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J Macerda  
5/2/06

## COMPLETION REPORT

**Project Title:** Fishery Independent Scup Survey of Selected Areas in Southern New England Waters (SNE)

**Project number:** 03-RSA-001

**Grant Number:** NA04NMF4540070

**Project period:** 5/1/04 – 11/30/04

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## **(1) Brief summary of the completion report**

Unvented scup pots were fished on six hard bottom areas in Southern New England (SNE) waters during the summer of 2004. A total of 2341 scup were captured in the unvented pots. The length frequency distribution of the catch was recorded. Mean length of scup between the sampling stations ranged from 24.4 to 28.5 and a significant difference was found between certain stations. Results were compared to the National Marine Fisheries Service (NMFS) 2004 spring and fall trawl data and the Rhode Island Department of Environmental Management (RIDEM) 2004 trawl survey (spring and fall combined). The proportion of older scup (ages 3+) was higher for the pot survey than for the trawl surveys with a greater than 10 fold difference. The results of the analysis implies that the trawl gear is not adequately sampling the older, larger scup and therefore not characterizing the size structure of the scup population as a whole. In the future, the population assessments might be improved by supplementing the traditional trawl data with data from an unvented pot survey.

## **(2) Description of the issue/problem that was addressed**

This project was designed to collect data on scup, which inhabit the hard bottom areas in SNE, and compare the length frequency distribution of the unvented fish pots to the catch in the NMFS trawl survey and the state (RIDEM) trawl survey. This project was initiated because of the major uncertainties noted in the 2002 scup assessment. Specifically, the 2002 scup assessment noted that the current level of sampling, and general lack of information on scup, impedes the development of an analytical assessment of the population. In particular, the lack of older animals in the NMFS survey is a major source of uncertainty in evaluating the status of the population and hinders the development of mortality estimates.

The 35<sup>th</sup> Stock Assessment Workshop (SAW) Report noted major uncertainties in the 2002 scup assessment and recommended the development of alternative sampling methodologies to characterize the population. The major deficiencies relate to the following:

- “Increased and more representative sea and port sampling of the various fisheries in which scup are landed and discarded is needed to adequately characterize length composition of both landings and discards. The current level of sampling, particularly of discards, particularly impedes the development of analytical assessments and forecasts of catch and stock biomass for this stock” (NEFSC 2002).
- “Several previous SARC panels (SAW 25, 27 and 31) have concluded that new or enhanced data reporting or sampling are required to produce a reliable assessment. Members of the 35<sup>th</sup> Stock Assessment Review Committee emphasized that an analytical formulation for scup will not be feasible until the quality and quantity of the input data ( biological sampling and all components of catches) are significantly improved for and adequate time series” (NEFSC 2002).
- “Fishing mortality could not be estimated on older animals because they’re currently absent from the NMFS spring and autumn surveys” (NEFSC 2000).

Scup associate with bottom structure for a major part of the year and are therefore unavailable to

