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A new species of flightless, jumping, alpine moth of the genus *Thyrocopa* from Hawaii (Lepidoptera: Xyloryctidae: Xyloryctinae)

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Abstract

A new species of brachypterous, flightless, jumping alpine *Thyrocopa* moth, *T. kikaelekea*, is described from Hawaii Island. This new species is similar to *T. apatela* (Walsingham), another flightless species from Maui Island. *Thyrocopa kikaelekea* is hypothesized not to be the sister taxon to *T. apatela*, instead representing an independent loss of flight.

Key words: Gelechioidea, brachyptery, flightlessness

Introduction

Other than in the genus *Thyrocopa* (Gelechioidea: Xyloryctidae), the subject of this paper, no alpine Hawaiian Lepidoptera are known to be flightless, even though some *Agrotis* species occur at very high elevation in Hawaii and female *Agrotis* from New Zealand are sometimes brachypterous (Patrick 1991). In Lepidoptera, brachyptery in both sexes is rare and typically restricted to very windy habitats, usually southern oceanic islands and areas with sparse vegetation where jumping is often utilized as a means of locomotion (Powell 1976; Sattler 1991).

Here, I describe a new flightless, jumping species of moth that inhabits the alpine area of Mauna Kea volcano on Hawaii Island. This moth is similar in outward appearance and behavior to *Thyrocopa apatela* (Walsingham 1907), which is nicknamed the Haleakala "grasshopper moth" because of its jumping behavior, and inhabits alpine areas on Maui Island. *Thyrocopa* is endemic to the Hawaiian Islands; see Zimmerman (1978, pp. 932–936) for a general overview.

R.C.L. Perkins first collected *Thyrocopa apatela* in 1896. This moth historically occurred at elevations above ~1800 m (6000 feet) on Haleakala volcano (Howarth 1979; Zimmerman 1978, from personal communication with J.W. Beardsley). These elevations on Haleakala are characterized by high winds, severe fluctuations in temperature, scattered vegetation, and low moisture content of the soil (Howarth 1987). Currently, this moth is restricted to elevations above ~2750 m (9000 ft.) (pers. obs.), possibly as a result of predation by introduced ants (Cole *et al.* 1992). *Thyrocopa apatela* is quite unusual in that both adult males and females are flightless and brachypterous (Sattler 1991; Sattler & Wojtusiak 2000; Zimmerman 1978). It should be noted that observations by K. & E. Sattler (Zimmerman 1978, p. 940) indicated that "fully-winged males" of this species were found; the taxonomic status of those specimens will be discussed elsewhere.

In 1976, Klaus and Edith Sattler found several *Thyrocopa* on Mauna Kea, near the Hale Pohaku area from between ~2957–2987 m (9700–9800 ft.) (K. Sattler, unpublished field notes; Zimmerman 1978), and several other individuals were collected as well between 1977 and 1991. Both sexes of this moth are also brachypterous, though less so than in *T. apatela*. In 2004, and again in 2005 and 2006, I also collected this species, near the Hale Pohaku area at ~2896m (9500 ft.). This area (fig. 6) is characterized by rocky, dry soil, frequent high

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