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A LIST OF THE SCUTELLEROIDEA OF THE LA RUE-PINE HILLS ECOLOGICAL AREA WITH NOTES ON BIOLOGY

J. E. McPherson¹ and R. H. Mohlenbrock²

ABSTRACT

A survey of the scutelleroid fauna of the LaRue-Pine Hills Ecological Area, Union County, Illinois was conducted from May, 1972 to September, 1974. Forty-nine species were collected, five of which were state records. The remaining 44 represented over 57% of the species presently listed for Illinois.

Life history information was collected for the majority of species, including host plants, predators and parasites. The pertinent literature is summarized for each species.

INTRODUCTION

The La Rue-Pine Hills Ecological Area is part of the Shawnee National Forest and located in southern Illinois (Fig. 1). Though small, encompassing about 3 mile², the area is well known for its biological diversity. Several of its vertebrate and plant species are rare in Illinois and, for many, La Rue-Pine Hills lies along the northern border of their ranges (Forbes & Richardson, 1920; Gunning & Lewis, 1955; Hoffmeister & Mohr, 1957; Layne, 1958; Rossman, 1960; Smith, 1961; Klimstra, 1969; Mohlenbrock & Voigt, 1965).

To our knowledge, no published work deals solely with La Rue-Pine Hills invertebrates. The purpose of our report is to present a list of the Scutelleroidea in this Ecological Area, supplemented with life history information for several of the species.

GENERAL DESCRIPTION OF AREA

The La Rue-Pine Hills Ecological Area lies about 18 miles northeast of Cape Girardeau, Missouri, in the northwest corner of Union County, Illinois (Fig. 2). It is about 3½ miles from north to south and averages 1 mile wide. The eastern quarter is comprised of a high ridge of sheer, west-facing, limestone bluffs, reaching a height of 350 feet above the floodplain, with a steep talus (Fig. 4). Atop the densely forested bluffs is a layer of reddish cherty gravel. Some of the vegetation growing in the chert is unusual in Illinois (e.g., *Pinus echinata* Miller) (Mohlenbrock & Voigt, 1965). Infrequently, small grassy openings known as hill prairies interrupt the forest cover.

At the foot of the limestone bluffs lies La Rue Swamp, partially fed by clear springs issuing from their base (Figs. 3,5). On slightly elevated areas adjacent to the swamp are moist woodlands. Thus, the habitats at La Rue-Pine Hills are diverse and include swamps, clear springs, moist woods, limestone bluffs, dry woods, cherty slopes, and hill prairies.

METHODS AND MATERIALS

Field and laboratory studies were conducted from May, 1972, to September, 1974. Collecting trips to the La Rue-Pine Hills Ecological Area, hereafter referred to as Pine Hills, were taken once or twice a week during the active seasons, about April to November, of 1972-1974 and sporadically during other months. Specimens were collected by sweeping, hand-picking, and blacklighting. Berlese funnels were used to collect cydnids and overwintering adults from leaf litter.

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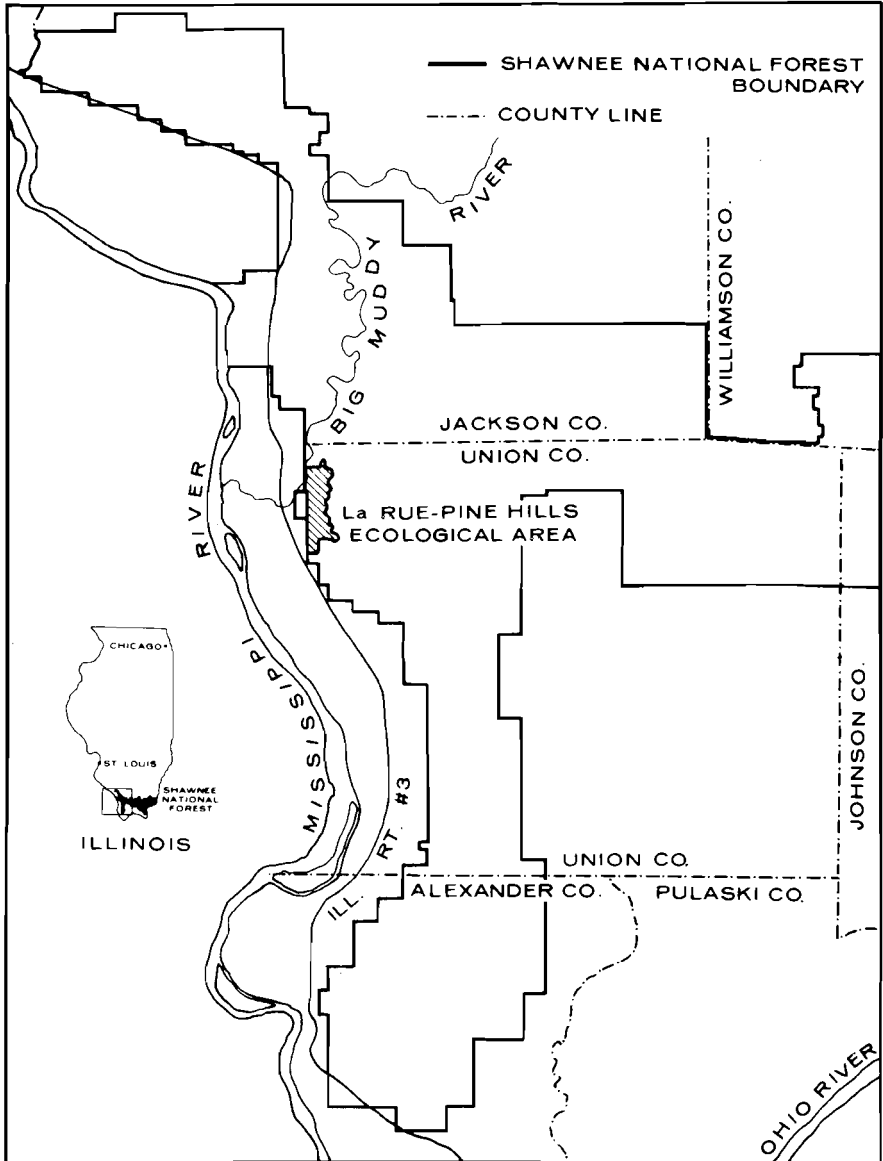


Fig. 1. Location of Shawnee National Forest in Illinois (insert) and of La Rue-Pine Hills Ecological Area in Shawnee National Forest.



Fig. 2. View, looking southwest, of Ecological Area from atop Pine Hills bluffs. Note La Rue Swamp in background, and yellow pines (*Pinus echinata* Miller).



Fig. 3. Open area of La Rue Swamp with various genera of duckweed (Family: Lemnaceae) covering surface, interrupted by several dead green ashes [*Fraxinus pennsylvanica* Marshall var. *subintegerrima* (Vahl)].

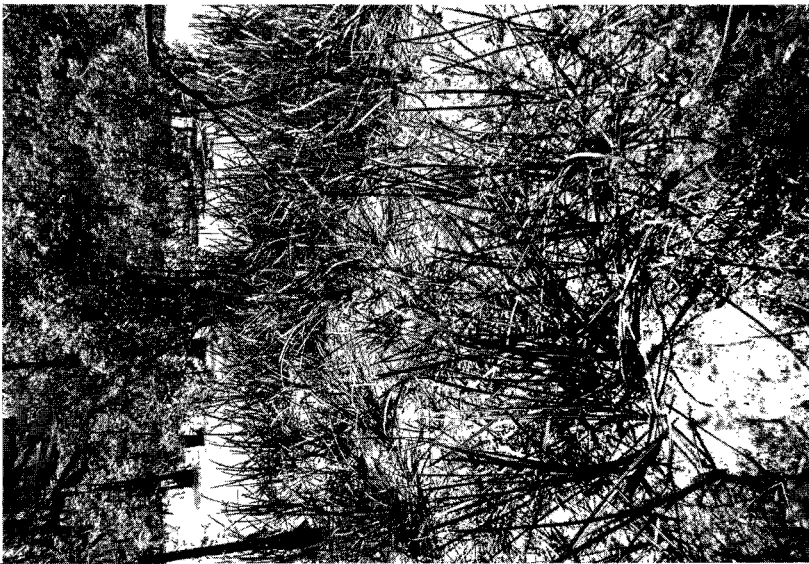


Fig. 4. Pine Hills bluffs.



Fig. 5. Area of La Rue Swamp with several emergent specimens of bur-reed (*Sparganium eurycarpum* Engelmann) in foreground.

We gathered information on several life histories including habitats of the various species. If individuals were observed on a particular plant, we recorded their instar(s) and whether or not the animals were feeding and/or *in copulo*. The scientific name of each host plant is listed in Table 1.

Relative abundance of each species was estimated from the number of adults collected of each species by separating totals into four categories: (1) 0-20, (2) 21-50, (3) 51-100, (4) 101 or more adults.

The arrangement of genera follows that of Van Duzee (1916). The pertinent literature for each species is summarized. Dipteran and hymenopteran parasites listed as synonyms are according to Stone *et al.* (1965) and Muesebeck *et al.* (1951), respectively.

All specimens are housed in the Entomology Collection, Southern Illinois University Zoological Research Museum, hereafter referred to as SIUEM.

IDENTIFICATION OF IMMATURES

Because there are no adequate keys to immature scutelleroids, we reared field-collected eggs and nymphs to adults to verify identification, especially in the early stages of this project. To identify field-collected immatures of common species which died during capture or rearing, we made a synoptic collection of laboratory-reared animals preserved in various stadia. The rearing technique followed that of McPherson (1971b), with the following modifications. Nymphs were reared in 1 pint milk bottles rather than mason jars, and a moist cotton plug and *Tenebrio molitor* Linnaeus larvae were placed in jars containing predaceous specimens.

Field-collected adults were placed in 1 quart mason jars. Green beans (*Phaseolus vulgaris* L.) served as food for phytophagous species, *T. molitor* larvae for predaceous ones. The food and, for predaceous species, a moist cotton plug, were placed on a disc of filter paper that covered the bottom of the jar. Two strips of paper toweling were also added. The filter paper and toweling increased the surface area available for walking and for absorption of excrement. A strip of cheesecloth served as a site for oviposition. The jar was closed with a disc of paper toweling and wire screen and secured with the band of a two piece mason jar lid.

Cheesecloth with attached egg clusters was removed daily and placed on moist filter paper in petri dishes. Enough water was added daily to keep the filter paper moist. The 1st instars, a non-feeding stage, were kept in the dishes. The 2nd-5th instars were reared in 1 pint milk bottles, prepared similarly to the mason jars but lacking cheesecloth. The bottles were closed with standard cardboard lids.

The rearing technique used for field-collected immatures depended on the number and instars collected. They were grouped by instar and date. Eggs were treated similarly to those obtained under laboratory conditions. Specimens of the same nymphal instar were reared in milk bottles, unless they were few in number, usually five or less; then they were reared in petri dishes. A moist cotton plug was added to each dish containing predaceous specimens and, normally, green beans or *T. molitor* larvae were added as food. In some cases, we used the host plants upon which the nymphs were collected.

Species reared through some or all stages on green beans included *Brochymena quadripustulata*, *Holcostethus limbolarius*, *Euschistus politus*, *E. servus*, *E. t. tristigmus*, *E. variolarius*, *Coenus delius*, *Hymenarcys nervosa*, *Cosmopepla bimaculata*, *Thyanta calceata*, *T. pallido-virens accerra*, *Nezara viridula*, and *Acrosternum hilare*; on *T. molitor* larvae included *Stiretrus anchorago fimbriatus* and *Podisus maculiventris*; and on host plants included *Stethaulax marmorata* on smooth sumac, *Corimelaena l. lateralis* and *Trichopepla semivittata* on wild carrot, *Mormidea lugens* on short sedge, *Oebalus pugnax* on Johnson grass, *Proxys punctulatus* on wide-leaved spiderwort, and *Hymenarcys nervosa* and *Cosmopepla bimaculata* on Carolina cranesbill.

All rearing containers were kept in incubators at $23.9 \pm 0.6^\circ\text{C}$ and under constant light of about 130 candles. Food and paper were changed every four to five days.

COLLECTION OF PARASITES

Parasites occasionally emerged from field-collected specimens reared in the laboratory. Also, specimens appearing abnormal when collected were set aside to permit any parasites to emerge. These included pale eggs with bands of brown or black, and lethargic or unusually spotted nymphs and adults. These animals were reared similarly to healthy ones, in the same incubators, for a maximum of six weeks.

All parasites were preserved in 75% ethanol and are listed in Table 2.

COLLECTING SITES

Most specimens were collected on roadside vegetation or in fields in early stages of secondary succession. Fewer than 1% were collected in other habitats. Even those species known to be arboreal were found along the outer edges of woods.

The primary collecting sites were numbered and are described below. The location of each site is shown in Figure 6.

Much of the Levee Road leading into Pine Hills on the north is not part of the Ecological Area. Although Site 9 lies along this part of the Levee Road, all species collected here were also collected at Pine Hills. Thus, we have included information gathered from this site (Fig. 6).

Site 1 (Fig. 7). This site was a low, mostly weedy clearing about 15 yards north of Otter Pond. The periphery was wooded, with black walnut (*Juglans nigra* L.), pawpaw [*Asimina triloba* (L.)], hackberry (*Celtis occidentalis* L.), sweet gum (*Liquidambar styraciflua* L.), American elm (*Ulmus americana* L.), shingle oak (*Quercus imbricaria* Michaux), false shagbark hickory [*Carya ovalis* (Wangenheim)], cottonwood (*Populus deltoides* Marshall), and smooth sumac (*Rhus glabra* L.), the most common species.

