

THE SLUGS OF FLORIDA (GASTROPODA: PULMONATA)¹

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INTRODUCTION: Florida has a depauperate slug fauna, having only 3 native species which belong to 3 different families. Eleven species of exotic slugs have been intercepted by USDA and DPI quarantine inspectors, but only one is known to be established. Some of these, such as the gray garden slug (*Deroceras reticulatum* Müller), spotted garden slug (*Limax maximus* L.), and tawny garden slug (*Limax flavus* L.), are very destructive garden and greenhouse pests. Therefore, constant vigilance is needed to prevent their establishment. Some veronicellid slugs are becoming more widely distributed (Dundee, 1977). The Brazilian *Veronicella ameghini* (Gambetta) has been found at several Florida localities (Dundee, 1974). This velvety black slug should be looked for under boards and debris in vacant lots and cemeteries. Slugs are not commonly seen or collected because they are active mostly at night and inconspicuous during the day. In Spanish they are called "babosas" from the verb "babear" (to drool), because of the copious amount of mucus they secrete. Slugs should be preserved in 75% isopropyl alcohol. It is best to drown them in water overnight in a covered container without air pockets so the bodies will be extended. After drowning they should be washed under running water to remove excess mucus before placing in preservative. Notes on the color of the mucus secreted by the living slug would be helpful in identification.

IDENTIFICATION: Slugs are easily recognized by their soft, unsegmented bodies, dorsally covered completely or in part by a tough leathery skin (mantle). The head has a pair of upper tentacles bearing eyes, and a pair of shorter, olfactory ones. Positive identification of species often depends upon internal anatomy. Color is often used, but considerable variation can occur.

KEY TO SLUGS OF FLORIDA INCLUDING INTERCEPTED SPECIES

- 1. Mantle covering all of the back of the animal (fig. 1-3)..... 2
- 1'. Mantle covering only anterior part of the animal (fig. 4-10)..... 4
- 2(1). Breathing pore visible in short slit near anterior right mantle edge (fig. 1); (Family Philomycidae)..... *Philomycus carolinianus* (Bosc)

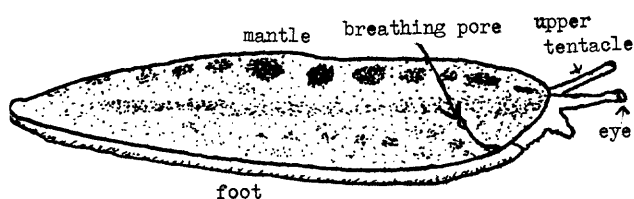


Fig. 1

- 2'. Breathing pore not visible (fig. 2, 3); (Family Veronicellidae)..... 3
- 3(2'). Body velvety black in color (fig. 2) length to about 50 mm, elongate.

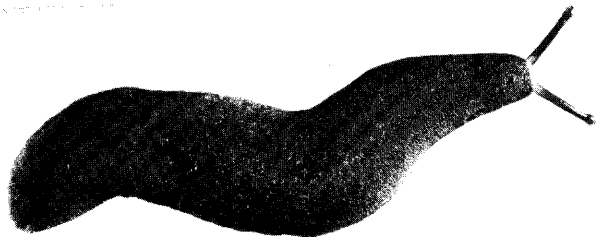


Fig. 2

Length 50-100 mm. Albino (Hermann & Dundee, 1959) and melanistic forms known but typically yellowish brown with 2 rows of dark spots along back. Feeds on fungi. Found under loose bark and aerial bromeliads.

Native: Maine to Florida, west to Iowa and Texas. County records: Alachua, Collier, Jackson, Marion, Volusia.

..... *Veronicella ameghini* (Gambetta)
 This Brazilian slug was first noticed at New Orleans in 1960 and now appears to be established in the Gulf states. Dundee (1974) records it from Pensacola, Miami, St. Augustine and Tallahassee. An aggregate of 14 slugs was found in October 1978, under a large board lying upon grass near the Port of Pensacola. It is an urban slug found in vacant lots and

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cemeteries. Economic importance not known. Dundee (1974) records 3 other related species intercepted at Florida ports. County records: Dade, Escambia, Leon, St. Johns.

