

Cyanea truncata
(Haha)

**5-Year Review
Summary and Evaluation**

**U.S. Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
Honolulu, Hawaii**

5-YEAR REVIEW
***Cyanea truncata* (Haha)**

I. GENERAL INFORMATION

A. Methodology used to complete the review:

This review was conducted by staff of the Pacific Islands Fish and Wildlife Office (PIFWO) of the Fish and Wildlife Service between July 2005 and June 2006. The Hawaii Biodiversity and Mapping Program was contracted to provide updated information on the current status of *Cyanea truncata*. They also provided recommendations for future actions that may be needed prior to the next 5-year review. The evaluation of the lead PIFWO biologist was reviewed by the Plant Recovery Coordinator, whose comments were incorporated into the draft 5-year Review. The draft 5-year Review was then reviewed by the Recovery Program Leader and the Assistant Field Supervisor for Endangered Species before PIFWO submission to the Regional Office.

B. Reviewers

Lead Region: Region 1

Lead Field Office: Pacific Islands Fish and Wildlife Office

C. Background

1. FR Notice citation announcing initiation of this review:

U.S. Fish and Wildlife Service. July 6, 2005. Endangered and Threatened Wildlife and Plants; Initiation of 5-year Reviews (of 33 species in Region 1). 70 FR 38972-38975.

2. Species status:

Decreasing (FY 2006 Recovery Data Call)

3. Recovery achieved:

1, meaning 0 - 25 percent of the identified recovery objectives for *Cyanea truncata* have been achieved (FY 2006 Recovery Data Call)

4. Listing history

Original Listing

FR notice: 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. *Federal Register* 59(59): 14482-14493.
Date listed: March 28, 1994
Entity listed: Species
Classification: Endangered

Revised Listing, if applicable

N/A

5. Associated actions:

Critical habitat was designated for *Cyanea truncata* in two units totaling 5,539 acres (2,239 hectares) on Oahu (U.S. Fish and Wildlife Service. 2003. Endangered and threatened wildlife and plants; final designations or nondesignations of critical habitat for 101 plant species from the island of Oahu, Hawaii. *Federal Register* 68(116): 35950-36406).

6. Review History: Just the original listing, designation of critical habitat, and recovery plan development actions.

7. Species' Recovery Priority Number at start of review: 5, meaning a species with a high degree of threat and a low recovery potential.

8. Recovery Plan or Outline

Name of plan: Recovery Plan for the Oahu Plants. 1998. U.S. Fish and Wildlife Service, Portland, Oregon. 207 pp. plus appendices.

Date issued: August 10, 1998

Dates of previous revisions: N/A

Some of the actions outlined in the Recovery Plan have been initiated but not completed (*e.g.*, construct exclosures to protect populations from feral pigs; control nonnative plants within fenced exclosures). Some recovery actions will require long-term commitments (*e.g.*, maintenance of exclosure fences; weed and slug control) or may only be necessary intermittently (*e.g.*, provide protection against fire).

II. REVIEW ANALYSIS

A. Application of the 1996 Distinct Population Segment (DPS) Policy

This Policy does not apply to plant species.

B. Recovery Criteria

1. Does the species have a final, approved recovery plan?

Yes
 No

2. Does the recovery plan contain recovery (i.e., downlisting or delisting) criteria?

Yes
 No

3. **Adequacy of recovery criteria.**
- a. **Do the recovery criteria reflect the best available (i.e., most up-to-date) information on the biology of the species and its habitat?**
 Yes
 No
- b. **Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria (and there is no new information to consider regarding existing or new threats)?**
 Yes
 No
4. **List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing information. For threats-related recovery criteria, please note which of the 5 listing factors* are addressed by that criterion. If any of the 5-listing factors are not relevant to this species, please note that here**

The threats (Factors A, C, and E) affecting this species are discussed in detail in section II.D. Factors B and D are not considered a threat to this species.

