

MAYFLIES FROM JAPANESE TORRENTS  
V. NOTES ON THE GENERA *CINYGMA* AND  
*HEPTAGENIA*<sup>1</sup>

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ONE PLATE

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In the preceding paper I reported on the genus *Epeorus* of the family Ecdyonuridae. Among the remaining genera of the family I wish to deal with the genera *Cinygma* and *Heptagenia* in this paper. The species of the genus *Cinygma* are similar to those of the genus *Ecdyonurus* in the ratio of the lengths of tarsal joints, but as most of them possess separated penis-lobes they are also similar to the species of the genus *Rhithrogena*. Their nymphs resemble much more those of *Rhithrogena* than those of *Ecdyonurus* in their general appearance. However, it seems to me that the following nymphal features form a sufficient basis to recognize them as forming an independent genus: the respiratory filaments, it present, usually single and filiform and never developed into a tuft.

With regard to the genus *Heptagenia* I wish to confine myself to a redescription of *Heptagenia kihada* Matsumura, the commonest species of the genus around Kyoto, including some revisional notes, for the male of this species was once described by Prof. Matsumura as *Kageronia suzukiella*. On the nymph of this species I wish to give my opinion when I deal with the nymphs of the genus *Ecdyonurus* in my next paper.

Genus: *Cinygma* Eaton, 1885

1. *Cinygma cavum* Ulmer, 1927

*Cinygma cavum* Ulmer: Ulmer, 1927, Arkiv för Zool., Bd. 19 A, Nr. 8, S. 16.

1 ♂, 2 ♀ from Sakhalin in my collection of the year 1932. Dr. Uéno reported one nymph and one female subimago collected by Mr.

<sup>1</sup> Contribution from the Otsu Hydrobiological Station, Kyoto Imperial University.

K. Koba from the northern Kuriles in the year 1931 as *Cinygma cavum* Ulmer? (Bull. Biogeogr. Soc. Jap., vol. 4, p. 190) Specimens in my collection are smaller than the type-specimens, viz., the length of body 8.00 mm.

## 2. *Cinygma hirasana* n. sp.

This species is similar to *C. cavum*, but differs from it in the yellowish coloration of the body and the penis-lobes which do not show in the ventral view a deep round hollow on the outer margin.

| Measurement :     | Male        | Female      |
|-------------------|-------------|-------------|
| Body, length      | 7.0- 8.5 mm | 7.5- 8.5 mm |
| Fore wing, length | 8.0- 9.0    | 8.5-10.0    |
| Cercus, length    | 17.0-23.0   | 11.5-13.0   |

Description. Male:—General colour ochraceous. Head yellowish; eyes dichoptic, in life light greenish; each ocellus ringed with a fuscous band; the distance between the eyes: the breadth of the head = 0.35 to 0.44. Thorax above yellowish, not brownish as in the following species; propleuron with a distinct fuscous spot; mesopleuron with 2 fuscous spots in front of and behind the middle coxa; fore legs dark greyish, middle and hind legs yellowish; in the fore leg, femur: tibia: tarsus = 7: 12: 23, tarsal joints rank 2, 3, 4, 1, 5; in the hind leg, femur: tibia: tarsus = 13: 11: 5, tarsal joints rank 5, 1, 2, 3, 4; claws similar in the fore legs, dissimilar in the hinder legs. Wings hyaline, pterostigmatic portion obscured; veins greyish. Abdomen: above pale brownish, each of the tergites 1-9 with a narrow darker band on its posterior margin. Penis-lobes separated, with a round membranous part between them; each lobe broad; titillators distinct as in *C. cavum*. Forceps and cerci greyish.

Female:—Similar to the male; three fuscous spots on the pleuron more distinct than in the male. Wings hyaline, veins greyish to dark yellowish. Legs: femur yellowish, tibia and tarsus greyish; in the fore leg, femur: tibia: tarsus = 6.5: 8: 5, tarsal joints rank 2, 3 = 1 = 5, 4; in the hind leg, femur: tibia: tarsus = 7: 6: 2.7, tarsal joints rank 5, 1, 2, 3, 4; claws dissimilar in all legs. Each of the tergites 1-8 with a brownish band on its posterior margin; sternite 9 prolonged and deeply notched on its posterior margin.

Subimago:—Similar to the imago; general colour pale yellowish. Wings greyish, subhyaline; three fuscous spots of the pleuron distinct.

Nymph:—Similar to the nymph of *Rhithrogena* in shape and size.