Herbaceous plants and grasses numerous in the clearing in spring months included Kentucky blue-grass (*Poa pratensis* L.), wild geranium (*Geranium carolinianum* L.), and white avens (*Geum canadense* Jacquin). By midsummer, these were dominated by a coarse herb and grass community containing beefsteak plant [*Perilla frutescens* (L.)], white vervain (*Verbena urticifolia* L.), figwort (*Scrophularia marilandica* L.), pokeweed (*Phytolacca americana* L.), and orange-spotted touch-me-not (*Impatiens biflora* Walter). Much of the ground was covered by mats of nimble will (*Muhlenbergia schreberi* J. F. Gmelin).

Site 2 (Fig. 9). This site was along a dirt road through a dense, mesophytic woodland, with an overstory of slippery elm (*Ulmus rubra* Muhlenberg), yellow chestnut oak (*Quercus muhlenbergii* Engelm.), hackberry (*C. occidentalis*), shagbark hickory [*Carya ovata* (Miller)], and sugar maple (*Acer saccharum* Marshall). Spring wildflowers included waterleaf (*Hydrophyllum appendiculatum* Michaux), blue phlox (*Phlox divaricata* L.), and larkspur (*Delphinium tricornis* Michaux). During the summer, panic grass (*Panicum commutatum* Schultes), bottle-brush grass (*Elymus hystrix* L.), yellow ironweed [*Verbesina alternifolia* (L.)], black raspberry (*Rubus occidentalis* L.), poison ivy (*Rhus radicans* L.), muhly (*Muhlenbergia sobolifera* Muhlenberg), and purple top [*Tridens flavus* L.]) were common.

Site 3 (Fig. 8). This site, near the junction of two gravel roads, was composed of a disturbed roadside community encroached upon by a small tree community. Thirty yards east of this station was a limestone escarpment about 120 feet high. An equal distance westward began La Rue Swamp. Dominant herbs were goldenrod (*Solidago canadensis* L.), yellow ironweed (*V. alternifolia*), American bellflower (*Campanula americana* L.), hairy aster (*Aster pilosus* Willdenow), bog-hemp [*Boehmeria cylindrica* (L.)], and panic grass (*P. commutatum*). The tree community was characterized by slippery elm (*U. rubra*) and red mulberry (*Morus rubra* L.).

Site 4 (Fig. 11). This site was along a gravel road 30 yards west of high limestone cliffs. The roadside was densely shaded by sweet gum (*L. styraciflua*), rough-leaved dogwood (*Cornus drummondii* Meyer), hackberry (*C. occidentalis*), slippery elm (*U. rubra*), redbud (*Cercis canadensis* L.), and pawpaw (*A. triloba*). The most common early

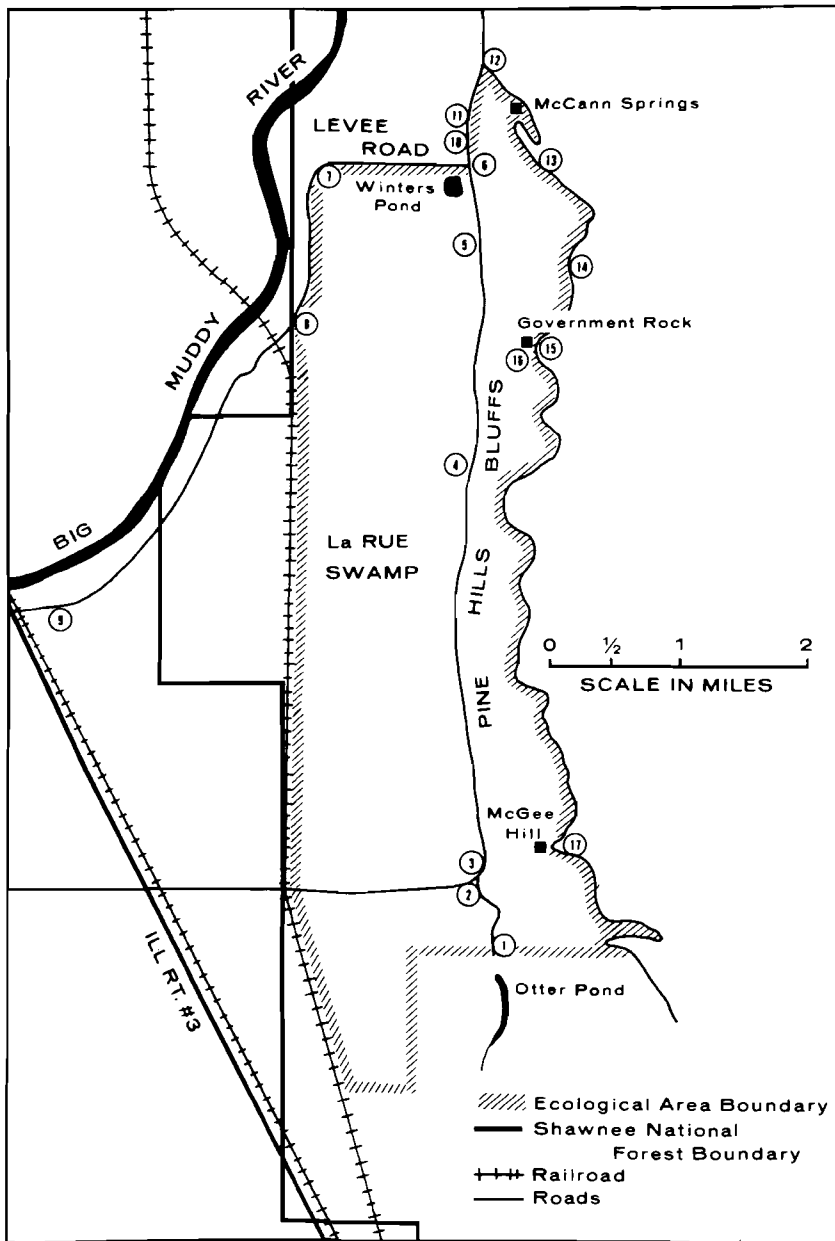


Fig. 6. Map of La Rue-Pine Hills Ecological Area showing location of collecting sites.

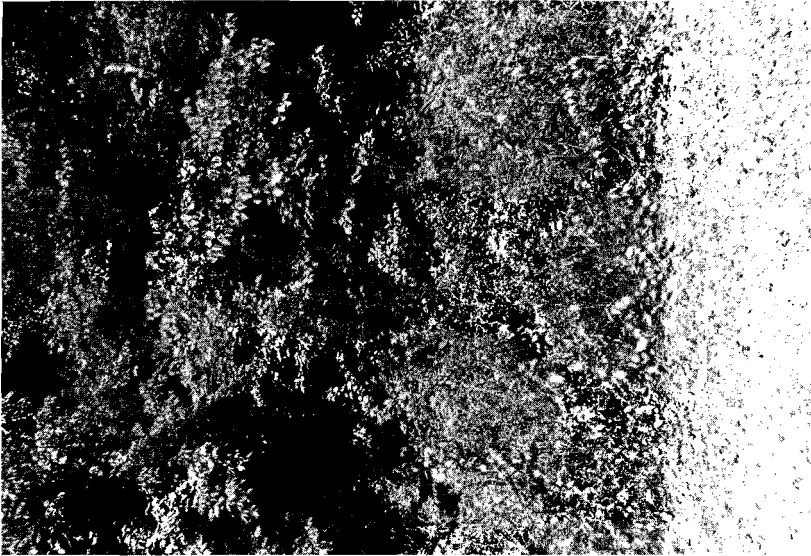


Fig. 8. Collecting site 3.

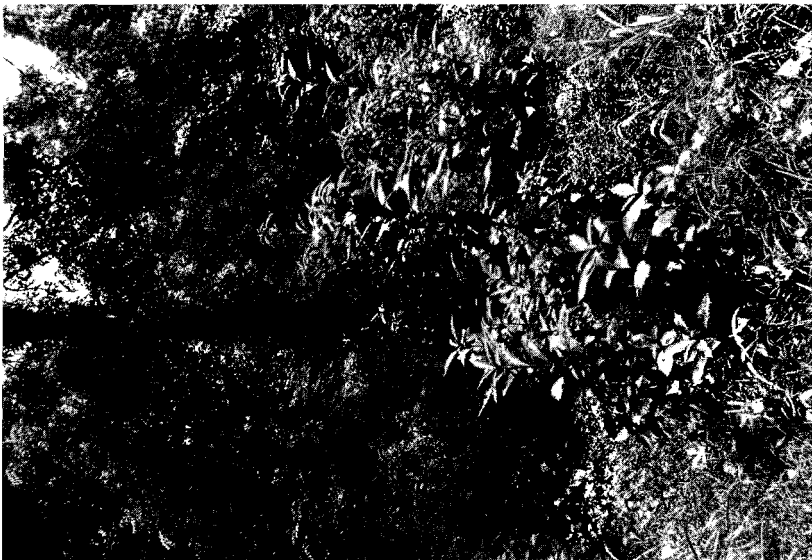


Fig. 7. Collecting site 1.



Fig. 9. Collecting site 2.



Fig. 10. Collecting site 7.

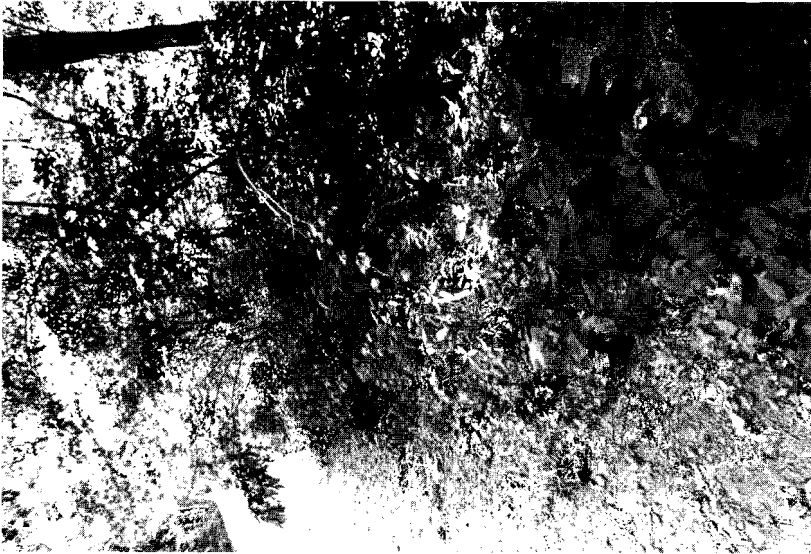


Fig. 12. Collecting site 5.

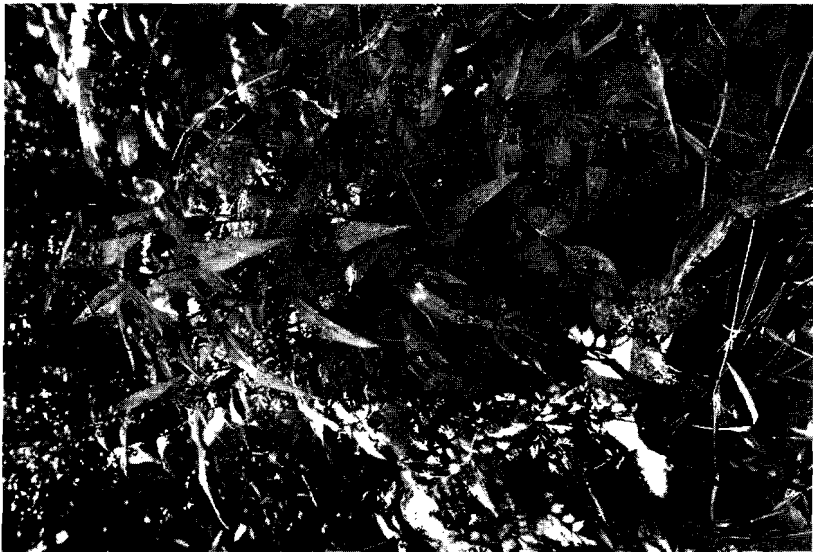


Fig. 11. Collecting site 4. Tall specimens of wide-leaved spiderwort (*Tradescantia subaspera* Ker) are in foreground.

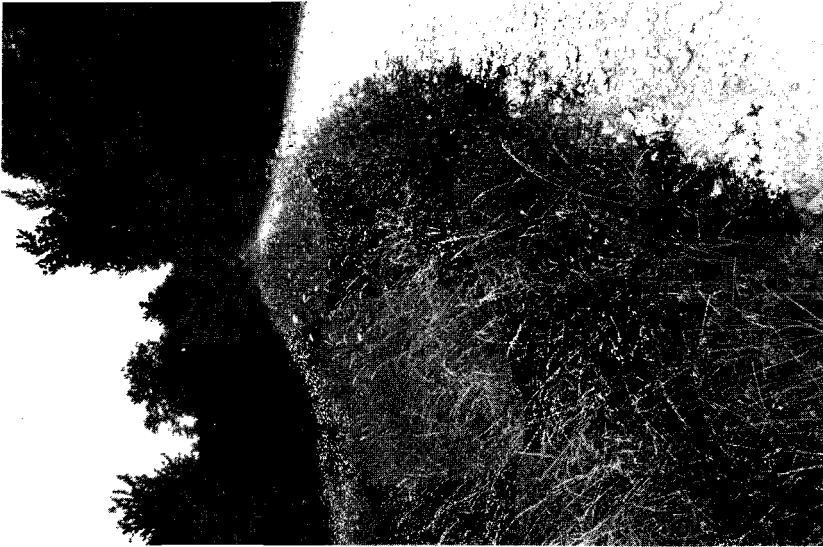


Fig. 14. Collecting site 6 on north side of Levee Road.



Fig. 13. Collecting site 6 on south side of Levee Road.

spring wildflowers were wild geranium (*G. maculatum*), blue phlox (*P. divaricata*), and Miami mist (*Phacelia purshii* Buckley). Dominant herbs during spring and fall were broad-leaved spiderwort (*Tradescantia subaspera* Ker), pagoda plant [*Blephilia ciliata* (L.)], loosestrife (*Lysimachia ciliata* L.), starry campion [*Silene stellata* (L.)], clearweed [*Pilea pumila* (L.)], and orange-spotted touch-me-not (*I. biflora*).

