

# Terrestrial Invertebrates



Photo: James Liebherr, *Blackburnia* spp. Photo: *Rhyncogonus* spp.

## Beetles Order Coleoptera

### ORDER INCLUDES:

26 Native families

87 Native genera

1,348 Native Species

1,337 Endemic Species

**GENERAL INFORMATION:** The order Coleoptera is the largest order of animals in the world, containing well over a million species. Beetles can be found in all habitats and fill a huge variety of ecological niches. In Hawai'i, beetles have undergone extensive adaptive radiations and are the dominant insects in most habitats. Carabid beetles are the dominant predatory insects in native wet forests, and species in the family Curculionidae (weevils) are the dominant herbivorous insects in all habitats. Different species of beetles also feed on fungus, some specialize on particular plant parts and others are detritivores. Diversity within most families is generally highest on Maui, O'ahu, and Kaua'i. The most speciose families include: Carabidae (5 genera/239 spp.), Curculionidae (10 genera/169 spp.), Aglycyderidae (*Proterhinus*/158 spp.), Anobiidae (3 genera/138 spp.), Cerambycidae (3 genera/128 spp.), Nitidulidae (7 genera/93 spp.), and Staphylinidae (12 genera/92 spp.). Many species are little known, especially in the families Aglycyderidae and Staphylinidae; substantial research has not been conducted on either family in over 100 years. As an example of the diversity of Hawaii's beetles, two genera are briefly outlined below. *Blackburnia* (Family: Carabidae) are nocturnal, occupy a variety of ecological niches, and nearly all species are flightless and restricted to single islands or volcanoes. Endangered or threatened species in this genus are mostly known from shrublands and mesic koa forest. Recent research has discovered 38 new species (29% of the species in the genus), and non-native ants are a particular threat to this genus. *Rhyncogonus* (Family: Curculionidae weevils) are flightless, nocturnal weevils; most adults are herbivorous. Nearly all are endemic to single islands and are known from all the MHI and the NWHI. Members of the genus are the dominant leaf-chewing beetle group in Hawai'i, and many species are specific to particular plant communities where they feed on a narrow range of host plants. Threats to this genera include habitat degradation by pigs (*Sus scrofa*), and by habitat-modifying non-native invasive plants, predation by ants, and human disturbance. All species in this genus are considered to be of concern. Recent research has discovered 15 new species (31% of the species in the genus).

**DISTRIBUTION:** Beetles are known from all the MHI and the NWHI.

**ABUNDANCE:** As a group unknown. A lack of systematic surveys prevents accurate population estimates. However, the loss and degradation of native habitats likely means that species within the order are declining. Based on extensive collecting effort in suitable habitats abundance of common species is estimated minimally at 5,000 adult individuals per hectare. In contrast, the rarest species are collected or observed once per decade. Comparing modern

collections with those from the 1890s indicates that abundance in mesic koa (*Acacia koa*) forests, *Sophora-Deschampsia* shrublands, and low elevation mesic 'ōhi'a (*Metrosideros polymorpha*) forests has declined precipitously. These habitats are often those most heavily impacted by alien predaceous, social Hymenoptera (e.g., ants and vespid wasps), other alien arthropods such as non-native isopoda (sowbugs), and invasive weeds.

**LOCATION AND CONDITION OF KEY HABITAT:** Beetles are among the most ecologically diverse group and occur in most terrestrial and aquatic habitats. Key habitat requirements of individual species are poorly known.

**THREATS:**

- Loss and degradation of habitat due to habitat-modifying invasive plants, browsing and grazing by non-native ungulates, and logging.
- Non-native predaceous ants (Formicidae) and wasps (Vespidae) as well as non-native competitors such as non-native sowbugs (Isopoda) and the black twig borer (*Xylosandrus compactus*; Scolytidae; Coleoptera) are negatively affecting native beetle populations.
- Insufficient information, especially for rare species, hampers conservation efforts.
- Collecting certain showy or large beetles for sale may affect populations, especially in the genus *Plagithmysus* (Cerambycidae).
- Biocontrol agents or organisms may affect some native species.

**CONSERVATION ACTIONS:** The goals of conservation actions are not only to protect current populations and key breeding habitats, but also to establish additional populations thereby reducing the risk of extinction. In addition to common statewide and island conservation actions, specific management directed toward beetles should include:

- Baiting and control of Argentine ant (*Linepithema humile*) in Haleakalā shrublands.
- Rehabilitation of mesic koa forests on O'ahu, Maui, Moloka'i, and the island of Hawai'i.
- Control of weeds in wet and mesic forests, especially species of *Miconia*, *Clydemia*, *Tibouchina*, *Alsophila*, and *Passiflora*.
- Improve commercial shipment inspections to prevent further introduction of alien invertebrates harmful to native species.
- Initiate studies on life history, distribution, and critical habitats to better direct conservation measures.
- Conduct surveys to determine distribution and abundance of known coleopterans and to document and identify new species.
- Preserve, maintain, and restore habitats supporting existing populations.

**MONITORING:**

- Support and expand existing monitoring efforts.
- Establish new monitoring for priority species that are not currently monitored.

**RESEARCH PRIORITIES:**

- Initiate targeted searches for species not recently collected or observed.
- Initiate studies to determine species' distributions to determine areas supporting large numbers of native species.
- Initiate efforts to locate and identify new species.
- Initiate studies to determine the effects of biocontrol organisms on beetle populations.

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