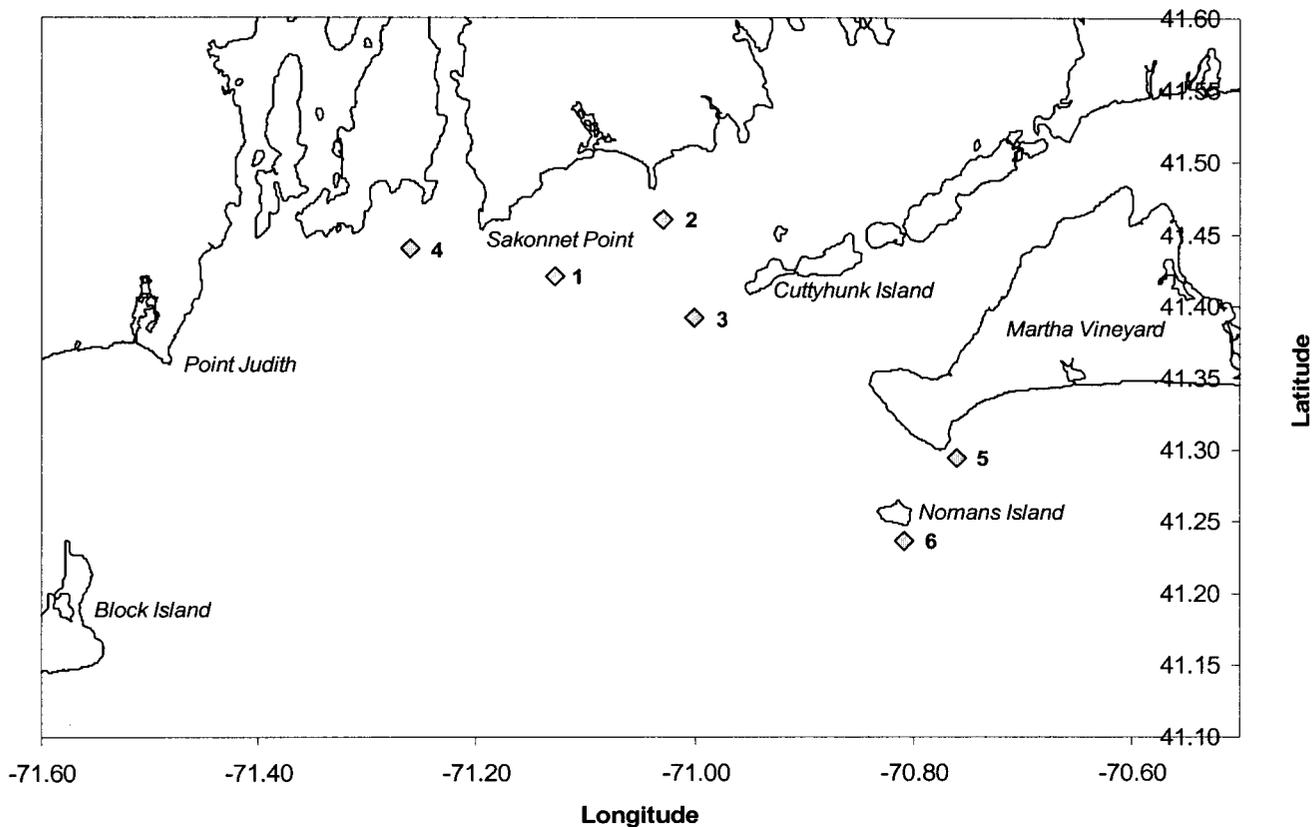
traditional bottom trawl gear, particularly during the early spring, summer, and fall months. Since existing State and Federal research vessels, which rely on bottom trawls as their primary collection method, sample only fishable grounds they do not survey hard bottom areas which constitute the majority of summer inshore habitat of scup. All of the sampling sites in this study are on rocky substrate and are located a considerable distance offshore, where there is little or no scup pot fishery and no active trawl fisheries. Due to the distance from coastal ports, in combination with low trip limits, these study areas are fished infrequently, if at all. In addition, the sampling locations are in close proximity to deep water which may attract and hold larger scup.

Since scup inhabit a narrow geographic range (New York to Southeastern Massachusetts) during the summer months, it may be possible to implement a fishery independent survey of hard bottom areas to better characterize the size composition of the population, or further supplement and complement the existing state and federal sampling program. The scientific benefits of this program will allow state and federal assessment scientists to assess the merit of deploying a more comprehensive hard bottom sampling program in the future to supplement existing assessment sources. If this technique proves useful, it may substantially improve the current and future understanding of the scup resource. In addition, sampling in offshore areas may result in the collection of larger fish which are currently absent from the NMFS survey.

### **(3) Detailed description of methods of data collection and analyses**

The project was designed to be a fishery independent survey of six rocky bottom areas in SNE. At the beginning of the project, the research vessel fished at each collection site in order to focus the sampling activity on areas with a high abundance of scup. The selection sites generally corresponded to the following:

Number	Description	Coordinates
1	South of Sakonnet Point, R. I. (most likely inner Mayo Ledge or Elisha Ledge)	14325/43953
2	Western end of Buzzards Bay (most likely south of Old Cock rock or in the proximity of Buzzards Bay Tower)	14280/43960
3	West of Sow and Pigs reef off Cuttyhunk Island	14285/43930
4	Cormorant Reef (South of Newport)	14370/43973
5	West or south of Squibnocket Point on Martha Vineyard Island	14220/43870
6	West or south of Nomans Island	14250/43850



