#3

Habitat PDT Meeting

July 24-25, 2008
Portland, ME

Summary written by: Sarah Pautzke

In attendance were PDT members Chad Demarest, David Dow, Jon Grabowski, Mark Lazzari, Vincent Malkoski, Dave Packer, Sarah Pautzke, Dave Preble, and Dave Stevenson.

As an aside and reminder, Sarah is filling in for Chad while he is on medical leave.

One note: I will put anything that requires action on someone's part in yellow and label it as an "AR" (Action Required) so that we don't forget anything.

Presentation by Dave Stevenson

The meeting started with a presentation by Dave Stevenson, who provided an overview of reviews that tell us what others have concluded with regards to gear effects. These reviews looked at international papers as well as those that were strictly relevant to New England. Dave's review focused exclusively on papers dealing with direct habitat impacts, not ecosystem (secondary) impacts, and excluded modeling papers from review. The biggest problem Dave S. encountered was that many reports did not differentiate between gear types. For example, the 2000 ICES report does not differentiate between beam and bottom trawls, nor does the 2002 NRC report or the 2003 PEW report. Many reports also did not identify type of dredge gear. However, the most important "take-home" message is that there is a lot of information that the PDT needs to take into account while populating the impact matrices. The NOAA Tech Memo 181 includes a detailed review of 73 research studies published through 2002 that were judged to be relevant to the gears used and the habitats fished in the NE region. In preparation for this meeting, Dave Packer has updated that review with an additional 25 journal articles. After subtracting studies done with toothed scallop dredges (included in TM 181), we now have reviewed 89 studies. Dave S. provided a printout of his summary, his PowerPoint presentation, and a copy of Dave Packer's review of the recent publications. Dave S. also provided a summary of which trawling papers included information about trawl door sizes or weights and/or descriptions of ground gear.

One point Chad raised was in reference to a statement from the presentation about the 2006 Canadian DFO report: "Accounting for expected impact per unit effort." He asked what the units for measuring that were and said that as we transition to the SASI model, we will want to come up with a way to "marginalize" the impacts of fishing on habitats (i.e. identify the margin to the next unit), identify our rate of change, identify our units, and see if we can evaluate management options.

Jon brought up that meta-analyses were originally designed for medical analyses. He cautioned that we need to be careful when using them because "we" have been hit hard for not going back to original papers to look for biases. For example, in some cases predators cause plant biota to increase, but other times decrease, and the summary reflects the average, showing no impacts of predators when quite the opposite is true (this comment is in reference to the meta-analysis paper: Kaiser et al. 2006).

One concern of note is that there are not many published papers about New Bedford style scallop dredges. Toothed scallop dredges are used to harvest other scallop species on soft bottom, but we have a harder bottom, hence the other style used here. Thus, it is tough to compare between the two types of dredges.

One issue that was raised that may affect how we view fishing impacts on EFH is fishermen's desire to operate their vessels with higher fuel efficiency. They are now making changes to their gear (acoustic sensors) to make it fly better above the bottom, minimizing the stress on the boat so that the boat fishes more fuel-efficiently. This is good for bottom habitat, but we will have difficulty quantifying these habitat effects because our evaluation of gear impacts will be based on trawls that were not equipped with these systems, so our conclusions may need to be modified to account for the new technologies that reduce bottom contact.

AR (Dave Stevenson): Update the literature that we have and probably pull in some more gray literature and projects. We also need to revise the summaries of all research conducted for each gear type / habitat type combination in Tech Memo 181 based on publications that have come out since 2002.

It was discussed how we should weigh non-peer reviewed papers. We need to use quality data so that when the SSC reviews our work, there will not be any questions about the information upon which it is based.

AR (PDT): The various working groups in this PDT should weigh the gray literature similarly, so we need to establish how to rank these studies.

AR (Dave Stevenson) – Review modeling papers.

Swept Area Seabed Impact (SASI) Model Discussion

We reviewed a one-page summary from Steve about the SASI model and a four-page discussion paper from Chad about parameterizing and populating the model. Various questions were asked.

Q1: Is seabed sensitivity a function of habitat?
A1: It is habitat modified by energetics, which is consistent with what the PDT has discussed previously. We might need a separate set of sensitivities for animals vs. inanimate objects. It was discussed that C (contact index) should include critters.

