

Wasps of the Tribes Stizini and Bembicini in Indiana (Hymenoptera: Sphecidae)

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As a state, Indiana is small in size with a relatively uniform climate and without striking topographic features. However, faunistic and floristic studies conducted within these political boundaries have shown a peculiar biotic admixture which seems to be not generally recognized.

The dynamics of faunistic survey have been discussed by Ross (11). Such studies transcend the "species list—key" stages, although this is the first step, and provide a more comprehensive basis for biosystematic consideration.

Wasps of the tribes Stizini and Bembicini illustrate and emphasize several of the above points. Fourteen species are recorded in this paper as occurring within Indiana. At least eight of these records are new for the state. There is the possibility that five other species may be found and these are included in the discussions. Of the 14 species listed, six are common throughout the state, whereas eight are restricted to certain portions of the state or to certain ecological sites of disjunct distribution.

Specific and generic limits are fairly well understood, but relationships of taxa, from lowest to highest, have, until recently, been unknown or poorly known and controversial. Several additional areas of study have provided evidences as striking and valuable as those of adult morphology. When behavior (4), larval morphology (6), prey records (7) and prey-carrying mechanisms (5) were integrated with adult morphology and distribution as a biosystematic unit, group relationships were more clearly elucidated.

In North America, eight subfamilies of Sphecidae are recognized (6). Keys to subfamilies and tribes were given by Borror and DeLong (1). Brues, Melander and Carpenter (2) published identification keys; however, the names now regarded as subfamilies and/or tribes were accorded familial status. The status of names and relationships found in older literature was summarized by Parker (9, 10).

Key for the Separation of Tribes

1. Ocelli normal; labrum wider than long; middle tibiae each with two apical spursStizini
- 1'. Ocelli distorted, median ocellus in a pit or reduced to a slit; labrum as long as, or longer than, wide; middle tibiae each with one apical spurBembicini

Key for the Separation of Genera of Stizini

1. Posterior surface of propodeum strongly concave, the posterior-lateral angles compressed, wedge-shaped; second cubital cell petiolate*Bembicinus*

- 1'. Posterior surface of propodeum flat or convex, without posterior-lateral projections; second cubital cell not petiolate 2
2. Mandibles dentate; inner eye margins nearly parallel.... *Stizus*
- 2'. Mandibles edentate; inner eye margins converging at clypeus *Stizoides*

Stizus Latreille

Stizus brevipennis Walsh.—This is a very large wasp superficially resembling in size and coloration the more familiar cicada-killer, *Sphecius speciosus* (Drury). Our only record of its occurrence in Indiana is based upon specimens collected in Posey County in September, 1964, by Prof. R. T. Everly. Specimens have been seen from Warren County but these are no longer extant. *S. brevipennis* utilizes long-horned grasshoppers of the genus *Conocephalus* as prey (8).

Stizoides Guerin

Stizoides uncinatus (Say).—This wasp is jet-black except for the second abdominal tergite which is red. The wings are also black except for the apices of the fore wings which are white. *S. uncinatus* is a parasitic species in the nests of *Priononyx atratus* (Lep.). The host species is common throughout Indiana but we have only a single record of *S. uncinatus*. This specimen was taken in an extensive gravel pit south of Plainville, Daviess County (June 27, 1958) by C. E. McCoy.

Bembecinus Costa

Bembecinus neglectus (Cr.).—From May to October, 1958, an entomological reconnaissance of the Hovey Lake area (Posey County) was undertaken by the Purdue biosystematic group. On June 26, a large number of individuals of *B. neglectus* (det. K. V. Krombein) were taken from the flowers of creeping yellow watercress, *Rorippa sylvestris* (L.) Bess. The area was an extensive sand flat, all of which had been submerged by the flooding of the Ohio River during late spring. No other collections have been made of this species nor have we been able to secure additional specimens from this same area during subsequent trips. The reported prey of *B. neglectus* is leafhoppers and fulgorids (8).

Key for the Separation of Genera of Bembicini

1. Median ocellus in a pit, the borders of which are distinctly elevated 2
- 1'. Medium ocellus not in a pit but reduced to a transverse or semicircular slit 3
2. Tarsi without or with much reduced arolia (Male: second sternite bituberculate; female: scutum without discal marks) *Stictiella*
- 2'. Tarsi with conspicuous arolia (Male: second sternite non-tuberculate; female; scutum with yellow discal marks) *Glenostictia*

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| 3. | Posterior surface of propodeum strongly concave, the posterior lateral angles compressed, wedge-shaped | <i>Bicyrtes</i> |
| 3'. | Posterior surface of propodeum slightly concave, flat or convex, without pronounced posterior-lateral angles | 3 |
| 4. | Mandibles edentate | <i>Microbembex</i> |
| 4'. | Mandibles dentate | 4 |
| 5. | Anterior ocellus reduced to a transverse slit | <i>Bembix</i> |
| 5'. | Anterior ocellus reduced to a semi-circular slit, incomplete ventrally | <i>Stictia</i> |

Stictiella Parker

No species of *Stictiella* has been taken in Indiana as yet but one, *S. emarginata* (Cresson), should be present in northern Indiana.

