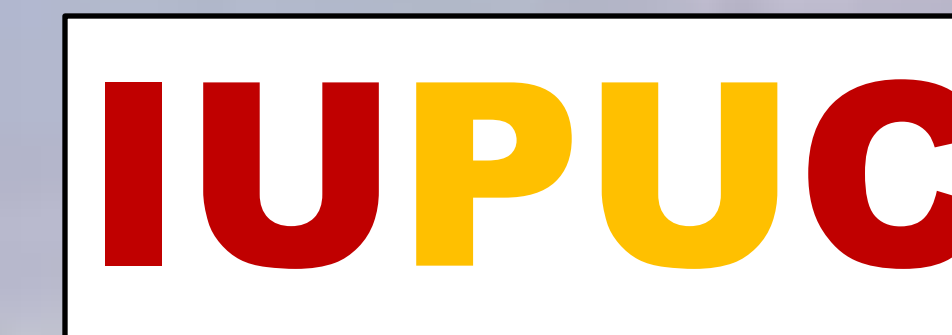


The Mayflies (Insecta: Ephemeroptera) of the Serengeti in Tanzania, Africa



Ashley Garlick & Luke M. Jacobus

Division of Science, Indiana University Purdue University Columbus
Columbus, Indiana 47203, USA; agarlick@iupuc.edu; lmjacobu@iupuc.edu



Fig. 1 Hippos from the Katavi National Park

Abstract

Water quality is a major concern in the lives of many Africans. Being able to monitor that water is extremely important. Mayflies (Insecta: Ephemeroptera) are particularly sensitive to pollution in water and are used all around the world for checking the quality of the environment, in general. Relatively little is known about African mayflies. Based on our research, 49 genera from 11 families are now known from Tanzania, several of which represent new country records, including one genus new to science. One additional new species has been discovered.

Background

The country of Tanzania in Africa is 945,087 sq. km in area and has a great diversity of habitats. Elevation ranges from 5,895 m above sea level at Mt. Kilimanjaro (highest elevation point), to land at sea level along the Indian Ocean. Out of the 945,097 sq. km of land area, about 59,050 sq. km is water. This is a remarkable 16% of the country's surface. Many of these aquatic habitats include rivers, lakes, natural ponds, and natural springs. Tanzania is widely known for the Serengeti, a diverse ecological region in its North, that is popular among tourists (Figs. 1, 4).

Tanzania has numerous environmental problems that may affect the drainage of water through natural systems, including sometimes severe droughts, resulting in the drying out of lakes and ponds, and low flowing rivers. As a result of these problems, and severe human pollution, less than one third of water is safe to drink.

Many Tanzanians have to work extremely hard to obtain water that is clean and drinkable (Fig. 5), sometimes having to walk more than eight hours a day to find clean sources (Gov't Tanzania, 2012; Ministry of Water, 2012; WaterAid, 2012). Stagnant, standing waters are notorious for holding disease and chemicals that are deadly to both humans and aquatic insects (de Moor et al., 2003).



Fig. 2 Baetidae: *Tanzaniops* sp. larva



Fig. 3 Heptageniidae: *Afronurus* sp. larva

Aquatic insects are excellent water quality indicators, because their bodies are sensitive to pollution that is in their habitat, responding to those changes almost immediately. Mayflies (Ephemeroptera) are one of these particularly sensitive insects that are widely used in the world for monitoring water and its associated terrestrial habitats (Figs. 2, 3). Generally speaking, a greater diversity of mayflies indicates greater environmental health. Mayflies can be easy to identify, so they can be a good way for local people to monitor their own water (de Moor et al. 2003), if resources are available for them to do so. We are seeking to improve those resources.

Materials and Methods

In this study, we investigated the diversity of mayflies from the poorly known continent of Africa (Jacob, 2003), with a focus on the Serengeti region of Tanzania (Fig. 4). We did a thorough review of the historical scientific literature (Garlick & Jacobus, unpublished) and identified approximately 650 recently collected specimens using dichotomous keys (de Moor et al. 2003) to create the first comprehensive checklist of mayfly species from Tanzania. Specimens were examined using compound and dissecting light microscopes. Specimens are stored in 70% ethanol in a freezer. A PupilCam microvideo recorder (available from BioQuip) was used to document images of taxa (e.g., Figs. 2, 3). Voucher specimens will be archived in permanent natural history collections at the University of Missouri.

