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A. M. Hagerty
Southern Illinois University

J. E. McPherson
Southern Illinois University

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SURVEY OF THE REDUVIIDAE (HETEROPTERA) OF SOUTHERN ILLINOIS,
EXCLUDING THE PHYMATINAE, WITH NOTES ON BIOLOGYA. M. Hagerty¹ and J. E. McPherson¹

ABSTRACT

A survey of the nonphymatine reduviids of southern Illinois was conducted from April 1996 to November 1998. In addition to county distributions, information was collected on times of occurrence of adults and nymphs and associated habitats. These data were supplemented with label information associated with southern Illinois specimens housed in the Southern Illinois University Entomology Collection (SIUEC).

Twenty-five species were collected during this survey. An additional six species housed in the SIUEC were collected previously in southern Illinois but not during the survey. Of the 31 species, nine are state records: *Ploiaria hirticornis*, *Rocconota annulicornis*, *Sinea complexa*, *Microtomus purcis*, *Rasahus hamatus*, *Saica elkinsi*, *Oncocephalus geniculatus*, *Priontis languida*, and *Priontis modesta*.

The family Reduviidae occurs worldwide and contains approximately 930 genera and 6,500 species (Schuh and Slater 1995); approximately 195 species and subspecies in 49 genera occur in America north of Mexico (Froeschner 1988).

In the older literature, the Reduviidae (assassin bugs) and Phymatidae (ambush bugs) were treated as separate families (e.g., Slater and Baranowski 1978, Froeschner 1988, Maldonado Capriles 1990). However, the families now have been combined, and the phymatids currently are treated as a subfamily of equal status to the other reduviid subfamilies. Of the 23 subfamilies currently recognized worldwide, 10 occur in America north of Mexico (Schuh and Slater 1995). For the purposes of this paper, only the nonphymatine reduviids will be considered. The *Phymata* spp. still are in need of major taxonomic revision.

Reduviids are characterized by a bilobed, cone-shaped head; a three-segmented beak, with the tip resting in a stridulatory groove on the prosternum; and usually four-segmented antennae (Blatchley 1926). In Illinois, species range in length from approximately 7 mm (*Oncerothelus*) to 40 mm (*Emesaya arilus*) and vary in body shape from ovoid (e.g., Harpactorinae) to narrow and elongate (i.e., Emesinae). There usually are five nymphal instars although *Fitchia aptera* Stål (DeCoursey 1963) and *Melanolestes picipes* (Herrich-Schaeffer) (Readio 1927) reportedly only have four.

Reduviids are predaceous (Blatchley 1926, Readio 1927, Schuh and

¹Department of Zoology, Southern Illinois University, Carbondale, IL 62901-6501.

Slater 1995), but their habits and habitats vary greatly. Most are ambush predators, remaining motionless or stalking potential prey on the foliage of herbs and shrubs (Blatchley 1926). However, peiratinines are active nocturnal predators, and most are attracted to lights (Readio 1927); triatomines feed on the blood of humans and other vertebrates and transmit Chagas' disease (Lent and Wygodzinsky 1979); and the emesines frequently are found on spider webs (Wygodzinsky 1966).

Assassin bugs feed primarily on other insects and, thus, are considered beneficial. However, as is typical of predaceous bugs, they occur in low numbers. Thus, even though beneficial, the reduviids, in North America, have been studied little, either biologically or taxonomically (McPherson 1992).

During the early twentieth century, Blatchley (1926) and Readio (1927) authored monographs on North American reduviids, which included keys and original notes on biology. In recent years, work on this group has consisted primarily of life history studies of individual species (e.g., DeCoursey 1963; Swadener and Yonke 1973 a, b, c, 1975). In addition, a few state lists with notes on biology have been published (e.g., Torre-Bueno 1923, Connecticut; Froeschner 1944, Missouri; Elkins 1951, Texas; Drew and Schaefer 1963, Oklahoma; McPherson 1992, Michigan).

Identification of North American reduviids to species level is problematic due to the lack of recent comprehensive keys. Slater and Baranowski (1978) authored keys to the common genera, with brief descriptions of several species. Generic and species revisions (e.g., Barber 1929-1930; Elkins 1954; Wygodzinsky and Usinger 1964; Wygodzinsky 1966; Giacchi 1969, 1984; Lent and Wygodzinsky 1979; Coscaron 1983; Willems 1985; Hart 1986) have decreased the usefulness of Blatchley's (1926) and Readio's (1927) keys for some groups. The only source available for the identification of nymphs is the generic key of Fracker and Usinger (1949).

Little is known about the reduviids of Illinois. Van Duzee (1917) listed nine species from Illinois and an additional 11 from surrounding states (defined here as Minnesota, Wisconsin, Michigan, Indiana, Kentucky, Tennessee, Arkansas, Missouri, and Iowa). Malloch (1920) increased the state total to 27 (including *Sinea diadema* [Fabricius], which he listed as *Acholla diadema* [Fabricius])². His list included nine of the 11 species listed by Van Duzee (1917) from surrounding states (*Rhynocoris v. ventralis* [Say] and *Pnirontis modesta* Banks were not included). Froeschner (1988) listed 28 species from Illinois, including all those from the earlier lists except *Fitchia spinosula* Stål and *Oncocephalus apiculatus* Reuter and an additional 15 from surrounding states (Hagerty 1999, Table 1). Finally, *Pseudometapterus umbrosus* (Blatchley) (McPherson 1991a) and *F. spinosula* (McPherson et al. 1992) were added, increasing the number of species to 30. Even though the state fauna is diverse, no reduviid lists specifically for Illinois, or for smaller geographic regions within the state, have been published since Malloch (1920). Therefore, the purposes of this study were to survey the reduviid fauna of southern Illinois and to determine county distributions, times of occurrence of adults and nymphs, and associated habitats. Southern Illinois was defined as the eleven southernmost counties in the state (i.e., Jackson, Williamson, Saline, Gallatin, Union, Johnson, Pope, Hardin, Alexander, Pulaski, and Massac) (Fig. 1).

²Malloch's list actually increased the state total to 30, but two of the species, *Ploiariola tuberculata* Banks (see Froeschner 1988) and *Melanolestes abdominalis* Herrich-Schaeffer (see McPherson et al. 1991), are invalid, and *Barce annulipes* Stål and *B. fraterna* Say currently are listed as subspecies of *B. fraterna*.

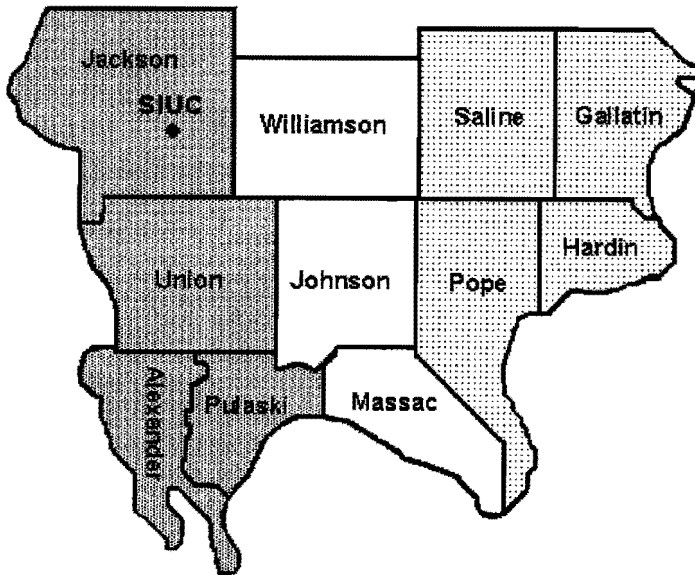


Figure 1. Southern Illinois map showing counties surveyed and the three collecting subareas.

MATERIALS AND METHODS

This study was conducted from April to November 1996 and from March to November 1997 and 1998, from before until after the insects became active, respectively, during each year. During 1996, most effort was devoted to finding productive collecting sites. As a result, samples were collected sporadically. During 1997 and 1998, samples were collected weekly, the entire study area being sampled three times per year (i.e., May to June, July to August, and September to October). Because the area was large, it was subdivided into three smaller areas with the Southern Illinois University campus (SIUC) serving as a home base (Fig. 1). During each of the three bimonthly sampling periods, each subarea was sampled daily at various locations over a 4-day period. Therefore, sampling of the entire study area per year occurred during 36 daily collecting trips. Supplemental collections were made in Jackson County throughout the survey to examine the life histories of some species more closely. Occasional collecting trips also were made from December through February in Jackson County to locate overwintering sites.

Sampling was conducted along major roads with side trips to promising habitats. Insects were collected by sweeping, beating foliage, and handpicking along roadsides, grassy fields, and forest edges. Additional potential sites were examined including under logs, debris, rocks, and bark; and at lights at night. Portable blacklights were used at several locations to attract specimens in wooded areas. Also, Townes Malaise traps (1 m high, 2 m long) (see Townes 1972) were set up in a weedy field in Jackson County and checked weekly from June through October 1997 and from March through October

1998. Field data (e.g., collection sites, times of occurrence of developmental stages, types of habitat) were supplemented with data associated with specimens housed in the Southern Illinois University Entomology Collection (SIUEC). Several of the SIUEC specimens were collected in the La Rue Pine Hills Ecological area, now the La Rue-Pine Hills Research Natural Area, in Union County.

