

MAUI OFFSHORE ISLETS BOTANICAL SURVEY

Prepared for:

Department of Land and Natural Resources, Division of Forestry and Wildlife
and
Offshore Islet Restoration Committee

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INTRODUCTION

The offshore islets of Maui are mostly made up of tall near shore sea stacks, with the exception of the cinder cones Puu Ku and Alau, and the tuff cone Molokini. The islets are seabird sanctuaries, managed by the State Department of Land and Natural Resources, Division of Forestry and Wildlife. The Maui islets, though fairly close to the main island of Maui, are very remote due to rough seas which makes boating or swimming dangerous and sheer cliffs. Approach for most is best made via helicopter. Being so inaccessible, these predator free islets are havens for native plants and numerous nesting seabirds. With the exception of Molokini, the only known previous botanical surveys of these islets were done by Robert Hobdy and Kay Kepler in the early 1980's.

On March 7, 2005, an initial reconnaissance helicopter flight was done by Maya LeGrande, Ken Wood, Forest Starr, and Kim Starr to familiarize ourselves with the islets and figure out which ones were feasible for landings. Botanical and arthropod surveys were done from April 4, 2005 through April 6, 2005 by Ken Wood, Forest Starr, and Kim Starr. Maya LeGrande assisted with logistical support. Permission to access the islets was given by Fern Duvall. Additional surveys were done the following year for islets which did not get surveyed in 2005. On April 5, 2006, the islet of Molokini was surveyed. We were accompanied by Chris Swenson who conducted an ordnance survey and by David Preston who conducted an insect survey. On April 22, 2006, the islet of Puu Ku was surveyed. Later that day, we surveyed the small islets at Waianapanapa from the main island using binoculars.

The following report details our findings. For each islet a brief description is given with notes on vegetation, wildlife, threats, and restoration opportunities. Location coordinates follow the datum NAD83 UTM zone 4. A species checklist provides information on presence and abundance for plants observed. An annotated list of the vascular plant species for each islet details the current distribution observed during this survey, historical collections and observations, and recommendations for restoration. Also included for each islet are location maps, and photos showing general landscape and vegetation types. Additional photos of the plants and insects of the Maui offshore islets can be viewed at: <http://www.hear.org/starr>.

METHODOLOGY

Prior to the field work, survey notes of the islets from 1981-1982 by Robert Hobdy and Angela Kay Kepler were reviewed. We also conducted literature searches and checked Bishop Museum's and Smithsonian Institute's online herbariums for historical collections of plants known from the offshore islets of Maui. Plant specimens collected during this survey have been deposited at the National Tropical Botanical Garden (PTBG) and Bishop Museum (BISH). Most islets were approached by helicopter, with the exception of Puu Ku, which we will approach on foot, and Molokini, which we will approach by boat. It usually took several hours to survey each islet. We did walk through surveys noting plant species present and their relative abundance. We also collected insects in our spare time. Insects will be deposited at BISH. For some islets which we were not able to land on, we did helicopter fly-by surveys and scanned for plants with binoculars.

Our goal was to make a list of plants present on the islets, describe their relative abundance, and highlight threats and restoration opportunities. We also made notes of general islet features, birds, arthropods, other wildlife, and observations of importance. Coordinates for the islets are in the datum UTM NAD 83 zone 4. Photos were taken during surveys. Due to wet winters over the past several years, the islets were green and it was a good time to search for plants and insects and see the area at a maximum biomass state. The lack of nesting birds at this time of year also helped by allowing a full survey without disturbing the birds. The weather was mostly sunny and windy, with some high clouds and occasional passing showers, and trade winds blowing about 10-20 mph. In 2006, the weather was similar, though the previous winter was unusually dry in early months (Dec. through late Feb.) with decent rains arriving late in the season (Mar. through Apr.).

RESULTS

During trips in April 2005, we surveyed 12 islets (Mokeehia, Kaemi, Hulu, Keopuka, Moku Hala, Moku Mana, Makoloaka, Moku Huki, Kuhawa Rock, Moku Pipi, Malaeloa Rock, and Alau). Some of these islets (Moku Hala, Makoloaka, Kuhawa Rock, and Malaeloa Rock) were only surveyed from the helicopter and did not receive full on the ground surveys. During our surveys, we recorded the presence and abundance of 73 plant species. There were 38 native plant species and 35 non-native plant species. We made 183 plant collections. While surveying the islets, we took 1,939 digital images. During trips in 2006, we surveyed the following islets (Molokini, Puu Ku, and Waianapanapa). We recorded the presence and abundance of 48 plant species. There were 14 native plant species, 33 non-native plant species, and 1 unknown. We made 52 plant collections. We took 675 digital images. All images can be viewed at "www.hear.org/starr".

Table 1. Total # plants by islet.

TOTALS	Mokeehia	Kaemi	Hulu	Keopuka	Moku Hala	Moku Mana	Makoloaka	Moku Huki	Kuhawa Rock	Moku Pipi	Malaeloa Rock	Waianapanapa	Puu Ku	Alau	Molokini
Total (this survey)	20	6	14	23	6	17	10	33	7	11	2	8	16	23	35
Native #	10	4	7	8	3	9	7	17	5	7	2	4	8	9	9
Native %	50%	67%	50%	35%	50%	53%	70%	52%	71%	64%	100%	50%	50%	39%	26%
Alien #	10	2	7	15	3	8	3	16	2	4	0	4	8	14	26
Alien %	50%	33%	50%	65%	50%	47%	30%	48%	29%	36%	0%	50%	50%	61%	74%

Native Plants

Moku Huki islet had the most number (17) of native plant species, followed by Mokeehia (10), Moku Mana (9), Alau (9), Molokini (9), Keopuka (8), Puu Ku (8), Hulu (7), Makoloaka (7), Moku Pipi (7), Kuhawa Rock (5), Kaemi (4), Waianapanapa (4), Moku Hala (3), and Malaeloa Rock (2). The top five islets with the highest concentrations of

native plants include Malaeloa Rock (100%), Kuhiwa rock (71%), Makoloaka (70%), Kaemi (67%), and Moku Pipi (64%). A few interesting new native plants were found, including *Panicum fauriei* on Mokeehia, lama (*Diospyros sandwicensis*) on Keopuka, akia (*Wikstroemia oahuensis*) on Moku Huki, and maia pilo (*Capparis sandwichiana*) on Alau.

In general, many native species were found on the Maui offshore islets, especially the more common indigenous coastal plants, such as akulikuli (*Sesuvium portulacastrum*), ohelo kai (*Lycium sandwicense*), and naupaka (*Scaevola taccada*), as well as some rare endemic components, such as makou (*Peucedanum sandwicense*), maia pilo (*Capparis sandwichiana*), native grasses (*Panicum fauriei*), ihi (*Portulaca villosa*), and schiedea (*Schiedea globosa*). Previous surveys of these islets were done by Robert Hobdy and Kay Kepler in the early 1980's. Some of the species they recorded, both native and non-native were not found during this survey. In some cases, this is attributable partly due to differing survey methods, such as Keopuka, where Hobdy did his survey by kayak and therefore viewed mostly the lower portions of islets, whereas we landed on the top of most islets by helicopter and therefore viewed mostly the upper portions.

Non-native Plants

Molokini had the highest number of non-native plants (26), followed by Moku Huki (16), Keopuka (15), Alau (14), Mokeehia (10), Moku Mana (8), Puu Ku (8), Hulu (7), Moku Pipi (4), Waianapanapa (4), Moku Hala (3), Makoloaka (3), Kaemi (2), and Malaeloa Rock (0). The islets with the highest concentration of non-native plants include Molokini (74%), Keopuka (65%), Alau (61%), Mokeehia (50%), Hulu (50%), Moku Hala (50%), and Puu Ku (50%), and Waianapanapa (50%). Some of the new invasive non-native plant species found include Port Jackson fig (*Ficus cf. platypoda*) on Keopuka, Chinese banyan (*Ficus microcarpa*) on Moku Huki, Kuhiwa rock, and Moku Pipi, and shoebottom ardisia (*Ardisia elliptica*) on Keopuka, Moku Huki, and Kuhiwa rock.

Some non-native species previously observed in earlier surveys were not found during this survey and may have disappeared or have become rare. For instance, on Mokeehia, both koa haole (*Leucaena leucocephala*) and lantana (*Lantana camara*) were relatively common during Kepler and Hobdy's survey. Yet, there were no koa haole and very few lantana present during our survey. It is hypothesized that these species became rare during the recent drought of the late 1990's. Many new non-native plants were found. A few of these were found in limited numbers and were removed when possible, such as sandbur (*Cenchrus echinatus*). Several other weeds were found in limited distribution (only 1 tree), but due to strong roots could not be removed at the time of survey, including *Ficus cf. platypoda* on Keopuka and *Ficus microcarpa* on Moku Pipi. A return visit to chemically control these species may be warranted to prevent these species from taking over the islet.

Plant Restoration

The Maui offshore islets, though not far from shore, are fairly difficult to approach and helicopter landings are needed for access to most of them. This helps keep the islets relatively pest free, but may also make restoration more costly and complicated. A few

of the islets can be approached by boat including Molokini, Puu Ku, and Alau. Puu Ku can even be accessed on foot or with a short swim. Regular surveys in a time interval which seems appropriate could be done to monitor new weeds and check on the status of native species. Harmful non-native plants could be removed. Native plant species were most abundant on windward sides of the islets and near the ocean where they have a competitive advantage due to harsh salt spray and windy conditions. These areas may be treated as special ecological areas and could be focus points for removing weeds and enhancing native plants. Restoration could start in these areas and work towards weedier areas. Many of the management recommendations we suggest in this paper are drawn from the Laysan restoration plan created by Morin and Conant (1998). A more detailed restoration plan, further following the Laysan plan, could be created for each islet. A non-technical pictorial guide of plants for each islet would assist future workers in identification and management.

Native Wildlife

Birds: The islets are important seabird nesting sites. The following bird observations were made during surveys. Wedge tailed shearwaters (*Puffinus pacificus*) were observed on most of the islets and appeared to be pairing up at the time of the surveys. Some islets, including Mokeehia, Hulu, and Alau were heavily burrowed in areas with often hundreds dug into slopes. Frigatebirds (*Fregata minor palmerstoni*) were observed roosting on Moku Mana and Alau. There were a few brown boobies (*Sula leucogaster plotus*) observed flying near Moku Mana. Other bird species observed on Alau including akeakeke (*Arenaria interpres*) and white tailed tropic birds (*Phaeton lepturus dorotheae*) flying near the islet. Black noddies (*Anous minutus melanogenys*) were commonly observed. An occasional ulili (*Heteroscelus incanus*) and Pacific golden plover (*Pluvialis fulva*) were observed.

Insects: A few native insects were observed on the islets including what appeared to be a native wolf spider (*Lycosa* sp.) on Mokeehia; native palm leaf roller moths (*Omiodes blackburni*) on Alau, and native naupaka moths (*Udea littorea*) on Moku Mana.

Others: In addition to native seabirds and insects found on the islets, we observed many other native species on or near the islets including, native tornatellid (*Tornatellides* sp.) snails on Moku Mana; whales in the ocean, a turtle off of Mokeehia, and many mullusks, fish, and other critters in tide pools.

Non-native Wildlife

Birds: Non-native birds may prey on seabirds and transport fruit of non-native plants from the main island of Maui. Several non-native birds were observed during surveys, including zebra doves (*Geopelia striata*) and rock doves (*Columba livia*) on Hulu; what appeared to be mannakins (*Lonchura* sp.) were heard and observed on Alau.

Insects: Several harmful insects were observed and collected during surveys. The hala scale (*Thysanococcus pandani*) poses a threat to it's host, hala, a dominant component of coastal wet forests in Hawaii. This hala scale was introduced to Maui in 1995, apparently on a shipment of hala brought in to a botanical garden in the Hana area from somewhere

in the western/southern Pacific. Today, the hala scale can be readily observed along the entire windward coast of Maui. Trees inflicted by the hala scale have a yellowish color from afar and when closely examined, leaves are covered with scales. The hala on the islets are not immune to this infestation and hala scale was present on Keopuka, Moku Huki, and Puu Ku. Hala scale has the potential to degrade hala forests on islets, thereby leading to further erosion and opportunities for increased invasion by non-native plant species which take advantage of disturbance and light gaps caused by thinning hala due to the scale damage. Ants were present on all of the islets. Ants are a potential threat to nesting seabirds and native insects due to their painful stings and aggressive feeding habits. The following ants, to mention a few, were found on islets during surveys: tropical fire ants (*Solenopsis geminata*) on Hulu; big headed ants (*Pheidole megacephala*) on Mokeehia, Alau, and Puu Ku; crazy ants (*Paratrechina longicornis*) on Mokeehia, Hulu, Moku Pipi, and Moku Mana; and long legged ants (*Anoplolepis longipes*) on Keopuka.

Others: Skinks were also observed on most of the islets surveyed, though it is not certain whether they were native or not.

ITINERARY

Apr. 4, 2005	Mokeehia
Apr. 4, 2005	Kaemi
Apr. 4, 2005	Hulu
Apr. 5, 2005	Moku Hala (fly-by only)
Apr. 5, 2005	Makoloaka (fly-by only)
Apr. 5, 2005	Kuhiwa Rock (fly-by only)
Apr. 5, 2005	Alau
Apr. 5, 2005	Moku Pipi
Apr. 5, 2005	Keopuka
Apr. 6, 2005	Alau
Apr. 6, 2005	Malaeloa Rock (fly-by only)
Apr. 6, 2005	Moku Huki
Apr. 6, 2005	Moku Mana
Apr. 5, 2006	Molokini
Apr. 22, 2006	Puu Ku (Kii)
Apr. 22, 2006	Waianapanapa (scan from main island)

The islets are presented here in order from north to south.

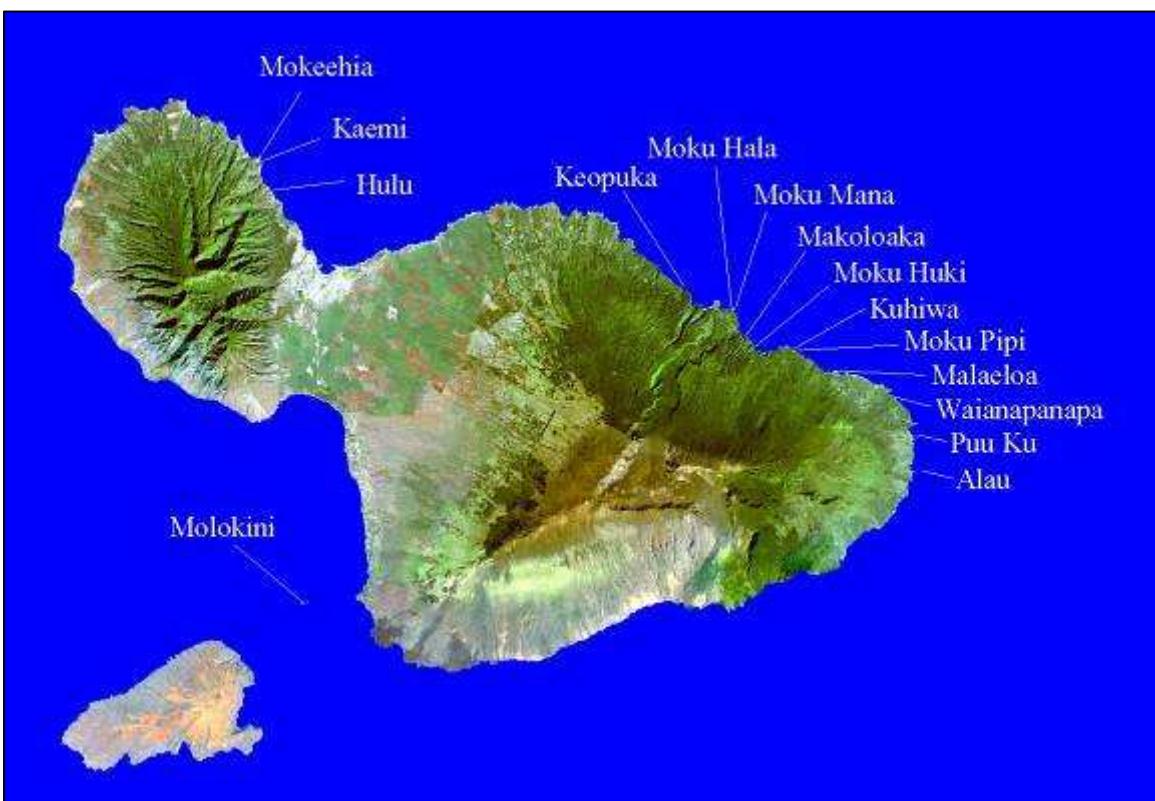


Figure 1. Map of Maui offshore islets.

Table 2. Checklist of plants -- Maui offshore islets.

Scientific name	Common name	Mokeehia	Kaemi	Hulu	Keopuka	Moku Hala	Moku Mana	Makoloaka	Moku Huki	Kuhiwa Rock	Moku Pipi	Malaeloa Rock	Waianapanapa	Puu Ku	Alau	Molokini
<i>Abutilon grandifolium</i>	Hoary abutilon	-	-	X	-	-	-	-	-	-	-	-	-	-	-	X
<i>Ageratum conyzoides</i>	Ageratum	--	--	--	--	--	--	--	--	--	--	--	--	--	--	R
<i>Anagallis arvensis</i>	Scarlet pimpernel	--	--	--	--	--	--	--	--	--	--	--	--	--	--	X
<i>Andropogon contortus</i>	Broom sedge	--	--	--	--	--	--	--	--	--	--	--	--	--	R	--
<i>Ardisia elliptica</i>	Shoebutton ardisia	--	--	O	--	--	--	R	Q	--	--	--	--	--	--	--
<i>Argemone glauca</i>	Pua kala	--	--	--	--	--	--	--	--	--	--	--	--	--	--	X
<i>Artemisia australis</i>	Hinahina	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
<i>Atriplex semibaccata</i>	Australian saltbush	O	X	O	--	--	--	--	--	--	--	--	--	--	--	O
<i>Atriplex suberecta</i>	Saltbush	--	--	--	--	--	--	--	--	--	--	--	--	--	--	X
<i>Bacopa monnieri</i>	Aeae	--	--	--	--	--	--	R	--	U	--	--	--	--	--	--
<i>Bidens hillebrandiana</i>	Kookoolau	--	--	--	--	--	Q	--	--	--	--	--	--	--	--	--
<i>Bidens hillebrandiana</i> subsp. <i>polycephala</i>	Kookoolau	--	--	--	--	R	--	--	--	--	--	--	--	--	--	--
<i>Bidens pilosa</i>	Spanish needles	--	--	--	--	--	--	--	--	--	--	--	--	--	--	X
<i>Boerhavia glabrata</i>	Alena	--	--	--	--	--	--	--	--	--	--	--	--	--	--	X
<i>Boerhavia herbstii</i>	Alena	--	--	--	--	--	--	--	--	--	--	--	--	--	--	X
<i>Boerhavia repens</i>	Alena	--	--	--	--	--	--	--	--	--	--	--	--	O	--	X
<i>Capparis sandwichiana</i>	Maiapilo	--	--	--	--	--	--	--	--	--	--	--	C	R	--	--
<i>Carex wahuensis</i>	Carex	--	--	R/O	Q	O	O	O	O	O	--	--	--	--	--	--
<i>Casuarina equisetifolia</i>	Ironwood	--	--	--	--	--	--	--	--	--	--	--	D	--	--	--
<i>Cenchrus ciliaris</i>	Buffel grass	--	--	--	--	--	--	--	--	--	--	--	--	--	--	D
<i>Cenchrus echinatus</i>	Sand bur	O	--	R	--	R	--	--	--	--	--	--	--	--	--	O
<i>Centella asiatica</i>	Asiatic pennywort	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--
<i>Chamaesyce celastroides</i>	Akoko	X	--	--	--	--	--	--	--	--	--	--	--	--	--	--
<i>Chamaesyce celastroides</i> var. <i>amplectens</i>	Akoko	R	X	--	--	--	--	--	--	--	--	--	--	--	--	--
<i>Chamaesyce hirta</i>	Hairy spurge	--	--	--	--	--	--	--	--	--	--	--	--	--	--	R
<i>Chenopodium murale</i>	Lambs quarters	--	--	--	--	--	--	--	--	--	--	--	--	--	--	O
<i>Chenopodium oahuense</i>	Aweoweo	O	--	X	--	--	--	--	--	--	--	--	--	--	--	--
<i>Chloris barbata</i>	Swollen fingergrass	--	--	O	--	--	--	--	--	--	--	--	--	--	--	O
<i>Chloris</i> sp.	Fingergrass	--	--	--	--	--	--	--	--	--	--	--	--	--	--	X
<i>Chloris virgata</i>	Feather fingergrass	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
<i>Cocculus orbiculatus</i>	Huehue	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
<i>Cocos nucifera</i>	Coconut	--	--	--	--	--	--	--	--	--	--	R	--	Q	--	--
<i>Commelinia diffusa</i>	Honohono	--	--	--	X	--	--	--	--	--	--	--	--	--	--	--
<i>Conyza bonariensis</i>	Hairy horseweed	--	--	--	--	--	--	O	--	--	--	--	R	X	--	--
<i>Cordyline fruitcosa</i>	Ti	--	--	--	--	--	--	O	--	--	--	--	--	--	--	--
<i>Coronopus didymus</i>	Swinecress	--	--	--	--	--	--	--	--	--	--	--	--	--	--	X
<i>Crotalaria incana</i>	Fuzzy rattlepod	--	--	--	--	--	--	--	--	--	--	--	--	--	--	X
<i>Cuscuta sandwichiana</i>	Kaunaaoa	--	--	--	--	--	--	--	--	--	--	--	--	--	--	X
<i>Cyperus cyperinus</i>	Sedge	--	--	--	--	--	--	--	--	--	--	--	--	--	--	X
<i>Cyperus halpan</i>	Cyperus	--	--	--	--	--	--	--	U	--	--	--	--	--	--	--
<i>Cyperus javanicus</i>	Ahuawa	--	X	--	--	--	--	--	--	--	--	--	--	--	--	--
<i>Cyperus phleoides</i>	Cyperus	--	--	R	X	--	Q	--	--	--	--	--	X	R	--	--
<i>Cyperus phleoides</i> var. <i>phleoides</i>	Cyperus	--	--	--	--	--	--	O	--	--	--	--	--	--	--	--
<i>Cyperus polystachyos</i>	Cyperus	--	--	--	--	--	--	O	--	R	--	--	R	X	--	--
<i>Cyperus</i> sp.	Cyperus	--	--	--	--	--	--	--	--	--	--	--	--	X	--	--
<i>Cyrtomium falcatum</i>	Holly fern	--	--	--	--	--	--	Q	R	--	--	--	--	--	--	--

X = Previously observed U = Uncommon R = Rare O = Occasional C = Common D = Dominant

-- = Not observed _ = No collection

Scientific name	Common name	Mokēehia	Kaemi	Hulu	Keopuka	Moku Hala	Moku Mana	Makokoaka	Moku Huki	Kuhia Rock	Mokupipi	Malaeoa Rock	Waianapanapa	Puu Ku	Alau	Molokini
<i>Dactyloctenium aegyptium</i>	Beach wiregrass	: -	-	-	-	-	-	-	-	-	-	-	-	-	-	O
<i>Desmodium incanum</i>	Desmodium	--	--	--	O	--	U	--	--	--	--	--	--	--	--	--
<i>Desmodium sandwicense</i>	Spanish clover	--	--	--	--	--	--	--	--	--	--	--	--	--	--	X
<i>Dianella sandwicensis</i>	Uki uki	--	--	--	X	--	--	Q	--	--	--	--	--	--	--	--
<i>Digitaria ciliaris</i>	Henry's crabgrass	O	--	X	O	O	--	C	--	O	--	Q	O	C	C	X
<i>Digitaria insularis</i>	Sourgrass	O	X	C	--	Q	--	--	--	--	--	--	--	O	R	
<i>Digitaria setigera</i>	Itchy crabgrass	--	--	--	X	--	--	--	--	--	--	--	--	--	X	--
<i>Diospyros sandwicensis</i>	Lama	--	--	--	R	--	--	--	--	--	--	--	--	--	--	--
<i>Doryopteris decipiens</i>	Iwaiwa	--	--	--	--	--	--	--	--	--	--	--	--	--	--	X
<i>Eleusine indica</i>	Wiregrass	C/D	--	C/D	--	O	--	--	O	--	--	O	--	--	C	--
<i>Emilia fosbergii</i>	Pualele	--	--	X	R	--	O	--	Q	--	--	Q	--	O	R	
<i>Erechtites valerianifolia</i>	Fireweed	--	--	--	R	--	--	--	--	--	--	--	--	--	--	--
<i>Ficus cf. platypoda</i>	Port Jackson fig	--	--	--	R	--	--	--	--	--	--	--	--	--	--	--
<i>Ficus microcarpa</i>	Chinese banyan	--	--	--	--	--	--	R	Q	R	--	--	--	--	--	--
<i>Fimbristylis cymosa</i>	Button sedge	R	--	R	X	--	--	X	O	C	--	C	C	X	--	
<i>Fimbristylis cymosa</i> subsp. <i>spathacea</i>	Button sedge	--	--	--	--	O	--	O	--	--	--	--	--	--	--	--
<i>Gamochaeta pupurea</i>	Purple cudweed	--	--	--	--	--	--	--	--	--	--	--	--	--	--	X
<i>Gnaphalium</i> sp.	Gnaphalium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	R
<i>Hedysotis littoralis</i>	Hedyotis	--	--	--	--	--	--	--	--	--	--	--	--	--	X	--
<i>Heliotropium curassavicum</i>	Nena	O	X	--	--	--	--	--	--	--	--	--	--	--	--	O
<i>Heteropogon contortus</i>	Pili grass	--	--	--	--	--	--	--	--	--	--	--	--	--	--	R
<i>Hibiscus tiliaceus</i>	Hau	--	--	--	--	--	--	--	R	--	--	--	--	--	--	--
<i>Ipomoea obscura</i>	Morning glory	--	--	R/O	--	--	--	--	--	--	--	--	--	--	--	--
<i>Ischaemum byrone</i>	Ischaemum	--	--	--	X	--	--	O	Q	U	--	--	X	--	--	--
<i>Jacquemontia ovalifolia</i> subsp.	Pau o hiiaka	--	--	--	--	--	--	--	--	--	--	--	--	O	--	--
<i>Lactuca serriola</i>	Prickly lettuce	--	--	--	--	--	--	--	--	--	--	--	--	--	R/O	--
<i>Lantana camara</i>	Lantana	R	--	R	C	Q	O/C	--	Q	--	--	O	O	O	X	
<i>Lepidium bidentatum</i> var. <i>o-waihiense</i>	Anaunau	--	--	--	--	--	--	--	--	--	--	C	--	--	--	--
<i>Leucaena leucocephala</i>	Haole koa	X	--	--	--	--	--	--	--	--	--	--	--	--	O/C	--
<i>Lipochaeta integrifolia</i>	Nehe	--	X	--	--	--	--	--	--	--	--	--	--	--	--	--
<i>Lipochaeta lavarum</i>	Nehe	--	--	--	--	--	--	--	--	--	--	--	--	--	--	X
<i>Lycium sandwicense</i>	Ohelo kai	O/C	--	O	X	--	--	R	--	O	--	--	--	--	R	
<i>Macroptilium lathyroides</i>	Cow pea	--	--	--	--	--	--	--	--	--	--	--	--	--	--	O
<i>Malva parviflora</i>	Cheeseweed	--	--	--	--	--	--	--	--	--	--	--	--	--	--	O
<i>Malvastrum coromandelianum</i>	Malvastrum	--	--	--	O	--	--	--	--	--	--	--	--	--	--	--
<i>Medicago polymorpha</i>	Bur clover	--	--	--	--	--	--	--	--	--	--	--	--	--	--	X
<i>Merremia aegyptia</i>	Hairy morning glory	--	--	--	--	--	--	--	--	--	--	--	--	--	--	R
<i>Morinda citrifolia</i>	Noni	--	--	--	--	--	--	--	U	--	--	--	--	--	--	--
<i>Nephrolepis exaltata</i> subsp. <i>hawaiiensis</i>	Kupukupu	--	--	--	X	--	--	--	--	--	--	--	--	--	--	--
<i>Nephrolepis multiflora</i>	Sword fern	--	--	--	R	--	--	Q	--	--	--	--	--	R	X	
<i>Nicotiana glauca</i>	Tree tobacco	--	--	--	--	--	--	--	--	--	--	--	--	--	--	C
<i>Opuntia ficus-indica</i>	Panini	--	--	--	--	--	--	--	--	--	--	--	--	--	--	X
<i>Osteomeles anthyllidifolia</i>	Ulei	O	X	--	D	--	Q	Q	Q	--	--	O	--	--	--	--
<i>Oxalis corniculata</i>	Yellow wood sorrel	R	--	O	--	--	--	--	--	--	--	--	--	--	X	X
<i>Pandanus tectorius</i>	Hala	--	--	--	C	--	--	C	--	--	O	--	O	--	--	--

X = Previously observed U = Uncommon R = Rare O = Occasional C = Common D = Dominant

-- = Not observed _ = No collection

Scientific name	Common name	O	Mokeehia	I	Kaemi	I	Hulu	I	Keopuka	I	Moku Hala	I	Moku Mana	I	Makoloaka	I	Moku Huki	I	Kuhia Rock	I	Moku Pipi	I	Malaeoa Rock	I	Waianapanapa	I	Puu Ku	I	Alau	I	Molokini
<i>Panicum faurei</i>	Panicum	O		-		-		-		-		-		-		-		-		-		-		-		-	X				
<i>Panicum faurei</i> subsp. <i>latius</i>	Panicum	--		-		-		-		-		-		-		-		-		-		-		-		-		X			
<i>Panicum pellitum</i>	Kaioio	--		-		-		-		-		-		-		-		-		-		-		-		-		X			
<i>Panicum torridum</i>	Kakonakona	--		-		-		-		-		-		-		-		-		-		-		-		-		X			
<i>Paspalum scorbiculatum</i>	Ricegrass	--		-		O	-	-		C	-	-		-		-		-		-		-		-		-		--			
<i>Paspalum vaginatum</i>	Seashore paspalum	--		-		-		-		-		-		-		-		-		-		-		R	-	-					
<i>Passiflora foetida</i>	Love-in-a-mist	--		-		-		-		-		-		-		-		-		-		-		-	-		R				
<i>Peucedanum sandwicense</i>	Makou	--		-		O	-	-	O	-	-	O	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
<i>Phyllanthus</i> sp.	Phyllanthus	--		-		-		-		R	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
<i>Phymatosorus grossus</i>	Lauae	--		-		C	-	-	O	C	-	-		-	-	-	-	-	-	-	-	-	O/C	-	-						
<i>Pityrogramma austroamericana</i>	Golden fern	--		-		-		-		-		-		-	-	-	-	-	-	-	-	-	-	-	-	-	X				
<i>Pluchea carolinensis</i>	Sourbush	--		-	R	C	-	-	O	-	-	O	-	-	-	-	-	-	C	-	O	-	-	-	-	-					
<i>Pluchea indica</i>	Indian fleabane	--		-	-	-		-	-	-		-		-	-	-	-	-	-	-	-	-	-	-	-	-	R				
<i>Polycarpon tetraphyllum</i>	Polycarpon	--		-	-	-		-	-	-		-		-	-	-	-	-	-	-	-	-	-	-	-	-	R/O				
<i>Portulaca lutea</i>	Ihi	--		-	-	-		-	O	-	-	-		-	-	-	-	-	O	-	O	-	-	-	-	-					
<i>Portulaca molokiniensis</i>	Ihi	--		-	-	-		-	-		-	-		-	-	-	-	-	-	-	-	-	-	-	-	R					
<i>Portulaca oleracea</i>	Pigweed	C	X	C	O	-	O	-	-	O	-	-	O	-	-	O	-	-	O	-	O	C	C	-	-						
<i>Portulaca pilosa</i>	Portulaca	--		-	-	-		-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	O					
<i>Portulaca villosa</i>	Ihi	--		-	-	-		-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	R	X				
<i>Psidium guajava</i>	Guava	--		-	-	-		-	-	-		-	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
<i>Psilotum nudum</i>	Moa	--		-	-	-		-	-	-		U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
<i>Sadleria cyatheoides</i>	Amau	--		-	-	-		-	-	-		X	O	-	-	-	-	-	-	-	-	-	-	-	-	-					
<i>Sadleria pallida</i>	Amau	--		-	-	-		-	-	-		C	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
<i>Scaevola coriacea</i>	Dwarf naupaka	X	--	-	-	-		-	-	-		-	-	-	-	-	-	-	-	-	-	X	-	-	-	-					
<i>Scaevola taccada</i>	Naupaka	X	X	R	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	D	D	C	-	-	-	-					
<i>Schiedea globosa</i>	Maolioli	--		-	-	-		-	-	-		-	-	-	-	-	-	-	-	-	-	O	-	-	-	-					
<i>Schinus terebinthifolius</i>	Christmasberry	R	X	--	D	--	O	Q	--	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
<i>Sesuvium portulacastrum</i>	Akulikuli	C	X	O	X	C	C	Q	C	--	C	C	C	C	C	C	C	C	C	C	O/D	C	O	-	-						
<i>Setaria verticillata</i>	Bristly foxtail	--		X	--	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X					
<i>Sida fallax</i>	Ilima	O	X	--	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C					
<i>Solanum americanum</i>	Popolo	O	X	X	R	--	O	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C					
<i>Sonchus oleraceus</i>	Pualele	O	X	--	X	--	-	-	-	-	-	-	-	-	-	-	-	-	-	-	R	O	R	-	-						
<i>Spathoglottis plicata</i>	Malayan ground orchid	--		-	-	-		-	-	-		R	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
<i>Sphenomeris chinensis</i>	Pala'a	--		-	-	X	--	-	-	-	D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
<i>Sporobolus indicus</i>	Dropseed	--		-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	R	-	-	-	-					
<i>Tournefortia argentea</i>	Beach heliotrope	--		-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	R	-	-	-						
<i>Tribulus cistoides</i>	Nohu	--		-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X					
<i>Tridax procumbens</i>	Coat buttons	--		-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	R					
<i>Verbesina encelioides</i>	Golden crown-beard	--		-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	R					
<i>Vigna marina</i>	Beach pea	--		-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	O	--	-	-						
<i>Waltheria indica</i>	Uhaloa	--		O	--	-	-	-	-	R	--	-	-	-	-	-	-	-	-	-	-	C	-	-	-						
<i>Wikstroemia oahuensis</i>	Akia	--		-	-	-		-	-	-	R	--	-	-	-	-	-	-	-	-	-	-	-	-	-	--					

X = Previously observed U = Uncommon R = Rare O = Occasional C = Common D = Dominant

-- = Not observed _ = No collection

MOKEHIA



Figure 2. Mokekia Islet.

