An Internal Review of the SEFSC Ship-Based Resource Surveys Program

(Pascagoula, Mississippi; 23-25 January 2008)

1. Background and Objectives

An Internal Review of SEFSC ship-based fishery independent Resource Survey Program was initiated. The Agenda adopted for the review by the Review Panel[1] and the List of Participants are in Annex 1. The Terms of Reference (Annex 2) included examining the current ship-based surveys out of the Mississippi Laboratories (MSL), evaluating how well they satisfy stock assessment needs, and recommending improvements or redesign if warranted in order to make more optimal use of the resources available.

The Review followed the structure established for the internal review of the Beaufort Headboat Survey. For the review, MSL staff provided input to the Review Panel regarding the objectives of the current resource surveys, their design, the species involved, the chronology of their application, and a description of the current method used for priority setting regarding utilization of resources for surveys.

As a first step, leading to the possibility of a broader review of the overall Resource Survey Enterprise in the Region, this effort did not fully encompass the joint state-federal efforts, but discussion of the resources directed at such efforts and how they influence in a strategic or analytical product sense, the resource survey activities conducted at the Pascagoula Laboratory was undertaken.

For this Review, a number of questions were posed, including:

What is the history/chronology of resource survey activities at Pascagoula?
What questions were/are being addressed by each survey ?
What designs were/are applied?
Which surveys are intended to provide a time-series useful for monitoring trends in resource abundance?
What is the balance (DAS) between the resources attributed to time-series monitoring versus other activities?
How long a (consistent) time-series is available for each monitoring survey type?
What species/stage composition was/is being sampled?
What data are collected, how is the data base maintained, and what quality assurance processes are applied in the databases?
Have the survey data been used for stock assessments? If so, which species? If not, are there species held in FMPs or within ESA/MMPA authority for which the data could be applied?
What process is presently used in allocating DAS between competing requests for survey activities?

Resource data collections in the Gulf of Mexico, Caribbean Sea and Atlantic Ocean range back to 1950. Data collection objectives and methodologies have changed over the years along with agency missions, but the types of information collected have remained remarkably constant. In the early 1970's statistically based sampling designs were initiated as a means of providing a time-series consistent data set for monitoring trends in abundance. This was motivated, at least in part, by the large reductions in catch per unit effort experienced by the northern Gulf trawl fisheries in the late 1960s and subsequent calls for investigation of the reasons underlying such declines.

2. Presentations & Discussion of Resource Survey Program Activities Relevant to the Review Terms of Reference

Background documentation on the chronology and objectives of the surveys undertaken by the SEFSC MSL was provided to the Panel in advance of the meeting (Annex 3). The Resource Surveys Group at MSL is organized into a number of Survey Teams, each with responsibility for certain types of surveys. Answers to the questions posed for the review, were prepared by Team Leaders and are provided in Annex 4. Presentation materials from each of the MSL Resource Surveys were made by staff and are provided in Annex 5 and an example of survey metadata in Annex 6. The ongoing MSL surveys discussed are largely within the Gulf of Mexico (although the longline and marine mammal surveys extend beyond) and do not encompass the entire Fishery Independent Survey Enterprise within the Region, The surveys discussed included the following:

[1] G. Scott (Chair), C. Porch, J. Nance, M. Prager, and V. Restrepo

Plankton Surveys

SEAMAP spring plankton survey
SEAMAP fall plankton survey
SEAMAP winter plankton survey
SEAMAP piggyback plankton surveys (on groundfish surveys)

Trawl Surveys

SEAMAP Fall groundfish trawl survey
SEAMAP Summer groundfish trawl survey
Small Pelagic high opening bottom trawl (HOBT) survey

Reef Fish Surveys

SEAMAP Trap/video survey
Madison-Swanson Monitoring
Oil Rig Monitoring

Longline Surveys

Bottom Longline Survey
Pelagic Longline Survey
Regional, Coastal Longline Survey

Marine Mammal Shipboard Surveys.

Gulf of Mexico
Atlantic
Caribbean

The Panel again noted that the surveys examined do not encompass the full suite of fishery independent surveys in the region, some of which are conducted by States and Universities, and as such could not be considered a comprehensive review of the issue. Additional evaluations of the other components of this enterprise may be warranted in the near future.

3. Panel Findings

a. Do the current surveys satisfy stock assessment needs?

1 Time-series monitoring of resource abundance

The Resource Surveys discussed generally contain useful information about time-series resource relative abundance levels, although of different species and ages/stages and over different lengths of time, depending on survey type. The following is a description of the survey-by-survey type of time-series information.

Plankton Surveys

The plankton surveys in their present form started data collection in 1982. There are five general time frames where data were collected in the present format. These include spring plankton, summer ground fish, fall plankton, fall ground fish, and winter plankton. Plankton surveys are 'piggybacked' on the summer and fall groundfish survey designs and are hence categorized as 'piggyback plankton surveys.' The spring plankton and fall ground fish cruises have occurred each year since 1982. Some early plankton collection occurred in 1950-1976, but mainly for bluefin tuna. The Panel recommends recovering, to the degree possible, these data and incorporating the information into an archived database. Additionally, there were data in the spring survey time from 1977 through 1981, but the sampling design was different than the current version. Fall plankton started in 1986 and has occurred most every year since that time. The winter surveys have been conducted sporadically since 1992 (Table 1). Bongo and Neuston nets are used during each of the surveys and use of MOCNESS (Multiple Opening/ Closing Net and Environmental Sampling System) and CUFES (Continuous Underway Fish Egg Sampler) applications are under consideration. The number of taxa sampled by the ongoing surveys is large and a partial list of these can be found in Annex 4.

