

***Telmatogeton* SCHINER, 1866 (Chironomidae: Diptera), a newly recorded genus of chironomid larva for the Egyptian Mediterranean Fauna**

KHALED MAHMOUD ABDELSALAM\*

National Institute of Oceanography and Fisheries, Alexandria, Egypt

**ABSTRACT.** Sampling of fouling organisms carried out during January 2019 at Al-Max (west of the city of Alexandria) on the Mediterranean coast of Egypt revealed the presence of larval populations belonging to the genus *Telmatogeton* (Chironomidae), which is reported for the first time from the Mediterranean coast of Egypt. The larvae were found among clumps of fine filamentous green algae (*Enteromorpha compressa*). A description of the larva with taxonomic remarks and comments on its ecology and geographical distribution are given.

**KEY WORDS:** Diptera, Chironomidae, *Telmatogeton* SCHINER, 1866, systematics, Mediterranean coast, Egypt.

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## INTRODUCTION

There are more than 20 000 species of Chironomidae (non-biting midges) in the world (SHARMA & GUPTA 2014), making it the most diverse family among the aquatic dipteran insects. The chironomid fauna of Europe includes 1 262 species (SÆTHER & SPIES 2013). The duration of the larval stage in Chironomidae is the longest among insects, compared with the short-lived adults. Chironomid larvae play an important role in the production and transformation of benthic biomass in aquatic environments (THORP & COVICH 2010). They can survive in a wide range of conditions owing to their capacity to adjust to the physicochemical parameters of the surrounding water, representing fantastic signals of

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\* Corresponding author: kh.abdelsalam@gmail.com

water quality (ROSENBERG & RESH 1993). Moreover, in hypoxic conditions, chironomid larvae may be the only insects present in benthic sediments (ARMITAGE et al. 1995).

Marine larvae of aquatic insects, often scarce and cryptic, have been to a great extent ignored by marine biologists through exclusion from textbooks and marine biodiversity compilations (e.g. HOWSON & PICTON 1999, LEVINTON 2001, ARCHAMBAULT et al. 2010). The non-biting midges (order Diptera) provide an exception, with a high number of marine species distributed among a large number of genera (CHENG 1976, NEUMANN 1976).

The genus *Telmatogeton* SCHINER, 1866 is affiliated to the subfamily Telmatogetoninae WIRTH, 1949, previously known as Clunioninae. Telmatogetoninae used to be regarded as a homogeneous phylogenetic group derived from the Orthocladiinae (USINGER 1957). At present, it forms a sister group of the remaining chironomid subfamilies in all cladograms (SÆTHER 2000).

Although some larvae of chironomid taxa are confined to marine habitats (e.g. the genera *Thalassomya* SCHINER, 1856, *Clunio* HALIDAY, 1855 and *Thalassosmittia* STRENZKE & REMMERT, 1957), other larvae can be found in all types of aquatic habitats (marine, brackish and freshwater). Species of the genus *Telmatogeton* are examples from the last-mentioned type, which appear to be transitional between marine and freshwater environments (WIRTH 1947).

Worldwide, there are 28 species of the genus *Telmatogeton* (ANDERSEN et al. 2013): *Telmatogeton abnormis* (TERRY, 1913), *T. alaskensis* COQUILLET, 1900, *T. amphibius* (EATON, 1875), *T. antipodensis* SUBLETTE & WIRTH, 1980, *T. atlanticum* OLIVEIRA, 1950, *T. australicus* WOMERSLEY, 1936, *T. eshu* OLIVEIRA, 2000, *T. fluviatilis* WIRTH, 1947, *T. hirtus* WIRTH, 1947, *T. japonicus* TOKUNAGA, 1933, *T. latipennis* WIRTH, 1949, *T. macswaini* WIRTH, 1949, *T. macquariensis* (BRUNDIN, 1962), *T. magellanica* (JACOBS, 1900), *T. minor* KIEFFER, 1914, *T. mortoni* LEADER, 1975, *T. murrayi* SÆTHER, 2009, *T. nanum* OLIVEIRA, 1950, *T. pacificus* TOKUNAGA, 1935, *T. pectinatus* (DEBY, 1889), *T. pusillum* EDWARDS, 1935, *T. sancti-pauli* SCHINER, 1866, *T. simplicipes* EDWARDS, 1931, *T. spinosus* (HASHIMOTO, 1973), *T. torrenticola* (TERRY, 1913), *T. trilobatus* (KIEFFER, 1911), *T. trochanteratum* EDWARDS, 1931 and *T. williamsi* WIRTH, 1947. According to OLIVEIRA (1950), only five species can live in freshwater on waterfall stones: *T. abnormis*, *T. fluviatilis*, *T. hirtus*, *T. torrenticola* and *T. williamsi*.

