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DESCRIPTION OF SOME MAYFLY NYMPHS FROM CONGO

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Through the kindness of Dr. Kinji Imanishi, the writer has been able to study a small collection of aquatic insect larvae gathered by him in Congo (Africa) during the Kyoto University African Anthropoid Expedition in 1958. The specimens, in two vials, consisted of 29 nymphs (larvae) and fell into three genera belonging to two families of Ephemeroptera.

The writer's grateful thanks are due to Dr. Imanishi who placed the collection at the writer's disposal for the present study and rendered much useful information regarding the localities. The writer is very grateful to Prof. Matsunae Tsuda of Nara Women's University for his guidance during the present study.

List of localities and collected nymphs

Loc. 1. A mountain torrent flowing into Kivu Lake, Congo; April 18, 1958.

The collected nymphs are:

- | | |
|--------------------------------|----------------|
| 1. <i>Ecdyonurus</i> sp. CEA | 2 individuals. |
| 2. <i>Ecdyonurus</i> sp. CEB | 3 indivs. |
| 3. <i>Pseudocloeon</i> sp. CPA | 3 indivs. |
| 4. <i>Baetis</i> sp. CBB | 3 indivs. |

Loc. 2. A small stream narrower than 10 meters by the ascent road to Ruwenzori, Congo, at about 3,500 meters above the sea-level; March 16, 1958.

The collected nymphs are:

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|--------------------------|-----------------|
| 5. <i>Baetis</i> sp. CBA | 18 individuals. |
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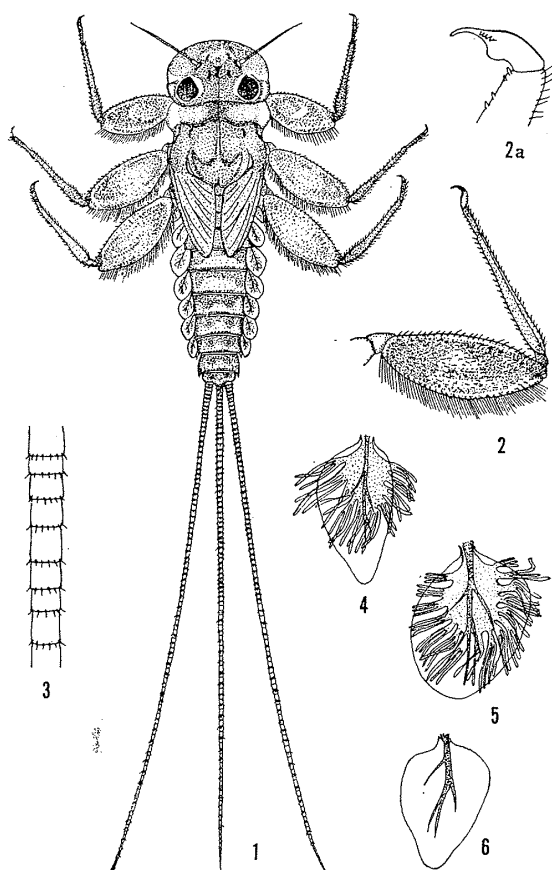
ECDYONURIDAE

Ecdyonurus sp. CEA

Two nymphs; length of body 14.0 mm, caudal filaments 17.0 mm. General colour brown (specimens in alcohol), ventral part of body and legs pale.

Head flattened, more than twice as wide as its length, widest at the level of anterior portion of eyes, frontal margin rounded; general colour brown, in front of the median ocellus, outside of the hind ocelli and coronal and epicranial sutures pale. A triad of pale spots present in the median anterior margin of head (Figs. 1, 7).