Reef Fish Surveys

After more than a decade of development, the reef fish survey design currently in place was instituted in 1992 using video/trap technology (Table 1). The survey has been conducted most years since the initial cruise. Video gear has continued to be refined over the time frame, with stereoscopic imaging (for length/mass measures) the next step. A partial, ranked list of species encountered can be found in Annex 4. The survey could be considerably improved by increasing the sampling frame, especially along the Florida shelf. This would require more detailed bathymetric information on reef structure than is currently available. This video technology is also being used at the Madison - Swanson marine management reserve. After

several years of development testing appropriate methods, a randomized bandit reel survey at oil platforms was started in 2007.

Trawl Surveys

Ground Fish Trawl Surveys

After several decades of development, the fall ground fish (*aka* "bottom fish") survey using started in 1972 and the summer component of the ground fish survey started in 1981 (Table 1), with the same format as developed in the fall. A 40' shrimp otter trawl is the gear used for these surveys. A partial, ranked list of species can be found in Annex 4. It should be noted that many fishery exploratory cruises were conducted on a variety of vessels and a multitude of seasons during the early years (1950 – 1971). Apparent change in resource abundance during this period was one driving force for instituting the statistically based sampling design for resource abundance monitoring. However, information from these early period surveys can prove to be highly valuable in stock assessments and data from these surveys need to be incorporated into the database, to the degree possible.

Small Pelagics Survey

After a decade of development, the small pelagics survey began in 1988, and has been conducted intermittently since then due to vessel access limitations (Table 1). The survey uses a high opening bottom trawl (HOBT) for data collection. A partial list of species can be found in Annex 4. While the time-series is relatively short (compared to groundfish), the species composition and age structure sampled provides valuable information for stock assessment of Federally managed species. Further analysis of this data base and expansion of effort (time and space) are warranted and the Panel recommends such.

Longline Surveys

Longline surveys were begun in 1995 with the bottom longline survey (Table 1). A standard bottom longline gear is used during the data collection. These surveys have been used for HMS (particularly shark) stock assessments and have proved invaluable to these assessments. A list of species can be found in Annex 4. A pelagic longline survey was conducted in 2004, and a regional inshore bottom longline program was conducted in the last two years. The bottom longline surveys are anticipated to be critical for reef fish assessments, but as the time-series remained short as of the most recent assessments for these species, the information has not yet been used in the reef fish stock assessments. The Panel recommends increasing sampling intensity and expansion (further inshore and further into Atlantic waters) of the bottom longline survey. Collaboration with the NEFSC Apex Predator Program which conducts shark longline surveys may be warranted.

Marine Mammal Ship Surveys

The MSL marine mammal ship-based surveys began in 1990 and have continued for most years since that time (Table 1). MSL surveys of the Gulf of Mexico shelf/slope area began in 1994. Additional surveys have also been conducted in the Atlantic and the Caribbean. Future plans are for sequential, rotating 3-year sampling amongst the Gulf, Atlantic, and Caribbean areas. A list of species can be found in Annex 4. In order to meet MMPA obligations, the Panel recommends this planned sampling level be implemented.

Table 1. Chronology of Mississippi Laboratories Shipboard Resource Surveys

Year

Survey	Season	Gear	1950 +	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	Years
Plankton	Spring Plankton	Bongo / Neuston	**1**						■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		■	■	■	■	■	■		■	■	**29**
	Summer Groundfish Piggyback	Bongo / Neuston												■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	**26**
	Fall Plankton	Bongo / Neuston												■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	21
	Fall Groundfish Piggyback	Bongo / Neuston												■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	26
	Winter Plankton	Bongo / Neuston												■	■	■	■								■			■											■	7
Reef Fish	SEAMAP	Video / Trap																						■	■	■	■	■	■				■			■		■	■	12
	Madison - Swanson	Video																															■	■	■	■	■	■	■	7
	Summer Oil Rigs	Bandit																																					■	1
Trawl	Summer Groundfish	40' Shrimp Trawl										■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	27
	Fall Groundfish	40' Shrimp Trawl		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	31
	Exploratory Cruises	Varied	**1**																																					
	Fall Small Pelagics	90' HOBT																		■	■	■	■	■	■	■	■	■	■					■	■	■		■	■	15
Longline	Summer	Bottom Longline																									■	■	■	■	■	■	■	■	■	■	■	■	■	13
	Spring	Pelagic Longline																																		■	■	■	■	4
	Regional Inshore	Bottom Longline																																					■	1
Marine Mammal	Gulf of Mexico Oceanic	Line Transect																				■	■	■	■			■	■		■	■	■		■	■				12
	Gulf of Mexico Shelf	Line Transect																								■				■	■	■	■						■	6
	Atlantic	Line Transect																						■						■	■			■		■	■	■		7
	Caribbean	Line Transect																									■					■	■			■				4

1. Intermittent surveys.

2 Adequacy of data base quality assurance and maintenance

A considerable investment is made to collect fishery-independent survey data and it is important to ensure that these data are assimilated and maintained in a database system that conforms to NOAA standards.

Data management has improved considerably from the time the surveys started when quality control issues included multiple steps in which transcription errors could occur. Much of the shipboard collection of ancillary data (environmental variables, ship variables, time and date) and survey data (fish samples, species, *etc.*) have now been completely automated via the Fisheries Scientific Computer System (FSCS) and Scientific Computer System (SCS) data collection packages, especially for NOAA Office of Marine and Aviation Operations (NMAO) vessels (Annex 6).

