1980s - KAWELA BAY
HABITAT ASSESSMENTS
G.H. BALAZS FILES

Turtle Bay Hilton and Country Club

A new Hilton in Hawaii

On Aug. 1, 1983, the Kuilima resort on Oahu's North Shore was renamed the Turtle Bay Hilton and Country Club. Following a complete renovation program, and under the direction of new General Manager Bruce Ulrich, this new Hilton will open in time for the winter season. The $15 million renovation will include remodeling of guest rooms, cottages, cabanas and restaurants; installation of fire safety systems and golf course beautification, making the new Turtle Bay Hilton Oahu's most exciting resort and country club.

Enjoy our recreation facilities NOW!

During the renovation period, Turtle Bay Hilton's sports and recreation facilities are still open for daily use. Call now for reservations and information.

Championship Golf Course, Pro Shop & Snack Shop
293-1643

Horseback Riding
293-8693

Tennis Courts & Pro Shop
10 Plexipave courts, 4 lighted
293-1596

Dune Cycling
293-1861

Hazel? Hawaiian-Rec? Ham. Of deck? Rob. dation maps

DEPTH IN SCALE

LAT.- LONG.- (Check them all on the map)

4 Islands
12 "LOCATIONS
3 MAJOR STUDY AREA
(ACCESSIBILITY, SPECIAL CONDITIONS, ETC)

OAHU (4)

✓1. WEST BEACH BROWN'S CAMP = 21°21'N 158°08'W

✓2. MAUNALUA BAY ("TURTLE CANYON") "Turtles" 21°17'N 157°45'W

✓3. SANDY BEACH = HALONA Pt. 21°17' 157°41'

✓4. MAJOR KAWELA BAY × 21°42°N 158°01'W

MOLOKAI (1)

MAJOR 1. ✓ PALAAU = ~~21°07'N 157°06'W~~
KAHANUI PT. = 21°06'N 157°05'W
PAKANAKA FISHPOND = 21°06'N 157 07'W

MAUI (4)

MAJOR 1. ✓ KAHULUI BAY (See Maui Elect. Report)
HOBRON Pt - 20.54 156.27

2. ✓ HONOKAWAI 20°57'N 156° 42'W

3. ✓ OLOWALU 20°49'N 156°38'W

4. ✓ MALIKO × 20°49'N 156°38'W

LANAI (3)

1. KEOMUKU = "Turtle Heaven" = 20°51'N, 156°50W
2. Lae WAHIE PT. = 20°56'N 156°56W
3. POLIHUA = 20°55'N 157°03'W

COULTER, J.W. (compiler) 1935. A gazetteer of the Territory of Hawaii. University of Hawaii Research Publications Number 11. Univ. Hawaii, Honolulu, 241p.

COOKE - 11-2285

NO ANIMALS FOUND

7917

8545

LIST OF SPECIES IDENTIFIED IN THESE SAMPLES:

dated 1 AUG 1985 from Dennis Russell

CHLOROPHYTA

Bryopsis pennata Lamx.
Caulerpa sertularioides (Gmelin) Howe
Codium arabicum Kutzing
Codium edule Silva
Dictyosphaeria versluysii Weber von Bosse
Halimeda discoidea Decaisne

PHAEOPHYTA

Dictyopteris sp.
Dictyota crenulata J. Ag.
Dictyota friabilis Setchell
Ectocarpus indicus Sonder
Ralfsia occidentalis Hollenberg
Sargassum polyphyllum J. Ag.
Sphacelaria sp.

RHODOPHYTA

Acanthophora spicifera (Vahl) Boerg.
Amansia glomerata C. Ag.
Antithamnion sp.
Ceramium sp.
Chondria tenuissima (Good. and Wood) C. Ag.
Chondrococcus hornemannii (Mert.) Schmitz
Chrysymenia glebosa Abbott and Litter
Gelidium pucillum (Stackhouse) LaJolis
Gracilaria coronopifolia J. Ag.
Heteroderma subtilissima (Foslie) Foslie
Hypnea cervicornis J. Ag.
Hypnea musciformis (Wulfen) C. Ag.
Hypnea nidifica J. Ag.
Hypnea sp.
Jania capillacea Harvey
Laurencia carolinensis Saito
Laurencia nidifica J. Ag.
Polysiphonia pseudovillum Hollenberg
Pterocladia capillacea (Gmelin) Bornet
Spyridia filamentosa (Wulfen) Harvey
Tolypiocladia calodictyon (Harvey) Silva

CYANOPHYTA

Oscillatoria sp.

BACILLARIOPHYTA (DIATOMS)

Climacosphenia sp.
Synedra sp.

SEAGRASS

Halophila ovalis (R. Br.) Hook

More coming!,

aloha,

(3)

School of Natural & Mathematical Sciences

Seattle Pacific University
Seattle, Washington 98119
Phone: (206) 281-2140

George Balazs
National Marine Fisheries Service F/SWC2
P.O. Box 3830
Honolulu, Hawaii 96812

Dear George,

Here is a list of the algae from the last three samples:

Sample 1, Kawela Bay, 3-29-84 1985

Acanthophora spicifera	Trace
Amansia glomerata	3%
Codium edule	Trace
Hypnea musciformis	Trace
Laurencia cartilaginea	Trace
Martensia fragilis	1%
Pterocladia capillacea	20%
Turbinaria ornata	5%
Ulva reticulata	70%

Black colonia ascidians (?)

Sample 2, Kawela Bay, 3-29-1985

Acanthophora spicifera	Trace
Amansia glomerata	1%
Botryocladia skottsbergii	Trace
Cladophoropsis gracillum	Trace
Codium arabicum	Trace
Codium edule	Trace
Griffithsia tenuis	Trace
Leveillia jungermannioides	Trace
Pterocladia capillacea	24%
Sargassum polyphyllum	Trace
Turbinaria ornata	Trace
Ulava reticulata	75%

Black colonial ascidians (?) chondrosia ?

Sample 3, Kawela Bay, 3-29-1985

Acanthophora spicifera	Trace
Amansia glomerata	Trace
Codium arabicum	Trace
Gelidiopsis variable	Trace
Griffithsia tenuis	Trace
Martensia fragilis	Trace
Pterocladia capillacea	18%
Turbinaria ornata	1%
Ulava reticulata	80%

Alphabetical listing:

Chlorophyta
- Cladophoropsis gracillum Dawson
- Codium arabicum Kutzing
- Codium edule Silva
- Ulva reticulata Forsskal

Rhodophyta
- Acanthophora spicifera (Vahl) Boerg.
- Amansia glomerata C. Ag.
- Botryocladia skottsbergii (Boerg.) Levr.
- Griffithsia tenuis C. Ag.
- Hypnea musciformis (Wulfen) C. Ag.
- Laurencia cartilaginea Yamada
- Leveillea jungermannioides Harv.
- Martensia fragilis Harv.
- Pterodladia capillacea (Gmelin) Bornet
- Gelidiopsis variable J. Ag.

Phaeophyta
- Sargassum polyphyllum J. Ag.
- Turbinaria ornata J. Ag.

TO BILL COOKE

George,

Thank you for the note and the card with Hypnea musciformis on it. It is included with this letter. The other sample is also H. musciformis, and the really great thing would be to finid int on Lanai, Kaui, etc. I think I told you it was very very abundant on the beaches, in the drift, by Lahaina. I think the most important information about this species, now, would be here it is located and the date.

The only additional thing that could go in the sample data would be the blue string found in sample 3. I didn't find anything unusual besides that. You note that we have not found H. musciformis at Kawela, but it was in sample 1. I found one distinct hook from this species. Most of these algae are shallow water species and the Botryocladia skottsbergii usually grows under rock overhangs or in caves. This is where we also find Amansia.

Aloha,

Dennis

George,

Thank you for the "History of Sea Turtles at Polihua Beach, Northern Lanai", and for the articles you have sent to me. This past week (December 12-23, 1984) I was with a Hawaiian Marine Bilogy class on Maui. I found piles of limu on the beach at Launiupoko Park, about 3 miles toward Olowalu from Lahaina. It was Hypnea musciformis, which was originally introduced to Kaneohe Bay. It was not present at this park two years ago, but now is abundant there and also at Halama Park in Kihei. This alga was in your samples numbered GB-29; GB-533; GB-601; GB-755; GB-757; GB-758; GB-1041; and GB-1042. I am trying to get a manuscript out on Acanthophora and may include Hypnea musciformis distribution in it as well. Sometime in the future I might ask you for the locations and dates of these samples.

Just a few hundred yards off shore at Launiupoko we saw two green turtles swimming near the bottom in about 30 ft of water. My trip was too quick and we spent only two hours on Oahu, so maybe next time I'll give a call and try to visit you.

I'm sending the samples under a separate cover.

Aloha,

Dennis

Dennis J. Russell

Identification of Invertebrates

from Turtle Stomach Samples

Sample	Description (Remarks)
GB-1 May 75 Wo.K.K. TMR Adult	Brachidontes crebristriatus (approx. 100) Simocarcinus simplex (one)
GB-4 6/24/77 FFS Tiger mortality	Cerithiidae (micromolluscs, 2); pteropod shells, empty (blue green algal mat)
GB-6 7/12/77 Midway mortality	No invertebrates (algae, cloth fragments, thread, magnetic tape)
GB-24 11/5/77 Honolulu Harbor 2365	Unidentified tissue
GB-33 9/11/77 FG "A"	Chondrosia chucalla de Laubenfels, 1936 (fresh)
GB-38 7/28/77 Bellows feces	C. chucalla (partially digested; plant material present)
GB-41 11/20/77 V/S Kaneohe	C. chucalla (fresh)
GB-101 3/15/78 Bellows feces	C. chucalla (partially digested)
GB-112 3/15/78 Bellows feces	C. chucalla (partially digested)
GB-114 3/15/78 Bellows feces	Spongia oceania (?) see remarks
GB-115 3/15/78 Bellows feces	No invertebrates (unidentified algae)
GB-116 3/15/78 Bellows feces	Unidentified tissue (algal fragments)
GB-132 3/15/78 Bellows feces	C. chucalla (partially digested)
GB-139 3/15/78 Bellows feces	Unidentified tissue
GB-140 3/15/78 Bellows feces	C. chucalla (partially digested)
OCOMB	1 piece unidentified zoanthid coelenterate (Palythoa ?)

Remarks

Sponges

Chondrosia chucalla de Laubenfels, 1936

Syn. Chondrosia collectrix Lendenfeld, 1888, (nec. C. collectrix Schmidt, 1870.)

This sponge was described by Lendenfeld from Australia in 1888, but the specific name he gave it, collectrix, had earlier been used by Schmidt in 1870 for a different species in the same genus. To correct this nomenclatural overlap, de Laubenfels (1936) gave this species its present specific name, chucalla. de Laubenfels (1951) recorded this species as common in tide pools at Halape, Island of of Hawaii. It also appears to be common around Oahu.

This sponge is unusual in that it lacks both mineral spicules, or a spongin fiber network. Its consistency is derived from a gel of "non-living colloidal material" (de Laubenfels, 1951). Perhaps this lack of spicules and fiber meshwork make this a more palatable (and the gel may make it more nutritious) item than other sponges.

Spongia oceania de Laubenfels, 1950

The spongin meshwork of this species is present, but most of the material surrounding this meshwork is algal. It is not clear whether this represents a spongin meshwork which had (in nature) been overgrown by algae, or a partially digested sponge mixed with algae in the turtles stomach. Probably the former is the case, as the algae seems more intimately associated with the meshwork than mixing would allow. Thus this would not really count as ingestion of this species of sponge.

Mollusc

Brachidontes crebristriatus

A small mussel (family Mytilidae) which grows in beds both intertidally and subtidally. Often intermixed with algae.

Crustacea

Simocarcinus simplex

A common decorator crab (family Majidae) usually found among algae on reef flats and subtidally. Noted as being a slow moving species.

108 Are double Breaths? 3 MAY 1985 - FRIDAY EVENING

COUNTS AFTER DINNER

(Friday night power demand?)

Plume sweeping to the left in front of Block #2 - LARGER than usual - LARGEST I've seen yet -

(5/3)

	HEADCOUNTS
9:10 pm	6
9:11	8
9:12	5
9:13	9
9:14	7
9:15	2
9:16	10
9:17	4
9:18	5
9:19	4

7pm TO the right - near break (on shore wind chop)

6 pm SHIP departure

(5/3)

Carry off TO THE LEFT (on feed?)

CONSECUTIVE START	Left	Pod	Right
7:17 -	6	1 = 7	0
7:18	2	1 = 3	0
7:19 etc	1	4	0
	2	1	0
	2	3	0
	1	0	0
	3	1	0
	HARD TO SEE 0	3	0
	1	2	0
	0	3	0
	can't see → 0 so discontinued	0	0
		2	
		2	
		1	
		3	
		1	

both - add these and enter total

yellows seems in head very visible - + glistening water on the back of head.

	POOL
7:33 -	4
34 -	3
35 -	3
36 -	7
37 -	5
38 -	4
39 -	6
40 -	3

~7:40 pm Keith Kean - DOCARE ARRIVED - Counts discont

(Request more info FROM HIS FATHER)

Bo... Pur... Cha... C...

3
F

5/2

Went to powerplant - light winds.

①	9:37 pm - 26	⑥ 43-12	⑪ 48-20
②	38 - 22	⑦ 44-19	
③	39 - 27	⑧ 45-19	
④	40 - 28	⑨ 46-29	
⑤	41 - 22	⑩ 47-19	

5/2

Counts - 10:06 pm - 0 | 10:10 - 1 | 10:14 - 0
10:07 - 0 | 10:11 - 0
10:08 - 1 | 10:12 - 0
10:09 - 1 | 10:13 -

189.

Turtles - "STAND" OUT when surfacing

(826pm MIDPACIFIC)

(815pm 2 pockets? H2O)

4/10/85 wednesday

725 - - 50' out scum line

732 mid Pacific - overhead

"HOT SPOT"

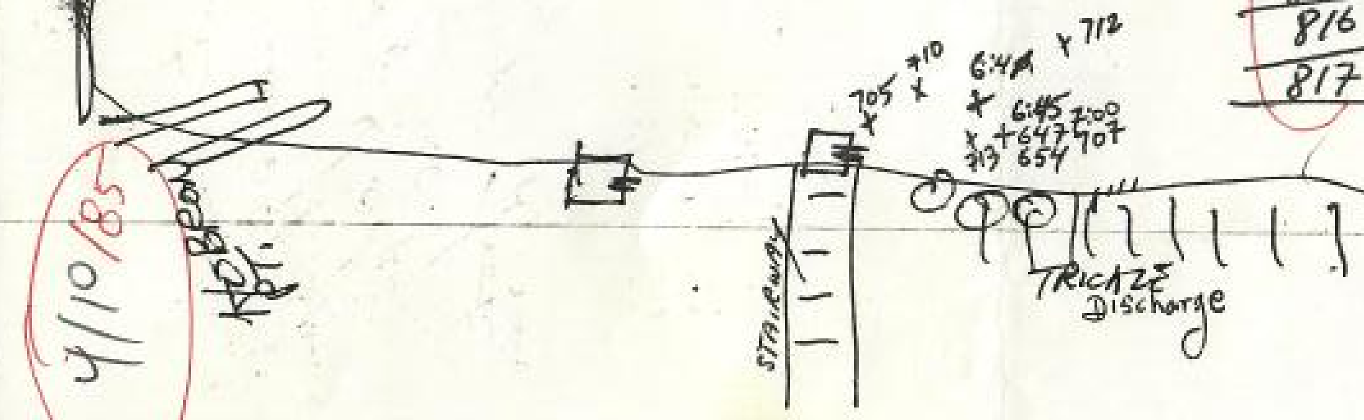
Convert to 24-h clock 7pm = 1900h

start transposing columns go right to left!

Swell dist in against rocks of breakwater.

818 ||| (3)	801 |||| (4)	740 - |||||| (6)	714
819 |||| (4)	802 |	741 ||| (3)	715
820 ||||||| (7)	803 |	742 - || (2)	716
821 |||| (4)	804 |||||| (6)	743 - || (2)	717 - (2)
822 |||||| (6)	805 - || (2)	744 - ||| (3)	718
823 |||||| (6)	806 - || (2)	745 |||||||| (8)	719 - (2)
824 |||||| (6)	807 ||||| (5)	746 ||||| (5)	721 - (2)
825 ||||| (5)	808 || (2)	747 |||| (4)	722 (2)
826 ||||| (5)	809 ||| (3)	748 |||| (4)	723
827 ||| (3)	810 |	749 (4)	724 (2)
828 ||| (3)	811 |||| (4)	750 - ||||| (5)	724 - 1
829 || (2)	812 ||||||||| (9)	751 ||| (3)	725 (3)
830 |||||||| (8)	813 || (2)	752 ||| (3)	725 - 1
	814 |||| (4)	753 || (2)	726 - 1
	815 |||| (4)	754 |||||| (6)	727 (2)
	816 ||||| (5)	755 ||||||| (7)	728 (2)
	817 ||||| (5)	756 ||||||||| (9)	729 - 2
		757 || (2)	729 (4)
		758 ||| (3)	730 (2)
		759 ||||| (5)	731 (3)
		800 ||| (3)	731 (3)
			732 (2)
			733 (2)
			734 (2)
			735 (2)
			736 (3)
			737 - 1
			737 (4)
			738 - 2
			738 - 1
			739 (2)
			739 (2)

PAU



4/10/85

BACON 84

4/10

1105- IIII (3)
1106-1
1107-IIIII (5)
1108-IIII (4)
1109-
1110-II (2)
1111-~~IIII~~ (5)
1112-III (3)
1113-IIII (4)
1114-IIII (4)
1115-1
1116-II (2)
1117-II (2)
1118-III (3)
1119-1
1120-IIII (4)
1121-1
1122-IIII (4)
1123-1
1124-III (3)
1125-~~IIII~~ (5)
1126-III (3)
1127-III (3)
1128-1 Returning of Notes
1129-1
1130-III (3)
1131-1
1132-1
1133-IIII (4)
1134-II (2)
1135-II (2)
1136-II (2)
PAV

MAUi

4/11

bathroom
hose
gate
park

NAIC/mpe Clock CLEANING Station?
Dark Gloves
MANINI present

(Has swell)
Light wind (from shore) & swell down.

More Flood lights at Matson ON TONIGHT?
Car Lights bright!

6:58 pm 1 small (To the right)
659 1 same? (Light came on)
705 - 1 same?

709 1
710 1
715 - 11 (2)
717 - 1
719 - 11 (2)
720 - 1
721 - 1
722 - 11 (2)
723 - 1
724 - 11 (2)
726 - 11 (2)
727 - 1
728 - 11 (2)
729 - 1
730 - 1
731 - 11 (2)
733 - 111 (3)
734 - 1
735 - 1
736 - 111 (3)
739 - 11 (2)
741 - 11 (2)
742 - 1
743 - 1
744 - 11 (2)
747 - 1
748 - 1
749 - 1
750 - 11 (2)
752 - 1
753 - 1
754 - 1
756 - 1
758 - 1
759 - 1
800 - 1
801 - 111 (3)
803 - 1
804 - 1

805 - 1
806 - 1
807 - 1
808 → 3' Shark by stairs outflow
810 - 11 (2)
812 - 11 (2)
814 - 11 (2)
815 - 11 (2)
816 - 1
819 - 1
820 - 1
821 - 1
822 - 1
823 - 1
824 - 111 (3)
826 - 11 (2)
828 - 1
829 - 1
830 - 1111 (4)
831 - 11 (2)

DINNER

932 - 1 most further to the right
933 - 11111 (5)
934 - 111 (3)
935 - 1111 (4)
936 - 1111 (4)
937 - 1
938 - 11111 (5)
939 11 (2)
940 - 1
941 - 1111 (4) Alot seem small tonight
942 - 1
943 - 111 (3)
944 - 11 (2)
945 - 1
946 - 11 (2)

Fishermen to the right

947 - 111 (3)
948 - 111 (3)
949 - 1111 (4)
950 - 111 (3)
951 - 1
952 - 11 (2)
953 - 111111 (6)
954 - 11 (2)
955 - 1111 (4)
956 - 1
957 - 𝍸 (5)
958 - 1
959 - 111 (3)
1001 - 11 (2)
1002 - 1111 (4)
1004 - 1111 (4)
1005 - ∅

faint twilight ~~OSIT TO PLANT~~
523 - ∅
524 - ∅
↓
605 ∅

FRIDAY 4-12-85
LEGS
Discharge present

4/12 FRIDAY - 6:15Am Depart after looking for foraging turtles. None seen. No surf, no wind - calm seas. No fishermen

~10Am
Center, most easterly discharge 31°C.
One by steps 30°C+

Reef Collection #2 6-1-1985 Palaau, Molokai

Spyridia filamentosa
Caulerpa sertularioides
Dictyota crenulata
Laurencia nidifica
Chondria tenuissima
Halophila ovalis

Reef Collection #2 5-3-1985 Waikane, Molokai

Spyridia filamentosa
Halimeda discoidea
Laurencia carolinensis

Molokai Reef Sample 4-85

Hypnea cervicornis
Sargassum polyphyllum
Laurencia nidifica
Spyridia filamentosa

Maui Assortment (reef collection) May 1985 ✓

Codium edule
Hypnea musciformis
Amansia glomerata
Bryopsis pennata
Pterocladia capillacea
Chrysymenia glebosa
Heteroderma subtilissima (epiphytic on Pterocladia)

H_2S Smell from?
Smelled on steps.

EARL HELM SAYS IT'S FROM ELSEWHERE - POSSIBLY SEWAGE TREATMENT

6 MAY
MONDAY

5/6

POWER PLANT HEAD COUNTS

7:47 pm	7	7:53	4
:48	2	54	3
49	3	55	3
50	10	56	4
51	5	57	4
52	5		

Light wind - RAW CLOUDS "POOL" slightly to the right.

---

8 MAY 85
WEDNESDAY

POWER PLANT OBSERVATIONS - ARRIVE 8:10pm

HEAD COUNTS

5/8

8:23	7	8:28	5
:24	9	:29	4
:25	6	:30	4
:26	5	:31	3
:27	3	:32	5

THURSDAY
9 MAY 85

Powerplant

HEAD COUNTS

5/9

8:46	12	8:51	6
47	17	52	7
48	6	53	10
49	9	54	14
50	9	55	12

6/17

Counts made by Robert and I: MOUTH INSIDE NET, OUTSIDE POOL PLUME

9:35 pm	- 3	9:40	- 5	
:36	- 3	:41	- 7	9:45 - 4
37	- 6	:42	2	
38	- 2	:43	3	
39	- 7	:44	5 (Hit net) THIRD	

(3)

HEAD

8:48	-4		-2
8:49	1		-2
850	0		-7
851	4		4
852	1		2

6/18

Overcast.

6/17

11:38 pm	- 0	11:43	- 4
:39	- 5	:44	- 2
40	- 2	45	- 3
41	- 3	46	- 5
42	- 4	47	- 6

HEAD COUNTS

5/5

7:45pm - 1	7:49 - 1	7:53 - 5
46 - 3	:50 - 0	7:54 - 1
47 - 1	:51 - 3	7:55 - 4
48 - 0	:52 - 1	

6/19

9:28pm - 7	9:34 - 9	4-5 minutes apart
29 - 10 } note	35 - 8 } note	
30 - 10 }	36 - 4	
31 - 2	37 - 4	
32 - 3	38 - 1	
33 - 4		

18 JUNE 85
TUESDAY

33

HAD Lights turned on ~ 9:25pm ~est. 5 minutes to full intensity

HEAD COUNT

6/18

9:34 - 4	39 - 3
35 - 2	40 - 3
36 - 5	41 - 3
37 - 0	42 3
38 - 1	43 - 1

6/19

	ELSEWHERE		POOL		
11:44pm -	6	+	9	= 15	Robt - odd these plans
45 -	3	+	4	= 7	
46 -	4	+	5	= 9	
47 -	8		9		
48 -	8		7		
49 -	5		5		
50 -	1		11		
51 -	3		5		
52 -	5		5		
53 -	8		11		

17 JUNE 85
MONDAY

Alan had walked to the right while Robert and I did counts. He didn't see any.
Turtle heads also seen just outside net.
Some heads very close to net.
Conclusion: Turning off step light, (net set in milky H2O NO moon), allows turtles to come in even though net is there. However, something (light off?) is keeping turtles from coming right into flume pool.
CHANGE) more important than attribute itself?

(5) 10:05pm - splash hit and capture.
BREATH - HOLD
Counts on this turtle while in net:
(ALAN & I) (LAY ING AT REST?

6/17

11:01-35 > 45 sec
11:02-15 > 55
11:03-10 > 1:50
11:05 > 2:30
11:07-30 > 4:00
11:11-32 > 2:03
11:13-35 > 4:45
11:18-20 > 1:05
11:19 35 > 3:40
11:23-15 > 1:45
11:25-00

Note - No close "double" breaths. Relate about to counts previous made with disturbance.

LIST OF SPECIES IDENTIFIED IN THESE SAMPLES:

CHLOROPHYTA

Bryopsis pennata Lamx.
Enteromorpha tubulosa Kützing
Halimeda discoidea Decaisne
Pilinia rimosa Kutzing
Ulva fasciata Decaisne
Valonia aegagropila C. Ag.

PHAEOPHYTA

Dictyopteris plagiogramme (Mont.) Vickers
Dictyota acuteloba J. Ag.
Dictyota divaricata Lamx.
Dictyota sp.
Sargassum polyphyllum J. Ag.
Sphacelaria furcigera Kützing
Sphacelaria tribuloides Meneghini
Sphacelaria sp.
Turbinaria ornata (Turn.) J.Ag.

RHODOPHYTA

Acanthophora spicifera (Vahl) Boerg.
Acrochaetium sp.
Amansia glomerata C. Ag.
Centroceros clavulatum (C.Ag.) Montagne
Ceramium sp.
Chondrococcus hornemanni (Mert.) Schmitz
Gelidium sp.
Gelidiella sp.
Griffithsia rhizophora Grunow
Griffithsia sp.
Hypnea cervicornis J. Ag.
Hypnea musciformis (Wulfen) C. Ag.
Hypnea nidifica J. Ag.
Hypnea sp.
Hypneocolax stellaris J.Ag.
Laurencia nidifica J. Ag.
Laurencia sp.
Nemalion sp.
Polysiphonia howei Hollenberg
Polysiphonia scropulorum Harvey
Polysiphonia setacae Hollenberg
Polysiphonia tsudana Hollenberg
Polysiphonia sp.
Spyridia filamentosa (Wulfen) Harvey
Wurdemannia sp.

CYANOPHYTA

Calothrix sp.
Lyngbya majuscula Gomont
Lyngbya semiplena (C.Ag.) J.Ag.
Lyngbya sp.
Oscillatoria sp.

SEAGRASS

Halophila ovalis (R. Br.) Hook

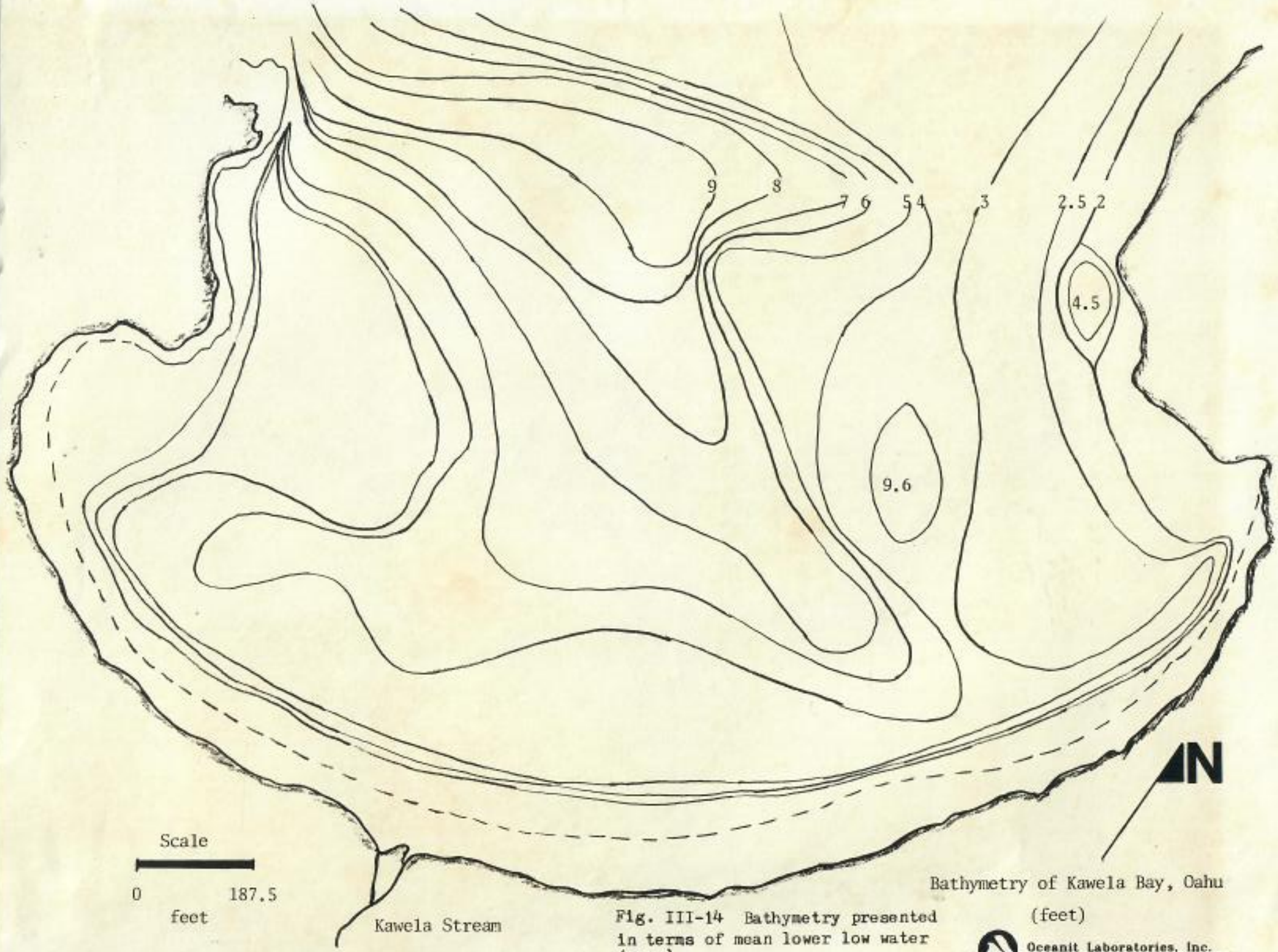


Fig. III-14 Bathymetry presented in terms of mean lower low water (MLLW).

Oceanit Laboratories, Inc.

KAWELA BAY:

Development plans for the once-tranquil community on Oahu have stirred up emotional issues: preservation of lifestyle, unemployment, over-employment and—of course—ecology

Honolulu

The family was gathering for a large weekend revel. Aunts, uncles, cousins—all the generations coming together. Usually I enjoyed these congregations of the family. There would be masses of food, music, games and the great lauhala mats spread on the lawn near the sandy beach. Someone would make a bonfire and the talk would begin. I would sit at the edges of the inner circle of elders as they ruminated on past events. Old chiefs, kings, queens, great house parties—scandals and gossip of one sort or another would billow up from the central core of adults and leap into the air like flames . . . I heard of this carriage or that barouche or landau, this house or that garden, this beautiful woman in love with so-and-so, or that abiding "good and patient" soul whose handsome husband dashed about town in a splendid uniform, lavishing on his paramour a beautiful house, a carriage and team . . . O, the tales that steamed up from those gatherings on lauhala mats at Kawela's shore!

From *Princess of the Night Rides and Other Tales* by John Dominis Holt

Kawela Bay has almost a magical hold on those who have lived on its beach-fringed shore.

John Dominis Holt, whose family once retained the fishing rights to the bay, remembers Kawela as a very remote place, very empty, with almost no trees. The periphery of the bay consisted mainly of rock outcroppings. Hawaiian fishing shrines, where fishermen prayed before going out to sea and where they returned offering the first catch in thanksgiving, dotted the area.

For generations, the bay has maintained its own brand of exclusivity. According to John Clark in his book *The Beaches of Oahu*, in ancient times it was the private lobster grounds for Hawaiian chiefs. Later, small beach cottages provided weekend and summer retreats for employees of Campbell Estate and Kahuku Plantation. The sheer distance from Honolulu made excursions to the bay infrequent events even for those who were familiar with its pristine beach. While other areas on Oahu were yielding to the pressures of a burgeoning population and a rapidly expanding tourist industry, the bay's natural and manmade buffers hid its calm, protected waters from outside eyes.

Now the solitude and anonymity are being threatened. A neighbor, the Turtle Bay Hilton and Country Club, wants to expand into Kawela Bay.

Stormy or Fair?

By Tom Yoneyama

Kawela Bay (upper left corner of photo) is located practically next door to the Turtle Bay Hilton and Country Club, which sits on Kuilima Point (center of photo).

A classic confrontation between developer and anti-development factions—a drama witnessed many times in the Islands since statehood and the rise of tourism—seems imminent. At odds are desire for economic growth and concern for the area's rural lifestyle and the environment.

Unlike past confrontations, however, this showdown between developer and community has yet to break out into a full-fledged storm over Kawela Bay. To be sure, there have been rumblings. But they have been nothing like the outcry that erupted when developers went into Nukolii on Kauai.

The bay and much of the land around it currently belongs to Prudential Insurance Company of America. The Kuilima Development Co., a Hawaii-based subsidiary of Prudential, is in the process of requesting land-use changes to accommodate its plans for expanding the present Turtle Bay Hotel (formerly the Kuilima Hotel) and creating a major resort complex with additional hotels, parks and recreational amenities. Around Kawela's shoreline, the company plans to construct two 500-room hotels and a 4.8-acre public park. Farther back adjacent to Kamehameha Highway, plans call for 40,000 square feet of commercial space for shops and restaurants. (See accompanying story, "Developing a Piece of the Rock.")

The Kawela Bay community consists of two groups of residents. Those living on the western (Sunset Beach) side of the bay own their property in fee. Those along east Kawela Bay lease their property from the Kuilima Development Co. and have had their leases extended on a month-to-month

Tom Yoneyama is a free-lance writer whose last HONOLULU feature, "Preschool Panic," appeared in the March 1984 issue.

Aerial photograph courtesy Group 70

basis for the last four years. Some of these families utilize their homes essentially for beach cottages. Others consider Kawela their permanent home. If Prudential receives all the necessary approvals to develop the area, the families on the east side will have to vacate.

It is, of course, not the first time the residents have been confronted with the possibility of a major resort development in their midst.

In 1972, Del E. Webb Corp. opened the Kuilima Hotel at Kahuku Point, just down the beach from Kawela Bay. Prudential bought out Del Webb's interest in 1976, and contracted Hyatt to manage the hotel. Two years ago, Hilton took over management, and refurbished and re-named the hotel the Turtle Bay Hilton and Country Club.

Over the years, the hotel has had frequent periods of low occupancy. In a study done for Kuilima Development, the Robert Charles Lesser & Co., a real estate market research consultant, concluded that the present hotel does not provide the right combination of services and amenities to become a successful major resort destination.

Continued on page 71

DEVELOPING A PIECE OF THE ROCK

The Kuilima expansion—will it be a resort with parks or a huge park system with resort amenities? The planners for Prudential envision the latter.