According to Fauna Europaea (SÆTHER & SPIES 2013), there are only three European species in the genus *Telmatogeton*: *T. japonicus* TOKUNAGA, 1933 – the marine splash midge (distributed worldwide), *T. murrayi* SÆTHER, 2009 (Iceland and the British Isles (LANGTON & HANCOCK 2013, LANGTON 2015)) and *T. pectinatus* (DEBY, 1889) (Britain and French mainland).

There have been few studies of marine dipteran larvae in the Egyptian waters. The first record of a chironomid larva (*Clunio* sp.1) from Hurghada, Egyptian Red Sea, investigated

by ABDELSALAM (2017), could belong to a species new to science. Recently, ABDELSALAM (2019) studied the first record of a larva of the dipteran genus *Aphrosylus* HALIDAY, 1851 (Dolichopodidae) from the Abu Qir area, Egyptian Mediterranean Sea. However, no immature stages of *Telmatogetoninae* (Chironomidae) have been recorded before in Egypt, so the present study documents the first record of chironomid larvae of the genus *Telmatogeton* SCHINER, 1866 from the Al-Max area, west of the city of Alexandria, on the Egyptian Mediterranean coast. A full morphological description of the larva is provided, supplied with taxonomic comments, distribution and habitat.



**Fig. 1.** Map of Egypt (A) showing the location of the sampling site on the Mediterranean coast of the Al-Max area (B).

## MATERIAL AND METHODS

In January 2019, samples of marine fouling organisms were scraped from the surface of submerged cubic cement blocks near the outfall of the El-Umum drain in the El-Max area, west of Alexandria, on the Mediterranean coast of Egypt (Fig. 1). Most of the surfaces of these cement blocks were covered by a dense mat of green algae (*Enteromorpha compressa*). The sampling site (salinity 4~5 ‰) received drainage water in varying amounts and frequency from the El-Umum drain.

The fouling samples were anaesthetized with 7% aq. magnesium chloride and subsequently preserved in 7% formalin. During the examination, a considerable number of chironomid larvae were found and isolated for identification. These larvae were cleared in 10% aq. sodium hydroxide (NaOH) for examination under an Optika compound microscope (total magnification up to 1000 x). Illustrations of some anatomical parts were made under a microscope equipped with a camera lucida. Microphotographs of the chironomid larva were taken with a Nikon D-5200 digital camera attached to the stereo- and/or compound microscopes.

The following scientific articles were consulted for the identification of the species (WILLIAMS 1944, WIRTH 1947, 1949, ARMITAGE et al. 1995 and ANDERSEN et al. 2013). The terminology of the larval morphological features generally follows that of ANDERSEN et al. (2013).

## RESULTS

Class: Insecta

Order: Diptera

Suborder: Nematocera

Family: Chironomidae

Subfamily: Telmatogetoninae WIRTH, 1949

Genus: *Telmatogeton* SCHINER, 1866

***Telmatogeton* sp.**

**Figs (2-11)**

*Telmatogeton* SCHINER, 1866: 931. WIRTH (1947).

