CHAPTER 9.

Monitoring Myoporum thrips, *Klambothrips myopori* (Thysanoptera: Phlaeothripidae), in Hawaii

(Project WC-EM-B-10-02)

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INTRODUCTION

Myoporum thrips, (*Klambothrips myopori)* was detected in California in 2005, where it has caused high levels of mortality in ornamental *Myoporum* species used for landscaping residential and freeway margins (Sullivan 2014). Before its detection in California, this was an unknown species to science and was subsequently formally described by Mound and Morris (2007). It is now known that this species is native to Tasmania.

Myoporum thrips feeds on terminal growth of plants in the genus *Myoporum*. Feeding causes gall-like symptoms in young leaves. Infested new leaves normally harbor multiple life stages. High infestations can cause terminal dieback that can eventually lead to plant mortality (Bethke and Shaw 2008). It was first detected in Hawaii in March of 2009 attacking the native *Myoporum sandwicense*, locally known as naio (Conant and others 2009).

Locally known as naio thrips, the distribution of myoporum thrips in Hawaii is currently restricted to the Big Island (Hawai'i Island). The high mortality rates seen in California provide cause for alarm for forest managers and landscapers in Hawaii, where naio is an appreciated native species that is often used in ornamental plantings, holds cultural significance to native Hawaiians, and is an integral component of native Hawaiian ecosystems. While naio is most dominant in dry forests, lowlands, and upland shrublands, the species also populates mesic and wet forest habitats. Naio is distributed across all of the main Hawaiian Islands and is present from sea level to 3000 m (Wagner and others 1990). The loss of this species would be both a significant loss of native biodiversity and a structural loss to native forest habitats.

In September of 2010, the Hawaii Department of Land and Natural Resources (DLNR) Division of Forestry and Wildlife (DOFAW) and the University of Hawai'i initiated efforts to determine spatial distribution, infestation rates, and overall tree health of naio populations on the Big Island. This report summarizes information of a 4-year monitoring period at nine sites. The main objective of the project was to document myoporum thrips infestation and dieback rates on the native *M. sandwicense* at these selected sites.

METHODS

Monitoring Sites on Hawai'i Island

Nine monitoring sites were established on the Big Island in November of 2010 (fig. 9.1). All these sites were protected natural habitats.

Sites spanned an elevational gradient and included an array of habitats: Kaloko-Honokōhau (2 m), Oweowe (589 m), Pelekane (792 m), Koai'a Sanctuary (975 m), Pu'u Wa'awa'a Low (975 m), Pu'u Wa'awa'a Mid (1289 m), Pu'u Wa'awa'a High (1603 m), Kaohe Low (1778 m), and Kaohe High (2128 m).

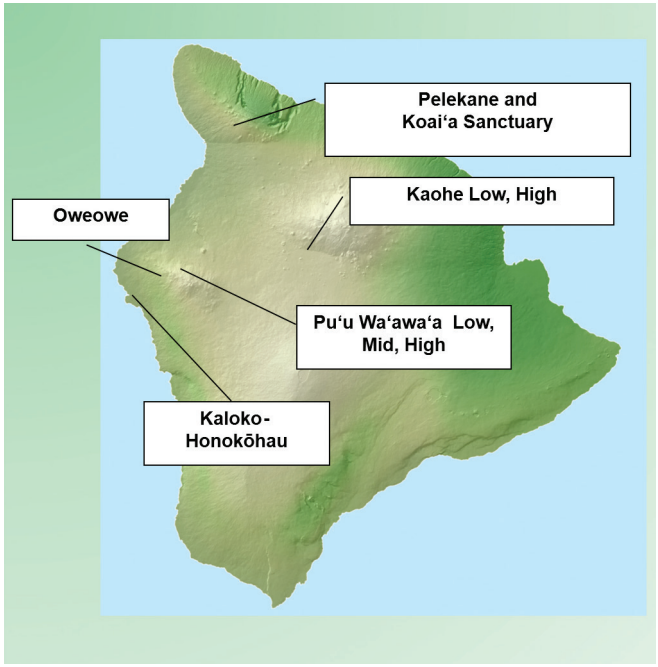

Figure 9.1—Monitoring sites on Hawai'i Island.

