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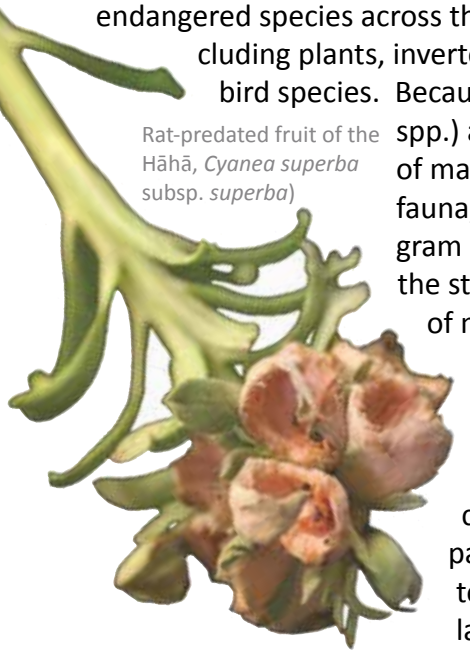
A Bolt in Time Saves Army's Bottom Line—Investigating the Utility of Automatic Rat Traps

By Katie Franklin

SINCE 1995 the O'ahu Army Natural Resources Program (OANRP) has managed more than 60 endangered species across the island of O'ahu, including plants, invertebrates and one forest bird species. Because invasive rats (*Rattus* spp.) are known predators of many Hawaiian flora and fauna, a rodent control program plays a critical role in the stabilization and recovery of many of these endangered species.



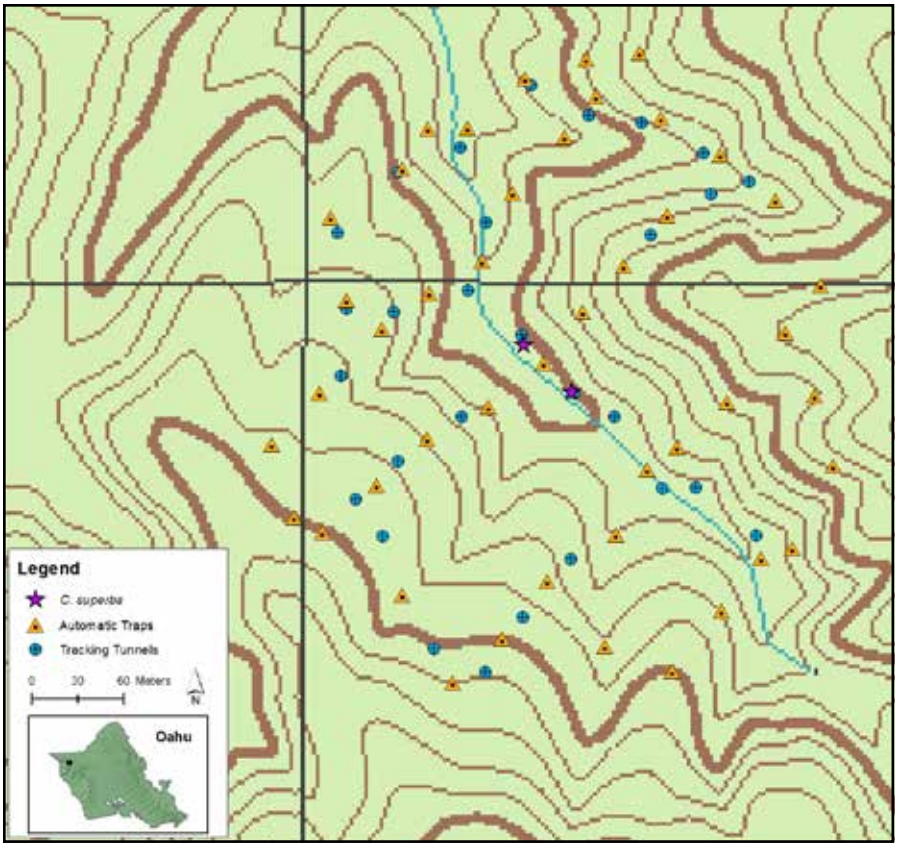
Rat-predated fruit of the Hāhā, *Cyanea superba* subsp. *superba*)

