

# New Records of Chironomidae Species (Insecta: Diptera) from Greek Lakes

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**Abstract:** *Endochironomus tendens* (Fabricius, 1775), *Cladopelma viridulum* (Linnaeus, 1767) and *Psectrocladius* (*Psectrocladius*) *psilopterus* (Kieffer, 1906) are non-biting midges known from several countries in South-Eastern Europe. However, they have not been previously recorded from Greece. The first two species are new records from Lake Volvi, while *P. (Psectrocladius) psilopterus* is a new record from Lake Kastoria. *Cryptochironomus* (*Cryptochironomus*) *gr. defectus* (Kieffer, 1913), previously reported from Greek freshwaters, is now recorded from Lake Volvi.

**Key words:** Orthocladiinae, Chironominae, Greece, distribution, Lake Volvi, Lake Kastoria.

## Introduction

Chironomidae is a family of non-biting midges (Insecta: Diptera). About 5,000 species have been described worldwide (FERRINGTON 2008, PAPE et al. 2011) and 1,270 in Europe (DE JONG et al. 2014). The total number of extant species is estimated up to about 15,000 (BROOKS et al. 2007). The species of the family are found in a variety of biotopes, with larvae recorded from terrestrial, semi-terrestrial and aquatic habitats. Chironomidae is the most abundant insect family in all types of freshwater habitats, with a wide distribution in all geographical zones, as well as in the Arctic Region (ANDERSEN et al. 2013). Chironomids play a key role in aquatic ecosystems and in the frame of the implementation of the European Water Framework Directive (2000/60/EC) they are used for the assessment of surface water quality (VALLENDUUK & MOLLER PILLOT 2007). Their larvae, being sensitive to environmental pressures, are often used as cytogenetic biomarker test systems (ILKOVA et al. 2017). Consequently, their presence and distributional patterns are of crucial importance.

The fauna of Chironomidae in the Mediterranean Region was firstly reviewed by LAVILLE & REISS (1992). Many other contributions followed from both running (PRAT et al. 2016) and standing waters (SAHUQUILLO et al. 2008, MARZIALI & ROSSARO 2016). However, there are still gaps in our knowledge on the accurate range distribution of each known species. So far, only a few studies have been carried out in Greece, providing detailed faunistic data on chironomids mostly from lotic ecosystems (e.g. MORA & CSABAI 2008, PŁÓCIENNIK & KARAOUZAS 2014). Nevertheless, a significant number of 76 taxa of Chironomidae (28 Orthocladiinae, 36 Chironominae, 9 Tanytopodinae, 2 Diamesinae and 1 Prodiamesinae) have been reported from Greek rivers, streams, lakes and springs (PŁÓCIENNIK & KARAOUZAS 2014). Concerning lentic benthic fauna, there is information for only eight out of the 25 lakes existing in the country: Doirani (GRIFFITHS et al. 2002, BOBORI & SALVARINA 2009), Kastoria (KOUSSOURIS et al. 1987, PŁÓCIENNIK & KARAOUZAS 2014, NTISLIDOU

et al. in press), Lysimachia (PETRIDIS 1993), Mikri Prespa (KOUSSOURIS et al. 1987, PETRIDIS & SINIS 1995, PŁÓCIENNIK & KARAOUZAS 2014, NTISLIDOU et al. in press), Pamvotis (KAGALOU et al. 2006), Trichonis (KOUSSOURIS & PUCH-THOMAS 1982), Volvi (ECONOMIDIS 1991, NTISLIDOU et al. in press) and Vegoritis (PŁÓCIENNIK & KARAOUZAS 2014).

In the present study, the presence of three chironomid species in two lakes is reported for the first time, thus contributing to our knowledge on distribution of Chironomidae in lakes in Greece and in the Mediterranean Region.

## Materials and Methods

Benthic surveys were conducted in two lakes (Volvi and Kastoria) located in northern Greece. Sediment samples were taken from the soft substratum with an Ekman-Birge grab (225 cm<sup>2</sup> sampling area) in autumn 2011 and spring 2012. Samples were sieved through 200 µm mesh size and fixed in 10% neutralised formaldehyde. Macroinvertebrates were sorted and larvae or pupae were identified to species level using the keys of WIEDERHOLM (1983, 1986) and MOLLER PILLOT (2009, 2013). For the microscopic identification, specimens were permanently mounted in slides using Canada balsam, after clearing with 10% KOH. Samples are deposited in the collection of the Department of Zoology, School of Biology (Aristotle University of Thessaloniki, Greece).

