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ARTHROPODS ON BRAZILIAN PEPPERTREE,
SCHINUS TEREBINTHIFOLIUS
(ANACARDIACEAE), IN SOUTH FLORIDA

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ABSTRACT

Arthropods on *Schinus terebinthifolius* Raddi were collected by hand and with a sweep net every other week between 8 May 1979 and 29 July 1980 at three sites in Lee County, Florida. Of the 115 arthropod species identified, 46 (40.0%) were phytophagous, 59 (51.3%) predatory, and 10 (8.7%) miscellaneous. The six most frequently occurring species belonged to either the Formicidae or Araneae. The most frequently (65.5%) occurring phytophagous sp. was a bush cricket (*Cyrtoxipha* sp.). The phytophagous

hemipterans *Hyalymenus potens* (Alydidae) and *Leptoglossus phyllopus* (Coreidae) also occurred frequently especially when *Schinus* fruit was abundant. No significant herbivory was observed on *S. terebinthifolius* at any time during the survey. A list of insect species recorded from *S. terebinthifolius* in Florida by the Florida Department of Agriculture and Consumer Services, Division of Plant Industry between 1934 and 1981 is incorporated and discussed.

RESUME

Se coleccionaron artrópodos en *Schinus terebinthifolius* Raddi a mano y con redes de ciega cada otra semana entre Mayo 8, 1979 y Julio 29, 1980, en 3 sitios en el Condado de Lee en la Florida. De las 115 especies de artrópodos identificadas, 46 (40%) eran fitófagos, 59 (51.3%) eran depredadores, y 10 (8.7%) eran misceláneas. Las seis especies que ocurrieron más frecuentemente pertenecían a la Formicidae o a la Araneae. La especie de fitófago que ocurrió con más frecuencia fue el grillo *Cyrtoxipha*. Los fitófagos hemípteros *Hyalymenus potens* (Alydidae) y *Leptoglossus phyllopus* (Coreidae) también ocurrieron frecuentemente, especialmente cuando la fruta *Schinus* era abundante. No se observó ningún herbívoro significativo en *S. terebinthifolius* en ningún momento durante la encuesta. Se incorpora y se discute una lista de las especies obtenidas de *S. terebinthifolius* de la Florida por el Departamento de Agricultura y Servicios al Consumidor de la Florida, División de la Industria de Plantas, entre 1934 y 1981.

The woody shrub *Schinus terebinthifolius* Raddi (Anacardiaceae), is an aggressive colonizer throughout south Florida. A native of Argentina, Paraguay and Brazil, it is thought to have been introduced into Florida as an ornamental during the 1840's (Ewel et al. 1982). *S. terebinthifolius* is also found in southern Arizona and southern California and is naturalized in over 20 countries (Ewel et al. 1982). The plant is called Florida Holly, Christmas Berry, Brazilian pepper and Brazilian peppertree (BP), which is the approved common name (WSSA 1984). BP is reported as a "sparse species" in its native range, but reaches heights of 13m and often grows as an impenetrable thicket invading and disrupting a variety of habitats including hammocks and mangrove forests in Florida (Ewel et al. 1982). Areas disturbed by human activities or hurricanes are often the most aggressively invaded (Alexander & Crook 1973). The influx of urban development associated with a disruption of natural hydrological cycles by the construction of canals and other water control structures in south Florida during recent years, has essentially "opened the door" for *Schinus* invasion. A variety of control strategies including herbicides, burning and bulldozing have been undertaken in localized areas as Everglades National Park and Sanibel Island with limited success (Koepp 1979, Pierce 1979).

The introduction of three exotic insect species, *Crasimorpha infuscaia* Hodges (Lep.:Gelechiidae), *Episimus utilis* Zimmerman (Lep.: Tortricidae) and *Bruchus atronotatus* Pic (Col.:Bruchidae), for biological control of BP in Hawaii between 1954 and 1961 resulted in the bruchid and tortricid becoming established but with little effect on the plant's dispersal (Julien 1982, C. J. Davis pers. com.). However, these species or other insect or pathogen control agents present in the native range of *Schinus* spp. may be more suitable in south Florida. For example, there are several species of shrubby *Schinus* in the northwest region of Argentina where fruits are severely attacked by undescribed bruchid species in the genus *Lithraeus* (A. L. Teran pers. com.).

