

Range Extension for *Limnichoderus naviculatus* (Casey, 1889) (Coleoptera: Limnichidae) in North America Based on Records from Missouri, USA

Author(s): Seth W. Lanning, David A. Woods, William R. Mabee, Matthew D. Combes and J. H. Epler

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SCIENTIFIC NOTE

**RANGE EXTENSION FOR *LIMNICHODERUS NAVICULATUS* (CASEY, 1889)
(COLEOPTERA: LIMNICHIDAE) IN NORTH AMERICA BASED ON RECORDS FROM
MISSOURI, USA**

SETH W. LANNING

Missouri Department of Conservation, Central Region Office and Conservation Research Center
3500 E. Gans Road, Columbia, MO 65201, U.S.A.

DAVID A. WOODS

Missouri Department of Conservation, Southwest Regional Office
2630 N. Mayfair, Springfield, MO 65803, U.S.A.

WILLIAM R. MABEE

Missouri Department of Conservation, Central Region Office and Conservation Research Center
3500 E. Gans Road, Columbia, MO 65201, U.S.A.
william.mabee@mdc.mo.gov

MATTHEW D. COMBES

Missouri Department of Conservation, Agriculture Systems Field Station
Northeast Regional Office, 3500 S. Baltimore
Kirksville, MO 63501, U.S.A.

AND

J. H. EPLER

461 Tiger Hammock Road
Crawfordville, FL 32327, U.S.A.

The beetle family Limmichidae (minute marsh-loving beetles) are composed of four subfamilies, Cephalobryrrhinae, Hyphalinae, Limmichinae, and Thaumastodinae, with a total of 37 genera and 354 species (Integrated Taxonomic Information System 2015). The subfamily Limmichinae is the most species-rich with 24 genera and 290 species or nearly 82% of all species within the Limmichidae (ITIS 2015). Within the subfamily Limmichinae, the genus *Limnichoderus* Casey is represented worldwide by 24 recognized species known to occur only in the Western Hemisphere, where *Limnichoderus naviculatus* (Casey, 1889) has been reported to occur in Arizona, California, Nevada, New Mexico, Oklahoma, and Texas in the USA (Wooldridge 1986; Spangler *et al.* 2001). The primary purpose of this report is to present the first record of *L. naviculatus* in Missouri, USA and document a range extension for this species in North America. Because little information is available on environmental factors associated with the occurrence, distribution, and autecology of *L. naviculatus*, this report also presents phy-

sical and water quality characteristics from the localities where this species was collected in Missouri.

We collected aquatic macroinvertebrate community samples on 18 September 2012 from two reaches of Spring Creek and one reach of Crane Creek in Stone County in the Ozark Highlands Ecological Section of Missouri (Cleland *et al.* 1997; Nigh and Schroeder 2002) (Fig. 1). The samples were collected using 500 μm mesh kick nets in riffle, pool, and submerged rootmat habitats according to methods outlined by Sarver *et al.* (2002). Coleoptera found within the samples were examined with a dissection microscope using magnifications up to 80X. Taxonomic keys and descriptive information provided in Wooldridge (1981), Larson *et al.* (2000), Shepard (2002), Ciegler (2003), White and Roughley (2008), and Epler (2010) were used to identify beetle specimens. Reference specimens are retained in a collection at the Missouri Department of Conservation, Central Region Office and Conservation Research Center, Columbia, Missouri.

