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## Some notes about Nemouridae larvae (Plecoptera) from Nepal

by I. Sivec

**Abstract:** Larvae of five different nemourid species from Nepal are described and figured. They belong to *Indonemoura adunca* (Harper), *Indonemoura indica* (Kimmings), *Nemoura gosainkundensis* Harper, *Mesonemoura funicula* (Harper) and *Protonemura paraproctalis* Aubert. Some notes about possibilities for their distinction are added.

Several intensive studies have added significantly to knowledge of Asian and especially Himalayan Nemouridae in the last years. Nemouridae, usually the dominant Plecoptera in mountain river ecosystems, are much less abundant in older collections from Asia, probably because of their early occurrence and relatively small size. In most cases Plecoptera material originates from biological expeditions collecting various other groups of insects. The 1<sup>st</sup> and 2<sup>nd</sup> Yugoslav Entomological Expeditions in 1978 and 1980 for the first time concentrated their collecting activities exclusively on Plecoptera. Several hundred adults as well as larvae were collected in Langtang Valley, Marsyangdi Valley and Kali Gandaki Valley in Central Nepal, north of Kathmandu (ZWICK & SIVEC, 1980; SIVEC, 1981).

Some nemourid larvae definitely identified by dissecting adults out of larval skins are being described here, with some notes on diagnostic characters. Full views of larvae in Figs 1–5 are to different scales, but for details the same magnification has been used in all figures.

The importance of such a study arises from the fact that the diagnoses of nemourid genera largely consider larval characters (BAUMANN, 1975). This is evidently so because the ground-plan of adult structures, mainly genitalia, is too uniform between genera and at the same time so prodigiously varied at the species level that generic limits are often not easily established. The problem lies with the fact that larvae are known only for a very small minority of species. However, recent discoveries seem to indicate that congeneric species are not as uniform in some of their larval characters, (such as gills, setal arrangement) as has been thought so far. For example, some *Mesonemoura* larvae we have differ in gill structure from what has been described for the genus.

Problems related to the distinction of *Nemoura* and *Illiesonemoura* have already been discussed (ZWICK & SIVEC, 1980), but detailed descriptions of larvae had not yet been included.

There is evident need for much more accurate information on as many named Asian nemourid larvae as possible. Therefore, the exceptional larva of what is presently known as *Protonemura paraproctalis* Aubert is redescribed adding information on details not previously considered.