### *Fieldwork*

Scup were collected from each site utilizing standard fish pots (2 x 2 x 2 foot) made with 1½ x 1½ inch coated wire mesh with double entry wire heads. Pots were unvented, in order to retain all size classes of scup. The sampling protocol required the commercial vessel to take 15 pots to each sampling site once during each three week sampling cycle. Pots were baited with clams, which fish very quickly, and set on the sampling site, as single pots. A one hour soak time was employed. The date, area, depth, and catch were recorded and all scup captured were measured. After recording the catch in each pot, the gear was rebaited and reset within 200 yards of the original site. Thereafter, traps were re-hauled following the same protocol, thus there were a total of 30 trap hauls on each sample site once each cycle. At the conclusion of each days sampling, pots were placed on the vessel for transport back to port. Sampling was conducted beginning May 26<sup>th</sup> and continuing until November 2<sup>nd</sup>, 2004. Stations 1 to 4 were sampled for 7 cycles, whereas stations 5 and 6 were sampled for 4 cycles finishing at the end of September.

### *Analysis*

The mean lengths between the six sampling stations were compared using a one-way analysis of variance (GLM procedure, SAS 8, 1994). If a significant difference among means was found, the Duncan multiple range test was applied to determine where significant differences were observed.

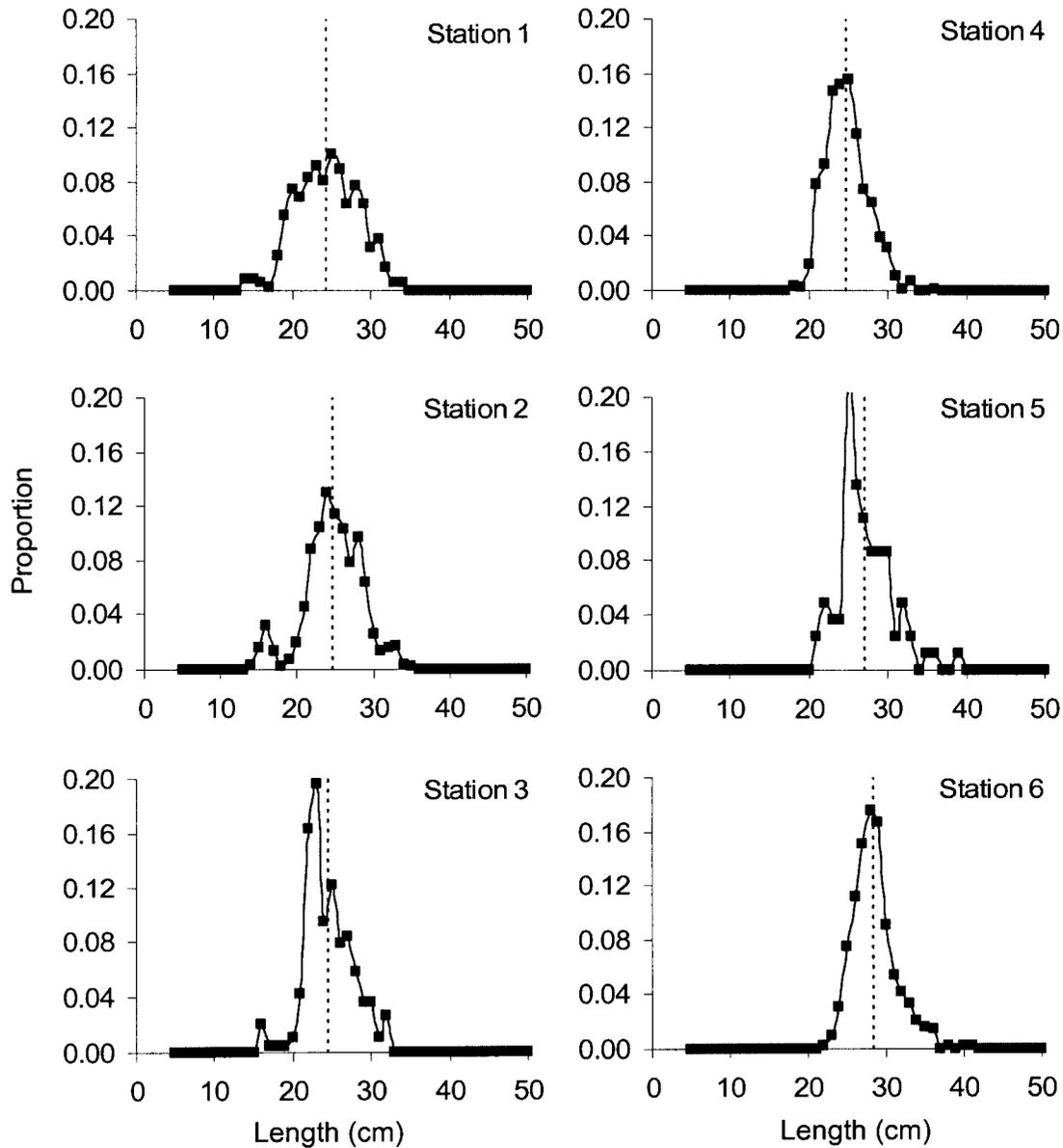
Mean number of scup at age was calculated using a known age matrix for the most recent year available (2003), obtained from the RIDEM. The average number of scup at age sampled at each of the 6 stations by length was calculated to obtain a mean frequency for all stations sampled which was then converted to proportions.