Site 5 (Fig. 12). This site was along the same gravel road mentioned in the site 4 description but about ½ mile farther north. Downy phlox (*Phlox pilosa* L.) was common during spring and early summer. In mid-summer, cup-leaf (*Polymnia uvedalia* L.) and orange-spotted and pale touch-me-nots (*I. biflora* and *I. pallida* Nuttall, respectively) were abundant. Overstory plants included pawpaw (*A. triloba*), redbud (*C. canadensis*), yellow chestnut oak (*Quercus muhlenbergii* Engelm.), and American elm (*U. americana*).

Site 6 (Figs. 13, 14). This site was a disturbed roadside just northeast of Winter Pond. Periodic mowing of this and sites 7, 8, and 9 occurred throughout the summer. Red and white clover (*Trifolium pratense* L. and *T. repens* L., respectively) appeared in early spring, followed by white and yellow sweet clover [*Melilotus alba* Desrousseaux¹ and *M. officinalis* (L.), respectively], and later by hairy aster (*A. pilosus*). Coarse grasses, the most conspicuous feature of this site, included Johnson grass [*Sorghum halepense* (L.)], awnless brome grass (*Bromus inermis* Leysser), barnyard grass [*Echinochloa pungens* (Poiret)], bead-grass (*Paspalum ciliatifolium* Michaux), and green foxtail [*Setaria viridis* (L.)]. Nut sedge (*Cyperus esculentus* L.) was also common.

Site 7 (Fig. 10). This site was along the Levee Road and was unique because of a great encroachment by woody plants. Illinois mimosa [*Desmanthus illinoensis* (Michaux)] and young specimens of white ash (*Fraxinus americana* L.) and honey locust (*Gleditsia triacanthos* L.) were common. Several vines were present, including poison ivy (*R. radicans*), pepper vine [*Ampelopsis arborea* (L.)], winter grape (*Vitis cinerea* Engelm.), catbrier (*Smilax bona-nox* L.), and trumpet-creeper [*Campsis radicans* (L.)]. All herbs flowered during the summer and included wood-sage (*Teucrium canadense* L.), black-eyed susan (*Rudbeckia hirta* L.), wild carrot (*Daucus carota* L.), fleabane [*Erigeron annuus* (L.)], and Indian hemp (*Apocynum cannabinum* L.).

Site 8 (Figs. 15, 16). This site was along the Levee Road a short distance from site 7 and comprised of two distinct plant communities. The first (Fig. 15) was a thick roadside stand of Johnson grass (*S. halepense*), intermixed with wild carrot (*D. carota*), black-eyed susan (*R. hirta*), timothy (*Phleum pratense* L.), green foxtail (*S. viridis*), and purple top (*T. flavus*). The second (Fig. 16) was in the low swale beyond the steep embankment and included goldenrod (*S. canadensis*), thistle [*Cirsium discolor* (Muhlenberg)], ironweed (*Vernonia missurica* Rafinesque-Schmaltz), beggar's lice [*Desmodium paniculatum* (L.)], and evening primrose (*Oenothera biennis* L.).

Site 9 (Fig. 17). This Levee Road site, located a few yards east of Illinois Highway 3, was primarily an open disturbed roadside. Hairy chess (*Bromus tectorum* L.) was predominant during early summer, but was soon over-topped by white and yellow sweet clover (*M. alba* and *M. officinalis*, respectively), wild carrot (*D. carota*), ragweed (*Ambrosia trifida* L.), black-eyed susan (*R. hirta*), goldenrod (*S. canadensis*), Indian hemp (*A. cannabinum*), ironweed (*V. missurica*), and evening primrose (*O. biennis*). Summer grasses included witch grass (*Panicum anceps* Michaux), taller fescue (*Festuca elatior* L.), Johnson grass (*S. halepense*), and purple top (*T. flavus*). Illinois mimosa (*D. illinoensis*) and trumpet-creeper (*C. radicans*) were also common.

Site 10 (Fig. 19). This site included a variety of herbaceous plants beneath an overstory of Mississippi hackberry (*Celtis laevigata* Willdenow) and Kentucky coffee tree [*Gymnocladus dioica* (L.)]. High-climbing winter grape (*V. cinerea*) was abundant in the overstory trees. The predominant herb was wood-sage (*T. canadense*), although prickly sida (*Sida spinosa* L.), wild petunia (*Ruellia humilis* Nuttall), beggar's lice (*Desmodium illinoense* Gray) and hairy aster (*A. pilosus*) were also present.

Site 11 (Fig. 18). This site, on the west side of the Levee Road about ¼ mile north of site 10, was open and disturbed and lacked the over story plants characteristic of site 10. Common plants included beggar's tick [*Bidens aristosa* (Michaux)], Spanish needles

(*Bidens bipinnata* L.), beefsteak plant (*P. frutescens*), swamp milkweed (*Asclepias incarnata* L.), mist flower (*Eupatorium coelestinum* L.), white grass (*Leersia virginica* Willdenow), and barnyard grass (*E. pungens*).

Site 12 (Fig. 21). This site was an open, disturbed habitat between a gravel road and a 30 foot limestone cliff. Common plants included elderberry (*Sambucus canadensis* L.), white vervain (*V. urticifolia*), goldenrod (*S. canadensis*), blue lettuce [*Lactuca floridana* (L.)], wood-sage (*T. canadense*), yellow ironweed (*V. alternifolia*), beefsteak plant (*P. frutescens*), and pale touch-me-not (*I. pallida*).

Site 13 (Figs. 20, 22). This site was along either side of a gravel road which led from the floodplain to the limestone ridge. The roadside had been cleared to a width of 10 yards. Common mullein (*Verbascum thapsus* L.) was the most common species, with sunflower (*Helianthus decapetalus* L.), New England aster (*Aster novae-angliae* L.), partridge pea (*Cassia fasciculata* Michaux), and wild bergamot (*Monarda fistulosa* L.) also present. Seedlings and young trees of red cedar (*Juniperus virginiana* L.), common persimmon (*Diospyros virginiana* L.), smooth sumac (*R. glabra*), and slippery elm (*U. rubra*) had invaded the clearing. New Jersey tea (*Ceanothus americanus* L.) and a large thicket of dwarf sumac (*Rhus copallina* L.) were present.

Site 14 (Fig. 23). This site was at the junction of a cherty slope with the gravel ridge road. New Jersey tea (*C. americanus*) was dominant. Other common species included Indian grass [*Sorghastrum nutans* (L.)], purple top (*T. flavus*), white sweet clover (*M. alba*), goldenrod (*S. canadensis*), rosin weed (*Silphium integrifolium* Michaux), and evening primrose (*O. biennis*).

Site 15 (Fig. 24). This site was a weedy, open area with an encroachment around the periphery by black locust (*Robinia pseudoacacia* L.), smooth sumac (*R. glabra*), New Jersey tea (*C. americanus*), and wild raspberry (*R. occidentalis*). Orchard grass (*Dactylis glomerata* L.), beefsteak plant (*P. frutescens*), bracted plantain (*Plantago aristata* Michaux), and purple top (*T. flavus*) were common.

Site 16 (Fig. 25). This ½ acre site is known as Government Rock Hill Prairie. A hill prairie is a prairie remnant located on primarily limestone cliffs. The vegetation is similar, but on a smaller scale, to the prairies of the Great Plains. Common grasses which predominated were big and little bluestem (*Andropogon gerardii* Vitman and *A. scoparius* Michaux, respectively), Indian grass [*Sorghastrum nutans* (L.)], and side-oats grama [*Bouteloua curtipendula* (Michaux)]. Prairie herbs included butterfly weed (*Asclepias tuberosa* L.), white and purple prairie clover [*Petalostemum candidum* (Willdenow) and *P. purpureum* (Ventenat), respectively] and St. John's-wort (*Hypericum spherocarpon* Michaux). There was also an encroachment by black locust (*R. pseudoacacia*), Iowa crab apple [*Malus ioensis* (Wood)], smooth sumac (*R. glabra*), and rough-leaved dogwood (*C. drummondii*).

Site 17 (Figs. 26, 27). This site was on either side of the ridge road at McGee Hill Vista, the highest elevation above mean sea level at Pine Hills. A short distance below this site was a cherty slope with shortleaf pine (*Pinus echinata* Miller). Giant cane [*Arundinaria gigantea* (Walter)], unusual at this high elevation in southern Illinois, pale touch-me-not (*I. pallida*), Johnson grass (*S. halepense*), and beefsteak plant (*P. frutescens*) were abundant. Woody plants, some occurring as roadside invaders and some as canopy species, included post oak (*Quercus stellata* Wangenheim), white oak (*Q. alba* L.), common persimmon (*D. virginiana*), redbud (*C. canadensis*), black locust (*R. pseudoacacia*), and fragrant sumac (*Rhus aromatica* Aiton). Wild yam (*Dioscorea villosa* L.) occurred as a climber over some of the herbaceous understory.

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Fig. 15. Collecting site 8. Wild carrot (*Daucus carota* L.) is in foreground, Johnson grass [*Sorghum halepense* (L.)] in background.



Fig. 16. Collecting site 8. Wild carrot (*D. carota*) and black-eyed Susan (*Rudbeckia hirta* L.) are in foreground.



Fig. 18. Collecting site 11.

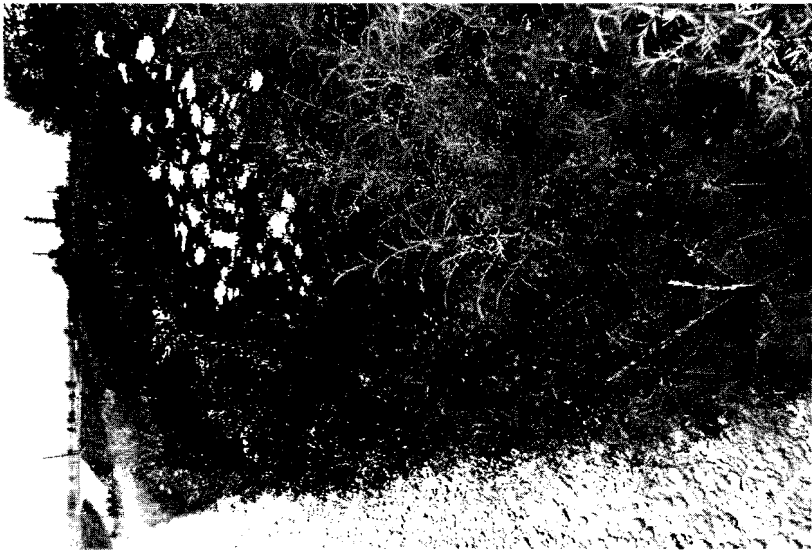


Fig. 17. Collecting site 9. Illinois Route 3 is in background, perpendicular to Levee Road.



Fig. 19. Collecting site 10. Note winter grape (*Vitis cinerea* Engelman) hanging from tree in foreground.



Fig. 20. Collecting site 13 on northeast side of bluff road.

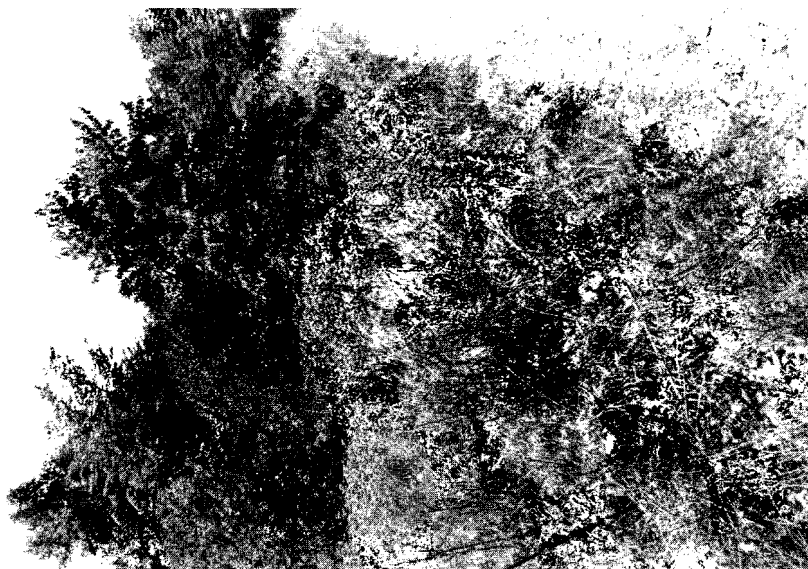


Fig. 22. Collecting site 13 on southwest side of bluff road.



Fig. 21. Collecting site 12. Note dead American elm (*Ulmus americana* L.) covered by poison ivy (*Rhus radicans* L.).



Fig. 24. Collecting site 15. Black raspberry (*Rubus occidentalis* L.) is in foreground.



Fig. 23. Collecting site 14. Sunflower (*Helianthus divaricatus* L.) is in foreground.

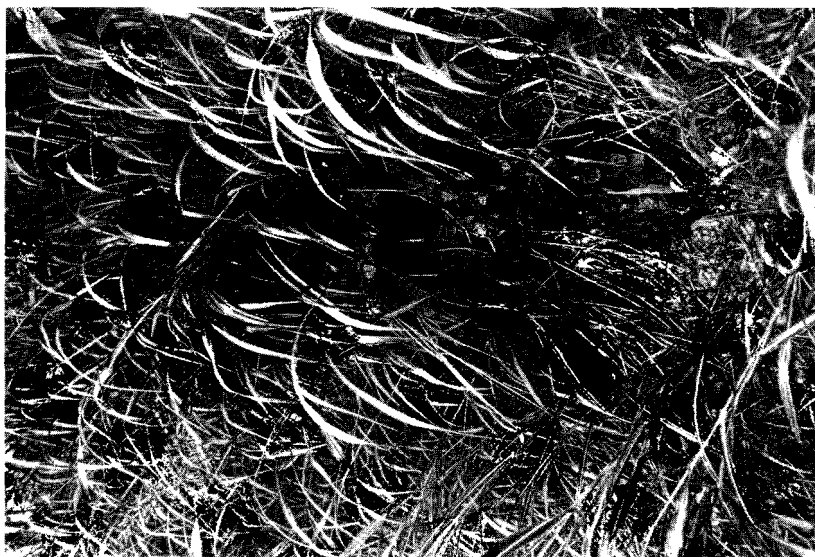


Fig. 26. Collecting site 17 on east side of McGee Hill. Note specimen of wild yam (*Dioscorea villosa* L.) surrounded by Johnson grass (*S. halepense*).

