SEA TURTLES-PETROGLYPHS AND DATA
ON MAJOR HAWAIIAN IS.

1980s-1990s
GHBALAZS

washed up on
7/15/75 Pyramid Beach - Makapu
Dictyoptais australis
by Dennis J. Russell
Bruce Allender
Botany Dept.

algae from Silva
ID by Heather Forthner
Pterocladia capillacea - Lolo
also Gelidium

May 75 "og" Gracilaria sp. Kaneohe Bay
89.3% water
10.7% D.M.
D.M. Basis - 1.64% N = 10.25% P

Sept 8, 75 Algae - Brown w/small nodules -
9.7% D.M.

Oct 15, 75 - washed up by L. Lipuma
Red algae Hypnea - eaten by
captive greens.

GHBALAZS

CULTURAL LEADER — E. Laurence Gay, Amfac vice chairman and chief finance and administrative officer, is serving his second term as president of the Honolulu Symphony Society. He was in charge of the extremely successful symphony fund-raising campaigns starting in 1970. Gay also was elected president of the newly formed Hawaii Council on Culture and the Arts last year.

WE PAY MORE . . .
Call immediately. Stereo equip./TV.
Ace Music, 1852 Kalakaua. 941-7771

717—Misc. for Rent

Color TV ..... $15 mo
ALL SEW INC. 941-7771

718—Garage & Lanai Sales

Console bar, turtle shells, household items, clothing, misc. 595-7078.

DINETTE SET, coffee & end tables, sewing machine & misc. items. 45-711 Pilina Pl., Kaneohe. Sun. 10-4

DIVORCE SALE. King size bedroom set, Hawaii piano, console stereo, lamps, letter set, many misc. 487-5074.


'Alenuihāhā Channel
1
2
3
156°00'
50'
40'
A
B
C
20'
10'
20°00'
NORTH
KOHALA
ELEVATION CONVERSION
feet
meters
14,000
12,000
10,000
8000
6000
4000
2000
0
4000
3000
2000
1000
0
KOHALA MOUNTAINS
Honoipu Landing
Puakea Pt.
Hāwī
Kapa'au (Kohala)
Kohala Mill
Māhukona
Māhukona Harbor
Kawaihae
Kawaihae Bay
Waimea (Kamuela P.O.)
Pu'u Huluhulu 2471
Pu'u Pā 2667
Ouli
Hāpuna Bay
Kauna'oa Beach
Mauna Kea Beach Hotel Golf Course
Hāpuna Beach St. Rec. Area
Kahei Ranch
Pu'u Hue Ranch
Pu'u Hue 2375
Lapakahi State Historical Park
Pololū Valley
Pololū Valley Lookout
Niuli'i
Makapala
Halaula
Hālawa
Mālā'e Pt.
Kaulili Point
Maka o Hule Pt.
Hā'ena Pt.
Puakea Pt.
Holona Bay
Kauhola Point
Kukui Pt.
Wai'ula'ula Pt.
Ka'aha Pt.
Kauna'oa Pt.
Kohala Estates
Kamehameha I Birthplace
Upolu Airport
'Upolu Point
Kamehameha I Statue
SOUTH
publis
The U
Honolu
H


HAWAI'I
Hawai'i
The Big Island
James A. Bier
Department of Geography, University of Illinois at Urbana-Champaign
published by
The University Press of Hawaii
Honolulu 96822

6
7
8
9
HILO
Hawai'i County Seat
HILO BAY
Blonde Reef
Puhi Bay
WAINAKU
PU'U'EO
MAKAOKŪ
KEAUKAHA
General Lyman Field (Hilo Airport)
overseas
terminal
inter-island
Wainaku Camp
'Ale'ale'a Pt.
Kaula'inBwi I.
Coconut I.
Lili'uokalani Park
Banyan Golf Course
Wailoa River State Rec. Area
Kamehameha Av.
Wailuku River State Park
Rainbow Falls
Hilo Mem. Hospital
Hilo High School
University of Hawai'i Hilo College
Hawai'i Community College
Municipal Golf Course
Orchid Gardens
Hirose Nurseries (garden)
Nani Mau Gardens
Hale Manu Crafts
Lokoaka Pond
Kong's Floraleigh Gardens
Onekahakaha Park
Kūhiō Bay
to Honoka'a
to Hawai'i Volcanoes Nat'l Pk.
1 Civic Center Auditorium
2 County Building
3 County Library
4 Fish Auction
5 Haili Church (1824)
6 Hilo Shopping Center
7 Ho'olulu Park Swimming Pool
8 Kaiko'o Mall Shopping Center
9 Lyman Museum
10 Naha and Pinao Stones
11 Orchidarium (garden)
12 Orchids of Hawai'i (garden)
13 Post Office
14 State Office Building
15 Tanaka's Anthurium Nursery (garden)
16 Tree Nursery (garden)
17 Visitor Center (information)
18 Waiākea Square Shopping Center
1.6 miles
2.4 kilometers
City
Town or village
Site or locality
District boundary
Elevation in feet
Cave
Forest reserve
Roads
Divided
Principal through
paved
Secondary through
Other (paved, gravel, graded dirt)
Ungraded dirt or jeep trail
Foot or pack trail
Laupāhoehoe Point
Laupāhoehoe Co. Beach Pk.
Tidal Wave Memorial
Pāpa'aloa Co. Pk.


Irrigation ditch or water pipeline
Waterfall and length in feet
Coral reef
Intermittent stream
Swamp or marsh
Mileage between red dots
Golf course
Park, county beach, country club
Point of interest
Small-boat harbor
0 1 2 3 4 5 6 7 8 9 10 miles
0 2 4 6 8 10 12 14 16 kilometers
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PRONUNCIATION MARKS
The glottal stop, ', is similar to the stopping of sound between the oh's in English oh-oh! Macrons denote long, stressed vowels (ā, ē, ī, ō, ū).
HILO
PUNA
Honohina
Hakalau Co. Pk.
Wailea
Kolekole Co. Beach Pk.
Honomū Co. Pk.
Pepe'ekeo Point
Pepe'ekeo Mill
Pepe'ekeo Scenic Drive (4 miles)
Onomea Bay
Pāpa'ikou Co. Pk.
Pauka'a
Hilo Bay
General Lyman Field (Hilo Airport) (scheduled flights)
Kaumana Caves Co. Pk.
Hilo Co. Golf Course
macadamia nut factory and orchards
Ha'enakalele
Kea'au
Kurtistown
Eleven-mile Homestead
Mountain View
Glenwood
Fern Forest Vacation Estates
'ŌLA'A RAIN FOREST (Hawai'i Volcanoes Nat'l Pk.)
HAWAI'I VOLCANOES N.P.-HILO 30 miles
Kilauea Iki Crater
Hawaiian Paradise Park
Orchid Estates
Hawaiian Beaches
Hawai'i Beaches Estates
Pahoa
Kapoho
Kapoho Crater
Kapoho Pt.
Cape Kumukahi
Pohoiki
Isaac Hale Co. Beach Pk.
MacKenzie State Park
Opihikao
Kalapana
Kehena
ancient Hawaiian trail
Pu'ulena Crater
Pu'u Kali'u 1071
Heiheiahulu 1711
Pu'u Kauka
Pu'u Kahauale'a
Kamoamoa
Pu'u Maka'ala 3707

VOLCANOES
PARK
Hōlei Pali
Pu'u Lapu (Haunted Hill)
Kalapana
Queen's Bath
Harry K. Brown Co. Beach Pk.
Ancient canoe landing site
Star of the Sea "Painted" Church (1929)
Park Visitor Center and Museum
Kamoamoa Campground and ancient village
Nāulu Sea Arches
Petroglyphs
Kealakomo
Ka'ena Pt.
'Āpua Point
Keauhou Landing
'Āinahou Ranch
Kīpuka Nēnē Campground
Makaopuhi Crater
CRATERS
HAWAI'I VOLCANOES NATIONAL PARK
Kilauea Volcano
OLA'A RAIN FOREST
KA'U DISTRICT
PUNA DIST.
Kīlauea Military Camp
Sulphur Banks
Park Visitor Center and Museum
Volcano Golf Course
Tree Molds
Bird Park Picnic Area
Nāmakanipaio Campground
Kīlauea Overlook
Volcano Observatory
Kīlauea Caldera
4077
Halema'uma'u 3118
Steaming Bluff
Volcano House
Volcano
Kīlauea Iki Crater
Kīlauea Iki Overlook
Twin Craters
Thurston Lava Tube
Tree Fern Jungle
Devastation Trail
Lua Manu Crater
Puhimau Crater
Ko'oko'olau Crater
Keanakāko'i Crater
Cone Peak 3659
Southwest Rift Zone
Ke'āmoku Lava Flow
1919 Lava Flow
KA'Ū DESERT
1974 Lava Flow
Cone Crater
Pit Craters
Pu'u Koa'e 3250
Mauna Iki 3032
Ancient Footprints in Lava
CHAIN OF CRATERS
Devil's Throat
Hi'iaka Crater
Pauahi Crater
Pu'u Huluhulu
Maunaulu
'Alo'i Crater
'Alae Crater
Makaopuhi Crater
East Rift Zone
Kāne Nui o Hamo
Lava Trees
1969–74 Lava Flows
'Āinahou Ranch
Pali Le'ie o Kalapana
Kīpuka Pepeiaomoku
Kīpuka Nēnē Campground
to Hilina Pali Lookout
Hilina Pali Trail
to Mauna Loa Trail and Lookout
to Hilo
Fern Forest
Vacation Estates
Hawai'i Belt Road
0 1 2 3 miles
0 1 2 3 4 kilometers
6
7
8
9
155°00'
10'
50'
Forest reserve
Foot or pack trail

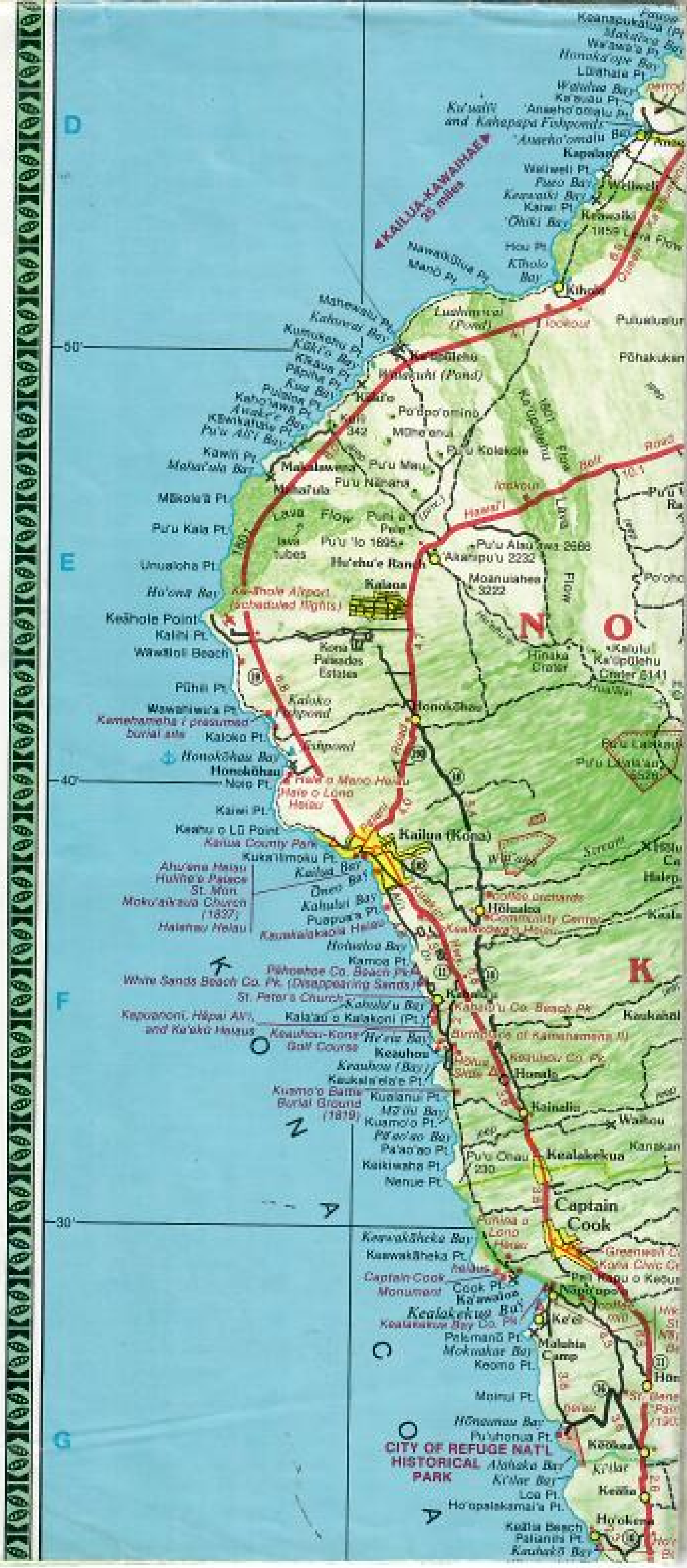

SOUTH
K A ʻŪ
ONA
Southwest Rift
Pahala
Na'ālehu
Hawaiian Ocean View Estates
Kona Gardens Estates
Ka Lae (South Point)
Southernmost point in United States
Kona Coast Shop. Center
Kona Shop. Center
Post Office
Whittington Co. Beach Pk.
Punalu'u Co. Beach Pk. (Black Sand Beach)
Aspen Institute for Humanistic Studies
Henry 'Ōpūkaha'ia Shrine
Ka'ū Center of History and Culture
Seamountain Nihole Golf Course
A. Halo Hālāwai Co. Park
B. Hutiha'a Palace St. Mon.
C. Moku'ae'ae'a Church (1837)
D. St. Michael's Church (1845)
E. SeaFlite Hydrofoil Terminal
F. Wund Square Shopping Mall
50'
40'
30'
3
4
5

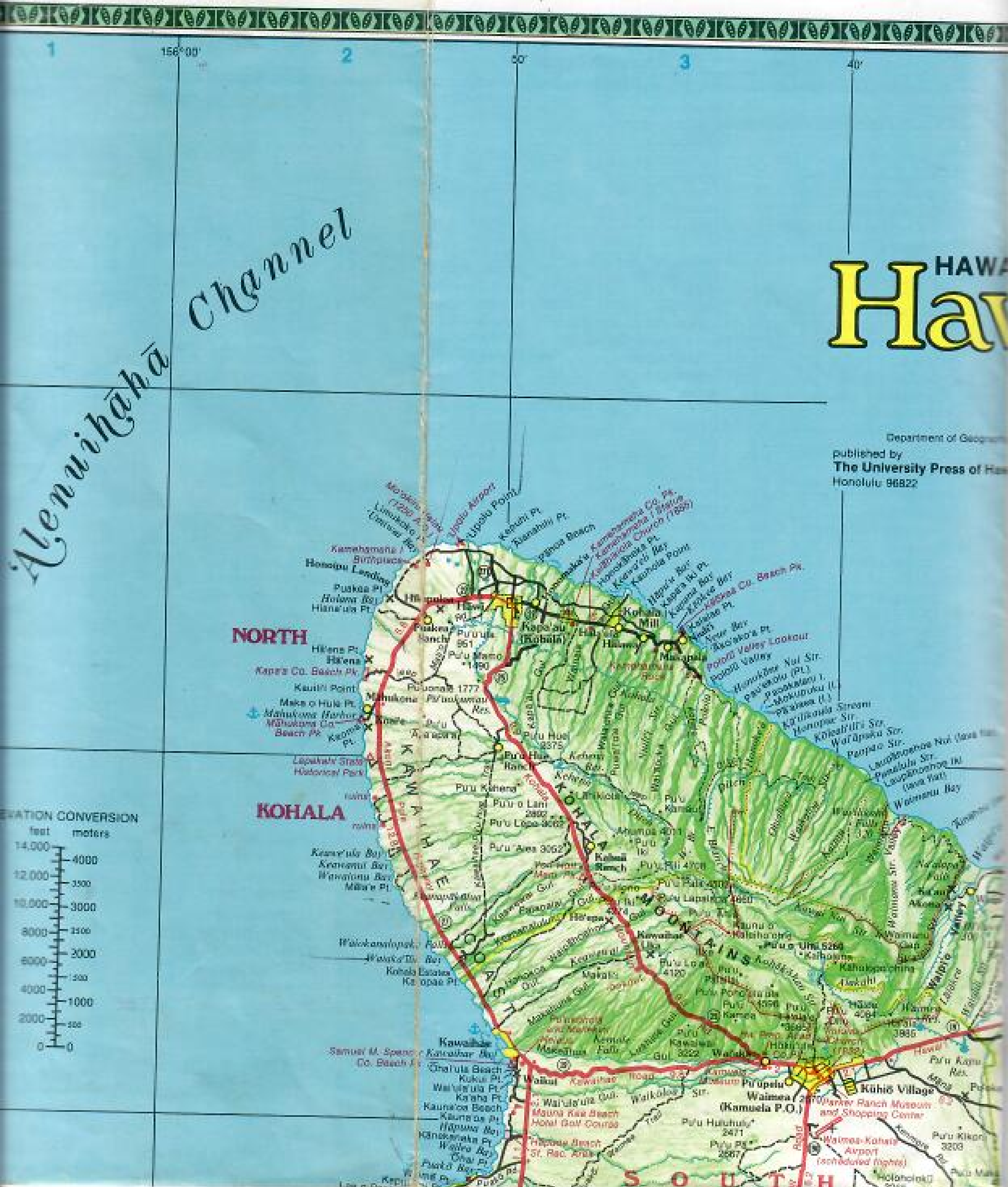

K A 'Ū
Southwest Rift
NATIONAL
Pahala
Na'alehu
Waiohinu
Hīlea
Punalu'u
Honu'apo
Kapāpala Ranch
Kahuku Ranch
Ka Lae (South Point)
Southernmost point in United States
Kaulana Bay
Ninole
Whittington Co. Beach Pk.
Mark Twain Monkeypod Tree
Kahuku Ranch
Great Crack
NĀ'ĀLEHU-HAWAI'I VOLCANOES N.P. 28 miles
Aspen Institute for Humanistic Studies
Henry 'Ōpūkaha'ia Shrine
Ka'ū Center of History and Culture
Punalu'u Co. Beach Pk. (Black Sand Beach)
Seamountain Ninole Golf Course
Kailua
Kona Coast Shop. Center
Kona Shop. Center
Post Office
Kailua Bay
Kamakahonu Lagoon
A Hale Halawai Co. Park
B Hulihe'e Palace St. Mon.
C Moku'aikaua Church (1837)
D St. Michael's Church (1848)
E SeaFlite Hydrofoil Terminal
F World Square Shopping Mall
Kahului Bay
Wai'aha Bay
to Waimea
to Kawaihae
3
4
5
40'
30'
20'


S O U T H
Waikapū


SOUTH
KONA
K
Southwest Rift
Papakōlea Pt.
Kapilo Bay
Palikaholo
Lepeamoa Rock
Ka'ū Loa Pt.
Orchid Plantation (garden)
'Au'au Pt.
Pu'u'ō Pt.
Ka Lae Pa'akai (Pt.)
Kaananui'onaha Pt.
Laeohoku
Ka'apuna (Bluff)
Pa'akai Pt.
Kīpāhoehoe Bay
Arched Rock
Laeokamimi (Pt.)
Hōlua Slide
'Ālika Bay
Pāpā Bay
Makahiki Pt.
Ho'ōpūloa
Pāpā
Ho'ōpūloa Church Monument
Miloli'i Bay
Moku o Kaha'ilani Rock
Miloli'i
Miloli'i Co. Beach Pk.
Ōmaka'a Bay
Kapulau Pt.
Honomalino Bay
macadamia nut orchards
Mokunai'a Pt.
Hanamalo Pt.
Okoe Bay
Kapu'a Bay
Pu'u Hinahina Bay
Kākio Pt.
Kamā'oa Bay
Niuou Pt.
Kāneware Point
Niuou Coconut Grove
lava tubes
petroglyphs
Manuka State Park
1780
Hawaiian Ocean View Estates
Kīpuka Kaulanamauna
Ahuloa
Kamoi Pt.
Manukā Bay
Kaulanamauna (Cove)
Kīpuka Māhi
Kaiakekua (Beach)
Kaunā Point
Kīpuka Kāmilo'āina
Nā Pu'u a Pele 245
Kona Gardens Estates
Kīpuka Pueo
Kīpuka Kanohina
Kanōnone Waterhole
Kīpuka Kīlauea
Kahuku Ranch
Luapā'ali
Kaulanamauna 1822
1907
1868
1887
Pōhue Bay
Kīlauea Bay
Pu'u Ki
petroglyphs
Hā'ī'ōwalu (Pt.)
Kanakanaka (Pt.)
Kākio
Kaimu'uwala
Kāpōpū
Kepuhi o Kahio Pt.
Kahio
Pu'u Hou
Nā Hoa
Ka'alu'alu
Heiau o Mōlilele
Kahukupoko
Paiha'uke'uke
Ancient canoe moorings
Heiau o Kalalea
Ka Lae Co. Pk.
Ka Lae (South Point)
Southernmost point in United States
Pu'u Ali'i (Pt.)
Lae o Palahemo (Waterhole)
Kaulana (Pt.)
Makalei Cave
Kīpuka Hanalua
Pohakuloa
Paoakalani (Beach)
Mahana Bay
Pu'u Manu (Pt.)
Ka Lae Pa'akai (Pt.)
Oniknalu (Cove)
Kalaeokalaiko (Pt.)
Pu'u Ulalana 175
Onikipuka
Green Sand Beach
Ka'alu'alu
Kamā'oa
Pu'u Kāwāi'ulu
Pu'u o Kāwaiulu
Pu'u Kaimu'uwala
Pu'u Waimānalo
Kīpuka Kamakalepo
Ka'alāiki
Kīpuka
Waikapuna
Hōlualoa
Pu'u'eo
Lupo'ali 1822
Mark Twain Monkeypod Tree
Wai'ohinu
Kauaha'ao Church 1942
Pu'u o Lokuana
1952
Nā'ālehu
Kīpuka Konohele
Kīpuka Kanuhonu
Portuguese Springs
Pu'u One 3220
Palimakā
Makā'ala
Nāmanaokaiaiu (Swamp)
Kīpuka Pe'ehi
Kīpuka Akala
Kīpuka 'Ākea
Kāpū'ala'ala 6178
Pu'u 'Ōhi'a 6524
Ihuanu 5308
One Hundred Acre Waterhole
Pu'u'ohe'ohe'o 6675
Ancient Hawaiian trail
Kaapahana
Pu'u Kinikini 5157
Punalu'u Kahawai
'Umi Caverns
'Ālika Cone 7843
Kaunā'ōa Lava
Ka'ohe Ranch
Polohua Waterhole
1950 Lava Flow
1919
'Ālika
Koa Mill
Ōhi'a Mill
Ho'ōpūloa
1926
Pu'u Pōhakuloa 6222
Luamauna Waterhole
Honokua
KAILUA-NĀ'ĀLEHU 60 miles
156°00'
50'
40'
1
2
3
4
S
T

D
E
F
G
50'
40'
30'
KOHALA
NORTH
KONA
KONA
OCEAN
KAILUA-KAWAIHAE 35 miles
KAILUA-WAIMEA 39 miles
Waikoloa Village
Waikoloa Golf Course
Saddle Road Junction
Lālāmilo
Keāhole Point
Ke-āhole Airport (scheduled flights)
Kalaoa
Kona Palisades Estates
Honokōhau
Kailua (Kona)
Kailua County Park
Hulihe'e Palace
Mokuaikaua Church (1837)
Hale o Lono Heiau
Hōlualoa
Kahalu'u
Keauhou
Kainaliu
Kealakekua
Captain Cook
Captain Cook Monument
Kealakekua Bay
Ka'awaloa
Nāpō'opo'o
Ke'ei
Hōnaunau
CITY OF REFUGE NAT'L HISTORICAL PARK
Ho'okena
Kīholo
Kīholo Bay
Ka'ūpūlehu
Kukio
Hualālai 8271
Pu'u Lehua Ranch
Hu'ehu'e Ranch
Pu'uanahulu
Pu'u Wa'awa'a Ranch
Mizotas Kīpuka
Big Hill Camp
Kōmakawai
Sleeping Cave
Kaloko Fishpond
Kamehameha I presumed burial site
White Sands Beach Co. Pk. (Disappearing Sands)
St. Peter's Church
Kuamo'o Battle Burial Ground (1819)
Greenwell Co. Pk.
Kona Civic Center
St. Benedict's "Painted" Church (1902)
Manukā Co. Pk.


D
E
F
G
50'
40'
30'
KAILUA-KAWAIHAE 25 miles
Ku'uali'i and Kahapapa Fishponds
Kapalaoa
Waiulua Bay
Honoka'ope Bay
Lūahala Pt.
Weliweli Pt.
Paeo Bay
Keawaiki Bay
Kawai Pt.
'Ōhiki Bay
Keawaiki
1859 Lava Flow
Hou Pt.
Nawaikūlua Pt.
Manō Pt.
Kīholo Bay
Kiholo
Lua Makani (Pond)
lookout
Mahewalu Pt.
Kaiwi Bay
Kumukahi Pt.
Kīki'o Bay
Ka'ūpūlehu
Kaūhuhu'ula (Pond)
Pōhakuloa Pt.
Kua Bay
Pu'u Kuili 342
Po'opo'omino
Mōhe'enui
Pu'u Kolekole
Kawili Pt.
Mahai'ula Bay
Makalawena
Pu'u Mau
Pu'u Nānana
Mahai'ula
Mākole'ā Pt.
Pu'u Kala Pt.
1801 Lava Flow
lava tubes
Pu'u 'Io 1895
Pu'u Alaū'awa 2686
Hu'ehu'e Ranch
'Akahipu'u 2232
Unualoha Pt.
Ho'ona Bay
Kalaoa
Moanuiahea 3222
Keāhole Airport (scheduled flights)
Keāhole Point
Kalihi Pt.
Wāwaloli Beach
Kona Palisades Estates
N O
Hinaka Crater
Ka'ūpūlehu Crater 5141
Pūhili Pt.
Kaloko Fishpond
Wawahiwa'a Pt.
Kamehameha I presumed burial site
Kaloko Pt.
Honokōhau
Honokōhau Bay
Fishpond
Noio Pt.
Hale o Mano Heiau
Hale o Lono Heiau
Kaiwi Pt.
Keahu o Lū Point
Kailua County Park
Kailua (Kona)
Kuka'ilimoku Pt.
Ahu'ena Heiau
Hulihe'e Palace
St. Mon.
Moku'aikaua Church (1837)
Hale'ohau Heiau
Kailua Bay
Oneo Bay
Kahului Bay
Puapua'a Pt.
Ku'emanu Heiau
Hōlualoa
Coffee orchards
Community Center
Hōlualoa Bay
Kamoa Pt.
Pāhoehoe Co. Beach Pk.
White Sands Beach Co. Pk. (Disappearing Sands)
St. Peter's Church
Kahalu'u Bay
Kahalu'u Co. Beach Pk.
Kapuanoni, Hāpai Ali'i, and Ke'ekū Heiaus
Kala'au o Kalakoni (Pt.)
Keauhou-Kona Golf Course
He'eia Bay
Birthplace of Kamehameha III
Keauhou
Keauhou (Bay)
Keauhou Co. Pk.
Honalo
Kuamo'o Battle Burial Ground (1819)
Kualanui Pt.
Mā'ihi Bay
Kuamo'o Pt.
Pā'oa'oa Bay
Pa'oa'oa Pt.
Kainaliu
Kaikiwaha Pt.
Nenue Pt.
Pu'u Ohau 230
Kealakekua
K
Kaukahōkū
Captain Cook
Ka'awaloa
Kealakekua Bay
Kealakekua Bay Co. Pk.
Captain Cook Monument
Cook Pt.
Ke'ei
Palemanō Pt.
Mokuakae Bay
Keomo Pt.
Moinui Pt.
Hōnaunau Bay
Pu'uhonua Pt.
CITY OF REFUGE NAT'L HISTORICAL PARK
Alahaka Bay
Ki'ilae Bay
Loa Pt.
Ho'opūloa Pt.
Ke'ei Beach
Ho'okena
K O N A C O A S T


1
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156°00'
50'
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ʻAlenuihāhā Channel
HAWA
Hav
Department of Geograp
published by
The University Press of Haw
Honolulu 96822
NORTH
KOHALA
ELEVATION CONVERSION
feet
meters
14,000
12,000
10,000
8000
6000
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2000
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4000
3500
3000
2500
2000
1500
1000
500
0
Upolu Point
Upolu Airport
Kamehameha I Birthplace
Honoipu Landing
Puakea Pt.
Hīlapuka
Hāwī
Kapaʻau (Kohala)
Kohala Mill
Makapala
Pololū Valley Lookout
Pololū Valley
Hikiʻau Pt.
Kapaʻa Co. Beach Pk.
Kauiliʻi Point
Māhukona Harbor
Māhukona Co. Beach Pk.
Lapakahi State Historical Park
KOHALA
MOUNTAINS
Puʻu Hue Ranch
Kahua Ranch
Waimanu Bay
Kawaihae
Samuel M. Spencer Co. Beach Pk.
Kawaihae Bay
Kawaihae Road
Waikui
ʻŌhaiʻula Beach
Kukui Pt.
Waiʻulaʻula Pt.
Kaʻaha Pt.
Kaunaʻoa Beach
Kaunaʻoa Pt.
Hāpuna Bay
Hāpuna Beach St. Rec. Area
Mauna Kea Beach Hotel Golf Course
Waimea (Kamuela P.O.)
Puʻu Hūluhulu 2471
Kūhiō Village
Parker Ranch Museum and Shopping Center
Waimea-Kohala Airport (scheduled flights)
Puʻu Kikoni 3203
SOUTH

SundayTravel

The Sunday Star-Bulletin & Advertiser

Legendary Waipio Valley meets the ocean along a spectacular stretch of Big Island coastline.

section F

Prepared by the staff of the Honolulu Advertiser

April 1, 1984

Misty mountains enclose Waipio Valley as a lone rider guides his horse into the interior.

'Lost Hawaii' is redisco

By Jerry Hulse
Los Angeles Times Service

WAIPIO VALLEY, Hawaii — Through the open window of Tom Araki's ramshackle inn I hear the ocean and the thunder of waterfalls pounding the earth deep inside the Waipio Valley.

Dawn is only beginning to filter away the darkness of a night whose memory doubtlessly will return. After the joy of Waipio Valley, the other world, I suspect, will never seem quite the same again.

Whenever I am caught up in the crush of traffic on a Los Angeles freeway, I shall recall the peacefulness of Waipio and mourn the passing of the strolls fresh with rain and along a black-sand beach littered with driftwood, fording streams and studying birds and butterflies. And returning to Tom Araki's inn with armfuls of bananas and papayas harvested from trees in a jungle where daylight becomes dusk, a place alive with the song of birds and the rustling of palm fronds struck by soft sea breezes.

So in case someone else has been brooding for the lost Hawaii, I've rediscovered it here on this northern shore of the Big Island, a journey worth every twist, every bump, every hairpin curve one must encounter to reach it.

Although barely an hour from Hilo and a trifle farther from Kailua-Kona, the Waipio Valley is like the dawning of another world. No tension, no stress, no pressure. Nothing but the trade winds and the thunder of waves and misty waterfalls, a few taro farmers and the ghosts of thousands of Hawaiians who disappeared mysteriously from the valley centuries ago.

In this place where Hawaiian royalty once vacationed, it's highly unlikely that developers will introduce the tawdry sort of tourism that flourishes elsewhere in Hawaii. For one thing, the trip into the valley must be undertaken by four-wheel vehicle to negotiate the narrow, 47-degree road that twists from the cliffs of Waipio Lookout to the valley floor more than 1,000 feet below.

When one arrives in the valley, there is only a single shelter: Tom Araki's humble five-room, one-bath inn. No electricity, no gas, no restaurant, no telephone. Only five rooms, one bath and a few kerosene lanterns.

Only a few years ago hundreds of families made the Waipio Valley their home. Locals attended five churches and four schools. They labored in a poi factory and on Saturday nights they brawled in the village bar and sometimes got tossed into the slammer. Farmers cultivated what was described as one immense garden, a valley six miles deep and a mile wide, lush with taro and bananas. The valley flourished until 1946 when a tidal wave thundered ashore, crushing everything in its path.

Cresting at 55 feet, it swept away everything. Nothing remained. Miraculously, not a single life was lost as the villagers were attending a celebration at another town beyond the cliffs.

