

THE BROWN LACEWINGS OF FLORIDA<sup>1</sup>

(NEUROPTERA:HEMEROBIIDAE)

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INTRODUCTION: Brown lacewings are small to medium-sized insects (forewing length 3-9 mm in Florida) which are predaceous both as adults and larvae. They prefer soft-bodied insects such as aphids, mealybugs, and also insect eggs. Because of the longevity of the adults (at least 5 months in some species), voracious appetites (for example, Micromus posticus (Walker) larva consumed an average of 41 aphids during its life (Cutright 1923), and high reproductive capacity (1 female Hemerobius humulinus Linnaeus can lay 460 eggs (Smith 1923), they are useful biological control agents. Some species have been utilized for this purpose, but limited work has been done. In Texas, Symphorobius barberi Banks is being mass reared for control of citrus mealybug (Hart, pers. comm.). Florida has a small fauna of 10 species in 4 genera, and the present circular provides keys to identification of the adults of our species.

BIOLOGY: Females lay non-stalked eggs, usually singly or in small groups. There are 3 larval instars. The 1st instar is active in all species. It can run fast, moving the head from side to side as it moves. In Symphorobius and especially Boriomyia, the later instars are relatively immobile. A white cocoon of double structure (outer loose thread, inner compact structure) is constructed in protected areas. Most groups appear to prefer aphids, but Symphorobius may prefer coccid insects (especially mealybugs). Spiders are considered one of the most important natural enemies. References on biology for species occurring in Florida are: Cutright (1923 - Micromus posticus), Smith (1923 - Symphorobius amicus, Hemerobius humulinus, H. stigma, M. posticus; 1934 - S. barberi), and MacLeod (1960 - Boriomyia fidelis).

IDENTIFICATION: Adults have a wing venation with 2 or more branches arising directly from the fused stem of R1 + Rs (fig. 1). The wing membrane has microtrichia (contrasted with Chrysopidae), ovipositor not exerted, antenna moniliform and front legs not raptorial. Larvae have jaws which are fairly straight basally and curved apically, mandibles lacking teeth along medial margin, pretarsal claws lack a trumpet-shaped empodium (except 1st instar), and are not trash bearers, in contrast to many statements in the older literature (e.g., Comstock 1925, Introduction to Entomology, p. 297).

DETECTION AND SURVEY: Adults are commonly attracted to lights. Adults and larvae can be found by beating or sweeping plants, especially oaks and pines and plants with high aphid infestations such as alfalfa.

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DISTRIBUTION: All the species are found in northern Florida and 3 of these (S. occidentalis, S. gracilis, B. fidelis) are here recorded for the first time for Florida (all from Gainesville). B. speciosa has not been rediscovered in Florida since Carpenter (1940) recorded it from Sanibel Island. S. amicus, S. barberi and H. stigma are known as far south as Highlands County, whereas both species of Micromus are found throughout peninsula Florida (M. subanticus also in the Keys and in the Caribbean). H. humulinus and H. stigma are Holarctic, but the former is relatively uncommon in Florida.

KEY TO GENERA AND SPECIES OF BROWN LACEWINGS OF FLORIDA  
(Wings and male terminalia after Carpenter 1940)

- 1a. Forewing with costal area quite narrow at base, lacking a recurrent humeral vein (fig. 1, 2).....  
..... Micromus Rambur.....2
- 1b. Costal area of forewing much broader basally (fig. 7), often abruptly broadened (fig. 4, 10) and always with a recurrent humeral vein.....3
- 2a. Inner gradate veins of forewing much more than their lengths apart (fig. 1); male terminalia as in fig. 3a.....  
..... Micromus subanticus (Walker)  
OBSERVATIONS: M. subanticus is found throughout Florida and also in the Caribbean (Cuba, Dominican Republic, etc.). It occurs in a variety of habitats including both trees and grasses. It is often found in alfalfa fields where both larvae and adults feed on aphids.
- 2b. Inner gradate crossveins of forewing at most only their lengths apart (fig. 2); male terminalia as in fig. 3b.....  
..... Micromus posticus (Walker)  
OBSERVATIONS: In most of the Nearctic Region this is the most common Micromus, but in Florida it is apparently somewhat less common than subanticus and does not occur in the Keys. Its habitats are similar to those of M. subanticus. Smith (1923) and Cutright (1923) published biological observations.
- 3a. Forewing with 3 or more branches arising from the fused stem of R1 and Rs distal to separation of MA (fig. 4); maxillary palpus 5-segmented, labial palpus with three segments.....  
..... Boriomyia Banks....4
- 3b. Forewing with fewer than 3 branches arising from R1 + Rs distal to separation of MA (fig. 7), most-basal branch arising from R1 + Rs often stalked with MA (fig. 10); maxillary and labial palpi with a small peg-like apiculus so that they appear 6- and 4-segmented respectively (fig. 16).....5
- 4a. Male paramere with lateral process not forked distally (fig. 6a); forewing usually lacking dark brown spots around distal crossveins between branches of Cu (although light-brown cloudings of the membrane adjacent to the crossveins may be present), usually with 2 broad transverse light-brown bands paralleling the inner and outer series of gradate crossveins.....  
..... fidelis (Banks)

