University of Florida Book of Insect Records
Chapter 19 *Adapted to Greatest Depth*

A.A. AKERS

Department of Entomology & Nematology
University of Florida, Gainesville, Florida 32611-0620

1 May 1996

Lake Baikal in the Siberian region of Russia is the world's deepest lake, with a maximum depth of 1620 m. Although many different orders of insects live in Lake Baikal, only non-biting midges (Diptera: Chironomidae) survive in its deeper waters. Sergentia koschowi *larvae have been found in the open waters of Lake Baikal at a depth of 1360 m, making it the only insect known to survive in waters so deep.*

The goal of this paper is to identify the insect species that lives in water at the greatest depths. The search was limited to the world's deepest lake, Lake Baikal in the Siberian region of Russia. Of all insect species living in or around the Baikal area, only one species of insect is able to live as deep as 1360 m.

Methods

To locate references on aquatic insects, I consulted aquatic insect textbooks, general entomology textbooks, and keyword searches on LUIS, the computerized library catalog at the University of Florida. I also searched AGRICOLA (1970-1990). Help in finding a champion was obtained from posting a request to the ENTOMO-L Bulletin Board.

Results

Only a few species of Chironomidae (midges) live in the deeper portions of Lake Baikal. The depth record belongs to the larvae of *Sergentia koschowi*, which occur in the fine oozes of the lake bottom at 1360 m (Linevich 1971). Larvae of a related species, S. baikalensis, also live in Lake Baikal but only at depths from 1.5 to 100 m.

Discussion

The insect living at the greatest depth in water must live in a freshwater habitat, since no insects live in the ocean depths (Norris 1991). The deepest lakes in the world are Lake Baikal (1620 m) (Kozhov 1963) and Lake Tangan-yika, located in Central Africa (1400 m) (Cole 1983). Lake Tanganyika is a tropical lake with no temperature-induced turnover of oxygen rich water and is considered anaerobic below 200 m (Cole 1983). Lake Baikal is a temperate lake with seasonal turnover of water. Oxygen levels approach saturation down to 500 m, and then drop to 10 mg/l (Kozhov 1963) becoming more depleted toward the bottom; within the bottom layers of ooze, there is no oxygen (Linevich 1971). S. *koschowi* can be found in the Abyssal Zone, which is greater than 500 m. The zone is composed of silt/clay ooze, and the temperature is about 3.4 to 3.6° C throughout the year.

Kozhov (1963) reported that *S. koschowi* larvae are big (12 to 20 mm) and bright-red colored with rudimentary eyes. The body color indicates that hemoglobin is present, allowing the insect to survive periods without oxygen. Hemoglobin is a respiratory pigment that can store oxygen (Eriksen et al. 1984). Among aquatic insects, only certain larval chironomids possess hemoglobin (Armitage et al. 1995).

Kozhov (1963) published a well documented biological monograph about Lake Baikal that includes over 200 years of work by over 1,000

scientists. Of the insect orders mentioned, Plecoptera (stoneflies), Trichoptera (caddisflies), Ephemeroptera (mayflies), Dip-tera (flies, midges, mosquitoes), Odonata (dragon and damsel flies), Coleoptera (beetles) and Hemiptera (true bugs), all live in open bays and gulfs of Lake Baikal. The bays and gulfs of Lake Baikal are small bodies of water connected to the open lake by a broad channel. Their depth rarely exceeds 4.5 to 5 m, but they can be influenced by Lake Baikal's open waters during inshore winds (Kozhov 1963). Only chironomid midges (Diptera) inhabit the open waters of Lake Baikal. Based on present knowledge, *Sergentia koschowi* is the insect adapted to the deepest fresh waters, and the only possibility for another record would be an unknown species from the same lake.

Acknowledgments

I thank T.J. Walker, for the memo that led me to search for information on Lake Baikal. W.L. Peters (Florida A & M University, Tallahassee) for providing me with helpful references on Lake Baikal. I also give special thanks Jon Gelhaus (Philadelphia, Academy of Natural Sciences) who provides information which lead me directly to a champion.

References Cited

Armitage, P., P. S. Cranston & L.V.C. Pinder. 1995. The Chironomidae: the biology and ecology of non-biting midges. Chapman & Hall, London.

Cole, G. A. 1983. Textbook of limnology, 3rd. ed. C.V. Mosby Co., St. Louis.

Eriksen, C. H., V. H. Resh, S. S. Balling & G. A. Lamberti. 1984. Aquatic insect respira-tion, p. 27-37. *In:* R. W. Merritt & K. W. Cummins [eds.], Aquatic insects of North America, 2nd. ed. Kendall/Hunt Publ., Dubuque, Iowa.

Kozhov, M. M. 1963. Lake Baikal and its life. W. Junk, The Hague.

Linevich, A. A. 1971. The Chironomidae of Lake Baikal. Limnologica (Berlin) 8: 51-52.

Norris, K. R. 1991. General biology, p. 68-108. *In: C*ommonwealth Scientific & Industrial Research Organization, The insects of Australia, 2nd ed., Vol. 1. Melbourne Univ. Press, Melbourne.