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HABITAT AND DISTRIBUTION OF MECOPTERA IN EAST TENNESSEE¹

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The order Mecoptera is a small and diverse group of primarily forest-dwelling insects. The distribution and abundance of mecopterans in Tennessee is imperfectly known. Cole and Gillespie (1950) recorded the results of several years of collections by members of the University of Tennessee Department of Zoology and Entomology. Although several new state records were reported, in addition to an inclusion of state records of Carpenter (1931, 1939), most species were recorded from a single location. Byers (1954) added three state and one new county record.

This account is the result of a biological and ecological study conducted by the author over the past two years. Several new records were found and the county and seasonal distribution of most species already known from the state were expanded. For each species habitat and brief biological notes are included. Species are listed under the recently revised families (Byers, 1965). The county distribution of the two largest genera in the east Tennessee fauna, *Bittacus* and *Panorpa*, are shown (Plates I and II). Open circles on the maps indicate previous county records, while closed circles are new records recorded by the author. Records for the remaining genera, and additional county records for *Bittacus* and *Panorpa*, are included in the text, under the appropriate species.

FAMILY MEROPEIDAE

Merope tuber Newman. One female specimen of the single North American species of this family was collected in Knoxville, Knox County (October 9, 1965, R. Collier) for a new state record. The specimen was dead when collected from a screen door and was probably attracted to a night light adjacent to the door. The habitat of this species is unknown, being almost exclusively collected after attraction to lights at night. This is the first record of *Merope* for October.

FAMILY BOREIDAE

Boreus brumalis Fitch. No new specimens of this winter mecopteran were collected in Tennessee. Cole (1938) collected a single female specimen in Sevier County (January 30, 1938) and Goslin (1950) recorded five adult specimens from Campbell County

(December 25, 1938), as well as *Boreus* larvae (not identified as to species, but concluded to be *brumalis*) at the same location, for the only Tennessee records.

Boreus nivoriundus Fitch. Known from a single male collected with the female *B. brumalis* specimen above (Cole, 1938).

FAMILY BITTACIDAE

Bittacus apicalis Hagen (Fig. 2). This species is the first hanging-fly to emerge in the spring, generally the first week in May, and occupies shaded, moist, forested locations. During early morning and late afternoon hours, members may also be collected in open fields adjacent to wooded sites. *B. apicalis* is extremely abundant in May and occasional individuals can be collected through June and into August. This species is well represented in east Tennessee (Fig. 2).

Bittacus punctiger Westwood (Fig. 3). An active hanging-fly, this species can occasionally be found in the canopy layer of the forests it occupies. Members occur at mid-elevations in the mountains and along cool water courses elsewhere from early June until September. It was never abundant in one location, and when found, another bittacid was always more common at the location.

Bittacus pilicornis Westwood (Fig. 4). This species is very common in east Tennessee and occurs in any shaded area where ground vegetation is present. It was common in June in all counties and occasional individuals were collected into September. *B. pilicornis* replaces *B. apicalis* on forested sites beginning in late May to become the predominant June bittacid species.

Bittacus occidentis Walker (Fig. 5). A positively phototaxic hanging-fly, *B. occidentis* is normally active at night. The adults were collected at light traps in wooded areas until September. Two immobile specimens, hanging at rest upon ground vegetation, were collected during daylight hours. No reliable population

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estimates of this species were obtained since only occasional individuals were collected.

Bittacus strigosus Hagen (Fig. 6). A common biting fly, *B. strigosus* attains a high population density in cool, damp, forested areas. Specimens were found from May until late August, but only commonly near the latter period of their emergence. *B. strigosus* replaces *B. pilicornis* in early August to become the dominant hanging-fly species.

Bittacus stigmaterus Say (Fig. 7). This hanging-fly is found throughout the summer from May to September and is widespread in the east Tennessee area. It inhabits cool, moist, forested sites and is more frequently encountered in the mountains. Byers (1954) also recorded it from Montgomery County.

FAMILY PANORPODIDAE

Brachypanorpa carolinensis Banks. Many males were found on June 17, 1965, one male on July 29, 1965, and several males and two macropterous females on June 21, 1966, at a single location about 5000 feet, Roan Mountain, Carter County, for a new state record. They were found upon vegetation and among the abundant ground moss of the forest floor along a water course. This record, as well as additional new information of this remarkable mecopteran, will be published.