Q2: Is the bottom type included in the sensitivity index? Bottom will affect how the gear is rigged and how the doors, ground cables, and sweep disturb the bottom.
A2: The sensitivity index will probably vary by energy level and bottom type, which are both included. We potentially can also include how the gear is run, thus giving us different C and S (sensitivity index) values.

Q3: In the model C, are we saying that only 30% is in contact w/bottom, or are we are just saying it is 30% of what full bottom contact would be?
A3: It is trying to capture both. It is the "effective" distance between the trawl doors over which the gear is 100% in contact with the bottom while the net is being towed.

Q4: How do you reconcile quantitative vs. qualitative aspects to the model? There is enough information to say how much is habitat is impacted, but not how.

Much discussion followed about the development of the SASI model, such as the sensitivity matrix. It was discussed that we would need a different index for each gear configuration, otherwise we may mask for bottom type (confound the results). This might increase the number of model runs. One real concern is that we can make the model unnecessarily complicated.

Cookie size (rockhopper) was discussed with regards to their ramifications for the model. Rockhoppers are only used in some bottom types, so may not have as much of an impact as initially thought.

Discussion started based on Chad's attempt to demonstrate how the SASI model could be used with respect to effective width of trawl doors, ground cables, and sweeps from observed tows in the observer database. One question was whether we condition the model on sea state because we know the net bounces off the bottom. With regards to distance the net travels, this will vary depending on vessel and current speed. Thus, it is essential to know if we use GPS speed or boat speed in the observer log because tide may have a large impact on the ground covered. The good news is that there will be a different bounce for each gear type and horsepower, but there will be a similar bias for each gear type because each fisherman has the same goal: to catch fish as efficiently as possible. Concern was voiced that we have no data on lengths or shapes of otterboards. With regards to determining angle of attack, total door spread, etc., we can test if our assumption of 40 degree for the angle of attack and angle of the doors is roughly correct for a specific configuration. Another way to get at vessel size is to look at distance from shore – generally bigger vessels will go farther.

AR (Steve Eayrs): Speak to Dave Buettel to get help determining how rounded the sweep of a net is with respect to footrope length. During an average tow, what is the distance between the doors as a percentage of the distance of the length of ground cables and the sweep? Is it 40%, 60%? How much does it vary depending on towing speed, bottom type, type of ground gear, etc.?

AR (Sarah): Talk to Demet and observer program about how to link permit data to observer data to determine the best linkage being that the observer data does not have permit numbers, just haul numbers.

Sensitivity Indices
It was discussed whether the sensitivity matrix belongs in the SASI model. It is critical, but complicates the model. We agreed that **Steve (AR)** should remove the sensitivity index from his model, but we lose the impact of a particular unit of area swept on habitats of different types and different energy levels in doing so. We want to keep C in the model, which means that we use

SASI to assess the relative amount of bottom contact associated with the use of different types of trawls w/o any consideration of the geological or biological feature of the seafloor. How bottom disturbance varies with respect to habitat types would be evaluated after the SASI model is run. IT is also important to understand that the SASI model can be used to measure bottom contact and swept area, but not the impact of a unit of bottom contact. Impacts to geological and biological structure, and to the availability of prey, will have to be evaluated later. The results of these evaluations will vary depending on the species affected.

Prey Matrix Discussion

David Dow described the prey matrix created by the prey group. The matrix is set up to evaluate fishing impact on prey availability in different habitat types and energy regimes based on the sensitivity of individual prey types to impacts and their recovery/resilience to those impact. Primary prey types included in the analysis were identified in Phase 1 as making up >5% of the diet of any managed fish species. Invertebrate prey are classified at higher taxonomic levels (families, orders, classes) than fish species. In each classification, there are different sized species with different life history characteristics, which in some cases complicates the analysis. These prey are ranked by an ordinal ranking scale for each component of the matrix described below (per David Dow's July 23 email):

Sensitivity Classifications:

Location – a: deep infauna, b: surface infauna, c: epibenthic fish, d: epibenthic invertebrates
Morphology – 0: hard shells, 1: soft carapaces, 2: other, 3: fragile and/or soft-bodied
Size – 0: microscopic/very small, 1: small, 2: medium, 3: large
Gear impacts – 0: none/positive, 1: re-suspension, 2: slicing, 3: crushing (not sure, but I think this may have changed w/our discussion to a degree of gear impact instead of type)
Capacity to regenerate – 0: large regeneration, 1: medium regeneration, 2: asexual reproduction/budding, 3: no regeneration capacity/sexual reproduction required