Field-collected specimens were preserved in 70% EtOH and taken to the laboratory for identification. Adults were identified using keys by Blatchley (1926) and Slater and Baranowski (1978) and keys in revisionary studies that included southern Illinois taxa (e.g., Hart 1986). Nymphs were identified to genus using Fracker and Usinger (1949) and to species using published descriptions of immature stages and a synoptic collection (see below).

Synoptic collection. For problematic specimens, a synoptic collection was made by allowing field-collected adults to reproduce and preserving the resulting nymphs in various instars. Adults were placed on moistened disks of filter paper in petri dishes (approximately 9 cm diam, 1.5 cm deep) and provided two to four specimens of *Drosophila* sp. per day per adult as food. Approximately four to six drops of distilled water were added daily to keep the filter paper moist.

Petri dishes were checked daily for eggs, which were removed and placed in similar dishes on filter paper moistened as described above for adults.

Nymphs were kept in petri dishes on moistened filter paper as described above and provided one or two specimens of *Drosophila* sp. per nymph per day as food. The dishes were examined daily, molts observed, and exuviae removed. Nymphs were grouped by molting date to determine instars accurately.

Eggs, nymphs, and adults were kept in incubators maintained at $26 \pm 0.5^\circ\text{C}$ and an 18L:6D photoperiod (130 ft-c).

Field-collected nymphs were determined to instar by comparing individuals with the synoptic collection, with published descriptions, and by using standard morphological features (e.g., ratio of antennal segment lengths, head capsule size and shape, wing pad length, and development of external genitalia).

RESULTS

Reduviid Species and Subspecies Accounts.

Subfamily Ectrichodiinae Genus *Rhiginia*

R. cruciata (Say). This species often occurs under logs (Blatchley 1926, Elkins 1951) and stones (Elkins 1951) and apparently overwinters as adults in these same places (Torre-Bueno and Brimley 1907, Brimley 1938, Froeschner 1944). It also has been swept from vegetation and beaten from dead pine tops and palmetto leaves (Blatchley 1926), collected from pitcher plants (Wray and Brimley 1943), and collected frequently at lights during the summer (Elkins 1951).

During the survey, three adults and one nymph were found in Jackson, Union, and Johnson counties, collectively. They were found inside a building (1 adult; 6 May); in the webbing of a theridiid spider, *Anelosimus studiosus* (Hentz) (1 adult; 13 May); on a rotten cypress log in a swampy area (1

nymph, apparently a fifth instar; 13 September); and by sweeping low shrubs along a wooded roadside (1 adult; 16 May).

An additional 34 adults are housed in the SIUEC; additional counties represented include Williamson and Alexander. They were collected from 14 April to 9 November, the majority during April and May ($n = 19$, 55.9%) and October and November ($n = 9$, 26.5%). Additional label information indicates specimens were collected on a log in a wooded area ($n = 1$; 23 June), from inside rotten logs ($n = 2$; 7, 9 November), by sweeping vegetation ($n = 1$; 14 May), and with a Malaise trap ($n = 2$; 1–8 May, 8–15 May).

The survey and SIUEC data suggest that this species is univoltine and overwinters as adults.

Subfamily Emesinae
Tribe Metapterini
Genus *Barce*

B. fraterna (Say). This species seems to prefer moist protected places (Readio 1927). Reported collection sites, among many others, include debris (Mills 1931, Drew and Schaefer 1963); Spanish moss (Elkins 1951); under rocks on the ground among grasses and weeds in fields (Froeschner 1944); beneath boards and loose bark, on foliage, under cover along borders of ponds and in cultivated grounds (Blatchley 1926); on the surface of water among bulrushes (Hussey 1922a); from a grassy bank near a pool among grass roots, under leaves of a mullein plant near a brook, and under boards and sticks in a grassy area by an ox-bow lake (Readio 1927). It also has been collected at lights (Elkins 1951, Wygodzinsky 1966, McPherson 1992) and from spider webs (Wygodzinsky 1966).

This species overwinters as adults, as eggs, or in both stages (Readio 1927). Adults and nymphs have been collected as late as October (Readio 1927) and copulation has been observed as late as 20 November (Blatchley 1926). Overwintering individuals have been found in bunches of Spanish moss (Blatchley 1926); beneath logs, boards, and old rails (Blatchley 1926, Readio 1927); and along edges of low cultivated fields (Blatchley 1926). Early instars have been found in early spring (Readio 1927).

During the survey, four adults were collected, all from Jackson County. They were collected at lights ($n = 1$; 12 September), with a Malaise trap ($n = 1$; 30 September–7 October), on a spider web on a sandstone bluff ($n = 1$; 20 October), and under a board in a weedy field ($n = 1$; 28 February); the February specimen apparently was overwintering.

An additional nine adults, from Williamson, Union, and Alexander counties, are housed in the SIUEC. They were collected between 27 May and 29 October. Additional label information indicates that specimens were collected from a window flight trap on 27 June ($n = 1$) and from mowed grass in a cemetery on 11 September ($n = 1$).

Genus *Emesaya*

E. brevipennis brevipennis (Say). This subspecies has been collected under bridges (e.g., Gates and Peters 1962); from sheds, barns, out-buildings (e.g., Uhler 1884; Banks 1909; Wickham 1909, 1910; Howes 1919; Torre-Bueno 1923, 1925; Blatchley 1926; Readio 1927; Froeschner 1944; Gates and Peters 1962; Slater and Baranowski 1978), vegetation (e.g., Banks 1909; Torre-Bueno 1923, 1925; Blatchley 1926; Froeschner 1944) including trees (Uhler 1884, Wickham 1909, Gates and Peters 1962), flood

debris, Spanish moss (Elkins 1951), and screens (Brown and Lollis 1963); and in association with spider webs (Banks 1909, Wickham 1910, Howes 1919, Readio 1927, Usinger 1941, Brown and Lollis 1963, Slater and Baranowski 1978).

This subspecies reportedly is univoltine (Banks 1909) and overwinters as eggs (Howes 1919, Readio 1927). Nymphs occur in the spring and much of the summer (Uhler 1884, Wickham 1910, Readio 1927), and adults occur during the summer and fall (Uhler 1884, Wickham 1910, Readio 1927, Brown and Lollis 1963, McPherson 1992). Eggs are deposited in the summer and fall (Uhler 1884, Wickham 1910, Howes 1919, Readio 1927, Brown and Lollis 1963) and are attached to spider webs (Readio 1927, Brown and Lollis 1963), rafters of wooden structures (Howes 1919, Readio 1927), and, possibly, twigs of bushes and trees (Uhler 1884).

During the survey, 28 adults and 25 nymphs were found in Jackson, Saline, Gallatin, Union, Johnson, Pope, Hardin and Alexander counties, collectively. They were collected on spider webs on rock outcrops (19 adults, 25 nymphs), from roots along a washed-out creek bank (1 adult), on spider webs under a concrete bridge (2 adults), and by sweeping shaded, herbaceous vegetation (4 adults) and pine trees (2 adults). Adults were collected from 1 July to 9 November, the majority ($n = 22$, 78.6%) from August to September; early instars were collected (2 seconds, 8 thirds) from 3 June to 24 June, and late instars (3 fourths, 12 fifths) from 24 June to 1 September.

An additional 34 adults and 43 nymphs are housed in the SIUEC; additional counties represented include Williamson and Massac. Adults were collected from 23 July to 10 November, the majority ($n = 24$, 70.6%) during September and October; early instars (3 firsts, 7 seconds, 4 thirds) were collected on 27 June and late instar nymphs (2 fourths, 27 fifths) from 20 June to 3 September.

The survey and SIUEC data suggest that this species is univoltine and overwinters as eggs, supporting the statements of Banks (1909), Howes (1919), and Readio (1927)³.

Genus *Pseudometapterus*

P. umbrosus (Blatchley). This species has been beaten from the fallen leaves of a royal palm in a dense hammock (Blatchley 1926) and collected from Spanish moss (Wygodzinsky 1966).

During the survey, 43 adults were found in Jackson and Union counties, collectively. They were taken on spider webs and plants (*Heuchera parviflora*) on sandstone bluffs ($n = 41$), and on spider webs on limestone bluffs ($n = 2$). They were collected from 13 April to 24 November, the majority ($n = 30$, 69.8%) during August and September. These data suggest the species is univoltine and overwinters as adults.

This species was reported from Illinois by McPherson (1991a) based on two male adults housed in the SIUEC. Both specimens were collected on 27 July 1972 in the La Rue-Pine Hills Ecological Area, Union Co.

