

‘Resource Fish’ Timed Swim

Overview and Objectives:

Pairs of divers conduct 5 or 7 minute timed swims recording the number of all medium-large (>15cm TL on Big Island; >10cm TL on Maui) ‘resource fishes’ (Table 1). Divers aim to cover moderate to large areas while looking as far ahead as possible so that diver-observers can focus on the large, mobile and sometimes skittish fishes which are the principal targets of commercial and recreational food fisheries.

Detail:

Divers work in pairs, starting from a fixed central point in the survey site (e.g. central pins of WHAP H formation). Divers swim outward from the starting point following the depth contour and remaining where possible within a contiguous stretch of habitat. Divers should aim to move steadily, and adjust their own speeds to prevailing currents so that total distance covered is around 120-150m per 5-minute survey. In West Hawaii, most survey sites are aligned roughly N-S, so one pair of divers swim approximately north and one pair south. Each diver records the size and number of ‘resource fishes’ with total length larger than 15cm within a 5m-wide swathe centered on themselves. One diver in each pair will either tow a surface float with a tracking GPS, or deploy a buoy at the end of the swim, so that distance covered per survey can also be calculated (and therefore counts can be analyzed on a per-time or per-distance basis). Data from a pair of divers will always be pooled prior to analysis and therefore, divers should strive not to double count fishes (e.g. a fish moving across the field of vision of both divers should only be counted one of the pair, normally the diver from which side the fish started). Fish sizes are to be recorded in 5cm-slot size categories: “D” = 15-20 cm; “E” = 20-25 cm; and fishes larger than 25cm recorded to nearest 5 cm.

In West Hawaii, transects are laid out in an H pattern and are labeled from A to D: transects A and C run parallel, approximately 10m apart and heading northwards from the central pin following the depth contour. B and D transects are also 10m apart and parallel, but run southwards. Mid-depth of each site is around 40ft.

Maui sites are aligned parallel to shore – sites are either ‘shallow’ (~10ft) or ‘deep’ (~35ft).

Data sheet shown in Table 2. Site lists in Tables 3 and 4. Map of West Hawaii sites in Figures 1 and 2.

Table 1. 'Resource Fishes'

Family/Grouping	Species
Carangidae	All jacks
Scaridae	All parrotfish
Labridae	<i>B. bilunulatus</i> <i>O. unifasciatus</i>
Acanthuridae	<i>A. achilles</i> <i>A. blochii</i> <i>A. dussumieri</i> <i>A. leucopareius</i> <i>A. olivaceus</i> <i>A. xanthopterus</i> <i>N. lituratus</i> <i>N. brevirostris</i> <i>N. hexacanthus</i> <i>N. unicornis</i>
Mullidae	<i>M. flavolineatus</i> <i>M. vanicolensis</i> <i>P. bifasciatus</i> <i>P. cyclostomus</i> <i>P. multifasciatus</i>
Serranidae	<i>C. argus</i>
Lutjanidae	<i>A. furca</i> <i>A. virescens</i> <i>L. kasmira</i> <i>L. fulvus</i>
Lethrinidae	<i>M. grandoculis</i>
Kyphosidae	<i>Kyphosus sp.</i>
Charismatic Others..	Sharks, Mackerel, Tuna, Turtles

Table 2. 5-minute 'Free-Swim' Data Sheet

Names: /	Bearing:	Date:	Site:	Line:	Visibility
≥15cm only	Start Time				
<i>A. achilles</i>					
<i>A. blochii</i>					
<i>A. dussumieri</i>					
<i>A. furca</i>					
<i>A. leucopareius</i>					
<i>A. nigroris</i>					
<i>A. olivaceus</i>					
<i>A. virescens</i>					
<i>B. bilunulatus</i>					
<i>C. argus</i>					
<i>C. carolinus</i>					
<i>C. melampygus</i>					
<i>C. sordidus</i>					
<i>Kyphosus sp.</i>					
<i>L. kasmira</i>					
<i>M. grandoculis</i>					
<i>M. flavolineatus</i>					
<i>M. vanicolensis</i>					
<i>N. brevirostris</i>					
<i>N. hexacanthus</i>					
<i>N. lituratus</i>					
<i>N. unicornis</i>					
<i>O. unifasciatus</i>					
<i>P. bifasciatus</i>					
<i>P. cyclostomus</i>					
<i>P. multifasciatus</i>					
<i>S. dubius</i>					
<i>S. psittacus</i>					
<i>S. rubroviolaceus</i>					
Non-Transect Target Fish	Record number and size of any of these seen at any time throughout the survey.				
# & size of all Jacks, Uku, Mu, O'io, Awa, Ama Ama, Barracuda, Sharks & Rays					

Table 3. Resource Fish monitoring sites with coordinates and status.

