The Great Lakes Entomologist

Volume 26
Number 2 - Summer 1993 *Number 2 - Summer 1993*
Article 2

June 1993

Seasonal Flight Patterns of Miridae (Hemiptera) in a Southern Illinois Black Walnut Plantation

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SEASONAL FLIGHT PATTERNS OF MIRIDAE (HEMIPTERA) IN A SOUTHERN ILLINOIS BLACK WALNUT PLANTATION

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ABSTRACT

The seasonal flight patterns of 92 species of Miridae collected in window traps in a southern Illinois black walnut plantation are compared with similar data from a North Carolina black walnut plantation. Flying height distributions and seasonal flight activities of *Amblytylus nasutus*, *Deraeocoris nebulosus*, *Leptopterna dolabrata*, *Lopidea heidemanni*, *Lygus lineolaris*, and *Plagiognathus politus* are considered in detail. Six species are newly recorded for Illinois.

Previously, we presented information on seasonal flight patterns of Hemiptera, except the Miridae, in a black walnut (*Juglans nigra*) plantation in southern Illinois (SI) (McPherson and Weber 1990). These data were based on weekly collections of specimens from window traps during 1979 and 1980, and were compared with similar data collected during 1977 and 1978 in a black walnut plantation near Asheville, North Carolina (NC) (McPherson and Weber 1980; 1981a, b, c, d, e). We present here the SI data for the Miridae and compare them, where possible, with the mirid results from the NC plantation (McPherson et al. 1983).

MATERIALS AND METHODS

The SI black walnut plantation is a 2.8 ha plot located in Alexander County that was established by the U. S. Forest Service. Within this plantation are 2,700 trees planted at a 1.83 × 3.66 m spacing. Additional information about the history and geographic location of this plantation is given by McPherson and Weber (1990).

The window traps were described in detail by McPherson and Weber (1980). Briefly, each trap was constructed with a section of Plexiglass (76.2 × 76.2 × 0.3 cm) enclosed on the sides and top with a painted pine frame, and on the bottom with a galvanized metal pan (71 × 20 × 8 cm) bolted to the pine frame. The support frames consisted of 3/4 inch pipe mounted above bell reducers and attached to 1 1/2 inch base pipe. A brace piece was added to the taller traps to provide additional support during high winds. Four guy wires on each trap were attached to the brace piece and to metal stakes in the

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ground to prevent twisting of the frame. Traps were raised and lowered by a rope and pulley system.

The SI and NC studies differed in the number of traps used (16 in SI, 28 in NC) and their height above the ground (SI, 1 m intervals from 1 to 4 m; NC, 1 m intervals from 1 to 7 m). As noted in the earlier SI study (McPherson and Weber 1990), the difference in height of traps between the two plantations resulted from the primary emphasis of this study, which was to determine flight activity of the ambrosia beetle, *Xylosandrus germanus* (Blandford). The SI traps were set at a maximum of 4 m because we found that most flight activity of this beetle in the NC plantation was at 1 m (Weber and McPherson 1983). Unfortunately, this makes comparisons of flight activity of the mirids between the plantations more difficult.

In the SI study, flying height and seasonal distributions were determined in 1979; only seasonal distribution was determined in 1980. Insects were removed weekly from 30 March to 13 October in 1979, and from 28 March to 10 October in 1980.

All specimens collected during this study are deposited in the Southern Illinois University Entomology Collection, Carbondale, and National Museum of Natural History, Washington, D. C.

RESULTS AND DISCUSSION

Species diversity was higher in the SI plantation than in the NC plantation with, respectively, 92 and 79 species collected. Of the 79 NC species, only 37 were also collected in SI. As in NC, the Mirinae were best represented (Table 1). Numbers of specimens for all SI taxa ranged from 1 to 1,154. The known distribution of the mirids treated in this paper and in McPherson et al. (1983) can be found in Henry and Wheeler (1988). Six of the SI species are newly recorded for the state (Table 1).

