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**Pictorial Keys of Chironomid Species  
(Order: Diptera) in El-Tall El-Keber Wastewater  
Treatment Plant, Egypt**

R. Saleh-Ahmed, F.M. Ismail, A. Abo-Ghalia and N.S. El-Shenawy  
Department of Zoology, Faculty of Science,  
Suez Canal University, Ismailia, Egypt

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**Abstract:** In the present study, pictorial keys are given for the identification of larvae, pupae and adults of chironomid species collected from El-Tall El-Keber wastewater treatment plant, Egypt. Two genera: *Chironomus* Meigen and *Kiefferulus* Goetghbuer and six species: *C. calipterus* Kieffer, *C. formosipennis* Kieffer, *C. cafrarius* Kieffer, *C. imicola* Kieffer, *C. seydeli* Goetghbuer and *K. brevibuca* (Kieffer) are recorded from this region for the first time. Outline drawings of the representatives of each genus were presented.

**Key words:** Chironomidae, keys, wastewater treatment plant, Egypt

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## INTRODUCTION

The Chironomidae, known popularly as non-biting midges are considered the most widely distributed and abundant family of aquatic insects (Mousavi *et al.*, 2003). Adult chironomids are most evident when forming conspicuous swarms, hovering over bushes, trees or other proud markers, before dusk on summer days. The developmental stages of Chironomidae are typically aquatic and benthic. Larvae often represent a major component of the multi-plate fauna in all types of waters and are used frequently as bio-indicators of ecosystem health. Also, they are playing an important role in detritus processing and food chains (Garcia and Suárez, 2007).

The country of Egypt, although important for its location, serving as a corridor between the Palaearctic and the Afro tropical regions, presently offers little knowledge of its chironomids fauna. The most old publications (Kieffer, 1925; Freeman, 1958; Steyscal and El-Bialy, 1967) are now outdated. While the present knowledge of taxonomy, ecology and biology of the Egyptian chironomid fauna remain limited, there are efforts to remedy the situation (Zalat *et al.*, 1992; Ghonaim *et al.*, 2001a, b, 2004, 2005a, b). The purpose of the present study is to add some knowledge on the taxonomy of this family, which has not fully studied in Egypt.

## MATERIALS AND METHODS

### **The Study Area**

El-Tall El-Keber wastewater treatment plant was designed to serve the population of El-Tall El-Keber city (Fig. 1). Wastewater is pumped to the plant from a pumping station located outside the plant. The station was built on five feddans by the Egyptian government; it lies in the Eastern South of El-Tal El-Kbeer city (Fig. 2).

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**Corresponding Author:** Rowaida Saleh Ahmed, Department of Zoology, Faculty of Science, Suez Canal University, Ismailia, Egypt

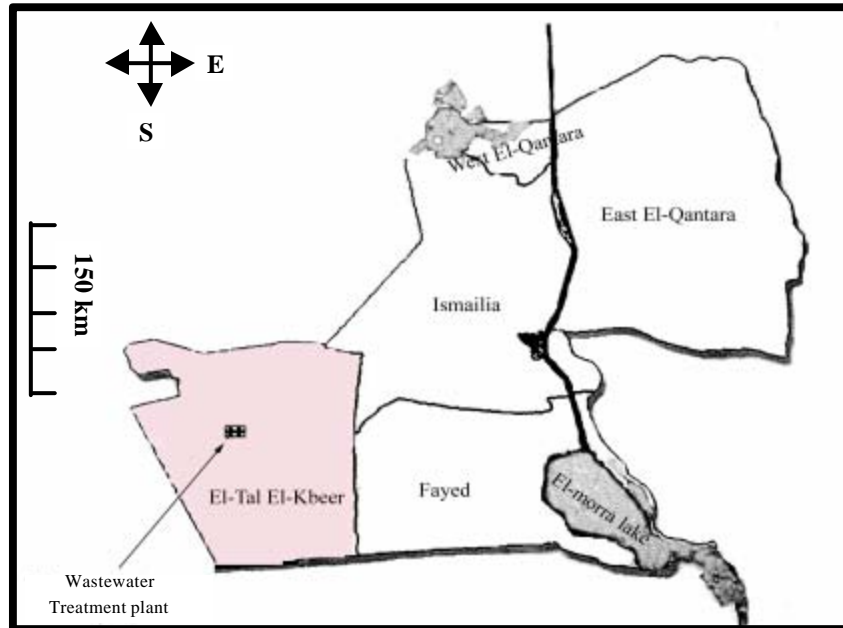


Fig. 1: Map of El-Tal El-Kaber city



Fig. 2: El-Tal El-Kaber wastewater treatment plan

The exact areas that feed the station are El-Tal El-Sagheer, Abd Al Dayem suburb, El-Tal City and north of rail way station. The output water runs through Al Wadi drain from El-Tal El-Kbeer to Ismailia waterway to reduce the under ground water level.

#### **Sample Collection and Preparation**

Field investigations were conducted monthly from September 2003 to August 2004. Chironomid larvae were collected by short sweeps at depth up to about 1 m from inlet and outlet lagoons. They sorted live, separated from the sludge and returned to the laboratory in plastic buckets with some field water.

In the laboratory, each sample was washed by distilled water and sorted under the microscope, some larvae were fixed in 70% alcohol with few drops of glycerin for identification by dissection of head capsule, the remaining sorted larvae were reared to the adult stage as the methods described by Chattopadhyay (1991).

#### **Identification and Preservation**

Identifications were mainly based on available keys (Epler, 2001; Ghonaim *et al.*, 2001a, b, 2004, 2005a, b) with updates from more recent available literature. The examination and drawing of specimens were made by using a binocular microscope and a camera Lucida. Identification of each species was based primarily on reared adult male specimens; then females, larvae and pupae were later identified by association with males.

#### **Dissection of the Head Capsule**

The mouth parts are of great importance in the identification of chironomid species. Therefore, larval specimens were dissected for extraction and examination of head capsule and mouth parts. Then mouth parts were mounted on cleaned slides using the technique described by Epler (2001).

### **RESULTS AND DISCUSSION**

The field-collected larvae simply cannot be identified with certainty. The most desirable procedure for associating larvae with their respective pupae and adult is by rearing. A successfully reared individual yields all the larval, pupal and adult characters for that particular species. Confirmation of species identifications by rearing larvae is important to ensure the integrity of chironomid database (Watts and Pascoe, 1996). The identification of the collected species depends on the rearing mechanism and studying the characters of all stages.

Chironomids as biomonitors should prove to be quite valuable once taxonomy is improved and environmental requirements are defined at the species level. If this were done, the accurate species lists and identification keys would be valuable tools in the biological assessment of water quality (Seire and Pall, 2000). According to this study Two genera: *Chironomus* Meigen and *Kiefferulus* Goetghebuer and six species: *C. calipterus* Kieffer, *C. formosipennis* Kieffer, *C. cafrarius* Kieffer, *C. imicola* Kieffer, *C. seydeli* Goetghebuer and *K. brevibucca* (Kieffer) are now confirmed to the Egyptian fauna. Outline drawings and pictorial keys are given for the identification of larvae, pupae and adults of the collected species (Fig. 3-20).

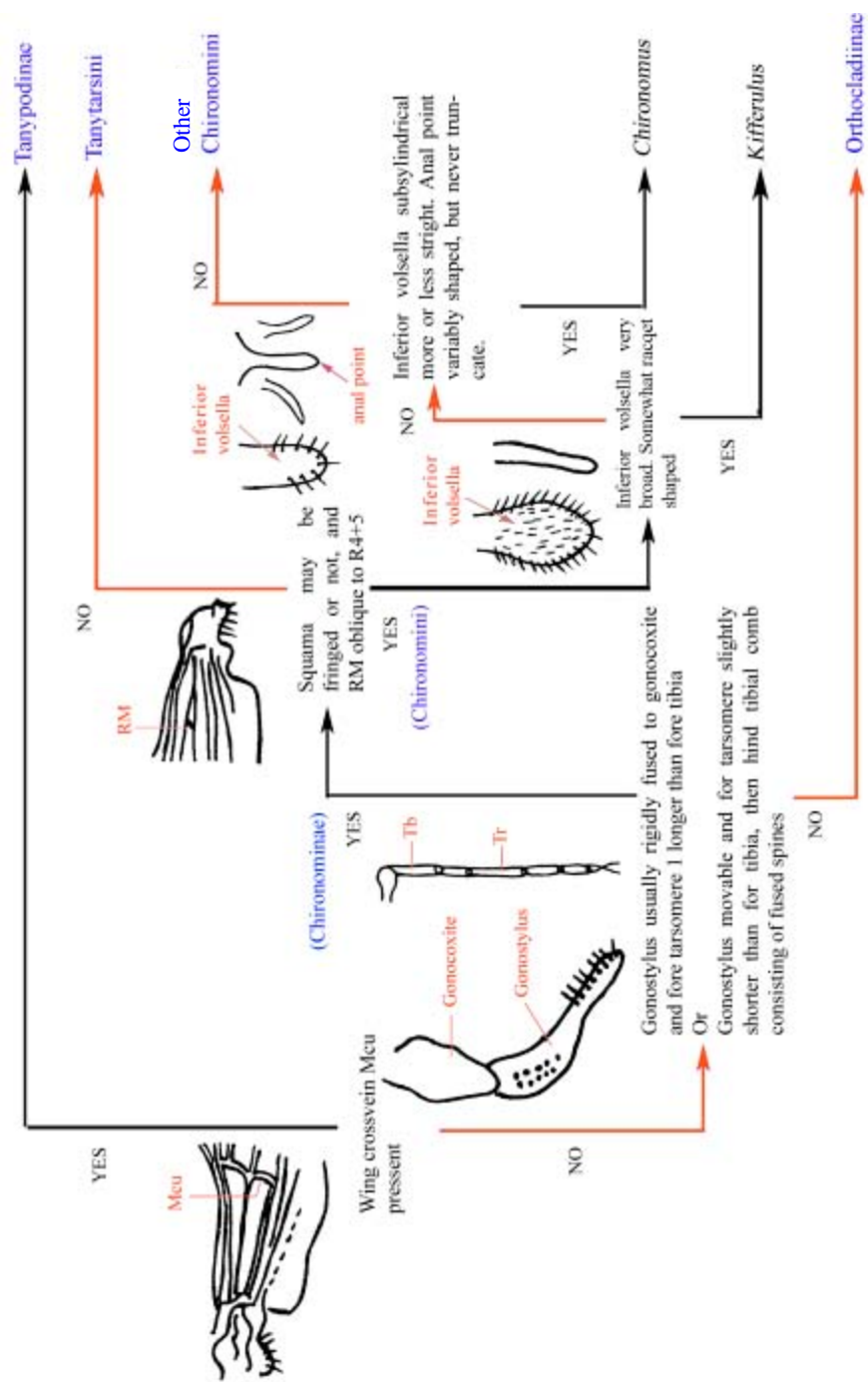


Fig. 3: Pictured key to the studied species (characters of adult male)