Overview

Mokekia is a relatively large islet, about 6.5 acres in size, rising to about 160 ft. in height, and is located near the coast of West Maui just south of Puu Koae, Kahakuloa. The location coordinates are: 757,234 E 2,322,644 N. The west side facing Maui is steep and slopes down towards the east with a saddle in the middle. There was a seep running down the south side of the slope. The vegetation is sparse, especially in burrowed areas, but was fairly lush from the recent winter rains. A botanical survey of Mokekia was done on Apr. 4, 2005. We (Starr, Starr, & Wood) began our survey around 10:00 am and finished at 2:00 pm. We were dropped by helicopter on the summit and did walk through surveys. The only known survey previously conducted was by A.K. Kepler on July 19, 1981. Notes on species abundance and collections from our survey and from Kepler's survey are included below. It is not certain where her collections are currently stored. They were not found at Bishop Museum or Smithsonian Institute.

Vegetation

Mokekia is made up of a mixture of native and non-native coastal vegetation that is sparse in most areas, especially near heavily burrowed areas towards the summit and upper slopes. These areas appear to have high erosion and disturbance from climatic conditions including wind, waves, and salt spray, as well as from burrowing seabirds.

Mokeehia

Near the summit are scattered patches of aweoweo (*Chenopodium oahuense*), ulei (*Osteomeles anthyllidifolia*), pigweed (*Portulaca oleracea*), wiregrass (*Eleusine indica*), and sandbur (*Cenchrus echinatus*). A few ilima (*Sida fallax*) were observed about the islet. There is one christmas berry (*Schinus terebinthifolius*) near the upper slope that appeared almost dead. The sheer slopes include plants such as aweoweo and ohelo kai (*Lycium sandwicense*) which is commonly observed and often found cascading down walls. The near coast areas include many native species such as akulikuli (*Sesuvium portulacastrum*), ohelo kai, and nena (*Heliotropium curassavicum*). There is a healthy patch of *Panicum faurei* on the north slope near the saddle. Higher on the slope, a few akoko (*Chamaesyce celastroides* var. *amplectens*) were observed in full flower. We did not find any dwarf naupaka (*Scaevola coriacea*), which had been observed in 1981 by Kepler and had also been recently out-planted by the Maui Nui Botanical Garden. Several other plants observed by Kepler were not observed during this survey, including naupaka (*Scaevola taccada*) and koa haole (*Leucaena leucocephala*). Only a few lantana (*Lantana camara*) were observed. Several dead woody plants were observed on the south slope. It is not certain if these were the naupaka or koa haole, or even perhaps ulei (*Osteomeles anthyllidifolia*). Many plants may have decreased during the recent drought during the late 1990's. There was a lot of germination going on and many small cotyledon like plants were seen. During this survey, we observed a total of 20 plant species. There were 10 (50%) native species and 10 (50%) non-native species. We made 29 plant collections.

Wildlife

There were at least several hundred wedge-tailed shearwater (*Puffinus pacificus*) burrows dug into the slopes of the islet. Several dozen pairs of shearwaters, which appeared to be pairing up at the time, were observed in their burrows and flying off to sea. No eggs or young were observed. Insects were abundant. We observed what appeared to be a wasp, which was fairly common, visiting various plants including flowers of akoko. Ants, including big headed ants (*Pheidole megacephala*), were observed all over the islet.

What appeared to be a Hawaiian wolf spider (*Lycosa* sp.) was collected near the coast on the south side. Hawaiian beet webworms (*Spolodea recurvalis*) were observed. We collected an interesting looking micro-lepidoptera from the summit area. We collected other insects by beating and sweeping plants. There were numerous skinks seen scurrying about which were copper in color and about 5 in. long, none were collected. One turtle was observed on the north side in the lee near the coast.

Threats

There are a few non-native plants which could potentially threaten native species. One unhealthy christmas berry (*Schinus terebinthifolius*) tree was observed and could be removed. A relatively small population of *Cenchrus echinatus* exists on the islet near the summit. Most plants were pulled during our survey, though follow up will likely be needed. Control of this species now could help prevent a larger infestation from occurring. Other non-native plant threats include: lantana, sow thistle (*Sonchus oleraceus*), and wiregrass (*Eleusine indica*). A few weeds have increased since the previous survey done by Kepler. For instance, sow thistle went from 1 plant in 1981 to a couple dozen plants today and wiregrass went from uncommon in 1981 to common /

Mokeehia

dominant today. Ants were found over most of the islet and could be a potential threat to nesting seabirds.

Restoration

The non-native invasive plant species could be removed. Native plants that are suitable and found nearby could be added through out-planting. Some of these include the following: dwarf naupaka, awiwi (*Centaurium sebaeoides*), shiedea (*Schiedea globosa*), ohai (*Sesbania tomentosa*), and emoloa (*Eragrostis variabilis*). Seeds of native species could be spread, including aweoweo (*Chenopodium oahuense*) and others. The rare native plants existing on the islet, including panic grass (*Panicum fauriei*) and akoko, could be propagated and out-planted on Mokeehia and other Maui islets.

Mokeehia

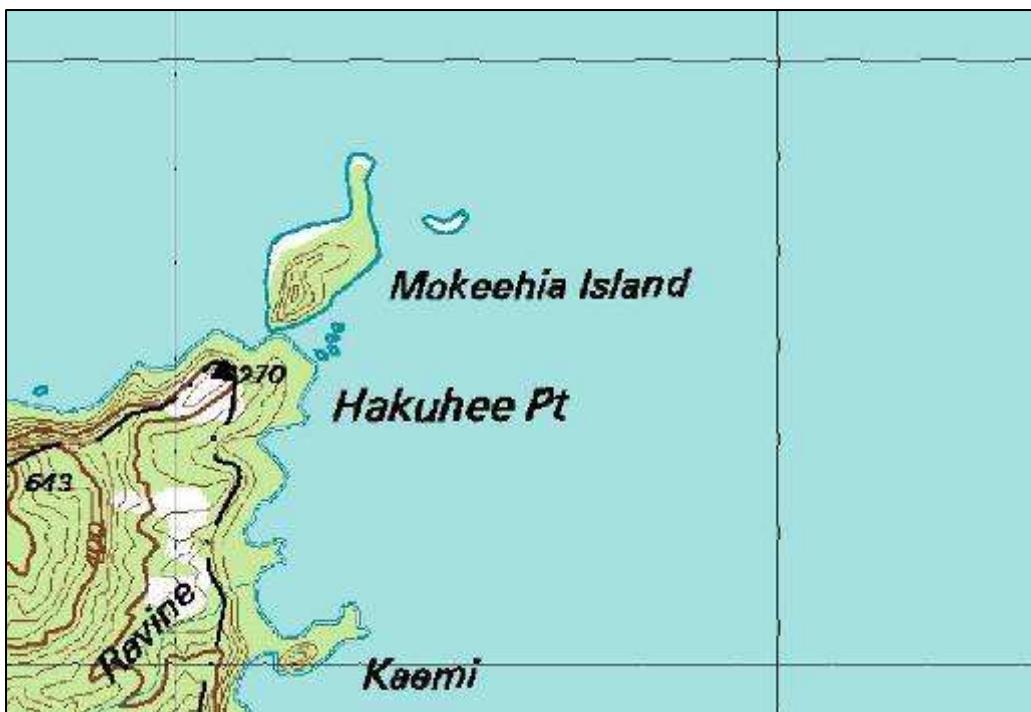


Figure 3. Mokeehia map.



Figure 4. Mokeehia orthophoto.

Mokeehia



Figure 5. Sparse patches of akulikuli (*Sesuvium portulacastrum*) and pigweed (*Portulaca oleracea*) in heavily burrowed areas on north facing slope.

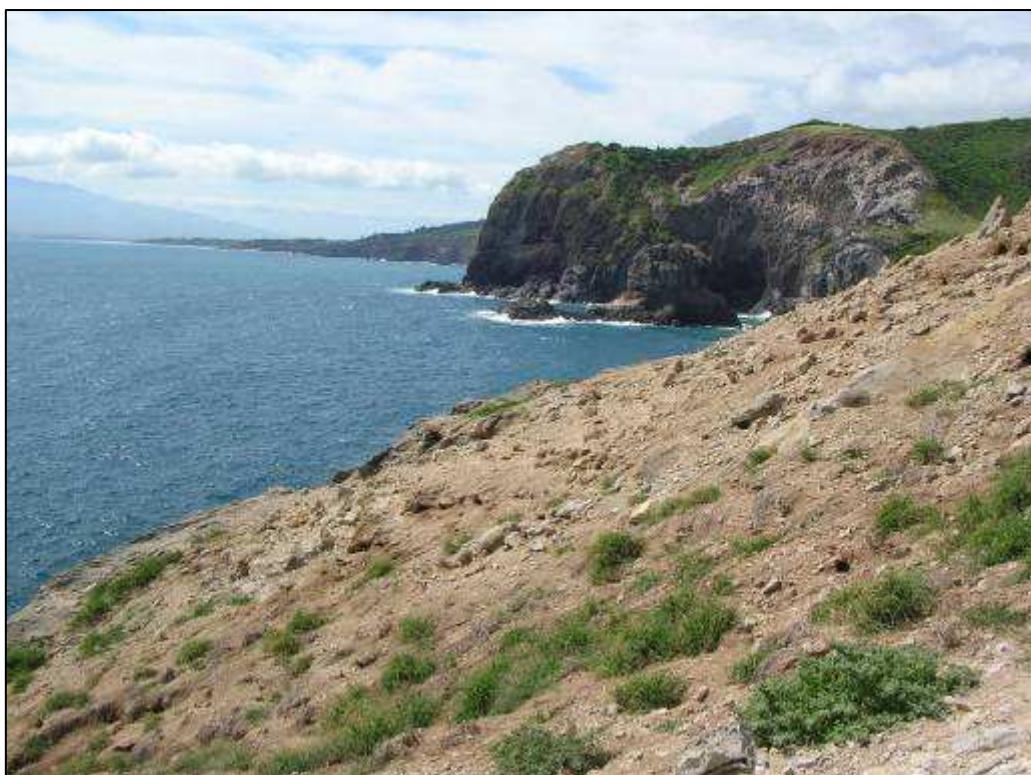


Figure 6. Scattered patches of aweoweo (*Chenopodium oahuense*) and wiregrass (*Eleusine indica*) on south facing slope.

Mokeehia



Figure 7. East point with mats of akulikuli and ohelo kai (*Lycium sandwicense*).



Figure 8. Summit area with mixed grasses including sandbur (*Cenchrus echinatus*), wiregrass (*Eleusine indica*), scattered aweoweo, and ulei (*Osteomeles anthyllidifolia*).

Mokeehia

Annotated Plant List -- Mokeehia

Atriplex semibaccata -- Australian saltbush -- (Chenopodiaceae) -- Alien

Occasional. A few patches scattered here and there. First collected in 1981 by Kepler who noted it as abundant. Collected again during this survey.

19 Jul 1981, Kepler, K. (AKK 21).

4 Apr 2005, Starr, F., K. Starr, & K. Wood (#050404-13), BISH.

4 Apr 2005, Wood, K., F. Starr, & K. Starr (#11180), 9 m (30 ft), herb, matting in areas, vegetative, BISH; PTBG.

Cenchrus echinatus -- Sandbur -- (Poaceae) -- Alien

Occasional. A few seeding patches near summit and on south slope near coast. Most of it was pulled. First collected during this survey.

4 Apr 2005, Starr, F., K. Starr, & K. Wood (#050404-16), BISH.

Chamaesyce celastroides var. *amplectens* -- Akoko -- (Euphorbiaceae) -- Endemic

Rare. A couple flowering plants on south slope, about one-third way up the large hill. First collected as "*Euphorbia celastroides*" in 1981 by Kepler who noted it as uncommon. Collected again during this survey.

19 Jul 1981, Kepler, K. (AKK 18).

4 Apr 2005, Starr, F., K. Starr, & K. Wood (#050404-2), BISH.

4 Apr 2005, Wood, K., F. Starr, & K. Starr (#11183), 9 m (30 ft), shrub, well branched, stems brown-red, on north side of saddle, in flower and early fruit, ca 4 plants observed, BISH; PTBG.

Chenopodium oahuense -- Aweoweo -- (Chenopodiaceae) -- Endemic

Occasional. Scattered here and there. Couple dozen large plants observed. Carpet of seedlings under some dead ones. First collected in 1981 by Kepler who noted it as abundant. Collected again during this survey.

shrub, 25-50 cm tall, many branched, in flower and fruit, occasional

19 Jul 1981, Kepler, K. (AKK 24).

4 Apr 2005, Starr, F., K. Starr, & K. Wood (#050404-6), BISH.

4 Apr 2005, Wood, K., F. Starr, & K. Starr (#11175), 15 m (50 ft), shrub, 25-50 cm tall, many branched, in flower and fruit, occasional, BISH; PTBG.

Digitaria ciliaris -- Henry's crab grass -- (Poaceae) -- Alien

Occasional. In and near saddle between two peaks. Also seen on a sheer area shelf. First collected in 1981 by Kepler who noted it as uncommon. Collected again during this survey.

19 Jul 1981, Kepler, K. (AKK 23).

4 Apr 2005, Starr, F., K. Starr, & K. Wood (#050404-19), BISH.

4 Apr 2005, Starr, F., K. Starr, & K. Wood (#050404-20), BISH.

Digitaria insularis -- Sourgrass -- (Poaceae) -- Alien

Occasional. Scattered over the islet, especially the top where it is tucked in next to rocks. First collected during this survey.

4 Apr 2005, Starr, F., K. Starr, & K. Wood (#050404-18), BISH.

Eleusine indica -- Wire grass -- (Poaceae) -- Alien

Common to dominant. Found over most of the islet. First collected in 1981 by Kepler who noted it as uncommon. Collected again during this survey.

19 Jul 1981, Kepler, K. (AKK 8).

4 Apr 2005, Starr, F., K. Starr, & K. Wood (#050404-17), BISH.

Mokeehia

***Frimbristylis cymosa* -- Button sedge -- (Cyperaceae) -- Indigenous**

Rare. One plant on base of north slope of big hill. It was first observed during this survey, but not collected due to limited abundance. A photo was taken.

***Heliotropium curassavicum* -- Heliotrope -- (Boraginaceae) -- Indigenous**

Occasional. Forming mats on small hill. Scattered plants on ridges and muddy slopes. First collected in 1981 by Kepler who noted it as uncommon. Collected again during this survey.

19 Jul 1981, Kepler, K. (AKK 25).

4 Apr 2005, Starr, F., K. Starr, & K. Wood (#050404-5), BISH.

4 Apr 2005, Wood, K., F. Starr, & K. Starr (#11177), 15 m (50 ft), herb, decumbent stems, leaves blue-green or green-white, occasional, BISH; PTBG.

***Lantana camara* -- Lantana -- Verbenaceae -- Alien**

Rare. Few plants found and pulled. First observed in 1981 by Kepler who noted it as common above 40 m. First collected during this survey.

4 Apr 2005, Wood, K., F. Starr, & K. Starr (#11181), 9 m (30 ft), shrub, 1 m tall, stems light brown, armed with thorns, few plants observed and pulled, BISH; PTBG.

***Leucaena leucocephala* -- Koa haole -- (Fabaceae) -- Alien**

Not observed during this survey. First observed in 1981 by Kepler who noted it as common above 30 m.

***Lycium sandwicense* -- Ohelo kai -- (Solanaceae) -- Indigenous**

Occasional to common. Draping off rocks. Lots of fruit present. First collected in 1981 by Kepler who noted it as common. Collected again during this survey.

19 Jul 1981, Kepler, K. (AKK 9).

4 Apr 2005, Starr, F., K. Starr, & K. Wood (#050404-1), BISH; (#050404-7), BISH.

4 Apr 2005, Wood, K., F. Starr, & K. Starr (#11178), 9 m (30 ft), shrub, 50-70 cm tall, stems gray-brown, long diffuse branching, mature fruit red, calyx yellow-green, scattered on northeastern end of islet, occasional, BISH; PTBG.

***Osteomeles anthyllidifolia* -- Ulei -- (Rosaceae) -- Indigenous**

Occasional. A few patches. One on summit, one of steep west wall, adn some on large east slope. First collected in 1981 by Kepler who noted it as occasional above 30 m.

Collected again during this survey.

19 Jul 1981, Kepler, K. (AKK 17).

4 Apr 2005, Starr, F., K. Starr, & K. Wood (#050404-8), BISH.

4 Apr 2005, Wood, K., F. Starr, & K. Starr (#11176), 15 m (50 ft), shrubs, 30-50 cm tall, decumbent stems brown with red tinge, immature fruit light green, occasional, BISH; PTBG.

***Oxalis corniculata* -- Yellow wood sorrel -- (Oxalidaceae) -- Questionably Polynesian**

Rare. One small patch on south slope near coast. First collected during this survey.

4 Apr 2005, Starr, F., K. Starr, & K. Wood (#050404-12), BISH.

***Panicum fauriei* -- Hawaiian panic grass -- (Poaceae) -- Endemic**

Occasional. Found on north slope of saddle. About a dozen patches. First collected during this survey. The two collections resulted in two different identifications.

Mokeehia

Collection #050504-33 was identified by Derral Herbst as *Panicum fauriei* var. *fauriei*. Collection #11182 was identified by Ken Wood as *Panicum fauriei* var. *latius*.

4 Apr 2005, Starr, F., K. Starr, & K. Wood (#050404-33), BISH.

4 Apr 2005, Wood, K., F. Starr, & K. Starr (#11182), 9 m (30 ft), stems decumbent, scattered plants around northwestern side below saddle, around 50 plants observed, BISH; PTBG.

***Portulaca oleracea* -- Pigweed -- (Portulacaceae) -- Alien**

Common. Scattered, locally common on bottom part of islet. First collected in 1981 by Kepler who noted it as common. Collected again during this survey.

19 Jul 1981, Kepler, K. (AKK 22).

4 Apr 2005, Starr, F., K. Starr, & K. Wood (#050404-14), BISH.

***Scaevola coriacea* -- Dwarf naupaka -- (Goodeniaceae) -- Endemic**

Not observed during this survey. First collected in 1981 by Kepler who noted it as "occasional, 13-23 m., rocky and sandy areas, 15 plants, approx. 130 sq. ft. coverage." In 2002 additional plants were out-planted.

19 Jul 1981, Kepler, K. (AKK 19).

***Scaevola taccada* -- Naupaka -- (Goodeniaceae) -- Indigenous**

Not observed during this survey. First collected in 1981 by Kepler who noted it as occasional.

19 Jul 1981, Kepler, K. (AKK 15).

***Schinus terebinthifolius* -- Christmas berry -- (Anacardiaceae) -- Alien**

Rare. One tree. At its prime it was 2 m tall by 4 m wide. Now highly died back to main main. First collected during this survey.

4 Apr 2005, Starr, F., K. Starr, & K. Wood (#050404-11), BISH.

***Sesuvium portulacastrum* -- Akulikuli -- (Aizoaceae) -- Indigenous**

Common. Forming mats on windward coastal parts of islet. First collected in 1981 by Kepler who noted it as abundant. Collected again during this survey.

19 Jul 1981, Kepler, K. (AKK 19).

4 Apr 2005, Starr, F., K. Starr, & K. Wood (#050404-3), BISH; (#050404-15), BISH

***Sida fallax* -- Ilima -- (Malvaceae) -- Indigenous**

Occasional. Half dozen or so scattered about slopes. First collected in 1981 by Kepler who noted it as uncommon. Collected again during this survey.

19 Jul 1981, Kepler, K. (AKK 16).

4 Apr 2005, Starr, F., K. Starr, & K. Wood (#050404-9), BISH.

4 Apr 2005, Wood, K., F. Starr, & K. Starr (#11184), 9 m (30 ft), shrubs, up to 1 m tall, mostly decumbent stems light brown, leaves blue-green, occasional, BISH; PTBG.

***Solanum americanum* -- Popolo -- (Solanaceae) -- Questionably Indigenous**

Occasional. A few small, succulent plants found about islet. First collected during this survey.

4 Apr 2005, Starr, F., K. Starr, & K. Wood (#050404-10), BISH.

4 Apr 2005, Wood, K., F. Starr, & K. Starr (#11179), 9 m (30 ft), shrub, spreading stems prostrate or short erect, green, corolla white, on northern end, occasional, BISH; PTBG.

***Sonchus oleraceus* -- Sow thistle -- (Asteraceae) -- Alien**

Mokeehia

Occasional. A couple dozen plants scattered about. First collected in 1981 by Kepler who noted it as rare, one only, dead. Collected again during this survey.

19 Jul 1981, Kepler, K. (AKK 26).

4 Apr 2005, Starr, F., K. Starr, & K. Wood (#050404-4), BISH.

KAEMI



Figure 9. Kaemi Islet.

Overview

Kaemi is a small islet just south of Mokeehia approximately 2 acres in size and about 120 ft. tall. The location coordinates are: 757,241 E 2,322,030 N. There is a lower portion and a taller outcrop on the western side. A brief botanical survey of Kaemi was done on Apr. 4, 2005 by Ken Wood who was dropped off on the lower east shelf and spent about 20 min. on the islet.

Vegetation

Vegetation is sparse with a few native plants including naupaka (*Scaevola taccada*), popolo (*Solanum americanum*), ulei (*Osteomeles anthyllidifolia*), and akulikuli (*Sesuvium portulacastrum*). There is some non-native christmas berry (*Schinus terebinthifolius*) and sourgrass (*Digitaria insularis*). During this survey, we observed a total of 6 species. There were 4 (67%) native species and 2 (33%) non-native species.

Threats

The christmas berry could be removed. There were signs of human activity on the islet and it is possible that the islet is one of the easier ones to gain access to from the main island, leading to increased potential for trash, weeds, and trampling.

Restoration

If desired, the christmas berry could be removed and native species could be added either through seed throwing or out-planting.

Annotated Plant List -- Kaemi

***Atriplex semibaccata* -- Australian saltbush -- (Chenopodiaceae) -- Alien**

Not observed during this survey. First collected by Kepler in 1982.

18 Jun 1982, Kepler, K. (AKK 58), BISH 441737.

***Chamaesyce celastroides* var. *amplectens* -- Akoko -- (Euphorbiaceae) -- Endemic**

Not observed during this survey. First collected by Kepler in 1982.

18 Jun 1982, Kepler, K. (AKK 72), BISH 441734.

***Cyperus javanicus* -- Ahuawa -- (Cyperaceae) -- Indigenous**

Not observed during this survey. First collected by Kepler in 1982.

18 Jun 1982, Kepler, K. (AKK 69), BISH 441735.

***Digitaria insularis* -- Sourgrass -- (Poaceae) -- Alien**

Present. First collected by Kepler in 1982.

18 Jun 1982, Kepler, K. (AKK 57, 66, 64, 67), BISH 441736, 441749, 441748, 441733.

***Heliotropium curassavicum* -- Heliotrope -- (Boraginaceae) -- Indigenous**

Not observed during this survey. First collected by Kepler in 1982.

18 Jun 1982, Kepler, K. (AKK 71), BISH 441746.

***Lipochaeta integrifolia* -- Nehe -- (Asteraceae) -- Endemic**

Not observed during this survey. First collected by Kepler in 1982.

18 Jun 1982, Kepler, K. (AKK 63), BISH 441742.

***Osteomeles anthyllidifolia* -- Ulei -- (Rosaceae) -- Indigenous**

Present. First collected by Kepler in 1982.

18 Jun 1982, Kepler, K. (AKK 62), BISH 441741.

***Portulaca oleracea* -- Pigweed -- (Portulacaceae) -- Alien**

Not observed during this survey. First collected by Kepler in 1982.

18 Jun 1982, Kepler, K. (AKK 60), BISH 441739.

***Scaevola taccada* -- Naupaka -- (Goodeniaceae) -- Indigenous**

Present. First collected by Kepler in 1982.

18 Jun 1982, Kepler, K. (AKK 68), BISH 441744.

***Schinus terebinthifolius* -- Christmas berry -- (Anacardiaceae) -- Alien**

Present. First collected by Kepler in 1982.

18 Jun 1982, Kepler, K. (AKK 73), BISH 441747.

***Sesuvium portulacastrum* -- Akulikuli -- (Aizoaceae) -- Indigenous**

Present. First collected by Kepler in 1982.

18 Jun 1982, Kepler, K. (AKK 70), BISH 441745.

***Sida fallax* -- Ilima -- (Malvaceae) -- Indigenous**

Not observed during this survey. First collected by Kepler in 1982.

18 Jun 1982, Kepler, K. (AKK 65), BISH 441743.

***Solanum americanum* -- Popolo -- (Solanaceae) -- Questionably Indigenous**

Present. First collected by Kepler in 1982.

18 Jun 1982, Kepler, K. (AKK 61), BISH 441740.

***Sonchus oleraceus* -- Sow thistle -- (Asteraceae) -- Alien**

Not observed during this survey. First collected by Kepler in 1982.

18 Jun 1982, Kepler, K. (AKK 59), BISH 441738.

Kaemi

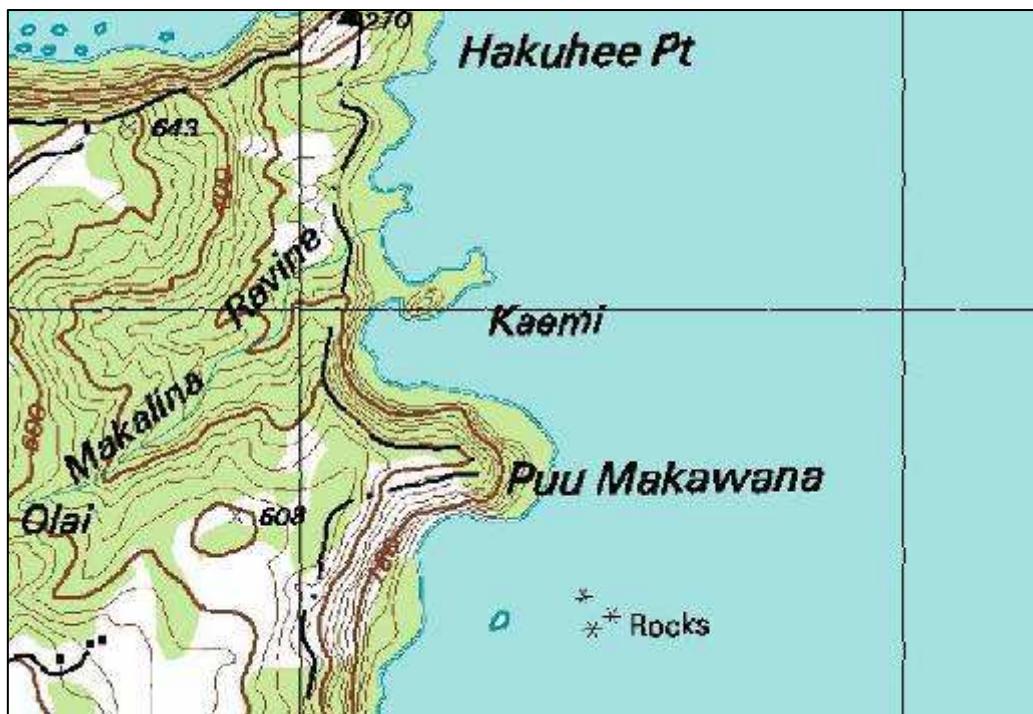


Figure 10. Kaemi map.