The current databases are maintained in Microsoft ACCESS. Certain datasets may exist in different formats, and several scientists may have their own front-end computer code to extract the data. The MSL have been working for some time to integrate all of these and migrate to the ORACLE platform. The review panel was of the view that this should continue to be pursued aggressively. The option to create an additional permanent NMFS FTE position for a database manager may be more effective than trying to achieve the database migration through a contractor. Even if the cost of and FTE is higher in the short term, such data management costs in general are minor relative to the investment that is being made to collect the data.

Not all of the survey data collected by the MSL are available in computer databases and routinely analyzed. Some surveys were conducted going back into the mid-1950s, many of which may have been "exploratory fishing" rather than surveys that followed rigorous statistical designs. While the analysis and interpretation of such datasets is not straightforward, they may be of value in assuring the agency can meet its stewardship responsibility to management in the establishment of historical benchmarks. The Panel recommends that efforts be made to recover these data and incorporate them into the databases, giving higher priority to FSSI species.

It was noted that the Gulf States Marine Fisheries Commission (GSMFC) is interested in carrying out data management for SEAMAP overall, perhaps with a view of making the database available on-line. This may provide value added to the survey data in terms of public accessibility. However, independent of GSMFC's efforts, the MSL must continue to maintain the databases for the surveys that it conducts following NOAA standards.

Other storage/proccessing issues

Some of the surveys conducted by the MSL collect large amounts of samples that are not being analyzed today because of priorities and limited resources. However, priorities may change at a future time, so it is important that the information that is collected be properly archived to allow for future use. Three examples of such information are plankton samples, reef fish videos, and tissue samples (these are currently being stored by the State of Florida, the Mississippi Labs and the NOS Charleston Lab, respectively). Similar to the mandate for maintaining databases (see above), it is critical that adequate resources be made available and applied for secure archival storage of these materials.

The issue of plankton sorting, which has been carried out by a sorting center in Poland for many years, was raised to the Panel. Current costs for sorting are increasing due to a number of factors, including the decreasing value of the dollar compared to the Euro. Costs for sorting currently are on the order of $130-200K and FY08 funds have yet to be identified to support this activity (sorting the 2007 surveys samples). The Panel recommended identifying, as soon as possible, funds to complete the sorting tasks for the 2007 samples and also recommended seeking alternative and less costly means of sorting the samples collected.

3 Utilization level for survey data bases in stock assessments

Resource surveys conducted by the MSL have contributed important data to many stock assessments. This is particularly true of Gulf of Mexico stocks, because our resource survey coverage is most extensive in the Gulf of Mexico.

To summarize current uses of survey results, the Review Panel and resource survey staff prepared tables showing which surveys are used—or might be usable—in stock assessments (Table 2). Because the number of stocks in the region is very large, the tables show only FSSI[2] stocks. Cells marked "U" denote surveys used in assessment of listed species. Cells marked "P" denote combinations where additional analysis of existing data should reveal if a particular survey might be useful in assessing the listed species. Cells marked "C" indicate that additional spatial coverage or increased sampling intensity (or both) are necessary for the particular surveys to contribute to assessment of listed species. Levels of person years and DAS attributed to each survey are repeated in each Table.

Even in the Gulf of Mexico FMC area, where our resource surveys are most extensive, there is considerable opportunity to derive more value from our surveys (Table 2). However, that will require additional resources to leverage those already invested in the resource survey program. In stocks shared between GMFMC and SAFMC, the plankton and trawl surveys are currently used (Table 2). It appears that increased resources applied to the longline surveys could provide information for assessment of numerous species.

In the South Atlantic FMC area, most of the fishery-independent surveys used in assessments are provided by MARMAP & SEAMAP, Federal–State programs run by the SC Department of Natural Resources. Although in combination, they are the most extensive resource survey programs in the SAFMC area, a review of the surveys not conducted by the MSL was beyond the scope of the current review. Use of resource surveys conducted by the MSL in Atlantic stock assessments is in the early stages. In particular considerable opportunity exists to analyze longline survey results for possible use in SAFMC assessments (Table 2).

MSL resource surveys also are used in assessing highly migratory species (Table 2). For bluefin tuna, plankton survey results have been used for about 30 years as an index of spawning-stock size. Given resources to support additional work, it may be possible to develop similar indices for other tunas and billfishes. The trawl survey currently is used in assessing several shark species. Although not yet used for assessments, the bottom longline survey warrants further analysis, as it has potential in assessing tuna, swordfish, and sharks.

Resource survey programs reviewed currently do not sample the Caribbean, except for marine mammals, although there exist plans for survey operation in FY09. There is ample opportunity to expand into this important region, although considerable resources will be necessary. Shallow water, extensive areas, and extraordinary species diversity will present challenges.

Table 2 includes only FSSI stocks, but the FSSI list includes fewer than half the stocks in the Southeast Region and its composition may change over time. A strength of broad resource surveys, such as those described here, is that they are likely to help us evaluate stocks that take on great importance in future years, even though they are not in FSSI today.

The marine-mammal sighting survey has proven invaluable in monitoring these species of great concern. As with other surveys, increases in sampling intensity or area would provide smaller confidence intervals on survey results.In summary, the MSL resource survey programs are providing information that has been useful in numerous stock assessments and that provides information on species that may assume greater importance in the future. There are extensive opportunities to increase use of the information gathered by these programs. In many cases, additional resources will be necessary and recommended to increase the value received from these surveys.