³In a separate study (unpublished data), we found this subspecies is bivoltine; in the present study, we, as did so many earlier investigators, missed the spring generation.

Subfamily Hammacerinae
Genus *Microtomus*

M. purcis (Drury) (STATE RECORD). This species has been collected under bark (Blatchley 1926, Brimley 1938, Froeschner 1944, Elkins 1951, Drew and Schaefer 1963, Slater and Baranowski 1978) and at lights (Blatchley 1926).

This insect probably is univoltine (Readio 1927); it overwinters as both adults and nymphs (Torre-Bueno and Brimley 1907, Readio 1927, Brimley 1938, Froeschner 1944) under bark (Torre-Bueno and Brimley 1907, Brimley 1938). Adults have been found in Missouri from 24 September to 3 March and young nymphs from November to December (Froeschner 1944); adults and third through fifth instars were collected in Texas on 7 March (Readio 1927).

During the survey, four adults were found, all from Union County. They were collected at lights on 3 (n = 1) and 7 (n = 3) September.

An additional 31 adults, from Jackson, Williamson, and Johnson counties, are housed in the SIUEC. They were collected from 23 August to 20 October, the majority (n = 17, 54.8%) during September. Additional label information indicates that five of the adults (n = 3; 25 August) (n = 2; 30 August) were collected at lights.

The survey and SIUEC data suggest that this species is univoltine, supporting the opinion of Readio (1927).

Subfamily Harpactorinae
Genus *Acholla*

A. multispinosa (De Geer). This species has been collected from trees (e.g., Torre-Bueno 1923, 1925; Blatchley 1926; Readio 1926, 1927; Elkins 1951) including oak (Van Duzee 1894, Readio 1927), elm (Smith 1909), *Crataegus* (Blatchley 1926), hickory (Hussey 1922a), walnut (Readio 1927); from other vegetation (Lugger 1900, Blatchley 1926); and on bare ground in open places (Blatchley 1926). It feeds on other insects (Lugger 1900, Torre-Bueno 1923). It also has been observed wandering over the nests of a thomisid spider, *Philodromus canadensis* Emerton, suggesting that it preys on the eggs or the young spiders (Auten 1925).

This species reportedly is univoltine and overwinters as eggs (Readio 1927), which are cemented to twigs (Readio 1926, 1927). The eggs hatch in the spring and nymphs are found during much of the summer (Readio 1927). Adults are found in August and September in Kansas (Readio 1927) and as late as October in Indiana (Blatchley 1926).

During the survey, two adults and two nymphs were found in Jackson, Gallatin, and Pulaski counties, collectively. They were collected from a spider web under a bridge (1 adult; 12 October); by sweeping a semiwooded, grassy roadside (1 adult; 1 September) and herbaceous vegetation along a roadside (1 third instar; 15 June); and by beating understory shrubs and small trees (1 fifth instar; 8 July).

An additional adult, housed in the SIUEC, was collected with a window flight trap (height, 4.0 m) from Alexander County on 7 September 1979.

Genus *Apiomerus*

A. crassipes crassipes (Fabricius). This reduviid occurs on trees, shrubs, and flowers (Blatchley 1926, Froeschner 1944, Elkins 1951, Swadener and Yonke 1973a) in wooded (Blatchley 1926, Froeschner 1944)

and semiwooded (Swadener and Yonke 1973a) areas and open fields (Froeschner 1944, Elkins 1951); specific plants include hazel, juniper (Blatchley 1926), pine (Uhler 1884), thistle (Elkins 1951), and persimmon (Swadener and Yonke 1973a). It feeds on plant lice, young caterpillars (Uhler 1884), bees (e.g., Knowlton and Taylor 1951, Bouseman 1976a), and a variety of other insects (Thompson and Simmonds 1965).

This subspecies is univoltine and overwinters as late instars (Swadener and Yonke 1973a) that emerge in early spring (Froeschner 1944). Adults occur from March (Uhler 1884) or April (Swadener and Yonke 1973a) into the fall (Uhler 1884, Swadener and Yonke 1973a). Eggs are laid in spring (Uhler 1884) and early summer (Swadener and Yonke 1973a), and nymphs are found during the fall (Froeschner 1944, Swadener and Yonke 1973a).

During the survey, 16 adults were found in Jackson, Saline, and Hardin counties, collectively. They were collected with a Malaise trap in a weedy field ($n = 3$), by sweeping herbaceous vegetation in fields ($n = 9$) and along roadsides ($n = 3$), and by sweeping shrubs in a wooded area ($n = 1$). Specimens were collected from 3–10 June to 16–19 July.

An additional 61 adults and one nymph are housed in the SIUEC; additional counties represented include Williamson, Union, Pope, and Alexander. The adults were collected between 25 May and 3 August, the majority ($n = 52$, 85.2%) during June and July. A fourth instar was collected on 29 April 1971.

The survey and SIUEC data suggest that this species is univoltine, supporting the statement of Swadener and Yonke (1973a).

Genus *Arilus*

A. cristatus (L.). This species occurs on trees and shrubs (e.g., Barber 1920, Blatchley 1926, Readio 1926, Froeschner 1944, Elkins 1951, Swadener and Yonke 1973b) but can be collected from other vegetation (Barber 1920, Blatchley 1926, Readio 1926, Elkins 1951, Drew and Schaefer 1963, Whitcomb and Bell 1964, Wheeler and Stimmel 1983). It feeds on a wide variety of insects including, among many, the fall webworm, *Hyphantria cunea* (Drury); imported cabbageworm, *Pieris rapae* (L.); Mexican bean beetle, *Epilachna varivestis* Mulsant (Thompson and Simmonds 1965); tent caterpillar, *Malacosoma* sp. (Surface 1906); orangedog, *Papilio cresphontes* Cramer (Watson 1918); and bollworm, *Helicoverpa zea* (Boddie) (Whitcomb and Bell 1964).

A. cristatus is univoltine (Readio 1927, Todd 1937). It overwinters as eggs (Garman 1916; Readio 1926, 1927; Todd 1937; Froeschner 1944; Swadener and Yonke 1973b) that are laid in clusters in the fall on the bark of tree trunks and twigs (Garman 1916; Barber 1920; Readio 1926, 1927; Froeschner 1944; Swadener and Yonke 1973b). The eggs hatch the following spring, and nymphs are found from May to July and adults from June to October (Froeschner 1944). Copulation occurs in the fall (Barber 1920) and the eggs are laid shortly thereafter (Garman 1916; Readio 1926, 1927).

During the survey, 36 adults and 157 nymphs were collected; all counties were represented. They were swept from trees (14 adults, 12 nymphs), shrubs (16 nymphs), grasses (4 nymphs), herbaceous vegetation along wooded edges (12 adults, 73 nymphs), herbaceous understory vegetation (12 nymphs), and herbaceous vegetation in fields and along roadsides near wooded areas (39 nymphs); and handpicked from goldenrod (*Solidago* sp.) (1 adult), a limestone bluff (1 adult), a spider web (1 nymph), man-made objects (i.e., houses, sheds) (5 adults), and at lights (3 adults). Egg clusters ($n = 13$) were found in the fall on the bark of sassafras (*Sassafras albidum*) and beech (*Fagus grandifolia*). Adults were collected from 8 July to 25 November, the

majority ($n = 24$, 66.7%) during August and September; first instars ($n = 5$) were collected from 16 May to 27 June, second instars ($n = 2$) 22 May to 29 May, third instars ($n = 24$) 27 May to 1 July, fourth instars ($n = 80$) 3 June to 14 July, and fifth instars ($n = 46$) 10 June to 4 August.

An additional 53 adults and 24 nymphs are housed in the SIUEC. The adults were collected from 3 July to 10 November, the majority ($n = 36$, 67.9%) during August and September; early instars (17 firsts, 1 third) were collected from 1 May to 12 June and late instars (4 fourths, 2 fifths) from 12 June to 15 August. Additional label information indicates that specimens were collected from pine trees (1 adult; 26 August), from a window flight trap (1 adult; 12 September), and at lights (1 adult; 18 September); also, 17 first instars were collected on their egg cluster on 1 May.

The survey and SIUEC data indicate that this insect is univoltine and overwinters as eggs, supporting the statements of Readio (1926), Todd (1937), Froeschner (1944), and others.

Genus *Fitchia*

F. aptera Stål. This species has been found at the bases of grass clumps in old or abandoned fields (DeCoursey 1963, Slater and Baranowski 1978); in grass along streams and ponds and in shady protected places (Elkins 1951); on bushes (Smith 1909); under rocks, logs, and boards (Smith 1909, Blatchley 1926, Froeschner 1944); on wooded hillsides (Froeschner 1944); and in sandy upland fields (Blatchley 1926) and salt meadows (Smith 1909, Blatchley 1926). Adults occasionally have been swept from tall grass, especially in early evening; during the day, they remain on the ground (DeCoursey 1963). Nymphs can be found on the ground, usually in grassy areas (DeCoursey 1963). This species also has been collected from pitcher plants (Wray and Brimley 1943).