Recovery/Resilience Classifications:

Life history strategies – 0: "K" selected w/late-stage maturity/long life span, 1: moderate "K" selected w/intermediate maturity age/intermediate life span, 2: moderate "r" selected w/lower maturity age and life span, 3: optimum "r" selected with short life spans and maturity ages
Population/turnover rates – 0: P/B < 25, 1: P/B < 10, 2: P/B < 2, 3: P/B < 0.5 (turnover is the reciprocal of the P/B ratios)
Field studies recovery times – 0: < 1 months, 1: < 6 months, 2: <2 years, 3: >5 years (where does 2-5 fit in?)
Recovery potential from re-suspension – 0: motile species w/ high potential, 1: mobile species w/ moderate potential, 2: immobile species w/ small potential, 3: immobile species with no/limited potential
Uncertainty – 0: low based on experiments/data from our region using the mobile gear types of interest, 1: small based on comparable gear studied elsewhere in similar habitats, 2: moderate based on non-comparable gear studied in similar habitats, and 3: large based on non-comparable gear studied elsewhere in dissimilar habitats.

These classifications assume that larger organisms are more vulnerable than smaller ones; soft-bodied organisms (e.g., polychaetes) are more vulnerable than hard-bodied ones (bivalves); and that immobile, K-selected species with low turnover rates, low production-to-biomass ratios, and long recovery times are more at risk from gear impacts. Sensitivity also refers to susceptibility.

After lengthy discussion, two data elements were removed from the analysis (see "Tier 1" and "Tier 2" spreadsheets from Prey Species VA Matrix.xls):

- Location – removed because the ranking (low for deep infauna, high for epibenthic) would depend on the gear being used (see "Tier 1" and details below)
- Gear Effect – removed because this will be evaluated in a second spreadsheet once the average susceptibility and recovery/resilience scores are derived for each prey type (see "Tier 2" and details below)

We may want to say how certain we are with regards to our data and conclusions, but that should not influence the results of sensitivity and recovery matrices, thus it was not included in any of those calculations. We now have columns that, for each prey type, evaluate the relevance, methodology, and quantity of literature used in the "Tier 1" of the "Prey Species VA Matrix.xls." We may also want to identify prey types for which we base our decisions on "best judgment" because there is no literature available. Although uncertainty isn't very helpful in our case, it can help guide the Habitat Committee and the Council towards more informed management decisions if the prey types with limited information are identified.

As an aside, the table is for all mobile bottom-tending gear. Static gears would not be responsible for most impacts, with exception of crushing some species. This may be revisited at another PDT meeting, though.

The end result for the tables (check out spreadsheet "Tier 1" in "Prey Species VA Matrix.xls") was three columns that reflect prey susceptibility to gear impacts and another four columns that reflect prey ability to recover from (or their resilience to) impacts, based solely on biological and ecological factors. There will be a number of tables generated for different sediment types and energy levels (for example: gravel/high energy, gravel/low energy, sand/high energy…). In the end, there should be one number for each substrate/energy level based on the following for each prey type (row): the average of the sensitivity columns plus the average of recovery/resilience columns, multiplied by the relative abundance and relative importance. Relative abundance scores (0, 1/3, 2/3, 1) will be based on an evaluation of the relative abundance of each prey type in a given substrate/energy regime and relative importance of the occurrence of each prey type in the diets of the 27 species managed by the NEFMC. Relative importance scores will be based on an analysis of diet composition data in the NEFSC food habits database and should be calculated on a percentage basis. If they are summed, they all look important. Next, the average susceptibility and recovery values and the relative abundance and importance score will be carried forward into the "Tier 2" spreadsheet, where the effects of each gear type will be incorporated into the matrix analysis for each habitat type (substrate and energy level) and a final total impact value computed. Some gear type tables will fall out if a particular gear isn't used in a particular habitat.

"TIER 1":

Susceptibility columns:

Location (a-d), Morphology (0-3), Size (0-3), Regeneration (0-3), and Average of last 3 things (A)

Recovery columns:

Life History (0-3), Turnover rates (0-3), Recovery time (0-3), Recovery potential (0-3) and Average of those 4 things (B)

Total:

A+B

Relative Abundance column = c

Relative Importance column = d

Final column: (A+B) * c * d (this equals T)

Uncertainty / Data Quality columns:

Relevance, Methodology, and number of citations (N)

Sum over species for TOTAL number

I left Mud/low energy filled in as an example, but scroll down for more sediments and energy combinations.