The hāhā (*Cyanea superba* subsp. *superba*) is one species that has shown particular vulnerability to rat predation. In the late 1990s, the species was facing extinction with only six *C. superba* plants in the Wai'anae Mountains. The OANRP installed rat bait stations and traps around the last remaining wild plants in order to protect their invaluable fruit. Thankfully, viable seeds were collected before the last plants died, and they were successfully propagated and cultivated to a stage where they could be outplanted in the forest. Because of these efforts, there are now hundreds of *C. superba* plants in the forests of the Wai'anae Mountains. However, rats continue to degrade habitat and prey on *C. superba* and other endangered species. Reducing rat populations to a level that adequately protects vulnerable species is a never-ending and labor-intensive battle.

Recently, the OANRP acquired a new tool that may prove to be an important component for long-term rat control efforts: automatic rat traps. These automatic traps are designed to kill rats and stoats (a New Zealand pest) and are powered by compressed carbon dioxide (CO_2). Goodnature® Ltd., a New Zealand-based company, invented and designed the

Inside this issue:

How does the automatic trap work?



O'ahu Army Natural Resources staff installed 45 automatic rat traps around a small population of endangered *Cyanea superba* subsp. *superba* in Pahole Natural Area Reserve, to test the performance of this new technology.

traps specifically for conservation use. Unlike single-kill snap traps, which can often be found un-sprung with bait missing or sprung with no animal, the automatic traps remain set and baited. The traps can reset up to 24 times before the CO_2 canister needs to be replaced and are a humane alternative to other rat control methods.

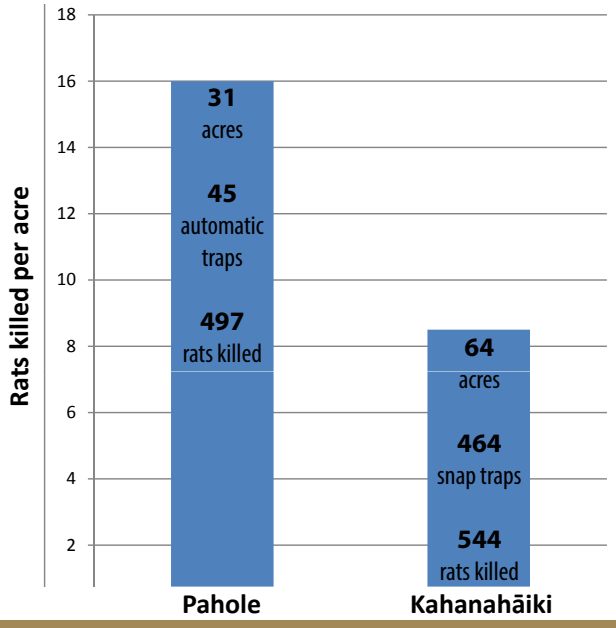
The OANRP began putting this new rat control technology to the test in October of 2012, when the staff installed a small grid of 45 automatic traps around an outplanting site of *C. superba* in Pahole Natural Area Reserve in the northern Wai'anae Mountains. The traps are installed on lines 100 meters apart and are placed 50 meters apart on each line, extending roughly 200 meters in all directions from the outplanting. This layout is in accordance with the New Zealand Department of Conservation's (DOC) recommendation for trap placement.

The objective of this trial is to systematically collect data regarding trap performance, rat activity levels and ecological response to the traps. This data is being compared to two neighboring areas: Kahanahāiki, where 464 traditional Victor snap traps are set in a grid across 64 acres; and Kapuna, a control area with no rat control measures currently in place. Preliminary data is promising despite record high levels of rats in the area this winter. The automatic traps at Pahole have eliminated 497 rats, which is more than twice the rats per acre eliminated by the snap traps at nearby Kahanahāiki. Additionally, rat activity inside Pahole is decreasing relative to the Kapuna control area (based upon animal tracking data). Finally, predation on *C. superba* fruit did not increase by the same magnitude this year in Pahole as it did in Kahanahāiki.