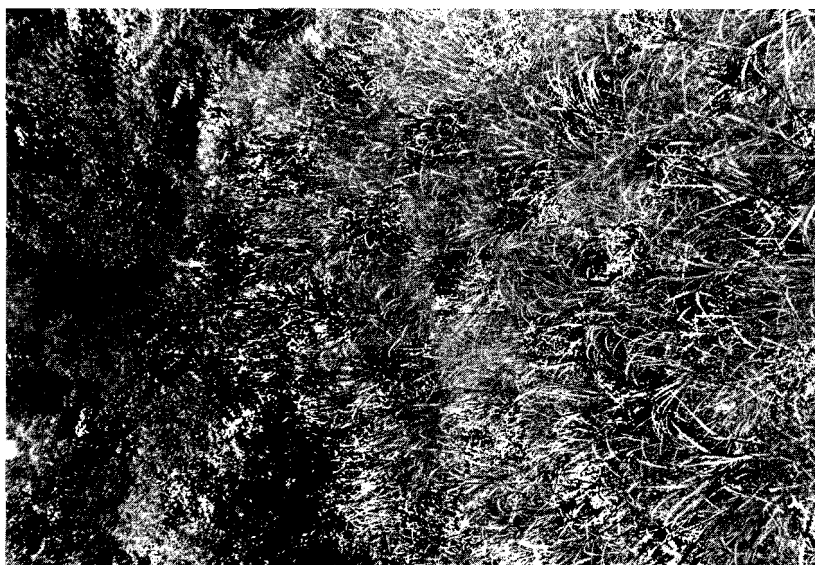


Fig. 25. Collecting site 16. Government Rock hill prairie.



Fig. 27. Collecting site 17 on west side of McGee Hill. Summer grape (*Vitis aestivalis* Michaux) is in foreground.

Research and Projects and Department of Botany, Southern Illinois University at Carbondale (SIUC), who provided the photographs, and Ms. Fredda Burton, Research and Projects, who provided the map figures. We wish to thank Drs. B. D. Burks and C. W. Sabrosky, U. S. National Museum, for identifying the hymenopteran and dipteran parasites, respectively, and Dr. R. H. Foote, Chief, Systematic Entomology Laboratory, U. S. Department of Agriculture, Beltsville, Maryland, for expediting the identifications. We are grateful to Drs. R. A. Brandon, Department of Zoology, SIUC, and L. F. Wilson, USDA Forest Service, North Central Forest Experiment Station, East Lansing, Michigan, for reviewing parts of the manuscript. We are indebted to Dr. R. C. Froeschner, U.S. National Museum, for confirming some of our scutelleroid identifications.

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RESULTS

The superfamily Scutelleroidea was well-represented in the fauna of Pine Hills. We collected 49 species, five of which were state records (Table 3). The remaining 44 represented over 57% of the species listed for Illinois (Table 4).

Such diversity was expected. Over 1,000 species of flowering plants have been recorded for Pine Hills, representing about 30% of the flowering plants in Illinois (Mohlenbrock & Voigt, 1965). About 40 species of mammals (Klimstra, 1969), 30 of reptiles, 20 of amphibians (Rossman, 1960), and 20 of fish (Gunning & Lewis, 1955) have also been recorded.

Common mullein was by far the most common host species, with 14 species of scutelleroids collected from it (Table 5).

Data are summarized as follows:

albus Jones (15 April-5 October)³ (3)⁴. This species was collected on wild carrot (A,F, C,E,N)⁵.

Superfamily SCUTELLEROIDEA
Family SCUTELLERIDAE
Subfamily TETYRINAE
Genus *STETHAULAX* Bergroth

marmorata (Say). (26 May-3 July) (1). This insect occurs on cedar (species unknown) (Blatchley, 1926), *Rhus aromatica* Aiton, *R. canadensis* Marshall (= *R. aromatica*?) (Froeschner, 1941), *R. copallina* L., *R. glabra* L., *Morus rubra* L., and *Thuja occidentalis* L. (Walt & McPherson, 1973). It has been reared in the laboratory (Walt & McPherson, 1972). Notes have been published on its life history and the immature stages described (Walt & McPherson, 1973).

Most Pine Hills specimens were collected at site 1 from red mulberry (A), yellow ironweed (N), and sweeping (N).

Genus *HOMAEMUS* Dallas

parvulus (Germar). This small scutellerid has been collected sweeping tall grasses around ponds and low shrubs in open sandy areas in Florida (Blatchley, 1926), on tumble-mustard in Utah (Knowlton, 1936), and on willow (Deay & Gould, 1935).

An adult female was collected on 29 June, 1972, sweeping orchard grass adjacent to the Hill Prairie (site 16). A second Pine Hills specimen (adult male), collected 7 May, 1966, is deposited in the SIUEM.

Family CORIMELAENIDAE
Genus *GALGUPHA* Amyot & Serville

aterrima Malloch. (19 April-10 August) (3). This mainly eastern species has been collected from ground vegetation on dunes (Hussey, 1922) and sweeping weedy fields (Froeschner, 1941).

Most Pine Hills specimens were collected at sites 1, 9 and 13 sweeping low-lying vegetation. Host plants included blue speedwell (A,F) and reflexed sedge (A).

atra Amyot & Serville. (6 April-3 November) (3). This widespread species occurs in summer on grass and weeds in moist soil along roadsides, stream borders, and forests (Blatchley, 1926) and has been collected on barley, *Plantago aristata* Michaux, *Castilleja sessiliflora* Pursh (Stoner, 1920), and redtop grass (Stoner, 1922).

We collected *atra* specimens at the same sites as *aterrima*. Host plants included common mullein (A), sunflower (A,F), and allegheny blackberry (A,N).

carinata McAtee & Malloch. Information on this uncommon species is limited. The only feeding record is that of Hoffman (1971), who observed it feeding on capsules of *Oxalis* in Virginia.

Discovery of *carinata* was a state record (McPherson, 1974c). However, its collection was not surprising since it had previously been recorded from Missouri (Froeschner, 1941) and Michigan (McPherson, 1970).

An adult male and female were collected at site 10 on 25 May and 27 July, 1973, respectively, sweeping exposed roadside vegetation. We obtained no host plant records.

³Earliest and latest date of collection of adults.

⁴Relative abundance; see p. 129 for explanation of categories.

⁵A, adults; F, feeding; C, copulation; E, eggs; N, nymphs.

denudata Uhler. (19 April-29 September) (2). Nothing has been published on the life history of this species.

Discovery of *denudata*, collected only as adults at Pine Hills, was a state record (McPherson, 1974c). It appeared to prefer low-lying areas; almost all specimens were collected sweeping roadside vegetation at sites 1-4. However, additional collecting may show it to be as widespread at Pine Hills as *atra* and *aterrima*. No host plants were recorded.

We were rarely able to rear *Galgupha* nymphs to adults. Unfortunately, keys are not available to allow separation of these nymphs to species. Thus their life cycles at Pine Hills are still unknown.

Genus CORIMELAENA White

agrella McAtee. (19 April-14 September) (4). The life history of this species has not been studied.

Discovery of *agrella* was a state record (McPherson, 1974c). Only adults were collected, primarily by sweeping roadside vegetation at sites 1-5. Host plants included downy phlox (A,F) at site 5 and wild chervil (A) at site 12.

harti Malloch. Nothing is known of this insect's life history. We collected 1 adult male at Pine Hills 10 August, 1972, sweeping roadside vegetation near site 13.

lateralis *lateralis* (Fabricius) (19 April-19 October) (4). This subspecies is common throughout the midwestern, southern, and eastern United States. Blatchley (1926) reported it from ferns in dense hammocks and leaves of semi-aquatic plants along margins of ponds in Florida, and on weeds and tall grasses near water in Indiana. It has been reared in the laboratory (McPherson, 1971a). Notes have been published on its life cycle on wild carrot and the immature stages described (McPherson, 1972a).

C. l. lateralis was widespread at Pine Hills, but was most often collected on exposed roadside vegetation. Host plants included bottle-brush grass (A), daisy fleabane (A,C) Carolina cranesbill (A,C) wild chervil (A,F) and wild carrot (A,F,C,E,N).

pulicaria (Germar). (11 April-29 September) (4). *C. pulicaria* is common throughout the United States and Canada. It has been collected from numerous plants, including *Veronica peregrina* L., New Jersey tea, Spanish needles, wheat, blue-grass, strawberry, celery (Forbes, 1905), potato (Stoner, 1920), wild plum (Blatchley, 1926), toadflax (Smith, 1959), corn, some ornamental flowers (Metcalfe, Flint & Metcalfe, 1962), and wild carrot (McPherson, 1972a). A brief account of its life cycle is given by Forbes (1905).

C. pulicaria was the most common and widespread corimelaenid at Pine Hills but, surprisingly, only two immatures (5th instars) were collected. Host plants included wild carrot (A,F), Indian hemp (A,F), smooth sumac (A), swamp milkweed (A), common mullein (A), daisy fleabane (A), pussy-toes (A,F), and wild chervil (A).

Family CYDNIDAE

Subfamily CYDNINAE

Genus PANGAEUS Stål

bilineatus (Say). (2 March-10 July) (1). This species attacks spinach (Gould, 1931), cotton seedlings (Cassidy, 1939), pepper seed beds (Tissot, 1939), strawberry (Watson & Tissot, 1942), and peanuts (Smith & Pitts, 1974), and thus is capable of causing economic damage. The literature was summarized through 1950 by Sailer (1954a).

Smith & Pitts (1974) studied this insect's life cycle. It is attacked by the strepsipteran parasite *Triozocera mexicana* Pierce (Johnson, 1973) and the southern fire ant, *Solenopsis xyloni* McCook (Smith & Pitts, 1974).

This species was uncommon at Pine Hills. Only adults were collected, and these by sweeping moist and shady areas at sites 1, 4, and 5.

Genus MELANAETHUS Uhler

pennsylvanicus (Signoret). This species is rare in Illinois, having previously been reported only from Urbana (Hart, 1919) and Charleston (Froeschner, 1960). Since ecological information was essentially lacking for this cydnid, Froeschner (1960) listed the following label information from specimens he examined: "on okra," "swept grasses," "tanglefoot trap posts," "from soil, peach orchard," and "under litter, peach orchard."

We can add little to the above. An adult female was collected at Pine Hills on 5 May, 1972, 1 June, 1973, and 16 August, 1974, sweeping low-lying vegetation at site 1.

robustus Uhler. This cydnid has been swept from herbage in thick, moist woodlands, and found in debris beneath beech in Indiana (Blatchley, 1926), in "woods ground cover" in Illinois (Froeschner, 1960), and in leaf litter at the bottom of a sinkhole in Virginia (Hoffman, 1971).

M. robustus was uncommon at Pine Hills. Two adults were collected 8 June, 1973, sweeping roadside vegetation at site 3. Six additional adults were found with the aid of a Berlese funnel, in leaf litter collected at sites 1-5 on 3 and 17 November, 1972.

Subfamily AMNESTINAE

Genus AMNESTUS Dallas

pallidus Zimmer. This uncommon cydnid has been collected on *Antennaria plantaginifolia* (L.) (Stoner, 1920), on roadside vegetation (Blatchley, 1926), "at *Spartina* consocias" (Hendrickson, 1930), and around lights (Froeschner, 1960).

We can add little to this information. An adult female was swept from low-lying vegetation at site 1 on 1 June, 1973.

pusillus Uhler. (5 May-19 May) (1). As with *pallidus*, this species is attracted to light (Froeschner, 1960). Blatchley (1926) reported it from low vegetation along streams and margins of cultivated fields and roadsides, Torre-Bueno (1915) from beach drift.

The few specimens collected at Pine Hills support Blatchley's statements. All were collected as adults, sweeping roadside vegetation at site 6.

spinifrons (Say). (26 April-1 June). This species appears generally associated with vegetation in moist areas (Van Duzee, 1894; Blatchley, 1926). It has been collected in beach drift (Torre-Bueno, 1915; Froeschner, 1960), on blue-grass on sandy knolls (Stoner, 1920), "at *Andropogon furcatus* consocias" (Hendrickson, 1930), and on beets in Utah (Knowlton, 1932).

A. spinifrons was rare at Pine Hills. An adult female was swept from low-lying vegetation at site 1 on 1 June, 1973, and 26 April, 1974. An adult male specimen, collected at Pine Hills on 7 May, 1966, is housed in the SIUEM.

Subfamily SEHIRINAE

Genus SEHIRUS Amyot & Serville

cinctus cinctus (Palisot de Beauvois). (12 March-7 September) (4). This common subspecies attacks a wide variety of plants including *Monarda punctata* L., sweet clover, *Stachys* (Hart, 1919), raspberry, wild cherry, blue-grass, timothy (Stoner, 1920), milkweed, wild plum (Blatchley, 1926), other mints, nettles (Torre-Bueno, 1939), blackberry, *Solidago*, and *Helianthus* (Froeschner, 1941).

Hoffman (1971) found eggs, nymphs, and adults on 9 August beneath flat boards in a garden. Hart (1919) felt adults overwintered. Our own data would support Hart's contention since we collected adults so late and early in the year. McDonald (1968a) raised *S. c. albonotatus* Dallas on *Stachys palustris* L. in the laboratory and described the eggs and nymphs.