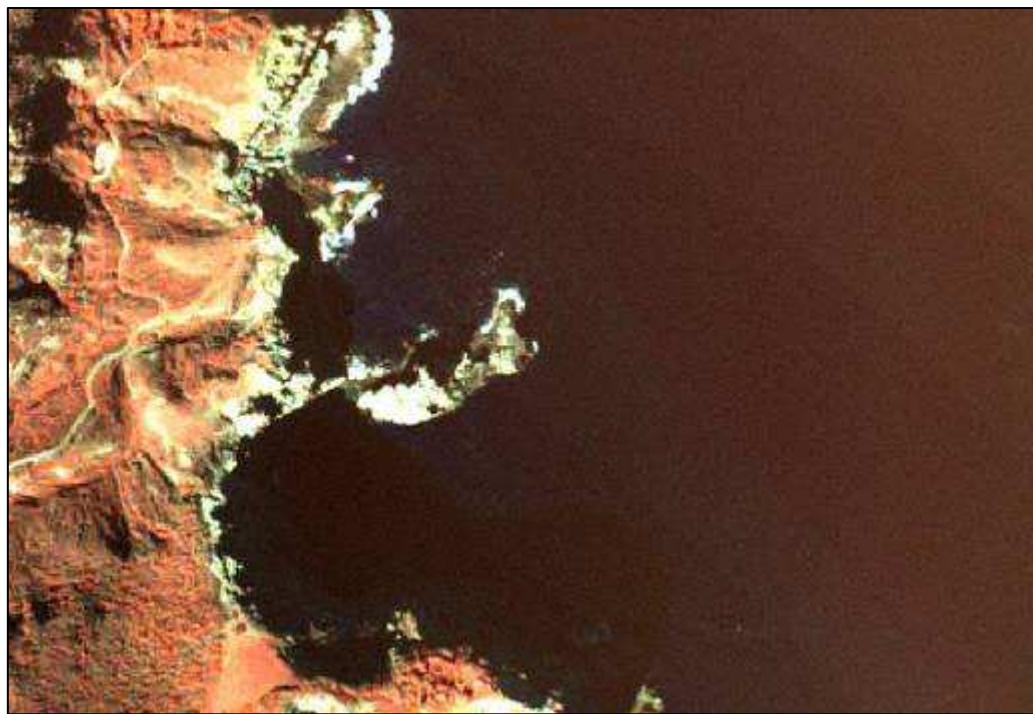


Figure 11. Kaemi orthophoto.

HULU



Figure 12. Hulu Islet.

Overview

Hulu islet, approximately 1.25 acres in size and reaching a height of about 100 ft., is located north of Waihee Pt., West Maui, fairly close to the main island with several basalt outcrops in the ocean nearby. The location coordinates are: 758,177 E 2,319,493 N. It is an oblong shaped sea stack made up of three main layers, with a prominent ridge running down the length of the islet. It is similar to Mokeehia, but is smaller in size. We (Starr, Starr, & Wood) landed by helicopter on the lower area on the east side near the coast and did a botanical survey on April 4, 2005. The only known previous survey was conducted by A.K. Kepler on August 20, 1981. Notes on species abundance and collections from our survey and from Kepler's survey are included below.

Vegetation

The islet is fairly weedy and was mostly covered in wiregrass (*Eleusine indica*). Mixed in with the wiregrass are patches of uhloa (*Waltheria indica*). Near the coast are native species including akulikuli (*Sesuvium portulacastrum*), button sedge (*Fimbristylis cymosa*), and naupaka (*Scaevola taccada*). There are a few healthy patches of ohelo kai (*Lycium sandwicense*) often cascading down sheer slopes. Near the top of the islet are a few clumps of a native sedge (*Cyperus phleoides*). We also observed a small plant of sourbush (*Pluchea carolinensis*) near the top but it was too steep to collect it, and a few lantana bushes (*Lantana camara*). There was one plant of the weedy morning glory (*Ipomoea obscura*) on the south side that was pulled, but will likely need follow up

Hulu

control. During this survey, we observed a total of 14 plant species. There were 7 (50%) native species and 7 (50%) non-native species. We collected 13 plant specimens.

Wildlife

The following birds were observed: one zebra dove (*Geopelia striata*), a few rock doves (*Columba livia*) that flushed from a ledge on the south side of the islet, and about several hundred wedge-tailed shearwater (*Puffinus pacificus*) burrows. Shearwaters were pairing up with some adults in burrows and some that flew out of burrows to sea. Insects were not as abundant as on Mokeehia. The following insects were noted: ants, including tropical fireants (*Solenopsis geminata*); white lined sphinx larva (*Agrius cingulata*) on pigweed (*Portulaca oleracea*); uhaloa moths (*Eublemma accedens*); the same small micro-lepidoptera that was collected on Mokeehia was also observed on Hulu, but was not collected. Skinks were observed.

Threats

A few other weedy species that exist on the islet in limited abundance include sourbush and lantana. These could be removed before they become more widespread. A few other non-native plant threats that are found on Hulu or have been found there in the past include: Australian saltbush (*Atriplex semibaccata*), hoary abutilon (*Abutilon grandifolium*), fingergrass (*Chloris barbata*), Henry's crabgrass (*Digitaria ciliaris*), sourgrass (*Digitaria insularis*), wiregrass (*Eleusine indica*), pualele (*Emilia fosbergii*), weedy morning glory, pigweed (*Portulaca oleracea*), and bristly foxtail (*Setaria verticillata*). Other potential threats include rock doves, which are large fruit eating birds that have the potential to bring weedy non-native species from nearby areas of Maui, and tropical fireants, which are aggressive stinging ants that could potentially have a negative effect on nesting seabirds.

Restoration

Areas exposed to harsh salt spray tend to have more native species which are tolerant of these conditions. Restoration could begin in these areas. The few weeds in limited distribution, such as sourbush and lantana could be removed. Native species could be encouraged to spread by removing weeds and through out-planting and seed throwing.

Hulu

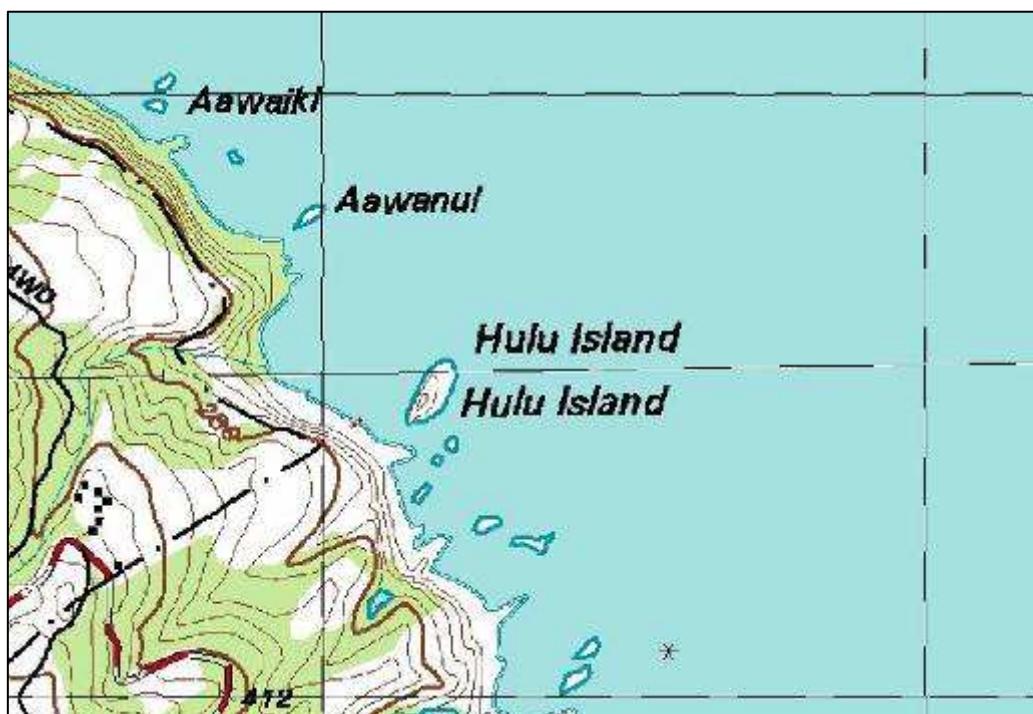


Figure 13. Hulu map.

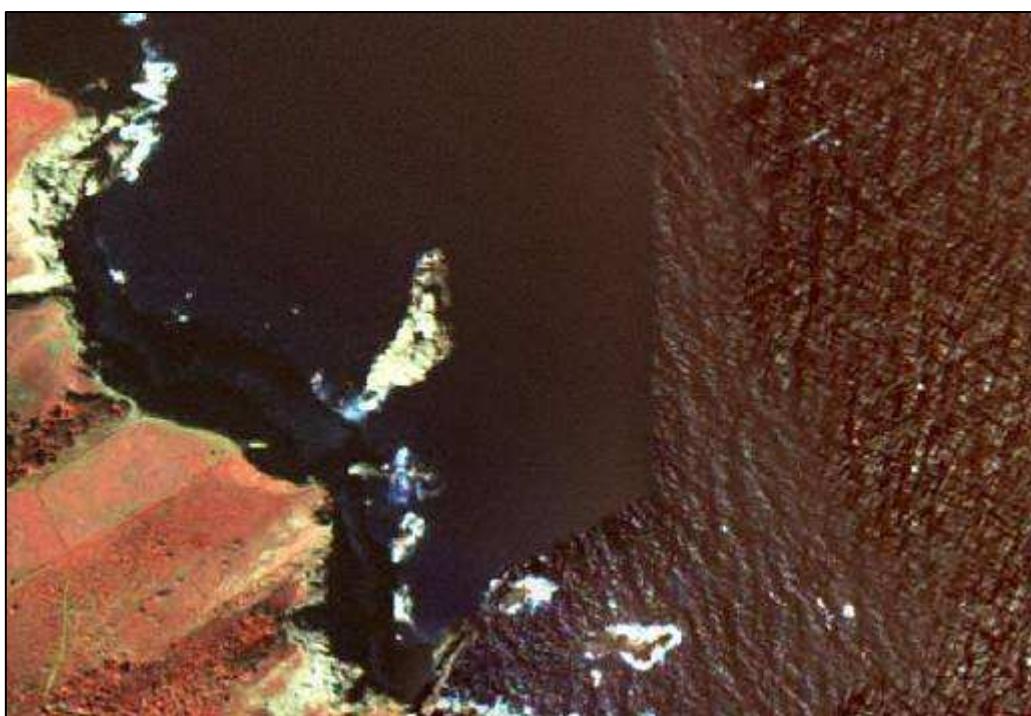


Figure 14. Hulu orthophoto.

Hulu



Figure 15. Southeast side of islet with mixed wiregrass (*Eleusine indica*) and uhaloa (*Waltheria indica*).



Figure 16. View toward coast from summit with sourgrass (*Digitaria insularis*) and wiregrass (*Eleusine indica*).

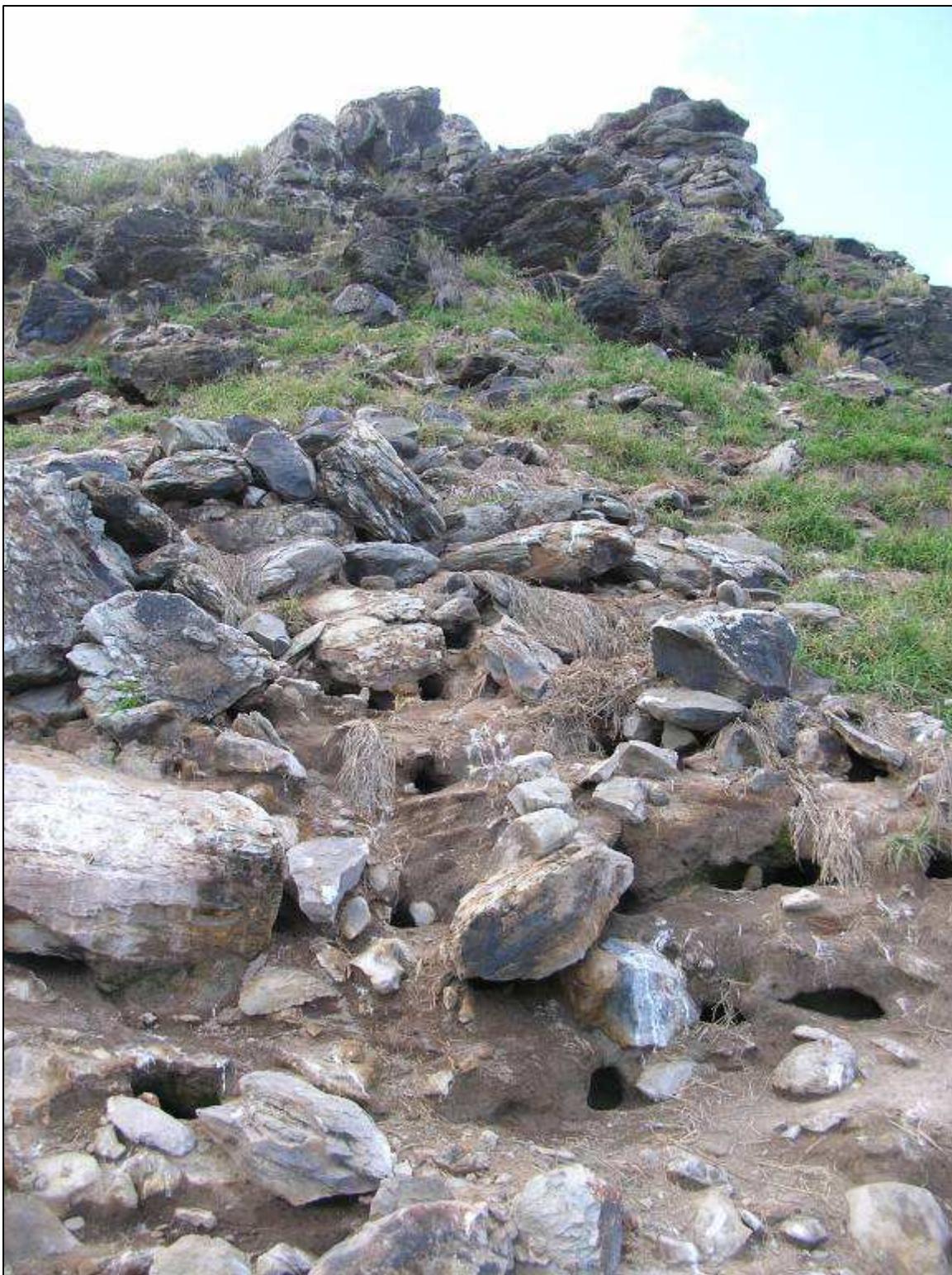


Figure 17. Heavily burrowed slope covered with wiregrass (*Eleusine indica*) and rocky summit area with sourgrass (*Digitaria insularis*) and lantana (*Lantana camara*).

Hulu

Annotated Plant List -- Hulu

Abutilon grandifolium -- Hoary abutilon -- (Malvaceae) -- Alien

Not observed during this survey. First collected in 1981 by Kepler who noted it as rare.
20 Aug 1981, Kepler, K. (AKK 28), BISH 432684.

Atriplex semibaccata -- Australian saltbush -- (Chenopodiaceae) -- Alien

Occasional. A few scattered patches. First collected in 1981 by Kepler who noted it as abundant. Collected again during this survey.

20 Aug 1981, Kepler, K. (AKK 27), BISH 432699.
4 Apr 2005, Starr, F., K. Starr, & K. Wood (#050404-31), BISH.

Chenopodium oahuense -- Aweoweo -- (Chenopodiaceae) -- Endemic

Not observed during this survey. First collected in 1981 by Kepler who noted it as common.

20 Aug 1981, Kepler, K. (AKK 30), BISH 432686.

Chloris barbata -- Swollen fingergrass -- (Poaceae) -- Alien

Occasional. Scattered about. First collected in 1981 by Kepler who noted it as common. Collected again during this survey.

20 Aug 1981, Kepler, K. (AKK 33), BISH 432689.
4 Apr 2005, Starr, F., K. Starr, & K. Wood (#050404-29), BISH.

Cocculus sp. -- Huehue -- (Menispermaceae) -- Indigenous

Not observed during this survey. First collected in 1981 by Kepler who noted it as uncommon.

20 Aug 1981, Kepler, K. (AKK 29), BISH 432685.

Cyperus phleoides -- Cyperus -- (Cyperaceae) -- Endemic

Rare. A dozen or so plants on north slope of summit ridge.

20 Aug 1981, Kepler, K. (AKK 45), BISH 432700.
4 Apr 2005, Wood, K., F. Starr, & K. Starr (#11185), 9 m (30 ft), sedge with woody rhizome, clumping on west side of central ridge, group of 10 plants, BISH; PTBG.

Digitaria ciliaris -- Henry's crab grass -- (Poaceae) -- Alien

Not observed during this survey. First collected in 1981 by Kepler who noted it as occasional.

20 Aug 1981, Kepler, K. (AKK 44), BISH 432702.

Digitaria insularis -- Sourgrass -- (Poaceae) -- Alien

Common. Scattered about, often at the bases of rocks. First collected in 1981 by Kepler who noted it as abundant. Collected again during this survey.

20 Aug 1981, Kepler, K. (AKK 42), BISH 432698.
4 Apr 2005, Starr, F., K. Starr, & K. Wood (#050404-26), BISH.

Eleusine indica -- Wire grass -- (Poaceae) -- Alien

Common to dominant. Covering much of the south slope. First collected in 1981 by Kepler who noted it as occasional. Collected again during this survey.

20 Aug 1981, Kepler, K. (AKK 31), BISH 432687, 432692.
4 Apr 2005, Starr, F., K. Starr, & K. Wood (#050404-30), BISH.

Hulu

***Emilia fosbergii* -- Pualele -- (Asteraceae) -- Alien**

Not observed during this survey. First collected in 1981 by Kepler who noted it as uncommon.

20 Aug 1981, Kepler, K. (AKK 41), as subsp. *umbellato-capitato*, BISH 432703, 432697.

***Fimbristylis cymosa* -- Button sedge -- (Cyperaceae) -- Indigenous**

Rare. A couple plants on north slope of lower portion, near coast. First collected in 1981 by Kepler who noted it as uncommon. Collected again during this survey.

20 Aug 1981, Kepler, K. (AKK 40).

4 Apr 2005, Starr, F., K. Starr, & K. Wood (#050404-32), BISH.

***Ipomoea obscura* -- Morning glory -- (Convolvulaceae) -- Alien**

Rare to occasional. One patch on south side of islet near coast which was pulled. First collected during this survey.

4 Apr 2005, Starr, F., K. Starr, & K. Wood (#050404-25), BISH.

***Lantana camara* -- Lantana -- Verbenaceae -- Alien**

Rare. Two plants at top. First collected in 1981 by Kepler who noted it as occasional. Collected again during this survey.

20 Aug 1981, Kepler, K. (AKK 43), BISH 432704.

4 Apr 2005, Starr, F., K. Starr, & K. Wood (#050404-24), BISH.

***Lycium sandwicense* -- Ohelo kai -- (Solanaceae) -- Indigenous**

Occasional. Cascading off rocks. First collected in 1981 by Kepler who noted it as common. Collected again during this survey.

20 Aug 1981, Kepler, K. (AKK 32), BISH 432688.

4 Apr 2005, Starr, F., K. Starr, & K. Wood (#050404-21), BISH.

***Pluchea carolinensis* -- Sourbush -- (Asteraceae) -- Alien**

Rare. One plant seen on sheer north slope just below summit but out of reach. First observed during this survey.

***Portulaca oleracea* -- Pigweed -- (Portulacaceae) -- Alien**

Common. Found over much of the islet. First collected in 1981 by Kepler who noted it as abundant. Collected again during this survey.

20 Aug 1981, Kepler, K. (AKK 35), BISH 432691.

4 Apr 2005, Starr, F., K. Starr, & K. Wood (#050404-28), BISH.

***Scaevola taccada* -- Naupaka -- (Goodeniaceae) -- Indigenous**

Rare. One patch on the north slope of the lowest part of the islet. First collected in 1981 by Kepler who noted it as uncommon. Collected again during this survey.

20 Aug 1981, Kepler, K. (AKK 36), BISH 432701.

4 Apr 2005, Starr, F., K. Starr, & K. Wood (#050404-22), BISH.

***Sesuvium portulacastrum* -- Akulikuli -- (Aizoaceae) -- Indigenous**

Occasional. Forming mats on bottom part of islet on north slope. First collected in 1981 by Kepler who noted it as common. Collected again during this survey.

20 Aug 1981, Kepler, K. (AKK 34), BISH 432690.

4 Apr 2005, Starr, F., K. Starr, & K. Wood (#050404-27), BISH.

Hulu

***Setaria verticillata* -- Bristly foxtail -- (Poaceae) -- Alien**

Not observed during this survey. First collected in 1981 by Kepler who noted it as uncommon.

20 Aug 1981, Kepler, K. (AKK 39), BISH 432695, 432696.

***Solanum americanum* -- Popolo -- (Solanaceae) -- Questionably Indigenous**

Not observed during this survey. First collected in 1981 by Kepler who noted it as uncommon.

20 Aug 1981, Kepler, K. (AKK 38), BISH 432694.

***Waltheria indica* -- Uhaloa -- (Sterculiaceae) -- Questionably Indigenous**

Occasional. Scattered patches found over most of islet. First collected in 1981 by Kepler who noted it as occasional. Collected again during this survey.

20 Aug 1981, Kepler, K. (AKK 37), BISH 432693.

4 Apr 2005, Starr, F., K. Starr, & K. Wood (#050404-23), BISH.

KEOPUKA



Figure 18. Keopuka Islet.

Overview

Keopuka is a long steep narrow islet about 2 acres in size and 120 ft. tall with a knifelike ridge running through the center. It is located off the coast of east Maui just west of Honomanu. The location coordinates are: 794,198 E 2,310,977 N. The islet is difficult to land on by helicopter and the terrain is severely steep and eroded, making access and getting around the islet challenging. A survey was done by Ken Wood and Forest Starr on April 5, 2005, who were dropped off on the north hump around 1:00pm and picked up around 4:00pm. A previous survey was done from the base of the islet by R. Hobdy on May 16, 1982.

Vegetation

The islet is heavily vegetated with native and non-native plant species. It is made up of a thick tangle of christmas berry (*Schinus terebinthifolius*), hala (*Pandanus tectorius*), lantana (*Lantana camara*), and ulei (*Osteomeles anthyllidifolia*) on the narrow ridge top. There are two lama (*Diospyros sandwicensis*) trees on the south hump. There were two young Port Jackson figs (*Ficus cf. platypoda*) observed on the west wall towards the saddle of the two humps. Scattered under the canopy is lauae fern (*Phymatosorus grossus*). The sides of sheer slopes are slightly less vegetated and include naupaka (*Scaevola taccada*), native sedges (*Cyperus phleoides* and *Carex wahuensis*) and other species, such as makou (*Peucedanum sandwicense*) found closer to the upper portions of sheer walls and akulikuli (*Sesuvium portulacastrum*) closer to the lower wave worn

Keopuka

sections. During this survey, we observed a total of 23 plant species. There were 8 (35%) native species and 15 (65%) non-native species. We made 29 plant collections.

Wildlife

Wedge-tailed shearwaters (*Puffinus pacificus*) were pairing up in burrows. One dead shearwater was observed snagged in lantana (*Lantana camara*). Long legged ants (*Anoplepis longipes*) were present. Pupa cases of *Hyposmocoma* sp. moths were found.

Threats

Several invasive weeds were present including the following: sourbush (*Pluchea carolinensis*), pigweed (*Portulaca oleracea*), christmas berry, inkberry (*Ardisia elliptica*), Henry's crabgrass (*Digitaria ciliaris*), lantana, *Malvastrum coromandelianum*, *Phymatosorus grossus*. The Port Jackson fig, which can grow large and eventually engulf surrounding vegetation, is an invasive epiphytic tree that could be controlled before it becomes larger and more widespread. There is abundant seed source of this *Ficus* species nearby on Maui and future surveys should keep an eye out for more. Other widespread weeds such as lantana and christmas berry would be difficult to completely remove due to access issues and severely steep terrain. The hala scale (*Thysanococcus pandani*) was collected from hala leaves on Keopuka. The presence of hala scale could lead to further degradation of the vegetation of the islet, which in turn would facilitate erosion and invasion by non-native species.

Restoration

Due to limited access and difficult terrain, potential restoration activities are limited. If desired, some of the worst weeds that are still in limited distribution could be removed, such as *Ficus* cf. *platypoda*, shoebottom ardisia (*Ardisia elliptica*), and sanbur (*Cenchrus echinatus*). Rare natives, such as makou (*Peucedanum sandwicense*), could be brought into cultivation and out-planted on other suitable Maui sites. Weeds could be removed from high value sites.

Keopuka

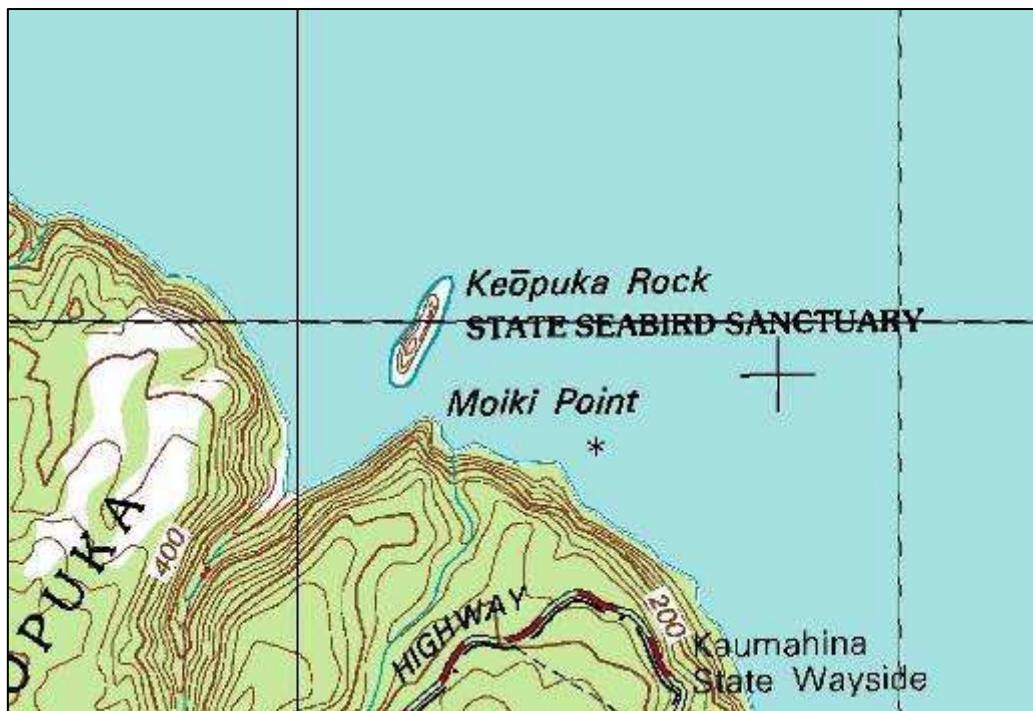


Figure 19. Keopuka map.

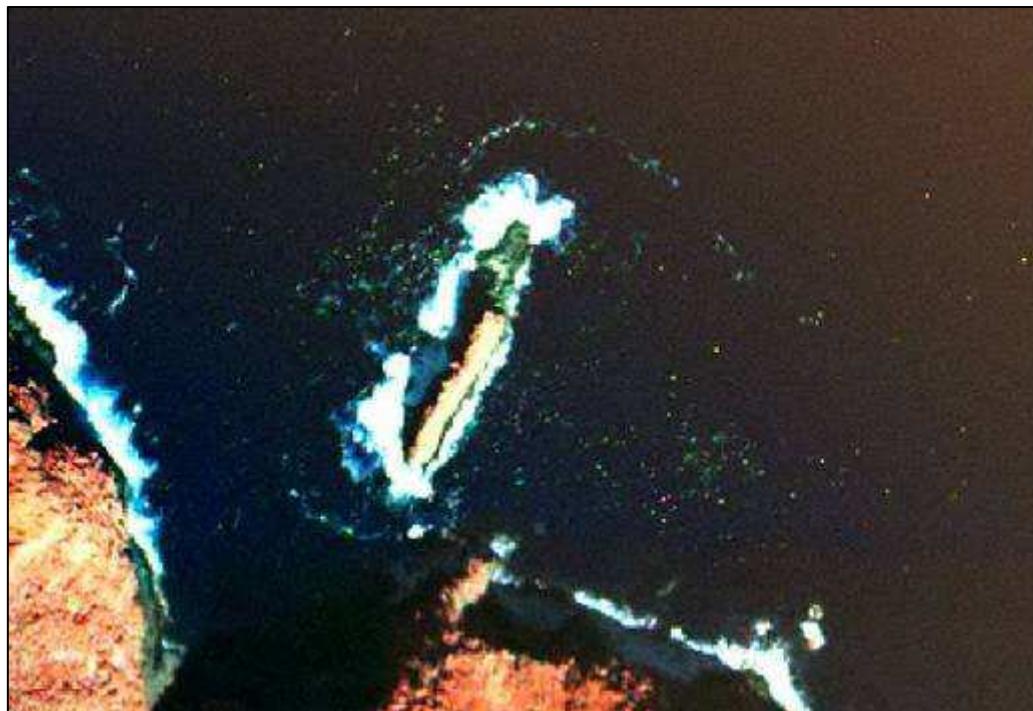


Figure 20. Keopuka orthophoto.

Keopuka



Figure 21. West wall of south hump with scattered hala (*Pandanus tectorius*), ulei (*Osteomeles anthyllidifolia*), and christmas berry (*Schinus terebinthifolius*) on ridge, patches of naupaka (*Scaevola taccada*), and scattered akulikuli (*Sesuvium portulacastrum*), native sedges (*Carex wahuensis* and *Cyperus phleoides*), and makou (*Peucedanum sandwicense*).

Keopuka



Figure 22. Tangle of christmas berry (*Schinus terebinthifolius*) with lauae fern (*Phymatosorus grossus*) underneath.



Figure 23. Knifelike ridge covered with lantana (*Lantana camara*), ulei (*Osteomeles anthyllidifolia*), and christmas berry.



Figure 24. Hala (*Pandanus tectorius*) and sheer west wall where makou (*Peucedanum sandwicense*) is found.

Keopuka

Annotated Plant List -- Keopuka

Ardisia elliptica -- Shoebutton ardisia -- (Myrsinaceae) -- Alien

Rare. A couple plants on ridge of south hump. First collected during this survey.
5 Apr 2005, Starr, F. & K. Wood (#050405-34), BISH.

Artemisia australis -- Hinahina -- (Asteraceae) -- Endemic

Not observed during this survey. First observed in 1982 by Hobdy who noted it as uncommon.

Carex wahuensis -- Carex -- (Cyperaceae) -- Endemic

Rare to occasional. Scattered clumps. First observed in 1982 by Hobdy who noted it as uncommon. First collected during this survey.

5 Apr 2005, Starr, F. & K. Wood (#050405-30), BISH.

5 Apr 2005, Wood, K. & F. Starr (#11193), 15 m (50 ft), clumping sedge along ridge, leaves dark green, culm yellow-green, occasional, BISH; PTBG.

Cenchrus echinatus -- Sandbur -- (Poaceae) -- Alien

Rare. One patch. First collected during this survey.

5 Apr 2005, Starr, F. & K. Wood (#050405-29), BISH.

Commelina diffusa -- Honohono -- (Commelinaceae) -- Alien

Not observed during this survey. First recorded in 1982 by Hobdy who noted it as uncommon.

