

Anomalous Mayfly Individuals (Ephemera).

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Among mayflies cases of anomaly seem to be rather rare. It is only during the last years that some gynandromorphic and intersexual individuals have been described. They all belong to the species *Baëtis Rhodani* PICT. LESTAGE (1922) describes a ♀-imago of this species, which had a large turbinate eye on the left side, similar to the eye of the male, while the right side of the head was normal. M. and R. CODREANU (1931) describe very minutely 10 cases of sexual mosaic in the same species, viz. 5 larvae, 1 subimago and 4 imagines. Seven of these had one turbinate eye, while three specimens had both the turbinate eyes, but of different size; the individuals were thus asymmetric. In all other respects they were like females, except one larva, in the abdomen of which, besides oviducts, was also found a tissue giving rise to spermatozooids. Since all these individuals were found in the same place, a mountain brook in the South Carpathian Mountains, and during three successive summers, this anomaly is probably due to a hereditary mutation.

These are, as far as I know, the only anomalies of mayflies, mentioned in the literature. In the material, collected in Finland I have found altogether 5 anomalous mayfly-individuals. They particularly deserve to be published, since they differ more or less from the ones, above mentioned, as regards the quality of the anomalies.

Three intersexual mayfly-individuals.

1. *Baëtis scambus* ETN. Imago, ♀, with small turbinate eyes. — This specimen I caught in LK: Salmi, Mantsinsaari 7. VIII. 1936. I made the following notes about it, while it still was fresh. Head, thorax and I segm. of abdomen dark brown, the rest of the abdomen

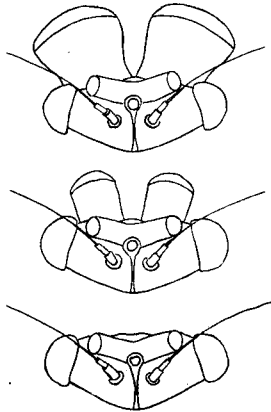


Fig. 1. *Baëtis scambus* ETN. Head of ♂, an intersex and ♀, viewed from the front (somewhat schematically).

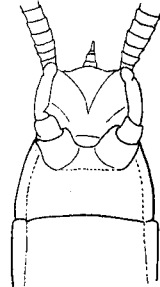


Fig. 2. *Baëtis* sp., intersex. Ventral aspect of the VIII—X segments (Orig.).

greenish brown as in the ♀, opaque, without gonopods, of a slightly lighter hue than the thorax. Head symmetrical, turbinate eyes both of the same size, seen from above quite round, cylindrical in form. Their diameter only $\frac{1}{4}$ of the breadth of the head, their color brownish green (fig. 1). Lateral eyes larger than turbinate eyes, oval, their color greenish black. Forelegs short, as in the female. Cerci white, except 4 basal joints, which are brown. In the hindwing two not branched longitudinal veins, and a tooth in the front-edge; the third vein is missing. Body 5, forewing 5.5, cerci 9.5 mm.

2. *Baëtis* sp. (? *bioculatus* L.) intersexual subimago. — Found in PS: Kuopio, Maljapuro 14. VII. 1901 (J. E. ABO). Preserved in alcohol and has already lost its color completely. Both turbinate eyes developed; they are obviously of the same size and probably somewhat smaller than normal (this cannot be stated with certainty, as the head is somewhat injured, apparently the specimen has been

put in dried condition into the conservation-liquid). The abdomen is broad and opaque as in the female, probably full of eggs. Also the end of the abdomen is, seen from above, as in the female, but this is caused by the fact, that the X segm. is exceptionally strongly developed, about as long as the IX segm., and conceals the forceps under itself. Looking from underneath (fig. 2), one sees, that the gonopods, located in their normal place, the hind edge of the IX segment, extend just to the end of the abdomen.