The six most commonly collected species in NC were *Deraeocoris nebulosus* (Uhler) (N = 612), *Ilnacora stalii* Reuter (N = 82), *Keltonia tuckeri* (Poppius) (misidentified as *K. sulphurea* [Reuter] [Henry 1991]) (N = 194), *Lygus lineolaris* (Palisot de Beauvois) (N = 929), *Plagiognathus politus* Uhler (N = 506), and *Reuteroscopus ornatus* (Reuter) (N = 2,673) (McPherson et al. 1983). Of these, *D. nebulosus* (N = 199), *L. lineolaris* (N = 300), and *P. politus* (N = 1,046) were also among the six most commonly collected species in SI (Table 1). The remaining three in SI were *Amblytylus nasutus* (Kirschbaum) (N = 295), *Leptopterna dolabrata* (L.) (N = 563), and *Lopidea heidemanni* Knight (N = 1,154). *R. ornatus*, the most commonly collected NC species, was much less frequently collected in SI (N = 28). Because none of these mirids is known to feed on black walnut, the abundance of their host plants or prey in and around the plantations could account for differences in their frequency between the two study sites.

The Holarctic *A. nasutus* has been collected in fields of timothy (*Phleum pratense*), orchard-grass (*Dactylis glomerata*), and awnless brome-grass (*Bromus inermis*) in New York (Hardee et al. 1963), tall fescue (*Festuca arundinacea*) in Missouri (Blinn and Yonke 1982), and Kentucky bluegrass (*Poa pratensis*) in Kentucky (Jewett and Spencer 1944, Jewett and Townsend 1947). It feeds and reproduces on bluegrass seed heads (Jewett and Spencer 1944, Jewett and Townsend 1947), is univoltine, and overwinters as eggs (Jewett and Townsend 1947). Adults are found during May and June in Kentucky (Jewett and Townsend 1947) and Missouri (Blinn and Yonke 1982). Wheeler and Henry (1992) summarized distribution, hosts, and biological information

https://scholar.valpo.edu/tgle/vol26/iss2/2
DOI: 10.22543/0090-0222.1812

Table 1. Seasonal flight activity of Miridae during 1979–1980 in a southern Illinois black walnut plantation