S. c. cinctus occurred throughout the Pine Hills collecting sites. We collected it on beefsteak plant (A), common mullein (A), curly dock (A), common wild rye (A), common persimmon (A), white snakeroot (A), poison ivy (A), yellow ironweed (A),

wood-sage (A,F), Indian hemp (A,F), pussy-toes (A), daisy fleabane (A), and wild chervil (A). We did not collect eggs or nymphs.

Although we have listed several cydnid species as rare at Pine Hills, the burrowing habits of this family make collection of specimens difficult. Thus, some of the cydnid species listed as rare may be more common than our data would indicate.

Family PENTATOMIDAE
Subfamily GRAPHOSOMATINAE
Genus AMAUROCHROUS Stål

cinctipes (Say). (11 May-24 August) (1). This stink bug occurs in low marshy areas or in weeds bordering bodies of water (Froeschner, 1941), and has been collected on *Carex*, *Scirpus* (Hussey, 1922), and cattail rushes (*Typha*) (Davis 1925).

A. cinctipes was rare at Pine Hills. Adults were swept from low-lying vegetation at sites 1 and 6. No eggs or nymphs were collected.

Subfamily PENTATOMINAE
Genus BROCHYMENA Amyot & Serville

arborea (Say). (11 April-1 October) (1). This species is primarily phytophagous, attacking oak, beech, willow, apple, peach, pear, grape, and pine (Ruckes, 1946). However, it occasionally attacks the Colorado potato beetle (Hart, 1919).

This species has been reared from nymph to adult on 'bush bean' (Torre-Bueno, 1908). It is parasitized by the scelionid *Trissolcus brochymenae* (Ashmead) (Ashmead, 1893).

B. arborea was rare at Pine Hills and collected only from black walnut (A) at site 1.

quadripustulata (Fabricius). (11 April-16 October) (1). This species attacks elm, mountain ash, pine, sumac, grape, cherry, apple, and pear (Ruckes, 1946). It occasionally attacks soft-bodied larvae (Ruckes, 1946).

B. quadripustulata has been reared from nymph to adult on 'cultivated bean' (Torre-Bueno, 1909). Notes on its sexual behavior have been published (Gamboa & Alcock, 1973). Knowlton (1944) stated it was attacked by birds.

This species was more common at Pine Hills than *arborea*, and showed no marked site preference. We collected 2nd-5th instars between 22 June and 10 August and thus it was probably univoltine. However, our data were too limited to be certain.

Host plants included black walnut (A), common wild rye (N), trumpet-creeper (N), and white ash (N,F).

Genus HOLCOSTETHUS Kirkaldy

limbolarius (Stål). (13 July-26 October) (2). This species has been collected from numerous plants, including goldenrod (Kirkaldy, 1909), cauliflower (Hart, 1919), timothy, red clover, sweet clover, common mullein, wild grape (*Vitis vulpina* L.), ragweed (Stoner, 1920), wheat (Pack & Knowlton, 1930), cabbage, various melon vines (Froeschner, 1941), pepper-grass (Esselbaugh, 1948), winter cress, cheat, and alfalfa (Oetting & Yonke, 1971c).

H. limbolarius has been reared in the laboratory (Esselbaugh, 1948; Oetting & Yonke, 1971c). Notes have been published on its life history (Oetting & Yonke, 1971c) and the eggs (Esselbaugh, 1946) and nymphs (DeCoursey & Esselbaugh, 1962) described.

This stink bug is attacked by the tachinid parasites *Gymnoclytia occidua* (Walker) (Rings & Brooks, 1958), *Cylindromyia fumipennis* (Bigot), *Gymnosoma fuliginosum* Robineau-Desvoidy, and *G. occidentale* Curran (Oetting & Yonke, 1971c). It is also parasitized by the scelionid *Telenomus podisi* Ashmead (Muesebeck *et al.*, 1951).

It is impossible from our limited data, to state whether this species was uni- or bivoltine at Pine Hills. Third and 4th instars were collected during July; 5th instars from

early July to early September. All were collected sweeping roadside vegetation at sites 9, 13, and 15. Stoner (1920) and Oetting & Yonke (1971c) stated that it was at least bivoltine in Iowa and Missouri, respectively.

The only host plant recorded was common mullein (A).

Genus TRICHOPEPLA Stål

semivittata (Say). (3 May-3 August) (1). This species feeds on wild carrot (Kirkaldy, 1909), button snakeroot, and other species of Umbelliferae (Blatchley, 1926). Van Duzee (1904) found it in all stages of development on the blossoms of wild carrot.

T. semivittata has been reared in the laboratory (Esselbaugh, 1948; McPherson, 1972b). Some notes have been published on its life history (Esselbaugh, 1948) and the eggs (Esselbaugh, 1946) and nymphs (DeCoursey & Esselbaugh, 1962) described. It is parasitized by the scelionid *Telenomus podisi* (Muesebeck *et al.*, 1951).

T. semivittata was uncommon at Pine Hills. Adults and 5th instars were collected on wild carrot (A,F,N) or sweeping vegetation near wild carrot, primarily at sites 8 and 13. The 5th instars were collected 10 and 31 July, 1972, and thus, the number of generations per year remains unknown. Esselbaugh (1948) felt it was probably bivoltine in central Illinois.

Genus MORMIDEA Amyot & Serville

lugens (Fabricius). (19 April-2 November) (4). This common species is frequently collected from vegetation along roadsides and borders of cultivated fields in dry sandy places (Blatchley, 1926). It occurs on *Ceanothus* (Banks 1912), *Verbascum* (Kirkaldy, 1909), raspberry (Hussey, 1922), strawberry bush (Blatchley, 1926), blue-grass, *Actinomeris alternifolia* (L.), *Setaria*, *Hydrophyllum appendiculatum* Michaux (Esselbaugh, 1948), and cheat (Oetting & Yonke, 1971c).

M. lugens has been reared in the laboratory through some stages by Esselbaugh (1948) and Oetting & Yonke (1971c) and from egg to adult by McPherson (1974a). The eggs (Esselbaugh, 1946) and 1st, 2nd, 4th, and 5th instars have been described (DeCoursey & Esselbaugh, 1962).

M. lugens is parasitized by the tachinid *Cylindromyia dosiades lobata* Sabrosky (Oetting & Yonke, 1971c), and preyed upon by the wasp genus *Bicyrtes* (Evans, 1966).

This bivoltine species was common at Pine Hills, and overwintered as adults (McPherson, 1974a). Young instars (2nds-3rds) were collected from late May to mid-June and from early August to the third week of September, older instars (4ths-5ths) from mid-June to mid-July and from mid-August to early November. Newly emerged, red adults were collected in late July.

M. lugens was generally collected in or near site 1, sweeping shaded low-lying vegetation. Host plants included timothy (A,F), pale sedge (A), short sedge (A,F), narrow-leaved sedge (A,F), larger straw sedge (A,F), deer-tongue grass (A,F,N), Bosc's panic-grass (A,F), and wide-leaved spiderwort (N).

Genus OEBALUS Stål

pugnax (Fabricius). (12 May-3 November) (4). This pest species attacks several plants including wheat, rice, corn, *Panicum*, *Setaria* (Torre-Bueno, 1939), asparagus (Esselbaugh, 1948), and *Sorghum vulgare* Persoon (Dahms, 1942). It also reportedly attacks the "cotton worm," *Alabama argillacea* (Hubner) (Riley, 1885). The economic literature for this insect through 1942 was summarized by Sailer (1944).

O. pugnax has been reared in the laboratory (Esselbaugh, 1948) and the eggs (Garman, 1891; Ingram, 1927; Douglas & Ingram, 1942; Esselbaugh, 1946) and 1st, 2nd, 4th, and 5th instars (Ingram, 1927; Douglas & Ingram, 1942; DeCoursey & Esselbaugh, 1962) have been described.

O. pugnax is attacked by red-winged blackbirds, 2 hymenopteran egg parasites

[*Ooencyrtus anasae* (Ashmead) and *Telenomus podisi*] (Ingram, 1927), and a fungus (*Sporotrichum globuliferum* Spegazzini) (syn. of *Beauveria globulifera*) (Headlee & McCulloch, 1913).

This stink bug was common at Pine Hills, especially in 1972, and probably bivoltine. Young instars (1sts-3rds) were found from late May to late June and from early August to late September, older instars (4ths-5ths) from late June to mid-October. Apparently adults overwintered. According to Douglas (1939), this species can be trivoltine in Louisiana and Texas.

Most specimens of *pugnax* were collected on Johnson grass (A,F,C,E,N) at site 8. Numerous copulating pairs were observed on the heads and stems of this grass during the day; Davis (1925) reported similar observations at night. It was also swept from black raspberry (A), wild carrot (A), orchard grass (A), and goldenrod (A,N).

The tachinid parasite *Gymnoclytia immaculata* (Macquart) emerged from *pugnax* adults.

Genus EUSCHISTUS Dallas

ictericus (Linnaeus). (19 April-28 September) (1). This species is most frequently found on vegetation growing in or near water (Blatchley, 1926). Kirkaldy (1909) recorded it from carices in wet places and *Iris versicolor* L., Hussey (1922) from *Saururus cernuus* L., and Froeschner (1941) from *Salix* bordering bodies of water.

This was the rarest of the *Euschistus* species found at Pine Hills. Only adults (1 male, 9 females) were collected. The majority were found at site 1, thus supporting Blatchley's statement. The one exception was a female collected on mullein at site 13, 6 June, 1973.

politus Uhler. (13 April-13 October) (3). This species occurs in pine woods on scrub-oak (Olsen, 1912) and on goldenrod and hazel (Blatchley, 1926). It has been reared in the laboratory (McPherson, 1974a).

E. politus was relatively common at Pine Hills as adults but little evidence of reproduction was seen (McPherson, 1974a). Copulation was observed in late May. Late instars (4ths-5ths) were collected from late June to the third week of July and again from mid-August to early September. Thus it possibly was bivoltine. It apparently overwintered as adults.

All specimens were collected in or near site 13 on mullein (A,F,C,N) or by sweeping (A,N).

servus (Say). (6 April-2 November) (4). *E. servus* is divided into two subspecies, *E. s. servus* and *E. s. euschistoides* (Vollenhoven). The Pine Hills population falls in the zone of intergradation between these subspecies (Sailer, 1954b).

E. servus feeds on several plants including cotton (Morrill, 1910), red clover, timothy, corn, wheat (Stoner, 1920), raspberry, blackberry, smooth sumac (Stoner, 1922), dogwood, wild hydrangea, goldenrod, thistle (Blatchley, 1926), pear (Mundinger & Chapman, 1932), peach (Chandler & Flint, 1939), cantaloupe (Gould, 1943), tobacco (Jewett, 1955), common mullein (Woodside, 1946b), *Erigeron annuus* (L.), buckhorn plantain, oxeye daisy, sweet clover, wild carrot, yarrow, pigweed, chicory, evening primrose, sunflower (Woodside, 1947), tomato, and pepper (McPherson, 1970).

The hybrid population has been reared under insectary conditions (Woodside, 1946b). Life history and laboratory rearing information have been published for *s. servus* (Rolston & Kendrick, 1961) and *s. euschistoides* (Esselbaugh, 1948). The eggs and nymphs of *s. euschistoides* have been described (DeCoursey & Esselbaugh, 1962).

E. s. servus is attacked by the tachinid parasites *Gymnosoma fuliginosum* and *Cylindromyia binotata* (Bigot) (Rolston & Kendrick, 1961). Hymenopteran parasites include the scelionids *Telenomus podisi* (Muesebeck *et al.*, 1951), *T. ashmeadi* Morrill (syn. of *T. utahensis* Ashmead) (Morrill, 1907), and *Trissolcus euschisti* (Ashmead) (Ashmead, 1893).

This was the most common and widespread scutelleroid in the Pine Hills collecting sites. It was bivoltine with most young instars (2nds-3rds) collected from mid-May to late

June and from late July to mid-September, older instars (4ths-5ths) from early June to late July and from mid-August to mid-October.

Host plants included mullein (A,F,C,N) Carolina cranesbill (A,F,E,N), common wild rye (A,F,C), slippery elm (A), trumpet creeper (A), orchard grass (N), white snakeroot (A), Indian hemp (A,F), white sweet clover (A,F), red clover (A), wild carrot (A,F,N), Johnson grass (A,F,N), wild yam (A), buckhorn (A,F), bead-grass (A), Canadian wild rye (F,N), prickly lettuce (A,F), yellow sweet clover (A,F), curly dock (A,F,N), wide-leaved spiderwort (F,N), timothy (A,F), elderberry (A,F), panic-grass (N), Canada thistle (A,F,N), beefsteak plant (A,F), goldenrod (N), and daisy fleabane (A,F).

Three tachinid parasites, *Cylindromyia binotata*, *Euthera tentatrix* Loew, and *Gymnocyrtia immaculata* emerged from *servus* adults.

tristigmus tristigmus (Say) [inc. *t. pyrrhocerus* (Herrich-Schaeffer)]. (23 March-13 November) (4). This subspecies attacks several plants including cotton (Morrill, 1910), ragweed, oak (Froeschner, 1941), peaches (Woodside, 1946a), common mullein (Woodside, 1946b), *Erigeron annuus* (Woodside, 1947), wild raspberry, wild blackberry, elderberry (Esselbaugh, 1948), sweet corn (McPherson, 1970), and wild carrot (McPherson, 1972a).

This insect has been reared under caged conditions (Woodside, 1946b; Esselbaugh, 1948; McPherson, 1971b) and the eggs (Esselbaugh, 1946) and nymphs (DeCoursey & Esselbaugh, 1962) described. It is preyed upon by *Podisus maculiventris* (Say) (Kirkaldy, 1909).

E. t. tristigmus was common at Pine Hills but limited in distribution; most individuals were found near water at sites 1, 6, and 12. It was bivoltine with most young instars (1sts-3rds) found from mid-May to late June and from early August to late September, older instars (4ths-5ths) from early June to late July and from mid-August to late October (McPherson, 1975).

Woodside (1946b) felt this species was bivoltine in Virginia. Esselbaugh (1948) stated it had two partial generations per year around Urbana, Illinois.

