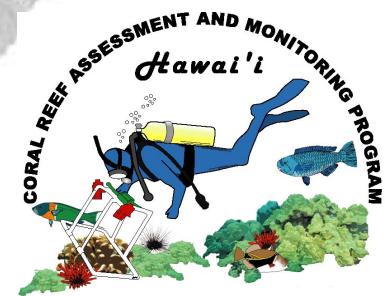
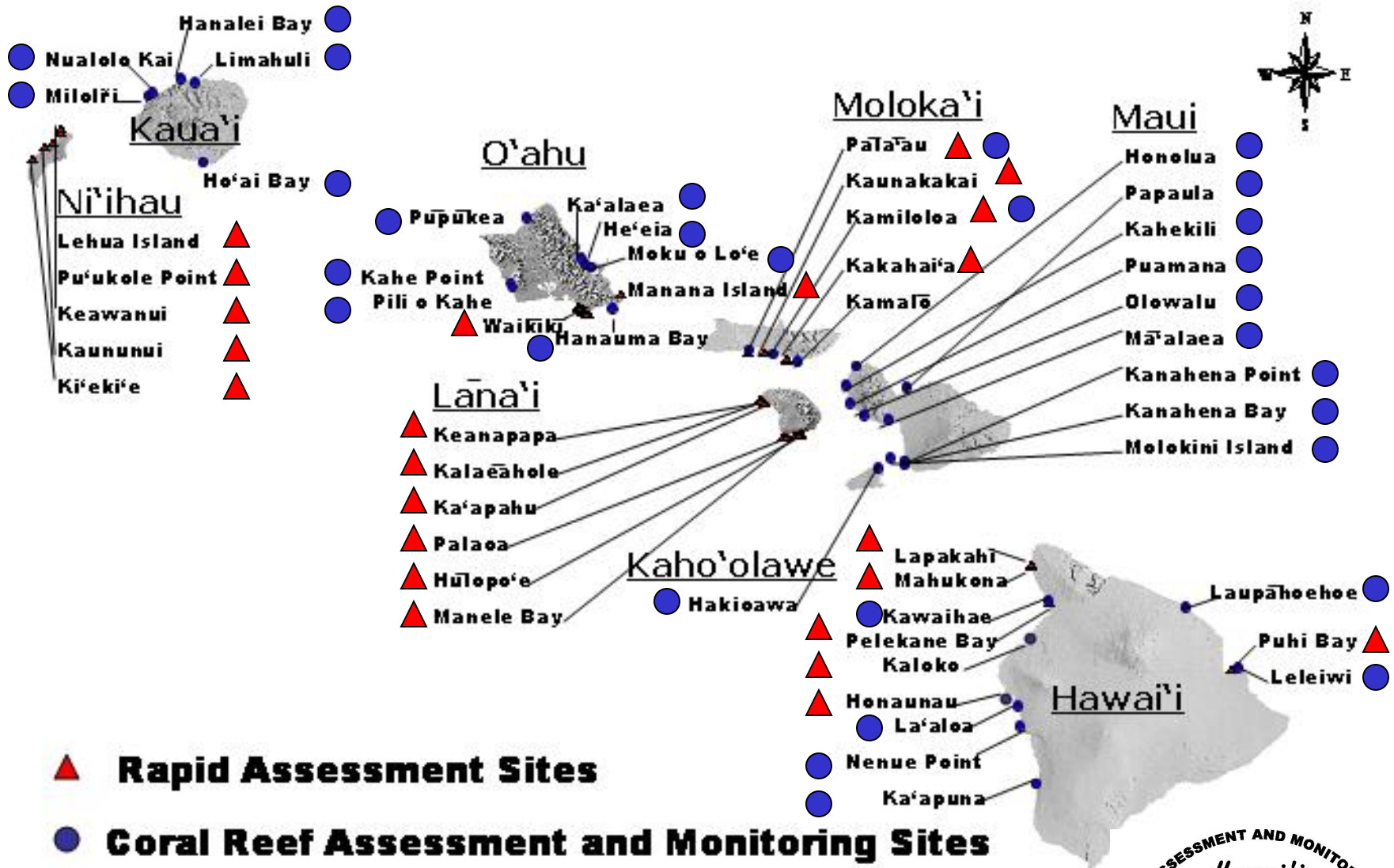