FAMILY PANORPIDAE

Panorpa rufa Gray. Cole and Gillesie (1950) recorded a single female, collected in June, 1939, from the Smokies. No new specimens were found. In light of other collection data for *P. rufa* (eastern North Carolina, southern Georgia and Alabama, and Florida, in May and again from October to December), and the difficulties in separating the female *P. rufa* from *P. banksi*, as described by Byers (1954), the author believes this record is erroneous due to misidentification. Unfortunately the specimen was not available for re-determination.

Panorpa maculosa Hagen (Fig. 8). This species, the earliest scorpion-fly to be found in the east Tennessee area, frequents ground vegetation along streams and lakes and is found only at low elevations (below 2500 feet) in the mountains. The first specimens were collected in mid-April and occasional individuals were found until mid-June. It is common only in April and early May, prior to the occurrence of *P. nebulosa* on the same sites.

Panorpa submaculosa Carpenter (Fig. 9). Found inhabiting east Tennessee for the first time, this species frequents dry areas of sparse ground vegetation. It is apparently absent in the valleys, being found only in the more mountainous sections. It is never abundant in any one area, although present from early May to mid-August. This species is unusual in that it was only occasionally found in moist areas with abundant ground vegetation, while other species of *Panorpa* preferred such areas. It was not found above 3500 feet.

Panorpa nebulosa Westwood (Fig. 10). This species is the most common and widespread scorpion-fly in east

Tennessee. It was recorded from a great variety of habitats including the usual shaded, moist locations to drier open sites and from open fields adjacent to wooded areas. The greatest population densities were recorded on moist sites of abundant ground vegetation, with a decreasing density found radiating from such sites. *P. nebulosa* is abundant from early May until late August. The wide ecological tolerance and high population densities displayed by *P. nebulosa* were not exhibited by any other panorpid species in the east Tennessee fauna.

Panorpa flexa Carpenter (Fig. 11). This species occupies moist, shaded locations in the east Tennessee area and is present from May until September. It is apparently restricted only to the eastern-most mountain range of the state and was not found below 2000 feet. It is a secretive scorpion-fly and when disturbed frequently flies to the ground and remains motionless. Other panorpids, especially its greatest competitor *P. nebulosa*, normally fly to adjacent vegetation when disturbed. Other differences were also observed between *P. flexa* and *P. nebulosa* that probably contribute to keeping the species separated. *P. flexa* females deposit eggs (in existing cavities in the soil) during daylight hours, while *P. nebulosa* females do so during darkness. *P. flexa* rests vertically on ground vegetation, more frequently woody vegetation, while *P. nebulosa* selects ground vegetation almost exclusively and is horizontal in position. *P. flexa* is restricted to moist, mountainous areas while *P. nebulosa* is of wider ecological tolerance. Also, *P. flexa* is never as abundant as *P. nebulosa* on common locations (no site was found to contain *P. flexa* exclusively but some areas were sampled in the mountains where *P. nebulosa* was present, while *P. flexa* was not.)

Panorpa acuta Carpenter (Fig. 12). Males were found from mid to high elevations in the Unaka Mountains on both deciduous and coniferous forests from May to September. The type locality for this species is Sevier County (Newfound Gap, near 3500 feet, September 1, 1930). *P. acuta*, like *P. flexa* described above, was found to share all locations with the more abundant *P. nebulosa*. The author was not able to separate *P. acuta* females from those of *P. nebulosa*. Male *P. flexa*, although easily differentiated from male *P. nebulosa* under low magnification, did not display ecological or behavioral differences in field studies.

Panorpa banksi (= *chelata*) Hine (Fig. 13). *P. banksi* was widespread in the forested areas of east Tennessee, a new state record (see discussion under *P. rufa*). Specimens were collected from May at lower elevations until July at higher sites. This species resembles *P. nebulosa* in exhibiting a fairly wide ecological tolerance, but it is not as common or widespread. It is most common on moist sites and was found up to 5000 feet.

Panorpa latipennis Hine (Fig. 14). This is the largest scorpion-fly in east Tennessee and is a strong flier. Specimens were found in May and early June only in the Smokies (Sevier County) from cove hardwood locations at moderate (2000-3500 feet) elevations.