**Synonyms**

=*Halirytus* EATON, 1875

=*Psamathiomya* DEBY, 1889

=*Jacobsiella* RÜBSAAMEN, 1906

=*Paraclunio* KIEFFER, 1911

=*Charadromyia* TERRY, 1913

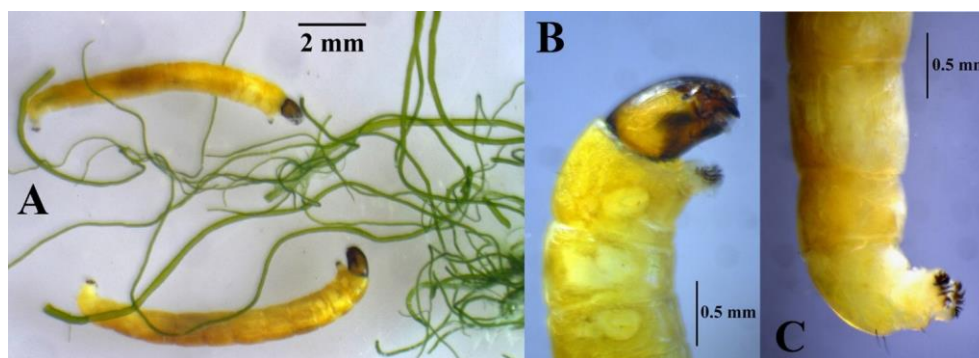
=*Trissoclunio* KIEFFER, 1920

### Material examined

14 larvae were collected from an area of about (0.5 m<sup>2</sup>) on submerged cement blocks in the Al-Max area. The larvae varied in length between 8 and 11 mm.

### Description

Larvae large, yellowish-brown in colour (Fig. 2A). Thorax and abdomen with minute setae, except for the two pairs of long anal setae on the ninth abdominal segment. No procerci, and anal gills and tubules absent (Fig. 2C).



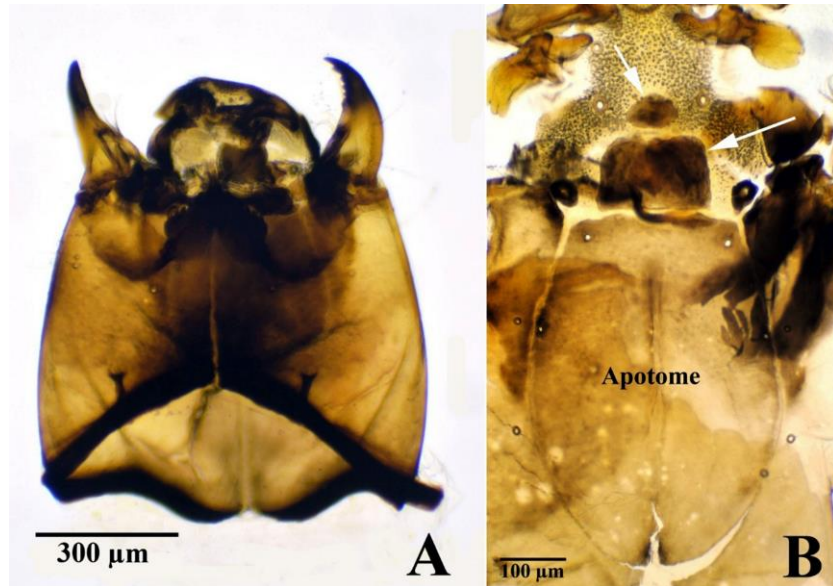
**Fig. 2.** Larvae of *Telmatogeton* sp. **A**, among green algae *Enteromorpha compressa*; **B**, head and anterior pseudopod; **C**, posterior end.

### Head & mouth parts

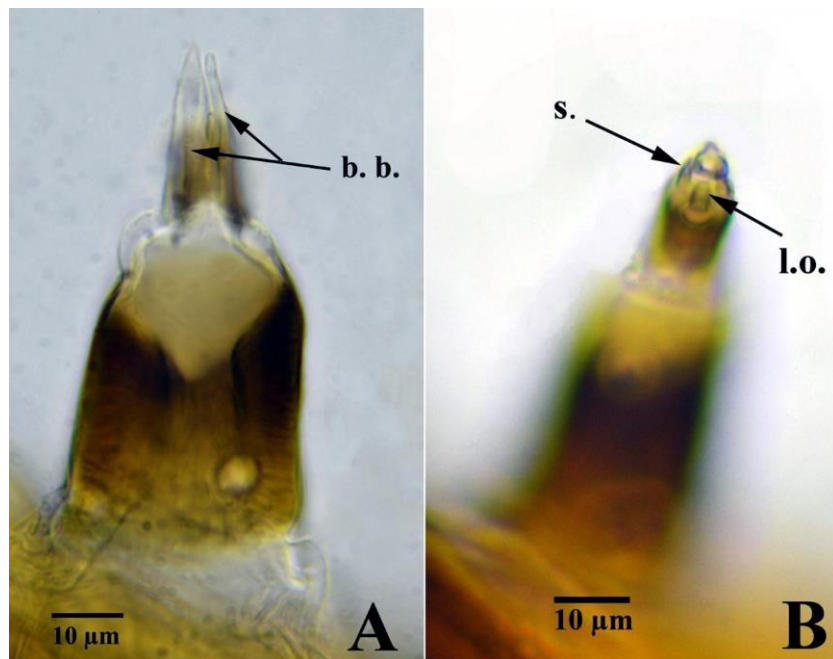
Head distinct, well chitinized (Fig. 2B, Fig. 3A). Paired eye spots. Two well developed medial sclerites (one larger trapezoidal and one smaller semicircular) anterior to apotome, the remaining area granulate without delimited sclerites (Fig. 3B). Ventrally, head without ventromental plate or beard beneath (Fig. 3A).

