



Cover

Source: The Journal of the Lepidopterists' Society, 70(4)

Published By: The Lepidopterists' Society

URL: <https://doi.org/10.18473/lepi.v70i4.a13>

BioOne Complete (complete.BioOne.org) is a full-text database of 200 subscribed and open-access titles in the biological, ecological, and environmental sciences published by nonprofit societies, associations, museums, institutions, and presses.

Your use of this PDF, the BioOne Complete website, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at www.bioone.org/terms-of-use.

Usage of BioOne Complete content is strictly limited to personal, educational, and non - commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

BioOne sees sustainable scholarly publishing as an inherently collaborative enterprise connecting authors, nonprofit publishers, academic institutions, research libraries, and research funders in the common goal of maximizing access to critical research.

Volume 70 Number 4

2016

ISSN 0024-0966

Journal of the Lepidopterists' Society



Published quarterly by The Lepidopterists' Society

THE LEPIDOPTERISTS' SOCIETY

EXECUTIVE COUNCIL

JOHN CALHOUN, President
TODD GILLIGAN, Immediate Past President
GREGORY POHL, Vice President
MARL KEKKONEN, Vice President
GEOFF MARTIN, Vice President

MICHAEL E. TOLIVER, Secretary
CHRISTOPHER C. GRINTER, Asst. Secretary
KELLY M. RICHERS, Treasurer
KEITH SUMMERVILLE, Editor of *Journal*
JAMES ADAMS, Editor of *News*

Members at large:

MEGAN McCARTY
KATHLEEN PRUDIC
MARK WALKER

CHRISTI JAEGER
CAITLIN LaBAR
ERIK RUNQUIST

DAVID BETTMAN
SHANNON MURPHY
BRIGETTE ZACHARCZENKO

EDITORIAL BOARD

JOHN W. BROWN (*Chair*)
MICHAEL E. TOLIVER (*Member, at large*)
KELLY RICHERS (*Memoirs*)

KEITH SUMMERVILLE (*Journal*)
JAMES ADAMS (*News*)
TODD GILLIGAN (*Website*)

HONORARY LIFE MEMBERS OF THE SOCIETY

LINCOLN P. BROWER (1990), RONALD W. HODGES (2004) CHARLES V. COVELL, JR. (2009), DON R. DAVIS (2009),
JACKIE MILLER (2010), JERRY POWELL (2010), CARL COOK (2011), PAUL R. EHRLICH (2011), RUDI MATTONI (2011), PAUL OPLER (2012)

The object of The Lepidopterists' Society, which was formed in May 1947 and formally constituted in December 1950, is "to promote the science of lepidopterology in all its branches, . . . to issue a periodical and other publications on Lepidoptera, to facilitate the exchange of specimens and ideas by both the professional worker and the amateur in the field; to secure cooperation in all measures" directed towards these aims.

Membership in the Society is open to all persons interested in the study of Lepidoptera. All members (except Affiliate) receive the *Journal* and the *News of The Lepidopterists' Society*. Prospective members should send to the Treasurer full dues for the current year, together with their full name, address, and special lepidopterological interests. The additional cost for members outside the U.S. is to cover mailing costs. In even-numbered years the Society publishes a Membership Directory, with addresses, a geographical index, and a subject index of special interests.

Active members—annual dues \$45.00 in U.S. (\$50.00 in Canada & Mexico; \$55 elsewhere)
Affiliate members—annual dues \$10.00 worldwide
Student members—annual dues \$20.00 in U.S. (\$25.00 in Canada & Mexico; \$30 elsewhere)
Sustaining members—annual dues \$60.00 in U.S. (\$65.00 in Canada & Mexico; \$70 elsewhere)
Life members—single sum \$1,800.00
Institutional subscriptions—annual \$60.00 (\$65.00 in Canada & Mexico; \$70 elsewhere)
Airmail postage for the *News* \$15.00, \$30.00 outside North America (U.S., Canada, Mexico)

Send remittances, payable to *The Lepidopterists' Society*, to: Kelly M. Richers, Treasurer, 9417 Carvalho Court, Bakersfield, CA 93311-1846; and address changes, claims for missing or damaged issues, and back issue orders to: Chris Grinter, Illinois Natural History Survey, 1816 South Oak St., Champaign, IL 61820-0904, e-mail: cgrinter@gmail.com. For information about the Society, contact: Michael E. Toliver, Division of Math & Sciences, Eureka College, 300 E. College Ave., Eureka, IL 61530-1500, e-mail: miketol@eureka.edu. To order back issues of the *Memoirs*, write for availability and prices to Kenneth R. Bliss, 1321 Huntington Trail, Round Rock, TX 78664, e-mail: krlbliss@gmail.com.

Journal of The Lepidopterists' Society (ISSN 0024-0966) is published quarterly by The Lepidopterists' Society, c/o Chris Grinter, Asst. Secretary, Illinois Natural History Survey, 1816 South Oak St., Champaign, IL 61820-0904. Periodicals postage paid at Champaign, IL and at additional mailing offices. POSTMASTER: Send address changes to THE LEPIDOPTERISTS' SOCIETY, c/o Chris Grinter, Illinois Natural History Survey, 1816 South Oak St., Champaign, IL 61820-0904.

Website: <http://www.lepsoc.org/>

Facebook: <https://www.facebook.com/lepsoc> | Twitter: @thelepsoc

Cover illustration: Fifth instar larvae of *Calyptra canadensis* (Bethune) on host plant, photo taken by J. L. Snyder See article on page 253.

