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REPORT OF THE SIXTH NEFC STOCK ASSESSMENT WORKSHOP (SIXTH SAW)

☑ APPROVED FOR DISTRIBUTION

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(APPROVING OFFICIAL)

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1. INTRODUCTION

1.1. OVERVIEW

The Sixth Stock Assessment Workshop was held at the Northeast Fisheries Center, Woods Hole, MA in the Aquarium Conference Room from May 3 to May 5, 1988. The workshop had the same general goals as previous ones. The reports of these workshops serve as the best available advice on the status of the stocks and are reviewed for use by groups with fishery management responsibilities. The special topics and working groups provide valuable information to interested user groups. The annual document "Status of the Fishery Resources off the Northeastern United States" provides a more general description of the status of each of the stocks in this region. In the present report, a source document is identified for each assessment where available for further information.

1.2. REVIEW OF TERMS OF REFERENCE

The participants in the previous SAW recommended several terms of reference for the Sixth SAW (NEFC 1987a). These recommendations have been adjusted slightly since the last SAW to reflect changes in timing and priorities; the final terms of reference are listed next.

1.2.1. Management Terms of Reference

1. Review the status of butterfish, Loligo squid, and Illex squid stocks.

2. Report on preliminary summer flounder and bluefish work.

3. Review scallop work in the New England and Mid-Atlantic regions.

4. Report on methods for measuring long-term potential catch.

1.2.2. Scientific Terms of Reference

1. Review methods of assessing the impact of density-dependent processes on mackerel and assessment advice.

2. Report on recent work on black sea bass, American shad, and juvenile cod.

3. Report on working group discussions on sea sampling, the port agent interview system, and winter flounder.

4. Review working group reports on research needs.

1.2.3. Generation of Stock Assessment Information

1. Develop terms of reference for the Seventh SAW.

1.3. IDENTIFICATION OF WORKING PAPERS

Several working papers were distributed to participants, as listed in Appendix 1. These are cited as WP#-SAW6, indicating Working Paper (WP) number (#) for the Sixth SAW. Some papers were distributed that had been prepared for other purposes, but were relevant to workshop discussions. These are not considered published and should not be cited without the author's permission.

1.4. REVISION AND ADOPTION OF AGENDA

A revised agenda was distributed reflecting adjustments made since the first draft agenda was made available in March. It is included as Appendix 2 of this report. A few modifications of this agenda occurred during the meeting, such as moving a scheduled talk to a different time, to accommodate participant schedules.

2. MID-ATLANTIC FISHERY RESOURCES

2.1. REPORT OF PRELIMINARY SUMMER FLOUNDER WORK

2.1.1. Report

A preliminary analysis of the factors affecting commercial catch per unit effort (CPUE) was presented. Standardized CPUE indices from the recreational fishery are also being developed, but this work is not yet complete. A generalized linear model (GLM) was employed to standardize CPUE data from the NEFC commercial weigh-out database. The linear model used for effort standardization incorporated year, tonnage class, and season effects as follows:

$$\ln(CPUE) = a + [B_j X_j] + e$$

where a = intercept estimate
B_j = model parameter estimates in logarithmic units for category j (tonnage class, season, and year)
X_j = indicator variable (=1 when category j occurs; = 0 when category j does not occur)
e = error term

2.1.2. Discussion

The percentage of the total summer flounder landings covered by the NEFC database increased markedly over time, as landings statistics from other states were added to the system. Prior to 1978, as much as 80% of the summer flounder landings may have been taken in states or by gears not included in the weigh-out system. If the NEFC catch and effort data are representative of the fishery as a whole, standardized CPUE indices developed from these data may be a useful index of summer flounder abundance. It was suggested that since the GLM approach is being used to standardize CPUE, the "representativeness" of the NEFC data should be tested by considering the frequency of significant area effects in recent years compared to the number in years prior to 1978.

It was noted that some of the changes in the fishery's characteristics, such as the increasing proportion of larger vessels in recent years and change in seasonal distribution of the landings, may be caused to some extent by the incorporation of additional states into the database in recent years. However, it was felt that the overall trend of increasing vessel size was valid, particularly the increase in tonnage class 3 vessels.

Analysis of variance (ANOVA) testing of the summer flounder data indicated fewer significant main effects and interactions (tested at the 1% level) than similar analyses on other species (O'Brien and Mayo 1984). Part of the reason for fewer significant effects in this case may be that there is little data for earlier years for many of the factors in the annual ANOVA. It was suggested that relaxing the testing criteria to the 5% level may be more appropriate, given that summer flounder sample size is much smaller.

The trend in standardized CPUE from the GLM analysis does not correspond well with the trend in catch per tow from the NEFC survey data. Several possible explanations were offered.

1. The survey tends to take a larger proportion of younger fish than the commercial fishery. This may account for a mismatch of about one year, but not enough to reconcile the differences.

2. The incorporation of interaction terms into the final GLM should provide a better fitting model and may be worth pursuing.

3. Investigation of the differences in trend of the year-effect term and the standardized CPUE from the GLM may provide additional insight.

4. Qualitative differences in the databases over time may not be reflected in the current model structure.

Because the issues are an integral part of an FMP trigger mechanism for summer flounder, it was suggested that a working group be established.

2.2. UPDATED BUTTERFISH ASSESSMENT

Source Document: Waring, G.T. and E. Anderson. 1983. Status of the Northwestern Atlantic Butterfish Stock - 1983. NMFS, NEFC, Lab. Ref. Doc. No. 83-91. 39pp; Report of the Fourth NEFC SAW. 1987. Woods Hole Lab. Ref. Doc. No. 87-07. 102pp.

2.2.1. Status of the Resource

Commercial Fishery

The total international catch of butterfish declined 2% from 4,582 mt in 1986 to 4,508 mt in 1987 (Table 2.2.1). The distant water fleet (DWF) catch declined from 164 mt in 1986 to less than 1 mt in 1987. This decline resulted from the low TALFF. USA catches increased slightly from 4,418 mt in 1986 to 4,508 mt in 1987. Since 1985, increased catch of smaller butterfish, coupled with decreased abundance of larger butterfish resulted in overall stability of the domestic landings. Strong market conditions and decreased availability of larger-sized butterfish on the traditional southern New England fishing grounds resulted in movement of freezer/trawlers into the Gulf of Mexico to fish gulf butterfish, *Peprilus burti* in winter 1988.

Discard rates of small butterfish in the domestic fishery during 1987 declined dramatically compared to rates reported in the early 1980s (less than 10% compared to 40 to 70% by weight of the landed catch). This decline is primarily due to a new market category, super super small (SSS) butterfish, and a good bait market for previously discarded fish.

Total landings (L), landings per unit effort (LPUE), and effort (f) increased 85%, 17%, and 57%, respectively, over 1986 levels during the January to June period (Table 2.2.2); whereas, during the July to December period

(LPUE), (L), and (f) were 52%, 20%, and 40% below 1986 levels, respectively. This decline may be attributable to unusually cool 1987 autumn bottom temperatures in offshore southern New England waters that may have changed the autumn distribution of butterfish to areas not fished by the domestic fleet.

Survey Abundance Indices

Indices of relative abundance and biomass (number and weight) from the NMFS, NEFC 1987 bottom trawl survey declined 36% and 31%, respectively from 1986 values (Table 2.2.3). Likewise, the recruitment index (number per tow at age 0) and the age 1+ index declined 44% and 12%, respectively (Table 2.2.3). The 1987 indices are similar to 1982 values (Table 2.2.3), and the recruitment (78.6) index is the lowest observed since 1977 (47.7). Also, the 1987 recruitment (78.6), age 1+ (39.0), and biomass (4.7 kg) indices are 46%, 13%, and 33%, respectively, below the 19-year (1968-86) averages (144.4, 45.2, and 7.0). The decline in age 1+ abundance is largely attributed to declines in age 2 and older fish (Table 2.2.4). No age 4 were fish were taken in 1987.

Indices of relative abundance (number and weight) for all regions combined from the Massachusetts 1987 inshore bottom trawl survey declined 99.8% and 87.8%, respectively from 1986 values (Table 2.2.4). In addition, 1987 average bottom temperatures in most sampling strata were lower than values recorded from 1978 to 1986. Overall, however, Massachusetts 1978-87 indices do not exhibit the same yearly trends as seen in NEFC data (Figure 2.2.1).

A marked decline in abundance of large butterfish (>20 cm) was also noted in 1987 Connecticut summer surveys in Long Island Sound (D. Simpson, pers. comm). Indices of relative abundance from Connecticut surveys (Figure 2.2.1) follow yearly trends seen in the NEFC 1984-87 data.

Total Mortality

Total instantaneous mortality (Z) rates between ages 0/1, and 1/2 declined 34% and 27% respectively, from 1985-86 to 1986-87 levels (Table 2.2.5); while between ages 2/3, Z increased by 111%. The mean Zs between ages 0/1 and 1/2 from 1978-87 are less than the corresponding values for the previous 10 years (1968-77) (Table 2.2.5). Meanwhile, the Z between ages 2/3 is slightly higher in the more recent time period.

Summary

Although the 1987 NEFC survey abundance indices are the lowest observed since 1983, they are generally greater than 1968-76 levels when total butterfish catches were high (6,500-19,500 mt). This suggests that sufficient fish are available to support a catch up to the maximum currently allowed by the FMP (16,000 mt). However, partial recruitment factors used in yield per recruit analyses that established MSY (Murawski and Waring 1979) may not be appropriate under current fishing practices. The spatial and seasonal nature of that fishery was different than the current USA fishery, and super super

small (SSS) market size fish were not taken then. The domestic fishery has been conducted principally in autumn in southern New England waters (Waring 1986), but the pre-1977 DWF fleets harvested butterfish throughout its range.

The dramatic decline in 1987 Massachusetts butterfish indices may be attributable to cooler than normal bottom temperatures in deeper strata. Since these coastal waters are at the northern end of the butterfish range, cooler than normal waters may keep the butterfish offshore. Butterfish catches in NEFC inshore sampling strata between Delaware Bay and Cape Cod were at record low levels in 1987.

High discard rates that beset the fishery over the past several years ceased as new markets developed for previously unmarketed sizes. Presently, the butterfish market remains strong and landings can be expected to remain at or above 1987 levels.

The decline in mean Z between ages 1/2 fish since 1978 probably reflects the decline in total DWF fishing mortality. The DWF fishery on butterfish was conducted principally in winter, thus affecting recruitment of age 1 fish. The mean Zs between ages 0/1 for the two time periods are nearly identical implying that current domestic fishing mortality rates are equivalent to historical DWF levels, assuming natural mortality, M=0.8, has remained constant over time. However, the decline in Z between ages 0/1 from 1986-87 may be attributed to fewer discards in autumn 1986. The similarity in the Zs between ages 2/3 fish probably reflects market preference and thus directed effort on larger fish.

2.2.2. Discussion

The possible relationship between record low 1987 survey indices and cooler than average bottom temperatures was discussed. It was suggested that cool water may have affected the vertical distribution of butterfish, thus making them unavailable to bottom trawls.

Concerns were raised about estimates of total mortality (Z). It was noted that Z decreased between ages 0/1 and 1/2, coinciding with new market categories for small butterfish that were previously discarded. It was pointed out that the increased landings under the new market categories were lower than discard rates reported in the early 1980s. The increase in Z between ages 2 and 3 raised questions on the relationship between F and effort (f) on the older age groups. It was noted that higher mortality on older age groups may be associated with low availability. Also, mean Zs for older fish are not as robust, therefore you cannot put much faith in these estimates. Finally, it was noted that current estimates of the F component of Z are below F_{max}.

Table 2.2.1. Nominal catch (mt) of butterfish from Northwest Atlantic Fisheries Organization (NAFO) Subareas 5 and 6, 1965-1987

YEAR	US	FOREIGN	NOMINAL CATCH	ADJUSTED NOMINAL CATCH[1]
1965	3,340	749	4,089	4,089
1966	2,615	3,865	6,480	6,480
1967	2,452	2,316	4,768	4,768
1968	1,804	5,437	7,241	7,241
1969	2,438	15,073	17,511	17,816
1970	1,869	9,028	10,897	14,319
1971	1,570	6,238	7,853	10,483
1972	819	5,671	6,490	13,040
1973	1,557	17,847	19,454	33,236
1974	2,528	10,337	12,865	17,993
1975	2,088	9,077	11,165	14,852
1976	1,528	10,353	11,881	16,249
1977	1,448	3,205	4,653	4,760
1978	3,676	1,326	5,002	5,375
1979	2,831	840	3,671	3,938
1980	5,356	879	6,235	6,748
1981	4,855	936	5,791	6,255
1982	9,060	631	9,691	10,483
1983	4,905	630	5,535	6,816
1984	11,972	429	12,401	16,854
1985	4,739	804	5,543	7,969
1986	4,418	164	4,582	6,166
1987[2]	4,508	-	4,508	4,508

[1] Adjusted to account for non-reported discards of countries not reporting butterfish from directed Loligo fishing operations Murawski and Waring, 1979). The 1976-1986 adjusted catch incorporate estimated discards in US fishery.

[2] Provisional

Table 2.2.2. International landings (L), USA LPUE (mt/day), and international effort (f) expressed as equivalent USA days fished

	Jan-Jun			Jul-Dec		
Year	L	LPUE	f	L	LPUE	f
1976	10164.7	2.20	4620.3	1716.3	3.69	465.1
1977	3182.4	7.66	415.5	1470.6	5.05	291.2
1978	1549.5	8.83	175.5	3452.5	8.64	399.6
1979	1562.4	7.64	204.5	2108.6	6.12	344.5
1980	1491.4	6.79	219.6	4743.6	13.05	363.5
1981	2090.2	14.16	147.6	3700.8	11.85	321.3
1982	2199.9	13.12	167.7	7490.8	22.59	331.6
1983	1467.6	12.79	115.5	4067.7	13.39	303.7
1984	6763.6	40.33	167.7	5637.4	20.91	269.6
1985	3523.5	16.07	219.3	2019.0	11.51	175.4
1986	1685.2	17.40	96.9	2896.8	17.06	169.8
1987[1]	3113.4	20.41	152.5	1394.5	13.61	102.5

[1] Provisional.

Table 2.2.3. Indices of relative abundance (stratified mean catch per tow) for butterfish by age group derived from NEFC autumn bottom trawl survey data. 1968-1987[1]

YEAR	AGE 0	AGE1+ AND OLDER	TOTAL	WEIGHT (kg)
1968	41.3	52.3	93.6	7.7
1969	39.5	21.1	61.6	3.9
1970	26.4	12.2	38.6	2.3
1971	208.9	9.6	218.6	4.3
1972	73.2	8.7	81.9	2.7
1973	119.1	29.3	148.4	6.1
1974	8.2	18.0	100.2	3.8
1975	26.3	19.4	45.7	2.3
1976	110.6	29.0	139.6	5.8
1977	47.7	39.3	87.0	5.2
1978	135.0	19.2	154.2	4.3
1979	231.5	78.1	309.6	12.1
1980	233.2	100.0	333.2	15.2
1981	234.6	60.3	294.9	7.0
1982	80.3	30.7	111.0	4.7
1983	358.8	92.5	451.3	12.8
1984	268.6	93.4	362.0	11.4
1985	286.3	100.4	386.7	15.2
1986	140.2	44.3	184.4	6.8
1987	78.6	39.0	117.6	4.7

[1] Strata 1-12, 61-76, 13, 14, 16, 19, 20, 23, 25 (offshore); 1-46 (inshore).

Table 2.2.4. Indices of abundance and biomass (kg/tow) for butterfish taken in 1978-1986 Massachusetts inshore bottom trawl surveys

Year	Buzzards Bay	Nantucket Sound	East of Cape Cod	Cape Cod Bay	Mass. Bay	All Regions
			numbers/tow			
1978	240.37	200.31	276.90	14.46	4.09	135.10
1979	204.04	62.91	132.60	11.93	1.46	76.11
1980	452.81	798.77	274.18	367.89	125.61	414.91
1981	160.99	143.85	92.37	114.51	5.20	104.86
1982	777.33	81.09	31.31	12.57	3.56	177.68
1983	499.39	162.42	206.89	52.59	27.06	181.12
1984	148.05	58.73	78.65	9.25	19.84	59.33
1985	217.68	116.74	153.23	72.88	163.24	140.42
1986	517.66	194.54	107.39	56.64	29.72	178.44
1987	25.56	17.58	4.12	0.47	0.07	9.50
			kg/tow			
1978	3.54	1.99	1.22	0.44	0.09	1.42
1979	2.63	0.68	0.56	0.62	0.07	0.91
1980	6.14	7.91	0.99	5.22	1.49	4.61
1981	2.33	2.37	0.38	5.76	0.02	2.43
1982	7.14	0.59	0.27	0.33	0.21	1.68
1983	5.28	1.13	1.90	1.60	0.57	2.06
1984	2.93	1.72	0.36	0.30	0.40	1.15
1985	2.02	1.42	0.60	2.03	7.48	2.77
1986	9.48	1.67	1.69	1.66	1.67	3.20
1987	1.15	0.73	0.01	0.01	0.01	0.39

Table 2.2.5. Total mortality rates (Z) for butterfish derived from NEFC autumn abundance indices (Table 2.2.4), 1968-1987

Year	AGE			
	0/1	1/2	2/3	3/4
1968-69	.78	3.17	2.33	---
1969-70	1.26	3.09	3.05	---
1970-71	1.10	2.78	1.28	---
1971-72	3.22	3.34	2.64	---
1972-73	.97	1.72	1.49	---
1973-74	2.01	2.77	1.40	---
1974-75	1.54	2.23	2.45	---
1975-76	.01	2.11	1.65	---
1976-77	1.22	1.45	2.18	---
1977-78	1.79	1.17	1.78	---
1978-79	.61	.50	4.03	---
1979-80	1.06	1.36	1.88	1.50
1980-81	1.60	1.83	4.17	4.29
1981-82	2.20	2.30	4.52	.73
1982-83	.02	.89	.38	.69
1983-84	1.51	1.96	1.34	---
1984-85	1.14	1.86	1.58	3.43
1985-86	2.26	1.95	1.84	1.93
1986-87	1.49	1.42	3.89	---
68-77 MEAN	1.39	2.38	2.03	
78/87 MEAN	1.32	1.56	2.62	

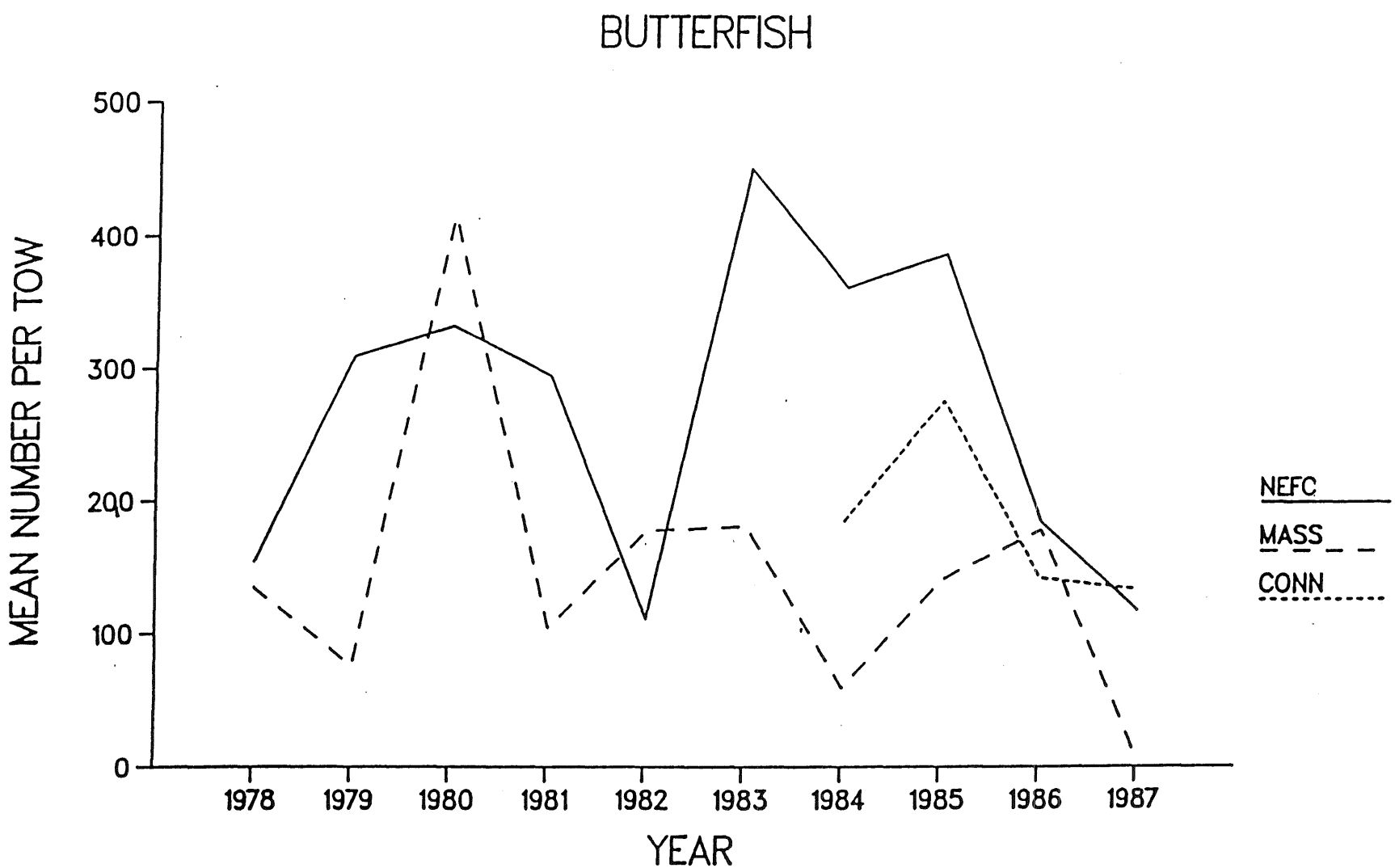


Figure 2.2.1. Bottom trawl survey abundance indices comparing NEFC, Massachusetts and Connecticut surveys.

