

On the family *Stenopsychidae* Mart. with a revision of the genus *Stenopsyche* Mc Lachl.

(Trichopt.)

BY

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Historical.

In 1866 R. Mac Lachlan described ¹, from India, under the name *Stenopsyche griseipennis*, n. gen. n. sp., a peculiar new large caddis-fly, belonging to the fam. *Hydropsychidae* (in old sense). Subsequently this family was subdivided, chiefly by G. Ulmer ², in four separate families, *Philopotamidae*, *Polycentropidae*, *Psychomyidae*, *Hydropsychidae*, and the question appeared, in what family the gen. *Stenopsyche* ought to be placed. Taking into consideration, chiefly, the presence of three well developed ocelli Ulmer considered ³ this genus—at that time with three species—, as belonging to the fam. *Philopotamidae*, though in the venation and in the shape of the wings, in the structure of genitalia, as well as in the whole habitus and in large size it is very unlike other genera of this family.

Prof. N. Banks considers four families of Ulmer only as subfamilies of the old fam. *Hydropsychidae* ⁴, and includes the gen. *Stenopsyche* in the subfam. *Hydropsychini* ⁵.

In 1916 Ulmer described ⁶ from Australia a new genus *Stenopsychodes* Ulm. (with a species *S. mjobergi* Ulm.), similar enough to *Stenopsyche* in the venation of the wings, in the structure of antennae,

¹ Mc Lachlan (R.): *Trans. Entom. Soc. Lond.* (3), V, pp. 264-266, pl. XVII fig. 5.

² Ulmer (G.): *Trichoptera in Gen. Insect.*, fasc. 60, 1907.

³ Ulmer, loc. cit., p. 200.

⁴ N. Banks: *Proc. Entom. Soc. Washington*, XV, 1913, p. 179.

⁵ N. Banks: *Canad. Entom.*, XLVI, 6, pp. 204-205.

⁶ Ulmer (G.): *Ark. for Zool.*, B. 10, num. 13, 1916, pp. 5-9, figs. 7-11.

of legs, in formula of spurs (3.4.4) and, chiefly, in the structure of genitalia, but differing in the absence of ocelli and in elongation, in the males, of both labrum and labium into a haustellum. Notwithstanding all these similarities with *Stenopsyche*, Ulmer acknowledged the gen. *Stenopsychodes* as belonging to *Polycentropidae*.

Somewhat earlier, in 1914 and 1915, W. Döhler¹ described from Chile a new genus *Pseudostenopsyche* (1 ♀ only), resembling both *Stenopsyche* and *Stenopsychodes* in the wings as well as in its general habitus, but differing from the first genus by the elongation of lobi externi (in ♀), and from the second by the presence of ocelli and by the elongation of lobi, instead of labrum and labium.

In 1922 Tillyard² described from Australia three more new species of *Stenopsychodes*, both males and females, and the latter had normal oral appendages. Following Ulmer, Tillyard regarded this genus as belonging to the fam. *Polycentropidae*. Lestage³ left also the gen. *Stenopsychodes* in this family, but separated it into a distinct subfamily *Stenopsychodinae*.

A more detailed study of the gen. *Stenopsyche*, and, especially, of its genital structures inclined me in 1922 to unite all three genera in a separate new family *Stenopsychidae* Mart. This family I have introduced in my synopsis of Trichoptera of the European Russia⁴. More detailed characteristic is given here.

Some preliminary remarks.

I employ in the venation of wings the usual terminology, accepted by most trichopterologists, with only slight modifications. I denominate the branches of RS as Rs_1, Rs_2, \dots , apical forks as AF_1, AF_2 , etc.; as in my previous papers I accept the number of analia as four in both pairs of wings; the nervure, running in the nealar region, I

¹ Döhler (W.): *Sitzungsb. Naturf. Ges. Leipzig*, 1914, p. 57; *Deutsche Entom. Zeitsch.*, 1915, p. 399, figs. 4-8.

² Tillyard (R.): *Austr. Zool.*, II, Pt. III, 1922, pp. 75-82, with Pl., figs.

³ Lestage: *Bull. Ann. Soc. Entom. Belg.*, 65, IV, 1925, p. 117.

⁴ Martynov (A.): *Trichoptera in Practical Entomology*. Leningrad, 1924, vol. V. (In Russian).

denominate *v. arcuata*. Proximately from *v. arcuata* there is an indistinct superficial chitinisation, sometimes simulating a nervure; vena cardinalis is short. In the ♂ genital appendages I employ also the usual terminology: ap. praeanales, pedes genitales (= gonapophyses), lateral processes of 9th segment, etc.

Fam. **Stenopsychidae** Mart., 1924.

Fam. *Stenopsychidae* Martynov.—*Trichoptera* in «Practical Entomology», vol. V, Leningrad, 1924.

Eyes large, ocelli present or absent; antennae longer than the wings, somewhat crenulated, with rather short joints; mandibles robust; labrum and labium normal, or modified (much elongated in ♂♂ of *Stenopsychodes*); lobi externi present in both maxillae and labium, and in maxillae they are sometimes elongated (*Pseudostenopsyche* ♀); palpi maxillares, 1st and 2nd joints short, 4th and, especially, 3rd one longer; 5th joint nearly equal in length to four preceding joints together, flexible and very indistinctly annulated; 3rd joint of the palpi labiales has the same structure.

Anterior wings elongate and often narrow and truncate at the apices; basal half of the wings in *Stenopsyche* very elongate, apical one comparatively short. DC elongate, mostly small, all five apical forks present; AF₁ rather short, narrow at the base, sessile or with a small pedicel; AF₂ impinging deeply on the DC; thyridial cell (TC) long and reaching MC (median cell), which is closed and commences somewhat earlier, than DC and AF₅; AF₄ longer than AF₃, which is sometimes pedicellate; postcostal area rather broad, jugal lobe prominent. Hind wings shorter and usually much dilated in ano-jugal region, sometimes triangular; nervation of costo-cubital region resembling much that in fore-wings, but AF₄ absent and RS, mostly fused with R or absent. MC mostly open and at its base united by a transverse nervule with the base of AF₅; anal region much dilated; vena arcuata long, resembling anal nervures.

Anterior wings with a close and delicate reticulation of fuscous or brownish, partly confluent in some greater spots; sometimes the wings are dark with numerous pale irrorations.

Legs. Spurs 3.4.4; subapical spurs in fore and median tibiae placed at the middle; intermediate tibiae and tarsi dilated in both sexes, but much more in females.

♂. 9th segment broad in the ventral and narrow in the dorsal portion; side-plates very broad, bearing each a prominent lateral process.

10th tergite short or elongate, with two or four, sometimes very long and slender appendages. Pedes genitales one-jointed, band-shaped, hairy, usually with two long upper branches or appendages, arising from their bases and then running at the sides of 10th segment; penis rather large, distal portion erectile and armed with various denticles.

♀. Apical portion of the ♀ abdomen narrowing to the end, but not forming an ovipositor; 10th segment small, elongated, its apical portion subdivided in two portions, rounded or produced; 8th sternite large, but does not cover (*Stenopsyche*) 9th sternite; 9th tergite large, stretched, 9th sternite short. Size large, females somewhat larger than the males; expanse of the smallest species (*Stenopsychodes montana*) 24 mm., that of the largest (*Stenopsyche maxima*) about 65 mm. Larvae of all species live, probably, in rapid rivers and streams. Pupal case in *Stenopsyche* settled with various small stones and grains of sand. Larvae of *Stenopsyche*¹ resemble more *Philopotamidae* and *Psychomyidae*; those of *Stenopsychodes* unknown.

The family is allied to *Philopotamidae*, but in many features, especially in ♂ genital structures, is more advanced and resembling rather the family *Psychomyidae* (see below). It contains now three genera, with 14 living and 1 fossil species (from Baltic amber).

Key to the genera.

