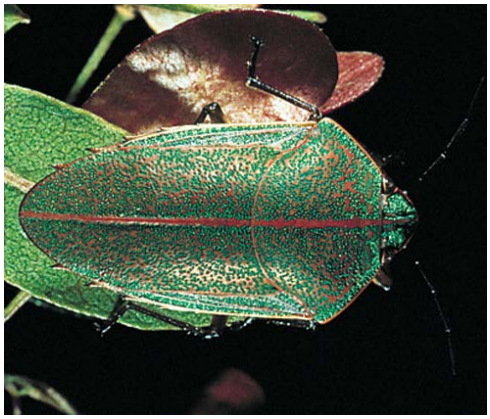

Photo: W. P. Mull; *Coleotichus blackburniae; Koa bug*

Terrestrial Invertebrates

True bugs

Order Heteroptera

ORDER INCLUDES:
12 Native Families
39 Native Genera
418 Native Species
415 Endemic Species

GENERAL INFORMATION: Heteroptera is a large and diverse order that includes terrestrial and aquatic species. Most species are small and feed on plants; however, some are predaceous and others are scavengers. Members of the order also are known as true bugs, and the most familiar members of the order are assassin bugs (Reduviidae), stink bugs (Pentatomidae), and water bugs (Belostomatidae). The largest number of native species occurs in the families Lygaeidae (i.e., seed bugs) and Miridae (i.e., plant bugs), many of the latter of which are still poorly studied and understood. Of the 415 endemic species, 39 have not been collected in over 50 years. As an example of the diversity of Hawaii's true bugs, three genera are briefly outlined below. Most species in the genus *Nesiomiris* (Miridae) are endemic to single islands. The 50 described native species are known from all the MHI and feed only on the host plants in the following genera: *Cheirodendron, Reynoldsia, Tetraplasandra, Munroidendron,* and *Ilex*. All species in the genus *Orthotylus* (Miridae) are all endemic to single islands. The 63 native species described are known from all the MHI. Overall, species within the genus feed on a wide variety of native host plants, although most individual species depend on a single host plant or several closely related species, with plants in Rubiaceae being particularly important. All but one of the 40 described native species in the genus *Sarona* (Miridae) are endemic to single islands, and most depend on a single host plant, often in the genus *Melicope*.

DISTRIBUTION: True bugs are known from all the MHI.

ABUNDANCE: Unknown. A lack of systematic surveys prevents any population estimate. However, the loss of native habitats likely means that species within the order are declining with populations occurring in dry and mesic forests are believed to be declining rapidly.

LOCATION AND CONDITION OF KEY HABITAT: True bugs occur in aquatic (both marine and freshwater) and terrestrial habitats, including high-elevation alpine areas and caves.

THREATS:

- Loss or degradation of habitat, especially dry lowland habitats and coastal zones.
- Loss of host-specific plants.
- Insufficient information for species assessments.
- Predation and parasitism by invasive non-native insects including ants (Formicidae), the southern green stinkbug (*Nezara viridula*), parasitoid flies (Diptera) and wasps (Hymenoptera), and generalist egg predators.
- Displacement by non-native congeners (e.g., invasive members of the family Lygaeidae).

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 true bugs should include:

- Control of fire in dry and mesic forest habitats.
- Outplanting of native plants, especially those that are hosts to declining heteropteran species.
- Protect coastal strand habitats from off-road vehicles and excessive foot traffic in areas where native vegetation remains.
- Conduct surveys to determine the distribution and abundance of known true bugs and to document and identify new species.
- Preserve, maintain, and restore habitats supporting existing populations.

MONITORING:

- Continue monitoring the status of known populations.

RESEARCH PRIORITIES:

- Initiate studies of the genera *Orthotylus*, *Koanoa*, *Sulamita*, *Kalania* and *Pseudoclerada*, all of which appear to have many undescribed species.
- Initiate efforts to relocate 39 species that have not been observed in at least 50 years.

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