

# INTEGRATIVE TAXONOMY OF NON-BITING MIDGES (DIPTERA CHIRONOMIDAE): SKADAR LAKE VERSUS EUROPEAN BARCODE LIBRARY

Piotr Gadawski<sup>1</sup>, Bruno Rossaro<sup>3</sup>, Giulia Magoga<sup>2</sup>, Wojciech Giłka<sup>4</sup>, Michał Grabowski<sup>1</sup>, Matteo Montagna<sup>2</sup>

1 – Department of Invertebrate Zoology and Hydrobiology, University of Lodz, Banacha Street 12/16, 90-237 Lodz, Poland, piotr.gadawski@biol.uni.lodz.pl  
2 – University of Milan, Department of Agricultural and Environmental Sciences – Production, Landscape, Agroenergy, Via Celoria 2, 20133 Milano, Italy  
3 – University of Milan, Department of Food, Environmental and Nutritional Sciences, Via Celoria 2, 20133 Milano, Italy  
4 – University of Gdansk, Department of Invertebrate Zoology and Parasitology, Wita Stwosza Street 59, 80-308 Gdansk

norbol2019.03d014c

## ABSTRACT

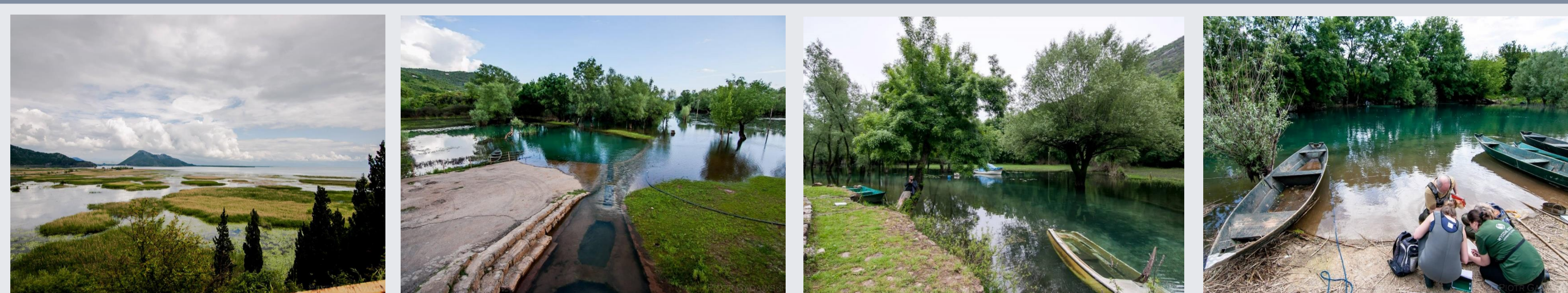
We use non-biting midges (Diptera **Chironomidae**) as flagship taxa of freshwater ecology to focus on the poorly investigated **Skadar Lake** system.

We collected **7,300+ individuals** from the lake, springs, sublacustrine springs, rivers inflow. **Morphological** identification revealed **83-86 species**, **56-59 species** new to the area, **6 putative species** new for the knowledge.