2.3. UPDATED LOLIGO ASSESSMENT

Source Document: Lange, A.M.T. 1984. An Assessment of the Long-Finned Squid Resource off the Northeastern United States - Autumn 1984. NMFS,NEFC, Woods Hole Lab. Ref. Doc. No. 84-37. 24pp; Report of the Fourth NEFC Stock Assessment Workshop. 1987. NMFS, NEFC, Woods Hole Lab. Ref. Doc. No. 87-07. 102pp.

2.3.1. Report

The Fishery

The USA Loligo fishery reported about 46% (4,762 mt) of the 1987 directed US catch from Subarea 5 (primarily south of Cape Cod), with 5,581 mt (54%) taken in Subarea 6 (the mid-Atlantic area primarily south of Long Island, to Hudson Canyon). Joint venture catches accounted for an additional 994 mt of US catch. The total domestic harvest of 11,337 mt represented a 15% decrease from the 1986 landings (Table 2.3.1). Domestic landings were distributed throughout the year with high catches between February and July, peaking in May (Figure 2.3.1). The fishery continued to be dominated by 50 to 150 GRT vessels, as has been the case since 1978. Most of the directed catch (defined as catch from those trips for which squid accounted for over 75% of the total) prior to 1984 was attributed to the inshore fishery in Vineyard and Nantucket Sounds (Statistical Area (SA) 538; Figure 2.3.2). Since 1984, the directed catch in SA 537 (offshore, southern New England) has accounted for between 28% and 66% of the directed catch. Catches in SAs 611 to 616 (off New York and New Jersey), which had generally accounted for less than 20% of the US catch, accounted for 34% in 1986 and 46% in 1987.

The distant water fleet (DWF) fishery was reduced to a very low by-catch allocation during 1987 and took only 2 mt.

Commercial Length Frequencies

Length frequency data from the 1987 USA fishery in the southern New England and mid-Atlantic areas indicate that the fishery was dominated by a single size class in most months. The bulk of the catch between January and September consisted of 12 cm to 19 cm individuals with significant numbers longer than 20 cm taken in most months. The predominant size class found from October through December ranged from 6 to 14 cm, with few individuals longer than 20 cm.

Commercial Catch Per Unit Effort

Catch per unit effort (CPUE, metric tons per day fished) indices from the USA directed fishery (as defined earlier) are given in Figure 2.3.3 for 1976 to 1987. This index is based on all directed otter trawl trips in Subareas 5 and 6, and reflects the relative availability of Loligo to the directed fishery. The 1987 index reflects an 18.5% increase in CPUE over the 1986 index, and is the second highest since 1976.

Research Vessel Surveys

Minimum biomass and abundance estimates based on areal expansion of stratified mean weights and numbers per tow are provided in Table 2.3.2. These estimates assume 100% catchability of Loligo during daytime, and account for off-bottom movements during the night. The 1987 estimates were the lowest of the time series, only 60% of the previous low (in 1971).

The 1987 NEFC autumn bottom trawl survey abundance index (stratified mean number per tow) for the mid-Atlantic through Georges Bank strata was also the lowest of its series (1967-87), 81% below the 1968-85 mean (Table 2.3.3; Figure 2.3.3). The pre-recruit ($\leq$ 8 cm dorsal mantle length individuals) index was 87% below the 1968-85 mean.

The low indices of abundance from the 1987 autumn survey apparently were not due to differences in the stock's distribution or to decreases in only portions of the survey area. Examination of the autumn survey data on a stratum by stratum basis indicates that, compared with the 1967-86 means for each stratum, the 1987 mean catches of Loligo per tow were substantially lower in each of the strata in the mid-Atlantic through Georges Bank areas (except in Stratum 62 which was about three times the mean).

An alternative index derived from the survey data, the proportion of zero tows (PZ), was found in preliminary analyses to be negatively correlated ($p=0.015$) to the subsequent availability of Loligo to the inshore fishery (NEFC 1987b). This index is independent of stock abundance. The 1987 index ($PZ=0.14$) was the highest (indicating a higher proportion of tows that took no squid) since 1982, but 30% below the 1976-85 mean. If the relationship holds for 1988, availability to the domestic fishery should be above the historic average.

The Massachusetts research survey stratified mean number per tow index for Loligo for autumn 1987 was about 23% below the 1980-86 average (302.9 vs 392.3 squid per tow; Table 2.3.4). While catch rates in the area south of Cape Cod were slightly above average, the indices for each of the strata sets east and north of Cape Cod were substantially below their means.

Prospects for 1988

Total abundance during the NEFC autumn 1987 survey, based on daytime tows, was 0.6 billion. Pre-recruits accounted for 56.4% of the total (0.34 billion). If 55% of the pre-recruits are from the spring cohort, and catchability is 45% (Lange 1984), 0.41 billion [0.34 (0.55/0.45)] recruits are estimated from that cohort. The autumn cohort is assumed to contribute additional recruits equivalent to about 18% (on average) of those from the spring cohort (0.07 billion). Total recruitment from the 1987 year class is therefore estimated to be 0.48 billion.

Table 2.3.5 contains estimates of potential yield of Loligo from the 1987 year class, assuming 0.48 billion recruits, for an offshore/inshore and an inshore fishery and a range of fishing mortality rates. The nature of the current fishery probably falls somewhere between these two models. Lange et al. (1984), assuming a moderate stock recruitment relationship, found the highest equilibrium yield associated with an F of 0.70, while actual F levels have probably been around 0.4 or less. Based on the level of stock abundance estimated from the 1987 autumn survey, 1988 yields would not be expected to exceed 10,000 mt even if F were increased to the long-term maximum equilibrium as estimated by Lange et al. (1984).

Environmental Considerations

Loligo are highly migratory, moving inshore in spring and summer and offshore to deep waters during autumn and winter. The timing and extent of these seasonal migrations are assumed to be related, at least in part, to temperature preferences of this species. Regression analysis indicates that about 77% of the variation in Loligo mean catch per tow (autumn surveys, mid-Atlantic through Georges Bank areas, 1976-86) may be accounted for by changes in bottom temperature ($p \leq 0.001$). Lange and Waring (MS 1988) found that in the mid-Atlantic and southern New England areas, mean temperature of capture (mean temperature weighted by the catch in number) for large Loligo during autumn (1976-85) was 13.3 ^{o}C (SD 3.31) and for small ($\leq$8 cm) Loligo 15.8 ^{o}C (SD 3.45).

Hydrographic investigations during autumn 1987 (Manning and Lierheimer, personal communication) indicated the presence of a cold water pool in the southern New England - mid-Atlantic region. Much of the water from central Georges Bank through the Hudson Canyon area was 1 to 2 SD (1.2^{o} to 3 ^{o}C) below the 10 year average for the area in November. This cold water was caused by late occurrence of the autumn overturn (late November rather than September-October), which mixes warm surface waters with cooler bottom water. The bottom water did not warm up as it usually does in October. A bottom transect in the area of Hudson Canyon, where temperatures were about 14 ^{o}C in November 1985 and about 16 ^{o}C in 1986, indicated temperatures of less than 10 ^{o}C in

1987. Another hydrographic measure, the volume of water per ^{o}C, indicated average bottom temperatures of about $5^{o}C$ less in 1987 than in 1985 and 1986.

The effect that this mass of cold water may have had on the Loligo stock as it was migrating offshore during autumn 1987 is not known. However, it is possible that the stock avoided the cold water, possibly by moving off the bottom, accounting for the low catches during the bottom trawl survey. This is quite plausible since the colder than normal temperatures were not caused by water moving into the area, but failure of the water which was there to warm as usual. It is possible that the stock maintained itself within its preferred temperature range by moving up in the water column.

Conclusions

Apparent below average abundance of both adults and pre-recruits during the autumn 1987 NEFC research vessel survey suggests that current abundance of Loligo is not adequate to provide 1988 catches at the initial optimum yield level (IOY) established in the 1988 Annual Specifications for the Fishery Management Plan (14,036 mt). However, it is not known how the below normal water temperatures affected the number of squid available to survey gear during the 1987 NEFC Autumn survey. Loligo were distributed over their normal range during the survey and it is possible that the extremely low catches per tow occurred because the squid sought more preferable temperatures higher in the water column. In fact, catches of Loligo by the USA in its winter offshore fishery were above normal for the first three months of 1988, indicating reasonable availability of the stock.

Table 2.3.1 Annual long-finned squid catches (in metric tons) from the Northwest Atlantic (Cape Hatteras to Gulf of Maine) by the USA[1] and the distant water fleet (DWF), 1963-87

Year	USA	DWF	Total
1963	1,294	0	1,294
1964	576	2	578
1965	709	99	808
1966	772	226	948
1967	547	1,130	1,167
1968	1,084	2,327	3,411
1969	899	8,643	9,542
1970	653	16,732	17,385
1971	727	17,442	18,169
1972	725	29,009	29,734
1973	1,105	36,508	37,613
1974	2,274	32,576	34,850
1975	1,621	32,180	33,801
1976	3,602	21,682	25,284
1977	1,088	15,586	16,674
1978	1,291	9,355	10,646
1979	4,252	13,068	17,320
1980	3,996	19,750	23,746
1981	2,316	20,212	22,528
1982	5,464	15,805	21,269
1983	15,943	11,720	27,663
1984	11,592	11,031	22,623
1985	10,155	6,549	16,704
1986	13,292	4,598	17,890
1987	11,337	2	11,339

1 Includes joint venture catches made by USA catcher vessels.

Table 2.3.2. *Loligo pealei* minimum biomass (metric tons) and abundance (in millions) estimates[1] for the mid-Atlantic to Gulf of Maine, 1968-87

Year	Biomass	Abundance
1968	29,114	1,212
1969	48,055	2,393
1970	19,640	1,946
1971	14,050	1,106
1972	21,039	1,533
1973	44,252	3,092
1974	46,442	4,757
1975	48,636	7,789
1976	51,436	4,372
1977	27,421	3,157
1978	18,800	1,251
1979	19,333	2,114
1980	34,275	9,314
1981	24,345	3,411
1982	26,527	2,303
1983	62,363	4,460
1984	66,122	4,670
1985	55,612	4,865
1986	47,029	3,139
1987	8,363	689

[1] From areal expansion of stratified mean weights (kg) and numbers per tow assuming 100% catchability during daytime. Night catch data were expanded to account for diel differences in catch.

Table 2.3.3. Total and pre-recruit (≤8 cm) stratified mean numbers per tow[1] of *Loligo pealei* from the NEFC autumn bottom trawl surveys (Mid-Atlantic to Georges Bank), 1967-87

Year	All sizes	Pre-recruits
1967	134.5	126.9
1968	176.5	159.9
1969	237.3	217.4
1970	85.6	79.3
1971	163.3	161.5
1972	271.4	258.5
1973	372.0	353.9
1974	251.7	233.3
1975	614.4	593.3
1976	410.9	302.5
1977	388.5	297.7
1978	144.2	93.4
1979	193.7	156.5
1980	364.1	279.8
1981	226.2	161.8
1982	310.4	256.6
1983	373.4	251.1
1984	299.8	152.2
1985	442.2	310.8
1986	453.0	360.4
1987	56.7	32.0

[1] Stratified mean number per tow of all sizes and of individuals ≤ 8 cm mantle length

Table 2.3.4. Massachusetts state research vessel autumn survey catch per tow indices by area, in numbers, 1980-87

	Area				
Year	Buzzards Bay	Nantucket Sound	East of Cape Cod	Cape Cod Bay	Mass. Bay
1980	402.1	580.0	140.9	150.4	19.2
1981	379.9	365.6	301.3	216.5	186.3
1982	868.4	851.4	477.3	988.8	6.0
1983	476.9	438.5	90.9	695.8	244.4
1984	209.2	147.8	194.9	128.3	11.9
1985	445.5	1010.7	684.2	747.6	274.4
1986	919.5	359.8	610.7	103.7	29.3
1987	546.6	584.9	138.3	232.4	0.4
Mean (1980-86)	528.8	536.3	357.2	433.0	110.2

Table 2.3.5. Estimated yield (in metric tons) of long-finned squid associated with various levels of fishing mortality and the 1987 recruitment level of 0.48 billion individuals for the offshore/inshore and inshore fisheries (assuming a moderate stock-recruitment relationship)

F	Offshore/Inshore	Inshore
0.27	4,299	4,771
0.41	5,626	6,372
0.55	6,466	7,376
0.70	6,748	7,955
0.93	6,229	8,922

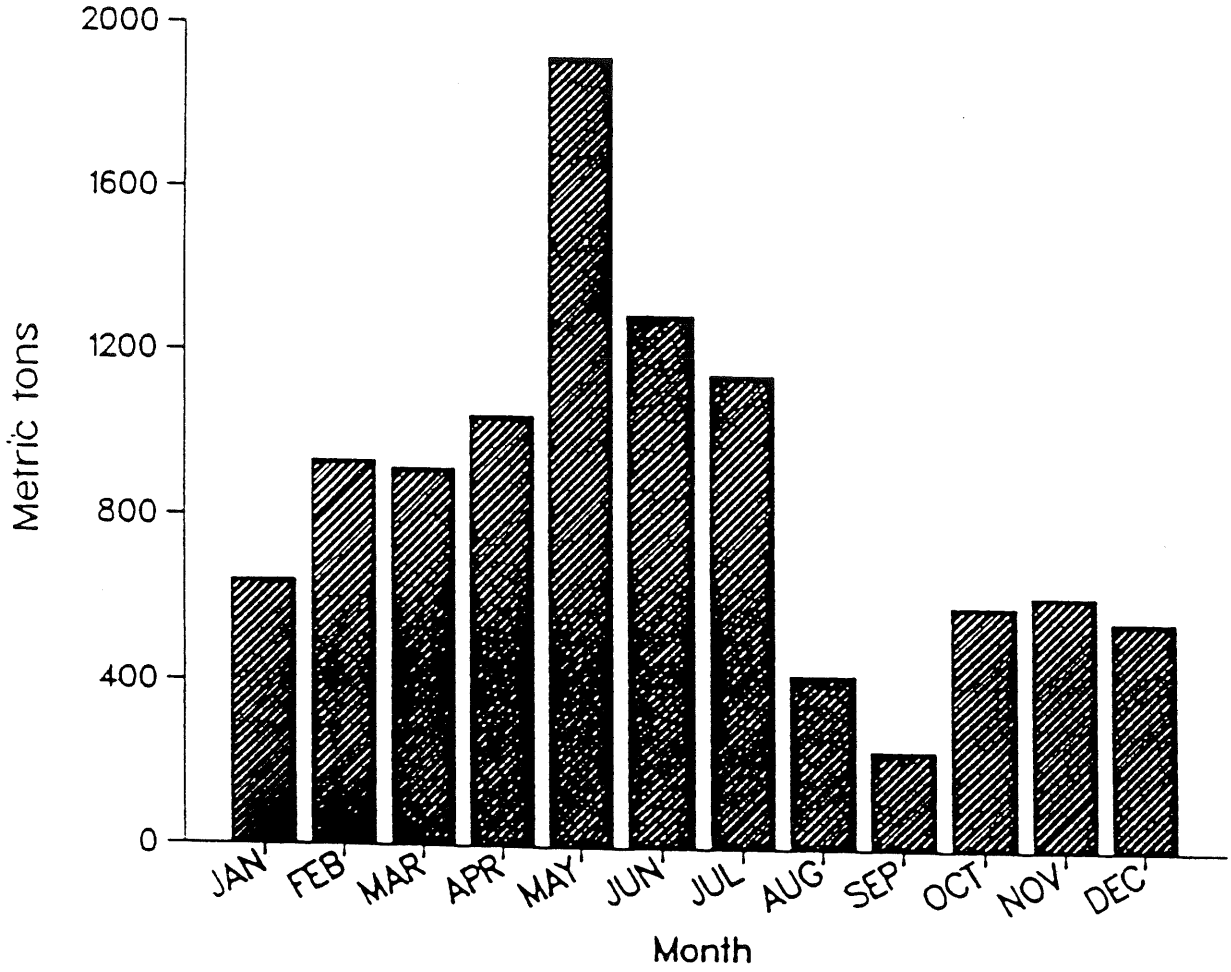


Figure 2.3.1. Monthly landings of long-finned squid in the USA fishery during 1987, in metric tons.

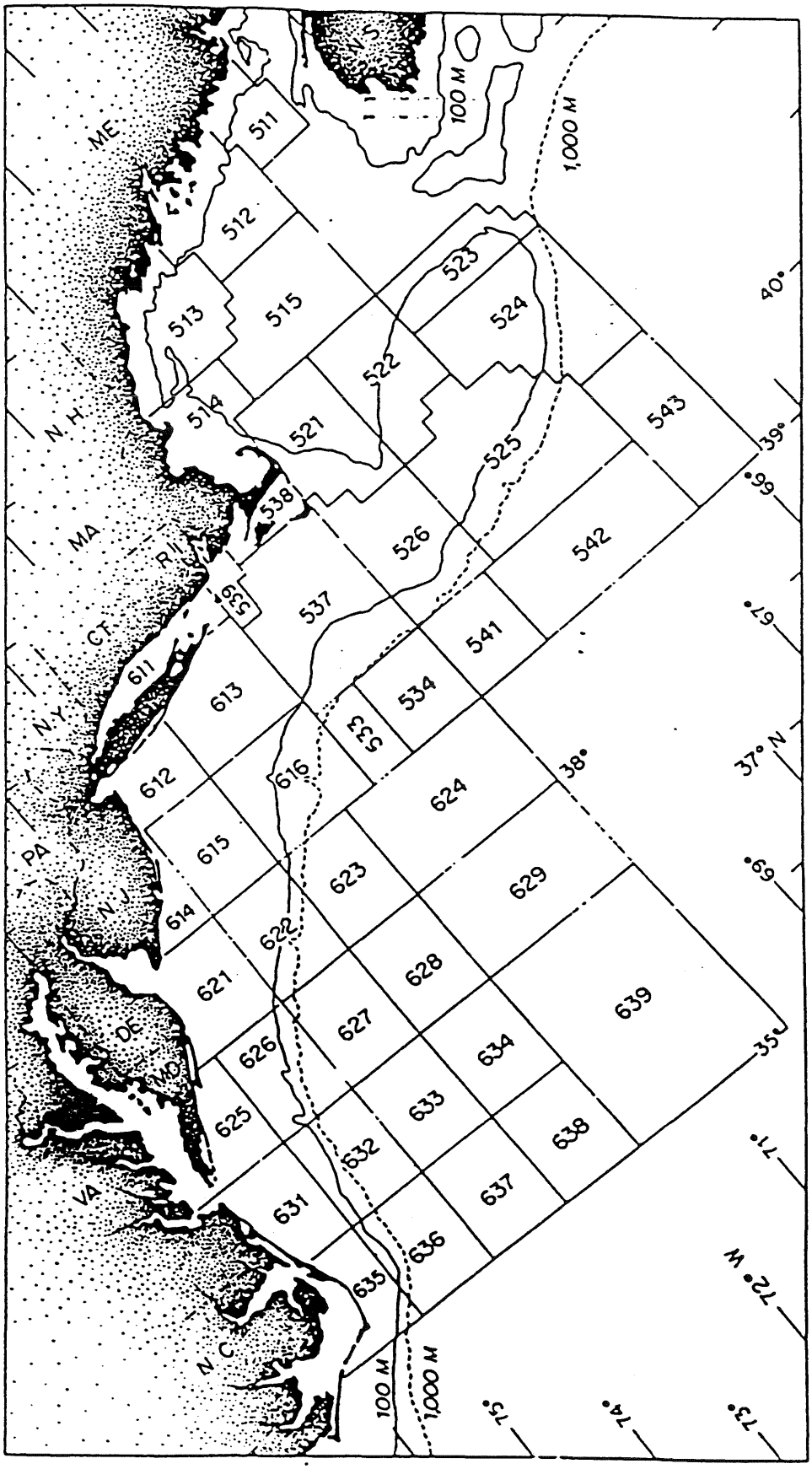


Figure 2.3.2. Statistical areas of the Northwest Atlantic used to report catch locations.