"While we are designing what is essentially a resort, the plan establishes 90 percent of the project as open space," says Francis Oda of Group 70, the planners for Prudential's Kuilima expansion project.

"It can just as readily be seen as a very large park—a park in the European sense of the word. In Europe, parks are not just open spaces. They have facilities for staying overnight, for dining, and for a variety of recreational activities. And the parks are not just reserved for tourists, but are there for the entire community.

"That's how we see the proposed development at Kuilima: as a recreational park where people can go to restaurants, play golf, swim, surf, see natural habitats and wildlife, jog, bike and shop.

"We feel that a low-key, low-density resort is more appropriate than one similar to Kaanapali—which, by the way, is a very successful resort. Our whole thought while planning the project was to create something that could only be created on Oahu's North Shore. We recognize that the North Shore is a unique place because of its rural lifestyle. In fact, when you think about it, it's amazing that it still exists with its close proximity to urban Honolulu."

The property sits along an 808-acre corridor makai of Kamehameha Highway, stretching from Kawela Bay to Marconi Road, east of Kahuku Point. The Kuilima master plan divides the resort into two major sections. On the west end (toward Sunset Beach), two 500-room hotels would front Kawela Bay, rising with staggered roof lines to 90 feet. A 350-room, low-rise hotel would be located midway between Kuilima Point and Kahuku Point. In addition, 100 cabanas along Kaihalulu Beach would increase the capacity of the present Turtle Bay Hilton.

With Kawela Bay and Turtle Bay as its core, the west end would also include a 4.8-acre park, the existing golf course and a 40,000-square-foot commercial center located next to the highway. The shopping complex would feature regional products such as arts and crafts, as well as agricultural and aquacultural products of the North Shore. An informal "country" boulevard would broadly loop through the property's west end. This part of the resort would focus on active recreation and emphasize "resort-related" amenities.

Group 70's version of a resort "that could only be created on Oahu's North Shore."

The east end (toward Kahuku) of the resort is being designed with a more rustic character, with lower densities and emphasis on passive, outdoor recreation. A number of condominium and townhouse units would be scattered throughout the Kahuku end of the property. The area would sport a second golf course, designed by Arnold Palmer, a golf clubhouse with restaurants, convenience shopping and athletic facilities. Four parks (two public and two private), a marsh preserve and a stable would reinforce the ranchlike setting. An existing dune area and ironwood forest would be preserved, as would the 106-acre Punahoolapa Marsh located at the Kahuku end of the property. Much of the marsh is currently overgrown. To enhance the wetland habitat for the native Hawaiian birds that frequent the area, the master plan proposes to:

- Construct a moat around the marsh and add a 6.2-acre buffer zone to the boundary.
- Construct additional open waterways and islands on those waterways.
- Fill about 13 acres of marginal marshland along its perimeter.

"There's been a lot of environmental concerns directed at Kawela Bay," says Oda. "But here you have more than 100 acres of very significant marshlands which we are proposing not only to preserve but to create into a wildlife sanctuary.

"The ecology of the area is just as important to us as part of the total package we want to develop," declares Oda. "It would make no sense for us to destroy these marshlands or Kawela Bay. The wildlife and natural surroundings can only enhance our product. And this is true of the North Shore community that we want this resort to be a part of. Resorts can no longer exist as entities outside the social context of the community. Resorts cannot exist in communities that are separate or even hostile to them."

Prudential's plans may sound good and look great on paper. But master plans, like municipal general plans, have a way of changing before they leave the drawing board. In the end, will Kawela Bay be just another piece of Prudential's corporate rock? Or will it indeed be a major innovation in resort development unique to the North Shore? —T.Y.

Project map courtesy Group 70

Kawela Bay

Continued from page 50

Bob Moncrief, who is an ecologist with the Army Corps of Engineers and who owns a beach house on the Kahuku side of Kawela, sees another reason for the hotel's difficulties.

"I've seen the weather over a 40-year period and I don't think it's what the average tourist wants," says Moncrief, referring to the strong winds and rain squalls that frequently hit the area.

"The day they took Del Webb and his entourage out to Kahuku Point to determine the site of the hotel, it was one of those beautiful days with no wind and no surf. The chopper landed right out there, and they must have thought what a perfect place to put a hotel. And they put it there without any regard for the weather pattern.

"And now they just sank a whole mess of money into refurbishing the hotel which isn't really that old. All the railings were totally corroded and eaten away by the salt air, and they'd had innumerable maintenance problems due to the environment. Maybe they can afford refurbishing hotels to the tune of millions of dollars every few years, but I don't think that is good planning."

Prudential feels otherwise, of course. And besides devising what it feels is the best plan for the area, the insurance company must work within government guidelines as well.

There are essentially two basic planning documents utilized by city agencies: The General Plan is a broad policy document which addresses 12 areas of concern including economic, environmental and population planning. The regional Development Plans (including the Koolauloa plan) outline specific land-use designations. Each Development Plan is reviewed annually by the city's chief planning officer who recommends changes, through the Planning Commission, to the City Council. The council, in turn, votes on those amendments and passes it on to the mayor in the form of a city ordinance for his signature.

Amendments to the Koolauloa Development Plan during this year's review included land-use changes that would permit Prudential to construct 4,000 hotel units and convert 375 acres of agricultural land primarily to resort (140 acres) and park (194 acres)

uses. They would eliminate 17 acres from residential use, and add 11 acres for commercial use and 24 acres for preservation. In addition, Prudential requested the minimum shoreline setback for Kawela (and other unidentified sites within the master plan) be changed from 300 feet to 100 feet.

In January, the city Planning Commission held public hearings on the proposed changes, then recommended approval.

During the hearings process, several commissioners had questioned why Prudential never initiated construction with the 2,000-unit allowance granted by the existing Koolauloa Development Plan. (Prior to this year's review, the Development Plan had designated part of the Kawela area as resort and allowed for 2,000 hotel and apartment units.)

Prudential contended that in order to create a successful resort destination and justify the company's share in infrastructure costs, a minimum number of hotels, amenities and services need to be provided. This "critical mass," Prudential said, can be accomplished by raising the total allowable number of hotel units to 4,000.

Prudential's justification for its reduced-setback request included assurances that free public access to the bay would be guaranteed and that the hotel at Kawela would minimally take advantage of the reduced setback through a "fingerlike" design in which only the tips would touch the 100-foot bounds.

Even lukewarm acceptance from a community with a history of strong opposition to any development would have been seen as a victory. But testimony at the hearings was overwhelmingly *in favor* of Prudential's plans. One major reason is the banner that Prudential waved in courting the various community groups: jobs.

At all the public hearings, individuals lined up to testify in behalf of the proposed development, pointing to the jobs the project would create. Said one Neighborhood Board member: "How can you argue with someone who is saying they can provide jobs, particularly in a historically disadvantaged and economically depressed area? They [Prudential] are dangling a carrot that our people find very hard to resist."

Ellie Nordyke is one resister. A researcher for the East-West

Population Institute since 1969, she and her husband share a home with another family on the east side of Kawela Bay, and have used it as a beach cottage since 1964. Nordyke contends that Prudential's development plans will provide *over*-employment for the surrounding communities and consequently will lead to in-migration into the area. She says that two neighboring communities adjacent to the development show a "deficit of unemployment."

"Economists usually agree that any figure below 5 percent unemployment constitutes full employment," notes Nordyke. "Although Kahuku does have a 7 percent unemployment rate (of the civilian labor force), it is only slightly higher than the state average. Haleiwa's unemployment rate is only 1.2 percent, and Hauula's is 4.1 percent."

She maintains that the development would create more jobs than the residents of the surrounding communities could fill. This excess of jobs, she says, would produce in-migration, speeding up population growth and urbanization of an area (Koolauloa) that the city's own General Plan seeks to keep rural.

"What is the point of spending all that time and money to establish guidelines if we turn around and ignore them at the implementation stage?" asks Nordyke.

John Knox of Community Resources Inc. (an outside firm that is analyzing the social impact of the project for Prudential's Environmental Impact Statement) disagrees with Nordyke's over-employment picture. At the Planning Commission's public hearing at Haleiwa, he testified that both the North Shore and the Koolauloa regions need new employment sources.

He reported that both areas have higher unemployment rates and lower labor force participation rates than the rest of Oahu. In addition, one-fourth of the employed residents of the area have to commute 45 minutes or more to get to work.

The 1983 reopening of the Turtle Bay Hilton seems to bear out his contention. When the North Shore Career Training Corp. conducted interviews for the 375 Turtle Bay Hilton jobs, more than 2,500 people applied. (The North Shore Career Training Corp. is a private, nonprofit agency that has been working since 1977 to reduce unemployment on the North Shore.)

"We were there one evening until 1:30 a.m.," recalls Raymond "Buddy" Ako, a board director of the agency and a community relations specialist for Kuilima. "Those who are saying that the jobs the expansion will create will not be needed were not among the 2,000 people who stood in line for the Turtle Bay jobs. We heard applicant after applicant tell us, 'I don't care what the pay is, I want this job.' And more than 97 percent of the applicants were from the region. Ask the people who know, those who have to help the unemployed find jobs. They'll tell you. We need jobs."

Says Norman Quon, project manager for Kuilima Development Co.: "If you look at the history of Kuilima, you'll see that jobs are the very reason for its existence. The main reason the hotel was created was to take up the employment slack when Kahuku Plantation shut down and the mill closed."

There is another reason why the storm surrounding Prudential's expansion plans has not been as violent as it could have been.

About two years ago when Prudential first came out with its most recent plan to continue development of its Kahuku property, it was "blasted out of the water," as one planning commissioner put it. Community group after community group testified against the plan. The Kuilima people backed off and regrouped.

A year later, at the Planning Commission's hearings with the Koolauloa and the North Shore Neighborhood Boards, many community associations reversed their positions and came out in favor of the project.

Opponents of the project say the associations had been wined and dined and promised the sky. Officials of Kuilima say they had merely done their homework.

The campaign to promote the expansion project centered around an organization called the Kuilima/North Shore Strategy Plan Community Advisory Committee. It consisted of representatives of community from Waialua to Kaaawa, and North Shore/Koolauloa businesses and government. It was organized by Kuilima and headed by Norman Quon.

"In the past, developers would plan a project, then take it to the community and say here it is," says Quon. "Communities were faced with only two options: to accept the project at face value or voice opposition. The relationship between developer and community was strictly confrontational. It is no longer the best way to plan a project. It never was, for that matter.

"Through this committee, we wanted to bring the various community factions into the planning process. We were breaking new ground. No one had ever attempted this on such a scale or for such a major project. We were honestly trying to bring people together in order to have dialogue during the planning process. We conducted monthly meetings for almost a year with anywhere from 50 to 100 representatives in attendance. No point was non-negotiable; no issue was closed."

Quon cites the park proposed for Kawela Bay as a good illustration of how the committee affected the planning process. The initial master plan had provided for a 2-acre park on the bay and another 2 acres set across Kamehameha Highway for parking. The committee felt that the park size was too small and was concerned about the safety of pedestrians crossing the highway from the parking area. Consequently, the park was redesigned, increasing its size to 4.8 acres and providing rights of way—with parking—to the beach.

"That was a major shift by the developer," contends Francis Oda of Group 70, planners for the Kuilima project. "4.8 acres is about the size of Swanzy Beach Park and signaled a major concession on the part of Prudential. The whole process with the committee was an incredibly democratic one."

In March, the City Council conducted its hearings. The meetings were held at Kahuku High School, where more than 70 speakers gave testimony on the project. Nearly 400 people sat through the three-hour session. In contrast to public hearings conducted by the Planning Commission, the testimony at the City Council hearing was more mixed.

Opposition to the project focused on environmental and social issues. Opponents pointed out that these concerns had not been answered sufficiently since no Environmental Impact Statement had been filed.*

One problem brought up by a number of residents was Kawela Bay's vulnerability to tsunamis. They

pointed to the damage inflicted by a tsunami that had rolled into Kawela Bay in the '40s, and questioned whether any hotel could adequately safeguard the lives of its guests in the event of such a disaster.

Prudential asserted that it had made adequate allowances for tsunamis by designing the first floors of the Kawela Bay hotels above 17 feet—as required by federal law—and by creating a non-habitable, "blow out" zone beneath the hotels.

Two other major concerns brought up at the hearing were public access to Kawela Bay and what that access could mean to Kawela's relatively untouched environment.

James Lam is not a resident of Kawela Bay. Lam is a retired state land agent who stumbled upon Kawela several years ago while spending a weekend at the Turtle Bay Hilton. Since last November he has doggedly led a one-man campaign to ensure that development of the bay does not preclude public access to Kawela.

Ideally, he would like to see the bay turned into a marine sanctuary like Hanauma Bay and the entire shore front dedicated to a park. With more than 3,300 lineal feet of sandy beach and more than 40 acres of surface water, the bay contains more usable shoreline frontage and swimming area than Hanauma Bay, according to Lam.

In a report to the 1978 state Legislature, the bay was targeted by the Department of Land and Natural Resources as a potential underwater marine park. However, no further evaluation was made because it fronted private property and there was no public access to the bay.

"As a land agent for the state I've seen a number of choice beachfront properties developed over the years, particularly on Maui and the Big Island," says Lam. "Time and time again, I've seen local people squeezed out of these areas. First Waikiki, then Wailea, and now it looks like it'll happen again at Kawela Bay."

He is not reassured by Prudential's plan to provide public rights of way to the beach with parking areas as well as a park. He points to the Turtle Bay.

"And will those parking areas later be closed off for security reasons," he asks, "with a guard gate and toll booth as it is there? How free will your access be then—a dollar per half-hour? Sure you can go to the beach at Turtle Bay. But how many local people go, unless they happen to be there as paying guests of the hotel? You can go to the beach at Wailea on Maui too. But there the townhouses are pushed right up to the shoreline. How comfortable would you feel at Kawela Bay with a hotel 100 feet from the shore? There are other subtler ways to prohibit someone from enjoying a beach than blatantly putting up private property signs. They've done it throughout this state."

Lam feels that legal guarantees should be established for public access before Prudential is allowed to build.

"The bay's calm waters and sandy beach offer the only major safe

*The Environmental Impact Statement is required when Prudential submits its rezoning request, a step which comes after action on the Development Plan. For amendments to the Development Plan, the city's Department of Land Utilization requires an Environmental Assessment; according to Robin Foster, the DLU's chief of the Environmental Affairs Branch, Prudential fulfilled this requirement last October when it filed a notice of preparation for an EIS.

swimming area along that entire North Shore," he says. "It's a rare jewel that should be preserved for all people."

Other Kawela residents are worried that the developers might alter the bay in order to create a more attractive resort setting. Barry Blomfield, a Waialua fireman and part-time commercial fisherman who lives on East Kawela Bay, worries about the possibility of the developers' dredging the bottom of the bay.

"Kawela's beach is sandy," says Blomfield, "but you go out about 3 feet from the shoreline and the bottom consists of coral, rocks and caves. It's perfect for fish habitat but it might be less than ideal for what Prudential has in mind."

According to Group 70's Francis Oda, the developers *are* looking at ways to remove some of the silt that has built up on the bottom of the bay, but he adds that any method (including dredging) will be evaluated in terms of its effect on the bay's overall ecology.

As it turned out, the City Council did approve all of the Development Plan changes affecting the Turtle Bay expansion. The council's action now allows Prudential to seek the rezoning and special-use permits necessary for the project. Council approval of the Development Plan changes is only the first step in a complex permit process that the developer still needs to hurdle, but it is a major step.

Examining the project one step at a time seems to be the course of action taken by one community group. The Koolauloa Neighborhood Board has given Prudential's resort plans a partial OK. Says board Chairman Creighton Mattoon, "The Kuilima expansion is such a massive project that we tried to break it down to its elements, such as setback requests, height limits, land-use changes. In general, the board supported a gradual phasing in of the project in increments, with a wait and see attitude on how the first phase goes."

The board's endorsement of the first phase was not unanimous. Several community associations represented on the board were opposed to the Kawela development.

"We've been going through these hearings for a number of years now," Mattoon points out, "and addressing several Environmental Impact State-

ments. Prudential's plans have changed with the change in project director, but the current plan seems to be their most ambitious and comprehensive one.

"However, they still need to get approval through every step of the permit process. That's why the board has taken the position to at least look at the development incrementally."

That position, according to one North Shore resident and a longtime activist for area concerns, signals a significant change in attitude toward developers in general.

"All development can no longer be viewed as being automatically bad, just as the status quo cannot be assumed to be automatically good for the community," he says. "It has been a hard lesson for the North Shore/Koolauloa people to learn. Many of us have still to learn this. And you can't blame us, because we've been burned so often in the past . . . not just on the North Shore, but all of Hawaii's people."

Talking with Kawela Bay residents who face eviction if Prudential's plan is approved underscores his point. They describe the good times, growing up along the shores of the bay, the lessons learned, and the fear that their children might not enjoy similar good times. But some express acceptance of change and its inevitability.

Jeanie Kotubetey's family has had a house on Kawela Bay since 1959; she lives there now with her 6-year-old son. She remembers the tranquillity of the place and its residents. "We've had a lot of gatherings, memorable ones, out here at the bay," she recalls. "Hula retreats, graduation luaus . . ." Her voice softens.

"The bay will not be the same whichever way it [the development] goes. I know that. Most of us do. But you know, if the bay was at least preserved—maybe made into a park—then at least it could still be appreciated in the manner in which we appreciate it and have come to love it. That would be nice."

The future of Kawela Bay may not be as bleak as the initial storm warnings indicated. Prudential is listening to and considering community concerns. And some North Shore leaders believe that this attitude marks new thinking by at least one developer of vacation resorts in Hawaii. Maybe this time there'll be no losers.

HONOLULU MAG. NOVEMBER 1985

LETTERS

STILL CLOUDY

I am writing in reference to the article on Kawela Bay in your July issue ["Kawela Bay: Stormy or Fair?"]. Tom Yoneyama's article was relatively unbiased and covered the broader aspects of the issue. I feel, however, that he missed many important (and more subtle) points relating to this topic. I would like to briefly address two of them.

The first point concerns the importance of Kawela, and the adjoining Turtle Bay, as a habitat for the Hawaiian green sea turtle. A study is presently being conducted by the National Marine Fisheries to determine to what extent the bays are utilized by green sea turtles. It has been found that at night, these animals feed on seaweed in the shallow waters of the bays, and during the day they sleep on the bottom a short distance from shore. Green sea turtles are completely protected in Hawaii under the U.S. Endangered Species Act. It would be a crime if Kuilima Development Co. and Prudential are allowed to pursue actions such as dredging the bay that would destroy the green turtles' habitat and drive them from our shores.

The second point concerns the relationship between the developers and the community. The developers claim the community is actively involved in their planning process. Yet, the community has no power to make decisions or changes concerning such things as number of hotel rooms or location of hotels. Norman Quon states otherwise, but the fact is many points are non-negotiable and many issues are closed. Although the developers are making an attempt to communicate, there is no real delegation of authority or active give-and-take decision-making going on. Until that happens, what the members of the North Shore Strategy Plan Community Advisory Committee really do is serve as community participation tokens.

TERRY J. WALKER
Kawela Bay

■ Regarding your article about Kawela Bay—I wish someone in Hawaii would stop all this so-called "progress" in the name of "tourists."

I recall a few years ago they said they would stop high-rises and start making it look like "Old Hawaii." I've been there many times, on all your islands, and I have friends and family there. Your legends—your land—your people—are precious and should be kept so. Otherwise, while you're chipping away here and there, one of these days you will look up and wonder where it all went. Suddenly it won't be there.

My youngest grandson was born there a year ago. I'd love to see him be a real Hawaiian—I hope his mom realizes what a precious heritage he really has.

The developers make it sound good, but as the article says, plans have a way of changing before they leave the drawing board.

Keep Hawaii for the people—not for tourists.

ROSE GREEN
LaCrescenta, Calif.

COMPASSION FOR CHING

I've spent a fair amount of time in Honolulu. I'm a bit of a political animal, and I'm interested in social issues. So, those letters in the May issue from readers who were upset about Ronnie Ching ["Lunch with a killer," March] really made me wonder what kind of people live in Hawaii today. Such a complete lack of compassion coupled with a fortress mentality. And no, I don't advocate that the Ronnie Chings of the world be turned loose on society, but he is a human being, and he was a medic in prison, and that in itself shows he is capable of real human feelings, as bad as his crimes were.

There is no way HONOLULU Magazine should shy away from presenting controversial material. Otherwise, you might as well close up shop and print nothing but sugar-coated stories of la-la land.

As a matter of fact, Ronnie Ching comes across as much more real and human than Roger Mosley. Mosley gave off such bad vibes that he nearly spoiled your April issue for me.

Keep on being *real*.

MIKE CLANCY
Oshawa, Ontario
Canada

SYMPHONY SALVOS II

Upon learning about firing of five musicians of the Honolulu Symphony, I wrote a letter to Mr. Vogel suggesting an objective investigation instead of defending Mr. Johanos. I received a circular letter addressed to all symphony subscribers from Mr. Vogel justifying the firing.

After reading the article by Ted Kurrus ["The Honolulu Symphony's Discordant Melody," August], I am convinced that the board of the Honolulu Symphony must take drastic measures if this city is to maintain the orchestra.

MUNEYUKI NAKANO

■ As a reader of your magazine for many years, I have appreciated the lack of sensationalism, the general objectivity and fairness which I took to be in some sense your editorial policy. It was quite a shock, then, to read the recent article on the Honolulu Symphony by Ted Kurrus.

It is totally obvious to anyone who reads the dailies that the orchestra has had its problems in recent years, but I would have hoped for a more rational and constructive discussion of them from your publication. Such a badly biased and negative article can only add to the confusion and exacerbate the problems, when the reverse is needed.

MICHAEL M. STROUP

■ I was very pleased to see the article "The Honolulu Symphony's Discordant Melody" in the August issue of HONOLULU Magazine. I had meant to write to you then and commend you for your courage in publishing the story.

I recently saw the letters which appeared in your September issue, together with your apology for "inaccuracies and incorrect inferences." You had no reason to apologize. You did a great service in bringing those troubles to the attention of the public. Ted Kurrus's article contains fewer inaccuracies than do the three Letters to the Editor.

EMERSON CURTIS SMITH
Chairman, The Friends of
the Philharmonic

■ I would like to respond briefly to the criticisms of my article, "The Honolulu Symphony's Discordant Melody" made by Robert Vierck, chairman of the Honolulu Symphony Society, Sarah Richards, executive director of the State Foundation on Culture and the Arts, and Mark Schubert, a member of the symphony's review committee, in your Letters column [September].

I spent nearly four months investigating the symphony story, during which time I interviewed approximately 170 people. Except for one 90-minute meeting March 27 with Executive Director Howard Grant, however, neither Mr. Grant, former Symphony Society President Laurence Vogel nor Maestro Donald Johanos would respond to my many attempts to meet with them for their comments concerning the symphony, its morale, finances and future. If there were misinterpretations of data, perhaps they could have been avoided if Messrs. Grant, Vogel and Johanos took the time to respond to my many queries.

TED KURRUS

Sept 4, '85

George,

I returned James Lam's call today. He wanted to know the status of your "Kaneohe Bay Turtle Report."

I told him the turtle report (for all study sites including Kaneohe) would be completed in draft form by the end of the month, and a final report for release would not be available until the end of October (dates I got from Bill Gilmartin).

I suggested he give you a call near the end of Oct to check on the availability of the final report.

He wanted to know what our findings were concerning Kaneohe Bay green turtles. I told him that a look at the initial field work indicated that the bay was certainly an important chunk of habitat for green turtles residing along that particular coastal area of Oahu.

John

9/4 evening

Sounds fine John - look please stick these in my box.

Thx GB

MEMORANDUM OF CALL — Previous editions usable

TO: George

☒ YOU WERE CALLED BY— James Lam

☐ YOU WERE VISITED BY—

OF (Organization) 3876 Sierra Dr. HNL, HI 96816

☒ PLEASE PHONE ▶ 734-5191 ☐ FTS ☐ AUTOVON

☐ WILL CALL AGAIN ☐ IS WAITING TO SEE YOU

☐ RETURNED YOUR CALL ☐ WISHES AN APPOINTMENT

MESSAGE

Is interested in receiving a report on turtle research in Hawela Bay / information on the subject.

RECEIVED BY	DATE	TIME
Rhea	29 Aug 85	1313

63-110 NSN 7540-00-634-4016 STANDARD FORM 63 (Rev. 8-81) Prescribed by GSA FPMR (41 CFR) 101—11.6

* GPO : 1983 0 - 381-529 (316)

Dr(+ Sept(and)

End Oct: 9/2

Bill -

Return return this call or better still, refer it to John Naughton who talked to him before. GB

George:

Mike Callahan 948-8350 called 5/23 to talk turtle feeding with you - he's doing a survey @ Kawela of algae & was wondering if any of what he was seeing turtles might eat -

I told him you'd call & we'd be interested in seeing his data for our study. I said you'd call week of 5/27 - 31.

Bill

Kawela Bay Archaeological Study Urged

CITY Hall

The redesignation of land at Kawela Bay should be deferred until an archaeological survey has been completed, James C. Lam has recommended in a letter to the City Council.

Lam, a retired state land officer, is active with a group called Voters for Kawela that wants to assure adequate public access to the small bay on Oahu's North Shore.

He also called the Council's attention to an article in the September 1936 issue of the Paradise of the Pacific magazine.

Prudential Insurance Co. is asking the Council to amend the development plan for the area from residential to resort use. It wants to construct four hotels, with 4,000 units, in the area from Kawela to Kahuku Point. Two of the hotels would be on Kawela Bay.

The City Planning Commission on Jan. 23 approved Prudential's request on condition the company dedicate 4.8 acres for park use and keep all buildings at least 100 feet from shoreline.

Lam said the offer of a 4.8-acre park does not adequately address the access issue. He proposes that a 150 feet wide area along the bay's shoreline be made available for public recreational use.

THE COUNCIL has until May 30 to act on the Planning Commission's recommendation.

The article in Paradise of the Pacific was written by Emma Ahuena Taylor, who said that in 1936 a spring — Ka Wai O Ke Kala (The Water of Forgiveness) — could be found at the upper extremity of Kawela Bay, almost at the edge of the sea.

"About a stone's throw from this spot, facing the beach, is the site of the ancient abode of the austere and stately high priests, the Kahuna-poo-Kanaka, who were the guardians of the spring," she wrote.

"This sacred precinct was kapu, that is forbidden. The priests used the spring water for absolution before performing a religious ceremony."

She said that until a few years ago pilgrims came to the spring.

"The Kahuna Lapa-au, or medical priest, would send his patients there, to drink of this peculiar healing water, and live on a diet of certain fish and seaweed, found in Kawela Bay," she wrote.

IN HAWA

BROKEN DREAMS—Marvin Holt and brother-in-law Kelly Lopes stand in front of the Holt family's demolished beachfront home. They were evicted by the Kuilima Development Co.

THE WAY IT WAS—A solitary stroller enjoys a sunny day at Kawela Bay yesterday. A planned resort has forced the eviction of many long-time tenants along the beach. —Star-Bulletin Photos by Dennis Oda.

Kawela Bay Families See the 'End of an Era'

By Lucy Young
Star-Bulletin Writer

It wasn't just another weekend scene at Kawela Bay.

As they had for decades, families and friends were enjoying a retreat, sharing hibachi chicken and coolers of soda and beer.

But for many, yesterday's ohana gatherings were a "last hurrah."

"It's too bad, too sad," said Dee Lum. "It's the end of an era. That's all there is to it."

The Lums are one of 37 tenants and six farmers evicted from their beachfront cottages to make room for resort development at the idyllic North Shore bay.

The Kuilima Development Co., a unit of the Prudential Insurance Co. of America, plans to begin building a hotel and golf courses on the bay within a couple of months.

THE TENANTS received their six-month notices Oct. 19, ending years of month-to-month leases. With the exception of a few families who asked for 10-day extensions, most tenants were enjoying their last day at the bay yesterday.

Lum's husband, K.Y., remembered vacationing at the bay as a child but said he began regular trips with his wife and friends about 20 years ago.

"That's it," Mrs. Lum said. "You just walk away. The house is not moveable."

Lum said she is concerned about public access to the beach and whether the developers would preserve the yet-unspoiled beauty of the bay. The developers have said public access will be maintained.

"I hope the developers give some sensitivity to what they're going to do here," she said.

JOHN HENRY Felix, a gubernatorial candidate, said he had occupied the old Kahuku Plantation House on the bay for about 25 years.

"I hope they don't invade the integrity of the bay," said Felix, who stopped by for a last "nostalgic look" of the house and bay, where he used to write books in the quiet of the area.

Felix, who had "put a lot of tender loving care" into fixing the house, said he "felt rejuvenated out here."

Standing on the beach, Marvin Holt stared at the pile of lumber and debris that used to be his family's beachfront home.

The house, built by his grandmother and her sisters some 60 years ago, was torn down by the family last week. The family managed to salvage some things, including old-fashioned sinks and bathtub.

Holt, a diving enthusiast, said he has enjoyed fun-filled weekends at Kawela Bay as long as he can remember.

"Oh yeah, yeah, it's too bad," he said. "I learned how to swim here."

When asked if the eviction notices were fair, Holt responded, "I don't think so. We've been here so long, it's like ours already."

"IT'S SOMETHING we knew would come," said Ginger Bush, with tears rolling down her cheeks.

"It's finally upon us now. And there's nothing to do but say aloha to it."

Bush's grandparents built the cottage about 70 years ago and she said she'll remember "the pleasure of being with the Island elements."

Progress, she noted, "is not good for everybody. But it is needed."

A FISHERMAN who also works as a firefighter, Barry Blomfield's situation is more serious than many of his neighbors'.

Unlike most of the others who use the cottages as weekend and vacation getaways, Blomfield lives in his beachfront residence with his wife and two daughters all year round.

Even with a 10-day extension on the eviction notice, Blomfield has been scrambling to find storage space for his fishing gear and to find temporary shelter.

But he's finding that he's in the so-called "gap group" of residents who make too much money to qualify for low-income housing but not enough to finance a house.

"That's one thing that made me kind of bitter," Blomfield said. "Prudential's not willing to help the families who really needed it."

WITH SEMIANNUAL property taxes, rent and other housing costs, Blomfield estimated that he paid an average of $300 a month to live at Kawela Bay.

With the money saved, he said, he was able to send his oldest daughter to Punahou School.

"This area is the last real country area,, but when this gets developed, it's going to be a real squeeze," he said. "Our country's not country anymore.

"This is close to the mountains too," he continued. "And that's another big part of me enjoying it over here. It's a real country situation — pretty free, pretty open."

Like his neighbors, Blomfield is worried about the preservation of Kawela Bay marine life.

"They're talking about carefully vacuuming the silt in ocean, but hey, that's just going to be for the tourist. It's going to affect the fishes and other ocean life.

"They have the land," he said. "They shouldn't get the ocean."

The Sunday Advertiser

Established July 2, 1856

Thurston Twigg-Smith — *President & Publisher*
George Chaplin — *Editor-in-Chief*
Buck Buchwach — *Executive Editor*
John Griffin — *Editorial Page Editor*
Mike Middlesworth — *Managing Editor*
Gerry Keir — *City Editor*

May 12, 1985

Kawela Bay & Kuilima

Given sometimes stormy weather, distance and other factors, it will take some doing to establish a major resort area on Oahu's North Shore. And obviously any development, even gradual, will have an impact in an area many know and appreciate as "country."

Still, some development and change are inevitable there, and the main concern has to be that it's done right. In that sense, the Honolulu City Council seems to be moving in the right direction in approving long-range plans to expand the current Kuilima resort area to nearby Kawela Bay.

RESORT PLANS, phased over the next 20 years, call for construction of three new hotels, including two on Kawela Bay and an addition to the existing Turtle Bay Hilton Hotel.

Also planned are 2,063 condominium units, two public parks, a second golf course, a commercial center and numerous other amenities. A number of government approvals are still needed before construction could begin.

Among the advantages of planned and phased development of such a resort:

- It would mean hundreds of new jobs for an area that has been short of them since the closing of Kahuku sugar plantation.
- It would generate millions of dollars in tax revenue and have direct impact on regional businesses, from the Polynesian Cultural Center to small stores.
- It would give the public access to Kawela Bay. For years this beautiful bay has been the

In fact, plans for the area from Kawela to Kahuku call for five public access ways to the shoreline, each with a minimum of 15 parking stalls. That is a minimum, and there could and should be more.

THE RESORT'S developer, Prudential Insurance, is making a concerted effort to address concerns of residents who worry about loss of the region's ambience and identity.

To be sure, North Shore traffic would increase and put some additional pressure on a narrow highway already busy at certain times. But resort traffic is often off-peak, so that problem may be less extreme than some fear.

The developer has offered to help provide affordable housing in the area, to set up job training and community outreach programs for long-time residents, and to develop new water sources and a sewage treatment plant for the resort. Those are essential.

Meanwhile, to receive its county, state and federal permits, the developer must be sensitive to ecological concerns that affect Kawela and Turtle Bays, the shoreline and surrounding land.

DESPITE ATTEMPTS to diversify the North Shore economy with new agriculture and aquaculture — both can and will continue — nothing looms on the horizon that would generate enough needed jobs for the growing resident population there.

The Kuilima resort can help fill that void, and provide Oahu tourism with a larger "neighbor island" dimension.

FISHING HOLES—Fishery biologist Jeffrey J. Polovina believes these coils will enhance fish production on Penguin Bank. —Star-Bulletin Photo by Craig T. Kojima.

Artificial Reef

By Helen Altonn
Star-Bulletin Writer

A 13-ton artificial reef from Japan will be dropped onto the sandy plains of Penguin Bank in the deep waters off Molokai within the next few weeks.

It's hoped that the huge fiberglass reef will provide a home for commercially valuable fish to gather and reproduce, fishery biologist Jeffrey J. Polovina said in an interview.

Polovina is leader of the artificial reef program at the Honolulu Laboratory of the Southwest Fisheries Center, which is part of the National Marine Fisheries Service.

Car bodies and concrete pipes have been dumped in Island waters in the past to create artificial reefs. But there has been concern whether they were "biologically appropriate," Polovina said.

His project is the first of its type here. He made several trips to Japan to find the right reef module for Hawaii's ocean conditions and marine animals.

It was purchased for about $10,000.

"We felt rather than spend a lifetime engineering our own modules that we should take something proven . . . and put that on Penguin Bank as the first step to see what biological marine community would develop."

THE FIXINGS for the artificial reef — 10 fiberglass-reinforced plastic cylinders — were brought here from Japan on the Honolulu Laboratory's research vessel Townsend Cromwell. They were assembled at the University of Hawaii marine center at Sand Island and two blocks of concrete were added to the structure to hold it down in the surge.

The finished product is 23 by 20 feet and 16 feet high. It has an enclosed volume of 3,800 cubic feet for fish to congregate and feed.

It won't have any environmental effects because it will be about 240 feet deep, Polovina said.

Getting it out to Penguin Banks has posed some engineering problems, but it isn't that big compared with artificial reefs used elsewhere, he said. Japan, for example, is putting out some reefs like the one being tested here that have a volume totaling 500 modules.

Japan also has been spending $50 million a year for the past 10 years to develop artificial reefs and another $50 million to stock coastal environments with young fish.