[2] Fish Stock Sustainability Index (FSSI) is a high level index to reflect the sustainability of 230 fish stocks selected for their importance to commercial and recreational fisheries. The FSSI is used as a quantitative measure of progress toward meeting resource stewardship responsibilities as laid out in the Magnuson-Stevens Act.

Table 2. Surveys applied to FSSI stocks

Survey:	Reef Fish			Plankton					Longline			Trawl		
Designator:	SEAMAP	Madison Swanson MPA	Summer oil rig	Spring	Summer groundfish	Fall plankton	Fall groundfish, small pelagics	Winter	Summer	Spring	Regional inshore	Grounfish summer	Groundfish fall	Small pelagics, fall
Gear:	Video/Trap	Video	Bandit reel	Bongo net					Bottom LL	Pelagic LL	Bottom LL	40' Shrimp Trawl		90' HOBT
Years of Data:	12	7	1	31	26	21	26	5	13	4	1	27	31+	15
DAS NMAO	30	0	0	42	38	35	42	39	60	30	0	38	42	43
DAS Small boats	60	25	60	0	0	0	0	0	0	0	36	0	0	0
Person years: support	2.22	0.71	1.70	0.51	0.46	0.42	0.43	0.47	0.73	0.36	1.02	0.46	0.51	0.52
Person years: sea	2.10	0.75	1.80	1.21	Note 1	1.01	Note 1	1.13	3.50	1.70	0.60	1.50	1.70	1.70
Person years: lab	3.30	0.80	0.06	1.60	1.6	1.60	1.6	1.60	0.23	0.23	0.23	0.50	0.50	0.50
Special Costs	–	–	–	$137k – 200k per year for sorting					–	–	–	–	–	–
Applications to Gulf of Mexico Council FSSI stocks														
Stone crab	–	–	–	–	–	P	–		–	–	–	–	–	–
Brown shrimp	–	–	–	P	P	P	P		–	–	–	U	U	–
Pink shrimp	–	–	–	–	P	P	–		–	–	–	U	U	–
White shrimp	–	–	–	–	P	P	P		–	–	–	U	U	–
Royal red shrimp	–	–	–	–	P	P	–	P	–	–	–	–	–	–
Red snapper	U	–	C	–	U	U	–		U	–	C	U	U	P
Red grouper	U	–	–	P	–	P	–		U	–	–	–	–	–
Greater amberjack	P	–	–	P	P		–		C	–	C	U	U	P
Vermilion snapper	C	–	–	–	–	P	–		C	–	–	U	U	P
Gag	U	–	–	P	–		–	P	C	–	–	–	–	–
Gray triggerfish	U	–	–	–	U	P	–		–	–	–	U	U	P
Yellowedge grouper	C	–	–	P	–	–	–	P	U	–	–	–	–	–
Snowy grouper	C	–	–	P	–	–	–	P	P	–	–	–	–	–
Black grouper	C	–	–	P	–	–	–	P	–	–	–	–	–	–
Hogfish	P	–	–	–	–	P	–	P	–	–	–	–	–	–
Nassau grouper	C	–	–	P	–	–	–	P	–	–	–	–	–	–
Red drum	–	–	–	–	–	P	–		P	–	P	–	–	–
Applications to shared (Gulf of Mexico Council and South Atlantic Council) FSSI stocks														
Goliath grouper	–	–	–	–	–	–	–	–	C	–	–	–	–	–
Dolphin	–	–	–	–	–	–	–	–	–	C	–	–	–	–
King mackerel - Gulf group	–	–	–	–	–	U	–	–	C	C	C	U	U	P
King Mackerel - Atlantic group	–	–	–	–	–	–	–	–	C	–	–	–	–	–
Spanish mackerel - Gulf	–	–	–	–	–	C	–	–	C	–	–	U	U	P

group														
Spanish mackerel - Atlantic group	–	–	–	–	–	–	–	–	C	–	–	–	–	–
Little tunny	–	–	–	–	–	P	–	–	–	C	–	–	–	–
Cobia	–	–	–	–	–	P	–	–	C	–	C	*	*	–
Yellowtail snapper	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Spiny lobster	–	–	–	–	–	–	–	P	–	–	–	–	–	–
Applications to South Atlantic Council FSSI stocks														
White Shrimp	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Rock Shrimp	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Brown Shrimp	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Pink Shrimp	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Vermilion Snapper	–	–	–	–	–	–	–	–	P	–	–	–	–	–
Red Snapper	–	–	–	–	–	–	–	–	P	–	–	–	–	–
Snowy Grouper	–	–	–	–	–	–	–	–	P	–	–	–	–	–
Tilefish	–	–	–	–	–	–	–	–	P	–	–	–	–	–
Red Grouper	–	–	–	–	–	–	–	–	P	–	–	–	–	–
Black Sea Bass	–	–	–	–	–	–	–	–	P	–	–	–	–	–
Gag	–	–	–	–	–	–	–	–	P	–	–	–	–	–
Greater Amberjack	–	–	–	–	–	–	–	–	P	–	–	–	–	–
Scamp	–	–	–	–	–	–	–	–	P	–	–	–	–	–
White Grunt	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Black Grouper	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Gray Triggerfish	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Hogfish	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Red Porgy	–	–	–	–	–	–	–	–	P	–	–	–	–	–
Speckled Hind	–	–	–	–	–	–	–	–	P	–	–	–	–	–
Warsaw Grouper	–	–	–	–	–	–	–	–	P	–	–	–	–	–
Wreckfish	–	–	–	–	–	–	–	–	P	–	–	–	–	–
Applications to HMS FSSI stocks														
Blue marlin - Atlantic	–	–	–	P	–	–	–	–	–	C	–	–	–	–
White marlin - Atlantic	–	–	–	P	–	–	–	–	–	C	–	–	–	–
Sailfish - Western Atlantic	–	–	–	P	–	–	–	–	–	C	–	–	–	–
Bigeye Tuna - Atlantic	–	–	–	P	–	–	–	–	–	C	–	–	–	–
Albacore - North Atlantic	–	–	–	P	–	–	–	–	–	C	–	–	–	–
Bluefin tuna - West Atlantic	–	–	–	U	–	–	–	–	–	C	–	–	–	–
Yellowfin tuna - Atlantic	–	–	–	P	–	–	–	–	–	C	–	–	–	–

