NOTES ON THE CHRYSOPIDAE1/ AND HEMEROBIIDAE2/ OF EASTERN TEXAS WITH KEYS FOR THEIR IDENTIFICATION2/

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ABSTRACT

Keys and photographs are provided for identifying the Chrysopidae and Hemerobiidae found to occur in east Texas. Trap catches and general collecting led to the detection of a total of 13 species of Chrysopidae in 3 genera and 8 species of Hemerobiidae in 3 genera at College Station, TX or at the Ellis Unit of the Texas Department of Corrections near Huntsville, TX.

Chrysopa carnea Stephens was the most abundant chrysopid in the spring in both locations. Chrysopa rufilabris Burmeister peaked later in the summer and was active throughout the year.

RESUMEN

Claves y fotografías son proveerado para identificar las Chrysopidae y Hemerobiidae que se encuentran en el este de Tejas. Broches de trampa y colecciones generales conducir a averiguación de un total de 13 especies de Chrysopidae en 3 generos y 8 especies de Hemerobiidae en 3 generos a College Station, TX o a la Ellis Unit de la Tejas Departamento de Correcciones cerca de Huntsville, TX.

Chrysopa carnea Stephens estuvo la mas abundante crisópido durante la primavera en ambos lugares. Chrysopa rufilabris Burmeister puntiaguraron mas tarde en el verano y estuvo activo durante el año.

INTRODUCTION

The Chrysopidae (green lacewings) and Hemerobiidae (brown lacewings) are 2 of the best known families of the order Planipennia (Neuropteroidea). They are found in a wide variety of habitats and, because the larvae (and sometimes the adults) are predaceous, they have

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received considerable attention as part of the natural enemy complex in agricultural systems. Not all species of lacewings are found in crops and some are of only minor importance. For this reason, keys and photographs are provided to aid in identification of those species generally thought to be of importance in agroecosystems along with those which probably are of minor importance.

The Chrysopidae are generally green or yellowish insects but some species are dull or dark colored. Hemerobiids are brown or yellowish-brown and are usually smaller. Only Eremochrysa punctinervia McLachlan of the east Texas Chrysopidae is not the typical green color. In addition to body coloration, the Chrysopidae differ by having filiform antennae as opposed to moniliform antennae in the Hemerobiidae. Differences also occur in wing venation with hemerobiids having some costal cross-veins forked and 2 or more Rs veins while chrysopids have unforked costal cross-veins and 1 Rs vein.

Chrysopids are generally much more abundant than hemerobiids in most habitats, especially in agroecosystems. The importance of these insects depends largely on the numbers present and their prey preference. Lacewing larvae were important in destroying eggs and larvae of Heliothis spp. in Arkansas cotton (Whitcomb and Bell 1964) but were not very abundant on cotton in east Texas (Sterling et al. 1979) nor were they considered important in North Carolina soybeans (Deitz et al. 1976). Chrysopids have been reported from corn (Sparks et al. 1966), alfalfa (Pimentel and Wheeler 1973), sorghum (Fye 1972), tobacco (Roach 1980), citrus (Cherry and Dowell 1979), grapes (Jubb and Masteller 1977), and many other types of field crops and orchards. Hemerobiids are usually found in many of these same situations as well.

Because green lacewing larvae are voracious predators, techniques have been developed to use them more effectively to suppress pest outbreaks. Ridgway and Jones (1969) and Ridgway (1972) have shown that the release of Chrysopa carnea Stephens eggs and larvae in cotton to control Heliothis spp. outbreaks can give control comparable to insecticides. Also, food sprays containing protein hydrolysate of yeast have been shown to increase egg production from adults in the field (Hagen 1971).

Chrysopa spp. as predators have characteristics that make them one of the key predators in many agricultural crops. Some advantages are larval tolerance to some insecticides (Plapp and Bull 1978, Shour and Crowder 1980) and high searching rates (Fleschner 1950). With the emphasis shifting away from broad-spectrum insecticides and towards better utilization of native natural enemies, the ability to sight identify these lacewings will take on greater importance in future pest management systems.