Developing and Evaluating Coral Reef Biocriteria



Ku'ulei Rodgers
Paul Jokiel
Eric Brown



Precision and statistical power

Repeatability

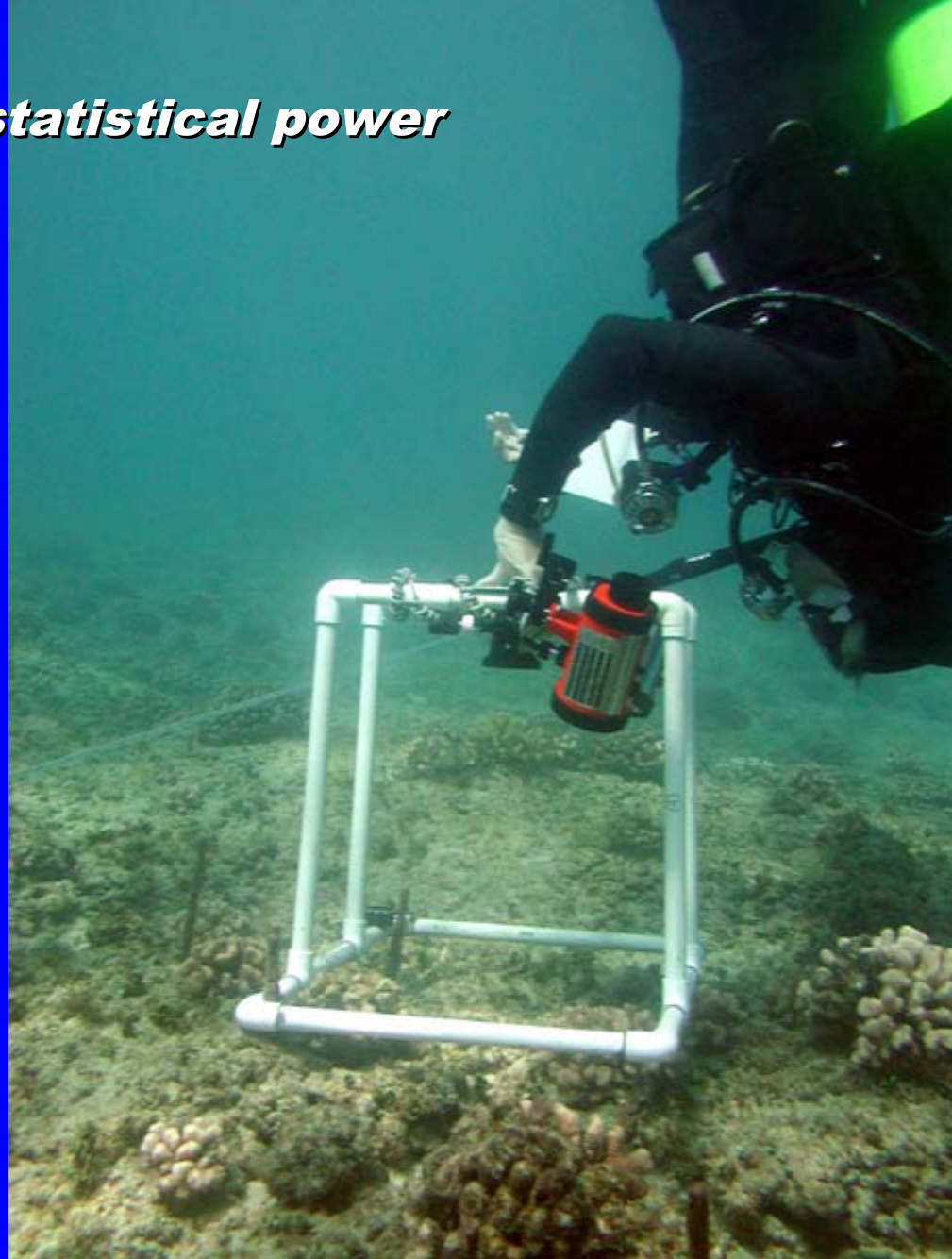
**Appropriate length and
number of the transects**