### **Indonemoura adunca** (Harper)

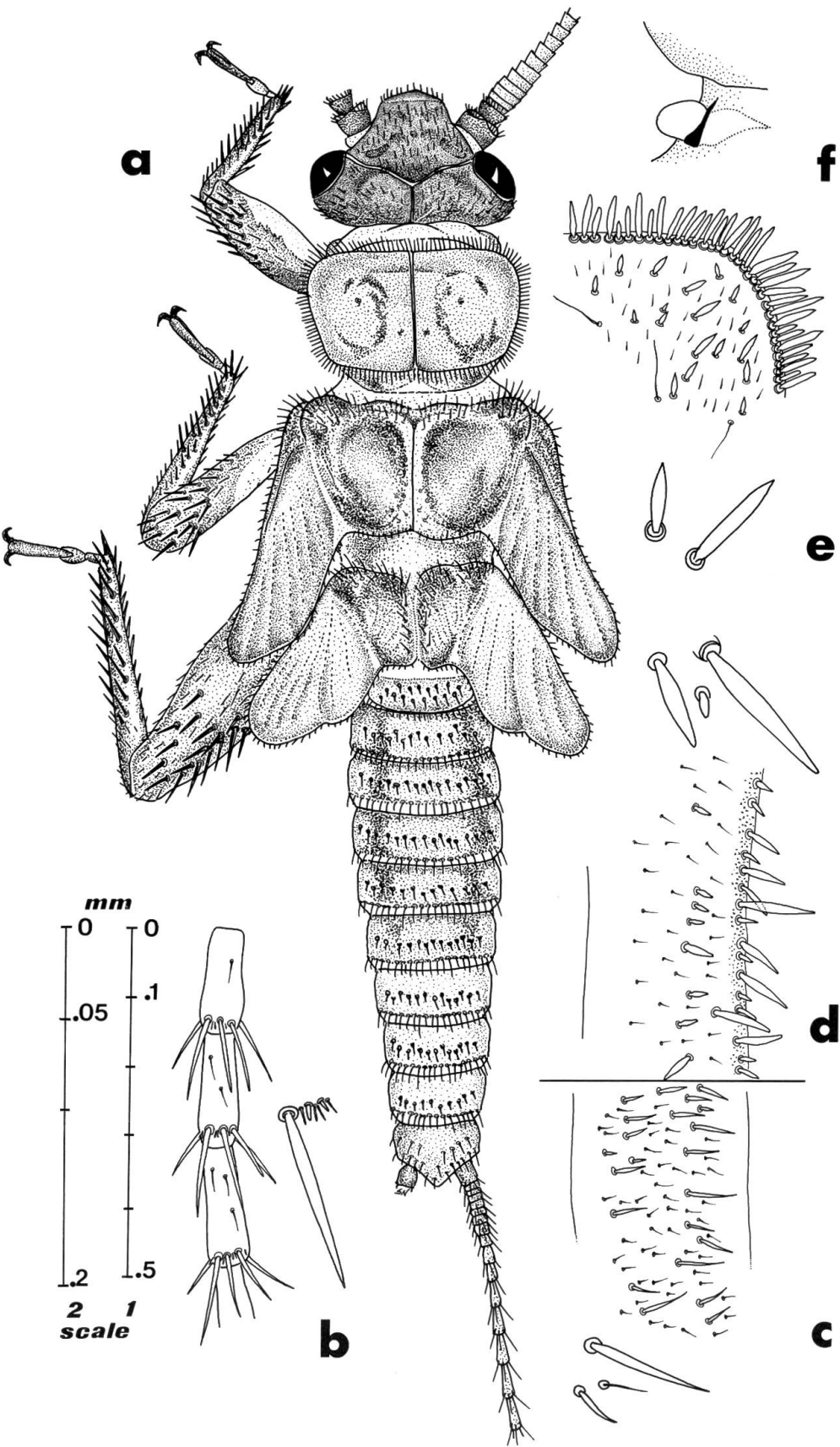
Fig. 1a–f.

*Protonemura adunca* HARPER, 1974, Psyche 81: 372, Figs 12–14.

Material: Nepal: Marsyangdi Valley: 1 ♂ larva, Thangja, 21.V.1980; 2 ♂, 2 ♀ larvae, Bagarchap, 21.V.1980; 4 ♂ larvae, 5 km W Bagarchap, 21.V.1980; 3 ♂, 1 ♀ larvae, 2 km W Chame, 21.V.1980; 4 ♂, 6 ♀ larvae, Gunsang, 23.V.1980; 2 ♂, 1 ♀ larvae, 3 km N Gunsang, 23.V.1980.

Length of the body (last instar larva) ♂ 7 mm, ♀ 8 mm. Brownish species with head distinctly darker than rest. Antennae, palpi and cerci pale. Head uniformly dark brown in young larvae, with an indistinct reticular pattern on its posterior margin in older ones, densely covered with short pale bristles. Gills absent but with single small membranous gill like knobs outside lateral cervical sclerites. Pronotum wider than long, uniformly brownish in young larvae, older larvae with an indistinct pattern. Pronotal margins with dense pointed bristles of equal length all around. Meso- and metathorax with an indistinct pattern and stronger bristles on their anterior margins. Legs short, uniformly pale brown with strong bristles arranged in the usual way. Abdomen cylindrical, slightly darker than thorax. Tergites 2–5 with a pair of lateral longitudinal bands, best seen in young larvae. Each tergum has a fringe of bristles on its hind margin, and another irregular row in the middle of the tergum. Cerci pale, the longest segments 4 times as long as wide. Setation as in Fig. 1b.

No remarkable sexual dimorphism, sexes are distinguishable in older larvae, mainly by interruption of the setal fringe and scar of the genital opening on sternite 8 of ♀♀.



**Indonemoura indica** (Kimmins)

Fig. 2a–f.

*Protonemura indica* KIMMINS, 1947, Ann. Mag. Nat. Hist., 13 (11): 727, Fig. 4.