Panorpa longicornis Carpenter (Fig. 15). Another uncommon species, *P. longicornis* occurs only in the Unaka Mountains in May and again in late August and September. It is never abundant. The species was originally described from specimens collected in Sevier and Carter Counties and North Carolina. No specimens were found in the spruce-fir communities at the highest elevations.

Panorpa virginica Banks (Fig. 16). No new specimens of this species were collected. It was reported by Carpenter (1931) from Cocke County (August 30, 1930) and by Cole and Gillespie (1950) from Sevier County (May, 1940).

Panorpa isolata Carpenter (Fig. 17). Four specimens of this species were collected, all above 2000 feet in forest in Sevier County. Byers (1954) recorded *P. isolata* from April to September. Carpenter secured one specimen in Cocke County (August 30, 1930), a paratype.

Panorpa carolinensis Banks (Fig. 18). This species is present only in the mountains at high elevations (above 3500 feet) in both deciduous and coniferous forests from May until September. It is not an active species and can usually be captured without the use of a net among ferns in the spruce-fir forests where it is more frequently found.

Panorpa helena (= *venosa*) Byers (Fig. 19). A common late fall species of forests throughout east Tennessee,

P. helena is seldom above 2500 feet in the mountains. Several specimens were taken in early May upon vegetation along streams and occasional individuals were found throughout the summer months at isolated, cool locations. In August *P. helena* replaces *P. nebulosa* on most sites. It is then very abundant and is found in all but excessively dry and open sites.

Panorpa debilis (= *canadensis*) Banks (Fig. 20). Carpenter (1931) recorded this species from east Tennessee but gave no county record. The author found all specimens on poorly shaded sites where ground vegetation and moisture were abundant. All locations were poorly-drained low areas with very dense, tall, herbaceous growth. Adults are present from July until September.

LITERATURE CITED

- Byers, G. W. 1954. Notes on North American Mecoptera. *Ann. Ent. Soc. Amer.* 47: 484-510.
- . 1965. Families and genera of Mecoptera. *Proc. Twelfth Int. Congr. Ent.*, London (1964): 123.
- Carpenter, F. M. 1931. Revision of the nearctic Mecoptera. *Bull. Mus. Comp. Zool.* 72: 205-277.
- . 1939. Records and notes of nearctic Mecoptera and Raphidioidea. *Bull. Brooklyn Ent. Soc.* 34: 162-166.
- Cole, A. C. 1938. Insect collecting in the Great Smoky Mountains National Park, Tennessee. *Jour. Tenn. Acad. Sci.* 13: 274-276.
- Cole, A. C. and D. S. Gillespie. 1950. Mecoptera records from Tennessee. *Jour. Tenn. Acad. Sci.* 25: 84-85.
- Goslin, R. M. 1950. Additional records of *Boreus brumalis* (Mecoptera: Boreidae) from Tennessee. *Jour. Tenn. Acad. Sci.* 25: 309.