PENGUIN BANK was chosen for an exploratory artificial reef project after explorations of the area with the UH submersible Makali'i, Polovina said. "It is a very interesting volcanic feature," he said.

It is the largest submarine shelf near the main Hawaiian Islands, with sheer cliffs on the sides. The dropoff is very sharp, from 150 feet to 1,800 feet, Povolina said. The top also is very long, extending 40 miles from the edge of Molokai, he said.

"We've just been amazed," he said, describing the bank as a large, flat and barren area — about 400 to 500 square nautical miles — that is nearly devoid of fish.

He said little lobsters may be seen in holes. "But it's like driving on the beach. There are no outcrops — nothing to give relief or provide fish a place to burrow or gather around. It's just a large sandy plain."

However, he said the richest bottomfish grounds in Hawaii are around the ledges of Penguin Bank. Bottomfish include opakapaka, onaga and other valuable species of snappers and groupers.

BASED ON WHAT he saw in the Makali'i, Povolina said he believes a habitat will increase bottom-dwelling resources on the shelf. But he said, "We want to make sure we're enhancing production and not merely drawing fish from the steep slopes."

Nine smaller reef modules — each with six concrete pipes — will be dropped on the bank to help build up the lobster population, he said.

He said he will monitor Penguin Bank with quarterly dives in the Makali'i, starting in October or November, and he'll do some handline fishing to see if the artificial reef produces any fish.

There are many basic questions about factors limiting or increasing fish production which the reef studies hopefully will answer, Polovina said.

9-30-85 HSB

to Be Tested Off Penguin Bank

10-17-85
HSB

For Help in Solving Problems

KOKUA LINE

Harriet Gee

Phone 525-8686 or Write Kokua Line, Box 3080, Honolulu, HI 96802

Q — While at the Turtle Bay Hilton hotel recently, I asked a desk clerk how to get to nearby Kawela Bay where the hotel plans a controversial expansion. I wanted to see it for myself, after reading so much about this beautiful bay that very few of us kamaainas have had the privilege to enjoy.

The clerk said I would have to get there from the highway since someone had erected a fence on the beach a few years ago to stop people from going onto the bay. The clerk said the fence ran across the public portion of the beach. Is this true?

A — Norman Quon, project director for the proposed expansion, personally looked into your complaint over the weekend. "Yes, I saw it," Quon told Mrs. K yesterday. He found out that a tenant at Kawela Bay erected the wire fence over a rock outcropping because he was concerned with acts of vandalism against residents there.

Quon, project director for the Kuilima Development Co., said he directed the resident caretaker at Kawela Bay to remove the fence immediately and that it had been done. He said the wire fence was "crudely put together" at the Haleiwa end of Turtle Bay.

Q — I recently went to my first University of Hawaii football game this season and had to walk miles before I could find an entry way into the stadium parking lot. I started from the Stadium Mall across the street. I didn't want to take a chance of falling so I didn't climb over the fence.

I walked along the road and found the entry way closest to the traffic lights was now a gate, but it was locked. I had to walk farther up, past the canal area, before I was able to enter the parking lot. Why are there so few entry ways from the Stadium Mall direction?

A — Walkways are not placed near parking lot entrances because they endanger pedestrians, said stadium manager Charley Bessette. The closest entrances from the mall area are at the stadium's Halawa main entrance and from Salt Lake Boulevard.

Q — I attended the Seniors' Fair '85 recently and found it interesting and informative. But I would like to know why only foods such as chili and dogs, hamburgers, nachos, potato chips, candy, soda, coffee, cake, beer and cigarettes were available for lunch and snacking?

With this "captive audience," why wasn't the fair used to introduce senior citizens to foods that they should be eating?

A — In addition to the foods you mentioned, the concessionaire at Blaisdell Center also offered "deli selections," consisting of tasty and wholesome sandwiches and salads, said Mike Rossell, who produced the fair. Also, the state health department's nutrition branch sponsored a booth with charts and food displays to promote good nutrition among seniors, he said.

Rossell said the concessionaire's food was not part of the fair but was made available to those who wanted it. However, he said, it was the concessionaire who suggested adding the deli selections in keeping with the fair's theme. He said the concessionaire determines what is sold there.

Auwe

"Auwe to those big department stores that spend a lot of money to lure you onto their premises with slick ads and 'easy-payment plans.' They're all smiles until THEIR records say your payment is late. That's when they dun you with nasty messages saying 'your account is now past due... If payment has been made, please accept our thanks.' Why can't they also apologize if they're wrong?"

Mahalo

"I'm sure I speak for the rest of the depositors of Manoa Finance and Great Hawaiian in conveying my deepest gratitude to all those who worked so hard to make the impending return of our deposits possible, especially Walter Dods, who came up with the bailout plan. Mahalo, mahalo, mahalo to all."

Mahalo

"Our warmest mahalos to the three men in the Waikiki Diving van who stopped to help my sister and me Saturday afternoon when I thought we were going to be crushed by oncoming traffic. My car turned completely around after I had to brake abruptly to avoid hitting another car that had cut in front of me on the H-1 freeway, just before the Tripler off-ramp.

"The three men pushed my car out of the way and stayed to comfort us until we had stopped shaking with fright. We were so shaken we failed to get their names. Thank God we were not hurt and for those men."

(Editor's note: The driver of the van was David Brice, a Waikiki Diving instructor.)

HSB 10-23-85 A

For Help in Solving Problems

KOKUA LINE

Harriet Gee

Phone 525-8686 or Write Kokua Line, Box 3080, Honolulu, Hi. 96802

Q — We took the family on a walk along the shoreline Saturday from Turtle Bay Hilton hotel all the way to Kawela Bay. This was after I read in Kokua Line Thursday that a fence that had been stopping people from getting onto the bay had been removed. Our day was wasted.

The big solid fence is still there, blocking the point to Kawela; we never saw the bay. Also, a "Keep Out" sign is on the fence. And to top everything off, there are mean dogs behind the fence that scared us to death. That Kuilima Development Co. official who told you the fence was removed must have fibbed to you. Or maybe he didn't know what he was talking about?

A — Norman Quon, project director for Kuilima Development, had the fence taken down yesterday — the third time that a fence has been removed from that spot since Thursday. "Someone is putting a fence back every time we take it down," he told Mrs. K yesterday. He thinks tenants there are doing it because their property has been vandalized.

Quon said the Kawela Bay caretaker not only takes the fence down but also removes it from above the rock outcropping where it sits. He said he believes the fence actually is on private property as it is above the high-water mark. For this reason, he said, the "Keep Out" sign will remain because of the liability problem. "You know how people are these days; they'll sue if they get hurt trying to climb over the rock outcropping," he said.

Quon said his company, developer of the proposed expansion of the Turtle Bay Hilton hotel on Kawela Bay, wants the public to see the beautiful bay but is afraid of liability if someone gets hurt while on the site. "That's why we want to get the development going so that the public can use it safely," he said.

Q — I recently got a phone call from Sunderland and Associates, 526-3717. The caller said the company is doing a survey involving commuter patterns of students in public and private schools in Honolulu. Could you check to see if this survey is legitimate?

A — Yes, it is. The Legislature mandated the study being done by Sunderland and Associates, said Pat Shutt, director of field services for the professional research company. She said findings will be presented to the 1986 legislative session. The phone calls started Oct. 1 and should end tonight at 9.

Appeal for Blood

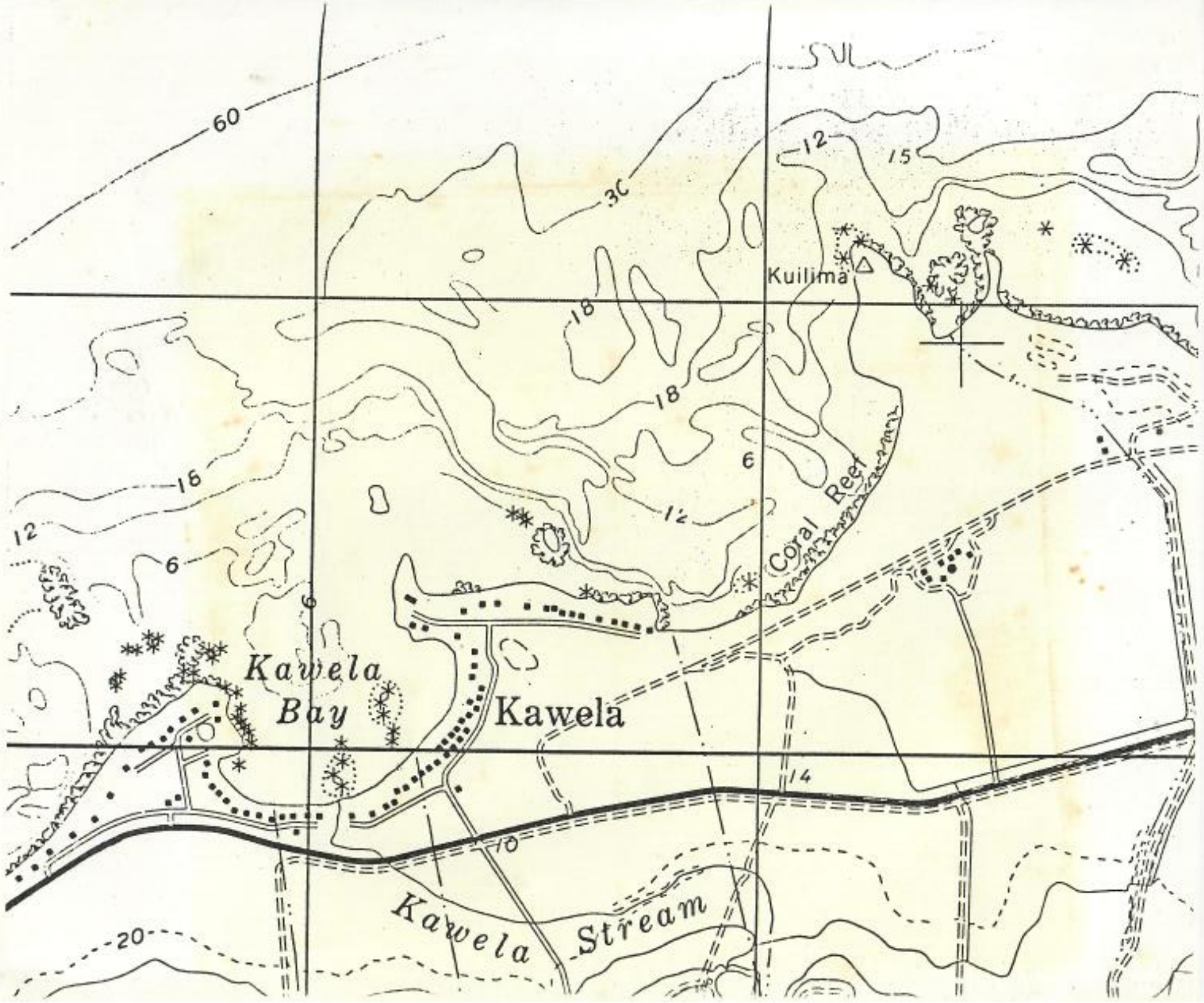
St. Francis Hospital has issued an appeal for B positive blood donors to help a young woman, 19, stricken with leukemia. She underwent a bone marrow transplant at the hospital Friday.

Interested people should call the hospital's cell separator department, 547-6403, between 8 a.m. and 3:30 p.m. Mondays through Fridays only.

They must call first for screening, blood testing and appointments.

Mahalo

"I've been away at college for two years and will return to the Mainland after a brief visit home, rejuvenated with the aloha spirit. It happened on the night of Aug. 25. My sister, seven months pregnant, had to make an emergency stop under the Farrington Highway bridge. Along came a kind-hearted couple and their son in a green pickup. They towed my sister's car, along with her sleeping 2-year-old and me, to our father's home in Nanakuli. Mahalo to that wonderful family!"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Kawela Bay
Kawela
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Kawela Stream
20

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Fisheries Center
Honolulu Laboratory
P. O. Box 3830
Honolulu, Hawaii 96812

20 FEB 1986

MR. VINCENT SHIGIKUNI
GROUP 70
924 BETHEL STREET
HONOLULU, HI 96813

DEAR MR. SHIGIKUNI:

IN RESPONSE TO YOUR RECENT REQUEST MADE TO MR. NAUGHTON OF OUR WPPO OFFICE, I AM SENDING YOU COPIES OF DR. BROCK'S LETTERS TO OCEANIC INSTITUTE, AS WELL AS A DRAFT COPY OF THE DATA ON GREEN TURTLES AT KAWELA BAY.

I HOPE THAT THIS INFORMATION WILL BE USEFUL TO YOUR PLANNING PROCESS.

SINCERELY,

GEORGE H. BALAZS
ZOOLOGIST

University of Hawaii at Manoa

Hawaii Institute of Marine Biology
Coconut Island, Kaneohe, Hawaii

MEMORANDUM

October 9, 1985

TO: Dave Ziemann

FROM: Richard Brock R. Brock

SUBJECT: Data on Kawela Bay Turtles

On 7 October I had a meeting with Mr. G. H. Balazs of the Honolulu Laboratory, Mr. G. Nitta and Mr. J. Naughton of the Western Pacific Programs Office of the Honolulu Laboratory regarding available information on the population of green turtles that utilize resources in Kawela Bay, Oahu.

Mr. Balazs indicated that he would like to be credited with providing the information herein. All his data relative to the Kawela Bay population are in manuscript form and are in preparation. If you need further clarification on anything below, his card is enclosed.

Mr. Balazs has conducted field studies on the green turtles found in Kawela Bay. These studies were initiated in February 1985 and continued through July; some observational work is still being carried out. Methods employed include the use of shoreline surveys, skindiving, personal interviews with residents and knowledgeable individuals as well as through netting studies. Most of the survey work was carried out in the western part of the bay. The inner eastern part of the bay is quite shallow and turtles did not appear to use it according to the NMFS data, however, Mr. Balazs relates that one resident reported seeing 10 to 12 turtles in these nearshore shallows affronting her house at dawn for several days in February 1985. These sightings occurred during a period of exceptionally high dawn tides. Turtles were probably entering these shallow flats to feed when the water levels were appropriately high at night or at dawn. Subsequently, turtles have been absent from this area until recently (presumably the tides have not been right). This same resident called Mr. Balazs very recently to report that the turtles are again back in that same shallow area in eastern Kawela Bay. He expects to follow up on these reports now that the tidal conditions and timing are appropriate.

According to Mr. Balazs' data, green turtles are absent or nearly so from Kawela Bay during the daylight hours. Netting activity (mostly in the inner western corner of the bay) has shown that turtles use the bay resources at night. Resources sought by the Kawela Bay turtles includes a number of macroalgae species: Acanthophora spicifera, Ulva reticulata (also an indicator of freshwater input) and Pterocladia species. These algae occur in the bay and Acanthophora is very abundant on the shallow reef flats.

Turtles were caught in stationary nets and were sampled for a number of attributes including size, sex and food consumed (stomach samples). The latter studies confirmed that the turtles captured in the bay were feeding on the above species of macroalge.

The evidence suggests that green turtles probably sleep and rest elsewhere outside of Kawela Bay during the daytime. Mr. Balazs does not know the location(s) of these sleeping areas but feels that they are within a kilometer or so of the Kawela Bay feeding grounds. They use the bay under the cover of darkness thus explaining my not having seen them during my short daytime survey of the bay in 1981.

Perhaps the most pertinent data to the importance of Kawela Bay to turtles are the results of Mr. Balazs' netting efforts in the bay. I have reproduced his Table 2 (attached). Very notable is that the catch per unit of effort (CPUE) for Kawela Bay turtles is better than that for many other important turtle areas including Johnston Atoll and Bellows Beach. He noted that human impacts to turtles (i.e., spear holes, tumors probably related to pollution, etc.) caught in Kawela Bay are considerably less in occurrence than for many other areas studied by him. This contrasts to other areas, e.g., the waters affronting Maui Power plant have turtles with an unusually high incidence of obvious human impact.

Another interesting point is that the turtles caught in Kawela Bay ranged in size from ∿38 to 75 cm in carapace length. Thus the size range of turtles using the bay resources ranges from about the smallest known size that recruits to the adult habitat (∿38 cm) to individuals that are just under the size at first reproduction. There were no adults caught in Kawela Bay.

Mr. Balazs conducted temperature measurements of turtles captured in Kawela Bay. He found that the turtles caught at low tide (and at night) were undergoing a considerable thermal deficit to forage on the algae present in the area. Turtles on these shallow flats move through an area with (cold) freshwater input that lowers their body temperature below that which is usually seen; this suggests that green turtles find the shallow Kawela Bay flats appropriate areas in which to forage, despite the expense of creating a thermal deficit.

In summary, Kawela Bay appears to be an important nocturnal foraging ground for green turtles.

In closing, Mr. Balazs noted that individuals interested in green turtles at Kawela Bay may want to contact Mr. Bob Moncrief, a former turtle fisherman and resident of the Kawela Bay area. Mr. Moncrief is presently a biologist with the Army Corps of Engineers in Honolulu and may be reached at phone no. 438-2264.

I hope that this information has helped to answer your questions.

RB:ec
Encl.
cc: G. Balazs

University of Hawaii at Manoa

Hawaii Institute of Marine Biology
Coconut Island, Kaneohe, Hawaii

MEMORANDUM

November 13, 1985

TO: Dave Ziemann
O.I. Consultants, Inc.

FROM: Richard Brock
HIMB

Dick Brock

SUBJECT: Further information on Kawela Bay turtles from Mr. G. Balazs

A couple of weeks ago Mr. Balazs (NMFS, Honolulu office) related further observational data on the presence of green turtles in Kawela Bay. If you recall the previous information that I received from Mr. Balazs and sent on to you showed little or no turtle activity in the eastern end of Kawela Bay. I did note, however, that one bay resident had seen turtles feeding on the shallow flats at dawn.

In October Mr. Balazs received a call from that same resident who indicated that turtles were once again back in the eastern part of the bay. He checked the area on 15 and 17 October arriving before first light. Mr. Balazs noted that on 15 October he saw about 10 turtles on the eastern bay flats while a NMFS helper saw approximately 10 to 15 turtles on the western side of the bay at dawn. Mr. Balazs returned on 17 October alone and counted about 20 turtles in the eastern part of the bay.

This information confirms the presence of turtles in eastern Kawela Bay; Mr. Balazs is of the opinion that they come in and feed on the shallow flats when the tide is appropriately high in the early morning hours. Apparently 20 to 30 minutes after first light the turtles retreat to deeper waters.

Hope that this information is of use to you.

RB:ec

George: I forgot to have a cc made for you so this is it!
Thanks for your help
Dick

Ka Wai O Ke Kala

The Water of Forgiveness

By Emma Ahuena Taylor

The little Spring of Forgiveness, Purification and Healing of the *God Kane of Io* is situated at the upper extremity of Kawela Bay, between Kamehameha Highway and almost at the edge of the sea, near where the feathery-leafed wild *koa* shrub shades the lane, carpeted by purple *lupens.* Where the *po-hue-hue* vine with bright purple nodding flowers creep along the sand beside the dainty white flowered *hina-hina* and lush *nau-paka* plant of legendary fame and where the *kowali* climbs and trails over vari-hued *lantana* and snuggles its pale bell-like blossoms amongst the tiny starry blue *honohono* that grows there.

Just close to this patch of rioting wild-flower colors, hidden beneath a pile of debris, one may find to-day, the once noted spring of *Ka Wai O Ke Kala*—The Water of Forgiveness. About a stone's throw from this spot, facing the beach, is the site of the ancient abode of the austere and stately high priests, the *Kahuna poo-Kanaka,* who were the guardians of the spring.

This sacred precinct was *kapu,* that is forbidden. The priests used the spring water for absolution before performing a religious ceremony. They had to be purified before and after.

Mecca of many pilgrims in search of health in olden days, was this spring. Even as late as a few years ago.

The *Kahuna Lapa-au,* or Medical Priest, would send his patients there, to drink of this peculiar healing water, and live on a diet of certain fish and seaweed, found in Kawela Bay. Most always an incantation was made to the spring, pleading for health.

Inquiring of an aged fisherman of Kahuku, why this spring water was not used to-day, he replied in cryptic language:

"Ua hala Ka Uhu (parrot fish), *ua ma-alo ihola-ua hoi akula i makapu-u—nou ka hala!"* which, translated is, "The *uhu* fish has gone—it has just dodged (the net). It has returned to *Makapu-u*—yours was the fault". He meant that it was our fault that this knowledge was lost through lack of appreciation of ancient remedies and customs.

Paradise of the Pacific (1936)
Vol. 48 No. 9 September

January 15, 1986 F/SWR1:JJN

Mr. Vincent Shigekuni
Group 70
924 Bethel Street
Honolulu, Hawaii 96813

Dear Mr. Shigekuni:

Thank you for sending the National Marine Fisheries Service (NMFS) a copy of the Letter of Transmittal (LOT) sent by your office to the Army Corps of Engineers on 9 January 1986. The LOT included a report from Oceanit Laboratories, Inc. identifying the location of silt and clay size sediments found during a survey of Kawela Bay, Oahu. These sediments have been recommended for removal by dredging.

We were quite surprised to see the large area within Kawela Bay in which fine sediments were found during the survey conducted by Oceanit Laboratories. On 21 November 1985, NMFS, the U.S. Fish and Wildlife Service and the Corps of Engineers conducted a visual survey of the bottom of Kawela Bay in the area of the proposed desilting operation. We found very little exposed fine sediment. Those areas we found consisted of several small patches, of no more than two meters in diameter, located mainly on the northeast side of the proposed desilting area (defined by the silt curtain in the Oceanit report).

NMFS requests some additional information be provided concerning the proposed desilting area. Primarily we would like to know if the expanded area of fine sediments located during the Oceanit survey was exposed or partially/completely covered by coral rubble and sand. It would be useful to know if corings were taken and if so please provide us with the estimated volume of fines proposed for removal.

As mentioned by NMFS in the Kawela Bay (Kuilima-Turtle Bay) meeting of 18 December 1985, we are concerned with both primary and secondary impacts from dredging activities on the important green turtle foraging habitat within Kawela Bay. The large area outlined within the Oceanit Laboratories report which contains silt and clay size sediment recommended for removal cannot help but heighten our concern. Please contact Mr. John Naughton of my staff for additional information or clarification of the above.

LETTER OF TRANSMITTAL

Sincerely yours,

Doyle E. Gates
Administrator

cc: F/SWR, Terminal Island, CA
F/M4, Washington, D.C.
FWS, Honolulu
Corps of Engineers, Honolulu
EPA, Region IX, (P-5)
Hawaii State Div. of
Aquatic Resources

Oceanit Laboratories, Inc.
coastal & offshore engineering services • research & development

MEMORANDUM

December 23, 1985

To: Mr. Vincent Shigekuni
Group 70

From: Dr. Patrick K. Sullivan, OLI

Re: Map of area to be desilted

Enclosed is a map and two xerox photographs of Kawela Bay, Oahu. These illustrations identify the location of silt and clay size sediments found during our survey of Kawela Bay that have been recommended for removal. Some of these areas could currently be covered with coarser sediments as a result of the recent high surf conditions on the North Shore. However, most of these fine sediments are probably exposed.

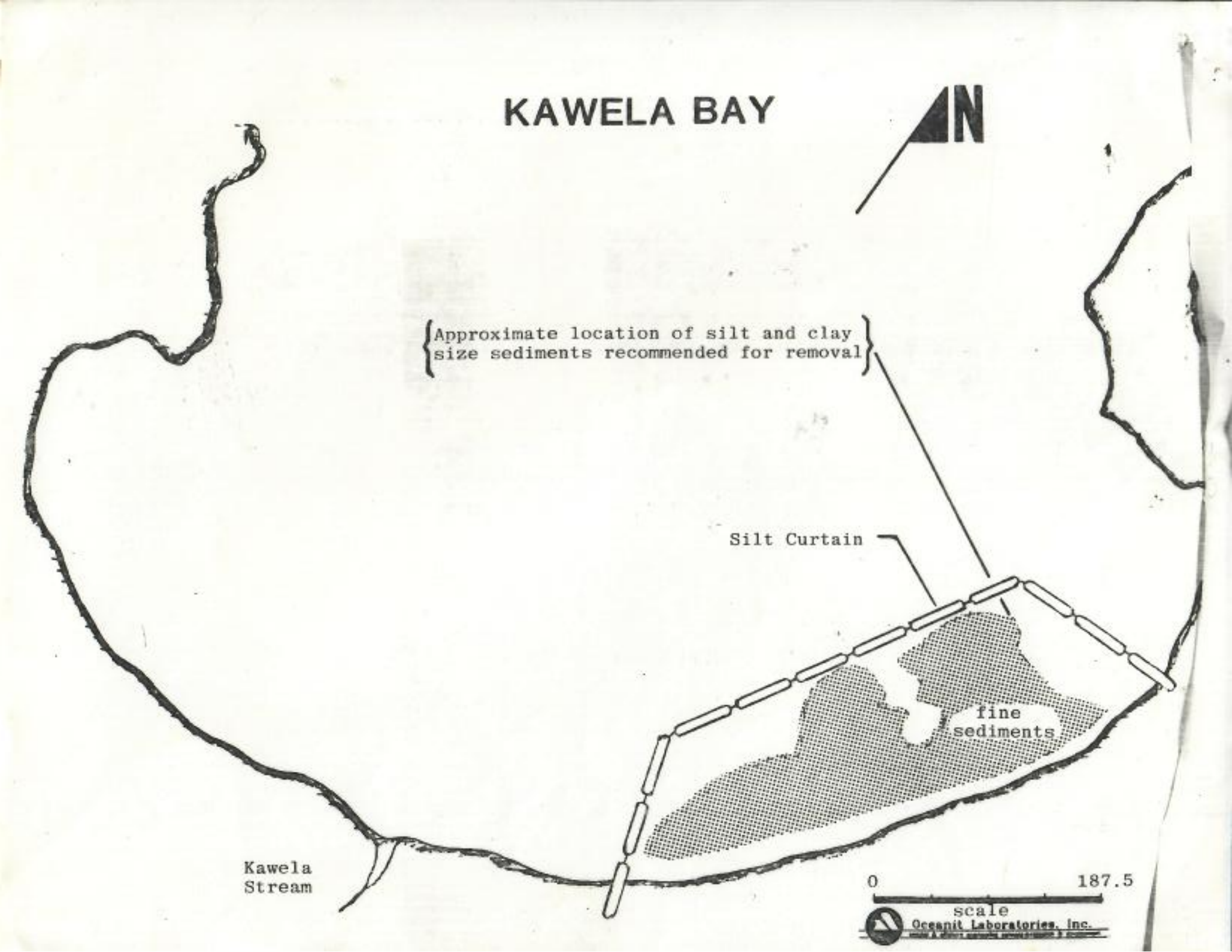
The samples that we obtained during our survey indicated that either sediments were coarse, having less than 0.3 percent silt and clay size particles, or they were fine, having greater than 19 percent silt and clay size particles. The sediment sizes that we are recommending for removal can be described as "fine sediments with approximately 5 percent or more of their diameters less than or equal to 63 microns" -- that is, approximately 5 percent silt and clay size particles. Five percent was chosen to account for areas that we visually sampled but did not do size fraction analysis.

Sincerely,

Patrick K. Sullivan, Ph.D.
President

PKS:hk
Encl.
xc: Mr. Norman Quon, KDC
Mr. Paul Low, EDP Hawaii, Inc.
Mr. Francis Oda, Group 70

1188 Bishop Street, Suite 1601, Honolulu, Hawaii 96813
TELEX: 7431404 Ph: (808) 531-3017


KAWELA BAY
N
Approximate location of silt and clay size sediments recommended for removal
Silt Curtain
fine sediments
Kawela Stream
0
187.5
scale
Oceanit Laboratories, Inc.

2/24/86

LETTER OF TRANSMITTAL

Architects • Planners • Interior Designers • 924 Bethel St. • Honolulu, HI • 96813 • PH: (808) 523-5866

GROUP 70

Francis S Oda AIA, Inc
Robert K L Wong AIA, Inc
Norman G Y Hong AIA, Inc
Sheryl B Seaman AIA, Inc

TO NATIONAL MARINE FISHERIES SERVICE
P.O. BOX 3830
HONOLULU, HI 96812

ATTENTION MR. DOYLE E. GATES, ADMINISTRATOR

DATE 21 FEBRUARY 1986

PROJECT TURTLE BAY DA PERMIT PROJECT NO. 8352.74

GENTLEMEN: WE ARE SENDING YOU ☑ ATTACHED ☐ UNDER SEPARATE COVER VIA THE FOLLOWING ITEMS:
☐ SHOP DRAWINGS ☐ PRINTS ☐ PLANS ☐ SAMPLES ☐ SPECIFICATIONS ☐ COPY OF LETTER ☐ CHANGE ORDER
☒ OTHERS

COPIES	DATE	NO.	DESCRIPTION
1	2/12/86		Response to your letter dated 15 January 1986

THESE ARE TRANSMITTED AS CHECKED: ☐ FOR APPROVAL ☒ FOR YOUR USE ☐ AS REQUESTED ☐ FOR REVIEW AND COMMENT

REMARKS:

Enclosed is a copy of Oceanit Laboratories, Inc.'s response to your letter. If there are any further questions, please feel free to call me.

VERY TRULY YOURS,

BY Vincent Shigekuni jr
VINCENT SHIGEKUNI

CC:

Oceanit Laboratories, Inc.
coastal & offshore engineering services • research & development

February 12, 1986

Mr. Vincent Shigekuni
Group 70
924 Bethel Street
Honolulu, Hawaii 96813

Dear Mr. Shigekuni,

I am responding to your request for comments regarding a letter by Doyle E. Gates of the U.S. Department of Commerce, National Marine Fisheries Service, dated January 15, 1986, that was forwarded to Oceanit Laboratories, Inc. (hereinafter "OLI"). I will respond to specific remarks made in this letter regarding Kawela Bay.

Comment 1 taken from page 1

"... We found very little exposed fine sediments. Those areas we found consisted of several small patches, of no more than two meters in diameter, located mainly on the northeast side of the proposed desilting area (defined by the silt curtain in the Oceanit report)."

Response to comment 1

Oceanit Laboratories, Inc. spent several days investigating the distribution of fine sediments in Kawela Bay. The area identified within the bay is not "large" and covers approximately 2 to 3 percent of the area of Kawela Bay. During OLI's survey they located patches of anaerobic sediments and other fine sediments. The anaerobic sediments were identified by their dark grey and black color, their gelatinous texture and/or their slight sulfide smell. The existance of these sediments can be overlooked and depends on the extensiveness of the survey and the point of entry into Kawela Bay. The area identified in OLI's memorandum, dated December 24, 1985, represents hours of field surveying that was conducted in May and June of 1985. The location of each sampling was identified on a map by an engineer either on the shore or in a nearby boat. The depth of the survey area was not deep and did not require SCUBA gear; therefore, snorkeling along the coastline of the bay, i.e., swimming up-and-down, facilitated extensive data taking.

1188 Bishop Street, Suite 1601, Honolulu, Hawaii 96813
TELEX: 7431404 Ph: (808) 531-3017

Comment 2 page 1

" ... Primarily we would like to know if the expanded area of fine sediments located during the Oceanit survey was exposed or partially/completely covered by coral rubble and sand. It would be useful if corings were taken and if so please provide us with the estimated volume of fines proposed for removal."

Response to comment 2

The fine sediments identified during the Oceanit Laboratories, Inc. study were exposed, although some of the gelatinous sediments were covered with free-moving fine sediments. OLI found patches of coarse rubble and coral dispersed throughout the area of concern. Sediment samples were taken by scooping sediments into a container rather than using a standard coring device. The depth of the sediments was determined by excavating to the coarser coral and rubble sublayer at several locations. Results from OLI's survey indicated that the approximate average thickness of the fine sediments was 4 inches, with thicknesses varying from 2 to 8 inches. OLI estimated the volume of sediments to be removed to be approximately 50,000 cubic feet; however, since this is a conservative estimate, the actual volume is expected to be less.

Comment 3 from page 1

" ... we are concerned with both primary and secondary impacts from dredging activities on the important green turtle foraging habitat within Kawela Bay."

Response to comment 3

In OLI's study of Kawela Bay a description of the benthic communities and fishery resources was included. They also discussed the impacts from dredging the southeastern portion of Kawela Bay on the rest of Kawela Bay. Results indicated that "... certain areas (most of habitat E) were depauperate in fishes, corals and large invertebrates". However, certain abundant growths of algae that are known to be important diet items of C. mydas (specifically Codium spp. and Ulva spp.) were found in Habitat C. The removal of sediments in Habitat E, as per OLI's preliminary design (i.e., employing a silt curtain), is not expected to disrupt the existing more productive areas (e.g., habitats A-D).

The primary impacts from dredging are expected to have vary little measurable effect on the foraging habitat of the green turtle within Kawela Bay because the area proposed for dredging does not contain much of the algae that the turtles are known to eat. Furthermore, OLI's computer model study of Kawela Bay indicated that the changes in circulation resulting from dredging are not expected to significantly change the hydrodynamics of the bay beyond those occurring from natural variations in meteorological conditions. In other words, the uncertainty in our prediction is less than the natural deviations that occur in the bay each year. Therefore, the secondary impacts from dredging are expected to be equal in magnitude to the changes that naturally occur in the bay, and are thereby expected to be insignificant.

I believe that the responses adequately address the above identified comments. If you have any questions, please do not hesitate to call me.

Sincerely,

Patrick K. Sullivan, Ph.D.
President

PKS:hk
cc: Mr. Norman Quon, KDC
Mr. Paul Low, EDP Hawaii, Inc.
Mr. Francis Oda, Group 70
Ms. Jan Sullivan, Roy Takeyama, A Law Corp.

HABITAT ASSESSMENT STUDIES
1980s GEORGE H. BALAZS FILE

August 23, 1985 F/SWC2:CHB

TO: Lewis D. Consiglieri
Eugene T. Nitta

FROM: George H. Balazs

SUBJECT: Green sea turtles at Barbers Point, Oahu

I recently came across a note from John R. K. Clark, written to me in April of 1978, responding to my request for historical information about sea turtles around Oahu. John is the author of "The Beaches of Oahu" (1977) and "The Beaches of Maui County" (1980) published by the University of Hawaii Press. John told me that he had interviewed a man who had fished turtles commercially at Barbers Point, including offshore Campbell Industrial Park, after World War II and into the 1950's. He was told that the man and his partners "were responsible for decimating the turtle population there." Huge piles of turtle shells were left to rot on the beach because there was no demand for them, only for the meat.

In view of the Section 7 consultations currently underway, I thought that you would be interested in this anecdotal information.

cc: Balazs
HL

6/26/86
WPPO

C. Brewer Properties, Inc.

June 24, 1986

Department of Commerce
National Marine Fisheries Service
2570 Dole Street
Honolulu, Hawaii 96822

Subject: Punalu'u Resort Draft EIS
Preparation Notice

Dear Sir:

Enclosed for your review and comment is C. Brewer Properties, Inc. Preparation Notice for the Punalu'u Resort Draft Environmental Impact Statement. As indicated in the Notice, the changes to the Resort Master Plan will improve land use efficiency and the Resort's long-term economic viability. The increased economic viability of the Resort translates into increased population levels and increased employment and economic opportunities for the residents of Ka'u District.