**Antenna:** Short, 4-segmented; large basal segment, about 1.3 x as long as wide (measured example – length: 59  $\mu$ m, width: 45  $\mu$ m). Very short flagellum, with apparently unequal bifid blade (Fig. 4A), sub-equal to flagellum. Antennal ratio about 1.25. Lauterborn organ small and style weak (Fig. 4B).



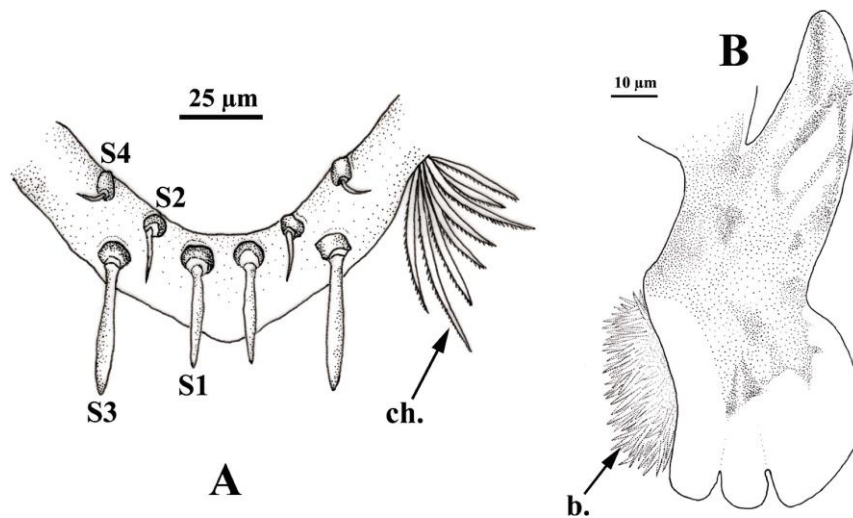


**Fig. 3.** Larva of *Telmatogeton* sp. Head capsule: **A**, ventral view; **B**, dorsal view, apotome of the head with its anterior medial sclerites (arrows).

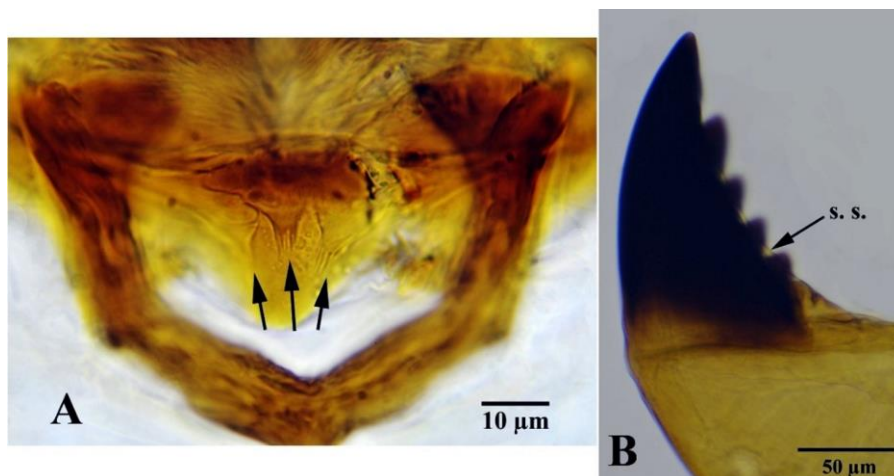


**Fig. 4.** Larva of *Telmatogeton* sp. Antenna. **A**, bifid blade, (b.b.); **B**, Lauterborn organ, (l.o.); style, (s.).

