

5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Cyanea crispa* (No common name)

Current Classification: Endangered

Federal Register Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2007. Endangered and threatened wildlife and plants; initiation of 5-year reviews of 71 species in Oregon, Hawaii, Commonwealth of the Northern Mariana Islands, and territory of Guam. Federal Register 72(45):10547-10550.

Lead Region/Field Office:

Region 1/Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii

Name of Reviewer(s):

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Gina Shultz, Pacific Islands Fish and Wildlife Office, Deputy Field Supervisor

Methodology used to complete this 5-year review:

This review was conducted by staff of the Pacific Islands Fish and Wildlife Office (PIFWO) of the U.S. Fish and Wildlife Service (USFWS) in 2008. The review was based on the critical habitat designation for *Cyanea crispa* and other species from the island of Oahu (USFWS 2003a), as well as a review of current, available information. The Bernice P. Bishop Museum provided an initial draft of portions of the 5-year review and they also provided recommendations for conservation actions needed prior to the next five-year review. The evaluation of the status of the species was prepared by our lead PIFWO biologist and reviewed by the Plant Recovery Coordinator. The document was then reviewed by the Recovery Program Leader and the Deputy Field Supervisor before submission to the Field Supervisor for approval.

Background:

For information regarding the species listing history and other facts, please refer to the Fish and Wildlife Service's Environmental Conservation On-line System (ECOS) database for threatened and endangered species (http://ecos.fws.gov/tess_public).

Application of the 1996 Distinct Population Segment (DPS) Policy:

This Policy does not apply to plants.

Review Analysis:

Please refer to the final critical habitat designation for *Cyanea crispa* published in the Federal Register on June 17, 2003 (USFWS 2003) for a complete review of the species' status (including biology and habitat), threats, and management efforts. No new threats and no significant new information regarding the species biological status have come to light since listing to warrant a change in the Federal listing status of *C. crispa*.

At the time of Federal listing, only ten individual *Cyanea crispa* plants in five populations were known extant (USFWS 1994). Currently, 12 populations with approximately 110 mature and eight immature individuals are known from across the Koolau Mountains on Oahu (USFWS 2003a, b; U. S. Army 2006, 2007). All populations contain fewer than 30 individuals each, four populations contain only a single mature individual each, and no populations have seedling recruitment (U.S. Army 2006, 2007). Little else is known about the life history or biology of the species, or the genetic variability within the species (USFWS 1998, 2003a, b).

This species was originally listed as *Rollandia crispa* (USFWS 1994). However, phylogenetic analyses based on molecular data indicated that all species of *Rollandia* are not distinct from those in *Cyanea*, and the two genera have been merged under *Cyanea* (Lammers *et al.* 1993).

The major threats to *Cyanea crispa* include habitat alteration through trampling by feral pigs (*Sus scrofa*) (Factors A and D) and humans (Factor A), and competition with introduced invasive plant species (Factor E). Introduced invasive plant species threatening this species include *Clidemia hirta* (Koster's curse), *Psidium cattleianum* (strawberry guava), *P. guajava* (guava), *Rubus rosifolius* (thimbleberry), *Schinus terebinthifolius* (Christmas berry), *Arthostemma ciliatum* (no common name), *Setaria palmifolia* (palm grass), *Paspalum conjugatum* (Hilo grass), *Aleurites moluccana* (kukui), *Pterolepis glomerata* (false meadowbeauty), and *Zingiber zerumbet* (awapuhi) (USFWS 1994, 1998, 2003a, b; U.S. Army 2006, 2007). The fruits and fleshy stems of *C. crispa* are a potential food source for pigs, rats (*Rattus* spp.), and various slug species (Factor C) (USFWS 2003, 2008; U.S. Army 2006, 2007). One population has been impacted by the spread of introduced invasive plants and trampling directly associated with U.S. Army military training actions (Factor E) (USFWS 2003b).

In addition to the above threats, species like *Cyanea crispa* that are endemic to small portions of a single island are inherently more vulnerable to extinction than are widespread species because of the higher risks posed to a few populations and individuals by random demographic fluctuations and localized catastrophes such as hurricanes, landslides and disease outbreaks (Factor E). When considered on their own, the natural processes associated with being a single island endemic do not affect *C. crispa* to such a degree that it is threatened or endangered with extinction in the foreseeable future, but these natural processes can exacerbate the threat from anthropogenic factors, such as habitat loss from predation by introduced species (Factor E) (USFWS 1998).

To safeguard existing genetic material, propagation for genetic storage and reintroduction is occurring at the University of Hawaii's Lyon Arboretum Micropropagation Laboratory and the National Tropical Botanical Garden (Harold L. Lyon Arboretum Micropropagation Laboratory Database 2007; National Tropical Botanical Garden 2007). Seeds have been stored dry at 4 degrees Celsius for five years with no decrease in viability. Initial viability is high with no special germination requirements. Propagation from suckers, cuttings, and micropropagation has been successful. However, plants propagated via micropropagation have been observed to have altered morphologies when removed from test tubes and grown in the greenhouse. This matter will be investigated to identify if this form is rare or typical for this taxon (U.S. Army 2007).