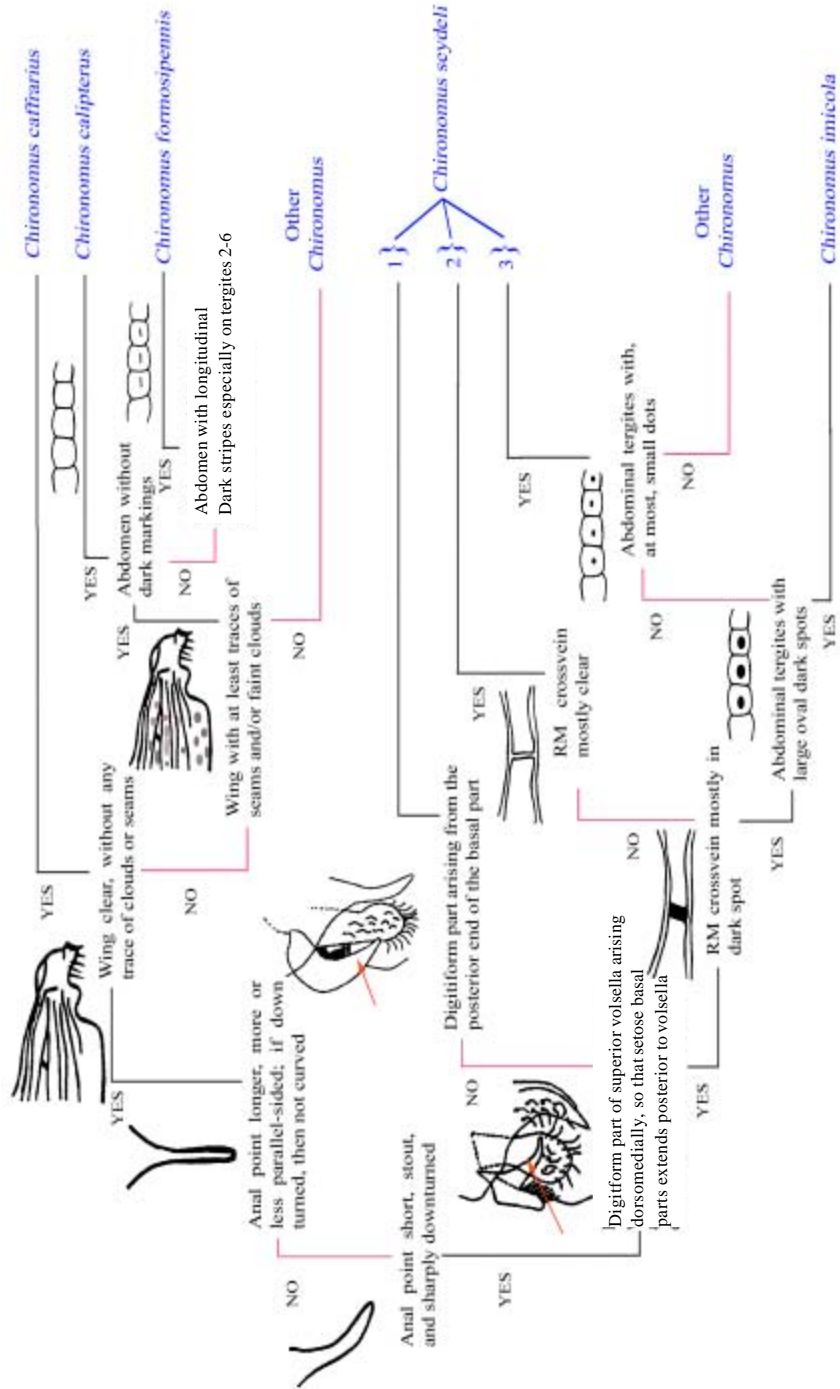


Fig. 4: Pictured key to *Chironomus* species (characters of adult male)

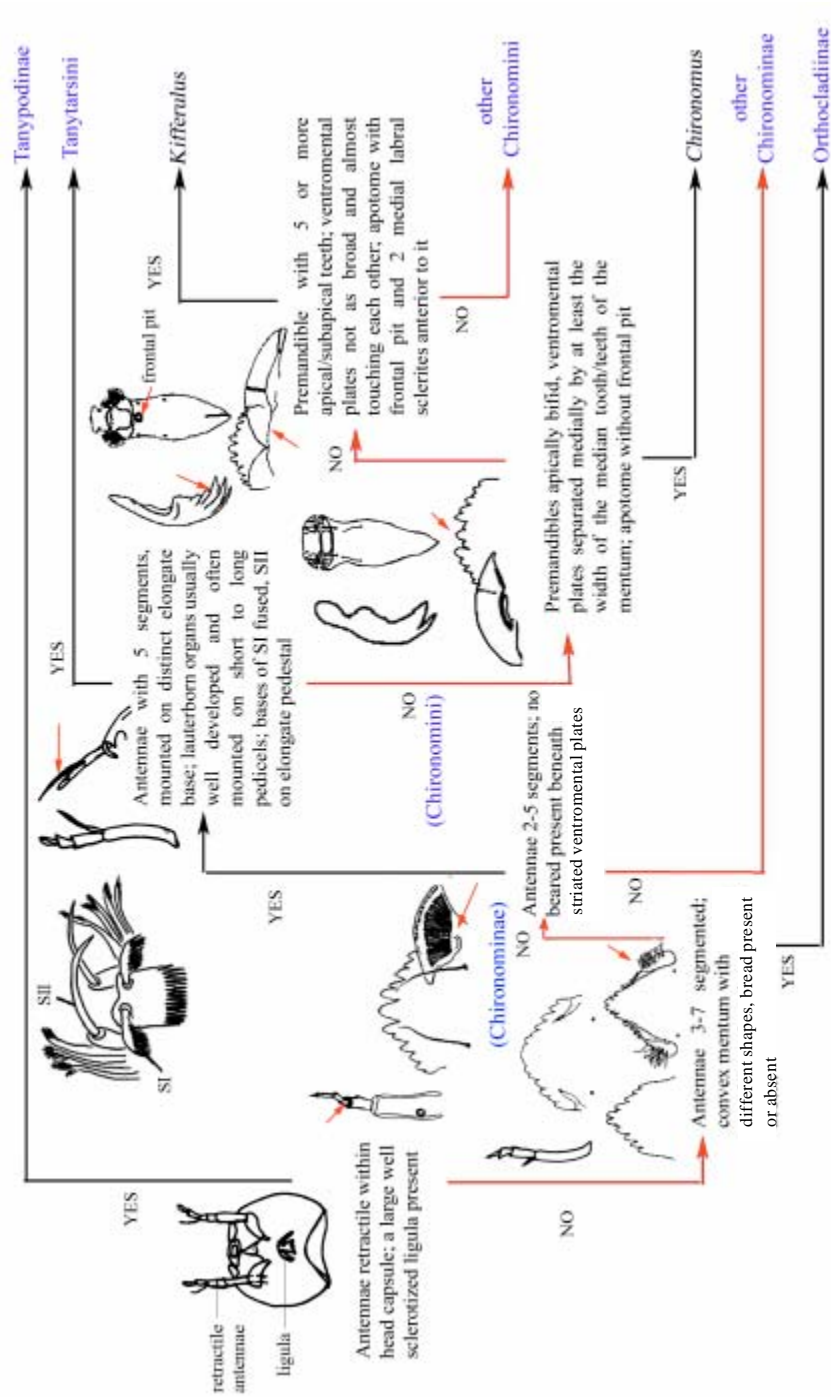


Fig. 5: Pictured key to the studied species (larval characters)

