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MEMORANDUM

DATE: September 22, 2010
TO: Habitat Committee
FROM: Michelle Bachman, Habitat PDT
SUBJECT: Incorporating additional substrate data into the SASI model

The spatial results from the SASI model are strongly influenced by substrate data. The substrate data layer (unstructured grid) that underlies the SASI model is derived from two datasets, SMAST video survey and usSEABED, with the latter database comprised of samples from various sources. These datasets and their associated strengths and limitations are discussed at length in Part 2 of the SASI model document. Habitats characterized by dominant substrate (from the above datasets) and energy regime (from shear stress modeling outputs and depth) form the foundation of the vulnerability assessment. The structural features (geological and biological) were inferred to these different substrate-based habitats, and as such the SASI model spatial assessment of habitat vulnerability is highly substrate dependant. The distribution and quality of the substrate information directly impacts the PDT's assessment of high adverse impact clusters in the LISA spatial analysis. These clusters form the basis for the PDT's spatial adverse effect minimization recommendations to the Committee.

The SSC reviewed the substrate data inputs to the SASI model in March 2009. They questioned the use of trawl survey hangs as a proxy for boulder habitat (these were later removed) and also encouraged the PDT to consider alternate methods for aggregating individual data points (aggregation of individual data points was subsequently eliminated). An update to the substrate grid occurred during November 2009 with the addition of the 2009 SMAST video survey data, including new station locations in selected portions of the Gulf of Maine. Model coding, including updates to the vulnerability assessment parameters (susceptibility and recovery), were revised through late May 2010 (although most updates were completed by March), and the current set of Z_∞ outputs which were used in the LISA spatial analysis were produced in early June. Work to characterize data uncertainty throughout the model domain and within the LISA clusters in particular is ongoing. In addition, the June 2010 Z_∞ outputs form the basis for the ongoing practicability (Z Net Stock) analyses.

The PDT has spent time at a number of meetings over the past 2+ years deliberating what types of substrate data to use in the base grid, including the mechanism for integrating acoustic multibeam data with the existing samples. Among other considerations, data integration requires that:

- The data are or result from direct seabed observations
- The data are in x/y (latitude/longitude) point format
- The methods of data collection be well specified and preferably published
- The data be commensurate with the Wentworth sediment classification scheme, and amenable to dominant sediment type characterization
- That any data derived from remote sensing (i.e. acoustic) samples be ground-truthed using direct seabed sampling methods following published methodologies

Recent PDT discussions have been focused on the possibilities of short-term integration of additional data (i.e. before completion of the Omnibus Amendment) as well as long-term considerations related to regular updates of the SASI model. One long term goal is to develop a straightforward and transparent mechanism for incorporation of acoustic multibeam data, as this approach to habitat mapping is being used increasingly throughout the region. During recent PDT discussions, the integration of various multibeam datasets has generally been discussed in a long-term (i.e. post Omnibus) context. A primary reason for this is that during early development of the model, despite outreach to various researchers, no multibeam datasets could be identified that meet the data integration criteria specified above.

At its September 16, 2010 meeting, the PDT recognized three possible options for moving forward with analysis of the SASI model outputs and alternatives development. **The team is seeking guidance from the Habitat Committee as to which course of action is most appropriate at this time, before investing additional resources in the analysis of current model outputs.** Costs and benefits of each approach, while uncertain, are characterized as accurately as possible below. Note that whichever approach is selected, the PDT will continue to discuss its concerns about the underlying substrate data (as well as other model inputs and assumptions) and will continue to evaluate the likely impacts on model outputs. **The PDT is of the opinion that all three options meet the National Standard 2 guidance for incorporating best science available into management decisions.**

1. **Continue with analysis and alternatives development using existing model outputs (Z_{∞}, and resulting LISA clusters and Z_{net} values) that are based on the substrate data sources already incorporated in the model.**

   Advantages: Fastest way to move forward: in the short term, analysts can focus on characterizing clusters and evaluating Z_{net} values, rather than updating the grid, rerunning the model, and rerunning the secondary analyses (LISA and Z_{net}). PDT can draft specific adverse impact minimization alternatives beginning at its next meeting for Committee review in October/early November.