Cyperus phleoides -- Cyperus -- (Cyperaceae) -- Endemic

Not observed during this survey. First collected in 1982 by Hobdy who called it "Cyperus phleoides var. *phleoides*" and noted it as rare.

16 May 1982. Hobdy, R.W. (#1399), BISH 460004.

Desmodium incanum -- Desmodium -- (Fabaceae) -- Alien

Occasional. At summit of north hill. First collected during this survey.

5 Apr 2005, Starr, F. & K. Wood (#050405-42), BISH.

Dianella sandwicensis -- Ukiuki -- (Liliaceae) -- Endemic

Not observed during this survey. First recorded in 1982 by Hobdy who noted it as uncommon.

Digitaria ciliaris -- Henry's crab grass -- (Poaceae) -- Alien

Occasional. Scattered patches. First observed in 1982 by Hobdy who noted it as abundant. First collected during this survey.

5 Apr 2005, Starr, F. & K. Wood (#050405-35), BISH.

Diospyros sandwicensis -- Lama -- (Ebonaceae) -- Endemic

Rare. Two trees on summit ridge on south hump. Roots highly eroded underneath. First collected during this survey.

5 Apr 2005, Starr, F. & K. Wood (#050405-36), BISH.

5 Apr 2005, Wood, K. & F. Starr (#11195), 15 m (50 ft), tree, 2 m tall, stems black-brown, vegetative, 2 trees observed, BISH; PTBG.

Keopuka

***Emilia fosbergii* -- Pualele -- (Asteraceae) -- Alien**

Rare. One plant seen. First recorded in 1982 by Hobdy who noted it as uncommon. First collected during this survey.

5 Apr 2005, Starr, F. & K. Wood (#050405-37), BISH.

***Erechtites valerianifolia* -- Fireweed -- (Asteraceae) -- Alien**

Rare. A couple plants on west side of summit ridge. First collected during this survey.

5 Apr 2005, Starr, F. & K. Wood (#050405-47), BISH.

***Ficus cf. platypoda* -- Port Jackson fig-- (Moraceae) -- Alien**

Rare. Two trees on sheer west wall. First collected during this survey.

5 Apr 2005, Starr, F. & K. Wood (#050405-40), BISH.

5 Apr 2005, Wood, K. & F. Starr (#11194), 15 m (50 ft), tree, young with established roots spreading into steep slopes, 2 trees observed, BISH; PTBG.

***Fimbristylis cymosa* -- Button sedge -- (Cyperaceae) -- Indigenous**

Not observed during this survey. Likely in lower areas where this survey did not go.

First collected in 1982 by Hobdy who called it "*Fimbristylis cymosa* subsp. *umbellato-capitata*" and noted that it was occasional.

16 May 1982. Hobdy, R.W. (#1397), BISH 460006.

***Lantana camara* -- Lantana -- (Verbenaceae) -- Alien**

Common. Widespread on summit. First observed in 1982 by Hobdy who noted it as occasional. First collected during this survey.

5 Apr 2005, Starr, F. & K. Wood (#050405-46), BISH.

***Lycium sandwicense* -- Ohelo kai -- (Solanaceae) -- Indigenous**

Not observed during this survey. Likely in lower areas where this survey did not go.

First recorded in 1982 by Hobdy who noted it as occasional.

***Malvastrum coromandelianum* -- Malvastrum -- (Malvaceae) -- Alien**

Occasional. Here and there on ridge. First collected during this survey.

5 Apr 2005, Starr, F. & K. Wood (#050405-44), BISH.

5 Apr 2005, Wood, K. & F. Starr (#11191), 15 m (50 ft), sub-shrub, stems brown-green, corolla orange, occasional along ridge, BISH; PTBG.

***Nephrolepis exaltata* -- Nianiau -- (Nephrolepidaceae) -- Endemic**

Not observed during this survey. First observed in 1982 by Hobdy who noted it as rare.

***Nephrolepis multiflora* -- Sword fern -- (Nephrolepidaceae) -- Alien**

Rare. On cinder wall. First collected during this survey.

5 Apr 2005, Starr, F. & K. Wood (#050405-4631), BISH.

***Osteomeles anthyllidifolia* -- Ulei -- (Rosaceae) -- Indigenous**

Dominant. Thick windswept mat along summit ridges. First observed in 1982 by Hobdy who noted it as occasional. First collected during this survey.

5 Apr 2005, Starr, F. & K. Wood (#050405-38), BISH.

5 Apr 2005, Wood, K. & F. Starr (#11192), 15 m (50 ft), shrub, thickly branched, stems dark brown, corolla white, leaves glossy green, immature fruit light green, common, BISH; PTBG.

Keopuka

***Oxalis corniculata* -- Yellow wood sorrel -- (Oxalidaceae) -- Questionably Polynesian**
Occasional. On ridge. First recorded in 1982 by Hobdy who noted it as rare. First collected during this survey.

5 Apr 2005, Starr, F. & K. Wood (#050405-33), BISH.

***Pandanus tectorius* -- Hala -- (Pandanaceae) -- Indigenous**

Common. In saddle of islet. The hala scale (*Thysanococcus pandani*) was present. First observed in 1982 by Hobdy who noted it as occasional. First collected during this survey.

5 Apr 2005, Starr, F. & K. Wood (#050405-41), BISH.

***Paspalum scorbiculatum* -- Ricegrass -- (Poaceae) -- Questionably Indigenous**

Occasional. Scattered patches. First collected during this survey.

5 Apr 2005, Starr, F. & K. Wood (#050405-50), BISH.

5 Apr 2005, Wood, K. & F. Starr (#11190), 15 m (50 ft), clumping grass in large patches, leaves dark green, lower stems with red tinge, spikelets pale green, BISH; PTBG.

***Peucedanum sandwicense* -- Makou -- (Apiaceae) -- Endemic**

Occasional. On sheer walls on west side of islet. First observed in 1982 by Hobdy who noted it as common. First collected during this survey.

5 Apr 2005, Wood, K. & F. Starr (#11189), 9 m (30 ft), herb, stems dark green with white-green nerves, vegetative or in early flower on steep slopes of west side, ca 15 plants observed, BISH; PTBG.

***Phymatosorus grossus* -- Lauae -- (Polypodiaceae) -- Alien**

Common. On ridge. First recorded in 1982 by Hobdy who noted it as occasional. First collected during this survey.

5 Apr 2005, Starr, F. & K. Wood (#050405-49), BISH.

***Pluchea carolinensis* -- Sourbush -- (Asteraceae) -- Alien**

Common. On sheer cliffs. First observed in 1982 by Hobdy who noted it as occasional. First collected during this survey.

5 Apr 2005, Starr, F. & K. Wood (#050405-48), BISH.

***Portulaca oleracea* -- Pigweed -- (Portulacaceae) -- Alien**

Occasional. On ridge. First recorded in 1982 by Hobdy who noted it as common. First collected during this survey.

5 Apr 2005, Starr, F. & K. Wood (#050405-39), BISH.

***Scaevola taccada* -- Naupaka -- (Goodeniaceae) -- Indigenous**

Common. On lower platform of islet. First recorded in 1982 by Hobdy who noted it as common. First collected during this survey.

5 Apr 2005, Starr, F. & K. Wood (#050405-32), BISH.

***Schinus terebinthifolius* -- Christmas berry -- (Anacardiaceae) -- Alien**

Dominant. Dominates the summit ridge, along with Lantana, ulei, and hala. First recorded in 1982 by Hobdy who noted it as occasional. First collected during this survey.

5 Apr 2005, Starr, F. & K. Wood (#050405-45), BISH.

***Sesuvium portulacastrum* -- Akulikuli -- (Aizoaceae) -- Indigenous**

Keopuka

Not observed during this survey. Likely in lower areas where this survey did not go.
First recorded in 1982 by Hobdy who noted it as common.

***Solanum americanum* -- Popolo -- (Solanaceae) -- Questionably Indigenous**

Rare. A couple plants on ridge. First recorded in 1982 by Hobdy who noted it as uncommon. First collected during this survey.

5 Apr 2005, Starr, F. & K. Wood (#050405-43), BISH.

***Sonchus oleraceus* -- Sow thistle -- (Asteraceae) -- Alien**

Not observed during this survey. First recorded in 1982 by Hobdy who noted it as occasional.

***Sphenomeris chinensis* -- Palaa -- (Lindsaeaceae) -- Indigenous**

Not observed during this survey. First recorded in 1982 by Hobdy who noted it as rare.

MOKU HALA



Figure 25. Moku Hala.

Overview

Moku Hala is a narrow steep pyramid shaped columnar basalt rock located west of Moku Mana near Pauwalu Pt., Maui. The location coordinates are: 798,252 E 2,309,154 N. It is approximately 0.2 acres in size and reaches a height of about 55 ft. We did not land due to lack of landing areas. We did a helicopter fly-by on April 5, 2005 and circled around the islet identifying plants using binoculars. The northern side and lower portions are wave worn and most vegetation exists on the southern side and upper portions of the rock.

Vegetation

Moku Hala is covered mostly by naupaka with occasional patches of grass (*Digitaria* spp.) and sedges (*Carex wahuensis*). Akulikuli (*Sesuvium portulacastrum*) is found lowest / closest to ocean. We observed a total of 6 plant species during our fly-by survey. There were 3 (50%) native species and 3 (50%) non-native species.

Threats

The invasive plant *Lantana camara* was observed.

Restoration

The islet is very steep, making access difficult.

Moku Hala



Figure 26. Moku Hala map.



Figure 27. Moku Hala orthophoto.

Moku Hala

Annotated Plant List -- Moku Hala

***Carex wahuensis* -- Carex -- (Cyperaceae) -- Endemic**
Occasional. A few observed.

***Digitaria ciliaris* -- Henry's crab grass -- (Poaceae) -- Alien**
Occasional. A few observed.

***Digitaria insularis* -- Sourgrass -- (Poaceae) -- Alien**
Occasional. A few observed.

***Lantana camara* -- Lantana -- (Verbenaceae) -- Alien**
Occasional. Scattered patches.

***Scaevola taccada* -- Naupaka -- (Goodeniaceae) -- Indigenous**
Common. Forming large patches on the southern side.

***Sesuvium portulacastrum* -- Akulikuli -- (Aizoaceae) -- Indigenous**
Occasional to common. Close to ocean and near wave swept areas.

MOKU MANA



Figure 28. Moku Mana Islet.

Overview

Moku Mana is located east of Keanae just offshore of Pauwalu Point in a cluster of basaltic sea stacks which also includes Moku Hala and Manahoa Rock. The location coordinates are: 798,597 E 2,309,278 N. Moku Mana is a long shaped islet about 1.1 acres in size and about 65 ft. in height. There is a larger north hump which is oblong in size with sheer walls on all sides and a flattish top. The south hump is much smaller. The lower portions are wave worn. A botanical survey of Moku Mana was done on April 6, 2005. Forest Starr and Kim Starr were dropped on the north section of the islet. Ken Wood was dropped on the south section of the islet. We were dropped off around 11:00am and picked up around 1:00pm.

Vegetation

The vegetation on the top flattish area of the islet is made up of a fairly dense low grass, herb, and shrubland. There are large patches of wiregrass (*Eleusine indica*), akulikuli (*Sesuvium portulacastrum*), and naupaka (*Scaevola taccada*). In between these large patches and on margins are occasional lantana (*Lantana camara*), christmas berry (*Schinus terebinthifolius*), popolo (*Solanum americanum*), ihi (*Portulaca lutea*), pigweed (*Portulaca oleracea*), and pualele (*Emilia fosbergii*). Ulei (*Osteomeles anthyllidifolia*) is found on the sheer windward slopes, along with a few native sedges, including *Carex wahuensis* and *Cyperus phleoides*. Akulikuli drapes down the slopes. Additional native plants include kookoolau (*Bidens hillebrandiana* subsp. *polycephala*), button sedge

Moku Mana

(*Fimbristylus cymosa*), and itchy crabgrass (*Digiteria setigera*). During this survey, on the north islet, we observed a total of 17 plant species. There were 9 (53%) native species and 8 (47%) non-native species. 14 plant species were collected.

Wildlife

Many seabirds were observed on Moku Mana. The following bird observations were made: couple dozen wedge-tailed shearwaters (*Puffinus pacificus*) on top of north islet; black noddies (*Anous minutus melanogenys*) were flying about and nesting on sheer walls; one ulili (*Heteroscelus incanus*) was heard; and one brown booby (*Sula leucogaster plotus*) was flying near islet. The 10 or so frigatebirds (*Fregata minor palmerstoni*) that we saw near the north tip during our initial fly-by earlier in the month were not observed the day of the survey. The following insects were observed on the north islet: honey bee (*Apis mellifera*); native naupaka moth (*Udea littorea*) larva feeding damage was observed on naupaka leaves and larva was observed; one *Hyleus* bee observed; and Hawaiian beet webworms (*Spolodea recurvalis*) were observed flying about. Ants, including crazy ants (*Paratrechina longicornis*), were collected. A praying mantis egg case was observed attached to lantana. Tornatellid snails (*Tornatellides* sp.) were found on the north tip of the north islet amongst vegetation and rocks.

Threats

A few invasive weeds were found on the north islet, including sandbur (*Cenchrus echinatus*), lantana, and christmas berry. Only two plants of the sandbur were observed and pulled, though seeds were present and follow up control will likely be necessary to completely remove this species from the islet.

Restoration

Access to the islet is limited, making restoration more costly and difficult. If desired, the non-native species listed above could be removed. Other native species could be spread, either through out-planting or seed throwing.

Moku Mana



Figure 29. Moku Mana map.

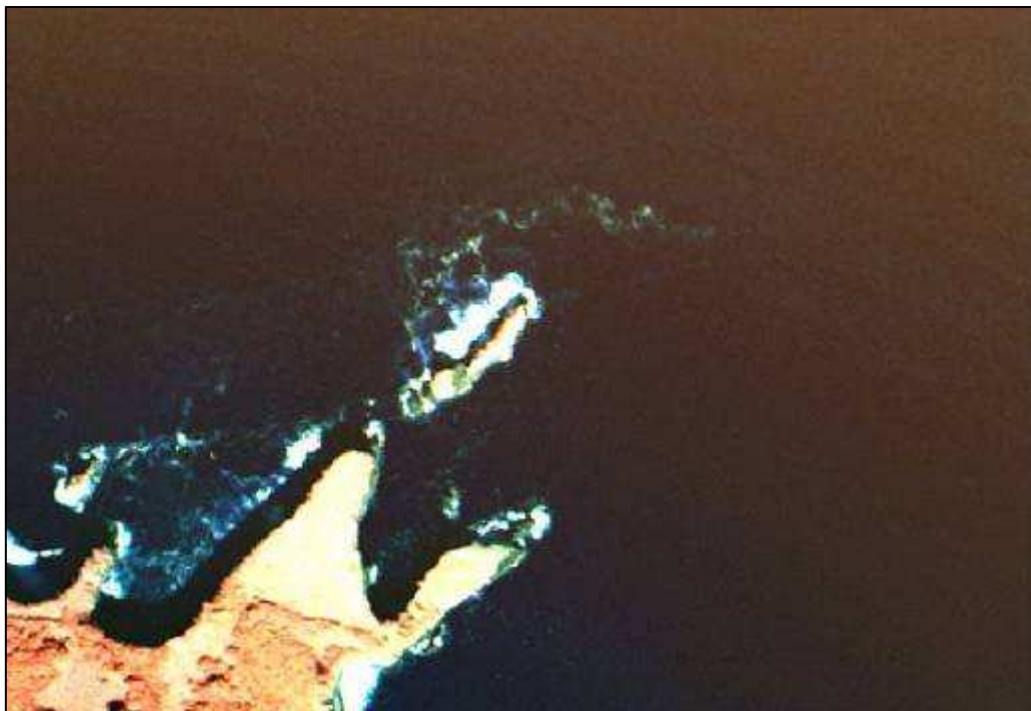


Figure 30. Moku Mana orthophoto.

Moku Mana



Figure 31. Vegetation on north hump with large patches of akulikuli (*Sesuvium portulacastrum*) and naupaka (*Scaevola taccada*).



Figure 32. Margins and windward slopes covered with lantana (*Lantana camara*) and ulei (*Osteomeles anthyllidifolia*).

Moku Mana



Figure 33. South hump with trailing akulikuli on sheer walls and pockets of native sedges (*Carex wahuensis* and *Cyperus phleoides*) in cracks and crevices.

Annotated Plant List -- Moku Mana

***Bidens hillebrandiana* subsp. *polycephala* -- Kookoolau -- (Asteraceae) -- Endemic**

Rare. Shrub, decumbent and matting over 1 sq m area, stems green, single patch on southern plateau.

6 Apr 2005, K. R. Wood (#11209), 15 m (50 ft), BISH; PTBG.

***Carex wahuensis* -- Carex -- (Cyperaceae) -- Endemic**

Occasional. A few plants on sheer areas of north islet.

***Cenchrus echinatus* -- Sandbur -- (Poaceae) -- Alien**

Rare. One small plant on north islet that was pulled. First collected during this survey.

6 Apr 2005, Starr, F., K. Starr, & K. Wood (#050406-4), BISH.

***Cyperus phleoides* -- Cyperus -- (Cyperaceae) -- Endemic**

Occasional. One sterile plant on north tip of north islet.

***Desmodium incanum* -- Desmodium -- (Fabaceae) -- Alien**

Uncommon. Sub-shrub, moderately branched, corollas pink-purple.

6 Apr 2005, K. R. Wood (#11211), 15 m (50 ft), BISH; PTBG.

***Eleusine indica* -- Wire grass -- (Poaceae) -- Alien**

Occasional. Most common grass on north islet. First collected during this survey.

6 Apr 2005, Starr, F., K. Starr, & K. Wood (#050406-14), BISH.

***Emilia fosbergii* -- Pualele -- (Asteraceae) -- Alien**

Occasional. Here and there on north islet. First collected during this survey.

6 Apr 2005, Starr, F., K. Starr, & K. Wood (#050406-12), BISH.

***Fimbristylis cymosa* subsp. *spathacea* -- mauu aki aki -- (Cyperaceae) -- Indigenous**

Occasional. Sedge, leaves dark green, clumping on steep basalt walls between the northern and southern plateau.

6 Apr 2005, K. R. Wood (#11210), 15 m (50 ft), BISH; PTBG.

***Lantana camara* -- Lantana -- (Verbenaceae) -- Alien**

Occasional to common. On windward margin of north islet. First collected during this survey.

6 Apr 2005, Starr, F., K. Starr, & K. Wood (#050406-13), BISH.

***Osteomeles anthyllidifolia* -- Ulei -- (Rosaceae) -- Indigenous**

Occasional. Wind sheered. Near south end and on ridge of north islet.

***Phyllanthus* sp. -- Phyllanthus -- (Euphorbiaceae) -- Alien**

Rare. One plant on south tip of north islet. First collected during this survey.

6 Apr 2005, Starr, F., K. Starr, & K. Wood (#050406-5), BISH.

***Portulaca lutea* -- Ihi -- (Portulacaceae) -- Endemic**

Occasional. In open spots, especially south tip of north islet. First collected during this survey.

6 Apr 2005, Starr, F., K. Starr, & K. Wood (#050406-10), BISH.

***Portulaca oleracea* -- Pigweed -- (Portulacaceae) -- Alien**

Occasional. Here and there on north islet. First collected during this survey.

6 Apr 2005, Starr, F., K. Starr, & K. Wood (#050406-11), BISH.

***Scaevola taccada* -- Naupaka -- (Goodeniaceae) -- Indigenous**

Common. Over much of the middle of north islet. First collected during this survey.

6 Apr 2005, Starr, F., K. Starr, & K. Wood (#050406-7), BISH.

***Schinus terebinthifolius* -- Christmas berry -- (Anacardiaceae) -- Alien**

Occasional. A few trees in center on windward ridge of north islet. First collected during this survey.

6 Apr 2005, Starr, F., K. Starr, & K. Wood (#050406-9), BISH.

***Sesuvium portulacastrum* -- Akulikuli -- (Aizoaceae) -- Indigenous**

Common. Forming mats on slopes of north islet. First collected during this survey.

6 Apr 2005, Starr, F., K. Starr, & K. Wood (#050406-8), BISH.

***Solanum americanum* -- Popolo -- (Solanaceae) -- Questionably Indigenous**

Occasional. Scattered plants on north islet. First collected during this survey.

6 Apr 2005, Starr, F., K. Starr, & K. Wood (#050406-6), BISH.

MAKALOAKA



Figure 34. Makaloaka Islet.

Overview

Makaloaka, located near the shore at Papiha Pt. on the east side of Wailua Bay. The location coordinates are: 799,631 E 2,306,944 N. It is similar to Moku Hala in shape and composition. It is approximately 0.25 acres in size and reaches a height of about 80 ft. We did not land on this islet, but did a helicopter fly-by and hovered for several minutes. Plant observations were made with binoculars.

Vegetation

We observed a total of 10 species during our fly-by survey. There were 7 (70%) native species and 3 (30%) non-native species. A few interesting native species were observed including makou (*Peucedanum sandwicense*).

Threats

The invasive tree christmas berry (*Schinus terebinthifolius*) was observed on the islet.

Restoration

Access is difficult. The christmas berry could be removed if landing could be figured out.

Makaloaka

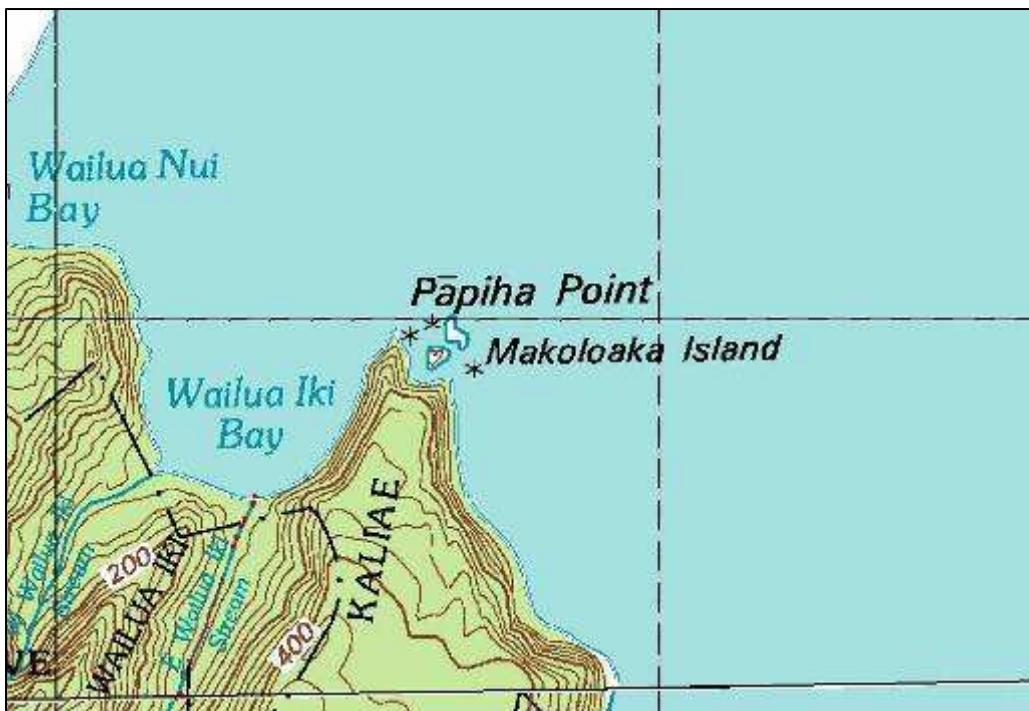


Figure 35. Makaloaka map.



Figure 36. Makaloaka orthophoto.

Makaloaka



Figure 37. North side of islet with what appears to be ukiuki (*Dianella sandwicensis*) and ulei (*Osteomeles anthyllidifolia*) near top with scattered sedges (*Carex wahuensis*) in cracks. A few patches of christmas berry (*Schinus terebinthifolius*) occur. Akulikuli (*Sesuvium portulacastrum*) is found near wave splash areas.

Makaloaka

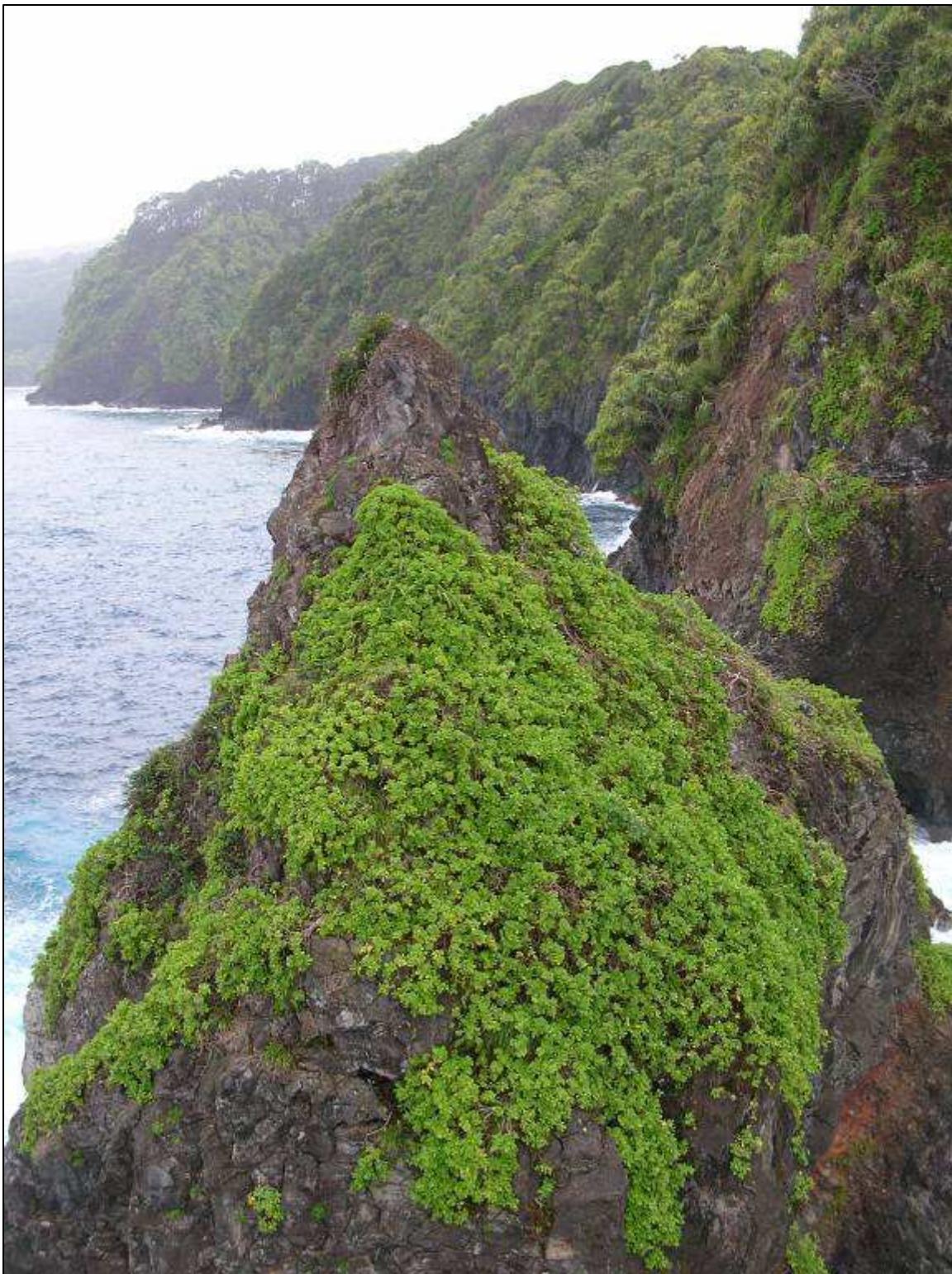


Figure 38. Makou (*Peucedanum sandwicense*) in middle of large patch of naupaka (*Scaevola taccada*). Scattered kookolau (*Bidens hillebrandiana*) about islet in open areas.

Makaloaka

Annotated Plant List -- Makaloaka

***Bidens hillebrandiana* -- Kookoolau-- (Asteraceae) -- Endemic**
Occasional. Observed here and there, near top.

***Carex wahuensis* -- Carex -- (Cyperaceae) -- Endemic**
Occasional. Scattered, in cracks.

***Cyrtomium falcatum* -- Holly fern-- (Dryopteridaceae) -- Alien**
Occasional. Scattered patches on sheer walls.

***Dianella sandwicensis* -- Ukiuki -- (Liliaceae) -- Endemic**
Occasional. What appeared to be this plant was observed near the top.

***Osteomeles anthyllidifolia* -- Ulei-- (Rosaceae) -- Indigenous**
Occasional. Some patches on east side.

***Peucedanum sandwicense* -- Makou-- (Apiaceae) -- Endemic**
Occasional. Observed in a patch of naupaka, about 1/3 way from the top on the west side.

***Phymatosorus grossus* -- Lauae -- (Polypodiaceae) -- Alien**
Occasional. Scattered patches.

***Scaevola taccada* -- Naupaka -- (Goodeniaceae) -- Indigenous**
Common. Forming large mats and scattered about islet.

***Schinus terebinthifolius* -- Christmas berry -- (Anacardiaceae) -- Alien**
Occasional. Observed on the east side.

***Sesuvium portulacastrum* -- Akulikuli -- (Aizoaceae) -- Indigenous**
Occasional to common. Near wave splash areas.

MOKU HUKI



Figure 39. Moku Huki Islet.

Overview

Moku Huki is a small islet about 0.4 acres in size off the northern coast of East Maui which lies only about 66 ft. off-shore of a rolling boulder beach in Waiohue Bay. The location coordinates are: 800,252 E 2,305,746 N. It is approximately 215 ft. long x 75 ft. wide and has an elevation of around 30 ft. The lower northern end is composed of a low flat basalt shelf with tide-pools. The central and southern portions are elevated with a crown of thick vegetation that completely covers the upper ridgeline. The eastern vertical slopes are sparsely vegetated and the western side is moderately so. In order to access the upper vegetation, one of the authors (KRW) tossed a climbing line into a tree on the northern wall of the islet and ascended to the crown. Several rappels were made at random points along the ridge to investigate the vertical sections for vegetation.

Vegetation

The vegetation of Moku Huki is unique for Hawaii's off-shore islets in that its upper ridge-line is thickly covered in the indigenous fern palaa (*Sphenomeris chinensis*). This is complimented by the occasional presence of the endemic fern amau (*Sadleria pallida*). Interspersed and emergent within the native fern cover is the alien fern lauae (*Phymatosorus grossus*) in addition to the indigenous shrubs ulei (*Osteomeles anthyllidifolia*) and naupaka (*Scaevola taccada*). Along the upper eastern cliff zone a single 10 ft. tall x 7 ft. wide akia (*Wikstroemia oahuensis*) was observed in early flower.

Moku Huki

Hala (*Pandanus tectorius*) is the most common tree and reaches a height of approximately 16-23 ft. Moss can be observed growing on their twisting trunks and both male and female plants were observed. Native sedges and grasses of interest include mauu laiki (*Paspalum scrobiculatum*) which can be seen along the eastern upper cliff zone. *Carex wahuensis*, *Cyperus phleoides*, and *Cyperus polystachyos* can be seen both on the upper slopes and along the lower walls and flat northern tide-pool zone. Also along the northern tidal shelf the stiff-leaved mauu aki aki (*Fimbristylis cymosa* subsp. *spathacea*) is occasionally present. The rare grass *Ischaemum byrone* can be observed both along the lower western cliff zone, in addition to the northern flats and seepy walls. During this survey, a total of 33 species of vascular plants were observed. There were 17 (52%) native species and 16 (48%) non-native species. 13 numbered voucherized specimens were made and will be housed at the PTBG & BISH herbaria.