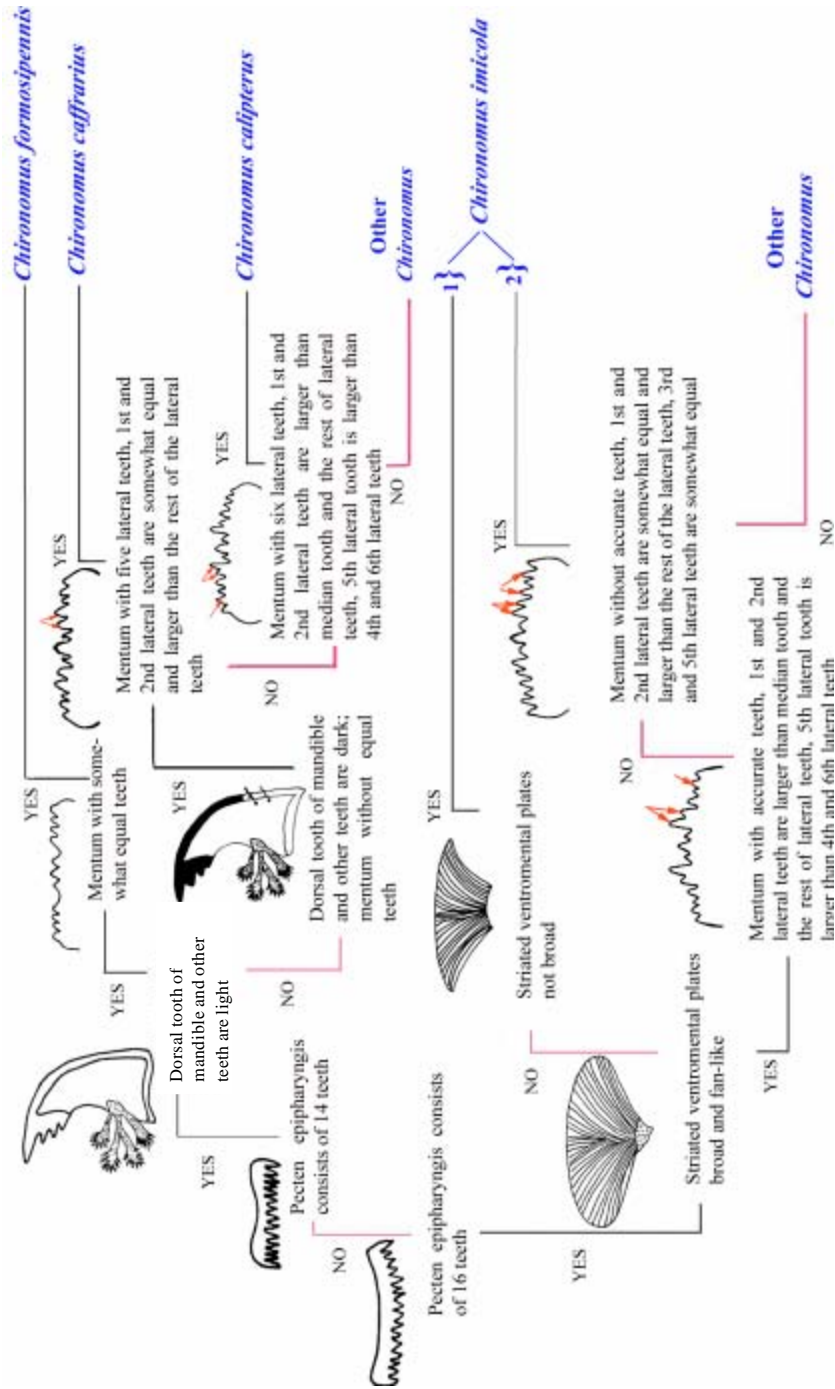


Fig. 6: Pictured key to *Chironomus* species (larval characters)



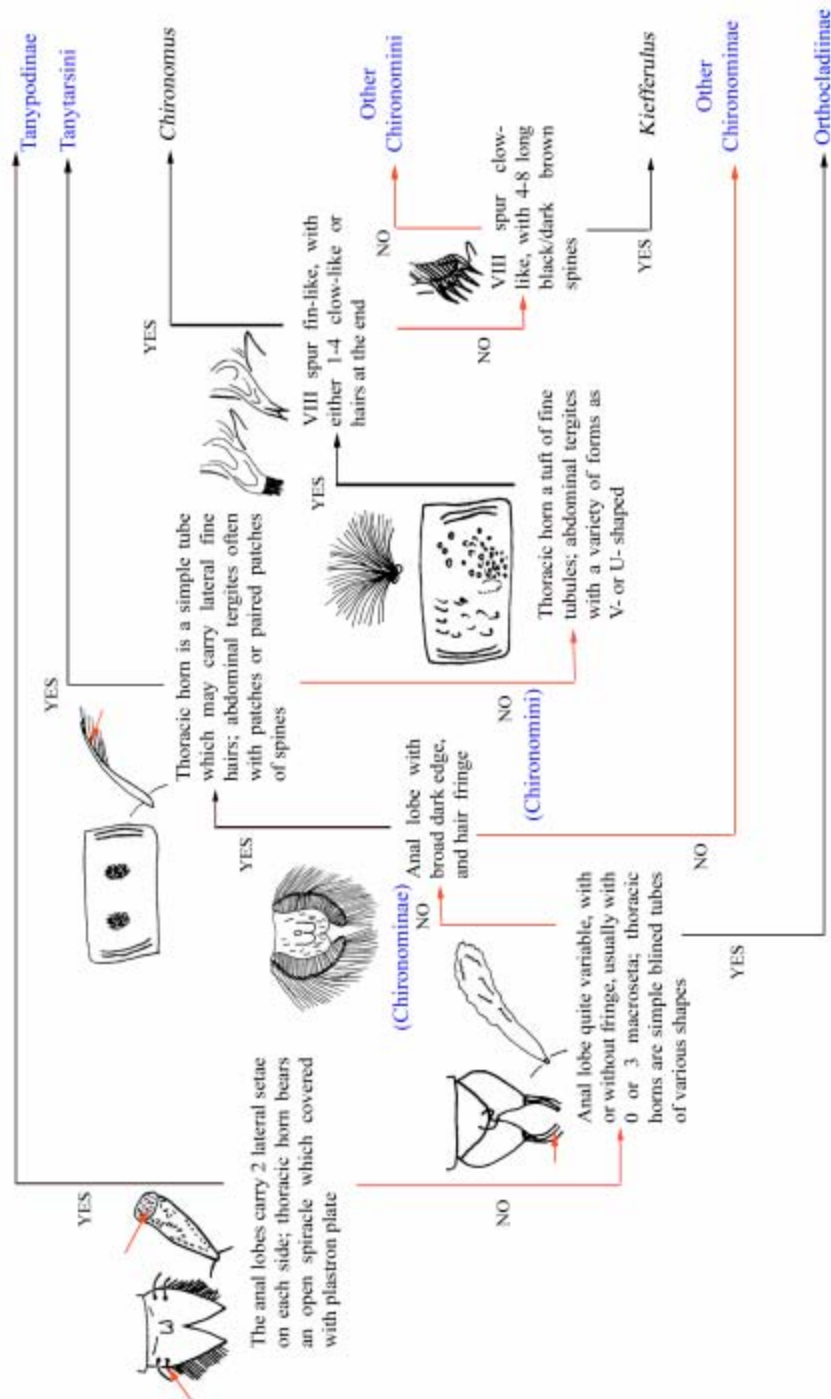


Fig. 7: Pictured key to the studied species (pupa characters)

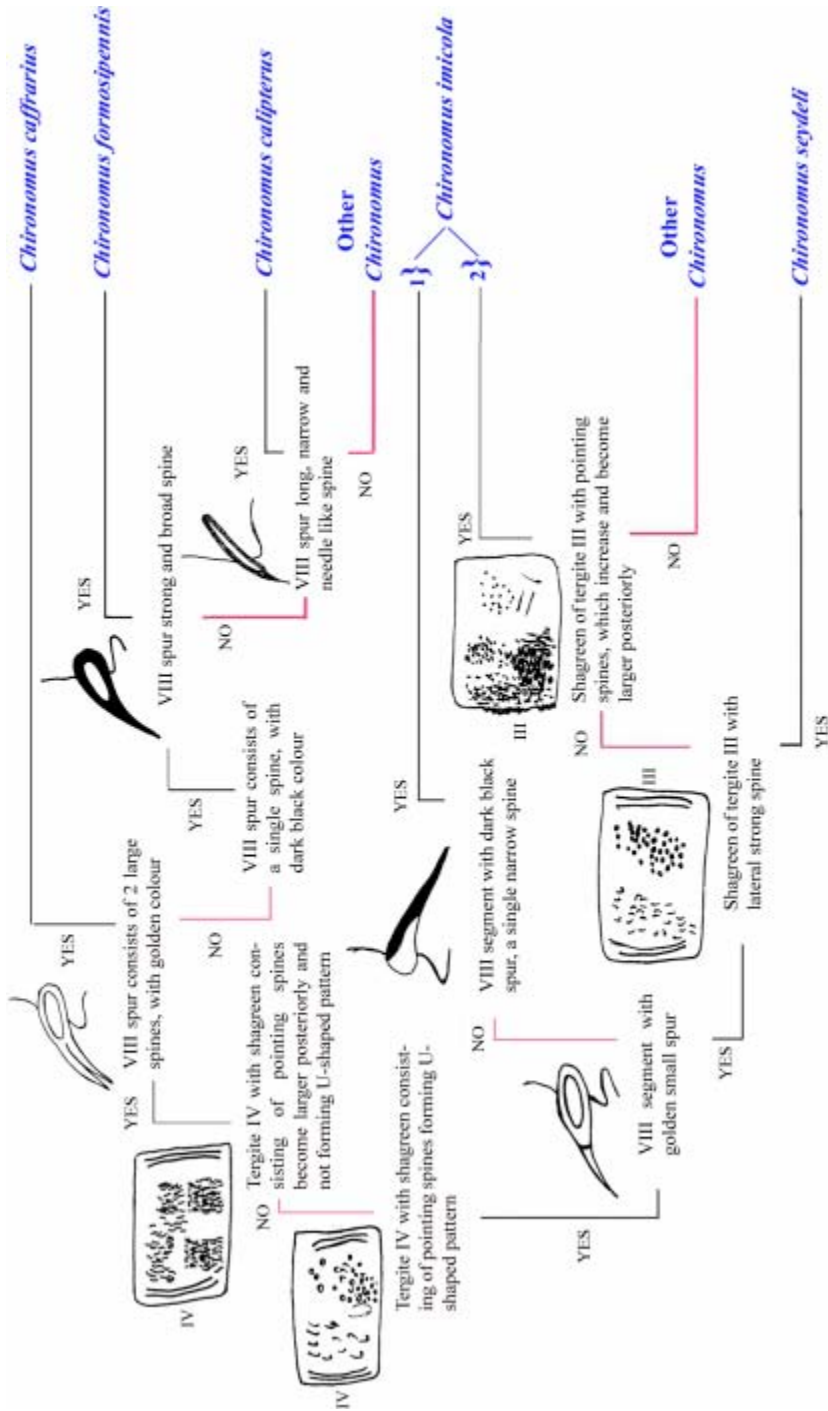


Fig. 8: Pictured key to *Chironomus* species (pupal characters)