1. Head with three prominent ocelli..... 3
2. Ocelli lacking; labrum and labium much produced in the males.....
..... **Stenopsychodes** Ulm.
3. Oral appendages normal in both sexes..... **Stenopsyche** Mc Lachl.
4. Labium short, normal, but lobi externi, at least in females, are much elongated, nearly stick-shaped..... **Pseudostenopsyche** Döhl.

¹ Description see below (pp. 291-292).

Gen. **Stenopsyche** Mc Lachlan.

Stenopsyche Mc Lachlan, Trans. Entom. Soc. London (3), vol. V, p. 265 (1866); G. Ulmer, *Trichoptera* in Genera Insectorum, fasc. 60 (1907), p. 200, pl. XLIX, fig. 244, pl. XLI, fig. 3; *Trichopteren* des baltischen Bernsteins, Leipzig u. Berlin, 1912, p. 57.

To the Mc Lachlan's and Ulmer's descriptions I can add the following.

Eyes large, in males somewhat larger than in females, the space between the eyes being narrower in males; ocelli large; antennae lon-

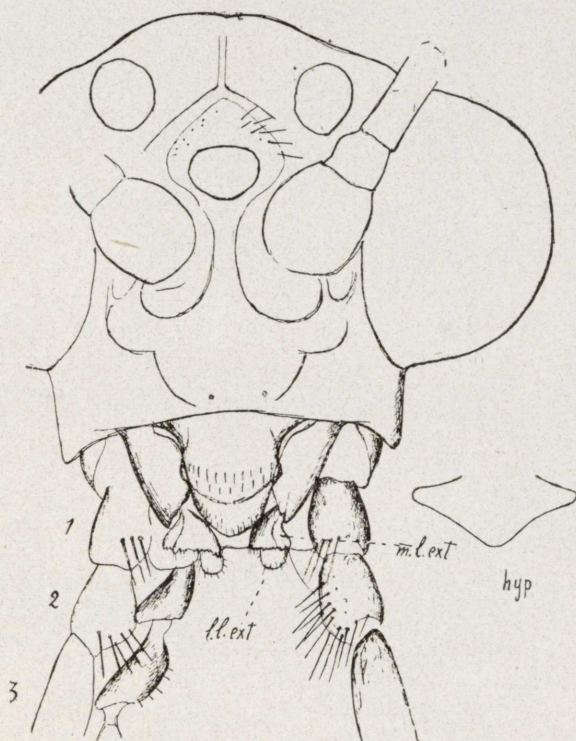


Fig. 1.—Head of *Stenopsyche griseipennis* Mc Lachl.; *m. l. ext.*, maxil. lobi externi; *l. l. ext.*, labial lobi externi; *hyp.*, hypopharynx.

ger in males. Labrum elongate (fig. 1, *Stenopsyche griseipennis*), narrowing to the end; mandibles comparatively robust, with remains of two teeth at their ends; lobi maxillares externi short, broad, but narrowed at the base, apical margin nearly straight and somewhat tuberculate, bearing minute spinules; on the labium there are also two

small hairy lobi externi (fig. 2); hypopharynx rhomboidal, transverse, with produced outer angles; in the palpi last joint flexible, its chitinous wall subdivided in numerous minute sclerites with a very feeble tendency to form rings.

Anterior wings long and narrow, somewhat truncate at the apices; basal half of wing much stretched, apical one comparatively short; DC small, AF_3 sessile. In the hind wings SC reaches the apical margin only in a fossil species (*St. imitata* Ulm.); in the living species SC approaches or fuses with R and then vanishes; RS_1 also fuses with RS_2 ,

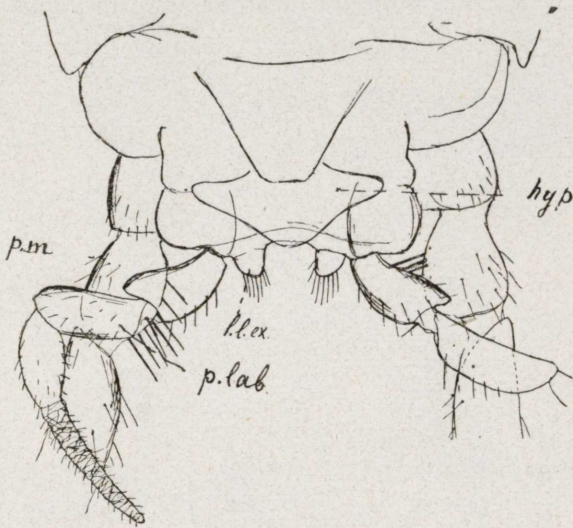


Fig. 2.—Mouth-parts of *Stenopsyche griseipennis*, from behind:

and its distal portion vanished; DC very small and somewhat varying in the shape. Coloration of anterior wings reticulate and rather similar in all species.

♂. 8th tergite with a median projection above; 9th tergite often with a small median triangular projection of its apical margin; app. praeanales long, hairy; 10th tergite of various shape, usually with a pair of short appendages near its base; pedes genitales bandshaped, and each is furnished with an upper branch, which is long, slender and running at the sides of 10th segment.

♀. 8th sternite (subgenital plate) large, bilobed at the end, but not greatly produced and not covering the 9th sternite; 8th tergite with a median subtriangular projection above; 9th dorsal segment rather narrow but long, with a membranous median projection, fused with the base

of 10th tergite; 9th sternite with a convex hind-margin or somewhat produced; 10th segment mostly elongate, its apical lobes oral and turned somewhat downwards.

Larva.—See *St. griseipennis*.

Stenopsyche is a rather homogeneous genus, containing 9 living (known) species and one fossil.

Distribution of the genus: chiefly, in Chinese-Himalayan subregion (see below).

Key to the species (by the males).

1. Expanse not more than 55 mm.; 10th segment much elongated in the ♀♀. 3
2. Expanse more than 55 mm., about 65 mm. in the ♀; in the ♀, 10th segment much shorter, somewhat bulbous externally..... **St. maxima** sp. n.
3. In the ♂, lower portions of the pedes genitales present; 10th segment without a plate-like appendage at the end..... 5
4. Lower portions of the pedes genitales absent, 10th segment, above, with a plate-like appendage at the apex..... **St. ochripennis** Albr.
5. 10th tergite long, more or less split into two parallel slender branches. 7
6. 10th tergite usually short, or elongate, but not split into two parallel pieces..... 9
7. 10th tergite split only in the distal half; all genital appendages (♂) shining black..... **St. bergeri** sp. n.
8. 10th tergite divided up to the base into two parallel stick-shaped pieces; app. praeanales yellowish, 10th segment somewhat brownish..... **St. sauteri** Ulm.
9. 10th tergite very elongated, with two curved appendages, arising from the upper surface, near the base; upper portions of the pedes genitales long, sinuous..... **St. himalayana** sp. n.
10. 10th tergite rather short, with two lateral appendages or without them; upper portions of the pedes genitales usually long and curved outwards..... 11
11. 10th tergite very short, transverse, with two lateral appendages, directed hindwards..... **St. pjasetzkyi** Mart.
12. 10th tergite longer, not transverse, lateral processes, when present, arise from its basal portion and directed outwards..... 13
13. 10th tergite without lateral appendages; lateral projections of the 9th segment large, only slightly shorter, than the pedes genitales..... **St. pallidipennis** sp. n.
14. 14th tergite with lateral appendages; lateral projections of the 9th segment much shorter, than the pedes genitales..... 15

15. Lower portions of the pedes genitales obliquely truncate at the apex, their upper portions slender and curved outwards at an obtuse angle.
 **St. griseipennis** Mc Lachl.
16. Lower portions of the pedes genitales obliquely rounded at the apex; their upper portions slightly thicker and curved outwards more sharply.....
 **St. japonica** sp. n.

1. **Stenopsyche griseipennis** Mc Lachl. (figs. 1-14).

