

Robber Flies, *Asilidae* (Insecta: Diptera: Asilidae)¹

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The Featured Creatures collection provides in-depth profiles of insects, nematodes, arachnids and other organisms relevant to Florida. These profiles are intended for the use of interested laypersons with some knowledge of biology as well as academic audiences.

Introduction

The robber flies are an abundant and diverse family (Asilidae) known for their predatory behavior. Asilidae diversity can be attributed to their broad distribution, as most species tend to occupy a selective niche. As their common name implies, robber flies have voracious appetites and feed on a vast array of other arthropods, which may help maintain a healthy balance between insect populations in various habitats (Joern and Rudd 1982, Shurovnekov 1962). Asilidae adults attack wasps, bees, dragonflies, grasshoppers, other flies, and some spiders. Robber flies are particularly abundant in arid and sunny habitats, which are optimal conditions for observing their many morphs and behaviors.

Distribution

The Asilidae enjoy a worldwide distribution, with some groups limited to certain regions (Hull 1962). For instance, the *Megapodinae* spp. are unique to the Neotropical region. Large island chains tend to encompass abundant Asilid faunas, particularly those south of Asia. By contrast, smaller islands such as the Hawaiian chain have no indigenous or introduced species (Hull 1962). The majority of robber fly

species are found in dry, sandy conditions, as confirmed by the diversity of species found in such locales. Some species are well adapted to desert climates, where they are known to thermoregulate in response to temperature variations throughout the day (O'Neill et al. 1988, Morgan and Shelly 1988, O'Neill and Kemp 1990). Few species occur in woodland areas, and those that do tend to aggregate along the edges, near grasslands. In Florida, all four subfamilies of Asilidae (Asilinae, Dasypogoninae, Laphriinae, and Leptogastrinae) are present. Within these subfamilies, the following genera are known to exist in Florida (see Table 1).



Figure 1. Adult *Ospricerus abdominalis* Say robber fly.
Credits: Ken Gray, Oregon State University

Description

Asilidae are a family of true flies, belonging to the superfamily Asiloidea within the suborder Brachycera. To date, there are approximately 7,003 described species of Asilidae distributed worldwide (Geller-Grimm 2008). There are nearly 1,000 North American species of robber flies, with more than 100 species occurring in Florida. Loew was perhaps the most influential dipterist to contribute information to the study of robber flies, describing several

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species and more than 80 genera. Other mid-nineteenth century contributors include Macquart, Walker, Rondani, and Bigot. Later, dipterists in the 1900s became specialists of robber flies in particular locales, most notably Curran and Bromley in North America.



Figure 2. Adult *Dioctria media* Banks robber fly.
Credits: Ken Gray, Oregon State University



Figure 3. Adult *Mallophorina* sp. robber fly.
Credits: Ken Gray, Oregon State University



Figure 4. Adult *Stenopogon* sp. robber fly.
Credits: Ken Gray, Oregon State University

All robber flies have a characteristic divot on top of the head, which is located between their especially prominent compound eyes. In general, adult Asilidae have an elongate body with a tapered abdomen. However, some species are stout and hairy, mimicking bumble bees, and still others may be slender and have a damselfly appearance. Adults range in size from small (3 mm ($\sim\frac{1}{8}$ in)) to very large (over 50 mm (2 in)), averaging 9 to 15 mm ($\sim\frac{1}{3}$ to $\frac{2}{3}$ in) in length

(Wood 1981). Robber flies have long, strong legs that are bristled to aid in prey capture. Sexual dimorphisms are not extreme, although females tend to have slightly broader abdomens than males. Most robber flies have brown, gray, or black coloration.



Figure 5. Adult female *Dysmachus trigonus* robber fly.
Credits: Fritz Geller-Grimm



Figure 6. *Dasyllis haemorrhhoa*, a robber fly mimic of *Euglossadimidiata* (Hymenoptera) in Brazil.
Credits: Fritz Geller-Grimm



Figure 7. Adult *Laphria* sp., a robber fly that mimics a bumble bee.
Credits: Ken Gray, Oregon State University



Figure 8. Adult *Proctacanthus occidentalis* Hine robber fly.
Credits: Ken Gray, Oregon State University

Biology

Female Asilidae deposit whitish-colored eggs on low-lying plants and grasses or in crevices within soil, bark, or wood. Egg-laying habits depend on the species and their specific habitat; most species lay their eggs in masses, which are then covered with a chalky protective coating. Robber fly larvae (Figure 9) live in the soil or in various other decaying organic materials that occur in their environment.



