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MAYFLIES (EPHEMEROPTERA, EPHEMERELLIDAE, HEPTAGENIIDAE)  
IN THE RIVERS OF THE ISSYK-KUL DEPRESSION

L. A. KUSTAREVA

Down to the present there has been hardly any investigation of the mayflies of Kirgizia. Fragmentary information on species of mayflies is given by Pavlova (1964) and by Konurbayev and Madzhar (1969); those of the Akbura River basin (southern Kirgizia) have been most fully investigated (Omorov, 1973).

It is only recently that some nymphs and adults of members of the genus Rhithrogena (Heptageniidae) have also been described from Kirgizia (Sinichenkova, 1973a, 1973b).

Information is given in the present article on the Ephemeroptera of individual rivers of the Issyk-Kul depression (the Aksu River - a tributary of the Dzhergalan and the Karasu River - a tributary of the Irdyk). The article contains information on benthic collections and on the rearing of mayfly imagines from nymphs obtained by the author in the lower reaches of the Aksu and the Karasu in 1972.

The article contains descriptions of two new species of the families Ephemerellidae and Heptageniidae, and descriptions of the nymphs of Rhithrogena tianschanica, Iron montanus and L. rheophilus known previously only from the adults (Brodsky, 1930); the previously unknown adults of Rh. tianschanica are also described and the adults of Rh. submontana and L. montanus are redescribed. The illustrations in the article are originals.

The author is sincerely indebted to K. A. Brodskiy (Zool. Inst. Acad. Sci. USSR) for assistance in identification of the material and for valuable comment on the work in progress.

Fam. EPHEMERELLIDAE

Drunella karasuensis Kustareva, sp. n.

Nymph. Body narrow and thin; head relatively small, rounded, without a rectangular frontoclypeal projection and without tubercles, smooth. Eyes located along sides of head. Labrum with a shallow notch (Fig. 1, a), with a dense covering of simple and lacinate setae along the sides; mandibles, maxillae, hypopharynx and labium of the usual structure (Fig. 1, b, c, d, e). Thorax lacking tubercles, its width 2.1 times its length; fore legs appreciably shorter than middle and hind legs; fore femora broadened, middle and hind femora narrow; outer margins of femora bearing long dark setae, between which there are infrequent fine hairs; in the middle of the upper surface of the fore femur there is a row of 4 receptor setae; tibiae and tarsi of all legs bear a row of pointed long spines along the inner margin (Fig. 1, f); the claws of the fore legs have 8 denticles on the inner side (Fig. 1, f). The lateral processes of the

abdominal segments are well developed on the 4th-9th segments and bear flat setae along the margins (Fig. 1, g). The abdominal tergites have paired median spinules that are barely perceptible on the 2nd-3rd segments and well developed on the 4th-7th segments; there is a group of dark flat setae on the 8th-9th segments (Fig. 1, h); there are similar setae on the ridge of spinules. Gill leaflets small, 5 pairs; inner posterior margins of 1st, 2nd and 3rd gill leaflets elongate and pointed; lower lobes of gill leaflets with large lobules arranged in a horseshoe shape; 5th gill leaflet very small, barely discernible, with 1-2 lower lobes. Caudal filaments half length of body, coarse, bearing whorls of long flat setae that are replaced toward their ends by fine hairs.

Nymphs yellowish brown, with a mosaic pattern of dark brown small spots on the head between the eyes; thorax lighter than head, with indistinct markings; legs brownish yellow, caudal filaments ochraceous, their terminal parts slightly darker.

Body length of nymph 7.0-8.0 mm; length of caudal filaments 4.0-4.2 mm. Adult insects unknown.

Material. Kirgizia. Terskey-Alatau, Karasu River, 13 July 1972, nymphs (including holotype) (L. A. Kustareva).

The nymph described is similar in the structure of the mouth parts and legs to the Siberian D. zapelkinae (Baykova, 1967), from which it is distinguished by the lack of tubercles on head and thorax, by the color of the body and by the presence of dark setae on the dorsal paired spinules. In the last character it resembles the D. setigera, known from Siberian rivers, from which D. karasuensis is distinguished by the lack of verrucose sculpture on the head and wings, and of dense pubescence and bands on the femora and tibiae and by the well developed paired spinules on the 4th-7th abdominal tergites. In addition, the nymphs compared differ in the size of the body and the caudal filaments.

Biology. So far the species has been found only in the Karasu River, where it is fairly numerous. Nymphs were collected in places where the flow rate was 0.5-0.7 m/sec among small stones at a depth of 0.3-0.5 m. Most of the nymphs collected were in the penultimate development stage before emergence (13 July 1972).

Drunella submontana Brodsky.