St. griseipennis Mc Lachlan, Trans. Entom. Soc. London (3), vol. V, p. 265, pl. 17, fig. 5, 1866 (India orient.); Journal Linn. Society London, Zool., vol. XI, p. 134, 1871 (♀, Assam, ♂, vic. of Ningpo Chine); Ann. Mag. Nat. Hist. (6), vol. XIII (W. Chine); Ulmer, Annal. Soc. Entom. Bel., vol. XLIX, p. 41, 1905 (env. d'Irkutsk); Betten, Records of the Indian Museum, vol. III, p. 231, 1909 (Sikkim, Kulu, Kurseong, Darjiling, Calcutta, Assam); Martynov, Ann. Mus. Zool. Acad. Sci. St. Pétersb., vol. XV, p. 397, 1910 (gov. Irkutsk, South-Ussurian land); Rev. Russe d'Entomol., vol. XIV, 1, p. 9, 1914 (Altaj).

New materials in Coll. of the Zool. Mus. Ac. Sci. Russ. 1 ♂, Pung-Tung. Korea, O. Herz; 1 ♀, Manchuria, Stat. Echo, Heinrichsen; 5 ♀, Slawjanka, Ademi, S. Ussurian land, 15-20-VII-1911, Rodzevsky; ♀, Chernigovka, Marit. prov., 9-VI-1912, Emeljanov; 1 ♀, S. Ussuri, 1891, Gavronsky; 1 ♂, Ongudaj (Altaj), 16-VII-08, Jakobson, 1 ♀, St. Charyshskaja, Bijsk distr. (Altaj), 15-VII-23, Vinogradov; ♀, Narymskaja, Semipalatinsk distr., 12-VII-06, Jakobson; ♀, river Bija, near Kureevo, Bijsk distr., 21-VII-21, Lepneva.

St. griseipennis was described by R. Mc Lachlan long time ago, in 1866. Thereupon it was mentioned repeatedly from China (Mc Lachlan, Martynov), Japan (Ulmer, Banks), India (Ulmer, Betten), S. Ussurian land (Martynov), S. Siberia (Ulmer, Martynov), Altaj (Martynov), Formosa (Ulmer), but no new description of this species and of its genital structures was given. It is true, that in 1907 Ulmer gave¹ a description and figures of the ♂ genital appendages of a ♂ specimen from Baltistan, which Ulmer considered as *St. griseipennis*, but it is obvious now, that this specimen does not belong to *St. griseipennis* and represents a distinct new species, described below. Ma-

¹ *Catal. descr. Coll. du baron de Selys-Longchamps*, fasc. VI (1), p. 77, figs. 116-117, 1907.

terial studied by me allows to establish, that under the name *griseipennis* were confounded not less than three species.

Mc Lachlan's original description is satisfactory enough, and I add here the following.

Antennae dark yellow, with brown annulations; first three joints yellow; oral appendages see in the description of the genus (fig. 1-2) head and thorax mostly brown above, somewhat paler beneath, but varying from dark brown to brownish-yellow, with whitish grey hairs; legs yellow to testaceous, median legs with usual dark markings externally. Abdomen dark brown, but hind margins of the segments

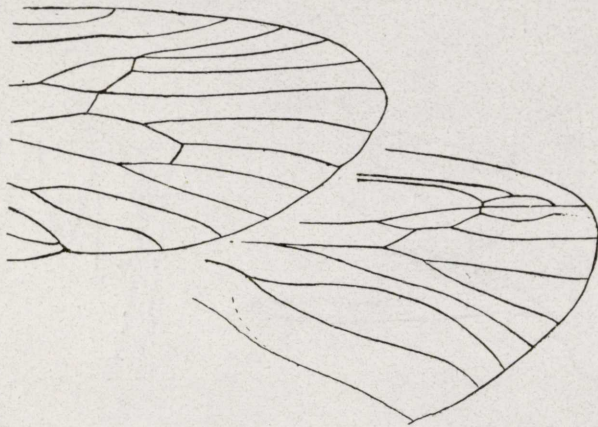


Fig. 3.—Apical portions of the wings in ♂♂ of *Stenopsyche griseipennis*.

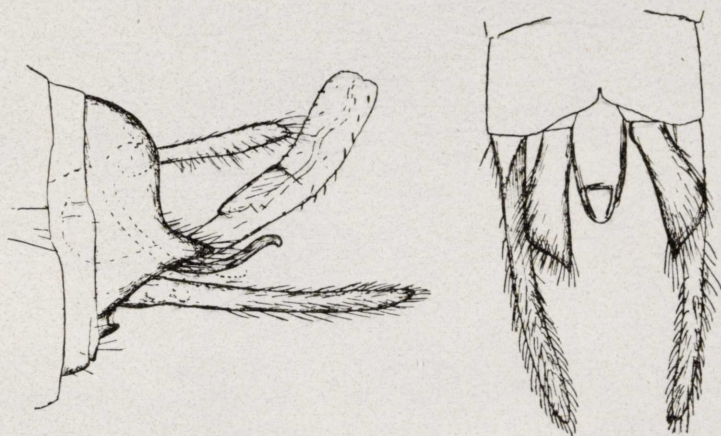
paler, yellowish-brown, 3-5 basal segments often somewhat reddish; rarely the whole abdomen is dark reddish.

In the ♂ anterior wings (fig. 3) apical margin is somewhat rounded, in the ♀♀ the apices are obliquely truncated and more produced at the ends. Posterior wings rounded at the end; venation of posterior wings somewhat varying in the apical portion, i. e., in the configuration of DC and in the relations of R, RS₁ and RS₂; in one specimen RS₁ does not fuse with RS₂, but its distal portion is nevertheless absent. Colouring of anterior wings varying, the elements of reticulum becoming sometimes much paler and diffuse; transverse fasciae absent; on the postcosta there are usually two large brown spots, divided by the pale space; hair-clothing varying, but dark elements of reticulum bear always brownish hairs, pale spots—yellowish ones;

manchurian ♀ specimen nearly without pubescence. Posterior wings greyish, slightly darker in the apical portion.

♂. (Figs. 4-5). 8th tergite with a subtriangular median projection above; 9th tergite with a small triangle; side-pieces, each, with a not very large triangular projection. 10th tergite short, dark yellowish, slightly narrowing to the end, apical margin with a minute median notch; lateral processes short, directed outwards and slightly backwards; basal portion, between the bases of app. praeanales, triangular and somewhat prominent.

Appendices praeanales long, pale, hairy. Pedes genitales yellowish, somewhat broadened to the apex, which is obliquely truncate,

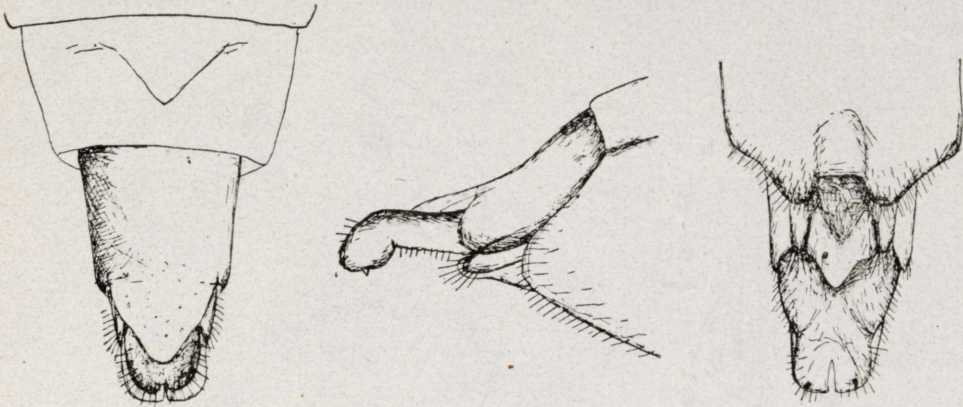


Figs. 4 and 5.—*Stenopsyche griseipennis*. Apex of ♂ abdomen, from side and from beneath.

with inner angle produced, outer one rounded; upper branches slender, long, brownish and, if seen from above, curved outwards at an obtuse angle. Penis large; its erectile portion (fully extended) bears minute spinules, directed forwards.

