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Biology and development of Stenochironomus gibbus
Fabr. (Diptera, Chironomidae)

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THE BIOLOGY AND DEVELOPMENT OF *STENOCHIRONOMUS GIBBUS* FABR.
(DIPTERA, CHIRONOMIDAE) UNEDITED DRAFT TRANSLATION

Only for information

N.S. Kalugina

TRADUCTION NON REVISÉE

Information seulement

In the literature there are data on the metamorphosis and biology of two species of the genus *Stenochironomus* Kieff., namely: *St. fascipennis* Kieff. (A.A. Zabolotskii (ЗАБОЛОЦКИЙ), 1939) and *St. nelumbus* Tok. et Kur. (M. Tokunaga and M. Kuroda, 1935*). The biology and development of *Stenochironomus gibbus* Fabr. have not been described. There are data on the occurrence of this species in the lakes of Central Europe (L. Brundin, 1949).

Stenochironomus gibbus is a characteristic representative of the fauna of the Uchinsk †(artificial) Reservoir. The larvae of this species mine the soft layers of the flooded wooden stumps which are decomposing in the water. For them, the decomposing wood serves not only as a shelter, but also as a source of nutrition. The gut of larvae

* The pagination of the text is thus indicated. Translator

* Due to non-availability of the literary source, we have not been able to familiarize ourselves with the work of Tokunaga and Kuroda (M. Tokunaga and M. Kuroda, 1935). The work is cited by Lenz (Fr. Lenz, 1941) and Thienemann (A. Thienemann, 1954).
(Author)

† Italic brackets () enclose translator's parentheses.

extracted from the wood is stuffed, as a rule, with wood-crumb^s. Rarely, the larvae are encountered in the dead parts of macrophytes. The larvae are narrowly adapted to mining. They usually do not emerge onto the surface of the substrate, and can neither crawl on the surface of the substrate nor swim. Newly-born larvae, on the contrary, are well adapted to movement in a free aquatic medium. The behaviour of new-born larvae and their hypothetical rôle in the distribution of larvae by stations (*sic*) are described in another article (N.S. Kalugina, in the course of publication). The larvae winter within the wood. Larvae of the older stages winter in the Uchinsk Reservoir. The maximum flight of the imago is observed in the middle of June and at the end of July. The males swarm near the shore of the reservoir at a height¹ of 1-1.5 metres. The swarms are fairly dense, vertically drawn-out, egg-shaped. The height² of a swarm is 1 metre. The females sit on neighbouring shrubs.

Data on the development of *St. gibbus* was collected in the following manner. From impregnated females caught in nature, ovipositions were obtained in the laboratory. The larvae which emerged from the ovipositions were reared in pieces of soft, rotten wood. As the development of the larvae proceeded, a proportion of them was taken out of the wood and fixed. *St. gibbus* pupae that are ready for transformation emerge from the wood and float to the surface. We collected the exuvia of the pupae on the surface of the water in a vessel. The imagines which flew out were caught by the gas hood that covered the vessel.

Given below is a description of the various stages of metamorphosis of the species under study.

Stenochironomus gibbus Fabr. 1794.

Fabricius. Ent. Syst., IV, 245.

Syn. *flexilis* auct., nec. Linn.; *fasciatus* Geoffr., Kieff.

Imago. Male. Body well-proportioned, thin, length 5 mm. Head and bulbs of antennae, brownish-yellow; oral parts and flagella of antennae, [22] brown; proximal part of second segment of antennae, yellow. Pronotum, light-green. Middle zone of mesonotum, reddish-yellow; lateral zones, brown.

¹ ² Meaning altitude and vertical dimension respectively. Translator

Scutellum, greenish-yellow; metanotum, brown. Thorax, reddish-yellow underneath. Legs, yellow; femora and hind tibia, brown; proximal third of fore femur and distal third of hind tibia, yellow. The wings (Figure 1 B) have a light-grey transverse stripe; at the edges of the wing, the stripe becomes pale, and is sometimes not visible; the costal cell is sometimes slightly darkened; wing length, 3.5 *mm*, width, 1 *mm*. First four segments of abdomen, light-green, remainder, brown; the rear edge of the fourth segment may be brown, and the front edge of the fifth segment, green. The hypopygium (Figure 1*B), is brown.