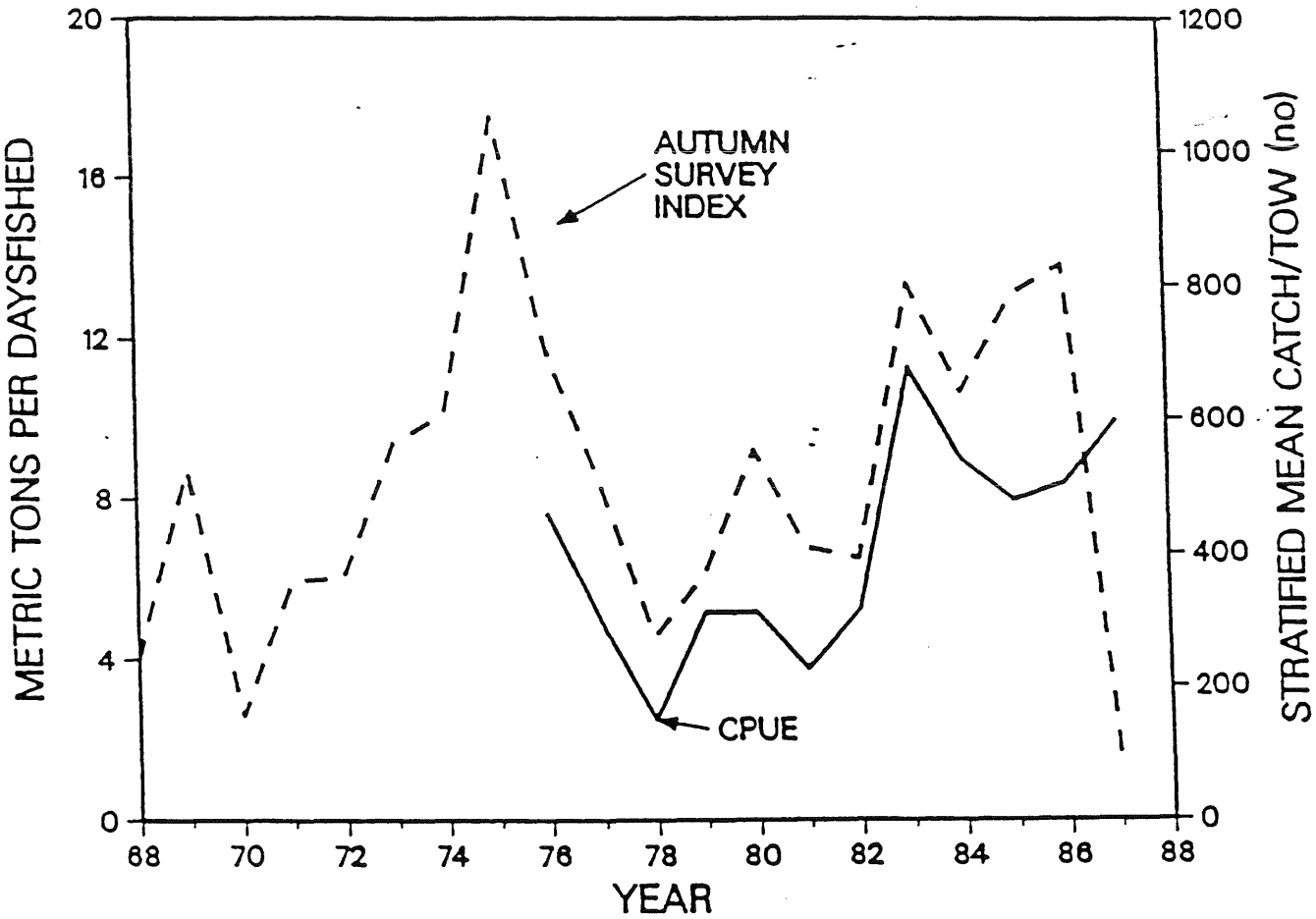


Figure 2.3.3. Commercial USA catch per unit effort (CPUE) of long-finned squid in the directed fishery (otter trawl trips in all areas, where squid made up over 75% of the trip catch), and NEFC autumn survey stratified mean catch per tow (numbers) indices.

2.3.2. Discussion

Opening discussion of the assessment update for long-finned squid (Loligo pealei) centered on the very low 1987 NEFC autumn survey abundance index and the high commercial catch rates. An explanation for this discrepancy is that squid moved off the bottom due to the cooler than normal bottom temperatures and were not caught by survey gear. Although the survey index was very low, the availability index (proportion of zero tows) would indicate above average availability inshore in 1988. It was noted that caution should be used in interpreting the survey index.

A question was raised concerning the vertical movement of squid in the water column. It was pointed out that Loligo have a preferred temperature range; recruited (>8 cm) Loligo prefer mean temperatures of about 13.3°C and pre-recruit Loligo (≤8 cm) of about 15.8°C and may move toward these zones. This vertical movement ability is demonstrated by diurnal feeding behavior. One comment suggested that comparison of the weighted mean temperature of capture to the overall stratified mean temperature may provide some insights into availability.

With respect to a revised assessment for this species, it was noted that this fishery is still in transition. The domestic fishery is continuing to shift to offshore winter fishing patterns, similar to the past foreign fishery. It was suggested that this may not be the appropriate time for a revision in the assessment.

2.4. UPDATED ILLEX ASSESSMENT

Source Documents: Lange, A.M.T. 1984 Status of the Short-finned Squid (Illex illecebrosus) off the Northeastern USA, November 1984. NMFS, NEFC, Woods Hole Lab. Ref. Doc. No. 84-38. 20pp; Report of the Fourth NEFC Stock Assessment Workshop, 1987. Woods Hole Lab. Ref. Doc. No. 87-07. 102pp.

2.4.1. Report

The Fishery

Total USA catch of the short-finned squid (Illex illecebrosus) during 1987 was 10,102 mt (Table 2.4.1). The USA fishery was conducted entirely in Subarea 6 (mid-Atlantic area, primarily Statistical Area (SA) 622, (Figure 2.4.1) during 1987, with only 53 mt reported from Subarea 5 (primarily SA 537). A total of 6,962 mt were landed, about double the 1986 level, and nearly five times the 1968-82 average. Joint ventures with Spain, Japan, Italy and the Faroe Islands accounted for an additional 3,140 mt, or about 31% of the total domestic catch. About 87% of the directed landings were made between June and September (Figure 2.4.2), with 96% from the area south of Delaware Bay (SA 622-636, Table 2.4.2). The fishery was again dominated by tonnage class 3 (51 to 150 gross registered tons) and tonnage class 4 (150 to 500 GRT) vessels as seen since 1982. There was no allocation to the distant water fleet fishery for Illex during 1987.

Length frequency data from the 1987 USA fishery in SAs 621-626 indicate presence of a single age class, taken at an average of 14 cm during May and increasing to an average 17 cm during June. Two size modes, at 17 and 21 cm, were seen in the more southern catches (SAs 631-636) during June. Length frequency data from joint venture fisheries indicated a single mode during July through September, at about 18 to 19 cm.

Catch (metric tons) per unit effort (days fished) indices from the USA directed fishery, defined as those trips where over 50% of the catch was Illex, are given for 1982-87 in Figure 2.4.3. This index is based on all otter trawl trips in SAs 622-636 (which have accounted for over 90% of landings in recent years) and reflects the relative availability of Illex to the directed fishery. Catch per unit effort in 1987 was about 82% above the 1982-86 mean and increased 60% over the 1986 level.

Research Vessel Surveys

The 1987 NEFC autumn bottom trawl survey abundance index (stratified mean number per tow) for mid-Atlantic through Georges Bank strata was ten times greater than that for 1986 and was the third highest of the 1968-87 time series (Figure 2.4.4; Table 2.4.3). The pre-recruit ($\leq$10 cm dorsal mantle length individuals) index was three times greater than in 1986 and comparable to the 1968-86 mean. Catch per tow indices for each of the three major strata sets were also examined separately (Figure 2.4.5). While indices were up in each area, catches in the southern New England and mid-Atlantic area accounted for most of the increase seen in 1987.

Research vessel catch per tow data, however, have not been very useful in predicting availability to the subsequent Illex fishery. While highly significant results ($p<0.01$) were found for the relationship between southern New England and mid-Atlantic mean numbers per tow for years with above average indices, and USA catches in the following year, this relationship was strongly influenced by a single point (1981 index). No significant relationship was found when data for all years were used.

As a short-lived, migratory species, environmental factors are expected to be important to this stock. Research survey and commercial fishery data, however, have not been useful in evaluating the significance of these factors. Stepwise regression analyses of mean catch per tow in weight (or number) for the autumn surveys (by area and overall) and average bottom temperatures from the autumn (mid-Atlantic through Georges Bank strata) and spring (mid-Atlantic strata) surveys, on USA annual catch and CPUE data were not significant.

Conclusions

Above average apparent abundance of adult Illex during the autumn 1987 NEFC research vessel survey suggests that current abundance should be adequate for 1988 catches at the optimum yield level established in the Annual Specification of the Fishery Management Plan. However, the ability of the fishery to take this level of catch depends on the availability of squid within the area of the fishery. This availability is associated with environmental and behavioral factors which are not yet understood.

Table 2.4.1. Annual short-finned squid landings (in metric tons) from the Northwest Atlantic (Cape Hatteras to Gulf of Maine) by USA and the distant water fleet (DWF), 1963-87

Year	USA	DWF	Total
1963	810	0	810
1964	358	2	360
1965	444	78	522
1966	452	118	570
1967	707	285	992
1968	678	2,593	3,271
1969	562	975	1,537
1970	408	2,418	2,826
1971	455	159	614
1972	472	17,169	17,641
1973	530	18,625	19,155
1974	148	20,480	20,628
1975	107	17,819	17,926
1976	229	24,707	24,936
1977	1,024	23,771	24,795
1978	385	17,310	17,695
1979	1,780	15,742	17,522
1980	349	17,529	17,878
1981	631	14,723	15,354
1982	5,902	12,350	18,252
1983	9,944	1,776	11,720
1984	9,547	676	10,223
1985	4,997	1,053	6,050
1986	5,176	250	5,422
1987	10,102	0	10,102

Table 2.4.2. USA catches of short-finned squid, in metric tons, by month and area, 1987

Area	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
513	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.1	0.2	0.1	0.0	1.2
514	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.6	0.7	0.3	1.8
515	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.2
(5Y)	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.1	0.2	0.9	0.8	0.3	3.2
521	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
526	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.9	0.0	0.0	5.9
(5Ze)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.9	0.0	0.0	6.0
537	0.0	0.0	0.0	0.0	0.0	36.2	0.0	2.0	0.0	5.6	0.0	0.0	43.8
(5Zw)	0.0	0.0	0.0	0.0	0.0	36.2	0.0	2.0	0.0	5.6	0.0	0.0	43.8
613	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.4	0.3	0.0	0.0	0.0	0.9
616	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.1	56.4	0.1	0.0	58.7
622	0.0	0.0	1.4	0.0	423.7	1512.1	1644.6	1698.1	1019.1	397.2	0.0	14.0	6710.2
626	0.0	0.0	0.0	0.0	0.0	32.1	0.0	0.0	0.0	5.9	0.0	0.0	38.0
632	0.0	0.0	0.0	0.0	0.0	72.4	28.9	0.0	0.0	0.0	0.0	0.0	101.3
(SA6)	0.1	0	1.4	0	423.7	1616.6	1673.7	1698.5	1021.5	459.5	0.1	14	6909.1
Total	0.1	0	1.4	0	423.7	1652.8	1674.5	1700.6	1021.7	471.9	0.9	14.3	6962.1

Table 2.4.3. Short-finned squid abundance and pre-recruit indices from NEFC autumn surveys, 1968-87

Year	Mean Number per tow[1] Total	Pre-recruit	Pre-recruit[2] ratio
1968	2.3	0.6	0.26
1969	0.8	0.3	0.38
1970	3.4	0.2	0.06
1971	1.9	0.6	0.32
1972	3.5	1.8	0.51
1973	1.3	0.3	0.23
1974	3.0	2.1	0.70
1975	12.4	9.6	0.77
1976	28.7	0.6	0.02
1977	15.8	1.1	0.07
1978	28.4	5.1	0.18
1979	32.1	2.6	0.08
1980	17.0	0.7	0.04
1981	54.8	0.5	0.01
1982	4.3	1.0	0.23
1983	2.8	0.2	0.07
1984	6.4	0.4	0.06
1985	2.0	0.3	0.15
1986	3.2	0.5	0.16
1987	30.0	1.4	0.05
1968-86 mean	12.7	1.5	0.12

1 Stratified mean number per tow of all size individuals (total) and of pre-recruits ($\leq$10 cm), mid-Atlantic to Georges Bank.

2 Ratio of pre-recruits to total mean numbers per tow.

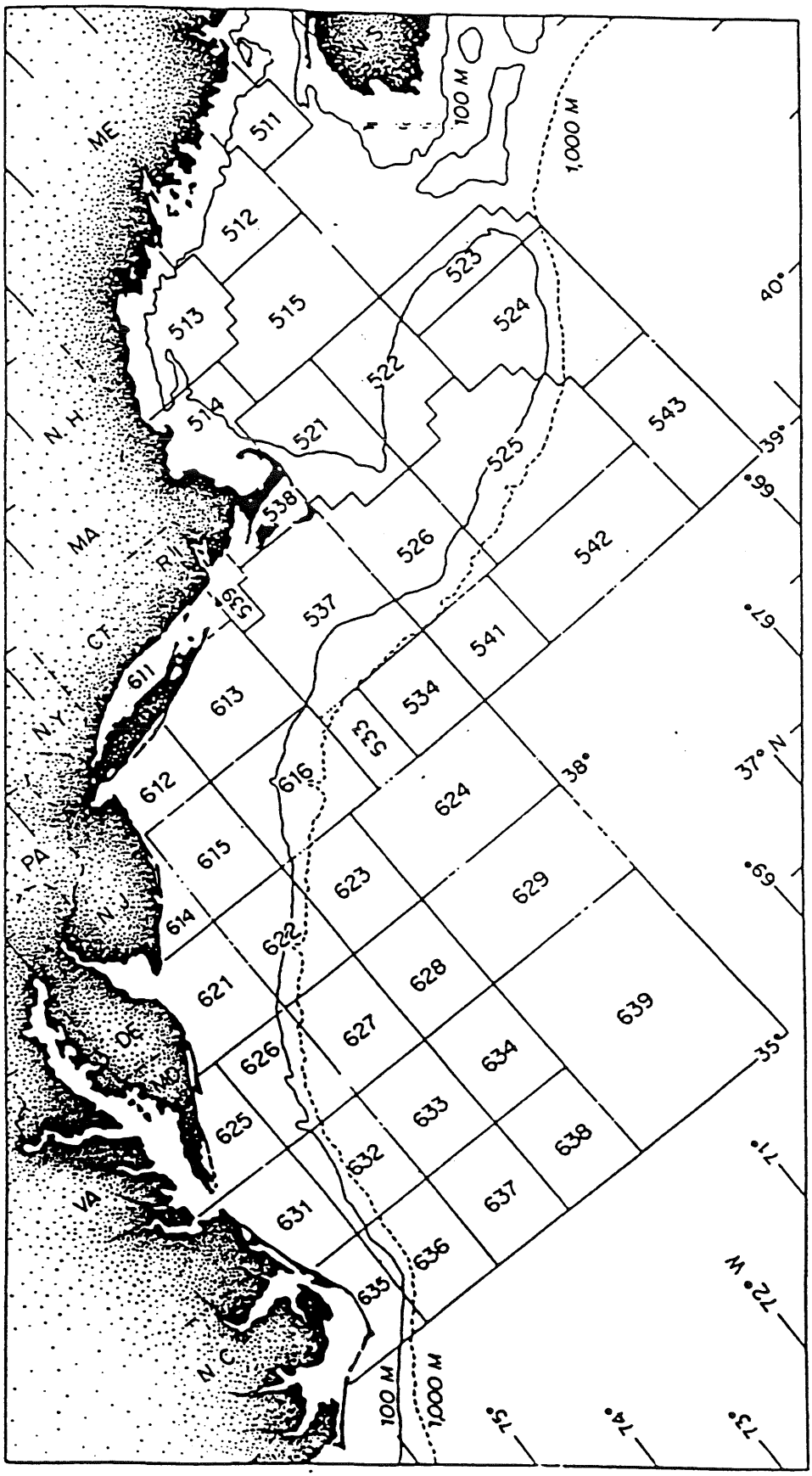


Figure 2.4.1. **Statistical areas of the Northwest Atlantic used to report catch locations.**

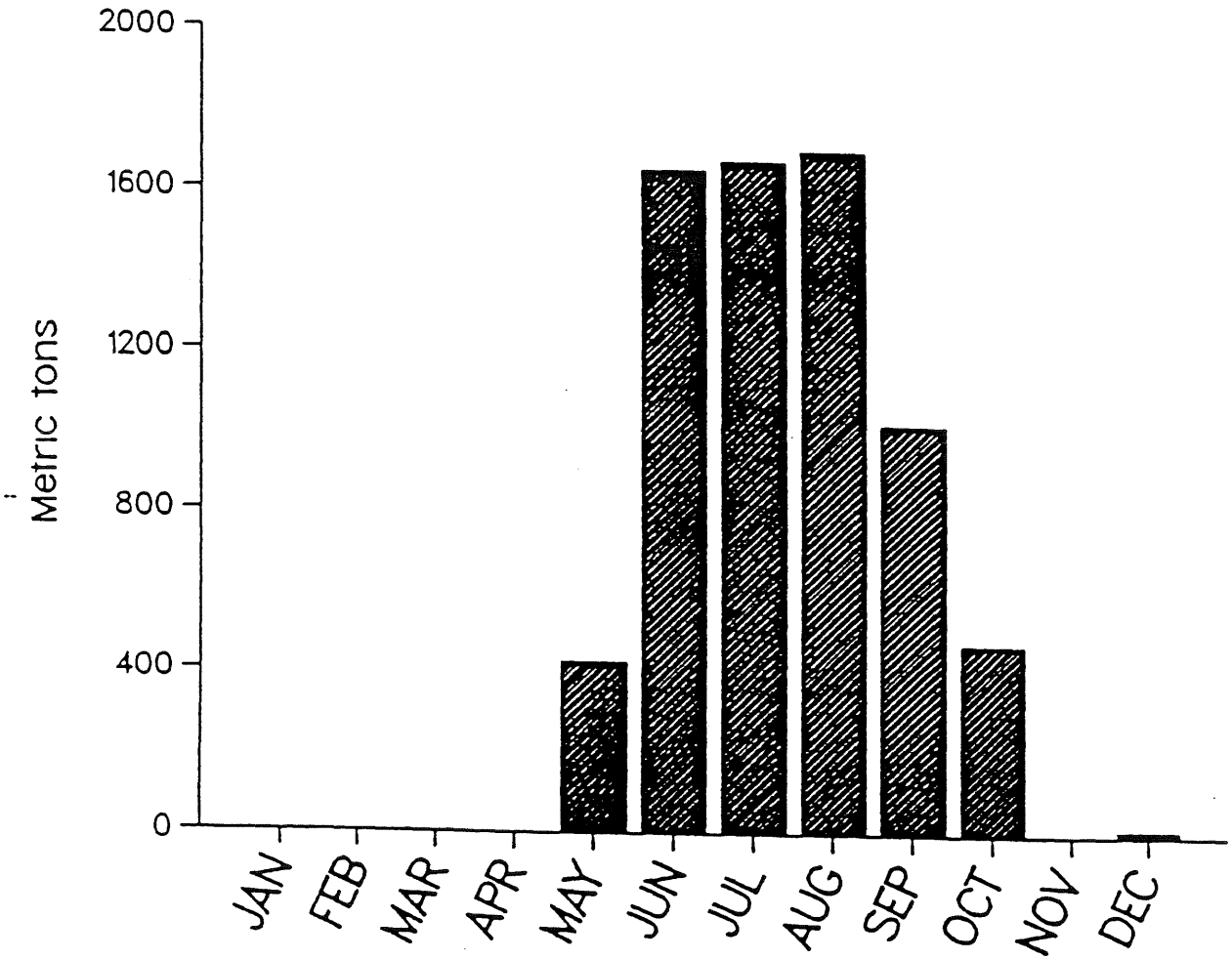


Figure 2.4.2. Monthly catches of short-finned squid in the USA domestic fishery during 1987.

