

Ramie Moth *Arcte coerulea* (Guenée) (Lepidoptera: Noctuidae)

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INTRODUCTION

In November 2018, Department of Land and Natural Resources, Division of Forestry and Wildlife (DLNR-DOFAW) staff discovered unknown caterpillars (larvae) defoliating mānaki in the back of Olowalu, in the West Maui Mountains. Within a week, the same caterpillars were found feeding on mānaki plants in the Olinda Rare Plant Facility in East Maui. Molecular sequencing by the University of Hawai‘i, Laboratory of Insect Systematics and Biodiversity, and morphological evaluation by Paul Goldstein (United States Department of Agriculture, Systematic Entomology Laboratory) confirmed the identity of *Arcte coerulea* (Guenée, 1852). This represents the first record of the ramie moth (RM) in Hawai‘i and the United States.

RM poses a threat to the endemic Kamehameha butterfly by competing for the same native host plant resources, native forests by decimating endemic plants, and is a potential pest of mānaki and olonā grown for agriculture and Native Hawaiian cultural practices.

HOSTS

Larvae are known to feed on a range of host plants in the nettle family (Urticaceae). This includes but is not limited to *Cypholophus* spp., *Debregeasia* spp., *Girardinia* spp., *Pipturus* spp., and especially *Boehmeria* spp. Other sources have noted larvae feeding on *Vitis* sp. (Vitaceae) and *Trema tomentosa* (Ulmaceae) (Robinson et al 2010). Adults are known to feed on tree sap and rotting/overripe fruit.

DESCRIPTION

Eggs: Clear-white in color, circular in shape (1 mm in diameter), and laid singly on the underside of leaves (Fig. 2).

Larvae: Caterpillars (Fig. 1) are often mistaken for Kamehameha butterfly (KB; *Vanessa tameamea*) caterpillars (Fig. 5, 7, 9) in Hawai‘i because of their preference for the same native Hawaiian host plants, specifically mānaki. For this reason, we compare images of eggs (Fig. 2, 3) and larvae of the two species (Fig. 4 - 9). Early instar RM larvae (Fig. 4) are green and black in color. As they develop, RM larvae range in size from 2 mm to 100 mm and become vibrant yellow and black with bright orange-red spots and thin white hairs (Fig. 1, 6, 8). Head capsules are usually black but can also be reddish-brown in color (Fig. 6). KB larvae range from 2 mm to 45 mm in length and do not have bright red spots on their side which RM larvae do. KB larvae have thick, short spines on their bodies, as opposed to the thin, long white hairs of RM larvae.