♀. (Figs. 6-8). 8th segment modified; ventral half large, forming, if seen from the side, two subtriangular projections; beneath, both projections are rounded and divided by a broad excision with straight base; dorsal portion separated from ventral one by two impressed black lines. 9th segment narrow and divided into a very elongated dorsal and a short ventral portions; ventral portion membranous in the middle, and its hind margin is triangularly produced (fig. 8). 9th tergite forming a large and prominent subtriangular membranous pro-

jection, fused with basal portion of the 10th tergite. 10th segment somewhat chitinised, yellow and bearing short hairs; before the end it is slightly compressed, and the apical portion divided by a median cleft into two oval lobes, turned somewhat downwards and bearing, each, a very minute brown cercus; seen from side 10th segment is bandshaped, with nearly parallel upper and lower margins, lower



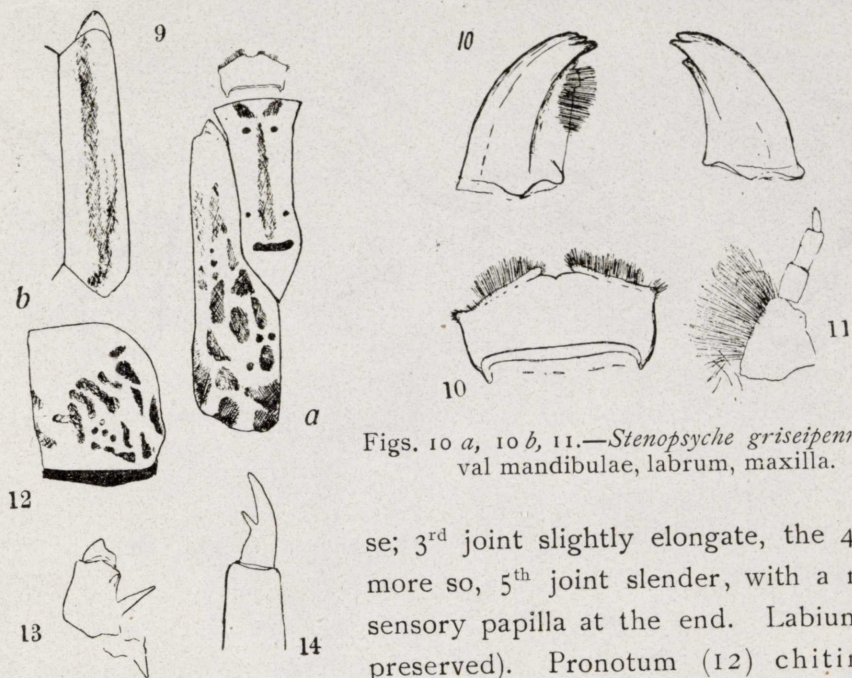
Figs. 6-8.—*Stenopsyche griseipennis*. Apex of ♀ abdomen from above, from side and from beneath.

margin bearing a dense row of short hairs, size varying; length of body 14-17 mm., expanse 45-54 mm.

Larva (figs. 9-14) campodeoid. Head long, narrow; clypeus very long and narrow, with a very feeble constriction at $\frac{2}{5}$ from the end (9a); anterior marginal portion slightly dilated and hardly separated by an also very feeble constriction; ground colour yellow, with several brown markings, as follows: an indistinct median streak, two oblique spots anteriorly; one transverse small spot in the hind portion, and two pairs of minute round spots at the constrictions. Pleural pieces long, with several irregular dark spots on the upper and lateral parts and with indistinct longitudinal streaks beneath (9b). Labrum chitinised, transverse, yellowish, with two pale and soft bandshaped transverse projections anteriorly, divided by a median excision; both bands bear dense rows of yellowish hairs, directed forwards; anterior angles slightly produced into small hairy lobes (10b). Mandibulae black, assymetrical (10a), the left mandible broader, than the right and having two cutting edges, the space between them bearing an

oblong tuft of hairs; the lower edge straight, ending anteriorly with two low teeth, upper edge arcuate; right mandible without tuft, upper edge indistinct, lower edge somewhat concave; both mandibles furnished anteriorly with two small teeth.

Maxillary lobe very low, indistinct, bearing, as also the basal joint of the palpi, a large and dense tuft of very long hairs (II); basal joint of the palpi maxillares large, bulbous; second one transver-



Figs. 10 a, 10 b, 11.—*Stenopsyche griseipennis*; larval mandibulae, labrum, maxilla.

Figs. 9, 12, 13, 14.—*Stenopsyche griseipennis*, larva: 9a, clypeus and left pleuron, above; 9b, left pleuron, beneath; 12, right half of pronotum; 13, anterior coxa; 14, anterior claw.

se; 3rd joint slightly elongate, the 4th still more so, 5th joint slender, with a minute sensory papilla at the end. Labium? (not preserved). Pronotum (12) chitinised, yellow, with several irregular elongated and rounded dark markings; hind margin broadly black; mesonotum and metanotum not chitinised. Claw of anterior legs bears a robuste spine-shaped appendage,

without any hair (14); anterior coxa with an acute appendage (13).

Pupal case large, settled with pieces of stones of very variable size and shape.

One specimen (pupal case with remains of larval skin) found in the rapid river Bija (a tributary of the river Ob).

The just described larva resembles partly that of *Philopotamidae*, partly that of *Psychomyidae*.

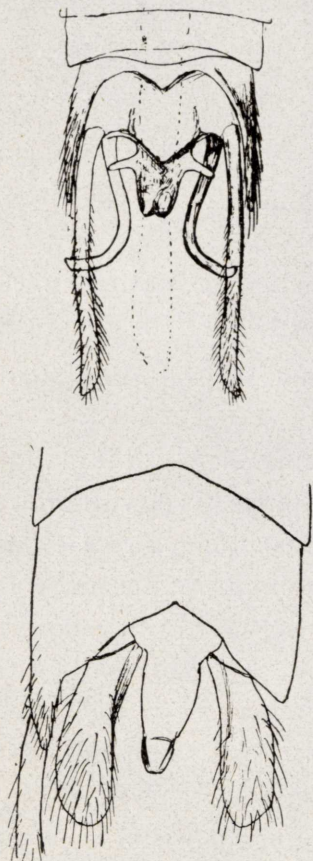
2. *Stenopsyche japonica*, n. sp. (figs. 15-17).

St. griseipennis Banks, Proc. Entom. Soc. Wash., vol. VII, nums. 2-3, p. 112 (1906); Ulmer, Cat. Coll. Sélys, fasc. VI (1), p. 77, figs. 116-117 (1907); Deutsche Entom. Zeitschr., 1908, Heft III, p. 354 (Japan).

1 ♂, Kyoto, Honsbun, 5-V-1912, A. Nohira; 1 ♂, Kibune, near Kyoto, 10-IX-1913. Nohita (from coll. of Dr. Kuwayama).

Closely allied to *St. griseipennis*.

Head and thorax brown, paler, yellowish-brownish, beneath; legs testaceous, brown markings diffuse. Abdomen brown, somewhat



Figs. 16-17.—*Stenopsyche japonica*, n. sp. ♂. Apex of abdomen from above and from beneath.



Fig. 15.—Apical portions of the wings of *Stenopsyche japonica*, n. sp. ♂.

paler beneath. Anterior wings obliquely truncate at the end, with the apices more produced, than in *St. griseipennis*, subacute (fig. 15); nervation as in that species; transverse nervule, closing MC, convex; membrane nude, without pubescence, yellow, reticulated with brown; elements of reticulum distinct, brown, in the distal portion forming, partly, short narrow transverse fasciae or stripes; hind wings

also somewhat more produced at the apices, than in *St. griseipennis*.

♂ (figs. 16-17). Genital structures resembling very much those in that species, with only slight differences. 9th segment fuscous; 10th segment brownish, similar to that in *St. griseipennis*, but slightly broader; pedes genitales obliquely rounded at the end, hairy; their upper appendages as in *griseipennis*, but somewhat darker, and more sharply curved outwards.

Length of body of our specimens 15 mm., expanse 45 mm.

