CHRYSOPIDAE ASSOCIATED WITH CITRUS
IN FLORIDA

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The following annotated list of green lacewings, Chrysopidae, represents the present known fauna of this family in Florida citrus groves. Because of their large size and common occurrence these predators have received some emphasis during an intensive survey of the predators and parasites of citrus insects and mites. As is usually the case with such lists, incompleteness is to be expected but it is believed that the common species have been recognized.

Literature references citing species of Chrysopidae from citrus in Florida are rare. Hubbard (1885) recorded a trash-bearing species as *Chrysopa oculata* that apparently was the *C. cubana* Hagen listed here. In addition Hubbard suspected the existence of several species, one of which he stated was described as *C. citri* by Ashmead, listed here as *C. rufilabra* Burm. Hubbard erroneously thought, however, that all of the species had similar habits. Miller (1929) recorded two lacewings feeding on aphids, *C. harrisii* Fitch and *C. sp.* (near *lateralis*). The former possibly was the *C. interrupta* Schneid. listed here, but the latter may have been any of the several trash-bearing species included in the present paper. All recent records of lacewings have been reported as *C. lateralis* Guer. or *Chrysopa* sp. and have been references to predatory habits.

In the annotated list of species given below the original description of each species is cited from Bickley and McLeod (1956), intra-state and seasonal distribution are discussed, food habits on citrus noted and the life cycle, when known, summarized. Larval and adult characters for field identification are given. Distribution on citrus is discussed for the common species, otherwise records are cited. For ease of reference the species are listed alphabetically. A key for field identification of the known species is also included.

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**KEY FOR FIELD IDENTIFICATION OF CHRYSOPIDAE ON CITRUS**

*Adults*

Large species with at least one dark spot near end of front wing.

Distinct markings on mesothorax, none on prothorax, fig. 8. Hind wings with two spots—*Allochrysa virginica* (Fitch).

Distinct markings on prothorax. Hind wings with one spot.

Mesothorax without markings, antennae dark, fig. 16—*Nodita pavida* (Hagen).

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Mesothorax with distinct markings, antennae light.
With a dark bar on interocular area, fig. 12—Nodita floridana
(Banks).
With two dark spots on interocular area, fig. 18—Nodita
callota (Banks).
Small species without a dark spot on front wing.
With a pale yellow longitudinal stripe on abdomen.
Antennae and last segment of palpi dark, fig. 14—Chrysopa plorabunda Fitch.
Antennae and last segment of palpi light, fig. 9—Chrysopa interruppta Schneider.
Without a pale yellow longitudinal stripe on abdomen.
Antennae dark.
Interocular area behind antennae mainly pink, fig. 6—Chrysopa sp. (undetermined).
Interocular area behind antennae mainly green, fig. 4—Chrysopa cubana Hagen.
Antennae light.
First segment of antennae with one dark stripe, fig. 1—Chrysopa bimaculata McClendon.
First segment of antennae with two dark stripes, fig. 3—Chrysopa bicarnea Banks.

Larvae (3rd Instar)

Naked larvae, first thoracic scoli short and indistinct, aphid lions.
Head striped from mandibles to prothorax, fig. 10—Chrysopa interruppta Schneider.
Head not distinctly striped, fig. 13—Chrysopa plorabunda Fitch.
Trash-bearing larvae, first thoracic scoli elongate and distinct, trash bugs.
First thoracic scoli very long, extending forward beyond front margin of head.
Head markings extensive, head mainly dark, fig. 15—Nodita floridana (Banks).
Head markings restricted, head mainly light, fig. 17—Nodita pavida (Hagen).
First thoracic scoli long, extending forward to eye line.
Maxillary palpi dark at tips, fig. 5—Chrysopa sp. (undetermined).
Maxillary palpi light at tips, fig. 2—Chrysopa bimaculata McNeldeen.
First thoracic scoli short, head markings transverse, fig. 7—Chrysopa cubana Hagen.