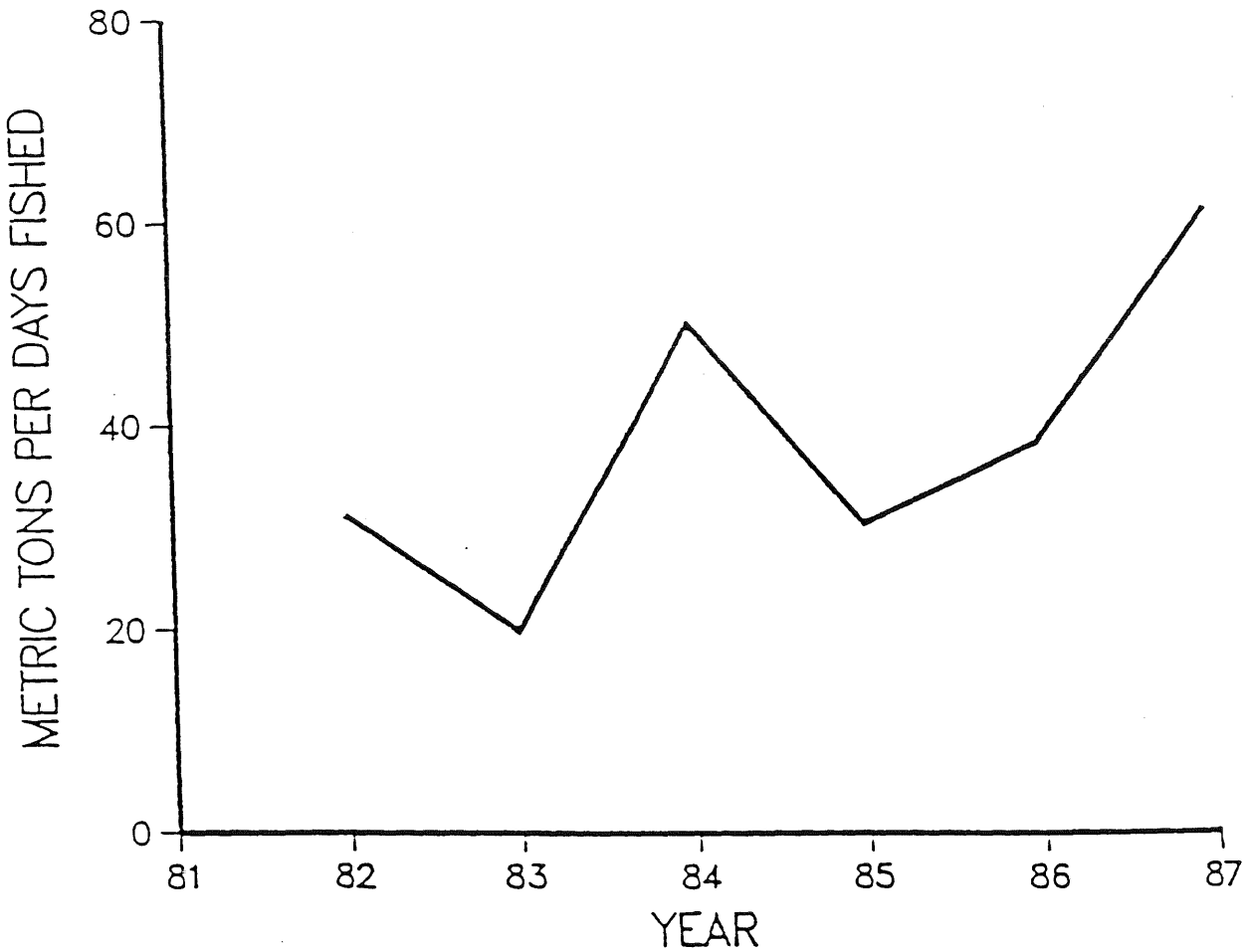


Figure 2.4.3. Catch per unit effort (CPUE) of short-finned squid in the directed USA fishery (where the directed fishery is defined as all those trips where squid accounted for more than 50% of the total trip catch).

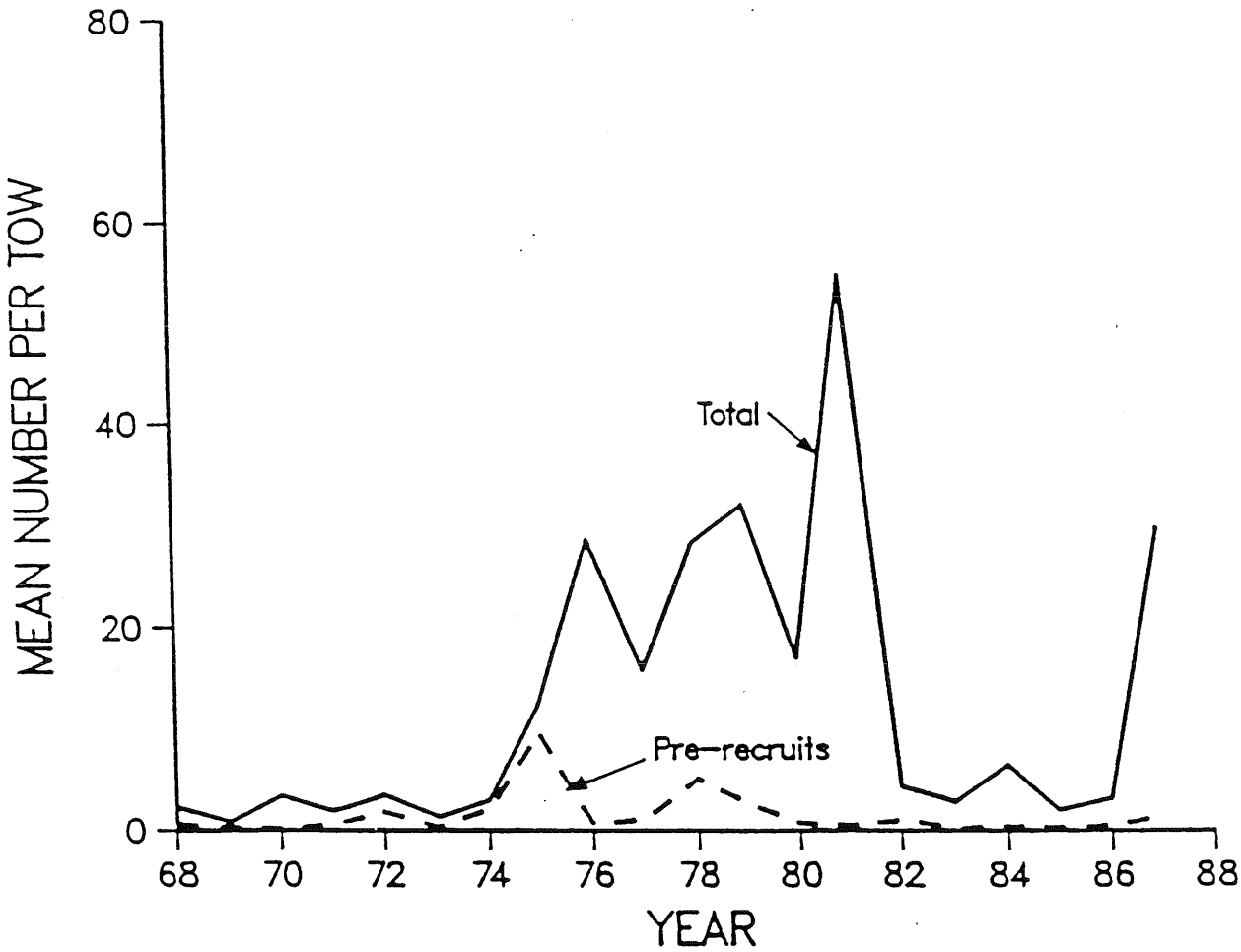


Figure 2.4.4. Total and pre-recruit ($\leq$ 10 cm dorsal mantle length) indices (mean catch in number, per tow) for the short-finned squid, from the autumn NEFC bottom trawl survey.

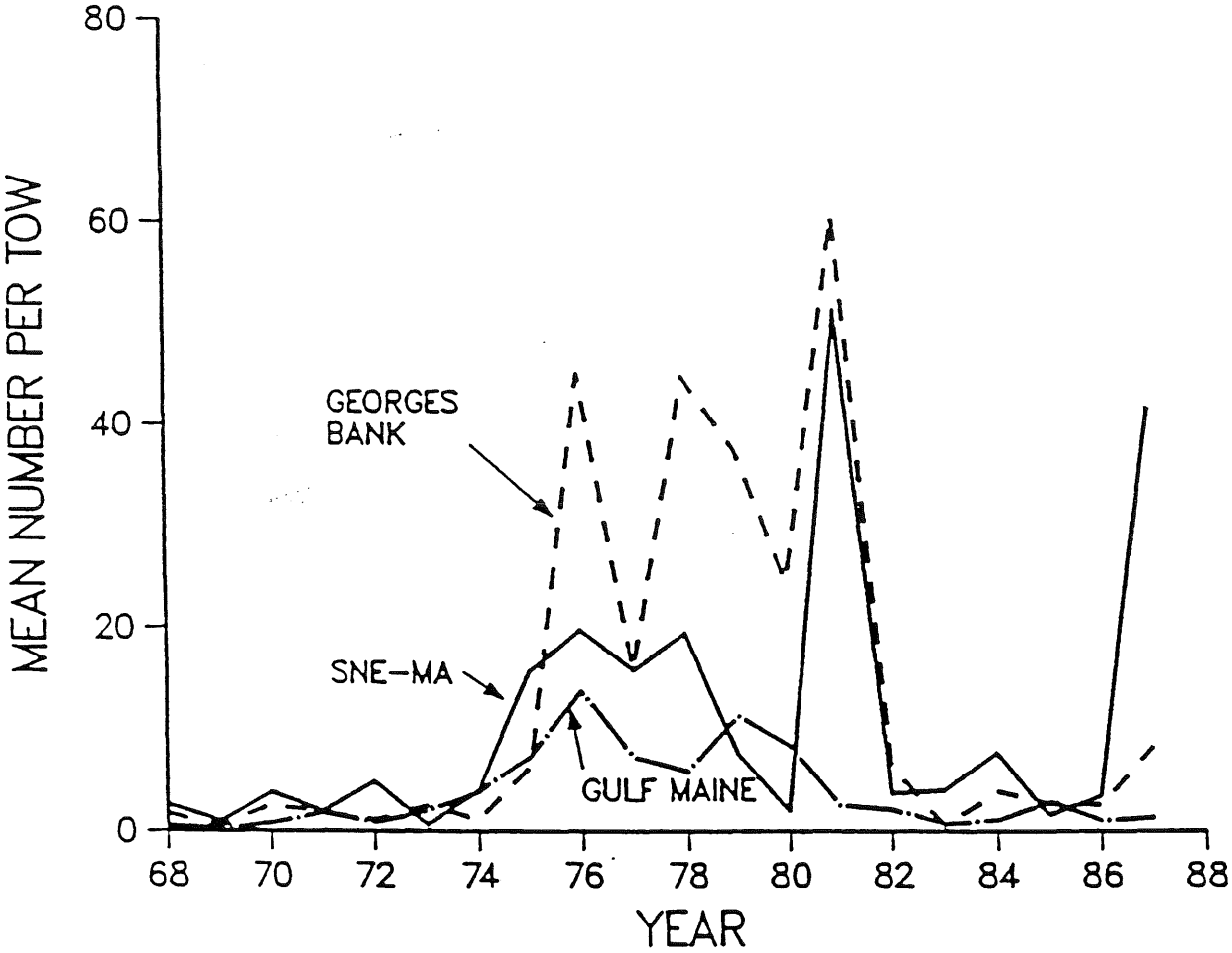


Figure 2.4.5. Stratified mean number per tow of short-finned squid from the NEFC bottom trawl surveys, by area (southern New England, mid-Atlantic, Georges Bank, and Gulf of Maine).

2.4.2. Discussion

Initial discussion of the assessment update for short-finned squid (Illex illecebrosus) focused on the relationship between bottom water temperatures and survey abundance indices. It was noted that 1987 fall bottom temperatures were cooler than normal, but survey indices were the highest observed since 1981. While there does not appear to be a significant relationship throughout the time series between bottom temperatures and survey catches, the higher catches generally occurred in years with lowest temperatures.

It was suggested that a shift in abundance southward may have occurred since the early 1980s in response to changes in oceanographic events. A major decline in the fishery in the Gulf of Maine and Canada was noted. Differences in abundance and distribution on Georges Bank between 1986 and 1987 were presented. A portion of the area where below normal bottom temperatures were observed in 1987 appears to have coincided with Statistical Area 622, which contributed 96% of the 1987 USA landings. Further analysis of oceanographic data may provide insights into Illex distribution.

Based on the abundance level observed in the 1987 NEFC autumn survey, it was concluded that the stock should be abundant enough to support catches during 1988 at the optimum yield level established in the FMP.

2.5. SPECIAL TOPIC: MACKEREL GROWTH RATES, MORTALITY RATES, AND ASSESSMENT IMPACTS

2.5.1. Report

The fishery for Atlantic mackerel has been important in the United States for almost two centuries. More recently, catches were dominated by foreign fleets, peaking at 430,000 mt in 1973. Several years of overfishing resulted in a collapse of the stock prior to MFCMA. Since that time the stock has increased, landings averaged 52,000 mt between 1983 and 1986, and fishing mortality has remained low. Recent assessment advice based on an $F_{0.1}$ management strategy has indicated that catches in the 300,000 mt range are feasible. Indications are, however, that the stock has increased to the point that compensatory responses are becoming important.

A study of recent trends in growth showed that since 1980 cohorts are growing much more slowly and average size of fish has declined by 30 to 40%. Predation on young mackerel, primarily ages 1 and 2, has increased; predation mortality rates appear to be higher on large year classes than on smaller ones. Results from modeling exercises suggest that recent assessments have correctly followed trends in this stock, but advice based on a standard single species model has been too optimistic. Stock rebuilding since 1978 has been very successful and biomass is in excess of 1,000,000 mt. However, if recruitment continues to be relatively high, small catches (such as those of the last several years) will not insure annual increases in the stock. Catches could be increased to 150,000 to 200,000 mt annually without decreasing the spawning stock appreciably and trends in growth could be

reversed or stabilized. Fishery management goals such as maintenance of a minimum spawning stock and sufficient biomass for a viable recreational fishery could also be preserved.

2.5.2. Discussion

Initial discussion centered around the calculation of M_2. The question was asked if there was a discrepancy between the low consumption rates and some of the high M_2 values when stock sizes were low. The response was that at low stock sizes, even a 0.1% consumption rate can translate into high mortality rate. It was also asked if the apparent inverse relationship between F and M_2 for younger age fish was a feature of the method used to calculate M_2. The answer was that the method did not induce any relationship and that years with low Fs were years in which there were only very small catches of younger fish.

Further discussion centered around the interrelationship between the northern and southern components of the stock. It was pointed out that there is no current data for distinguishing to which component an individual fish belongs. Both morphometric and chemical techniques have not been successful in determining the percent composition by component. Canadian biologists are currently investigating whether first year growth patterns in otoliths can be used to distinguish between northern and southern fish. The question was raised about which component accounts for most of the current biomass. Good data do not exist to resolve this question, although data from last summer suggest a possible 8 to 1 ratio between the northern and southern components (Peter Berrien, pers. comm. NEFC, Sandy Hook, N.J. February 1988). The data need to be examined further. It was asked whether the dominance of the northern component could be responsible for the decline in availability noted in last year's recreational fishery. It was pointed out that this seems unlikely since catch rate and availability appear to be high this year. In response to a question, it was stated that there is no mixing between the northern and southern components during the summer but that the two components are probably well-mixed in the winter.

The question was asked whether the increased production of mackerel was likely to be transferred into other components of the ecosystem. Marine mammals, sea birds, large pelagics and to some extent, dogfish were seen as the main benefactors. In response to a question about the size of mackerel that pilot whales consume, it was stated that some information on pilot whales exists, but better data is available for common dolphins. They consume mackerel in the 30 to 40 cm size range and pilot whales are likely to be able to consume this size range of fish and larger.

2.6. SPECIAL TOPIC: PROPOSAL BY ASMFC FOR TRAWL SURVEY WORKSHOP

2.6.1. Report

During the Second and Third SAWs there was considerable discussion of existing trawl surveys. Topics in the Second SAW included descriptions of existing programs at the NEFC, and in Massachusetts, Rhode Island, Delaware,

Maryland, and Virginia; the desire for standardization of methods and procedures; and studies of trawl survey accuracy and precision (NEFC 1986a, P.96). In the Third SAW work on a paper for ICES on the theoretical basis and operational and technical limitations of the trawl surveys was reviewed (NEFC 1986b, P.83). Subsequent to these SAW discussions, NEFC staff completed a technical memorandum entitled "An Evaluation of the Bottom Trawl Survey Program of the NEFC" (NEFC 1988).

During the Second SAW the desirability of forming a survey coordination committee was discussed (NEFC 1986a, P.105), where it was noted that "analytical problems may override the coordination problems, but there has to be a constant reminder to have consistent surveys."

With the completion of the NEFC analyses, it appears timely to now address the consistency of the many surveys identified during the 2nd SAW, as well as any other trawl surveys that may exist or may be contemplated. In this context, the ASMFC is proposing to convene a workshop to review trawl survey methodology and applications. Plans for this workshop include:

1. States from Maine to Florida will be asked to participate, as well as the NMFS Northeast and Southeast Fisheries Centers.

2. The workshop will be co-chaired by a NMFS, NEFC person and a state representative.

3. Participants will be asked to give an overview of the individual programs (15 to 30 min.).

4. There will be some overall discussions on how coordination and data exchanges among the states and the NMFS Centers could be improved.

5. A workshop report will be prepared by the workshop chairman and ASMFC staff. The report will include recommendations to NMFS Centers, ASMFC, and the states on what improvements could be made to better coordinate the information collected for East Coast trawl surveys.

6. The workshop will be held this fall, possibly around the time of the Seventh SAW.

2.6.2. Discussion

The meeting attendees unanimously supported this proposal.

3. COASTAL AND ESTUARINE RESOURCES

3.1. REPORT OF PRELIMINARY WORK ON BLUEFISH

3.1.1. Report

Two further bluefish assessment analyses, suggested during the Fifth SAW, were summarized. First, an attempt was made to reconcile the inconsistencies between recruitment estimates from the NEFC autumn inshore trawl survey indices and the VPA from recreational survey catch data. The approach suggested was to use separable VPA to see if there were annual differences in partial recruitment of age 1 bluefish to the recreational fishery. Second, the sensitivity of the VPA terminal F estimate was examined using alternative smoothing and tuning procedures.

The results of the separable VPA were similar to the VPA results reported during the Fifth SAW (NEFC 1987b). Both analyses indicated the same pattern of exploitation of bluefish by the recreational fishery. Specifically, the partial recruitment of age 1 bluefish to the recreational fishery was consistent from 1979 to 1986 and that the U-shaped exploitation pattern observed for older age groups persisted.

The results of the sensitivity analysis indicated reliable estimates of terminal F could not be made at this time. Use of an alternate smoothing procedure for the NEFC survey indices indicated the tuning procedure was not robust with respect to input data. The alternate tuning approach, which employs a minimization of an objective function comparing NEFC survey indices and VPA stock size estimates, did not yield a precise estimate of terminal F.

3.1.2. Discussion

The basis for concluding bluefish are fully recruited to the fishery at age 1 was described. With reference age for terminal F set at 2 years and S = 1.0 at age 7, the coefficients of variation of the log catch ratios over a range (0.1 to 0.6) of input terminal F values averaged 17%. This suggests that the resulting U-shaped exploitation pattern (coefficients highest at ages 1,2 and 6, but lower at ages 3 to 5) was consistent over the 1979-86 period.

Age 0 bluefish (snappers) were not included in the separable VPA because it was assumed that the natural mortality for this age group is extremely high.