   Disadvantages: Criticisms that base grid does not accurately characterize true substrate distributions will continue, likely slowing the process of alternatives development and possibly negating any time saved by proceeding with existing model inputs and outputs.

   Important considerations: The PDT has been very open throughout the development of the SASI model in terms of incorporating stakeholder and PDT member input and discussing the limitations of the available substrate data and the likely impact on model output. The SSC reviewed the two substrate data sources being used at their March 2009 and December 2009 meetings and did not find the base grid to be limited or inadequate, other than expressing the concerns outlined earlier in this memo. Throughout late 2008, 2009, and into 2010, interested parties had ample opportunity at public meetings to discuss the data sources used in the model. Recent stakeholder concerns about the need to incorporate additional data sources only surfaced after preliminary model results were produced, despite maps of the base grid being available to the public throughout 2009.

2. **Incorporate two additional known data sources, recreate the base grid, rerun the model, and redo the secondary analyses (LISA and Z_{net}).** The data sources that would be incorporated are: (1) 2005 USGS polygons showing the distribution of large and small boulder ridges and bedrock outcrops in the vicinity of SBNMS (see http://woodshole.er.usgs.gov/pubs/sim2840/INDEX.HTML), and (2) 2010 SMAST video survey data for the MAB, GB, and GOM.

Advantages: This approach would hopefully serve to mitigate the concerns of vocal stakeholders via incorporation of the USGS boulder reef dataset into the base grid (note that additional multibeam data available for that same area was reviewed by the PDT in July and will not be incorporated, primarily due to lack of ground-truthing). Additional SMAST samples would be added because they are available and would represent little additional work to incorporate if the grid is already being updated.

Disadvantages: There would likely be a delay of at least 6-8 weeks with this approach (possibly longer depending on other PDT member time commitments), beyond the time required under option 1. This time is necessary to determine the exact methods for incorporation of the boulder ridge polygons, recalculate the base grid polygons, re-run the SASI model, re-map the outputs, re-run the LISA analyses, and re-run the Z_{net} model. Documents such as the SASI gazetteer and spatial analysis methods and results would need to be updated as well.

Important considerations: It is not known without completing the work outlined above how the model outputs and in particular the LISA clusters might change following this analysis. However, the current LISA clusters represent an extreme tail of the distribution of $Z\infty$ values, so it is unlikely that the current high Z_∞ cluster areas would change much in the updated analysis. For the generic otter trawl gear type, these clusters are strongly correlated with gravel substrate. Adding new data will only result in new high Z_∞ clusters if they change the amount of gravel substrate in an area. Running detailed sensitivity tests on the impacts of substrate changes to the SASI spatial analysis is as time consuming as updating the substrate grid and re-running the model.

3. **Incorporate two additional known data sources (described above), and solicit additional appropriate data sources publicly. The PDT envisions that this would involve publishing a Federal Register notice and allowing a public comment period of 45 days. Following the comment period, the datasets would need to be assessed for compliance with data integration guidelines specified by the team in the notice, and processed as necessary if determined to be appropriate. Then, the team would recreate the base grid, rerun the model, and redo the secondary analyses (LISA and Z_{net}).**

Advantages: This approach would publicly provide clear criteria for datasets to be integrated in the model, and would state a firm deadline for their submission in order to be considered in the Omnibus Amendment process. Hopefully, this would help to buffer the alternatives development process against these types of concerns. The benefits of option 2 would also be realized under this scenario.

Disadvantages: There would likely be a delay of 75-90 days with this approach (possibly longer depending on other PDT member time commitments) beyond the time required under option 1, depending on whether and how many additional datasets were submitted for consideration.

Important considerations: See #2 above.