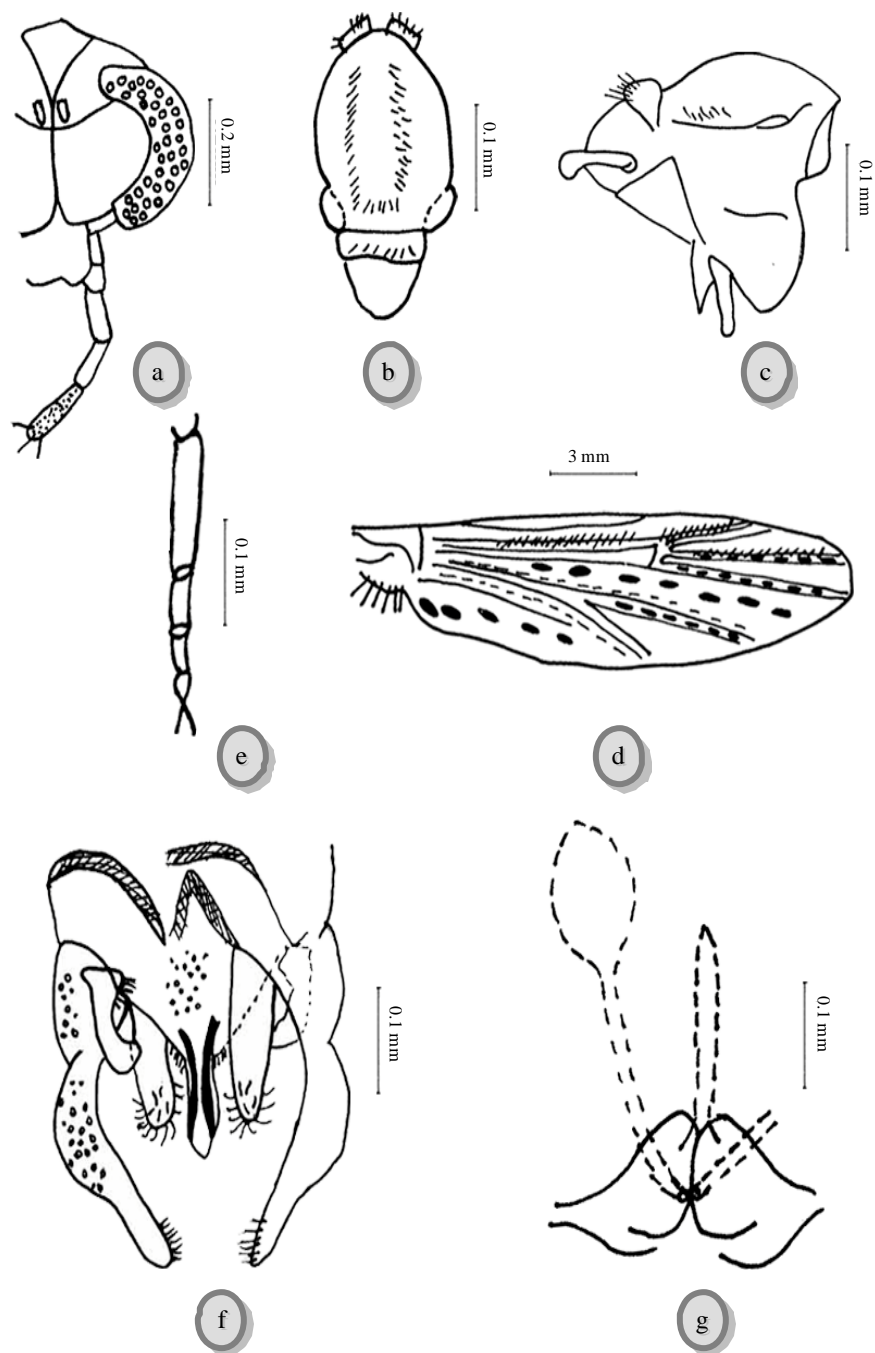


Fig. 9: *Chironomus calipterus*. Adult: (a) head, (b) dorsal view of thorax, (c) lateral view of thorax, (d) wing, (e) fore tarsomeres, (f) hypopygium of male and (g) female genitalia

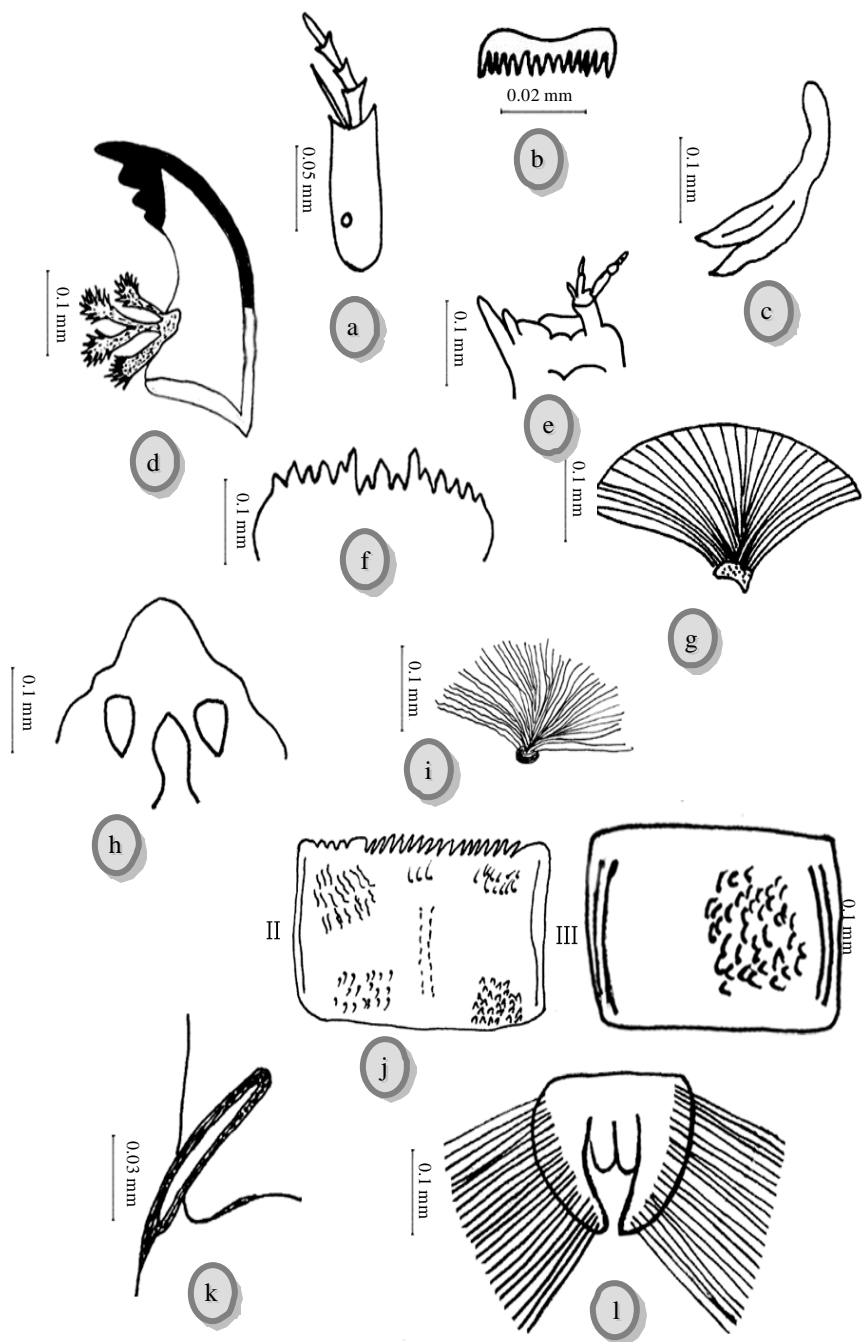


Fig. 10: *Chironomus calipterus*. Larva: (a) antennae, (b) pecten epipharyngis, (c) premandible, (d) mandible, (e) maxilla, (f) mentum, (g) ventromental plate, Pupa: (h) frontal plate, (i) thoracic horn, (j) shagreen of tergite IV, (k) VIII spur and (l) anal lobe