General colour brownish. Center of the frontal margin of the head constricted in some specimens; there are two paler spots between the eyes in some specimens, but these spots are obscure in other specimens; the distance between the eyes : the breadth of the head = 0.33 to 0.37 in the male, 0.38 to 0.44 in the female. Thorax with a distinct median paler line and two paler little spots on each side of the scutellum; three fuscous spots on the pleuron usually distinct as in the imago and subimago. In the dorsal view fore coxa forms a triangular protuberance; femur brownish on its outer side with a paler longitudinal marking in which no darker spot is present. Abdomen: each of the tergites 2-9 with a paler triangular marking on its center and an obscure paler round marking on its each side; each of the tergites 5-9 with two additional, small paler markings on each side of the median triangular marking but in some specimens these markings of the tergite 9 disappear as the ground colour of that tergite is pale brownish; tergite 10 with two paler striches. Gill-lamellae present on the abdominal segments 1-7; gill-lamellae 1-6 ovoid, gill-lamella 7 lanceolate in shape; gill-lamella 1 not enlarged; each of the gill-lamellae 1-5 with a single respiratory filament. Cerci greyish. Length of body 6.5-8.5 mm; length of cercus 5.5-6.5 mm.

Holotype:—Male.

Allotype:—Female.

Type locality:—Hiragawa, Shiga. Specimens: alcoholic; types obtained on May 21, 1930 by rearing nymphs.

Other localities:—Kamogawa, Kyoto; Kamiyagawa, Kyoto.

### 3. *Cinygma kurobensis* n. sp.

This species is closely allied to *C. hirasana*, but in the male of this species the distance between the eyes : the breadth of the head is 0.23 to 0.31.

| Measurement:      | Male        | Female      |
|-------------------|-------------|-------------|
| Body, length      | 8.0-11.0 mm | 8.0-10.0 mm |
| Fore wing, length | 9.5-12.0    | 10.0-13.0   |
| Cercus, length    | 19.0-28.0   | 12.0-19.0   |

Description. Male:—General colour pale brownish; eyes dichoptic; each ocellus ringed with a fuscous band; the distance between the eyes : the breadth of the head = 0.23 to 0.31. Thorax above luteous; mesopleuron with a brownish spot in front of the middle coxa. Legs

brownish; fore legs darker than the hinder legs; in the fore leg, femur: tibia: tarsus = 8.5:16:26, tarsal joints rank 2  $\Rightarrow$  3, 4  $\Rightarrow$  1, 5; in the hind leg, femur: tibia: tarsus = 9.5:10:5.5, tarsal joints rank 5, 1, 2, 3, 4; claws similar in the fore legs, dissimilar in the hinder legs. Wings hyaline, veins brownish. Abdomen pale brownish; segments 2-7 translucent, segments 8-10 appearing pruinose; each of the tergites 1-9 with a brownish band on its posterior margin. Penis-lobes similar to those of *H. hirasana*; forceps and cerci brownish.

Female:—Similar to the male; in the fore leg, femur: tibia: tarsus = 8.5:10.5:7, tarsal joints rank 2, 3  $\Rightarrow$  1  $\Rightarrow$  5, 4; in the hind leg, femur: tibia: tarsus = 9:8:4.4, tarsal joints rank 5, 1, 2, 3, 4; claws dissimilar in all legs.

It is not easy to distinguish the female of this species from that of *C. hirasana*. Even the ratio of the distance between the eyes to the breadth of the head does not hold good to separate these two species when it is applied to the case of the female, namely the ratio in *C. hirasana* is 0.46 to 0.49 and that is 0.45 to 0.48 in this species.

Nymph:—Very similar to the nymph of *C. hirasana* and it is just about as difficult to distinguish the nymphs of these two species as in the case of the female. The distance between the eyes: the breadth of the head = 0.24 to 0.35 in the male, 0.36 to 0.46 in the female.

Considering these points these two species may be regarded as one species if all probable transitional forms between the male of *C. hirasana* and that of this species be collected in the districts between Kyoto and the Japanese Alps, but if we are to give a special weight to the ratio of the distance between the eyes to the breadth of the head, these two forms may be considered as two distinct species as I have done so in this paper. It may be noted also that three fuscous spots observed in *C. hirasana* are usually obscure in the nymph as well as in the imago in this species.

Holotype:—Male.

Allotype:—Female.

Type locality:—Okunotarusawa, a side valley of the Kurobe River, Northern Japanese Alps, altitude ca. 2300 mtr. Specimens: alcoholic; types collected by K. Imanishi, on Aug. 17, 1931.