PLATE I



Fig. 1
County Map

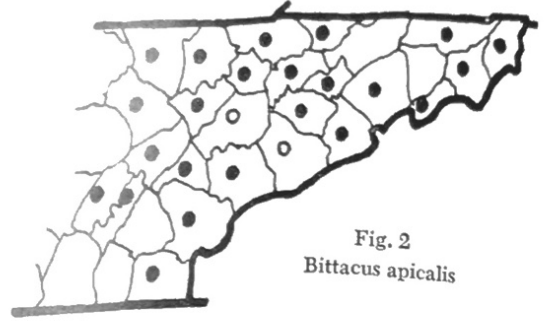


Fig. 2
Bittacus apicalis

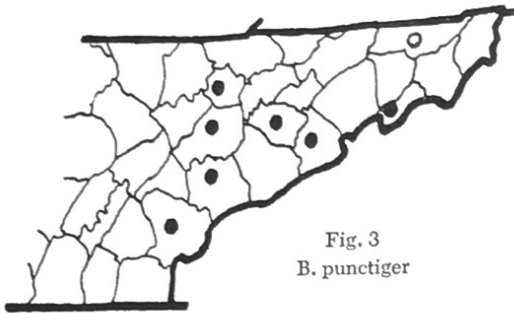


Fig. 3
B. punctiger

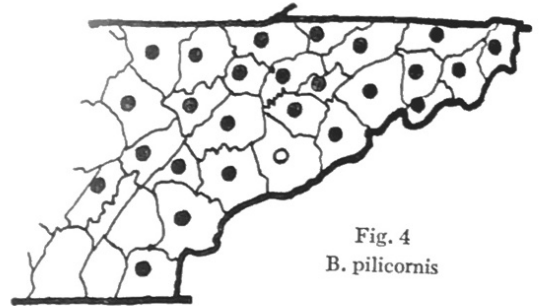


Fig. 4
B. pilicornis

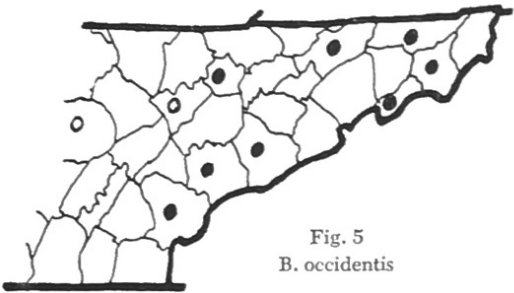


Fig. 5
B. occidentis

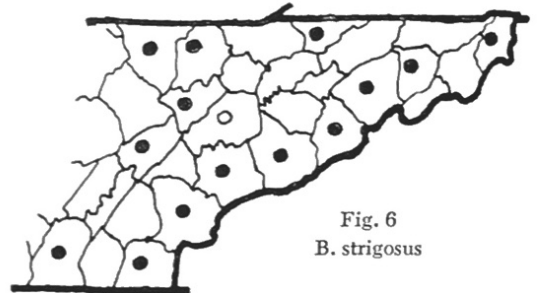


Fig. 6
B. strigosus

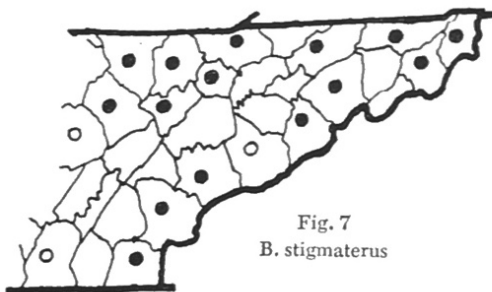


Fig. 7
B. stigmaterus

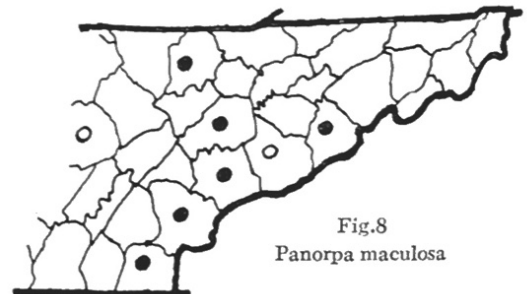


Fig. 8
Panorpa maculosa

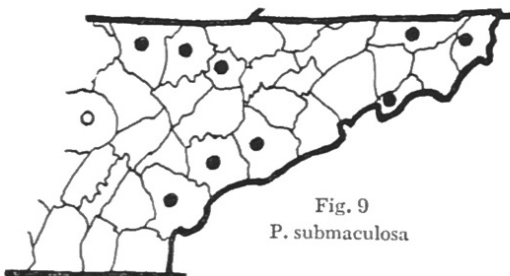


Fig. 9
P. submaculosa

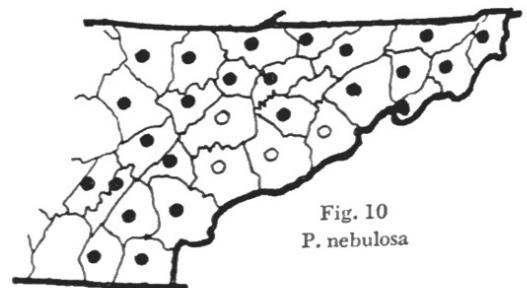


Fig. 10
P. nebulosa

PLATE II