Labrum short and wide, nearly four times as wide as its length, fringed with long hairs on the apical margin, on the upper surface near the anterior margin there is a transverse row of short hairs (Fig. 11). Mandibles broad in the portion of galea-lacinia, but very slender in the basal half (Figs. 8, 9). Inner canine of the left man-



Figs. 1-6. *Ecdyonurus* sp. CEA. 1, dorsal view of the nymph; 2, fore leg, 2a, claw; 3, part of caudal filament; 4-6, gills 1, 3, and 7, numbered from the front.

dible $7/10$ as long as the outer canine, with two blunt projections at the tip; inner margin of the outer canine crenated with about 12 blunt teeth; prostheca is represented by two long spines. Inner canine of the right mandible $6/7$ as long as the outer canine, with one rather long spine-like process at $4/5$ from the base, prostheca composed of two long spines. Molar surface of both mandible well developed, irregularly serrated with stiff bristles; a row of 5-6 bristles present close to the lacinial end of the molar surface on the right mandible.

Maxillary palp rather slender, proximal joint with a series of long bristles on the outer and the inner margin respectively, second joint fringed on the outer margin with two series of long setae and apical portion beset thickly with short bristles; on the apical margin of galea-lacinia there is a series of about 18-20 pectinate spines, with a series of long bristles on the inner margin and on the upper surface (Figs. 10, 10a).

Glossae of labium small, separated widely at the base, slightly divergent apically from each other, apical margin rounded, thickly beset with long hairs on the intero-apical margin; labial palp large and robust, thickly beset with bristles on the outer border of the distal $2/3$ (Fig. 12). Lateral portion of hypopharynx strongly out-curved, narrowest at the tip, outer margin rather sinuate, fringed with long hairs on margin from the inner to the sinuated portion (Fig. 13).

Pronotum short, slightly wider than head, with dilated and rounded lateral margins which are prolonged behind and fused to the side of mesonotum, with darker markings on either side of the median line (Fig. 7).

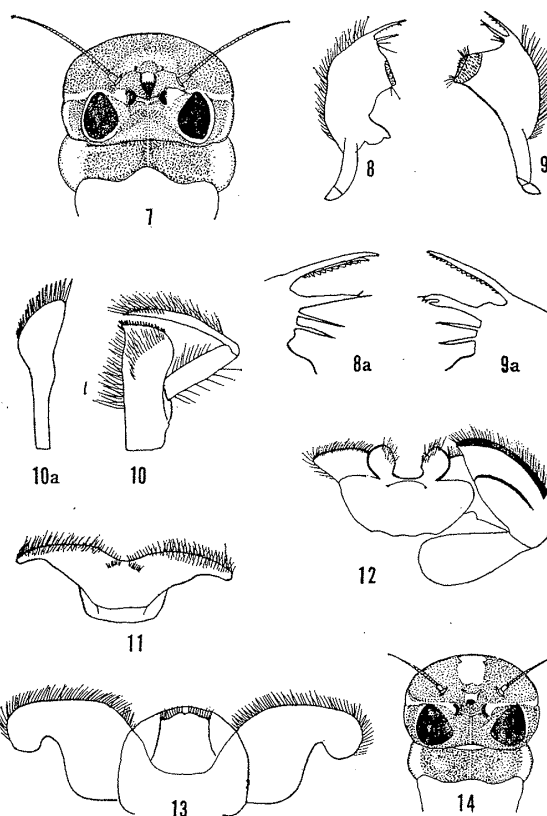
Legs pale brownish; femora flattened and broad, 2.5 times as long as their width, with a row of long bristles on outer margin, short spines on inner margin. Claws with four teeth on the inner margin. The ratio, tarsus : tibia : femur, in the fore-leg, is 1 : 4 : 4 (Figs. 2, 2a).

Three caudal filaments nearly equal in length, and longer than body, pale yellow; at joinings with whorls of minute spines.

Seven pairs of gills on the abdominal segments form 1 to 7 (Figs. 4-6), all lamellate, with filamentous gills, except the seventh pair which consists of lamellae only; the first pair a little longer than the seventh but lanceolate in outline; lamellae 2 to 6 broadly oval or obtuse oval, tracheation distinct, pinnately branched, blackish brown.

Locality: Loc. 1; April 8, 1958, collected by Imanishi.

Remarks: This nymph is characterized by the presence of a triad of pale spots on the median anterior margin of the head. The nymph resembles closely that of *Ecdyonurus* sp. 1 (Ueno, 1955), which has been collected from Nepal Himalaya, but differs from this by the absence of the small lanceolate apical appendage in 2 to 6 gill lamellae.