Stabilizing, downlisting, and delisting objectives are provided in the Recovery Plan for Oahu Plants (Service 1998), based on whether the species is an annual, a short-lived perennial (fewer than 10 years), or a long-lived perennial. *Cyanea truncata* is a short-lived perennial, and to be considered stable, this species must be managed to control threats (e.g. fenced) (Factors A, C, and E) and be represented in an *ex situ* collection. In addition, a minimum of three populations should be documented on the island of Oahu where the species now occurs or occurred historically. Each of these populations must be naturally reproducing and increasing in number, with a minimum of 50 mature individuals per population.

This recovery objective has not been met.

For downlisting, a total of five to seven populations of *Cyanea truncata* should be documented on the island of Oahu where it now occurs or occurred historically. Each of these populations must be naturally reproducing, stable or increasing in number, and secure from threats (Factors A, C, and E), with a minimum of 300 mature individuals per population. Each population should persist at this level for a minimum of 5 consecutive years before downlisting is considered.

This recovery objective has not been met.

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- A) Present or threatened destruction, modification or curtailment of its habitat or range;
 - B) Overutilization for commercial, recreational, scientific, or educational purposes;
 - C) Disease or predation;
 - D) Inadequacy of existing regulatory mechanisms;
 - E) Other natural or manmade factors affecting its continued existence.

For delisting, a total of 8 to 10 populations of *Cyanea truncata* should be documented on the island of Oahu where it now occurs or occurred historically. Each of these populations must be naturally reproducing, stable, or increasing in number, and secure from threats (Factors A, C, and E), with a minimum of 300 mature individuals per population. Each population should persist at this level for a minimum of 5 consecutive years before delisting is considered.

This recovery objective has not been met.

C. Synthesis

Historically, *Cyanea truncata* was known from the northern Koolau mountains of Oahu, from Waiahole Valley to Hanaimo Gulch in the Hauula area (59 FR 14482). During the 1970s the only known wild individuals of *C. truncata* were located on private land in Makaua Gulch, located between Kaaawa and Kahana Valleys. The last of the wild Makaua Gulch plants died in the early 1980s (68 FR 35950). Subsequently, no plants were known to be extant in the wild or in cultivation until a single mature plant was found on state land in Hanaimoa Gulch in the Hauula area in October 1998. This plant died in 2001 (J. Lau, Hawaii Biodiversity and Mapping Program, pers. comm. 2006). Again there were no wild plants known to be extant, although plants propagated from the Hanaimoa Gulch individual were in cultivation (J. Lau, pers. comm. 2006). In February 2004 a new wild population was found on state and private land in a gulch in Kahana Valley, which adjoins Makaua Gulch (J. Lau, pers. comm. 2006). This population consisted of three plants, only two of which were mature. As of February 2006, all three plants were still alive, and the largest, most vigorous individual has been observed to flower and fruit year-round (A. Bakutis, Genetic Safety Net Program, pers. comm. 2006). In 2003, eight immature cultivated offspring of the wild Hanaimoa Gulch plant were outplanted in Makaua Gulch, where wild *C. truncata* had been extant until the early 1980s. The individuals were planted within a small enclosure that had been built to protect wild plants of another federally listed endangered plant species, *Schiedea kaalae*, from feral pigs. Four of the outplanted individuals were found to be alive and still immature in December 2005, at which time seven more immature plants of the Hanaimoa Gulch stock were outplanted (A. Bakutis, pers. comm. 2006). Currently, there are 3 mature individuals in Hanaimoa Gulch and 11 immature individuals in Makaua Gulch.

A major threat to *Cyanea truncata* is habitat degradation by feral pigs (Service 1998; 68 FR 35950) (Factor A). As early as 1778, European explorers introduced livestock, which became feral, increased in number and range, and caused significant changes to the natural environment of Hawaii. The pig is originally native to Europe, northern Africa, Asia Minor, and Asia. European pigs became feral and invaded forested areas, especially wet and mesic forests and dry areas at high elevations. Feral pigs are currently present on Oahu and inhabit rain forests and grasslands. While rooting in the ground in search of the invertebrates and plant material they eat, feral pigs disturb and destroy vegetative cover, trample plants and seedlings, and threaten forest regeneration by damaging seeds and seedlings. They disturb soil and cause erosion, especially on slopes. Alien plant seeds are dispersed on their hooves and coats as well as through their