The proposed project includes site development work for hotel, multifamily residential, commercial and recreational facilities. Your comments regarding the proposed project, especially those related to your agency's facilities and operations in Ka'u District, will be included in the Draft EIS and are appreciated.

Should you have any questions or require additional information regarding the proposed project, please contact:

C. Brewer Properties, Inc.
P. O. Box 85
Pahala, Hawaii 96777
Attention: Mr. Leroy Uyehara,
Vice President

or

Phillips Brandt Reddick
130 Merchant Street, Suite 1111
Honolulu, Hawaii 96813
Attention: Mr. Thomas S. Witten

P.O. Box 1826 / Honolulu, Hawaii 96805
(808) 536-4461, Telex 392481 CBREWO

Thank you for your cooperation and assistance in this matter.

Very truly yours,

C. Brewer Properties, Inc.

Leroy Uyehara
Vice President

June 6, 1986

CHAPTER 343, HAWAII REVISED STATUTES

ENVIRONMENTAL IMPACT STATEMENT

NOTICE OF PREPARATION

for

PUNALU'U RESORT

PROJECT LOCATION:	Punalu'u, Ka'u District, County of Hawaii TMK 9-5-19:11, 15, 24, 26, 30, 31, 33, 35; 9-6-01:01, 02, 03, 06, 11, 12, 13; and 9-6-02:08, 37, 38, 41, 45
APPLICANT:	C. Brewer Properties, Inc. P.O. Box 1826 Honolulu, Hawaii 96805
EIS CONSULTANT:	Phillips, Brandt, Reddick & Assoc., Inc. (PBR-Hawaii) 130 Merchant Street, Suite 1111 Honolulu, Hawaii 96813
ACCEPTING AUTHORITY:	Department of Planning, County of Hawaii 25 Aupuni Street Hilo, Hawaii 96720
PROPOSED ACTIONS:	(1) Request a General Plan Amendment to redesignate a portion of the mauka area of the Resort to Medium Density and Open Area from Low Density; (2) Request a Special Management Area Use Permit; and (3) Revise the physical configuration and zoning to conform to the Resort Master Plan.
DETERMINATION:	Pursuant to Chapter 343 HRS, as amended, a request for a General Plan Amendment is being submitted to the Hawaii County Planning Department. Since the project, as a whole, may have a significant effect on the environment, an Environmental Impact Statement will be prepared for the Punalu'u Resort.

I. Background

Punalu'u Resort (previously known as SeaMountain at Punalu'u) is a destination resort started in 1972 by C. Brewer Company, Ltd. in Ka'u District. The district is bordered by the Mauna Loa Ridge and the Pacific Ocean and stretches from Volcanoes National Park on the east side of Hawaii, around South Point to Manuka Natural Area Reserve on the west side of Hawaii. Ka'u has a land area of 624,990 acres making the district larger than any other Hawaiian Island and one and one-half times the size of Oahu. Punalu'u Resort fronts approximately 4,000 lineal feet of coastline from Punalu'u Harbor to Ninole Cove and is situated between Pahala Town (five miles north of Punalu'u) and Na'alehu Town (eight miles southwest of Punalu'u). Refer to Figures 1A and 1B. Punalu'u Resort is the only resort destination currently operating in Ka'u District.

The entire urban designated resort area encompasses approximately 600 acres, including 433 acres of C. Brewer fee property, with the majority of the remaining lands owned by Bishop Estate and several other land owners.

Designated as an "Intermediate Resort" on the Hawaii County General Plan Land Use Pattern Allocation (LUPAG) Map, the makai portion of the resort (below the Hawaii Belt Highway) includes approximately 325 acres designated Resort, Medium Density, Low Density and Open Area. The mauka portion of the resort (above the Hawaii Belt Road) includes approximately 108 acres designated Low Density.

Existing County zoning designations in the resort total approximately 433 acres and include approximately 5.5 acres Village - Commercial (CV-10), 28 acres Resort - Hotel (V1.5), 22 acres Multiple Family Residential (RM-2.0), 17.5 acres Single Family Residential (RS-20 and RS-7.5), 118 acres Agricultural (A-20a) and 242 acres Open (O). Refer to Figure 3.

The current land uses adjacent to the Resort are either barren lava flows or low utility grazing lands. Located in the general area are extensive C. Brewer sugar plantation and macadamia nut orchards along with cattle ranching operations and other small diversified agricultural activities. The two neighboring communities of Pahala and Na'alehu are the primary residential communities that house the agricultural and resort work force supporting these operations. Other residential communities in the area include Volcano Village, Waiohinu (including Mark Twain Estates and Discovery Harbor), and Hawaiian Ocean View Estates.

A substantial portion of the resort infrastructure and facilities have already been developed as shown on Figure 2: Exisiting Conditions Map. Existing improvements at Punalu'u Resort include the 18-hole championship golf course, the golf Clubhouse, the Punalu'u Black Sands Restaurant and the Ka'u Cultural Center.

Additionally, the 76-unit Colony I condominiums and the 19-lot Kalana I single family subdivision were completed in 1975 and have since been sold to individual buyers. The Aspen Institute for Humanistic Studies and the first four courts of the Tennis Center with a convenience store were opened in 1976. A dining room and bar were added to the golf Clubhouse in 1981. These facilities are served by an extensive existing infrastructure system including roads, water, and self-contained sewerage system with sewage treatment plant, drainage, and power, telephone, and cable TV. In 1984 the acquisition of 64.7 acres of adjoining Bishop Estate land was completed in order to implement the resort master plan.

Ninole Cove, a State-owned parcel which is included in the SeaMountain Hawaii Ranch Corporation State Revocable Permit (S-5491), the County's park facilities at Punalu'u Beach Park (leased from C. Brewer), and the Punalu'u Black Sand Beach and boat launching ramp are existing coastal recreational resources. Public shoreline access to Ninole Cove is provided over C. Brewer property with parking provided jointly within the clubhouse parking lot. The Punalu'u Beach Park improvements include a pavilion, picnic shelters, a comfort station, and parking. Access to the park is provided from Punalu'u Road with the unimproved old government road along the Punalu'u Black Sand Beach serving as a secondary access.

Other owners located within or adjacent to the project limits of Punalu'u and not included in the proposed action include Colony I, Kalana I, the Ninole Cove State parcel (except for restoration and maintenance), the Hawaiian Evangelical Association cemetery, and 6 privately owned parcels with two existing houses at Punalu'u Black Sand Beach.

II. Objective

C. Brewer Properties' objective is to develop a high quality, low to medium density resort community at Punalu'u which is economically viable and integrated into the overall Ka'u community. Punalu'u will be a human scale, pedestrian oriented, low rise integrated resort community.

The resort community will be a significant component of the visitor industry in East Hawaii and provide needed stability to East Hawaii's economy. East Hawaii's economy presently is dependent on agricultural operations including sugar, macadamia nut, ranching, and fishing.

To achieve this objective, it is necessary to amend the Hawaii County General Plan, change the zoning, and obtain a Special Management Area (SMA) permit to relocate Punalu'u Road and relocate golf holes to create a Village as the central focus of the resort development.

The Master Plan for Punalu'u improves land use efficiency and consequently the Resort's potential for long term economic viability. This increased economic efficiency results from a design that also increases the quality of the resort experience by unifying the resort and providing a cohesive "sense of place" at a human/village scale.

III. Description of the Proposed Project

C. Brewer Properties, Inc. is submitting a petition for General Plan Amendment for approximately 75 acres of the mauka area of the resort, Change in Zone application for the master rezoning of Punalu'u Resort, and a Special Management Area Use Permit Petition for infrastructure modifications and site improvements to approximately 55 acres of the 433 acre Punalu'u Resort at Punalu'u, Ka'u, Hawaii.

The General Plan Amendment of the Land Use Pattern Allocation Guide (LUPAG) Map includes the designation of approximately 75 acres from Low Density to Medium Density (35 acres) and Open Area (30 acres) on the mauka portion of the resort. This amendment will allow for the master re-zoning of the mauka area to allow for a mixture of single family residential lots and multi-family residential units and properly designate the existing golf course.

The development concept involves creating a Village Center on the bluff overlooking the ocean and the proposed shoreline golf hole. This is accomplished by relocating four golf holes and the coastal section of Punalu'u Road, presently a private road. The plan improves and provides for additional development parcels with increased golf and recreational amenity frontage and/or ocean views. Resultant development parcels include a mixture of single family residential, multifamily residential, mixed-use multifamily, commercial, hotel, and open space recreational amenities.

The major portion of the Punalu'u Resort (approximately 325 acres) lies on the makai side of the Hawaii Belt Highway and is within the Special Management Area (SMA) designated by the County of Hawaii.

The proposed project will include improvements within the SMA of the resort and modify the existing resort infrastructure to provide for the reallocation of density to conform to the natural features of Punalu'u. Specifically, the proposed actions to be taken include:

1. Developing 500 to 650 hotel rooms (Ninole Cove and Black Sands Restaurant site);

2. Creating a Village Center (a low rise, mixed-use complex including 330 to 500 multi-family residential units and 65,000 square feet of commercial use located on the central bluff);

3. Creating a Water Play Area within the Village Center that will include a series of pools, waterfalls and sand areas flanked by a landscaped courtyard.

4. Relocation and construction of approximately 6,800 lineal feet of Punalu'u Road and Ninole Cove Place (private roadways within the Resort);

5. Golf course modifications and relocation of four golf holes;

6. Providing for the development of 1,360 to 1,925 additional multi- and single family residential units;

7. Developing a recreation and entertainment center (Lagoon Club);

8. Expanding the existing Punalu'u Beach Park, providing a new access road, and constructing additional parking and recreation facilities;

9. Restoration of Ninole Cove as an ocean recreation area (State, County, and Federal permits, as required, will be obtained prior to initiating the restoration), which has been filled due to flooding and storm waves; and,

10. Adding eight tennis courts and other resort support facilities and amenities.

The project will also improve existing conditions of the shoreline area while protecting other important natural resources which are an integral part of the project area. Pedestrian easements will be provided for shoreline access with parking use easements for non-resort guests.

The completed Punalu'u Resort will include the land use and density allocations as shown on Table 1.

TABLE 1

General Land Use Allocation

Land Use	Approximate Acres	Planned Number of Units
Hotel / Resort	45	500 - 650
Village Commercial	23	330 - 500
Multiple Family Residential	120	1,250 - 1,800
Single Family Residential	45	110 - 125
Golf Course, Open & Roadways	200	0
Total:	433	2,190 - 3,075

IV. Description of the Affected Environment

Punaluu Resort is a 433 acre destination resort started in 1972 by C. Brewer Properties, Inc. Entirely within the urban district, approximately 75 acres are included in a General Plan Amendment application, approximately 150 acres are being requested for a change in zone, and 55 acres are subject of improvement included in a pending SMA permit application.

The entire area is underlain by ancient and recent volcanic flows and the majority of the vegetation in and around the resort are exotic introduced species that have been used to landscape the existing golf course, condominiums and support facilities. No rare, endangered or threatened species of plants or animals have been observed on the project site.

Archaeological surveys conducted on the project site have confirmed that the area contains numerous historical and archaeological resources. Those that are within areas to be developed or modified by the proposed project will be properly recorded or preserved and incorporated into the project. A management plan for archaeological resources will be developed and submitted to appropriate agencies for approval.

Marine and coastal pond surveys that have been conducted indicate that the nearshore and immediate offshore areas of the project site are relatively depauperate biologically or contain low to moderate biological diversity. Numerous intertidal and subtidal freshwater springs and large point-source surface discharges of cool, low saline water from the coastal ponds appear responsible for the low to moderate biological diversity of the area. No modifications are proposed to the marine and coastal ponds except for periodic cleaning to maintain the ponds as attractive features of the resort.

V. Major Impacts

Implementation of the proposed resort master plan will involve grading, vegetation removal and replacement, modifications to the present infrastructure including underground utilities, restoration of Ninole Cove to its original condition, construction of a 500 to 650 hotel rooms, 1,580 to 2,300 multifamily residences, 110 to 125 single family residences, realigned and modified golf holes, and resort support facilities. The potential exists for significant effects, including the following, many of which are considered beneficial:

- o Reconfiguration of the terrain due to grading and landscaping;
- o Change in the visual character of the site due to new landscaped areas, hotels, multifamily residences, commercial spaces and new recreational areas;
- o Airborne dust and noise during the construction period;
- o Use of treated sewage for golf course irrigation with resulting potential increased nutrient loading in the coastal ponds and immediate offshore areas;
- o Impacts on historical and archaeological sites that will be mitigated through recordation and preservation;
- o Improved access and increased use of Ninole Cove, Punalu'u Harbor and Punalu'u Beach Park;
- o Increased use of available potable water supplies, public utilities and services;
- o Increased short-term and long-term employment;
- o Increased population levels;
- o Increased personal income and business activity;
- o Increased employee demand for housing;
- o Increased governmental revenues and expenditures; and,
- o Increased demand on public services.

VI. Determination and Supporting Reasons

The applicant, C. Brewer Properties, Inc. is requesting an amendment to the Hawaii County General Plan. Since the project, as a whole, may have a significant effect on the environment, an EIS, per Chapter 343, Hawaii Revised Statutes, will be prepared. Important to the well-being of a majority of the residents in Ka'u, the anticipated benefits of the resort improvements and related zoning changes will contribute to the achievement of the economic, social and environmental goals of the State, County and other public and private agencies and groups. These benefits, as well as potential adverse environmental impacts, will be fully documented in the EIS.

VII. Parties to be Consulted for the Preparation of the EIS

The agencies and organizations listed below will be sent copies of the EIS Preparation Notice (EISPN) and requested to comment on the proposed project.

Federal Agencies

U.S. Army Corps of Engineers, Pacific Ocean Division
Department of Agriculture, Soil Conservation Service
Department of Commerce, National Marine Fisheries Service - Honolulu
Department of Energy
Department of Health, Education and Welfare
Department of Housing and Urban Development
Department of Interior - Fish and Wildlife Service
Department of Interior - Geological Survey, Water Resources Division
Department of Labor, Occupational Safety and Health Administration
Department of Transportation - Federal Aviation Administration
Department of Transportation - U.S. Coast Guard
Environmental Protection Agency

State Agencies

Department of Accounting and General Services
Department of Agriculture
Department of Budget and Finance
Department of Defense
Department of Education
Department of Hawaiian Home Lands
Department of Health
Department of Labor and Industrial Relations
Department of Land and Natural Resources
Department of Planning and Economic Development
Department of Social Services and Housing
Department of Taxation
Department of Transportation
Office of Environmental Quality Control
Office of the Governor
Office of Hawaiian Affairs

Congressional Representatives

The Honorable Daniel K. Inouye
The Honorable Spark M. Matsunaga
The Honorable Daniel K. Akaka
The Honorable Cecil Heftel

State Legislatures

Senator Richard Henderson
Senator Richard M. Matsuura
Senator Malama Solomon
Representative Virginia Isbell
Representative Andrew Levin
Representative Robert Lindsey
Representative Wayne Metcalf
Representative Harvey Tajiri
Representative Dwight Takamine

Hawaii County

Mayor Dante K. Carpenter
Planning Department
Department of Public Works
Department of Parks and Recreation
Department of Water Supply
Department Research and Development
Fire Department
Office of Housing and Community Development
Safety Coordinator
Civil Defense Agency
Finance Department
Hawaii Redevelopment Agency
Planning Department
Police Department

Hawaii County Council

James K. Dahlberg
Frank De Luz, III
Takashi Domingo
Robert Herkes
Lorraine Jitchaku
Russell Kokubun
Merle K. Lai
Spencer Kalani Schutte
Stephen K. Yamashiro

Public Utilities

Hawaii Electric Light Company
Hawaiian Telephone
Gasco, Inc., Hawaii Division

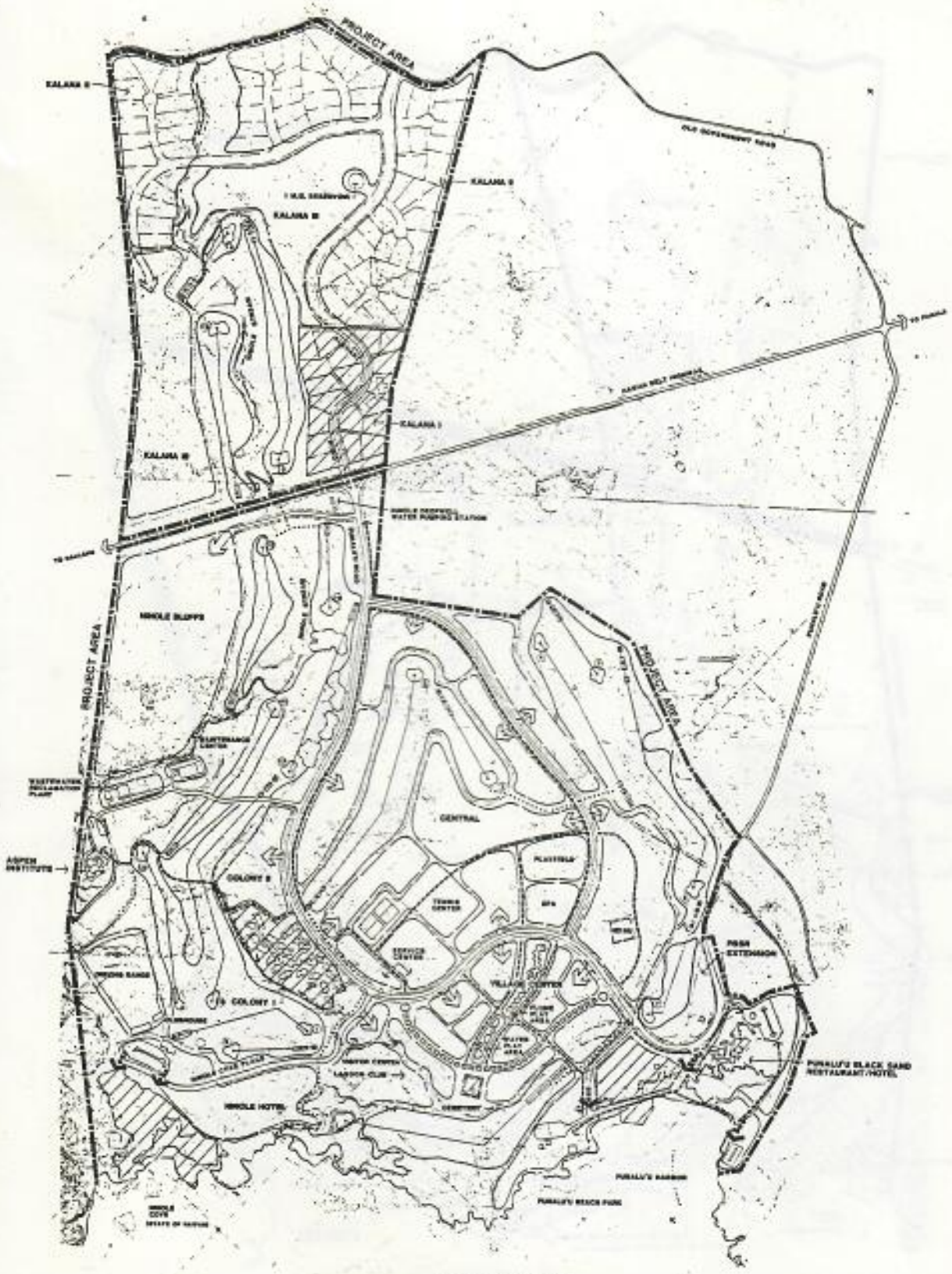
Community Organizations and Other Public Interest Groups

Big Island Chamber of Commerce
Big Island Business Council
Hawaii Hotel Association
Hawaii Visitors Bureau - Big Island Chapter

Life of the Land
Moku Loa Group, Hawaii Chapter Sierra Club
Ka'u Historical Society
Kona Chamber of Commerce
Japanese Chamber of Commerce
Kohala Chamber of Commerce
Portugese Chamber of Commerce
ILWU
Hilo Hawaii Visitor Industry Association
Audubon Society - Hawaii Chapter
Hawaiian Civic Club of Ka'u
Ka Ohana O Kalae
Hui O Kokua
Ka'u Roping and Riding Club
Naalehu Community Club
Pahala Community Association
Ka'u Lions Club
Ka'u High School
Naalehu Elementary School
Ka'u Hospital
Colony I Homeowners Association
Alu Like
Board of Realtors - Island of Hawaii
Rotary Clubs - Island of Hawaii
Various East Hawaii Community Associations

IX. List of Exhibits

Figure 1A. Island and Regional Location
Figure 1B. Ka'u District
Figure 2. Existing Conditions Map
Figure 3. Existing Zoning and Regulatory Map
Figure 4. Proposed Resort Master Plan



LEGEND

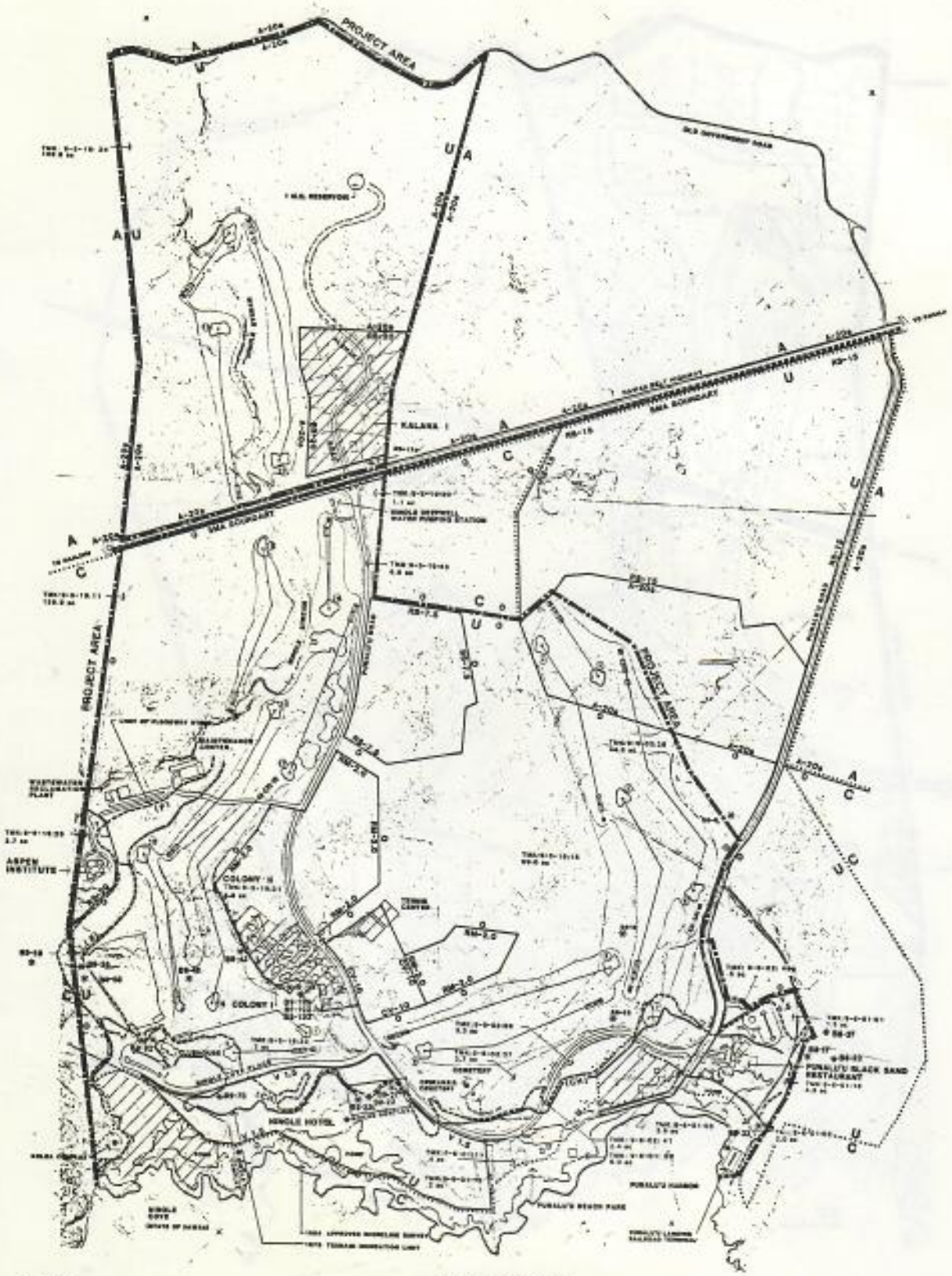
- PROJECT BOUNDARY
- OTHER OWNERS
- VILLAGE CENTER/MIXED USE
- HOTEL SITES/MIXED USE
- SERVICE CENTER/MIXED USE
- SINGLE FAMILY RESIDENTIAL
- MULTI-FAMILY RESIDENTIAL
- PUBLIC SHORELINE ACCESS
- PEDESTRIAN NETWORK
- GOLF CART PATHS

FIGURE 4:
PROPOSED RESORT MASTER PLAN
Punalu'u

KA'U, ISLAND OF HAWAII

JUNE 1986

pbr



LEGEND

- PROJECT BOUNDARY
- OTHER OWNERS

COUNTY ZONING

- VILLAGE COMMERCIAL CV-10
- HOTEL/RESORT H-1.5
- SINGLE FAMILY RS-7.5
- SINGLE FAMILY RS-20
- MULTIPLE-FAMILY RM-3.5
- AGRICULTURE A-20a
- OPEN O

COASTAL ZONE MANAGEMENT

- SPECIAL MANAGEMENT AREA (SMA)

FLOOD HAZARD

- FLOODWAY (F)
- COASTAL HIGH HAZARD (CH)

STATE LAND USE (TO BE CONFIRMED)

- URBAN U
- CONSERVATION C
- AGRICULTURE A

ARCHAEOLOGICAL SITES

- BISHOP MUSEUM INVENTORY
- STATE HISTORIC INVENTORY

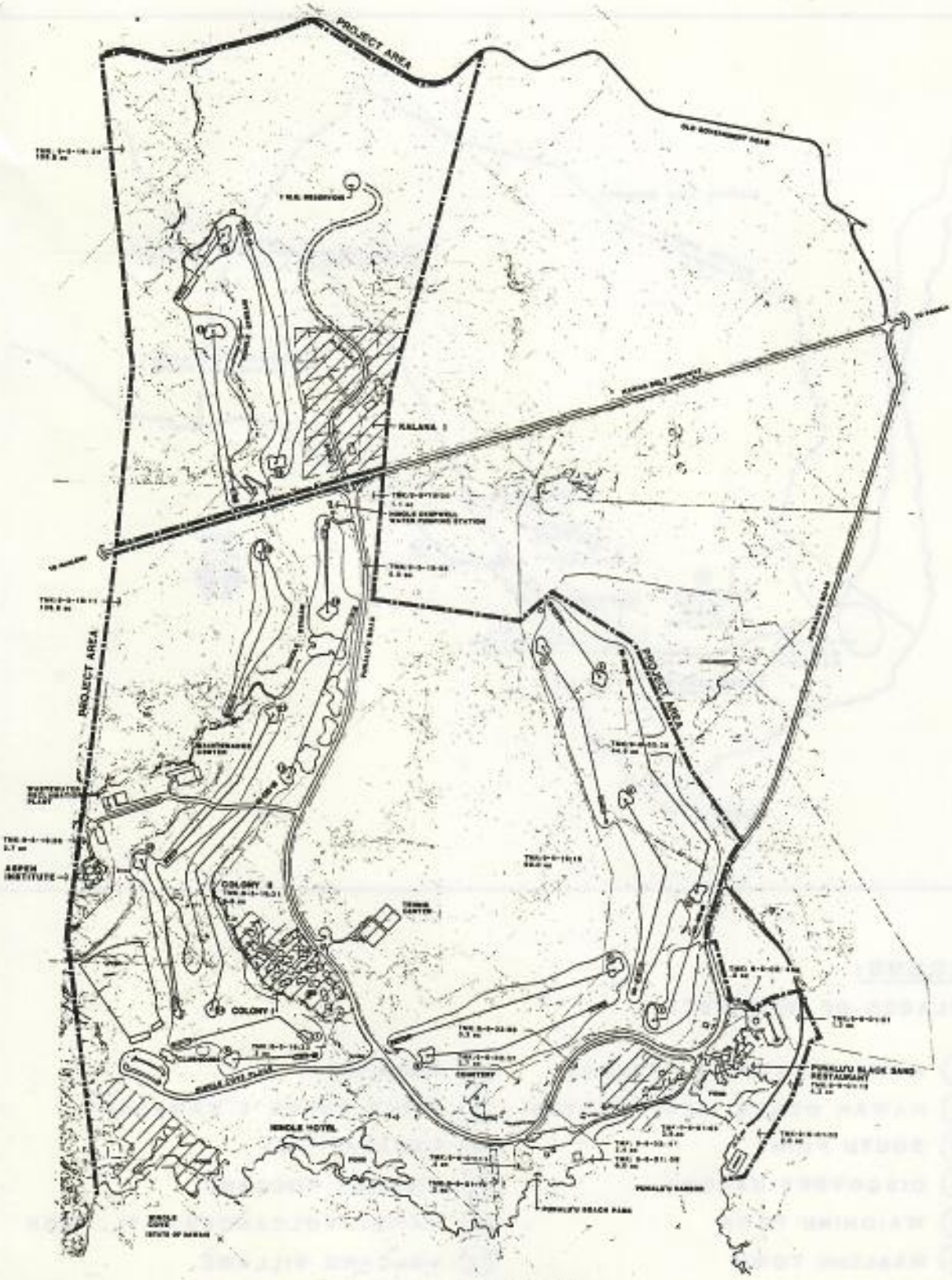
FIGURE 3:
EXISTING ZONING AND REGULATORY MAP

Punalu'u

KA'U, ISLAND OF HAWAII

JUNE 1986

pbr



LEGEND

PROJECT BOUNDARY

OTHER OWNERS

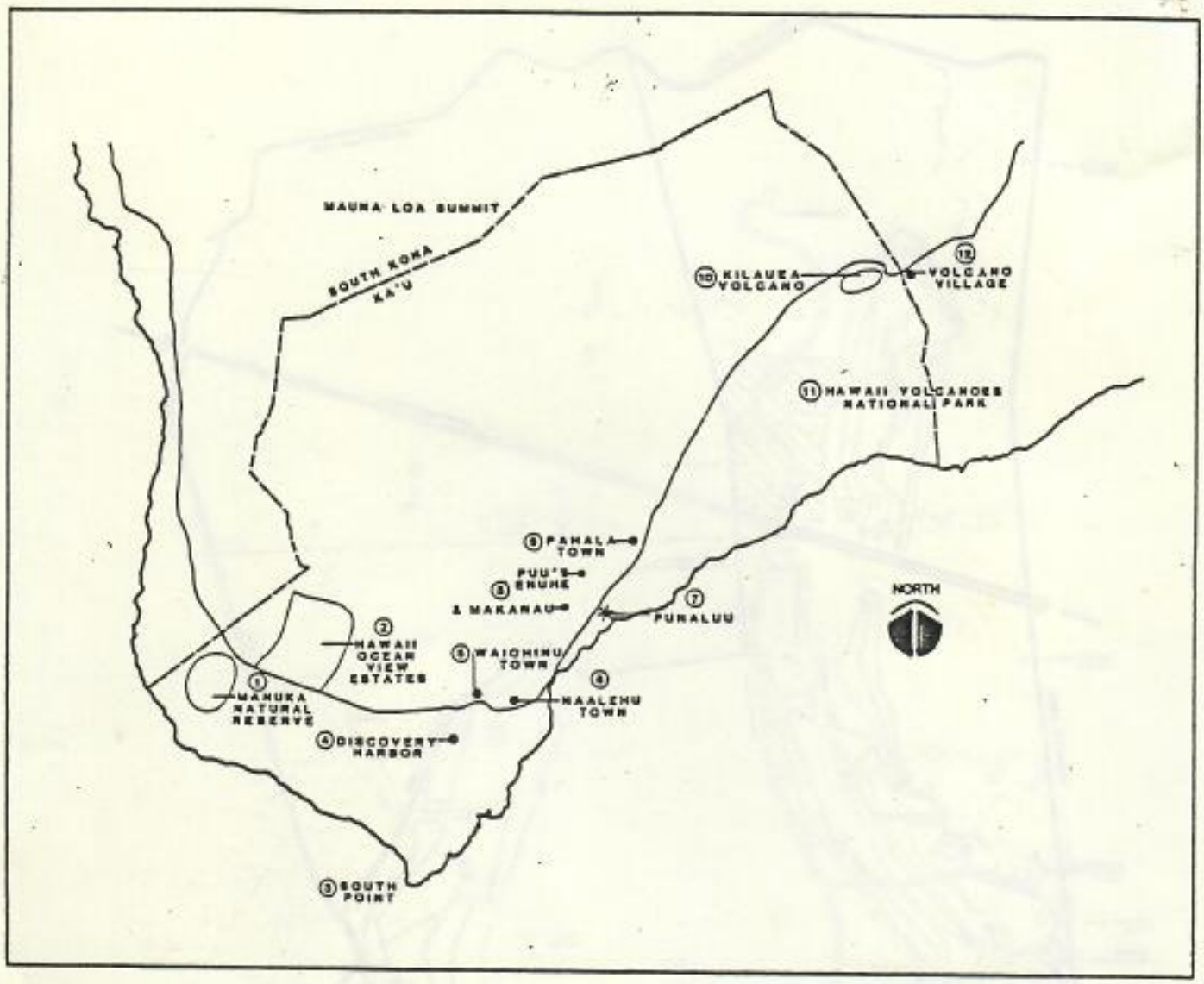
FIGURE 2:
EXISTING CONDITIONS MAP

Punalu'u

KA'U, ISLAND OF HAWAII

JUNE 1988

pbr



LEGEND:

(PLACES OF INTEREST)

1. MANUKA NATURAL RESERVE
2. HAWAII OCEAN VIEW ESTATES
3. SOUTH POINT
4. DISCOVERY HARBOR
5. WAIOHINU TOWN
6. NAALEHU TOWN
7. PUNALUU
8. PUU'S ENUHE & MAKANAU
9. PAHALA TOWN
10. KILAUEA VOLCANO
11. HAWAII VOLCANOES NATL. PARK
12. VOLCANO VILLAGE

FIGURE 1B: KA'U DISTRICT

Punalu'u

KA'U, ISLAND OF HAWAII

pbr

Call Glenn Iverson

Predeveloper Regime
of the Water Quality
and Macrobiota
Conditions
of Fronting the
West Beach
Condos, Oahu, HI

Tec. Rept
Sub. to
Environ. Comm INC.
1152 Bishop St
Honolulu Hawaii

by Dr. Paul K. Bienfang
&
Dr. R. E. Brock

January 1980

This report
60-70'
contours

West Beaches Estates

Table 28

1-21
B- Dist. of Macbiota
23-112

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region
Western Pacific Program Office
P. O. Box 3830
Honolulu, Hawaii 96812

uly 23, 1985 F/SWR1:LDC

TO: F/SWC2 - Richard S. Shomura

FROM: F/SWR1 - Doyle E. Gates

SUBJECT: Sea Turtle Habitat Research

My office is currently involved in two separate Endangered Species Act Section 7 consultations regarding possible impacts to threatened and endangered species resulting from construction activity at West Beach and Ewa Beach, Oahu. The West Beach proposal calls for a 642 acre development that will include 4 swimming lagoons and a 42 acre (500 slip) marina. The Ewa Marina Community proposal calls for a 730 acre development that will include a 108 acre (1600 slip) marina.