Taxon	No. Collected[a]	Collection Height (m)[b] $\bar{x} \pm SE$	Collection Height (m)[b] Range	Range of Collection Dates
BRYOCORINAE				
Macrolophus brevicornis Knight[c]	1 (1, 0)	2.00	–	15 June
Pycnoderes medius Knight[c]	2 (1, 1)	4.00	–	13–22 June
Sixeonotus areolatus Knight[c,d]	2 (2, 0)	3.00 ± 1.00	2–4	14–21 Sept.
CYLAPINAE				
Fulvius imbecilis (Say)	2 (2, 0)	4.00 ± 0.00	–	10 Aug.
Fulvius slateri Wheeler	5 (4, 1)	1.75 ± 0.75	1–4	11 July-7 Sept.
Peritropis saldaeformis Uhler[c]	1 (1, 0)	4.00	–	14 Sept.
DERAEOCORINAE				
Deraeocoris grandis (Uhler)[c]	4 (0, 4)	–	–	6–13 June
Deraeocoris nebulosus (Uhler)	199 (190, 9)	2.84 ± 0.06	1–4	20 April-21 Sept.
Deraeocoris poecilus McAtee	2 (2, 0)	2.00 ± 1.00	1–3	22 June-6 July
Deraeocoris quercicola Knight	5 (4, 1)	3.00 ± 0.71	1–4	18 July-3 Aug.
Deraeocoris sayi (Reuter)	1 (0, 1)	–	–	30 May
Hyaliodes harti Knight	11 (10, 1)	3.00 ± 0.26	1–4	3 July-28 Sept.
Hyaliodes vitripennis (Say)	9 (8, 1)	3.00 ± 0.38	1–4	8 June-5. Oct.
MIRINAE				
Adelphocoris lineolatus (Goeze)	1 (1, 0)	2.00	–	1 June
Agnocoris pulverulentus (Uhler)	5 (2, 3)	4.00 ± 0.00	–	20 April-15 June
Leptopterna dolabrata (L.)	563 (275, 288)	1.09 ± 0.02	1–4	18 May-22 June
Lygocoris caryae (Knight)	139 (62, 77)	3.20 ± 0.11	1–4	9 May-13 July
Lygocoris fagi (Knight)[d]	2 (1, 1)	4.00	–	6 June-20 July
Lygocoris geneseensis (Knight)	1 (1, 0)	1.00	–	6 July
Lygocoris hirticulus (Van Duzee)	4 (1, 3)	3.00	–	13–29 June
Lygocoris omnivagus (Knight)	7 (0, 7)	–	–	23 May-27 June
Lygocoris quercalbae (Knight)[c]	59 (17, 42)	3.15 ± 0.19	1–4	16 May-20 July
Lygus lineolaris (Palisot de Beauvois)	300 (186, 114)	2.12 ± 0.08	1–4	6 April-12 Oct.
Lygus plagiatus Uhler	5 (2, 3)	2.00 ± 0.00	–	11 April -3 Aug.
Megaloceroea recticornis (Geoffroy)	45 (28, 17)	1.00 ± 0.00	–	6–20 June
Neocapsus leviscutatus Knight	5 (0, 5)	–	–	16 May-6 June
Neurocolpus nubilis (Say)	100 (93, 7)	2.47 ± 0.08	1–4	6 June-10 Aug.
Phytocoris albifacies Knight[c]	6 (4, 2)	3.00 ± 0.58	2–4	8 June-13 July
Phytocoris antennalis Reuter	1 (1, 0)	4.00	–	5 Oct.
Phytocoris breviusculus Reuter[c]	1 (1, 0)	2.00	–	1 June
Phytocoris canadensis Van Duzee	2 (2, 0)	3.00 ± 1.00	2–4	13 July-24 Aug.
Phytocoris eximius Reuter	1 (0, 1)	–	–	6 June
Phytocoris infuscatus Reuter	3 (2, 1)	3.50 ± 0.50	3–4	20 June-6 July
Phytocoris neglectus Knight[c]	1 (1, 0)	2.00	–	13 July
Phytocoris puella Reuter	3 (2, 1)	2.00 ± 1.00	1–3	20 June-10 Aug.
Phytocoris purvus Knight	13 (12, 1)	2.75 ± 0.35	1–4	25 May-28 Sept.
Phytocoris spicatus Knight	1 (1, 0)	4.00	–	13 July
Phytocoris tibialis Reuter	32 (24, 8)	2.04 ± 0.23	1–4	6 July-12 Oct.
Polymerus proximus Knight[c]	1 (1, 0)	3.00	–	1 June
Prepops fraterculus (Knight)	1 (1, 0)	2.00	–	13 July
Prepops insitivus (Say)	1 (1, 0)	2.00	–	29 June
Salignus distinguendus (Reuter)[c,d]	1 (0, 1)	–	–	6 June
Stenodema trispinosum Reuter	1 (0, 1)	–	–	30 May
Stenodema vicinum (Provancher)	2 (2, 0)	2.00 ± 1.00	1–3	8 June
Stenotus binotatus (Fabricius)	139 (80, 59)	1.71 ± 0.12	1–4	30 May-22 June
Taedia casta (McAtee)[c]	1 (0, 1)	–	–	1 Aug.
Taedia evonymi (Knight)[c]	8 (7, 1)	3.71 ± 0.18	3–4	13 June-27 July
Taedia multisignata (Reuter)[d]	1 (1, 0)	3.00	–	13 July
Taedia scrupea (Say)[c]	14 (5, 9)	3.70 ± 0.20	3–4	6–29 June
Trigonotylus caelestialium (Kirkaldy)	12 (9, 3)	3.28 ± 0.36	1–4	25 May-6 July

