SPIDERS OF FLORIDA CITRUS GROVES

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ABSTRACT

A corrected list of 148 species of spiders from Florida citrus is presented, based on the literature and collections made in Seminole, Lake and Orange counties during 1979-81. Twenty-two families are represented. Fifty of the species and 3 of the families have not been reported previously from Florida citrus.

RESUMEN

Se presenta una lista corregida de 148 especies de arañas de cítricos en Florida basada sobre la literatura ye unas colecciones hechas durante 1979-81 en los Condados de Seminole, Lake, y Orange. Se representan 22 familias. Cinquenta de las especies y 3 de las familias no se há registrado previamente de citricos en Florida.

Citrus groves in Florida are populated by numerous spiders. Previous studies of spiders in Florida have been more extensive than for most states, but the fauna is still not completely known. The present investigation would have been extremely difficult and would have required many more years of research had it not been for the earlier work of Muma (1973, 1975), who reported 99 species (91 not counting confused forms) from Florida citrus. Although data were collected over a 20 year period he felt that his list was incomplete. We obtained data on the composition of the spider fauna in citrus groves in North Central Florida as part of a series of studies on spiders as predators of pest insects. We found 50 species not previously recorded from Florida citrus. Thus this fauna is now known to contain a total of 148 species after corrections (including confused forms). For comparison, Nakao and Okuma (1958) reported 53 species of spiders from citrus near Fukuoka, Japan, and Carroll (1980) reported 61 species from California citrus groves. In the past, the impact of spiders as predators has been thought to be minimal, since many of the most important pests in citrus are sessile Homoptera. With the increased importance of weevil pests, such as *Diaprepes abbreviatus* (L.), *Araecerus fasciculatus* (DeGeer), *Pantomorus cervinus* (Boheman), and *Pachnaeus* spp., this situation may be changing.

METHODS AND MATERIALS

Three collection methods were used: branch shaking, pitfalls, and incidental collecting. Spiders were collected by the shake method usually bimonthly from a mature orange grove in Forest City, Seminole Co., FL, from December 1979-December 1980. Selected branches of a tree were of sufficient size and spread to overshadow a 2x1.5 m reinforced plastic ground

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cloth. Completely random selection of trees and/or branches was impractical because of the physical structure of the trees.

Once an appropriate branch was located, it was grasped about midway between the trunk and foliage and shaken 3-5 times. After each of 10 branches (on separate trees) were shaken, spiders found on the cloth were captured in 7-dram plastic snap cap vials. At the conclusion of the last daily replication, most recognizable adult spiders were identified, counted, and released. Less easily identified and immature spiders were preserved for taxonomic determination. No attempt was made to keep records on the ratio of adults to immatures.

Pitfall traps were made from quart size plastic jars containing 3 cm of ethylene glycol. A plastic funnel was inserted in each jar. Five traps were placed in the Forest City grove and these checked weekly from October 1979 to June 1980. Incidental capture of spiders was also utilized to obtain species not easily collected by branch shakes.

Supplementary data were collected in an "organic" (never sprayed with pesticides) orange grove in Yalaha, Lake Co., FL, as well as in groves near Apopka and Plymouth, FL. Voucher specimens of the spiders collected in the current study are deposited in the Florida State Collection of Arthropods (FSCA), Division of Plant Industry, Florida Department of Agriculture and Consumer Services, Gainesville, FL. Most identifications were made by Dr. G. B. Edwards of the FSCA.

Results and Discussion

An updated summary list of spiders found in Florida citrus is presented in Table 1. We have changed some names from Muma's (1973, 1975) lists to reflect recent revisionary work. Additions made in the current study are noted. Ten of the most numerous spiders were selected for examination of relative abundance in shake samples over 1 year of sampling in the Forest City grove (Table 2). There was a large degree of variation. *Dictyna florens*, *Theridion flavonotatum*, *Araneus miniatus*, *Tetragnatha versicolor*, and *Hentzia palmarum* appeared to be most numerous during the winter; *Gasteracantha cancriformis* was most abundant during the winter and early spring. *Aysha velox*, *Trachelas similis*, and *Thiodina sylvana* seemed to have peaks of abundance at various times of the year with little apparent pattern, although *A. velox* seemed to show a double peak, in winter and early fall. *Leucauge* spp. were most abundant in winter and fall.

Tetragnatha versicolor seemed to be more abundant in these samples than any other spider. However, *Aysha velox* was the most numerous in fall. *Hentzia palmarum* also reached relatively high numbers (84 in Jan. 16 samples) during part of the year. Sample sizes of similar magnitude for the latter species also have been collected (D. B. Richman) on black mangrove during much of the year (1975) in coastal swamps near Cedar Key, Levy Co., FL.

