EMP
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# Rare Plant Program Update

by Matt Keir

THE O'AHU ARMY Natural Resources Program (OANRP) manages rare plants that occur on or around Army training areas on O'ahu. Since many of these species are only known from very small populations, outplanting (putting plants grown in the nursery into the wild) is used to increase the number of individuals. Planting is done during the rainy season between November and March to take advantage of the cooler, wetter conditions. In order to prepare for this year's outplanting, the nursery crew has been transferring the seedlings and small plants out of the incubators (climate controlled growing chambers), onto the mist bench and into the nursery. This year we will be planting many of the same species as previous seasons such as *Cyanea superba* subsp. *superba* (hāhā), *Delissea waianaensis* ('ōhā wai), *Schiedea kaalae*, and *Pritchardia kaalae* (loulu). We will also be outplanting *Kadua degeneri var. degeneri*, an endangered manono species, for the first time.

For the first time, OANRP will reintroduce endangered *Kadua degeneri* var. *degeneri* into the wild.

Outplantings into a new management area, the Manuwai Management Unit (MU), will be another "first" for OANRP this winter. Manuwai MU is located on State of Hawai'i lands on the north shore of O'ahu. The MU is fenced to protect the ecosystem from degradation by goats and pigs, and weed control is ongoing. This year, six endangered plant

## Inside this issue:



## The Journey of an Endangered Plant Species at OANRP

The tiny seeds of *Cyanea superba* subsp. *superba* are extracted from the fruit in the OANRP seed lab.


Seedlings germinate in tiny pots within a temperature-regulated incubator to ensure a successful start to life.

As the young *Cyanea superba* subsp. *superba* grow, they are placed into larger pots.

OVER

## The Journey, continued

At their last stage in the nursery, plants are placed in one-gallon pots and enjoy high-elevation growing at the OANRP rare plant facility in the Wai'anae Mountains.

Staff & volunteers dig new homes for plants in the field. Planting during the winter time gives the young plants a rainy start for spreading their roots in the forest.

OANRP staff and interns return to the reintrodution site on a regular basis to monitor plants' size, vigor and reproductive status.

When reintroduced plants start producing their own seed and those seedlings go on to germinate and survive on their own, we know we are using the right tools to manage a species.

Volunteers tour the OANRP rare plant facility in the Wai'anae Mountains and learn about many of the endangered species ready for planting in the wild. (Photo by OANRP staff)

species will be returned to this area. The plants were grown from propagules (seeds and cuttings) gathered from the Manuwai MU and will be ready for planting in a few months.

The nursery work entails transplanting small seedlings into larger and larger pots until they are of planting size. Each seedling is tagged from the beginning so that its origin and age are known. The plants receive regular weekly fertilizer and pesticides in the nursery, but these treatments are scaled back as outplanting time approaches, to acclimate plants to harsher growing conditions in the wild. Plants are thoroughly cleaned to ensure no other pests or pathogens accompany the plants into the native forest. Each plant will receive an additional metal identification tag that will remain with the plant for life. This metal tag allows OANRP staff to accurately monitor and track the success of each individual plant once returned to the wild.

Once the plants are ready, they will be inspected and prepared for planting, loaded for transport to planting sites and outplanted back into the native forests by OANRP staff and volunteers. •

Matt Keir is the Rare Plant Program Manager with RCUH / PCSU, working for the Oʻahu Army Natural Resources Program.

# To Catch a Chameleon

By Parker Paredes

IN ITS NATIVE range of central Kenya and isolated regions of Tanzania, the Jackson's chameleon, *Chamaeloeo jacksonii* subsp. *xantholophus*, is a woodland/montane forest species that exists in mid- to high elevations. The story of the Jackson's chameleon in Hawai'i started in 1972 when an import permit allowed these chameleons to reach the islands legally through the southern California pet trade. Today, Jackson's chameleons can be found on most of the main Hawaiian Islands.

The O'ahu Army Natural Resources Program (OANRP), tasked with managing rare and endangered species on Army land, has been removing Jackson's chameleons from high elevation native forests on the Wai'anae mountain range since December 2011. Many people think of Jackson's chameleons as rare and unique. So, why remove them?

The endangered kāhuli tree snail (*Achatinella mustelina*) was once abundant in the Wai'anae Mountains. However, in an area that was once dubbed "the land of 10,000 snails," a rapid decline is occurring. Years of data collected by OANRP on Wai'anae *A. mustelina* populations indicate that the decline of these native tree snail populations directly correlates with the increased volume of invasive predators such as the rosy wolf snail (*Euglandina rosea*) and Jackson's chameleons.

