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The Brachiacantha (Coleoptera: Coccinellidae) of Illinois

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The Brachiacantha (Coleoptera: Coccinellidae) of Illinois

(TITLE)

BY

Harry Wilson Montgomery, Jr.

THESIS

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ABSTRACT

The Illinois fauna of Brachiacantha (Coleoptera: Coccinellidae) is treated in this paper. Seven species were found to occur in Illinois through active collecting and study of specimens from 16 museums and private collections. A key to the identification of adults, descriptions of the adults, habitus photographs and national and state distribution maps are provided. The most commonly collected Illinois species are B. ursina, B. felina, B. quadripunctata quadripunctata and B. decempustulata. Uncommonly collected species are B. dentipes and B. rotunda. Brachiacantha indubitabilis is represented in the Illinois fauna only by the lectotype for the species. Malaise traps, sweep netting, yellow sticky traps, visual inspection of plant material, U-V light traps and pit-fall traps were used in attempts to collect Brachiacantha adults. Since 1990, Malaise traps collected four species and 63.3% of the specimens, manual collecting yielded five species and 27.3% of the specimens and yellow sticky traps collected two species and 9.4% of the specimens. U-V light traps and pit-fall traps did not collect Brachiacantha. The larvae of only two species are known and both have been identified as myrmecophiles. The evolutionary basis of this Brachiacantha-ant relationship is discussed. Also discussed is the species status of Brachiacantha rotunda Gordon.

ACKNOWLEDGMENTS

First and most importantly, I would like to acknowledge Dr. Michael A. Goodrich, my major professor, for his advice, leadership, constant encouragement and patience throughout the course of this research. I would also like to extend acknowledgment to Dr. Robert D. Gordon for his confirmation of the more difficult determinations.

The collection curators who sent specimens for study in this research are gratefully acknowledged for their assistance. Also, I thank my graduate committee members: Dr. Kipp C. Kruse, Dr. Richard C. Funk and Dr. John E. Ebinger.

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INTRODUCTION

The Coccinellidae (ladybird beetles) are well known members of the order Coleoptera. Ladybird beetles have been of popular interest for centuries because of their bright, often contrasting color patterns, and their diurnal, non-secretive mode of life. More recently, coccinellids have received considerable attention from naturalists and agriculturalists because of their potential as biological control agents.

Fifty-seven genera and more than 475 species are currently recognized in the family Coccinellidae from America north of Mexico (Gordon 1985, Gordon and Vandenberg 1991). In temperate regions these beetles are considered beneficial insects as predators of many plant pests. Many coccinellids are known to feed on scale insects, mites, and aphids (Balduf 1935, Hodek 1967). During scarcity or absence of other food, coccinellids are also known to feed on immature stages of Coleoptera, Lepidoptera, and Hymenoptera (Conrad 1959, Yun and Ruppel 1964, Harrison 1960). Plant pollen is an essential food for some (Hagen 1962, Smith 1965), while others feed exclusively on fungal hyphae and spores (Davidson 1921). In tropical regions, some species are economically important plant feeders (Belicek 1976). With some exceptions, larvae of coccinellids occur in the same habitat and have similar

feeding requirements as the adults (Belicek 1976).

Beetles of the family Coccinellidae are usually oval to round, sometimes elongate oval, and convex to weakly convex. Their colors are usually red, orange, or yellow, with black maculations, or black with red or yellow markings. Antennae are clavate, with 11 antennomeres, sometimes reduced to 10, 9, 8, or 7. The apical segments of the maxillary palpi are securiform, parallel sided, or conical. The elytra are either pubescent or glabrous, but not truncate or striate. The prosternal process distinctly separates the transverse front coxae. The abdomen has 5-7 visible sternites and a postcoxal line is nearly always present on the first abdominal sternite. The tarsal formula is 4-4-4 and often cryptotetramerous, with the smaller third segment hidden by the bilobed second segment, or truly 3-3-3. Tibial spurs are either present or absent; tarsal claws are simple or toothed. Male genitalia consist of a curved, sclerotized aedeagus, with trilobed phallobase. Larvae are campodeiform, usually with numerous setae, and often colored in contrasting colors of black, brown, yellow, or orange.

The cryptotetramerous tarsi and the presence of postcoxal lines on the first abdominal sternite will usually distinguish an adult North American coccinellid from any other family. In species that lack postcoxal lines, the maxillary palpi are strongly securiform. The distinctive

shape of the curved, sclerotized aedeagus is a certain character for family recognition (Gordon 1985).

The genus Brachiacantha is included in the subfamily Scymninae, which are all small in size, with the dorsal surface pubescent or glabrous. Antennae are very short, usually two-thirds or less the length of the head, and are inserted ventrally. The terminal segments of the maxillary palpi are parallel sided or securiform. The elytra have a narrow, short epipleuron; and the middle coxal cavities are broadly separated. The femora are usually cylindrical, stout, or occasionally flattened. The tarsal formula is cryptotetramerous (4-4-4), or truly 3-3-3.

All members of the tribe Hyperaspini, including Brachiacantha spp., are small to medium size, 1.5-6.0 mm long. The body form is rounded to elongate-oval and convex to weakly convex. The dorsal surface is glabrous except in the genus Blaisdelliana. Antennae have 11, 10, or 9 antennomeres with elongate, fusiform clubs having the reduced apical segments recessed into the preceding segments. The eyes are large, entire or weakly emarginate, and without pubescence. The terminal segments of the maxillary palpi are securiform. Epipleura of the elytra are narrow, usually flat, and typically excavated for reception of the femoral apices. The legs are short with the femora grooved for reception of the tibiae. The tarsal formula is

cryptotetramerous.

Beetles of the genus Brachiacantha are rounded to elongate oval, and strongly convex. Their color is black with variable patterns of yellow to orange spots, some of which may become confluent. The antennae have 11 antennomeres, with the insertions concealed ventrally. The eyes are narrowly emarginate by the expansion of the epistoma. The epipleura are strongly excavated for reception of middle and hind femoral apices. The prothoracic tibiae are flanged or grooved and have distinct spines (Figs. 2 & 3). Tarsal claws have large, basal, quadrate lobes. Abdominal sterna 3-6 of males have sexual modifications depending upon species group placement. The basal lobe of the trilobed phallobase is either symmetrical or asymmetrical; the aedeagus of most species have fan-like membranous lobes on apical 1/3. The emarginate eyes and the spine on the prothoracic tibiae will easily distinguish Brachiacantha from all other members of the Hyperaspini, particularly Hyperaspis species which they closely resemble.

The generic name Brachiacantha, from the Greek "brachys" meaning short and "akantha" meaning thorn, was first published by Dejean (1836) in part 5 of the 2nd edition of his Catalogue des Coléoptères, without a generic description. However, Dejean did include several previously described species in the genus. In part 5 of the 3rd

edition of his Catalogue des Coléoptères, which contained the preface of the work, Dejean (1837) identified his assistant Chevrolat as the author of many of the included genera.

Barber and Bridwell (1940) and Blackwelder (1949) believed that part 5 of the 3rd edition appeared before part 5 of the 2nd edition. Therefore edition 3 should have priority and Chevrolat should be attributed authorship. Chevrolat (1842) emended the name to Brachyacantha. This date and spelling were subsequently used by Mulsant (1850), Crotch (1873), Casey (1899), Blatchley (1910), Leng (1911), Blackwelder (1949), Dillon and Dillon (1961), and Arnett (1968). Canepari (1990) states, "..., I think the correct attribution is "Chevrolat in Dejean" or more simply "Chevrolat"."

Belicek (1976), in his revision of the Coccinellidae of Western Canada and Alaska, attributed for the first time authorship of Brachiacantha and several other genera to Dejean (1836). Recently Pope (1992) drew attention to a publication by Madge (1988) that introduces the following evidence which had remained unnoticed. Erichson (1837), in writing a review of the entomological literature published in 1836, writes of Dejean's catalogue and quotes several generic names that appear in part 5 of edition 2 and edition 3. Therefore edition 2 did appear before edition 3. As

this is now clearly the case, authorship of Brachiacantha should be accorded to Dejean (1836). This spelling and date were correctly used by Melsheimer (1847), LeConte (1852), Belicek (1976) and Gordon (1985), and should be used by all subsequent authors.

Brachiacantha is a New World genus with 50 species and subspecies currently recognized, ranging from Canada to Argentina. Twenty-six species and subspecies are recognized from America north of Mexico (Gordon 1985). Two North American species of the genus have been found to be myrmecophilous as larvae, in nests of ants of the genus Lasius, where they feed upon root aphids and root coccids (Smith 1886, Wheeler 1911). Adults are found on vegetation in deciduous forest habitats (Blatchley 1910, Maredia, et al. 1992).

The purposes of this research were to (1) determine the Brachiacantha species occurring in Illinois, (2) provide descriptions and a key to those species, (3) record the distribution and seasonal occurrence of each species within the state, and (4) add to our knowledge of the biology of these species when possible.

MATERIALS AND METHODS

A total of 1575 specimens of Brachiacantha, 404 of which were from Illinois, were examined and identified. These specimens were collected in the context of this research, or borrowed from 16 institutions and private collections. The following list identifies the institutions and curators that provided the borrowed specimens. The acronyms for the museums used in the text and the Appendix are from Arnett, et al. (1993).

Eastern Illinois University, Charleston, IL, (EIUC), M. A. Goodrich.

Field Museum of Natural History, Chicago, IL, (FMNH), P. P. Parrillo.

Florida State Collection of Arthropods, Gainesville, FL, (FSCA), P. E. Skelley.

Hastings College, Hastings, NE, (HCCA), C. A. Springer.

Illinois Natural History Survey, Champaign, IL, (INHS), K. R. Zeiders.

Illinois State University, Normal, IL, (ISUC), D. Whitman.

Louisiana State University, Baton Rouge, LA, (LSUC), J. E. Chapin.

P. E. Skelley Collection, Gainesville, FL, (PESC)

Purdue University, West Lafayette, IN, (PURC), A. V. Provonsha.

Southern Illinois University, Carbondale, IL, (SIUC), J. E. McPherson.

University of Arkansas, Fayetteville, AR, (UADE), J. B. Whitfield.

University of Kentucky, Lexington, KY, (UKYC), M. F. Potts.

University of Missouri, Columbia, MO, (UMRM), K. Simpson.

University of Wisconsin, Madison, WI, (UWEM), S. Krauth.

Washington State University, Pullman, WA, (WSUC), R. Zack.

Western Illinois University, Macomb, IL, (WIUC), Y. Sedman.

Several techniques were employed to collect additional Brachiacantha for this study. "Light-weight Malaise traps," as described by Townes (1972), manufactured by the John W. Hock Company, Gainesville, FL, provided a continuous collection method for flying insects. These light weight, dacron marquisette traps measure 6 ft long, 4 ft wide, and 6 ft 8 in high at the peak (Fig. 1). They were equipped with "wet" head type collecting jars containing 80% ethanol. Collecting jars were replaced weekly from early spring to early winter. Malaise traps have been monitored and

maintained in 10 woodland sites in Illinois over the past decade by Dr. M. A. Goodrich and his graduate students, J. W. Griffiths and R. S. Hanley.

Yellow sticky traps from the Necessary Trading Company were also used to collect Brachiacantha adults. These traps were made of thin plastic, 6 by 12 inches, with a coating of "Tangle-trap," and were suspended by cotton string from tree branches, usually near the bank of a small stream. Specimens were removed from the sticky traps in the field with forceps and placed in screw-top glass vials containing 80% ethanol. Cleaning the "Tangle-trap" material, usually polyisobutylene (PIB), from these specimens required a 24-48 hr bath in pure lemon extract, followed by a 24-48 hr bath in xylene.

Sweep sampling of ground cover and lower tree foliage, using a 12 inch standard insect net, visual collection of specimens from foliage, U-V light trapping and pitfall traps were also employed in attempts to collect adult Brachiacantha.

Collecting of adult Brachiacantha was concentrated in deciduous forest habitats. Wooded habitats were selected as a result of previous collecting experience. Preliminary collecting studies were conducted from May to November of 1993, consisting of weekly "20 sweep samples" in each of three distinct habitats. These habitats were: a commercial

apple orchard located 11.25 kilometers south of Charleston, Illinois, a grassy field located south of the boundary of Fox Ridge State Park, and a prairie restoration area at the entrance to Fox Ridge State Park. These studies, although successful in collecting several genera of coccinellids, yielded no specimens of Brachiacantha. Brachiacantha were regularly taken in deciduous forests during the same period.

In examining adults in the laboratory, body lengths were measured from the anterior margin of the pronotum to the apex of the elytra. Body widths were measured at the widest point between the lateral margins of the closed elytra.

The Illinois collection maps are based on locations taken from the labels of specimens examined in the course of this study. National distribution maps are plotted based on Gordon (1985), with modifications based on specimens I have examined.

The terminology used in the text is from Nichols (1989). To prevent any possible confusion, the following terms are defined as used in the text.

Aedeagus. The terminal part of phallus, as distinct from phallobase, or just the united mesomeres.

Antennomere. A subunit of the antenna, including scape, pedicel, and individual flagellomeres.

Coxa (pl. coxae). The basal part of the leg, by means of which the leg is articulated to the body.

Epipleuron (pl. epipleura). The deflexed or inflexed portion of the elytron, as seen laterally, when the elytra are closed.

Episternum (pl. episterna). The anterior sclerite of the pleuron, marked posteriorly by the pleural sulcus.

Epistoma. The oral margin, or sclerite directly behind the labrum.

Femur (pl. femora). The third, and usually the stoutest part of the leg, articulated to the body through the trochanter and coxa and bearing the tibia at its distal end.

Metepisternum (pl. metepisterna). Episternum of the metathorax.

Phallobase. Proximal part of phallus, in contrast to aedeagus, sometimes a large basal structure supporting aedeagus.

Postcoxal Line. Line on the first abdominal sternite after or behind the coxa.

Prosternal Process. A posterior prolongation of prosternum behind the forecoxae.

Prosternum. Sternum of the prothorax.

Securiform. Hatchet-shaped.

Sternite (pl. sterna). A subdivision of a sternum, or any

one of the sclerotic components of a definite sternum.

Tarsus (pl. tarsi). The leg part attached to the apex of the tibia, bearing the pretarsus and consisting of from one to five tarsomeres.

Tarsal Formula. The number of tarsomeres on the fore, mid, and hind tarsi, respectively.

Tibia (pl. tibiae). The fourth part of the leg, between the femur and the tarsus.

RESULTS

From a total of 1575 Brachiacantha specimens seen, 404 of which were from Illinois, six Brachiacantha species collected in Illinois were examined and identified. Collected most commonly were B. ursina, B. felina, B. q. quadripunctata and B. decempustulata; more rarely collected were B. dentipes and B. rotunda. A seventh species, B. indubitabilis, has been recorded for Illinois. Although no specimens of this species from Illinois were seen in this study, it has been included in the list of species because the lectotype for the species, designated by Gordon (1985), is an Illinois specimen in the LeConte collection. Of the methods employed in this study to collect Brachiacantha adults, Malaise trapping proved to be the most successful. Four species, B. decempustulata, B. q. quadripunctata, B. felina and B. rotunda and were collected using this method. Yellow sticky traps were effective in collecting two species, B. decempustulata and B. q. quadripunctata. Sweep sampling and visual inspection of plant material (manual collecting) also yielded specimens of Brachiacantha, although these methods were very time consuming for the number of specimens collected. The five species collected by these methods were B. q. quadripunctata, B. felina, B. ursina, B. decempustulata and B. rotunda. U-V light traps and pitfall traps were not successful in collecting

specimens of Brachiacantha (Table 1).

Two Illinois species were not collected in the course of this study, B. dentipes and B. indubitabilis. Illinois specimens of B. dentipes were seen among museum specimens examined.

KEY TO THE BRACHIACANTHA SPECIES OF ILLINOIS *

1. Prothoracic tibia with arcuate flange on outer margin (Fig. 2); male abdomen with 3rd sternite prominently bicuspid..... B. dentipes

   Prothoracic tibia not noticeably flanged, or if flanged, then flange not arcuate (Fig. 3); male abdomen with 3rd sternite lacking cusps..... 2

2. Elytra black, with five yellow to yellow-orange spots on each elytron; spots may be partially confluent or confluent to the extent that the elytron is mostly yellow to yellow-orange..... 3

   Elytra black, with less than five yellow spots on each elytron..... 6

3. Form round..... 4

   Form oval to elongate-oval..... 5

4. Length 3.20 mm or less; male pronotum with anterior margin of black area sinuate, slightly indented at middle..... B. felina

   Length 3.20 mm or more; male pronotum with anterior

margin of black area straight, not indented at middle..... B. rotunda

5. Less than 3.00 mm long; elytra black, with five small yellow spots on each elytron; elytra coarsely punctured, punctures separated by more than the diameter of a puncture..... B. decempustulata

More than 3.00 mm long; elytra black, with five yellow to yellow-orange spots on each elytron, spots may be partially confluent or confluent to the extent that the elytron is mostly yellow to yellow-orange; elytra finely punctured, punctures separated by less than the diameter of a puncture..... B. ursina

6. Elytra black, with two yellow spots on each elytron, one basal and one apical; male with additional feeble humeral spot on each elytron..... B. quadripunctata quadripunctata

Elytra black, with 3 yellow spots on each elytron, two median, one apical..... B. indubitabilis

* Modified from Gordon (1985).