Biology. The biology of the Chrysopidae and Hemerobiidae is similar, the main difference between the 2 families being that chrysopids lay their eggs on long thin stalks (Plate 1a), while brown lacewings oviposit directly on the substrate. The larvae of both are fusiform with sickle-shaped mandibles used to pierce prey and suck the body juices. They commonly feed on aphids, mites, mealybugs, whiteflies and the immature stages of many arthropods. After 3 larval instars, they spin a silken cocoon (Plate 1a).

Adults of many lacewings overwinter and are active throughout the year. Some species have multiple generations while others have but one. The adults are generally poor fliers and are nocturnal.

Hemerobiids and some chrysopids are predaceous as adults, feeding on much the same prey as the larvae. Those species in the subgenus
Chrysoperla are not predaceous as adults but feed primarily on honeydew and pollen (Sheldon and MacLeod 1971).

The biology of the Chrysopidae has been detailed by Smith (1922) and the Hemerobiidae by Smith (1923).

**Taxonomy.** The North American species of Chrysopidae are currently being revised by Adams (personal communication). Adams (1978) reported that work underway had reduced the number of described New World species from nearly 700 down to about 350. There are at present, nearly 90 described species in the U.S. in several genera. Chrysopa as currently defined, is the largest genus containing the most common species. Adams (1975) discussed the need to subdivide this genus. Other nearctic genera include Eremochrysa, Meleoma, Chrysopiella, Nothochrysa, Pimachrysa, Nodita, Leucochrysa, Abachrysa, Soarius, and Mallada. Bickley and MacLeod (1956) provided the most recent key to the genera but it is now outdated. Bram and Bickley (1963) provided keys and figures of the male genitalia for the Chrysopa of Maryland.

The revision of the nearctic Hemerobiidae by Carpenter (1940) is the most recent comprehensive work; only 10 new species have been found or described since that time (Gurney 1948, Parfin 1956, Nakahara 1960, 1965). There are now about 61 described species in 8 genera. Sympheroius, Kimminia, and Hemerobius are the largest genera. Others include Micronomus, Megalomus, Boriomyia, Wesmaelius, and Pectra. Historically, separation of genera of the Chrysopidae and Hemerobiidae has been based on wing venation characters. The genitalia must now be examined to assign some chrysopids to the proper genus (Adams, personal communication). The use of male genitalia has been the only reliable way to make determinations at the species level for both families, but body coloration, wing markings and shape have proved helpful.

**METHODS**

The determination of the lacewing fauna of east Texas was based on specimens caught in Johnson-Taylor suction traps (Johnson and Taylor 1955) located in College Station (Brazos County) and at the Ellis Unit of the Texas Department of Corrections near Huntsville in Walker County, and on specimens from the Texas A&M University collection and private collections. The College Station site was adjacent to a small cotton field near Texas A&M University. College Station is located in the post-oak savannah region of Texas. The Ellis site lies on a flood plain of the Trinity River and is surrounded by cropland and pine woods. It differs from the College Station area by the dominance of pine rather than oaks and grasses. The College Station trap was operated from March 26, 1979 to March 25, 1980, the Ellis trap for the period of April through August, 1980.

Identification of the chrysopids was made with the help of Dr. Phillip Adams of California State-Fullerton. The Hemerobiidae determinations were made by the senior author using the keys and descriptions by Carpenter (1940). Interpretation of chrysopid wing venation follows Adams (1967).