Figs. 7-13. *Ecdyonurus* sp. CEA. 7, head and pronotum; 8, left mandible, 8a, canine area; 9, right mandible, 9a, canine area; 10, maxilla; 10a, pectinate spines of apical margin of galea-lacinia; 11, labrum; 12, labium; 13, hypopharynx. Fig. 14. *Ecdyonurus* sp. CEB. 14, head and pronotum.

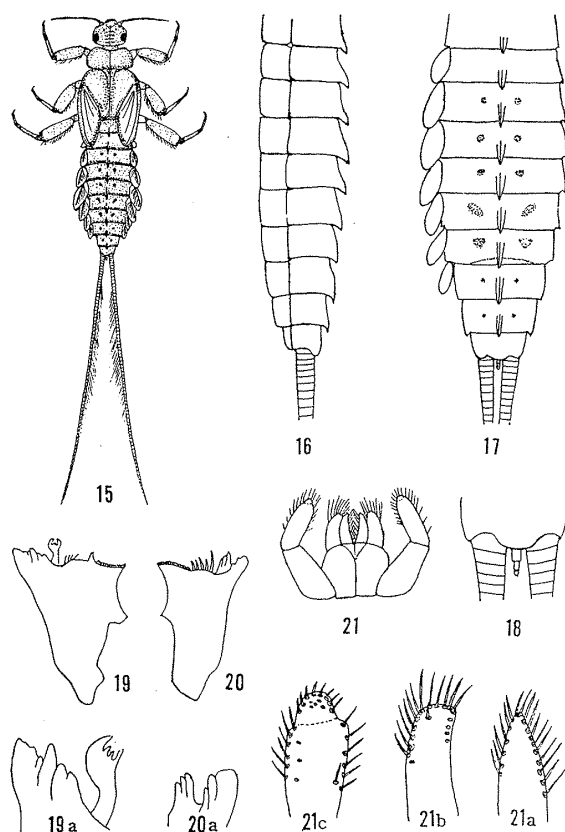
Ecdyonurus sp. CEB

Three nymphs; body length 8.5 mm, caudal filaments 10.3 mm.

Head of this nymph is quadrangular as in *Ecdyonurus* sp. CEA (Fig. 14). General colour of head brown (specimen in alcohol); coronal and epicranial suture pale, the latter enlarged into a pale area close to the lateral margin. This nymph is characterized by one large pale spot in the middle of the frontal portion of the head.

Pronotum equal in width with the head, lateral margins rounded, posterior processes fused to mesothorax at the sides; pale patterns on each side, as the outer longitudinal bands.

Legs pale yellow. The ratio of tarsus : tibia : femur, in fore-leg, 1 : 3.1 : 3.6; mid-leg, 1 : 3.7 : 4.5; hind-leg 1 : 3.8 : 5.0; femur bulged and flattened, longest in the hind-leg; the ratio width : length is : fore-leg, 1 : 2.5; mid-leg, 1 : 3.0; hind-leg, 1 : 3.3. Claws bear four teeth on inner margin.



Figs. 15–21. *Pseudocloeon* sp. CPA. 15, dorsal view of the nymph; 16, lateral view of the same; 17, dorsal view of abdominal segments 1 to 10; 18, ventral view of the last abdominal segment; 19, left mandible, 19a, canine area; 20, right mandible, 20a, canine area; 21, labium, 21a, glossa, 21b, tip of paraglossa, 21c, distal part of labial palp.

irregularly. There is a pair of long bristle near the centre of the upper surface; and also seven bristles in the posterior portion.

Mandibles (Figs. 19, 20) robust, canine of the left mandible bears five blunt teeth, the outermost one of which is truncated and larger than the others, prostheca well developed, bearing on its outer margin four teeth, of which the two at both sides are longer than the other two. Canine of the right mandible bears three teeth; prostheca with three.

Maxillary palp slightly shorter than galea-lacinia which bears two terminal teeth and two rows of long bristles on the apical margin (Figs. 26, 26a).