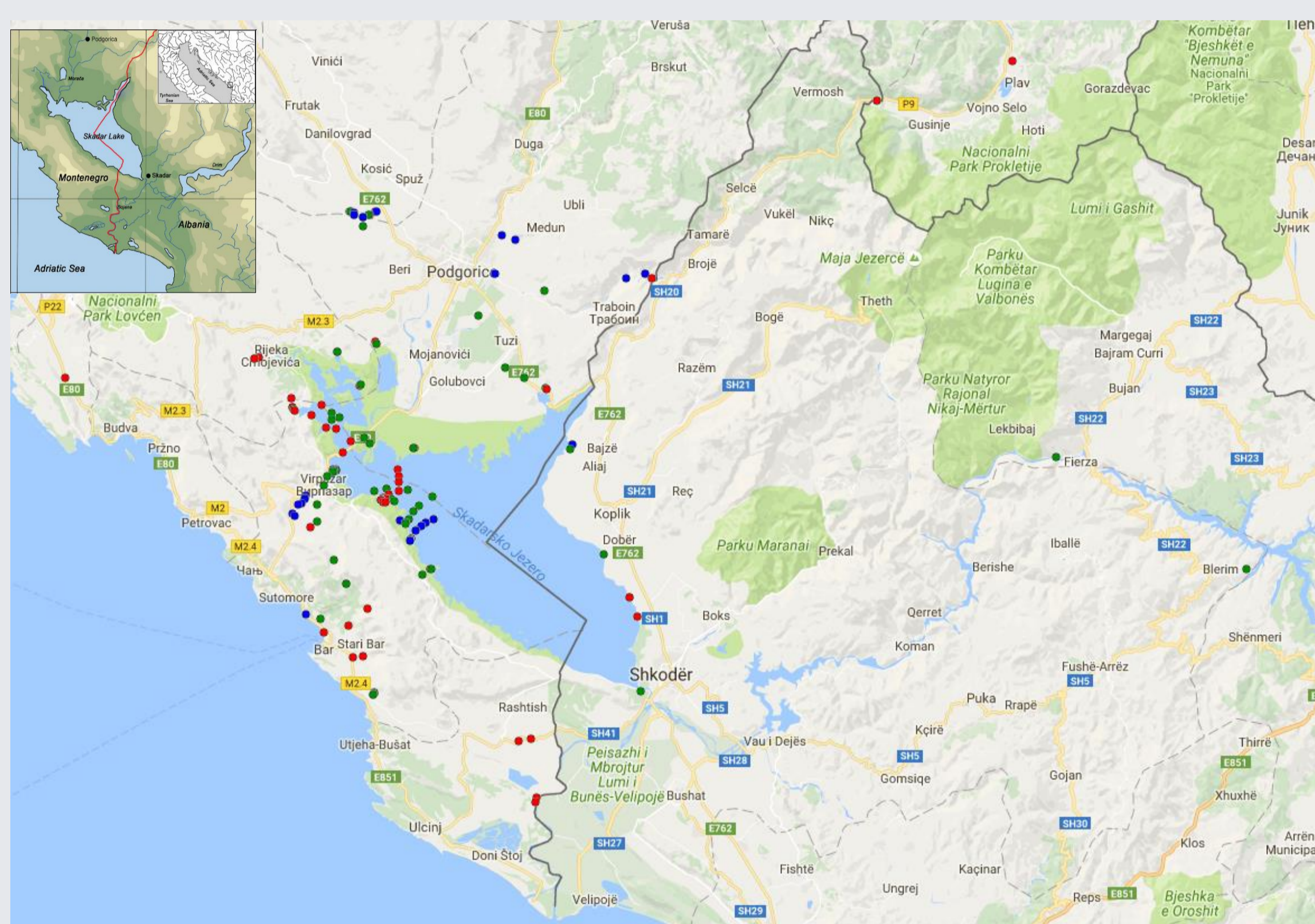
The COI barcode library was developed. We tested the efficiency of DNA barcoding for European chironomids, merging Skadar Lake **739 COI sequences** dataset plus **10,009** publically available barcode sequences, *ad hoc* filtered in order to retain only those identified to species level. The efficiency of the species identification through DNA-barcoding tested using *spider* R library.

## MATERIAL AND METHODS

### SKADAR LAKE



- The biggest lake on the Balkan Peninsula
- Originated 1200 years ago
- Includes old system of springs originated during Pliocene
- High inflow from permanent and seasonal springs
- High number of sublacustrine springs
- Well-known hotspot of freshwater biodiversity
- High degree of endemism
- Uncertain time of origin and diversification of the local faunal and floral elements
- Variety of different habitats



A) Red points – Summer 2015; B) Blue points – Autumn 2014; C) Green points – Spring 2014.

