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Rediscovery of five species of *Omiodes* Guenée (Lepidoptera: Crambidae) on Hawai‘i Island

WILLIAM P. HAINES (University of Hawai‘i at Mānoa, Department of Plant and Environmental Protection Sciences, Gilmore 310, Honolulu, Hawai‘i 96822, USA; email: whaines@hawaii.edu), JON GIFFIN¹ (65-1266 Laelae Road, Kamuela, Hawai‘i 96720, USA) and DAVID FOOTE (Pacific Island Research Center, U.S. Geological Survey, P.O. Box 52, Hawaii National Park, Hawai‘i 96718, USA; email: david_foote@usgs.gov)

Beginning in 1980, through a contract from the U.S. Fish & Wildlife Service, an assessment of the conservation status of more than 800 species of native Hawaiian insects was undertaken by Wayne Gagné, Carl Christensen, and others (Gagné, 1982; Gagné & Christensen, 1985). Twenty-two species of endemic leafrollers in the genus *Hedylepta* (=

¹ Research Associate, Hawaii Biological Survey, Bishop Museum, 1525 Bernice Street, Honolulu, Hawai‘i 96817-2704, USA.

Omiodes: Crambidae) were among the first groups of Lepidoptera analyzed, and Gagné (1982: Table 2) reported nine species that were “presumed recently extinct”. These results were based upon an analysis of the most recent museum specimen collection dates and an assessment of threats. The results were subsequently reported internationally (Gagné & Howarth, 1985), citing the reasons for extinctions as the combined pressures of habitat destruction, increased rarity of host plants, and the introduction of alien parasitoids for biological control. These data were subsequently reported to the U.S. Fish & Wildlife Service and became the basis for listing candidate endangered species (U.S. Fish & Wildlife Service, 1984).

Since then, 14 of the 23 known Hawaiian species of *Omiodes* leafroller moths have been variously cited as extinct or possibly extinct (Table 1) (Gagné & Howarth, 1985; Beattie, 1994; Evenhuis, 2002; IUCN, 2003). This amounts to more than half of the native species in this genus. The species currently listed as extinct by HBS are: *O. anastrepta* Meyrick, *O. anastreptoides* Swezey, *O. asaphombra* Meyrick, *O. continuatalis* Wallengren, *O. epicentra* Meyrick, *O. euryprora* Meyrick, *O. fullawayi* Swezey, *O. giffardi* Swezey, *O. iridias* Meyrick, *O. laysanensis* Meyrick, *O. meyricki* Swezey, *O. monogona* Meyrick, *O. musicola* Swezey, and *O. telegrapha* Meyrick.

An examination of the insect collections of Hawaii Volcanoes National Park and the collection of J. Giffin revealed recently collected specimens for five of these 14 species. Some of these species are represented by only a few specimens from a few localities, and may truly be threatened with extinction. Other species, however, have been quite widely collected on Hawai‘i Island. The “rediscovery” of these widespread species suggests either that they were never truly in danger of extinction (at least on this island), or that their numbers have increased in recent decades. It is possible that the previous lack of recent collection records for these species may have been due to a lack of active interest in them since the 1950s.

Much of the concern for *Omiodes* moths and the speculation surrounding their conservation status stems from the group’s unusual history. Because of their occurrence on sugarcane and coconut palms, two species, *O. accepta* and *O. blackburni*, were specifically targeted for biological control using imported parasitoids between 1895 and 1958 (Funasaki *et al.*, 1988). As early as 1954, entomologists in Hawai‘i recognized a decline in populations of native *Omiodes* moths, and suggested that this decline was due in part to pressure from introduced parasitoids and predators (Swezey, 1954; Zimmerman, 1958).

However, at least some species seem to be present in good numbers, and it is clear that the conservation status of *Omiodes* moths should be reexamined. The many peculiarities of this genus, with regards to biological control (Funasaki *et al.*, 1988), conservation biology (Gagné & Howarth, 1985), and evolutionary history (Zimmerman, 1960), make it an ideal subject for future surveys and studies.