**Labrum:** All S setae well-developed, simple, especially S III (Fig. 5A), without labral lamellae, but anterior labral margin apparently 3-lobed. Chaetae in tufts of simple and/or serrate chaetae. Pecten epipharyngis composed of 3 subequal scales, each with variable-sized teeth (Fig. 6A). Heavily sclerotized premandible, with three blunt apical teeth, supported with well advanced brush (Fig. 5B).



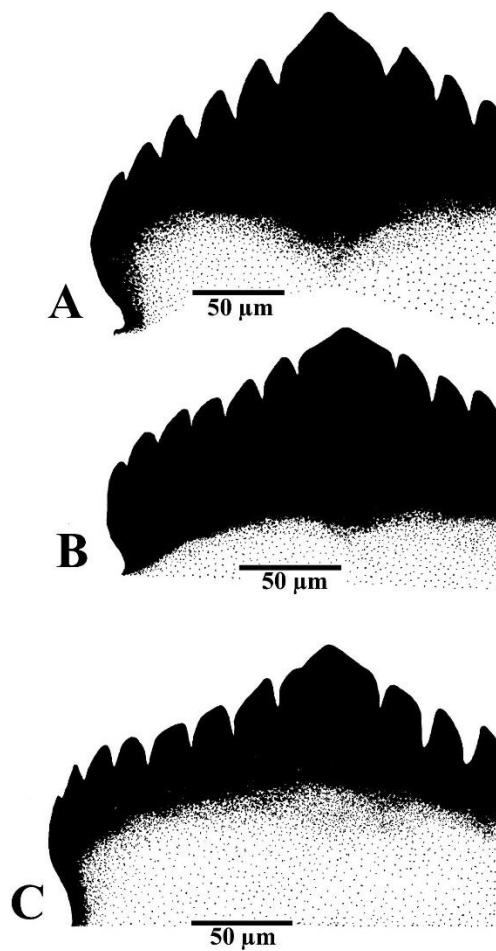
**Fig. 5.** Larva of *Telmatogeton* sp. Mouth parts. **A**, Simple S setae of labrum, and chaetae (ch.); **B**, Premandible with brush (b.).



**Fig. 6.** Larva of *Telmatogeton* sp. Mouth parts. **A**, Pecten epipharyngis with 3 subequal scales (Arrows); **B**, the five-toothed mandible, with long seta subdentalis (s.s.).

**Mandible:** Heavily sclerotized, with five darkened teeth, the largest being the apical one. Long seta subdentalis but no pecten mandibularis (Fig. 6B). Also 6-7 fine, simple branched setae internae and 2 lateral setae.

**Mentum:** Single large median pointed tooth; with variable number of lateral tooth pairs (5~7), decreasing outwards, the outermost one minute (Fig. 7). Prementum with dense median brush of featherlike setae (Fig. 8). Without distinct ventromental plate; beard absent.



**Fig. 7.** Larva of *Telmatogeton* sp. Variation in the mentum. **A**, Five lateral teeth; **B**, Six lateral teeth; **C**, Seven lateral teeth.



