

2000; HINHP Database 2000; Lammers 1999; K. Wood, *in litt.* 2000).

On Molokai, *Brighamia rockii* is found in rock crevices on steep basalt sea cliffs, often within the spray zone, in coastal dry or mesic forest, *Eragrostis variabilis* (kawelu) mixed coastal cliff communities or shrubland, or *Pritchardia* sp. (loulu) coastal mesic forest between sea level and 671 m (0 and 2,201 ft) in elevation. Associated native species include *Artemisia* sp., *Bidens* sp. (kookoolau), *Carex wahuensis* ssp. *wahuensis* (NCN), *Chamaesyce celastroides* var. *amplectans* (akoko), *Cocculus orbiculatus* (huehue), *Cyperus phleoides* ssp. *phleoides* (NCN), *Cyrtomium falcatum* (ahina kuahiwi), *Dianella sandwicensis* (ukiuki), *Diospyros sandwicensis*, *Hedyotis littoralis* (NCN), *Lepidium bidentatum* var. *o-waihiense* (anaunau), *Metrosideros polymorpha*, *Osteomeles anthyllidifolia*, *Pandanus tectorius* (hala), *Peucedanum sandwicensis* (makou), *Phymatosorus grossus* (lauae), *Pittosporum halophilum* (hoawa), *Pritchardia hillebrandii* (loulu), *Psydrax odorata*, *Reynoldsia sandwicensis* (ohe), *Scaevola sericea* (naupaka kahakai), *Schiedea globosa* (NCN), *Senna gaudichaudii* (kolomona), *Tetramolopium* spp., or *Wikstroemia uva-ursi* (akia) (HINHP Database 2000; Lammers 1999; K. Wood, *in litt.* 2000).

The threats to this species on Molokai are habitat degradation (and possibly predation) by axis deer and goats; competition with the non-native plants *Cyperus gracilis* (McCoy grass), *Digitaria ciliaris* (Henry's crabgrass), *Digitaria insularis* (sourgrass), *Ficus microcarpa* (Chinese banyan), *Kalanchoe pinnata*, *Lantana camara* (lantana), *Oxalis corniculata* (yellow wood sorrel), *Pluchea carolinensis* (sourbush), *Portulaca oleracea* (pigweed), and *Solanum seafortianum* (NCN); seed predation by rats; and lack of pollinators (HINHP Database 2000, Service 1996a, 57 FR 46325).

#### *Centaurium sebaeoides* (awiwi)

*Centaurium sebaeoides*, a member of the gentian family (Gentianaceae), is an annual herb with fleshy leaves and stalkless flowers. This species is distinguished from *Centaurium erythraea* (bitter herb), which is naturalized in Hawaii, by its fleshy leaves and the unbranched arrangement of the flower cluster (Wagner *et al.* 1999).

*Centaurium sebaeoides* has been observed flowering in April. Flowering may be induced by heavy rainfall. Occurrences are found in dry areas, and plants are more likely to be found following heavy rains. This species appears to be an annual; triggered by

declining photo-period, the plant produces seeds and dies. Medeiros *et al.* (1999) noted that in the wild, seedlings first appeared in March and April; flowers first appeared in April and May; mature capsules were observed beginning in May and continuing through June; and by the first week of July, most plants were dead. Little is known about the life history of this species. Its pollination vectors, seed dispersal agents, specific environmental requirements, and limiting factors are unknown (Service 1995a).

Historically and currently, *Centaurium sebaeoides* is known from scattered localities on Kauai, Oahu, Molokai, Lanai, and Maui. Currently on Molokai, there are a total of two occurrences containing thousands of individuals, near Mokio Point on privately owned land and in Kalaupapa National Historical Park on State-owned land managed by the National Park Service (GDSI 2000; HINHP Database 2000; Wagner *et al.* 1999; Chuck Chimera, U.S. Geological Survey, pers. comm., 2000).