This species is closely allied to *St. griseipennis*, but distinct. I think, that all Japanese specimens, mentioned earlier as *griseipennis*, belong to this species. What is the Formosan form of *St. griseipennis* (Ulm.), is unknown. Perhaps, it does not belong to this species.

3. *Stenopsyche sauteri* Ulm.

St. sauteri Ulmer, Coll. Zool. Selys Longchamps, fasc. VI, 1907, p. 78, figs. 118-119, Deutsche Entom. Zeitschr., 1908, Heft III, p. 354.

I ♂. Gifu, Japan (from Prof. N. Banks, now in Coll. Mus. Zool. Ac. Sci.).

To Ulmer's descriptions (only genital appendages) I can add the following. Head brown, thorax brown above, yellowish-brown beneath; middle portion of mesonotum and metanotum also somewhat paler; abdomen greyish-brownish, somewhat reddish beneath, with hind margins reddish-yellow; legs yellowish fuscous, with yellowish spines. Anterior wings resembling those in *St. griseipennis*, with fuscous reticulation; in the apical portion the elements of the reticulum form somewhere short transverse fuscous stripes; both brownish large spots in the dorsal portion indistinct.

♂. 9th segment and all appendages dark-yellowish; 8th tergite with the usual triangular projection above; 9th tergite transverse, lateral projections of the 9th segment triangular, broad, but rather short; 10th tergite divided up to the base into two parallel stick-shaped processes; seen from side, they are slender and bear, each, a vertical acute process near the end and another one nearer to the base; upper processes of the pedes genitales slender, brownish, nearly straight, but

somewhat irregularly crenulate in the distal portion; lower branches resembling praeanal appendages, but somewhat shorter, hairy.

Expanse 41-43 mm.

With the following species, *St. bergeri*, this species forms in the genus *Stenopsyche* a separate «group of *sauteri*». *St. sauteri* occurs only in Japan.

4. ***Stenopsyche bergeri*** sp. n. (figs. 18-21).

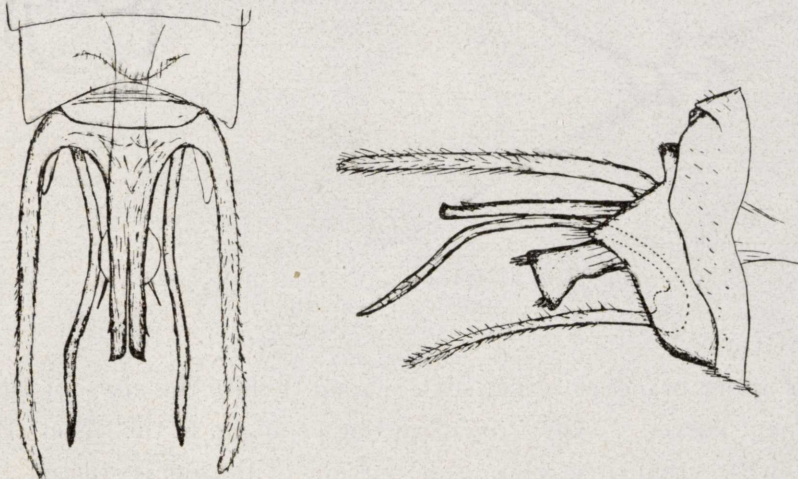
♂. The valley of the river Siz, near Vladivostok, 10-VII-14, Berger.

3 ♂. Sutchan mines, 175 klm. from Vladivostok, 23-VII-14, Berger.

1 ♀. Sutchan mines, 25-V-15-VI, 1913, Kasanzeva.

Closely allied to *St. sauteri*.

Head dark brown to reddish brown; thorax dark brown above, but varying to castaneous; dark yellow beneath, legs dark yellow, the me-



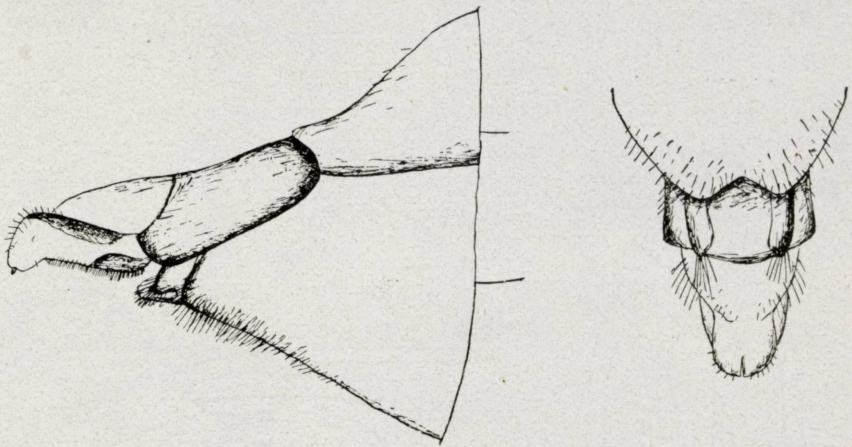
Figs. 18-19.—*Stenopsyche bergeri*, n. sp. End of ♂ abdomen, from above and from side.

dian ones with usual fuscous markings externally; abdomen brown or blackish brown, 2-4 anterior segments and hind margins of segments somewhat dark reddish or castaneous; apex of abdomen shining black.

Anterior wings resembling those in *St. sauteri*, but not so produced at the apices; reticulum fine, but somewhat more diffuse; there are no traces of transverse dark stripes; three dark spots on the sub-

costa and in the distal portion distinct, divided by two pale spaces, clothed with whitish hairs.

♂ (figs. 18-19). The whole apex and appendages black, but their structure resembles much that in *St. sauteri*. Middle projection of the 8th tergite seems to be slightly smaller and somewhat rounded; 9th segment with two triangular lateral projections; app. praeanales long, hairy, black; 10th tergite resembling that in *St. sauteri*, but the dividing median cleft is much narrower and reaching only to the middle of the plate; each branch bears a small and acute tooth near the end and a minute tubercle placed more proximally, at 2/5 from the base. Pedes genitales slightly shorter than the praeanal appendages, hairy, slender, but somewhat dilated at the base and in the apical portion;



Figs. 20-21.—*Stenopsyche bergeri*, n. sp. End of ♀ abdomen, from side and from beneath.

their upper branches black, stick-shaped, before the apex of the 10th segment curved downwards at an obtuse angle; in the distal portion somewhat crenulated; chitinised portion of the penis dilated to the apex and furnished here with four spines in the upper and several small ones in the lower portion.

♀ (figs. 20-21). 8th sternit, as usually, large, its apical margin with a triangular excision; 9th tergite with its membranous portion greatly produced and fused with the 10th tergite; side portions rounded externally; 9th sternit with apical margin slightly convex; 10th segment elongated, shaped as in *griseipennis*, but lower margin with only few hairs (fig. 20); apical projection large, oval from side, with a minute cercus.

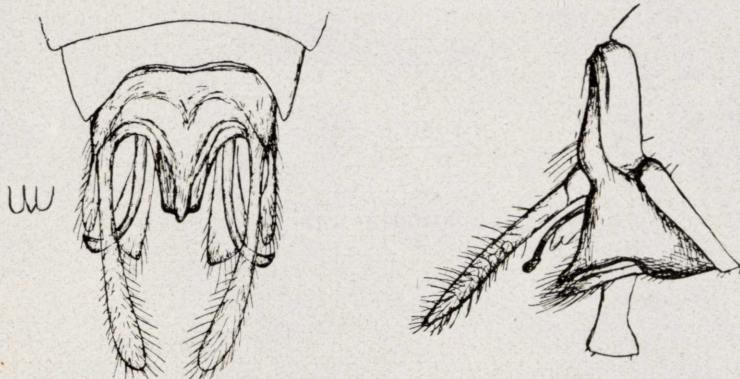
Expanse of the ♂♂ specimens 37-40 mm.; that of the ♀ about 50.

