Figure C1. US and foreign commercial landings (calculated live weight, mt) of goosefish by assessment area.
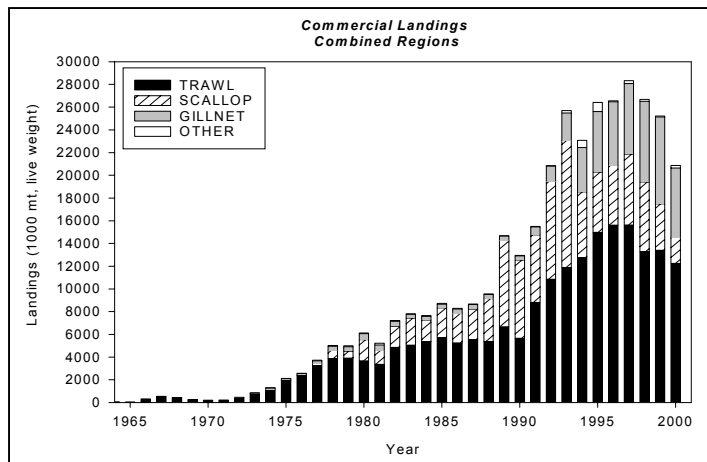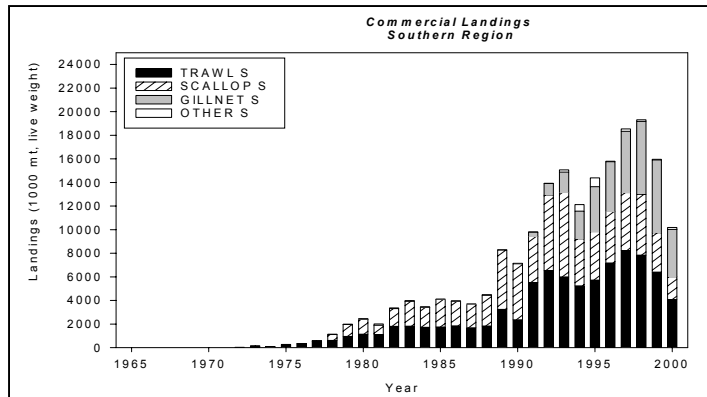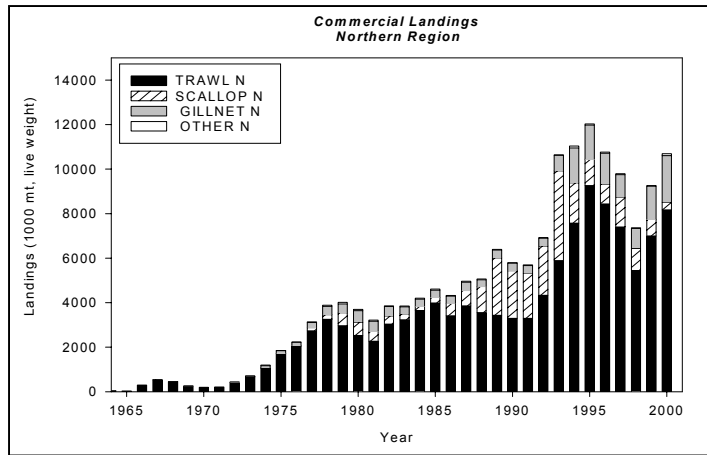
Figure C2. US landings (live weight, mt) by gear type, A. northern management region;
B. southern management region, and C. both regions combined.
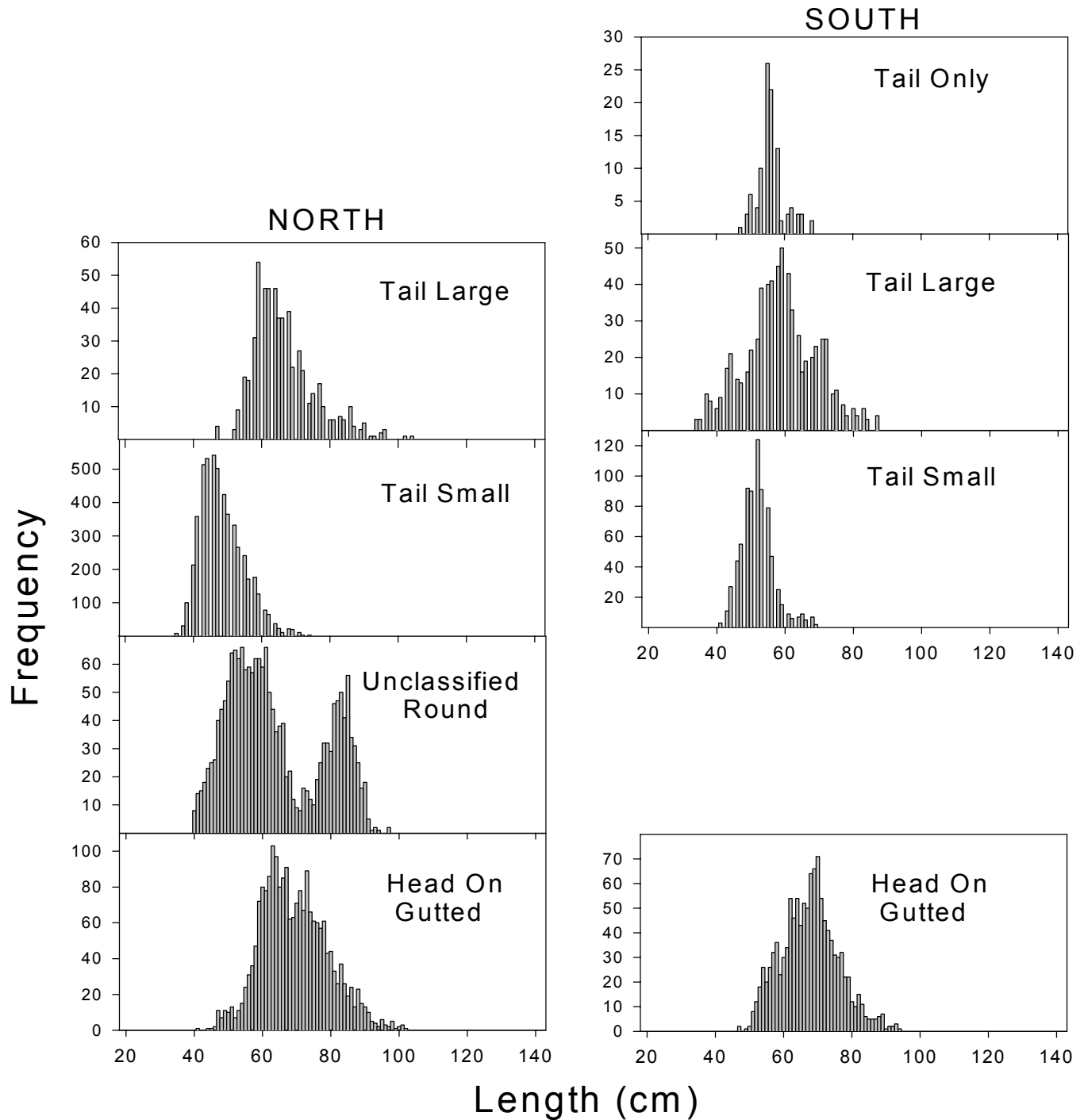
2000

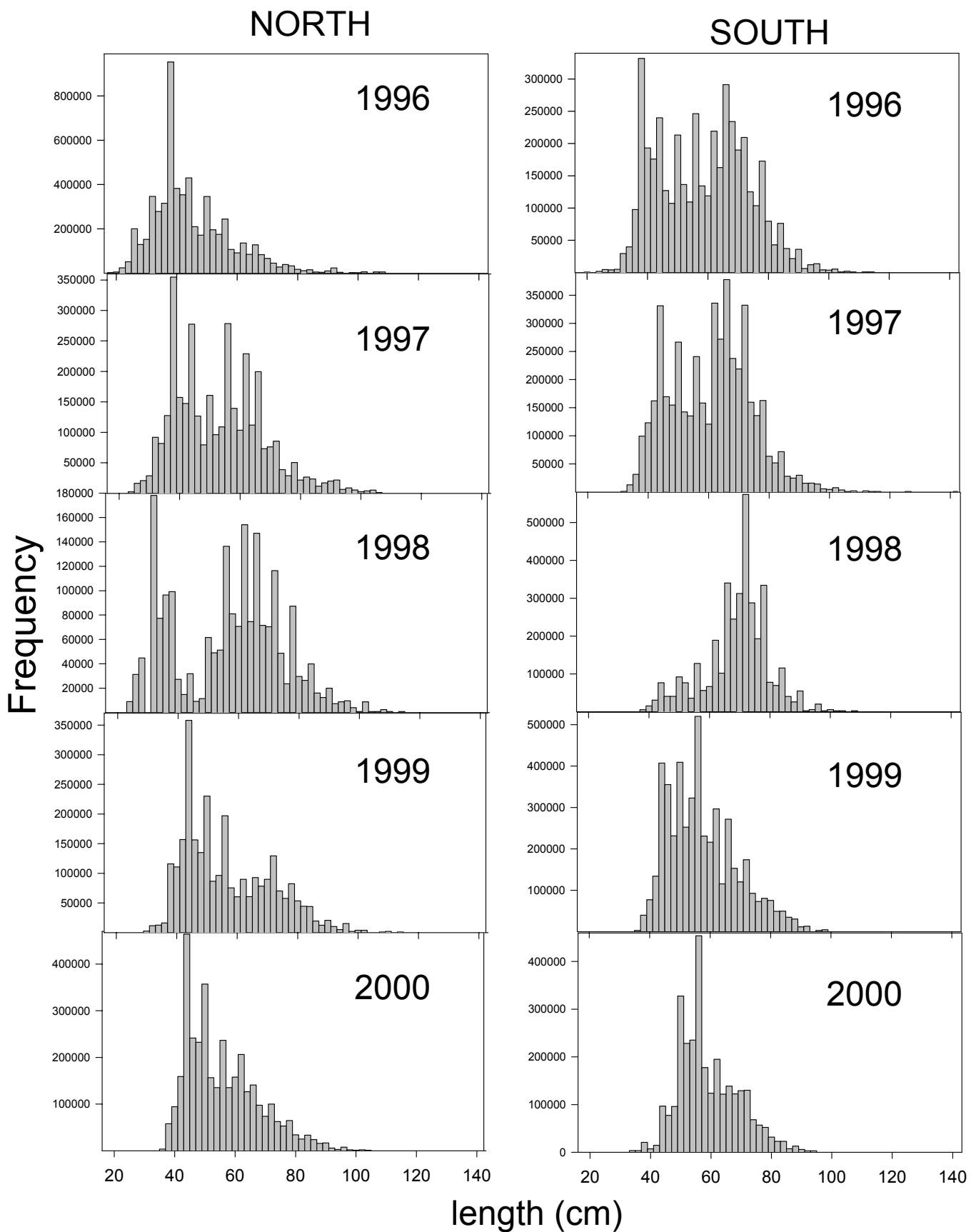Figure C3. Length frequencies of goosefish in commercial samples taken during 2000.

Figure C4. Estimated length frequency of goosefish commericial landings by management region, 1996-2000.
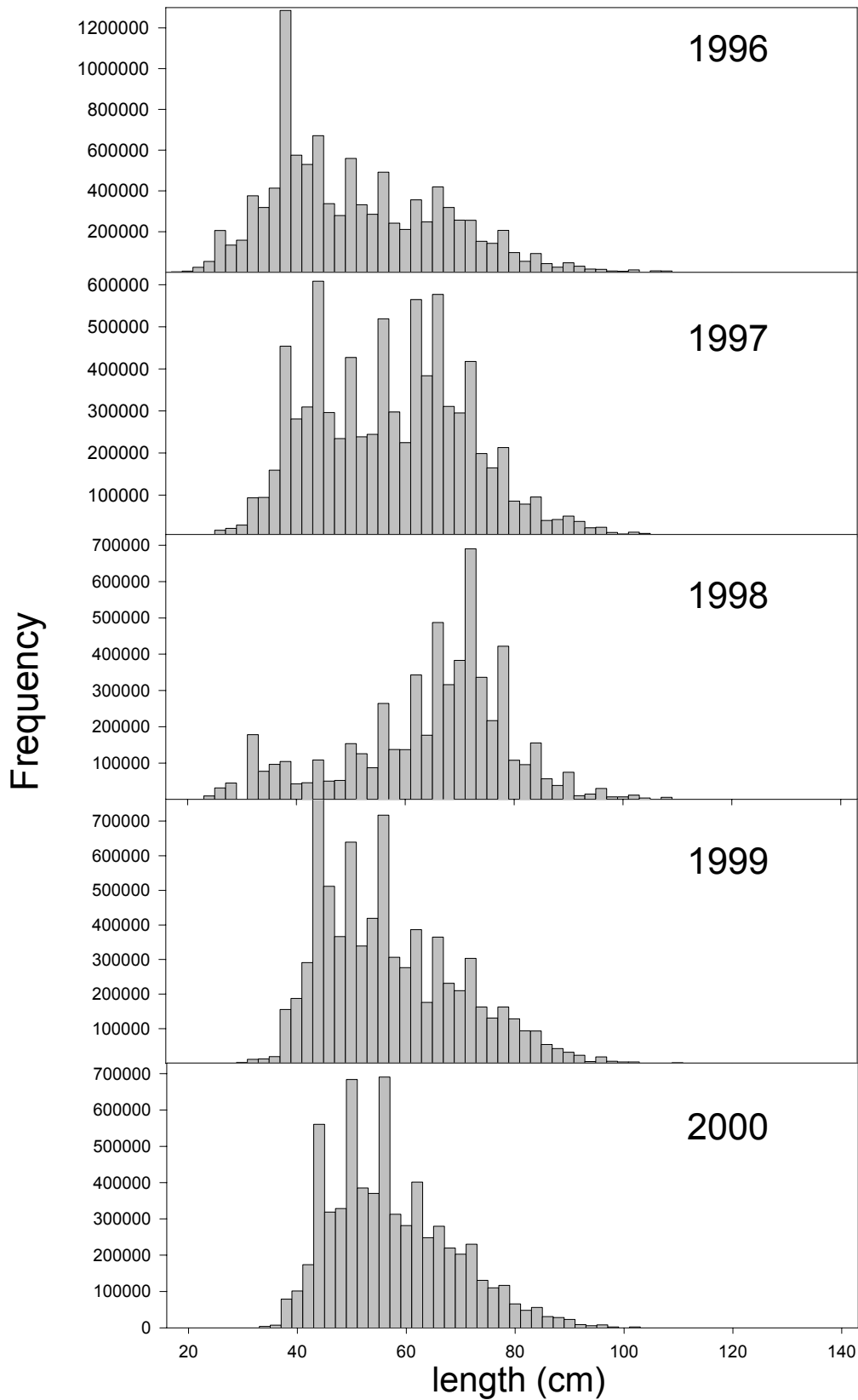
Figure C5. Estimated length frequency of goosefish commericial landings, management regions, combined, 1996-2000.
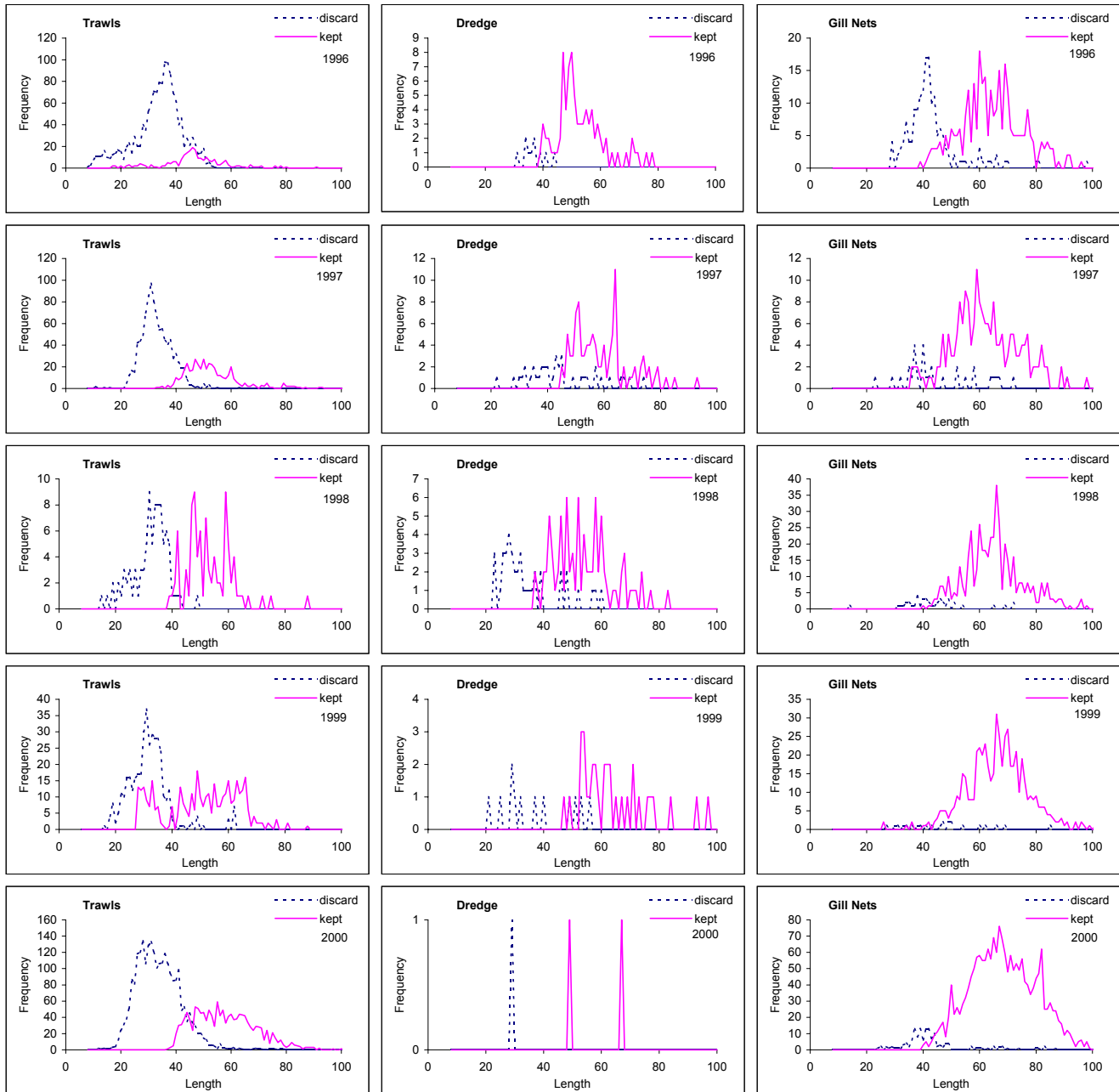
Figure C6. Size composition of discarded and kept goosefish estimated from sea sampling observations, northern region.
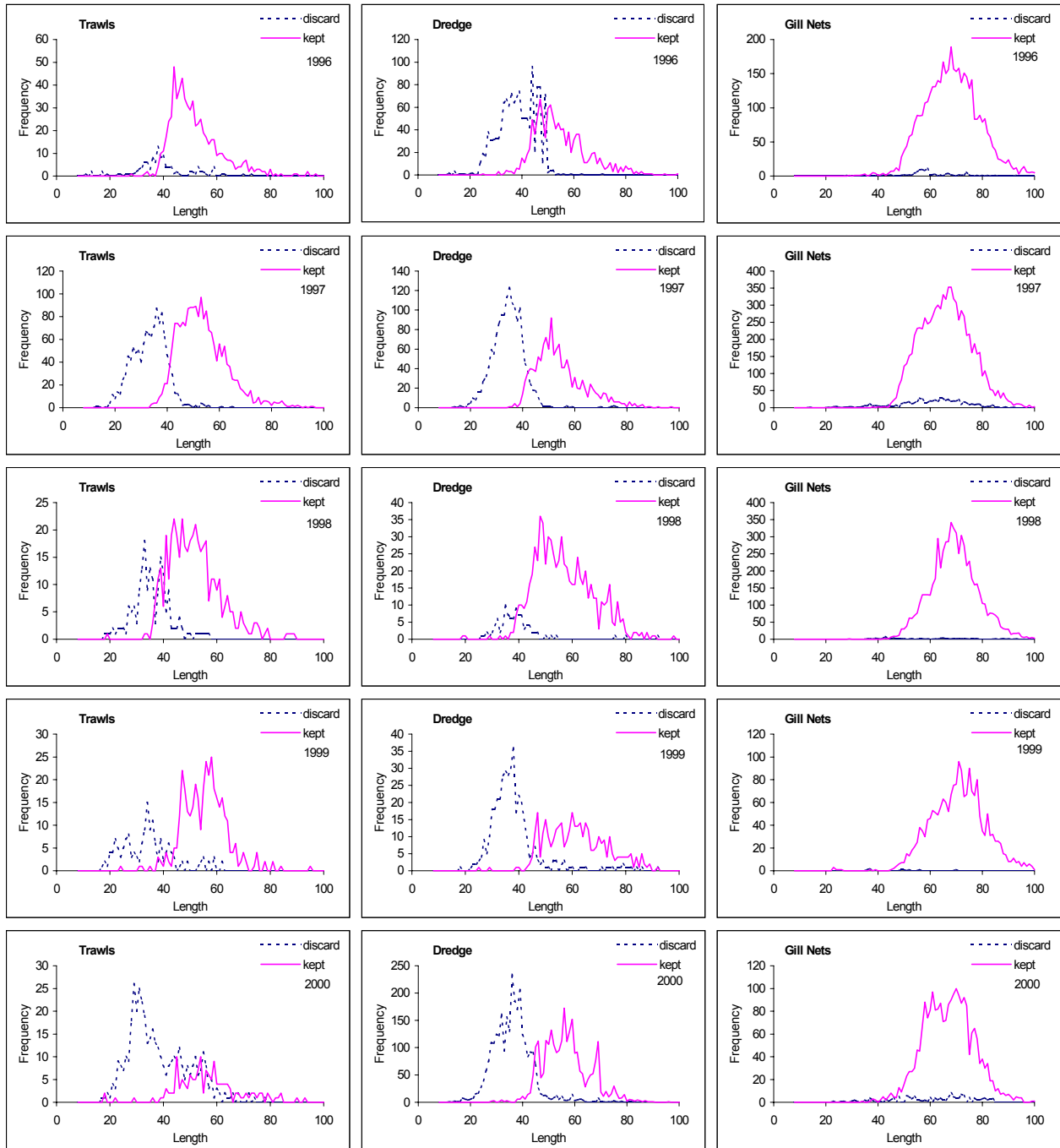
Figure C7. Size composition of discarded and kept goosefish estimated from sea sampling observations, southern region
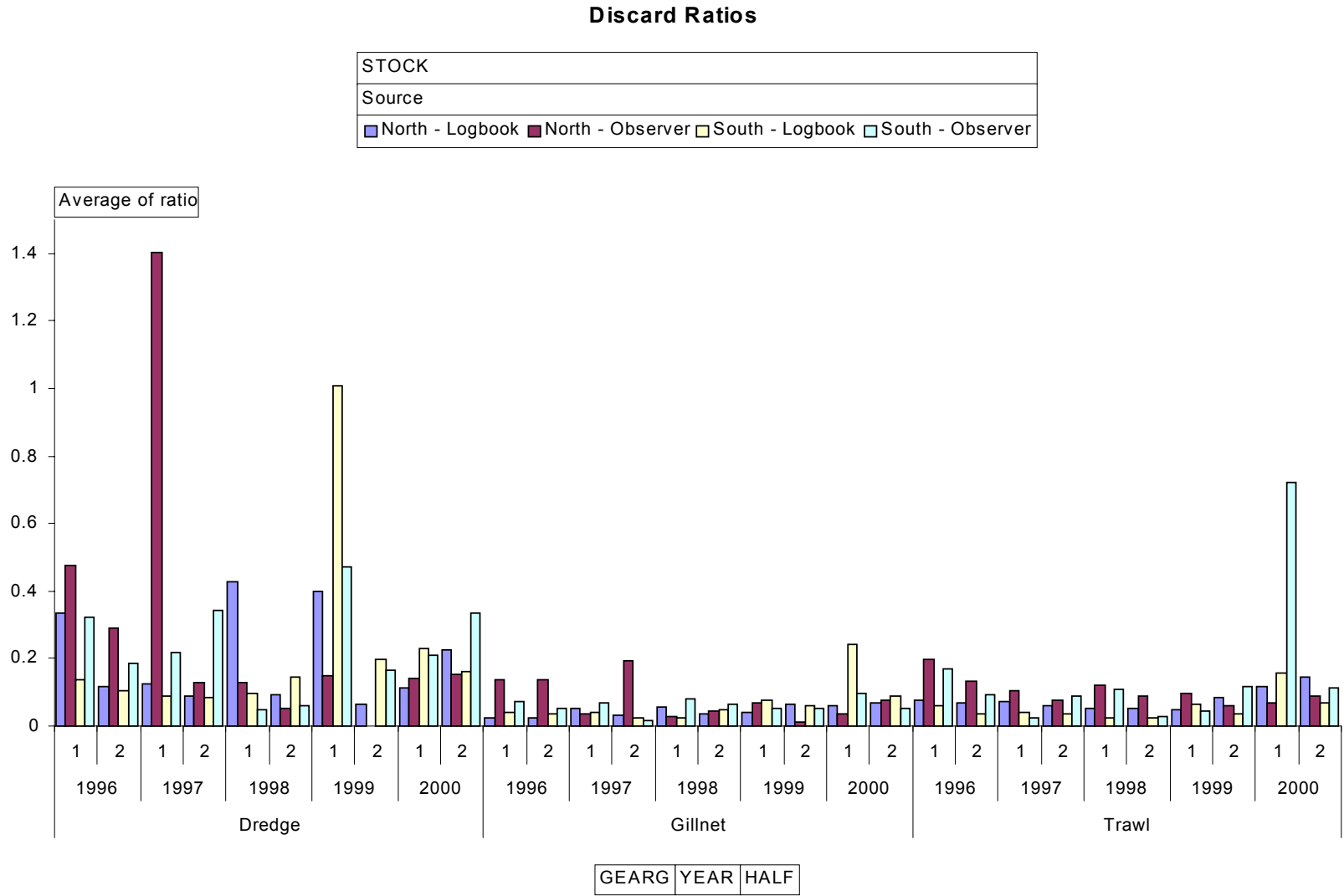
Discard Ratios

STOCK
Source
■North - Logbook ■North - Observer □South - Logbook □South - Observer

Average of ratio

| GEARG | YEAR | HALF |

Figure C8. Discard ratios by stock area, gear, and half year from the observer program and VTR database.

Goosefish Survey Distributions

Winter Survey 1992-1999

Spring Survey 1968-1999

Scallop Survey 1984-1999

Autumn Survey 1963-1999

Legend (each panel):
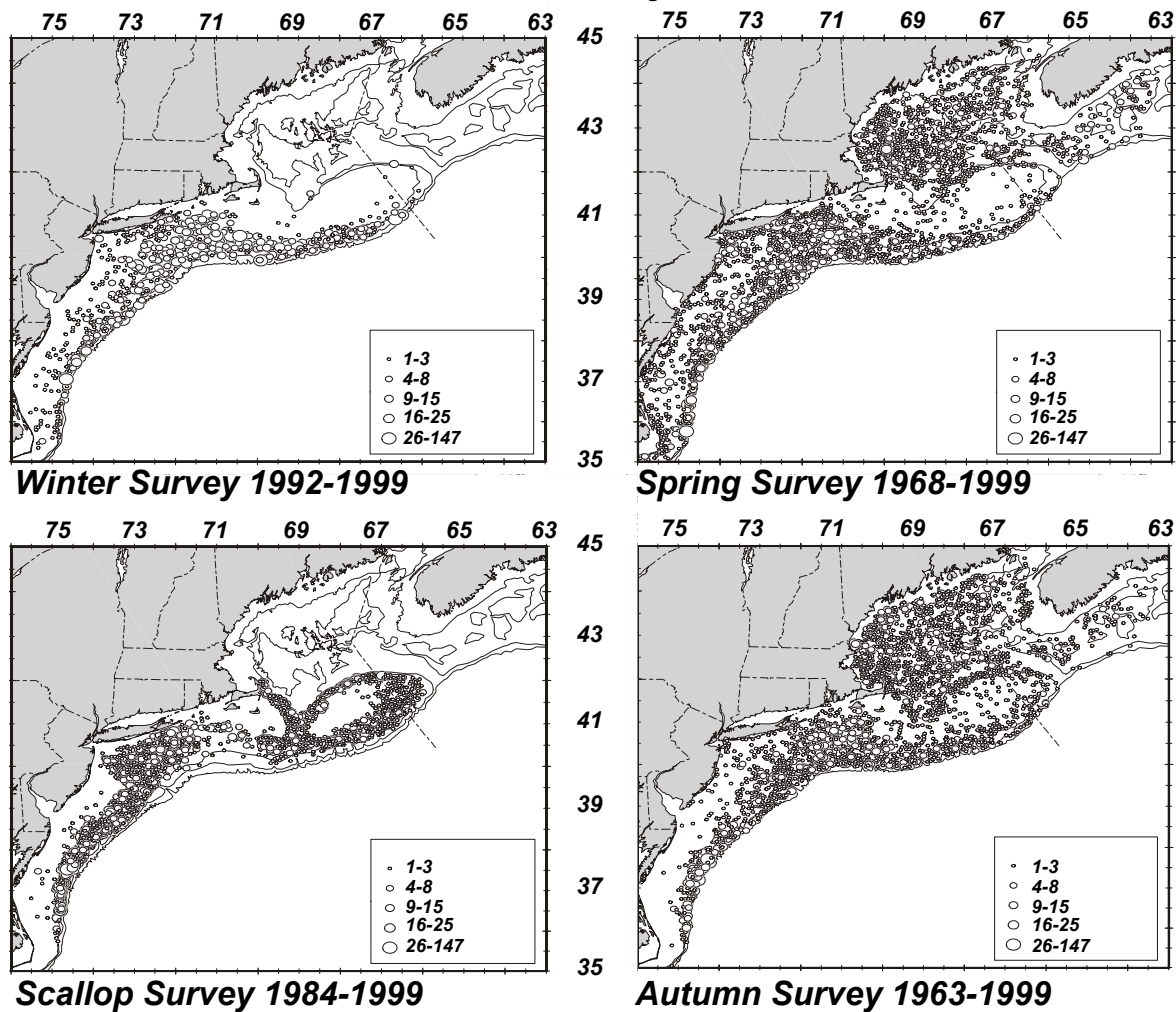1-3
4-8
9-15
16-25
26-147

Figure C9. Distribution of goosefish catches in NEFSC winter surveys (1992-1999), spring surveys (1968-1999), scallop surveys (1984-1999), and autumn surveys (1963-1999).-
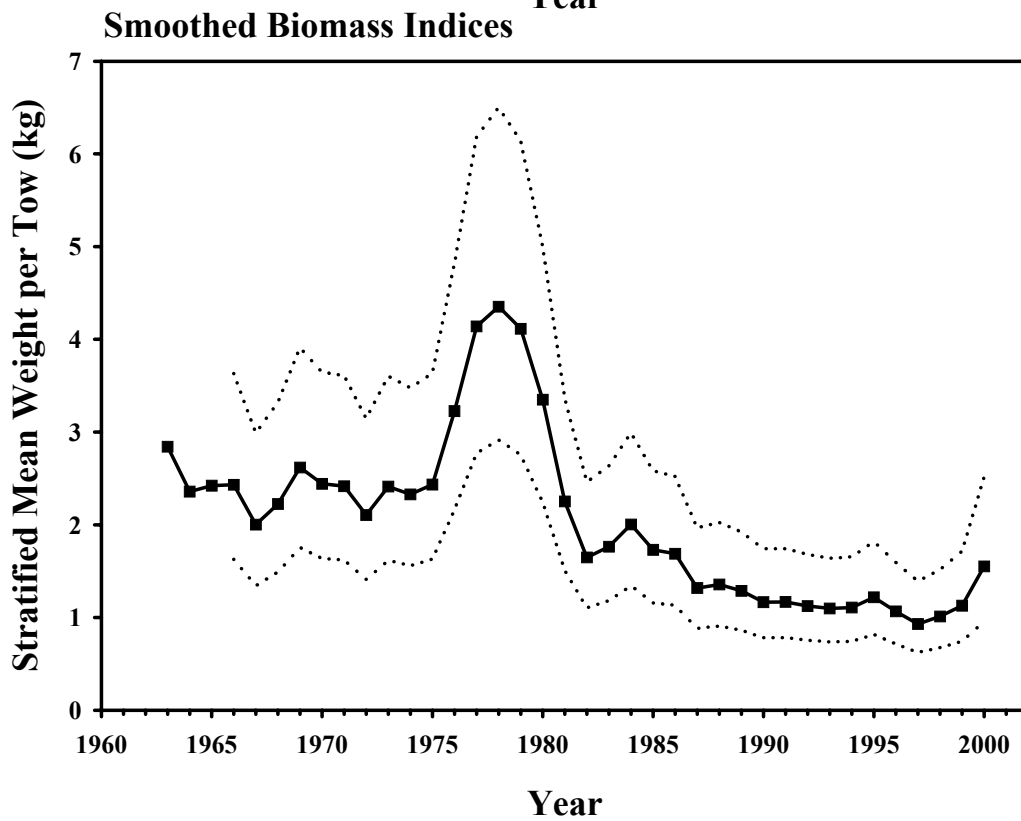
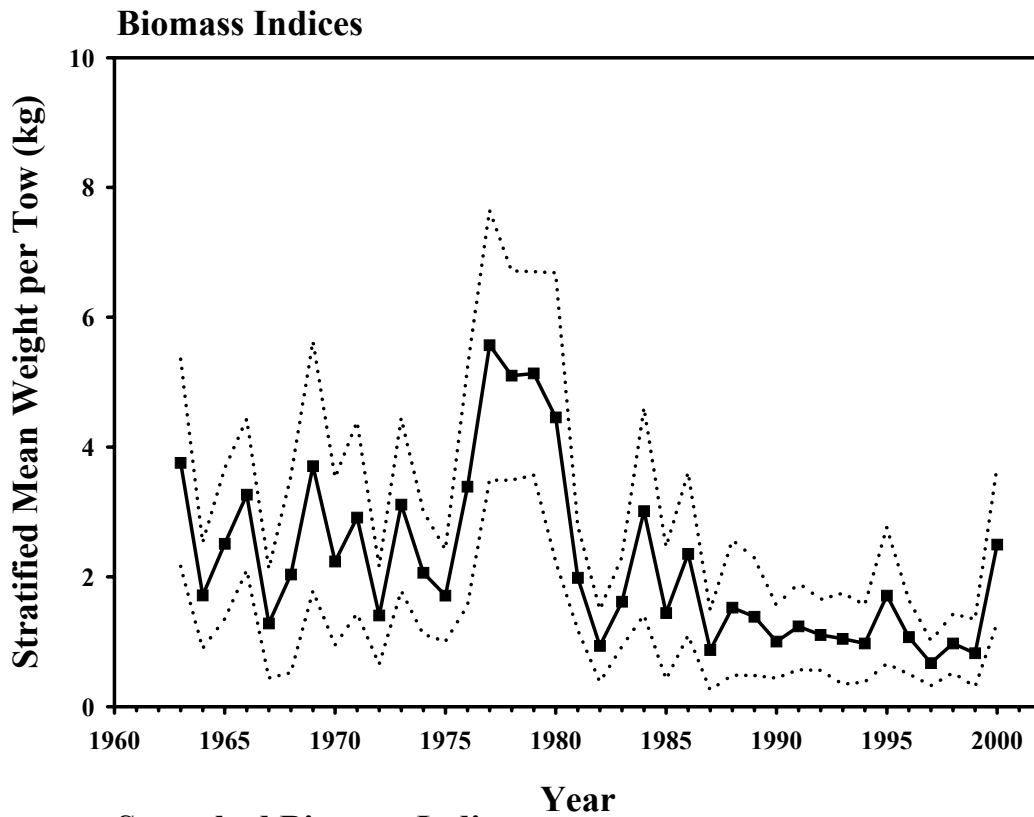## Biomass Indices

Smoothed Biomass Indices

Figure C10. Biomass indices and smoothed indices from the NEFSC autumn bottom
trawl survey for the northern management region from 1963-2000.
The 95% confidence limits are shown by the dashed line.
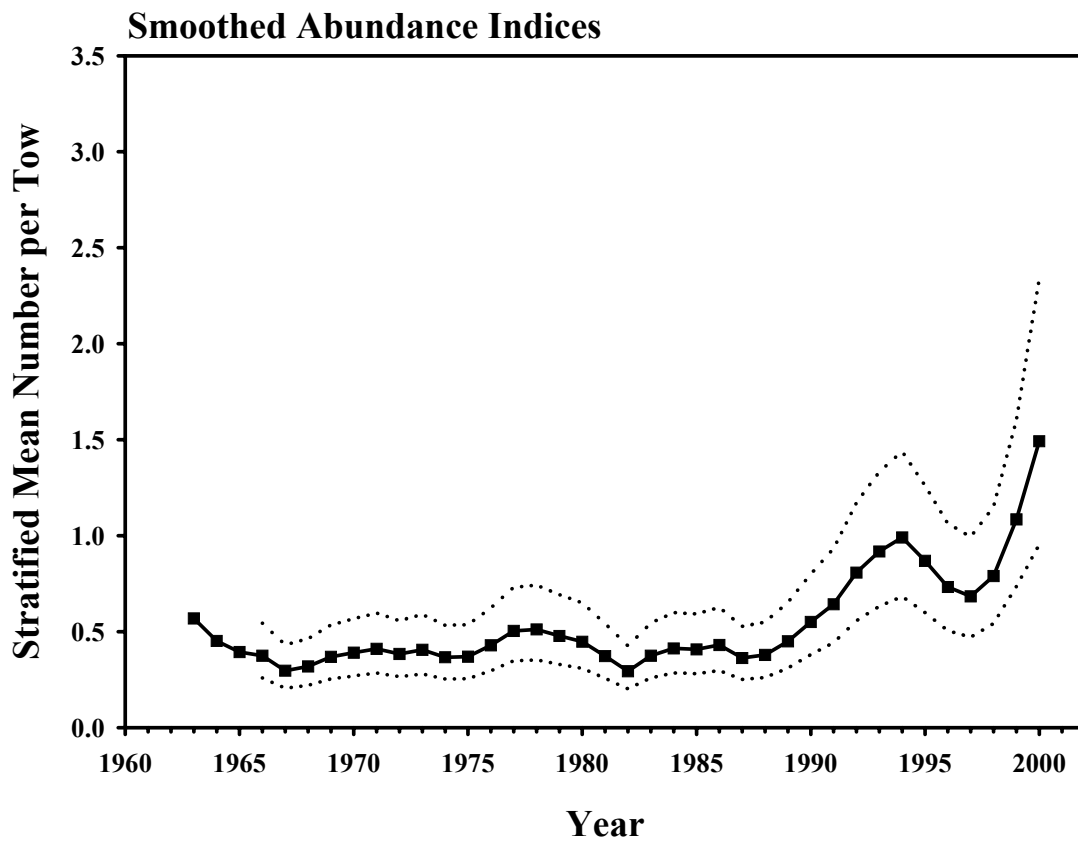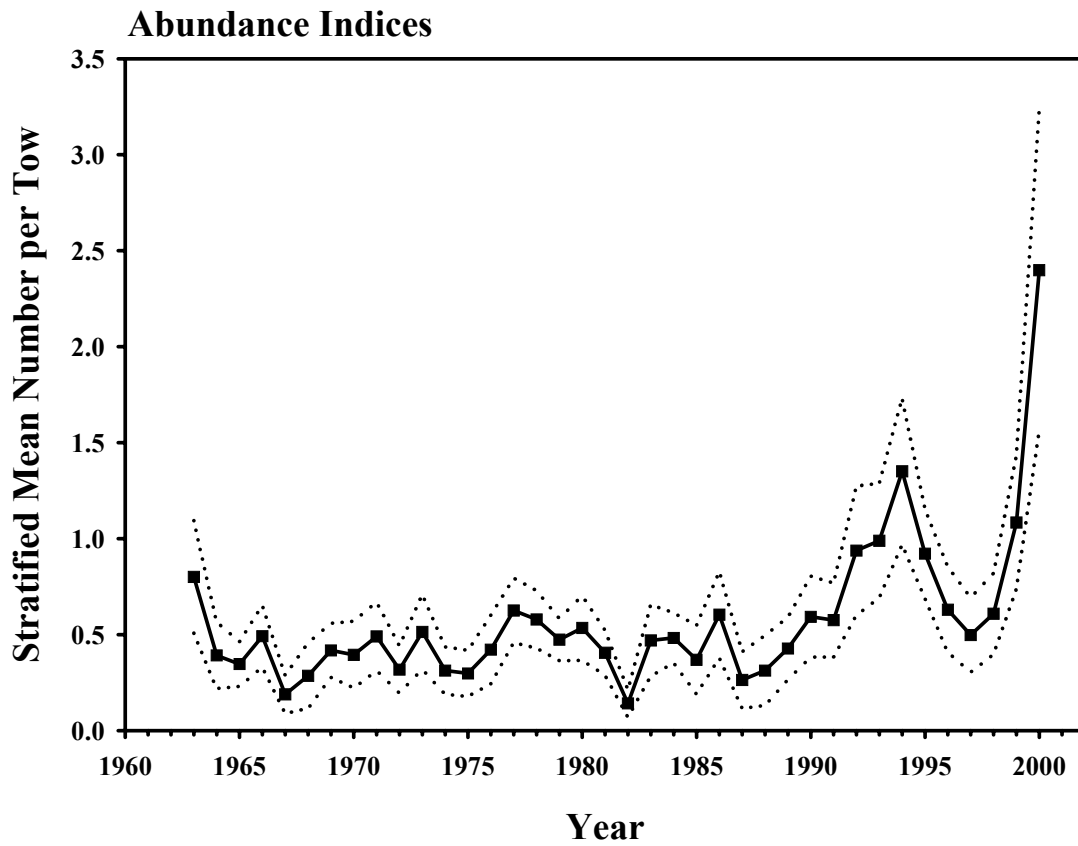
Abundance Indices

Smoothed Abundance Indices

Figure C11. Abundance indices and smoothed indices from the NEFSC autumn bottom trawl survey for the northern management region from 1963-2000. The 95% confidence limits are shown by the dashed line.
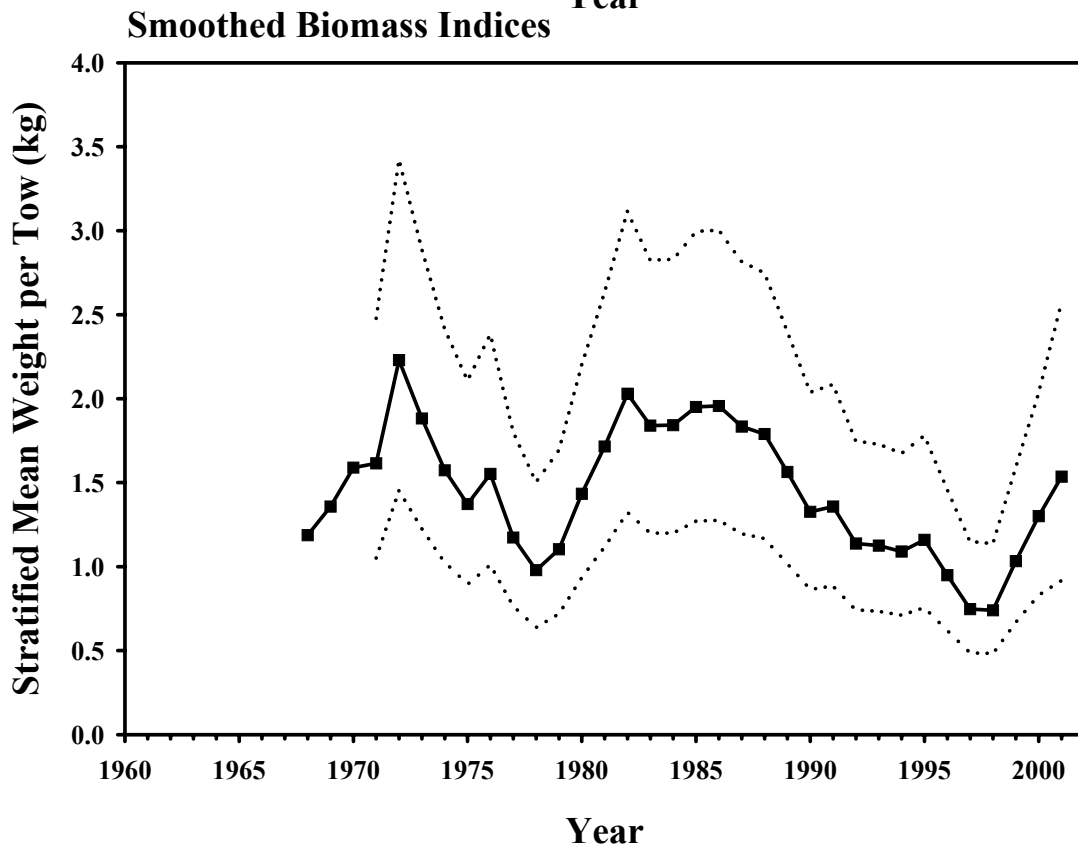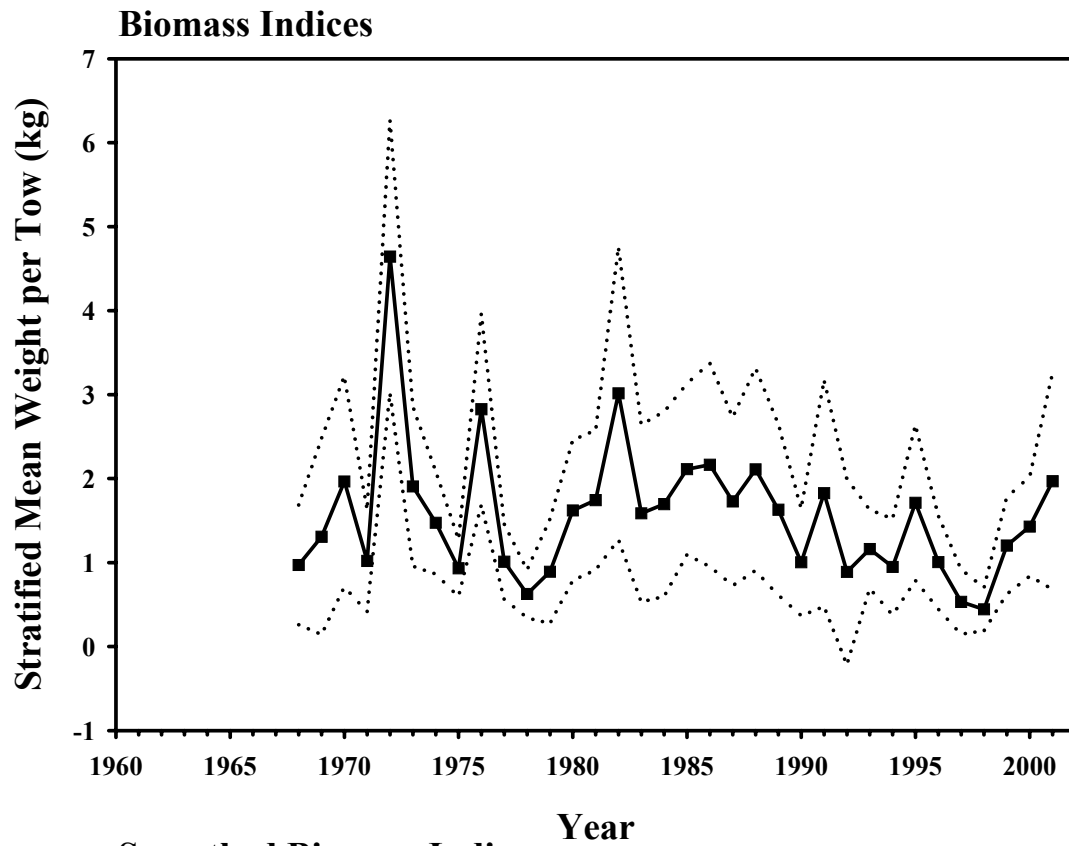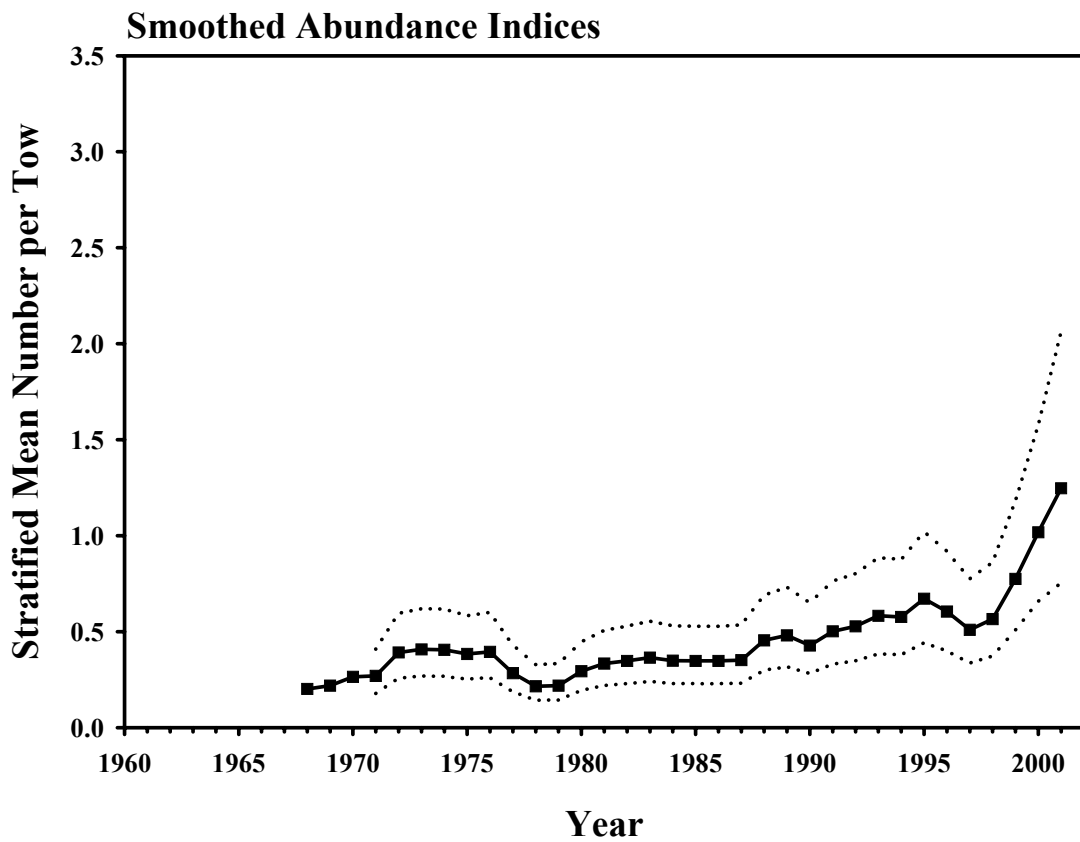
Biomass Indices

Smoothed Biomass Indices

Figure C12. Biomass indices and smoothed indices from the NEFSC spring bottom trawl survey for the northern management region from 1968-2001. The 95% confidence limits are shown by the dashed line.
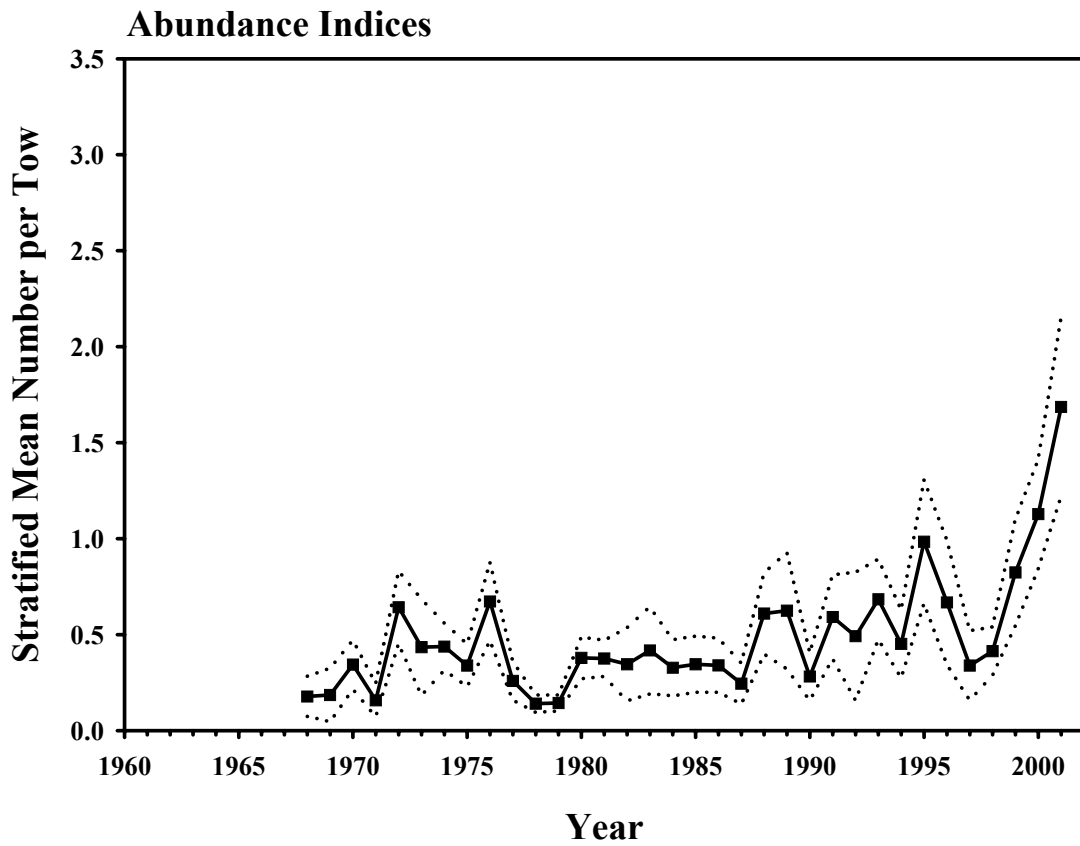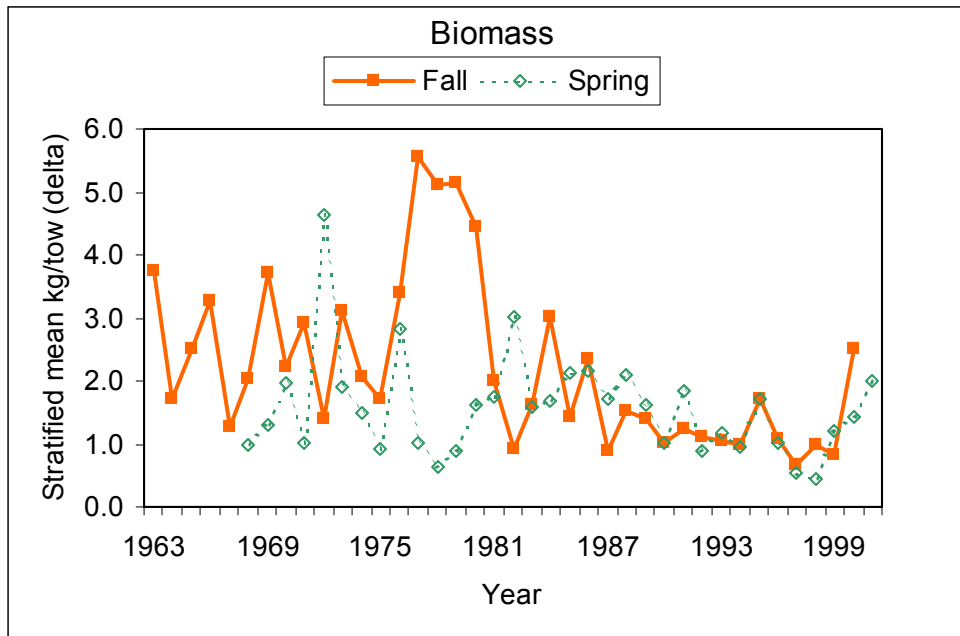
Abundance Indices