Threats

Two plants of Chinese banyan (*Ficus microcarpa*) were observed, one on the steep central west side and the other along the southeastern slope. This species has the potential to cover large areas of land and can easily displace native species. In addition, a few trees of shoebottom ardisia (*Ardisia elliptica*) were observed along the central ridge line. Other non-native plant threats include: sourbush (*Pluchea carolinensis*), lantana (*Lantana camara*), swordfern (*Nephrolepis multiflora*), hairy horseweed (*Conyza bonariensis*), Henry's crabgrass (*Digitaria ciliaris*), and pualele (*Emilia fosbergii*). Yellowing hala trees indicate that the hala scale (*Thysanococcus pandani*) are present.

Restoration

All invasive alien species could potentially be removed.

Moku Huki

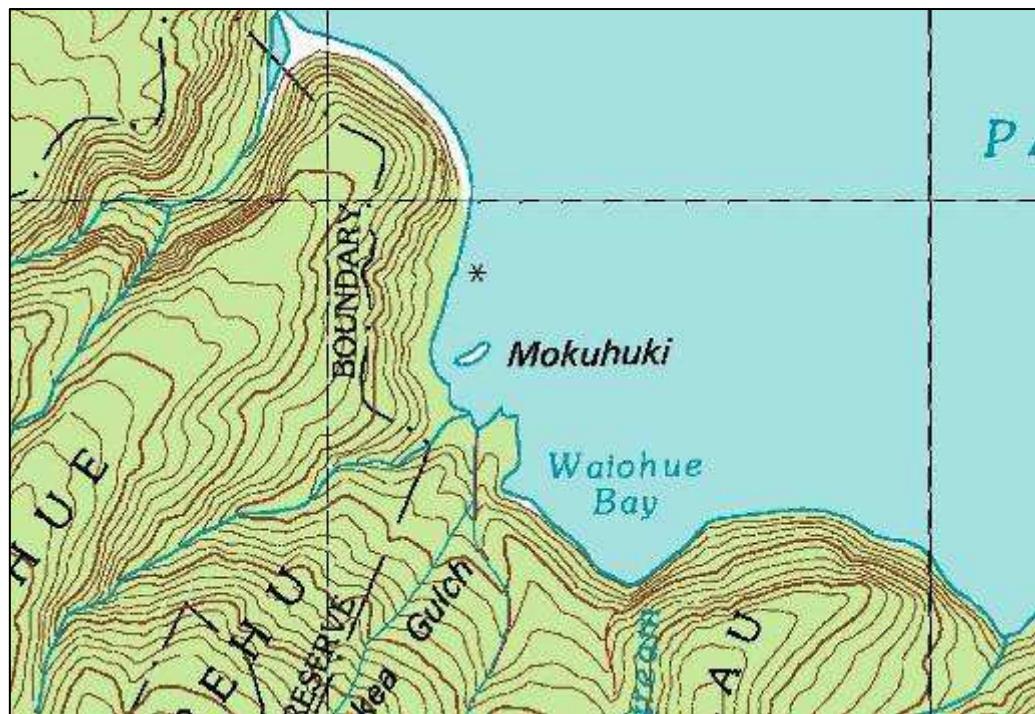


Figure 40. Moku Huki map.

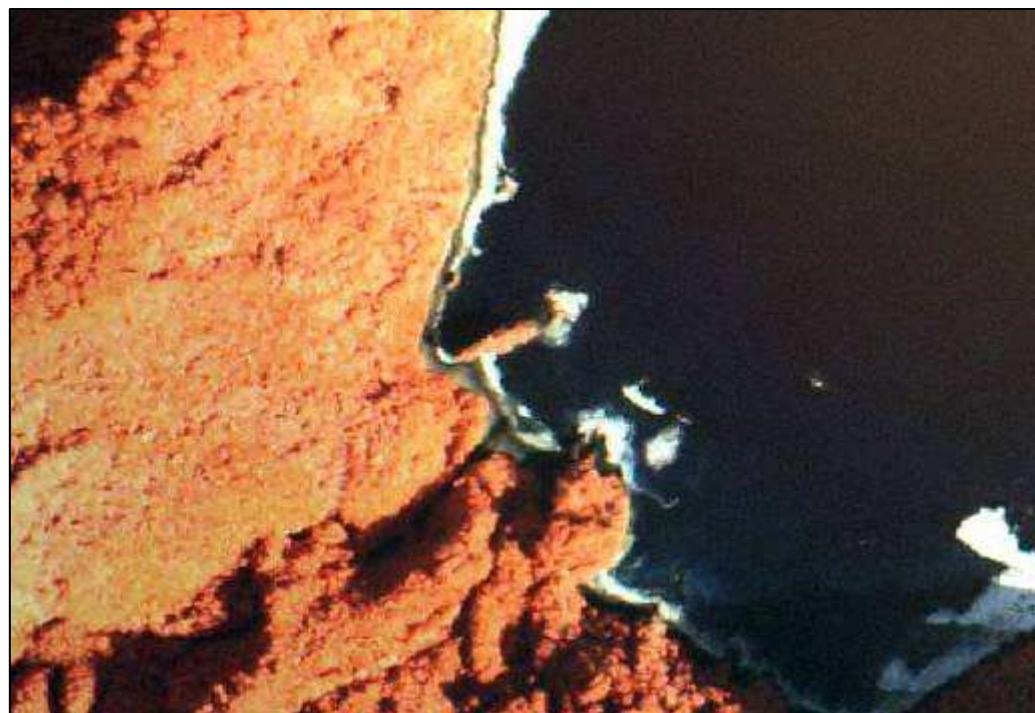


Figure 41. Moku Huki orthophoto.

Moku Huki



Figure 42. Moku Huki with scattered hala (*Pandanus tectorius*) and palaa fern (*Sphenomeris chinensis*).

Annotated Plant List -- Moku Huki

***Ardisia elliptica* -- Shoebutton ardisia -- (Myrsinaceae) – Alien**

Rare. Tree, 7 ft. tall, stems brown with red tinge, leaves medium green, petiole with red tinge, fruit purple-black, corolla cream green with purple tinge, several trees along ridge. First collected during this survey.

6 Apr 2005, K. R. Wood (#11196), 10 m (33 ft), BISH; PTBG.

***Bacopa monnieri* -- Ae ae -- (Scrophulariaceae) – Indigenous**

Rare. Along northern basalt shelf.

***Carex wahuensis* -- Carex -- (Cyperaceae) – Endemic**

Occasional. Observed on the steep eastern and western slopes.

***Centella asiatica* -- Pohe kula -- (Apiaceae) – Alien**

Occasional. Scattered plants can be seen throughout the islet.

***Conyza bonariensis* -- Hairy horseweed -- (Asteraceae) – Alien**

Occasional. Mostly growing along the western slopes.

***Cordyline fruticosa* -- Ti -- (Agavaceae) -- Polynesian**

Occasional. Several plants along the summit ridge.

***Cyperus halpan* -- Cyperus -- (Cyperaceae) -- Alien**

Uncommon. Clumping sedge, collected on southwest corner during rappel. First collected during this survey.

6 Apr 2005, K. R. Wood (#11204), 5 m (16 ft), BISH; PTBG.

***Cyperus phleoides* var. *phleoides* -- Cyperus -- (Cyperaceae) – Endemic**

Occasional. Clumping sedge along northern end of islet.

6 Apr 2005, K. R. Wood (#11207), 5 m (15 ft), BISH; PTBG.

***Cyperus polystachyos* -- Cyperus -- (Cyperaceae) -- Indigenous**

Occasional. Sedge, observed along northern end of islet below knobbed outcrop. First collected during this survey.

6 Apr 2005, K. R. Wood (#11206), 4 m (13 ft), BISH; PTBG.

***Cyrtomium falcatum* -- Holly fern -- (Dryopteridaceae) – Alien**

Rare. Small dry clumps clinging to northwestern walls of islet.

***Digitaria ciliaris* -- Henry's crab grass -- (Poaceae) -- Alien**

Common. Plants observed throughout islet.

***Emilia fosbergii* -- Pualele -- (Asteraceae) -- Alien**

Occasional. Plants scattered around islet.

***Ficus microcarpa* -- Chinese banyan -- (Moraceae) -- Alien**

Moku Huki

Rare. Tree, 2 m (7 ft) tall, with potential to cover large areas of land with time, two trees observed, one on the steep central west side, and the other along the southeastern slope. First collected during this survey.

6 Apr 2005, K. R. Wood (#11199), 7 m (23 ft), BISH; PTBG.

***Fimbristylis cymosa* subsp. *spathacea* -- mauu aki aki -- (Cyperaceae) -- Indigenous**
Occasional. Sedge, clumping on southern basalt shelf in sea spray, leaves stiff dark green with white-yellow around rhizome, old sheaths brown-red. First collected during this survey.

6 Apr 2005, K. R. Wood (#11205), 2 m (7 ft), BISH; PTBG.

***Hibiscus tiliaceus* -- Hau -- (Malvaceae) -- Questionably Indigenous**
Rare. Single small tree observed on southeastern corner of islet during rappel.

***Ischaemum byrone* -- Ischaemum -- (Poaceae) – Endemic**

Occasional. Grass along open exposed vertical basalt and preferring seeps, vegetative with no flower or fruit, ca. 20 patches scattered on the north and west end of islet. First collected during this survey.

6 Apr 2005, K. R. Wood (#11200), 4 m (13 ft), BISH; PTBG.

***Lantana camara* -- Lantana -- (Verbenaceae) – Alien**

Occasional. Plants observed in scattered locations.

***Lycium sandwicense* -- Ohelo kai -- (Solanaceae) – Indigenous**

Rare. A few plants observed along tidal shelf at northern end.

***Morinda citrifolia* -- Noni -- (Rubiaceae) – Polynesian**

Uncommon. Several plants observed along summit ridge zone.

***Nephrolepis multiflora* -- Sword fern -- (Nephrolepidaceae) – Alien**

Occasional. Plants observed throughout the islet.

***Osteomeles anthyllidifolia* -- Ulei -- (Rosaceae) – Indigenous**

Occasional. Shrubs occurring along the upper slopes and ridge.

***Pandanus tectorius* -- Hala -- (Pandanaceae) – Indigenous**

Common. Trees observed around the northern basalt shelf and along the summit ridge. Trees appear to be infested with hala scale (*Thysanococcus pandani*).

***Paspalum scrobiculatum* -- Mauu laiki -- (Poaceae) – Questionably Indigenous**

Common. Clumping grass, dark green leaves, scattered throughout islet. First collected during this survey.

6 Apr 2005, K. R. Wood (#11201), 7 m (23 ft), BISH; PTBG.

***Phymatosorus grossus* -- Lauae -- (Polypodiaceae) – Alien**

Common. Plants interspersed within the *Sphenomeris chinensis* and throughout the islet.

Moku Huki

***Pluchea carolinensis* -- Sourbush -- (Asteraceae) – Alien**

Occasional. Plants observed throughout the islet, especially along the steep upper slopes.

***Psidium guajava* -- Common guava -- (Myrtaceae) – Alien**

Uncommon. A few plants observed along the summit ridge.

***Psilotum nudum* -- Moa -- (Psilotaceae) – Indigenous**

Uncommon. Erect fern, several clumps on eastern slopes. First collected during this survey.

6 Apr 2005, K. R. Wood (#11202), 7 m (23 ft), BISH; PTBG.

***Sadleria pallida* -- Amau -- (Blechnaceae) – Endemic**

Common. Terrestrial rhizome erect, fronds arching erect, scales at base of stipe stiff, golden, ca. 50 plants on islet. First collected during this survey.

6 Apr 2005, K. R. Wood (#11198), 10 m (33 ft), BISH; PTBG.

***Scaevola taccada* -- Naupaka -- (Goodeniaceae) – Indigenous**

Common. Plants observed throughout the islet.

***Sesuvium portulacastrum* -- Akulikuli -- (Aizoaceae) – Indigenous**

Common. Plants concentrated around the lower tidal zone and basalt shelf area.

***Spathoglottis plicata* -- Malayan ground orchid -- (Orchidaceae) – Alien**

Rare. A few plants observed around the steep upper slopes.

***Sphenomeris chinensis* -- palaa -- (Lindsaeaceae) -- Indigenous**

Dominant. Terrestrial rhizomes short creeping with brown scales, covering large areas of ground along main ridge. First collected during this survey.

6 Apr 2005, K. R. Wood (#11208), 10 m (33 ft), BISH; PTBG.

***Wikstroemia oahuensis* -- Akia -- (Thymelaeaceae) -- Endemic**

Rare. Tree, 3M (10 ft) tall, 2 M (7 ft) wide, stems brown-orange, single tree observed along upper eastern cliff zone, in early flower.

6 Apr 2005, K. R. Wood (#11197), 10 m (33 ft), BISH; PTBG.

KUHIWA ROCK



Figure 43. Kuhiwa Rock.

Overview

The un-named rock, which we are calling "Kuhiwa Rock", is a steep basalt rock with a round top just west of Moku Pipi just offshore of Nahiku, where Kuhiwa stream enters the ocean. The location coordinates are: 803,626 E 2,305,599 N. The islet is small, about .05 acres in size and attains a height of about 25 ft. We circled around on Apr. 5, 2005 and observed plants from the helicopter with binoculars.

Vegetation

The vegetation is limited to the round top of the islet and is mostly made up of naupaka (*Scaevola taccada*). A few sedges grow on the lower sheer walls. Two invasive non-native plant species, shoebottom ardisia (*Ardisia elliptica*) and Chinese banyan (*Ficus microcarpa*), are fairly well established and are interspersed in the naupaka. During our helicopter fly-by survey, we observed a total of 7 plant species. There were 5 (71%) native species and 2 (29%) non-native species.

Threats

Two invasive weeds, Chinese banyan and shoebottom ardisia, are found on the islet.

Restoration

With limited access, restoration may be restricted. Weeds may be able to be removed if someone could be dropped off on the islet, even then it is uncertain if it is possible to

Kuhiwa Rock

move about the islet to where the trees occur. Alternatively, it may be possible to control the invasive trees by chemical treatment using a helicopter.

Annotated Plant List -- Kuhiwa Rock

***Ardisia elliptica* -- Shoebottom ardisia -- (Myrsinaceae) -- Alien**

Occasional to common. Scattered trees observed among the naupaka.

***Carex wahuensis* -- Carex -- (Cyperaceae) -- Endemic**

Occasional. A few in open areas.

***Ficus microcarpa* -- Chinese banyan -- (Moraceae) -- Alien**

Occasional to common. In between naupaka and *Ardisia* on top.

***Fimbristylis cymosa* -- Button sedge -- (Cyperaceae) -- Indigenous**

Occasional. A few observed.

***Ischaemum byrone* -- Ischaemum -- (Poaceae) -- Endemic**

Occasional. A few observed.

***Scaevola taccada* -- Naupaka -- (Goodeniaceae) -- Indigenous**

Common. Covering most of the top.

***Sadleria cyatheoides* -- Amau -- (Blechnaceae) -- Endemic**

Occasional. A few observed.

Kuhiwa Rock

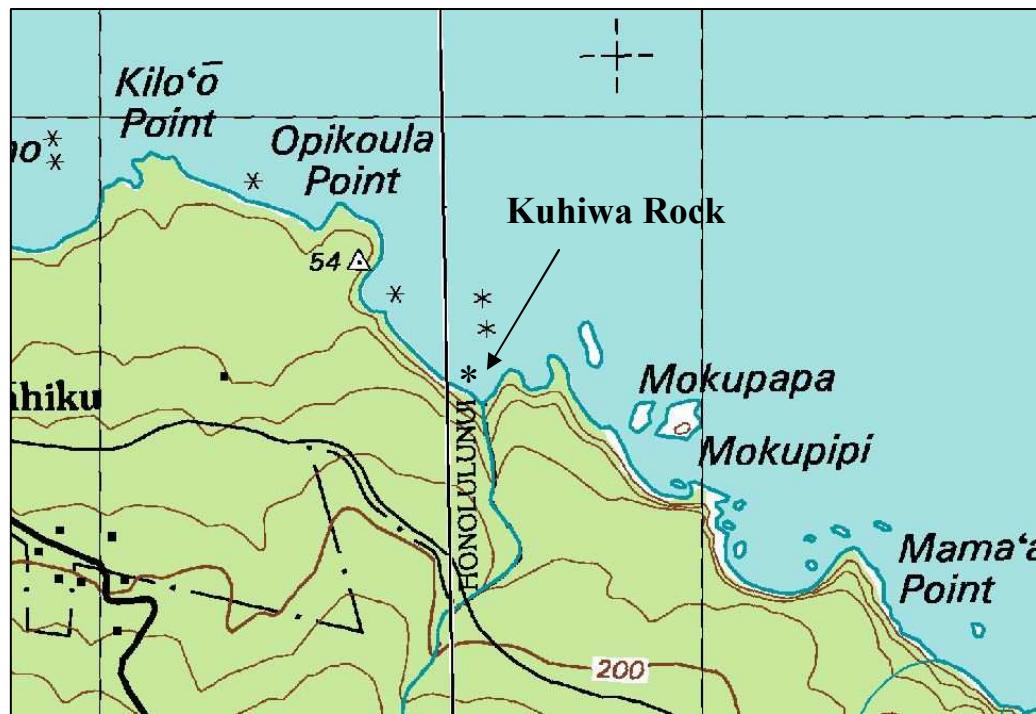


Figure 44. Kuhawa Rock map.



Figure 45. Kuhawa Rock orthophoto.

Kuhiwa Rock

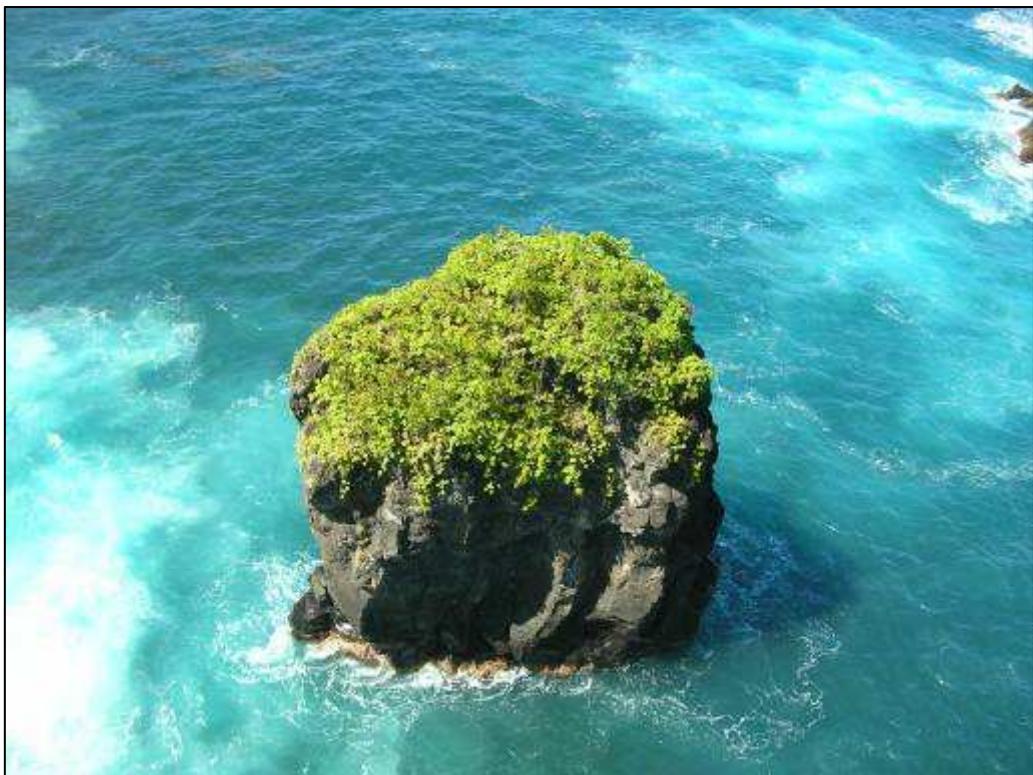


Figure 46. Dominant cover of naupaka (*Scaevola taccada*).



Figure 47. Two invasive species, shoebbutton ardisia (*Aridisa elliptica*) and Chinese banyan (*Ficus microcarpa*) coming up through the naupaka.

MOKU PIPI



Figure 48. Moku Pipi Islet.

Overview

Moku Pipi, located just offshore from Nahiku, is a relatively small flat basalt rock with a taller outcrop and a few surrounding tide pools. The location coordinates are: 803,971 E 2,305,496 N. It is approximately 0.8 acres in size and reaches a height of about 40 ft. Moku Pipi was surveyed on April 5, 2005 by Kim Starr who was dropped off around 1:00 pm and picked up around 4:00 pm. There are other basalt outcrops nearby. Waves were pounding the north side of the islet and occasionally splashed over the islet. The islet is covered mostly with naupaka (*Scaevola taccada*) on the taller outcrop with a mix of button sedge (*Fimbristylis cymosa*) and akulikuli (*Sesuvium portulacastrum*) on the lower portion.

Vegetation

The islet is mostly made up of native species with naupaka covering most of the taller portion and *Fimbristylis cymosa* and akulikuli (*Sesuvium portulacastrum*) on the lower portion. Akulikuli was found closest to splash zone areas. One invasive tree, Chinese banyan (*Ficus microcarpa*) was found on the top section among the naupaka. There are two small patches of *Ischaemum byrone* on the top section towards the southern side on the margin of dense naupaka. Many naupaka seedlings were observed. Ohelo kai (*Lycium sandwicense*) and akulikuli draped off the taller portion. There is a small patch of *Bacopa monnieri* and *Cyperus polystachyos* near a fresh water seep or perhaps a rain puddle on the lower portion. There were scattered patches Henry's crabgrass (*Digitaria ciliaris*) on the lower portion. One wiregrass (*Eleusine indica*) was found on the upper

Moku Pipi

portion and pulled, a few were found on the lower portion as well. Pigweed (*Portulaca oleracea*) in open areas on both the lower and upper portions of the islet. During this survey, we observed a total of 11 plant species. There were 7 (64%) native species and 4 (36%) non-native species. All 11 plant species were collected.

Wildlife

About a dozen wedge-tailed shearwater (*Puffinus pacificus*) pairs were observed resting in their burrows under rock ledges on the lower portion and among the naupaka on the taller outcrop. Several black noddies (*Anous minutus melanogenys*) were observed flying around the islet over the ocean. One Pacific golden plover (*Pluvialis fulva*) was seen and heard flying by. Naupaka had some sign of the endemic *Udea littorea* moth larva feeding, though none were found. Crazy ants (*Paratrechina longicornis*) were collected. One bean butterfly (*Lampides* sp.) flew by. Not much insect activity was going on other than the ants. In salt spray areas saw scattered speckled periwinkles or pipi (*Littoraria pintado*), which the islet is likely named after. Severns (2000) reports that Hawaiians harvested these for food, as they were concentrated in large numbers and easily plucked from rocks. Also saw crab parts on rocks. Tide pools on the south and west side had some fish including black blenny like fish that were basking in the shallower pools. In deeper pool there were a few larger fish, including a manini and a wrasse like fish swimming in circles. Skinks were also observed in abundance all over the islet.

Threats

There was one small *Ficus microcarpa* tree that could not be pulled due to strong roots. It could be removed using a cut stump herbicide method. The non-native grasses, Henry's crabgrass (*Digitaria ciliaris*) and wiregrass (*Eleusine indica*) could be removed with foliar herbicide applications or by hand pulling.

Restoration

Landing is relatively easy by helicopter and getting around the islet is fairly straight forward. If desired, non-native species could be removed. More *Ischaemum byrone* could be added by throwing seeds or out-planting. The tide pools offer an opportunity for further study as well.

Moku Pipi

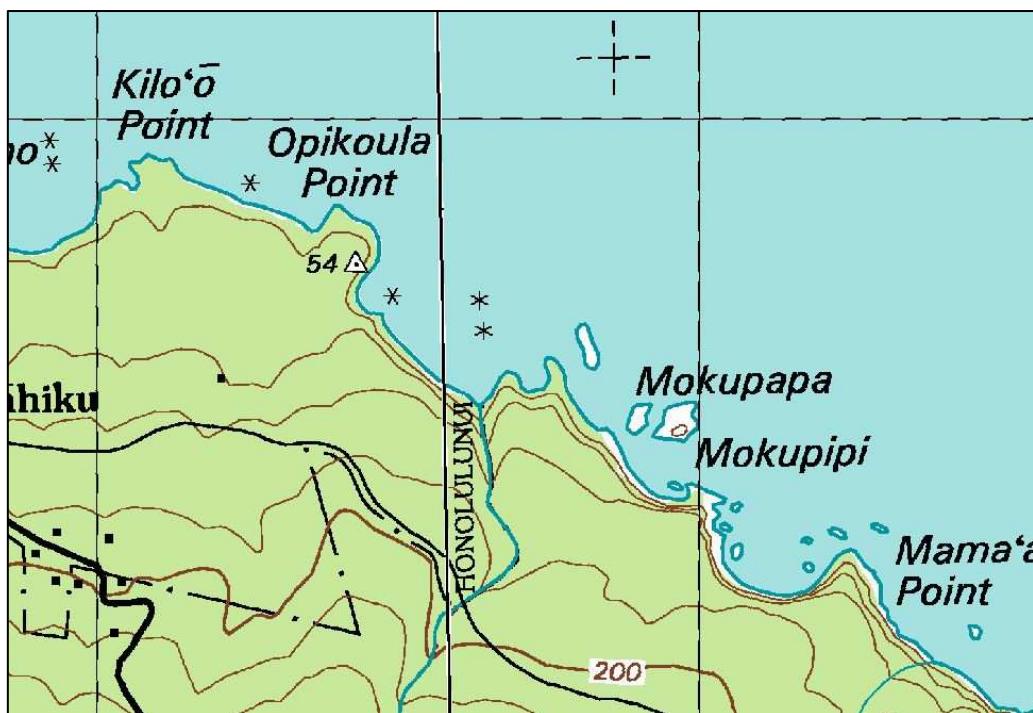


Figure 49. Moku Pipi map.



Figure 50. Moku Pipi orthophoto.

Moku Pipi

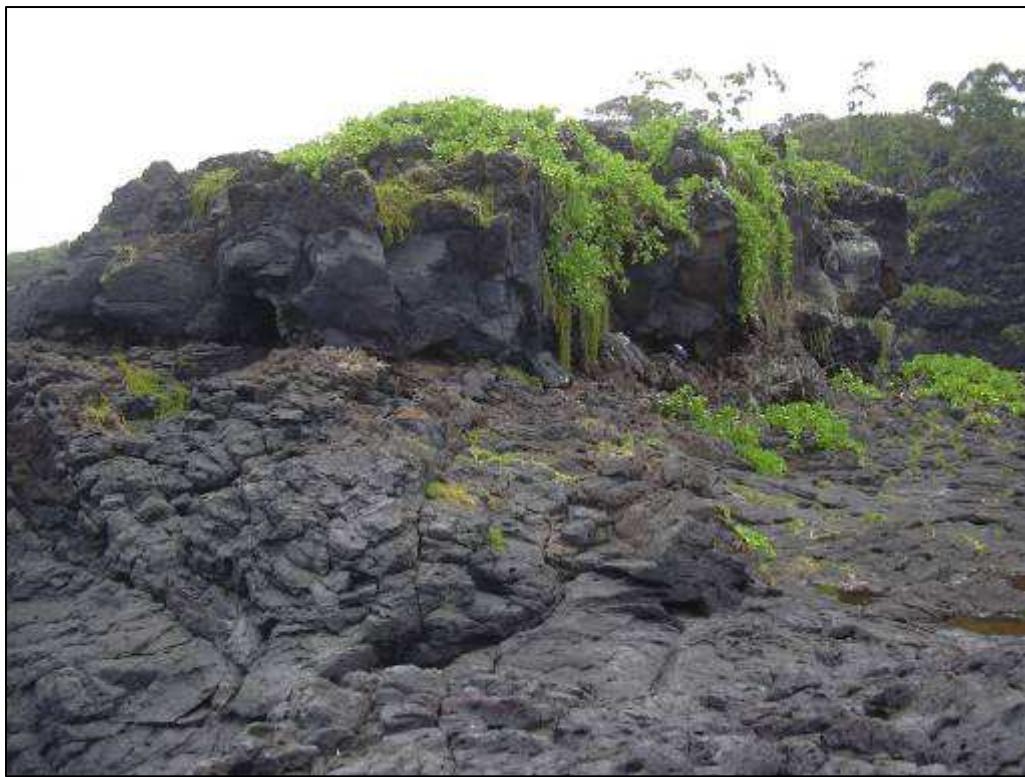


Figure 51. Naupaka (*Scaevola taccada*) and ohelo kai (*Lycium sandwicense*) draping off taller portion rocky islet.



Figure 52. Lower portion of islet dominated by button sedge (*Fimbristylis cymosa*) with a seep of fresh water where ae (*Bacopa monnieri*) and a native sedge (*Cyperus polystachyos*) is found.

Moku Pipi



Figure 53. Akulikuli (*Sesuvium portulacastrum*) growing in wave splash zone.



Figure 54. Top portion with dense cover of naupaka and a single Chinese banyan (*Ficus microcarpa*). Scattered pigweed (*Portulaca oleracea*) and a native grass (*Ischaemum byrone*) found in open rocky spots.

Moku Pipi



Figure 55. Tide pools on western side of islet with naupaka, akulikuli, and button sedge.

Moku Pipi

Annotated Plant List -- Moku Pipi

Bacopa monnieri -- Bacopa -- (Scrophulariaceae) -- Indigenous

Uncommon. One patch in fresh water seep or puddle. First collected during this survey.
5 Apr 2005, K. Starr (#050405-7), BISH.

Cyperus polystachyos -- Pycreus -- (Cyperaceae) -- Indigenous

Rare. One small patch found by the *Bacopa monnieri* in the fresh water seep or puddle.
First collected during this survey.
5 Apr 2005, K. Starr (#050405-10), BISH.

Digitaria ciliaris -- Henry's crab grass -- (Poaceae) -- Alien

Occasional. A few scattered patches on the south side. First collected during this survey.
5 Apr 2005, K. Starr (#050405-6), BISH.

Eleusine indica -- Wire grass -- (Poaceae) -- Alien

Occasional. One plant on taller portion. Small patch on lower portion. First collected
during this survey.
5 Apr 2005, K. Starr (#050405-4), BISH.

Ficus microcarpa -- Chinese banyan -- (Moraceae) -- Alien

Rare. One small tree (<1 m) in naupaka on top of islet. Tried to hand pull but would not
budge. First collected during this survey.
5 Apr 2005, K. Starr (#050405-9), BISH.

Fimbristylis cymosa -- Button sedge -- (Cyperaceae) -- Indigenous

Common. Scattered about, especially on the lower portion of the islet. First collected
during this survey.
5 Apr 2005, K. Starr (#050405-2), BISH.