Further comparison between the Pahole automatic trap trial and the snap trap grid in Kahanahāiki indicates that automatic rat traps may have the potential to reduce labor costs for natural resource managers in Hawai'i. It currently takes four staff to reset (and re-bait) all 464 Kahanahāiki snap traps biweekly, and typically fewer than 60 rats are eliminated each month. Since 2009, the average labor cost for installing and maintaining this snap trap grid each year has been more than $40,000.

If automatic traps were used in a grid layout of 100 meters by 50 meters, as recommended by the

Snap Traps vs. Automatic Traps in Pahole and Kahanahāiki Grids



New Zealand DOC, then only 54 traps would be needed in the Kahanahāiki management unit. At the high catch rate of 60 rats per month in Kahanahāiki, 21 months would pass before all traps would need new CO_2 cartridges. In reality, the traps could be checked two to four times per year by two to four staff to refresh the bait and replace CO_2. This roughly equates to less than 20% of the labor currently required for snap trap grid maintenance.

Finding bait that lasts as long as possible is crucial to maximizing the effectiveness of both traditional snap traps and automatic traps. The utility of the automatic traps is dependent on finding an ideal lure that is both attractive to rats and long-lasting. The bait is contained in a compartment at the top of the trap, behind the trigger, and is virtually inaccessible to the rats. The jars can be filled with a variety of baits, including peanut butter, frosting or even scented oils. Currently, the OANRP is using peanut butter in the jars because it has proven to be very attractive to rats; however, peanut butter does not have the longevity desired to maximize the utility of

The effectiveness of traditional snap traps is reduced as baits mold, making them unattractive to rats, or as baits are consumed by other speices, such as the leopard slug (*Limax maximus*) shown here. (Photo by OANRP staff)

the automatic traps. The OANRP is currently investigating other types of attractants, including scented waxes and oils.

Even with the high cost per trap ($123 each), the OANRP is optimistic that the automatic traps could reduce long-term costs for maintenance of rat control grids and foresees their greatest utility in remote areas that are typically accessed by helicopter. Given rats' varied eating behaviors (*e.g.*, some feed in trees while others feed on the ground), it is difficult to

Rats (*Rattus* spp.) prey on endangered plants such as *Cyanea grimesiana* subsp. *obatae* (*upper/lower left*) and Cyanea acuminata (*upper/lower right*). (Photos by OANRP staff)

predict how rats will behave across different terrains. Using a variety of control methods, including automatic traps, snap traps and bait boxes, may be the best solution in the effort to control this pest. Ultimately, decisions regarding future rat control strategies must be made by weighing options and assessing the costs and benefits of using each type of trap. While the data in Hawai'i is not yet ready for such a cost-benefit analysis, the *C. superba* in Pahole are benefitting from reduced rat predation thanks to this trapping trial. The OANRP looks forward to sharing trial results and the program's trapping efforts with other organizations dedicated to island ecosystem conservation at this year's Hawai'i Conservation Conference, July 16-18, at the Hawai'i Convention Center. •

Katie Franklin is a small vertebrate pest specialist with the O'ahu Army Natural Resources Program.

This project is one of several in Hawai'i and across the world conducted by conservation organizations to assess the utility of the Goodnature® traps across different landscapes. The DOC in New Zealand has led the way on investigating the use of automatic traps as a management tool to control invasive pests such as possums (Trichosurus vulpecula), stoats (Mustela erminea) and rats (Rattus spp.*) that prey on the native species of their island nation. The DOC provides a valuable source of information for the OANRP and other conservation organizations in Hawai'i.*

Preserving the Past for the Future: The Role of Archaeologial Curation in Cultural Resource Management

By Jill Sommer

Stone artifacts, recovered from Schofield Barracks in 2010, are labeled and processed in the O'ahu Army Cultural Resources Program lab. (Photo by OACRP)

THE O'AHU ARMY Cultural Resources Program (OACRP), established by the U.S. Army Garrison-Hawaii in 1995, is charged with managing cultural resources on Army lands on O'ahu. Identification and protection of archaeological sites is one of the major responsibilities of the program. The information and objects collected from cultural sites provide clues that help archaeologists determine a function or use of a site and evaluate its potential historical significance. Collected information can also help define questions for future research. Significant archaeological sites are recommended for preservation as an important part of Hawai'i's unique cultural history; however, some sites cannot always be preserved in their current state. Archaeological sites can be impacted by naturally occurring erosion, invading vegetation, pedestrian and animal traffic, and human activities that cause ground disturbance. Curation after site investigation is an important component to help mitigate these impacts and preserve the record of a particular site that may have been altered due to change in land use.

