

## **Linking Ecological and Socioeconomic Monitoring Results, 1995-96 to 2000-01**

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### ***Goals***

Our goals were to monitor and assess perceptions of recreational/tourist users as they relate to the market and nonmarket economic values of Sanctuary resources. Here, specifically, we test whether user perceptions of resource conditions are in agreement with what marine scientists are observing in actual conditions.

### ***Methods***

We chose to focus on four main attributes measured by FKNMS monitoring projects, with which we could integrate socioeconomic data from the 1995-96 study (Leeworthy and Wiley 1996) and the 2000-01 reef study (Johns et al. 2003a, b). These attributes were: 1) diversity of fish and other sea life, 2) abundance of fish, 3) amount of living coral on the reef, and 4) water clarity. We compared ecological monitoring results and socioeconomic results to investigate how these measurements contrasted with human perceptions of the performance of Sanctuary Preservation Areas (SPAs) and Ecological Reserves (ERs) within the FKNMS.

Comparisons were made between socioeconomic and ecological monitoring from two perspectives. First, trends across the entire FKNMS were evaluated. For the socioeconomic measures we looked at the differences in mean satisfaction scores between 1995-96 and 2000-01. This was done for all boating visitors and residents and for more-experienced versus less-experienced visitor and resident boaters (more-experienced users were those with five or more years of boating experience). The socioeconomic and ecological measures are described in the full report (Leeworthy et al. 2004) and the ecological measures can be found in greater detail in NOAA et al. (2003). Second, SPAs and ERs were compared to reference areas. For socioeconomic measures, mean satisfaction ratings of SPA and ER users were compared with non-SPA and non-ER users.

Two-sample t-tests were used to test for differences in mean satisfaction scores using the 0.05 level of significance as a cut-off for determining significance (95% confidence level).

### ***Key Findings***

#### *Overall FKNMS 1995-96 to 2000-01*

##### Water Clarity

Socioeconomic and ecological monitoring was in agreement for visitors, i.e., there has been no change in water clarity. However, residents perceived that water clarity has declined, and this was more prevalent among more-experienced residents. This may indicate a need for education and outreach, if residents are misperceiving actual water clarity conditions.

##### Diversity

There was disagreement between socioeconomic and ecological monitoring results regarding diversity of marine life. Users perceived a decline, while research results indicated that actual conditions are improving. There would appear to be a need for education and outreach to correct

these misperceptions. Perhaps ratings on diversity were influenced by the status of the amount of living coral on reefs (see below).

Abundance

For this parameter users perceived significant declines, while ecological monitoring produced mixed results. There may be needs to both make greater investments in protecting and restoring resources and in education and outreach efforts.

Amount of Living Coral on Reefs

For living coral, socioeconomic and ecological monitoring was in agreement. Marine scientists observed significant declines in stony coral cover and increases in diseases, and users perceived the decline. There is a clear need to identify the sources and solutions to the problems. Given the higher use and economic value of natural versus artificial reefs in the FKNMS (see Johns et al. 2003), there is economic justification to make investments to solve these problems before they translate into economic losses.

**Table 1: Reef User Perceptions vs. Ecological Observations: Overall FKNMS**

<b>Socioeconomics (Satisfaction Scores)</b>		<b>Ecological</b>	
	Trends (95-96 vs. 00-01) <sup>1</sup>	Experienced vs. Less Experienced <sup>2</sup>	
<b>Diversity</b>			
Visitors	Significant Decline	Significantly Lower	Increase
Residents	Significant Decline	Lower – Not Significant	
<b>Abundance</b>			
Visitors	Significant Decline	Significantly Lower	Targeted species (+)
Residents	Significant Decline	Lower – Not Significant	Non-targeted species (+/-) Spiny Lobsters (-)
<b>Amount of Living Coral</b>			
Visitors	Significant Decline	Significantly Lower	37% Decline in stony coral cover
Residents	Significant Decline	Lower – Not Significant	Increase in disease infections
<b>Water Clarity</b>			
Visitors	Lower – Not Significant	Lower – Not Significant	No trend
Residents	Significantly Lower	Significantly Lower	

1. Trends are based on comparison of mean scores for 1995-96 samples of visitors and residents versus 2000-01 samples of visitors and residents. T-test for differences in means with significance cut-off at 0.05 or 95 percent confidence level

2. Experienced users are those with five or more years of experience in FKNMS. Statistical test is a T-test on mean satisfaction scores of experienced vs. less experienced samples of users from the 2000-01 survey. Significance cut-off is at 0.05 or 95 percent confidence level.

**SPAs and ERs vs. Open (Reference) Areas**

Water Clarity

*Users did not perceive any changes in water clarity between SPAs and ERs and associated reference areas. This was consistent with ecological monitoring, which indicated that there would be no expected differences based on actual measurements.*

Diversity

Overall, there was general agreement between socioeconomic and ecological monitoring. SPAs and ERs have increased in diversity relative to reference areas and visitors perceived the difference, while residents did not perceive the change.

Abundance

Both socioeconomic and ecological monitoring had mixed results regarding abundance. Overall, however, both socioeconomic and ecological monitoring supported the notion that SPAs and ERs provided benefits from improved quality of fully protected sites.

Amount of Living Coral on Reefs

There was only a small difference between the results of socioeconomic monitoring and ecological monitoring when comparing amount of living coral on reefs in SPAs and ERs versus reference areas. Visitors that used SPAs and ERs had slightly higher mean satisfaction scores than non-users, whereas there was no difference between resident reef users and non-users.

**Table 2.** Reef User Perceptions vs. Ecological Observations: Comparison of SPAs & ERs to Open (Reference) Areas

	<b>Socioeconomics (Satisfaction Scores)</b> 2000-01 Comparison: SPA & ER Users vs. Non-SPA & ER Users <sup>1</sup>	<b>Ecological</b>
<b><i>Diversity</i></b>		
Visitors	Significantly Higher	Higher for SPAs and ERs
Residents	Lower – Not Significant	
<b><i>Abundance</i></b>		
Visitors	Significantly Higher	Mixed Results
Residents	Lower – Not Significant	(see write-up)
<b><i>Amount of Living Coral</i></b>		
Visitors	Significantly Higher	No difference
Residents	Lower – Not Significant	
<b><i>Water Clarity</i></b>		
Visitors	Higher – Not Significant	No difference
Residents	No Difference	

1. Comparison of mean scores using T-test. Significance cut-off level is 0.05 or the 95 percent confidence level.

For the two items for which managers had expectations for improvement (e.g., diversity and abundance), SPAs and ERs appeared to be generating expected benefits. Visitors seemed more apt to perceive these benefits than residents.

## References

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