This bug overwinters as adults under boards, stones, and around the roots of grass clumps (DeCoursey 1963).

During the survey, five adults were found in Jackson, Williamson, and Alexander counties, collectively. One adult was collected from the roots of a grass clump along the edge of a grassy field (10 April); the others were swept from herbaceous vegetation along a forest edge in the evening ($n = 2$; 18, 19 June), herbaceous vegetation along a roadside ($n = 1$; 25 September), and a grassy field ($n = 1$; 13 May).

One specimen, collected 29 May 1968 from Pope County, is housed in the SIUEC. No additional label information is available.

Genus *Pselliopus*

P. barberi Davis. This reduviid occurs on various types of vegetation (Elkins 1951, Drew and Schaefer 1963) including trees (Blatchley 1926, Froeschner 1944) such as plum (Swadener and Yonke 1975), oak, elm (Blatchley 1926), and sycamore (Readio 1927). It feeds on *Molorchus bimalatus* Say (Cerambycidae), *Lygus* sp. (Miridae) (Swadener and Yonke 1975), and *Nomada (Nomada) illinoensis* Robertson (Apidae) (Bouseman 1976b).

P. barberi is univoltine and overwinters as adults (Readio 1927, Froeschner 1944, Swadener and Yonke 1975) under rocks (Froeschner 1944, Swadener and Yonke 1975), loose bark, logs (Froeschner 1944), and leaves (Readio 1927, Froeschner 1944); adults have been found in large numbers in curled sycamore leaves or rolls of sycamore bark (Readio 1927). Copulation occurs in the spring (Readio 1927, Froeschner 1944) and fall (Davis 1912).

Nymphs have been found during June, July (Froeschner 1944, Swadener and Yonke 1975), and August (Froeschner 1944).

During the survey, 40 adults and seven nymphs were found in Jackson, Saline, Gallatin, Union, and Hardin counties, collectively. They were collected under bark of dead trees (2 adults), from the trunks of sycamore trees (31 adults), by beating a tree (1 nymph), and by sweeping herbaceous vegetation (7 adults, 6 nymphs). Adults were collected from 13 April to 22 October, the majority ($n = 36$, 90%) during September and October; two copulating pairs were collected from the trunks of sycamore (*Plantanus occidentalis*) on 17 October. An early instar (1 third) was taken on 27 June, and late instars (1 fourth, 5 fifths) were collected from 1 August to 17 September.

An additional 68 adults and one nymph are housed in the SIUEC; additional counties represented include Williamson, Johnson, and Pope. The adults were collected between 28 March and 28 November, the majority during April and May ($n = 21$, 30.9%) and September and October ($n = 40$, 58.8%). A fifth instar was collected on 7 September.

The survey and SIUEC data indicate that this insect is univoltine and overwinters as adults, supporting the statements of Readio (1927), Froeschner (1944), and Swadener and Yonke (1975).

P. cinctus (Fabricius). This species is found on a variety of plants (Uhler 1884; Torre-Bueno 1923; Blatchley 1926; Readio 1926, 1927; Elkins 1951; Drew and Schaefer 1963) but often is associated with trees (Readio 1926) including red cedar (Swadener and Yonke 1975), oak, hickory (Uhler 1878), and pine (Uhler 1884). It feeds on several insect pests including the chinch bug, *Blissus l. leucopterus* (Say) (Thompson and Simmonds 1965); and Colorado potato beetle, *Leptinotarsa decemlineata* (Say) (Chittenden 1907).

This species is univoltine (Readio 1927, Swadener and Yonke 1975) and overwinters as adults (Readio 1927, Froeschner 1944, Swadener and Yonke 1975) under bark (McAtee 1912, Froeschner 1944) and rocks (Froeschner 1944). Copulation (Froeschner 1944) and oviposition (Readio 1927, Swadener and Yonke 1975) occur in the spring. Eggs often are glued to the bark of pine trees (Uhler 1884). Nymphs are found during the summer (Readio 1927), with fifth instars most common in August (Swadener and Yonke 1975). The subsequent adults are found in late summer and early fall (Readio 1927).

During the survey, 10 adults and 15 nymphs were found in Jackson, Saline, Gallatin, Union, Johnson, Pope, and Hardin counties, collectively. They were collected by sweeping herbaceous vegetation (7 adults, 14 nymphs), shrubs, and low trees (2 adults); and by beating trees and bushes (1 adult, 1 nymph). Adults were collected from 29 May to 20 October and distributed evenly throughout this period. Nymphs were collected (2 thirds, 1 fourth, 12 fifths) from 24 June to 31 August.

An additional 23 adults and two nymphs are housed in the SIUEC; Williamson represented an additional county. The adults were collected between 25 April and 14 October, the majority ($n = 12$, 52.2%) during September. The nymphs were collected on 13 July (1 fifth) and 1 August (1 fourth).

The survey and SIUEC data indicate that this insect is univoltine and overwinters as adults, supporting the statements of Readio (1927) and Swadener and Yonke (1975).

Genus *Rocconota*

R. annulicornis (Stål) (STATE RECORD). This species has been beaten from foliage along the margins of a dense wet hammock in Florida (Blatchley 1926).

During the survey, seven adults and one nymph were found in Jackson,

Williamson, Union, Pope, and Alexander counties, collectively. They were swept from shrubs in a wooded area (1 adult), trees and shrubs along a limestone bluff (1 adult), dense woody understory vegetation (2 adults), and herbaceous roadside vegetation (1 adult, 1 fifth instar); taken at lights (1 adult); and captured with a Malaise trap in a weedy field (1 adult). Adults were collected from 9 June to 21 September and the nymph was collected on 21 August.

An additional six specimens are housed in the SIUEC. They were collected in the La Rue-Pine Hills Research Natural Area, Union County, from 16 May to 17 September.

Genus *Sinea*

S. complexa Caudell (STATE RECORD). This species is found on leaves and stems near the bases of plants (Swadener and Yonke 1973b). It is associated with grass, flowers (Elkins 1951), red clover (Swadener and Yonke 1973b), goldenrod (Froeschner 1944), weedy vegetation (Swadener and Yonke 1973b), and agricultural crops (Werner and Butler 1957).

This bug apparently is bivoltine and overwinters as adults (Swadener and Yonke 1973b); one individual was found overwintering in a grass clump (Froeschner 1944).

During the survey, eight adults and two nymphs were found in Jackson, Saline, Alexander, and Pulaski counties, collectively. The adults were collected from 2 June to 26 September, and one fourth and one fifth instar on 10 June, all by sweeping grassy vegetation.

An additional four adults and two nymphs are housed in the SIUEC; additional counties represented include Williamson and Union. The adults were collected from 14 June to 14 September, and the nymphs (2 fifth instars) on 15 September and 23 October.

S. diadema (Fabricius). This common reduviid often is found in grassy (Hussey 1922a, Readio 1924, Blatchley 1926, Elkins 1951, Drew and Schaefer 1963) and weedy (Hussey 1922b, Readio 1924, Blatchley 1926, Froeschner 1944, Slater and Baranowski 1978) vegetation. Specifically, it has been collected from alfalfa (Readio 1924, Knowlton and Harmston 1940), soybean (Wheeler and Stimmel 1983), clover (Torre-Bueno 1923, 1925; Procter 1938, 1946), goldenrod (Readio 1924, 1927; Procter 1938, 1946; Strickland 1953), trees, shrubs, Spanish moss (Elkins 1951), thistle, asters (Blatchley 1926), and daisy (Readio 1927). It feeds on a wide variety of insects (Smith et al. 1943, Knowlton 1944a, Gates and Peters 1962) including flies, bees (Readio 1924), and caterpillars (Torre-Bueno 1923, Knowlton and Harmston 1940). Specific examples include the fall cankerworm, *Alsophila pometaria* (Harris); tarnished plant bug, *Lygus lineolaris* (Palisot de Beauvois); spring cankerworm, *Paleacrita vernata* (Peck); stalk borer, *Papaipema nebris* (Guenée); western yellow striped armyworm, *Spodoptera praefica* (Grote); European corn borer, *Ostrinia nubilalis* (Hübner); Mexican bean beetle; birch leaf miner, *Fenusa pusilla* (Lepelletier); forage looper, *Caenurgina erecta* (Cramer) (Thompson and Simmonds 1965); and boll weevil, *Anthonomus g. grandis* Boheman (Whitcomb and Bell 1964).

This species is bivoltine and overwinters as adults (Readio 1924, 1927). Eggs are laid on stems and leaves of plants or other objects (Readio 1924, 1927). Nymphs are found from May through October (Froeschner 1944), reaching maturity in early June, and are found in "scores" during July and August (Blatchley 1926). Adults are found from June through October in Missouri (Froeschner 1944).