Allocrysca virginica (Fitch)

Figure 8.

Chrysopa virginica Fitch, 1856, First Rept. Ins. N. Y., p. 91.
The adult of this large, handsome species is easily separated from all other green lacewings found on citrus in Florida by the presence of
two dusky spots on each forewing and the unusual mesothoracic markings shown in figure 8. Larvae have not been obtained or identified as yet. To date only one specimen has been taken from citrus and nothing is known of its life cycle or food habits.

**FLORIDA DISTRIBUTION:** Bartow, September, 1956, one specimen.

*Chrysopa bicarnea* Banks

*Figures 3.*


Only two specimens of this species have been taken from citrus. It is possible that they were accidental occurrences. Adults seem to be very closely related to *bimaculata.* This species has the sub-lateral prothoracic markings very pale and further removed from the margin of the prothorax and the two stripes on the basal segments of the antennae extend some distance onto the surface of the head (figure 3). Larvae are unknown and the food habits and life cycle have not been determined.

**FLORIDA DISTRIBUTION:** Both specimens of this species were collected from the West Coast citrus area, one from Rubonia, the other from Palmetto.

*Chrysopa bimaculata* McClendon

*Figures 1 and 2.*


Adults of this species are readily distinguished from other green lacewings found on citrus by the presence of a pair of light to deep red, sub-lateral, prothoracic stripes and pale yellow antennae bearing a single narrow, lateral red stripe on the basal segment (figure 1). Adults have a quick darting flight when disturbed. The eggs are a green to yellow white in color when laid. Larvae are trash-bearers and are easily confused with those of *Chrysopa* sp. (undetermined), but may be separated by the distally pale labial palpi and less distinct or extensive caudal head blotches (figure 2). Larvae have an extremely erratic, jerky, walking gait and are found primarily on the leaves and fruit.

The life cycle of *bimaculata* has been studied in the laboratory at 80° F. utilizing two different hosts as food. On Florida red scale, *Chrysomphalus aonidum* (L.), four of six larvae completed development to the adult stage in a maximum of 37 days and a minimum of 31 days. None of the adults survived beyond the first day. On six-spotted mites, *Eotetranychus sexmaculatus* (Riley), five of five larvae completed development to the adult stage in a maximum of 35 days and a minimum of 30 days. Adults survived on honey and water from one to three days. At 70° F., only four out of 16 larvae developed to pupation on a diet of cloudy-winged whiteflies, *Diaulurodes citrifolii* (Morg.), in a maximum of 50 days and a minimum of 27 days with none surviving to emerge. Additional studies must be conducted before the preferred host can be determined.

**FLORIDA DISTRIBUTION:** This species seems to occur throughout the citrus belt. More than thirty specimens are in the collection; each major citrus growing area is represented.
Plate I. Dorsal view of head and thorax of adult: fig. 1, Chrysopa bimaculata McClendon; fig. 3, Chrysopa bicarnea Banks; fig. 4, Chrysopa cubana Hagen; fig. 6, Chrysopa sp. (undetermined); fig. 8, Allochrysa virginica (Fitch). Dorsal view of head of third instar larva: fig. 2, Chrysopa bimaculata McClendon; fig. 5, Chrysopa sp. (undetermined); fig. 7, Chrysopa cubana Hagen.
Chrysopa cubana Hagen

Figures 4 and 7.


This species is the most common green lacewing found on citrus in the state. Adults are characterized by the presence of a pair of deep red to maroon, sub-lateral, prothoracic stripes, dark brown to black antennae that become lighter toward the distal end and one or two dark red sub-lateral stripes on the basal segment of the antennae (figure 4). Adults have a clumsy, fluttering flight when disturbed. The eggs are a light pearl grey when deposited. Larvae are trash-bearers and are distinctive, having all of the head markings extending transversely rather than longitudinally (figure 7). There are three dark transverse bars; one, somewhat curved, near the anterior margin of the head; a second, V-shaped, near the middle; the third, also V-shaped, with the basal part usually hidden by the prothorax. Larvae have a relatively smooth but erratic walking gait and are found primarily on leaves and fruit.