**Key to the Chrysopidae Occurring in East Texas**

[Adapted from Bickley and MacLeod (1956) and Bram and Bickley (1963)]

1. Hindwings with 2 series of gradate cross veins (as in Fig. 1) ...2
2. Hindwings with 1 series of gradate cross veins

............................................Eremochrysa punctinervia McLachlan (Plate 3d).
2. Antennae much longer than wings; pterostigmas usually dark, spotted with purple or brown spots; lst cross vein from radial sector meeting MP at a point more basal than the origin of the radial sector (Fig. 1) (Nodita)..........................3
Antennae at most, equal to or usually shorter than wings; pterostigmas at most, only slightly darkened, never spotted; lst cross vein from radial sector meeting MP at a point which is even with or more distal than the origin of the radial sector (Fig. 1) (Chrysopa)....................................................4
3. Antennae black for some distance beyond base
Antennae pale beyond base...........................................N. pavida (Hagen)(Plate 3c).
Antennae black beyond base........................................N. floridana (Banks).
4. Basal 1/4 of antennae black except for basal segment............5
Basal 1/4 of antennae pale; apical 1/3 may be brownish............6
5. Basal segment of antennae with dark-red or black line on the lateral surface...........................................C. lineaticornis group (Plate 3b).
Basal segment of antennae unmarked....................................
.................................................................C. nigricornis Burmeister (Plate 2f).
6. Black band present across frons beneath antennal sockets (may be broken in middle); vertex of head with black markings..............7
Frons and vertex without such markings................................8
7. Second antennal segment circled by dark band
Second antennal segment unmarked...................................C. oculata Say (Plate 2d).
Gradate cross veins dark colored......................................9
All veins pale or with only an occasional dark cross vein..........11
8. Pronotum with 2 or 3 orange spots on lateral margins; additional orange spots often present on thorax, abdomen, and on head near eyes..................................................C. quadripunctata Burmeister (Plate 2c).
Pronotum and abdomen without orange markings....................10
9. Genae with red markings running from eye to mouth
Genae without such markings........................................C. rufilabris Burmeister (Plate 1b).
Genae with straight dark line, often suffused with red, running from eye to mouth...........................................C. carnea Stephens (Plate 1d).
Genae without dark line..............................................12
10. Genae with red markings running from eye to mouth..............13
Genae without red markings; clypeus with black spots at base on each side...........................................C. nigricornis Burmeister (Plate 2f).
11. Forewing cells anterad to inner gradate veins, broader than adjacent cells between inner and outer gradate veins.............14
Forewing cells anterad to inner gradate veins, remaining similar in width to cells between inner and outer gradates..................C. harrisi Fitch (Plate 1f).
12. Delicate species; hind wings narrow; eyes large; lower face below eyes short; prefers grassy habitat..........................C. extrema Hagen (Plate 2a).
More robust; hind wings not especially narrow; eyes normal; lower face longer; prefers trees and bushes..............................C. camanche Banks (Plate 2b).

37 Shortly after preparation of this manuscript, a specimen of Abachrysa eureka (Banks) was found in the departmental teaching collection labeled: College Station, Brazos Co., Texas 4-12-1976 student colln. J. S. Smith. This species has been recorded by Bickley and MacLeod (1956) from Arkansas, Mississippi and Georgia. Abachrysa eureka, the lone species of the genus, is a large and brownish species and can be distinguished by its short pronotum with 8 black spots.
Chrysopidae Hagen

Thirteen species of this family in 3 genera were found in east Texas; more than any other family of the order. Most of these species have a wide nearctic distribution, especially in the east.

**Chrysopa Leach**

Ten of the 13 species found belong to this genus. Virtually all chrysopids found in Texas agroecosystems are members of the genus Chrysopa. The Texas representatives fall into 3 species groups (Thorne 1971a): the carnea group (subgenus Chrysoperla), C. rufilabris, C. carnea, C. harrisii, C. externa, and C. comanche; the perla group, (subgenus Chrysopa), C. quadripunctata, C. oculata, C. nigricornis, and C. incompleta; and C. lineaticornis of the lineaticornis group.