Figure 9. Larva of an unidentified laphriine robber fly.
Credits: Stephen W. Bullington

Larvae are also predatory, feeding on eggs, larvae, or other soft-bodied insects. Robber flies overwinter as larvae and pupate in the soil. Pupae migrate to the soil surface and emerge as adults, often leaving behind their pupal casing (Figure 10). Complete development ranges from one to three years, depending on species and environmental conditions. Theodor (1980) proposed that larval growth

is accelerated in warmer regions and that many Asilidae species live no longer than one year.



Figure 10. Exuviae of an unidentified laphriine robber fly.
Credits: Stephen W. Bullington

Behavior

Robber flies are opportunistic predators, their diets often reflecting prey availability in a particular habitat. Shelly (1986) reported that of the nine Neotropical Asilidae species he studied, diet constituents were more than 85% composed of insects from the orders Diptera, Coleoptera, Hymenoptera, Hemiptera, and Lepidoptera. Furthermore, larger species tended to consume a greater diversity of prey taxa. Robber flies generally establish a perching zone in which to locate potential prey. Perching height varies by species, but generally occurs in open, sunny locations. Asilidae seize their prey in flight and inject their victims with saliva containing neurotoxic and proteolytic enzymes (Figure 11). This injection, inflicted by their modified mouthparts (hypopharynx), rapidly immobilizes prey and allows digestion of bodily contents. The robber fly soon has access to a liquid meal, which is generally consumed upon returning to a perched position.

Robber flies exhibit minimal courtship behavior. Instead, the male pounces on the female, much like an act of prey acquisition. Copulation is accomplished in a tail-to-tail fashion (Figure 12) with the male and female genitalia interlocked. Flight is not completely inhibited during mating.



Figure 11. Robber fly, *Stenopogon* sp., with an antlion, *Palpares libelluloides*, prey.
Credits: Mike Taylor



Figure 12. Mated pair of *Dasypogon diadema*.
Credits: Fritz Geller-Grimm

Key to the Subfamilies of Florida Asilidae

1. Marginal cell open 2
- 1'. Marginal cell closed 3

2. Palpi one-jointed; small, slender species; antennae with slender terminal arista **Leptogastrinae**
- 2'. Palpi two-jointed; antennae with or without a thickened terminal style **Dasypogoninae**
3. Antennae with or without a terminal style, never a terminal arista; palpi two-jointed **Laphriinae**
- 3'. Antennae with slender terminal arista; palpi one-jointed **Asilinae**

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Table 1. Asilidae subfamilies that live in Florida.

Asilinae	Dasypogoninae	Laphriinae	Leptogastrinae
<i>Asilus</i> (10)	<i>Ceraturgopsis</i> (1)	<i>Andrenosoma</i> (3)	<i>Apachekelos</i> (1)
<i>Efferia</i> (11)	<i>Ceraturgus</i> (1)	<i>Atomosia</i> (3)	<i>Beameromyia</i> (2)
<i>Mallophora</i> (5)	<i>Cyrtopogon</i> (1)	<i>Cerotainia</i> (1)	<i>Leptogaster</i> (6)
<i>Mallophorina</i> (2)	<i>Dioctria</i> (3)	<i>Lampria</i> (2)	<i>Psilonyx</i> (1)
<i>Neoitamus</i> (1)	<i>Diogmites</i> (7)	<i>Laphria</i> (8)	<i>Tipulogaster</i> (1)
<i>Ommatius</i> (2)	<i>Dizonias</i> (1)	<i>Orthogonis</i> (1)	
<i>Proctacanthus</i> (8)	<i>Heteropogon</i> (1)	<i>Pogonosoma</i> (1)	
<i>Promachus</i> (4)	<i>Holcocephala</i> (2)		
	<i>Holopogon</i> (1)		
	<i>Laphystia</i>		
	<i>Nicocles</i> (2)		
	<i>Stenopogon</i> (2)		
	<i>Stichopogon</i> (2)		
	<i>Taracticus</i> (1)		