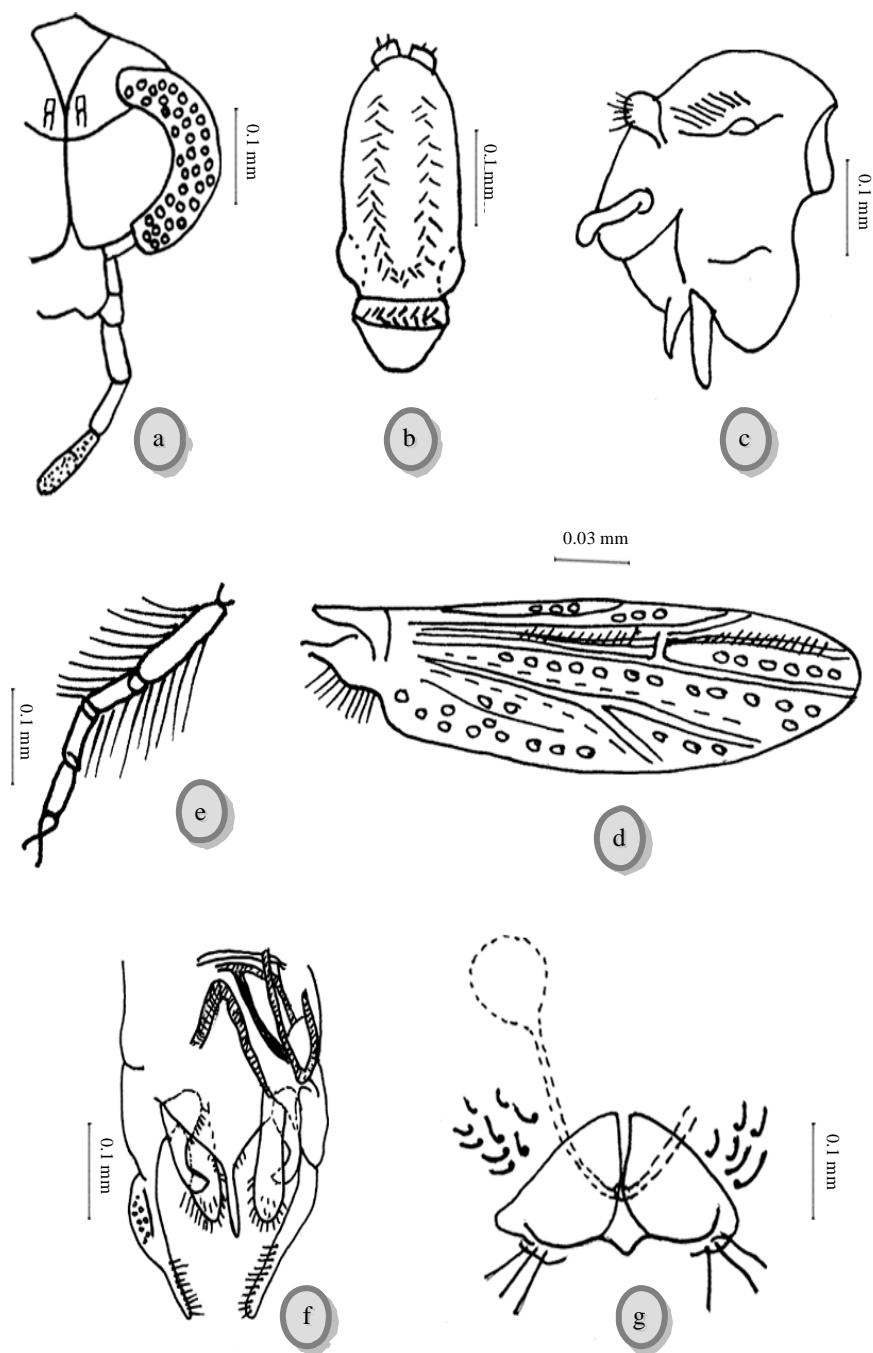


Fig. 11: *Chironomus formosipennis*. Adult: (a) head, (b) dorsal view of thorax, (c) lateral view of thorax, (d) wing, (e) fore tarsomeres, (f) hypopygium of male and (g) female genitalia

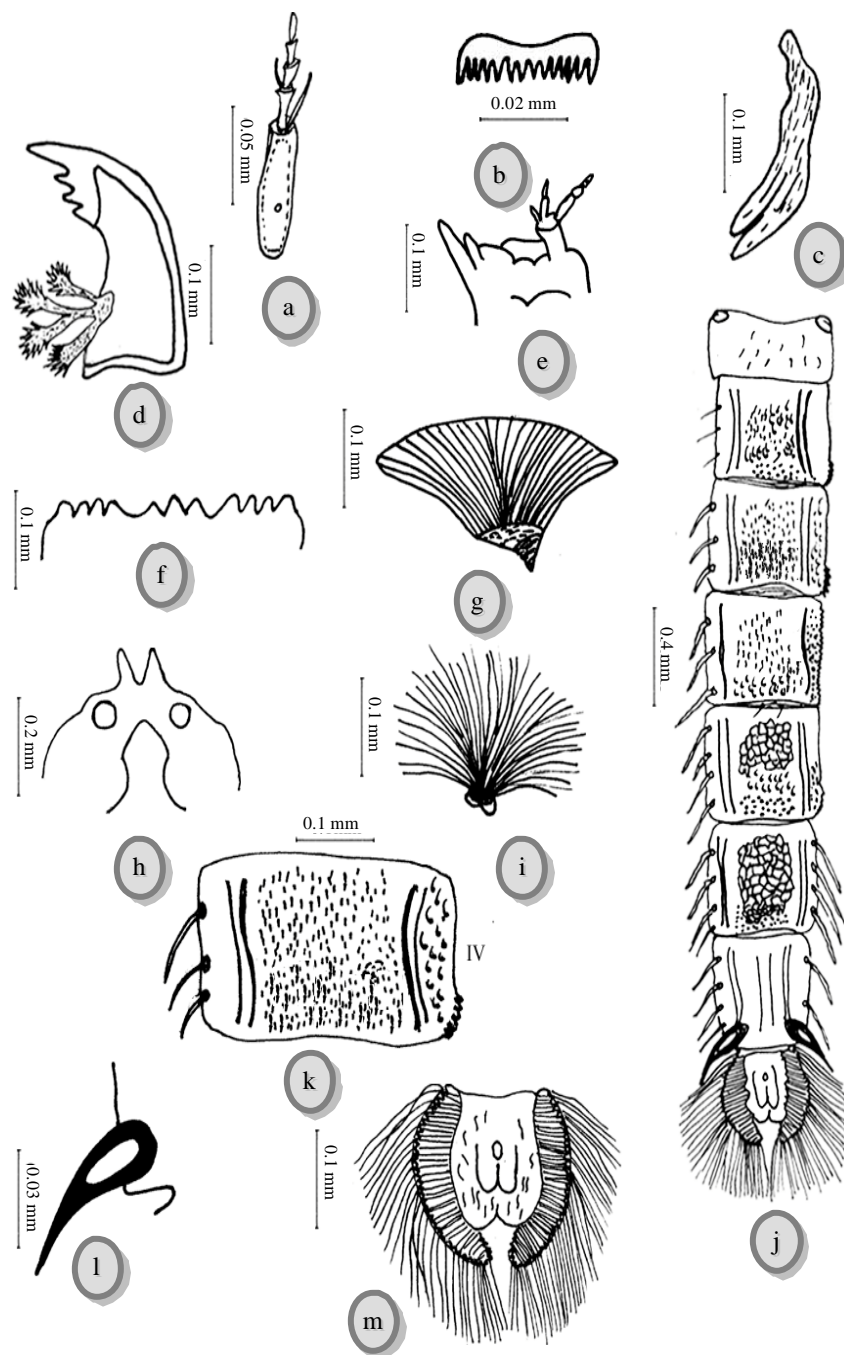


Fig. 12: *Chironomus formosipennis*. Larva: (a) antennae, (b) pecten epipharyngis, (c) premandible, (d) mandible, (e) maxilla, (f) mentum, (g) ventromental plate; Pupa: (h) frontal plate, (i) thoracic horn, (j) abdominal tergites, (k) shagreen of tergites II and III, (l) VIII spur and (m) anal lobe

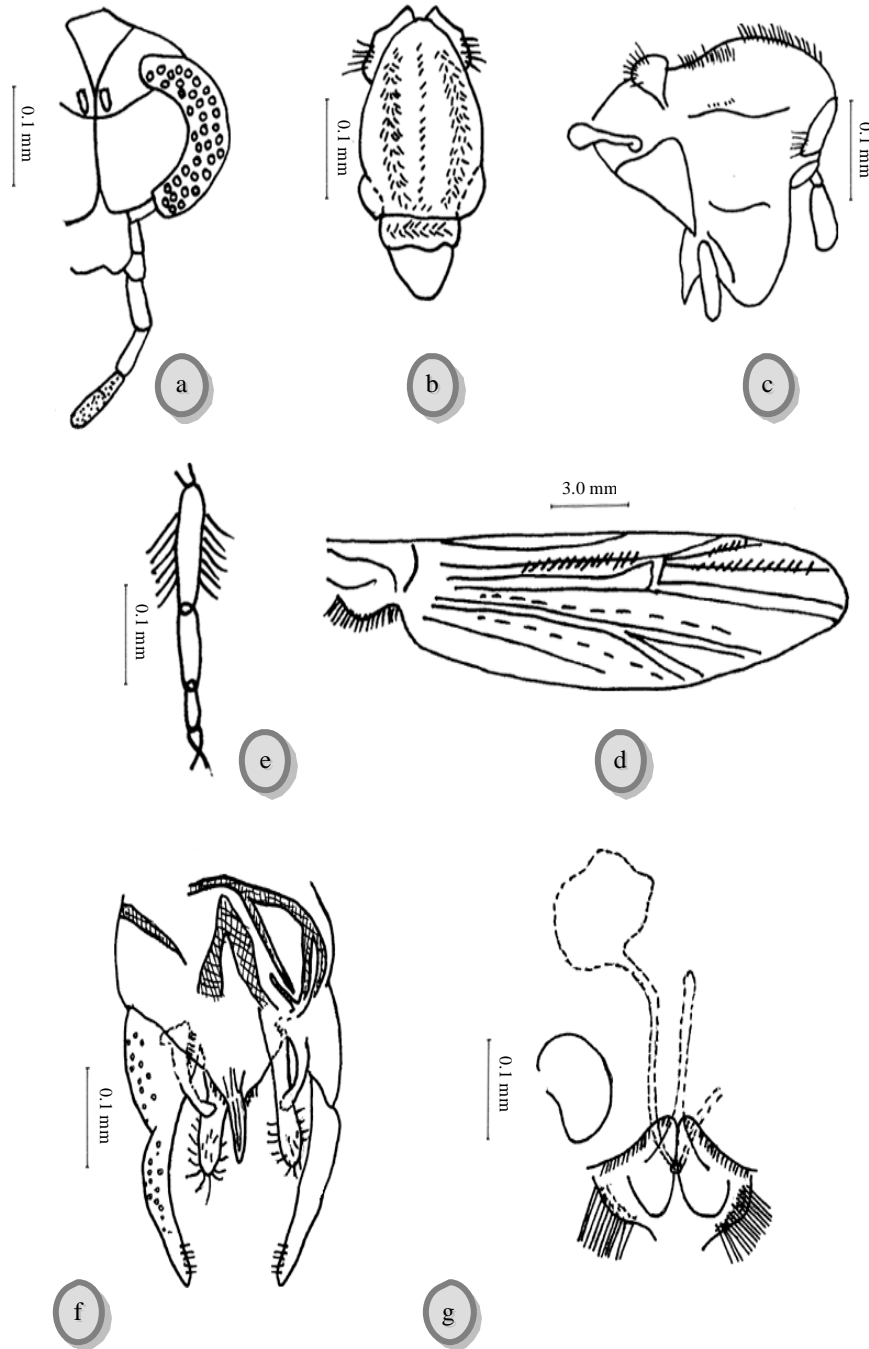


Fig. 13: *Chironomus cafrarius*. Adult: (a) head, (b) dorsal view of thorax, (c) lateral view of thorax, (d) wing, (e) fore tarsomeres, (f) hypopygium of male and (g) female genitalia