**Subgenus Chrysoperla Steinmann**

**Chrysopa rufilabris Burmeister (Plate 1b)**

This species was the most abundant chrysopid in suction trap catches at College Station (Table 1) and Ellis (Table 2). It is a widely distributed species in North America (Bickley and MacLeod 1956) and was most abundant in August and September when C. carnea was scarce. **Chrysopa rufilabris** peaked in June at Ellis during the April through August sampling period. It was also the most abundant species in cotton at Ellis. Burke and Martin (1956) reported that it was the most abundant species in cotton in College Station and could be found throughout the year.

The distinguishing characteristics of C. rufilabris are the red genae (which fade badly in alcohol) and the black gradate cross veins, the latter separating it from C. harrisii, C. comanche and C. externa which also have red genae. **Chrysopa rufilabris** was the only species found in all months of the yr in College Station and was occasionally captured in the suction trap on cold days when the highest temperature was less than 7°C.

The larvae have 2 dark stripes on the head and are marked as in Plate 1c.

**Chrysopa carnea Stephens (Plate 1d)**

This species is perhaps the most familiar, being found throughout most of North America as well as many other parts of the world. It is characterized by a straight dark line on the genae, running from eye to mouth. Also, there is usually a red suffusion of the genae. The wing venation is green with a broad pale stripe on the dorsum of the body.

In suction trap catches at College Station and Ellis, C. carnea was 2nd to C. rufilabris in abundance. It was the most abundant species in the spring decreasing in numbers during June. No C. carnea were collected during July in the College Station suction trap or at either location in August. This seasonal trend of C. carnea yielding numerical dominance to C. rufilabris was also observed by Dinkins et al. (1970b) in Mississippi cotton fields. Although we found no C. carnea in cotton, Burke and Martin (1956) reported that it was the 2nd most abundant species in cotton in College Station and could be found throughout the year.

The larvae of C. carnea (Plate 1e) have 2 stripes on the head, but each is broadened basally unlike C. rufilabris. The adults of C. carnea undergo a color change to reddish-brown in the fall as they prepare to overwinter. These species have been described and illustrated by Tauber (1974).

A larval-pupal parasite, **Tetrastichus chrysopae** (Crawford) (Eulophidae), was reared from a C. carnea larvae collected from College Station in April.
FIG. 1 (Page 7). Forewings of *Chrysopa oculata* Say and *Nodita americana* (Banks) showing posterior media (MP₁) and radial sector + anterior media (Rs+MA).

FIG. 2 (Page 7). Forewing of *Sympherobius amiculus* (Fitch).

FIG. 3 (Page 7). External male genitalia of *Hemerobius humulinus* L., lateral view.

FIG. 4 (Page 7). External male genitalia of *Hemerobius pacificus* Banks, lateral view.


Chrysopa harrisii Pitch (Plate 1f)

This is a widely distributed species which can be distinguished from related species by the narrow, pointed wings with dense venation. It is somewhat difficult to separate this species from others with red genae and pale venation, but the wings are fairly characteristic and can be used reliably for determination after some experience with the group. The body coloration is generally darker green than C. externa and C. comanche which resemble C. harrisii.

Tauber (1974) reported that C. harrisii is primarily associated with conifers, however, it has been reported from cotton (Whitcomb and Bell 1964, Dinkins et al. 1970a). We have taken specimens from Heliothis spp. pheromone traps adjacent to the field at Ellis.

Tauber (1974) provided an illustration of the larva of C. harrisii.

Chrysopa externa Hagen (Plate 2a)

This species is difficult to separate from C. comanche. Chrysopa externa is yellowish and more delicate with large bulging eyes. The lower face below the eyes is shorter and more triangular than C. comanche. Adams (1963) discussed some of the differences between C. comanche and C. externa (as C. lanata Banks) and includes figures of the internal male genitalia.