SYSTEMATIC ACCOUNT OF THE SPECIES

Genus Brachiacantha Dejean 1836

This genus differs from all other genera in the family Coccinellidae by the sum of the following characters: small

size, 1.80 mm to 6.30 mm long; having emarginate eyes by the expansion of the epistoma; having small spines at the basal 2/5 of the prothoracic tibiae; two carinae may, or may not, be present on the prosternum, if carinae are present, they are slightly convergent apically; scutellum wider than long; epipleura nearly flat; postcoxal line on first abdominal sternite incomplete, of the Scymnus type (Fig. 4d).

Male: frons mostly yellow; clypeus may be slightly darkened to dark brown; pronotum black, with broad yellow to orange anterolateral angles and a narrow to broad yellow to orange anterior margin, usually with an extension medially into apical margin of black area; metepisternum light yellow to yellow; seven abdominal sterna present; apical 1/3 of the sclerotized aedeagus with, or without fan-like membranous lobes, depending upon species group placement. Female: head yellow, except clypeus brown or black; pronotum black, except for broad yellow to orange anterolateral angles; six abdominal sterna present.

Leng (1911), in his revision of Brachiacantha, separated the genus into six "species groups" based on modifications of the male abdominal sterna 3-6 and color pattern. Except for descriptions of new species, his classification remained unchanged until 1985. Gordon (1985), in his revision of the Coccinellidae of America north of Mexico, reduced Leng's six species groups to four.

These groups are based on the structure of male genitalia and modifications of abdominal sterna 3-6. They are designated species groups dentipes, ursina, indubitabilis, and lepida. In this paper the species groups of Gordon (1985) are employed. Only species groups dentipes, ursina, and indubitabilis are found in Illinois.

Species group dentipes

Diagnostic Description:

Prothoracic tibiae with arcuate flanges on the margins and tibiae widest just before the spines; third abdominal sternite bicuspid; fourth abdominal sternite bicuspid or medially depressed; fifth and sixth abdominal sterna medially depressed or flat; basal lobe of phallobase asymmetrical, apex abruptly bent to the left in ventral view (Fig. 5); aedeagus with fan-like membranous lobes (Fig. 8).

Brachiacantha dentipes (Fabricius) 1801

Diagnostic Description:

This species differs from other North American species of Brachiacantha by: having a yellow to orange apical spot and irregular median band on each elytron, varying in shape and width and sometimes separated into two large spots; and oblong to slightly oval body form. This species is easily

the largest of the Illinois Brachiacantha. Overall length 4.75-6.30 mm; width 3.6-4.6 mm (Fig. 12). Male: pronotum black, with broadly yellow to orange anterolateral angles, narrow yellow to orange anterior margin with slight extension medially into apical margin of black area; third abdominal sternite with cusps separated by 1/2 the diameter of a cusp. Female: pronotum black, with anterolateral angles yellow to orange; abdominal sternites glabrous.

National Distribution:

Found in eastern and midwestern North America, ranging in the north from New Hampshire to Ontario and Nebraska, in the south from Florida to Louisiana and northern New Mexico (Fig. 18).

Illinois Distribution:

I have recorded a single specimen from Union County in southern Illinois. I have also examined one specimen labeled only "IL."

Seasonal Occurrence:

The Illinois specimen from Union County was collected 26 May 1972.

Material Examined:

I have examined 32 specimens of B. dentipes, two of which were from Illinois.

Remarks:

B. dentipes was designated as the type-species for the

genus by Crotch (1873).

Because this species is uncommonly collected in Illinois, despite its large size, I suspect it has a more southerly distribution than Figure 18, which is modified from Gordon (1985), suggests.

The immatures of this species have not been described.

Species group ursina

Diagnostic Description:

Prothoracic tibiae not noticeably flanged; if flanged then flanges not arcuate and tibiae widest at middle or just before tibial excavations; abdomen without bicuspid third sternite; fifth abdominal sternite weakly depressed medially; basal lobe of phallobase symmetrical, apically truncate (Fig. 6); aedeagus with fan-like membranous lobes (Fig. 9).

Brachiacantha ursina (Fabricius) 1787

Diagnostic Description:

This species differs from other Illinois species of Brachiacantha by: having five yellow to yellow-orange spots on each elytron; a finely punctured elytral surface which gives it a slightly dull appearance; and elongate-oval body form. There is some tendency, in midwestern specimens, for

the elytral spots to become partially to completely confluent, making the elytra mostly yellow to yellow-orange. Overall length 3.0-4.5 mm; width 2.1-3.2 mm (Fig. 13). Male: pronotum black, with anterolateral angles broadly yellow to yellow-orange, narrow yellow to yellow-orange anterior margin with the yellowish color extending medially into the apical margin of black area. Female: pronotum black, with only the anterolateral angles yellow to yellow-orange.

National Distribution:

Found in eastern and midwestern North America, ranging in the north from Newfoundland to Saskatchewan, in the south from South Carolina to Arkansas. Gordon (1985), reports a disjunct population in Louisiana (Fig. 19).

Illinois Distribution:

I have recorded specimens from 28 counties ranging throughout the state (Fig. 19).

Seasonal Occurrence:

Adults have been collected in Illinois from 31 March through 12 October, with the greatest number of specimens taken in June (Table 2).

Material Examined:

I have examined 597 specimens of B. ursina, 132 of which were from Illinois.

Remarks:

I have seen specimens with the elytral spots partially to completely confluent from all of the midwestern states from which I have seen specimens.

Of the 132 adult specimens seen from Illinois, 26 (19.7%) are in the E. I. U. Collection. Only eight of these 26 specimens (30.1%) have been collected since 1990 and all were collected by manual collecting. Although this species historically has been the most commonly collected in Illinois, it has not been collected in Malaise traps despite extensive Malaise trap collecting by Dr. M. A. Goodrich and his graduate students in various locations in the last decade. This is in contrast to three other species of this genus which are frequently taken in these traps (Table 1).

Smith (1886) collected larvae of B. ursina in nests of ants of the genus Lasius. He reported that these larvae were not attacked by the ants even as they fed on the aphids domesticated by the ants. These larvae were described as being a sordid whitish-yellow and of similar form to other coccinellids. Smith also states that the larva ".. excretes a waxy substance that exudes in long strings and gives the insect the appearance of being covered with cotton or hoar frost." Larvae of this species have not been collected since and a more complete and diagnostic description is needed.

Brachiacantha decempustulata (Melsheimer) 1847

Diagnostic Description:

This species differs from all other North American species of Brachiacantha by: having five light yellow to yellow spots on each elytron; a sparsely punctured elytral surface, with the punctures separated by the diameter of a puncture or more; and oval, slightly elongate body form. Overall length 1.8-2.8 mm; width 1.3-2.0 mm (Fig. 13). Male: pronotum black, with anterolateral angles broadly yellow and narrow yellow anterior margin with yellow extending medially into the apical margin of black area. Female: pronotum black, with anterolateral angles yellow; pronotum often with very narrow, pale yellow margin without extension into the black area.

National Distribution:

Found in eastern and midwestern North America, ranging in the north from New Brunswick and Nova Scotia to North Dakota, in the south from Florida to Louisiana (Fig. 20).

Illinois Distribution:

I have recorded specimens from 12 counties scattered throughout the state (Fig. 20). This species is probably much more widespread throughout the state but is not commonly collected because of its small size and infrequent collection by conventional means (see Remarks).

Seasonal Occurrence:

Adults have been collected in Illinois from 15 May through 7-14 September, with the greatest number of specimens taken in July (Table 2).

Material Examined:

I have examined 149 specimens of B. decempustulata, 80 of which were from Illinois.

Remarks:

Of the 80 adult specimens seen from Illinois, 59 (73.8%) are in the E.I.U. Collection. Of these 59 specimens, 52 (88.0%) have been collected since 1990. Malaise trapping yielded 39 specimens (75.0%), yellow sticky traps yielded 10 specimens (19.2%), and manual collecting yielded 3 specimens (5.8%) (Table 1).

The immatures of this species have not been described.

Brachiacantha felina (Fabricius) 1775

Diagnostic Description:

This species differs from other Illinois species of Brachiacantha by: having five large yellow spots on each elytron; coarsely punctured elytral surface, with the punctures separated by the diameter of a puncture or less; and round body form. Overall length 2.2-3.2 mm; width 1.65-2.50 mm (Fig. 14). Male: pronotum black, with anterolateral

angles broadly yellow and narrow yellow anterior margin with yellow extending medially into the apical margin of black area. Female; pronotum black with anterolateral angles yellow; pronotum may have narrow, pale yellow anterior margin without extension into black area.

National Distribution:

Found in eastern and midwestern United States, ranging in the north from Massachusetts to Minnesota, in the south from North Carolina to Oklahoma (Fig. 21).

Illinois Distribution:

I have recorded specimens from 28 counties ranging throughout the state (Fig. 21).

Seasonal Occurrence:

Adults have been collected in Illinois from 1 April through 15-29 November, with the greatest number of specimens taken in May. There is also an increase in the number of specimens collected during September and October (Table 2).

Material Examined:

I have examined 514 specimens of B. felina, 95 of which were from Illinois.

Remarks:

Of the 95 adult specimens seen from Illinois, 35 (36.8%) are in the E.I.U. Collection. Twenty-four of those 35 specimens (68.6%) have been collected since 1990. Of

these 24 specimens, 13 (54.2%) were Malaise trapped and 11 (45.8%) were manually collected (Table 1).

The immatures of this species have not been described.

Brachiacantha rotunda Gordon 1985

Diagnostic Description:

This species differs from other Illinois species of Brachiacantha by: having five yellow spots on each elytron; a coarsely punctured elytral surface, with the punctures separated by the diameter of a puncture or less; and round body form. Overall length 3.2-4.0 mm; width 2.2-3.0 mm (Fig. 15). Male: pronotum black, with anterolateral angles broadly yellow, with narrow yellow anterior margin, and apical margin of black area straight. Female: pronotum black, with only anterolateral angles yellow.

National Distribution:

Found in eastern and midwestern North America, ranging in the north from Massachusetts and Quebec to Wisconsin, in the south from Virginia to Missouri (Fig. 22).

Illinois Distribution:

I have recorded specimens from five counties scattered throughout the state and one specimen labeled only N. Ill. (Fig. 22).

Seasonal Occurrence:

Adults have been collected in Illinois from 2 May through 29 September-6 October (Table 2).

Material Examined:

I have examined 30 specimens of B. rotunda (these identifications were confirmed by Dr. R. D. Gordon, author of this species). Seven of these specimens were from Illinois.

Remarks:

Of the 2 Illinois specimens in the E.I.U. Collection, one was Malaise trapped, the other was manually collected.

It is very difficult to distinguish B. rotunda from B. felina, with the only described difference being size, which is continuous between these forms in Illinois and Missouri. I am therefore only provisionally treating B. rotunda as a distinct species, until other specific characters can be discovered to separate these forms.

The immatures of this species have not been described.

Brachiacantha quadripunctata quadripunctata (Melsheimer) 1847

Diagnostic Description:

This species differs from all other North American species Brachiacantha by: having two yellow spots, one

apical and one basal, on each elytron; a coarsely punctured elytral surface with punctures separated by the diameter of a puncture or less; and round body form. Overall length 2.5-4.4 mm; width 2.0-3.4 mm (Fig. 16). Male: pronotum black, with anterolateral angles broadly yellow and wide yellow anterior margin with the yellow extending medially into the apical margin of black area; additional humeral spot often confluent with basal spot on each elytron. Female: pronotum black, with only anterolateral angles yellow.

National Distribution:

Found in eastern and midwestern United States, ranging in the north from Massachusetts to Wisconsin, in the south from Virginia to Arkansas and Kansas (Fig. 23). **Illinois Distribution:**

I have recorded specimens from 18 counties ranging throughout the state (Fig. 23).

Seasonal Occurrence:

Adults have been collected in Illinois from 9 April through 13 November, with the greatest number of specimens captured in May (25) and June (30). There is also a small increase in the number of specimens collected in October (Table 2).

Material Examined:

I have examined 167 specimens of B. q. quadripunctata,

88 of which were from Illinois.

Remarks:

Of the 88 specimens seen from Illinois, 55 (62.5%) are in the E.I.U. Collection. Of those 55 specimens, 53 (96.4%) have been collected since 1990. Of these 53 specimens, Malaise trapping yielded 35 specimens (66.0%), conventional manual collecting yielded 15 specimens (28.3%), and yellow sticky traps yielded 3 specimens (5.7%) (Table 1).

Wheeler (1911) collected ten larvae of this species from nests of the ant Lasius umbratus var. aphidicola near Great Blue Hill near Boston, Massachusetts. He described these larvae as moving slowly or resting among the root-coccids and root-aphids abundant in these ants' nests. The larvae were covered by waxy tufts and measured about 10 mm in length. The body was 6-7 mm long with a whitish or pinkish-yellow color. They were further described as having short, feeble legs, a smaller head, and a more obese body than common coccinellid larvae. Larvae of this species have not been collected since then and a more complete and diagnostic description is needed.

Blatchley (1910), reported B. q. quadripunctata adults to "... occur especially on maple trees infested with plant lice."

Species group indubitabilis

Diagnostic Description:

Prothoracic tibiae not noticeably flanged; if flanged, then flanges not arcuate, and tibiae widest at middle or just before tibial excavations; abdomen without bicuspid third sternite; fifth abdominal sternite weakly depressed medially; basal lobe of phallobase asymmetrical, apically emarginate on the left side in ventral view (Fig. 7); aedeagus without fan-like membranous lobes (Fig. 10).

Brachiacantha indubitabilis Crotch 1873

Diagnostic Description:

This species differs from all other North American species of Brachiacantha by; having three yellow spots, two median and one apical, on each elytron; long, slender spines on prothoracic tibiae; and oval body form. Overall length 2.5-3.2 mm; width 1.8-2.6 mm (Fig. 17). Male: pronotum black, with anterolateral angles broadly yellow, and wide yellow anterior margin with yellow prominently extending medially into apical margin of black area. Female: pronotum black with only anterolateral angles yellow.

National Distribution:

Found in eastern and midwestern United States, ranging in the north from New Hampshire to Minnesota, in the south

from North Carolina to Tennessee (Fig. 24).

Illinois Distribution:

I did not see any specimens of this species from Illinois. Gordon (1985), shows B. indubitabilis occurring in the northern 4/5 of the state, but he gives no specific location data for specimens seen.

Material Examined:

I have examined ten specimens of B. indubitabilis, none of which were from Illinois.

Remarks:

The immatures of this species have not been described.

DISCUSSION

Twenty-six Brachiacantha species and subspecies are recognized as occurring in America north of Mexico (Gordon 1985). Questions of synonomy and species status may change this number when this genus is more fully studied.

The focus of this study is the seven Brachiacantha species with ranges which include Illinois. These species are B. dentipes, B. ursina, B. decempustulata, B. felina, B. rotunda, B. q. quadripunctata and B. indubitabilis. Of the 19 species and subspecies not recorded for Illinois, 13 are southern species occurring from Florida to Arizona, three occur within the Rocky Mountain Range and the Great Plains from Arizona to Texas and north into Canada, one occurs in the southeastern United States, one is limited to California, Nevada and Oregon and one occurs throughout most of the western United States.

Adults of five of the seven Brachiacantha species known to occur in Illinois were collected during this study. These species are B. ursina, B. decempustulata, B. felina, B. rotunda and B. q. quadripunctata. Specimens of B. dentipes and B. indubitabilis were not collected. Two specimens of B. dentipes from Illinois were seen among museum specimens examined. No specimens of B. indubitabilis from Illinois were collected or seen in museum specimens examined. This species is included in the Illinois fauna

because Gordon (1985) designated a specimen from Illinois in the LeConte collection as the lectotype for the species.

In my Illinois collecting, plus that of Dr. M. A. Goodrich and several of his graduate students, the following procedures were employed with varying results. Visual inspection of plant material yielded one specimen, from an unidentified plant, of B. felina from 24 specimens collected since 1990. This method also yielded eight of the 53 B. q. quadripunctata specimens taken since 1990, one specimen under bark and seven specimens from a decaying tree stump. Of a total of 139 Brachiacantha specimens of all species taken in Illinois by E.I.U. collectors since 1990, nine (6.5%) were collected by visual inspection of plant material. This method is very time consuming for the few specimens collected.

Sweep netting, while frequently used to sample arthropods, is affected by a wide range of factors limiting its efficiency (Powell, et al. 1996). Sweep netting was the second most successful collecting method in this study's Illinois collecting for adult Brachiacantha. The majority of the 29 of 139 (20.9%) Brachiacantha specimens of all species with no collection method information on the collection label were likely taken by sweeping (Table 1).