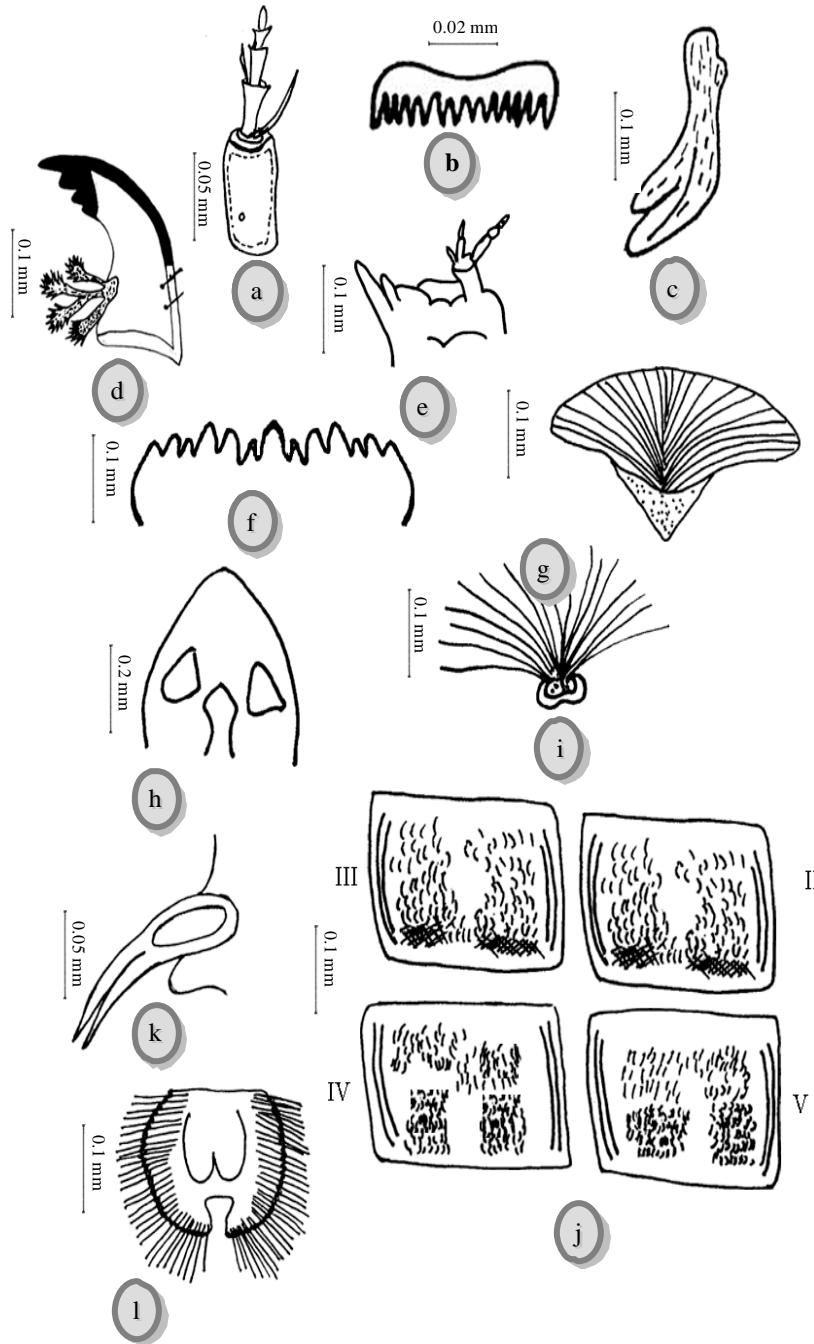


Fig. 14: *Chironomus cafrarius*. Larva: (a) antennae, (b) pecten epipharyngis, (c) premandible, (d) mandible, (e) maxilla, (f) mentum, (g) ventromental plate; Pupa: (h) frontal plate, (i) thoracic horn, (j) shagreen of tergites II, III, IV and V, (k) VIII spur and (l) anal lobe



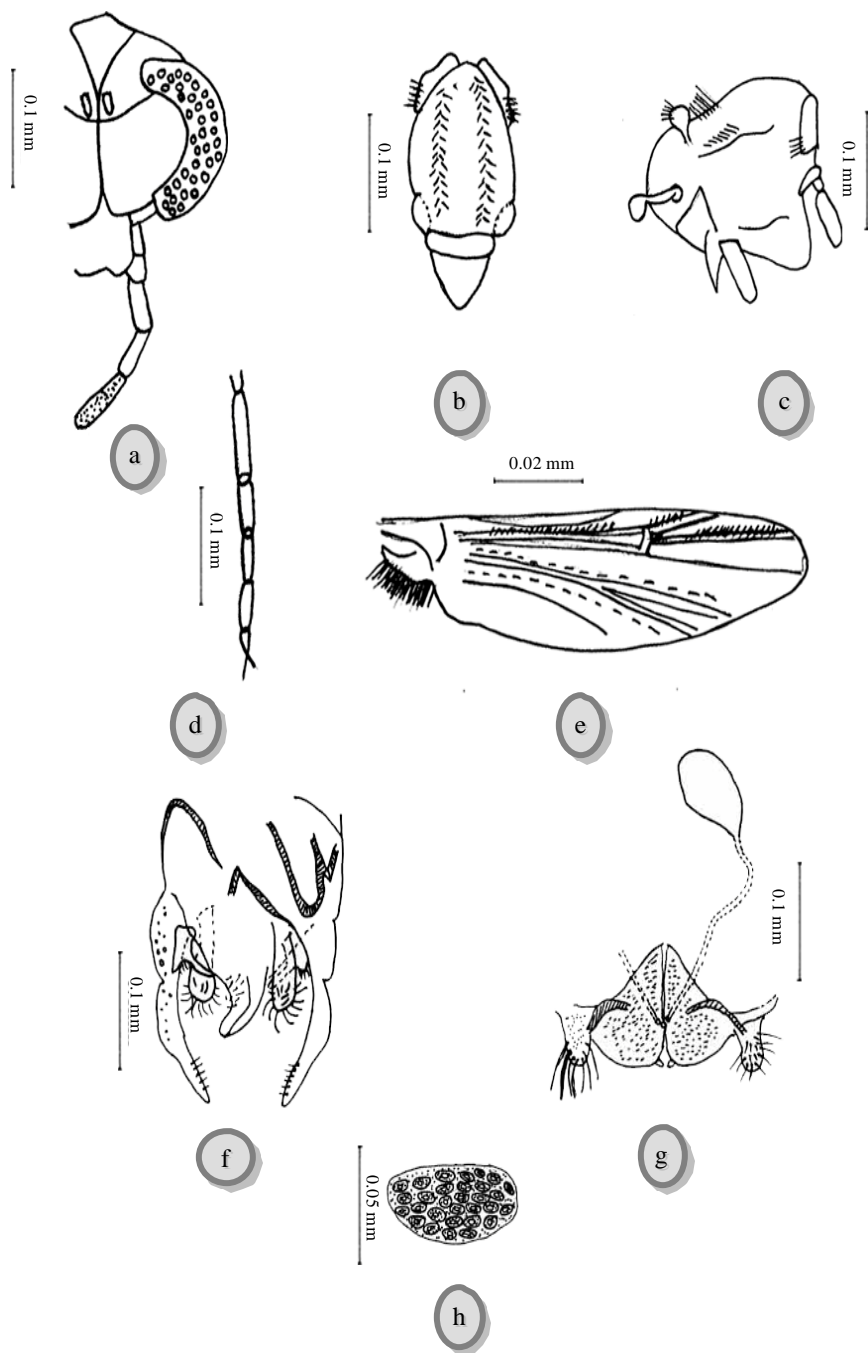


Fig. 15: *Chironomus micola*. Adult: (a) head, (b) dorsal view of thorax, (c) lateral view of thorax, (d) wing, (e) fore tarsomeres, (f) hypopygium of male, (g) female genitalia and (h) egg sac