It appears that C. externa is a grassland species. We have seen many specimens collected from johnsongrass and roadside vegetation in the Rio Grande Valley of Texas. It ranges north into South Carolina (Adams 1963). We collected a single specimen from College Station on October 21. Tauber (1974) provided a description of the larva.

Chrysopa comanche Banks (Plate 2b)

Like C. externa, this is a rare species in College Station which is probably close to the eastern limit of its range. It extends westward to Hawaii (Adams 1963) and can be confused with C. carnea, C. harrisii and C. externa.

Adams (personal communication) states that C. comanche prefers trees and shrubs. The larvae of C. comanche are described by Tauber (1974).

Subgenus Chrysopa Leach

Chrysopa quadripunctata Burmeister (Plate 2c)

This species can be recognized by the orange spots on the pronotum and abdomen. The gradate cross veins and several others are black. Throne (1971a) claimed that it is primarily a tree and shrub species, but numerous adults and larvae were found in cotton at Ellis. Suction trap catches show it to be the 3rd most common species at both College Station and Ellis. At College Station, specimens were found from July to October, most of them captured in September. At Ellis they were taken from April to July. We have swept several specimens from oak in College Station in the spring, so it is evidently found throughout most of the year. Bickley and MacLeod (1956) reported C. quadripunctata from the eastern and central states. Toschi (1965) collected a single specimen in California.

The larvae, unlike most species of Chrysopa, carry aphid skins and other debris on their backs but do not build a 'trash packet' like the true trash carriers (Smith 1922). An illustration of the larva of this species is given by Smith (1922).
Chrysopa oculata Say (Plate 2d)

This is a common and widely distributed species. Bickley and MacLeod (1956) reported that it is the most common lacewing in most areas. It can be recognized by the markings on the head and the ring on the 2nd antennal segment. It is similar to 2 other eastern species, C. chi Fitch, which has a black 'Y' shaped interantennal mark rather than a reddish one, and an undescribed species discussed by Throne (1971a) which differs in having large brownish spots on the clypeus.

Chrysopa oculata was the 4th most common species at Ellis and 5th most common at College Station in the suction trap. It appeared to be more common locally than numbers in the trap would indicate. It is a slightly larger species and a superior flier, possibly accounting for reduced numbers in the suction trap. Larvae and adults were found in cotton at Ellis in June. Chrysopa oculata was very abundant in cotton at Ellis and College Station in October. The larvae are marked as in Plate 2e.

The adults of C. oculata give off a disagreeable odor when handled, stronger than that of most other species. The 3rd instar larvae of C. oculata overwinter in the cocoon (Propp et al. 1969). Burke and Martin (1956) suggested that in the College Station area, C. oculata spins a cocoon beneath the soil surface.

Chrysopa nigricornis Burmeister (Plate 2f)

This species can be quite variable and so the usual characters, basal 1/4 of antennae black and 2 small spots on the clypeus, are not always reliable. However, all specimens we have seen from this area have shown these characters. Chrysopa nigricornis is larger than most species and, as with C. oculata, may be more common than suction trap catches would indicate. Whitcomb and Bell (1964), van den Bosch and Hagen (1966), and Dinkins et al. (1970a) reported it from cotton, but it is fairly uncommon in field crops since it is primarily a tree-inhabiting species (Throne 1971a).

Smith (1922) provided an illustration of the larva of this species. Published records indicate C. nigricornis is found nearly nationwide and is fairly common in the east.

Chrysopa incompleta Banks (Plate 3a)

This species may be confused with C. oculata, however, the vertex and facial markings are different and it lacks the dark ring around the 2nd antennal segment.

Throne (1971a) reported this species from several eastern states, but none closer to Texas than Georgia. It is not common locally, but we have seen a few specimens from College Station and Walker County. Throne (1971a) reported sweeping specimens from pine and oak in sandy areas. We collected this species from a similar habitat in Walker County, TX.