Table 1. Seasonal flight activity of Miridae during 1979–1980 in a southern Illinois black walnut plantation *(Continued)*

Taxon	No. Collected[a]	Collection Height (m)[b] $\bar{x} \pm SE$	Collection Height (m)[b] Range	Range of Collection Dates
Tropidosteptes canadensis Van Duzee[c]	2 (0, 2)	–	–	23–30 May
Tropidosteptes geminus (Say)[c]	6 (0, 6)	–	–	23 May-20 June
Tropidosteptes pettiti Reuter[c]	1 (1, 0)	4.00	–	8 June
ORTHOTYLINAE				
Ceratocapsus digitulus Knight	23 (13, 10)	2.31 ± 0.21	1–4	20 June-31 Aug.
Ceratocapsus fuscinus Knight	1 (1, 0)	3.00	–	20 July
Ceratocapsus modestus (Uhler)	4 (4, 0)	3.00 ± 0.00	–	20 July-3 Aug.
Ceratocapsus pumilus (Uhler)[c]	10 (10, 0)	2.30 ± 0.26	1–3	13 July-7 Sept.
Ceratocapsus setosus Reuter	8 (2, 6)	1.00 ± 0.00	–	6 June-28 Sept.
Ceratocapsus uniformis Knight[c,e]	81 (80, 1)	2.80 ± 0.08	1–4	13 July-28 Sept.
Diaphnocoris provancheri (Burque)	76 (76, 0)	2.78 ± 0.11	1–4	15 June-27 July
Halticus bractatus (Say)	7 (4, 3)	2.50 ± 0.29	2–3	23 May-12 Oct.
Ilnacora stalii Reuter	19 (19, 0)	2.84 ± 0.29	1–4	8 June -7 Sept.
Lopidea confluenta (Say)	17 (9, 8)	1.89 ± 0.31	1–3	29 June-3 Aug.
Lopidea heidemanni Knight	1,154 (570, 584)	2.44 ± 0.04	1–4	9 May-3 Aug.
Lopidea robiniae (Uhler)	2 (2, 0)	3.00 ± 1.00	2–4	29 June-27 July
Orthotylus juglandis Henry[c,d]	10 (9, 1)	3.56 ± 0.18	3–4	11 May-6 July
Orthotylus modestus Van Duzee	5 (1, 4)	2.00	–	6–15 June
Paraproba capitata (Van Duzee)[c]	1 (1, 0)	1.00	–	21 Sept.
Pseudoxenetus regalis (Uhler)	22 (8, 14)	3.13 ± 0.40	2–4	25 May-22 June
Reuteria bifurcata Knight	14 (14, 0)	2.71 ± 0.24	1–4	29 June-27 July
Sericophanes heidemanni Poppius	1 (1, 0)	4.00	–	6 July
Slaterocoris atritibialis (Knight)	2 (1, 1)	3.00	–	6–15 June
Slaterocoris stygicus (Say)	4 (3, 1)	2.67 ± 0.88	1–4	1–15 June
PHYLINAE				
Amblytylus nasutus (Kirschbaum)[c,d]	295 (126, 169)	2.00 ± 0.10	1–4	11 May-7 Sept.
Chlamydatus associatus (Uhler)	3 (1, 2)	3.00	–	8–22 Aug.
Criocoris saliens (Reuter)	2 (1, 1)	1.00	–	18 May-6 June
Keltonia tuckeri (Poppius)	10 (10, 0)	1.40 ± 0.22	1–3	22 June-5 Oct.
Atractotomus miniatus (Knight)	1 (1, 0)	4.00	–	1 June
Atractotomus sp., prob. *miniatus* (Knight)	1 (1, 0)	3.00	–	18 May
Microphylellus modestus Reuter	8 (7, 1)	2.79 ± 0.49	1–4	6 June-6 July
Pilophorus brunneus Poppius[c]	1 (0, 1)	–	–	3 July
Plagiognathus blatchleyi Reuter[c]	1 (1, 0)	1.00	–	14 Sept.
Plagiognathus gleditsiae Knight[c]	1 (0, 1)	–	–	23 May
Plagiognathus guttulosus (Reuter)	1 (1, 0)	4.00	–	1 June
Plagiognathus politus Uhler	1,046 (1,015, 31)	2.49 ± 0.03	1–4	6 June-12 Oct.
Plagiognathus repletus Knight[c,e]	87 (21, 66)	3.10 ± 0.17	2–4	6 June-20 July
Plagiognathus n. sp.[e]	37 (12, 25)	3.08 ± 0.28	1–4	13 June-6 July
Plesiodema sericeum (Heidemann) or near	1 (1, 0)	4.00	–	22 June
Pseudatomoscelis seriatus (Reuter)	6 (5, 1)	2.20 ± 0.58	1–4	15 June-5 Oct.
Reuteroscopus ornatus (Reuter)	28 (27, 1)	2.04 ± 0.22	1–4	1 June-12 Oct.
Semium hirtum Reuter	1 (0, 1)	–	–	26 Sept.
Sthenaridea vulgaris (Distant)[c,d]	1 (1, 0)	1.00	–	21 Sept.