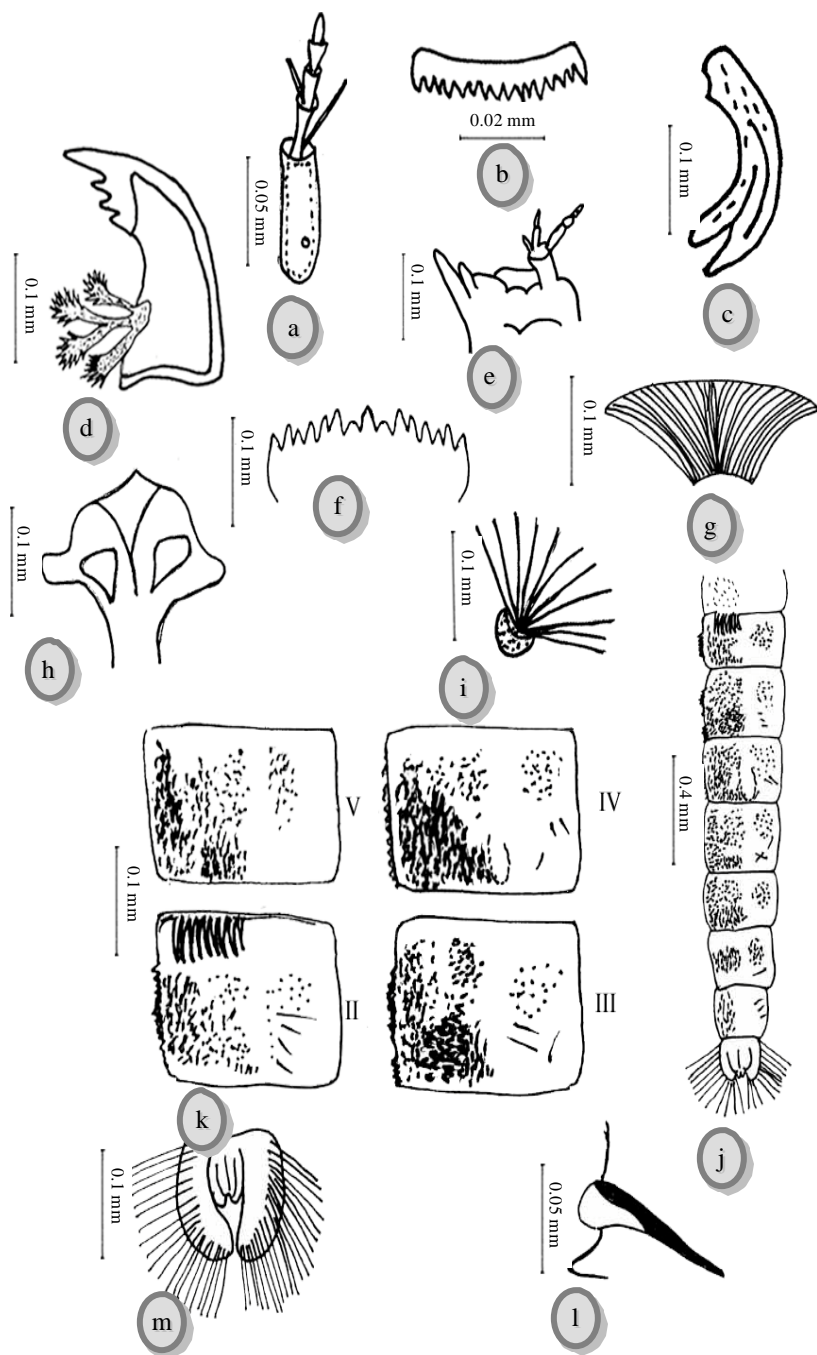


Fig. 16: *Chironomus imicola*. Larva: (a) antennae, (b) pecten epipharyngis, (c) premandible, (d) mandible, (e) maxilla, (f) mentum, (g) ventromental plate; Pupa: (h) frontal plate, (i) thoracic horn, (j) abdominal tergites, (k) shagreen of tergites II, III, IV and V, (l) VIII spur and (m) anal lobe

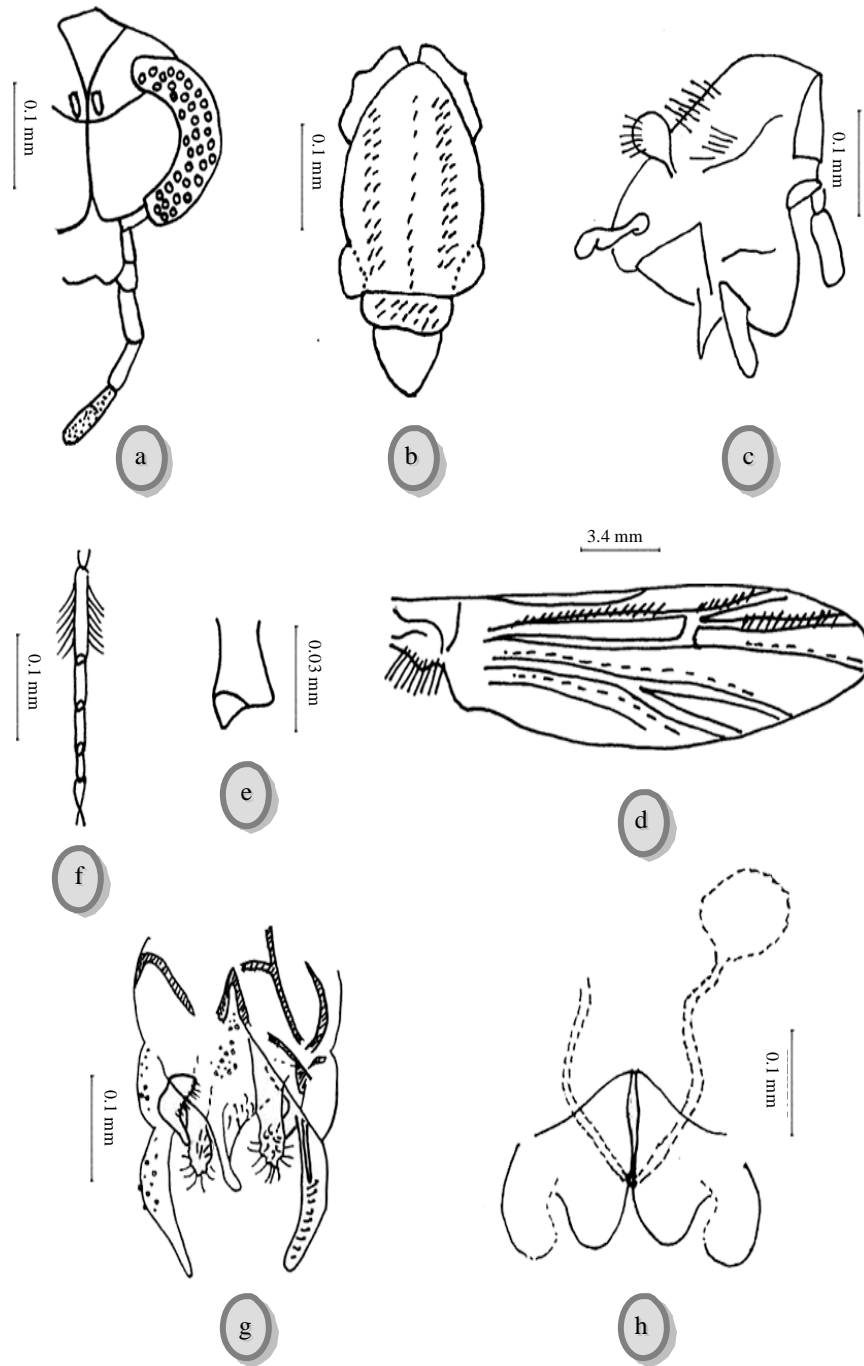


Fig. 17: *Chironomus seydeli*. Adult: (a) head, (b) dorsal view of thorax, (c) lateral view of thorax, (d) wing, (e) fore tibia, (f) fore tarsomeres, (g) hypopygium of male and (h) female genitalia