The organic Yalaha grove had a relatively extensive fauna, based on our few samples, but this fauna seemed to be no more complex than that at Forest City, where the usual foliar insecticides and fungicides had been applied. Winn Grove near Plymouth appeared to have a less diverse fauna as also has been shown for ants (Tryon and Whitcomb, in press). During one afternoon of observation only a few spiders were seen on the ground

TABLE 1. CORRECTED AND EXPANDED LIST OF THE SPIDERS OF FLORIDA CITRUS BASED ON MUMA (1973 AND 1975) AND DATA COLLECTED FROM GROVES IN ORANGE, LAKE, AND SEMINOLE COUNTIES DURING 1979-81. MOST SPIDERS LISTED ONLY AS "SP." ARE REPRESENTED BY IMMATURE SPECIMENS WHICH COULD NOT BE DETERMINED TO SPECIES.

	Muma 1973	Muma 1975	Present Study
Filistatidae			
Filistata hibernalis Hentz		X	
Dinopidae			
Dinopis spinosa Marx		X	
Uloboridae			
Hyptiotes cavatus (Hentz)			X
Uloborus cinereus O. P.-Cambridge		X	
U. glomosus (Walckenaer)		X	X
Dictynidae		X	
Dictyna altamira Gertsch & Davis		X	
D. annulipes (Blackwall)		X	
D. capens Chamberlin	X	X	
D. coweta Chamberlin & Gertsch		X	
D. florens Ivie & Barrows		X	X
D. formidolosa Gertsch & Ivie			X
D. manitoba Ivie		X	
D. roscida (Hentz)		X	
D. spathula Gertsch & Davis	X	X	
D. volucripes Keyserling		X	
Amaurobiidae			
Metaltella simoni (Keyserling)			X
Titanoeca brunnea Emerton			X
Scytodidae			
Scytodes fusca Walckenaer	X	X	
Oonopidae			
Oonopinus floridanus Chamberlin & Ivie	X	X	
Opopaea brasima Chickering	X	X	
Pholcidae			
Pholcus phalangioides (Fuesslin)		X	
Theridiidae		X	
Achaearanea porteri (Banks)	X		
A. tepidariorum (C. L. Koch)			X
Anelosimus studiosus (Hentz)		X	X
Argyrodes americanus (Taczanowski			X
A. elevatus Taczanowski			X
A. furcatus (O. P.-Cambridge)			X
A. globosus Keyserling		X	
A. nephilae Taczanowski		X	
Chrysso albomaculata O. P.-Cambridge		X	

TABLE 1. CONTINUED

	Muma 1973	Muma 1975	Present Study
C. pulcherrima (Mello-Leitão) [=*clementinae* (Petrunkevitch)]		X	X
Coleosoma acutiventer (Keyserling)		X	X
C. floridanum Banks [=*Theridion antonii* (Keyserling)]		X	
Latrodectus mactans (Fabricius)		X	
Paratheridula perniciosa (Keyserling)		X	
Steatoda erigoniformis (O. P.-Cambridge)	X	X	X
S. quadrimaculata (O. P.-Cambridge)	X	X	
Theridion adamsoni Berland			X
T. crispulum Simon			X
T. flavonotatum Becker		X	X
T. glaucescens Becker		X	
Theridula gonygaster (Simon)			X
T. opulenta (Walckenaer)		X	X
Thymoites marxi (Crosby) [=*Paradisca marxi* (Crosby)]	X	X	
Tidarren sisyphoides (Walckenaer)		X	
Mysmenidae [= Symphytognathidae]			
Mysmenopsis sp. [= *Mysmena* sp.]		X	
Linyphiidae			
Eperigone banksi Ivie & Barrows	X	X	
E. inornata Ivie & Barrows	X	X	
E. maculata (Banks)	X	X	
E. serrata Ivie & Barrows	X	X	
Erigone autumnalis Emerton	X	X	
Florinda coccinea (Hentz)		X	X
Grammonota maculata Banks	X	X	X
Meioneta spp. (six, possibly some new)	X	X	
Prolinyphia marginata (C. L. Koch)			X
Tennesseellum formicum (Emerton)			X
Walckenaera spiralis (Emerton) [=*W. vigilax* (Blackwall)]	X	X	
Araneidae			
Acacesia hamata (Hentz)		X	X
Acanthepeira stellata (Marx)		X	X
Araneus cingulatus (Walckenaer)		X	
A. miniatus (Walckenaer)		X	X
A. pegnia (Walckenaer)			X
Argiope argentata (Fabricius)		X	
A. aurantia Lucas		X	
A. trifasciata (Forskäl)		X	
Cyclosa caroli (Hentz)			X
C. sp. prob. *turbinata* (Walckenaer) [=*C.* nr *conica* (Walckenaer)]		X	