Material: Nepal: Marsyangdi Valley: 2 ♂, 1 ♀ larvae, Bagarchap, 21.V.1980.

Length of the body (last instar larva) ♂ 8 mm, ♀ 9 mm. General colour reddish brown. Antennae, palpi and cerci pale. Head darker than rest of body, an indistinct pattern on its posterior margin in grown larvae. A patch of short blunt bristles on the postero-lateral margin of the parietal sclerite. Gills absent but with a single membranous gill-like knob outside lateral cervical sclerites. Pronotum quadrangular with an indistinct dark pattern; a fringe of large flat club shaped bristles of different sizes along its margins. Meso- and metathorax unicolorous with bristles of the same type as on the pronotum on their anterior margins. Legs pale, darker at distal ends of femora only. Distal parts of femora and dorsal sides of tibiae with short blunt bristles. Stronger pointed bristles on legs arranged as in other Nemouridae, except on forelegs where they are in a characteristic transverse row on the dorsal side of the femur. Distal parts of tibiae with long pale hairs. Abdomen darker than thorax (especially expressed in younger larvae). Tergites covered with very short blunt bristles. On the posterior margin of each tergum are several larger blunt bristles, two of which are longer than others. Cerci pale, length of segments slowly increasing from base to tip, with an apical whorl of stout bristles on each segment; the longest segments not more than 3 times as long as wide.

No remarkable sexual dimorphism, sexes are distinguishable in older larvae.

**Mesonemoura funicula** (Harper)

Fig. 3a–f.

*Protonemura funicula* HARPER, 1974, Psyche, 81: 370, Figs 9–11.

Material: Nepal: Marsyangdi Valley: 2 ♂, 1 ♀ larvae, Chame, 21.V.1980.

Length of the body (last instar ♂ larva) 7 mm. General colour brownish, darker in the older larvae. Antennae, palpi and cerci paler. Head uniformly brown, posterior margin with slightly expressed reticu-

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Fig. 1. *Indonemoura adunca* (Harper), full view of larva (a); 14<sup>th</sup>–16<sup>th</sup> cercal segments, with details of bristles (b); 6<sup>th</sup> abdominal segment, with details of bristles, left ventral (c), right dorsal (d); margin of the pronotum, with details of bristles (e); right cervical gill (f). Scale 1 applies to figures b–e, scale 2 to the details of bristles, Figs 2–5 are to the same scales!

