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Northeast Area Monitoring and Assessment Program (NEAMAP) Data collection and analysis in support of single and multispecies stock assessments in the Mid-Atlantic: Northeast Area Monitoring and Assessment Program Near Shore Trawl Survey Final Report

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Northeast Area Monitoring and Assessment Program (NEAMAP)

Data collection and analysis in support of single and multispecies stock assessments in the Mid-Atlantic: Northeast Area Monitoring and Assessment Program Near Shore Trawl Survey

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Introduction

Concerns regarding the status of fishery-independent data collection from continental shelf waters between Cape Hatteras, North Carolina and the U.S. / Canadian border led the Atlantic States Marine Fisheries Commission's (ASMFC) Management and Science Committee (MSC) to draft a resolution in 1997 calling for the formation of the Northeast Area Monitoring and Assessment Program (NEAMAP) (ASMFC 2002). NEAMAP is a cooperative state-federal program modeled after the Southeast Area Monitoring and Assessment Program (SEAMAP), which has been coordinating fishery-independent data collection south of Cape Hatteras since the mid-1980s (Rester 2001). The four main goals of this new program directly address the deficiencies noted by the MSC for this region and include 1) developing fishery-independent surveys for areas where current sampling is either inadequate or absent 2) coordinating data collection among existing surveys as well as any new surveys 3) providing for efficient management and dissemination of data and 4) establishing outreach programs (ASMFC 2002). The NEAMAP Memorandum of Understanding was signed by all partner agencies by July 2004.

One of the first major efforts of the NEAMAP was to design a trawl survey that would operate in the coastal zone (i.e., between the 6.1 m and 27.4 m depth contours) of the Mid-Atlantic Bight (MAB - i.e., Montauk, New York to Cape Hatteras, North Carolina). The National Marine Fisheries Service (NMFS), Northeast Fisheries Science Center's (NEFSC) Bottom Trawl Survey had been sampling from Cape Hatteras to the U.S./Canadian border in waters less than 366 m since 1963 (NEFSC 1998, R. Brown, NMFS, pers. comm.), with areas inshore of the 27.4 m contour sampled at lower densities than desired to assess coastal species managed by the Atlantic States Marine Fisheries Commission. In addition, of the six coastal states in the MAB, only New Jersey conducts a fishery-independent trawl survey in its coastal zone (Byrne 2004). The NEAMAP Near Shore Trawl Survey was therefore developed to address this gap in fishery-independent survey coverage, which is consistent with the program goals. The main objectives of this new survey were defined to include the estimation of abundance, biomass, length frequency distribution, age-structure, diet composition, and various other assessment-related parameters for fishes and select invertebrates inhabiting the survey area.

In early 2005, the ASMFC received $250,000 through the Atlantic Coastal Fisheries Cooperative Management Act (ACFCMA) and made these funds available for pilot work designed to assess the viability of the NEAMAP Near Shore Trawl Survey. The Virginia Institute of Marine Science (VIMS) provided the sole response to the Commission's request for proposals and was awarded the contract for this work in August 2005. VIMS conducted two brief pre-pilot cruises and a full pilot survey in 2006 (Bonzek *et al*. 2007).

Following a favorable review of the pilot sampling, the ASMFC bundled funds from a combination of sources in an effort to provide the resources necessary to support the initiation of full-scale sampling operations for NEAMAP. The ASMFC awarded VIMS this new contract in the late spring of 2007, and the first full NEAMAP cruise was scheduled for fall 2007.

Two significant changes to the NEAMAP survey area were implemented prior to this first full-scale cruise:

- In 2007, the NEFSC took delivery of the *FSV Henry B. Bigelow*, began preliminary sampling operations with this new vessel, and determined that this boat could safely operate in waters as shallow as 18.3 m. NEFSC personnel then determined that future surveys would likely extend inshore to that depth contour (R. Brown, NMFS, pers. comm.). The NEAMAP Operations Committee subsequently decided that the offshore boundary of the NEAMAP survey between Montauk and Cape Hatteras should be realigned to coincide with the inshore boundary of the NEFSC survey, and that NEAMAP should discontinue sampling between the 18.3 m and 27.4 m contours in these waters.
- The NEFSC contributed an appreciable amount of funding toward NEAMAP full implementation with the provision that Block Island Sound (BIS) and Rhode Island Sound (RIS), regions that were under-sampled at the time, be added to the NEAMAP sampling area. These waters are deeper than those sampled along the coast by NEAMAP; however, the offshore extent of sampling in these sounds (with respect to distance from shore) is consistent with that along the coast. The NEAMAP Survey has sampled BIS and RIS since the fall of 2007 and intends to continue to do so.

VIMS acquired funding for full sampling (i.e., two cruises, one in the spring and one in the fall, each covering the entire survey range) in 2008 from two sources, ASMFC "Plus-up" funds and Research Set-Aside (RSA) quota provided by the Mid-Atlantic Fishery Management Council and the National Oceanographic and Atmospheric Administration (NOAA). ASMFC "Plus-up" was used for the spring survey, while the proceeds derived from the auction of RSA quota supported the fall cruise. All sampling in 2009 and 2010 was funded through the Mid-Atlantic RSA Program; for 2011 (and 2012), partial support (approximately 20%) was gained though the Commercial Fisheries Research Foundation (CFRF) for operations in BIS and RIS. This report summarizes the results of the both the spring and fall 2011 survey cruises and for some analyses includes data for all prior cruises.

Methods

The following protocols and procedures were developed by the ASMFC NEAMAP Operations Committee, Trawl Technical Committee, and survey personnel at VIMS and approved through an external peer review of the NEAMAP Trawl Survey. This review was conducted in December 2008 in Virginia Beach, Virginia, and all associated documents are currently available (Bonzek *et al.* 2008, ASMFC 2009). While the review found no major deficiencies with the survey, some recommendations were offered to improve data collection both in the field and in the laboratory. Efforts to implement these suggestions are ongoing and are discussed in the following sections where they occur.

Stratification of the Survey Area / Station Selection

Sampling sites are selected for each cruise of the NEAMAP Near Shore Trawl Survey using a stratified random design. During the planning stages of the survey, the Operations Committee and personnel at VIMS developed a stratification scheme for the survey area. Because the

NEFSC sampled these same waters for decades prior to the arrival of the *Bigelow*, and since the NEAMAP Survey is effectively viewed as an inshore compliment to the NEFSC Bottom Trawl Surveys, consistency with the historical strata boundaries used by the NEFSC for the inshore waters of the MAB and Southern New England (SNE) was the primary consideration. Alternate stratification options for the near shore coastal zone (i.e., NEAMAP sampling area) were also open for consideration, however, given NEFSC plans to reevaluate the stratification of their survey area in the near future.

An examination of NEFSC inshore strata revealed that the major divisions among survey regions (latitudinal divisions from New Jersey to the south, longitudinal divisions off of Long Island and in BIS and RIS) generally correspond well with major estuarine outflows (Figure 1). These boundary definitions were therefore adopted for use by the NEAMAP Survey; minor modifications were made to align regional boundaries more closely with state borders. Evaluation of the NEFSC depth strata definitions, however, indicated that in some areas (primarily in the more southern regions) near shore stratum boundaries did not correspond well to actual depth contours. NEAMAP depth strata were therefore redrawn using depth sounding data from the National Ocean Service and strata ranges of 6.1 m - 12.2 m and 12.2 m - 18.3 m from Montauk to Cape Hatteras, and 18.3 m - 27.4 m and 27.4 m - 36.6 m in BIS and RIS. Following the delineation of strata, each region / depth stratum combination was subdivided into a grid pattern, with each cell of the grid measuring 1.5 x 1.5 minutes (1.8 nm^2 , corrected for the difference in nm per degree of longitude at the latitudes sampled by the survey) and representing a potential sampling site.

One of the main goals of the NEAMAP trawl survey is to increase fishery-independent sampling intensity in the nearshore zone of the MAB and SNE. When designing the survey, it was decided that the target sampling intensity would be approximately 1 station per 30 nm^2, a moderately high intensity when compared with other fishery-independent trawl surveys operating along the US East Coast. This intensity, when applied to the NEAMAP survey area, results in the sampling of 150 sites per cruise. The number of cells (sites) to be sampled in each stratum during each survey cruise was then determined by proportional allocation, based on the surface area of each stratum (Table 1). A minimum of 2 sites was assigned to smallest of the strata (i.e., those receiving less than 2 based on proportional allocation).

Prior to each survey, a SAS program is used to randomly select the cells to be sampled from each region / depth stratum during that cruise (SAS, 2002). Again, the number of cells selected in a particular stratum is proportional to the surface area of that stratum. Once these 150 ‘primary’ sampling sites (i.e., those to be sampled during the upcoming cruise) are generated, the program is run a second time to produce a set of ‘alternate’ sites. In instances where sampling a primary site is not possible due to fixed gear, bad bottom, vessel traffic, etc., an alternate site is selected in its stead. If an alternate is sampled in the place of an untowable primary, the alternate is required to occupy the same region / depth stratum as the aberrant primary. Usually, the alternate chosen is the closest towable alternate to that primary. The actual locations sampled during both 2011 cruises are provided (Figure 2.).

Table 1. Number of available sampling sites (Num. cells) in each region / depth stratum along with the number selected for sampling per stratum per cruise (Stations sampled). Totals for each region, along with surface area (nm^2) and sampling intensity (nm^2 per Station) are also given.

Region	State*	Stations Sampled								Totals			nm^2 per Station
		6.1m-12.2m		12.2m – 18.3m		18.3m – 27.4m		27.4m –36.6m					
		Stations sampled	Num. cells	Stations sampled	Num. cells	Stations sampled	Num. cells	Stations sampled	Num. cells	Stations sampled	Num. cells	nm^2**	
RIS	RI					6	85	10	161	16	246	553.2	34.6
BIS	RI					3	42	7	88	10	130	291.9	29.2
1	NY	0	0	2	19					2	19	42.3	21.2
2	NY	2	8	3	19					5	27	57.9	11.6
3	NY	2	16	3	28					5	44	95.4	19.1
4	NY	2	16	3	29					5	45	100.7	20.1
5	NY	2	27	3	45					5	72	160.6	32.1
6	NJ	2	20	3	42					5	62	132.1	26.4
7	NJ	4	49	6	97					10	146	318.9	31.9
8	NJ	2	32	7	90					9	122	269.2	29.9
9	DE	4	53	8	113	5	68			17	166	523.9	30.8
10	MD	2	33	8	114					10	147	324.3	32.4
11	VA	5	62	8	122					13	184	408.2	31.4
12	VA	5	60	4	67					9	127	280.2	31.1
13	VA	6	94	10	142					16	236	523.7	32.7
14	NC	2	24	5	61					7	85	180.8	25.8
15	NC	2	25	4	55					6	80	165.7	27.6
Total		42	519	77	1043	14	195	17	249	150	1938	4429.0	29.5

* Note that region boundaries are not perfectly aligned with all state boundaries:

- Some stations in RI Sound may occur in MA
- Some stations in BI Sound may occur in NY
- Region 5 spans the NY-NJ Harbor area
- Some stations in Region 9 may occur in NJ

** Calculation does not account for decreases in distance per minute of longitude as latitude increases.

Species Priority Lists

During the survey design phase, the NEAMAP Operations Committee developed a set of species priority lists intended to guide catch processing and sample collection. Species of management interest in the MAB and SNE were to be of top priority and taken for full processing (see *Procedures at Each Station* below) at each sampling site in which they were collected (Table 2). Initially, this list was subdivided into Priority ‘A’, ‘B’, and ‘C’ so that if time and/or resources became limited, species could be eliminated from full processing in a manner that would preserve the most important species (i.e., Priority ‘A’) at the expense of those of lesser interest (‘B’ and ‘C’ species). In practice, because survey personnel work quickly and efficiently, time constraints are not an issue and it has never been necessary to eliminate any of the Priority ‘B’ or ‘C’ species from full processing. Because the species on each of these lists have been and will continue to be treated as though they are all ‘A’ species, the ‘B’ and ‘C’ designations were eliminated and all of these species were included as ‘A’ list. For all other fishes (here called Priority ‘D’), aggregate weights and individual length measurements, at a minimum, are recorded. A third category ('E') includes species which require special handling, such as sharks (other than dogfish) and sturgeon, which are measured, weighed, tagged, and released. Select invertebrates of management interest are also Priority 'E' species; individual length, weight, and sex are recorded, at a minimum, from these.

Table 2. Species priority lists (A list only – includes all species from the A-C categories presented in previous reports).

A LIST			
Alewife	*Alosa pseudoharengus*	Pollock	*Pollachius virens*
All skate species	*Leucoraja sp. & Raja sp.*	Red drum	*Sciaenops ocellatus*
American shad	*Alosa sapidissima*	Scup	*Stenotomus chrysops*
Atlantic cod	*Gadus morhua*	Silver hake	*Merluccius bilinearis*
Atlantic croaker	*Micropogonias undulatus*	Smooth dogfish	*Mustelus canis*
Atlantic herring	*Clupea harengus*	Spanish mackerel	*Scomberomorus maculatus*
Atlantic mackerel	*Scomber scombrus*	Speckled trout	*Cynoscion nebulosus*
Atlantic menhaden	*Brevoortia tyrannus*	Spiny dogfish	*Squalus acanthias*
Black drum	*Pogonias cromis*	Spot	*Leiostomus xanthurus*
Black sea bass	*Centropristis striata*	Striped bass	*Morone saxatilis*
Blueback herring	*Alosa aestivalis*	Summer flounder	*Paralichthys dentatus*
Bluefish	*Pomatomus saltatrix*	Tautog	*Tautoga onitis*
Butterfish	*Peprilus triacanthus*	Weakfish	*Cynoscion regalis*
Haddock	*Melanogrammus aeglefinus*	Winter founder	*Pseudopleuronectes americanus*
Monkfish	*Lophius americanus*	Yellowtail flounder	*Limanda ferruginea*

Gear Performance

The NEAMAP Survey uses the 400 x 12cm, three-bridle four-seam bottom trawl designed by the Mid-Atlantic / New England Fishery Management Council Trawl Survey Advisory Panel for all sampling operations. This net is paired with a set of Thyboron, Type IV 66" doors. Wingspread, doorspread, and headrope height were monitored during each tow of the spring and fall 2011 cruises using a digital Netmind® Trawl Monitoring System. Bottom contact of the footgear was also evaluated using the Netmind system. Wingspread sensors were positioned on the middle 'jib' of the net, which is consistent with NEFSC procedures for this gear, and doorspread sensors were mounted in the trawl doors according to manufacturer specifications. The headrope sensor was affixed to the center of the headline. The bottom contact sensor, which is effectively an inclinometer, was attached to the center of the footrope and used to evaluate the timing of the initial bottom contact of the footgear at the beginning of a tow, liftoff of the footgear during haulback, and the behavior of the gear throughout each tow. The inclusion of this bottom contact sensor was based on the recommendations of the NEAMAP peer review panel. The bottom contact sensor was attached for all tows during the fall of 2009 and the resulting data confirmed that the net was on the bottom at the proper phases of each tow. Due to the relative complexity in attaching and detaching this sensor before and after each tow, in 2011 the sensor was used for only one tow per stratum per cruise. A catch sensor was mounted in the cod-end, and set to signal when the catch reached approximately 2,200 kg. GPS coordinates and vessel speed were recorded every 2 seconds during each tow. These data were used to plot tow tracks for each station.

It is important to note that, while the performance of the survey gear had been recorded on all previous cruises, NEAMAP began to use these data to assess tow validity in 2009. The peer review panel recommended that acceptable ranges be defined for headrope height and wingspread such that if the average value of either or both of these parameters for a given tow fell outside of these ranges, the tow be considered invalid, the catch discarded, and a re-tow of the sampling site be initiated. Doorspread was not included since doorspread and wingspread are typically highly correlated (Gómez and Jiménez 1994). Such a procedure is intended to promote consistency in the performance of the survey gear and resulting catch data. The review panel and VIMS personnel agreed that 4.7 m to 5.8 m would be an appropriate range for headrope height while 12.3 m to 14.7 m would be acceptable for wingspread. These values were generated by adding to the optimal ranges of each parameter (defined by the Trawl Survey Advisory Panel), 5% of the midpoint of each range. This use of trawl performance to assess tow validity was used successfully during both the spring and fall 2011 survey cruises, and it was not necessary to discard any tows due to poor gear performance.

Procedures at Each Sampling Site

The *F/V Darana R* served as the sampling platform for all field operations in 2011 as well as for all previous surveys (both pilot and full-scale cruises). This vessel is a 27.4 m (waterline length) commercial stern-dragger, owned and operated by Captain James A. Ruhle, Sr. of Wanchese, North Carolina.

All fishing operations were conducted during daylight hours. Standard tows were 20 minutes in duration with a target tow speed of 3.0 kts. During the spring 2011 cruise, three tows were truncated at less than the full 20 minutes, one due to triggering of the catch sensor (17 minutes), and two due to logistical constraints (15 and 19 minutes). Five tows were shortened during the fall 2011 cruise, two due to the catch sensor activating (17 and 19 minutes) and three others due factors such as fixed gear and grass or mud buildup in the net, as evidenced by the net measurements contracting to reach the predefined limits (18, 18, and 19 minutes).

At each station, several standard variables were recorded. These included:

- *Station identification parameters* - date, station number, stratum, station sampling cell number.
- *Tow parameters* - beginning & ending tow location, vessel speed & direction, engine RPMs, duration of tow, water depth, current direction.
- *Gear identification and operational parameters* - net type code & net number, door type code & door numbers, tow warp length, trawl door spread, wing spread, headline height & bottom contact of the footgear.
- *Atmospheric and weather data* - air temperature, wind speed & direction, barometric pressure, relative humidity, general weather state, sea state.
- *Hydrographic data* - water temperature, salinity, and dissolved oxygen.

Upon arrival at a sampling site, the Captain and Chief Scientist jointly determined the desired starting point and path for the tow. Flexibility was allowed with regard to these parameters so that a complete tow (i.e., 20 minutes in duration) could be executed while remaining within the boundaries of the defined cell.

Vessel crew personnel were responsible for all of the fishing-related aspects of the survey (gear handling, maintenance, repair, etc.). The Captain and Chief Scientist were charged with determining the amount of wire to be set by the winches; for a given tow, the lengths deployed from each winch were equal and a function of water depth (Table 3). One scientist was present in the wheelhouse during deployment and retrieval of the trawl. For the set-out, the Captain would signal when the winch breaks were engaged; this marked the beginning time of the tow. At this point, the scientist would activate the Netmind software, the tow track recording software, and the digital countdown timer clock (used to record tow time).

Table 3. Relationship between warp length and water depth used by the NEAMAP Near Shore Trawl Survey.

Water Depth (m)	Warp Length (fm)
<6.1	65
6.1 - 12.2	70
12.2 - 36.6	75
>36.6	100

At the conclusion of each tow, the scientist signaled the Captain when the clock reached zero time, haul-back commenced, and the Netmind and tow track programs were stopped. Average headrope height and wingspread were then calculated to assess tow validity. Assuming that gear performance was acceptable, vessel crew dumped the catch into one of two sorting pens (depending on the size of the catch) for processing. Otherwise, a re-tow of the sampling site would be initiated (this was not necessary in 2011).

Hydrographic data were recorded at the end of each tow while the vessel was stationary and the fishing crew emptied the catch. This protocol was developed as a time-saving mechanism; prior to 2010 these data were collected preceding setting the gear, resulting in a pause in net streaming (and therefore survey operations) while instruments were deployed and these data were recorded. Measurements were taken at approximately 1 m below the surface, at 2m of depth, then at approximately 2m depth intervals, and finally at 0.5 m to 1 m above the bottom.

Each catch was sorted by species and modal size group (e.g., small, medium, and large size) within species. Aggregate biomass (kg) and individual length measurements were recorded for each species-size group combination of the Priority 'D' species. For Priority 'A' species, a subsample of five individuals from each size group was selected for full processing (see next paragraph). For some very common Priority 'A' species including spot (*Leiostomus xanthurus*), Atlantic croaker (*Micropogonias undulatus*), skates, and dogfishes, only three individuals per size group were sampled for full processing.

Data collected from each of these subsampled specimens included individual length (mm fork length where appropriate, mm total length for species lacking a forked caudal fin, mm pre-caudal length for sharks and dogfishes, mm disk width for skates), individual whole and eviscerated weights (measured in grams, accuracy depended upon the balance on which individuals were measured), and macroscopic sex and maturity stage (immature, mature-resting, mature-ripe, mature-spent) determination. Stomachs were removed (except for spot and butterfish; previous sampling indicated that little useful data could be obtained from the stomach contents of these species) and those containing prey items were preserved for subsequent examination. Otoliths or other appropriate ageing structures were removed from each subsampled specimen for later age determination. For the Priority 'A' species, all specimens not selected for the full processing were weighed (aggregate weight), and individual length measurements were recorded as described for Priority 'D' species above.

Following the recommendation of the peer review panel, the NEAMAP Survey began recording individual length, weight, and sex from an additional 15 specimens per size-class per species per tow from the following fishes: black sea bass (*Centropristis striata*), summer flounder (*Paralichthys dentatus*), striped bass (*Morone saxatilis*), winter flounder (*Pseudopleuronectes americanus*), skates, and dogfishes. These species were chosen because either they are known to exhibit sex-specific growth patterns or sex determination through the examination of external characters is possible.

In the event of a large catch, appropriate subsampling methods were implemented (Bonzek *et al.* 2008). In accordance with recommendations of the NEAMAP peer review panel, improved subsampling methods to more closely approximate random sampling procedures were implemented in 2009 and continued throughout 2011.

Laboratory Methods

Otoliths and other appropriate ageing structures were (and are in the process of being) prepared according to methodology established by the NEFSC, Old Dominion University, and VIMS. Typically, one otolith was selected and mounted on a piece of 100 weight paper with a thin layer of *Crystal Bond*. A thin transverse section was cut through the nucleus of the otolith, perpendicular to the sulcal groove, using two *Buehler* diamond wafering blades and a low speed *Isomet* saw. The resulting section was mounted on a glass slide and covered with *Crystal Bond*. If necessary, the sample was wet-sanded to an appropriate thickness before being covered. Some smaller, fragile otoliths were read whole. Both sectioned and whole otoliths were most commonly viewed using transmitted light under a dissecting microscope. Other structures such as vertebrae, opercles, and spines were processed and read using the standardized and accepted methodologies for each. For all hard parts, ages were assigned as the mode of three independent readings, one by each of three readers, and were adjusted as necessary to account for the timing of sample collection and mark formation.

Stomach samples were (and are being) analyzed according to standard procedures (Hyslop 1980). Prey items were identified to the lowest possible taxonomic level. Experienced laboratory personnel are able to process, on average, approximately 60 to 70 stomachs per person per day.

Analytical Methods

Abundance Indices: The methodology employed to calculate relative abundance indices for the NEAMAP survey has evolved with nearly every annual report and is still being developed.

- Initially, as it was considered impractical to report point estimates with only one or two data points, abundance was reported as 'minimum trawlable abundance' by state. These were area-expanded area-swept calculations and helped show the general pattern of distribution of species of interest (Bonzek *et al*., 2007).
- Catch data from fishery-independent trawl surveys tend not to be normally distributed. Preliminary analyses of NEAMAP data showed that, at least for some species, these data followed a log-normal distribution. As a result, following reports utilized the stratified geometric mean of catch per standard area swept, including catch data from all stations for every species so analyzed, as an appropriate form for the abundance indices generated by this survey (Bonzek *et al.* 2009).
- The next iteration involved making two simultaneous changes to the methodology used for calculating abundance indices. First, due to the small number of years sampled through 2009, as stated above, prior abundances had been calculated using data from all survey strata, for all species. Given the broad geographic range of the survey, for many species this resulted in a larger than necessary number of zero values entering the calculation, as some species were rarely captured in many survey strata. These zero values both unnecessarily biased point estimates and inflated variance estimates. In 2010-2011 it was considered that enough data had been gathered over relatively warm and relatively cold years so that reasonable restrictions could be defined as to which strata were to be used for each species. Therefore strata were selected for inclusion and exclusion on a species by species basis (these defined strata can still be refined as more data are gathered in future years).
- The other change made in 2011 involved the 'transformation' and 'back-transformation' involved in calculating the geometric mean. As stated above, this and many other fishery surveys have used the geometric mean for reporting indices of abundance because survey data catch rates often approximate a log-normal distribution. However, the process of calculating the geometric mean introduces statistical anomalies in and of itself. For example, back-transformed confidence limits are non-symmetrical, and because the variance estimate itself cannot be back-transformed, coefficients of variation have to be calculated on transformed data and then reported on the back-transformed means. To address these issues, in the immediately preceding NEAMAP annual report (Bonzek 2011) we reported indices without retransforming data from the log scale. This was done on an exploratory basis and subsequently NEAMAP survey investigators recognized that the disadvantage of compression of the ranges of abundance indices due to the logarithmic scale outweighed any perceived advantages.
- For the current report, abundance estimates are presented as the (back-transformed) geometric mean, using only the strata of importance for each species.

For a given species, its abundance index for a particular survey cruise is given by:

$$\hat{N} = \exp\left(\sum_{s=1}^{n_s} \hat{A}_s \hat{\bar{N}}_s \right) \tag{1}$$

where ns is the total number of strata in which the species was captured, $\hat{A}_s$ is an estimate of the proportion of the total survey area in stratum s, and $\hat{\bar{N}}_s$ is an estimate of the loge transformed mean catch (number or biomass) of the species per standard area swept in stratum s during that cruise. The latter term is calculated using:

$$\hat{\bar{N}}_s = \frac{\sum_{t=1}^{n_{t,s}} \log_e \left(\frac{c_{t,s}}{\hat{a}_{t,s}/25000} \right)}{n_{t,s}} \tag{2}$$

where $\hat{a}_{t,s}$ is an estimate of the area swept by the trawl (generated from wing spread and tow track data) during tow t in stratum s, 25,000m^2 is the approximate area swept on a typical tow (making the quantity [$\hat{a}_{t,s}$ / 25000] approximately 1), $n_{t,s}$ is the number of tows t in stratum s that produced the species of interest, and $c_{t,s}$ is the catch of the species from tow t in stratum s.

- In addition to the overall abundance estimates, for several species in this report, either separate young-of-year (YOY) or several age-specific indices are also reported.
    - For species for which either a reliable literature source or examination of NEAMAP length-frequency plots (or both) revealed a dependable single YOY length cutoff value (separately for spring and fall surveys to allow for growth) this value was used to segregate the youngest survey age class (typically age-0 in the fall and age-1 in the spring as the species passed its assigned assessment birthdate during the succeeding winter) to calculate indices for that youngest age class. These species are alewife, Atlantic menhaden, black sea bass, blueback herring, silver hake, and smooth dogfish.
    - For species for which a sufficient numbers of otoliths have been examined to allow estimation of age-length keys, these keys were developed and the proportional age-at-size assignments were made to NEAMAP length data and age-specific abundance indices then calculated. For certain species aged specimens from other VIMS surveys were pooled with NEAMAP samples to achieve adequate sample sizes. Wherever sufficient data was available, these age-specific indices were calculated for the same age classes as were used in the most recent assessments. These species are Atlantic croaker (ages 0 – 4+), bluefish (age 0 – spring and summer cohorts separately), summer flounder (ages 0 – 7+), weakfish (ages 0 – 3+), and winter flounder (ages 1 – 7+).

- NEAMAP investigators are still evaluating alternatives for abundance index calculation. Preliminary examination of NEAMAP catches indicates that for at least some species a delta lognormal based index may best fit the underlying statistical distribution of catches. While these investigators realize that these several changes can result in a certain amount of confusion by users of these data, it is still (hopefully!) early in the NEAMAP time series and it is considered preferable to eventually make these calculations as statistically robust as they can be rather than to too-early settle on an inferior methodology simply for the sake of consistency. It was hoped that these investigations could have been completed in time for the present annual report but this was not possible.

Length-Frequency: Length-frequency histograms were constructed for each species by survey cruise using 1cm or 0.5cm length bins (depending on the size range of the species). These were identified using bin midpoints (e.g., a 25cm bin represented individuals ranging from 24.5cm to 25.4cm in length). Although these histograms are presented by survey cruise, the generation of length-frequency distributions by year, sex, sub-area, overall, and a number of other variables, is possible.

For this and several other stock parameters, data from specimens taken as a subsample (either for full processing or in the event of a large catch) were expanded to the entire sample (i.e., catch-level) for parameter estimation. Because of the potential for differential rates of subsampling among size groups of a given species, failure to account for such factors would bias resulting parameter estimates. In the NEAMAP database, each specimen was assigned a calculated expansion factor, which indicated the number of fish that the individual represented in the total sample for the station in which the animal was collected.

Age-Structure: Age-frequency histograms were generated by cruise for each of the Priority 'A' species for which age data are currently available (i.e., processing, reading, and age assignment has been completed). These distributions were constructed by scaling the age data from specimens taken for full processing to the catch-level, using the expansion factors described above. Again, while the age data are presented by survey cruise, the generation of these age-structures by year, sex, sub-area, overall, and a number of other variables (or a combination of these variables), is possible.

Diet Composition: It is well known that fishes distribute in temporally and spatially varying aggregations. The biological and ecological characteristics of a particular fish species collected by fishery-independent or -dependent activities inevitably reflect this underlying spatio-temporal structure. Intuitively, it follows then that the diets (and other biological parameters) of individuals captured by a single gear deployment (e.g., NEAMAP tow) will be more similar to one another than to the diets of individuals captured at a different time or location (Bogstad *et al*. 1995).

Under this assumption, the diet index percent by weight for a given species can be represented as a cluster sampling estimator since, as implied above, trawl collections essentially yield a cluster (or clusters if multiple size groups are sampled) of the species at each sampling site. The equation is given by (Bogstad *et al*. 1995, Buckel *et al*. 1999):

$$\%W_k = \frac{\sum_{i=1}^{n} M_i q_{ik}}{\sum_{i=1}^{n} M_i} * 100 \tag{3}$$

(3),

where

$$q_{ik} = \frac{w_{ik}}{w_i}$$

(4),

And where *n* is the total number of clusters collected of the fish species of interest, M_i is the number of that species collected in cluster *i*, w_i is the total weight of all prey items encountered in the stomachs of the fish collected and processed from cluster *i*, and w_{ik} is the total weight of prey type *k* in these stomachs.

This estimator was used to calculate the diet compositions of the NEAMAP Priority 'A' species (for those where diet data are currently available); the resulting diet descriptions are included in this report. Again, while these diets reflect a combination of data collected from the eight full-scale survey cruises (fall 2011 data are not yet available), presentations of diet by sub-area, year, cruise, size, age, etc., are possible (for those where diet data are currently available); the resulting diet descriptions are included in this report.

The percent weight (%W), percent number (%N) indices are each useful in different contexts so both are presented here. For %W and %N, only those specific prey types that reach a 1% threshold in the overall diet are shown individually. All others are summed into broader taxonomic categories (On the figures showing diets for each species, prey items which were identified to a low taxonomic level but which did not reach the 1% threshold are combined in categories labeled 'xxxxxx-other' where 'xxxxx' represents a broad taxonomic group such as crustaceans. In combination these prey types may reach well beyond the 1% threshold. Prey items that could not be identified below a broad taxonomic level are labeled 'unid xxxxxx'). Further, for these indices, closely related prey types (e.g. different species of mysids or of amphipods) are generally summed and reported together as a group.

In each diet composition figure, prey types are ordered first in descending order of percentage by weight by broad taxonomic category (e.g. fishes, crustaceans, molluscs) and within each category by descending order by weight of each specific prey type. For clarity and ease of comparison, the same order of broad taxonomic groups is maintained in the %N figure even though this may not reflect the true decreasing order by that measure (e.g. for some predator species, fishes may constitute a plurality of their diet by weight but smaller crustaceans may dominate by number).

Results

General Cruise Information / Station Sampling

The spring 2011 survey began on 24 April and ended on 21 May, while the fall cruise spanned from 22 September to 26 October. All 150 sites were sampled during each of these surveys. The number of primary and alternate sites sampled during each cruise is given both by region and overall (Table 4). At the cruise level, the rate at which alternate sites were substituted for primaries declined in 2011 from 12%-15% to about 8.5%. This was to be expected as the survey personnel gained experience fishing in questionable areas and as the data base of non-towable areas improved. Among regions within a cruise, the frequency of alternate sampling continued to be variable. In particular, and as in previous years, the sampling of alternate sites in the place of primaries occurred most often in BIS and especially in RIS for both surveys. These Sounds are notorious for their bad bottom and large fixed-gear (i.e., lobster pots) areas and, as a result, finding a 'towable lane' within a primary cell was often not possible. Lack of familiarity with these waters was also an issue; the captain of the survey vessel had not fished in these sounds prior to his involvement with NEAMAP. While the survey protocol calls for sampling of the closest suitable alternate in the event of an untowable primary, this was often not possible in the Sounds for the same reasons outlined above. It is anticipated that the rates of substitution of alternates for primaries in BIS and RIS will continue to decline in future cruises, as NEAMAP continues to accumulate information on known towable and untowable locations in these waters through both survey experience and cooperation with local industry representatives.

Outside of the Sounds, the rate of alternate sampling tended to be low though somewhat variable. The sampling of alternates in the more northern portion of the survey range (i.e., off of New York and New Jersey) was mainly due to rocky bottom and the presence of wrecks, while issues related to water depth (specifically, the lack of), were the most common cause of alternate substitution off of Virginia and North Carolina.

Table 4. Number of sites sampled in each region during the spring and fall 2011 NEAMAP cruises. The numbers of primary and alternate sites sampled in each region are given in parentheses.

Region	**Spring 2011** **Total** - (*Prim. / Alt.*)	**Fall 2011** **Total** - (*Prim. / Alt.*)	**Region**	**Spring 2011** **Total** - (*Prim. / Alt.*)	**Fall 2011** **Total** - (*Prim. / Alt.*)
RI Sound	**16** - *(10 / 6)*	**16** - (*11 / 5*)	**8**	**9** - *(9 / 0)*	**9** - (9 / *0*)
BI Sound	**10 – (***8 / 2)*	**10** - (9 / *1*)	**9**	**17** - *(16 / 1)*	**17** - *(16 / 1*)
1	**2** - *(2 / 0)*	**2** - *(2 / 0)*	**10**	**10** - *(10 / 0)*	**10** - (*10 / 0*)
2	**5** - *(5 / 0)*	**5** - *(5 / 0)*	**11**	**13** - *(13 / 0)*	**13** - (*11 / 2*)
3	**5** - *(5 / 0)*	**5** - *(5 / 0)*	**12**	**9** - *(9 / 0)*	**9** - (9 / *0*)
4	**5** - *(5 / 0)*	**5** - *(5 / 0)*	**13**	**16** - *(16 / 0)*	**16** - (*13 / 3*)
5	**5** - *(5 / 0)*	**5** - *(2 / 3)*	**14**	**7** - *(7 / 0)*	**7** - (7 / *0*)
6	**5** - *(5 / 0)*	**5** - (*5 / 0*)	**15**	**6** - *(6 / 0)*	**6** - (6 / *0*)
7	**10** - *(9 / 1)*	**10** - (9 / *1*)	**Total**	**150** - (*128 / 22*)	**150** - (*131 / 19*)

Water Temperature
Because of the relatively narrow near shore band of water sampled by NEAMAP, catches can be influenced by environmental factors that affect the movement of fish into and out of the sampling area. Most likely, bottom temperature is a driving force in the distribution and availability of many species. For each cruise, geographic information system (GIS) figures are provided which summarize the bottom temperature data recorded at each station with interpolation among stations (Figures 3A-3I). Each figure has three representations of temperature data: a) a figure at the top of each page gives the bottom temperatures averaged over all spring or fall cruises (as appropriate), b) interpolated actual measurements from the cruise, and c) a figure with the difference between a and b. From these figures it is seen that in the spring of 2008 it was warmer than average through the sampling range; the spring of 2009 most areas were cooler than average except in southern NY and northern NJ; spring 2010 had below average bottom temperatures except in the middle portion of the sampling range between mid-NJ and VA; and in spring 2011 a mixture of above and below average temperatures was seen up and down the coast. During the fall of 2007, below average temperatures were found in RIS, BIS, to a point about halfway down Long Island and considerably above average temperatures below that point; in fall 2008 temperatures were measured as about average throughout the survey range; for the fall 2009 cruise, the 2007 pattern was exactly reversed with above average temperatures found in RIS and BIS and cool to very cool from there southward; fall 2010 again saw generally average-to-slightly-below-average temperatures through the sampling area; and temperatures in fall 2011 again were near average in most locations except for a patch of very cold water at deeper stations in RIS. It is expected/hoped that future analyses of such environmental variability can help explain variability in survey catches and could even be incorporated into abundance index calculations.

Gear Performance
The NEAMAP Trawl Survey currently owns three nets (identical in design and construction) and a single set of trawl doors. Generally, NEAMAP has used one of these nets during the spring cruises and a second net during fall sampling (to date, the third net has yet to be fished) and this held true during 2011. The 'fall net' (designated net # G01) had its bottom bellies replaced, due to normal wear and tear, prior to 2010 sampling. Likewise the 'spring net' (#G02) underwent extensive repairs (bottom bellies, footrope, sweep, and traveler wires, up and down lines all replaced) due to its being torn in half off of the coast of New Jersey during the 107th tow of the spring 2009 survey. This net was returned to the manufacturer to be rebuilt according to the original specifications. Both of these nets were subjected to the NEAMAP gear certification process before being returned to service (Bonzek *et al.* 2008). VIMS currently owns only a single pair of Thyboron type IV 66" trawl doors that have been used for all sampling thus far. No excessive wear and tear has been experienced, though the rear 'knife edges' upon which the doors ride along the bottom are replaced prior to each survey.

As was observed during the pilot cruises and all previous full-scale surveys, the NEAMAP survey gear performed consistently and within expected ranges during the spring and fall 2011 cruises (Figure 4). The cruise averages for door spread (32.1m spring, 32.3 m fall), wing spread (13.6m spring, 13.4 m fall), and headline height (5.4m spring, 5.6 m fall) were within optimal ranges for the spring 2011 cruise. Average towing speed was 3.1 kts and 3.0 kts for the spring and fall cruises respectively. For both cruises, the overwhelming majority of the station averages for each of these parameters fell within the optimal ranges. It was not necessary to disregard any tows due to poor net performance.

On four consecutive tows during the fall 2011 cruise, a small tilt sensor (Star-Oddi® DST-COMP-TILT) was attached to one door which collected data on depth and door angle, both pitch (whether the door angles up or down in the direction of travel) and heel (the angle the door assumes perpendicular to the direction of travel). All four tows yielded very similar measurements. At the beginning of each tow as wire is deployed and the doors settle on the bottom, the doors are heeled in nearly flat to the bottom, indicating that they are not pulling the net open at that point. Within about 15-20 seconds of increased RPMs, the doors assume their normal condition. While at fishing speed, the doors pitch up (i.e. travel on their back third) at an average of about 12° and heel in (i.e. tops toward each other) at about 7°. At the end of a tow, within about 30 seconds of the official stop time and while the boat is slowing down, they again fall flat and are no longer performing their normal function (Figure 5).

Catch Summary

Almost 1,023,000 individual specimens (fishes and invertebrates) weighing approximately 62,000 kg and representing 149 species, including boreal, temperate, and tropical fishes, were collected during the two surveys conducted in 2011 (Table 5a & b). As expected, catches were larger and more diverse on the fall surveys relative to the spring cruises. In all, individual length measurements were recorded for 158,890 animals. Lab processing is proceeding on the 7,013 stomach samples and 10,028 ageing structures (otoliths, vertebrae, spines, opercles) collected in the field. As of the date of this report, stomachs from all cruises except for fall 2011 have been examined and prey contents identified and quantified. Likewise, preparation of ageing structures is proceeding for all species and all cruises, though ages have yet to be assigned for many species as methodology must be verified (for some species) and each specimen must be examined by three independent readers and then the final age assigned by one of two senior age readers.

A change has been implemented in ageing protocols to improve the accuracy of age determination. As noted in previous reports the NEAMAP protocol was to process all age structures collected from a given species in a given year at one time (i.e., spring and fall samples processed together after the fall survey). The aforementioned protocol was in place to facilitate ‘blind reading’ of these samples to avoid bias. Previously only the senior readers had information about the catch time and location because they must interpret otolith edge patterns in the context of the season in which the specimen was captured. As experience has been gained however, it became apparent that each reader must be aware of the season and general latitude of capture in order to correctly interpret edge patterns in relation to the time of annulus formation. No readers are aware of the specimen’s size or sex.

To assure consistency in ageing methodologies across programs, sample exchanges have been implemented between NEAMAP staff at VIMS and fish ageing personnel at the NEFSC's Fishery Biology Program in Woods Hole, MA.

Further, for two species (scup and black sea bass) for which differing structures have been used both within and among fish ageing groups, an ongoing effort has been implemented by NEAMAP personnel to assess potential differences between ages as determined by scales and otoliths. Results should be available in 2013.

Table 5a. For each species collected during the NEAMAP spring 2011 cruise, the total number and biomass of specimens caught, number measured for individual length, number sampled for ageing, and number of stomachs collected that contained prey. Species are grouped by priority level.

Priority "A" Species					
Species	Total Number Collected	Total Species Weight (kg)	Number Measured	Number for Ageing	Number of Stomachs
alewife	3,373	154.1	1,828	323	314
American shad	1,712	73.6	1,418	251	249
Atlantic cod	15	4.8	15	15	13
Atlantic croaker	10,576	349.2	890	71	62
Atlantic herring	1,563	90.6	828	169	164
Atlantic mackerel	29	0.8	29	29	29
Atlantic menhaden	1,564	59.1	328	45	45
barndoor skate	2	1.2	2	2	2
black seabass	136	61.8	136	121	86
blueback herring	77,071	957.3	2,713	226	219
bluefish	18	10.5	18	11	3
butterfish	66,089	1,464.5	17,806	766	0
clearnose skate	2,216	2,744.8	1,854	211	190
little skate	7,800	4,323.0	4,880	322	291
monkfish	14	45.4	14	14	9
scup	3,007	755.9	1,812	451	369
silver hake (whiting)	8,675	174.6	5,631	572	527
smooth dogfish	521	1,741.5	458	186	169
spiny dogfish	180	548.1	180	139	120
spot	15,390	557.0	2,416	52	0
spotted seatrout	1	0.3	1	1	0
striped bass	43	284.3	43	42	23
summer flounder	1,352	636.4	1,246	547	254
tautog	5	10.5	5	5	5
weakfish	28,701	1,476.6	2,633	227	110
winter flounder	1,672	589.5	1,549	464	424
winter skate	2,271	4,413.2	1,540	275	222
yellowtail flounder	2	0.7	2	1	1
TOTAL	**231,725**	**17,115.3**	**48,733**	**5,262**	**3,677**

Table 5a. continued.

Priority "D" Species					
Species	Total Number Collected	Total Species Weight (kg)	Number Measured	Number for Ageing	Number of Stomachs
Atlantic cutlassfish	154	3.3	154		
Atlantic stingray	2	2.9	2		
Atlantic sturgeon	16	326.3	16		
banded drum	1,397	19.7	73		
bay anchovy	46,807	137.4	5,212		
blackcheek tonguefish	4	0.2	4		
bluntnose stingray	64	413.4	64		
bullnose ray	23	106.1	23		
cownose ray	4	13.7	4		
cunner	1	0.0	1		
Etropus sp.	1	0.0	1		
eyed flounder	3	0.0	3		
fawn cusk-eel	5	0.2	5		
fourspot flounder	311	68.4	311		
gray triggerfish	1	0.9	1	1	
Gulf Stream flounder	9	0.1	9		
hogchoker	26	3.0	26		
jellyfish spp		0.9			
kingfish spp	2,098	147.2	1,216		
Leucoraja spp.	725	140.3	652		
longhorn sculpin	81	23.3	81		
northern puffer	93	7.9	93		
northern searobin	109	9.4	109		
northern stargazer	1	5.1	1		
ocean pout	243	306.4	110		
pigfish	26	1.8	26		
pinfish	26	0.6	26		
red hake	276	17.5	276		
rock crab	285	17.4	210		
rough scad	7	0.0	7		
roughtail stingray	1	3.0	1		
sea raven	20	12.2	20		
sheepshead	6	20.0	6		
silver perch	646	25.9	212		
smallmouth flounder	22	0.3	22		
smooth butterfly ray	1	6.9	1		
spotted hake	15,545	196.3	5,468		
striped anchovy	4,381	68.9	665		
striped burrfish	6	2.1	6		
striped cusk-eel	1	0.0	1		
striped searobin	27	11.1	27		
windowpane	936	214.0	936		
witch flounder	1	0.2	1	1	1
TOTAL	**73,426**	**2,109.1**	**15,117**	**N/A**	**N/A**

Table 5a. continued.

Priority "E" Species					
Species	Total Number Collected	Total Species Weight (kg)	Number Measured	Number for Ageing	Number of Stomachs
American lobster	216	67.1	216		
Atlantic angel shark	5	56.8	5		
blue crab, adult female	1	0.2	1		
blue mussel	3	0.3			
brief squid	5	0.0	5		
channeled whelk	1	0.1	1		
common spider crab	88	16.5	88		
egg case	20	0.5			
grass shrimp	7	0.0			
horseshoe crab	1,747	1,625.1	1,559		
jonah crab	3	0.5	3		
knobbed whelk	4	1.7	4		
lady crab	88	1.6	88		
loggerhead turtle	1		1		
Loligo squid	9,579	416.4	6,492		
moon snail	14	1.5			
northern shortfin squid	8	0.3	8		
potato sponge		41.8			
purple sea urchin	13	0.2			
quahog clam	17	4.0	17		
roughneck shrimp	5	0.0			
sand shrimp	25	0.1			
sand tiger shark	1	12.7	1		
sandbar shark	7	20.9	7		
sea scallop	19	1.6	19		
sea whip	2	0.0			
six spine spider crab	9	2.3	9		
slippersnails		0.0			
squid eggs		3.4			
thresher shark	1	106.0	1		
unidentified	131	0.1	131		
unidentified Asteriid sea stars	3,434	24.4			
unidentified comb jelly		7.2			
unidentified corals		0.1			
unidentified right-hand hermit crab	19	0.4			
unidentified rock crab	3	0.3	3		
unidentified spider crab	36	7.5	36		
TOTAL	**11,879**	**2,270.1**	**8,515**	**N/A**	**N/A**
CRUISE TOTAL	**317,030**	**21,495**	**72,365**	**5,262**	**3,677**

Table 5b. For each species collected during the NEAMAP fall 2011 cruise, the total number and biomass of specimens caught, number measured for individual length, number sampled for ageing, and number of stomachs collected that contained prey. Species are grouped by priority level.

Priority "A" Species					
Species	Total Number Collected	Total Species Weight (kg)	Number Measured	Number for Ageing	Number of Stomachs
alewife	27	1.2	27	13	13
American shad	13	1.3	13	13	13
Atlantic croaker	58,671	6,148.1	5,561	324	294
Atlantic herring	565	6.3	169	47	45
Atlantic mackerel	2	0.2	2	2	2
Atlantic menhaden	144	19.4	91	54	53
barndoor skate	1	0.9	1	1	1
black drum	50	30.9	50	48	15
black seabass	196	67.3	196	169	150
blueback herring	2	0.1	2	2	2
bluefish	3,885	454.9	1,887	482	295
butterfish	234,974	5,245.4	15,489	499	0
clearnose skate	1,178	1,357.3	1,110	318	291
little skate	6,293	3,729.9	3,553	259	218
monkfish	1	3.2	1	1	1
red drum	12	83.1	12	8	8
scup	64,928	1,906.3	7,944	619	586
silver hake (whiting)	1,057	35.8	503	135	130
smooth dogfish	606	616.9	606	205	200
Spanish mackerel	9	0.6	9	6	5
spiny dogfish	40	104.4	40	18	6
spot	6,407	538.3	1,394	147	0
striped bass	153	721.9	63	12	8
summer flounder	500	314.2	500	403	226
tautog	12	11.8	12	12	12
weakfish	115,593	7,556.9	10,061	796	636
winter flounder	572	186.3	572	173	126
winter skate	1,301	1,451.7	1,018	129	97
yellowtail flounder	1	0.1	1	1	1
TOTAL	**495,891**	**29,142.9**	**49,868**	**4,766**	**3,336**

Table 5b. continued.

Priority "D" Species					
Species	Total Number Collected	Total Species Weight (kg)	Number Measured	Number for Ageing	Number of Stomachs
American eel	19	2.0	19		
Atlantic bumper	67	0.3	67		
Atlantic cutlassfish	624	4.0	528		
Atlantic moonfish	2,251	10.9	781		
Atlantic spadefish	402	11.9	136		
Atlantic stingray	15	11.6	15		
Atlantic sturgeon	7	244.5	7		
Atlantic thread herring	22	0.4	22		
Atlantic torpedo	4	103.2	4		
banded drum	657	20.9	530		
barrelfish	2	0.0	2		
bay anchovy	33,401	100.0	3,311		
bigeye scad	14	0.2	14		
blackcheek tonguefish	16	0.6	16		
blue runner	397	20.6	397		
bluntnose stingray	85	215.0	85		
bullnose ray	565	641.2	524		
cownose ray	335	644.5	168		
crevalle jack	4	0.6	4		
cunner	9	3.4	9		
cusk eels	5	0.1	5		
fawn cusk-eel	4	0.2	4		
Florida pompano	1	0.2	1		
fourspot flounder	171	23.8	171		
fringed filefish	1	0.0	1		
harvestfish	774	31.1	347		
hickory shad	6	0.9	6		
hogchoker	300	20.1	194		
inshore lizardfish	275	31.7	275		
kingfish spp	10,644	1,398.8	3,245		
Leucoraja spp.	88	18.1	88		
longhorn sculpin	1	0.2	1		
lookdown	20	0.4	20		

Table 5b. continued.

Priority "D" Species (continued)					
Species	Total Number Collected	Total Species Weight (kg)	Number Measured	Number for Ageing	Number of Stomachs
mantis shrimp	1	0.1	1		
naked goby	1	0.0	1		
naked sole	1	0.0	1		
northern puffer	371	27.7	371		
northern searobin	1,323	83.3	798		
northern sennet	345	28.3	345		
northern stargazer	11	13.7	11		
orange filefish	2	0.0	2		
pigfish	693	37.5	322		
pinfish	160	9.5	160		
red hake	121	7.0	121		
rock crab	82	5.0	82		
rough scad	1,539	57.0	1,172		
roughtail stingray	48	296.4	48		
round herring	75	1.3	75		
round scad	282	9.7	282		
sea raven	3	2.1	3		
sharksucker	2	0.2	2		
sheepshead	44	212.2	44		
silver jenny	1	0.0	1		
silver perch	12,896	426.4	2,316		
smallmouth flounder	41	0.9	41		
smooth butterfly ray	77	154.9	77		
southern stingray	23	142.9	23		
Spanish sardine	4	0.1	4		
spiny butterfly ray	118	999.1	118		
spotfin butterflyfish	2	0.0	2		
spotfin mojarra	101	1.7	101		
spotted hake	4,992	514.7	3,190		
striped anchovy	73,546	932.5	5,704		
striped burrfish	108	27.2	108		
striped cusk-eel	27	1.2	27		
striped searobin	328	76.0	328		
white hake	2	0.3	2		
windowpane	1,202	189.3	1,202		
TOTAL	**149,758**	**7,820**	**28,082**	**N/A**	**N/A**

Table 5b. continued.

Priority "E" Species					
Species	Total Number Collected	Total Species Weight (kg)	Number Measured	Number for Ageing	Number of Stomachs
American lobster	106	30.2	106		
Atlantic angel shark	19	159.3	19		
Atlantic sharpnose shark	6	23.4	6		
blue crab, adult female	23	2.9	23		
brief squid	2,279	19.4	591		
brown shrimp	406	10.2	406		
channeled whelk	1	0.2	1		
common spider crab	64	1.2	64		
horseshoe crab	1,144	1,613.9	1,070		
iridescent swimming crab	1	0.0	1		
Kemp's ridley sea turtle	2		2		
knobbed whelk	3	1.9	3		
lady crab	37	1.4	37		
lesser blue crab	4	0.2	4		
loggerhead turtle	3		3		
Loligo squid	56,026	948.7	6,087		
quahog clam	15	3.4	15		
sand tiger shark	10	517.4	10		
sandbar shark	43	116.6	43		
sea scallop	51	3.5	51		
six spine spider crab	4	0.1	4		
smooth hammerhead	1	1.8	1		
spinner shark	1	3.0	1		
thresher shark	6	82.1	6		
unidentified Callinectes crab	1	0.0	1		
unidentified spider crab	4	0.3	4		
white shrimp	16	0.5	16		
TOTAL	**60,276**	**3,542**	**8,575**	**N/A**	**N/A**
CRUISE TOTAL	**705,925**	**40,504**	**86,525**	**4,766**	**3,336**
YEARLY TOTAL	**1,022,955**	**61,999**	**158,890**	**10,028**	**7,013**

Species Data Summaries

The data summaries presented in this report include the information collected on each of the NEAMAP Trawl Survey full-scale cruises conducted to date and focus on species that are of management interest to the Mid-Atlantic Fishery Management Council. Some that are of interest to the New England Fishery Management Council and the ASMFC, or that are not managed but considered valuable from an ecological standpoint, are also included. It is important to note that these summaries represent only a subset of the biological and ecological analyses that are feasible using the data collected by the NEAMAP Survey. Several additional analyses are possible for each of the species included in this report, as well as for others that have been collected by this survey but are not presented. Some analyses (e.g., length-weight relationships, growth curves, maturity ogives) found in previous reports are excluded here in an effort to make the scope of this document somewhat manageable. Certainly, any NEAMAP information (data or analyses) requested by assessment scientists and managers would be made available in a timely manner.

For a small subset of species that are not captured in large numbers but are of particular interest or concern (Atlantic sturgeon – Figure 6A, sea turtles – Figure 6B, and coastal sharks – Figure 6C) single-page summaries of NEAMAP catches over all survey years are presented, showing geographic locations and numbers in a GIS format.

Although this report focuses on the data collected during 2011, some information from previous years is included in these species summaries to both place the 2011 data in context as well as to increase sample sizes. Relative indices of abundance are given for each species included in this report and are presented by survey as stratified logarithmic mean of catch per standard area swept. The total number and biomass collected, number sampled for individual length measurements, and numbers taken and processed for age determination and diet composition (Priority 'A' species only) are also given for each cruise. Catch distribution plots and length-frequencies are provided for these species on a per-cruise basis. Sex-specific length frequency histograms and sex ratios by size are presented for all Priority 'A' species as well as for some of the invertebrates, and were generated by combining data across all cruises (spring and fall separately). Age-frequency distributions (by cruise) and diet compositions (all cruises combined) are also included for these priority species where field collections and subsequent laboratory progress have resulted in sufficient sample sizes.

For most species, the following tables and figures are presented:

- GIS figures showing the biomass of that species collected at each sampling site for each of the 2011 cruises.
- A table presenting, for each cruise, the total number of specimens of that species collected, total biomass of these individuals, number sampled for individual length measurements, number taken for full processing (including age and stomach analysis), and the number of age and stomach samples processed to date.
- A table highlighting which strata were included for calculation of abundance indices.

- A table is shown with relative abundance indices (number and biomass) calculated as stratified geometric mean of catch per standard area swept, for all ages/sizes combined; additionally for species for which a reasonable basis for separating either the youngest age class present in the data (usually either 0 or 1) existed or age-specific data were available, separate indices are presented for these subgroupings as well. Sample sizes and percent coefficients of variation are also given.
- Figures displaying stratified geometric mean catch per standard area swept (both number and biomass) for each cruise, along with 95% confidence intervals.
- Length-frequency histograms, by cruise.
- Sex-specific length-frequency histogram for each cruise.
- Age-frequency histograms for each cruise, indicating the number caught at each age along with the year-class associated with each age group (Priority 'A' only, when available).
- For species for which adequate numbers of specimens have been aged, a figure and a table for development of an age-length key are both presented.
- Histogram of sex ratio by size group, annotated with the number of specimens examined in each size category (available only for Priority 'A' species and select invertebrates). These histograms were generated by combining data across all cruises (spring and fall separately).
- Bar plots of diet composition by weight and by number, generated using data from all survey cruises combined. The number of stomachs examined as well as the number of 'clusters' sampled (i.e., effective sample size) is provided. Diet is presented for Priority 'A' species only, when available.

Species have been arranged alphabetically in this data summary section, and a full listing of species, along with their associated table and figure numbers, is given below (Each species is followed by a code or codes that designate the management authorities responsible: A = ASMFC, M = MAFMC, N = NEFMC, S = SAFMC, X = not managed or managed individually by states.). Text associated with these tables and figures is provided following this list. Detailed descriptions of these data and analyses are included for the MAFMC-managed and selected other species, while a listing of the contents of the tables and figures is given for all others.

Species list

Alewife (*Alosa pseudoharengus*)

Atlantic Croaker (*Micropogonias undulatus*)

Atlantic Menhaden (*Brevoortia tyrannus*)

Figure 32. Atlantic menhaden biomass (kg) at each sampling site for 2011 NEAMAP cruises.

Table 19. Atlantic menhaden sampling rates and preserved specimen analysis status for each NEAMAP cruise.

Table 20. Strata used for calculation of abundance indices for American menhaden..

Table 21. Atlantic menhaden preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured and for the youngest year class captured.

Figure 33. Atlantic menhaden preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured (A) and for the youngest year class captured (B – numbers only).

Figure 34. Atlantic menhaden length-frequency distributions, by cruise.
(Blue reference lines are placed at the size cutoff values used to separate recruits from older specimens. Cutoff values – Spring 17cm, Fall 15cm - taken from http://www.asmfc.org/speciesDocuments/menhaden/reports/stockAssessments/04MenhadenPeerReviewReport.pdf.).

Figure 35. Atlantic menhaden length-frequency distributions, by cruise and sex.

Figure 36. Atlantic menhaden sex ratio, by length group, for NEAMAP Spring and Fall cruises 2007-2011.

Bay Anchovy (*Anchoa mitchilli*)

Figure 37. Bay anchovy biomass (kg) at each sampling site for 2011 NEAMAP cruises.

Table 22. Bay anchovy sampling rates for each NEAMAP cruise.

Table 23. Strata used for calculation of abundance indices for bay anchovy.

Table 24. Bay anchovy preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

Figure 38. Bay anchovy preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

Figure 39. Bay anchovy length-frequency distributions, by cruise.

Black Sea Bass (*Centropristis striata*)

Figure 40. Black sea bass biomass (kg) at each sampling site for 2011 NEAMAP cruises.

Table 25. Black sea bass sampling rates and preserved specimen analysis status for each NEAMAP cruise.

Table 26. Strata used for calculation of abundance indices for black sea bass.

Table 27. Black sea bass preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured and for the youngest year class captured.

Figure 41. Black sea bass preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured (A) and for the youngest year class captured (B – numbers only).

Figure 42. Black sea bass length-frequency distributions, by cruise (Blue reference lines are placed at the size cutoff values used to separate recruits from older specimens. Cutoff values – Spring 16cm, Fall 12cm - taken from http://mrl.cofc.edu/pdf/tr40s/Techreport43.pdf).

Figure 43. Black sea bass length-frequency distributions, by cruise and sex.

Figure 44. Black sea bass sex ratio, by length group, for NEAMAP Spring and Fall cruises 2007-2011.

Figure 45. Black sea bass diet composition, expressed as percent by weight and number collected during NEAMAP cruises in 2007 through Spring 2011.

With respect to the distribution of the catches of black sea bass, collections during the spring 2011 survey, were low and were concentrated in the northern portion of the survey area, especially in Block Island and Rhode Island Sounds though specimens were captured as far south as Region 11 in Virginia. During the fall survey catches again were also generally low, were more dispersed (ranging between RIS and Region 14 in North Carolina), and often occurred in clusters of nearby stations. Overall, the largest samples of black sea bass occurred near Block Island (Figure 40).

No consistent inter or intra-annual patterns were observed between the spring and fall survey cruises in terms of the number or biomass of black sea bass caught, although it appeared that catches may be greater in the fall (Table 25). The largest number of sea bass was collected during the Fall 2009 cruise, while the fewest were sampled during the Spring 2010 survey. In biomass units, the largest and small total amounts caught were in the Fall 2009 and Fall 2010 cruises respectively. Trawl surveys are not considered to be the ideal platforms for sampling this species, given the structure-orientated nature of sea bass and the tendency for trawl surveys to avoid towing their gear over structure. It seems, however, as though enough fish were collected by NEAMAP to extract a variety of useful information. Except for the most recent cruise, virtually all stomach samples have been analyzed; otoliths however have not yet been assigned ages pending development and verification of analytical methods.

Overall abundance indices for black sea bass appeared to show declines, both in terms of number and biomass, over the short time series, for both spring and fall surveys (Table 27, Figure 41). Variability, as measured by the coefficient of variation (CV) was generally higher for the fall surveys than for the spring, likely the result of more widespread but spotty catch rates during fall cruises, and was generally higher for biomass indices than for those based on counts. CVs ranged from 9.7% (Spring 2009, numerical index) to 49.6% (Spring 2010, biomass index). Considering the youngest age-classes captured (Age-0 in the fall, Age-1 in the spring), both surveys showed increasing trends through 2009, significant declines in 2010 followed by higher values in 20111 (Figure 41).

A broad size range (~4cm – 60cm TL among all cruises) of sea bass was collected during each of the surveys, and included both juvenile and adult specimens (Figure 42). The majority of the sea bass collected ranged between 15cm and 40cm TL, and it appeared that multiple modal size groups (likely corresponding to age-classes) were present. A 60cm sea bass, which is believed to be the maximum size for this species, was collected during the spring 2008 cruise and a second one of the same size was collected during the fall of 2010.

Black sea bass are protogynous hermaphrodites, meaning that they begin life as female and, around a certain size, switch to male. This life history characteristic is evident in the trends both in length distribution by sex (Figure 43) and in sex ratio by size (Figure 44) documented by the NEAMAP Survey. It is important to note however that this species is incompletely metagonous, meaning that some fish are actually born as males are remain so throughout their lifetime, while some females never switch to male and as is evidenced in both of the aforementioned figures.

Crustaceans comprised the largest portion (51.3% by weight, 59.4% by number) of the diet of black sea bass sampled by the NEAMAP Survey (Figure 45). This is consistent with the findings of several past studies. Rock crabs (*Cancer irroratus*), hermit crabs (superfamily *Paguroidea*), and sand shrimp (*Crangon septemspinosa*) were the main crustaceans consumed. Fishes accounted for 21.8% of the sea bass diet by weight and 16.1% by number and were represented mainly by butterfish and bay anchovy among identifiable species. Longfin inshore squid accounted for approximately 10% of the diet by both weight and number.

Blueback Herring (*Alosa aestivalis*)

Figure 46. Blueback herring biomass (kg) at each sampling site for 2011 NEAMAP cruises.

Table 27. Blueback herring sampling rates and preserved specimen analysis status for each NEAMAP cruise.

Table 28. Strata used for calculation of abundance indices for blueback herring.

Table 29. Blueback herring preliminary geometric mean indices of abundance, by number and biomass, for spring NEAMAP surveys, for all specimens captured and for the youngest year class captured.

Figure 47. Blueback herring preliminary geometric mean indices of abundance, by number and biomass, for spring NEAMAP surveys, for all specimens captured (A) and for the youngest year class captured (B – numbers only).

Figure 48. Blueback herring length-frequency distributions, by cruise (Blue reference lines are placed at the size cutoff values used to separate recruits from older specimens. Cutoff values - Spring 14cm - estimated by examination of these length frequency figures.).

Figure 49. Blueback herring length-frequency distributions, by cruise and sex.

Figure 50. Blueback herring sex ratio, by length group, for NEAMAP Spring and Fall cruises 2007-2011.

Bluefish (*Pomatomus saltatrix*)

Figure 51. Bluefish biomass (kg) at each sampling site for 2011 NEAMAP cruises.

Table 30. Bluefish sampling rates and preserved specimen analysis status for each NEAMAP cruise.

Table 31. Strata used for calculation of abundance indices for bluefish.

Table 32. Bluefish preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured and for the youngest year class captured (numbers only – spring and summer cohorts shown separately).

Figure 52. Bluefish preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured (A), for the youngest year class captured (B – numbers only) and (using fall data only) for the spring and summer age-0 cohorts separately (C – numbers only).

Figure 53. Bluefish length-frequency distributions, by cruise (Blue reference line is placed at the size cutoff value – 17cm - used to separate the spring YOY cohort – to the right of the line – from the summer YOY cohort – to the left. Age-length key values presented in Table 33 were applied to the spring cohort specimens).

Figure 54. Bluefish length-frequency distributions, by cruise and sex.

Figure 55. Bluefish age-at-length proportions for all spring vs. all fall cruises combined, showing actual and loess smoothed proportions at each 1cm length bin (Data from a single aged NEAMAP survey year pooled with samples from the VIMS ChesMMAP survey).

Table 33. Bluefish loess-smoothed age-at-length proportions for all fall cruises combined.

Figure 56. Bluefish sex ratio, by length group, for NEAMAP Spring and Fall cruises 2007-2011.

Figure 57. Bluefish diet composition, expressed as percent by weight and number collected during NEAMAP cruises in 2007 through Spring 2011.

This species was sampled throughout the NEAMAP survey range during the fall 2011 cruise. Catches tended to be largest and most consistent along the western coast of Long Island and in northern New Jersey waters. Collections of bluefish during the Spring 2011 were rare, occurring at only seven widely dispersed stations, with no catches greater than 5 specimens (Figure 51).

Bluefish are a fast-swimming, coastal pelagic species, and as such survey trawls are not deemed the most effective tool for sampling this species, especially at larger sizes. Nevertheless, appreciable amounts (number and biomass) of bluefish were caught during fall surveys and one of the four spring surveys through 2011 (few fish were sampled during the spring 2008, 2011 and 2011 surveys – Table 30).

Fall bluefish indices of overall abundance (both number and biomass) were relatively stable over the time, with low survey variability (Table 32 – Figure 52). As the species does not usually reinvade the survey area until later in the spring after survey operations are completed Indices as measured during spring cruises are likely not representative of true abundance. This is evidenced by the small number of survey strata in which the species appears in the spring and by the large percent CVs for spring cruises. It is likely that spring catches are determined more by water temperatures than by abundance.

Bluefish are believed to exhibit an extended and geographically widespread spawning season, with two distinct concentrations, one in the spring in the South Atlantic Bight and one during summer in the Middle Atlantic Bight (Kendall and Walford, 1979). This pattern results in two distinct YOY cohorts. Examination of NEAMAP length frequency plots (Figure 53) shows that these two cohorts reveal themselves in NEAMAP data and cohort strength can likely be estimated separately. Therefore, using fall survey data only, YOY indices are calculated both for all YOY fish pooled and for each cohort separately (Figure 52). Interestingly, the indices for each cohort appear to have followed substantially different trends over the time series. The spring cohort followed a mild but consistent decline between 2007 and 2010 before reaching a time series high value in 2011. Summer cohort YOY increased consistently between 2007 and 2009 before following an equally consistent decline in 2010 and 2011.

Bluefish collected during the fall surveys generally ranged from 7cm to 75cm FL (Figure 53). The sizes of the majority of the specimens sampled during each of these surveys indicate that YOY and age-1 fish were the dominant age-classes sampled. This is probably due both to the structure of the population (i.e., more younger fish available) and the ability for larger, faster bluefish to avoid the trawl. Bluefish collected during spring cruises were almost exclusively those from the previous summer cohort, though a small number of larger specimens are normally captured.

Un-aged specimens were assigned to age-classes by use of an age-length key developed from a single NEAMAP survey-year's aged samples pooled with similar specimens (343) aged by the VIMS ChesMMAP survey. Data were loess-smoothed and the smoothed values were used as the age-length key (Figure 55 – Table 33).

In neither the sex-specific length analyses (Figure 54) nor a plot of sex ratio by size (Figure 56) did bluefish exhibit any apparent sexually dimorphic trends, and ratios were approximately 1:1 (male to female) for most length groups.

As expected, the diet of bluefish collected by NEAMAP was overwhelmingly dominated by fishes, 96.9% by %W, and 92.5% by %N (Figure 57). Bay anchovy accounted for nearly half of the bluefish diet by both weight and by number. Butterfish, striped anchovy and sand lances also constituted significant amounts of the identifiable teleost prey types. The morphology and behavior of this species are well suited for a piscivorous lifestyle. Besides fishes, squid were the only other prey type accounting for any appreciable portion of bluefish diets.

Brown Shrimp (*Farfantepenaeus aztecus*)

Figure 58. Brown shrimp biomass (kg) at each sampling site for 2011 NEAMAP cruises.

Table 34. Brown shrimp sampling rates for each NEAMAP cruise.

Table 35. Strata used for calculation of abundance indices for brown shrimp.

Table 36. Brown shrimp preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

Figure 59. Bay anchovy preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

Figure 60. Brown shrimp length-frequency distributions, by cruise.

Butterfish (*Peprilis triacantus*)

Figure 61. Butterfish biomass (kg) at each sampling site for 2011 NEAMAP cruises.

Table 37. Butterfish sampling rates and preserved specimen analysis status for each NEAMAP cruise.

Table 38. Strata used for calculation of abundance indices for butterfish.

Table 39. Butterfish preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

Figure 62. Butterfish preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

Figure 63. Butterfish length-frequency distributions, by cruise.

Figure 64. Butterfish length-frequency distributions, by cruise and sex.

Figure 65. Butterfish sex ratio, by length group, for NEAMAP Spring and Fall cruises 2007-2011.

Butterfish have consistently been one of the most abundant species in collections made by the NEAMAP Trawl Survey and are ubiquitous throughout the survey's range (Figure 61). In the spring of 2011 catches were greatest in the Sounds but large collections were also made along western Long Island. Fall abundances were also high in the Sounds and low but consistent at most other sites but high in isolated locations throughout the survey area.

Catches of this species in the fall have been several times greater than those in the spring, both in terms of number and biomass (Table 37). The largest collections to date, by both number and biomass occurred during the fall 2009 survey cruise, where over a half of a million specimens, weighing more than 8,600 kg in all, were encountered. The second largest levels of catch occurred in the fall 2011 and total catch by number for all other fall cruises has been surprisingly stable, though the total biomass of this species captured in fall 2010 was over twice that in 2007 and 2008. Given the relatively consistent and abundant catches of this species by the NEAMAP gear, it is likely that butterfish were well sampled by this survey.

Butterfish fall indices of abundance exhibited a steady upward trend over the first four survey years before falling substantially in 2011, both in numbers and biomass (Table 39 - Figure 62). Spring index trends however were generally flat between 2008 and 2010 before increasing to a time series high in 2011. Estimates of index variability are quite small.

Examination of cruise-by-cruise length frequencies (Figure 63) reveals that in most years distinct year-classes may be evident. However, separate YOY indices have not been calculated here pending confirmation of age-class age-length keys or reliable distinct cutoff values. Penttila et. al (1989) estimated mean length-at-age for YOY butterfish in the fall at about 10cm, thus an age-0/age-1 cutoff value for the fall survey would be somewhat larger. Length frequencies show that the large majority of butterfish in the fall survey are smaller than about 14cm so the ‘All Specimens’ index may be a reasonable proxy for a YOY index until a reliable age-length key or specific age analyses can be completed for NEAMAP butterfish.

Butterfish sampled during spring surveys ranged from 2cm and 22cm FL (Figure 63). Two distinct modal groups, likely representing age-classes, were observed during the spring 2008 cruise; the smaller group appeared to be less abundant in 2009 and again in 2010 though in that year a larger size group appeared with a mode at about 14cm; the smaller cohort appeared again in spring 2011 survey catches. For both surveys, the majority of the specimens collected were between 8cm and 12cm FL. The overall size range encountered during the fall cruises was identical to that documented for the spring surveys, although the average size on the former tended to be smaller. Examination of inter-annual patterns indicates that the relative abundances of the two cohorts may alternate on a yearly basis.