Monitoring Infestation and Dieback Levels

Selected sites were visited at monthly intervals for a 3-year period. During the fourth year, sites were monitored every 3–4 months. At each visit, 20 young shoots per plant were randomly chosen and inspected to determine infestation and dieback levels. A total of 10 plants were inspected per site, whenever possible. A four-point scale (0–3) was used to assess the levels of infestation (fig. 9.2) and levels of dieback (fig. 9.3).

RESULTS

Results show that myoporum thrips has spread and colonized natural habitats on the leeward side of Hawai'i Island. Infestation rates increased considerably at all sites over the duration of the sampling period. Trees experiencing high infestation levels also showed branch dieback. Sites that showed no to low infestation levels at the start of the monitoring,

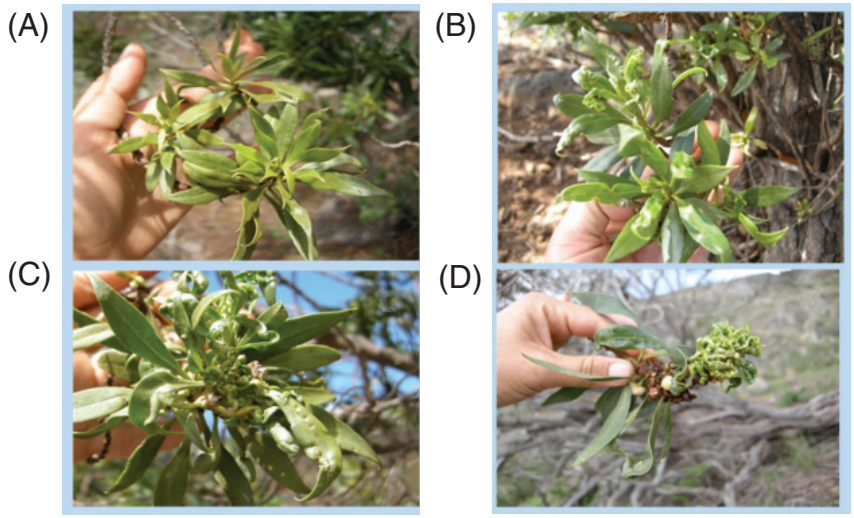

Figure 9.2—Infestation scale: (A) 0 = no galls; (B) 1 = <33 percent tissue galled; (C) 2 = 33–66 percent of tissue galled; (D) 3 = >66 percent of tissue galled. (Photos by Leyla Kaufman, The Pacific Cooperative Studies Unit (PCSU), University of Hawai'i)

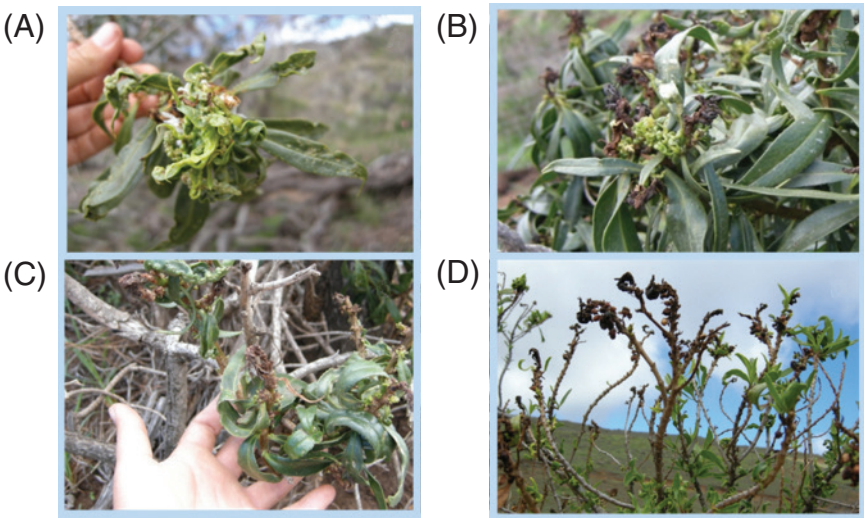

Figure 9.3—Dieback scale: (A) 0 = no dieback; (B) 1 = <33 percent tissue with dieback; (C) 2 = 33–66 percent of tissue with dieback; (D) 3 = >66 percent of tissue with dieback. (Photos by Leyla Kaufman, The Pacific Cooperative Studies Unit (PCSU), University of Hawai'i)

such as Kaohe Low, suffered visibly high infestation levels by the end of the monitoring period (fig. 9.4).