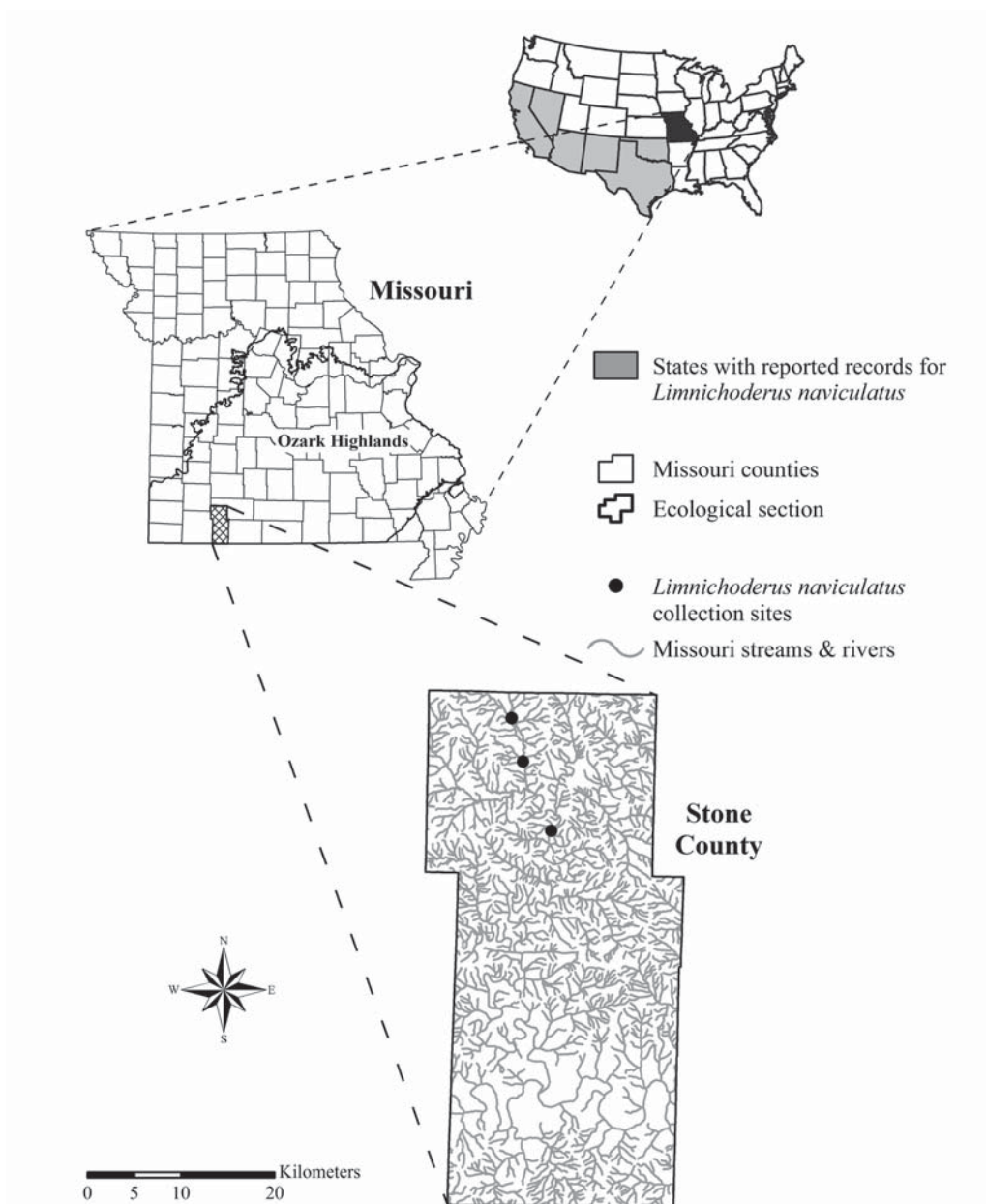


Fig. 1. Map depicting states in the USA with reported records for *Limmichoderus naviculatus* and locations of reaches of streams where adult specimens of *L. naviculatus* were collected in Missouri during 18 September 2012.

Fifteen adult specimens of *L. naviculatus* were found in the material collected. The specimens were found only in samples collected from submerged rootmat habitat and composed 0.3–4.1% of the macroinvertebrate fauna found in those samples.

Stream order of the reaches where *L. naviculatus* were collected ranged from second to fifth order.

Mean watershed area was 179.7 km² (range 33.2–399.3 km²). Mean wetted width was 13.5 m (range 8.0–19.4 m). Mean depth was 45.3 cm (range 37.0–50.0 cm). Mean discharge was 0.57 m³/s (range 0.30–1.27 m³/s). Substrates of the reaches were primarily coarse gravel with 38–57% being 16–64 mm. Riparian corridors had 86–100% canopy,

Table 1. Means and ranges (in parentheses) of water quality characteristics from reaches of streams where adult specimens of *Limnichoderus naviculatus* were collected in Missouri during 18 September 2012. Temp = water temperature (°C), DO = dissolved oxygen (ppm), Cond = conductivity (μS/cm), Turb = turbidity (Nephelometric Turbidity Units), TP = total phosphorus (μg/L), TN = total nitrogen (mg/L), NVSS = nonvolatile suspended solids (mg/L), VSS = volatile suspended solids (mg/L), Chlor = total chlorophyll (μg/L).