Sweeping with an insect net was the only collecting method which yielded specimens of the five Brachiacantha

species collected in Illinois since 1990. Of the 24 specimens of B. felina collected, ten were taken by sweeping. One of two specimens of B. rotunda taken since 1990 was collected by sweeping. Brachiacantha q. quadripunctata (seven of 53 specimens) and B. decempustulata (three of 52 specimens) were less commonly collected by sweeping. Sweep netting was also the only method by which B. ursina was collected, producing all eight specimens taken during this research in Illinois since 1990 and all collected from the same Cumberland County location. This is despite extensive collecting, using several collecting methods, in many other Illinois locations (Table 1).

Malaise traps of the type used in this study (Townes 1972) are light-weight, tent-like interception traps that are useful for obtaining insects for faunal surveys, relative abundance studies and several other types of studies (Powell, et al. 1996). This was the most successful collecting technique to collect Brachiacantha spp. employed in this study. Of a total of 139 adult Brachiacantha of all species collected in Illinois since 1990, 88 (63.3%) were collected in Malaise traps (Table 1).

Adult specimens of four species of Brachiacantha were collected by Malaise trapping. Brachiacantha decempustulata and B. q. quadripunctata were most commonly collected by this method. Since 1990, 39 of 52 B. decempustulata and 35

of 53 B. q. quadripunctata Illinois specimens were taken by Malaise trap. Also, since 1990, 13 of 24 B. felina and one of two B. rotunda Illinois specimens were taken by Malaise traps (Table 1).

Malaise traps offer an effective, continuously operating technique for collecting arthropods. However, they do not trap all species of some taxonomic groups equally well (Goodrich 1997). I note that B. ursina was never taken in a Malaise trap during the course of this study, although this is the most common Illinois species of Brachiacantha, when all insect collections I examined are considered. The location of Malaise traps may have affected collecting B. ursina by this method. Malaise traps used in Illinois collecting were located in interior forest habitats. Brachiacantha ursina may have a different microhabitat preference (see later comments).

Two species, B. decempustulata (ten specimens) and B. q. quadripunctata (three specimens), were collected on yellow sticky traps. These traps were used only during July and August of 1994, which may have biased their effectiveness. Two of the most common species, B. ursina and B. felina, are most often collected during May and June and could have been missed by the timing of this method. Brachiacantha ursina has been collected in Michigan on yellow sticky traps (Maredia, et al. 1992). Yellow sticky

traps proved to be less effective at taking adult Brachiacantha than either Malaise trapping or sweep netting. Thirteen (9.4%) Brachiacantha of a total of 139 specimens of all species were collected on yellow sticky traps (Table 1).

Pitfall traps are commonly used to sample ground-dwelling arthropods and usually provide reliable data for presence/absence studies (Powell, et al. 1996). U-V light traps collect light attracted nocturnal insects of many species and often in great numbers. Neither of these collecting methods yielded adult specimens of any species of Brachiacantha, although these collecting strategies were extensively pursued in this and in related studies.

In my Illinois collecting I was not able to associate adult Brachiacantha species with any specific plants or host insects. The only published plant references and insect hosts for adult Brachiacantha are from Blatchley (1910). He reports B. ursina occurring on common milkweed, but gives no further account of what the insect was doing. He also reports B. q. quadripunctata as occurring on maple trees infested with plant lice (aphids). I did see a single specimen of B. ursina from Missouri labeled "aphids on canadian thistle." Aphids are commonly fed upon by many coccinellids.

Data from the museum specimens I examined included some references to various forest trees and shrubs. Two species,

B. ursina and B. felina, are also reported from various grasses and legumes. This supports my hypothesis that Brachiacantha are forest species, but also suggests that the latter two species may be edge species. Additional support for this speculation comes from my examination of a large number of specimens from Missouri. I examined 165 specimens of B. felina collected by Malaise trap between 17 May and 14 August 1968 at Tucker Prairie, Callaway County, Missouri.

The only published references to larval Brachiacantha insect hosts are from Smith (1886) and Wheeler (1911). Smith reported finding B. ursina larvae feeding on a species of aphid (Pemphigus) in an ant's nest. Wheeler (1911) reported finding B. q. quadripunctata larvae feeding on "root-coccids", also in an ant's nest. Mann (1911) also describes what may be Brachiacantha larvae in an ant's nest, although he provides no insect host data. None of the larval descriptions provided by the above authors can accurately be used to identify any Brachiacantha larvae to species.

The only known Brachiacantha species for which larval descriptions exist, B. ursina and B. q. quadripunctata, were both found in ant's nests (Smith 1886, Wheeler 1911). For this reason these species are considered myrmecophilous. Myrmecophiles are organisms which must spend at least part of their life cycle with ant colonies (Nichols 1989). Other

Brachiacantha species may also eventually be found to be myrmecophiles as larvae. This relationship is recognized for other Coccinellidae (Chapin 1966, MacKay 1983) and many other Coleoptera (Schwarz 1890, Mann 1911, Borror, et al. 1981, MacKay 1983). These relationships are reported with many different species of ants (Smith 1886, Schwarz 1890, Mann 1911, MacKay 1983).

The Brachiacantha larvae collected and described from ant's nests, B. ursina and B. q. quadripunctata, were both found in nests of the ant genus Lasius. The larvae reported by Mann (1911) were found in a nest of the ant genus Formica. Species of both of these ant genera are represented in the Illinois fauna (DuBois and LaBerge 1988) and may have species of Brachiacantha associated with them.

The nature of Brachiacantha-ant associations is not well understood. The evolutionary basis is most likely similar to that suggested for other insect species, that is selection for enemy free space (Way 1963, Atsatt 1981, Cushman and Whitman 1989), access to food (Fielder and Maschwitz 1989, Paulson and Akre 1994) and/or shelter from adverse conditions (Way 1963). In return, the ants may receive additional food (Fielder and Maschwitz 1989, Way 1963) by feeding on the waxy secretion covering the Brachiacantha larva's body, as suggested by Smith (1886). This relationship is probably mediated by the Brachiacantha

larva's ability to use the chemical and mechanical language of the host ant (Hölldobler 1971).

As a result of my examination of specimens from the institutions and private collections borrowed for this study, I question the status of two Brachiacantha species. These species are B. uteela and B. rotunda.

I suspect that B. uteela is conspecific with B. ursina. Leng (1911) and Belicek (1976) considered these to be the same species. Kirk and Balsbaugh (1975), in their checklist of the beetles of South Dakota, list B. ursina as a species occurring across that state. Gordon (1985) gives B. uteela specific rank stating, "I have not seen intergrade material between the two, and they are widely separated geographically, therefore it seems logical to accord both specific rank." I have seen museum specimens from across South Dakota, a large part of Gordon's geographic separation, several southwestern and western specimens and nearly 600 eastern specimens. I believe them all to be B. ursina.

Gordon (1985) describes the new species B. rotunda and distinguishes it from B. ursina. I can easily separate this form from B. ursina, but I cannot distinguish it from B. felina. Gordon (pers. comm.) acknowledges this difficulty. In examining 230 Illinois and Missouri specimens, I found that the size and shape from the smallest B. felina to the

largest B. rotunda is continuous and the specimens to be morphologically indistinguishable from one another. To illustrate, I have examined a series of three female specimens from Palos Park, Cook County, Illinois with identical collection data which span the size range from B. felina thru B. rotunda. I can not separate these specimens morphologically by any means other than size.

Considerable research remains to be done to more fully understand the taxonomic and biological relations of the species of Brachiacantha. The following four areas of future research are needed: (1) resolution of the question of the species status of B. uteela, B. rotunda and possibly others, (2) more complete descriptions of immatures of all Brachiacantha species, (3) investigate what myrmecophilous relationships exist for the Brachiacantha species and (4) determination of the prey species fed upon by larval and adult Brachiacantha species.

SUMMARY

Of the seven Brachiacantha species expected to be found in Illinois, five were collected during this study. These species are B. ursina, B. decempustulata, B. felina, B. rotunda and B. q. quadripunctata. The sixth species, B. dentipes, was observed among the Illinois museum specimens examined. The seventh species, B. indubitabilis, is represented by the lectotype of the species, an Illinois specimen in the LeConte collection. Collecting methods employed proved to be very variably effective in capturing Brachiacantha. Of the two most successful collecting methods, manual collecting yielded the greatest number of Brachiacantha species (five), but Malaise trapping yielded the greatest number of specimens (88). My collecting data shows that Brachiacantha are forest species. Plant association data from museum specimens confirm this, but also suggest that two species, B. ursina and B. felina, may be edge species.

Because the larvae of the only two species for which larval descriptions exist were found in ant's nests, these species are considered myrmecophilous. This relationship may exist for all species of Brachiacantha. Resolution of a question of species status could reduce the number of species in the Illinois fauna from seven to six.

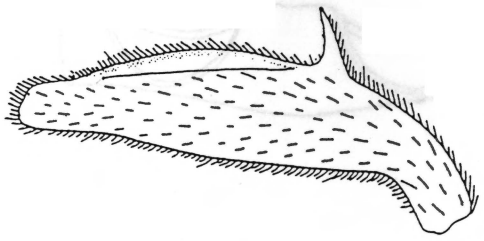
Table. 1. Successful collecting methods and number of Brachiacantha specimens collected, since 1990, in Illinois (% of total in parentheses).

Species	Malaise trap	manual collecting	sticky trap	Total
B. ursina	0 (0.0)	8(100.0)	O (0.0)	8
B. decempustulata	39 (75.0)	3 (5.8)	10(19.2)	52
B. felina	13 (54.2)	11 (45.8)	0 (0.0)	24
B. rotunda	1 (50.0)	1 (50.0)	0 (0.0)	2
B. q. quadripunctata	35 (66.0)	15 (28.3)	3 (5.7)	53
Total	88	38	13	139

Table. 2. Seasonal occurrence and number of specimens examined of Brachiacantha species in Illinois for which seasonal data are available.

Species	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Total
B. ursina	1	14	17	71	15	1	2	1		122
B. decempustulata			1	11	44	19	4			79
B. felina		11	33	9	6	1	8	12	1	81
B. rotunda			1	2	1			1		5
B. q. quadripunctata		5	25	30	7		1	4	1	73

Figure. 1. Light-weight Malaise trap used for collecting Brachiacantha.



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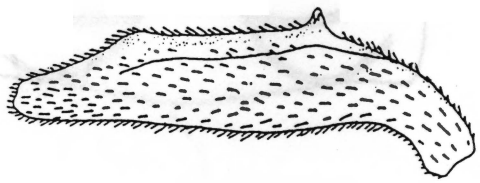

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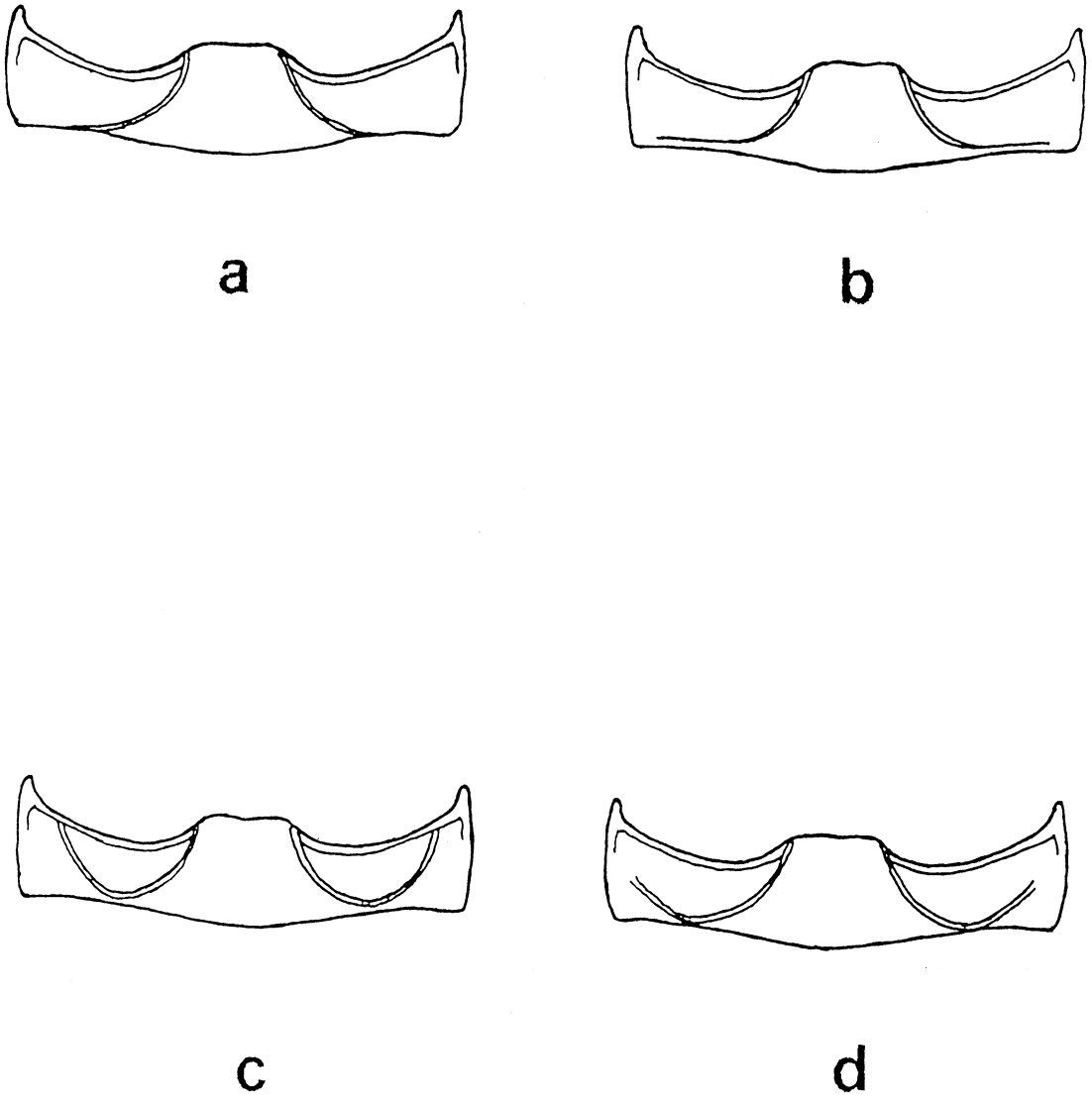
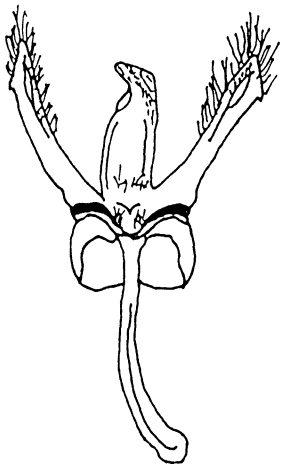
Figures. 2 & 3. Prothoracic tibia of Brachiacantha (after Gordon 1985). 2. Spine and arcuate flange of species group dentipes. 3. Spine and groove of species groups ursina and indubitabilis.



Figures. 4a-d. Types of postcoxal lines in the Coccinellidae. (a) Diomus, (b) Nephus, (c) Pullus, (d) Scymnus.