Chrysopa lineaticornis group

Chrysopa lineaticornis Fitch (Plate 3b)

The character used to distinguish this lacewing from C. nigricornis is the black line on the outside of the 1st antennal segment. It differs from other species of Chrysopa by having black antennae. It might be confused with Notiia pavida, but its antennae are shorter and it is usually smaller in size. This species is found throughout much of the eastern U.S. An undescribed relative of C. lineaticornis has been found in central Texas (Adams, personal communication). This species has not yet been collected locally.

The larvae of C. lineaticornis are the only true trash carriers of the Texas Chrysopa. It is largely a tree-inhabiting species (Throne
1971a) and the only record from agriculture we have seen is a single specimen in cotton (Dinkins et al. 1970a). It appears to be rather uncommon in College Station.

**Nodita Navás**

Members of this genus are generally rare and tropical to subtropical in distribution. Banks (1939) provided a key to the U.S. species. All 7 described species from this country have been found in Texas, 2 from College Station.

**Nodita pavida** (Hagen) (Plate 3c)

This large and striking species can be distinguished from *N. floridana* by its black antennae. It occurs in the southern states north to Ohio (Slocum & Lawrey 1976). We have taken several specimens of this insect locally in the spring, but none were found in the suction trap. An adult was reared from a larva which carried a trash packet like *C. lineaticornis*.

**Nodita floridana** (Banks)

Previously reported from Florida and Mississippi (Bickley and MacLeod 1956), 2 specimens were taken during August and September from the suction trap in College Station. From all indications, it is an uncommon species.

**Eremochrysa** Banks

This genus is primarily restricted to the west (Bickley and MacLeod 1956) and is characterized by having only 1 series of gradate veins in the hindwings. Members of this genus are generally brown in color.

Banks (1950) provided a key to the species of this genus, but only one (*E. punctinervis*), occurs locally.

**Eremochrysa punctinervis** McLachlan (Plate 3d)

Common in the western U.S., this species also extends east to Florida. It appears to be uncommon locally as we have taken only 2 specimens from the College Station suction trap and 1 specimen from Ellis.

The larvae of this species were reared and found to carry trash on their backs.

**Other Chrysopidae**

It is possible other members of this family may be found in College Station. *Chrysope bimaculata* McLeod occurs in Texas as does *C. bicarnea* Banks (Bickley and MacLeod 1956). Additional species of *Nodita* may also be found. Bickley and MacLeod (1956) listed several other chrysopid species from eastern states, most of which are not widespread and seem unlikely to occur locally.

**Key to the Hemerobiidae Occurring in East Texas**

[Adapted from Carpenter (1940)]

1. Forewings each with a recurrent humeral vein (Fig. 2).................2
2. Forewings each without a recurrent humeral vein (*Micromus*)........7
3. Forewings with not more than 4 outer gradate cross veins (Fig. 2) (*Sympherobius*)................................................3
4. Forewings with 5 or more outer gradate cross veins (*Hemerobius*)...5
5. Forewings with all cells filled with dark brown and margined with hyaline membrane..................*S. occidentalis* (Fitch) (Plate 4d). Forewings spotted with gray or brown ......................4
4. Radial cross vein present in forewings (Fig. 2)............................
   Radial cross vein absent in forewings.................................
   \textit{S. amiculus} (Pitch) (Plate 4b).
   \textit{S. barberi} (Banks) (Plate 4c).

5. Pronotum with median broad longitudinal stripe present ..........6
   Pronotum with median longitudinal stripe thin or absent;
   poststigmae usually reddish......................\textit{H. stigma} Stephens (Plate 4a).

6. Distal 1/2 of forewing symmetrical in regard to longitudinal axis
   of wing; apical posterior margin smoothly curved...................
   \textit{H. humulinus} Linnaeus (Plate 3e).
   Distal 1/2 of forewing asymmetrical in regard to longitudinal axis
   of wing; apical posterior margin nearly straight...................
   \textit{H. pacificus} Banks (Plate 3f).