Ischaemum byrone -- Ischaemum -- (Poaceae) -- Endemic

Uncommon. Two clumps of plants on the taller portion of the islet on ledges on the south
side. No fertile material found. First collected during this survey.
5 Apr 2005, K. Starr (#050405-11), BISH.

Lycium sandwicense -- Ohelo kai -- (Solanaceae) -- Indigenous

Occasional. Draping over ledges. First collected during this survey.
5 Apr 2005, K. Starr (#050405-1), BISH.

Portulaca oleracea -- Pigweed -- (Portulacaceae) -- Alien

Occasional. Found on upper and lower portion of islet. First collected during this
survey.
5 Apr 2005, K. Starr (#050405-5), BISH.

Scaevola taccada -- Naupaka -- (Goodeniaceae) -- Indigenous

Common. Covering most of the taller portion of the islet and scattered plants on the
lower portion. Many seedlings found. First collected during this survey.
5 Apr 2005, K. Starr (#050405-3), BISH.

Sesuvium portulacastrum -- Akulikuli -- (Aizoaceae) -- Indigenous

Moku Pipi

Common. Draping over rock ledges and found near salt spray areas on the windward side. First collected during this survey.

5 Apr 2005, K. Starr (#050405-8), BISH.

MALAELOA ROCK



Figure 56. Malaeloa Rock.

Overview

Malaeloa Rock is a small rock off Malaeloa Point in Nahiku. The location coordinates are: 807,264 E 2,303,761 N. The islet is ca. .05 acres in size and 20 ft. tall. We did a fly by on April 6, 2005 and observed plants from the helicopter with binoculars.

Vegetation

Most of the vegetation is on the top of the islet which is extremely wave worn. We observed a total of 2 native plant species, naupaka (*Scaevola taccada*) and akulikuli (*Sesuvium portulacastrum*).

Threats

Proximity to Maui could cause increased human visitation.

Restoration

Not much suggested. The plants seem to be doing fine.

Annotated Plant List -- Malaeloa Rock

***Scaevola taccada* -- Naupaka -- (Goodeniaceae) -- Indigenous**

Common. Forming clumps on top of islet.

***Sesuvium portulacastrum* -- Akulikuli -- (Aizoaceae) -- Indigenous**

Common. Forming mats on summit of islet.

Malaeloa

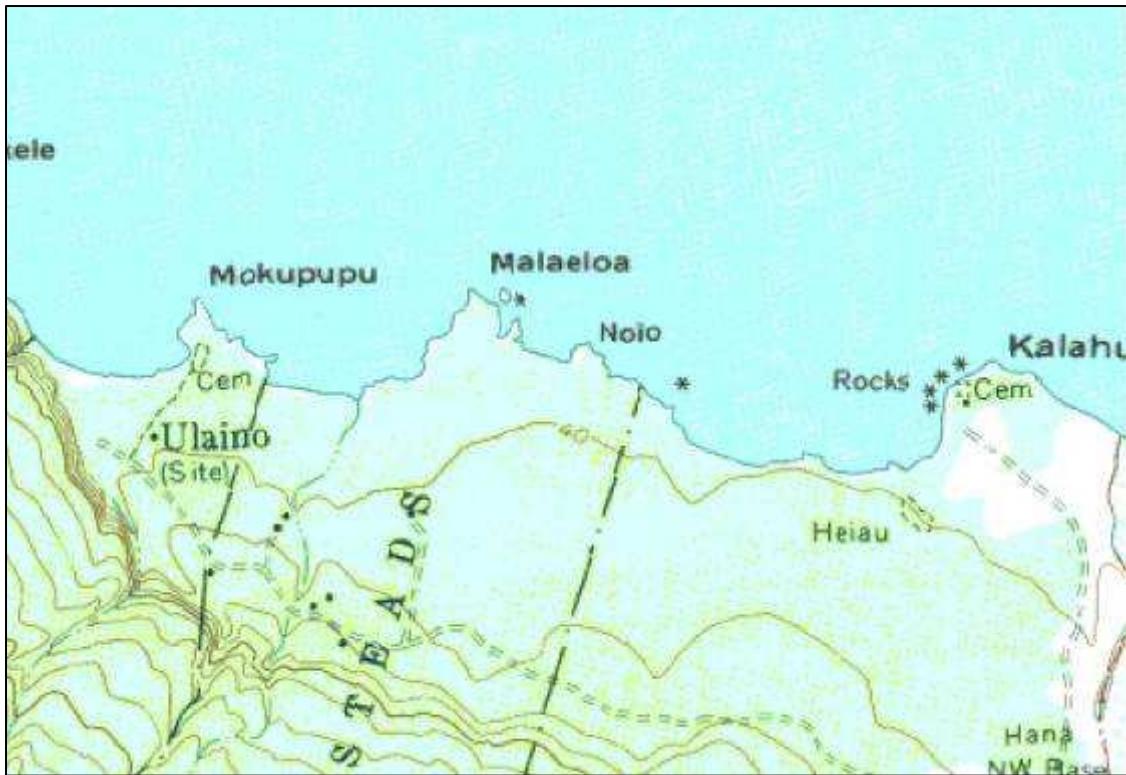


Figure 57. Malaeloa Rock map.



Figure 58. Scattered naupaka (*Scaevola taccada*) and akulikuli (*Sesuvium portulacastrum*) on the top of the small wave worn islet.

WAIANAPANAPA



Figure 59. Waianapanapa Islets.

Overview

The islets of Waianapanapa are located just offshore in Pailoa Bay, and are accessed through Waianapanapa State Park. The location coordinates are: 812,060 E 2,301,572 N. On April 22, 2006, we (Starr & Starr) scanned the islets for plants using binoculars from the main island of Maui. The islets are both fairly small in size, the one closer to shore being larger than the other and supporting more vegetation. The smaller islet is covered with black noddies (*Anous minutus melanogenys*), looks occasionally wave battered and supports a couple species of plants. The larger islet is also covered in black noddies and appears less battered by waves.

Vegetation

On the smaller islet, a few plants were observed, including akulikuli (*Sesuvium portulacastrum*) which was the most common plant and ihi (*Portulaca lutea*) which was less common. The larger islet was mostly dominated by naupaka (*Scaevola taccada*) with akulikuli in the lower portions, button sedge (*Fimbristylis cymosa*) in open areas, one small coconut tree (*Cocos nucifera*) near the top, and an occasional ihi, pualele (*Emilia fosbergii*), and grasses (*Digitaria ciliaris* and *Paspalum vaginatum*). A total of 8 species of plants was observed, 4 (50%) were native and 4 (50%) were non-native.

Waianapanapa

Wildlife

Black noddies occupy most of the islet and were observed flying about and resting on the islets. We observed at least 100+ black noddies in the vicinity. Numerous mongooses were observed in the park area.

Threats

The following threats exist: ease of access, no protection, high surf, and lots of mongooses on nearby park.

Restoration

The islets appear to be doing fairly well on their own. Could refrain from planting non-native species, such as coconuts at the nearby park area. Could also control incipient patches of non-natives.

Annotated Plant List -- Waianapanapa

***Cocos nucifera* -- Coconut -- (Arecaceae) -- Polynesian**

Rare. On larger islet. One small plant on flat area on top.

***Digitaria ciliaris* -- Henry's crab grass -- (Poaceae) -- Alien**

Occasional. On larger islet. Patches on summit.

***Emilia fosbergii* -- Pualele -- (Asteraceae) -- Alien**

Occasional. On larger islet. Scattered in bare areas along summit ridge.

***Fimbristylis cymosa* -- Button sedge -- (Cyperaceae) -- Indigenous**

Common. On larger islet. Scattered patches on bare rocks.=

***Paspalum vaginatum* -- Seashore paspalum -- (Poaceae) -- Alien**

Rare. On larger islet. One plant on east side close to ocean. Appeared recently wave washed.

***Portulaca lutea* -- Ihi -- (Portulacaceae) -- Endemic**

Occasional. On both islets. There were a few patches on the summit of what appeared to be *P. lutea*, looking at flower size through binoculars.

***Scaevola taccada* -- Naupaka -- (Goodeniaceae) -- Indigenous**

Dominant. On larger islet. Large patches covering middle of islet and draping down sides. One plant growing on summit spire. Somewhat wave battered on the south west side.

***'Sesuvium portulacastrum* -- Akulikuli -- (Aizoaceae) -- Indigenous**

Common. On both islets. On smaller islet, a few patches draping off east end. On larger islet, a large patch on lower flat area on south side and draping over sheer areas.

Waianapanapa

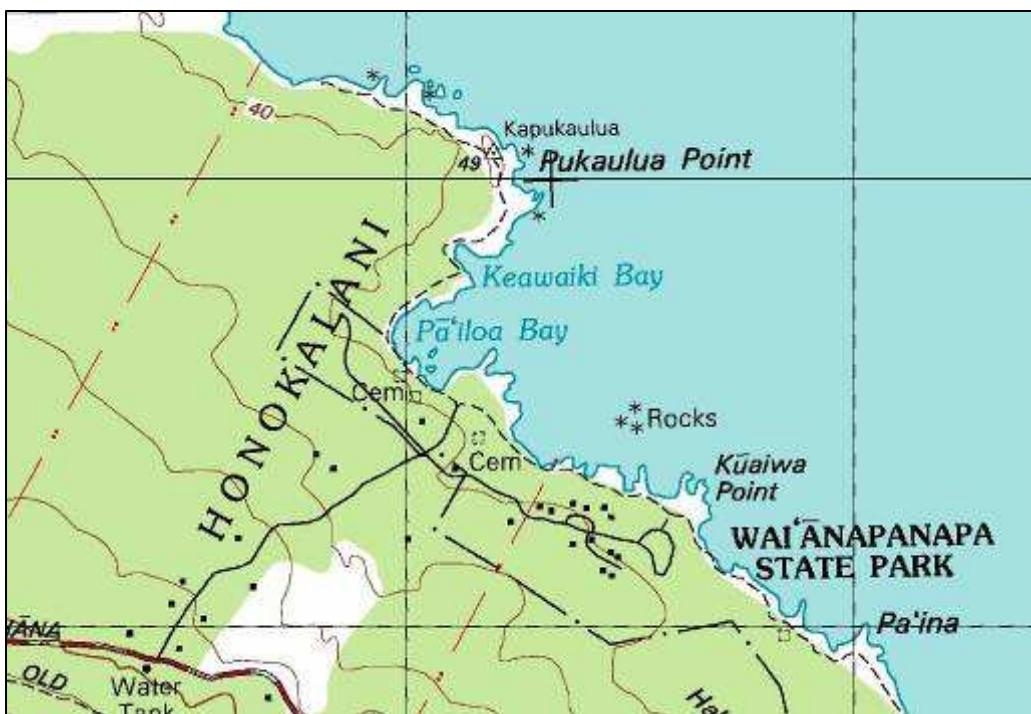


Figure 60. Waianapanapa Islets map.



Figure 61. Waianapanapa Islets orthophoto.

Waianapanapa



Figure 62. Smaller islet with akulikuli (*Sesuvium portulacastrum*) and noio (*Anous minutus melanogenys*) flying about.

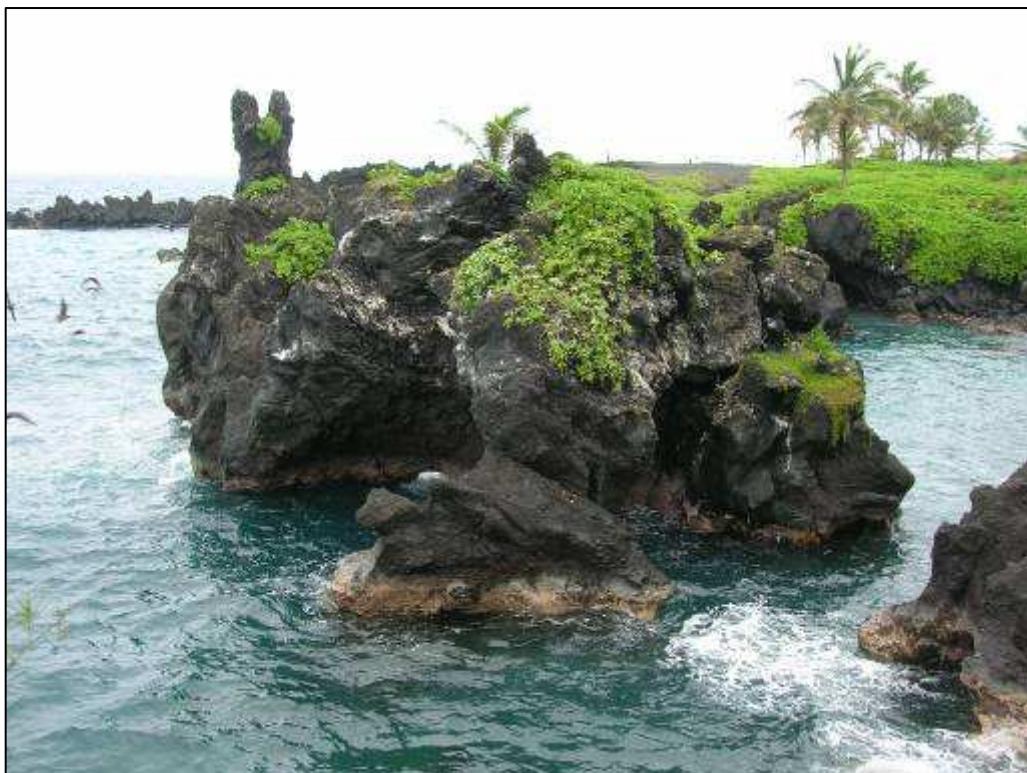


Figure 63. Larger islet with large patches of naupaka (*Scaevola taccada*) and single coconut (*Cocos nucifera*) on top.

PUU KU



Figure 64. Puu Ku Islet.

Overview

Puu Ku (Puu Kii) Islet is located in Hana Bay just offshore from the main island of Maui. The location coordinates are: 814,532 E 2,298,201 N. Puu Ku is about 1.3 acres in size and reaches a height of about 60 ft. Puu Ku is a mix of cinders and lava flows, part of the East rift of Haleakala. The islet is barely detached from the main island, and at one time it was attached by a bridge, the only remnants of which are concrete blocks. On April, 22, 2006 we (Starr & Starr) conducted a botanical survey of Puu Ku. We walked along the shore of Hana Bay toward the islet then waded a short distance to the islet. We spent about two hours on the islet doing walk through surveys. There is a small < 5 m active lighthouse on the summit. The islet is relatively easy to get on, but can be tricky to get around on, due to the steep areas that contain loose cinders. Several detached rocks lie nearby the islet on the west side. We scanned the rocks for plants using binoculars from the west side of Puu Ku. Two of the rocks had vegetation, one tall narrow pinnacle and a smaller rounded rock. We did not try scaling the pinnacles offshore. Papaloa and the other rocks to the southeast looked barren. Several tide pools were observed on the west side of Puu Ku.

Vegetation

The islet is covered on the west side by ironwood (*Casuarina equisetifolia*) with a mix of naupaka (*Scaevola taccada*), maia pilo (*Capparis sandwichiana*), and anaunau (*Lepidium bidentatum* var. *o-waihiense*) on the steep north and east sides. The summit is a mix of

Puu Ku

sourbush (*Pluchea carolinensis*), ulei (*Osteomeles anthyllidifolia*), lantana (*Lantana camara*), lauae (*Phymatosorus grossus*), and naupaka (*Scaevola taccada*). Hala (*Pandanus tectorius*) is found scattered about the islet. We scanned the two nearby pinnacles that appeared to have sparse vegetation. The smaller of the two only had akulikuli (*Sesuvium portulacastrum*) and appears to be washed over occasionally. The taller pinnacle had akulikuli, ironwood, anaunau, and naupaka, and button sedge (*Fimbristylis cymosa*). We observed a total of 16 species of plants, 8 (50%) were native and 8 (50%) were non-native. We made 16 collections of plants. A previous botanical survey was done by R. Hobdy in April, 1982. His notes are incorporated below.

Wildlife

There were several areas which appeared to have signs of seabirds where we smelled guano and saw burrows. There is probably room for 1000 birds on the islet. Some burrows and scrapes under bushes appeared somewhat used, but only a few appeared recently used and only one was observed being occupied. One mynah bird (*Acridotheres tristis*) was heard in the ironwood. One wedge-tailed shearwater (*Puffinus pacificus*) was observed in a burrow in the ironwood grove on the west side of the islet. We also observed a white-tailed tropic bird (*Phaeton lepturus dorotheae*) flying above Hana Bay. We observed long legged ants (*Pheidole megacephala*) and garden spiders (*Argiope* sp.). We also observed the hala scale (*Thysanococcus pandani*) on the hala leaves. Skinks were observed on the islet. Some interesting fish, coral, and limu were observed in tide pools. Crabs were observed near the ocean.

Threats

The largest threat to the native vegetation appears to be ironwood. The ease of access may contribute to easier introduction of weeds and perhaps predators such as cats, rats, mongooses, and dogs. Long legged ants were observed over the entire islet. The sheer terrain may help protect some of the more inaccessible areas.

Restoration

The ironwood trees could be removed. The summit could be cleared of weeds. The anaunau and maia pilo will likely rebound on their own when weeds are removed. Existing plants could be supplemented with selected replanting and seed tossing of native species, such as ihi (*Portulaca villosa*), native grasses (*Ischaemum byrone* and *Panicum fauriei*), and schiedea (*Schiedea globosa*). The islet was relatively easily accessed by walking or swimming from Hana Bay. Could also be approached by kayak or small boat. The best landing is on the lee (southwest) side, at the spot where the old bridge was.

Puu Ku

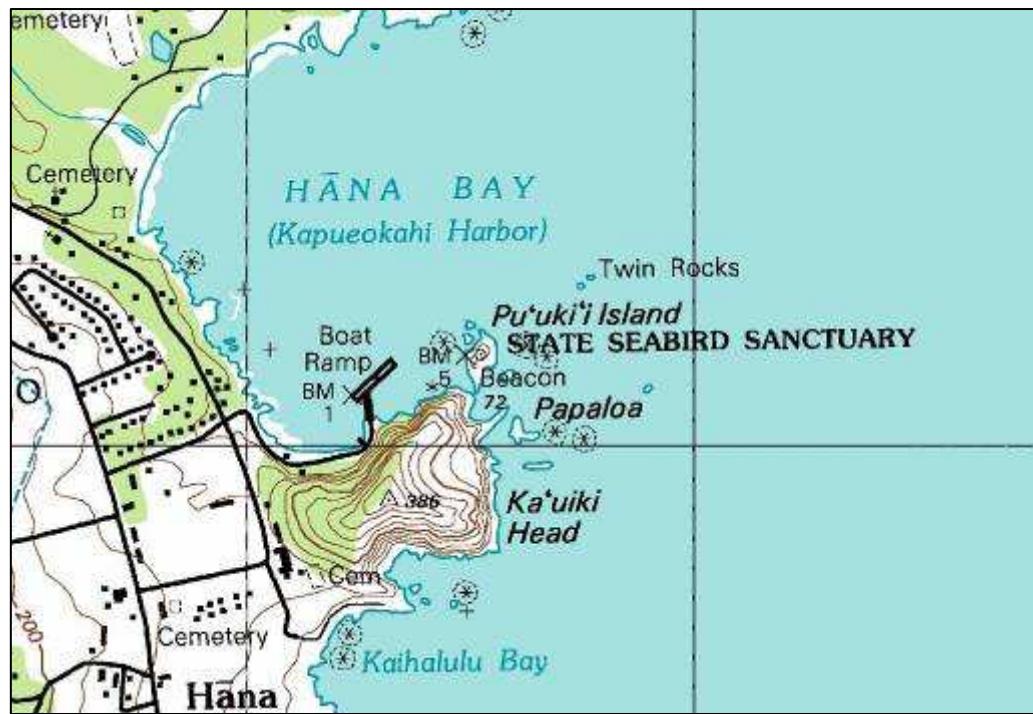


Figure 65 Puu Ku (Puu Kii) map.

Puu Ku



Figure 66. West side with naupaka (*Scaevola taccada*) and button sedge (*Fimbristylis cymosa*) in foreground with ironwood (*Casuarina equisetifolia*) on steep sides and light on summit surrounded by sourbush (*Pluchea carolinensis*) and maia pilo (*Capparis sandwichiana*).



Figure 67. Summit thicket of sourbush, lauae (*Phymatosorus grossus*).

Puu Ku

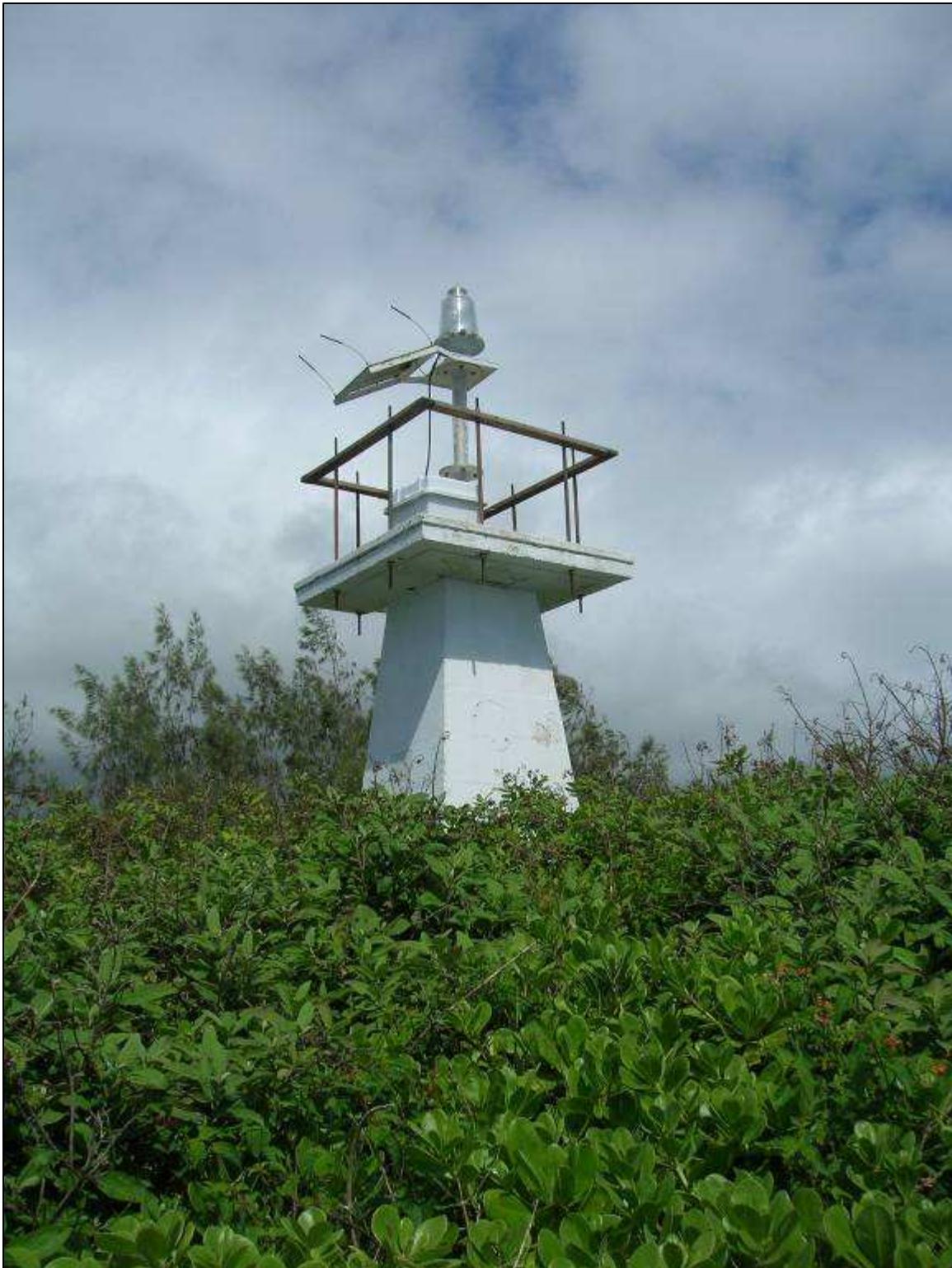


Figure 68. Summit mix of sourbush, ulei (*Osteomeles anthyllidifolia*), lantana (*Lantana camara*), lauae (*Phymatosorus grossus*), and naupaka (*Scaevola taccada*) with light in center.

Puu Ku



Figure 69. Hala (*Pandanus tectorius*) found as single trees and small groves throughout islet. Rocks to west with mix of naupaka, anaunau (*Lepidium bidentatum* var. *o-waihiense*), button sedge, ironwood, and akulikuli (*Sesuvium portulacastrum*) on sheer sides. Smaller rock with only akulikuli.

Puu Ku



Figure 70. Mix of native coastal plants including anaunau and maia pilo on north and east slopes.

Puu Ku

Annotated Plant List -- Puu Ku

Andropogon virginicus -- Broom sedge -- (Poaceae) -- Alien

Rare. One plant which was pulled, though it had gone to seed. First collected during this survey.

5 Apr 2005, Starr, F. & K. Starr, (#060422-01), BISH.

Capparis sandwichiana -- Maiapilo -- (Capparaceae) -- Endemic

Common. Most abundant on northeast facing slopes, generally on steep areas. No flowers, fruits, or plutellid moths (*Plutella capparidis*) observed. First observed in 1982 by Hobdy who noted it as occasional. First collected during this survey.

5 Apr 2005, Starr, F. & K. Starr, (#060422-06), BISH.

Casuarina equisetifolia -- Ironwood -- (Casuarinaceae) -- Alien

Dominant. Much of the west face of the islet is covered with ironwood, where it grows to the exclusion of virtually everything else. Some large trees appear to be cut back, but have re-grown. There are many seedlings and saplings, some on virtually inaccessible pinnacles. A few small ones on summit and sides of tallest rock west of Puu Ku. First observed in 1982 by Hobdy who noted it as occasional. First collected during this survey.

5 Apr 2005, Starr, F. & K. Starr, (#060422-16), BISH.

Cyperus phleoides -- Cyperus -- (Cyperaceae) -- Endemic

Not observed during this survey. First observed in 1982 by Hobdy who noted it as rare.

Cyperus polystachyos -- Cyperus -- (Cyperaceae) -- Indigenous

Rare. A few small clumps seen, mostly on north slope. First collected in 1969 by Hendrickson. Observed again in 1982 by Hobdy who noted it as rare. Collected again during this survey.

26 Jun 1969, Henrickson, J.S. (#3720), 10 ft, With *Scaevola*, *Casurina*, ferns, BISH 35785.

5 Apr 2005, Starr, F. & K. Starr, (#060422-09), BISH.

Digitaria ciliaris -- Henry's crab grass -- (Poaceae) -- Alien

Occasional. Here and there, especially on summit and on north side. First observed in 1982 by Hobdy who noted it as occasional. Collected again during this survey.

5 Apr 2005, Starr, F. & K. Starr, (#060422-12), BISH.

Fimbristylis cymosa -- Button sedge -- (Cyperaceae) -- Indigenous

Common. Common on exposed areas. Often the only plant in the area. On cinder and in lava crevices. Also observed through binoculars on tall rock just west of Puu Ku where it was scattered in cracks on bare rock face. First collected in 1969 by Hendrickson. Observed again in 1982 by Hobdy who noted it as uncommon. Collected again during this survey.

26 Jun 1969, Henrickson, J.S. (#3719c), as subsp. *umbellato-capitata*, 8 ft, Growing on reddish lava boulders with *Ischaemum*, near *Scaevola*, *Casurina*, etc., BISH 35790.

5 Apr 2005, Starr, F. & K. Starr, (#060422-08), BISH.

Ischaemum byrone -- Ischaemum -- (Poaceae) – Endemic

Not observed during this survey. It could have been overlooked. First collected in 1969 by Hendrickson. Observed again in 1982 by Hobdy who noted it as rare.

Puu Ku

26 Jun 1969, Henrickson, J.S. (#3718c), 2m, rare, With *Fimbristylis cymosa*, *Scaveola*, *Casurina*, etc., BISH 35860.

***Lantana camara* -- Lantana -- Verbenaceae -- Alien**

Occasional. Found mostly on summit area scattered in naupaka and anaunau. First observed in 1982 by Hobdy who noted it as uncommon. First collected during this survey.

5 Apr 2005, Starr, F. & K. Starr, (#060422-11), BISH.

***Lepidium bidentatum* var. *o-waihiense* -- Anaunau -- (Brassicaceae) -- Endemic**

Common. Found over much of the islet. A series of healthy looking patches were observed on the north and east slopes, in open areas and occasionally mixed in with maia pilo and naupaka. Also observed on tall rock west of Puu Ku where there was one small plant on the north east face near the bottom. First collected in 1982 by Hobdy who noted it as occasional. Collected again during this survey.

17 Apr 1982, Hobdy, R.W. (#1363), BISH 460473.

5 Apr 2005, Starr, F. & K. Starr, (#060422-03), BISH.

***Osteomeles anthyllidifolia* -- Ulei -- (Rosaceae) -- Indigenous**

Occasional to common. A solid stand forming a ring around the summit. A few clumps found recently cut and thrown over north slope, perhaps part of the lighthouse maintenance. First observed in 1982 by Hobdy who noted it as uncommon. First collected during this survey.

5 Apr 2005, Starr, F. & K. Starr, (#060422-07), BISH.

***Oxalis corniculata* -- Yellow wood sorrel -- (Oxalidaceae) -- Questionably Polynesian**

Rare. Just a few small mats on north slope. First collected during this survey.

5 Apr 2005, Starr, F. & K. Starr, (#060422-14), BISH.

***Pandanus tectorius* -- Hala -- (Pandanaceae) -- Indigenous**

Occasional. A half dozen clumps, mostly lone individuals, but a small patch of a dozen or so individuals found on north side of gully. Hala scale (*Thysanococcus pandani*) noted with yellowing visible on a few of the most leeward portion of large patch. The ocean side plants did not appear affected. First observed in 1982 by Hobdy who noted it as common. First collected during this survey.

5 Apr 2005, Starr, F. & K. Starr, (#060422-10), BISH.

***Phymatosorus grossus* -- Lauae -- (Polypodiaceae) -- Alien**

Occasional to common. Part of the summit thicket. First observed in 1982 by Hobdy who noted it as uncommon. First collected during this survey.

5 Apr 2005, Starr, F. & K. Starr, (#060422-13), BISH.

***Pluchea carolinensis* -- Sourbush -- (Asteraceae) – Alien**

Common. Forming a dense thicket on the summit, a couple scattered individuals beyond that. Summit plants appear to have been cut within the past year or so, and are now a 1.5 m tall thicket of re-sprouts. First observed in 1982 by Hobdy who noted it as rare. First collected during this survey.

5 Apr 2005, Starr, F. & K. Starr, (#060422-04), BISH.

Puu Ku

***Portulaca oleracea* -- Pigweed -- (Portulacaceae) -- Alien**

Occasional. What appeared to be *P. oleracea* or a *P. oleracea* x *P. lutea* hybrid or something, was found scattered across the islet, especially on the flat lower areas and on the east side. First observed in 1982 by Hobdy who noted it as common. First collected during this survey.

5 Apr 2005, Starr, F. & K. Starr, (#060422-02), BISH.

***Scaevola coriacea* -- Dwarf naupaka -- (Goodeniaceae) -- Endemic**

Not observed during this survey. Planted a few years ago. Perhaps under the sea of sourbush and lantana.