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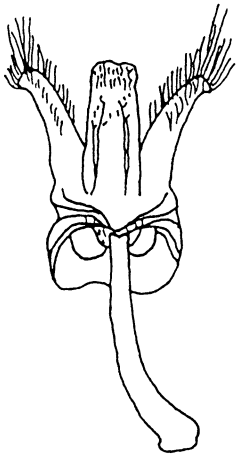

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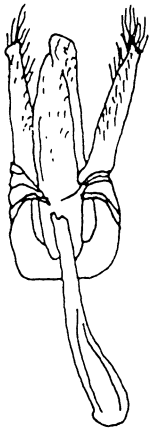

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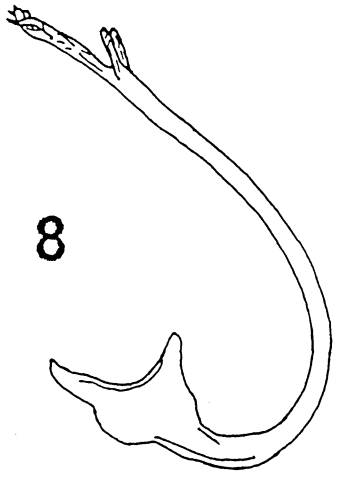
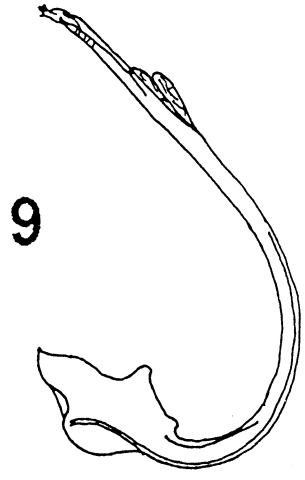
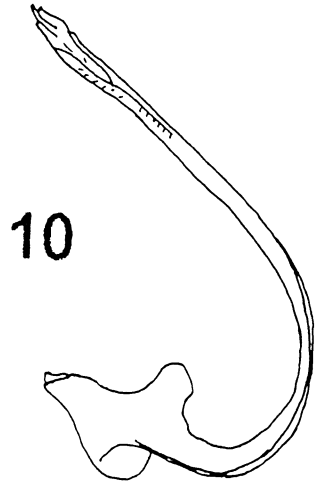
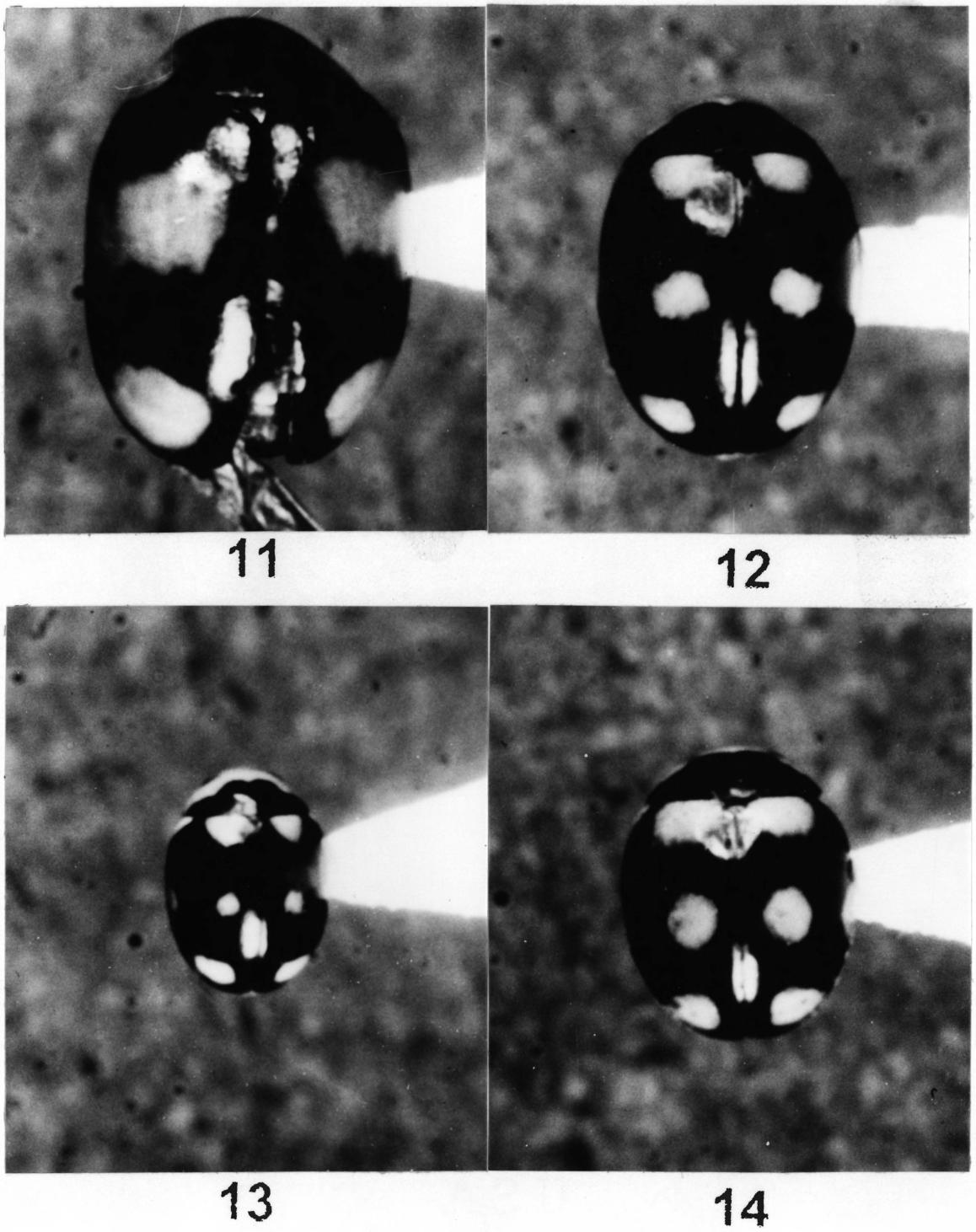
Figures. 5-7. Ventral view of the phallobase of Brachiacantha (after Gordon 1985). 5. Species group dentipes. 6. Species group ursina. 7. Species group indubitabilis.



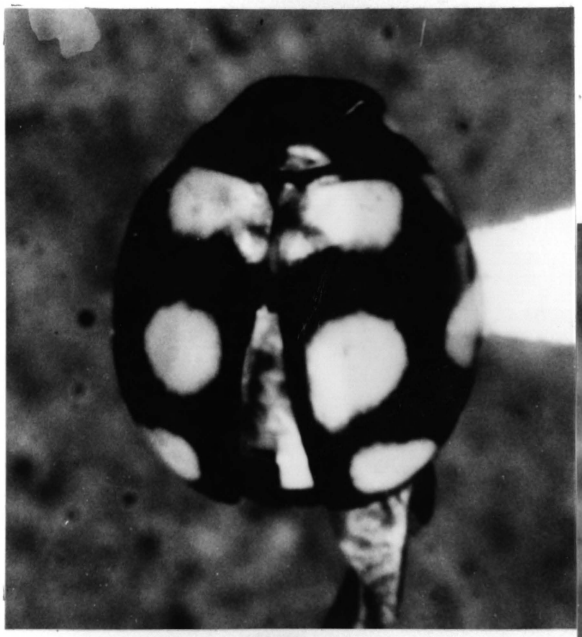




Figures. 8-10. Lateral view of the aedeagus of Brachiacantha (after Gordon 1985). 8. Species group dentipes. 9. Species group ursina. 10. Species group indubitabilis.



Figures. 11-14. Dorsal habitus of Brachiacantha. 11. B. dentipes (Fabricius). 12. B. ursina (Fabricius). 13. B. decempustulata (Melsheimer). 14. B. felina (Fabricius).



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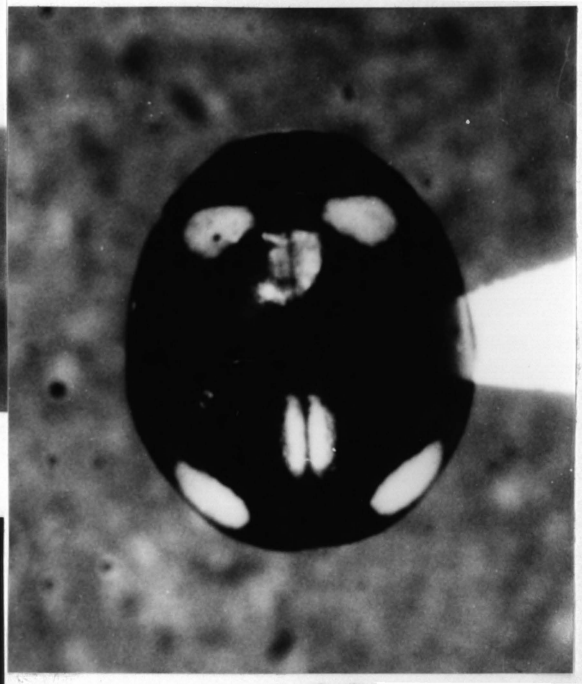

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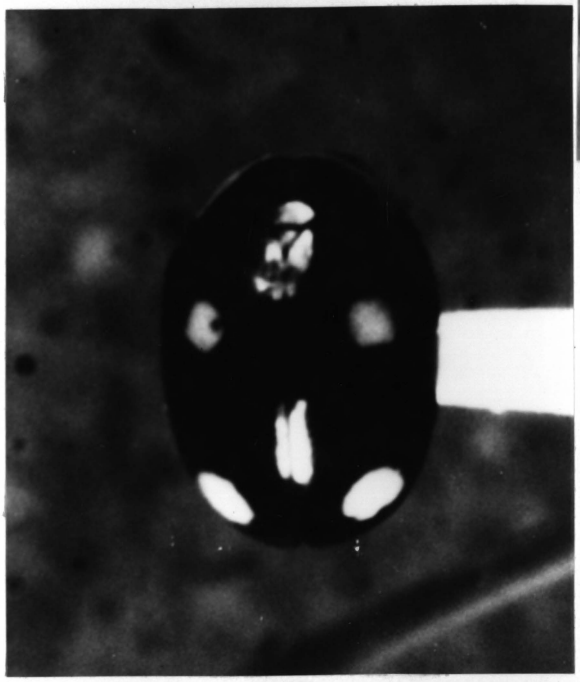

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Figures. 15-17. Dorsal habitus of Brachiacantha. 15. B. rotunda Gordon. 16. B. q. quadripunctata (Melsheimer). 17 B. indubitabilis Crotch.

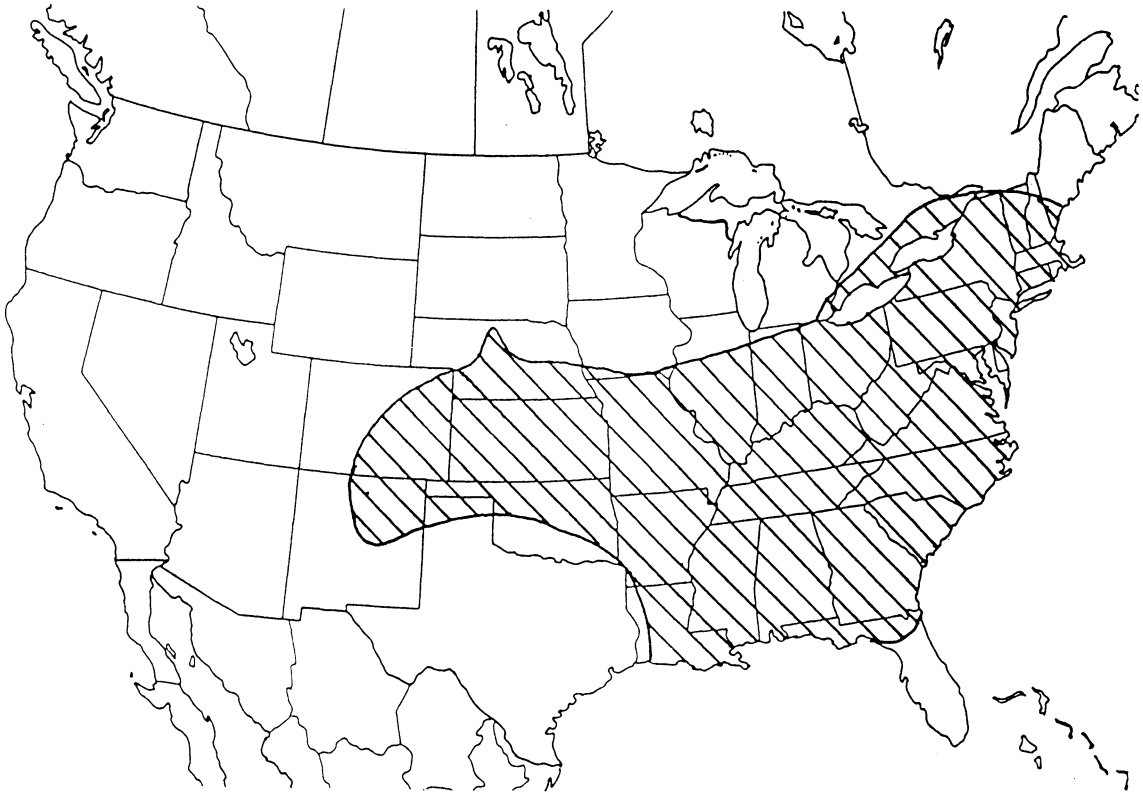

Figure. 18. National distribution map of Brachiacantha dentipes (Fabricius).

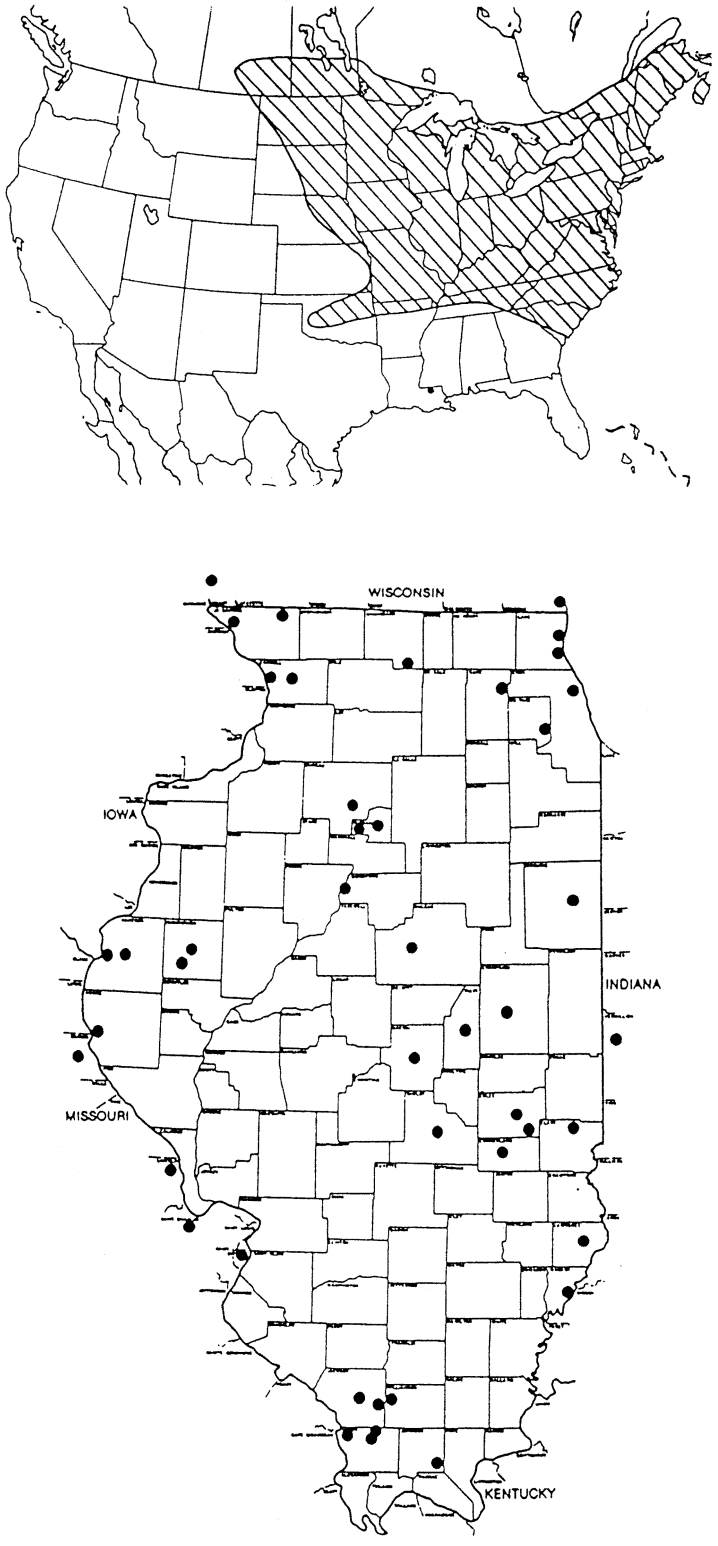

Figure. 19. National and Illinois distribution maps of Brachiacantha ursina (Fabricius).