## Results

Previous studies in Lake Volvi and Lake Kastoria reported the presence of seven and five chironomid species, respectively (Table 1). Below, we present new records of chironomids in these two lakes.

### SUBFAMILY ORTHOCLADIINAE

*Psectrocladius* (*Psectrocladius*) *psilopterus* (Kieffer, 1906) (Fig. 1a)

Previous record: None in Greece. New to Greek fauna; pupae were collected from the sublittoral zone (40°31'44.8", 21°15'48.7"; 4.5 m depth) of Lake Kastoria.

### SUBFAMILY CHIRONOMINAE

*Cryptochironomus* (*Cryptochironomus*) gr. *defectus* (Kieffer, 1913) (Fig. 1b)

Previous records: Tavropos Reservoir (PETRIDIS & SINIS 1993) and Lake Doirani (BOBORI & SALVARINA 2009). New to Lake Volvi: found at three sites (40°41'13", 23°26'21.3"; 40°41'20.6", 23°25'43.9"; 40°41'30.4", 23°25'39") in the profundal zone, at depths ranging from 9 to 21 m.

*Cladopelma viridulum* (Linnaeus, 1767) (Fig. 1c)

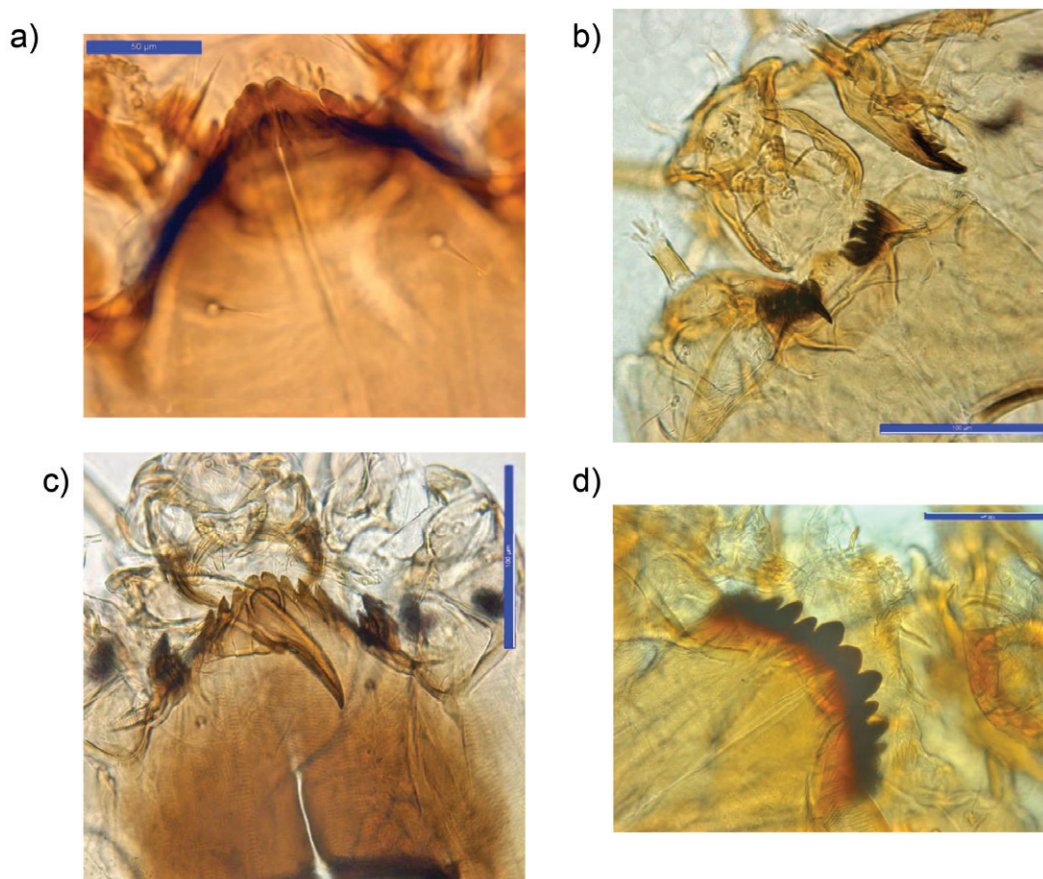
Previous record: None in Greece. New to Greek fauna; pupae were collected only in the sub-littoral zone (40°41'30.4", 23°25'39"; 9 m depth) of Lake Volvi.

*Endochironomus tendens* (Fabricius, 1775) (Fig. 1d)

Previous record: None in Greece. New to Greek fauna; larvae were found in the sublittoral zone (40°40'28.8", 23°33'52"; 13.5 m depth) of Lake Volvi, thus confirming the species presence in the country.