***Scaevola taccada* -- Naupaka -- (Goodeniaceae) -- Indigenous**

Dominant. Found all over islet, often forming large monotypic clumps. Also observed on tallest rock west of Puu Ku where it was scattered on nearly sheer walls and on the summit. First collected in 1969 by Hendrickson. Observed again in 1982 by Hobdy who noted it as common. Collected again during this survey.

26 Jun 1969, Henrickson, J.S. (#3730), sea level, Forming patches 2-4 feet high, 10 feet thick along shore.
Common, BISH 35980.

5 Apr 2005, Starr, F. & K. Starr, (#060422-05), BISH.

***Sesuvium portulacastrum* -- Akulikuli -- (Aizoaceae) -- Indigenous**

Observed using binoculars on two rocks west of Puu Ku. Dominant on the smaller rock where it was observed on the summit and sprawling down cliff faces. Occasional of the taller rock where a few small patches were observed tucked in areas near the ocean.

***Sonchus oleraceus* -- Sow thistle -- (Asteraceae) -- Alien**

Rare. A few small stunted plants in bare cinder areas. First observed in 1982 by Hobdy who noted it as occasional. First collected during this survey.

5 Apr 2005, Starr, F. & K. Starr, (#060422-15), BISH.

ALAU



Figure 71. Alau Islet.

Overview

Alau is a fairly large islet, approximately 5 acres in size and 148 ft. in height (Hobdy notes). It is located a short distance offshore south of Hana. The islet is a cinder cone and has a central sloped section, with sheer cliffs on the south and west side, a few ridges on the east side which protrude from the central cindery section toward the sea, and a small cinder and boulder beach between the two ridges. Alau islet was surveyed on April 5, 2005 and re-visited on April 6, 2003. A previous survey was conducted by R. Hobdy on March 7, 1982. The islet has many native plants, with a few rare species found on sheer cliffs and near the coast. There are mostly native herbs found near the coast, with a band of grasses and shrubs on slopes, and a grove of palms on the summit.

Vegetation

Alau islet is made up primarily of coastal vegetation dominated by naupaka (*Scaevola taccada*) and akulikuli (*Sesuvium portulacastrum*) with patches of nanea (*Vigna marina*), alena (*Boerhavia repens*), ihi (*Portulaca lutea*), and schiedea (*Schiedea globosa*). There is a grove of about a dozen coconuts (*Cocos nucifera*) on summit. The west tip has some lantana (*Lantana camara*) with nanea and love-in-a-mist (*Passiflora foetida*) sprawling over the area. Just below, on the sheer west cliffs, a few rare native plants exist, including numerous schiedea and several maia pilo (*Capparis sandwichiana*). The slopes are predominantly naupaka and grasses including Henry's crabgrass (*Digitaria ciliaris*) and wiregrass (*Eleusine indica*), with scattered popolo (*Solanum americanum*), pigweed

Alau

(*Portulaca oleracea*), sow thistle (*Sonchus oleraceus*) and pualele (*Emilia fosbergii*). The near ocean areas are blanketed with akulikuli, alena, and ihi. A couple plants of the native sedge (*Cyperus phleoides*) was observed. The rare ihi (*Portulaca villosa*) was found on the windswept cinder ledges on the east side. About 3 small patches were found and the plants were in flower at the time. We observed a total of 23 plant species. There were 9 (39%) native species and 14 (61%) non-native species. We collected 22 plant specimens.

Wildlife

Most of the islet is heavily burrowed by wedge-tailed shearwaters (*Puffinus pacificus*), especially near the top of the islet. Shearwaters were pairing up. There were a couple white tailed tropic birds (*Phaeton lepturus dorotheae*) flying by the islet. About 20 frigatebirds (*Fregata minor palmerstoni*) circled the islet after being flushed from their roosts. Many black noddies (*Anous minutus melanogenys*) were flying around. A few ruddy turnstones (*Arenaria interpres*) were by the beach and flying about the islet. What appeared to be manakins (*Lonchura* sp.) were heard and observed flying about the grasses. Insects were fairly abundant. There was evidence of feeding by larvae of the native palm leaf roller (*Omiodes blackburni*) found on the coconut fronds at the summit. Big headed ants (*Pheidole megacephala*) were collected.

Threats

A few weedy species occur on the islet including lantana (*Lantana camara*), love-in-a-mist (*Passiflora foetida*), and pigweed (*Portulaca oleracea*), Henry's crabgrass (*Digitaria ciliaris*), sourgrass (*Digitaria insularis*), fingergrass (*Eleusine indica*), and pualele (*Emilia fosbergii*). The non-native coconut trees (*Cocos nucifera*) currently support a population of native *Omiodes* moths. If removal of these palms was desired, it should be done only after an appropriate species of *Pritchardia* palm were established, to ensure survival of the moth. These could be selectively removed from high value sites. Alau is one of the more accessible islets, with a kayak approach from Koki Beach. Though not an apparent issue now, if unauthorized visitation was to increase, "no landing" signs could be posted at potential landing sites, as has been done on Oahu islets.

Restoration

Alau is a fairly large islet with many native plants. Weeds could be selectively removed from high value sites. Seeds could be spread of the existing native sedge (*Cyperus phleoides*). The coconuts are currently providing host material for the endemic moth (*Omiodes blackburni*). An appropriate species of native loulu palm (*Pritchardia* sp.) could be added to the grove. A few small tips of the ihi (*Portulaca villosa*) was brought to the Maui Nui Botanical Garden in hopes of growing this species. Plants could be grown and used to make material for out-planting or seed throwing in suitable habitat on Alau and other Maui islets. This could also be done for the schiedea and the maia pilo. Other native species suitable to the islet could be added through seed throwing or out-planting.

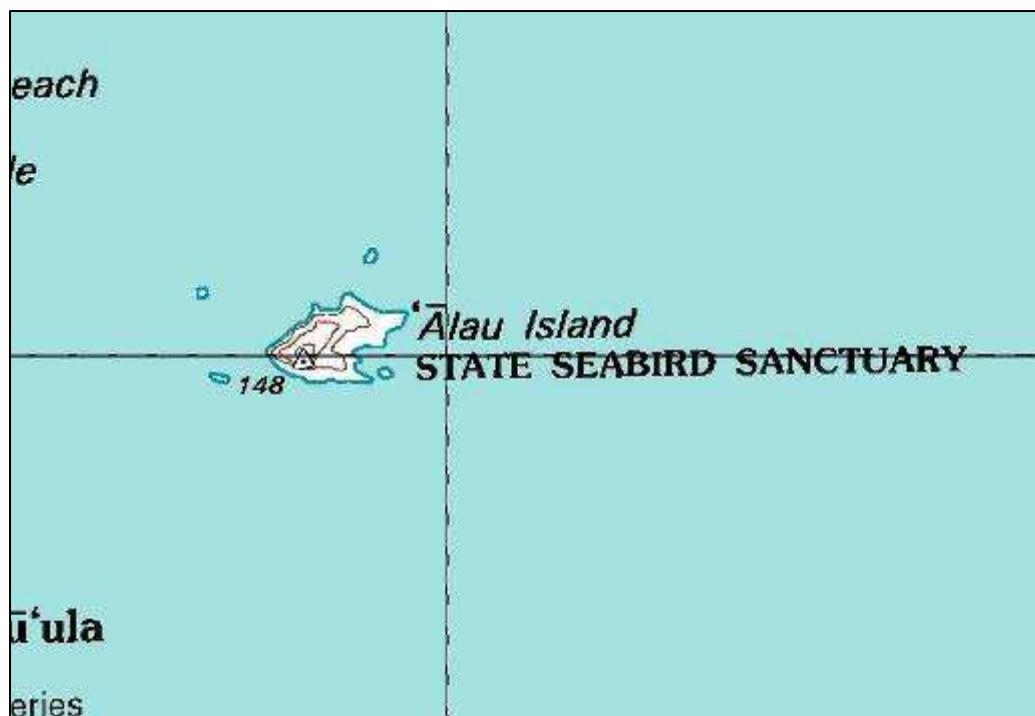


Figure 72. Alau map.

Alau

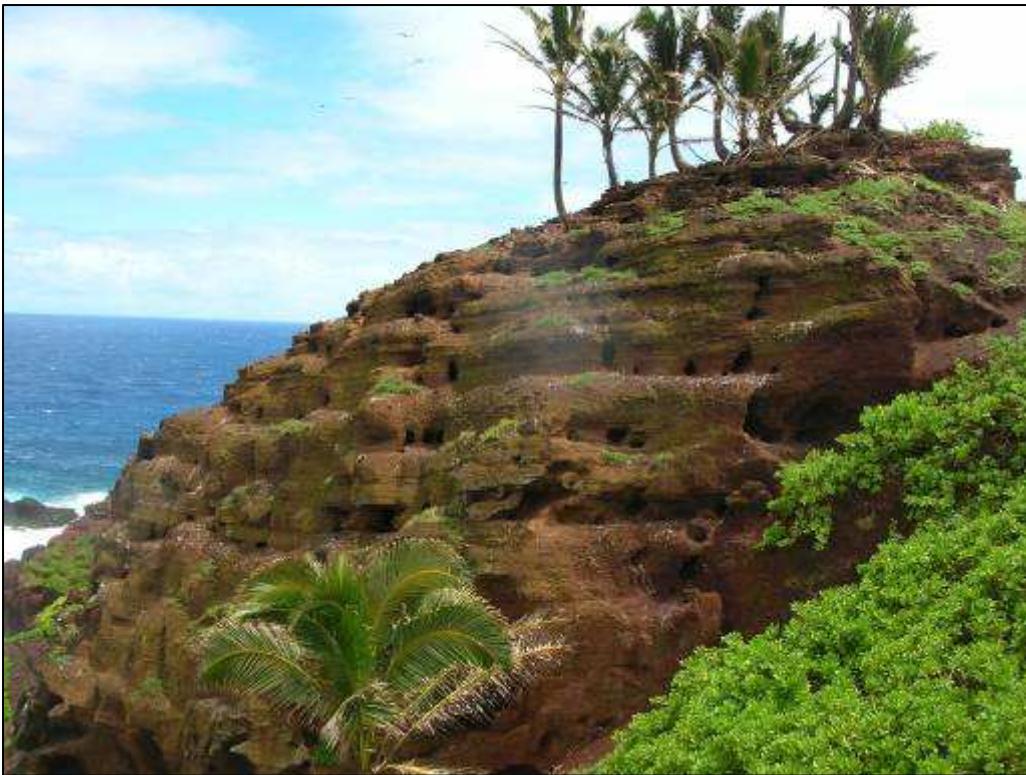


Figure 73. Heavily burrowed western slope with large patches of naupaka (*Scaevola taccada*) and lantana (*Lantana camara*). Coconuts (*Cocos nucifera*) on summit.



Figure 74. Sheer west wall with maia pilo (*Capparis sandwichiana*) in foreground and shiedea (*Schiedea globosa*) below.



Figure 75. Cinder slopes with naupaka and akulikuli (*Sesuvium portulacastrum*).



Figure 76. Cinder ledges with ihi (*Portulaca villosa*) and mats of akulikuli, alena (*Boerhavia repens*), and ihi (*Portulaca lutea*).

Annotated Plant List -- Alau

***Boerhavia repens* -- Alena -- (Nyctaginaceae) -- Indigenous**

Occasional. In sheer open areas. First observed in 1982 by Hobdy who noted it as common. First collected during this survey.

5 Apr 2005, Starr, F., K. Starr, & K. Wood (#050405-12), BISH.

5 Apr 2005, Wood, K., F. Starr, & K. Starr (#11186), 15 m (50 ft), herb, prostrate, stems yellow with slight pink tinge, corolla white with yellow tinge, many patches matting large areas with Sesuvium, BISH; PTBG.

***Capparis sandwichiana* -- Maiapilo -- (Capparaceae) -- Endemic**

Rare. Four plants observed on sheer west wall. First observed during this survey. It was out of reach and not collected.

***Cocos nucifera* -- Coconut -- (Arecaceae) -- Polynesian**

Occasional. A dozen or so on summit and two on the west wall. First observed in 1982 by Hobdy who noted it as rare, two trees.

***Conyza bonariensis* -- Hairy horseweed -- (Asteraceae) -- Alien**

Rare. One plant on east flank of large hill which was pulled. First collected during this survey.

5 Apr 2005, Starr, F., K. Starr, & K. Wood (#050405-22), BISH.

***Cyperus phleoides* -- Cyperus -- (Cyperaceae) -- Endemic**

Rare. Few clumps, two on north wall, one on sheer bowl facing east, one of east ridge of large hill. First collected in 1982 by Hobdy who noted it as occasional. Collected again during this survey.

7 Mar 1982, Hobdy, R.W. (#1304), as var. *pleoides*, Largest plants I have seen, a full 3 ft. tall, BISH 460505.

5 Apr 2005, Starr, F., K. Starr, & K. Wood (#050405-26), BISH.

***Cyperus polystachyos* -- Cyperus -- (Cyperaceae) -- Indigenous**

Not observed during this survey. First collected by Strong in 1982.

7 Mar 1982, Strong, M.T. (#1301), In bare areas cinders in a protected spot, BISH 612022.

***Cyperus* sp. -- Cyperus -- (Cyperaceae) -- Unknown**

Not observed during this survey. First observed in 1982 by Hobdy who noted it as rare.

***Digitaria ciliaris* -- Henry's crab grass -- (Poaceae) -- Alien**

Common. A real wide leaved variety. First observed in 1982 by Hobdy who noted it as common. First collected during this survey.

5 Apr 2005, Starr, F., K. Starr, & K. Wood (#050405-18), BISH.

***Digitaria insularis* -- Sourgrass -- (Poaceae) -- Alien**

Occasional. Scattered near rocks on ridge on west side. First collected during this survey.

5 Apr 2005, Starr, F., K. Starr, & K. Wood (#050405-28), BISH.

***Digitaria setigera* -- Itchy crabgrass -- (Poaceae) -- Questionably Indigenous**

Not observed during this survey. First collected in 1982 by Hobdy who noted it as occasional.

Alau

7 Mar 1982, Hobdy, R.W. (#1301), Growing with *Digitaria adscendens* & *Portulaca oleracea*, BISH 460064.

***Eleusine indica* -- Wire grass -- (Poaceae) -- Alien**

Common. Dense in spots. First observed in 1982 by Hobdy who noted it as occasional. First collected during this survey.

5 Apr 2005, Starr, F., K. Starr, & K. Wood (#050405-15), BISH.

***Emilia fosbergii* -- Pualele -- (Asteraceae) -- Alien**

Occasional. Here and there in middle part of islet. First observed in 1982 by Hobdy who noted it as uncommon. First collected during this survey.

5 Apr 2005, Starr, F., K. Starr, & K. Wood (#050405-16), BISH.

***Fimbristylis cymosa* -- Button sedge -- (Cyperaceae) -- Indigenous**

Not observed during this survey. First observed in 1982 by Hobdy who noted it as occasional.

***Hedyotis littoralis* -- Manono -- (Rubiaceae) -- Endemic**

Not observed during this survey. First observed in 1982 by Hobdy who noted it as rare.

***Lantana camara* -- Lantana -- (Verbenaceae) -- Alien**

Occasional. On ridge on west side of islet. First observed in 1982 by Hobdy who noted it as rare. First collected during this survey.

5 Apr 2005, Starr, F., K. Starr, & K. Wood (#050405-24), BISH.

***Nephrolepis multiflora* -- Sword fern -- (Nephrolepidaceae) -- Alien**

Rare. A few patches on sheer east walls. First collected during this survey.

6 Apr 2005, Starr, F., K. Starr, & K. Wood (#050406-2), BISH.

***Oxalis corniculata* -- Yellow wood sorrel -- (Oxalidaceae) -- Questionably Polynesian**

Not observed during this survey. First observed in 1982 by Hobdy who noted it as rare.

***Passiflora foetida* -- Love-in-a-mist -- (Passifloraceae) -- Alien**

Rare. On ridge on west side of islet. First observed in 1982 by Hobdy who noted it as rare. First collected during this survey.

5 Apr 2005, Starr, F., K. Starr, & K. Wood (#050405-25), BISH.

5 Apr 2005, Wood, K., F. Starr, & K. Starr (#11187), 15 m (50 ft), vine, scandent on western saddle with *Scaevola taccada*, and *Vigna marina*, stems green, tendrils yellow-green, in flower and early fruit, BISH; PTBG.

***Portulaca lutea* -- Ihi -- (Portulacaceae) -- Endemic**

Occasional. Near coast. First observed in 1982 by Hobdy who noted it as rare. First collected during this survey.

5 Apr 2005, Starr, F., K. Starr, & K. Wood (#050405-20), BISH.

***Portulaca oleracea* -- Pigweed -- (Portulacaceae) -- Alien**

Common. More in the interior. First observed in 1982 by Hobdy who noted it as abundant. First collected during this survey.

5 Apr 2005, Starr, F., K. Starr, & K. Wood (#050405-21), BISH.

***Portulaca villosa* -- Ihī -- (Portulacaceae) -- Endemic**

Rare. About 10 plants on consolidated cinder shelves on east part of islet. Collected two tips and capsules for identification and propagation. It is being propagated by the Maui Nui Botanical Garden. Once grown, a specimen will be sent to BISH. Also observed in 1982 by Hobdy who called it *P. sclerocarpa* and noted it as rare and stated the following: "An outstanding find was the *Portulaca* plants in a protected pocket on the east slope. They appear to fall into the *P. villosa* complex but further study is necessary for proper placement."

***Scaevola taccada* -- Naupaka -- (Goodeniaceae) -- Indigenous**

Common. Widespread. First observed in 1982 by Hobdy who noted it as abundant. First collected during this survey.

5 Apr 2005, Starr, F., K. Starr, & K. Wood (#050405-13), BISH.

***Schiedea globosa* -- Schiedea-- (Caryophyllaceae) -- Endemic**

Occasional. Locally abundant. Hundreds on sheer west wall. First collected in 1982 by Hobdy who noted it as rare. Collected again during this survey.

7 Mar 1982, Hobdy, R.W. (#1302), BISH 460504.

6 Apr 2005, Starr, F., K. Starr, & K. Wood (#050406-1), BISH.

***Sesuvium portulacastrum* -- Akulikuli -- (Aizoaceae) -- Indigenous**

Common. Forming dense mats often closest plant to ocean. First observed in 1982 by Hobdy who noted it as abundant. First collected during this survey.

5 Apr 2005, Starr, F., K. Starr, & K. Wood (#050405-14), BISH.

***Solanum americanum* -- Popolo -- (Solanaceae) -- Questionably Indigenous**

Common. Locally common. Not observed during this survey. First observed in 1982 by Hobdy who noted it as occasional. First collected during this survey.

6 Apr 2005, Starr, F., K. Starr, & K. Wood (#050406-3; 050405-19), BISH.

***Sonchus oleraceus* -- Sow thistle -- (Asteraceae) -- Alien**

Occasional. Here and there. Not observed during this survey. First observed in 1982 by Hobdy who noted it as occasional. First collected during this survey.

5 Apr 2005, Starr, F., K. Starr, & K. Wood (#050405-17), BISH.

***Sporobolus indicus* -- Dropseed -- (Poaceae) -- Alien**

Rare. One plant. First collected during this survey.

5 Apr 2005, Starr, F., K. Starr, & K. Wood (#050405-27), BISH.

***Tournefortia argentea* -- Tree heliotrope -- (Boraginaceae)-- Alien**

Rare. One tree on east end near coast. First observed in 1982 by Hobdy who noted it as rare.

***Vigna marina* -- Nanea -- (Fabaceae) -- Indigenous**

Occasional. On ridge on west side of islet. Also scattered on sheer areas and near the coast. Not observed during this survey. First observed in 1982 by Hobdy who noted it as uncommon. First collected during this survey.

Alau

5 Apr 2005, Starr, F., K. Starr, & K. Wood (#050405-23), BISH.

5 Apr 2005, Wood, K., F. Starr, & K. Starr (#11188), 15 m (50 ft), vine, scandent in *Scaevola taccada*, stems green with ridges, corolla yellow, with fruit, common along western end of saddle ridge, BISH; PTBG.

MOLOKINI



Figure 77. Molokini Islet.

Overview

Molokini islet is a horseshoe shaped tuff cone located about midway in the channel between the islands of Maui and Kahoolawe. The location coordinates are: 760,861 E 2,283,251 N. Molokini is approximately 22 acres and reaches a height of 160 ft. The outer slope is steep and precipitous with sparse vegetation and the inner slope is less steep and is where most of the vegetation occurs. We (Starr & Starr) conducted a botanical survey on Apr. 5, 2006. We were accompanied by Chris Swenson who conducted an ordnance survey and by David Preston who conducted an insect survey. We were taken to the islet on the National Oceanic & Atmospheric Association (NOAA) boat in the morning and swam to shore near the western tip. We spent about 5 hours on the islet and did walk through surveys noting the vegetation present and abundance. We made collections of all plants encountered, except for the *Portulaca molokiniensis*, a federally listed endangered species, though photos were taken. Specimens will be accessioned to Bishop Museum (BISH). We took 396 photos which will be displayed at <www.hear.org/starr>. Prior to our survey, we reviewed previous voucher specimens housed at BISH and the Smithsonian Institute (USNM). We also reviewed previous surveys, including one by C.N. Forbes in 1913, one by R. Hobdy in 1982, and one by us in 2002. These are incorporated into the annotated checklist below.

Vegetation

At the time of our survey, the island was fairly green. However, this winter had a late rainfall, and as a result, the plants already growing were able to flush, but plants that

Molokini

came from seed were just starting to get going, with many still in the seedling stage. Most vegetation was low in stature, likely due to the harsh winds and surrounding ocean environment. Even woody shrubs, such as koa haole (*Leucaena leucocephala*) and tree tobacco (*Nicotiana glauca*) did not get much taller than a 1-2 meters. Many of the species previously reported are likely gone, though many may also lay dormant as seeds, or exist in low numbers amongst the sea of buffel grass (*Cenchrus ciliaris*), which dominates the islet. Near the landing are a few non-native species, such as sourgrass (*Digitaria insularis*) and Boerhavia (*Boerhavia coccinea*). Non-native portulaca species (*Portulaca pilosa* and *Portulaca oleracea*) are scattered about the islet, mostly in open areas. Also scattered about the islet are tree tobacco and koa haole. Native species, such as pau o hiiaka (*Jacquemontia ovalifolia* subsp. *sandwicensis*) and ilima (*Sida fallax*) are also found scattered about the islet. The diversity of plants increases in open areas not dominated by buffel grass. Along the lower portions of the islet, close to the ocean, a few native species were found, including ena ena (*Heliotropium curassavicum*), akulikuli (*Sesuvium portulacastrum*), and ohelo kai (*Lycium sandwicense*). The ihi (*Portulaca molokiniensis*) was found in a buffel grass patch along with an ilima plant. No other plants of the ihi were located, though there could have been more hidden in the buffel grass. It may be useful to revisit the islet to search for more *Portulaca molokiniensis* in the summer months when the buffel grass is down. We observed a total of 35 species of plants during our survey. Of the 35 species, 9 (26%) were native and 26 (74%) were non-native. We made 36 collections for 34 species of plants.

Wildlife

There was not too much seabird activity on the islet at the time of the survey. The wedge-tailed shearwaters (*Puffinus pacificus*) had just begun pairing up and only a few pairs were encountered. A few frigate birds (*Fregata minor*) were observed soaring over the islet. Many skinks were observed about the islet.

Threats

Non-native buffel grass (*Cenchrus ciliaris*) dominated the vegetation. Most native plants encountered were observed in open areas where there was a break in the buffel grass. One exception was the endangered ihi (*Portulaca molokiniensis*) which was growing directly in a large patch of buffel grass. Some plants, such as ilima (*Sida fallax*) seem to be able to compete with the buffel grass, but many others do not. Other non-native plants that could pose potential problems for native species could also be removed, including golden crown beard (*Verbesina encelioides*), sourbush (*Pluchea carolinensis*), Indian fleabane (*Pluchea indica*), koa haole (*Leucaena leucocephala*), and sandbur (*Cenchrus echinatus*). Most of these species are not yet in high numbers and some were hand pulled during this survey. Other threats include non-native invertebrates, such as ants and spiders. Humans currently are not allowed to land, though a large crowd of tour boats occupy the inner waters of the islet in the morning hours. While they do provide some policing to keep people from landing on the islet, it is likely that shy seabirds, such as boobies (*Sula* spp.) and sooty terns (*Sterna fuscata*) will not use the islet with so much human commotion present. There was a fair amount of shrapnel, practice bombs, and practice rockets observed on the islet.

Restoration

Non-native grasses could be removed which would help allow the native species to spread. Areas around native species could be prioritized for removal of non-native grasses. Several native species have not been observed on the islet in some time, such as nehe (*Lipochaeta lavarum*), pua kala (*Argemone glauca*), ihi (*Portulaca villosa*), alena (*Boerhavia* sp.), kaunaoa (*Cuscuta sandwichiana*), and native grasses (*Panicum fauriei* subsp. *latius*, *Panicum pellitum*, and *Panicum torridum*). Some of these species may still lay dormant as seeds and have the potential to return once the pressure from the buffel grass is removed. These species could also be reintroduced after sufficient weed control of non-native grasses. Additionally, plant species not known from the island but found in similar habitats elsewhere could be introduced, such as ohai (*Sesbania tomentosa*), kawelu (*Eragrostis variabilis*), and The native ihi (*Portulaca molokiniensis*) was observed in a thicket of buffel grass. The grasses nearby could be carefully removed, allowing the ihi to spread. What appeared to be seedlings of the ihi lay just below the plant and there were spent seed capsules present on the adult plant. Only one cluster of perhaps three plants were found, though there could be more present hiding in the buffel grass. Additional plants could be propagated through seeds or cuttings and out-planted in areas free of buffel grass. It should be determined if the *Portulaca molokiniensis* is able to hybridize with *Portulaca oleracea* before it is propagated by seeds. The shrapnel and ordnance could be removed.

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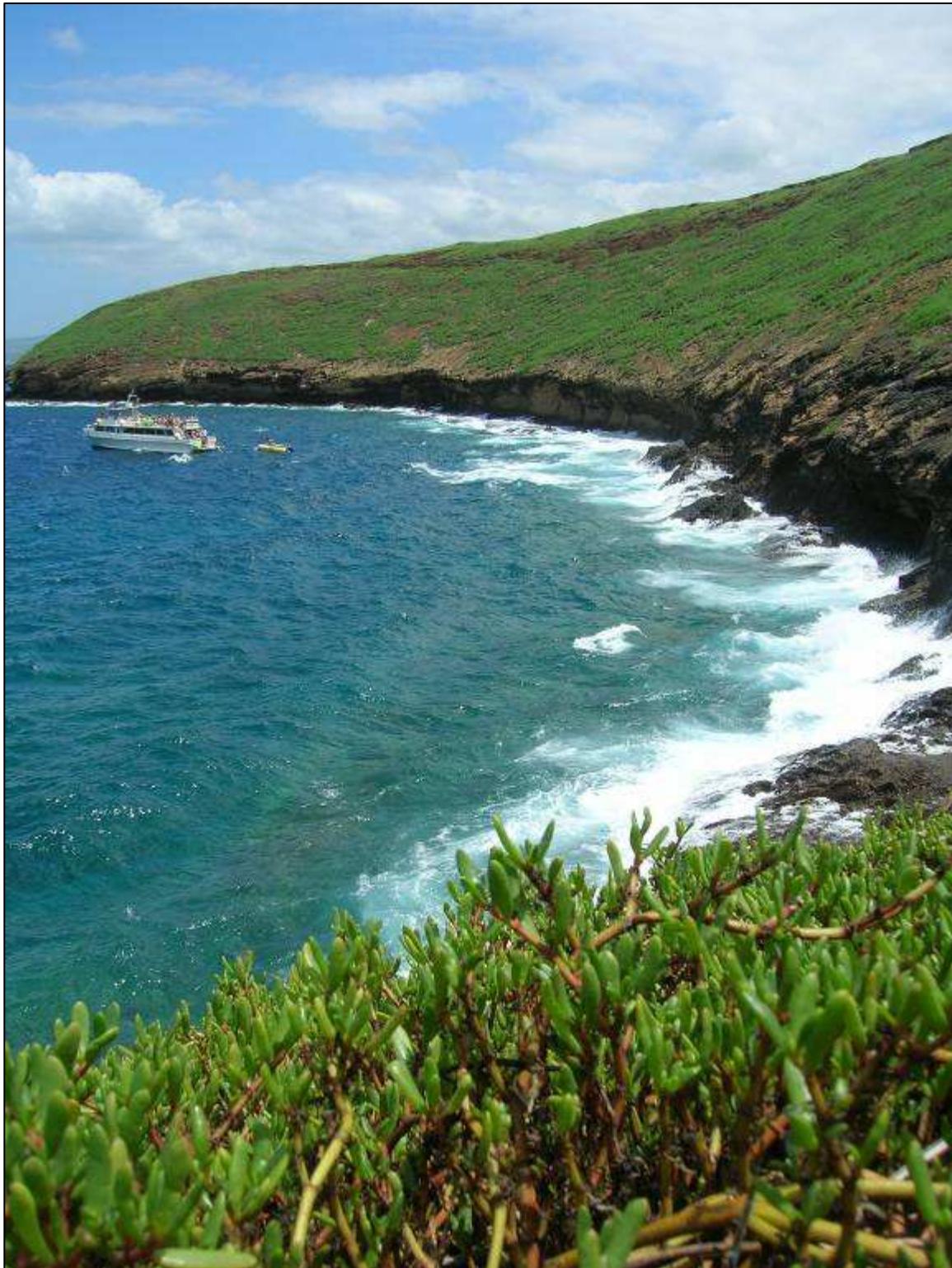


Figure 78. Molokini Islet toward eastern tip with akulikuli (*Sesuvium portulacastrum*) in lower reaches of inner crescent shaped slope near the ocean and upper portions dominated by buffel grass (*Cenchrus ciliaris*).

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Figure 79. Tallest section of islet showing steep backside with sparse vegetation.