No apparent trends were evident in the butterfish sex-specific size frequencies (Figure 64) or sex ratio by size (Figure 65); however it was not possible to accurately classify most of the fish smaller than 10cm FL due to the small size of the gonads.

Clearnose Skate (*Raja eglanteria*)

Figure 66. Clearnose skate biomass (kg) at each sampling site for 2011 NEAMAP cruises.

Table 40. Clearnose skate sampling rates and preserved specimen analysis status for each NEAMAP cruise.

Table 41. Strata used for calculation of abundance indices for clearnose skate.

Table 42. Clearnose skate preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

Figure 67. Clearnose skate preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

Figure 68. Clearnose skate width-frequency distributions, by cruise.

Figure 69. Clearnose skate width-frequency distributions, by cruise and sex.

Figure 70. Clearnose skate sex ratio, by length group, for NEAMAP Spring and Fall cruises 2007-2011.

Figure 71. Clearnose skate diet composition, expressed as percent by weight and number collected during NEAMAP cruises in 2007 through Spring 2011.

Horseshoe Crab (*Limulus polyphemus*)

Kingfish (*Menticirrhus* spp.)

Little Skate (*Leucoraja erinacea*)

Table 51. Little skate preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

Figure 81. Little skate preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

Figure 82. Little skate width-frequency distributions, by cruise.

Figure 83. Little skate width-frequency distributions, by cruise and sex.

Figure 84. Little skate sex ratio, by length group, for NEAMAP Spring and Fall cruises 2007-2011.

Figure 85. Little skate diet composition, expressed as percent by weight and number collected during NEAMAP cruises in 2007 through Spring 2011.

Longfin Inshore Squid (*Doryteuthis pealeii*)

Figure 86. Longfin inshore squid biomass (kg) at each sampling site for 2011 NEAMAP cruises.

Table 52. Longfin inshore squid sampling rates for each NEAMAP cruise.

Table 53. Strata used for calculation of abundance indices for longfin inshore squid.

Table 54. Longfin inshore squid preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

Figure 87. Longfin inshore squid preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

Figure 88. Longfin inshore squid length-frequency distributions, by cruise.

In 2011, longfin inshore squid (commonly called *Loligo* though the scientific name was recently changed) were collected nearly throughout the NEAMAP survey area in both the spring and the fall (Figure 86). In both surveys catch levels were very consistent from station to station with the exception of high catch rates at several sites in the Sounds during the fall cruise.

The abundances of *Loligo* squid encountered during the fall cruises have consistently been greater than those observed during spring (Table 52). When comparing within seasons, during the spring there appears to be a generally decreasing level of total catch; during fall cruises 2010 and 2011 had substantially lower levels of catch than the first three survey years.

Abundance indices for *Loligo* squid followed similar patterns as overall catches both in terms of number and biomass (Table 54 - Figure 87). Indices for both spring and fall vary year by year with a decreasing trend.

With respect to the sizes of specimens collected, squid caught on the spring cruises ranged from 1cm mantle length (ML) to 29cm ML (Figure 88). Most of the *Loligo* collected in fall surveys are less than 15cm while many larger specimens tend to be captured in the spring. Examination of the length frequencies reveals apparent cohorts within our catches but no attempt has yet been made to develop a distinct YOY index for NEAMAP. This may be possible with additional research.

Scup (*Stenotomus chrysops*)

Figure 89. Scup biomass (kg) at each sampling site for 2011 NEAMAP cruises.

Table 55. Scup sampling rates and preserved specimen analysis status for each NEAMAP cruise.

Table 56. Strata used for calculation of abundance indices for scup.

Table 57. Scup preliminary geometric mean indices of abundance, for all specimens captured (by number and biomass) and by age-class (numbers only) for spring and fall NEAMAP surveys. Age-specific indices for ages 1 and older calculated using fall survey data only.

Figure 90. Scup preliminary geometric mean indices of abundance, for all specimens captured (A - by number and biomass) and by age-class (B – numbers only) for spring and fall NEAMAP surveys. Age-specific indices for ages 1 and older calculated using fall survey data only.

Figure 91. Scup length-frequency distributions, by cruise (Blue reference line is placed at the size cutoff value used to separate recruits from older specimens, 14cm for Spring - estimated by examination of these length frequency figures. Age-class separation for Fall is by age-length key).

Figure 92. Scup length-frequency distributions, by cruise and sex.

Figure 93. Scup age-at-length proportions for all spring vs. all fall cruises combined, showing actual and loess smoothed proportions at each 1cm length bin.

Table 58. Scup loess-smoothed age-at-length proportions for all spring vs. all fall cruises combined.

Figure 94. Scup sex ratio, by length group, for NEAMAP Spring and Fall cruises 2007-2011.

Figure 95. Scup diet composition, expressed as percent by weight and number collected during NEAMAP cruises in 2007 through Spring 2011.

Scup were collected from throughout the survey area during the spring 2011 cruise, with the highest biomass tows being in the northern (BIS and RIS) and consistent but small catches south to nearly the mouth of Chesapeake Bay (Figure 89). During the fall 2011 survey the highest catch rates were again in RIS and BIS and catch rates were small but steady all the way to the southernmost stations.

Scup have typically been one of the most abundant species collected by the NEAMAP Trawl Survey (Table 55). Over a quarter of a million specimens were sampled during the fall 2007 cruise, weighing nearly 4,000 kg. Catches on the subsequent surveys were much smaller with respect to number but the total biomass captured in fall 2010 was even higher than that in fall 2007, evidence that those individuals captured were of a larger size. Both 2011 cruises saw the lowest levels of total catch as measured either in numbers or biomass. Even during the relative ‘down’ cruises, scup was still one of the dominant species collected. It is likely, then, that the scup population within the NEAMAP sampling area was well sampled by the survey trawl.

The abundance indices for scup showed large declines between the fall of 2007 and 2008, followed by a leveling off or small decline through 2011 (Table 57 - Figure 90). Small decreases in abundance were also seen among the spring indices over the time series. This decline between spring surveys may have been the result of the availability of this species in the sampling area. Scup move inshore to spawn during the spring, and their migration is likely triggered by temperature. In varying portions of the survey area in each year, water temperatures remained cold, throughout the time of the survey and may have affected catch rates for this species.

As the overwhelming majority of the scup collected during the fall surveys were YOY specimens (see below), the youngest-age indices tend to follow those for overall abundance. However, age-specific indices for age-1 and for ages 2+ (fall only) follow similar trends as the overall abundance estimates.

Scup sampled during the fall cruises ranged from 3cm to 41cm FL (Figure 91– difficult to see range due to scale of y-axis). As noted above, an overwhelming number of fish collected during the fall surveys were likely YOY individuals. The provisional age-length key for fall scup (Figure 93 – Table 58) assigns all specimens less than 6cm FL and a decreasing proportion up to 18cm FL to age-0. Currently the spring YOY indices are based on using a single size cutoff value of 14cm FL to assign specimens to the age-0 cohort. Generally, a broader size range and somewhat more even distribution of specimens is seen in spring surveys and a significant number of larger individuals ranging up to 43cm FL were captured.

No particular trends were evident in either sex specific length frequencies (Figure 92) or in the sex ratio of scup presented by size (Figure 94). The largest specimens collected were mainly female, but sample sizes of the bigger fish are relatively small, so it would be necessary to collect additional information prior to drawing any conclusions.

Crustaceans accounted for about 54% of the scup diet composition by weight and 61% by number (Figure 95). Amphipods and small, shrimp-like animals were the dominant prey types within this category. Of the remaining prey categories, worms accounted for roughly 15% (by %W and %N) of the diet, with fishes and molluscs at about 6% or less.

Silver Hake (*Merluccius bilinearis*)

Figure 96. Silver hake biomass (kg) at each sampling site for 2011 NEAMAP cruises.

Table 59. Silver hake sampling rates and preserved specimen analysis status for each NEAMAP cruise.

Table 60. Strata used for calculation of abundance indices for silver hake.

Table 61. Silver hake preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured and for the youngest year class captured (numbers only).

Figure 97. Silver hake preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured (A) and for the youngest year class captured (B – numbers only).

Figure 98. Silver hake length-frequency distributions, by cruise (Blue reference lines are placed at the size cutoff values used to separate recruits from older specimens. Cutoff values - Spring 14cm, Fall 17cm - estimated by examination of these length frequency figures.).

Figure 99. Silver hake length-frequency distributions, by cruise and sex.

Figure 100. Silver hake sex ratio, by length group, for NEAMAP Spring and Fall cruises 2007-2011.

Figure 101. Silver hake diet composition, expressed as percent by weight and number collected during NEAMAP cruises in 2007 through Spring 2011.

Smooth Dogfish (*Mustelus canis*)

Figure 102. Smooth dogfish biomass (kg)at each sampling site for 2011 NEAMAP cruises.

Table 62. Smooth dogfish sampling rates and preserved specimen analysis status for each NEAMAP cruise.

Spiny Dogfish *(Squalus acanthias)*

Figure 113. Spiny dogfish biomass (kg) at each sampling site for 2011 NEAMAP cruises.

Table 68. Spiny dogfish sampling rates and preserved specimen workup status for each NEAMAP cruise.

Table 69. Strata used for calculation of abundance indices for spiny dogfish.

Table 70. Spiny dogfish preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

Figure 114. Spiny dogfish preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

Figure 115. Spiny dogfish length-frequency distributions, by cruise.

Figure 116. Spiny dogfish length-frequency distributions, by cruise and sex.

Figure 117. Spiny dogfish sex ratio, by length group, for NEAMAP Spring and Fall cruises 2007-2011.

Figure 118. Spiny dogfish diet composition, expressed as percent by weight and number collected during NEAMAP cruises in 2007 through Spring 2011.

Figure 119. Spiny dogfish reproductive data; A – frequency histogram of number of embryos found in females, B – frequency histogram of embryo stages, C – length-frequency histogram of embryos.

The seasonality of the NEAMAP collections of spiny dogfish is consistent with the accepted migratory patterns of this species. These fish congregate in Mid-Atlantic waters in winter and early spring, and then migrate north in the late spring and summer. By fall, the southern extent of this species' range only overlaps with the most northeastern reaches of the NEAMAP sampling area (i.e., RIS and BIS).

The catch distribution of spiny dogfish from the 2010 NEAMAP survey cruises reflected this migratory pattern (Figure 114). In 2011 this species was largely absent from collections during the fall survey except for a small number of individuals in the northern extent of the survey range. Spiny dogfish were consistently collected through a large portion of the NEAMAP survey area (mid NJ and south) during the spring 2011 cruise, along with isolated catches near Block Island. Sites near the mouths of Delaware and Chesapeake Bays, tend to produce the largest catches of this species during fall NEAMAP surveys.

Catches of spiny dogfish by the NEAMAP Trawl Survey varied seasonally, and within seasons annual variability is high; spring collections consistently exceeded fall catches (Table 68). Approximately 1,300 specimens, weighing between 3,300 kg and 3,600 kg, were sampled during the spring cruises in 2008 and 2009 but only 249 and 180 individuals (804 kg, 548 kg) were captured in spring 2010 and 2011 respectively. Catches on the second and third fall surveys exceeded those on the first by an order of magnitude in terms of number and by two orders of magnitude with respect to weight but were almost nonexistent (4 and 40 specimens respectively) in fall 2010 and 2011.

Likewise, the abundance indices for spiny dogfish, both in terms of number and biomass, showed a slight increase between the 2008 and 2009 spring surveys before falling considerably in 2010 and 2011 (Table 70 - Figure 114). For the fall surveys, abundance with respect to biomass generally increased between 2007 and 2009 and, similarly to the spring survey, fell dramatically in 2010 and was flat in 2011. These fluctuations are as likely to be due to variability in annual migration patterns and availability to the survey as to real changes in stock size and must be used in consideration with data from other surveys.

Based on the length-frequency distributions, it appeared that both juvenile and adult dogfish were collected on most NEAMAP surveys (Figure 115). Fish sampled on the first fall survey ranged from 63cm to 88cm pre-caudal length (PCL). Those collected during the fall 2008 cruise were from 21cm to 78cm PCL, but two very distinct modal size groups were present (21cm to 36cm PCL and 52cm to 78cm PCL). These modal size groups represented the juvenile and adult fish. The length distribution documented during the fall 2009 cruise was similar, however the size range of the smaller modal group was slightly larger (i.e., 29cm PCL to 40cm PCL) that that observed in 2008. Length data for fall 2010 and 2011 was generally uninformative due to very small sample sizes. Dogfish collected on the spring 2008 survey ranged from 18cm to 87cm PCL, and two distinct modal groups were again observed. Juvenile fish, while present, were much less abundant on the spring 2009 cruise. For both spring surveys, the size range of most of the adults collected was between 55cm and 80cm PCL. Specimens collected in spring 2010 and spring 2011 had a similar length distribution but generally compacted due to a considerably smaller sample size

Spiny dogfish are known to school by sex, with males most often found in offshore waters and females typically inhabiting shallower waters. NEAMAP sex ratio by size data were consistent with this pattern; nearly all of the spiny dogfish collected across all sizes were female (Figures 116 & 117).

Approximately half of the spiny dogfish diet by both weight and number was fishes (Figure 118). The largest 'prey type' within this category was unidentifiable fish followed by a combination of 36 species of fishes, each of which individually contributed a small amount to the dogfish diet. Atlantic menhaden, striped bass, and butterfish comprised between 2% and 7% of the diet by weight. Of the remaining prey categories, molluscs (primarily *Loligo* squid) accounted for the greatest percentage of the diet of spiny dogfish.

Beginning with the spring 2010 survey cruise data on the reproductive status of spiny (and smooth) dogfish have been recorded on specimens sampled for 'full workup.' These data include number of embryos/pups present, the development stage ('candle', embryo, pups with yolk sac, pups without yolk sac) and gross weights and individual lengths of any pups present. For 2010 and 2011 combined, the number of pups present in female spiny dogfish ranged from 0 to 11 with the non-zero peak being between 4 and 6. Of those that were gravid, most were either at the 'candle' or 'pups with yolk sac' stage of development, though specimens with all four stages were noted. Length frequencies of pups seem to exhibit two distinct modal groups, one with a center at about 60cm and one at 150cm (Figure 119).

Spot (*Leiostomus xanthurus*)

Figure 120. Spot biomass (kg) at each sampling site for 2011 NEAMAP cruises.

Table 71. Spot sampling rates and preserved specimen analysis status for each NEAMAP cruise.

Table 72. Strata used for calculation of abundance indices for spot.

Table 73. Spot preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

Figure 121. Spot preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

Figure 122. Spot length-frequency distributions, by cruise.

Figure 123. Spot length-frequency distributions, by cruise and sex.

Figure 124. Spot sex ratio, by length group, for NEAMAP Spring and Fall cruises 2007-2011.

Striped Anchovy (*Anchoa hepsetus*)

Figure 125. Striped anchovy biomass (kg) at each sampling site for 2011 NEAMAP cruises.

Table 74. Striped anchovy sampling rates for each NEAMAP cruise.

Table 75. Strata used for calculation of abundance indices for striped anchovy.

Table 76. Spot preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

Figure 126. Striped anchovy preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

Figure 136. Summer flounder length-frequency distributions, by cruise.

Figure 137. Summer flounder length-frequency distributions, by cruise and sex.

Figure 138. Summer flounder age-frequency distribution, by cruise. The estimated total number collected at a given age is provided above each corresponding bar.

Figure 139. Summer flounder age-at-length proportions for all spring vs. all fall cruises combined, showing actual and loess smoothed proportions at each 1cm length bin.

Table 83. Summer flounder loess-smoothed age-at-length proportions for all spring vs. all fall cruises combined

Figure 140. Summer flounder sex ratio, by length group, for NEAMAP Spring and Fall cruises 2007-2011.

Figure 141. Summer flounder diet composition, expressed as percent by weight and number collected during NEAMAP cruises in 2007 through Spring 2011.

Summer flounder were collected from throughout the NEAMAP survey range on each of the 2011 cruises (Figure 134). A restriction of summer flounder to the southern portion of the survey area during spring, as was observed with other fishes such as sciaenids, was not seen for summer flounder as this species undertakes inshore-offshore, rather than north-south, migrations each spring and fall. For both of the survey cruises, summer flounder catches were greatest in the northern portion of the sampling area (i.e., off of the coast of Long Island and in BIS and RIS) though this pattern was more pronounced in the spring than in the fall. Small but consistent catches of summer flounder were encountered throughout the rest of survey area during both 2011 surveys. In general, however, catches became patchier and declined with decreasing latitude.

Catches of summer flounder by the NEAMAP Near Shore Trawl Survey were relatively consistent among survey cruises (500 – 1,352 specimens weighing 314 kg to 636 kg; Table 80). The number of specimens sampled during the fall 2011 survey was the smallest out of nine surveys conducted to date. It is apparent that the NEAMAP survey gear samples this species well.

After a two year decline in the numerical and biomass overall number-based indices for summer flounder exhibited an increase to a (brief) time series high in spring 2011, though the biomass index for 2011 did not quite reach the previous high value seen in spring 2008 (Table 82 – Figure 135). Fall survey numerical indices reached a high in 2009 and have declined in the following two survey years, whereas the overall biomass fall index has declined at a fairly constant, though small, rate over the time series.

Abundance indices for young-of-year (fall only) mirrored the overall abundance estimates with an increase from 2007 to 2009 and a decline in the succeeding two years. Indices for the older age groups (both spring and fall) generally followed a similar pattern, indicating that at least to some degree, NEAMAP abundance estimates for this species may be related to availability to the survey as well as to stock size.

A broad range of sizes of summer flounder were collected during the all cruises ranging from 12cm to 78cm TL, with several distinct modal size groups normally evident in each survey (Figure 136). The size ranges collected during the spring surveys were similar to those seen during the fall cruises (18cm to 78cm TL, Spring; 12cm to 76cm TL, Fall). Because the gear used by NEAMAP collects appreciable numbers of summer flounder over a broad size range, it is likely that this survey will prove to be a valuable source of information for this species into the future.

As noted in previous project reports, a distinct trend was evident in the sex ratio of summer flounder collected by NEAMAP when examined by flounder size (Figures 137, 140). Specifically, the proportion of females in the sample increased with increasing length. Females began to outnumber males at about 35cm TL, and nearly all fish greater than 60cm TL were female.

Specimens between ages 0 and 13 have been collected during the nine NEAMAP surveys to date with the large majority usually aged 3 and younger (Figure 138). Strong vs. weak year classes do not generally propagate themselves in the successive years as is often seen with other species. For example, the large number of age-0 specimens found in fall 2009 is not evident as age-1s in fall 2010, though the number of age-2s in spring 2011 is exceptionally high.

Likely due to the large sample sizes, broad age range, and careful ageing protocols, age-length keys for this species appear to be quite reliable, as the observed and regressed values for each age class follow nearly identical patterns (Figure 139 – Table 83) except at ages and sizes with very small sample sizes (e.g. large age-5 specimens in the fall survey). NEAMAP personnel have worked closely with staff at NEFSC to assure consistent ageing protocols.

Summer flounder are known piscivores, and the diet of flounder collected by NEAMAP confirmed this classification (Figure 141). Specifically, fishes accounted for 57% of the summer flounder diet by weight and 46% by number; a wide array of species comprised this category. Crustaceans (mostly small, shrimp-like animals) and molluscs (mainly *Loligo* squid) composed the remainder of the diet. A similar feeding ecology was recently documented for summer flounder in Chesapeake Bay. *Loligo* squid were absent from flounder stomachs collected in the bay, however, likely due to the relative absence of this prey from this estuary.

Weakfish (*Cynoscion regalis*)

Figure 142. Weakfish biomass (kg) at each sampling site for 2011 NEAMAP cruises.

Table 84. Weakfish sampling rates and preserved specimen analysis status for each NEAMAP cruise.

Table 85. Strata used for calculation of abundance indices for weakfish.

Table 86. Weakfish preliminary geometric mean indices of abundance, for all specimens captured and by age-class for spring and fall NEAMAP surveys.

Figure 143. Weakfish preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured (A) and for the youngest year class captured (B – numbers only).

Figure 144. Weakfish length-frequency distributions, by cruise.

Figure 145. Weakfish length-frequency distributions, by cruise and sex.

Figure 146. Weakfish age-frequency distribution, by cruise. The estimated total number collected at a given age is provided above each corresponding bar.

Figure 147. Weakfish age-at-length proportions for all spring vs. all fall cruises combined.

Table 86. Weakfish loess-smoothed age-at-length proportions for all spring vs. all fall cruises combined.

Figure 148. Weakfish sex ratio, by length group, for NEAMAP Spring and Fall cruises 2007-2011.

Figure 149. Weakfish diet composition, expressed as percent by weight and number collected during NEAMAP cruises in 2007 through Spring 2011.

In spring 2011 weakfish were captured at nearly all stations south of Chesapeake Bay and at about half of the stations between Chesapeake Bay and Delaware Bay. In the fall of 2011 this species was captured throughout the survey range but highest concentrations were found between Delaware Bay and Chesapeake Bay (Figure 142).

Catches during fall cruises are consistently higher than during the spring. The largest spring total catch was in 2008, followed by the smallest in 2009, with increasing numbers and biomass in 2010 and 2011. Numbers captured during fall surveys have followed an up and down pattern with the largest number taken in fall 2011. Fall biomass has followed a generally increasing pattern (Table 84).

Overall abundance indices for spring surveys declined sharply between 2008 and 2009 and have risen modestly in following years (2008 indices were heavily influenced by a small number of very large catches). Fall indices have alternately risen and fallen each year but perhaps with an upward overall trend. As the survey catches are dominated by age-0 and age-1 fish, the age-specific indices closely follow the patterns seen for the total catch. Spring and fall trend lines seem to follow opposite patterns of up and down years but upon further examination this may actually reveal a consistency. The young weakfish captured during fall surveys would be the same year classes captured during the following spring, so if the pattern were offset by one calendar year there would actually be good agreement in the patterns between the two time series (Figure 143).

Weakfish have been captured at sizes ranging between 5cm and 56cm. Examination of length frequencies reveals apparent length (likely age) groups but with significant overlap among modal groups. This is not surprising given the protracted spawning season of this species. Considering the known historical size range for this species the observed length frequencies are considerably compressed with the vast majority of specimens captured at less than 30cm (Figure 144).

Inspection of sex-specific length frequencies (Figure 145) and sex ratios by size group (Figure 148) reveals an approximate 50-50 sex ratio at all size groups and no pattern of sexually dimorphic growth.

As with the length frequency examination, cruise-by-cruise age-frequencies exposes a stock that appears to be both size and age compressed. In all cruises the large preponderance of captured specimens are between ages 0 and 2. A small and decreasing number of age-3 specimens have been captured and only a single age-4 weakfish has been captured (Figure 146).

Attempted development of an age-length key for NEAMAP captured weakfish also reveals an odd growth pattern. Typically the youngest and oldest age classes exhibit smooth sigmoidal patterns (in opposite directions) of proportion of age-x at size and all ages in between have a normal-shaped pattern (see Figure 139 for summer flounder). For weakfish, the youngest age classes (age-0 in the fall, age-1 in the spring) do display the smooth sigmoidal shape but for succeeding age classes the right-hand side of the normal curve never fully descends. This implies that a significant proportion of specimens are achieving a large size at younger ages. The oddly shaped curves are undoubtedly affected by small sample sizes of larger older individuals but it is apparent that some weakfish are exhibiting a very fast growth rate, perhaps due to a lack of older individuals in the stock. In order to force the age-length calculations to 'behave' in a more traditional way, all specimens greater than 38cm were pooled and indeed the curves did show somewhat more traditional shapes (Figure 147 – Table 87).

Weakfish are known to be significantly pisciverous. While this is confirmed (Figure 149) from examination of stomachs sampled by NEAMAP (46% by weight, 30% by number, dominated by species of anchovies), at the sizes of fish generally sampled by NEAMAP thus far crustaceans also contribute large portions to the diet of this species (44% by weight, 64% by number, primarily mysids).

White Shrimp (*Litopenaeus setiferus*)

Figure 150. White shrimp biomass (kg) at each sampling site for 2011 NEAMAP cruises.

Table 88. White shrimp sampling rates for each NEAMAP cruise.

Table 89. Strata used for calculation of abundance indices for white shrimp.

Table 90. White shrimp preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

Figure 151. White shrimp preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

Figure 152. White shrimp length-frequency distributions, by cruise.

Windowpane Flounder (*Scopthalmus aquosus*)

Figure 153. Windowpane flounder biomass (kg) collected at each sampling site for 2011 NEAMAP cruises.

Table 91. Windowpane flounder sampling rates for each NEAMAP cruise.

Table 92. Strata used for calculation of abundance indices for windowpane flounder.

Table 93. Windowpane flounder preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

Figure 154. Windowpane flounder preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

Figure 155. Windowpane flounder length-frequency distributions, by cruise.

Winter Flounder (*Pseudopleuronectes americanus*)

Figure 156. Winter flounder biomass (kg) collected at each sampling site for 2011 NEAMAP cruises.

Table 94. Winter flounder sampling rates and preserved specimen analysis status for each NEAMAP cruise.

Table 95. Strata used for calculation of abundance indices for winter flounder.

Table 96. Winter flounder preliminary geometric mean indices of abundance, for all specimens captured and by age-class for spring and fall NEAMAP surveys.

Figure 157. Winter flounder preliminary geometric mean indices of abundance, for all specimens captured (A - by number and biomass) and by age-class (B – numbers only) for spring and fall NEAMAP surveys.

Figure 158. Winter flounder length-frequency distributions, by cruise.

Figure 159. Winter flounder length-frequency distributions, by cruise and sex

Figure 160. Winter flounder age-frequency distribution, by cruise. The estimated total number collected at a given age is provided above each corresponding bar.

Figure 161. Winter flounder age-at-length proportions for all spring vs. all fall cruises combined.

Table 97. Winter flounder age-at-length proportions for all spring vs. all fall cruises combined.

Figure 162. Winter flounder sex ratio, by length group, for NEAMAP Spring and Fall cruises 2007-2011.

Figure 163. Winter flounder diet composition, expressed as percent by weight and number collected during NEAMAP cruises in 2007 through Spring 2011.

Winter flounder are nearly always captured in the largest numbers in the Sounds and this pattern held in 2011 (Figure 156). In spring however, this species was consistently captured down to the mid-New Jersey coast specimens were even captured at a single station in Maryland.

While significant numbers of winter flounder are seen in both spring and fall surveys, total numbers captured in spring are typically three to four times higher than in the fall. While natural variations are observed, over the survey time series thus far, catch rates for this species have been relatively constant within the seasonal surveys (Table 94). Not surprisingly then, both the overall and age-specific indices of abundance have generally varied without trend (Table 96 – Figure 157).

A wide range of sizes of winter flounder (7cm – 50cm) have been captured. Length frequency figures typically exhibit a pattern with obvious modal groups, presumably age classes, and the pattern is typically more pronounced in the fall than in the spring (Figure 158).

As is typical of many Pleuronectiform fishes, sexually dimorphic growth, with females typically growing faster and to larger maximum sizes, is seen in examination of sex-specific length frequencies (Figure 159) and sex ratios by size group (Figure 162).

Winter flounder between ages 0 (a single specimen) and 19 (2 specimens) have been captured during NEAMAP cruises. Most specimens captured are younger than age-6 to age-7. These significant numbers of aged specimens has allowed development of age-length keys for calculation of age-specific abundance indices (Figure 161 – Table 97).

Together, various worms and small crustaceans constitute 69% of winter flounder diets by weight and 85% by number. Amphipods constitute the largest identifiable prey type at 28% by weight and 58% by number.

Winter Skate (*Leucoraja ocellata*)

Figure 164. Winter skate biomass (kg) at each sampling site for 2011 NEAMAP cruises.

Table 98. Winter skate sampling rates and preserved specimen analysis status for each NEAMAP cruise.

Table 99. Strata used for calculation of abundance indices for winter skate.

Table 100. Winter skate preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

Figure 165. Winter skate preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

Figure 166. Winter skate length-frequency distributions, by cruise.

Figure 167. Winter skate length-frequency distributions, by cruise and sex.

Figure 168. Winter skate sex ratio, by length group, for NEAMAP Spring and Fall cruises 2007-2011.

Figure 169. Winter skate diet composition, expressed as percent by weight and number collected during NEAMAP cruises in 2007 through Spring 2011.

Public Outreach

In an effort to share survey information with interested parties, such as fishery managers, fishermen and those involved in support industries, other scientists, political figures, students, and the general public, NEAMAP staff use a multi-faceted approach. The centerpiece of these efforts is the survey ‘demonstration tows’, where guests are invited to observe sampling operations first hand for a few hours at sea. During these events, past project reports, current data summaries, and informational brochures are available. Approximately 100 individuals from the aforementioned groups observed survey operations both in port and in the field during layovers in New Bedford, Massachusetts, Point Judith, Rhode Island, Montauk, New York, Cape May, New Jersey and Hampton, Virginia during the 2011 survey cruises. The demonstration in New Bedford was conducted as part of that city's annual Working Waterfront Festival. With respect to political figures, 2011 guests included U.S. Senator Jack Reed from Rhode Island Kyle Strober(a staff member of U.S. Senator Charles Schumer from New York), Bob King (a staff member of Senator Mark Begich of Alaska), and Josh Bowlen (a staff member of U.S. Representative Walter Jones from North Carolina). In all, we estimate that approximately 400 guests have participated in these demonstrations since the inception of the survey in 2007. Outside of the demonstrations, dockside interactions have proven to be an excellent way to share NEAMAP survey data with the fishing communities, and these will continue.

More formally, the ASMFC maintains the official NEAMAP website (www.neamap.net – referenced in the brochures), which contains an array of background information on the survey and past reports and is expected to offer much more data in the near future. VIMS also maintains a site, www.vims.edu/fisheries/neamap, which contains several links that enable users to interact with the survey data (i.e., www.vims.edu/fisheries/fishfood). Also, staff have made thorough presentations of NEAMAP results at several Mid-Atlantic Fishery Management Council, New England Fishery Management Council, and ASMFC meetings to date. During 2011, formal presentations of survey activities and results were made for the ASMFC NEAMAP Board.

Data Utilization

While the time series of relative abundance data generated by the NEAMAP Trawl Survey is still deemed insufficient for the most part to support stock assessment efforts for the MAB and SNE, the biological and life history information that this program yields has been (or is currently being) incorporated into the assessments for various species. These include:

- Atlantic croaker
- Atlantic sea scallop
- Black sea bass
- Bluefish
- Butterfish
- Black drum
- Longfin inshore squid
- River herring
- Scup
- Sea scallop
- Skates (Clearnose, Little, and Winter)
- Summer flounder
- Spiny dogfish
- Spot
- Weakfish
- Winter flounder

It is expected that, as the time series of data collected by this survey continues to become established, the abundance data for each of these species will also begin to be incorporated into the assessment process. In fact, several assessment scientists have indicated that NEAMAP abundance data will be incorporated during the next 'round' of assessments for some of these species. Also, it is anticipated that the number of species for which assessment data is provided will expand as additional data become available and the assessments for some of the species not listed above are undertaken.

The data and samples collected by NEAMAP also support a number of collaborative efforts beyond the stock assessment process. These include:

- Inclusion of catch data from BIS and RIS into the Rhode Island Ocean Special Area Management Plan (SAMP) process
- Collection of scale samples to support striped bass scale/otolith ageing comparisons
- Collection of scale samples to support black sea bass scale/otolith ageing comparisons
- Sampling of monkfish tissue to facilitate a genetics-based population analysis
- Acquisition of whole specimens to support a library of fishes in Virginia
- Recording of acoustic data to track the movement of bats off of the MAB and SNE coasts
- Collection of spleen samples of striped bass to delineate the prevalence and severity of *Mycobacterium* infection of striped bass along the coast
- Collection of sciaenid samples in conjunction with SEAMAP to support investigations of coast-wide stock structure
- Collection of gadid samples to support investigations of stock structure.

A number of these collaborative efforts are expected to continue into the foreseeable future, and it is very likely that additional initiatives will be undertaken as the opportunities arise.

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Figure 1. NEAMAP sampling area including region boundaries and depth strata.

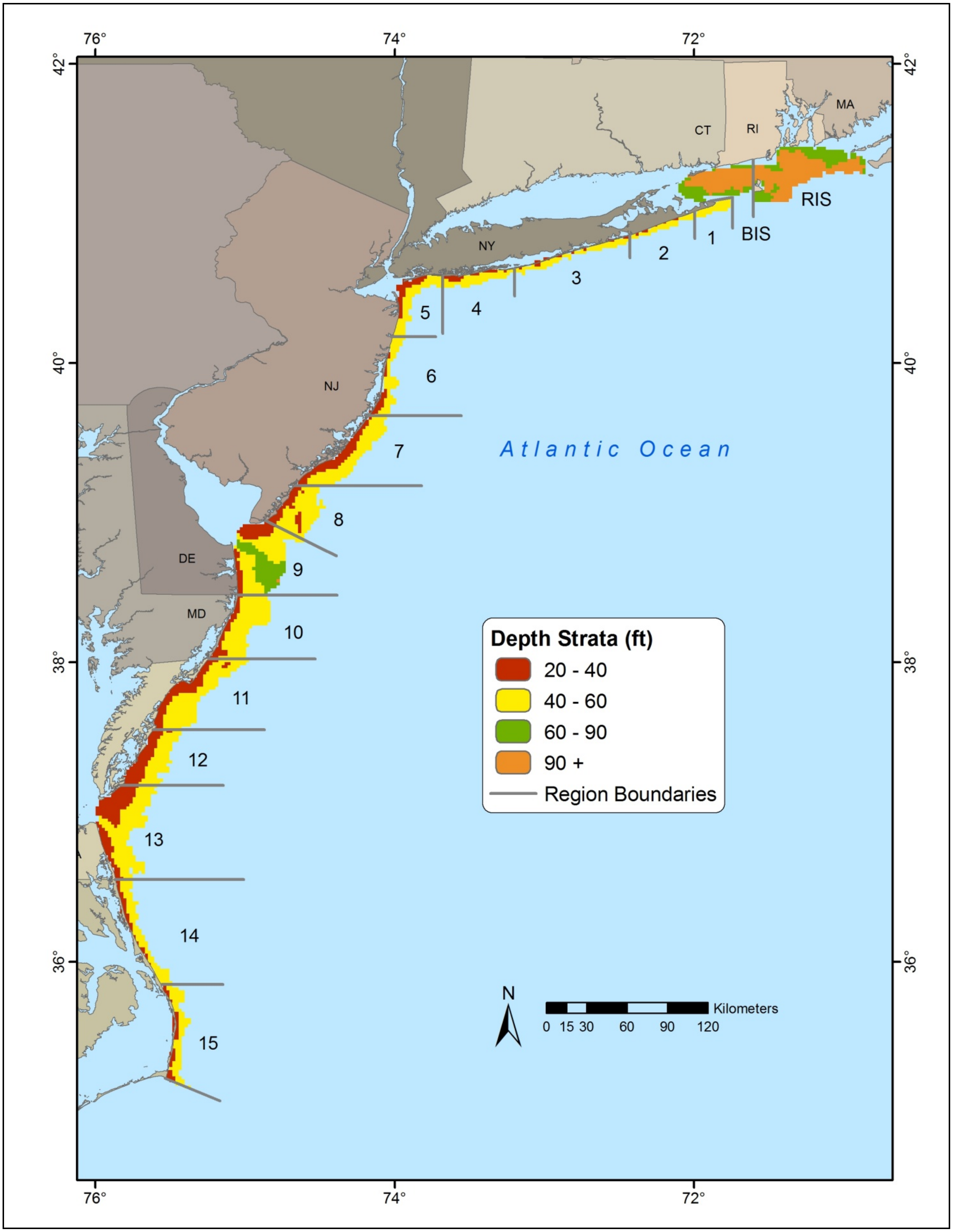


Figure 2A. NEAMAP sampling sites for the Spring 2011 cruise. Regional strata are defined by black lines, while the shapes of the station symbols indicate the depth strata occupied by each.

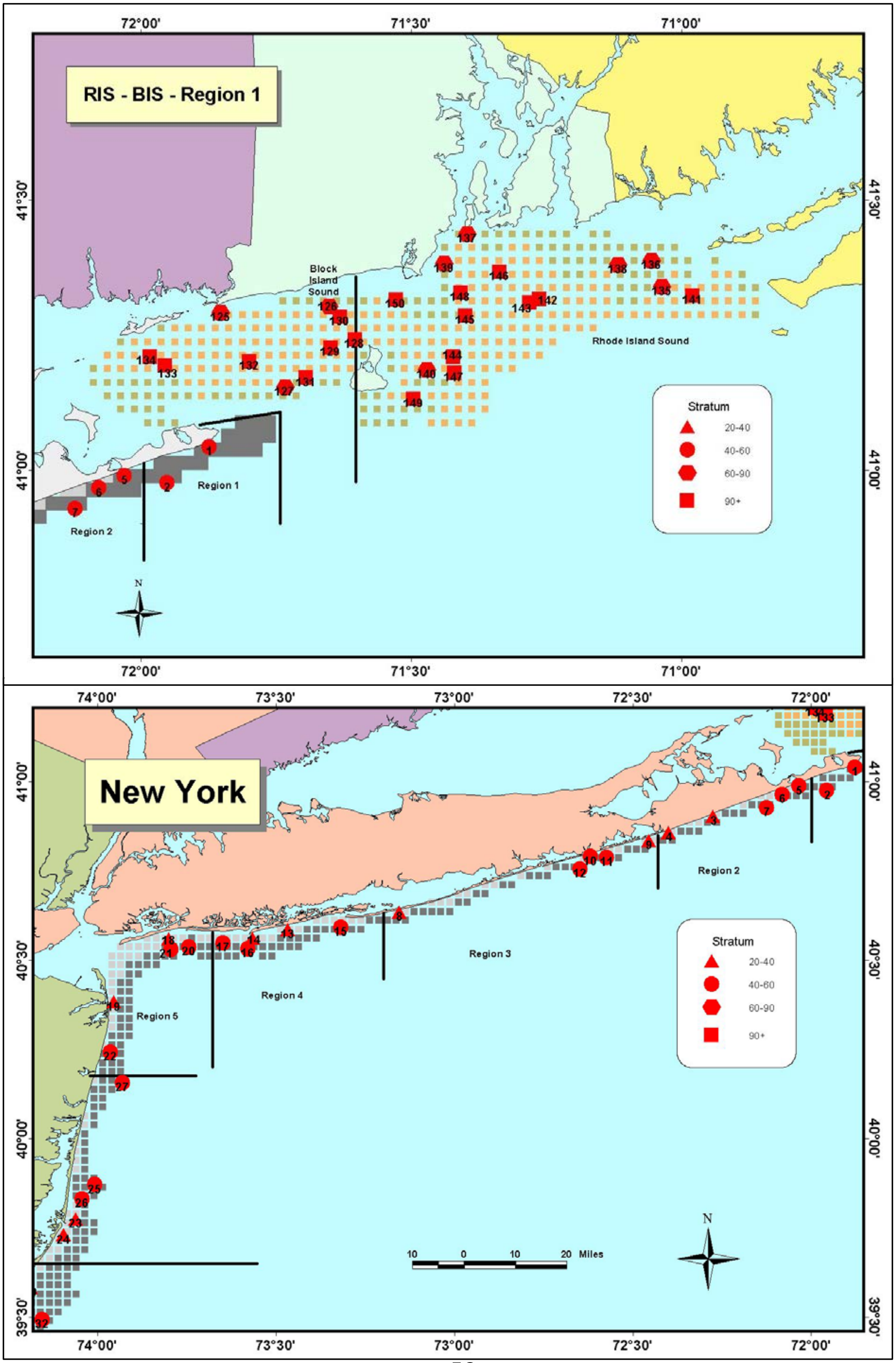


Figure 2A. continued.

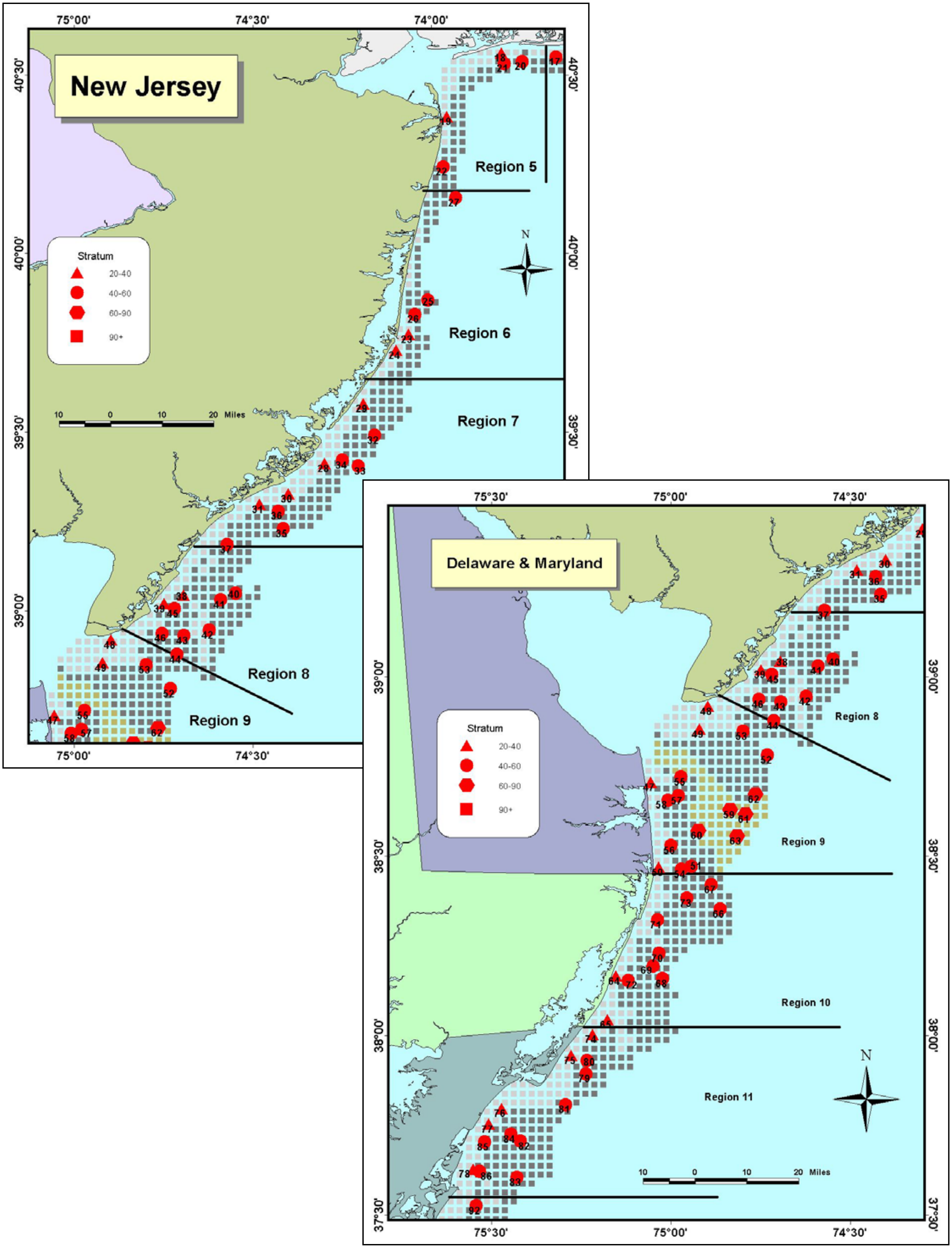


Figure 2A. continued.

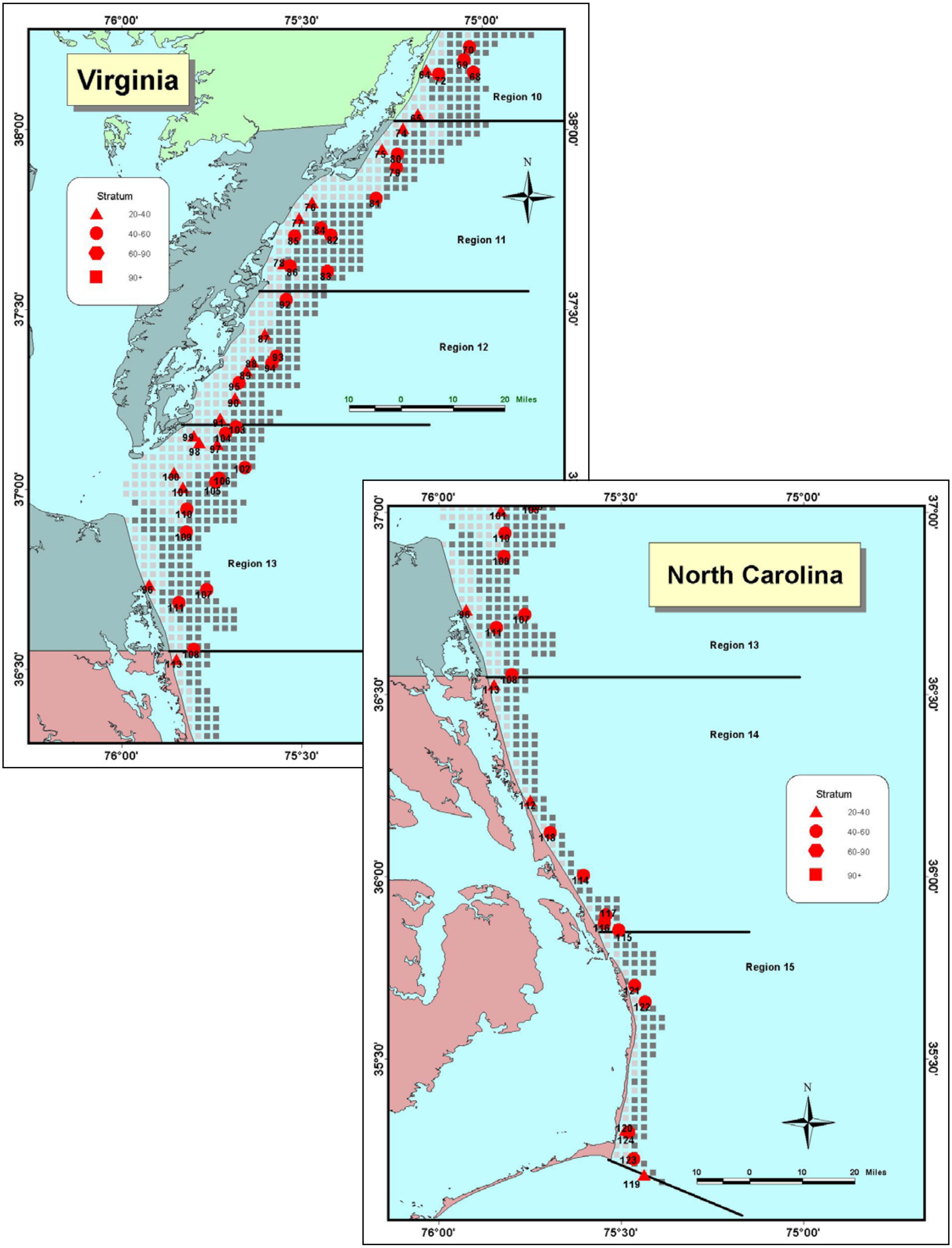
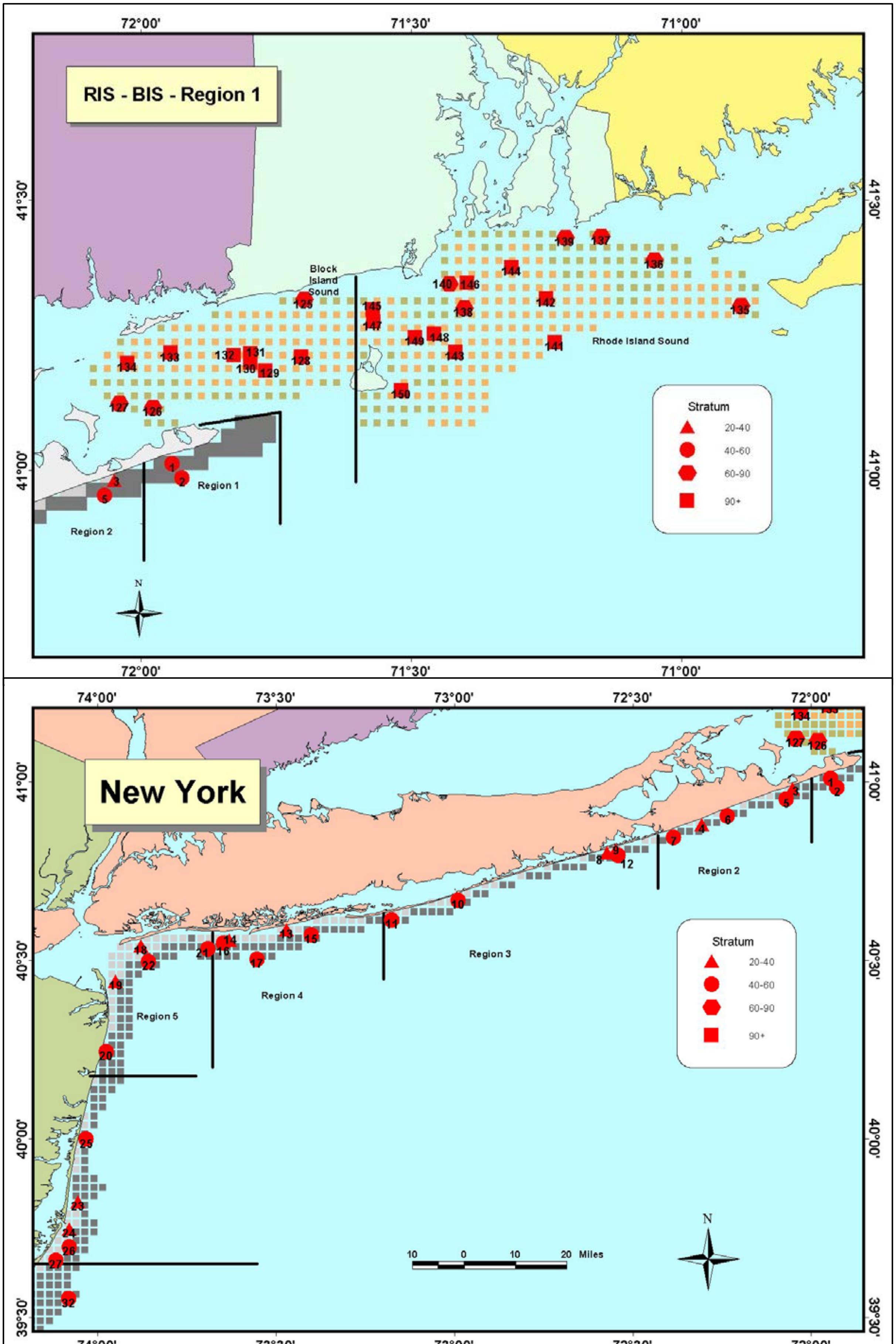


Figure 2B. NEAMAP sampling sites for the Fall 2011 cruise. Regional strata are defined by black lines, while the shapes of the station symbols indicate the depth strata occupied by each.



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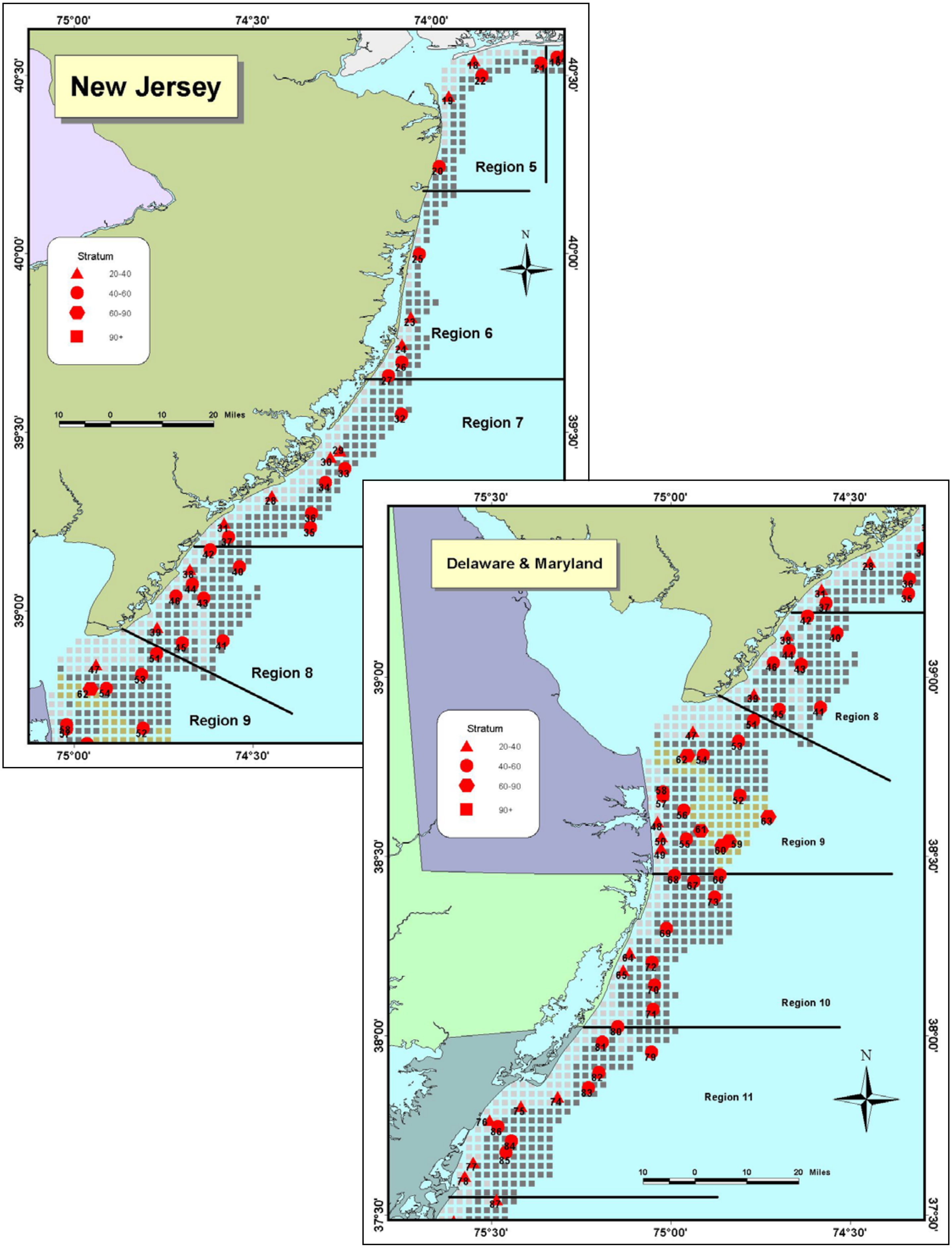

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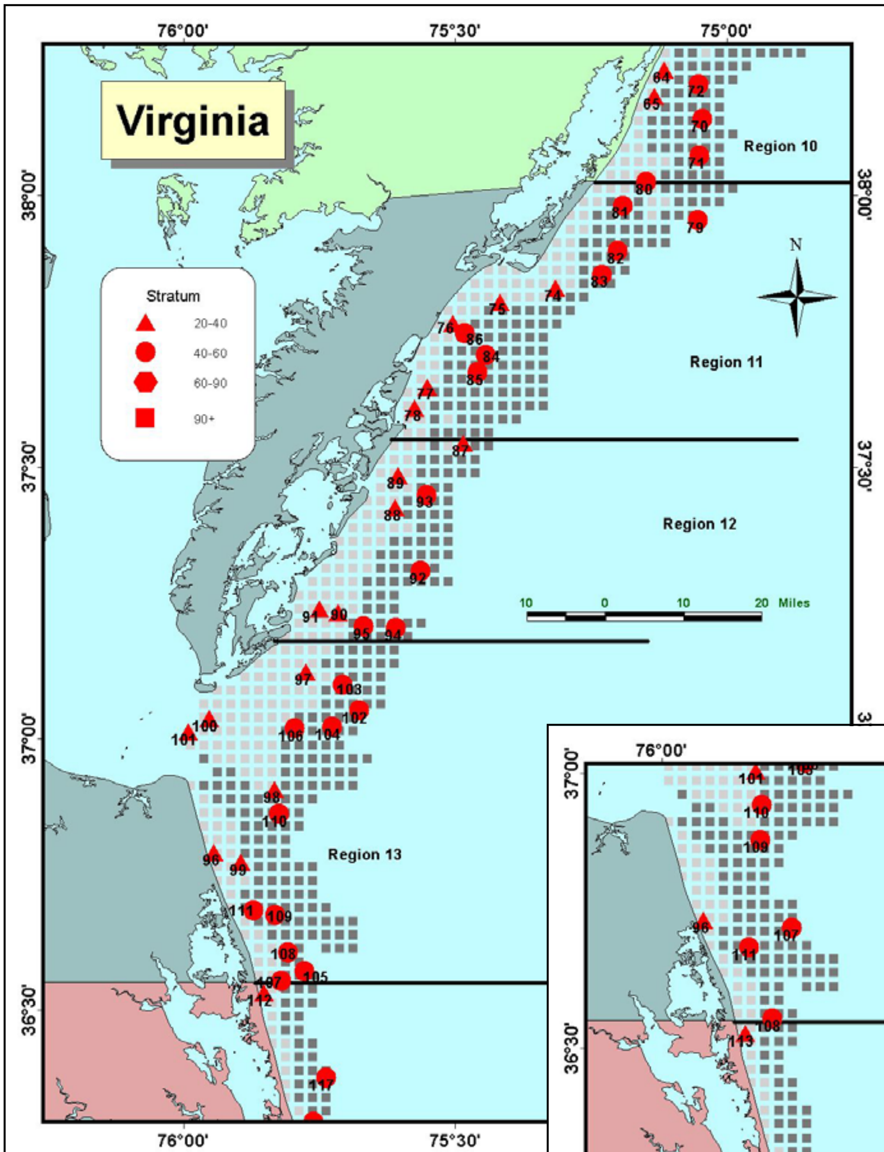


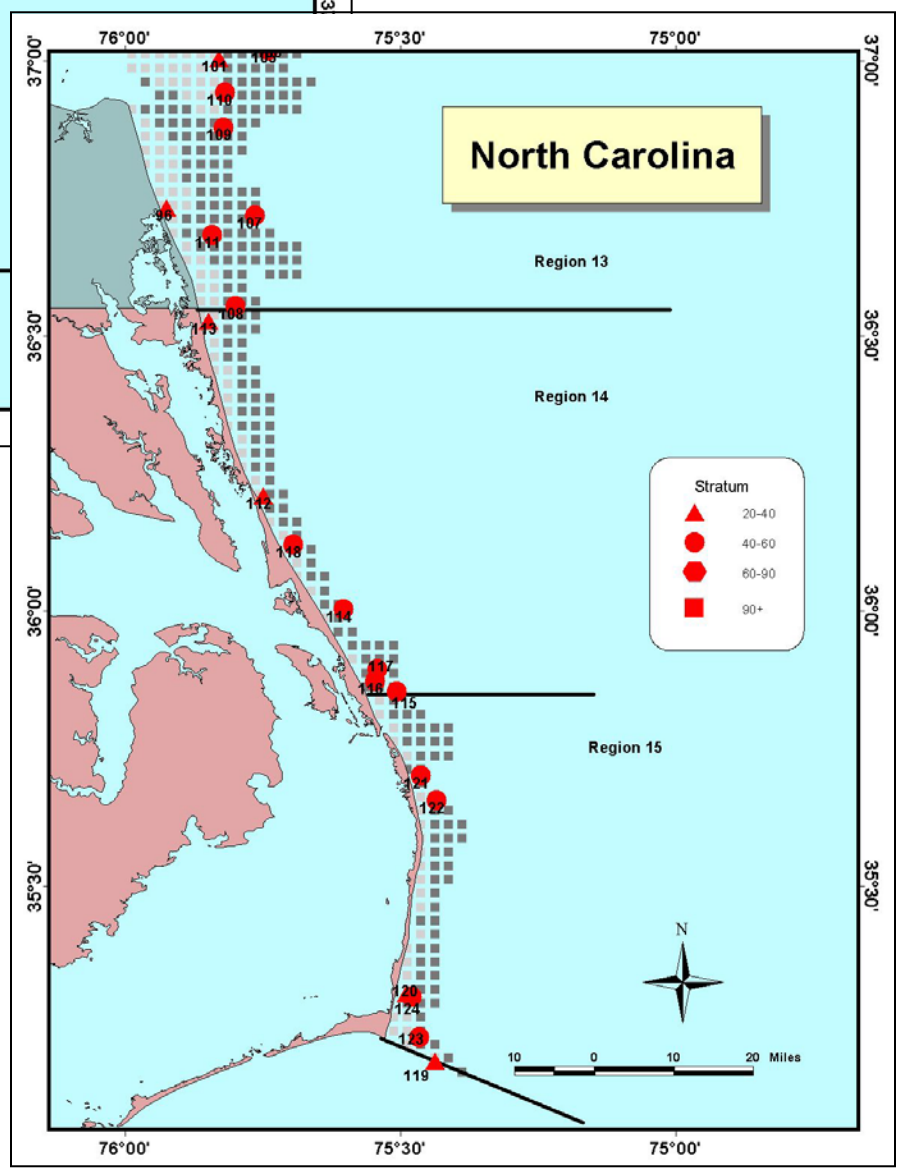


Figure 3A. Bottom temperatures as measured by NEAMAP for Spring 2008. (Map 'a' represents measured values averaged over all spring cruises , 'b' gives actual values for spring 2008, and 'c' represents the difference. Note that the color scheme and value ranges are the same for 'a' and 'b' which both differ from 'c.')

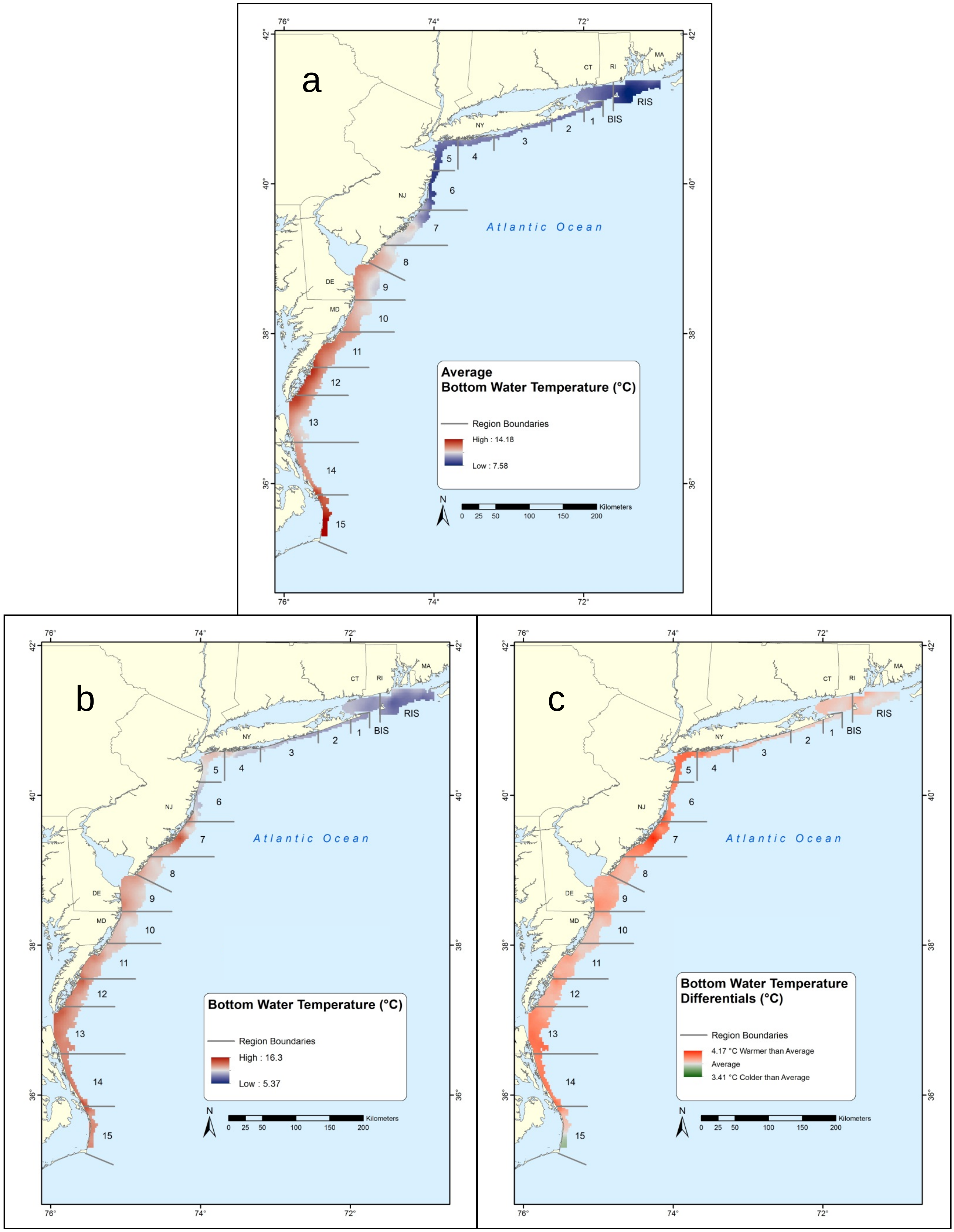


Figure 3B. Bottom temperatures as measured by NEAMAP for Spring 2009. (Map ‘a’ represents measured values averaged over all spring cruises , ‘b’ gives actual values for spring 2009, and ‘c’ represents the difference. Note that the color scheme and value ranges are the same for ‘a’ and ‘b’ which both differ from ‘c.’)

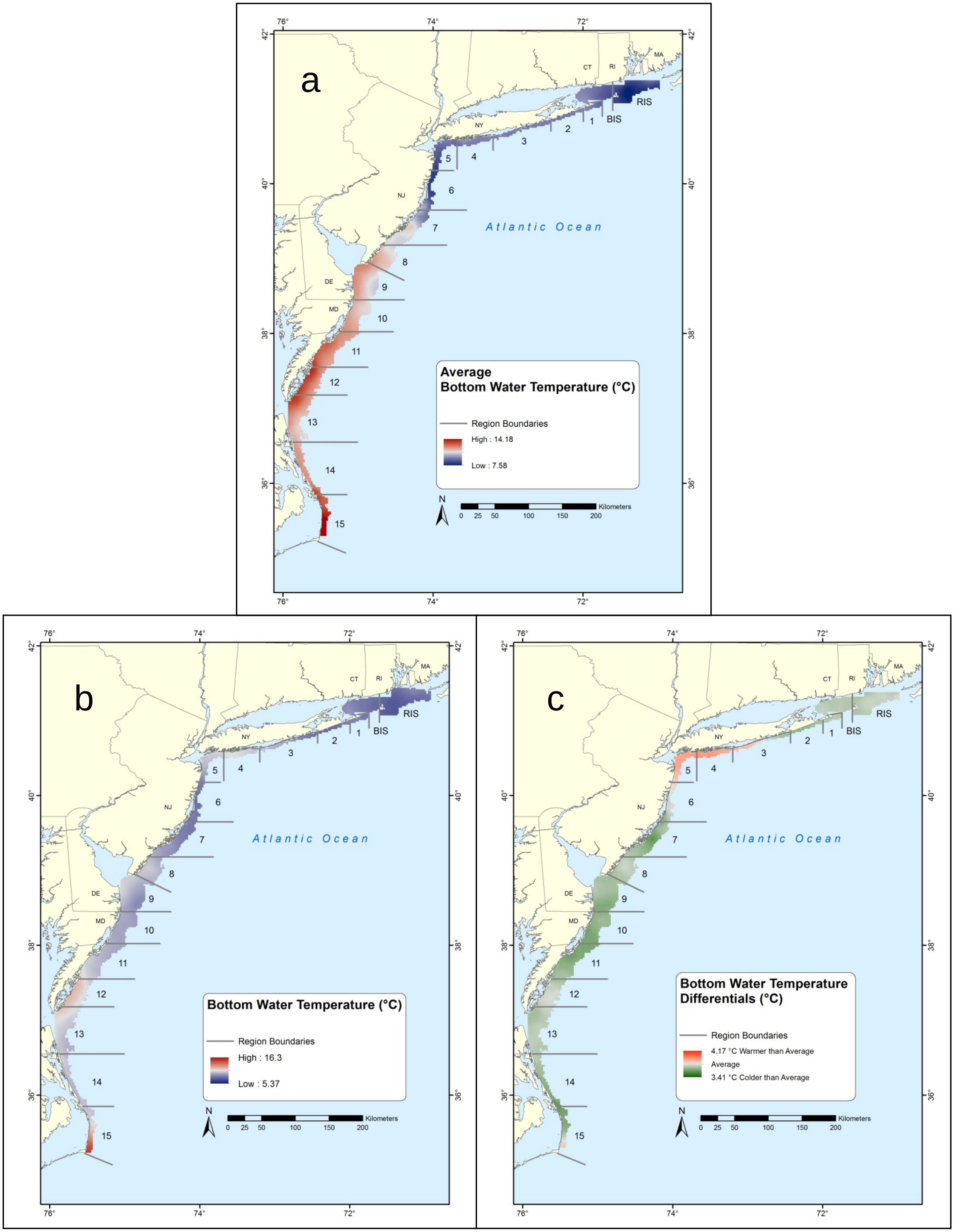


Figure 3C. Bottom temperatures as measured by NEAMAP for Spring 2010. (Map 'a' represents measured values averaged over all spring cruises , 'b' gives actual values for spring 2010, and 'c' represents the difference. Note that the color scheme and value ranges are the same for 'a' and 'b' which both differ from 'c.')