Fig. 1. RM larva under a mānaki leaf. Photo: Theresa H. Martinson

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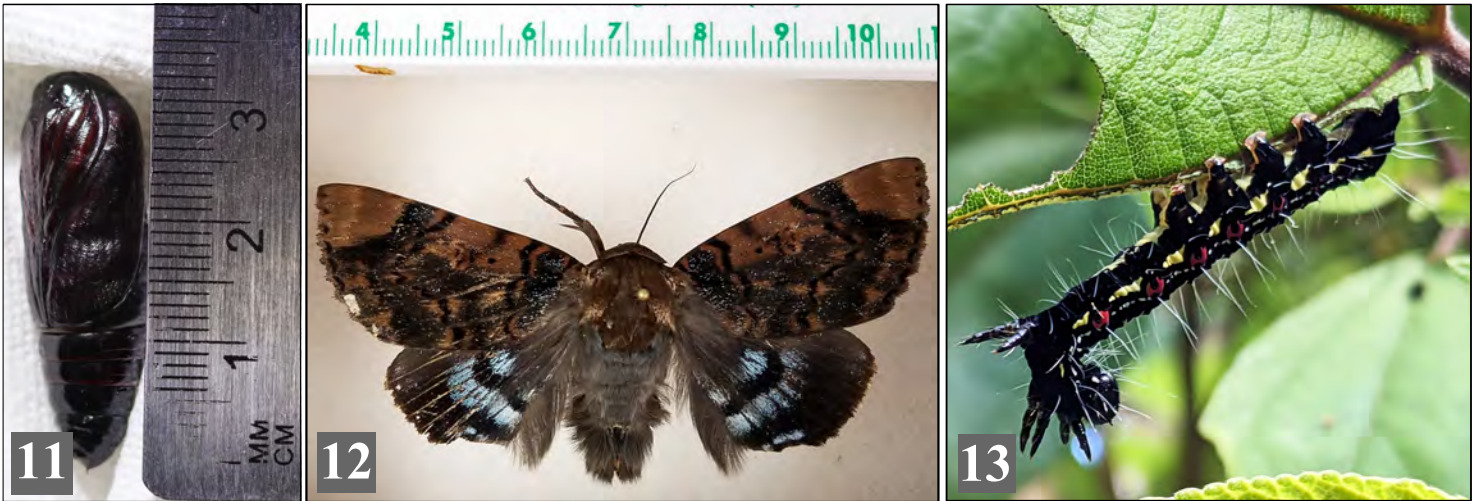
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Fig. 2. RM egg. Photo: Michelle Au; **Fig. 3.** KB egg. Photo: DLNR-DOFAW; **Fig. 4.** RM 1st instar larva. Photo: Anna Palomino; **Fig. 5.** KB 1st instar larva. Photo: DLNR-DOFAW; **Fig. 6.** RM yellow morph larva. Photo: Anna Palomino; **Fig. 7.** KB late instar green morph larva. Photo: DLNR-DOFAW; **Fig. 8.** RM late instar black morph larva. Photo: Anna Palomino; **Fig. 9.** KB late instar brown morph larva. Photo: DLNR-DOFAW; **Fig. 10.** The red admiral (*Vanessa atalanta*) is also known to feed on plants in the nettle family and is a potential RM larva lookalike due to its variable coloration. Photo: <http://www.raisingbutterflies.org/red-admiral/>.

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DESCRIPTION CONT.

Pupae: About 35 mm in length (Fig. 11).

Adults: Large (28-32 mm from head to the tip of the abdomen and 65-90 mm wingspan) moths with dark brown head, and dark brown forewings with black markings, speckles of silvery-blue, and scalloped wing edges (Fig. 12). Hindwings have bright silvery-bluish markings.

BEHAVIOR

RM are very distinct from other species in Hawai'i because of the aggressive defensive behavior larvae exhibit. When disturbed or threatened, the larva rears up its head (Fig. 13), thrashes around, and regurgitates a green liquid to defend itself.

