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Habitat PDT Meeting Summary

November 3-4, 2008
Gloucester, MA

The PDT met on Monday, November 3 and Tuesday, November 4, 2008 in Gloucester, MA to continue work on the Vulnerability Analysis portion of Phase 2 of the Omnibus Habitat Amendment.

Intro

The PDT reviewed the Phase II timeline and the Chair announced a new addition to the Team; the Council has hired Michelle Bachman to assist the Chair in supporting the Council's Habitat Committee.

Vulnerability assessment

Endpoints

In discussing the Phase 2 vulnerability assessment (VA), the Chair presented a document (document 3) that discussed potential changes to the assessment endpoints and a general approach to relating the VA to subsequent mapping and modeling efforts.

Table 1 – Original and amended assessment endpoints

	Original assessment endpoints	Ammended assessment endpoints
1	Geological structure	Physical habitats
2	Biological structure	Biological habitats
3	Prey species	Prey species
4	Deep sea corals	Deep sea corals

The Team discussed specifically the change from "structure" to "habitats." The rationale for the change was that there may be components of a species' essential habitat that are not distinctly structure-related. Likewise, fishing gears may have effects on habitat components beyond modifying or eliminating structure (e.g. Re-suspension of sediments, changes in chemical composition). The Team determined that the word "habitats" did not work well because it implied a compartmentalization of distinct habitats, when in fact the habitat is a combination of physical/abiotic and biological/biotic components.

One way to make these endpoint conceptually clear could be to refer to them not as assessment endpoints but rather habitat components. They could then be grouped as:

- Geological, or Abiotic
- Biological, or Biotic
- Prey
- Deep Sea Corals

No consensus or decision on this was reached at the meeting, but the Team should decide soon on the final wording for these.

Document 3 noted also that there is an important difference between providing the public and decision makers with a product that analyzes the potential susceptibility to adverse effects from fishing for a habitat component, or the realized adverse effects from fishing for that habitat component. In discussion, the Team indicated that the product would be most useful if it could address both of these aspects.

Literature database

The Team then discussed the Chair's conception of a literature database. A Microsoft Access database containing 412 individual references was presented. These references make up the backbone of the analysis, and through the data quality metric Team member David Dow had presented there appeared to be a need to hard-code references to individual decisions made when filling out individual matrix cell values. To accomplish this, the references may be reviewed and categorized according to the various components of the matrices (i.e. substrate, energy, depth) and the desired endpoints (i.e. Abiotic, Biotic, Prey, DSC). This would not be an insubstantial undertaking, but it was noted by several Team members that such an endeavor would have enduring benefits, as the database could be added to and utilized for updating similar assessments in the future. A Team member noted that many of the references in the database are either inapplicable or redundant, and that an initial culling could significantly reduce the number of references for which metadata may be included. This project seemed reasonable, and the database will be further developed by the PDT as the first step in populating the matrices.

Matrices

The Team next took up the matrices themselves. The Chair presented Document 5, which made the case for the following issues with the current matrix structure:

1. <u>They are potentially confusing to the readers because they are not quite fungible</u>. That is, the habitat component being evaluated is sometimes a characterization (like topography/rugocity/patchiness in the –former- geo structure matrix) and sometimes a species (like, well, the other three – prey, bio and DSC).

2. They are too detailed. There is very little chance that the literature review, no matter how rigorous, will be able to tell us anything about the potential adverse effects of fishing resulting from a combination of flatfish otter trawl gear, sandy bottom with high energy/shallow water on encrusting bryozoans. Further, the odds of differentiating, based on literature, such effects between flatfish otter trawl and roundfish otter trawl gears are approaching zero. The same could be said about sand/low energy or any other slight change in parameter combinations.
3. They do not focus enough on MSA/EFH mandates. We need to include reference to the habitat function served, the type of impact from the gear, and the level of adversity. These are the key to the MSA/EFH rules, and we should keep it similarly simple.
4. They should address the same underlying issues. Specifically, if relative abundance and relative importance are critical to the public and Council's consideration of prey species, then shouldn't they be similarly important to their consideration of physical habitats? Likewise, if we are to break down components of susceptibility and recovery in one matrix, is there a good reason for not doing likewise in the others?