This stink bug was found most frequently on beefsteak plant (A,F,N), less frequently on yellow sweet clover (A), red mulberry (A), slippery elm (A,E), Carolina cranesbill (N), wild hydrangea (A), common mullein (A,F,C,N) allegheny blackberry (N), yellow ironweed (A), wide-leaved spiderwort (A,F,C,N), black raspberry (A), orchard grass (A), wild carrot (A), foxtail (A), grape (A), wood-sage (A), ironweed (A,F), bead-grass (A), green foxtail (F,N), bog-hemp (A,N), and horse-nettle (A).

Two parasites, the scelionid *Trissolcus euschisti* and the tachinid *Euthera tentatrix*, emerged from *t. tristigmus* eggs and adults, respectively.

variolarius (Palisot de Beauvois). (23 March-3 November) (3). This species attacks several plants including mullein, thistle (Olsen, 1912), peach (Pack & Knowlton, 1930), pear (Mundinger & Chapman, 1932), corn, oats, wheat, blue-grass, wild rye, red clover, white clover, gooseberry, tomato, onion, squash, pea, wild sunflower (Parrish, 1934), cantaloupe (Gould, 1943), tobacco, cotton, asparagus, beans, and raspberry (Esselbaugh, 1948).

E. variolarius has been reared under controlled conditions (Olsen, 1912; Foot & Strobell, 1914; Parrish, 1934; Mundinger, 1940; Woodside, 1946b; Esselbaugh, 1948; Rings & Brooks, 1958) and the eggs (Parrish, 1934; Esselbaugh, 1946) and nymphs (Parrish, 1934; DeCoursey & Esselbaugh, 1962) have been described.

E. variolarius is attacked by the tachinid parasites *Trichopoda pennipes* (Fabricius), *Gymnosoma fuliginosum*, *Cistogaster immaculata* Macquart (syn. of *Gymnocyrtia immaculata*) (Parrish, 1934), *Euthera tentatrix*, *Cylindromyia binotata*, *C. fumipennis* and *Gymnocyrtia occidua* (Rings & Brooks, 1958). It is also attacked by birds (Knowlton, 1944) and *Chrysopa* larvae (Rings & Brooks, 1958).

E. variolarius was collected most frequently as adults at Pine Hills. Nymphs (2nd-5th instars) were collected from late May to early July but because they were so few in number, it was impossible to determine if this species was uni- or bivoltine. Parrish (1934), Mundinger (1940), and Woodside (1946b) felt it was univoltine, Esselbaugh (1948) bivoltine.

Most specimens were collected at site 13. Host plants included common mullein (A,F,N) and little barley (A,F). Other specimens were collected sweeping low-lying vegetation at site 1 and roadside vegetation at sites 3, 7, and 9.

Genus PROXYS Spinola

punctulatus (Palisot de Beauvois). (12 June-18 October) (3). This species is primarily southern in distribution and thus, Pine Hills must presently be considered near the northern limit of its range. It has been collected beneath logs in sandy areas in Indiana (Blatchley, 1926), in Japanese beetle traps in Missouri (Froeschner, 1941), and at electric street lights in southern Illinois (Hart, 1919). Morrill (1910) reported its occurrence on cotton and stated it was normally predaceous. Riley (1885) reported its attack on the "cotton worm," *A. argillacea*. Ashmead (1895) stated it attacked cotton.

P. punctulatus was common at Pine Hills but fed only on wide-leaved spiderwort found at sites 1-5. This information casts doubt on Morrill's statement about its predaceous activities.

Vangeison and McPherson (1975) studied its life history, most data being collected at Pine Hills, reared it under laboratory conditions, and described the eggs and nymphs. Also, its reproductive behavior was investigated.¹

P. punctulatus emerged from overwintering sites during the second week of June and began feeding and copulating on inflorescences and leaves of wide-leaved spiderwort. The eggs and 1st-5th instars were also found on the host plants. Adults overwintered in leaf litter. This species was at least partially bivoltine.

No parasites were found but a 4th instar assassin bug, *Sinea spinipes* (Herrich-Schaeffer) and an immature crab spider, *Xysticus* sp., were observed feeding on a 3rd and 5th instar, respectively, of *punctulatus* (Vangeison and McPherson, 1975).

Genus COENUS Dallas

delius (Say). (6 April-6 October) (2). This species has been collected from several plants including wild raspberry (Stoner, 1922), timothy, clover, moth mullein, blue-grass (Torre-Bueno, 1939), soybeans, bull thistle, alfalfa, sweet clover, yellow foxtail, and red clover (Oetting & Yonke, 1971c).

C. delius has been reared in the laboratory through the 3rd instar by Esselbaugh (1948) and to adult by Oetting & Yonke (1971c). Notes have been published on its life history and the eggs (Esselbaugh, 1946) and nymphs (DeCoursey & Esselbaugh, 1962) described.

This species was not common at Pine Hills. Only adults and 5th instars were collected, the latter between late May and late June. Thus, the number of generations per year was impossible to determine. Stoner (1920), Esselbaugh (1948), and Oetting and Yonke (1971c) felt it was univoltine. Our data support their opinion.

Most specimens of *delius* were collected sweeping grassy areas at sites 6 and 13. Host plants included common wild rye (A,F,N), timothy (A,F), and common mullein (A).

Genus HYMENARCYS Amyot & Serville

aequalis (Say). This species is considered rare throughout its range. It has been collected from mullein, thistle (Blatchley, 1926), *Hydrophyllum appendiculatum* (Esselbaugh, 1947), cheat, and blue-grass (Oetting & Yonke, 1971b).

H. aequalis has been reared in the laboratory (Oetting & Yonke, 1971b) and the eggs (Esselbaugh, 1946; Oetting & Yonke, 1971b) and nymphs (Esselbaugh, 1947; Oetting & Yonke, 1971b) have been described. The number of generations per year is still unknown.

This species was rare at Pine Hills. An adult male and female were collected sweeping low-lying vegetation at sites 8 (13 July, 1973) and 1 (1 June, 1973), respectively. No host plants were recorded.

nervosa (Say). (6 April-5 October) (3). This species apparently is more common throughout its range than *aequalis*. Host plants include cotton (Kirkaldy, 1909), sunflower (Adams & Gaines, 1950), red clover, white clover, low hop clover, timothy, blue-grass, and cheat (Oetting & Yonke, 1971b).

H. nervosa has been reared in the laboratory (Oetting & Yonke, 1971b). Notes have been published on its life history and the eggs and nymphs described (Oetting & Yonke, 1971b).

One tachinid parasite, *Gymnocyttia immaculata*, is known to attack this stink bug (Oetting & Yonke, 1971b).

H. nervosa was relatively common at Pine Hills and found most frequently at sites 1, 7, and 13. It was difficult from our data to determine the number of generations per year. Most eggs and young instars (1sts-3rds) were found from mid-May to late June, older instars (4ths-5ths) from mid-June to mid-July. After early August, it was difficult to find immatures or adults. However, some adults collected in a log in Williamson County in early September, 1973, were probably overwintering at this time. These data suggest that this species was univoltine at Pine Hills.

Oetting and Yonke (1971b) stated this species was bivoltine in Missouri with eggs of the second generation collected during the first half of August; 5th instars during the first half of September. Thus it appears that either this insect differs in number of generations per year in Missouri and Illinois, or we overlooked the second generation during each year of this study. We find it difficult to decide which possibility is more likely.

Host plants at Pine Hills included common mullein (A,C), beefsteak plant (A), drop-seed (N), and Carolina cranesbill (A,F,E,N).

Genus AELIA Fabricius

americana Dallas. Little information is available for this rare species. The genus has been reported to attack wheat kernels (Kretovich, 1944). It had been collected from apple tree orchards in Missouri (Froeschner, 1941) and driftwood in Nebraska (Zimmer, 1911).

This stink bug is rare in southern Illinois. Although no specimens were found during this study, an adult male collected at Pine Hills 26 May, 1961, is housed in the SIUEM. This and four other southern Illinois specimens in the collection represented a state record (McPherson, 1974b).

Genus NEOTTIGLOSSA Kirby

cavifrons Stål. This species has been collected from several plants including bush clover (*Lespedeza* sp.) (Blatchley, 1926), *Pycnanthemum* (Hart, 1919), blue-grass, red top (Esselbaugh, 1948), and cheat (Oetting & Yonke, 1971c). It appears to prefer dry sandy areas.

N. cavifrons has been reared in the laboratory through the 2nd instar (Oetting & Yonke, 1971c). Some notes have been published on its life history (Oetting & Yonke, 1971c) and the eggs described (Esselbaugh, 1946).

This stink bug was rare at Pine Hills. An adult male and female were swept from roadside grasses at site 15 on 18 May and 4 May, 1973, respectively. A 2nd female was swept from roadside vegetation at site 8 on 10 May, 1974.

sulcifrons Stål. This species has been collected from oak, timothy (Blatchley, 1926), blue-grass (Stoner, 1920), and red top (Esselbaugh, 1948). The eggs (Esselbaugh, 1946) and 1st, 2nd, 4th, and 5th instars have been described (DeCoursey & Esselbaugh, 1962).

No specimens were collected during this study. However, two adult female specimens, collected at Pine Hills 27 April, 1965, are housed in the SIUEM.

Genus COSMOPEPLA Stål

bimaculata (Thomas). (12 March-14 September) (4). This common species has been collected from wild columbine (Van Duzee, 1894), *Ranunculus*, *Scrophularia nodosa* L.,

currant, blackberry, mint, mullein, potato, raspberry, thistle (Kirkaldy, 1909), moth mullein (Olsen, 1910), *Stachys*, pokeberry (Hart, 1919), wild carrot, *Thaspium aureum* Nuttall [= *T. trifoliatum* (L.)] (Stoner, 1920), *Potentilla monspeliensis* L. (= *norvegica* L.) (Stoner, 1922), snapdragon (Balduf, 1926), greater ragweed, nettle, oats, bouncing-bet (Blatchley, 1926), beardtongue (Griswold, 1937), goldenrod (Torre-Bueno, 1939), *Collinsia verna* Nuttall, *Leonurus* (motherwort), *Ranunculus abortivus* L., *Sanicula canadensis* L., *Physostegia virginiana* (L.), *Hydrophyllum appendiculatum* (Esselbaugh, 1948), and *Gypsophila* (Hoffman, 1971).

C. bimaculata has been reared in the laboratory (Olsen, 1910; Esselbaugh, 1948; McDonald, 1968b). Some notes have been published on its life history (Balduf, 1926; McDonald, 1968b), including reproductive behavior (Fish & Alcock, 1973), and the eggs (Esselbaugh, 1946; McDonald, 1968b) and nymphs (DeCoursey & Esselbaugh, 1962) described.

This stink bug is parasitized by the scelionids *Telenomus cosmopeplae* Gahan (Gahan, 1926; Balduf, 1926) and *T. podisi* (Muesebeck *et al.*, 1951).

C. bimaculata was common at Pine Hills, especially in 1972, and collected most frequently at sites 1, 6, 10, 11, and 12. It was probably bivoltine. Reproduction began in early May, with several copulating pairs observed. Young instars (1st-3rds) were found from late May to mid-July, older instars (4ths-5ths) from mid-June to the 3rd week of July and from mid-August to mid-September. New adults appeared in late June as evidenced by cast 5th instar skins; copulation was seen again at this time. Thus, there was sufficient time for these new adults to have given rise to the 5th instars collected in mid-September.

Host plants included curly dock (A,F), buckhorn (F,N), wild carrot (A,F), cheat (A,F), blue speedwell (A,F,C), trumpet-creeper (A,C), common mullein (A,C), Carolina cranesbill (A,F,C,N), timothy (A), and wood-sage (A,F,N). Carolina cranesbill and wood-sage were the preferred hosts.

Genus MENECLÉS Stål

insertus (Say). Little is known about this species. It apparently is nocturnal, arboreal (Park & Strohecker, 1936) and primarily phytophagous, feeding on elm, beech, hackberry, hard maple, and hickory (Balduf, 1945). Kirkaldy (1909) listed it as a predator of gypsy moth.

This species has been reared through the 4th instar on head lettuce and honeysuckle berries (Esselbaugh, 1948). The eggs (Esselbaugh, 1946) and nymphs (DeCoursey & Esselbaugh, 1962) have been described.

One adult female was collected at Pine Hills on 22 June, 1973, sweeping vegetation at the forest edge at site 1.

Genus THYANTA Stål

calceata (Say). (15 May-16 November) (3). This species has been collected from several plants including red clover, white clover, ladino clover, goldenrod, blue-grass, mullein, cheat, wheat, timothy, winter cress, milkweed, horseweed, buckbrush, sericea, *Lepedeza*, soybeans, beans, peas, and tomato plants (Oetting & Yonke, 1971c).

T. calceata has been reared in the laboratory, and the eggs have been described (Oetting & Yonke, 1971c).

The only parasite recorded for *calceata* is the tachinid *Gymnoclytia occidua* (Oetting & Yonke, 1971c). However, several additional parasites have been collected from *T. custator* (Fabricius), a closely related species, including the hymenopteran egg parasite *Eupelmus hirtus* Ashmead [syn. of *Anastatus hirtus* (Ashmead)] (Ashmead, 1885), *Trissolcus thyantae* Ashmead (Ashmead, 1893), *Telenomus ashmeadi* (syn. of *Telenomus utahensis*) (Morrill, 1907), *Telenomus podisi* (Muesebeck *et al.*, 1951), possibly *Hadronotus mesillae* Cockerell (syn. of *Telenomus utahensis*) (Cockerell, 1897), and the tachinid parasites *Cylindromyia fumipennis*, and *Euclytia flava* (Townsend) which develop in nymphs

(Oetting & Yonke, 1971c). Some species of birds have been listed as predators of *T. custator* (Knowlton, 1944). The entomogenous fungi *Sporotrichum globuliferum* (syn. of *Beauveria globulifera*) and *Entomophthora aphidis* Hoffman also attack *custator* (Headlee & McColloch, 1913).