Smoothed Abundance Indices

Figure C13. Abundance indices and smoothed indices from the NEFSC spring bottom trawl survey for the northern management region from 1968-2001. The 95% confidence limits are shown by the dashed line.
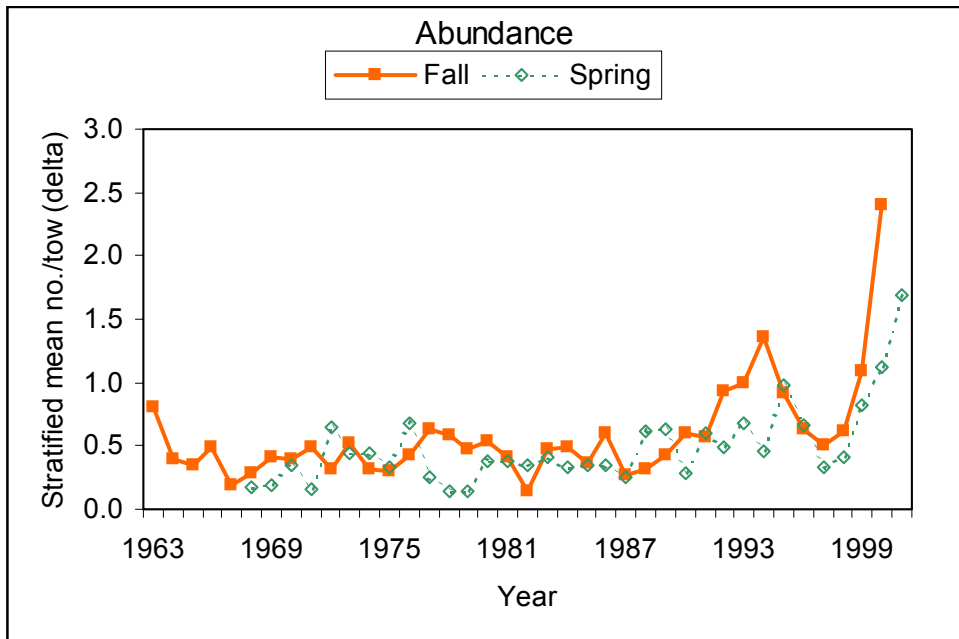
Northern Region

Northern Region

Figure C14. Biomass and abundance indices from NEFSC spring and autumn
trawl surveys, northern management region.
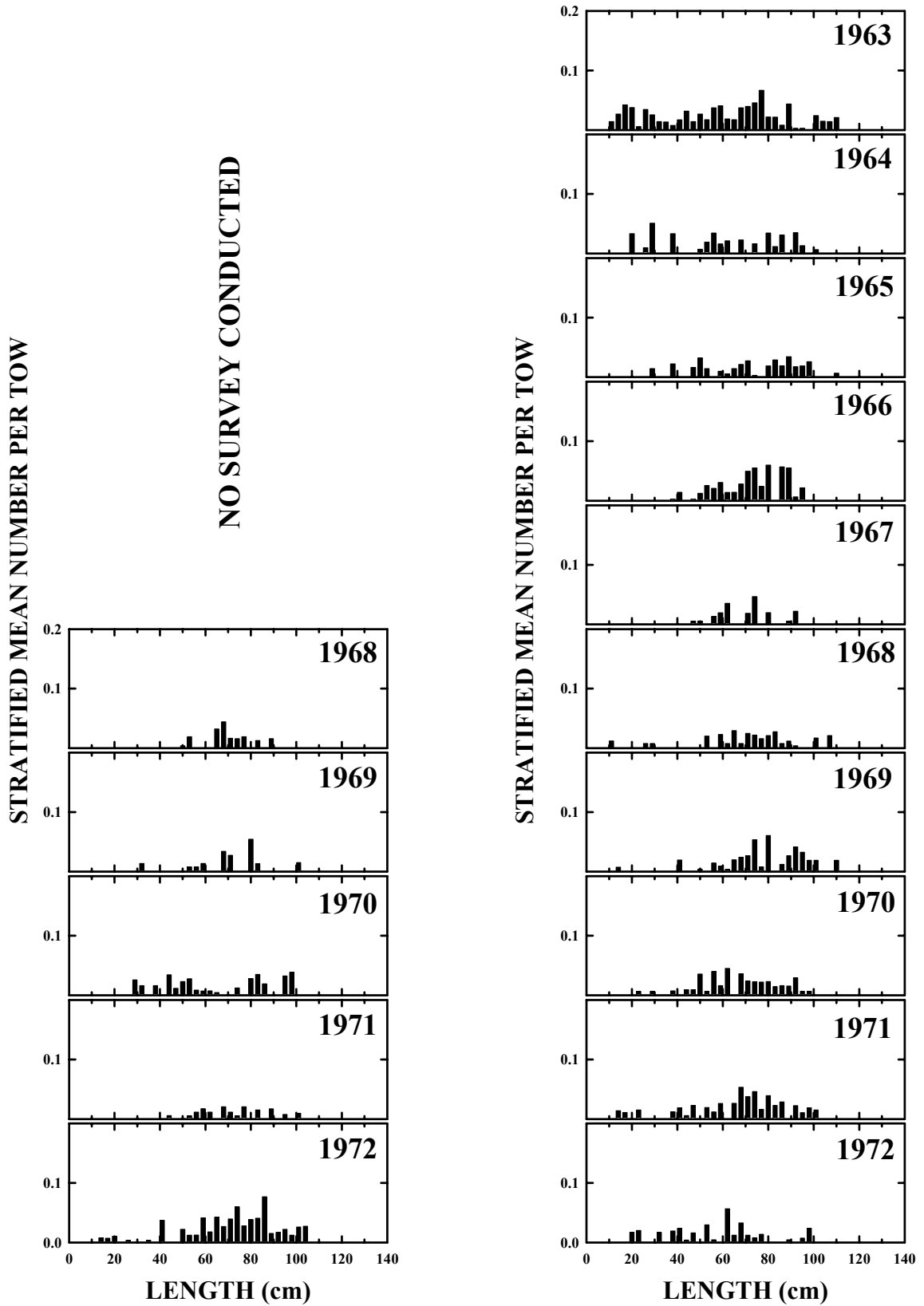
Spring Survey

Autumn Survey

STRATIFIED MEAN NUMBER PER TOW

NO SURVEY CONDUCTED

1963

1964

1965

1966

1967

1968

1969

1970

1971

1972

1968

1969

1970

1971

1972

LENGTH (cm)

LENGTH (cm)

Figure C15a. Goosefish length composition from the NEFSC spring and autumn bottom trawl surveys in the northern management region, 1963-2001.
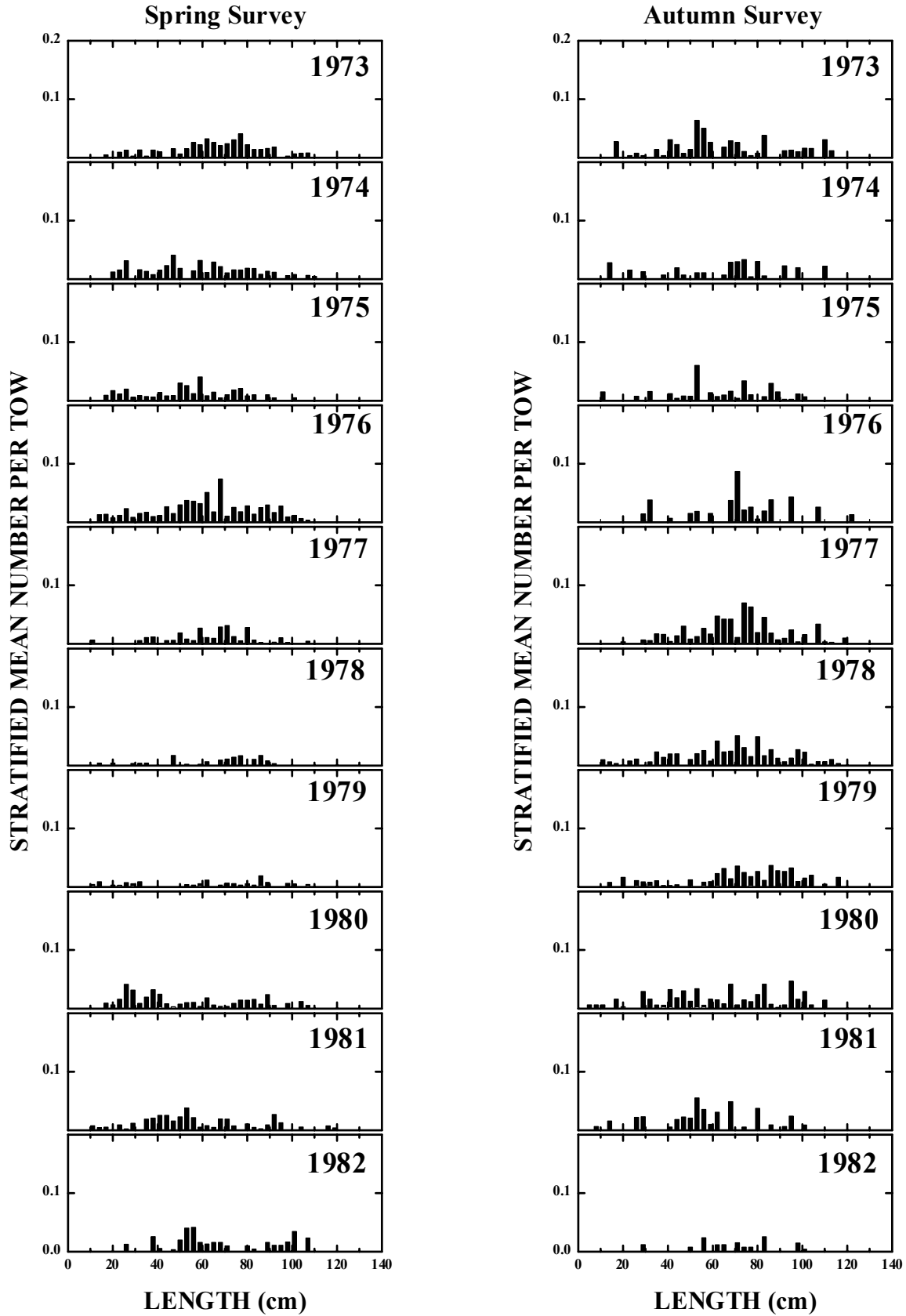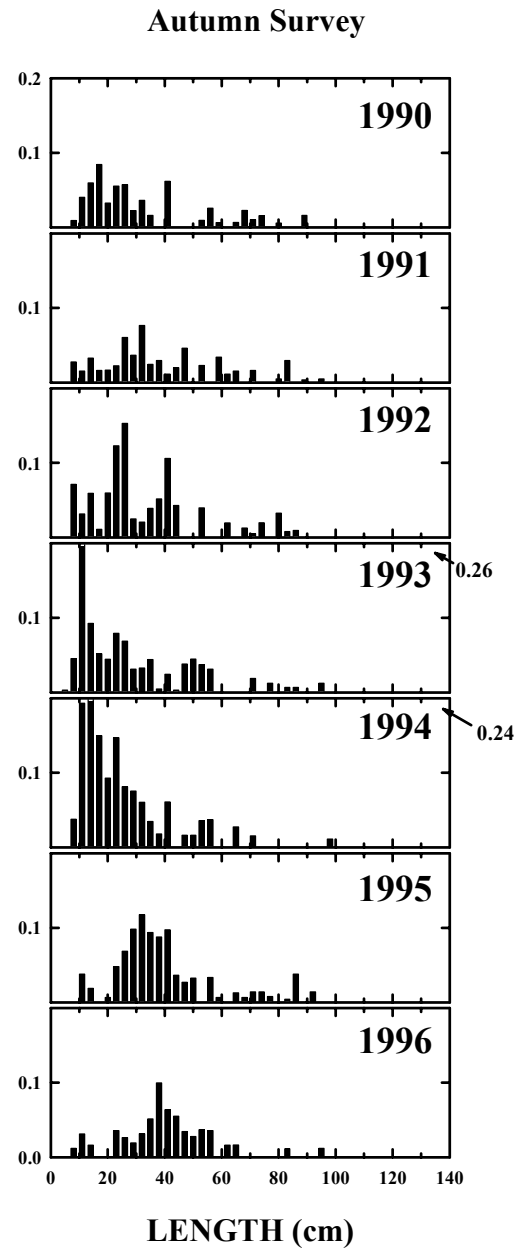
Figure C15, continued.
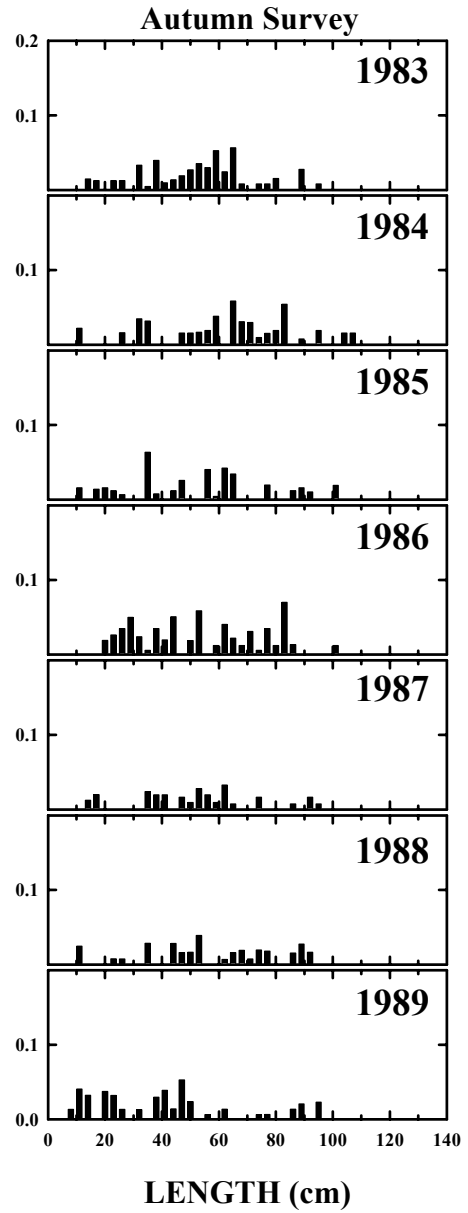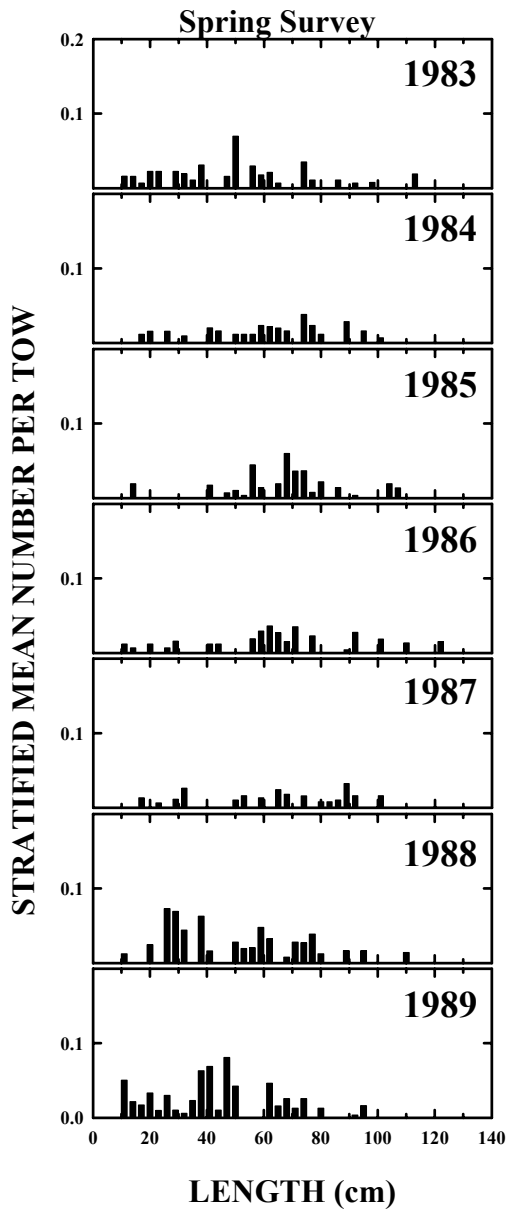
Figure C15c, continued.
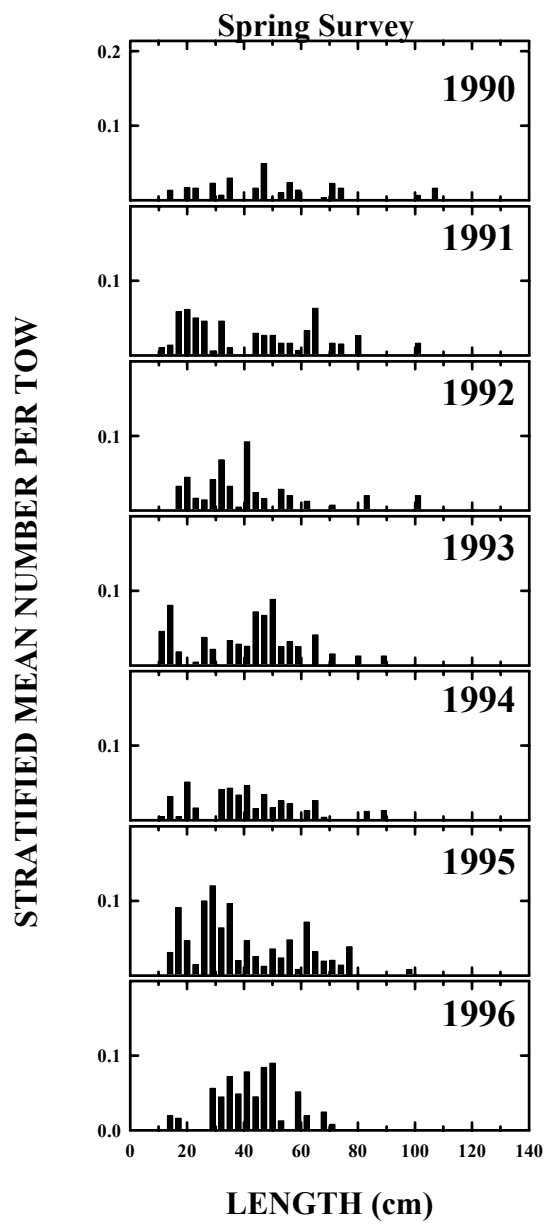
Figure C15d, continued.

Spring Survey

Autumn Survey

STRATIFIED MEAN NUMBER PER TOW
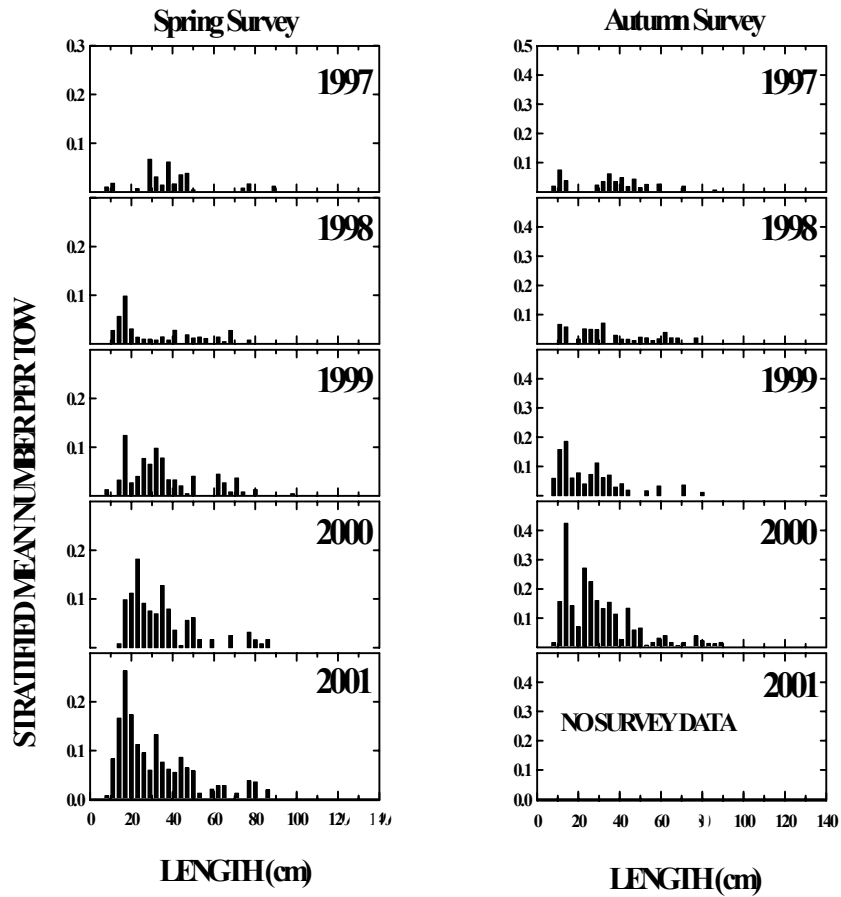
LENGTH (cm)

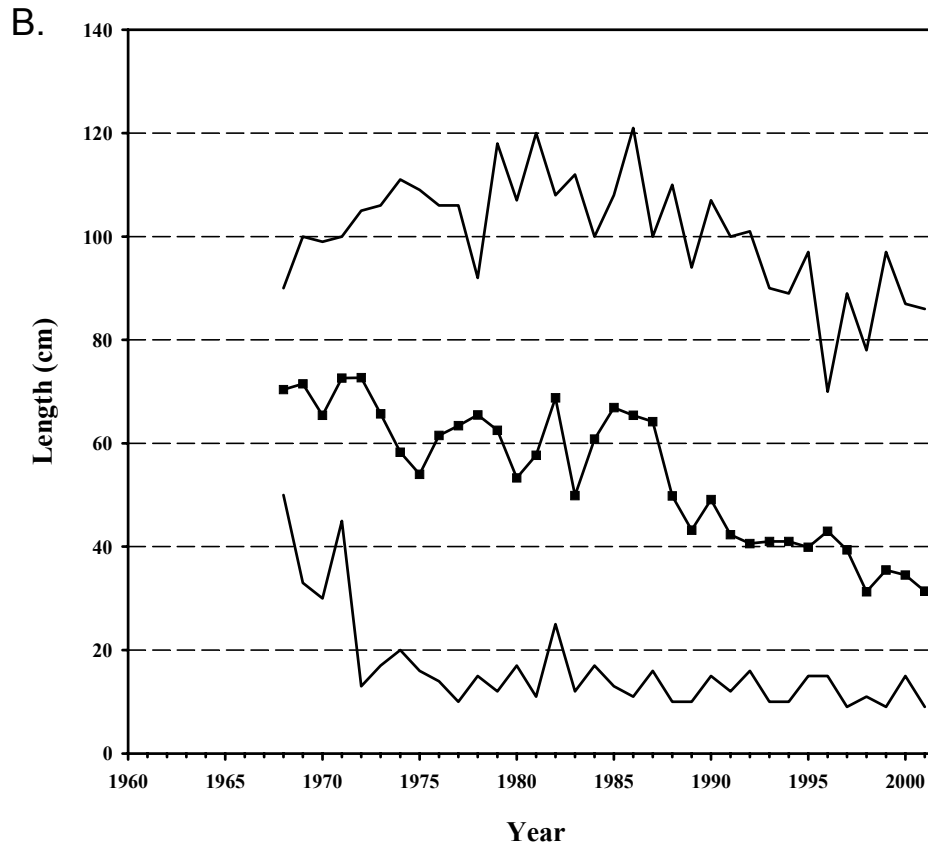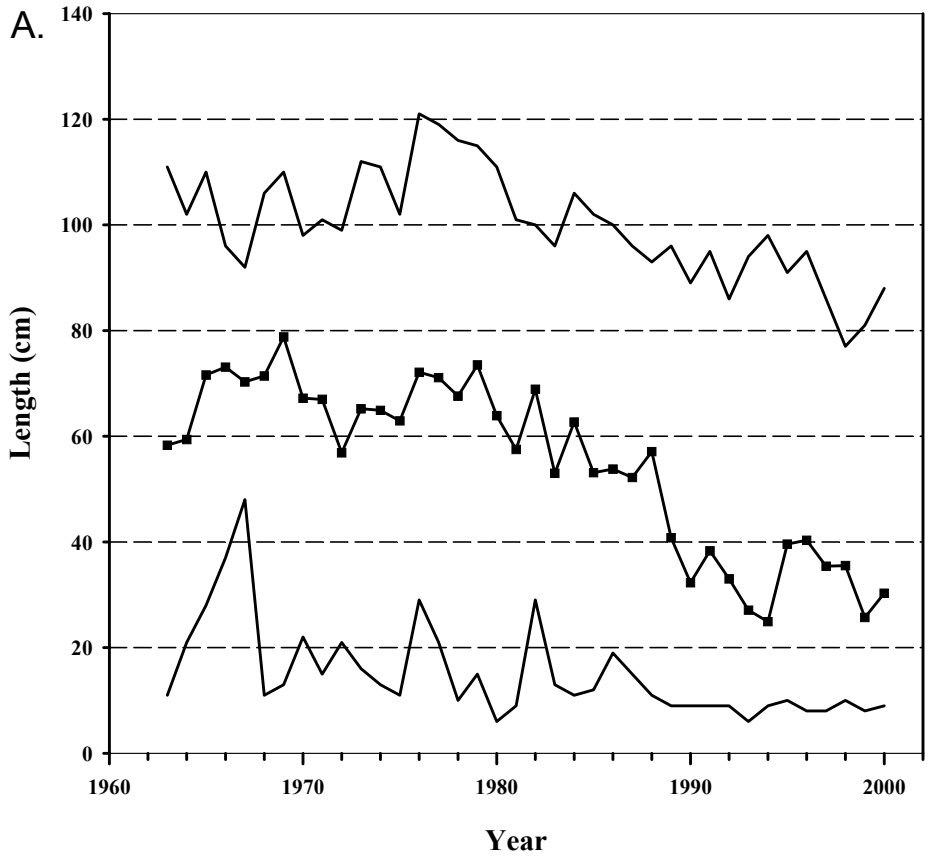LENGTH (cm)

Figure C15e, continued.

Figure C16. Minimum, mean, and, maximum lengths for the northern management region from (A) NEFSC autumn surveys and (B) NEFSC spring surveys.
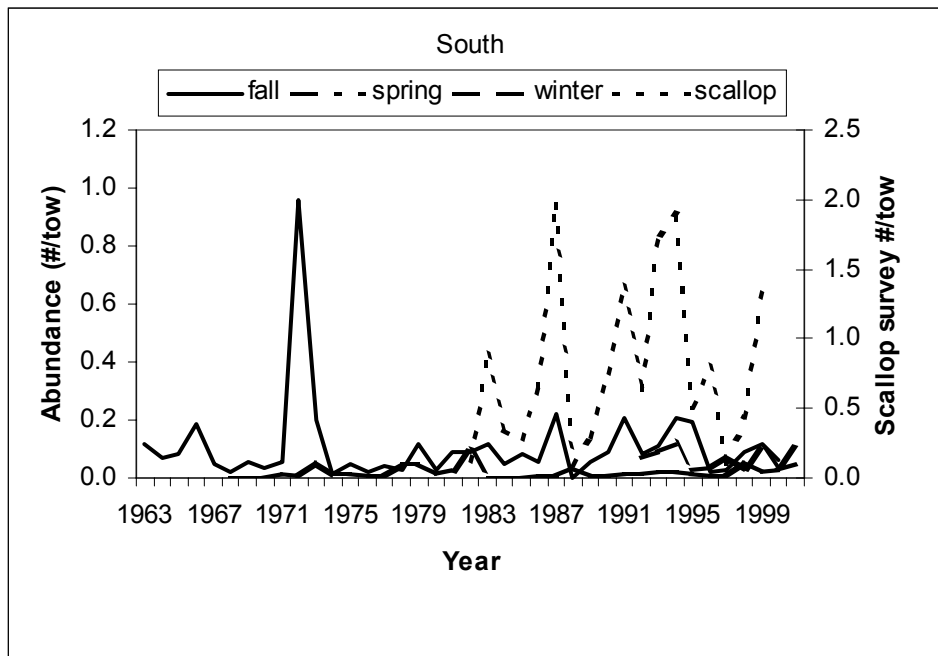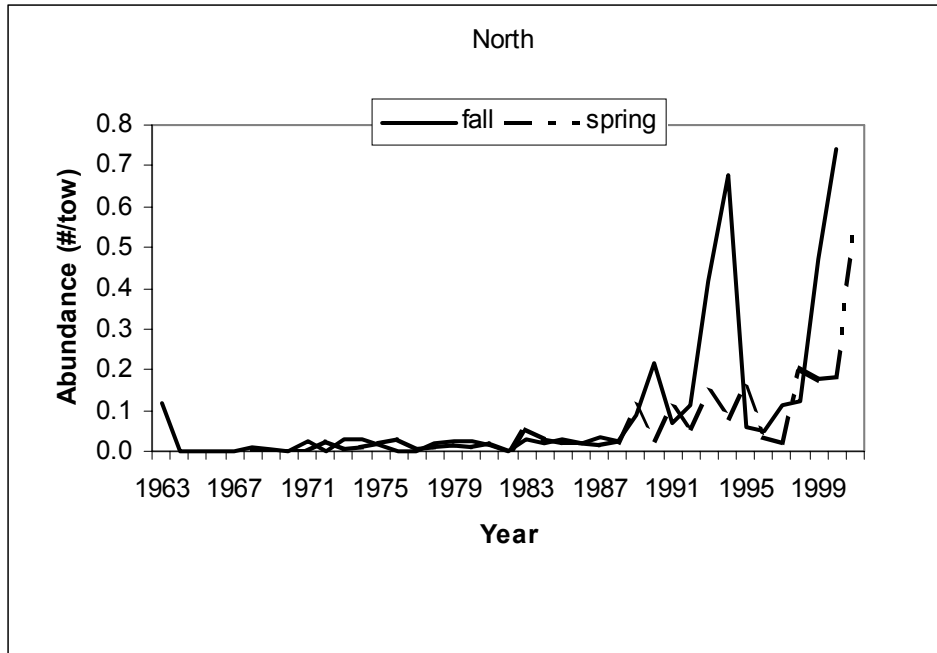
Figure C17. Abundance indices (stratified mean number per tow)
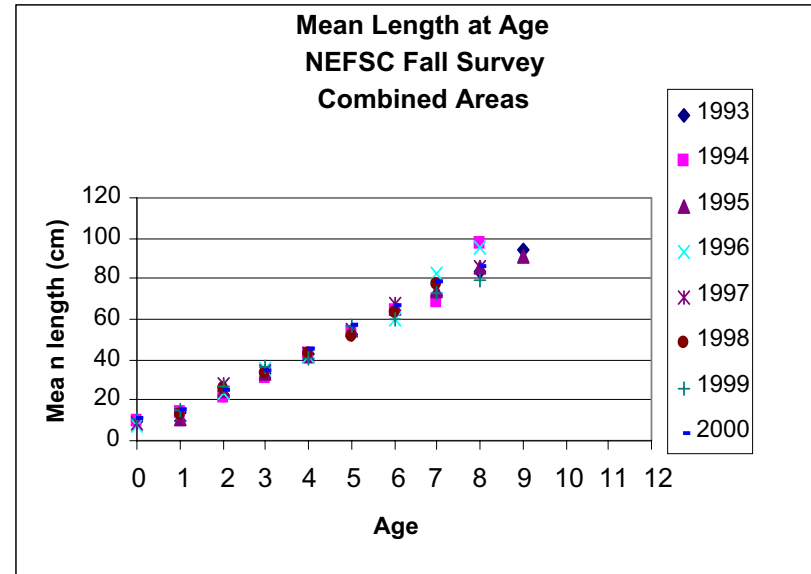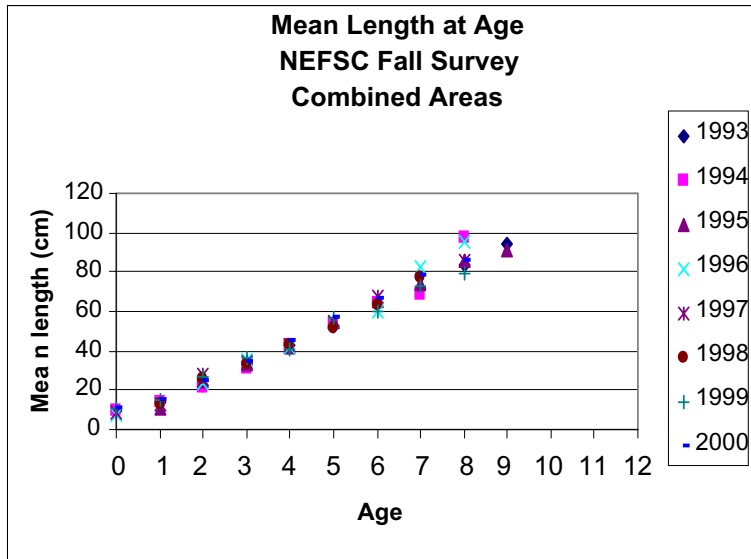for 10-20 cm goosefish.
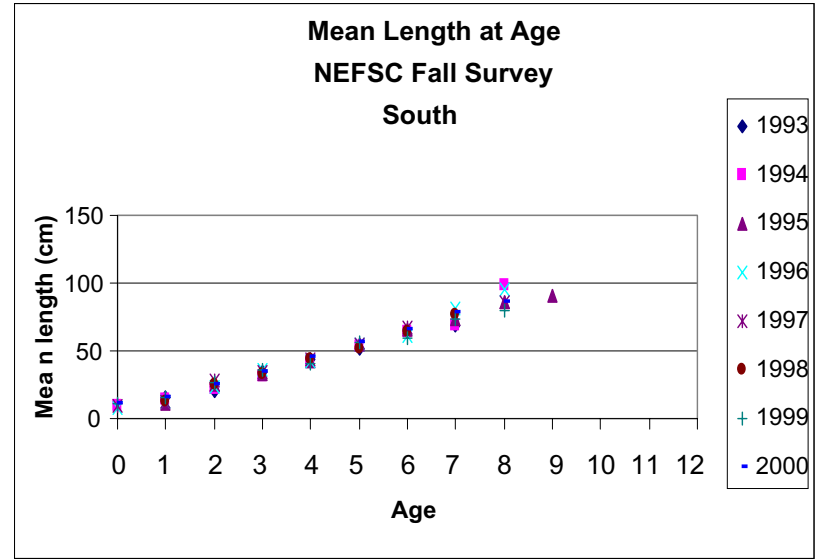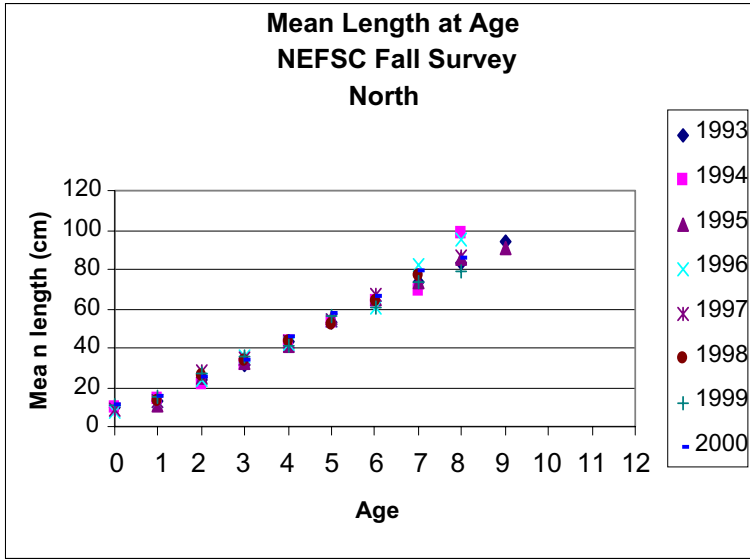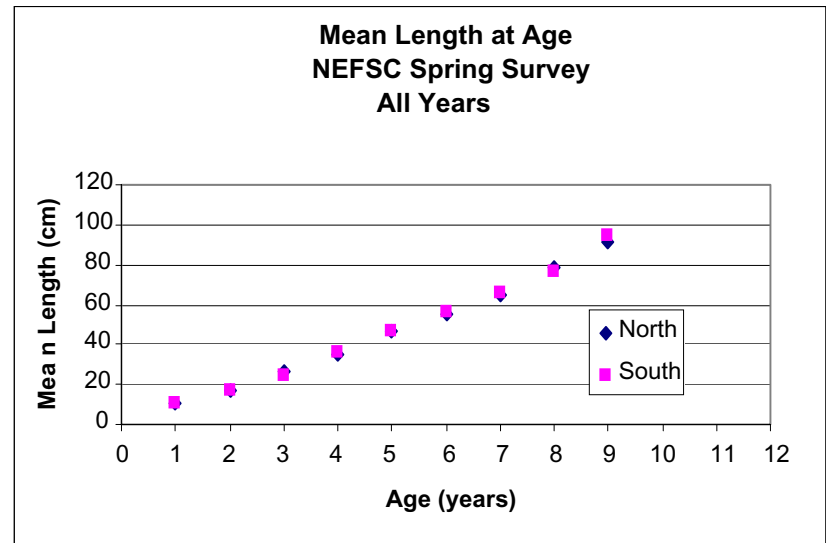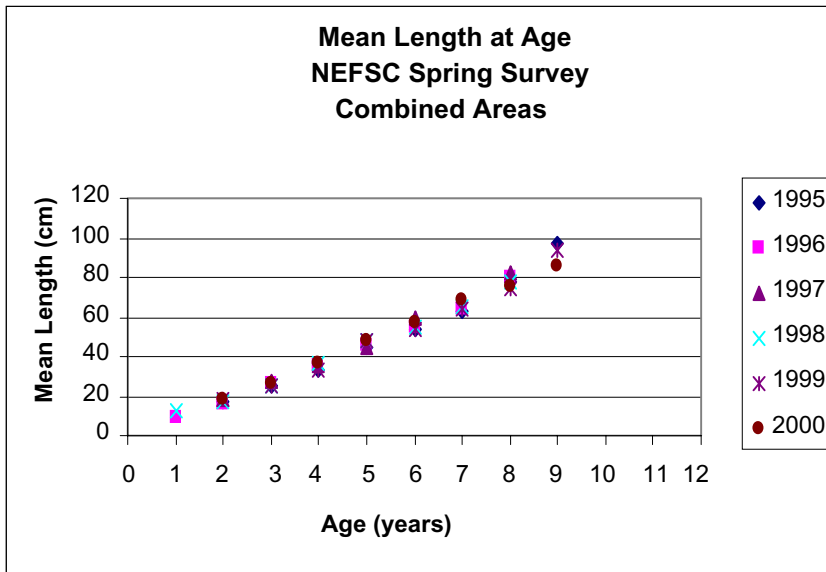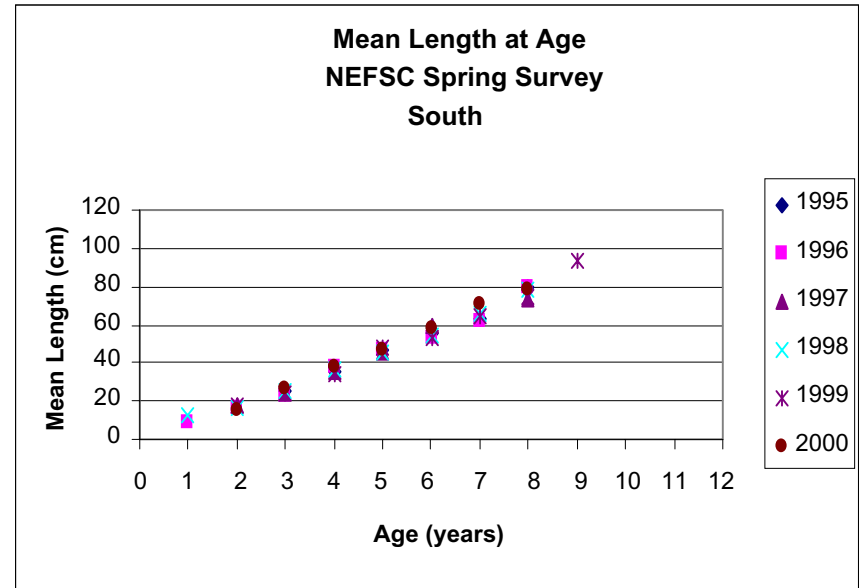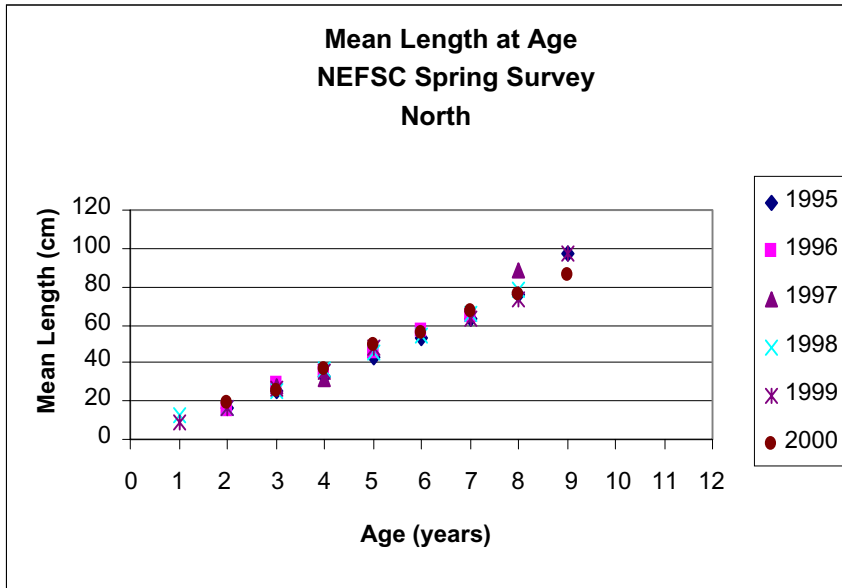
Figure C18. Mean length at age from NEFSC autumn offshore surveys.
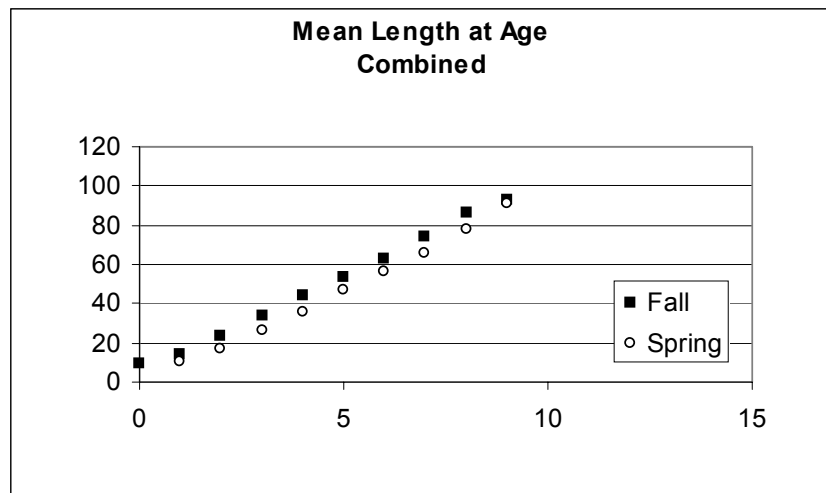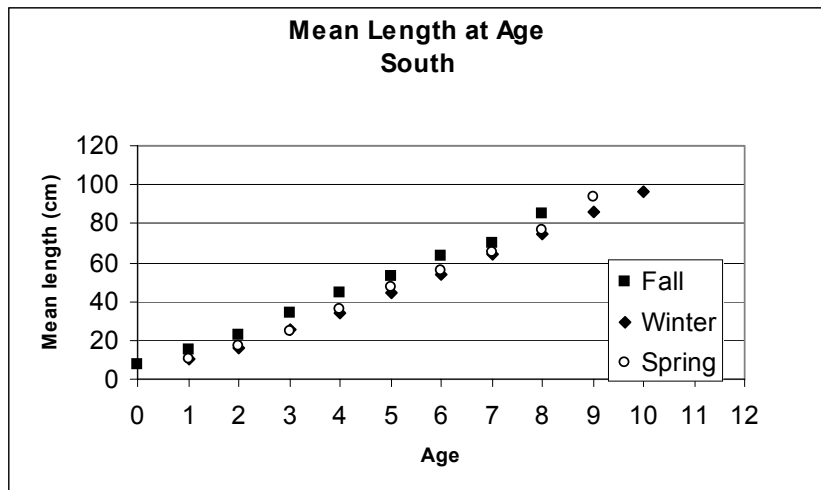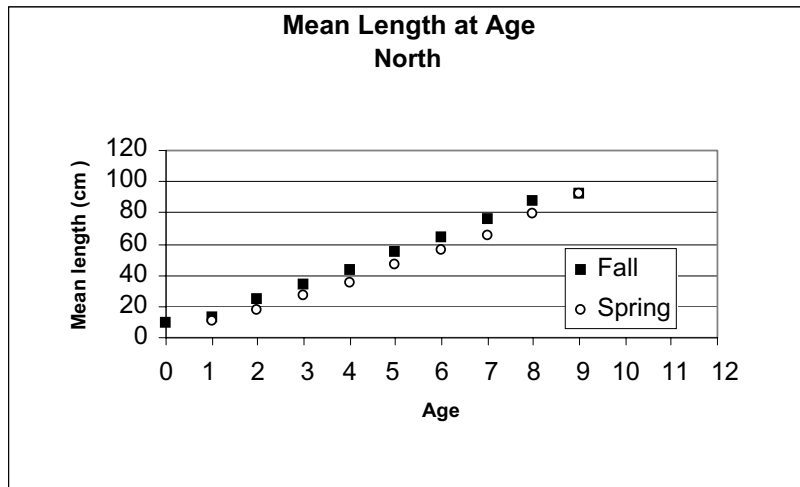
Figure C19. Mean length at age from NEFSC spring offshore surveys.

Mean Length at Age
North

Mean Length at Age
South

Mean Length at Age
Combined

Figure C20. Comparison of mean length at age from NEFSC fall and spring surveys.

Biomass Indices

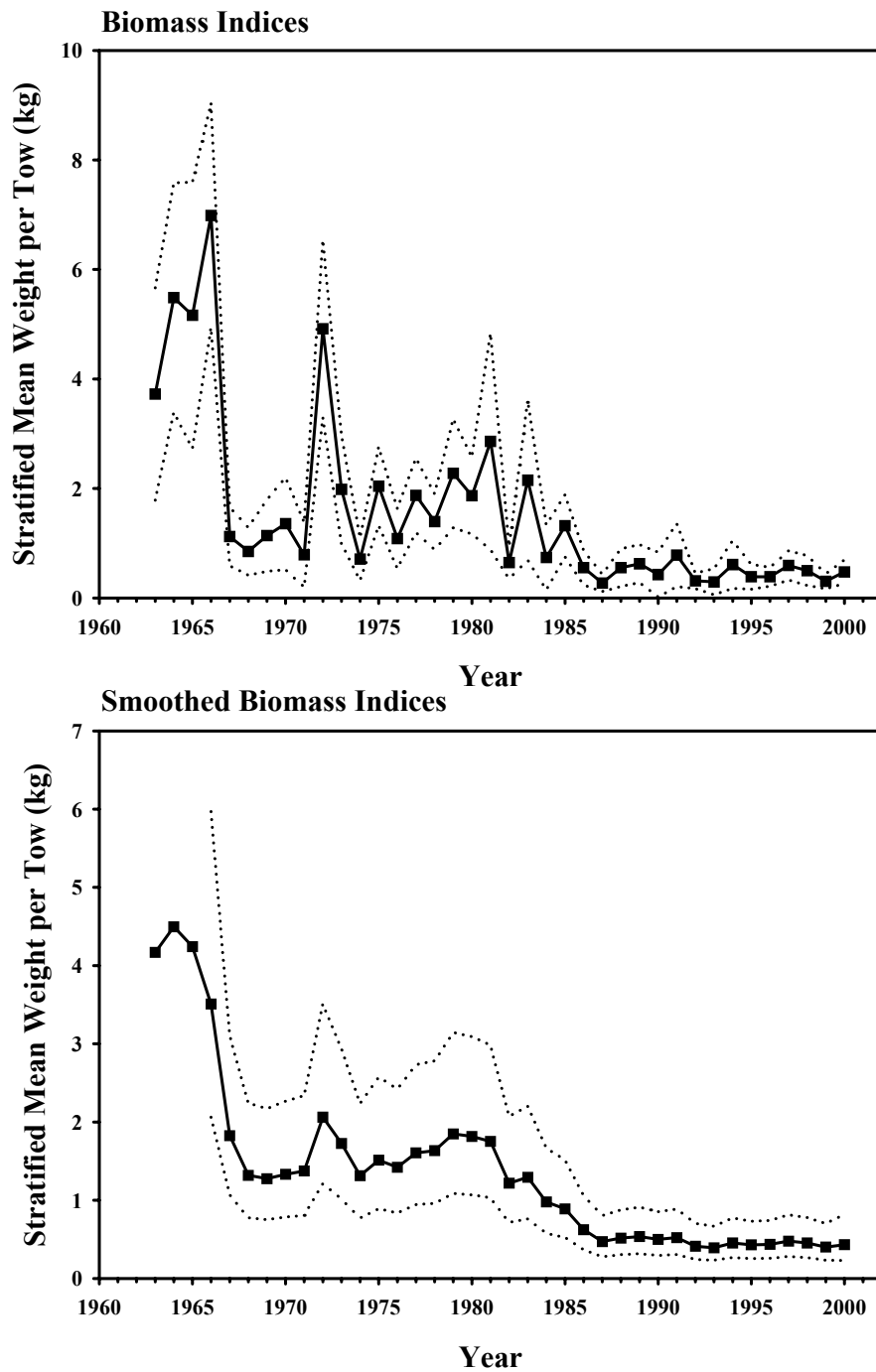

Smoothed Biomass Indices

Figure C21. Biomass indices and smoothed indices from the NEFSC autumn bottom
trawl survey for the southern management region from 1963-2000.
The 95% confidence limits are shown by the dashed line.