[a]Total number of specimens for 1979–80, 1979, and 1980, respectively.
[b]Based only on 1979 specimens.
[c]Species not know to occur in North Carolina, based on Henry and Wheeler (1988) and McPherson et al. (1983).
[d]New Illinois state record, based on Knight (1941) and Henry and Wheeler (1988).
[e]Species feed on or previously recorded from black walnut.

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DOI: 10.22543/0090-0222.1812

and concluded that this grass-feeding species is a "clear-cut immigrant" in North America.

We did not collect *A. nasutus* in the NC study (McPherson et al. 1983), and it was not listed by Henry and Wheeler in the 1988 heteropteran catalog. However, it is now known from the state (Wheeler and Henry 1992). In the present study, it was collected from 11 May to 7 September (N = 295) and flew at an average height of 2.00 m (N = 126) (Table 1).

As noted above, and supported here by the lateness of the appearance of adults in the window traps, this species overwinters as eggs (Fig. 1). Most (97.3%, N = 287) were collected between the third week of May and mid-June, thus corresponding with earlier reports of adult activity in Kentucky and Missouri.

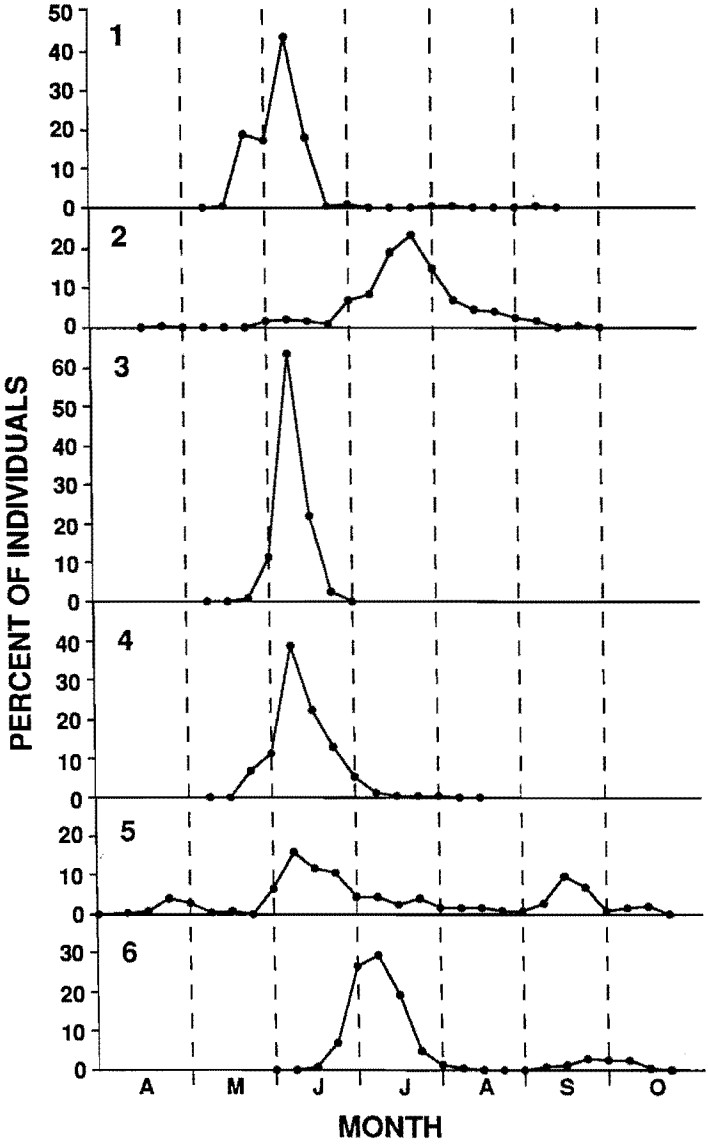
D. nebulosus is a predaceous species often collected on trees and shrubs (Wheeler et al. 1975). It attacks several species of mites and insects including, among others, European red mite, *Panonychus ulmi* (Koch); woolly apple aphid, *Eriosoma lanigerum* (Hausmann); clover aphid, *Nearctaphis bakeri* (Cowen); hop aphid, *Phorodon humuli* (Schrank); cotton aphid, *Aphis gossypii* Glover; terrapin scale, *Lecanium nigrofasciatum* Pergande; eyespotted bud moth, *Spilonota ocellana* (Denis and Schiffermüller); and possibly codling moth, *Cydia pomonella* (L.) (see literature survey of Wheeler et al. 1975). Wheeler et al. (1975) also reported it feeding on the mite *Oliogonychus bicolor* (Banks); the oak lace bug, *Corythucha arcuata* (Say); hawthorn lace bug, *C. cydoniae* (Fitch); and greenhouse whitefly, *Trialeurodes vaporariorum* (Westwood). It overwinters as adults and is trivoltine in central Pennsylvania (Wheeler et al. 1975).