Number of frames or subsamples

Cover estimation techniques

Observer variation

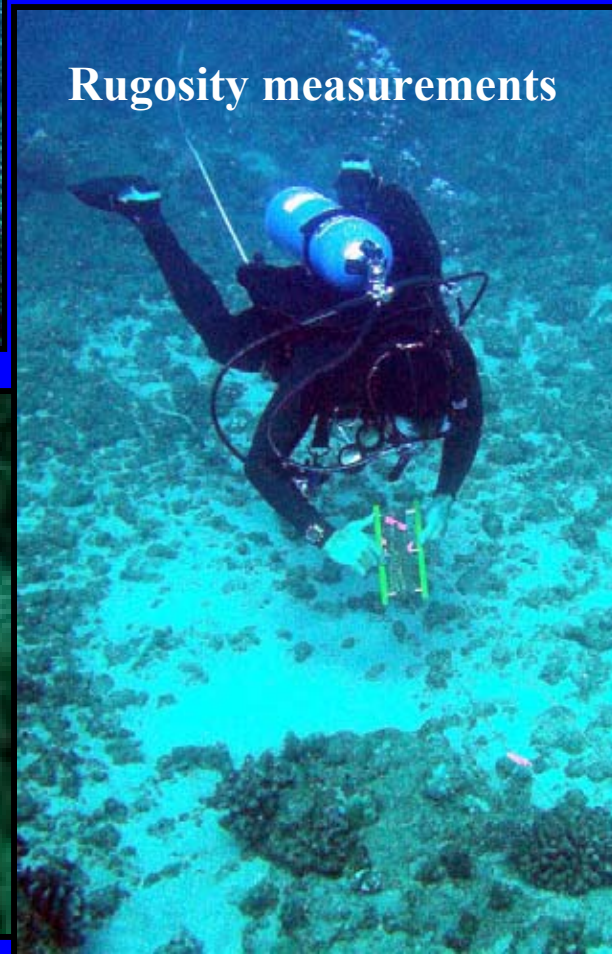
Time and costs



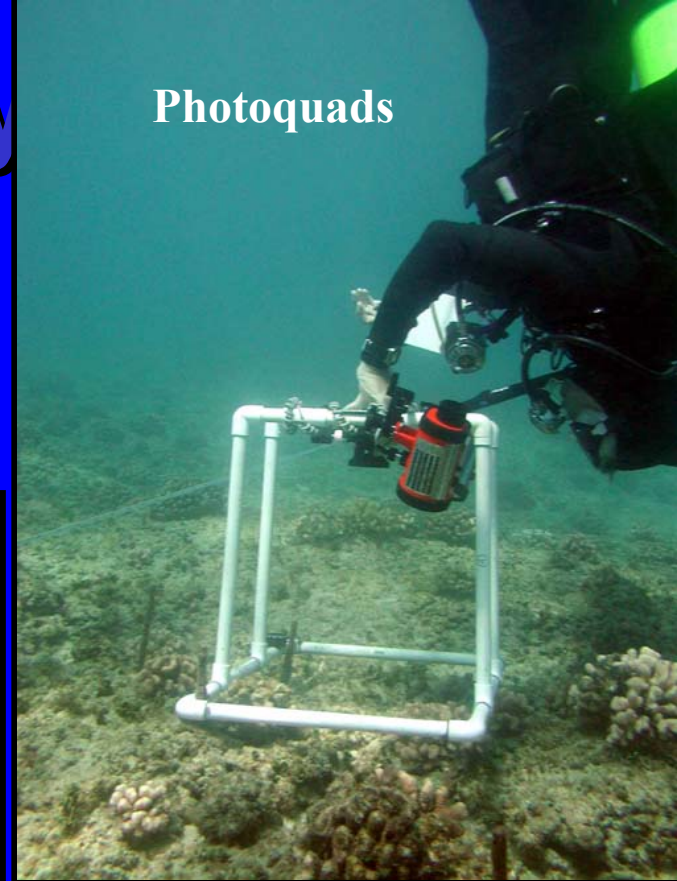
Methodology



Benthic Digital Photos



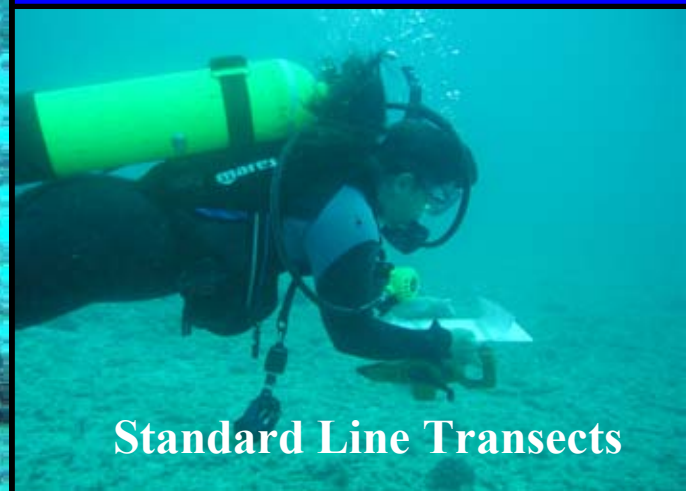
Rugosity measurements



Photoquads



Sediment collection



Standard Line Transects



Coral

- Total coral cover
- Species cover
- Species richness
- Diversity

Fish

- Total number
- Biomass
- Size categories
- Endemism status
- Diversity
- Evenness
- Trophic guilds
- Target species



Algal

- Macroalgae
- Calcareous algae
- Turf algae

Physical

- Rugosity
- Depth

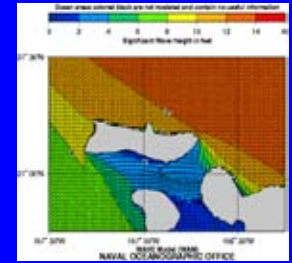


Sediment and Substrate

- Sand
- Silt
- Rubble
- Organics
- Carbonate
- Sediment grain-sizes

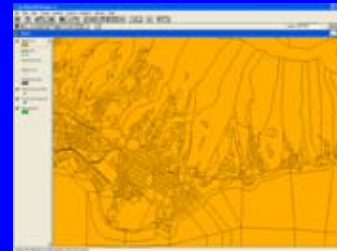
Wave factors

- Wave heights maximums
- Wave height means
- Wave direction
- Seasonal wave parameters