During the survey, 73 adults and 49 nymphs were collected; all counties were represented. They were swept from herbaceous vegetation in sunny

areas (45 adults, 30 nymphs) and from grasses (25 adults, 19 nymphs), and handpicked from goldenrod (3 adults). Adults were collected from 13 May to 20 October, the majority in June (n = 19, 26.0%) and during September and October (n = 51, 69.9%); early instars (2 firsts, 7 seconds, 10 thirds) were collected from 13 May to 25 July, and late instars (21 fourths, 9 fifths) from 13 May to 1 September.

An additional 99 adults and 15 nymphs are housed in the SIUEC. The adults were collected from 12 May to 31 October, the majority in June (n = 18, 18.2%) and during September and October (n = 71, 71.7%); early instars (2 thirds) were collected from 1 August to 1 September, and late instars (6 fourths, 7 fifths) from 9 June to 12 September.

The survey and SIUEC data suggest that this species is bivoltine and overwinters as adults, supporting the statements of Readio (1924, 1927).

S. spinipes (Herrich-Schaeffer). This species has been collected from weedy (Blatchley 1926, Froeschner 1944) and grassy (Elkins 1951, Drew and Schaefer 1963) areas, from foliage along woodland borders (Blatchley 1926, Swadener and Yonke 1973b), and from forested areas (Torre-Bueno 1925; Readio 1926, 1927; Elkins 1951); specific trees include hickory, walnut, pawpaw, elms, and oaks (Readio 1927); nymphs have been found in semiclosed flower heads of Queen Anne's lace (Swadener and Yonke 1973b). This reduviid feeds on Say stink bug, *Clorochroa sayi* (Stål) (Caffrey and Barber 1919, Thompson and Simmonds 1965); cotton fleahopper, *Pseudatomoscelis seriatus* (Reuter); tarnished plant bug; and boll weevil (Whitcomb and Bell 1964).

This species apparently is univoltine and overwinters as adults (Readio 1927) under dead leaves and rubbish (Blatchley 1926). The bugs emerge in early spring (Readio 1927), and oviposition occurs from late April and early May to early August (Readio 1927). The resulting nymphs reach maturity from early July to late in the season (Readio 1927). Fourth and fifth instars have been collected most frequently during July in Missouri (Swadener and Yonke 1973b).

During the survey, 53 adults and 109 nymphs were collected; all counties were represented. They were swept from shaded herbaceous vegetation along forest edges (44 adults, 96 nymphs), trees (5 adults, 5 nymphs), and grasses (2 nymphs); and handpicked from sassafras (1 adult), Queen Anne's lace (*Daucus carota*) (3 nymphs), goldenrod (2 adults, 1 nymph), sumac (*Rhus* sp.) (2 nymphs), and a spider web (1 adult). Adults were collected from 2 May to 16 October, the majority (n = 35, 66.0%) during September and October; early instars (1 first, 4 seconds, 16 thirds) were collected from 19 May to 26 September, and late instars (24 fourths, 59 fifths) from 22 June to 29 September. One copulating pair was noted on goldenrod on 21 September. A fifth instar was observed inserting its beak in a flower of goldenrod on 29 September.

An additional 81 adults and 29 nymphs are housed in the SIUEC. The adults were collected from 20 March to 3 November, the majority (n = 55, 67.9%) during September and October; early instars (2 thirds) were collected on 29 June and 20 July, and late instars (13 fourths, 14 fifths) from 29 June to 17 September.

The survey and SIUEC data indicate that this insect is univoltine and overwinters as adults, supporting the statements of Readio (1927).

Genus *Zelus* Subgenus *Zelus*

Z. (Z.) luridus Stål. This bug has been collected from trees (Hussey 1922a; Torre-Bueno 1923; Readio 1926, 1927; Froeschner 1944; Procter 1946;

West and DeLong 1955; Slater and Baranowski 1978), shrubs (Blatchley 1926, Readio 1927, West and DeLong 1955, Slater and Baranowski 1978), weedy fields (Froeschner 1944), and low herbage (Blatchley 1926); specific trees include staghorn sumac (Blatchley 1926), ironwood, maple (West and DeLong 1955), hickory, pawpaw (Readio 1927), and basswood (Readio 1927, West and DeLong 1955). It feeds on a wide variety of insects (West and DeLong 1955, Edwards 1966) including the forest tent caterpillar, *Malacosoma disstria* Hübner (West and DeLong 1955); tarnished plant bug; bollworm; cotton leafworm, *Alabama argillacea* (Hübner); and cabbage looper, *Trichoplusia ni* (Hübner) (Whitcomb and Bell 1964).

Z. luridus is univoltine (Readio 1927, Edwards 1966). Nymphs overwinter as fourth or fifth instars (Readio 1927, West and DeLong 1955) and have been found overwintering in curled leaves (Readio 1927). Adults appear in late April in Missouri (Froeschner 1944), mid-May in Kansas (Readio 1927), mid- to late May in Michigan (McPherson 1992) and Ontario (West and DeLong 1955), and early June in New York (Van Duzee 1894). Oviposition occurs from mid-June into August (Readio 1927) with eggs laid on the foliage of such trees as ironwood, maple, and basswood (West and DeLong 1955). The nymphs mature during the rest of the summer (Readio 1927, West and DeLong 1955).

During the survey, 15 adults and 77 nymphs were found in Jackson, Williamson, Saline, Union, Johnson, Pope, Alexander, and Pulaski counties, collectively. They were collected by sweeping and handpicking shaded herbaceous vegetation along forest edges (6 adults, 41 nymphs), sweeping shrubs (2 adults, 2 nymphs); sweeping and beating trees (6 adults, 22 nymphs); and handpicking from the surface of limestone bluffs (4 nymphs), man-made items (e.g., cars, window screens, park shelters) (1 adult, 7 nymphs), and poison ivy (*Rhus radicans*) (1 nymph). The adults were collected from 8 May to 6 August, the majority during May ($n = 7$, 46.7%) and August ($n = 6$, 40.0%); early instars (1 first, 1 second, 16 thirds) were collected from 8 July to 17 October and late instars (20 fourths, 39 fifths) from 20 February to 27 May and 8 July to 17 October.

An additional 47 adults and 22 nymphs are deposited in the SIUEC. The adults were collected from 28 April to 27 September, the majority ($n = 20$, 42.6%) during May; and the nymphs (9 fourths, 13 fifths) from 27 April to 17 November. Additional label information indicates specimens were collected from leaf litter (1 fifth instar; 27 April), with a UV light trap (1 adult; 11 June), and in a window flight trap (1 adult; 27 June).

The survey and SIUEC data suggest that this species is univoltine and overwinters as nymphs, supporting the statements of Readio (1927), West and DeLong (1955), and Edwards (1966).

Subfamily Peiratinae Genus *Melanolestes*

M. picipes (Herrich-Schaeffer). This common and widespread species has been found under stones, rocks (e.g., Walsh and Riley 1869; Torre-Bueno and Brimley 1907; Blatchley 1926; Readio 1926, 1927; Brimley 1938; Froeschner 1944; Elkins 1951; Gates and Peters 1962; Drew and Schaefer 1963), logs (e.g., Walsh and Riley 1869; Blatchley 1926; Readio 1926, 1927; Froeschner 1944; Elkins 1951; Drew and Schaefer 1963), planks and boards (e.g., Hart 1907, Torre-Bueno 1925), dead bark (Torre-Bueno and Brimley 1907, Blatchley 1926, Brimley 1938), and debris (Blatchley 1926, Elkins 1951). It also is attracted to lights (e.g., Readio 1926, 1927; Froeschner 1944; Elkins 1951; McPherson 1992). It feeds on May beetle adults and larvae (Readio 1927) and various subterranean insects (Walsh and Riley 1869).

This insect is univoltine (Readio 1927) and overwinters as adults under rocks, stones (Readio 1927, Smith et al. 1943, Gates and Peters 1962), and logs (Blatchley 1926); and in tree stumps (Readio 1927). Adults become active in the spring and commonly are found under rocks (Readio 1927). Oviposition occurs under stones; the eggs are inserted in the ground, leaving only the starlike tops visible (Readio 1926, 1927). The eggs hatch in less than a month, and the nymphs mature during the rest of the summer, becoming adults by fall (Readio 1927). Adults are found from early May to late October in Michigan (McPherson 1992).

During the survey, 35 adults and 3 nymphs were found in Jackson, Williamson, Saline, Gallatin, Union, and Pulaski counties, collectively. They were collected under the bark of dead trees (4 adults, 1 nymph), rocks (4 adults), logs, boards (3 adults), and a pile of old shingles (1 nymph); from leaf debris (1 adult); in rotten logs (2 adults), spider webs (7 adults, 1 nymph) and a house (1 adult); by sweeping grasses (1 adult); and at lights (12 adults). The adults were collected from 20 February to 16 November, the majority ($n = 19$, 54.3%) during April and May; the nymphs were found on 18 July (1 third), 1 August (1 fourth), and 23 August (1 fourth). Two adults, apparently overwintering, were collected on 14 and 16 November in rotten logs.