It is interesting, that Japanese *St. sauteri* differs from the continental *St. bergeri*, partly, in the same features, in which *St. japonica* differs from its continental partner *St. griseipennis*, namely: *a*) in the more produced and subacute anterior wings (♂); *b*) in the more differentiated reticulum, tending to form some stripes in the distal portion; *c*) in the diminishing of the pubescence of the wings, and *d*) in the paler coloration, what is especially evident in *St. sauteri*. Some other species, occurring in S. Ussurian land and having its nearest relations in Japan, differ also from their Japanese allies by very dark coloration. These differences must be explained, at least in a part, by the differences in the climate of S. Ussurian land and Japan.

5. ***Stenopsyche pallidipennis*** sp. n. (figs. 22-24).

2 ♂, 2 ♀. N. E. Assam, lat. 27°53', long. or. 96°5'. 8-II-12. Von Wick.

Head brownish above, with large eyes and ocelli, the space between the eyes being comparatively narrow in ♂♂; antennae rather



Figs. 22-23.—*Stenopsyche pallidipennis*, n. sp. Apex of ♂ abdomen from above and from side.

slender, their joints slender and somewhat longer, than in *St. griseipennis*. Thorax brownish above, paler beneath; legs dark yellowish with usual markings. Abdomen yellowish brown, paler beneath, with hind margins of the segments dark yellowish. Anterior wings as in *St. griseipennis*, but the reticulation is more fine and pale, pale-

brownish or greyish, partly confluent and sometimes (1 ♂) diffuse, with many small pale irrorations; reticulum clothed with blackish hairs, pale irrorations—with golden-yellow ones.

♂ (figs. 22-23). Apex of abdomen yellowish; 9th tergite without any triangular projection: but below, at the base of the 10th segment, there is a figure of a triangle; 10th tergite brownish and elongate, broadening to the base and in general shape resembling that in *St. griseipennis*, but its apical portion is subdivided by two short clefts into two lateral oval lobes and a median one, equal or slightly longer than the lateral ones; basal lateral processes absent.

App. praeanales pale, gradually thickened in the apical portion, hairy; pedes genitales bandshaped, yellow, hairy, obliquely truncated at the end and resembling those in *St. griseipennis*; their upper branches slender, brownish, gradually curved outwards, with somewhat thickened apices; chitinised portion of the penis broadened at the apex.

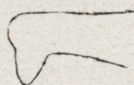


Fig. 24.—*St. pallidipennis* n. sp., ♀, 10th segment from side.

♀ (fig. 24). Apical margin of the 8th sternite with a very shallow excision in the middle, rather concave than excised; hind margin of the 9th sternite feebly convex; 10th segment as in *St. griseipennis*, elongated, but the end lobes are more sharply produced and somewhat attenuated apically.

Length of body, 12-13 mm.; expanse, 36-37 mm.

A species, allied to *griseipennis* and *japonica*.

6. *Stenopsyche himalayana* sp. n. (figs. 25-27).

St. griseipennis Ulmer, Catal. Coll. Sélys, fasc. VI, p. 77, figs. 116-117, 1907 (1 ♂ from Baltistan).

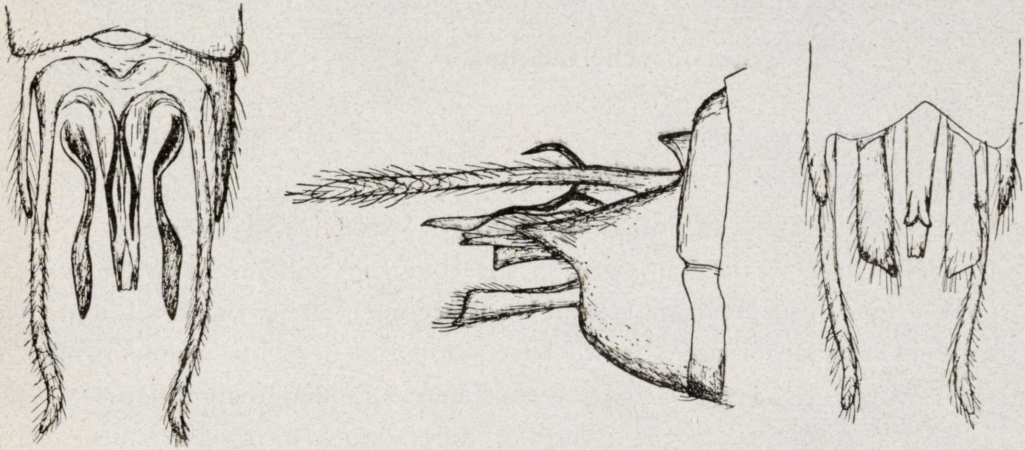
1 ♂, N. E. Assam, lat. 27°53', long. or. 96°5'. 8-II-12. Von Wick.

♂. Head yellowish brown, with large yellow ocelli; antennae dark yellow with blackish annulations, as in *St. griseipennis*. Thorax yellowish-brown, slightly darker than the head, with greyish hairs; abdomen brown; 2-3 anterior segments somewhat reddish; hind margins of the segments reddish brownish; legs dark yellow, median tarsi and distal portions of tibiae blackish externally.

Anterior wings reticulated with greyish-brownish; some few larger

spots present; pubescence blackish on the reticulum, golden-yellow on pale spots; narrow pale space, dividing near postcosta both larger dark spots, clothed with whitish hairs.

♂ (figs. 25-27). 9th segment brownish, with a small median triangle, above; lateral projections not very large, triangular; app. praeanales pale, long, slender, somewhat tuberculated in the apical portion. 10th segment dark yellowish, elongated and narrow, with two blackish curved slender appendages, arising from the upper surface, near the base; apical portion of the plate subdivided by two narrow



Figs. 25-27.—*Stenopsyche himalayana*, n. sp., ♂. Apex of abdomen, from above, from side and from beneath.

and short excisions (clefts) into two slender acuminate lateral processes and one pale median one of equal length; chitinised portion of the penis slightly broadened at the apex; pedes genitales yellowish, broad, obliquely truncate at the apex; their upper branches long, brownish, bandshaped, somewhat twisted and sinuous, if seen from side; their apical portions are rather broad above, attenuate apically and directed backwards.

Length of the body 14 mm.; expanse, 45 mm.

♀ unknown.

This is a distinct species, allied to the group of *griseipennis*.

The ♂ specimen from Baltistan, which was described and figured by Ulmer in 1907, belongs, probably, here. Thus, this species is known now from both ends of the Himalaya mountains.

7. *Stenopsyche pjasetzkyi* Mart.

St. pjasetzkyi Martynov, Ann. Mus. Zool. Acad. Sci. Pétersb., vol. XIX, 1914, p. 327, figs. 4-6 (China, Hanjang).

I have nothing to add to my original description. This is a distinct species, though belonging to the group of *griseipennis*. From other species it differs at once by its short, transverse dorsal plate, by the presence of two long spines on the penis, etc.

8. *Stenopsyche maxima* sp. n. (figs. 28-30).

St. griseipennis Martynov, Ann. Mus. Zool. Acad. Sci. Pétersb., vol. XIX, 1914, p. 326 (1 ♀, Setchwan).

1 ♀. Szechwan, Lunanjfu, Hodzigow, 6000 f. 1893. Beresovsky.

As I have noticed in 1914, in the colouring and in the shape of the wings this specimen resembles very much *St. griseipennis*, but differs in its larger size. Now I have studied the ♀ genital segments in this specimen and found, that in these features it differs much from other species and thus represents a distinct new species.