Swordfish - North Atlantic	–	–	–	P	–	–	–	–	–	C	–	–	–	–
Sandbar shark	–	–	–	–	–	–	–	–	U	P	P	–	–	–
Gulf of Mexico blacktip shark	–	–	–	–	–	–	–	–	U	P	P	–	–	–
Atlantic blacktip shark	–	–	–	–	–	–	–	–	U	P	–	–	–	–
Large coastal shark complex	–	–	–	–	–	–	–	–	U	P	P	–	–	–
Finetooth shark	–	–	–	–	–	–	–	–	C	–	P	–	–	–
Atlantic sharpnose shark	–	–	–	–	–	–	–	–	U	–	P	U	U	U
Blacknose shark	–	–	–	–	–	–	–	–	U	–	P	–	–	–
Bonnethead shark	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Small coastal shark complex	–	–	–	–	–	–	–	–	U	–	P	U	U	U
Shortfin mako shark	–	–	–	–	–	–	–	–	–	P	–	–	–	–
Porbeagle Shark	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Blue shark	–	–	–	–	–	–	–	–	–	C	–	–	–	–
Dusky shark	–	–	–	–	–	–	–	–	P	P	–	–	–	–

Index Precision versus Sample Size, Range Expansions

The data obtained from the survey programs have been used in a number of stock assessments of FSSI stocks, primarily as indices of relative abundance. In most cases, the annual coefficients of variation (CV) are rather high, typically above 30% and often on the order of 50% or more. As a result, the statistical power of these surveys to detect changes in abundance from one assessment to the next is generally low. For this reason, SEDAR review panels and other stock assessment fora have consistently recommended substantial increases in sampling effort to enable managers to better determine the appropriate catch quotas and other management actions. As a general rule, the CV associated with a survey decreases in proportion to the square root of the sample size (see Figure 1). For example, if the goal were to reduce the CV from 40% to 20% (as would be desirable in any assessment), the number of samples would need to be quadrupled.