An environmental control system at the Schofield Barracks Curation Facility regulates temperature and humidity levels to prevent deterioration and maintain the integrity of the collection. (Photo by OACRP staff)

Federal law, regulations and Army-wide guidance require Army installations to curate archaeological collections recovered from Army-owned and managed lands. Locally, the OACRP takes a collaborative approach to ensure all aspects of an archaeological investigation are preserved for future reference. Curation of archaeological collections involves the preservation of artifacts, documentation produced in the recovery of those artifacts and other project documents, to include: field records, field maps, journals, photo documentation, laboratory findings and professional project reports. Following appropriate curation guidelines increases survivability of collections, allowing them to be available for scientific research, public education and potential cultural use in the future.

Archaeological curation is an ongoing process that begins well before archaeologists enter the field. Most of the time, archaeological fieldwork actually begins with archival records. The preliminary research for a project helps determine what might be found in a given area and suggests what methods are likely to be most effective for fieldwork.

This background research involves a study of the local history, review of historical maps of the area, a search for known archaeological or historic properties in the vicinity and a review of the environmental setting of the study area. For example, a review of a historical map of the area now known as Pililā‘au Army Recreation Center (PARC), or “Rest Camp” to local residents, illustrates distinctive features of the early nineteenth century coastline including heiau (temples), houses and fishponds (Fig. 1).

In the field, the provenience (location within an archaeological site) of artifacts and features is important to understanding the use, function, significance and relative age of the site. The place where an artifact is found, including the soil, the site type, the layer from which it was found and additional items found within the same layer, provides context. Context is important for gathering clues about how an area was utilized in the past and about the people who lived there.

Curation guidelines provide protection for archaeological collections when they are recovered. Keeping provenience information intact begins in the field by properly labelling and inventorying all items; this data is compiled in the laboratory as items are processed. Collections without original supporting documentation are of less scientific value and render the time and effort spent excavating materials, collecting information and documenting the process useless. If an artifact is taken out of its context, information about its history, use and possible maker is absent. Evidence gathered during a 1984 PARC project, which included pōhaku lūhe‘e (stone sinkers used for octopus lures), supported local and historical knowledge of fishing practices in Pōka‘ī Bay.

Prior to 2009, various permitted archaeological contractors were responsible for the long-term curation of much of the material recovered from Army lands on O‘ahu. This caused challenges with consistent curation standards and access to collec-

Hawaiians were skilled fishermen and used stones and coral to make weights and anchors. Pōhaku lūhe‘e (stone sinkers for octopus lures) were used along with wooden shafts, cowrie shells and hooks to complete a lure (*top left*). These pōhaku lūhe‘e (*top right*) were recovered from the PARC excavation in 1984. (Photo by OACRP staff)