Abundance Indices
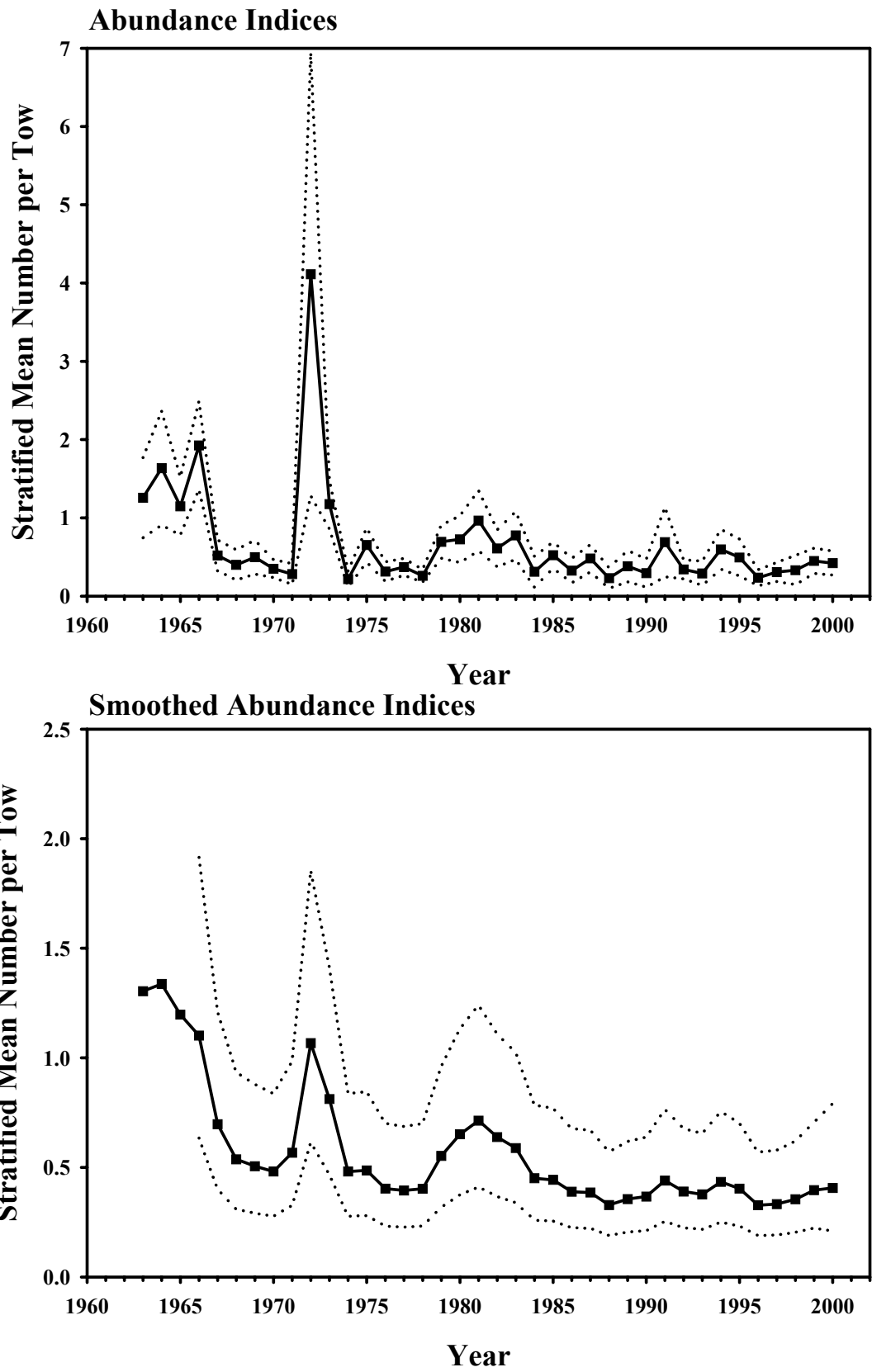

Smoothed Abundance Indices

Figure C22. Abundance indices and smoothed indices from the NEFSC autumn bottom trawl survey for the southern management region from 1963-2000. The 95% confidence limits are shown by the dashed line.

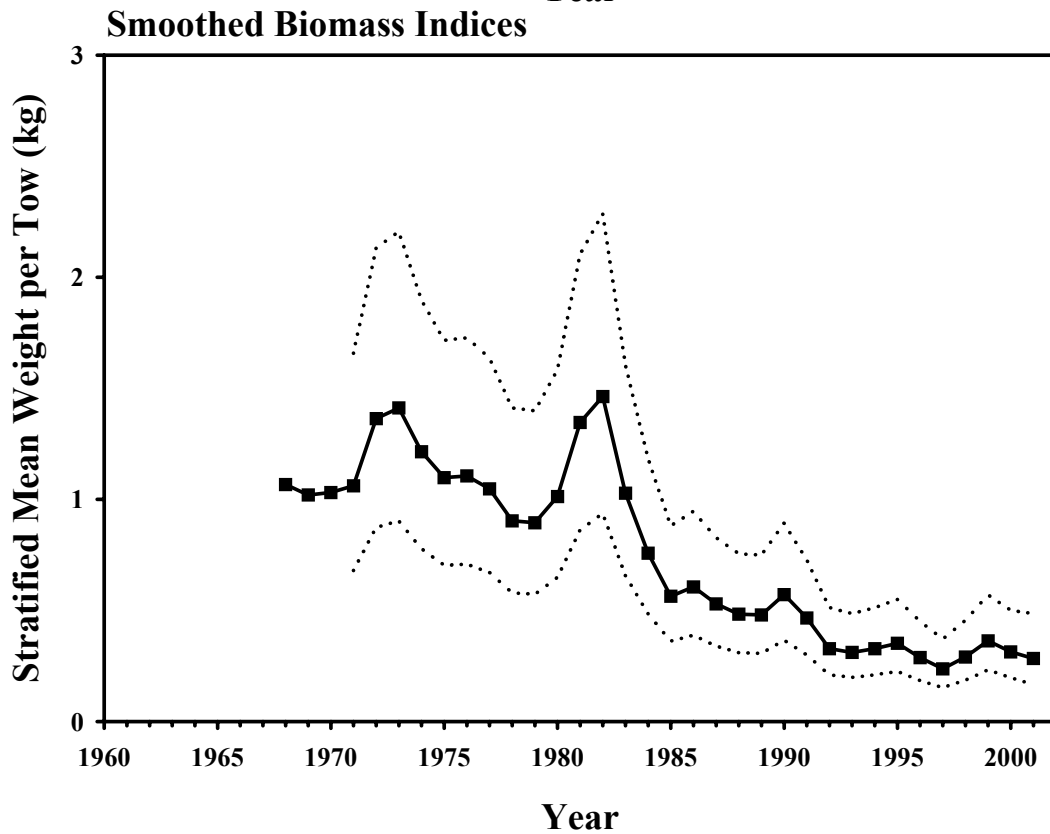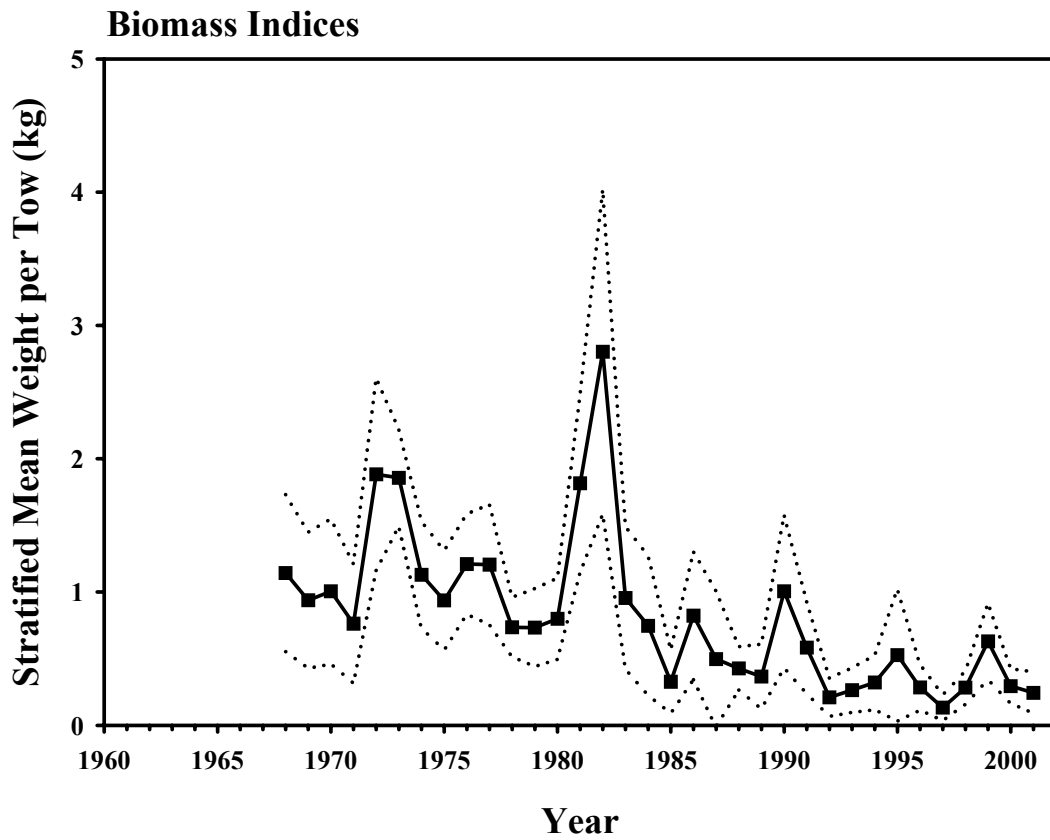## Biomass Indices

Smoothed Biomass Indices

Figure C23. Biomass indices and smoothed indices from the NEFSC spring bottom
trawl survey for the southern management region from 1968-2001.
The 95% confidence limits are shown by the dashed line.

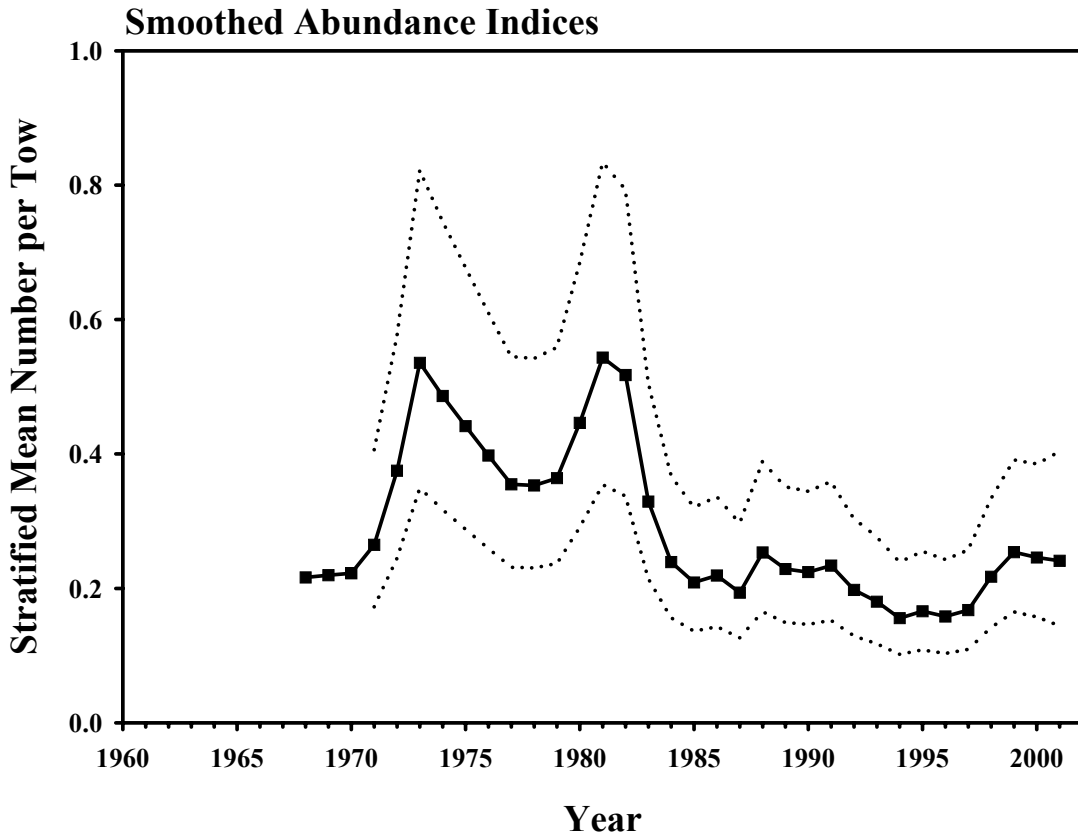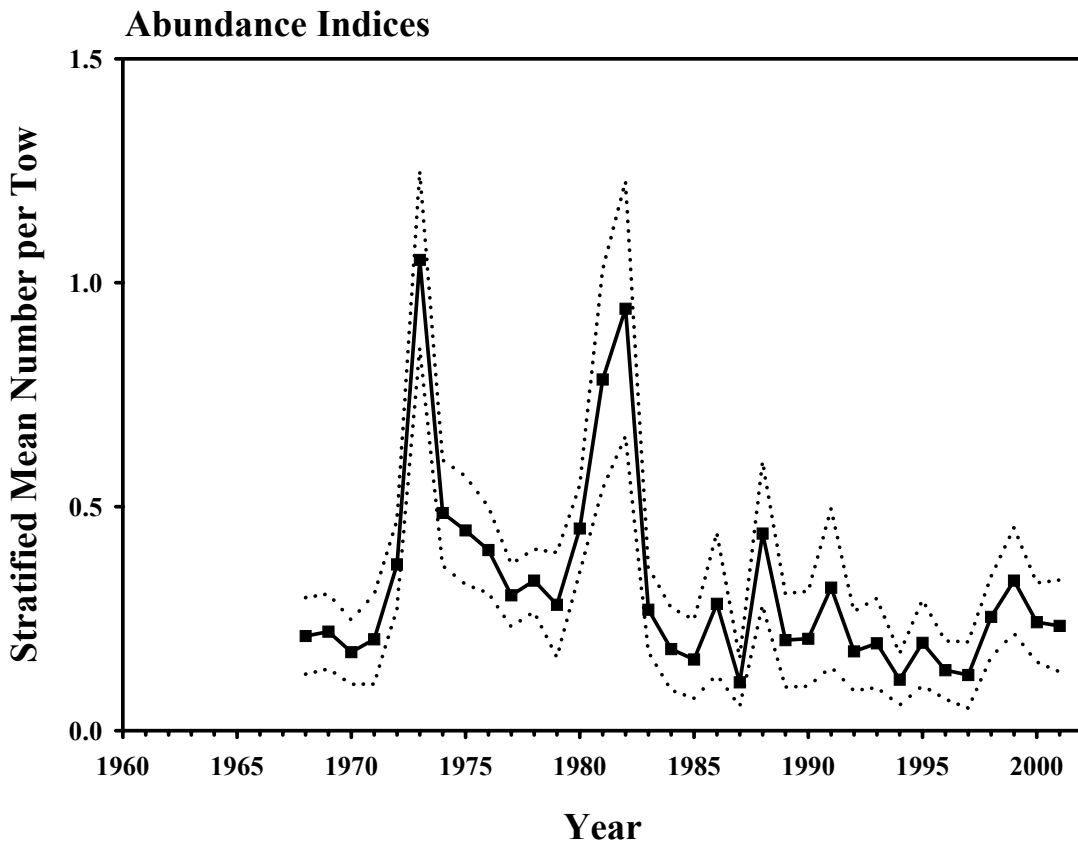## Abundance Indices

Smoothed Abundance Indices

Figure C24. Abundance indices and smoothed indices from the NEFSC spring bottom trawl survey for the southern management region from 1968-2001. The 95% confidence limits are shown by the dashed line.
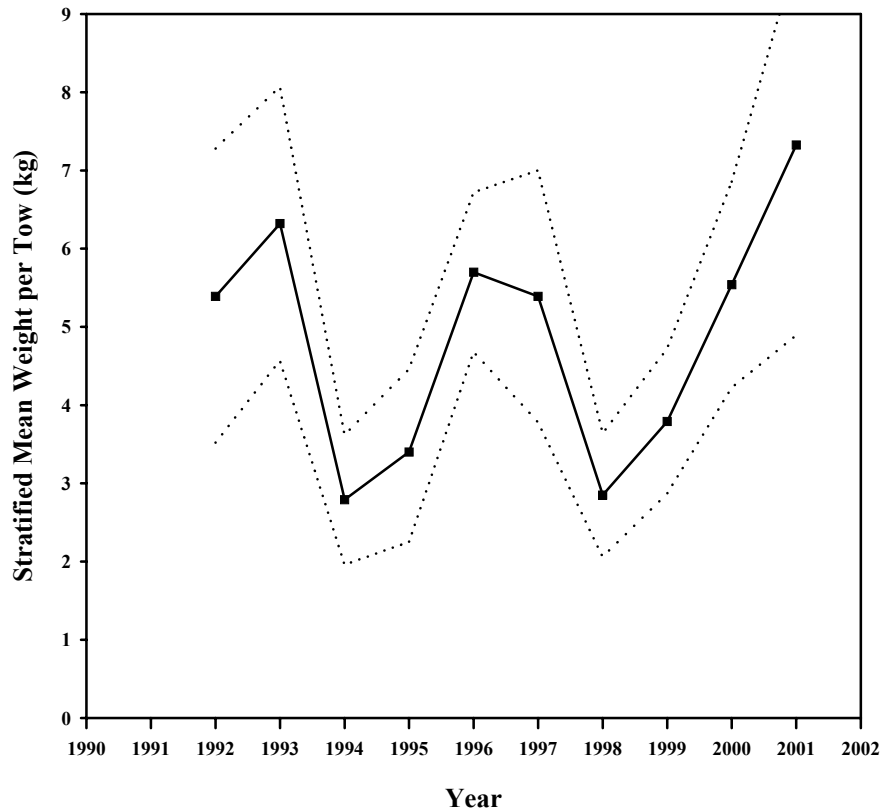
Figure C25. Biomass indices from the NEFSC winter flatfish survey for the southern management region from 1992-2001. The 95% confidence limits are shown by the dashed line.
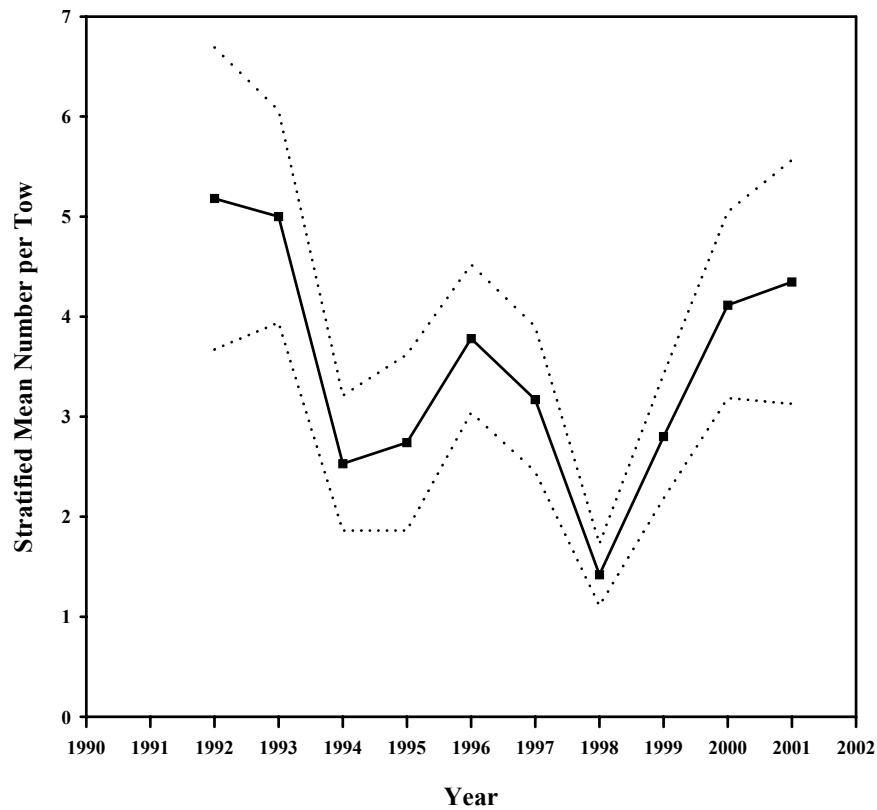

Figure C26. Abundance indices from the NEFSC winter flatfish survey for the Southern Georges Bank to Mid-Atlantic region from 1992-2001. The 95% confidence limits are shown by the dashed line.
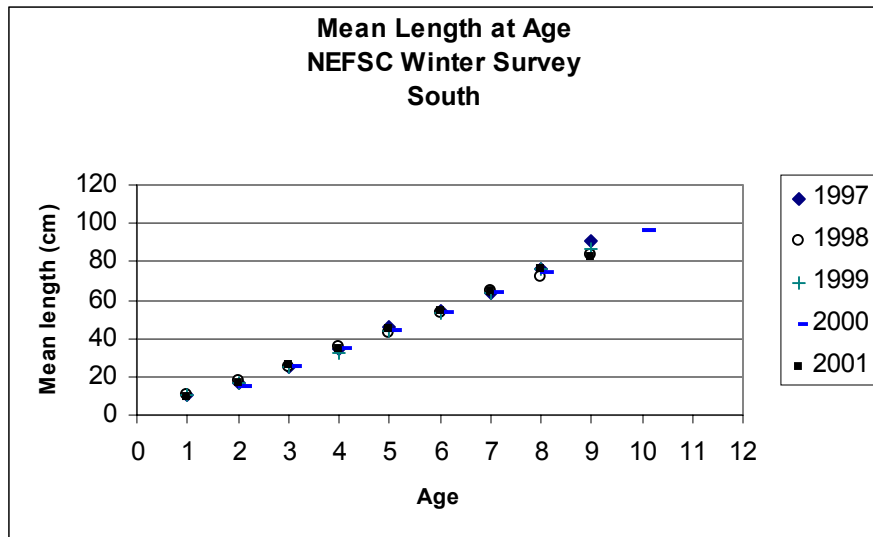
Figure C27. Mean length at age for goosefish in NEFSC winter surveys, southern management region.

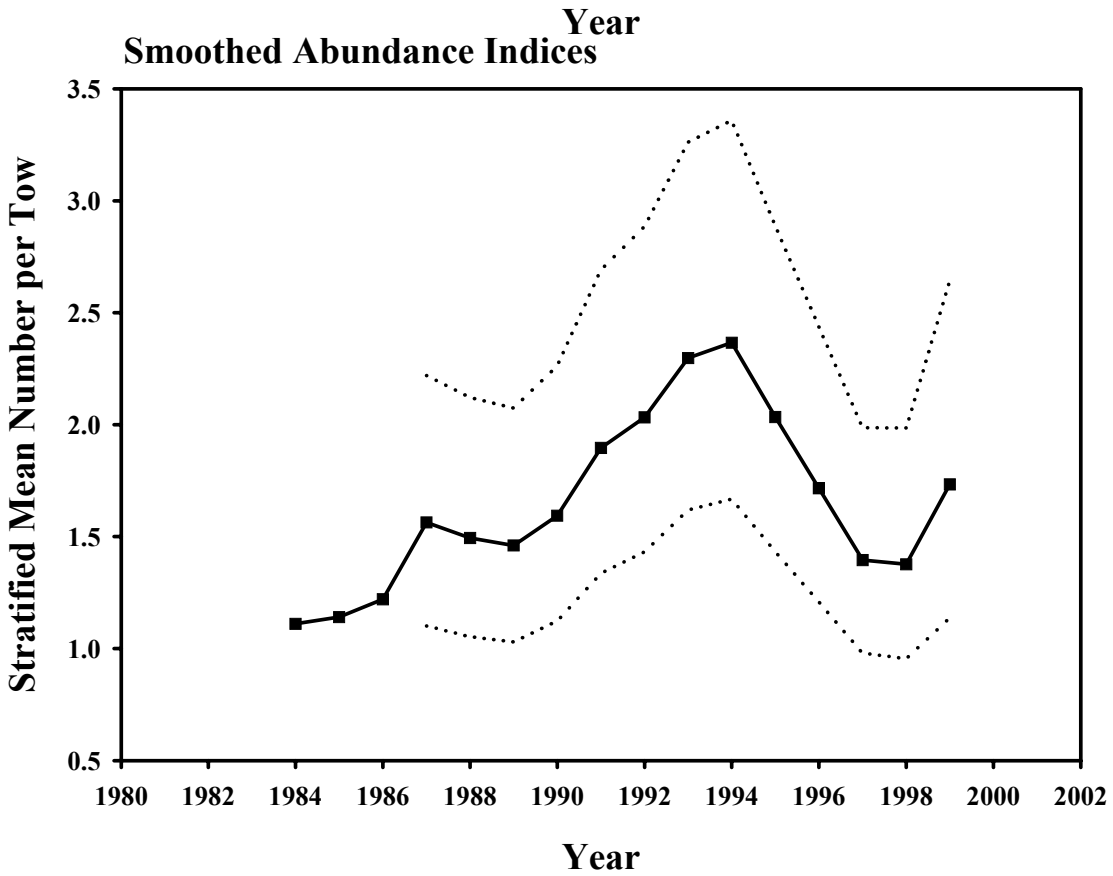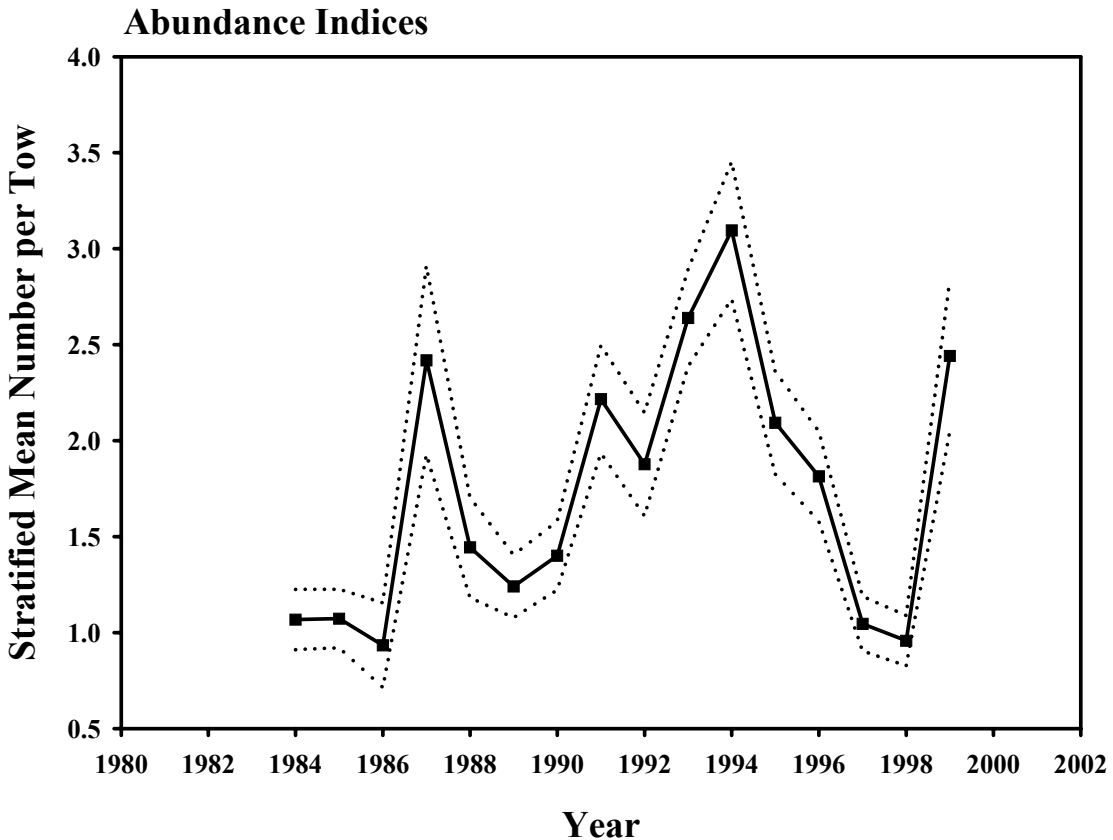## Abundance Indices

Smoothed Abundance Indices

Figure C28. Abundance indices and smoothed indices from the NEFSC scallop
dredge survey for the southern management region from 1984-1999.
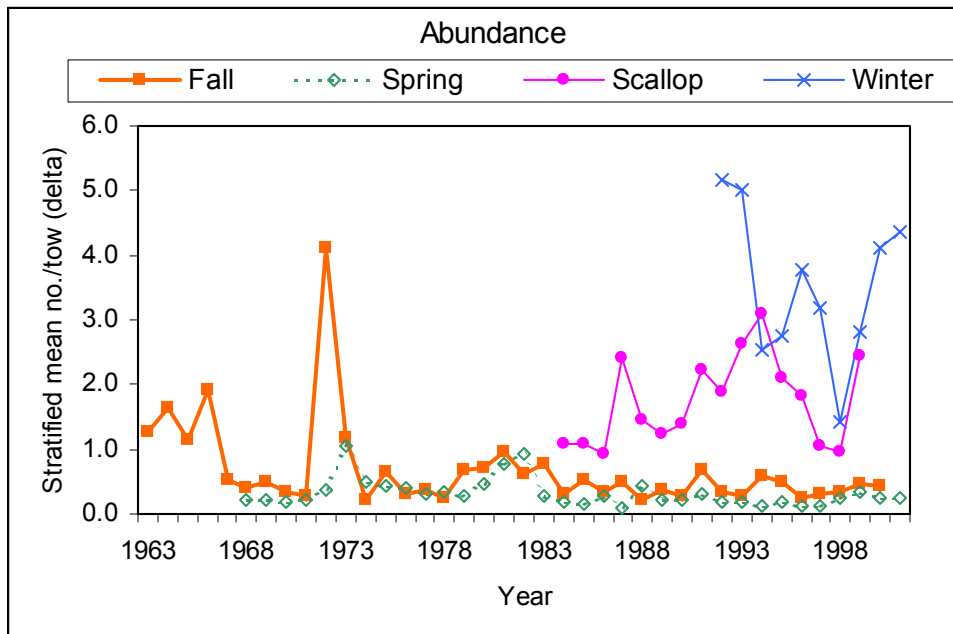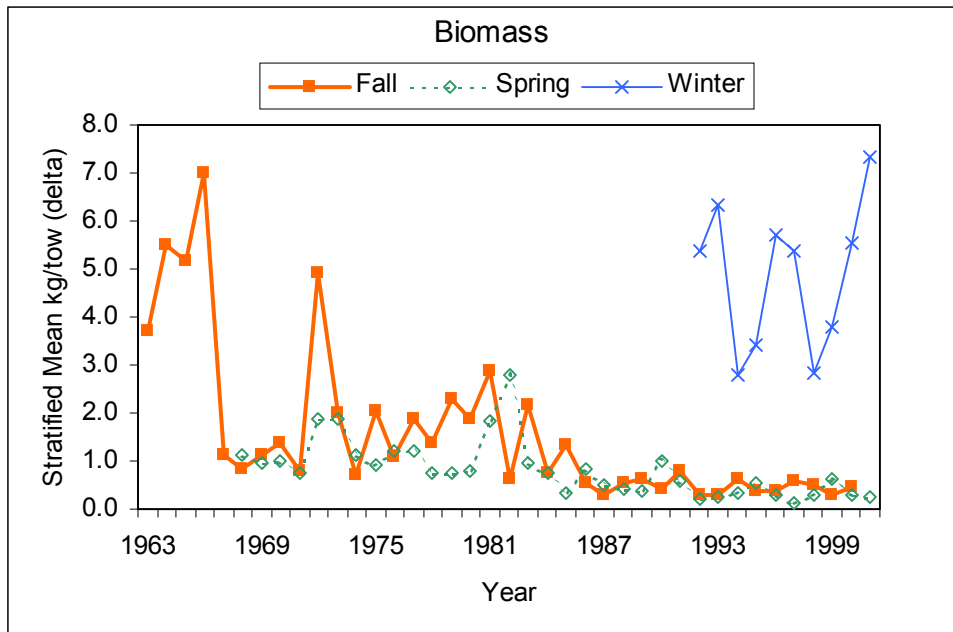The 95% confidence limits are shown by the dashed line.

Figure C29. Biomass and abundance indices from NEFSC spring and autumn trawl surveys, southern management region.

Spring Survey

Autumn Survey

NO SURVEY CONDUCTED

STRATIFIED MEAN NUMBER PER TOW

STRATIFIED MEAN NUMBER PER TOW

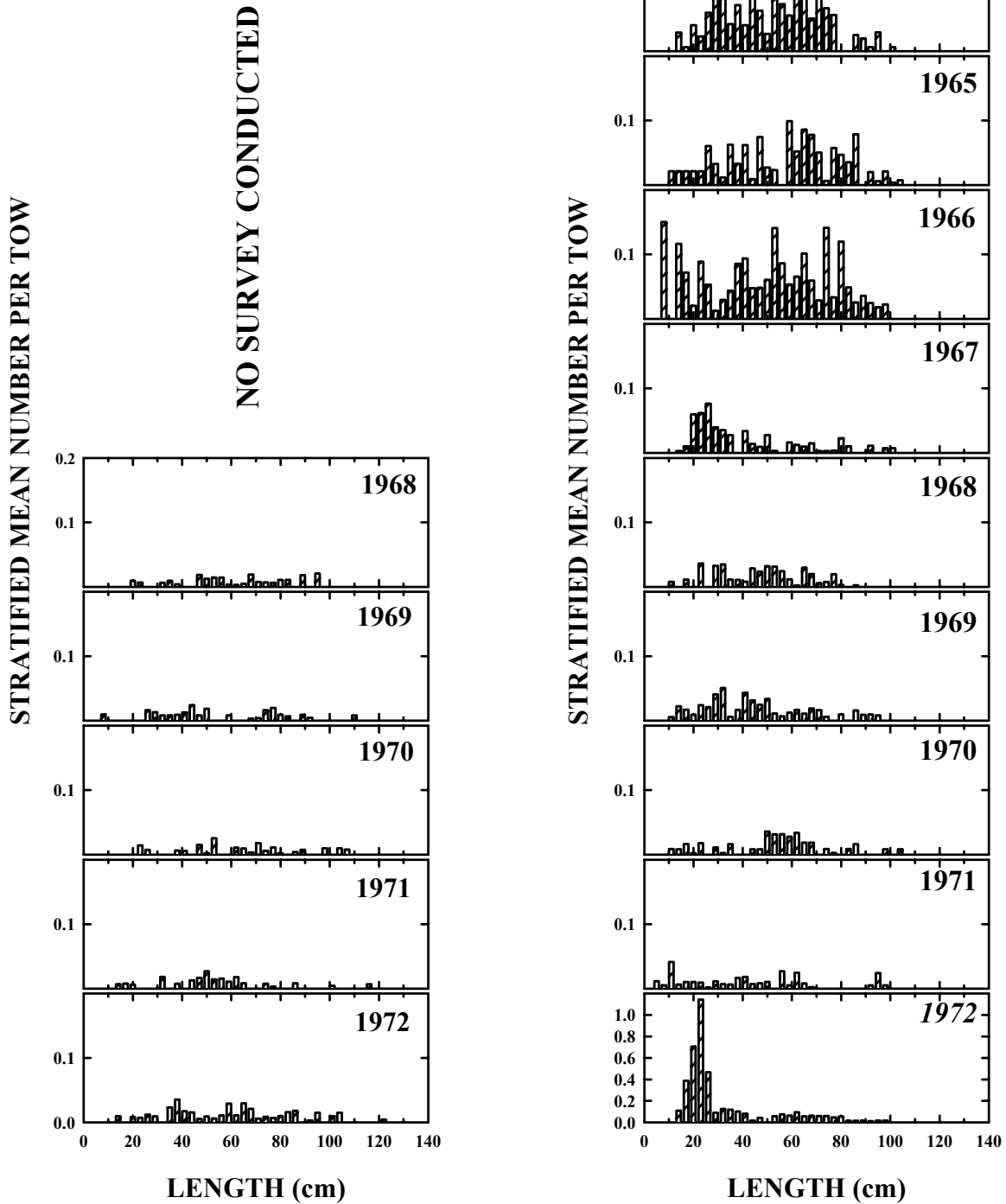**LENGTH (cm)**

LENGTH (cm)

Figure C30a. Goosefish length composition from the NEFSC spring bottom trawl
(March-April), winter flatfish (February), summer scallop (July-August),
and autumn (September-October) bottom trawl surveys in the southern
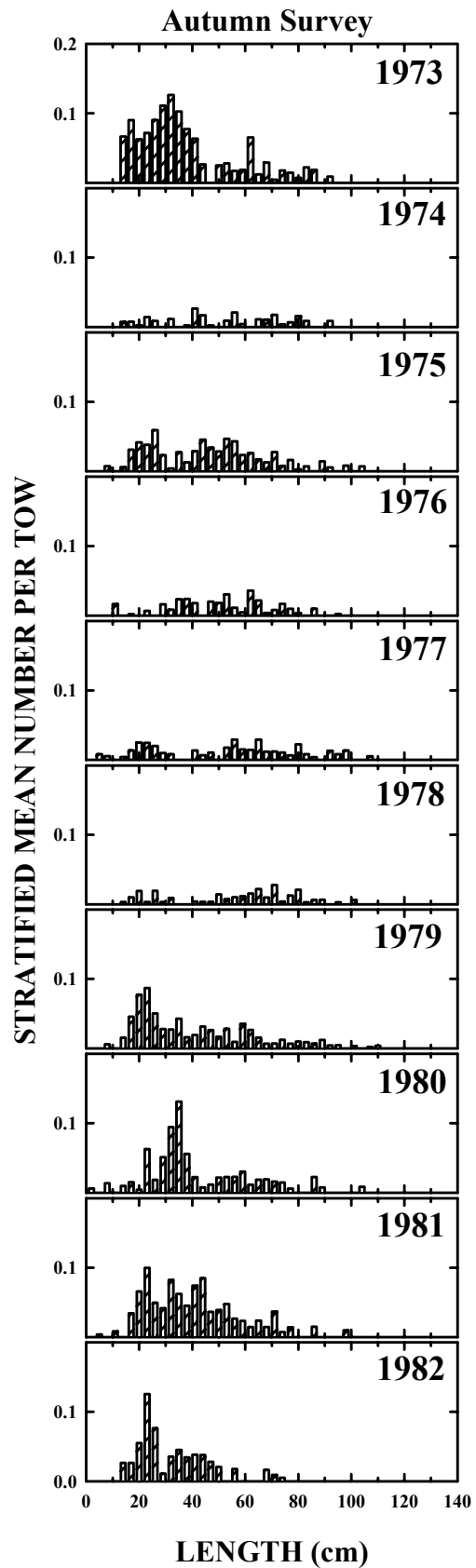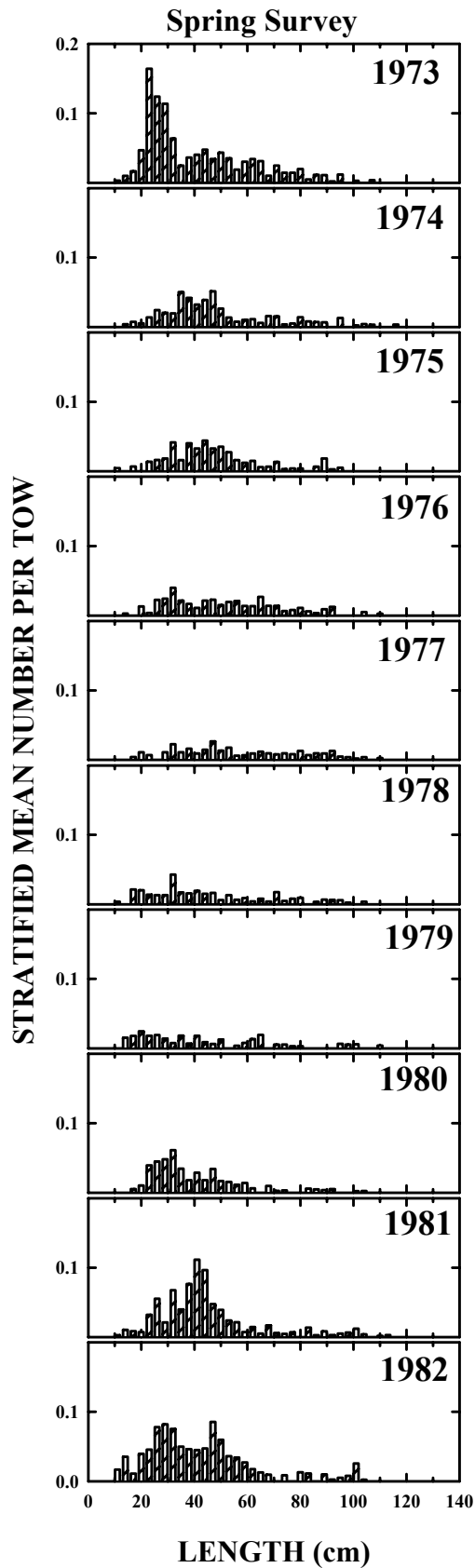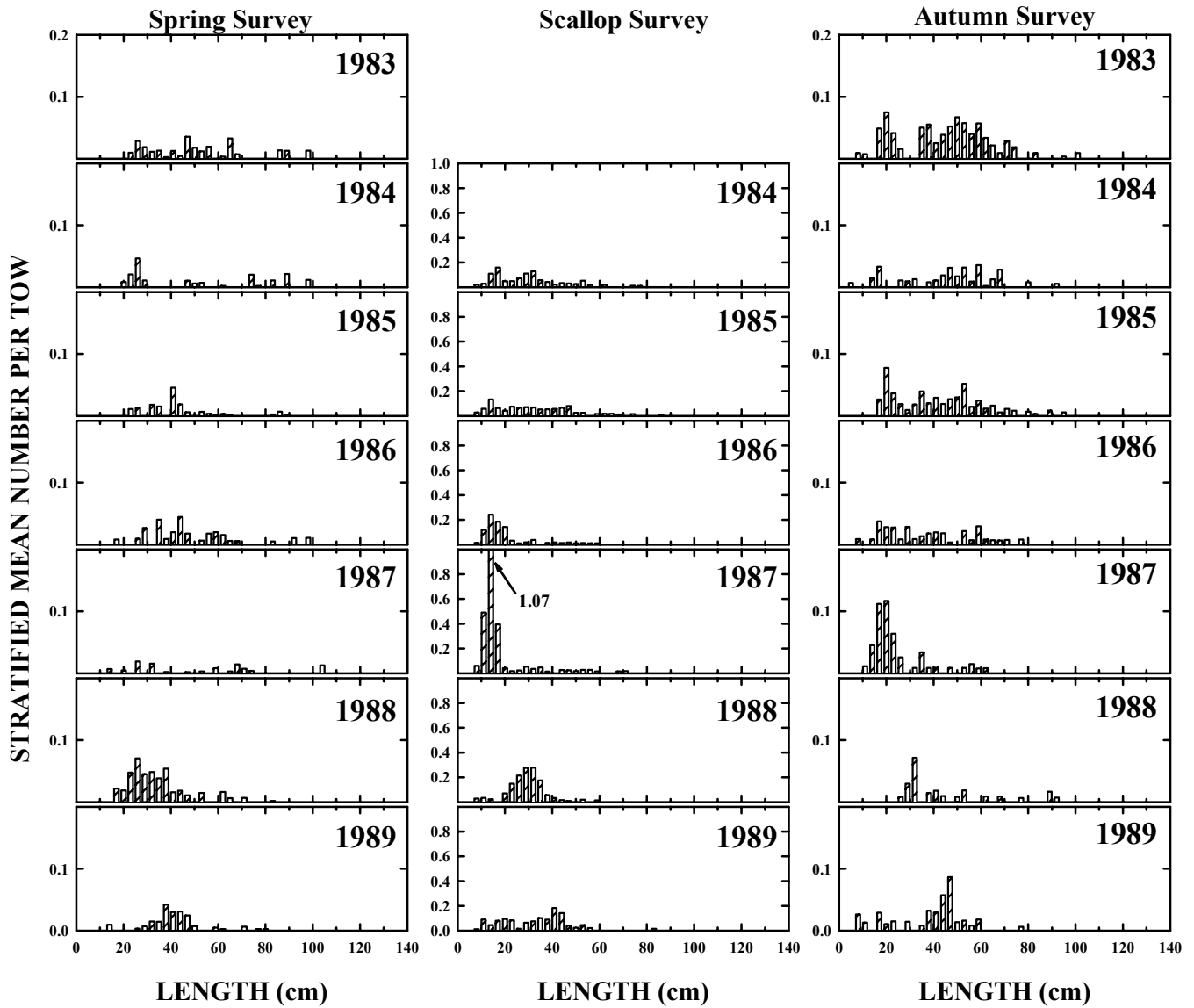management region, 1963-2001.

Spring Survey

Autumn Survey

STRATIFIED MEAN NUMBER PER TOW

1973

1974

1975

1976

1977

1978

1979

1980

1981

1982

LENGTH (cm)

LENGTH (cm)

Figure C30b, continued.

Figure C30c, continued.

Winter Survey   **Spring Survey**   **Scallop Survey**   **Autumn Survey**

STRATIFIED MEAN NUMBER PER TOW

LENGTH (cm)   **LENGTH (cm)**   **LENGTH (cm)**   **LENGTH (cm)**
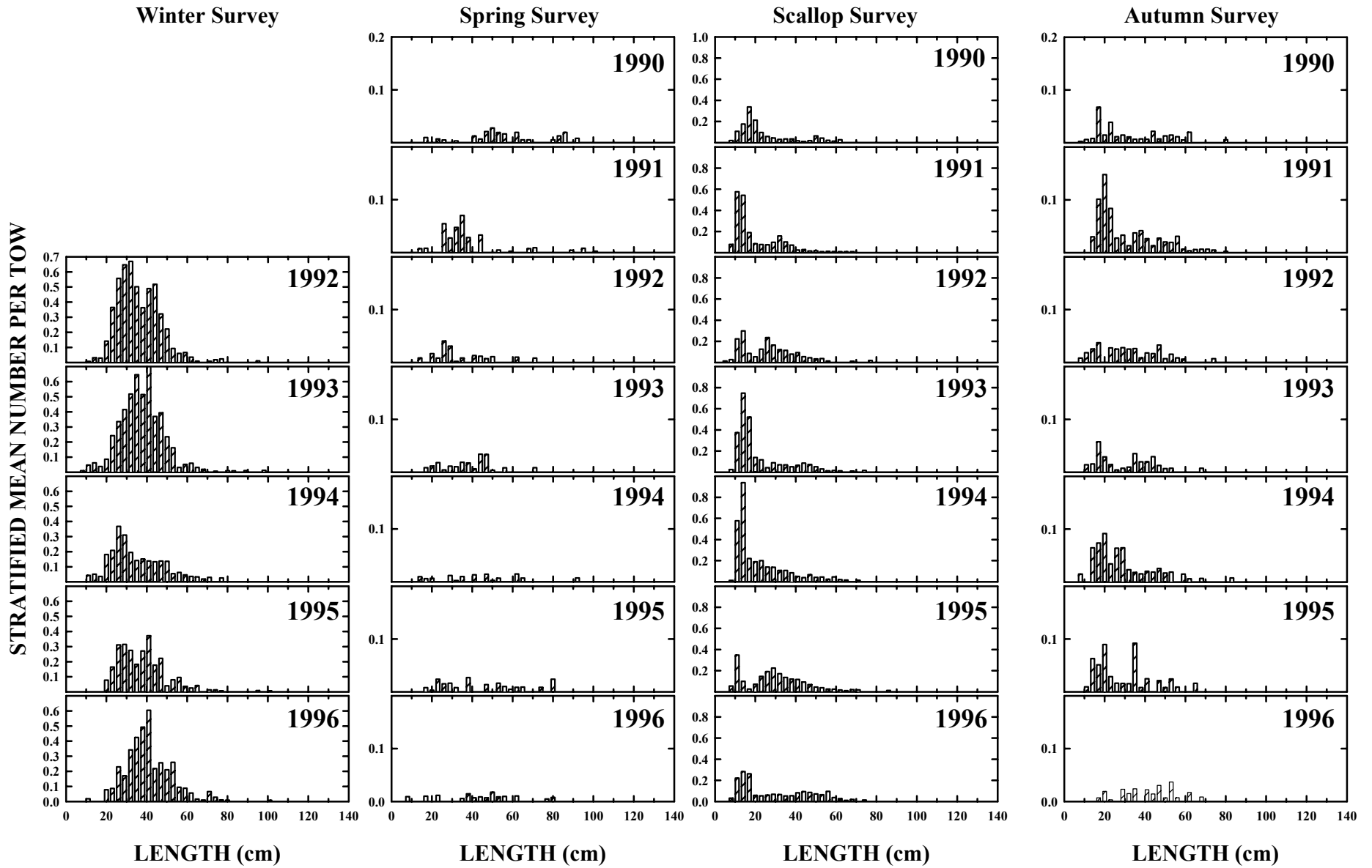
Figure C30d, continued.
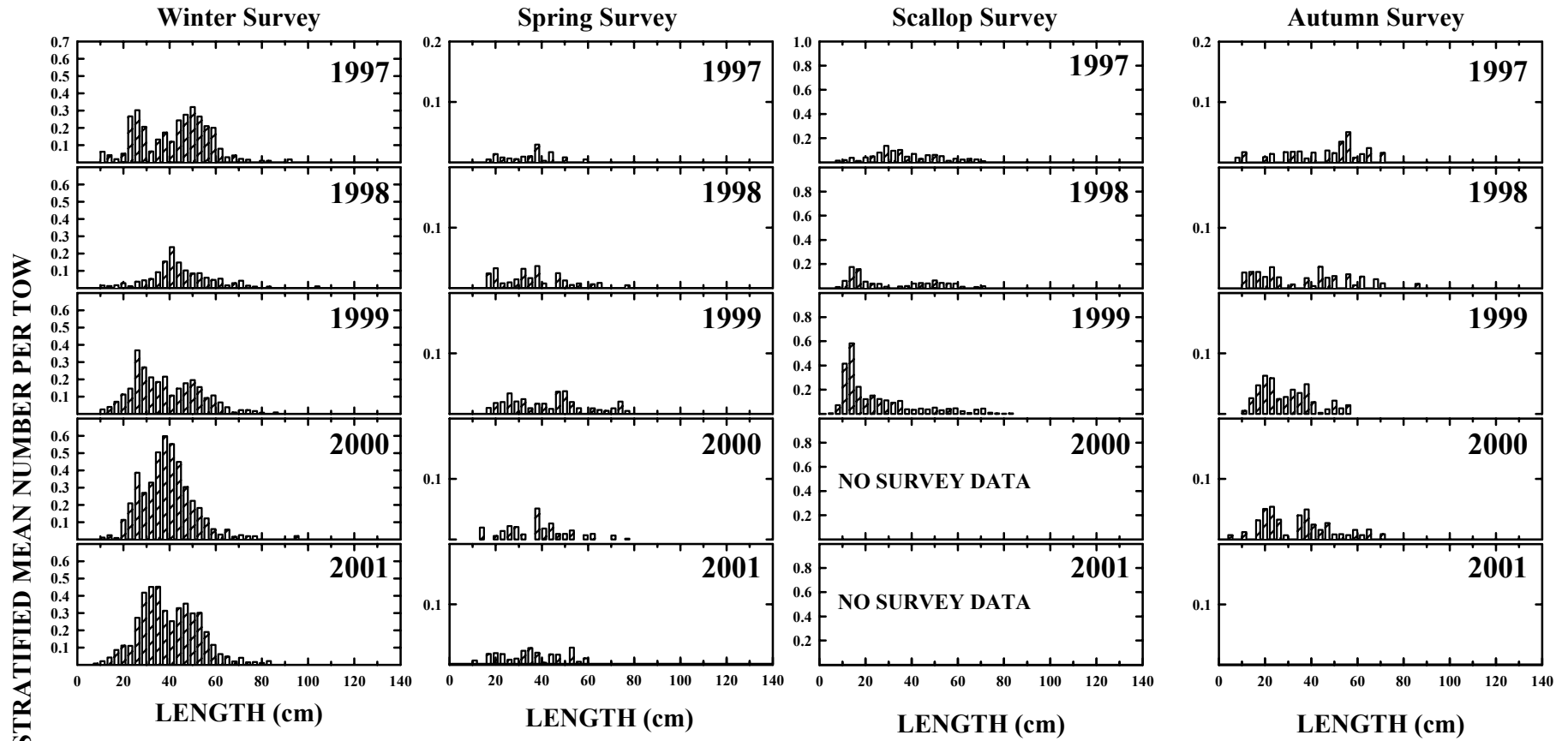
Figure C30e, continued.

Year
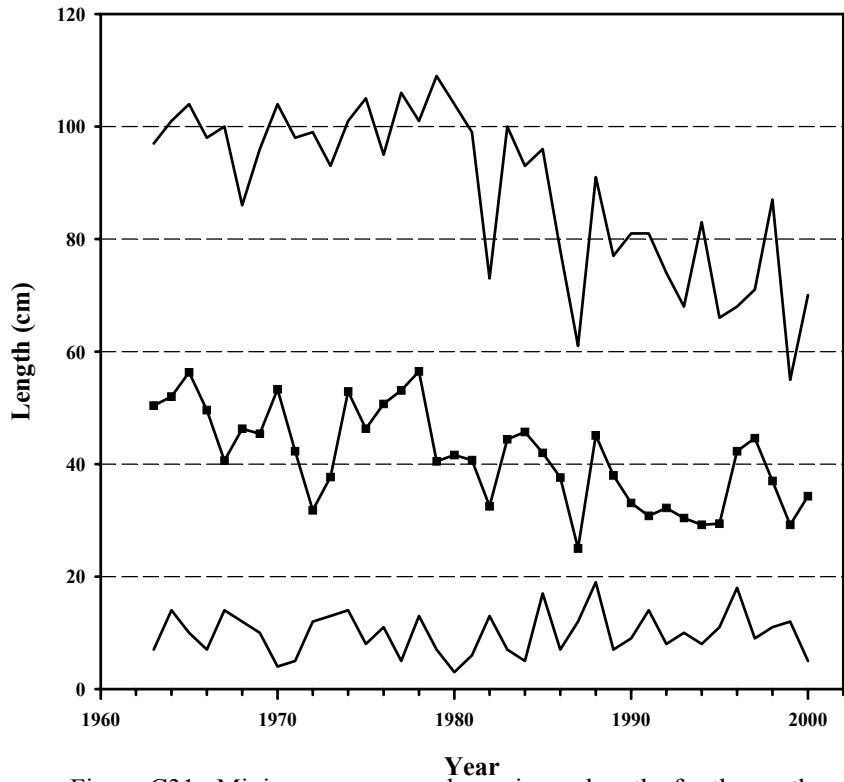
Figure C31. Minimum, mean, and, maximum lengths for the southern
management region from the NEFSC autumn surveys.