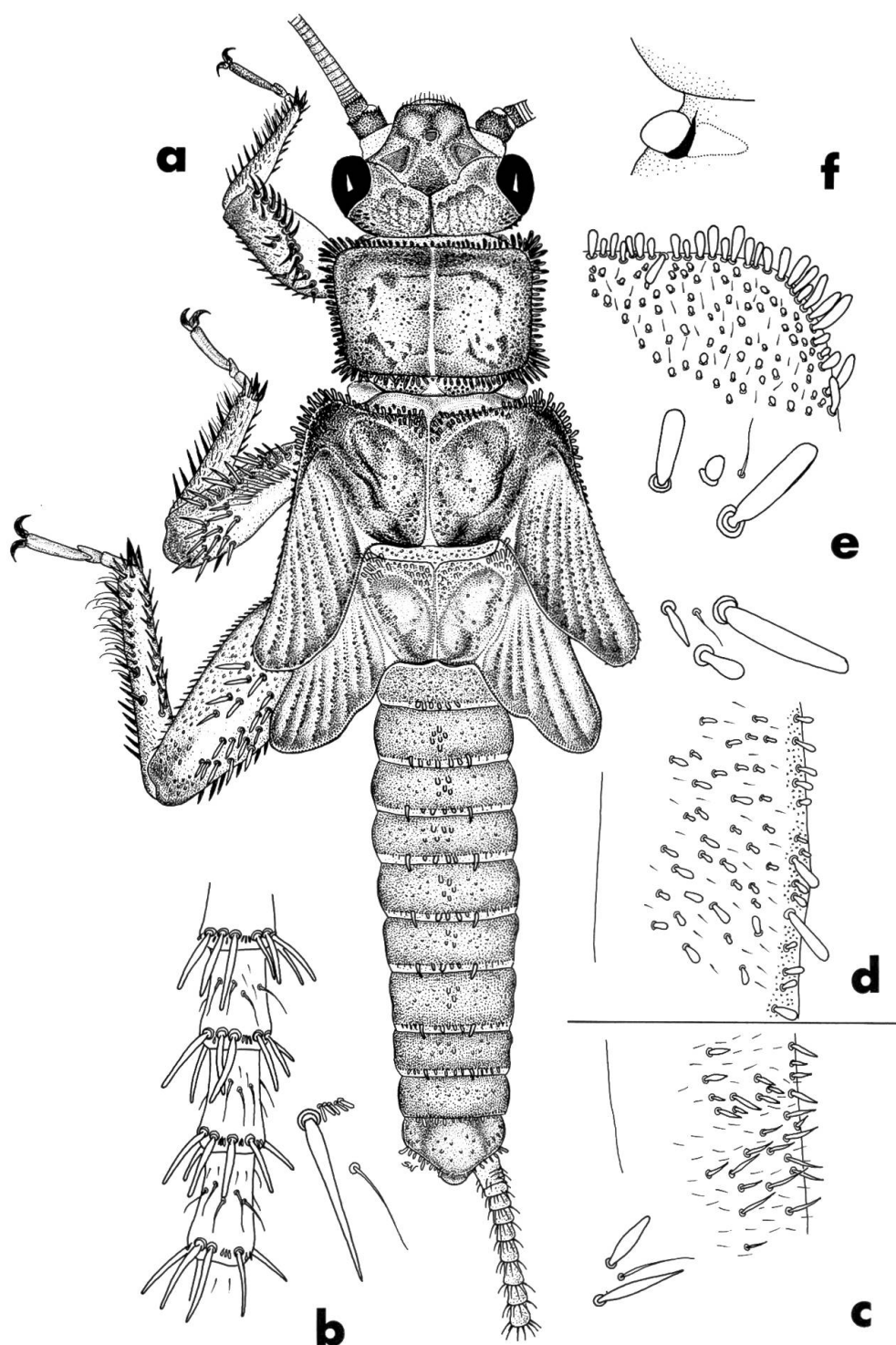


Fig. 2. *Indonemoura indica* (Kimmins), full view of larva (a); 14<sup>th</sup>–16<sup>th</sup> cercal segments, with details of bristles (b); 6<sup>th</sup> abdominal segment, with details of bristles, left ventral (c), right dorsal (d); margin of the pronotum, with details of bristles (e); right cervical gill (f).

lar pattern only in older larvae. Only a few minute bristles behind the eyes. One cervical gill on each side of midline, arising outside lateral cervical sclerites. Gills short and triangular, small gill like knobs on inside of cervical sclerites. Pronotum quadrangular, slightly narrower behind with widely rounded posterior margin; uniformly brown, dark brown in older larvae, pattern not very distinct. Pronotal margins with a fringe of pointed bristles of different sizes. Meso- and metathorax without pattern, unicolorous. Anterior margins with strong pointed bristles. Wing pads of nearly equal size with scattered short bristles on their outer margins. Legs uniformly brownish with strong dark bristles arranged in the usual way. Abdomen cylindrical, uniformly brownish, ventrally reddish brown. Posterior margin of each tergum with a pair of strong darker bristles arranged in longitudinal rows except on first and on some posterior segments, where arrangement is irregular. Cerci pale, longest segments 3 times as long as wide, each of them with an apical whorl of stout bristles.

No remarkable sexual dimorphism, sexes are distinguishable in older larvae.