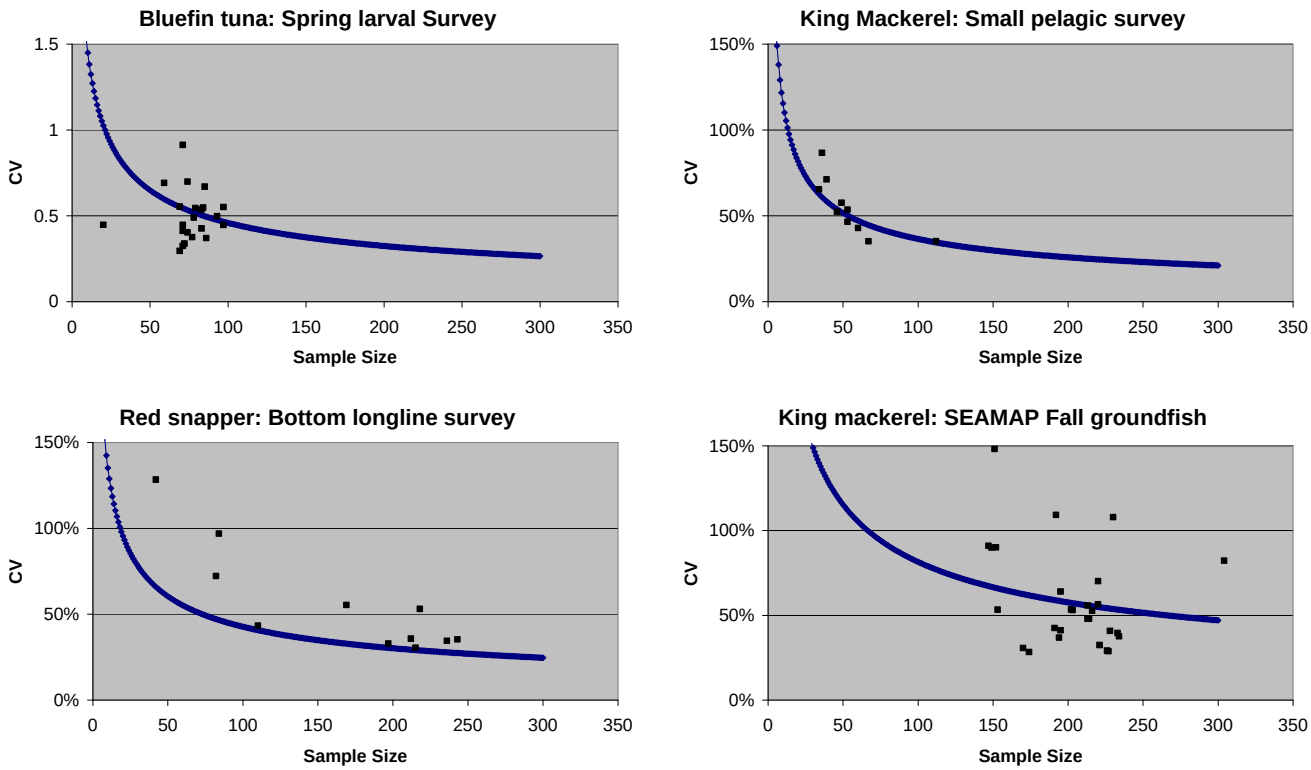

Figure1. Theoretical coefficients of variation (lines) and GLM estimated coefficients of variation (points) as a function of the number of samples for selected species and surveys. The theoretical and GLM estimates may differ in any particular year owing to the unbalanced sampling designs used for the various surveys.

Another concern of several SEDAR review panels has been the limited geographic coverage of several otherwise useful surveys. It was pointed out, for example, that the utility SEAMAP video/trap survey would benefit by expanding the coverage in southwest Florida and along the Texas coast, as well as further inshore. This is particularly true as stock assessments and fishery management plans increasingly move towards answering ecosystem-based management goals.

Several recent assessments have begun to use the size and age data collected from these surveys to help estimate the age composition of the surveyed population. These data are important because the only other sources of age composition come from highly variable fishery landings. Again however, the analyses have been hampered by insufficient samples.

4 Balance of resource surveys for time-series monitoring versus other activities

Annually, 483 DAS for NMAO vessels are planned for use through the MSL. Of these, slightly more than 85% are planned for time-series monitoring of resource abundance and about 15% for other activities (*e.g.* striped bass tagging, Oculina Bank surveys, *etc*.). Due to vessel limitations generally related to age and maintenance requirements of the presently available vessels or, at times, reprogramming of vessel time by NMAO, fewer than this number of DAS is generally realized. Attempts have been made to compensate for these lost DAS, but generally at the cost of other priority activities in the region. The Review Panel noted that recent changes in NMAO policy to no longer provide chartering of replacement vessels in the event of unavailability has, at times, severely limited the MSL from conducting time-series survey monitoring and thus negatively impacts our ability to conduct the Agency's resource stewardship mission.

In addition to the large vessel surveys addressed in this review, the MSL uses three small vessels (**R/V Gandy, R/V Caretta and R/V HST**) to conduct short- and long-term surveys that cannot be scheduled on the NOAA vessels due to DAS limitations in the NMAO fleet. In FY06 and FY07, these program vessels were used to support the reef fish video survey, Dauphin Island longline surveys, post-Katrina surveys, Panama City video surveys, Madison/Swanson MPA surveys, vertical longline (bandit rig) surveys of oil and gas platforms and BRD/TED testing. During FY06, a total of 272 DAS were completed on the program vessels and during FY07, 308 DAS were completed on the small vessels. In combination, currently the three program vessels account for more DAS per year than either of the NOAA vessels, and illustrate the demand for DAS on board NMAO vessels is not being met. The Panel noted with concern, the increasing trend in the use of small vessel DAS (approximately 60% of the small vessel DAS were used to support time-series data collections for monitoring resource abundance trends) for surveys needing large vessels, which, if continued, will likely jeopardize the time-series value of the available information sets.

The Panel noted a number of safety concerns and sampling inefficiencies introduced through substitution of small vessel DAS for surveys needing large vessel performance capabilities (due to limited duration at sea, greater risks during difficult weather conditions, small crew size limiting sampling to 12hr periods only, limited data collection capabilities, and limited offshore range, among others). Also of concern is the effect of changing platform for data collection on the consistency of the resulting time-series for resource abundance monitoring (see subsequent section in Intercalibration)

The MSL program vessels have no NMAO operation or maintenance budgets, and are supported out of MSL program dollars which mostly are 'contract' funds from other agencies. Staffing for the vessels (crew and scientists) also comes directly out of MSL program funds. Without funding to operate these vessels which is likely to be reduced without continuing 'contractural' interagency agreements, over one third of the MSL seagoing survey operations, including a substantial number of those DAS providing time-series resource trend data (Table 2), could not be accomplished.

5 Intercalibration

The FY 2010-2024 NOAA Ship recapitalization plan retains the *Oregon II* for continued support of SEFSC surveys until her replacement in FY 2015 by the shallow-draft FSV 5. *FSV Pisces* which comes online in FY 2009 will be used to conduct shrimp and HOBT trawl, longline, and plankton resource monitoring surveys. In order to retain the integrity of long term data bases it is critical that calibration be conducted between the *Oregon II* and the *Pisces* for shrimp/bottom fish trawl survey, and between the *Pisces* and *Gunte*r for pelagic trawl, longline, and plankton surveys. The *Oregon II* is experiencing frequent breakdowns and subsequent loss of DAS and is well past her designed operational life. The uncertainty of the operational capability of the *Oregon II* requires that intercalibration be conducted between the three vessels in order to provide capability to continue surveys with the *Pisces* and *Gordon Gunter* until the FSV 5 comes on line.

The SEAMAP shrimp and groundfish trawl surveys have been conducted using two vessels: the *Oregon II* and the *Gordon Gunter*. Calibration studies conducted over a three year period indicated no significant difference in fishing power between those two vessels. *Similar calibration studies for the shrimp and groundfish survey trawls using the Pisces and Oregon II must be conducted*, as is the current plan for the summer and fall of 2009. The current pelagic trawl survey has been conducted exclusively on the *Gordon Gunter*. However, future sampling may need be conducted using the *Pisces* and thus there is also a need to calibrate these two vessels for pelagic trawls should this survey be conducted on the *Pisces*.