T. calceata was collected at Pine Hills almost exclusively at site 13. It probably was bivoltine. Young instars (2nds-3rds) were found from late August to early September. However, older instars (4ths-5ths) were collected from early June to early October. Oetting & Yonke (1971c) felt this species was probably bivoltine in Missouri, Esselbaugh (1948) at least partially bivoltine in Illinois.

It should be noted that *calceata* adults were dimorphic. Summer adults were green with sparse pubescence, spring and fall adults brown with heavier pubescence. Dimorphism in *Thyanta* was discussed by Ruckes (1957).

Host plants at Pine Hills included common brome-grass (A), common mullein (A,F,C,N), and allegheny blackberry (A,N).

pallido-virens accerra (McAtee). (19 April-16 November) (1). This subspecies has been collected from a wide range of host plants including asparagus, corn (Hart, 1919), clover, goldenrod (Blatchley, 1926), buckwheat, *Panicum*, lima beans, cow-peas, alfalfa, soybeans, ragweed, yarrow, chickory, and oxeye daisy (Hoffman, 1971). To our knowledge, this stink bug has not been reared in the laboratory nor have the eggs and nymphs been described.

The wasp genus *Bicyrtes* uses this stink bug in its nest provisions (Evans, 1966).

This subspecies was much rarer at Pine Hills than *T. calceata* but more widely distributed among the collecting sites. Most specimens were collected as adults and swept from open grassy areas at sites 9 and 13. A 4th instar was collected on both 17 July, 1972 and 10 August, 1973, sweeping grasses at site 13. Thus the data were too limited to determine the number of generations per year.

No host plants were discovered.

Genus NEZARA Amyot & Serville

viridula (Linnaeus). This cosmopolitan stink bug is important economically, and has been well investigated. DeWitt & Godfrey (1972) have thoroughly summarized the literature which includes studies on host plants, parasites, and immature stages.

N. viridula is limited in distribution in the United States, ranging from Virginia and Florida west to Texas (Blatchley, 1926).

On 26 July, 1974, a 3rd instar was swept from roadside vegetation at site 8. It was subsequently reared to adult in the laboratory on green beans (McPherson & Cuda, 1974).

The discovery of this insect at Pine Hills represented a state record. Pine Hills lies near the northern edge of this stink bug's range.

Genus ACROSTERNUM Fieber

hilare (Say). (16 April-31 October) (3). The literature on this large green stink bug is extensive but has been adequately summarized by Esselbaugh (1948) and Sailer (1953).

This species attacks a wide range of host plants including goldenrod (Torre-Bueno, 1908), tomato, eggplant, turnip, cotton, mustard, pea, orange, beans, cabbage, corn, peach, okra (Morrill, 1910), grape, apple, ash, catalpa (Hart, 1919), hazel, basswood, black cherry (Stoner, 1920), apricot (Pack & Knowlton, 1930), pear (Mundinger & Chapman, 1932), elderberry, and asparagus (Esselbaugh, 1948). Thus it is capable of causing economic damage. It is also reported to feed on some insect larvae (Olsen, 1912).

Recently, several papers have been published concerning its potential as a vector of yeast-spot disease of soybeans (Foster & Daugherty, 1969; Clark & Wilde, 1970a,b, 1971).

A. hilare has been reared under caged conditions (Whitmarsh, 1914; 1917; Sorenson & Anthon, 1936; Underhill, 1934; Esselbaugh, 1948; Sailer, 1953; Wilde, 1968). The eggs

and nymphs have been most thoroughly described by Esselbaugh (1946) and DeCoursey & Esselbaugh (1962), respectively.

Several parasites of *hilare* have been discovered including *Trichopoda pennipes* (Schoene & Underhill, 1933) and *Hexacladia hilaris* Burks (Burks, 1972) from nymphs and adults and *Anastatus reduvii* (Howard), *A. mirabilis* (Walsh & Riley), *A. pearsalli* Ashmead, *Telenomus podisi* and *T. dimmocki* Ashmead (Underhill, 1934; Schoene & Underhill, 1933) from eggs. It is also attacked by birds (Knowlton, 1944).

A. hilare was common at Pine Hills and apparently bivoltine. Most eggs and young instars (1sts-3rds) were collected from mid-June to early September, older instars (4ths-5ths) from early July to the third week of October. However, the older instars were common in late July and early October. Newly emerged adults were found in mid-August and thus had sufficient time to give rise to the October peak of older instars.

Previous authors have generally felt that *hilare* was univoltine. Sailer (1953) suggested that though this might be true over most of its range, it might be bivoltine under favorable conditions such as encountered in the Gulf States. Miner (1966) stated it was bivoltine in Arkansas.

A. hilare was collected from slippery elm (A), yellow ironweed (N), wild garlic (A), summer grape (A,N), allegheny blackberry (N), common mullein (A,E,N), New Jersey tea (N), wide-leaved spiderwort (N), beefsteak plant (F,N) smooth sumac (A,F), and orange-spotted touch-me-not (A,F,N). It was most frequently collected on orange-spotted touch-me-not growing at sites 1, 4, and 12. Esselbaugh (1948) reported that a fellow student brought him several nymphs of this stink bug which he found feeding on this same species of touch-me-not. *A. hilare* was also collected at blacklight at Pine Hills.

The only parasite of *hilare* collected during this study was the tachinid *T. pennipes* which emerged from an adult of this stink bug.

Genus BANASA Stål

calva (Say). (11 April-13 July). This species feeds on *Citrus aurantium* L. (Kirkaldy, 1909), native dogwoods, and red fruits of deciduous holly, and will feed on fruit of hawthorn under caged conditions (DeCoursey, 1963).

B. calva has been reared in the laboratory, brief notes have been published on its life history, and the eggs and nymphs described (DeCoursey, 1963).

This stink bug was rare at Pine Hills. An adult male and female were collected at blacklight 15 May, 1971, (site 6) and 13 July, 1972, (site 17), respectively. A second adult male was taken by another collector 11 April, 1972.

dimidiata (Say). (10 May-16 August) (1). This species attacks dogwood, deciduous holly, blueberry, huckleberry, hawthorn, red garden currant (DeCoursey, 1963), arbor vitae, and serviceberry, and is found in beach drift (Stoner, 1922).

B. dimidiata has been reared in the laboratory, notes have been published on its life history, and the eggs and nymphs described (DeCoursey, 1963).

Egg parasites of this stink bug include the scelionid *Telenomus podisi* and a cecidomyiid larva (DeCoursey, 1963).

Although *dimidiata* was more common at Pine Hills than *calva*, all but one specimen were collected at blacklight, primarily at sites 6 and 17. The one exception was an adult male swept from roadside vegetation at site 7, 10 May, 1974.

Genus DENDROCORIS Bergroth

humeralis (Uhler). (15 May-6 July) (1). This species reportedly is predaceous. It has been collected on oak, hickory (Kirkaldy, 1909), hazel (Torre-Bueno, 1939), pine, and small bushes (Nelson, 1955), and attacks larvae of the gypsy moth and tent caterpillar (Kirkland, 1897).

D. humeralis was rare at Pine Hills and most frequently collected as adults at sites 6, 13, and 17. One 5th instar was found on brome-grass at site 6 on 26 June, 1974.

Subfamily ASOPINAE
Genus STIRETRUS Laporte

anchorago fimbriatus (Say). (10 May-6 October) (1). *S. anchorago* is predaceous on coleopterous and lepidopterous larvae, including larvae of *Galeruca* sp., *Epilachna borealis* (Fabricius), the black swallowtail, and the Colorado potato beetle (Kirkaldy, 1909). *S. a. fimbriatus* has been observed feeding on larvae of the Mexican bean beetle and a noctuid species (Oetting & Yonke, 1971a). Interestingly, Oetting & Yonke (1971a) observed an adult of this stink bug probing yellow flowers of goldenrod as if attempting to feed.

This subspecies has been reared in the laboratory, notes have been published on its life history, and the eggs and nymphs described (Oetting & Yonke, 1971a).

The tachinid, *Cylindromyia fumipennis*, parasitizes this stink bug (Oetting & Yonke, 1971a).

S. a. fimbriatus was not common at Pine Hills and thus, the life history data were sketchy. Eggs were found 17 May, 1974, on allegheny blackberry. Young instars (2nds-3rds) were found in late May to late June and again in mid-August, older instars (4ths-5ths) from mid-June to mid-July. Thus, although the data are not conclusive, it would appear this stink bug is bivoltine. Oetting & Yonke (1971a) felt this insect was at least bivoltine in Missouri.

Most specimens were collected at site 13. Although no feeding records were obtained, specimens were collected on smooth sumac (A,N), dwarf sumac (A,N), common mullein (A,N), allegheny blackberry (E), New Jersey tea (N), grape (A), and goldenrod (A). In the latter record, the adult was observed probing the flowers with its beak, thus confirming the observation of Oetting & Yonke (1971a).

Genus APATETICUS Dallas

cynicus (Say). (6 June-14 September) (1). This predaceous stink bug is unusual because, unlike the majority of North American pentatomids, it overwinters in the egg stage. It is found on foliage of shrubs and trees at edges of open woods and cultivated fields (Blatchley, 1926) and preys upon various insect larvae including the Colorado potato beetle (Kirkaldy, 1909) and introduced pine sawfly (Jones & Coppel, 1963). In the laboratory it will feed on larvae of various *Datana* species (Whitmarsh, 1916), eastern tent caterpillar, and gypsy moth (Stone, 1939).

A. cynicus has been reared in the laboratory (Whitmarsh, 1916; Stone, 1939; Jones & Coppel, 1963). Some notes have been published on its life history and were summarized by Jones & Coppel (1963). The eggs (Esselbaugh, 1946; Jones & Coppel, 1963) and nymphs (Jones & Coppel, 1963) have been described.

Jones & Coppel (1963) observed *Podisus maculiventris* (Say) feeding on the eggs of *cynicus*.

A. cynicus was collected on boxelder (N), sugar maple (N), Mississippi hackberry (N), smooth sumac (A), yellow ironweed (N), goldenrod (A), and roadside grasses (N). Most specimens were collected at sites 6 and 17 on tree foliage at edges of open woods. We obtained no feeding records.

We collected 4th and 5th instars from mid-May to early June, 1972. Only adults were subsequently collected during the same year. This would indicate this species was univoltine at Pine Hills. Jones & Coppel (1963) stated it was univoltine in Wisconsin.

Genus PODISUS Herrich-Schaeffer

maculiventris (Say). (29 March-13 November) (3). The literature on this predaceous stink bug is extensive and scattered but partially summarized by Esselbaugh (1948), Coppel & Jones (1962), and Warren & Wallis (1971).

P. maculiventris is found on herbaceous vegetation and trees and frequently attacks insect larvae, many of which are of economic importance. Many of these prey species are listed by Kirkaldy (1909) and Mukerji & LeRoux (1965). These include the spotted

cucumber beetle (Hart, 1919), Colorado potato beetle (Kirkaldy, 1909), cabbage butterfly (Olsen, 1912), eastern tent caterpillar (Baker, 1927), strawberry leaf roller (Fink, 1932), introduced pine sawfly (Coppel & Jones, 1962), and probably fall webworm (McDermott, 1911). It also feeds upon *Lygus pratensis* (Linnaeus) [syn. of *L. lineolaris* (Palisot de Beauvois)] and nymphs of *E. tristigmus* (Kirkaldy, 1909). Interestingly, Olsen (1912) lists evening primrose as a food plant.

P. maculiventris has been reared in the laboratory (Morrill, 1906; Olsen, 1910; Whitmarsh, 1916; Stoner, 1930; Wilson, 1933; Landis, 1937; Esselbaugh, 1948; Coppel & Jones, 1962; Mukerji & LeRoux, 1965; Warren & Wallis, 1971). The eggs and nymphs have been most thoroughly described by Esselbaugh (1946) and DeCoursey & Esselbaugh (1962), respectively.

Four scellionid parasites, *Telenomus podisi* (Ashmead, 1893), *T. dimmocki* (Girault, 1907), *Trissolcus thyantae*, and *T. podisi* Ashmead (Ashmead, 1893) attack eggs of this stink bug.

P. maculiventris was relatively common at Pine Hills, especially in 1973. No feeding records were obtained.

There has been some disagreement about the number of generations per year of this insect. Stoner (1920) and Warren & Wallis (1971) stated it was bivoltine in Iowa and Arkansas, respectively. Esselbaugh (1948) felt it was trivoltine in Illinois, and Coppel & Jones (1962) univoltine in Wisconsin.

We found young instars (1sts-3rds) from mid-May to early June and from mid-July to mid-September, older instars (4ths-5ths) from late May to the third week of June and from early August to early October. Thus it would appear that *maculiventris* was bivoltine at Pine Hills.

This species showed no site or plant preference. It was recorded from white clover (N), poison ivy (N), yellow ironweed (N), leafcup (A), Indian hemp (A), wide-leaved spiderwort (N), common persimmon (N), and goldenrod (A). It was also collected at blacklight.

placidus Uhler. This predaceous species is associated with scrub-oak (Olsen, 1912) and hazel (Stoner, 1920) and attacks larvae of eastern tent caterpillar, gypsy moth (Kirkland, 1897), chrysomelids (Pack & Knowlton, 1930), and introduced pine sawfly (Coppel & Jones, 1962).

P. placidus has been reared in the laboratory (Coppel & Jones, 1962; Oetting & Yonke, 1971a), and the eggs and nymphs have been described (Kirkland, 1897; Coppel & Jones, 1962; Oetting & Yonke, 1971a).

The number of generations per year is not definitely known. Kirkland (1897) felt it was bi- or trivoltine in Massachusetts. Coppel & Jones (1962) stated it was univoltine in Wisconsin.

Only 1 specimen of *placidus* was found during this study. An adult male was collected at site 1, 15 June, 1972, sweeping spicebush.