Five individuals were outplanted in the Helemano fenced enclosure in February 2007 and three were surviving in August 2007 (U.S. Army 2007). Although this site is not within the historical boundaries of the species, these plantings will be maintained as living collections for future seed collections (U.S. Army 2006).

Stabilizing, downlisting, and delisting objectives are provided in the recovery plan for plants from the island of Oahu (USFWS 1998), based on whether the species is an annual, a short-lived perennial (fewer than ten years), or a long-lived perennial. *Cyanea crispa* is a short-lived perennial, and to be considered stable, the taxon must be managed to control threats (e.g., fenced) and be represented in an *ex situ* (off-site) collection. In addition, a minimum of three populations should be documented on the island of Oahu. For the species to be considered stable, each of these populations must be naturally reproducing and increasing in number, with a minimum of 50 mature individuals per population.

The stabilization goals for this species have not been met (see Table 1), as none of the populations contain 50 mature individuals and most of the threats are not being managed. Therefore, *Cyanea crispa* meets the definition of endangered as it remains in danger of extinction throughout its range.

Recommendations for Future Actions:

- Collect seeds from any reintroduced individuals that set seed to add to the genetic diversity of the *ex situ* material.
- Construct enclosure fences to protect individuals from the adverse effects of feral pigs, and eradicate introduced invasive plant species within the enclosures.
- Determine and implement adequate rat and slug control methods.
- Survey the geographical and historical range of *Cyanea crispa* for additional populations.
- Assess genetic variability within extant populations.

- Develop a plan for conserving the species' genetic diversity in *ex situ* collections and in reintroduced populations.
- Enhance current natural populations to increase numbers of individuals.
- Study *Cyanea crispa* populations with regard to population size and structure, geographical distribution, flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, limiting factors, and threats.

References:

- Lammers, T.G., T.J. Givnish, and K.J. Sytsma. 1993. Merger of the endemic Hawaiian genera *Cyanea* and *Rollandia* (Campanulaceae: Lobelioideae). *Novon* 3:437–441.
- Harold L. Lyon Arboretum Micropropagation Laboratory. 2007. Micropropagation database. University of Hawaii at Manoa, Honolulu, HI. Unpublished.
- National Tropical Botanical Garden. 2007. Report on controlled propagation of listed and candidate species, as designated under the U.S. Endangered Species Act. Unpublished.
- [U.S. Army] U.S. Army Garrison. 2006. 2006 Status reports for the Makua Implementation Plan and the draft Oahu Implementation Plan. U.S. Army Garrison, Directorate of Public Works, Environmental Division, Schofield Barracks, Hawaii. Unpublished.
- [U.S. Army] U.S. Army Garrison. 2007. 2007 Status reports for the Makua Implementation Plan and the draft Oahu Implementation Plan. U.S. Army Garrison, Directorate of Public Works, Environmental Division, Schofield Barracks, Hawaii. Unpublished.
- [USFWS] U.S. Fish and Wildlife Service. 1994. Endangered and threatened wildlife and plants; endangered status for 11 plant species from the Koolau Mountain Range, Island of Oahu, HI; final rule. *Federal Register* 59(59):14482–14493.
- [USFWS] U.S. Fish and Wildlife Service. 1998. Recovery plan for the Oahu plants. U.S. Fish and Wildlife Service, Portland, OR. 270 pages, plus appendices.
- [USFWS] U.S. Fish and Wildlife Service. 2003a. Endangered and threatened wildlife and plants: final designation or nondesignation of critical habitat for 101 plant species from the island of Oahu, HI: final rule. *Federal Register* 68(116):35949–35998.
- [USFWS] U.S. Fish and Wildlife Service. 2003b. Biological Opinion of the U.S. Fish and Wildlife Service for routine military training and transformation of the 2nd

Brigade 25th Infantry Division (Light), U.S. Army installations, island of Oahu.
Unpublished.

[USFWS] U.S. Fish and Wildlife Service. 2008. Rare plant tracking database. Pacific Islands Fish and Wildlife Office, Honolulu, HI. Accessed on April 28, 2008.
Unpublished.

Table 1. Status of *Cyanea crispa* from listing through 5-year review.

Date	No. wild individuals	No. outplanted	Stability Criteria identified in Recovery Plan	Stability Criteria Completed?
1994 (listing)	29	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
1998 (recovery plan)	40	0	All threats managed in all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2003 (critical habitat)	56	unknown	All threats managed in all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2008 (5-year review)	118	3	All threats managed	No
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No

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SIGNATURE PAGE for 5-YEAR REVIEW of *Cyanea crispa*

Pre-1996 DPS listing still considered a listable entity? N/A

Recommendation resulting from the 5-year review:

- Delisting
- Reclassify from Endangered to Threatened status
- Reclassify from Threatened to Endangered status
- No Change in listing status

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Patricia d

Date 4/8/09