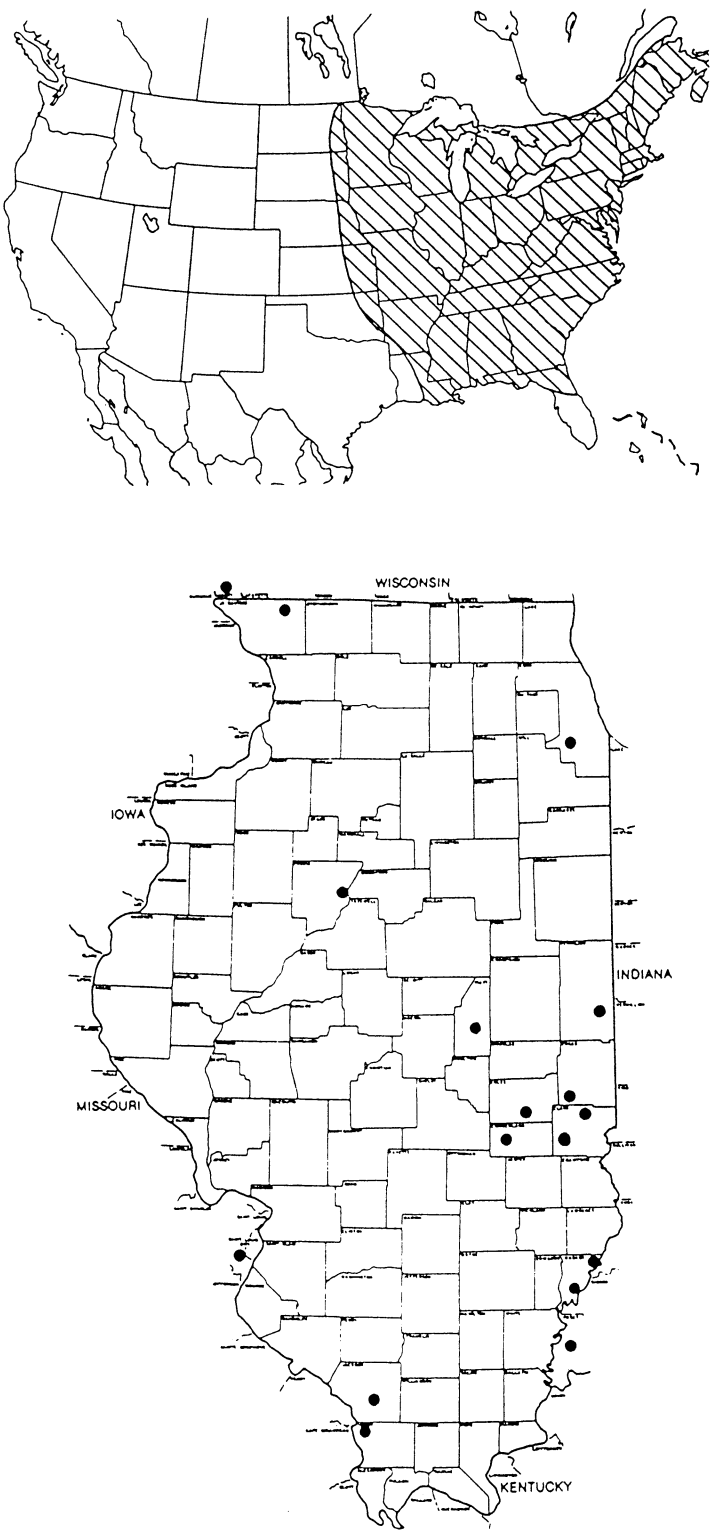

Figure. 20. National and Illinois distribution maps of Brachiacantha decempustulata (Melsheimer).

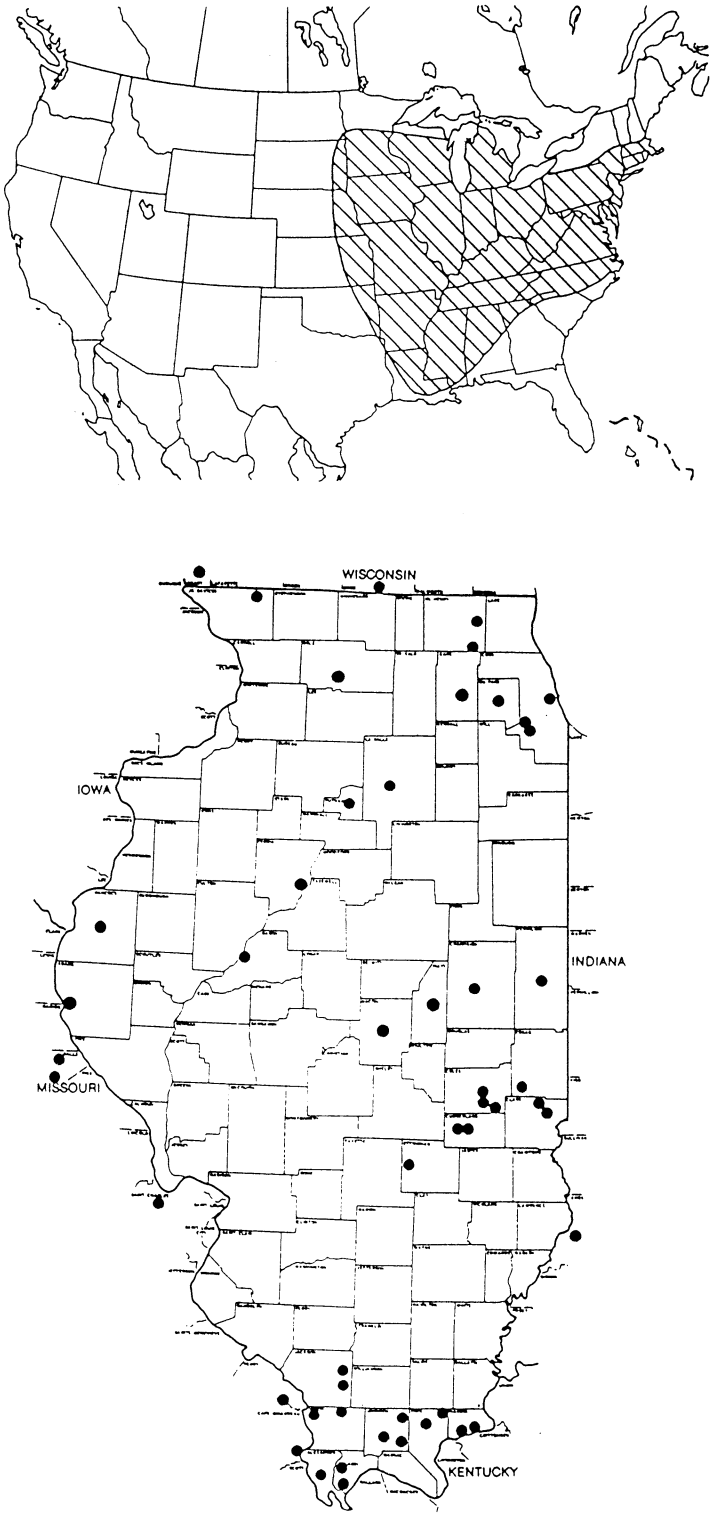

Figure. 21. National and Illinois distribution maps of Brachiacantha felina (Fabricius).

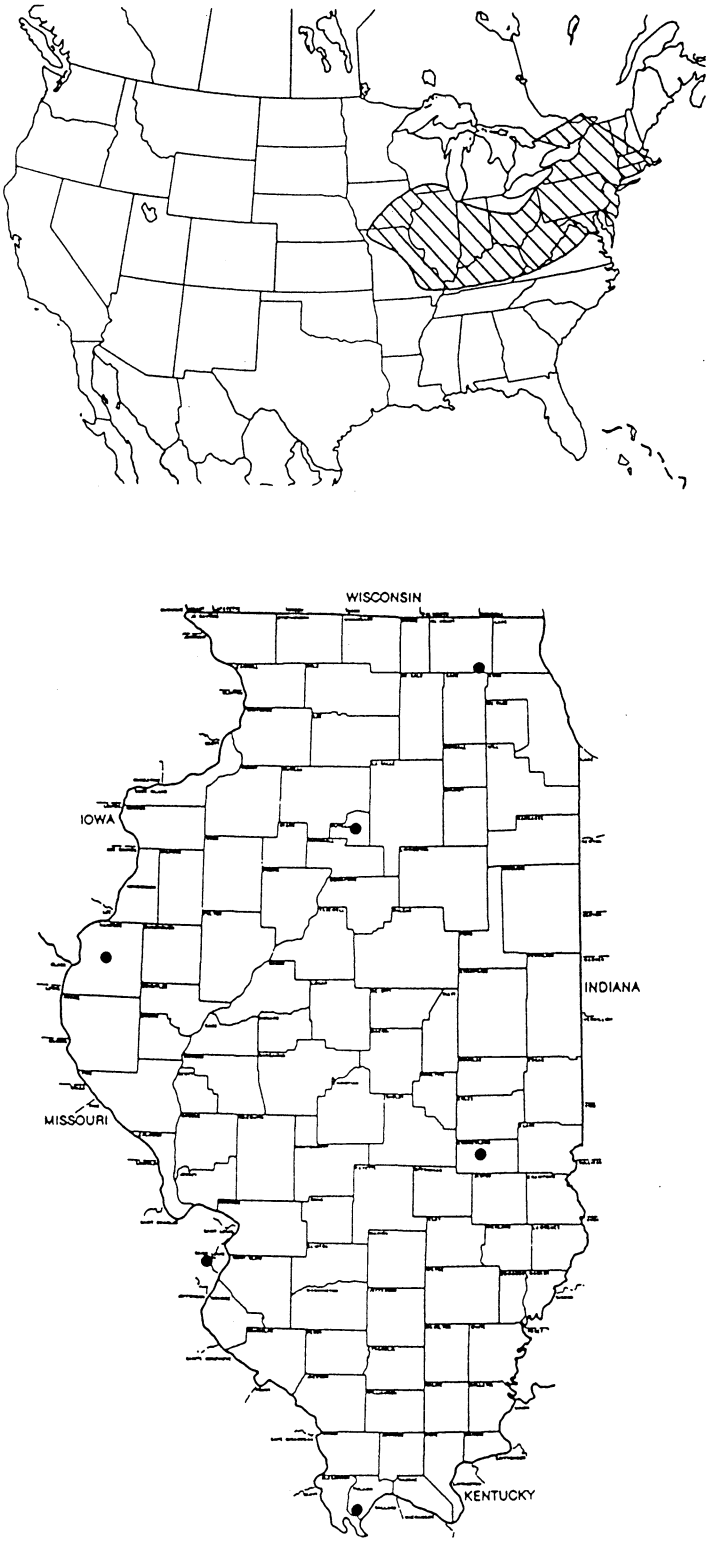

Figure. 22. National and Illinois distribution maps of Brachiacantha rotunda Gordon.

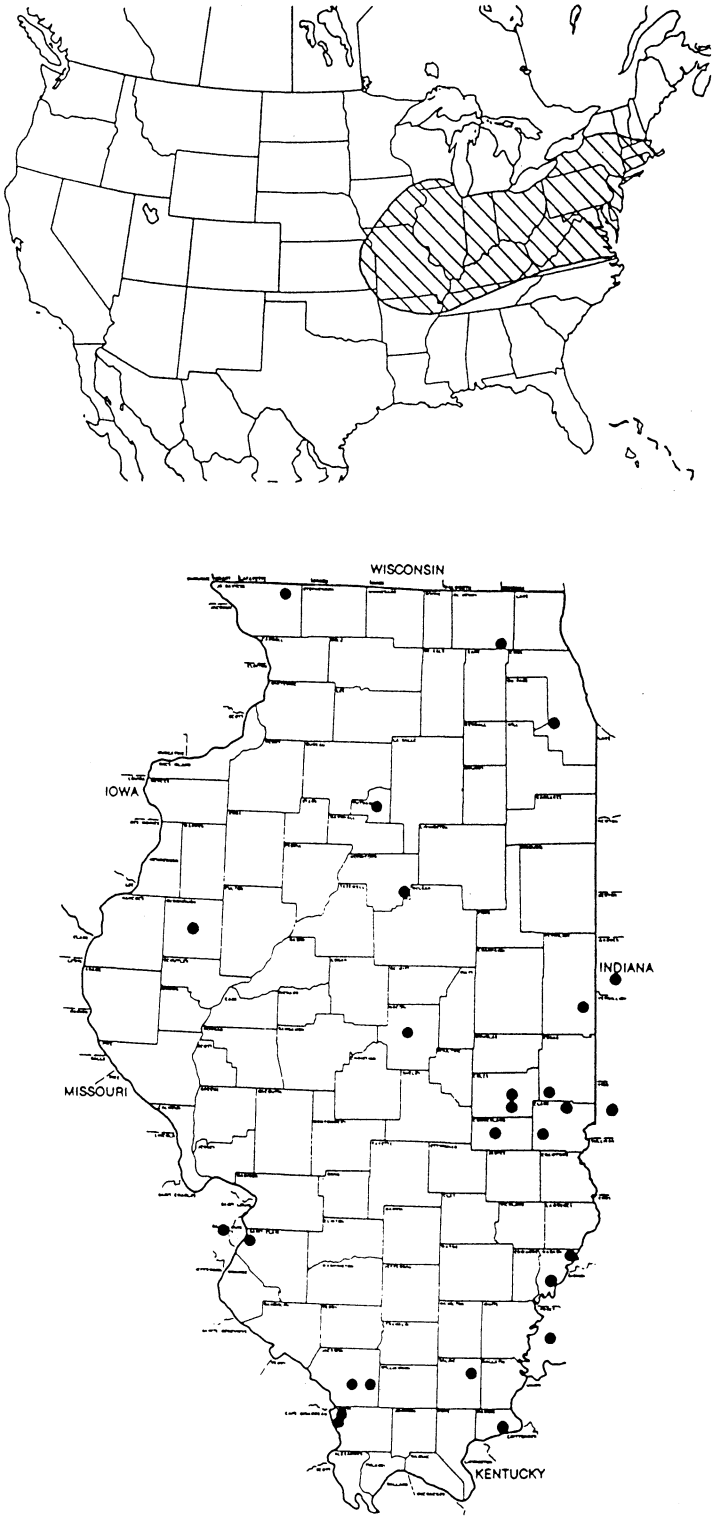

Figure. 23. National and Illinois distribution maps of Brachiacantha quadripunctata quadripunctata (Melsheimer).

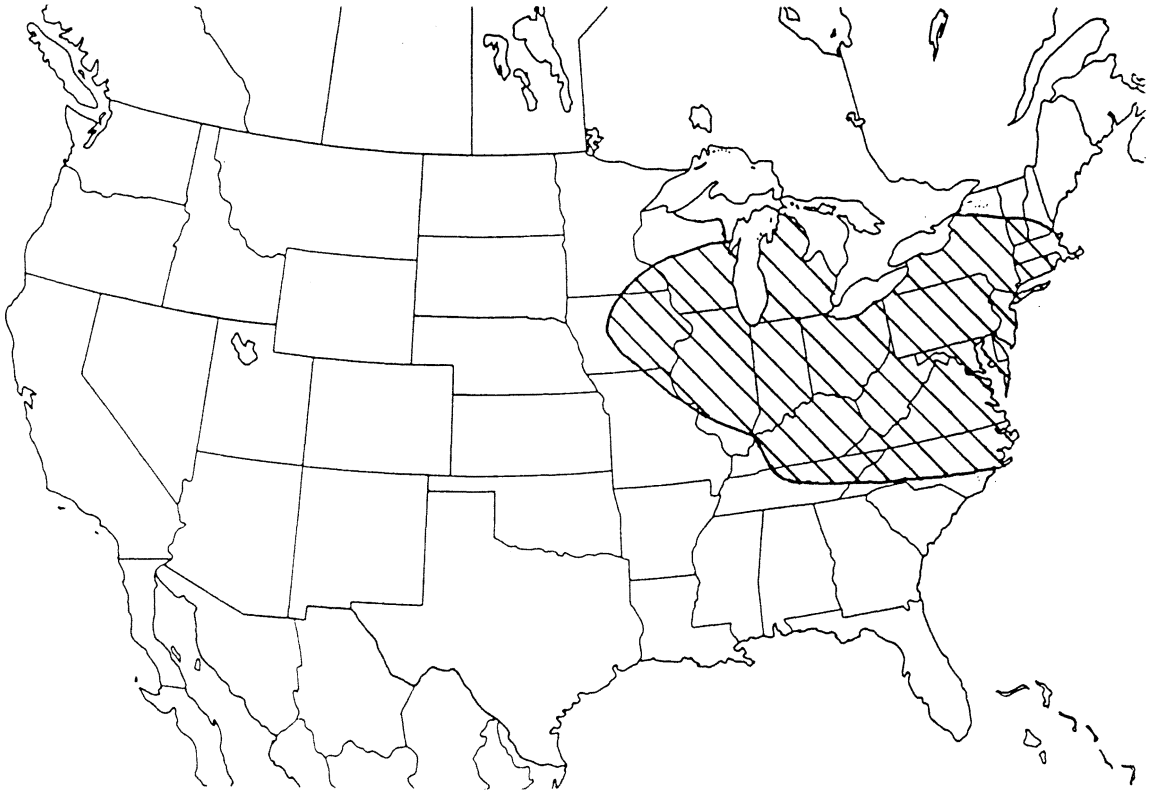

Figure. 24. National distribution map of Brachiacantha indubitabilis Crotch.

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APPENDIX

North American Locality Data for the Illinois Brachiacantha

The geographical and temporal discussions presented in the preceeding text are based, in part, on data from the specimens in the following list. Listed by species are the distributional data grouped by country, state or province, and specific locality. Also recorded are the collection date, the number of specimens in each series, and the depositories for the specimens.