The objective of this survey was to provide a better understanding of the arthropod fauna on BP in south Florida in order to identify arthropods that may have potential for manipulation as control agents and to provide a basis for further work on arthropod control agents of BP.

MATERIALS AND METHODS

Three sites in Lee County, Florida, dominated by BP growth, were surveyed every other week between 8 May 1979 and 29 July 1980. Site 1 was located on Sanibel Island on Tarpon Bay Road between Gulf Drive and Periwinkle Way (T46S, R22E, S26). This site is characterized as a narrow roadside strip of BP growing on a roadside ditch spoil bank. Site 2 was located in Fort Myers west of Marsh Avenue between Ballard Road and Madison Avenue (T44S, R25E, S17). This site consisted of intermittent stands of BP growing in a field of mixed grass spp. and a variety of herbs. Site 3 was located near Tice Road approximately 200m east of Interstate 75 (T44S, R25E, S10), and was of a similar habitat and surrounding plant community as Site 2.

Arthropod collection methods included sweeping and hand collecting. Forty standard sweeps were made on BP at each site with a 30-cm-diam. sweep net. The area of vegetation swept ranged from approximately 0.6m to 2.4m above ground level and included leaf, flower and fruiting portions of the plants. Arthropods were also collected by hand for a 5-min. period at each site and notes were made concerning their location on the plant and related behavior. The contents of the sweep net samples were returned to the laboratory in plastic bags and kept frozen until they could be sorted. Hand collected samples were transported in killing jars and stored as above.

The compilation of insects collected from BP by DPI (Florida Department of Agriculture and Consumer Services, Division of Plant Industry) workers was made from identification slips on record at DPI headquarters in Gainesville. The DPI file included 221 individual collections made on BP in south Florida during the following years: 1934, 1935, 1939, 1948, 1950, 1954, 1956, 1958-74, 1977-81. Due to the lengthy list of insect species and the subjective and non-comprehensive nature of the DPI survey, only those insect spp. collected on more than one date were included in this compilation.

RESULTS AND DISCUSSION

In the Lee County (LCHCD) survey, 115 arthropod species were collected of which 46 (40.0%) were phytophagous and 59 (51.3%) predatory (Tables 1 and 2). Those species categorized as miscellaneous are also included in Table 2. A total of 44 species are listed from the DPI survey of which 37 (84.1%) are phytophagous, 5 (11.4%) predatory and 2 (4.5%) miscellaneous. DPI field agents are trained to scout for pests of agriculture as evidenced by the high percentage of phytophagous species from this survey. The six most common species from the LCHCD survey were either ants (Formicidae) or spiders (Araneae). Dead BP branches resulting from periodic freezing temperatures provide a suitable nesting habitat for the arboreal formicids, *Pseudomyrmex mexicanus*, *P. brunneus*, *Crematogaster clara* and *Camponotus floridanus* which are important predators of small arthropods and of eggs and young of larger ones (Trager pers. com.). A small inconspicuous bush cricket (*Cyrtoszipha* sp.) was the most common phytophagous species from the LCHCD survey. Blatchley (1920) reports *C. gundlachi* Saussure and *C. gundlachi columbiana* Caudell as occurring in Florida on shrubs and small trees usually near water.

During October through March when BP fruit is plentiful, the most conspicuously abundant and commonly occurring species are *Hyalymenus potens* (Alydidae), the *Leptoglossus* group, primarily *L. phyllopus*, and the scutellerids *Symphylus carribeanus* and *Sphyrocoris obliquus*, all of which imbibe juice from ripening fruit. The effect of feeding by true bugs on the normal development of BP fruit and eventual effect on the seed is unknown, however, there was no evidence of a decline in seedling density and distribution in areas that were surveyed. Aggregations of immature *H. potens* and *Leptoglossus* spp. were often observed on clusters of BP fruit indicating that oviposition

probably also occurs on BP. Hussey (1952) also observed *L. phyllopus* and *L. gonagra* on BP fruit.