3. *Cloëon praetextum* BGTN., intersexual imago. It has been caught by J. E. ABO 5. VII. 1906 in St: Heinoo, Myllypuro. He has labelled it »hermaphrodite». This specimen has been preserved in benzine and is now quite faded and has also otherwise kept badly. One can, nevertheless, still ascertain, that it has both turbinate eyes and comparatively small gonopods. Abdomen opaque, evidently containing ovaries.

All our three intersexual mayflies differ from those previously known by being bilaterally symmetrical, the two last mentioned also by having both turbinate eyes and gonopods.

It may be mentioned, that in this case it is a question of intersexes and not of gynandromorphs, as the ♂- and ♀-parts of the body in these three individuals are not strictly apart from one another, as is the case in gynandromorphs according to MEISENHEIMER (1930). The head of the specimen 1. is a fine intermediate form between a ♂- and a ♀-head, on the other hand the abdomen of the two latter contain both ovaries and gonopods. In the specimen 2. even the end of the abdomen is an intermediate form between ♂- and ♀-qualities.

I have not wished to examine more closely the contents of the abdomina of these specimens, because it would give very small results, as they have not been kept as fresh in fixation-liquid and are also otherwise rather badly preserved. Besides, I wish to keep these rare specimens whole for some time.

Among the insects, sexually intermediate forms are generally effected by the xx-xy mechanism (GOLDSCHMIDT 1931). Only last year it was found out, that in a certain chironomid-species, *Chironomus plumosus* L., nematods (*Paramermis* sp.) living as parasites in the abdomen of this gnat, may cause an abundant occurrence of gynandromorphic individuals (PHILIPP 1936). These

gynandromorphs are bilaterally symmetrical. It is not impossible, that parasites, that cause symmetrical anomalies similar to the above described, may also live in mayflies, — since they are slender water-animals like the *Chironomidae*.

A case of hypertrophy of the male qualities in *Leptophlebia marginata* L.

J. E. ARO found in PK: Liperi 28. VI. 1905 an anomalous ♂-imago of *Leptophlebia marginata* L., which has been preserved in alcohol and is now quite faded. In this individual's abdomen's VIII

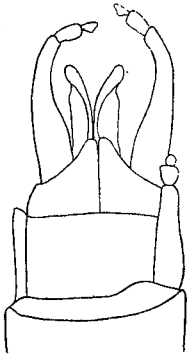


Fig. 3. *Leptophlebia marginata* L., a male with 3 gonopods. Ventral aspect of the VIII—IX segments (Orig.).

segment's hind-edge is an additional forceps-plate, which extends from one side of the segment to the other (fig. 3). It is asymmetrical: on the right side it has an outstanding portion, which probably corresponds to the right half of a normal forceps-plate, but the median fissure is missing. From the outstanding part projects an additional gonopod, which is shorter than the regular, normal gonopods, — its length is $\frac{7}{10}$ of the length of the forceps. It is not bent towards the median line as the normal gonopods, but is fairly straight, tightly pressed to the skin, and directs itself directly backwards. Its joints are also in some degree of a different form than the forceps-joints.

The origin of this anomaly is probably difficult to explain. It may be a new formation, but considering the fact, that that third gonopod is located just in the VIII segment, it is possible that we have to do with an atavism. The additional gonopod would consequently be an inheritance from early, primitive forms, that still had a pair of styli in the VIII segment.

One can make many objections against this supposition. No known fossil representative of the order *Ephemeroidea* has styli in the ♂'s VIII segment, neither have their predecessors, the species of the order *Protephmeroidea*, known from the upper carbon-layers (HANDLIRSCH 1919, p. 140). In addition, that third gonopod is too strongly developed to be a reminiscence of a rudimentary organ. Further-

more it is not paired and very much resembles the IX segment's normal gonopods.

The possibility of atavism offers, nevertheless, so much of interest, that there is reason to discuss it further.