I understand George Balazs is planning some work in the West Beach area. As the Ewa Marina project is in proximity to the West Beach development, may I suggest that the planned research be expanded to cover this area as well. These two large developments, along with the other attendant development that will result, may displace a portion of the green turtle population over a large stretch of the Oahu coast. We are anticipating the results of George's research to form the basis for the Biological Opinions, as we have little or no information on turtles in the area.

Lew Consiglieri will be available to assist George as a diver, if the need arises.

7/10 Cement pad point 3 feeding (small)
4pm - 10-20' from shore
rocky bottom - shallow

Mangroove seeds (shoots?)

5pm closer to ship wreck

(5:10pm) 3 close
more east 4 Near the Forge site limit in sing
(6pm) same place 4 close

7/11 Snorkel Barry reef - collected algae
Roberts channel 3m deep max
lots of good sleeping - silt - bottom relief
Spyrida all over
also lots of ~~Lymbia~~, Dictyota acutiloba

Snorkeled reverslope limestone and collected
algae - see p32.
bees, deer & bird tracts - seep

∴ No ~~sleeping~~ resting seen inside

~~sargassum~~ (NO) farther out,

∴ silt, lots of Rubble
Algae ~~seen~~ right next to shore was different
& much sparser that further off - all over reef and others

7/11 1830h near sunset — close to shore — few inches of water on carapace.
hand capture toy 8516
Mouth contents —

1830h Same
toy 8514

CLARK, 1980
ABANDONED VILLAGE (Deserted)
Keomuku - 6" 9.6 Km miles of shoreline
Kahohunui to Halepalaoa (old landing)

narrow DARK black detrital sand beaches Backed by thick KIAWE + COCO
" one of longest stretches of fringing reef in Hawaii - > 1/2 mile from shore in several places (usually 500M
Spring low
Shallow reef flat - murky, choppy & cold - strong trades
(Not examined in this study) - But needs to be done from shore.
RUINS
Kaa & WAIopae fishponds

Small fishing village until 1899 - sugar cane plantation
RAILROAD - Pier Halepalaoa - ship to OlowALU
PLAGUE - 1900; then freshwater irrigation sources
turned brackish - Maunlei Sugar Co. folded in 1901.

Whaleboats - 1935 mark shoreline - 500' 15M of new
Shore created by soil runoff from mountains.

NE coast of Lanai.

Access from Maui by Zodiac

→ former turtle fishing from ( ) by

15M

7 1/2

Dead & Broken Coral - ALOHALU
Add further to Captains

Dive charters from Maui - very popular

"Turtle Heaven" - Church & Church 1985
"Turtle Town"

15Km - channel name = ANAU CHANNEL
usually calm waters - Maui Lee Clark 1980

Turtle Fish Spear from Maui for restaurant trade - NOOSE, GAFF & Powerhead

Halepaloa - Charter Destination - picnic

Dirt road not easily access from Lanai City / (Long drive over very rough road)
POPULATION OF ISLAND
PINEAPPLE PLANTATION
Armstrong 1983 see

KI'AWE
LANAI Pop. ~ 2200 (see latest Armstrong ED?)

Possible cleaning station described - Capt. Nemo

CAPTIONS ON MAPS

5/4 Dive outside fuajis - not present at Stars

Points Compressed +
Lots of live coral cover - ends at ~60' Sand/silt starts
Sand channels going inshore
Swift current - eastward flow 1 seen

SKIN diving at reef start - No. of Stars + 3 seen surface
from land (7269) - 20' ledge in sandpocket 5 UW Survey

Amansia Covered w/SILT - abundant in cracks 15'

Scuba #2 "0"

Turtles captured/seen
Foraging Habitat
Resting Habitat ~~Algae~~ ?

5/6 20' followed narrow sand channels down

Undercuts 30' → 50' crashed & Caught
Charter just 5 of us

Coral ID - 3 — IN BROWSE ON FILE

10 total
2 Dives
of which
3 caught

Drift north - changes w/tide

Surface seawater 25°C

None seen larger than 75.8 cm captured.

All Bite

Turtle where there are sand channels, more solid coral cover. overhang of Coral

Table 28.—Biometrics of green turtles sampled at Lanai and Maunalua Bay, Oahu.

Tag No.	Carapace length		Carapace width		Plastron length (cm)	Tail length (cm)	Head width (cm)	Front flipper width (cm)
	Straight (cm)	Curved (cm)	Straight (cm)	Curved (cm)				
			Keomuku, Lanai					
7259-60	52.1	56.0	41.2	49.0	41.1	10.0	7.8	8.7
7264-66	62.3	66.0	48.7	59.5	50.8	11.0	6.3	9.7
7267-69	65.8	69.5	51.9	64.0	52.7	13.5	9.5	10.6
7261-63	75.8	81.5	57.3	76.0	61.3	15.0	10.3	12.3
			KUAHUA Wahiawa, Lanai					
8514-15	--	47.0	--	43.7	37.5	--	--	--
8516-18	--	72.5	--	66.0	57.0	--	--	--
			Maunalua Bay, Oahu					
7257-58	39.2	40.1	34.8	40.0	31.1	7.0	6.3	6.2
7273-74	41.7	43.7	34.5	40.5	34.3	7.0	6.6	7.1
8451-52, 7275	62.2	66.5	49.2	61.5	49.8	13.0	9.6	10.4

Table 29.--Identification of stomach contents sampled from green turtles at Lanai and Maunalua Bay, Oahu.

Tag No.	Straight carapace length (cm)	Sample contents (%) T = trace	
Waiopae, Lanai (natural mortality on 4-28-85)	38.9	Acanthophora spicifera	99
		Codium edule	1
		C. arabicum	T
		Chondrococcus hornemanni	T
Halepalaoa, Lanai (natural mortality on 5-4-85)	38.9	Stomach contents	
		Filefish bones	99
		Amansia glomerata	1
		Acanthophora spicifera	T
		Intestinal contents	
		Amansia glomerata	99
		Codium edule	1
		Acanthophora spicifera	T
		Dictyosphaeria versluysii	T
		Fish bones	
Keomuku, Lanai			
7259-60	52.1	Amansia glomerata	99
		Jania capillacea	T
		Acanthophora spicifera	T
		Ceramium sp.	T
7267-69	65.8	Amansia glomerata	99
		Hypnea cervicornis	T
		Jania capillacea	T
		Sargassum polyphyllum	T
		Amphipods	
		Copepods	
[redacted], Lanai			
8514-15	(Curved length 47.0)	Acanthophora spicifera	90
		Hypnea musciformis	10
		Griffithsia sp.	T
		Ulva fasciata	T
8516-18	(Curved length 72.5)	A. spicifera	90
		Hypnea musciformis	5
		Ulva fasciata	5
Maunalua Bay, Oahu			
7257-58	39.2	Codium edule	67
		C. arabicum	33

Apple, R.A. and W.K. Kikuchi. 1975. Ancient Hawaii Shore zone fishponds: An evaluation of Survivors, for historical preservation. National Park Service 157pp.

THORNY

Kiawe (algaroba) Prosopus sp.

Kiawe is a phreatophyte, ie robs moisture from the soil. When growing near pond, or in their watersheds, the kiawe may eliminate or reduce the flow of any springs feeding the pond.

Introduced in 1828, spread rapidly since 1900.

Coulter (1935) Lat. Long. place-names

Palaau - length of area. define geographic limits

Quiescence

Meaning of Palaau; kawela

5/10/8? 2 not bagged

Adults caught, or not bagged at other times - Palaau

300-400 lbs in the past

kawela - Big ones in the past

750 (1500) Instantaneous adults (compute by coastline?)

Color change between two small turtles; fouling.

Palaau - passed over in the lit.; brief mention by Clark & Summer (2 papers).

lubricated w/cooking oil.

Dick Moore - Chondrococcus

NIGHT dives needed.

Stormy or Fair?

Pickleweed = Batis maritima

curved not as accurate as SCL, so SCL to posterior tip of a postcentral was used as a "standard" measurement.

p 13 Papilloma Incidence seems to be on the increase (Balazs in press)

Boat length 21' = M

Table 14, footnote 6 "16-17 1985

Stipple kawela insert - add to caption.

22 to 21 in food contents TOC for Palau.

plenty Available habitat for nesting.
Neither forage nor nesting seem limited.

MAUI KAHULUI

Mr. Helm
ALVIN BOKEILHO

Matson Shipping Freight terminal - lots of lights

37 years

Sewage treatment ~ 1981

ON Breakwater - Pterocladia & Ulva

4/9/84 3 out 25 TIMES

Turtle basked in net - FIMD paper

Airport - Planes overhead

URBAN Center of Maui - Great pop. density on Maui

Power generating plant 40,000 kilowatts

(Clark 180)
(Hawaiian Electric Co. and B.P. Bishop Museum 1975)
Armstrong 1983

[INSERT IN KAWELA SECTION:
MaGRUDER "OF NO USE"]

DETRITAL SAND

CAL. SAND & MAT. ERODED FROM LAND

Melebiig also on tag.

Ack. Ishizaki & Ag. Service

Table 17

Stomach contents sampled from

Prominent species

Dump turtle (?)

39-71 cm 21 turtles

Amphipod

✓ Epizoites - Table 9

✓ Injury / Abnormality Table 18?

✓ Growth Table 19

Meaning of Palaau.

Homing behavior Table 20

* change 22 to 21 in T.O.C. listing for Table 17

* Coulter (1935) for place name - geographic Lat. long. data.

* Change T.O.C. - Table 29 becomes 27; Table 27 becomes 28 Table 28 becomes Table 29;

ADULTS Caught at other times at Palaau? - need to Calculate

Palaau - length of area dimension calling it 4 km? or extending to Waikano

TO Palaau from Pie (about 8 km)

INSERT Meaning of Kawela (springs?)

Table 3 Molokai Samples

Table 6. weight & length
14 turtles
range 39 - 63 cm

Table 9. Epizoites
2 turtles
Spirorchis
Polyorchis

Figure 5.
CCL vs SCL Hawaii & Palmyra

Figure 8. SCL v WT " "
N=20

Figure 6. C/S Ratio vs. SCL
128/34 " "

Figure 7. % of total vs SCL " "
128/34

Color change between two individuals

Passed over in lit. Brief work by Clark

Summer Citation Fishpond survey

Palaau

TUBE Lubricated with Pam

✓ Tide change - fish come onto reef flat

✓ No different in feeding by size

✓ Food different by size?

ABOVE
* Mouth samples? Skindive catches?

need ✓ Amphipods
Ref. ~~from~~ Cook-Balazs note

Telephone
Ref? DICK MOORE — TOXIC Properties
Chaetoceros

Seaweed exposed TO AIR

A. ~~spicifera~~ displaced others?

Springs Paloau -

change kawakakai to 8 km

seen to Feed during the day

Insert
Some got spray point numbers

GET PHOTOS - COMP. JUVS. FW SPRINGS BUT KAWE

with Amphipods = 8 (38.1%)

Table 17

		Halo.	Hirudo	Acanth.	Turbinaria	Valonia	Hypnea mid	Gelidium	Amansia	H. cervicor	Laurencia	Spyridia
38.8	1			40 1			40 ①		20 1S			
38.8	2			40 2						50 1		
39.6	3	75 1							25 2D			
39.9	4			"T"								
Ⓐ40.6	5			95 3			"T" Hypnea sp.					
41.2	6											
42.7	7			90 4						10 2		
Ⓐ46.7	8			75 5								S25 1
47.5	9			99 6								
49.3	10			25 7					75 3S			
51.3	11											99 2
Ⓐ51.9	12			20 8						20 ③ (14.3%)	20 ①	S40 3
51.8	13	50 ②		20 9								S30 4
52.1	14	20 ④		95 10					2 4S	1		
Ⓐ53.0	15	(9.5%)	90									
Ⓐ53.6	16							5	95 4D			
55.8	17			99 11						1		
Ⓐ60.2	18								99 5D			
Ⓐ63.4	19		30		40 ①				30 ⑤D (38.6%)			
68.6	20			25 12								S75 5
Ⓐ71.3	21			80 13 (61.9%)		5 ①			20% or more			S15 ⑥ (28.6%)
				(20% or more)								(25% or more)

① Acanthophora SPYRIDIA
② SPYRIDIA ~~SPYRIDIA~~ 2 KINDS
③ Hypnea
④ Halopteris
④ Amansia further out in corals

NOTES RELEVANT TO RESTING / FORAGING HABITAT APPRAISAL

Nylon BAG - 2½" (cm)
Guide - 2¾" = (cm)

Calcareous

4/23 GB & RF skin 2½ hours - 10 turtles + 2-3 heads
channels w/sand-silt bottoms, close to wave break where channel ends in coral wall. - barrier against incoming waves. No surge
Little Algae out here - Limu kohu

Nearshore mudflat bottom - C. ~~serrulordes~~ caulerpa sertularioides
Hot muck near house. Lots of HALOPHILA.

4/25 25°C net site

5/22 Zodiac Deep green areas - shallow mud
Seawater 25.5 coral head zone
A. PUA reports sleeping turtle in deep area by Pakanaka + other deep spots close to shore
5/23 zodiac - mud band turns into zone of coral heads.
Scuba holes: 10-15' Particles make limited vision
Hard to see inside dark overhangs
Reef framework - cracks in reef.
hand capture 6-8' under head. (not green hole)
Hard to get to green spots at low tide - zodiac hits them - hard to get over them with scuba.
after Heads seen at the surface at a distance - but then not UW.
- Silt clouds lift up from swim fins
- go at night

BAKLAD

✓ need - reef collections
IDed by Dennis

5/24 Zodiac cast to kawela - ED's net. Saba kawela "drop".
"soft mud" - quicksand-like, very deep.

5/28 Drove to Waikaua Rm shore only

5/29 " " " SKIN zig-zag
Asparagopsis
small seeps

5/30 " Petroglyph site Petro. site
small seeps
note: waist-deep, then snorkel
" coral heads appears.
" seen

GALAXAURA RUGOSA - common like to HI,
Amansia in crack in coral head zone.

5/31 "Petro" site SKIN (early morn. at low tide) ↑ TOO
Petroglyph 2 SKIN captures! zig-zag survey

6/1 moved/disass. zodiac to Aeo from Bill's
Halawa

6/2 Zodiac to Palaau
Skin. Rising Sun reflects on suspended particles.
~~so~~ CAN'T SWIM IN TO IT.
TOPS OF HEADS EXPOSED. 26°C
Caulerpa & Halophila on soft mud.
All others on hard substrate, - rubble, etc.

6/3 disassemble & return to Aeo.

note: In Muddy water conditions, you can't see where to set the net without going over coral heads

22' boat

- Adults are rare -- look at FFS & pop. est.

— Plastron completely white - VS - orange/yellow later
NOTE PHOTOS; NO SLIMY growth, clean,

— Grandpa BiCoy Reported Big turtles caught Palaau (see notes)

KUNUKUAWA POND - Loc. ? SL 83 4/14/84
BIOMASS 5/10 "2 TOO BIG TO HANDLE"

Scuba Needed off-reef
wetty
7/17 28.3° wet
hip deep 31°C 5pm glassy conditions

7/18 Check commercial catch stats for BiCoy - "TEMP" OF NO USE
"300-400 lbs"
29°C enclave - waist deep
[Spray used on some turtles - not all]

No (N-H2O work possible when wind comes up - AM?.
∴ Survey "no wind" times, or early morning

Note - algae (Trace) growing on tag in just (B) days (7939 4/11 by Bill)

8/29/82 SL - 56cm in dump
Mostly Halophilia & small amounts Amansia

not - "side canals"

11 Terrygrove "SINK into mud calve deep

NIGHT dives at low tide w/light no anim to search for sleeping ones.

Coral "chips" mixed w/ soft mud (silt)

Acanthophora - Algae - dense standing crop / frequency of occurrence / distribution.

Ubiquitous; consistently present;

Algae was substratum upon which eggs were attached.
egg-case attachment by Molluscs not very specific

Halophila roots hold sand/mud into MOUNDS.

Amansia & Halophila more off shore.

Heat; H_2O causes or limits? fast growth?

"Green" turbid water harbor area, & nearshore — off breakwater.

30' to anchor — out along left-hand breakwater
used depth finder

25-30' hard smooth bottom ↓ down to 30'

1 ft (3+1

relatively smooth hard bottom

Zodiac used on Maui & Lanai had a depth finder.

✓ Another large dead turtle w/ tumors was found here on ———.

✓ Balazs, G.H. in press. Incidence of Fibropapillomas ...

PLANT CONSTRUCTED?? call Helen

LIGHTS out -- better catch?

Around or UNDER NET

over 30 yrs ago

Size of plume:

offshore channel - Scuba ~3 M - 3.5 M

(see p112)

1947 is correct

— Scute from a small turtle

5(7 30.0 - 30.5° C PAL 2 - TOP TO BOTTOM

7272 - slight red skin algae
- MANY SKIN BARNS
- STEPANOLOPAS on Front Flipper
- white coralline on carapace

6/18 8464 dense, almost complete coverage with skin barns
white coralline; Stephanolepas; Front margins flippers: no skin algae
YANAGI' — many just in last few years"

5/11 - Single surfacing 5-6 MIN

6/17 Breathe hold in net 1-4 minutes 1-6 MINUTES

5-minute start up for floodlight

pool of clear discolored water - plume

8468 6/18/85 no skin algae
Lots of SKIN Barns

6/18 8472 Burrowing - front & back flippers
Bright pink on carapace
Several small chelon scat.
MANY SKIN Barns

8476 only one with red skin

8486 turtle barn on head

Mangove - Palaau - portions of intertidal reef flat.

Channels flow out (scuba here) Lots of ALGAE + Ptero.
(Nearshore Right Depth 1-1.5 M (1-2 M depending upon tide) out 2-3 M) - 3-3.5 M

NEED Surface water warmer > 1m cooler

✓ can lights go by

✓ Baby bows? other epizoites

hard, smooth bottom with rubble - debris

Pieces of cement piling
IRON
MARBLES
Fishing SINKERS line
Gill net
TIRE
Big PIPE
= Codium ACAN.

Turtles right by outfall not believed feeding though detached pieces on the bottom.

Felt likely further out -- perhaps they feed then come in to warm although sightings at dusk did not support to this.

✓ 28 turtles counted 5/2/85 SCUBA DIVE

✓ Sighting per minute

✓ used to lights - others present + cars

✓ Thermal advantage is considerable, so lights may not be so threatening.

NEED Small Sharks in discharge HARMLESS TO TURTLES, BUT COULD NIP DIVERS 4/11 2008 8:08pm + 5/2
TIGERS COULD COME IN MORE, BUT APPARENTLY DON'T!

4/12 6:15 am - SUNRISE
NO turtles

Clear plume formed by the clear freshly discharged warm water

Table 1 Surveys

Visual skin Diving - no feeding in clear plume - nothing growing, but detached pieces

Turbid area ± + shallow channel 200m out Lots of algae growing.

But beyond ~500m? NO Algae they eat.

Breakwater Boulders - profuse Pterocladia, but they don't seem to be eating it, except trace.

~ 20' Elevated Banks 6 meters
No reports inside harbor, except are Barn. encrust seen regularly.

ARTIFICIALLY high pop. built up by ATTRACTIVENESS OF DISCHARGE - aggregates large turtles from a considerable stretch?
- Firearms - Rene Sylvia said turtles Shot there
discharge by steps 30°C
EAST discharge 31°C

ppt seawater - prevent fresh intrusion

* Little movement - Lying there motionless - "stacked"
Some drifting back & forth with mild surg.

✓ Few sightings before latter part of twilight

Converge on site - "Race"

on shore wind "holds" warmer water
along embankment - spreads
out and disappears along shore
moves to the east to pocket of breakwater
Pteroclodia on cement of breakwater

No algae growing? at discharge - up-wind though

Matson yard - breakwater ~ 1964

Thermal plume doesn't kill ectoparasites - None dead - rather may be promotes!

Text add Page 1 NWHI

readd Armstrong to Kawela "Turtle Bay"

previous Maui

Strand at Paukoloa Site w/TARS

change TABLE + T.O.C. List of TABLES

(PAGE 1 additions ...

Table 22. ✓ Biometrics - KAHULUI Bay

Table 23. ✓ ID of Stomach Contents

was Table 26 Table 24. ✓ Injuries & abnormalities (+ Add footnote)
"Blow By SOMETHING" ADD and change

was Table 27 Table 25. ✓ Percent injuries & abnormalities - Comparison of all 3 places
corrections/changes needed

was Table 24 Table 26. Percent nutrient composition

was Table 25 Table 27. Mineral Composition

Table 28. Biometrics - Lanai +

Table 29. ~~Food~~ Stomach Contents - Lanai +

Table 9 - Epizoites - many additions needed

✓ Table 9 - Epizoites - kahului

✓ Table 13 deep - body temp. - both - kal captures

✓ Figure 10. Size-class comparison - all 3 places

Figure 11 - sightings - surfacing to breathe

"Turtles" ↓ MAUNALUA BAY

Pukui Place Name (NEED ACCOS) + Clarke + Church & Church + Diving Guide

IN MY OFFICE "Turtles"

Edule
C. arabicum

SCUBA 4/30 1 caught, 1 saw

5/15 35' sand bottom 2 caught (1 on palm frond, 1 headed in hole)
small
1 w/ tines

ECTOCARPUS see sample bottle - stipe or gut?

5/15/85
TAG NO. 7273

Combine everything - paragraphs

East end of Maunalua Bay, near koko head
Shallow reef flat
dredged channel, boat ramp
land-filled shore line - major residential areas (high-density)
popular surfing area
scuba diving charters - TURTLE CANYON ADVERTISE
Depth of 35-40', outside breakers
Resting habitat - No. seen?
series of coral ridges and sand channels
Turtles regularly seen - a diving attraction for customers
Cleaning station, like at FFS
1980: page
Galapagos
Symbiosis
cleaning

BACK
NOTE: COLOR DIFFERENCES OF SMALL TURTLES AT PALAAU.

9-2-86

George,

Dale & I dove (scuba) with the Aloha Dive Shop on Sunday, August 31. Our first dive in Manzanillo Bay was rather dull (45 ft). The second dive was done about 250 yds WSW of the breakers beyond the channel markers (outside the jet-ski area) in about 30' of water. Dale & I were first in the water (i.e. no previous disturbance). We saw about 12 turtles, 3 or 4 may have been repeats. Most were in the 50-70 cm range, with one at about 85 cm (guesstimate, of course). The bottom consists of a series of rocky gullies with numerous overhangs and depressions. About half the turtles were observed resting, but alert (they moved away even though we didn't approach closer than 15' - once they noticed us). The other half was slowly cruising, stopping to nibble on algae from the [illegible]. We

followed one for about 10 minutes & were able to find the places he'd (she'd?) been eating.

One turtle had a metal tag on the right f.f. (unable to read). Another had a large, tennis-ball sized fibropapilloma on its r. f.f., where a tag would be placed.

Here's an area that gets good currents, lots of boat traffic, and divers - yet supports "a lot" of turtles.

I think you'd be able to tag a good number of turtles there, catching them in their resting places.

Lew

S

Sliding Sands Trail. See Ke-one-he'ehe'e.

Smith. Street, downtown Honolulu, named in 1850 for the Reverend Lowell Smith (1802–1891). Smith established Kau-maka-pili Church in 1838, then a 30- by 65-foot grass house (TM.); he was pastor of the church for 30 years. See Kau-maka-pili, Lowell.

Snyder Hall. Department of Microbiology building, Mānoa campus, University of Hawai'i, Honolulu, completed in 1962, and named for Laurence H. Snyder (1901–), sixth president of the university 1958–1963.

Solomon. Elementary School, Schofield Barracks, O'ahu, named for Samuel K. Solomon, a soldier from Kohala, Hawai'i, who was killed in combat in Vietnam in 1965.

Sonoma. Street and place, Mānoa, Honolulu, named for the steamer *Sonoma*, sister ship of the *Sierra*. (TM.)

Spalding Hall. A University of Hawai'i building, Mānoa campus, Honolulu, housing the economics department and the graduate division, completed in 1961 and named for Philip E. Spalding, chairman of the board of regents 1943–1961.

Spalding House. Branch of the Honolulu Academy of Arts, Makiki Heights, Honolulu, named for the former owner, Alice Cooke Spalding (Mrs. Philip E. Spalding), who left the property to the Honolulu Academy of Arts in 1970 as a museum for Oriental art. It was built in 1927 by her mother, Mrs. C.M. Cooke, founder of the Academy of Arts.

Spartan. Reef, Pā'ia qd., Maui.

Spencer. Beach park, Pua-kō qd., Hawai'i, named for Samuel Mahuka Spencer, Hawai'i County chairman 1924–1944. (*Honolulu Advertiser*, March 1, 1960.) See Kamuela. Street, Punchbowl, Honolulu, named for Charles N. Spencer, minister of interior under Ka-lā-kaua. (TM.)

Spreckels. Street, Puna-hou section, Honolulu, named for the sugar industrialist, Claus Spreckels. (Clark 18.)

Stangenwald Building. Honolulu's first "skyscraper," a six-story structure on Merchant Street built in 1901 and probably named for Dr. Hugo Stangenwald, whose house on 'Iliahi Street, probably built in 1860, is still a residence. The doctor died in 1899.

Sugarloaf. Mountain behind Honolulu. See Pu'u-Kākea, Tantalus.

Sulphur Banks. See Ha'akula-manu.

Sunset Beach. See Pau-malū.

Swanzy. Five-acre beach park and playground, Ka-'a'awa, Kahana qd., O'ahu, named for Mrs. F.M. (Julie Judd) Swanzy, who donated the land in 1921. See Ka-'a'awa.

Sweetheart Rock. See Pu'u-Pehe.

TtTtTtTt

T

Tantalus. Mountain (2,013 feet high) behind Honolulu, named by early Puna-hou students for the Greek god who, always thirsty, was punished by being placed in a pool of water. When he tried to drink, the water receded. (Thrum's Annual, 1928:105–106.) Perhaps similarly, as the students climbed, the peak seemed always to recede. See Pu'u-'ōhi'a. The same students (including children of the Emersons and Gulicks) also named Olympus, Round Top, and Sugarloaf.

Thirty. Hill (3,224 feet high), Mā'alaea qd., Maui.

Thomas Square. Park and section 17 of Honolulu (map 6), named for British Rear Admiral Richard Thomas who, on orders from Queen Victoria, raised the Hawaiian flag at this site on July 31, 1843, thus returning Hawai'i to Ka-mehameha III after Lord George Paulet had seized and declared Hawai'i annexed to Britain on February 25, 1843. See Victoria.

Thurston Lava Tube. Lava tube, Kī-lau-ea, Hawai'i, named for the missionary Thurston family. The old name was Nā-huku.

Thurston Memorial Chapel. Completed in 1966 on the Puna-hou campus, Honolulu, given by the Thurstons in honor of their son, Robert S. Thurston, Jr., a 1941 graduate who was lost on a military mission in 1945 in the Pacific.

Tripler. Army hospital, Moana-lua, Honolulu; opened on North King Street in 1907 as a post hospital for Fort Shafter. In June 1920 it was officially named for Major General Charles Stuart Tripler (1806–1866), medical director during the Civil War. In 1948 a new Tripler general hospital was built on Moana-lua Ridge, Honolulu, and in July 1950, the name was changed to Tripler Army Hospital. It serves members of the armed forces and their dependents, veterans, and members of the Public Health Service.

Trousseau. Street, Ka-pahulu section, Honolulu, named for Dr. George Trousseau, a French physician who in 1873 advocated segregation of lepers (Kuy. 2:257).

Turtles. Surfing area on the fringing reef seaward of Hawai'i-kai, O'ahu. Turtles are sometimes seen here.

Place Names of Hawaii 1974

Kū'ē'ē Ruins. Old village site with extensive house sites, within Hawai'i Volcanoes National Park, Pāhala qd., Hawai'i. *Lit.*, confrontation.

Ku'ele. Hill near Wai-ehu Point, northeast Moloka'i. (Summers 176.)

Ku'emanu. *Heiau,* now restored, at Kaha-lu'u, Hawai'i, where chiefs prayed for good surfing conditions. Nearby is a brackish pool where chiefs rinsed salt off their bodies after surfing.

K

Kū-hela. Coastal area and bay, north central Ka-ho'olawe. *Lit.*, stand entangled.

Kū-hiō. Bay, Hilo; village, Wai-pi'o qd., Hawai'i. Elementary school, theater, hotel, beach park, avenue, housing area, and playground, Honolulu, named for Prince Jonah Kū-hiō Ka-lani-ana-'ole (1871–1922), delegate to Congress and father of the Hawaiian Homes Commission Act. See Ka-lani-ana-'ole.

Kūhiwa. Gulch and land section, Nā-hiku qd., Maui. The median annual rainfall is 365 inches. Kūhiwa is the name of a special taboo made by a chief.

***Kuholilea.** Land division, Lahaina qd., Maui.

Kuhua. Land division, Lahaina qd., Maui. *Lit.*, to thicken.

***Kui.** Point, Ka-malō qd., north Moloka'i. Place, Ka-lihi Uka, Honolulu; channel, Mauna-lua Bay, O'ahu.

Ku'ia. Shoal, northern Ka-ho'olawe. Valley and stream, Wai-mea district, Kaua'i. Land division, Lahaina qd., Maui. *Lit.*, obstructed.

Kū-i-Helani. Classroom building, Ka-mehameha Schools, Honolulu, built in 1954 and named for one of Ka-mehameha's chiefs. He died in 1827. *Lit.*, standing at Helani (a mythical land).

Ku'ikahi. Street, Wai-kīkī, Honolulu. (TM.) *Lit.*, agreement.

Kuikui. Cape, Ka-ho'olawe. The name is a variant of *kukui* (candlenut *or* torch).

***Kui-lau.** Ridge, Ke-ālia Forest Reserve, Ka-wai-hau district, Kaua'i.

Kui-lei. Cliffs and lookout, Diamond Head; lane, Mō-'ili'ili, Honolulu (TM). *Lit.*, lei stringing.

Kuili. Hill near the beach, not far from Makala-wena, North Kona, Hawai'i. *Lit.*, memorized temple prayer.

Kui-lima. Point and resort hotel and golf course between Ka-huku Point and Ka-wela Bay, O'ahu. *Lit.*, joining hands.

Kū-'īlio-loa. *Heiau* at tip of Kāne-'īlio Pt., Wai-'anae qd., O'ahu, named for a legendary dog who protected travelers; later the qualities of a bad dog were unfairly attributed to him. In one story (For. Sel. 214) he is defeated by Kama-pua'a. (HM 93.) *Lit.*, long dog Kū.

***Kuinihu.** Cone, 'Īlio Pt. qd., Moloka'i.

Ku'i-pa'akai. Lane, Ka-pā-lama section, Honolulu. *Lit.*, pounding salt.

Kūkae-moku. Old name for 'Ī-ao Needle, West Maui. *Lit.*, broken excreta.

Kūkae-'ula'ula. Land section inland of Wai-'ōhinu, Ka'ū, Hawai'i, formerly called Kū-ka'e-'ula'ula'a (stand edge uprooted). A captured warrior who was to be sacrificed was imprisoned here. When the guards slept, an owl bit the cords that tied him to a post and led him toward Hale-o-Lono *heiau* for safety. The guards woke and

gave chase. The man hid by crouching against some rocks at a spot called Po'o-pueo (owl head), with the owl perched on his head. The guards thought the owl was looking for mice and went on. This happened several times, but finally the man reached the safety of the *heiau,* and he became a priest of Lono. *Lit.*, red excreta.

Kūka'i-au. Village, ranch, gulch, and land section near Pāpa'a-loa, Hawai'i. *Lit.*, current appearing.

Kūka'i-manini. Island, Ka-wela Bay, O'ahu. *Lit.*, *manini* fish procession.

K

Kūka'i-wa'a. Point, Ka-malō qd., north Moloka'i. *Lit.*, canoe extension. (The demigod Kana came to Hā'upu to rescue his mother, Hina, in a canoe called Kau-mai-'eli'eli; For. 4:442–444. He anchored the canoe's bow at Hā'upu and the stern at Kūka'i-wa'a. See Hā'upu.)

Kūkala-'ula. Cliff, Kī-lau-ea qd., Hawai'i. *Lit.*, red proclamation (probably referring to a chief and his feather cloak).

Kū-ka-lau-'ula. Cliffs, Kī-lau-ea and Pāhala qds., Hawai'i. *Lit.*, the red spear tips stand.

Kū-kani-loko. Walk, Ka-lihi Kai, Honolulu, named for the stones near Wahi-a-wā, O'ahu, where royalty gave birth (Fornander believed that these birth stones were established in the twelfth century); also the name of an ancient chief. (TM.)

Kū-kanono. Subdivision, Kai-lua, O'ahu. Street names here begin with *Manu* (bird). *Lit.*, stand strike.

Kū-ki'i. Land division, Maku'u qd., Hawai'i. Stones from a *heiau* here of the same name, said to have been built by 'Umi (HM 391), were brought to Honolulu by Ka-lā-kaua in 1877 and used in construction of the foundation of 'Io-lani Palace. Point and surfing area north of Nā-wiliwili Bay, Kaua'i. (PH 158.) *Lit.*, standing image.

Kūkila. Street and place, Foster Village subdivision, Hālawa, Waipahu qd., O'ahu. Name suggested by Mary Kawena Pukui in 1956. *Lit.*, majestic, regal.

Kū-ki'o. Land section, North Kona, Hawai'i. See Manini-'ōwali. Fishpond, Ka-huku, O'ahu. *Lit.*, settled dregs.

Kūkūau. Section of Hilo, Hawai'i, named for a grapsid crab.

Kukui. Village, Hilo qd.; beach, Kohala qd.; point, Honomū qd.; stream, Wai-pi'o qd.; ancient surfing areas, Nā-po'opo'o and Hōnaunau qds. (Finney and Houston 26), Hawai'i. Peak (3,005 feet high) and trail, Wai-mea Canyon, Kaua'i. Point, north Lā-na'i. Peak (5,788 feet high), Lahaina qd., and bay, Kī-pahulu qd., Maui. *Heiau,* Ka-malō qd., south Moloka'i; and elevation, Mauna Loa, Airport qd., Moloka'i, where the men of Pā-lā'au to the north were turned into *kauila* trees. In this story 'Umi-a-Maka, a youth skilled in *mokomoko* (hand-to-hand fighting) who lived above 'Īloli hill at Ka-wai-loa, was challenged by an unknown from Kawahuna. On the advice of his *kahuna,* 'Umi-a-Maka brought a small black pig to Kukui Hill. Its squealing drove away his opponents' gods and turned the people into *kauila* trees (*Ka Nupepa Kuokoa,* September 14, 1922). Area on

A number of other identification techniques have been tested for possible use in conjunction with the basic tag. This has included the production of identifiable antibodies (Benedict 107, 108; Hendrickson 262), epoxy paint applied to the carapace (Kridler 324; Anonymous 579), tattooing (Balazs 77), carapace notching of juveniles, vinyl strips attached through the carapace, and plastic tags manufactured by various companies. None of these techniques have proven to be very satisfactory for long-term identification.