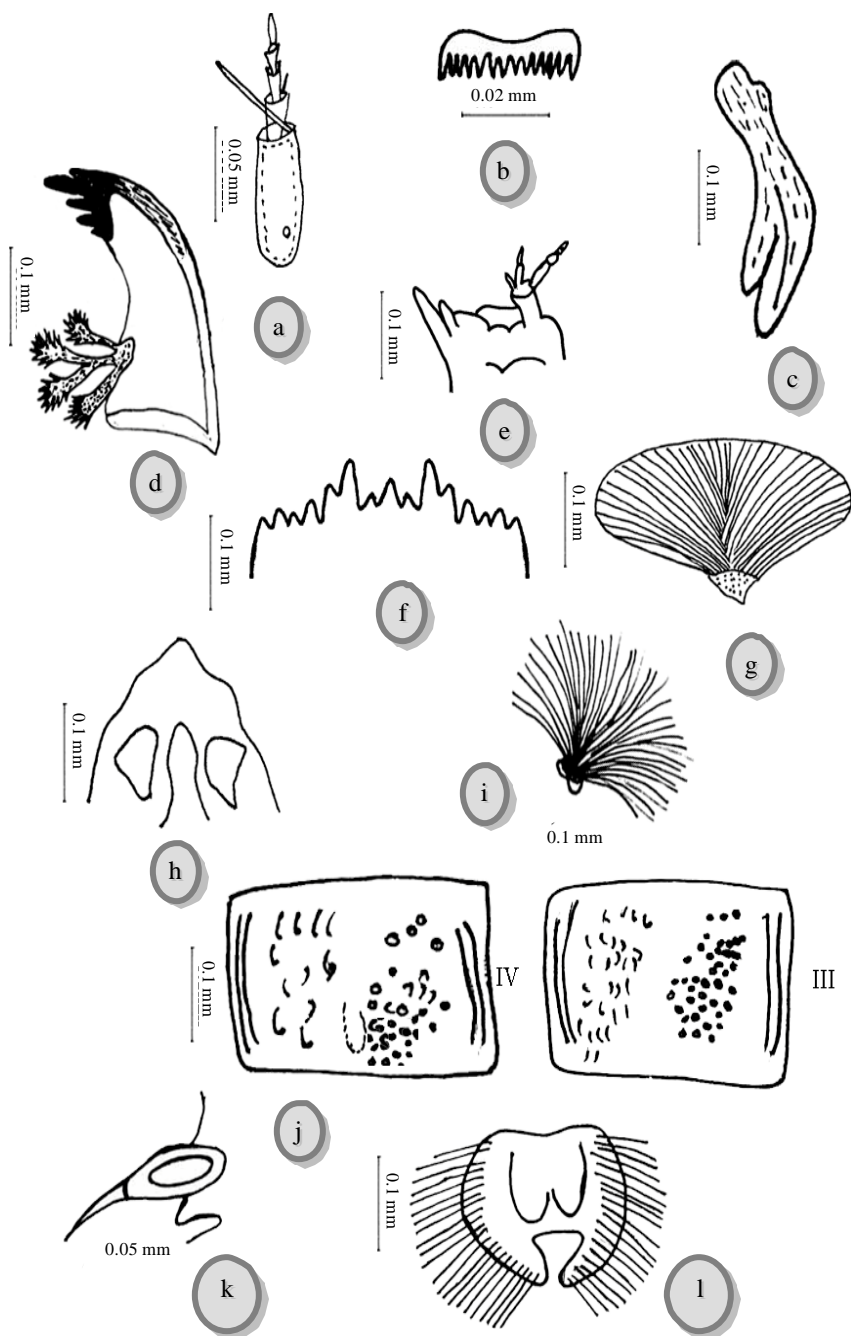


Fig. 18: *Chironomus seydeli*. Larva: (a) antennae, (b) pecten epipharyngis, (c) premandible, (d) mandible, (e) maxilla, (f) mentum, (g) ventromental plate; Pupa: (h) frontal plate, (i) thoracic horn, (j) shagreen of tergites III and IV, (k) VIII spur and (l) anal lobe

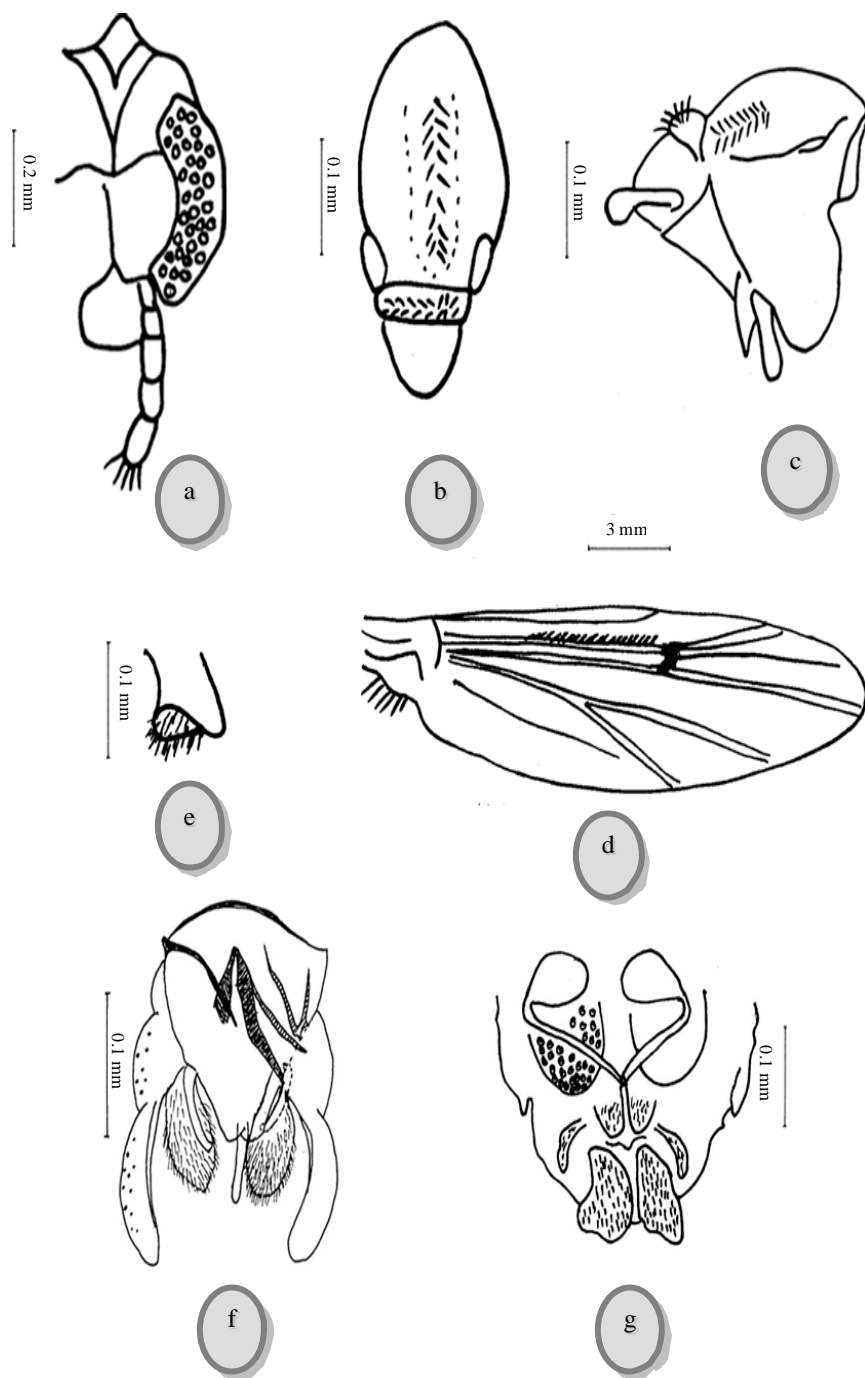


Fig. 19: *Kifferulus brevibuca*. Adult: (a) head, (b) dorsal view of thorax, (c) lateral view of thorax, (d) wing, (e) fore tarsomeres, (f) hypopygium of male and (g) female genitalia

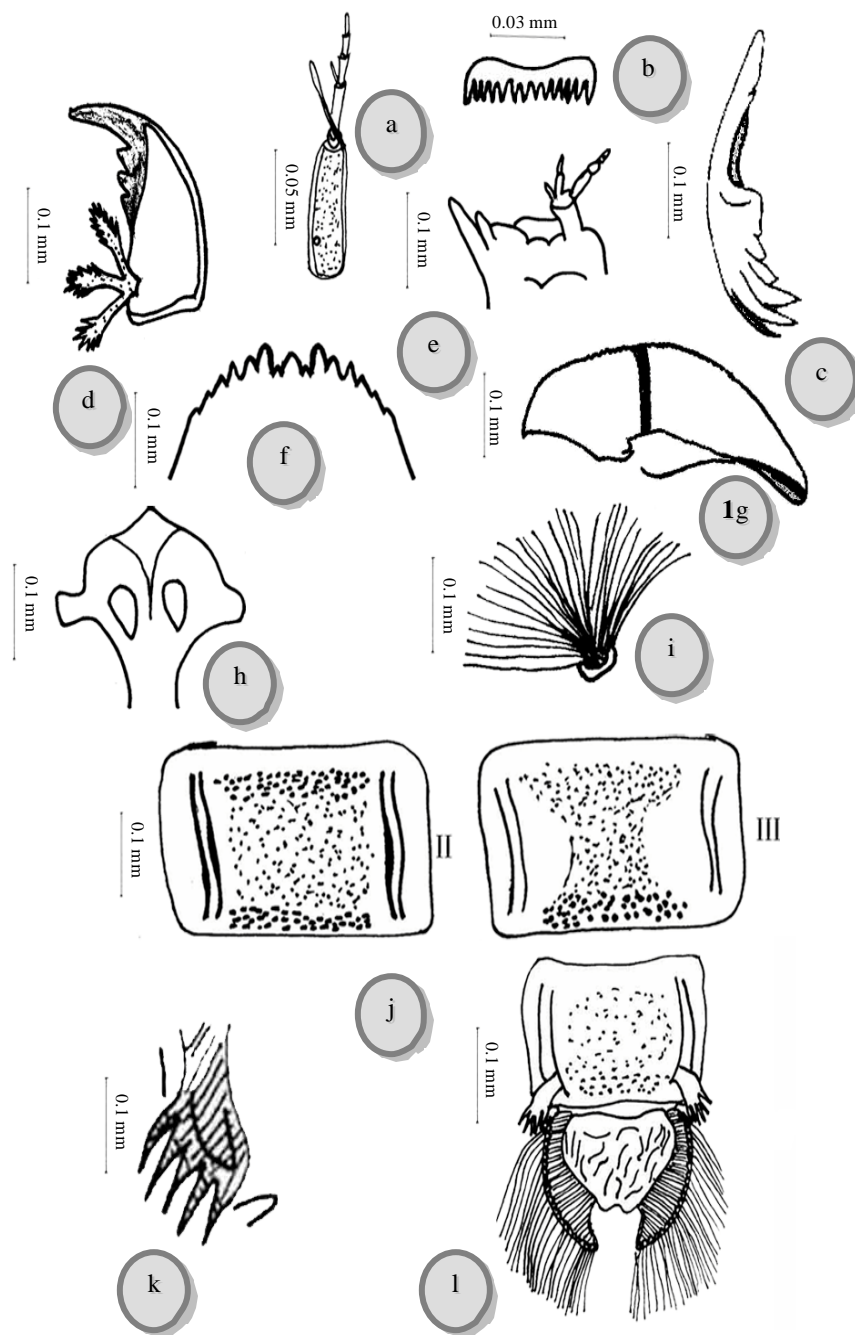


Fig. 20: *Kifferulus brevibuca*. Larva: (a) antennae, (b) pecten epipharyngis, (c) premandible, (d) mandible, (e) maxilla, (f) mentum, (g) ventromental plate; Pupa: (h) frontal plate, (i) thoracic horn, (j) shagreen of tergites II and III, (k) VIII spur and (l) anal lobe

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