The locals left, and, years later, the valley was ravaged by flood waters carrying boulders and trees onto land that had been agricultural, but now is a tangle of jungle, with streams and a river flowing from the far reaches of the valley to the sea.

It is how the valley is said to have appeared when the Tahitians paddled ashore centuries ago in their double-hulled outriggers.

On the trip to Tom Araki's funky little inn we made a pit stop at Tex's Drive-In in the old plantation town of Honokaa to buy "malasadas," those heavenly Portuguese doughnuts without the holes, and checked out a hotel, the Honokaa Club, where Henry Morita will rent you a room for less than $9 a night, although you will have to come up with a few extra bucks if you don't like sharing a bath.

Picture windows in the dining room frame the metal rooftops of homes below, and beyond this the ocean stretches to infinity. Morita's grandfather opened the Honokaa Club in 1908, which was before the hotel introduced live entertainment on Friday and Saturday nights and a menu that features tripe stew, pork tofu, chicken "hakka" and tomato beef. While it is not the Kahala Hilton, it is colorful and a little like strolling into some boardinghouse in the Old West, with swinging doors and characters in jeans and straw hats sitting on the porch.

The rest of the town resembles some Hollywood set, too. Locals sit on the curbs or gather on the steps of the

vered in Waipio Valley

Honokaa Club to play cards and exchange gossip.

Only a few miles beyond Honokaa Town, on a quiet road, a sign announces The Last Chance, an old-fashioned plantation-style store where Bob Impson will sell you anything from gumdrops to Army fatigues. Or just about anything else. Here is where you load up with groceries if you intend to spend the night at Tom Araki's inn in the Waipio Valley.

While we waited for our ride, one of the local characters, Jim Rice, a refugee from New York, told how he married his wife after her 390-pound father caught Rice and his daughter holding hands. Nothing else.

Reservations and tours

For reservations at the Waipio Hotel, write to 25 Malana Place, Hilo, Hawaii 96720, or telephone (808) 935-7466 in Hilo or (808) 775-0368 in the Waipio Valley.

For Jeep rides into the valley contact Bob Berger, co the Waipio Shuttle, P.O. Box 128, Kukuihaele, Hawaii 96727, or telephone (808) 775-7121. Rates: $10 per person, half price for children under 12.

For other tours into the valley, contact the transportation desk at the Mauna Lani Bay Hotel, P.O. Box 183, Honokaa, Hawaii 96727.

"You don't argue with anyone that big unless you're crazy. I'd of married Dracula if he'd insisted," Rise said.

No one can argue with the success of their marriage, not after 53 years.

Bob Berger operates a fleet of vintage British Jeeps that take you on a bone-cracking 90-minute ride by an abandoned teahouse built by a Philadelphia millionaire, a couple of 1,200-foot waterfalls, a series of taro patches and a scene that looks for all the world like the Garden of Eden into the Waipio Valley.

What does one do of an evening after arriving at the ramshackle inn? First you light your lantern, and the punk to discourage mosquitoes. Then, providing you stocked up at The Last Chance, you repair to what passes as a kitchen with its Coleman stove, table and four chairs. On this evening the old Japanese proprietor with the wispy mustache and spectacles showed up with a jug of wine and a platter of fresh-caught prawns. When the grape began taking effect, he referred to his small inn as the "Waipio Hilton" and cautioned that it is necessary to write ahead for reservations (even though only two of the five rooms were spoken for this particular night).

Pouring himself another glass of red, Araki said: "Tell your readers Tom Araki is not always in the Waipio Valley. If he's not in Waipio he's in Hilo, where he lives with his wife and he has to drive 60 miles to open the door for them. So remember, reservations."

"Always?"

"Always!"

The roar of the ocean drowned out Araki's voice momentarily, then he continued: "Be sure to tell everyone to bring plenty of wine when they come to the Waipio Hotel. Tell them that for sure!"

Araki sipped and philosophized while a woman with almond-shaped eyes and a mischievous smile served the meal, and Tom Araki refilled his glass and became even more loquacious.

He waved his arms and declaimed: "This is not the Hilton or Sheraton. Be sure to tell people that. Some woman from Kansas City asked me when she got here, 'Where is the lobby?' and I said, 'What do you mean, lobby?' And she said, 'Well, you know, where you have TV and chairs. That sort of thing.' I took a while to get this straight and then I told her, 'Lady, there no lobby. You think you're in Hilton or Sheraton? Hell, you're in the Waipio Valley! We got no electricity, no telephone, no food, no nothing! You rough it here at the Waipio Hotel.'"

Well, it's morning now, and I can't think of another place I'd rather be than Tom Araki's old clapboard hotel. For now, I'm wealthy. Outside I hear the ocean and the waterfalls, which makes up for the lack of electricity or a hot shower or a restaurant. I'm thinking of climbing out of bed soon. I'm going outside to pick my breakfast off a papaya tree just beyond the door.

The price for all this? Eight bucks a night.

Letter sent 3-2

W.H. SHIPMAN, LTD.

KEAAU
HAWAII ISLAND

January 30, 1984

National Marine Fisheries Service
Honolulu Laboratory
P. O. Box 3830
Honolulu, Hawaii 96812

Dear Mr. Balazs:

Thank you for your letter of November 21, 1983 and for all of the interesting material on turtles.

I'm sorry that I was not on the island on November 25 - 28 when you visited Hilo. I was on an extended trip to Japan, Taiwan and Hong Kong.

If you are still interested in diving off of our coastline to study turtles, please let me know. We often see turtles in the vicinity sometimes two or three. I would certainly be interested in knowing what the turtle population is around here.

If there is anything we can do to assist you, I can be reached at the office at 966-9325 and at home at 966-9711.

My wife Jackie is a turtle collector (not the live kind!) and was especially interested to see the beautiful chart of "Sea Turtles of the World."

Yours very truly,

Roy S. Blackshear

Roy S. Blackshear, President
W. H. Shipman, Limited

1:08

3-31
call 3-29
or 3-30

Male and Female Rocks

Tales of Old Hawai'i

By Russ Apple

NINOLE, Ka'u, Hawai'i — Now famous for its C. Brewer golf course, condominiums and homes, when Hawaiians alone ran Ninole it had a living legend; Hilo'e, one of its two fishponds had unusual clientele, and a Ninole beach was famous for its unusual rocks.

At Ninole lived a cannibalistic water lizard, a *mo'o* named Kai-kapu. Her pretty granddaughter lured unwary visitors in ancient times to her grandmother's cave.

Kai-kapu ate them raw.

If Kai-kapu is still around today, she has changed her diet. Perhaps she sends her pretty granddaughter out nights to collect her raw food along the fairways. If so, her new diet may explain all the lost golf balls.

At least, there are no reports of missing golfers.

Unusual and exclusive clientele for Hilo'e fishpond at Ninole were the *kauwa*, the caste of untouchable Hawaiians who lived apart and were drawn upon for human sacrifices.

Ninole's untouchables lived inland and upslope. They were permitted to fish from Hilo'e and to obtain fresh and brackish water for drinking and poi making from one of the nearby springs.

PRIVILEGES SUCH as this were granted to the Ninole kauwa to prevent them from ritually polluting fishing and water areas used by other Hawaiians.

Other Hawaiians had the use of the larger Ninole fishpond and its nearby springs.

Hawaiians also had the use of Ninole's rocks.

Koloa beach, between Ninole and Punalu'u, was the home of multiplying rocks. It was also a place to gather stones for use in sling shots and to gather stones used in the Hawaiian checker-like game of *konane*.

Black konane "men" were pieces of basalt; white "men" were of bleached coral. Both had been rounded and polished by the action of the waves on Koloa beach.

When stones mated, the offspring were powerful indeed.

Naturally rounded and polished beach stones were also collected for use in slings. Some of the beach rocks were also dense and hard enough to be finished into small adzes.

But the best known use of Koloa's rocks involved the priests — priests who could tell a male beach rock from a female beach rock.

Not only must a priest be able to determine sex in rocks, but be able to tell which stones should be deified.

GODS MADE FROM Koloa beach rocks presided at games all over the Island.

Male and female rocks, selected as potentially able to cause their owners to win at games and betting contests, were taken by the selecting priests to the nearby temple Ka'ie'ie for the ceremonies which transformed them into gods.

Just how owners qualified for possession of the gods is not known, but the owners got the new gods-of-the-games and tried them out.

If the owners were successful, the fame of the gods (and of Ninole and the priests) was established. But if there were a series of failures in games and bets, the Ninole rocks were either broken or just thrown away in contempt.

Now sex rears its head.

Ninole priests presented each new owner with two rocks, one male, one female. Owners kept them wrapped between games and bets in the folds of kapa — bark cloth.

Successful stones mated. After due time a small stone would be found in the folds of cloth with the large stones. When this stone grew to be the size of its parents, it was taken to the temple for deification.

Second generation game gods were believed to be more powerful than first generation.

Hawaiians called the multiplying stones of Ninole *'ili'ili hanau*.

Blame coastal subsidences in 1868 and 1975 for destroying Koloa beach at Ninole. It and its rocks are now underwater.

the daughter of the cannibal woman Kaikapu. Ninole was beautiful but cruel. While she and her mother lived by the pools, the people of Punalu'u were afraid to go there for water.

The spring on the east side of the Ninole ponds was named Kau-wale, meaning "Useless-landing." Here is why it was so named. Ninole the ogress used to go to the beach near this spring, where she could be seen by men passing in canoes. She would beckon to them and they would come ashore. She invited them to eat, and led them to the cave in which her mother lived. When they entered, the cave mouth would close. The men were trapped; some were eaten, some were tormented and starved.

Punalu'u

Punalu'u is the name of a bay with a beach which, viewed from the sea, would perhaps have appealed more than any other along this coast to Polynesian migrants from the south as a place for a landing and first settlement. It is deep and sheltered enough to be shielded somewhat from the prevailing winds, and it has a beach on which fishing canoes can comfortably land in normal weather. Chester Lyman, in 1846 found it "romantically situated on the beach, shut in in part by a rough lava stream." This bay is also the best in Ka'u for sheltering beached canoes. Now it is mounded quite high, and thrust back; formerly it was more extensive. But still it has survived the tidal waves which have swept other beaches away completely.

Punalu'u means "Diving spring," and takes its name from the fact that for their drinking water the natives had to dive (*lu'u*) down in the bay to an underwater spring (*puna*) some ways out from the shore. A man would take gourds out to the place and dive under. When he came to the fresh cold water near the bottom of the bay, he would unstop his containers, fill them, then surface and bring them to shore. In ancient times the Punalu'u people went to the springs at Ninole for their drinking water until the ogress Kaikapu settled there. Then they learned to dive for water in the bay. Some 50 yards in from the beach is a pond that now is stagnant, but formerly it was large and had ample fresh water from a deep spring named Ka-wai-hu-ō-kauila. In the old days the spring was *kapu* and used only for drinking purposes.

A legend relates that there was a time when stormy weather prevented the men from diving for water. There were two supernatural turtles who had come out of the ocean to Punalu'u: Honu-po'o-kea (Turtle-with-white-head), the mother; and Honu-'ea (Turtle-with-reddish-brown-shell), the father. The mother gave birth to an object resembling a piece of *kauila* wood, which she buried in the sand to be hatched out by the sun. Then they dug into the earth and made a spring, then returned to the sea. When it was time for her "egg" to hatch, Honu-po'o-kea returned. When the thing she had laid did hatch it was a turtle the color of polished *kauila* wood. Mother and

daughter lived in the spring until the baby turtle grew up. The young turtle was named Kauila. The spring came to be named "The-rising-water-of-Kauila." The turtle girl was able to assume human form and play with the young folk, but would become a turtle again when she went back into the spring. When bubbles came up in the spring, people knew the turtle girl was asleep in her home. Children used to catch fish and shrimps in the spring, and Kauila watched lest the little ones fall in. The people loved Kauila for this and because her spring gave them drinking water. They never used her water for any other purposes.

In and around the pond whose water came from the spring the folk of Punalu'u were able to grow good wet taro. This is the only place in Ka'u besides Waiohinu where *kalo wai* could be grown. There is a quaint legend about the flight of two taro plants from Kona to Punalu'u. Here is Kawena Pukui's version of the story, and her interpretation.

Big-Taro and Little-Taro grew in Kona, Hawaii, in a patch owned by a man named Laka.

One day, the sound of wood-chopping was heard and both knew that he was at Lani-pae, preparing fuel for his *imu*.

"Listen," said Big-Taro, "Laka is cutting wood and I know that he is planning to put us in the *imu*."

"Not I," declared Little-Taro, "for when I am uprooted, the smallness of my root will be noticed and I will be pushed into the earth again. But you are large and will not be spared."

"Let us flee before the *imu* is lighted," suggested Big-Taro, and so the two flew to Punalu'u, in Ka'u. There they settled down and took root again in a spot known as Kalo-nui-me-Kalo-iki (Big-Taro and Little-Taro) since that day.

This old tale has been mentioned as a "children's legend" by *Haole* writers of our old tales, but I feel that there is more to it than something to amuse little folks.

The old saying *Ke kalo kanu o ka 'aina* ("The-taro-planted-on-the-land") was applied to the hereditary chief of the locality. He was responsible for the life and welfare of his people, hence the term.

Perhaps an invading chief (Laka) came to Kona and Big-Taro, the ruler, and Little-Taro, his personal *kahu* or attendant, were taken captives and subjugated. The victor became their chief and they his unwilling subjects. Whether they wanted to or not, they "grew in his patch."

Then the day came when certain activities on the part of Laka, the chief, warned them of their coming deaths as human sacrifices. Both "Taros," decided to escape (fly) to Ka'u. The escape was successful and the two settled, unmolested for the rest of their lives, in Punalu'u.

On the shore, not far from their new home, is a spot called Lani-pae (Chiefs' landing) and I guess that they escaped by canoe to this landing place.

The Lani-pae in Kona might have been Laka's landing place, and the one in Ka'u that of the two "Taros" who sought refuge there.

This is just my *mana'o* (opinion) on the subject. (Pukui notes.)

The area of the beach and the old lava flow that flanks Punalu'u is low and flat, and here many coconut trees flourish. This is, in fact, the only place

Native Planters in Old Hawaii

Their Life, Lore, and Environment

E. S. CRAIGHILL HANDY and ELIZABETH GREEN HANDY

With the Collaboration of

MARY KAWENA PUKUI

BERNICE P. BISHOP MUSEUM BULLETIN

Bishop Museum Press, Honolulu, Hawaii

1972

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

DIVISIONS:
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FISH AND GAME
FORESTRY
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF CONSERVATION AND RESOURCES ENFORCEMENT
P. O. BOX 936
HILO, HAWAII 96720

February 26, 1981

Mr. George H. Balazs
Assistant Marine Biologist
Hawaii Institute of Marine Biology
P.O. Box 1346
Kaneohe, Hawaii 96744

Dear Mr. Balazs:

This letter is in response to a letter from you dated January 30, 1981, regarding information on the green sea turtle.

Although sightings reported to me personally or to the conservation officers on the island of Hawaii have been sparse, a large concentration of these reptiles were seen in the Kaalualu Bay area in April or May of 1980.

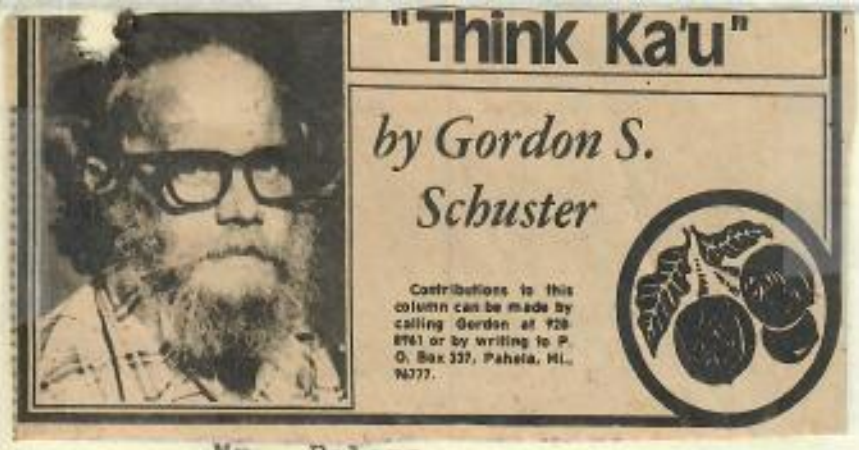
I realize that this information is meager but it is all that I can report at this time. If a sighting or unusual concentration of these sea turtles are seen, I will see to it that the information is forwarded to you.

If I can be of further assistance, please do not hesitate to call or write to me.

Yours truly,

CHARLES K. SUPE
Hawaii Branch Chief

CKS/mjy



March 22, 1980

Mr. Balazs,

Sorry this is way overdue.

We've had two months of beautiful weather since the first of this year and have been very very busy with fishing.

Now that our kamaaina weather has returned I've been trying to get other things done which I had been neglecting and doing repair jobs on all fishing equipments.

Of course the past rain storm didn't help, gave us more work but it didn't hurt us any, thank God.

Enclose is the last of the Ka'u Report published. The first page explains why. Also enclose is a picture of Mr. Schuster who writes his column (Think Ka'u) for the Hawaii Tribune Herald. He, at present is trying to see if he could acquire some funds somewhere to get the Ka'u Report going again.

So, maybe between these two papers the publicity of tag recovries may help and keep publicising it every now and then.

Appreciate the Turtle buttons. Mahalo.

Sincerly,

Arnold L. Howard

Arnold L. Howard

Honolulu Star-Bulletin

Published by Gannett Pacific Corporation

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A-14 Friday, April 9, 1982

Satellite Launching at South Point

Among the possible new industries for Hawaii one of the most intriguing is that of providing a base for commercial satellite launching.

Space Services Inc., of Houston, is scouting a site at South Point on the Big Island that was used for classified U.S. Air Force launches in the 1970s.

From there it would put up satellites as often as once a month, carrying loads of up to 500 pounds into orbit for whatever private customers wanted to buy in.

Not too many other sites are competitors because not too many places in the United States face on such a vast expanse of open ocean where booster rockets can fall back to earth without danger.

The firm is sure it can satisfy all safety demands. Its propellants are solid and non-sensitive. Launches will be to the southeast entirely away from land.

In addition to the jobs such an industry would create, it would provide the Big Island with a very special new visitor attraction — "bird watching" after the fashion of Cape Canaveral.

February 18, 1983

Dr. Samuel H. Elbert
Professor Emeritus
3293 Huelani Drive
Honolulu, Hawaii 96822

Dear Dr. Elbert:

I am writing to ask if you can give me any additional information relating to the Hawaiian legend of the turtle maiden (mo'o) of Ka-wai-hu-o-kauila pond at Punalu'u on the Big Island. This story was told by Mary Pukui in the Bishop Museum Bulletin 233, "Native Planters in Old Hawaii" (1972). Copies of pages 608-609 from this Bulletin are enclosed for your reference.

Do you know of other accounts, perhaps in greater details, that have been presented for this legend? I have been unable to find any other versions. Also, it is interesting to find that none of the other literature coauthored by Mary Pukui dealing with the Kau District mentions this turtle legend. Your Hawaiian Dictionary does, however, list "Honu-po'o-kea' (turtle with the white head) (a leatherback?), and "Honu-'ea" (turtle with reddish-brown shell) (a hawksbill). Any assistance or insight that you can offer on this subject will be most appreciated.

I should also mention that I greatly enjoyed reading the article in the January 30th Star-Bulletin about your lifetime work with Mary Pukui. I thought that reporter Helen Altonn wrote an interesting and informative story.

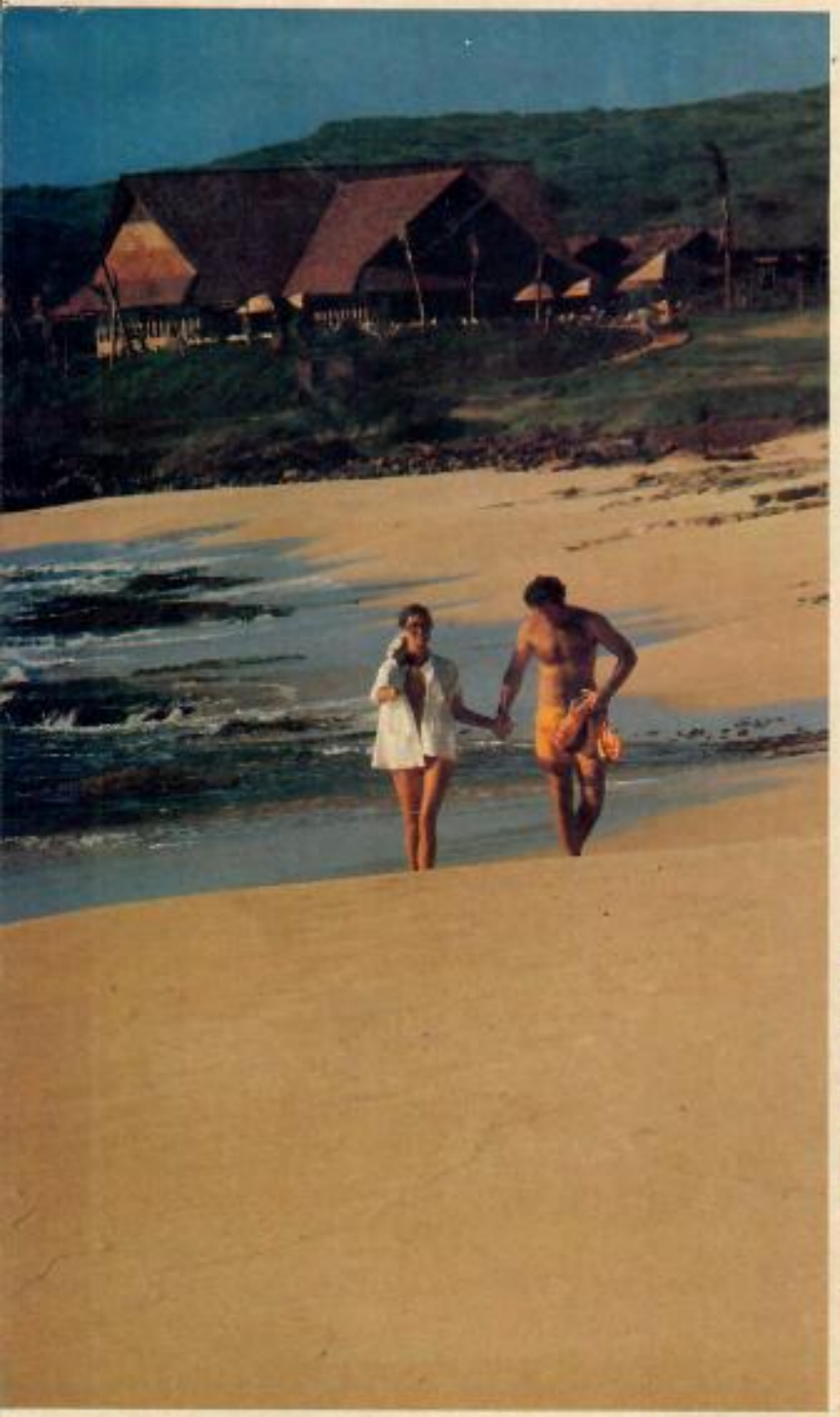
Sincerely,

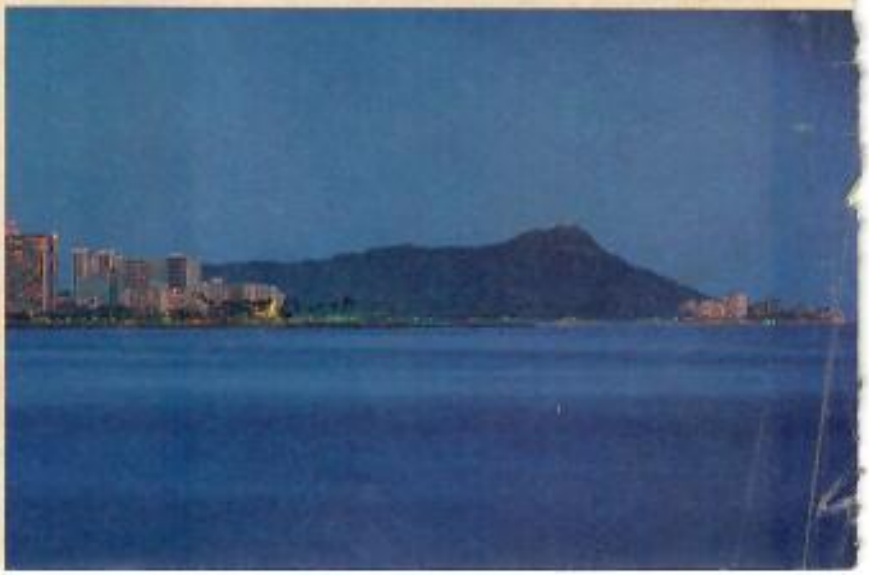
GEORGE H. BALAZS
Assistant Marine Biologist

GHB:ec

Encl.

The Shores of Paradise





In Hawaii...

PROTECTED BY PETROGLYPH?—Big Island resident Kalima Holstein says this stone he found several years ago in the Royal Gardens area has protected his family from the wrath of Madame Pele. —Star-Bulletin Photo by Llewellyn Stone Thompson.

Police/Fire

Opihi Picker Missing

PUNALUU, Hawaii — Hawaii County fire personnel were to resume a search today for Richard Ng, 27, of Hilo, washed into the ocean Saturday morning while picking opihi at Turtle Bay, Punaluu, Ka'u.

Two friends were with Ng at the time and reported him missing at 8:52 a.m.

The county helicopter, a rubber boat and divers were expected to participate in today's search effort.

UH HILO MARINE OPTION PROGRAM NEWSLETTER

February 1, 1984

Hi guys,
So much is happening this month, be a part of it.

WE'RE TALKING ACCESS

We've made alist for MOP students who would like to volunteer an hour or more (or less) to keeping the office open. You are needed to answer questions and disseminate information to anyone who walks in. But there are benefits, we've got a coffee pot. The schedule is in the office on the bulletin board, see if you can fit in.

THE ICEMAN TROPHY

As a new feature, with the Football Season behind us, we see a need to nominate for M.V.P. and the Iceman Trophy, a MOP student who has demonstrated extraordinary effort and talent in MOP projects and carryings on.

The first recipient of this prestigious monthly award is Mr. Hitoshi Ariga. (Yeah!) Mr. Ariga has blessed us with his presence this month, both as a gourmet chef for our dedication and welcome-back party, as a valuable interior designer, and flower arranger, and also let us not fail to mention our cresting wave.

We, at UHH MOP, Thank you Mr. Ariga for being our M.V.P.

SCUBA

The SCUBA class is scheduled to begin Feb. 13th from 6:30-9:30 at the YWCA pool. The class is limited to ten students and there are a few places still open. A deposit is necessary to secure your position. All interested students are encouraged to become certified. Stop by the office to sign up, soon.

TURTLE PROJECT

The Punaluu Tagging trip is on for Feb. 17th, 18,19, and 20. There is a meeting with George 1:00pm on Friday Feb. 17, we'll discuss strategies, We have a sign up sheet in the office to facilitate the logistics. Please come in and let us know when your last class will be over on Friday. I mail the finalized list of participant taggers to George on Friday the 3rd -- Sign now or never.

CAN YOU HANDLE AN EMERGENCY?

MOP is sponsoring a CPR class and a First Aid class in February. The dates are not yet definite, and may be offered before the next newsletter. Keep in touch with the office if you are interested. Remember if you would like to participate on the Turtle Project, it is important to have

Cont. CPR + First Aid Certification

INSTRUCTION : FISH ??

There is a Fish Identification class scheduled for February 16th in L.S.16 from 7:00pm-10:00, open to all MOP students. The class will cover species common to the Hawaiian waters. The following Thursday, Feb. 23, there will be a mandatory test for all Maui DAP participants from 5:00-5:30pm.

There is a Limu workshop in the planning.

FLASH: LIMU CLASS SCHEDULED

The Limu ID class has been scheduled for Feb. 9 from 7-9pm. Dr. Hemmes will instruct.

The Hawaiian Invertebrate Presentation will be Feb. 22, 6-7:30 and Dr. Little will instruct.

A Coral ID. class will probably be the following week.

GET INVOLVED (MAUI FOR THE HOLILAY'S)

There will be another Data Acquisition Project on Maui March 25-April 1, during Spring break. All UHH MOP students are welcome to attend. We will have an orientation to the DAP workshop on Feb. 3 at 4:30 in LS 22. UHH students who have previously participated will enlighten us unilluminated students, who would like to know the scoop. The project encompasses SCUBA diving and underwater transecting. Refreshing refreshments provided.

HALAPE'

We'll do the Halape' hike sometime in April, if you;ve got a preference for dates, let it be known. It's a pretty hot hike, so we'll be leaving early morning. Very early morning.

SKILL PROJECT

Like to talk to people? Are you a history buff? Did you always want to know about Sea Turtles in Hwn. culture?
George Balazs from the National Marine Fisheries Service has provided the UHH Marine Option Program with a stipendable position for a student especially interested in Hwn. cultural relationships with Sea Turtles. The position of an interviewer is to properly record for history Hawaiian interactions with the Green Sea Turtle. Sociology or Hawaiian studies students welcome. Contact Diane at the MOP office.

P.S.

The coffee pot is on.

MARINE OPTION PROGRAM
UNIVERSITY OF HAWAII AT HILO
1400 KAPIOLANI STREET
HILO, HAWAII 96720

FEB-3'84
HAWAII
U.S.POSTAGE
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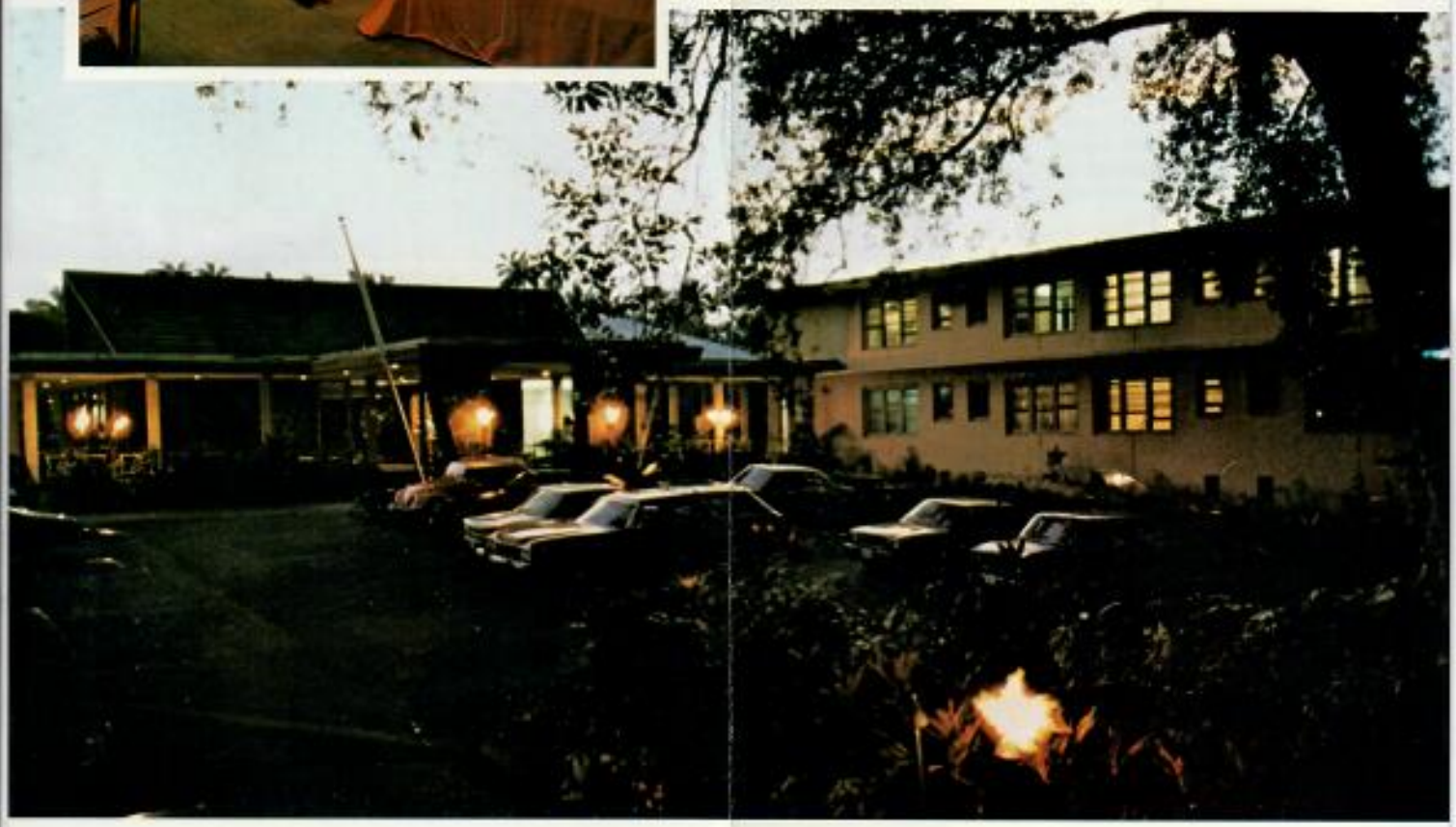
George Balazs
National Marine Fisherie
Box 3830
Honolulu, 96812

HILO HOTEL

142 KINOOLE STREET
HILO, HAWAII

In downtown Hilo
1 block to banks and post-office



Hilo Hotel
P. O. Box 726
142 Kinoole St., Hilo, Hawaii 96720
Phone (808) 961-3733

A Detached Palace
In Hawaii

Hilo Hotel

was acquired by George Lycurgus from his old friends, Spreckels family in 1908. The Spreckels interest had built the main hotel structure in 1888, a hostelry consisting of ten rooms with two baths.