TABLE 1. CONTINUED

	Muma 1973	Muma 1975	Present Study
Eriophora ravilla (C. L. Koch)			X
Eustala anastera (Walckenaer)	X	X	X
Gasteracantha cancriformis (Linnaeus)		X	X
Glenognatha foxi (McCook)			X
Leucauge argyra (Walckenaer)			X
L. venusta (Walckenaer)		X	
Mastophora archeri Gertsch		X	
Micrathena sagittata (Walckenaer)		X	
Neoscona spp. prob. *arabesca* (Walckenaer), *domiciliorum* (Hentz) and *hentzi* (Keyserling)		X	X
Nephila clavipes (Linnaeus)		X	
Nuctenea cornuta (Clerck)			X
Tetragnatha guatemalensis O. P.-Cambridge [=*T. seneca* Seeley]		X	
T. versicolor Walckenaer [=*T. limnocharis* Seeley]		X	X
Verrucosa arenata (Walckenaer)		X	
Mimetidae			
Mimetus interfector Hentz			X
M. nelsoni Archer			X
M. notius Chamberlin [=*M.* sp. undetermined]		X	
Pisauridae			
Pisaurina sp.			X
Lycosidae			
Arctosa incerta Bryant [=*Schizocosa incerta* Bryant]	X	X	
Arctosa sp.			X
Lycosa lenta Hentz		X	X
L. helluo Walckenaer			X
Pardosa georgiae Chamberlin & Ivie [=*P. pauxilla* Montgomery]	X	X	X
P. longispinata Tullgren	X	X	
P. milvina (Hentz)			X
Pirata appalacheus Gertsch	X	X	X
P. suwaneus Gertsch	X	X	
Schizocosa segregata Gertsch & Wallace			X
Trabea aurantiaca (Emerton)			X
Oxyopidae			
Oxyopes salticus Hentz	X	X	
Peucetia viridans (Hentz)			X
Gnaphosidae			
Callilepis imbecilla (Keyserling)	X	X	

TABLE 1. CONTINUED

	Muma 1973	Muma 1975	Present Study
Camellina elegans (Bryant)			X
Cesonia bilineata (Hentz)			X
Drassyllus adocetus Chamberlin			X
D. aprilinus (Banks)			X
D. prob. *eremitus* Chamberlin [= *Drassyllus* n. sp. (nr *gymnosaphes* Chamberlin)]	X	X	
D. seminolus Chamberlin & Gertsch	X	X	
Micaria laticeps Emerton			X
Sergiolus kastoni Platnick & Shadab [=*S. decipiens* Chamberlin]	X	X	X
Zelotes florodes Platnick & Shadab [=*Z.* n. sp.]	X	X	
Clubionidae			
Castianeira crocata (Hentz) [=*C.* n. sp. *longipalpus* group]	X	X	
C. floridana (Banks)	X	X	
C. gertschi Kaston			X
Chiracanthium inclusum (Hentz)			X
Clubiona abboti L. Koch			X
Trachelas deceptus (Banks) [=*Meriola decepta floridana* Chamberlin]		X	X
T. similis F. O. P.-Cambridge [=*T. laticeps* Bryant]		X	X
T. volutus Gertsch			X
Anyphaenidae			
Anyphaena sp.			X
Aysha gracilis (Hentz)	X	X	
A. velox (Becker)			X
Teudis mordax (O. P.-Cambridge)			X
Sparassidae			
Heteropoda venatoria (Linnaeus)	X	X	
Thomisidae			
Misumenops sp.			X
Tmarus sp.			X
Xysticus ferox (Hentz)			X
X. fraternus Banks			X
Salticidae			
Admestina tibialis (C. L. Koch)			X
Corythalia canosa (Walckenaer)			X
Habrocestum bufoides Chamberlin & Ivie			X
Hentzia palmarum (Hentz) [=*H. ambigua* (Walckenaer)]		X	X

TABLE 1. CONTINUED

	Muma 1973	Muma 1975	Present Study
Lyssomanes viridis (Walckenaer)			X
Metacyrba sp.		X	
Metaphidippus galathea (Walckenaer)			X
Pellenes cf. *viridipes* (Hentz) [=*P. peregrinus* Peckham]		X	
Phidippus otiosus (Hentz)		X	
P. regius C. L. Koch		X	X
P. workmani Peckham & Peckham		X	
Plexippus paykulli (Audouin)		X	X
Synemosyna formica (Hentz)			X
Thiodina sylvana (Hentz) [=*T. iniquies* (Walckenaer)]		X	X
Tutelina sp. [=*Icius* sp.]		X	
Zygoballus rufipes Peckham & Peckham [=*Z. bettini* Peckham]	X	X	

and one orb web was found in a tree. This is apparently a result of the destruction of many arthropod species through the use of chlorinated hydrocarbons. Only earwigs seem to be more numerous in Winn Grove than at other groves.