EDITORIAL STAFF OF THE JOURNAL

KEITH S. SUMMERVILLE, Editor
Department of Environmental Science and Policy
Drake University
2507 University Ave., 131 Olin Hall
Des Moines, Iowa 50311-4505
ksummerville@drake.edu

PEG TOLIVER, Layout Editor
Natural Imprints
1003 Dillon Drive
Normal, Illinois 61761
naturimp@mtco.com

Associate Editors:

GERARDO LAMAS (*Peru*), KENELM W. PHILIP (*USA*), ROBERT K. ROBBINS (*USA*), FELIX SPERLING (*Canada*),
DAVID L. WAGNER (*USA*), CHRISTER WIKLUND (*Sweden*), CARLA PENZ (*USA*), ANDREW WARREN (*USA*)

NOTICE TO CONTRIBUTORS

The Lepidopterists' Society has since its inception valued the contributions of both professional and amateur Lepidopterists. We maintain a policy of accepting for publication in the Journal articles from both groups, while maintaining high standards of scholarship. The Journal of The Lepidopterists' Society is a quarterly publication welcoming articles addressing any aspect of the study of Lepidoptera, including systematics, natural history, behavior, ecology, distribution and biogeography, and evolution. Categories are Articles, Profiles, General Notes, and Advances in Methodology. Instructions for electronic submission appear below.

Short articles, especially those of a less quantitative nature, may be more appropriate for publication in the *News of the Lepidopterists' Society*. Content for the *News* typically includes natural history and life cycle observations, techniques for collecting, rearing and observation, photography, state records, book reviews and notices of new publications, and current events. Such material should be sent to the editor: James Adams, School of Sciences and Math, 650 College Dr., Dalton State College, Dalton, GA 30720-3778; email: jadams@daltonstate.edu .

Send *Journal* submissions electronically to: ksummerville@drake.edu or to the editor at the above address. Contributors should feel free to recommend one or two reviewers upon submission of their manuscript.

Before submitting manuscripts or electronic files, consult instructions on the Society's web site at <http://www.lepsoc.org/>.

Authors should provide an electronic copy of the manuscript in a standard PC or Macintosh-based word processing format.

Abstract: Include an informative abstract for Articles, Profiles, and Technical Comments.

Additional key words: Up to five key words or terms not in the title should accompany Articles, Profiles, General Notes, and Technical Comments.

Text: Write with precision, clarity and economy, and use the active voice and the first person whenever appropriate. Make title explicit, descriptive, and as short as possible. The first mention of a plant or animal in the text should include the *full scientific name* with *author*, and *family*. Use metric units for measurements, and a 24-h clock (0930 h, not 9:30 AM) to express time. Underline only where *italics* are intended.

Literature cited: References to Articles, Profiles, General Notes, and Technical Comments should be given as Sheppard (1959) or (Sheppard 1959, 1961a,b) and listed alphabetically under the heading Literature Cited, in plain text (**do not capitalize author names**) and without underlining as follows:

Sheppard, P. M. 1959. Natural selection and heredity. 2nd ed. Hutchinson, London. 209 pp.

— 1961a. Some contributions to population genetics resulting from the study of the Lepidoptera. *Adv. Genet.* 10:165–216.

Illustrations: Electronic submissions are expected. Initial submissions may be low-resolution *.jpg format, but final illustrations should be *.tif format with image layers flattened, saved at a resolution of at least 350 ppi (137 pixels per cm). Illustrate only half of symmetrical objects such as adults with wings spread, unless whole illustration is crucial. Bear in mind that your illustrations will be sized to fit a *Journal* page (plan to make lettering sufficiently large) and that the figure legend will appear at the bottom of the page (*Journal* page: 16.5 cm width, 22.5 cm height). One-column illustrations should be a minimum of 1000 pixels wide; two-column illustrations should be at least 2200 pixels wide. Figures, both line drawings and photographs, should be numbered consecutively in Arabic numerals; do not use "plate." Type figure legends double-spaced at the end of the manuscript following Literature Cited. Use a separate paragraph for each legend. Color illustrations are encouraged; contact editor or consult our web site for submission requirements and cost.

Tables: Number tables consecutively in Arabic numerals. Label them in plain text (e.g., Table 1.) and use a concise and informative heading. Type each table on a separate sheet and place after the Literature Cited section, with the approximate desired position indicated in the text. Avoid vertical lines and vertical writing.

Voucher specimens: When appropriate, manuscripts must name a public repository where specimens documenting the identity of organisms can be found. Kinds of reports that require vouchering include descriptions of new taxa, life histories, host associations, immature morphology, and some experimental studies.

Proofs: The edited manuscript and galley proofs will be mailed to the author for correction of printer's errors. Excessive author's changes will be charged to authors at the rate of \$3.00 per line. A purchase order for reprints will accompany proofs.

Page charges: For authors affiliated with institutions, page charges are \$50 per *Journal* page. For authors without institutional support, page charges are \$25 per *Journal* page. For authors who are not members of the Society, page charges are \$75 per *Journal* page. Authors unable to pay page charges for any reason should apply to the editor at the time of submission for a reduced rate. Authors of Book Reviews and Obituaries are exempt from page charges.

Correspondence: Address all matters relating to the *Journal* to the editor. Address book reviews directly to the *News* editor.