An additional 278 adults and two nymphs are housed in the SIUEC; additional counties represented include Pope, Hardin, Alexander, and Massac. The adults were collected from 1 April to 28 November, the majority ($n = 214$, 77.0%) during April and May; the nymphs (2 fourths) were collected on 9 August and 4 October.

The survey and SIUEC data indicate that this insect is univoltine and overwinters as adults, thus supporting the conclusions of Readio (1927), Smith et al. (1943), and Gates and Peters (1962).

Genus *Sirthenea*

S. stria carinata (Fabricius). Nymphs have been found beneath boards along the margins of ponds in Florida; and beneath stones and logs, usually in damp places, in Indiana (Blatchley 1926). This subspecies also has been collected from flowers of *Garberia fruticosa* (1 nymph) (Blatchley 1926), under a rock (an adult, presumably) (Readio 1927), and at lights (e.g., Van Duzee 1909, Torre-Bueno 1923, McPherson 1992). In Michigan, 38 adults were collected between 27 June and 12 September (McPherson 1992).

During the survey, three adults were found, all in Jackson County. They were collected at lights on 6 May, 12 May, and 13 July.

An additional 27 adults and four nymphs are housed in the SIUEC. Additional counties represented include Williamson, Union, and Pope. The adults were collected from 20 May to 21 October, the majority ($n = 15$, 55.6%) during September. The nymphs were collected on 23 March (1 third instar), 18 April (1 fourth), 4 May (1 fifth), and 29 September (1 fifth).

The limited data suggest that this species is univoltine and overwinters as adults, nymphs, or in both stages.

Subfamily Saicinae Genus *Oncerothelus*

O. acuminatus (Say). This species has been collected in grasses (Elkins 1951, Blinn 1994), debris (Blatchley 1926, Slater and Baranowski 1978), rubbish and weeds in low ground or on edges of stubble fields (Uhler 1884), moist situations (Blatchley 1926, Froeschner 1944, Elkins 1951, Slater and

Baranowski 1978), spider webs (Fracker and Bruner 1924), and pitcher plants (Wray and Brimley 1943); and at lights (Blatchley 1926, Froeschner 1944, Elkins 1951, Slater and Baranowski 1978, Blinn 1994).

This species overwinters as adults under leaves in woodlands (Readio 1927), as many as 50 individuals (presumably adults) having been found together beneath logs and other cover (Blatchley 1926). Adults have been collected throughout the year in Missouri (Froeschner 1944).

During the survey, 48 adults were found in Jackson, Gallatin, and Union counties, collectively. They were swept from grasses along a wooded roadside ($n = 1$) and from herbaceous vegetation in a moist low area ($n = 2$), and collected at lights ($n = 45$). They were collected from 12 May to 21 September, the majority ($n = 42$, 87.5%) during May and June.

An additional 56 adults are housed in the SIUEC; additional counties represented include Williamson, Hardin, and Alexander. They were collected from 10 April to 10 November, the majority ($n = 51$, 91.1%) from April to June.

Although the data are limited, they suggest that this species is univoltine.

Subfamily Stenopodainae Genus *Narvesus*

N. carolinensis Stål. This species has been found beneath rocks (Readio 1927, Froeschner 1944, Elkins 1951) and logs (Readio 1927, Elkins 1951); it also is attracted to lights (Blatchley 1926, Readio 1927, Froeschner 1944, Elkins 1951).

Nymphs are collected in the spring and probably overwinter as late instars; the eggs of this species probably are laid in late June and early July (Readio 1927).

During the survey, 34 adults were found in Jackson and Union counties, collectively. They were collected at lights from 14 June to 12 July, the majority ($n = 30$, 88.2%) from mid- to late June.

An additional 33 adults are housed in the SIUEC; additional counties represented include Williamson, Saline, Pope, and Alexander. They were collected from 29 April to 17 October, the majority ($n = 25$, 75.8%) during June.

The survey and SIUEC data suggest that this species is univoltine.

Genus *Oncocephalus*

O. geniculatus (Stål) (STATE RECORD). This species has been found beneath rocks (Readio 1927, Elkins 1951), boards (Blatchley 1926, Readio 1927, Elkins 1951), and logs (Elkins 1951). It also is attracted to lights (Readio 1927, Elkins 1951).

This reduviid overwinters as nymphs in several instars and probably is univoltine (Readio 1927). Adults have been collected in late spring and early summer, and nymphs from mid-June to late November (Readio 1927). Eggs are inserted in the ground with their tops visible (Readio 1927).

During the survey, three adults were found in Jackson and Union counties, collectively. They were collected at lights on 16 June, 18 June, and 12 July. In addition, four late instars that probably are *O. geniculatus* were found beneath a pile of asphalt shingles in a grassy area ($n = 3$; 10 April) and under the bark of a dead tree ($n = 1$; 2 April) in Jackson County.

One adult, collected 6 June 1966 from Jackson County; and one late instar nymph, probably *O. geniculatus*, collected 17 November 1973 from Union County; are housed in the SIUEC.

Genus *Pnirontis*

P. modesta Banks (STATE RECORD). This species has been collected at lights (Elkins 1951). One specimen was swept from foliage along a canal in Florida (Blatchley 1926).

During the survey, 62 adults were found in Jackson and Union counties, collectively. They were collected at lights ($n = 56$), by sweeping grasses ($n = 5$), and with a Malaise trap in a weedy field ($n = 1$). The bugs were collected from 1–8 April to 3 September, the majority ($n = 54$, 87.1%) during May and June.

An additional 40 adults are housed in the SIUEC; additional counties represented are Williamson, Pope, Alexander, and Massac. The insects were collected from 18 April to 25 October, the majority ($n = 27$, 67.5%) during May and June.

The survey and SIUEC data suggest that this species is univoltine.

Genus *Pygolampis*

P. pectoralis (Say). This species has been found under rocks and boards (Readio 1927, Elkins 1951) and beneath loose bark of oak stumps in high dense woods (Blatchley 1926). It also has been found in grass (Elkins 1951), including bluegrass (Wirtner 1904), sifted (nymphs) from weed debris in low moist grounds (Blatchley 1926), and collected at lights (Readio 1927, Elkins 1951).

This insect apparently overwinters as both adults and nymphs under rocks (Readio 1927), boards (Blatchley 1926, Readio 1927), "chunks," and other cover along roadsides and edges of upland woods (Blatchley 1926). Adults are active in the spring in Kansas (Readio 1927), and have been collected between 2 May and 13 September in Michigan (McPherson 1992).

During the survey, 39 adults were found in Jackson and Union counties, collectively. They were collected at lights from 6 May to 24 June, the majority ($n = 27$, 69.2%) during June.

An additional 126 adults and one nymph are housed in the SIUEC; additional counties represented include Williamson, Saline, Pope, Pulaski, and Massac. The adults were collected from 4 April to 24 September, the majority ($n = 78$, 61.9%) during May; a late instar was collected on 16 April 1993.

The survey and SIUEC data suggest that this species is univoltine.

Genus *Stenopoda*

S. spinulosa Giacchi. This species has been collected under boards, logs, and rocks (Elkins 1951); on branches and twigs (Uhler 1884); in dead leaves of cabbage and royal palms, and in weed debris (Blatchley 1926); from pitcher plants (Wray and Brimley 1943); and at lights (Readio 1927, Elkins 1951). It feeds on caterpillars (Uhler 1884, Ashmead 1895).

This insect overwinters as nymphs (Blatchley 1926, Froeschner 1944). Adults are found from mid-June to mid-August, and late instars from late October to mid-June (Froeschner 1944).

During the survey, nine adults were found in Jackson and Union counties, collectively. They were collected at lights ($n = 7$; 14 June–13 July), with a Malaise trap in a weedy field ($n = 1$; 10–16 July), and in a spider web ($n = 1$; 3 June).

An additional 36 adults and one nymph are housed in the SIUEC; additional counties represented include Williamson, Saline, Pope, Alexander, and Massac. The adults were collected between 6 May and 14 September, the ma-

majority ($n = 24$, 66.7%) during May and June; the nymph (late instar) was collected on 27 September. Additional label information indicates that specimens were collected from a mullein plant (1 adult; 2 September), from a grassy field (1 late instar; 27 September), with a Malaise trap (1 adult; 12–19 June), and with window flight traps (10 adults; 6 June–5 September).

The survey and SIUEC data suggest that this species is univoltine.

Subfamily Triatominae
Tribe Triatomini
Genus *Triatoma*

T. sanguisuga (LeConte). This species, the bloodsucking conenose, often can be found in man-made structures including houses (e.g., Uhler 1876, 1884; Kimball 1894; Elkins 1951; Mead 1965; Slater and Baranowski 1978), chicken houses (Kimball 1894, Brimley 1938, Elkins 1951, Mead 1965), dog houses (Elkins 1951, Mead 1965), barns (Kimball 1894, Elkins 1951, Mead 1965), and outhouses (Mead 1965). Natural habitats include rodent nests (Elkins 1951), including those of the wood rat (*Neotoma* sp.) (Usinger 1944, Mead 1965); hollow trees and stumps (Wirtner 1904, Mead 1965); palmetto boots and trunks (Mead 1965); under bark of oak and pine (Blatchley 1926, Mead 1965); and in weeds in damp places (Blatchley 1926). It feeds on insects (Marlatt 1896, Lugger 1900, Mead 1965, Slater and Baranowski 1978) and the blood of various vertebrates (e.g., frogs, lizards, rodents and other mammals) (Kimball 1894, Smith et al. 1943, Gates and Peters 1962, Mead 1965).

