Limahuli, Kauai

22^{o} 13.489' N 159^{o} 34.755' W

Management Status: Open Access

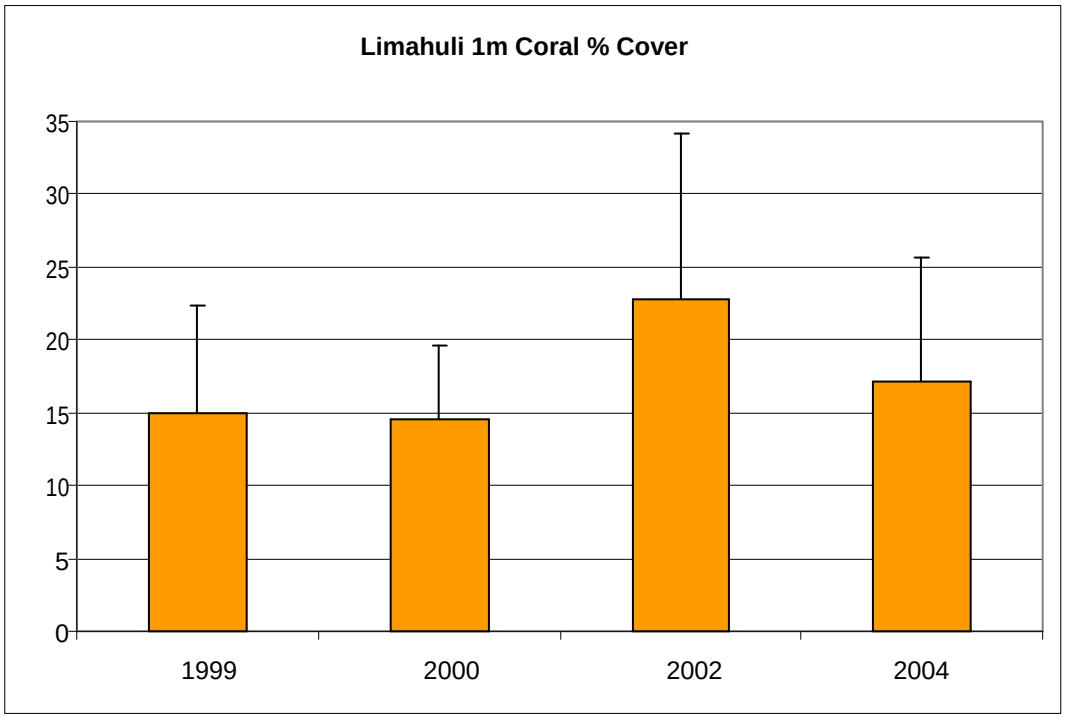
Area Description: Watershed national botanical garden and DLNR conservation land with some private holdings. One of few remaining intact ahupua'a systems. Limahuli stream drainage (pristine stream). Only a few private residences along shoreline. Limestone/basalt bolder shoreline with sand pockets. Shallow carbonate reef flat with low rugosity protected from north swell by well-developed reef crest. Deep reef high relief colonized basalt and boulder habitat with high standing fish stock. North exposed site. North Pacific Swell dominant forcing factor.

Benthic Habitat Data: 1 m

			Sediment Composition (% wt.)		Sediment Grain Size (% wt.)			
	Depth (m)	**Rugosity**	**LOI**	**H2CO3**	**Gravel**	**Coarse**	**Fine**	**Silt**
Mean	1	1.24	3.27	74.83	46.64	46.22	6.70	0.45
S.D.		0.04	0.17	0.54	10.07	10.20	0.77	0.05

Video Transect data (1 m):