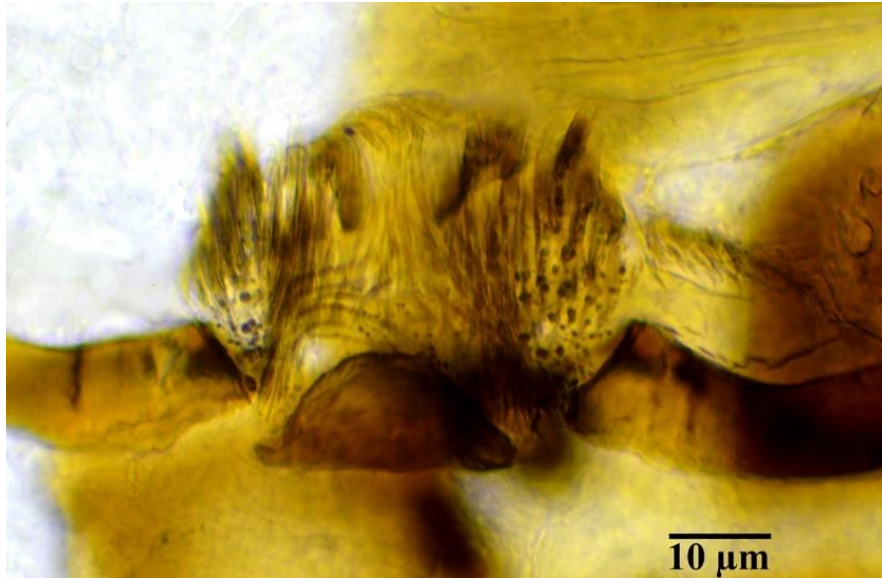


Fig. 8. Larva of *Telmatogeton* sp. Hypopharynx and prementum.

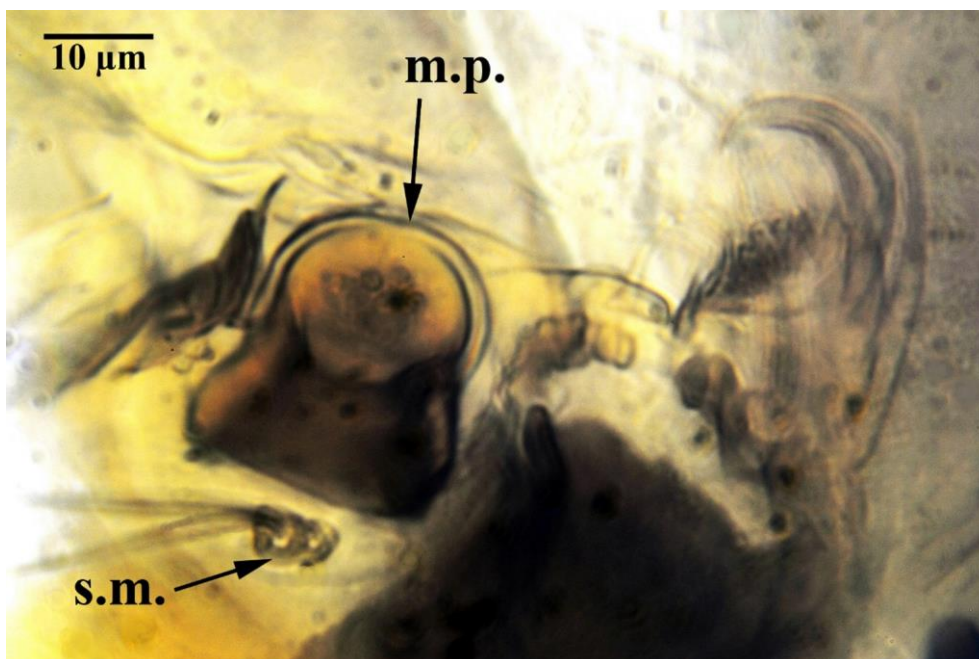
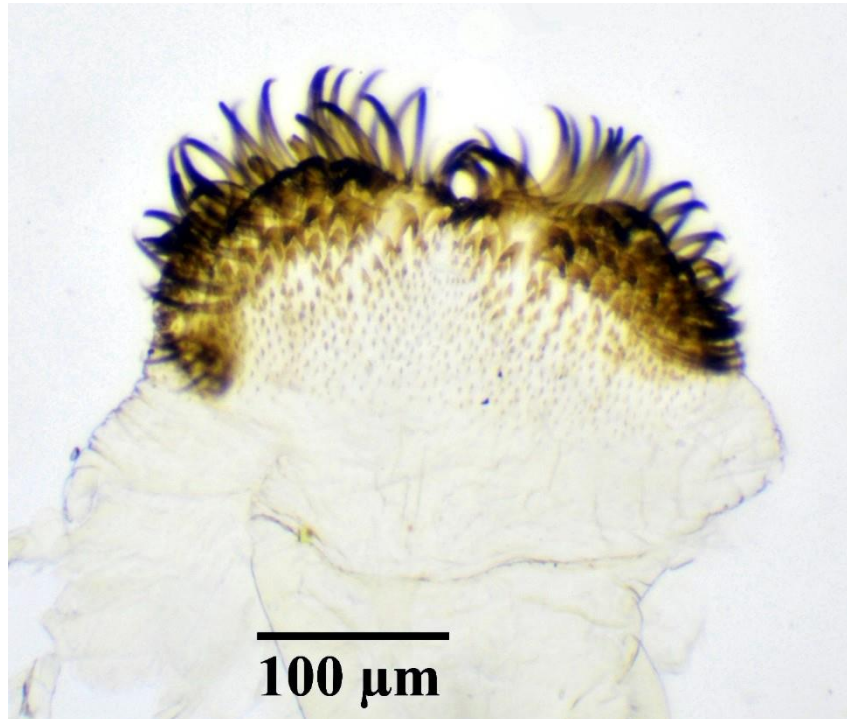