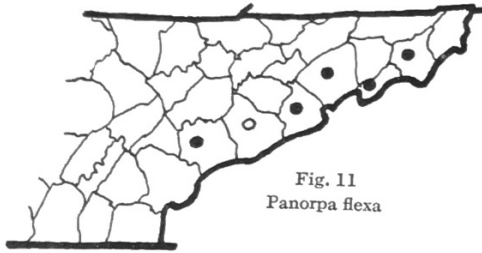


Fig. 11
Panorpa flexa

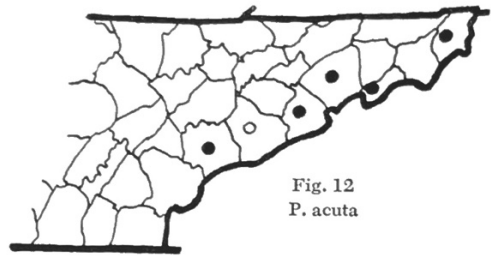


Fig. 12
P. acuta

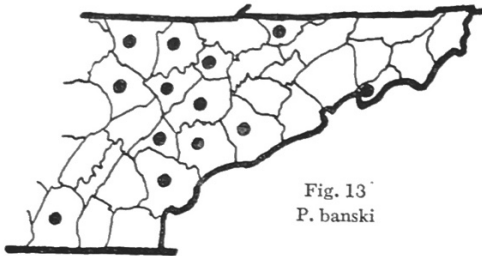


Fig. 13
P. banksi

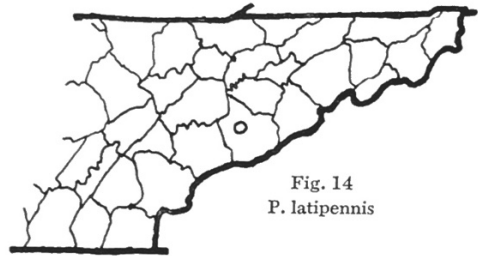


Fig. 14
P. latipennis

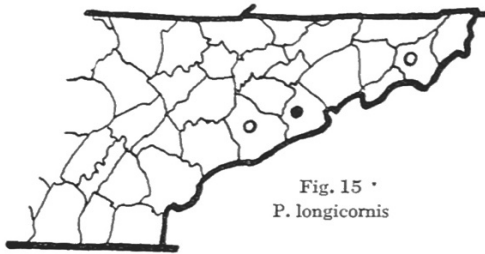


Fig. 15
P. longicornis

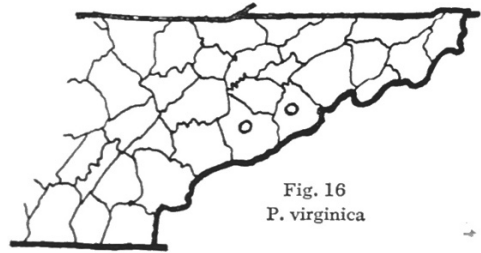


Fig. 16
P. virginica

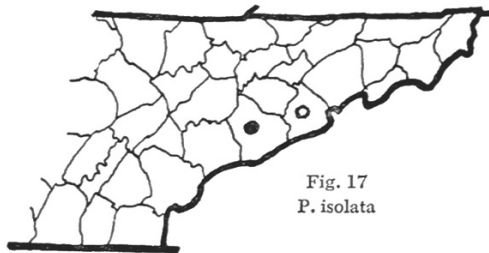


Fig. 17
P. isolata

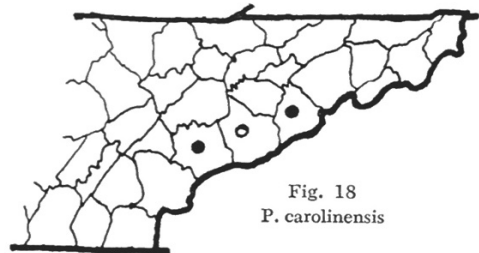


Fig. 18
P. carolinensis

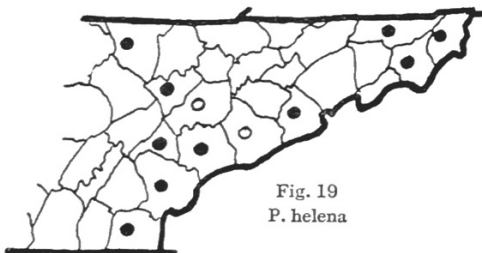


Fig. 19
P. helena

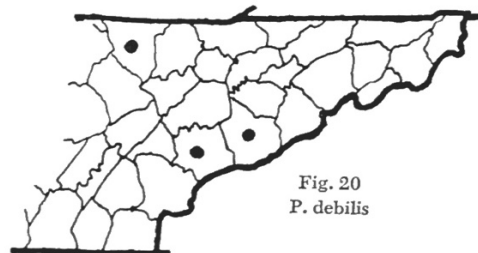


Fig. 20
P. debilis