D. nebulosus was collected in SI (Table 1) from 20 April to 21 September (N = 199) and flew at an average height of 2.84 m (N = 190), and in NC from 1 April to 29 September and flew at an average height of 2.86 m (N = 612) (McPherson et al. 1983).

As noted in our NC study (McPherson et al. 1983), and supported by the present study, this species overwinters as adults in SI but as in NC, the number of generations per year was unclear from the data available (Fig. 2). The flight period was similar in both plantations and if it is trivoltine as Wheeler et al. (1975) reported for central Pennsylvania, then the data suggest overlapping generations; if not, then the data suggest it is univoltine.

The Holarctic *L. dolabrata* (meadow plant bug) feeds on grasses including Kentucky bluegrass, orchard-grass (Froeschner 1949, Jewett and Spencer 1944, Jewett and Townsend 1947), redtop (*Agrotis alba* var. *vulgaris*), hairy chess (*Bromus commutatus*) (Jewett and Spencer 1944, Jewett and Townsend 1947), and timothy (Jewett and Townsend 1947, Knight 1941, Osborn 1918). Other recorded hosts, such as spiderwort (*Tradescantia* sp.) (Knight 1941), undoubtedly are 'sitting' records. It overwinters as eggs (Blatchley 1926, Jewett and Townsend 1947, Osborn 1918, Watson 1928) and is univoltine (Jewett and Townsend 1947, Osborn 1918, Watson 1928). Nymphs are common in April and May (Blatchley 1926, Jewett and Townsend 1947). Adults are found in May and June in Kentucky (Jewett and Townsend 1947), May to July in Ohio (Watson 1928), and June to August in Maine (Osborn 1918). Wheeler and Henry (1992) summarized the distribution, hosts, and biology of *L. dolabrata* and concluded, based on the absence of records from northwestern North America, and the continued preference of this species for naturalized grasses, that this mirid is an immigrant in the Nearctic.