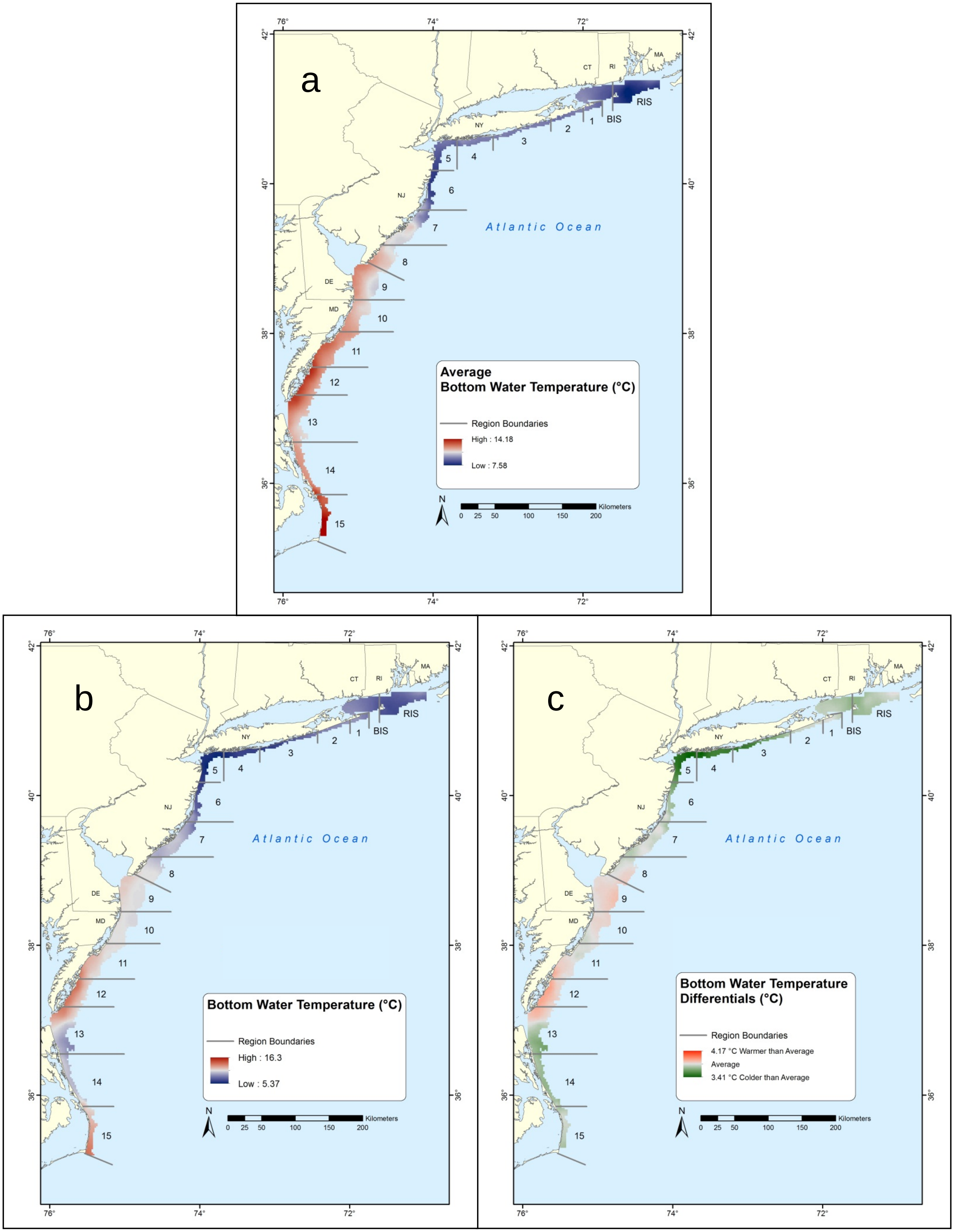


Figure 3D. Bottom temperatures as measured by NEAMAP for Spring 2011. (Map 'a' represents measured values averaged over all spring cruises , 'b' gives actual values for spring 2011, and 'c' represents the difference. Note that the color scheme and value ranges are the same for 'a' and 'b' which both differ from 'c.')

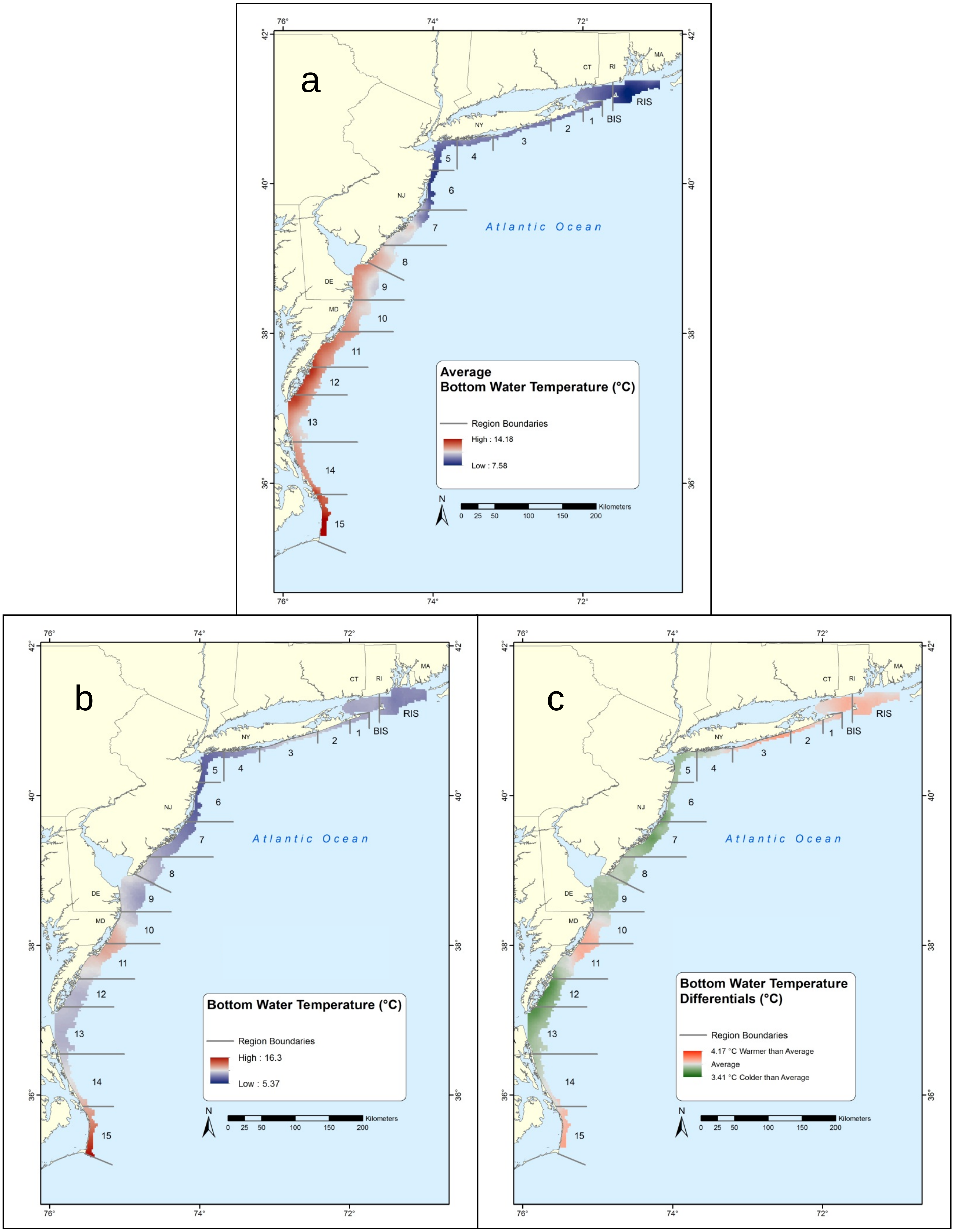


Figure 3E. Bottom temperatures as measured by NEAMAP for Fall 2007. (Map 'a' represents measured values averaged over all fall cruises , 'b' gives actual values for fall 2007, and 'c' represents the difference. Note that the color scheme and value ranges are the same for 'a' and 'b' which both differ from 'c.')

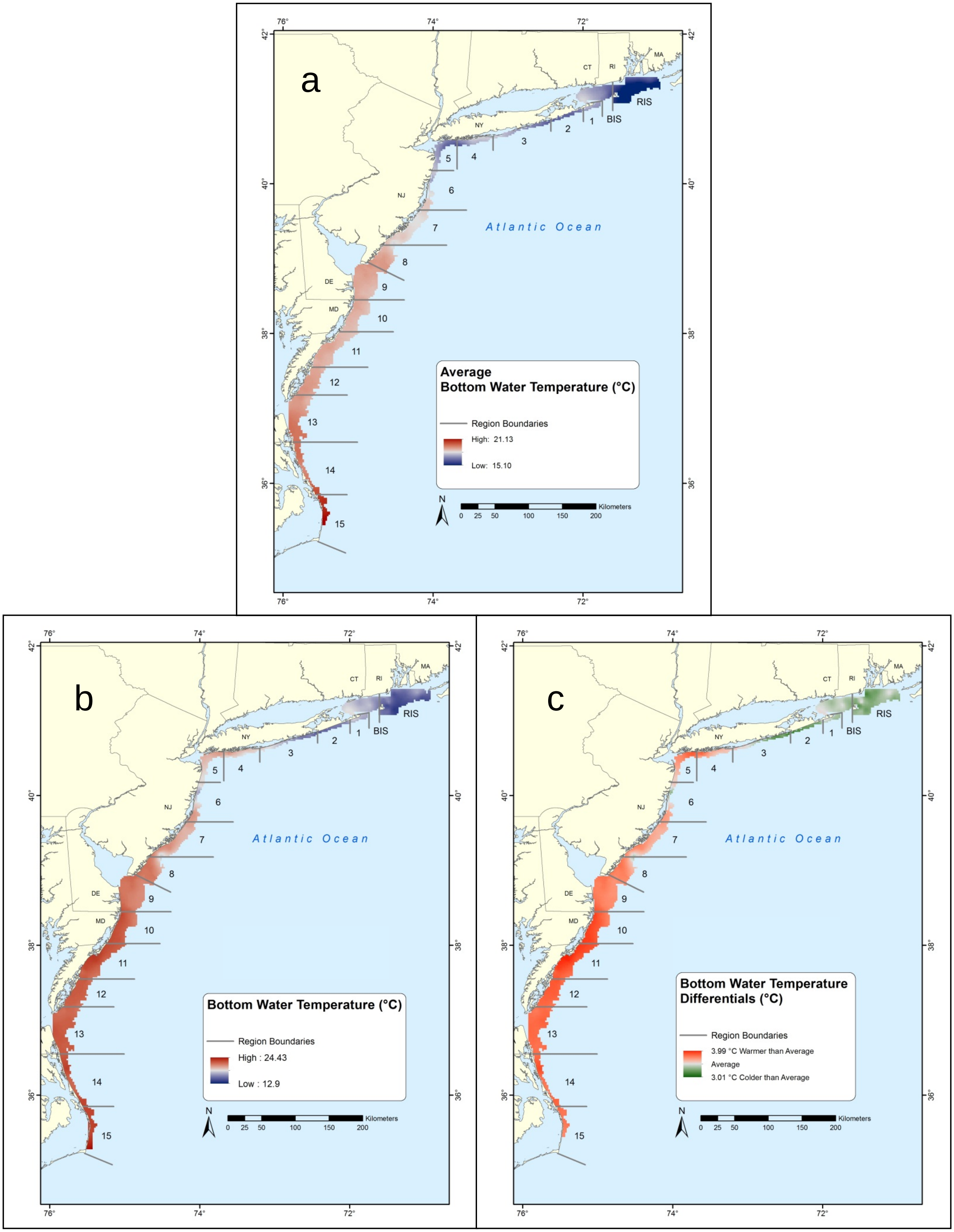


Figure 3F. Bottom temperatures as measured by NEAMAP for Fall 2008. (Map 'a' represents measured values averaged over all fall cruises , 'b' gives actual values for fall 2008, and 'c' represents the difference. Note that the color scheme and value ranges are the same for 'a' and 'b' which both differ from 'c.')

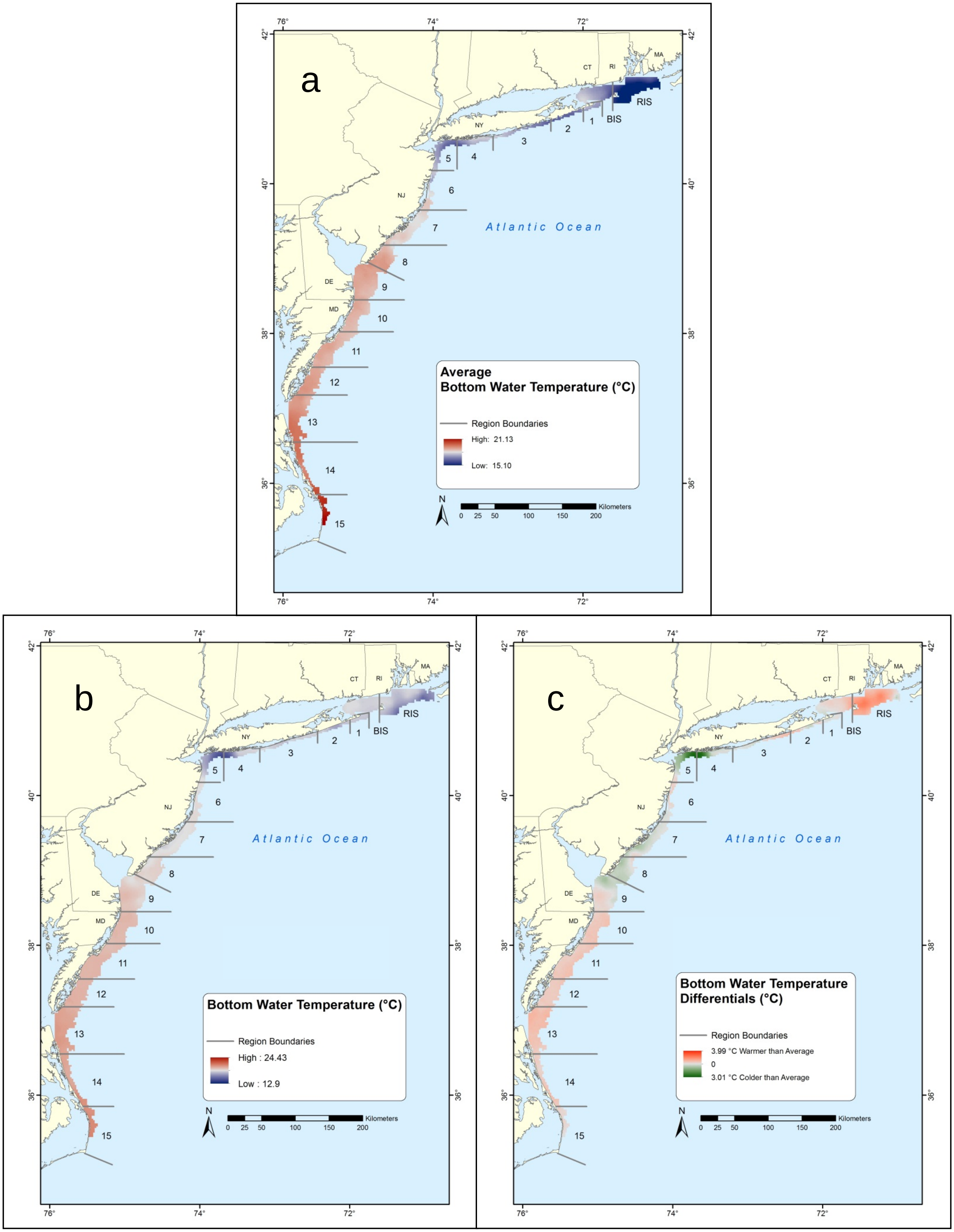


Figure 3G. Bottom temperatures as measured by NEAMAP for Fall 2009. (Map ‘a’ represents measured values averaged over all fall cruises , ‘b’ gives actual values for fall 2009, and ‘c’ represents the difference. Note that the color scheme and value ranges are the same for ‘a’ and ‘b’ which both differ from ‘c.’)

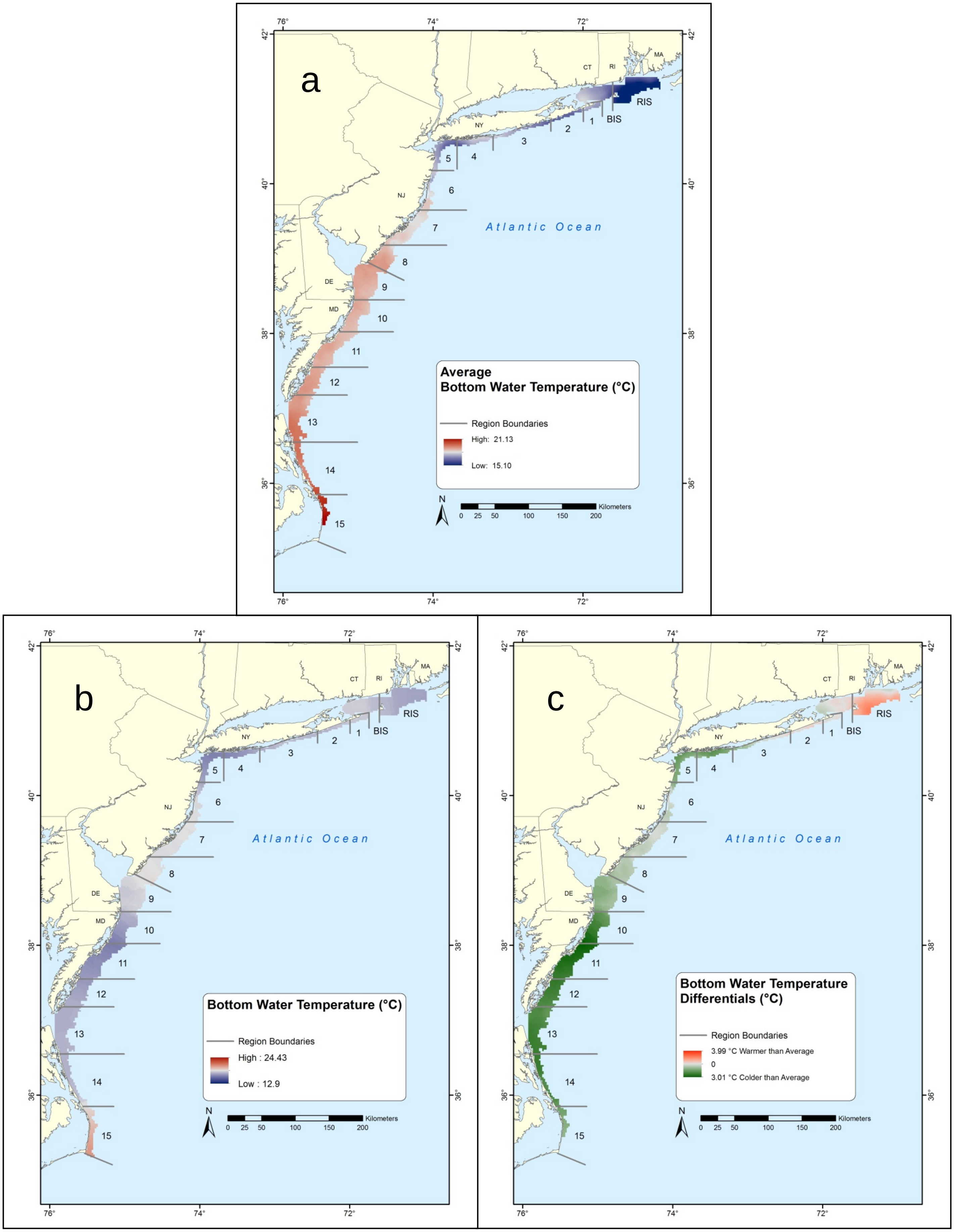


Figure 3H. Bottom temperatures as measured by NEAMAP for Fall 2010. (Map 'a' represents measured values averaged over all fall cruises , 'b' gives actual values for fall 2010, and 'c' represents the difference. Note that the color scheme and value ranges are the same for 'a' and 'b' which both differ from 'c.')

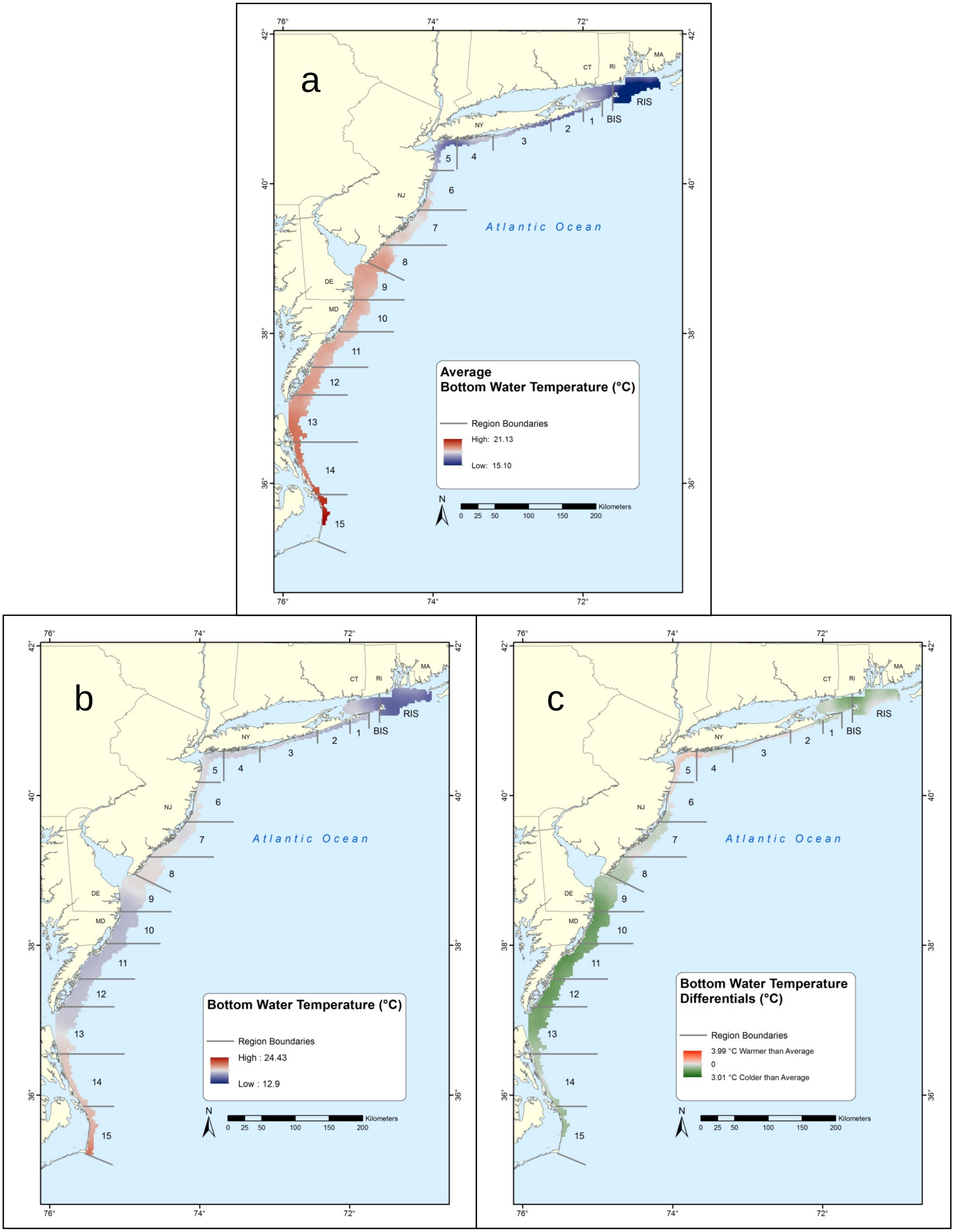


Figure 3I. Bottom temperatures as measured by NEAMAP for Fall 2011. (Map 'a' represents measured values averaged over all fall cruises , 'b' gives actual values for fall 2011, and 'c' represents the difference. Note that the color scheme and value ranges are the same for 'a' and 'b' which both differ from 'c.')

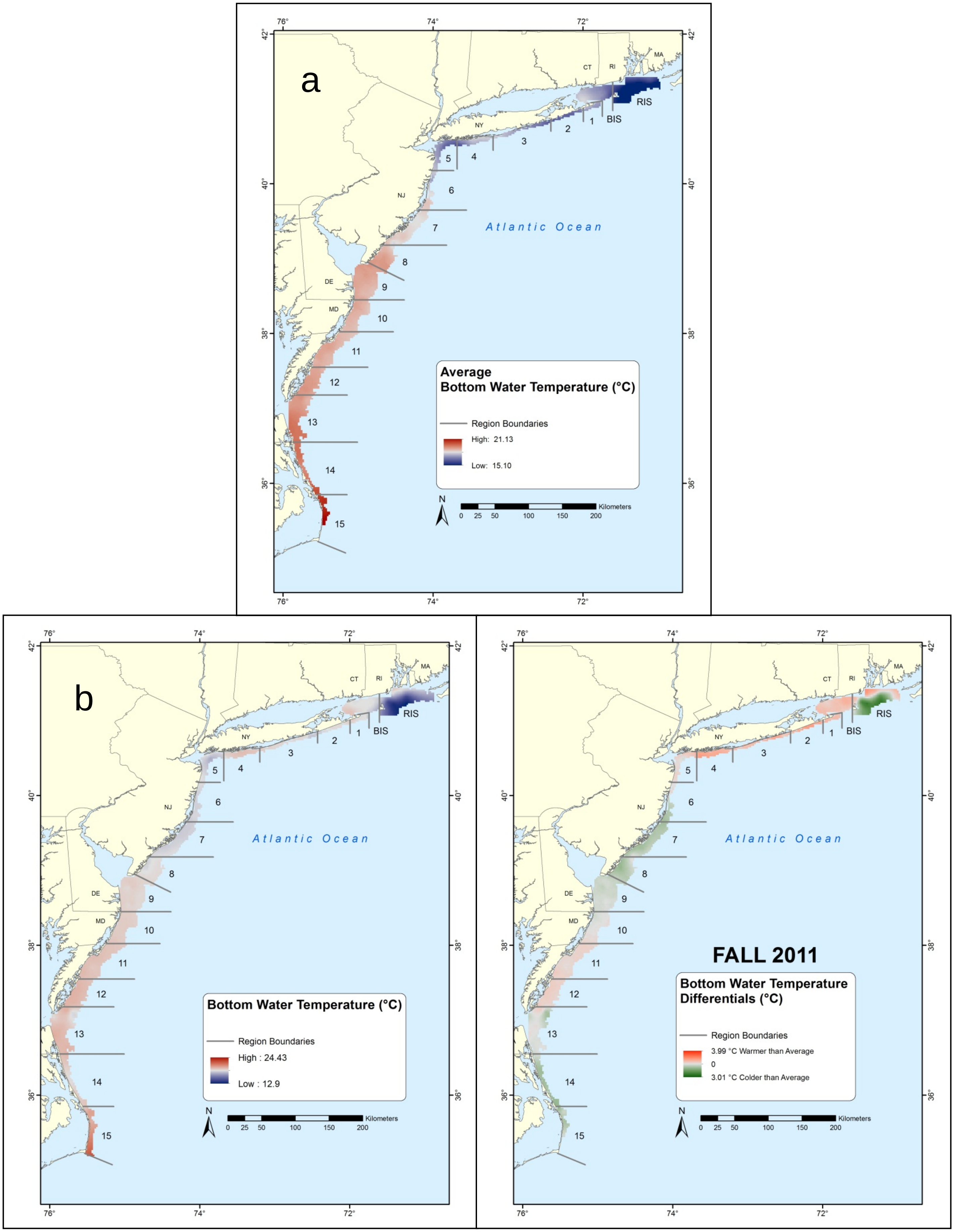
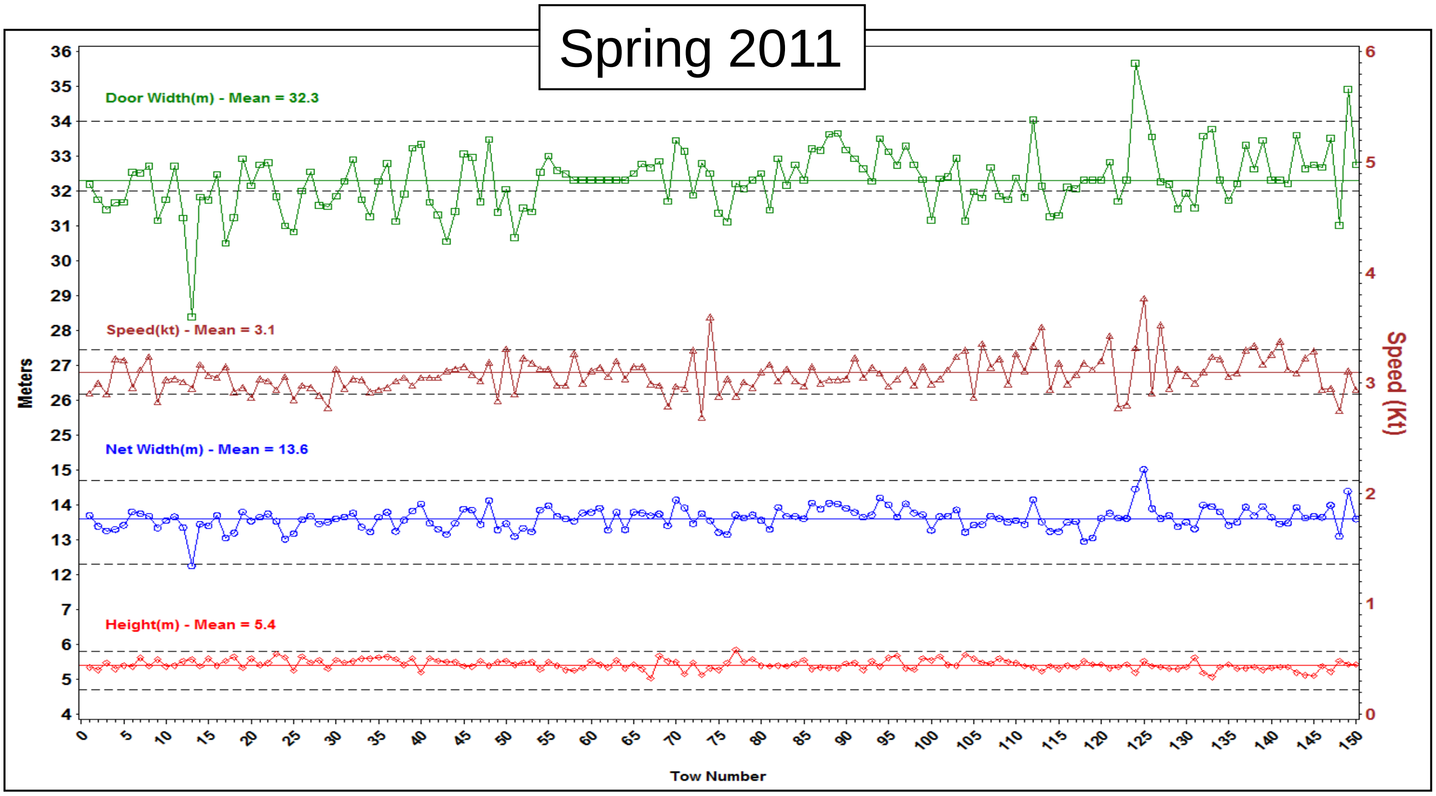


Figure 4. Performance of the NEAMAP Trawl Survey sampling gear during the Spring and Fall 2011 cruises. Tows are numbered chronologically along the x-axis. Points on the graph are tow averages for each of the respective parameters. Average door spreads (m) for each tow are given in green, average vessel speeds over ground (kts) in brown, average wing spreads (m) in blue, and average headline heights (m) in red. Cruise averages are given with each parameter. Optimal ranges for each parameter are represented by the horizontal dotted lines. Optimal door spreads are 32.0 m - 34.0 m, vessel speeds over ground are 2.9 kts - 3.3 kts, wing spreads are 13.0 m - 14.0 m, and headline heights are 5.0 m - 5.5 m.



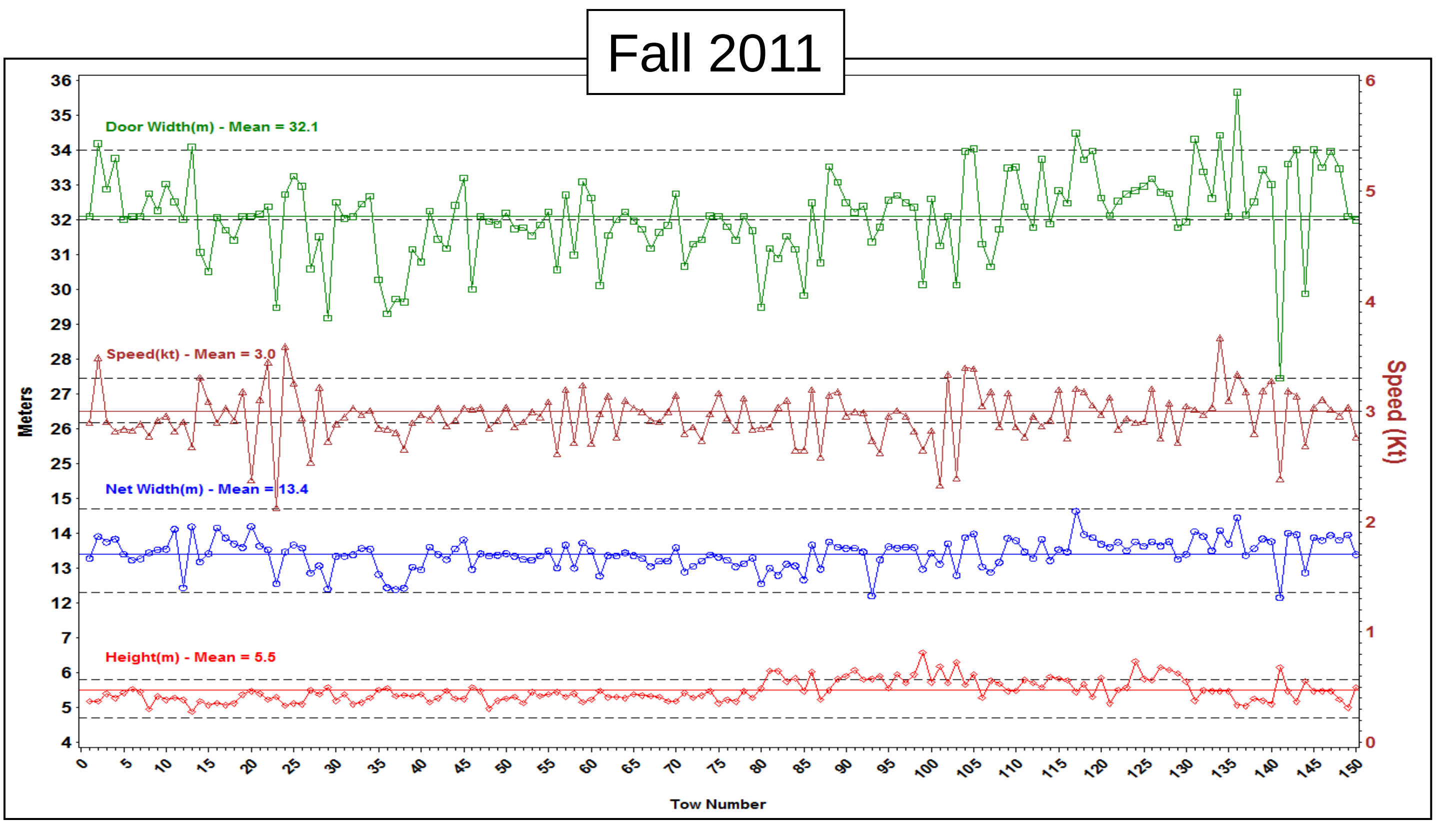
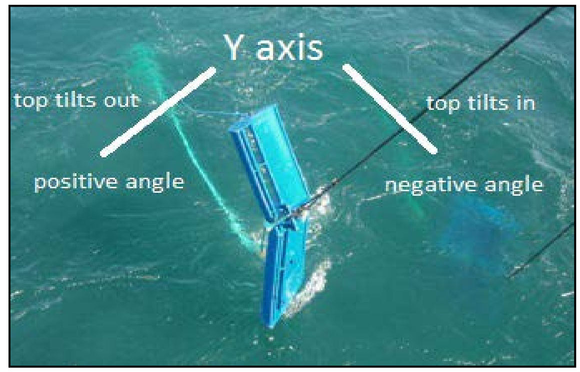


Figure 5. Performance of the NEAMAP Trawl Survey Thyboron Type IV 66" trawl doors on one tow during which the doors were equipped with 'tilt sensors.' These sensors measured Depth in meters (blue line), Pitch in degrees (red line - the extent that the doors either lean forward or back) and Heel in degrees (green line - the amount that the doors tilt in or out perpendicular to the direction of travel). Expected positive values for Pitch indicate that the doors were angled up in front. Expected negative values for Heel show that the doors tilted in during normal operation. Readings are presented from the entrance and exit times of the doors in the water. Dashed lines indicate the brakes-on to brakes-off official start and end times of the tow. These sensors were used on four consecutive tows with nearly identical results on all tows.

Pitch

Heel



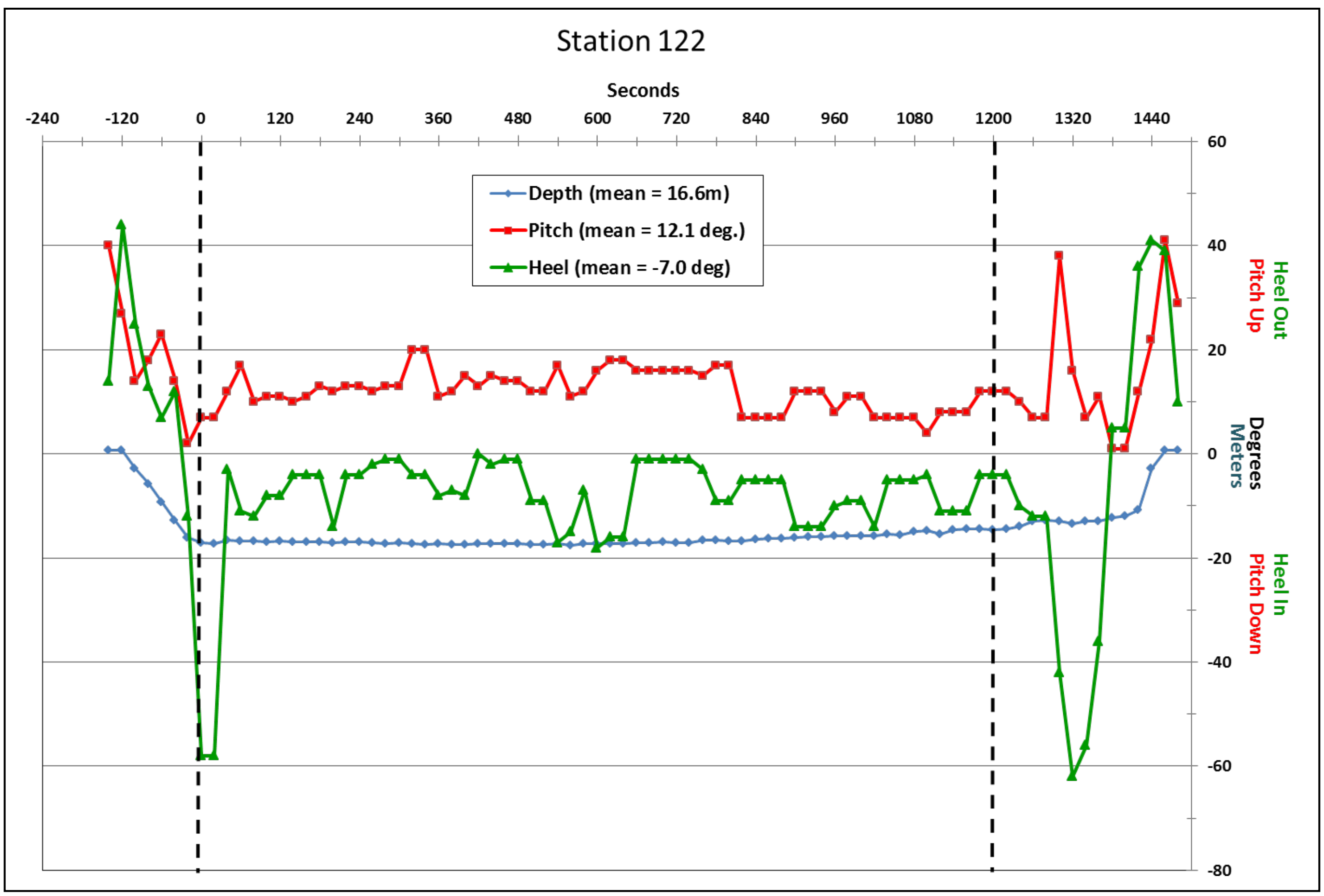


Figure 6A. Catch history for non-index species of interest or concern, Atlantic sturgeon.

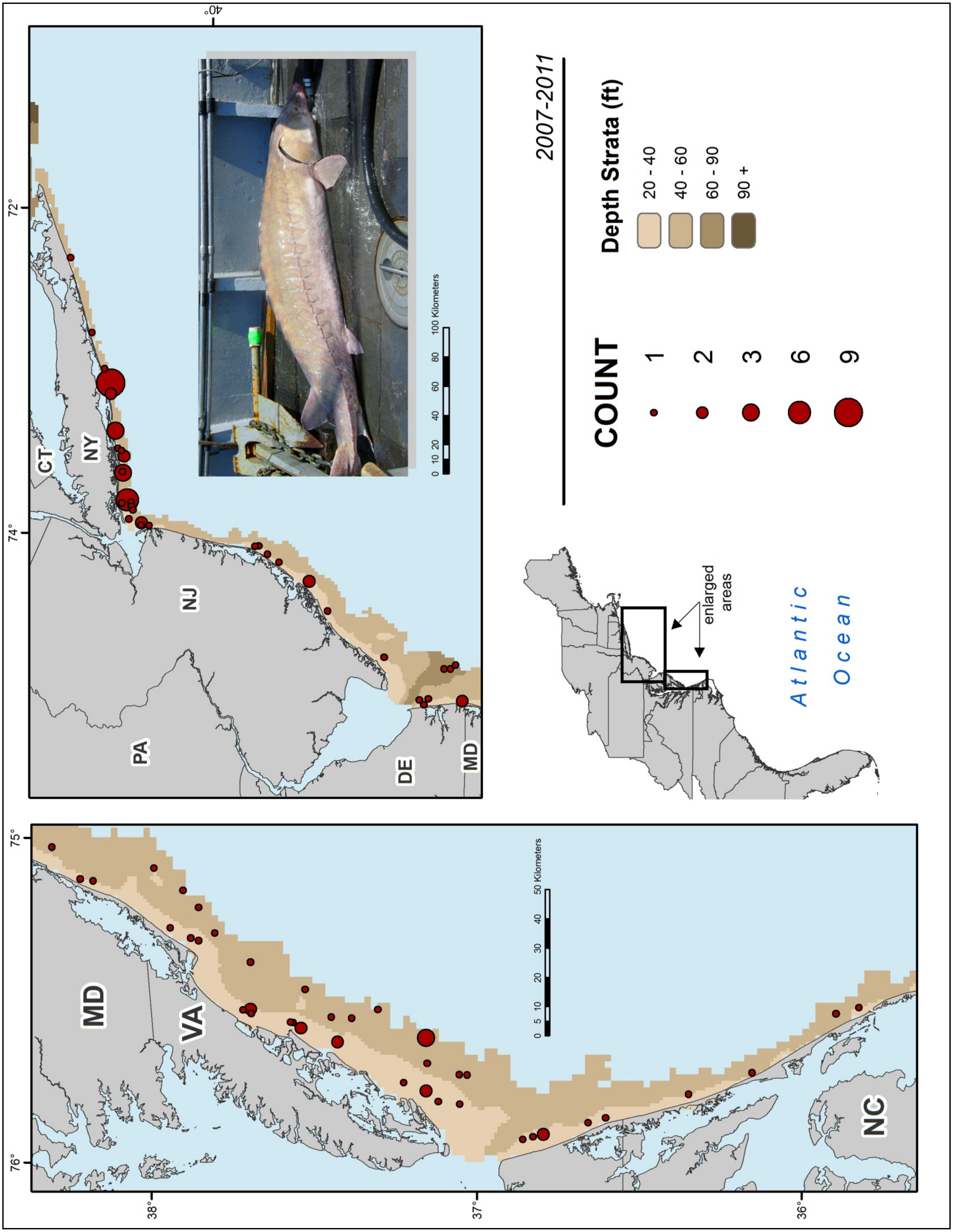


Figure 6B. Catch history for non-index species of interest or concern, sea turtles.

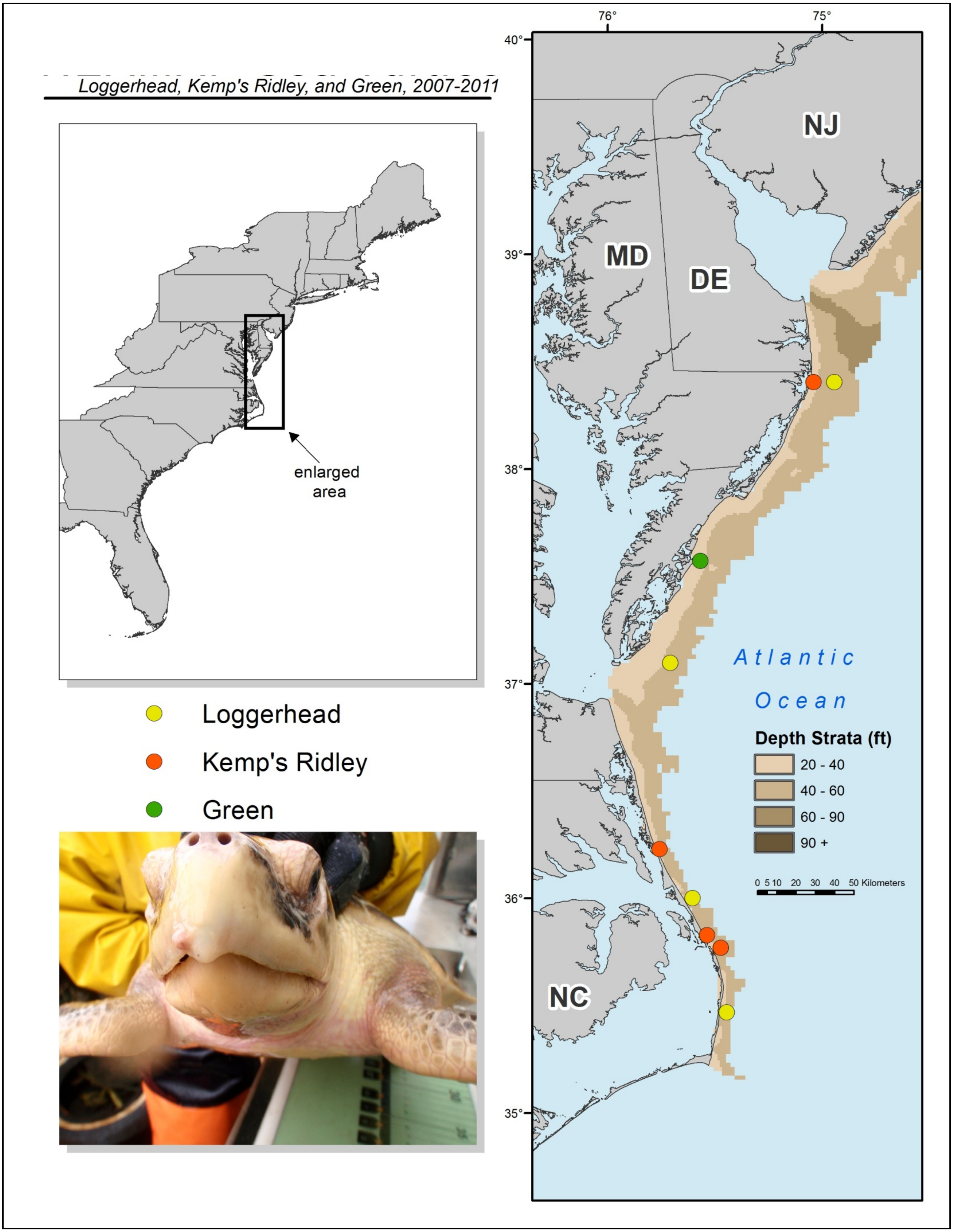
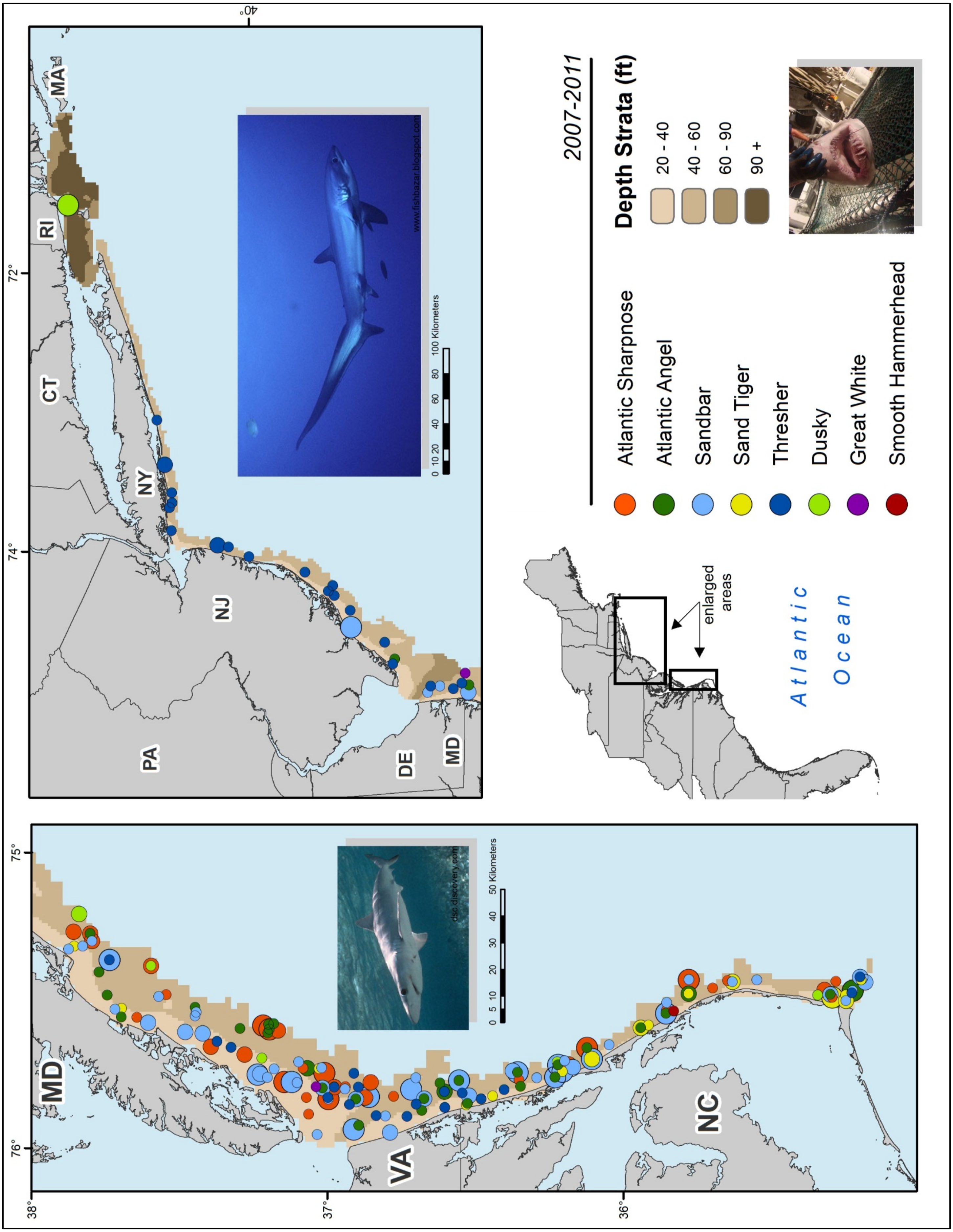


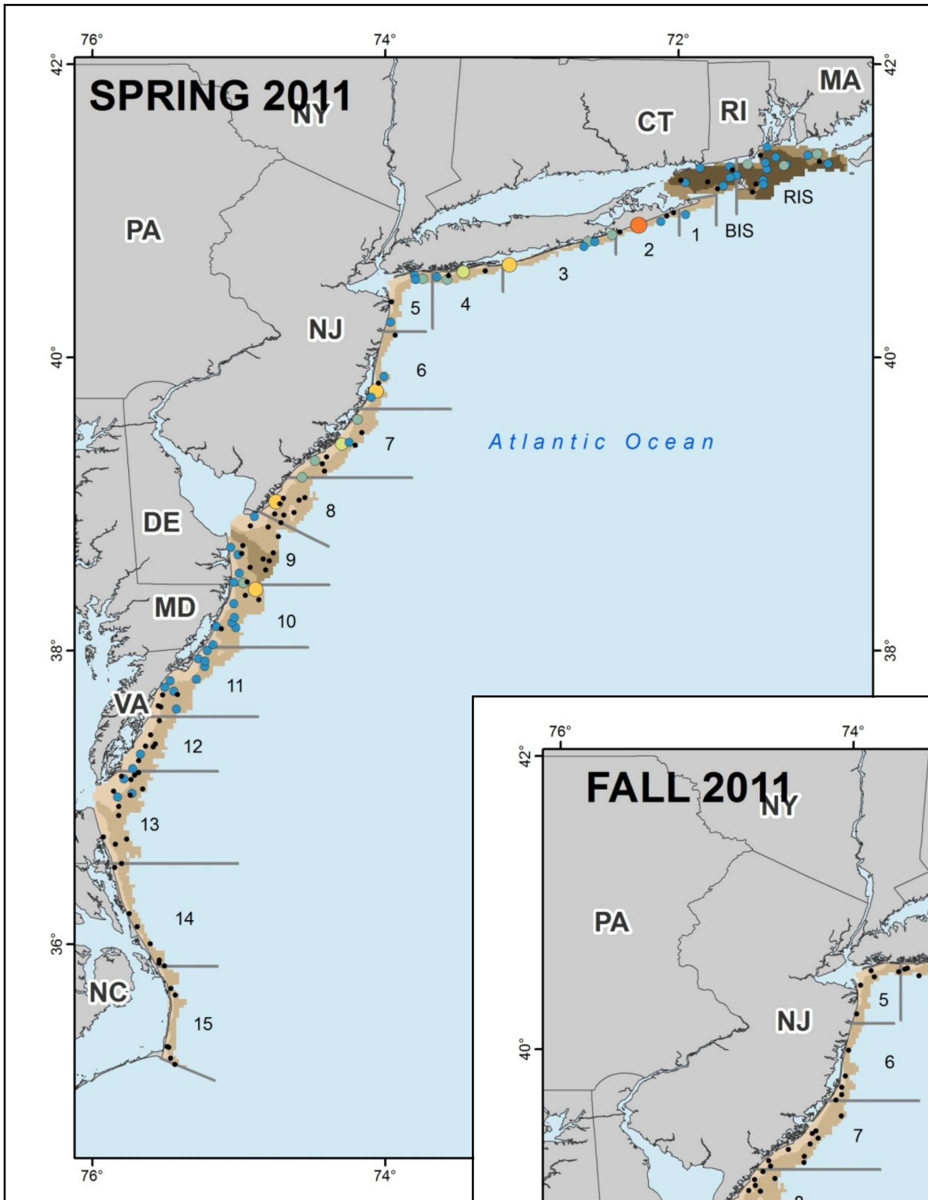
Figure 6C. Catch history for non-index species of interest or concern, coastal sharks.



Alewife

Sampling Priority: A

Figure 7. Alewife biomass (kg) at each sampling site for 2011 NEAMAP cruises.



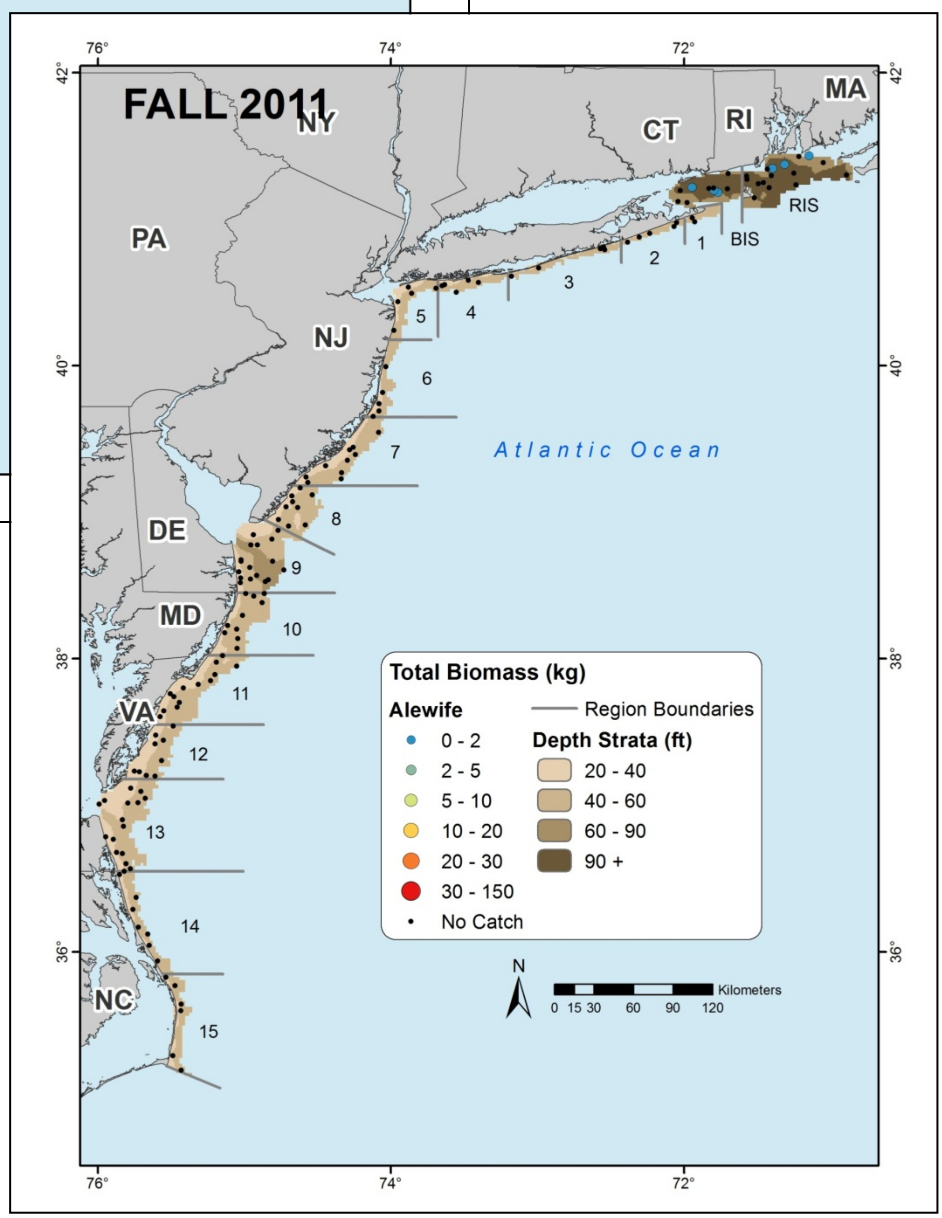


Table 6. Alewife sampling rates and preserved specimen analysis status for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught (kg)	Number Measured	Age Specimens	Ages Read	Stomach Specimens	Stomachs Analyzed
Spring	2008	2,419	141.8	1,572	350	0	344	5
	2009	2,955	233.0	1,225	235	0	235	4
	2010	3,735	209.7	1,547	273	0	270	21
	2011	3,373	154.1	1,828	323	0	314	309
Fall	2007	56	3.1	56	24	0	24	0
	2008	5	0.3	5	5	0	5	0
	2009	87	3.9	87	17	0	16	16
	2010	565	13.7	360	39	0	38	38
	2011	27	1.2	27	13	0	13	0

Table 7. Strata used for calculation of abundance indices for alewife (Depth strata definitions are in feet).

State (Nominal)	Region	Depth Stratum	Spring Index	Fall Index
RI	RIS	60-90		
		90+		
	BIS	60-90		
		90+		
NY	01	40-60		
	02	20-40		
		40-60		
	03	20-40		
		40-60		
	04	20-40		
		40-60		
	05	20-40		
		40-60		
NJ	06	20-40		
		40-60		
	07	20-40		
		40-60		
	08	20-40		
		40-60		
DE	09	20-40		
		40-60		
		60-90		
MD	10	20-40		
		40-60		
VA	11	20-40		
		40-60		
	12	20-40		
		40-60		
	13	20-40		
		40-60		
NC	14	20-40		
		40-60		
	15	20-40		
		40-60		

= used for abundance indices

= not used for abundance indices

Table 8. Alewife preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured and for the youngest year class captured .

Season	Year	Age	Numerical Index					Biomass Index				
			n	LCI	**Index**	UCI	CV (%)	n	LCI	**Index**	UCI	CV (%)
Spring	2008	All	150	1.67	**2.27**	3.00	8.5	150	0.26	**0.38**	0.51	14.1
	2009		160	0.86	**1.23**	1.67	11.4	160	0.16	**0.27**	0.39	19.6
	2010		150	0.95	**1.43**	2.02	12.3	150	0.15	**0.27**	0.40	20.5
	2011		150	1.39	**1.97**	2.68	9.9	150	0.23	**0.33**	0.45	14.6
Fall	2007	All	17	0.06	**0.63**	1.51	44.1	17	0.00	**0.10**	0.25	62.7
	2008		16	0.00	**0.06**	0.18	100.0	16	0.00	**0.01**	0.02	100.0
	2009		16	0.00	**0.36**	1.34	87.8	16	0.00	**0.11**	0.35	98.3
	2010		16	1.36	**5.69**	18.02	27.5	16	0.11	**0.50**	1.02	36.9
	2011		16	0.00	**0.40**	1.16	65.0	16	0.00	**0.06**	0.16	80.1
Fall	2007	0	17	0.00	**0.00**	0.00		17	0.00	**0.00**	0.00	
	2008		16	0.00	**0.00**	0.00		16	0.00	**0.00**	0.00	
	2009		16	0.00	**0.09**	0.23	70.8	16	0.00	**0.01**	0.01	75.3
	2010		16	0.97	**4.69**	15.50	30.6	16	0.09	**0.45**	0.94	38.7
	2011		16	0.00	**0.23**	0.72	79.2	16	0.00	**0.03**	0.09	92.1
Spring	2008	1	150	0.93	**1.31**	1.76	10.6	150	0.11	**0.18**	0.25	18.9
	2009		160	0.51	**0.75**	1.02	13.0	160	0.07	**0.13**	0.19	20.7
	2010		150	0.72	**1.08**	1.53	13.2	150	0.09	**0.17**	0.26	23.2
	2011		150	0.89	**1.32**	1.85	12.2	150	0.11	**0.19**	0.27	19.1

Figure 8. Alewife preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured (A) and for the youngest year class captured (B – numbers only).

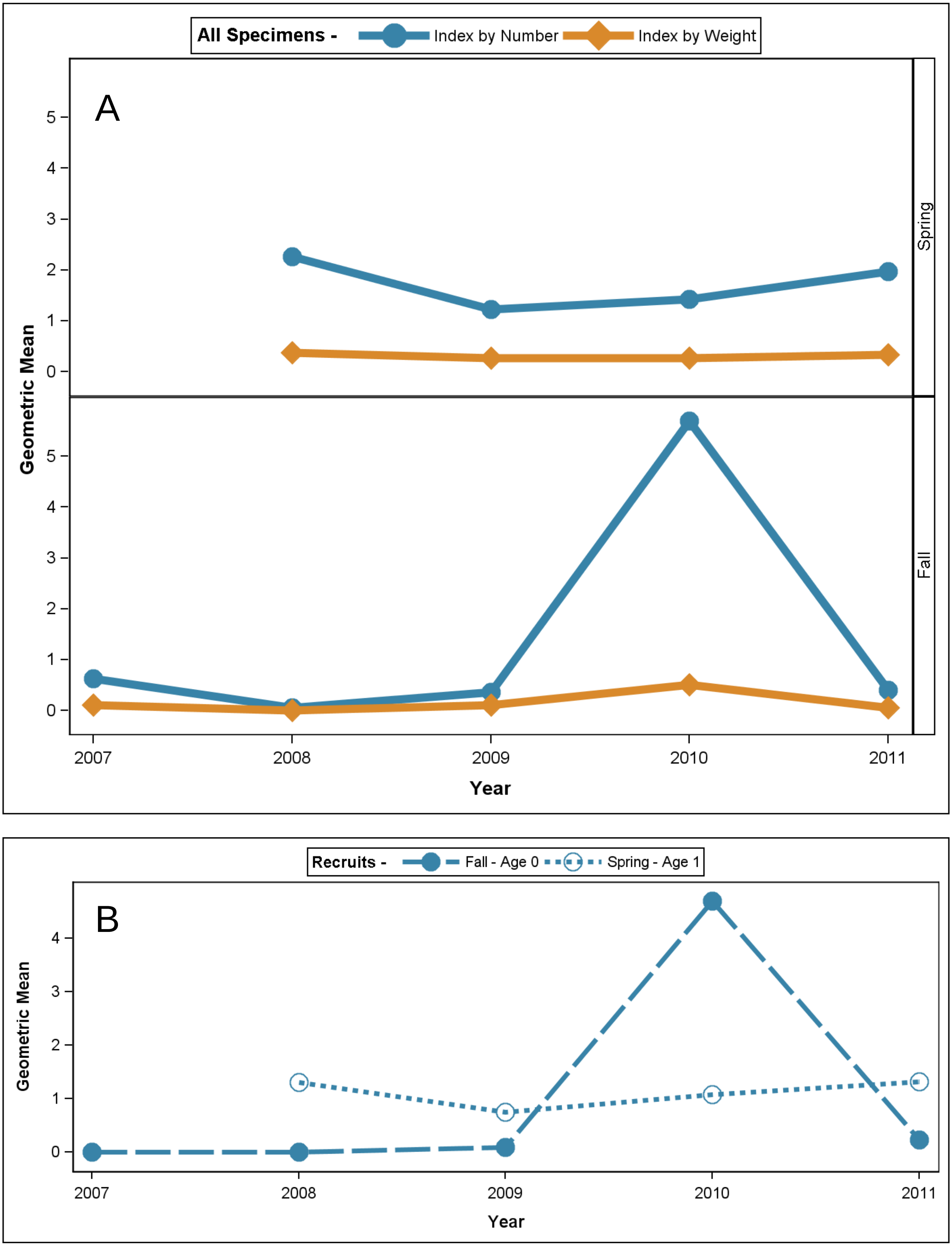


Figure 9. Alewife length-frequency distributions, by cruise (Blue reference lines are placed at the size cutoff values used to separate recruits from older specimens. Cutoff values - Spring 16cm, Fall 14cm - estimated by examination of these length frequency figures.).

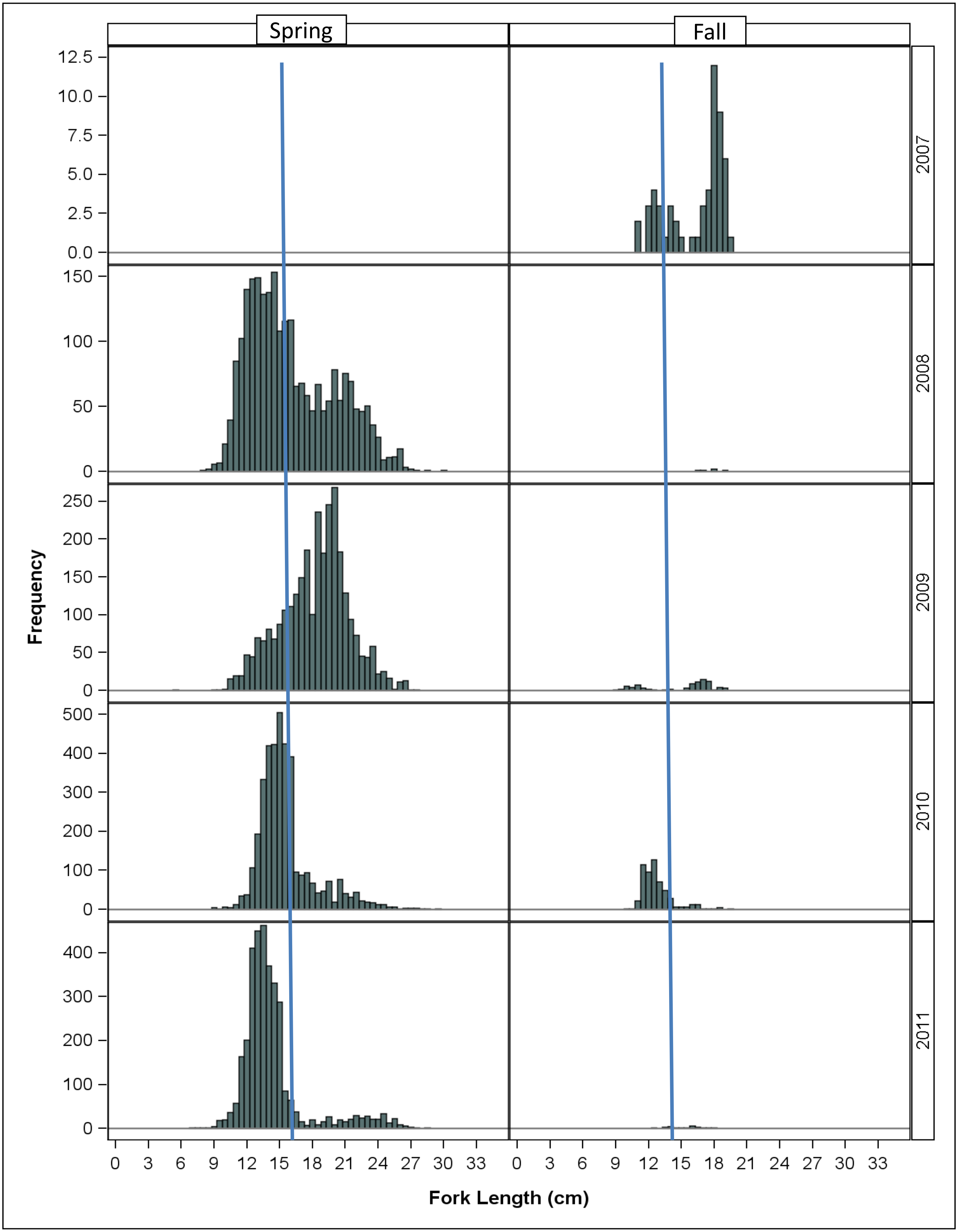


Figure 10. Alewife length-frequency distributions, by cruise and sex.

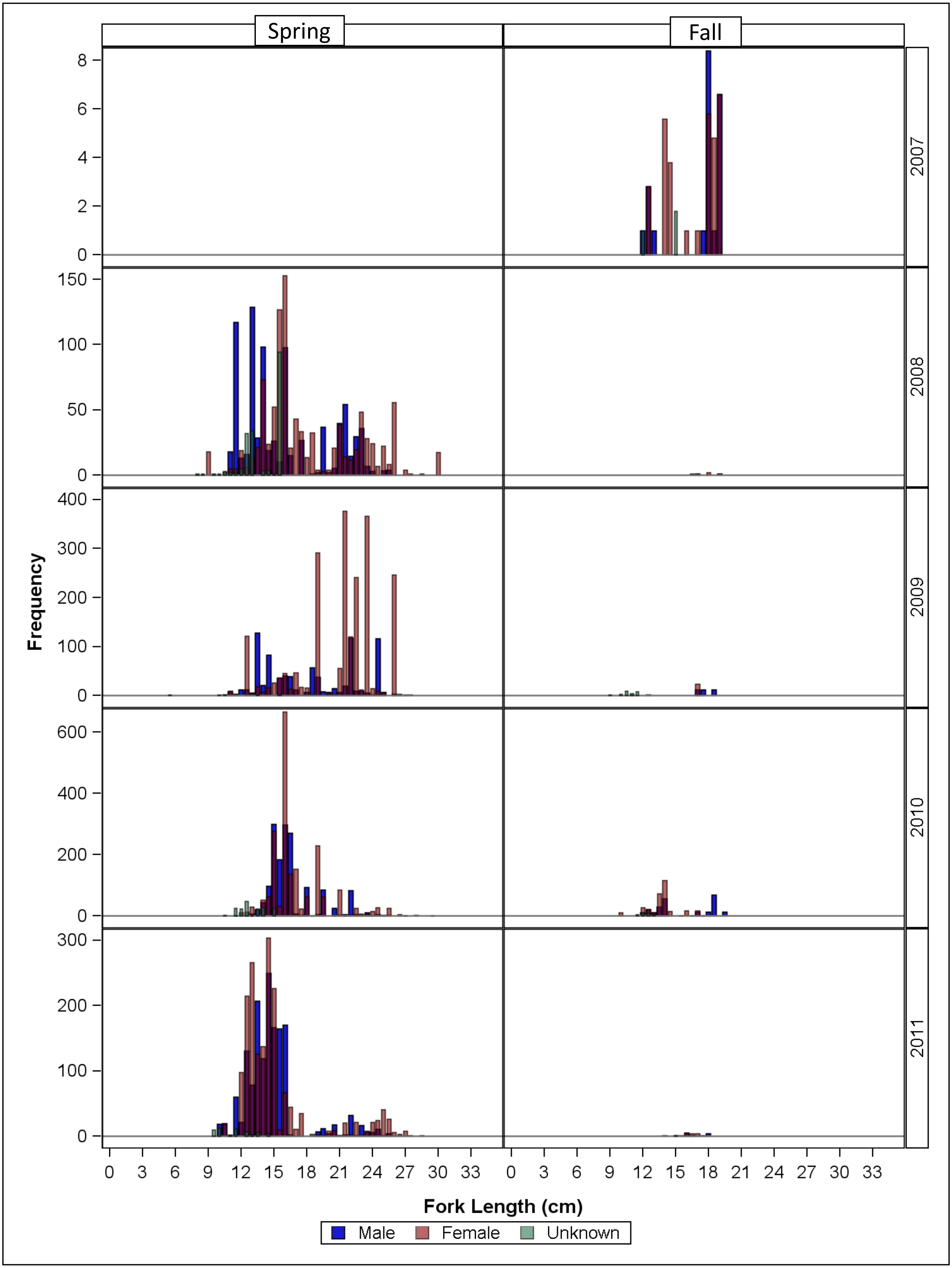


Figure 11. Alewife sex ratio, by length group, for NEAMAP Spring and Fall cruises 2007-2011.
(The percentages for each category are given near the bottom of each bar. The number sampled for sex determination is provided near the top of each bar, and the length categories expressed in inches are shown between the two figures.).