There was agreement that the points were valid, but not all of the entire Chair's offered remedies were considered improvements. For example, the following figures show prior and proposed matrices for the geological/abiotic habitat component:

Table 2 – prior Geological Structure sample matrix

Gear type, Substrate, Energy/depth					
	Susceptibility	Recovery	Data Quality		
			Relevance	Methodology	*N*
Topography/relief	1	1			
Rugocity	2	2			
Patchiness	3	1			
Bio-excavation	1	3			

Table 3 – proposed geological/abiotic component sample matrix

Gear type / Energy										
	Gear effect						Adversity of impact			
	Habitat function served	Fishing gear impact type	Susceptibilty		Recovery		Reduction in quality or quantity of habitat functions?	More than minimal effect?	Effect more than temporary?	Adversity score
Habitat type			Single pass	Chronic disturbance	Single pass	Chronic disturbance				
Mud										
Sand										
Peble										
Cobble										
Boulder										

	Data Quality						
	Relevance		Methods				
Habitat type	Mean	StDev	Mean	StDev	*n*	Rel. abundance	Rel. importance
Mud							
Sand							
Peble							
Cobble							
Boulder							

Given that items like topography, rugocity, and patchiness refer to descriptions of features, unlike similar matrices considered for the biological/biotic and prey species components which use actual habitat features (species), the former version seemed to be inconsistent. However, several team members noted that the generic conception of substrate classes as habitat is not accurate—habitats are formed by multiple substrates and combinations of other biotic and prey components. The Team determined that getting away from substrate-based classifications of geological habitat components would probably not be possible given that the literature available is almost always substrate (and not feature) based, and that existing data for mapping is primarily focused on substrates. The Team decided that additional combinations of substrate may be needed to adequately categorize the geologic or abiotic component of fish habitat. Further investigation here is needed, and the no decisions were made.

The Team next took up the Prey Species matrix. The Chair offered that perhaps disaggregating impacts by substrate was not necessary, but several members made the point that the impacts of various fishing gears are not indifferent to the substrates that contain the various prey species. So substrate remains as a separate analysis category.

Regarding the individual components of susceptibility in the matrix, it was noted that the word morphology was not properly used—it refers to shape and not hardness.

Further, speed and size are independent and should not be incorporated into one component.

The Team clarified the difference between susceptibility and vulnerability, and this is an important distinction. Susceptibility essentially implies that the event (gear disturbance) is capable of producing the impact (adverse effect). Vulnerability implies the actualization of that impact/event. An area may be susceptible to a particular gear effect, but if the gear is not permitted, or the area is otherwise inaccessible, than the area is not vulnerable to the impact.

One PDT member brought up the point that vulnerability should be related to critical values. That is, if two generic units of gear impact result in a change to 5% of an unlimited quantity of habitat, that habitat is not adversely affected. But if those two generic units of gear impact result in a change of 50% of a highly limited quantity of habitat, that is much more likely to be viewed as an adverse effect. The Team determined that it would continue to develop metrics for all habitat components that would enable us to be as explicit as possible about these critical values. However, the fate of Relative Importance and Relative Abundance condition factors remains undecided. The Team agreed to not include them explicitly in the Prey Species matrix, but rather incorporate the work already done on the back end of the analysis, such that the intent of the condition factors is not lost. The actual mechanics of this remain unclear.

A lengthy discussion on individual vs. population-level recovery led to an even more lengthy discussion on the focus of the impact analysis itself. Specifically, are the impacts we're evaluating felt at the individual organism level, or the population level? This question is critical to assessing both susceptibility and recovery. Fortunately, the EFH Final Rule is clear that the prey habitat component should be assessed at the population level. One team member put forth a non-parliamentary motion to not assess impacts to prey species at the population level in the matrices, but rather infer any adverse effects to prey species using the same method the Team will employ for linking vulnerability to individual managed species. Specifically, use the EFH source documents to infer connections to specific habitat components that are analyzed in the vulnerability assessment.

This idea was neither agreed to nor dismissed. Generally, the Team felt that the prey species impacts could be analyzed within the VA concept (the matrices) but that there was some discomfort with assessing these impacts at the population level, where a lack of data and adequate studies in the literature may lead to an inconclusive result.