Many of the most frequently occurring insects from the DPI survey (Table 1) are major or minor pests of agriculture. *Diaprepes abbreviatus* (sugarcane root borer) is a pest of sugarcane, citrus and other crops (Hill 1975). *Pulvinaria psidii* (green shield scale) is a minor pest of guava and mango (Hill 1975). Major pests of citrus including *Aleurocanthus woglumi* (citrus blackfly) and *Coccus viridus* (soft green scale) were collected from BP but infrequently during the DPI survey.

The only commonly occurring species from the LCHCD survey that is a significant agricultural pest is *Leptoglossus phyllopus*, a major pest of citrus. During serious infestations it causes premature color break and fruit drop (Mead 1971). *L. phyllopus* also heavily infests at times a variety of other crops including tomato, bean, bell pepper and cucurbits which are important winter vegetable crops in south Florida (Mead 1971). Other species of *Leptoglossus* are also pests. BP growing in proximity to agricultural areas probably supports large populations of vegetable damaging coreids, pentatomids and scutellerids especially during October through December when BP fruiting is at its peak and winter vegetable crops are nearing harvest. Scale insects were never very numerous during the LCHCD survey. On several occasions the coccinellids *Azya luteipes* and *Cycloneda* sp. were observed preying on scales. None of the phytophagous arthropods collected from BP as a part of the LCHCD survey were observed causing significant damage to the plant nor was extensive herbivory of any type observed.

Ewel et al. (1982) reported 29 species of insects visiting male and female BP flowers in Everglades National Park. Only three of these 29 species were also collected in the LCHCD survey indicating that the arthropod fauna on BP is probably influenced to a large extent by the composition and diversity of the surrounding plant communities. None of the phytophagous insects reported here are thought to utilize BP exclusively. This is not surprising since BP has been present in Florida for a relatively short period. Only 9 (12%) of the 74 phytophagous species in Table 1 were common to both the DPI and LCHCD surveys. This suggests that sampling sites over a greater geographical range and/or other habitat types may have been more appropriate for the LCHCD survey.

The compatibility of an introduced biological control agent with the existing arthropod fauna of BP will depend in part on its susceptibility to predation by ants and spiders which are the most common groups on this plant. Soft bodied larvae with limited defense mechanisms that occur on exposed portions of the plant would seem to be the most susceptible to foraging ants and spiders.

Due to its prolific dispersal and aggressive colonization of rapidly increasing disturbed areas, BP remains a significant component of the flora in south Florida. Introduction of an exotic phytophagous arthropod may be economically feasible, if suitable agents can be found, considering the high cost of present control activities in some areas. Despite the problems associated with BP, the plant is still being used as an ornamental, mostly at older residences where scattered plants were already growing prior to construction and were allowed to remain as a part of the landscape. Introduction of a leaf feeding insect for control of *Schinus* would result in a conflict of interest since the plant is still used for landscape purposes. Control by a leaf feeding insect, even if possible, is probably impractical. An agent that damages or consumes a large percentage of flowers or seeds may be a long-term solution to the problem of seed dispersal and the continued invasion of *Schinus* to uninfested areas.

ACKNOWLEDGMENTS

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TABLE 1. PHYTOPHAGOUS ARTHROPODS COLLECTED FROM *SCHINUS TERREBINTHIFOLIUS*.