Since the rediscoveries reported here are primarily based on incidental collections on a single island, rather than active searches for *Omiodes* moths, it is highly possible that other ‘extinct’ species are extant. These rediscoveries illustrate the drawbacks of relying solely on museum specimens (although they are often the best data source available), and the need for focused surveys when proposing extinction status. An attempt should be made to relocate *Omiodes* species on all islands, especially since several of the currently listed species are likely to be rare or threatened, if not yet extinct. If populations of threatened moths are located, distributions may be mapped, and actions may be taken to protect these moths by protecting their host plants and habitats.

Institutions with vouchered material are abbreviated as follows: Hawaii Volcanoes National Park (HVNP); Jon Giffin, personal collection (JGPC).

Table 1: Species of Hawaiian *Omiodes* currently listed as extinct.

Species	Agencies listing as extinct*	Rediscovered?
<i>anastrepta</i> Meyrick	HBS, USFWS.	Yes
<i>anastreptoides</i> Swezey	HBS.	Yes
<i>asaphombra</i> Meyrick	HBS, USFWS, IUCN, Gagné & Howarth.	Yes
<i>continuatalis</i> Wallengren	HBS, IUCN, Gagné & Howarth.	Yes
<i>epicentra</i> Meyrick	HBS, IUCN, Gagné & Howarth.	No
<i>eurypora</i> Meyrick	HBS, USFWS, IUCN, Gagné & Howarth.	No
<i>fullawayi</i> Swezey	HBS, USFWS, IUCN, Gagné & Howarth.	No
<i>giffardi</i> Swezey	HBS.	No
<i>iridias</i> Meyrick	HBS, USFWS.	No
<i>laysanensis</i> Meyrick	HBS, IUCN, Gagné & Howarth.	No
<i>meyricki</i> Swezey	HBS, USFWS, IUCN, Gagné & Howarth.	No
<i>monogona</i> Meyrick	HBS, USFWS.	Yes
<i>musicola</i> Swezey	HBS, USFWS, IUCN, Gagné & Howarth.	No
<i>telegrapha</i> Meyrick	HBS, IUCN, Gagné & Howarth.	No

* HBS = Hawai'i Biological Survey (Evenhuis 2002), USFWS = U.S. Fish & Wildlife Service (Beattie 1994), IUCN = International Union for the Conservation of Nature (IUCN 2003), Gagné & Howarth (1982).

Omiodes anastrepta Meyrick

Rediscovery

This species has historically been reported from the islands of O'ahu, Moloka'i, and Hawai'i (Nishida, 2002). Its recorded host plant is *Carex wahuensis* Mey (Zimmerman, 1958). Here we report thirteen specimens, collected from wet and mesic forest on the windward and leeward sides of the island of Hawai'i. This species was first cited as possibly extinct in 1994 by the U.S. Fish & Wildlife Service (Beattie, 1994). Subsequently, it was listed as extinct by HBS (Evenhuis, 2002).