7. Distance separating gradate cross veins in forewings greater than
   the length of each cross vein ....................................
   \textit{M. subanticus} (Walker) (Plate 4e).
   Distance separating gradate cross veins in forewings equal to or
   less than the length of each cross vein...........................
   \textit{M. posticus} (Walker) (Plate 4f).

\textbf{Hemerobiidae Westwood}

Three genera and 8 species of \textit{Hemerobiidae} were found to occur in
the College Station area. \textit{Hemerobius pacificus}, a western species, was
not previously thought to occur as far east as the College Station
area.

\textbf{Hemerobius Linnaeus}

Three species of \textit{Hemerobius} were found at the 2 trap locations but
\textit{H. stigma} was found primarily at Ellis whereas \textit{H. humulinus} and \textit{H.
pacificus} were found only at College Station. There are 14 species of
\textit{Hemerobius} in the U.S. and Canada.

\textbf{Hemerobius humulinus Linnaeus (Plate 3e)}

This species is very widely distributed in North America and
Europe (Carpenter 1940). In the U.S., it is more common in the
northern states. Whitcomb and Bell (1964) reported \textit{H. humulinus} from
cotton in Arkansas. Jubb and Masteller (1977) reported it as the 3rd
most abundant hemerobid in Pennsylvania vineyards. We did not find
this species in cotton at Ellis and all specimens in the suction trap
were collected from September to March at College Station only. Though
no \textit{H. humulinus} were found during the period April through August, it
was the most common brown lacewing in March.

\textbf{Hemerobius pacificus Banks (Plate 3f)}

Two specimens of \textit{H. pacificus} were taken in late winter in the
College Station suction trap. An additional specimen was collected
April 20. This species is generally considered to be western in
distribution. Carpenter (1940) described its range as extending to
the eastern limits of the Rocky Mountains and questioned a record from
Nebraska. Gurney (1948) reported \textit{H. pacificus} from New Mexico and from
California and Washington where it may be confused with \textit{H. neadelphus}
Gurney. College Station may lie near the actual eastern distributional
limits of \textit{H. pacificus}.

\textit{Hemerobius pacificus} closely resembles \textit{H. humulinus}, but differs
in that the apical posterior margin of the forewing is nearly straight.
The most reliable character to separate the two is the male genitalia
(Figs. 3, 4).
**Hemerothius stigma** Stephens (Plate 4a)

This species was known as H. *stigmaterus* Fitch in North America before Tjeder (1960) synonymized it with Europe's H. *stigma*. Nakahara (1965) still treated the two as separate species.

*Hemerothius stigma* is the most widely distributed nearctic hemerobiid (Carpenter 1940). According to Killington (1937) and Throne (1971a), H. *stigma* is largely a conifer-inhabiting species which would explain its abundance at the Ellis location. There is 1 College Station specimen of H. *stigma* in the Texas A&M University collection. Recently, we found 1 specimen in the suction trap at College Station, but it appears to be uncommon here, probably due to the dominance of grasses and oak rather than pine. It was common in April suction trap catches at Ellis, but none were found after May 4.

Individuals of this species may be separated from the other 2 *Hemerothius* in this area by the median stripe of the pronotum being very thin or absent. Most specimens also have reddish pterostigmata.

**Sympherobius** Banks

This genus of relatively small brown lacewings constitutes the largest of the family (containing 19 species) in the U.S. In the past, they have been placed in a separate family, Sympherobiidae, by some authors. Three species were found at College Station.

**Sympherobius amiculus** (Fitch) (Plate 4b)

Found throughout the eastern U.S. (Throne 1971b), S. *amiculus* was fairly common in both trap locations in Texas. Sympherobius *amiculus* can be distinguished from S. *barberi* by the presence of a radial cross vein between R4+5 and R2+3 of the forewings (Fig. 2).