Year
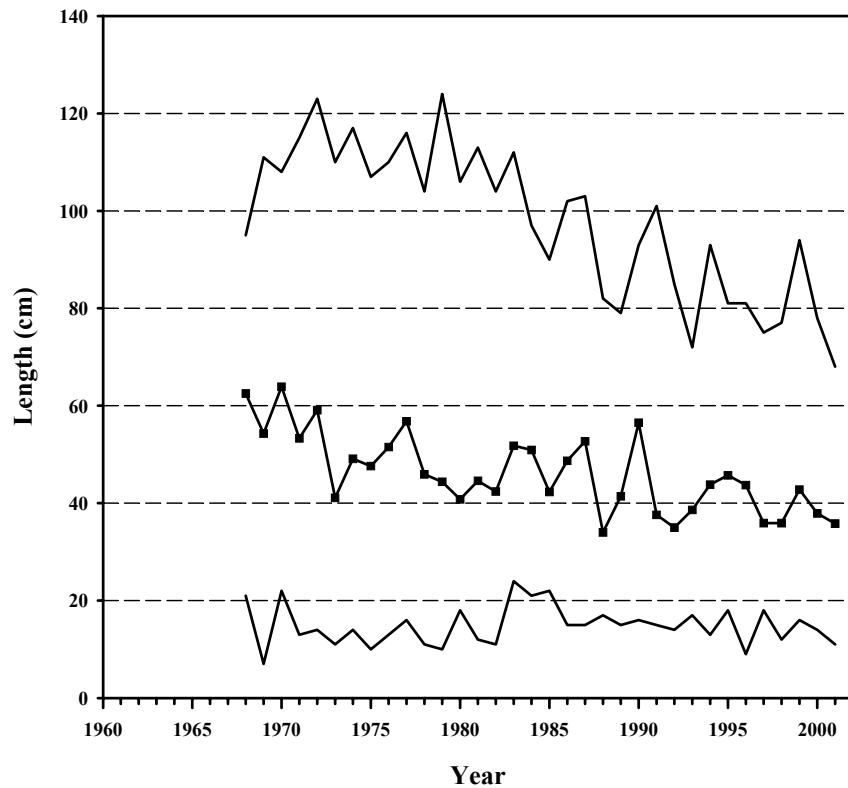
Figure C32. Minimum, mean, and, maximum lengths for the southern
management region from the NEFSC spring surveys.
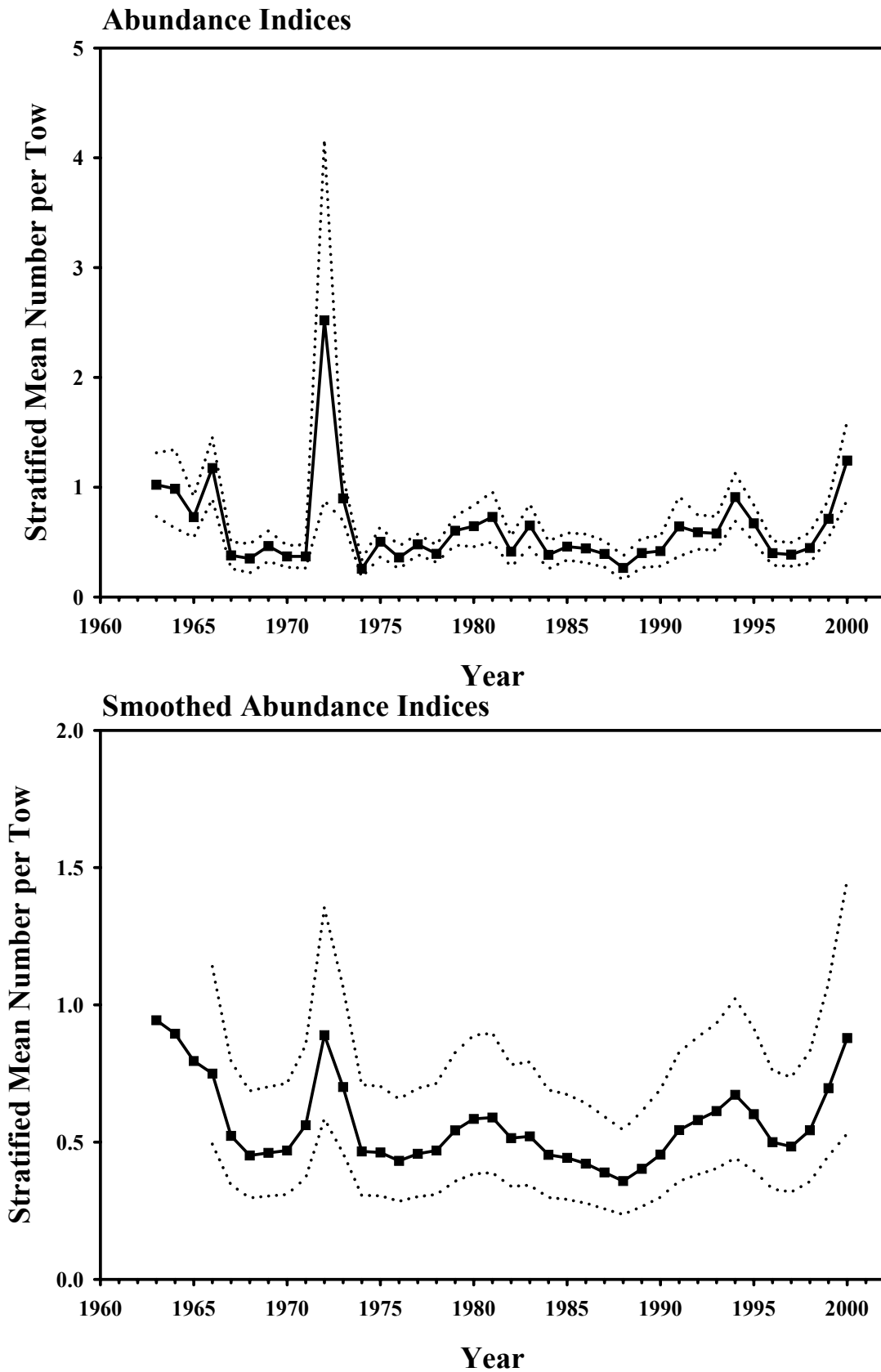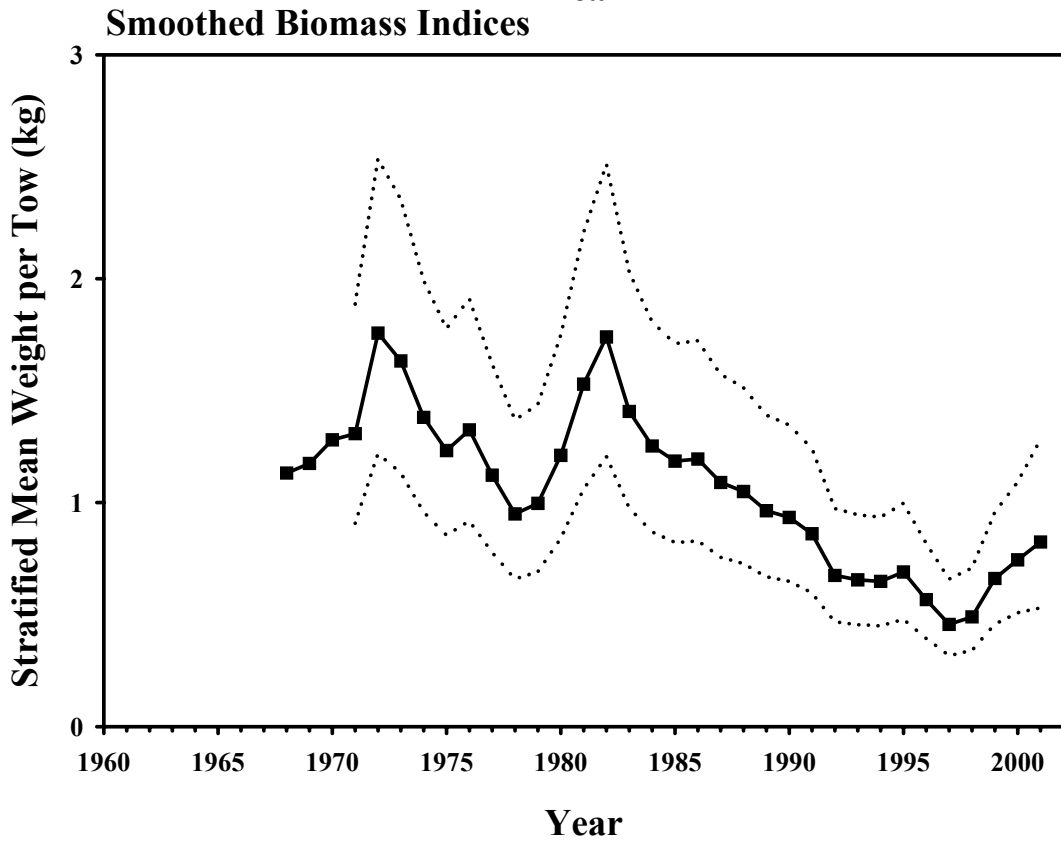
Biomass Indices

Smoothed Biomass Indices
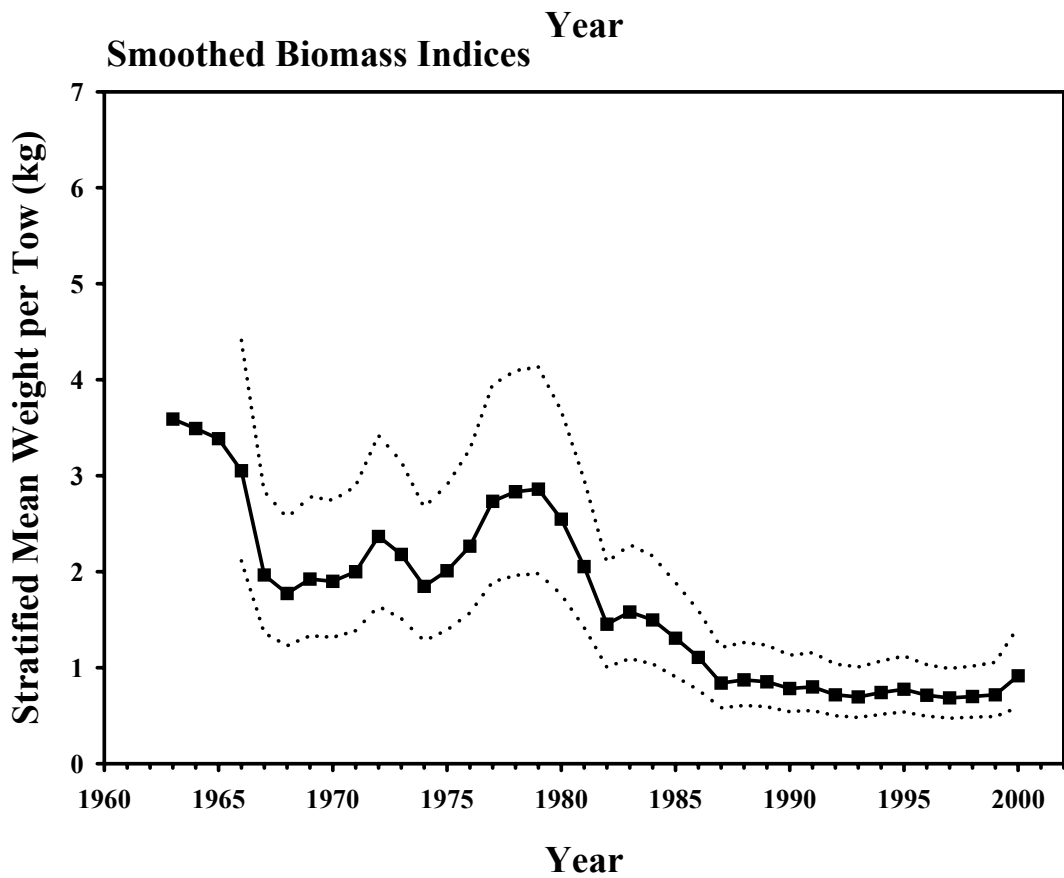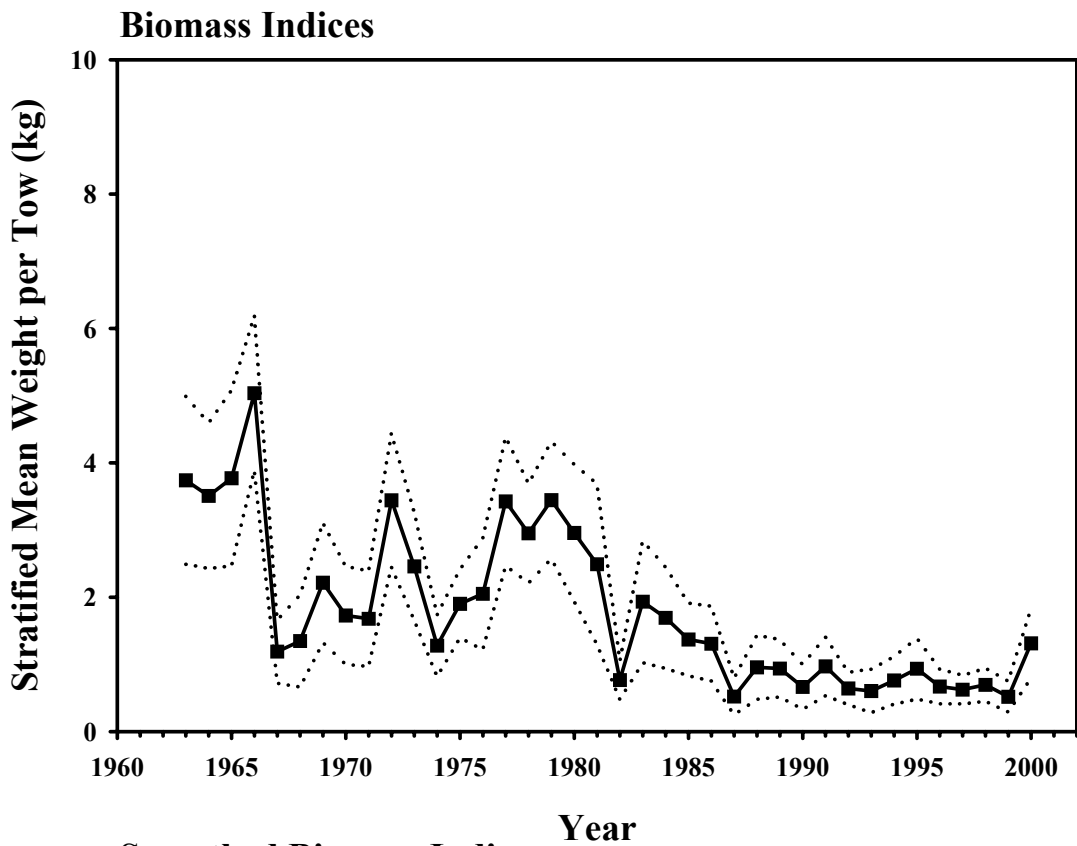
Figure C33. Biomass indices and smoothed indices from the NEFSC autumn bottom trawl survey for management regions combined,1963-2000. The 95% confidence limits are shown by the dashed line.
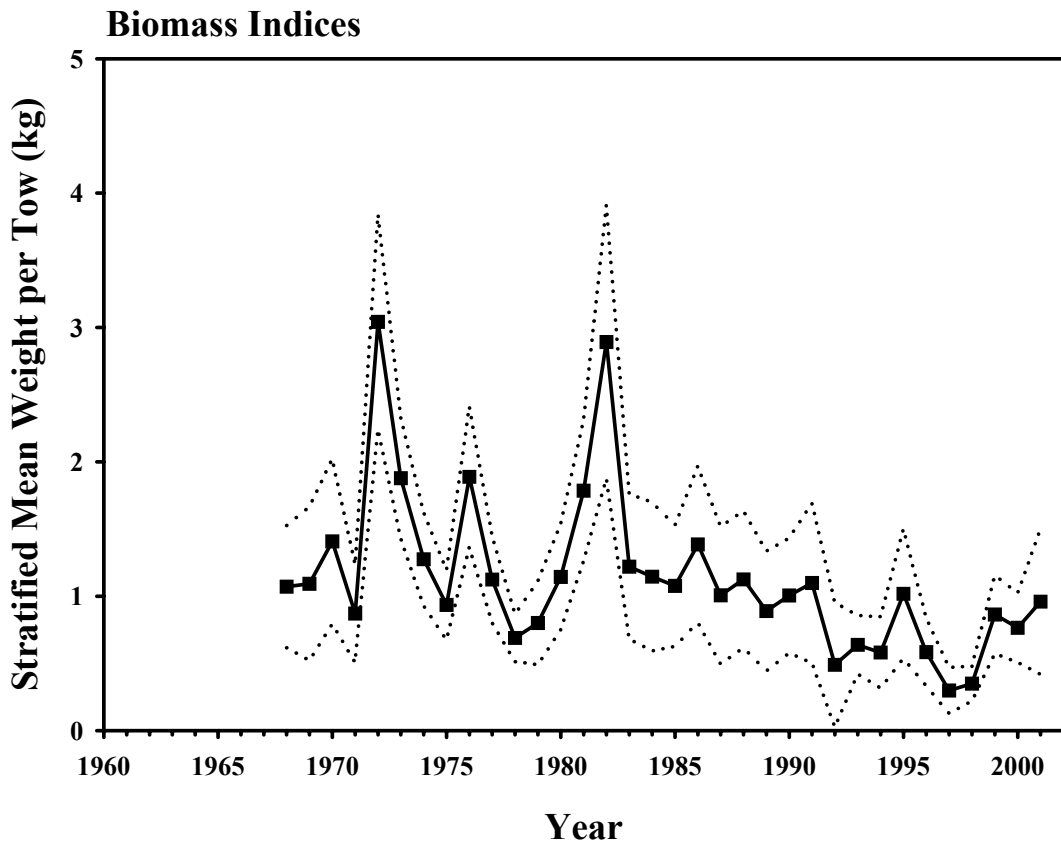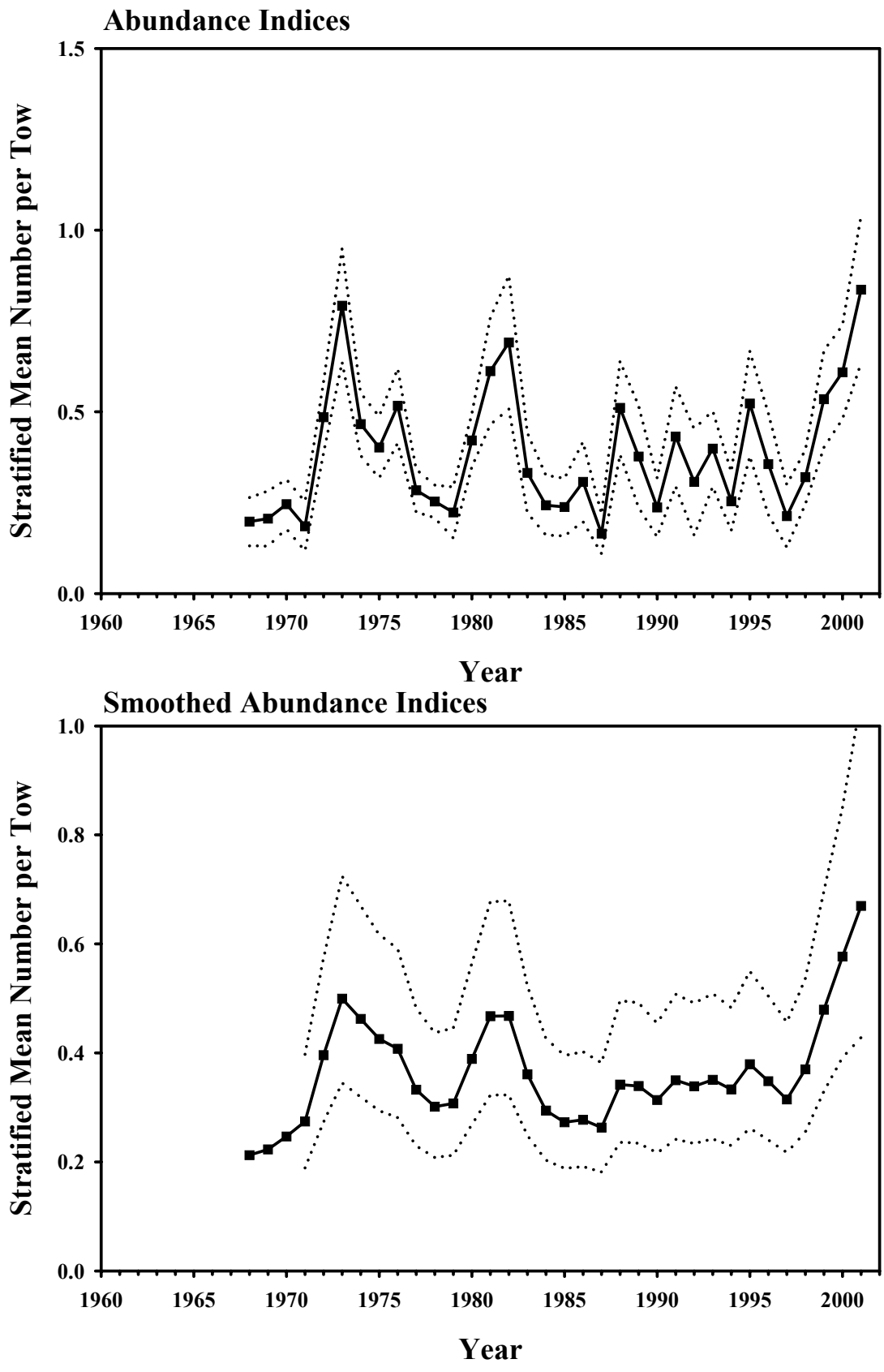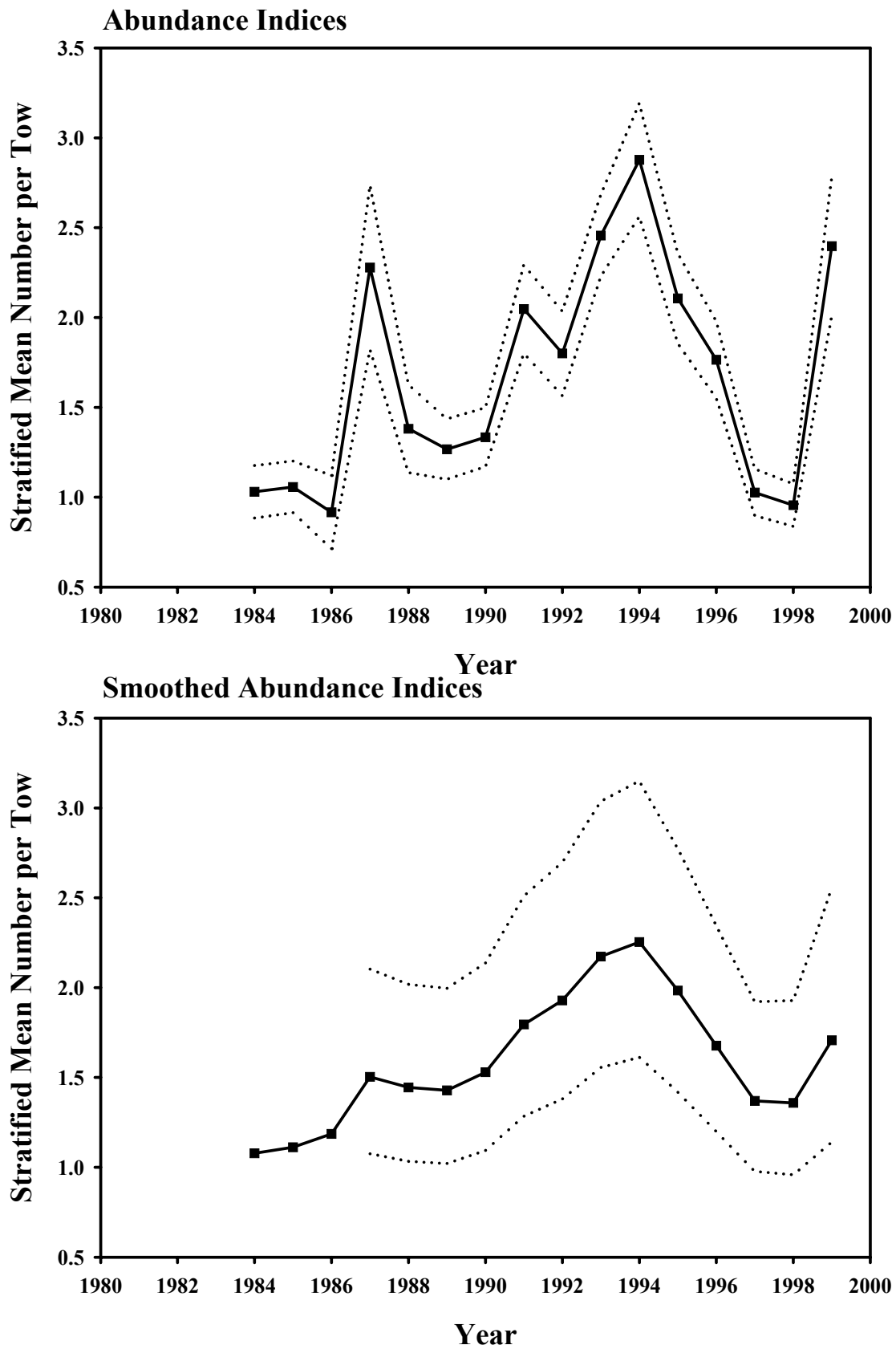
Abundance Indices

Smoothed Abundance Indices

Figure C34. Abundance indices and smoothed indices from the NEFSC autumn bottom trawl survey for management regions combined, 1963-2000. The 95% confidence limits are shown by the dashed line.

Biomass Indices

Smoothed Biomass Indices

Figure C35. Biomass indices and smoothed indices from the NEFSC spring bottom trawl survey for management regions combined,1968-2001. The 95% confidence limits are shown by the dashed line.

Abundance Indices

Smoothed Abundance Indices

Figure C36. Abundance indices and smoothed indices from the NEFSC
spring bottom trawl survey for management regions combined,
1968-2001. The 95% confidence limits are shown by the dashed line.

Abundance Indices

Smoothed Abundance Indices

Figure C37. Abundance indices and smoothed indices from the NEFSC scallop
dredge survey for management regions combined, 1984-1999.
The 95% confidence limits are shown by the dashed line.

Spring Survey

Autumn Survey

NO SURVEY CONDUCTED

STRATIFIED MEAN NUMBER PER TOW

STRATIFIED MEAN NUMBER PER TOW
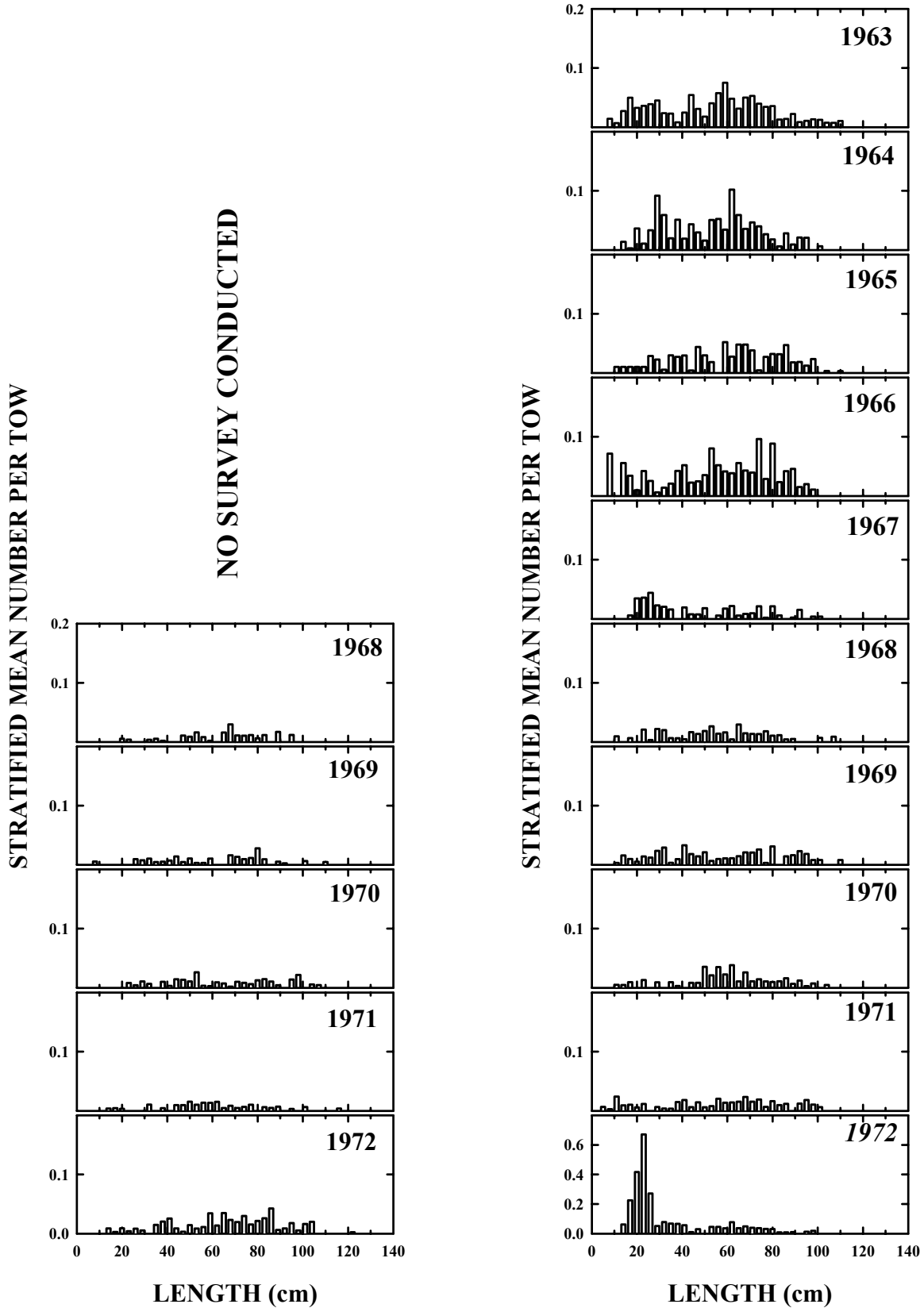
LENGTH (cm)

LENGTH (cm)

Figure C38. Goosefish length composition from the NEFSC spring bottom trawl,
summer scallop, and autumn bottom trawl surveys in the management
regions combined, 1963-2001.
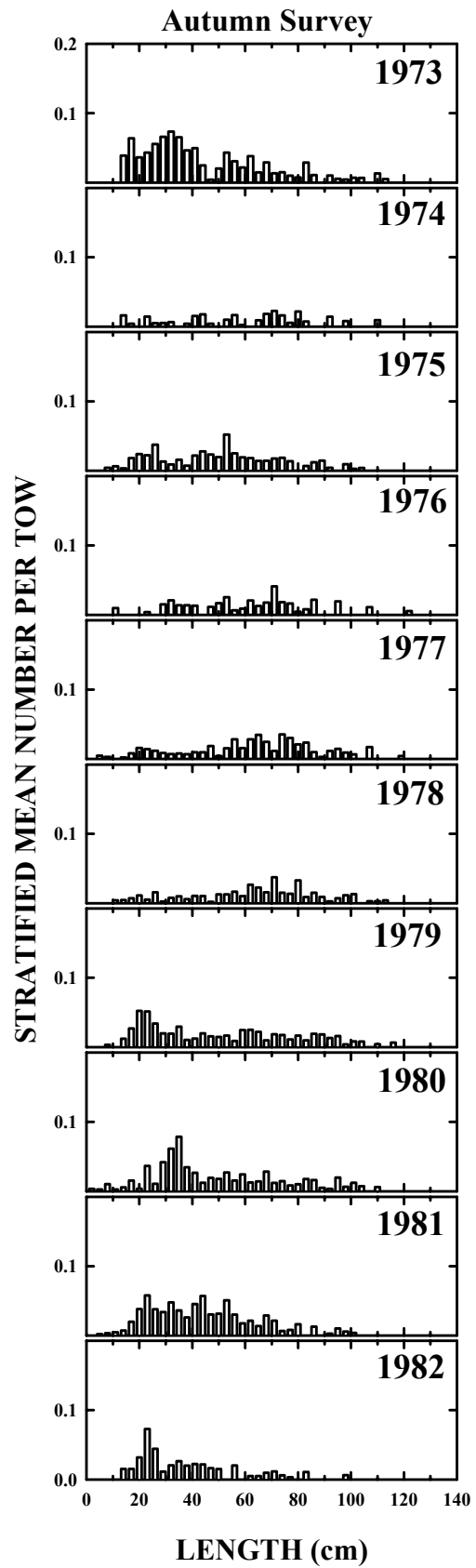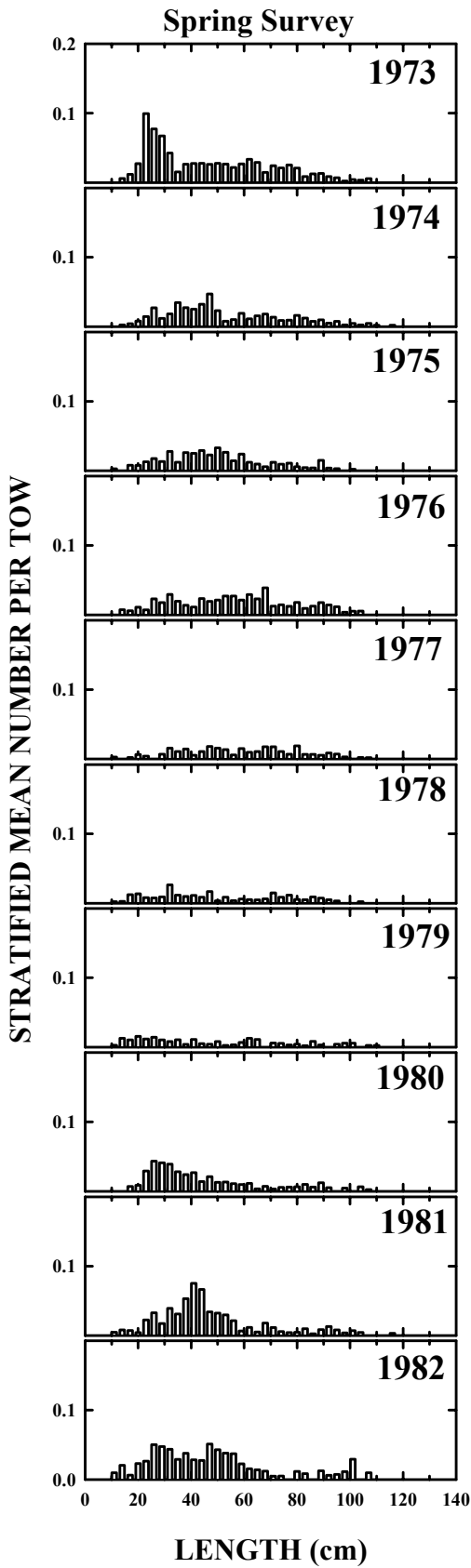
Figure C38b, continued.

Spring Survey   **Scallop Survey**   **Autumn Survey**

STRATIFIED MEAN NUMBER PER TOW

LENGTH (cm)   LENGTH (cm)   LENGTH (cm)
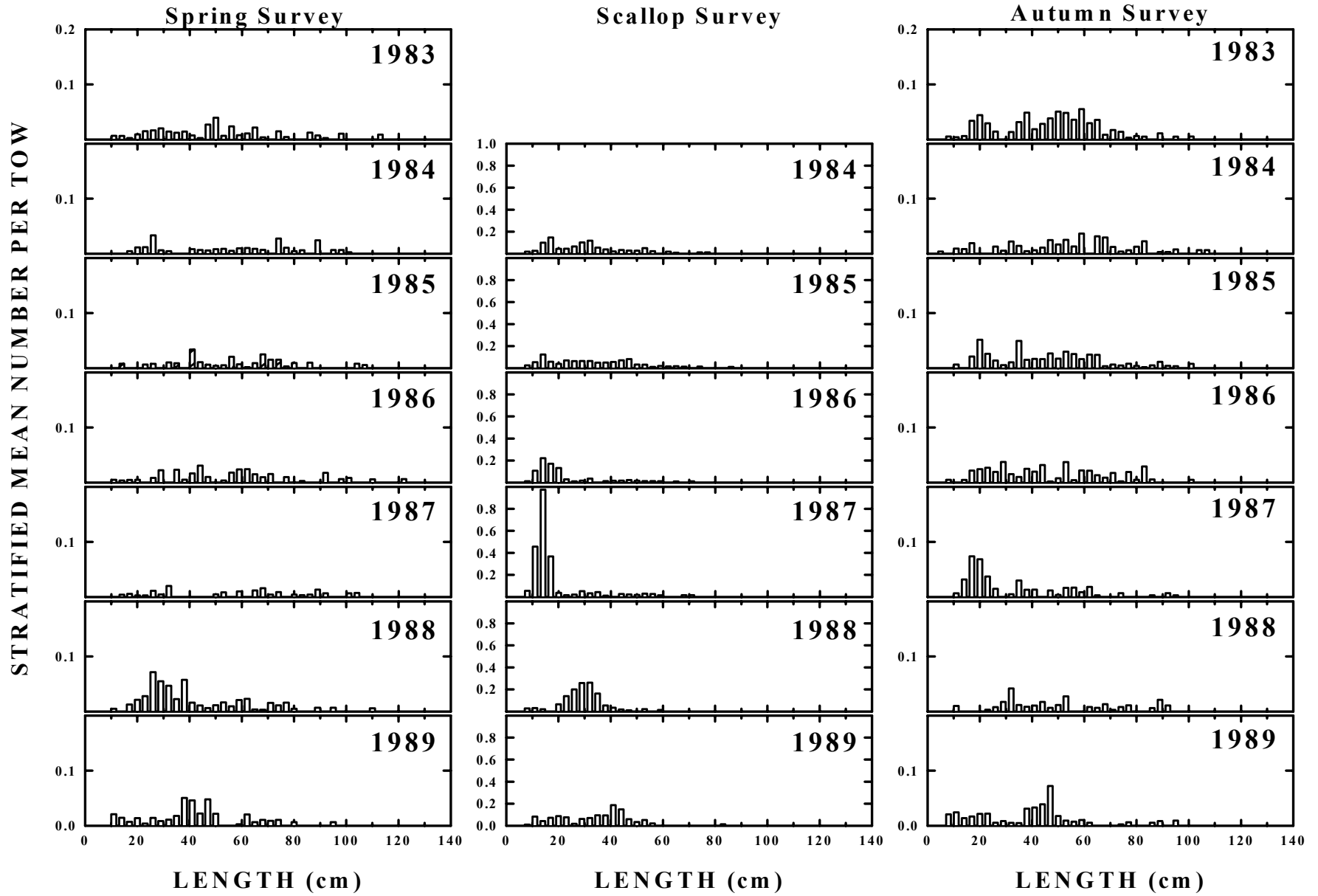
Figure C38c, continued.
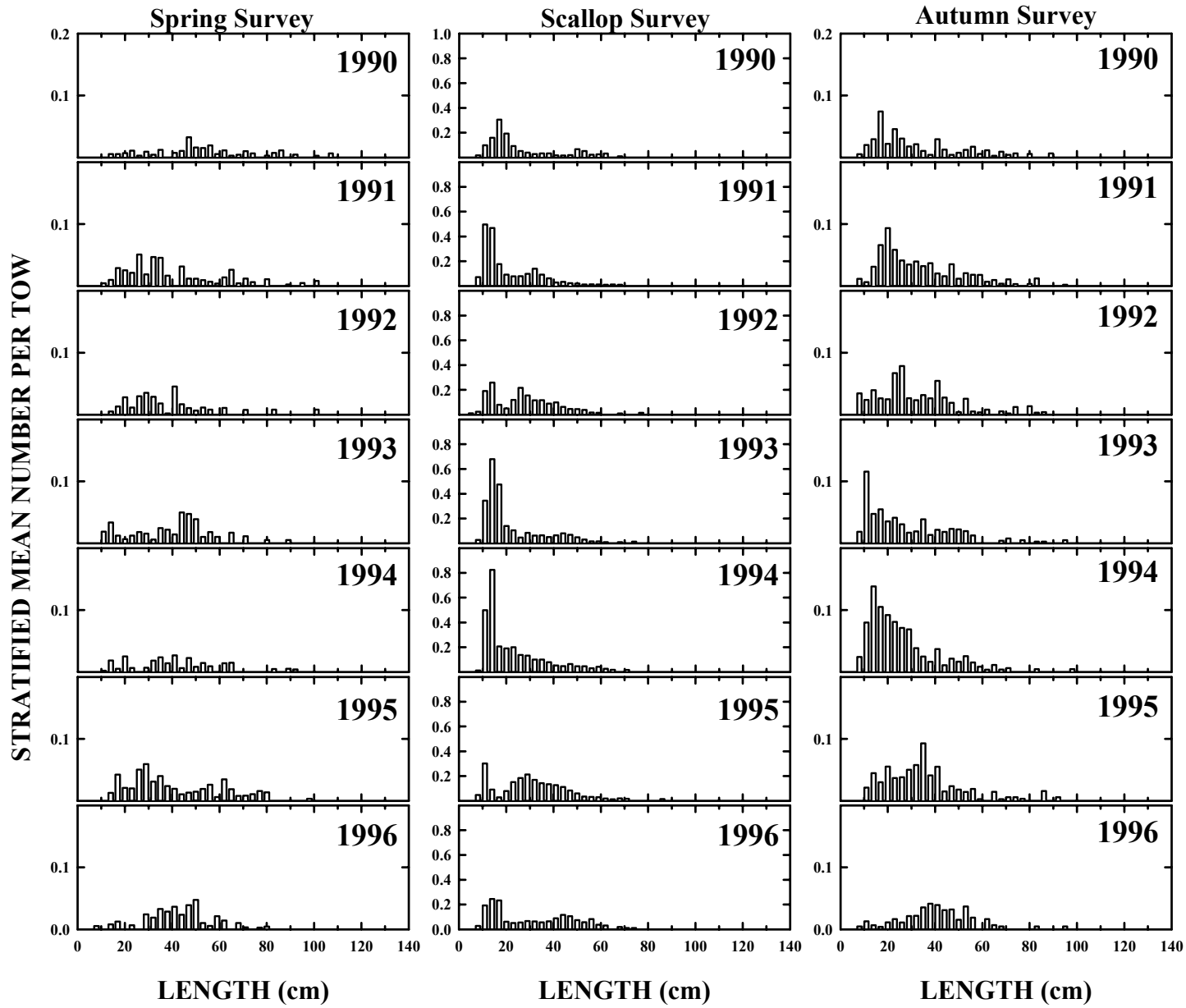
Figure C38d, continued.
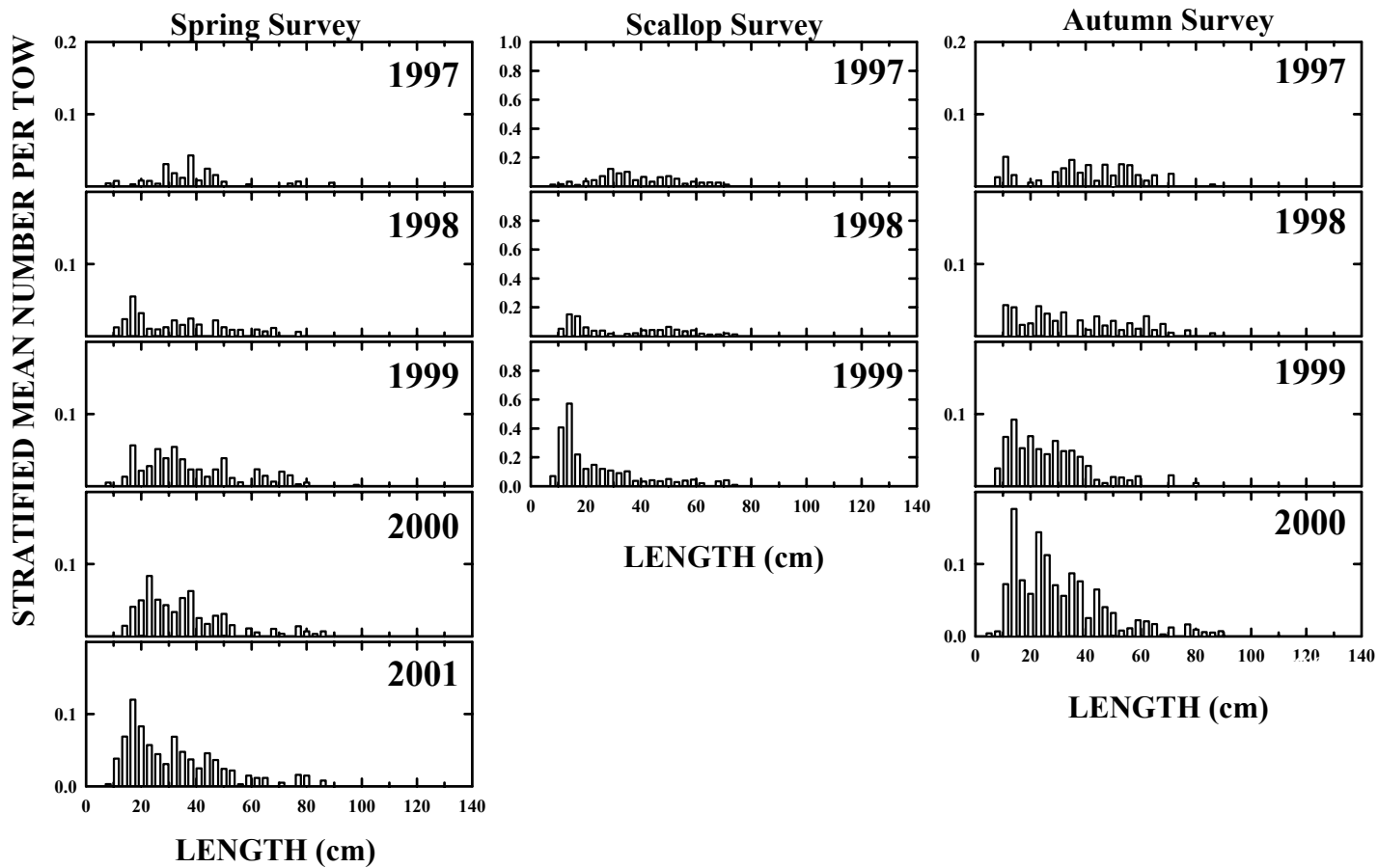
Figure C38e, continued.
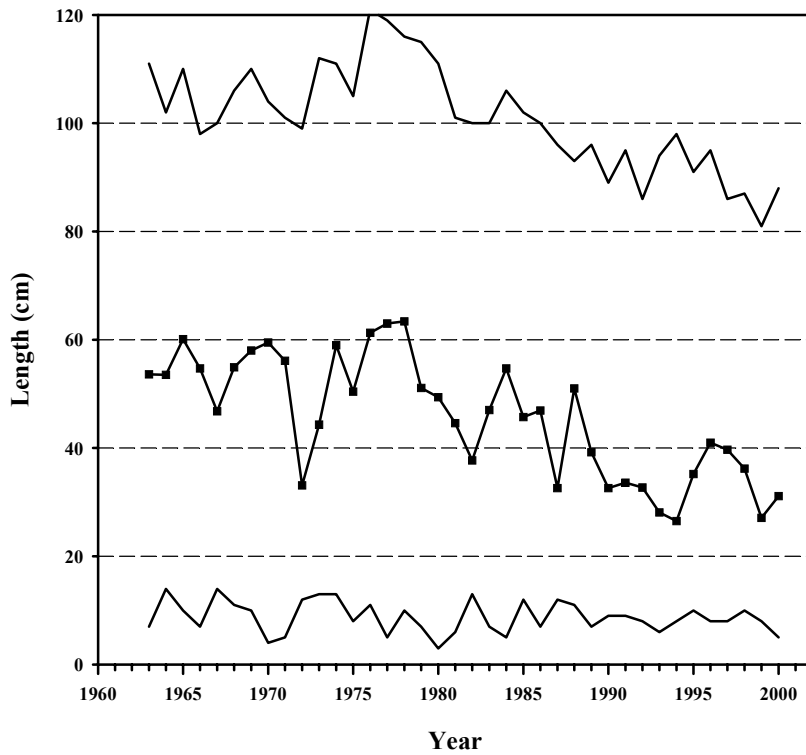
Figure C39. Minimum, mean, and, maximum lengths for managment regions combined from the NEFSC autumn surveys.
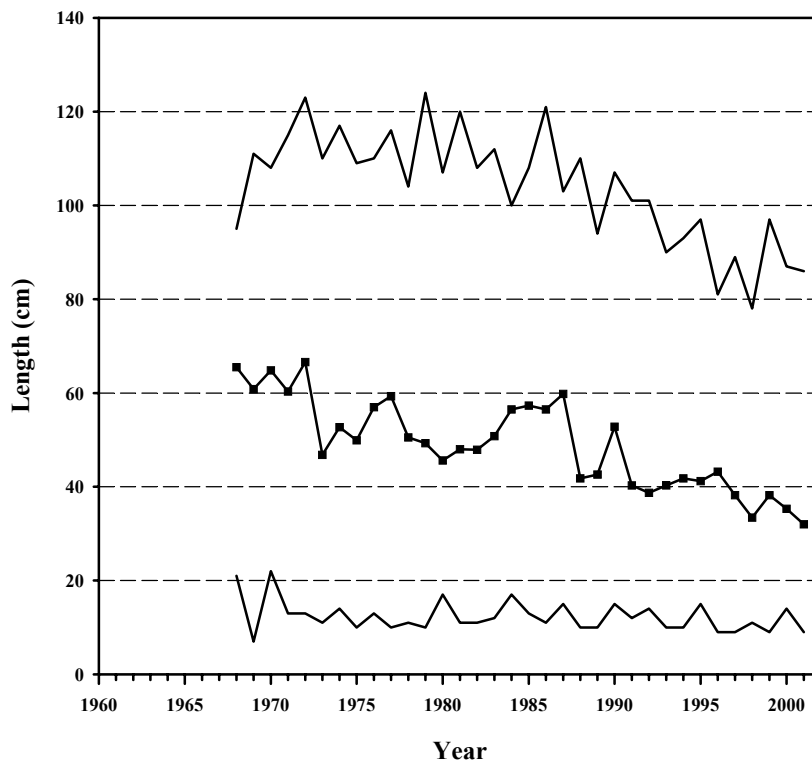
Figure C40. Minimum, mean, and, maximum lengths for managment regions combined from the NEFSC spring surveys.
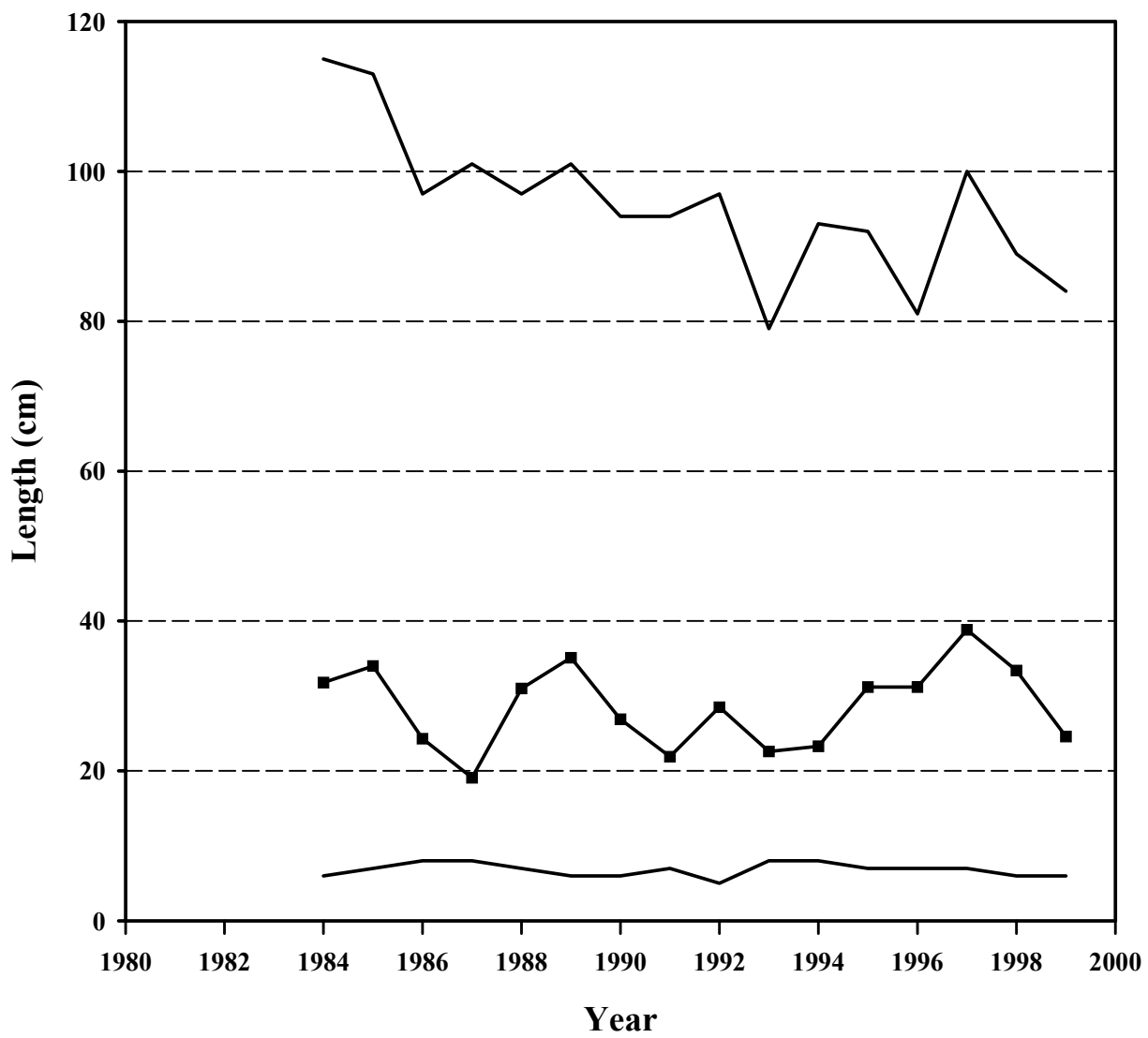
Figure C41. Minimum, mean, and, maximum lengths for management regions
combined from the NEFSC scallop surveys.
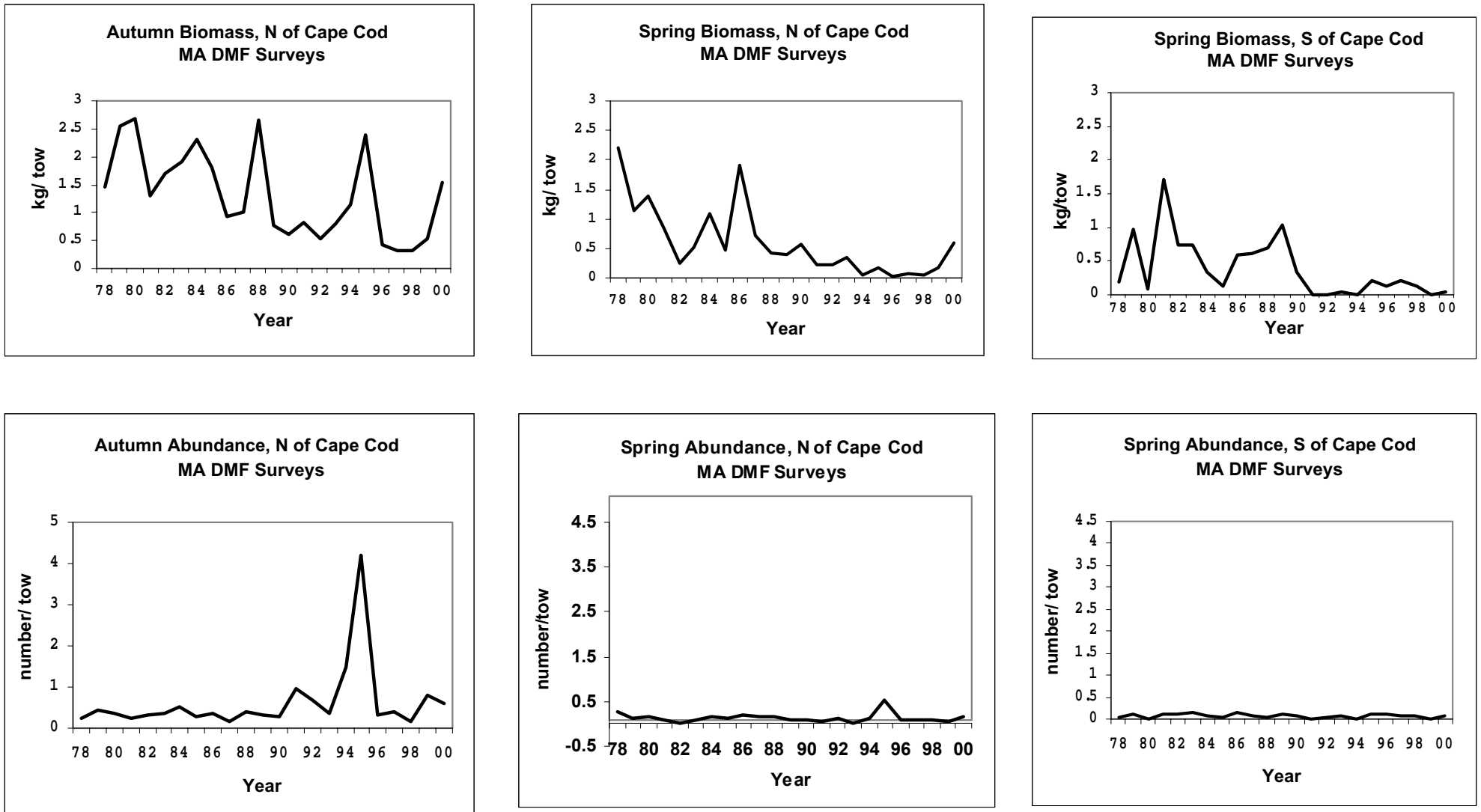
Figure C42. Biomass and abundance indices for goosefish from Massachusetts state bottom trawl surveys.
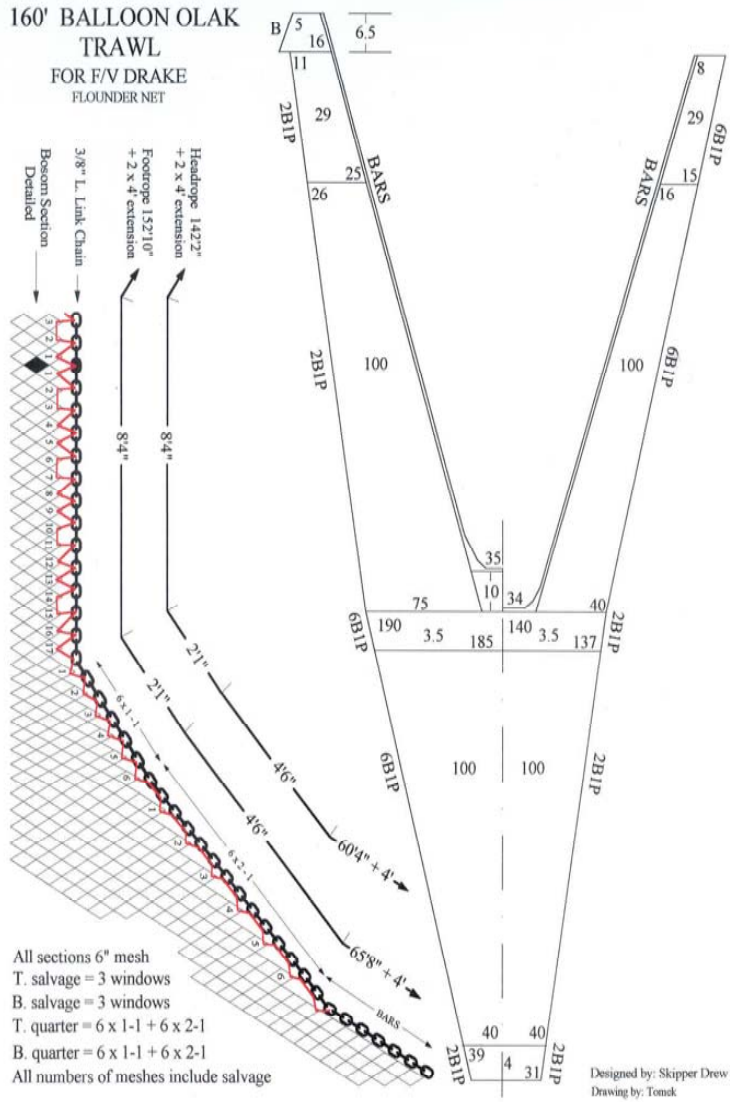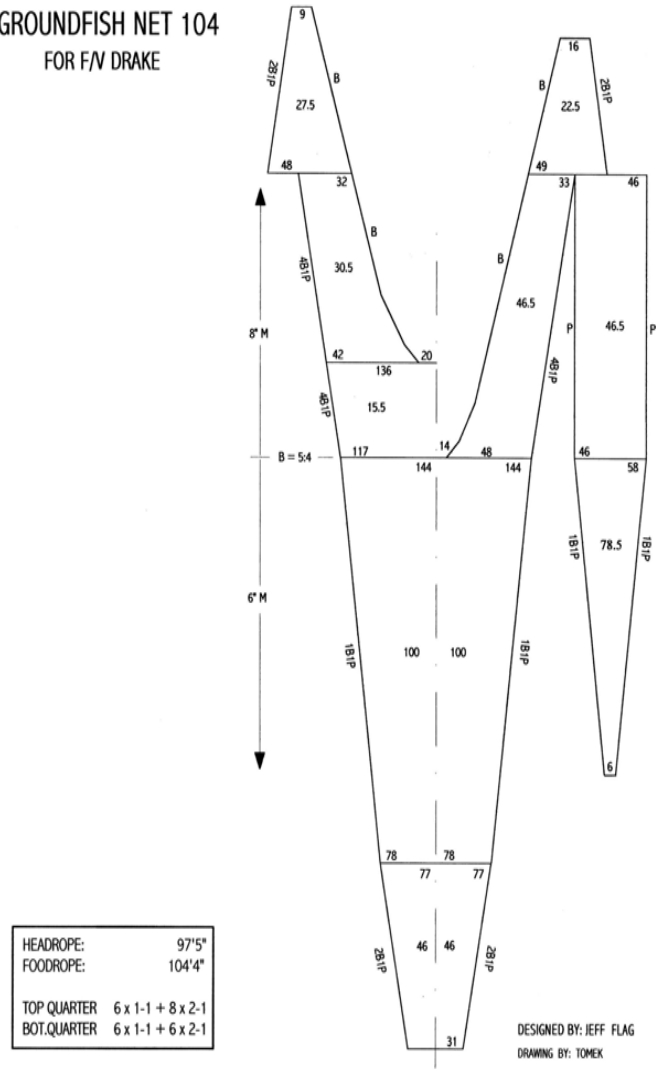
Figure C43. Diagram of nets used on the F/V Drake. (A.) Net number 1; (B.) Net number 2.
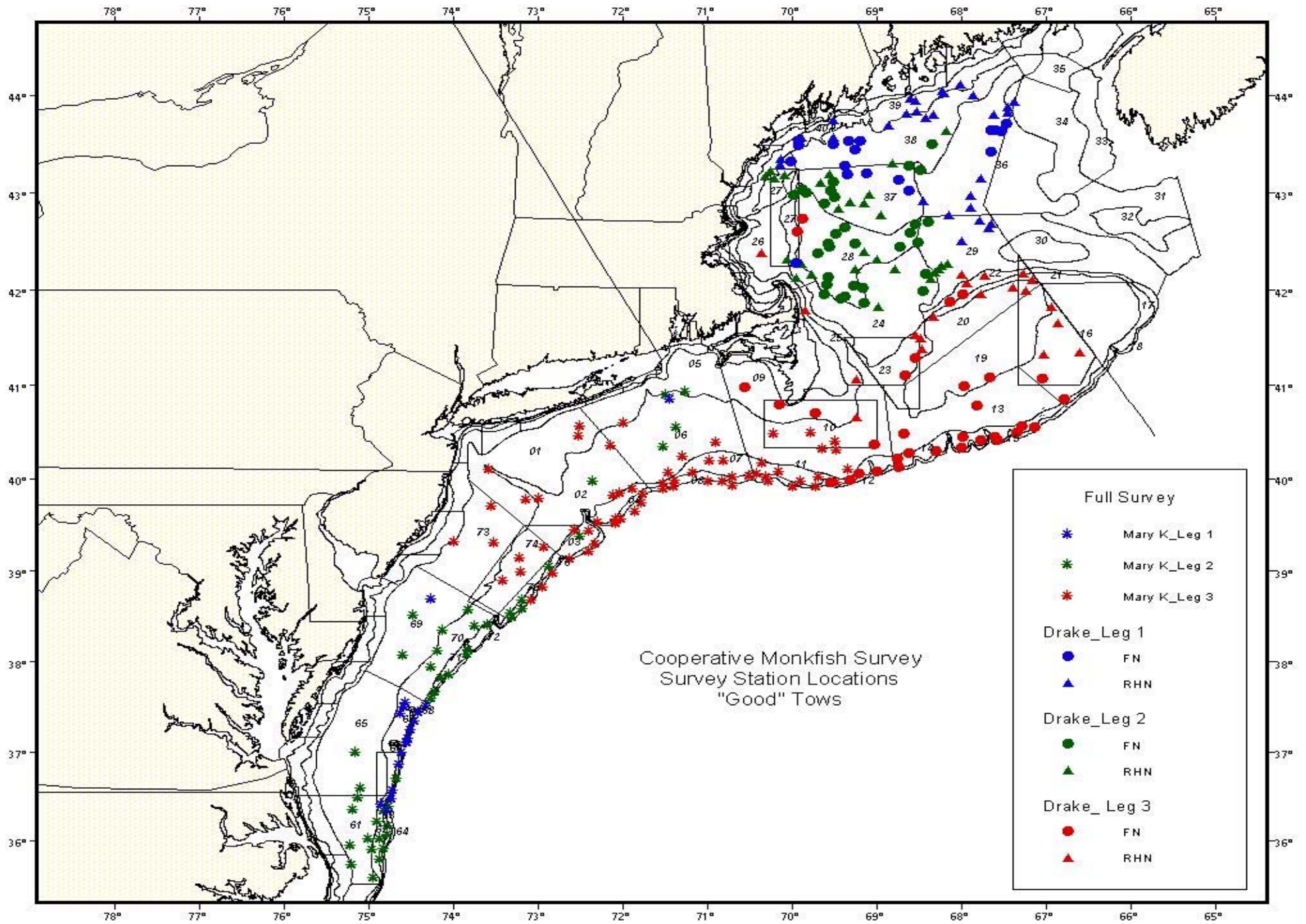
Figure C44. Survey stations successfully sampled during cooperative monkfish survey. Experimental tows not shown.
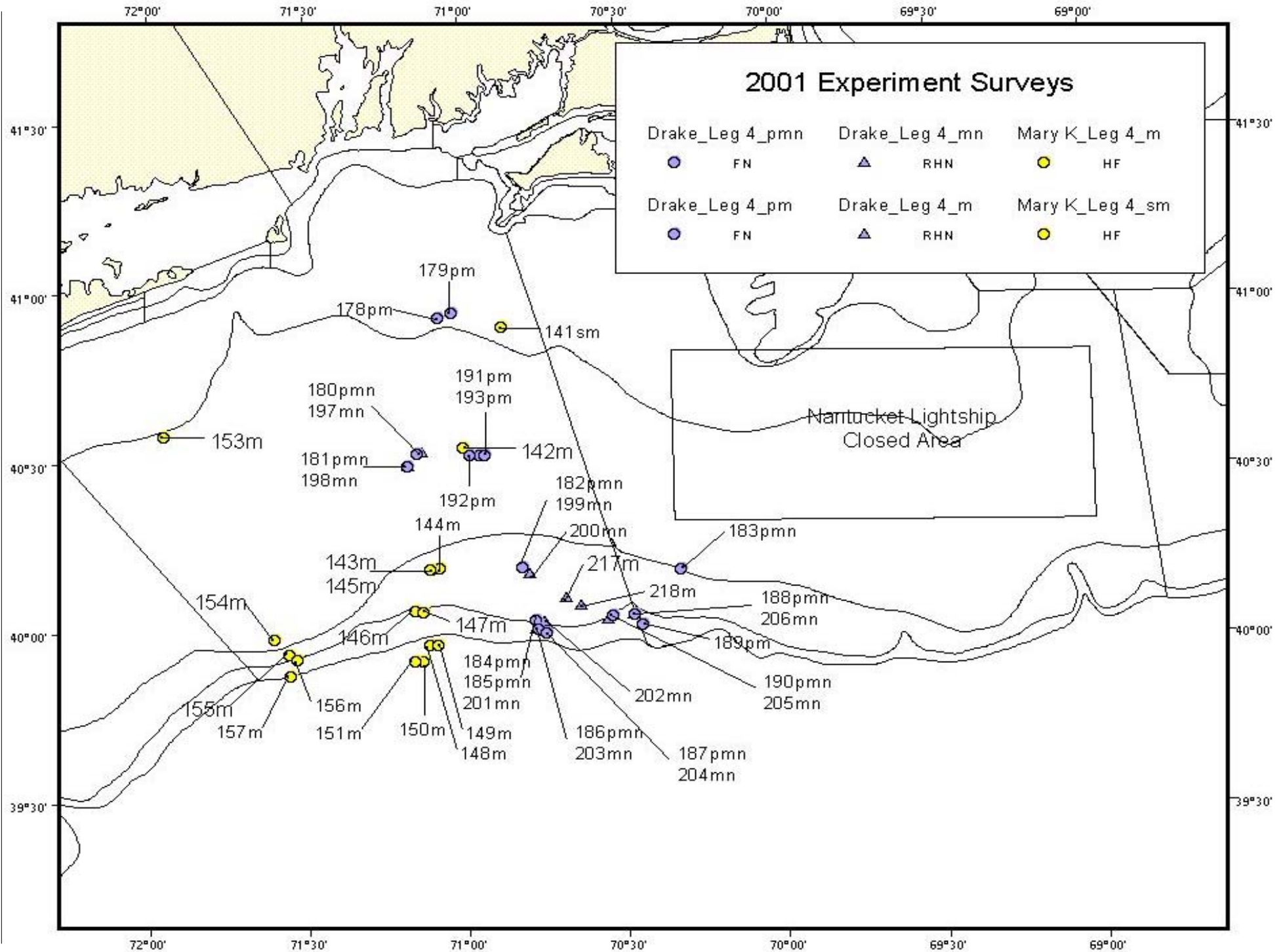
Figure C45. Locations of experimental tows conducted for net mensuration studies on F/V Drake and F/V Mary K.