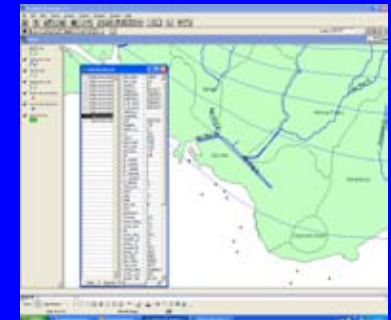
Population

- Human population (within 5 km, 10 km)
- Population of surrounding watershed



Other Relevant Parameters

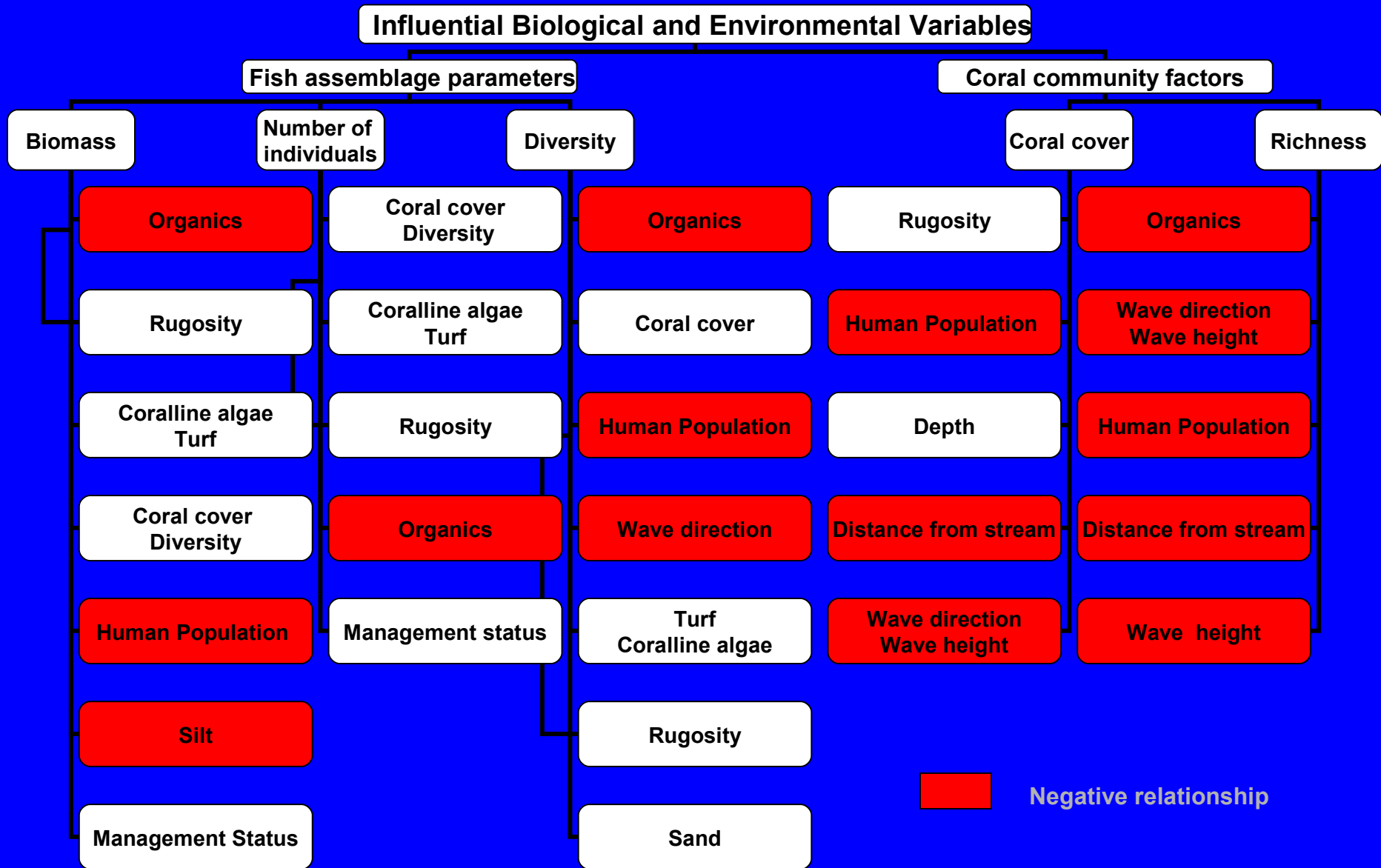
- Geologic age
- Fishing pressure
- Status of management protection



Environmental Parameters

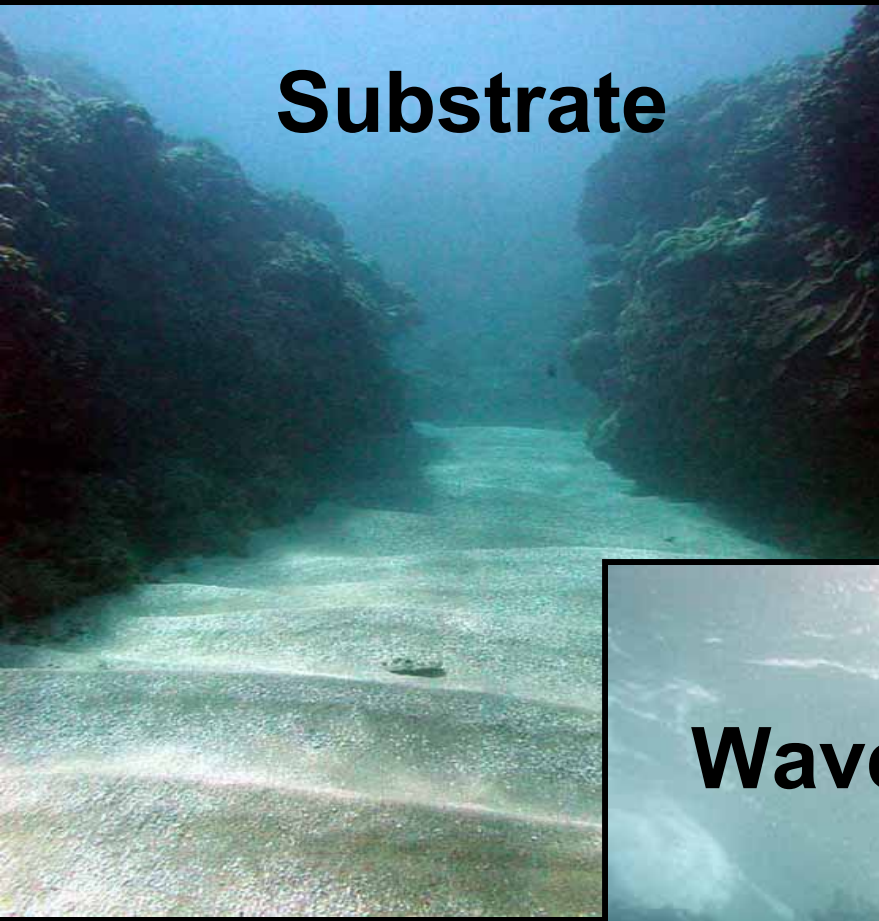
- Watershed size
- Stream length
- Distance from nearest perennial stream
- Precipitation