A small cottage in the rear, built some time in the 60's, had served as King Kalakaua's "Summer Palace", a hideout used by the monarch for poker and relaxation when they wanted to escape from the pressure of court life and politics in Honolulu.

Kalakaua's cottage remained in existence until 1955, when it was torn down to make way for a new hotel, but a rubber tree reputed to have been planted by Princess Ruth in 1873 and now a giant over a hundred feet tall with a girth of thirty feet still shades the grounds of the present hotel.

Comfort & Luxury — exciting holidays await you

Restaurant Fuji

The relaxing atmosphere, combined with the oriental touch of Restaurant Fuji will give you a meal to remember.

Restaurant Fuji features a great number of unusual and delectable dishes prepared by chefs from Japan.

The lunch menu offers 8 complete "teishoku" lunches plus 4 "don" dishes and 5 noodle dishes.

The dinner menu consists of 15 different selections. For example, the Teppanyaki is a selection of beef and vegetables cooked before your eyes on a buttered grill. Also the Uminoko is prepared with various kinds of seafood, shrimp, crab, salmon, oyster and scallop.

Try something new and exciting at Restaurant Fuji.

Dear editor,

I am writing in response to the concern of the article written by Heather Hedenschau on Operation Pele, 3/29/84.

I, too, question Operation Pele's search and seizure of parcels in the mail. Since the dogs are alerted to food in order to detect Marijuana, I would like to know what happens when parcels are torn or mutilated (by dogs).

I believe the police and the Postal Service are obligated to give a written explanation of what happens when mistakes are made. This would tend to clear the minds of the law-abiding citizens.

Abraham Lincoln said, "All men are created equal" ... (the dogs are) saying, "In the U.S. Mail you're just as equal as a dope dealer."

Kalima Holstein

Hawaii TRIBUNE-HERALD 4-15-84

Protest dune bikes

Dear editor,

A few Sundays ago I did my usual Black Sand Beach sun-fun trip. Normally there are a few Jeeps driving over the beach but nothing that really troubles me.

But this time the beach was invaded by four riding-lawnmower-looking dune buggies, and they were having a ball.

It wasn't like the normal lazy Sunday at Harry K. Brown. It was like Sunday at a dirt-bike rally.

It's time to do something to protect this small strip of sand for sun bathers and children swimming. I really don't expect any legislation to come soon. Perhaps if a few others out there get sand kicked in their faces enough, maybe some one will protest also.

Charlie of Kalapana

I'm sleeping better

Dear editor,

A report on my two letters of March 20 and 21 on dogs.

I wish to thank the many people for their phone calls with sympathy and advice, but most of all, I thank the subject of my criticism for his kindness toward me for full night's sleep since March 21.

Margaret Frink
Kurtistown

operating gambling casinos.

The marchers, carrying banners and chanting union slogans, took up half the street with police leading the way and closing intersections to cross traffic as the marchers approached.

a. August 21, 1954

b. March 14, 1972

Fig. 23. LOOKING *MAKAI* FROM TOP OF A'A FLOW TOWARD EASTERN WALL OF NINOLE POND AND SMALL POND NE OF NINOLE POND (at left in photo).

5-3-84

Dear George,
Aloha!
Finally got to see Ralph and got his mailing address for you.

Ralph Dedman
P.O. Box 469
Naalehu, Hawaii
96772

He really doesn't live down here in Punaluu, only comes down to fish mostly.
See a lot of turtle heads poping out of water for the past few days now - small and big.
Sure do appreciate the copies, pictures of Ninole, male and female rocks and other reading materials of Punaluu or the Kau area.
Like you said, stay in the big Pavilion and let the police

know that you will be there
so they will come down to check.
Hope you and the family had
a nice Easter as we did -
Say thanks to Linda for the
Nice Easter card and note.
See you guys soon —

Always
The Howards
Arnold & Jeanette

Mr. & Mrs. Arnold L. Howard
P.O. BOX 4
PAHALA, HAWAII 96777

FREE

The CENTER

VOL. 2, ISSUE 7 | *Monthly from the East Hawaii Cultural Council* | MAY 1984

Ha'aku'i Pele i Hawai'i

(Pele prevails on Hawai'i)

A13 HSB 5-24-84

Summer Time in the Ka'u District

Tales of Old Hawai'i

By Russ Apple

ABOUT THIS TIME of the year a century or more ago, the Hawaiians of the Ka'u district of the Big Island began their summer activities.

Their hot season, *kau wela*, began in late May or early June. What the Ka'u Hawaiians did in summer was much different from what they did in winter. Men hunted in the upslope forests when summer came. Men also went deep sea fishing. They worked on their canoes, nets and lines in the shady canoe sheds by the sea.

In the upland gardens, men of the family planted taro. They covered it against sun and wind with dried grass and ferns. When a rain shower came, the planters pulled the mulch aside so the water could soak in. When the shower passed, mulch was replaced to trap the moisture in the soil. Someone in the family always stayed around upslope to tend the mulch, day and night.

Women left their upslope homes to camp by the rocky shore. Salt was collected from hollows in the shore rocks where it had evaporated from sea water. Some of the salt was used immediately to salt and dry the fish brought ashore by the men. Prepared fish was packed in baskets to take home — winter food. Some of the sea salt was packed to take home.

SUMMER'S UPSLOPE and coastal activities prepared for winter.

Ka'u's main harvest came in early October.

Taro corms were cooked in underground ovens and pounded to make "hard poi" that stored and could be mixed even months later with water to make a thinner paste for eating. Sweet potatoes and yams were cooked and dried in the sun.

Down at the shore, the last catches before November's high seas yielded bonito, tuna, albacore, swordfish and dolphin. Men cut them up; women salted the pieces, dried them in the sun and when ready, packed them in baskets to take upslope and home for the winter.

Much is known about how the Ka'u Hawaiians lived in the old days because the Hawaiian scholar Mary Kawena Pukui is a Ka'u girl who listened to the stories of the old folks. With E.S. Craighill Handy and Elizabeth Green Handy, Pukui supplied details of the Ka'u annual cycle — details that are often lacking for other districts of the Island chain. (Their book, "The Polynesian Family System in Ka'u, Hawai'i," has been reissued recently.)

The different seasons meant different jobs.

RAINY, CHILLY weather, called *ho'oilo*, began in October.

Strong winds made the seas thunder ashore along Ka'u's rocky coast. Some Hawaiians still credited the ancient god Kanehekili for the real thunder which echoed in the uplands and over the agricultural plains. Thunder announced the rains.

Deep sea fishing was abandoned for the winter; inshore fishing became chancy — done only when the waves calmed a bit.

Timber cutting and bird hunting by men, bark stripping by women, the collecting of wild foods by all, stopped when the cold rains came.

Ho'oilo was the time for indoor work.

Women made baskets and mats — baskets for salt, baskets with lids for storing fish; mats for floors, and fine mats for bedding and shrouds.

Fibers of coconut and olona were rolled between hand and thigh by the women to make the many balls of cordage that would be needed next summer.

During breaks in the rains, men repaired the thatch of the houses. Indoors, men repaired weapons, fishing gear, and wooden bowls. Men also rolled cordage. It was men's work to make the lines used in fishing.

WINTER WAS NEVER too busy a season to neglect the opportunity imposed by weather — rest and sleep.

By February, the heavy rains stopped. The soaked ground was ready for planting, although the planting was not done until March and April.

By March, stored food supplies were low. People ate fern stalks for starch and searched for wild bananas. Inshore fishing gave shellfish and seaweed — when waves permitted.

Hard times lasted through May, when the first sweet potatoes from the March plantings were ready.

Yams and arrowroot were harvested later in May.

And in May, the *kau wela* came again.

OCEANIC PUBLISHING CO.
BOX 156 NA'ALEHU, HAWAII
HAWAII 96772 U.S.A.
TELEPHONE: (808) 929-9101

Dear Mr. Balazs,

Enclosed is a copy of TURTLE DANCE. The title is derived from an ancient hula using the metaphor of an ancient turtle rising from beneath the sea as our islands have risen. The Title Poem has won a poem contest in our state as you may read. There are several other researched references to turtles and their important metaphoric meaning in Hawaiian Legends. I recall when reading Native Planters... the reference sheet you so kindly have sent me. I may just write another turtle poem about Kauila. Thanks for the thoughtful mailings.

From the mailing am I to understand that you sell Native Planters? I am curious as I had to borrow a copy from the public library. Do you handle other volumes such as researched collections such as TURTLE DANCE through the National Marine Fisheries Service? If so, I would be glad to allow my volume for sale through the Service.

(Not the large, closed restaurant)

Other notes: At the Lanakila Restaurant at Sea Mountain Resort Golf Course is a painting done I believe of Lanila (the girl headed turtle) I am quite sure this is the topic. An excellent painting. Also you may know, Sesame Street recently sent a film crew to the Big Island, and I unable it to film the sea turtles which may still be found there.

Maybe there is a revival in interest of the sea turtles its meaning for mankind and our own lives in as much as so many of us including yourself have encountered their lives through our varied professions.

I feel further inspired to do some more art work (as I paint also) - acrylics of the turtle and its legends. Perhaps a good environmental stamp might at least come out of the plan.

Thank you so much, again, for your interest.

Albert C. Hehegmen

An olelo nane

Kuu wahi i'a nona ke kai hohonu.

My little fish to whom belongs the deep sea.

Ha-ina (Answer)

Honu.

Turtle.

To the Hawaiians the turtle is a fish.

Collected in 1922 on the island of Hawaii by Theodore Kelsey.

Puha ka honu i ka la makani (nogenarian Kalama)

Olelo laula. The Turtle puffs noisly at the surface on a windy day.

Kaona. THe needy sluggard gossips abroad till invited to eat.

Explanations. Puha, breath moisily through the mouth.

When wind and wave are high the sea-turtle, pushed here and there by the agitation of the depths (au lewa) as he nibbles his sea-weed (limu) rises to the surface and breaths noisly. Well does he typify the lazy man, his peace disturbed by the storms of life, who gads with his neighbors till invited to dine.

Back of Hilo are threee hills, the middle one of which is know as Turttle Hill (Puu Honu) for jealous Queen Rain-Hina (Hina-kulu-'i-ua) like a turtle who doesn't get anywhere, failed in her fatal attempt to provide food as her elder sister Queen Fire Hina (Hina_a-ke-ahi) had done for her starving subjects by being buried in a big under-ground oven (imu) in her hill (Puu-o Hala'i, Hill of Calm, or easy times) just below.

Kelsey, 1923
Hilo

Sorry about the cat prints but its the only envelope of this size that I have at the moment.

J. J.

W. Ll keep looking for turtle things

Yutmans
85-1373-B5
Waianae Ul Rd
Waianae Hi
96792


Big Island
Upolu Airport
Kapaau
Pololu Valley Lookout
Hawi
Mahukona
NORTH KOHALA
WAIPIO Valley Lookout
Hawaiian Holiday Macadamia Nut Factory
Paauhau
Honokaa
MACADAMIA NUT CAPITAL
Parker Ranch
Waimea
(Kamuela)
Waimea-Kohala Airport
Kawaihae
Hapuna Beach Park
Puako
Waikoloa Village
Waikii
Observatory
MAUNA KEA
Rainbow Falls
Sugar Cane
Akaka Falls
Pepeekeo
Onomea
Honomu
Papaaloa
Honohina
Hakalau
Wailea
HILO
Hilo Bay
Banyan Drive
Keaukaha
Hilo Airport
Mauna Loa Macadamia Nut Mill
Keaau
Makuu
Cape Kumukahi
Kurtistown
Mountain View
Pahoa
Glenwood
Kaueleau
Opihikao
Kaimu
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Ke ahole Airport
Kailua
Holualoa
Kona Hawaiian Macadamia Nut Company
Kainaliu
Kealakekua
Captain Cook
Keauhou Bay
Napoopoo
Kona Coffee Mill
Pu'uhonua O Honaunau (City of Refuge)
Painted Church
Coffee Trees
Kaokea
MAUNA LOA
Kilauea Caldera
Volcanoes National Park
CHAIN OF CRATERS ROAD
Deep Sea Fishing
Hookena Beach Park
Hookena
Lava Flows 1919 1926 1950
Macadamia Nut Orchards
Papa Kau
Milolii
MANUKA STATE PARK
Pahala
Hilea
Punaluu
Waiohinu
Honuapo
Naalehu
Ka Lae (South Point)
NORTH
Miles
SEE TABLE OF CONTENTS FOR LOCATIONS OF DETAIL MAPS
(AREAS SHOWN BY BROKEN RED LINES)
POLICE STATION LOCATIONS
MILEAGE TABLE
Hilo Airport
To Akaka Falls
Airport Terminal
To Volcanoes National Park
© Copyright 1983 Hagadone Hawaii, Inc.

• **Volcanoes National Park**

Follow the highway signs to the **Kilauea Visitor Center,** where free eruption films are presented every hour on the hour from 9 a.m. to 4 p.m., along with a map and information on all there is to see and do in the Park. Taking the **Crater Rim Road** to **Chain of Craters Road,** you'll visit several significant sites. (Follow the Park signs.) On **Chain of Craters Road,** you'll see the devastation wreaked by past eruptions from the goddess Pele's abode. Lookout points are spotted all along the highway for spectacular views. As you continue, you'll reach a marker directing you to a petroglyph (ancient Hawaiian stone carvings) field, a ¼-mile hike from the road.

Continue on to **Kamoamoa Campsite** and **Wahaula Park and Visitor Center,** with its historic Hawaiian village, premissionary temples, indigenous plant life and displays. (Call 965-8936 for detailed information.)

Chain of Craters Road connects to Hwy. 130, where you can swim in the **Queen's Bath,** once a favorite swimming spot of the Hawaiian royalty. Then onward to **Kalapana** (with two small drive-ins serving meals and snacks) and **Star of the Sea Painted Church, Harry Brown Park** and **Kaimu Black Sand Beach.**

Hwy. 130 will lead you directly to **Pahoa** and **Kea'au,** or you may take Hwy. 137, a narrow cinder road leading to **Mackenzie State Park.** Turn on **Hwy. 132** to see the new **Geothermal Visitors Center** in **Pohoiki,** offering free tours daily from 7 a.m. to 5:30 p.m. Then proceed through **Lava Tree State Park** to **Pahoa.**

Here you'll see papaya orchards and anthurium farms. The small quaint town itself offers a nice oasis to rest and have a bite to eat before heading to **Kea'au.**

Before entering **Kea'au,** you'll pass the **Hawaiian Beach Estates,** magnificent old homes which were once the dwellings of sugar plantation managers. If you make a right turn at the small intersection, you can visit the **Puna Hongwanji Mission.** Continuing along the road will bring you back to Hwy. 11, heading towards **Hilo.** Be sure to stop at the **Mauna Loa Macadamia Nut Orchard,** with its **Visitor Center** open Monday through Friday from 8 a.m. to 5 p.m., and 9 a.m. to 1 p.m. on Saturdays.

For a tour that includes some of these stops call **Akamai Tours** at 329-7324.

VOLCANO

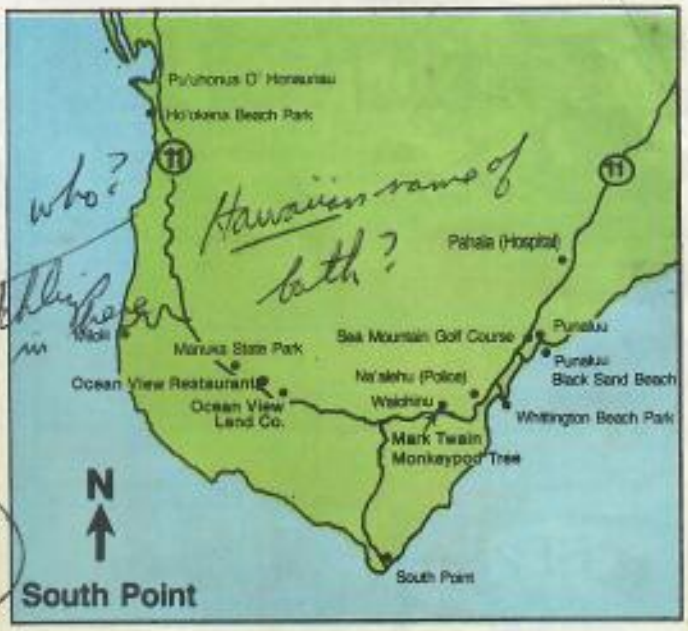
GO Dining

American

International Sportsman Restaurant Extraordinaire at Volcano Golf & Country Club. Breathtaking views of Mauna Loa next to Hawaii Volcanoes National Park. Serving delicious full menu lunch daily and by chef de cuisine Frank Ke. Call 967-7331 for reservations.

Volcano House, Hawaii Volcanoes National Park. Breakfast, lunch, and dinner served in a dramatic setting overlooking Madame Pele's home. Phone 967-7321.

Ocean View Restaurant, Ocean View at South Point, on Hwy. 11 at mile marker 76. Good homestyle cooking and homemade cream pies in a dining room overlooking the southernmost point in the U.S. Serving breakfast and lunch all day. Dinner includes salad bar. Beer and wine served with meals. Open 9 a.m. to 7:30 p.m., closed Mon. MasterCard & Visa accepted. Phone 929-9985.



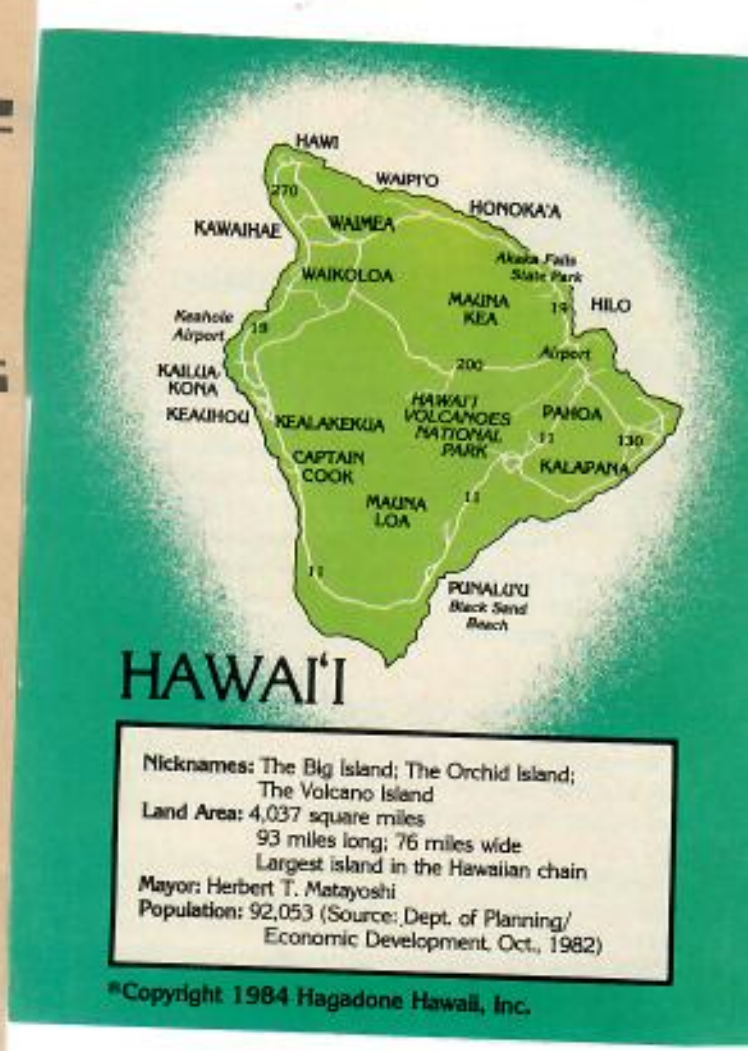
Tribune-Herald Aug 22, 1984 p25

LIFESTYLE

TURTLE DANCE

Poems of Hawaii

AELBERT AEHEGMA



HAWAI'I

Nicknames: The Big Island; The Orchid Island; The Volcano Island
Land Area: 4,037 square miles
93 miles long; 76 miles wide
Largest island in the Hawaiian chain
Mayor: Herbert T. Matayoshi
Population: 92,053 (Source: Dept. of Planning/ Economic Development, Oct., 1982)

Illustrations by D.E. Addlesberger

Volume of poems celebrates Silver Jubilee of Statehood

"Turtle Dance"—Poems of Hawai'i—by Aelbert Aehegma of Ka'u has been published as a commemorative edition celebrating the Silver Jubilee of Hawai'i Statehood.

Included in the volume are several translations and interpretations of the "Prologue to the Night World" from the Kumulipo, the 2,000 line poem of genesis of the Hawaiian and Polynesian peoples and nature.

Linocut reproductions of Polynesian themes based on research by Dale Addlesberger enhance the limited edition collection of poems. First editions are limited and available as long as the supply lasts, according to the author.

The volume received first place for its title poem "Turtle Dance" in a statewide contest held by the Hawai'i Education for Social Progress Foundation, and the poem based on ancient hula and accompanying legend of the islands " rising like a turtle" has been published in the foundation's Ka Huliau. It also appeared in Turning Point, a national anthology about endangered species.

Author Aehegma, a resident of Ka'u, has to his credit two previous publications—a collection of poems, and a history of the American Revolution. He also works with a partner in a macadamia nut orchard and sheep ranch.

He is listed in the International Who's Who of Authors and Writers, London, and was nominated to the International Platform Association.

Also a visual artist, Aehegma will be featured in a one-man show at Galerie Cluny in Geneva, Switzerland during September and October. He also exhibited last fall at Le Salon des Nations' International Exhibition at the Center for Contemporary Art in Paris, France.

Loihi, Undersea Volcano off

By Harry Whitten
Star-Bulletin Writer

It's 13,000 feet high now but it can't be considered part of the Hawaiian chain of islands yet because it hasn't broken the surface of the ocean.

This is Loihi, an undersea volcano 21 miles southeast of Pahala, Big Island, and 18 miles from the nearest point of land.

Some day Loihi, which means "long" or "tall," may become a new Hawaiian island. And again, it may not. In any case, the emergence won't happen very soon, but scientists are fascinated by what is going on now.

A report on Loihi has been released in Washington, D.C., by Alex Malahoff, chief scientist of the National Ocean Survey of the National Oceanic and Atmospheric Administration (NOAA), and an elaboration has been given here by Stephen Hammond, marine geophysicist who works with Malahoff.

Malahoff, in a report he is making this week at the annual meeting of the American Geophysical Union, said the undersea volcano is now 3,222 feet beneath the ocean's surface and is 15 miles long and eight miles wide.

Hammond said it's impossible to predict when Loihi may break the surface of the ocean. "It may just die before that occurs. We don't know what will happen."

There are other undersea volcanoes near the Big Island, he said, but there has been no contemporary evidence to indicate they are active. Earthquakes tipped off scientists to the fact that Loihi was active, he said.

THE OCEAN FLOOR is about 16,000 feet deep near Loihi, and since its top is about 3,000 feet beneath the ocean surface, its height can be estimated at 13,000 feet, he said.

Hammond pointed out that he and Malahoff are not the first scientists to study Loihi. The U.S. Geological Survey and its Hawaiian Volcano Observatory have done previous studies.

Malahoff and Hammond did bathymetric surveys last October aboard the Kanakeoki, a University of Hawaii research vessel, accompanied by two NOAA hydrographic vessels, the Rainier and the Fairweather. Bathymetric refers to measurement of ocean depths or the contours of

Big Isle, Intrigues Scientists

ocean bottoms.

They used a deep-tow camera system, known as ANGUS, belonging to the Woods Hole Oceanographic Laboratory, Massachusetts, which made transects along the undersea volcano and took pictures of surface features, including rifts, craters and the shapes of lava flows.

They also did some dredging and recovered fresh, glassy basalt, some of which showed evidence of being altered by hot volcanic fluids.

"From a geological point, Loihi is active; there's no question about that," Hammond said. "But it's not erupting now. The eruptions occurred within the last decades, certainly, but it's very difficult to date something that recent.

"IT'S A REASONABLE-sized volcanic mass, but it is much smaller than the active volcanoes on the Big Island, such as Mauna Loa or Kilauea. If it should come above the surface, it would be a baby compared to those volcanoes."

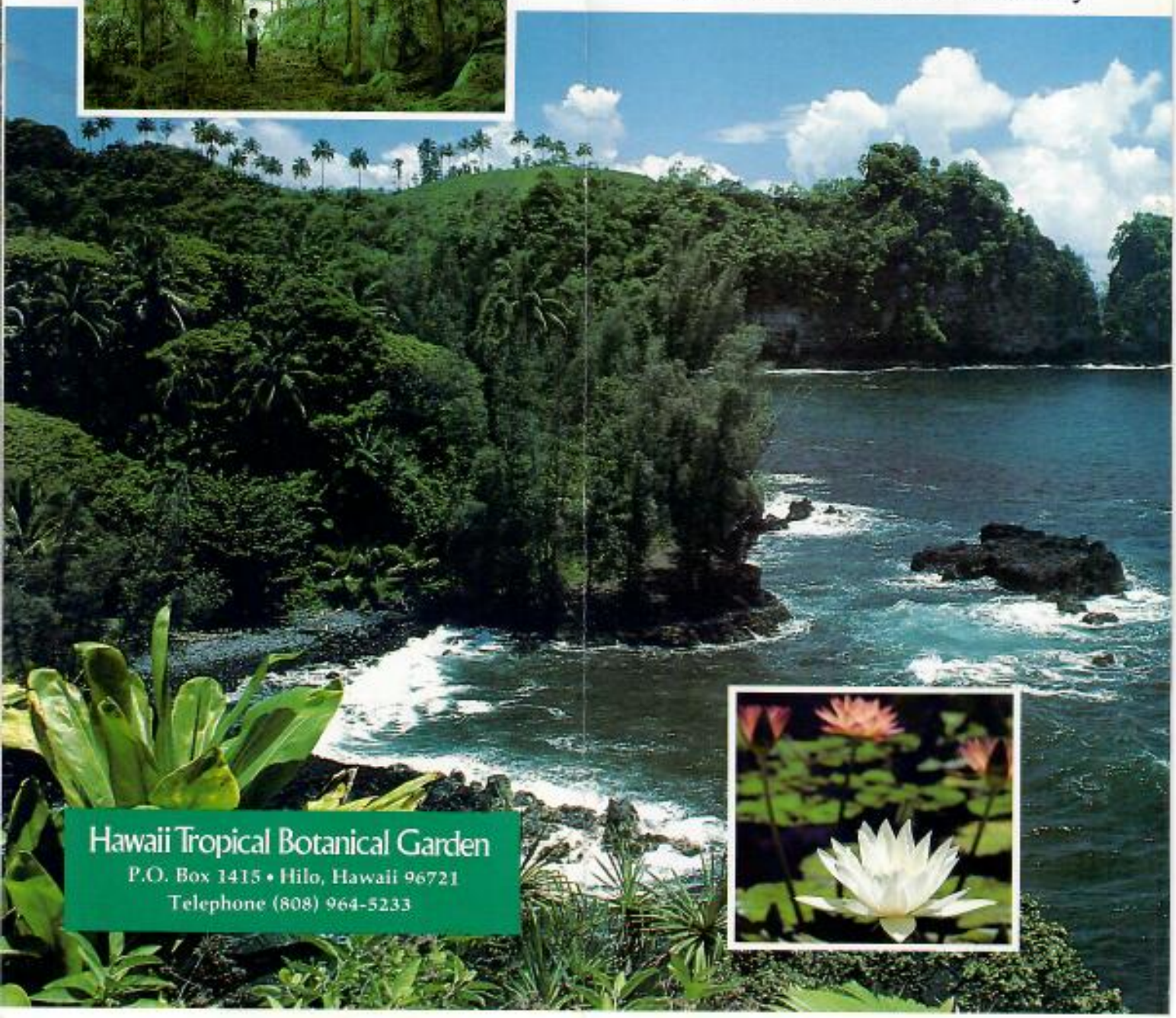
He said there can be speculation it will become the next Hawaiian island but there is no guarantee. In the meantime, it's very interesting to study and gives an insight into the evolution of a Hawaiian-type island, he said.

There is no visible signs of Loihi on the surface of the ocean, he said.

Hammond will be here until the end of next week working with colleagues at the Hawaii Institute of Geophysics on marine physical research not connected with Loihi. The institute and NOAA have a cooperative research agreement.

Hawaii Tropical Botanical Garden

A Non-Profit Foundation
Nature Preserve and Sanctuary



Hawaii Tropical Botanical Garden
P.O. Box 1415 • Hilo, Hawaii 96721
Telephone (808) 964-5233

On the 4-Mile Scenic Drive at Onomea Bay, Hawai'i

Aloha

Hawaii Tropical Botanical Garden is a nature preserve being developed to protect the natural beauty and harmony of a tropical rain forest. Visitors can enjoy the wonders of a natural, unspoiled botanical environment unique to the island of Hawaii with its living collection of tropical plants, birds and marine-life.

Within this primitive forest with its water-falls, meandering streams and rugged ocean coast, there is a vast array of tropical vegeta-tion, flowers and fruit. To enhance this natural beauty a wide selection of tropical plantlife is being collected from many parts of the world. These include many species of palms, bromeliads, gingers, heliconias, exotic ornamentals, plants of medicinal value, as well as rare endangered species.

For visitors wishing to come to the garden it is best to phone in advance for reservations. However, you may drive directly to the garden parking area where our garden mini-bus will take you to the garden site. (See directions on HOW TO GET THERE.)

There will be a limit of 50 people per day visiting the garden in order to preserve the natural conditions of the environment, as well as give each visitor a chance to enjoy nature in an uncrowded, relaxing manner. The garden's atmosphere is one of peace, quiet and serenity. For the photographer, it offers a tantalizing array of unique subject matter. To protect the environment no picnicking is allowed and no food or beverages are sold on the premises.

This tropical jungle garden is truly a place of spectacular beauty. The present trails of this 17-acre nature preserve are approximately a mile long. You can plan on spending 2 or more hours if you like, to walk the trails, take photographs or to just enjoy the beauty.

You will enjoy the rugged ocean coast, cascading streams and waterfalls. Colorful Japanese koi fish and tropical water lilies enhance the beauty of our lily lake. Many species of birds abound in our jungle forest including peacocks and Chinese thrushes. If your timing is right, you may even see giant sea turtles swimming in the bay. A garden brochure and trail map will be furnished to each guest at the garden site.

GARDEN RULES AND SUGGESTIONS

RESTROOM FACILITIES ARE AVAILABLE AT THE PARKING AREA ONLY. There are no restroom facilities at the garden site.

FOR YOUR SAFETY AND PERSONAL COMFORT:

DO NOT LEAVE TRAILS FOR ANY REASON. Some of the coastline and terrain is extremely dangerous. Falling coconuts can cause serious injury.

DO NOT LEAN ON GUARD RAILS.

DO NOT PICK FRUIT OR ANY PART OF PLANTS, SOME PLANTS ARE POISONOUS.

You may sample fruits which have fallen from the trees such as mango, passion fruit, and guavas which are all edible.

STAY WITH YOUR GROUP OR GUIDE.

Wear old and comfortable shoes—preferably with flat soles.

Remember, the garden is a wild nature preserve and there is no drinking water at the garden site. There are also no beverages or food sold. Picnicking or lunching in the garden is not permitted. PLEASE DO NOT LITTER.

Yes, we do have mosquitoes—all tropical wooded areas do; insect repellents are available at the garden for your use unless you are allergic to them.