Fig. 9. Larva of *Telmatogeton* sp. Maxilla, ventral view; maxillary palp (m.p.); setae maxillaris (s.m.).

**Maxilla:** Almost triangular in shape, with short one segment maxillary palp bearing small sensillae and setae apically. Ventrally outer margin of palpiger bears variable numbers of lamellae (tetrahedral, simple or apically serrate). Galea apparently without lamellae or pecten galearis, but sensillae and setae well developed with two setae maxillaris (Fig. 9).

### ***Thorax***

The anterior three segments form the thorax. Prothorax with anterior pseudopod shallowly bilobed, each flap with gradually developed apical crown of narrow hooks (Fig. 10).



**Fig. 10.** Larva of *Telmatogeton* sp. Anterior pseudopod.

### ***Abdomen***

Segments four to twelve comprise the abdomen. Posterior pseudopods, each with 19-21 acute curved sickle-like hooks, gradually increase in size towards the apex (Fig. 11).

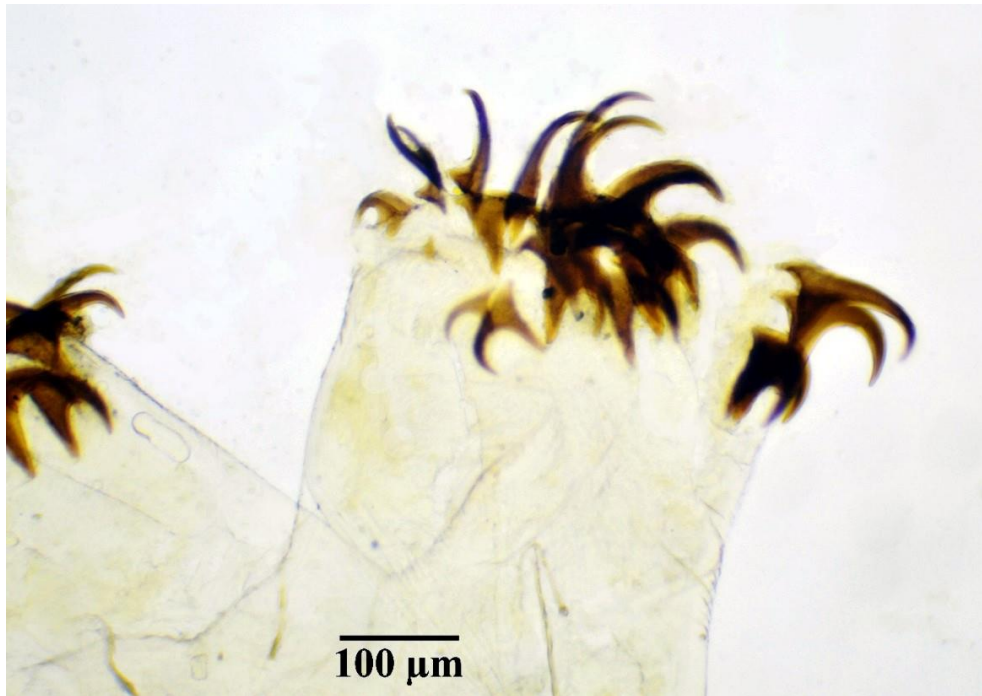


Fig. 11. Larva of *Telmatogeton* sp. Posterior pseudopod.

#### Ecology and distribution

In the present study, larvae of the genus *Telmatogeton* were found among clumps of fine filamentous green algae (*Enteromorpha compressa* (L.) NEES), which cover submerged cement blocks in the Al-Max area. The salinity at the sampling site was 4~5‰, indicating brackish water. However, species of the genus *Telmatogeton* in the intertidal environment often settle in habitats where freshwater mixes with the sea (WIRTH 1947), and thus are marine species that tolerate brackish waters (COLBO 1996).