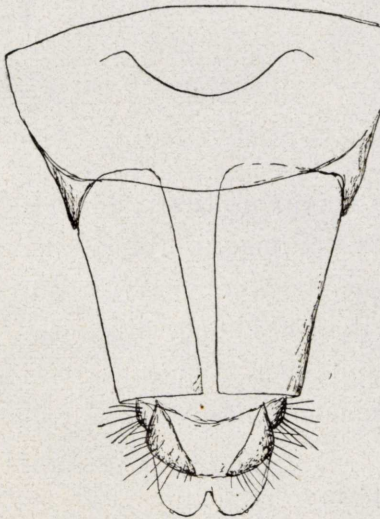
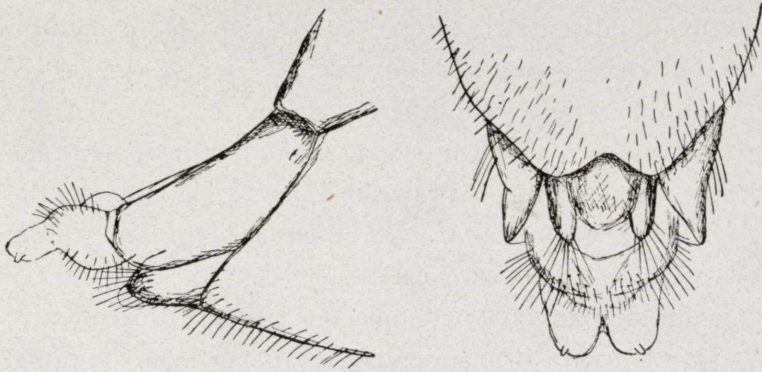


Fig. 28.—*Stenopsyche maxima* n. sp. Apex of ♀ abdomen from above.

The space between the eyes somewhat narrower than in *St. griseipennis*, with three prominent ocelli, yellowish-brownish; antennae distinctly crenulated, dark yellow, with blackish annulations; thorax brownish above, somewhat yellowish beneath; legs yellow, abdomen dark yellowish. Wings, as in *St. griseipennis*; reticulation fuscous and somewhat diffuse; two distinct dark spots on postcosta.

♀ (figs. 28-30). 8th segment brownish, with an oval projection in the middle of its dorsal side; 9th tergite elongate and by narrow longitudinal cleft subdivided into two portions; 8th sternite with a shallow

triangular excision at the apical margin; 9th sternit forming a plate with convex apical margin; the median membranous projection of the 9th tergite very short, though prominent from side; 10th segment, very short, somewhat bulbous, from side, with two oval pro-



Figs. 29-30.—*Stenopsyche maxima* n. sp., ♀. Apex of ♀ abdomen, from side and from beneath.

jections, directed backwards (if seen from side) and bearing each, a very minute cercus; side-portions yellow, chitinised, bearing rather long hairs.

Length of the body 20 mm.; expanse, 65 mm.

By the short and bulbous 10th segment, by the divided 9th tergite, etc., the just described species differs rather strongly from other known species (except *St. ochripennis*, in which the females are unknown).

9. *Stenopsyche ochripennis* Albarda.

St. ochripennis Albarda, Midden-Sumatra ed Veth., p. 20, pl. 6, fig. 2, 1881 (Sumatra); Ulmer, Cat. Coll. Selys, fasc. 6, p. 79, f. 120, 121, 1907 (Borneo).

I have not seen this species. According to Ulmer's description and figures this is a very distinct species, differing (♂) by the absence of the lower branches of the pedes genitales, by the shape of their upper branches, by the shape of 10th segment, etc. Occurs in Borneo and Sumatra.

Thus, the genus *Stenopsyche* contains not less than 9 living species. They are all very similar in the whole habitus, in the structure of the head and thorax with their appendages, in the shape, venation and colouring of the wings and differ chiefly in the structure of their genitalia, which, nevertheless, are formed on the similar plane. Taking into consideration these structures, ♂ and ♀, we can distinguish in the genus *Stenopsyche* 5 groups, as follows:

1. Group of *griseipennis*; differing chiefly (in the males) by short 10th segment with two lateral appendages and by the upper branches of the pedes genitales curved outwards in a bow. Here belong the compact subgroup *griseipennis-japonica*, then *pallidipennis* and, finally *pjasetzkyi*, which is the most isolated species.

2. Group of *himalayana* contains one species, differing, in ♂, by long 10th segment with two appendages, arising from its upper-side, by bandshaped and sinuous upper branches of the pedes genitales, etc. This species approaches also the first group.

3. Group of *sauteri* contains two closely allied species, *bergeri* and *sauteri*; characterised by long 10th tergite, deeply divided in two parallel branches, and by upper branches of the pedes genitales curved downwards.

4. Group of *ochripennis* contains now one distinct species from Borneo and Sumatra, differing (♂) by the absence of the pedes genitales (inferior branches) and by peculiar shape of the 10th segment and of the upper branches of the pedes genitales.

5. To the fifth group belongs *St. maxima*, which differs by the structure of the genital segments in the ♀. In the remaining species — except *St. ochripennis* and *himalayana*, females of which are unknown — ♀ genital segments are formed in a very similar manner and differ only in details. *St. himalayana* is allied to the first group and must have the ♀ structures shaped in the same manner. *St. maxima* differs rather sharply from them, and we cannot compare it only with *St. ochripennis*, the ♀♀ of which are unknown.

Discussion of the relations of the family.

As I have mentioned above, the genera *Stenopsyche* and *Pseudostenopsyche* were placed by authors in the fam. *Philopotamidae*, *Stenopsychodes* in the fam. *Polycentropidae*. In fact, both these genera are distant enough from both these families, especially from *Polycentropidae*. On the other hand, though differing in the presence or absence of ocelli, all these genera are very similar in all main features, i. e., in the venation and even in the colouring of the wings, in the structure of the thorax with legs, in the structure of the head (except ocelli and differences in the elongation of mouth-parts), in the large size and in the whole habitus of these insects. But the most interesting and convincing circumstance is a rather close similarity in the structure of ♂ genital appendages, namely, in the shape of 9th segment with its peculiar lateral processes, in the configuration of app. praeanales, in the form of pedes genitales and even in the structure of 10th segment and of the penis.

The structure of ♀ genital segments in *Stenopsychodes* is not sufficiently known; in any case the ends of ♀ abdomens, as they are figured by Tillyard, do not seem to be formed on a different plan.

Undoubtedly, this is a group of allied genera, which must be placed in the same family. As they cannot be placed in *Philopotamidae* or *Polycentropidae*, they must be separated into a distinct new family *Stenopsychidae* Mart. What is the position of this family? Let us examine briefly the relationships with various families of the suborder *Annulipalpia* Mart. ¹, separately.

Comparison with *Philopotamidae*.

The wings in *Stenopsyche* in shape and venation are more specialised than in *Stenopsychodes*, therefore it is more rational to compare *Philopotamidae* with last named genus. The venation of its anterior wings resembles, undoubtedly, much that in *Philopotamidae*; moreover, in *Dolophilus* and *Wormaldia* DC and AF₁ have the shape similar to that in *Stenopsychodes*.

¹ Martynov, Trichoptera in *Practical Entomology*, V, 1924.

However, in *Philopotamidae* forks 3 and 4 became stalk and in some genera vanished; in *Stenopsychidae* they remain near always sessile (more primitive condition). On the other hand, in hind-wings all *Philopotamidae* preserved in a very archaic condition, as they are not dilated and their general form remains similar to that of the anterior wings. In *Stenopsychidae* on the contrary, posterior wings are much dilated in ano-jugal region, especially in *Stenopsyche*, where they adopted a very close (but superficial) resemblance to those in many *Macronematinae*.

♀ genital segments manifest a rather general resemblance to those in *Philopotamidae*, as well as in *Polycentropidae* and *Psychomyidae*, but in more detailed configuration of the genital segments and of their appendages there exist great differences. In *Philopotamidae* 10th segment is divided into two halves and bears cerci; in *Stenopsychidae* it is only subdivided at the apex and bears quite minute cerci (*Stenopsyche*); 9th segment is more fully developed in *Stenopsychidae*, and therefore subgenital plate (of the 8th sternit) never forms (in *Stenopsyche*) such a large projection, as in *Philopotamidae*. Thus the structure of the ♀ abdomen in *Stenopsychidae* in some features is more archaic, in others—more specialised (reduction of cerci), than in *Philopotamidae*.

The structure of the ♂ genital segments differs rather strongly from that in most *Philopotamidae*, and it seems superfluous to compare it in detail.

In *Philopotamidae* the ♂ genital appendages retain, mostly (except some species of *Chimarra*), more archaic condition, than in *Stenopsychidae*.