This species was collected in both the SI and NC plantations but was rare in NC. It was collected in SI (Table 1) from 18 May to 22 June (N = 563) and flew at an average height of 1.09 m (N = 275), and in NC from 13 May to 26 May at an average height of 3.20 m (N = 5) (McPherson et al. 1983). It overwinters as eggs, based on the lateness of the first collection of adults, and



Figures 1–6. Seasonal flight activities of six mirid species during 1979–1980 in a southern Illinois black walnut plantation. 1, *Amblytylus nasutus* (N = 295); 2, *Deraeocoris nebulosus* (N = 199); 3, *Leptopterna dolabrata* (N = 563); 4, *Lopidea heidemanni* (N = 1,154); 5, *Lygus lineolaris* (N = 300); 6, *Plagiognathus politus* (N = 1,046).

https://scholar.valpo.edu/tgle/vol26/iss2/2
DOI: 10.22543/0090-0222.1812

was univoltine (Fig. 3). The flying distribution strongly supports data from Kentucky, Maine, and Ohio in that all adults were collected between mid-May and late June.

L. heidemanni has been collected from elm (*Ulmus* sp.) (Blatchley 1926; Knight 1917, 1941; Watson 1918), yarrow (*Achillea millefolium*) (Knight 1917, 1941), goldenrod (*Solidago rugosa*) (Knight 1917), hollyhock, hickory (Froeschner 1949), honeylocust (*Gleditsia triacanthos*), willow (*Salix* sp.), coralberry (*Symphoricarpos orbiculatus*), bedstraw (*Galium aparine*) (Knight 1941), Ohio buckeye (*Aesculus glabra*), green ash (*Fraxinus pennsylvanica*), wild plum (*Prunus americana*), white oak (*Quercus alba*), jack oak (*Q. ellipsoidalis*), black locust (*Robinia pseudoacacia*), common ragweed (*Ambrosia artemisiifolia*), common mouse-ear chickweed (*Cerastium vulgatum*), common sunflower (*Helianthus annuus*), blue phlox (*Phlox divaricata*) and grape (*Vitis* sp.) (Blinn and Yonke 1985).

Little is known of the life cycle of this insect. Knight (1917), in his original description and discussion of this species, reported it breeding on elm, and the nymphs feeding and maturing on the terminal growth. He also collected nymphs on yarrow and adults on *S. rugosa* where they were apparently breeding. All adults used in his description were collected between 18 May and 16 July. Blatchley (1926) reported beating specimens (presumably adults) from elm from 1 June to 5 July and Froeschner (1949) reported specimens from 28 April to 17 June.

This species was collected in SI (Table 1) from 9 May to 3 August (N =1,154) and flew at an average height of 2.44 m (N = 570), and in NC from 19 May to 18 August and flew at an average height of 2.06 m (N = 33) (McPherson et al. 1983). The time of occurrence of adults in the flight traps in both SI and NC corresponds well with the reports of adult activity by earlier authors. In addition, it appears that this species overwinters as eggs, based on the lateness of the appearance of adults, and is univoltine (Fig. 4).

The well known tarnished plant bug (*L. lineolaris*) has been recorded from numerous host plants including alfalfa, apple, apricot, aster, bean, beet, blackberry, cabbage, carnation, carrot, celery, cherry, chrysanthemum, clover, cotton, cucumber, currant, dahlia, grape, lettuce, marigold, pea, peach, pear, peony, plum, potato, quince, raspberry, rose, strawberry, tobacco, and turnip (Kelton 1975). Several additional host plants are given by Snodgrass et al. (1984) and Young (1986). It also is known to have predaceous tendencies and has been reported feeding on the alfalfa plant bug, *Adelphocoris lineolatus* (Goeze); potato leafhopper, *Empoasca fabae* (Harris); pea aphid, *Acyrthosiphon pisum* (Harris); Colorado potato beetle, *Leptinotarsa decemlineata* (Say); alfalfa weevil, *Hypera postica* (Gyllenhal); various species of Noctuidae; *Pleuroprucha insulsaria* (Guenée); alfalfa blotch leafminer, *Agromyza frontella* (Rondani); *Aphidius ervi pulcher* Baker; *A. smithi* Sharma and Subba Rao; *Praon* sp.; various species of Formicidae; and the harvestman *Phalangium opilio* L. (Wheeler 1976).