Laboratory life cycle and food-preference studies have been partially reported by Muma (1937). Although the species will feed and develop on several different food hosts, the most rapid development and more vigorous adults are produced on a restricted diet of Florida red scale and six-spotted mites. On these foods life cycles are completed in 32 and 30 days respectively resulting in large, active adults. Mites and armored scales were hosts used in the studies but soft-scales and mealybugs will have to be checked before the study can be considered complete, even for citrus groves.

Florida Distribution: This common green lacewing is distributed throughout the citrus growing areas of the state. Over 100 specimens are in the collection.

Chrysopa interrupta Schneider

Figures 9, 10, and 11.

Chrysopa interrupta Schneider, 1851, Mon. Chrysopae, p. 76.

In certain groves this species rivale cubana as the most common species. Adults are readily identified by red genae, red post-ocular spots, pale antennae and a median, white to yellow stripe that extends the entire length of the body (figure 9). Four specimens collected in the late fall and early winter have had pink blotches on the head and prothorax as shown in figure 11. Adults have a quick, darting flight when disturbed. The eggs are light, yellow-green in color. Larvae are naked aphid lions characterized by a pair of dark convergent head stripes (figure 10). They have a quick, flowing, undulate walking gait and to date have been found only on leaves and fruit.

Under laboratory conditions at 80°F. interrupta completes a life-cycle on Florida red scale in a maximum of 39 days and a minimum of 14 days. At 62°F. the maximum is 60 days and the minimum is 62 days. Larvae have been observed feeding in aphid and six-spotted mite colonies but the life cycle on these hosts has not been determined.

Florida Distribution: This common species is represented by more than 50 specimens in the collection. It is found throughout the citrus growing areas.
Chrysopa plorabunda Fitch
Figures 13 and 14.


This species is easily confused with interrupta in the adult stage. It can be distinguished by the dusky antennae, pink spotted prothorax and light median stripe that does not extend anteriorly beyond the prothorax (figure 14). The eggs are yellow-green when laid. Larvae are naked aphid lions with the head distinctively marked with dusky spots and bars as shown in figure 13. They are more slender and move more rapidly than larvae of interrupta.

The life cycle has not been determined although larvae have been reared to the third instar on Florida red scale. Biological information available from literature indicates that the species feeds on mealybugs (DeBach and Fleschner, 1947), red spiders (DeBach and Fleschner, 1950), aphids (Davidson, 1914), and thrips (Essig, 1920). Putnam (1932) obtained an average life cycle of 31 days for the species when fed on oriental fruit moth eggs under insectary conditions.

**Florida Distribution:** Three specimens of this species are in the collection; one is from Lake Alfred, March 18, 1953, and two are from Weirsdale, December 20, 1956.

Chrysopa rufilabris Burmeister

Chrysopa rufilabris Burmeister, 1839, Handbuch der Entomologie 2: 979.

One female of the species was collected at a light in a citrus grove in 1953 and one larva was reared, but it is not known whether the species lives on citrus trees or on weed plants under the trees.

**Florida Distribution:** Lake Alfred, one specimen, March 18, 1953.

Chrysopa sp. (Undetermined)
Figures 5 and 6.

Adults of this knowling are easily confused with those of cubana. This species may be identified by the pink color of the basal segments of the antennae which extends across the interocular area at the level of the antennae (figure 6). Adults have the same clumsy flight as cubana. Eggs of the species are light grey in color. Larvae are easily confused with those of bimaculata, but may be separated by the dark terminal segment of the labial palpi and darker, more extensive head blotches (figure 5). Larvae have the same jerky, erratic walking gait as bimaculata but most specimens have been found on limbs and trunks.

The life cycle of the species has been determined on Florida red scale. Development is completed in 25 to 28 days at laboratory temperatures. Nothing is known concerning food habits or preference of the species.