Stictiella is closely related to *Glenostictia* from which it has been separated recently (7). The two genera are probably more readily differentiated ethologically than morphologically. Species of *Stictiella* utilize adult Lepidoptera as prey; species of *Glenostictia* use adult Diptera and Hymenoptera. *S. emarginata* has been taken with a noctuid moth of the genus *Euxoa* as prey (7).

Glenostictia Gillasp

G. pictifrons (Smith) should occur in Indiana but has not been taken. The prey of this species has been recorded (7) as bombyliid flies of the genus *Villa*.

Bicyrtes Lepeletier

Four species of *Bicyrtes* have been taken in Indiana. Two additional species, *B. capnoptera* (Handl.) and *B. insidiatrix* (Handl.) have been taken in Kentucky and one or both may possibly occur in southernmost Indiana. All of the species utilize Hemiptera as nest provisions.

Key to Species of *Bicyrtes* in Indiana

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| 1. | Posterior coxae each with a tooth on the inner distal margin | <i>fodiens</i> |
| 1'. | Posterior coxae without teeth | 2 |
| 2. | Fore wings with a heavily clouded area in the first submarginal cell | <i>viduata</i> |
| 2'. | Fore wings hyaline or uniformly clouded | 3 |
| 3. | Males | 4 |
| 3'. | Females | 7 |
| 4. | Middle femora each with a basal ventral projection.... | <i>ventralis</i> |
| 4'. | Middle femora smooth or carinate but without basal ventral projections | 5 |
| 5. | Flagellum entirely black; legs black and yellow.... | <i>quadrifasciata</i> |

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| 5'. Flagellum, in part, ferruginous; legs wholly ferruginous or black and ferruginous | 6 |
| 6. Scape, basal segments of flagellum and legs ferruginous | <i>insidiatrix</i> |
| 6'. Scape and basal segments of flagellum black above, yellow or ferruginous below; legs black and ferruginous | <i>capnoptera</i> |
| 7. Pygidial area strongly demarcated by lateral ridges | <i>capnoptera</i> |
| 7'. Pygidial area lacking | 8 |
| 8. Mesopleura each with yellow spot | <i>quadrifasciata</i> |
| 8'. Mesopleura immaculate | 9 |
| 9. Flagellum black; legs black with yellow or ferruginous; apex of tergite 6 black | <i>ventralis</i> |
| 9'. Flagellum, legs and apex of tergite 6 ferruginous | <i>insidiatrix</i> |

B. fodiens (Handl.)—This species has not been recorded previously from Indiana. Our record is based upon a single specimen taken in Jackson County, August 5, 1938, on tulip poplar, by R. L. Schnell. The specific determination was by Miss Grace Sandhouse.

B. quadrifasciata (Say).—This is a common species throughout the western half of Indiana. It has been collected from June 19 to September 23 in the following counties: Daviess, Gibson, Greene, LaPorte, Marshall, Porter, Posey and Tippecanoe.

B. ventralis (Say).—Our records indicate that this species is more widely distributed than is *B. quadrifasciata* but it is less numerous in terms of individuals taken. Collection dates range from June 6 to October 1 from the following counties: Clark, Daviess, Gibson, LaPorte, Marshall, Newton, Porter, Ripley, Starke, Tippecanoe and Vermillion.

B. viduata (Handl.).—Within all insect groups there occurs, on occasion, a record which raises questions as to the accuracy of identification or labeling or to the status of the record (i.e., an isolated specimen which may have been transported or an established population). Our record is based upon a single female collected September 11, 1952, on *Solidago* sp., at West Lafayette (Tippecanoe Co.) by the author. *B. viduata* has been collected previously in Utah, Arizona and Texas (7, 3). The wings of this specimen are badly worn but the body coloration is bright.

Microbembex Patton

M. monodonta (Say) is the only species in the genus which occurs in Indiana. It undoubtedly occurs throughout the state and is usually abundant. Our collection dates in Indiana range from June 1 to October 2 from the following counties: Clark, Daviess, Newton, Porter, Posey, Ripley and Tippecanoe. The prey of this species is diverse, including both immature and adult insects, living or dead, and even parts of insects (3).