The nymph had not been described until recently and it was only in 1972 that O. Chernova gave a detailed description of it on the basis of material from Soviet Central Asia. The nymphs of D. submontana found by us in rivers of the Issyk-Kul depression are

D. author's correction

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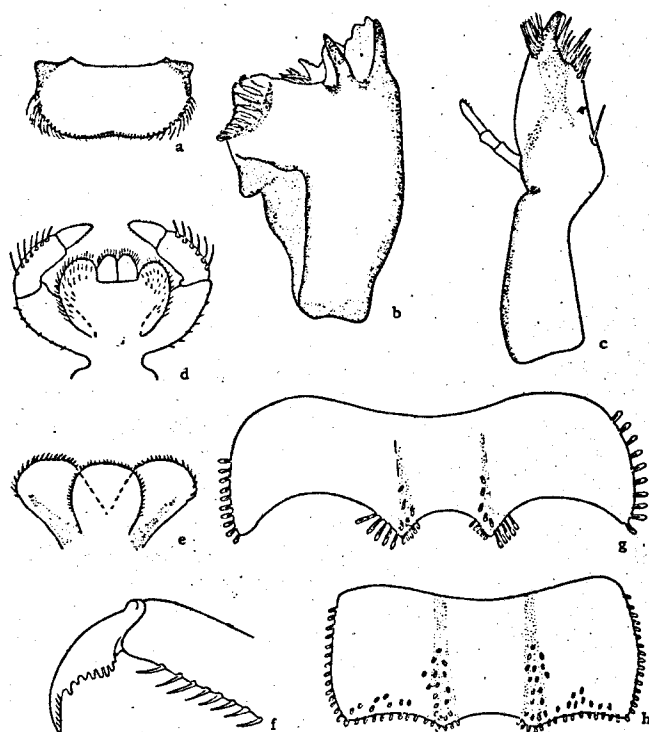


Fig. 1. *Drunella karasuensis* sp. n., nymph.

a) Labrum; b) left mandible; c) right maxilla; d) labium; e) hypopharynx; f) claw of fore leg; g) 7th abdominal segment from above; h) 8th abdominal segment from above.

identical to the nymph described, differing only in coloration and body size. The living nymph is between light brown and black; the abdomen has a raspberry tinge in many specimens. The nymph appears variegated owing to the abundance of light spots and striae on the wings. The body of the adult nymph is 9-10 mm long, 14.5-16 mm with the caudal filaments.

**Female imago** (alcohol, reared from the nymph). Head reddish brown, with dark anterior margin and black spots on the occipital sclerite; posterior margin black. Compound eyes black, ocelli fumose, light. Thorax light cream; abdominal tergites dark brown, sternites brownish raspberry; 8th segment lighter than preceding and succeeding segments, with a triangular brownish-cream spot on its sternite, the base of which is at the anterior part of the sternite; femur and tibia of fore leg reddish brown, tarsus dark gray; middle and hind legs lighter than fore legs, yellow brown, tarsi olive-gray. Caudal filaments dark brown, with distinct black annulation; genitalia light brown. Wings transparent, with brown longitudinal veins and colorless crossveins; venation of fore and hind wings distinct; costal and subcostal areas in the upper posterior part of the wing light brown, transparent. Fore tibia equal to the femur, tarsus shorter than tibia, 3rd tarsal segment the shortest, 4th twice length of 3rd; femora and tibiae of middle and hind legs practically identical, 4th tarsal segment equal in length to the first 3 combined, each of which is of the same size as the others.

Body length of female 9.7-10 mm, length of wing 11.5 mm, of caudal filaments 13-14 mm.

**Male imago** (alcohol, reared from the nymph). Described for the first time. Color light cream, thorax light yellow; abdominal tergites brownish cream, with markings consisting of light and dark spots (Fig. 2, a); oval dark spots at sides of 9th segment; abdominal sternites lighter than tergites, with markings consisting of oblong and oval light spots on a cream-ochraceous ground (Fig. 2, b). Fore legs long, brownish gray, with dark joints, tarsus practically colorless, creamy. Middle and hind legs light yellow, with darkening at the articulations of femora

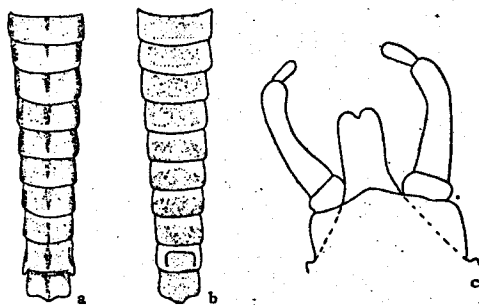


Fig. 2. *Drunella submontana* Brodsky, ♂ imago.

a) Abdomen from above; b) abdomen from below; c) genital appendages.

