PEST ALERT

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Florida Department of Agriculture and Consumer Services
Division of Plant Industry

Papilio demoleus, Lime Swallowtail, on Key West, Florida

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INTRODUCTION
On September 23, 2022, photographs were posted online of larvae of the Lime Swallowtail (*Papilio demoleus* L.) on a citrus tree on Key West. Division of Plant Industry (DPI) personnel visited the property and collected two specimens, which morphological examination and DNA sequencing confirmed to be *P. demoleus malayanus* Wallace, the subspecies that is invasive in the Caribbean (Eastwood et al. 2006). This butterfly is a well-known pest of citrus foliage in the Old-World tropics. It has been established in the Greater Antilles since 2004, and its invasion of Florida has been anticipated. A thorough survey by DPI personnel found more residential properties on Key West with immature stages on dooryard citrus trees.

DESCRIPTION AND FIELD SCREENING
Eggs are 1.0–1.5 mm, white to yellow, spherical and smooth. They are laid in groups of one to three near the edges of leaves (Lewis 2008). Young larvae (Fig. 1) are dark gray with white marks, resembling bird droppings with short spines. The final instar (Fig. 3) is 3–4 cm long and green with black and yellow bands across the thorax and abdomen. Pupae (Fig. 4) are rough and usually grayish brown, but pink or green forms occur. Adult butterflies (Fig. 5) have a black and yellow checkered pattern with a red hind-wing spot. Unlike most swallowtail butterflies, they do not have "tails" on the hind wings. The only stages that may be field-screened are the adult butterfly and the final-instar larva: a large, green papilionid caterpillar on *Citrus* is probably this species. However, the eggs, pupae and younger dropping-mimic larvae resemble those of native butterflies, so they must be collected and submitted to DPI's diagnostics bureau for determination.

BIOLOGY AND HOSTS
Hosts are almost exclusively Rutaceae. Larvae prefer *Citrus* species and *Atalantia buxifolia* (boxthorn). Other hosts include species of *Acronychia, Aegle, Chloroxylon, Clausena, Flindersia, Fortunella, Glycosmis, Limonia, Microcitrus, Micromelum, Murraya, Ruta, Toddalia, Triphasia* and *Zanthoxylum* (Robinson et al. 2001). In Cuba, it has been observed on *Citrus*, limeberry (*Triphasia trifolia*) and boxthorn (Hernandez and Minno 2015; M. Minno, pers. comm.). *Papilio demoleus* is a strong flier and frequents urban habitats. A female may lay more than 100 eggs under optimal conditions. Caterpillars chew out large, semicircular pieces of leaves, and they prefer young growth (Fig. 2).

DISTRIBUTION
Papilio demoleus is native from the Middle East to southern China, with the subspecies *P. d. malayanus* native to mainland Southeast Asia. Its range has expanded into Indonesia and the Philippines following citrus cultivation. In the Caribbean region, it occurs in Cuba, Hispaniola, Puerto Rico, the Virgin Islands, Jamaica and the Cayman Islands. In the continental U.S., butterflies have been reported by the general public in California and Louisiana, but their status is uncertain.

POTENTIAL ECONOMIC IMPACT
Papilio demoleus is a key pest of citrus in Asia (Mineo 1986). It can defoliate seedlings and young trees, so its effect on nursery stock may be greater than on established groves.

SURVEY

Specimens must be sent to DPI's Entomology section for positive identification and documentation. Larvae sit on leaves, hidden only by mimicry and camouflage. Live specimens should be photographed before collection. Eggs, larvae and pupae should be placed in 70–95 percent alcohol. If large larvae start to darken in alcohol, they may be put into white vinegar (5 percent acetic acid) to preserve color. Adults are caught with a net, immobilized by pinching the thorax and put into an envelope. Forms and instruction for sample submission can be found at www.FDACS.gov/DPIsamples.

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Fig. 1: 3rd instar larva; Fig. 2: Leaf damage on citrus; Fig. 3: 5th (final) instar; Fig. 4: pupa (encircled); Fig. 5: adult butterfly. Images not to scale.
Photos by K.M. Burnette, FDACS-DPI (Fig. 1); J.E. Hayden, FDACS-DPI (Figs. 2 and 5); D.M. Fernández Hernández, Camagüey, Cuba (Figs. 3 and 4).