Brachiacantha dentipes (Fabricius)

UNITED STATES

Arkansas
Washington Co., 10 April 1911 (1 UADE); Yell Co., 27 April 1975 (1 UADE)

Illinois
IL, (1 INHS); Union Co., Pine Hills, 26 May 1972 (1 SIUC)

Kansas
Pottawatomie Co., Onaga, (2 UWEM)

Missouri
Shell Knob, 13 April 1961 (2 UMRM); Adair Co., Kirksville, 25 May 1941 (1 UMRM); Callaway Co., Tucker Prairie, 15 June 1977 (1 UMRM); Camden Co., Camdenton, 9 May 1957 (1 UMRM); Jasper Co., Carthage, 17 May 1920 (1 UMRM); Reynolds Co., Bunker, 5 May 1959 (1 UMRM); St. Louis Co., St. Louis, 18 April 1897 (8 UMRM), 23 June 1899 (1 UMRM)

Nebraska
Brown Co., Extreme N.W. corner, 10 June 1950 (9 UMRM); Cherry Co., Clear Lake, Valentine Nat. Wldlf. Area, (1 EIUC)

Brachiacantha ursina (Fabricius)

CANADA

Newfoundland
St. Johns, 19 June 1898 (2 UWEM)

UNITED STATES

Arkansas
Wash. Co., Summer 1976 (3 UADE); Washington Co., Summer 1976 (1 UADE)

Connecticutt
Ct., June (1 WSUC); New Haven Co., New Haven, 9 July 1939 (1 WSUC)

Delaware
New Castle Co., Newark, 19 June 1905 (1 INHS)

Illinois
Ill, (3 INHS); N. Ill., (3 WSUC); Beach, 26 June 1927 (1 FMNH); Adams Co., Quincy, 30 June 1951 (1 INHS), 1 July 1953 (1 INHS); Bureau Co., Princeton, 2 July 1937 (2 INHS); Carroll Co., Savanna, 15 June 1932 (1 INHS); Mt. Carroll, 15 June 1932 (1 INHS); Champaign Co., 23 June 1926 (1 INHS); Cham., 4 June 1915 (1 INHS); Champaign, 30 May 192- (1 INHS); Urbana, 19 June 1940 (1 INHS), 28 June 1940 (1 INHS), 13 June 1941 (1 INHS); Clark Co., Rocky Branch, Dolson, 25 June 1932 (1 INHS); Coles Co., 16 June 1959 (1 EIUC), 14 June 1965 (1 EIUC), 17 June 1965 (1 EIUC), 27 June 1966 (1 EIUC), 15 June 1972 (1 UADE), 30 June 1985 (2 PESC); Charleston, July 1937 (2 EIUC), 7 June 1941 (2 INHS), 14 June 1962 (1 EIUC), 9 June 1965 (1 EIUC), 10 June 1966 (1 EIUC); Salisbury, 10 June 1934 (1 EIUC), 27 July 1935 (1 EIUC); Cook Co., (4 FMNH); Skokie, 13 July 1953 (1 UMRM), 25 June 1955 (1 UMRM); Cumberland Co., 2mi W. Toledo, 29 June 1993 (1 EIUC), 8 July 1993 (1 EIUC), 25 May 1996 (6 EIUC); Dupage Co., Hinsdale, 10 June 1953 (4 INHS); Hancock Co., A. L. Kibbe Life Sci. Sta., 25 June 1969 (1 WIUC), 6 July 1982 (1 WIUC); Hamilton, 6 July 1982 (1 WIUC); Iroquios Co., Watseka, 4 June 1932 (1 INHS); Jackson Co., Carbondale, 24 May 1961 (1 SIUC), 19 June 1963 (1 SIUC), 31 March 1964 (1 SIUC), 4 June 1979 (1 SIUC); Giant City, 27 May 1975 (6 SIUC); Murphysboro, 27 May 1965 (1 SIUC); SIU campus, 27 June 1974 (1 SIUC), 10 Sept 1974 (1 SIUC), 5 June 1975 (1

Illinois (cont.)

SIUC), 16 June 1975 (3 SIUC), 25 June 1975 (1 SIUC); Jo Daviess Co., Galena, 30 June 1932 (4 INHS); Apple River Canyon St. Pk., 27 June 1940 (2 INHS); Johnson Co., Grantsburg, 20 June 1940 (2 INHS); Kane Co., Elgin, 16 June 1934 (1 INHS); Elgin, Prairie Hill, 2 Aug 1945 (1 INHS); Lake Co., Lake Forest, 4 July 1952 (1 UMRM); Waukegan, 10 June 1933 (1 INHS); Lawrence Co., Lawrenceville, June 1935 (1 EIUC); Macon Co., 12 June 1983 (1 PESC), 10 June 1984 (3 EIUC); Decatur, 12 June 1935 (1 INHS); McDonough Co., Fandon, 12 June 1979 (1 WIUC); Macomb, July 1957 (1 WIUC), 19 April 1968 (1 WIUC), 27 June 1982 (1 WIUC); McLean Co., Bloomington, June 1963 (1 ISUC); Normal, 27 June 1883 (2 INHS); Piatt Co., Monticello, 28 June 1932 (1 INHS); Putnam Co., 12 June 1932 (2 INHS), 4 July 1932 (1 INHS); 1.5mi S. Putnam, 27 June 1984 (1 INHS); Shelby Co., 24 June 1984 (2 EIUC); Shelbyville, Lakewood Rd., 8 Sept 1936 (1 EIUC); Union Co., Cobden, 28 April 1884 (13 INHS); Pine Hills, 12 Oct 1974 (1 SIUC); Giant City St. Pk., 23 June 1963 (1 SIUC); Wabash Co., Mt. Carmel, 6 June 1941 (4 INHS); Williamson Co., Carterville, 30 May 1961 (1 SIUC); Winnebago Co., New Milford, 2 July 1936 (2 INHS); Woodford Co., Spring Bay region, 21 June 1942 (1 INHS)

Indiana

Ind., (1 WSUC); Indiana, June 1953 (2 INHS); Clarke, 11 June 1904 (1 FMNH); Grantsburg, 14 June 1966 (1 FSCA); Miller, 30 May 1934 (1 FMNH); Tremont, 21 June 1934 (1 UMRM); Brown Co., 26 May 1962 (1 FSCA), 8 June 1983 (3 FSCA), 27 May 1988 (2 FMNH); Bear Wallow, 10 June 1972 (1 FSCA); Cass Co., Young America, 17 Aug 1985 (1 LSUC); Clark Co., State Forest, 14 April 1932 (1 PURC); Howard Co., N.W. Howard Co., 2 July 1984 (9 LSUC), 13-14 June 1986 (2 LSUC), 23-24 June 1986 (13 LSUC); Sylvan Lake, 30 June-3 July 1984 (7 LSUC); Johnson Co., Henderson Farm, 16 June 1971 (1 PURC); Knox Co., Vincennes, 18 June 1924 (1 LSUC); Kosciusko Co., 23 June 1935 (1 PURC); La Grange Co., Pigeon River State Fish and Game Area, 26 June 1959 (1 PURC); Marion Co., 6-8-1943 (1 ISUC), 3 June 1944 (1 ISUC); Indianapolis, 1-15 June 1958 (1 FSCA), 15 June 1958 (1 FSCA), 4 July 1958 (1 FSCA), 27 June 1965 (1 FSCA), 8 June 1968 (1 FSCA); Morgan Co., Martinsville, 12 June 1934 (1 WSUC); IN 39 at Morgan/Hendricks Co. Line, 15 June 1972 (1 PURC); Noble Co., Albion, 13 July 1935 (1 UMRM); Cromwell, 20 June 1932 (1 UMRM); Tippecanoe Co., 13 June 1952 (2 FMNH), 27 June 1963 (1 FMNH), 28 July 1965

Indiana (cont.)
(1 FMNH), 12 June 1979 (2 FMNH), 13 June 1989 (1 FMNH); Lafayette, S. River Rd., 20 June 1950 (1 INHS); S. River Rd., 4 July 1962 (1 PURC); Wildcat Creek, IN Hgwy. 26, 10 June 1989 (2 FSCA); Vermillion Co., Big Vermillion River, 6mi S. Perrysville, 28 June 1972 (1 PURC); Wells Co., 10 July 1972 (1 PURC); White Co., Brookston, 12 July 1961 (1 FSCA); Whitley Co., 17 June 1972 (3 FSCA)

Iowa
Argyle, 15 June 1967 (1 UMRM); Lake McBride, 7-8-1950 (1 UMRM); Dickinson Co., Spirit Lake, June 1896 (1 UWEM); Fayette Co., Clermont, 20 June 1929 (1 WSUC), 27 June 1929 (1 WSUC); Henry Co., Mt. Pleasant, 21 July 1928 (1 UMRM), 19 June 1929 (1 UMRM); Johnson Co., Iowa City, (1 LSUC); Story Co., Ames, 27 June 1927 (1 LSUC), 9(?) July 1927 (1 LSUC), 23 June 1948 (1 UMRM); Winneshiek Co., Decorah, 2 July 1950 (2 UMRM)

Kentucky
KY, (2 INHS); Rockhaven, 4-7-1893 (1 UMRM); Bullitt Co., 16 June 1971 (1 UKYC); Caldwell Co., 7-12 June 1973 (4 UKYC); Carter Co., 3 June 1971 (5 UKYC); Fayette Co., Lexington, 10 June 1890 (1 UKYC), 23 June 1890 (1 UKYC), 1 July 1891 (1 UKYC), 20 June 1893 (1 UKYC), 24 May 1896 (2 UKYC), June 1904 (1 UKYC), Autumn 1904 (1 UKYC), 27 June 1910 (1 UKYC), 18 June 1917 (1 UKYC), 3 July 1917 (1 UKYC), 10 June 1918 (1 UKYC), 17 June 1919 (2 UKYC), June 1920 (2 UKYC), 1925 (1 UKYC), Summer 1926 (1 UKYC), 14 June 1941 (1 UKYC), 2 June 1965 (1 UKYC), 26 June 1969 (1 UKYC), 16-18 June 1970 (3 UKYC), 22-24 June 1970 (2 UKYC), 11-14 June 1971 (1 UKYC), 16 June 1971 (1 UKYC), 16-20 June 1971 (1 UKYC), 21-24 June 1971 (2 UKYC), 25-28 June 1971 (2 UKYC), 28-30 June 1971 (1 UKYC), 20-21 July 1971 (1 UKYC), 25-28 July 1971 (1 UKYC), 26 June 1973 (1 UKYC), 3-6 June 1975 (3 UKYC), 6-9 June 1975 (1 UKYC), 13 June 1980 (1 UKYC); Kenton Co., 6-5-1938 (1 UKYC)

Maine
Naples, (1 INHS)

Maryland
College Park, 1910 (2 UKYC)

Massachusetts
Barnstable Co., Woods Hole, (1 WSUC); Nantucket Co., Nantucket Isl., (4 INHS)

Michigan

Mich., (5 FMNH); Bath, 20 July 1963 (1 UKYC); Cheboygan Co., Douglas L., 1927 (2 WSUC); Univ. of Mich. Biol. Station, Douglas Lake, 9 July 1961 (1 FSCA); Genesee Co., Flint, 30 July 1944 (1 FMNH); Hillsdale Co., Pittsford, 15 June 1959 (1 UKYC); Ingham Co., E. Lansing, 22 July 1963 (1 UKYC), 23 July 1963 (1 UKYC), 20 June 1964 (1 UKYC); MSU campus, E. Lansing, 3 July 1963 (1 UKYC); Macomb Co., Mt. Clemens, Selfridge Field, 15-25 June 1944 (11 FMNH); New Baltimore, 17 June 1944 (2 FMNH), 30 June 1944 (3 FMNH), 18-21 July 1944 (1 FMNH); Oakland Co., Orion Lake, 17 June 1944 (2 FMNH); Sanilac Co., Port Sanilac, 15 July 1944 (1 FMNH); St. Clair Co., Port Huron, 27 June 1944 (4 FMNH); Washtenaw Co., Ann Arbor, 27 June 1934 (3 FMNH), 2 July 1944 (1 FMNH); Wayne Co., 1895 (2 FMNH); Detroit, 14 June 1905 (2 UMRM), 24 June 1907 (1 UMRM)

Minnesota

Stearns Co., 16 June 1985 (1 PESC)

Missouri

Mo., (3 FMNH), (1 FMNH), 5-6-1898 (1 UMRM); 5.4mi S. Rucker, 3 June 1974 (1 UMRM); Adair Co., 5 June 1967 (1 UMRM); Boone Co., 21 Sept 1968 (1 FSCA), 6-10-1988 (1 UMRM); Ashland, 28 May 1969 (1 UMRM); Columbia, 1 May 1966 (1 UMRM), 30 June 1967 (1 UMRM), 12 June 1980 (1 UMRM), 8 June 1983 (2 UMRM), 13 June 1988 (1 UMRM); Callaway Co., Little Dixie Lake, 25 May 1972 (3 UMRM), 20 May 1975 (1 UMRM); Daviess Co., Coffey, 13 June 1968 (1 UMRM); Dekalb Co., Unionstar, 12 June 1968 (1 UMRM); Harrison Co., New Hampton, 13 June 1968 (4 UMRM); Holt Co., Mound City, 25 June 1959 (1 UMRM); Knox Co., 14 June 1967 (2 UMRM); Lincoln Co., Elsberry, 25 May 1938 (4 UMRM); Linn Co., New Cambria, 16 June 1969 (1 UMRM); Marion Co., Palmyra, 14 June 1967 (1 UMRM); Randolph Co., 1mi E. Moberly, 18 May 1976 (1 LSUC); St. Charles Co., Weldon Spr., 11 June 1968 (1 UMRM), 1 July 1968 (1 UMRM), 22 July 1968 (1 UMRM); St. Clair Co., Taberville Prairie, 1.5mi E. Appleton, 10 June 1979 (1 UMRM); St. Louis Co., St. Louis, 24 June 1894 (1 UMRM), 26 May 1895 (1 UMRM), 25 May 1898 (1 UMRM), 23 May 1899 (1 UMRM), 12 June 1935 (1 UMRM), 27 May 1939 (1 UMRM); Sullivan Co., Milan, 18 July 1967 (2 UMRM)

Nebraska

Brown Co., extreme N.W. corner, 10 June 1950 (2 UMRM)

New Hampshire
Pike, 18 July 1908 (3 UADE)

New Jersey
Gloucester Co., Glassboro, 23 May 1942 (1 INHS); Union Co., Eliz., 28 June 1943 (1 INHS)

New York
NY, (1 INHS), (2 INHS); L. I., (1 INHS), (2 INHS); Richmond Hill, L. I., (1 UWEM); Cayuga Co., Mineral Spgs., 26 July 1979 (1 WSUC); Clinton Co., Plattsburg, 29 June 1927 (1 WSUC), 12 July 1927 (1 WSUC); Erie Co., Buffalo, (2 INHS); Schenectady Co., Schenectady, 15 June 1934 (1 WSUC); St. Lawrence Co., Canton, 12 June 1935 (1 WSUC), 2 July 1935 (1 WSUC), 16 June 1936 (1 WSUC); Tomkins Co., Ithaca, 5 July 1937 (6 ISUC), 7-4-1939 (1 UADE), 9 July 1978 (1 WSUC)

North Carolina
Buncombe Co., Black Mts., 2 July 1912 (1 WSUC); Macon Co., Highlands, 21 July 1908 (1 WSUC); Moore Co., Southern Pines, 30 May 1911 (2 INHS), 20 May 1915 (1 WSUC), 17 May 1916 (1 WSUC), 22 May 1916 (1 WSUC); Northampton Co., 13 June 1979 (2 UADE), 5 July 1979 (1 UADE), 10 July 1979 (1 UADE), 12 July 1979 (1 UADE), 15 July 1979 (4 UADE), 1 Aug 1979 (1 UADE)

Ohio
Moxahala, 18 June 1926 (1 WSUC); Put-In-Bay, 13 July 1924 (1 WSUC); Ashtabula Co., Andover, 10 June 1939 (1 WSUC); Coshocton Co., W. Lafayette, 2 July 1972 (1 INHS); Erie Co., Sandusky, 24 July 1924 (1 WSUC); Franklin Co., Columbus, 22 June 1924 (1 WSUC), 17 June 1926 (1 WSUC), 6 May 1938 (1 WSUC), 14 June 1939 (3 WSUC), 4 June 1968 (1 WSUC); Henry Co., 27 June 1938 (1 WSUC); Ottawa Co., Cedar Point, 26 June 1915 (1 UWEM)

Oklahoma Territory (?)
Norman, O.T., June 1899 (1 UWEM)

Pennsylvania
PA, (2 INHS); Penn., (1 WSUC); Colemanville, 7 June (2 INHS); Madisonburg, 12 June 1962 (1 FSCA); Pgh., June 1940 (2 INHS); Alleghany Co., (1 INHS); Centre Co., Boalsburg, 9 July 1963 (3 EIUC); State College, 8 July 1961 (2 EIUC); Chester Co., W. Chester, June 1899 (2 UWEM); Erie Co., Presque Isle, 3 July 1940 (1 INHS); Lancaster Co., Ephrata, 2 June 1909 (2 INHS); Mercer Co., Sharpsville, (1 WSUC)

South Dakota

Brookings Co., Brookings, 4 June 1941 (1 UMRM); Hughes Co., Blunt, 16 June 1932 (1 UMRM); Pierre, 10 June 1952 (1 UMRM); Lawrence Co., Spearfish, 28 June 1947 (1 UMRM)

Tennessee

Davidson Co., Nashville, 20 June 1892 (1 UMRM)

Vermont

VT, (1 INHS); Vt., July (1 WSUC)