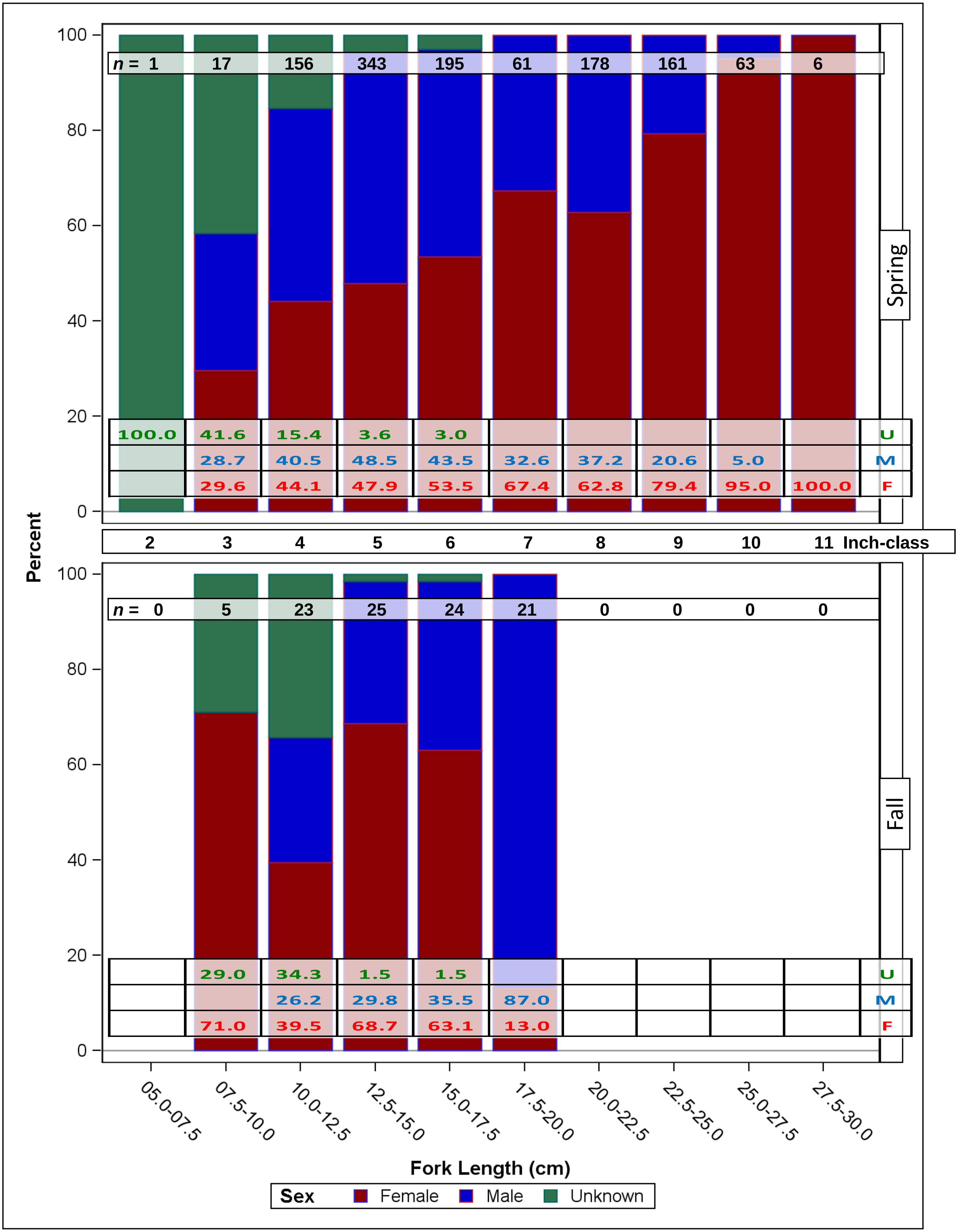
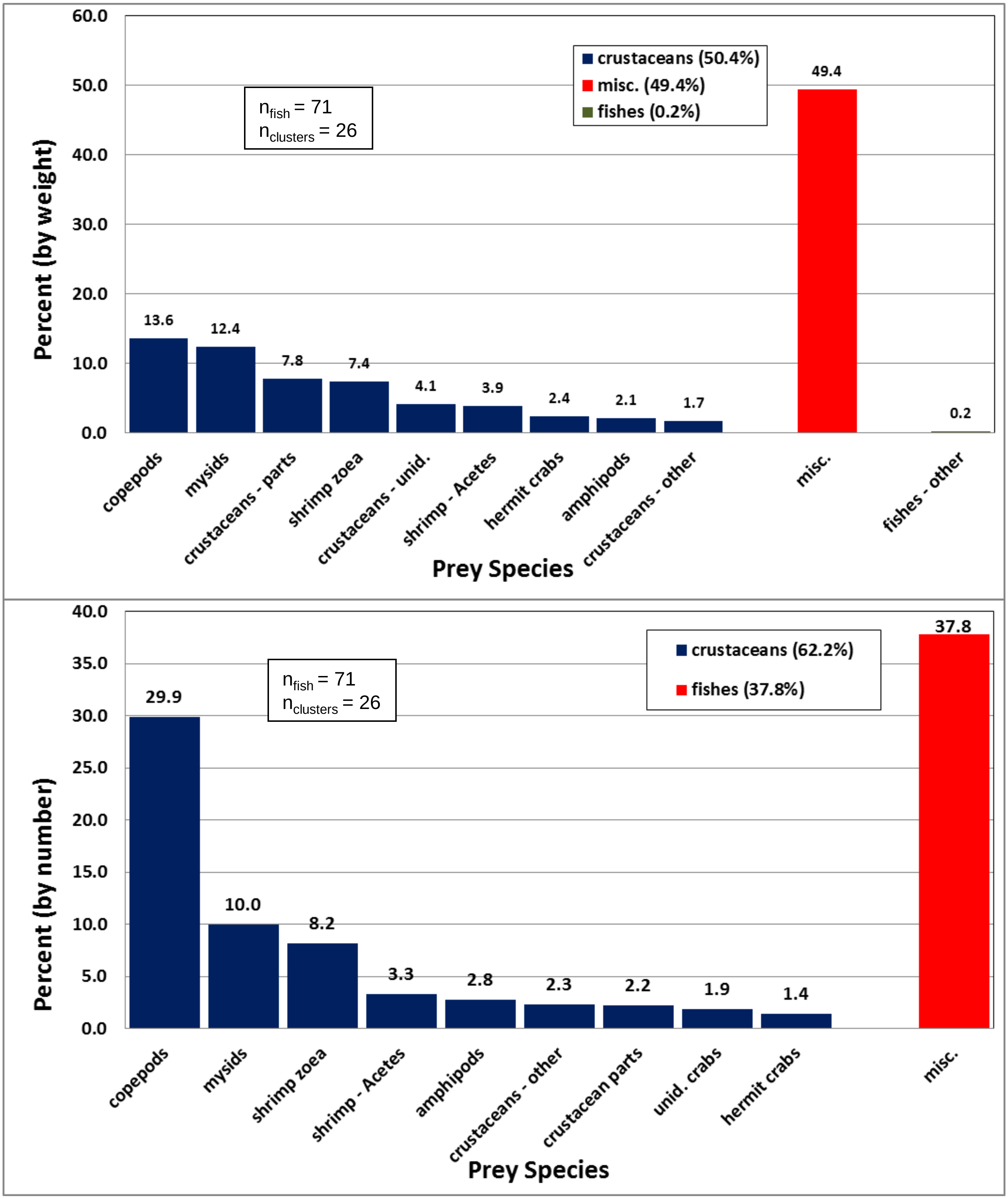
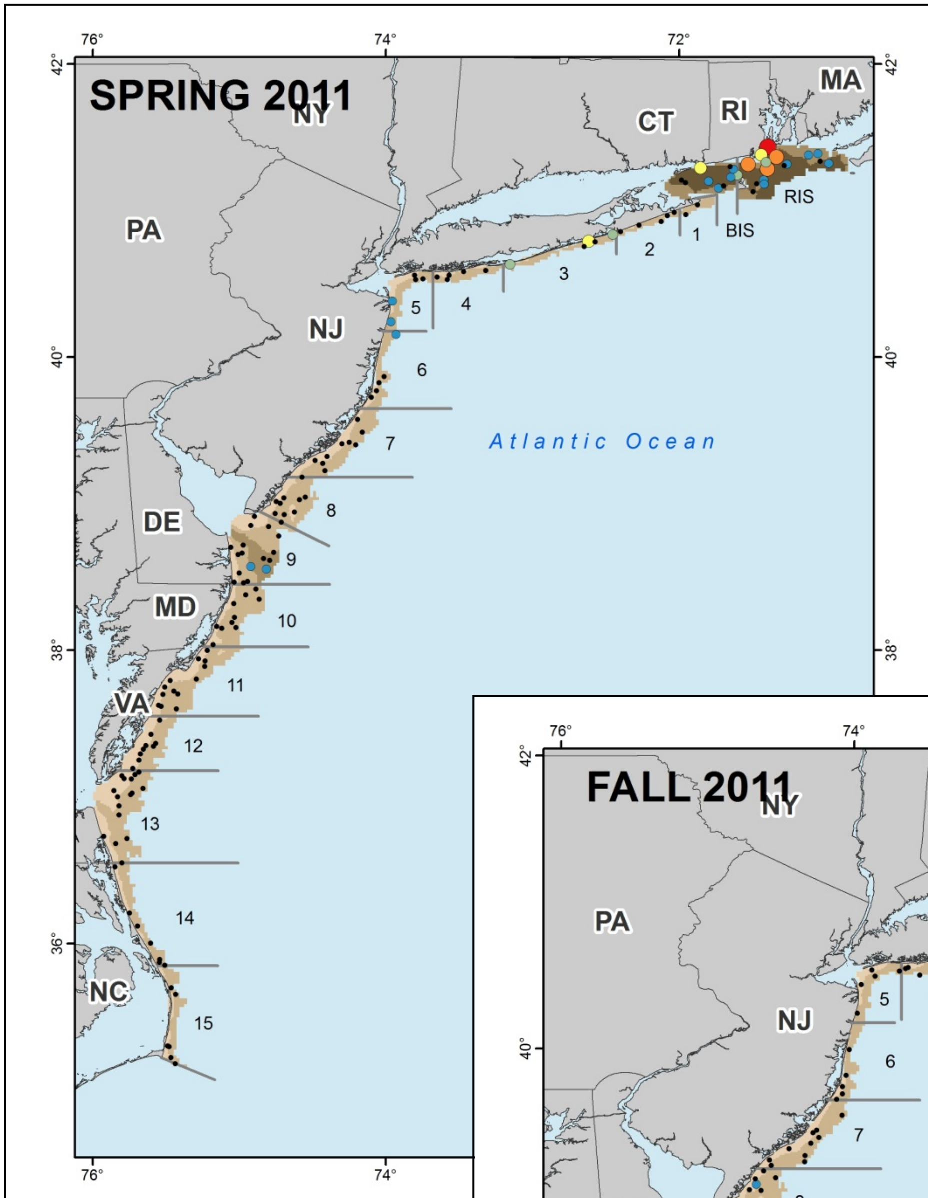
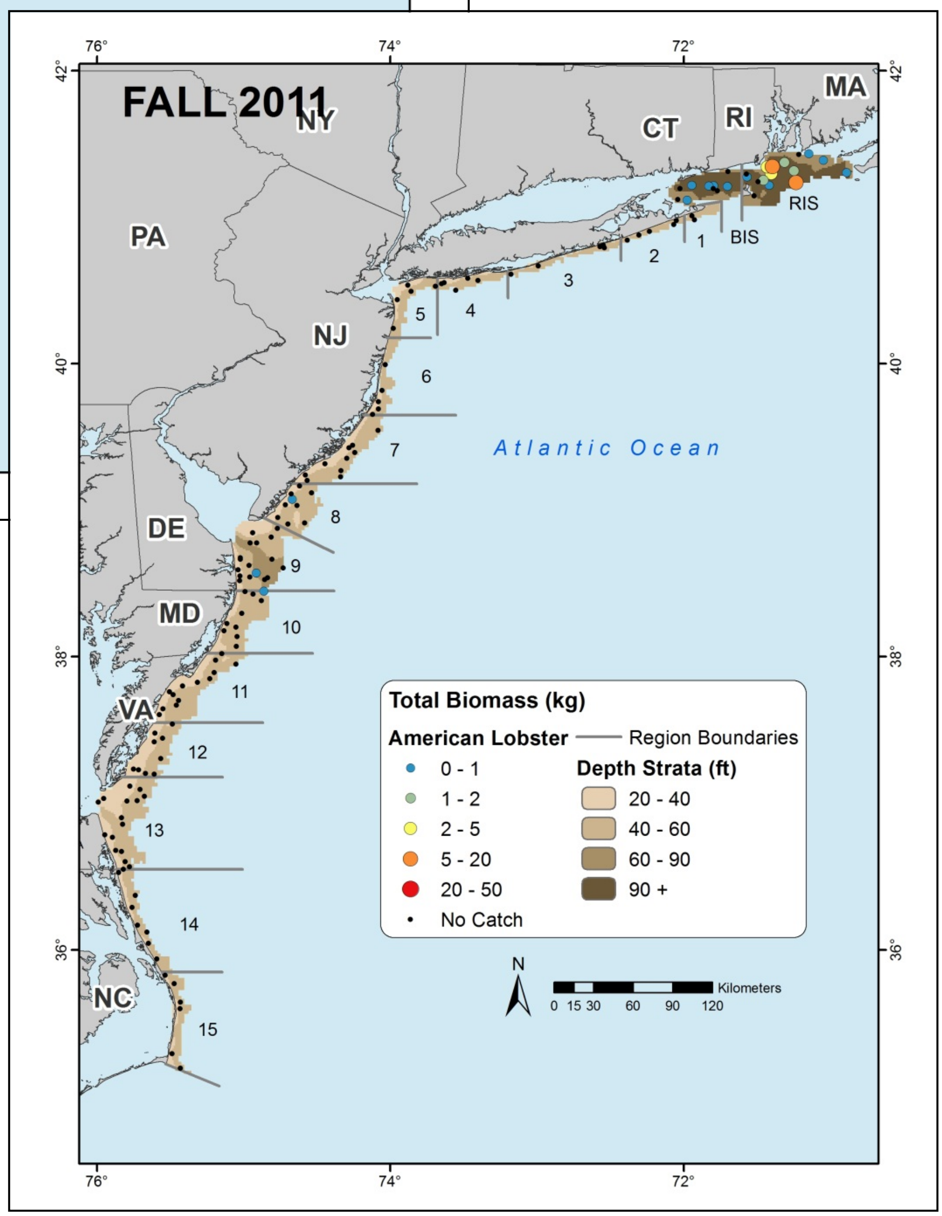


Figure 12. Alewife preliminary diet composition, expressed as percent by weight and number collected during NEAMAP cruises in 2007 through Spring 2011. (The number of fish sampled for diet is given by n_{fish}, while $n_{clusters}$ indicates the number of clusters of this species sampled. Only a small proportion of specimens of this species have been analyzed)







American Lobster
Sampling Priority: E

Figure 13. American lobster biomass (kg) at each sampling site for 2011 NEAMAP cruises.

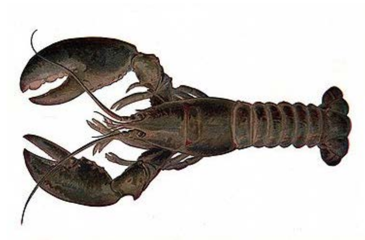


Table 9. American lobster sampling rates for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught (kg)	Number Measured	Age Specimens	Ages Read	Stomach Specimens	Stomachs Analyzed
Spring	2008	519	89.8	286	N/A	N/A	N/A	N/A
	2009	290	89.9	248	N/A	N/A	N/A	N/A
	2010	86	24.0	86	N/A	N/A	N/A	N/A
	2011	216	67.1	216	N/A	N/A	N/A	N/A
Fall	2007	262	59.0	262	N/A	N/A	N/A	N/A
	2008	352	80.6	178	N/A	N/A	N/A	N/A
	2009	89	29.1	89	N/A	N/A	N/A	N/A
	2010	63	19.4	63	N/A	N/A	N/A	N/A
	2011	106	30.2	106	N/A	N/A	N/A	N/A

Table 10. Strata used for calculation of abundance indices for American lobster.

State (Nominal)	Region	Depth Stratum	Spring Index	Fall Index
RI	RIS	60-90	(red)	(red)
		90+	(red)	(red)
	BIS	60-90	(red)	(red)
		90+	(red)	(red)
NY	01	40-60	(grey)	(grey)
	02	20-40	(grey)	(grey)
		40-60	(grey)	(grey)
	03	20-40	(grey)	(grey)
		40-60	(grey)	(grey)
	04	20-40	(grey)	(grey)
		40-60	(grey)	(grey)
	05	20-40	(grey)	(grey)
		40-60	(grey)	(grey)
NJ	06	20-40	(grey)	(grey)
		40-60	(grey)	(grey)
	07	20-40	(grey)	(grey)
		40-60	(grey)	(grey)
	08	20-40	(grey)	(grey)
		40-60	(grey)	(grey)

State (Nominal)	Region	Depth Stratum	Spring Index	Fall Index
DE	09	20-40	(grey)	(grey)
		40-60	(grey)	(grey)
		60-90	(grey)	(grey)
MD	10	20-40	(grey)	(grey)
		40-60	(grey)	(grey)
VA	11	20-40	(grey)	(grey)
		40-60	(grey)	(grey)
	12	20-40	(grey)	(grey)
		40-60	(grey)	(grey)
	13	20-40	(grey)	(grey)
		40-60	(grey)	(grey)
NC	14	20-40	(grey)	(grey)
		40-60	(grey)	(grey)
	15	20-40	(grey)	(grey)
		40-60	(grey)	(grey)

(red) = used for abundance indices
(grey) = not used for abundance indices

Table 11. American lobster preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

Season	Year	Age	Numerical Index					Biomass Index				
			n	LCI	**Index**	UCI	CV (%)	n	LCI	**Index**	UCI	CV (%)
Spring	2008	All	27	2.16	**4.43**	8.32	16.0	27	0.61	**1.27**	2.20	21.0
	2009		26	2.05	**3.79**	6.52	14.4	26	0.86	**1.60**	2.63	17.5
	2010		26	0.54	**1.29**	2.41	23.8	26	0.23	**0.54**	0.93	26.4
	2011		26	0.97	**2.32**	4.58	21.7	26	0.32	**0.91**	1.76	28.7
Fall	2007	All	26	0.98	**2.41**	4.86	22.1	26	0.34	**0.88**	1.65	27.0
	2008		26	1.75	**3.23**	5.50	14.9	26	0.50	**1.05**	1.81	21.8
	2009		26	0.79	**1.58**	2.73	19.4	26	0.26	**0.57**	0.95	24.2
	2010		26	0.47	**1.00**	1.73	22.4	26	0.14	**0.36**	0.63	28.7
	2011		26	0.97	**1.94**	3.39	18.7	26	0.33	**0.71**	1.20	23.3

Figure 14. American lobster preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

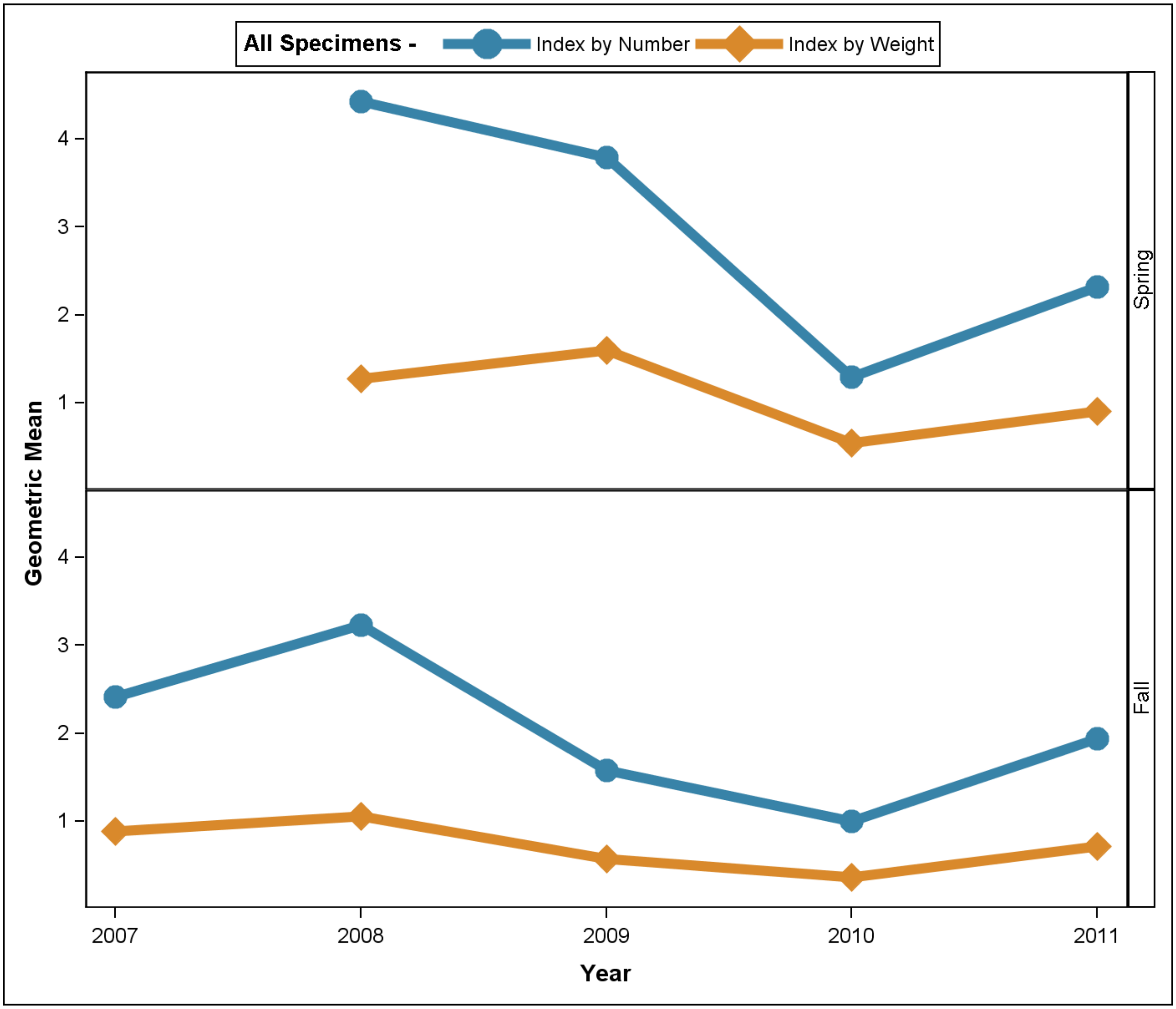


Figure 15. American lobster length-frequency distributions, by cruise.

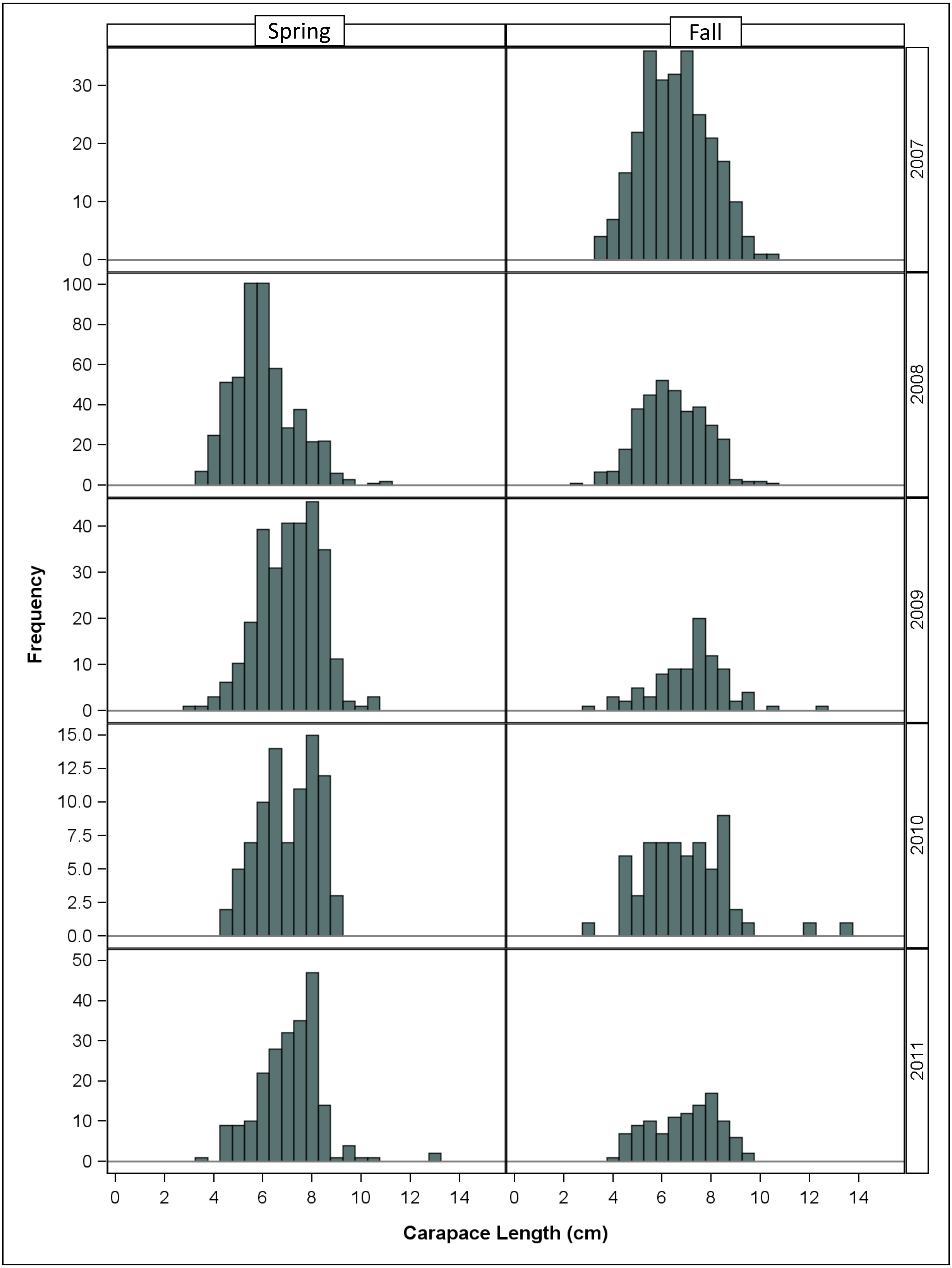


Figure 16. American lobster length-frequency distributions, by cruise and sex.

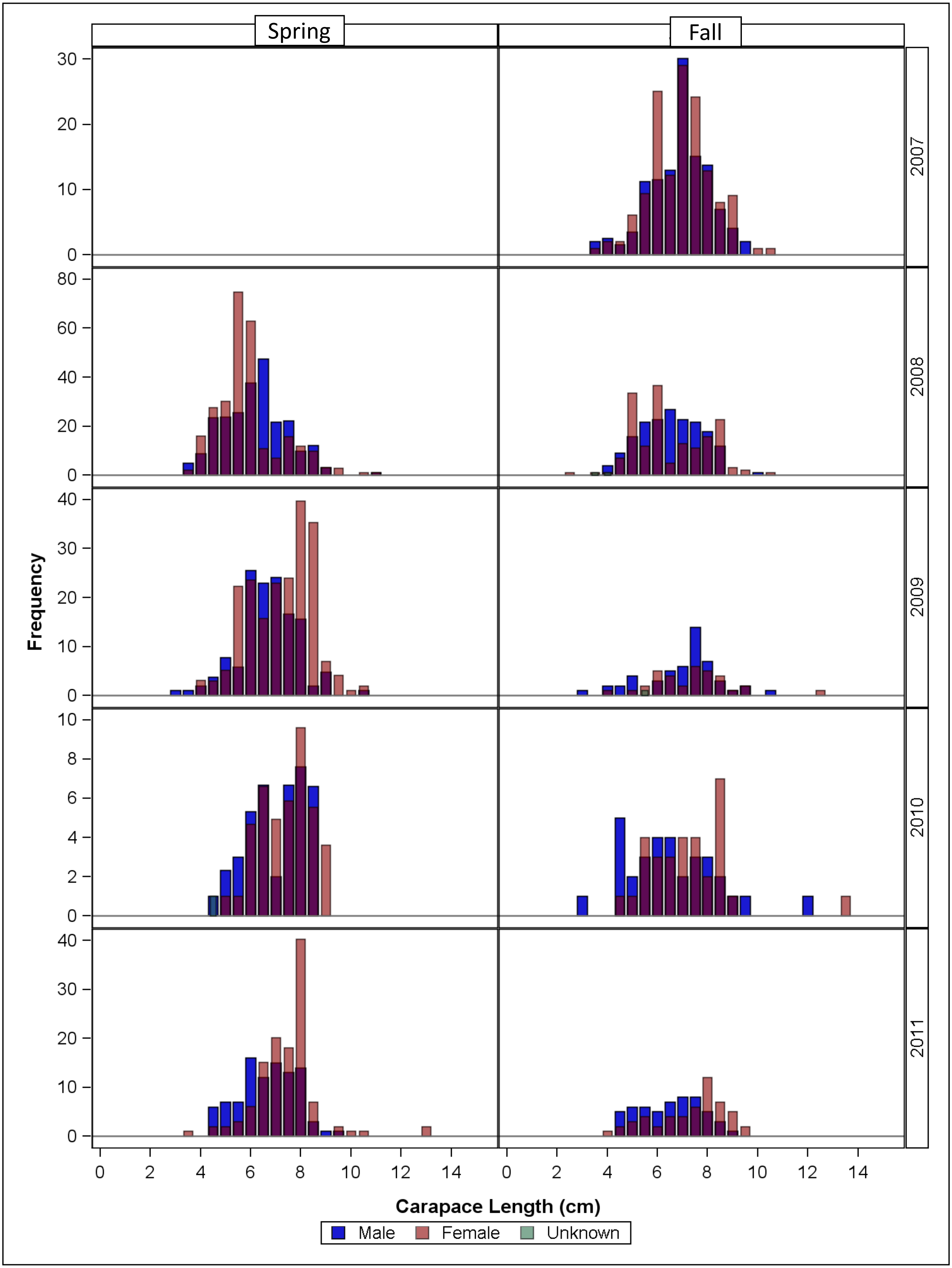
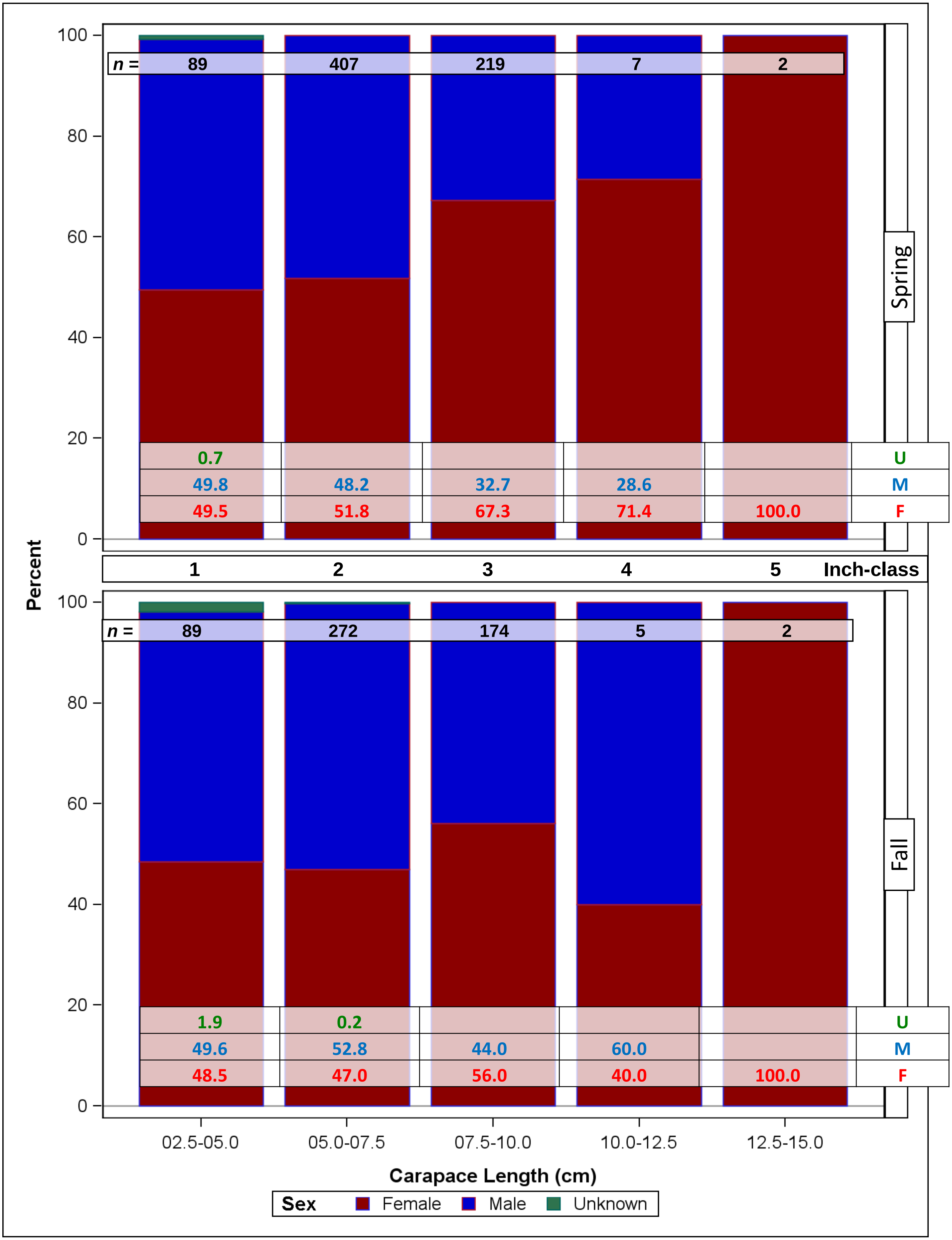
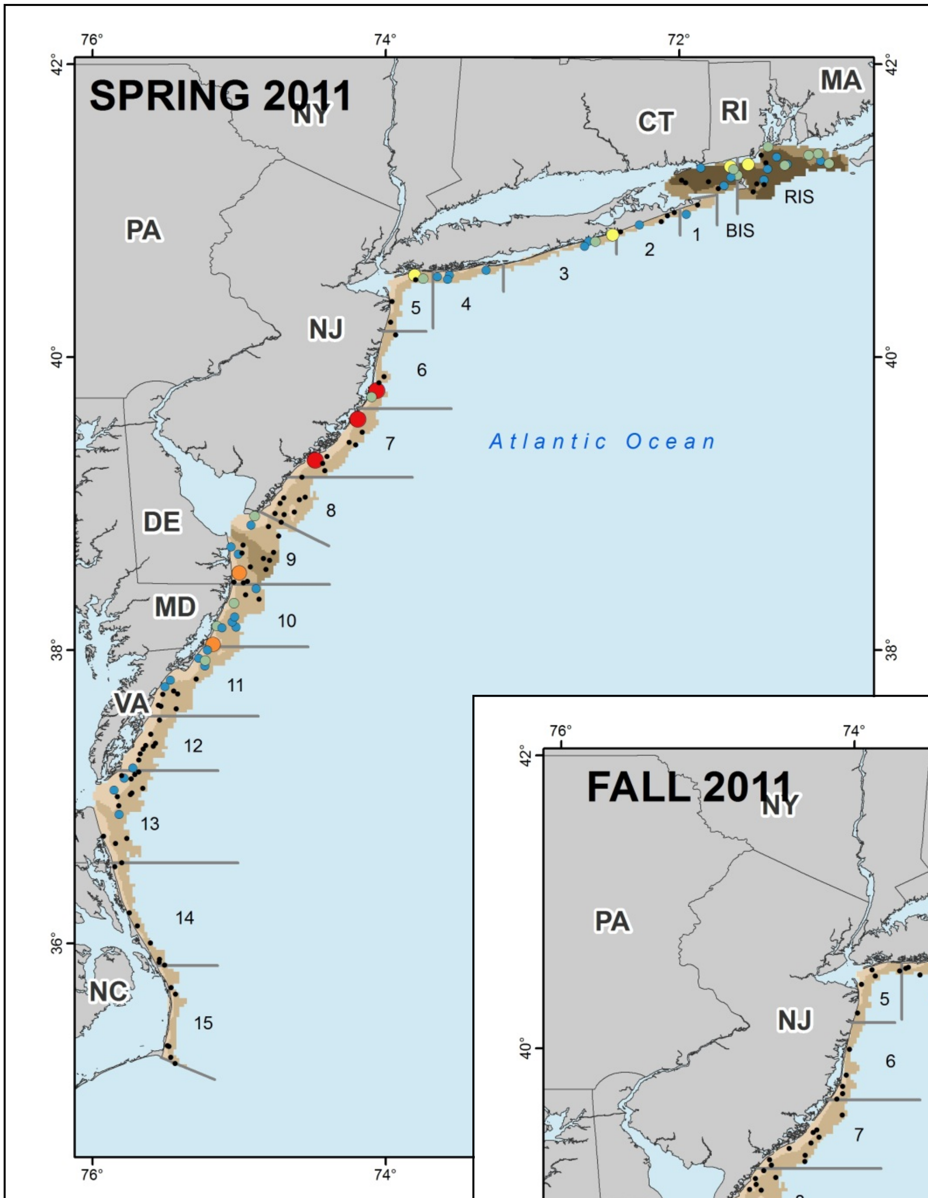


Figure 17. American lobster sex ratio, by length group, for NEAMAP Spring and Fall cruises 2007-2011. (The percentages for each category are given near the bottom of each bar. The number sampled for sex determination is provided near the top of each bar, and the length categories expressed in inches are shown between the two figures.).





American Shad

Sampling Priority: A

Figure 18. American shad biomass (kg) at each sampling site for 2011 NEAMAP cruises.

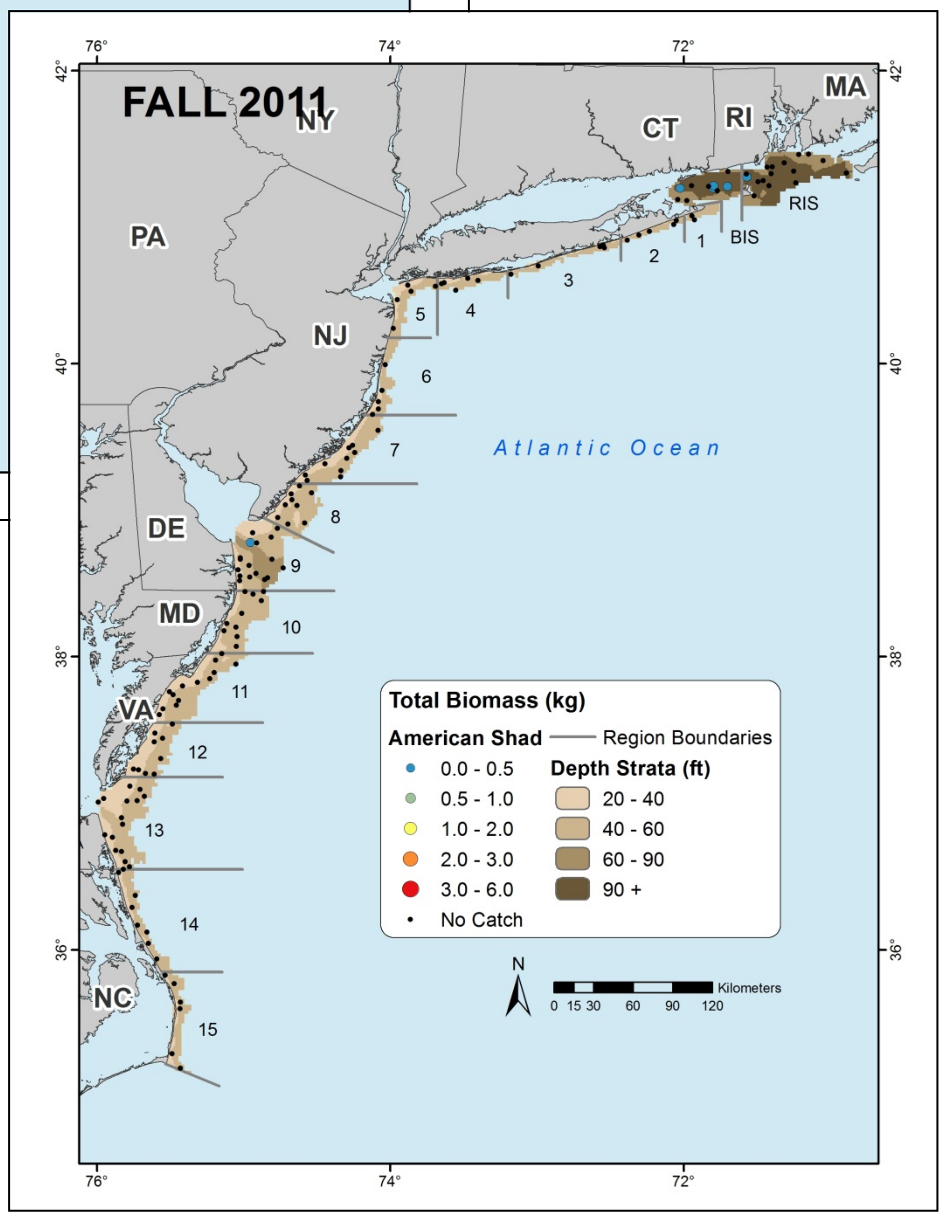


Table 12. American shad sampling rates and preserved specimen analysis status for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught (kg)	Number Measured	Age Specimens	Ages Read	Stomach Specimens	Stomachs Analyzed
Spring	2008	1,205	40.8	1,205	327	0	321	0
	2009	1,141	33.2	859	260	0	260	9
	2010	1,236	43.8	942	274	0	273	22
	2011	1,712	73.6	1,418	251	0	249	248
Fall	2007	9	0.8	9	9	0	9	0
	2008	9	0.5	9	5	0	5	0
	2009	28	3.1	28	10	0	10	9
	2010	32	1.1	6	3	0	3	3
	2011	13	1.3	13	13	0	13	0

Table 13. Strata used for calculation of abundance indices for American shad.

State (Nominal)	Region	Depth Stratum	Spring Index	Fall Index	State (Nominal)	Region	Depth Stratum	Spring Index	Fall Index
RI	RIS	60-90			DE	09	20-40		
		90+					40-60		
	BIS	60-90					60-90		
		90+			MD	10	20-40		
NY	01	40-60					40-60		
	02	20-40			VA	11	20-40		
		40-60					40-60		
	03	20-40				12	20-40		
		40-60					40-60		
	04	20-40				13	20-40		
		40-60					40-60		
	05	20-40			NC	14	20-40		
		40-60					40-60		
NJ	06	20-40				15	20-40		
		40-60					40-60		
	07	20-40							
		40-60				= used for abundance indices			
	08	20-40				= not used for abundance indices			
		40-60							

Table 14. American shad preliminary geometric mean indices of abundance, by number and biomass, for spring NEAMAP surveys, for all specimens captured.

Season	Year	Age	Numerical Index					Biomass Index				
			n	LCI	**Index**	UCI	CV (%)	n	LCI	**Index**	UCI	CV (%)
Spring	2008	All	150	1.81	**2.36**	3.02	7.4	150	0.16	**0.20**	0.25	10.3
	2009		160	1.09	**1.47**	1.93	9.4	160	0.09	**0.14**	0.19	16.5
	2010		150	1.26	**1.70**	2.21	8.9	150	0.11	**0.17**	0.23	16.3
	2011		150	1.07	**1.52**	2.07	10.7	150	0.14	**0.21**	0.29	15.2

Figure 19. American shad preliminary geometric mean indices of abundance, by number and biomass, for spring NEAMAP surveys, for all specimens captured.

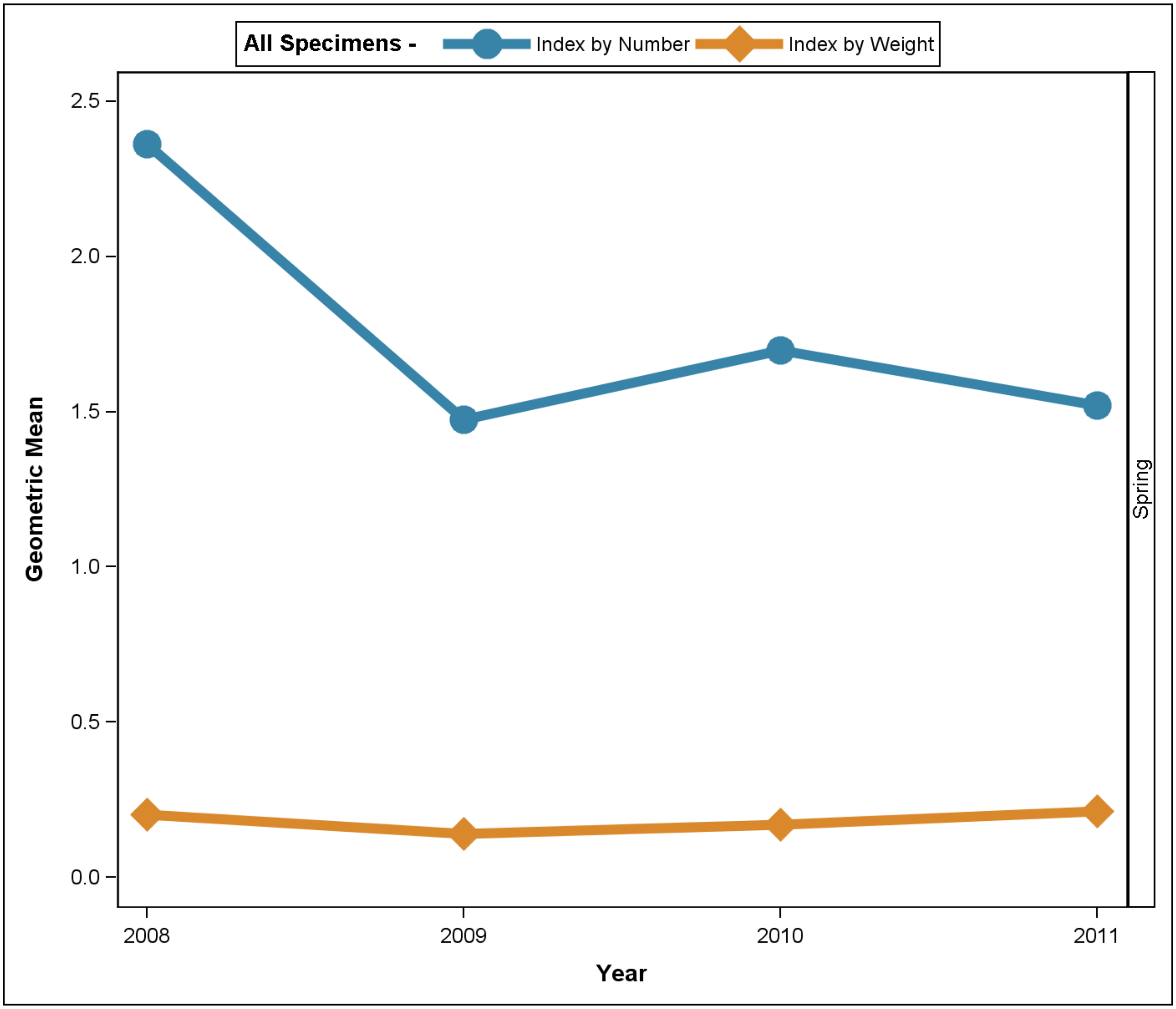


Figure 20. American shad length-frequency distributions, by cruise.

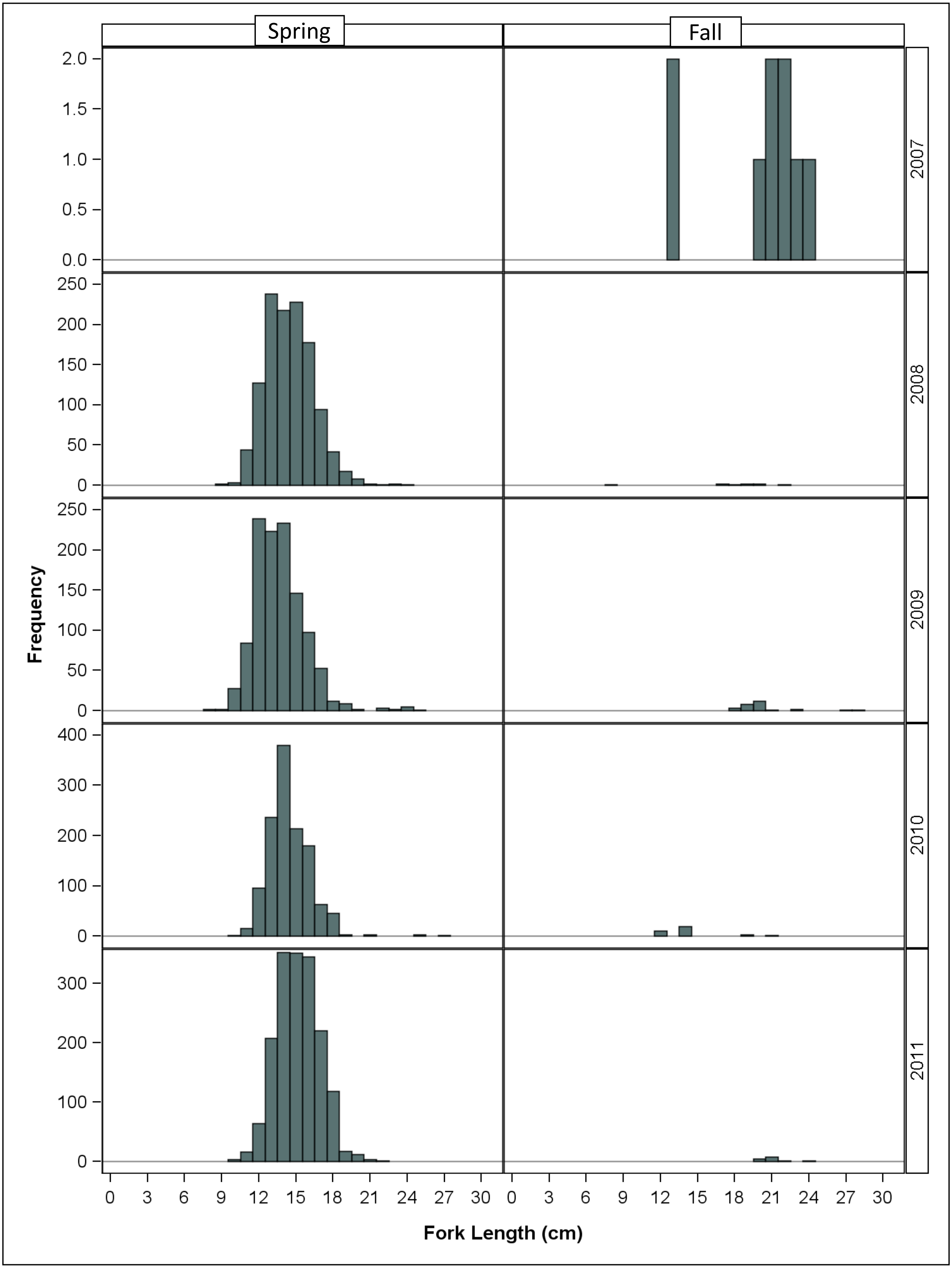


Figure 21. American shad length-frequency distributions, by cruise and sex.

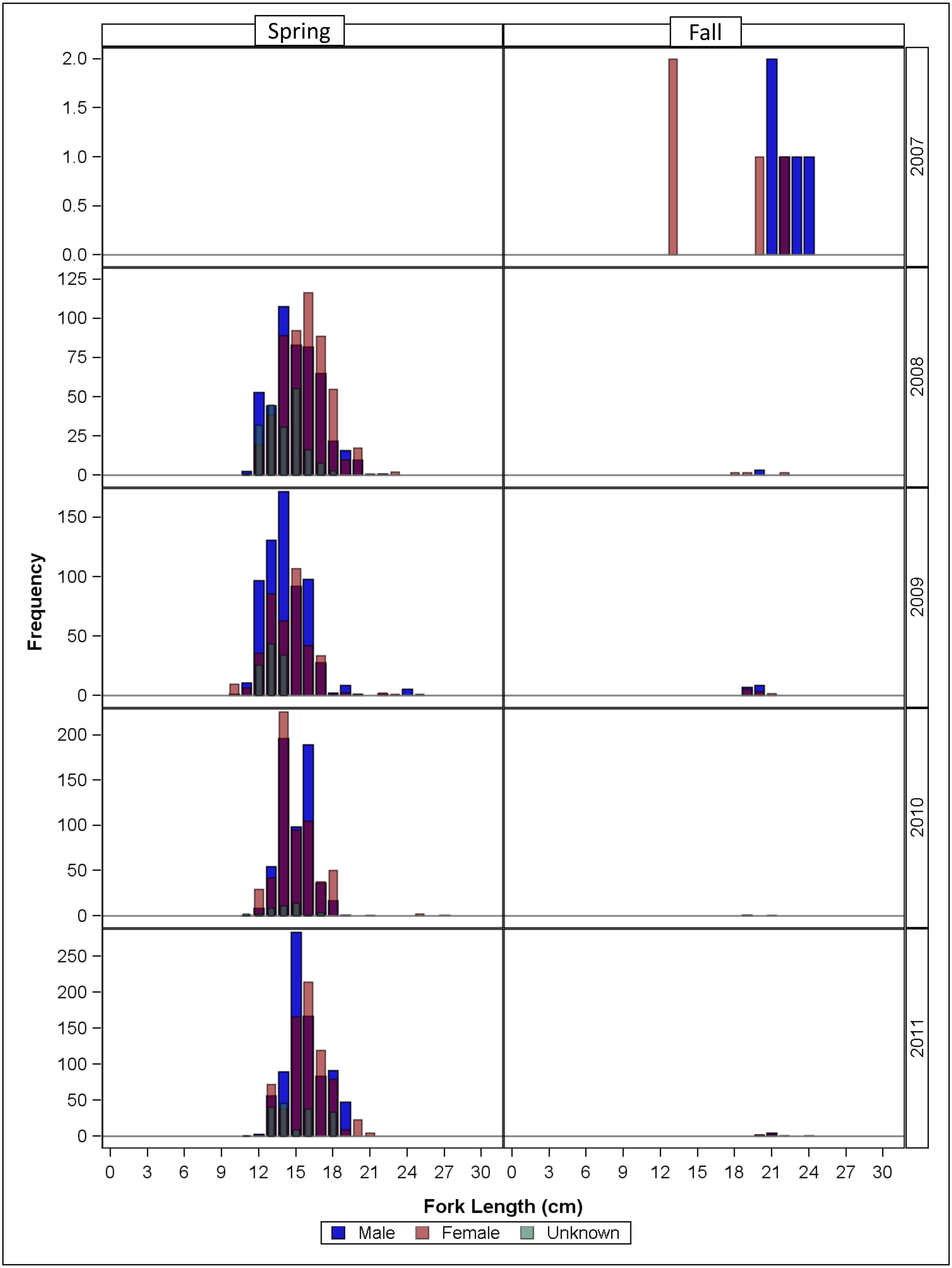


Figure 22. American shad sex ratio, by length group, for NEAMAP Spring and Fall cruises 2007-2011. (The percentages for each category are given near the bottom of each bar. The number sampled for sex determination is provided near the top of each bar, and the length categories expressed in inches are shown between the two figures.).

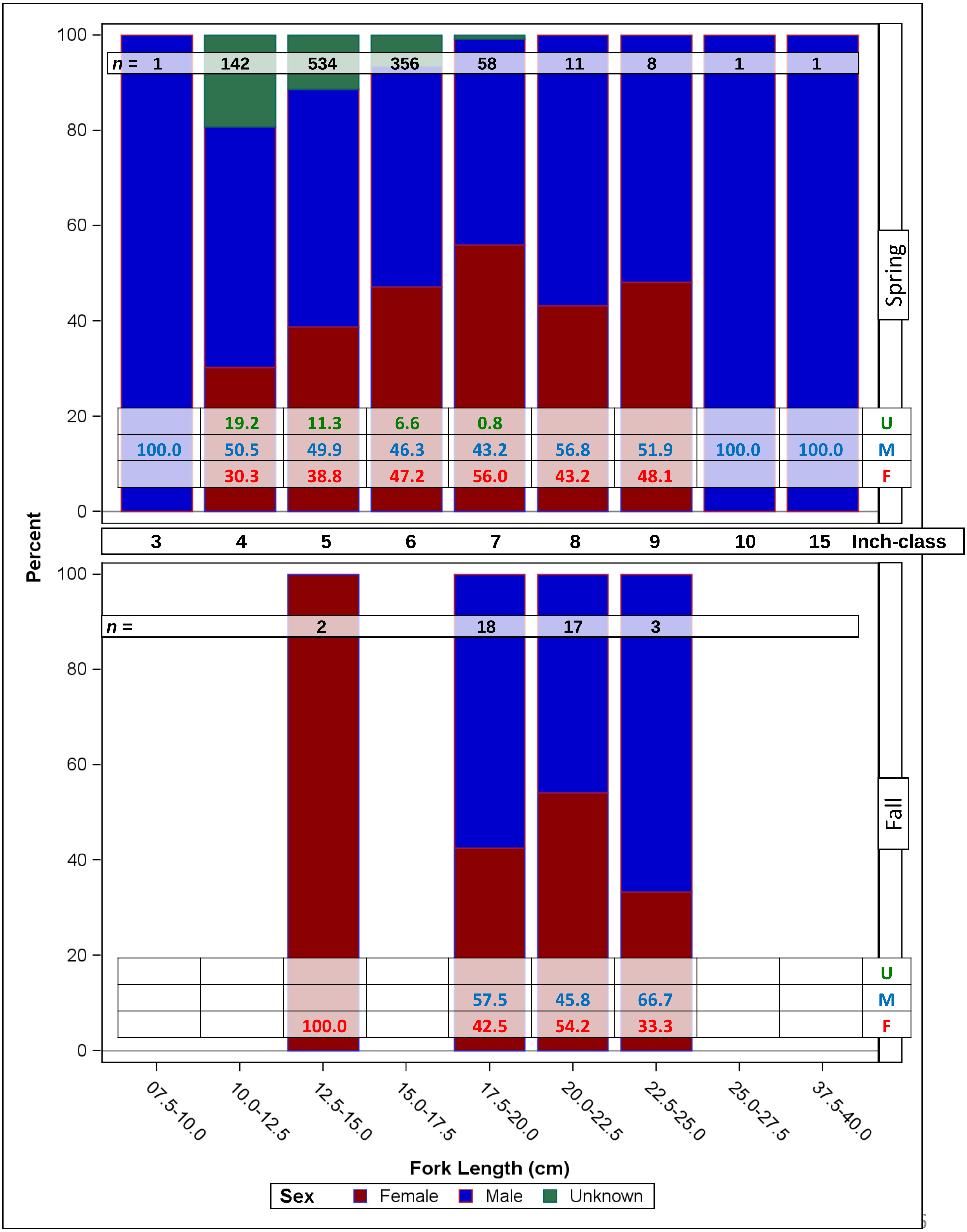
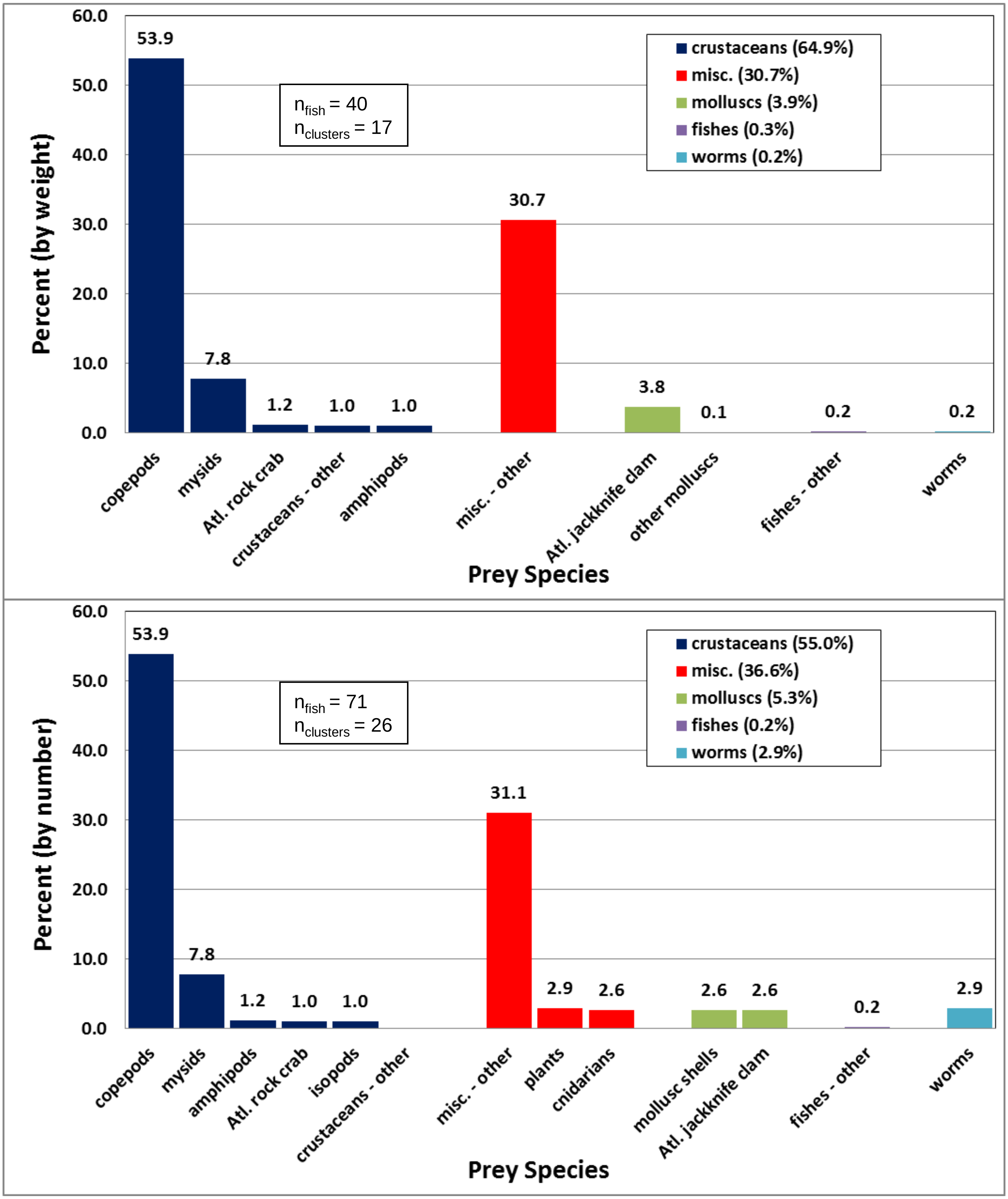


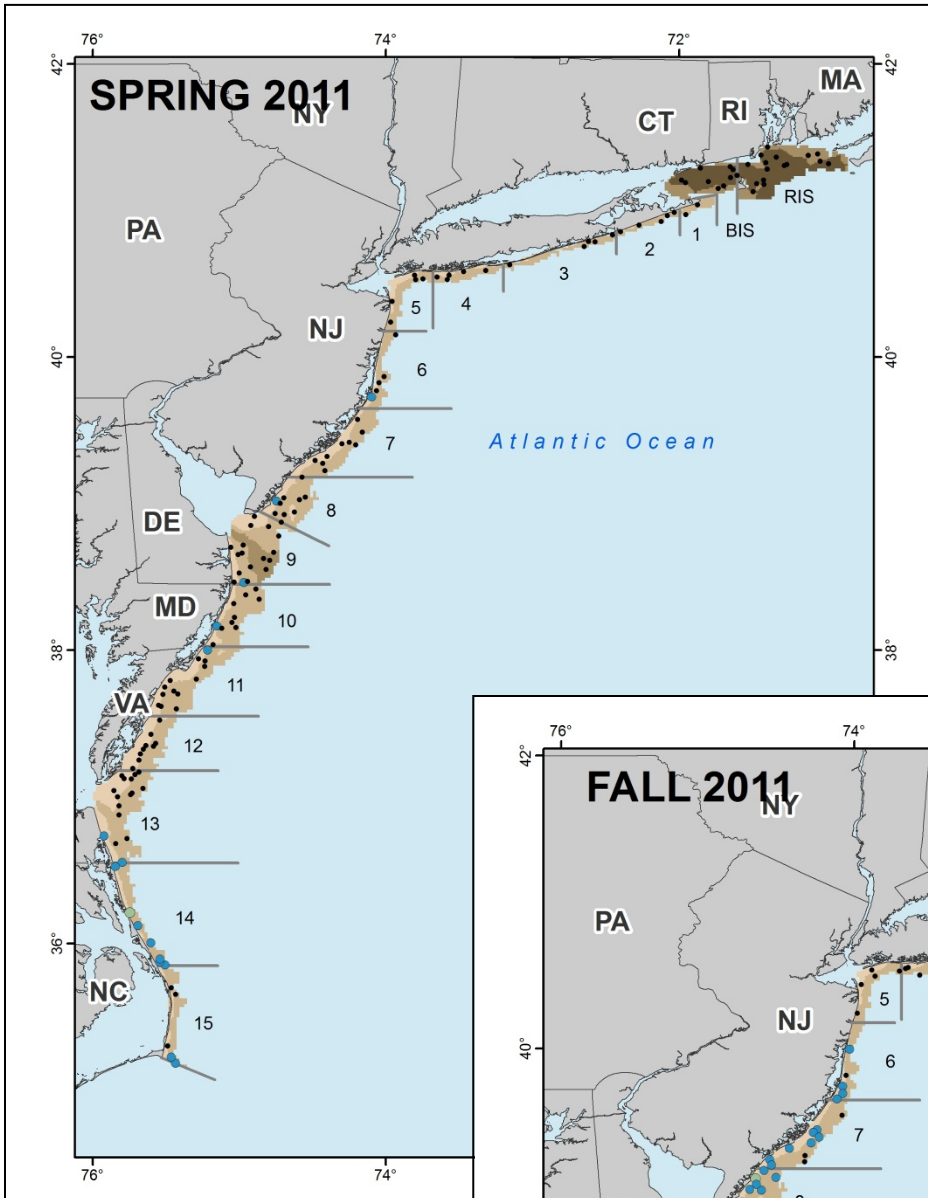
Figure 23. American shad preliminary diet composition, expressed as percent by weight and number collected during NEAMAP cruises in 2007 through Spring 2011. (The number of fish sampled for diet is given by n_{fish}, while $n_{clusters}$ indicates the number of clusters of this species sampled. Only a small proportion of specimens of this species have been analyzed)



Atlantic Croaker

Sampling Priority: A

Figure 24. Atlantic croaker biomass (kg) at each sampling site for 2011 NEAMAP cruises.



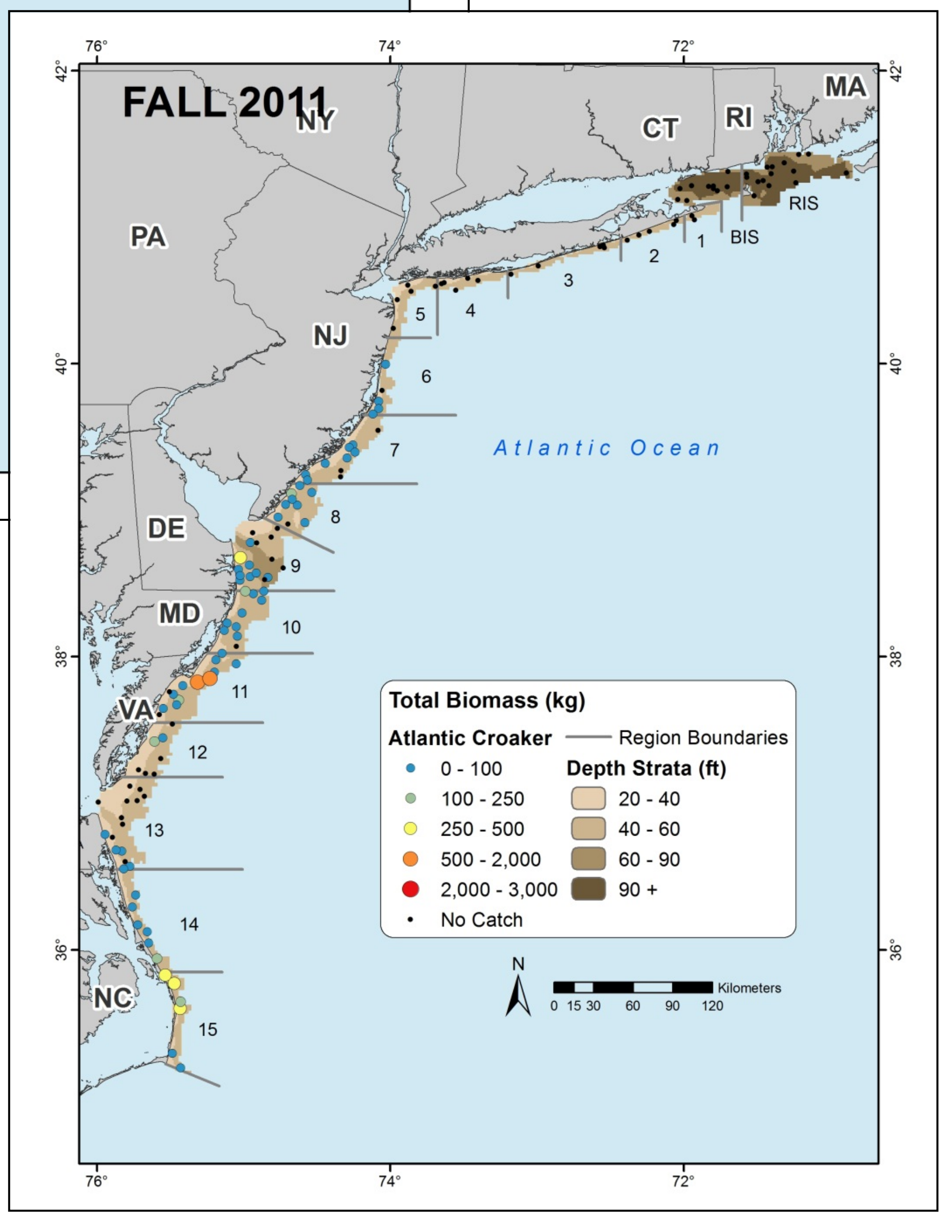


Table 15. Atlantic croaker sampling rates and preserved specimen analysis status for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught (kg)	Number Measured	Age Specimens	Ages Read	Stomach Specimens	Stomachs Analyzed
Spring	2008	467	25.0	212	41	41	38	38
	2009	17,040	1004.3	1,225	80	78	66	60
	2010	29,365	1656.2	929	49	49	48	13
	2011	10,576	349.2	890	71	70	62	62
Fall	2007	58,763	7616.5	2,843	211	211	194	188
	2008	66,823	5123.2	3,591	307	307	283	280
	2009	45,730	5685.3	5,277	415	414	341	291
	2010	73,685	5715.1	4,095	275	271	217	213
	2011	58,671	6148.1	5,561	324	323	294	0

Table 16. Strata used for calculation of abundance indices for Atlantic croaker.