% Cover:	**1999**		**2000**		**2002**		**2004**	
Species	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Cyphastrea ocellina	0	0	0	0	0	0	0	0
Fungia scutaria	0	0	0	0	0	0	0	0
Leptastrea purpurea	0	0	0	0	0	0	0	0
Montipora flabellata	2.2	1.5	2.0	1.4	3.2	1.8	1.9	1.4
Montipora patula	0.8	0.8	0.9	1.1	0.1	0.2	0.3	0.7
Montipora studeri	0	0	0	0	0	0	0	0
Montipora capitata	0.0	0.1	0	0	0.1	0.3	0.0	0.1
Pavona duerdeni	0	0	0	0	0	0	0.0	0.1
Pavona maldivensis	0	0	0	0	0	0	0	0
Pavona varians	0	0	0	0	0	0	0	0
Pocillopora damicornis	0	0	0	0	0	0	0	0
Pocillopora eydouxi	0	0	0	0	0	0	0	0
Pocillopora ligulata	0	0	0	0	0	0	0	0
Pocillopora meandrina	0.1	0.2	0.5	0.6	0.9	1.6	0.1	0.1
Porites brighami	0.7	1.0	1.1	0.6	1.4	1.5	0.1	0.1
Porites compressa	0	0	0.3	1.1	0.2	0.6	0	0
Porites evermanni	0	0	0	0	0	0	0	0
Porites lichen	0	0	0	0	0	0	0	0
Porites lobata	11.1	7.2	9.7	3.7	16.8	10.6	14.8	8.1
Porites rus	0	0	0	0	0	0	0	0
Psammocora nierstraszi	0	0	0	0	0	0	0	0
Unknown Coral	0	0	0	0	0	0	0	0
Total Coral	**14.9**	7.5	**14.5**	5.1	**22.8**	11.4	**17.2**	8.5
Species Richness:	**7**		**6**		**8**		**9**	



Photoquads not installed due to shallow depth below camera level

Photoquadrat Data (1 m): No data.

Findings : Initial coral cover rank is 36 among 60 reefs. Coral cover very similar between the 2 sampling periods. Low macroalgae coverage. High percentage of crustose coralline algae and turf algae. Low percentage of fine sediments with low content of terrigenous material in high wave energy environment. No rare or unusual species observed.

