioculus* sp. n., *Ch. (E.) sumbarensis* sp. n., as well as *Ch. (E.) balcanicus* Ikon. and *Ch. (E.) bugandensis* Kimmins, 1956 is similar to that of *Cryptopenella facialis*. The shape of the posterolateral projection of abdominal tergite IX, presence of posterolateral spines on abdominal tergite III (in *Choroterpes* s. l., these spines are present only from tergite IV or V on), and presence of a large projection at the inner apical corner of maxilla have been mentioned as larval generic characters of *Cryptopenella*. The shape of projections of tergite IX in *Ch. (E.) altioculus* sp. n. and *Ch. (E.) sumbarensis* sp. n. is similar to that of *C. facialis*. The extent of development of the posterolateral spines on the middle abdominal tergites is a very indistinct character and cannot be used for separating the genus. Thus, the large projection on the larval maxilla remains the only generic character of *Cryptopenella*. Possibly, *C. facialis* cannot be considered as an independent genus and the name *Cryptopenella* should be considered as a synonym of *Euthraulus*.

The difference between adults of genera *Choroterpides* Ulmer, 1939 and *Choroterpes*

is not clear. A diagnosis of the genus *Choroterpides* in the adult stage is not given in the original description. Peters and Edmunds indicated the following character for *Choroterpides*: sclerotization of hindmargin of forewing and hindwing on inner side of alar edge. This is also true for *Ch. (E.) altioculus* sp. n., but this character is less expressed in *Ch. (E.) sumbarensis* sp. n. (Fig. 6, 25). In larval structure, the *Choroterpides* group differs well from *Choroterpes* and, possibly, fully deserves the status of genus. Genus *Choroterpides* should be redescribed on the basis of the adult.

#### LITERATURE CITED

- ALI, S. R. 1967. The mayfly nymphs (Order: Ephemeroptera) of Rawalpindi District. Pak. J. Sci., 19: 73-86.
- CHERNOVA, O. A. 1952. Ephemeroptera of the Amur basin and adjoining waters and their role in the nutrition of Amur fish. Report of the Amur Ichthyological Expedition 1945-1949. [In Russ.]. Vol. 3: 229-360. Moscow.
- GILLIES. 1957. New records and species of *Euthraulius* Barnard (Ephemeroptera) from East Africa and Oriental region. Proc. R. Entomol. Soc. Lond. (B) 26: 43-48.
- GOSE, K. 1963. The imago of *Choroterpes trifurcata* Ueno (Ephemeroptera). Kontyu 31: 140-141.
- IKONOMOV, P. 1961. Ephemeroptera from Yugoslavia. *Euthraulius balcanicus* sp. n. (Leptophlebiidae). [In Bulg.]. Izd. Prirodonauchniot Muzej. Skopje 4 (1, 85): 1-10.
- IMANISHI, K. 1940. Ephemeroptera of Manchoukuo, Inner Mongolia and Chosen. Rep. Limnobiol. Surv. Kwant. a. Manch.: 169-263.
- KAZLAUSKAS, R. S. 1963. New and little known Ephemeroptera from the USSR. [In Russ.]. Entomol. Obozr. 42: 582-592.
- KIMMINS, D. E. 1956. New species of Ephemeroptera from Uganda. Bull. Brit. (Nat. Hist.), Entomol. 4: 69-87.
- PETERS, W. L. 1974. Results of the Austrian Hydrobiological Mission to the Seychelles, Comores and Mascarene Archipelagos. Part VIII: The Leptophlebiidae of the Seychelles and Comoro islands (Ephemeroptera). Ann. Naturhistor. Mus. Wien., 1979 (1980) 83: 733-740.
- PETERS, W. L. and G. F. EDMUNDS. 1970. Revision of the generic classification of the Eastern Hemisphere Leptophlebiidae (Ephemeroptera). Pac. Insects 12: 157-240.
- SUKATSKENE, I. K. 1962. Ephemeroptera of the Angara River and its tributaries near the Bratsk hydroelectric power plant. [In Russ.]. Tr. Akad. Nauk Lit. SSR (Ser. G) 2: 107-121.
- UENO, M. 1928. Some Japanese mayfly nymphs. Mem. Coll. Sci., Kyoto Imp. Univ. (Ser. B) 4: 19-63.
- ULMER, G. 1939. Eintagsfliegen (Ephemeropteren) von den Sunda-Inseln. Arch. Hydrobiol., Suppl. XVI: 443-692.
- YOU, D., T. WU, H. GUI and Y. HSU. 1980. A new species of the genus *Choroterpes* from Nanjing (Ephemeroptera, Leptophlebiidae). Acta Zootaxon. Sin. 5: 388-391.