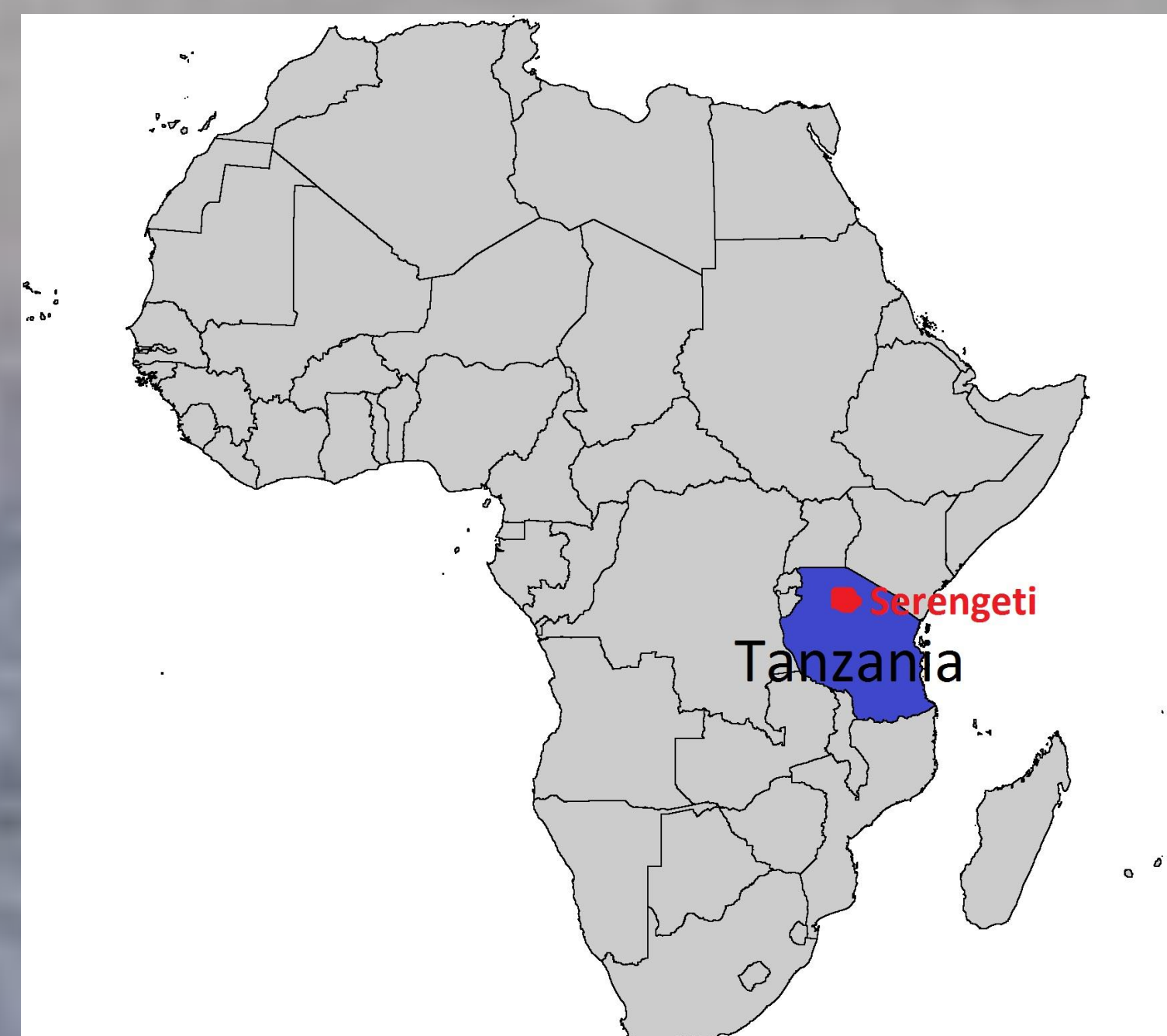


Fig. 4 Map of Africa/Serengeti



Fig. 5 African man checking water quality.

Results

Checklist of Families & Genera (# of Species)

Baetidae	Caenidae	Leptophlebiidae
<i>Afrobaetodes</i> (2)	<i>Afrocaenis</i> (3)	<i>Euthraulus</i> (4)
<i>Acanthiops</i> (3)	<i>Caenis</i> (1)*	<i>Fulletomimus</i> (1)
<i>Baetis</i> (3)	<i>Caenopsella</i> (4)	<i>Thraulus</i> (1)
<i>Bugilliesia</i> (1)	Dicercomyzidae	Machadorythidae
<i>Centroptiloides</i> (1)	<i>Dicercomyzon</i> (1)	<i>Machadorythus</i> (1)
<i>Cheleocloeon</i> (2)	Ephemerythidae	Oligoneuriidae
<i>Cloeon</i> (8)	<i>Ephemerythus</i> (1)	<i>Elassoneuria</i> (2)
<i>Crassabwa</i> (1)	<i>Limnokijara</i> (2)	Polymitarciidae
<i>Dabulamanzia</i> (1)	Heptageniidae	<i>Povilla</i> (1)
<i>Dicenetrotium</i> (1)	<i>Afronurus</i> (1)	Prosopistomatidae
<i>Glossidion</i> (2)	<i>Componeuria</i> (?)	<i>Prosopistoma</i> (1)
<i>Pseudocloeon</i> (1)		
<i>Rhithrocloeon</i> (2)		
<i>Tanzaniops</i> (1)		
<i>New Genus</i> (1)		

* Our research has shown that there is more than one species within the Genus *Caenis* in Tanzania, based on the discovery of seven or more morphospecies in recent samples. Currently, names cannot be assigned to these morphospecies. Further research is needed.

Acknowledgments

This study is funded in part by the IUPUC Office of Student Research. Robert Sites and Kris Simpson (Univ. Missouri) provided the fresh specimens and the pictures from Africa.

References

- de Moor, II, JA Day, and FC De Moor. 2003. Guides to the Freshwater Invertebrates of Southern Africa. Vol. 7. Republic of South Africa: Water Research Commission.
- Government of Tanzania. 2012. *The United Republic of Tanzania*. <<http://www.tanzania.go.tz/waterf.html>>. Accessed 19 February.
- Jacob U. 2003. Africa and its Ephemeroptera: Remarks from a biogeographical view. Pages 317-325 in Gaino E. (ed). Research update on Ephemeroptera & Plecoptera. Università di Perugia. Perugia, Italy.
- Ministry of Water. 2012. *The United Republic of Tanzania*. <<http://www.maji.go.tz/basins/nine.php>>. Accessed 19 February.
- WaterAid. 2012. *Tanzania*. <http://www.wateraid.org/uk/what_we_do/where_we_work/tanzania/>. Accessed 19 February.