The tarnished plant bug overwinters as adults (Guppy 1958, Kelton 1975, Ridgway and Gyrisco 1960, Stewart and Khoury 1976) and has two (Guppy 1958, Kelton 1975) or possibly three (Ridgway and Gyrisco 1960, Stewart and Khoury 1976, Wheeler 1974) generations per year.

Ridgway and Gyrisco (1960), using tanglefoot traps, found that *L. lineolaris* flew fairly close to the ground; of 323 adults collected, 300 were captured within 6 ft (1.8 m) of the ground and only one as high as 15–18 ft (4.6–5.5 m).

The seasonal flight activity of *L. lineolaris* was similar in both the SI and NC plantations; it was collected in SI (Table 1) from 6 April to 12 October (N = 300) and flew at an average height of 2.12 m (N = 186); and in NC from 31

March to 13 October and flew at an average height of 2.60 m (N = 929) (McPherson et al. 1983).

As noted for NC, this species overwinters as adults and is apparently bivoltine (Fig. 5). In SI, adults began to emerge from overwintering sites in early April. Their adult offspring (summer generation) occurred from about late May to late August. Adults of the second (overwintering) generation occurred from about early September to the end of the season. These peaks occurred close to those found in NC (McPherson et al. 1983).

P. politus has been collected from apple (*Pyrus*) (Leonard 1915, Knight 1941), black locust, coralberry, willow, ragweed (*Ambrosia* sp.), birch (*Betula* sp.), hickory (*Carya* sp.), hazelnut (*Corylus* sp.), red cedar (*Juniperus virginiana*), white pine (*Pinus strobus*), oak (*Quercus* sp.), goldenrod (*Solidago* sp.), bald cypress (*Taxodium distichum*) (Knight 1941), fleabane (*Erigeron*), and mullein (*Verbascum*) (Froeschner 1949). It overwinters as eggs (Leonard 1915), and is bivoltine (Froeschner 1949, Holdsworth 1968, Knight 1941, Wheeler 1974). In Missouri, adults of the first generation have been collected from 10 June to 20 August and those of the second from 8 August to 31 September (Froeschner 1949).

The seasonal flight activity of *P. politus* began about one month later in SI than in NC. Adults were collected in SI (Table 1) from 6 June to 12 October (N = 1,046) and flew at an average height of 2.49 m (N = 1,015), and in NC from 5 May to 13 October and flew at an average height of 2.51 m (N = 506) (McPherson et al. 1983).

In the NC study, we felt this species apparently overwintered as eggs because of the large number of flying adults in the fall and the extended period in the spring before the first adults were collected (i.e., early May). It also appeared to be bivoltine. The SI data also support these conclusions (Fig. 6). Although there was not a large number of fall adults, the first adults appeared even later in the year than in NC (i.e., early June) and, thus, apparently resulted from overwintered eggs. These adults dramatically increased in numbers and represented the first (summer) generation; they were present until mid- or late August. Adults of the second generation were present from early September to the end of the season. These adults presumably produced the overwintering eggs.

ACKNOWLEDGMENTS

We thank D. M. Baines, D. E. Alley, and F. D. McBride, North Central Forest Experiment station, Forestry Sciences Laboratory, Carbondale, IL (FSL-C), for their help in maintaining the traps. We appreciate the cooperation and assistance of Shawnee National Forest personnel in providing access to the Pleasant Valley Plantation. We are also grateful to personnel of the Scientific Photography and Illustration Facility, Southern Illinois University, Carbondale (SIUC), for preparing the final figures. Cost of the figures was met by the Department of Zoology.

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