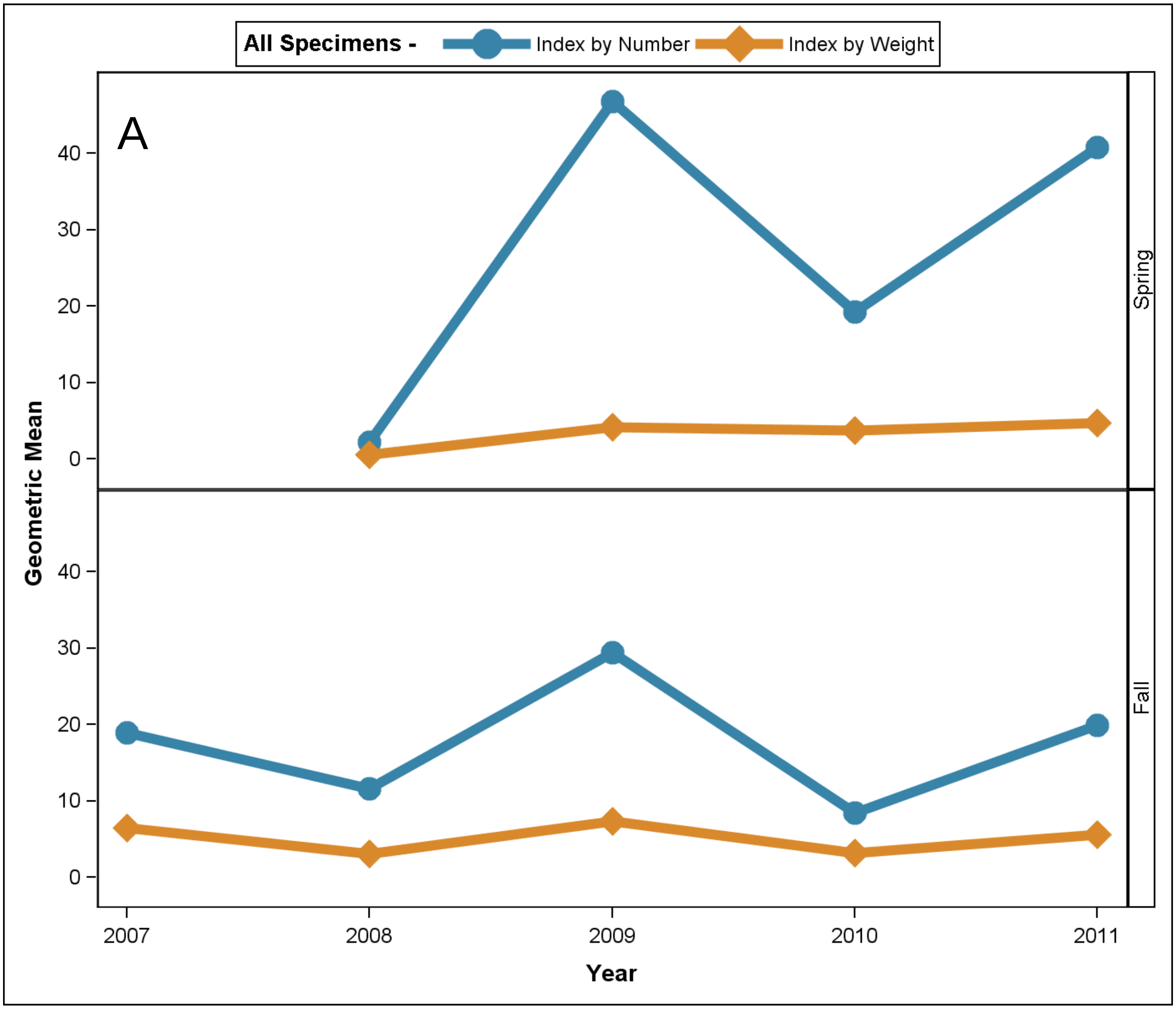
State (Nominal)	Region	Depth Stratum	Spring Index	Fall Index
RI	RIS	60-90	[grey]	[grey]
		90+	[grey]	[grey]
	BIS	60-90	[grey]	[grey]
		90+	[grey]	[grey]
NY	01	40-60	[grey]	[grey]
	02	20-40	[grey]	[grey]
		40-60	[grey]	[grey]
	03	20-40	[grey]	[grey]
		40-60	[grey]	[grey]
	04	20-40	[grey]	[grey]
		40-60	[grey]	[grey]
	05	20-40	[grey]	[grey]
		40-60	[grey]	[grey]
NJ	06	20-40	[grey]	[red]
		40-60	[grey]	[red]
	07	20-40	[grey]	[red]
		40-60	[grey]	[red]
	08	20-40	[grey]	[red]
		40-60	[grey]	[red]
DE	09	20-40	[grey]	[red]
		40-60	[grey]	[red]
		60-90	[grey]	[red]
MD	10	20-40	[grey]	[red]
		40-60	[grey]	[red]
VA	11	20-40	[grey]	[red]
		40-60	[grey]	[red]
	12	20-40	[grey]	[red]
		40-60	[grey]	[red]
	13	20-40	[grey]	[red]
		40-60	[grey]	[red]
NC	14	20-40	[red]	[red]
		40-60	[red]	[red]
	15	20-40	[red]	[red]
		40-60	[red]	[red]

[red] = used for abundance indices
[grey] = not used for abundance indices

Table 17. Atlantic croaker preliminary geometric mean indices of abundance, for all specimens captured and by age-class for spring and fall NEAMAP surveys (age-specific indices for age-2 and older calculated for fall surveys only).

Season	Year	Age	Numerical Index					Biomass Index				
			n	LCI	**Index**	UCI	CV (%)	n	LCI	**Index**	UCI	CV (%)
Spring	2008	All	13	0.00	**2.19**	9.81	52.5	13	0.00	**0.53**	1.72	67.8
	2009		15	10.76	**46.78**	193.10	18.1	15	1.30	**4.13**	10.44	24.5
	2010		13	1.70	**19.25**	150.71	33.5	13	0.12	**3.77**	19.27	46.3
	2011		13	6.82	**40.80**	222.45	22.5	13	1.18	**4.74**	14.12	27.7
Fall	2007	All	102	11.28	**18.94**	31.38	8.1	102	4.18	**6.50**	9.85	9.2
	2008		102	6.23	**11.55**	20.78	10.9	102	1.79	**3.10**	5.03	13.6
	2009		107	17.26	**29.44**	49.73	7.5	107	4.67	**7.32**	11.21	9.1
	2010		102	4.72	**8.42**	14.52	11.1	102	1.93	**3.20**	5.01	12.5
	2011		102	11.79	**19.88**	33.08	8.1	102	3.57	**5.55**	8.37	9.5
Fall	2007	0	102	0.93	**1.74**	2.89	17.4	102	0.32	**0.67**	1.10	22.6
	2008		102	3.62	**6.76**	12.04	12.7	102	1.03	**1.84**	2.98	16.0
	2009		107	3.73	**6.04**	9.50	10.2	107	1.02	**1.61**	2.38	13.3
	2010		102	1.32	**2.49**	4.25	16.3	102	0.53	**1.00**	1.62	19.2
	2011		102	3.57	**5.98**	9.65	10.9	102	1.18	**1.89**	2.83	13.2
Spring	2008	1	13	0.00	**1.68**	6.95	55.2	13	0.00	**0.37**	1.16	73.1
	2009		15	9.75	**39.68**	152.97	18.0	15	1.18	**3.53**	8.42	24.2
	2010		13	1.28	**15.63**	120.16	35.3	13	0.05	**3.27**	16.40	48.4
	2011		13	6.14	**36.46**	195.57	22.9	13	1.05	**4.26**	12.52	28.4
Fall	2007	1	102	4.51	**7.59**	12.41	10.3	102	1.69	**2.71**	4.12	12.3
	2008		102	4.05	**7.46**	13.19	12.1	102	1.15	**2.02**	3.24	15.4
	2009		107	10.49	**17.63**	29.22	8.3	107	2.90	**4.52**	6.80	10.2
	2010		102	3.04	**5.46**	9.33	12.6	102	1.25	**2.11**	3.32	14.4
	2011		102	7.73	**12.86**	20.99	8.8	102	2.41	**3.73**	5.56	10.5
Fall	2007	2	102	4.34	**6.87**	10.59	9.4	102	1.72	**2.56**	3.67	10.6
	2008		102	1.26	**2.27**	3.73	15.6	102	0.42	**0.76**	1.19	19.2
	2009		107	5.24	**8.32**	12.92	9.0	107	1.68	**2.51**	3.59	10.7
	2010		102	1.98	**3.23**	4.99	12.1	102	0.78	**1.21**	1.73	13.5
	2011		102	4.00	**6.19**	9.33	9.2	102	1.23	**1.80**	2.53	11.2
Fall	2007	3	102	3.10	**4.59**	6.62	9.0	102	1.26	**1.78**	2.43	10.2
	2008		102	0.58	**1.02**	1.60	17.7	102	0.19	**0.37**	0.59	22.5
	2009		107	2.58	**3.88**	5.65	9.8	107	0.84	**1.22**	1.68	11.7
	2010		102	1.11	**1.69**	2.44	12.3	102	0.40	**0.60**	0.82	14.0
	2011		102	1.67	**2.46**	3.48	10.4	102	0.47	**0.69**	0.94	13.0
Fall	2007	4+	102	2.23	**3.18**	4.42	9.0	102	0.96	**1.33**	1.77	10.3
	2008		102	0.37	**0.64**	0.98	18.7	102	0.14	**0.27**	0.41	22.5
	2009		107	1.41	**2.05**	2.87	10.6	107	0.46	**0.67**	0.91	13.1
	2010		102	0.67	**0.99**	1.38	13.0	102	0.23	**0.35**	0.49	15.9
	2011		102	0.74	**1.08**	1.49	12.2	102	0.19	**0.29**	0.39	15.5

Figure 25. Atlantic croaker preliminary geometric mean indices of abundance, for all specimens captured (A - by number and biomass) and by age-class (B – numbers only) for spring and fall NEAMAP surveys (age-specific indices for age-2 and older calculated for fall surveys only).



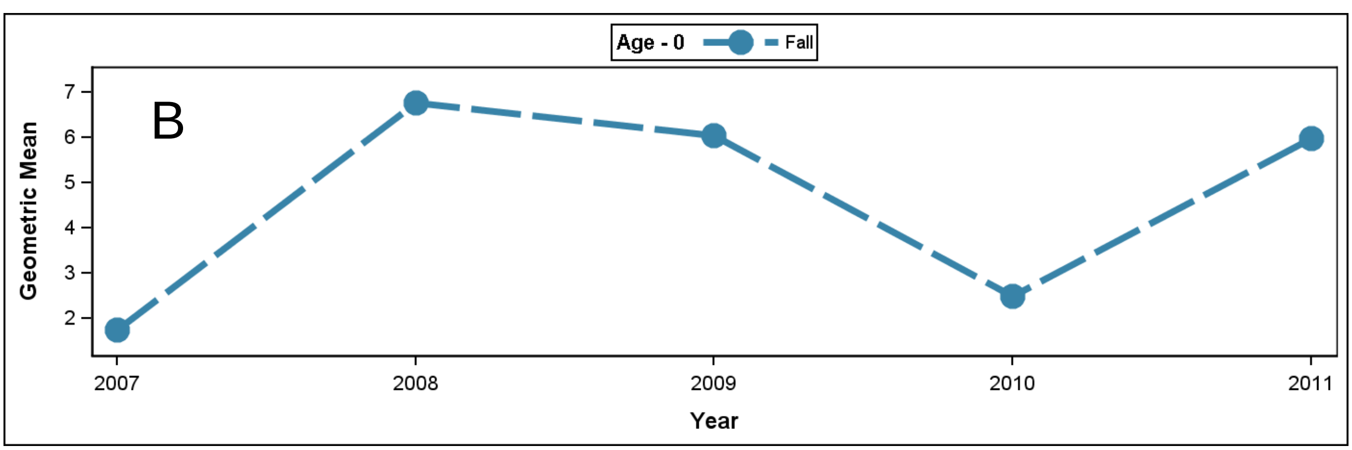


Figure 25. cont.

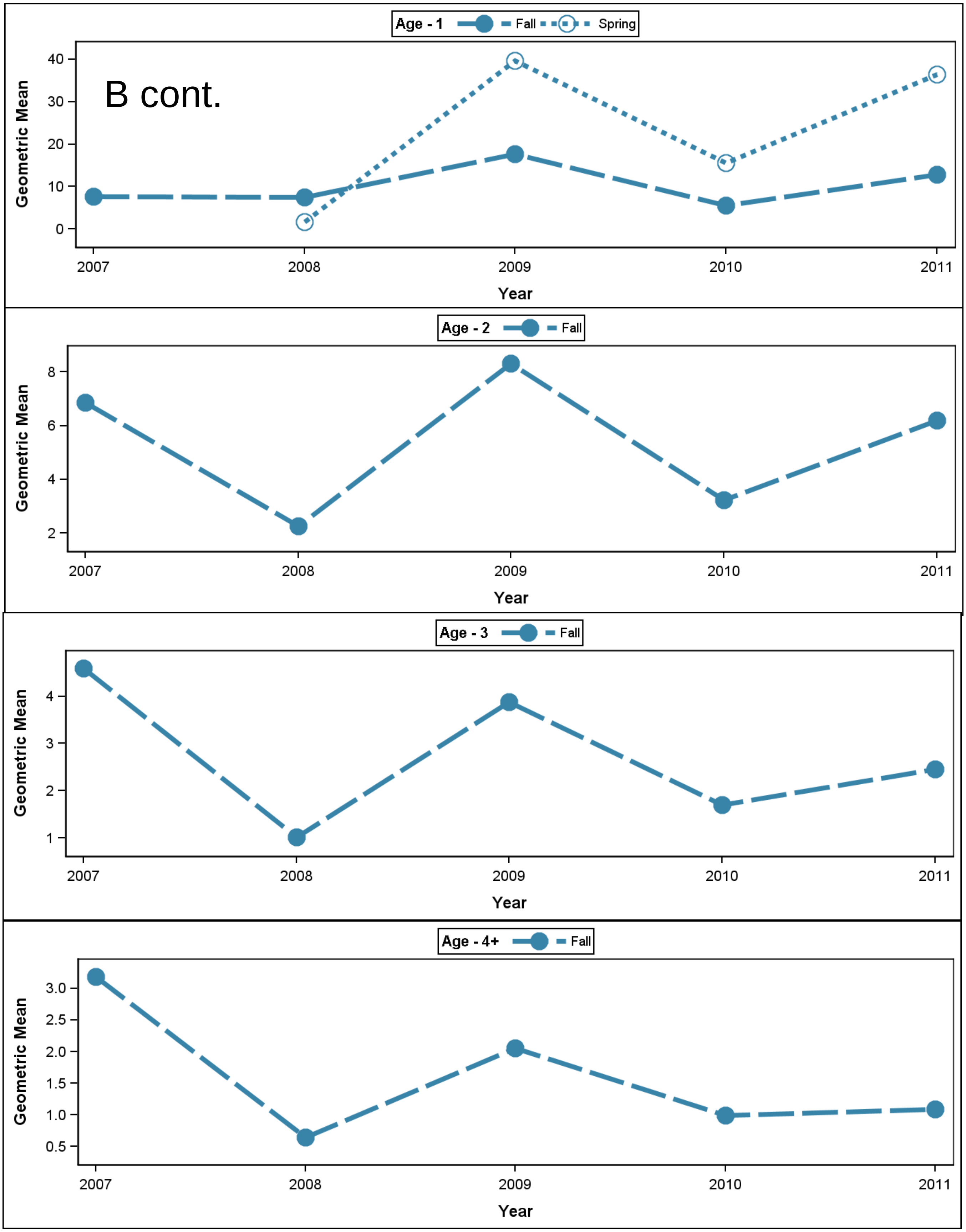


Figure 26. Atlantic croaker length-frequency distributions, by cruise.

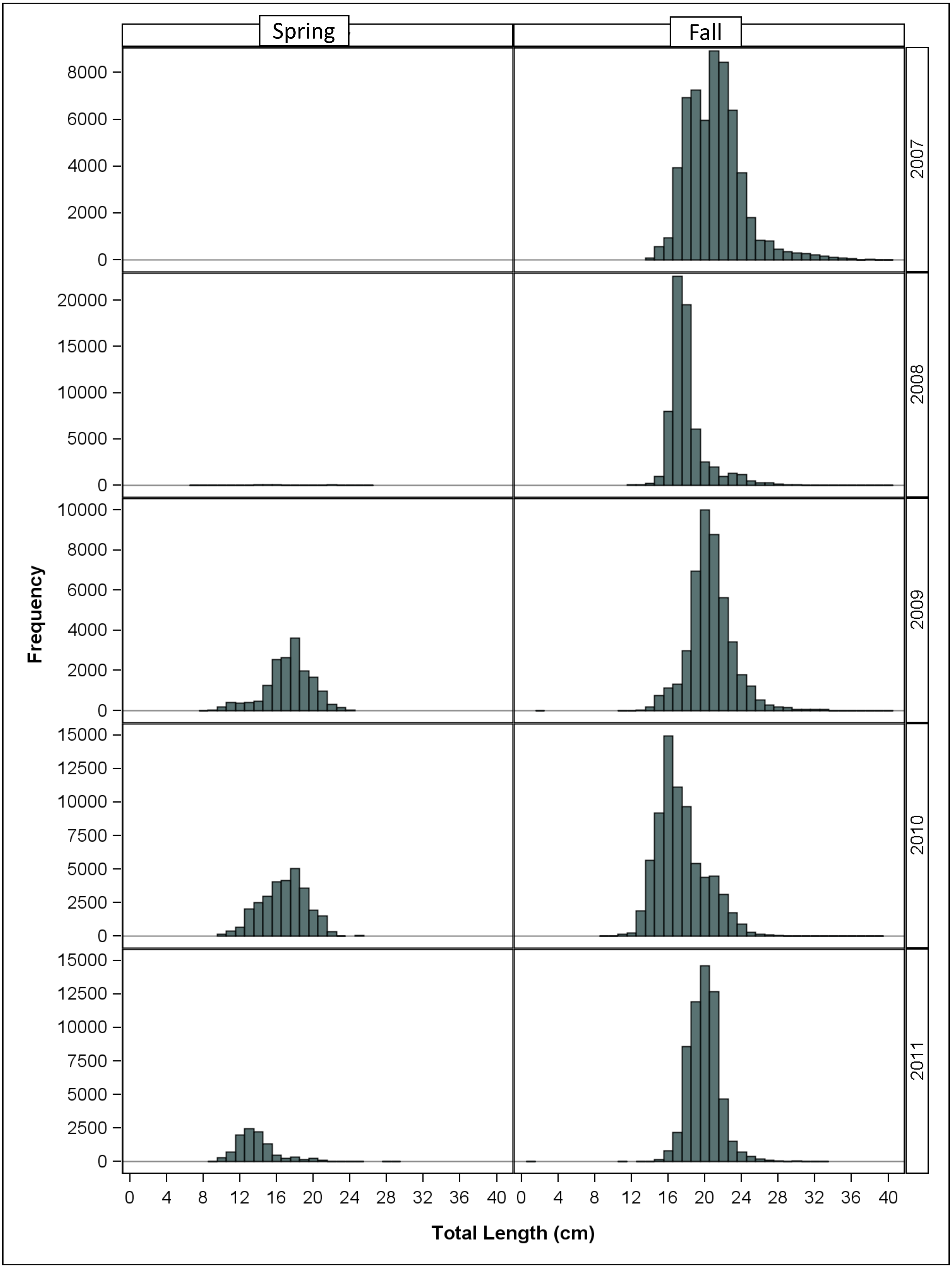


Figure 27. Atlantic croaker length-frequency distributions, by cruise and sex.

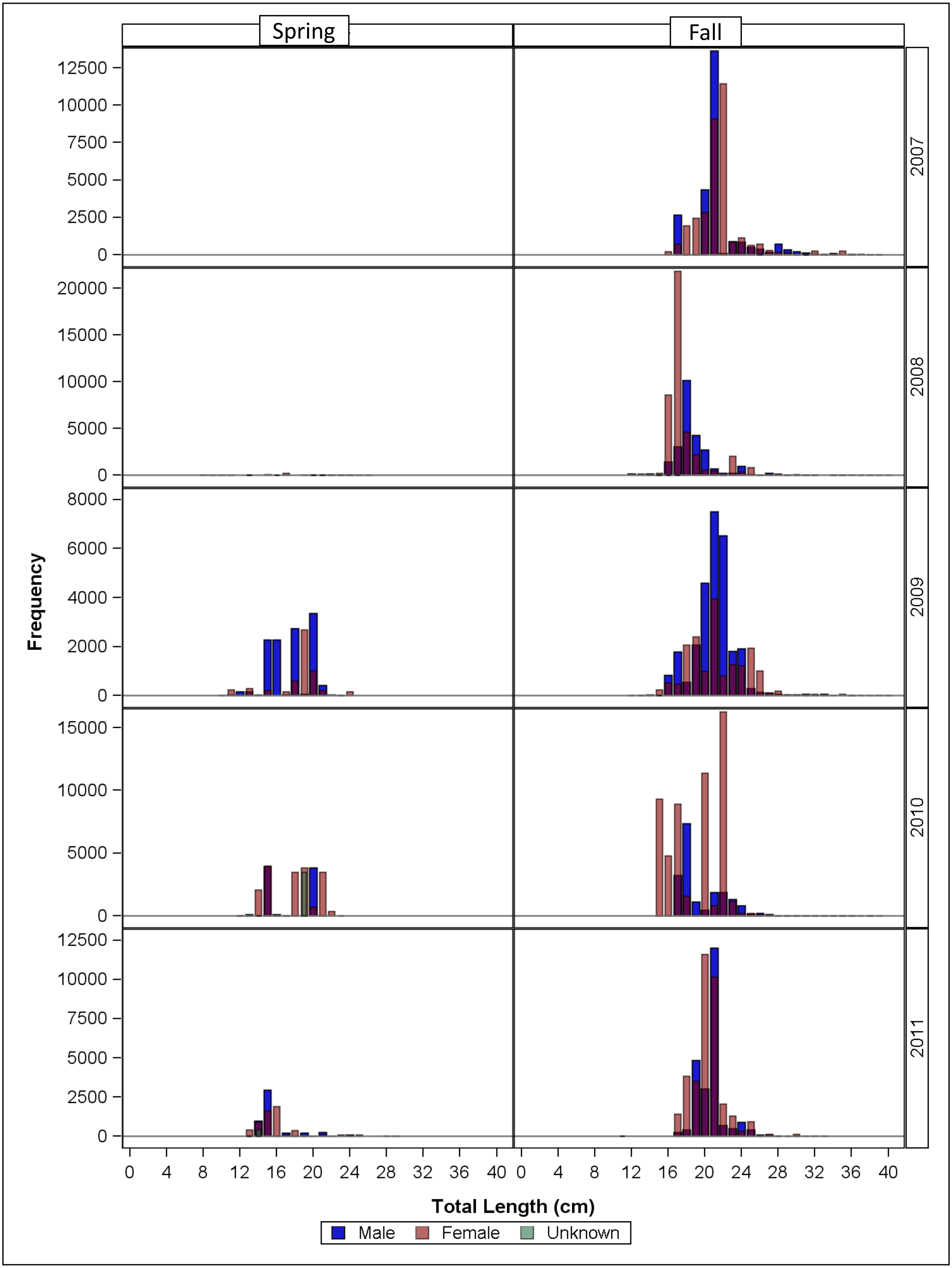


Figure 28. Atlantic croaker age-frequency distribution, by cruise. The estimated total number collected at a given age is provided above each corresponding bar.

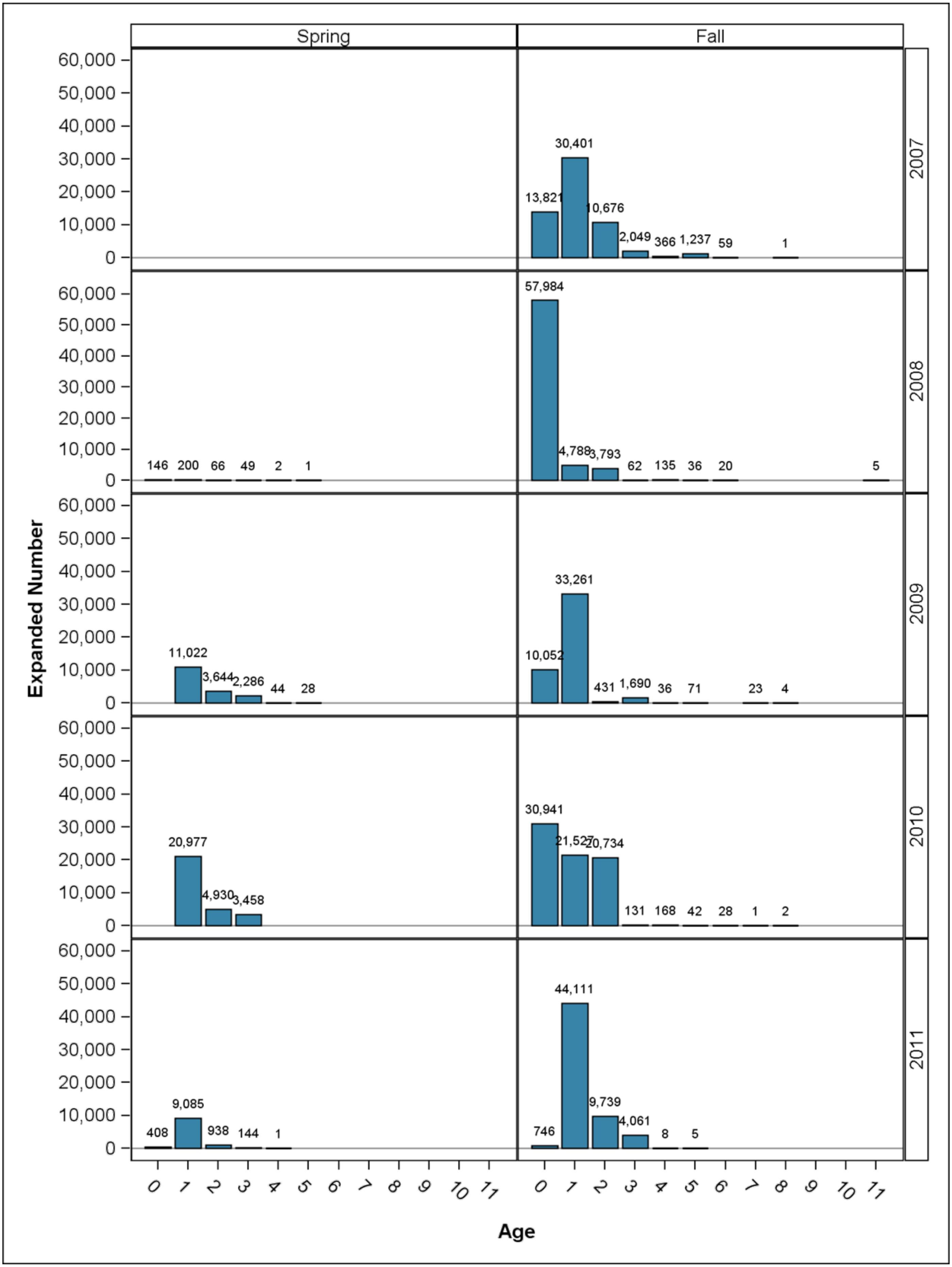


Figure 29. Atlantic croaker age-at-length proportions for all spring vs. all fall cruises combined, showing actual and loess smoothed proportions at each 1cm length bin.

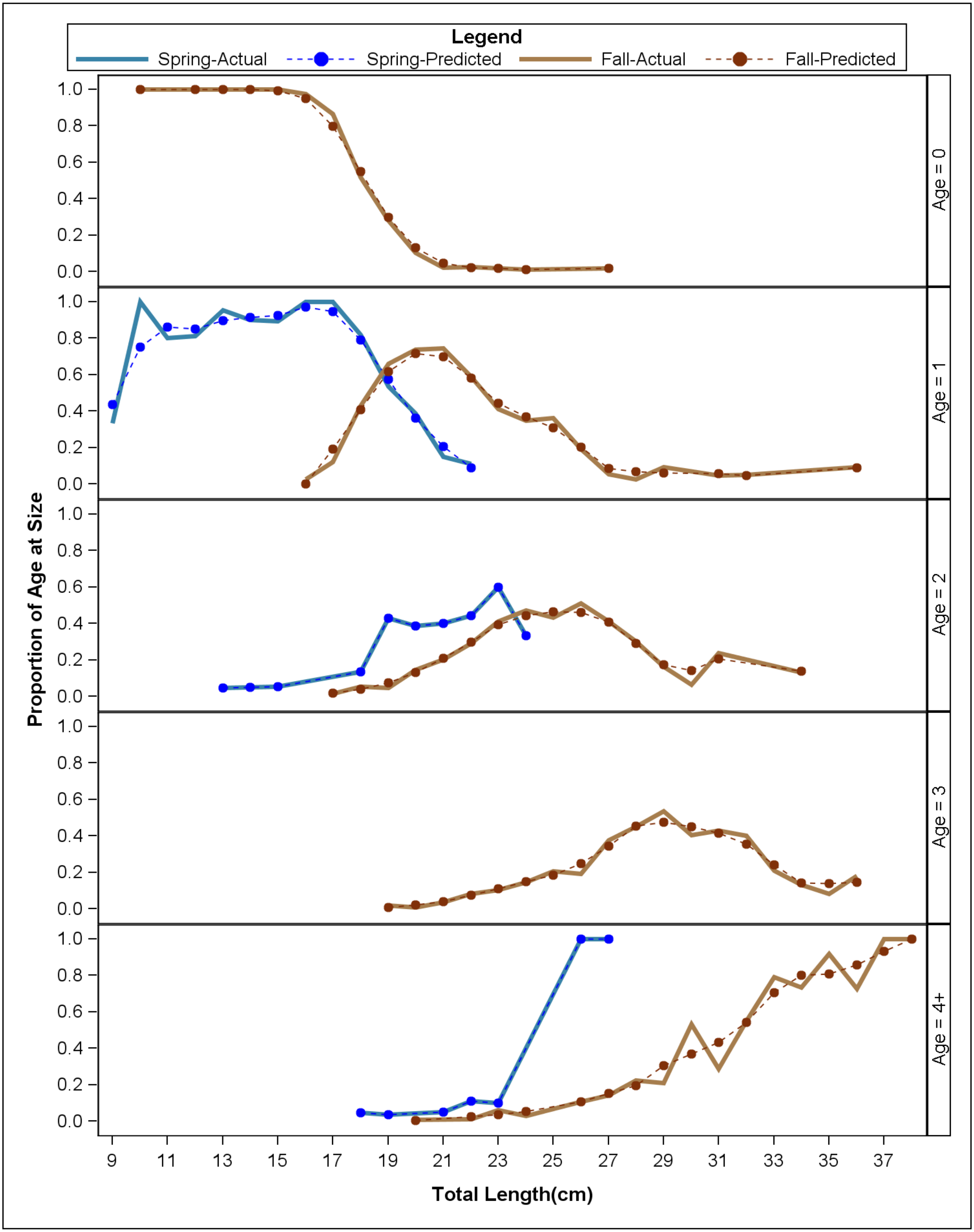


Table 18. Atlantic croaker loess smoothed age-at-length proportions for all fall cruises combined.
(Greyed values assigned rather than calculated due to lack of data in particular cells. Arrows indicate the same value used for all length bins covered. Struck-through values are from actual data but are not used. Note that within a Season and a Length bin proportions may not add to exactly 1.0 due to the smoothing algorithm. Smoothing is done within an age-class rather than across all age-classes at any given length.)

	Spring					Fall				
Total Length(cm)	**Age-0**	**Age-1**	**Age-2**	**Age-3**	**Age-4+**	**Age-0**	**Age-1**	**Age-2**	**Age-3**	**Age-4+**
9		0.437								
10		0.752								
11		0.861								
12		0.850								
13		0.899								
14		0.914				1.000				
15		0.926				0.993				
16		0.970				0.951	0.000	0.000		
17		0.948				0.798	0.193	0.019		
18		0.789				0.549	0.407	0.039	0.000	
19		0.574				0.297	0.615	0.076	0.008	0.000
20		0.361				0.130	0.717	0.132	0.022	0.005
21		0.206				0.046	0.698	0.211	0.040	0.010
22		0.088				0.022	0.582	0.300	0.074	0.025
23		0.000				0.017	0.443	0.394	0.108	0.035
24						0.010	0.369	0.443	0.150	0.053
25						0.000	0.309	0.466	0.184	0.041
26							0.201	0.459	0.249	0.108
27						~~0.018~~	0.085	0.407	0.344	0.153
28							0.068	0.293	0.453	0.197
29							0.061	0.174	0.474	0.306
30							0.057	0.142	0.450	0.369
31							0.055	0.140	0.414	0.432
32							0.045	0.140	0.354	0.543
33							0.000	0.139	0.243	0.705
34								0.139	0.141	0.802
35								0.000	0.139	0.810
36							~~0.089~~		0.147	0.860
37									0.069	0.931
38									0.000	1.000

Figure 30. Atlantic croaker sex ratio, by length group, for NEAMAP Spring and Fall cruises 2007-2011. (The percentages for each category are given near the bottom of each bar. The number sampled for sex determination is provided near the top of each bar, and the length categories expressed in inches are shown between the two figures.).

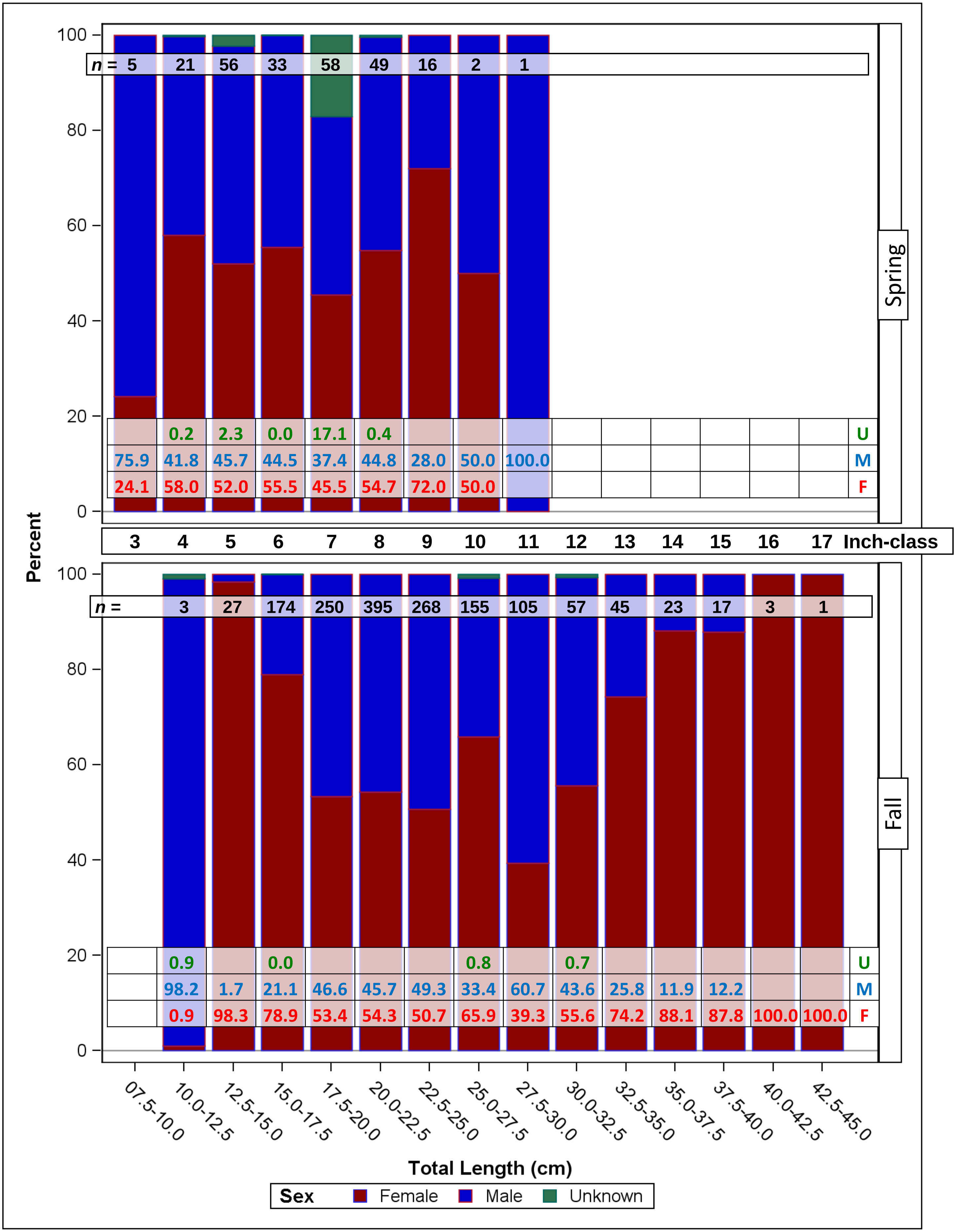
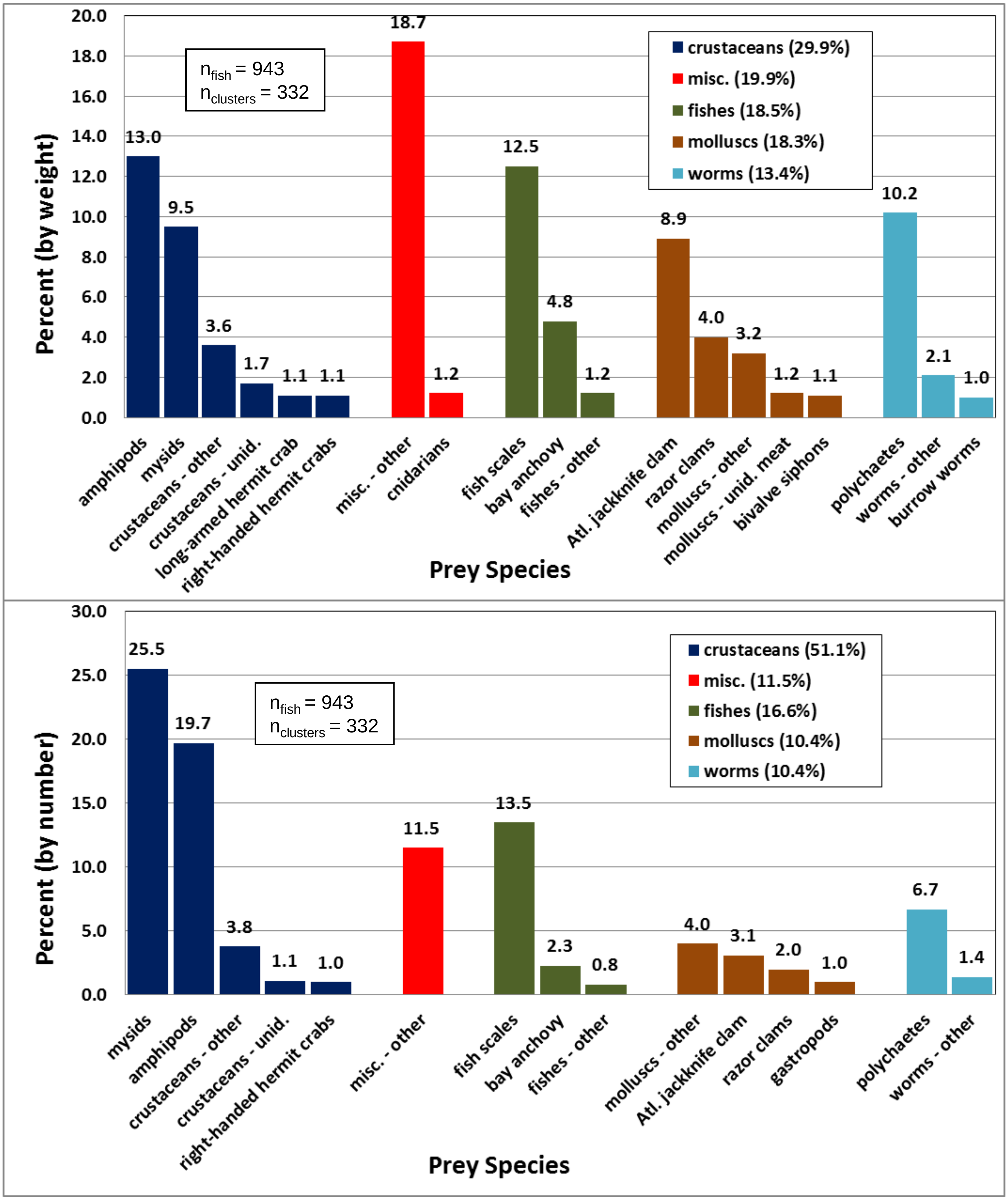
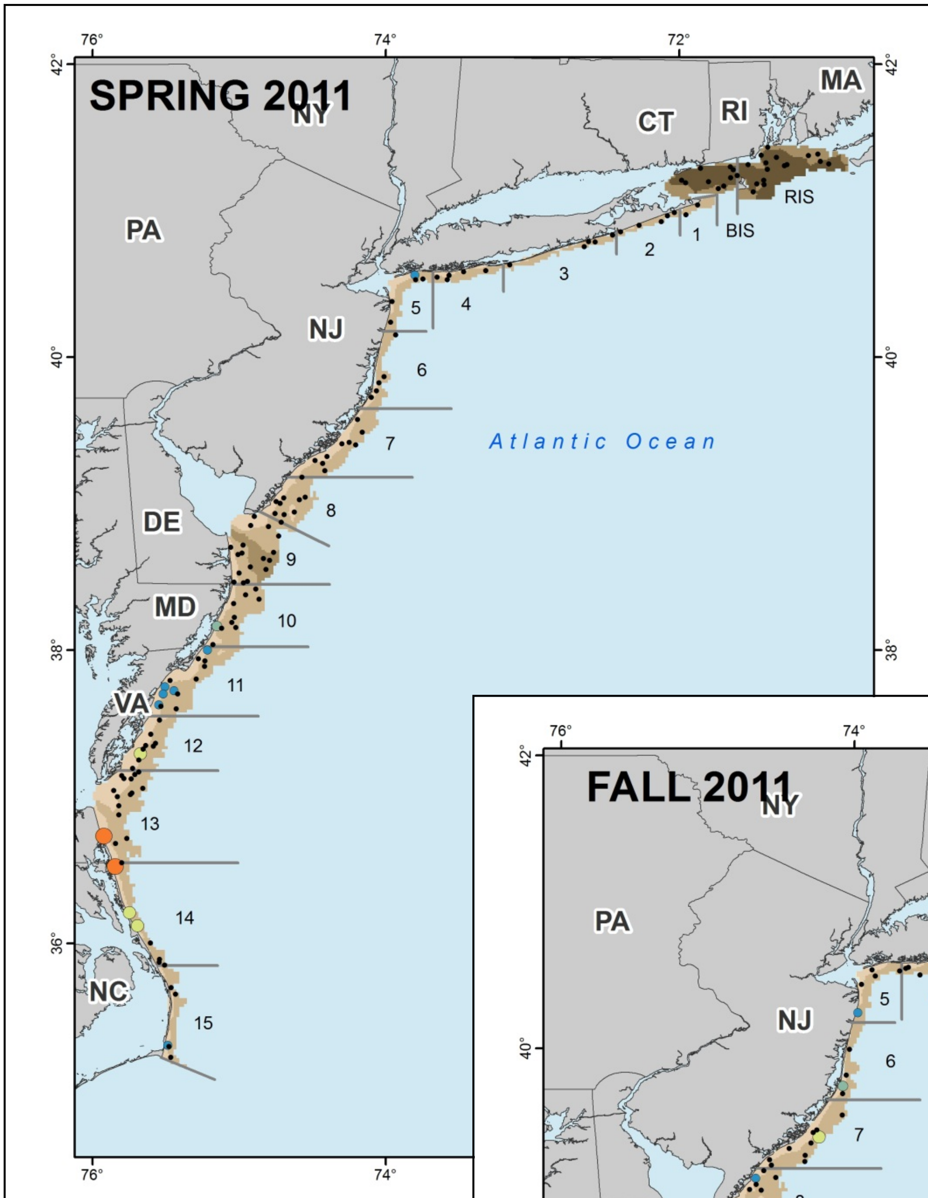


Figure 31. Atlantic croaker diet composition, expressed as percent by weight and number collected during NEAMAP cruises in 2007 through Spring 2011. (The number of fish sampled for diet is given by n_{fish}, while $n_{clusters}$ indicates the number of clusters of this species sampled.



Atlantic Menhaden

Sampling Priority: A



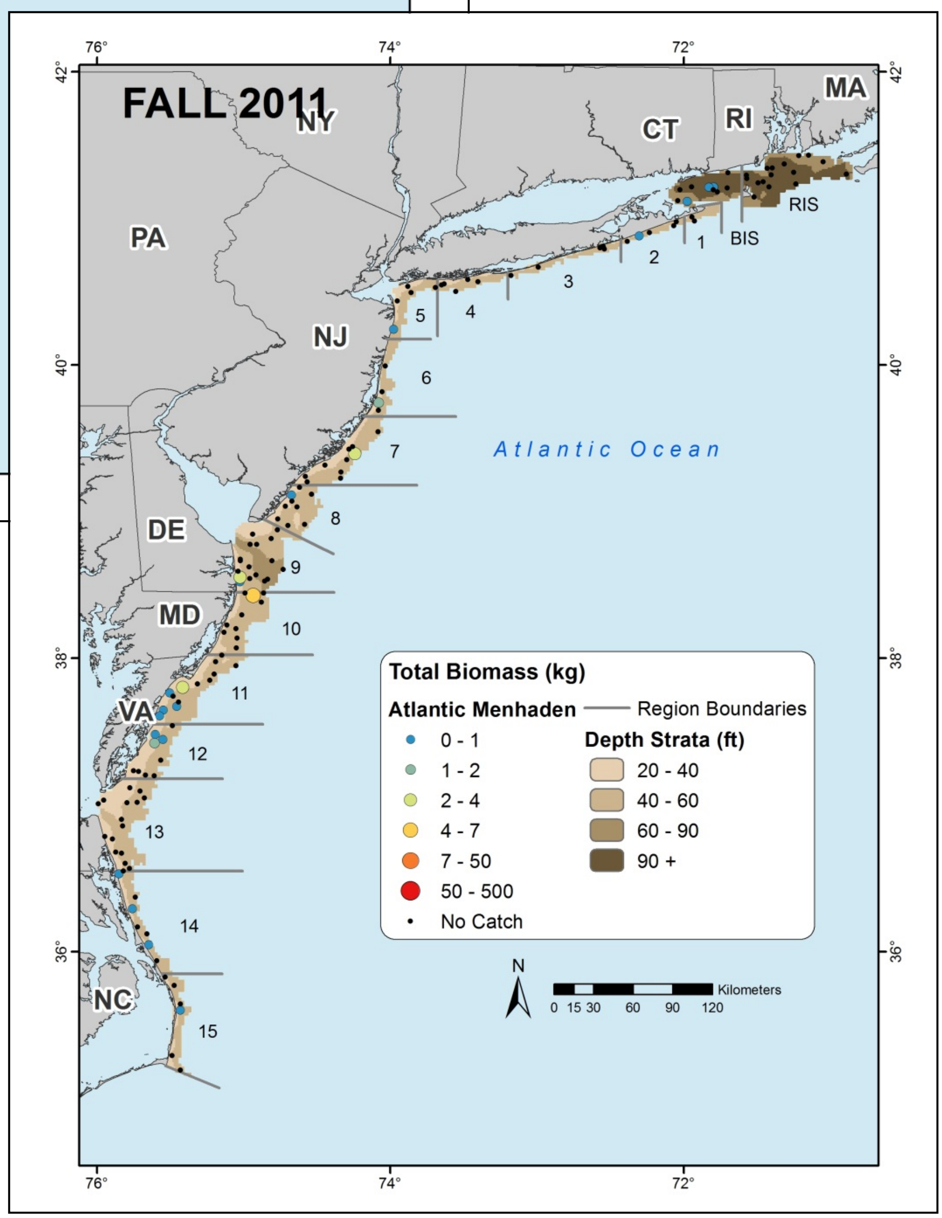


Figure 32. Atlantic menhaden biomass (kg) at each sampling site for 2011 NEAMAP cruises.

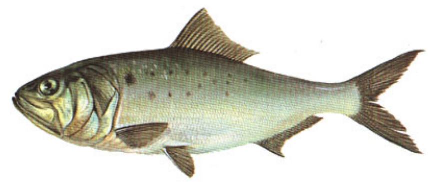


Table 19. Atlantic menhaden sampling rates and preserved specimen analysis status for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught (kg)	Number Measured	Age Specimens	Ages Read	Stomach Specimens	Stomachs Analyzed
Spring	2008	32	2.0	32	10	0	10	0
	2009	24,566	786.0	2,146	78	0	78	0
	2010	8,177	446.1	224	30	0	30	0
	2011	1,564	59.1	328	45	0	45	1
Fall	2007	740	30.2	288	78	0	78	1
	2008	208	25.0	208	68	0	68	0
	2009	146	11.9	146	59	0	58	6
	2010	974	29.3	229	56	0	56	1
	2011	144	19.4	91	54	0	53	0

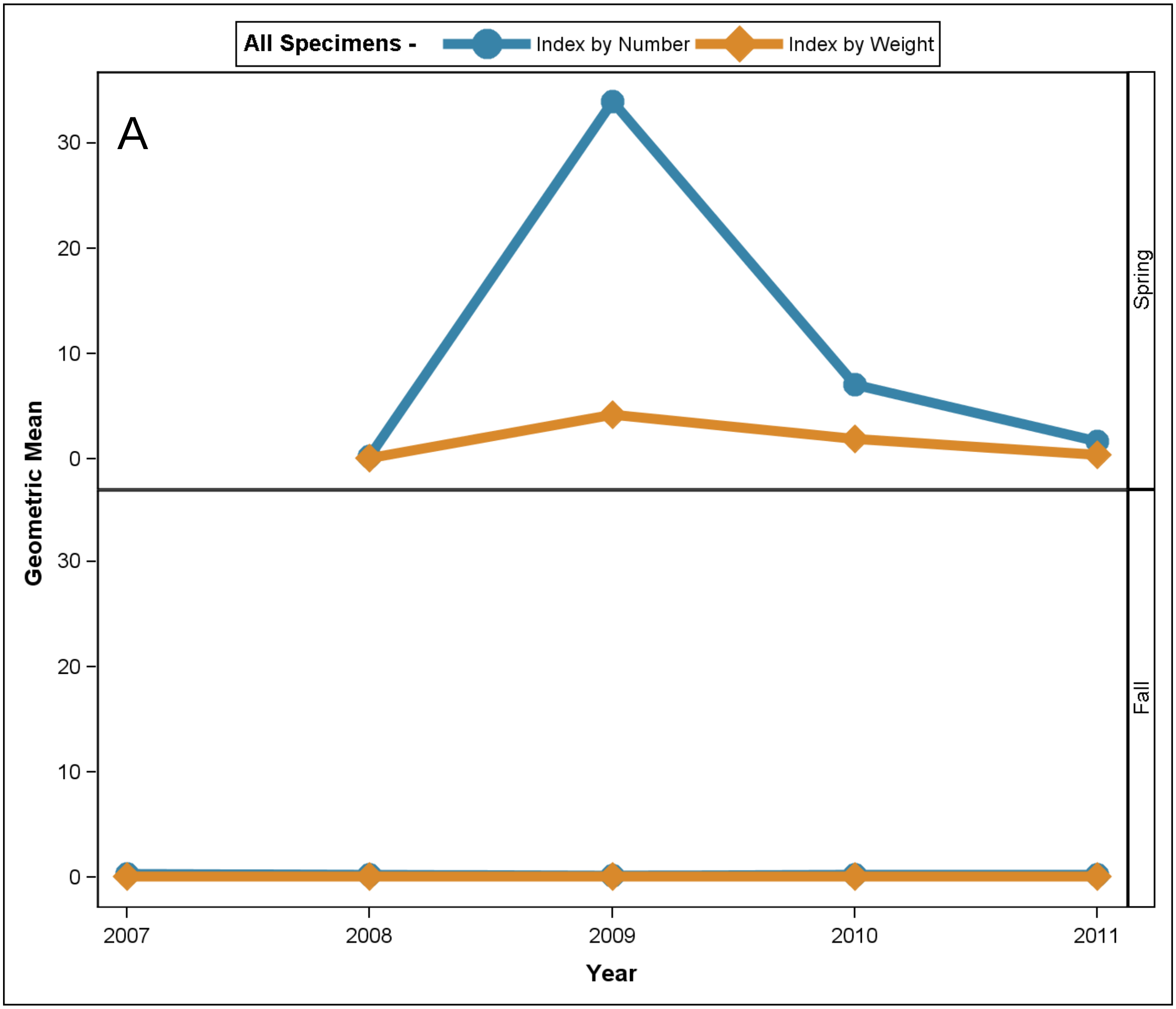
Table 20. Strata used for calculation of abundance indices for American menhaden.

State (Nominal)	Region	Depth Stratum	Spring Index	Fall Index	State (Nominal)	Region	Depth Stratum	Spring Index	Fall Index
RI	RIS	60-90	[grey]	[red]	DE	09	20-40	[grey]	[red]
		90+	[grey]	[red]			40-60	[grey]	[red]
	BIS	60-90	[grey]	[red]			60-90	[grey]	[red]
		90+	[grey]	[red]	MD	10	20-40	[grey]	[red]
NY	01	40-60	[grey]	[red]			40-60	[grey]	[red]
	02	20-40	[grey]	[red]	VA	11	20-40	[grey]	[red]
		40-60	[grey]	[red]			40-60	[grey]	[red]
	03	20-40	[grey]	[red]		12	20-40	[grey]	[red]
		40-60	[grey]	[red]			40-60	[grey]	[red]
	04	20-40	[grey]	[red]		13	20-40	[grey]	[red]
		40-60	[grey]	[red]			40-60	[grey]	[red]
	05	20-40	[grey]	[red]	NC	14	20-40	[red]	[red]
		40-60	[grey]	[red]			40-60	[red]	[red]
NJ	06	20-40	[grey]	[red]		15	20-40	[red]	[red]
		40-60	[grey]	[red]			40-60	[red]	[red]
	07	20-40	[grey]	[red]					
		40-60	[grey]	[red]	[red]	= used for abundance indices			
	08	20-40	[grey]	[red]	[grey]	= not used for abundance indices			
		40-60	[grey]	[red]					

Table 21. Atlantic menhaden preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured and for the youngest year class captured.

Season	Year	Age	Numerical Index					Biomass Index				
			n	LCI	**Index**	UCI	CV (%)	n	LCI	**Index**	UCI	CV (%)
Spring	2008	All	13	0.00	**0.22**	0.83	100.0	13	0.00	**0.07**	0.23	100.0
	2009		15	5.75	**33.97**	180.07	23.1	15	0.88	**4.18**	13.31	30.9
	2010		13	0.15	**7.07**	55.91	46.8	13	0.00	**1.93**	8.94	56.9
	2011		13	0.43	**1.71**	4.11	32.0	13	0.11	**0.40**	0.77	35.0
Fall	2007	All	150	0.16	**0.30**	0.45	22.0	150	0.05	**0.10**	0.15	25.0
	2008		150	0.13	**0.21**	0.30	18.6	150	0.04	**0.08**	0.11	24.1
	2009		160	0.10	**0.19**	0.30	23.7	160	0.02	**0.05**	0.08	28.0
	2010		150	0.14	**0.27**	0.42	23.3	150	0.03	**0.08**	0.13	30.4
	2011		150	0.12	**0.23**	0.36	23.2	150	0.03	**0.08**	0.12	29.5
Fall	2007	0	150	0.05	**0.15**	0.27	33.9	150	0.00	**0.02**	0.05	62.2
	2008		150	0.04	**0.09**	0.15	30.1	150	0.00	**0.02**	0.04	49.2
	2009		160	0.02	**0.10**	0.18	38.4	160	0.00	**0.02**	0.03	52.4
	2010		150	0.05	**0.16**	0.28	32.7	150	0.00	**0.04**	0.08	48.5
	2011		150	0.00	**0.07**	0.13	47.8	150	0.00	**0.01**	0.03	70.1
Spring	2008	1	13	0.00	**0.00**	0.00		13	0.00	**0.00**	0.00	
	2009		15	5.27	**31.79**	170.51	23.7	15	0.85	**4.11**	13.12	31.2
	2010		13	0.14	**6.91**	53.86	46.8	13	0.00	**1.88**	8.68	57.3
	2011		13	0.36	**1.59**	3.93	33.7	13	0.10	**0.39**	0.76	35.6

Figure 33. Atlantic menhaden preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured (A) and for the youngest year class captured (B – numbers only).



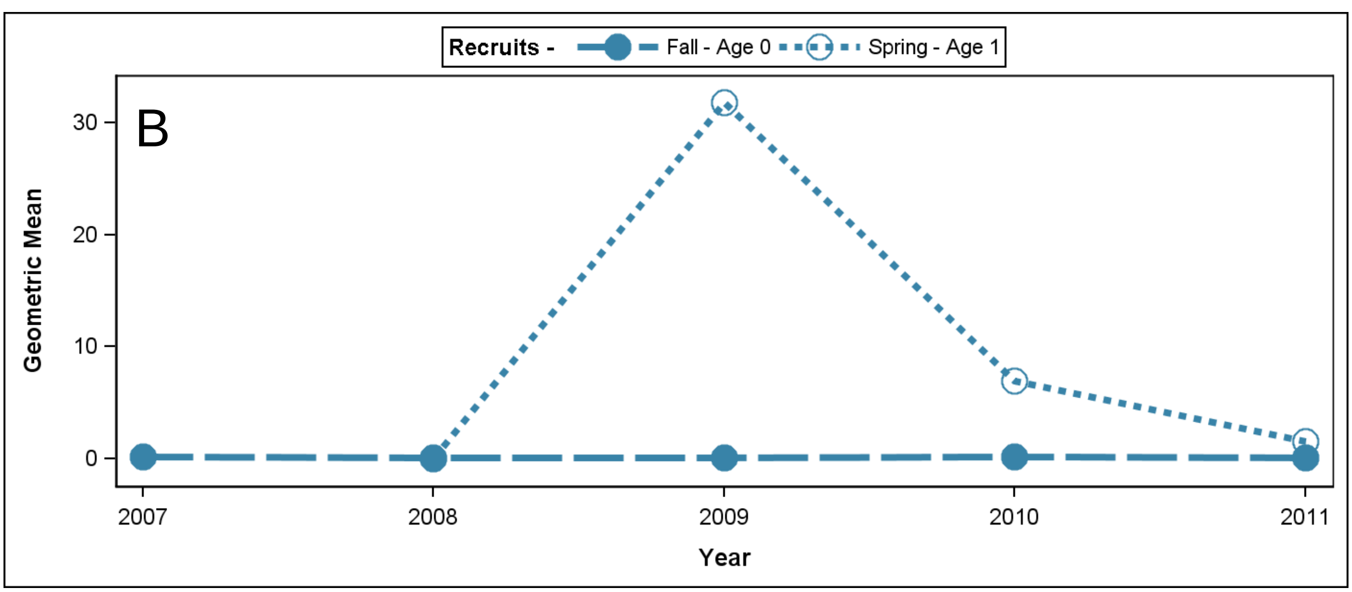


Figure 34. Atlantic menhaden length-frequency distributions, by cruise (Blue reference lines are placed at the size cutoff values used to separate recruits from older specimens. Cutoff values – Spring 17cm, Fall 15cm - taken from http://www.asmfc.org/speciesDocuments/menhaden/reports/stockAssessments/04MenhadenPeerReviewReport.pdf.).

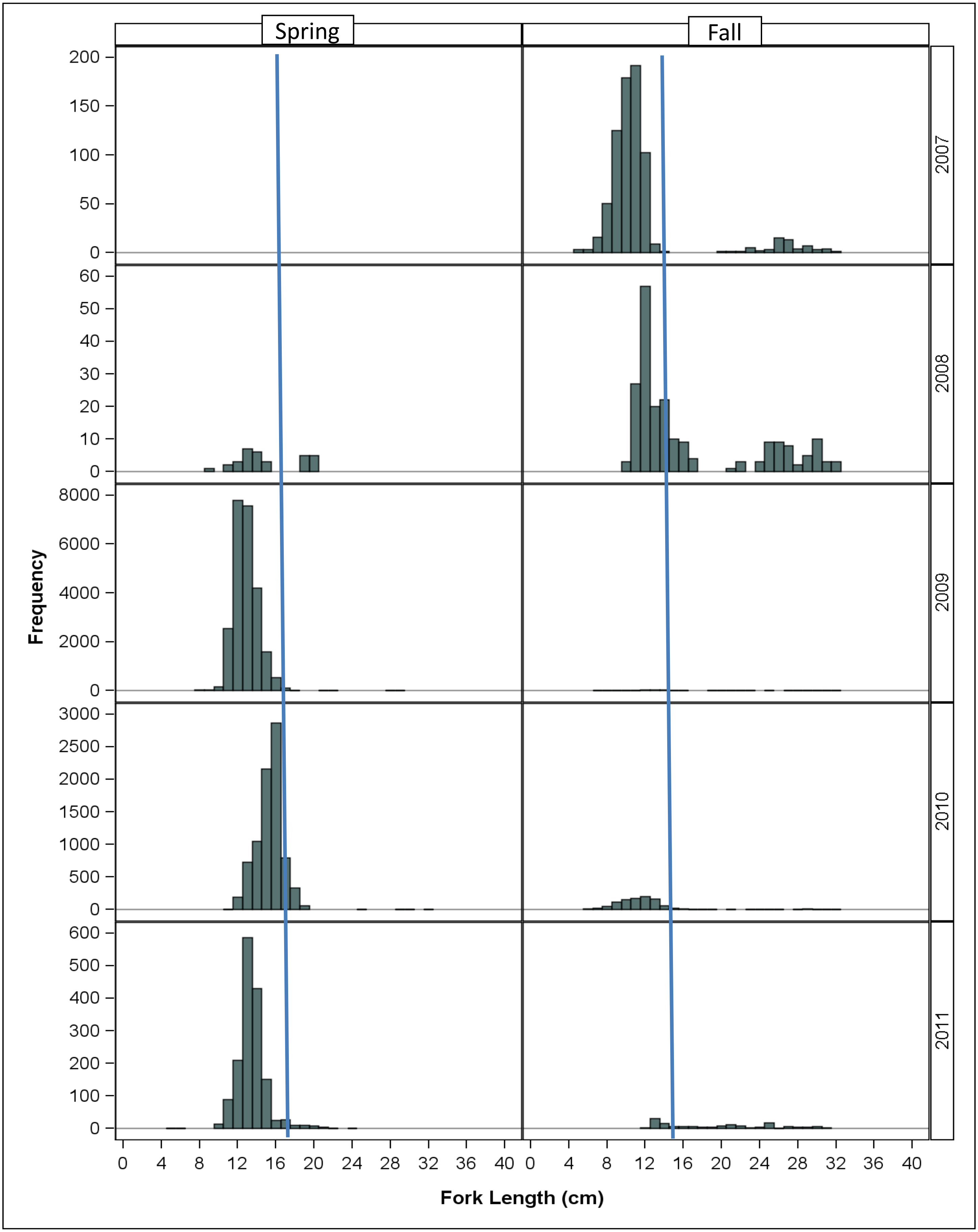


Figure 35. Atlantic menhaden length-frequency distributions, by cruise and sex.

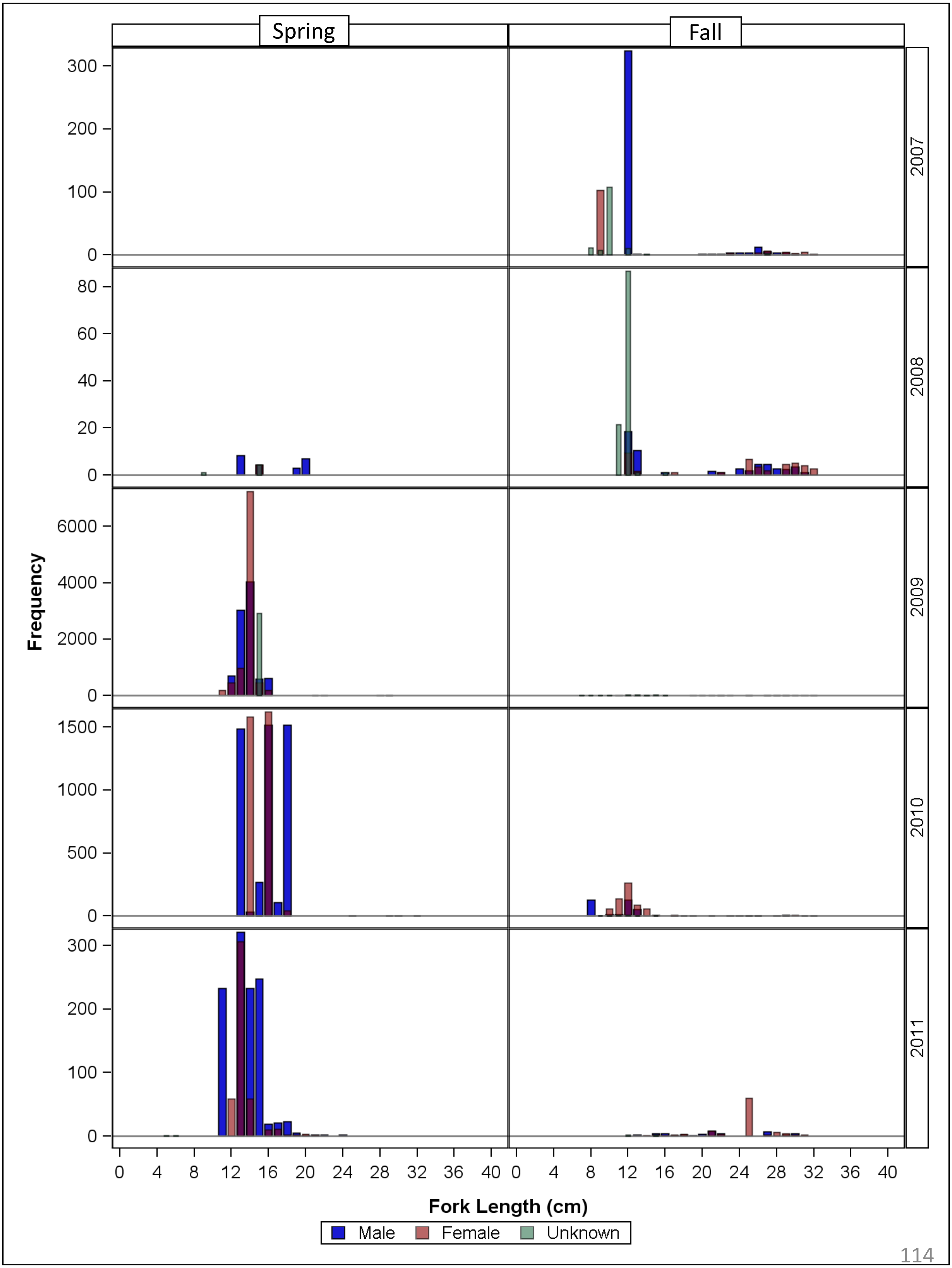
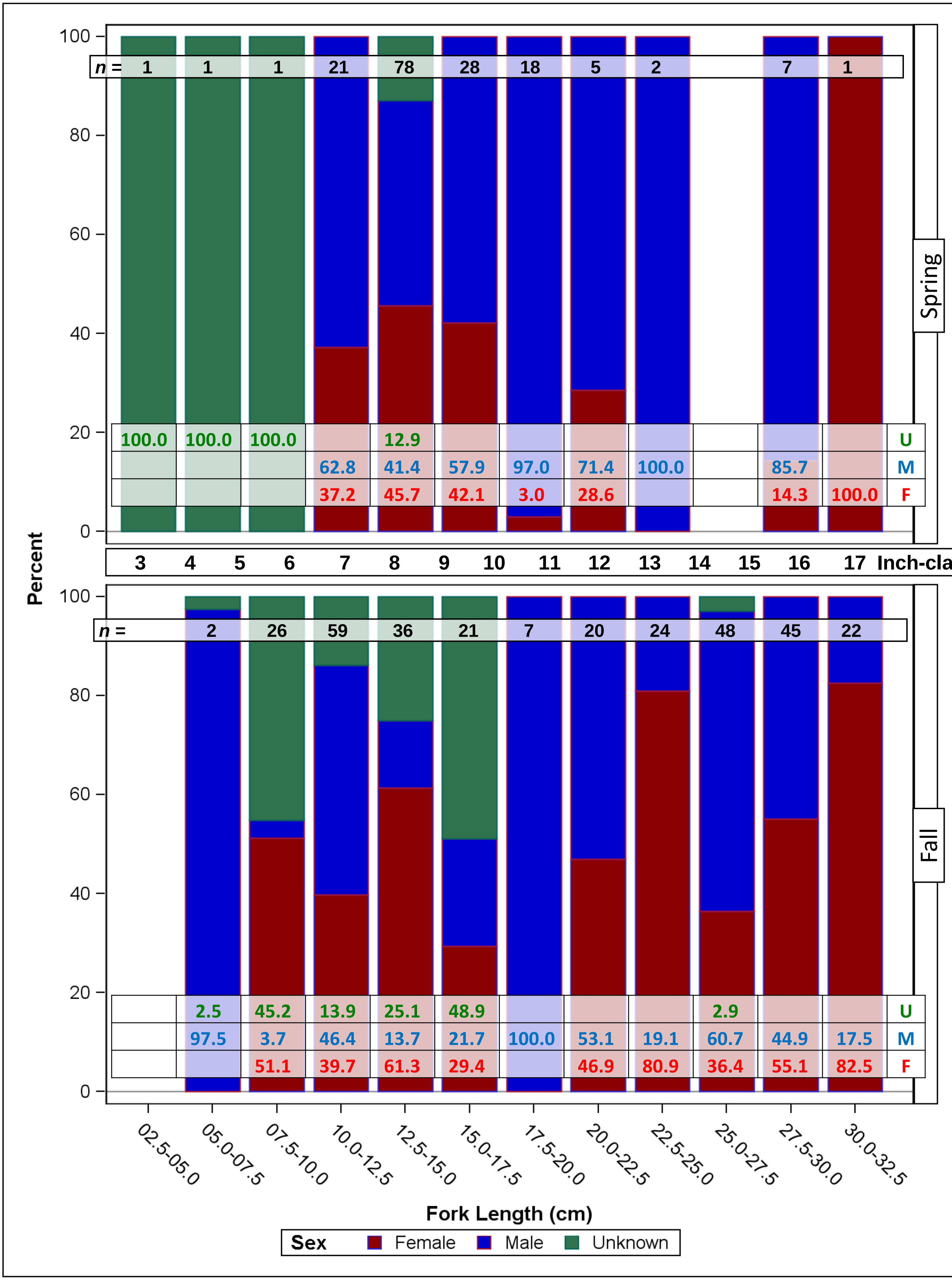


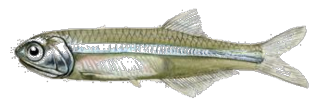
Figure 36. Atlantic menhaden sex ratio, by length group, for NEAMAP Spring and Fall cruises 2007-2011. (The percentages for each category are given near the bottom of each bar. The number sampled for sex determination is provided near the top of each bar, and the length categories expressed in inches are shown between the two figures.).