To date, investigations of NEFC trawl survey data for bluefish appear to have limited utility for this assessment because of extremely variable catchability/availability of the species to the trawl survey gear. These data remain in conflict with the trends in recruitment indicated by analyses of the recreational survey data. Suggestions for future research include an examination of biomass estimates from MARMAP data and development of a better defined measure of directed effort from the recreational survey data.

3.2. BLACK SEA BASS: A PROGRESS REPORT ON STOCK ID WORK

3.2.1. Report

Black sea bass morphometric and meristic data were collected (n=743) from three locations (Nantucket Sound, Cape May and Virginia). Morphometric (12 variables) and meristic (9 variables) analyses included multivariate analysis of covariance (morphometric) and variance (meristic). Additionally, principle component analyses were done on both sets of parameters. Also, a time series of CPUE data for fish traps were analyzed. The work was to determine if there was evidence of multiple stocks of sea bass north of Cape Hatteras for the purpose of assessment studies on these fish.

Investigators concluded that management of black sea bass north of Cape Hatteras should proceed on the basis of a single unit stock. Evidence indicated some geographic differences in morphology but the presence of multiple stocks was not clearly determined. Additionally, CPUE trends showed no evidence of differences between the regions.

3.2.2. Discussion

The timing of the sampling might mask morphometric and meristic differences by areas by allowing mixing of stocks (due to migration). Additionally, the limited number of sampling sites have an effect on the analyses, but these are the data available. There have been no long term tagging studies; Massachusetts is currently involved in tagging approximately 2,000 fish up to 12 in. long.

This analysis provides no basis to reject Mercers' (1978) hypothesis of a single stock north of Cape Hatteras. Consequently, an assessment can proceed and consider the northern fish as one stock with local variations. Of greater concern are the differences in growth rates between sexes and the confounding influence of sex change in the species.

It was further mentioned that Massachusetts had, in response to concern of commercial fisherman, enacted a moratorium on licenses (300) and a limit on the number of pots (400 per license). It was reported that black sea bass commercial landings in Massachusetts last year were down 30%.

3.3. ASMFC AMERICAN SHAD STUDIES

3.3.1. Report

Introduction

The American shad spawns in a number of Atlantic coast rivers and supports valuable sport and commercial fisheries. The coastwide landings of American shad rose steadily during the 1960s then declined steadily thereafter, particularly from mid-Atlantic and south-Atlantic rivers. The underlying causes for the recent decline in shad landings are unclear and no comprehensive stock assessment of Atlantic coast shad has ever been conducted.

This stock assessment was performed by several state biologists under the auspices of the Atlantic States Marine Fisheries Commission. The objectives of the assessment were to:

1. Estimate maximum sustainable yields (MSY) and F_{MSY} levels for selected shad populations

2. Compare current rates of fishing mortality in these rivers to the F_{MSY} value

3. Examine how certain biotic (fecundity, fish size, natural mortality) and abiotic factors (river flows) might affect latitudinal changes in MSY and F_{MSY}.

Methods

The assessment was completed for 17 shad stocks from Rhode Island to Florida based on 10 to 65 years of age structure, juvenile indices, and catch and effort statistics. More assessments were originally attempted, but some analyses were dropped because the time series was short and the data were poor. In the analysis we assumed the existence of density-dependent mortality underlying the parent-progeny relationship of American shad. The stock-recruitment relationship was expressed by the three parameter Shepherd S-R model, which predicts equilibrium yield by combining yield per recruit (Y/R) and biomass per recruit (B/R) analyses with the stock-recruitment characteristics of each stock. The sequence of analytical procedures was:

1. Estimate population size from catch-effort statistics and tagging studies.

2. Determine spawning stock size as the initial population size minus the commercial landings.

3. Estimate current fishing rates (F) by catch curve analyses and tagging studies.

4. Estimate recruitment from juvenile indices or from age structure and populations sizes lagged four, five and six years later.

5. Fit the Shepherd S-R model to the stock recruitment data by nonlinear least squares regression, where the A parameter represents the recruitment rate at the origin, B is the coefficient of density-dependent mortality, and K is a scaling parameter that is related to the carrying capacity of each river.

6. Generate Y/R and B/R for various levels of F with the Thompson-Bell yield per recruit model.

7. Merge results of the S-R model with Y/R and B/R using several equations from Shepherd (1982) to estimate total yields at each level of F. This analysis was further confined to shad stocks where the S-R

parameters (A,B,K) were estimated with reasonably high precision (CV <25%). The MSY and F_{MSY} levels were represented by the peak of the equilibrium yield curve. To determine whether shad stocks may be presently overfished, the F_{MSY} value for each stock was compared to the current fishery rate.

Results

Fits of the general Shepherd recruitment function to shad S-R data were highly variable. Coefficients of determination ranged from .017 to .624. Precision of the parameter estimates as judged by the coefficients of variation (CV) ranged from .03 to 1.54. A wide range of recruitment scatter patterns were observed. In depressed populations an ascending limb was clearly observed. For populations that had not experienced significant stock declines, a dome and descending limb were apparent. In several stocks, the relationship was indeterminant.

Estimated instantaneous rates of fishing mortality for sustainable yields (F_{MSY}) ranged from .4 to 1.2 (Table 3.3.1). Estimated F_{MSY} was controlled by the slope of the stock recruit function (a). Estimates of "a" were positively correlated with fecundity suggesting that the S-R analysis had accurately captured the productivity of the stocks; "a" was also related to environmental stability. Northern shad have lower fecundity and productivity, reaffirming the hypothesis of adaptive life history variation (iteroparous vs. semelparous spawning) in response to local environmental effects. Historical estimates of yield (1895-1905) were correlated to the estimates of K from the S-R analysis.

A potential source of bias lies in the estimates of spawning stock and the fitting procedure used. Simulation studies with Pacific salmon suggest that errors in the measurement of spawning stocks and a non-zero expected (time series bias) error term due to "natural" vs. "planned" experiments may result in an overestimate of stock productivity. Because of this potential problem, a general S-R model was constructed using only those parameter estimates having a CV $\leq$ 25%, from the most reliable data sets. When merged with Y/R and B/R models, the procedure gives F_{MSY} values ranging from .6 to .8. It was therefore recommended that exploitation rates for shad be held to less than 45 to 50% of adult stock until the potential bias in higher estimates can be evaluated.

Estimates of current fishing mortality rates were generally at or below recommended rates. Notable exceptions were the Susquehanna, Nanticoke, Ogeechee, and Cape Fear Rivers.

Conclusions

Density-dependent stock and recruitment models were applied to shad populations with varying degrees of success. The productivity parameter (a) was critical in estimating the fishing mortality rate producing maximum sustainable yield; "a" was correlated with independent biological and physical factors. Estimates of maximum rate of exploitation (u) ranged from 33% to 71% of adult stock. A relationship between maximum fishing rates and

adaptive life history strategy was suggested, although errors in variables bias could also be responsible. Stocks are not producing as well as they did at the turn of the century. Conservative exploitation rates of 45% to 54% are recommended until the error bias is further investigated. The ASMFC plan for shad exploitation is 40%. This rate was recommended to the states but there is no obligation to comply.

3.3.2. Discussion

A question concerning the difference in effectiveness between fixed escapement and fixed exploitation policies was raised. While fixed escapements at an optimum level may result in higher long-term yield, fixed exploitation is easier to implement and may result in lower variation in catches.

There was some discussion about the actual mechanism of density dependence resulting in recruitment depression at high spawning stocks. There are several possible mechanisms including:

1. Large spawning stocks may deposit eggs in less than optimal habitat.

2. There may be starvation induced mortality.

3. Predators may aggregate on egg concentrations.

Experimental manipulation of spawning stocks was discussed. For shad rivers currently closed to fishing and under restoration, it is possible.

The stability of S-R parameters through time was also questioned. Where heavy pollution has occurred and been alleviated, parameters may change. Many rivers in the mid-Atlantic and New England areas have improved in terms of water quality.

The impact of ignoring recreational catches in the analysis was discussed.

Table 3.3.1. Estimated fishing mortality rate at MSY (F_{MSY}), exploitation rate at MSY (U_{MSY}), MSY, and current fishing mortality rate (F_c) for 17 rivers from New England to Florida.

SITE	F m.s.y.	U m.s.y.	M.S.Y.	Fc
Pawcatuck	.605	.454	39,200	.008
Connecticut	.600	.451	684,200	.151
Hudson	.600	.451	2,722,128	.375
Delaware	.795	.548	651,500	.321
Susquehanna	.700	.503	1,342,000	.942
Nanticoke	.400	.330	85,000	.801
James	.500	.393	814,440	.448
Chowan	1.250	.713	282,100	.675
Tar	1.030	.643	340,000	.794
Neuse	1.000	.632	430,874	.641
Cape Fear	1.100	.667	46,007	1.657
Waccamaw-Pee Dee	.900	.593	106,200	.677
Edisto	.800	.551	136,317	.135
Savannah	1.120	.674	261,000	.416
Altamaha	.700	.503	288,640	.573
Ogeeche	1.200	.699	45,563	.496
St. John's	.600	.451	768,928	.110

4. NEW ENGLAND FISHERY RESOURCES

4.1. SCALLOP STUDIES IN THE NEW ENGLAND AND MID-ATLANTIC REGIONS

Source Document: Smolowitz, R.J. and F.M. Serchuk. 1987. Current technical concerns with sea scallop management, p. 639-644. IN Proceedings of Ocean 87, The Ocean - An International Workplace. Marine Technology Society, Ocean Engineering Society Meeting. Halifax, N.S., Sept. 28 - Oct. 1, 1987. Halifax, N.S.: William MacNab and Son Publisher. 1172 p.

OVERVIEW

Cooperative Sea Scallop Data Collection Program

The USA fishery for sea scallops in the Georges Bank and middle Atlantic regions has recovered significantly since 1985. Scallop landings, after reaching a ten year low point in 1985, increased to the third highest recorded level in 1987. Revenue from the fishery in 1987 was at a record high level. Current management of the resource is based on controlling size at first capture in the fishery by using an average meat count standard (presently 30 meats/lb) for shucked scallops, and a minimum shell height standard (presently 3.5 in.) for scallops landed in the shell.

In 1986, studies were initiated as part of the Cooperative Sea Scallop Data Collection Program to address questions regarding variability in meat weights with respect to season, area, and depth. Participating institutions in the program include: National Marine Fisheries Service, New England Fisheries Management Council, Mid-Atlantic Fisheries Management Council, Virginia Institute of Marine Science, New Bedford Seafood Producers Association, Offshore Mariners Association, and East Coast Fisheries Association. Southeastern Massachusetts University is also expected to participate in the near future.

Activities of the program to date include:

1. Determination of meat weight/shell height relationships, spawning condition, maturation studies, gonad/meat weight ratios, and volumetric dockside sampling of live sea scallop samples.

2. At-sea volumetric meat count sampling.

3. Dredge and trawl selectivity studies.

4. Sea sampling to evaluate fishery performance.

5. A study to evaluate potential management impediments to marketing roe-on scallops. Aging studies have also been conducted based on the data collected from this program. It was noted that in the future, studies evaluating the impact of freezer vessels in the scallop fishery may be emphasized.

Results to date include:

1. Documentation of seasonal and areal variation in shell height/meat weight relationships.

2. Documentation of the spawning cycle using gonad weight indices and histological techniques.

3. Development of volumetric sampling techniques.

4. Evaluation of gear selectivity.

5. Monitoring of fishery behavior with respect to discarding and mixing practices and CPUE performance.

6. Development and evaluation of sampling requirements for enforcement procedures.

4.2. SCALLOP MEAT-WEIGHT/SHELL-HEIGHT STUDIES IN NEW ENGLAND

4.2.1. Report

New England Studies

Information on meat weight/shell height relationships and reproductive condition has been obtained from New Bedford-based scallop vessels fishing on Georges Bank and in the New York Bight area (south of Long Island) of the mid-Atlantic. At present, 33 samples (representing 33 scallop trips) have been collected with the longest time series coming from the area south of Long Island (Table 4.2.1). Monthly estimates of average meat weight, average meat count, average ovary weight, and reproductive condition factor (ovary weight/meat weight) were summarized by 5 mm shell height intervals.

Monthly patterns in average meat count at shell height (Figure 4.2.1) indicate that scallops 92 mm or less in shell height remain above 30 meat count irrespective of seasonal fluctuations. Conversely, scallops larger than 102 mm remain below 30 count throughout the year. Meat counts for all shell heights increased from April to October and declined by the following April. It was concluded that scallops meats lose weight between April and the autumn spawning period, then regain the muscle weight during the subsequent winter and spring. Ovary weights for all shell heights also increased to peak levels in September and October as maturation progressed. The period of peak spawning, as indicated by a sharp decline in gonad weights, coincides with the period of maximum meat count (minimum meat size), suggesting an inverse relationship between meat weights and ovary weights. Reproductive condition factors, computed as the ratio of gonad weight to meat weight also peaked during the September to October spawning period.

Experiments conducted to compare at-sea volumetric meat counts to dockside digital scale measurements indicated that volumetric measuring is feasible.

Information from the database is also being used to evaluate fishery performance practices with respect to current and proposed management measures.

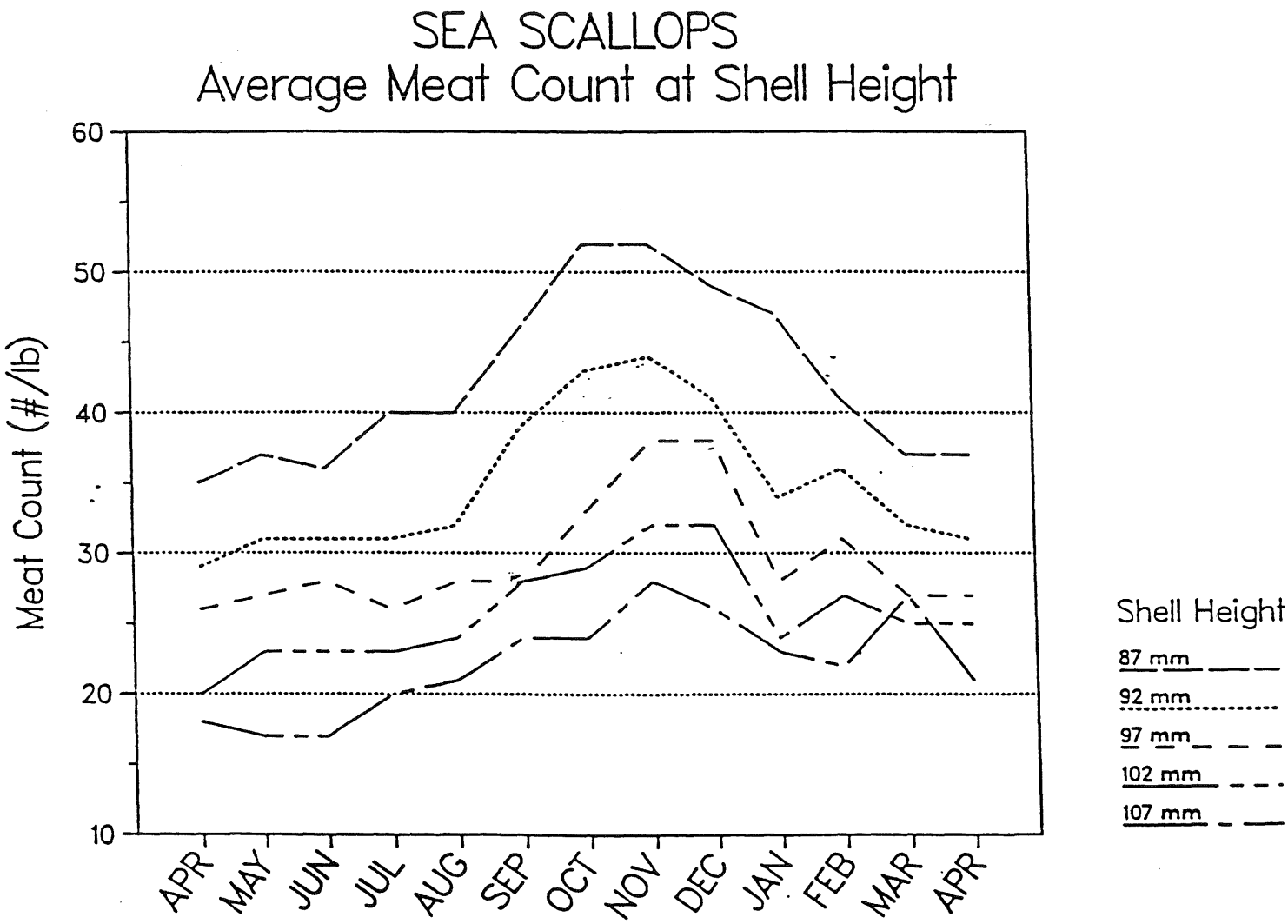
4.2.2. Discussion

It was suggested that perhaps ovary weights alone may be a better measure of reproductive condition than the ratio of gonad weight to meat weight, since the ratio may exaggerate the condition factor due to the interaction of two concurrent processes. Areal differences between Georges Bank and New York Bight meat weight:shell height relationships and reproductive condition factors were not evaluated due to the limited number of total samples and the general lack of temporal overlap between Georges Bank and New York Bight samples (Table 4.2.1). The samples from the area south of Long Island were taken primarily from the New York Bight region. It was noted that an 87 mm scallop measured in April would have grown larger by the time of spawning. The question was raised whether the decline in meat weight at spawning for a given size class of scallop represents an actual loss of weight in the abductor muscle of an individual scallop or a recruitment effect.

Area	1986 Nov	1986 Dec	1987 Jan	1987 Feb	1987 Mar	1987 Apr	1987 May	1987 Jun	1987 Jul	1987 Aug	1987 Sep	1987 Oct	1987 Nov	1987 Dec	1988 Jan	1988 Feb	1988 Mar	1988 Apr	TOTAL
GEORGES BANK																			
South Channel	107 (1)		188 (1)	179 (1)									661 (3)						1135 (6)
So. East Part				263 (1)							185 (1)								448 (2)
No. Edge & Peak													1555 (9)						1555 (9)
Total	107 (1)		188 (1)	442 (2)							185 (1)		2216 (12)						3138 (17)
MID-ATLANTIC																			
So. of Long Island						441 (2)	239 (1)	190 (1)	172 (1)	233 (1)		114 (1)	408 (2)	216 (1)	137 (1)	557 (2)	541 (2)	226 (1)	3474 (16)
GRAND TOTAL	107 (1)		188 (1)	442 (2)		441 (2)	239 (1)	190 (1)	172 (1)	233 (1)	185 (1)	114 (1)	2624 (14)	216 (1)	137 (1)	557 (2)	541 (2)	226 (1)	6612 (33)

Table 4.2.1. Number of sea scallops sampled for shell weight and meat weight data from commercial samples obtained from Cooperative Sea Scallop Collection Program, 1986-88
The number of samples collected is also given in parenthesis

iqure 4.2.1. Average meat count (#/lb) at shell height (mm) of sea scallops from samples taken by New Bedford scallop vessels participating in the Cooperative NMFS/Council/Industry Sea Scallop Data Collection Program, April 1987 - April 1988.



4.3. SCALLOP STUDIES, ECONOMICS, AND BASELINE DATA IN THE MID-ATLANTIC

4.3.1. Report

Mid-Atlantic Studies

Studies were begun in 1986 in response to questions concerning the impact of shell stocking practices in the mid-Atlantic area. Studies conducted to date include evaluating selectivity of 3.5 vs. 3 in. rings and effects of chaffing gear. The cooperative sampling program has provided 100 scallop samples (trips) from approximately 20 cooperating vessels fishing between Hudson Canyon and Virginia. Samples were also examined for meat weight/shell height relationships. Shucking studies suggested that 7% to 10% of the meat was not removed from the shell. Elimination of the smaller adductor muscle also excluded an additional 9% of the meat weight. Meat weights were found to be most stable during the June to August period, and the presence of gonadal material was minimal.

Seasonal evaluations of meat count variability suggested relatively low meat counts during the summer months and higher counts during winter. Meat counts also increased latitudinally from north to south during spring and from south to north during autumn. Smaller meats were prevalent in deeper water (greater than 30 fathoms) during winter, and in shallower areas during summer. Samples obtained for February and March 1988 indicated that 90 mm scallops had meat counts between 20 and 40 per pound. Also, more than 25% of the February and March samples of scallops larger than 89 mm yielded counts in excess of 33 meats per pound. Counts from scallops between 89 and 91 mm failed to satisfy the seasonal adjustment of 36 meats per pound.