- 3'. Body color (fig. 3) ashy to brownish gray mottled with black, median whitish line usually flanked by longitudinal dark band on each side; length to 70 mm, oblong Veronicella floridana (Leidy)

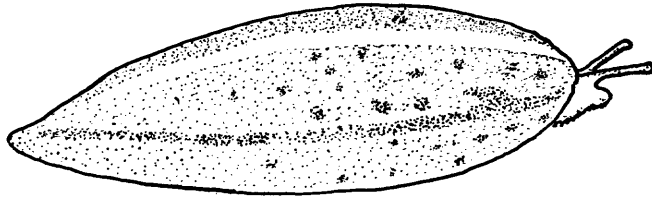


Fig. 3

This native slug was restricted to southern Florida and Cuba until recently. First noticed in Central Florida about 1968. Usually associated with St. Augustine grass but has been found damaging beans and tomatoes. County records: Alachua, Dade, Duval Jackson, Hardee, Hillsborough, Lee, Orange, Volusia.

- 4(1'). Breathing pore located in anterior half of mantle (fig. 4); back never keeled; posterior end rounded when viewed from above (Family Arionidae).

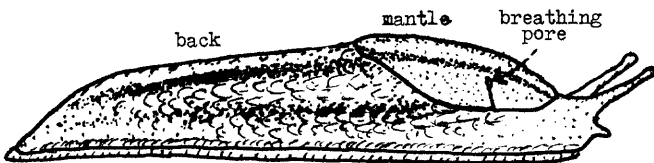


Fig. 4 Banded slug

..... Arion circumscriptus Johnson Length 25-30 mm. Color pattern is distinctive from the other U.S. introduced species of Arion with the sole of the foot porcelain white. Intercepted in Florida from California on potted Pinus. Can cause considerable damage in greenhouses and vegetable and flower gardens. A. ater (L.) which attains a length of more than 70 mm has also been intercepted in Florida according to Dundee (1974).

- 4'. Breathing pore located in posterior half of mantle (fig. 5-10); back keeled at least at posterior end which is pointed in dorsal view (Family Limacidae).... 5
5(4'). Back strongly keeled from the mantle to tip of tail (fig. 5); mantle granulate with center part bound by groove.....Milax gagates (Draparnaud)

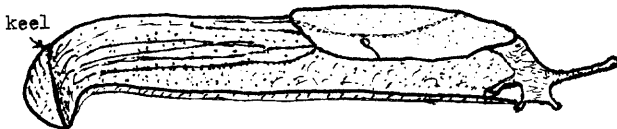


Fig. 5 Greenhouse slug

Length 60-70 mm. Widely introduced in the U. S. from Europe, but in Florida only intercepted at ports. This slug usually burrows in the soil and feeds on roots.

- 5'. Back keeled only near posterior end; mantle concentrically wrinkled, without groove 6
6(5'). Mantle and body with outstanding yellow or black spots (fig. 6, 7); length 60-70 mm 7
6'. Mantle and usually back without well defined spots; size 60 mm or less 8
7(6). Black-spotted; mucus colorless Limax maximus Linnaeus

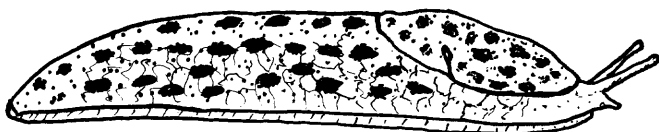


Fig. 6 Spotted garden slug

Length 80-120 mm. Introduced: Massachusetts south to Virginia, west to Oregon and California. This is the largest of the European slugs introduced in the U.S.A. Important pest of gardens, greenhouses, cellars, and mushroom beds. Intercepted in Florida on grape leaves from Tennessee.

- 7'. Yellow-spotted; mucus yellow Limax flavus Linnaeus

Length 75-100 mm. Found in urban and suburban gardens, greenhouses, and other cultivated places. One specimen found in 1965 in Tallahassee. Associated with celery, lettuce, roses. Native to Greece, Italy, Spain.

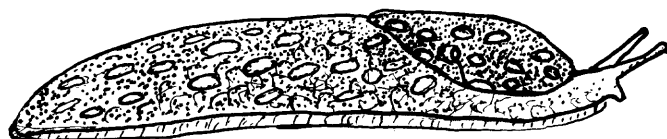


Fig. 7 Tawny garden slug

- 8(6)'. Length 25 mm or less; mantle situated near middle of body (fig. 8); mucus colorless..... Deroceras laeve (Müller)

Smallest of the slugs in Florida. Widespread (Arctic to Central America) and highly adaptive. Feeds on great variety of plants in cultivated areas as well as in swamps, forests, etc. Can survive subfreezing temperatures, (Getz, 1959). Native throughout Florida from the Keys to Pensacola.