This reduviid is well known mostly because adults sometimes enter man-made structures to feed on the blood of humans (e.g., Uhler 1876, 1884; Marlatt 1896; Lugger 1900; Surface 1906; Mead 1965) and domestic animals (e.g., dogs, horses) (Kimball 1894, Mead 1965). Even more seriously, it transmits *Trypanosoma cruzi* Chagas (Davis et al. 1943), the microorganism that causes Chagas' disease (Mead 1965, Slater and Baranowski 1978). The adults are nocturnal (Kimball 1894, Mead 1965, Slater and Baranowski 1978) and attracted to lights (Kimball 1894, Marlatt 1896); during the day, they hide in clothing, furniture (Kimball 1894) and other secretive places (e.g., cracks in floors and walls) (Marlatt 1896, Mead 1965).

This species overwinters as adults and partly grown nymphs (Walsh and Riley 1869, Marlatt 1896, Wirtner 1904, Froeschner 1944) under bark of trees or any similar protection (Walsh and Riley 1869, Marlatt 1896, Wirtner 1904). In Missouri, adults have been collected throughout the year and nymphs from 11 December to 20 April (Froeschner 1944). Eggs apparently are laid, and nymphs occur, outdoors (Marlatt 1896). Adults usually enter houses in April and May (Marlatt 1896).

During the survey, four adults and 10 nymphs were found in Jackson and Union counties, collectively. They were collected from under the bark of dead trees (10 nymphs), at lights (2 adults), and in spider webs (2 adults). The adults were collected from 4 August to 9 November, early instars (first-thirds, $n = 2$) on 12 March, and late instars (fourths and fifths, $n = 8$) from 12 March to 15 June.

An additional 23 adults and 10 nymphs are housed in the SIUEC; additional counties represented include Williamson, Johnson, and Pope. The adults were collected from 26 January to 28 September, one early instar (first-third) was collected 29 June, and late instar nymphs (fourths and fifths, $n = 9$) were collected from 13 April to 15 October. Additional label information indicates that specimens were collected in a weedy field (1 adult, 3 September) and at lights (1 adult, 22 September).

The survey and SIUEC data suggest that this species overwinters as

adults and nymphs, supporting the work of Walsh and Riley (1869), Marlatt (1896), and Froeschner (1944).

Species not collected during the survey but represented in the SIUEC.

**Subfamily Emesinae
Tribe Leistarchini
Genus *Ploiaria***

P. hirticornis (Banks) (STATE RECORD). This species is reported from Washington, D. C., North Carolina, Florida, Louisiana (Froeschner 1988), and Missouri (McPherson 1991b). Specimens have been found beneath a board on the site of an old house, beaten from dead leaves of cabbage palmetto, sifted from roots of grass tufts (Blatchley 1926), and captured with a Malaise trap (McPherson 1991b, label information); the Malaise trap specimens were collected between 17 and 21 July in Missouri.

A late (fourth or fifth) instar is housed in the SIUEC. It was collected 4–18 November 1966 from the La Rue Pine Hills Ecological Area, Union County.

**Subfamily Harpactorinae
Genus *Zelus*
Subgenus *Pindus***

Zelus (P.) tetracanthus Stål. This bug occurs in weedy (Froeschner 1944, Swadener and Yonke 1973c) and grassy areas (Radio 1927, Elkins 1951); and on trees (e.g., Blatchley 1926; Downes 1927; Procter 1938, 1946; Elkins 1951), bushes, (Elkins 1951), and flowers (Elkins 1951, Strickland 1953). Specific plants include red clover, ragweed, goldenrod (Swadener and Yonke 1973c), alfalfa (Drew and Schaefer 1963), cedar (Banks 1910, Swadener and Yonke 1973c), spruce (Downes 1927), and pine (Blatchley 1926). This bug also has been collected at lights (Swadener and Yonke 1973c) and in beach drift (Torre-Bueno 1915). It feeds on the beet leafhopper, *Circulifer tenellus* (Baker) (Knowlton and Harmston 1940, Thompson and Simmonds 1965); tarnished plant bug; and bollworm (Whitcomb and Bell 1964).

This species is univoltine and overwinters as fourth and fifth instars in leaf litter and clumps of grass along fence rows and at the bases of trees (Swadener and Yonke 1973c). Nymphs emerge in the spring and adults are collected from mid-May to early September in Missouri (Swadener and Yonke 1973c) and from early June to mid-August in Michigan (McPherson 1992).

Three adults are housed in the SIUEC; counties represented include Jackson and Williamson. They were collected on 24 April 1963, 20 July 1963, and 30 September 1987.

**Subfamily Peiratinae
Genus *Rasahus***

R. hamatus (Fabricius) (STATE RECORD). This species has been found under rocks, logs (Froeschner 1944, Elkins 1951), and boards (Blatchley 1926); swept from borders of wet hammocks; and collected at lights (Blatchley 1926).

Little is known about the life cycle of this insect. In Missouri, adults have been collected during June, and nymphs from 15 September to 2 June (Froeschner 1944).

Two adults are housed in the SIUEC. They were collected on 22 May 1960 and 7 June 1957 in Jackson County.

Subfamily Reduviinae
Genus *Reduvius*

R. personatus (L.). This species often is associated with houses or other buildings (e.g., Uhler 1878; Torre-Bueno 1923, 1925; Blatchley 1926; Readio 1927, 1931; Drew and Schaefer 1963; Slater and Baranowski 1978). It also has been found under logs (Elkins 1951, Drew and Schaefer 1963) and boards (Uhler 1878); in rodent nests (Elkins 1951, Drew and Schaefer 1963); and at lights (e.g., Hussey 1922a; Torre-Bueno 1923; Blatchley 1926; Readio 1927, 1931; Smith et al. 1943; Knowlton 1944b; Elkins 1951; Gates and Peters 1962). It feeds on other insects including bed bugs (e.g., Torre-Bueno 1923, Blatchley 1926, Smith et al. 1943, Knowlton and Taylor 1951, Gates and Peters 1962, Thompson and Simmonds 1965, Slater and Baranowski 1978).

This bug has been reported as univoltine (Readio 1927, 1931) and semi-voltine (Scudder 1992). It overwinters as nymphs (usually fourth or fifth instars) that become adults the following May or June; eggs and nymphs are found for the rest of the warm season (Readio 1927). Adults are found from May to September in Kansas (Readio 1931) and Michigan (McPherson 1992) and May to early October in Canada (Scudder 1992). Eggs are laid singly in dusty corners of dwellings (Readio 1931) or out-of-the-way places (Readio 1926).

Nine adults are housed in the SIUEC; counties represented include Jackson, Williamson, Union, and Pope. The bugs were collected between 12 April and 4 August; none was collected after 1972.

Subfamily Saicinae
Genus *Saica*

S. elkinsi (STATE RECORD). This recently described species has been reported from Virginia, North Carolina, Florida, Mississippi, Louisiana, Arkansas, and Missouri (Blinn 1994). It has been collected from tall fescue and at lights (Blinn 1994).

A late (fourth or fifth) instar is housed in the SIUEC. The specimen was collected 29 April 1971 in Jackson County.

Subfamily Stenopodainae
Genus *Pnirontis*

P. languida Stål (STATE RECORD). This species is collected commonly at lights in Texas (Elkins 1951).

An adult from Williamson County, collected 10 August 1957, is housed in the SIUEC.

DISCUSSION

The nonphymatine reduviid fauna is well represented in southern Illinois. Thirty-one species and subspecies are recorded, 9 of which are state records (Table 1); the remaining 22 represent 73.3% of the taxa known for Illinois (Hagerty 1999, Table 1).