Material examined: **HAWAII:** Ka'u Distr, Hawaii Volcanoes National Park, Kīpuka Kī, at white light, 10 Mar 1994, D. Foote *et al.*, 1 specimen, 1994-4275a (HVNP); Ka'u Distr, Hawaii Volcanoes National Park, Kīpuka Kī, at UV light, 8 Jun 1994, D. Foote *et al.*, 1 specimen, 1994-5156 (HVNP); Ka'u Distr, Hawaii Volcanoes National Park, Kīpuka Kī, at UV light, 1 Dec 1994, D. Foote *et al.* 1 specimen, 1994-5820 (HVNP); Ka'u Distr, Hawaii Volcanoes National Park, Kīpuka Kī, at white light, 4 Jan 1994, D. Foote *et al.*, 1 specimen, 1994-5904 (HVNP); Ka'u Distr, Hawaii Volcanoes National Park, Keamoku lava flow, at white light, 10 Mar 1994, D. Foote *et al.*, 4 specimens, 1994-4276, 1994-4277, 1994-4278, 1994-4279 (HVNP); Ka'u Distr, Hawaii Volcanoes National Park, Keamoku lava flow, at UV light, 13 Apr 1994, D. Foote *et al.*, 1 specimen, 1994-4627 (HVNP); Ka'u Distr, Hawaii Volcanoes National Park, Keamoku lava flow, at white light, 2 Mar 1994, D. Foote *et al.*, 1 specimen, 1994-6031 (HVNP); Ka'u Distr, Hawaii Volcanoes National Park, Thurston Lava Tube, at white light, 10 May 1994, D. Foote *et al.*, 1 specimen, 1994-4887 (HVNP); South Hilo Distr, Hakalau National Wildlife Refuge, Maulua, 1300 m, 11 Feb 1999, D. LaPointe, 1 specimen, (HVNP); N. Kona, Hualālai, Keauhou 2, Pu'u Lehua, 14 Dec 2000, J. Giffin, 1 specimen, (JGPC).

Omiodes anastreptoides Swezey

Rediscovery

This species has historically been reported only from the island of Hawai'i (Nishida, 2002). Larvae have been reared from a sedge, possibly *Carex wahuensis* Mey (Zimmerman, 1958). Here we report nine specimens of this species, all collected from wet forest

on the windward side of the island of Hawai'i. This species was first officially cited as a Category 2 species of concern in 1994 by the U.S. Fish & Wildlife Service (Beattie, 1994). Subsequently, it was listed as extinct by HBS (Evenhuis, 2002).

Material examined: **HAWAII:** S. Hilo Distr, Hilo Watershed, Pu'u O'o boundary, at light, 2 Jul 1999, J. Giffin, 1 specimen, (JGPC); S. Kohala Distr, Kohala Forest Reserve, at light, 4 Apr 1994, 30 Aug 1994, 29 Oct 1994, J. Giffin, 4 specimens, (JGPC); S. Hilo Distr, Hakalau National Wildlife Refuge, Maulua, 1300 m, 11 Feb 1999, P.L. Little, 1 specimen, (HVNP); S. Hilo Distr, Upper Waiākea Forest Reserve, at light, 8 Jul 1999, 30 May 2000, J. Giffin, 3 specimens, (JGPC).

Omiodes asaphombra Meyrick

Rediscovery

This species has historically been collected on the islands of Kaua'i, O'ahu, Moloka'i, and Hawai'i (Nishida, 2002). Here we report six specimens from the leeward and windward sides of the island of Hawai'i. This species has only been reared from *Joinvillea adscendens* Gaudichaud, and has been reported to be specific to this plant (Swezey, 1954). Despite the fact that this plant is not known to occur on the leeward side of Hawai'i Island, five of these six specimens were collected from the district of S. Kona. Therefore, we consider it likely that *O. asaphombra* is able to utilize another host plant. *Omiodes asaphombra* was first presumed extinct by Gagné & Howarth (1982) due to the scarcity of *Joinvillea adscendens*. It was subsequently listed as possibly extinct by FWS (Beattie, 1994), and as extinct by the IUCN (2003) and HBS (Evenhuis, 2002).

Material examined: **HAWAII:** S. Hilo Distr, Hilo Watershed, Pu'u O'o boundary, at light, 2 Jul 1999, J. Giffin, 1 specimen, (JGPC); S. Kona Distr, Kona Forest Unit of Hakalau NWR, Field camp, 20 Jul 2000, W. Haines, 1 specimen, *HVNP003587*, (HVNP); S. Kona Distr, Kona Forest Unit of Hakalau NWR, 1372 m, 1 Aug 2000, K. Magnacca, 3 specimens, *HVNP003712*, *HVNP003713*, *HVNP003714* (HVNP); S. Kona Distr, S. Kona Forest Reserve, 1500 m, at light, 10 Apr 2001, J. Giffin, 1 specimen, (JGPC).