### ***Nemoura gosainkundensis* Harper**

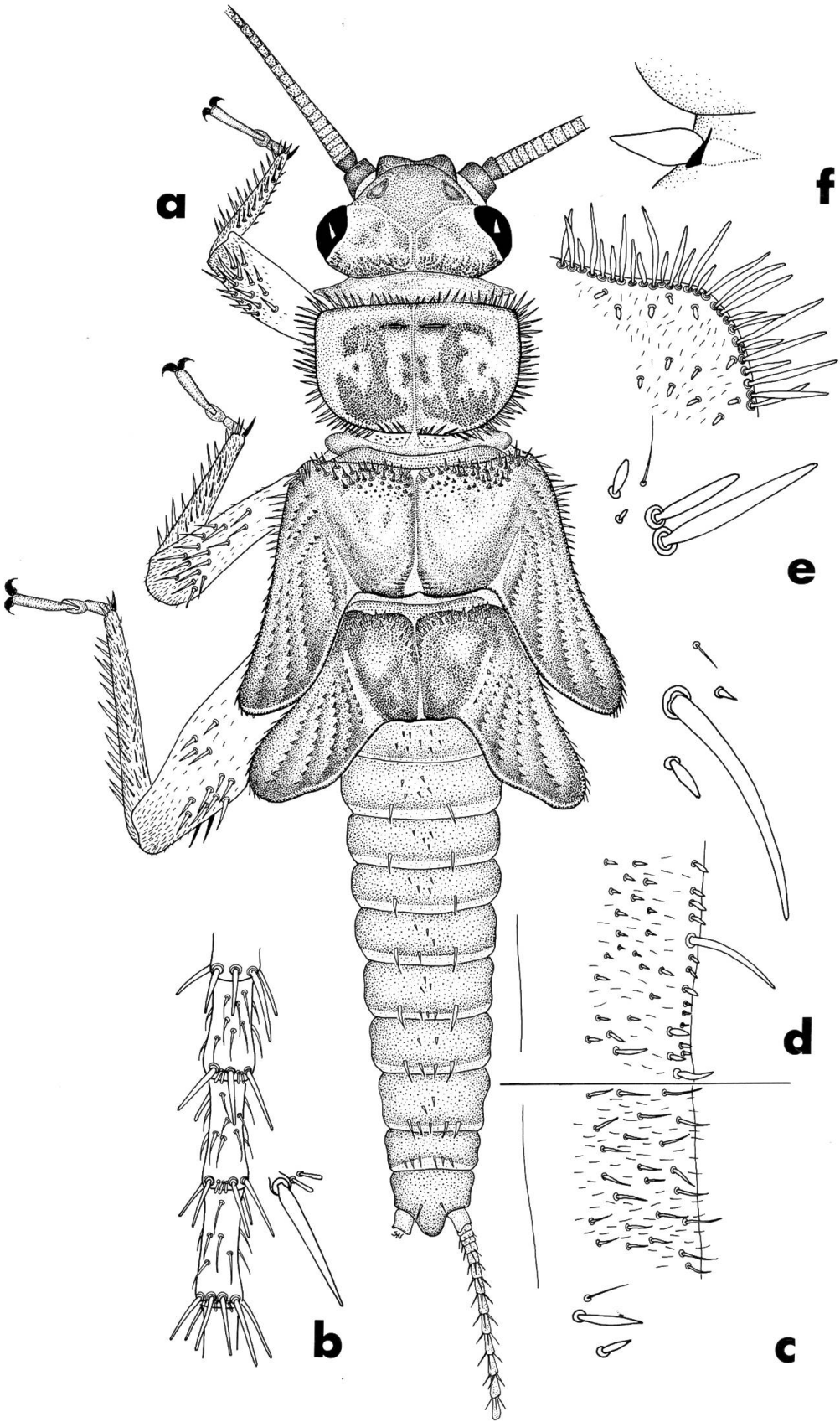
Fig. 4a–f.

*Nemoura gosainkundensis* HARPER, 1975, Nouv. Rev. Ent. 5: 125, Figs 25–30.

Material: Nepal: Marsyangdi Valley: numerous larvae, 10 km N Gunsang, Manang, 23.V.1980. Kali Gandaki Valley: 1 larva, Lupra, Jomosom, 24.V.1980.

Length of the body (last instar larva) ♂ 6 mm, ♀ 8.5 mm. General colour brownish. Head as wide as pronotum, a dark pattern in front, pale behind. Single, simple, long, sausage shaped gills arising outside of lateral cervical sclerites. Pronotum slightly narrower behind with a dark pattern in older larvae. Meso- and metathorax with dark pattern in older larvae, unicolourous in younger larvae. Pronotal margins with well developed fringes of dense dark bristles of fairly equal size. Anterior margins of meso- and metathorax covered with strong bristles while bristles on outer margins of wing pads are short and scattered. Legs pale with stronger regularly placed bristles. Abdomen cylindrical, reddish brown, darker than thorax, with a slight pattern in old larvae. Abdomen of younger larvae more uniformly coloured, only the last segments darker. Posterior margins of tergites with a row of setae as shown in Figs. 4c, d. Cerci pale, joints cylindrical, basal ones short, succeeding ones longer and more slender; longest segments 6 times as







long as wide. Bristles on apical whorls short, except one on inner face which is longer than others.