HOW TO GET THERE:

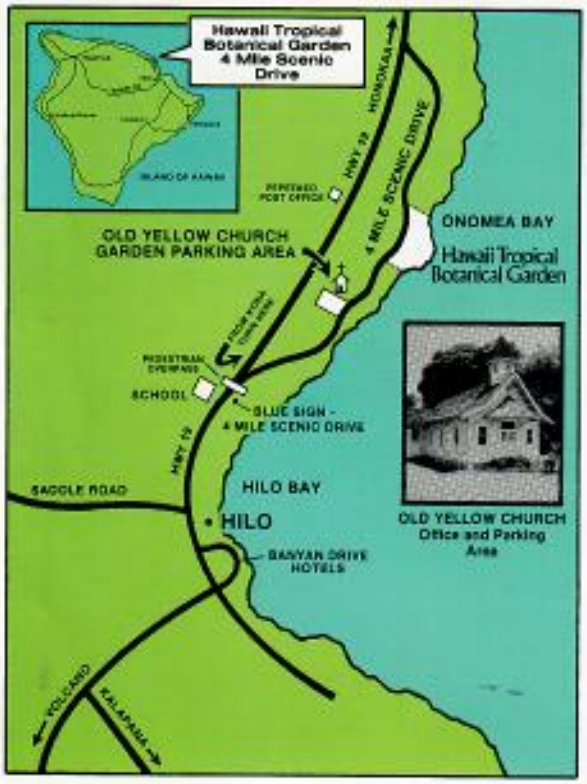
The only transportation into the garden is by mini-bus which is provided at no extra charge to and from the garden parking area. To get to the garden parking area, please follow the directions specified below. There is no parking at the garden site.

FROM HILO:

Travel north on Hwy 19 along the Hamakua Coast for approximately 5 miles until you reach a school on the left with an overpass crossing highway. There will be a blue sign on the right which says "Scenic Route approx. 4 miles long". There will be a crossroad intersection. Turn right onto the scenic route and drive for about ½ mile until you reach an old historical yellow church on the left. You will see a sign that reads, "Hawaii Tropical Botanical Garden Parking". Turn into the parking area. This is where the mini-bus will transport you to and from the Garden.

FROM KONA:

Follow Route 19 south on the Hamakua Coast toward Hilo. Approximately 5 miles before Hilo you will reach a small town called Pepeekeo (there will be a small pink colored post office). Continue approximately 3 miles on Hwy 19 until you reach a crossroad intersection with a school on the right and a pedestrian overpass crossing highway. Turn left at this crossroad onto the 4-Mile Scenic Route and continue for about ½ mile until you reach an old historic yellow church on the left. You will see a sign that reads, "Hawaii Tropical Botanical Garden Parking". Turn into parking area.



MINI-BUS TRANSPORTATION:

A mini-bus will take you from the parking area to the garden at Onomea Bay which is located at a distance of approximately 1 mile. Following your visit to the garden, the mini-bus will then return you to the parking area.

GARDEN HOURS:

The garden is open between the hours of 8 am to 5 pm, seven days a week (except Christmas and New Year's Day). You may visit the garden as long as you like between these hours. Mini-bus service is provided continuously throughout the day, approximately every ½ hour. You must leave the garden no later than 5 pm at which time the last mini-bus will depart for the garden parking area and the garden will be locked for the night.

COST TO VISIT THE GARDEN:

A donation of $6.00 per person is required to visit the garden which includes mini-bus transportation to and from the garden. Hawaii Tropical Botanical Garden is a non-profit foundation and is solely supported by contributions. ALL DONATIONS ARE TAX DEDUCTIBLE. After your visit to the garden, you may make an additional donation if you wish, using the envelope attached to your garden trail guide brochure.

HOTEL PICKUP:

For those who do not have automobile transportation to the garden parking area, hotel pickups from the Hilo area only can be arranged by making a reservtion in advance. For hotel pickup a donation of $10.00 per person is required (must be a minimum of 2 people). ALL DONATIONS ARE TAX DEDUCTIBLE.

SPECIAL GROUPS:

Accommodations for large or special interest groups can be arranged if reservations and arrangements for transportation are made in advance.

For Information and Reservations
Telephone 964-5233

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GEORGE,

WILL YOU PLEASE REVIEW THE KIHOLO TEXT, WRITE IN ANY COMMENTS OR CORRECTIONS NECESSARY, & RETURN IT TO ME BY AUG 21, IF POSSIBLE. THANKS.

JOE

8-83 DRAFT By John Clark

KIHOLO

Ke pa mai nei e ka Mumuku,
Ka makani o launiu o Kekaha
Ka hea mai a Kiholo i ka la'i
Auau i ke kai konahenahe.

The Mumuku wind is blowing.
The coconut leave-rustling wind of Kekaha
The serenity of Kiholo calls us
To swim in the gentle sea.

Pu'u Wa'awa'a, traditional song.

Kiholo Bay, a long, wide bay that stretches for two miles from Luahinewai Pond in its southern margin to Wainanali'i Pond in its northern margin, contains several private homes, many archaeological sites, and an extensive expanse of undeveloped shoreline that offers a wide variety of recreational opportunities. Although there is no convenient public access to the bay, many fishermen and campers obtain permission to visit the area, particularly on weekends and holidays. Common activities include swimming, snorkeling, spear fishing, lay-netting, throw-netting, pole fishing, salt-gathering, hiking, and occassionally surfing.

Probably the most popular spot at Kiholo is Luahinewai, the huge spring-fed pond located at the southern end of the bay. Coconut and naupaka surround this beautiful, prestine pond that sits between a black sand beach and the edge of a rugged lava flow. Luahinewai attracts not only the campers at Kiholo, but many boaters as well who anchor off the beach and swim ashore.

Apparently such visits to this oasis were just as popular in times past with the Hawaiians. In his book Ruling Chiefs of Hawaii historian Samuel Kamakau, reporting on a journey to Kawaihae by the high chief Keoua and his party, noted that "they left Kailua and went as far as Luahinewai at Kekaha, where they landed the canoes."

Three black sand and pebble beaches are located in the southern end of Kiholo Bay, two large ones fronting Luahinewai and Waiaelepi and one small one on the trail between the other two. All drop quickly to overhead depths, but during normal, calm water conditions swimming is good fronting each one. Hazardous conditions occur when high surf and winter storms generate heavy shorebreaks and rip currents. The remaining bayfront from Waiaelepi to the small embayment bordering the private homes and fishponds is primarily rocky with many tidepools and scattered pockets of black sand and coral rubble. Along this reach a large coconut grove borders the jeep road on the shoreline, the onshore mark for the favored surfing break in Kiholo Bay. Surfing conditions on the shallow reef shelf in this part of the bay are generally best during the winter months early in the morning. As the rising sun begins to warm the land, the difference in temperature between the land and the ocean generates an onshore sea breeze that results in sloppy, poorly shaped waves.

The northern end of Kiholo Bay contains a shallow sheltered embayment that adjoins a large brackish water lagoon, Wainanali'i Pond. Both the bay and the pond comprise an important feeding and sleeping site for sea turtles, principally the green sea turtle. The green sea turtle, a migrant breeder, travels regularly from its nesting grounds in French Frigate Shoals in the Northwestern Hawaiian Islands to the eight major Hawaiian Islands in the Hawaiian Archipelego. This turtle, as well as all sea turtles and their nests, are protected by state and federal wildlife laws and may not be harassed or harmed in any way. Other important nearshore feeding and sleeping areas on the Big Island where the turtles seek santuary are Pelekane in South Kohala and Kamehame, Punalu'u, and Ka'alu'alu in Ka'u.

Wainanali'i Pond, the 5 acre lagoon at Kiholo, sits between the edge of the 1859 lava flow from Mauna Loa and a sand and boulder spit approximately one-quarter of a mile long. The flat-bottomed pond, lined with several small coconut palms averages 10-12 feet deep, opens into Kiholo Bay at its southern end, and constitutes an easily recognizable landmark from the Kiholo Bay Lookout on Queen Ka'ahumanu Highway where the pond's aqua-colored waters are highly visible against the dark lava.

Oneof the most interesting accounts of the 1859 lava flow that comprise the northern margin of Kiholo Bay is found in the November 9, 1859 edition of teh Hawaiian newspaper Ka Hae Hawai'i and was translated as follows by Mary Kawena Pukui:

Concerning the Lava Flow

It will be well for me to tell what I have seen concerning th lava flow at Wailea and at Kiholo in North Kona, and you will te those who have not seen it. The flow began to go seaward in the month of February of this year, from the northwest side of Mauna Loa. It reached Wailea first, and from there it turned south to Wailoa, and continued on to the deep sea, smooth lava extending into it to about forty chains or more in length. This new point has been named Lae Hou. There is a long point there called Koena Limu. It is an old point and shorter than Lae Hou. The flow turned on the south side of Wailoa and went to Kiholo where it covered the pond. Then it turned again to the west, where a new point is burning now. Lae Hou is a long point, but this one is shorter. The lava has not finished building it, but it is now in the depths of the sea. I think it is about forty or more fathoms deep where it is burning, and from that burnign spot it is about fifty fathoms to shore. The sea there is very hot and any fish that comes there dies. This is the news concerning these doings of the volcano.

It the year 1810, the Kiholo pond was built, during the reign of Kamehameha I. It was a fishpond in which many of the deep sea fish were kept and in this year, in the reign of Kamehameha IV, Kiholo is closed by the lava. It is now only a heap of lava rocks.

This is another thing. The Protestant church that stood at Kiholo was removed when the lava flow drew near. The people thought that it would be burned down, so they razed it and took the lumber away lest it be destroyed. There is a circle of lava rocks surrounding it and the spot where the church stood remains like a grave. I believe that if the church had not been razed, it would not have been destroyed anyway.

J.H. Kaakua
Puapua, North Kona
October 25, 1859

Ka'akua's account not only tells of the formation of Lae Hou for Hou Point as it is marked on most maps today, but also of the destruction of Kamehameha I's fishpond at Kiholo, one of the wonders of its day. The missionary William Ellis described the pond during his circle-island journey in 1823:

About four in the afternoon I landed at Kiholo, a straggling village, inhabited principally by fishermen. This village exhibits another monument of the genius of Tamehameha. A small bay, perhaps half a mile wide, runs inland a considerable distance. From one side to the other of this bay, Tamehameha built a strong stone wall, six feet high in some places, and twenty feet wide, by which he and an excellent fish-pond, not less than two miles in circumference. It was well stocked with fish and water fowl were seen swimming on its surface.

Even though the lava destroyed the immense fishpond and dramatically altered the entire shoreline, Kiholo continued to provide a haven for a small

community of fishermen who relocated their homes to an untouched point of the bay south of the flow. During the 1890s this area developed into a commercial landing after Robert Hind and Eben Lowe aquired the lease for Pu'u Wa'awa'a Ranch from the Republic of Hawai'i. Located directly mauka of teh bay the ranch, in the absence of any circle-island roads, used Kiholo as its cattle shipping point. Living accomodations were built in the area where the private homes are located today and this site also served as a base of operations on the shoreline. The cattle were herded to Shipping Pen Beach, the black sand beach at Waiaelepi, where they were tied alongside lighters and rowed to the steamers waiting offsore. Pu'u Wa'awa'a Ranch discontinued shipping cattle to market about 1935 when improved roads and transportation made it possible to truck the cattle to the pier in Kailua.

Lesser commercial activity still continued at Kiholo with the annual harvesting of awa and moi from the comparatively small fishponds left in the wake of the 1859 lava flow. Pigs were raised, and a small herd of cattle was fattened on kiawe beans when the beans were in season and falling off the trees. The tsunami of 1960, however, ended all commercial operations at Kiholo after it wiped out everything within its reach.

Since the catastrophy a handful of the private shoreline homes have been rebuilt. The portion of Kiholo Bay fronting the homes is very shallow and rocky, offering few opportunities for swimming. Fresh water intrusion occurs in profusion in the nearby ponds and lagoon as well as in may parts of the bay, and as a result a surface lens sof fresh water, often several degrees colder than the bottom water, commonly floats over much of the entire bay, especially near Hou Point.

FOCUS/1946 tsunami

The Honolulu Advertiser
Tuesday, April 1, 1986

Photos courtesy of Hawaii State Archives

The 1946 tsunami that hit the Islands left three- and four-story buildings as heaps of rubble in Hilo. Waves reached 55 feet.

The day the sea went crazy

By Beverly Creamer
Advertiser Staff Writer

It's the kind of thing that's supposed to happen only in nightmares.

Forty years ago today, both Marsue McShane and Helen Sakaguchi were fighting for their lives in the worst natural disaster in the history of Hawaii — the 1946 tidal wave.

The April Fool's Day tsunami, generated by a massive earthquake in the Aleutians, wreaked most of

A street in Hilo is filled with debris pushed or pulled by the waves.

struggled upstream.

"I knew if I didn't struggle, I'd be pushed out to sea. My life was still important to me. I wasn't going to give up."

Finally she grabbed a hunk of log, and held on.

Then suddenly all became calm. "So calm," she says, gesturing with her hands.

Then the next wave hit.

The log was pulled away and the wave tugged her seaward. Again she struggled upstream, grabbing hold of a rooftop sticking up

This bridge along the Hamakua coast was unsafe for traffic after the waves ripped out some of its support.

its havoc on Hilo and Laupahoehoe on the Big Island but it struck all islands, killing 159 people, injuring 163 and leaving another 5,000 homeless.

The two women, now in their 60s and 70s, have been friends for 25 years and met because of their common experience. But in all those years, neither had heard the other's whole story.

"You don't want to think about it," says Sakaguchi, who lost a young son.

McShane, a young teacher fresh from Ohio at the time, was one of only a handful of survivors of the 32 people swept into the sea off Laupahoehoe, a low-lying lava peninsula jutting out from the Hamakua coast. She clung to wreckage for eight hours and later married her rescuer, Dr. Leabert Fernandez, the son of E.K. Fernandez.

Advertiser photo by David Yamada

Marsue McShane and Helen Sakaguchi were both swept into the raging waters of the 1946 wave that devastated the Big Island. They think they survived partly because they wouldn't give up.

Sakaguchi was a housewife in Hilo who heard the first wave coming, thundering "like a freight train" only moments before it struck at 7 a.m., crumpling her house into kindling and sweeping away her two little boys.

"It was such a beautiful morning, that Monday, and I had just done my washing and was getting the oldest boy ready for school."

Then the thundering started and Sakaguchi went to the door to look.

"I saw the wave and I thought 'Oh, my God, what am I going to do?'"

She had time only to grab both children and hoist them as high as she could before the wave washed into her cottage, nestled near the now-demolished old Ironworks Building between the river and the ocean.

"I could hear the house shattering . . . crack crack. The water came to my neck."

Walls broke apart and furniture floated toward the ceiling. A Japanese chest floated by and Sakaguchi hoisted Harold, 5, atop it and yelled, "Hold on."

"Then I began to lift the other one up. Before I could, we were covered with water. Everything went pitch black."

Her younger child, Stanley, 4, was pulled from her arms and disappeared in the swirling water. Harold, aboard the chest, disappeared too. Sakaguchi thought that at least they'd all die together.

through the water, but she couldn't pull herself up. "Debris was pushing against me and I thought, 'If I stay like this, I'm going to be squooshed.'"

Clinging to the roof on the other side was an older Filipino man. "Come and help me," she yelled. In shock, he didn't respond. "Everybody *make* (dead)," he said.

She yelled at him again, this time in pidgin. "Come *kokua* (help) me . . . I like go on top."

Finally he came and pulled her onto the roof as the wave subsided again.

By then, one of her neighbors was paddling a rowboat down the river looking for his family. He plucked her off the roof and took her to safe ground.

Later she was taken to hospital, only to find her older son safe there.

"I said, 'What did you do?' And he said, 'I swam.'"

But her younger son died in the tidal waves — not drowned, but apparently killed when struck by debris. His body was recovered the next day.

Even though she moved away from the Big Island 10 years later, for years Sakaguchi returned to Hilo each April to visit her son's grave.

"He was looking forward to going

A street in Hilo is filled with debris pushed or pulled by the waves.

"Not being able to swim, I struggled to hold my breath and grab hold of something. I went up and down, bob, bob. It seemed so long."

She was swept into the river behind her cottage but felt the water drawing her toward the ocean. She

to school in September," she says gently. "When I was getting his clothes ready he'd say, 'That's for me, isn't it, Mom?'"

As Sakaguchi relived the 40-year-old memory, McShane listened intently, finally breaking into the story as Sakaguchi spoke of the

See When on Page B-2

This bridge along the Hamakua coast was unsafe for traffic after the waves ripped out some of its support.

When sea just went berserk

A battered section of Hilo after the 1946 tsunami.

from page B-1

several waves that hit Hilo.

"That's what people don't understand," said McShane strongly. "It's a series of waves, and you have plenty of time to get out of the way."

It was that misunderstanding of how the waves worked that cost all the lives in Laupahoehoe, she said.

People were so fascinated by what was happening that they walked down to the water's edge and watched. She remembers how the Laupahoehoe School science teacher, Fred Cruz, had camera poised, as the wave that pulled their little teacher's cottage apart rushed toward her.

"I thought, 'I hope the next one's a big one,' " she says. When she realized it was, it was too late to get away.

As the wave hit, collapsing the roof, McShane and her three roommates, who were all just out of college and had come to Laupahoehoe to teach, rushed for the back door. McShane looked back and saw a wall of water fighting at the front door, then heard the crash of glass as it broke through.

When she surfaced, she and Fay Johnson were both says.

She went down, then bobbed to the surface, gulping air. The third time she surfaced, she was floating near the small offshore lighthouse — her bluejeans, saddle shoes and socks gone. "But my arms worked and my legs worked."

A strong swimmer, McShane struck out for deeper water, grabbing the largest piece of debris she could find. "My thought was to go out into the ocean and get out of the rocks . . . You can't imagine all the junk out there. It was like the bilge in 'Star Wars.' " At one point a chicken floated past.

The sky was gray and dull,

with Crisco for protection. They drifted to shore the next morning, alive.

As McShane drifted offshore, rescue was on its way. First, a small plane spotted her and dropped a rubber raft. Second, Dr. Leabert Fernandez, who also served as coroner for the Hamakua coast, was trying to find a boat. "He thought if anyone's alive he was going to try and find them," she says.

All the boats in Hilo had been damaged but he eventually located a pond boat in Waimea, found an outboard motor, then got plantation carpenters to rebuild the back so it would fit. Finally, near darkness, he and three

Avoi amon

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Q: I have hea that the n stay awake after se and pet the woman

berserk

from page B-1

A battered section of Hilo after the 1946 tsunami.

several waves that hit Hilo.

"That's what people don't understand," said McShane strongly. "It's a series of waves, and you have plenty of time to get out of the way."

It was that misunderstanding of how the waves worked that cost all the lives in Laupahoehoe, she said.

People were so fascinated by what was happening that they walked down to the water's edge and watched. She remembers how the Laupahoehoe School science teacher, Fred Cruz, had taken his class out onto the shoreline rocks and was pointing seaward and describing each succeeding wave.

When the sixth and seventh waves hit, Cruz and his class were all swept out.

"If there had just been a worrywart among us," says McShane, "if only we had said, 'Hey, wait a minute, maybe we better move back,' nobody would have lost their lives . . . "

Instead, they all moved forward.

In fact McShane was standing on the porch. Brownie camera poised, as the wave that pulled their little teacher's cottage apart rushed toward her.

"I thought, 'I hope the next one's a big one,' " she says. When she realized it was, it was too late to get away.

As the wave hit, collapsing the roof, McShane and her three roommates, who were all just out of college and had come to Laupahoehoe to teach, rushed for the back door. McShane looked back and saw a wall of water fighting at the front door, then heard the crash of glass as it broke through.

When she surfaced, she and Fay Johnson were both clinging to what was left of the roof. It had been carried seaward and dumped on the rocks. Dorothy Drake was hanging onto the roof's edge, panic-stricken. They called to her to climb up with them, but she was in shock and didn't respond.

"We thought it's going to tidal wave again and we'll be squished on the rocks." So she and Fay scrambled down and started for higher ground just as the next wave caught them.

"I thought, 'That's the end, you're going to die.' " she says.

She went down, then bobbed to the surface, gulping air. The third time she surfaced, she was floating near the small offshore lighthouse — her bluejeans, saddle shoes and socks gone. "But my arms worked and my legs worked."

A strong swimmer, McShane struck out for deeper water, grabbing the largest piece of debris she could find. "My thought was to go out into the ocean and get out of the rocks . . . You can't imagine all the junk out there. It was like the bilge in 'Star Wars.' " At one point a chicken floated past.

The sky was gray and dull, the water cold and choppy. Seasickness swept over her and she vomited into the littered sea.

Hours passed and she kept paddling, worrying alternately about sharks, finding better debris to cling to, and rescue.

Twice she saw other survivors, but never could reach them. At one point she saw three boys clinging to wreckage. "It looked like their skin was peeling off." Later she realized it was because they'd smeared themselves with Crisco for protection. They drifted to shore the next morning, alive.

As McShane drifted offshore, rescue was on its way. First, a small plane spotted her and dropped a rubber raft. Second, Dr. Leabert Fernandez, who also served as coroner for the Hamakua coast, was trying to find a boat. "He thought if anyone's alive he was going to try and find them," she says.

All the boats in Hilo had been damaged but he eventually located a pond boat in Waimea, found an outboard motor, then got plantation carpenters to rebuild the back so it would fit. Finally, near darkness, he and three others set out.

Two seventh-grade boys were plucked from the water first. Then they found McShane. "I think I would have lasted till the next day, but I was really glad to see Dr. Fernandez and that boat."

They wrapped her in blankets and headed for shore where people lined the road.

All three of her roommates died. Their bodies, and those of the others lost at Laupahoehoe, most of them children, were never found.

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corporate earnings

By United Press International
Net income (per share)

Latest Period		Year Earlier
Foxboro Co (4th Q)		
d-$32,745,000	$1,476,000 (.12)	
d-deficit.		
Morse Shoe Inc (4th Q)		
$2,584,000 (.48)		$3,489,000 (.64)
Pitt-Des Moines (4th Q)		
$150,465 (.06)		$2,370,259 (.94)
Quanex Corp (1st Q 1-31)		
d-$5,091,000	$2,426,000 (.23)	
d-deficit		

Standard & Poor's

	400 Indls	20 Trans	40 Utils	40 Fncls	500 Stocks
Fri	246.10	208.73	100.44	29.45	225.57
Thu	247.88	207.91	99.83	29.29	225.13
Wk ago	250.57	210.38	100.69	29.19	226.92
Mo ago	236.78	202.44	95.17	28.86	214.56
Yr ago	200.25	156.49	77.85	20.64	179.10
85-86 Hi	250.18	212.04	100.69	29.19	226.92
85-86 Lo	182.24	141.56	74.70	18.37	163.68

Dow Jones

Stock	Open	High	Low	Close	Change
30 Indus	1694.60	1713.46	1692.83	1699.83	+3.23
20 Trans	788.74	797.23	782.35	791.34	+2.33
15 Utils	181.58	183.94	179.68	181.53	-0.38
65 Stock	673.35	680.69	667.83	675.03	+1.09

precious metals

	Price	Prev. Day
Gold	343.35	344.75
Silver	5.60	5.59
Platinum	402.50-406	402.50-406

dividends

Co.	Per. Increased	Amt.	Pay	Rec.
Alberta Nat Gas	Q	.15	3-31	3-17
NBSC Corp	Q	.20	3-31	3-21

A-Annual; M-Monthly; Q-Quarterly; S-Semi-Annual.

Lowering interest rates send market up slightly

Combined News Services

NEW YORK — The stock market made a modest gain yesterday as investors reacted apathetically to a Federal Reserve Board discount rate cut and subsequent reductions in banks' prime rates. Trading was heavy.

The Dow Jones industrial average closed little changed at 1699.83, a gain of 3.23 points. Over the week, the Dow lost 9.23 points, marking its first decline after five consecutive weeks of gains.

Winning issues beat losers 888-771 among the 2,079 traded.

Broader market indexes also made headway. The New York Stock Exchange index rose 0.23 to 130.38. The Standard & Poor's 500-stock index climbed 0.44 to 225.57. The price of an average share rose seven cents. Big Board volume totaled

its discount rate to 7 percent from 7½ percent.

Following the Fed's announcement, many major banks lowered their prime rates to 9 percent from 9.5 percent.

On the trading floor, Eastman Kodak was the most active NYSE-listed issue, falling 1½ to 58.

Meanwhile, trading was very active on the Toronto Stock Exchange, with the TSE 300 composite index up 13.01 points to a record high 2,927.03.

On the international markets as of 4 p.m., with New York prices and comparable Thursday rates in parentheses:

Frankfurt, 2.2403 marks, down from 2.2466 (2.2360 vs 2.2370); Zurich, 1.8875 Swiss francs, down from 1.9010 (1.8925 vs. 1.89); Paris, 6.86 francs, down from 6.8750 (6.8775 vs. 6.8825); Milan, 1.525

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Fisheries Center Honolulu Laboratory
2570 Dole St. • Honolulu, Hawaii 96822-2396

July 10, 1986 F/SWC2

Mr. Joe Evans
Backcountry District Ranger
Hawaii Volcanoes National Park
Hawaii 96718-0052

Dear Joe,

I am sorry that we still haven't had the opportunity to meet in person to talk about hawksbill nesting during any of your trips to Honolulu. I greatly appreciated the excellent color slides you sent with your letter of January 13th. The coastal and beach views gave me a better understanding of the habitat used by hawksbills in the Volcanoes National Park. Thank you for providing me with this material.

The approximate hawksbill nesting season of July through October is here again. I hope that you will be able to undertake some patrols during coming months to monitor any nesting activity that takes place. I look forward to hearing about your findings.

Sincerely,

George H. Balazs
Zoologist

cc: Tim Ohashi, FWS

/ Balazs

BOX 4
96777

June 19, 1986

Dear George Linda + boys,
We were in Honolulu for a couple of days last weekend to visit Arnold's mom, celebrate our 21st. Anniversary and of course Father's Day too. It was kinda short but it was enough of all that rat race. Tried to call you at home but could not get an answer. Wanted to thank you in person for sending us the nice turtle book and the certificate of Merit. It was very thoughtfull of you and do appreciate them very much. Congratulation's for your second son. What is his name and when was he born? Now you need a girl (smile). For the last week we have been having strong trade winds and rough seas. When it's high tide the turtle all come in to feed on the limu's at the bottom close to shore. all the tourist are facinated especially when they come up for air, not only one but a lot

of them here and there. Of course some who have never seen one thinks they are seals or sea lions (smile) they even wait for them on the rocks to come up again for picture taking. We are still doing our everyday chores. Arnold fish every day when weather permits and catches a lot of ono's. July 22nd we are visiting cousins in California then from there on the 28th, Arnold will go Salmon fishing for 7 days at Ketchican, Alaska. This will be his 2nd time and last time. He had gone there last summer and like it so well. I will be staying on in Calif. and wait until he comes back and we both will return on the 6th of August.

We also got a book from John R.K. Clark on the "Beaches of the Big Island" which I haven't as yet read.

Meanwhile, best wishes to all of you

Love Aloha,
Arnold & Jeanette

Hi! Christian.

United States Department of the Interior
NATIONAL PARK SERVICE
HAWAII VOLCANOES NATIONAL PARK
HAWAII 96718

IN REPLY REFER TO:

N2219(HAVO)

November 13, 1982

Mr. George H. Balazs
Assistant Marine Biologist
Hawaii Institute of Marine Biology
University of Hawaii
P.O. Box 1346, Coconut Island
Kaneohe, Hawaii 96744

Dear Mr. Balazs:

Thank you for your informative Sea Grant proposal and letter of September 22nd. We would like to be kept informed of progress with your proposal and of dates and locations of your trips to the Ka'u Coast.

Personnel and facilities of the Research Center at Hawaii Volcanoes National Park may be of some help to you during your study. Please contact Dr. Charles Stone, Research Scientist, Hawaii Volcanoes National Park, Hawaii 96718 (telephone: 967-7367) if you need assistance. He can give you details about dormitory space, laboratory facilities, storage space, and logistical help.

We wish you success in getting your proposal funded. We anticipate a productive study and look forward to your recommendations for proper resources management to enhance the survival of green turtles.

Sincerely,

Bryan Harry

G. Bryan Harry
Pacific Area Director

HAWAII TRIBUNE HERALD 8/3/86 SUNDAY

Vast changes in store for Ka'u?

Punaluu Resort expansion could shift district economy

PUNALUU — The sleepy district of Ka'u, a sparsely populated region larger in size than all of Oahu, could undergo an agriculture - to - tourism economic transformation similar to that seen in North and South Kohala in the 1970's, if C. Brewer has its way.

The headlines may be going to developer Christopher Hemmeter's ultra - luxury Hyatt Regency Waikoloa project, but Brewer plans to develop its Punahau Resort with over 1,000 more units than the Hyatt.

And Brewer officials, previously hesitant to put a price tag on the Punaluu project, have now come up with a figure considerably in excess of the $360 million Hyatt development.

"We have to be in the half - a - billion range, retail," said Leroy Uyehara, the Harvard - trained executive who is Ka'u area vice president for C. Brewer Properties, in an interview last week.

A key difference between the Brewer and Hemmeter resorts is that the Hyatt's financing is already complete, while Brewer is seeking investors. Also, Hemmeter plans to have completed his project by 1989, while the Brewer timetable extends as far as 2005.

But Brewer's plans — to build three major hotel properties and 1,300 multi - family condominium units — are grand by any standards.

And the Punaluu Resort expansion, which could create jobs for as many as half of Ka'u's adult population, portends a profound change for the isolated district, whose economic base consists of sugar and macadamia nut plantations, and little more.

The resort presently includes the 18 - hole SeaMountain golf course, a 76 - unit condominium, a conference center, tennis complex, restaurant and 19 single - family houselots, employing about 70 people.

Brewer officials envision a resort with a 330 - room "European - style" hotel integrated into a 65,000 - square - foot village commercial center, a 325 - room hotel near a restored Ninole Cove and a 150 - room hotel near the Punaluu Black Sand restaurant and beach. The multi - family condos would be slightly upslope from the coast.

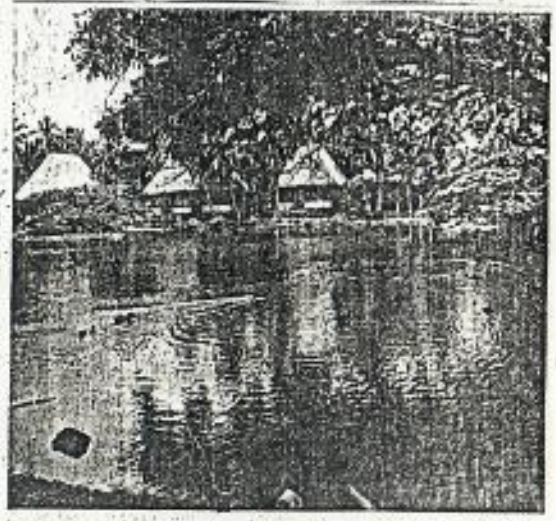
Uyehara said Brewer hoped to begin construction next year, after final regulatory approvals are granted by the Planning Commission and the County Council. Brewer will give the Planning Department a draft environmental impact statement for the project this month, with public hearings on the EIS expected soon after.

When completed, the 450 - acre resort would create "at least" 1,450 jobs, preferrably for Ka'u residents, according to Uyehara.

"Ka'u has 4,100 residents spread over 520,000 acres. Unemployment is about 15 percent and it could be higher. And we have 850 students in the school system ... Sugar and ranching are not doing well. With the resort, the dynamics of the community will change," Uyehara said.

The Brewer executive said

See KA'U Page 10



—T-H photo by Larry Kudo'oka

KA'U CATALYST — C. Brewer's plans to build more than 2,000 hotel and condominium units in several phases at its Punaluu Resort could transform Ka'u's agriculture - based economy. Brewer executives say the resort expansion could create 1,450 or more jobs.

KA'U

From Page 1

efforts were being redoubled to make sure Ka'u natives understand his company's plans.

"All communities fear what they do not understand. I take responsibility for the community knowing what it is we're attempting to do," Uyehara said.

"I've spend a lot of time in small presentations, to obtain the feelings and comments of the people. I think most of the people in this community support this project. They see it as mostly beneficial.... It's not just economics. It's the break - up of the family unit (in Ka'u) that happens when people have to leave to find jobs."

Brewer has company in its plans to develop a Ka'u resort, though it is much further along in the planning and regulatory process than other potential developers.

Mt. Lebanon has floated plans to develop a 550 - acre resort south of Manuka Natural Reserve.

Another project, known as Hawaii Ka'u Aina, could include up to 1,200 hotel rooms and two golf courses.