Numbers formed on the carapace of nesting and basking turtles with aerosol paint (DuPont Lucite) have been successfully utilized for short-term identification and monitoring of daily activities (Balazs 49, 51).

Under the present research program, a total of 1,102 *Chelonia* has thus far been tagged throughout the Hawaiian Archipelago (Table 1). This includes 444 immature turtles and 140 adult males, two categories that are not normally tagged in most other marine turtle populations.

The measurements recorded for Hawaiian *Chelonia* have consisted of: straight and curved carapace length along the midline; straight and curved carapace width at the widest point (usually the sixth marginal), head width; straight plastron length along the midline; tail length from the posterior edge of the plastron along the midline; and body weight. Since June 1973, basking and nesting turtles have not been regularly turned over or otherwise restrained in order to carry out tagging and measuring. The suspension of this previous practice has lessened the opportunities to record plastron and tail measurements, body weight and, at times, other measurements. Nevertheless, this reduction of impact on turtles from research activities was deemed necessary in order to ensure the continuation of normal basking and nesting behavior (see Wallace 535).

2. DISTRIBUTION

2.1 Total Area

Green turtles are distributed at select locations throughout the 2,450-km long Hawaiian Archipelago. This nearly linear chain consists of 132 islands, islets, and reefs extending from lat. 18°54'N, long. 154°40'W to lat. 28°15'N, long. 178°20'W in an isolated region of the North Central Pacific Ocean (Figure 1). Eight main and inhabited islands (Hawaii, Maui, Kahoolawe, Lanai, Molokai, Oahu, Kauai, and Niihau) located in the southeastern segment of the Hawaiian Archipelago comprise over 99% or 16,650 km^2 of the total land area. The remainder consists of offshore islets and the small islands extending to the northwest of Kauai and Niihau known as the Leeward Islands or the NWHI. Except for Kure and Midway, the islands and certain adjacent waters in this segment of the chain constitute the Hawaiian Islands National Wildlife Refuge.

There are 1,210 km of coastline in the Hawaiian Archipelago, with the main islands accounting for 1,165 km or 96% of the total. However, the adjacent underwater coastal shelf where most green turtles reside is generally very narrow with the 20-fathom curve (37 m) often only a few kilometers from shore. A number of large banks with little or no associated emergent land occur in the northwestern segment of the Hawaiian Archipelago. Within the 100-fathom curve (182 m), these submerged areas encompass approximately 16,000 km^2.

The closest island area to the Hawaiian Archipelago is Johnston Atoll located 820 km south of French Frigate Shoals at lat. 16°45'N, long. 169°31'W. A green turtle aggregation of undetermined composition and size occurs at Johnston, however, its relationship, if any, to Hawaiian *Chelonia* is not known at the present time. An isolated green turtle aggregation also occurs at Wake Island (lat. 19°18'N, long. 166°36'E), which is 1,900 km southwest of Midway and the closest island area located to the west of the Hawaiian Archipelago. One of the juveniles tagged at Midway was subsequently recovered at Wake, however, the weakened and apparently pathological condition of the turtle suggests that it may have passively drifted there with prevailing winds and currents (Balazs 69, 81; Anonymous 641). Nevertheless, the relationship of the Wake aggregation remains to be determined.

The distribution of green turtles in the Hawaiian Archipelago has been reduced within historical times. A breeding colony that formerly occurred at Polihua Beach on the island of Lanai no longer exists (Balazs 55; Emory 213; Kahaulelio 281; Tabrah 473). Reductions have also occurred in the distribution of green turtles in their resident foraging areas adjacent to the main islands (Balazs 46, 48; Hendrickson 262; State of Hawaii 459-463). In the NWHI, the large aggregation of green turtles that formerly occurred at Laysan Island has now nearly disappeared (Ely and Clapp 211). The aggregation at Pearl and Hermes Reef appears to be following a similar pattern and the situation at this location warrants attention.

2.2 Differential Distribution

2.21 Adults

The distribution of adult *Chelonia* in the Hawaiian Archipelago is determined primarily by the locations of acceptable breeding, feeding, and resting habitat and, of course, the existence of sufficient numbers of animals to utilize such areas.

In excess of 90% of all breeding by Hawaiian *Chelonia* occurs at French Frigate Shoals (Figure 2), a 35-km long crescent-shaped atoll situated in the middle of the Archipelago (Amerson 30; Balazs 51, 55, 57; Hendrickson 262; Hirth 265; Kridler 311-327; Olsen 380-385). Small groups of turtles and separately nesting individuals using Laysan and Lisianski Islands and Pearl and Hermes Reef account for the remaining reproductive effort. Only a few nestings have ever been recorded at Kure and Midway (Balazs 76).

Feeding and resting areas where adult Hawaiian *Chelonia* live the greater portion of their lives during nonbreeding periods are located in coastal waters of both the main islands and the NWHI. The principal food source, marine benthic algae of several genera, is restricted to shallow depths where sunlight, substrate and nutrients are conducive to plant growth. Feeding pastures used by adults are usually less than 10 m deep, and frequently not more than 3 m deep. The underwater sites where adults regularly retreat for periods of quiesence include coral recesses, the undersides of ledges, and sand bottom areas (called "nests") that are relatively free of strong currents and disturbance from natural

predators and man. These resting areas for adults in the main islands usually occur at depths >20 m, but probably not normally exceeding 50 m. Available information indicates that the resting areas are in proximity to the feeding pasture. Periods of rest near the feeding pasture are also known to take place while floating at the surface during light winds and calm seas. This surface basking undoubtedly yields a thermal advantage due to solar radiation directly on the carapace and the warmer layer of water present at the surface. In addition, less energy would be expended by not having to periodically swim to the surface for respiration.

Some of the important resident areas in the main islands where adult *Chelonia* feed and rest are shown in Figure 3 and include the following: Hawaii--Kau and North Kohala Districts; Maui--Hana District and Paia; Lanai--northern and northeastern coastal areas bordering the Kalohi and Auau Channels; Molokai--southern coastal areas from Kamalo to Halena; Oahu--Kailua and Kaneohe Bays, and northwestern coastal areas from Mokuleia to Kawailoa Beach; Kauai--Princeville, northwestern coastal areas of Na Pali, and southern coastal areas from Kukuiula to Makahuena Point. Additional investigations are needed to adequately delineate these and other coastal areas.

In the NWHI, resident aggregations of adults are known to occur at Necker Island, French Frigate Shoals, Lisianski Island, Pearl and Hermes Reef, and, to a lesser extent, Laysan, Midway, and Kure Islands. Except for Midway, resting habitat at these locations also includes shoreline areas where land basking regularly takes place. Although a few random sightings have been made, it is still unknown if adults, or any other size categories, reside on or in some way utilize the submerged banks with no emergent land located in the northwestern segment of the Hawaiian Archipelago. Data are also lacking for Nihoa and Gardner Pinnacles.

While in transit during reproductive migrations, adult Hawaiian *Chelonia* are distributed at unknown locations in the pelagic environment between the islands of the Hawaiian Archipelago.

2.22 Hatchlings, juveniles, and subadults

Hatchlings emerge from their nests and enter the water at French Frigate Shoals and the other breeding sites in the NWHI between mid-July and early October. Following a rapid departure from the adjacent waters, they are lost to almost all human contact. This disappearance is consistent with what has been found to occur in other *Chelonia* populations (Hirth 265). Hawaiian green turtle hatchlings are thought to be subsequently dispersed in the pelagic environment by currents and vigorous swimming. Surface drift trajectories plotted for the theoretical movement of hatchlings leaving French Frigate Shoals suggest a predominant westerly dispersal (Figure 4). However, *Chelonia* hatchlings are strong swimmers and the distinct possibility exists that considerable movement takes place at variance with prevailing surface currents.

The 28 March 1779 log of the *Resolution* records the pelagic sighting of a posthatchling turtle of unknown species to the southwest of the Hawaiian Archipelago at lat. 20°15'N, long. 179°20'E (Beaglehole 105).

The distribution of juveniles up to 35 cm in the Hawaiian Archipelago is also unknown, due again to a nearly complete absence of human contact. Turtles of this size are almost certainly still residing in the pelagic environment where the chances of seeing them are greatly reduced. Nevertheless, predation by certain pelagic fishes such as the oceanic whitetip shark, *Carcharhinus longimanus*, could be expected to take place. Efforts are therefore being made to recover juveniles of this "lost" size from the stomachs of potential predators (Balazs 70, 79; Hendricks 261; Anonymous 658).

Juveniles larger than 35 cm as well as subadults can be found feeding and resting in coastal areas throughout the Hawaiian Archipelago. These turtles frequently reside in the same general area as the adults. There is, however, the tendency among juveniles and subadults to utilize resting habitat located at a shallower depth. In addition, only juveniles are able to use some feeding pastures due to the very shallow depths involved.

3. ECOLOGY AND LIFE HISTORY

3.1 Reproduction

3.11 Sexuality

Adult males of the Hawaiian *Chelonia* population have a 35 to 45 cm long prehensile tail that extends beyond the hind flippers while swimming and is larger in overall diameter than the tail of the adult female. The adult female's tail ranges from 20 to 25 cm in length and only extends to about the middle of the hind flippers. The single nail present on the foremargin of each front flipper is also longer in the adult male. However, in both sexes this structure can be considerably worn down, probably due mostly to abrasion with hard substrate encountered while feeding and resting underwater. Furthermore, the nails on the female receive some wear during nesting, while nails on the male may be abraded during copulation. A heavily keratinized tip is present at the end of the male's tail, but this may be missing in many individuals due to injury from other turtles or predators.

It is presently only possible to determine sex on the basis of external characteristics in individuals larger than 65 cm. Even then, caution must be exercised in that lengthening of the tail in some males does not start until a greater size is reached.

3.12 Maturity

The smallest female thus far found nesting at French Frigate Shoals measured 81 cm in straight carapace length, with 92 cm being the overall mean (Table 2). Curved carapace measurements are presented in Table 3 for comparative purposes. Data by Kridler (311-327) and Olsen (380-385) show that the mean weight of adult females is 110 kg (range 68-148 kg N=69). As noted by Hirth (265), nesting aggregations of *Chelonia* may consist of some females that grew to a large size after reaching maturity, and some that did not mature until reaching a large size. Such a phenomenon could also be expected for adult males. It is presently not possible to identify newly matured individuals (recruits) in

242lbs. 150lbs - 326lbs

Table 13 presents growth rates for both immature and adult Hawaiian *Chelonia* captured from the wild and held for extended periods in captivity at Sea Life Park on Oahu. The diets of these turtles consisted of fresh frozen squid and fish.

3.5 Posthatchling Movements

3.51 Dispersal and developmental migrations

The dispersal of green turtle hatchlings from French Frigate Shoals into the pelagic environment takes place by surface currents and vigorous swimming (section 2.22). After an undetermined period of time in the open ocean, during which unknown routes are followed, juveniles of approximately 35 cm arrive at coastal areas throughout the Hawaiian Archipelago. The recruitment of these turtles at islands to the northwest of French Frigate Shoals could be a direct result of northwesterly currents that prevail for hatchlings entering the water during the month of July (Figure 4). In addition, the low level of breeding that occurs principally at Laysan and Lisianski Islands and Pearl and Hermes Reef may be a further source of juveniles in this segment of the Archipelago. The recruitment of juveniles in the main islands is more difficult to theorize. One possibility is that during the peak hatching month of August, prevailing surface currents transport hatchlings in a northerly direction for a 2-mo period to approximately lat. 28°40'N (Figure 4). At this point instead of turning to the southwest along with the same current system, the turtles swim to the vicinity of lat. 30° to 31°N where winter surface currents of 19° to 20°C travel eastward. Over an ensuing period of 6 mo or longer, the turtles could be carried by a gyre that ultimately delivers them to the main islands. Another possibility is that a far larger circular transport system is involved in which hatchlings are carried well to the west of the Hawaiian Archipelago and around a vast area of the North Pacific back to the main islands. Of course it is also conceivable that some of the turtles leaving French Frigate Shoals are not carried by the currents, but rather swim against the currents on a course directly toward the main islands. Nevertheless, whatever oceanic routes of dispersal are involved, there is little doubt that juveniles <35 cm are residing somewhere outside of the coastal areas where larger turtles feed and rest. This is supported by the dearth of direct sightings, as well as by the absence of juveniles <35 cm in the stomachs of tiger sharks. The single observation of a 20 to 25 cm juvenile reported at French Frigate Shoals (Balazs 57) was undoubtedly a rare occurrence involving a stray individual.

Juveniles measuring 35 to 40 cm that are believed to be recent arrivals to coastal areas have, on a few occasions, been observed by the author at Kure, Midway, Oahu, and along the Kau District (Wright *et al.* 557). These new recruits were discernible by an absence of epizoics and superficial scratches, and by the presence of thin translucent edges to the periphery of the marginal laminae and terminal scales on the flippers. In addition, the cutting edges of the lower beak had more pronounced serrations than other juveniles of the same or a slightly larger size. All of these characteristics could be expected to disappear rapidly after establishing resting and herbivorous foraging habits in a coastal area.

Most evidence accumulated to date indicates that after leaving the pelagic environment, Hawaiian *Chelonia* reside in the same general coastal area for

extended periods, possibly throughout their entire lifetime except for remigrations for reproduction. This extended residency concept is at least partially supported by the fact that all sizes of turtles from 35 cm juveniles to mature adults are frequently present along a given coastal area. Some specific foraging sites have been identified that can only be used by juveniles (section 3.42), however habitat employed by larger turtles is usually only a short distance away. The recovery of tagged immature turtles after periods ranging up to 37 mo has also provided evidence for extended residency. With the exception of two turtles, all recaptures (146 out of 524--Table 4) have been made in the same foraging and resting areas where initial tagging occurred. At French Frigate Shoals, recoveries have shown that no movement takes place between sites separated by as short a distance as 8 km. At Kure a tagged turtle was found resting under the same coral ledge where it had been captured 13 mo earlier (Balazs 81). The only two recoveries that indicated movement of any distance involved the weak 38 cm juvenile tagged at Midway and found downwind at Wake Island (section 2.1), and a 40 cm juvenile also tagged at Midway that was reported to the author 7 mo later as having been recovered and released alive in Hilo Bay on the island of Hawaii. This latter case involves an ocean distance of approximately 2,300 km against the prevailing winds and currents in the latitudes of the Hawaiian Archipelago. Although two Monel tags were originally placed on this turtle, only one tag was found and recorded at the time of recovery. The possibility must therefore be considered that the tag number was misread due to corrosion or other causes. If such movements can, in fact, be substantiated through additional recoveries, immature turtles residing in the northwestern segment of the Hawaiian Archipelago would constitute a significant factor in recruitment to the main islands. Such a recruitment system was theorized by the author (Balazs 57) prior to the accumulation of existing data which supports the concept of an extended residency at the coastal area entered from the pelagic environment. This theory was based, in part, on observations of groups of juveniles 35 to 60 cm periodically occurring at French Frigate Shoals. These sightings suggested that developmental migrations of some nature were taking place (Balazs 57). However, subsequent tagging revealed that the same turtles were involved, and not new aggregations as originally speculated. The regular disappearance of these turtles for several weeks and possibly even months at a time has still not been resolved. One explanation would be that a form of dormancy is periodically being undertaken at sheltered underwater locations. Such behavior has been documented for *carrinegra* in the Gulf of California, but is presently unknown for Hawaiian *Chelonia*.

If significant levels of recruitment to the main islands occur through developmental migrations from the northwestern segment of the Hawaiian Archipelago, then revisions would be necessary in the projected number of years needed for Hawaiian green turtles to reach maturity (section 3.12 and Table 4).

Since January 1973, 10 adult and 31 subadult green turtles have been returned to the wild after extended periods in captivity. The dispersal patterns of the five turtles that have been recaptured in the main islands are presented in Table 14 and Figure 8.

An experimental model for the life history and habitats of Hawaiian *Chelonia* is presented in Figure 9.

feeding on invertebrates that occur at or near the surface. In pelagic waters surrounding the Hawaiian Archipelago, this could include *Physalia, Velella, Janthina*, the megalops stage of some portunid crabs, and immature individuals of certain oceanic squids that come to the surface at night in large numbers (i.e. *Symplectoteuthis oualaniensis, Onychoteuthis banksi* and *Hyaloteuthis pelagica*). Light organs present in these squids could conceivably serve as attractants to the young turtles.

3.42 Feeding behavior

Hawaiian *Chelonia* spend most of their lives residing in coastal areas where they alternate between periods of feeding and quiescence (sections 2.21, 2.22). The habitat characteristics of these resident areas can differ throughout the Hawaiian Archipelago, consequently variations exist in feeding strategy and behavior.

In the Kau District on the island of Hawaii, feeding takes place along lava coastlines that lack protective reefs. The major food source, *Pterocladia capillacea*, grows in shallow water close to shore, often on rocks just below the low tide line and in areas where freshwater enters the ocean from underground springs. Although a few partially sheltered bays are present, most foraging occurs under turbulent conditions resulting from exposure to ocean swells and tradewind waves. Observations of turtles made from adjacent coastal cliffs have indicated that considerable swimming and maneuvering are required while foraging in order to prevent contact with the bottom, and to travel to the surface at regular intervals for respiration. Under these rough surf conditions, only a single rapid breath is usually taken before returning to the bottom. If human activity is observed on land during the surface interval, a turtle will frequently terminate feeding and retreat to deeper water. Along Bellows Beach on Oahu, the feeding areas used by *Chelonia* consist of sand bottoms 25 to 100 m from shore where detached pieces of *Codium, Ulva*, and other algae periodically collect as a result of wave action and currents. Subtidal reefs located further offshore buffer the coastline from large surf, thereby making it possible for turtles to forage with comparatively little effort. A greater tolerance is displayed in this area to human activities, such as recreational swimming and beach use. This is probably due to the fact that turtles are seldom pursued or killed at Bellows, while along the Kau coastline such activities are a periodic occurrence. French Frigate Shoals is another representative foraging area for Hawaiian *Chelonia* in which feeding behavior displays some adaptation to the characteristics of the habitat. At this location, aggregations of juveniles 37 to 55 cm in straight carapace length feed on *Caulerpa, Codium* and at times small anthrozoans that grow on calcareous reef structures near the islands of East, Whale-Skate, and Tern. Although the tidal difference at French Frigate Shoals is only about 1 m, foraging is generally restricted to periods of high tide due to the shallow depths present at these sites. Furthermore, many of the recesses in the substrate where the food sources grow are only large enough for juvenile turtles to reach into with their heads and beaks. Turtles foraging within French Frigate Shoals are not usually subjected to rough surf conditions. Surface intervals for respiration therefore frequently last 2 min or longer, during which time from three to eight deep breaths may be taken. The subsequent submergence times while feeding range from approximately 5 to 15 min. While grazing on a food source, juveniles will frequently place themselves in an almost vertical position with

the head down and the hind flippers extending at right angles. This appears to help stabilize the turtle directly over the desired feeding site.

Stomach samples from adults of both sexes at French Frigate Shoals have shown that feeding takes place during the breeding season. This is usually not thought to occur in other *Chelonia* populations (Hirth 265), probably due to the scarcity of food at many breeding sites.

At all of the resident foraging areas thus far investigated, tagged Hawaiian *Chelonia* have been found to repeatedly feed at the same locations. This fixation has been documented on both a short-term basis (daily and weekly), and for longer periods ranging up to 37 mo (Balazs 81).

At resident foraging areas in the main islands, research techniques for tagging turtles have involved the use of carefully monitored large-mesh tangle nets (Balazs 64, 81; Kam and Balazs 286). Most of these captures have involved turtles that entered the net at night, frequently from 1 to 3 h before sunrise during periods of incoming tides. This has occurred in total darkness from heavy cloud cover, as well as during various phases of the moon with some illumination present. Mouth and stomach samples from many of these turtles have shown that active feeding was taking place. Sensory cues to supplement vision would appear to be necessary for commuting at night from resting sites to feeding areas. Olfactory cues may aid in this short-range navigation due to the fact that many of the algae eaten by turtles have pronounced odors. In addition, freshwater seepage associated with pastures of *Pterocladia* could provide a traceable salinity gradient. Tactile cues with the flippers while slowly swimming along the bottom would also seem to be a plausible orientation component for any short-range movement in the dark. Ridgeway *et al.* (433) found that Hawaiian *Chelonia*, and presumably all green turtles, are able to hear low frequency sound (60-1,000 Hz), with maximum sensitivity occurring in the range of 300 to 400 Hz. Hirth (265) has even suggested the possibility that green turtles may possess some sonar capabilities. Nevertheless, the simple detection of sounds originating from certain fish, invertebrates, and the surf could be of some navigational value at night. With respect to foraging without the benefit of vision, it is also of interest to note that a moribund juvenile with massive fibropapillomas on both eyes recovered from Kaneohe Bay was found to have relatively fresh algae in its stomach.

Examinations of stomach contents have revealed that Hawaiian *Chelonia* of all sizes generally bite off only small pieces of algae while foraging. The deeply grooved and serrated cutting edges of the beaks appear to be well adapted for this purpose. The foremargin of a front flipper rubbed against the beaks also aids in shearing food, as evidenced by an underwater observation of a juvenile feeding on *Codium edule* at Kure. In shallow water off Kahoolawe in the main islands, a juvenile was observed using its upper beak to scrape off an algal mat of *Gelidium* sp. growing on a rock. Approximately 10% of the stomach contents of an adult from Lanai was found to consist of *Halophila* blades. The cropping of this small seagrass apparently took place in a delicate manner in that no sand or other fine substrate in which *Halophila* grows was found in the stomach contents.

Short-term changes in the food preferences of some turtles have been detected by examining the complete contents of excised gastrointestinal tracts.

Differences have at times been found in the species of algae present at various distances along the intestines, and in the two compartments that comprise the stomach. Periodic dietary shifts of this nature probably help Hawaiian *Chelonia* meet their requirements for essential nutrients (i.e. amino acids, fatty acids, vitamins, minerals) that may be more concentrated in some species of algae. Certain of these nutrients may also be synthesized by microbial action within the intestine. As with other vertebrates, the nutritional requirements of green turtles in the wild would vary with age, activity, and reproductive condition.

It is not unusual for juvenile and subadult green turtles in the Hawaiian Archipelago to bite on hooks baited with squid, shrimp, and fish flesh (Carter 158; Anonymous 583). These carnivorous interludes probably represent regressions to the feeding habits exhibited while living in the pelagic environment.

3.43 Growth rates

The mean rates of growth of immature green turtles (37-59 cm) occurring naturally at seven resident areas in the Hawaiian Archipelago have been found to range from 0.08 to 0.44 cm/mo in straight carapace length (Table 4). The most rapid growth takes place along the Kau coastline of Hawaii (0.38-0.52 cm/mo), while the slowest occurs at French Frigate Shoals (0.02-0.13 cm/mo) and Kure (0.04-0.12 cm/mo). In addition to the growth data presented in Table 4, 34 healthy appearing immature turtles have been recovered after periods ranging from 2 to 20 mo in which no measurable growth could be detected. This has included 6 turtles at Midway, 3 at Lisianski, 24 at French Frigate Shoals, and 1 at Necker. One of the turtles at French Frigate Shoals was a 68 cm subadult that showed no increase in straight carapace length after an interval of 20 mo. The turtle at Necker was a 42.5 cm juvenile that was recaptured after a 17-mo interval. Although the apparent absence of growth could, in some cases, possibly be attributed to measuring errors, this is not believed to be a significant factor in that the author has personally taken most of the inital and recovery measurements. The causes and implications of cessation of growth among some turtles are unknown and further investigations are warranted.

In addition to utilizing large-mesh tangle nets, the capture of immature turtles for growth studies in the Hawaiian Archipelago has been accomplished with long-handled scoop nets and by hand while diving with scuba. In the NWHI, particularly at Lisianski, periodic basking also provides access to these turtles. The use of curved carapace length for detecting growth has been found to be generally unreliable due to variations in positioning the flexible measuring tape (see Kridler 322), and changes in the curvature of the carapace that appear to be independent of an increase in size. The use of body weight has also been found to be unreliable. This is probably due to differences in the amount of food material in the gastrointestinal tract, a component that can comprise up to 18% of the weight of juvenile Hawaiian *Chelonia* (Balazs 81).

The different rates of growth exhibited by immature turtles at various locations in the Hawaiian Archipelago are most likely a function of the sources and abundance of food at the resident areas (section 3.41). Seawater temperature would be expected to have some influence, but this is not evident based on the available data. At Kure and Midway, and probably extending to the

+ Research PhD Thesis
at Hawaiian Pacific College

Molokai

approx. times → Sunrise
Sunset
+ Twilight

April 22-26 netting

16-19 July netting
Sunrise
Sunset

6am
716pm

HABITAT ASSESSMENT

Need Patterns!

Look in back newspapers?

Kawela — Twilight

Sunset —

Kahului

Sunrise —

		Sunrise	Sunset
Kawela Spotting 3/19/85			
3/26/85	1st kawela netting		
4/4/85	— extensive kawela snorkel		
4/8	kawela terns	6:18	Twi. 22 minutes 6:49
15 April 85	kawela 3rd		
27 June - 28	4th		
2-3 July	5th	718 sunset 553 sunrise	

Sunrise Twilight Sunset

Barbers

3/20 spotting

4/2 spotting & snorkel

4/24 Kam spotting

Maui

Consider W. Maui mountains

twilight

~~Sunrise~~ Sunset

1. 1st netting Maui – 5/7 – ~~6~~ 8 5/8
   5/2 0600 1900
2. 6/17 – ~~18~~
3. 6/18 ~~19~~
4. 6/19 ~~20/21~~
5. 6/20

550 sunrise

716 sunset

Moon
rise 7:48am
set 941pm

IN HAWA

Kuilima Expansion to Keep 'Quality'

Project Director Explains Plans for the Area

By Tim Ryan
Star-Bulletin Writer

The controversial, multimillion dollar expansion of the Turtle Bay Hilton resort at Kuilima that includes a portion of Kawela Bay will be a "quality project," environmentally "sensitive" and "integrated into (Oahu's) North Shore community," the project's director said yesterday.

Norman Quon, project director, and Francis Oda, chief architect, explained the plan to the news media at the Plaza Club in Honolulu. The meeting was organized by Starr-Seigle-McCombs, the public relations agency for the Kuilima Development Co.

Prudential Insurance Co. intends to build two 500-room hotels along the eastern edge of Kawela Bay as well as an additional 2,063 condominiums, two golf courses, 40,000 square feet of commercial property, two public parks, five public accesses and other facilities on 460 of 800 acres of the Kuilima development. Construction will take place over a 20-year period.

Prudential owns the eastern half of Kawela Bay; the western half is privately owned.

Those favoring the expansion say it will provide much-needed jobs for North Shore and Windward residents and allow public use of the bay, which now is restricted to residents. Quon said two large signs at the entrances warning the public to stay out of Kawela Bay were erected by residents, not Prudential.

TO GUARANTEE public access at Kawela and Turtle bays, the developers will file a public-access plan with the state Bureau of Conveyances, Quon said.

Over the 20-year development, the project will provide about 8,500 construction jobs and 6,300 jobs to operate the resort, he said.

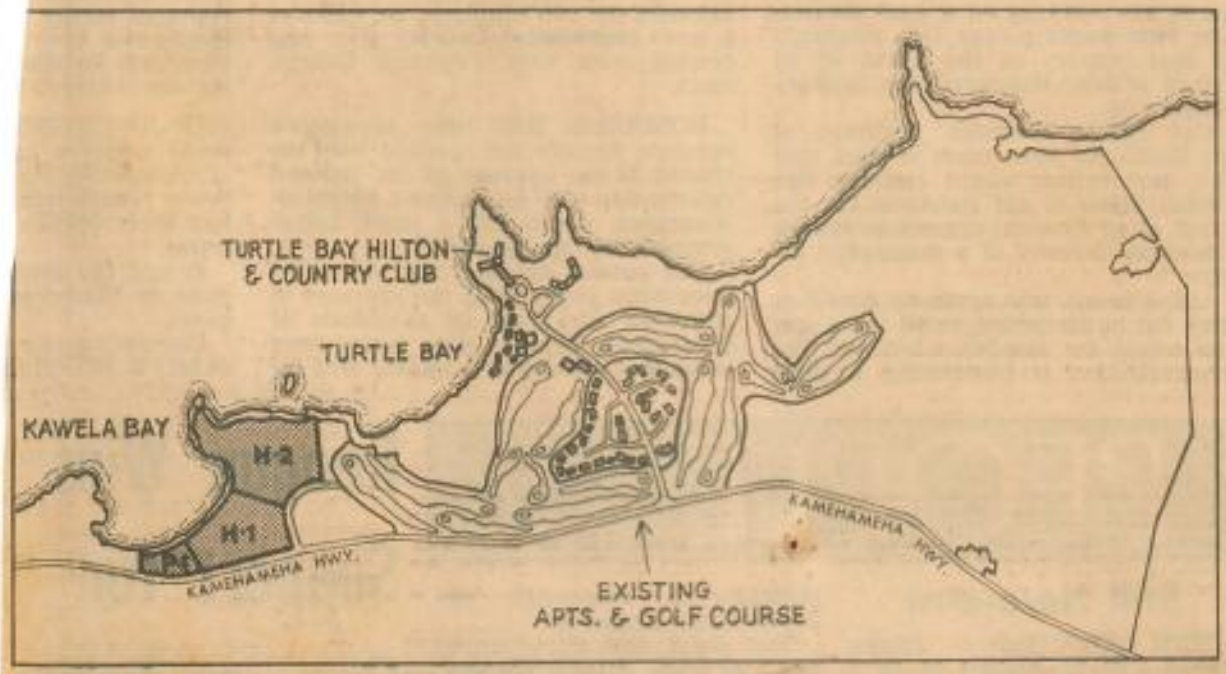
The resort is designed to "intermix" with the North Shore community and not be "isolated" from it like other destination resorts, Oda said.

A primary feature of the plan will be its "open quality," with about 10 percent of the land being developed and the remaining property left as open space, he said.

The plan calls for preserving an ironwood tree forest and the Punahoolapa marsh near Kahuku Point. The marsh will be dedicated as a wildlife sanctuary, Quon said. The developers also are considering asking government officials to have Kawela Bay designated a marine reserve "like Hanauma Bay," Quon said.

A committee of North Shore community, business and political leaders helped design the current development plan, he said.

The project's opponents have strongly criticized Prudential's plans to dredge Kawela Bay and divert Kawela Stream from Kawela Bay to Turtle Bay. They say the stream adds nutrients to the bay necessary for marine life. Dredging the bay also will damage marine life, they said.



KAWELA DEVELOPMENT—Map shows the planned development at Kawela Bay and the existing resort at nearby Kuilima Point. Hotel sites at Kawela are designated with the letter H, and a planned public park site is marked P. —Star-Bulletin Map by Ray Higuchi.

BUT ODA SAID Kawela Stream is filling up portions of the bay with silt and mud. It is the company's understanding that Kawela Stream was diverted for agricultural purposes about 40 years ago from emptying into Turtle Bay, he said. However, proof of this has been "hard to document," Oda said.

The bay will not be dredged but a portion "carefully vacuumed" to remove the silt and mud, Quon explained. This should enhance the marine environment in the bay, he said.

First phase of construction will be one of the two hotels along Kawela Bay's east point and 20,000 feet of commercial space near Kamehameha Highway, followed by the two golf courses, Quon said. Construction could begin by late 1986 with an opening date by 1988, he said.

The City Council recently approved an amendment to the North Shore development plan rezoning a portion of Kawela Bay from residential to resort. It also approved building code amendments to allow building-height limitations to exceed the 70-foot limit by 20 feet and decrease the 300-foot setback to 100 feet.

East Kawela Bay residents are on a month-to-month lease and will be given eviction notices six to eight months in advance, Quon said.

Prudential hopes the expansion project eventually will help it recoup losses from the financially ailing Turtle Bay Hilton resort.

- This report gives the results of a preliminary study (AIMS/OBJECTIVES)
- enumerate
- Physiography
- identify key sites

- Maximum recruitment size to nearshore habitat

where:
← IMMATURES GROW AND DEVELOP
ADULTS LIVE

NOT EVENLY DISTRIBUTED
* FIXATED - RETURNED TO THE SAME ONE

- COMPETITION FOR Food & Space
- Behavior & ECOLOGY OF MARINE ORGANISMS
- BEHAVIORAL ECOLOGY
- SPECIAL ADAPTATIONS
- TERRITORIAL BEHAVIOR
- HOW MUCH ALGAE ARE THEY EATING?
- HOW MUCH IS GROWING THERE (STANDING CROP) AND HOW FAST DOES IT GROW?
- CHARACTERIZE THE POPULATION (STRUCTURE)
- What kind of HABITAT ARE THEY MOST COMMONLY DISTRIBUTED IN?

- POINT OUT DATA-GAPS
- "HIGH RELIEF BOTTOM
- VERTICAL RELIEF
- FEEDING ECOLOGY
- SUBSTRATE COMPLEXITY

Shreffler Am. Sci.

- Identify key habitat
- Physical factors
- diversity of habitats
- distribution / limits
- Substratum types
- Water motion
- Salinity
- temperature
- Availability of suitable substrata
- Limiting factors
- Light
- Barriers are obstacles to dispersal (p220)
- Suitable habitats

- Wide reef flat where it attaches to small stones
- Protected Bays
- Distribution / DISPERSAL
- ABrasion
- Physical factors defining distribution
- Biological factors limiting distribution
- Summary of basic habitats
- GREGARIOUSNESS
- Substratum
- Competition
- Aspects HAVE NOT BEEN ADEQUATELY RESEARCHED
- PASTURAGE

- EMBellish

- certain neighborhoods
- parochial
- Developmental habitat for immatures and resident for adults
- Resident foraging habitat where immatures develop.
- Characterize habitat and turtle population
- Adult & developmental foraging habitat
- Body of knowledge
- Population structure by size class in different habitats
- Reproductive biology
- Ecologic ontogony
- Interviews
- ecology & biology
- benthic littoral habitats
- homing behavior
- shell shoved under a rock or coral ledge
- INCIDENTAL REPORTS
- NUTRITIONAL STATEGY
- Quantify habitat occupancy
- Qualitative
- Adaptations
- Survival value
- Coastal habitats
- Habitat-related research

MODEL STUDY

Baby S - FM BACKground
Johnston Atoll

Littoral = ① relating to, on or near a shore
② a coastal zone; esp. the zone between high and low water.

- Life-history pattern
Life-history patterns
Geographic
- Visual observations from shore
- Utilization of habitat
- Meet requirements / habitat requirements
- Protein & Energy

K.B. = Constraints 1) Slow growth 2) delayed sexual maturity 3) Low annual reproductive effort 4) High juvenile mortality; (5) Specialization of diet (low-quality food source).

- Activity, population size & structure
- Biology & ecology
- Identify sites
- DEFINE LIMITS of HABITAT
- Coastal / near shore
- Diversity / differences
- Ecological Aspects
- Habitat requirements

FOLLOW JA outline

Definition needed - Sedentary

parochial

Neritic habitat -

Foraging / resting areas are far removed from nesting beaches.

Limits - Limiting factors - Limitations
WATER TEMPERATURE

Distribution
Differential distribution
FFS - Monospecific
Beach habitat - P. Ross etc.
Ackman - gas

Reef Niches
witzel p 35 (see p46) - "overlap habitats but spacially separated"

Competitors

What makes a good nesting beach?
- Virtually unknown -

DEFINE LIMITS OF HABITAT

Shabica – identification of habitat upon which the resource is dependent

SEA TURTLES LIVE IN THE SEA!