Hierarchical Influential Indicators of Biological Community Parameters

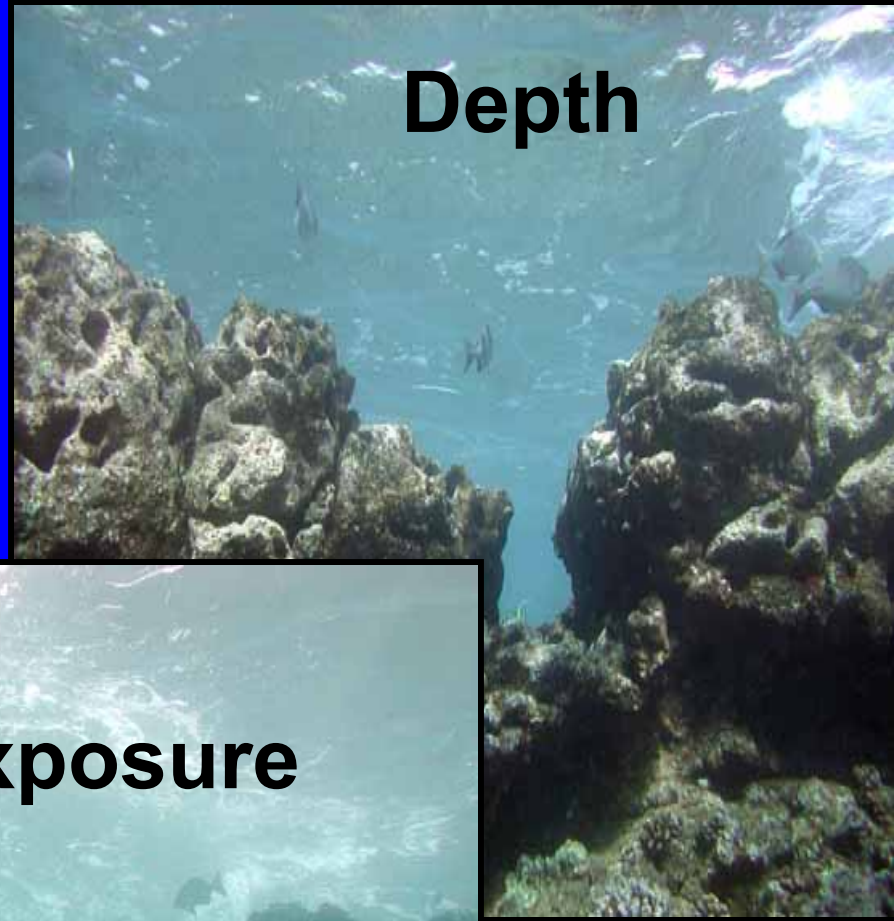


Classification

Substrate



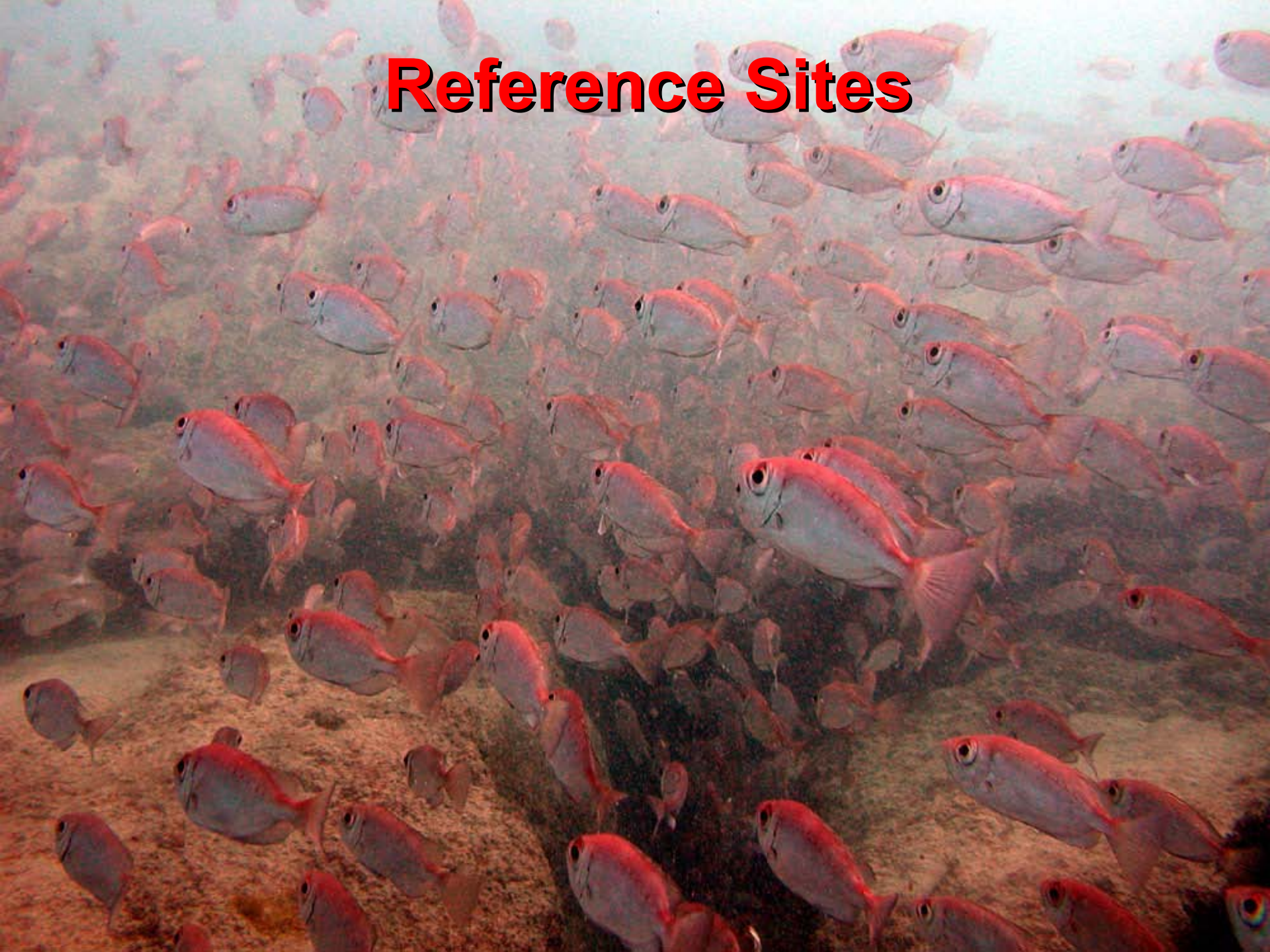
Depth



Wave Exposure



Reference Sites



Male
Age 40- 50
Medium frame

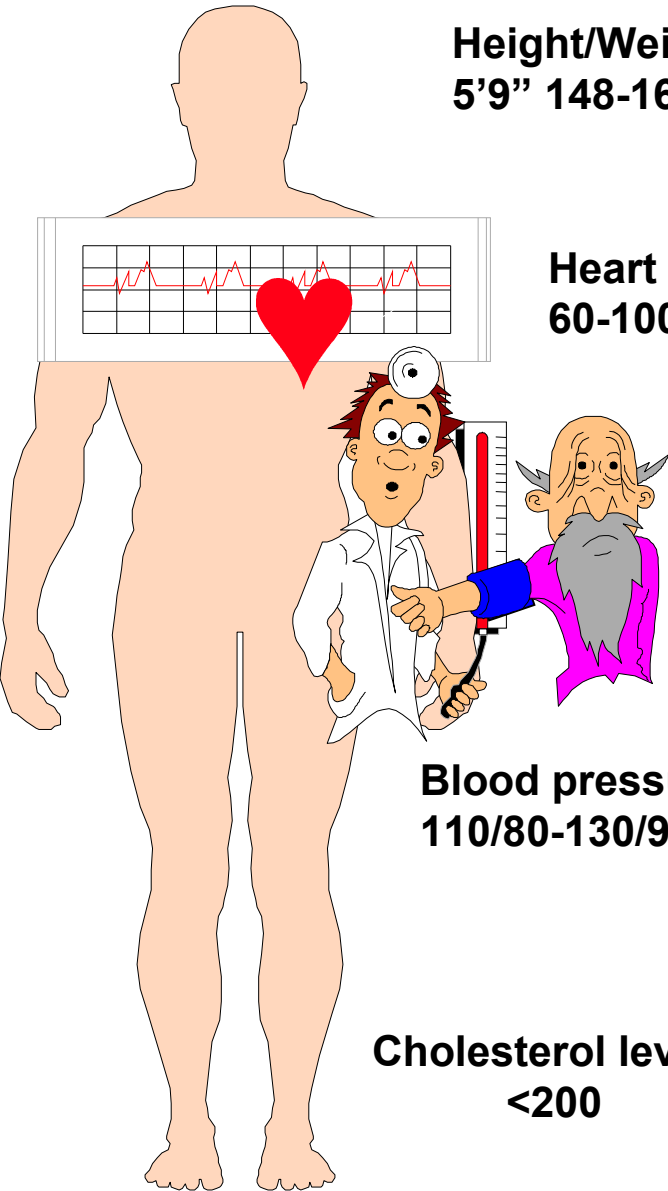
Height/Weight
5'9" 148-160#

Heart rate
60-100 beats/min

Blood pressure
110/80-130/90

Cholesterol levels
<200

Vital Statistics



Colonized hardbottom
South facing shore
10m-20m depth

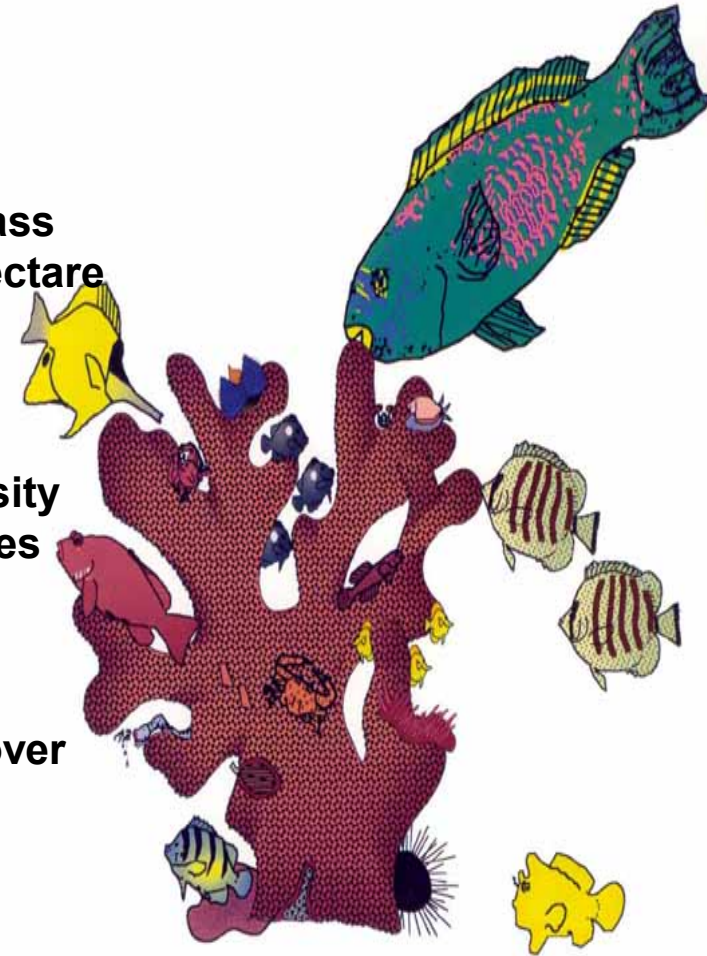
Fish biomass
0.8-1.5 mT/hectare

Coral diversity
6-10 species

% Coral cover
60-80%

Rugosity index
1.5-2.0

Biological criteria



Reference Site Limitations

Subjective site selection

Can not distinguish degree of impairment

High heterogeneity

Limited power in detecting disturbance

No comparative value

Ecological Gradient Model

Microsoft Excel - EQprototype2 4-24-2008

File Edit View Insert Format Tools Data Window Help Adobe PDF

C11 3.35

A B C D E F G H I J K

1
2 1) Input depth of station in meters **5**
3 2) Select wave exposure **South**
4 3) Input Northing Data In UTM **621672** <http://www.dmap.co.uk/d2m.htm>
5 4) Input Easting Data In UTM **2351876**
6 5) Input Site Name **Evaluation Site**
7 6) Input values for parameters of interest under assessment data below
8
9