By Chris Reed

The Sunday Star-Bulletin & Advertiser Honolulu, June 29, 1986 B-5

Brewer to revise plans for Punalu'u expansion

HILO — C. Brewer & Co. has backed off its pending resort expansion at Punalu'u and is going to revise its plans, company officials informed the Hawaii County Planning Department last week.

Brewer ran into a storm of criticism at a public hearing held by the county Planning Commission last January after reviving its interest in Ka'u tourism.

Since then, little had been said about the resort until May, when Brewer withdrew its shoreline management application because of the criticism.

Then last week Leroy Uyehara announced Brewer has filed a preparation notice with the county that it is planning to do an environmental impact statement on its Punalu'u project.

In the 1970s, Brewer opened a resort golf course, tennis facility and a restaurant in Ka'u. But it halted its development before any hotels were started.

Uyehara is vice president of C. Brewer Properties, a subsidiary that owns and operates Punalu'u. By doing an EIS, Brewer will "ensure that the resort can be properly integrated into the Ka'u community," he said.

The EIS will "cover the effects of site improvement and physical changes to the roadways and infrastructure at Punalu'u," Uyetake added in a prepared statement.

At January's hearing, Ka'u residents expressed concerns about roads that would be closed, asking about access for residential fishers and campers and expressing concern over possible blocked evacuation routes in the event of a tsunami.

The planning commission then voted to grant a request for a contested case hearing on Brewer's then-pending request to rezone 206 acres, relocate four holes on the Seamountain Golf Course and realign Punalu'u Road.

The preparation notice said Brewer intends to develop 500 to 600 hotel rooms, a commercial village with 65,000 square feet of commercial space and up to 500 residential units and to expand and "enhance" the existing Punalu'u Beach Park.

August 13, 1986 P/SWC2

Ms. Keolalani Hanoa
P. O. Box 472
Naalehu, Hawaii 96722

Dear Ms. Hanoa:

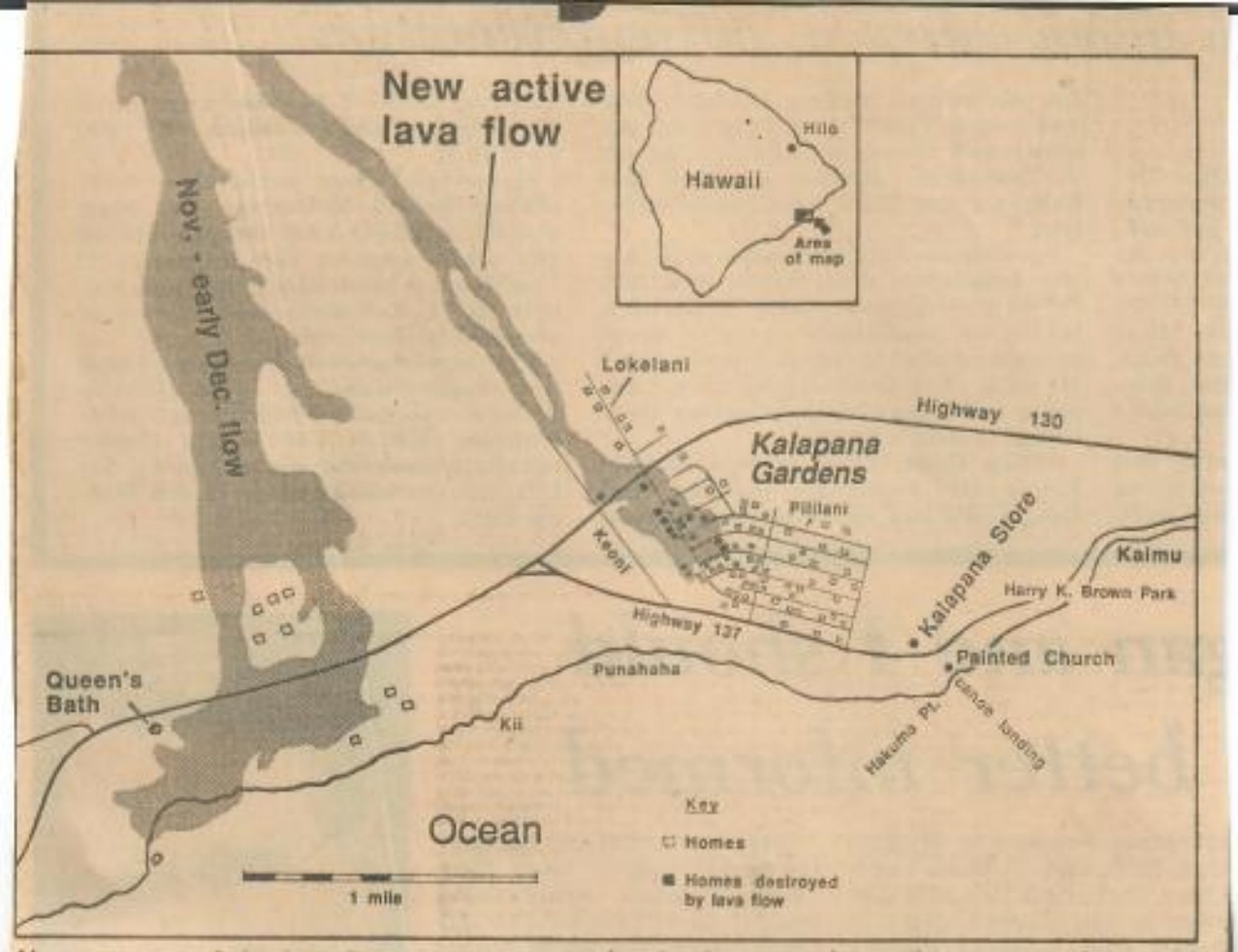
Thank you for your recent inquiry concerning tagging and other research activities we have conducted on sea turtles at Punaluu Bay and the adjacent Kau coastline. This is an extremely important area for the Hawaiian green turtle, Chelonia mydas (honu), and hawksbill, Eretmocheleys imbricata (honu'ea). Both of these species are listed and protected under the U.S. Endangered Species Act and wildlife laws of the State of Hawaii. As a property owner just across the street from Punaluu Bay, I can certainly appreciate your concern for these animals with respect to future coastal development. Please be assured that a branch of our agency will be closely monitoring this matter as it progresses.

As promised, I am sending you an assortment of literature covering some of our work with Hawaiian sea turtles. If I can be of any further assistance, please feel free to contact me.

Sincerely,

George H. Balazs
Zoologist

cc: P/SWR1 - Western Pacific Program Office
FSWR43 - Gene Witham, Law Enforcement



Above, a map of the lava flow. At right, a child's tricycle was quiet testimony yesterday to the hasty evacuation of some Kalapana residents.

HAWAII CLIPPING SERVICE
P.O. Box 10242-Honolulu, Hawaii
PHONE: 734-8124
Victoria Custer Elaine Stroup

WEST HAWAII TODAY

MAY 26 1988

HPA students aid in study of sea turtles

High school students are helping scientists of the Southwest Fisheries Center Honolulu Laboratory of the National Marine Fisheries Service study Hawaiian green sea turtles at Kiholo Bay on the island of Hawaii.

Such an opportunity is rare even for college students much less high school students, according to George Balazs, a zoologist with the NMFS Marine Mammals and Endangered Species Program.

Students of the Hawaii Preparatory Academy at Waimea, have assisted Balazs in three field studies on green turtles at Kiholo Bay since October 1987. The field study on April 27-29, 1988, included 17 HPA students as well as four students from the Hawaii School for Girls in Honolulu.

"Students helping scientists" is the brainchild of Dave Gulko, an HPA science teacher. Gulko got the idea while assisting Balazs during a joing research project between NMFS and college students in the University of Hawaii's Marine Option Program.

Long-term recaptures indicate that the growth rates of turtles averaged about half an inch per year. Long-term recaptures also indicate that Kiholo Bay is "home" to at leat those turtles.

"It's interesting that we don't have more recaptures," said Balazs. "That we catch 10-13 turtles indicates there's a good number of turtles depending on that site for eating, sleeping and living."

Students selected for the program must have good grades and display a high degree of motivation and a willingness to work. Part of their evaluations are also based on how well they perform during the planning stages of the research. This experience gives students a taste of the logistics involved in planning a scientific field study.

The other teachers and the HPA administration are behind the program 100 percent, according to Gulko, who knows of no other project like this in Hawaii and perhaps the United States. Gulko is presenting a paper on the program in July at the National Marine Educator's Association in Santa Cruz, California.

Neither Gulko nor Balazs could say for certain whether the program would continue next year. "But we've been so judicious in spending the money, we have enough for one or two nights of research this summer, with seven or so students," said Balazs.

Both Gulko and Balazs agree that the program is a success so far. "The future of the joint program looks very bright," said Balazs.

The NMFS is an agency within the U.S. Department of Commerce, National Oceanic and Atmospheric Administration.

HAWAII HOCHI
MAY 25 1988

students help lab study green turtles

High school students are helping scientists of the Southwest Fisheries Center Honolulu Laboratory of the National Marine Fisheries Service study Hawaiian green sea turtles at Kiholo Bay on the Big Island. Such an opportunity is rare even for college students much less high school students, according to George Balazs, a zoologist with the NMFS Marine Mammals and Endangered Species Program.

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"Students helping scientists" is the brainchild of Dave Gulko, an HPA science teacher. Gulko got the idea while assisting Balazs during a joint research project between NMFS and college students in the University of Hawaii's Marine Option Program.

Balazs was very interested in Gulko's idea: Kiholo Bay, an important feeding and sleeping area for green turtles, was monitored only sporadically because of budget constraints. Gulko's students would provide the needed manpower for such research; a generous donation from the late Robert L. Hind, Jr., of Kailua-Kona, provided the necessary funds for one year of research.

During the field studies, the student-scientists are grouped into teams that work in 2-to 3-hour shifts through the night, when turtles are sleeping and much easier to catch. The duties of each team are rotated so that students learn as much as possible about turtle research. Duties include watching for turtles, tending captured turtles, helping collect data, photographing turtles, camp duties and cooking.

To study and tag a turtle, it must first be caught either by hand or by net. Using a net is the more successful method. Dive teams stretch a large mesh tangle net across the lagoon. When a turtle is snagged in the net, the team watching from shore notifies a dive team, which quickly moves into action to carefully remove the turtle. The turtle is carried to shore and, in the morning, is tagged on a fore flipper and measured. Also, stomach and fecal samples are taken and external parasites are noted and sometimes removed. Then the turtle is set free.

The research results of the three field studies have been very promising. In the April study, 10 turtles were captured. Three had been captured previously in 1980, 1984 and February 1988. In the February study, 13 turtles were captured; 2 of them were long-term recaptures.

Long-term recaptures indicate that the growth rates of turtles averaged about half an inch per year. Long-term recaptures also indicate that Kiholo Bay is "home" to at least those turtles.

Hawaii Preparatory Academy student scientists at Kiholo Bay, Big Island.

"It's interesting that we don't have more recaptures," said Balazs. "That we catch 10-13 turtles indicates there's a good number of turtles depending on that site for eating, sleeping and living."

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The NMFS is an agency within the U.S. Department of Commerce, National Oceanic and Atmospheric Administration.

Listen carefully and you will hear . . .

Seawords

MARINE OPTION PROGRAM UNIVERSITY OF HAWAII

News of the Marine Option Program University of Hawaii at Manoa
Seawords May 20, 1988 Vol. III No. 6

Turtle Tagging on the Big Island

By Dan Bauer

Tagging sea turtles drew about 25 MOP students from Hilo, Manoa and Maui programs to the black sand beach park of Punaluu on the Big Island for three days during spring break, March 21 through 23. The project was coordinated by UH-Hilo MOP and conducted by researcher Robert Forsyth of the National Marine Fisheries Service (NMFS).

MOP students helped Forsyth capture, study, tag and release Hawaiian green sea turtles (Chelonia mydas), a threatened species that frequents the southeast coastline of the Big Island, a region known as Ka'u.

The cove at Punaluu has been the site for several turtle tagging expeditions in the past, by Hilo MOP and others, under the direction of George Balazs of NMFS. The sea turtles may be attracted to the area by a species of red limu (Pterocladia capillacea) that grows there. By studying the green sea turtles, NMFS scientists hope to learn more about their growth patterns, and feeding and migratory habits.

Being classified as a threatened species means that the Hawaiian green sea turtle is likely to become an endangered species in the near future, according to the federal Endangered Species Act. An endangered species is one that is in immediate danger of extinction.

Turtle tagging Manoa MOP students take time out to visit the UH Hilo MOP campus. L to R: Dan Bauer, Tina Xavier, Lara Asato, Mary Roney, and Raymond Boland.

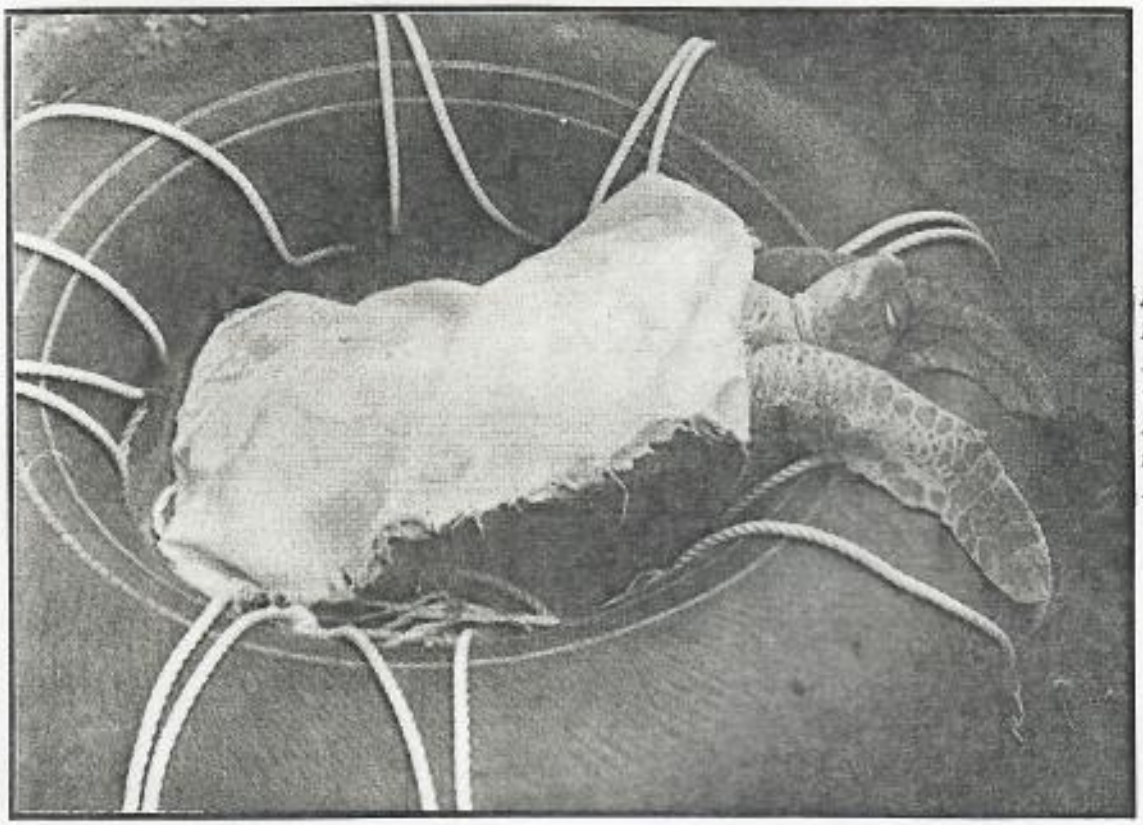
UH-Hilo MOP Coordinator and project supervisor, Walt Dudley explained the two-fold purpose of the project: NMFS receives data from the turtles, and MOP students learn about the sea turtles by participating in the methods that scientists use to study these reptiles.

Everyone camped out around the main pavillion of the county beach park for the duration of the project, which began Monday afternoon with the setting of the 60-feet long by 10-feet deep tangle nets used to snare the feeding sea turtles.

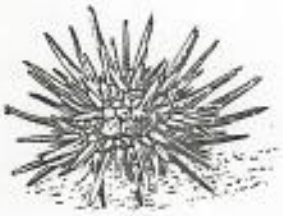
See page 3

Turtle Tagging

From page 1



A turtle caught in Punaluu in the evening rests on an inflated tire tube, and waits to be measured in the morning. -Photo by Raymond Boland.



Wetsuits were worn by practically all the snorkelers. Cool groundwater that seeps in abundance into the cove through the porous lava rock made the water temperature feel to some snorkelers more like that of an alpine lake than a tropical ocean.

It didn't take long to catch the first turtle: one snared itself in the net while the snorkelers were still trying to get it set. The turtle was hauled out and set on its back inside an inner tube to rest out the night. Being placed on its back overnight immobilizes the turtle, while doing it no harm, Forsyth explained. That is the way that all caught turtles are stored overnight; then in the morning all measurements and samples are taken together.

That evening, four-person teams working two-hour watches monitored the net's floats for any sign of snared turtles. Netted turtles could easily become exhausted and drown if not promptly removed from the net. During normal activity, turtles need to come up for air every few minutes.

The net yielded no more turtles that evening, and at 1 a.m. a few hardy MOPers ventured into the water with snorkels and dive lights to pin up the net to the floats, so that the net could remain set in the water. However, no more turtles would get caught while the crew slept.

The following morning students helped as Forsyth took several measurements of the turtle, tagged its two front flippers, and turned it back on its stomach. The newly released turtle wasted no time in finding its waay downhill and back into the water, where it proceeded to make itself scarce.

Tuesday afternoon, a local throw-net fisherman gave the tagging crew a small green sea turtle that he had cuaght in his net. No more turtles were netted that evening, even though it was decided to pull an all-night watch (to the surprise of a few unlucky souls who had gone to bed unaware that they were due for late-night wakeup call).

Wednesday morning, Hilo MOPer William Dana decided that the team hadn't tagged enough turtles, so he snorkeled out into the frigid cove and caught one with his bare hands. That gave Forsyth and the students two small turtles to measure and tag that morning.

See page 4

Turtle Tagging

From page 3.

Stomach samples were also taken of the two turtles. After some difficulty in getting the turtles to open their mouths, a rubber hose was inserted down their throats. Water was then flushed through the hose. As it washed back out their mouth, small pieces of limu came out with it. The sample was collected in a jar for later laboratory analysis. The newly tagged turtles were each then returned to the beach, where they swiftly splashed off, undoubtedly glad that their terrestrial ordeal was over.

Everyone stayed more than well-fed during the expedition, thanks to Kimber Alspach from Hilo MOP, who organized the whole project. Each of the students had their turn at kitchen duty for one meal. Some bemoaned the fact that this was the first camping trip that they had actually gained weight on.

Many students expressed that the most interesting part of the trip was meeting all the different MOPers from the various islands, who presented a wide assortment of personalities. Some enjoyed a trip to a large heiau located across the cove from the pavillion. Several felt they benefitted most from the hands-on participation in capturing, studying and releasing the sea turtles.

Following the return to Hilo, some visiting Manoa and Maui students stayed on to witness the creation of Big Island real estate when they ventured down the coast to Kalapana, where heavy ocean breakers were assaulting an active Kilauea lava flow.

Lara Asato, Tina Xavier, and Robert Forsyth (NMFS) after they have placed the turtle on its back in the inner tube. -Photo by Raymond Boland.

NMFS researcher and sea turtle specialist George Balazs normally heads such turtle tagging projects, but unfortunatley, circumstances prevented his attendance this year.

About 18 Hilo students participated in this year's turtle tagging project. Manoa MOP students in attendance were: Lara Asato, Dan Bauer, Ray Boland, Mary Roney, and Tina Xavier. The two MCC MOP students participating were: Robert Lohle and Heidi Tobias-Glover. The Manoa students recently held a MOP-in slide show about the expedition.

Left: MOP students detangle and lay out the net to be used to snare turtles. -Photo by Raymond Boland.

JUNE ? 1988
WEST HAWAII TODAY

SPORTS

SEA LOG

PETE HENDRICKS

Enjoy them... from a distance

We saw left handed Louie again a few days ago. I first met Louie in 1983 at the newly-opened Mauna Lani Resort. Louie had moved to the Makaiwa Bay area after losing his right arm in an unfortunate water accident.

Louie does a lot of swimming, so the loss of an arm meant a difficult rehabilitation. Getting used to swimming with just one front flipper is difficult at best when you are a green sea turtle, but Louie has made a remarkable adjustment.

The injury was most likely caused by a shark, probably a tiger, the main predator (besides humans) of sea turtles. Louie has obviously adjusted to his handicap and has since moved to a new home up the coast along the reef near Honokoa Gulch. If you see him, say hello for me.

Louie (or maybe it's Louise) is one of hundreds of green sea turtles (Chelonia mydas) which inhabit the main Hawaiian islands. Greens, named for the color of their body fat, are the most commonly sighted sea turtles in Hawaii.

Green turtles are actually olive brown on top of the shell and white-yellow underneath. They are herbivores like cows and horses, grazing on nearshore sea grasses (limu) although they have been known to accept fish.

Sea turtles are air-breathing reptiles and must come to the surface to breathe, although adults can stay underwater for hours and "sleep" on the bottom.

Resident turtles here swim to the Northwestern Hawaiian Islands to mate and breed, swimming more than a thousand miles of open ocean. Nestings on the main Hawaiian Islands beaches are almost none as the green sea turtle is very sensitive to nesting site disturbance, and humans also like beaches. Development of shoreline areas and ocean pollution also threaten sea turtle reproduction.

The entire Hawaiian sea turtle population is sustained by only about 750 adult females that only nest once every one to three years. Just the presence of man on and in the ocean has some effect on turtle population dynamics, but active harassment can contribute to the decline of this threatened species.

All sea turtles including (hawksbill, leatherback, and Ridley's in Hawaii) are protected by the Federal Endangered Species Act of 1973, and by Hawaii State Law.

Under these laws, it is illegal to "take" protected species, which means not only to kill but to harass, harm, pursue, hunt, etc. — which includes hitching a ride on the back of a turtle.

Turtles used to be a food source in old Hawaii, but stocks have been depleted enough in modern times to call for Federal and State protection. People are now encouraged to watch and enjoy turtles from a distance.

NEWSMAKER 6-17-88 H.SB A3

Studying turtles is his thing

Name: Dave Gulko
Age: 27
Position: Biology teacher, Hawaii Preparatory Academy
Education: UH-Manoa
Next project: Manta rays

Knowledge about threatened Hawaiian green sea turtles is growing because of an idea Big Island high school teacher Dave Gulko had last year.

In March, Gulko joined college students studying the turtles at Punaluu in Ka'u.

Study leader George Balazs of the National Marine Fisheries Service had known since 1973 about another turtle site at Kiholo in North Kona, but rarely had time to go there.

Gulko proposed leading teams of his Hawaii Preparatory Academy students to Kiholo, as Balazs leads college students to Punaluu.

The proposal was accepted both by Balazs and by Kiholo landowner Robert L. Hind Jr., who donated enough money for food and camping gear for groups of 15 to 20 students at a time.

Gulko led three three-day field trips in October, February and April.

The turtles were captured, usually with nets, by students working in two- to three-hour shifts during the night. During the day the turtles were tagged, studied and released.

Some of the Kiholo turtles captured by Balazs in prior years were found to be growing two to three times faster than their cousins at Punaluu.

Much remains to be learned, says Gulko. The turtles breed at French Frigate Shoals, 500 miles northwest of Honolulu, and have been much studied there.

But little is known of the major part of the turtles' lives after hatchlings leave the shoals and swim to the main Hawaiian Islands.

"How long does it take for the turtles to reach sexual maturity? What do they feed on? People have found a bunch killed by parasites. We took parasite samples to find out more," Gulko says.

Gulko's interest in marine biology started while he was a student at Castle High School when he joined a program called the Blue Water Marine Laboratory. He continued on for a degree in zoology at UH Manoa.

Gulko prepares much of his own teaching material because no one has written a text on Hawaiian marine biology since there are so few people teaching it.

"There's a whole other world in the ocean," he says. "It's something people should be learning about. It's part of their heritage."

Rod Thompson, Star-Bulletin

United States Department of the Interior
NATIONAL PARK SERVICE
HAWAII VOLCANOES NATIONAL PARK
P. O. BOX 52
HAWAII 96718-0052

IN REPLY REFER TO:

21 Sept. 88

967-8133 home-967-7416 959-7169
- MAPS
- greens
- Binocs
- camera/film
- Tide

N 1415

August 22, 1988

To: George Balazs, NOAA

From: Larry Katahira, Hawaii Volcanoes National Park

Subject: Monitor Endangered Hawksbill Turtles at HAVO

Hi George,

We are currently planning an overflight along the Park's coastline to identify potential breeding sites of the Hawksbill turtle. During the past 15 years there has been incidental observations by backcountry hikers of nesting sites, tracks and hatchlings but the Park has not yet developed a management plan for these endangered turtles.

We would like to invite you to assist in initiating this program by taking part in a helicopter overflight along the Park's coastline. We plan to conduct an early morning reconnaisance from the Park's southwestern boundary, Kuee, and follow the coastline easterly to Kalapana.

I've confirmed a helicopter flight for September 7 at 0630 hours. If possible, could you arrive the evening of September 6? We will provide dormitory space for you. Do you need transportation from the airport to the Park?

Enclosed is a new project statement on monitoring turtles which will be included in the Park's Resource Management Plan for fiscal year 1989.

We are looking forward in working with you. Please call me at 967-8133 (bus) or 967-7416 (res) if you have any questions.

Larry K.

HAVO-87 MONITOR ENDANGERED SEA TURTLES

Statement of the problem

The endangered hawksbill and green sea turtles occur along the Park's 21 miles of rugged coastline. Green sea turtles nest only in the Northwestern islands known as the Hawaiian Islands National Wildlife Refuge, but their feeding grounds extend along the main Hawaiian islands. Hawksbill turtles, on the other hand, nest on the main islands with confirmed sites only on Molokai and the Puna-Kau coast of the Big Island. Since 1978, there have been several incidental observations by hikers and employees of turtle nests, tracks, and hatchlings at Apua Point and Halape Beach. In August 1987, an employee at Halape found a dead hawksbill turtle carrying approximately 320 eggs. Noting the importance of the Park as a nesting area for the hawksbill turtle, Dr. George Balazs of the National Oceanic and Atmospheric Administration (NOAA), has supported the designation of "critical habitat" for Halape.

Due to competing management priorities, the Park has been unable to develop a management plan for the endangered green and hawksbill turtles. The only information received has been through incidental observations by hikers and employees. The Park must protect known and potential nesting sites, solve problems of predation by cats and mongooses, educate the public, and reduce recreational use conflicts such as impacts of camping sites, horses, gill net fishing, and disorientation of turtles by lights.

Alternative Actions and their Probable Impacts

1. No action. Continue at present levels without a monitoring program, and rely only on incidental sightings. This kind of information is not reliable and not proper management practice. Moreover, under the Endangered Species Act, the Park is required to carry out management programs which will ensure the protection and recovery of listed species.

2. Collaborate with NOAA personnel and develop a monitoring program for the green and hawksbill turtles. Gather information on nesting beaches, public use, and occurrence of predators which will enable the Park to develop a more enlightened protection and management program.

Recommended Course of Action

Select #2. This course of action is responsive to the Endangered Species Act.

Cost/Workload

$8,000 first year, .5 FTE
$10,000 second year ff, .5 FTE and support

Environmental Factors

The monitoring action proposed for this project is categorically excluded from further environmental documentation.

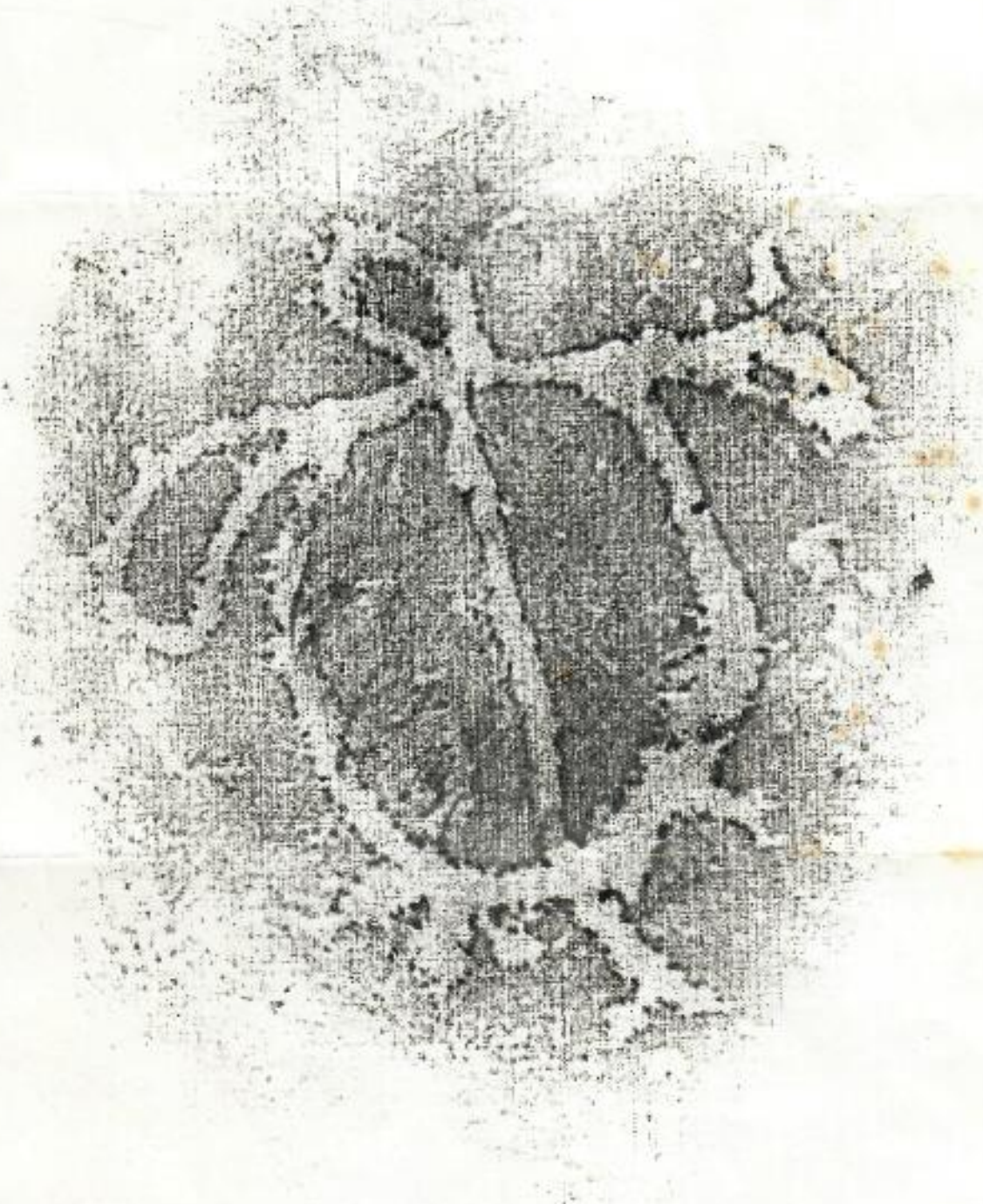
PUNALU'U –Kau District, Island of Hawaii

Punalu'u is the name of a bay with a beach which, viewed from the sea, would perhaps have appealed more than any other along this coast to Polynesian migrants from the south as a place for a landing and first settlement. It is deep and sheltered enough to be shielded somewhat from the prevailing winds, and it has a beach on which fishing canoes can comfortably land in normal weather. Chester Lyman, in 1846 found it "romantically situated on the beach, shut in in part by a rough lava stream." This bay is also the best in Ka'u for sheltering beached canoes. Now it is mounded quite high, and thrust back; formerly it was more extensive. But still it has survived the tidal waves which have swept other beaches away completely.

Punalu'u means "Diving spring," and takes its name from the fact that for their drinking water the natives had to dive (*lu'u*) down in the bay to an underwater spring (*puna*) some ways out from the shore. A man would take gourds out to the place and dive under. When he came to the fresh cold water near the bottom of the bay, he would unstop his containers, fill them, then surface and bring them to shore. In ancient times the Punalu'u people went to the springs at Ninole for their drinking water until the ogress Kaikapu settled there. Then they learned to dive for water in the bay. Some 50 yards in from the beach is a pond that now is stagnant, but formerly it was large and had ample fresh water from a deep spring named Ka-wai-hu-o-kauila. In the old days the spring was *kapu* and used only for drinking purposes.