Shabica p. 515 – physical & biological features

SYNONYMS OF "CRITICAL HABITAT"
- habitat vital to survival
- high-priority habitats
- habitats upon which marine turtles depend for survival

Powerplants discharge see lit. = Richardson? Ross —?

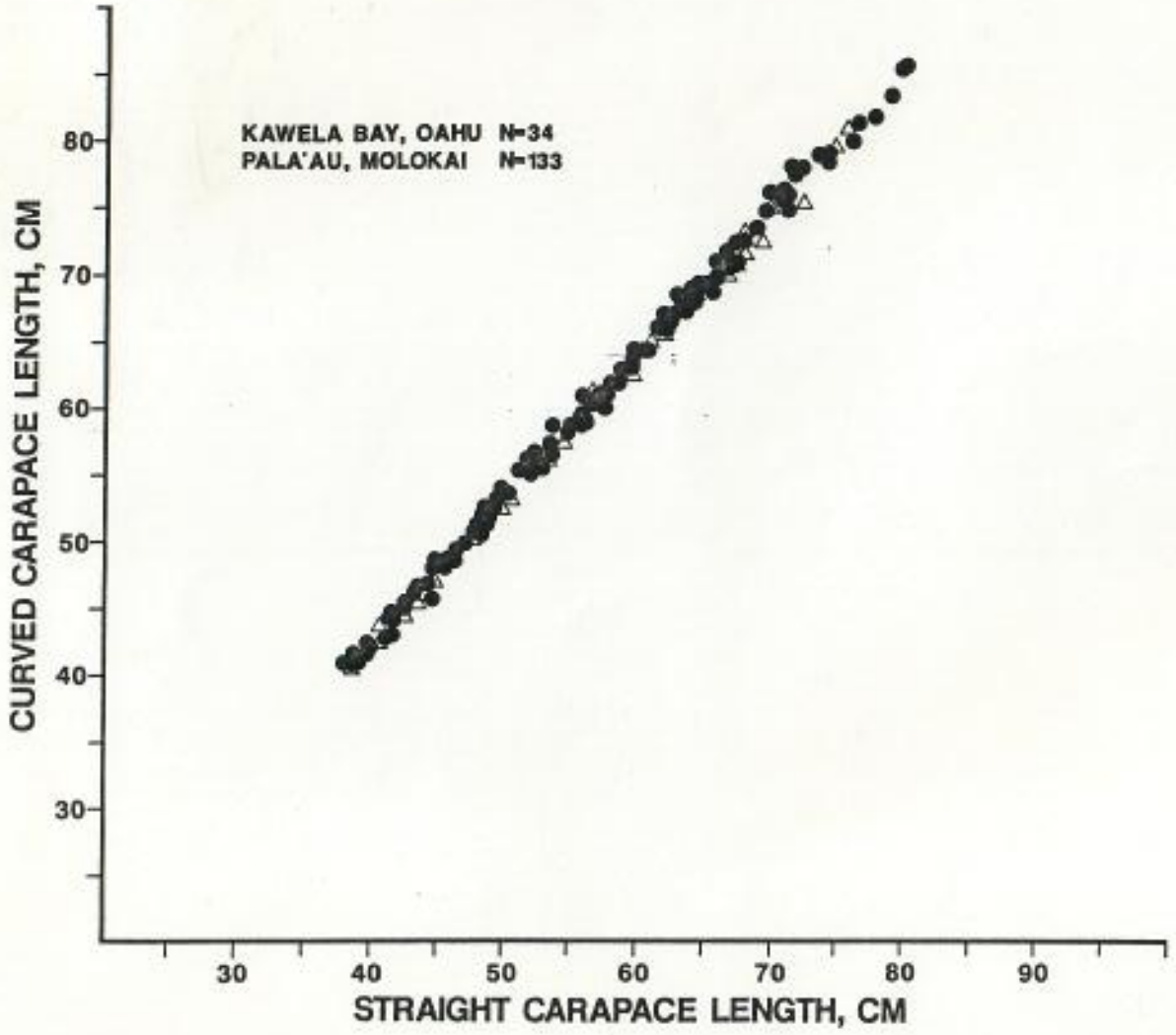
Ehrenfeld – "Protect feeding grounds and other aquatic habitat"

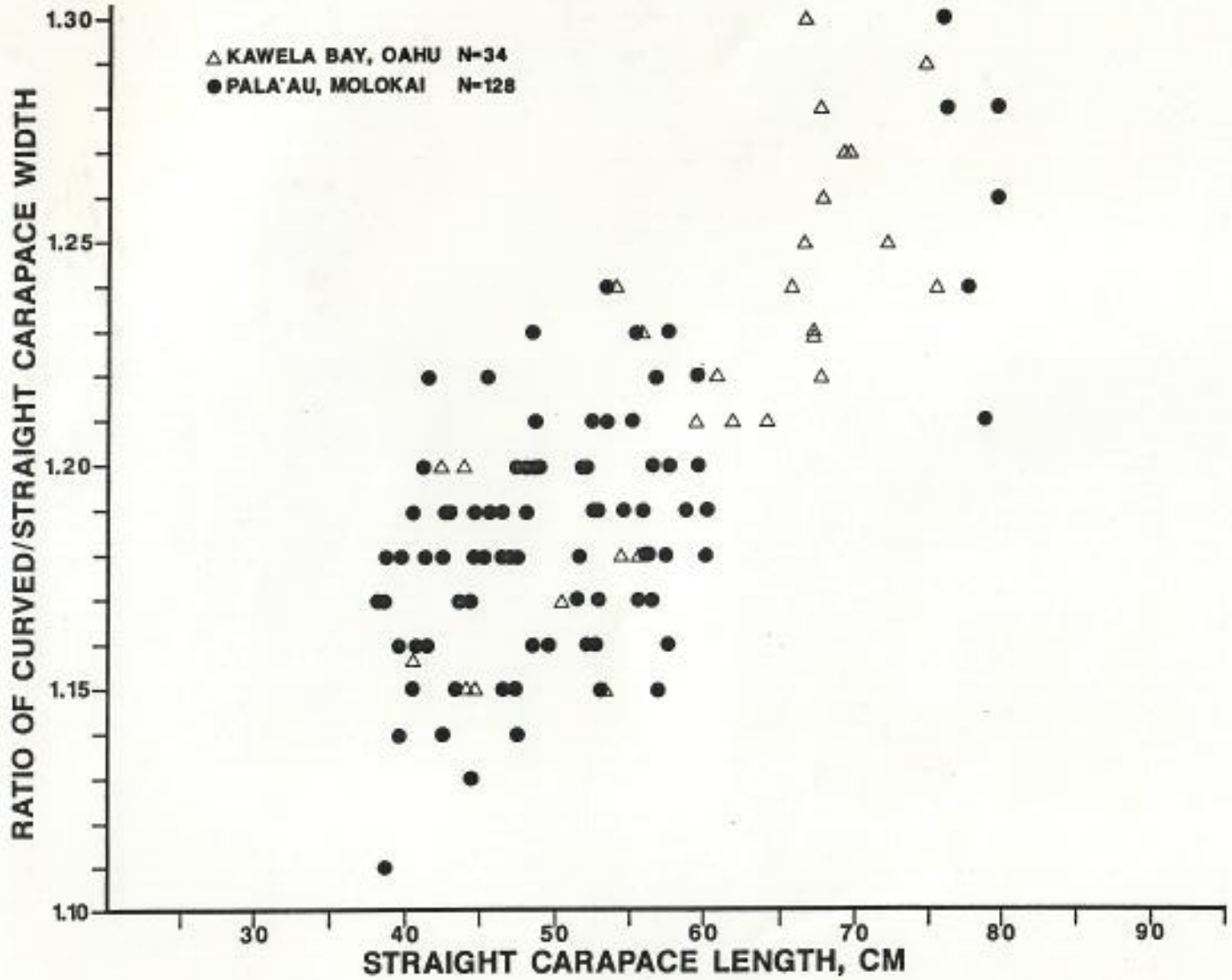
BIOMETRICS = BODY DATA

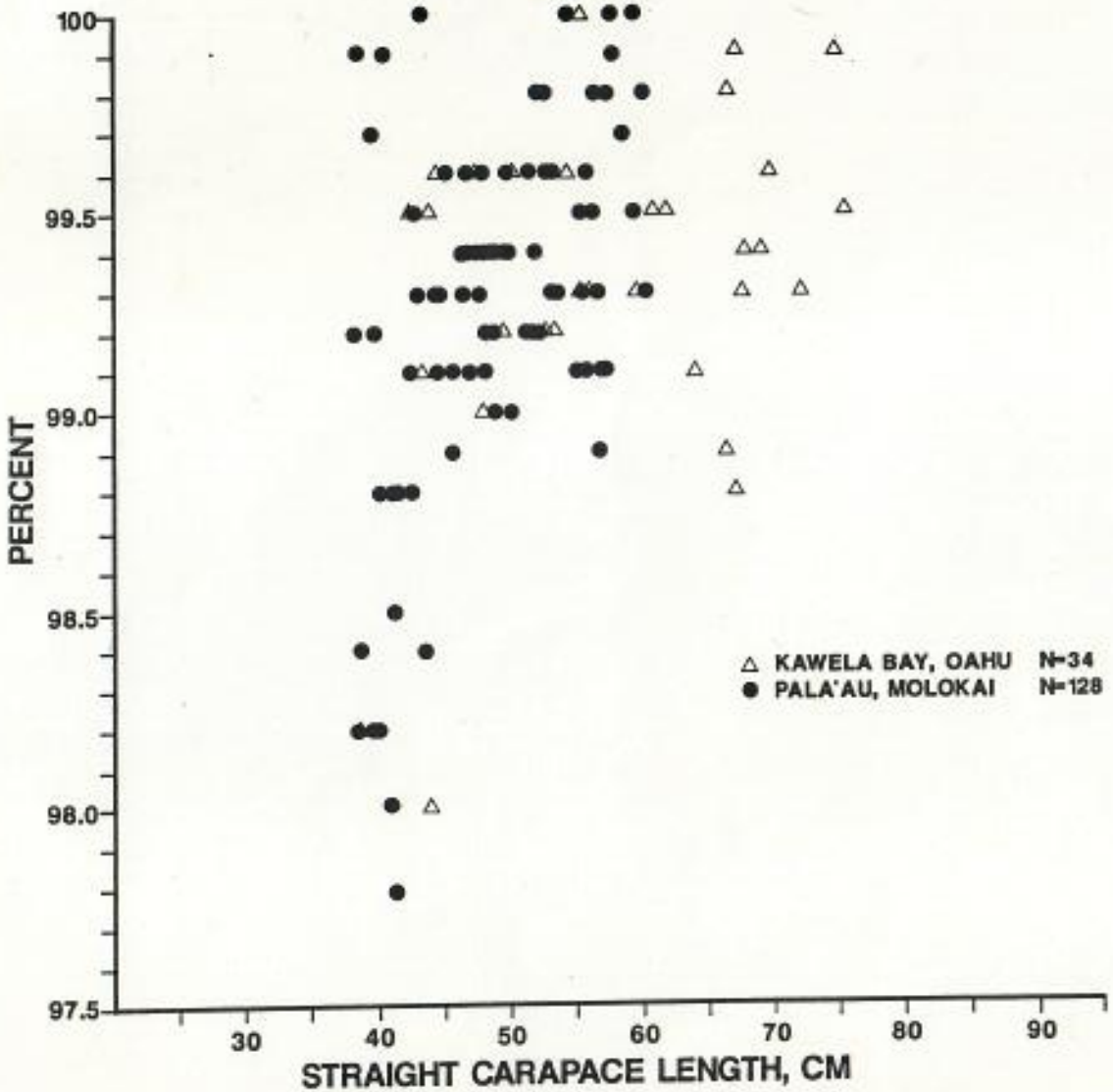
WEAKNESS of MANY others = studying few turtles

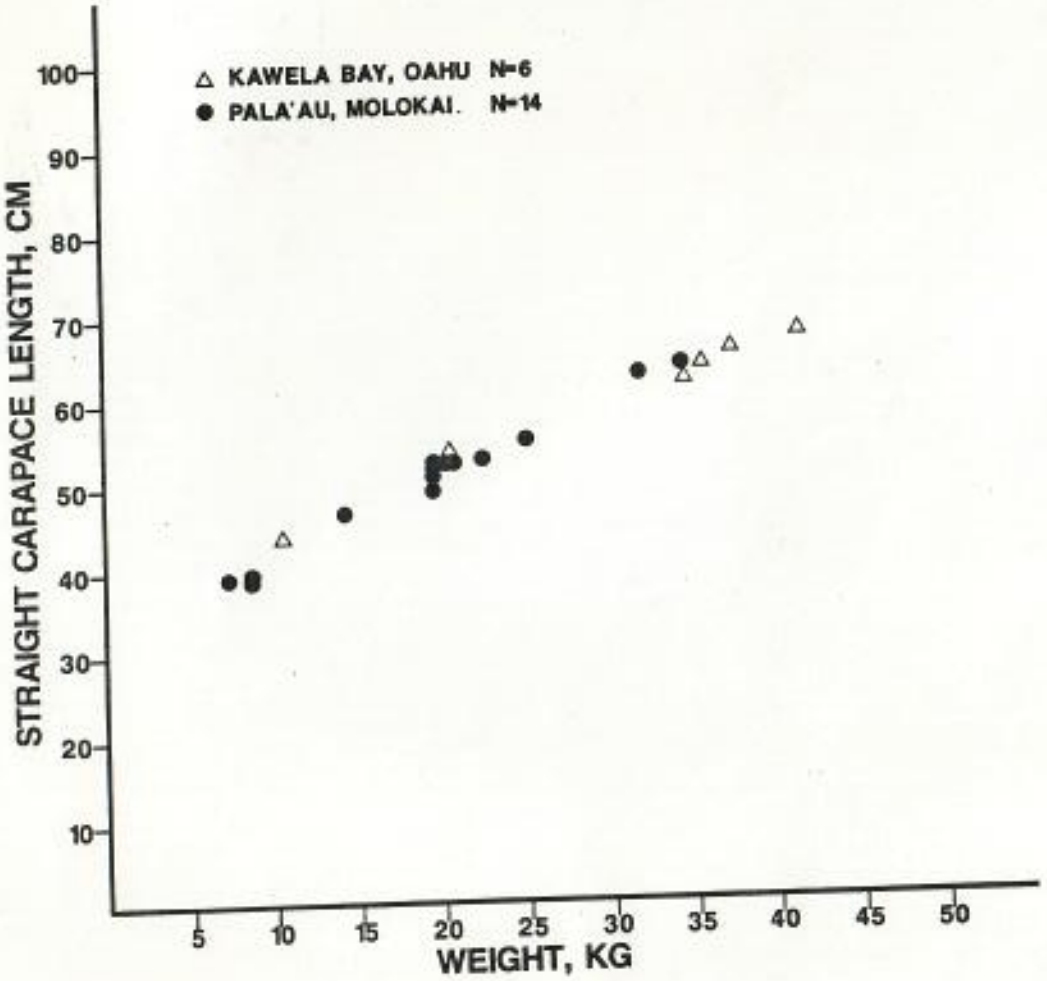
MT plan rec. plan Recruitment p. 26 "Recruitment is the rate with which new animals are being added to a population".

alternate - Utilization of residential foraging habitat by the Hawaiian green turtle


KAWELA BAY, OAHU N=34
PALA'AU, MOLOKAI N=133
CURVED CARAPACE LENGTH, CM
80
70
60
50
40
30
30
40
50
60
70
80
90
STRAIGHT CARAPACE LENGTH, CM


△ KAWELA BAY, OAHU N=34
● PALA'AU, MOLOKAI N=128
RATIO OF CURVED/STRAIGHT CARAPACE WIDTH
1.30
1.25
1.20
1.15
1.10
30
40
50
60
70
80
90
STRAIGHT CARAPACE LENGTH, CM


100
99.5
99.0
98.5
98.0
97.5
PERCENT
30
40
50
60
70
80
90
STRAIGHT CARAPACE LENGTH, CM
△ KAWELA BAY, OAHU N=34
● PALA'AU, MOLOKAI N=128


△ KAWELA BAY, OAHU N=6
● PALA'AU, MOLOKAI. N=14
STRAIGHT CARAPACE LENGTH, CM
100
90
80
70
60
50
40
30
20
10
5
10
15
20
25
30
35
40
45
50
WEIGHT, KG

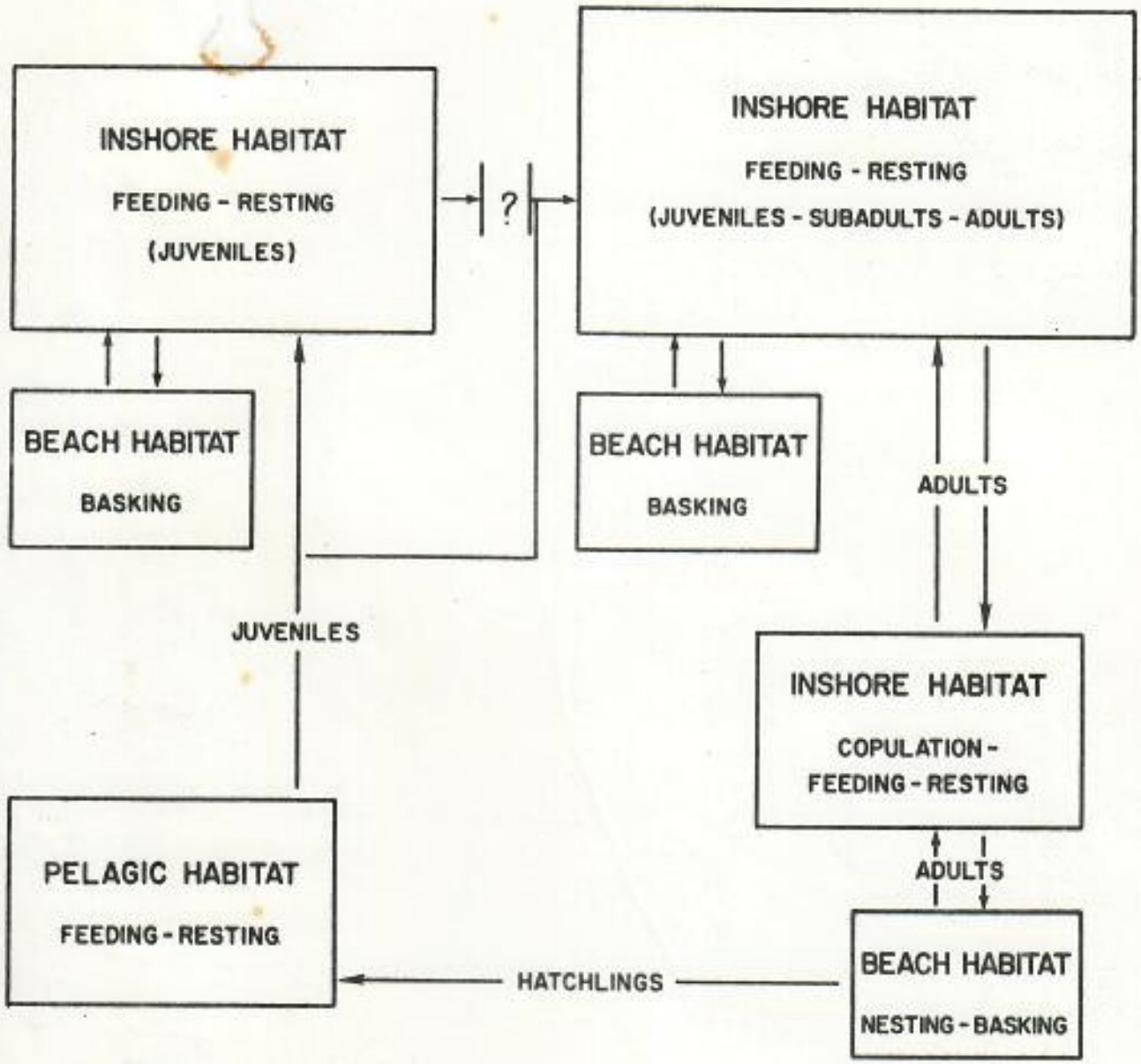


Figure 2. Life history and habitat model for Hawaiian *Chelonia* (adapted from Carr *et al.* 153).

Sample No. 7260 Lanai

Amansia glomerata	99%
Jania capillacea	Trace
Acanthophora spicifera	Trace
Ceramium sp.	Trace

Sample No. 7267 Lanai 5-6-1985

Amansia glomerata	99%
Hypnea cervicornis	Trace
Jania capillacea	Trace
Sargassum polyphyllum	Trace
Amphipods	
Copepods	

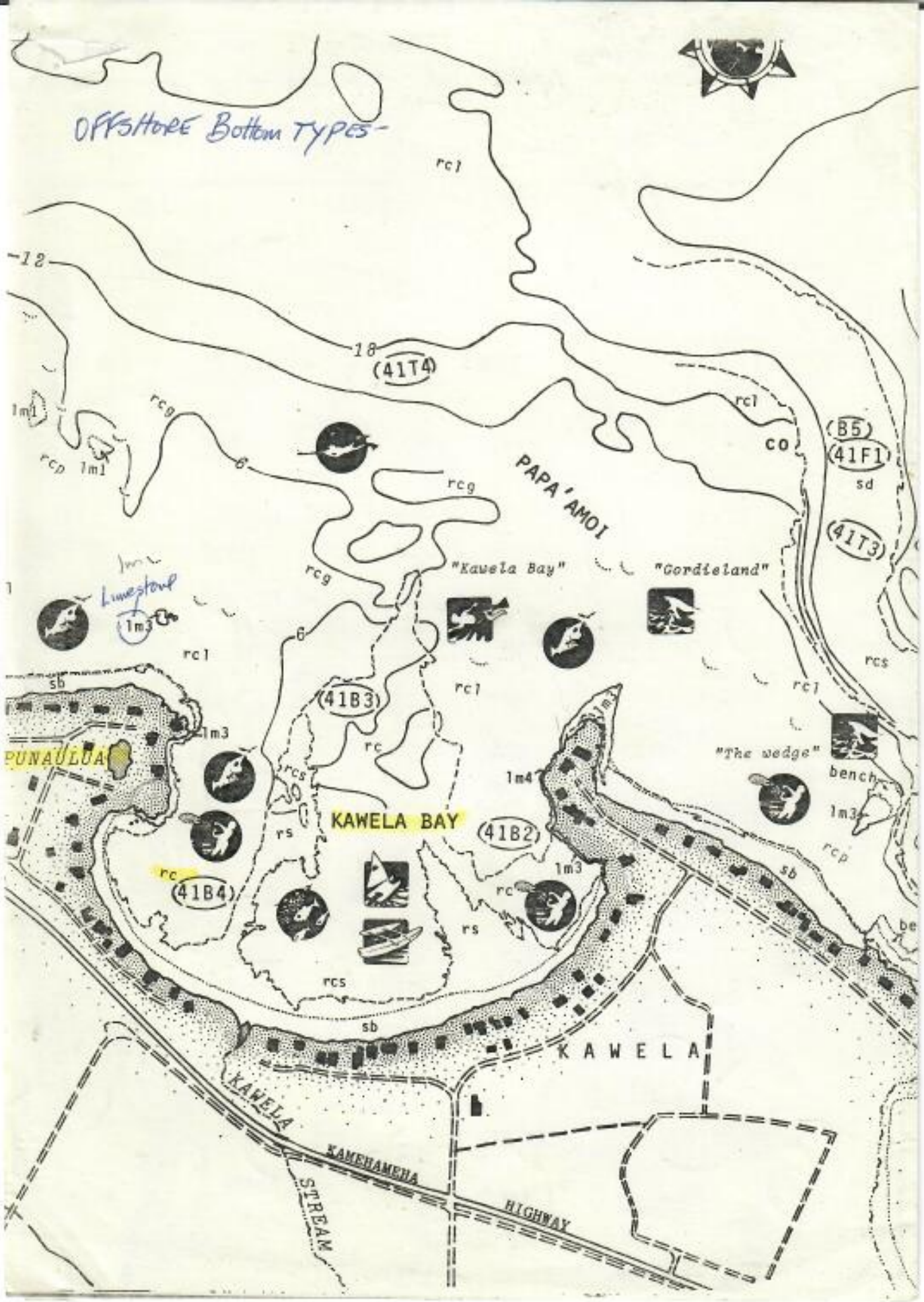
Sample No. 7272 Kahului

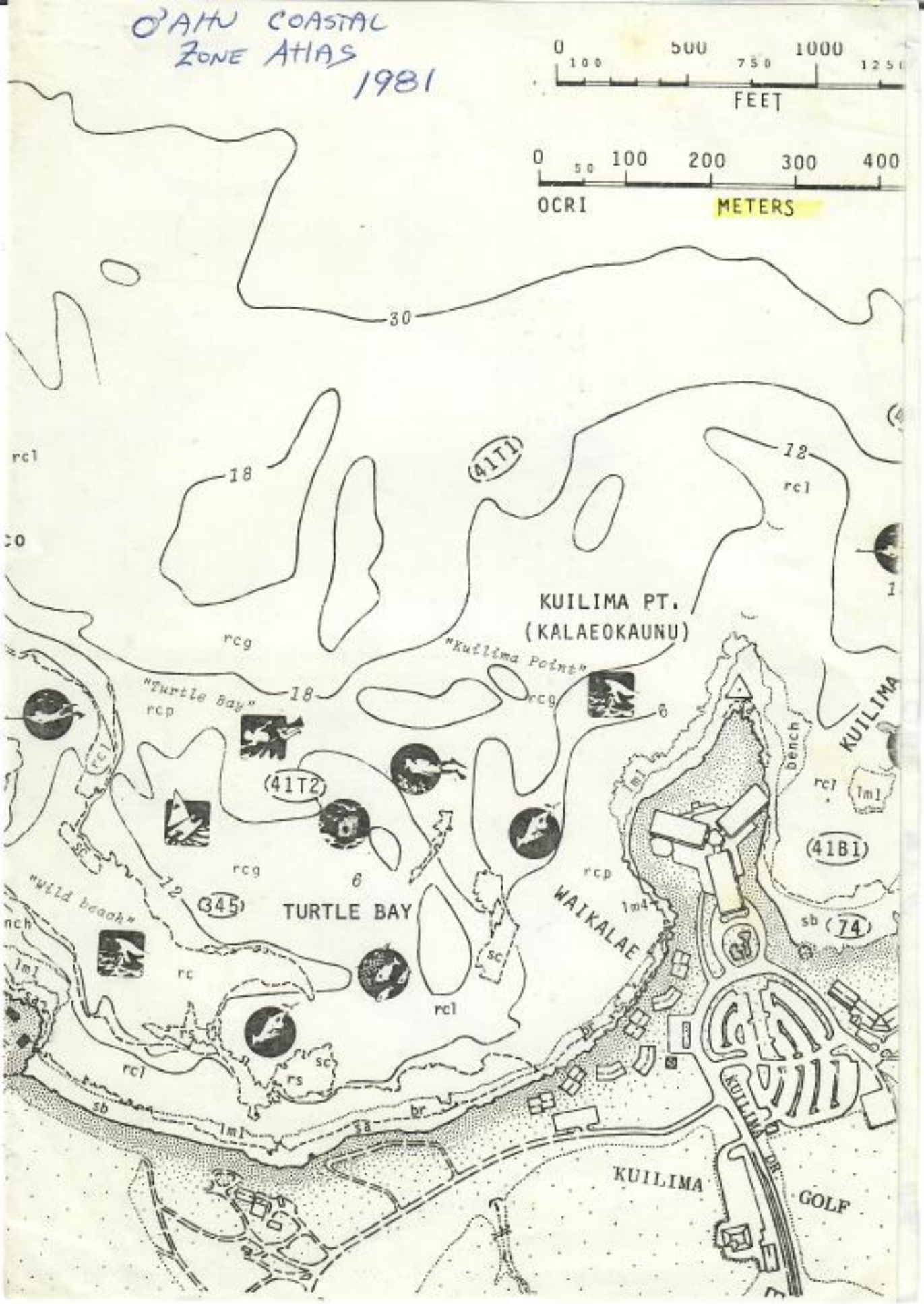
Codium edule	99%
Antithamnion sp.	Trace
Climacosphenia	Trace
Synedra sp.	Trace

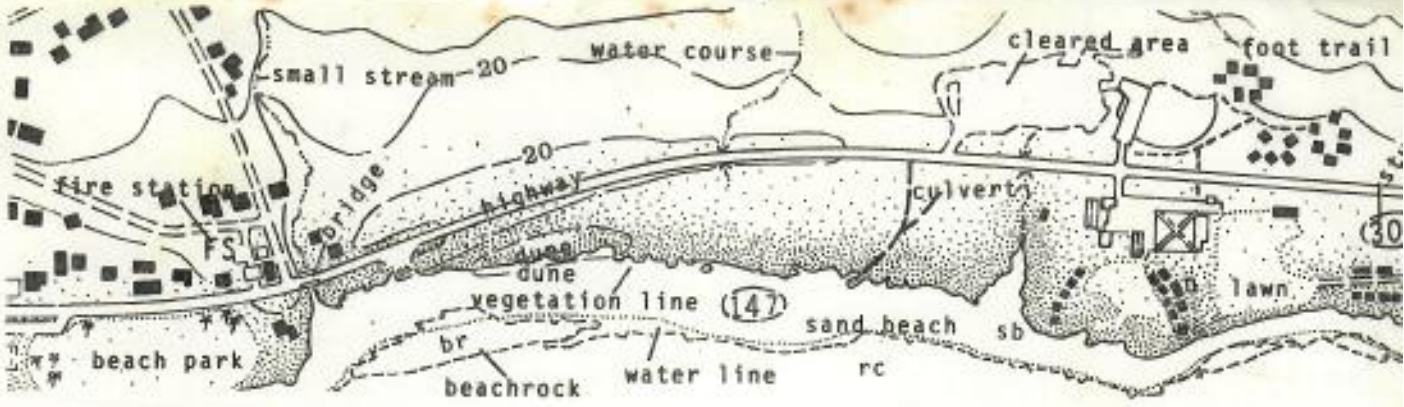
Maui Assortment (reef collection) May 1985

Codium edule
Hypnea musciformis
Amansia glomerata
Bryopsis pennata
Pterocladia capillacea
Chrysymenia glebosa
Heteroderma subtilissima (epiphytic on Pterocladia)

Give them all
Give them all to
Jesus, and he
will give you rest!


OFFSHORE Bottom TYPES-
rcl
-12
18
(41T4)
1m1
rcg
rcp
6
PAPA'AMOI
co
(B5)
(41F1)
sd
(41T3)
"Kawela Bay"
"Gordieland"
Limestone
1m3
rcs
sb
PUNAULUA
(41B3)
rc
KAWELA BAY
"The wedge"
bench
1m4
(41B2)
(41B4)
rs
KAWELA
KAMEHAMEHA
HIGHWAY
STREAM


OAHU COASTAL ZONE ATLAS 1981
0 500 1000
100 750 1250
FEET
0 50 100 200 300 400
OCRI METERS
30
18
12
6
rcl
rcg
rcp
(41T1)
(41T2)
(41B1)
(345)
(74)
KUILIMA PT.
(KALAEOKAUNU)
"Kuilima Point"
"Turtle Bay"
TURTLE BAY
"wild beach"
WAIKALAE
KUILIMA
bench
lml
lm4
sb
sc
rc
rs
br
KUILIMA DR.
GOLF



coastline

The coastline on the OCRI maps is represented by two lines: a vegetation line and a shoreline. The vegetation line is usually a solid line with stipling grading inland from dense to sparse. This line is dotted or broken where the vegetation is sparse (and the position of the true vegetation line uncertain). The waterline or shoreline is drawn as either a solid or as a dotted line. Where the shore is rocky and steep, and the position of the shoreline unchanged (at the scale of the maps) by tidal fluctuation, the line is solid. Where the shore is a sedimentary deposit (i.e., a beach), or where the shore is rocky but of very little slope (e.g., a bench), the line is dotted. Two dotted lines are used to represent the front and back of a shoreline bench.

The shoreline type is indicated by an alphanumeric code. There are four basic code categories.

1) ba - volcanic rock (including tuff) shore.
2) lm - limestone rock shore.
3) s - deposi
4) bb, bc, or

Various letter
basic shoreline cat
or lm) a "1" (e.g., b
(bench) surface; a "
occur at the base o
3 and 10 feet (1 to
cliff between 10 a
indicates a high sea
(10 m) above the se
shoreline subtypes (
easy access. Access
difficult to danger
dangerous to impos
occur inland of the
relief behind the
(ba4 or ba5) behind
a shoreline bench
below.

offshore bottom types

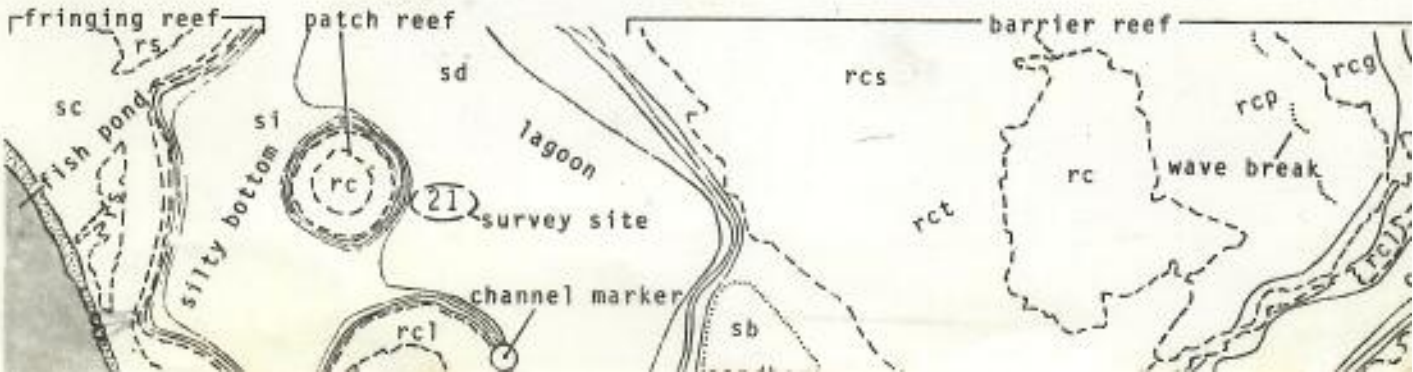
The differentiation of submerged bottom types from aerial photographs is highly dependent on factors of depth, water clarity, water surface smoothness, and both light intesity and angle. One or more of these factors can obscure some or all of the bottom in any aerial photograph of the marine realm. To the extent possible with available photographs, boundaries between bottom types are designated on the OCRI maps by a dashed line. Bottom types are differentiated into three basic types.