Mud / Low energy

	Prey Sp.	Location (Susceptibility)	Morphol. (Susceptibility)	Size (Susceptibility)	Regen/Bu (Susceptibility)	average (Susceptibility)	LifeHist. (Recovery/resilience)	Turnover (Recovery/resilience)	RecovTim (Recovery/resilience)	RecovPot (Recovery/resilience)	average (Recovery/resilience)	TOTAL	rel.abu.	rel.imp.	FINAL TOTAL	Relevance (Uncertainty / Data Quality)	Methodology (Uncertainty / Data Quality)	N (Uncertainty / Data Quality)
6		a-d	0-3	0-3	0-3	A	0-3	0-3	0-3	0-3	B	A+B	c	d	T=(A+B)*c*d			
7													c=(0, .33, .66, 1)	d=%				
8	AMPHIP		1	1	1	1.00	3	1	0	1	1.25	2.25	0.33	0.44	0.33			
9	CANFAM		0	3	3	2.00	1	2	3	1	1.75	3.75	0.66	0.82	2.04			
10	CEPHAL		2	3	0	1.67	1	2	0	0	0.75	2.42	0.33	0.98	0.78			
11	COPEPO		1	0	0	0.33	3	0	0	2	1.25	1.58	0.66	0.29	0.30			
12	CRANFAM		1	3	2	2.00	3	1	2	0	1.5	3.50	1	0.66	2.30			
13	CRUSHR		1	2	1	1.33	2	1	0	0	0.75	2.08	1	0.40	0.82			
14	DECCRA		0	2	3	1.67	1	2	2	1	1.5	3.17	0.33	0.99	1.03			
15	DECSHR		1	2	2	1.67	2	1	0	0	0.75	2.42	0.66	0.24	0.39			
16	ECHINI		0	3	3	2.00	1	3	3	3	2.5	4.50	0.33	0.16	0.24			
17	GAMMAR		1	1	1	1.00	3	1	0	1	1.25	2.25	0.66	0.68	1.00			
18	EUPFAM		1	3	0	1.33	1	1	0	0	0.5	1.83	0	0.31	0.00			
19	ILLESP		2	3	0	1.67	1	2	0	0	0.75	2.42	1	0.75	1.82			
20	LOLISP		2	3	0	1.67	1	2	0	0	0.75	2.42	1	0.72	1.74			
21	MYSIDA		1	2	0	1.00	2	1	2	0	1.25	2.25	0.33	0.45	0.33			
22	OPHIUI		0	3	3	2.00	1	2	3	3	2.25	4.25	0.66	0.95	2.67			
23	PANFAM		1	2	0	1.00	2	1	0	0	0.75	1.75	0.66	0.21	0.25			
24	POLYCH		3	1	3	2.33	2	2	1	3	2	4.33	0.33	0.17	0.25			
25	AMMOSP		3	2	2	2.33	1	1	1	1	1	3.33	0.33	0.69	0.75			
26	CRYMAC		2	3	1	2.00	0	3	1	1	1.25	3.25	0.66	0.61	1.31			
27	MERALB		2	3	0	1.67	0	3	0	0	0.75	2.42	1	0.82	1.97			
28	MERBIL		2	3	0	1.67	0	3	0	0	0.75	2.42	0.33	0.27	0.21			
29	MYOOCT		2	3	0	1.67	0	3	0	0	0.75	2.42	0.66	0.75	1.20			
30	SYMPSP		2	3	0	1.67	0	3	1	1	1.25	2.92	1	0.55	1.61			
31														SERIOUS, FINAL, REAL TOTAL	=SUM(all rows)			
32															23.35			

AR (Prey group): Clean up the prey spreadsheet to accurately reflect and group prey types. There is currently a lot of duplication in the listed taxa, e.g. decapod shrimp (DESCHR), crustacean shrimp (CRUSHR), and the crangon family (CRANFAM) all include some of the same species.

Prey Location vs. Gear Effect

One question that was raised was whether the location of the animal (on or in the bottom) is important to have in the table. We decided it is important, but it was pointed out that each gear can affect each organism differently. For example, a hydraulic clam dredge will have a much greater impact on deep infauna organisms than those that are epibenthic, but a trawl will have the opposite effect. As a result, we decided to simply identify the location of each prey type (a-d, "Tier 2" worksheet in Prey spreadsheet) without including this data element in the analysis.