Sexes are difficult to distinguish even in the older larvae.

### ***Protonemura paraproctalis* Aubert**

Fig. 5a–f.

*Protonemura paraproctalis* AUBERT, 1967, Mitt. schweiz. ent. Ges. 39: 224, Figs 64–68.

Amphinemurinae gen. spp. 3 ZWICK & SIVEC, 1980 Ent. Bas. 5: 93.

*Protonemura paraproctalis* SIVEC, 1981, Aquatic Insects, in print.

Material: Nepal: Marsyangdi Valley: 1 ♂ larva, 3 km N Jagat, 20. V. 1980. Langtang: 10 larvae, Bajando, Dhunche, 1800 m, 1. V. 1978.

Length of the body (last instar ♂ larva) 12 mm. General colour brown, head darker, antennae and palpi paler than rest of body. Head as wide as pronotum, slightly rugose frontally, smooth and paler behind. Postero-lateral margin of parietal sclerite with a well developed patch of minute bristles. Two simple sausage like cervical gills on each side of midline, one arising inside, the other outside of lateral cervical sclerites. Pronotum transverse, slightly wider than long, dorsal surface with dark irregularly scattered small markings. In younger larvae pronotum paler than head. Pronotal margins with a well developed fringe of bristles of varying length, generally long. Meso- and metathorax without expressed pattern; with small bristles anteriorly. Wing pads with long bristles on outer margins. Arrangement of spines on legs not distinctive. The species differs from others in the presence of short blunt bristles on distal part of femora and along dorsal side of tibiae as well as in the long pale hairs on outer sides of femora and tibiae. Abdomen cylindrical, brown in older larvae, slightly darker than in young ones. Posterior margin of each tergum with a few stronger bristles, at least two are usually longer than the rest. Older larvae also have a few long pale hairs on the abdominal terga. Cerci with unique bulb shaped segments increasing in diameter from base to middle of cerci; whorl of proportionally long stout bristles, with tufts of short membranous outgrowths in between, on distal ends of segments. A few terminal segments without bristles.

No remarkable sexual dimorphism, sexes are distinguishable in older larvae.

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Fig. 3. *Mesonemoura funicula* (Harper), full view of larva (a); 14<sup>th</sup>–16<sup>th</sup> cercal segments, with details of bristles (b); 6<sup>th</sup> abdominal segment, with details of bristles, left ventral (c), right dorsal (d); margin of the pronotum, with details of bristles (e); right cervical gill (f).