Adults of this species have been identified as Chrysopa cubana var. sanchezi Navas by Dr. William E. Bickley of the University of Maryland. Differences in head and thoracic color patterns and in behavior between larvae of this species and those of C. cubana Hagen have prompted its placement here in an undetermined status for the present. An attempt is presently being made to obtain a series of males of cubana and of this
Plate II. Dorsal view of head and thorax of adult; fig. 9, Chrysopa interrupta Schneider, typical form; fig. 11, Chrysopa interrupta Schneider, variant; fig. 12, Nodita floridana (Banks); fig. 14, Chrysopa plurabunda Fitch; fig. 16, Nodita pavida (Hagen); fig. 18, Nodita callota (Banks). Dorsal view of head of third instar larva; fig. 10, Chrysopa interrupta Schneider; fig. 13, Chrysopa plurabunda Fitch; fig. 15, Nodita floridana (Banks); fig. 17, Nodita pavida (Hagen).
species for a systematic morphologic study of genitalia which may indicate its proper relationship with other species of the genus.

**FLORIDA DISTRIBUTION:** The species appears to be principally southern in distribution. Most of the 20 specimens in the collection are from southern citrus areas with the most northern being taken at St. Leo on November 31, 1956.

*Nodita callota* (Banks)

Figure 18.


Four adult specimens of this species have been taken from citrus trees. Adults are readily identified by the spotted-type of markings illustrated in figure 18. Larvae have not been collected or reared to determine the food habit or life cycle.

**FLORIDA DISTRIBUTION:** The four specimens in the collection are from central and southern citrus growing areas. Two are from Rubonia, January 16, 1956, one from Lake Placid, October 8, 1956, and one from Haines City, September 28, 1956.

*Nodita floridana* (Banks)

Figures 12 and 15.


In the adult stage this species is found more commonly on citrus than any other member of the genus. Larvae, however, have not been found on citrus trees to date. Adults are readily identified by the pale antennae, the basal segment of which is marked with two red to brown longitudinal stripes and a thin red to brown, transverse, interocular bar (figure 12). Adults have the same clumsy, fluttering flight as *C. cubana* Hagen but may be distinguished by their larger size. Larvae have head markings reminiscent of those of *C. bimaculata* and *Chrysopa* sp. (undetermined) but the pattern is much more extensive, causing the head to be almost entirely dusky (figure 15). Because of the long, forward-projecting, prothoracic scoli, the head of the larva is usually hidden beneath the trash packet.

The life cycle of the species has been investigated in the laboratory utilizing Florida red scale as larval food. A minimum of 56 days was required for complete development from egg to adult. It is felt that this probably is not a typical life cycle as nothing is known of the food habits of the species.

**FLORIDA DISTRIBUTION:** This species appears to be southern in distribution. All of the more than 20 specimens in the collection were taken from Polk County southward.

*Nodita pavida* (Hagen)

Figures 16 and 17.


This species, in the larval stage, is the most common member of the genus found on citrus. Adults, on the other hand, are comparatively rare and only two specimens have been collected under grove conditions. Adults are easily confused with *C. cubana* from which they may be distinguished
by their larger size, dark pterostigma of the wings and darker prothoracic and antennal markings (figure 16). Larvae are trash-bearers with a smooth running gait, “play possum” when disturbed, and are found on limbs and trunks. They are readily identified by the long, sub-parallel, prothoracic scoll which cause the packet to completely hide the head and the distinctive head markings shown in figure 17.

Because of the rarity of adults it has been impossible to obtain data on the life cycle of this species. Further, most efforts to rear larvae under laboratory conditions have failed owing, it is believed, to a lack of knowledge concerning food habits. On several occasions late instar larvae have pupated and produced adults, but from the only set of eggs obtained all but one larva died before pupation and it failed to emerge. Florida red scale was used as food in this case.

**Florida Distribution:** This seems to be a southern species. The ten or more specimens in the collection have been taken from the southern and central citrus areas.

**Literature Cited**