In this species there are two color forms. In one, the light markings are ivory or greenish-white and these individuals are always females. In the other, the light markings are bright yellow, and these individuals are predominantly males.

Stictia Illiger

The so-called "horse guard," *S. carolina* (F), is our only species. The common name stems from the behavior of the females which commonly patrol among herds of livestock searching for their principal prey, tabanid flies. Most farmers in the lake-sand ridge area of northern Indiana recognize this species and know of its beneficial habits.

Records of collection range from July 18 to September 12, in the following counties: Gibson, Jasper, Marshall, Montgomery, Owen, Starke, Tippecanoe and White. Earle Cross and I observed a tremendous assemblage of males on button-snakeroot, *Eryngium yuccaeifolium* Michx., in the prairie area north of Monon (White Co.), August 13, 1958.

Bembix Fabricius

Five species of this widespread genus have been recorded from Indiana and a sixth species, *B. belfragei* Cresson, probably occurs. The work of Evans (4), cited earlier, details the behavioral characteristics of all species treated here.

Key to the Species of *Bembix* in Indiana

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| 1. Males (antennae with 13 segments, abdomen with 7 segments, without a sting) | 2 |
| 1'. Females (antennae with 12 segments, abdomen with 6 segments, with a sting) | 6 |
| 2. Without processes on sternites 2 and 6. (Sternite 7 reduced to a spine which is grooved ventrally; middle femora smooth) | <i>pruinosa</i> |
| 2'. With processes on sternites 2 and 6 | 3 |
| 3. Lateral processes on sternite 6 in addition to prominent median process | <i>nubilipennis</i> |
| 3'. Without lateral processes on sternite 6 | 4 |
| 4. Process on sternite 6 bifurcate at apex | <i>sayi</i> |
| 4'. Process on sternite 6 entire at apex | 5 |
| 5. Sternite 2 with a large, median, laterally compressed, slightly hooked process; process on sternite 6 a transverse ridge, not sharply pointed but slightly curved on each side of midline | <i>belfragei</i> |
| 5'. Sternite 2 with a prominent median tubercle; sternite 6 with a small median process which is pointed and obliquely directed backward; sternite 7 with a median carina pointed posteriorly | <i>spinolae</i> |
| 6. Dorsal surface of ultimate tergite strongly wrinkled longitudinally | <i>belfragei</i> |

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| 6'. Dorsal surface of ultimate tergite pitted or smooth,
not wrinkled | 7 |
| 7. Clypeus with black area basally; fasciae on scutel-
lum, metanotum and propodeum; second tergal
fasciae never with a tendency to enclose black spots. <i>pruinosa</i> | |
| 7'. Clypeus without black area basally | 8 |
| 8. Second and third tergal fasciae enclosing black
spots; lateral spots on sternites 1-5 or 2-4 | <i>sayi</i> |
| 8'. Third tergal fasciae never enclosing black spots | 9 |
| 9. Wings infumated medially; lateral spots on ster-
nites 2-5; second tergal fasciae usually enclosing
spots | <i>nubilipennis</i> |
| 9'. Wings hyaline; lateral spots on sternites 2-4;
second tergal fasciae without enclosures | <i>spinolae</i> |

B. nubilipennis Cr.—This species probably occurs throughout the state. Its nesting habits differ from those of other species in that it utilize areas of hardpacked clay such as baseball diamonds, poultry yards, parking lot edges, etc. Dates of collections range from June 9 to October 17 from Clark, Harrison, Jefferson, Montgomery, Posey, Ripley and Tippecanoe counties.

B. pruinosa Fox.—This is a species confined to areas of extensive sand. It occurs throughout the Dune area of Lake Michigan and has also been taken from the large gravel pits in Daviess and Tippecanoe counties and from the alluvial sand flats in Posey County. Collection records range from June 29 to July 29.

B. sayi Cr.—Not recorded previously from Indiana, *B. sayi* is a species found most often in upland sand areas. We have taken it from two counties, Crawford and Tippecanoe. It is not uncommon in the latter. Collection dates range from July 4 to August 26.

B. spinolae Lep.—This is the most abundant and widespread species of bembicine wasp in Indiana. Dates of collection range from June 6 to October 30 from the following counties: Carroll, Daviess, Decatur, Gibson, Greene, Hamilton, Kosciusko, LaGrange, LaPorte, Marshall, Newton, Noble, Posey, Ripley, Tippecanoe, Vermillion and White.

B. texana Cr.—These are the first Indiana records for this species. It has been taken from two localities, Daviess and Posey counties, from June 26 to August 26. *B. texana* is reported to nest in areas of hard-packed sand and clay.

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