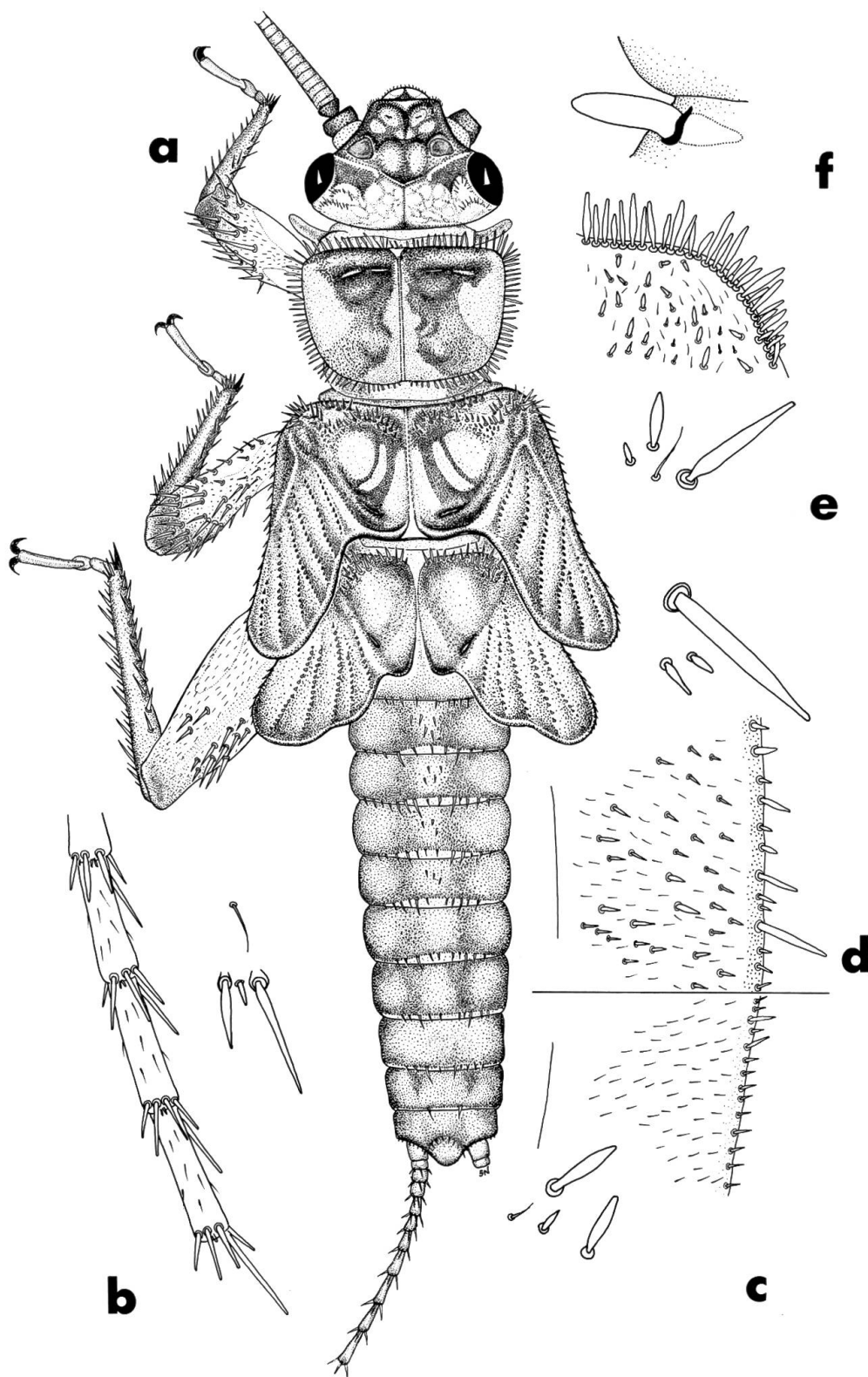


Fig. 4. *Nemoura gosainkundensis* Harper, full view of larva (a); 14<sup>th</sup>–16<sup>th</sup> cercal segments, with details of bristles (b); 6<sup>th</sup> abdominal segment, with details of bristles, left ventral (c), right dorsal (d); margin of the pronotum, with details of bristles (e); right cervical gill (f).