Paraglossae of labium nearly the same length (Fig. 21). Inner apical margin of glossae bears a row of about 10 spines; the outer margin bears about 7 bristles

Three caudal filaments, longer than body, pale yellow; at joinings with whorls of minute spines.

Locality: Loc. 1: April 8, 1958, collected by Imanishi.

Pseudocloeon sp. CPA

Three nymphs; length of body 6.8 mm, caudal filaments 7.3 mm. Body slender, stream-lined form, brown (specimens in alcohol).

Head directed downwards, narrower than pronotum; antennae rather robust.

Labrum (Fig. 25) quadrangular, twice as wide as its length, apical margin rounded, with a narrow but distinct median notch. The upper surface of the right half of the labrum is illustrated in Fig. 25a. At the frontal margin there is a row of many long bristles, and inside the apical margin a row of smaller bristles which run parallel to the margin; between the above-mentioned two rows near the frontal corner there is a row of five stout bristles, and in the inner part there are two rows of bristles, of which one runs regularly and the other one runs somewhat

(Fig. 21a); apical margin of paraglossae bears one row of 12–13 long spines (Fig. 21b). Labial palp 3-jointed, the articulation of the terminal two joints not distinct, the last joint with numerous minute spines and bristles.

Legs pale, with a dark marking in the middle of femora; distal end of each femur, tibia, tarsus and claw dark; along the outer margin of femur there are moderately long straight spines which are replaced by short stout spines on its frontal half; moderately long spines present also on tibia and tarsi. Along the inner margin of femur of each leg there is a row of short spines. Claws bear 5 teeth on the inner margin.

Fore-leg is shorter than mid- and hind-legs, especially in the tibia; the ratio, tarsus: tibia: femur, is: fore-leg, 1:2.9:4.5; mid-leg, 1:2.8:3.8; hind-leg, 1:2.3:2.9; femora of all legs are longer than tibiae and tarsi (Figs. 22, 23, 24).

Abdomen cylindrical, on the segments from 1 to 9 inclusive there is on the hind margin a median dorsal tooth directed backwards. These teeth successively decrease in length in the posterior segments. On the abdominal segments from 3 to 9 inclusive there is a pair of dark dots.

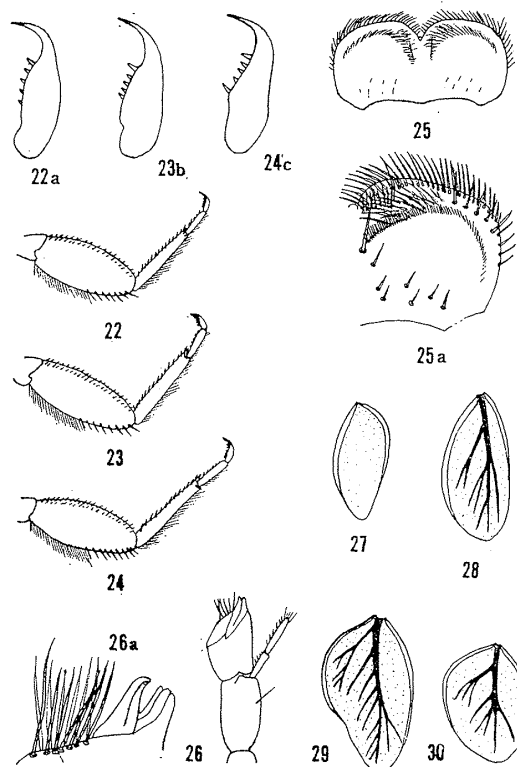
Gills present on the segments from 1 to 7, all simple lamellae are relatively larger in size (Figs. 27, 28, 29, 30): each lamella oblong oval, somewhat asymmetrical, tracheation distinct and pinnately branched mostly on inner side, blackish brown; the first and the seventh are nearly equal in length.

Two caudal filaments, nearly as long as body, fringed with short hairs only on the inner side; median filament rudimentary, only 3-jointed, shorter than 1/3 of the width of the hind margin of the tenth tergite.