LIST OF SCUTELLEROID SPECIES OF POSSIBLE OCCURRENCE IN THE LA RUE-PINE HILLS ECOLOGICAL AREA

Family CORIMELAENIDAE Genus GALGUPHA Amyot & Serville

loboprostethia Sailer. This species was described in 1940, long after Hart's 1919 list of Illinois Scutelleroidea. It has been recorded from South Dakota, Oklahoma, Kansas, Missouri (Sailer, 1940), Iowa, Tennessee, Illinois (Sailer, 1941), Michigan (McPherson, 1970), and Virginia (Hoffman, 1971). We have an adult specimen from Midland Hills, Jackson County. It will probably be collected at Pine Hills.

nitiduloides nitiduloides (Wolff). This insect is widespread in North America but less common in the more southern states (McAtee & Malloch, 1933). Hart (1919) stated that it occurred throughout Illinois and was especially common at Dubois in 1917. Thus it may occur at Pine Hills.

ovalis Hussey. This species is widespread in North America (McAtee & Malloch, 1933), and was also described subsequent to Hart's 1919 list. We have specimens from Jackson and Union Counties. Its occurrence at Pine Hills is likely.

Genus **CORIMELAENA** White

nigra Dallas. This insect, originally described as *C. nigra*, was listed by Hart (1919) as *Galgupha nigra* Dallas. It subsequently was returned to the genus *Allocoris* (= *Corimelaena*) (McAtee & Malloch, 1933). It is primarily western in distribution, but has been recorded from Michigan (McAtee & Malloch, 1933) and Illinois (Hart, 1919). Hart (1919) listed specimens from Metropolis and Grand Tower, Illinois, the latter in Jackson County but within 10 miles of Pine Hills. Thus it probably occurs at Pine Hills.

Family CYDNIDAE

Subfamily CYDNINAE

Genus **CYRTOMENUS** Amyot & Serville

ciliatus (Palisot de Beauvois). This cydnid ranges from New Jersey and Delaware south to Florida and west to Texas and Oklahoma (Froeschner, 1960). Hart referred to this species as *C. mirabilis* Perty and listed a single specimen taken at street light in Cairo. Thus it may occur at Pine Hills.

Family PENTATOMIDAE

Subfamily PENTATOMINAE

Genus **BROCHYMENA** Amyot & Serville

cariosa Stål. Ruckes (1946) listed *cariosa* from Florida, Alabama, Mississippi, Louisiana, eastern Texas, Arkansas, Kansas, Missouri, Nebraska, Illinois, Indiana, and Tennessee. More specifically, Hart (1919) reported it from Saline County in southern Illinois. We have specimens from Williamson and Jackson Counties. Thus it may be expected at Pine Hills.

Genus **CHLOROCHROA** Stål

persimilis Horvath. This species is widespread and has been recorded from Missouri (Froeschner, 1941), Michigan (McPherson, 1970) and Illinois (Hart, 1919). Hart (1919) listed this species as *C. uhleri* Stål and recorded it from Washington and St. Clair Counties. It may eventually be collected at Pine Hills.

Genus **THYANTA** Stål

custator (Fabricius). This species is found primarily in the maritime region of the Gulf states and along the Atlantic coast from Massachusetts south to Florida (Ruckes, 1957). However, it has also been recorded from Ohio (Ruckes, 1957) and Missouri (Oetting & Yonke, 1971c), and thus its occurrence at Pine Hills is possible.

Genus **MURGANTIA** Stål

histrionica (Hahn). This southern species is one of the better known stink bugs because of its striking red, yellow, and black coloration, and importance as a pest of cabbage and related plants. Hart (1919) listed Grand Tower as a collecting site. We have specimens from Jackson and Wayne Counties. Since Grand Tower is near Pine Hills, it was surprising we did not collect it during this study.

Genus **BANASA** Stål

euchlora Stål. This species ranges from Maryland and Virginia south to Florida and west to Iowa, Colorado, Arizona, and Texas (Blatchley, 1926). Hart listed it from St. Clair

County, several miles north of Pine Hills. However, we have specimens from Jackson, Pope, and Williamson Counties and thus its occurrence at Pine Hills is likely.

sordida Uhler. This species ranges from New England west to Vancouver's Island and California, south to Maryland and Virginia (Blatchley, 1926). Hart (1919) recorded it from Grand Tower. We have a specimen from Pope County. Thus it may eventually be collected at Pine Hills.

Subfamily ASOPINAE

Genus MINEUS Stål

strigipes (Herrich-Schaeffer). This species ranges from New York and Massachusetts south to Florida and west to Colorado,¹ New Mexico, and Texas (Hart, 1919). Hart (1919) stated it occurred throughout Illinois and listed one specimen from Carbondale, Jackson County. Thus it may occur at Pine Hills.

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Table 1. List of common and scientific names of host plants of La Rue-Pine Hills Scutellerioidea.

COMMON NAME	SCIENTIFIC NAME
allegheny blackberry	<i>Rubus allegheniensis</i> Porter
bead-grass	<i>Paspalum ciliatifolium</i> Michaux
beefsteak plant	<i>Perilla frutescens</i> (L.)
black raspberry	<i>Rubus occidentalis</i> L.
black walnut	<i>Juglans nigra</i> L.
blue speedwell	<i>Veronica arvensis</i> L.
bog-hemp	<i>Boehmeria cylindrica</i> (L.)
Bosc's panic-grass	<i>Panicum boscii</i> Poiret
bottle-brush grass	<i>Elymus hystrix</i> L.
boxelder	<i>Acer negundo</i> L.
brome-grass	<i>Bromus</i> sp.
buckhorn	<i>Plantago lanceolata</i> L.
Canada thistle	<i>Cirsium arvense</i> (L.)
Canadian wild rye	<i>Elymus canadensis</i> L.
Carolina cranesbill	<i>Geranium carolinianum</i> L.
cheat	<i>Bromus secalinus</i> L.
common brome-grass	<i>Bromus commutatus</i> Schrader
common mullein	<i>Verbascum thapsus</i> L.
common persimmon	<i>Diospyros virginiana</i> L.
common wild rye	<i>Elymus virginicus</i> L.
curly dock	<i>Rumex crispus</i> L.
daisy fleabane	<i>Erigeron philadelphicus</i> L.
deer-tongue grass	<i>Panicum clandestinum</i> L.
downy phlox	<i>Phlox pilosa</i> L.
drop-seed	<i>Muhlenbergia schreberi</i> J. F. Gmelin
dwarf sumac	<i>Rhus copallina</i> L.
elderberry	<i>Sambucus canadensis</i> L.
foxtail	<i>Setaria</i> sp.
goldenrod	<i>Solidago</i> sp.
grape	<i>Vitis</i> sp.
green foxtail	<i>Setaria viridis</i> (L.)
horse-nettle	<i>Solanum carolinense</i> L.
Indian hemp	<i>Apocynum cannabinum</i> L.
ironweed	<i>Vernonia missurica</i> Rafinesque-Schmaltz
Johnson grass	<i>Sorghum halepense</i> (L.)
larger straw sedge	<i>Carex normalis</i> Mackenzie
leafcup	<i>Polymnia canadensis</i> L.
little barley	<i>Hordeum pusillum</i> Nuttall
Mississippi hackberry	<i>Celtis laevigata</i> Willdenow
narrow-leaved sedge	<i>Carex amphibola</i> Steudel (= <i>C. grisea</i> Wahlenberg)
New Jersey tea	<i>Ceanothus americanus</i> L.
orange-spotted touch-me-not	<i>Impatiens biflora</i> Walter
orchard-grass	<i>Dactylis glomerata</i> L.
pale sedge	<i>Carex blanda</i> Dewey
panic-grass	<i>Panicum</i> sp.
poison ivy	<i>Rhus radicans</i> L.
prickly lettuce	<i>Lactuca scariola</i> L.
pussy-toes	<i>Antennaria plantaginifolia</i> (L.)
red clover	<i>Trifolium pratense</i> L.
red mulberry	<i>Morus rubra</i> L.
reflexed sedge	<i>Carex retroflexa</i> Muhlenberg

Table 1. (Continued)

COMMON NAME	SCIENTIFIC NAME
short sedge	<i>Carex shortiana</i> Dewey
slippery elm	<i>Ulmus rubra</i> Muhlenberg
smooth sumac	<i>Rhus glabra</i> L.
spicebush	<i>Lindera benzoin</i> (L.)
sugar maple	<i>Acer saccharum</i> Marshall
summer grape	<i>Vitis aestivalis</i> Michaux
sunflower	<i>Helianthus decapetalus</i> L.
swamp milkweed	<i>Asclepias incarnata</i> L.
timothy	<i>Phleum pratense</i> L.
trumpet-creeper	<i>Campsis radicans</i> (L.)
white ash	<i>Fraxinus americana</i> L.
white clover	<i>Trifolium repens</i> L.
white snakeroot	<i>Eupatorium rugosum</i> Houttuyn
white sweet clover	<i>Melilotus alba</i> Desrousseaux
wide-leaved spiderwort	<i>Tradescantia subaspera</i> Ker
wild carrot	<i>Daucus carota</i> L.
wild chervil	<i>Chaerophyllum procumbens</i> (L.)
wild garlic	<i>Allium canadense</i> L.
wild hydrangea	<i>Hydrangea arborescens</i> L.
wild yam	<i>Dioscorea villosa</i> L.
wood-sage	<i>Teucrium canadense</i> L.
yellow ironweed	<i>Verbesina alternifolia</i> (L.)
yellow sweet clover	<i>Melilotus officinalis</i> (L.)

Table 2. List of parasites collected from La Rue-Pine Hills Pentatomidae.

HOST SPECIES	HOST STAGE AT TIME OF PARASITE EMERGENCE	PARASITE	
		FAMILY	SPECIES
<i>Acrosternum hilare</i> (Say)	Adult	Tachinidae	<i>Trichopoda pennipes</i> (Fabricius)
<i>Euschistus servus</i> (Say)	Adult	Tachinidae	<i>Cylindromyia binotata</i> (Bigot)
<i>E. servus</i>	Adult	Tachinidae	<i>Euthera tentatrix</i> Loew
<i>E. servus</i>	Adult	Tachinidae	<i>Gymnoclytia</i> <i>immaculata</i> (Macquart)
<i>E. tristigmus</i> (Say)	Adult	Tachinidae	<i>Euthera tentatrix</i> Loew
<i>E. tristigmus</i>	Egg	Scelionidae	<i>Trissolcus euschisti</i> (Ashmead)
<i>Oebalus pugnax</i> (Fabricius)	Adult	Tachinidae	<i>Gymnoclytia</i> <i>immaculata</i> (Macquart)

Table 3. Scutelleroid state records from the La Rue-Pine Hills Ecological Area.

CORIMELAENIDAE

Corimelaena agrella McAtee
Galgupha carinata McAtee & Malloch
G. denudata Uhler

PENTATOMIDAE

Aelia americana Dallas
Nezara viridula (Linnaeus)

Table 4. Scutelleroid species diversity in the La Rue-Pine Hills Ecological Area.

GENUS	FAMILY	NO. SPECIES
	CYDNIDAE	
<i>Amnestus</i> Dallas		3
<i>Melanaethus</i> Uhler		2
<i>Pangaeus</i> Stål		1
<i>Sehirus</i> Amyot & Serville		1
		Subtotal 7
	CORIMELAENIDAE	
<i>Corimelaena</i> White		4*
<i>Galgupha</i> Amyot & Serville		4*
		Subtotal 8
	SCUTELLERIDAE	
<i>Homaemus</i> Dallas		1
<i>Stethaulax</i> Bergroth		1
		Subtotal 2
	PENTATOMIDAE	
<i>Acrosternum</i> Fieber		1
<i>Aelia</i> Fabricius		1*
<i>Amaurochrous</i> Stål		1
<i>Banasa</i> Stål		2
<i>Brochymena</i> Amyot & Serville		2
<i>Coenus</i> Dallas		1
<i>Cosmopepla</i> Stål		1
<i>Dendrocoris</i> Bergroth		1
<i>Euschistus</i> Dallas		5
<i>Holcostethus</i> Kirkaldy		1
<i>Hymenarcys</i> Amyot & Serville		2
<i>Meneclis</i> Stål		1
<i>Mormidea</i> Amyot & Serville		1
<i>Neottiglossa</i> Kirby		2
<i>Nezara</i> Amyot & Serville		1*
<i>Oebalus</i> Stål		1
<i>Proxys</i> Spinola		1
<i>Thyanta</i> Stål		2

Table 4. (Continued)

GENUS	FAMILY	NO. SPECIES
	PENTATOMIDAE	
<i>Trichopepla</i> Stål		1
<i>Apateticus</i> Dallas		1
<i>Podisus</i> Herrich-Schaeffer		2
<i>Stiretrus</i> Laporte		1
		Subtotal 32
		Grand Total 49

*State Record

Table 5. Scutelleroid species collected on common mullein (*Verbascum thapsus* L.) in the La Rue-Pine Hills Ecological Area.

PENTATOMIDAE	
1.	<i>Acrosternum hilare</i> (Say)
2.	<i>Coenus delius</i> (Say)
3.	<i>Cosmopepla bimaculata</i> (Thomas)
4.	<i>Euschistus ictericus</i> (Linnaeus)
5.	<i>E. politus</i> Uhler
6.	<i>E. servus</i> (Say)
7.	<i>E. tristigmus</i> (Say) [inc. <i>pyrrhocerus</i> (Herrich-Schaeffer)]
8.	<i>E. variolarius</i> (Palisot de Beauvois)
9.	<i>Holcostethus limbolarius</i> (Stål)
10.	<i>Hymenarcys nervosa</i> (Say)
11.	<i>Stiretrus anchorago</i> (Fabricius)
12.	<i>Thyanta calceata</i> (Say)
CORIMELAENIDAE	
1.	<i>Corimelaena pulicaria</i> (Germar)
2.	<i>Galgupha atra</i> Amyot & Serville