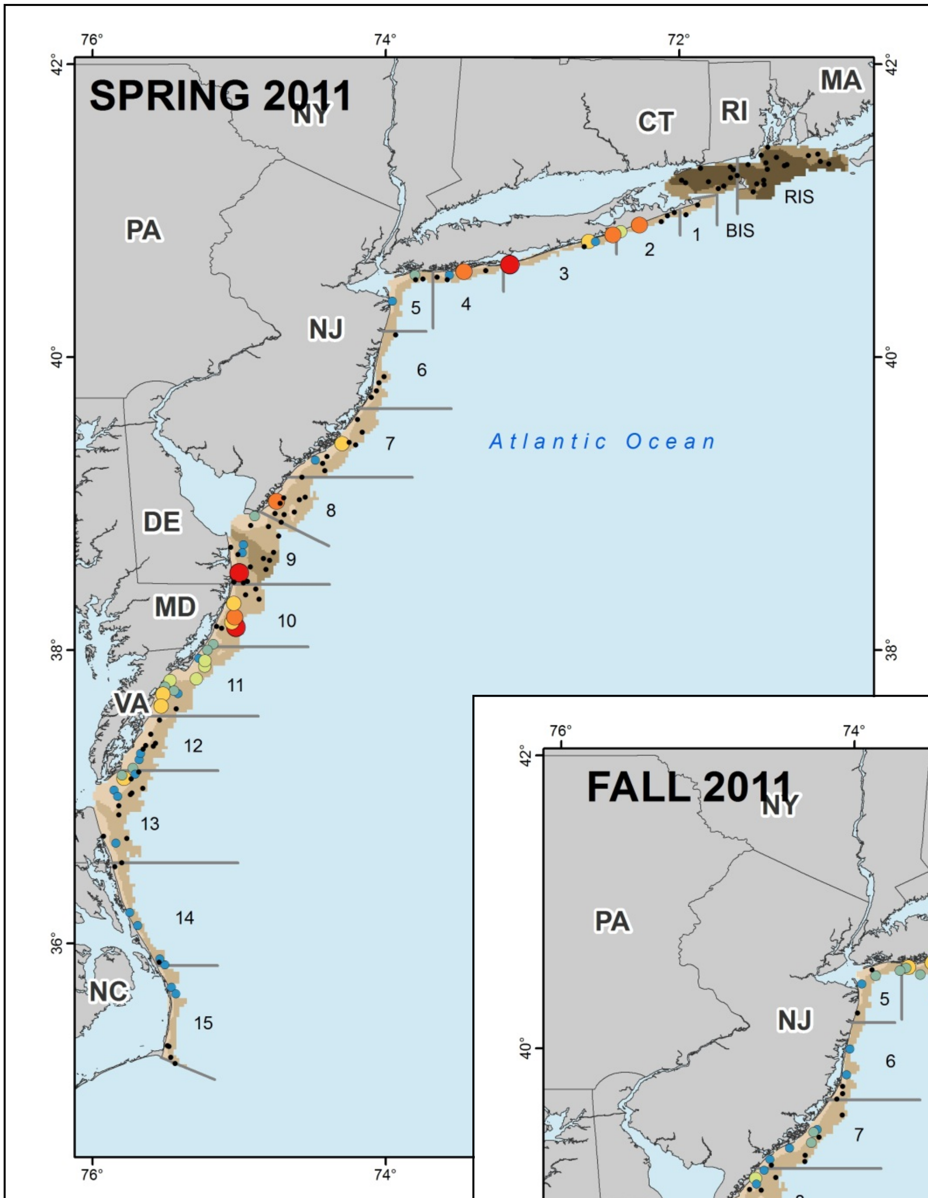


Bay Anchovy

Sampling Priority: D

Figure 37. Bay anchovy biomass (kg) at each sampling site for 2011 NEAMAP cruises.





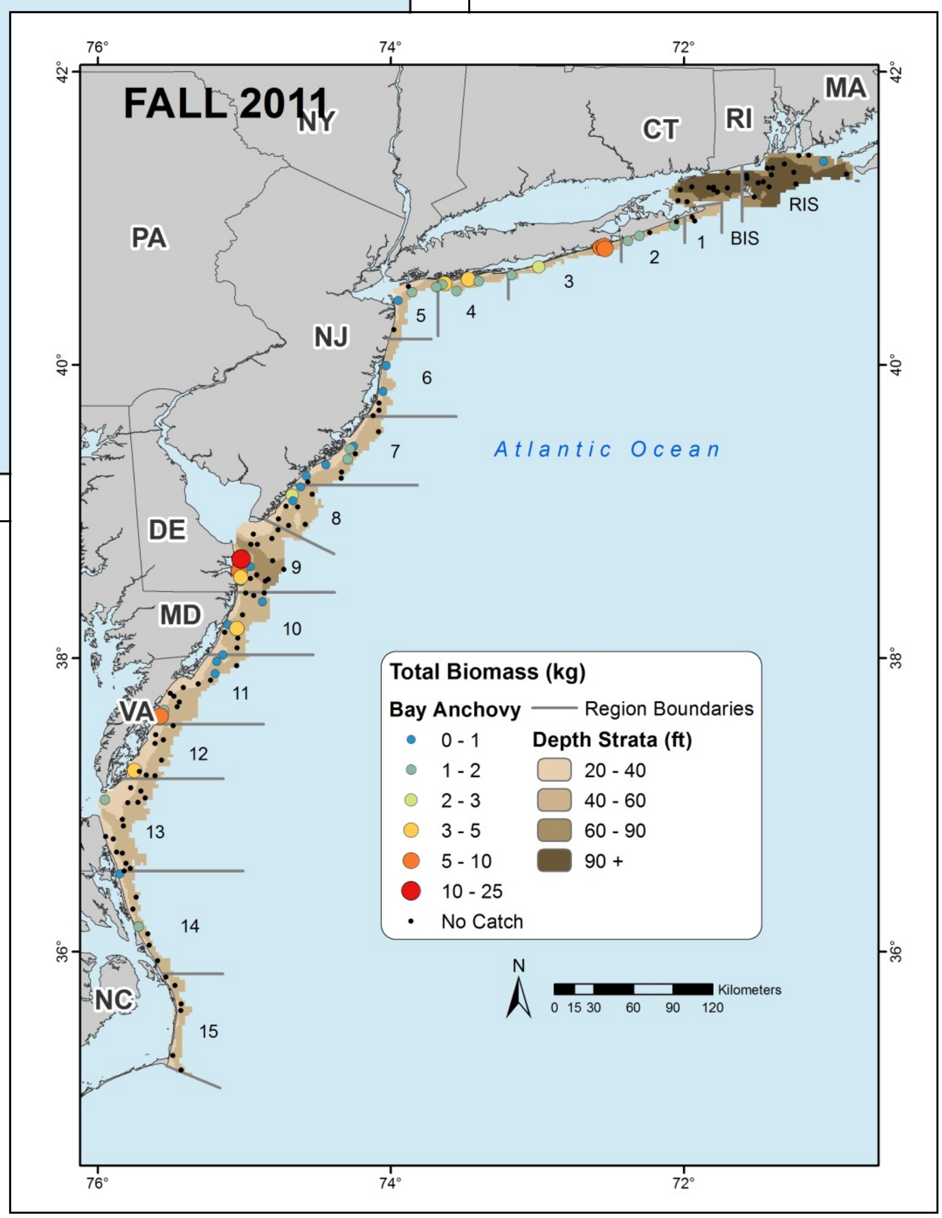


Table 22. Bay anchovy sampling rates for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught (kg)	Number Measured	Age Specimens	Ages Read	Stomach Specimens	Stomachs Analyzed
Spring	2008	23,926	75.8	3,838		0		0
	2009	62,807	145.9	7,112		0		0
	2010	57,202	175.6	6,143		0		0
	2011	46,807	137.4	5,212		0		0
Fall	2007	119,741	203.4	3,961		0		0
	2008	35,557	73.4	2,362		0		0
	2009	48,934	177.7	4,527		0		0
	2010	49,991	124.7	4,614		0		0
	2011	33,401	100.0	3,311		0		0

Table 23. Strata used for calculation of abundance indices for bay anchovy.

State (Nominal)	Region	Depth Stratum	Spring Index	Fall Index
RI	RIS	60-90	not used	not used
		90+	not used	not used
	BIS	60-90	not used	not used
		90+	not used	not used
NY	01	40-60	not used	used
	02	20-40	used	used
		40-60	not used	used
	03	20-40	used	used
		40-60	not used	used
	04	20-40	used	used
		40-60	not used	used
	05	20-40	used	used
		40-60	not used	used
NJ	06	20-40	used	used
		40-60	not used	used
	07	20-40	used	used
		40-60	not used	used
	08	20-40	used	used
		40-60	not used	used
DE	09	20-40	used	used
		40-60	not used	used
		60-90	not used	not used
MD	10	20-40	used	used
		40-60	not used	used
VA	11	20-40	used	used
		40-60	not used	used
	12	20-40	used	used
		40-60	not used	used
	13	20-40	used	used
		40-60	not used	used
NC	14	20-40	used	used
		40-60	not used	used
	15	20-40	used	not used
		40-60	not used	not used

(red) = used for abundance indices
(grey) = not used for abundance indices

Table 24. Bay anchovy preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

Season	Year	Age	Numerical Index					Biomass Index				
			n	LCI	**Index**	UCI	CV (%)	n	LCI	**Index**	UCI	CV (%)
Spring	2008	All	43	31.95	**66.55**	137.50	8.5	43	0.47	**0.74**	1.07	15.5
	2009		51	61.34	**136.62**	302.82	8.0	51	0.84	**1.20**	1.64	11.4
	2010		42	35.00	**71.43**	144.71	8.2	42	0.71	**1.10**	1.59	13.9
	2011		42	12.62	**36.46**	101.98	14.0	42	0.45	**0.80**	1.24	18.4
Fall	2007	All	118	10.27	**17.31**	28.74	8.3	118	0.50	**0.69**	0.91	11.4
	2008		113	5.30	**9.60**	16.84	11.0	113	0.22	**0.33**	0.46	15.9
	2009		122	10.13	**16.20**	25.59	7.7	122	0.39	**0.54**	0.71	11.9
	2010		113	14.16	**23.71**	39.28	7.6	113	0.45	**0.59**	0.74	10.0
	2011		113	3.95	**7.13**	12.35	11.8	113	0.25	**0.38**	0.52	15.0

Figure 38. Bay anchovy preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

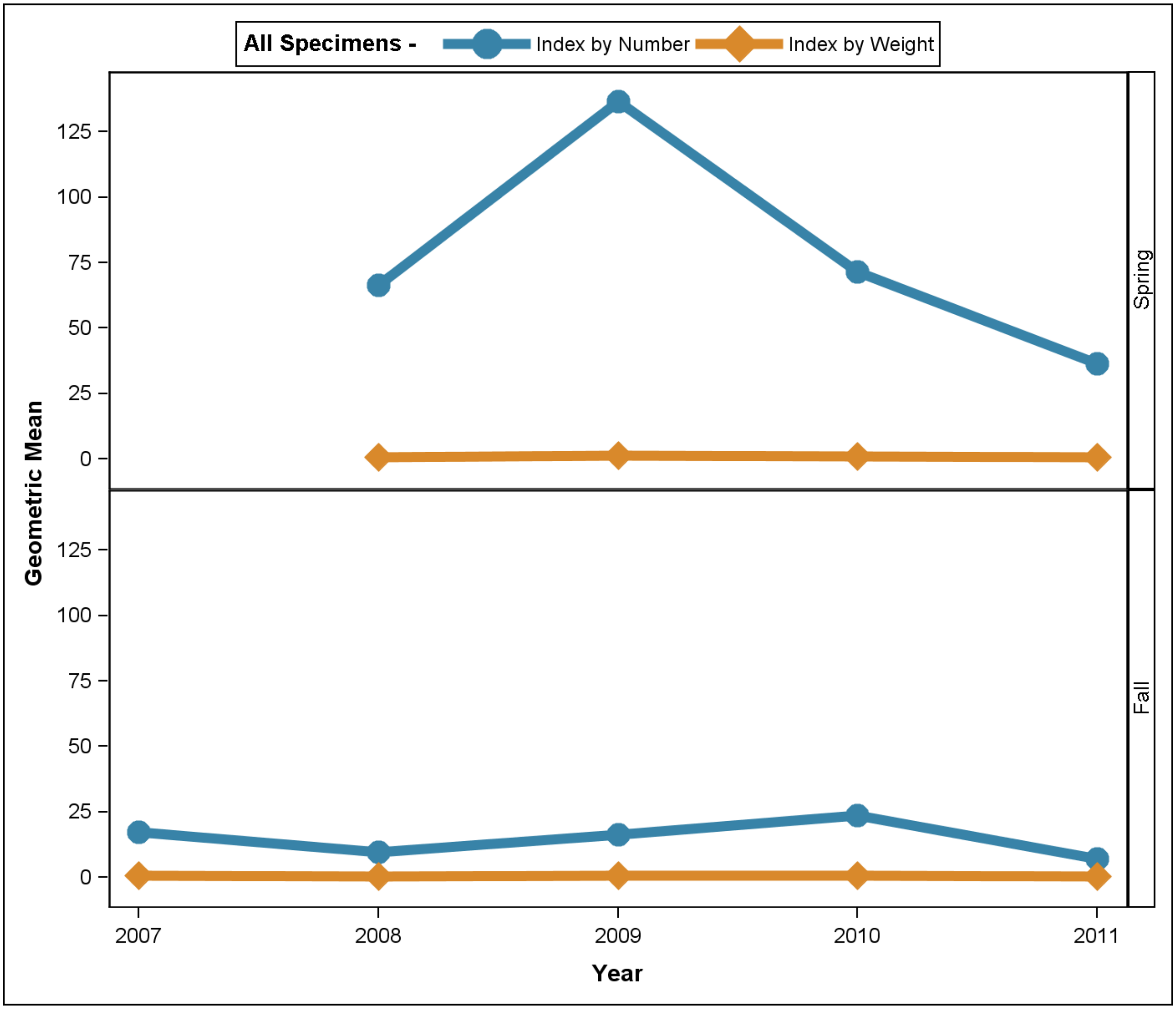
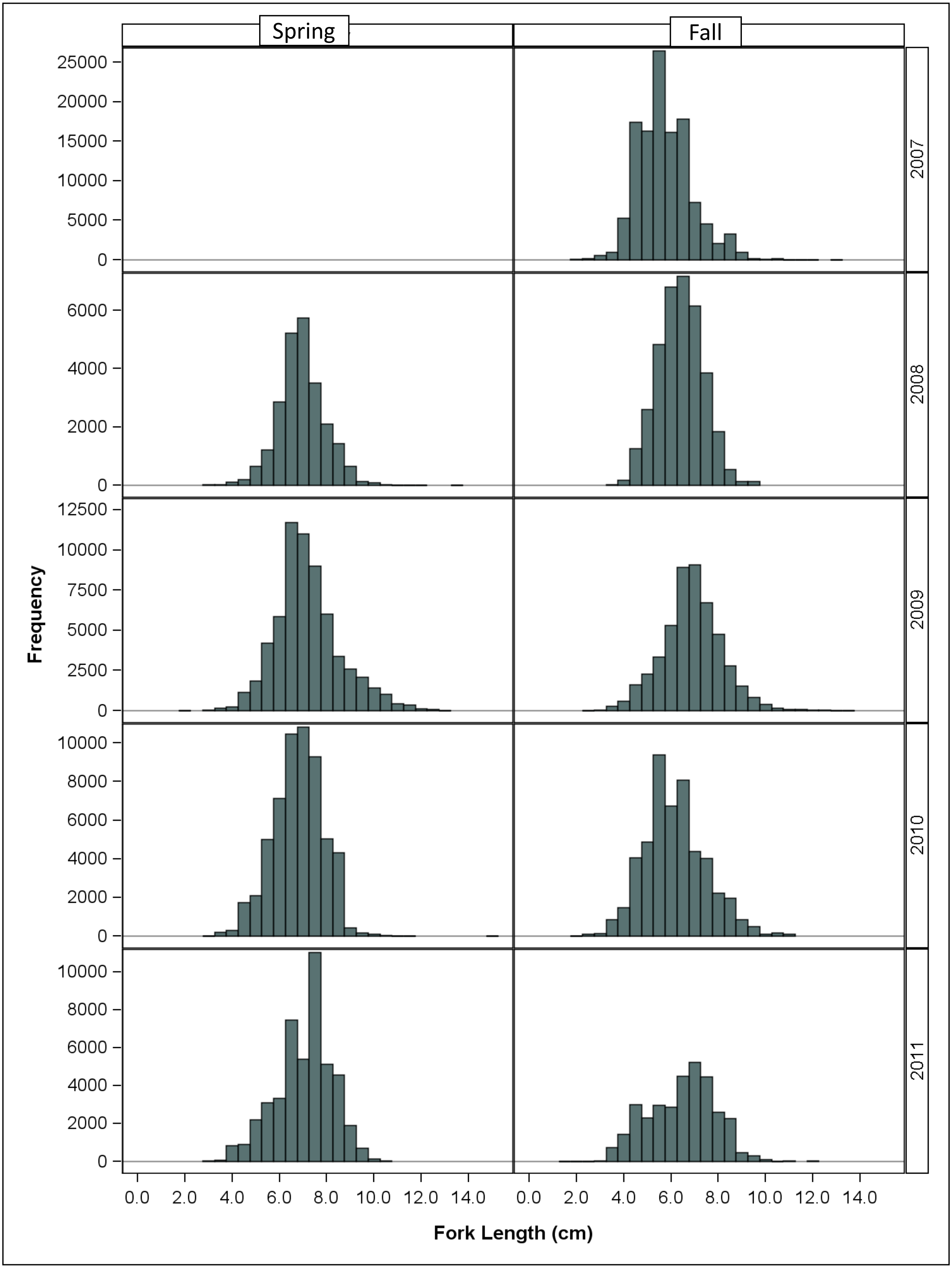


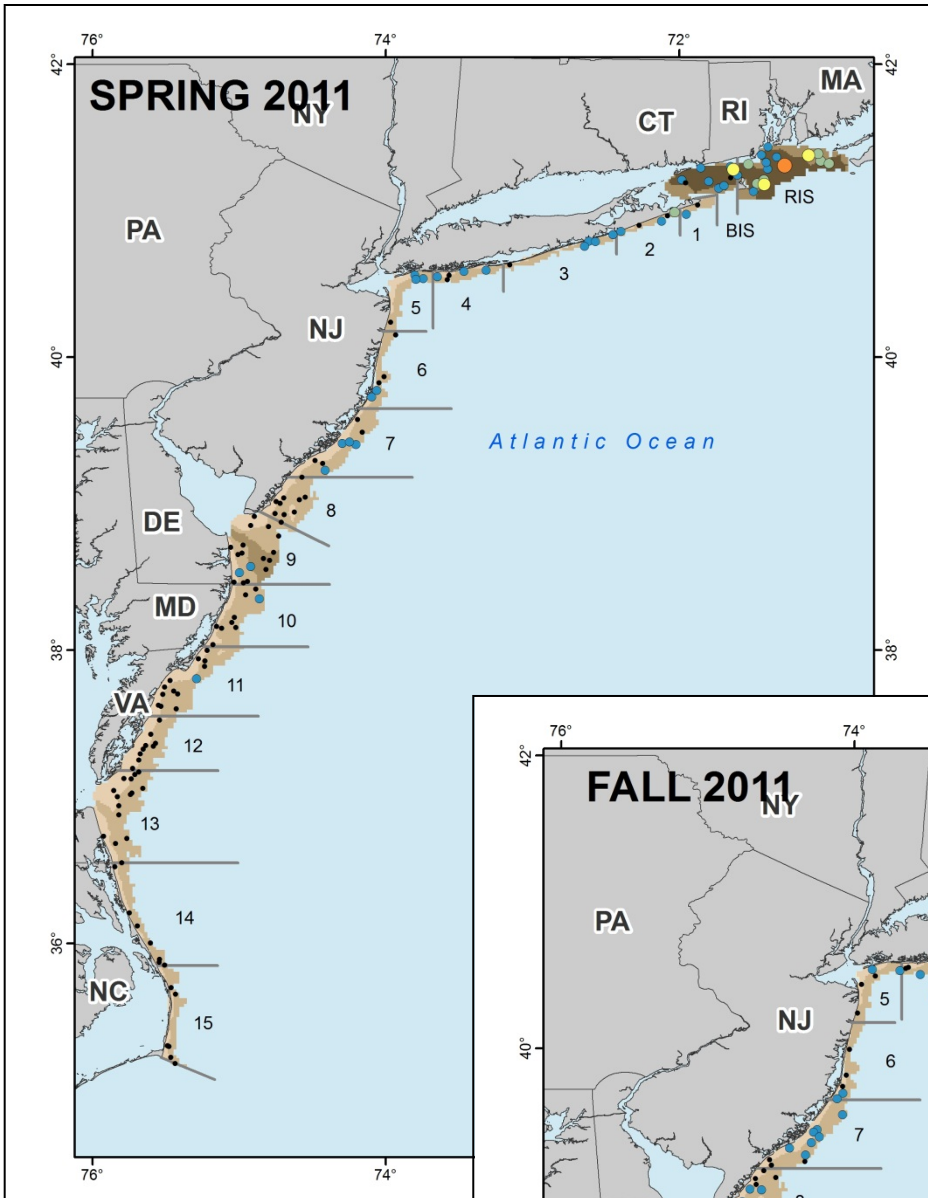
Figure 39. Bay anchovy length-frequency distributions, by cruise.



Black Sea Bass

Sampling Priority: A

Figure 40. Black sea bass biomass (kg) at each sampling site for 2011 NEAMAP cruises.



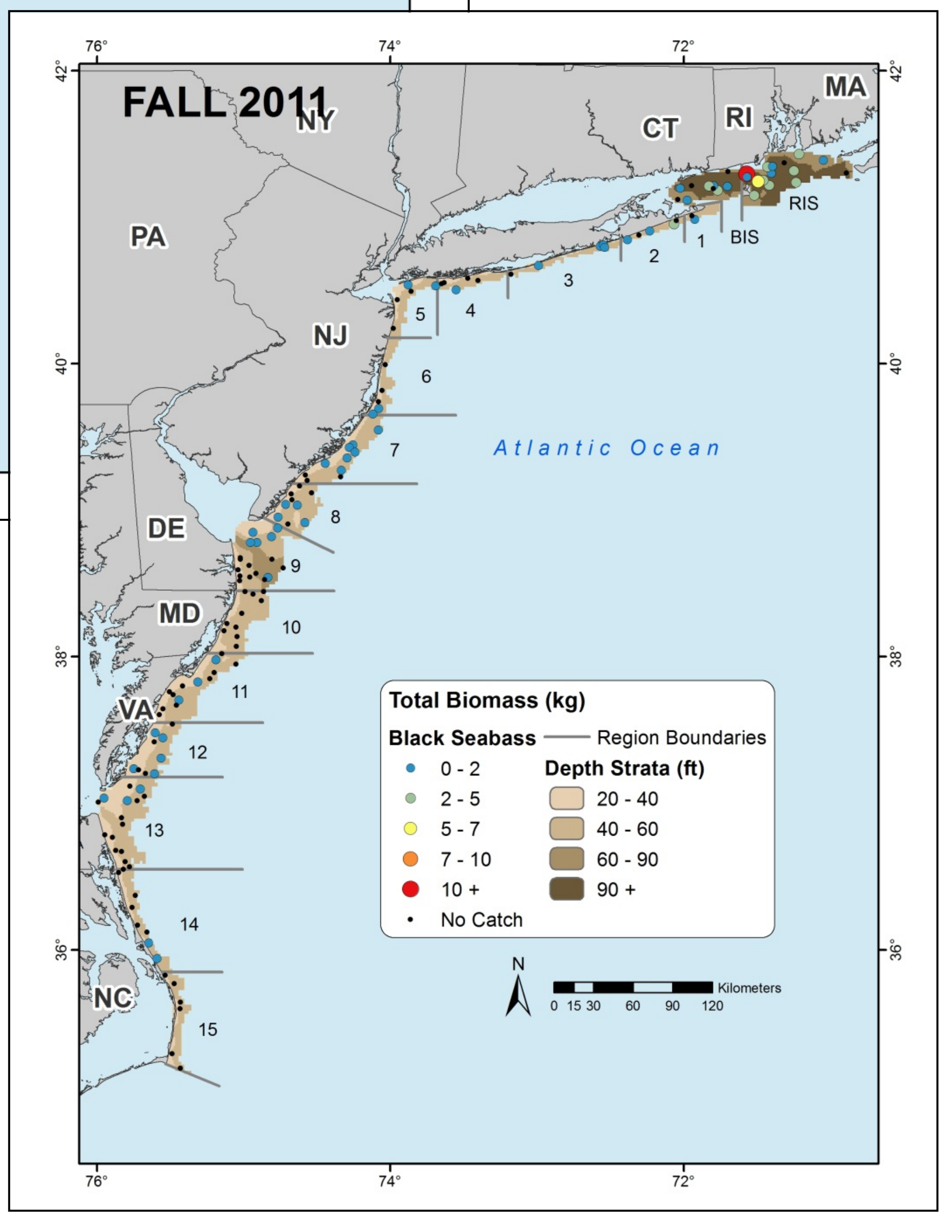


Table 25. Black sea bass sampling rates and preserved specimen analysis status for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught (kg)	Number Measured	Age Specimens	Ages Read	Stomach Specimens	Stomachs Analyzed
Spring	2008	166	83.9	166	140	0	119	115
	2009	237	67.6	237	168	0	163	161
	2010	114	54.7	114	112	0	97	90
	2011	136	61.8	136	121	0	86	83
Fall	2007	401	85.3	401	219	219	211	211
	2008	174	75.2	174	115	0	114	114
	2009	470	94.5	375	148	0	138	136
	2010	121	42.8	121	90	0	86	86
	2011	196	67.3	196	169	0	150	0

Table 26. Strata used for calculation of abundance indices for black sea bass.

State (Nominal)	Region	Depth Stratum	Spring Index	Fall Index
RI	RIS	60-90	red	red
		90+	red	red
	BIS	60-90	red	red
		90+	red	red
NY	01	40-60	red	red
	02	20-40	red	red
		40-60	red	red
	03	20-40	red	red
		40-60	red	red
	04	20-40	red	red
		40-60	red	red
	05	20-40	grey	red
		40-60	grey	red
NJ	06	20-40	grey	red
		40-60	grey	red
	07	20-40	grey	red
		40-60	grey	red
	08	20-40	grey	red
		40-60	grey	red

State (Nominal)	Region	Depth Stratum	Spring Index	Fall Index
DE	09	20-40	grey	red
		40-60	grey	red
		60-90	grey	red
MD	10	20-40	grey	red
		40-60	grey	red
VA	11	20-40	grey	red
		40-60	grey	red
	12	20-40	grey	red
		40-60	grey	red
	13	20-40	grey	red
		40-60	grey	red
NC	14	20-40	grey	red
		40-60	grey	red
	15	20-40	grey	red
		40-60	grey	red

red = used for abundance indices
grey = not used for abundance indices

Table 27. Black sea bass preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured and for the youngest year class captured.

Season	Year	Age	Numerical Index					Biomass Index				
			n	LCI	**Index**	UCI	CV (%)	n	LCI	**Index**	UCI	CV (%)
Spring	2008	All	44	1.17	**1.72**	2.42	11.4	44	0.79	**1.19**	1.67	12.8
	2009		47	1.22	**1.69**	2.25	9.7	47	0.56	**0.83**	1.16	13.5
	2010		43	0.84	**1.31**	1.90	13.5	43	0.51	**0.80**	1.14	15.1
	2011		43	1.40	**1.97**	2.68	9.8	43	0.63	**0.98**	1.40	14.1
Fall	2007	All	150	0.60	**0.84**	1.11	11.5	150	0.17	**0.27**	0.38	16.7
	2008		150	0.31	**0.46**	0.62	13.8	150	0.07	**0.15**	0.23	24.9
	2009		160	0.43	**0.65**	0.91	14.7	160	0.15	**0.25**	0.37	19.6
	2010		150	0.25	**0.36**	0.49	14.6	150	0.10	**0.16**	0.23	17.7
	2011		150	0.53	**0.70**	0.88	9.8	150	0.18	**0.26**	0.34	13.3
Fall	2007	0	150	0.00	**0.04**	0.07	46.1	150	0.00	**0.00**	0.01	61.1
	2008		150	0.04	**0.08**	0.12	25.6	150	0.00	**0.00**	0.01	47.6
	2009		160	0.05	**0.10**	0.16	25.2	160	0.00	**0.00**	0.01	57.1
	2010		150	0.00	**0.02**	0.03	44.8	150	0.00	**0.00**	0.00	41.9
	2011		150	0.06	**0.11**	0.17	23.4	150	0.00	**0.00**	0.00	28.5
Spring	2008	1	44	0.00	**0.05**	0.10	45.8	44	0.00	**0.00**	0.00	49.0
	2009		47	0.10	**0.23**	0.37	27.4	47	0.01	**0.01**	0.02	28.8
	2010		43	0.00	**0.02**	0.04	44.2	43	0.00	**0.00**	0.00	49.6
	2011		43	0.11	**0.25**	0.40	26.4	43	0.00	**0.01**	0.01	33.4

Figure 41. Black sea bass preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured (A) and for the youngest year class captured (B – numbers only).

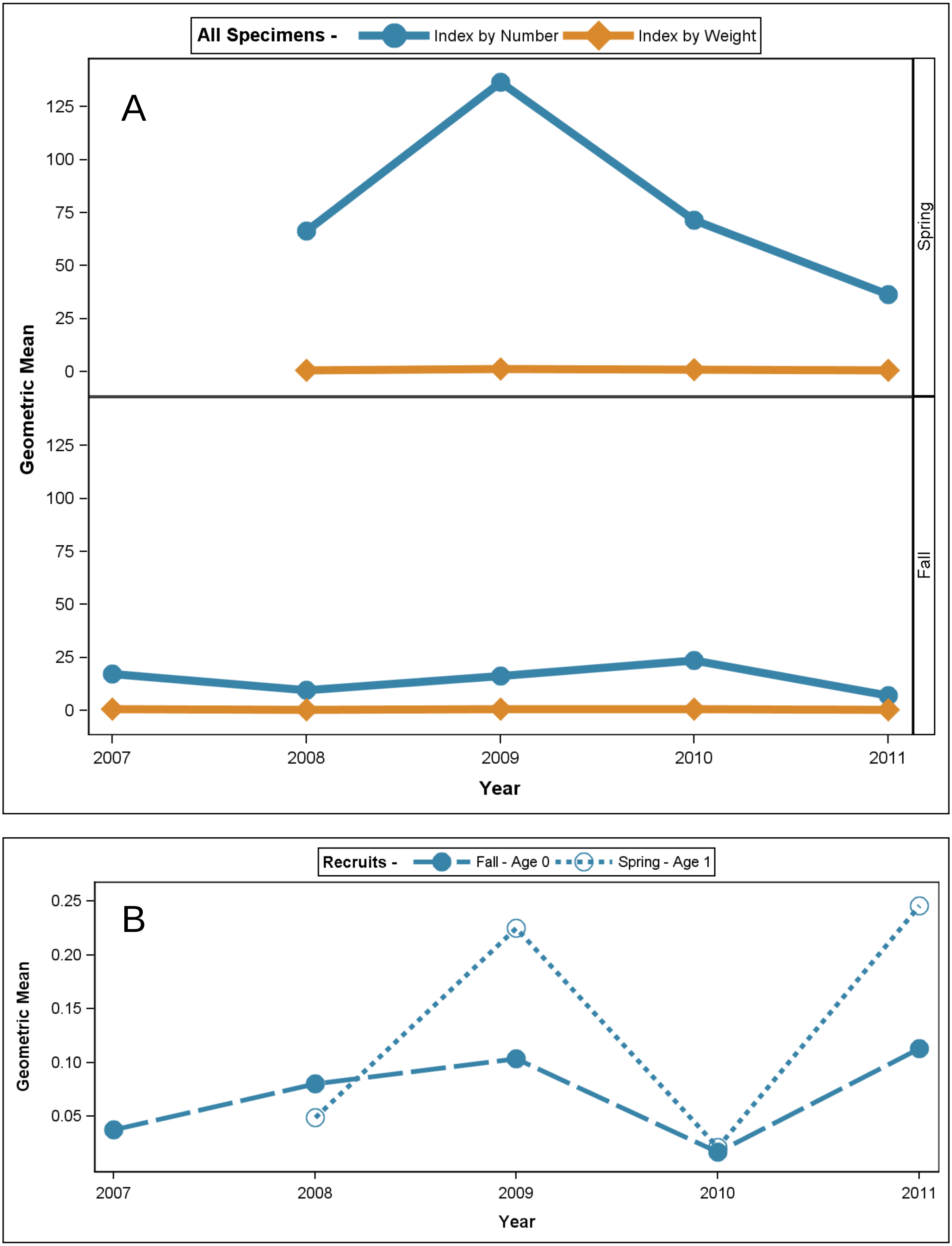


Figure 42. Black sea bass length-frequency distributions, by cruise (Blue reference lines are placed at the size cutoff values used to separate recruits from older specimens. Cutoff values – Spring 16cm, Fall 12cm - taken from http://mrl.cofc.edu/pdf/tr40s/Techreport43.pdf).

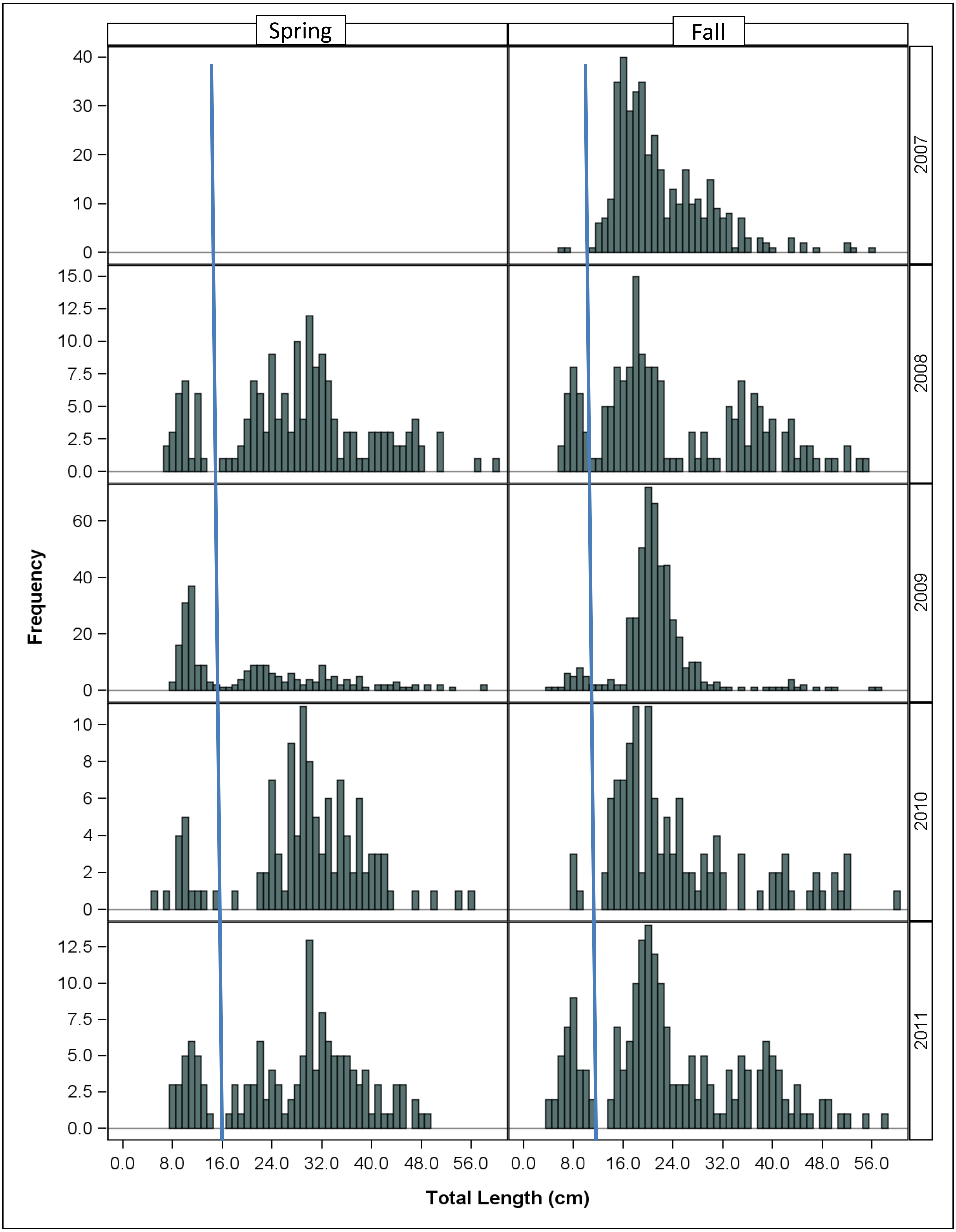


Figure 43. Black sea bass length-frequency distributions, by cruise and sex.

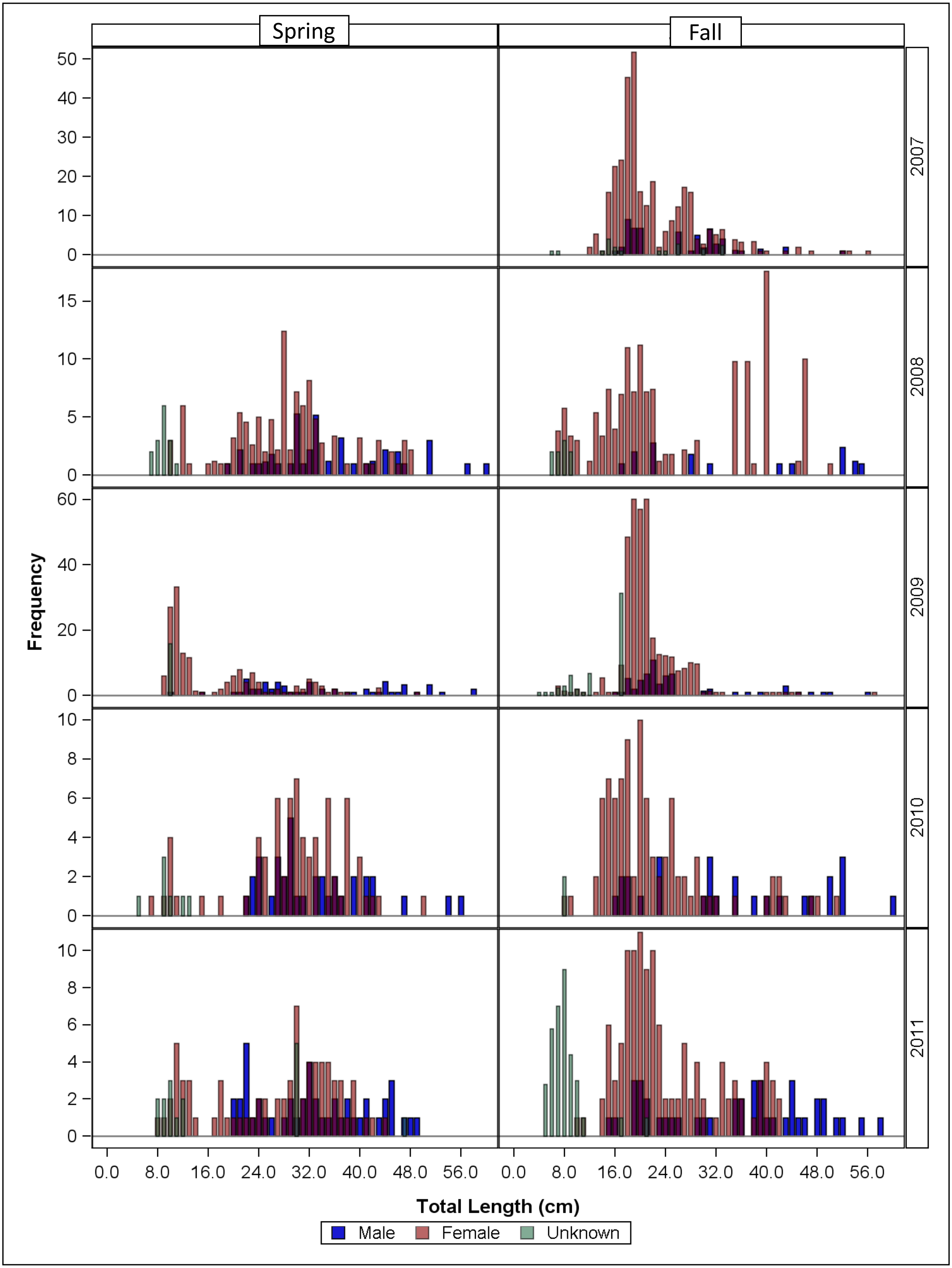


Figure 44. Black sea bass sex ratio, by length group, for NEAMAP Spring and Fall cruises 2007-2011. (The percentages for each category are given near the bottom of each bar. The number sampled for sex determination is provided near the top of each bar, and the length categories expressed in inches are shown between the two figures.).

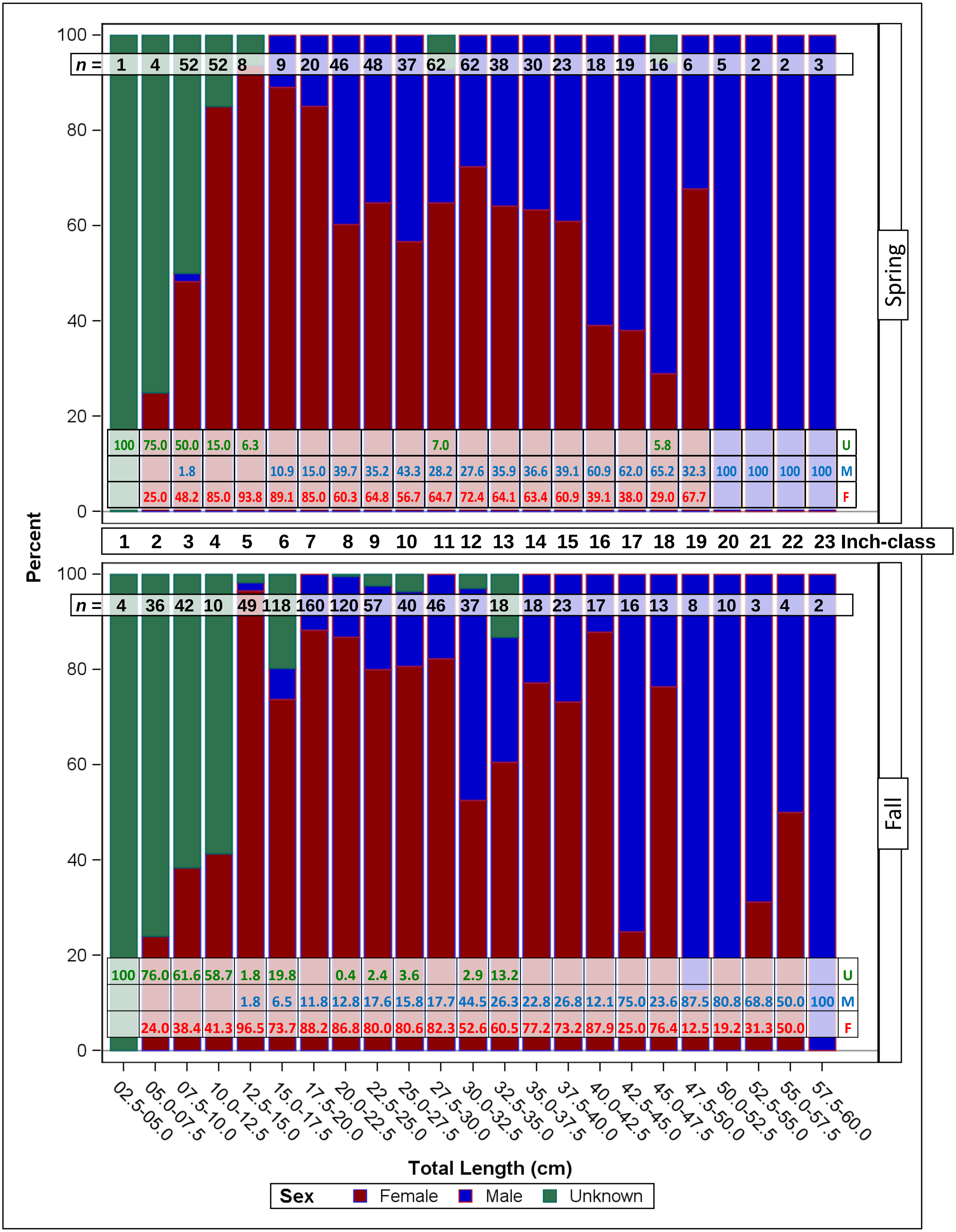
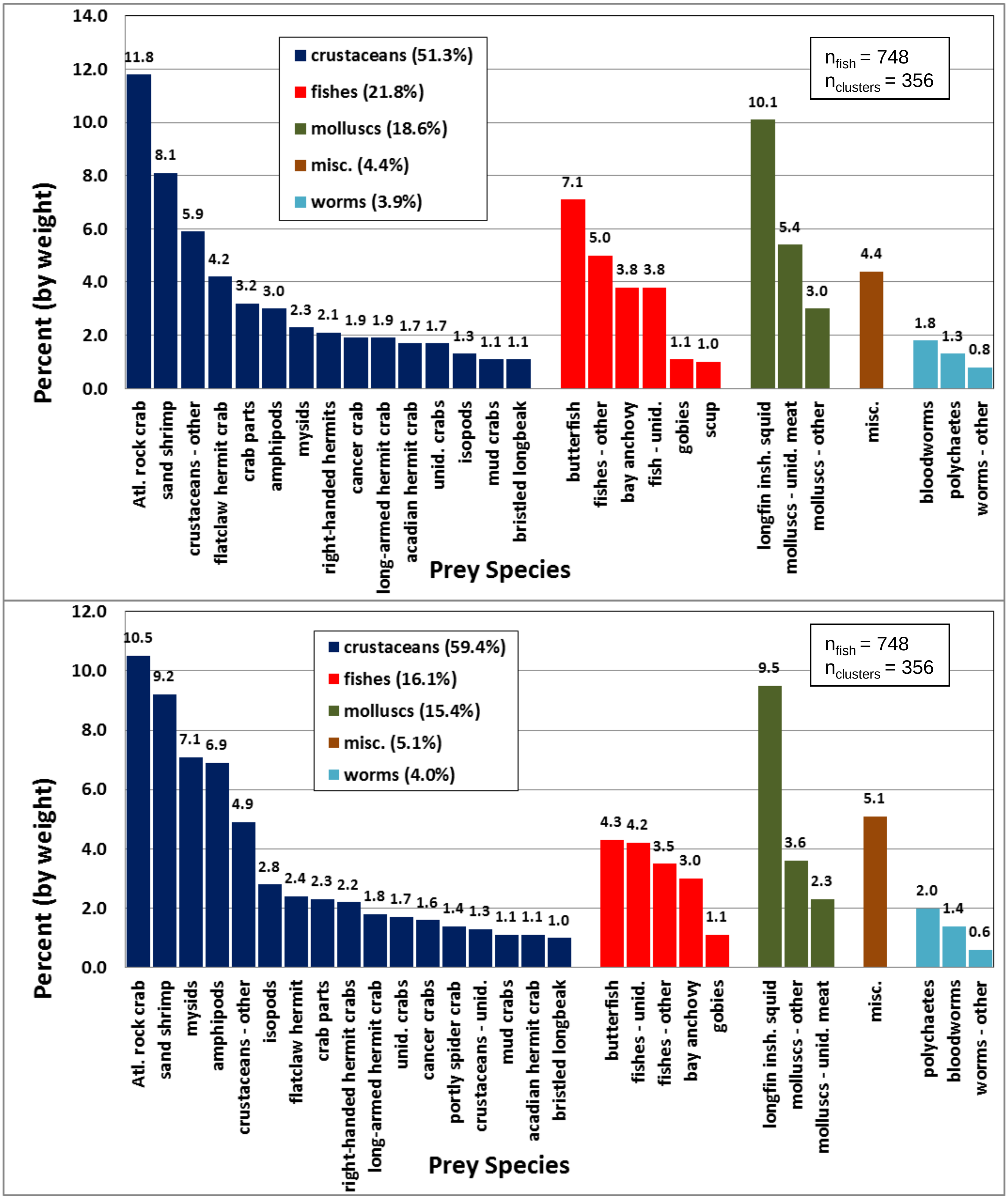


Figure 45. Black sea bass diet composition, expressed as percent by weight and number collected during NEAMAP cruises in 2007 through Spring 2011.

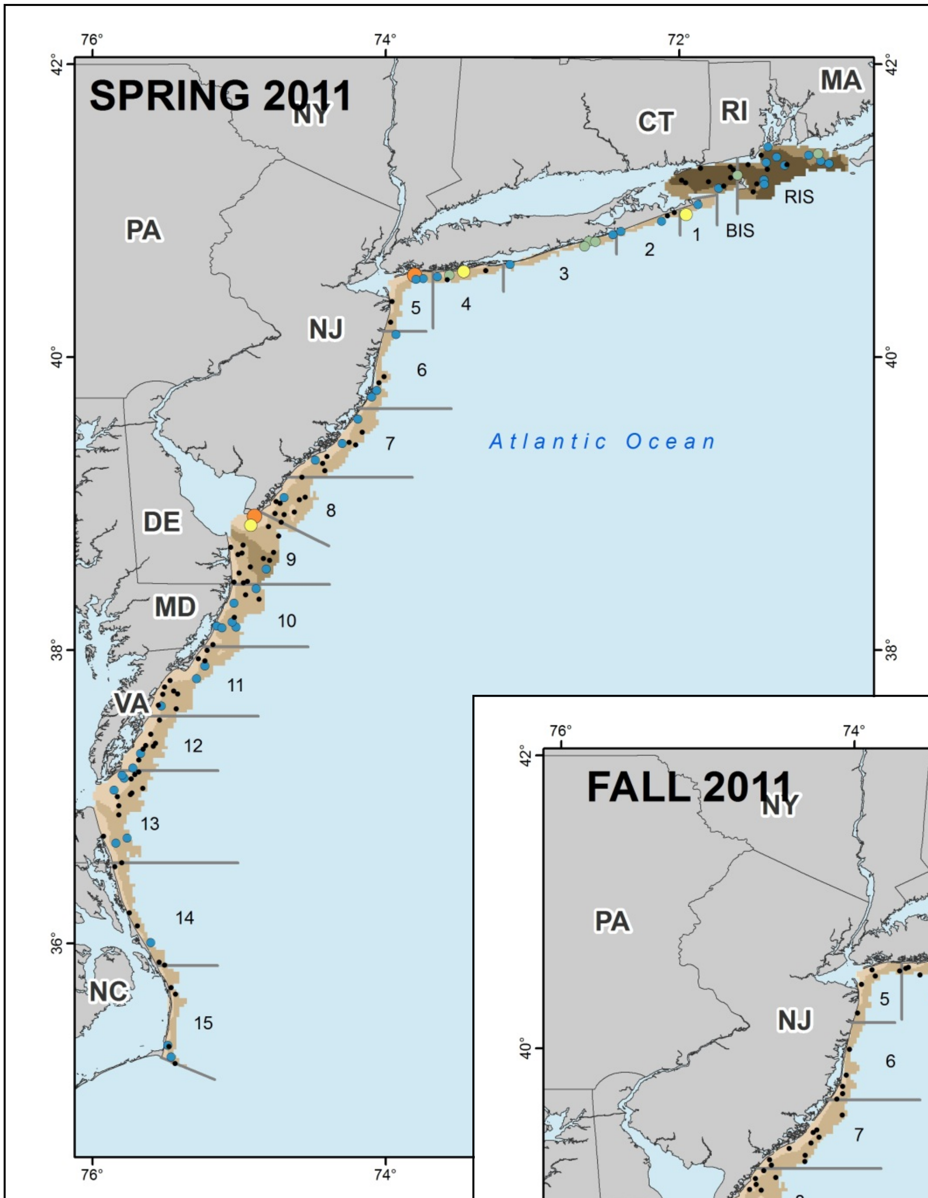
(The number of fish sampled for diet is given by n_{fish}, while $n_{clusters}$ indicates the number of clusters of this species sampled.



Blueback Herring

Sampling Priority: A

Figure 46. Blueback herring biomass (kg) at each sampling site for 2011 NEAMAP cruises.



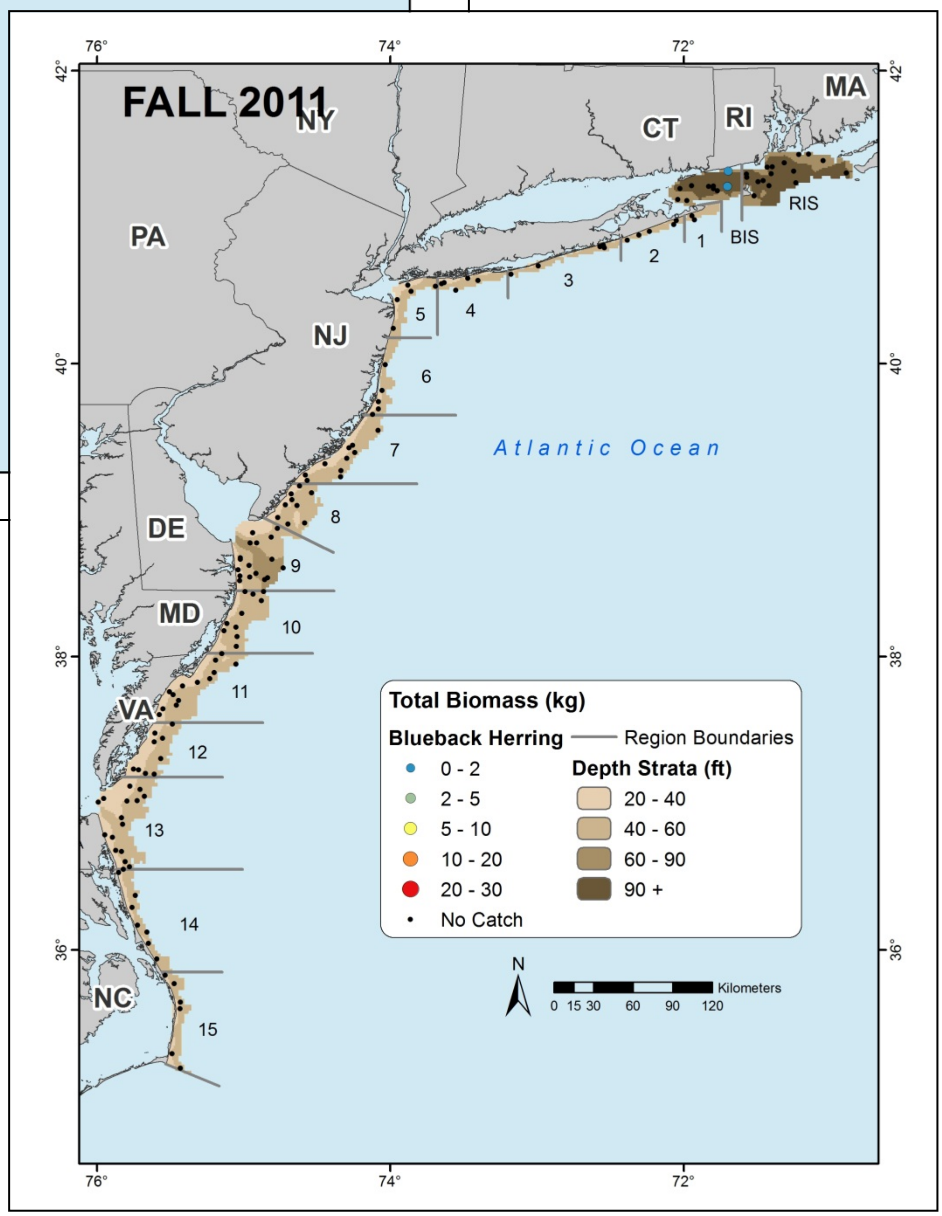


Table 27. Blueback herring sampling rates and preserved specimen analysis status for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught (kg)	Number Measured	Age Specimens	Ages Read	Stomach Specimens	Stomachs Analyzed
Spring	2008	3,693	62.2	1,774	237	0	235	0
	2009	5,603	160.3	2,808	315	0	315	2
	2010	4,992	86.6	2,436	280	0	276	21
	2011	77,071	957.3	2,713	226	0	219	216
Fall	2007	50	1.6	50	18	0	18	0
	2008	20	0.7	20	9	0	9	0
	2009	15	0.6	15	6	0	6	6
	2010	22	0.6	22	15	0	14	12
	2011	2	0.1	2	2	0	2	0

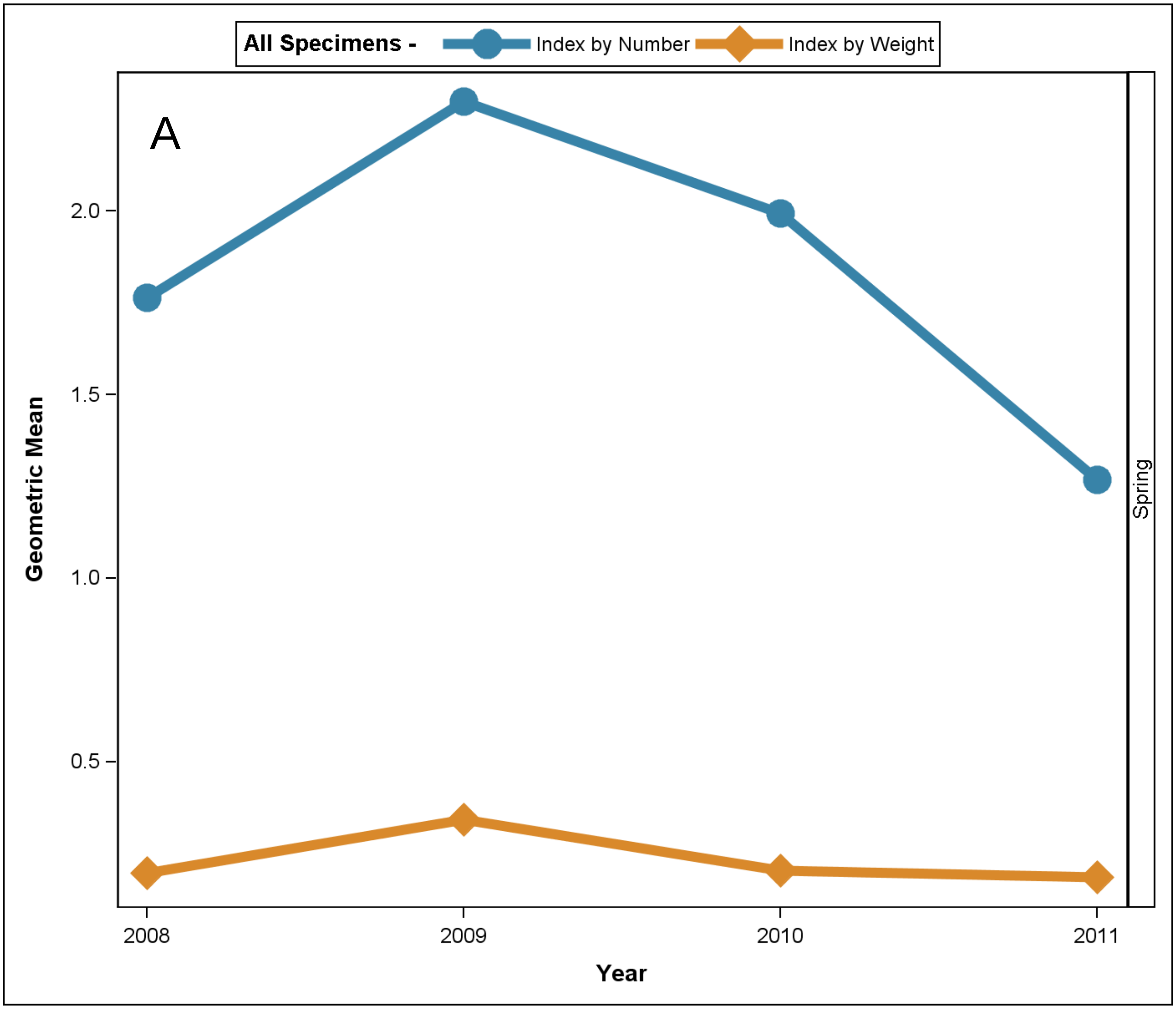
Table 28. Strata used for calculation of abundance indices for blueback herring.

State (Nominal)	Region	Depth Stratum	Spring Index	Fall Index	State (Nominal)	Region	Depth Stratum	Spring Index	Fall Index
RI	RIS	60-90		N/A	DE	09	20-40		N/A
		90+					40-60		
	BIS	60-90					60-90		
		90+			MD	10	20-40		
NY	01	40-60					40-60		
	02	20-40			VA	11	20-40		
		40-60					40-60		
	03	20-40				12	20-40		
		40-60					40-60		
	04	20-40				13	20-40		
		40-60					40-60		
	05	20-40			NC	14	20-40		
		40-60					40-60		
NJ	06	20-40				15	20-40		
		40-60					40-60		
	07	20-40							
		40-60				= used for abundance indices			
	08	20-40				= not used for abundance indices			
		40-60							

Table 29. Blueback herring preliminary geometric mean indices of abundance, by number and biomass, for spring NEAMAP surveys, for all specimens captured and for the youngest year class captured.

Season	Year	Age	Numerical Index					Biomass Index				
			n	LCI	**Index**	UCI	CV (%)	n	LCI	**Index**	UCI	CV (%)
Spring	2008	All	150	1.17	**1.76**	2.52	11.9	150	0.12	**0.20**	0.28	18.5
	2009		160	1.55	**2.30**	3.26	10.7	160	0.23	**0.34**	0.47	15.4
	2010		150	1.30	**1.99**	2.90	12.0	150	0.12	**0.20**	0.30	20.2
	2011		150	0.81	**1.27**	1.84	13.7	150	0.11	**0.19**	0.27	19.7
Spring	2008	1	150	0.91	**1.40**	2.02	13.1	150	0.08	**0.14**	0.20	21.1
	2009		160	0.77	**1.20**	1.73	13.8	160	0.08	**0.15**	0.21	21.3
	2010		150	1.06	**1.66**	2.44	13.1	150	0.09	**0.17**	0.25	22.3
	2011		150	0.59	**0.98**	1.48	16.3	150	0.07	**0.14**	0.22	24.0

Figure 47. Blueback herring preliminary geometric mean indices of abundance, by number and biomass, for spring NEAMAP surveys, for all specimens captured (A) and for the youngest year class captured (B – numbers only).



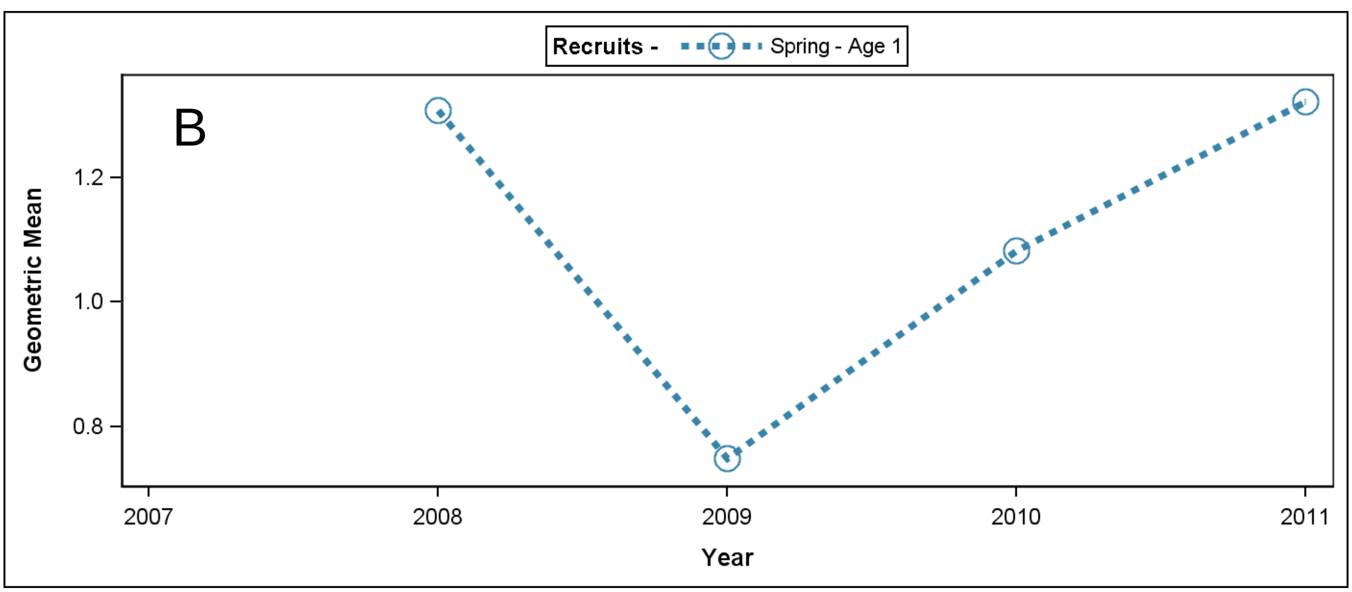


Figure 48. Blueback herring length-frequency distributions, by cruise (Blue reference lines are placed at the size cutoff values used to separate recruits from older specimens. Cutoff values - Spring 14cm - estimated by examination of these length frequency figures.).

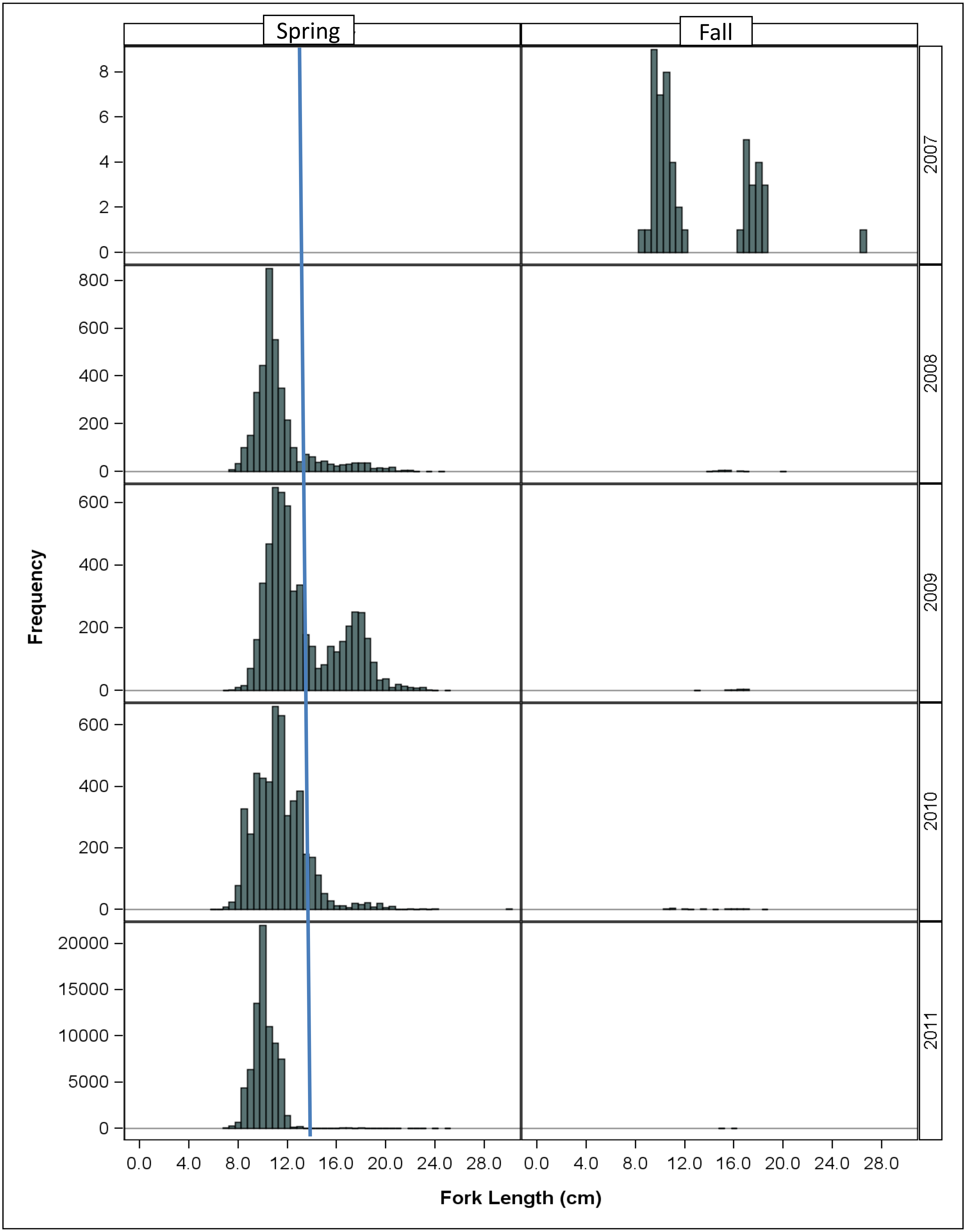


Figure 49. Blueback herring length-frequency distributions, by cruise and sex.

