



## Three new species of *Hyposmocoma* (Lepidoptera, Cosmopterigidae) from the Hawaiian Islands, based on morphological and molecular evidence

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### Abstract

The Cosmopterigid genus *Hyposmocoma* (Lepidoptera, Cosmopterigidae) is endemic to Hawaii and contains over 350 recognized species, though only one new species has been described in the past 62 years. We describe and illustrate three new species of *Hyposmocoma*: *Hyposmocoma kaupo* **sp. nov.** from the island of Maui, *H. kapakai* **sp. nov.** from Oahu, and *H. kakuono* **sp. nov.** from Molokai, all known from both sexes, and all apparently single-island endemics. The case-making larvae of all three species feed on lichen and organic debris on dry rocks in open or partly forested habitat. While morphological differences among these three species are small, genetic divergence across parts of the mitochondrial gene cytochrome oxidase I and the nuclear genes elongation factor 1  $\alpha$  indicate universally deep divergence, making these taxa a classic example of sibling species.

**Key words:** Microlepidoptera, Cosmopterigidae, *Hyposmocoma*, new species, endemic, Hawaiian Islands, COI, EF1  $\alpha$

### Introduction

The endemic cosmopterigid moth genus *Hyposmocoma*, contains over 350 recognized species (Zimmerman 1978), and is one of the greatest radiations in the Hawaiian Islands, rivaling or exceeding *Drosophila* (Kaneshiro 1997) in endemic species diversity. *Hyposmocoma* are present on all the high Hawaiian Islands at almost all elevations and on many of the older and lower Northwest Hawaiian Islands where no flowing water exists (Zimmerman 1978). They occupy an extraordinary diversity of native habitats, from recent lava flows, to rainforest, to alpine scrub, and their larvae feed on a wide range of native plants, dead wood, lichens, and debris (Zimmerman 1978). Recent observations confirm that some taxa are predators (Rubinoff & Haines 2005). Another remarkable trait of *Hyposmocoma* is the spectacular diversity of cases carried through larval development as shelters. Ostensibly to protect and camouflage the larvae as they feed, rest and pupate, the cases are often decorated with bits of lichen, sand, or other small objects, including feathers. Further, more than 90% of *Hyposmocoma* species are single-island endemics suggesting ample opportunity for isolation and radiation as compared with other groups (Gillespie & Roderick 2002).

Butler proposed the name *Hyposmochoma* for a single species in 1881 in reference to the distinct subcostal hair-pencil, also called subcostal brush. Since then the correct generic name spelling of *Hyposmocoma* was used and later validated (Walsingham 1907; Zimmerman 1978). Because of the remarkable diversity of the genus more than 187 species names were proposed for it by Walsingham (1907) who stated that this was “[a] variable genus containing many species in a plastic state of development”. Thirteen genera were proposed to encompass this diversity, but Zimmerman (1978) recognized that the synapomorphies for the 13 generic