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NATURAL HISTORY SURVEY
The Literature of Arthropods Associated with Soybeans

III. A BIBLIOGRAPHY OF THE

BEAN LEAF BEETLES

*Cerotoma trifurcata* (Forster) and *C. ruficornis* (Olivier)
(Coleoptera: Chrysomelidae)

M. P. NICHOLS • M. KOGAN • G. P. WALDBAUER

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*Cerotoma trifurcata* (Forster) and *C. ruficornis* (Olivier)
(Coleoptera: Chrysomelidae)

M. P. Nichols, M. Kogan, and G. P. Waldbauer

Two species of the genus *Cerotoma* Chevrolet, 1837,¹ are important agricultural pests and have become significant elements of the arthropod fauna associated with soybeans in the New World. *C. trifurcata* (Forster, 1771)² is the only species of the genus known to attack soybeans in the continental United States, while *C. ruficornis* (Olivier, 1791)³ occurs primarily south of the United States.

Both species are well defined taxonomically, and despite considerable variation in their color and pattern the synonymy is not extensive. The primary synonyms of *C. trifurcata* are *C. caminea* (Fabricius, 1801),⁴ which appears frequently in the literature, and *C. fibulata* (Germar, 1824).⁵ Barber (1945)⁶ lists *C. denticornis* (Fabricius, 1792)⁷ and *C. sexpunctatus* (Horn, 1872)⁸ as the synonyms of *C. ruficornis*. Herzog (1968)⁹ made a detailed study of the color variations of *C. trifurcata*.

The distribution of each species is known only in general terms. *C. trifurcata* is found from southern Canada to the Gulf states, extending from the Atlantic coast westward to South Dakota in the north and to Arizona in the south. It is also found in Puerto Rico. *C. ruficornis* is widely distributed in the West Indies and, on the mainland, occurs in Florida and Texas and from Mexico to northern Venezuela.

Bean leaf beetles damage several growth stages of soybeans, with the amount of damage varying from region to region according to the phenology of the beetles and their host plants. The larvae feed on the

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¹ See entry 97 in the bibliography.
² See entry 121 in the bibliography.
³ See entry 256 in the bibliography.
⁴ See entry 111 in the bibliography.
⁵ See entry 130 in the bibliography.
⁶ See entry 32 in the bibliography.
⁷ See entry 113 in the bibliography.
⁸ See entry 161 in the bibliography.
⁹ See entry 154 in the bibliography.

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L. J. Stannard — Taxonomy
G. P. Waldbauer — Bionomics
subterranean parts and adults feed on the foliage and sometimes on the green pods. The information outlined below is based largely on accounts of the behavior of *C. trifurcata*. However, it is likely that the behavior of *C. ruficornis* differs only in detail.

*C. trifurcata* has two or three complete generations per year throughout its geographic range. Thus, an abundance of adults may coincide with three stages of plant growth. In the Midwest, overwintered adults may invade soybean fields soon after germination and may destroy large numbers of seedlings. Replanting occasionally has been necessary. Adults of the first generation are usually present during the period of strong vegetative growth. They feed almost exclusively on the leaves, and economic damage due to feeding *per se* results only when populations are extremely high. However, *C. trifurcata* also transmits the bean pod moth virus. The effect of this virus on yield is not clear, but there is evidence that when multiple infections occur it may have a synergistic relationship with the soybean mosaic virus. *C. ruficornis* is known to transmit the cowpea mosaic virus. Adults of the last generation may accumulate in late maturing fields and attack green pods. In such cases the yield is directly affected.

Intercrop relationships are an important factor to be considered in pest-management programs involving the bean leaf beetles. Isely (1942) reported that in Arkansas enormous populations of adult *C. trifurcata* developed on soybeans. Snapbeans for the fall market were planted in midsummer and were still green when the early-planted soybeans were losing their leaves and nearing maturity. The smaller acreages of snapbeans were then suddenly flooded with large numbers of beetles emerging from the soybean fields.