Table 1. List of southern Illinois nonphymatine Reduviidae

Taxon	No. Examined ^c
SUBFAMILY ECTRICHODIINAE Amyot and Serville	
<i>Rhiginia cruciata</i> (Say) ^{ab}	37A, 1N
SUBFAMILY EMESINAE Amyot and Serville	
TRIBE LEISTARCHINI Stål	
<i>Ploiaria hirticornis</i> (Banks) ^b *	1A
TRIBE METAPTERINI Stål	
<i>Barce fraterna</i> Say ^{ab}	13A
<i>Emesaya b. brevipennis</i> (Say) ^{ab}	62A, 68N
<i>Pseudometapterus umbrosus</i> (Blatchley) ^{ab}	43A
SUBFAMILY HAMMACERINAE Schumacher	
<i>Microtomus purcis</i> (Drury) ^{ab} *	35A
SUBFAMILY HARPACTORINAE Amyot and Serville	
<i>Acholla multispinosa</i> (De Geer) ^{ab}	3A, 2N
<i>Apiomerus c. crassipes</i> (Fabricius) ^{ab}	77A, 1N
<i>Arilus cristatus</i> (L.) ^{ab}	89A, 181N
<i>Fitchia aptera</i> Stål ^{ab}	6 A
<i>Pselliopus barberi</i> Davis ^{ab}	108A, 6N
<i>Pselliopus cinctus</i> (Fabricius) ^{ab}	33A, 17N
<i>Rocconota annulicornis</i> (Stål) ^{ab} *	13A, 1N
<i>Sinea complexa</i> Caudell ^{ab} *	12A, 4N
<i>Sinea diadema</i> (Fabricius) ^{ab}	172A, 77N
<i>Sinea spinipes</i> (Herrich-Schaeffer) ^{ab}	134A, 139N
<i>Zelus (Zelus) luridus</i> Stål ^{ab}	62A, 99N
<i>Zelus (Pindus) tetracanthus</i> Stål ^b	3A
SUBFAMILY PEIRATINAE Amyot and Serville	
<i>Melanolestes picipes</i> (Herrich-Schaeffer) ^{ab}	313A, 5N
<i>Rasahus hamatus</i> (Fabricius) ^b *	2A
<i>Sirhenea stria carinata</i> (Fabricius) ^{ab}	30A, 4N
SUBFAMILY REDUVIINAE Latreille	
<i>Reduvius personatus</i> (L.) ^b	9A
SUBFAMILY SAICINAE Amyot and Serville	
<i>Oncerothelus acuminatus</i> (Say) ^{ab}	104A
<i>Saica elkinsi</i> Blinn ^b *	1N
SUBFAMILY STENOPODAINAE Amyot and Serville	
<i>Narvesus carolinensis</i> Stål ^{ab}	67A
<i>Oncocephalus geniculatus</i> (Stål) ^{ab} *	4A, 4N
<i>Pnirontis languida</i> Stål ^b *	1A
<i>Pnirontis modesta</i> Banks ^{ab} *	102A
<i>Pygolampis pectoralis</i> (Say) ^{ab}	165A, 1N
<i>Stenopoda spinulosa</i> Giacchi ^{ab}	45A, 1N
SUBFAMILY TRIATOMINAE Jeannel	
TRIBE Triatomini Jeannel	
<i>Triatoma sanguisuga</i> (LeConte) ^{ab}	27A, 20N

* New Illinois state record.

^aTaxon collected during survey.^bTaxon represented in SIUEC.^cA = Adult, N = nymph.

Table 2. Taxa collected during survey and associated collection sites^a

Taxon	Collection site and No. Individuals ^{b c}								
	LT	HV	FE	TS	GV	MT	UB	UR	SW
Ectrichodiinae Amyot and Serville									
<i>Rhiginia cruciata</i> (Say)	—	—	1A	—	—	—	—	—	—
Emesinae Amyot and Serville									
<i>Barce fraterna</i> (Say)	1A	—	—	—	—	1A	—	1A	1A
<i>Emesaya b. brevipennis</i> (Say)	—	—	4A	2A	—	—	—	—	19A, 25N
<i>Pseudometapterus umbrosus</i> (Blatchley)	—	—	—	—	—	—	—	—	43A
Hammacerinae Schumacher									
<i>Microtomus purcis</i> (Drury)	4A	—	—	—	—	—	—	—	—
Harpactorinae Amyot and Serville									
<i>Acholla multispinosa</i> (De Geer)	—	1N	—	1N	1A	—	—	—	—
<i>Apiomerus c. crassipes</i> (Fabricius)	—	12A	—	1A	—	3A	—	—	—
<i>Arilus cristatus</i> (L.)	3A	3A, 51N	12A, 73N	14A, 28N	—	4N	—	—	—
<i>Fitchia aptera</i> Stål	—	1A	2A	—	1A	—	—	—	—
<i>Pselliopus barberi</i> Davis	—	7A, 6N	—	31A, 1N	—	—	2A	—	—
<i>Pselliopus cinctus</i> (Fabricius)	—	7A, 14N	—	3A, 1N	—	—	—	—	—
<i>Rocconota annulicornis</i> (Stål)	1A	1A, 1N	—	4A	—	1A	—	—	—
<i>Sinea complexa</i> Caudell	—	—	—	—	8A, 2N	—	—	—	—
<i>Sinea diadema</i> (Fabricius)	—	48A, 30N	—	—	25A, 19N	—	—	—	—
<i>Sinea spinipes</i> (Herrich-Schaeffer)	—	5A, 3N	44A, 96N	6A, 7N	2N	—	—	—	—
<i>Zelus luridus</i> Stål	—	—	6A, 41N	8A, 24N	—	—	1N	—	—

(Continued)

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Peiratinae Amyot and Serville									
<i>Melanolestes picipes</i> (Herrich-Schaeffer)	12A	—	—	—	1A	—	4A, 1N	7A, 1N	—
<i>Sirthenea stria carinata</i> (Fabricius)	3A	—	—	—	—	—	—	—	—
Saicinae Amyot and Serville									
<i>Oncerothachelus acuminatus</i> (Say)	45A	2A	—	—	1A	—	—	—	—
Stenopodainae Amyot and Serville									
<i>Narvesus carolinensis</i> Stål	34A	—	—	—	—	—	—	—	—
<i>Oncocephalus geniculatus</i> (Stål)	3A	—	—	—	—	—	1N	3N	—
<i>Prirontis modesta</i> Banks	56A	—	—	—	5A	1A	—	—	—
<i>Pygolampis pectoralis</i> (Say)	39A	—	—	—	—	—	—	—	—
<i>Stenopoda spinulosa</i> Giacchi	7A	—	—	—	—	1A	—	—	—
Triatominae Jeannel									
<i>Triatoma sanguisuga</i> (LeConte)	2A	—	—	—	—	—	10N	—	—

^aAbbreviations: FE = forest edge; GV = grassy vegetation; HV = herbaceous vegetation; LT = lights; MT = Malaise traps; SW = associated with spider webs; TS = trees and shrubs; UB = under bark; UR = under rocks, logs, boards.

^bA = adult, N = nymph.

^cNumbers of individuals do not always correspond to those in text because the sites listed here are more inclusive.

These insects were collected from a wide variety of sites throughout the study area (Table 2). The most productive sites were lights (13 taxa, 218 individuals), herbaceous vegetation (10 taxa, 192 individuals), and forest edges including trees and shrubs (10 taxa, 409 individuals).

Some generalizations are possible about the habits and habitats of these insects at the subfamily level in southern Illinois (Table 2). Whether these generalizations will hold for a larger geographical area remains to be seen.

The ectrichodiines (i.e., *R. cruciata*) were collected in or near wooded areas.

The emesines (e.g., *E. b. brevipennis*) were found primarily on limestone and sandstone bluffs and often associated with spider webs. These sticklike predators remained motionless on the substrate unless disturbed.

The hammacerine (i.e., *M. purcis*) adults were collected at lights in small numbers.

The harpactorines were found on various types of vegetation and are diurnal. *S. spinipes* was found primarily on shaded herbaceous vegetation along forest edges and in the adjacent trees and shrubs, whereas *S. complexa* and *S. diadema* were found on grasses and herbaceous vegetation along sunny roadsides and in fields. Harpactorines were never or rarely (*R. annulicornis*, 1 specimen; *A. cristatus*, 3 specimens) collected at lights. These bugs generally are slow-moving predators, stalking prey on vegetation. The exception is *A. c. crassipes*, which is swift moving and readily takes flight.

The peiratines (e.g., *M. picipes*) are primarily nocturnal and attracted to lights. During the day, they were found under rocks, boards, logs, and bark. They are fast moving and difficult to catch.

The saicine (i.e., *O. acuminatus*) adults were collected in large numbers at lights during the early summer; when disturbed, they moved quickly and took flight readily. In addition, several individuals were swept from herbaceous vegetation.

Stenopodaine adults were attracted to lights in high numbers, and collected in Malaise traps in low numbers, during the spring and early summer. Adults of *P. modesta* were swept from vegetation, and nymphs of *O. geniculatus* were found under bark of dead trees and under shingles. When discovered, these insects were slow-moving. No other specimens were collected elsewhere.

Adult triatomines (i.e., *T. sanguisuga*) were taken at lights, and nymphs were found under the bark of dead trees. None was found in association with humans or domestic animals.

Sufficient data were collected on the majority of southern Illinois taxa to suggest that most species, regardless of subfamily, are univoltine, the exception being *S. diadema*, which apparently is bivoltine. A similar conclusion was reached by Readio (1927) in his study of the Reduviidae. However, as in the case of *E. b. brevipennis* (see footnote 3), further work may show that more species are bivoltine. Most species overwintered as adults, the primary exceptions being *A. cristatus* and *Z. luridus*, which overwintered as eggs and nymphs, respectively.

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