Other localities:—The nymph of this species is widely distributed and very common in every torrent of the Northern Japanese Alps. The emergence of imago from June to October.

4. *Cinygma adusta* n. sp.

This species is similar to *C. kurobensis* but the titillators is obscure in this species.

| Measurement :     | Male        | Female    |
|-------------------|-------------|-----------|
| Body, length      | 8.0-10.0 mm | 8.5 mm    |
| Fore wing, length | 9.0-10.0    | 9.5-10.0  |
| Cercus, length    | 24.0-29.0   | 12.5-13.0 |

Description. Male:—General colour brownish; eyes dichoptic, greyish; each ocellus ringed with a fuscous band; the distance between the eyes: the breadth of the head = 0.20 — 0.23. Thorax above brownish, below pale yellowish; propleuron with a distinct fuscous spot; mesopleuron with a fuscous spot in front of the middle coxa, but these spots are indistinct in some specimens. Fore legs brownish, middle and hind legs pale yellowish; in the fore leg, femur:tibia:tarsus = 9:14:23, tarsal joints rank 2 = 3, 4 = 1, 5; in the hind leg, femur:tibia:tarsus = 8:7:3, tarsal joints rank 5, 1, 2, 3, 4; claws similar in the fore legs, but dissimilar in the middle and hind legs. Wings hyaline, pterostigmatic portion obscured; veins brownish. Abdomen pale brownish; each of the tergites 2-9 with a darker band on its posterior margin; venter paler without any distinct marking. Penis lobes separated, each lobe broadened on its tip and somewhat curved outward; titillators obscured; forceps and cerci brownish.

Female:—Similar to the male; general colour much paler than in the male; the distance between the eyes: the breadth of the head = 0.42 — 0.45. In the fore leg, femur:tibia:tarsus = 7:8:5, tarsal joints rank 2, 3 = 1 = 5, 4; in the hind leg, femur:tibia:tarsus = 8.3:7.8:2.9, tarsal joints rank 5, 1, 2, 3, 4; claws dissimilar in all legs; subgenital plate semicircular; sternite 9 notched on its posterior margin.

Nymph:—Unknown.

Holotype:—Male.

Allotype:—Female.

Type locality:—Ohmi, Kyoto. Specimens: alcoholic; types collected by K. Imanishi, on May 2, 1932.

5. *Cinygma vernalis* n. sp.

This species is similar to *C. adusta*, but in the male of this species the distance between the eyes: the breadth of the head is 0.05 to 0.08.

| Measurement:      | Male        | Female      |
|-------------------|-------------|-------------|
| Body, length      | 7.5- 9.0 mm | 8.5- 9.0 mm |
| Fore wing, length | 8.0- 9.0    | 9.0-10.0    |
| Cercus, length    | 10.0-18.5   | 10.0-12.0   |

Description. Male:—General colour pale brownish; eyes dichoptic, greyish; each ocellus ringed with a fuscous band; the distance between the eyes: the breadth of the head = 0.05 to 0.08. Thorax above brownish; propleuron with a fuscous spot; mesopleuron with two fuscous spots in front of and behind the middle coxa as in *C. hirasana*. Legs pale brownish; in the fore leg, femur:tibia:tarsus = 7:9:17; tarsal joints rank 2=3, 1, 4, 5; in the hind leg, femur:tibia:tarsus = 7:5:3, tarsal joints rank 5, 1, 2, 3, 4; claws similar in the fore legs, dissimilar in the middle and hind legs. Wings hyaline, pterostigmatic portion obscured; veins pale brownish except Sc which is much paler. Abdomen pale brownish; each of the tergites 1-9 with a brownish band on its posterior margin; venter paler uniformly. Penis-lobes separated with a round membranous part between their bases; each lobe slender; titillators obscured; forceps and cerci pale brownish.

Female:—Similar to the male. The distance between the eyes: the breadth of the head = 0.35 to 0.40. In the fore leg, femur:tibia:tarsus = 6:7:5, tarsal joints rank 2, 3, 1=5, 4; in the hind leg, femur:tibia:tarsus = 7:5:2.5, tarsal joints rank 5, 1, 2, 3, 4; claws dissimilar in all legs. Abdomen reddish brown in some specimens due to eggs contained; sternite 9 prolonged and deeply notched on its posterior margin.

Nymph:—Undetermined.

Holotype:—Male.

Allotype:—Female.

Type locality:—Takagamine, Kyoto. Specimens: alcoholic; types collected by K. Imanishi, on April 15 and 19, 1931.