Concern was voiced that gear effect is a function of all the other columns and should not be treated as its own column in the first phase of the analysis ("Tier 1"). However, the argument was made that in fact, gear effects can be classified as the potential to be resuspended, sliced, or crushed (low to high impact) based on habitat and fishing gear. A suggestion was made to change it to a gear effects vulnerability column because the main problem is that the first 3 columns will change with gear type with regards to the organisms' sensitivities. The problem is that, for example, a scallop should always be on the bottom with a particular morphology and size, but its gear vulnerability will change depending on gear type. Thus, the gear effects column should be adjustable and not based on the three life history columns. We could have a gear column consistent with the structure of the table so that for each combination of sediment and energy regime, the intention of the gear effect column is incorporated into that Gear Impact column. We will use professional judgment and any available published information to identify the intensity of the gear impact.

Energy Regime
We discussed if we knew enough about the energy regime to include it in the matrices. We need to know the spatial extent and potential impact of the energy for the spatial model (as of yet not developed). Brad Harris's group is doing an analysis to determine maximum critical shear stress as a measure of energy level in the spatial model. It was argued that getting this type of information is easy, but determining how a particular life history stage and respective size varies as a function of the energy regime will be difficult. It was decided that if this becomes a useless exercise, we can remove it from the spatial model, but "low" and "high" energy should remain as part of the matrix analysis.

Combining Recovery and Susceptibility
A suggestion was to keep susceptibility and recovery separate to see if it tells us more. The concern is that combining susceptibility and recovery may result in very similar numerical outcomes for each sediment/gear type/energy level. In the end, we decided to keep them separate.

Recovery
What we miss in turnover rate is the frequency of impact. The current turnover rate doesn't factor in how frequently the area is fished. It reflects the population's ability to recover from one disturbance. The spatial model will need to evaluate the frequency of fishing impacts.

AR (Steve Eayrs): Provide a list of gear types and in which habitats they're used. Also, provide information about how each gear disturbs benthic habitats so that determinations can be made about what may really happen to the prey organisms when different gear types are used in different habitats at different intensity levels.

We will want to observer and VMS data to populate the spatial model with actualized fishing intensity estimates. For the matrices, Steve will provide the first cut at the data. We may also want to add some information provided by the fishing industry.

Documentation

For each prey type in the "Tier 1," we'll need to provide an explanation of why we chose the 0-3 number that we did for the susceptibility and recovery evaluations. We will have to do the same for the gear effect and data uncertainty scores. We will need a summary table of what each value stands for within each category.

<u>"TIER 2"</u>:

FINAL TOTAL = (A+B) * c * d * z (although (A+B)*c*d is determined in the Overall Table)

A = susceptibility (average)

B = recovery (average)

z = gear effect (0-1)

c = relative abundance (0, 0.33, 0.66, 1)

d = relative imporance (0-1)

FINAL TOTAL = vulnerability of the prey

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	Not sure relative abundance and importance need to be included here because they're already encompassed on Overall Table Sheet. Maybe do															
2	table to the right unless we're trying to show how we broke it all down.															
3						GEAR TYPE 1								GEAR TYPE 1		
4											Prey Sp.	Energy	Sediment	Total	Gear Effect	FINAL TOTAL
5	Prey Sp.	Energy	Sediment	Susc.	Rec.	Gear Effect	rel.abu.	rel.imp.	FINAL TOTAL					T	z	=T*z
6				A	B	z	c	d	=(A+B)*c*d*z					=(A+B)*c*d	0-1	
7				3½7	3½7	0-1	0,13,23,1	0-1			AMPHIP		Mud			
8	AMPHIP		Mud										Sand			
9			Sand									Low energy	Gran_Peb			
10		Low energy	Gran_Peb										Cobble			
11			Cobble										Boulder			
12			Boulder										Mud			
13			Mud										Sand			
14			Sand									High energy	Gran_Peb			
15		High energy	Gran_Peb										Cobble			
16			Cobble										Boulder			
17			Boulder													
18											CANFAM					
19	CANFAM										CEPHAL					

There will be no attempt to do a grand vulnerability analysis that combines the results of the three matrices. Fishing impacts on geological structure, biological structure, and prey will be evaluated separately and independently.