Run Default Query Modify Query View Data Map View Queried Data Site Map

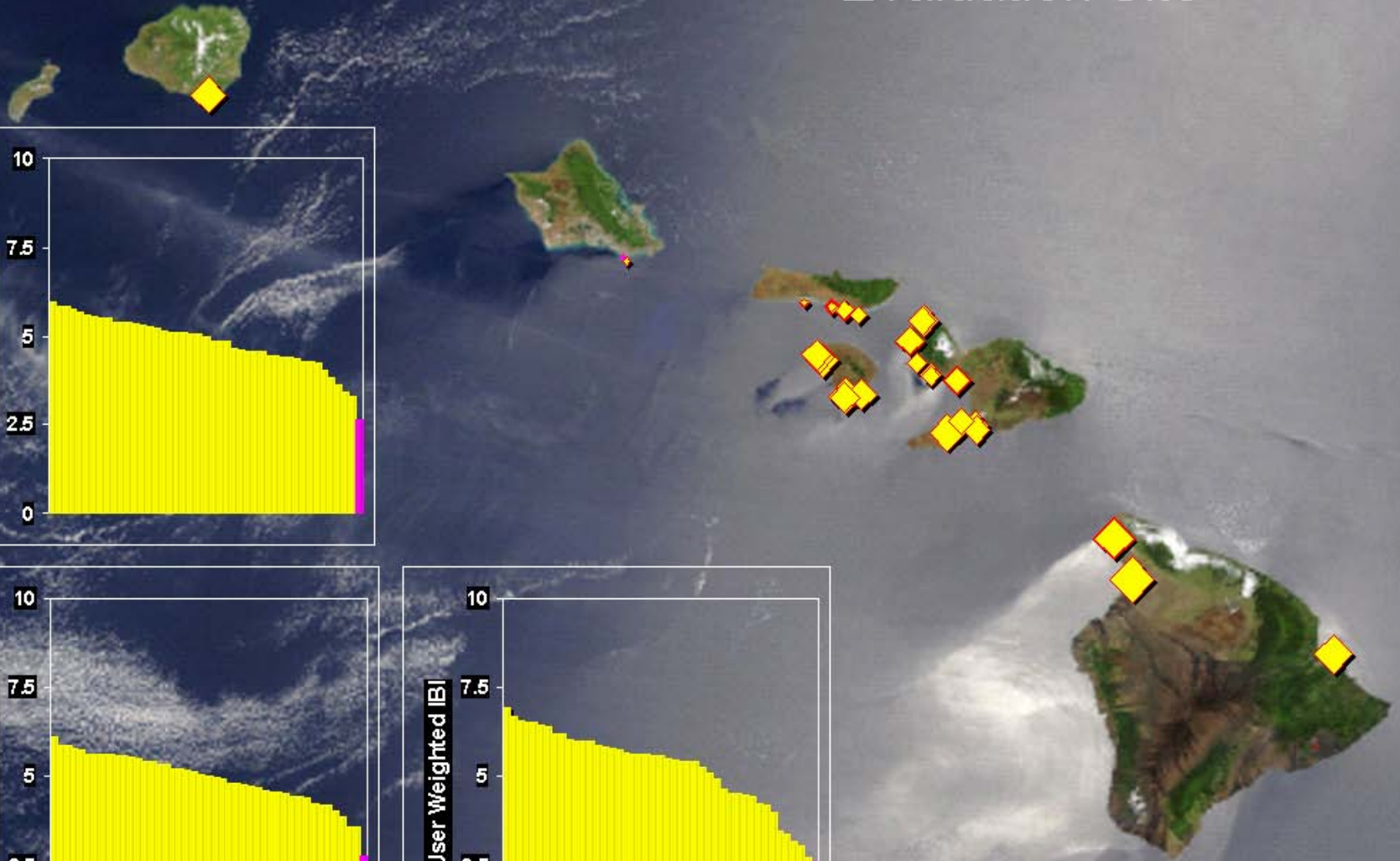
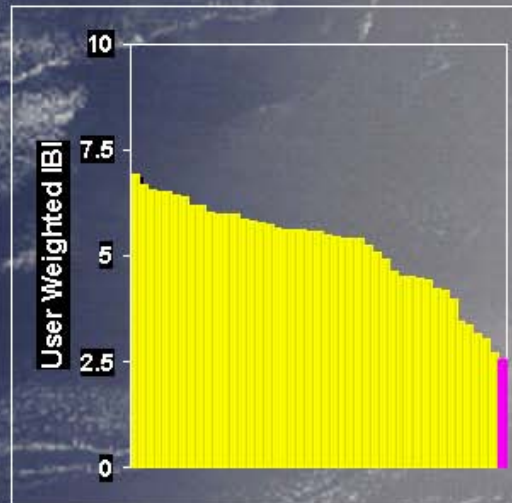
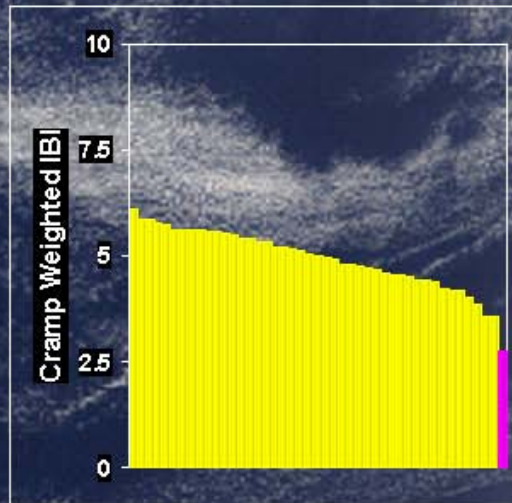
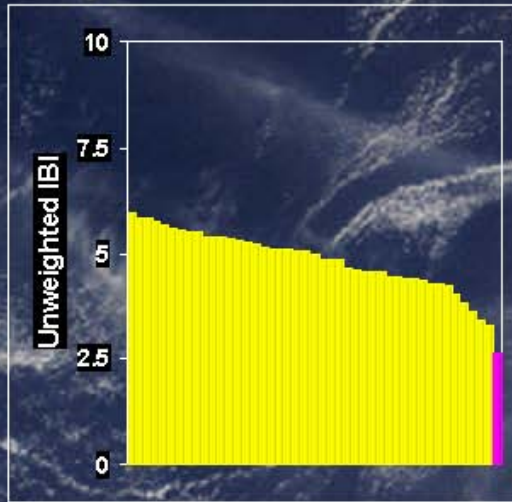
Unweighted IBI Chart Cramp Weighted IBI Chart Custom Weighted IBI Chart