Figure C46. Locations of experimental tows conducted to compare nets on F/V Drake.
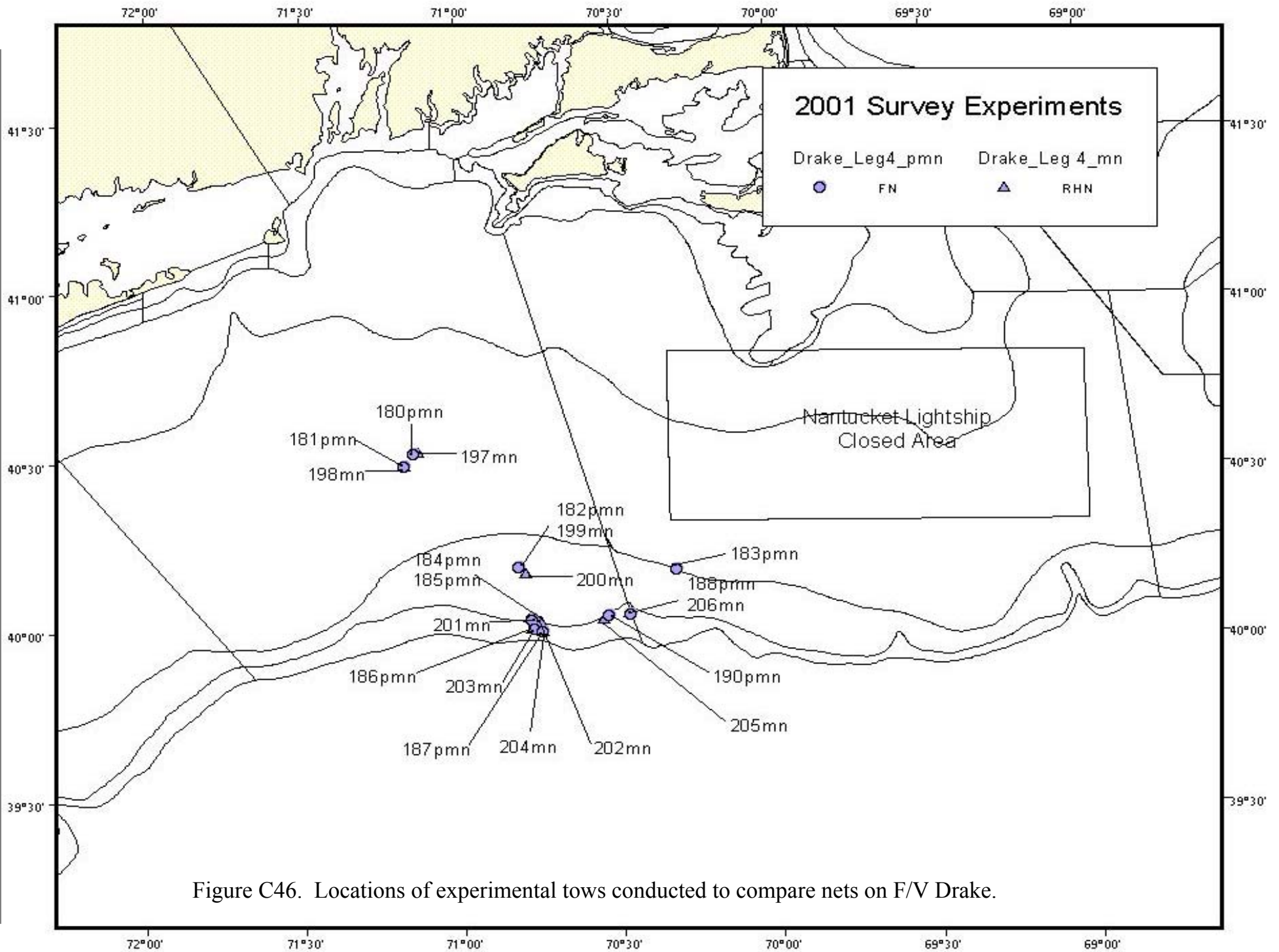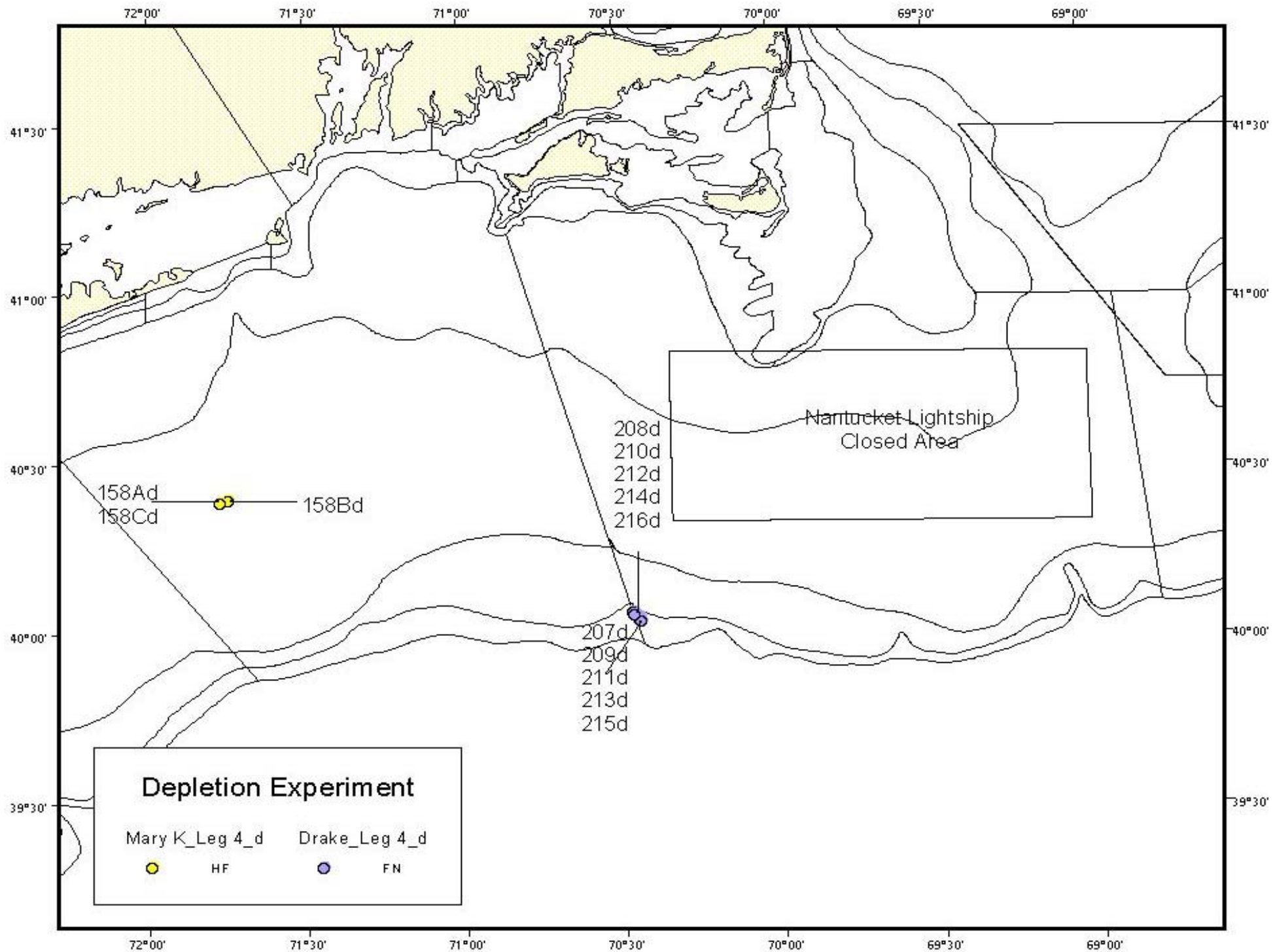
Figure C47. Location of depletion experiment tows conducted on F/V Drake and F/V Mary K.
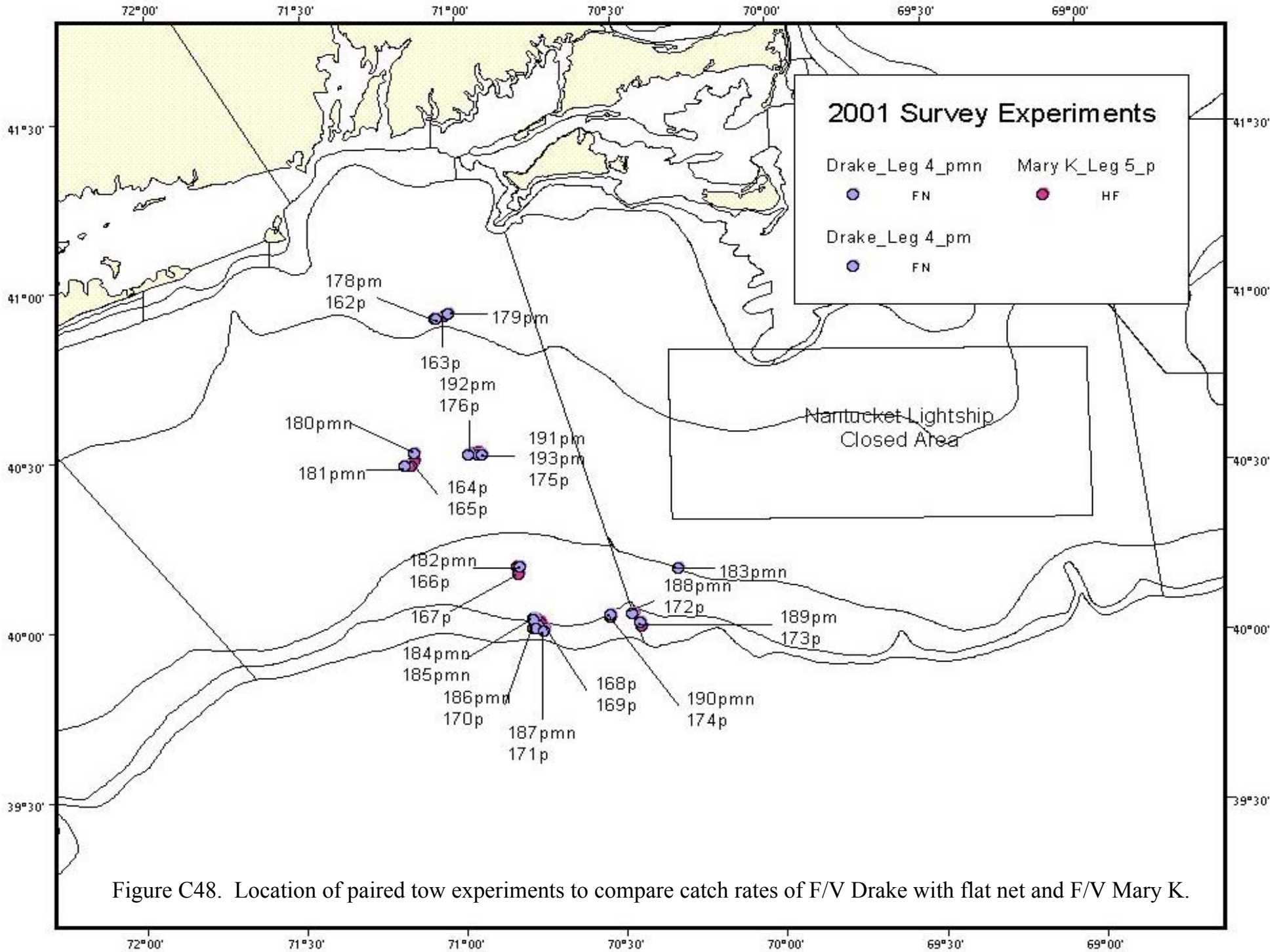
Figure C48. Location of paired tow experiments to compare catch rates of F/V Drake with flat net and F/V Mary K.
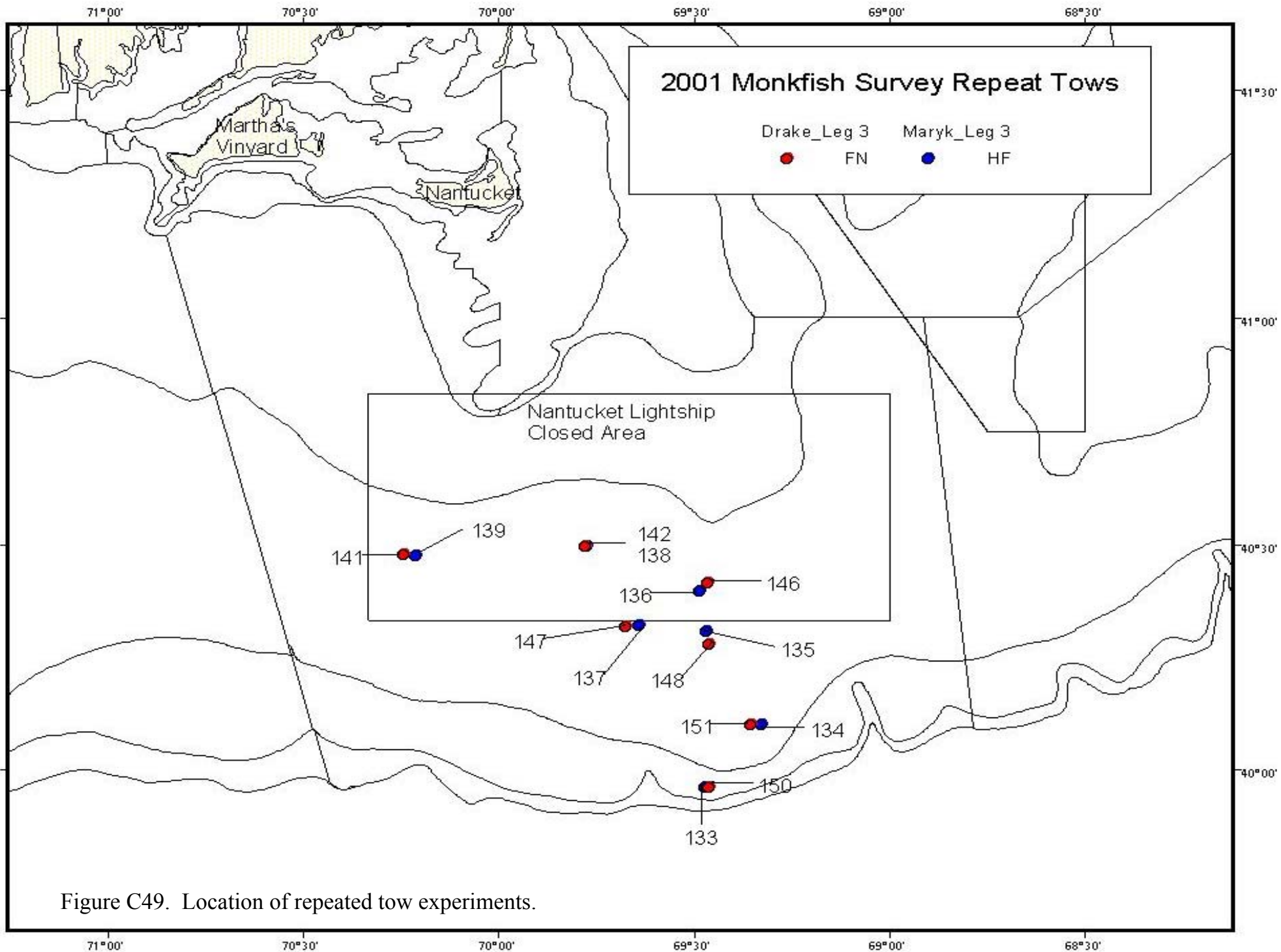
Figure C49. Location of repeated tow experiments.
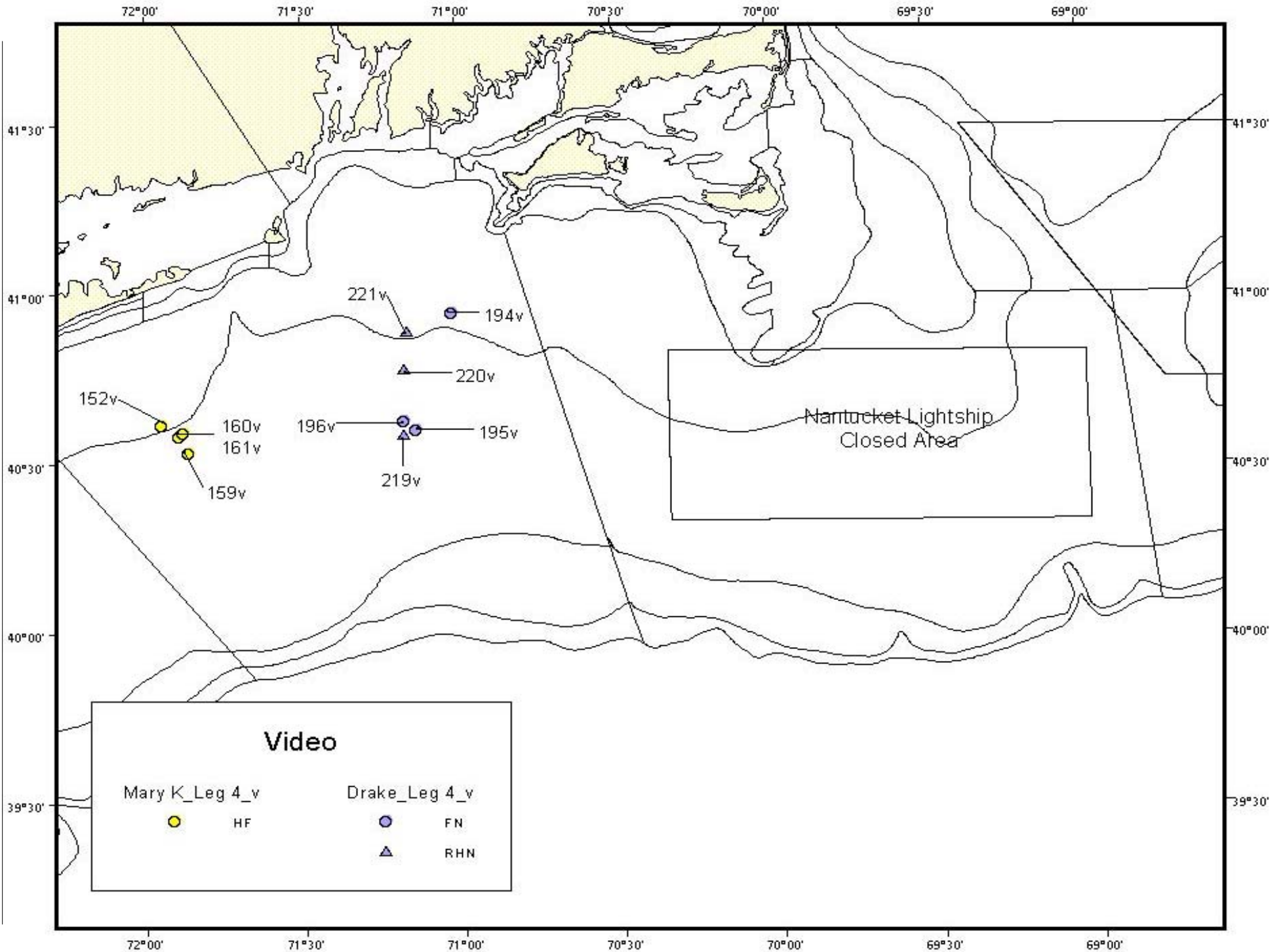
Figure C50. Location of tows made using video camera attached to net.
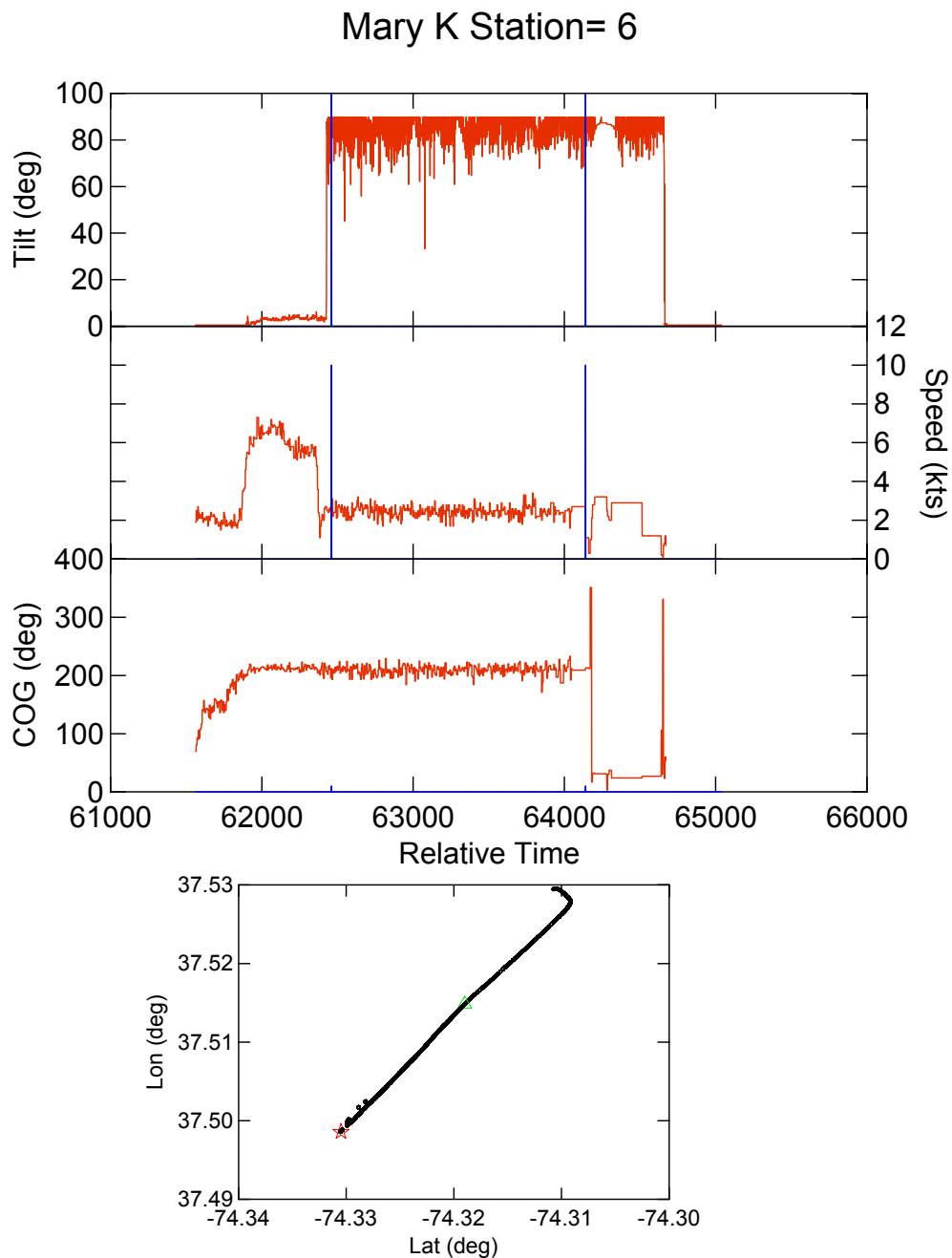
Figure C51. Example of sensor traces from a tow on the Mary K. From the top panel: inclinometer tilt angle, vessel speed, course over ground, and plot of ship's track. Triangle marks ship's position at start of tow, star marks position at end of tow.
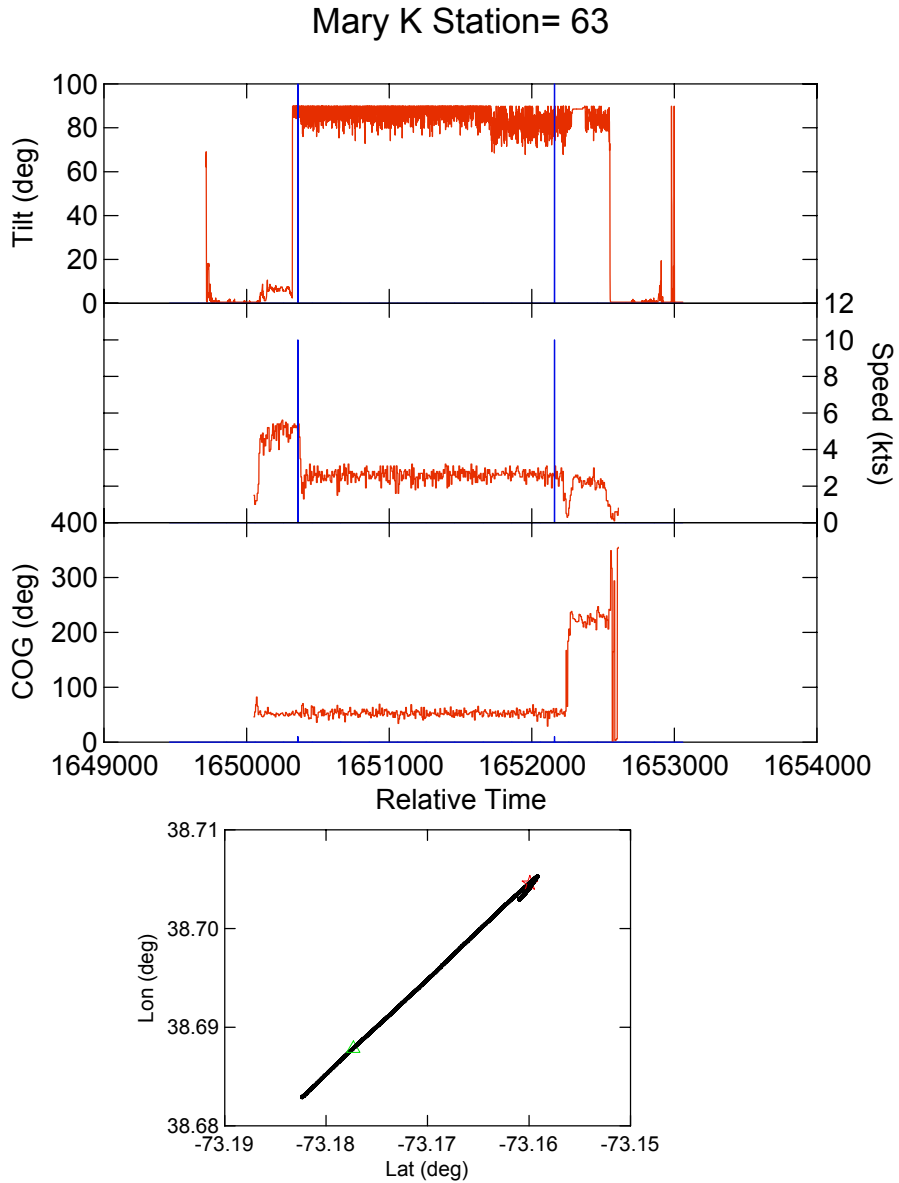
Figure C52. Example of sensor traces from a tow on the Mary K. From the top panel: inclinometer tilt angle, vessel speed, course over ground, and plot of ship's track. Triangle marks ship's position at start of tow, star marks position at end of tow.

Figure C53. Example of sensor traces from a tow using net 1 on the Drake. From the top panel: inclinometer tilt angle, vessel speed, course over ground, and plot of ship's track. Triangle marks ship's position at start of tow, star marks position at end of tow.