Medium-elevation sites (between 500–999 m) Oweowe and Koai'a had the highest infestation and dieback levels (figs. 9.4 and 9.5). Over 70 percent of the shoots inspected at medium-elevation sites had the highest infestation and dieback scores. At the medium-elevation Koai'a and Pelekane sites, over 70 percent of the monitoring trees have died due to myoporum thrips damage (fig. 9.6).

DISCUSSION

It was expected that trees that had high levels of infestation and dieback would tend to have reduced reproductive capacity; nevertheless, highly infested trees may sometimes flower and fruit vigorously. Probably this happens as a stress response, to make sure seeds are produced and left in the soil seed bank. Even though flowers and fruits were still seen at all sites, little to no plant recruitment was observed at these sites.

The invasive myoporum thrips is still confined to the Big Island and has not yet been detected on neighboring islands. It is expected that

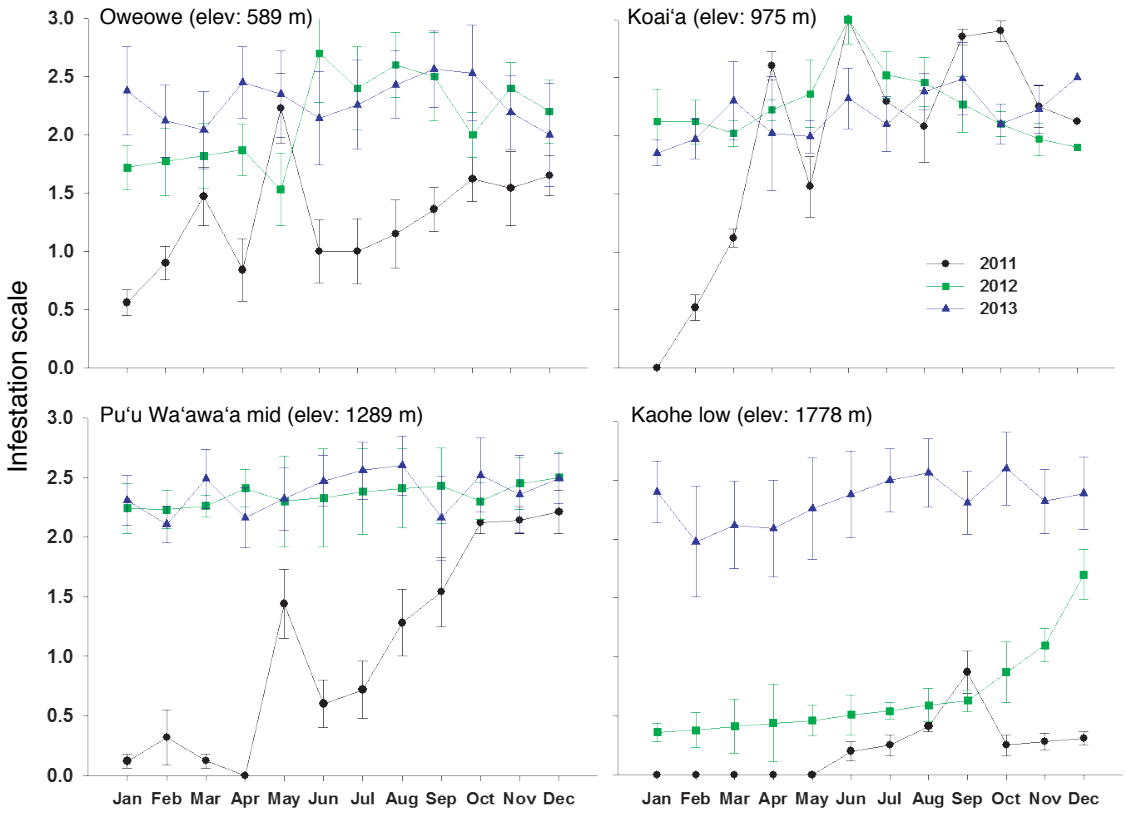

Figure 9.4—Naio thrips infestation levels by year (selected sites), on a 0–3 scale as described under Methods.