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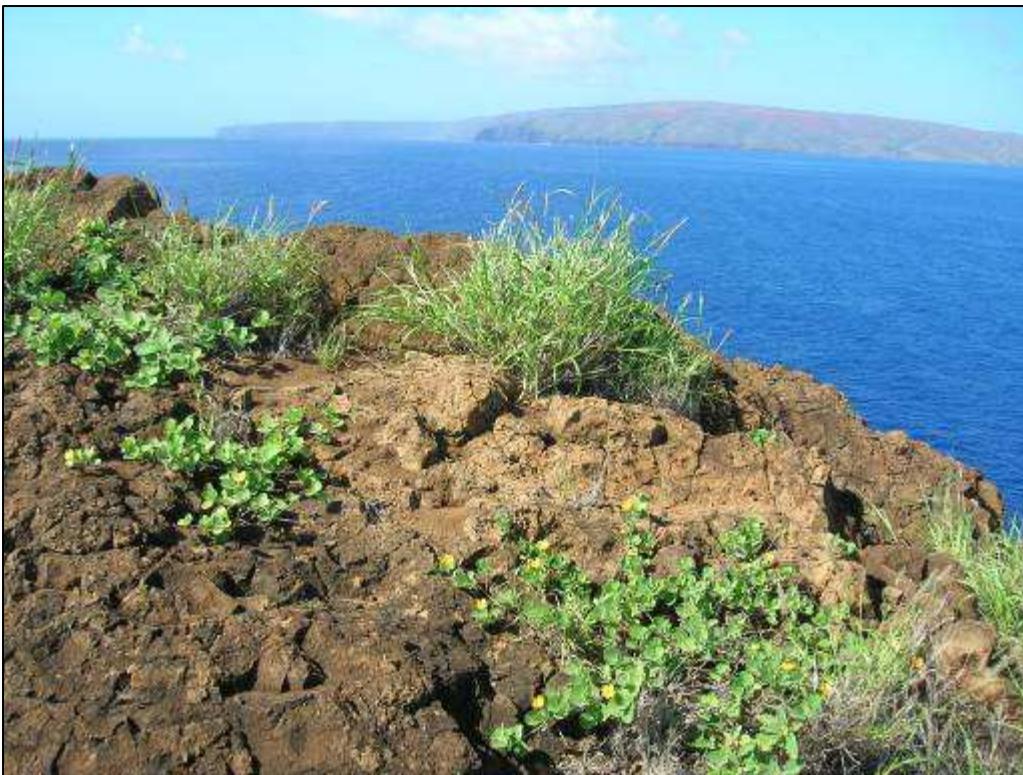


Figure 80. Scattered ilima (*Sida fallax*) and buffel grass with Kahoolawe in distance.



Figure 81. Ihi (*Portulaca molokiniensis*) with buffel grass and ilima nearby.

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Annotated Plant List -- Molokini

Abutilon grandifolium -- Hairy abutilon -- (Malvaceae) -- Alien

Not observed during this survey. First observed by Starr in 2002 who noted it as rare.

Abutilon incanum -- Hoary abutilon -- (Malvaceae) -- Questionably Indigenous

Rare. One plant on inner slope below the lighthouse. First collected during this survey.

5 Apr 2006, Starr, F. & K. Starr, (#060405-12), BISH.

Ageratum conyzoides -- Maile honohono -- (Asteraceae) -- Alien

Not observed during this survey. First collected by Hobdy in 1982 who noted it as occasional, rare on inner slopes.

14 Feb 1982. Hobdy, R.W. (#1234), rare on inner slopes, BISH 459994.

Anagallis arvensis -- Scarlet pimpernel -- (Primulaceae) -- Alien

Not observed during this survey. First collected by Richardson in 1954. Collected again in 1982 by Hobdy who noted it as uncommon.

June 1954. Richardson, F. (#s.n.), BISH 499127.

14 Feb 1982. Hobdy, R.W. (#1229), BISH 459998.

Argemone glauca -- Pua kala -- (Papaveraceae) -- Endemic

Not observed during this survey. First observed by Hobdy in 1982 who noted it as rare.

Atriplex semibaccata -- Australian saltbush -- (Chenopodiaceae) -- Alien

Occasional. Small clumps observed here and there, especially in open areas, such as near the coast. First collected by Palmer in 1925. Collected again in 1954 by Richardson and in 1982 by Hobdy who noted it as occasional, rare along inner slopes. Observed in 2002 by Starr who noted it as occasional. Collected again during this survey.

13 Aug 1925. Palmer, H. (#7), 80 m, BISH 46884.

June 1954. Richardson, F. (#s.n.), BISH 448460.

5 Apr 2006, Starr, F. & K. Starr, (#060405-33), BISH.

Atriplex suberecta -- Saltbush -- (Chenopodiaceae) -- Alien.

Not observed during this survey. First collected by Hobdy in 1982 [as syn. *Atriplex muelleri*] who noted it as rare.

14 Feb 1982. Hobdy, R.W. (#1232), rare on inner slope, BISH 459996.

Bidens pilosa -- Spanish needles -- (Asteraceae) -- Alien

Not observed during this survey. First observed by Hobdy in 1982 who noted it as rare.

Boerhavia coccinea -- Boerhavia -- (Nyctaginaceae) -- Alien

Rare. Observed only near sign and at landing. First collected during this survey.

5 Apr 2006, Starr, F. & K. Starr, (#060405-23), BISH.

Boerhavia glabrata -- Alena -- (Nyctaginaceae) -- Indigenous

Not observed during this survey. First collected in 1913 by Forbes *et al.* [as syn. *Boerhavia acutifolia*]. Collected again by Hobdy in 1982 who noted it as uncommon. Hobdy used the name, *Boerhavia tetranda*, now a synonym for *Boerhavia repens*, but after further investigation at BISH, this specimen was later identified as *Boerhavia glabrata* which has since been re-identified as *Boerhavia acutifolia*.

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10 Feb 1913. Forbes, C.N., J. Stokes, C. Cooke, H. Pilsbry (#s.n.), BISH 60679.
14 Feb 1982. Hobdy, R.W. (#s.n.), BISH 460001.

***Boerhavia herbstii* -- Alena -- (Nyctaginaceae) -- Endemic**

Not observed during this survey. First collected by Palmer in 1925.
13 Aug 1925. Palmer, H. (#12), ca. 100 ft, BISH 60719.

***Boerhavia repens* -- Alena -- (Nyctaginaceae) -- Indigenous**

Not observed during this survey. First collected by Richardson in 1954.
June 1954. Richardson, F. (#s.n.), BISH 685132.

***Cenchrus ciliaris* -- Buffel grass -- (Poaceae) -- Alien**

Dominant. Covers most of the islet, especially the inner slope. First collected by Clarke in 1980. Collected again in 1982 by Hobdy who noted it as abundant, though no voucher information was found at BISH. Observed in 2002 by Starr who noted it as dominant. Collected again during this survey.

23 Apr 1980. Clarke, G. (#405, 411, 413), north exposed slope, inner slopes, a new record never previously recorded from Molokini. The dominant herbaceous cover of island's north exposed slopes. 12-15" height, dry, growing in full sun and fruiting profusely, BISH 495370, 429907, 667003.
5 Apr 2006, Starr, F. & K. Starr, (#060405-36), BISH.

***Cenchrus echinatus* -- Sandbur -- (Poaceae) -- Alien**

Occasional. Not much present. Only forming small patches in a couple spots in center of islet. Seed heads seem less robust than the average *Cenchrus echinatus*. Perhaps the same species listed as *Cenchrus echinatus* var. *hillebrandii* by previous observers. The regular *Cenchrus echinatus* was seen near the landing. First collected by Clarke in 1980. Collected again in 1982 by Hobdy who noted it as occasional, though no voucher information was found at BISH. Hobdy also noted the presence of *Cenchrus echinatus* var. *hillebrandianus* as occasional. However, this taxon has since been combined with *Cenchrus echinatus*. Both forms were collected again during this survey.

23 Apr 1980. Clarke, G. (#412), A first time record from Molokini Island which is found occasionally growing with the *Cenchrus ciliaris* on the inner north facing slopes, BISH 429908.
5 Apr 2006, Starr, F. & K. Starr, (#060405-02), var. *hillebrandii*, BISH.
5 Apr 2006, Starr, F. & K. Starr, (#060405-31), BISH.

***Chamaesyce hirta* -- Hairy spurge -- (Euphorbiaceae) -- Alien**

Rare. Two plants on southeast outer slope. First collected in 1982 by Hobdy [as syn. *Euphorbia hirta*] who noted it as uncommon. Observed in 2002 by Starr who noted it as rare to occasional. Collected again during this survey.

14 Feb 1982. Hobdy, R.W. (#1236), BISH 459992.
5 Apr 2006, Starr, F. & K. Starr, (#060405-28), BISH.

***Chenopodium murale* -- Lamb's quarters -- (Chenopodiaceae) -- Alien**

Occasional. Occasional plants with a couple spots where it was the most common plant. First collected by Clarke in 1980. Collected again in 1982 by Hobdy who noted it as common. Observed in 2002 by Starr who noted it as rare to occasional. Collected again during this survey.

23 Apr 1980. Clarke, G. (#404), First time record from Molokini Island, Found occasionally throughout the *Cenchrus* dominant grassland of Molokini Island. Other common plants associated with Aheaea included *Nicotiana glauca*, *Sida fallax*, *Waltheria americana*, and *Ageratum conyzoides*, BISH 429909.
5 Apr 2006, Starr, F. & K. Starr, (#060405-17), BISH.

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***Chloris barbata* -- Swollen fingergrass -- (Poaceae) -- Alien**

Occasional. Scattered clumps in open areas. First collected in 1954 by Richardson. Collected again in 1982 by Hobdy [as syn. *Chloris inflata*] who noted it as rare, near Lalilali Point. Collected again during this survey.

June 1954. Richardson, F. (#s.n.), BISH 640512.

14 Feb 1982. Hobdy, R.W. (#1235), A few plants seen near point, BISH 459993.

5 Apr 2006, Starr, F. & K. Starr, (#060405-20), BISH.

***Chloris* sp. -- Radiate fingergrass -- (Poaceae) -- Alien**

Not observed during this survey. Observed in 2002 by Starr who noted it as occasional.

***Chloris virgata* -- Feather fingergrass -- (Poaceae) -- Alien**

Not observed during this survey. First collected in 1982 by Hobdy who noted it as occasional, eastern crest of islet.

14 Feb 1982. Hobdy, R.W. (#1237), BISH 459991.

***Conyza bonariensis* -- Hairy horseweed -- (Asteraceae) -- Alien**

Not observed during this survey. First collected in 1982 by Hobdy who noted it as rare, few young plants.

14 Feb 1982. Hobdy, R.W. (#1236), few young plants, BISH 460000.

***Coronopus didymus* -- Swinecress -- (Brassicaceae) -- Alien**

Not observed during this survey. First collected in 1982 by Hobdy who noted it as rare.

14 Feb 1982. Hobdy, R.W. (#1238), rare along inner slope, BISH 459999.

***Crotalaria incana* -- Fuzzy rattlepod -- (Fabaceae) -- Alien**

Not observed during this survey. First observed by Hobdy on May 9, 1990.

***Cuscuta sandwichiana* -- Kaunaoa -- (Cuscutaceae) -- Endemic**

Not observed during this survey. First collected in 1925 by Palmer. Collected again in 1982 by Hobdy who noted it as rare, though no voucher information was found at BISH.

13 Aug 1925. Palmer, H. (#11), 60 m, BISH 47269.

***Cyperus cyperinus* -- Sedge -- (Cyperaceae) -- Indigenous**

Not observed during this survey. First collected by Forbes *et al.* in 1913 as *Cyperus* sp. and later identified as *Cyperus cyperinus* by BISH.

10 Feb 1913. Forbes, C.N., C.N., J. Stokes, C. Cooke, H. Pilsbry (#s.n.), BISH 116955.

***Dactyloctenium aegyptium* -- Beach wire grass -- (Poaceae) -- Alien**

Occasional. Scattered over much of the islet, growing in open spots. First collected in 1982 by Hobdy who noted it as rare, though no voucher information was found at BISH. Observed in 2002 by Starr who noted it as rare to occasional. Collected again during this survey.

5 Apr 2006, Starr, F. & K. Starr, (#060405-27), BISH.

***Desmodium sandwicense* -- Spanish clover -- (Fabaceae) -- Alien**

Not observed during this survey. Previously collected by Forbes in 1913.

10 Feb 1913. Forbes, C.N. (#s.n.), BISH 55353.

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***Digitaria ciliaris* -- Henry's crab grass -- (Poaceae) -- Alien**

Not observed during this survey. First collected in 1925 by Palmer. Collected again in 1980 by Clarke who noted "near the landing". Collected in 1982 by Hobdy [as syn. *Digitaria sanguinalis*] who noted it as occasional, though no voucher information was found at BISH.

13 Aug 1925. Palmer, H. (#15), 24 m - 54 m, BISH 118689.

23 Apr 1980. Clarke, G. (#407), Only plant sighted and sterile, Growing in soil, under full sun, on a 30 degree slope, and on the trail to the lighthouse, BISH 667067.

***Digitaria insularis* -- Sour grass -- (Poaceae) -- Alien**

Rare. One plant near landing sign. First collected during this survey.

5 Apr 2006, Starr, F. & K. Starr, (#060405-14), BISH.

***Doryopteris decipiens* -- Iwa iwa -- (Pteridaceae) -- Endemic**

Not observed during this survey. First collected in 1913 by Forbes *et al.*

10 Feb 1913. Forbes, C.N., C.N., J. Stokes, C. Cooke, H. Pilsbry (#s.n.), BISH 5232.

***Emilia fosbergii* -- Pualele -- (Asteraceae) -- Alien**

Rare. One plant observed. First collected by Richardson in 1954. Collected again during this survey.

June 1954. Richardson, F. (#s.n.), BISH 444919.

5 Apr 2006, Starr, F. & K. Starr, (#060405-11), BISH.

***Gamochaeta [Gnaphalium] purpureum* -- Purple cudweed -- (Asteraceae) -- Alien**

See below. First collected in 1982 by Hobdy who noted it as rare, though no voucher information was found at BISH.

***Gnaphalium* sp. -- Gnaphalium -- (Asteraceae) -- Alien**

Rare. Observed towards the center of the islet on margin of open area towards the lower portion near ocean. Collected during this survey.

5 Apr 2006, Starr, F. & K. Starr, (#060405-09), BISH.

***Heliotropium curassavicum* -- Heliotrope -- (Boraginaceae) -- Indigenous**

Occasional. A few dozen patches draping over sheer wall on inner slope in middle part of islet near coast and in other moist open areas. First collected in 1982 by Hobdy who noted it as rare, fully developed plants seed in the spring of 1981. Collected again during this survey.

14 Feb 1982. Hobdy, R.W. (#1230), fully developed plants seen in the spring of 1981, BISH 459997.

5 Apr 2006, Starr, F. & K. Starr, (#060405-08), BISH.

***Heteropogon contortus* -- Pili -- (Poaceae) -- Questionably Indigenous**

Rare. A few clumps on SE back slope, near coast. First collected by Stokes and Forbes in 1913. Collected again in 1925 by Palmer who noted "9 m". Collected again in 1954 by Richardson. Collected again in 1982 by Hobdy who noted it as uncommon, though no voucher information was found at BISH. Collected again during this survey.

10 Feb 1913. Stokes, J.F.G. & C.N. Forbes (#s.n.), BISH 119374.

13 Aug 1925. Palmer, H. (#14), 9 m, BISH 119354.

June 1954. Richardson, F. (#s.n.), BISH 119325.

5 Apr 2006, Starr, F. & K. Starr, (#060405-30), BISH.

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***Jacquemontia ovalifolia* subsp. *sandwicensis* -- Pau o hiiaka -- (Convolvulaceae) -- Endemic**

Occasional. Scattered around islet. Though not abundant now, in previous wetter years, this ephemeral vine has been much more abundant. First collected by Stokes *et al.* in 1913. Collected again in 1925 by Palmer, in 1980 by Clarke, and in 1982 by Hobdy who noted it as uncommon, though no voucher information was found at BISH. Observed in 2002 by Starr who noted it as common. Collected again during this survey.

10 Feb 1913. Stokes, J.F.G., Dr. C.M. Cooke, Dr. H.A. Pilsbry, & C.N. Forbes, (#s.n.), BISH 47706, 47707.

13 Aug 1925. Palmer, H. (#6), compares well with the specimen coll. by Forbes in 1913 & identified by him as var. *tomentosa*, E.L.C., 100 m, BISH 47694.

23 Apr 1980. Clarke, G. (#410), Collected northeast of the lighthouse on Molokini Island, BISH 429910.

5 Apr 2006, Starr, F. & K. Starr, (#060405-24), BISH.

***Lactuca serriola* -- Prickly lettuce -- Asteraceae -- Alien**

Rare to occasional. A few small scattered plants. First observed by Hobdy on May 9, 1990. First collected during this survey.

5 Apr 2006, Starr, F. & K. Starr, (#060405-05), BISH.

***Lantana camara* -- Lantana -- Verbenaceae -- Alien**

Not observed during this survey. First observed in 1913 by Forbes. First collected in 1925 by Palmer. Collected again by Hobdy and Clarke in 1982 who noted it as rare, though no voucher information was found at BISH.

13 Aug 1925. Palmer, H. (#1), 40 m, BISH 71947.

***Leucaena leucocephala* -- Koa haole -- (Fabaceae) -- Alien**

Occasional to common. Found over much of the islet. Usually <1 m tall. First collected in 1925 by Palmer. Observed by Hobdy and Clarke in 1982 who noted it as uncommon. Observed in 2002 by Starr who noted it as occasional. Collected again during this survey.

13 Aug 1925. Palmer, H. (#17), BISH 55588.

5 Apr 2006, Starr, F. & K. Starr, (#060405-34), BISH.

***Lipochaeta lavarum* -- Nehe -- (Asteraceae) -- Endemic**

Not observed during this survey. First observed in 1913 by Forbes. First collected in 1925 by Palmer. Collected again in 1980 by Clarke and in 1982 by Hobdy who called this taxon *Lipochaeta lavarum* var. *ovata* and noted it as rare, near crest of islet west of the lighthouse.

13 Aug 1925. Palmer, H. (#9), 18 m, BISH 75824.

23 Apr 1980. Clarke, G. (#401), 90 ft, BISH 475925.

14 Feb 1982. Hobdy, R.W. (#1252), near crest of islet west of the lighthouse, One large decumbent plant 1 1/2 ft. tall, spreading about 10 ft. through grass and rocks, BISH 493629.

***Lycium sandwicense* -- Ohelo kai -- (Solanaceae) -- Indigenous**

Rare. Two patches draping over sheer wall on inner slope in middle part of islet near coast. First collected in 1913 by Stokes *et al.* Collected by Hobdy in 1982 who noted it as rare, though no voucher information was found at BISH. Collected again during this survey.

10 Feb 1925. Stokes, J.F.G., C.M. Cooke, H.A. Pilsbry, C.N. Forbes, (#s.n.), BISH 69742.

5 Apr 2006, Starr, F. & K. Starr, (#060405-13), BISH.

***Macroptilium lathyroides* -- Cow pea -- (Fabaceae) -- Alien**

Occasional. Not much. All very young. First collected in 1980 by Clarke who noted, "an herb found infrequently on the inner slopes of Molokini Island. The cow pea has note been previously recorded as growing on Molokini." Collected again in 1982 by Hobdy who noted it as uncommon, though no voucher information was found at BISH. Observed (as *Macroptilium* sp.) in 2002 by Starr who noted it as occasional. Collected again during this survey.

23 Apr 1980. Clarke, G. (#406), an herb found infrequently on the inner slopes of Molokini Island. The cow pea has not been previously recorded as growing on Molokini, BISH 429911.

5 Apr 2006, Starr, F. & K. Starr, (#060405-25), BISH.

***Malva parviflora* -- Cheeseweed -- (Malvaceae) -- Alien**

Occasional. Scattered plants. Lots of seedlings. First collected in 1982 by Hobdy who noted it as abundant. Observed in 2002 by Starr who noted it as occasional. Collected again during this survey.

14 Feb 1982. Hobdy, R.W. (#1233), BISH 459995.

5 Apr 2006, Starr, F. & K. Starr, (#060405-04), BISH.

5 Apr 2006, Starr, F. & K. Starr, (#060405-19), BISH.

***Medicago polymorpha* -- Bur clover -- (Fabaceae) -- Alien**

Not observed during this survey. First collected in 1982 by Hobdy who noted it as rare.

14 Feb 1982. Hobdy, R.W. (#1245), in dense patches along inner slopes, BISH 459985.

***Merremia aegyptium* -- Hairy merremia -- (Convolvulaceae) -- Questionably naturalized**

Rare. One small plant. First observed by Hobdy on May 9, 1990. Observed in 2002 by Starr who noted it as occasional. First collected during this survey.

5 Apr 2006, Starr, F. & K. Starr, (#060405-07), BISH.

***Nephrolepis multiflora* -- Sword fern -- (Nephrolepidaceae) -- Alien**

Not observed during this survey. First observed by Hobdy on May 9, 1990.

***Nicotiana glauca* -- Tree tobacco -- (Solanaceae) -- Alien**

Common. Scattered over islet. Most abundant on SE tip, Pahee o Lono, where it dominates. No sphinx moth (*Manduca blackburnii*) damage seen. Frigates (*Fregata minor*) appear to roost in the shrubby tree which gets no larger than a couple meters on Molokini. Large piles of frigate guano can be observed under dead tree tobacco, the plant succumbing to the toxic brew. First collected in 1954 by Richardson. Collected again in 1982 by Hobdy who noted it as common, inner slope, occasional. Observed in 2002 by Starr who noted it as occasional. Collected again during this survey.

June 1954. Richardson, F. (#s.n.), BISH 666207.

14 Feb 1982. Hobdy, R.W. (#1240), BISH 459911.

5 Apr 2006, Starr, F. & K. Starr, (#060405-15), BISH.

***Opuntia ficus-indica* -- Panini -- (Cactaceae) -- Alien**

Not observed during this survey. First observed in 1925 by Palmer (Hobdy 1982). Observed again in 1982 by Hobdy who noted it as rare.

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***Oxalis corniculata* -- Yellow wood sorrel -- (Oxalidaceae) -- Questionably Polynesian**

Not observed during this survey. First collected in 1982 by Hobdy who noted it as uncommon, though no voucher information was found at BISH.

***Panicum fauriei* var. *latius* -- Hawaiian panic grass -- (Poaceae) -- Endemic**

Not observed during this survey. First collected by Hobdy who noted it as uncommon, though no voucher information was found at BISH.

***Panicum pellitum* -- Hawaiian panic grass -- (Poaceae) -- Endemic**

Not observed during this survey. First collected in 1925 by Palmer. Collected again in 1982 by Hobdy who noted it as occasional, though no voucher information was found at BISH.

13 Aug 1925. Palmer, H. (#s.n.), c. 30m, BISH 458164.

***Panicum torridum* -- Konakona -- (Poaceae) -- Endemic**

Not observed during this survey. First collected in 1982 by Hobdy who noted it as "uncommon", and "common on inner slopes and open spots".

14 Feb 1982. Hobdy, R.W. (#1223, 1224), Common along the inner slopes, Common in open spots, BISH 476965, 632188.

***Pityrogramma austroamericana* -- Gold fern -- (Pteridaceae) -- Alien**

Not observed during this survey. First observed by Hobdy on May 9, 1990.

***Pluchea carolinensis* -- Sourbush -- (Asteraceae) -- Alien**

Occasional. Scattered plants. The tallest and most robust plants on the islet, reaching a couple meters in height and diameter. Observed in 2002 by Starr who noted it as rare. First collected during this survey.

5 Apr 2006, Starr, F. & K. Starr, (#060405-16), BISH.

***Pluchea indica* -- Indian fleabane -- (Asteraceae) -- Alien**

Rare. One patch near coast. First collected during this survey.

5 Apr 2006, Starr, F. & K. Starr, (#060405-01), BISH.

***Polycarpon tetraphyllum* -- Allseed -- (Caryophyllaceae) -- Alien**

Rare to occasional. A few scattered plants. Occasional small patches. First collected in 1954 by Richardson. Collected again in 1982 by Hobdy who noted it as rare. Collected again during this survey.

June 1954. Richardson, F. (#s.n.), BISH 448453.

14 Feb 1982. Hobdy, R.W. (#1238), uncommon on inner slope, BISH 459989.

5 Apr 2006, Starr, F. & K. Starr, (#060405-10), BISH.

***Portulaca molokiniensis* -- Ihī -- (Portulacaceae) -- Endemic**

Rare. One plant observed. One large plant with about 6 large arms, possibly a couple of plants in a cluster. Branches appear to be breaking off and re-growing. Observed what could be seedlings below large plant. Mealy bugs found on plant. GPS location: 760,751 E 2,283,331 N. Growing with buffel grass (*Cenchrus ciliaris*) and ilima (*Sida fallax*) about 100 m from lighthouse to the west and 15 m from top of rim. Spent flowers and seed capsules present. May be good to return in summer months when buffel is not as

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vigorous to search for more plants and get a better handle on the current population structure. First collected in 1913 by Forbes *et al.* as *Portulaca* aff. *lutea*. Collected again under the same name in 1925 by Palmer. Collected in 1980 by Clarke who notes that the population consisted of about 7 plants (seed notes below). Collected in 1982 by Hobdy who then described it as a new species, *Portulaca molokiniensis*. Wagner *et al.* (1999) report the following, "This recently described species of *Portulaca* actually was collected as early as 1913 by C.N. Forbes and several other times during the last few decades. It had previously been identified as *P. lutea*. *Portulaca molokiniensis* differs, however, in its conspicuous vegetative growth and larger leaves, and especially in its dense head-like clusters of flowers and spinose seeds. It is closely related to *P. lutea* and probably derived from it." This species is currently listed as a federally endangered species. No collection made during this survey. Several photos taken.

- 10 Feb 1913. Forbes, C.N., J.F. Stokes, C.M. Cooke & H.A. Pilbry (#s.n.), BISH 63821.
23 Apr 1980. Clarke, G. (#408), A total of 7 plants of Ihi were sighted localized, Collected between Keana and Kahuku on the NE facing inner slope of Molokini Island, 30 m, In a *Nicotiana glauca* - *Cenchrus ciliaris* dominant grassland, A low (6") succulent herb with yellow flowers in poor condition, BISH 429914.
14 Feb 1982. Hobdy, R.W. (#1244), Inner slopes of Lalilali Point up to lighthouse, BISH 459984.

***Portulaca oleracea* -- Pigweed -- (Portulacaceae) -- Alien**

Common. Found over entire islet. Most common on NW tip. First collected in 1913 by Stokes *et al.* Also observed in 1913 by Forbes (Hobdy 1982). Collected again in 1925 by Palmer, in 1954 by Richardson, in 1980 by Clarke, and in 1982 by Hobdy who noted it as occasional. No voucher information was found at BISH for the Hobdy collection. Observed in 2002 by Starr who noted it as occasional to common. Collected again during this survey.

- 10 Feb 1913. Stokes, J.F.G., Dr. C.M. Cooke, Dr. H.A. Pilsbry, & C.N. Forbes, (#s.n.), BISH 63873.
13 Aug 1925. Palmer, H. (#13), 60 m BISH 63872.
June 1954. Richardson, F. (#s.n.), BISH 430169.
23 Apr 1980. Clarke, G. (#403), 100 m, inner west slope of Molokini Island near Keana, BISH 429915.
5 Apr 2006, Starr, F. & K. Starr, (#060405-35), BISH.

***Portulaca pilosa* -- Portulaca -- (Portulacaceae) -- Alien**

Occasional. Scattered. In open areas. First collected in 1980 by Clarke. Collected again in 1982 by Hobdy who noted it as occasional. Observed in 2002 by Starr who noted it as occasional. Collected again during this survey.

- 23 Apr 1980. Clarke, G. (#402), 80 m, south of the landing on a 40 degree slope with a NW exposure, BISH 429913.
14 Feb 1982. Hobdy, R.W. (#1242), BISH 459987.
5 Apr 2006, Starr, F. & K. Starr, (#060405-18), BISH.

***Portulaca villosa* -- Ihi -- (Portulacaceae) -- Endemic**

Not observed during this survey. Previously collected in 1913 by Forbes *et al.* and in 1925 by Palmer as *P. sclerocarpa*, but it was later identified as *P. villosa* by BISH. Not observed in 1982 by Hobdy who notes status unknown.

- 10 Feb 1913. Forbes, C.N., J.F. Stokes, C.M. Cooke & H.A. Pilbry (#s.n.), BISH 63924.
13 Aug 1925. Palmer, H. (#10), BISH 63925.

***Senecio madagascariensis* -- Fireweed -- (Asteraceae) -- Alien**

Rare. One seedling pulled. First collected during this survey.

- 5 Apr 2006, Starr, F. & K. Starr, (#060405-29), BISH.

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***Sesuvium portulacastrum* -- Akulikuli -- (Aizoaceae) -- Indigenous**

Occasional. About a half dozen patches draping over sheer wall on inner slope in middle part of islet near coast. First collected in 1982 by Hobdy who noted it as rare. Collected again during this survey.

14 Feb 1982. Hobdy, R.W. (#1241), BISH 459988.

5 Apr 2006, Starr, F. & K. Starr, (#060405-06), BISH.

***Setaria verticillata* -- Bristly foxtail -- (Poaceae) -- Alien**

Not observed during this survey. First observed in 1982 by Hobdy who noted it as rare.

***Sida fallax* -- Ilima -- (Malvaceae) -- Indigenous**

Common. Inhabits much of the islet, occasional dominating small areas. First collected in 1913 by Forbes *et al.* Collected again in 1925 by Palmer, in 1954 by Richardson, and again in 1980 by Clarke. Observed in 1982 by Hobdy who noted it as common.

Observed in 2002 by Starr who noted it as common. Collected again during this survey.

10 Feb 1913. Forbes, C.N., C.N., J.F. Stokes, C.M. Cooke & H.A. Pilbry (#s.n.), BISH 57969.

13 Aug 1925. Palmer, H. (#4), 60 m BISH 57968.

June 1954. Richardson, F. (#s.n.), BISH 57976.

23 Apr 1980. Clarke, G. (#409), scattered along inner slopes of Molokini Island from Kaena to Pahee o Lono, BISH 429915, 429912.

5 Apr 2006, Starr, F. & K. Starr, (#060405-26), BISH.

***Sonchus oleraceus* -- Sow thistle -- (Asteraceae) -- Alien**

Rare. A few plants. First collected in 1982 by Hobdy who noted it as rare, though no voucher information was found at BISH. Collected again during this survey.

5 Apr 2006, Starr, F. & K. Starr, (#060405-22), BISH.

***Tribulus cistoides* -- Nohu -- (Zygophyllaceae) -- Indigenous**

Not observed during this survey. First observed in 1913 by Forbes *et al.* (Forbes 1913).

First collected in 1925 by Palmer.

10 Feb 1913. Stokes, J.F.G., Dr. C.M. Cooke, Dr. H.A. Pilsbry, & C.N. Forbes, (#s.n.), BISH 72402.

13 Aug 1925. Palmer, H. (#9), 100 ft BISH 72388.

***Tridax procumbens* -- Coat buttons -- (Asteraceae) -- Alien**

Rare. A few lone plants. Found in very open spots. First collected in 1982 by Hobdy who noted it as rare. Observed in 2002 by Starr who noted it as occasional. Collected again during this survey.

14 Feb 1982. Hobdy, R.W. (#1243), rare on crest of eastern arm, BISH 459986.

5 Apr 2006, Starr, F. & K. Starr, (#060405-21), BISH.

***Verbesina encelioides* -- Golden crown-beard -- (Asteraceae) -- Alien**

Rare. Just a few plants. Pulled what we came across. Observed in 2002 by Starr who noted it as rare. First collected during this survey.

5 Apr 2006, Starr, F. & K. Starr, (#060405-03), BISH.

***Waltheria indica* -- Uhaloa -- (Sterculiaceae) -- Questionably Indigenous**

Common. Scattered plants over most of the islet, generally in open spots. Lots of seedlings seen. First collected in 1913 by Stokes. Observed in 1913 by Forbes. Collected again in 1925 by Palmer. Observed by Hobdy in 1982 who noted it as

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uncommon. Observed in 2002 by Starr who noted it as common. Collected again during this survey.

10 Feb 1925. Stokes, J.F.G. (#s.n.), BISH 70279.

13 Aug 1925. Palmer, H. (#5), 100 m BISH 70302.

5 Apr 2006, Starr, F. & K. Starr, (#060405-32), BISH.

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