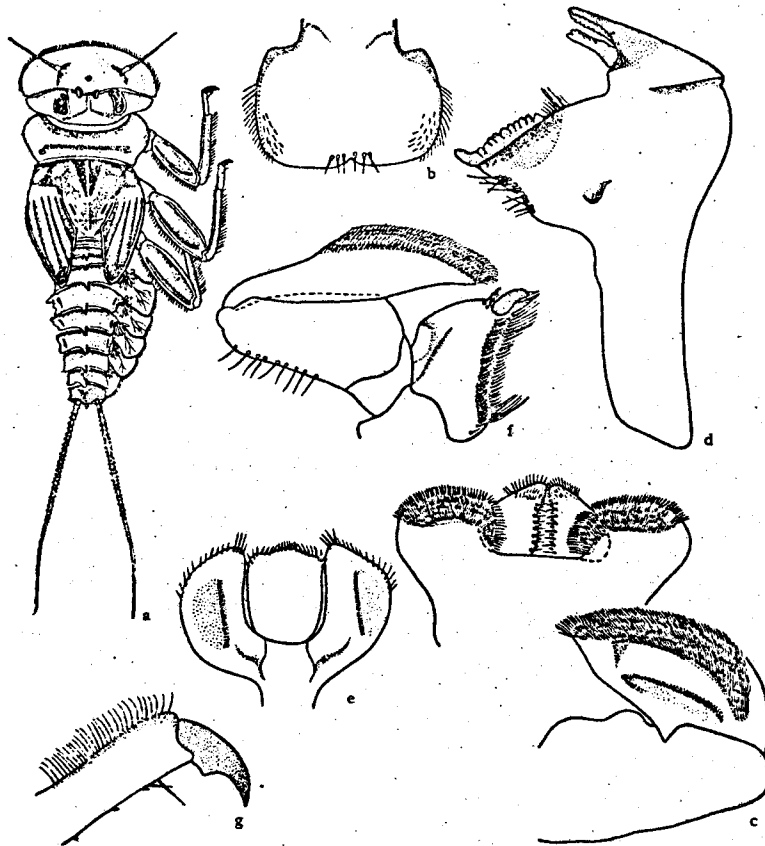


Fig. 3. *Iron montanus* Brodsky.

- a) General appearance of nymph; b) labrum; c) labium; d) left mandible; e) hypopharynx; f) right maxilla; g) claw of fore leg.

and tibiae; femora and tibiae of identical length, 1st, 2nd and 3rd tarsal segments all of the same length, 4th equal to the first 3 combined. Genitalia light ochraceous, lobe of penis slightly divided apically (Fig. 2, c). Caudal filaments yellow, with distinct black annulation. Wings transparent, longitudinal veins light brown, crossveins colorless. Eyes very large and touching, dark red with black bases.

**Male subimago** (alcohol, reared from the nymph). Darker than the male imago, brownish red. Wings dark fumose, crossveins distinct, areas between veins bearing small dark spots. Eyes reddish gray, practically touching. Markings on abdominal tergites and sternites the same as in the male imago. Fore legs appreciably longer than middle and hind legs; femur and tibia of identical length, tarsus shorter and lighter than tibia; length of all tarsal segments identical. Middle and hind legs yellow, tibiae narrower and shorter than femora, first 3 tarsal segments all of the same length, 4th long, slightly shorter than the first 3 combined.

**Dimensions:** male imago - length of body 11.5 mm, of wing 11.8 mm, of caudal filaments 14-14.1 mm; male subimago - length of body 9.8-10 mm, of wing 11.4 mm, of caudal filaments 10.3 mm.

**Biology.** Nymphs plentiful in the lower reach of the rivers and in springs (with ground water alimenta-

tion). The nymphs live underneath stones and on snags at a depth of 0.1-0.6 m, frequently being found around the water's edge. They are particularly numerous in the Aksu River in March at a water temperature of 3-5°C and a flow rate of 0.5-0.7 m/sec. Before the imago emerges the nymph becomes dark brown; emergence of the subimago from the nymph lasts 1-2 minutes, the subimaginal stage lasts 18-20 hours.

The specimens obtained by us differ from the dry specimen of a female imago and a specimen of the male subimago in alcohol described by K. A. Brodsky mainly in the coloration of the head, thorax and abdomen.

Fam. HEPTAGENIIDAE

*Iron montanus*.

**Nymph (male).** Body flattened, head large, broader than prothorax, its anterior margin densely covered with fine light hairs (Fig. 3, a); antennae short, consisting of 16-17 segments. Labrum (Fig. 3, b) with well expressed median notch, densely pubescent and with large setae on the upper side of the outer margin; mandible with broadened apex and narrowed lower part (Fig. 3, d); the maxilla is of the usual structure (Fig. 3, f), with two lacinate setae