| Taxon | Stages Collected ¹ | Assoc. ² | Months Collected ³ | % Frequency of Occurrence LCHCD Survey (Site) ⁴ | % Frequency of Occurrence DPI Surveys ⁵ |
|---|-------------------------------|---------------------|-------------------------------|--|--|
| COLEOPTERA | | | | | |
| Cantharidae | | | | | |
| <i>Chaetognathus marginatus</i> (Fabr.) | A | B, L, F | III, V, X | 17.2(2) | — |
| Chrysomelidae | | | | | |
| <i>Elytharida rhois</i> (Forst.) | A | L | V-VII | — | 3.6 |
| Curculionidae | | | | | |
| <i>Diaprepes abbreviatus</i> (L.) | all | L, B, R | III-IX | — | 4.1 |
| Elateridae | | | | | |
| <i>Conoderus</i> sp. | A | L | VIII | 3.4(3) | — |
| <i>Glyphonyx</i> sp. | A | — | V-VII | 10.3(2) | — |
| <i>Melanotus</i> sp. | A | L | VII | 3.4(2) | — |
| Scarabaeidae | | | | | |
| <i>Euphoria sepulchris</i> (F.) | A | B | III, V, IX | 6.9(2) | 1.0 |
| <i>Pachysphinx marginatus</i> (Fab.) | A | — | VI, X | — | 1.0 |
| <i>Trigonopeltastes delta</i> (Forst.) | A | L, B, S | IX, XI | — | 1.0 |
| DIPTERA | | | | | |
| Tephritidae | | | | | |
| <i>Tephritis subpara</i> (Johnson) | A | L | VIII | — | 1.4 |
| HEMIPTERA-HOMOPTERA | | | | | |
| Acanaloniidae | | | | | |
| <i>Acanalonia latifrons</i> (Walker) | A | — | VII | 3.4(1) | — |
| Aleyrodidae | | | | | |
| <i>Aleyrocanthus weglumi</i> Ashby | I | — | VII, IX | — | 2.3 |
| Alydidae | | | | | |
| <i>Hyalymenus</i> sp. | I, A | L, S | I, XII | — | 1.4 |
| <i>Hyalymenus potens</i> Torre-Bueno | I, A | F | I-V, X-XII | 41.4(2,3) | — |
| Aphididae | | | | | |
| <i>Aphis gossypii</i> Glover | I, A | — | IV, X | — | 1.0 |

| | | | | | |
|---|------|------|------------------------|-----------|------|
| Cercopidae | | | | | |
| <i>Clastoptera undulata</i> Uhler | A | — | VII, XI | 34.5(1-3) | — |
| <i>Clastoptera xanthocephala</i> Germa | A | — | III, VI, IX | 10.3(2) | — |
| Cicadellidae | | | | | |
| <i>Chlorotettix minimus</i> Baker | A | — | V | 3.4(2) | — |
| <i>Draecutacephala portola</i> Ball | A | — | II | 3.4(2) | — |
| <i>Graphocephala coccinea</i> (Forster) | A | — | I-III, V-VIII, IX, XII | 51.7(1-3) | — |
| <i>Graphocephala versuta</i> (Say) | A | — | VII | 3.4(2) | — |
| <i>Homaldisca coagulata</i> (Say) | A | — | V, VII, XI | 10.3(2) | — |
| <i>Oncometopia nigricans</i> (Walker) | A | — | III, IV, VI, VII, IX | 27.6(2,3) | — |
| <i>Stragania robusta</i> (Uhler) | A | — | II, VI | 6.9(1,3) | — |
| Coccidae | | | | | |
| <i>Ceroplastes</i> sp. | A, I | S, L | III, VIII-X | — | 1.8 |
| <i>Ceroplastes ceriferus</i> (And.) | A, I | — | X, XII | — | 1.0 |
| <i>Ceroplastes cirripediformis</i> | | | | | |
| Comstock | | | | | |
| <i>Ceroplastes floridensis</i> Comstock | A, I | L, S | II, III, V, VII, XII | — | 4.5 |
| <i>Coccus accuminatus</i> (Sign.) | A, I | L, S | I-III, V, VIII-X | — | 5.0 |
| <i>Coccus hesperidum</i> L. | A, I | L, S | I-VII, IX | — | 6.3 |
| <i>Coccus viridis</i> (Green) | A | L | III, IV, VI, X | 3.4(2) | 1.4 |
| <i>Kilifia accuminata</i> (Sign.) | A, I | L, S | I, X | — | 1.8 |
| <i>Parasaissetia nigra</i> (Nietner) | A, I | L, S | I-III, VI, VIII | 20.7(2,3) | 2.3 |
| <i>Protospulvinaria pyriformis</i> | A, I | L, S | V, X | — | 1.0 |
| Comst. | | | | | |
| <i>Pulvinaria psidii</i> Maskel | A, I | S | V, VII | — | 1.0 |
| <i>Saissetia coffeae</i> (Walker) | A, I | L | I-X | 31.0(1-3) | 13.1 |
| Coreidae | | | | | |
| <i>Acanthocephala femorata</i> (F.) | A | L, S | I-III, V-VIII | 3.4(1) | 2.3 |
| <i>Leptoglossus concolor</i> (Walker) | A | F | V | 3.4(2) | — |
| <i>Leptoglossus gonagra</i> (F.) | A, I | F, L | I, III, VIII, X-XII | 17.2(2,3) | 1.0 |
| <i>Leptoglossus oppositus</i> (Say) | A, I | F, L | I-IV, VIII, XI | 20.7(2,3) | 1.0 |
| <i>Leptoglossus phyllopus</i> (L.) | A, I | F, L | I | 3.4(2) | — |
| <i>Spartocera</i> sp. | I | — | I, V, VIII, X-XII | 37.9(2,3) | — |
| | | L | VI | — | 1.0 |