The resemblance in the structure of the head, with appendages, and of the thorax, is not very characteristic, as analogous similarities exist also between *Stenopsychidae* and *Polycentropidae* or *Psychomyidae*. Size in most *Stenopsychidae* is much larger, than in *Philopotamidae*.

CONCLUSIONS.—*Stenopsychidae* in some features are more specialised, in others—more primitive, than *Philopotamidae*. Some of their specialisations (shape of hind wings in *Stenopsyche*, ♂ genitalia) are very peculiar and do not remind of *Philopotamidae*.

b9:
vln.
Comparison with *Polycentropidae*.

In wing-venation there exists only a general resemblance with *Polycentropidae*. In nearly all *Polycentropidae* (except *Philocentropus*) first apical fork is stalked or even absent, and DC tends to become rather large, whereas in *Stenopsychidae* it has the tendency to a strong reduction. In *Polycentropidae* ocelli are always absent, mandibulae mostly more slender and sinuous, 2nd joint of the palpi maxillares bulbous internally, etc.

End-portion of ♀ abdomen is formed in most *Polycentropidae* in a different manner; 10th segment entire, with peculiar papilla-like appendages (about 3 pairs); cerci entirely absent.

♂ genital structures are very varied in *Polycentropidae*, and in the structure of 9th segment, of app. praeanales and of pedes genitales they do not show appreciable similarities with *Stenopsychidae*. Only the genus *Philocentropus* and its tertiary fossil species especially, in configuration of app. praeanales as well as of pedes genitales show more evident resemblance with *Stenopsychidae*.

CONCLUSION.—The differences from *Polycentropidae* seem to me to be more important, than in the case of *Philopotamidae*. Many similarities, which exist between *Stenopsychidae* and *Polycentropidae*, I am inclined to explain rather by the fact that both families are derived from the same *philopotamoid* stock and inherited some common complexes of the genes.

Comparison with *Psychomyidae*.

The shape and venation of the wings in *Psychomyidae* differ rather sharply from those in *Stenopsychidae*, and this difference is still increased by that in *Psychomyidae* hind-wings are not dilated and the size of most *Psychomyidae* is very small. However, in some fossil *Psychomyidae*, namely in the species of the genus *Archaeotiniodes* Ulm., from Baltic amber, hind wings were somewhat dilated, and the whole venation of the wing was more similar to that in *Stenopsychodes*.

In many *Psychomyidae* last segments of ♀ abdomen form a sort of ovipositor, but the genera *Ecnomus* and *Psychomyia* are deprived of such structure. Cerci are present in *Psychomyidae*.

On the other hand, ♂ genital appendages in many species of *Tinodes*, *Ecnomus* and in fossil genus *Archaeotinodes* have many evident similarities with those in *Stenopsychidae*, namely, in the configuration of app. praeanales, pedes genitales and even in the structure of the penis and of the 10th segment (in *Archaeotinodes*). The small triangular projection of the 9th tergite of *Stenopsyche* is much more developed in many *Psychomyidae*, for instance, in *Tinodes*, but in several species, as in *T. unicolor*, *T. waeneri* and some others, it remains small, nearly as in *Stenopsyche*.

CONCLUSION.—In the wings as well as in the size *Ptenopsychidae* differ strongly from *Psychomyidae*, but in the structures of ♂ genital appendages they show many obvious similarities with this family, especially with the fossil genus *Archaeotinodes*.

This resemblance with *Psychomyidae*, is more striking, than with *Polycentropidae* and others families. It must be explained also by that *Psychomyidae* derived from the same *philopotamoid* stock, from which *Stenopsyche* originated.

Let us now examine comparatively the known larval structures of *Stenopsyche*.

In its general shape the head resembles somewhat that in *Philopotamidae*, but is much larger and furnished with spotted coloration. Very long clypeus resembles also that in *Philopotamidae* and, in a less degree, in *Philocentropus*; labrum chitinised, but its unchitinised anterior portion with rows of hairs resembles somewhat *Philopotamidae*. Mandibulae assymetrical, and in their structure, as also in the presence of a tuft of hairs on the left mandible, remind much of the condition in *Psychomyidae*.

The shape of maxillary palps and, especially, the dense row of long hairs on the maxillae remind also of *Psychomyidae*, and, in a less degree, of *Philopotamidae* and of *Philocentropus*. The shape of anterior claw with its fused spine is somewhat peculiar. The fam. *Hydropsychidae* and *Arctopsychidae*¹ are more distant from *Stenopsychidae*, therefore the fam. *Stenopsychidae* in some features, especially archaic resembles more *Philopotamidae*, in other ones, which are chiefly fea-

¹ This family I described in *Trichoptera*, 1924 (l. cit.).

tures of specialisation, resembles more *Psychomyidae* and gen. *Philocentropus*, among *Polycentropidae*. Such a specialisation in the direction of *Psychomyidae* is interesting but I do not think that it signifies a close affinity to these, and it is impossible to unite *Stenopsychidae* and *Psychomyidae* in one family.

To the above named four families approaches also the fam. *Hydropsychidae* and, especially, *Arctopsychidae*, and thus, all these six families form a natural complex, corresponding to the family *Hidropsychidae* in the old sense. A quite analogous natural complex forms the family *Rhyacophilidae*, between the subfamilies of which exist the same interrelations, as between the families of *Hydropsychoid* complex.

Some remarks on the geographical distribution of *Stenopsychidae*.

Except *St. ochripennis*, occurring in Borneo and Sumatra, the remaining species of *Stenopsyche* occupy, mostly, the countries—Himalaya mountains, N. E. Assam, China, Formosa, Manchuria, Japan, South-Ussurian land—, which, taken together, almost entirely correspond to the so-called «Chinese-Himalayan» subregion¹ of the Palaearctic region. I include in this subregion Himalaya mountains and the greatest part of China, but I consider it as a subregion of my «Angara region». Except *St. griseipennis*, all species of *Stenopsyche* are reophil, but rather thermophil or mesothermophil, and have rather small areals. In the early tertiary, namely, in Oligocene-times, gen. *Stenopsyche* existed also in Europe, which had then a subtropical climate. Only one species, *St. griseipennis*, is obviously eurythermic what permitted it to enlarge its areal and to spread also into Siberia and Altai, up to the river Bija.

Gen. *Stenopsychodes* occupies chiefly S. W. Australia (3 sp.), only one species, *St. mjobergi* being found in Queensland. The allied ge-

¹ This subregion was established by N. Severtzof in 1877, but he considered it as a distinct regio (r. aemodo-serica). Lately its name was changed into r. palaeoarctica (A. Semenov, 1899). It corresponds only partly to Wallace S. Manchuria subregion. I consider it as a subregion of my «Angara-region» (*Trichoptera* in *Pract. Ent.*, 1924).

nus *Pseudostenopsyche* occurs in Chile. Such distribution resembles much that of some other genera and even subfamilies of *Trichoptera*, as also of other animals. Analogous distribution, for instance have gen. *Smicridea* (*Hydropsychidae*) and many *Hydrobiosinae*, which, besides, occur also in N. Zealand. We must remember, that *Marsupialia* have a distribution, much resembling that of *Stenopsychodes-Pseudostenopsyche*. Such a distribution can be well explained by the hypothesis of an ancient land-connection through the Antarctic between southern parts of S. America, Australia and N. Zealand, which existed, at least between S. Australia and S. America, up to the early Tertiary times (inclusively). I do not think, that the ancestors of the gen. *Stenopsychodes* could reach Australia from India. Against this supposition one can put the following considerations. The land connexion between India and Australia ended in the middle of mesozoic times; in the recent Indian zoogeographical region, as well as in N. Australia, *Stenopsychidae* are almost absent; most species (three from four) of *Stenopsychodes* occur in South Australia, what testifies that this genus is proper rather to a temperate climate.

All these circumstances indicate that the ancestors of this genus reached Australia by the above-named Southern route from S. America, whither they migrated, probably, from N. America, which has and had before many common traits with Europe.