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EENY-750

Ligurian leafhopper *Eupteryx decemnotata* (Rey) (Insecta: Hemiptera: Cicadellidae: Typhlocybinae)[1]

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Introduction

The Ligurian leafhopper, *Eupteryx decemnotata* (Rey), is a sap-feeding insect in the family Cicadellidae. Like many other cicadellids, the adult Ligurian leafhopper has a wedge-shaped head, bristle-like antennae, and two pairs of wings that are folded over body at rest (Figure 1). Originally native to the Mediterranean basin around the Ligurian Sea, including parts of Italy, France, and islands such as Capraia and Sardinia, the Ligurian leafhopper has generated scientific and regulatory interest by rapidly increasing its geographic range over the past three decades (Nickel and Holzinger 2006). This range expansion may have been facilitated by commercial transportation of host plants in the mint family (Lamiaceae).

Figure 1. Adult Ligurian leafhopper, *Eupteryx decemnotata* (Rey). Credits: Katja Schulz, Smithsonian National Museum of Natural History, photograph licensed by Creative Commons

Distribution

Prior to 1980, the Ligurian leafhopper was known only from the Mediterranean coasts of France and Italy but, starting in 1983, it began a northward spread into continental Europe via Switzerland and Austria, reaching Germany by 1989 (Nickel and Holzinger 2006). Adult or immature leafhoppers may have hitchhiked their way from country to country on imported catnip (*Nepeta cataria* (L.)) plants, which were becoming popular ornamental plants in the 1980s (Nickel and Holzinger 2006). Subsequently, the Ligurian leafhopper invaded the United Kingdom (Maczey and Wilson 2004), the United States (Rung et al. 2009), and Poland (Lubiarz and Musik 2015). Within the United States, the leafhopper has been reported from multiple individual sites in eight states, although collections made in Pennsylvania and Florida represent regulatory interceptions, and therefore may not imply the presence of an established population (Figure 2) (Halbert et al. 2009, Ciafré and Barringer 2017).

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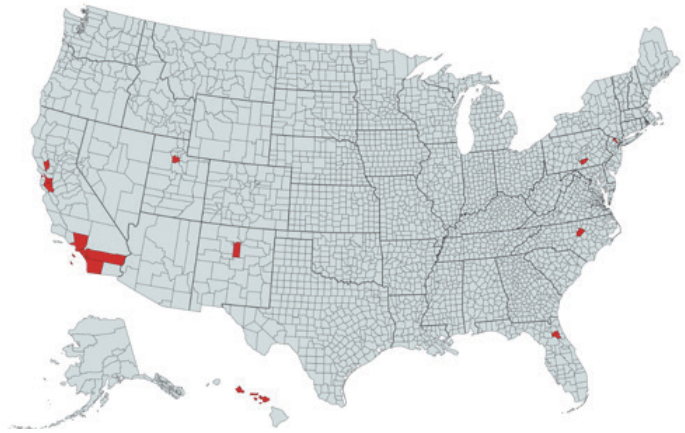

Figure 2. Reported distribution of Ligurian leafhopper (*Eupteryx decemnotata* (Rey)) occurrences within the United States. Counties where the leafhopper has been found are highlighted in red. Credits: created by Alexander Tasi using mapchart.net, after descriptions in Rung et al. (2009), Ciafré and Barringer (2017), Kittleberger (2018), Dietrich and Perreira (2019), and BugGuide.net

Description and Life Cycle

Eggs

Adult females oviposit (lay eggs) within the leaf tissues of host plants (Mazzoni and Conti 2006). Leonard and Barber (1923) described eggs of a related species, the sage leafhopper (*Eupteryx mellisae* (Curtis)), as being 0.85 mm long and 0.17 mm wide, translucently white, and inserted within the petioles (leafstalks) of catnip leaves. If the eggs of the Ligurian leafhopper are of a similar size and coloration, regulators might easily overlook their presence while visually inspecting imported plants; however, Leonard and Barber (1923) noted that the oviposition punctures were marked by corresponding brown discolorations on the leaf surface, which may alert inspectors to the presence of eggs. In Italy, it is thought that most of the population overwinters as eggs. At 20°C, Ligurian leafhopper eggs hatch within 20 to 26 days after oviposition (Mazzoni and Conti 2006).

Nymphs

After the eggs hatch, the Ligurian leafhopper passes through five nymphal (immature) stages known as instars. At the end of each instar, the nymph molts (shedding its exoskeleton to increase in size). The 5th instar is the longest developmental stage and lasts approximately five days, after which the nymph molts into an adult. The entire nymphal period takes about 20 days (Mazzoni and Conti 2006). Nymphs are green, wingless, and covered in hair-like structures called setae (Figure 3). Like the adults, nymphs are capable of hopping.

Figure 3. Lateral view of a Ligurian leafhopper (*Eupteryx decemnotata* (Rey)) nymph, from Rome, Italy.
Credits: Elena Regina, Flickr.com

Adults

The adults are less than 3 mm long, with a mottled, brown, yellow and white wing pattern (Halbert et al. 2009). Long hind legs allow the insects to jump rapidly when disturbed. Several rows of prominent spines on the hind legs are used to distribute water repellant secretions, known as bronchosomes, across exposed body parts (Burrows 2007). These secretions may protect the leafhoppers from becoming trapped by droplets of water, or their own sticky, sugar-rich waste (Rakitov and Gorb 2013).