Drake Station= 87
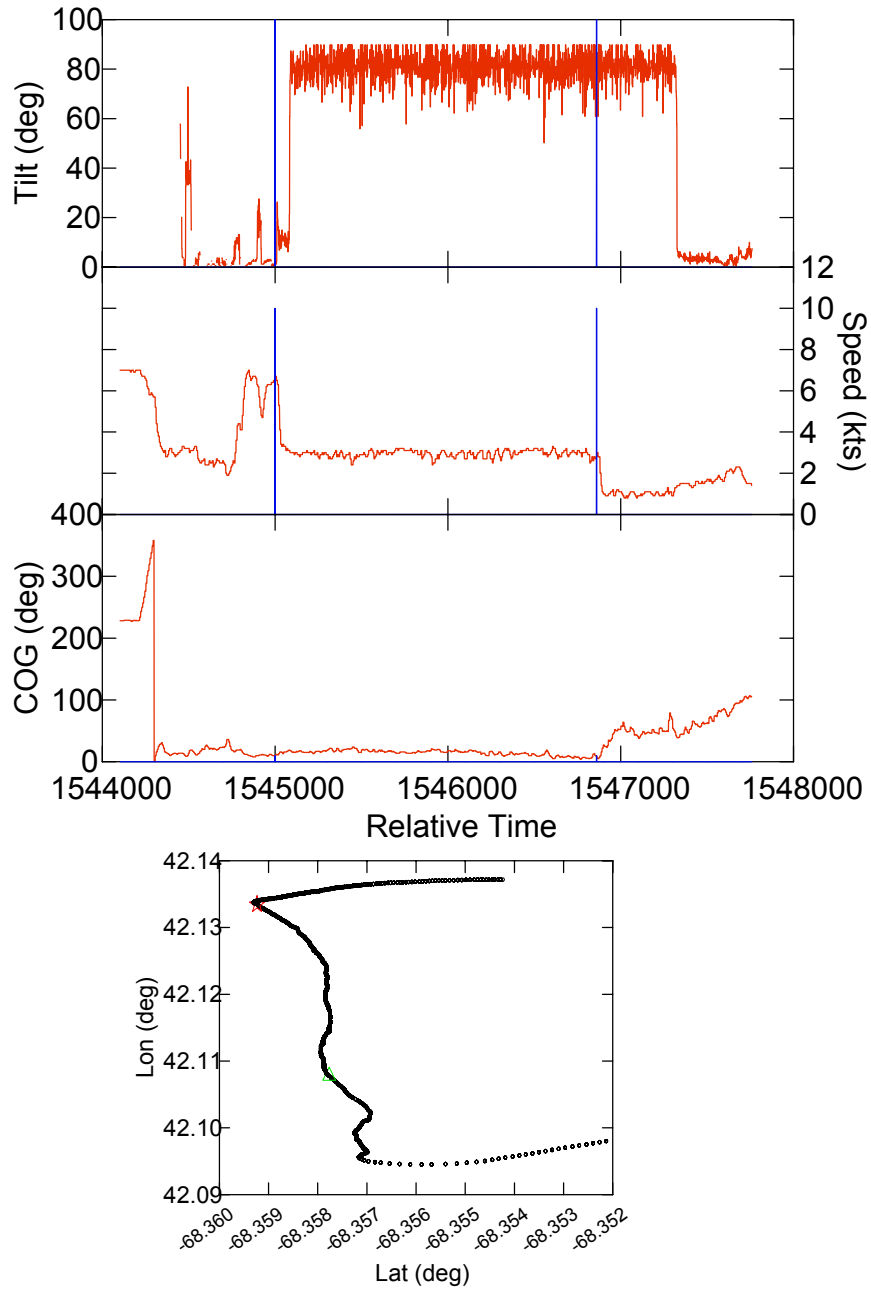
Figure C54. Example of sensor traces from a tow using net 2 on the Drake.
From the top panel: inclinometer tilt angle, vessel speed, course
over ground, and plot of ships track Triangle marks ship's
position at start of tow, star marks position at end of tow.
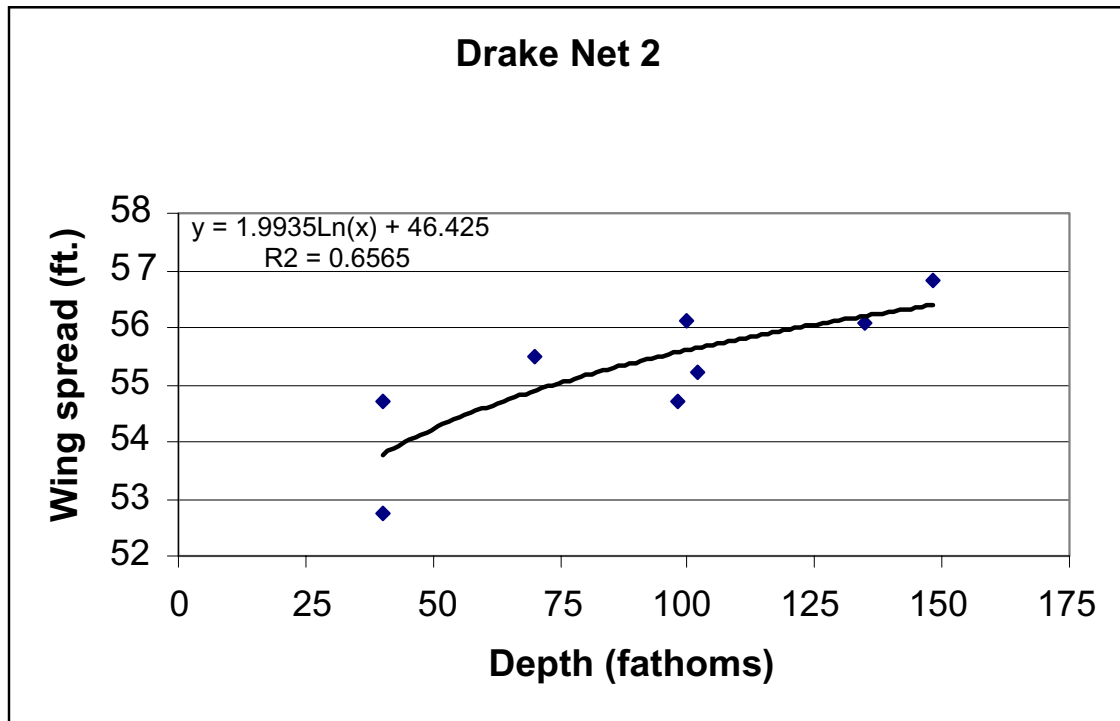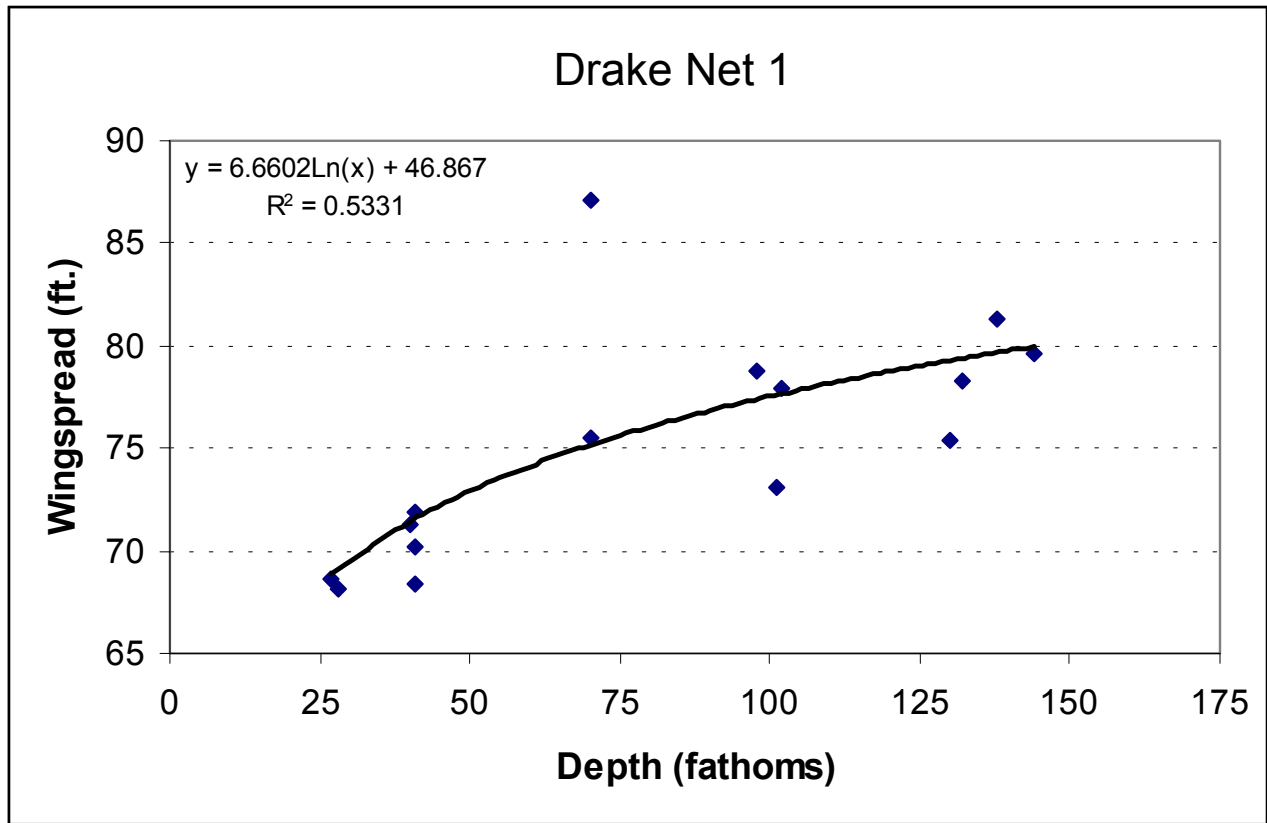
Figure C55. Wingspread vs. depth for Drake nets
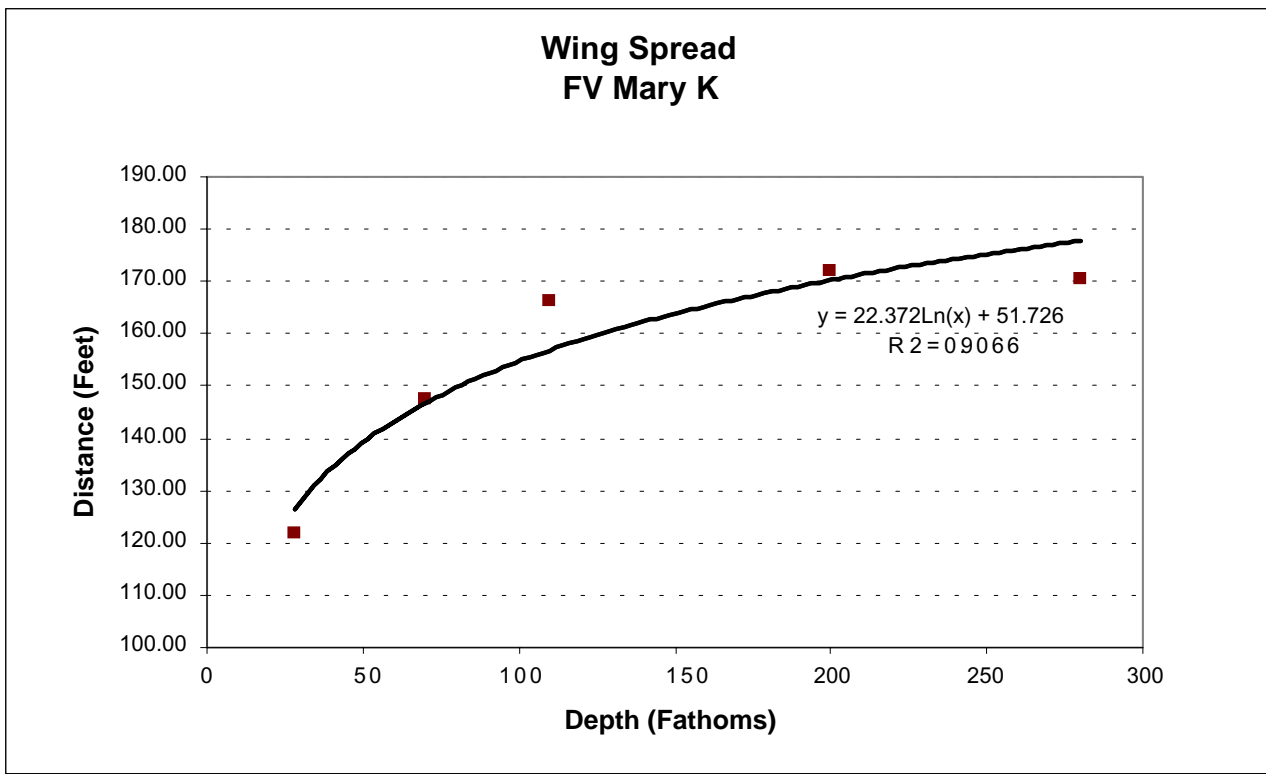
Figure C56. Wingspread-depth relationship for net used on the Mary K.
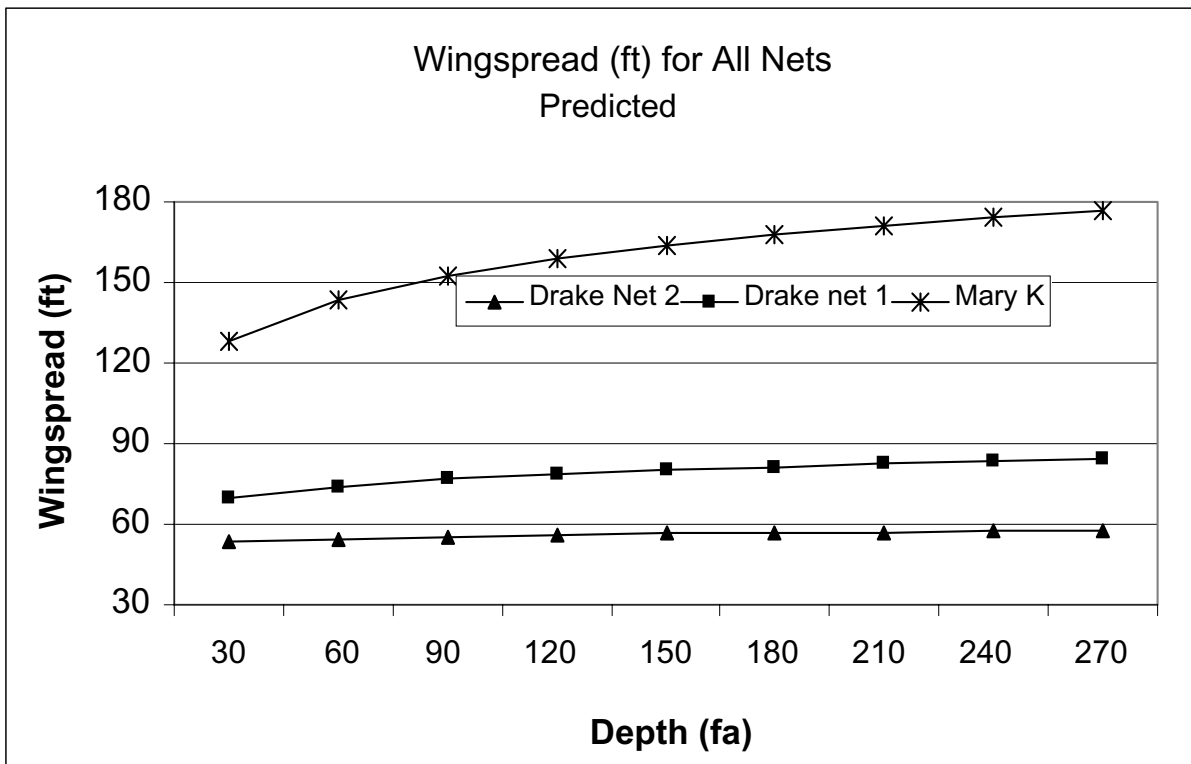
Figure C57. Wingspread-depth relationships for all 3 nets used in the
cooperative monkfish survey.
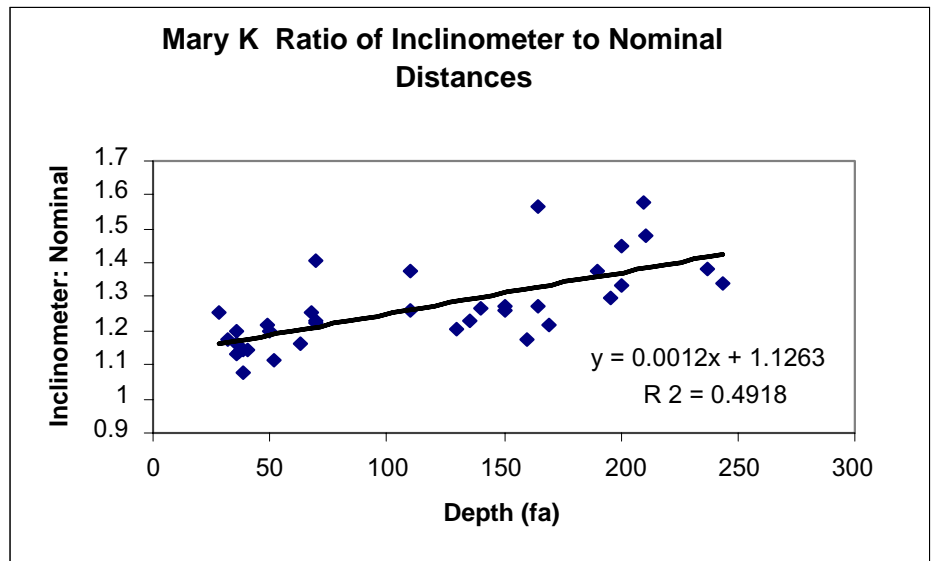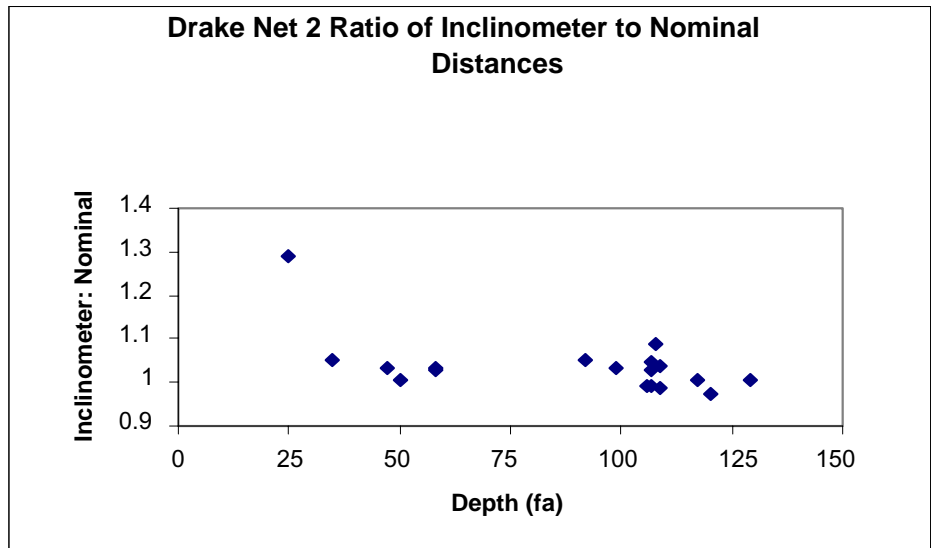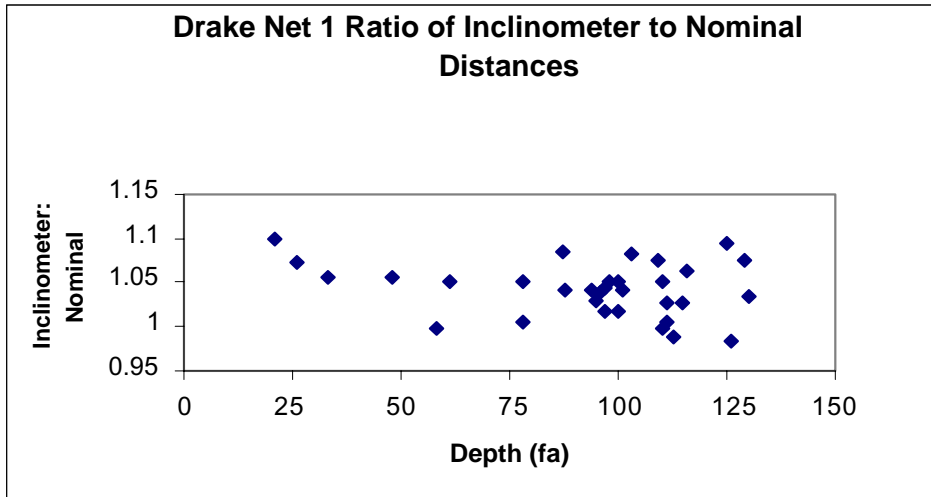
Figure C58. Ratio of inclinometer : nominal tow distances vs. depth for Drake and Mary K nets.
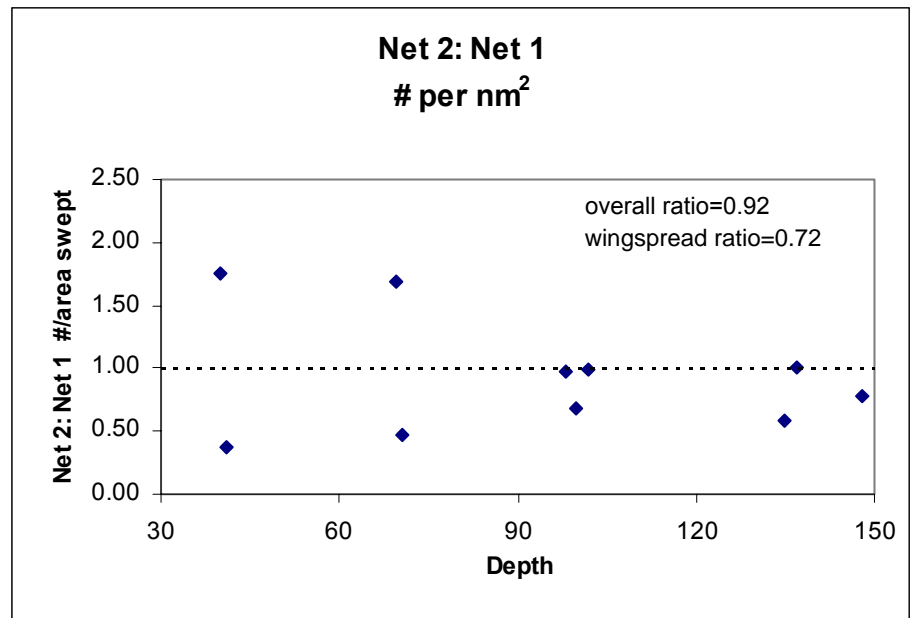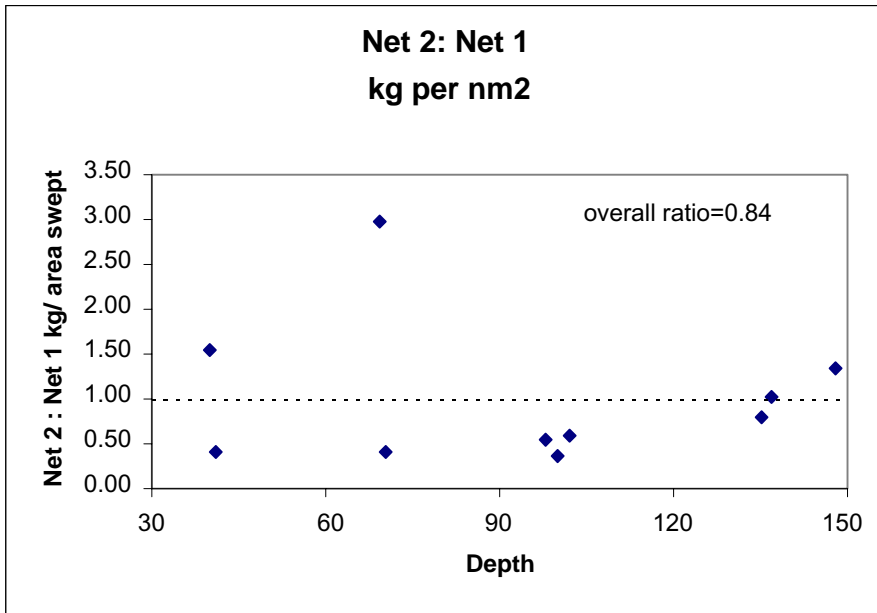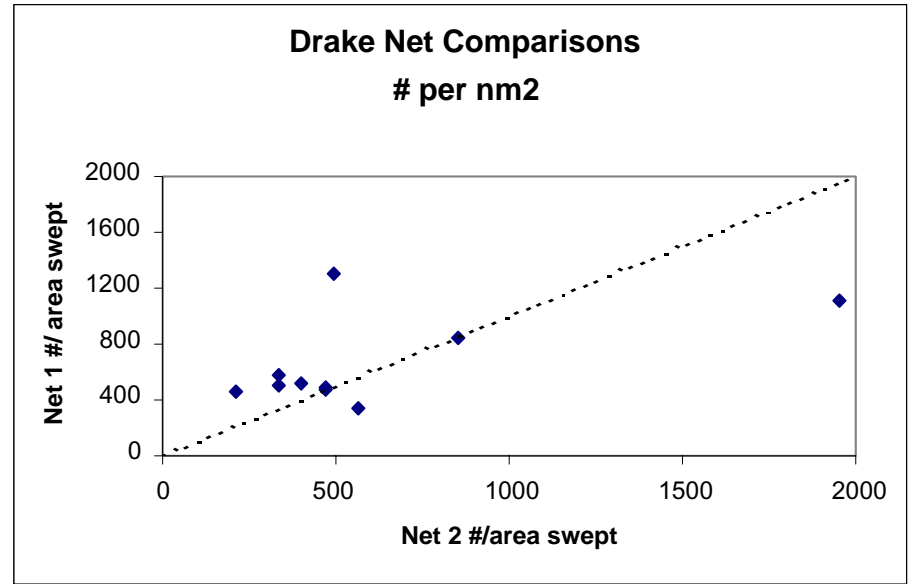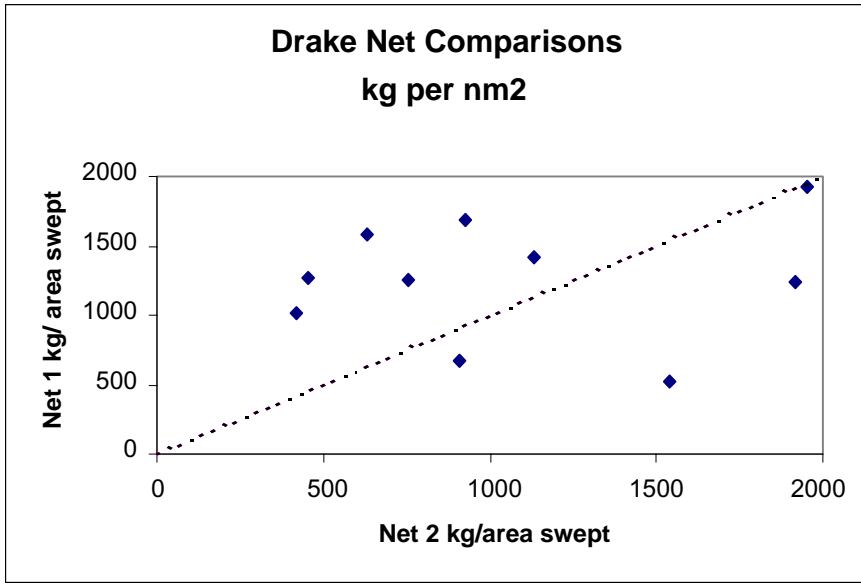
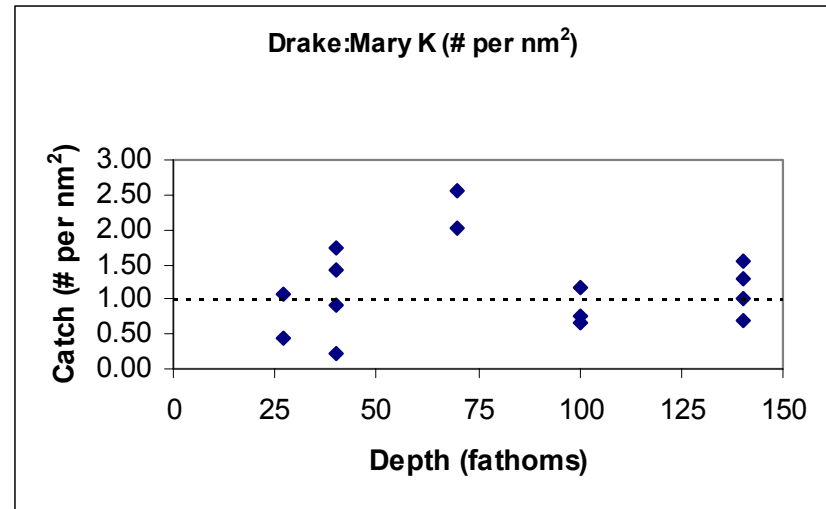Figure C59. Results of calibration tows for Drake nets (10 tows each net).
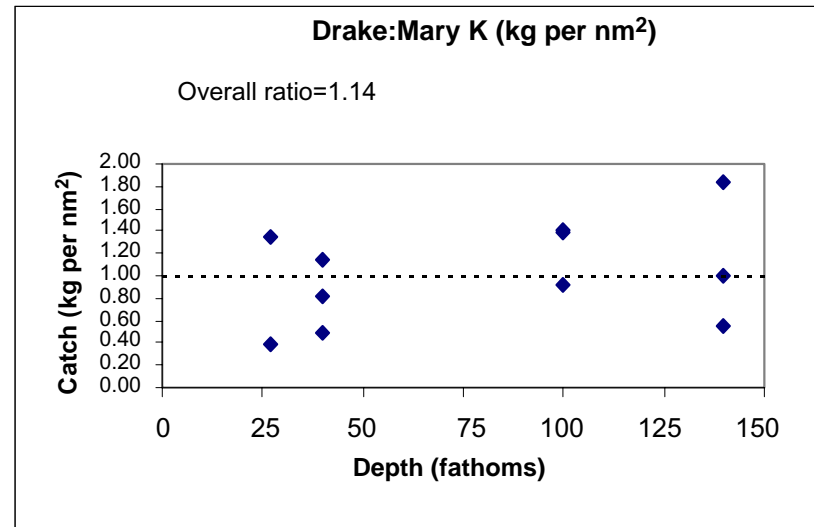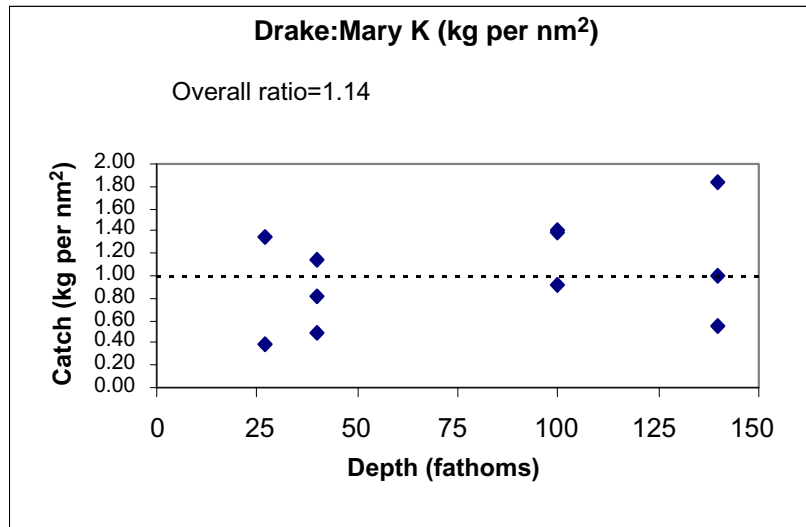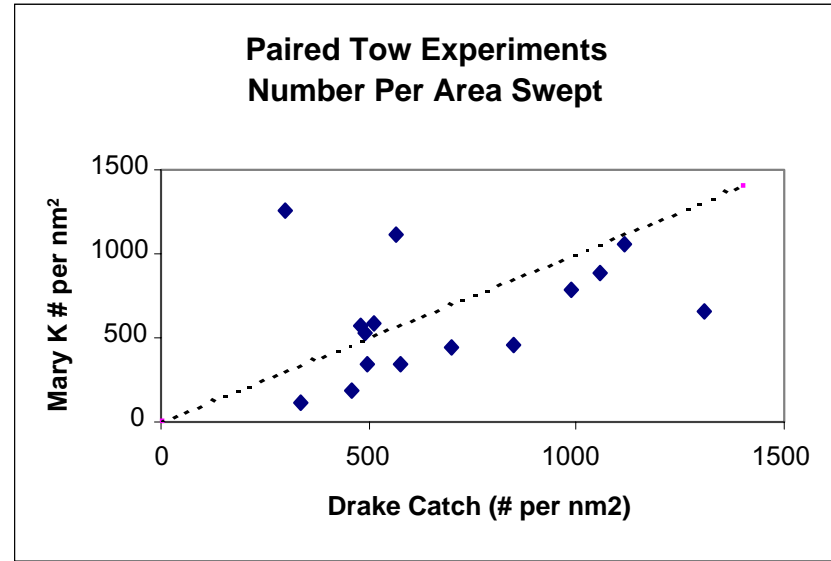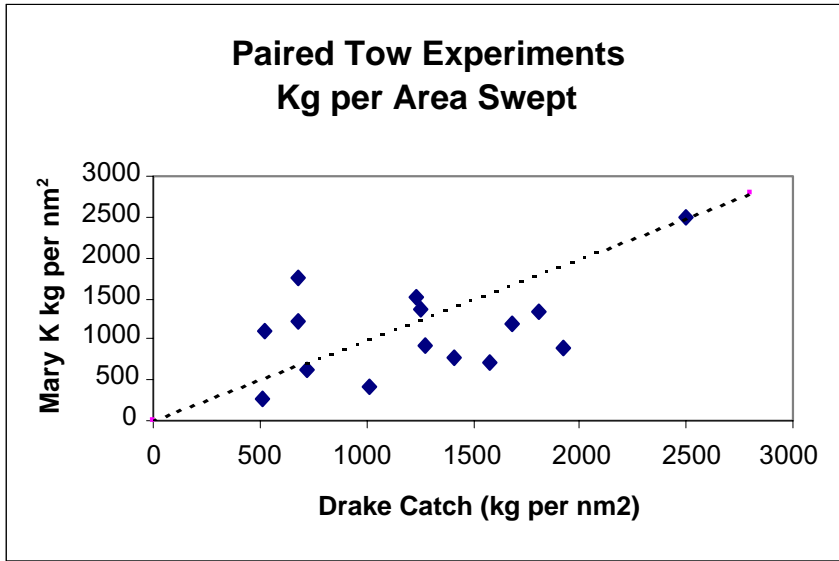
Figure C60. Comparison of catches in paired tows conducted by the Drake (net 1) and Mary K. Inclinometer distances assumed for Mary K and Drake tows.
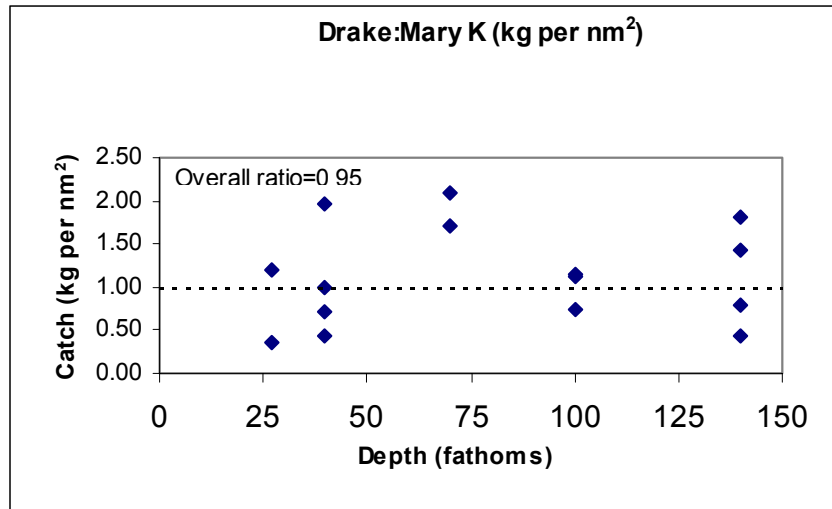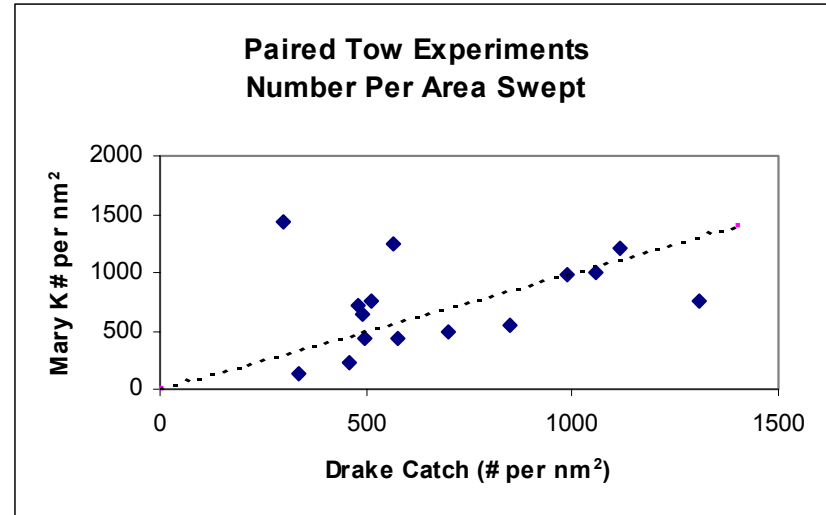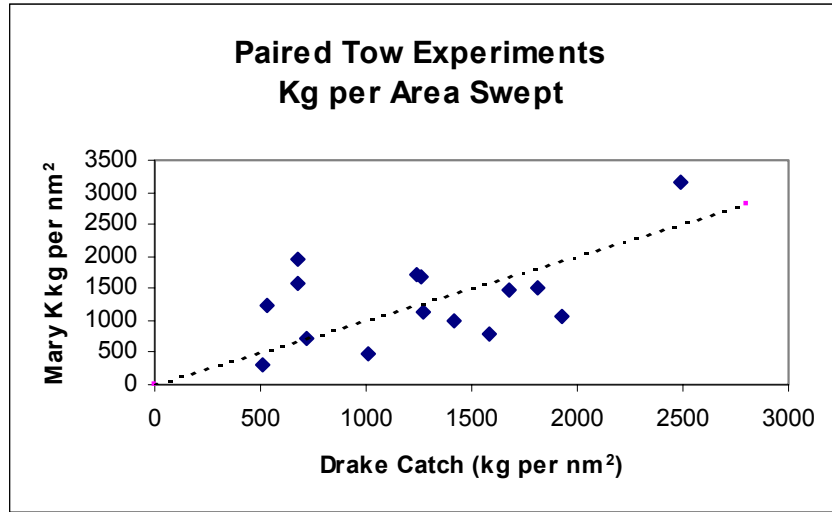
Figure C61. Comparison of catches in paired tows conducted by the Drake (net 1) and Mary K. Nominal
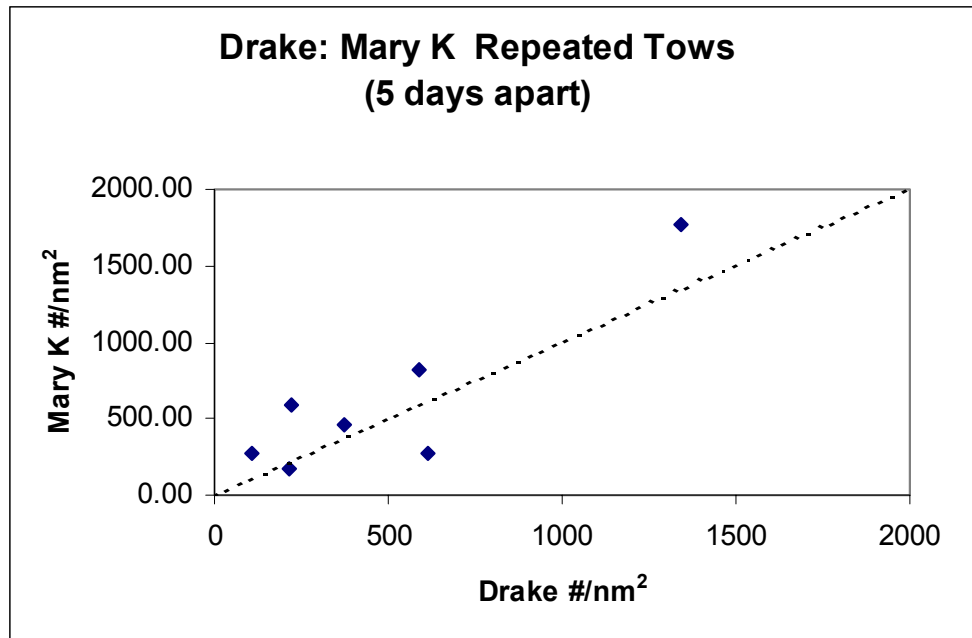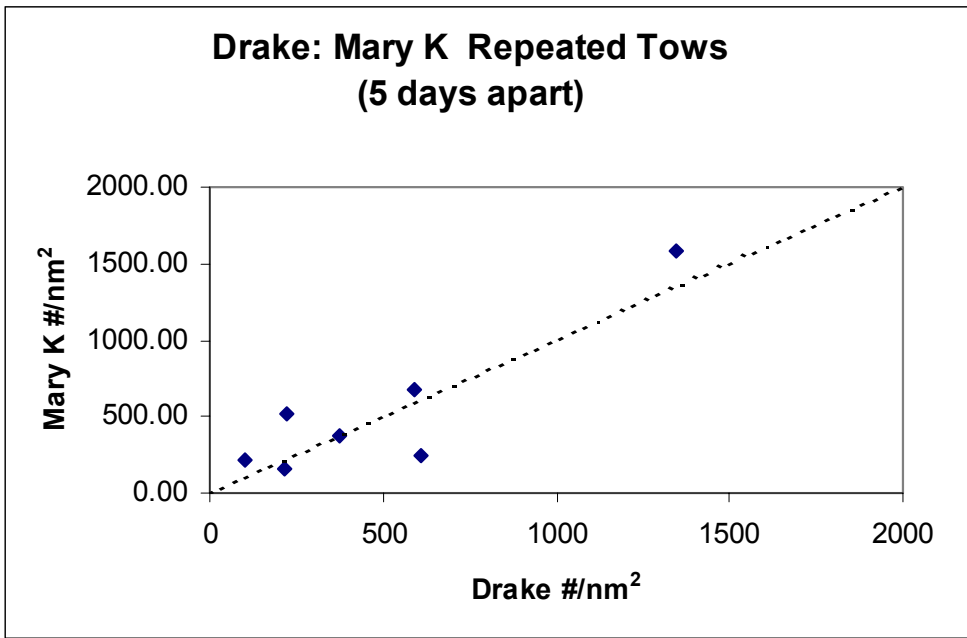distances assumed for Mary K tows.

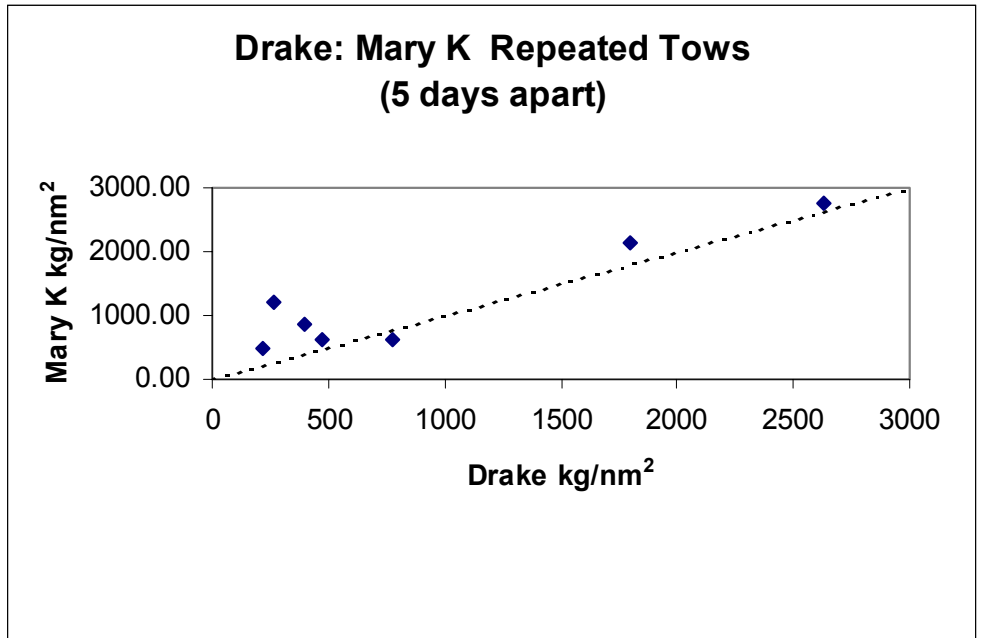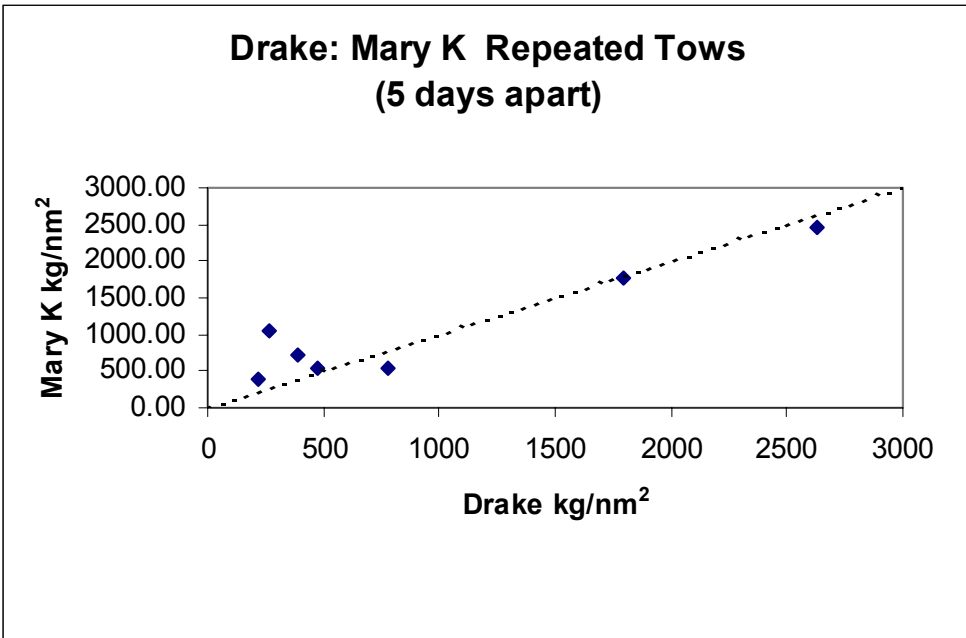Figure C62. Results of repeated tow experiments where Mary K occupied Drake stations after approximately 5 days.
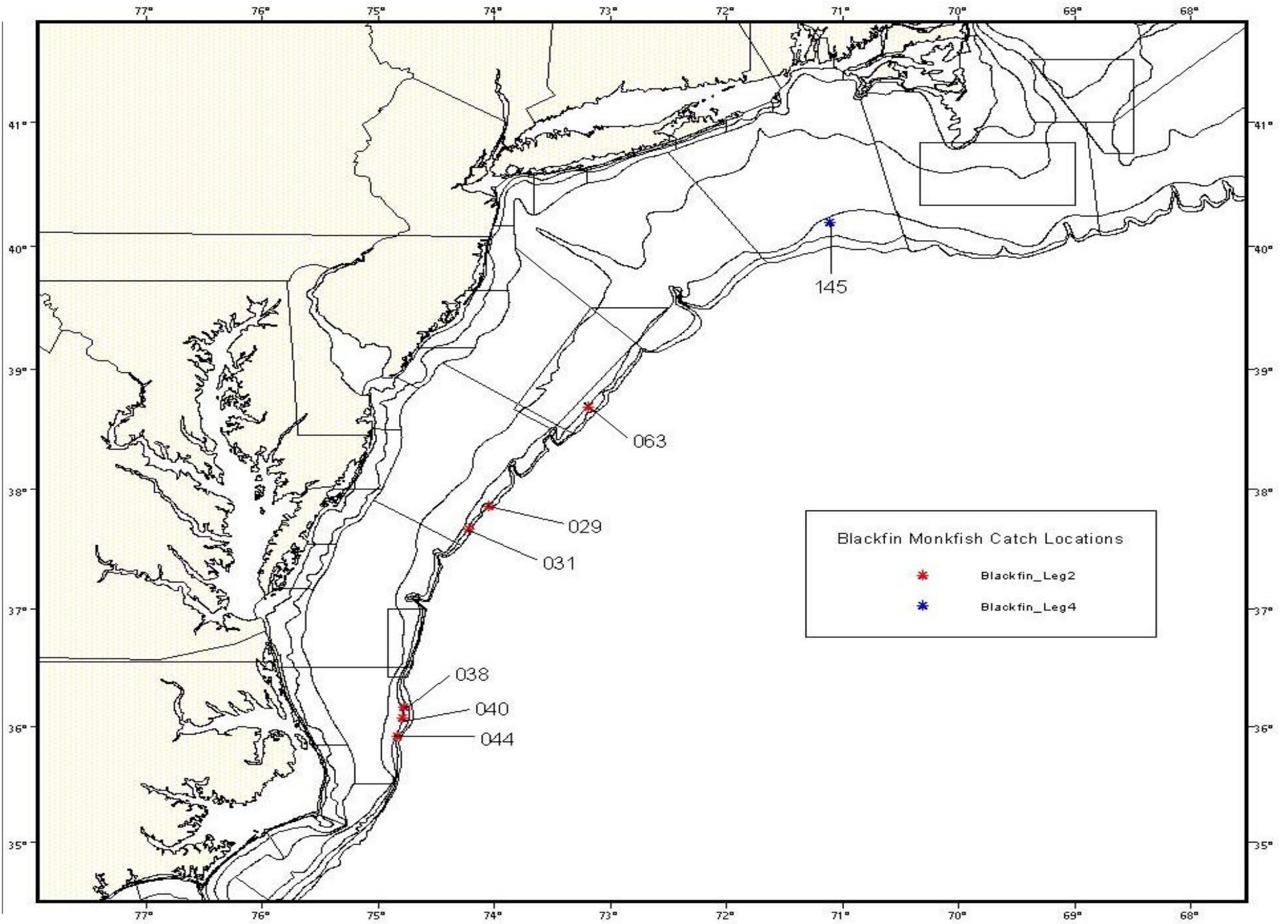
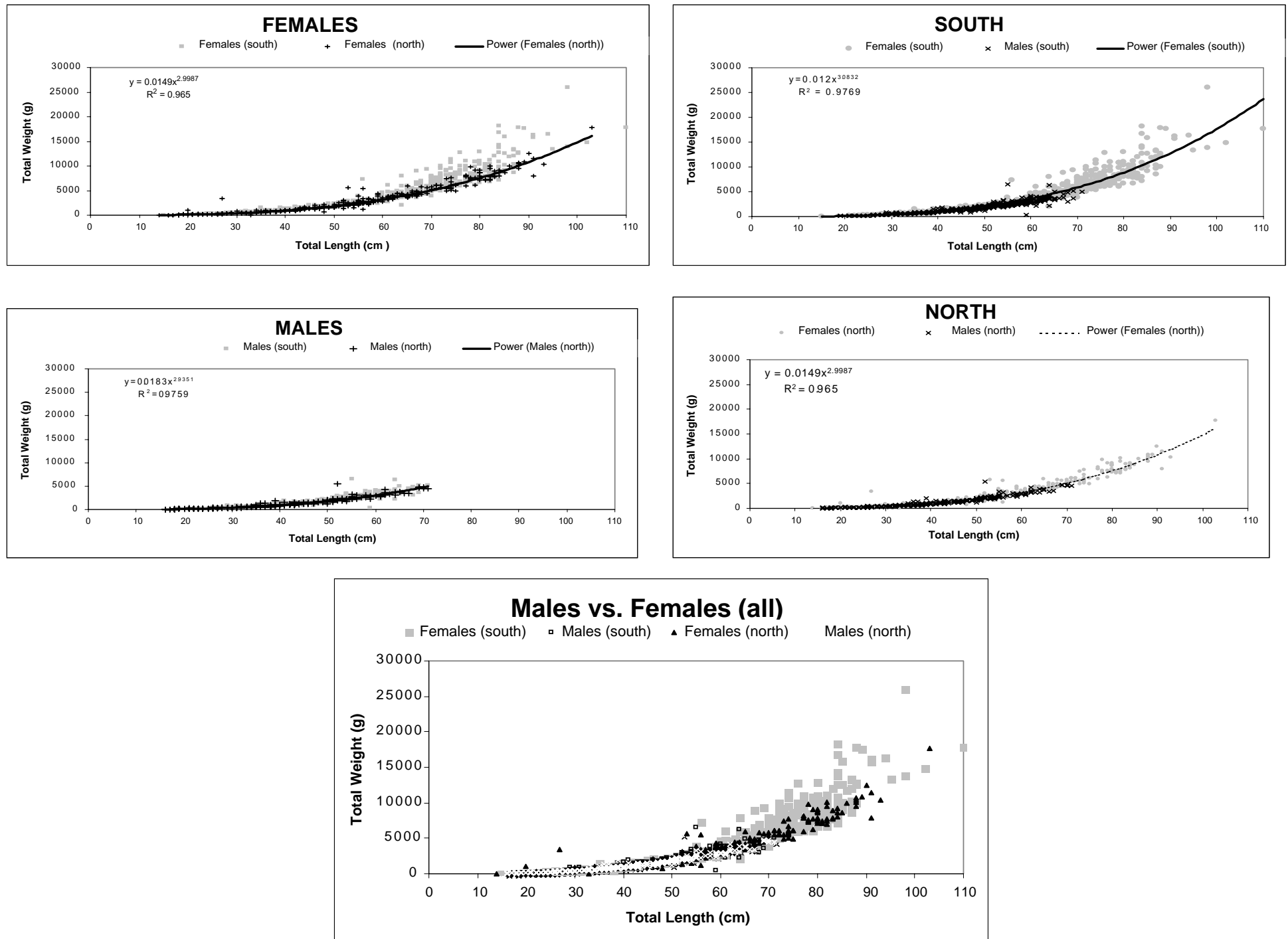Figure C63. Locations of stations where blackfin monkfish were captured.

Figure C64. Length-weight relationships for monkfish captured during cooperative survey.
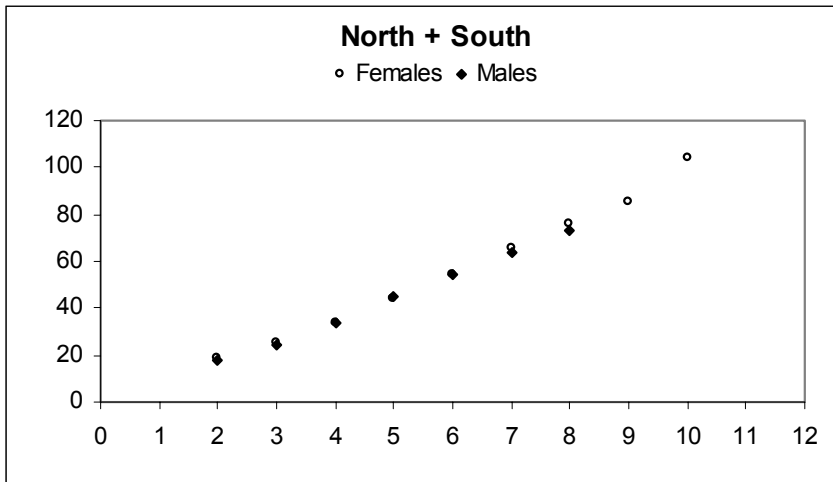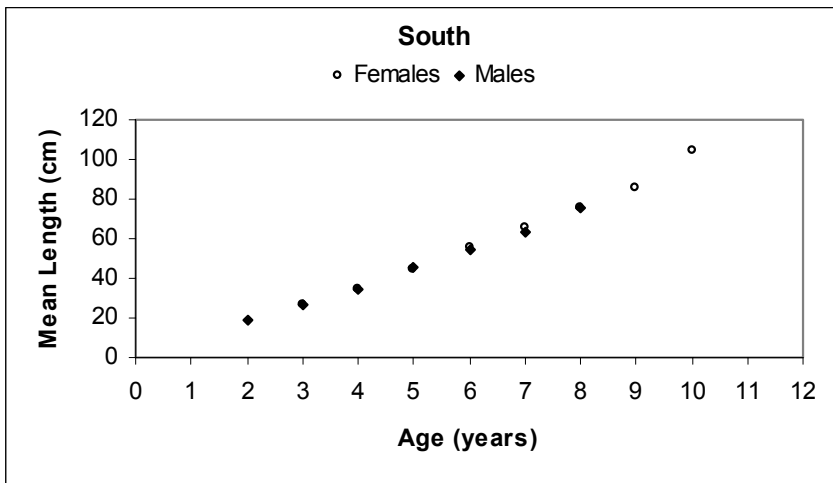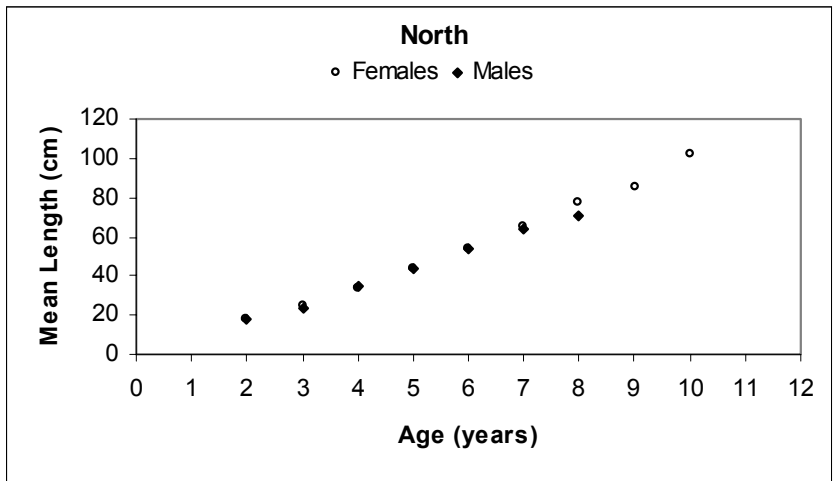
Figure C65. Age-length relationships for males and females by region.
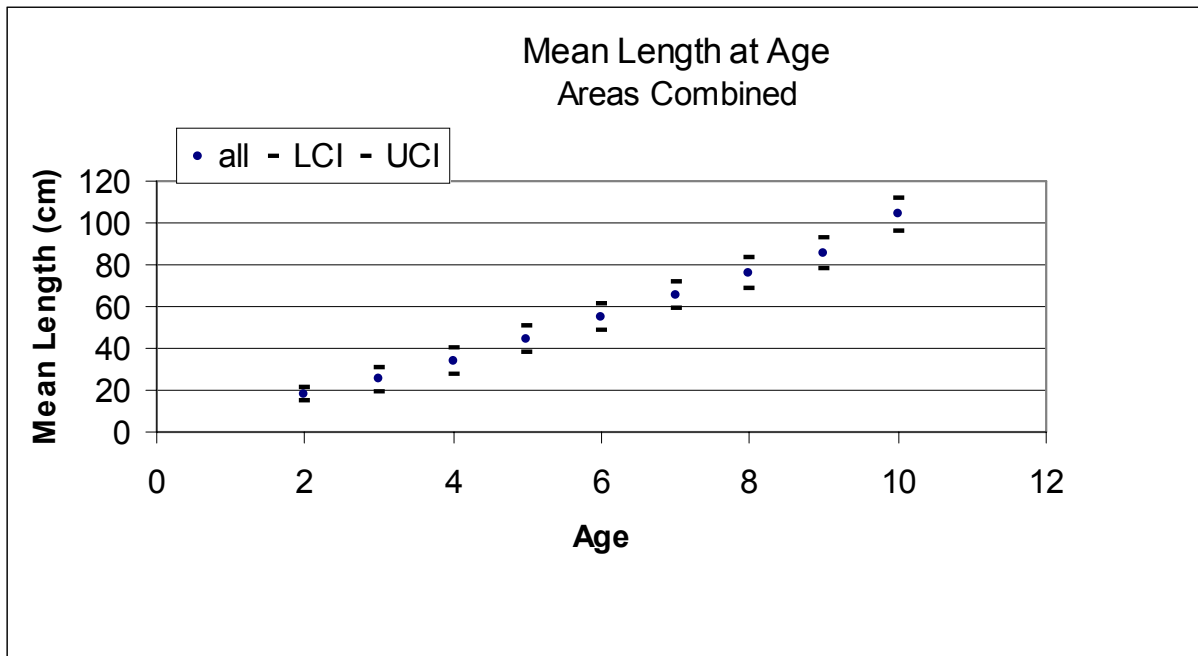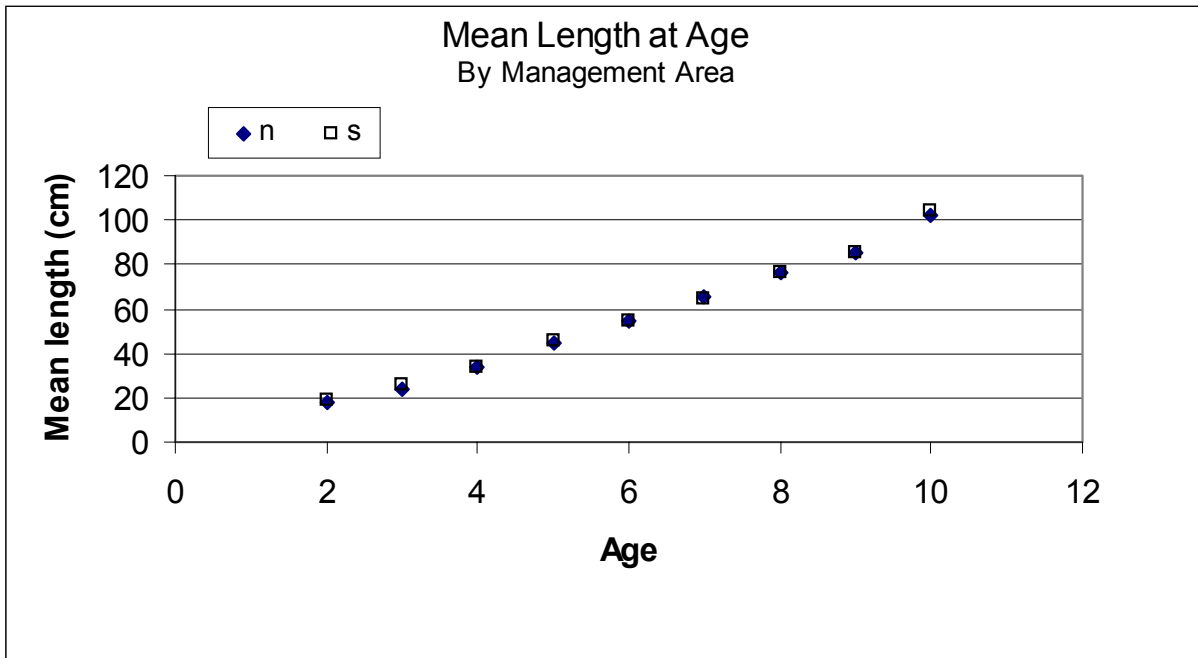
Figure C66. Mean length at age from cooperative survey data.
LCI=lower 95% confidence interval;
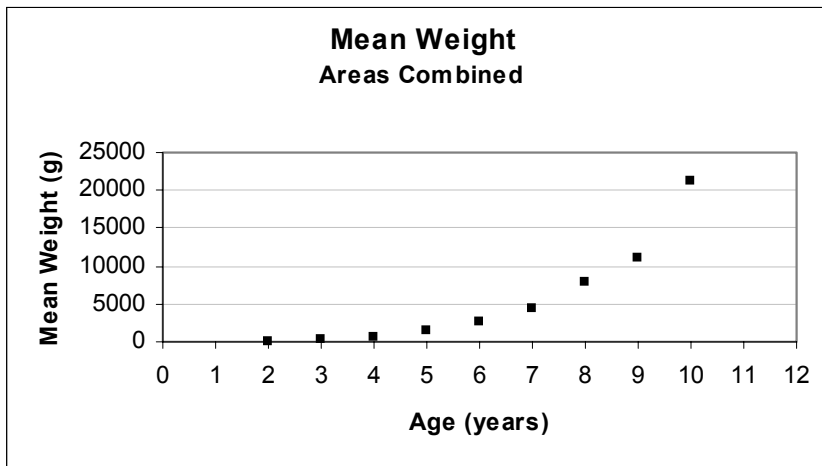UCI= upper 95% confidence interval.