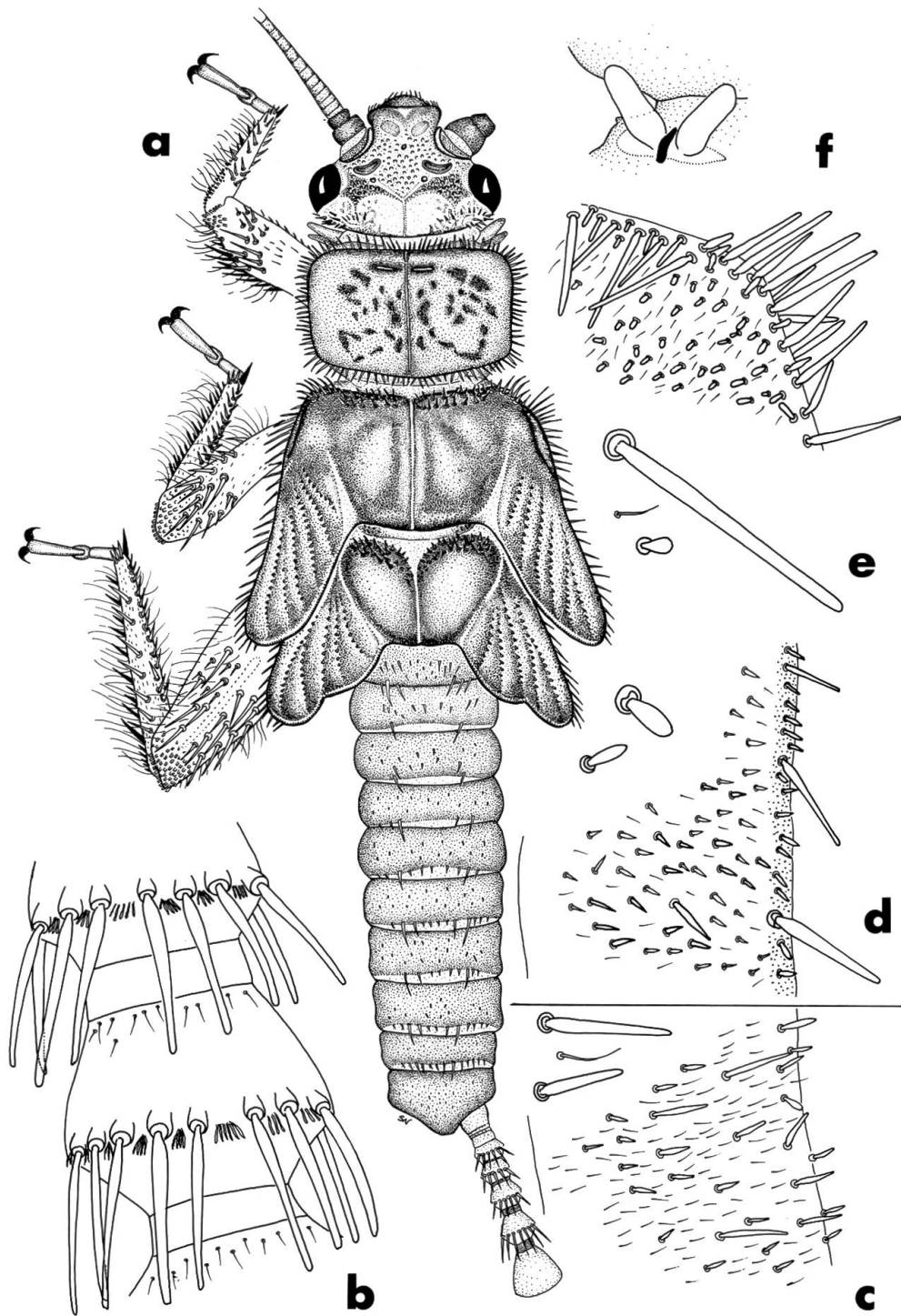


Fig. 5. *Protonemura paraproctalis* Aubert, full view of larva (a); 9<sup>th</sup> cercal segment (b); 6<sup>th</sup> abdominal segment, with details of bristles, left ventral (c), right dorsal (d); margin of the pronotum, with details of bristles (e); right cervical gill (f).

Knowledge of Asian Nemouridae is still inadequate. While the nymphs of genera occurring in Europe are quite well known, those of Asian species are largely unknown. Therefore, the importance of characters described above is uncertain. Many, like pigmentation and setation, may be useful only for distinction of individual species. It should be noted that details of pronotal fringes seem to be more constant than those of fringes on abdominal segments. Contrary to BAUMANN (1975), we have not been able to distinguish nymphs at the generic level by the kind and pattern of bristles on the legs. The legs seem to be generally quite uniform throughout the family, and while some species show slight differences, these may only be of some additional use for differentiation at the species level.

Cervical gills may be of some use for differentiation at the generic level. However our *Mesonemoura* (contrary to BAUMANN, 1975) shows a quite well developed single pair of short triangular gills. We are not able to place *Protonemura paraproctalis* Aubert, with two sausage like gills on each side, into any presently known nemourid genera in Asia. *Nemoura gosainkundensis* Harper has one long sausage like gill on each side while according to BAUMANN (1975) they should be short and triangular. He places this species in his genus *Illiesonemoura*. Some additional problems with this genus have already been discussed (ZWICK & SIVEC, 1980).

All this indicates that the situation is not yet sufficiently clear in Asian Nemouridae. Our descriptions are only a brief illustration of some nemourid larvae from different genera. Much additional material and further studies on larvae are necessary to find out which characters clearly differentiate species and genera in Asia.

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