the apical tooth. The outer lobes of the hypopharynx rise above the inner lobe (Fig. 3, e); labium densely pubescent, with a row of sharp spines and fine setae on the inner margins of the inner lobes (Fig. 3, c). Length of prothorax one quarter its width, anterior margin broader than posterior margin; fore legs shorter than middle legs, claws strong, with one triangular toothlike process nearer the base of the claw (Fig. 3, g). Femora of all legs flattened and broadened; legs densely pubescent. Lateral processes to the under side of which the gill leaflets are attached well developed on 1st-8th segments; gill leaflets of the usual structure, broad, with undulate margins and short pubescence forming an empodium. Abdominal tergites bearing long, pointed, slightly inwardly recurved spines, the ends of which are black in mature nymphs, in the middle of the posterior margin of the 2nd-9th segments; spine absent from 10th segment; row of light hairs along ridge of spines and along medial line of 10th segment. Nymphs gray-brown; head darker than prothorax, without markings; prothorax with a transverse brownish band on lower half; two light oblong spots in the upper outer angles on the mesothorax, dark brownish oval small spots at bases of wings; femora of all legs with light oblong areas basally and darkened distal ends; tibiae and tarsi yellow-gray, claws brown. Black oblong striae along sides of 5th-7th abdominal segments; abdominal sternites pale brown-yellow, with dark comma-like striae on the sides of the 1st-8th segments. Caudal filaments longer than body, widely spaced, brownish yellow, pubescent on outside and inside.

Length of nymph before emergence of the imago 7.7-8.1 mm, length of caudal filaments 8.7-9.1 mm.

**Male imago** (alcohol, reared from the nymph). Wings with distinct longitudinal veins and crossveins. Fore tibia 1.5 times length of femur; tarsus 1.5 times length of tibia, 1st tarsal segment longest, 5th shortest. Genitalia of the usual structure (Fig. 4). Ground color of body yellow brown with olive tinge; head and thorax dark olive-brown, thorax with light cream longitudinal stripes; eyes fumose-rosepink, lower part darker than upper part. Abdominal tergites yellow-brown; dark markings on 2nd-7th segments, a broad dark brownish stripe along median line of 10th segment; oblique symmetrical black striae along sides of tergites; sternites pale cream-yellow, with two dark comma-like striae arranged symmetrically relative to the median line on the 2nd-9th segments.

Wings transparent, costal and subcostal areas in upper posterior part of wing matte; longitudinal veins brown, crossveins colorless; fore legs yellow-brown, middle and hind legs yellow; caudal filaments brown-yellow, gradually becoming light yellow toward the end, annulation dark brown, distinct only for two thirds of the length of the filaments; genitalia brown-yellow. Length of body 9.1 mm, of wing 9.8 mm, of caudal filaments 27.0 mm.

**Female imago** (alcohol, reared from the nymph). Femur and tibia of fore leg of equal length, tarsus one third length of tibia; femur slightly longer than tibia in middle and hind legs, but tarsus half length of tibia, 5th tarsal segment the longest, but shorter than the previous segments combined.

Wing transparent, with yellowish brown longitudinal veins and colorless crossveins; eyes fumose-gray, with narrow black border along the base, ocelli high, milky white on black bases; head pale yellow, prothorax cream with a broad longitudinal brownish stripe along each side of the median line.

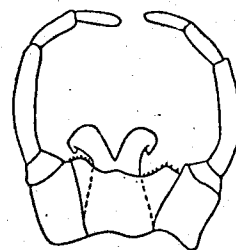


Fig. 4. *Iron montanus*, ♂, imago. Genital appendages.

Abdomen yellow, with delicate rosepink tinge, dark markings on the upper part of the 2nd-7th segments absent on the 8th-10th segments; oblique dark brownish striae on sides of tergites and on abdominal sternites; femur, tibia and tarsus of fore leg olive-yellow, with dark joints; middle and hind legs pale olive-yellow; caudal filaments brownish yellow with red annuli; ends of filaments dark, articulations of segments light yellow. Length of body 8.6 mm, of wing 10.6 mm, of caudal filaments 17.5 mm.

**Male and female subimagines** (alcohol, reared from the nymphs). Body lighter than in imago; wings wan, fumose; thorax pale yellow, without longitudinal dark stripes; eyes rosepink-gray; dark markings on abdominal tergites and striae on sternites well discernible; fore legs darker than middle and hind legs, femur with practically black stripes along outer and inner margins; caudal filaments light yellow with dark brownish annuli in the upper half. P. 63

**Dimensions:** male - length of body 8-8.6 mm, of wing 11.1 mm, of caudal filaments 14.5 mm; female - length of body 8.5-9 mm, of wing 11.5 mm, of caudal filaments 10-11 mm.

**Biology.** The nymphs inhabit rivers in which water temperature is 8-13°C and flowrate 1.5-2.0 m/sec, living beneath the stones at a depth of 0.1-1.0 m. Nymphs of different ages are found all the year round. Imagines were reared and caught under field conditions in July; no mass emergence was observed under natural conditions. The nymphal molt to the subimago takes 3-5 minutes; the subimaginal stage lasts 20-24 hours.

Distinguished from the specimens described by K. A. Brodskiy (1930) by some differences in the color of the body and in size.