Female. Body short, wide, the end of the abdomen not reaching the summits of the wings. Body length, 4 *mm*. Head and antennae, yellow. Oral parts and last segment of antennae, brown. Thorax and legs coloured as in the male; legs long, fore-legs reaching 10 *mm* in length. The wings (Figure 1 A) have a wide, dark-grey transverse stripe; at the leading and trailing edges of the wing, the stripe is drawn-out toward the wing-base. Moreover, at the leading edge, the stripe reaches the wing-base. The first 2-3 segments of the abdomen are green, and the remainder are light-yellow with black arabesques; the terminal segments are black. Wing length, 4 *mm*; wing width, 1.3 *mm*.

Pupa. The colour of the mature pupa is determined by the colour of the imago, which may be seen translucently through the integument of the pupa: thorax, yellow-brown; abdomen, light-green with a dark end. Exuvium, yellow. Length of pupa, 6-7 *mm*. Along the rear edge of tergite II there is a continuous band of hooks directed sharp end forward. On tergites II-VI and on the natatorial plate there is a shagreen of spinules whose pointed ends face to the rear. At the front edge of tergites II-V and at the rear edge of tergites III-VI, the spinules are twice as large as in the middle. In the middle of tergite VI, the spinules are small and are sometimes not visible. On the natatorial plate (Figure 2) the spinules are disposed near the lateral-basal angles. The anal-lateral angles of the preanal segment [23] bear combs having 4-7 short, wide, brown teeth. The number of marginal bristles on segments V-VIII is 4:4:4:5. The natatorial plate is oval, with a fringe of long, soft bristles.

* This is to be construed, not as the second letter of the Latin alphabet, but as the third letter of the Cyrillic alphabet.

Larva, stage IV*. The body is bright-red, with a widened, dorsally-ventrally flattened, muscular thorax and a long, thin, flabby abdomen (Figure 3 Г). The length of the body is about 15 mm. The fore prolegs have the appearance of a low ridge furnished with even rows of sickle-shaped claws, the pointed ends of which face to the rear (*vide* Figure 3 Д). The rear prolegs (*vide* Figure 3 E) are shorter than the segment which bears them; their distal ends are directed rearward. The penicilla are markedly reduced (vestigial). The anal gills are skittle-like. On the segments of the body, there are merely very short bristles. The head is dorso-ventrally oblate, widened toward the base, and the fore edge is cut off straight; the cephalic capsule is brown; the maximum width of the capsule is 0.8 mm. The submentum (*vide* Figure 3 A) has a concave upper edge, with black teeth; in the middle of the submentum there are two teeth, there are four pairs of lateral teeth, the edges of the submentum are curved into the head, and the fourth lateral tooth overlaps the third from behind. Within the oral cavity there is a complex, fairly strong, chitinized formation which may be seen translucently through the chitin of the submentum; in its position, this formation resembles the hypopharynx and glossa of larvae of the Tanypodinae (A.A. Chernovskii, 1949); on its distal end there is a bilobate plate with a granular surface and a thin trident, the points of which sometimes bifurcate at the ends. The paralabial plates are weakly scooped-out, with a smooth, concave upper edge and an obtuse outer angle. The mandible (*vide* Figure 3 B) is strongly chitinized, and its entire distal half is black; the base of the mandible is right-angled; there are five teeth, of which usually only three may be seen from without. The antenna (*vide* Figure 3 B) has five segments; on the distal end of the first segment there is a wide, flat, blunt bristle, [24] which reaches the proximal end of the third segment; on the distal third of the first segment, on one side, there is a thin, sharp bristle; the antenna index is 1.35.

Larva, stage III. In structure, it resembles the stage IV larva. Body length, 8 mm. Width of cephalic capsule, 0.4 mm. Antenna index, 1.15.

* The terminology of A.A. Chernovskii (1949) is used. (Author)

Larva, stage II. In structure, it resembles the stage IV larva. Body length, 4 mm. Width of cephalic capsule, 0.25 mm. Antenna index, 1.