#### 6. *Cinygma dorsalis* n. sp.

This species is similar to *C. hirasana*, but is distinguishable from it by the costal and subcostal area in the fore wings which are greenish in this species.

| Measurement:      | Male        | Female      |
|-------------------|-------------|-------------|
| Body, length      | 6.0- 7.5 mm | 6.5- 7.0 mm |
| Fore wing, length | 6.5- 7.5    | 7.5- 8.5    |
| Cercus, length    | 13.0-15.5   | 9.0-10.5    |

**Description. Male:**—General colour light ochraceous; eyes dichoptic, light greenish in life; each ocellus ringed with a fuscous band; the distance between the eyes: breadth of the head = 0.37 to 0.45. Thorax without any conspicuous marking; fore legs dark greenish grey, hinder legs faint ochraceous except the distal parts of the last tarsal segments and claws which are smoky; in the fore leg, femur: tibia: tarsus = 6.2:9.2:13.7, tarsal joints rank 3, 2, 4, 1, 5; in the hind leg, femur: tibia: tarsus = 5.6:5.0:2.4, tarsal joints rank 5, 1, 2, 3, 4; claws similar in the fore leg, dissimilar in the hinder legs. Wings hyaline, pterostigmatic portion obscured; in the fore wing cells *c* and *sc* tinted with pale green; veins *C*, *Sc* and *R* greenish grey, other veins pale brownish to whitish; there is a brownish spot at the base of the fore wing; in the hind wing *Sc* greyish in its basal part. Abdominal segments 1-6 translucent; penis-lobes separated but each lobe in contact with each other at its inner side; titillators obscured; forceps and cerci whitish.

**Female:**—Similar to the male. General colour light yellowish; eyes dull greenish; the distance between the eyes: the breadth of the head = 0.48 to 0.50. In the fore leg, femur: tibia: tarsus = 5.5:7.5:5.0, tarsal joints rank 2, 3, 1 = 5, 4; in the hind leg, femur: tibia: tarsus = 6.5:5.5:2.5, tarsal joints rank 5, 1 = 2, 3, 4; claws dissimilar in all legs. Wings hyaline; in the fore wing cells *c* and *sc* tinted with olive-green, veins *C*, *Sc* and *R* greenish, humeral brace-vein also greenish, other longitudinal veins whitish; crossveins situated on the area from the apex to the cubitus brownish, other crossveins whitish; in the hind wing all veins whitish. Cerci whitish.

**Subimago:**—Similar to the imago but duller coloured.

**Nymph:**—It seemed to me there were at least two forms of nymphs closely allied to each other and living together in the same habitat in the same season. Then I captured about thirty of them from the same habitat in Kibune, and obtained imagines of both sexes from each form by rearing. But as the imagines emerged were very much similar to each other in respect to their sizes, to their relative lengths, to their coloration and to their sexual organs, I decided to treat them as two forms of nymphs of this species. One form with a distinct median whitish line which continues from the center of the posterior margin of the head to the 6th tergite of the abdomen; each side of the pronotum also narrowly whitish; tergites 8-10 of the abdomen not whitish. The other form is characterized by the following points: head broadly whitish along its lateral and posterior margins; median



whitish line which continues from the pronotum to the 3rd tergite of the abdomen very broad, about one half as wide as the breadth of the pronotum and it extends into the wing-buds; each side of the pronotum not whitish but tergites 8-10 of the abdomen whitish; both forms without respiratory filaments on the gill-lamellae. Length of body 6.0-6.5 mm; length of cercus 4.0-5.5 mm.

Holotype:—Male.

Allotype:—Female.

Type locality:—Kibune, Kyoto. Specimens: alcoholic; specimens obtained for the first time on May 31, 1930; types obtained on May 18-22, 1935 by rearing nymphs.

Genus: *Heptagenia* Walsh, 1863.

*Heptagenia kihada* Matsumura, 1931

*Heptagenia kihada* Matsumura: Matsumura, 1931. 6000 Ill. Ins. Japan-Emp., p. 1478.

*Kageronia suzukiella* Matsumura: Matsumura, 1931. 6000 Ill. Ins. Japan-Emp., p. 1479.