In 2010, OANRP staff first collected a few Jackson's chameleons from this area and brought them to the University of Hawai'i Tree Snail Conservation Lab (UH Snail Lab) to begin a collaborative study of the chameleon's feeding ecology in Hawaiian forests. Land snails unique to Hawai'i, including the remains of the endangered *A. mustelina*, and insects were discovered in the stomach contents of the chameleons, confirming that Jackson's chameleons are indeed a serious threat to our remaining endangered forest fauna.

In response to the threat posed by chameleons and several other *Achatinella* predators, OANRP constructed a predator resistant exclosure in the forest to protect the dwindling native snail population in the Wai'anae Mountains (see Vol. 54 of the Ecosystem Management Program Bulletin for full story about the exclosure).


These endemic O'ahu tree snail shells (including an endangered *Achatinella mustelina* on far right) were found in the gut contents of a Jackson's chameleon collected in the Wai'anae Mountains. (Photo published in 2010 *Biodiversity and Conservation* 19(5):1437-1441, taken by Dr. Brenden Holland)

While the exclosure was very effective at keeping new chameleons from entering the protected *A. mustelina* habitat, the 40 foot-tall trees within the exclosure still harbored a small population of these cryptic reptilian predators that escaped detection prior to the exclosure's completion in December 2011.

Confident that the exclosure was sealed from any new predator incursion, OANRP staff began monthly searches within the exclosure in late December 2011 to remove any remaining chameleons from the protected snail habitat. Most of the searches were performed during the night, when it was easier to spot the chameleons' vibrant green color. Nevertheless, spotting a chameleon in the bush is a daunting

OANRP Rare Snail Conservation Specialist Vince Costello and Outreach Specialist Celeste Ventresca use headlamps to search for predatory Jackson's chameleons at night in a large pāpala kēpau tree (*Pisonia* sp.), known to host many endangered kāhuli tree snails (*Achatinella mustelina*). (Photo by OANRP staff)

OANRP Senior Natural Resource Management Coordinator, Dan Sailer, rappels along the tree canopy within the predator-resistent exclosure to search for remaining Jackson's chameleons. (Photo by OANRP staff)

OANRP Natural Resource Management Coordinator, Kahale Pali, holds a male chameleon he captured in the exclosure.
*LEFT* Finding a baby Jackson's chameleon in the forest canopy is challenging when they are the size of a AA battery. (Photos by OANRP staff)

task; cross-eyed vision and aching necks are to be expected while hunting these camouflaged creatures in four-story high tree canopy. The initial discovery of a mature female Dec. 28, 2011 was a "red flag" for OANRP. In Hawai'i, Jackson's chameleons can produce up to 21 offspring, two times per year, meaning staff would be spending many more hours searching for her offspring within the exclosure as well.

Over the course of nine months, OANRP staff spent 345 hours searching for chameleons in the Wai'anae Mountains exclosure. The searches turned up a total of 30 chameleons, including two mature females and nine mature males. The vast majority of the chameleons found were juveniles, likely the offspring from the two mature females. With the number of chameleons declining over the nine-month search period, data suggests that management efforts are paying off. The last chameleon found inside the exclosure was spotted Aug. 20, and diligent searching since that time has turned up no

| DATE | Dec 2011 | Jan 2012 | Feb 2012 | Mar 2012 | Apr 2012 | May 2012 | June 2012 | July 2012 | Aug 2012 | Sept 2012 | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Chameleons Found** | 6 | 5 | 1 | 0 | 2 | 2 | 8 | 5 | 1 | 0 | **30** |
| **Search effort (hrs.)** | 40 | 108 | 2 | 7 | 10 | 20 | 46 | 42 | 35 | 35 | **345** |


Staff from the University of Hawai'i Tree Snail Conservation Lab plan to distribute this poster (or a similar version) to local pet stores in hopes of preventing illegal releases of Jackson's chameleons into the wild.

further animals.

Nonetheless, there are still many more Jackson's chameleons roaming the forests outside the protective exclosure, along with many vulnerable native tree snails. On September 5, 2012 OANRP staff collected a large female chameleon just outside the exclosure. She was taken to the UH Snail Lab for inspection, and biologists discovered five *Achatinella* shells in her gut—along with 22 Jackson's embryos.

While we may not be able to remove all of these highly reproductive reptiles from the forest, we can prevent more from getting there. Jackson's chameleons are popular pets, but many people do not realize that it is illegal to release a Jackson's chameleon into the wild in Hawai'i, and that doing so threatens native Hawaiian animals. Controlling this reptilian invasion requires public outreach and depends on widespread cooperation from pet suppliers, pet shops, and pet owners.