TABLE 1. (Continued)

| Taxon | Stages Collected ¹ | Assoc. ² | Months Collected ³ | % Frequency of Occurrence LCHCD Survey (Site) ⁴ | % Frequency of Occurrence DPI Survey ⁵ |
|--|-------------------------------|---------------------|-------------------------------|--|---|
| Diaspididae | | | | | |
| <i>Howardia biclavata</i> (Comstock) | A,I | S | IV,VI,X | — | 1.4 |
| <i>Pyraspis strachani</i> (Cooley) | A,I | — | V,VI,X | — | 1.0 |
| <i>Pseudaonidia duplex</i> (Cockerell) | A,I | S | IV | — | 1.0 |
| <i>Pseudaonidia trilobitiformis</i> (Green) | A,I | L | I,X | — | 1.4 |
| Largidae | | | | | |
| <i>Largus davisi</i> Barber | A | — | VII | 3.4(3) | — |
| Lygaeidae | | | | | |
| <i>Oncopeltus fasciatus</i> (Dallas) | A,I | L,S | IV,VI,XI | 3.4(2) | 1.0 |
| Membracidae | | | | | |
| <i>Spissistilus festinus</i> (Say) | A | — | X-XII | 6.9(3) | — |
| <i>Umbonia crassicornis</i> (Amyot & Serville) | A,I | — | VII | — | 1.0 |
| Orthezitidae | | | | | |
| <i>Orthezia ignignia</i> Browne | A,I | S,L | VI | — | 1.0 |
| Pentatomidae | | | | | |
| <i>Acrosternum marginatum</i> (P. De B.) | I | L | VII | — | 1.0 |
| <i>Euschistus servus</i> (Say) | A,I | — | V-VIII,XII | 17.2(2,3) | — |
| <i>Loxa flavicollis</i> (Drury) | A | — | I,IV,VII | 10.3(1-3) | — |
| <i>Nezara viridula</i> (L.) | A,I | L | I,II,IV,XII | 17.2(2,3) | 1.0 |
| <i>Piezodorus guildinii</i> (Westwood) | A | — | I,II | 6.9(2) | — |
| <i>Thyanta perditor</i> (F.) | A | — | I,II | 6.9(3) | — |
| Pseudococcidae | | | | | |
| <i>Geococcus coffeae</i> Green | A,I | L,R | I,X,XII | — | 1.4 |
| <i>Phenacoccus solani</i> Ferris | A,I | R | X | — | 1.0 |