Omiodes continuatalis Wallengren

Rediscovery

This species has been reported from all the main islands except Kaho'olawe and Ni'ihau (Nishida, 2002), and early entomologists reported this to be one of the most commonly seen moths in Hawai'i in the late 1800s (Zimmerman, 1958). Recorded host plants for this species include both native and non-native grasses, including *pili*, (*Heteropogon contortus* (L.)). We here report 13 specimens from mesic forest on both the windward and leeward sides of Hawai'i Island. *Omiodes continuatalis* was first presumed extinct by Gagné & Howarth (1982) due to the loss of habitat and introduction of biocontrol agents and was subsequently listed as extinct by the International Union for Conservation of Nature (IUCN, 2003) and HBS (Evenhuis, 2002).

Material examined: **HAWAII:** S. Kona Distr, Honomalino Forest Reserve, at light, 24 Nov 2000, J. Giffin, 2 specimens (JGPC); Ka'u Distr, Hawaii Volcanoes National Park, Keamoku lava flow, at white light, 3 Oct 1994, D. Foote *et al.*, 1 specimen, *1994-5660* (HVNP); Ka'u Distr, Hawaii Volcanoes National Park, Kīpuka Kī, at white light, 10 Mar 1994, D. Foote *et al.*, 3 specimens *1994-4272*, *1994-4273*, *1994-4274a* (HVNP); N. Kona Distr, Pu'u Wa'awa'a, at light, 5 Apr 1994, J. Giffin, 1 specimen, (JGPC); N. Kona Distr, Pu'u Wa'awa'a, at light, 30 Jul 1994, J. Giffin, 1 specimen, (JGPC); N. Kona Distr, Pu'u Wa'awa'a, at light, 1 Nov 1994, J. Giffin, 1 specimen, (JGPC); N. Kona Distr, Pu'u Wa'awa'a, at light, 28 May 1995, J. Giffin, 1 specimen, (JGPC); S. Kona Distr, Pu'u honua o Honaunau, 1992, D. Foote *et al.*, 3 specimens, *PUHO 1992-424*, *PUHO 1992-425*, *PUHO 1992 449* (HVNP).

Omiodes monogona Meyrick**Rediscovery**

This species has been historically reported from all the main islands except Kaho'olawe and Ni'ihau (Nishida, 2002). Zimmerman (1958) reported its principal native host to be *wiliwili*, *Erythrina sandwicensis* Degener, but he also listed several other native and non-native legumes as alternate hosts for the caterpillars. Here we report seven specimens, from mesic to wet forest on both windward and leeward sides of southern Hawai'i Island. *O. monogona* was first cited as possibly extinct in 1994 by the U.S. Fish & Wildlife Service (Beattie, 1994) and was subsequently listed as such by HBS (Evenhuis, 2002).

Material examined: HAWAII: S. Kona Distr, Honomalino Forest Reserve, 1050 m, at light, 23 Mar 1995, J. Giffin, 1 specimen, (JGPC); Ka'u Distr, Hawaii Volcanoes National Park, Kīpuka Kī, at white light, 10 Mar 1994, D. Foote *et al.*, 2 specimens 1994-4274b, 1994-4725b (HVNP); Puna Distr, Hawaii Volcanoes National Park, Ola'a Forest Agric. Unit, at white light, 3 May 1994, D. Foote *et al.*, 2 specimens, 1994-4810, 1994-4811, (HVNP); Ka'u Distr, Hawaii Volcanoes National Park, Kīlauea Field Station, at white light, 8 May 1994, D. Foote *et al.*, 2 specimens 1994-5021, 1994-5024 (HVNP).

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