Terrestrial Invertebrates

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 fungi, 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.), Belidae (*Proterhinus*/158 spp.), Ptinidae (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 Belidae and Staphylinidae; substantial research has not been conducted on either family in over 100 years. As an example of the diversity of Hawai‘i’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 forests. 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*), 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 species within the order are declining. Based on extensive collecting efforts 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 most heavily impacted by alien, social Hymenoptera (e.g., ants and vespid wasps) predators, 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 groups 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 predators like ants (Formicidae) and wasps (Vespidae), non-naitve parasitoids (Hymenoptera), as well as non-native competitors such as non-native sowbugs (Isopoda) 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).

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.
- Baiting and control of other invasive non-native ant species in native habitats.
- Rehabilitation of mesic forests on Oʻahu, Maui, Molokaʻi, and the island of Hawaiʻi.
- Control of weeds in wet and mesic forests, especially species of *Miconia*, *Tibouchina*, *Alsophila*, and *Passiflora*.
- 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.
- Conduct and support systematic and taxonomic assessments of poorly known and understudied taxa. Review and revise genera in need of taxonomic scrutiny; work to identify and describe new species to science.

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