

## Summary of Mini-Symposium 4-2

### *Diagnostic Monitoring and Assessment of Coral Reefs: Studies from Around the World*

The aim of mini-symposium 4-2 was to report and continue progress on developing a new paradigm for coral reef monitoring and assessment, with early warning and diagnostic capabilities using stressor, exposure and response indicators (Table 1) called,

#### ***Diagnostic Monitoring and Assessment***

Jameson et al. 1998, 2001, subm;  
[www.epa.gov/owow/oceans/coral](http://www.epa.gov/owow/oceans/coral).

Mini-symposium 4-2 stressed the importance of *Diagnostic Monitoring and Assessment* in evaluating the condition of coral reefs as a result of human stressors and in answering the critical management questions of;

“What is happening?; Why is it happening?;  
How long will it continue?;  
and Will it spread?”

The mini-symposium oral presentations and posters focused on establishing a *Framework for Diagnostic Monitoring and Assessment* (Table 1), the development of coral reef indexes of biotic integrity and biocriteria, dose-response metrics, studies on bioindicators, development of biological response signatures, and other important *Diagnostic Monitoring and Assessment* tools such as; cellular, genetic and nitrogen/carbon isotope techniques. The mini-symposium also stressed the importance of classifying coral reefs for diagnostic monitoring and assessment and establishing minimally impaired reference conditions.

Special focus this year was given to the latest advances in coral reef cellular and genetic assays (Exposure Indicators - Table 1). These assays not only have the diagnostic power to determine specifically *what* is causing the change in coral reef systems but can also provide vital insight into *how* the stressor is operating within the metabolism of the target organism. We discussed the specific diagnostic role of cellular and genetic assays in *Diagnostic Monitoring and Assessment*. We showed what cellular assays work now for coral reefs, discussed research pitfalls to avoid and outlined promising areas for future research for coral reef *Diagnostic Monitoring and Assessment*.

Armed with the new tools from the mini-symposium papers, managers can be more effective in fighting for the regulatory and political change necessary for effective coral reef conservation.

## References

- Jameson SC, Erdmann MV, Gibson Jr GR, Potts KW (1998) Development of biological criteria for coral reef ecosystem assessment. *Atoll Res Bull*, September 1998, No. 450, Smithsonian Institution, Washington, DC, 102 pp,  
<http://www.epa.gov/owow/oceans/coral>
- Jameson SC, Erdmann MV, Karr JR, Potts KW (2001) Charting a course toward diag-

nostic monitoring: A continuing review of coral reef attributes and a research strategy for creating coral reef indexes of biotic integrity. Bull Mar Sci 69(2):701-744, <http://www.epa.gov/owow/oceans/coral>

Jameson SC, Karr JR, Potts KW (subm) Diagnostic monitoring and assessment of coral reefs. Coral Reefs

**Table 1.** Coral reef *Diagnostic Monitoring and Assessment Framework* showing the appropriate roles for indicators. All indicators can be used to manage and measure environmental progress, but only biological **Response Indicators** focus on end outcomes (modified from USEPA 1995, Yoder and Rankin 1998, Karr and Yoder 2004).

| Management and monitoring sequence   | Indicators  | Appropriate role   |
|--|---|--|
| 1. Management actions  | <b>Administrative</b><br>(i.e., permits, enforcement, plans, grants)  | Measures the results of administrative actions to improve water quality.   |
| 2. Response to management  |   |  |
| 3. Stressor abatement  | <b>Stressor</b><br>(i.e, changes in land use practices, pollutant discharges, effluent reduction, spills and releases, fish kills, habitat modifications) | Measures changes in human activity outputs that have the potential to degrade the marine environment.  |
| 4. Ambient conditions  |   |  |
| 5. Exposure to effects of pollution  |   |  |
| 6. Biological response.<br>↓<br><b>Endpoint:</b><br><b>“ecological health”</b><br><b>or</b><br><b>biological condition</b> | <b>Response</b><br>(i.e., Indexes of Biological Integrity (Jameson et al 1998, 2001, subm) and other biological dose-response metrics)                    | Measures the cumulative effects of stress and exposure and include the more direct measures of community and population response. They are assemblage based i.e., counts of whole individuals and species on the reef and represent the condition of the “system”. |