This species is primarily found by sweeping conifers and oak, but has been reported from vineyards (Jubb and Masteller 1977).

**Sympherobius barberi** (Banks) (Plate 4c)

This hemerobiid is commonly found in the southern U.S. It was the most abundantly collected species in the College Station suction trap, possibly due to its small size, and was 4th most abundant during the April through August sampling period at Ellis.

**Sympherobius occidentalis** (Fitch) (Plate 4d)

Considered rare by Carpenter (1940) and Throne (1971b), S. *occidentalis* does not appear to be particularly rare in College Station as we have seen more than 2 dozen specimens. Single specimens were taken in the suction trap during July, August and November. We have also swept a specimen from juniper in May. Sympherobius *occidentalis* is distinct from all other Texas species in that the cells of the forewing are filled with dark brown and margined with clear membrane. There is also a yellow 'V' on the thorax.

**Micromus** Rambur

There are 5 species of *Micromus* in the nearctic region. The 2 species in east Texas are probably the most abundant in agroecosystems. Roach (1980) reported that both species occurred in South Carolina on cotton, corn, tobacco and soybeans.

Nakahara (1960) split this genus into several genera based on male genitalic characters, but few authors have recognized his work.

**Micromus subanticus** (Walker) (Plate 4e)

This species was by far the most commonly collected hemerobiid at Ellis and 3rd most abundant at College Station in the suction trap. Its predominance in the collection at Texas A&M University and personal
TABLE 1. Chrysopidae and Hemerobiidae Collected in the Johnson-Taylor Suction Trap in College Station, TX from March 26, 1979 to March 25, 1980.

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TABLE 2. Chrysopidae and Hemerobiidae Collected in the Johnson-Taylor Suction Trap at the Ellis Prison Unit from April 1, 1980 to August 31, 1980.

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collecting experience indicates that it is probably the most abundant in College Station as well.

Throne (1971b) hypothesized that M. subanticus was mostly a tree inhabiting species, however, the fact that it was the most common hemerobiid in bluebonnets (collected by J. E. Eger) and cotton in east Texas indicates that it is found in a wide variety of habitats locally.

Micromus subanticus differs from M. posticus by its narrower wings and widely separated inner gradate veins in the forewings. It is primarily a southern species, occurring from Florida to California (Carpenter 1940).

Micromus posticus (Walker) (Plate 4f)

This is one of the more abundant species in crop systems. Whitcomb and Bell (1964) listed it as the most abundant hemerobiid in Arkansas cotton and Jubb and Masteller (1977) reported it as the most abundant species in vineyards. It has also been reported from alfalfa (Pimentel and Wheeler 1973). We have taken this species in cotton at Ellis.

Carpenter (1940) listed the range of M. posticus as the eastern U.S., west to Minnesota and Texas. He also stated that M. posticus is the most common nearctic species of the genus. Suction trap catches show M. posticus to be only 5th in abundance at Ellis and College Station but it does not appear to be uncommon locally based on our experience.

Other Hemerobiidae

The hemerobiid fauna of east Texas is not particularly rich as compared to the mountainous states. There are several species of Symphorobius which might be found in the College Station area in the future; S. perparvus (McLachlan) has been recorded from Bosque and Jackson counties in Texas, S. killingtoni Carpenter from Dallas (Carpenter 1940), and S. texanus Nakahara from Kerrville (Nakahara 1965).

One species found across the southeast that has not yet been found here is Borioymia fidelis (Banks). Members of this genus have broad oval wings with a large costal space.

ACKNOWLEDGMENT

We would like to thank Phillip Adams for his comments and help with chrysopid identifications, Sammie Merritt for use of material in the Texas A&M University collection and E. E. Grissell of the Systematic Entomology Laboratory, USDA for identifying the eulophid parasite. We would also like to thank James Anderson, Billy Moore and Joe Berry of the Texas Department of Corrections for their cooperation in this study.

LITERATURE CITED