If you or someone you know has a Jackson's Chameleon and no longer want to keep it, please contact Dr. Brenden Holland of the UH Tree Snail Conservation Lab at (808) 956-6176 or bholland@hawaii.edu for more information on how to turn in your Jackson's chameleon. If we all work together to keep the forests of Hawai'i free of introduced predators, the Wai'anae Mountains may once again be known as "the land of 10,000 snails." •

Parker Paredes is a Natural Resource Management Technician with RCUH / PCSU, working for the Oʻahu Army Natural Resources Program.

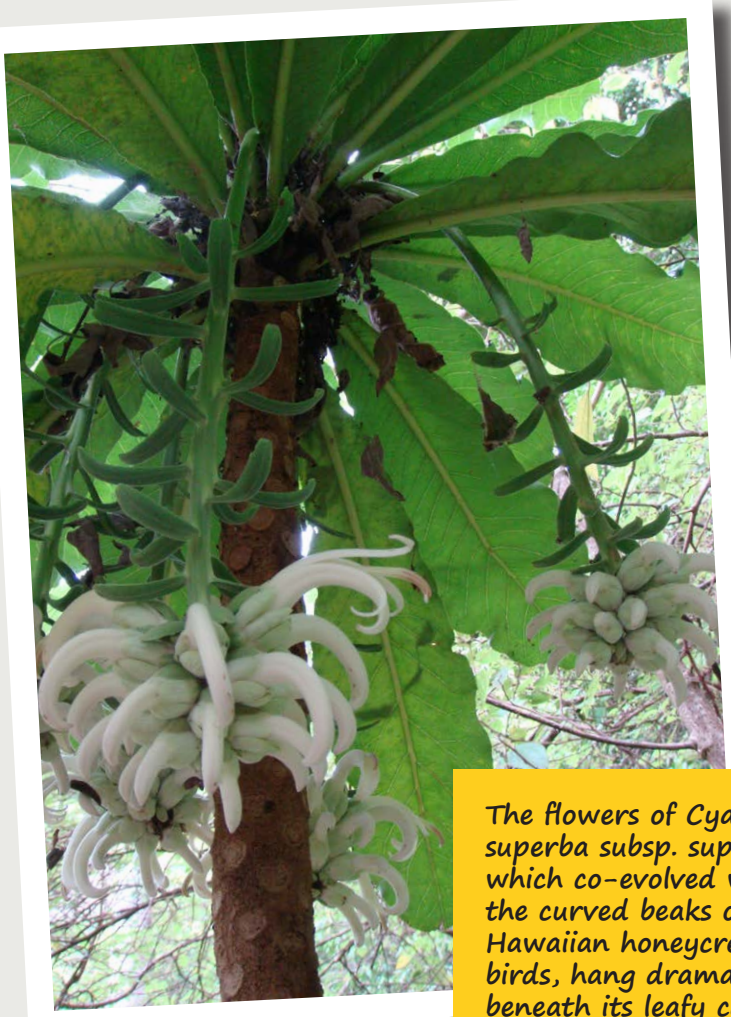
# Overcoming Adversity: Only Time Will Tell

## Reports from the Field

By Jamie Tanino

In the rich mesic forest of Mākaha Valley, a population of Cyanea superba subsp. superba (hāhā), a native Hawaiian lobelioid, stands gracefully despite its troubled past. Their sturdy stems with leaves clustered at the tips, tower overhead as they continue to reach for the sky. A recent monitoring visit allowed us to collect "vital signs" from this hāhā population, including height, stem diameter, vigor and reproductive status. Thankfully, the plants showed no signs of weakness.

The last documented locations of wild C. superba subsp. superba (from here after C. superba) were all in the northern Wai'anae Mountains along the eastern slopes. Threats, including slugs, rats and pigs, played a role in population decline. In 2002, the few remaining C. superba plants went extinct in the wild.



The flowers of Cyanea superba subsp. superba, which co-evolved with the curved beaks of Hawaiian honeycreeper birds, hang dramatically beneath its leafy canopy like chandeliers.

But all was not lost. Staff from the O'ahu Army Natural Resources Program (OANRP) were able to collect fruit from the wild C. superba before they died. Viable seeds from these precious fruit were stored, and many were grown in the OANRP nursery before the lobeliod's demise. OANRP first returned C. superba to the wild in 1998 in Kahanahāiki (the northern gulch of Mākua), close to where the last wild plants had died. Since this time, hundreds of C. superba have been reintroduced by OANRP into the shady gulches of Kahanahāiki.

In 2006-2007, OANRP began preparations to introduce C. superba to other areas within this lobelioids historical range. More seeds from the last remaining wild individuals were removed from storage and grown in the nursery. After two to three years of tender loving care from the OANRP horticultural staff, the plants were ready by 2009 for their introduction to Mākaha.