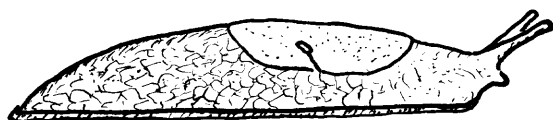


Fig. 8 Marsh slug

- 8'. Length 35 mm or more; mantle situated forward near head (fig. 9, 10)..... 9
- 9(8)'. Exudes milky adhesive slime when irritated; breathing pore surrounded by pale ring; usually without well defined dark longitudinal bands.

..... Deroceras reticulatum (Müller)
Length 35-50 mm. Feeds on variety of plants below and above the soil surface such as young corn, cabbage, tomatoes, peas, strawberries, also ornamentals, mushrooms, and decaying vegetation. Widespread in U. S. except in Gulf States. Intercepted in Florida many times, mostly on ornamentals.



Fig. 9 Gray garden slug

- 9'. Exudes watery slime; breathing pore not surrounded by pale ring with well defined dark longitudinal bands on mantle and back.

..... Lehmanna poirieri (Mabille)
Length 50-60 mm. Introduced into New York, Arizona, California. Intercepted in Florida several times on Hydrangea from California. Recorded from Pensacola (Dundee, 1974).

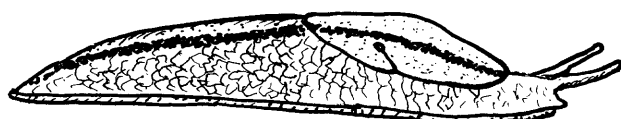


Fig. 10

BIOLOGY: Slugs are hermaphroditic, but often the sperm and ova in the gonads mature at different times (leading to male and female phases). Slugs commonly cross fertilize and may have elaborate courtship dances (Karlin & Bacon, 1961). They lay gelatinous eggs in clusters that usually average 20 to 30 on the soil in concealed and moist locations. Eggs are round to oval, usually colorless, and sometimes have irregular rows of calcium particles which are absorbed by the embryo to form the internal shell (Karlin & Naegele, 1958). As a result, slug eggs often become more transparent as they grow. As soon as they hatch, young slugs (often lighter in color than adults) are active, crawl and feed if the temperature and humidity conditions are right. It is often several days before any plant injury becomes apparent, because they merely rasp away surface tissues. Slugs, especially young and hungry ones, can lower themselves from plants by mucus threads (Key, 1902) that may extend several feet.

ECONOMIC IMPORTANCE: Little slug damage has been reported in Florida, but elsewhere some of the introduced European slugs have caused great damage on many vegetable plants in urban and suburban gardens and in cellars where they may attack potatoes. They are also fond of mushrooms. They also cause concern for the unsightly slime trails on ornamentals. They may transmit plant pathogens (Wester, et al, 1964). Little is known of their significance as intermediate hosts of disease parasites of animals (Chichester &

& Getz, 1968). Introduced slugs may disturb the natural ecological balance in some areas, leading to the disappearance of native species.

CONTROL: Natural enemies are relatively few (Stephenson & Knutson, 1966). Some birds, especially ducks, feed on slugs. Predator snails such as Euglandina rosea (Férussac) attack slugs. Few predaceous insects attack slugs, but the larvae of Lampyridae and adult Carabidae (Coleoptera) do so occasionally. There are some dipterous parasites (especially Sciomyzidae) (Trelka & Foote, 1970). A few fungous diseases are known. Adverse climatic conditions (e.g., dry, hot, weather or excessive rains) serve to lessen depredations but do not appear to be of great significance. The rather poor slug fauna of Florida may be due to historic factors or perhaps to some natural factor as soil types. Clean surroundings will aid in controlling slug populations, and removal of boards, sacks, piles of brush, and other debris will limit slug numbers. When chemical control is indicated, the use of baits (Mesurool; metaldehyde) is recommended in commercial greenhouses. In commercial foliage and woody ornamental pest control, metaldehyde sprays (50%WP), applied at 2-week intervals, are usually necessary. The homeowner can buy Mesurool and metaldehyde baits and should use them as directed on the label.

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