Volumetric changes were also considered. A logit model was used to estimate the probability that an at-sea count would equal the dockside count. The probability that a dockside count would equal the at-sea count was generally less than .5. However, the probability that they would be equal increased for recently harvested scallops.

The reproductive cycle of scallops was examined to determine the potential for multiple spawning periods. Although previous information suggested a July spawning period, data were based on minimal samples of spent gonads collected in August. While the sea scallop typically undergoes a single fall spawn, multiple spawning has been reported for a scallop population off Newfoundland (Naidu 1970) and for a deep-water population in the Gulf of Maine (Barber et al. 1988).

Information obtained from the cooperative program was used to document the reproductive cycle in three ways:

1. Visual inspection of the gonads to determine if flaccid or full.

2. Calculation of gonadal indices.

3. Histological examination of the tissue.

Histological sections were categorized and will be quantified by noting the relative proportions of connective tissue, ripe gametes, developing gametes, and empty lumen spaces.

Gonadal indices were relatively high in April but declined sharply in May, remaining low through September. Indices increased again in October but declined in November before increasing the following April. The increase in gonad weight during spring was not consistent among size groups, suggesting some degree of variability in gametogenesis during this period. The decline during summer, however, was consistent among all size groups. It was suggested that scallops inhabiting deeper water are subjected to colder temperature regimes and lower food availability, resulting in decreased fecundity and, therefore, less spawning potential. It was also noted that the transfer of energy from the meat to the gonad is greater during the spring spawning period, resulting in greater depletion of meat weight.

4.3.2. Discussion

Samples obtained for the VIMS study were all taken from the last tow on the trip and, therefore, do not reflect mixing of meats. It was concluded that there are, at present, no better ways to represent the meat weight/shell height relationship over the entire year.

4.4. SUMMARY OF SCALLOP STUDIES

The utility of the Cooperative Sea Scallop Data Collection Program was considered in light of questions raised at the Fifth SAW. In response to the presentations given during this session, the consensus was that this database is the strongest one available and it is revealing aspects of sea scallop biology that can enhance management programs. It was further concluded that this program should be continued in a formal and systematic manner with greater resources allocated from the Northeast Fisheries Center, the Regional Fishery Management Councils and others. It was noted that future work should integrate oceanographic data with scallop research.

The database is currently being used by people developing potential markets of up to 100 tons of roe-on scallops, which could generate increased revenue to the industry. There is increasing need to develop new management standards for the production of this and other products.

4.5. JUVENILE COD DISTRIBUTION STUDIES

4.5.1. Report

Results were presented from a study that examined the spatial and temporal distribution patterns of USA scrod (commercial market category, generally ages 1-3) cod landings. The data represented total commercial scrod landings from 1982 to 1986 in southern New England and Georges Bank by month and ten minute square, prorated by the ratio of total landings to interviewed landings.

The highest concentrations of scrod cod occurred off of Nantucket shoals and the northeast peak of Georges Bank with the majority of landings from SA 521 (Figure 4.3.1). Geographic distribution by age group (ages 1-3) did not reveal any age specific patterns. The seasonal movement of scrod progressed from a general dispersion over Nantucket shoals and Georges Bank during the first quarter of the year, northeasterly during the second and third quarters towards deeper,cooler water, then a transition back toward the shoals and bank in the fourth quarter. Year class strengths varied during the period 1982-86 but did not influence the distribution patterns of juveniles.

Commercial data were constrained by fishing practices and effort distribution, therefore NEFC and Massachusetts survey data from 1968 to 1986 were examined. Spring distribution patterns were generally consistent with the commercial landings data. While juvenile cod were dispersed over Georges Bank and southern New England during the spring, fall concentrations appeared along the 50 fathom contour northeast of Nantucket Shoals and on the Northeast Peak of Georges Bank. (Figure 4.3.2.)

The study concluded that definite seasonal and geographic distribution patterns exist for juvenile cod. Two primary nursery grounds for Atlantic cod are east-southeast of Nantucket (Nantucket Shoals), and the Northern Edge and Northeast Peak of Georges Bank. There was no difference in geographic distribution between strong and weak year classes, or between age classes.

4.5.2. Discussion

In response to a question it was noted that juveniles have the same distribution as larger cod.

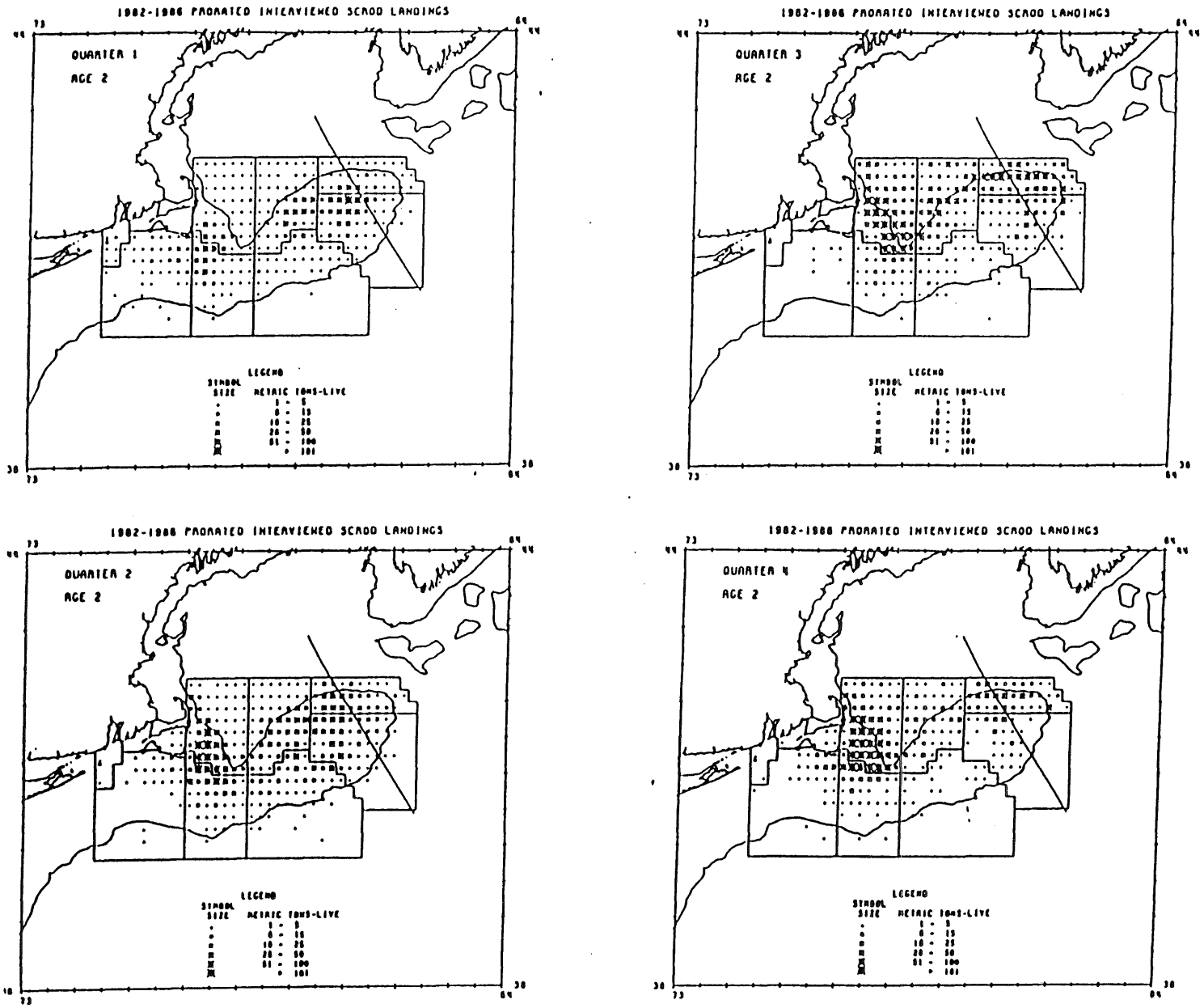


Figure 4.3.1. Distribution of quarterly landings of scrod cod for 1982-86 compiled from prorated interview data.

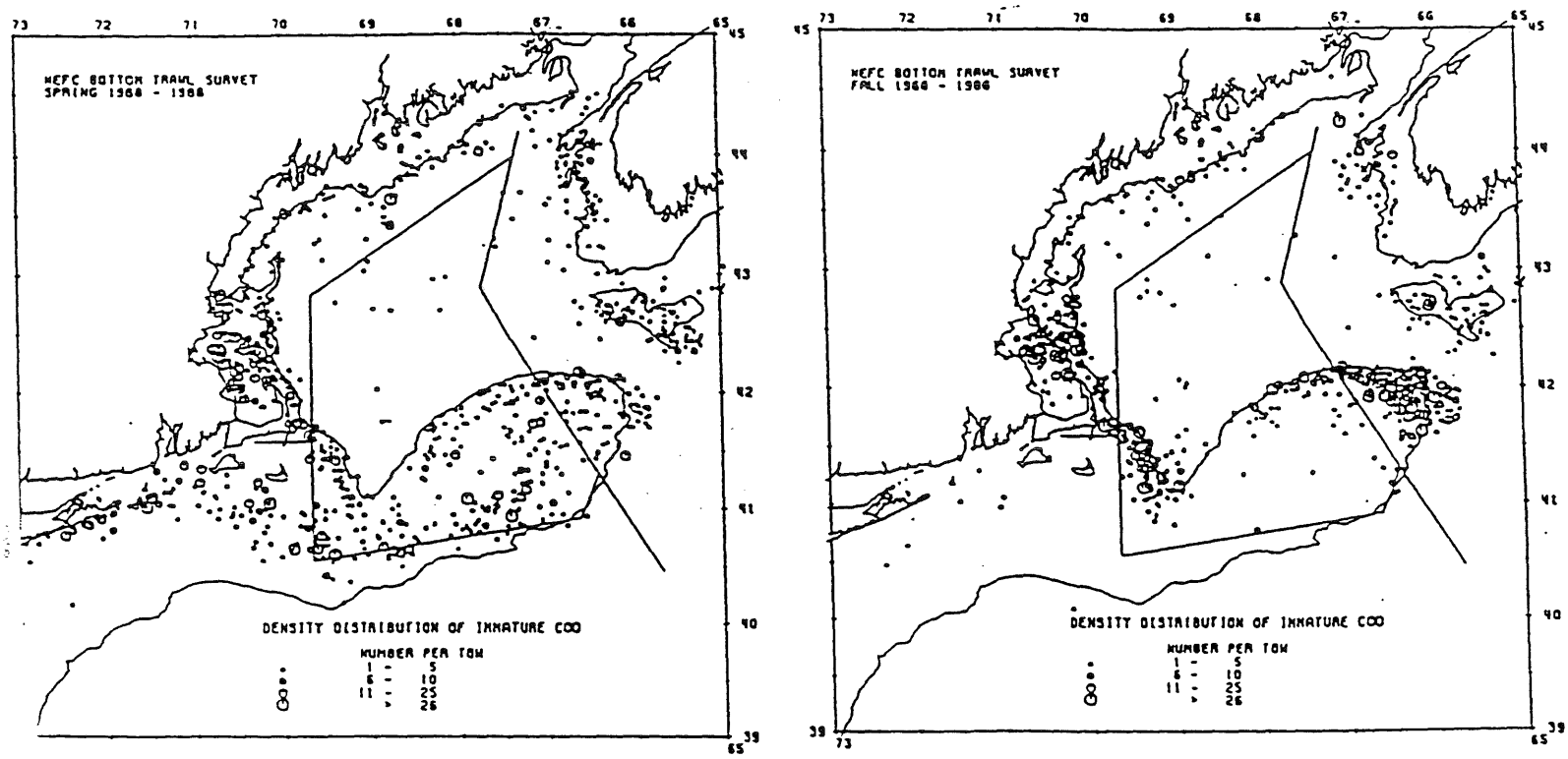


Figure 4.3.2. Distribution of sexually immature cod (<37cm) based on spring and fall NEFC inshore and offshore research survey cruises 1968-86 (number per tow). Easternmost lines represent U.S. - Canada boundary. Small mesh fishing is possible outside the bounded area (in U.S. waters) under the Northeast Multispecies Fishery Management Plan.

5. WORKING GROUP REPORTS

5.1. METHODS OF MEASURING LONG-TERM POTENTIAL CATCH (WG9)

Members: Brian Rothschild (Chair), Ray Conser (NEFC), Tom Hoff (MAFMC), Vaughn Anthony (NEFC), Howard Russell (NEFMC), Mike Fogarty (NEFC).

5.1.1. Terms of Reference

1. Review the classic definition of maximum yield (MSY) as well as the qualifications associated with that definition.

2. Consider alternatives to that definition and specify how these alternatives provide advice on either maximum yield, sustainable yield, or the desired combination of the two.

3. Review existing FMPs to determine how this problem has been handled under the FCMA.

4. Make recommendations on future research, noting any constraints in implementation.

5.1.2. Report

No report was given.

5.1.3. Discussion

A letter from the chair suggested that a report from this working group would be available for the Seventh SAW. A request was made to table the report for the Sixth SAW in view of this letter.

5.2. SCIENTIFIC GOALS OF COLLECTING DATA ON FISHING VESSELS (WG12)

Members: John Mason (Chair), David Pierce (MA), Howard Russell (NEFMC), Jeff Ross (NC), Fred Serchuk (NEFC), Ronnee Schultz (NEFC), Sal Testaverde (NEFMC).

5.2.1. Terms of Reference

1. Evaluate the utility of a sea sampling program for collecting scientific data that enhance our ability to assess the status of stocks and the likely or actual impact of specific management measures.

2. Evaluate the likely magnitude of such a program if it is to meet different objectives.

3. Consider the objectives of measuring discarding practices, evaluating mesh selectivity, and refining measures of fishing effort.

5.2.2. Report

The report primarily presented sea sampling priorities that were prepared when funds were allocated by Congress to conduct a one year sea sampling program (to begin in January 1989) that will address issues relative to the groundfish stocks in the northeast. After a brief description of five proposed levels of sampling, discussion centered around two primary issues: timeliness of data reporting and allocation of samplers in the program.

5.2.3. Discussion

The first issue discussed was how to make data available in a timely fashion after each of the sampling trips is completed. There will be a second contract under this year's funding for data processing and auditing software. Raw data should be available within two weeks after each sampling trip is completed. The NEFC will provide a review of the data within 30 days, with final data ready within two weeks of the NEFC review, resulting in a two month turnaround.

The second item was concerned with the allocation of sea samplers to vessels and fisheries in the program. It was stated that the program's success will depend on the voluntary cooperation of vessel captains.

5.3. ADEQUACY OF PRESENT PORT AGENT INTERVIEW SYSTEM (WG13)

Members: Darryl Christensen (Chair), Tom Hoff (MAFMC), Guy Marchesseault (NEFMC), Sukwoo Chang (NEFC), Dave Stevenson (ME).

5.3.1. Terms of Reference

1. Evaluate the present system of port agent interviews in terms of coverage and the questions asked to determine if better and more detailed information on catches, fishing effort, and fishing practices can be provided.

2. Identify alternate sources of data or methods of collecting such information.

5.3.2. Report

The report of this working group was compiled into Table 5.3.1. The table provides a detailed listing of the interview coverage of the 1987 landings statistics in response to items for which the working group required clarification.

5.3.3. Discussion

It was noted that for haddock, windowpane flounder, yellowtail flounder, and sea scallops, the proportion of commercial landings on interviewed trips in 1987 was greater than 70% of the total. There were several species where interview intensity was quite low (bluefish, tilefish, lobster, river

herrings, and striped bass). It was further explained that in some ports, there may be almost 100% coverage while in others, coverage may be very low, even for those species that may have a relatively high overall level of interview coverage.

The question was raised as to whether the level of interview coverage could be reduced in some ports while still maintaining an adequate database for confident proration of non-interviewed landings from those ports. This led to a discussion of what adequate levels of interviews should be, whether the working group should undertake further analyses of the interview database to answer some general questions regarding the adequacy of the data, or whether specific questions should be developed concerning specific analytical needs.

It was felt that the terms of reference of this working group had been met and any further questions pertaining to analyses of the interview database would be more adequately resolved by the formation of another working group.

Table 5.3.1. INTERVIEW COVERAGE EXPRESSED AS PERCENT INTERVIEWED LANDED WEIGHT (METRIC TONS)

SPECIES	NEFC WEIGHOUT/INTERVIEW			NON WEIGHOUT DATA			
	INTERVIEW LANDED WEIGHT	WEIGHOUT LANDED WEIGHT	PERCENT INTERVIEW IN WEIGHOUTS	GENERAL CANVASS NORTHEAST REGION	NORTH CAROLINA NORTHERN DISTRICT	TOTAL LANDED WEIGHT	PERCENT INTERVIEW IN TOTAL LANDINGS
ATLANTIC COD	16133	26508	61	308	0	26816	60
HADDOCK	2462	3003	82	24	0	3027	81
POLLOCK	10194	20251	50	141	0	20392	50
SILVER HAKE	4694	15564	30	139	0	15703	30
WITCH FLOUNDER	1771	3799	47	12	1	3812	46
WINTER FLOUNDER	5129	8280	62	753	1	9034	57
WINDOWPANE	1910	2480	77	140	0	2620	73
YELLOWTAIL FLOUNDER	5330	7378	72	181	1	7560	71
AMERICAN PLAICE	2725	5050	54	9	0	5059	54
ATLANTIC MACKEREL	1531	4339	35	35	208	4582	33
BUTTERFISH	1750	4508	39	47	52	4607	38
BLUEFISH	265	2849	9	683	1496	5028	5
TILEFISH	293	3205	9	5	14	3224	9
SUMMER FLOUNDER	3437	9518	36	435	1592	11545	30
SCUP	2040	5609	36	355	96	6060	34
BLACK SEA BASS	550	1635	34	142	76	1853	30
SEA SCALLOPS	77359	109159	71	93	244	109496	71
LOLIGO	2921	10355	28	91	0	10446	28
ILLEX	3122	6962	45	0	123	7085	44
AMERICAN LOBSTER	671	14654	5	7212	0	21866	3
ATLANTIC HERRING	10048	39429	25	0	0	39429	25
RIVER HERRINGS	35	402	9	42	1449	1893	2
STRIPED BASS	1	11	9	37	118	166	1

5.4. ESTUARINE WINTER FLOUNDER (WG16)

Members: Frank Almeida (NEFC), Jay Burnett (NEFC), Stan Chenowith (ME-DMR), Arnie Howe (MA-DNR), Mark Gibson (RI-DEM), Penny Howell (CT-DEP), Raoul Castaneda (NY-DEC).

5.4.1. Terms of Reference

The several topics discussed in the report of a meeting of this group provides general terms of reference.

5.4.2. Report

This working group is composed of individuals who are primarily responsible for winter flounder biological and assessment studies. Five research tasks identified by the group were:

1. Recreational catch statistics
2. Stock identification
3. Aging
4. Bottom trawl surveys
5. CPUE

The working group has addressed tasks 1, 2, and 3.

Task 1: The major concern was the separation and proportioning of Massachusetts recreational catch statistics into stocks north and south of Cape Cod. Previous Massachusetts studies defined the two stocks. Recreational statistics are now on the NEFC VAX, site codes in Barnstable and Plymouth counties have been assigned to stocks, and catch statistics will be allocated based on proportions calculated from the intercept data. These analyses should be available by the next SAW.

Task 2: The status of stock identification studies for several states was reviewed. Massachusetts stock identification studies using meristic counts from young-of-year (YOY) flounder and tagging were completed in the 1970s. Connecticut studies, using multivariate analysis of variance techniques (MANOVA) on YOY dorsal and anal fin ray counts and growth studies for Long Island Sound fish, were recently completed. Rhode Island may initiate mitochondrial DNA studies in Narragansett Bay and Rhode Island Sound. They will also be collecting YOY fish in these areas for meristics studies. New York will begin tagging studies in spring 1989. YOY samples are needed from the south shore of Long Island Sound and the Atlantic side of Long Island. However, funding for these studies is uncertain. New Jersey researchers will be asked to collect YOY samples from the state's coastal waters to supplement the coverage from New York, Connecticut, Rhode Island, and Massachusetts.

Overall, the Working Group felt that the major need is for samples from waters adjacent to Long Island and south to New Jersey.

Task 3: The status of aging studies at the NEFC and in the states was reviewed. The NEFC will conduct an age validation study for the Georges Bank stock. The NEFC has had problems aging fish taken in inshore strata because more than one growth pattern is often evident in samples collected in a single bottom trawl survey or commercial fishery tow. Results of recently completed Connecticut age validation studies will soon be available. A description of the aging techniques will also be reported. Massachusetts studies were completed in the mid-1970s. At the University of Rhode Island, a graduate student will begin looking at age samples collected from Narragansett Bay. Research will include age validation and growth studies in the Bay. New York is archiving trawl and angler samples.