#### *Iron rheophilus*.

**Nymph** (Fig. 5, a). Body broad, more massive than in *I. montanus*, flattened. Head flat, of same width as prothorax; eyes widely separated; antennae consisting of 23-25 segments; labrum with straight anterior margin, moderately pubescent (Fig. 5, b); outer lobes of hypopharynx (Fig. 5, c) with slightly elongated and rounded upper inner angles; mandible of typical structure (Fig. 5, e); maxilla with 4 long lacinate setae near the apical teeth (Fig. 5, f); labium constructed as in *I. montanus* (Fig. 5, d), but lacking spines on the inner margins of the inner lobes. Posterior margin of head bearing tufts of light hairs behind the eyes; a row of long light hairs on median line of thorax. Fore legs slightly longer than middle P. 64

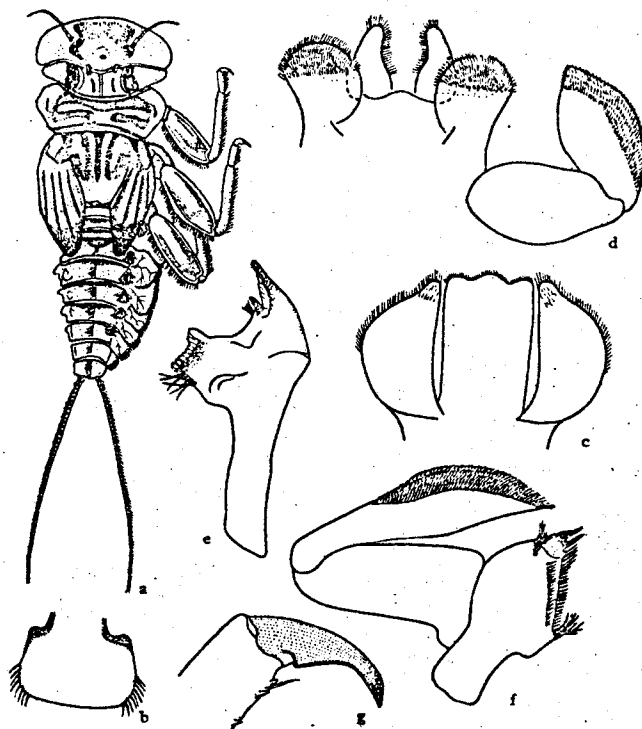


Fig. 5. Iron rheophilus.

- a) General appearance of nymph; b) labrum; c) hypopharynx;  
d) labium; e) left mandible; f) right maxilla; g) claw of fore leg.

and hind legs; femora bearing long sparse setae, tibiae and tarsi bearing dense and fine hairs; claw of fore leg (Fig. 5, g) with a triangular toothlike projection nearer the base. Row of light long hairs along median line of tergites on abdominal segments.

Nymph ochraceous; pattern of light spots and bands on head and thorax; abdominal tergites light brown with black markings in upper half of 2nd-7th segments; sternites light brown, without markings; oblong light spots on femora occupying the basal part; ends of tarsi dark, claws reddish brown; caudal filaments yellow-brown, with 4 distinct narrow annuli right at the base; pubescence consisting of dark hairs on the upper side of the filaments.

Length of nymph 11-12 mm, of caudal filaments 12-12.5 mm.

The nymph described differs from I. montanus and I. nigromaculatus, which are found under similar conditions, in greater size and the dark color of the body, as well as in the absence of spines on the abdominal tergites.

**Biology.** The nymphs are found along with I. montanus and I. nigromaculatus, but are less abundant; they live beneath stones in a fast current in rivers with cold glacial water at a depth of 0.2-0.9 m.

References are to be found in the works of K. A. Brodskiy (1930) and E. O. Omorov (1973) to the discovery of numerous I. rheophilus nymphs in the rivers

of Kazakhstan and Kirgizia. These authors report that since the nymphs of this species are typified by the absence of spines on the dorsum, apprehensions that the nymph described may belong to another species are eliminated.

Rhithrogena tianschanica.

Nymph (Fig. 6, a). Large, flattened; anterior margin of head with shallow notch; eyes larger in the nymphs of males than of females, and converged; antennae short, 1st segment massive, 2nd, 3rd and 4th segments narrow; labrum with a broad smooth notch, densely pubescent (Fig. 6, b); pubescence of labium consisting of numerous hairs and short spinules. Inner lobes deeply cleft (Fig. 6, c); inner lobe of hypopharynx lower than upper lobes (Fig. 6, d); mandible massive; its outer margin convex, with a deep submedial impression (Fig. 6, e), apical tooth large and dentate; maxilla with 3 apical teeth and 1 long spine, 3 practically parallel rows of spines and setae on inner surface (Fig. 6, f). Prothorax narrower than head, its posterior margin impressed in the middle; femora of all legs flat, broadened, bearing short dark setae, tibiae and tarsi without pubescence; claws of legs bearing 1 denticle (Fig. 6, g); receptor setae of upper surface of femora short and flattened (Fig. 6, h); gill leaflets of the normal type for Rhithrogena, forming suckers; 1st gill leaflet (Fig. 6, i) with a tuft of 30-35 filaments extending from a single trunk and branched; 7th gill leaflet with a tuft of 25-30 filaments. Caudal filaments diverging at a broad angle, massive, with very short pubescence.