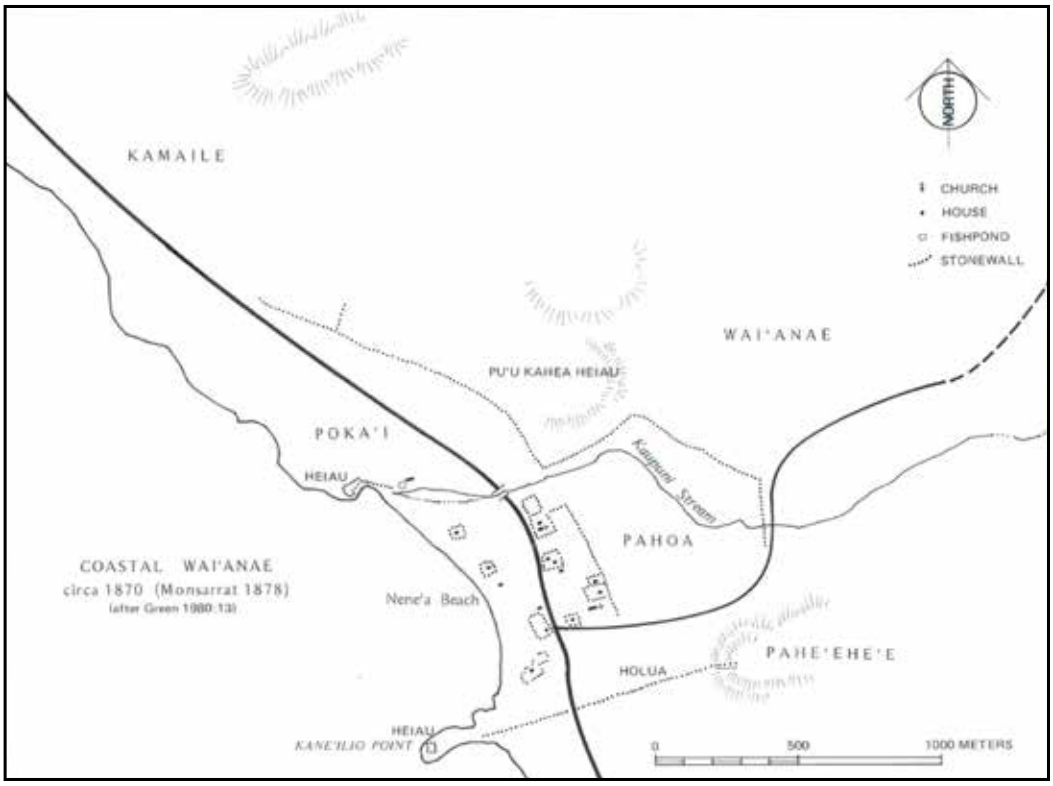


Fig. 1. Today Pililā‘au Army Recreation Center is a recreation facility for service members and their families located along the shoreline of Pōka‘ī Bay, in the Wai‘anae District of western O‘ahu. However, this early map shows how the coastal area of Wai‘anae Kai looked back in the late 19th century.

tions. The OACRP began reclaiming archaeological collections in 2004 and, in the summer of 2009, established a small curation facility on Schofield Barracks to provide consistent management in a central repository and to increase the standard of care for the material.

In addition to managing collections in the curation facility, the OACRP also manages a variety of reference materials that aid archaeologists, architectural historians and other programs in finding information that may be useful to their current projects.

The laws and guidelines that have been enacted to protect cultural resources all contain a component of time: artifacts must be preserved for the future. The OACRP's curation program operates with respect for the cultures represented in the collections and respect for future generations that can use the collections to conduct additional scientific research as emerging technology becomes available.

As the field of archaeology and scientific technologies advance, we learn new lessons in the preservation and study of artifacts. These innovations will lead to further opportunities for public education, increased knowledge, and connection with Hawai'i's cultural traditions. •

Jill Sommer is a curator with the
Oʻahu Army Cultural Resources Program.

For more information about the Oʻahu Army Cultural Resources Program, please visit: http://www.garrison.hawaii.army.mil/sustainability/CulturalResources.aspx.

The Schofield Barracks Curation Facility is located within the historic Schofield Fire House. The Oʻahu Army Cultural Resources Program maintains an extensive library and archives that include a large collection of historic maps, engineering drawings and numerous artifacts. (Photo by OACRP staff)

The O'ahu Army Natural Resources Program Celebrates Earth Month

Paint native! Keiki at Schofield Earth Day enjoyed painting native Hawaiian plants and animals on large canvas murals. (Photo by OANRP staff)