The existance of the salticid spiders *Thiodina sylvana, Corythalia canosa* (Walckenaer) and *Lyssomanes viridis* (Walckenaer) in citrus indicates at least some mesic fauna incursion, whereas the salticids *Hentzia palmarum, Phidippus regius* C. L. Koch, *Phidippus workmani* Peckham & Peckham and others indicates both transitional and xeric faunas. This probably is a result of the nature of citrus groves, with relatively uniform spacing of canopy, broken by bare or weed-filled areas between.

Weevils, especially *Diaprepes abbreviatus*, have become increasingly important as citrus pests in Florida (Woodruff 1964, 1968; Selhime and Beavers 1972) and thus their natural enemies have also become important. While spiders do not appear to be as effective predators of weevils as ants, they do at times attack various stages of weevils. Two salticids have been observed to feed on the weevil *Diaprepes abbreviatus. Phidippus regius* was collected feeding on adult weevils (T. D. Gowan, and W. H. Whitcomb, personal observation) and *Corythalia canosa* has been observed several times feeding on neonate larvae (Whitcomb, et al. 1982; D. B. Richman personal observation). Both *Aysha velox* and *Trachelas deceptus* (Banks) have been observed to eat the eggs of Diaprepes (D. B. Richman, personal observation). *Argiope trifasciata* (Forskäl) will also take adult weevils (W. H. Whitcomb, personal observation).

In summary, spiders are numerous and possibly important components of the predator complex in Florida citrus groves. While to date little definite data have been obtained indicating a major impact of spiders except in very specialized situations, they do form a major part of the predatory fauna. The spider fauna of citrus groves is a mixture of forest, ecotonal, and old-

TABLE 2. NUMBER OF SPECIMENS OF THE 10 MOST ABUNDANT SPECIES OF SPIDERS COLLECTED IN SHAKE SAMPLES DURING ONE YEAR AT FOREST CITY, FLORIDA, 1979-80. EACH SAMPLE WAS COLLECTED FROM 10 CITRUS BRANCHES SELECTED AS DESCRIBED IN THE TEXT.

Date of coll.	*Dictyna florens*	*Theridion flavonotatum*	*Araneus miniatus*	*Gasteracantha cancriformis*	*Leucauge* spp. probably most *argyra*	*Tetragnatha versicolor*	*Trachelas similis*	*Aysha velox*	*Hentzia palmarum*	*Thiodina sylvana*
XII-5	0	0	0	0	1	2	2	13	1	5
XII-20	4	1	2	8	10	2	0	42	4	18
I-3	8	2	20	13	18	23	0	62	13	14
I-16	21	9	0	16	18	153	2	17	84	16
I-31	10	3	4	13	4	35	0	33	10	9
II-14	14	4	5	5	4	67	0	0	16	20
II-28	8	27	3	10	8	110	2	15	57	25
III-14	3	1	8	18	1	50	2	14	3	34
III-26	4	5	12	14	3	12	3	30	13	15
IV-10	8	6	0	1	3	23	0	14	21	7
IV-22	4	0	7	6	8	20	14	11	2	6
VI-5	3	0	2	3	0	13	2	7	21	1
VI-24	4	0	5	2	0	24	4	12	11	9
VII-3	8	0	0	4	11	4	1	21	20	5
VII-17	8	2	8	4	0	9	5	12	7	24
VII-30	2	1	2	2	0	18	0	4	8	2
VII-14	0	2	0	0	4	2	2	13	4	4
VII-21	0	0	1	4	0	0	6	15	4	2
VIII-29	3	0	8	4	1	21	3	22	4	19
IX-11	0	0	0	1	3	2	1	0	1	0
IX-25	10	2	4	2	0	26	6	21	26	11
X-31	5	0	2	1	3	8	6	66	10	6
XI-15	16	1	6	1	14	35	8	31	19	22
TOTAL	143	66	99	138	114	659	69	475	359	274

field or xeric faunas; this fauna fluctuates greatly in numbers, as in many other ecosystems.

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