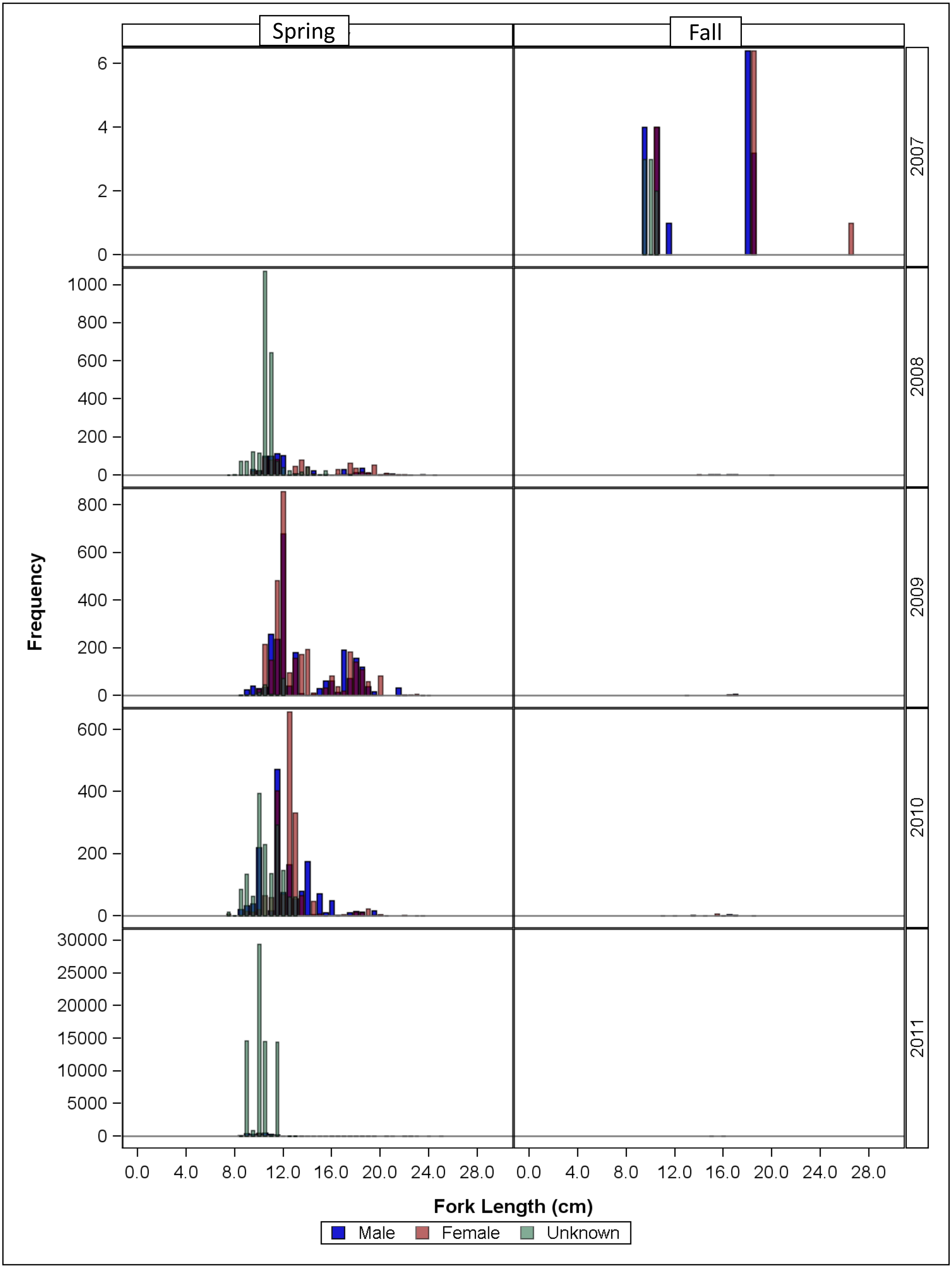
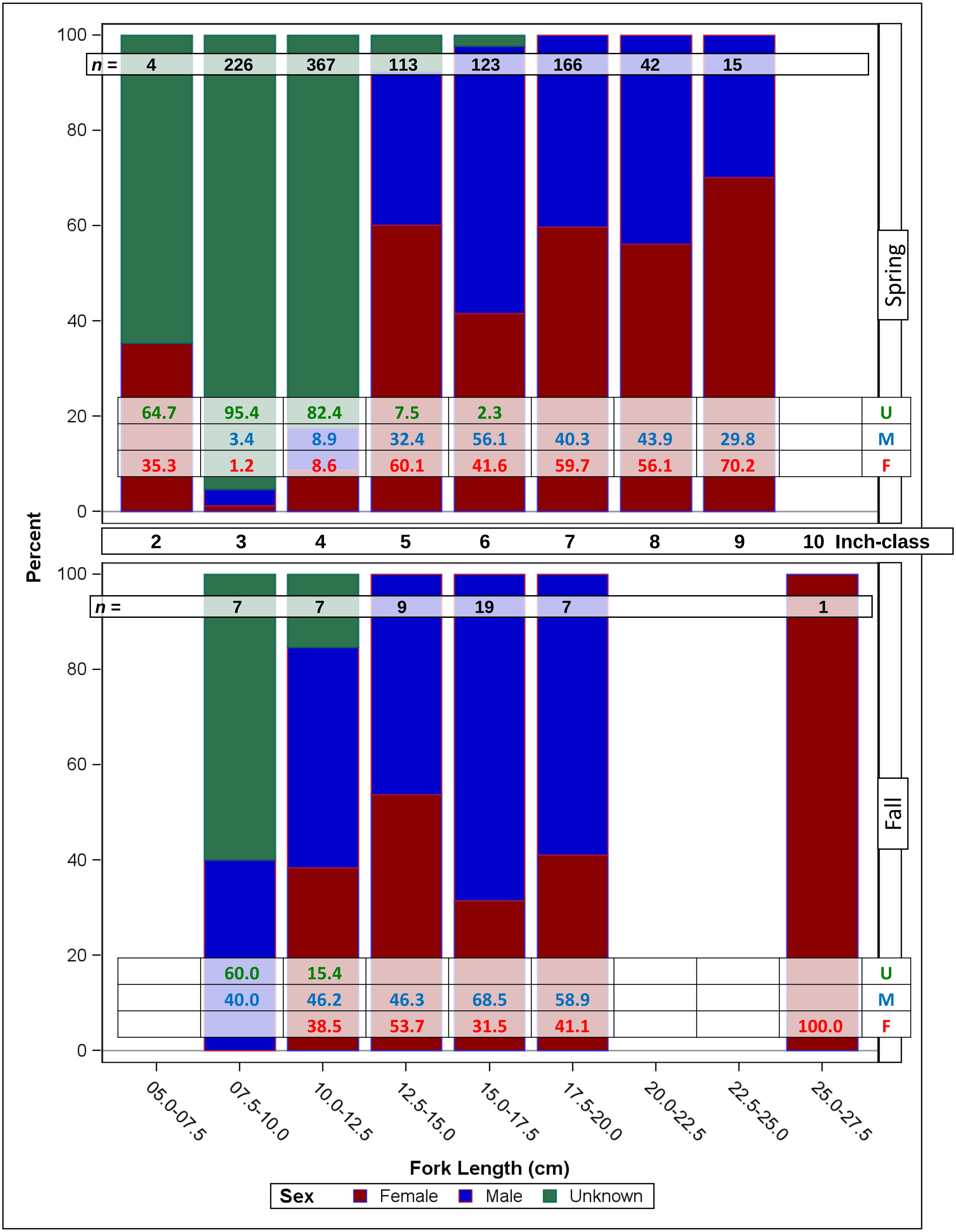
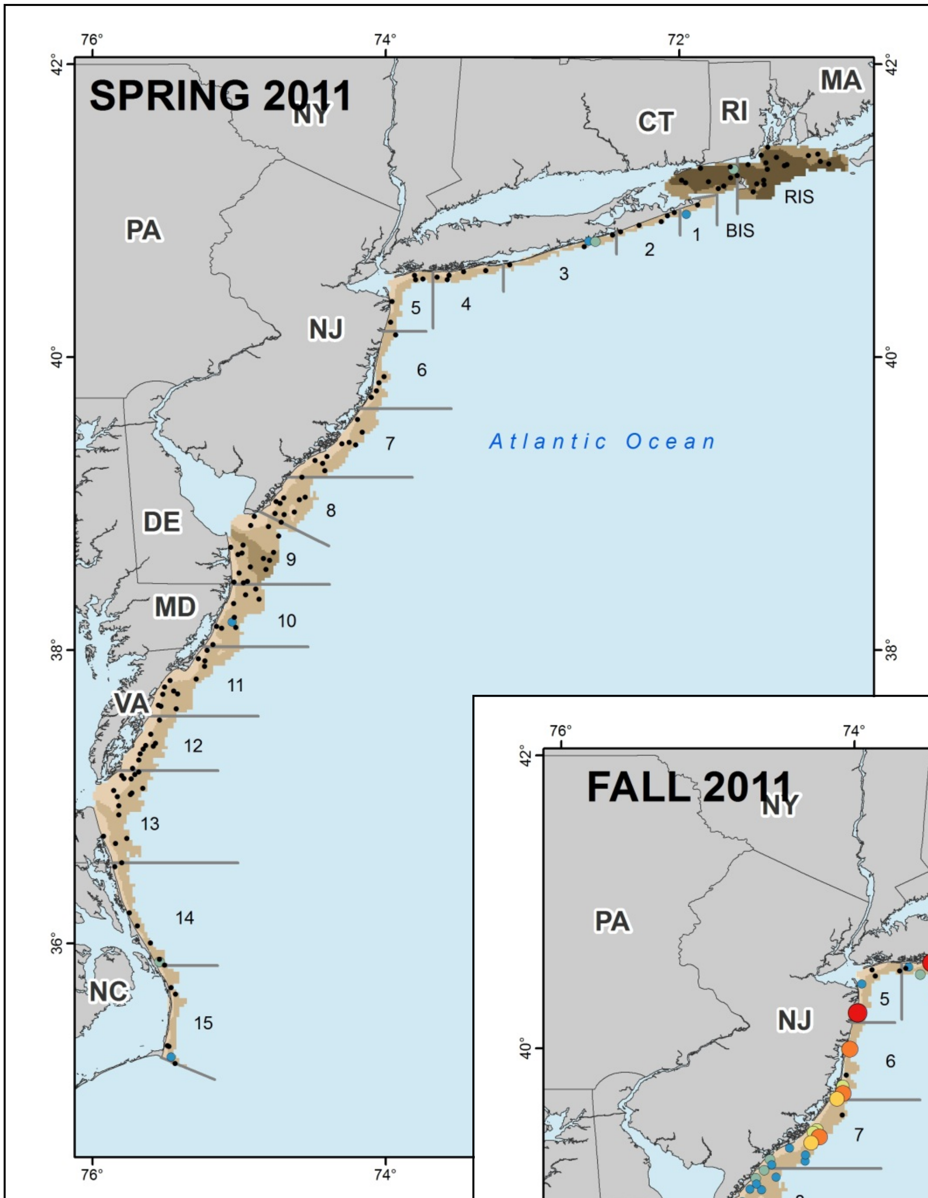


Figure 50. Blueback herring sex ratio, by length group, for NEAMAP Spring and Fall cruises 2007-2011. (The percentages for each category are given near the bottom of each bar. The number sampled for sex determination is provided near the top of each bar, and the length categories expressed in inches are shown between the two figures.).

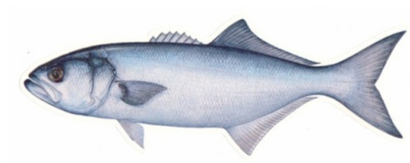




Bluefish

Sampling Priority: A

Figure 51. Bluefish biomass (kg) at each sampling site for 2011 NEAMAP cruises.



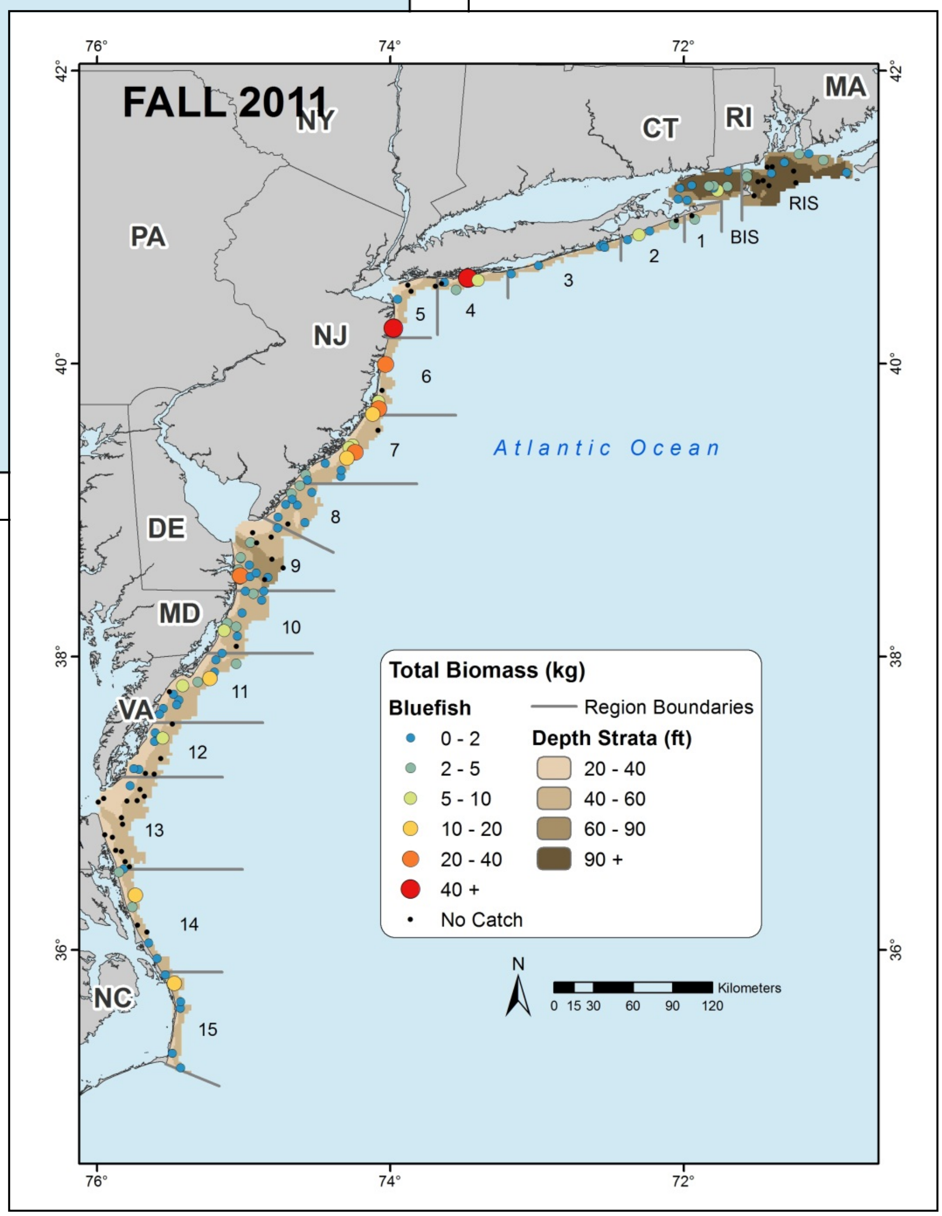


Table 30. Bluefish sampling rates and preserved specimen analysis status for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught (kg)	Number Measured	Age Specimens	Ages Read	Stomach Specimens	Stomachs Analyzed
Spring	2008	37	10.9	37	27	0	24	24
	2009	1,580	91.2	274	35	0	14	13
	2010	312	21.4	68	18	0	15	15
	2011	18	10.5	18	11	0	3	3
Fall	2007	4,635	394.5	2,613	588	588	485	478
	2008	7,120	908.7	2,214	529	0	409	402
	2009	18,075	910.7	4,016	632	0	432	421
	2010	4,432	271.6	1,967	498	0	379	369
	2011	3,885	454.9	1,887	482	0	295	0

Table 31. Strata used for calculation of abundance indices for bluefish.

State (Nominal)	Region	Depth Stratum	Spring Index	Fall Index
RI	RIS	60-90	not used	used
		90+	not used	used
	BIS	60-90	not used	used
		90+	not used	used
NY	01	40-60	not used	used
	02	20-40	not used	used
		40-60	not used	used
	03	20-40	not used	used
		40-60	not used	used
	04	20-40	not used	used
		40-60	not used	used
	05	20-40	not used	used
		40-60	not used	used
NJ	06	20-40	not used	used
		40-60	not used	used
	07	20-40	not used	used
		40-60	not used	used
	08	20-40	not used	used
		40-60	not used	used
DE	09	20-40	not used	used
		40-60	not used	used
		60-90	not used	used
MD	10	20-40	not used	used
		40-60	not used	used
VA	11	20-40	not used	used
		40-60	not used	used
	12	20-40	not used	used
		40-60	not used	used
	13	20-40	not used	used
		40-60	not used	used
NC	14	20-40	used	used
		40-60	used	used
	15	20-40	used	used
		40-60	used	used

(red) = used for abundance indices
(grey) = not used for abundance indices

Table 32. Bluefish preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured and for the youngest year class captured (numbers only – spring and summer cohorts shown separately).

			n	LCI	**Index**	UCI	CV (%)	n	LCI	**Index**	UCI	CV (%)
Spring	2008	All	5	0.00	**0.40**	1.72	100.0	5	0.00	**0.04**	0.13	100.0
	2009		6	5.66	**8.19**	11.69	7.3	6	1.57	**4.05**	8.92	20.8
	2010		5	0.00	**0.44**	2.00	100.0	5	0.00	**0.05**	0.16	100.0
	2011		5	0.00	**0.00**	0.00		5	0.00	**0.00**	0.00	
Fall	2007	All	150	3.20	**4.36**	5.83	7.3	150	1.01	**1.29**	1.61	7.9
	2008		150	4.03	**5.51**	7.43	6.9	150	0.98	**1.33**	1.75	9.8
	2009		160	4.15	**5.52**	7.26	6.3	160	0.73	**0.95**	1.20	9.1
	2010		150	2.56	**3.44**	4.55	7.5	150	0.65	**0.85**	1.06	9.0
	2011		150	3.01	**3.99**	5.19	6.7	150	0.86	**1.14**	1.46	9.2
Spring	2008	1	5	0.00	**0.40**	1.72	100.0	5	0.00	**0.04**	0.13	100.0
	2009		6	5.35	**5.68**	6.04	1.4	6	1.44	**1.59**	1.74	3.1
	2010		5	0.00	**0.44**	2.00	100.0	5	0.00	**0.05**	0.15	100.0
	2011		5	0.00	**0.00**	0.00		5	0.00	**0.00**	0.00	
Fall	2007	0	150	2.51	**3.49**	4.74	8.2	150	0.60	**0.79**	1.01	9.9
	2008		150	3.40	**4.68**	6.33	7.3	150	0.59	**0.83**	1.09	11.4
	2009		160	3.77	**5.05**	6.68	6.6	160	0.53	**0.70**	0.90	10.3
	2010		150	2.16	**2.96**	3.96	8.1	150	0.37	**0.50**	0.64	11.4
	2011		150	2.65	**3.51**	4.57	7.0	150	0.63	**0.84**	1.08	10.1
Fall	2007	0 (Spring Cohort)	150	1.58	**2.12**	2.78	8.4	150	0.43	**0.57**	0.72	10.2
	2008		150	1.48	**2.06**	2.77	9.3	150	0.28	**0.44**	0.62	16.4
	2009		160	1.16	**1.63**	2.19	10.1	160	0.23	**0.34**	0.46	15.0
	2010		150	0.79	**1.08**	1.42	10.2	150	0.18	**0.26**	0.34	13.6
	2011		150	2.29	**3.03**	3.94	7.3	150	0.56	**0.75**	0.96	10.3
Fall	2007	0 (Summer Cohort)	150	0.87	**1.29**	1.80	12.1	150	0.17	**0.27**	0.37	16.7
	2008		150	1.98	**2.75**	3.72	8.7	150	0.33	**0.46**	0.61	12.8
	2009		160	2.29	**3.03**	3.93	7.2	160	0.29	**0.39**	0.49	11.1
	2010		150	1.26	**1.78**	2.41	10.0	150	0.17	**0.25**	0.34	15.6
	2011		150	0.52	**0.77**	1.05	13.0	150	0.10	**0.18**	0.27	21.6

Figure 52. Bluefish preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured (A), for the youngest year class captured (B – numbers only) and (using fall data only) for the spring and summer age-0 cohorts separately (C – numbers only).

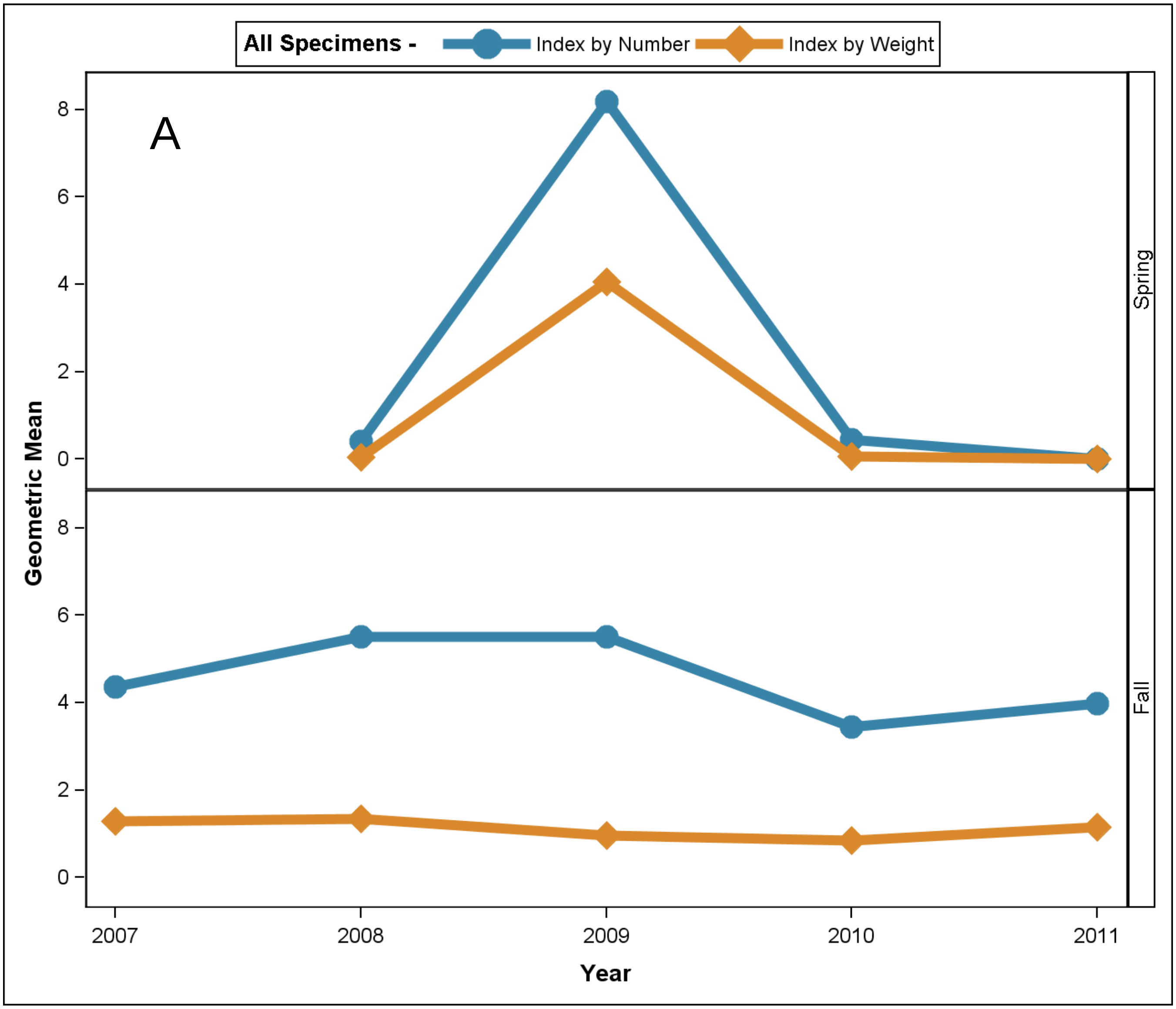


Figure 52. cont.

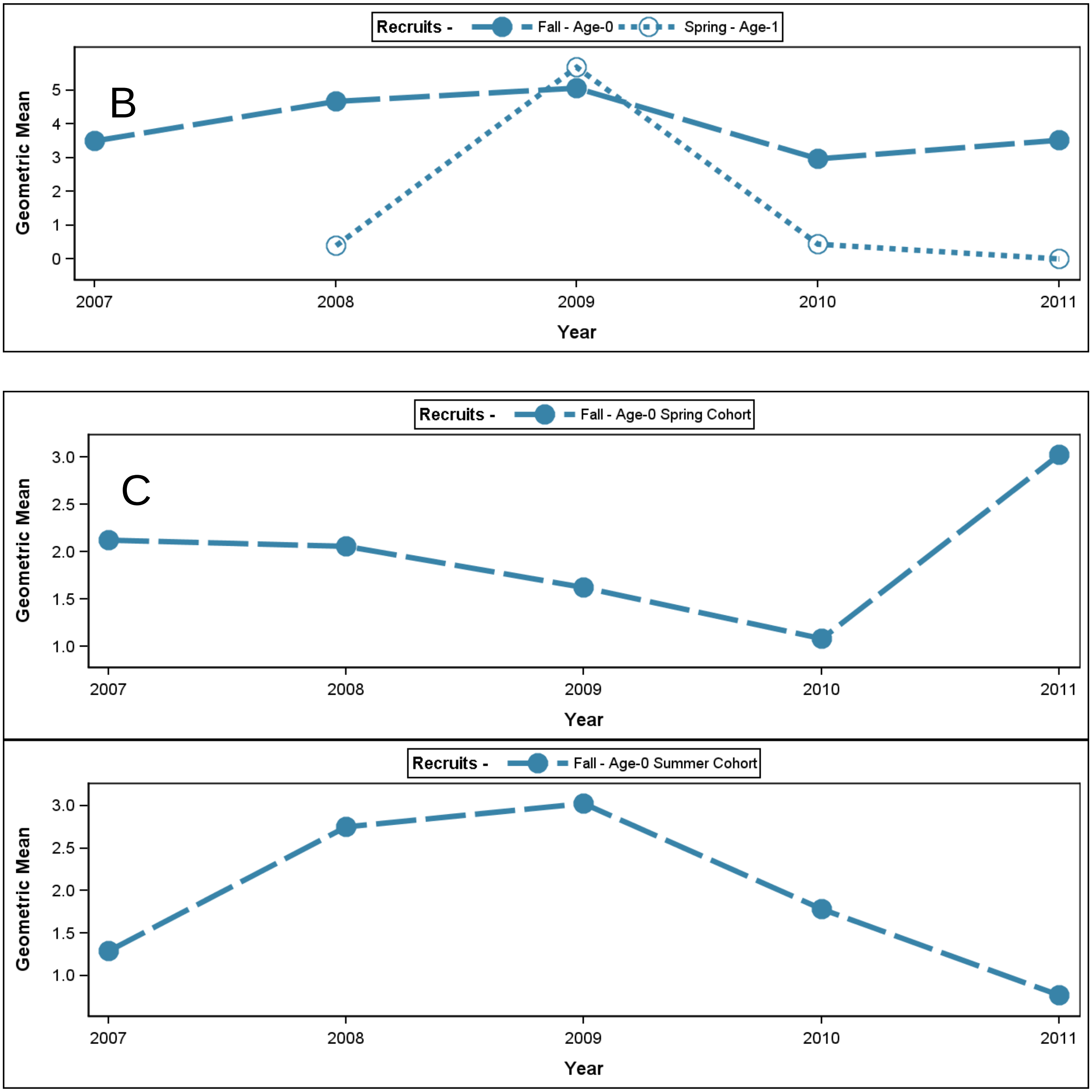


Figure 53. Bluefish length-frequency distributions, by cruise.(Blue reference line is placed at the size cutoff value – 17cm - used to separate the spring YOY cohort – to the right of the line – from the summer YOY cohort – to the left. Age-length key values presented in Table 33 were applied to the spring cohort specimens).

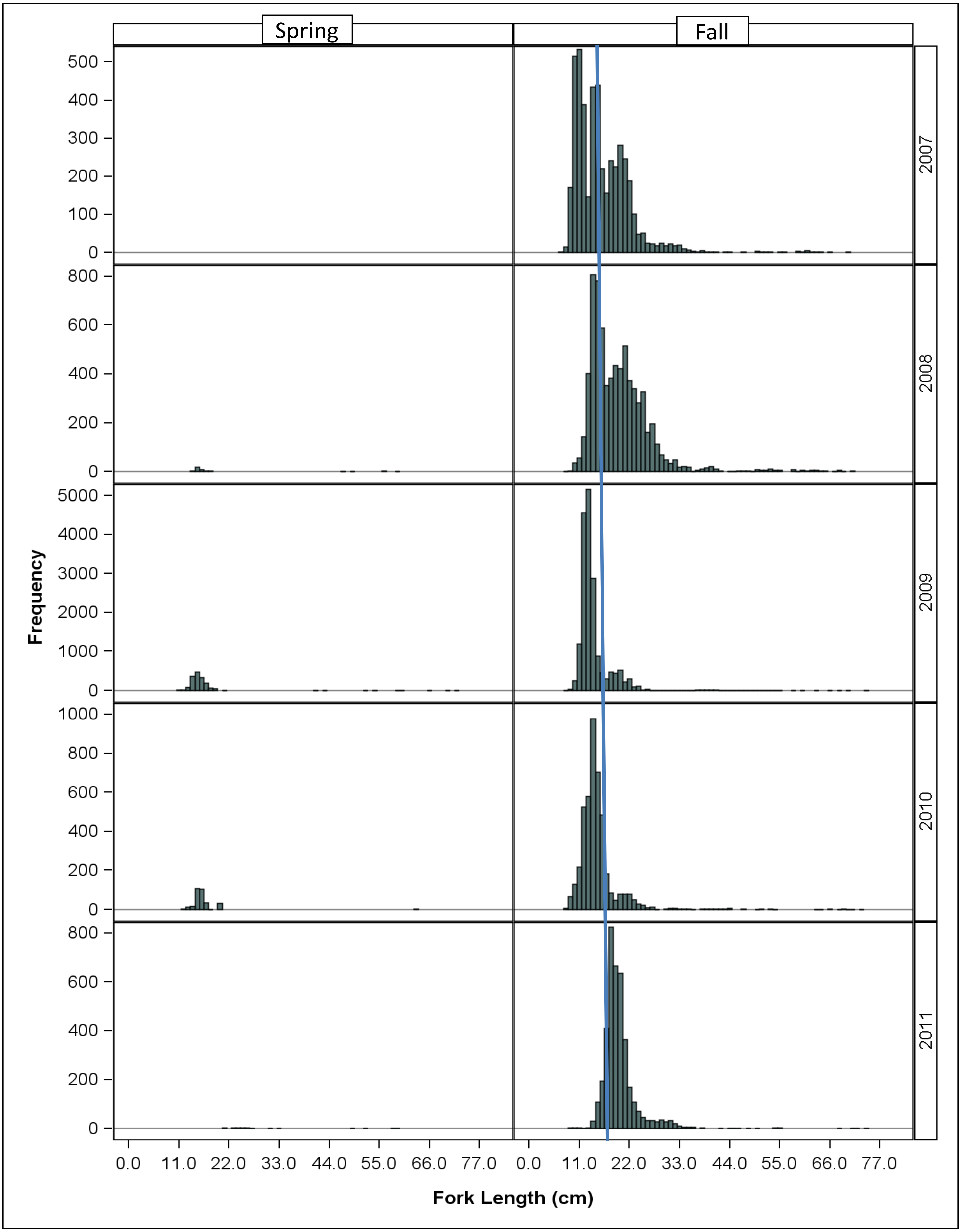


Figure 54. Bluefish length-frequency distributions, by cruise and sex.

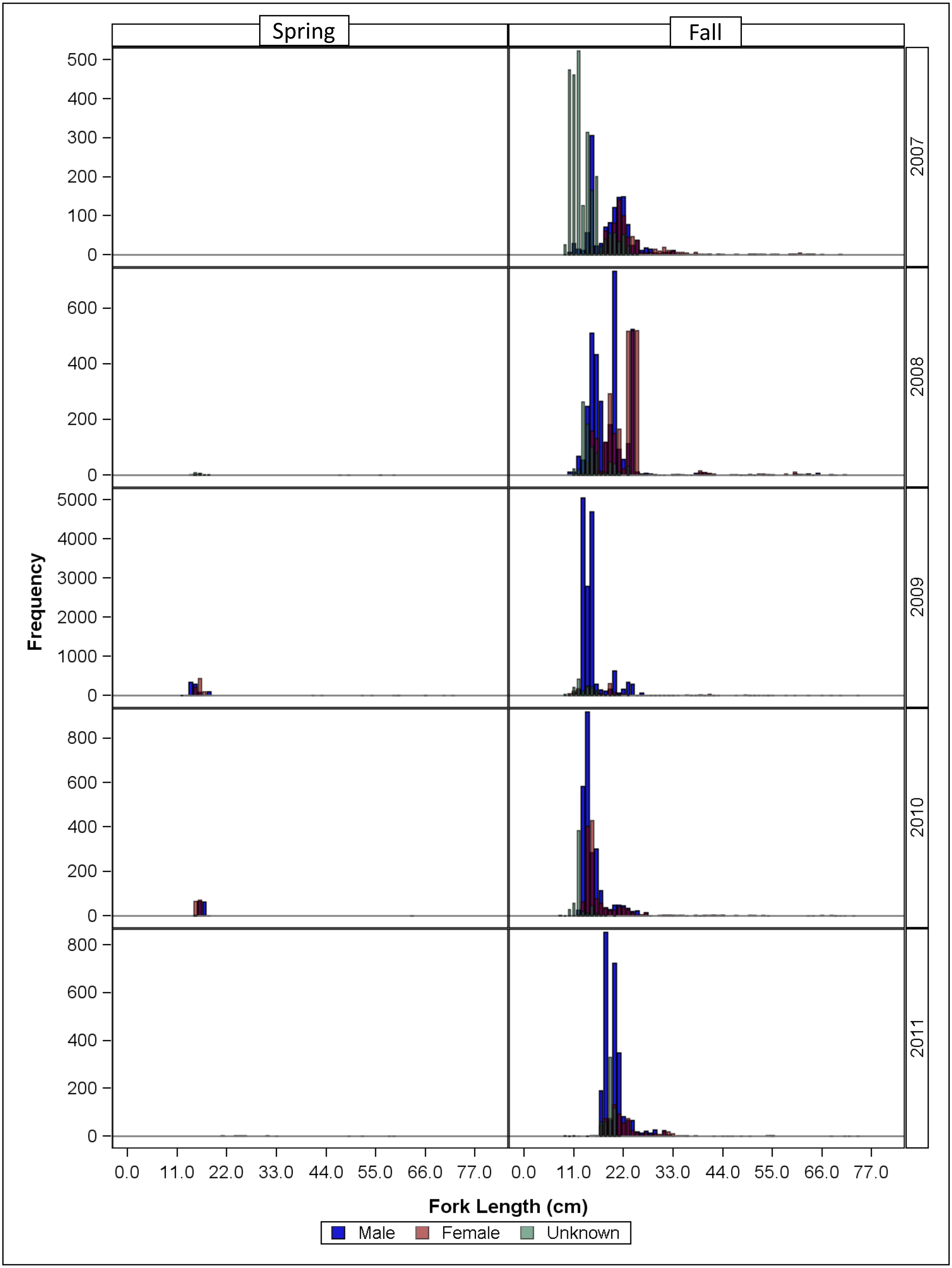


Figure 55. Bluefish age-at-length proportions for all spring vs. all fall cruises combined, showing actual and loess smoothed proportions at each 1cm length bin (Data from a single aged NEAMAP survey year pooled with samples from the VIMS ChesMMAP survey).

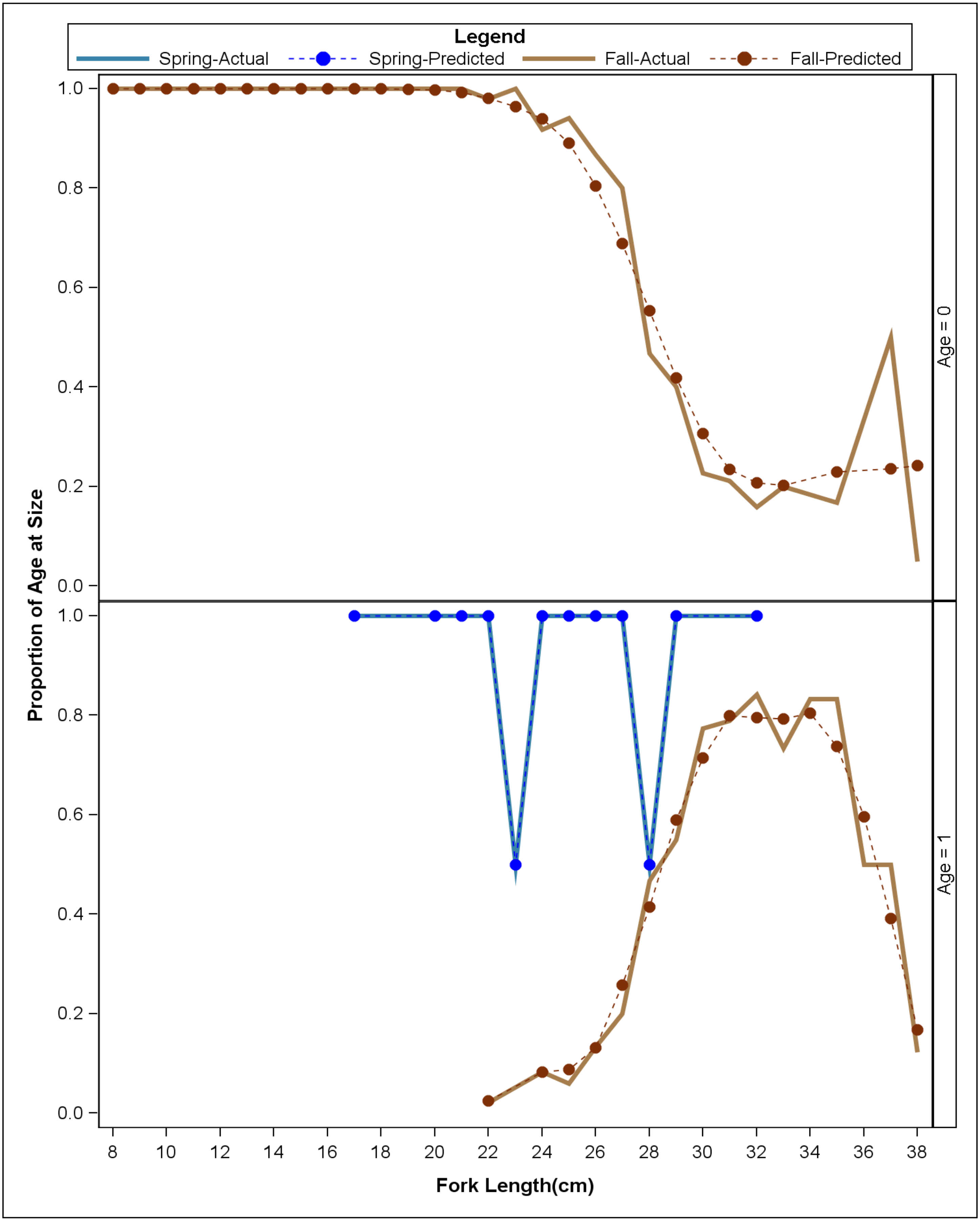


Table 33. Bluefish loess-smoothed age-at-length proportions for all fall cruises combined. (Greyed values assigned rather than calculated due to lack of data in particular cells. Arrows indicate the same value used for all length bins covered. Struck-through values are from actual data but are not used. Note that within a Season and a Length bin proportions may not add to exactly 1.0 due to the smoothing algorithm. Smoothing is done within an age-class rather than across all age-classes at any given length.)

	Spring		Fall	
Total Length(cm)	**Age-0**	**Age-1**	**Age-0**	**Age-1**
8			↑	↑
9				
10				
11				
12				
13				
14				
15				
16				
17				
18			1.000	
19			0.999	
20			0.997	
21			0.992	0.000
22			0.981	0.024
23			0.965	0.035
24			0.939	0.083
25			0.891	0.087
26			0.804	0.131
27			0.689	0.257
28			0.554	0.414
29			0.418	0.590
30			0.307	0.714
31			0.234	0.800
32			0.207	0.796
33			0.202	0.793
34			0.200	0.804
35			0.230	0.738
36			0.230	0.595
37			0.236	0.392
38			0.242	0.167
39+			0.000	0.000

Figure 56. Bluefish sex ratio, by length group, for NEAMAP Spring and Fall cruises 2007-2011.
(The percentages for each category are given near the bottom of each bar. The number sampled for sex determination is provided near the top of each bar, and the length categories expressed in inches are shown between the two figures.).

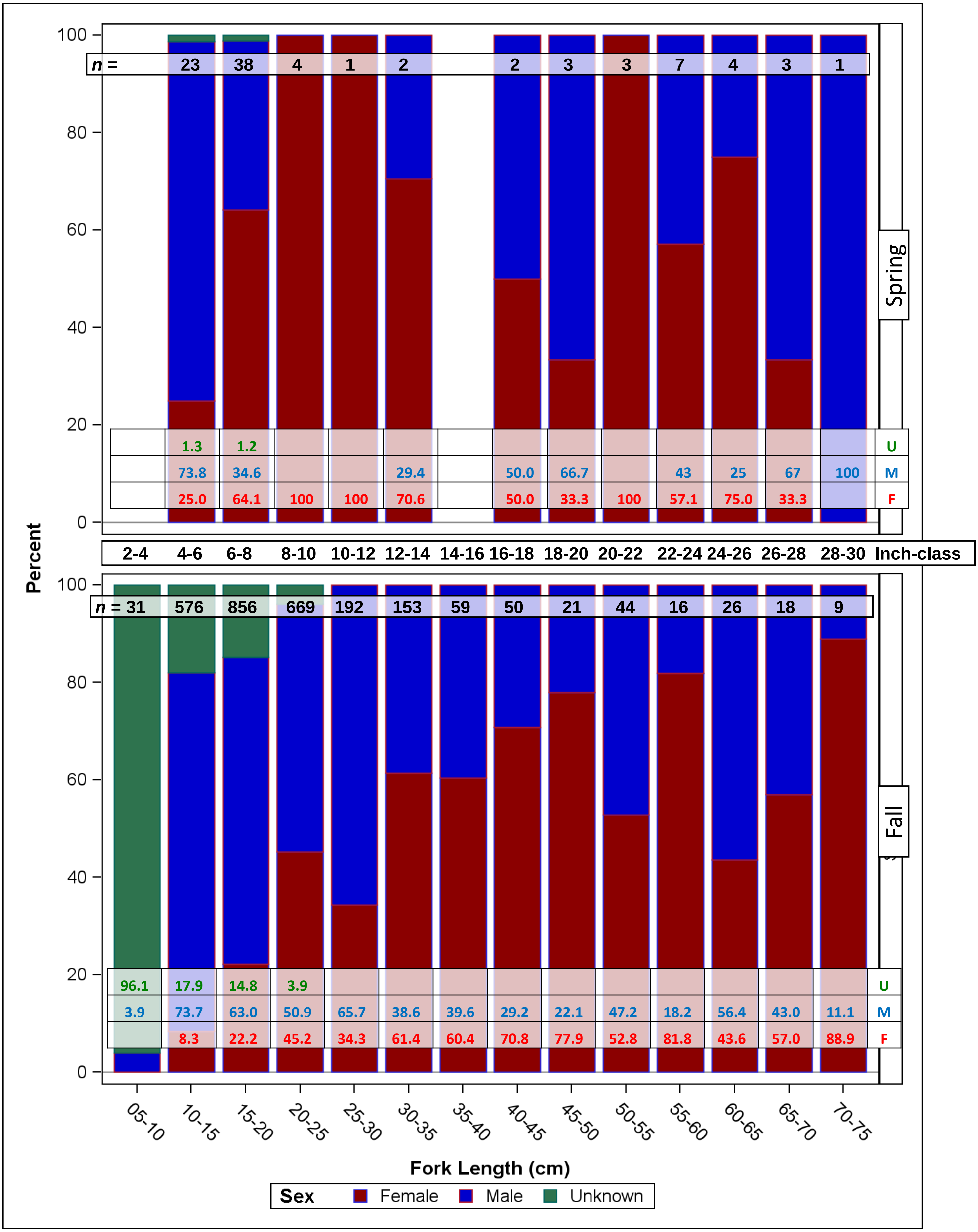
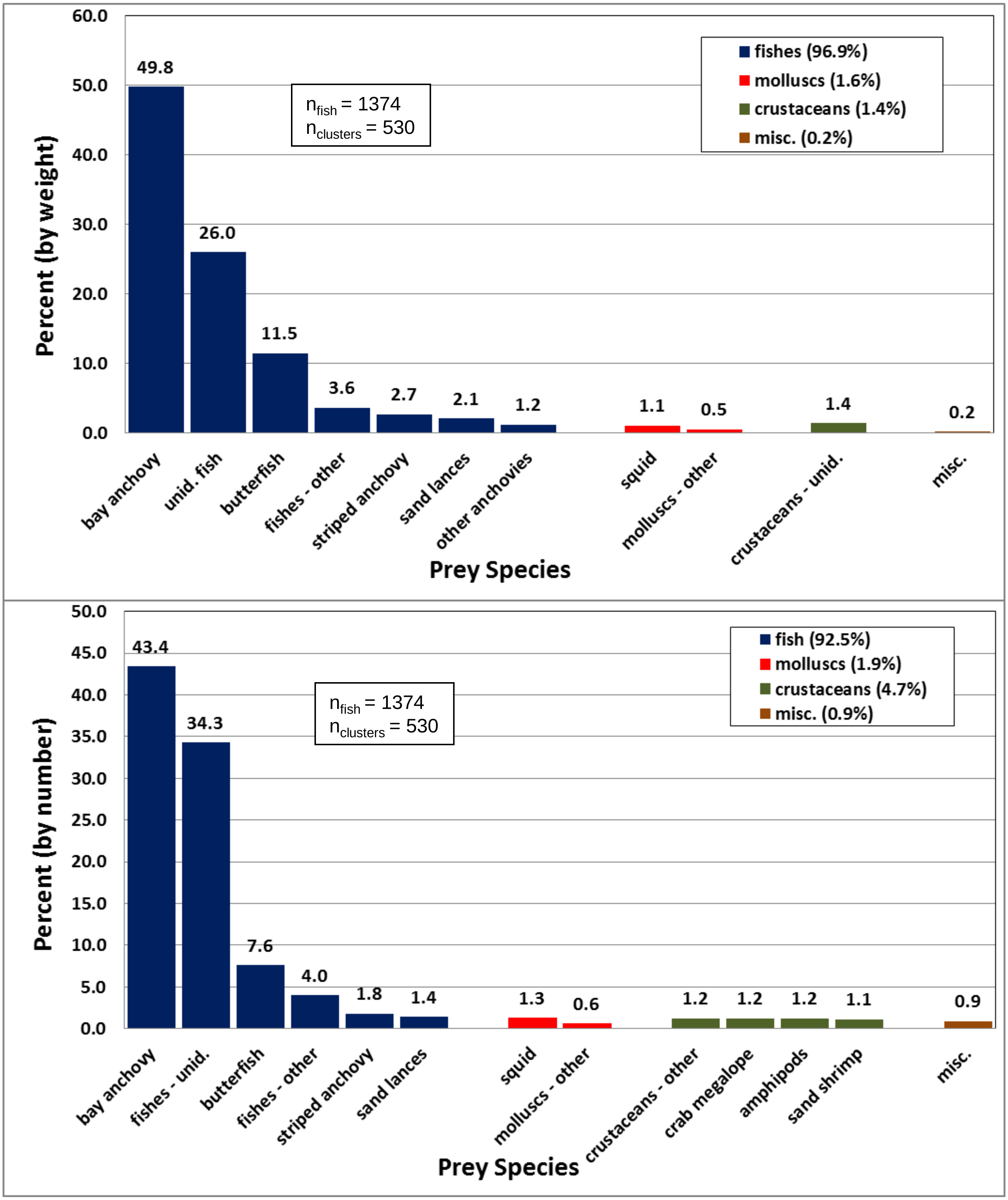


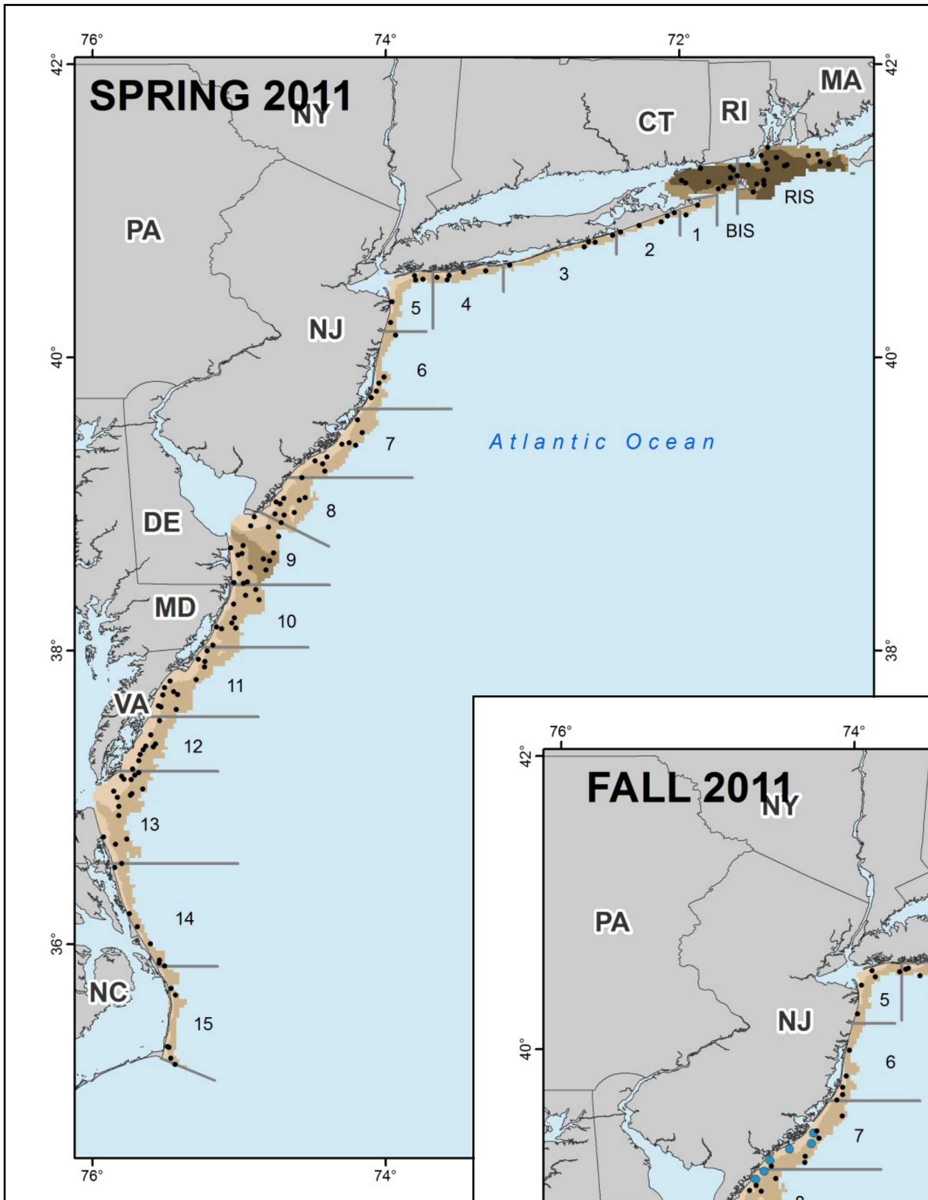
Figure 57. Bluefish diet composition, expressed as percent by weight and number collected during NEAMAP cruises in 2007 through Spring 2011. (The number of fish sampled for diet is given by n_{fish}, while $n_{clusters}$ indicates the number of clusters of this species sampled.



Brown Shrimp

Sampling Priority: E

Figure 58. Brown shrimp biomass (kg) at each sampling site for 2011 NEAMAP cruises.



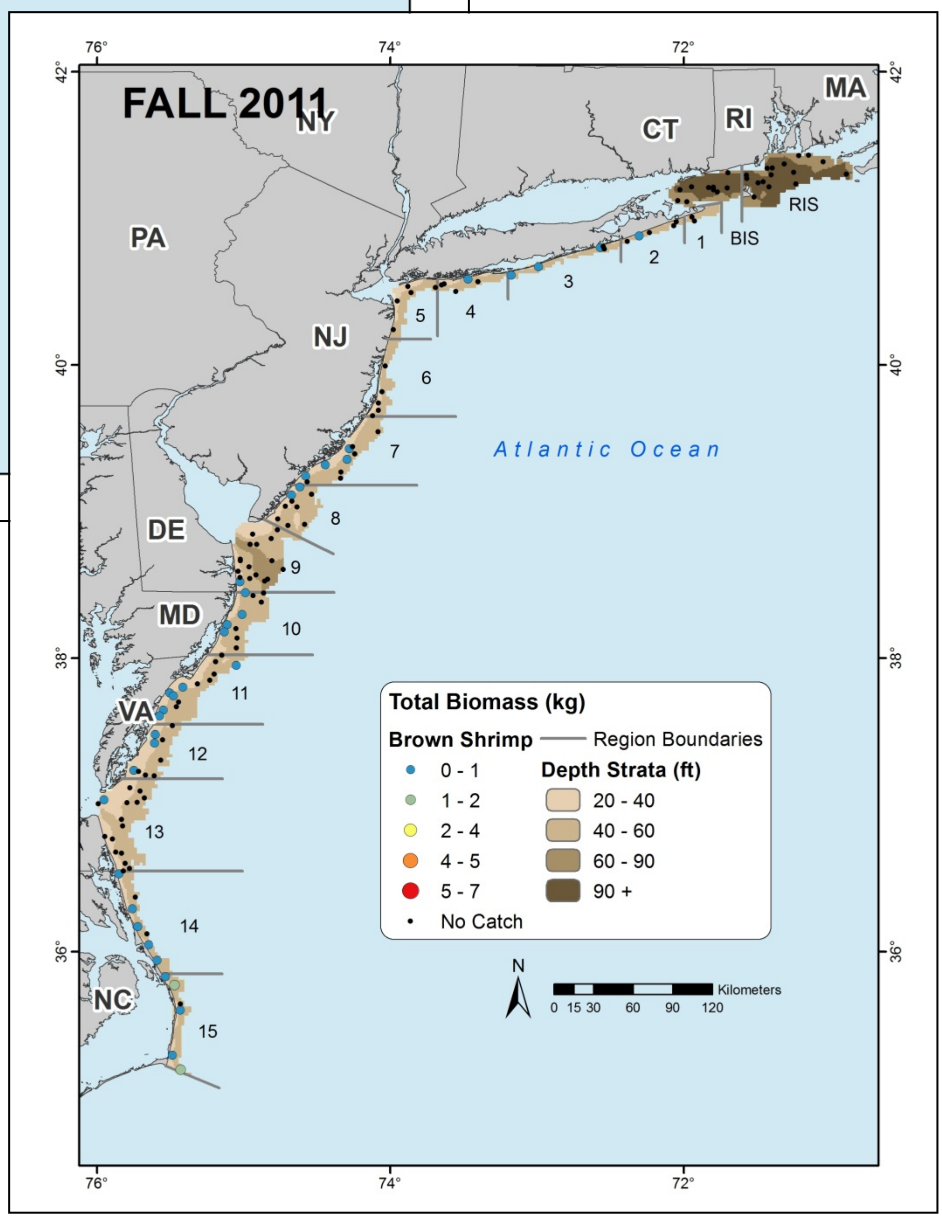


Table 34. Brown shrimp sampling rates for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught (kg)	Number Measured	Age Specimens	Ages Read	Stomach Specimens	Stomachs Analyzed
Spring	2008	5	0.2	5	N/A	N/A	N/A	N/A
	2009	7	0.1	7	N/A	N/A	N/A	N/A
	2010	0	0.0	0	N/A	N/A	N/A	N/A
	2011	0	0.0	0	N/A	N/A	N/A	N/A
Fall	2007	898	21.6	459	N/A	N/A	N/A	N/A
	2008	509	15.3	372	N/A	N/A	N/A	N/A
	2009	45	0.9	45	N/A	N/A	N/A	N/A
	2010	565	8.6	21	N/A	N/A	N/A	N/A
	2011	406	10.2	406	N/A	N/A	N/A	N/A

Table 35. Strata used for calculation of abundance indices for brown shrimp.

State (Nominal)	Region	Depth Stratum	Spring Index	Fall Index
RI	RIS	60-90	not used	not used
		90+	not used	not used
	BIS	60-90	not used	not used
		90+	not used	not used
NY	01	40-60	not used	not used
	02	20-40	not used	not used
		40-60	not used	not used
	03	20-40	not used	not used
		40-60	not used	not used
	04	20-40	not used	not used
		40-60	not used	not used
	05	20-40	not used	not used
		40-60	not used	not used
NJ	06	20-40	not used	not used
		40-60	not used	not used
	07	20-40	not used	not used
		40-60	not used	not used
	08	20-40	not used	not used
		40-60	not used	not used
DE	09	20-40	not used	not used
		40-60	not used	not used
		60-90	not used	not used
MD	10	20-40	not used	used
		40-60	not used	not used
VA	11	20-40	not used	used
		40-60	not used	not used
	12	20-40	not used	used
		40-60	not used	not used
	13	20-40	not used	used
		40-60	not used	not used
NC	14	20-40	not used	used
		40-60	not used	not used
	15	20-40	used	used
		40-60	used	not used

(red) = used for abundance indices
(grey) = not used for abundance indices

Table 36. Brown shrimp preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

Season	Year	Age	Numerical Index					Biomass Index				
			n	LCI	**Index**	UCI	CV (%)	n	LCI	**Index**	UCI	CV (%)
Spring	2008	All	5	0.00	**0.18**	0.65	100.0	5	0.00	**0.01**	0.03	100.0
	2009		6	0.00	**0.25**	0.61	57.6	6	0.00	**0.01**	0.02	69.3
	2010		5	0.00	**0.00**	0.00		5	0.00	**0.00**	0.00	
	2011		5	0.00	**0.00**	0.00		5	0.00	**0.00**	0.00	
Fall	2007	All	23	0.89	**2.62**	5.93	25.2	23	0.05	**0.22**	0.42	37.3
	2008		22	0.81	**2.51**	5.82	26.4	22	0.04	**0.22**	0.44	40.1
	2009		25	0.05	**0.47**	1.05	43.7	25	0.00	**0.02**	0.03	47.5
	2010		22	0.00	**0.08**	0.24	100.0	22	0.00	**0.00**	0.01	100.0
	2011		22	1.44	**2.81**	4.94	16.6	22	0.10	**0.17**	0.24	18.6

Figure 59. Brown shrimp preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

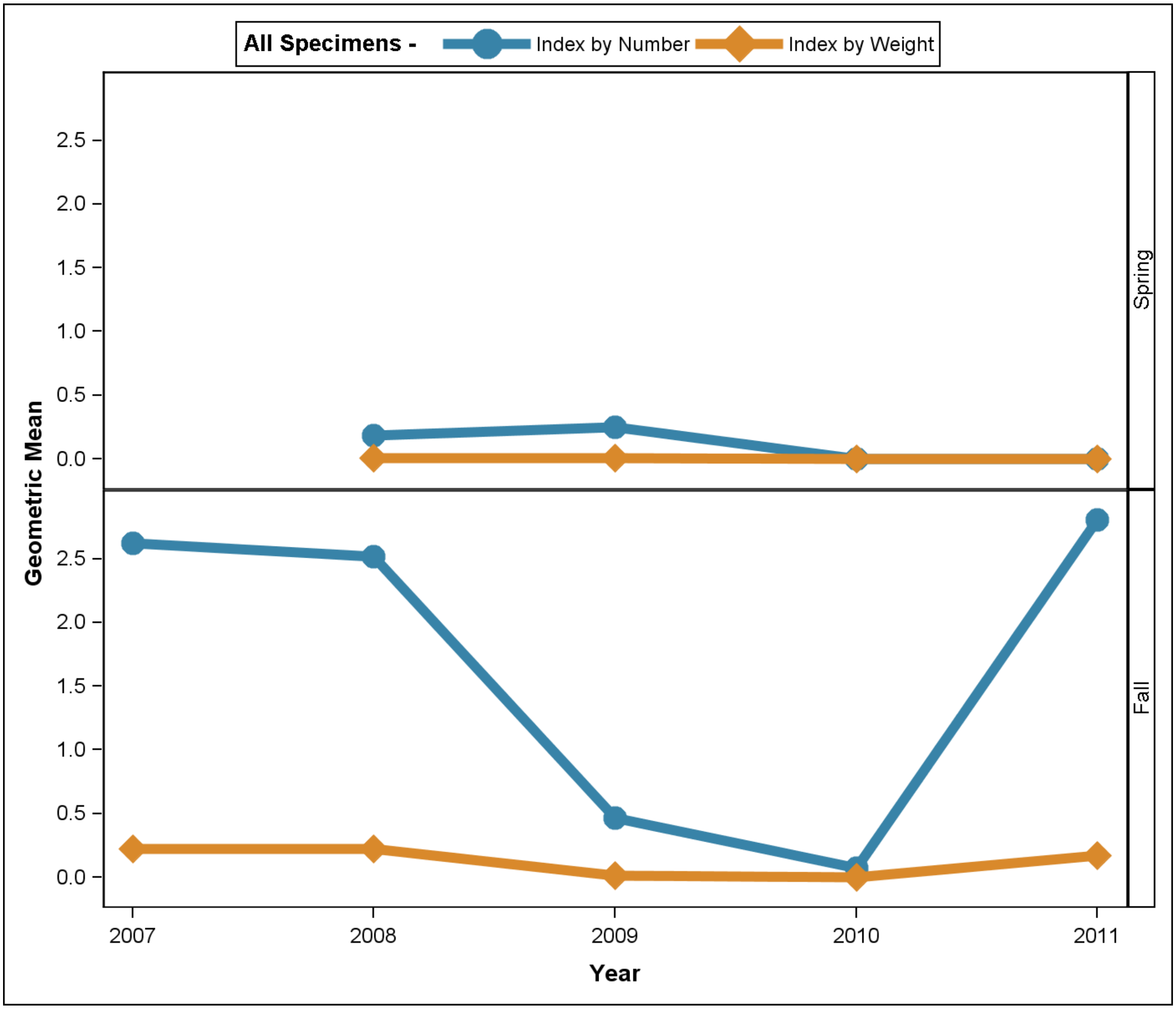
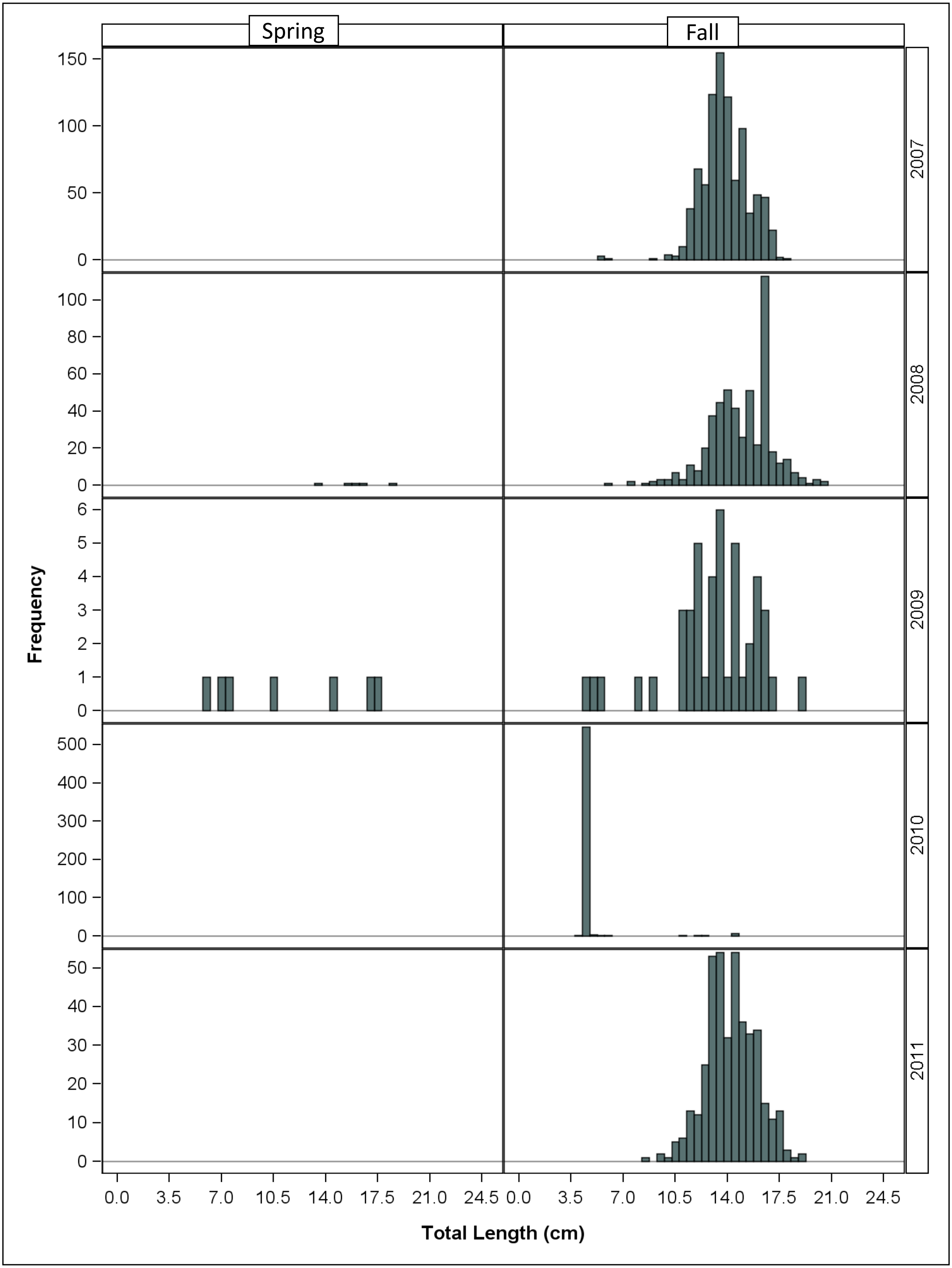


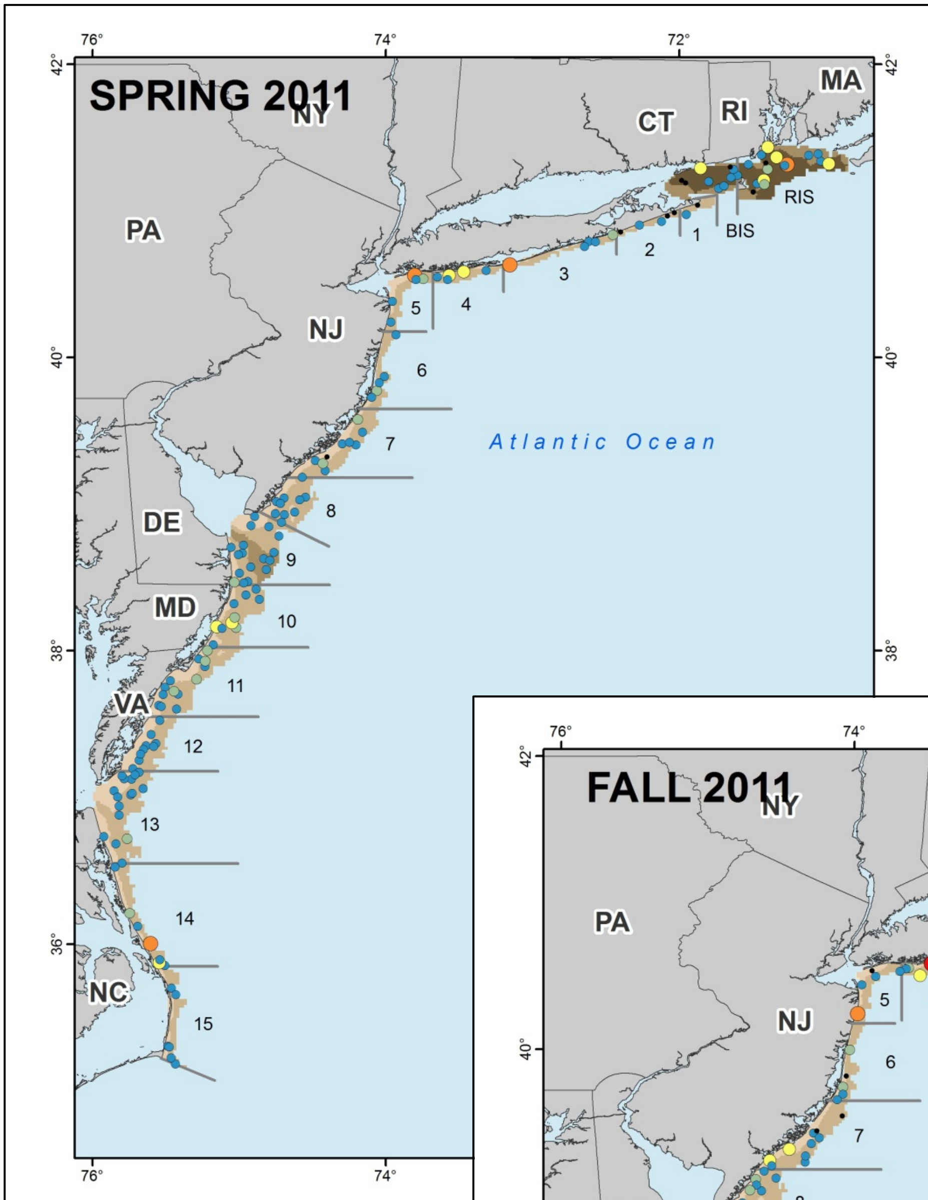
Figure 60. Brown shrimp length-frequency distributions, by cruise.

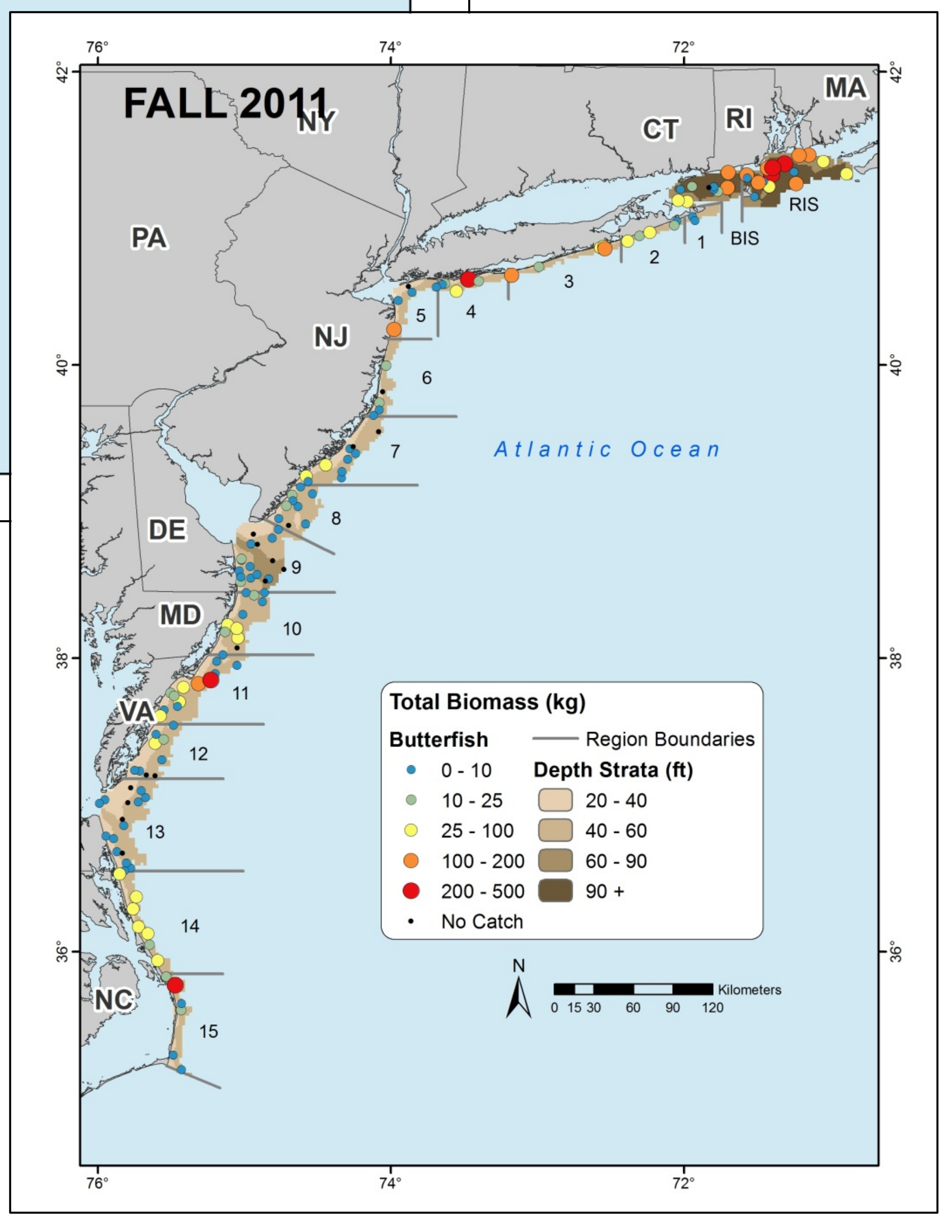


Butterfish

Sampling Priority: A

Figure 61. Butterfish biomass (kg) at each sampling site for 2011 NEAMAP cruises.