Mean Weight at Age
By Management Area
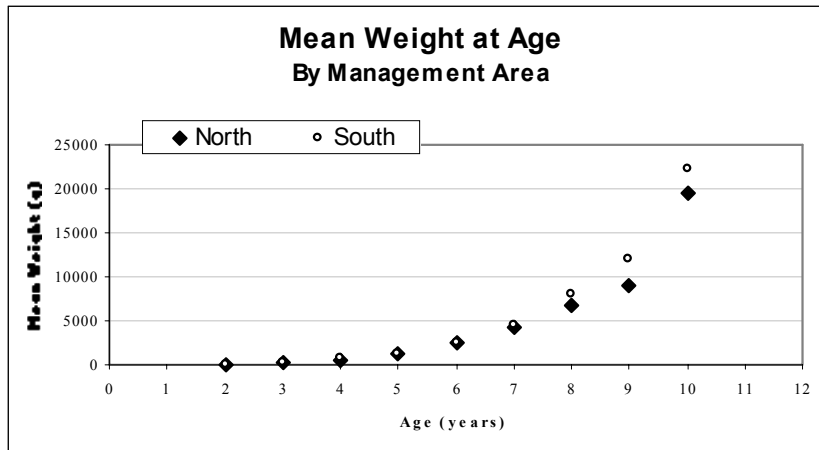

Mean Weight
Areas Combined

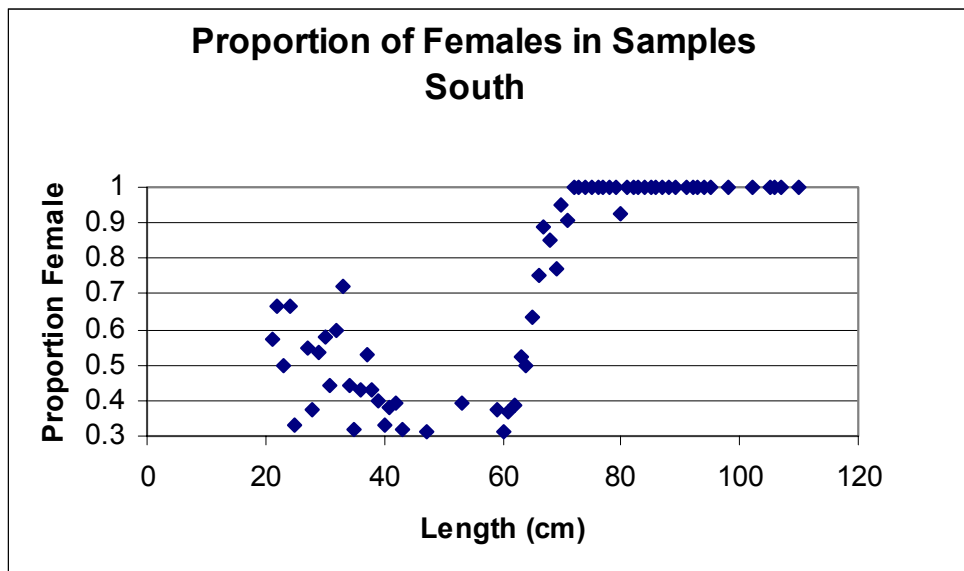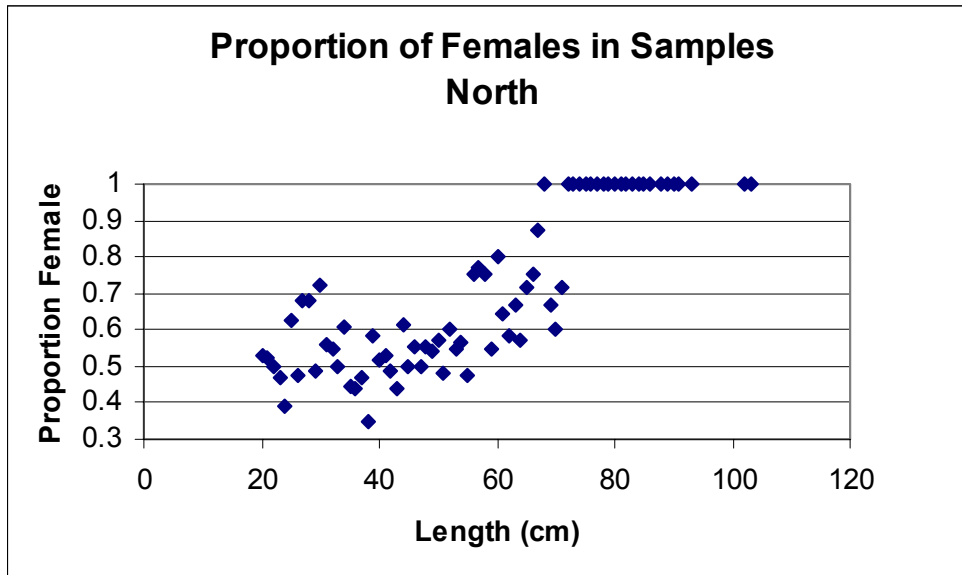Figure C67. Mean goosefish weight at age, by region from cooperative survey.

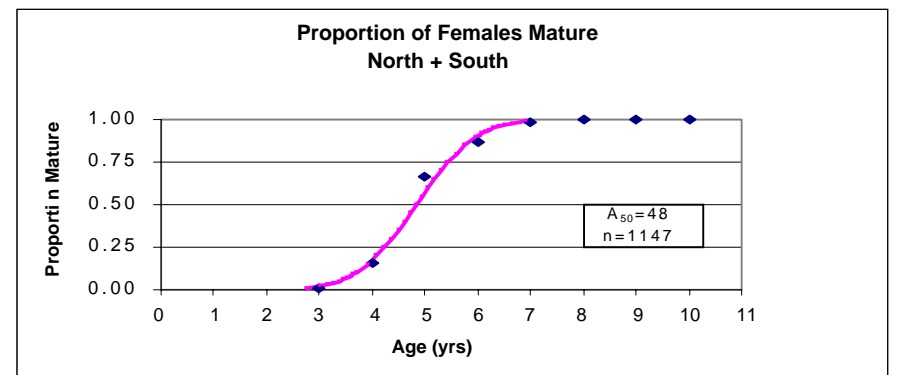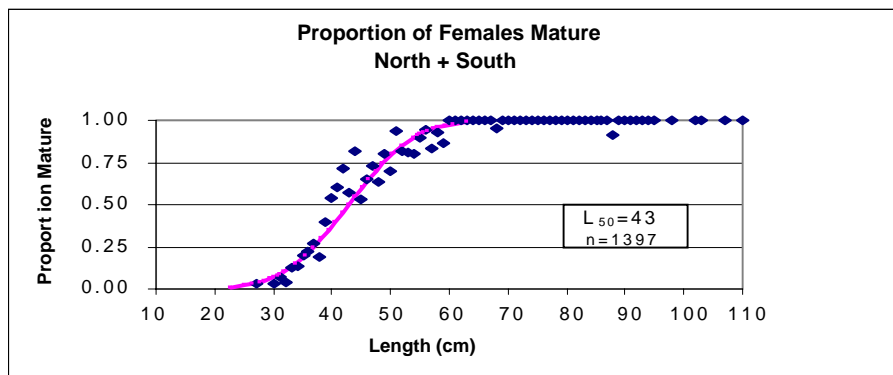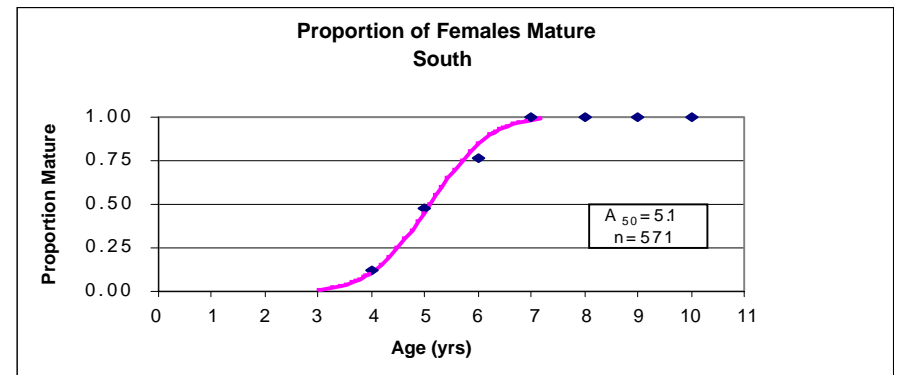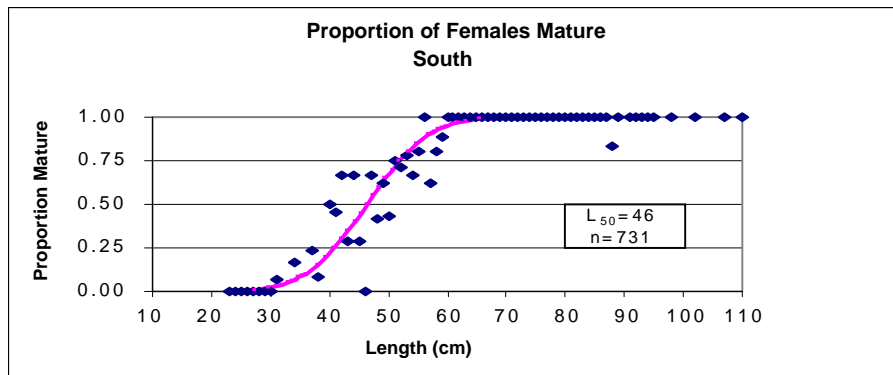Figure C68. Proportion of females at length by management area.
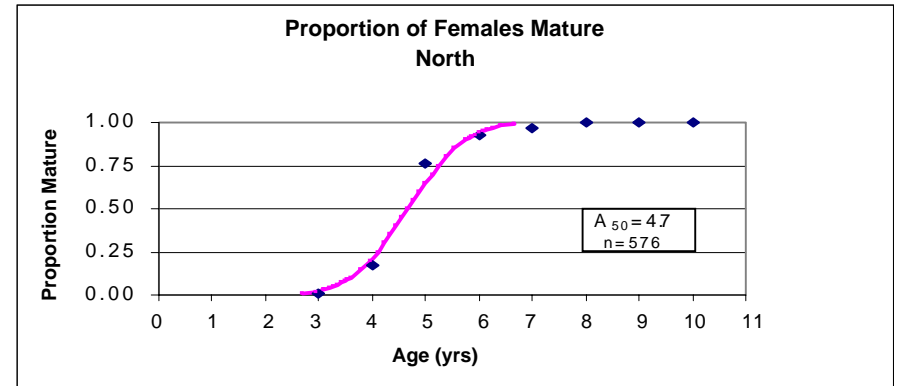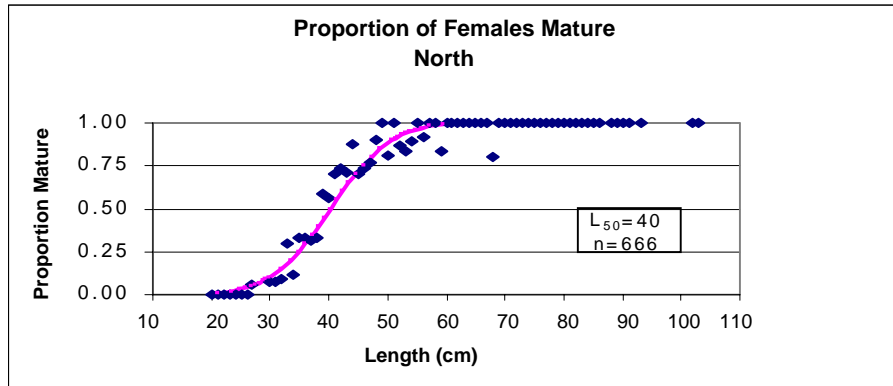
Figure C69. Proportion of females mature at length and age, by region and by areas combined.
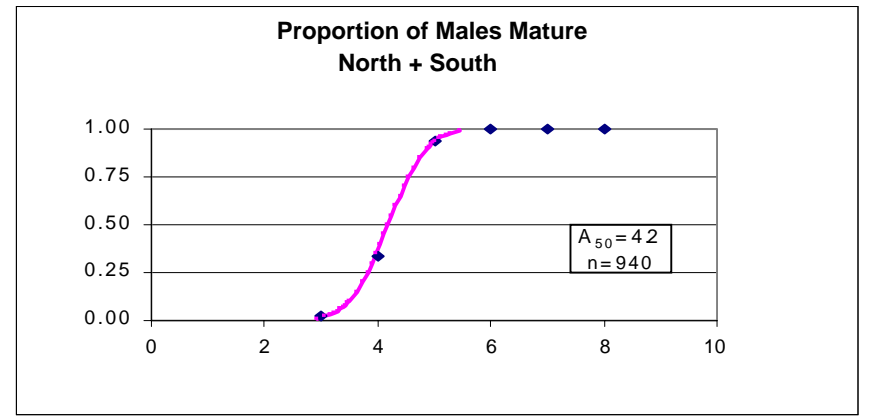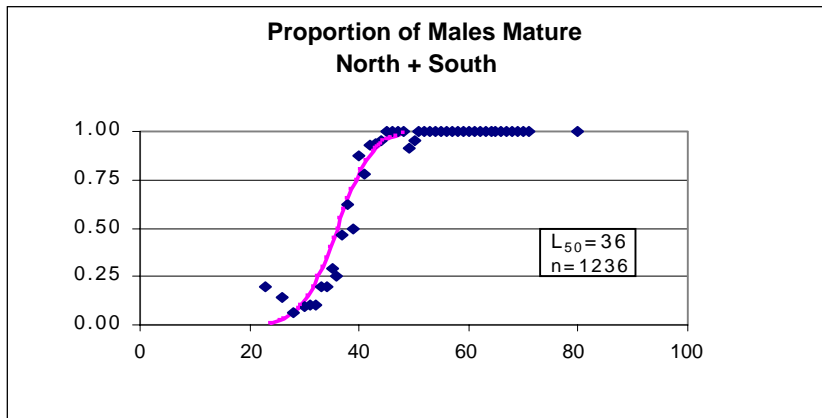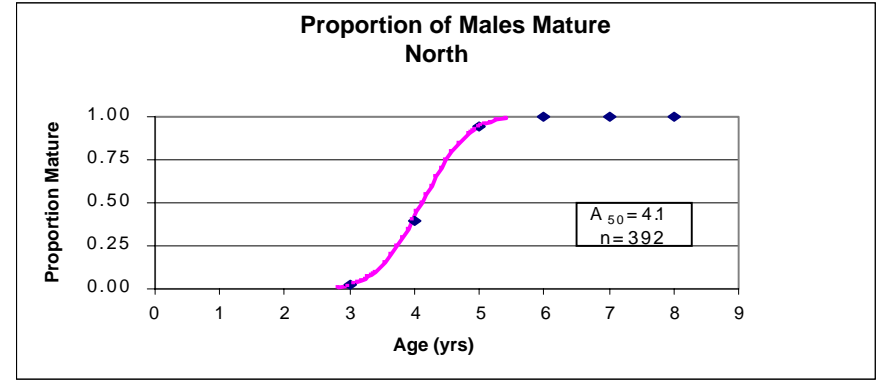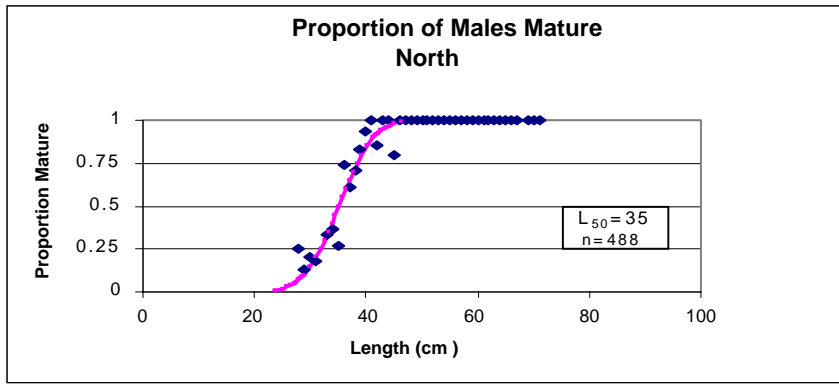
Figure C70. Proportion of males mature at length and age, by region and by areas combined.
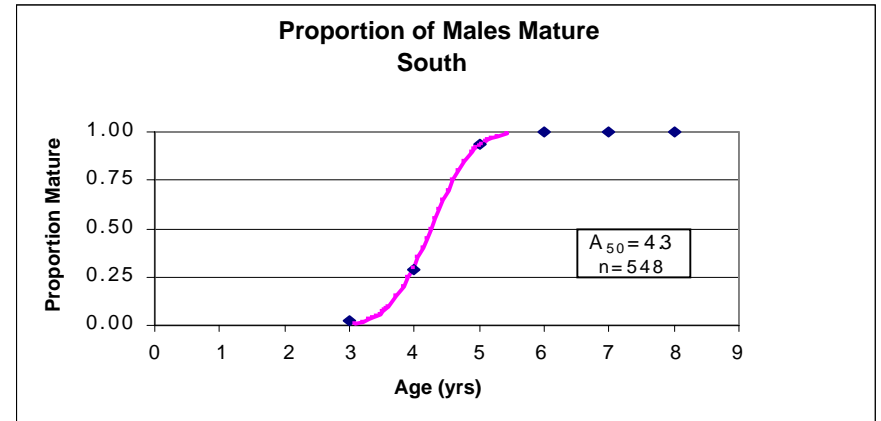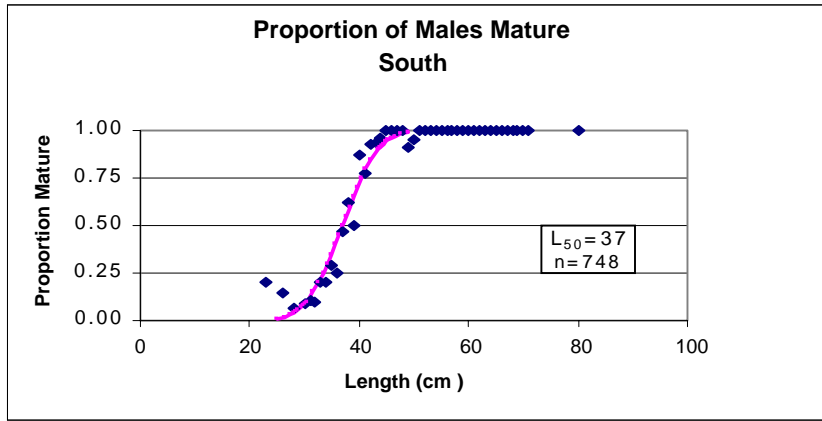
Biomass
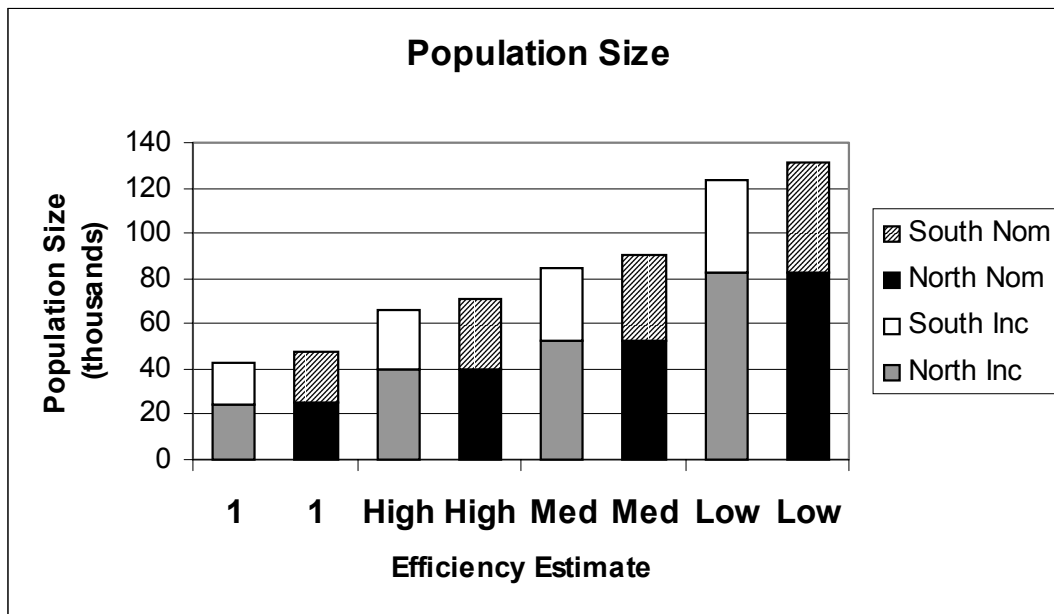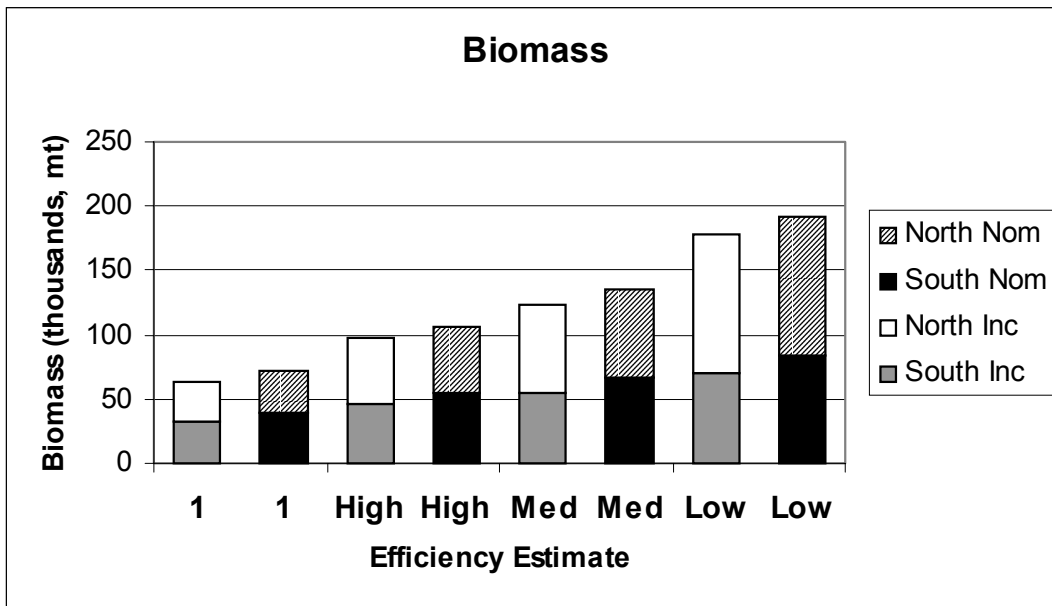
Population Size

Figure C71. Biomass and population size estimates from cooperative surveys under varying assumptions of net efficiency, calculated using inclinometer and nominal distances for the Mary K. Nom = nominal distance assumed, Inc = inclinometer distance assumed.
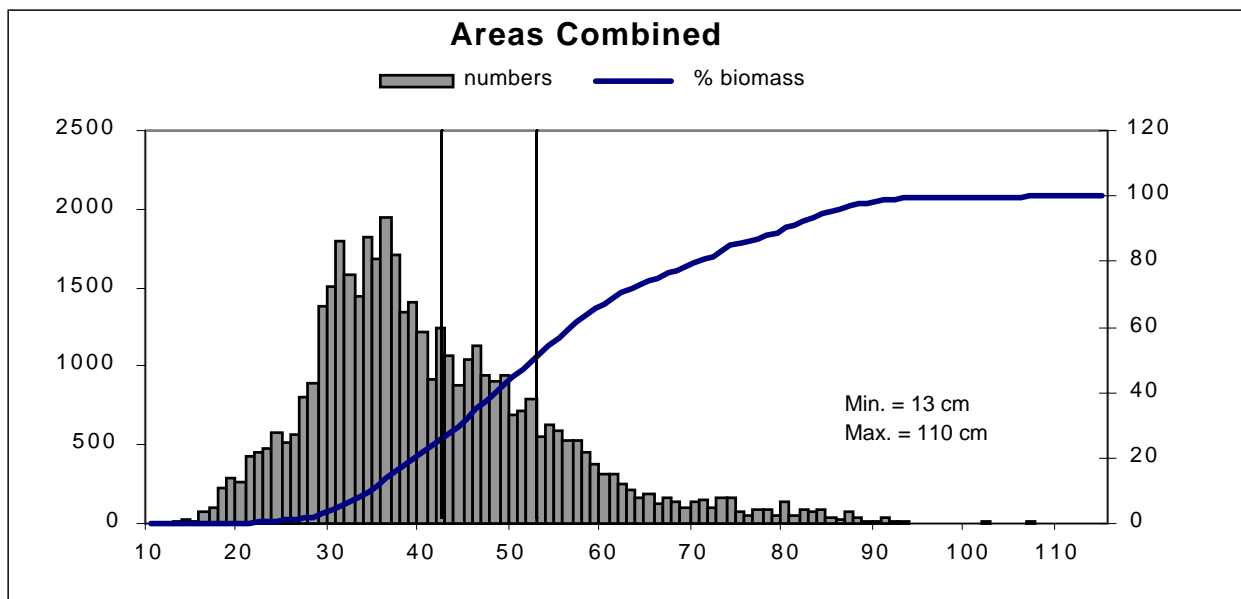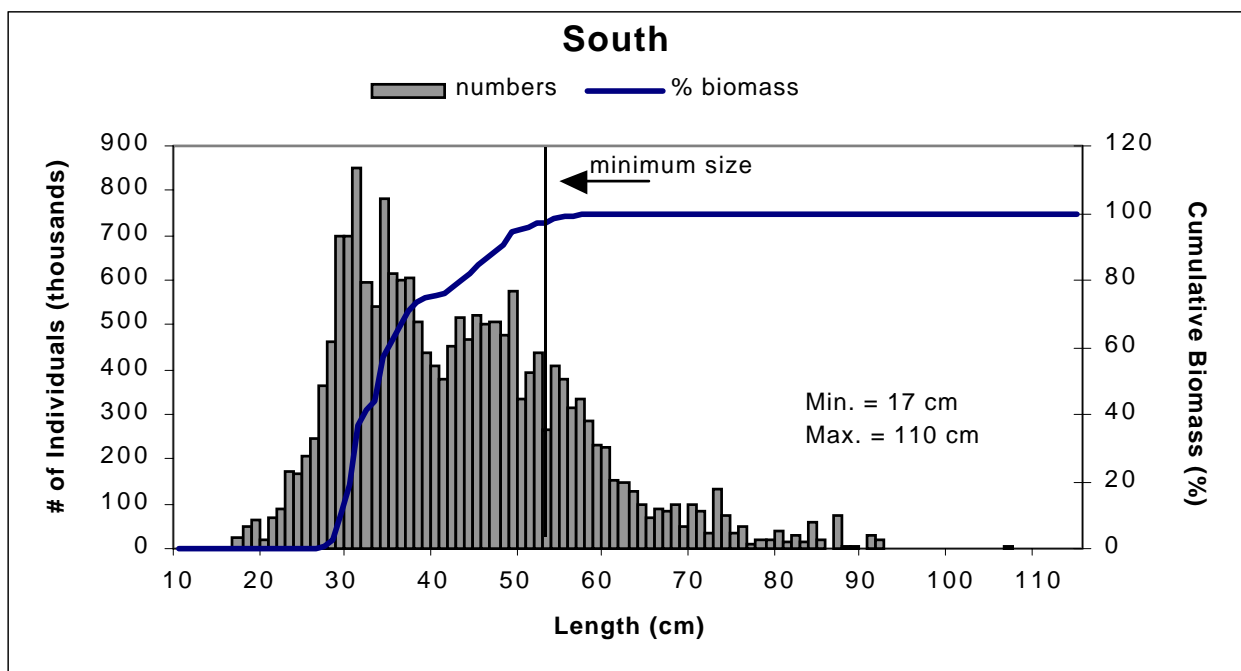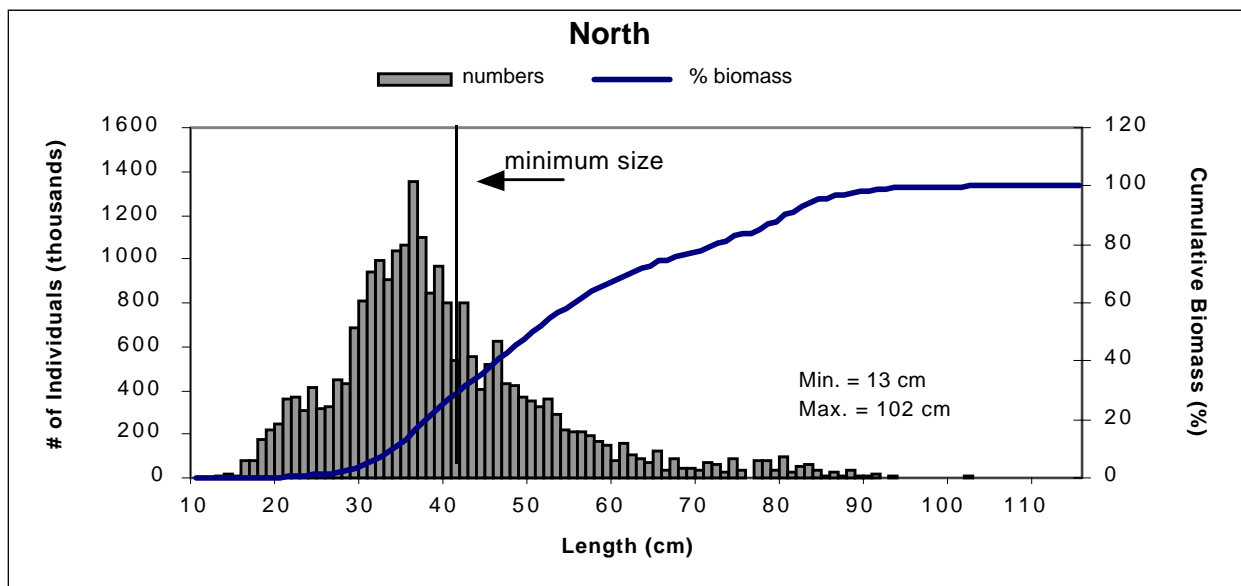
Figure C72. Length frequency of monkfish population based on cooperative survey, area swept from inclinometer tows, with cumulative biomass shown.
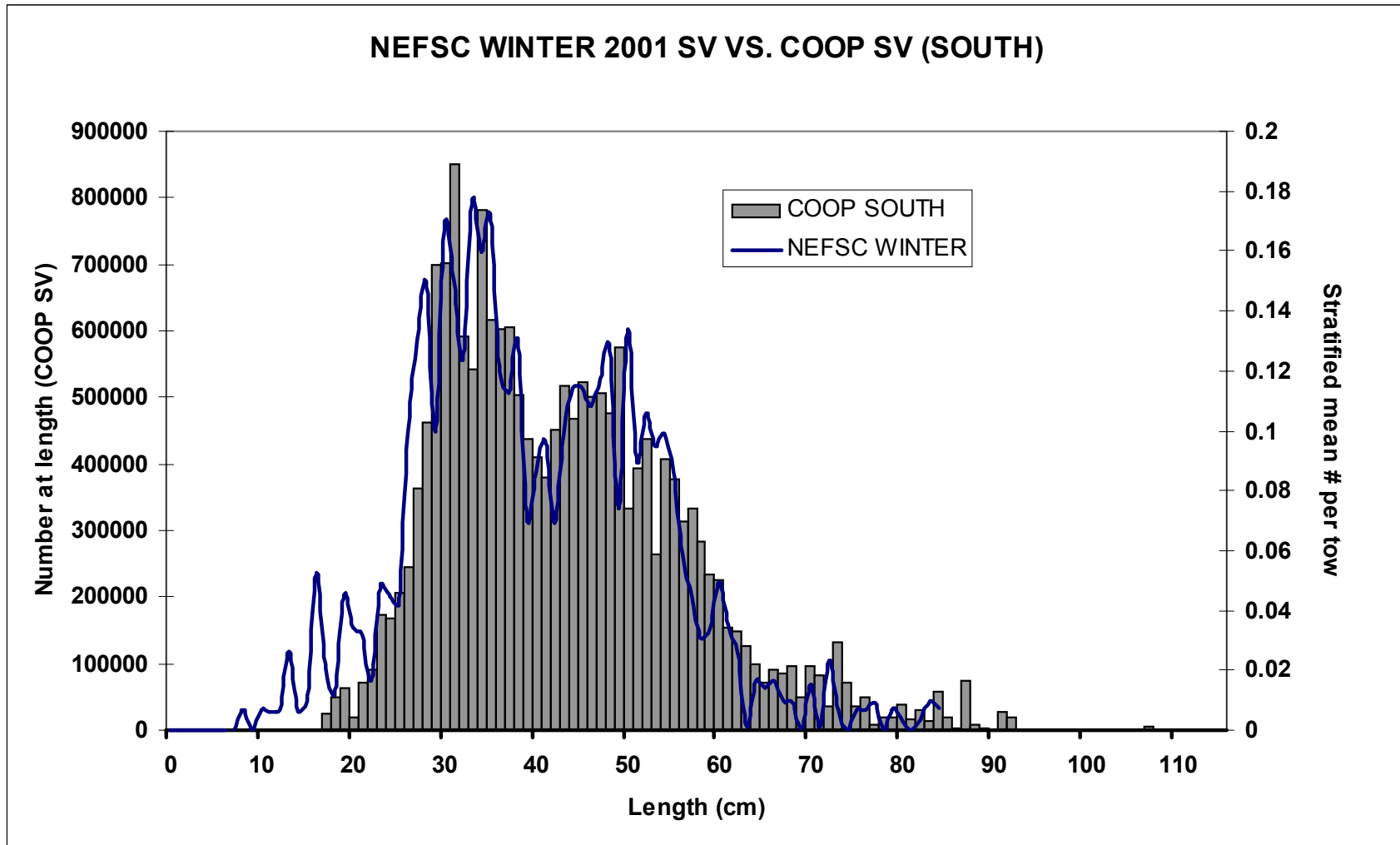
Figure C73. Comparison of length frequency distribution of monkfish estimated from the NEFSC winter survey 2001 and the cooperative industry survey.
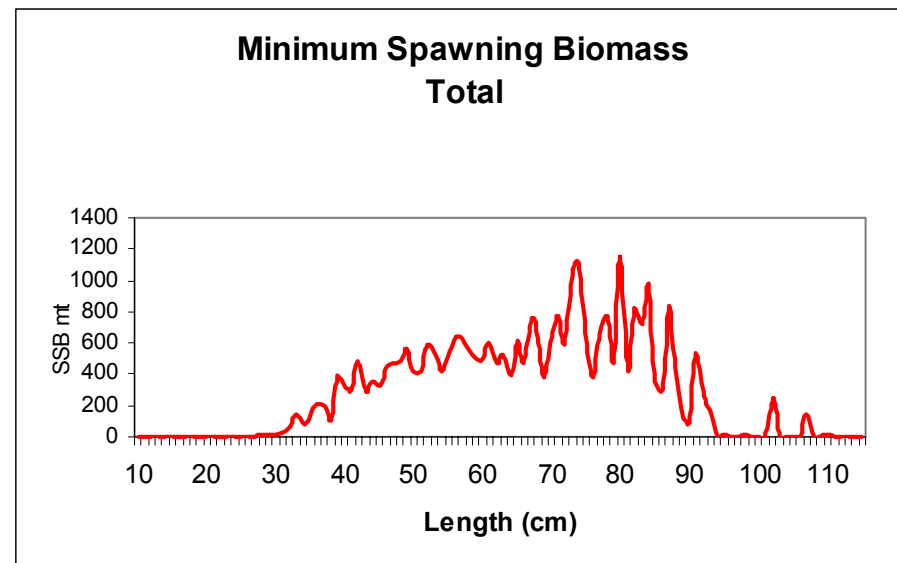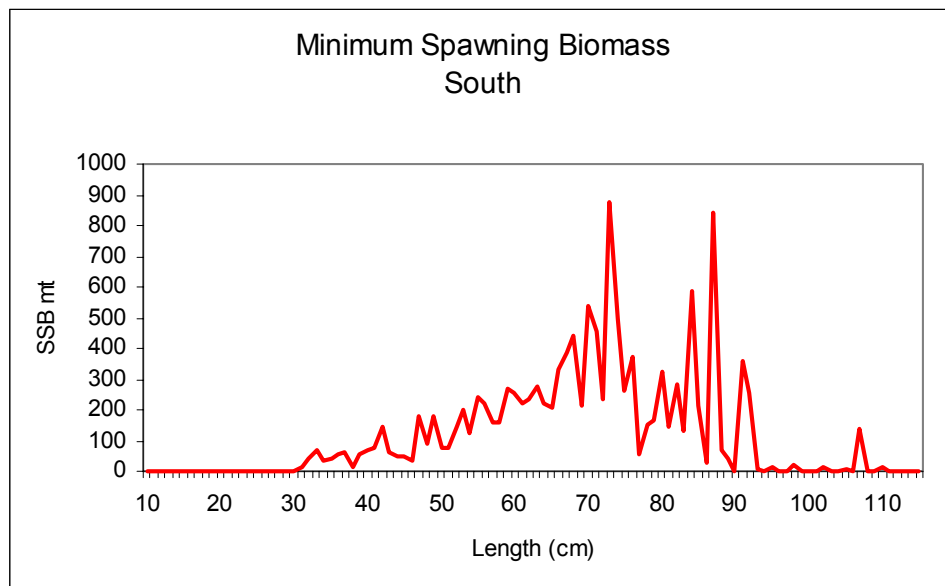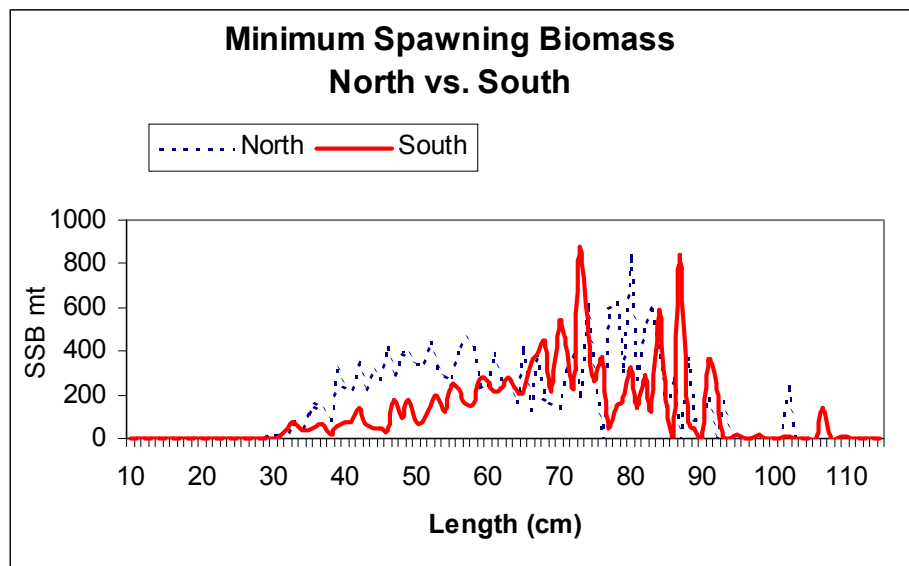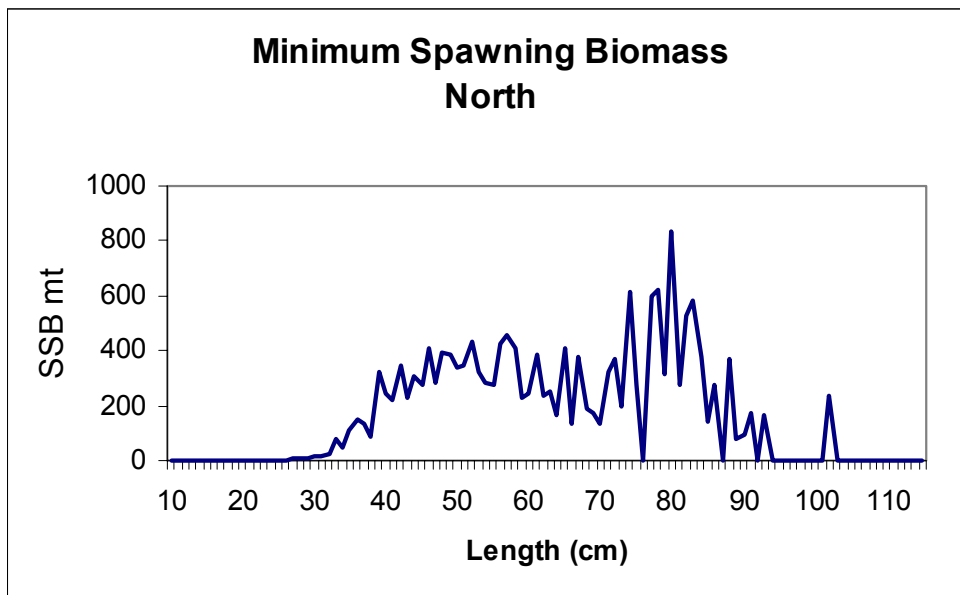
Figure C74. Minimum spawning biomass estimated from cooperative survey data.
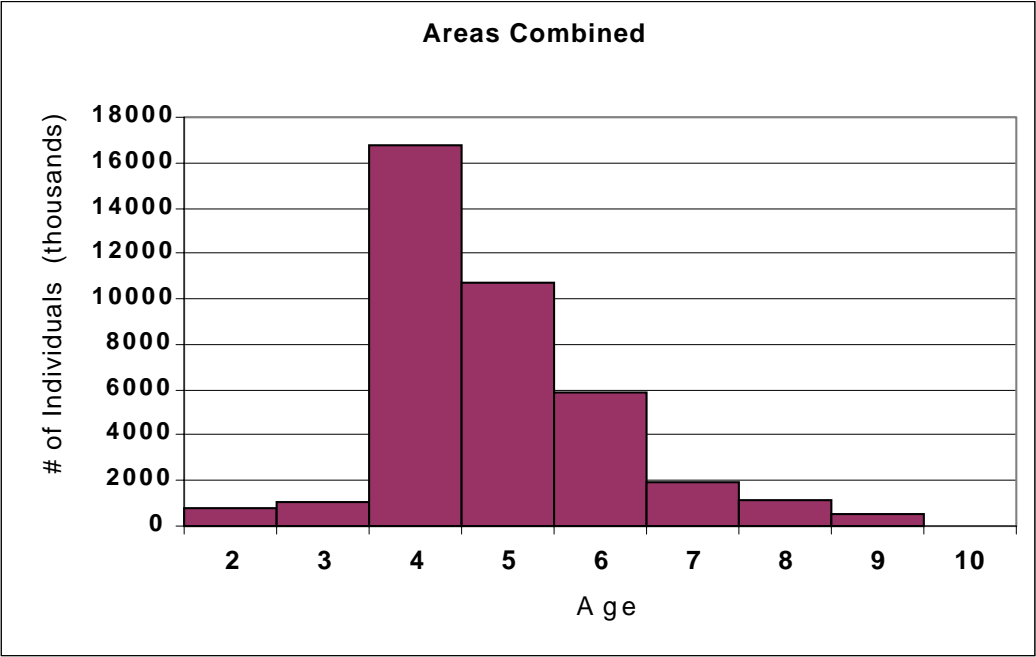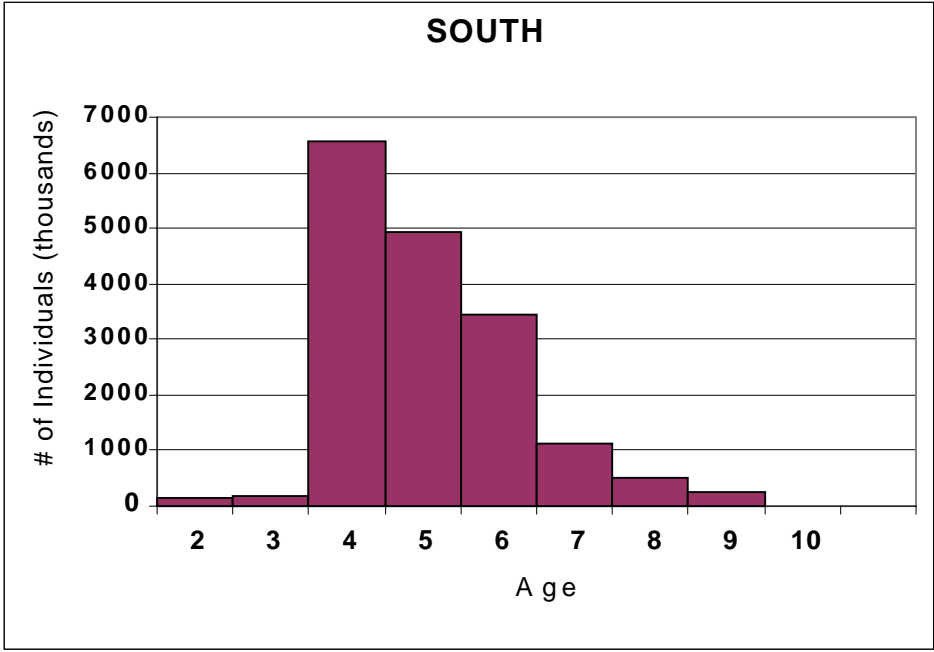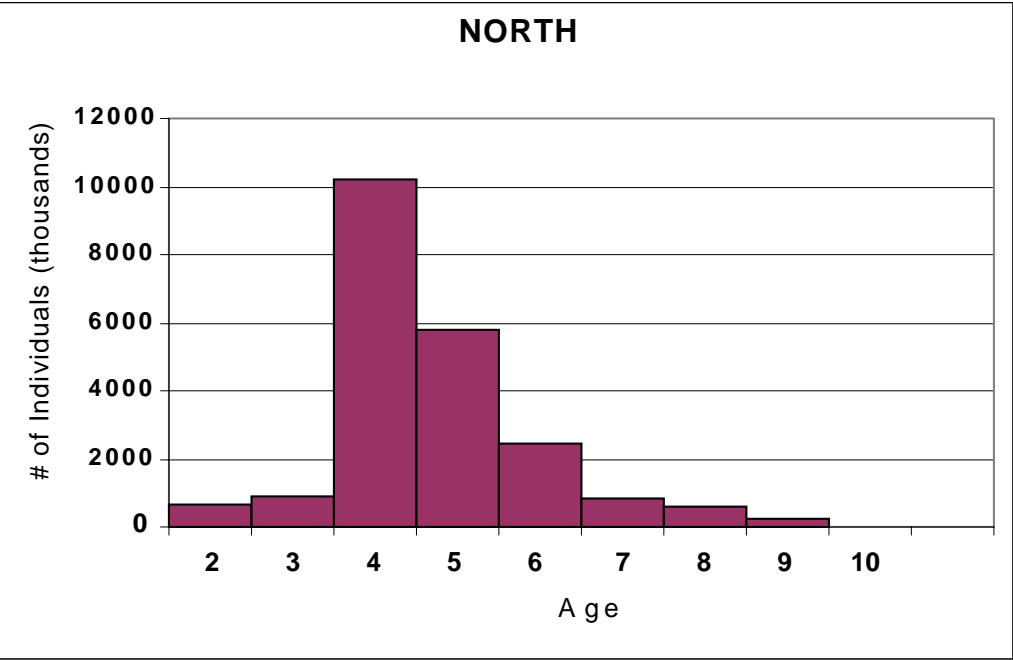
Figure C75. Minimum number of goosefish by age from cooperative survey, inclinometer distances used to calculate numbers in population.

Swept Area Biomass Estimates: All Regions
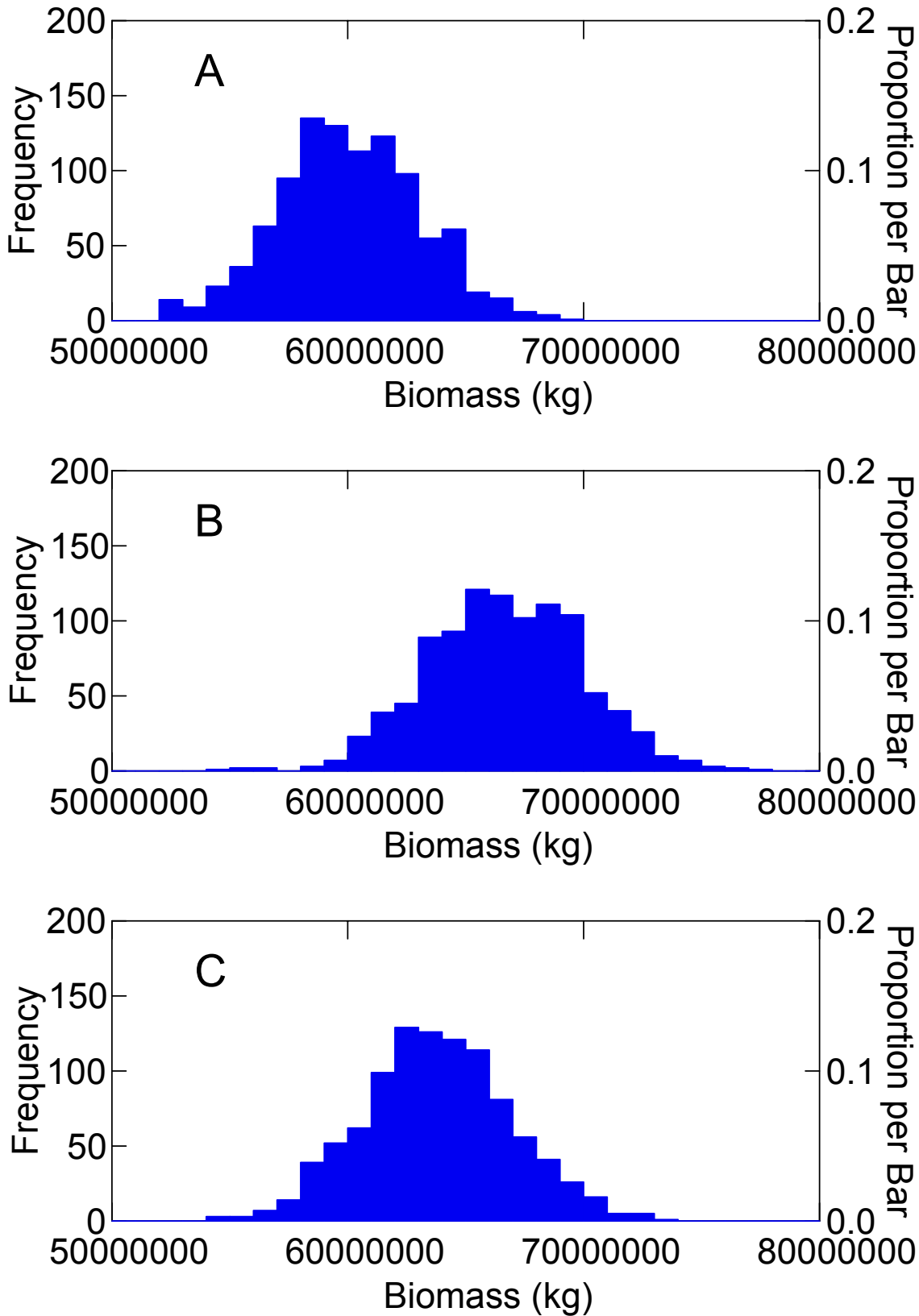
Figure C76. Distribution of bootstrap estimates of area swept biomass for management regions combined

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Swept Area Biomass Estimates: Northern Region
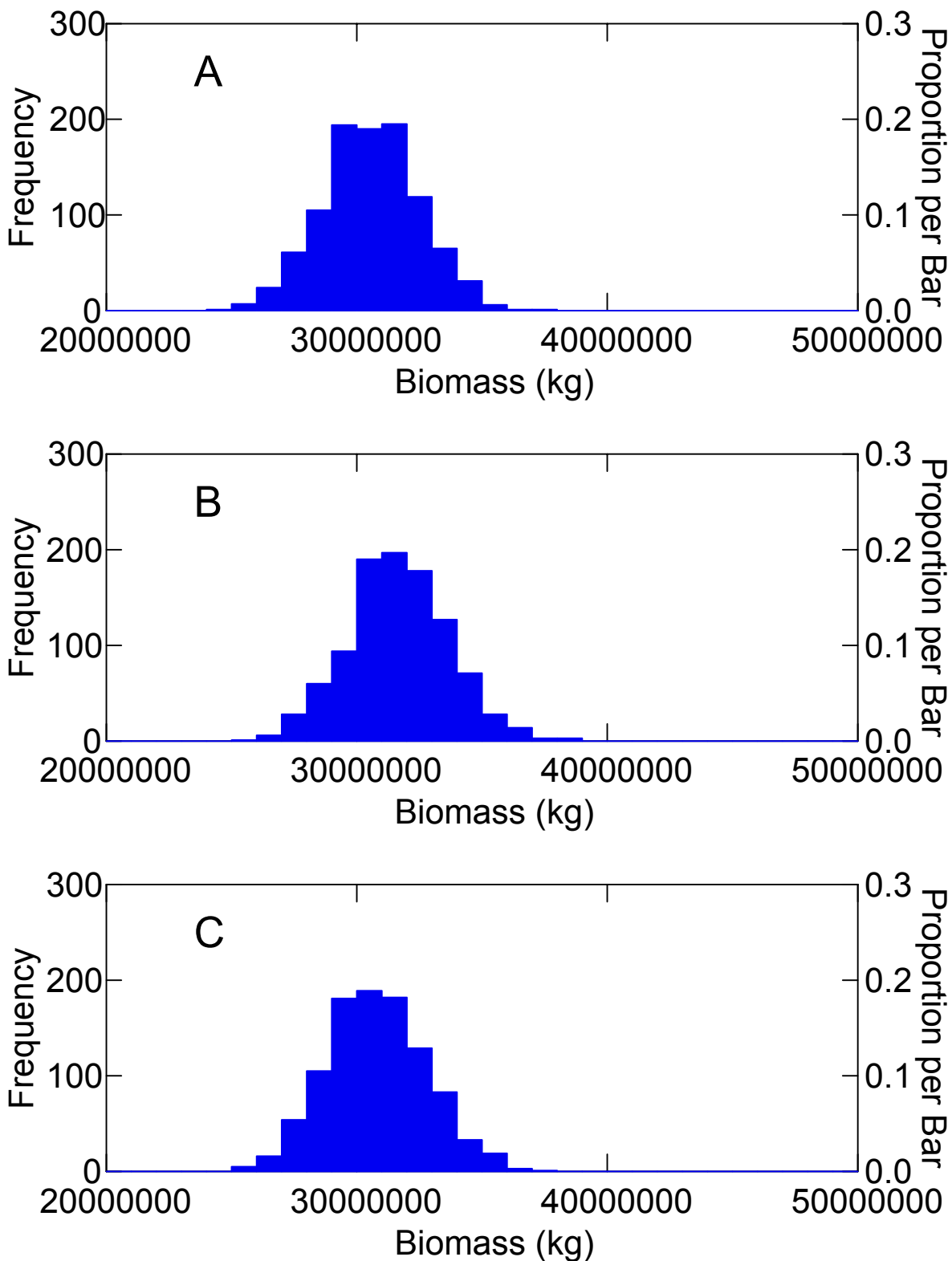
Figure C77. Distribution of bootstrap estimates of area swept biomass for
the northern management region.