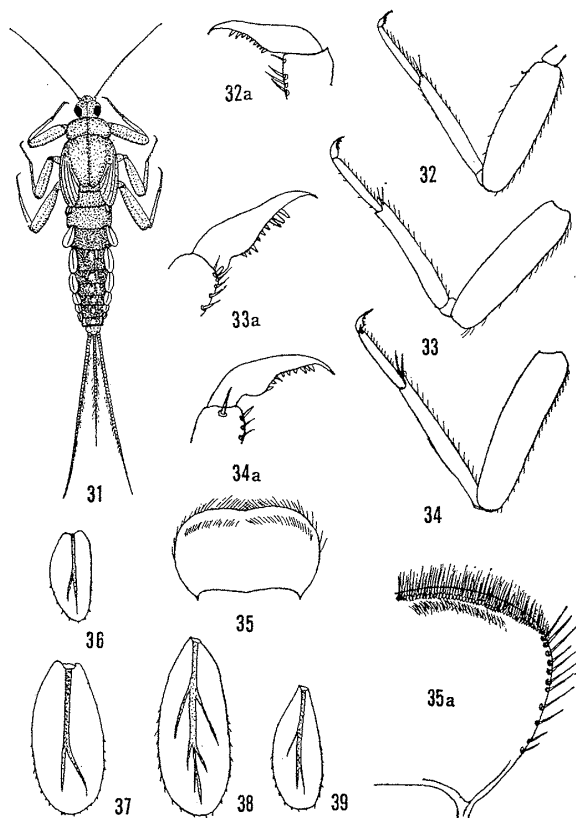
Locality: Loc. 1; April 8, 1958, collected by Imanishi.

Baetis sp. CBA

Eighteen nymphs: length of body 6.0 mm, outer caudal filaments 4.0 mm, median



Figs. 22–30. *Pseudocloeon* sp. CPA. 22–24, fore-, mid- and hind-legs; 22a, 23a, 24a, fore-, mid- and hind-claws; 25, labrum, 25a, upper surface of right half of labrum; 26, maxilla, 26a, apical part of galea-lacinia; 27–30, gills 1, 2, 5, 7, numbered from the front.



Figs. 31-39. *Baetis* sp. CBA. 31, dorsal view of the nymph; 32-34, fore-, mid- and hind-legs; 32a, 33a, 34a, fore-, mid- and hind-claws; 35, labrum, 35a, upper surface of the right half of labrum; 36-39, gills 1, 2, 5, 7, numbered from the front.

of right canine rounded and projecting far beyond the other teeth. Prostheca of the left mandible bears three teeth on its outer margin; that of the right mandible is more slender than that of the left one and bears two small teeth on the outer margin (Figs. 40a, 41a).

Maxillary palp 3-jointed, extending beyond the galea-lacinia (Fig. 42); galea-lacinia bears two terminal teeth; inner apical lacinal margin beset with a row of shorter bristles.

Paraglossae of labium extend a little beyond glossae (Fig. 43); outer margin beset with bristles arranged in 2 rows; apical margin beset with 6 clavate spines in a row. Labial palp 3-jointed, the articulation of the terminal two joints not distinct, terminal joint rounded conical, tip pointed, inner apical margin has small three knobs, beset with numerous spines and fine bristles (Figs. 43, 43a).

Legs pale, with a darker marking in the middle of femora. Along the outer margin of femur there is a row of stout bristles; similar row of less stout bristles

caudal filament 3.0 mm.

Body slender, stream-lined form, brown (specimens in alcohol) (Fig. 31). Head directed downwards, narrower than posterior margin of pronotum; antennae rather robust.

Labrum (Fig. 35) rather large, quadrangular, nearly twice as wide as its length; with a shallow median notch on rounded apical margin; just inside the apical margin there is a row of numerous bristles, inserted closely together, and another row of bristles on the apical margin; on the upper surface near the lateral margin there is a transverse row of stouter and longer bristles, about 11 in total number. The upper surface of the right half of the labrum is illustrated in Fig. 35a.