Wisconsin

Wis., (1 FMNH), S. Wi., 4 July 1975 (15 UADE); Grand Rapids, 7-3-1930 (1 UWEM); Leopold Memorial Reserve, 3 June 1987 (1 UWEM); Mather, 7-1-1930 (1 UWEM); Nakoma, 26 June 1920 (1 UWEM); Bayfield Co., 13-20 June 1977 (1 UWEM); Clark Co., Chili, 7 July 1978 (1 UWEM); Crawford Co., Gays Mills, 30 June 1930 (1 WSUC); Dane Co., 3 July 1947 (6 UWEM), 22 July 1947 (1 UWEM), 6 June 1957 (1 UWEM); DNR trail 1/2mi E. Ridge Rd., Cottage Grove, 5 July 1989 (1 UWEM); Madison, (1 UWEM), 7/8 (1 UWEM), 27 June 1915 (1 UWEM), 7-9-1916 (1 UWEM), 7-9-1917 (1 UWEM), 25 July 1917 (1 UWEM), 26 July 1920 (2 UWEM), 6 July 1928 (1 UWEM), 21 May 1930 (1 UWEM), 22 June 1933 (2 UWEM), 22 June 1933 (1 WSUC), 10 July 1935 (1 WSUC), June 1936 (1 UWEM), June 1936 (1 WSUC), 21 June 1938 (1 WSUC), 28 June 1938 (1 WSUC), June 1940 (1 WSUC), 26 June 1940 (2 WSUC), 11 July 1940 (1 WSUC), 16 July 1940 (1 WSUC), 10 June 1952 (1 UWEM), 26 June 1963 (2 UWEM), 23 June 1964 (1 UWEM), 18 June 1967 (1 UWEM), 21 June 1972 (3 UWEM); Mendota Lake, 16 July 1915 (1 UWEM); Sandhill Rd. 1.5mi from Co. Trunk B, Madison, 9 June 1963 (2 UWEM); Univ. WI Arboretum, 30 June 1949 (3 UWEM), 7-9-1946 (1 UWEM), 7-11-1946 (1 UWEM); Eau Claire Co., Eau Claire, 14 June 1986 (1 LSUC); Grant Co., 12mi N.N.W. Platteville, 13 June 1967 (2 FSCA), T6N. R6W. S17, 8-15 July 1975 (4 UWEM); Iowa Co., 18 June 1930 (1 WSUC), 18 June 1930 (1 FMNH); near Dodgeville, 24 June 1972 (1 UWEM); Jackson Co., T21N. R4W. S33, 21-28 June 1976 (1 UWEM); Jefferson Co., N 6089 Kroghville, Waterloo, 13 July 1989 (1 UWEM); Kenosha Co., near Kenosha, 13 July 1969 (2 UWEM); La Crosse Co., La Crosse, 14 June 1985 (1 PESC); Richland Co., Ithaca, 22 June 1991 (1 UWEM); Shawano Co., 21 June 1951 (1 FSCA); Tilleda, 20 June 1963 (1 FSCA); St. Croix Co., 1mi S.W. Hersey, 8 July 1954 (2 WSUC); Washburn Co., Spooner, 16 June 1931 (10 UWEM); Waupaca Co., Waupaca, 25 June 1920 (1 UWEM); Wood Co., 28 June

Wisconsin (cont.)
1949 (2 UWEM); Griffith St. Nursery, 15 July 1952 (1 UWEM)

Brachiacantha decempustulata (Melsheimer)

CANADA

Ontario
Muskoka, Lake Joseph, 26 July 1926 (1 INHS)

UNITED STATES

Arkansas
Mississippi Co., 15 July 1966 (1 UADE); Washington Co., 8 June 1970 (1 UADE)

Florida
FL, (2 INHS), (1 INHS), (2 INHS); Volusia Co., Ormond, 4-6-1911 (1 UWEM)

Illinois
Ill., (1 INHS); Fountain Bluff, 15 May 1932 (1 INHS); Roslyn, 7 July 1950 (1 INHS); Clark Co., 5mi S.E. Casey, 21 Aug 1994 (1 EIUC); Rocky Branch, 8-20 Aug 1987 (2 EIUC), 16-21 July 1989 (1 EIUC), 11-18 June 1990 (1 EIUC), 18-25 June 1990 (1 EIUC), 15 July-4 Aug 1990 (1 EIUC), 7-14 Sept 1990 (1 EIUC), 13-24 June 1991 (1 EIUC), 30 June-7 July 1991 (1 EIUC), 7-14 July 1991 (1 EIUC), 14-21 July 1991 (1 EIUC), 30 July-8 Aug 1991 (1 EIUC), 8-19 Aug 1991 (1 EIUC), 9-27 Aug 1993 (1 EIUC), 9 July 1994 (1 EIUC), 8-12 July 1994 (3 EIUC), 15-29 July 1994 (1 EIUC); Coles Co., 14 June 1965 (1 EIUC); Fox Ridge St. Pk., 13-20 July 1992 (1 EIUC), 17-24 July 1993 (1 EIUC), 8 Aug 1993 (1 EIUC), 24 July-1 Aug 1994 (3 EIUC), 1-7 Aug 1994 (2 EIUC), 21-28 Aug 1994 (1 EIUC); Cook Co., Palos Park, 15 July 1908 (7 FMNH); Cumberland Co., woods 8mi W. Toledo, 3 July 1932 (4 EIUC), 15 July 1932 (1 EIUC); Edgar Co., 4mi S.S.E. Kansas, 10-17 July 1994 (1 EIUC); Jackson Co., 7mi W. Carbondale, 19-26 June 1993 (1 EIUC), 26 June-3 July 1993 (1 EIUC), 3-11 July 1993 (4 EIUC), 1-8 Aug 1993 (3 EIUC), 8-15 Aug 1993 (2 EIUC), 28 Aug-5 Sept 1993 (1 EIUC); Jo Daviess Co., Apple River Canyon St. Pk., 27 June 1940 (4 INHS); Peoria Co., Peoria, Detwailer Pk., 25 Aug 1960 (1 INHS); Piatt Co., Monticello, 1 Aug 1908

Illinois (cont.)
(1 INHS); Union Co., Pine Hills, 3 July 1972 (1 SIUC), 5 July 1974 (1 SIUC); Vermillion Co., Danville, 16 July 1930 (1 INHS); Wabash Co., 3mi S.E. Allendale, 8-18 July 1993 (2 EIUC); Beall Woods Nat. Pres., 26 July-3 Aug 1995 (4 EIUC), 3-10 Aug 1995 (1 EIUC), 17-24 Aug 1995 (1 EIUC), 20-27 June 1996 (1 EIUC), 17-25 July 1996 (1 EIUC), 30 Aug-6 Sept 1996 (1 EIUC), 6-13 Sept 1996 (1 EIUC), 2-10 July 1997 (1 EIUC)

Indiana
Howard Co., N.W. Howard Co., 20 Aug 1984 (2 LSUC); Marion Co., Indianapolis, 23 July 1961 (1 FSCA); Montgomery Co., Shades St. Pk., 28 July 1963 (2 FSCA); Orange Co., 31 May 1904 (1 PURC); Parke Co., 20 July 1963 (FMNH); Posey Co., 4 June 1904 (2 PURC); Tippecanoe Co., 6 June 1952 (1 FMNH), 21 June 1953 (2 FMNH), 1 Aug 1962 (1 FMNH); McCormick's Woods, 21 July 1988 (1FMNH)

Iowa
Boone Co., Boone, 16 Sept 1949 (1 UMRM)

Kansas
Douglas Co., Lawrence, Aug (1 UWEM); Pottawatomie Co., Onaga, (1 UWEM)

Kentucky
Rockhaven, 4-7-1892 (1 UKYC); Breathitt Co., Robinson Forest, 13-19 July 1975 (1 UKYC); Fayette Co., Lexington, 12-16 July 1971 (1 UKYC)

Maine
Oxford Co., Paris, 11 July 1946 (1 FMNH)

Minnesota
Eaglesnest, 22 Aug 1957 (1 INHS), 30 June 1959 (1 INHS); Itaska Pk., 21 July 1937 (5 WSUC), 24 July 1937 (1 WSUC)

Missouri
Tyrone, 15 June 1951 (2 UMRM); Boone Co., Columbia, 3 Aug 1973 (1 UMRM), 9 July 1986 (1 UMRM); Pinacles, 7 Sept 1974 (1 UMRM); Callaway Co., Tucker Prairie, 23 June 1977 (2 UMRM); Carter Co., 6mi E. Van Buren, 14 June 1957 (1 UMRM); Greene Co., Springfield, 8 July 1972 (1 UMRM); Henry Co., Deepwater, County Line Prairie, 2 July 1977 (1 UMRM); Holt Co., 24 July 1970 (1 UMRM); Shannon Co., Eminence, 6 June 1950 (2 UMRM);

Missouri (cont.)
St. Louis Co., Valley Park, 30 Oct 1919 (1 INHS)

New York
NY, (2 INHS), (2 INHS)

Pennsylvania
Rockville, 5 July 1908 (1 INHS); Chester Co., Valley Forge, 29 July 1912 (1 INHS)

South Carolina
Meredith, 19 April 1927 (1 WSUC)

Tennessee
Great Smoky Mtns. Nat. Pk., 24 June 1935 (1 WSUC); Davidson Co., Nashville, 20 June 1892 (1 UMRM)

Wisconsin
Devils Lake, 22 Aug 1918 (1 UWEM); Grant Co., T6N. R6W. S17, 8-15 July 1975 (3 UWEM), 29 July-5 Aug 1975 (2 UWEM), 15-20 Aug 1975 (2 UWEM)

Brachiacantha felina (Fabricius)

UNITED STATES

Arkansas
ARK, (1 INHS); Desha Co., 18 Sept 1972 (1 UADE); Franklin Co., 18 May 1967 (1 UADE); Washington Co., 16 May 1924 (1 UADE), 15 June 1965 (2 UADE), 1 July 1965 (1 UADE), 22 Sept 1975 (1 UADE)

Florida
FL, (1 INHS)

Illinois
Ill., (1 FMNH), (3 INHS); N. Ill., (3 WSUC); S. Ill., 7-6-1890 (1 UMRM); Funkhauser, 21 May 1950 (3 INHS); Adams Co., Quincy, 30 June 1951 (1 INHS); Alexander Co., Olive Branch, 29 Sept 1909 (2 FMNH), 30 Sept 1909 (1 FMNH); Champaign Co., Champaign, 1 April 1957 (1 INHS), 13 July 1975 (1 INHS); Clark Co., Marshall, 18 May 1941 (1 EIUC); Rocky Branch, 15-29 Nov 1992 (1 EIUC); Coles Co., 10 Oct 1966 (1 EIUC), 15 June 1972 (1 UADE), 12 Oct 1985 (1 EIUC); Charleston, 2 Oct 1951 (1 EIUC); Diona, 12 June 1935 (1 EIUC); Fox Ridge St. Pk.,

Illinois (cont.)

13 May 1944 (1 EIUC), 5-12 Oct 1992 (1 EIUC); Salisbury, 28 April 1933 (1 EIUC), 28 April 1935 (1 EIUC); Cook Co., Chicago, July (1 UWEM); Palos Park, 3 May 1907 (3 FMNH), 14 May 1911 (1 FMNH); Willow Springs, 14 Sept 1906 (1 FMNH), 14 July 1912 (1 FMNH); Cumberland Co., 2mi W. Toledo, 29 Sept-6 Oct 1991 (1 EIUC), 26 Oct-3 Nov 1991 (1 EIUC), 23 May 1993 (1 EIUC), 25 May 1996 (1 EIUC); woods 8mi W. Toledo, 3 July 1932 (1 EIUC); Dupage Co., 19 May 1990 (1 EIUC); Green Valley F. P., 19-26 April 1996 (1 EIUC), 17-24 May 1996 (2 EIUC); Edgar Co., 4mi S.S.E. Kansas, 17 April 1994 (2 EIUC), 24 April 1994 (3 EIUC), 29 May-5 June 1994 (1 EIUC), 25 Sept-2 Oct 1994 (1 EIUC), 2-9 Oct 1994 (2 EIUC), 9-16 Oct 1994 (1 EIUC), 16 Oct 1994 (1 EIUC), 16-30 Oct 1994 (1 EIUC); Effingham Co., Altamont, 5 May 1943 (1 INHS); Hancock Co., A. L. Kibbe Life Sci. Sta., 19 May 1980 (1 WIUC); Hardin Co., Elizabethtown, 27-31 May 1931 (1 INHS), 27-31 May 1932 (2 INHS); near Tower Rock Rec. Area, 26 June 1994 (1 EIUC); Jackson Co., Carbondale, 2 May 1958 (1 SIUC), 23 May 1962 (1 SIUC); De Soto, 5-10-1957 (1 SIUC); Jo Daviess Co., Apple River Canyon St. Pk., 23 Aug 1939 (1 INHS); Johnson Co., Grantsburg, 20 June 1940 (1 INHS); Ozark, 18 May 1932 (1 INHS); Vienna, 18 May 1932 (1 INHS); Kane Co., Elburn, 19 May 1944 (1 INHS); La Salle Co., Starved Rock, 8-10-1924 (1 FMNH); Macon Co., 1 May 1980 (1 PESC); Mason Co., Havana, 31 May 1933 (1 INHS); McHenry Co., Algonquin, (2 INHS); McHenry, 25 June 1898 (1 WSUC); Ogle Co., Castle Rock, Grand Detour, 2 July 1932 (1 INHS); Peoria Co., Peoria, Bradley Park, 17 July 1942 (1 INHS); Piatt Co., Monticello, 22 Sept 1934 (1 INHS), 12 May 1947 (1 INHS); Pope Co., Eddyville, 16 May 1947 (1 INHS); Herod, 18 April 1944 (2 INHS); Lusk Creek, 12 Oct 1967 (1 SIUC); Pulaski Co., Mounds, 28 May 1957 (1 SIUC); Pulaski, 31 May 1909 (1 INHS); Putnam Co., 24 June 1932 (1 INHS); Union Co., Giant City St. Pk., 5 June 1931 (1 EIUC), 5-7-1971 (1 SIUC); Pine Hills, 10-8-1955 (1 SIUC), 11 Sept 1966 (1 SIUC), 25 May 1973 (1 SIUC), 7 May 1975 (1 SIUC), 6 May 1977 (1 SIUC); Vermillion Co., 12 Sept 1993 (1 EIUC)

Indiana

Howard Co., 19 May 1983 (1 LSUC); N.W. Howard Co., 2 July 1984 (1 LSUC), 24 Aug 1984 (1 LSUC), 23-24 June 1986 (1 LSUC), 24-30 Sept 1986 (3 LSUC); Jasper Co., 6 July 1935 (1 PURC); Knox Co., 30 April 1947 (1 UADE); Marion Co., Indianapolis, 1-15 July 1958 (1 FSCA), 3 May 1960 (2 FSCA), 23 July 1961 (1 FSCA); Monroe

Indiana (cont.)
Co./Morgan Co., Morgan-Monroe Forest, 29 April 1964 (1 FSCA); Owen Co., McCormick's Creek St. Pk., 24 Sept 1966 (1 EIUC); Perry Co., 20 May 1908 (1 PURC); Starke Co., San Pierre, 4 June 1983 (1 FSCA); Tippecanoe Co., 17 June 1988 (1 FSCA); Wildcat Creek, IN 26, 2 May 1988 (1 FSCA)

Iowa
Guthrie Co., Springbrook St. Pk., 14 June 1985 (1 FMNH); Polk Co., County Park, 28 April 1985 (1 FMNH); Van Buren Co., Lacey Keosauqua St. Pk., 9 Sept 1949 (2 UMRM)

Kansas
Pottawatomie Co., 5-11-1952 (1 UADE); Onaga, (1 UWEM); Shawnee Co., Auburn, 10-6-1933 (1 WSUC)

Kentucky
Cazier, 24 May 1964 (1 FSCA); Kentucky Lake St. Pk., 6 May 1957 (1 FSCA); Fayette Co., Lexington, 5-8 May 1975 (1 UKYC); Knox Co., 24 April 1965 (1 FSCA)

Michigan
Mich., (2 FMNH); Cheboygan Co., 13 July 1953 (1 UWEM); Midland Co., Sanford, 24 June 1944 (1 FMNH), 30 July 1944 (1 FMNH); Oceana Co., Pentwater, July 1935 (2 FMNH)

Minnesota
Traverse Co., (1 WSUC)

Missouri
Cornwall, 9 May 1959 (1 UMRM), 18 June 1960 (1 UMRM); New Hartford, 3 June 1940 (1 UMRM), 4 June 1940 (1 UMRM), 8 June 1940 (2 UMRM), 12 June 1940 (1 UMRM), 13 June 1940 (2 UMRM), 23 June 1940 (2 UMRM), 20 June 1946 (2 UMRM), 6 July 1946 (1 UMRM); Pierpont, 23 April 1961 (2 UMRM); Sam Baker St. Pk., 11 May 1940 (2 EIUC); Tyrone, 15 June 1951 (1 UMRM); Vera, 21 April 1946 (4 UMRM); Wakanda St. Pk., 21 May 1968 (1 UMRM); Atchison Co., Brickyard Hills Wldlf. Area, 17 June 1983 (2 UMRM); Bollinger Co., Marble Hill, 23 April 1940 (5 UMRM); Boone Co., 24 April 1980 (1 UMRM); Ashland, 22 June 1968 (1 UMRM), 24 June 1968 (1 UMRM), 25 June 1968 (1 UMRM), 29 June 1968 (1 UMRM), 12 May 1972 (2 UMRM); Ashland Wldlf. Area, 28 June 1968 (1 UMRM), 10 Sept 1977 (1 UMRM); Columbia, 19 June 1930 (1 UMRM), 29 Sept 1940 (1 UMRM), 13 Oct 1941 (1 UMRM), 14 May 1946 (1

Missouri (cont.)