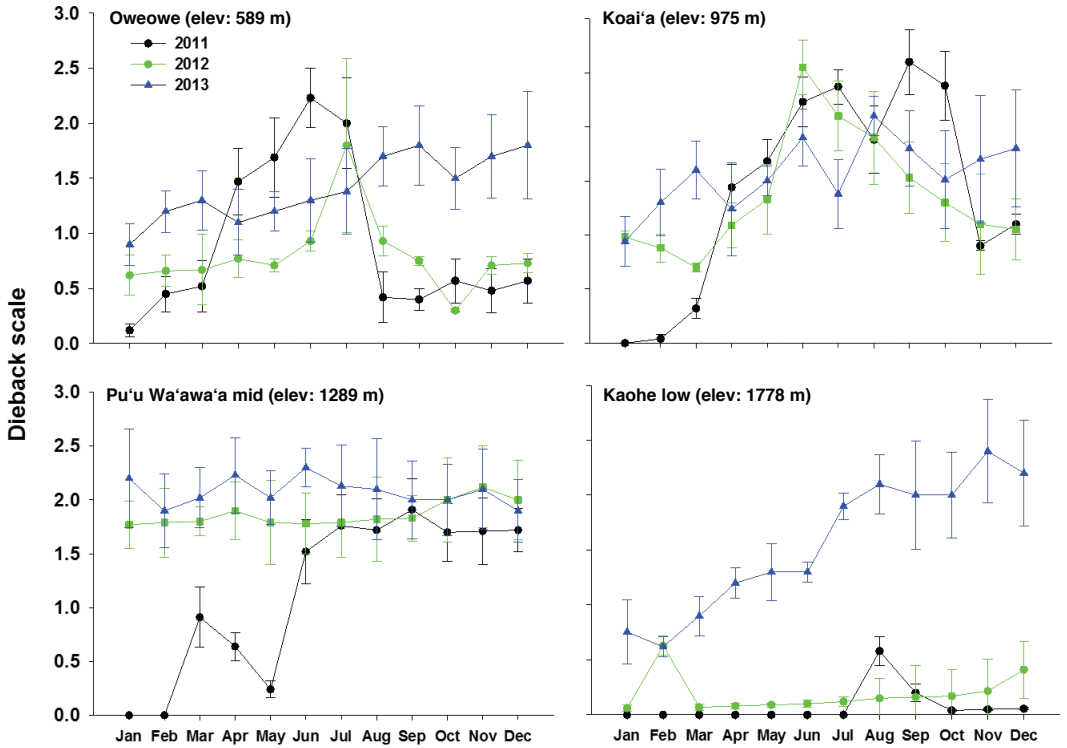

Figure 9.5—Plant dieback levels by year (selected sites), attributed to naio thrips.

Myoporum populations on neighboring islands will be as susceptible to myoporum thrips as the Big Island populations. During the monitoring period, no potential biocontrol agents were detected; this likely explains the successful establishment and population increases of this invasive species in Hawaii. It is possible that the highest infestation and dieback levels observed at medium-elevation sites might be due to early colonization of thrips at those sites; however, this has not been confirmed.

CONCLUSIONS

Myoporum thrips continues to threaten the native *Myoporum* populations on Hawaiʻi Island, where levels of infestation and dieback levels increased considerably throughout the monitoring period. Tree mortality due to thrips has been observed in medium-elevation sites. Early detection and rapid response (e.g., pesticide applications) are currently the only tools available for neighboring islands to prevent colonization and establishment.

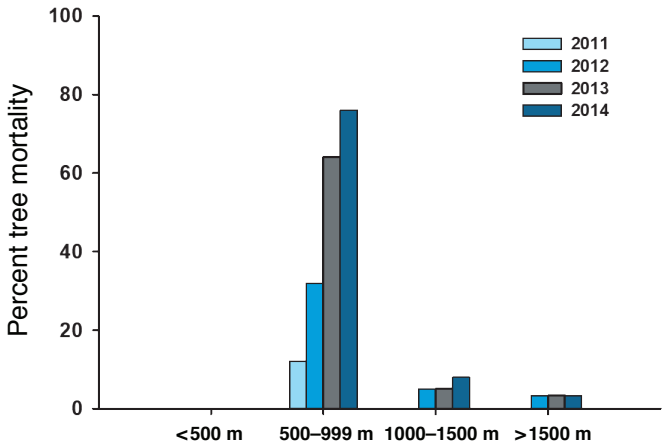

Figure 9.6—Naio mortality by elevation attributable to naio thrips damage.

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