Given considerations to the remarkable representation of existing population of the sampling method used in this survey, we used the size structure of pooled samples and computed total mortality based on catch curve analysis. The catch matrix was standardized in catch per unit of effort for the period of the study from May to November 2005, where natural mortality was assumed  $M=0.2$ . The CPUE<sub>i</sub> at length were converted into CPUE<sub>i</sub> at age using the NMFS trawl survey Age-Length-Keys. A linear regression was calculated for the descending limb of the curve for ages 3-7, 3-6, 3-5.

#### **(4) Discussion of results and any relevant conclusions**

The project resulted in the collection of fishery independent data on the scup population during the summer months when they are on hard bottom and unavailable to existing NMFS and state survey gear.

A total of 2341 scup were measured. Numbers of scup measured at each station ranged from 81 to 734 scup with an average of 390 fish per station. Size of scup sampled ranged from 14 to 41 cm. Mean length was all scup measured was 25.7 and ranged between stations from 24.4 to 28.5 cm (Figure 1).



**Figure 1. Length frequency distributions for scup at six sampling stations (dashed line represents mean length).**

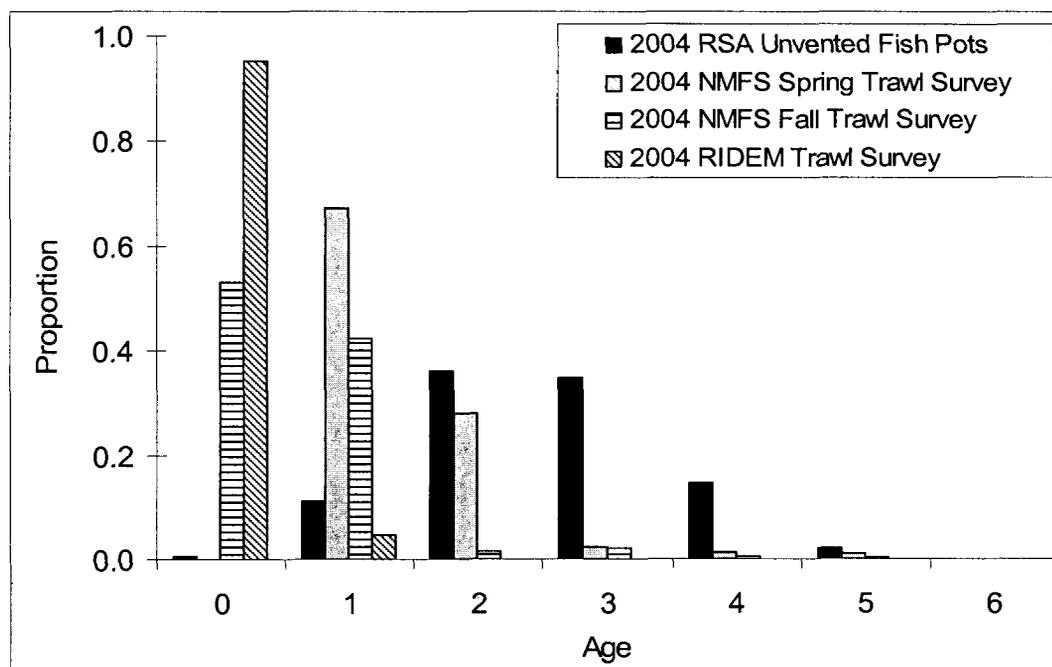
There was a significant effect of station on length of scup (Table 1). Results from the post-hoc Duncan comparison revealed that stations 1 to 4 had no significant difference in mean length of scup; however, stations 5 and 6 were significantly different from all other stations.