digestive tracts, and the disturbed soil is fertilized by their feces, helping these plants to establish. Pigs are a major vector in the spread of many introduced plant species (Smith 1985; Stone 1985; Medeiros *et al.* 1986; Scott *et al.* 1986; Tomich 1986; Cuddihy and Stone 1990; Wagner *et al.* 1999). Exclosures designed to exclude wild pigs were constructed around the three wild *C. truncata* plants in Kahana Valley in April 2004 (A. Bakutis, pers. comm. 2006). A 20 by 30 meter (m) exclosure was built around one of the mature plants. Another 3 by 3 m exclosure was constructed around the other mature plant. The immature plant was surrounded by a 2 by 2 m exclosure fence (A. Bakutis, pers. comm. 2006).

Cyanea truncata is threatened by habitat degradation by and competition with the invasive nonnative plant species *Aleurites moluccana* (kukui), *Christella parasitica*, *Clidemia hirta* (Koster's curse), *Cordyline fruticosa* (ti), *Oplismenus hirtellus* (basketgrass), *Psidium guajava* (common guava), *Schinus terebinthifolius* (Christmas berry), and *Schefflera actinophylla* (octopus tree) (J. Lau, pers. comm. 2006) (Factors A and E). Weed control is ongoing at the fenced populations of *C. truncata* (A. Bakutis, pers. comm. 2006).

Signs of rat predation have been observed on the Kahana population of *Cyanea truncata* plants (Factor C). Rats had gnawed off the bark of the stems of one of the plants, almost girdling the stems. A rat control program utilizing rodenticides has been implemented at all three exclosures (A. Bakutis, pers. comm. 2006).

Introduced slugs also pose a threat to *Cyanea truncata* (Service 1998; 68 FR 35950) (Factor C). Slugs feed on seedlings, stems, and fruit, thereby reducing the vigor of the plants and limiting regeneration (Service 1998). Field experiments conducted by Alvin Yoshinaga and Curt Daehler demonstrated that slugs could reduce the survival of *Cyanea* spp. seedlings by as much as 80 percent. Graduate student Stephanie Joe has been hired by the Army as a Natural Resources Research Specialist, and included among her duties is the investigation of control of slug herbivory. Her research on slug impacts on *Cyanea* seedlings has revealed similar levels of mortality, approximately 53 percent (Joe 2006).

In addition to the above threats, species like *Cyanea truncata* that are endemic to a small portion of a single island are inherently more vulnerable to extinction than widespread species because of the higher risks posed to a few populations and individuals by random demographic fluctuations and localized catastrophes such as hurricanes and disease outbreaks. The limited gene pool may depress reproductive vigor (Factor E). In 1999, seeds from the plant in Hanaimoa Gulch were successfully germinated, and the resulting cultivated plants and *in vitro* plant tissue is being maintained at the Lyon Arboretum of the University of Hawaii (Service 2005). Also maintained at the arboretum are plants and plant tissue originating from all three of the Kahana Valley plants (Nellie Sugii, Lyon Arboretum, pers. comm. 2006). *Cyanea truncata* is included in the State of Hawaii's Genetic Safety Net Program. The goal of this program is to secure and safeguard representative genetic material of the rarest of Hawaii's rare plants, either through the maintenance of living collections or through long-term storage of viable propagules (A. Bakutis, pers. comm. 2006).

The goals for genetic storage or stabilization of *Cyanea truncata* have not been met, and only two populations exist, both at low numbers. Therefore, *C. truncata* meets the definition of endangered as it remains in danger of extinction throughout all of its range.