Larva, stage I. The body of the new-born larva narrows uniformly toward the end, and is transparent (*vide* Figure 4 Г); body length, 0.7-2 mm. The fore prolegs have the appearance of tall tubercles, furnished both with short, sickle-like claws and with long, sword-like claws (*vide* Figure 4 Д). The rear prolegs (*vide* Figure 4 Е) are approximately twice as long as the segment bearing them, and they face ventrally with their distal ends. The bristles of the penicilla are long. The anal gills have the shape of cucumbers. Segments I-VI of the abdomen bear two pairs of long bristles each. Each bristle is approximately twice as long as the width of the body. Segment VII bears one pair of bristles. Segment VIII of the abdomen and the thoracic segments bear short bristles. The cephalic capsule is light-brown; its width is 0.1 mm. The submentum (*vide* Figure 4 А) has a concave upper edge, and the teeth are dark-brown; in the middle there is one tooth, which is lower and twice as wide as the first lateral tooth; narrowing toward the summit, it forms gently-sloping shoulders at the sides. There are three pairs of lateral teeth; the edges of the submentum curve inward, so that the third lateral tooth goes behind the second (overlaps the second from behind). The plate occurring within the oral cavity is not divided into two lobes. The paralabial plates are smooth, trapezoidal, expanding toward the base of the head, with a markedly concave, short, smooth upper edge and an acute outer angle. The mandible (*vide* Figure 4 Б), having a black distal part and a triangular base, bears four black true-teeth and one brown pseudo-tooth; all teeth may be seen from without. The antenna (Figure 4 В) consists of five segments; on the distal end of the first segment, there [25] is a wide band of blunt bristle^s, which reaches the middle of the fourth segment; the antenna index is 0.2. The shape of the body of the stage I larva changes markedly after the larva's transition to the mining way of life. The thoracic segments expand, and the thorax becomes twice as wide as the abdomen. The abdomen becomes drawn-out, lengthening by almost a factor of 3. The larva acquires the "golden*" body shape, becoming, in this regard, like the larvae of age stages II-IV.

* The allusion here is to the ЗЛАТИЦА (*zlatitsa*), i.e. the butterfly larva having a golden hue. Translator

Oviposition (Figure 5). A round lumplet of sticky, transparent mucus. In the centre of the lumplet there is an oval disc of denser mucus. The ends of the disc are curved as if going to meet one another. The eggs are located inside the disc. The longitudinal axes of the eggs are perpendicular to the plane of the disc. The eggs form unclear rows which go from one curved end of a disc to the other. The size of a disc is 2-2.5 mm, and the width (*sic*) of the layer of sticky mucus is 1.5-2 mm. The oviposition adheres readily to the surface of submerged objects either side.

The description of the imago given by us does not, on the whole, contradict the original description by J. Ch. Fabricius (1794). In (the reports of) F. Edwards (1929) and M. Goetghebuer (1937), the zones (stripes) of the imago's mesonotum are described as yellow, whereas in our specimens the lateral zones (stripes) of the mesonotum are brown. In view of the fact that the chromatic features often vary in the Chironomidae, we refrain, for the time being, from segregating our specimens into an independent species or subspecies on the basis of this difference. In the descriptions given by the two latter authors and in the classification key of R. Coe (1950), *St. gibbus* is not stated to have a darkening of the forward edge of the wing. Goetghebuer (1937) segregates specimens with a darkened forward wing-edge as *St. gibbus occultus* Kieff. In our material, darkening of the forward edge of the wing is always clearly visible in the females, but in the males it is sometimes so pale as to be unnoticeable. In consequence of the fact that this feature thus exhibits a tendency to variation, we do not segregate our specimens into a special subspecies as Goetghebuer does. The hypopygia of males from our material do not differ essentially from the *St. gibbus* hypopygium depicted by Goetghebuer (1937). In the collection of the Zoological Institute of the Academy of Sciences of the USSR, females similar to ours were identified by Goetghebuer as *St. fasciatus* Geoffr. and *St. gibbus* Fabr. A male similar to the ones described here was identified by A.A. Chernovskii as *St. gibbus* Fabr. The synonymy of the species is given according to Goetghebuer (1937).

The *St. gibbus* pupa differs from the *St. fascipennis* pupa described by A.A. Zabolotskii in a greater number of teeth on the anal-lateral angles of the preanal segment and in the oval shape of the natatorial plate.