A legend relates that there was a time when stormy weather prevented the men from diving for water. There were two supernatural turtles who had come out of the ocean to Punalu'u: Honu-po'o-kea (Turtle-with-white-head), the mother; and Honu-'ea (Turtle-with-reddish-brown-shell), the father. The mother gave birth to an object resembling a piece of *kauila* wood, which she buried in the sand to be hatched out by the sun. Then they dug into the earth and made a spring, then returned to the sea. When it was time for her "egg" to hatch, Honu-po'o-kea returned. When the thing she had laid did hatch it was a turtle the color of polished *kauila* wood. Mother and daughter lived in the spring until the baby turtle grew up. The young turtle was named Kauila. The spring came to be named "The-rising-water-of-Kauila." The turtle girl was able to assume human form and play with the young folk, but would become a turtle again when she went back into the spring. When bubbles came up in the spring, people knew the turtle girl was asleep in her home. Children used to catch fish and shrimps in the spring, and Kauila watched lest the little ones fall in. The people loved Kauila for this and because her spring gave them drinking water. They never used her water for any other purposes.

from Native Planters in Old Hawaii- Their Life, Lore, and Environment
by E.S.C. Handy and E.G. Handy, with the collaboration of Mary Kawena Pukui
Bernice P. Bishop Museum Bulletin 233 (1972)



GAIL Patterson 4/89

The Kona Earthquake of August 21, 1951, and Its Aftershocks[1]

GORDON A. MACDONALD and CHESTER K. WENTWORTH[2]

INTRODUCTION

AT THREE MINUTES before one o'clock on the morning of August 21, 1951, the southwestern part of the island of Hawaii was shaken by the strongest earthquake recorded there since 1868. The earthquake of August 21 was felt strongly all over the island of Hawaii, weakly on the island of Maui, and in Honolulu, 180 miles away from its origin. Extensive damage resulted in the central Kona district, and lesser damage extended all the way to Naalehu, about 38 miles from the epicenter. The major earthquake was followed by a large number of aftershocks which, although they did little damage, kept the populace of Kona uneasy for several weeks.

A detailed study of the earthquake was immediately undertaken by the staff of the Hawaiian Volcano Observatory. No sharp division of labors existed, but for the most part Macdonald was responsible for the general and instrumental phases of the investigation and Wentworth for the detailed studies of damage, such as that affecting water tanks, stone walls, and gravestones.

Acknowledgements: It is impossible to mention by name all the persons who aided the investigation by contributing observations on the earthquake itself and data on resulting damage. To all these we extend our sincere thanks. Special thanks are due Howard M. Tatsuno, seismograph operator at Konawaena High School near the epicentral area; Sister Mary Thecla, seismograph operator at St. Joseph's School in Hilo; Mrs. Alfred E. Hansen at Naalehu, Allan P. Johnston of Kapapala, and Nancy R. Wallace of Kealakekua, who contributed descriptive reports of many of the aftershocks. Roland E. White, of the Honolulu Magnetic Observatory, U. S. Coast and Geodetic Survey, kindly sent copies of the seismograms of the major earthquake as recorded at Barbers Point, on Oahu. Commander C. A. George, of the Coast and Geodetic Survey, supplied copies of the tide gauge records from Honolulu and Hilo harbors, showing the small tsunami that followed the earthquake. Many persons supplied information on damaged water tanks. Among these Mark Sutherland, Principal of Konawaena School, John Iwane, Extension Service, University of Hawaii, and Masuoka Nagai, of Captain Cook Coffee Company, were especially helpful.

NARRATIVE

Most residents of the island of Hawaii were in bed when the earthquake struck. Nearly everyone in the Kona and Kau districts was awakened, and most people rushed outdoors. Persons in the area near the epicenter reported that the initial movement was largely up and down, with some swaying in an east-west direction, increasing in intensity and giving way to what appeared to be a vortical motion. Noise during the earthquake was intense as doors and windows rattled,

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[2] Director and Geologist, respectively, Hawaiian Volcano Observatory, Hawaii National Park, Hawaii.

dishes and furniture toppled to the floor, water tanks collapsed, and rocks rolled down from stone walls and banks. A few persons who were awake at the time the earthquake occurred reported that the quake was immediately preceded by a dull roar seeming to come from the ground. Shaking is reported to have been nearly continuous for an hour or more after the major shock.

Macdonald was driving through Naalehu, 36 miles from the epicenter, when the earthquake occurred. The car swerved violently, as though it had struck a mudhole. Immediately afterward branches started to snap from trees overhead and fall on the pavement.

Within a matter of moments several houses, churches, and a school building were badly damaged, many other houses slightly damaged, about 200 water tanks destroyed, many miles of stone wall thrown down, roads partly blocked by rock slides, road pavement and shoulders badly cracked, cemeteries damaged, telephone communication and electric power supplies disrupted. Fortunately, only two persons were injured, and they not seriously.

Damage extended for more than 50 miles along the highway that encircles the island, from Holualoa on the north to Honuapo on the southeast. Damage was greatest along the 10-mile stretch from the village of Captain Cook to Hookena (Fig. 1), but as far away as Naalehu many dishes were thrown to the floor in homes, groceries and liquor bottles thrown from shelves in stores, and one house was shifted several inches on its foundations. A few objects were toppled from shelves, pavements were cracked, and numerous landslides started in the vicinity of Kilauea Caldera, 45 miles from the epicenter.

At Napoopoo the ocean was observed withdrawing from shore, and most of the inhabitants of the village were hurriedly evacuated to higher ground until the possibility of a destructive tsunami was past.

Two small fires broke out. One was at Kaimalino, 0.3 mile south of Kealia, where kerosene, spilled in a kerosene-powered refrigerator, caught fire. The other was in Naalehu, where the earthquake upset a kerosene lamp. Both fires were quickly extinguished.

Bright flashes of white light at the time of the major earthquake were reported by persons at Naalehu and Pahala. These persons believe the flashes were not the result of electrical short circuits. Peculiar lights have occasionally been reported during other strong earthquakes.

During the night of August 21–22 persons in the central Kona area reported a distinct odor of hydrogen sulfide, apparently occurring in intermittent waves. The source of this odor is not known. No increase of fuming was observed at the vents of the 1950 eruption on the southwest rift of Mauna Loa.

Aftershocks in great number followed the major earthquake. The seismograph at Konawaena School was badly damaged by the first quake, so the total number of aftershocks will never be known. However, Mrs. H. Masuhara, at Keei, counted 109 felt earthquakes between the principal shock and nine o'clock the next morning. The Konawaena seismograph was repaired and restored to operation at 15:15 on August 23. It recorded 90 earthquakes during the next 24 hours and 494 earthquakes up to midnight on August 31. Most of these, of course, were too small to be felt, even close to the epicenter. Strong aftershocks occurred at 01:28, 09:56, 10:12, 18:32, and 22:48 (Hawaiian Standard time) on August 21, and at 17:15 on August 22. Only slightly less strong were those at 02:14 and 06:28 on August 22. Because of continued earthquakes, graduation ceremonies at Konawaena School on August 22 were held outdoors instead of in the auditorium.

INSTRUMENTAL DATA

The major earthquake dismantled all seismographs on the island of Hawaii. All but the Bosch-Omori seismograph in the Whitney Laboratory on the northeast rim of Kilauea

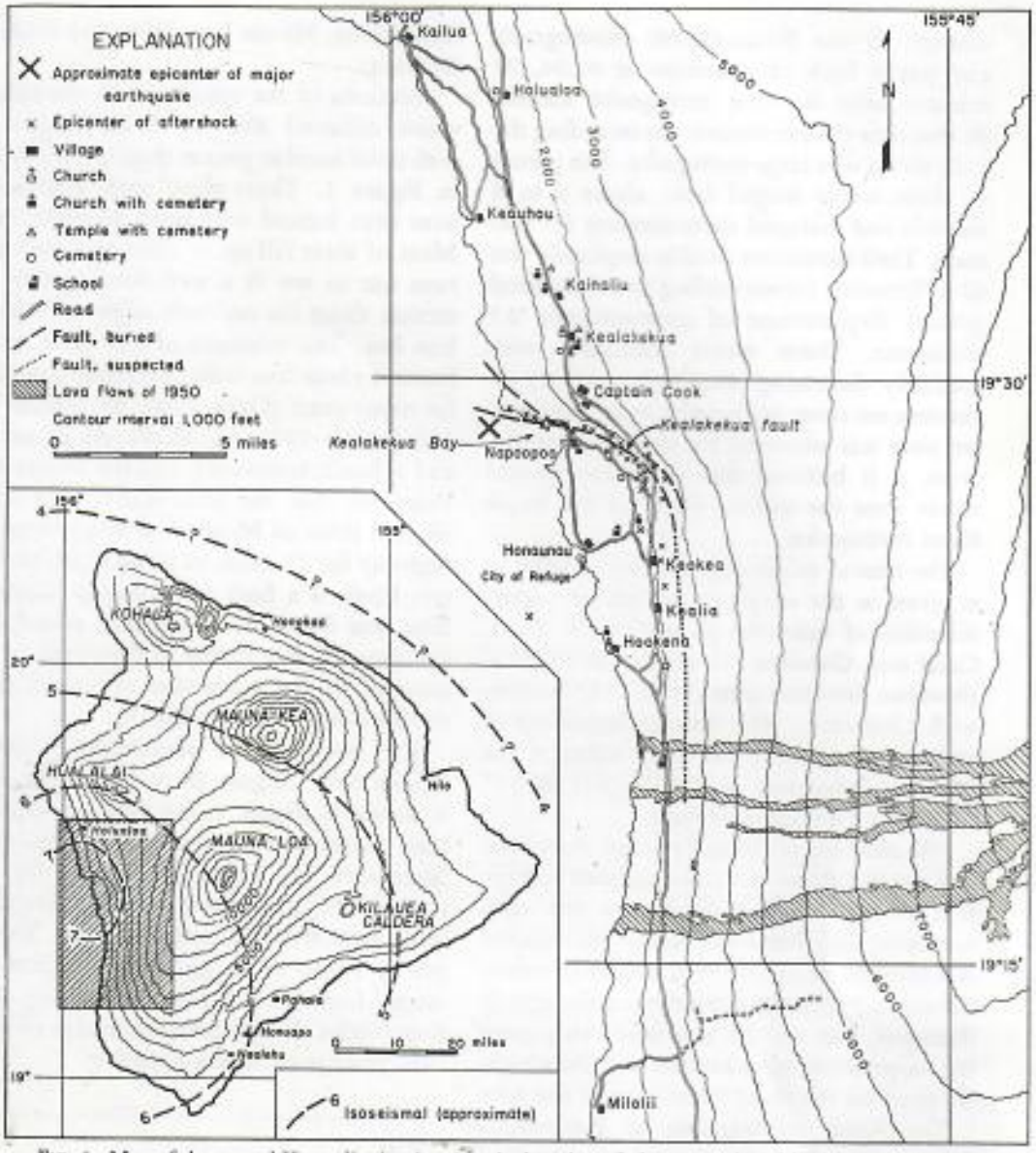

FIG. 1. Map of the central Kona district showing the location of places mentioned in the text and the approximate locations of the epicenters of the major earthquake of August 21, 1951, and of the aftershocks for which reasonably good locations were obtained. The inset map of the island of Hawaii shows the location of the area (shaded) covered by the other map and the approximate position of the isoseismal lines for the major earthquake.

Caldera were dismantled by the preliminary waves. Precise time control and, consequently, the precise time of arrival of the first waves are lacking on the Kona and Hilo instruments. As a result, instrumental data are inadequate for the close location of the focus of the earthquake. The duration of the preliminary waves on the north-south component of the Bosch-Omori instrument was 9.5 seconds, corresponding with a distance of approximately 47 miles from the Whitney Laboratory to the origin of the quake.

John C. Forbes, instrument maker at the Volcano Observatory, repaired the minor

damage to the Bosch-Omori seismograph and put it back in operation at 01:24, 27 minutes after the first earthquake started. At that time the instrument was recording the long waves of a large earthquake. The period of these waves ranged from about 6 to 8 seconds and averaged approximately 6.7 seconds. Their maximum double amplitude was 67 millimeters, corresponding to a theoretical ground displacement of approximately 0.5 millimeter. These waves continued with gradually decreasing amplitude until 03:20. Because no other earthquake at an appropriate time was observed by more distant stations, it is believed that these long-period waves were the surface waves of the major Kona earthquake.

The time of origin of the major earthquake is given in the notice of preliminary determination of epicenter issued by the U. S. Coast and Geodetic Survey as $00^h56^m57.5^s$ Hawaiian Standard time ($10^h56^m57.5^s$ Greenwich Civil time). The time of beginning of registration of the preliminary waves at the Whitney Laboratory at Kilauea was $00^h57^m09.5^s$ Hawaiian Standard time.

The direction of the first ground movement at Kilauea Caldera was east-southeast and up, that at the Mauna Loa station was east-northeast, and that at the Kealakekua station was east-northeast. At the Kealakekua station the north-south component was only slightly damaged, but on the east-west component the suspensions were broken and the weight dropped on the floor 2 feet west of the pier.

The Kona seismograph, at Konawaena School (Fig. 1), was restored to operation at 15:15 on August 23. Previous to that time, location of the points of origin of the aftershocks on an instrumental basis was uncertain because of the very short base of the triangle formed by the intersection of lines from the earthquake foci to the other stations. Earthquakes after that time are fairly well located because of the control given by the Kealakekua seismograph. Most of these were located by means of data from four stations: Kealakekua, Mauna Loa, Hilo, and Whitney (Kilauea).

Locations of the epicenters of aftershocks which occurred after 15:15 on August 23 with serial number greater than 190 are shown in Figure 1. Thirty-three such aftershocks have been located with small probable error. Most of them fall on or close to a fault that runs out to sea in a west-northwesterly direction along the northern edge of Kealakekua Bay. The existence of this fault, partly buried by later lava flows, has been recognized for many years (Dana, 1890: 30; Stearns and Macdonald, 1946: 37, pl. 1). At its eastern end it bends southward, and the writers have suspected that the abnormally steep lower western slope of Mauna Loa inland from the highway for 15 miles or more south of Captain Cook is a fault scarp deeply buried by later lava flows. An interesting partial confirmation of this theory is furnished by the location of the epicenters of several aftershocks along this line (Fig. 1).

The frequency of aftershocks decreased rapidly from August 23 to September 4. As is shown in Figure 2, the average frequency then decreased very slowly until the end of September. No figure is available for September 7 because of mechanical failure in the recorder at the Kealakekua station. The apparent depth of origin of the aftershocks ranged from 3 to 12 miles, most being about 6 or 7 miles. No progressive change of depth with passage of time is apparent.

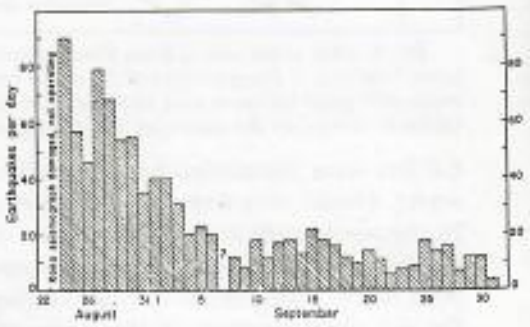

FIG. 2. Graph showing frequency of aftershocks to the end of September, 1951.

Altogether, from the time it was put back in operation until the end of August, the Kealakekua seismograph recorded 494 earthquakes, and until the end of September 965 earthquakes. Nearly all of these are regarded as aftershocks of the big earthquake of August 21. Most were too small and shallow-seated to be recorded at the other stations, hence their foci could not be closely located. It appears certain, however, that most originated along the Kealakekua fault at the northern edge of the Kealakekua embayment.

EFFECTS OF THE EARTHQUAKE

Description of Terrane

The epicentral area lies on the western slope of Mauna Loa, a few miles south of the surficial boundary between Mauna Loa and Hualalai Volcanoes. It is transversed from north to south at altitudes of 1,000 to 1,300 feet above sea level by the main highway, from which roads lead to the shore at Napoopoo, Honaunau, Hookena, and Milolii (Fig. 1). In the vicinity of the highway the average slope of the land surface is about 10 degrees, which is several degrees steeper than the average for Mauna Loa slopes in general. Above an altitude of 5,000 feet the average slope decreases to about 7 degrees. The steepness of the lower part of the slope is believed to result from an ancient fault scarp deeply buried by more recent lava flows.

In the area within 6 miles south of Napoopoo the steep zone is narrower and more sharply defined than farther south, and west of it the slope again flattens toward the sea. Three miles east-southeast of Napoopoo the steep zone turns sharply northwestward and becomes even steeper, taking on the unmistakable characteristics of a fault scarp mantled by more recent lava flows. This scarp forms the northern boundary of Kealakekua Bay, and there the older lava beds in the scarp are not mantled by later flows.

The steep seaward slope results in a distinct asymmetry of the terrane, which asymmetry of necessity extends to nearly all structures on the terrane. Buildings rest on foundations that are high on one side and low on the other. Roads in many places rest on a cut on one side and fill on the other, or on a fill which is shallow on one side and deep on the other. Stone walls parallel to the coast have one sloping side shorter than the other. All of this results in a lesser degree of stability than in structures built on level terranes, and in a favored direction of unstability. Partly because of the higher foundations and deeper fills on the seaward side and partly because of the continuous effect of gravity, structures tended to move downhill during the earthquake regardless of the direction of the actual shaking. This effect must be considered in using the direction of displacement of objects as a means of locating the epicenter.

Rock Slides

Many small rock slides in highway cuts were caused by the earthquake. Most of them came from cuts on the inland side of the highway, probably largely because the cuts were higher on that side. Most of the slides were small, bringing down blocks less than 2 feet across. These caused little damage and were easily removed. A few larger slides brought down large blocks weighing several tons, the removal of which required the use of bulldozers or other heavy equipment. The large slide farthest from the epicenter occurred at a high roadcut just west of Honuapo, 40 miles from the epicenter. Small slides and rock falls in road cuts extended all the way to Kilauea Caldera, 44 miles from the epicenter. Many small rock avalanches took place in Halemaumau Crater during and for several days after the earthquake.

A large part of the damage to road cuts did not, strictly speaking, result from sliding of the materials. Most of it was merely a fraying of the banks by the rolling down of loose or semiloose material. Few of the highway cuts exceeded 5 feet in height, and few

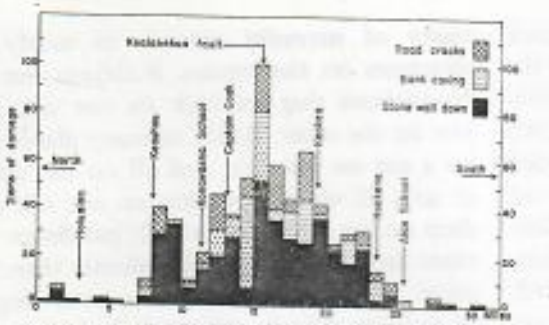

FIG. 3. Diagram showing the frequency distribution of three of the principal types of earthquake damage along the main highway. The arrows indicate the position on the highway of some villages and other features. Note the centering of damage close to the Kealakekua fault.

were dressed back to any approximation to an equilibrium slope. The earthquake of August 21 greatly exceeded in size any previous quake in the affected area since the road cuts were made, and shaking during the earthquake merely dislodged much of the loose material and allowed it to roll down onto the road.

The distribution of abundance of rock slides in road cuts is shown in Figure 3, in which it is represented by the portion of the columns labeled "bank caving." Like the other damage shown in the graph, it was greatest in the immediate vicinity of the Kealakekua fault, inland from and a little south of Kealakekua Bay.

Many large slides took place on the fault scarp at the northern edge of Kealakekua Bay. The slides caused a disturbance of the water of the bay just after the earthquake, and many residents of the coastal village of Napoopoo fled inland, fearing a big tsunami. Slides continued on the Kealakekua cliff for several days after the earthquake, sending up clouds of yellowish-brown dust, leaving fresh scars on the cliff face, and building talus fans at the foot of the cliff.

Less numerous and smaller slides also occurred along the cliff just inland from the village of Hookena Beach. The cliff at Hookena is believed to be an ancient fault scarp, mantled by lava flows from the upper slopes of Mauna Loa during prehistoric times. Many fragments of the lava veneer were shaken down during the earthquake.

Tsunami

Despite early reports to the contrary, there is no doubt that the earthquake was accompanied by a small tsunami, or "tidal wave." At Napoopoo wharf the water was observed to withdraw from shore. The tide was low at the time. Withdrawal of the water lowered the level to about 4 feet below normal low-tide level. Immediately afterward the water returned shoreward, and the level rose about 2 feet above low-tide level.

At Milolii, Eugene Kaupiko reported that a few minutes after the earthquake, which he felt while in a canoe anchored offshore, the water receded from shore, revealing the sea bottom as far out as the edge of the wharf. This represents a lowering of the water level of about 3 feet. After the withdrawal the water returned shoreward, causing a rise of the water level 3 or 4 feet above normal low water and floating away a canoe that had been drawn up on the beach about 2.5 feet above high-tide level. One large fall and rise of the water level appears to have been followed by many small oscillations.

At Honaunau, between Napoopoo and Milolii, Eli Cooper, caretaker of the City of Refuge, went down to the water's edge a few minutes after the earthquake. At that time he could see no signs of disturbance of the water, but a small tsunami could have occurred between the time of the earthquake and his arrival at the strand. At Hookena no tsunami was observed, and there was none large enough to flood the floor of the dock, about 4 feet above normal water level. However, it cannot be said definitely that no small tsunami occurred there.

The Honolulu tide gauge record shows a distinct oscillatory disturbance of the water starting at approximately 01:35, about 38 minutes after the earthquake. Seven or more oscillations are detectable, with an average

period of about 14 minutes, reaching an amplitude from crest to trough of 3.6 inches. This undoubtedly is the record of a seiche set up in Honolulu harbor by the tsunami. Using the time of beginning of the disturbance at Honolulu as that of arrival of the tsunami, the average speed of travel of the tsunami from the epicenter to Honolulu was approximately 284 miles an hour. The time of beginning of the disturbance at Honolulu corresponds well with the calculated theoretical arrival time of a tsunami caused by the Kona earthquake, so there can be little doubt the disturbance was of that origin. A similar disturbance is shown on the record of the Hilo tide gauge. The time of beginning of the disturbance at Hilo is less definite, but appears to have been about 02:38. This corresponds with a much slower average speed of travel of the tsunami, of about 78 miles an hour, as the waves were refracted around the island in comparatively shallow water.

Damage to Buildings

Shortly after the earthquake the Kona police estimated that about 200 houses in the area had suffered some degree of damage. Most houses in the area near the epicenter are of frame construction, set on knee-braced timber underpinning. Such supports proved capable of undergoing the shaking and distortion caused by the earthquake without serious damage. Most of the damage was minor and quickly repaired. Some houses shifted from a fraction of an inch to 3 or 4 inches on their foundations. Many were sufficiently twisted out of line to make it difficult or impossible to close windows and doors. In nearly all houses dishes and other objects were thrown from shelves. Only the more seriously damaged structures are enumerated here.

At Kaimalino, 0.3 mile south of Kealia (Fig. 1), a shop building collapsed. This building was placed on timber supports level with the highway in front but 6 feet above ground level in back, without adequate cross bracing.

FIG. 4. Overthrown shop building at Kaimalino, from the south.

Failure of the underpinning allowed the building to tilt backward and slump to the ground (Fig. 4). A similar situation was found at Keokea, 1.2 miles north of Kealia, where a service station building slumped downhill away from the highway and partly collapsed.

In the Kahauloa area, about 1.7 miles east of Napoopoo village, the walls of a store partly collapsed as a result of distortion of the building caused by shifting on its foundation. The warehouse of another store was badly damaged.

At Hookena Beach two old frame houses were destroyed. One, which had been occupied briefly in 1889 by Robert Louis Stevenson, fell when its timber underpinning failed, and collapsed. The other also was dropped onto the ground by collapse of its underpinning. It appears to have fallen almost straight downward. The building was somewhat twisted, but not otherwise seriously damaged. At Kealia and at Kiilae, about 0.4 mile south of Kealia, two other frame houses were badly damaged by collapse of their timber underpinning. All of these cases of collapse of frame houses appear to have been caused by inadequate bracing or poor materials in the underpinning, in some instances probably aggravated by insecure footings.

The cases of structural damage most distant from the epicenter occurred at Naalehu, 36 miles southeast of Napoopoo, where wallboard in a restaurant was cracked, and one

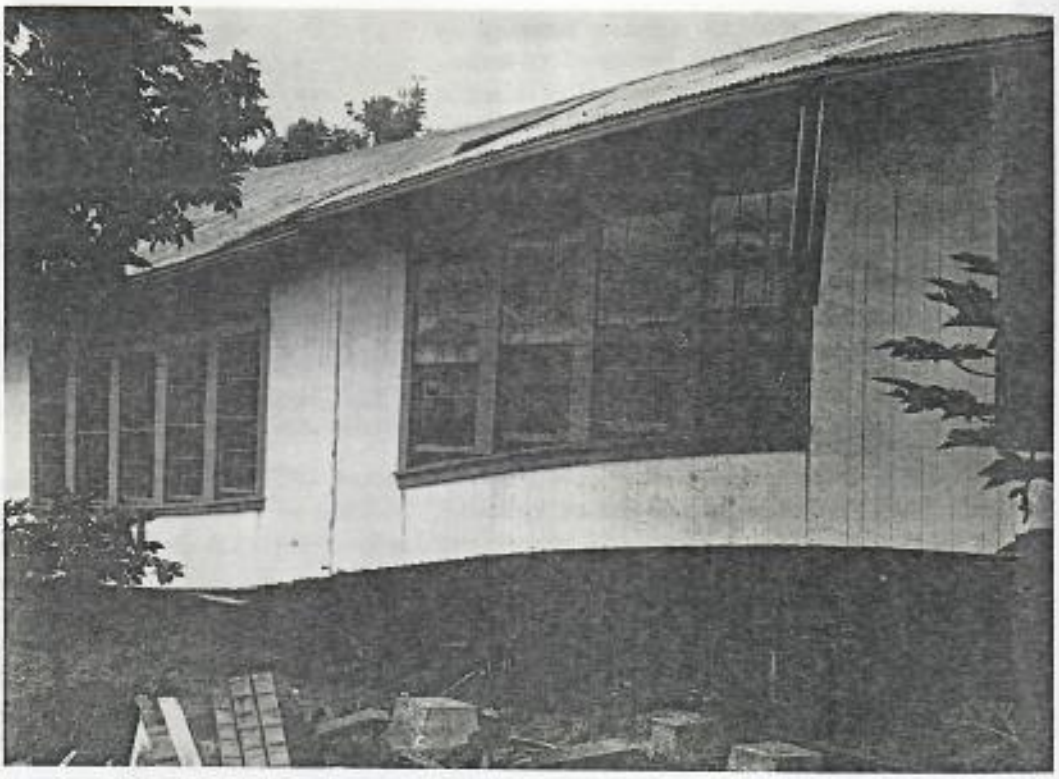

FIG. 5. Central portion of Honaunau School, from the southwest. All but the south end of this building was let down and moved westward owing to inadequate bracing of the underpinning in an east-west direction transverse to the longer dimension of the building.

house was moved several inches on its foundation.

A striking example of the effect of poorly designed underpinning is furnished by the Honaunau School. This was a long, narrow frame building placed with its length parallel to the contour of the ground surface. The front of the building was about 3 feet and the back about 10 feet above ground level. It was supported on timber posts. The posts and knee bracing parallel to the length of the building were entirely adequate, but there was comparatively little bracing parallel to the shorter direction of the building, and some of this was fastened not to joists but to floor boards. As a result, the underpinning was deficient in stiffness in the direction parallel to the ground slope. The direction of shaking during the earthquake was nearly parallel to this direction of weakness in the structure, and the swaying of the structure caused the underpinning to fail in part and to allow the building to slump downhill onto the ground (Fig. 5). The building is considered a total loss.

There were several church buildings with masonry walls in the area near the epicenter. Most of these suffered some damage, and some were very seriously damaged. The masonry consists of fragments of lava rock laid with a mortar made by calcining coral limestone. In some there was very little mortar in the inside parts of the wall. Most of the buildings were more than 95 years old.

The Central Kona Church at Kealakekua suffered cracking of the interior plaster on the east and west walls, but the masonry showed little or no cracking. At the back of the church is a small lean-to addition, the roof of which is supported by beams with

one end set into niches in the wall of the main building. During the earthquake there was enough differential movement of the two portions of the building to pull the beams out of their supporting niches and allow the roof of the addition to drop a few inches. At the front of the church is a tower covered with exterior plaster. The tower and main church building are essentially separate structures and appear to have moved independently during the earthquake. The plaster of the tower was badly cracked.

St. Paul's Church at Honalo, 1.9 miles north of Kealakekua, suffered severe cracking of the masonry in both the main building and the rectory. Kahikolu Church, at Napoopoo, suffered surprisingly little damage. The lintels and interior plaster showed some cracking, but the masonry was unharmed.

The Protestant church at Hookena Beach was badly damaged. The building consisted of masonry walls and a sheet-iron roof, supported on heavy handhewn beams which in turn were supported by east-west beams resting in niches on the upper edge of the front and back walls. During the earthquake nearly the whole front (west) wall was thrown out, some debris being as much as 25 feet from the building (Fig. 6). The other walls were not appreciably damaged, even the interior plaster being almost uncracked. It appears possible that during the quake the roof may have tended to move as a separate unit from the rest of the structure and, by its tendency to lag behind during the initial violent eastward movement of the ground, may have pushed out the front wall.

FIG. 6. West end of Pukaana Church at Hookena Beach showing complete demolition of masonry wall of this 100-year-old structure. Much of the debris was cleared away soon after the earthquake. No nearly comparable damage to this building is known to have taken place during the century since it was built.

FIG. 7. Catholic Church 0.6 mile north of Hookena Beach, from the northwest. The east end of this church was similarly thrown down and outward, to the east. The near corner and the corresponding corner of the small building, already without a roof, suggest displacement most markedly to the northwest, in the general direction of the epicenter.

Similarly, a small stone building nearby, which had long been without a roof as is shown by trees growing within the walls, had both its end walls thrown outward, to west and east, while the side walls remain standing though somewhat cracked.

The Catholic church 0.6 mile north of Hookena Beach was very heavily damaged. The upper portions of both the east and west walls were thrown down (Fig. 7), and the interior plaster on all walls was badly cracked. However, the walls were built merely of loose stones laid together without mortar between them except close to the faces, where the interior and exterior plaster had penetrated a short distance. Considering the type of

construction, probably the most surprising feature is that the building had not collapsed previously in one of the strong earthquakes which occur in Kona every few years.

The lessons to be learned from the structural damage caused by the earthquake are those which have been taught by many strong earthquakes elsewhere. A large proportion of the damage results from poor construction or from poor or inappropriate materials. Unreinforced masonry structures are inadvisable in any area subject to strong earthquakes. Footings should be firm, and construction materials, particularly the underpinning, should be sound. Cross bracing, particularly of underpinning, should be adequate in all directions. The best insurance against earthquake damage is good construction.

Damage to Water Tanks

Practically all dwellings in the Kona area are equipped with water tanks for storage of rain caught on the roof. Nearly all these tanks were of wooden stave construction. A large number of these round, tub-type tanks were destroyed or damaged by the earthquake.

The few metal and masonry tanks were undamaged. Because of their importance, not only in Kona but in many Hawaiian communities, a special study of damage to these tanks has been undertaken. The results will be published elsewhere. Only a brief summary is given here.

Altogether, approximately 200 tanks of a total of more than 1,000 in the heavily shaken area were damaged or destroyed by the earthquake. Tank damage extended from Keauhou on the north to Milolii on the south and was most severe in the area from Captain Cook to Hookena. Tanks showed all degrees of failure, from the development of slight leaks to complete collapse. A few tanks may, at least in part, have been pushed over by neighboring structures. Thus, the tank at the southern end of the Honaunau School building (Fig. 8) may have been partly pushed westward by the collapse of the adjacent

FIG. 8. Demolished tank west of the south end of Honaunau School, footings on which the tank formerly stood, and part of the school building, from the southwest.

building, to which it was connected by a rigid wooden down-spout. However, most of the damaged tanks appear to have failed because of their own behavior during the earthquake. The commonest features contributing to tank failure appear to have been poor footings and inadequate cross bracing of the underpinning.

Damage to Stone Walls

The loose stone walls characteristic of the Kona area were extensively damaged by the earthquake. The principal damage was in the area between Keauhou, 3.5 miles north of Kealakekua, and Pahoehoe, 3 miles south of Hookena (Fig. 1). However, isolated instances of wall derangement were observed as far north as Honokahau, 16 miles north of the epicentral area, and Naalehu, 36 miles southeast. The distribution of damage to walls is shown graphically in Figure 3. Many miles of wall required rebuilding. Since the cost of contract rebuilding is approximately a dollar a yard, the total monetary loss from the destruction of walls is considerable.