Mandibles (Figs. 40, 41) robust and pyramidal shape, each canine bears five teeth; the outermost tooth (1 and 2) of the left mandible pointed and projecting far beyond the 3 to 5 teeth, the first tooth as long as the second (outermost); the outermost tooth

present on the inner margin of tibia and tarsus. On the apical margin of each tibia there are two long spines. Claws bear 9 teeth on the inner margin (Figs. 32a, 33a, 34a). Fore leg is shorter than mid- and hind-legs; the ratio, tarsus : tibia : femur, is : fore-leg, 1 : 1.7 : 2.0; mid-leg, 1 : 1.8 : 2.3; hind leg, 1 : 2.2 : 2.3; femora of all legs are longer than tibiae and tarsi (Figs. 32, 33, 34).

Abdominal segments 1-3 and 10 brown, 4-9 dark; on each tergite (except 9) there are three brown markings in the median line, the median one spot-like, the other two rod-like, on the segment 9 there is only a median spot-like marking.

Seven pairs of gills, all simple lamellae, the 7th much smaller than the others, each oblong oval; tracheation distinct, pinately, branched and brown (Figs. 36, 37, 38, 39).

Three caudal filaments, pale throughout; the median one is $\frac{2}{3}$ as long as the outer ones, the former fringed with rather long hairs on both side and the latter only on the inner side.

Locality : Loc. 2; March 16, 1958, collected by Imanishi.

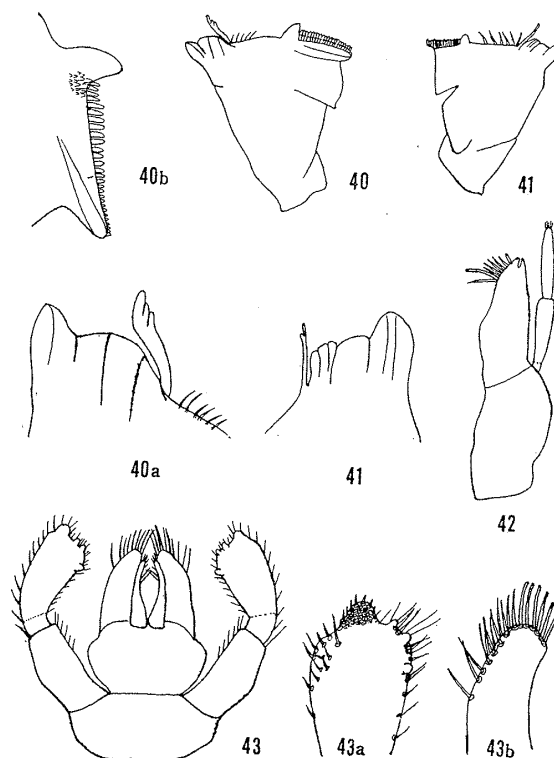
Baetis sp. CBB

Three nymphs; length of body 6.0 mm, caudal filaments 8.0 mm.

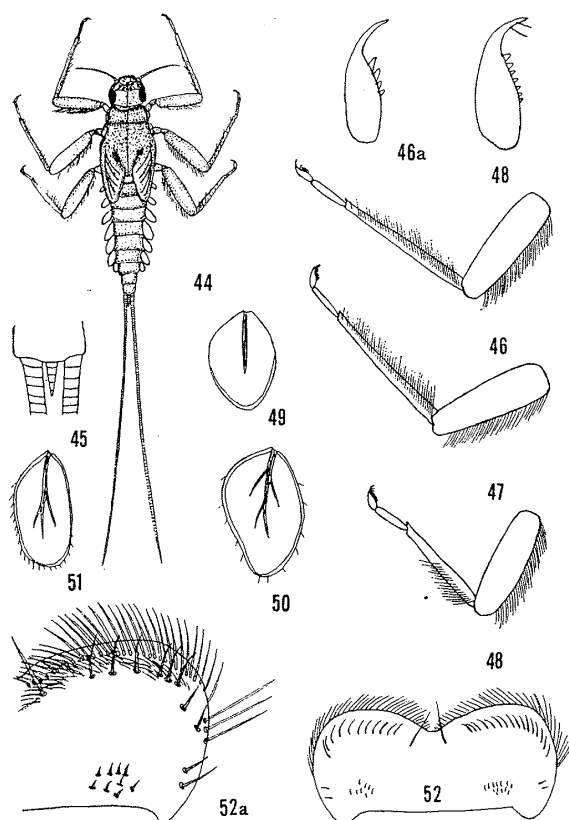
Body stream-lined form, brown dorsally and pale brown ventrally (Fig. 44).