In describing the development of representatives of the family (*sic*) Chironomidae, we consider it expedient to give, as well as descriptions of the imago, pupa, mature larva and oviposition, a description of the new-born larva. New-born larvae of the Chironomidae differ markedly, morphologically, from the larvae of the three subsequent stages, and for their identification the formulation of independent classification keys is required. The species [26] *St. gibbus* has been included by us in the classification key for new-born larvae of the Chironomidae (N.S. Kalugina, in course of publication).

In conclusion I express deep gratitude to N.Yu. Sokolova and A.V. Frantsov for the help given to me in the work.

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FIGURE 1. *St. gibbus* imago:

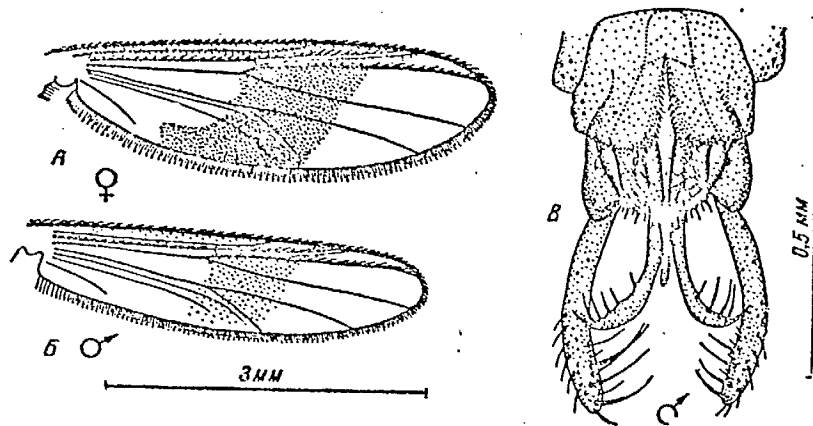


Рис. 1. Имаго *St. gibbus*. А — крыло самки; Б — крыло самца; В — гипопигий самца

- A wing of female;
- Б wing of male;
- B hypopygium of male.

* * *

FIGURE 2. *St. gibbus* pupa:

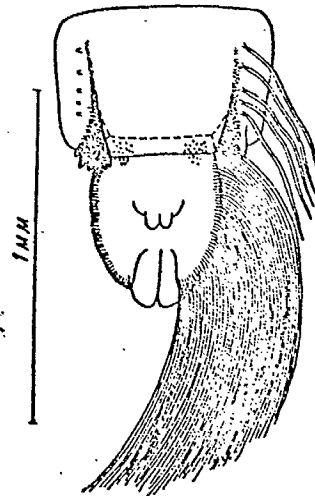


Рис. 2. Куколка *St. gibbus*.
Преанальный сегмент и плавательная пластинка

Preanal segment and natatorial plate.

FIGURE 3. *St. gibbus* larva, stage IV.