Among forms of the recent insects only the genera *Lepisma* and *Machilis* of the order *Thysanura* have styli in pairs and even a pair of gonapophyses in the ♂'s VIII segment. Just the thysanures have been supposed to be the nearest relatives of the mayflies, on the ground that the mandibles of the thysanures and the mayfly-nymphs resemble one another (HANDLIRSCH 1919, p. 360). The derivation of the thysanures from winged predecessors is supported by the trachea-system of the side-plates of *Lepisma*'s thorax (ibid. p. 325). It has been suggested, that the *Protephemeroidea* may be the common origin of the mayflies and the bristle-tails (ibid. p. 363). The common primary forms of these orders have possibly had styli in the VIII segment, — this primitive characteristic has then been maintained only in certain thysanures.

The original form of the winged insects is supposed to have been the hypothetical *Protentomon* (ibid. p. 318), the larva of which has styli in each segment, the ♀ in the VIII and IX segments, but the ♂ only in the IX segment. Nothing prevents us from supposing, that there has also been such a *Protentomon*, that has also had styli in the ♂'s VIII segment, and that these may appear atavistically in some mayfly of the present day.

To be atavism, this phenomenon in any case must originate from times immeasurably long ago. Comparing the recent mayflies with the representatives of the order *Ephemera* of the Permian period, *Prottereismidae* (HANDLIRSCH 1919, p. 140), we notice that the mayfly-type has prevailed surprisingly unchanged up to the present days. Why then could this type not also maintain the possibility of an atavistic appearance of the VIII segment's stylus?

Rudimentation of the cross-veins in the wings of *Heptagenia sulphurea* MÜLL.

I have already formerly (TIENSUU 1935, p. 13) briefly mentioned a certain ♂-imago of *Heptagenia sulphurea*, in the wings of which the cross-veins are rudimentary (fig. 4), and have given it the name forma *denervosa*. This specimen I got at Rytty in Sortavala

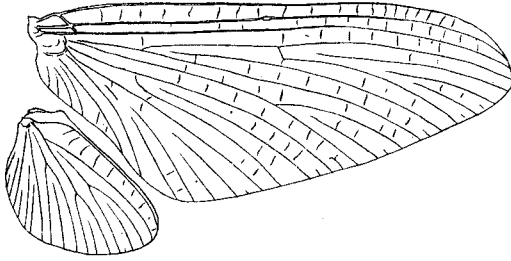


Fig. 4. *Heptagenia sulphurea* MÜLL. f. *denervosa*
TIENSUU. Wings (Orig.).

27. VII. 1934. As the system of veins in the wings of *H. sulphurea* is very thick and dark, this exceptional individual, having light wings, looks very peculiar.

There are normally in the forewing of the *H. sulphurea* ♂ about 170 cross-veins, of them 22—26 in the costal area and 24 in the subcostal area, and in the hind-wing 98—102 cross-veins, in the specimens, that I have examined.

The cross-veins of forma *denervosa* are all deficient, lying as short, free bits halfway between the longitudinal veins. It is only in the apical part of the costal area that some of them stretch as far as to the costa. All told, there are in the right fore-wing the remnants of 90 cross-veins, of them 20 in the costal area and 13 in the subcostal area. The rest are in the tracts of the medialis and the cubitus. In the right hind-wing there are altogether only 10 deficient cross-veins; they are in the subcostal area. Of the other cross-veins there are not even colorless traces in the wings. Both the longitudinal veins and the bits of the cross-veins are of normal color, greenish brown. The wings of the left side are, as regards the cross-veins, almost perfect reflected images of the ones of the right side, showing only small differences. In other respects this specimen does not differ from a normal one.

The origin of this anomaly is easy to explain. It is evidently a mutation. It may be mentioned, that in the gene-chart of *Drosophila melanogaster* (MORGAN 1928, p. 23) occurs a mutant gene, »crossveinless», that causes an analogous anomaly.

These five anomalous mayflies are in the collections of the Entomological Museum of the University of Helsinki.

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