Throughout the matrix development process, the Team has discussed the importance of natural disturbance as it impacts the short and long-term effects of gear disturbance. We have been interchangeably using depth and energy as proxies for natural disturbance, both of which are commonly employed in the literature. The Team discussed these in some detail, and decided that for the purposes of the VA depth and energy were independent of each other, and the matrices should disaggregate impacts on both.

Gear types

The Team discussed gear types from the perspective of both quantifying impacts and using the literature to inform the matrices, and reached the following refined gear list:

Table 4 – Revised gear list for vulnerability assessment

Otter trawl	Shrimp, groundfish and scallop
	Monkfish
	Squid
	Raised footrope
	Pelagic
Dredge	New Bedford-style scallop
	Surf clam/ocean quahog
Trap	Lobster
	Deep sea red crab
Longline	
Gillnet	

SASI model

The Team then shifted focus to the Swept Area Seabed Impact model, and it's correlation with the VA. The SASI model is summarized below:

Figure 1 – SASI model, as described in PDT document 7

$$SASI\ (m^2) = d_t[(2.w_o.c_o.s_o)+(2.w_c.c_c.s_c)+(w_s.c_s.s_s)$$

where;

d_t	=	distance towed in one tow (m)
w_o	=	effective width of otter board (m)
	=	otter board length (m).sin (angle of attack, α_o)
α_o	=	30^o to 50^o
c_o	=	contact index, otter board
s_o	=	sensitivity index, otter board
w_c	=	effective width of ground cables (m)
	=	ground cable length (m).sin (angle of attack, α_c)
α_c	=	10^o to 20^o
c_c	=	contact index, ground cables
s_c	=	sensitivity index, ground cables
w_s	=	effective width of sweep (m)
c_o	=	contact index, sweep
s_o	=	sensitivity index, sweep

At issue is the connection between this model and the gear impacts and adverse effects being summarized in the VA. The Team discussed the fact that the model disaggregates by gear component (i.e. doors, cables, sweep for trawl gear) while the VA aggregates these impacts across the major gear types. The link between the model and the VA would most logically be through the S_o (sensitivity index) parameter. The Team discussed sensitivity as an additive function of the susceptibility metric and recovery metric as determined in the VA matrices. Because these impacts (and their susceptibility and recovery indices) are aggregated in the matrix for each gear type, the Team discussed using the Impact Type descriptor to condition S_o values, such that a gear component receives a composite S_o value based on the Impact Types it shares with the gears evaluated in the matrices (see Table 5).

Mathematically, the sensitivity index could be represented as:

$$S^{\circ}(x)_{S,E,D} = \Sigma(U - R)_{\theta} \mid x : X \text{ and } X : Y$$

Where:

- x is a given gear component (e.g. otter trawl doors)
- X is a gear type category (e.g. squid trawl)
- S, E and D represent the VA delineations for substrate, energy and depth
- U equals the susceptibility index from the VA matrices and R equals the recovery index
- θ represents the set of habitat component features (e.g. for geological habitat components the set would consist of *mud, sand, gravel, cobble* and *boulder*) *(Note: θ here implies that the susceptibility*

and recovery values are summed across all habitat component features for a given combination of gear, substrate, energy and depth)

- Y represents the list of Impact Types for a given gear component

It should be noted that this functional relationship between the susceptibility index and the recovery index is only possible if they are calculated based on similar scales (e.g. 0-3) and that the values on both sides of the relationship are roughly commensurate.

NOTE: A problem with this approach may be that it effectively renders the Critical Sheer Stress (CSS) model and the SASI model independent. This may be appropriate, given that the both susceptibility and recovery are determined in the VA matrices…but it then the ultimate utility of the CSS model is in some doubt. Another approach may be to eliminate the recovery index from the S_o *relationship described above such that sensitivity = susceptibility, and instead create a condition factor--based on the CSS data--that is exogenous to SASI. This will require further consideration.*

Table 5 – Impact Type descriptors, applied to gears in the VA matrices and gear components in the SASI model

Description	*Shorthand*
Crushing	cru
Slicing	sli
Ploughing	plo
Scraping	scr
Creasing	cre
Suspending	sus
Burying	bur
Compressing	com
Breaking	bre
Fluidization	flu

These Impact Types obviously apply across gear components for all gear types, not just otter trawls. A separate but conceptually similar SASI model will be created for each gear type used in the VA.

After a long two days, the meeting adjourned at 1:55PM, November 4, 2008.