UMRM), 18 April 1947 (2 UMRM), 27 May 1947 (2 UMRM), 31 May 1947 (1 UMRM), 22 June 1947 (1 UMRM), 7 April 1948 (2 UMRM), 12 May 1950 (1 UMRM), 20 May 1953 (2 UMRM), 14 May 1957 (4 UMRM), 7 June 1957 (2 UMRM), 2 July 1959 (1 UMRM), 6 Oct 1960 (1 UMRM), 27 Oct 1961 (1 UMRM), 3 May 1966 (1 UMRM), 7-6-1966 (1 UMRM), 11 July 1967 (1 UMRM), 10-1-1967 (1 UMRM), 14 May 1980 (2 UMRM), 20 July 1989 (1 UMRM); 10mi S. Columbia, 23 April 1961 (1 UMRM); Hallsville, 20 June 1977 (1 UMRM); Little Dixie, 18 May 1971 (2 UMRM); McBaine, 30 June 1968 (1 UMRM); Rocheport, 5 May 1948 (1 UMRM); U.M.C. Dairy Farm, 21 May 1975 (1 UMRM); Callaway Co., Fulton, 23 May 1948 (1 UMRM), 8 May 1949 (3 UMRM), 14 May 1949 (5 UMRM); Little Dixie Lake, 18 May 1962 (1 UMRM), 19 May 1972 (1 UMRM), 25 May 1972 (1 UMRM), 20 May 1975 (2 UMRM); Tucker Priarie, 17 May 1968 (1 UMRM), 19 May 1968 (3 UMRM), 2 June 1968 (1 UMRM), 3 June 1968 (1 UMRM), 5 June 1968 (1 UMRM), 11 June 1968 (1 UMRM), 12 June 1968 (7 UMRM), 14 June 1968 (2 UMRM), 15 June 1968 (2 UMRM), 17 June 1968 (1 UMRM), 18 June 1968 (10 UMRM), 19 June 1968 (1 UMRM), 20 June 1968 (11 UMRM), 21 June 1968 (5 UMRM), 22 June 1968 (7 UMRM), 23 June 1968 (14 UMRM), 24 June 1968 (5 UMRM), 25 June 1968 (11 UMRM), 26 June 1968 (8 UMRM), 29 June 1968 (3 UMRM), 30 June 1968 (3 UMRM), 1 July 1968 (6 UMRM), 2 July 1968 (11 UMRM), 3 July 1968 (2 UMRM), 5 July 1968 (3 UMRM), 6 July 1968 (2 UMRM), 7 July 1968 (5 UMRM), 8 July 1968 (3 UMRM), 9 July 1968 (4 UMRM), 10 July 1968 (7 UMRM), 13 July 1968 (1 UMRM), 15 July 1968 (2 UMRM), 18 July 1968 (2 UMRM), 19 July 1968 (2 UMRM), 20 July 1968 (6 UMRM), 23 July 1968 (2 UMRM), 25 July 1968 (3 UMRM), 26 July 1968 (1 UMRM), 27 July 1968 (1 UMRM), 4 Aug 1968 (1 UMRM), 5 Aug 1968 (1 UMRM), 14 Aug 1968 (2 UMRM), 16 May 1972 (1 UMRM), 23 June 1977 (1 UMRM); Cape Girardeau Co., Cape Girardeau, 29 April 1941 (1 UMRM); Christian Co., 15 June 1940 (1 UMRM); Nixa, 14 May 1949 (1 UMRM); Clay Co., Kearney, 29 June 1977 (1 UMRM); Cooper Co., Boonville, 8 May 1960 (2 UMRM); Dade Co., 24 Aug 1967 (1 UMRM); Douglas Co., Ava, 25 June 1968 (1 UMRM); Gasconade Co., Gasconade, 10 May 1972 (1 UMRM); Holt Co., Mound City, 28 April 1968 (1 UMRM), 1 May 1968 (2 UMRM), 2 May 1968 (2 UMRM), 3 May 1968 (2 UMRM), 4 May 1968 (1 UMRM), 9 May 1968 (5 UMRM), 13 May 1968 (1 UMRM), 14 May 1968 (1 UMRM), 15 May 1968 (3 UMRM), 17 May 1968 (1 UMRM), 27 May 1968 (1 UMRM), 28 May 1968 (2 UMRM), 30 May 1968 (1 UMRM), 2 June 1968 (1 UMRM), 4 June 1968 (1 UMRM), 5 June 1968 (1 UMRM), 6 June 1968 (1 UMRM), 13 June 1968 (1 UMRM), 21 June 1968 (1 UMRM),

Missouri (cont.)
7 July 1968 (1 UMRM), 9 Sept 1968 (1 UMRM); Howell Co., Mtn. View, 11 May 1940 (2 UMRM); Jackson Co., Kansas City, Willow Creek, I 435 & Wornall Rd., 11 July 1977 (1 FSCA); Maries Co., Vichy, 2 May 1950 (1 UMRM); Newton Co., Granby, 23 April 1947 (1 UMRM); Nodaway Co., Barnard, 14 July 1966 (1 UMRM); Maryville, 19 May 1933 (1 WSUC); Osage Co., 13 May 1971 (1 UMRM); Perry Co., Altenburg, 16 April 1940 (1 UMRM); Phelps Co., Rosati, 24 May 1949 (1 UMRM), 2 May 1950 (1 UMRM); Ralls Co., New London, 17 May 1960 (20 UMRM); Perry, 21 April 1946 (6 UMRM), 16 July 1946 (1 UMRM); Randolph Co., 1mi E. Moberly, 4-7 July 1986 (1 LSUC); Shannon Co., Bunker Hill, 12 May 1951 (2 UMRM); St. Charles Co., Weldon Spr., 28 June 1968 (1 UMRM); Washington Co., Richwoods, 7 May 1947 (1 UMRM); Webster Co., 26 June 1968 (1 FSCA)

Nebraska
Adams Co., 3-10 Sept 1991 (1 HCCA), 10-17 Sept 1991 (1 HCCA)

New York
NY, (1 INHS)

North Carolina
Moore Co., Southern Pines, 1 May 1912 (1 WSUC), 21 April 1915 (1 WSUC), 14 May 1915 (1 WSUC), 14 April 1917 (3 WSUC)

Ohio
Butler Co., Oxford, 14 May 1954 (1 EIUC)

West Virginia
Seneca Creek, mouth of Seneca, 30 April 1944 (1 INHS)

Wisconsin
Wis., (1 FMNH), 1874 (1 UWEM); Dane Co., 26 May 1953 (1 UWEM); Madison, May 1954 (1 UWEM), 15 Sept 1972 (2 UWEM); Univ. WI Arboretum, 30 May 1953 (1 UWEM); Grant Co., 4 July 1959 (1 UWEM); T6N. R6W. S17, 29 July-5 Aug 1975 (3 UWEM); Juneau Co., 2 Sept 1949 (2 UWEM); Rock Co., T4N. R13E. S25, 20-28 May 1976 (3 UWEM); Shawano Co., Cloverleaf Lakes, 21 Sept 1938 (1 WSUC); Waupaca Co., 23 Aug 1949 (1 UWEM), 24 Aug 1949 (1 UWEM)

Brachiacantha rotunda Gordon

UNITED STATES

Arkansas
Crawford Co., 9 May 1958 (1 UADE)

Illinois
N. Ill., (1 WSUC); Cumberland Co., 2mi W. Toledo, 29 Sept-6 Oct 1991 (1 EIUC), 2 May 1993 (1 EIUC); Hancock Co., A. L. Kibbe Life Sci. Sta., 3 June 1980 (1 WIUC); McHenry Co., Algonquin, (1 INHS); Pulaski Co., Mounds, 30 July 1957 (1 SIUC); Putnam Co., 5 June 1932 (1 INHS)

Missouri
New Hartford, 7 June 1940 (1 UMRM), 13 June 1940 (1 UMRM); Boone Co., Columbia, 25 May 1940 (1 UMRM), 12 May 1950 (1 UMRM), May 1964 (1 UMRM), 24 Sept 1971 (1 UMRM); Butler Co., Poplar Bluff, 5-11-1940 (2 UMRM); Callaway Co., 21 May 1973 (1 UMRM); Little Dixie Lake, 21 May 1973 (1 UMRM); Tucker Prairie, 5 June 1968 (1 UMRM); Holt Co., Mound City, 1 May 1968 (2 UMRM); Pike Co., Clarksville, 1 May 1938 (1 UMRM); St. Charles Co., Weldon Spr., 10 June 1968 (1 UMRM); St. Louis Co., Ranken, 4 May 1947 (1 UMRM)

North Carolina
Moore Co., Southern Pines, 25 April 1916 (1 WAUS)

New York
NY, (1 INHS)

Pennsylvania
Pequea, (1 INHS)

Wisconsin
Egg Harbor, 21 June 1923 (1 WASU); Dane Co., 20 June 1898 (1 UWEM), 28 May 1901 (1 UWEM)

Brachiacantha quadripunctata quadripunctata (Melsheimer)

UNITED STATES

Illinois
Ill., (4 FMNH), (5 INHS); N. Ill., (1 WSUC); S. Ill.,

Illinois (cont.)

14 June 1896 (1 UMRM); Clark Co., 5mi S.E. Casey, 19 May 1994 (1 EIUC), 7 Oct 1995 (2 EIUC); Rocky Branch, 1-7 Sept 1988 (1 EIUC), 15 June 1989 (1 EIUC), 14-21 May 1990 (1 EIUC), 4-11 June 1990 (1 EIUC),12-19 May 1991 (3 EIUC), 19-27 May 1991 (4 EIUC), 27 May-2 June 1991 (1 EIUC), 2-13 June 1991 (5 EIUC), 24-30 June 1991 (1 EIUC), 14-21 July 1991 (1 EIUC), 21-30 July 1991 (1 EIUC), 10 May 1992 (1 EIUC), 1-8 May 1993 (2 EIUC), 8-16 May 1993 (1 EIUC), 7 May 1995 (2 EIUC), 1 June 1996 (1 EIUC); Coles Co., 16 June 1972 (1 UADE); Burgner Acres, 30 June 1997 (7 EIUC); Charleston, EIU campus, 21 Feb 1995 (1 EIUC); Fox Ridge St. Pk., 8-15 June 1992 (3 EIUC), 17-24 April 1993 (1 EIUC), 22-29 May 1993 (1 EIUC), 17-24 July 1994 (2 EIUC); Cook Co., Willow Spgs., 28 June 1903 (1 FMNH); Cumberland Co., 2mi W. Toledo, 2-8 July 1991 (1 EIUC); Edgar Co., 4mi S.S.E. Kansas, 2-9 Oct 1994 (1 EIUC), 16-30 Oct 1994 (1 EIUC), 13 Nov 1994 (1 EIUC); Hardin Co., Tower Rock Rec. Area, 25-26 June 1994 (1 EIUC); Jackson Co., Carbondale, 5-8-1957 (1 SIUC), 12 May 1958 (1 SIUC), 7-10-1958 (1 SIUC), 13 May 1962 (1 SIUC), 10 June 1962 (1 SIUC); 7mi W. Carbondale, 12-19 June 1993 (2 EIUC), 19-26 June 1993 (1 EIUC); Little Grand Canyon, 9 April 1978 (1 SIUC); Midland Hills, 13 May 1972 (1 SIUC); Jo Daviess Co., Apple River Canyon St. Pk., 27 June 1940 (1 INHS); Macon Co., N.W. side Decatur, 11 May 1987 (1 PSC); McDonough Co., Macomb, 24 May 1972 (1 WIUC); McHenry Co., Algonquin, (1 INHS); Putnam Co., 4 July 1932 (1 INHS); Saline Co., Eldorado, 23 June 1960 (1 SIUC); St. Clair Co., Kahokia, 8-6-1903 (1 UMRM); Union Co., Pine Hills, 6 July 1972 (1 SIUC), 3 May 1987 (1 PESC); Vermillion Co., Forest Glenn Preserve, 5mi S.E. Westville, 14-15 April 1977 (1 INHS), 19-20 April 1977 (1 INHS); Wabash Co., 3mi S.E. Allendale, 25 Apr-2 May 1993 (1 EIUC); Beall Woods Nat. Pres., 16-23 May 1996 (1 EIU), 23-30 May 1996 (1 EIUC); Woodford Co., Kappa, 15 June 1931 (1 INHS)

Indiana

Bear Wallow, 22 June 1963 (1 FSCA), 7 May 1965 (1 FSCA), 22 May 1965 (1 FSCA), 31 May 1965 (1 FSCA), 7 June 1965 (1 FSCA), 6 May 1966 (2 FSCA), 27 May 1966 (1 FSCA), 2 June 1967 (1 FSCA), 6 June 1967 (2 FSCA); Hovey, 3 June 1964 (1 FSCA); Brown Co., 6 June 1981 (1 FSCA), 11 May 1982 (1 FSCA); Fountain Co., Attica, 5 July 1950 (1 INHS); Howard Co., 19 May 1983 (1 LSUC); N.W. Howard Co., 24-30 Sept 1986 (1 LSUC), 15-21 July 1987 (1 LSUC); Jackson Co., 20 May 1904 (1 PURC);

Indiana (cont.)

Jasper Co., Jasper-Pul For., 16 May 1987 (1 FMNH); Lake Co., Whiting, 25 April 1905 (1 FMNH); Marion Co., Indianapolis, 23 May 1959 (1 FSCA), 1 Aug 1961 (1 FSCA); Monroe Co., Morgan-Monroe For., 29 April 1964 (1 FSCA); Montgomery Co., Shades St. Pk., 28 July 1963 (1 FSCA); Parke Co., 1mi N. Guion, 12 July 1972 (1 PURC); Posey Co., 8 July 1903 (1 PURC), Pulaski Co., Jasper-Pulaski For., 15 May 1985 (2 FSCA); Putnam Co., 4 July 1924 (1 PURC); Tippecanoe Co., 26 June 1952 (1 FMNH), 19 July 1952 (1 FMNH), 27 June 1953 (1 FMNH), 18 July 1956 (1 FMNH), 13 July 1962 (1 FMNH), 16 July 1965 (1 FMNH), 20 July 1965 (1 FMNH), 14 May 1982 (1 FSCA), 20 May 1988 (1 FSCA), 25 May 1988 (1 FSCA); W. Lafayette, McCormick's Woods, 10 July 1983 (1 FSCA); Wildcat Creek, 5 May 1972 (1 FSCA), 19 May 1972 (1FSCA), 1 June 1983 (2 FSCA), 17 May 1984 (1 FSCA), 2 May 1988 (2 FSCA); Vigo Co., 1 July 1894 (1 PURC); Warren Co., 11 June 1984 (1 FSCA), 23 May 1988 (3 FSCA)

Iowa

Ledges St. Pk., 21 May 1950 (1 UMRM); Clayton Co., Guttenburg, 4-10-1892 (5 UMRM)

Kansas

Shawnee Co., Auburn, 10-6-1933 (1 WSUC), 10-6-1933 (1 WSUC)

Kentucky

KY, (2 INHS); Kentucky Lake St. Pk., 6 May 1957 (1 FSCA); Breathitt Co., Robinson Forest, 26 July 1972 (1 UKYC)

Missouri

Mo., 16 June 1895 (1 UMRM): Callaway Co., Fulton, 7 May 1950 (1 UMRM); Little Dixie Lake, 25 May 1972 (1 UMRM); Tucker Prairie, 6 June 1968 (1 UMRM), 6 Aug 1968 (1 UMRM); Holt Co., Mound City, 15 May 1968 (1 UMRM); Randolph Co., 7 May 1976 (1 LSUC), 17 May 1976 (1 LSUC); St. Louis Co., Creve-Coeur Lk., 5 May 1919 (1 UMRM)

New York

Erie Co., Buffalo, (1 INHS)

Pennsylvania

Rockville, 5 July 1908 (1 INHS)

Wisconsin
Dane Co., 14 May 1915 (1 UWEM); Madison, 1 June 1924 (1 WSUC), 27 June 1935 (1 WSUC)

Brachiacantha indubitabilis Crotch

UNITED STATES

Indiana
Hessville, 14 July 1904 (3 FMNH)

Massachusetts
Nantucket Co., Nantucket, (1 INHS)

New Jersey
Gloucester Co., Glassboro, 28 June 1943 (1 INHS)

North Carolina
Moore Co., Southern Pines, 27 May 1915 (1 UWEM), 4 June 1915 (3 UWEM)

Tennessee
Davidson Co., Nashville, 20 June 1892 (1 UMRM)