The group felt that winter flounder aging is perceived as a problem, but in fact is not and questions about methods will probably be resolved by the next SAW.

5.4.3. Discussion

In reference to a question on the participation of New Jersey researchers in the working group, it was noted that the group is open to all interested individuals. It was also stated that New Jersey state biologists will begin looking at YOYs from that state's waters.

In response to a question on the participation of researchers involved in tagging studies at the 106 dump site, it was noted that none of those individuals were currently involved with the working group.

5.5. CONSERVATION ENGINEERING NEEDS (WG17)

Members: Eric Smith (Chair), Ron Smolowitz (NEFC), Guy Marchesseault (NEFMC), Tom Hoff(MAFMC)

5.5.1. Terms of Reference

Review informational requests and identify priorities and appropriate organizations and resources for addressing them, working closely with the Councils and other agencies, to generate a report to be considered in during the Sixth SAW.

5.5.2. Report

The working group was charged with identifying and prioritizing conservation engineering needs for fisheries management in the northwest Atlantic. The Conservation Engineering Working Group felt strongly that the following priority listing should be used for general orientation only. The group feels it is more productive to identify the importance of conservation engineering research relative to fisheries research and management than it is to prioritize everything that appears to be important at this time.

Developments in this field are dynamic. The list will grow and priorities will change. Having said this, certain issues seemed to surface more frequently than others during our review. Those are listed below as high priority issues; others to consider are unprioritized.

HIGH PRIORITY ISSUES

1. Development or modification of fishing gear to improve escapement and reduce unnecessary mortality, considering both selectivity and separator technologies.

PRIORITY	
A	mixed species trawl fisheries
A	summer flounder
A-B	whiting
A-B-C	sea scallop (nets and dredges)
A-C	northern shrimp
B-C	butterfish
B-C	surf clam dredge

2. Development of in situ observation technology for assessing the impact of fishing gear on resources and habitat

PRIORITY	
A-B	in situ observation technology (ROVs, manned submersibles)
B-C	high speed video equipment for monitoring fishing gear performance

3. Development or improvement of degradable material technology

PRIORITY	
B-C	escapement from pots (lobster, black sea bass)
B-C	degradation of lost nets

4. Assessment of resource and habitat impacts

PRIORITY	
C	dredging and trawling

UNPRIORITIZED ISSUES THAT SHOULD BE CONSIDERED WHEN IDENTIFYING CONSERVATION ENGINEERING NEEDS

* Gear conflict resolution
* Sampling systems
* Marine mammal entanglement
* Vessel safety
* Marine plastics pollution
* Fisheries development

5.5.3. Discussion

The discussion was initiated by a comment that one weakness in the process of setting priorities is that when topics are listed, other topics are necessarily left out. When needs change, these omissions will create problems. This working group therefore attempted to make a comprehensive list, and invited the SAW membership to add to it. No new topics were mentioned, but rather a concern was raised that nothing was going to come of this exercise.

The response to this question was that recent formation of the Marine Engineering Committee of the Marine Technology Society (MTS) had now institutionalized work that had previously been done on an ad hoc basis. This committee has put out a document that covers present studies and has sponsored two symposia, with a third scheduled for the near future. The ASMFC Advisory Committee also has a proposal to hire a regional coordinator for ongoing studies and data needs.

The comment was also made that the focus of conservation engineering has moved from studies on increasing gear productivity for fishermen to studies of ways to make gear "clean" and more specific in targeting species. Comment was added that such concerns had motivated an upcoming symposium in Rhode Island where Scottish researchers will discuss their work concerning mortality associated with mesh escapement.

The question was raised as to the need for the working group to continue. The group responded that they had completed their charge and that the group should be dissolved. However, the Marine Engineering Committee of the MTS should address future SAWs when new issues arise. A question was asked about how the group's work could be used. The response was that the working group's priority list should be generally available at the regional level because conservation engineering issues, and funding sources, are regional in nature. This priority list should be a tool to help these regional bodies orient their resources to prevent overlap, narrow scope, and repetitiveness in conservation engineering investigations.

The terms of reference for the working group were met and the members were thanked for their work.

5.6. ECONOMIC RESEARCH NEEDS (WG18)

Members: Phil Logan (Chair), Chris Kellogg (NEFMC), Lou Goodreau (NEFMC), Tom Hoff (MAFMC), Dick Seamans (NERO), Jack Terrill (NERO).

5.6.1. Terms of Reference

Review informational requests and identify priorities and appropriate organizations and resources for addressing them, working closely with the Councils and other agencies to generate a report to be considered in during the Sixth SAW.

5.6.2. Report

BACKGROUND

In an attempt to streamline consideration of all of the elements in the Fifth SAW Terms of Reference (WP2-SAW-5), Working Group 18 was formed to consider requests for economic research and analyses. The group met twice, on 17 November 1987 and 1 May 1988. In the first meeting, representatives from the NEFMC, MAFMC, NERO and NEFC attended. The second meeting was attended by people from the NEFMC, MAFMC, and NEFC.

The working group felt that a major short-run, and probable long-run, problem was the growing mismatch between requirements for economic information and analyses, and the resources (money and people) to provide these services. The demand is growing:

1. As councils and other management groups seek to improve the analyses of economic and social implications of regulations.

2. As the review of analyses legislated in the relevant laws become more demanding.

3. As allocation issues come to the fore in more fisheries.

4. As an ever larger number of fisheries come under regulation and management.

5. As new information requirements are being discussed.

The group agreed that it was important not to burden the SAW with the mechanics of dealing with an additional set of topics (Table 5.6.1.), yet recognized that a vehicle is needed for communicating ideas between those concerned with economic matters and the SAW.

PROPOSAL

The working group made the following proposals:

1. That Working Group 18 become a permanent working group of the SAW, with the opportunity to report at each meeting.

2. That it should consist of but not be limited to members representing the Mid-Atlantic and New England Council staffs, the NEFC and the NERO.

3. That it should operate as a conduit between the SAW and a similar body, yet to be organized, whose principal concern will be fishery economics.

4. That it will seek to establish such a forum in order to increase the amount of and improve the quality of analyses identified as priority requirements by the working group. [1]

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[1] A set of priorities has already been established for work and is contained in WP2-SAW-5 and in the attached MAFMC document dated 28 April 1988.

(A = Immediate, B = Near Term, C = Long Term, X = Remove From List; Bold = strongly disagree with NEFMC, underline = disagree with NEFMC)

MAFMC	NEFMC	ASMFC	Fishery	Specialty	Description
A	A	A	Multispecies	Economics	MODEL OPTIMAL EFFORT LEVELS
A	A	A	Scallops	Economics	MODEL OPTIMAL FISHING EFFORT LEVELS
C	B	C	All	Economics	DEVELOP MODELS OF SOCIO-ECONOMIC CONSIDERATIONS FOR OTHER SPECIES
C	A	A	Lobster	Economics	DETERMINE POTENTIAL IMPACTS OF LIMITING FISHING EFFORT (E.G. TRAP LIMITS)
C	C	C	Quahogs	Economics	DEVELOP MODELS OF SOCIO-ECONOMIC CONSIDERATIONS FOR SURF CLAMS AND QUAHOGS
C	C	C	Surf Clams	Economics	DEVELOP MODELS OF SOCIO-ECONOMIC CONSIDERATIONS FOR SURF CLAMS AND QUAHOGS
C	B	C	Surf Clams	Economics	MODEL DEMAND FOR PRODUCT TO DETERMINE EFFECTS OF DEVELOPMENT IN NEW ENGLAND
C	C	C	Surf Clams	Economics	MODEL OPTIMAL FISHING EFFORT AND VESSEL SIZES
X	A	X	Multispecies	Economics	MODEL DEGREE OF SUBSTITUTION OF IMPORTS FOR DOMESTIC CATCH
X	A	X	Scallops	Economics	MODEL DEGREE OF SUBSTITUTION OF IMPORTS FOR DOMESTIC CATCH
X	B	X	Scallops	Economics	SUPPLY MODEL TO DETERMINE DERIVED DEMAND FOR MODIFIED GEAR
X	B	X	Surf Clams	Economics	ANALYSIS USING COST DATA OF ECONOMIC EFFICIENCY IN NEW ENGLAND SURF CLAMS

Table 5.6.1. Information requests for economics research, sorted by fishery and speciality.

5.6.3. Discussion

It was generally agreed that Working Group 18 would continue. Questions were raised about the future of priority lists in general. In the general case, where the subject matter of the working groups was beyond the purview of the SAW, lists are an end in themselves; to be used by interested parties in demonstrating support for research and so on. In the case of the economics research list, it was noted that this would be a basis for organizing the forum described in the working group report.

It was noted that as each group involved in economic analysis had priorities defined within the context of their respective organizations, the forum was a first step in trying to make meaningful use of the lists. The forum would bring together those who fund research proposals (for example, those who set priorities for Sea Grant and Saltonstall-Kennedy funds) to compare ideas on needed research, serve as a clearinghouse for those ideas, and help avoid duplication of effort.

In a discussion session concerning Working Group 20, on data needs, it was agreed that Working Group 18 would include requirements for economic data acquisition in its area of concern, if that data cannot be aquired by augmenting existing data collection systems.

5.7. BIOLOGICAL RESEARCH NEEDS (WG19)

Members: Tim Smith (Chair), Arnie Howe (MA), Tom Hoff (MAFMC), Howard Russell (NEFMC), Paul Perra (ASMFC)

5.7.1. Terms of Reference

Review informational requests and identify priorities and appropriate organizations for addressing them, working closely with the Councils and other agencies, to generate a report to be considered during the Sixth SAW.

5.7.2. REPORT

Discussion of priorities in the Fifth SAW generated several lists of biological research needs. These lists were reviewed, with items added and deleted according to available information on research needs and technical feasibility. Members of the working group attempted to rank these items using the categories immediate need (A), near-term need (B), long-term need (C), and remove from list (X). Three different perspectives emerged, resulting in three set of rankings: MAFMC, NEFMC, and ASMFC. The results of the group's deliberations are not solely the points of view of these organizations, however, with considerable refinement of priorities occurring in the course of discussions.

The categories used did not necessarily imply a strategy of addressing the immediate needs topics first, although there was some sense of this from time to time in the discussions. For example, some of the long-term needs were recognized as being very important, and that the work would have to start well in advance of the time when results would be needed. We did not attempt to identify organizations for addressing these needs, noting that a variety of organizations were capable of handling many of them, but that the size and capability of these organizations varied greatly.

The results of the working group's review are shown in Table 5.7.1., where a ranking of each item is indicated from each perspective: MAFMC, NEFMC, and ASMFC. This version was assembled by editing a draft that was sorted according to the MAFMC representative's draft rankings. The resulting order is not intended to indicate priority within items with similar rankings.

There is considerable agreement in the rankings from the three perspectives. Some disagreements resulted from simple differences in regional perspective. For example, the ranking of fluke assessment in the NEFMC perspective, where there is some involvement, is B, compared to A for the MAFMC and ASMFC perspectives. In comparison, the ranking for bluefish assessment from the NEFMC perspective, where there is little involvement, is C, compared again to A from the MAFMC and ASMFC perspectives. Other examples of regional differences include scup-black sea bass assessment and Atlantic herring assessment.

The item "define NEFC responsibilities for large pelagics" includes two specific topics. One is the priority for biological work on sharks being done within the NEFC. It was noted that while the priority for an FMP for sharks is relatively low, the priority was volatile and the basic biology needs to be addressed. The second topic is the responsibility of the NEFC to do large pelagic assessments that are the province of SEFC.

It was felt that rankings related to Illex and Loligo assessments needed to be addressed following the Sixth SAW presentation on these species, and hence would be discussed when this report was presented. The rankings are somewhat uncertain because of recent geographical changes in the fisheries.

The item "assessment of black sea bass and scup" implies that these assessments should be developed together, reflecting the proposal for a joint FMP that would reflect the mixed species fishery for these two species throughout much of their ranges.

5.7.3. Discussion

A brief discussion ensued on the relevance of the classification scheme used to indicate the time frames associated with various proposed research needs (Table 5.7.1). It was noted that a relatively large proportion of projects were listed as "immediate" priority. It is unlikely that all items listed as of immediate priority can or will be addressed in the short term, and thus the utility of the classification was questioned. Since these needs were identified by each management authority (New England and Mid-Atlantic Councils and ASMFC), these lists represent a compilation of priority needs from the perspective of these agencies individually and not collectively.

The terms of reference of the working group were met and the members were thanked for their work.

Table 5.7.1. Information requests for biological research sorted by fishery and specialty
(A = immediate, B = Near Term, C = Long Term, X = Remove from List)

MAFMC	NEFMC	ASMFC	Fishery	Specialty	Description
A	A	A	All	Assessment	Define 'Directed Fishing' within context of mixed species fisheries.
A	C	A	All	Assessment	Define NEFC responsibilities for large pelagics.
A	A	A	All	Assessment	Estimate survival of discards in commercial fishery.
A	A	A	All	Assessment	Estimate survival of discards in rec. fishery (esp.bluefish, summer fldr, & weakfish).
A	X	A	All	Assessment	Evaluate concept of MSY/Long term potential catch.
A	A	A	All	Assessment	Review priorities for assessments of all species.
A	C	A	All	Assessment	Determine status of research and schedule on predator/prey relationships.
A	B	A	All	Biology	Determine effect of sand and gravel extraction on finfish, squid, and their food organisms.
A	B	A	All	Biology	Determine effects of contaminants on finfish and shellfish in coastal regions.
A	B	A	Billfish	Biology	Determine survival rate of released sport caught billfish.
A	C	A	Bluefish	Assessment	Revised bluefish assessment.
A	B	A	Fluke	Assessment	Revise summer flounder assessment to include VPA.
A	A	A	Illex	Assessment	Improved analysis of availability versus abundance for Illex.
A	B	A	Illex	Assessment	Evaluate alternate stock assessment methods for Illex
A	B	A	Illex	Assessment	Evaluate reliability of current surveys for basis of assessments.
A A	B	A	Lobster	Assessment	Improve age and growth models for inshore and offshore populations.
A	B	A	Lobster	Assessment	Improve stock assessments for eez resources.
A	A	A	Loligo	Assessment	Analysis availability versus abundance for Loligo.
A	B	A	Loligo	Assessment	Evaluate alternate stock assessment methods for Loligo.
A	B	A	Loligo	Assessment	Evaluate reliability of current surveys for basis of assessments for Loligo.
B	B	B	Mackerel	Assessment	Analysis availability versus abundance for mackerel.
A	A	A	Multispecies	Assessment	Model effort redistribution response to closed areas.
A	A	A	Multispecies	Assessment	Simulate effect of variability in recruitment.
A	A	A	Scallops	Statistics	Determine by-catch amount and species by scallopers.
A	C	A	Scup-sea bass	Assessment	Assessment of black sea bass and scup.
A	B	A	Surf Clams	Assessment	Evaluate MSY, and magnitude and long-term prospects for surf clams.
A	A	A	Surf Clams	Assessment	Assess risk of alternate extraction policies of New England resource.
B	A	B	All	Biology	Ecosystem codels of synergistic effects of multiple marine const. projects.
B	A	B	Lobster	Assessment	Determine recruitment relationship between inshore and offshore populations.
B	C	B	Lobster	Biology	Determine geographic stock boundaries (inshore, offshore, Long Island)
B	A	B	Multispecies	Assessment	Model more advanced stock recruitment relationships.
A	A	B	Scallops	Biology	Determine impact of scallop dredges on benthic species.
B	C	B	Surf clams	Biology	Determine impact of surf clam dredges on bethic species.
B	B	B	Surf clams	Biology	Determine factors affecting settlement and recruitment.

(Table 5.7.1. continued)

C	A	A	Herring	Assessment	Improve estimation of recruitment, using Brit. surveys and tagging studies.
C	A	A	Herring	Assessment	Revise herring assessment with VPA.
C	A	A	Herring	Biology	Improve information on stock separation and distribution.
C	B	C	Lobster	Assessment	Develop models of biological and economic processes for lobsters.
B	A	A	Lobster	Assessment	Estimate marginal effect of increased egg production.
C	C	C	Quahogs	Assessment	Evaluate MSY and magnitude and long-terms prospects for quahogs.
C	C	C	Quahogs	Assessment	Study density dependent growth and recruitment in quahogs.
C	C	C	Red hake	Assessment	Revised red hake assessment.
C	B	C	Scallops	Assessment	Model density dependent effects on recruitment, growth, mortality.
C	B	C	Scallops	Assessment	Model effort redistribution response to closed areas.
C	B	C	Silver hake	Assessment	Revised Silver hake assessment.
C	B	C	Surf clams	Assessment	Study density dependent growth and recruitment in surf clams.
C	C	C	Surf clams	Biology	Growth differences among surf clam populations.
X	C	X	Quahogs	Biology	Growth differences among quahog populations.
B	A	B	Winter flounder	Biology	Review regional growth patterns.
B	B	A	Weakfish	Assessment	Revise stock assessment.

5.8. DATA NEEDS (WG20)

Members: Darryl Christensen (Chair), Tom Hoff (MAFMC), Guy Marchesseault (NEFMC), Jack Terrill (NERO), William Emerson (NEFC), Tim Smith (NEFC), Paul Perra (ASMFC).

5.8.1. Terms of Reference

Review informational requests and identify priorities and appropriate organizations for addressing them, work closely with the Councils and other agencies to generate a report to be considered in during the Sixth SAW.

5.8.2. Report

A meeting was held 2 May 1988. Representatives from the MAFMC, ASMFC, NEFMC, NEFC, and NY-DEC attended.

The working group agreed to review the data needs previously submitted and attempt to establish priority recommendations. All recognized that certain needs are unique to each represented agency and that it was impossible to obtain complete agreement on priorities. Table 5.8.1. indicates the priority assigned to each data need and to the individual needs of MAFMC, NEFMC, and ASMFC. In addition, several generic needs were identified:

1. Retail Price Data Collection. WG 20 suggests that this topic be assigned to WG-18. Retail price information for all species is clearly needed yet ther is no suitable system for collecting it.

2. Review of Recreational Fisheries Data. WG 20 suggests there may be a need for improved collection of recreational statistics. The Atlantic States Marine Fisheries Commission (ASMFC) has established a Marine Recreational Fisheries Committee that is looking into ways to improve the collection of marine recreational statistics for East Coast fisheries. The Data Needs Working Group recommends that the ASMFC Recreational Fisheries Committee be invited to give a report of its findings at the Seventh SAW.

5.8.3. Discussion

The report was reviewed and several changes that had been made in priorities were noted (Table 5.8.1.). The chairperson also indicated that two areas of "generic" data had been identified: retail price data and recreational fisheries data. Concerning the first, for which there exists no organized collection system, the sense of the SAW was to refer the request to permanent Working Group 18 (economics). In regard to recreational data, it was pointed out that some of the items in this category were inappropriate for analyses. Assurances were given that before any attempts would be made to augment existing data collection systems, those responsible for managing such systems would ensure that the additional items to be collected were appropriate.