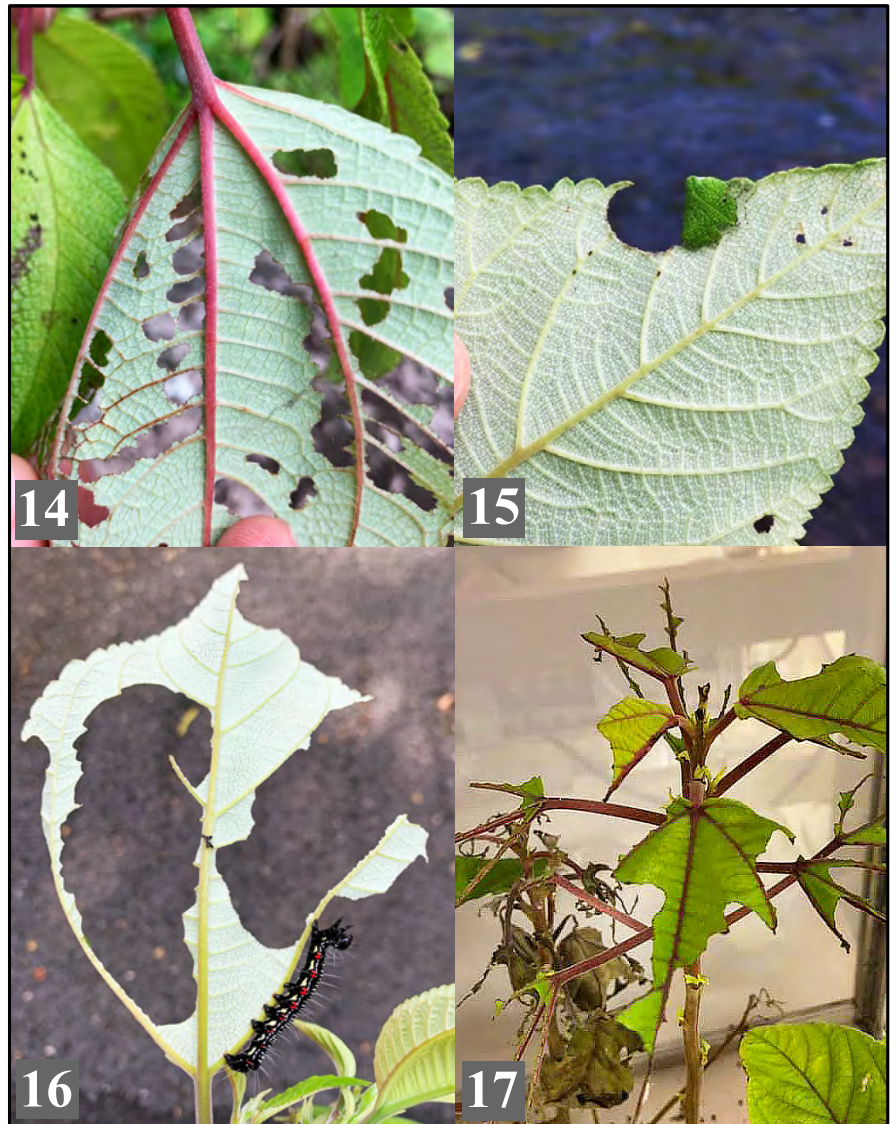


Fig. 11. RM pupa (in cm). Photo: Michelle Au; **Fig. 12.** RM adult (in cm). Photo: HDOA; **Fig. 13.** RM larvae will lift up their head and legs while shaking violently to ward off predators. Photo: Michelle Au; **Fig. 14.** Feeding damage to māmaki leaf from an early instar RM larvae. Photo: Michelle Au; **Fig. 15.** Māmaki leaf showing clipped folded leaf edge by KB larva. Photo: DLNR-DOFAW; **Fig. 16.** RM larva feeding damage, showing large areas fed on in the middle of leaves. Photo: Michelle Au; **Fig. 17.** Defoliation of potted māmaki plant by RM larvae. Photo: HDOA

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FEEDING DAMAGE

RM larvae will feed on both young and mature leaves of host plants. Early stages of RM feeding includes small holes in the middle of leaves (Fig. 14), while young KB larvae always feed from the leaf margins in, clipping leaves, and folding edges in to create shelters (Fig. 15). In later larval stages, RM larvae will create large areas of feeding damage in the middle of leaves (Fig. 16) and completely strip leaves, leaving only the major veins (Fig. 17, 18).

Adults will not cause any damage to the plants.

DISTRIBUTION

In Hawai'i, RM has been found on Maui and Hawai'i Island. Larvae have been recorded in both residential areas and native Hawaiian forests. Further surveying will be conducted by the University of Hawai'i to identify additional locations where this pest may be found.

Worldwide, RM can be found in Asia, Oceania, Australia, Fiji, and Papua New Guinea (Jackson & Mua, 2016).

PREVENT THE SPREAD

Do not move host plants such as māmaki and olonā between islands or areas. Plants should be inspected by HDOA Plant Quarantine Branch before being moved.

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Fig. 18. Extensive feeding and stripping of leaves to wild māmaki plant, showing RM larvae in red circles competing for food with KB larva in blue circle. Photo: Keahi Bustamente.