According to CRANSTON (1989), OLIVER et al. (1990), COLBO (1996), ASHE & O'CONNOR (2012), MOUBAYED-BREIL & ASHE (2012) and SÆTHER & SPIES (2013), *T. japonicus* is globally the most widely distributed species, including all European coasts, and the Australasian, Eastern Palearctic, Nearctic and Oriental regions.

However, in the laboratory, TOKUNAGA (1935) tracked the development of *T. japonicus* from larvae to adults in freshwater. RAUNIO et al. (2009) reported the extensive distribution of this species in the Baltic Sea, which has established fertile populations in fresh to brackish (salinity < 4 ‰) coastal habitats. *T. japonicus* can live on ships' hulls and is most likely transported far and wide by shipping (SÆTHER 2009).

However, the present larval record of *Telmatogeton* sp. is the first from the Al-Max area on the Alexandria coast, representing an addition to the list of fauna in the Egyptian Mediterranean Sea.

## DISCUSSION

Chironomidae is a very diverse group. However, larvae of the subfamily Telmatogetoninae could be confused with some orthoclaadiine larvae, but can be definitively identified by the dense median brush on the prementum, short antennae and the absence of procerci (EPLER 2001). Within the Telmatogetoninae, larvae of the genus *Telmatogeton* SCHINER, 1866 can be distinguished from the similar congeneric genus *Thalassomya* SCHINER, 1856 by the following: 1) *Telmatogeton* has two well-developed medial sclerites (a larger trapezoidal one and a smaller semicircular one) anterior to the apotome (the anterodorsal part of the head); *Thalassomya* has no such sclerites; 2) in *Telmatogeton* the premandible has 3 blunt apical teeth, but in *Thalassomya* it is simple.

In the current investigation, careful examination of six larvae showed that the menta of three larvae (50%) had 13 teeth, the menta of two (33%) had 15 teeth, and the mentum of the other individual (16%) with 11 teeth. On the other hand, all the mandibles have 5 teeth. TOKUNAGA (1935) and WIRTH (1947) reported that the larval stage of *T. japonicus* has a mentum with eleven teeth and a mandible with seven sharp teeth.

REMMERT (1963), who described the larva of a new species (*T. remanei*) from Germany, reported that this Palearctic species was at first confused with *T. japonicus*, but that examination demonstrated that *T. remanei* larvae had 5 mandibular teeth and *T. japonicus* larvae had 7 mandibular teeth. On the other hand, the mentum of both species possesses 5 teeth on each side of the large central tooth. REMMERT (1963) also maintained that the teeth of the mentum and mandible wear down only very slowly with eating, so they can have a very aberrant appearance. EPLER (2001) reported larvae of *T. japonicus* from eastern North America with a 15-toothed mentum and a 5-toothed mandible. His finding might depend on the fact that *T. gedanensis* SZADZIEWSKI 1977 is a junior synonym of *T. japonicus*. SZADZIEWSKI (1977) described the larval stage of the new species (*T. gedanensis*) with the larval mandible armed with six blunt distal teeth and the mentum with fifteen teeth.

Based on the fact that both *T. remanei* (REMMERT 1963) and *T. gedanicus* (SZADZIEWSKI 1977) (previously known as *T. gedanensis* SZADZIEWSKI 1977) are considered to be junior synonyms of *T. japonicus* (KRONBERG 1986, DE JONG et al. 2007), coupled with the finding of EPLER (2001), it is reasonable to tentatively identify the examined larva as *T. japonicus*.

Although the examined larvae closely resemble *T. japonicus*, it is hard to be absolutely sure of the identification without collecting pupae and/or adults from the sampling site. Indeed, three sampling trips to Al-Max site were made, one every ten days, to collect pupae or pupal exuviae but, unfortunately, none were found. It is well known that pupae or pupal exuvial samples can be used to definitively identify a specimen to the species level (LANGTON & VISSER 2003).

More intense investigations and sampling efforts are needed in order to determine the full biodiversity of dipteran insect larvae on Egyptian coasts.

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