Notes on CAS Biocontrol Agents of CAS in Hawaii and Guam

Hawaii

COCCINELLIDAE: ***Rhyzobius lophanthae***

- Previously known as *Lindorus lophanthae*. Originally collected in Australia and imported into California in 1892. Imported to Hawaii from California in 1894 (Moore et al. 2005)
- Discovered feeding on CAS in 1999 (Heu, Chun, and Nagamine 2003)

APHELINIDAE: **Aphytis lingnanensis** Compere (or cryptic or biotype)

- Reared from CAS on Cycas revoluta in 2008. Identified by Greg Adams. (Kumashiro 2009)
- Suspected fortuitous introduction.

APHELINIDAE: **Pteroptrix leptocera** Huang or a species very similar to it and new.

- Reared from CAS on Cycas revoluta in 2008. Identified by Greg Adams.(Kumashiro 2009)
- Suspected fortuitous introduction.

ENCYRTIDAE: **Plagiomerus** sp.

- Reared from CAS on Cycas revoluta in 2008. Identified by Greg Adams.(Kumashiro 2009)
- Suspected fortuitous introduction.

Guam

COCCINELLIDAE: ***Rhyzobius lophanthae***

- Imported and released on Guam in 1925 and 1926. Did not establish (Swezey 1942)
- One hundred adults imported from Maui in November 2004. Field releases on Guam started February 2005 (Moore et al. 2005)
- *R. lophanthae* collected on Guam were exported to Rota and Palau after CAS invaded those islands.

COCCINELLIDAE: additional unidentified species

- During a trip to Guam in March 2022, Ron Cave collected 4 additional coccinellids apparently preying on CAS, in addition to *Rhyzobius lophanthae.* One of these is *Scymnus* sp. The other three are unidentified beyond family.

APHELINIDAE: ***Coccobius fulvus***

- Imported from Florida and released on Guam multiple times. All attempts at establishing a lab colony failed. All field releases dead not result in establishment.
- "Dr. Ru Nguyen, an entomologist with the Florida Department of Agriculture and Consumer Services, maintains a culture for *C. fulvus* from China and was kind enough to send a few shipments to Guam. The first shipment of 500 adult parasitoids was received on 29 August 2005. Of this shipment, 250 parasitoids were released in a cage with a potted CAS-infested *Cycas revoluta* plant and the other 250 parasitoids were released on CAS-infested C. micronesica plants in the field at Marbo Caves on the east coast of the island. This site was selected because it was free of the previously released *Rhyzobius lophanthae*. Another shipment of 250 parasitoids received on 2 September 2005 was released at the Marbo caves sight, as attempt to culture this species in the quarantine laboratory was not progressing satisfactorily.To determine the field establishment of this parasitoid, a CAS-infested frond of *Cycas micronesica* from the Marbo Cave area was collected on 29 September 2005 for examination under a binocular microscope. One exit hole of the parasitoid was observe on this frond. Four exit holes of the parasitoids were found when the same procedure was repeated on 7 October 2005; however, no exit holes were found on a sample examined on 4 November 2005. We cannot declare whether the parasitoid has established or failed to establish at this stage. Additional field releases of this parasitoid may be needed for successful establishment." (Moore et al. 2005)
- Reddy imported *C. fulvus* from a lab colony in Florida established from wasps collected in Thailand. These wasps were released on CAS-infested cycads in Talafofo, Guam during 2008. (Checking on this)
- Moore imported *C. fulvus* which were field collected in Florida by Ron Cave on two occasions: September 30, 2014 and October 13, 2014. An attempt to establish a field colony failed. Half of both shipments were released at Ritidian, Guam.

APHELINIDAE: ***Aphytis lingnanensis***

- Imported from Hawaii. Attempts at establishing a lab colony failed in Hawaii and Guam. Field release on Guam did not result in establishment.
- “In 2012, we imported about 100 *A. lignanensis* adults from Honolulu, Hawaii. These wasps were reared by University of Hawaii entomologist, Dr. Leyla Kaufman, from CAS infesting *Cycas revoluta* in a home garden. (There are no wild cycads in Hawaii.) We put these wasps in a cage containing CAS-infested *Cycas micronesica* leaves. We had carefully removed all visible R. lophanthae adults and grubs from these leaves, but there were enough beetle eggs and 1st instar larvae hiding beneath scale covers to consume all scales before any adult wasps emerged.” (Moore 2013)

ENCYRTIDAE: ***Arrhenophagus chionaspidis***

- Suspected fortuitous introduction.
- Moore reported *Arrhenophagus chionaspidis* parasitizing male CAS on Guam on February 3 and February 14, 2013(Moore 2017). A specimen collected on February 3, 2013 at Ritidian Point was sent to the Natural History Museum and identified by John Noyes as *Arrhenophagus chionaspidis* (Fisher 2015).
- It was recently discovered that Reddy imported *Arrhenophagus chionaspidis* from a lab colony in Florida maintained by R. Nguyen. Field releases on Guam were made during 2008. Reddy reports that this parasitoid was already present on Guam prior to these releases, indicating a fortuitous introduction (G.V.P. Reddy 2022, personal communication).
- A CAS survey in 2007 and 2018 indicated that parasitism by *A. chionaspidis* was common (Deloso, Moore, and Marler 2018).

References

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