<u>Biological-Geological Matrix Discussion</u>

The second day was spent determining the data elements to be used in the biological-geological structure matrices and the way to score each cell. Concern was voiced about absent assessment endpoints for our geological and biological structure matrices (i.e., resuspension, reduction in bottom complexity, chemical changes, cycling, changes in biological communities) and if we are susceptible to criticism for failing to address them. One suggestion was to see what endpoints are missing at the end and add a paragraph about it. Impacts to geological and biological structures will be assessed for both susceptibility and recovery for each gear/habitat/energy combination. We will assess the direct habitat impacts, not look at ecosystem effects of fishing. We also will not address ecosystem integrity.

We discussed adding invasive species, but this was tabled because we could not reach consensus about whether invasive species are the result of a disturbed environment or take advantage of it. We also have no information about the connection between fishing and invasive species.

Geological Structure
The geological structures we will assess with regards to impacts from fishing gear are topography/relief, rugosity (bottom "roughness"), habitat patchiness, and micro-structure created by organisms (bio-excavation). "Recovery" here represents the likelihood of recovering to a former functional value within a certain time period. Sand in a high energy environment would probably get a 1 for the ability to recover from a fishing event – the ability to provide shelter would recover, but ability to provide forage may not. It can, however, return eventually to its original state. Meanwhile, boulder piles may never recover after being knocked over by a trawl or dredge.

Sensitivity/susceptibility (see Geo_bio_VA_matrix.xls) refers to the vulnerability of biological or geological structure in each habitat to disturbance and should be evaluated in terms of its ability to provide refuge from predators, a place for reproduction, or foraging for predators. If a particular habitat (substrate/energy level) receives a "3" for sensitivity/susceptibility to a particular gear type, that indicates that one pass (or set, in the case of stationary gear) of that fishing gear is expected to have a high impact on one or more of these ecological services. There was a lengthy discussion about whether or not to segregate susceptibility and recovery into these three habitat functions in the analysis. If we leave them desegregated into refuge, reproduction, and forage, and evaluate them for each species and life stage that utilizes each habitat type, it will show our line of reasoning a little better. We will decide, after filling out the sheet, whether it should be segregated or desegregated (see note at very end of this summary).

We also discussed whether to divide the species into groups with regards to habitat function for each species. The concern was that we may be making a mistake in assuming the function the habitat provides is similar across the species if we do not break down the matrix by species, or at least groups of species. The decision was to create the matrix for each managed species for both the juvenile and adult life stages because there is a lot of sediment affinity for juvenile stages of our managed fish, but that tends to fall apart for adults.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF
1	This spreadsheet gets filled in with a 1 or 0 (not 0-3 scale)																															
2			MUD						SAND						GRAVEL						COBBLE						BOULDER					
3	Managed		High energy			Low energy			High energy			Low energy			High energy			Low energy			High energy			Low energy			High energy			Low energy		
4	Species	Life Stage	RP	FO	RF	RP	FO	RF	RP	FO	RF	RP	FO	RF	RP	FO	RF	RP	FO	RF	RP	FO	RF	RP	FO	RF	RP	FO	RF	RP	FO	RF
5	Species X	juv																														
6		adult																														
7	Species Y	juv																														
8		adult																														
9																																
10																																
11																																
12																																
13																																

Table on page 128 of NOAA Technical Memorandum 181 has a lot of information in an EFH vulnerability matrix analysis for benthic life stages of our managed species. Starting on page 131 are EFH vulnerability matrices for individual managed species for each life stage, which may also be very helpful.

We need to tie in managed species to geological structure because otherwise it's just geology, it's not habitat. We need to look at / tie in the functional use of these habitats.

Biological Structure
We will assess the impact of fishing gear on the following biological structure categories: "soft" erect sessile organisms, "hard" erect sessile organisms, "soft" encrusting sessile organisms, "hard" encrusting sessile organisms, and shell hash. Shell hash is not a living structure, but since shells are created by living organisms, it fits better under biological structure than geological structure.

	A	B	C	D	E	F	G	H	I
1	Clearly more spreadsheets will need to be populated based on gear type, but here's something to start with....								
2									
3			**Gear type** / Mud / Low energy						
4		Susceptibility	Recovery				**Data Quality**		
5	Erect sessile - soft					**Relevance**	**Methodology**	***N***	
6	Erect sessile - hard								
7	Encrusting sessile - soft								
8	Encrusting sessile - hard								
9	Shell hash								
10									
11			**Gear type** / Mud / High energy						
12		Susceptibility	Recovery				**Data Quality**		
13	Erect sessile - soft					**Relevance**	**Methodology**	***N***	
14	Erect sessile - hard								
15	Encrusting sessile - soft								
16	Encrusting sessile - hard								
17	Shell hash								

AR (Dave S., Jon, and Mark): Take the first crack at the Geological-Biological vulnerability matrix. Also get Peter Auster's input.