Swept Area Biomass Estimates: Southern Region
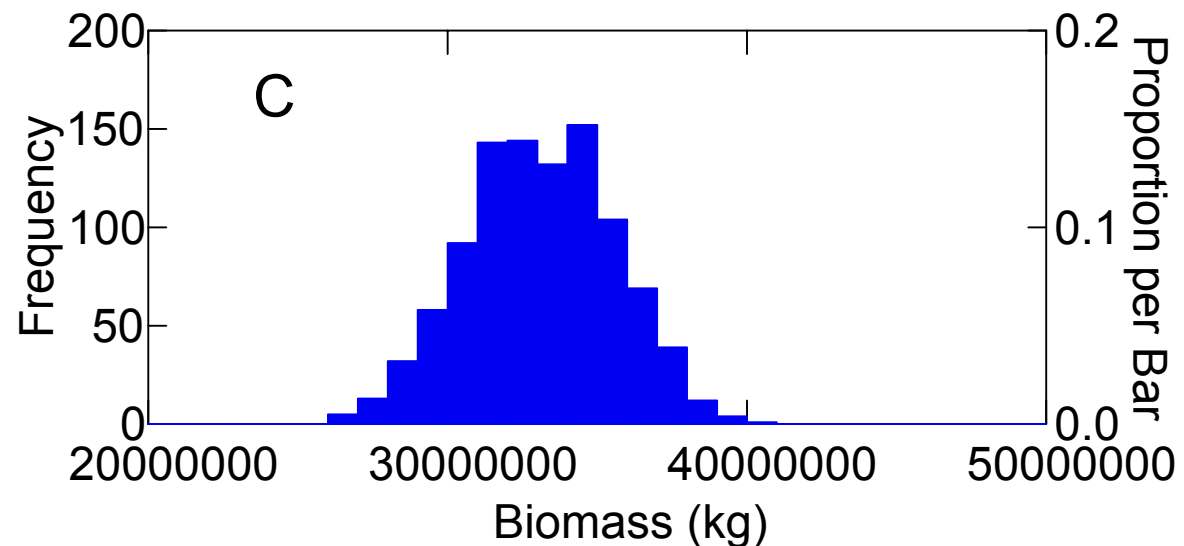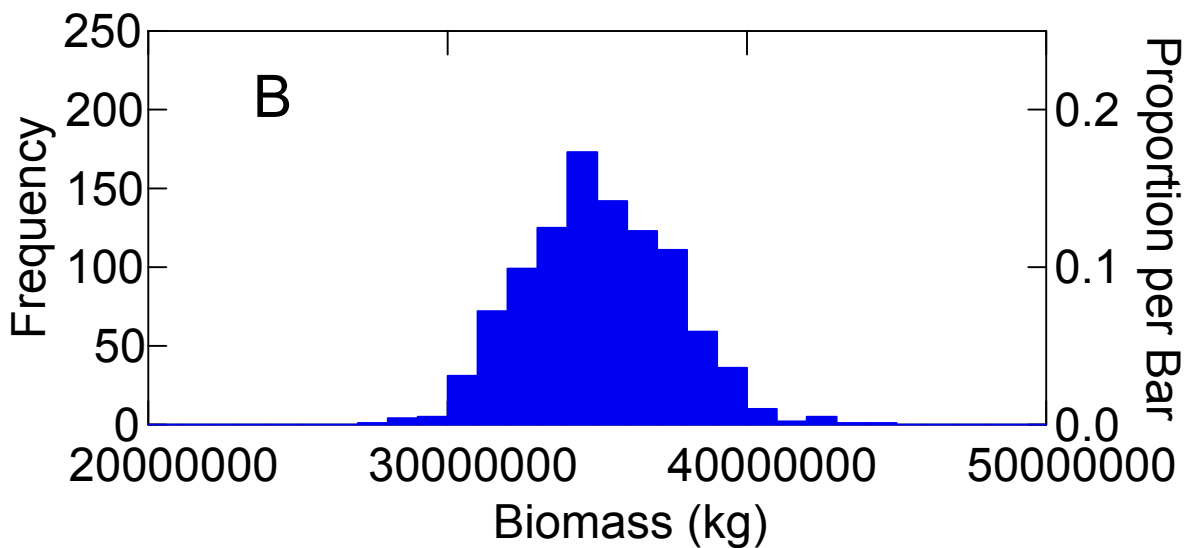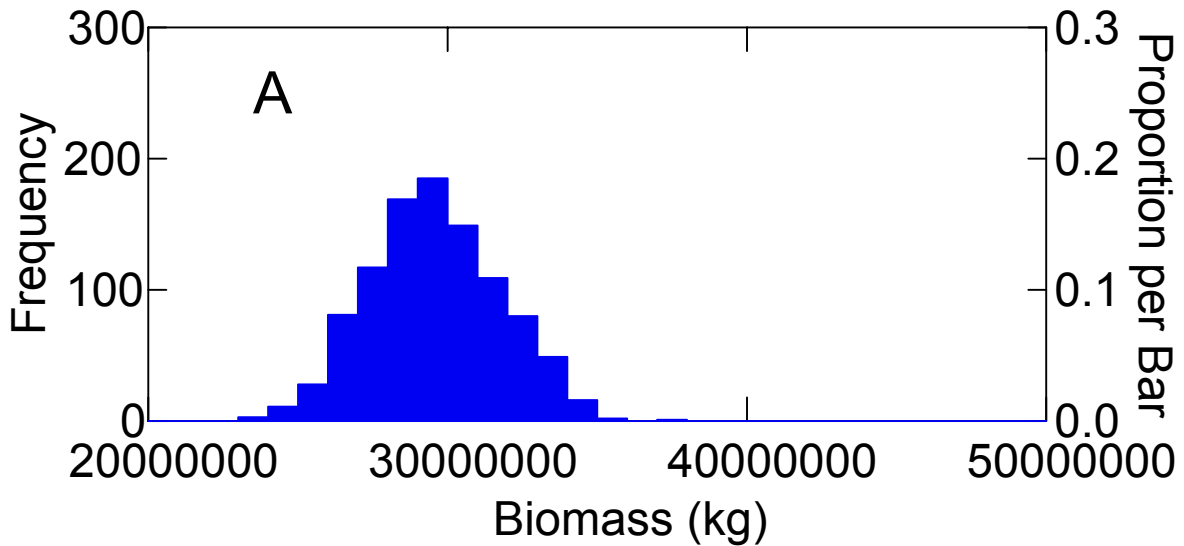
Figure C78. Distribution of bootstrap estimates of area swept biomass for the southern management region.
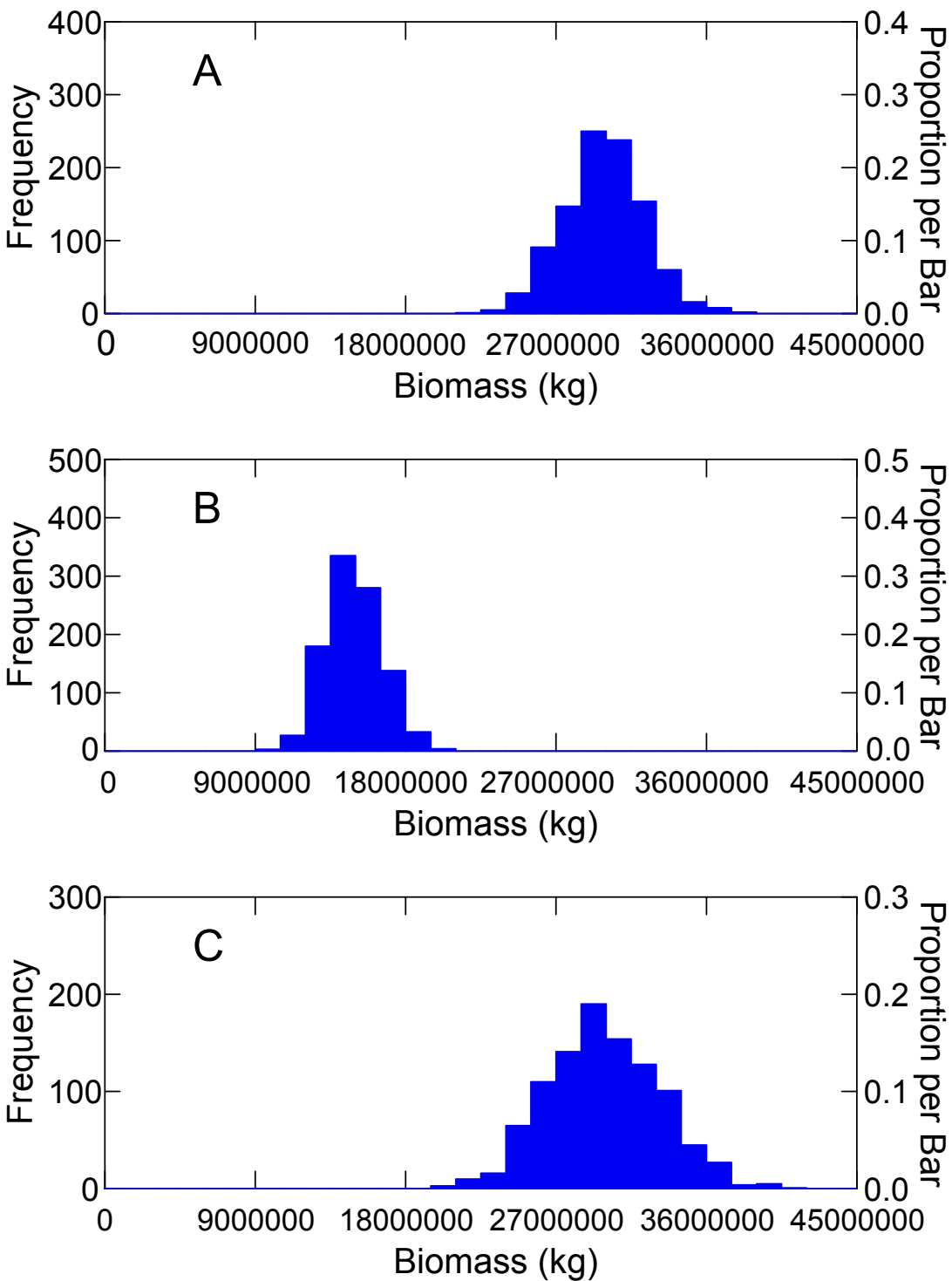
Figure C79. Distribution of bootstrap estimates of area swept biomass for NMFS Winter survey and the cooperative survey (subsetted to match aerial coverage of NMFS winter survey).

Figure C80. Indices of egg production by goosefish based on composite length frequency distributions from survey indices (number per tow at length), proportion mature at length, and fecundity at length. Year represents the terminal year of a 5-year pooled length frequency sample. Proportion < L99 is the fraction of egg production from goosefish smaller than the size at 99% maturity.
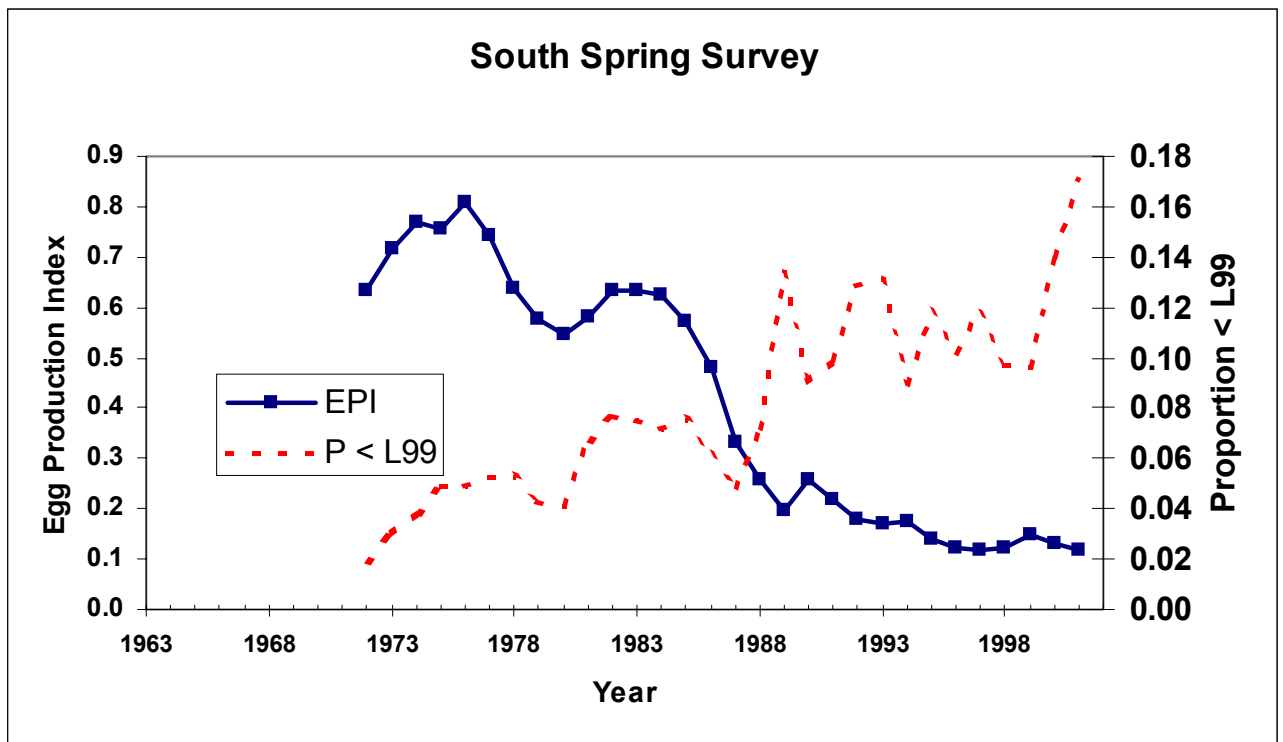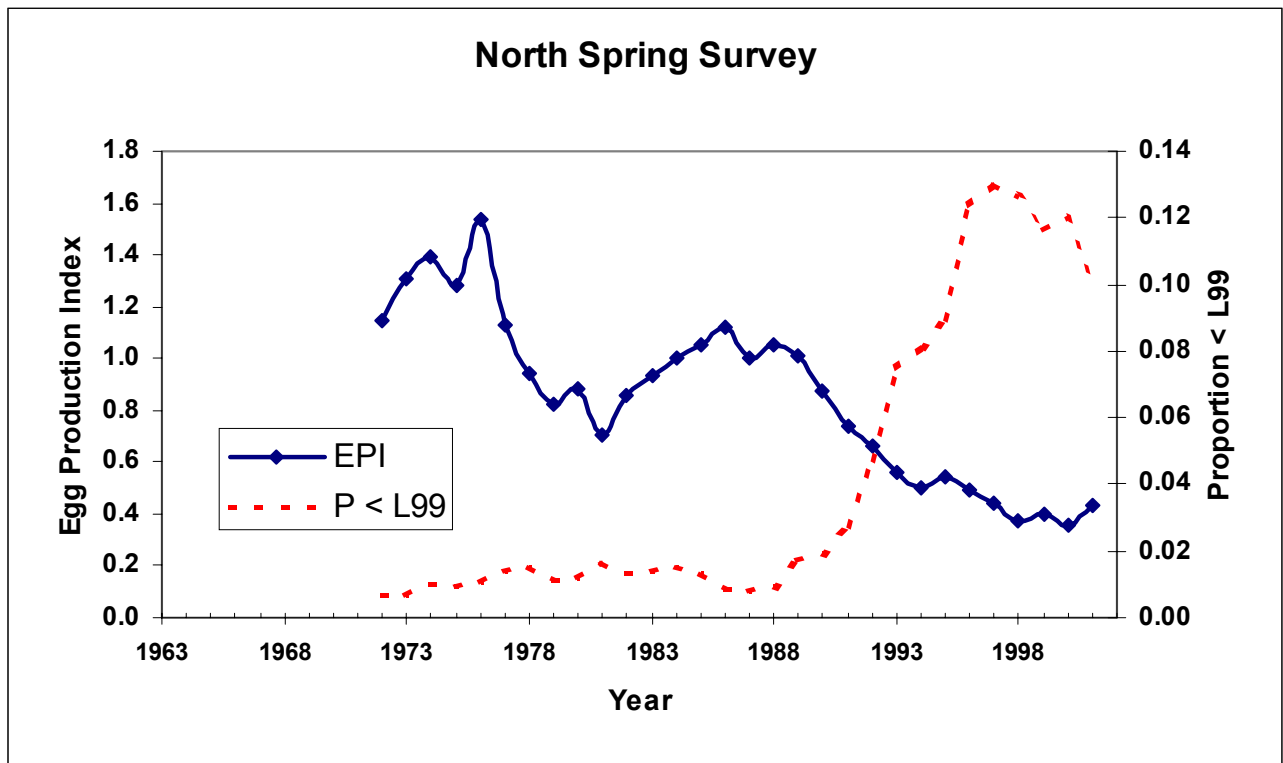
Figure C81. Indices of egg production by goosefish based on composite length
frequency distributions from survey indices (number per tow at
length), proportion mature at length, and fecundity at length. Year
represents the terminal year of a 5-year pooled length frequency
sample. Proportion < L99 is the fraction of egg production from
goosefish smaller than the size at 99% maturity.
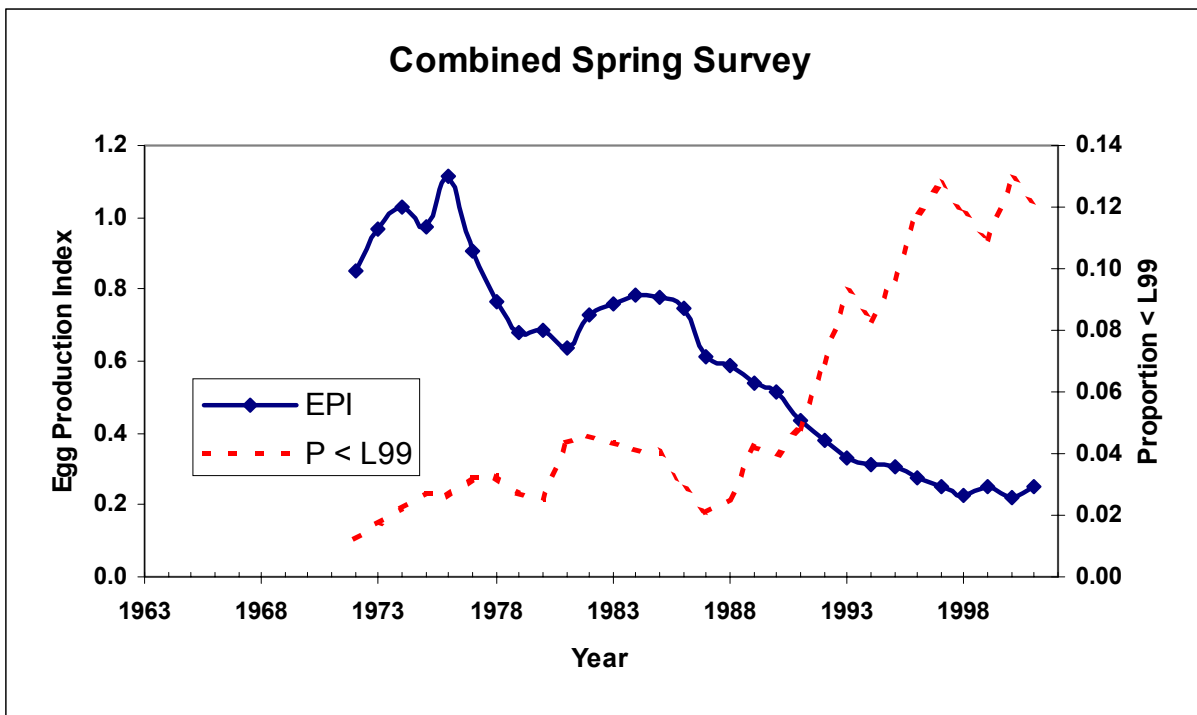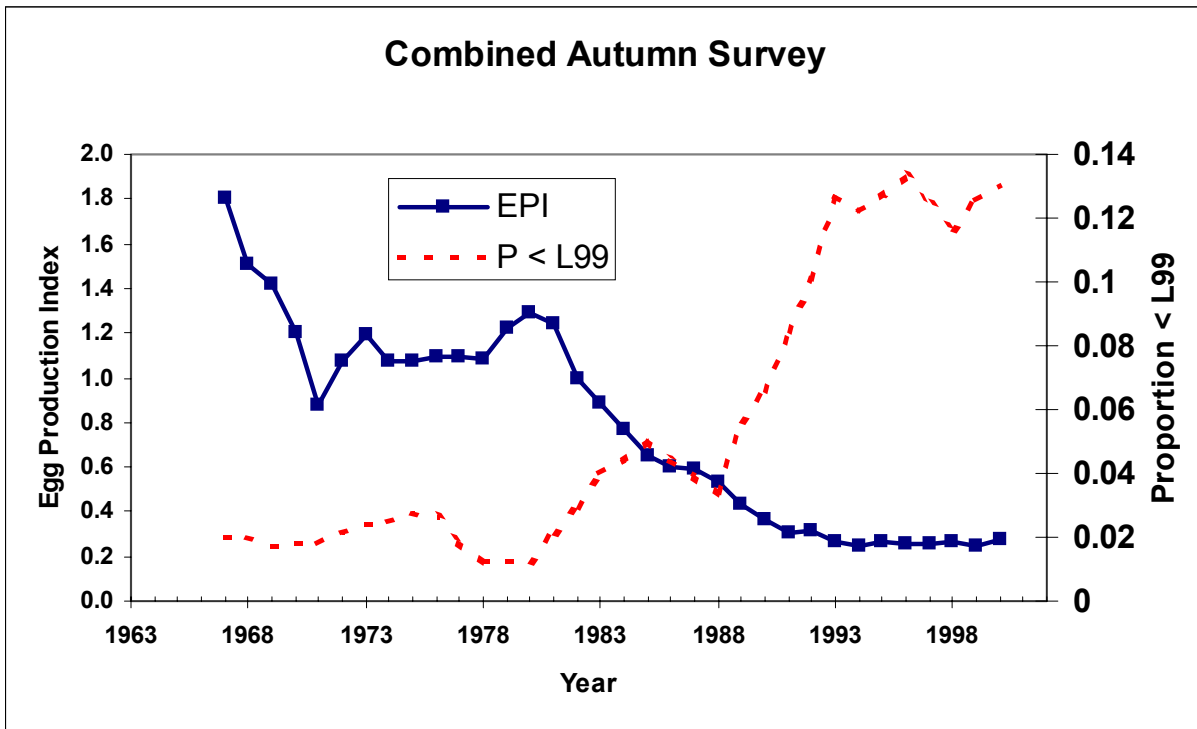
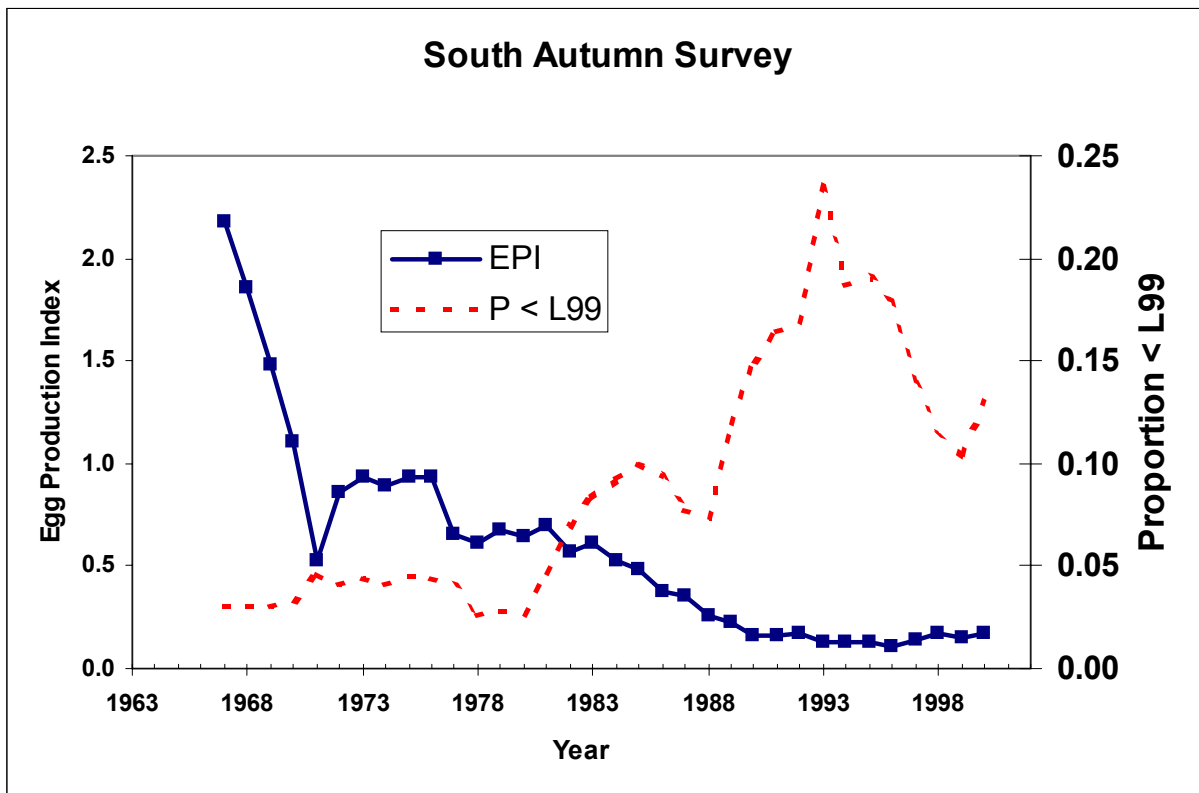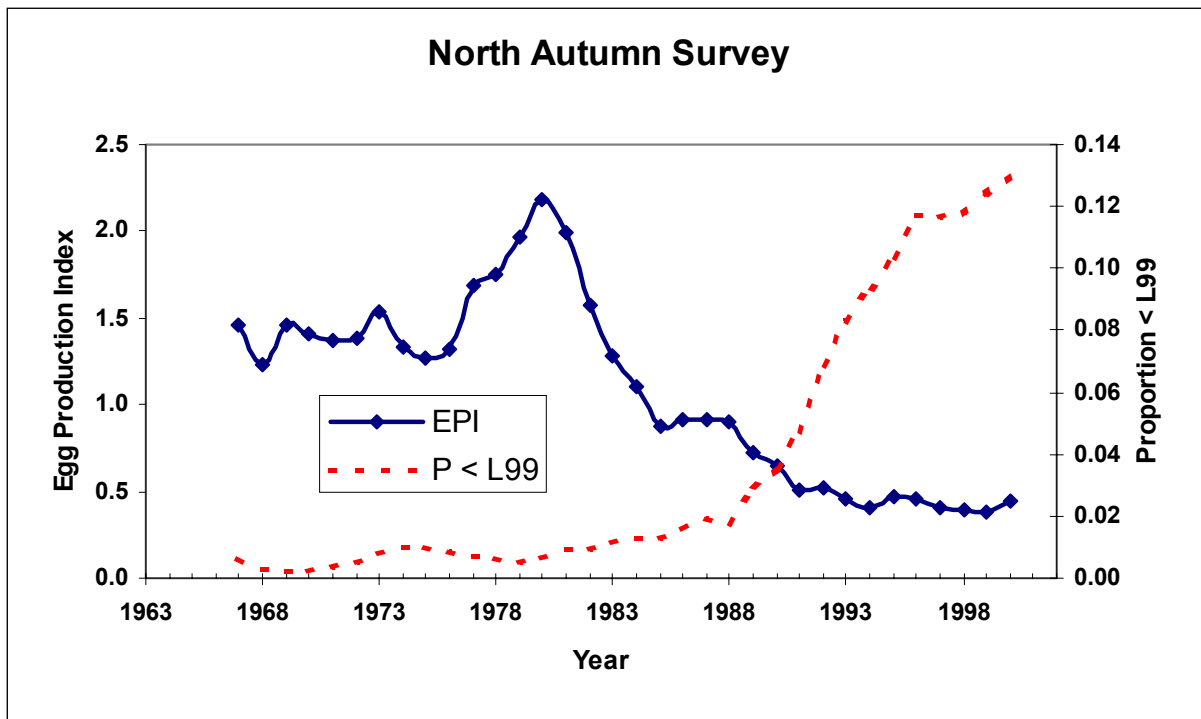Figure C82. Indices of egg production by goosefish based on composite length frequency distributions from survey indices (number per tow at length), proportion mature at length, and fecundity at length. Year represents the terminal year of a 5-year pooled length frequency sample. Proportion < L99 is the fraction of egg production from goosefish smaller than the size at 99% maturity.

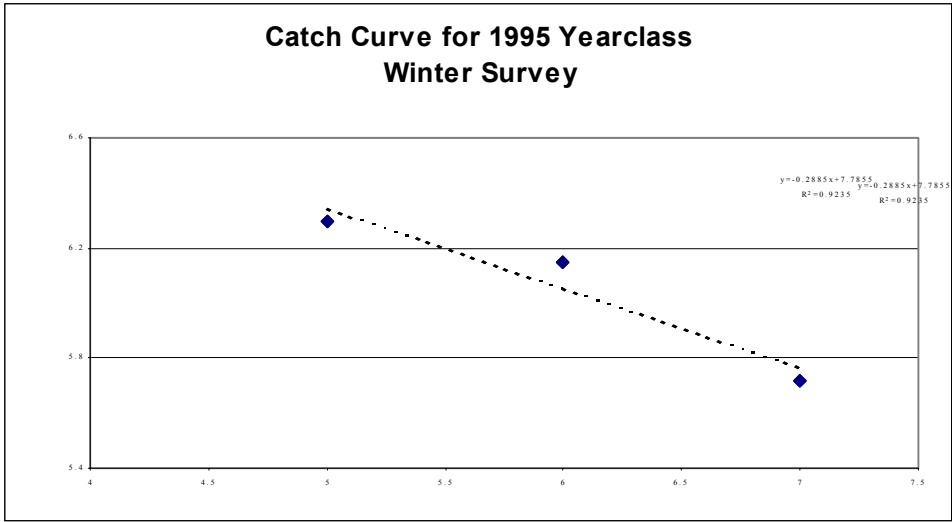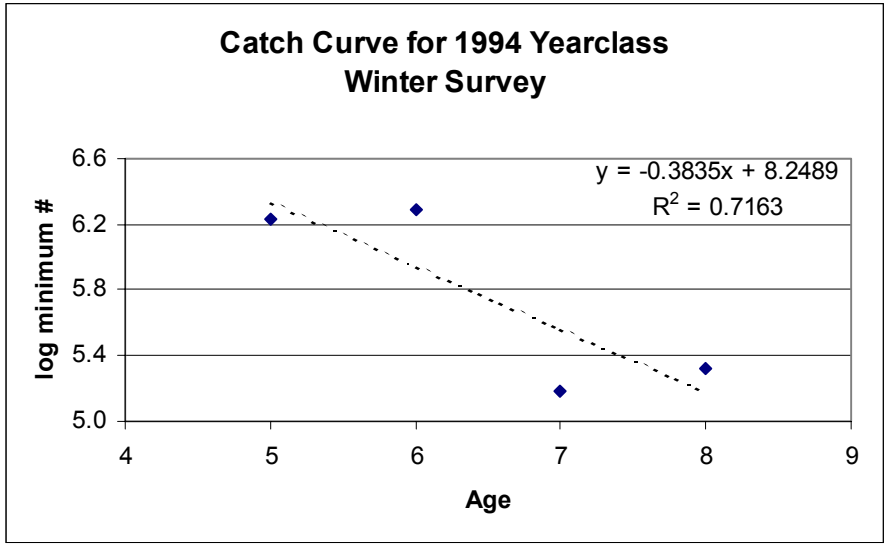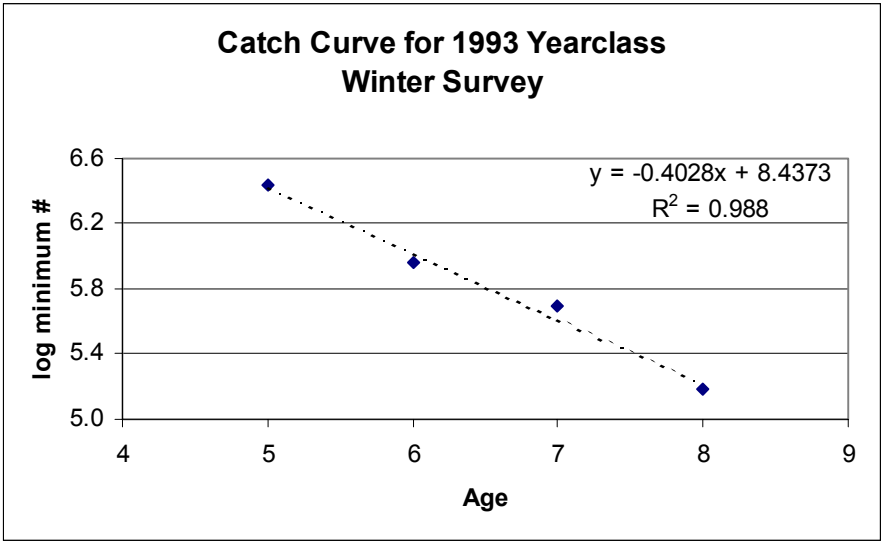| mean # per tow at age					
cohort	5	6	7	8	9
92	0.800	0.267	0.133	0.046	0.014
93	0.492	0.532	0.118	0.060	
94	0.534	0.423	0.151		
minimum pop size estimate in year					
sv year	97	98	99	2000	2001
	10,895,000	4,850,900	10,346,000	13,764,000	15,048,000
number at age in					
cohort at age	5	6	7	8	9
92	2,748,792	913,046	489,659	153,689	49,095
93	1,686,675	1,963,381	153,689	207,680	
94	1,972,510	1,413,557	522,380		
log(# at age)					
cohort	5	6	7	8	
93	6.439	5.960	5.690	5.187	
94	6.227	6.293	5.187	5.317	
95	6.295	6.150	5.718		

Catch Curve for 1993 Yearclass Winter Survey

$y = -0.4028x + 8.4373$
$R^2 = 0.988$

Catch Curve for 1994 Yearclass Winter Survey

$y = -0.3835x + 8.2489$
$R^2 = 0.7163$

Catch Curve for 1995 Yearclass Winter Survey

$y = -0.2885x + 7.7855$
$R^2 = 0.9235$

Figure C83. Catch curve estimates of total mortality (Z) for 1993-1995 cohorts of goosefish from NEFSC winter survey.

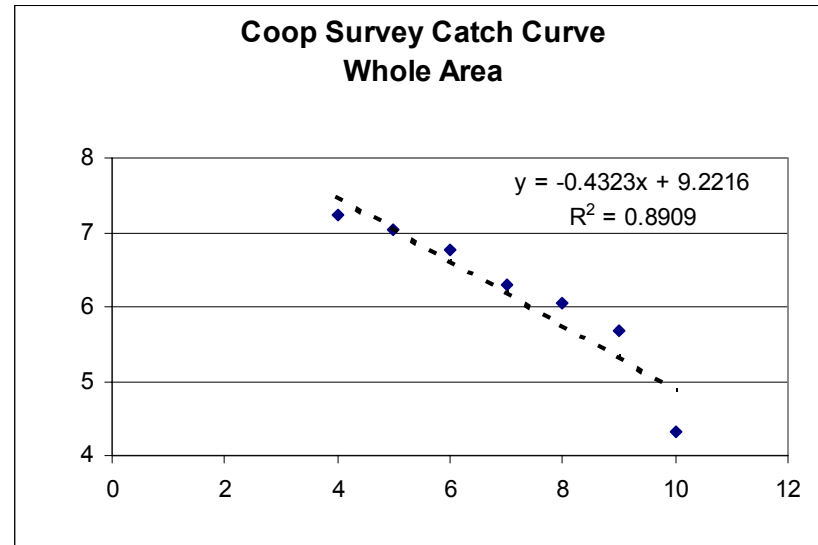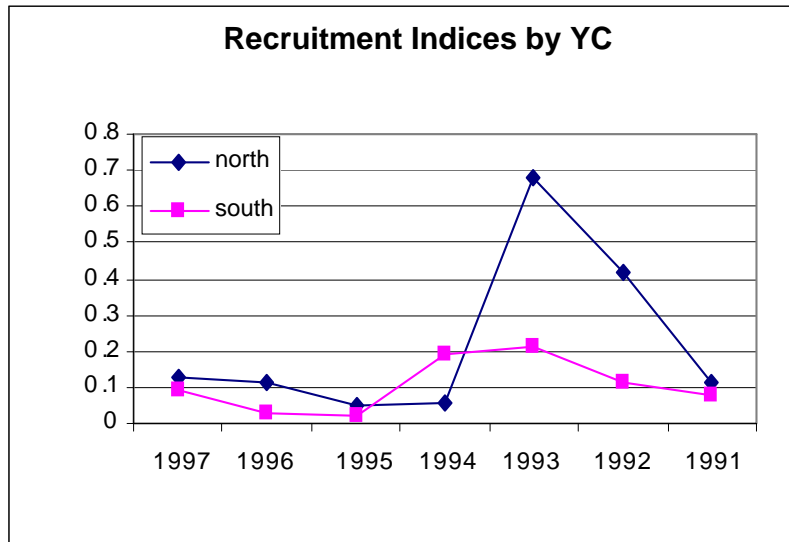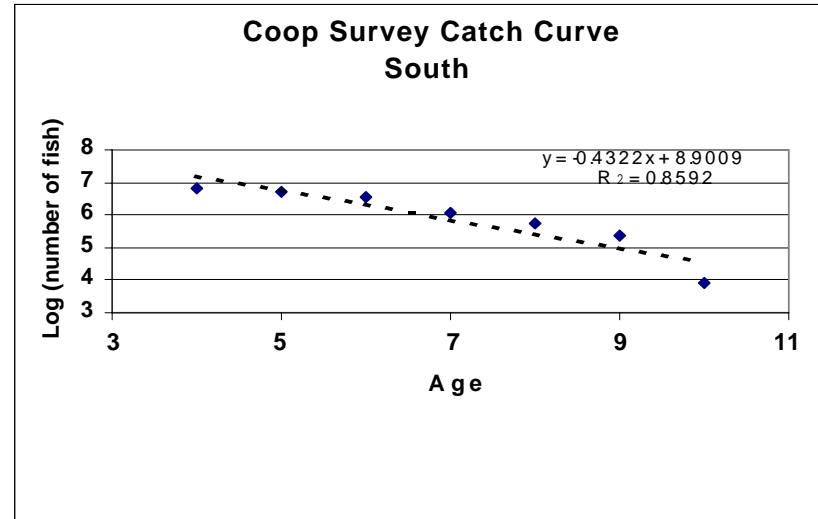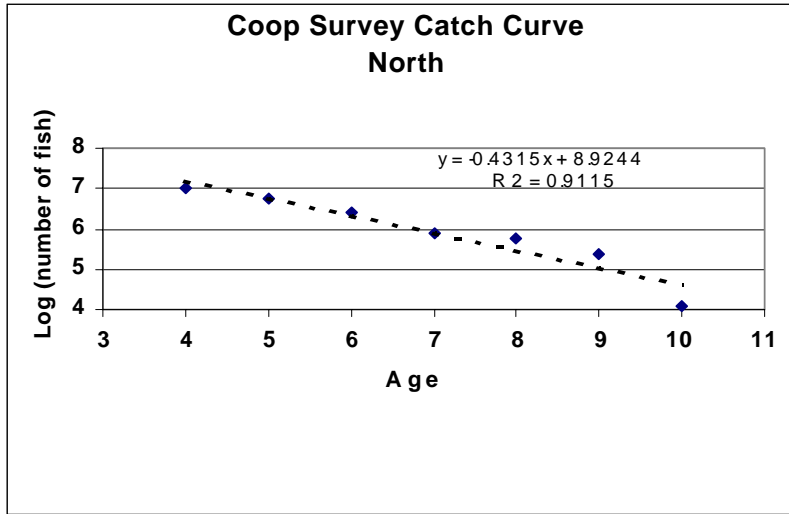|	yc	1997	1996	1995	1994	1993	1992	1991
	Age	4	5	6	7	8	9	10
north	log(#)	7.0083	6.7618	6.3886	5.9074	5.7724	5.3876	4.1028
south		6.817	6.6945	6.5367	6.0476	5.7167	5.3916	3.9251
all		7.2241	7.0305	6.7699	6.2842	6.0465	5.6907	4.324

Figure C84. Catch curve estimates of Z using cooperative survey numbers at age. Inclinometer distances assumed for Mary K.
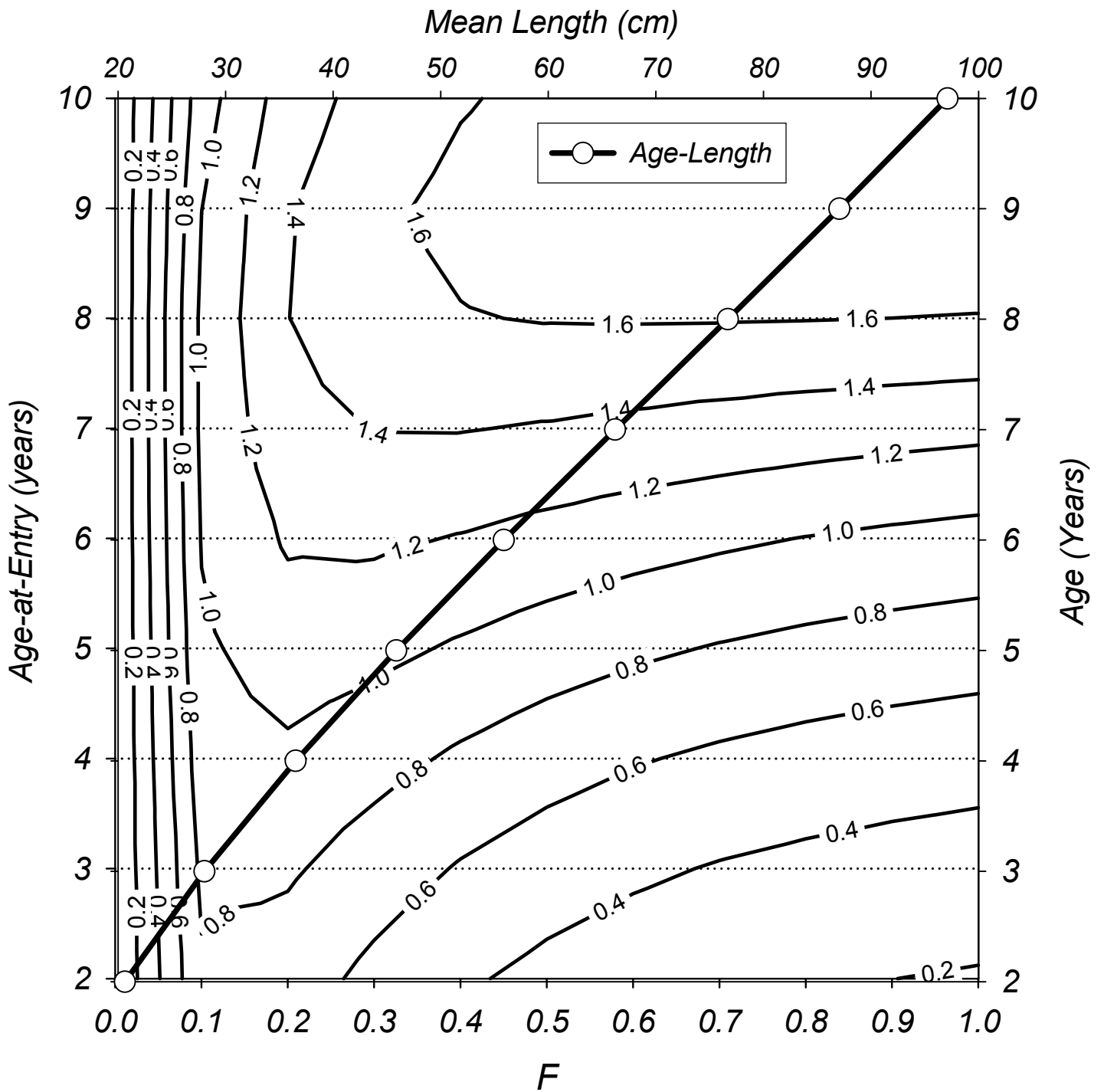
Figure C85. Yield per recruit for goosefish for varying ages of knife-edge recruitment and varying fishing mortality rates.
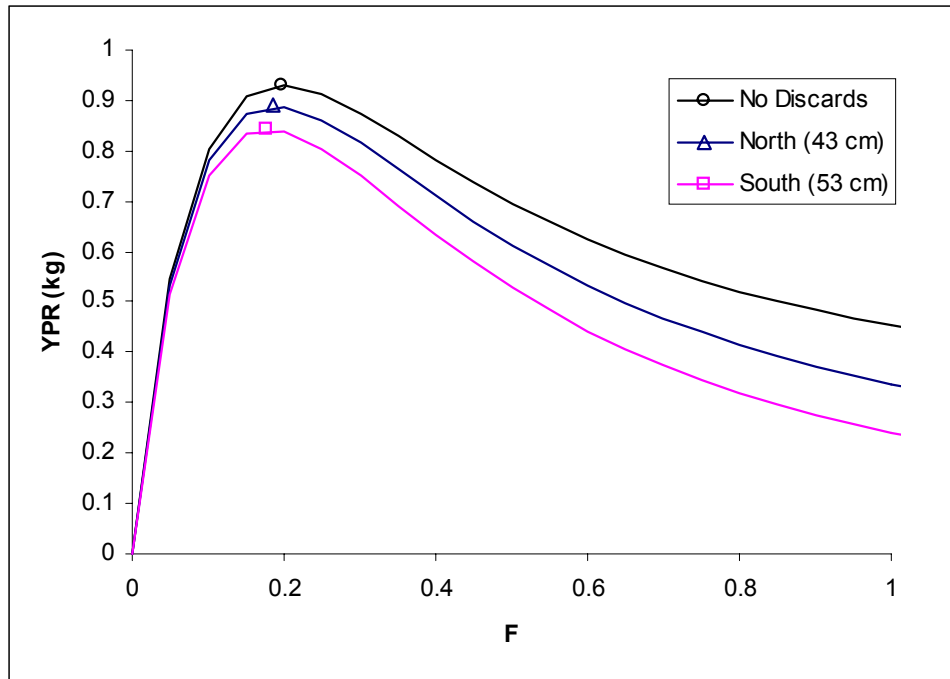
Figure C86. Yield per recruit curves for goosefish showing the effect of discarding on yield.
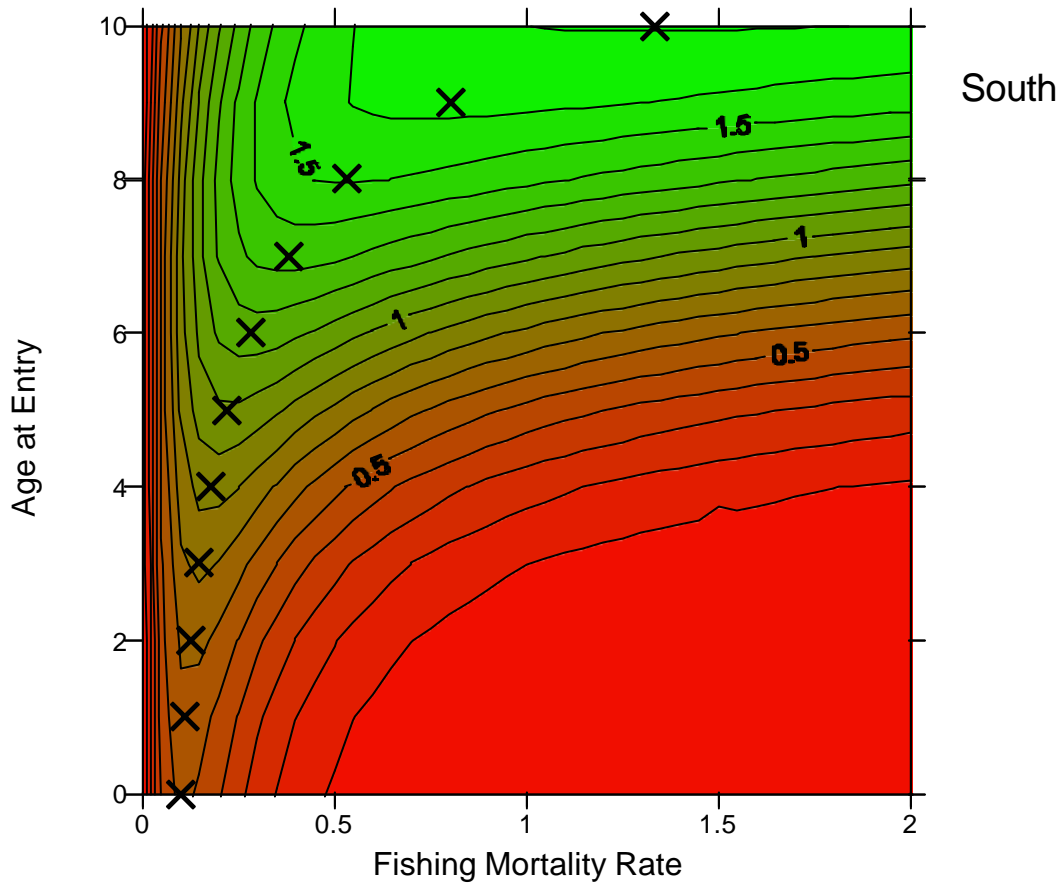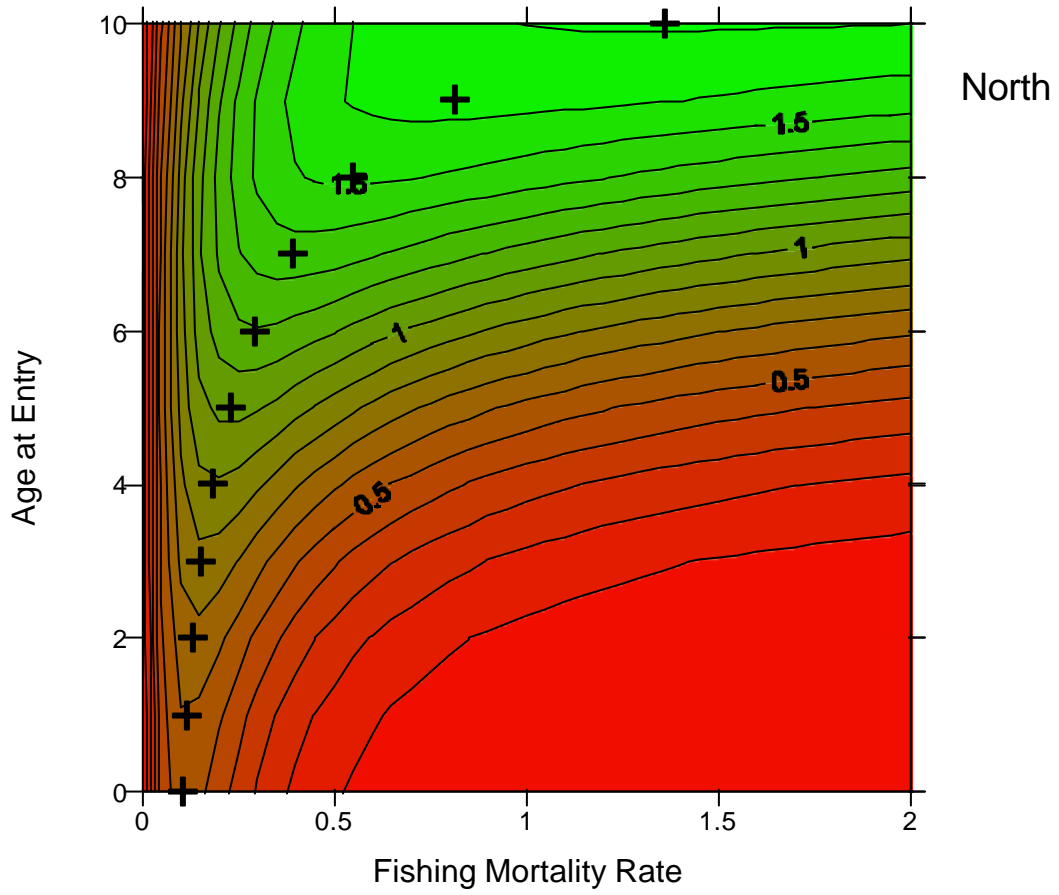
Figure C87. Yield-per-recruit for varying age at entry (with selection ogive) and fishing mortality rates.

SAW 34 Consensus Summary of Assessments