Parameters	Assessment data	RANK	Index	CRAMP Weighted Index	User Weights	User Weighted Index	Parameter Impact
Organics (LOI)	3.35	0.49	4.89	4.89	0.00	0.00	-
CaCO ₃	94.90	0.91	9.11	6.38	0.00	0.00	+
medium sand	87.61	0.80	9.00	5.60	0.00	0.00	+
fine sand	7.16	0.09	0.88	0.35	0.00	0.00	+
very fine sand	4.75	0.44	4.44	3.55	0.00	0.00	+
silt	0.47	0.93	9.34	7.47	0.00	0.00	-
Montipora flabellata	0	0.00	0.00	0.00	0.00	0.00	+
Montipora patula	0	0.00	0.00	0.00	0.00	0.00	+
Montipora capitata	0	0.00	0.00	0.00	0.00	0.00	+
Pocillopora meandrina	1	0.44	4.44	1.33	0.00	0.00	+
Porites compressa	0	0.00	0.00	0.00	0.00	0.00	+
Porites lobata	0	0.00	0.00	0.00	0.00	0.00	+
Total Coral	1	0.02	0.22	0.20	10.00	0.22	+
Coral Species Richness	1	0.00	0.00	0.00	10.00	0.00	+
Coral Diversity (H')	0	0.00	0.00	0.00	10.00	0.00	+
sand cvr	29.8	0.02	0.23	0.14	0.00	0.00	-
calcareous algae	0	0.00	0.00	0.00	10.00	0.00	+
macroalgae	25.4	0.05	0.45	0.27	10.00	0.45	-
substrate (turf)	43.8	0.78	7.78	4.67	10.00	7.78	-
Rugosity	1.31	0.18	1.77	1.77	0.00	0.00	+
Wave Height (mean)	4.2	0.27	2.67	2.40	0.00	0.00	-
Wave direction (mean)	184.3	0.29	2.89	1.73	0.00	0.00	-
population within 5 km	151265	0.02	0.23	0.21	0.00	0.00	-
population within 10 km	288400	0.02	0.23	0.14	0.00	0.00	-
population within watershed	105365	0.02	0.23	0.14	0.00	0.00	-
Stream (distance) m	2871	0.71	7.12	4.27	0.00	0.00	-
rain mm	600	0.78	7.77	3.89	0.00	0.00	+
fish<5cm (%)	75	0.96	9.55	5.73	0.00	0.00	+
5-15cm (%)	8	0.09	0.88	0.53	0.00	0.00	+
>15cm(%)	17	0.58	5.77	3.46	0.00	0.00	+
Total number of fish	12	0.00	0.00	0.00	0.00	0.00	+
Biomass	300.16	0.00	0.00	0.00	0.00	0.00	+
Number of fish (hax1000)	0.96	0.00	0.00	0.00	0.00	0.00	+
Biomass (tons per hectare)	0.02	0.00	0.00	0.00	10.00	0.00	+
Fish diversity (H')	0.98	0.00	0.00	0.00	10.00	0.00	+
Fish evenness	0.71	0.24	2.44	1.22	10.00	2.44	+
Endemic %	75	0.98	9.77	3.91	10.00	9.77	+
Indigenous %	25	0.00	0.00	0.00	10.00	0.00	+
Introduced %	0	1.00	10.00	4.00	10.00	10.00	-
Corallivores %	0	0.00	0.00	0.00	0.00	0.00	+
Detritivores %	0	0.00	0.00	0.00	0.00	0.00	+
Herbivores %	0	0.00	0.00	0.00	0.00	0.00	+
Mobile Invertebrate feeders %	100	0.98	9.77	3.91	0.00	0.00	+
Piscivores%	0	0.00	0.00	0.00	0.00	0.00	+
Sessile Invertebrate feeders %	0	0.00	0.00	0.00	0.00	0.00	+
Zooplanktivores %	0	0.00	0.00	0.00	0.00	0.00	+

Set to Default Param Impact

Ready

- ◆ Reference Sites
- ◆ Evaluation Site



**ID
degraded
areas**

**ID Marine
Protected
Areas**

**Assess
compatibility
of field sites**

**Link to
specific
disturbance**

**ID range
and type of
impact**

**Bioassessment
tool for reefs**

**Establish
standards for
reef quality**

**Evaluate
reef health**