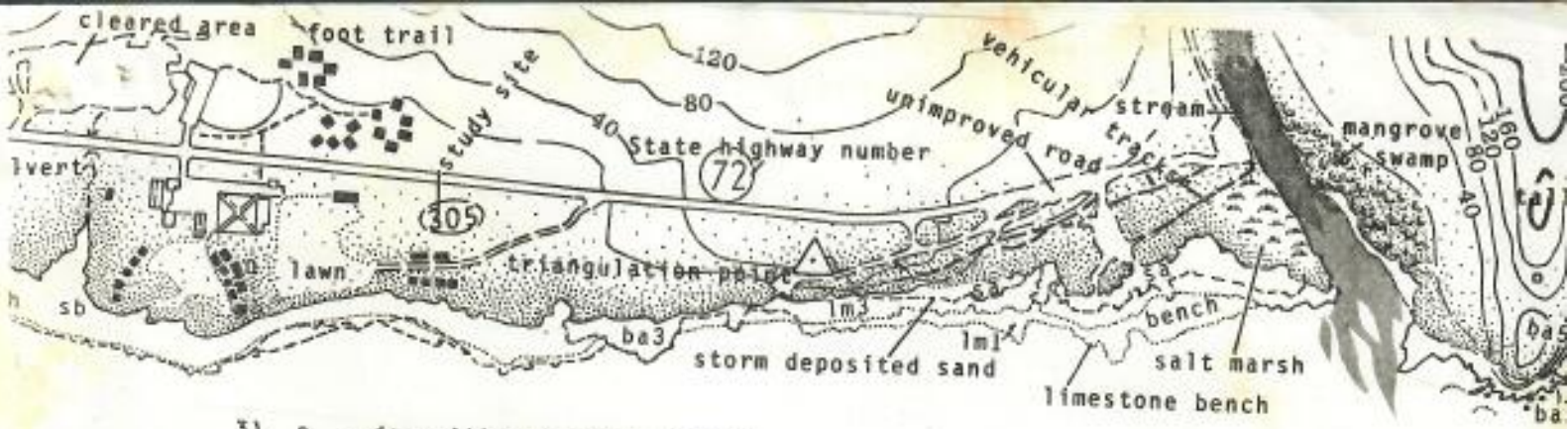
1) rb - hard (rock) bottom, basalt or limestone.
2) s - soft (sediment) bottom.
3) rc - mixed bottom types (limestone) associated with shallow reef formations.

Subtypes are indicated by additional letter codes (e.g., rbb, rcl). Where clearly demarcated, dashed lines may separate subtypes, although in many instances substratum gradients and/or poor photographic coverage do not permit an unambiguous line to be drawn. In such
boundary lines. The
types recognized of

HARD BO

rb - A solid
shallow
from lim
rbb - Submerge
water ex
rbc - Cobbles
or sbc s
rbs - Hard bo
prising
the desi
rs - Hard bot
more of
veneer;
rock bou





3) s - depositional shore (beach).
4) bb, bc, or bf - man-made shores.

Various letters or numbers are added to further refine the basic shoreline categories. Thus, on rock shoreline types (ba or lm) a "1" (e.g., ba1) indicates a low outcrop or nearly level (bench) surface; a "2" indicates talus (large boulders) as might occur at the base of a cliff; a "3" indicates an outcrop between 3 and 10 feet (1 to 3 m) in height; a "4" indicates a low sea cliff between 10 and 30 feet (3 to 10 m) in height; and a "5" indicates a high sea cliff rising generally greater than 30 feet (10 m) above the sea surface. In terms of access to the shore, shoreline subtypes (lm or ba) 1, 2, or 3 would provide generally easy access. Access to the water across a subtype 4 would be difficult to dangerous; and access across a subtype 5 would be dangerous to impossible. Note that subtypes 3, 4, or 5 may occur inland of the other subtypes to indicate ground of higher relief behind the immediate shore -- for example, a seacliff (ba4 or ba5) behind talus (ba2); or a "pitted zone" (lm3) behind a shoreline bench (lm1). Other shoreline codes are listed below.

DEP

sa - Storm beac rocky shor
sb - Sand beach material.
sb1 - Sand beach
sbb - Boulder bea
sbc - Cobble and
sbr - Generally gravel, and protected deposit.

MAN-MAD

bb - Boulder re rock".
bc - Concrete re
bf - Deposited containing
br - Beechrock.

Map Legend

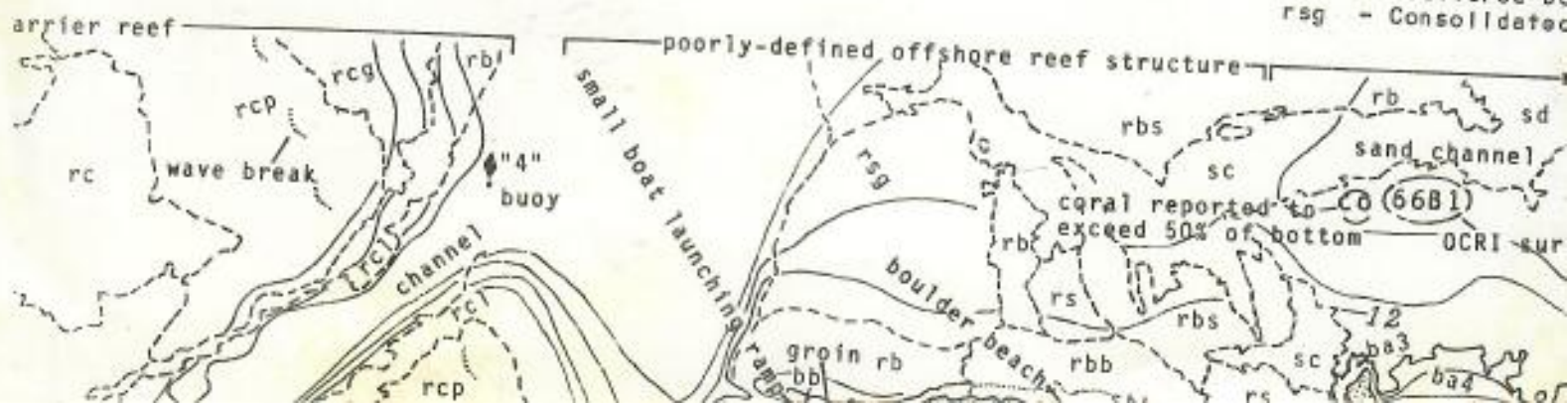
be drawn. In such cases, codes may appear on the map without boundary lines. The following tables list the offshore bottom types recognized off the O'ahu coast.

HARD BOTTOM AND DEEP BOTTOM TYPES (rb)

rb - A solid or hard bottom; a massive rock surface. In shallow water sometimes used to differentiate basalt from limestone bottom.
rbb - Submerged field of large to massive boulders; underwater extention of sbb and ba2 shore types.
rbc - Cobbles or small boulders, as may be found off sbb or sbc shore types.
rbs - Hard bottom with sand pockets, the latter comprising generally less then 60% of the area of the designated formation.
rs - Hard bottom with sand pockets comprising 60% or more of the formation; or, hard bottom with sand veneer; or, sand bottom with numerous scattered rock boulders.

SHALL

rc - Complex ree limestone hard botton
rcg - Consolidate (reef slope
rcl - Predominant
rcp - Predominant smooth, pav
rcs - Complex ree hard and (m
rct - Complex ree loose mater rents; the the tracts.
rs - Complex ree but with formation scattered bo
rsg - Consolidated



2

1

further refine the
horeline types (ba
op or nearly level
boulders) as might
an outcrop between
idicates a low sea
height; and a "5"
reater than 30 feet
cess to the shore,
provide generally
subtype 4 would be
subtype 5 would be
es 3, 4, or 5 may
e ground of higher
ample, a seacliff
zone" (lm3) behind
codes are listed

DEPOSITIONAL SHORE TYPES

- sa - Storm beach; sand and boulders deposited behind a rocky shore type.
- sb - Sand beach of predominantly calcareous (limestone) material.
- sb1 - Sand beach of predominantly detrital sediments.
- sbb - Boulder beach.
- sbc - Cobble and shingle ('111'111) beach.
- sbr - Generally a poorly sorted deposit of rubble, gravel, and sand usually associated with either a protected shore behind a fringing reef or a stream deposit.

MAN-MADE AND OTHER SHORELINE TYPES

- bb - Boulder revetment or groin, usually basalt "blue rock".
- bc - Concrete revetment, seawall, or piling.
- bf - Deposited fill of no particular type, but usually containing demolished building material.
- br - Beachrock.

d

n the map without
e offshore bottom

(rb)

ock surface. In
ferentiate basalt

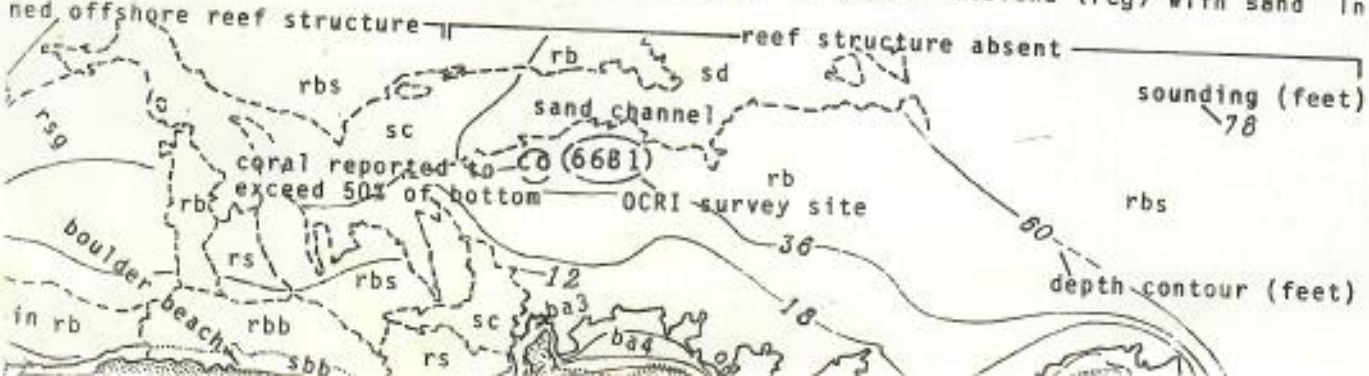
boulders; under-
e types.
be found off sbb

he latter com-
of the area of

lsing 60% or
tom with sand
ous scattered

SHALLOW REEF BOTTOM TYPES (rc)

- rc - Complex reef bottom type consisting of a mixture of limestone boulders and outcrops, as well as sand; hard bottom, rubble, or boulders predominate.
- rcg - Consolidated limestone (rcl) with distinct grooves (reef slope areas).
- rcl - Predominantly consolidated limestone bottom.
- rcp - Predominantly consolidated limestone bottom with a smooth, pavement-like surface.
- rcs - Complex reef bottom type consisting of a mixture of hard and (mostly) soft bottom types.
- rct - Complex reef bottom type (rc, rcs, or rs) with the loose materials formed into tracts by waves or currents; the code is oriented with the long axis of the tracts.
- rs - Complex reef bottom type consisting of mostly sand, but with limestone outcrops or boulders; if in a formation designated sc, then indicating widely scattered boulders in a part of that formation.
- rsg - Consolidated, grooved limestone (rcg) with sand in



Pole-and-line fishing

Throw-netting

Torch-fishing

Gill-netting

Spearfishing

Trapping

grooves.

sc - Areas of sand bottom without significant limestone outcrops or boulders.

SOFT BOTTOM TYPES

sc - Sand bottomed channel or large sand patch in water 30 feet (10 m) deep or less.

sd - Same as sc only in water greater than 30 feet (10 m) deep.

sl - Silt bottom (usually reported).

rs - Indicative of scattered outcrops or boulders in a sand bottom (sc) formation; or, sand bottom with significant (up to 40%) admixture of hard bottom types.

use symbols

Reproduced on this page are the symbols used to indicate uses and activities commonly occuring along and off the coast of O'ahu. The placement of a use symbol on a map should be inter-

preted as a gen
spaced placeme
activity can oc

surveys

Selected s
sections are in
a broken oval.
citations are
conducted in 19
the maps. These
the OCRI map nu
type (B = bott
invertebrates,
general survey
number providi
survey was cond
An example migh

31	-	Char (1972)	F
32	-	Chave (1971)	F
35	-	Chave, Tait, Stimson, and Chave (1973)	B,F,O,Sg,WQ
38	-	C&C Honolulu (1971)	WQ
41	-	Clutter (1973)	P
42	-	Coles and McCain (1973)	B,F,O,P,WQ
49	-	DeWreede (1970)	B
56	-	Elliott and Hall (1977)	G,V
57	-	Environmental Consultants Inc (1973)	B,F,G
58	-	Environmental Consultants Inc (1975)	B,G
59	-	Environmental Consultants Inc (1975)	B,F,O
60	-	Environmental Consultants Inc (1976)	G,WQ
61	-	Environmental Consultants Inc (1977a)	B,F
62	-	Environmental Consultants Inc (1977b)	B,WQ
64	-	Environmental Consultants Inc (1977d)	B,F,WQ
66	-	Environmental Consultants Inc (1978)	B,Sg,WQ
67	-	ECI and HECO (1974)	F,P
71	-	Evans and Simmons (1971)	B,G,V
74	-	Gerritsen (1978)	G,Sg
76	-	Gordon and Kelly (1962)	B,WQ
79	-	Grovhoug (1976)	Af,Sc
82	-	Harger (1972)	B
84	-	Hawaii Institute of Marine Biology (1978)	B,P,WQ

92	-	Higgins (1
95	-	Hoyle (19
99	-	Kawamoto
108	-	Kimmerer
109	-	Kiim (196
110	-	Kohn (195
112	-	Labrecque
116	-	Littler (1
117	-	Long (197
121	-	McCain (1
131	-	Maragos (1
133	-	Maragos (1
141	-	Miller (1
143	-	Miller (1
145	-	Moberly ar
146	-	Moberly,
147	-	Moberly ar
151	-	Muller (1
156	-	Oceanic In
158	-	Oishi (197
159	-	Oishi (197
161	-	Peeling,
164	-	R. M. Towl

Crabbing

Trolling, bottom fishing

Board surfing

Limpet (opihi)

Body surfing

Torch-fishing

Lobster

Octopus (he'e)

Trapping

Sea urchin (wana)

Baitfish

stone

water

(10 m)

In a
with
bottom

ndicate
coast of
inter-

preted as a general location for a particular activity; regularly spaced placements of a symbol type indicate that the specific activity can occur anywhere along the coastal section shown.

surveys

Selected studies and surveys as listed in OCRI Part B MAP sections are indicated on the atlas maps by a number enclosed in a broken oval. The number refers to the following list (complete citations are given in OCRI Part B). The location of surveys conducted in 1978 for the OCRI project are likewise indicated on the maps. These surveys have been assigned a code beginning with the OCRI map number, followed by a letter designating the survey type (B = bottom survey emphasizing algae, corals and other invertebrates, and fishes; F = detailed fish survey; or T = general survey made by a diver towed behind a boat), and a final number providing a survey number for cases where more than one survey was conducted within the area encompassed by a single map. An example might be 25B1.

Following e
cating the type c
= fouling or aufw
survey of benthic
tions, G = geolog
graphic data, P =
cides or heavy m
area use conside
and WQ = water q

1 - AECOS Inc
2 - AECOS Inc
3 - AECOS Inc
5 - Anderson
10 - B.K. Dynam
14 - Banner an
19 - Bowers (19
21 - Brock (19
22 - Brock and
25 - Campbell
27 - Campbell
28 - Caperon (

Map Legend

92 - Higgins (1969)	B,Sg	
95 - Hoyle (1976)	B	
99 - Kawamoto and Sakuda (1973)	B	
108 - Kimmerer and Durbin (1975)	B,F,U	
109 - Klim (1969)	WQ	
110 - Kohn (1959)	B	
112 - Labrecque (1966)	Av,G	
116 - Littler (1973a)	B	
117 - Long (1972)	Af	
121 - McCain (1974)	Af,B,F,P	
131 - Maragos (1972)	B	
133 - Maragos (1974)	B,G	
141 - Miller (1970)	B	
143 - Miller (1975)	B,O,P	
145 - Moberly and Campbell (1969)	G,Sg	
146 - Moberly, Campbell, and Coulbourn (1975)	G,Sg	
147 - Moberly and Chamberlain (1964)	G,Sg	
151 - Muller (1974)	B	
156 - Oceanic Institute (1976)	B,F,O,P,WQ	
158 - Oishi (1974a)	F	
159 - Oishi (1974b)	F	
161 - Peeling, Grovhoug, and Evans (1972)	Af,B,F	
164 - R. M. Towill (1974)	B	

165 - Reed, Kay,		
167 - Richardson		
168 - Richmond		
172 - Russo, Do		
174 - Santelices		
178 - Shallenber		
184 - Soegiarto		
190 - State Div		
192 - State Div		
193 - State Div		
195 - State Div		
196 - State Div		
198 - State Div		
199 - State Div		
200 - State Div		
202 - State Div		
204 - State Div		
205 - State Div		
217 - Struhsaker		
222 - Timbol (19		
223 - McCain, Co		
224 - Tomich, W		
225 - Tseu (195		

Board surfing

Canoe paddling

Aquatic recreation (smallcraft, windsurfing, water ski)

Body surfing

Sailing

Anchorage


Octopus (he'e)


Aquarium fish collecting


Sport-diving


Baitfish


Seaweed (limu)


Shell collecting

ar activity; regularly
ate that the specific
al section shown.

ed in OCRI Part B MAP
a number enclosed in
lowing list (complete
location of surveys
likewise indicated on
e code beginning with
lesignating the survey
le, corals and other
fish survey; or T =
a boat), and a final
s where more than one
ssed by a single map.

Following each citation in the list is a letter code indicating the type of information contained in the survey, where Af = fouling or aufwuchs study, Av = survey of bird populations, B = survey of benthic (bottom) organisms, F = survey of fish populations, G = geological or general description of site, O = oceanographic data, P = plankton study, Sc = sediment chemistry (pesticides or heavy metals), Sg = beach or marine sediment study, U = area use considerations, V = strand or marsh vegetation survey, and WQ = water quality data.

1	-	AECOS Inc (1979a)	WQ
2	-	AECOS Inc (1979b)	B,F
3	-	AECOS Inc (1979c)	B,F,WQ
5	-	Anderson (1979)	B,Sg
10	-	B.K. Dynamics (1972)	Af,B,O,WQ
14	-	Banner and Bailey (1970)	B
19	-	Bowers (1976)	B,G
21	-	Brock (1976)	B,Af
22	-	Brock and Brock (1977)	B
25	-	Campbell (1972)	G
27	-	Campbell and Moberly (1978)	G
28	-	Caperon (1974)	B,Sg,WQ

nd

	165	-	Reed, Kay, and Russo (1977)
B,Sg	167	-	Richardson and Fisher (1950)
B	168	-	Richmond and Mueller-Dombois (1972)
B	172	-	Russo, Dollar, and Kay (1977)
B,F,U	174	-	Santelices (1975)
WQ	178	-	Shallenberger (1977)
B	184	-	Soeglarto (1972)
Av,G	190	-	State Division of Fish and Game (1970)
B	192	-	State Division of Fish and Game (1971)
Af	193	-	State Division of Fish and Game (1972)
Af,B,F,P	195	-	State Division of Fish and Game (1972)
B	196	-	State Division of Fish and Game (1973)
B,G	198	-	State Division of Fish and Game (1974a)
B	199	-	State Division of Fish and Game (1974b)
B,O,P	200	-	State Division of Fish and Game (1975)
G,Sg	202	-	State Division of Fish and Game (1976)
G,Sg	204	-	State Division of Fish and Game (1977b)
G,Sg	205	-	State Division of Fish and Game (1977c)
B	217	-	Struhsaker (1968)
B,F,O,P,WQ	222	-	Timbol (1972)
F	223	-	McCain, Coles, and Peck (1975)
F	224	-	Tomich, Wilson, and Lamoureux (1968)
Af,B,F	225	-	Tseu (1953)
B			

B,F	
Av	
V	
B,F	
B	
Av,G	
B,Sg	
F	
F	
F	
F	
F	
F	
F	
F	
F	
F	
F	
B,G	
B	
B,F,O,P	
Av,G,U	
WQ	


Aquatic recreation (smallcraft, windsurfing, water ski)


Excursion boat


Anchorage

Various
restraining devices forced to work.

Need —
— Rabot
— Address of M.D's.

No. Turtles used on =
comes with clips and needles.

Carry to water's edge ~~in~~ immobilized, then unclip.

FIRST ~~clip~~ apply a tag on a flipper, then attach one lead here, and the 2nd clip on the inguinal ~~of the hind~~ on the opposite side.

More humane that physical restrain

Photo of hook-up

stress not electrical —

— neck left free for blood sampling —

Area immobilized =

Slight movement =

MA = range

G. Suarez

11-30-1

3 Holes

2
120
680
150
830

KWNHome?
135 photos Turtle IS.
NO LIMIT

Need —
— CAN OF MILK
— " " JUICE

Struggling, flapping around turtles injury to themselves, the research and lessening the quality of data obtained.

~~Recent~~ favorable results in surgery on 2 green turtles ~~of tail~~ with a electric prompted me to ~~try~~ acquire this unit for routine handling of turtles.

SIZE range =

(?) [illegible] arrive [illegible]
[illegible] there, but [illegible] gone —
yesterday — seen by east [illegible]
today — seen all along at
[illegible]

Depart Dock 6 AM

INTO Snapper
west of Harbor
just from first deep spot
7:10 - out ~9am
low tide - 5 -6 seen all coming
from one site only 7-8' deep
1 grabbed

12:45 ANCHOR MANGROVE "point" - snorkel walk by - head dug

Hot WATER over Flats
MAKES Algae grow?

11:30 Anchor
just outside
of green hole
3rd "harbor"
pro-turtle
Turtle alarm
in same
sand

Med. choppy
on flats
afternoon
anchor
just west of
1st harbor

26°C 9:30

9:20 Turtle
Swam by deep

10am walked
to Mangroves - where
Holopedia, squid? ocean hand.
Caulerpa, Mangrove
collected, stork
walked to shack
11 AM TO 2ND HARBOR

comfort

1500
230
1270

University. Contains scattered information on sea turtles. Order from Museum of Comparative Zoology, Harvard University, Cambridge, Mass. 02138, USA. $69 + $2 USA or $3 other for postage.

RUCKDESCHEL, C., ELLIS, L. and SHOOP, C.R. 1982. Dermochelys coriacea (leatherback sea turtle) nesting. Herp Review 13:126. C. Ruckdeschel, Box 796, St. Marys, GA 31558 USA.

SHOOP, C.R. and RUCKDESCHEL, C. 1982. Increasing turtle strandings in the southeast United States: a complicating factor. Biological Conservation 23:213-215. C.R. Shoop, Department of Zoology, University of Rhode Island, Kingston, RI 02881 USA.

VAN DISSEL, H.G. and VAN SCHRAVENDIJK, A.E. 1981. Zeeschildpadden in Mexico. Een aflopende zaak? Vakblad voor Biologen 61:374-381. H.G. van Dissel, Hoge der A 37 9712 AE Groningen Netherlands.

VAN RHIJN, F.A. and VAN GORKOM, J.C. 1983. Optic orientation in hatchlings of the sea turtle, Chelonia mydas. III. Sea-finding behaviour: the role of photic and visual orientation in animals walking on the spot under laboratory conditions. Mar. Behav. Physiol. 9:211-228. F.A. Van Rhijn, Laboratory of Comparative Physiology, University of Utrecht, Jan van Galenstraat, 40, 3572 LA Utrecht, Netherlands.

WATTS, D.A., ANGELIDES, T. and BROWN, W.D. 1983. The primary structure of myoglobin from Pacific green sea turtle (Chelonia mydas caranigra). Biochimica et Biophysica Acta 742:310-317. W.D. Brown, Institute of Marine Resources, University of California, Davis, CA 95616 USA.

WHITTOW, G.C. and BALAZS, G.H. 1982. Basking behavior of the Hawaiian green turtle (Chelonia mydas). Pacific Science 36:129-139. G.C. Whittow, University of Hawaii, Department of Physiology, Honolulu, Hawaii 96822 USA.

WITZELL, W.N. 1983. Synopsis of biological data on the hawksbill turtle, Eretmochelys imbricata (Linnaeus, 1766). FAO Fish. Synop. 137, 78 p. W.N. Witzell, NMFS, Southeast Fisheries Center, 75 Virginia Beach Drive, Miami, Florida 33149 USA.

DEC 83

MARINE TURTLE NEWSLETTER: BACK ISSUES

We do not provide back issues; if you need photocopies, please obtain these from whomever told you about this newsletter in the first place. Complete sets of the Marine Turtle Newsletter are in the Library of Congress, Washington, and the British Museum (Natural History).

Marine Turtle Newsletter 11

RECENT DEVELOPMENTS IN THE ANESTHESIA OF SEA TURTLES

Anesthesia of the green turtle with the injectable anesthetics sodium pentobarbital, ketamine hydrochloride, and sodium thiopental shows considerable variability among individuals as to induction, duration and recovery with the anesthetic used (Wood et al., 1982). Investigations suggest that a lower administered rate of sodium pentobarbital be used in loggerhead turtles than in green turtles. Recent work suggests that electroanesthesia of the green turtle may be used more effectively and with less stress to the turtle than the injectable anesthetics.

Seven loggerhead turtles were anesthetized for laparoscopic examination for sex determination as part of a turtle project conducted by the National

Marine Fisheries Service off the eastern coast of Florida. The turtles weighed 27-64kg. Three turtles received dosages of 20mg/kg body weight (sodium thiopental, pentothal, Abbott Laboratories); one turtle, 15mg/kg; and three turtles, 10mg/kg. One turtle receiving 20mg/kg and the one turtle receiving 15 mg/kg died within one hour following anesthesia. An administered rate of 20 mg/kg was recommended for the green turtle (Wood et al., 1982). The five other turtles recovered within 2 1/2-10 hours following anesthesia. However, the three turtles receiving 10 mg/kg failed to achieve deep anesthesia and laparoscopic entry was necessarily rapid and extensive examination of the turtle for other than sex determination would have been impossible. The two turtles receiving 20 mg/kg, and recovering from anesthesia, achieved deep anesthesia within 10 minutes and maintained surgical anesthesia for ca. 20 minutes. The use of sodium thiopental as an anesthetic in sea turtles should be used with caution. The dosage necessary for anesthesia depends upon the intended examination and may vary considerably among individuals.

Three green turtles (19, 25 and 100 kg) were recently electroanesthetized using a Feenix Stockstill Mark I electroanesthesia unit (Feenix International Pty. Ltd., Tarlee, South Australia). Electro-leads were inserted under the skin in the shoulder near the neck and at the base of the rear flipper. A current of .25ma was sufficient to achieve and maintain surgical anesthesia. Examination time (laparoscopic entry for sex determination) was 5 to 10 minutes and recovery of the turtle was immediate following suspension of current. The electroanesthesia unit is portable and offers an efficient method of anesthesia with the advantage of a minimal recovery time.

Wood, F.E., K.H. Critchley, and J.R. Wood, 1982. Anesthesia in the green sea turtle Chelonia mydas. Am. J. Vet. Res. 43:1882-1883.

JAMES R. WOOD AND FERN E. WOOD,
Cayman Turtle Farm (1983) Ltd., Box 645, Grand Cayman, British West Indies.

INFORMATION WANTED

Information and observations on the subject of aborted sea turtle eggs seen in the water. Please give location, date, species, number of eggs observed and marine habitat type (i.e. sandy bottom, fringing reef, etc.). Please write to John Fletemeyer, Oceanographic Center, Nova University, 8000 N. Ocean Drive, Dania, Florida, 33004 USA.

A COMPARISON OF THREE METHODS FOR INCUBATING TURTLE EGGS

During the summer of 1983 green turtle eggs from 3 clutches were incubated in Freas Precision incubators in Toronto. The eggs came from Suriname. Eggs from clutches 1 and 2 were collected at laying, washed in rain water and then put into styrofoam boxes for transport; eggs from clutch 3 had been in a styrofoam box for a day prior to transfer to the transport box. Clutches 1 and 2 arrived in Toronto about 24 h after laying, clutch 3 arrived about 48 h after laying. Most of the eggs were spotted on arrival indicating fertility; the white spots on eggs from clutch 3 were larger than the spots on the eggs from the younger clutches, 1 and 2. The eggs were incubated singly in plastic

11-8-85 AM Honolulu

Little Black Box Electrically

MINNEAPOLIS (AP) — By twisting a knob on a little black box, Richard Kindy was able to block the pain as his dentist cleaned out a large cavity and filled his tooth.

Kindy had not been given pain-killing drugs before Dr. Dennis Hogan began working on his tooth. He was trying a new system that blocked his perception of pain by electrically stimulating his nerves.

The makers of the patient-controlled device expect it to replace injection of drugs to block pain in many dental patients once it gains federal approval.

All Kindy felt as the dentist worked was pressure and a tingling sensation underneath his right eye, where an electrode was attached to his facial skin.

"I wouldn't have known whether he was working in and around a nerve or not. I didn't feel a thing," said Kindy, 58, of St. Louis Park, Minn. "I was not aware of pain."

The system combines the technology of Medical Devices Inc. of St. Paul, which produces the electrical stimulator, and LecTec Corp. of suburban Minnetonka, maker of a synthetic tape that adheres to the skin and transmits electrical impulses to stimulate nerves.

BRUCE MacFARLANE, a

Star-Bulletin

Blocks Dental Patients' Pain

scientist and director of clinical services for Medical Devices, said the use of electrical stimulation in dentistry is an adaptation of the TENS system widely used to block chronic pain and to make patients more comfortable following surgery.

"It's stimulating nerves. How that interferes with the perception of pain simply is not known," MacFarlane said. "What we do know is that in chronic pain, especially in acute pain, it is clinically effective."

He said components of the system had been approved separately by the U.S. Food and Drug Administration. Approval of the complete unit for marketing is expected to be routine, he said.

The Association for Advancement of Medical Instrumentation sets standards for recommended maximum output of electrical stimulation devices, he said. "Ours is only 20 percent of their recommended maximum, and that maximum has a safety factor built in."

CONTROLLED scientific testing of the system began this fall at the University of Minnesota Dental School. MacFarlane predicted that national marketing would begin March 1.

D-10 Honolulu, May 4, 1986 The Sunday Star-Bulletin & Advertiser

doctor fitness™

Dr. Chet Nierenberg
Honolulu
Sports Medical Clinic

Electricity can relieve pain

Dear Dr. Fitness:

I have had a sore neck on and off for years. It seems like every time I do anything strenuous, like play tennis or any other sport where I work up a sweat, I also get a sore neck. My doctor told me that I have some bone spurs in my neck and that I'll just have to live with occasional pain. I've heard that athletes often use electrical modalities to reduce pain and I wonder if this type of therapy is available for me, especially since I hate taking pills.

A — The most common way that athletes reduce pain electronically is in the training room. This is done by a physical therapist or athletic trainer who employs sophisticated electronic devices to reduce pain and swelling immediately after activity.

Another form of this type of therapy that you can actually take home and use yourself is called TENS. It stands for transcutaneous electrical nerve stimulation.

TENS relieves pain without medication. A TENS unit is about one-third the size of a package of cigarettes and has wires extending from it that attach to electrodes, very similar to Band-Aids, with wires coming out of them. The unit is made out of solid-state components and produces an electric current that can reduce pain.

It is useful for a wide variety of chronic pain problems in the neck, lower back or virtually anywhere pain is a problem.

TENS does not correct the underlying problem, it only relieves the pain. It is not for everybody, but you might ask your doctor if this could possibly be helpful for you.

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The answers in this column are general guidelines for most people. For individual problems, consult your physician. Address your questions to Dr. Fitness, c/o The Honolulu Advertiser, P.O. Box 3110, Honolulu, HI 96802.

Balloon barrage today to give lift to National Science Week

By Jim Borg
Advertiser Science Writer

Students from Hawaii schools will join those in 200 other U.S. cities in a massive launch of helium-filled balloons today to kick off National Science Week.

Some 900 balloons will be released in Hawaii, 200 of them from Farrington High School. Other schools participating are Maryknoll High School, Kamehameha Secondary School and Kona Adventist School on the Big Island.

The balloons aren't pure spectacle, however.

Each of the 150,000 balloons released nationwide will carry a yellow postcard, stamped and addressed, so that anyone finding it can mail it to the American Geological Institute in Washington, D.C. Many balloons will be lost at sea, but some may find dry land or passing ships in the Pacific, said Saul Price, staff meteorologist with the National Weather Service.

They will eventually be returned to the students for discussions on atmospheric conditions.

The week's activities here, billed as Science Awareness Hawaii '86, also include visits by scientists to schools, opportunities for school children to spend a day with a scientist, and the announcement of the winner of the Teacher in Inner Space competition. Schools also will have individual activities and there will be displays of science exhibits and posters at Kahala Mall.

The winner of the Teacher in Inner Space program will get a ride in the two-man submersible Makalii, operated by the Hawaii Undersea Research Laboratory at Makapuu.

The winner will be named Saturday at Sea Life Park at a 10 a.m. breakfast program sponsored by the Hawaii Science Teachers Association. Ten teachers are finalists.

Also at the breakfast, laboratory director Alexander Malahoff will give a talk on "Inner Space Frontiers." At 11 a.m., there will be a open house at the laboratory on nearby Makai Pier.

Jo Kanehiro, a Farrington chemistry teacher and president of the Hawaii Science Teachers Association, said the activities are designed to boost public understanding of science and technology and to encourage young students to study science and mathematics.

Other supporting organizations are the Hawaii Academy of Science, the Hawaii chapter of the American Chemical Society, the Hawaii Asscciation for Women in Science and the National Weather Service. The nationwide balloon launch is sponsored by the Triangle Coalition for Science and Technology Education.

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
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Honolulu Laboratory
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Honolulu, HI 96822-2396

May 12, 1986 F/SWC2:GHB

Dr. Karen Bjorndal
Department of Zoology
223 Bartram Hall
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Gainsville, FL 32611

Dear Karen,

In view of the attached article from this morning's newspaper, I feel that a point has now been reached where some form of action, or alert, needs to be taken by the IUCN Marine Turtle Group on the question of intentially released balloons drifting to sea and becoming surface pollutants to sea turtles. Many of the modern balloons are made of mylar plastic that persists indefinitely. Anne Meylan recently sent me one of these balloons in which the silvery coating had dissolved after being in sea water. With the hard-hold ribbon still attached giving the appearance of a "tenacle," the balloon looked even more similar to a jellyfish than the plastic bags ("plastic jellyfish") found in turtle guts by Sam Sadove and many others. There is no question in my mind that sea turtles, especially in pelagic habitat, would ingest deflated or bursted balloons in the same manner that they eat all sorts of other man-made debris.

I'm not sure what can be done about this problem, but perhaps the least we can do as a Group is to point out our concern to others.

Sincerely,

George H. Balazs
Zoologist

cc: A. Carr
L. Ogren
A. Meylan

Dr. I. Njoman S. Nuitja
The Foundation of National Herpetology
Jalan Widuri 2, Bogor
INDONESIA

Bogor, May 20, 1986

Dr. Karen Bjorndal
Dept. of Zoology
University of Florida
Gainesville, FL 32611
USA.

Dear Karen,

We has some action on Sea Turtles Conservation in Indonesia. One of that, the study of the population of Dermochelys. This species is nesting on the beach of 3 km long at Sukomade beach East Java. I don't have turtle tag in connection of this population study (migration, life cycle etc.). Therefore, I requeat that would you please to agree about 1000 tags by your grant received from Japan.

Thank you very much, I remain.

Best wishes,

I Njoman S. Nuitja