A=Immediate, B=Near Term, C=Long Term)

TABLE 5.8.1. PRIORITIZED INFORMATION REQUESTS FOR DATA NEEDS

MARMC	NERMC	ASMFC	Fishery	Specialty	Description
A	A	A	Billfish	Statistics	IMPROVE DATA FOR REC. AND COMM. FISHERIES FOR BILLFISH
A	A	A	All	Assessment	PROVIDE APPROPRIATE INFORMATION ABOUT ENFORCEMENT ACTIVITIES TO COUNCILS
A	A	A	Multispecies	Statistics	IMPROVE INTERVIEW COVERAGE IN MID-ATLANTIC AND SMALL NEW ENGLAND PORTS
A	A	A	All	Statistics	EVALUATE UTILITY OF WEIGH-OUT SYSTEM FOR "EFFORT" ANALYSES
A	A	A	Scallops	Biology	COLLECT SHELL HEIGHT AND MEAT WEIGHT DATA YEAR-AROUND BY REGION
A	A	A	Scallops	Statistics	IMPROVE LENGTH-FREQ. DATA FROM MID-ATLANTIC REGION
A	B	A	Bluefish	Statistics	REVIEW PORT SAMPLING OF BIOLOGICAL DATA FOR COVERAGE OF COMMERCIAL BLUEFISH
A	B	A	Swordfish	Statistics	SWORDFISH: COLLECT IMPROVED DATA ON BY-CATCH
A	B	A	Bluefish	Assessment	IMPROVE PREDICTIVE MODELS FOR FUTURE CATCHES OF BLUEFISH
A	B	A	Bluefish	Statistics	IMPROVE INTERVIEW OR LOGBOOKS FOR DIRECTED COMMERCIAL BLUEFISHING EFFORT
A	B	A	Quahogs	Statistics	IMPROVE QUALITY OF AREA OF CATCH FOR INSHORE QUAHOGS
A	B	A	Fluke	Biology	IMPROVE DATA ON SUMMER FLOUNDER REC. AND COMMERCIAL DISCARD SURVIVAL
A	B	A	Surf Clams	Statistics	IMPROVE QUALITY OF DATA ON AREA OF CATCH FOR INSHORE SURF CLAMS
A	B	A	Bluefish	Assessment	IMPROVED INDEX OF TOTAL BLUEFISH STOCK SIZE.
A	C	A	Fluke	Economics	COLLECT DATA ON VESSEL COSTS FOR COMMERCIAL SUMMER FLOUNDER FISHERY
B	C	A	Striped Bass	Statistics	IMPROVE DATA ON RECREATIONAL STRIPED BASS FISHING EFFORT
B	A	B	Lobster	Assessment	IMPROVE COMMERCIAL LANDINGS DATA, LENGTH SAMPLING, EXPANDED COVERAGE
B	B	A	River Herring	Statistics	DETERMINE DOMESTIC BY-CATCH
A	C	A	Bluefish	Economics	COLLECT DATA ON VALUE AND EXPENDITURES OF REC. BLUEFISHING
A	C	A	Bluefish	Economics	COLLECT VESSEL COST DATA FOR COMMERCIAL BLUEFISH
A	C	A	Fluke	Economics	DEVELOP DATA ON RECREATIONAL CATCH VALUE AND EXPENDITURES FOR SUMMER FLOUNDER
A	C	A	Illex	Statistics	IMPROVE ACCESS TO J-V DATA ON CATCH AND EFFORT FOR ILLEX
A	C	A	Loligo	Statistics	MAKE AVAILABLE J-V DATA ON CATCH AND EFFORT FOR LOLIGO
A	C	A	Striped Bass	Statistics	EVALUATE QUALITY OF RECREATIONAL CATCH DATA FOR STRIPED BASS
A	C	A	Swordfish	Economics	IMPROVED DATA FOR SWORDFISH ON WHO AND HOW FISHING
A	C	A	Tilefish	Biology	EVALUATE BIOLOGICAL DATA COLLECTION SCHEME FOR TILEFISH
A	C	A	Tilefish	Economics	IMPROVE DATA COLLECTION ON VESSEL COSTS FOR TILEFISH
B	A	B	Butterfish	Statistics	IMPROVE DISCARD DATA FOR BUTTERFISH

A	C	B	Fluke	Statistics	DEVELOP DATA ON CORECREATIONAL FISHING EFFORT FOR SUMMER FLOUNDER
B	A	C	Lobster	Economics	COLLECT WHOLESALE AND RETAIL PRICE DATA
B	A	C	Lobster	Economics	COLLECT DATA ON NUMBER OF FISHERMEN IN EEZ BY GEAR TYPE, USING PERMIT SYSTEM
B	A	C	Lobster	Statistics	COLLECT CATCH DATA FROM DRAGGERS
B	B	B	Loligo	Economics	IMPROVE WORLD MARKET DATA FOR LOLIGO
B	B	B	Bluefish	Statistics	COLLECT RECREATIONAL BLUEFISHING EFFORT DATA
B	B	B	Butterfish	Economics	COLLECT VESSEL COSTS FOR DOMESTIC BUTTERFISH FISHERY
B	B	B	Butterfish	Statistics	INCREASE COVERAGE OF BUTTERFISH FISHING TRIP FOR FISHING EFFORT DATA
B	B	B	Illex	Economics	IMPROVE WORLD MARKET DATA FOR ILLEX
B	A	C	Lobster	Statistics	IMPROVE CATCH DATA RELATIVE TO INSHORE (<3 MI) AND OFFSHORE GROUNDS
B	B	B	Illex	Economics	COLLECT VESSEL COSTS FOR DOMESTIC ILLEX FISHERY
B	B	B	Mackerel	Economics	IMPROVE WORLD MARKET DATA FOR MACKEREL
B	B	B	Sharks	Statistics	CONDUCT RECREATION SURVEY
B	A	C	Lobster	Assessment	ESTIMATE LEVEL OF FISHING EFFORT EEZ - VERY POOR EFFORT INDEX
B	B	B	Surf clams	Statistics	IMPROVE DATA ON SURF CLAM DISCARDS
B	C	B	Mackerel	Economics	COLLECT DATA ON VALUE OF REC. CATCH AND TOTAL EXPENDITURES FOR MACKEREL
B	C	B	Mackerel	Statistics	COLLECT RECREATIONAL FISHING EFFORT FOR MACKEREL
B	C	B	Mackerel	Statistics	ESTIMATE CATCH OF MACKEREL IN CANADIAN WATERS
B	C	B	Quahogs	Economics	IMPROVE DATA ON QUAHOGS VESSEL COSTS
B	C	B	Surf clams	Economics	IMPROVE DATA ON SURF CLAM VESSEL COSTS
B	C	B	Tilefish	Statistics	EVALUATE DATA COLLECTION SCHEME FOR TILEFISH CATCH
B	C	B	Tilefish	Statistics	EVALUATE COMMERCIAL EFFORT DATA COLLECTION FOR TILEFISH
C	B	C	Loligo	Economics	IMPROVE DATA ON DOMESTIC HARVESTING CAPACITY FOR LOLIGO
C	B	C	Loligo	Economics	COLLECT VESSEL COSTS FOR DOMESTIC LOLIGO FISHERY
C	B	C	Mackerel	Economics	IMPROVE DATA ON DOMESTIC HARVESTING CAPACITY FOR MACKEREL
C	B	C	Mackerel	Economics	COLLECT VESSEL COSTS FOR DOMESTIC MACKEREL FISHERY
C	B	C	Mackerel	Economics	IMPROVE DATA ON DOMESTIC PROCESSING CAPACITY FOR MACKEREL
C	B	C	Quahogs	Assessment	DOCUMENT EXTENT OF NEW ENGLAND RESOURCE - RESOURCE SURVEY
C	B	C	Tilefish	Assessment	DEVELOP FISHERY INDEPENDENT INDICES OF ABUNDANCE OF TILEFISH
C	B	C	Illex	Statistics	INCREASE COVERAGE OF ILLEX FISHING TRIPS FOR FISHING EFFORT DATA
C	B	C	All	Biology	EVALUATE UTILITY OF HYDROACOUSTIC STUDIES
C	B	C	Butterfish	Economics	IMPROVE DATA ON DOMESTIC HARVESTING CAPACITY FOR BUTTERFISH
C	B	C	Butterfish	Economics	IMPROVE WORLD MARKET DATA FOR BUTTERFISH
C	B	C	Illex	Economics	IMPROVE DATA ON DOMESTIC PROCESSING CAPACITY FOR ILLEX
C	B	C	Illex	Economics	IMPROVE DATA ON DOMESTIC HARVESTING CAPACITY FOR ILLEX
C	B	C	Loligo	Economics	IMPROVE DATA ON DOMESTIC PROCESSING CAPACITY FOR LOLIGO

C	C	C	Mackerel	Assessment	DEVELOP IMPROVED USE OF EGG AND LARVA SAMPLING DATA FOR MACKEREL
C	C	C	Mackerel	Biology	EVALUATE BIOLOGICAL DATA FROM RECREATIONAL FISHERY FOR MACKEREL
C	C	C	Mackerel	Biology	IMPROVE QUALITY OF BIOLOGICAL SAMPLES FROM DOMESTIC MACKEREL FISHERY
C	C	C	Mackerel	Statistics	IMPROVE DATA COLLECTION ON RECREATIONAL CATCH
C	C	C	Bluefish	Assessment	EVALUATE STATE SURVEY DATA FOR UTILITY FOR BLUEFISH ABUNDANCE
C	C	C	Bluefish	Assessment	DEVELOP IMPROVED USE OF EGG AND LARVA SAMPLING DATA FOR BLUEFISH
C	C	C	Butterfish	Biology	IMPROVE QUALITY OF BIOLOGICAL SAMPLES FROM DOMESTIC BUTTERFISH FISHERY
C	C	C	Striped bass	Economics	COLLECT DATA ON COMMERCIAL STRIPED BASS VESSEL COSTS
C	C	C	Fluke	Assessment	DEVELOP DATA ON EGGS AND LARVAE FROM MARMAP FOR SUMMER FLOUNDER
C	C	C	Striped bass	Statistics	IMPROVE DATA ON STRIPED BASS COMMERCIAL EFFORT
C	C	C	Fluke	Economics	IMPROVE DATA ON DOMESTIC HARVESTING CAPABILITY FOR SUMMER FLOUNDER
C	C	C	Illex	Biology	IMPROVE QUALITY OF BIOLOGICAL SAMPLES FROM DOMESTIC ILLEX FISHERY
C	C	C	Striped bass	Economics	EVALUATE DATA ON VALUE OF REC. STRIPED BASS CATCHES
C	C	C	Loligo	Biology	IMPROVE QUALITY OF BIOLOGICAL SAMPLES FROM DOMESTIC LOLIGO FISHERY
C	C	C	Loligo	Statistics	INCREASE COVERAGE OF LOLIGO FISHING TRIPS FOR FISHING EFFORT DATA
C	C	C	Mackerel	Statistics	INCREASE COVERAGE OF MACKEREL FISHING TRIPS FOR FISHING EFFORT DATA
C	C	C	Quahogs	Economics	IMPROVE DATA ON QUAHOG DOMESTIC PROCESSING CAPACITY
C	C	C	Surf clams	Economics	IMPROVE DATA ON SURF CLAM DOMESTIC PROCESSING CAPACITY

68 (con't.)

A discussion of items related to billfish led to the suggestion that when such items are the subject of the SAW, representatives of interested bodies (SEFC) should be invited to attend.

A discussion of the future of the working group ensued. It concluded with the recommendation that the group continue its work, that it consist of multidisciplinary membership, that the chair would be open, and that the working group would respond to requests as needed.

6. TERMS OF REFERENCE FOR SEVENTH SAW

6.1. Assessment Reviews or Updates

Several assessment reviews or updates were identified as possible agenda items for the next SAW.

1. A revised assessment of the southern New England and Georges Bank yellowtail flounder stocks

2. An assessment of the Gulf of Maine cod stock

3. An assessment update for scup

4. A review and assessment of weakfish

6.2. Special Topics

Various special topics may also be addressed.

1. The Marine Recreational Fisheries Committee of ASMFC will be invited to present a review and critique of recreational fisheries surveys and data collection methods.

2. Mark Holiday and various state people will be invited to present overviews of their recreational data collection systems, addressing the continuity and overlap of state programs to the federal procedures.

3. A review of regional growth patterns in winter flounder

4. A review of long-term yield potential for surf clams

5. A discussion of the Technical Monitoring Group report to the New England Fishery Management Council

6. A short report on activities by the Chesapeake Bay Stock Assessment Committee emphasizing their stock assessment plan and recreational fisheries data collection methods

7. A review and discussion of the E.E.C. workshop on technological interactions was held in Nantes, France during the Spring of 1987. Benoit Mesnil from France will be invited to chair a session on this subject.

8. The Mid-Atlantic Fisheries Management Council may also propose one or two other agenda items within the next several months.

9. The question of a butterfish mesh selectivity study was also mentioned and the discussion centered on two subjects. There was some question as to whether the study was still needed. Discarding seems to be less of a problem and a new SSS market category has been created. If the study is still needed, then the problems that have made it difficult to get the program started will have to be solved. The NEFC has repeatedly tried, without success, to set up sea sampling trips.

6.3. Working Groups

Several working group reports will also be presented.

1. Long term potential catch (WG9)

2. Winter flounder aging validation, recreational catch allocation north and south of Cape Cod (WG16)

3. Summer flounder CPUE methodology (WG21)

Objective: To identify CPUE indices from commercial and recreational fisheries that best reflect summer flounder abundance (as currently indicated by NEFC spring survey indices).

a. Report preliminary research on recreational CPUE (following model of report of preliminary commercial CPUE analysis)

b. Identify proportion of total landings reflected by weigh-out system over time. Compare landings by year,area,season from weigh-out data base with landings by year, area, season, gear from canvas database.

c. Review underlying assumptions of general linear model (GLM), generic and specific

d. Refine preliminary research on commercial CPUE GLM, reflecting feasible elements of SAW feedback

e. Compare trends in existing North Carolina data with other CPUE series

f. Refine preliminary research on recreational CPUE GLM, reflecting feasible elements of SAW feedback

7. PLANNING FOR FUTURE SAWS

7.1 Timing for the Seventh SAW.

The next SAW was scheduled for the week of November 28 to December 2, 1988. It was also agreed that a letter asking for an opinion on this date and the week of November 14-18 would be included in the mailing of the Sixth SAW document to all people on the mailing list.

8. MEETING LENGTH

8.1. Discussion

A discussion on the duration of the next and future SAWS occurred. There was a proposal made to start future meetings on the middle of the first day. The problem of whether a long or short meeting was appropriate was also mentioned. The next chair will have to decide on the meeting length and this decision would be based on the size of the final agenda. The last day was thought to be critical in terms of subject matter and attendance and everyone should be prepared to spend the whole day reviewing the report.

9. CHAIRPERSON FOR FUTURE SAWS

9.1. Discussion

A question as to whether a state or Council person should chair the next SAW was raised. It was felt that there would be some benefit to having a non-NEFC person chair the SAW for a change, to gain experience, and to show that it is not exclusively an NEFC process. The possibility of changing the location of the meeting was also addressed. Some people felt that this would cause a problem due to lack of facilities and clerical support. The fact that the NEFC would have to send a lot of people to this other location was mentioned knowing the problem with travel budgets, but it was felt that the NEFC could deal with this issue if it arose. Volunteers for the chair of the next SAW were solicited from the audience, but no one was ready to take the job at this time. It was decided that the NEFC would have to deal with these issues for the time being.

10. REFERENCES

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Lange, A.M., M.P. Sissenwine and E.D. Anderson. 1984. Yield analysis for the long-finned squid, Loligo pealei (LeSueur). Copenhagen, Denmark: International Council for the Exploration of the Sea, CM. 1984/K: 25. 40p.

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Waring, G.T. 1986. An analysis of spatial differences in size composition and abundance of butterfish, *Peprilus triacanthus*, off the northeast United States. Woods Hole, MA: NMFS, NEFC. Woods Hole Laboratory Reference Document 86-04, 23pp. Available from: Northeast Fisheries Center, Woods Hole, MA.

11. APPENDICES

11.1. APPENDIX 1: WORKING PAPERS

Working papers used in the 6th SAW. Papers with a MS designation should not be cited without prior reference to the author.

WP1-SAW6 Waring, G. MS. 1988. Status of butterfish in the Gulf of Maine Mid-Atlantic area, May 1988. 10pp.

WP2-SAW6 Lange, A. MS. 1988. Assessment update for long-finned squid (Loligo pealei). 15pp.

WP3-SAW6 Lange, A. MS. 1988. Assessment update for short-finned squid (Illex illecebrosus). 11pp.

WP4-SAW6 Overholtz,W.J., S.A. Murawski, W.L.Michaels, and L.M.Dery. MS. 1988. The effects of density dependent population mechanisms on assessment advice for the Northwest Atlantic mackerel stock. 20pp.

WP5-SAW6 Shepherd, G. R. MS. 1988. Stock identification of black sea bass north of Cape Hatteras. 20pp.

WP6-SAW6 Smolowitz, R.L. and F.M.Serchuk. 1987. Current technical concerns with sea scallop management. Proceedings: The oceans "an international workplace". pp 639-644. Marine Technology Society and Ocean Engineering Society Meeting, Halifax, N.S., Sept. 28 - Oct. 1, 1987. Halifax, N.S. William MacNab and Son Publisher. 1172 pp.

WP7-SAW6 Shultz, R. MS. 1988. A sea sampling program for the New England Mid-Atlantic region of the US: a preliminary report. 2pp.

WP8-SAW6 Richards, R. Anne. MS. 1988. Preliminary analysis of factors affecting commercial catch per unit effort of summer flounder. 12pp.

WP9-SAW6 Serchuk, F.M. and R.J. Smolowitz. MS. 1988. Seasonality in sea scallop meat weight and reproductive condition: preliminary results from the Cooperative NMFS/Council/Industry Sea Scallop Data Collection Program. 15pp.

11.2. APPENDIX 2: AGENDA

Draft Agenda For 6th SAW
May 3-5, 1988

Northeast Fisheries Center Aquarium Conference Room
Woods Hole, MA

Contact: Bill Overholtz 617-548-5123 FTS 840-1256

Monday May 2:

1300	Working Group 18: Economic Research Needs	Phil Logan
0900	Working Group 19: Biological Research Needs	Tim Smith
1300	Working Group 20: Data Needs Darryl Christensen	

These Working Groups will meet and prepare a report for presentation on Wednesday afternoon.

Tuesday May 3

Preliminaries
Chair: Bill Overholtz

0900 Introduction
Welcome by Center Director
Identification of Working Papers

0930 Revision and Adoption of Agenda

Mid Atlantic Fishery Resources
Chair: Bill Overholtz

0945	Report of Preliminary Summer Flounder Work	Anne Richards
1015	Updated Butterfish Assessment	Gordon Waring
1100	Updated Illex and Loligo Assessments	Anne Lange
1200	Lunch	
1300	Mackerel Growth Rates, Mortality Rates, Assessment Impacts	Bill Overholtz

Coastal and Estuarine Resources
Chair: Wendy Gabriel

1345 Report of preliminary work on Bluefish
Mark Terceiro

1415 Black Sea Bass Progress Report Gary Shepherd

1500 ASMFC American Shad Studies Mark Gibson
Vic Crecco

1600 Review Draft Report Sections

1800 Reception

Wednesday May 4:

0830 Rapporteurs' Reports due from previous day's work
Review Reports

New England Fishery Resources
Chair: Fred Serchuk

0900 Scallop Meat Weight/Shell Height Studies New England
Fred Serchuk

0945 Scallop Studies, Economics, and Baseline Data
Mid Atlantic Region Bill DuPaul
Jim Kirkley
Anne Schmitzer

1030 Juvenile Cod Distribution Studies Sue Wigley

Working Group Reports
Chair: Bill Overholtz

1100 Working Group 9: Methods of Measuring Long-Term Potential Catch
Brian Rothschild

1115 Working Group 12: Scientific Goals of Collecting Data on Fishing Vessels John Mason

1130 Working Group 13: Adequacy of Present Port Agent Interview System Darryl Christensen

1145 Working Group 16: Estuarine Winter Flounder Assessments
Frank Almeida

1200 Lunch

Working Group Reports
Chair: Phil Logan

1300 Working Group 17: Conservation Engineering Needs
Eric Smith

1400 Working Group 18: Economic Research Needs
Phil Logan

1500 Working Group 19: Biological Research Needs
Tim Smith

1600 Working Group 20: Data Needs Darryl Christensen

1700 Finalize Terms of Reference for 7th SAW

Thursday May 4:

0900 **Review Draft Report Sections**
Chair: Session Chairs, Bill Overholtz

1000 Finalize Workshop Report
Chair: Bill Overholtz

1200 Adjourn

11.3. APPENDIX 3: Participants

NERO
Kathi Rodrigues
Richard Seamans

NEFC
Tim Smith
Vaughn Anthony
Tom Polacheck
Carol Fairfield
Steve Murawski
Tom Morrissey
Sukwoo Chang
Ray Conser
Gordon Waring
Margaret McBride
Susan Wigley
Ralph Mayo
Frank Almeida
Anne Richards
Fred Serchuk
Teri Frady
James Sargent
Joseph Idoine
Mark Terceiro
Jon Volstad
Anne Lange
Gary Shepherd
Richard Greenfield
Kevin Friedland
Loretta O'Brien
Jay Burnett
Don Flescher
John Boreman
Karen Foster
Wendy Gabriel

MAFMC
John Mason
Tom Hoff
David Keifer
Warren Hader

NEFMC
Howard Russell
Guy Marchesseault
Lou Goodreau
Douglas Marshall
Chris Kellogg

MASSACHUSETTS
Steven Correia
David Witherell
Tom Currier
Arnold Howe

RHODE ISLAND
Mark Gibson

CONNECTICUT
Eric Smith
Penny Howell
David Simpson
Vic Crecco

NEW YORK
Raoul Castaneda

VIMS
Anne Schmitzer
James Kirkley
Bill DuPaul

ASMFC
Paul Perra