SITE	LATITUDE	LONGITUDE	MEAN DEPTH (M)	STATUS
LAPAKAHI	20.160	-155.900	12.1	MLCD
WAIAKAILIO BAY	20.074	-155.865	13.4	FRA
PUAKO	19.970	-155.849	9.2	FMA
ANAEHO`OMALU BAY	19.953	-155.866	10.0	FRA
MAKALAWENA	19.797	-156.033	10.2	FMA
HO`ONA / UNU ALOHA PT	19.743	-156.056	12.4	OPEN
KALOKO-HONOKOHAU	19.671	-156.030	13.1	FRA
OLD KONA AIRPORT	19.642	-156.012	12.2	MLCD
NORTH KEAUHOU	19.568	-155.969	12.0	FRA
RED HILL	19.505	-155.953	13.9	FRA
KEALEKEKUA BAY	19.479	-155.933	8.0	MLCD
KE`EI	19.463	-155.927	11.5	FRA
MILOLI`I/HONOMALINO	19.167	-155.913	12.3	FRA
OKOE BAY			16.5	FRA

Table 4. Resource Fish monitoring sites in Maui.

Site	Depth	Latitude	Longitude
Ahihi Kina'u NAR			
Kalaeloa	3-5 m	20.35.690	156.25.641
Kalaeloa	10m	20.35.672	156.25.758
Kanahena Point	3-5m	20.36.095	156.26.282
Kanahena Point	10m	20.36.110	156.26.227
Kanahena Bay	3-5m	20.37.034	156.26.317
La Perouse Bay (control sites for Ahihi Kinau)			
Keoneoio	3-5m	20.35.862	156.25.188
Keoneoio	10m	20.35.807	156.25.260
Lae O Papaka	3-5m	20.35.295	156.24.843
MK Black	3-5m		
Keoneoio Central	10m	20.35.557	156.24.998
Molokini MLCD			
MK Center	3-5m	20.37.889	156.29.783
MK East	3-5m	20.37.950	156.29.666
MK Center	10m	20.37.940	156.29.783
MK West	10m	20.37.992	156.29.858
MK West	3-5m	20.37.988	156.29.889
Makena/ Keawekapu (Molokini Control)			
Maluaka Point	3-5m	20.38.628	156.26.809
Maluaka Point	10m	20.38.694	156.26.837
Oneuli	3-5m	20.38.420	156.26.943
Pu'u Olai	3-5m	20.38.282	156.27.122
Keawekapu	10m	20.42.289	156.27.022
Manele-Hulopoe MLCD			
Manele East	3m	20.44.547	156.52.901
Manele West	10m	20.44.409	156.53.155
Manele Cove	3m	20.44.110	156.53.501
Hulopoe East	10m	20.44.124	156.53.678
Hulopoe East	3m	20.44.182	156.53.643
Lanai Lighthouse (LH) (Manele-Hulopoe Control)			
Palaoa West	3-5m	20.43.904	156.57.765
Palaoa Center	3-5m	20.43.941	156.57.606
Palaoa East	3-5m	20.43.970	156.57.469
Palaoa West	10m	20.43.887	156.57.619
Palaoa Center	10m	20.43.929	156.57.454
Honolua-Mokuleia Bay MLCD			
Honolua North	3-5m	21.00.941	156.38.368
Honolua North	10m		
Honolua South	3-5m	21.00.838	156.38.404
Honolua South	10m		
Mokuleia	3-5m	21.00.705	156.38.653
Kapalua Bay (control Sites for West Maui)			
Lipoa	3-5m	21.01.126	156.38.535
Lipoa	10m	21.01.090	156.38.604
Kapalua Bay	3M		
Honokahua Bay	3-5m	21.00.531	156.38.860
Makaluapuna Point	3-5m	21.00.590	156.39.410