On Molokai, *Centaurium sebaeoides* grows in volcanic or clay soils or on cliffs in arid coastal areas at elevations between sea level and 409 m (0 and 1,341 ft). Associated species include *Artemisia* sp., *Bidens* sp., *Chamaesyce celastroides* (akoko), *Cyperus phleoides* (NCN), *Dodonaea viscosa*, *Fimbristylis cymosa*, *Heteropogon contortus* (pili grass), *Jacquemontia ovalifolia* (pauohiika), *Lipochaeta heterophylla* (nehe), *Lipochaeta succulenta* (nehe), *Lycium sandwicense* (ohelo kai), *Lysimachia mauritiana* (kolokolo kuahiwi), *Melanthera integrifolia*, *Panicum fauriei* (NCN), *Panicum torridum* (kakonakona), *Scaevola sericea*, *Schiedea globosa*, *Sida fallax*, or *Wikstroemia uva-ursi* (Medeiros *et al.* 1999, Wagner *et al.* 1999, 56 FR 55770).

The major threats to this species on Molokai are displacement by non-native, woody species, such as *Casuarina equisetifolia* (paina), *Casuarina glauca* (saltmarsh), *Leucaena leucocephala* (koa haole), *Prosopis pallida*, *Schinus terebinthifolius*, *Syzygium cumini* (Java plum), and *Tournefortia argentea* (tree heliotrope); trampling and habitat degradation by feral goats and cattle; and damage caused by off-road vehicles (Medeiros *et al.* 1999).

#### *Ctenitis squamigera* (pauoa)

*Ctenitis squamigera* is a short-lived perennial in the spleenwort family (Asplenaceae). It has a rhizome (horizontal stem) 5 to 10 mm (0.2 to 0.4 in) thick, creeping above the ground and densely covered with scales similar to those on the lower part of the leaf stalk.

*Ctenitis squamigera* can be readily distinguished from other Hawaiian species of *Ctenitis* by the dense covering of tan-colored scales on its fronds (Degener and Degener 1957, Wagner and Wagner 1992).

Little is known about the life history of this species. Reproductive cycles, dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 1998b).

Historically, *Ctenitis squamigera* was recorded from the islands of Kauai, Oahu, Molokai, Lanai, Maui, and Hawaii Island. It is currently found on Oahu, Lanai, Molokai, and Maui. There is currently a single occurrence with 20 individuals on the island of Molokai in Wawaia Gulch on privately owned land (GDSI 2000; HINHP Database 2000; J. Lau, *in litt.* 2000).

On Molokai, *Ctenitis squamigera* is found in mesic forest and gulch slopes between elevations of 757 and 1,133 m (2,483 and 3,716 ft). Associated native plant taxa include *Carex meyenii*, *Diospyros sandwicensis*, *Dryopteris unidentata* (NCN), *Metrosideros polymorpha*, *Nephrolepis exaltata*, *Nestegis sandwicensis*, *Pleomele auwahiensis*, *Pouteria sandwicensis*, or *Xylosma hawaiiense* (maua) (Service 1998b; 59 FR 49025; J. Lau, *in litt.* 2000).

The primary threats to *Ctenitis squamigera* are habitat degradation by goats and competition with the non-native plants *Melinis minutiflora* and *Schinus terebinthifolius* (Service 1998b; 59 FR 49025; J. Lau, *in litt.* 2000).

#### *Cyanea grimesiana* ssp. *grimesiana* (haha)

*Cyanea grimesiana* ssp. *grimesiana*, a short-lived perennial member of the bellflower family (Campanulaceae), is a shrub with pinnately divided leaves. This species is distinguished from others in this endemic Hawaiian genus by the pinnately lobed leaf margins and the width of the leaf blades. This subspecies is distinguished from the other two subspecies by the shape and size of the calyx lobes, which overlap at the base (Lammers 1999).

Little is known about the life history of this plant. On Molokai, flowering plants have been observed in July and August. Its flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 1999a).

Historically and currently, *Cyanea grimesiana* ssp. *grimesiana* is known from Oahu, Molokai, Lanai, and Maui. On Molokai, it is found in a total of two occurrences containing seven individuals in Wailau, Puu Kahea and Olokui NAR on State-owned lands