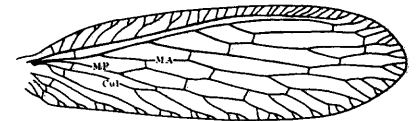


Fig. 1. Forewing - M. subanticus

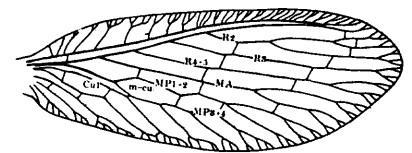


Fig. 2. Forewing - M. posticus

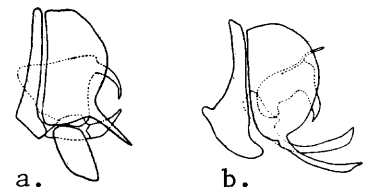


Fig. 3. Male Terminalia  
a. M. subanticus  
b. M. posticus

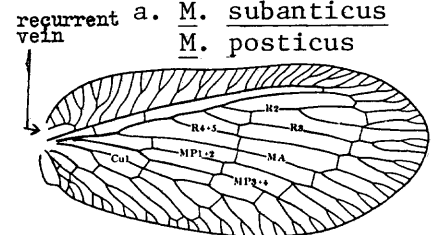


Fig. 4. Forewing - B. fidelis

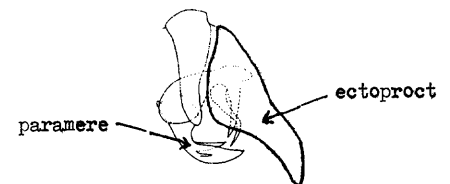


Fig. 5. Male Terminalia - B. fidelis

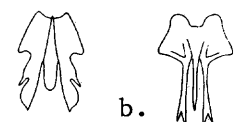


Fig. 6. Male paramere  
a. B. fidelis  
b. B. speciosa

OBSERVATIONS: Recorded here for the first time from Florida (34 specimens from Gainesville, March to September).

- 4b. Male paramere with lateral process forked distally (fig. 6b); forewing usually with discrete dark brown spots around distal crossveins of Cu and the M-Cu crossvein, pale brown maculations sometimes present elsewhere, especially around the inner and outer series of gradate crossveins.....  
 ..... speciosa (Banks)

OBSERVATIONS: Carpenter (1940) recorded female specimens from Sanibel Island but we know of no new records from Florida. Few specimens are known so that the constancy of the wing markings must still be verified.

- 5a. Forewing with 5 or more outer gradate veins (fig. 7); forewing without crossvein between MP and MA....  
 ..... Hemerobius Banks.....6
- 5b. Forewing with 4 or fewer outer gradate veins (fig. 10); MP and MA connected by crossvein shortly after origin of former (fig. 10).....  
 ..... Sympherobius Banks.....7

- 6a. Pronotum and mesonotum with broad yellow stripe; upper process of male ectoproct forked distally (fig. 8).....  
 ..... humulinus Linnaeus
- OBSERVATIONS: This holarctic species appears to be uncommon in Florida. Killington (1937) and Smith (1923) provided biological data.

- 6b. Pronotum and mesonotum with, at most, a narrow median stripe (this is often absent); mesonotum without defined stripe (fig. 17); upper process of male ectoproct not forked (fig. 9)..  
 ..... stigma Stephens
- OBSERVATIONS: This is the most common Hemerobius, ranging from the Panhandle to Highlands County. Smith (1923) gave some biological data. Adults hibernate. Tjeder (1960) synonymized stigmaterus Fitch.

- 7a. Forewing without radial crossvein; male ectoproct with 3 processes, none bifurcate; upper process shorter than lower one (fig. 11).....  
 ..... barberi Banks
- OBSERVATIONS: This is the most widespread U.S. species and has been introduced into Hawaii for biological control. It is being released in Texas for control of citrus mealybug. In Florida there are records from Escambia County to Hillsborough County.

- 7b. Forewing with radial crossvein (fig. 10, "rc"); male ectoproct either with 2 processes, or, if 3, 1 is bifurcate or the upper as long as lower one.....8

- 8a. Forewing vein Cul forks nearer hindmargin than to crossvein m-cu; male ectoproct with 2 processes (fig. 12).....  
 ..... occidentalis Fitch
- OBSERVATIONS: This is an uncommon species recorded here from Florida for the first time (2 males, Gainesville, March, October). Besides the distinctive wing venation and male ectoproct, the forewing

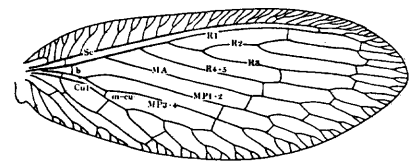


Fig. 7. Forewing - Hemerobius stigma

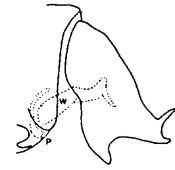


Fig. 8. Male Terminalia - H. humulinus



Fig. 9. Male Terminalia - H. stigma

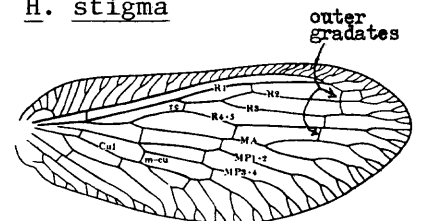


Fig. 10. Forewing - Sympherobius amicus

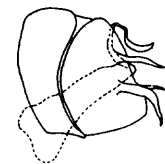


Fig. 11. Male Terminalia - S. barberi

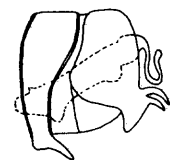


Fig. 12. Male Terminalis - S. occidentalis

markings are characteristic with veins dark brown and cell pattern similar to S. gracilis, but with the gradates more boldly margined.