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|--|------|------|----------------------|------------|-----|--|--|--|
| Scutelleridae | | | | | | | | |
| <i>Chelysoma guttatutum</i> (Her.-Sch.) | A | F | XI | 3.4(2) | — | | | |
| <i>Diolens chrysorrhoeus</i> (Fabr.) | A | — | VIII | 3.4(2) | — | | | |
| <i>Sphynocoris obliquus</i> (Germar) | A, I | — | I, X, XII | 20.7(2, 3) | — | | | |
| <i>Symphylus</i> sp. | A | — | I-III | 13.8(2, 3) | — | | | |
| <i>Symphylus caribeanus</i> Kirkaldy | A | — | I-II, V | 17.2(2, 3) | — | | | |
| Tropiduchidae | | | | | | | | |
| <i>Petitropis rotulata</i> Van Duzee | A | — | VI, VII | 10.3(1, 2) | — | | | |
| LEPIDOPTERA | | | | | | | | |
| Arctiidae | | | | | | | | |
| <i>Hyphantria cunea</i> Drury | L | L | VIII, IX | — | 1.0 | | | |
| Lycaenidae | | | | | | | | |
| Sp. A | A | L | V, VIII, XI | 10.3(3) | — | | | |
| ORTHOPTERA | | | | | | | | |
| Acrididae | | | | | | | | |
| <i>Melanoplus</i> sp. | A, I | L | VI, VIII, IX | 10.3(3) | — | | | |
| <i>Parortya</i> sp. | A | L | VI | 3.4(3) | — | | | |
| <i>Schistocera</i> sp. | A | L | VI | 3.4(3) | — | | | |
| Gryllidae | | | | | | | | |
| <i>Cyrtorhiza</i> sp. | A, I | L | I-VIII, XI, XII | 65.5(1-3) | — | | | |
| Tettigoniidae | | | | | | | | |
| <i>Pterophyla</i> sp. | A, I | L | VIII, XI, XII | 10.3(2, 3) | — | | | |
| <i>Neononocephalus</i> sp. | A, I | L | VII, IX, XII | 13.8(2) | — | | | |
| THYSANOPTERA | | | | | | | | |
| Thripidae | | | | | | | | |
| <i>Selenothrips rubrocinctus</i> (Giard) | A, I | L, B | III, VI, VII, IX, XI | — | 4.1 | | | |

*A = adult, I = immature
 *L = leaves, B = bloom, S = stem, F = fruit, R = root
 †includes both surveys

‡Lee County Hyacinth Control District
 *Division of Plant Industry, Florida Department of Agriculture and Consumer Services

TABLE 2. PREDACEOUS AND MISCELLANEOUS ARTHROPODS COLLECTED FROM *SCHINUS TERREBINTHIFOLIUS*.

| Taxon | Stages Collected ¹ | Assoc. ² | Months Collected ³ | % Frequency of Occurrence LCHCD Survey (Site) ⁴ | % Frequency of Occurrence DPI Survey ⁵ |
|--|-------------------------------|---------------------|-------------------------------|--|---|
| ACARI | | | | | |
| Phytoseiidae | | | | | |
| <i>Amblyseius hibisci</i> (Chant) | A | — | III, V | — | 1.0 |
| <i>Typhlodromatus peregrinus</i> (Muma) | A, I | — | XII | — | 1.0 |
| Tydeidae | | | | | |
| <i>Lorryia formosa</i> Cooreman | — | L | VII, IX | — | 1.0 |
| <i>Tydeus</i> sp. | A, I | L, S | VI, XII | — | 1.0 |
| ARANEAE | | | | | |
| Anyphaenidae | | | | | |
| <i>Ayscha</i> sp. | — | — | I-VII, X-XII | 89.7(1-3) | — |
| <i>Ayscha velox</i> | — | — | I, II, VI, XI, XII | 24.1(2,3) | — |
| <i>Tendis mordax</i> (O. P. Cambridge) | — | — | II | 3.4(2) | — |
| Araneidae | | | | | |
| <i>Acanthepeira</i> sp. | — | — | VI | 3.4(3) | — |
| <i>Avaneus pegnia</i> (Walckenaer) | — | — | IV | 3.4(2) | — |
| <i>Eriophora ravilla</i> (Kock) | — | — | II, VII, IX-XI | 17.2(2,3) | — |
| <i>Gasteracantha caneriformis</i> (L.) | — | — | III, VIII | 10.3(1) | — |
| <i>Neoscona arbesca</i> (Walckenaer) | — | — | I | 3.4(2) | — |
| <i>Tetragnatha</i> sp. | — | — | II-IV, IX-XI | 20.7(1-3) | — |
| <i>Tetragnatha guatemalensis</i> O. P. Cambridge | — | — | I | 3.4(3) | — |
| Clubionidae | | | | | |
| <i>Chiracanthium inclusum</i> (Hentz) | — | — | V, VIII | 10.3(3) | — |
| <i>Clubiona</i> sp. | — | — | VI | 10.3(3) | — |
| <i>Trechetas</i> sp. | — | — | V | 3.4(2) | — |