Temp	DO	Cond	pH	Turb	TP	TN	NVSS	VSS	Chlor
17.6	8.6	423	8.1	4.7	38	3.9	3.3	0.9	3.1
(14.3–21.2)	(7.8–9.6)	(365–457)	(7.7–8.3)	(3.9–5.5)	(29–44)	(2.1–5.6)	(2.8–4.2)	(0.6–1.1)	(2.2–4.0)

mid-story, and ground cover present on both sides of the streams. Means and ranges of select water quality characteristics from the reaches are provided in Table 1.

This report provides the first record of occurrence of *L. naviculatus* in Missouri and extends the northeastern boundary of the known distribution of the species in North America from Oklahoma into Missouri. Because our sampling methodology targeted truly aquatic macroinvertebrates, specimens of *L. naviculatus* may have been collected incidentally in our samples. Targeted sampling for limnichid beetles could, possibly, reveal this semi-aquatic species has a more widespread distribution in the region. Our provision of physical and water quality characteristics from the reaches of streams where we collected *L. naviculatus* should aid in delineation of environmental parameters associated with the occurrence, distribution, and autecology of this species.

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REFERENCES CITED

- Ciegler, J. C. 2003.** Water Beetles of South Carolina (Coleoptera: Gyrinidae, Haliplidae, Noteridae, Dytiscidae, Hydrophilidae, Hydraenidae, Scirtidae, Elmidae, Dryopidae, Limnichidae, Heteroceridae, Psephenidae, Ptilodactylidae, and Chelonariidae). Biota of South Carolina, Vol. 3. Clemson University, Clemson, SC.
- Cleland, D. T., P. E. Avers, W. H. McNabb, M. E. Jensen, R. G. Bailey, T. King, and W. E. Russell. 1997.** Chapter 9: The national hierarchical framework of ecological units [pp. 181–200]. *In: Ecosystem Management Applications for Sustainable Forest and Wildlife Resources* (M. S. Boyce and A. W. Haney, editors). Yale University Press, New Haven, CT.
- Epler, J. H. 2010.** The Water Beetles of Florida. An identification manual for the families Chrysomelidae, Curculionidae, Dryopidae, Dytiscidae, Elmidae, Gyrinidae, Haliplidae, Helophoridae, Hydraenidae, Hydrochidae, Hydrophilidae, Noteridae, Psephenidae, Ptilodactylidae, and Scirtidae. Final report to State of Florida Department of Environmental Protection, Division of Environmental Assessment and Restoration, Tallahassee, FL.
- Integrated Taxonomic Information System (ITIS). 2015.** Integrated Taxonomic Information System on-line database. www.ITIS.gov (accessed 10 April 2015).
- Larson, D. J., Y. Alarie, and R. E. Roughley. 2000.** Predaceous Diving Beetles (Coleoptera: Dytiscidae) of the Nearctic Region, with Emphasis on the Fauna of Canada and Alaska. NRC Research Press, Ottawa, ON, Canada.
- Nigh, T. A., and W. A. Schroeder. 2002.** Atlas of Missouri Ecoregions. Missouri Department of Conservation, Jefferson City, MO.
- Sarver, R., S. Harlan, C. Rabeni, and S. Sowa. 2002.** Biological Criteria for Wadeable Streams/Perennial Streams of Missouri. Missouri Department of Natural Resources, Jefferson City, MO.
- Shepard, W. D. 2002.** Family Limnichidae [pp.125–126]. *In: American Beetles Polyphaga: Scarabaeoidea through Curculionoidea, Volume 2* (R. H. Arnett, Jr., M. C. Thomas, P. E. Skelley, and J. H. Frank, editors). CRC Press, Boca Raton, FL.
- Spangler, P. J., C. L. Staines, P. M. Spangler, and S. L. Staines. 2001.** A checklist of the Limnichidae and Lutrochidae (Coleoptera) of the world. *Insecta Mundi* 15(3): 151–161.
- White, D. S., and R. E. Roughley. 2008.** Chapter 20: Aquatic Coleoptera [pp. 571–671]. *In: An Introduction to the Aquatic Insects of North America*. 4th edition (R. W. Merritt, K. W. Cummins, and M. B. Berg, editors). Kendall/Hunt Publishing, Dubuque, IA.
- Wooldridge, D. P. 1981.** New World Limnichidae VI. A revision of *Limnichoderus* Casey (Coleoptera: Dryopidae: Limnichidae). *Journal of the Kansas Entomological Society* 54(1): 171–191.
- Wooldridge, D. P. 1986.** A Catalog of the Coleoptera of America North of Mexico. Family Limnichidae. Agricultural Research Service, United States Department of Agriculture, Agriculture Handbook No. 529–48.

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