III. RESULTS

A. Recommended Classification:

- Yes, downlist to Threatened
- Yes, uplist to Endangered
- Yes, delist
- No, no change is needed

B. New Recovery Priority Number NA

IV. RECOMMENDATIONS FOR FUTURE ACTIONS

- There is much potential habitat for *Cyanea truncata* that has not been surveyed for the species. Surveys of this habitat would likely result in the discovery of new populations of a few additional individuals (J. Lau, pers. comm. 2006).
- Study *Cyanea truncata* with regard to flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, limiting factors, and threats to the species.
- Formulate a plan to maintain or increase genetic variability of *Cyanea truncata*.

Reintroduce individuals of *Cyanea truncata* into its historical range.

V. REFERENCES

- Cuddihy, L.W. and C.P. Stone. 1990. Alteration of native Hawaiian vegetation: Effects of humans, their activities and introductions. Coop. Natl. Park Resources Studies Unit, University of Hawaii, Honolulu. 138 pp.
- Joe, Stephanie. 2006. Impact of Alien Slugs on Native Plant Seedlings in a Diverse Mesic Forest, Oahu, Hawaii, and a Study of Slug Food Plant Preferences. Thesis, Master of Science in Botanical Sciences (Botany-Ecology, Evolution, and Conservation Biology), University of Hawaii, Honolulu. 87 pp.
- Medeiros, A.C. *et al.* 1986. Status of native flowering plant species on the south slope of Haleakala, East Maui, Hawaii. Coop. Natl. Park Resources Studies Unit, University of Hawaii, Honolulu. 230 pp.

- Scott, J.M. *et al.* 1986. Forest bird communities of the Hawaiian Islands: Their dynamics, ecology, and conservation. *Studies in Avian Biology* 9: 1-429.
- Smith, C.W. 1985. Impact of alien plants on Hawaii's native biota. *In* Hawaii's Terrestrial Ecosystems: Preservation and Management, Stone, C.P. and J.M. Scott, eds., Coop. Natl. Park Resources Studies Unit, University of Hawaii, Honolulu. pp. 180-250.
- Stone, C.P. 1985. Alien animals in Hawaii's native ecosystems: Toward controlling the adverse effects of introduced vertebrates. *In* Hawaii's Terrestrial Ecosystems: Preservation and Management, Stone, C.P. and J.M. Scott, eds., Coop. Natl. Park Resources Studies Unit, University of Hawaii, Honolulu. pp.251-297.
- Tomich, P.Q. 1986. Mammals in Hawaii: a Synopsis and Notational Bibliography. Bishop Museum Press, Honolulu. 375 pp.
- 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. *Federal Register* 59(59): 14482-14493.
- U.S. Fish and Wildlife Service. 1998. Recovery Plan for the Oahu Plants. U.S. Fish and Wildlife Service, Portland, Oregon. 207 pp., plus appendices.
- U.S. Fish and Wildlife Service. 2003. Endangered and Threatened Wildlife and Plants; Final Designations or Nondesignations of Critical Habitat for 101 Plant Species from the Island of Oahu, HI. *Federal Register* 68 (116): 35950-36406.
- U.S. Fish and Wildlife Service. 2005. Captive propagation database. Unpublished.
- Wagner, W.L. *et al.* 1999. Manual of the Flowering Plants of Hawaii, Second Edition. University of Hawaii Press and Bishop Museum Press, Honolulu. 1,918 pp.

EXPERTS CONSULTED

- Bakutis, Ane. 2006. Genetic Safety Net Program. Personal communication.
- Lau, Joel. 2006. Hawaii Biodiversity and Mapping Program. Personal communication.
- Sugii, Nellie. 2006. Lyon Arboretum Micropropagation Laboratory. Personal communication.

U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of *Cyanea truncata* (Haha)

Current Classification Endangered

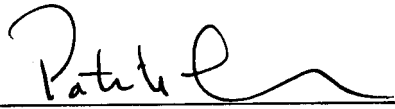
Recommendation resulting from the 5-Year Review

- Downlist to Threatened
- Uplist to Endangered
- Delist
- No change is needed

Appropriate Listing/Reclassification Priority Number N/A

Review Conducted By

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Date JUL - 3 2007

Field Supervisor, Fish and Wildlife Service



Date Aug 2 2007

Regional Director, Fish and Wildlife Service