The Ligurian leafhopper can be distinguished from all other members of this genus by the presence of five pairs of black spots on the head, which are visible in anterior view (from the front of the body). One other member of this genus, the sage leafhopper, also occurs in the United States, and may be found on similar host plants (Halbert et al. 2009); however, the sage leafhopper has fewer than six black spots on the front of the head (Figure 4).

Members of the Typhlocybinae, the subfamily of leafhoppers to which the Ligurian leafhopper belongs, feed by piercing the leaves of their host plants with specialized, tube-like mouthparts (Stewart 1988). Multiple adults may be present on a single plant, which implies that some level of competition for feeding sites is tolerated among members of the same species. *Eupteryx* species, like many other small leafhoppers, have been found to produce species-specific courtship songs that are transmitted as vibrations through the leaves and stems of their hosts plants. Males and females of two British species (*Eupteryx cyclops* (Matsumara) and *Eupteryx urticae* (F.)) sing in alternating duos. The female generally remains stationary while the male approaches her (Stiling 1980).

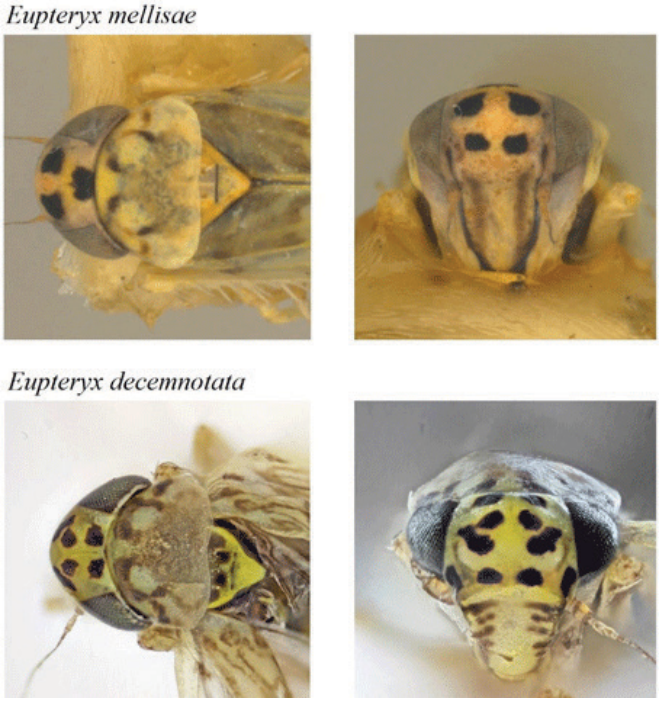

Figure 4.

Host Plants

The Ligurian leafhopper feeds on a wide variety of plants in the mint family (Nickel and Holzinger 2006). Many of these plants are widely planted for culinary and aesthetic purposes in farms and gardens. Within its native range, the leafhopper is reported to be common on both wild and cultivated herbs, and its feeding activity is associated with severe yellowing and branch drying of sage (*Salvia officinalis*) and rosemary (*Rosmarinus officinalis*) (Mazzoni 2005). Other host plants include lemon balm (*Melissa officinalis*), basil (*Ocimum basilicum*), marjoram (*Origanum majorana*), oregano (*Origanum vulgare*), and thyme (*Thymus vulgaris*). (Halbert et al. 2009). Like the Ligurian leafhopper, these host plants appear to have Mediterranean origins (Drew and Sytsma 2012).

Damage

In the United States over 150,000 acres of mint are grown each year, for both fresh market and essential oil production, and the market for herbal supplements is worth over 4 billion dollars (Craker et al. 2003). Feeding damage by leafhoppers in the genus *Eupteryx* is associated with lower essential oil content in Turkish oregano (*Origanum onites*) (Arslan et al. 2012), which suggests that overall mint essential oil yields might be impacted as well if the leafhopper reached damaging population levels in a field. The unsightly yellowing and stippling caused by Ligurian leafhopper feeding may also reduce the vigor and visual appeal of plants sold for human consumption or through the nursery trade. Damage to host plants reportedly increases with higher densities of feeding leafhoppers (Mazzoni and Conti 2006).

Members of the subfamily Typhlocybinae generally feed on the contents of mesophyll cells (non-vascular leaf tissue), and therefore may be less efficient at transmitting plant pathogens than hoppers feeding on xylem or phloem. At least one species in the subfamily is a known vector of phytopathogenic bacteria (Galetto et al. 2011). The Ligurian leafhopper specifically has not been shown to transmit any plant pathogens.

Management

Much of the published literature about Ligurian leafhopper management comes from Europe, rather than the United States, where it is still a relatively recent arrival. In Poland, herb producers reportedly vacuum plants and employ yellow sticky traps to reduce the abundance of Ligurian leafhopper during the growing season (Lubiarz and Musik 2015). Several applications of a neem seed derivative provided effective chemical control on rosemary grown under high tunnels in Switzerland (Crettenand and Mittaz 2001). Lastly, the eggs of *Eupteryx* sp. in Britain were parasitized by wasps resembling *Anagrus atomus* (L.) (Hymenoptera: Mymaridae) (Stewart 1988). These or similar wasps may be worth investigating as biological control agents if populations if Ligurian leafhopper achieve pest status in the United States.

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