**Table 1. Calculation of analysis of variance for the six sampling stations with Duncan post-hoc comparisons.**

Source	DF	Sum of Squares	Mean Square	F-value	p
Station	5	5846.23	1169.25	112.70	<.0001
Error	2335	24224.58	10.37		

Duncan grouping	Mean	N	Station
A	28.48	484	6
B	27.16	81	5
C	24.78	506	2
C	24.74	734	4
C	24.50	189	3
C	24.37	347	1

Proportion at age for the six stations sampled by fish pots was compared to the 2004 NMFS – Northeast Fisheries Science Center (NEFSC) spring and fall trawl survey and 2004 RIDEM trawl survey (spring and fall combined) (Figure 2).



**Figure 2. Proportion of scup at age for unvented pots (2004 RSA), NEFSC 2004 spring and fall trawl survey, and RIDEM 2004 trawl survey.**

The proportion of age 3+ scup was 0.52 for the pots, whereas, for the NMFS – NEFSC trawl surveys

it was 0.047 and 0.029 for the spring and fall, respectively. For the RIDEM 2004 trawl survey, the proportion of age 3+ scup was 0.0008. This analysis strongly implies that traditional trawl gear is not adequately sampling the older, larger scup and therefore not characterizing the size structure of the population as a whole.

Results of the catch curve analysis showed a moderate to high fishing mortality varying from 0.15 to 1.0 depending on the selection of the age group. Unfortunately, there is no completely appropriate statistical procedure for determining the age groups and accounting for source of errors such as recruitment and natural mortality. A non-linear multiplicative model approach ( $C=a * exp(b*age)+u$ ) and other semi-log models can be considered and compared. We did not consider these models with sensitivity analysis.

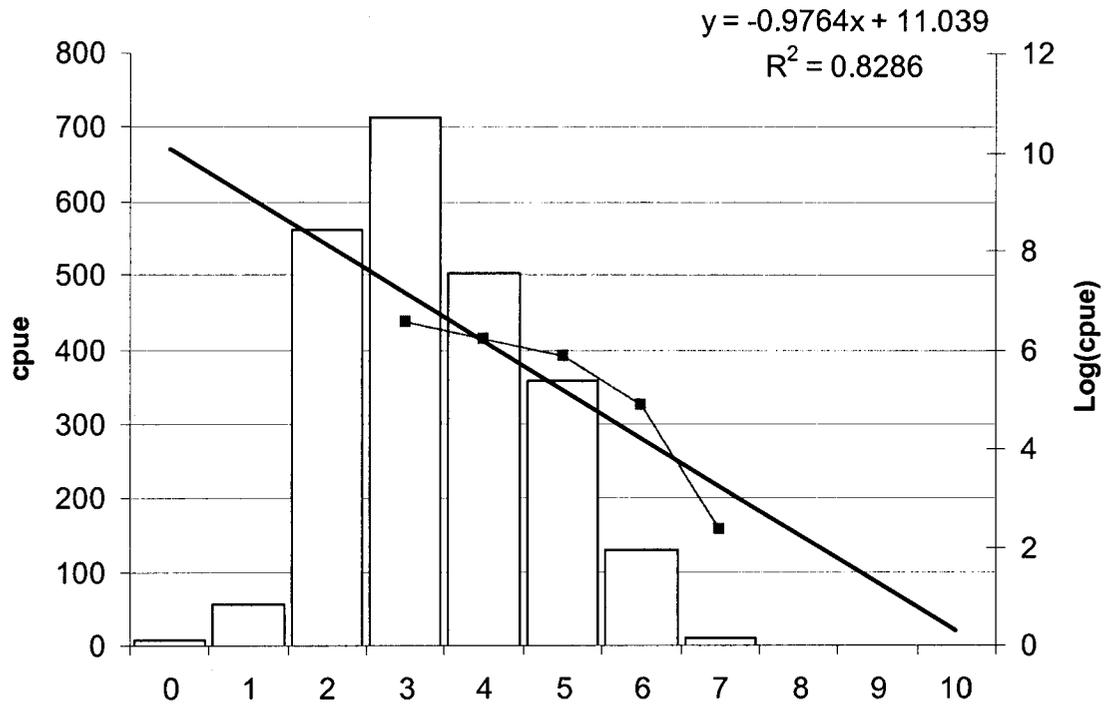


Figure 2. Catch curve analysis for scup pot survey ages 3-7.