### CHIRONOMIDAE



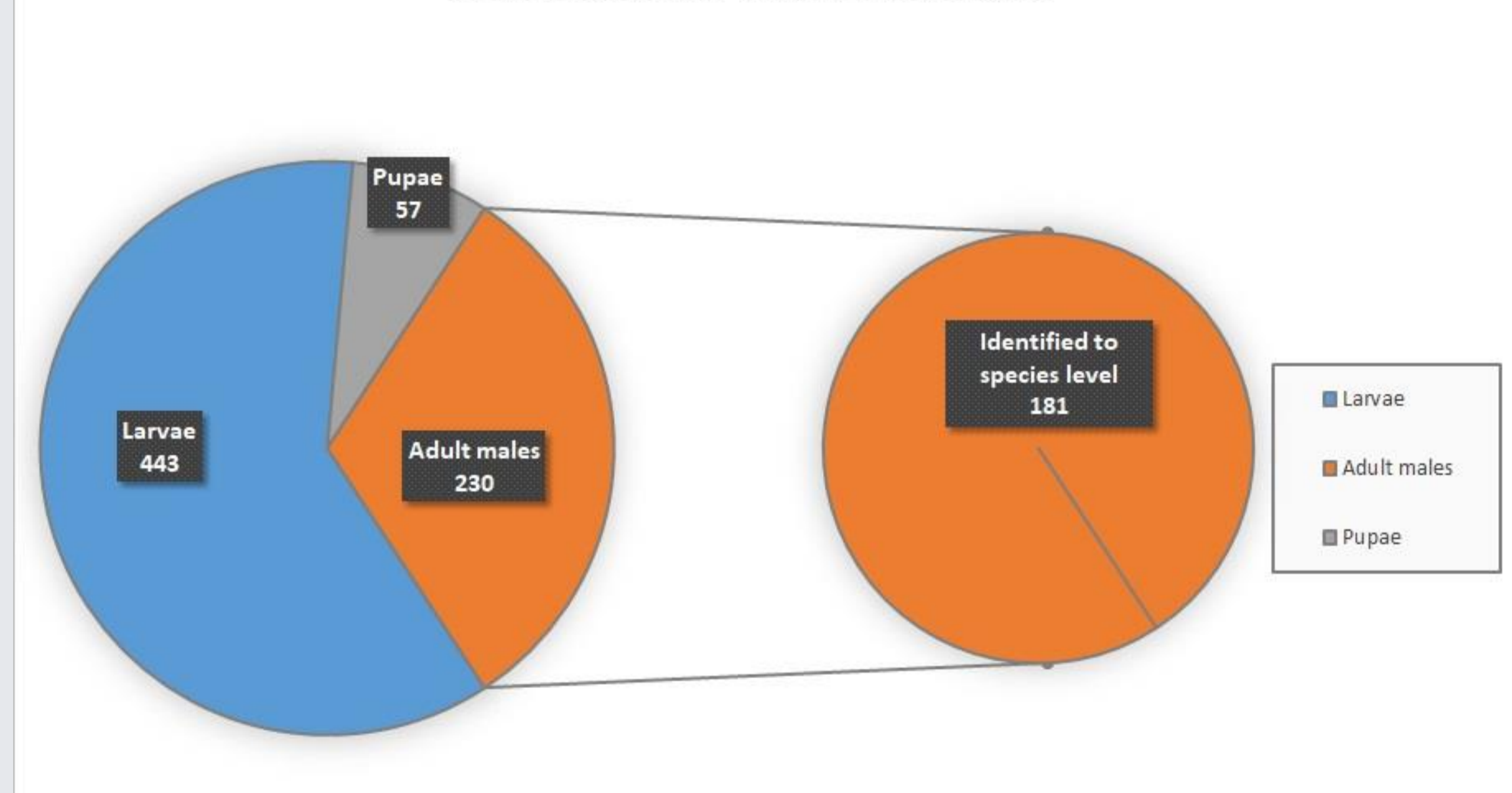
- One of the most species-abundant family of insects
- Most of species widespread and highly abundant
- Have terrestrial, flying dispersal stage
- Occur in almost all water systems creating multispecies assemblages
- Assemblages respond quick to environmental changes
- Taxonomic identification to species level usually difficult, time-consuming and expensive