| | | | | | |
|--|---|---|----------------------------------|------------------------|---|
| Dictyridae | — | — | X | 3.4(2) | — |
| <i>Dictyna altamira</i> (Gertsch & Davis) | — | — | | | |
| Linyphiidae | — | — | XII | 3.4(3) | — |
| <i>Eperigone cf. serrata</i> Ivie & Barrows | — | — | VII V | 3.4(1) 3.4(1) | — |
| Lycosidae | — | — | I-V, VII, IX-XII | 44.8(2,3) | — |
| Oxyopidae | — | — | VI VII, VIII | 6.9(3) 10.3(3) | — |
| Pisauridae | — | — | I-VIII, X-XII I, III-V, VI, X | 75.9(1-3) 27.6(2-3) | — |
| <i>Dolomedes</i> sp. | — | — | II, XII VI, X, XII | 6.9(2) 10.3(2) | — |
| <i>Pisaurina undulata</i> (Keyserling) | — | — | I, III | 10.3(2) | — |
| Salticidae | — | — | III, X VII | 6.9(2,3) 6.9(3) | — |
| <i>Hentzia palmarum</i> (Hentz) | — | — | VII | 3.4(2) | — |
| <i>Lysomanes viridis</i> (Walckenaer) | — | — | XI | 3.4(2) | — |
| <i>Metaphidippus galathea</i> (Walckenaer) | — | — | | | |
| <i>Phidippus regiosus</i> C. L. Koch | — | — | VII | 3.4(2) | — |
| <i>Thiodina</i> sp. | — | — | | | |
| <i>Thiodina syivana</i> (Hentz) | — | — | | | |
| <i>Zygoballus</i> sp. | — | — | | | |
| Thomisidae | — | — | | | |
| <i>Misumenopus</i> sp. | — | — | | | |
| <i>Misumenopus oblongus</i> (Keyserling) | — | — | | | |
| COLEOPTERA | | | | | |
| Coccinellidae | A | — | VII | 6.9(2) | — |
| <i>Azya luteipes</i> Muls. | A | — | I, V, VI, VIII, XI | 17.2(1-3) | — |
| <i>Cycloneda</i> sp. | | | | | |
| DIPTERA | | | | | |
| Bibionidae | A | L | IV, V, IX | 13.8(2,3) | — |
| <i>Plecia nearctica</i> Hardy | | | | | |

TABLE 2. (Continued)

| Taxon | Stages Collected ¹ | Assoc. ² | Months Collected ³ | % Frequency of Occurrence LCHCD Survey (Site) ⁴ | % Frequency of Occurrence of DPI Survey ⁵ |
|---|-------------------------------|---------------------|-------------------------------|--|--|
| Dolichopodidae | | | | | |
| <i>Chrysotus</i> sp. | A | L | V-VII, XI | 13.8(1-3) | — |
| <i>Condylostylus</i> sp. | A | L | V-VIII, XI, XII | 34.5(1-3) | — |
| <i>Condylostylus chrysoprastus</i> (Wik.) | A | L | VI, VII | 6.9(3) | — |
| <i>Condylostylus crinitus</i> (Aldr.) | A | L | VI | 6.9(2,3) | — |
| <i>Condylostylus mundus</i> (Wied.) | A | L | VII, VIII | 6.9(3) | — |
| Otitidae | | | | | |
| <i>Euzestus abdominalis</i> (Loew) | A | — | II, VII | — | 1.0 |
| Sarcophagidae | | | | | |
| <i>Blaesoxipha opifera</i> (Coq.) | A | — | X | 3.4(2) | — |
| <i>Erythrandra picipes</i> B & B | A | L | IV | 3.4(3) | — |
| <i>Oxysarcoderia ventricosa</i> (Wulp) | A | L | VI | 3.4(3) | — |
| <i>Ravinia derelicta</i> (Walk.) | A | L | VI | 3.4(3) | — |
| <i>Sarcoderia alata</i> (Ald.) | A | L | II | 3.4(2) | — |
| Stratiomyidae | | | | | |
| <i>Hermelia illucens</i> (L.) | A | L | VII | 3.4(2) | — |
| Syrphidae | | | | | |
| Sp. A | A | — | I | 3.4(1) | — |
| Sp. B | A | — | II-IV | 10.3(2) | — |
| HEMIPTERA-HOMOPTERA | | | | | |
| Pentatomidae | | | | | |
| <i>Euthyrhynchus floridanus</i> (L.) | A | LS | IV, V, VII | 3.4(2) | 1.8 |
| Phymatidae | | | | | |
| <i>Phymata fasciata</i> (Gray) | A | — | V | 3.4(3) | — |
| HYMENOPTERA | | | | | |
| Apidae | | | | | |
| <i>Apis mellifera</i> L. | A | B | VI, IX, X | 17.2(1-3) | — |