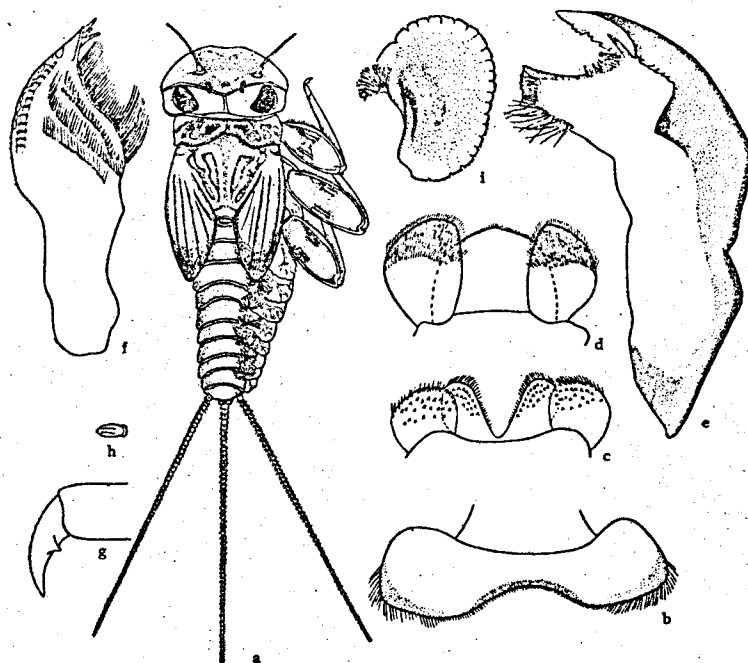


Fig. 6. *Rhithrogena tianschanica*.

a) General appearance of nymph; b) labrum; c) labium; d) hypopharynx; e) left mandible; f) right maxilla; g) claw of fore leg; h) receptor setae of right femur; i) 1st gill leaflet.

Nymphs rosepink with bright pink transverse bands on the femora; specimens are found with pale olive coloration. Eyes black with brown-rosepink margin; tibiae and tarsi of legs yellow-rosepink; abdomen yellow-rosepink, without markings; caudal filaments yellow, paracercus lighter than cerci.

Body length of imago 15-16 mm, length of caudal filaments 11-12 mm.

Male imago (alcohol, reared from the nymph). Wings transparent, with hyaline luster, venation distinct; fore femur shorter than tibia, tibia shorter than tarsus, 1st tarsal segment short, 2nd and 3rd longest, 4th equal to 1st, 5th shorter than 4th; first 4 tarsal segments of middle and hind legs of equal length; 5th equal to half their total length. Forceps of genitalia with very long 2nd segment and small 3rd and 4th segments (Fig. 7, d), lobes of penis deeply divided, with small spines on their outer margins.

General color of body brown; thorax much darker than abdomen; light bands stand out on the brownish ground of the tergites at the articulations of the segments; spiracles show up as small rounded light spots (Fig. 7, a); abdominal sternites light cream with a pattern of dark bands (Fig. 7, c); light spots on lateral surface of abdominal segments bordered by a dark brown irregular stripe (Fig. 7, b). Eyes reddish, with fumose-gray base, ocelli milky white. Fore femur brown red, with rosepink transverse spot in the middle, joints brownish rosepink; tibia olive-brown, tarsus olive, lighter than tibia; middle and hind femora brown-rosepink, with a bright rosepink-brown transverse spot in the middle and dark brown joints; tibiae

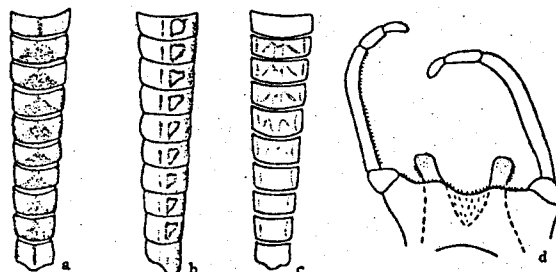


Fig. 7. *Rhithrogena tianschanica*, ♂ imago.

a) Abdomen from above; b) abdomen from the side; c) abdomen from below; d) genital appendages.

yellow, with dark distal ends; tarsi brownish, claws brown-red.

Wings colorless, costal and subcostal veins golden-brown, reddish brown toward the end of the wing; the mottled markings typical of the subimago are absent; other veins dark, practically black; genitalia dark brown, forceps brown, penis slightly lighter.

Caudal filaments yellow-brown, with dark annuli at base of segment.