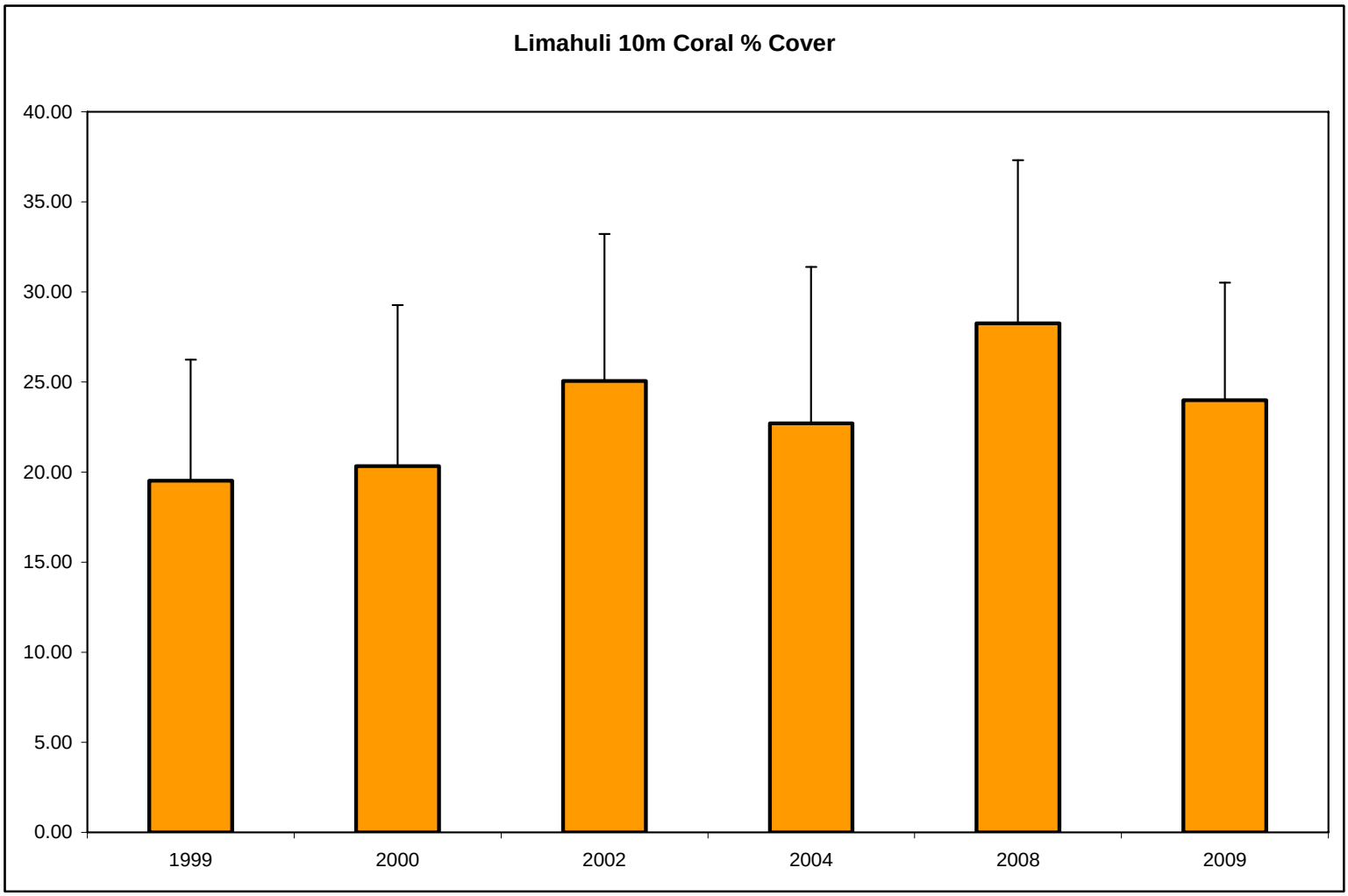
Limahuli, Kauai

Benthic Habitat Data: 10 m

			Sediment Composition (% wt.)		Sediment Grain Size (% wt.)			
	Depth (m)	Rugosity	LOI	H2CO3	Gravel	Coarse	Fine	Silt
Mean	10	1.60	3.28	72.63	11.12	74.94	13.15	0.78
S.D.		0.12	0.09	0.26	4.14	2.40	1.20	0.54

Video Transect data (10 m):

%Cover:	1999		2000		2002		2004		2008		2009	
Species	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Cyphastrea ocellina	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.1
Fungia scutaria	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Leptastrea purpurea	0	0	0	0	0.20	0.63	0	0	0.0	0.0	0.0	0.0
Leptoseris incrustans									0.0	0.0	0.0	0.0
Montipora capitata	0.1	0.1	0.5	0.8	0.1	0.1	0.2	0.2	0.0	0.0	0.0	0.0
Montipora flabellata	1.8	2.4	1.1	1.2	0.7	1.3	0.4	0.6	0.6	0.7	0.6	0.5
Montipora patula	14.5	7.4	17.5	8.8	22.2	8.4	20.6	9.1	1.5	1.2	1.3	1.0
Montipora studeri	0	0	0	0	0.2	0.7	0	0	25.0	6.2	21.3	6.1
Pavona duerdeni	0	0	0.0	0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.1
Pavona maldivensis	0	0	0	0	0	0	0	0	0.1	0.1	0.0	0.0
Pavona varians	0.0	0.1	0.2	0.3	0.0	0.1	0.3	0.5	0.0	0.0	0.0	0.0
Pocillopora damicornis	0	0	0	0	0	0	0	0	0.2	0.4	0.2	0.5
Pocillopora eydouxi	0	0	0.2	0.7	0.6	1.9	0	0	0.0	0.0	0.0	0.0
Pocillopora ligulata	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Pocillopora meandrina	0.6	0.7	0.6	0.8	0.6	0.9	0.9	0.9	0.0	0.0	0.0	0.0
Porites brighami	0.0	0.1	0.0	0.0	0	0	0	0	0.7	1.0	0.5	0.6
Porites compressa	0.1	0.3	0.0	0.1	0	0	0	0	0.0	0.0	0.0	0.0
Porites evermanni	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.1
Porites lichen	0	0	0	0	0	0	0.1	0.1	0.0	0.0	0.0	0.0
Porites lobata	2.4	6.3	0.1	0.3	0.3	0.6	0.3	0.5	0.0	0.0	0.0	0.0
Porites rus	0	0	0	0	0	0	0	0	0.3	0.6	0.3	0.6
Psammocora nierstraszi	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Psammocora stellata									0.0	0.0	0.0	0.0
Unknown Coral	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Total Coral	19.5	6.7	20.4	8.9	25.1	8.2	22.7	8.7	28.3		24.2	
Species Richness:	8		9		10		9		0.0	0.0	0.0	0.0


Limahuli 10m Coral % Cover
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
1999
2000
2002
2004
2008
2009

Photoquadrat Data (10 m): Photo analysis pending

Findings: Initial coral cover rank is 31 among 60 reefs. Coral cover very similar between the 2 sampling periods. Low macroalgae coverage. High percentage of crustose coralline algae and turf algae. Low percentage of fine sediments with low content of terrigenous material. High wave energy environment. No rare or unusual species observed.