| | | | | | | |
|--|------|---|------------------|-----------|---|-----|
| Formicidae | | | | | | |
| <i>Brachymyrmex</i> sp. | — | — | V | 3.4(3) | — | — |
| <i>Camponotus floridanus</i> (Buckley) | — | — | III, VI-X | 44.8(1,3) | — | — |
| <i>Camponotus pavidus</i> Wheeler | — | — | V, VII | 6.9(2) | — | — |
| <i>Camponotus rasilis</i> Wheeler | — | — | VI, VII | 10.3(3) | — | — |
| <i>Camponotus tortuganus</i> Emery | — | — | VI, VIII | 13.8(1,3) | — | — |
| <i>Cardiocondyla</i> sp. | — | — | VII | 6.9(2,3) | — | — |
| <i>Colobopsis impressa</i> Roger | — | — | I, III-IX, XII | 75.9(2,3) | — | — |
| <i>Conomyrma flavopecta</i> (Smith) | — | — | VII-IX | 10.3(3) | — | — |
| <i>Crematogaster ashmeadi</i> Mayr | — | — | VI | 3.4(1) | — | — |
| <i>Crematogaster clara</i> Mayr | — | — | I, III, V-X, XII | 72.4(2,3) | — | — |
| <i>Paratrechina bourbonica</i> (Forel) | — | — | VI, VII | 6.9(3) | — | — |
| <i>Pheidole dentata</i> Mayr | — | — | VII | 3.4(1) | — | — |
| <i>Pseudomyrmex ejectus</i> Smith | — | — | I, III-X | 65.5(1-3) | — | — |
| <i>Pseudomyrmex elongatus</i> (Mayr) | — | — | I, III, VII | 10.3(2,3) | — | — |
| <i>Pseudomyrmex mexicanus</i> (Roger) | — | — | II, XII | 89.7(1-3) | — | — |
| <i>Pseudomyrmex pallidus</i> (Smith) | — | — | I, VI | 6.9(3) | — | — |
| <i>Solenopsis geminata</i> (Fabr.) | — | — | VI, IX | 6.9(4) | — | — |
| <i>Tapinoma litorale</i> Wheeler | — | — | I | 3.4(2) | — | — |
| Halictidae | | | | | | |
| Sp. A. | — | B | X, XI | 6.9(2) | — | — |
| NEUROPTERA | | | | | | |
| Chrysopidae | | | | | | |
| <i>Chrysopa</i> sp. | A | L | I, XI | 10.3(2) | — | — |
| Mantispidae | | | | | | |
| <i>Mantispa</i> sp. | A | L | VI, VII, X, XI | 13.8(2,3) | — | — |
| PSOCOPTERA | | | | | | |
| Psocidae | | | | | | |
| <i>Cerastipsocus venosus</i> (Burmeister) | A, I | — | VI | — | — | 1.0 |

¹A = adult, I = immature

²L = leaves, S = stem

³includes both surveys

⁴Lee County Hyacinth Control District

⁵Division of Plant Industry, Florida Department of Agriculture and Consumer Services

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