Most of the stone walls in the area consist of irregular fragments of clinkery aa lava less than a foot across. A few walls have bases of blocks a foot or more long reaching half-

way or more through the wall, and, especially in the older walls, occasional slabs are laid partly or entirely through the wall to help tie it together. Because of the rough, irregular surfaces of the fragments it is possible to build them into a nearly vertical wall 3 or 4 feet high and only about 30 inches thick at the base. Such walls stand well under ordinary conditions, but, because of the shortness of the bonding surfaces of adjacent blocks, they are rather unstable under any joggling, such as by earthquakes. The earthquake of August 21 caused extensive shaking down of the walls. The commonest type of damage was a slumping of the upper part of the downslope face of the wall, the fragments rolling down and out a short distance from the base of the wall. Such damage was especially common on the north-south trending walls and at high places on the walls. In a few instances, walls on nearly level ground were dislodged almost equally in both directions, but the failure was preponderantly on the west side of the walls, and the material from the walls was displaced westward.

Some of the westward displacement of material probably resulted from the tendency of the loose material composing the wall to lag behind during the initial strong eastward movement of the ground. However, a large proportion, perhaps most, of the failures of the walls on their west side undoubtedly resulted from the fact that, because of the general westward slope of the ground, the west side of the wall was higher and usually steeper than the east side, and there was a tendency for materials to shift downslope under the influence of gravity.

Well-built walls were surprisingly resistant to earthquake damage. Thus, the wall along the landward side of the highway from Honaunau to Napoopoo, built of carefully placed rectangular blocks of lava, was almost wholly undamaged despite its location very close to the epicenter. Likewise, in other parts of the epicentral area, older walls in which slabs extending through a large portion of the wall had been used to tie the wall together showed comparatively little damage.

At the ancient City of Refuge at Honaunau, about 20 feet of the seaward side of the main outer wall of the enclosure collapsed. It is interesting to note that damage was restricted to a reconstructed portion of the wall, whereas the remaining portions of the original enclosure wall and the walls of the heiau platforms were undamaged. Homer Hayes, a close student of the City of Refuge, has made the highly plausible suggestion that the peculiar construction of the ancient walls, in which occasional broad slabs extend entirely or largely through the wall and sometimes bridge open spaces beneath, is responsible for the greater resistance to earthquakes of the old portions of the wall.

Damage to Roads

Damage to paved roads was of three general sorts: (1) cracking of pavement, (2) cracking and slumping of shoulders and separation of shoulders from pavement, and (3) collapse of road cuts, causing partial obstruction of the road. The latter has already been discussed under the heading "Rock Slides." Minor cracking of shoulders occurred over an area extending about 10 miles north and 12 miles south of the approximate epicenter, and a few cracks were formed as far away as the northeast side of Kilauea Caldera, 47 miles from the epicenter. However, extensive pavement cracking and slumping were restricted to the area between Captain Cook and Hookena. The distribution of cracks in the road is shown in Figure 3.

Observed cracking or slumping of the pavement or shoulders was entirely restricted to portions of the road on fills. In building the road, some gullies were crossed by laying in a rock fill having a batter, or departure from vertical, of less than 1 in 4, filling with fine material, and laying asphalt pavement across the top. Such fills were insufficiently stable to withstand the shaking of a strong earthquake, and in several places the down-

FIG. 9. Crack along roadside south of Kealakekua, from the south, showing separation of embankment from edge of pavement due to slumping.

slope face of the fill was dislodged, allowing the material of the road bed to settle, cracking the pavement. In other places the fill appears to have settled a little merely by compaction during the jostling by the earthquake, causing cracks in the pavement.

A common occurrence was the formation of a crack parallel to the edge of the pavement on its downslope side, either within the pavement a few inches from its edge or between it and the shoulder (Fig. 9). Some of these were as much as 75 feet long and 8 inches wide. This appears to have resulted from a downslope lurching of the shoulder, moving as a separate unit from the portion of the fill beneath the pavement. The independence of movement of the shoulder and pavement was interestingly shown along the highway about 2 miles southeast of Captain Cook, where soil and sod on the shoulder were overthrust as much as an inch onto the pavement.

Damage in Cemeteries

Many headstones in cemeteries in the area near the epicenter were deranged by the earthquake. As a part of the general earthquake investigation, these cemeteries were examined, and a rough statistical study of the damage was made. Unfortunately, owing to shortage of personnel and pressure of other duties, we were delayed several days in making the cemetery examinations, and some restoration of headstones had already taken place in some cemeteries before we visited them. However, in most cemeteries little restoration had been done, and the damage remaining was probably a representative sample of the original damage. It is believed that practically all stones which had been dislodged could be detected, even after they had been replaced, by breaks or scratches on the stone or disturbance of the cement bond at the base of the stone.

There are more than 50 cemeteries in the area, but most are small family or church plots with few graves and have not been used in recent times. In some places burial was in vaults without headstones or with headstones or markers firmly cemented in place and not readily susceptible to damage by an earthquake of the intensity of the one under study. Most of the valuable information came from a few of the larger cemeteries. Damage at these is summarized in the accompanying table, and their locations are shown in Figure 1.

Derangement of headstones included overturning of stones and shifting of stones on their bases with or without rotation. In addition many grave caps were broken, some by falling or disturbance of headstones and some by lurching or slumping of the adjacent subsoil. The latter type of damage was particularly prevalent on steep slopes, where the subsoil is thick and loose. Damage of all sorts was restricted to the area between Honalo and Honokua, 5 miles northeast and 10.5 miles south-southeast, respectively, of the probable position of the epicenter.

In cemeteries north of Keauhou no damage or derangement was noted. Two miles south of Keauhou, at Lanakila cemetery in Lehuula, 4 of the 15 headstones were dislodged to the west. Inland and slightly northward, at the Daifukuji Mission in Honalo, about 5 miles

FIG. 10. Gravestone rotated counterclockwise, in Daifukuji cemetery, Kainaliu, looking approximately northwest.

north of Napoopoo, of an estimated total of 150 grave markers, 6 toppled west, 7 north, 2 east, and none south. Six had been shifted north, 16 were twisted counterclockwise, and 2 clockwise; 8 grave caps were broken (Fig. 10). It was reported that many more had been disturbed but had been restored.

At Hongwanji Mission, Kealakekua, with more than 600 graves, 12 headstones were overthrown to the west, 9 to the east, and none to the north or south. Thirty-four were twisted clockwise, 11 counterclockwise, one each shifted north, west, and south; 22 grave caps were broken.

At the Central Kona Church cemetery at Kealakekua, 12 headstones and one large memorial monument were overturned westward and one stone eastward. Another stone was rotated counterclockwise. In the Episcopal cemetery, just across the highway, five headstones were overturned westward, one was rotated counterclockwise, and one clockwise.

At Kahikolu Church, about 0.5 mile south of the Kealakekua fault line, of a total of 10 headstones, 2 were overturned to the west and one was twisted clockwise. Two miles farther inland but only about 0.6 mile south of the fault line is another cemetery of the Hongwanji Mission. Here, of more than 200 headstones, 29 were still down on September 7, the majority having been dislodged to the west, and 10 or more had been replaced. Thirteen had been twisted clockwise and 4 counterclockwise; 24 grave caps were broken. There was much damage to caps and markers in the lower section of the cemetery where the ground is composed of rocky talus.

At St. Benedict Church, 1.5 miles farther south, there is a cemetery with approximately 100 markers. Nearly half of these are wooden crosses, which were not deranged. Several others are light concrete crosses with wire reinforcing. Some of these were broken at the shank so as to expose the wires one or two of which were the sole remaining support. Of about 20 vertical headstones, 11 were displaced or broken.

The most complete derangement of gravestones was found in the Kalahiki Japanese cemetery, a small hillside cemetery 3.8 miles south of Kealia, where only 2 of 30 markers were found in position 5 days after the earthquake (Fig. 11). The dislodgement was chiefly to the southwest and, to a lesser extent, to the northeast. Ten were shifted to the north without being thrown down. Seven, including some of these 10, were rotated clockwise and one counterclockwise. Here, on loose, steeply sloping ground, a large proportion of the grave caps were broken, owing to poor design and to construction on the newly heaped grave mound. This cemetery is about 11 miles south of the probable epicenter. South of this point no cemeteries with headstones susceptible to overturning or rotation were found.

The prevailing east-west azimuth of fall of gravestones throughout the area is probably largely the result of the prevailing westward slope. The orientation of most cemeteries is governed by the general north-south alignment of the principal roads, and, in turn, most gravestones face the west or east and have

TABLE 1
SUMMARY OF DAMAGE IN CEMETERIES IN AREA EXAMINED

NAME	LOCATION	DISTANCE AND DIRECTION FROM NAPOOPOO	APPROXIMATE NUMBER OF HEADSTONES	HEADSTONES OVERTURNED						HEADSTONES ROTATED	
				NUMBER	PER CENT	APPROXIMATE DIRECTION				CLOCKWISE	COUNTER-CLOCKWISE
						N	E	S	W		
		miles									
Holualoa Japanese	Holualoa	10 N	300	0	0	0	0	0	0	0	3
Daifukuji	Honalo	5 N	150	15	10	7	2	0	6	2	15
Lanakila Church	Kainaliu	4.5 N	12	4	33	0	0	0	4	0	0
Hongwanji Mission	Kealakekua	3 N	600	21	3.5	0	9	0	12	33	10
Central Kona Church	Kealakekua	2.5 N	30	12	40	1	0	0	11	0	1
Christ Church	Kealakekua	2.5 N	60	8	13	0	3	0	5	1	1
Kahikolu Church	Napoopoo	0.5 S	10	2	20	0	1	0	1	1	0
Hongwanji Mission	Keei	1.5 SE	200	40	20	3	22	1	14	13	4
St. Benedict Church	Honaunau	3.5 SE	100	11	11	0	0	0	11	0	0
Japanese	Kalahiki	7.5 S	31	20	64	1	6	1	12	14	1

FIG. 11. Broken bases, displaced base stones, and overturned headstones in Kalahiki Japanese cemetery, south of Kealia, looking southeast. Partly because of unstable hillside ground and partly because of proximity to the epicenter, damage in this cemetery was widespread and severe; scarcely a grave escaped marked derangement.

the long dimension of their base oriented north-south. Therefore, the stones rock in an east-west direction much more easily than in any other, and, consequently, the most likely azimuth of fall is east-west. Furthermore, under sustained shaking, there is a tendency for all loose objects, including the soil cover, to work downslope to the west under the influence of gravity.

Rotation of Columns

Imamura (1937: 96) has shown that the direction of rotation of short rectangular columns, such as many headstones are, can be useful in determining the direction of motion during an earthquake and, consequently, the approximate azimuth of the line toward the epicenter. If the earthquake motion is parallel to the sides or to the diagonal (A—B, inset, Fig. 12) of the column, rotation probably will not occur. However, if the earthquake motion is in some intermediate direction, such as E—E′ in Figure 12, a rocking of the column will be accompanied by a rotational tendency. A ground motion in the direction E′ will cause the column to rock on the corner B. At the same time, the resultant of the force E′ in the direction CD will tend to rotate the column about the corner B in a counterclockwise direction. Similarly, a motion in the direction E will tend to cause a counterclockwise rotation about corner A. Directions of earthquake motion lying in the unshaded octants of the diagram tend to cause counterclockwise rotation of the column, and directions of motion in the shaded octants tend to cause clockwise rotation.

However, this law of rotation can be, and commonly is, upset by other conditions. Inhomogeneity of the terrane may cause the principal motion to be, locally, in a direction other than the azimuth pointing directly to the epicenter. Also, excentric irregularities in the bottom of the monument or its underlying base, or in the adhesion between the monument and its base, may result in rotation around those irregularities independent of the rotation described above.

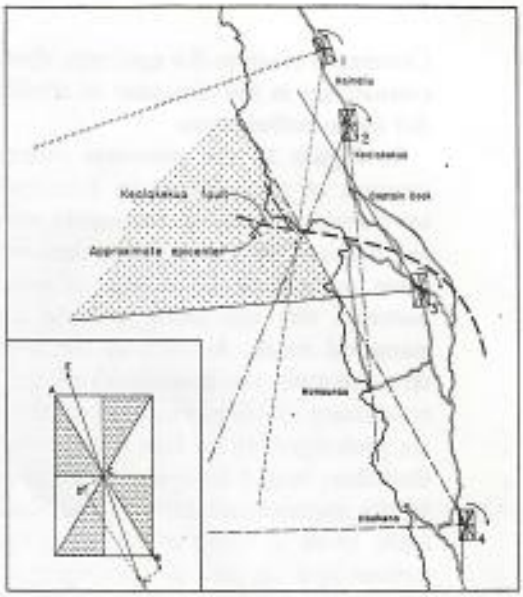

FIG. 12. Map of the central Kona area, showing the prevalent direction of rotation of monuments in cemeteries. The cemeteries are: 1, Daifukuji, Honalo; 2, Hongwanji Mission, Kealakekua; 3, Hongwanji Mission, Keei; 4, Kalahiki Japanese. At each cemetery the arrow indicates the prevalent direction of rotation. The boundaries of the octants containing the direction toward the epicenter are prolonged. The stippled area west of Captain Cook is that in which three or more of the octants overlap. The inset in the lower left is a diagram (after Imamura, 1937) of a horizontal cross section of a rectangular column, indicating the manner in which horizontal earthquake motion E—E′ causes rotation of the column.

During this study it soon became evident that, to be of value, the direction of rotation must be considered on a statistical basis. Thus, two columns only 10 feet apart in the Christ Church cemetery at Kealakekua were rotated approximately equal amounts in opposite directions. However, by using the prevailing direction of rotation of a number of columns in a single area, more useful results were obtained. The average direction of rotation of monuments in each of six cemetery areas from 5 miles north to 10 miles south of Napoopoo were all consistent with an origin of the earthquake on or near the Kealakekua fault from 2.5 to 5 miles west of Napoopoo.

Cemeteries close to the epicenter showed less consistency in the direction of rotation than did those farther away.

In Figure 12 the prevalent directions of rotation of monuments in four cemeteries are shown. Four other cemeteries were omitted because no monuments were rotated in them, or because the number of rotated monuments was too small to yield a reliable statistical result. At each of the four cemeteries plotted, the boundaries of the octants containing the direction toward the epicenter are prolonged. In an area largely west of the shoreline, from 2 miles south to 2 miles north of the approximate trace of the Kealakekua fault, three or more of the four significant octants overlap, and it is within this area of overlap that the epicenter should be situated.

LOCATION OF THE EPICENTER

Because of the dismantling of all but one of the seismographs on the island of Hawaii during the preliminary phase of the earthquake, it is not possible to locate the origin or epicenter instrumentally. The only instrumental datum available is the S—P interval of 9.5 seconds given by the Bosch-Omori seismograph at the northeast rim of Kilauea Caldera (Fig. 13). Using the travel times given by Byerly (1942: 210), this gives a distance of origin of the earthquake of approximately 47 miles from the Bosch-Omori instrument. These curves were derived for sedimentary and granitic rocks but, over a period of several years of use at the Volcano Observatory, have yielded more satisfactory and reasonable earthquake locations than any others. The use of Jones's (1935: 50) curve for duration of the preliminary waves (T*) increases the distance to only 49 miles. Taking into consideration the area of greatest intensity of the earthquake, these distances place the origin of the quake 3 to 5 miles west of the coastline in the vicinity of Napoopoo. The depth of origin appears probably to have been between 5 and 10 miles.

Some information bearing on the location of the epicenter can be derived from the study of damage by the earthquake. The general distribution of damage to roads, stone walls, and road cuts along the main highway is shown in Figure 3. This is based on a count checked against odometer mileage, assigning one unit of damage for each 1 to 15 feet of collapsed wall or road cut. Despite irregularities, the graph shows a distinctly symmetrical, bell-shaped distribution curve, with its peak about 2.5 miles by road southeast of Captain Cook. An average of more than 60 items of damage per mile in the central 5 miles decreases to only one or two per mile more than 9 miles from the center. This point of maximum damage coincides closely with the position of the buried inland extension of the Kealakekua fault. Other types of damage also were most abundant in the same general area. Together with the fact that most of the aftershocks, located by instrumental means, originated on the Kealakekua fault, it leaves little question that the origin of the major earthquake lay on or close to this fault, and that the earthquake almost certainly resulted from movement on it.

The greatest structural damage was farther south, at Hookena, where the destruction of the east and west walls of the two stone churches suggests an epicenter somewhat farther south. The possibility of a twin earthquake with one epicenter lying offshore nearly west of Hookena has been considered, but no other evidence suggests it, and no signs of a second earthquake could be detected from the seismograms either from the island of Hawaii stations or from that of the Coast and Geodetic Survey at Barbers Point on Oahu.

Throughout the Kona area, the prevalent direction of fall of rock slides, stone walls, and tombstones was westward, and the next commonest direction was eastward. The seismograms indicate that the first movement of the ground was eastward, and it is probable that some of the westward fall of objects was

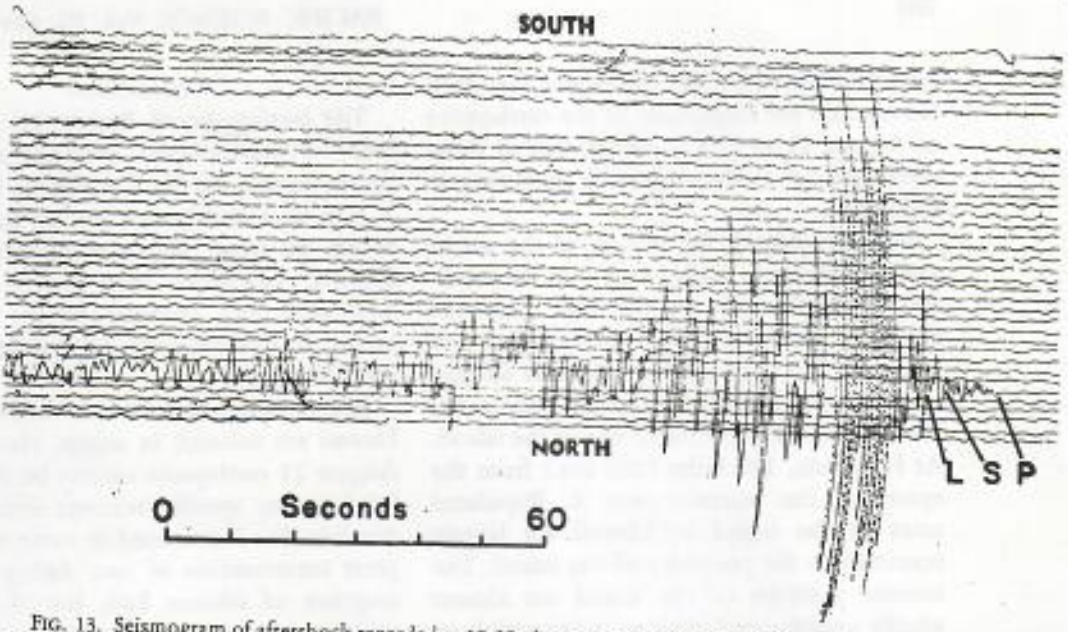

FIG. 13. Seismogram of aftershock recorded at 18:32, August 21, on the Bosch-Omori seismograph at Kilauea. Letters indicate the points of arrival of primary (P), secondary (S), and long (L) waves. The amplitude of 80 mm. on the seismogram corresponds to approximately 0.7 mm. of ground motion at Kilauea, 47 miles from the epicenter.

the result of lagging behind as the ground moved eastward under them. To some extent also, the general east-west azimuth of fall undoubtedly reflects the direction of the epicenter. However, the prevailing east-west slope appears to have been still more important in determining the direction of fall of objects. Its effects on various types of damage have already been indicated.

It has already been pointed out that the prevalent direction of rotation of columns in cemeteries indicates a location of the epicenter within the shaded offshore area in Figure 12. This area contains the seaward extension of the Kealakekua fault.

As a result of the consideration of all lines of evidence, the probable epicenter of the earthquake is placed approximately 3 miles west of Napoopoo, at latitude 19°29′ N, longitude 155°58′ W.

INTENSITY OF THE EARTHQUAKE

There are in common use two different methods of determining and expressing the strength of an earthquake. The older method is based on the observed effects of the earthquake on structures and various other objects. Based on these effects, a numerical value is assigned which is termed the intensity of the earthquake at any one point. Obviously, since the effects are less at greater distances from the origin of the quake, the intensity decreases away from the epicenter. Various scales of intensity have been proposed. That used in the present study is the modified Mercalli intensity scale of 1931 (Wood and Neumann, 1931), in which values range from 1, at which the earthquake is not felt except by a very few persons under especially favorable conditions, to 12, at which damage is total. The second method assigns a value called magnitude to the earthquake, based on the effect on standard seismographs at known distances from the origin of the quake (Richter, 1935). The magnitude is a measure of the amount of energy in the earthquake at its point of origin and, consequently, should be essentially the same at all measuring stations.

The notice of preliminary determination of

epicenter issued by the Coast and Geodetic Survey lists the magnitude of the earthquake of August 21 as 6.75 as determined at Pasadena and 7.0 as determined at Berkeley, in California.

Field studies of the effects of the earthquake indicate an intensity of 7 on the modified Mercalli scale in the area near the epicenter, decreasing to 6 at Waiohinu and Naalehu, 5 in the vicinity of Kilauea Caldera and in Hilo, and 4 at Honokaa and in the Kohala district at the north end of the island. At Honolulu, 180 miles (288 km.) from the epicenter, the intensity was 2. Populated areas of the island of Hawaii are largely restricted to the periphery of the island. The interior portions of the island are almost wholly unpopulated, making it impossible to draw accurate isoseismal lines. Approximate isoseismals are shown in Figure 1.

Given a single impulse, the minimum horizontal acceleration that can cause the sliding of a short stone column on a stone base is 71 per cent of the value of gravity, decreasing to 57 per cent at an angle of emergence of 35° to the horizontal (Imamura, 1937: 105). Because the sliding of headstones and, especially, base plates was common in cemeteries during the August 21 earthquake, it might be concluded that the acceleration during the earthquake was at least six tenths that of gravity. However, Imamura (1937: 106) also has shown that small, short-period vibrations in the epicentral areas of strong earthquakes, although they do not themselves cause the displacement of objects, may so lower the normal values of the coefficients of friction that sliding can be caused by longer period vibrations with accelerations much less than six tenths that of gravity. The presence of such vibrations in the Kona area is suggested by local vagaries of displacement and by other behavior. The acceleration which caused the lateral displacement of objects during the Kona earthquake is not known but probably was much less than six tenths that of gravity.

CONCLUSION

The earthquake of August 21, 1951, like most of its aftershocks, probably was caused by movement on the Kealakekua fault. This is one of a number of similar faults along which the lower slopes of Mauna Loa and Kilauea Volcanoes have moved relatively downward and outward toward the deep ocean. In this sense the earthquake was tectonic in origin.

In one sense, of course, all earthquakes in Hawaii are volcanic in origin. However, the August 21 earthquake cannot be directly related to any specific volcanic episode. It is possible that it is related in some way to the great extravasation of lava during the 1950 eruption of Mauna Loa, but there is no evidence to demonstrate such a relationship. On September 16 a series of smaller earthquakes originated on the Kaoiki fault system, a series of fractures corresponding to the Kealakekua fault, on the southeast slope of Mauna Loa. From mid-May until early July abnormally rapid eastward tilting at Kilauea Caldera indicated a tumescence of Mauna Loa Volcano. There is a possibility that both the August 21 earthquake and its aftershocks and the September 16 earthquakes were caused by a slight upward movement of the central portion of Mauna Loa in relation to the lower slopes. The August 21 earthquake has no known connection with any coming volcanic activity, though such a relationship may yet appear.

The southern part of the island of Hawaii is subject to frequent earthquakes, but few are as intense as that of August 21, 1951. The great earthquake of April 2, 1868, judging from the descriptions of damage, was much more severe. Wood (1914) assigned to it an intensity of 10. Its epicenter was farther south, near Waiohinu in Kau, where extensive surface faulting took place. The earthquakes of March 28 and April 3, 1868, also were probably at least as severe as that of August, 1951. The earthquake of October 6, 1929, centered beneath Hualalai Volcano, had a magnitude

of 6.5 (Gutenberg and Richter, 1949: 207), and caused damage as far south as Captain Cook. The Maui earthquake on January 23, 1938, had a magnitude of 6.75, about the same as that assigned by the California Institute of Technology Seismological Laboratory in Pasadena for the earthquake of August 21, 1951. During the years from 1929 to 1945, Gutenberg and Richter (1949, table 17) list eight earthquakes of magnitude 5 and over which originated in the general Hawaiian area. During the same interval they list 58 earthquakes in California with magnitude of 5 or more and 127 in Japan and Kamchatka. Thus, during those years, California had about seven times as many large earthquakes as the Hawaiian area, and the Japan-Kamchatka area had about 16 times as many. However, there are some areas, such as the northeastern United States, which have far fewer earthquakes than the Hawaiian area.

Based solely on the 1929–1945 interval, the Hawaiian area can expect an average of about one earthquake of magnitude 5 or more every 2 years. However, during the past century, there have been only six earthquakes of intensity comparable to that of August 21, and no other appears to have been quite as severe in central Kona. There is, of course, no assurance that another equally or even more severe earthquake might not occur in that area in much less time than a century. It might occur within the next few months, but, judging from the past, that is quite unlikely.

Well-built structures, with footings of better quality than many of those now found in Kona, will minimize or even eliminate the damage resulting from the lesser earthquakes which the Kona area experiences frequently in common with all the island of Hawaii except the northernmost part. However, it may not be economically feasible to build in such a way as to eliminate damage from the infrequent large earthquakes.

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July 29, 1986 F/SWC2:GHB

MEMORANDUM FOR: F/SWR1 - John J. Naughton

THROUGH: F/SWC2 - William G. Gilmartin

FROM: F/SWC2 - George H. Balazs

SUBJECT: Your recent request for biological and historical information on green turtles and hawksbills at Punaluu Bay and the adjacent Kau District coastline.

The assortment of literature which I am providing with this memo illustrates the importance of Punaluiu Bay and the adjacent coastline to the critically endangered Hawaiian hawksbill, Eretmochelys imbricata, and the threatened Hawaiian green turtle, Chelonia mydas.

We have periodically focused research attention on Punaluu over the past several years because it is the most concentrated resident foraging site for green turtle known to us in the Hawaiian Islands. Numerous interviews with fishermen and other local residents conducted over the years have confirmed this point. The turtles feed on the red alga Pterocladia capillacea which grows within the bay along the intertidal zone within the profuse groundwater discharge. The turtles are therefore forced to come close to shore to feed, hence are very susceptible to poaching and disturbance. Most foraging occurs at night, in the later afternoon, and immediately after sunrise. However, if a high tide occurs in the middle of the day, and human activity around the bay happen to be low, the turtles will venture into the bay during daytime to feed. Our scuba surveys outside of Punaluu have shown that when the turtles are not feeding they are resting on the bottom, often in coral crevices, at depths of 30 to 90 feet. I should also point out that Punaluu is the most productive site we have thus far identified in terms of Hawaiian green turtle growth rates. We have recovered tagged turtles at this site that demonstrate growth rates of 1-1/2 to 2 inches per year in shell length. Nevertheless, even at this rapid rate it would take green turtles resident at Punaluu 10 years to reach the breeding size needed to undertake the long-distance migration to French Frigate Shoals where nesting occurs.

The hawksbill is now very rare in Hawaiian waters. Consequently, the low level of nesting that occurs along the Big Island's east coast, and especially in Kau, is highly significant to the survival of the Hawaiian population. Nesting sites known to me

in Kau include the beach at Punaluu, Kamehame Point, Horseshoe "beach," and the beach at Kawa. As you will read in the enclosed literature, hawksbill nesting at Punaluu has stong historical ties to the Hawaiian culture. The nesting documented at Horseshoe points out the fact that hawksbills will come ashore across exceedingly rocky terrain to nest in pockets of sand that are not beaches in the classical definition of the word. The "beach" at Horseshoe, located just a few hundred yards south of Punaluu, is used as an unimproved jeep trail. In August of 1984, a nesting hawksbill became entanged in the lines of a tent of people camping there overnight.

The Hawaiian Sea Turtle Recovery Team in particular should be kept informed as the detailed plans for coastal and nearshore development at Punaluu become more fully known to our agency.

Enclosure

bc: Balazs
Gilmartin
HL

WEST HAWAII TODAY

JUL 1 8 1991

—BARON SEKIYA—WHT

FREEDOM — Scientists watch as a tagged turtle returns to the sea.

Scientists tagging turtles

By ANNE BAKER
West Hawaii Today

A young woman struggled with him in the swells just off shore of a South Point beach. She grabbed his front flippers as he thrashed to get away.

While the strong 110-pound turtle attempted to escape, the student holding on to him called for help. When other people arrived, they all managed to turn [illegible] float beneath his shell and swim him toward land. His flippers waved around in the air.

"It is a bit like turtle rodeo.... They are strong, gentle creatures that don't like to be caught," said Emmanouela Athanasiades, a student from Greece who described catching the turtle yesterday at Punaluu Beach.

See TURTLE:

...tle tagging may one day save them

...from Pagr 1A

The turtles are never subjected to stressful riding, but are caught by hand or corralled with a net and driven onto shore. Yesterday, their temporary captors were researchers and oceanography students gathering data to help the threatened green turtle species survive.

The turtles are thoroughly examined to determine injuries, disease, growth rate, migratory movements and population size. The information goes to a federal database to help design conservation strategies that will work, such as protecting breeding beaches from human intrusion, researchers said.

Punaluu Bay is one of eight locations throughout the Hawaiian Islands where turtles have rotuinely been captured, tagged and released in expeditions led by scientists of the National Marine Fisheries Service (NMFS) year, said George Balazs, researcher in charge of the NMFS Marine Turtle Program. The program costs about $76,000 a year, Balazs said.

Once the turtles at Punaluu were caught, they were carried up to shade resting upside down on huge floats that look like truck tire inner-tubes. Hundreds of curious people at the public beach were given handouts telling them what was going on. The turtles are measured, weighed and then tagged with a piece of metal, pierced through a flipper, for identification.

Only one of the 14 turtles caught during the Punaluu expedition was an adult and had been tagged before. This adult male turtle was originally tagged in 1982 at the breeding grounds 800 miles from his home in Punaluu, Balazs said. He weighed 150 pounds and was about 5 1/2 feet long from nose to tail.

The turtles captured are also thoroughly examined for injuries and signs of disease. One turtle captured had a propellor gash in his shell. The smallest turtle, about two feet long six years old, was found dead along the beach with slash marks on one flipper suggesting he was entangled in fishing line or a gill net and drowned, Balazs said.

The type of turtles captured reflect the actual population, he said, because very few turtles survive 25 years to reach maturity. The threats begin even before the half-dollar-sized turtles hatch.

"The kids race on the sand with four wheel-drives right over where turtles lay their eggs," said Komaka Bangay, who was born and raised at Punaluu Bay.

Bangay said he and his nephew built a fence around the nest. When the tiny turtles hatches, they instinctively headed for the brightest horizon, which is usually the ocean, and ended up in a parking lot confused by artificial lighting.

Green sea turtles navigate hundreds of miles, passing ideal beaches on Maui and Oahu to nest on the tiny islands of French Frigate Shoals, perhaps because that was where they hatched, Balazs said. The turtles that nest on Punaluu beach are hawksbill turtles, a critically endangered species of sea turtle.

Hawksbills once nested at Harry K. Brown Beach, now covered by Kilauea lava flows. It is also possible that acidic material from the lava is damaging seaweed Punaluu turtles feed on, Balazs said.

There is a new concern that land development may create alge that damages sea weed turtles feed on, said David Tarnas, University of Hawaii Sea Grant coordinator. Tarnas said he works with the private sector and government to make sure that the turtles are as protected as possible as coastal development continues. Athanassiades said that in Greece, coastal recreation development threatens many of the sea turtles because people hit turtles with jet skis and even picnic on the breeding beaches.

"It would be like putting a resort on French Frigate Shoals," Balazs said.

It is possible that human introduced pollution may cause a life-threatening tumor disease epidemic in some Hawaii green turtle populations, Balazs said.

Diseased turtles often are found in areas where human development is nearby, but have also been sighted in remote areas, a NMFS report indicates. Large numbers of tumor afflicted turtles have been sighted off the island of Oahu at Kaneohe Bay, Haleiwa Harbor, in the ocean off Kahala Beach and even at Hanauma Bay,the report said.

