

**Responses to Charge Questions: EPA Coral Biocriteria
Florida Dept. Environmental Protection
6-7-10**

- 1) *Does the report accurately convey the potential of the Clean Water Act (CWA) to protect coral reefs?*

Yes, the report is very well written and accurately discusses the important CWA provisions, including how biological integrity may be used as an environmental protection endpoint in the water quality standards process. For example, a statement in the document "...the process of developing biocriteria, summarized in this manual, is a legally defensible means to translate scientific understanding into legal and regulatory authority", summarized a great strength of this manual. The applicability of Biocriteria to other federal programs described in Chapter 9 was also very relevant.

However, when discussing biological integrity at the beginning of the document, the Biological Condition Gradient (BCG) should have been initially introduced to better describe the concept. In Chapter 6, the report should have provided guidance on how to quantify a minimum level on the BCG that relates to the biological integrity goals described in the CWA (*i.e.*, Category 2 and higher for the ultimate goal, and Category 4 as a minimum for the interim goal). On page 1-15, there is a statement that should be revised as it misinterprets the CWA, which does not actually say that underlying premise of biological integrity is "natural conditions." Rather, the CWA mandates that the designated use (typically viewed as a healthy, well balanced community) be achieved. The consensus opinion of over 42 experts participating in two separate BCG calibration exercises in Florida was that a departure from the natural condition was acceptable as long as ecosystem functions and some reproducing populations of sensitive taxa were maintained (which is a BCG of 4 or higher).

- 2) *Does the report provide a useful framework for coral reef managers to develop biocriteria?*

Yes, I was particularly impressed with how the authors linked ecosystem services and biological integrity protection under the CWA, as I found that to be a compelling argument to coral reef managers. Additionally, benefits of Biocriteria, such as implementing restoration action if a resource fails to meet objective criteria for designated use attainment, were clearly stated and in direct contrast with the status quo of most coral monitoring programs (assessing improvement or decline in a more general manner). This benefit was well articulated and should resonate with resource managers.

- 3) *Are the steps necessary for biocriteria development clearly explained and logical?*

Yes, this was accomplished quite eloquently, and I completely agree with the overall steps, approach, and framework presented. However, I think the document should acknowledge an important component of coral Biocriteria, which has not yet been successful in Florida and may be a general constraint for other states as well. This involved our present inability to establish a Human Disturbance Gradient (HDG) for coral communities related to land-based sources of pollution. Although discussion of overarching stressors that may interfere with HDG development, such as the effects of global climate change (more high temperature events), subsequent bleaching events and

coral disease susceptibility (from *Vibrios*, etc.) was provided in Chapter 8, there was no resolution concerning establishment of a practical HDG. Without an acceptable, objective HDG, coral metric selection may be viewed as arbitrary and not scientifically defensible. In my opinion, proper HDG development and metric selection, as well as BCG validation of the final index are the critical components for moving forward with coral Biocriteria in Florida.

Another small shortcoming of the document was insufficient attention to Quality Assurance when developing Biocriteria. If a procedure is perceived to be too variable or unreliable due to lack of quantifying the precision and accuracy of the method, stakeholders will actively oppose it. The document should describe the importance of Standard Operating Procedure development, intra- and extra-mural method variability studies, sampler auditing and proficiency evaluation, and proper data base management when developing Biocriteria.

4) *Is the presentation, including tables and graphs, clear, relevant and concise?*
Yes, the figures and tables articulated the key concepts in a succinct manner.

5) *Has the appropriate literature been cited?*

In general yes, but there were some broad statements, such as the following, that were not well supported by citations: “First and foremost, coral reef ecosystems are declining, threatened by a variety of human activities including polluted runoff from agriculture and land-use practices, over-fishing, ship groundings, coastal development and climate change, as well as with natural stressors such as tropical storms, bleaching and disease that may also be increasing due to human actions”. There were a few expansive statements similar to the one quoted that do not appear to be fully supported by results presented in the document or by citations of other scientific literature. For example, no information to definitively demonstrate that “polluted runoff from agriculture and land use practices” was described in the Chapter 4 discussion of quantifying a human disturbance gradient. The examples shown only referred to ship channels and harbors as sources of human disturbance, not the many factors broadly stated in the above quote.

6) *Are there publically available, peer-reviewed papers that have not been included, but that should be?*

I did not notice and obvious omissions, but my recommendation would be for the authors to visit the DEP Southeast Florida Coral Reef Initiative website:

<http://www.dep.state.fl.us/coastal/programs/coral/reports/> and scan the resources for potential additional citations.

Overall, this document is an excellent primer on the CWA and Biocriteria development, and presents convincing information to persuade coral reef managers to assist in pursuing coral reef Biocriteria through the existing water quality standards process.