8b. Forewing vein Cul forks at or near crossvein m-cu (fig. 10); male ectoproct with 3 processes.....9

9a. Most cells of forewing pale in centers and along margins of veins; veins nearly uniformly dark with at most slightly darker points at bases of setae; male ectoproct with lower process bifurcate (fig. 13) ..... gracilis Carpenter

OBSERVATIONS: This uncommon species is recorded here from Florida for the first time (14 specimens from Gainesville, May to July).

9b. Cells of forewing membrane hyaline with irregular gray or brown blotching; veins pale with dark spots at setal bases (especially along Cu and A) and where crossed by membrane maculations; male ectoproct without bifurcate process (fig. 14).....

..... amiculus (Fitch)

OBSERVATIONS: This appears to be the most common species in Florida, ranging from the Panhandle south to Highlands County. Smith (1923) described its biology. Both male terminalia and wing maculation are distinctive.

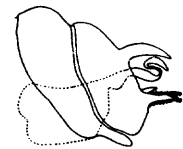


Fig. 13. Male Terminalia-  
S. gracilis

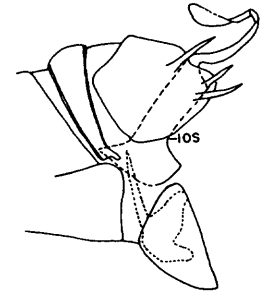


Fig. 14. Male Terminalia-  
S. amicus

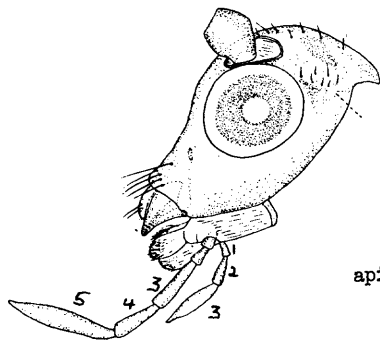


Fig. 15. Head of Micromus  
(after Tjeder, 1961)

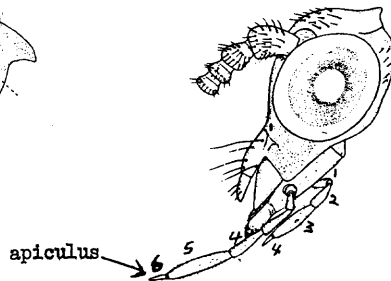


Fig. 16. Head of Hemerobius  
(after Tjeder, 1961)

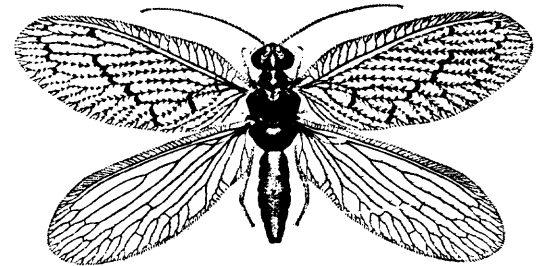


Fig. 17. Hemerobius stigma (after Smith, 1923)

#### REFERENCES

- Carpenter, F. M. 1940. A revision of the Nearctic Hemerobiidae, Berthidae, Sisyridae, Polystoechotidae and Dilaridae. Proc. American Acad. Arts & Sci. 74:193-280.
- Cutright, C. R. 1923. Life history of Micromus posticus Walker. J. Econ. Ent. 16:448-456.
- Dean, H. A., W. G. Hart and S. Ingle. 1971. Citrus mealybug, a potential problem on Texas grapefruit. J. Rio Grande Hort. Soc. 25:46-53.
- Killington, F. 1937. A monograph of the British Neuroptera. Vol. II. The Ray Society, London. p. 1-269, i-xix.
- MacLeod, E. G. 1960. The immature stages of Boriomyia fidelis (Banks) with taxonomic notes on the affinities of the genus Boriomyia. Psyche 67:26-40.
- Smith, R. C. 1923. The life histories and stages of some hemerobiids, and allied species. Ann. Ent. Soc. America 16:129-151.
- Smith, R. C. 1934. Notes on the Neuroptera and Mecoptera of Kansas, with keys to the identification of species. J. Kansas Ent. Soc. 7:120-144.
- Tjeder, B. 1961. Neuroptera Planipennia IV. Hemerobiidae. South African Animal Life 8:296-408.
- Tjeder, B. 1960. Neuroptera from Newfoundland, Miquelon, and Labrador. Opuscula Ent. 25:146-149.