West Hawai'i Coral Reef Monitoring Stations

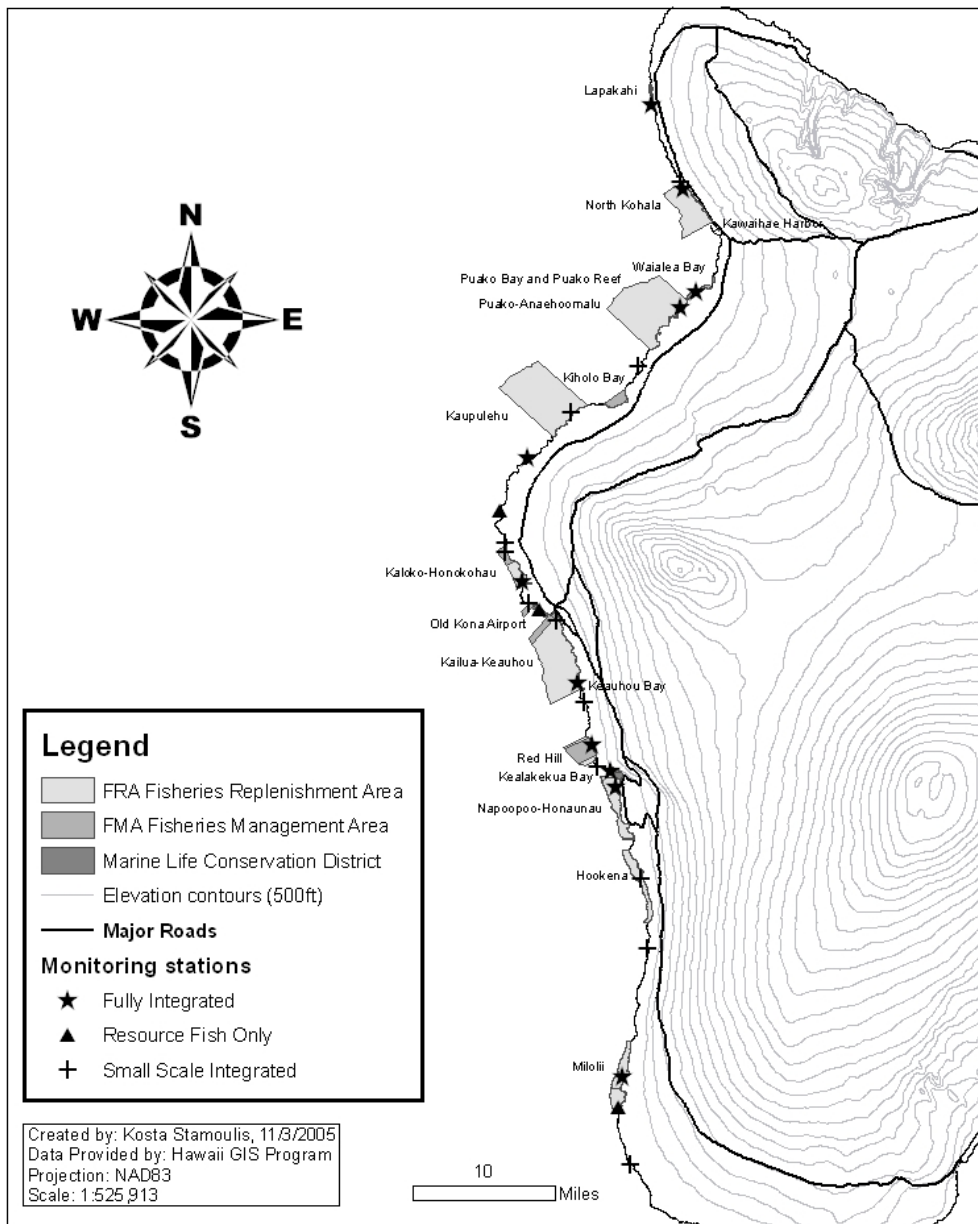


Figure 1. West Hawaii Monitoring Stations

Maui Coral Reef Monitoring Stations

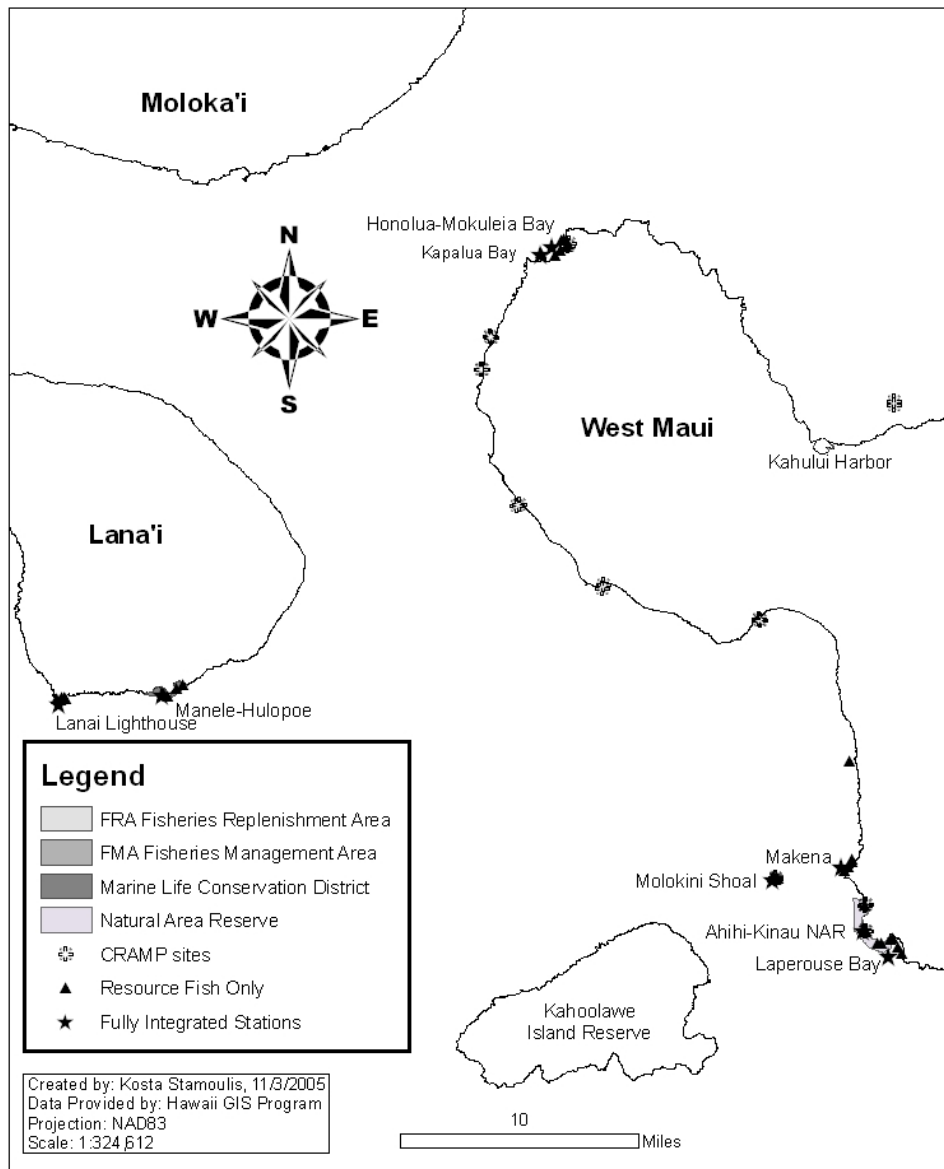


Figure 2. Maui Monitoring Locations.

Maui monitoring stations are based around comparing MMAs with 'controls' and maintaining existing CRAMP survey sites. There are therefore 8 main monitoring clusters each being a managed area or control (1a) Ahihi-Kina'u (NAR) + (1b) La Perouse Bay (control); (2a) Molokini-Shoal MLCD + (2b) Makena/Keawekapu (control); (3a) Manele-Hulopo'e MLCD + (3b) Lana'i Lighthouse (control); (4a) Honolua-Mokule'ia Bay MLCD + (4b) Kapalua Bay (control).

Each cluster is made up of 4-5 sub-sites which are either 'deep' (~35ft) or 'shallow' (~10ft).