## RESULTS

### SPECIES COMPOSITION

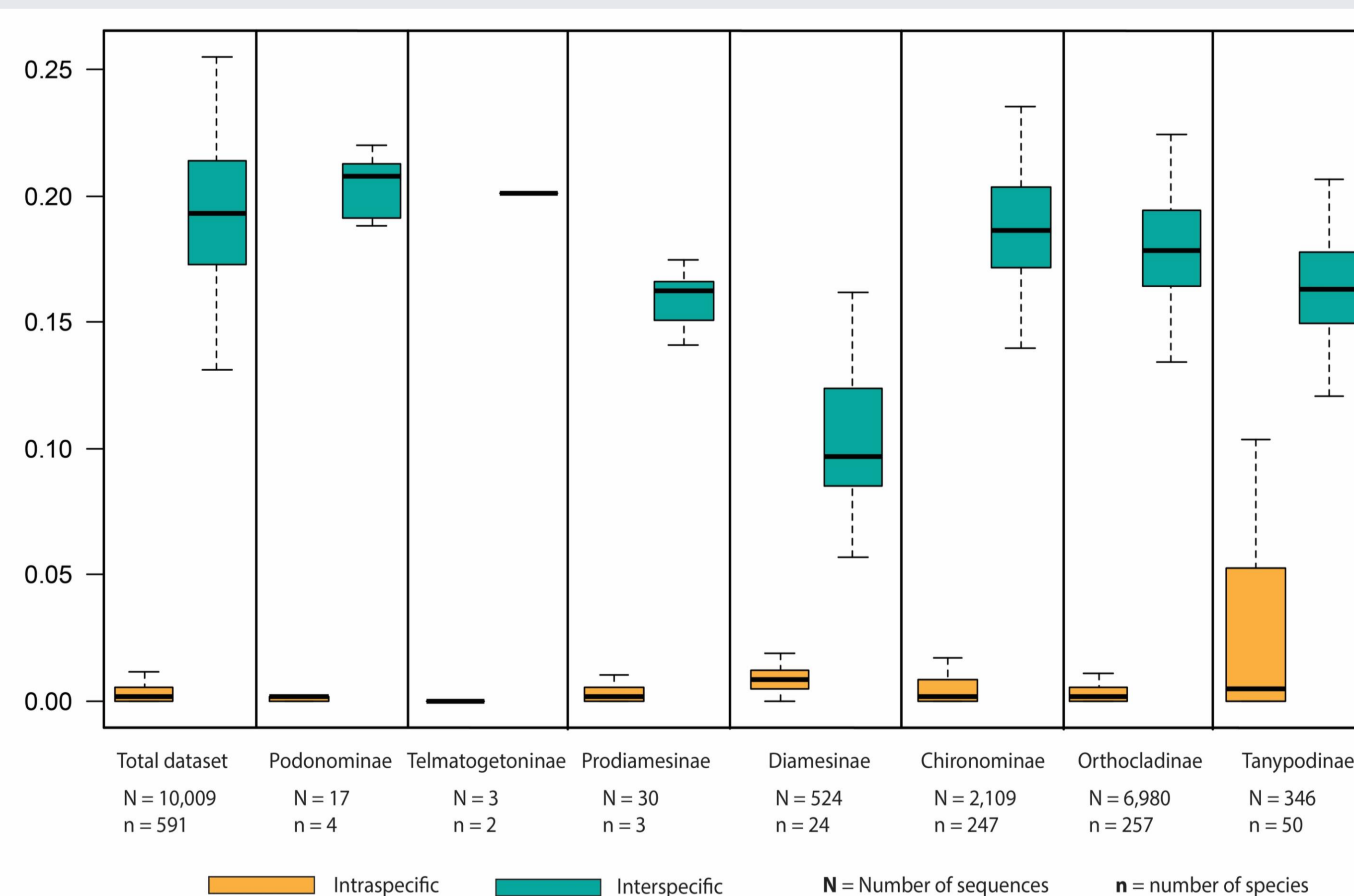
	Collected	Barcoded
Number of individuals	12.000 imagines+larvae	739
	Morphology ID	Species delimitation
Species	83-86	134-147
Species new for region	56-59	?
Putative new species for knowledge	2	6

### Barcoded individuals



### DNA-BARCODING

#### Boxplots of K2P inter and intraspecific pairwise nucleotide distances



## CONCLUSION

Our study provides COI sequences for the scarcely known Chironomidae fauna of the Balkan region. **The estimated barcoding efficiency 95,4% confirmed utility of this tool for Chironomidae identification.** The performed analysis developed and compared optimal thresholds for distance-based identifications estimated at the family and tribe level.

## FUNDING SOURCES:

Grant number 2016/23/NZ8/02123, PRELUDIUM 12 „Species diversity and origin of Chironomidae fauna from geologically young Lake Skadar (Montenegro/Albania) and its old spring system based on morphological characters and Next Generation Sequencing Techniques.”