The catch rates of the plankton surveys may also be somewhat dependent on the vessel used, but probably less so than for other gear types. The data used for current stock assessments has been collected using vessels *Oregon II, Gordon Gunter*, and *Chapman* as well several state vessels. To date, no attempt has been made to calibrate these.

The catch rates of the various long line surveys may in some circumstances also be dependent on the vessel used. The long lines themselves are relatively short (1 mile for bottom long lines) and therefore easily ported across vessels and, once in

place, fish independently of the vessel. For most vessels the retrieval rate is relatively constant and there is no reason to expect the observed catch rates to differ by vessel, if otherwise fished the same. In the case of the *Gordon Gunter* for example, the retrieval rate can be substantially slower and therefore, the soak time longer, than for the *Oregon II*, however the resulting catch rates were not significantly different. It is also possible that design features of the *Pisces* may alter retrieval time and potential for loss of catch prior to observation, therefore calibration studies are desirable.

The encounter rates of the taxa available to the reef fish video and summer oil-rig surveys are essentially independent of the type of vessel being used. In the case of the reef fish survey, cameras are lowered to fixed positions and then operate independently of the vessel. In the case of the oil-rig survey, baited hooks are dropped to the sea floor using heavy weights and then retrieved by electric reels. Accordingly, the only limitation relating to the vessel for either survey is the ability to deploy the gear in the appropriate location under prevailing sea conditions and there is no need for calibration.

b. Allocating DAS between competing requests for survey activities

A process for allocating DAS between competing requests for survey activities on board NMAO vessels within the SEFSC has been followed for a number of years. The following process is followed:

1. A letter is sent to the SEFSC Laboratory and Division Directors in January of each year requesting vessel requirements.

2. Based on responses to the request and in view of the current 10-year operating plan giving priority to maintenance of long-term databases, a vessel requirements plan for the following fiscal year is developed and sent to the SE Science Director for review/approval.

3. After review/approval, input to the NMAO NOAA-wide data call for vessel requirements is provided, fulfilling a requirement of the PPBES (Planning, Programming, Budget and Execution System) which currently contains a 5-year planning horizon, used within NOAA. The NMAO sends this data call to all identified vessel users, NMFS, NOS, other NOAA Centers, or any principal investigator that has used a NOAA Vessel. The information requested for this data call: SURVEY, TIME FRAME, AREA OF OPERATIONS, DAS, PI, VESSEL REQUIRED, LEGISLATIVE MANDATES, IMPACTS IF NOT CONDUCTED, ETC. In February 2007, NMAO posted a data call for FY10-14 and completion of PPBES documentation for FY08-FY10. The FY08 vessel allocation plan is shown as Figure 2, below.

4. Change to the DAS/operational requirements in the PPBES documentation requires Fleet Allocation Council (FAC)[3] approval, imposing a degree of inflexibility that makes reallocations difficult over a 5-year planning horizon.

The Panel considered that in view of the ageing of the fleet and resulting difficulty in accessing DAS for priority surveys in the region, mechanisms to introduce greater flexibility in the 5-year ship use plans should be considered. Additionally, the Panel endorsed the concept that requests for NMAO ship time from SEFSC programs follow the single point of contact structure established and outlined above (it was noted that at some times in the past, this process was circumvented by direct response from investigators to the NMAO data call).