Body length of male imago 14.6 mm, length of caudal filaments 33.0 mm.

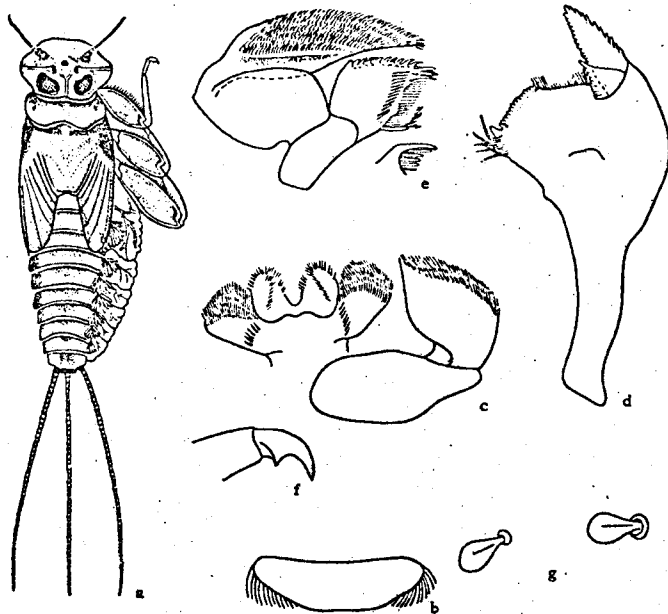


Fig. 8. *Rhithrogena brodskyi*, sp. n.

a) General appearance of nymph; b) labrum; c) labium; d) left mandible; e) right maxilla; f) claw of fore leg; g) receptor setae of the femur of the fore leg.

**Biology.** The nymph lives at a depth of 0.4-1.0 m in fast cold streams, usually on the undersurface of stones with a red or rosepink tinge; the numbers are low. Most frequently encountered in July and August.

In a cage in a flowing stream at a water temperature of 10-19°C imagines were obtained on the third day after nymphs had been placed in the cage. The subimaginal stage lasts 40-48 hours.

K. A. Brodskiy has described male and female subimagines of *Rh. tianschanica*. There are references in the work to the effect that nymphs of this species are large and rosepink or greenish. On comparison of the description of the nymph of *Rhithrogena tianschanica* by Sinichenkova (1973b) and our specimens of the same species certain differences are discovered (the width of the femora, the configuration of the cephalic plate and some other lesser differences). Although the shape of the head may be due to foreshortening in the illustration, the other differences may indicate either variability of the species or that different forms may have been described under the one specific name. Of course, only the rearing of imagines from nymphs, which we did, gives the most reliable comparison of nymphs and imagines. The author instanced by us states: "The nymphs first described are classified as belonging to the species *Rh. tianschanica* by similarity in size and by the similar dates on which adult nymphs were found and the subimago emerged" (p. 10).

*Rhithrogena brodskyi* Kustareva, sp. n.

**Nymph** (Fig. 8, a). Body narrow, head flat, with appreciably projecting protuberances along the sides,

without pubescence along the margin; eyes of medium size; antennae projecting beyond margin of head for half their length and set on a light base; labrum with a practically straight anterior margin, densely hairy (Fig. 8, b); one row of long setae on inner surface of maxilla, its upper margin ending in curved teeth with 5 narrow denticles on the inner side of each (Fig. 8, e); mandible with a narrow, shaft-shaped lower division and a broad upper part, apical tooth of mandible dentate, its inner tooth divided into many lobes (Fig. 8, d); labium with relatively small inner lobes bearing only dense hairs (Fig. 8, c). Prothorax narrower than head; fore tibia shorter than femur, tarsus one third length of tibia; femora of all legs appreciably broadened and flattened; the claw of the fore leg is of typical structure (Fig. 8, f); femora with a row of long thin setae along the outer margin and leaflike receptor setae on the inner margins and on the surface of the femora (Fig. 8, g), alternating with short light hairs; pubescence of tibia consisting of short hairs with sparse leaflike setae; distal ends of fore and middle tibiae with a group of three large brown, forward recurved spinules and 2-3 thin light spinules; tibia of hind leg with one large spine, the inner margin of which is serrate, and 3-4 transparent fine setae; distal ends of tarsi with short light setae. Abdomen without lateral processes, gill leaflets forming suckers, their margins undulating and pubescent; tuft of 1st gill leaflet consisting of 14-15 filaments, tuft of 7th consisting of 9-10 filaments. The caudal filament bears spinules and setae that are discernible only under the microscope.