*Heptagenia kihada* Matsumura: Matsumura, 1933. Ill. Common Ins. Japan, vol. 5, p. 95.

| Measurement:      | Male         | Female      |
|-------------------|--------------|-------------|
| Body, length      | 10.0-11.0 mm | 9.0-12.0 mm |
| Fore wing, length | 11.5-12.0    | 10.5-12.5   |
| Cercus, length    | 30.0-40.0    | 16.0-25.0   |

Description. Male:—General colour black and yellow; head blackish with a large yellowish area at the base of each antenna; eyes greenish grey; the distance between the eyes: the breadth of the head = 0.26 to 0.28. Thorax above blackish, shining; side pale yellowish with irregular brownish markings; below blackish. Fore legs greyish; middle and hind legs pale yellowish; in the fore leg, femur:tibia:tarsus = 5:6:9, tarsal joints rank 2=3, 4, 5, 1, 1st tarsal joint: 2nd tarsal joint = 1:3.3 to 4.7; in the hind leg, femur:tibia:tarsus = 17:16:9, tarsal joints rank 5, 2, 3, 1, 4; claws dissimilar in all legs. Wings hyaline, pterostigmatic portion obscured, veins blackish. Abdomen pale yellowish except first and last segments which are brownish; each of the tergites 2-9 with a large subtriangular brownish marking which stands on its posterior margin, and which has a pair of indistinct paler markings on its center; each of the sternites 2-8 with a similar but paler subtriangular marking, sternite 9 brownish on its side, sternite 10 slightly convex on the middle of its posterior margin. Penis-lobes very characteristic; titillators distinct; forceps and cerci blackish.



Female:—General colour luteous; eyes black, each ocellus ringed with a fuscous band; the distance between the eyes: the breadth of the head = 0.47 to 0.48; frontal margin of head broadly brownish. Legs yellowish with darker tibiae and tarsi; in the fore leg, femur: tibia: tarsus = 12:13:11.7, tarsal joints rank 2, 3, 5, 4, 1; in the hind leg, femur: tibia: tarsus = 9:8:4, tarsal joints rank 5, 2, 3 = 1, 4; claws dissimilar in all legs. Wings tinted with somewhat yellowish colour, veins brownish. Abdomen reddish brown due to eggs contained; each of the tergites 1-9 with a brownish band on its posterior margin; below paler, sternites 8 and 9 pruinose; subgenital plate semicircular, sternite 9 scarcely notched on its posterior margin. Cerci brownish, paler distally.

Subimago. Female:—Similar to the female imago; wings subhyaline. Pronotum brownish, mesonotum with a subquadrate brownish marking on its antero-mesal portion and an undulate black line on its each side; tibiae of the fore legs, tarsi of all legs and cerci infuscated. Length of body 10.0-11.0 mm; length of fore wing 10.0-12.0 mm; length of cercus 14.0-16.0 mm. Male:—Similar to the female subimago but much slender than in the female; there is not any sign of the coloration and markings so conspicuous as seen in the male imago. Length of body 9.0 mm; length of fore wing 9.5-10.0 mm; length of cercus 14.0-15.0 mm.

The oldest specimens in my collection dated back May 31, 1931.

General coloration: General coloration: brown; eyes black; each ocellus ringed with a fuscous band; the distance between the eyes the breadth of the head 0.17 to 0.18; frontal margin of head broadly brownish; legs yellowish with darker tibiae and tarsi; in the fore leg femur: tibia: tarsus = 12:13:11.5; tarsal joints rank 2:3:4:1:1; in the hind leg: femur: tibia: tarsus = 9:8:4; tarsal joints rank 2:3:4:1:1; wings tinted with somewhat yellowish; abdomen reddish brown due to cross coloration; wings brownish; 7th abdominal segment brown due to cross coloration; each of the tergites 1-2 with a brownish band on its posterior margin; below plates 3-6 and 8-9 a brownish band; the genital plate semi-circular, sternite 9 scarcely notched on its anterior margin. Cerci

## EXPLANATION OF PLATE 15

- Fig. 1. Head of *Chrysomelid n. sp.*  
 Fig. 2. Head of *Chrysomelid n. sp.*  
 Fig. 3. Head of *Chrysomelid n. sp.*  
 Fig. 4. Head of *Chrysomelid n. sp.*  
 Fig. 5. Head of *Chrysomelid n. sp.*  
 Fig. 6. Head of *Chrysomelid n. sp.*  
 Fig. 7. End of the abdomen of *Chrysomelid n. sp.*  
 Fig. 8. End of the abdomen of *Chrysomelid n. sp.*  
 Fig. 9. End of the abdomen of *Chrysomelid n. sp.*  
 Fig. 10. End of the abdomen of *Chrysomelid n. sp.*  
 Fig. 11. End of the abdomen of *Chrysomelid n. sp.*  
 Fig. 12. End of the abdomen of *Chrysomelid n. sp.*  
 The oldest specimens in my collection dated back May 11, 1931.