Head only slightly narrower than pronotum, directed downwards; antennae rather slender, composed of about 20 joints.

Labrum (Fig. 52) quadrangular, more than twice as wide as its length, apical margin rounded, with a narrow but distinct median notch. The upper surface of the right half of the labrum is illustrated in Fig. 52a. At the frontal margin there is a row of many long bristles, and 3 longer bristles near the lateral margin. And inside the apical margin a row of many smaller bristles which run parallel to the



Figs. 40-43. *Baetis* sp. CBA. 40, left mandible, 40a, canine area, 40b, molar; 41, right mandible, 41a, canine area; 42, maxilla, 43, labium, 43a, tip of labial palp, 43b, tip of paraglossa.



Figs. 44-52. *Baetis* sp. CBB. 44, dorsal view of the nymph; 45, last abdominal tergite and basal parts of caudal filaments, 46-48, fore-, mid- and hind-legs, 46a, fore-claw, 48a, hind-claw; 49-51, gills 1, 4, 7, numbered from the front; 52, labrum, 52a, left mandible.

rather slender, inner margin beset with a row of nine spines which increase in length apically; outer apical margin with six spines (Figs. 56, 56a). Labial palp 3-jointed; terminal joint rounded conical, beset with many spines and fine bristles, near the apex there is a small clavate spine (Fig. 56c).

Abdomen slender, cylindrical; dorsum pale brown; no marking on each tergite. Seven pairs of gills, all simple and small lamellae, the last pair smallest; each lamella oval or broadly oval, fringed with minute bristles and hairs on the margin; tracheation distinct, pinnately, branched and blackish brown (Figs. 49, 50, 51).

Legs rather slender (Figs. 46, 47, 48); hind-leg shorter than mid- and fore-legs which are equal in length. The ratio, tarsus : tibia : femur, is : 1 : 3.6 : 3.2 in the mid- and fore-legs respectively, but femur a little longer in hind-leg, the ratio being 1 : 2.8 : 3.3. On the median portion of the upper surface of each femur are paler. On the outer margin of each femur and tibia there is a row of many bristles; but in

margin; there are also a row of six stout bristles, near the apical margin there is a row of four stout bristles near the lateral margin. At the center of upper surface there is a pair of long and stout bristles, and at the basal portion of the surface a group of nine very short bristles.

Mandible robust (Figs. 53, 54); canine of the left mandible bears six blunt teeth, the outermost one of which is truncated; prosthema well developed, bearing on its outer margin nine teeth, of which five are shorter and four are longer (Fig. 53a). Canine of the right mandible bears seven teeth; prosthema with ten teeth on the inner margin (Fig. 54a).

Maxillary palp shorter than galea-lacinia which bears two terminal teeth and two rows of long bristles on the apical margin (Figs. 55, 55a).

Paraglossae of labium extend a little beyond glossae; apical margin beset with feathered bristles arranged in 1-2 rows; close to the each side of the row there is a non-feathered bristle; glossa