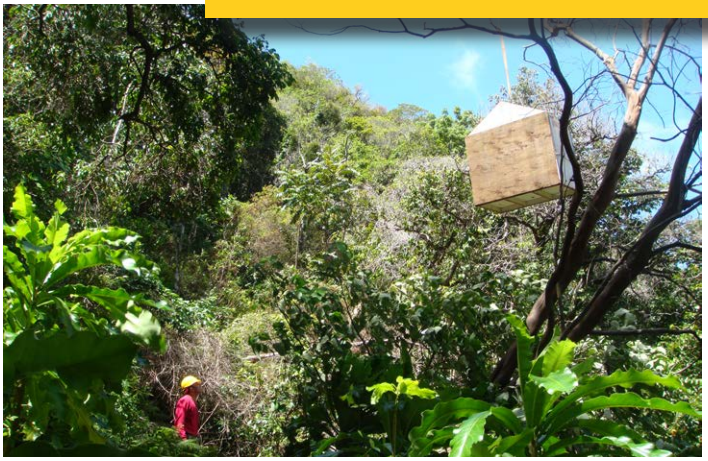
A planting site was prepared on a rocky upper-gulch slope in the heart of the valley. OANRP

staff cleared invasive weeds from the area and built a small fence exclosure within the larger fenced unit in Mākaha, to guard against possible pig damage. A total of 43 C. superba were introduced to this site that year, and for the first time in recent history, C. superba existed on the western/leeward slope of the Wai'anae Mountains.

As of today, after two more successful plantings, there are 125 C. superba in Mākaha. Planted at an average height of half a meter, many of these C. superba plants now stand at two meters or more. With at least eight


ABOVE OANRP staff wait for helicopter operations to begin. They will hook large plant carriers—designed by OANRP carpenter Dan Tanji—to the helicopter to transport plants to their new homes in Mākaha Valley.

LEFT OANRP staff work quickly to unload reintroduction tools before the helicopter returns with the plants, BELOW.



individuals producing flowers, we are hopeful that in time the others will mature as well.

This winter, we will be adding strength with numbers. If all goes as planned, the final C. superba introductions in Mākaha will include 65 plants. In an effort to maintain a stable population of C. superba in Mākaha, OANRP is working to ensure that at least 50 individual plants are thriving and producing viable seeds. If this goal can be reached and maintained, then Mākaha may be home to the beautiful C. superba well into the future. We have hope, but only time will tell.

Jamie Tanino is a Natural Resource Management Technician with RCUH/PCSU, working for the O'ahu Army Natural Resources Program.

# 'Tis the Season...

## for mēhamehame

AUTUMN

The endangered mēhamehame (*Flueggea neowawraea*) is one of the largest trees in the Hawaiian forest, reaching heights of 98 feet with a trunk up to 6½ feet wide. Beneath the rough, reddish-brown bark of this great tree is a hard, wavy-grained wood, traditionally prized by native Hawaiians for making weaponry.

The tiny yellow-green flowers of this mesic-to-dry forest dweller begin to appear as early as October, typically with male and female flowers on separate plants.

Male (above) and female (below) flowers of the endangered mēhamehame.

Despite the mēhamehame's great size, its numbers are small; only 35 wild trees remain on Oʻahu. The black twig borer (*Xylosandrus compactus*), accidentally introduced to Hawaiʻi in 1961 via the coffee trade, has become the greatest threat to the species. These tiny beetles kill young branches by boring holes into living plant tissue, where they farm fungus for food. The trees that remain alive in the wild are often mostly dead with a hollow trunk and some live sections extending into the forest canopy.

*ABOVE* Mēhamehame fruit

OANRP staff grow mēhamehame from seed and air layers and have reintroduced more than 100 immature trees into the Waiʻanae Mountains. Staff are also researching methods to control the black twig borer.

*Above* The endangered mēhamehame can grow as large as 98 feet. (Photo by OANRP staff)

# VOLUNTEER *Opportunities* AND UPCOMING EVENTS

The Oʻahu Army Natural Resources Program offers monthly volunteer service trips to help protect populations of rare and endangered plants and animals on Army land.
For information on how to get involved email **outreach@oanrp.com** or call **656-7741.**

## Sign-Up Information

Already filled out your volunteer paperwork? Visit **www.oanrp.ivolunteer.com** to sign up for volunteer trips. Please note that volunteer spots are offered on a first come, first served basis.

# EMP Bulletin

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*If you wish to contribute an article or have an idea for an article you'd like featured in the next Ecosystem Management Program Bulletin, please feel free to contact us! The deadline to submit articles for the next issue is* ***January 22, 2013.***


**http://www.garrison.hawaii.army.mil/sustainability/NaturalResources.aspx**

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