Future assessments of the population might be improved by developing a composite index based on the traditional trawl data in combination with data from an unvented pot survey. This study is ongoing and continued in 2005 and sampling is scheduled to begin in May of 2006. Therefore, these results are preliminary and final conclusions would be premature. Data will be combined with the 2005 study and submitted in the final report for that project, and all 3 years will be reported in the 2006 report. The potential benefits of this approach should become more apparent as we evaluate the results of future ventless pot studies.

**(5) List of entities, firms, or organizations that actually performed the work and a description of how the work was accomplished**

The field research was conducted by Charles Borden on the F/V *Long Haul*. This work was accomplished through the methodology described in part (3) under *Fieldwork*.

The University of Rhode Island – Rhode Island Sea Grant submitted the appropriate paperwork, conducted data input and analysis, and was in charge of preparation and submission of the reports.

**(6) Detailed final accounting of all funds used to conduct fish research, including those provided through the research set-aside.**

Proposed budget:

Fish allocated to the project:

40,000 lbs of scup @ \$.50	\$20,000
12,292 lbs of sea bass @ \$1.40	\$17,210

Total funding allocated to the project	\$37,210
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Funding received from sale of fish by all vessels:

31,193 lbs of scup @ \$1.21	\$38,193
4,446 lbs of sea bass @ \$2.23	\$ 9,915

<b>Total funding received</b>	<b>\$48,108</b>
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The price for scup ranged from \$.35 to \$ 1.66 per pound.

The price for sea bass ranged from \$ 1.40 to \$ 3.00 per pound.

Project activity:

A total of 39 days (27 survey, 2 search, and 10 compensation days) were projected to be required to complete the project and compensation days fishing. In the end, 59 days (17 survey, 6 search, and 36 compensation days) were required to complete the task. The vessels participating in the project were unable to harvest 16,327 lbs of fish allocated for the project due to a lack of fish in the project area. However, the lack of fish increased the price per lb received by the vessels. In addition, the lack of fish in the area enabled the participating vessels to broker the fish to different dealers in order to maximize the price per pound. However, the lack of fish caused the project to incur additional expense, by increasing the number of compensation and search days.

Actual Project expenses:

17 survey days @ \$890 per day	Total cost: \$ 15,130
6 search days @ \$890	Total cost: \$ 5,340
36 compensation-fishing days @ \$890, F/V Long Haul only	Total cost \$ 32,040
Cost of 19 days of compensation fishing by F/V Granville Davis	Total cost: \$ 18,097

Note: The F/V Grandville Davis did not charge a daily fee for compensation fishing but retained 50% of the sale value of each trip. NMFS paid this vessel a charter fee of \$1,730 per day for another project in 2003.

URI fee	Total cost: \$ 2,500
	<b>Total cost of project: \$ 73,107</b>

Actual Funds received by each participant:

URI	\$ 2,500
F/V Grandville Davis	\$18,097
F/V Long Haul	\$27,511
<b>Total</b>	<b>\$48,108</b>

**REFERENCES**

- NEFSC. 2000. Report of the 31<sup>st</sup> Northeast Regional Stock Assessment Workshop (31<sup>st</sup> SAW): Stock Assessment Review Committee (SARC) Consensus Summary of Assessments. Northeast Fisheries Science Center Ref. Doc. No. 00-15, Woods Hole, MA. 400 pp.
- NEFSC. 2002. Report of the 35<sup>th</sup> Northeast Regional Stock Assessment Workshop (35<sup>th</sup> SAW): Stock Assessment Review Committee (SARC) Consensus Summary of Assessments. Northeast Fisheries Science Center Ref. Doc. No. 02-14, Woods Hole, MA. 259 pp.
- SAS Institute. 1994. SAS/STAT user's guide. Volume 2, GLM-VARCOMP. Fourth Edition. SAS Institute Inc. New York. 1686 pp.