Nymph gray-brown, fixed nymph yellow-brown, head, thorax and wing cases without markings; mesothorax darker than prothorax, its anterior margin dark brown; femora with a single yellowish longitudinal

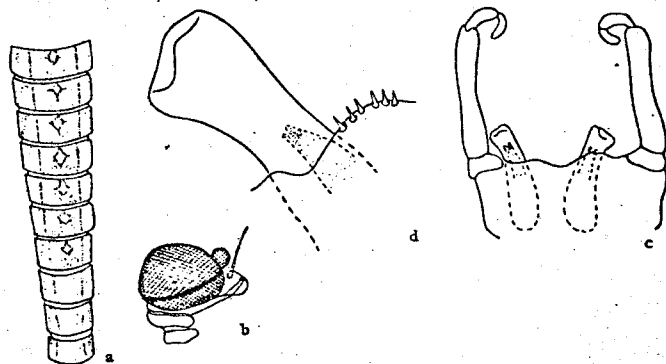


Fig. 9. *Rhithrogena brodskyi*, sp. n. ♂ imago.

a) Abdomen from below; b) eye in side view; c) genital appendages; d) lobe of penis.

stripe and darkened distal ends; abdominal tergite dark brown in upper half, light brown in lower half, creating the impression of alternating dark and light broad rings; sides of tergites brownish; sternites lighter than tergites; caudal filaments yellow-brown, paracercus lighter than cerci, annulation distinct and light.

Length of adult larva 9.6-10 mm, length of caudal filaments 7.1-7.5 mm.

**Male imago** (alcohol, reared from the nymph). Wings transparent, with distinct longitudinal veins; crossveins indistinct; fore legs longer than middle and hind legs, 1st tarsal segment shorter than 2nd, 2nd the longest, 5th same length as 1st; tarsus overall shorter than tibia; 5th tarsal segment of middle and hind legs the longest. Lobes of penis broadly diverging, apically broadened and slightly impressed; inner spine apically divided; small spines on margin of genital plate between lobes of penis (Fig. 9, c, d).

Head rosepink-brown, eyes fumose-gray, with a black band separating the upper half of the eye from the lower half (Fig. 9, b), lower margin of eye black; ocelli high, fumose-gray. Prothorax milky-yellow, abdominal tergites rosepinkish-brown, intersegmental bands practically white; abdominal sternites darker than tergites, markings on 1st-7th segments consisting of diamond-shaped figures and light cream oblique stripes on which there are longitudinal dark striae (Fig. 9, a); fore femur yellow-brown, tibia yellow-gray, tarsus light yellow; middle and hind legs light yellow, distal ends of femora darkened, tarsi yellow-gray. Genitalia yellow-brown, pale, inner spines of penis dark; caudal filaments basally yellow-brown gradually lightening to pale yellow toward the end; the noticeable dark annulation disappears toward the end of the cerci. Wings colorless, longitudinal veins gray.

Length of body 8.5 mm, of wing 8.2 mm, of caudal filament 16 mm.

**Female imago** (alcohol, reared from the nymph). Color of body slightly lighter than in males; eyes fumose-gray, with the same black band as in the male; thorax light brown, with yellow lower half. A broad, almost white band between 6th and 7th tergites; symmetrical longitudinal narrow stripes along median line on tergites of 8th and 9th segments; abdominal sternites lighter than tergites. Fore legs yellow-brown, femora and tibiae lighter than tarsi; middle

and hind legs light yellow, with darkenings where the joints are articulated, tarsi darker than femora and tibiae. Caudal filaments basally dark brown, lightening terminally, annulation clearly discernible in the dark area. Wings transparent, with distinct longitudinal veins and crossveins.

Body length of female 9.4 mm, wing length 10.9-11 mm, length of caudal filaments 14.6 mm.

**Female of subimago** (alcohol, reared from the nymph). General color of body brownish-yellow, with rosepink tinge; eyes with the characteristic black band already mentioned; color of legs as in the imago; caudal filaments dark, without annuli, briefly pubescent; wings fumose-gray.

Length of body 9.5 mm, of wing 10.0 mm, of caudal filaments 15.0 mm.

**Material.** Kirgizia. Terskey-Alatau, Aksu River, nymphs, adult males (including the holotype) and females, July 1973 (L.A. Kustareva).

**Biology.** The nymphs inhabit the lower reaches of rivers in the Issyk-Kul depression at a water temperature of 8-12°C and springs with groundwater alimentation, in which they are found far less frequently. They live underneath stones of various sizes; nymphs of different ages are found all the year round. Emergence of the subimago from the nymph takes 1-1.5 minutes; the subimaginal stage lasts between 15 and 24 hours. The imago is found under natural conditions in the summer months; no mass flight was observed.

Comparison of the nymphs of the new species with those of *Rhithrogena minima* and *Rh. asiatica* described by N.D. Sinichenkova (1973a, b) reveals a number of significant differences that prevent us from classifying our species as one of these. Thus, *Rh. minima* is distinguished by the structure of the mandible, the maxilla, the tarsal claws, etc. and also by considerably lesser size. Our species is also distinguished from *Rh. asiatica* by the structure of the mandible, the spinules on the femora and smaller size.

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# ENTOMOLOGICAL REVIEW

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