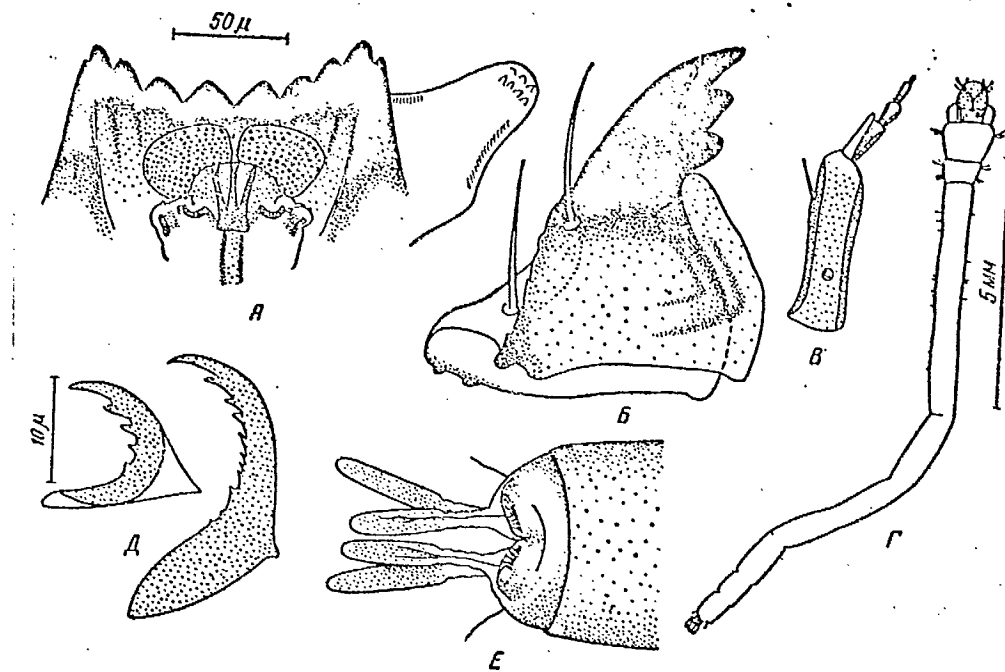


Рис. 3. Личинка *St. gibbus* IV стадии. А — субментум (7×40); Б — мандибула (7×40); В — усик (7×40); Г — общий вид личинки; Д — крючья передних подталкивателей (15×60); Е — конец тела личинки

- Legend: А submentum (7 × 40);
Б mandible (7 × 40);
В antenna (7 × 40);
Г general view/appearance of larva;
Д claws of the fore prolegs (15 × 60);
Е end of the larva's body.

* * *

FIGURE 4. New-born *St. gibbus* larva.

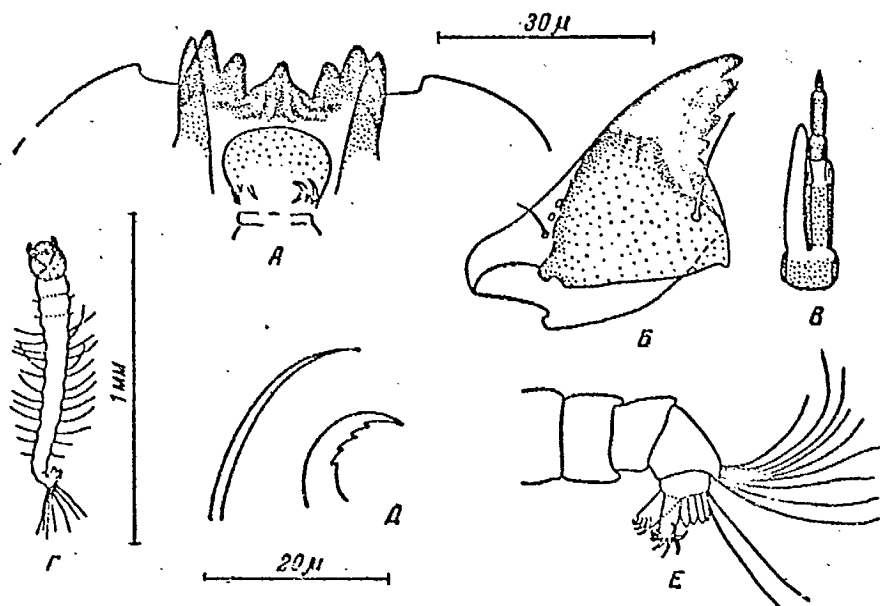


Рис. 4. Новорожденная личинка *St. gibbus*. А — субментум (10 × 60); Б — мандибула (19 × 60); В — усик (10 × 60); Г — общий вид личинки; Д — крылья передних подгалкивателей (20 × 60); Е — конец тела личинки

- Legend:
- A submentum (10 × 60);
 - Б mandible (10 × 60);
 - В antenna (10 × 60);
 - Г general view/appearance of larva;
 - Д claws of fore prolegs (20 × 60);
 - Е end of the larva's body.

* * *

FIGURE 5. *St. gibbus* oviposition:

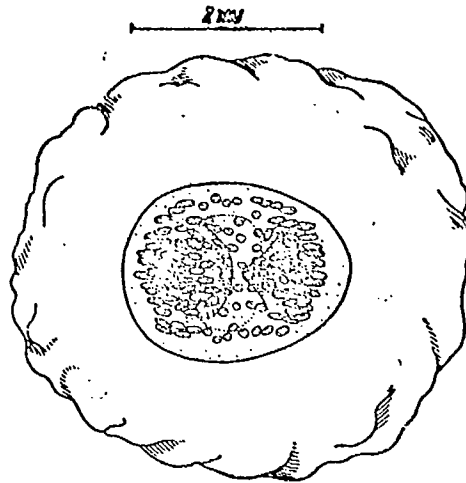


Рис. 5. Яйцекладка *St. gibbus*

* * *

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