"In Kaneohe Bay, 60 to 70 percent of the turtles have this disease," Balazs said. "Hilo Bay is not a healthy place for them either."

For the island of Hawaii, tumor afflicted turtles are found in in Puhi Bay — waters adjacent to a sewage treatment plant outside of Hilo, the report said. Balazs said that there are several hypothesis about what causes the tumors: a virus, a bloodworm or a low-level pollutant supressing their immune system.

"The bottom line is we don't have an answer," he said.

The turtles are very site specific, living in the same ocean areas for most of their lives. Researchers have never had a tagged turtle from Punaluu show up in Hilo for example, he said.

...while the strong 110-pound turtle attempted to escape, the student holding on to him called for help. When other people arrived, they all managed to turn the green sea turtle upside-down, place a ...stades, a student from Greece who described catching the turtle yesterday at Punaluu Beach.

See TURTLE: Page 4A

Spotlight Special

KONA KAI-YAKS

Kona Kai-Yaks provides one of the most serene ways to journey into remote coastal areas of the Big Island. Experienced guides, for beginners, intermediate and advanced kayakers alike, share their local knowledge of secluded valleys, beaches, wildlife, and Hawaiian history on trips planned for hours, a day and several days.

Kona Kai-Yaks can arrange camping trips, complete with food, gear and transportation, to launch and pick-up sites. These kayaks are unsinkable and the guides are well-trained and knowledgeable. 326-2922

KIHOLO

Spotlight Special

SEA QUEST RAFTING ADVENTURES

Sea Quest Rafting Adventures limits tours from two to six passengers for the most personalized snorkeling, sea cave and historic sites exploration by raft in Kona. Capt. Randy Farish skippers a comfortable, safe and large craft created by Zodiac of France — the same flexible vessel popularized by Jacques Cousteau — to ensure best access to marine lava tubes, caves and snorkeling reefs. Trips start at Keauhou Bay, thereby offering maximum time for snorkeling and exploring Kealakekua Bay, Capt. Cook's Monument and the Place of Refuge. Morning tours leave at 8:27 a.m. and afternoon trips depart at 1:34 p.m. Snacks and snorkel gear included. Call 322-3669 for information and reservations.

11/91 SPOTLIGHT - BIG IS.

11/91 SPOTLIGHT BIG IS.

self-inflicted calamities. In most cases, these accidents are brought about by diver error and could have easily been avoided.

Conditions such as these threaten the lives of hundreds of sport divers every year. The topic of accidents may be covered in scuba classes for only a minimum of time, especially if the course was a "couple hour quickie", that may have the novice certified in a matter of a few short classes and pool sessions. In my opinion, limiting one's formal scuba education to one short duration scuba course is ultimately unsafe. What happens after that short pool session, followed by a checkout, when that certified individual needs to plan their own dive? Will they be capable of doing so?

How important is it for a sport diver of average experience to know how to properly compute No-Decompression bottom times? In some cases it could mean the difference between a pleasant, after-dive dinner at one's favorite restaurant, or a stint in the hyperbaric chamber. (Let's hope they have Diver's insurance!) It isn't surprising for non-divers to be unaware of such factors, but how about a diver who is, "certified?" Sometimes there's not much of a difference. Many certified divers are not fully knowledgeable of the simplest principles involved in basic dive table computations. Knowing basic rules and concepts is easy and absolutely necessary if one is to utilize scuba safely.

So, is scuba diving just a sport? Maybe it's more of a responsibility. Nowhere is it written that scuba diving shouldn't be fun, but it's potential dangers should be focused upon more carefully by many divers.

Do you need to enhance your knowledge about the utilization of scuba? Many would say that experience is the best teacher, but how much do you know already? Knowing what to do during diving-related emergencies, and especially knowing how to prevent them, should be second nature to all certified divers. Advanced scuba certification, specialty courses, as well as Red Cross First-Aid and CPR, are excellent sources from which to learn skills that may be required in a life threatening situation.

If you are one who has already made an investment of a Grand or so in a hot pink, or neon green scuba ensemble, maybe it's time you made another. The time invested in such courses might save a life.

REWARD! TURTLES IN TROUBLE II

In our last edition of *Changing Tides*- May 8, '91 we featured an article by Sherri Miller concerning the *Honu*, the Hawaiian green sea turtle *(Chelonia mydas)* which is threatened with extiction, and the problem the Honu is having with a deadly tumor infection called Fibropapilloma disease.

Regretfully this story is about another type of sickness the Honu is having to contend with to avoid total extinction. This sickness isn't in the Honu though, it's in Man.

A 250 pound, sexually mature, female Honu was discovered dead in a vacant lot off Shower Drive in Hawaiian Paradise Park subdivision, Puna. Someone or more probably a group of people, removed the turtle from the ocean and abandoned it, away from the water, to die a miserable death.

This malicious act appeared intentional and violates both State and Federal Laws protecting the last of the Pacific green sea turtles: specifically the Endangered Species Act with penalties of up to $25,000 and/or one year in jail.

Any person with information on the person or persons involved in this heartless and potentially ecologically devastating act, or any other acts against our precious wildlife and marine animals are encouraged to call any of the following agencies:

State Dept. of Conservation & Resource Enforcement (808)-933-4291

National Marine Fisheries Service (808)-541-2727

U.S. Fish & Wildlife Service (808)-541-2682

Greenpeace Hawaii (808)-935-0770

Marine Option Program - UH Hilo (808)-933-3544

ALL SOURCES WILL BE TREATED CONFIDENTIALLY
MAHALO

THE MARINE TRADER "BUY - SELL - TRADE" MARINE RELATED EQUIPMENT

The Marine Option Program (MOP) at the UH Hilo campus has set up an information-exchange bulletin board for your benefit to facilitate buying, selling or trading of marine-related equipment, and advertising activities like: diving, sailing, snorkeling or anything related to the ocean.

The bulletin board will be outside the MOP office for your convenience (to view or place an add on).

The University of Hawaii at Hilo and the Marine Option Program are not responsible or liable for any faulty or damaged merchandise purchased through the Marine Trader bulletin board. All transactions are between buyer and seller - only.

QUEST 1991

Michael Childers

This past summer might have been the busiest one yet at the UHH Marine Option Program. Two days after the Spring Commencement Ceremony, QUEST, The University of Hawaii's Quantitative Underwater Ecological Survey Techniques course began. For the first time QUEST was offered as a credit course, Biol/Geol 264.

For the first four days, intensive classroom sessions were held at UHH, with lectures, quizzes, and instruction from 08:00 until 21:00. The hours were necessarily long as there was a lot of preparation needed before the diving could begin.

The diving began the fifth morning of the course at Puako, on the South Kohala Coast. The first dive was a geomorphology dive designed to map the submarine contours of the dive site. During the next four days, five more dives were made at Puako to teach research techniques used to census turtles, fish, invertebrates, coral and limu and nocturnal animals. Additionally, two dives were also made to demonstrate the advantages and disadvantages of U/W photo and video equipment as it relates to nearshore marine research. After allowing time for decompression, the group commuted over the 3500' elevation

Waimea Pass to UHH for the third part of the workshop.

The third part of the workshop centered on transcribing the data collected while diving, entering it into spreadsheets, and then analyzing and interpreting the information. Each dive team then had the opportunity to present their results at a mini-symposium held the last afternoon.

Even though the hours were demanding and the work rigorous, everyone came away from QUEST with a real sense of accomplishment. Student's comments written on the course evaluations reflect this view, "All in all it was a great learning experience and fun despite all the work (as it should be)." "Overall, an outstanding and unique diving/ learning experience."

For more information on QUEST 1992, stop by MOP.

Return Requested. Please Forward
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Hilo, HI. 96720-4091

MARINE OPTION PROGRAM
UNIVERSITY OF HAWAII

George Balaz
2570 Dole St.
Honolulu, HI. 96822

Summary of green turtles, *Chelonia mydas*, tagged and resighted at Kiholo Bay during the National Marine Fisheries Service/Hawaii Preparatory Academy sea turtle research project

compiled by
George H. Balazs
Honolulu Laboratory
Southwest Fisheries Science Center
2570 Dole Street
Honolulu, HI 96822-2396

3 days/2 nights study dates	Total no. captured	No. newly tagged	No. tag resighting	Total no. tagged in population to date	Peterson population index estimate*
Oct. 87	6	6	-	6	-
Feb. 88	13	13	0	19	-
April 88	10	9	1	28	190
June 88	11	4	7	32	44
Oct. 88	21	15	6	46**	112
March 89	29	24	5	70	226
May 89	37	17	20	87	130
October 89	24	6	18	93	116
24-26 Jan. 90	22	9	13	102	157
25-27 April 90	58	21	37	123	188
24-26 October 90	51	18	33	141	190
4-6 March 91	55	12	43	153	180
13-15 Jan. 92	62	21	41	173***	231

$$*\frac{\text{No. tagged turtles recaptured}}{\text{Total No. turtles captured}} = \frac{\text{Total No. turtles tagged}}{\text{Total No. turtles in resident population (X)}}$$

**Total number of tagged turtles reduced by one as of 8/19/88 when an individual tagged in 6/88 was found dead from gillnet entanglement.

***Total number of tagged turtles reduced by one as of 8/9/91 when an individual tagged in 1/90 was found dead from gillnet entanglement.

KIHOLO-7.GHB

JANUARY 1991

Dear George

Thank you too for all the copies of handouts and the information on Turtle disease. Our love to the family and

Can't recall ever seeing this type of disease in all the turtles were caught and consumed before it was illegal.

Thank you so much for your kind thoughts and warm holiday wishes.

Missed you when you came in Nov - somehow. Anyway, we didn't know whether you were with the group or not cause you didn't let us know.

Happy New Year

Much Aloha,

Jeanette & Arnold.

Anyway, hope to see you in April - oh! yes, I heard you were in Volcano. Mrs. Angum went to the mtg. or talk you gave! I teach at Waiakea Sch. Now. K to 2 - Maybe while you're here you can talk to my 2nd graders - ok? about the turtle. Let me know if possible or not - so I can prepare them.

Hallmark

TY 210-3

Your Greeting Meant So Much

Sund

The Sunday Star-Bulletin & Advertiser

By John W. Perry
Special to The Advertiser

A soft rain fell upon the towering cliffs and rugged, lava-encrusted grasslands separating Halape from Hilina Pali Lookout with its ribbon of roadway leading to Kilauea volcano. At sea level — gray sky, gray ocean — a rising tide shot wave after wave into Halape's tiny inlet, each wave flooding through a cluster of dead coconut trees, marking the scarred heart of Hawaii Volcanoes National Park's southern coastal boundary.

A mile or so away, below Puueo Pali, I wiped Ka'u raindrops from my face, jettisoned two quarts of emergency water from my backpack and walked the final distance to Halape shelter, terminus of the Halape Trail, a 7.2-mile highland path meandering seaward from Kipuka Nene Campground beyond the Big Island's magnificent Hilina Pali.

The shelter, Halape's only people-made structure, offers tentless hikers a protected bivouac in the wilds. The price is agreeable: free. One of three park-erected shelters along the park's 30-mile stretch of coastline, the horse-stallish shelter of plank, tin and rock straddles a watertank.

Its roof is a metal umbrella against sun and rain. To please neat-minded guests, a clean floor of sand decorates its interior and a broom stands guard at the entrance. Nail heads serve as clothes hangers for a fastidious hiker's outdoor wardrobe. A weathered logbook — "Halape, I love you!" — registers the shelter's transient visitors.

layTravel

Prepared by the staff o

Halape at low tide with its cluster of dead coconut tree trunks. An earthquake dropped the seashore into the sea.

John W. Perry photos

Halape: a scarred oasis

Nearby is Halape outhouse. It is not posh, simply an open-air pit toilet (with a civilized seat) enclosed by a knee-high wall of lava rocks. "Please Close Lid" is the simple instruction. A sitter's view is seaward, a stander's view is landward toward the approaching Halape Trail. On a rainless day it is a wonderful place to sit and sightsee.

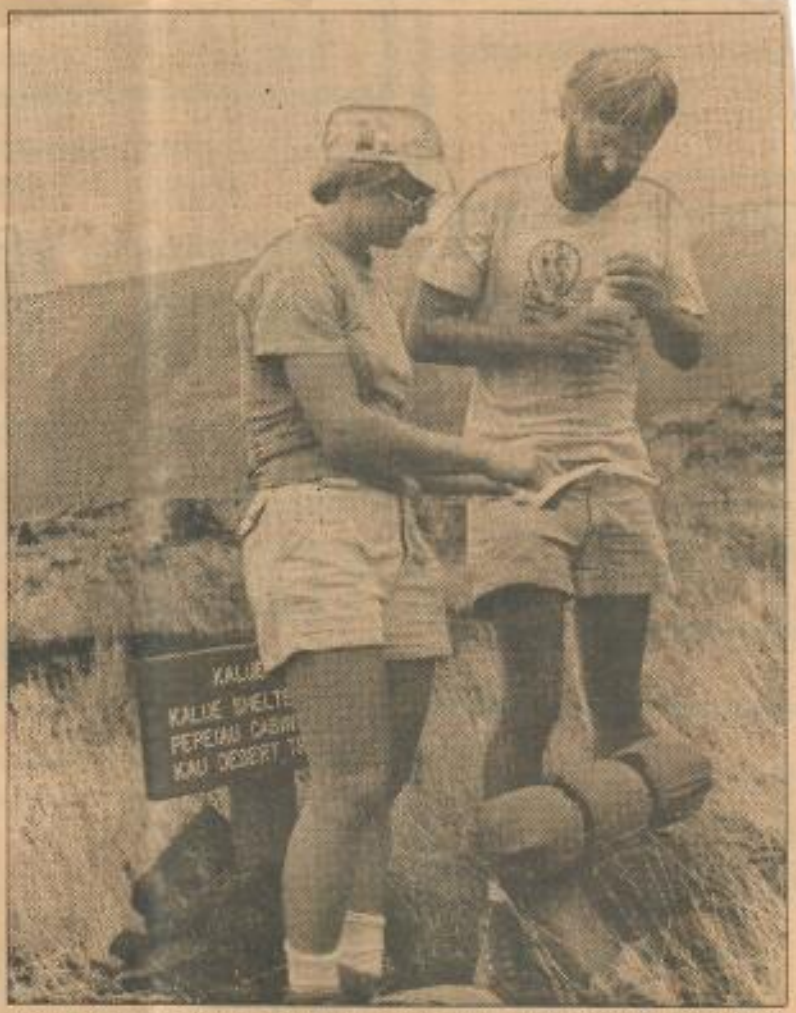
Below the shelter, wedged between ocean and hill Puu Kapukapu, is Halape Beach. A half-dozen tent sites mark shoreline homesteads of previous hikers. Dwarf coconut trees shade several sites.

One word describes the character of the beach's surrounding landscape: rugged. A massive earthquake fault severs the foot of Puu Kapukapu. Grassburrs grow in profusion. Black basalt boulders, reminiscent of oval slingstones, break the incoming tide at the beach's rim. On the basalt rocks, nibbling on blue green algae, camp "black foot" *opihi* , a marine molluck with a tent-shaped shell. A pistol-shot away, ringed in white surf, is barren Keaoi island.

On the eastern rim of the beach, beneath the branches of a lonely palm, I erected a tent. Hotel Halape. A slab of flat lava served as a kitchen table. Other outdoor kitchen hardware included a keep-it-hot-or-cold-in-the-wilderness thermos mug and an ingenious P-38 can opener. Cafe Halape.

On the opposite end of the beach, a two-minute walk from my tent site, an adventurous West Coast couple had encamped. I initiated a chat. Rather secretive, neither person volunteered a name.

I did learn that both were ex-teachers-turned-bicyclists who had stopped in Hawaii to hike on foot to Halape before flying to New Zealand to fulfill a bicyclist's dream: a six-month peddling tour of New Zealand's North and South islands. We talked about self-propelled locomotion: walking, hiking, peddling and paddling. The motorless talk blended lazily with Halape solitude.



Hikers on the Kalue Trail pause to study mileage to Halape, 6 miles away. In the background is Hilina Pali.

"Do you know what happened here in November 1975?" asked the female bike peddler, looking toward Halape inlet and its ocean-flooded tree trunks.

I nodded yes. The terror began on a Saturday, about 3:30 a.m., when a triple event rocked the island: an earthquake, an eruption at Kilauea and a coastal tsunami. The earthquakes — there were

two — and tsunami demolished Halape, where 34 campers — Boy Scouts, Sierra Club members and local fishermen — lay sleeping.

"Halape, a beautiful remote sandy beach," wrote a Hilo reporter, "literally disappeared as the entire coastline subsided. Tumbling rocks after the first earthquake and the sudden drop of land after the second injured many hikers in the area."

Four huge waves rolled over the camp sites, uprooting coconut trees and humans. A female hiker described the horror: "The next thing I knew a wave came along and washed me out to sea. I didn't know if I was ever going to come up from under the water. Then, just as suddenly, I was tossed high on the land."

A 56-year-old Hilo surgeon and a 26-year-old Puna fisherman died in the predawn nightmare. Rocks and waves injured 17. Two horses drowned. Ironically, the name Halape means "crushed missing" — Hawaiians once planted gourds here, those buried by wind-blown sand caused gourd harvesters to "miss" them.

Prior to Nov. 29, 1975, writers described Halape as a "coconut palm shrouded area." The jewel of the coastline. Sixty coconut trees shaded a cool, sandy beach. Today the headless white trunks of those trees stand in the blue-white surf, each rooted in a submerged campground.

The chitchat about death and disaster changed to fish talk when the male bike peddler produced a fishhook. I looked at his hook and asked, "What kind of bait do you use?"

"Portuguese sausage."

I was shocked. I had never heard of Portuguese sausage used as a fishbait (but what did I know?). I had never eaten Portuguese sausage — I only eat fish — and did not expect a fish to eat it either. I had read books on fly fishing for trout in New Zealand and how to hook Texas bass on spinning gear but never How To Fish Halape With Portuguese Sausage.

The confidence with which the bike peddler named his bait, fed it to his hook, mounted a black lava rock and tossed his line into Halape inlet disturbed me. I sensed a fish challenge — West Coast bicyclist versus Honolulu freelance writer; Portuguese sausage versus Hilo cutbait (*nenue*). I made a makeshift fishing pole from a tent pole and fished the shoreline rocks.

The two-man Halape fishoff did not last long. A sudden shower drove the bike peddler to his tent where his lady had prepared supper. For dessert, he ate his fishbait.

Hard-headed, I continued to fish in the rain, determined to dine on mushroom soup with fresh fish heads and bodies. Any critter with fins would do. In a matter of minutes I hooked three hardheaded hawkfish, called *po'opa'a* in Hawaii. "The fisherman who fools around in shallow waters takes home a *pa'opa'a* fish," is a fisherman's proverb. I wondered if hawkfish had an appetite for Portuguese sausage.

That night, beside my tent, I hid a hawkfish head in sand and anchored it with a rock. One never knows when one might need a hawkfish head — perhaps for cutbait. I did not know it would cause mental pain in my own head.

Next morning a red sunrise engulfed Halape and its tree-skeleton forest. My morning began with two discoveries, one a delightful surprise, the other sheer aggravation.

The delight: At sunrise I discovered a hawksbill turtle track engraved upon the beach. It reminded me of a giant horseshoe hoofprint. Under the camouflage of darkness the hawksbill had emerged from the water, flippered its way atop the beach, layed its eggs in sand beyond the high water mark and flippered its way seaward, leaving behind an inverted U track. Soon wind and tide would erase the track, leaving only hours-old eggs hidden beneath sand.

The turtle had chosen to drop its eggs near the bicyclists' tent. The male peddler thought he had heard sea turtle chatter during the night.

"Did you hear any strange sounds last night?" he asked.

"Only the flapping of my tent rainfly."

"Do sea turtles make noises on shore?"

"I don't know."

The human population at Halape that day — three — knew little about sea turtles. The last hawksbill I had seen decorated an endangered species poster sold by the Sea Turtle Rescue Fund. It cost $50, signed by the artist.

The aggravation: My hawkfish head had been stolen during the night. Gone. Without a trace. I sat on a rock and pondered about how or what would rip off a man's fish head. I complained to my fellow campers. "Mongoose," said one; "crab," said the other.

The mystery resolved itself when a gray head with feline eyes appeared from behind a gray rock: a wild pussycat. "Hawkfish head thief!" I shouted. "Give me back my head!" Without a social meow, the cat retreated into the bushes, my head digesting in its belly.

As the sun climbed to midday, I took a cooking pot and searched out a small pool of trapped rainwater near the base of the hill Puu Kapukapu. "Follow the beach until you come to a pile of five rocks. Descend into an earthquake trench. Pour cooooooool water over your head!" an Oahu hiker had told me. I did.

Among the rocks on the pool's bottom, dislodged from Puu Kapukapu during the earthquake that smashed Halape — I saw a carrot-colored crayfish. It marched back and forth over a rock, stopping each time my shadow darkened its aquatic pathway.

I left Halape in the noonday heat. From beneath the rim of a sun umbrella, I watched for a moment the wind fill with sand the hawksbill turtle track.

The moon would appear in its fullness twice over Halape before the sand would erupt with newborn hawksbills, each scrambling seaward to immerse itself in Halape water. A new generation of rare and endangered sea life in a scarred oasis.

John W. Perry, who specializes in outdoor and history writing, lives in Honolulu.

TURTLES

On the wall in Banjo's Taxidermy Shop
is two big, green turtles. They all shiny.
Banjo, he use varnish make um look wet.
Banjo say, before could catch turtles if you like
for the shell or for meat, but now,
he say not suppose to catch turtles
or else the police going arrest you.
He say, when you catch a turtle, the turtle he cry
a tear from his big, wet eye.
Banjo seen um when he went fish with his friend, Keone,
in a Boston whaler down South Point side.

He ask if I ever taste turtle meat.
He say, **Ono you know. I tell my wife cook**
the frozen turtle meat one night and you come over
try some. Ask yo mama first.
I thinking about the tear from the turtle eye.
I tell Banjo I no like.

Banjo say the turtle eggs look like ping pong balls.
He tell me, his friend Melvin, the lifeguard
down Punalu'u beach, seen turtle fin marks in the sand
couple weeks ago so him and Banjo wen' put all the eggs
in one hole and wen' put one cage over um
so nobody vandal it.

Late one Saturday afternoon, I was at Banjo's shop
helping him sweep up the loose feathers,
this white chemicals, and sheep wool off the floor,
the phone wen' ring and was Melvin.
Banjo stay all panic on the phone. Okay, Okay.

I going close the shop. C'mon, he tell me. **No need sweep.**
C'mon, c'mon. The turtles hatching. We never going see
this in our whole life again. Us get in the jeep and drive
fast down Punalu'u. **No speed, Banjo,** I tell him,
bumbye Officer Gomes give you one ticket.
But Banjo, he no listen.
When us get there, close to night time.
Get Melvin and his girlfriend, Coleen. Banjo's wife
stay too—she work the lei stand down the beach.
The little turtle babies, they pop their head
right out the black sand. They all black too.
And when one 'nother one about to come up,
the sand cave in a little bit around the turtle head.
Turtles, they know by instinct where is the ocean,
Banjo tell. **Watch.** And he turn a baby turtle
backwards to the mountain. Then the turtle he turn
his own self around and run to the water.

Get plenty. They all running to the water. They shine
when the wave hit them. And their heads stay bob up
and down in the ocean. Plenty little heads.
Banjo pick one up and give um to me.
Like take um home? Take um, take um, he tell me.
I think about the turtles on Banjo wall.
They look like they crying too.
Nah, I tell him. **I no like um.**
I take the baby turtle to the water edge,
his eye all glassy, his whole body shine,
and I put um down. **No cry now,** I tell um.
No cry.

1.29.93 Hi, George – I met you briefly last year – Jon Pierre Bowman's sister, also a writer. Anyway I just ran across this in the Fall 1991 issue of Bamboo Ridge quarterly and thought you might like it.

I'm home in Hawaii working on articles on the Canoe voyaging and Building and on Hawaiian sovereignty.

Aloha, Sally-Jo Bowman

Until Feb 8:
201-6620

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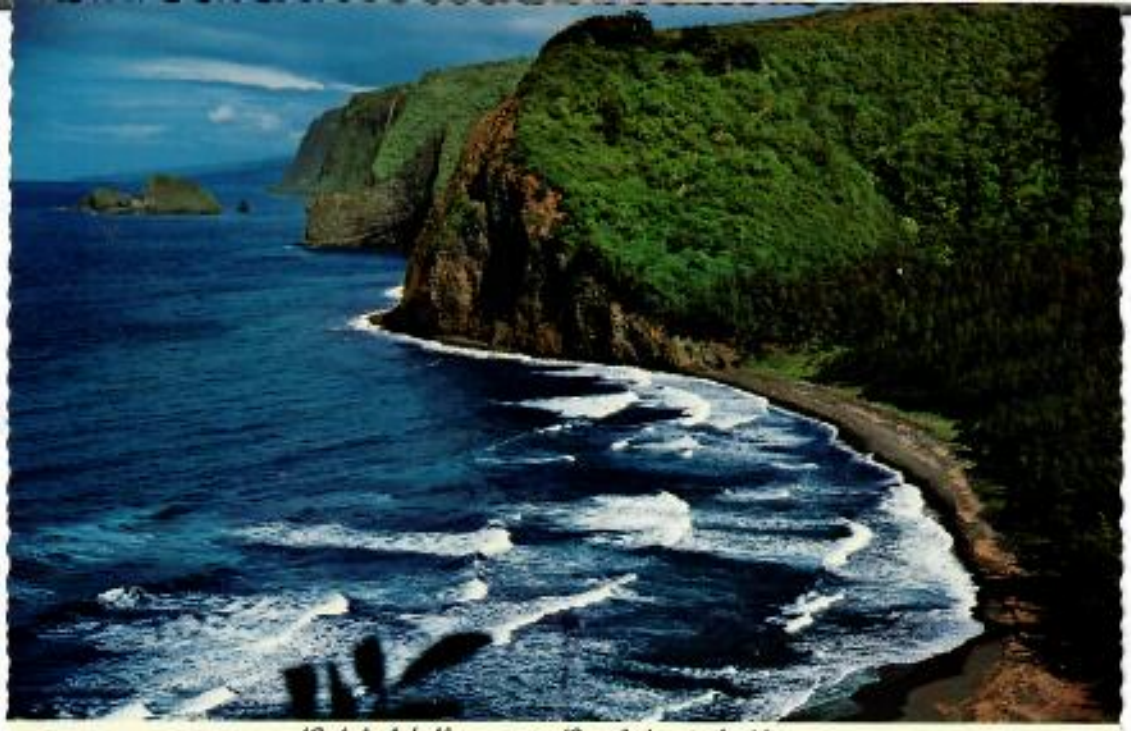
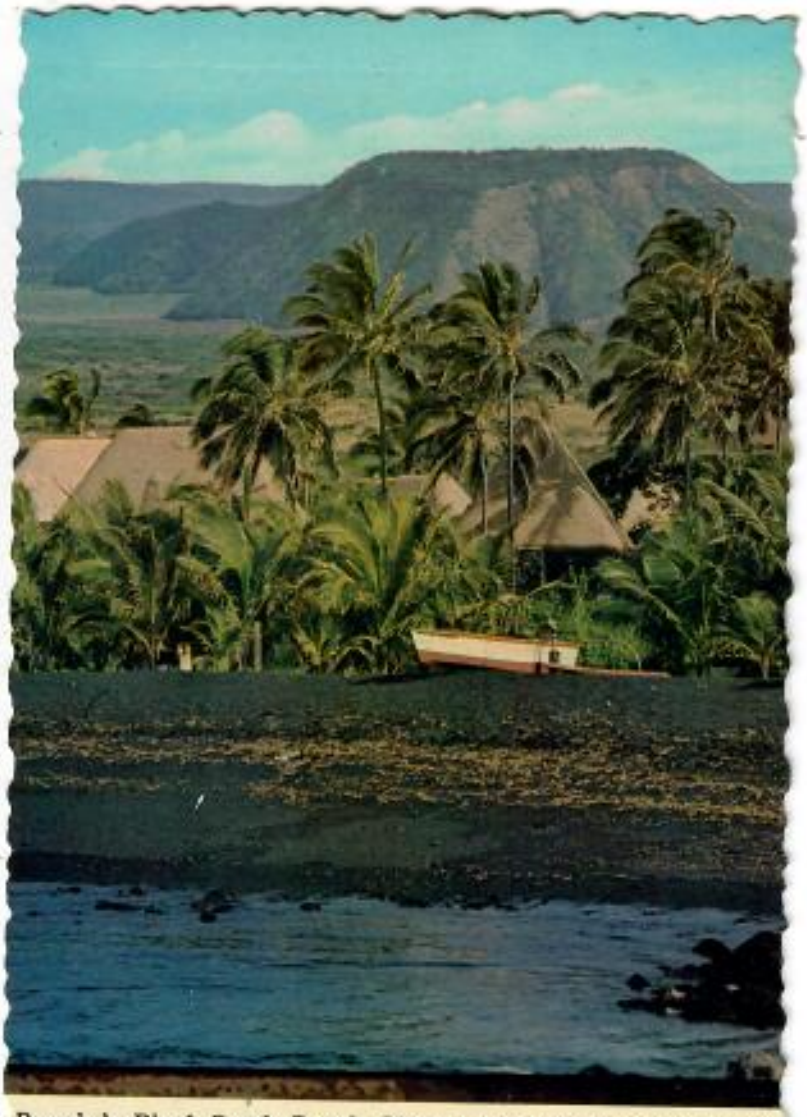
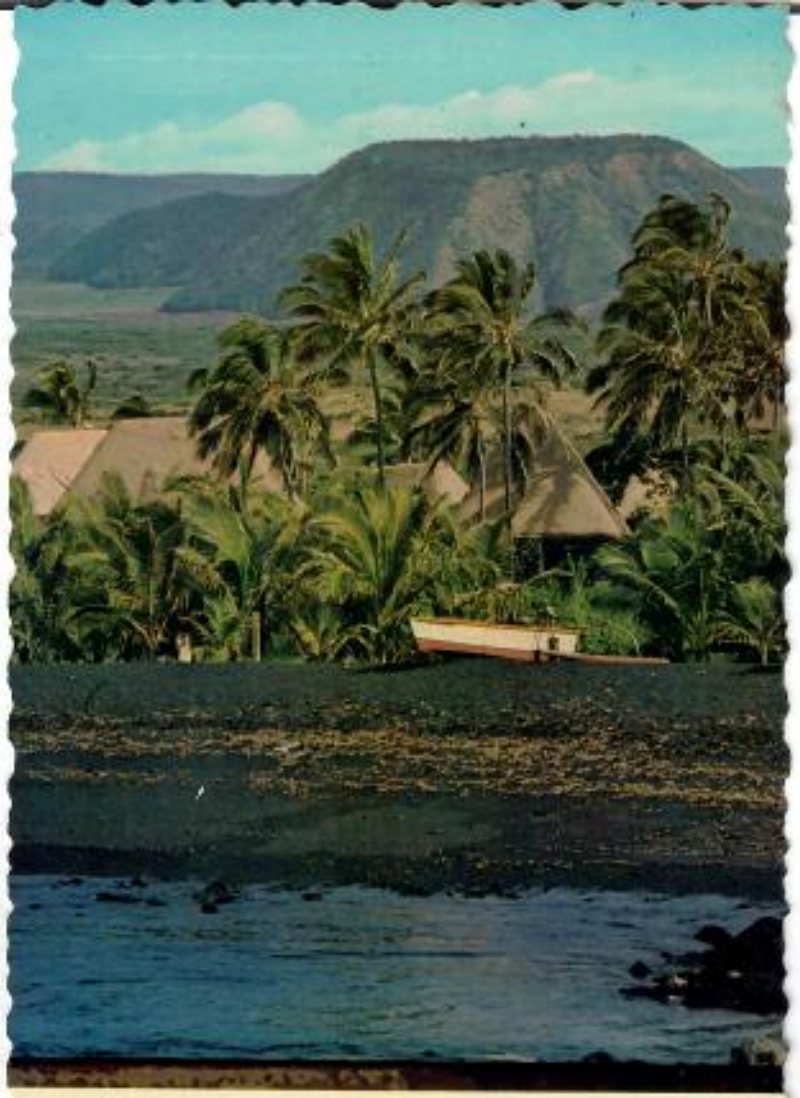


Pololu Valley on the Big Island of Hawaii



Punalu'u Black Sands Beach, Hawaii Camera - BUD THUENER - Hawaii



Punalu'u Black Sands Beach, Hawaii Camera - BUD THUENER - Hawaii