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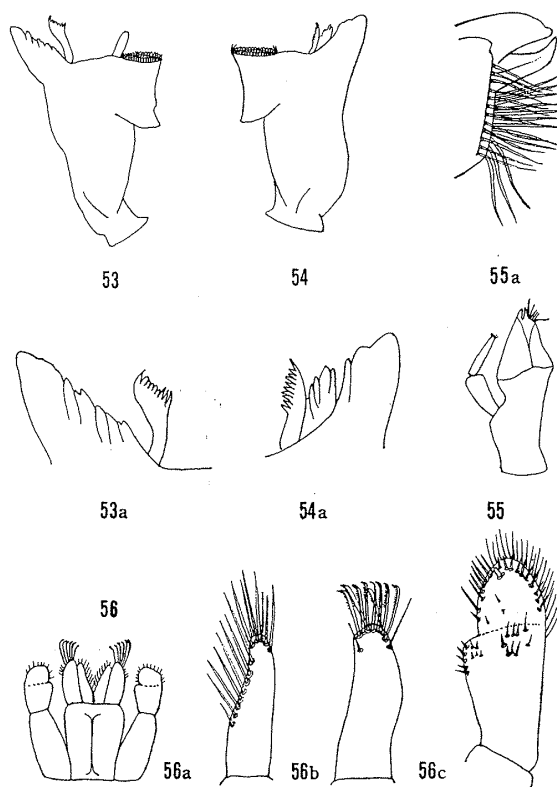


Fig. 53-56. *Baetis* sp. CBB. 53, left mandible, 53a, canine area; 54, right mandible, 54a, canine area; 55, maxilla, 55a, tip of galealacinia; 56, labium, 56a, glossa, 56b, paraglossa, 56c, tip of labial palp.

hind-leg tibia the row is only in basal half.

Claws rather large but slender, and bear on inner margin a row of 4 to 7 teeth; only the hind claw has 2 bristles at the distal inner margin (Figs. 46a, 48a).

Two caudal filaments slightly longer than body, without fringes on both sides; median filament rudimentary, only 5-jointed, shorter than $\frac{3}{5}$ of the width of the hind margin of the tenth tergite (Fig. 45).

Locality: Loc. 1: April 8, 1958, collected by Imanishi.

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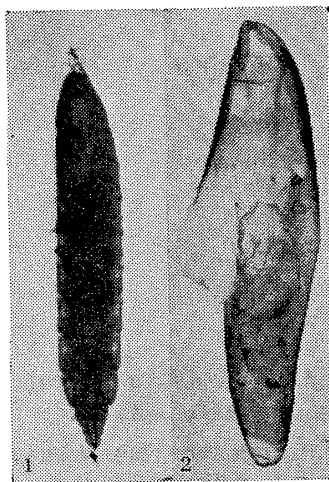
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アブ 1 令 幼 虫 の 脱 皮

大 森 康 正

孵化したアブの幼虫は水の中に入つて第1回の脱皮をするのが普通である¹⁾³⁾が、卵殻内で第1回の脱皮をすまして孵化してくる種類もあるという³⁾。ウシアブでは一般に孵化後、水に入つて脱皮するが、卵殻中で脱皮をすませるもの（図1, 2参照）から、2-3日水中で暮した後に脱皮するものまで色々と観察され、その時期が一定でないように思われた。たまたま刺戟で孵化させた²⁾同一卵塊からの孵化時期の異なる幼虫について脱皮の時期を比べると、皆ほぼ同時に脱皮の起ることがわかつた。脱皮は幼虫が一定の發育をとげた時に起るもので、孵化や水の中に入る事には何ら関係がないのである。ウシアブでは気温 25°-33°C で産卵後（厳密には受精時を起点とすべきである）6-7日、20°-27°C で7.5-9日目に脱皮が起つた。



1. 脱皮を始めたウシアブ1令幼虫, 2. 卵殻中に残された脱皮殻（ウシアブ）。

シロフアブ、アカウシアブ、ヤマトアブもウシアブと同じくらいの日時を要し、気温 27°-33°C で産卵後6-7日目に脱皮が行なわれた。

脱皮はまず頭部から始まる。口器を脱ぐようにはずして幼虫は後方に収縮する。頭部の遊離した皮膚を脱ぐとともに尾端で尾部の皮膚を強く後方に押す。この部分がやぶれればそのまま後方に移動して脱出するが、多くの場合胸部あたりの遊離した皮膚を口器にひっかけて切り、そこから脱出する。口器を脱ぐようにはずしてから、幼虫が脱皮を完了するまで、早いものは数分とかからないが、数日も脱殻をまともぐもぐしている不器用なものもあつた。また尾部の気管の部分がはずれないで、かなり長いこと脱殻を尾端にひっさげているものもあつた。

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