General Discussion

Data Quality / Relevance
The quality and relevance of the information used to populate these two matrices will be evaluated using criteria developed by the PDT.

AR (PDT): Draft criteria to be developed by the team as these matrices are filled in.

Frequency of disturbance
It was suggested that the matrix analyses should reflect how many times an area has been passed over already, which can tell us how vulnerable that environment is to additional disturbance. So far, our analyses are designed to assess the impacts of the "first pass" of a gear over an

undisturbed area of bottom, or an area of bottom that has fully recovered from previous disturbance from fishing, or has reached some new "steady state" as a result of prolonged exposure to fishing. The spatial model, on the other hand, will evaluate the degree to which different areas, or habitat types, are affected by fishing and have been affected in the past. The biggest caveat to all our matrix analyses is that fishing impact is based on the habitat impact of and recovery potential from and initial disturbance.

Alternatively, if we do our assessments looking at "next pass," it will bias the results towards areas that have been closed for a longer period of time, which may overwhelm other characteristics we've been assessing. We potentially can condition the matrix results with low, medium, and high levels of fishing frequency and intensity, or evaluate habitat impacts relative to the range of values that differentiate "no impact" from "full impact" according ot some "known" functional formula/curve. This shows that you know that the world doesn't operate under a 1-pass hypothesis. It is clear that we must incorporate fishing intensity into the matrix analyses, but we are unclear about how to proceed. A column for intensity in which intensity receives an ordinal ranking was suggested.

Other Notes
We discussed having an open-to-public meeting, maybe like a scoping meeting, so that we can get public input and buyoff. It was commented that we need to involve the public in determining what the most relevant studies are to incorporate into these designations and be as overt as possible.

A question was raised during the meeting about whether we're treating coastal inshore habitats equally with offshore habitats. The response was that we are just dealing with impacts of fishing in federal jurisdiction waters. Via the Omnibus amendment, the Council will not be able to make any management decisions that affect state waters, even though EFH extends into state waters. We decided the maps (in the spatial model) will stop at 3 miles for a couple reasons: 1) other things other than fishing affect inshore waters (sewer outfalls, etc), 2) the gears in the federal fisheries generally operate offshore (exception: shrimp trawls in estuary mouths).

AR for whole group: We need to create summary papers that explain the importance of the metrics we chose for the prey analysis, how the prey species were chosen in the first place, how they got their rankings, provide definitions for the biological-physical side (we have them for prey – read David Dow's email), and provide an explanation for why we chose the metrics.

AR (Sarah): Populate the matrices for deep sea corals. Talk to Peter Auster (UConn) and Dave Packer.

Next PDT meeting:
So far there is no published agenda, but it will not be freeform. We need to get from developing matrices around assessment endpoints to creating values that we can adequately feed into model endpoints (swept area, seabed, etc) and make sure these translate to a spatial model.

Summary of Documents handed out at PDT Meeting:

1) Dave Stevenson's powerpoint presentation
2) SASI model information sheet – Steve Eayrs
3) Parameterizing and populating the SASI model – Chad Demarest
4) Observer Manual, Gear Characteristics datafields – printed by Chad D.
5) ICES Cooperative Research Report, 2000
6) Gear Effects Literature Update – Dave Packer
7) Review of Information relating to the effects of commercial fishing gears on benthic marine habitats in the Northeast Region of the U.S. – Dave Stevenson
8) Impacts of Trawl Gears and Scallop Dredges on Benthic Habitats, Populations, and Communities, Canadian Science Advisory Report – provided by Dave Stevenson
9) Global analysis of response and recovery of benthic biota to fishing (Kaiser et al. 2006) – provided by Dave Stevenson
10) Reference guide for relevant literature – Dave Stevenson
11) Email that describes the metrics for the susceptibility and recovery matrices – David Dow

For more papers, please go to the FTP site: ftp://gadwall.nefmc.org/July%2024-25%202008%20PDT%20Mtg/ and ftp://gadwall.nefmc.org/Habitat/Habitat%20Literature/.