**Table 1.** Checklist of Chironomidae in Lake Volvi and Lake Kastoria. Records: 1. ECONOMIDIS (1991); 2. NTISLIDOU (2012); 3. PŁÓCIENNIK & KARAOUZAS (2014); 4. KOUSSOURIS et al. (1987); 5. Present study.

Taxa	Lake Volvi	Lake Kastoria
Chironominae		
<i>Chironomus</i> ( <i>Chironomus</i> ) gr. <i>plumosus</i> (Linnaeus, 1758)	1	2
<i>Chironomus</i> spp. Meigen, 1803		3
<i>Cladopelma viridulum</i> (Linnaeus, 1767)	5	
<i>Cryptochironomus</i> ( <i>Cryptochironomus</i> ) gr. <i>defectus</i> (Kieffer, 1913)	5	
<i>Dicrotendipes nervosus</i> (Staeger, 1839)	1	
<i>Endochironomus tendens</i> (Fabricius, 1775)	5	
<i>Glyptotendipes</i> ( <i>Glyptotendipes</i> ) <i>pallens</i> aggregate (Meigen, 1804)		4
<i>Microchironomus tener</i> (Kieffer, 1918)	1	
<i>Polypedilum</i> ( <i>Polypedilum</i> ) <i>nubeculosum</i> (Meigen, 1804)	1	
<i>Polypedilum</i> sp.	1	
Orthoclaadiinae		
<i>Psectrocladius</i> ( <i>Psectrocladius</i> ) <i>psilopterus</i> (Kieffer, 1906)		5
Tanypodinae		
<i>Procladius</i> sp. (Meigen, 1804)		3
<i>Procladius</i> ( <i>Holotanypus</i> ) <i>choreus</i> (Meigen, 1804)	1	2
<i>Procladius</i> ( <i>Holotanypus</i> ) <i>ferrugineus</i> (Kieffer, 1918)	1	



**Fig. 1.** Mentum of recorded species: a. *Psectrocladius (Psectrocladius) psilopterus*; b. *Cryptochironomus (Cryptochironomus) gr. defectus*; c. *Cladopelma viridulum*; d. *Endochironomus tendens*.

## Discussion

*Psectrocladius (Psectrocladius) psilopterus* is a widespread species, recorded from nearly all European freshwaters, except from Greece (DE JONG et al. 2014). On the Balkan Peninsula, it was recorded only in Turkey, Bulgaria and Romania (DE JONG et al. 2014). Its larvae live on the bottom or on submerged or emerged plants, more rarely also on floating leaves (MOLLER PILLOT 2013). This species is common and abundant in lakes (BROOKS et al. 2007) and it is found mostly in the littoral zone (LINDERGAARD 1992).

The widespread species *C. (Cryptochironomus) gr. defectus* is also recorded from the entire Europe, including the Balkan Peninsula (DE JONG et al. 2014). It prefers sandy substrata, mixed with detritus and fine organic material originating from lakes (VALLENDUUK & MOROZOVA 2005) and rivers (WIEDERHOLM 1983, VALLENDUUK & MOROZOVA 2005, BROOKS et al. 2007). Moreover, *C. (Cryptochironomus) gr. defectus* is tolerant to eutrophic waters (O'TOOLE et al. 2008). It presents a complex of sibling species, which cannot be determined based on external larval morphology without cytotaxonomical studies.

*Cladopelma viridulum* is recorded in European lentic and lotic ecosystems, including the Balkan Peninsula but with the exception of Albania, Bulgaria and Turkey (DE JONG et al. 2014). It is typical of mesotrophic lakes (SÆTHER 1979, BRODIN 1986) and occurs in the profundal zone (KANSANEN 1985).

*Endochironomus tendens* is distributed in Europe, including the Balkan Peninsula, Turkey, Bulgaria and Romania (DE JONG et al. 2014). Its larvae are leaf miners or spin their tubes on the surface of the leaves (MOLLER PILLOT 2009). *E. tendens* is considered sensitive to organic pollution (ROSSARO et al. 2012). DE JONG et al. (2014) have mentioned that its existence in Greece is doubtful.

In total, up to 150 species of the family Chironomidae are likely to exist in Greek freshwaters (personal data). Since taxonomic changes and new species descriptions are frequent in the Balkan Region (e.g. HAMERLÍK 2005, MILOŠEVIĆ et al. 2011), an annotated checklist of the Greek species of Chironomidae is needed. Additional research should be focused on surveying the areas with limited or no information on their benthic fauna as well as the isolated systems where endemism may be high.

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