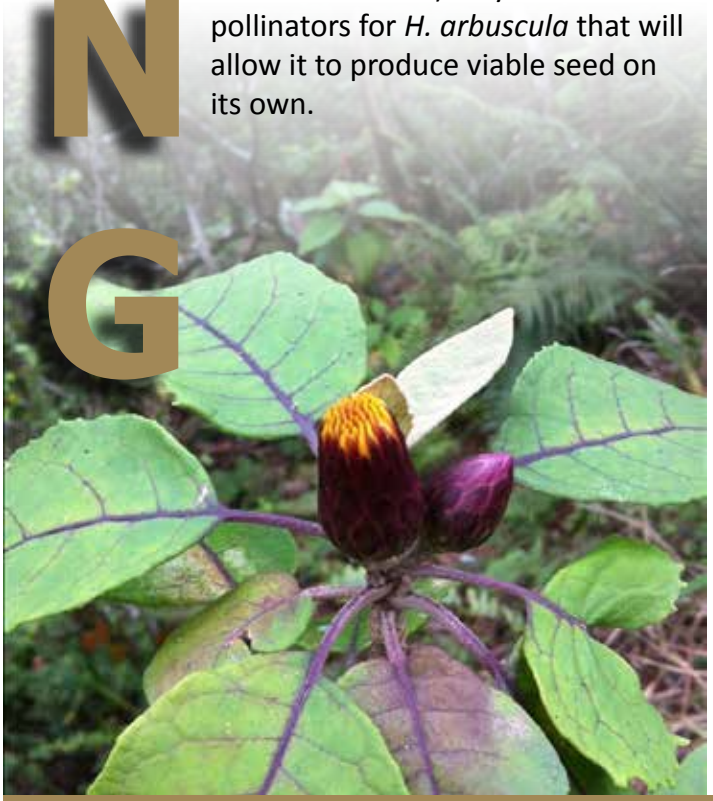
PEOPLE FROM ALL over the world celebrate Earth Month in April. While Earth Month is every month for the staff at the O'ahu Army Natural Resources Program (OANRP), we made a special effort to celebrate at several Earth-honoring events: Schofield Family Fun Fest (March 20), Schofield Earth Day (April 24) and Fort Shafter Fun Fest (April 27). The OANRP and the O'ahu Army Cultural Resources Program (OACRP) also organized a volunteer trip to Kahuku Training Area for Soldiers on Earth Day (April 22) to clear invasive weeds around a heiau, as well as in endangered nīoi (*Eugenia koolauensis*) habitat. The OANRP and OACRP send a big mahalo to all Soldiers who volunteered at Kahuku, to the staff at the U.S. Army Garrison Hawai'i Directorate of Public Works for organizing several Earth Month events, and to all of the community members who made it out to celebrate the earth this April!

Exploring nature and culture at Kahuku Training Area (KTA): Jaime Raduenzel, outreach specialist with the O'ahu Army Cultural Resources Program, shares about a large heiau with Soldiers at KTA before working to clear invasive weeds with the group. (Photo by OANRP staff)

'Tis the Season...

SPRING

To view the budding flowers of outplanted *Hesperomannia arbuscula*. Listed as endangered in 1991, *H. arbuscula* can be found growing in mesic forests on upper gulch slopes or ridge tops in the Wai'anae Mountains. The O'ahu Army Natural Resources staff has resorted to hand-pollinating this species so that it will produce viable seeds for propagation. The progeny of the hand-pollinated plants have been raised in OANRP rare plant nurseries and planted in the ground at three locations in the Wai'anae mountains. This year three of these plants have reached maturity, flowering for the first time since the program outplanted this species. OANRP staff hope that eventually, after establishing larger numbers of plants at reintroductions sites, synchronous flowering (multiple plants flowering at the same time) may attract pollinators for *H. arbuscula* that will allow it to produce viable seed on its own.



The *Hesperomannia arbuscula* outplantings at Puali'i and Keawapilau are flowering for the first time.

The fruit of the endangered *Hesperomannia arbuscula* is mature when it begins to dry out and fade to brown. (Photo by OANRP staff)

VOLUNTEER *Opportunities*

The O'ahu Army Natural Resources Program offers monthly volunteer service trips to 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.

Photo by Roy Kikuta, OANRP volunteer.

EMP Bulletin

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The success of this newsletter depends on article contributions from the staff of the Oʻahu Army Natural Resources Program, Oʻahu Army Cultural Resources Program, PTA Army Natural Resources Program, and PTA Army Cultural Resources Program. Mahalo to all staff who have contributed to this issue.

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

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