[3] Comprised of representation from NESDIS, NMFS, NOS, NWS, and OAR

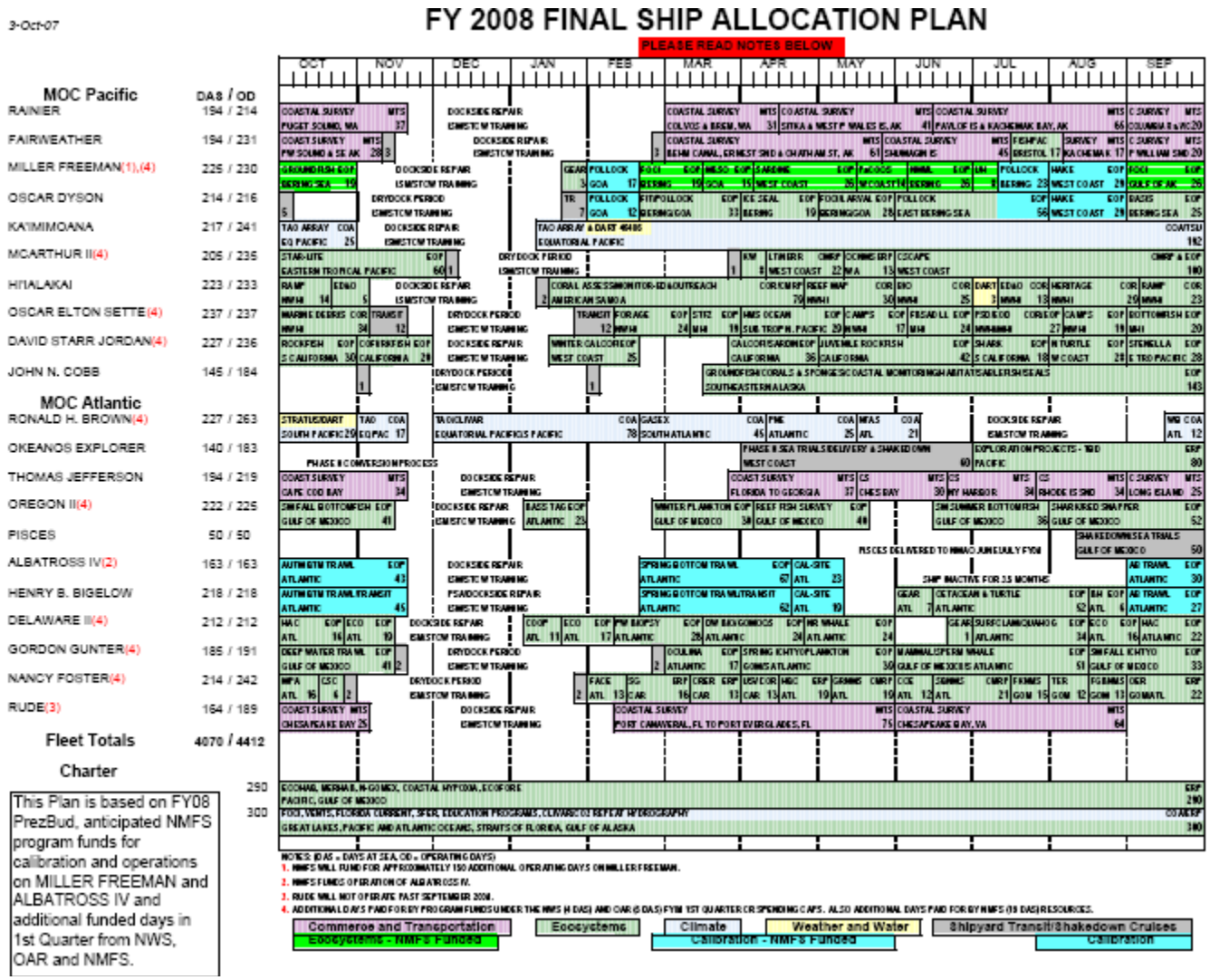

Figure 2. FY08 NMAO ship allocation plan available at http://www.omao.noaa.gov/08shipallocation.html.

4. Recommendations

While the current MSL Resource Surveys are critical to stock assessments conducted in support of the agency's mission, there are a number of improvements that should be undertaken to make the current survey data collections of higher utility in a broader range of stock assessments. These improvements include 1) further data base exploration and analysis to extract resource abundance signals for a wider range of stocks from the available data, 2) spatial and temporal expansion of some survey effort to provide improved precision in the measures taken, 3) increased basic research into methods for improving species identifications (*e.g.* genetics based methods for eggs and larvae) and into remotely sensed methodologies to collect size and age of the samples obtained, 4) appropriate intercalibration studies to assure the time-series consistency of the data bases are maintained as older vessels are replaced, and 5) improvements in data base (and specimen samples) archival to make sure the time-series continue to be available for future generations of stock assessments and to meet the resource stewardship responsibilities of the agency.

Next Steps

1. Broader involvement of SEFSC stock assessment scientists into SEAMAP/MARMAP annual program reviews and working groups which design and implement sampling surveys should be required to improve the utility of future data collections. This becomes increasingly important as increased resources for survey activities appear to have been "permanently" added to budgets.

2. As soon as possible, funds to complete the plankton sorting tasks for the 2007 surveys samples should be allocated for this work.

3. Planning for alternative and less costly means of plankton sorting should be initiated with the anticipation of changing to an alternative as early as next year.

4. Further data base exploration and analysis to extract resource abundance signals for a wider range of stocks from the available data should be initiated for stocks/surveys listed as "P" in Table 2.

5. Initiate intercalibration studies for vessels likely to be used in trawl surveys as soon as possible in order to avoid loss of time-series consistency.

6. Integration of the MSL survey data to the ORACLE platform needs to be completed. This should continue to be pursued aggressively. The option to create an additional permanent NMFS FTE position for a database manager may be more effective than trying to achieve the database migration through a contractor.

7. Assure adequate, secure archival of both digital data and specimen materials collected on surveys.

Longer Term

1. Efforts to recover data from the exploratory trawl surveys and incorporate them into the databases need to be undertaken.

2. Evaluate cost/benefit tradeoffs for improving survey precision through increased sample coverage in time/space for the stocks/surveys listed as "C" in Table 2.

    a. The Panel recommends increasing sampling intensity and expansion (further inshore and further into Atlantic waters) of the bottom longline survey. Collaboration with the NEFSC Apex Predator Program which conducts shark longline surveys may be warranted.

    b. In order to meet MMPA obligations, the Panel recommends the planned Marine Mammal sampling level be implemented.

    c. Expansion of effort (time and space) for the small pelagic survey are warranted and the Panel recommends such.

    d. The reef fish video/trap survey could be considerably improved by increasing the sampling frame, especially along the Florida shelf and should be pursued. This would require more detailed bathymetric information on reef structure than is currently available.

3. Increase research into genetic techniques for egg/larvae identification.

4. Develop techniques for collecting size/age information from reef fish surveys.

5. In view of the ageing of the fleet and resulting difficulty in accessing DAS for priority surveys in the region, consider mechanisms to introduce greater flexibility in the 5-year ship use plans.

Report Adoption and Closure

The Review Panel greatly appreciated the effort extended by the MSL and congratulated the staff on their work and preparations for the review. An initial draft of the report was constructed at the Panel meeting and was subsequently adopted through correspondence.