At least four additional species of *Cerotoma* are known to be associated with soybeans or other grain legumes in South America. *C. facialis* Erickson, 1847. and *C. salvinii* Baly, 1866, are known from Panama, Colombia, and Peru; *C. [Andrector] ruficollis* (Fabricius, 1801) and *C. unicorne* (Germar, 1824) are known from Brazil. Published information on these species consists of little more than the original descriptions and listings in faunistic surveys and systematic catalogues. The pertinent literature on the Brazilian species up to December 1962 may be found in Silva et al. (1967).

This bibliography follows closely the format and style of the two previous publications in this series. Sources of the entries listed were primarily Biological Abstracts, The Review of Applied Entomology Series A, Bio-Research Index, Biological and Agricultural Index, Index to the Literature of American Economic Entomology, and references cited in articles and inquiries to researchers. All entries except No. 121 were examined. The references are listed alphabetically by author and numbered consecutively. The numbers are arranged in a table (see pages 8 and 9) according to subject and period of publication. A reference may be listed under more than one subject. References which apply to *C. trifurcata* are tabulated by number in lightface type. Those which apply to *C. ruficornis* follow and are in boldface type. References which refer to both species will appear twice under a heading.

Interested researchers are urged to consult the USDA Cooperative Economic Insect Report and the USDA Insect Pest Survey Bulletin for further information concerning *C. trifurcata*.

SIRIC (Soybean Insect Research and Information Center, Illinois Natural History Survey and University of Illinois at Urbana-Champaign) has developed a series of computer programs which make possible more detailed searches of the literature according to subject matter. All citations in this bibliography are stored on tape, and can be retrieved through a series of key words which define categories considerably more refined than those listed in the table on pages 8 and 9. The computerized information system greatly increases the usefulness of the printed bibliographies, and the two together are an important part of the effort of the Illinois Soybean Entomology Team to search out, compile, and organize for ready access the ever-increasing information on soybean entomology for the benefit of all professionals working in this area.

Abbreviations and complete titles of the sources which appear in the bibliographic entries are to be found in a listing at the end of the paper.

We are grateful to Dr. Donald C. Herzog, Department of Entomology, Louisiana State University, for making his bibliography on *Cerotoma* available to us. Mrs. Jo Ann Auble typed the introduction and Mr. Raymond Kotek typed the bibliography and did portions of the bibliographic search. Mr. O. F. Glissen-dorf edited the manuscript and Mr. Lloyd LeMere designed the cover which shows a photograph by Mr. Wilmer Zehr. Their collaboration is gratefully acknowledged.

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16 See entry 174 in the bibliography.
19 See entry 114 in the bibliography.
20 See entry 139 in the bibliography.

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64. ______. 1907. Insects injurious to vegetables. Orange Judd Company, New York. 262 p. illus. refs.


95. ______. H. B. Owens, and F. P. Harrison. 1957. Experiments with sprays, dust, and aerosols for the home garden. J. Econ. Entomol. 50(3):324-328. illus. refs.


HUGHES, J. H. 1944. List of Chrysomelidae (Coleoptera) known to occur in Ohio. Ohio J. Sci. 44(3):129-142. refs.


______. 1971. Specificity of transmission of cowpea mosaic virus by species within the subfamily Galerucinae, family Chrysomelidae. J. Econ. Entomol. 64(2):365-367. illus. refs.


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<table>
<thead>
<tr>
<th>SUBJECT</th>
<th>1899 &amp; PRIOR</th>
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<tr>
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<td>56.97,114,121,129,130,142,162,163,194,195,257,366,97,113,114,129,142,144,161,176,177,179,256,352,387,390,</td>
<td>211.</td>
<td>197,391, 197,391,392,</td>
<td>36,220.</td>
<td></td>
</tr>
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<td>MORPHOLOGY &amp; PHYSIOLOGY</td>
<td>58,162.</td>
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<td>22, 21,22.</td>
<td>32,156,182,401.</td>
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<td></td>
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<td>186.</td>
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<td>25,244,245,246,247,267,409.</td>
<td>78,224,248.</td>
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<td>347.</td>
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<td>212.</td>
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for resistance to the bean leaf beetle, Cerotoma trifurcata (Forster), the southern green stink bug, Nezara viridula (Linnaeus), and the soybean looper, Pseudoplusia includens (Walker), Ph. D. Diss., Louisiana State University, Baton Rouge. 82 p. Illus. refs.


PERIODICAL ABBREVIATIONS