Limahuli, Maui
Fish Data: 1m and 10m

	Density (#/125m²)				Biomass (g/125m²)			
	1 m		10 m		1 m		10 m	
Species:	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Acanthurus blochii			1.5	3			507.8	1015.5
Acanthurus dussumieri			1	1.2			288.4	398.8
Acanthurus leucopareius			34.5	16.4			11363	7054.4
Acanthurus nigrofuscus	2	2.8	11.5	13.3	70.5	96.7	409.4	520.1
Acanthurus olivaceus	0.5	1	10	5.2	78	156.1	1889.7	1184
Acanthurus triostegus	18.5	12.2	2.5	3.8	717.5	728.4	94.9	143.7
Anampses cuvier			1.5	1			74.6	85.1
Aulostomus chinensis			0.5	1			11	22
Bodianus bilunulatus	0.5	1	1	1.2	56.4	112.9	254.1	427
Calotomus carolinus			0.5	1			161.8	323.5
Cantherhines dumerilii			1	1.2			932.8	1285.2
Canthigaster amboinensis			2.5	2.5			60.6	61.1
Canthigaster jactator	1	2	6	4	9	18	34.7	23.1
Centropyge potteri			1.5	1.9			55.5	76
Cephalopholis argus			1	2			480.1	960.2
Chaetodon auriga			1	2			80.7	161.5
Chaetodon fremblii			0.5	1			22.5	45
Chaetodon multicinctus			3	2			102.2	70
Chaetodon quadrimaculatus	0.5	1			29.9	59.8		
Chaetodon unimaculatus			1	2			50.3	100.7
Chromis hanui			0.5	1			1	2
Chromis ovalis			8	16			230.7	461.5
Cirrhitus pinnulatus			0.5	1			55.4	110.9
Coris venusta	4	5.4			67.7	105.8		
Ctenochaetus strigosus			46.5	10.5			2826.6	833.7
Halichoeres ornatissimus	0.5	1	3	2	7.2	14.4	39.7	27.6
Kyphosus species			26	49.4			4929.6	9504.2
Labroides phthirophagus			4.5	1			6.8	2.4
Lutjanus kasmira			1	1.2			88.6	102.4
Melichthys niger			10.5	19.7			3766.1	6725.1
Monotaxis grandoculis			0.5	1			34.8	69.5
Mulloidichthys vanicolensis			5	7.6			112.8	145.4
Naso unicornis			1.5	1.9			838.1	1088.5
Paracirrhites arcatus			3	3.5			54.4	62.9
Paracirrhites forsteri			1	1.2			37.5	52.2
Parupeneus bifasciatus			0.5	1			372.9	745.9
Parupeneus cyclostomus			2	2.3			13.5	16.9
Parupeneus multifasciatus	0.5	1	11.5	7	0.9	1.7	392.8	301.5
Parupeneus pleurostigma			1	1.2			48.3	87.6
Plagiotremus goslinei			1	1.2			0.9	1.3

Limahuli, Maui
Fish Data: 1m and 10m

	Density (#/125m²)				Biomass (g/125m²)			
	1 m		10 m		1 m		10 m	
Species:	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Plectroglyphidodon imparipennis	1.5	1.9			3.4	4.8		
Plectroglyphidodon johnstonianus			0.5	1			7.5	15.1
Pseudocheilinus octotaenia			1	1.2			15.9	18.9
Rhinecanthus rectangulus	3	3.5			279.8	323.1		
Scarus rubroviolaceus			0.5	1			14.8	29.6
Stegastes fasciolatus	2.5	1.9	9	2.6	19.9	13.5	188.7	61.4
Stethojulis balteata	28	7.3	1.5	1.9	70.4	33.2	17.8	21.7
Sufflamen bursa			3.5	1.9			349.6	194.1
Thalassoma ballieui			2.5	1.9			153.1	148.7
Thalassoma duperrey	46	27.2	21.5	5.7	616.1	539	202	23
Thalassoma trilobatum	1	1.2			64.1	74.7		
Zanclus cornutus			1	2			137.8	275.7
Total/Depth Avg ± SD:	**110**	4.7	**250.5**	4.6	**2090.9**	152.1	**31812.2**	746.5
Species Richness	**15**		**47**					
Species Diversity	**1.47**		**2.63**					

Findings: Among 60 reefs, Limahuli 1m ranked 58 in species richness, 51 in density, 57 in biomass, and 57 in diversity. Limahuli 10m ranked 5 in species richness, 24 in density, 8 in biomass, and 21 in diversity. The most abundant species were the Saddle wrasse (*Talassoma duperrey*) and the Goldring surgeonfish (*Ctenochaetus strigosus*) at the 3m and 10m reefs respectively. The species with the highest biomass were the Convict tang (*Acanthurus triostegus*) and the Whitebar surgeonfish (*Acanthurus leucopareius*) at the 3m and 10m reefs respectively. No rare or unusual species observed.