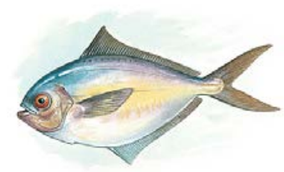


Table 37. Butterfish sampling rates and preserved specimen analysis status for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught (kg)	Number Measured	Age Specimens	Ages Read	Stomach Specimens	Stomachs Analyzed
Spring	2008	47,742	689.2	8,315	746	0		0
	2009	35,588	816.5	16,089	1,045	0		0
	2010	64,291	2136.2	11,212	740	0		0
	2011	66,089	1464.5	17,806	766	0		0
Fall	2007	148,182	1904.9	6,015	538	0	11	0
	2008	168,270	2120.7	10,091	551	0	8	0
	2009	544,718	8677.5	20,670	774	0		0
	2010	157,706	4957.3	19,276	690	0		0
	2011	234,974	5245.4	15,489	499	0		0

Table 38. Strata used for calculation of abundance indices for butterfish.

State (Nominal)	Region	Depth Stratum	Spring Index	Fall Index
RI	RIS	60-90	■	■
		90+	■	■
	BIS	60-90	■	■
		90+	■	■
NY	01	40-60	■	■
	02	20-40	■	■
		40-60	■	■
	03	20-40	■	■
		40-60	■	■
	04	20-40	■	■
		40-60	■	■
	05	20-40	■	■
		40-60	■	■
NJ	06	20-40	■	■
		40-60	■	■
	07	20-40	■	■
		40-60	■	■
	08	20-40	■	■
		40-60	■	■
DE	09	20-40	■	■
		40-60	■	■
		60-90	■	■
MD	10	20-40	■	■
		40-60	■	■
VA	11	20-40	■	■
		40-60	■	■
	12	20-40	■	■
		40-60	■	■
	13	20-40	■	■
		40-60	■	■
NC	14	20-40	■	■
		40-60	■	■
	15	20-40	■	■
		40-60	■	■

■ (red) = used for abundance indices
□ (grey) = not used for abundance indices

Table 39. Butterfish preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

Season	Year	Age	Numerical Index					Biomass Index				
			n	LCI	**Index**	UCI	CV (%)	n	LCI	**Index**	UCI	CV (%)
Spring	2008	All	150	32.37	**44.60**	61.31	4.1	150	1.81	**2.29**	2.85	6.6
	2009		160	52.21	**64.88**	80.58	2.6	160	1.66	**2.01**	2.42	5.7
	2010		150	24.68	**35.36**	50.46	4.8	150	1.54	**2.12**	2.83	9.0
	2011		150	72.97	**99.23**	134.81	3.3	150	2.41	**3.09**	3.90	6.5
Fall	2007	All	150	52.75	**70.75**	94.77	3.4	150	2.18	**2.82**	3.59	6.8
	2008		150	155.91	**207.38**	275.72	2.7	150	3.70	**4.71**	5.94	5.6
	2009		160	129.66	**166.77**	214.42	2.4	160	4.74	**5.86**	7.20	4.6
	2010		150	169.05	**219.68**	285.39	2.4	150	5.99	**7.70**	9.83	5.1
	2011		150	76.50	**106.34**	147.67	3.5	150	5.61	**7.17**	9.10	5.1

Figure 62. Butterfish preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

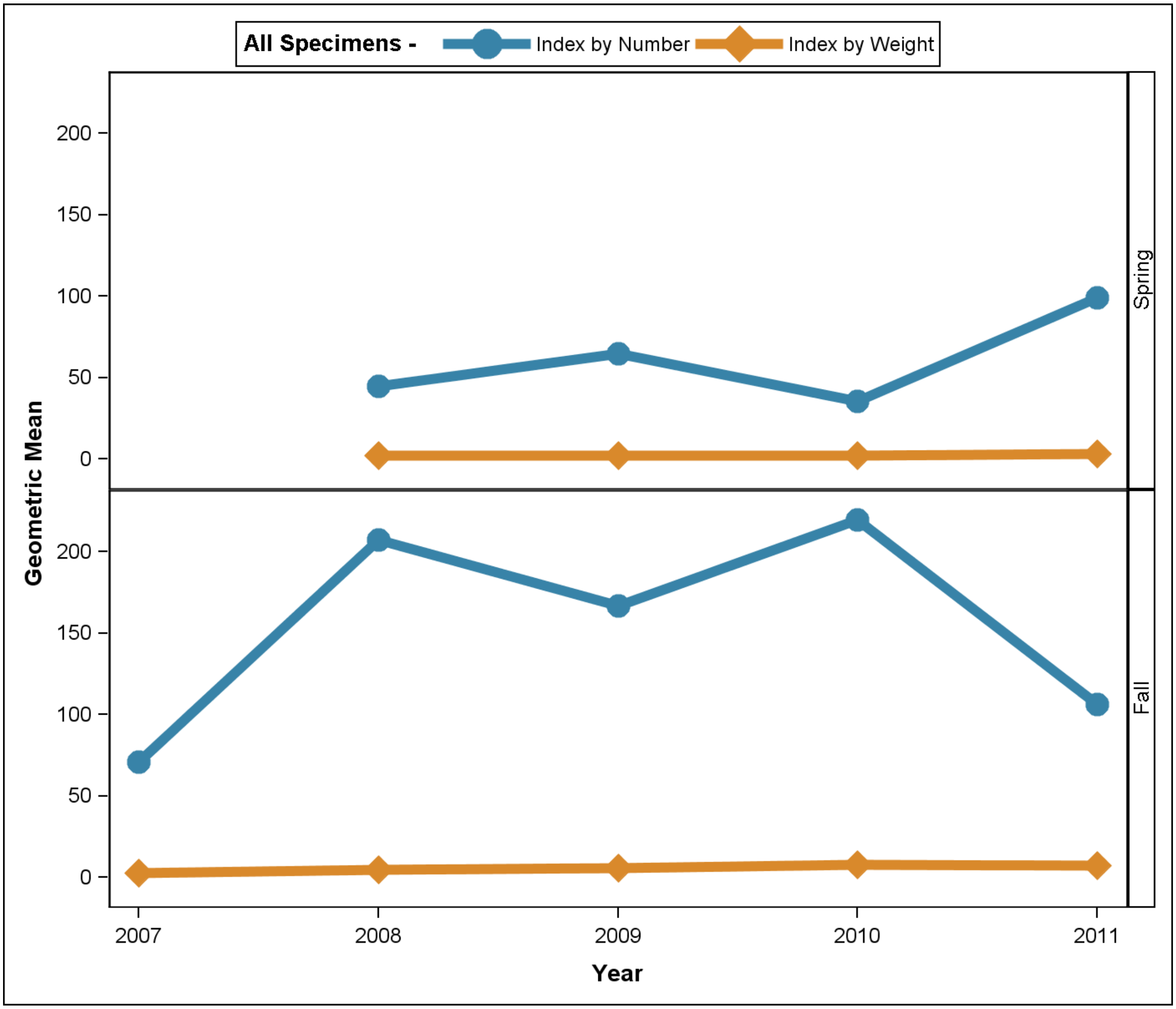


Figure 63. Butterfish length-frequency distributions, by cruise.

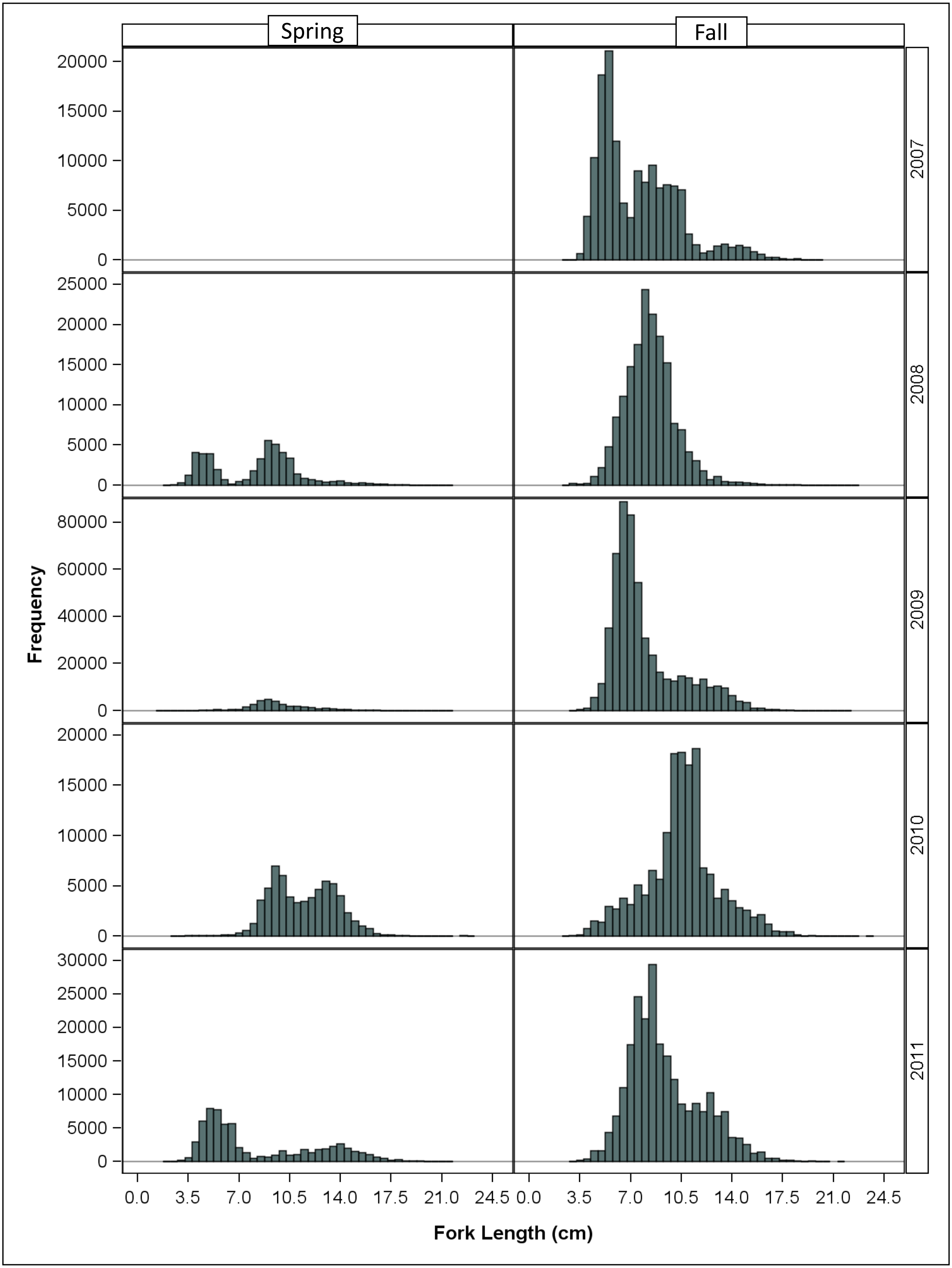


Figure 64. Butterfish length-frequency distributions, by cruise and sex.

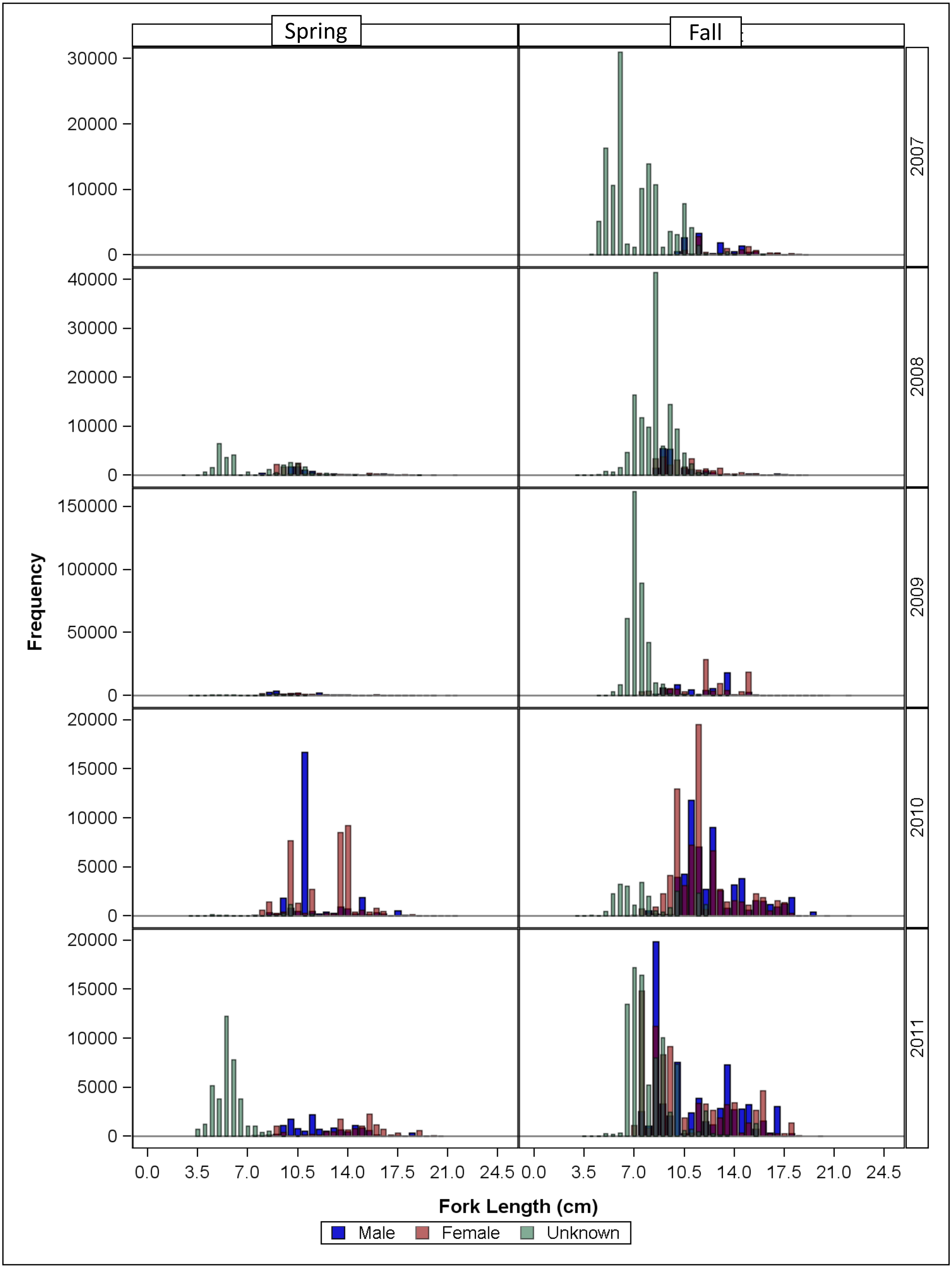
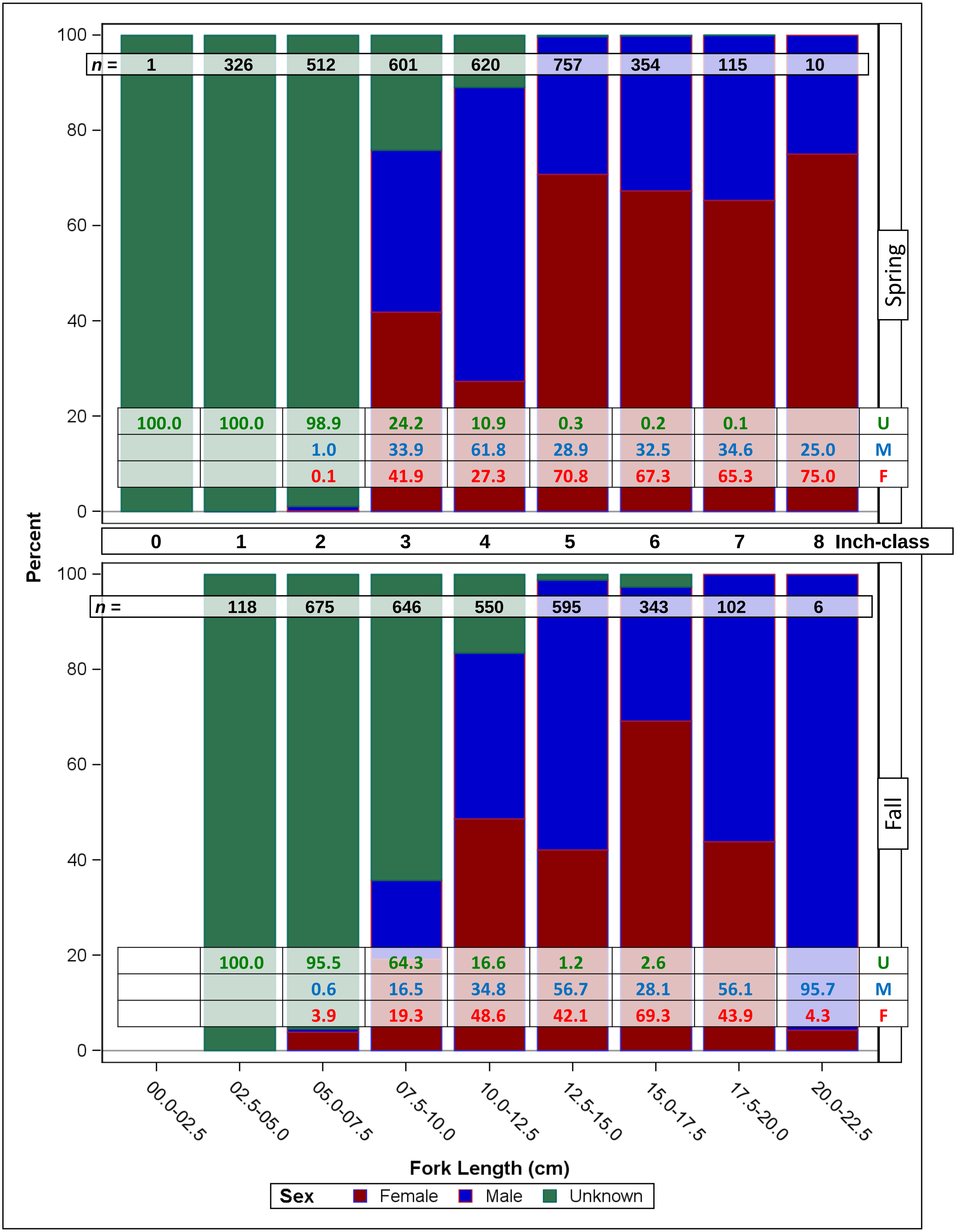


Figure 65. Butterfish sex ratio, by length group, for NEAMAP Spring and Fall cruises 2007-2011.
(The percentages for each category are given near the bottom of each bar. The number sampled for sex determination is provided near the top of each bar, and the length categories expressed in inches are shown between the two figures.).



Clearnose Skate

Sampling Priority: A

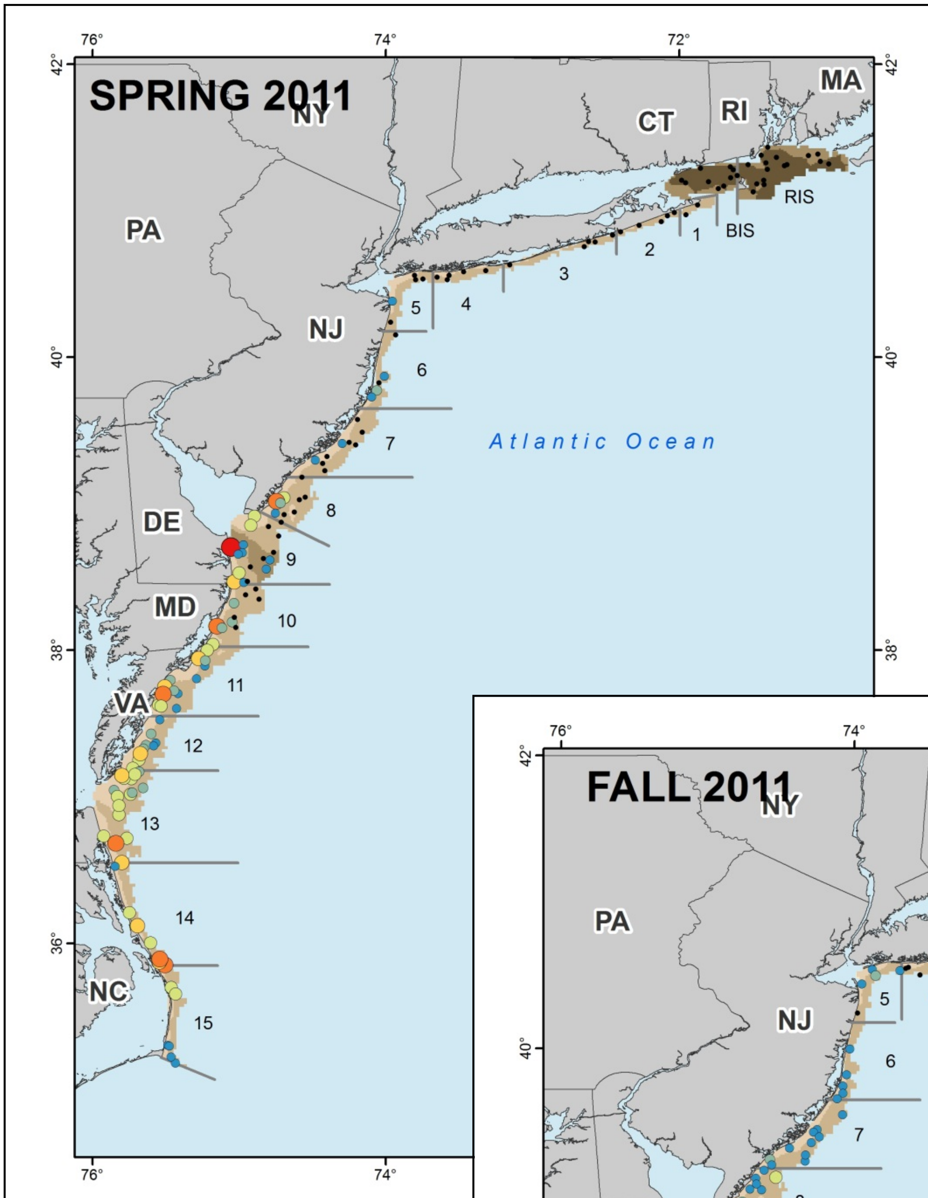
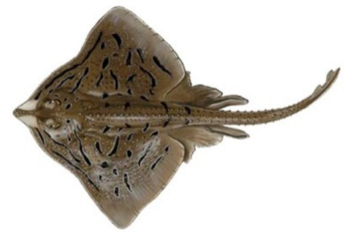


Figure 66. Clearnose skate biomass (kg) at each sampling site for 2011 NEAMAP cruises.



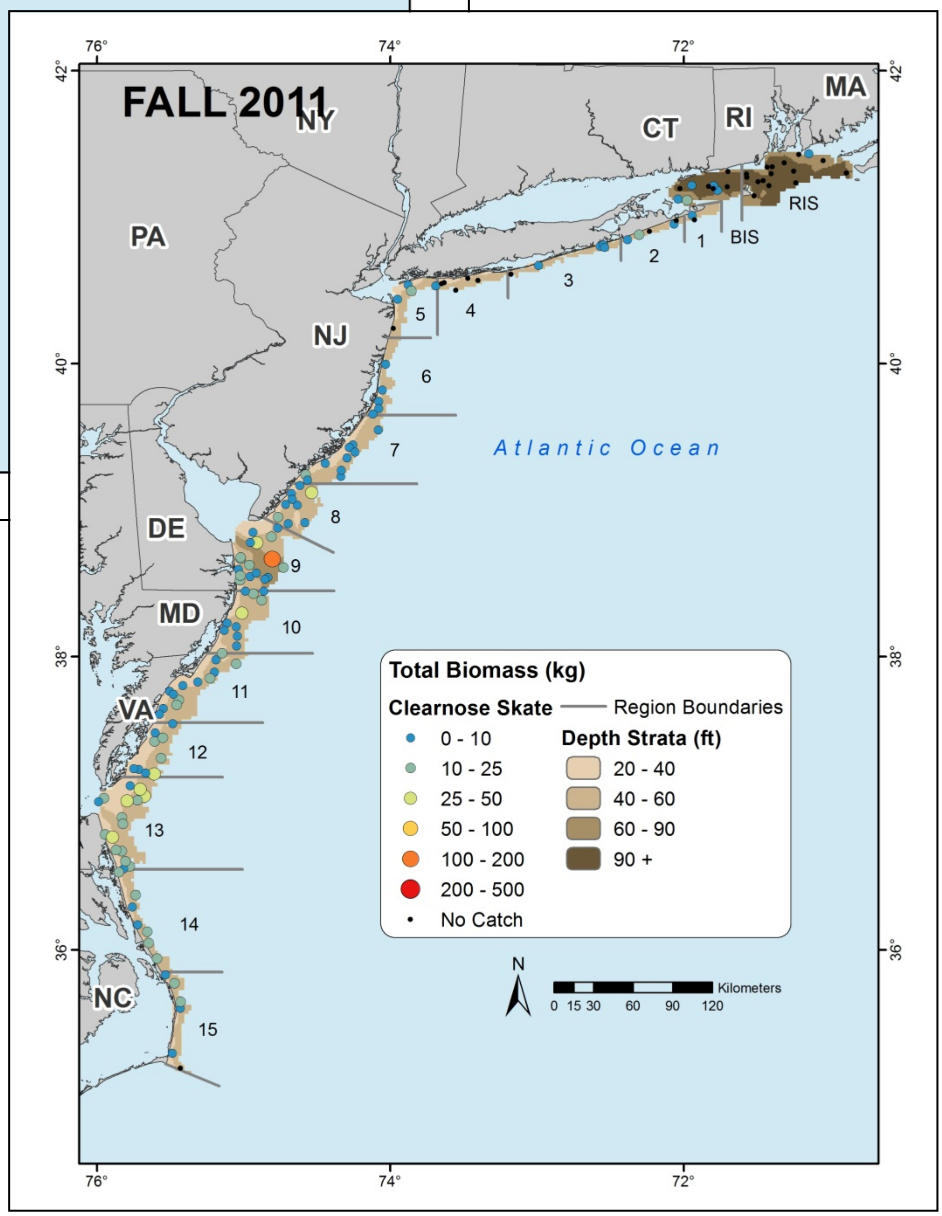


Table 40. Clearnose skate sampling rates and preserved specimen analysis status for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught (kg)	Number Measured	Age Specimens	Ages Read	Stomach Specimens	Stomachs Analyzed
Spring	2008	3,219	4237.3	1,050	212	0	207	205
	2009	2,429	3382.1	1,431	205	0	188	183
	2010	1,702	2516.4	1,353	197	0	183	176
	2011	2,216	2744.8	1,854	211	0	190	190
Fall	2007	1,505	1854.6	1,361	346	0	330	294
	2008	885	1196.2	806	289	0	287	287
	2009	1,107	1352.1	1,007	335	0	306	302
	2010	875	1056.7	875	307	0	278	274
	2011	1,178	1357.3	1,110	318	0	291	0

Table 41. Strata used for calculation of abundance indices for clearnose skate.

State (Nominal)	Region	Depth Stratum	Spring Index	Fall Index
RI	RIS	60-90	not used	not used
		90+	not used	not used
	BIS	60-90	not used	not used
		90+	not used	not used
NY	01	40-60	not used	used
	02	20-40	not used	used
		40-60	not used	used
	03	20-40	not used	used
		40-60	not used	used
	04	20-40	not used	used
		40-60	not used	used
	05	20-40	not used	used
		40-60	not used	used
NJ	06	20-40	not used	used
		40-60	not used	used
	07	20-40	not used	used
		40-60	not used	used
	08	20-40	used	used
		40-60	used	used
DE	09	20-40	used	used
		40-60	used	used
		60-90	used	used
MD	10	20-40	used	used
		40-60	used	used
VA	11	20-40	used	used
		40-60	used	used
	12	20-40	used	used
		40-60	used	used
	13	20-40	used	used
		40-60	used	used
NC	14	20-40	used	used
		40-60	used	used
	15	20-40	used	used
		40-60	used	used

(red) = used for abundance indices
(grey) = not used for abundance indices

Table 42. Clearnose skate preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

Season	Year	Age	Numerical Index					Biomass Index				
			n	LCI	**Index**	UCI	CV (%)	n	LCI	**Index**	UCI	CV (%)
Spring	2008	All	86	9.76	**12.03**	14.78	3.7	86	11.57	**14.31**	17.65	3.6
	2009		91	5.53	**7.21**	9.31	5.4	91	6.80	**9.01**	11.85	5.4
	2010		87	6.27	**7.61**	9.20	3.9	87	7.68	**9.43**	11.53	3.9
	2011		87	7.86	**9.75**	12.04	4.1	87	8.92	**11.26**	14.17	4.2
Fall	2007	All	124	6.62	**7.73**	9.00	3.1	124	7.78	**9.20**	10.84	3.2
	2008		124	3.86	**4.51**	5.25	3.7	124	4.67	**5.57**	6.63	3.9
	2009		134	4.77	**5.56**	6.47	3.4	134	5.54	**6.50**	7.61	3.4
	2010		124	3.95	**4.62**	5.38	3.7	124	4.64	**5.43**	6.32	3.5
	2011		124	5.57	**6.40**	7.33	3.0	124	6.36	**7.31**	8.39	2.9

Figure 67. Clearnose skate preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

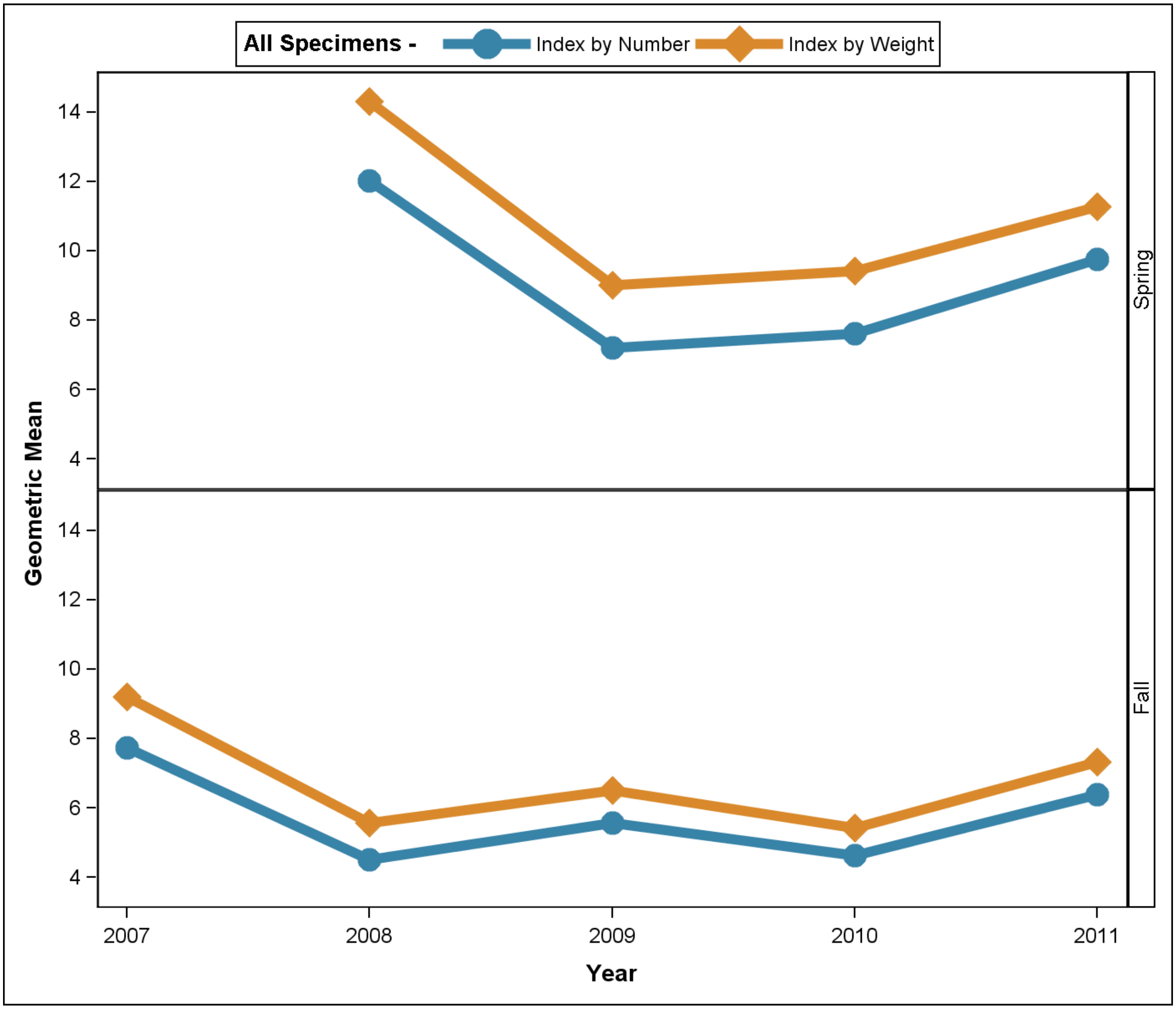


Figure 68. Clearnose skate width-frequency distributions, by cruise.

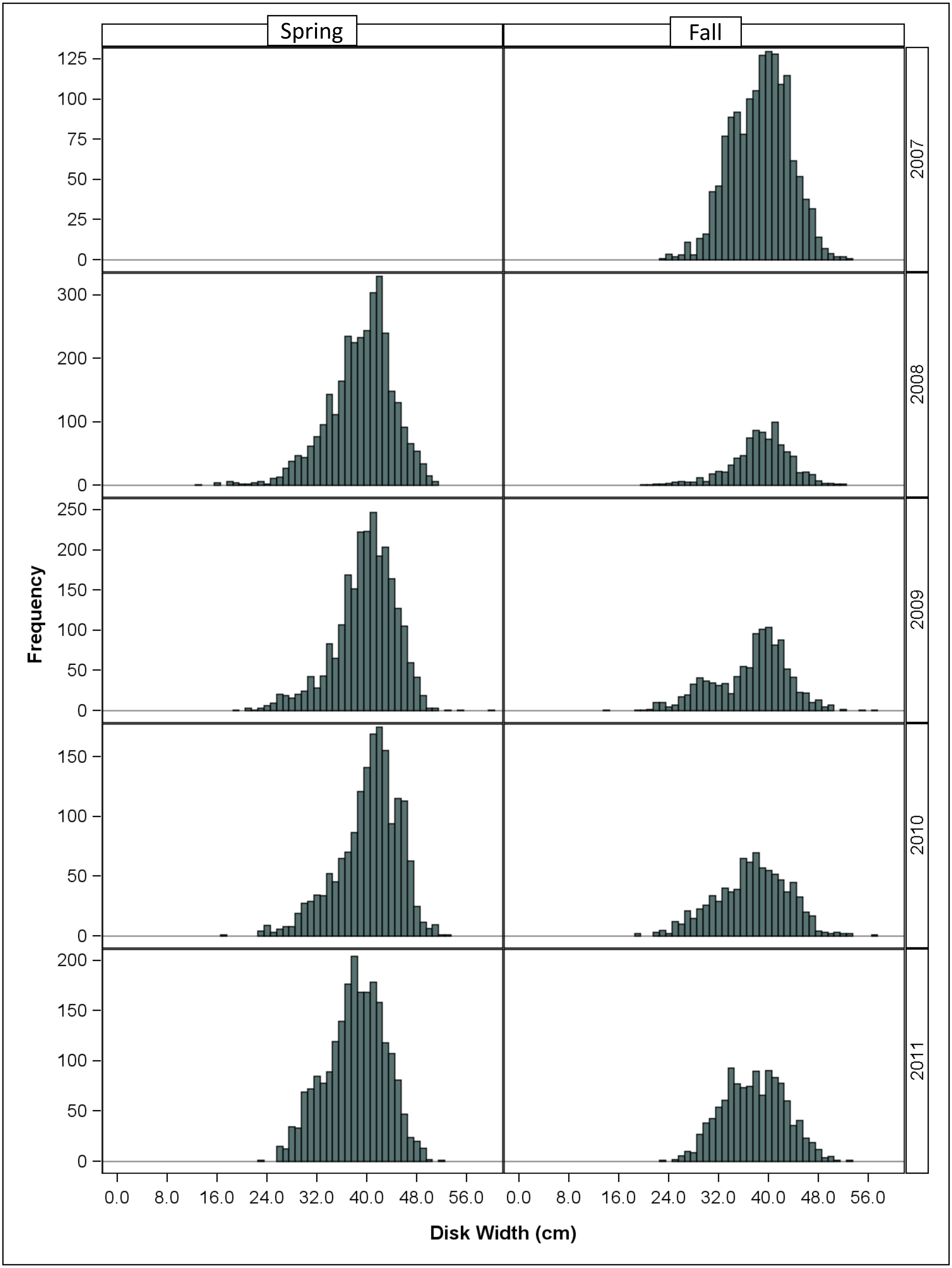


Figure 69. Clearnose skate width-frequency distributions, by cruise and sex.

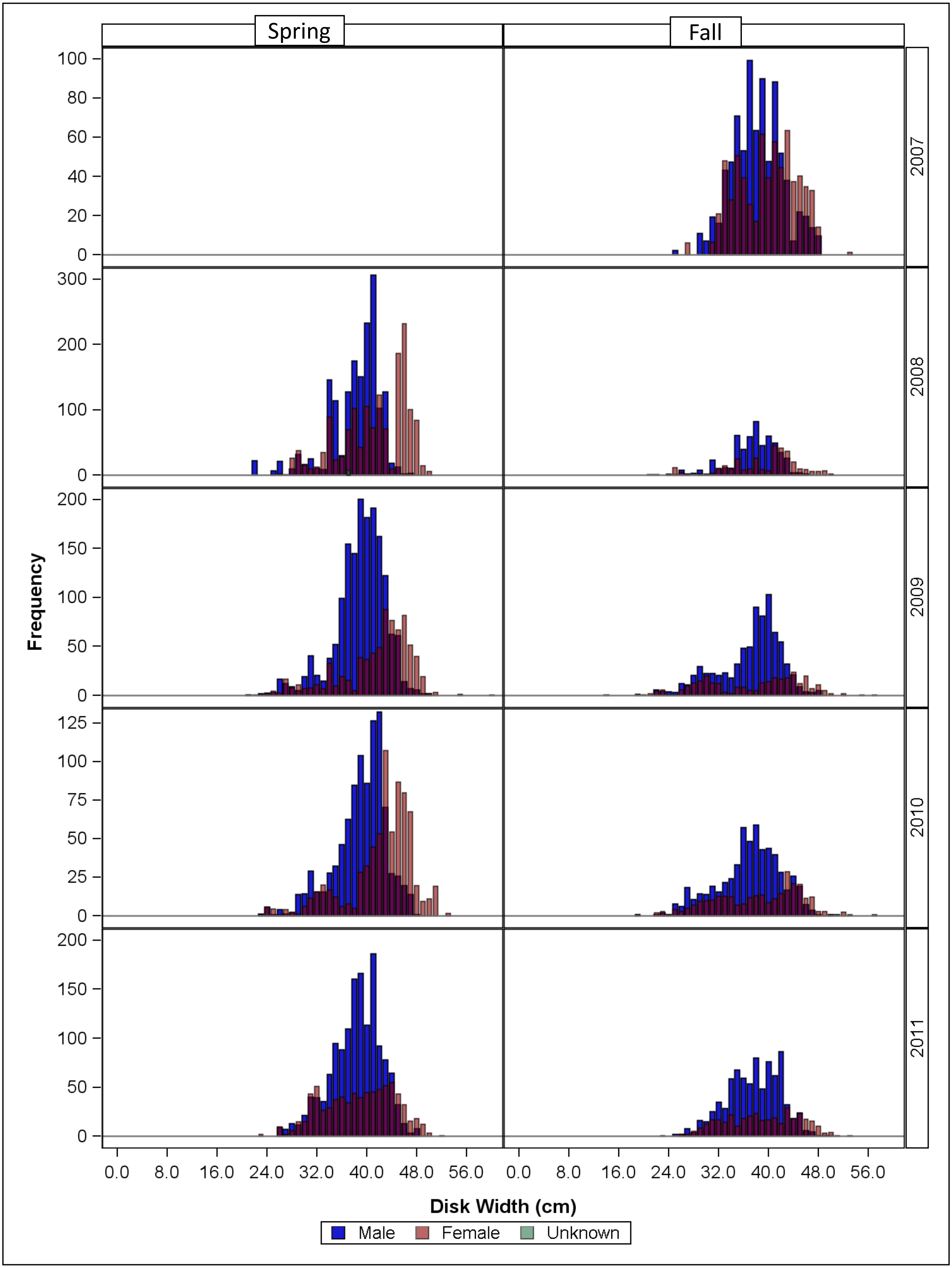


Figure 70. Clearnose skate sex ratio, by length group, for NEAMAP Spring and Fall cruises 2007-2011.
(The percentages for each category are given near the bottom of each bar. The number sampled for sex determination is provided near the top of each bar, and the length categories expressed in inches are shown between the two figures.).

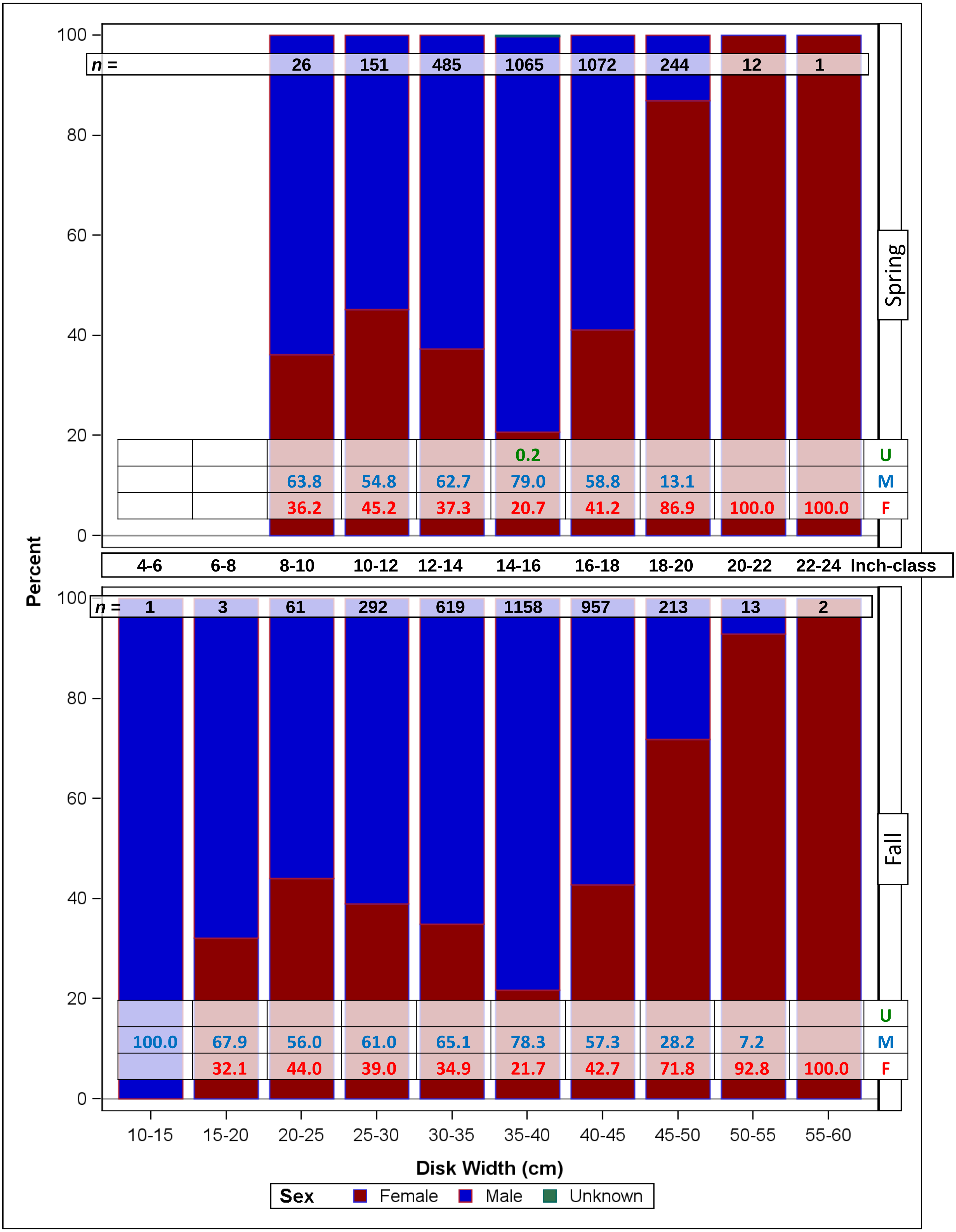
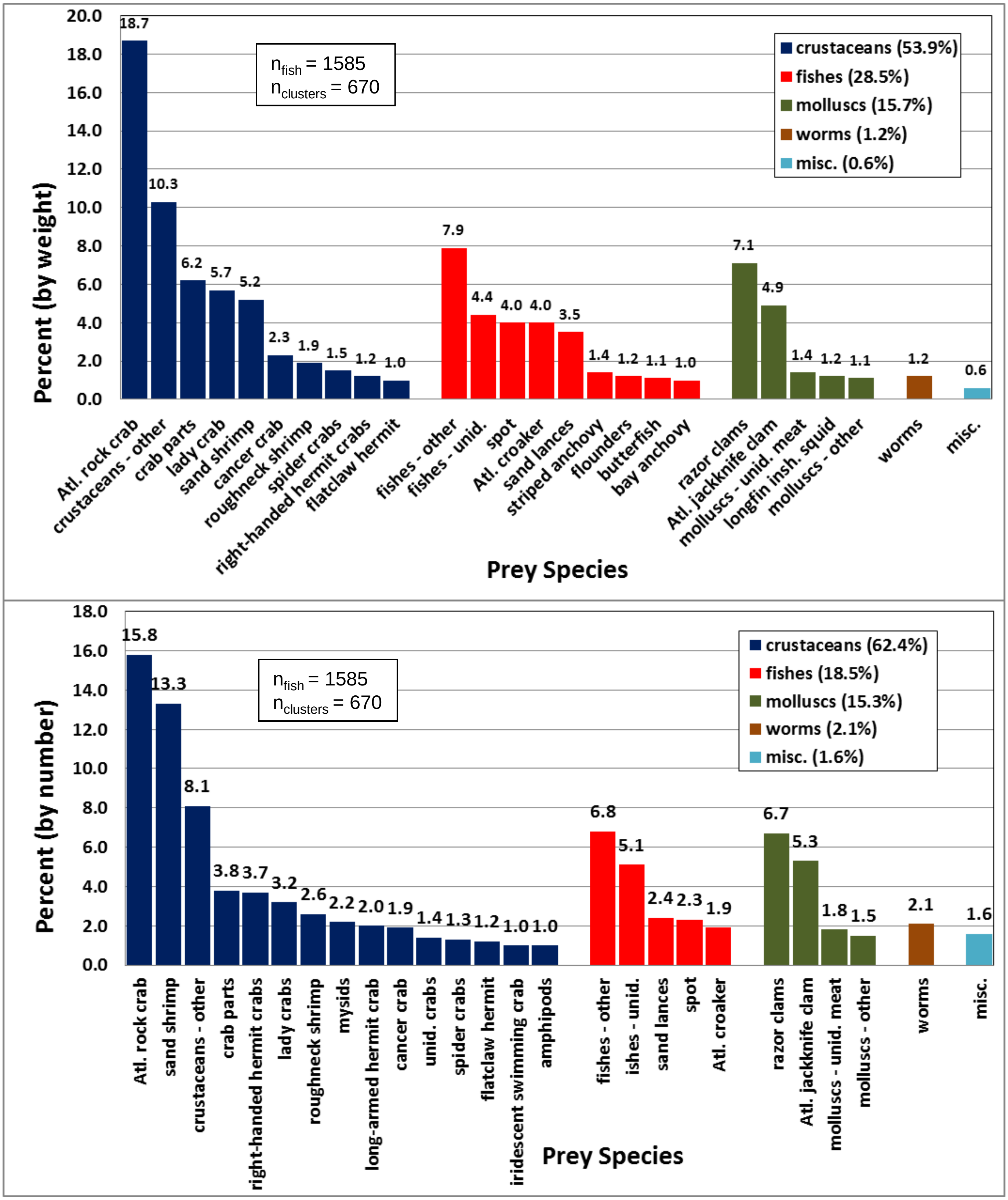


Figure 71. Clearnose skate diet composition, expressed as percent by weight and number collected during NEAMAP cruises in 2007 through Spring 2011. (The number of fish sampled for diet is given by n_{fish}, while $n_{clusters}$ indicates the number of clusters of this species sampled.)



Horseshoe Crab

Sampling Priority: E

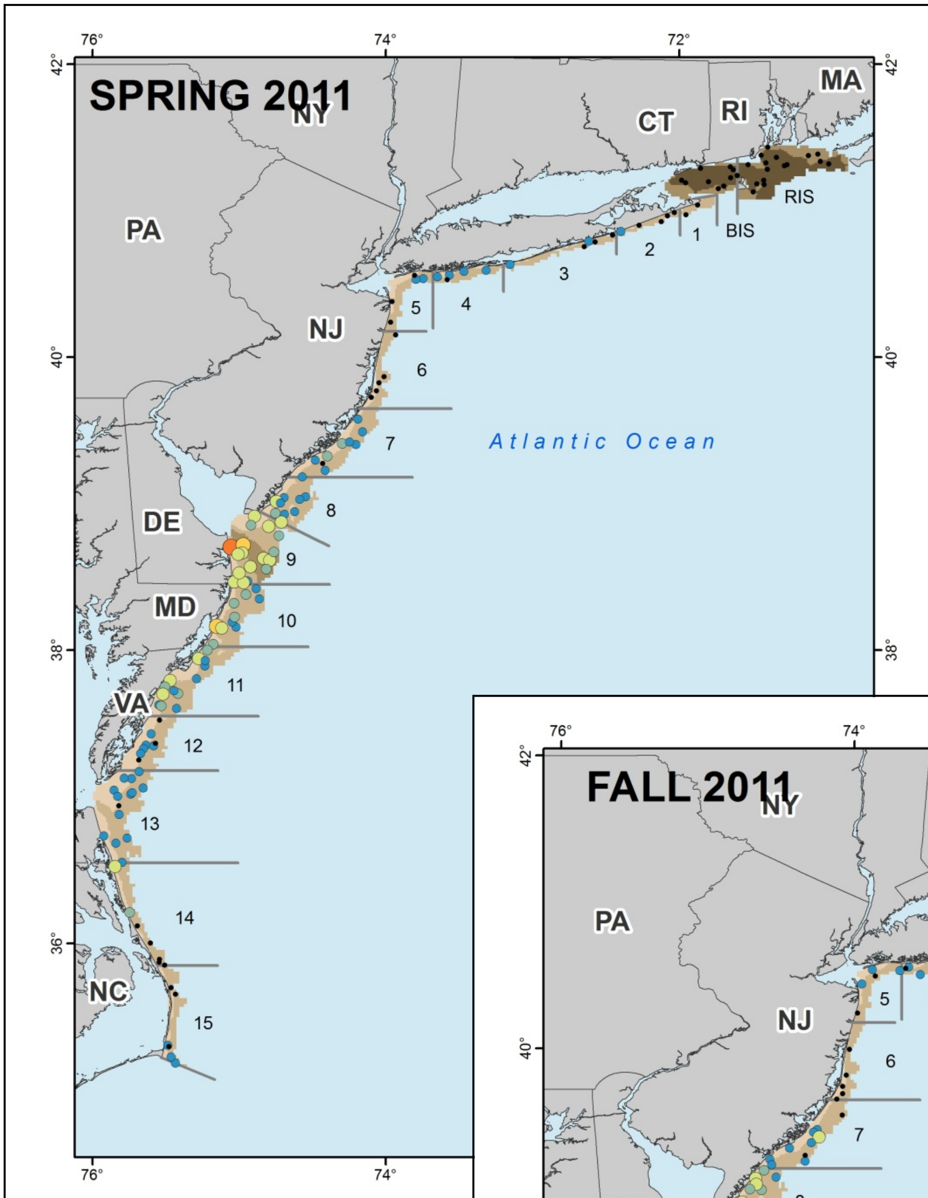


Figure 72. Horseshoe crab biomass (kg) at each sampling site for 2011 NEAMAP cruises.

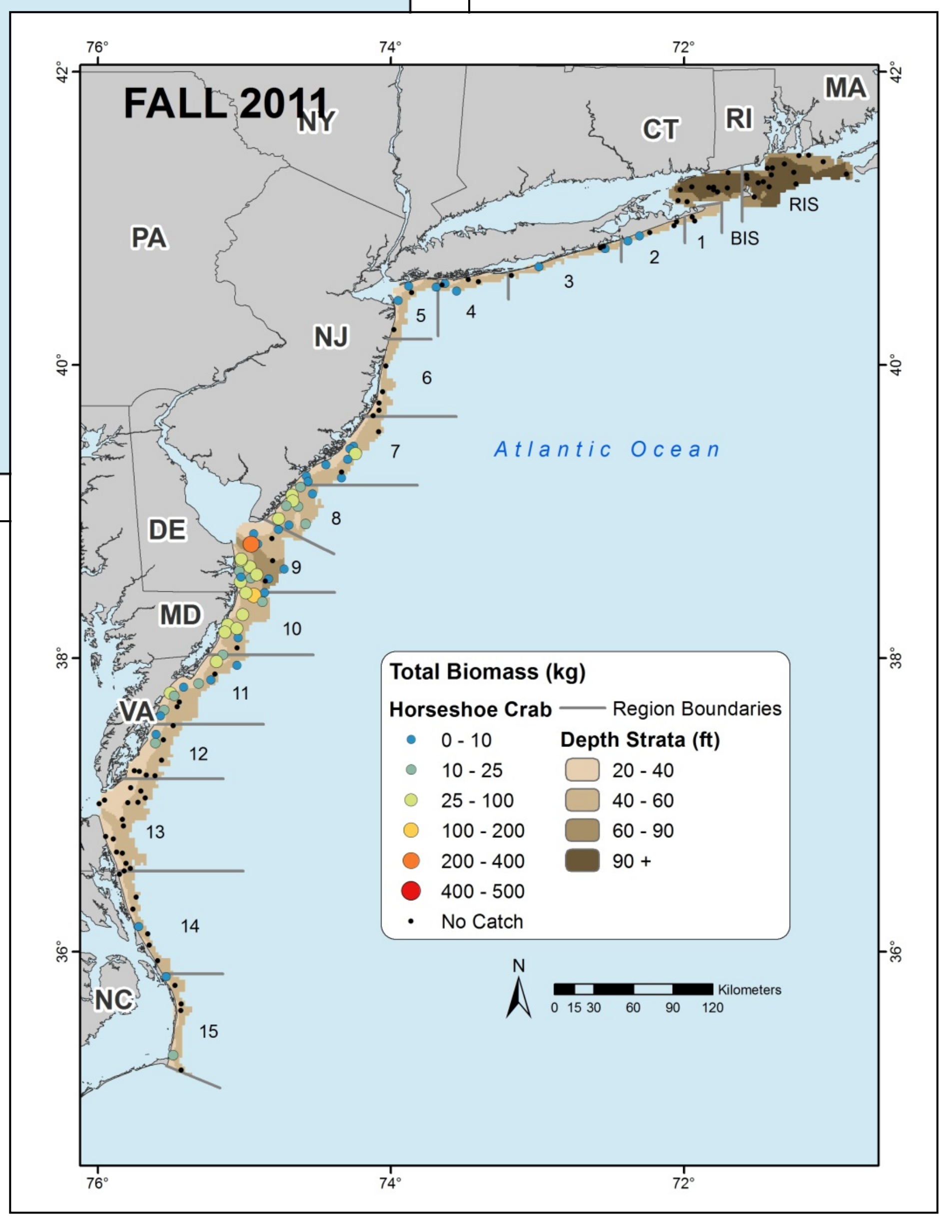


Table 43. Horseshoe crab sampling rates for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught (kg)	Number Measured	Age Specimens	Ages Read	Stomach Specimens	Stomachs Analyzed
Spring	2008	1,201	1229.6	774	N/A	N/A	N/A	N/A
	2009	2,388	2702.1	1,673	N/A	N/A	N/A	N/A
	2010	1,432	1220.7	979	N/A	N/A	N/A	N/A
	2011	1,747	1625.1	1,559	N/A	N/A	N/A	N/A
Fall	2007	795	1447.9	342	N/A	N/A	N/A	N/A
	2008	1,149	1839.4	473	N/A	N/A	N/A	N/A
	2009	1,931	2164.4	1,092	N/A	N/A	N/A	N/A
	2010	613	862.2	498	N/A	N/A	N/A	N/A
	2011	1,144	1613.9	1,070	N/A	N/A	N/A	N/A

Table 44. Strata used for calculation of abundance indices for horseshoe crab.

State (Nominal)	Region	Depth Stratum	Spring Index	Fall Index
RI	RIS	60-90	[grey]	[grey]
		90+	[grey]	[grey]
	BIS	60-90	[grey]	[grey]
		90+	[grey]	[grey]
NY	01	40-60	[grey]	[grey]
	02	20-40	[grey]	[grey]
		40-60	[grey]	[grey]
	03	20-40	[red]	[red]
		40-60	[red]	[red]
	04	20-40	[red]	[red]
		40-60	[red]	[red]
	05	20-40	[red]	[red]
		40-60	[red]	[red]
NJ	06	20-40	[red]	[red]
		40-60	[red]	[red]
	07	20-40	[red]	[red]
		40-60	[red]	[red]
	08	20-40	[red]	[red]
		40-60	[red]	[red]

State (Nominal)	Region	Depth Stratum	Spring Index	Fall Index
DE	09	20-40	[red]	[red]
		40-60	[red]	[red]
		60-90	[red]	[red]
MD	10	20-40	[red]	[red]
		40-60	[red]	[red]
VA	11	20-40	[red]	[red]
		40-60	[red]	[red]
	12	20-40	[red]	[red]
		40-60	[red]	[red]
	13	20-40	[red]	[red]
		40-60	[red]	[red]
NC	14	20-40	[red]	[grey]
		40-60	[red]	[grey]
	15	20-40	[red]	[grey]
		40-60	[red]	[grey]

[red] = used for abundance indices
[grey] = not used for abundance indices

Table 45. Horseshoe crab preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

		All Ages						Youngest Survey Age Class							All Other Age Classes						
Season	Year	Numerical Index			Biomass Index				Numerical Index			Biomass Index				Numerical Index			Biomass Index		
		n	Index	CV (%)	n	Index	CV (%)	Age	n	Index	CV (%)	n	Index	CV (%)	Age	n	Index	CV (%)	n	Index	CV (%)
Spring	2008	116	1.51	6.1	116	1.58	6.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	2009	125	2.10	4.0	125	2.24	3.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	2010	117	1.46	6.3	117	1.38	6.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fall	2007	104	0.80	12.6	104	0.99	12.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	2008	104	1.16	10.9	104	1.38	10.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	2009	110	1.35	10.0	110	1.43	9.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	2010	104	1.12	7.6	104	1.30	7.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Figure 73. Horseshoe crab preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

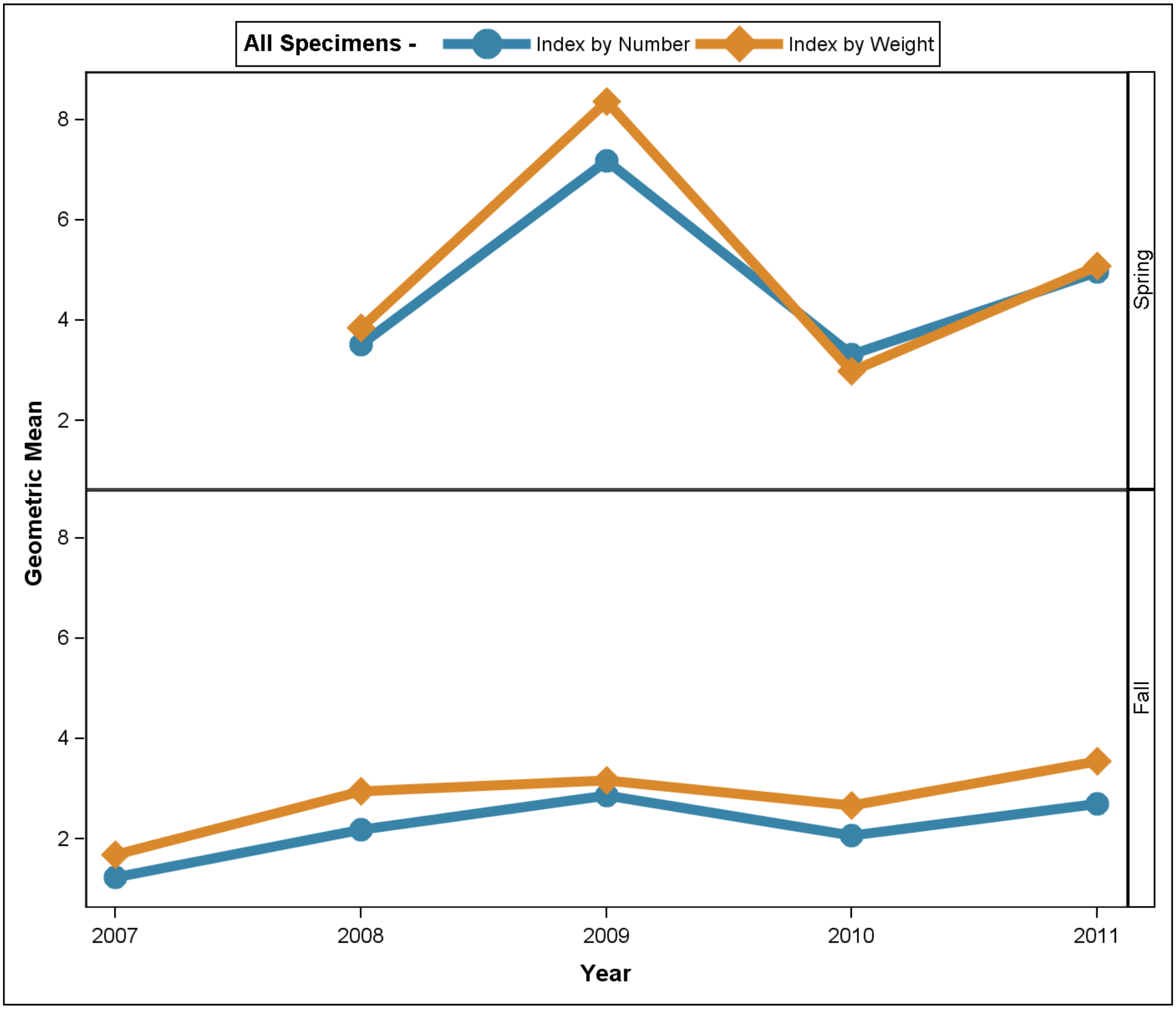


Figure 74. Horseshoe crab width-frequency distributions, by cruise.

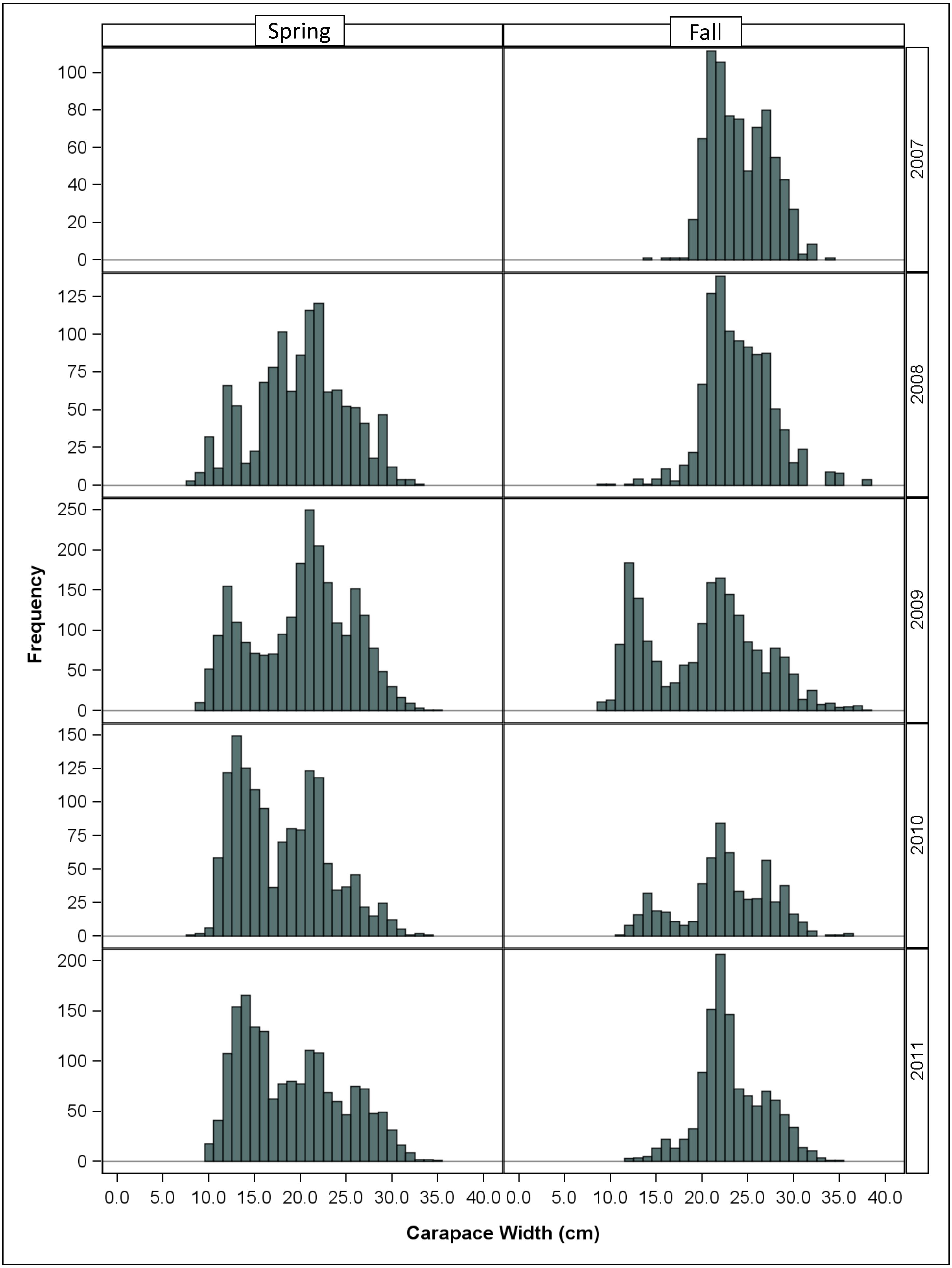


Figure 75. Horseshoe crab width-frequency distributions, by cruise and sex.

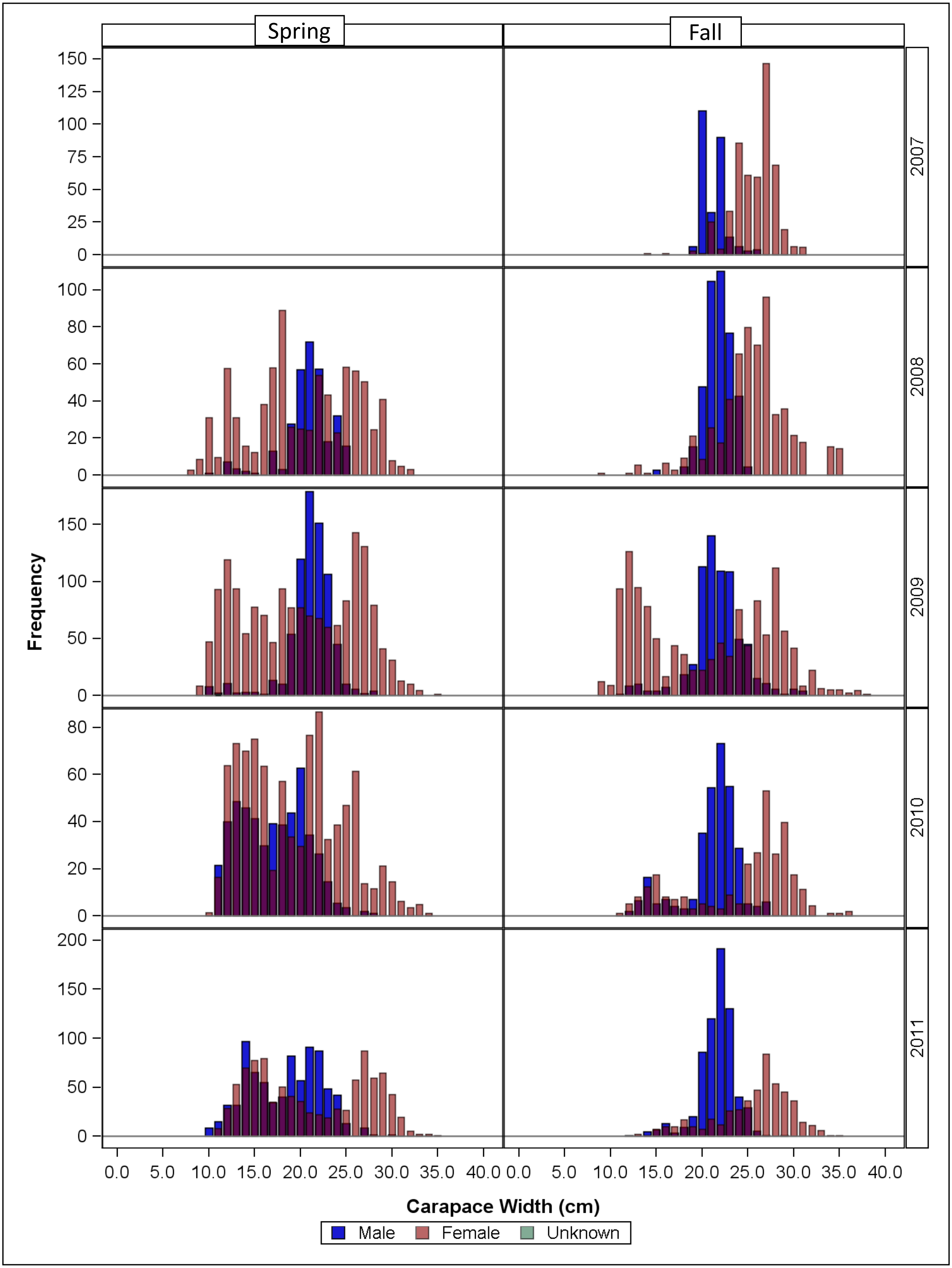
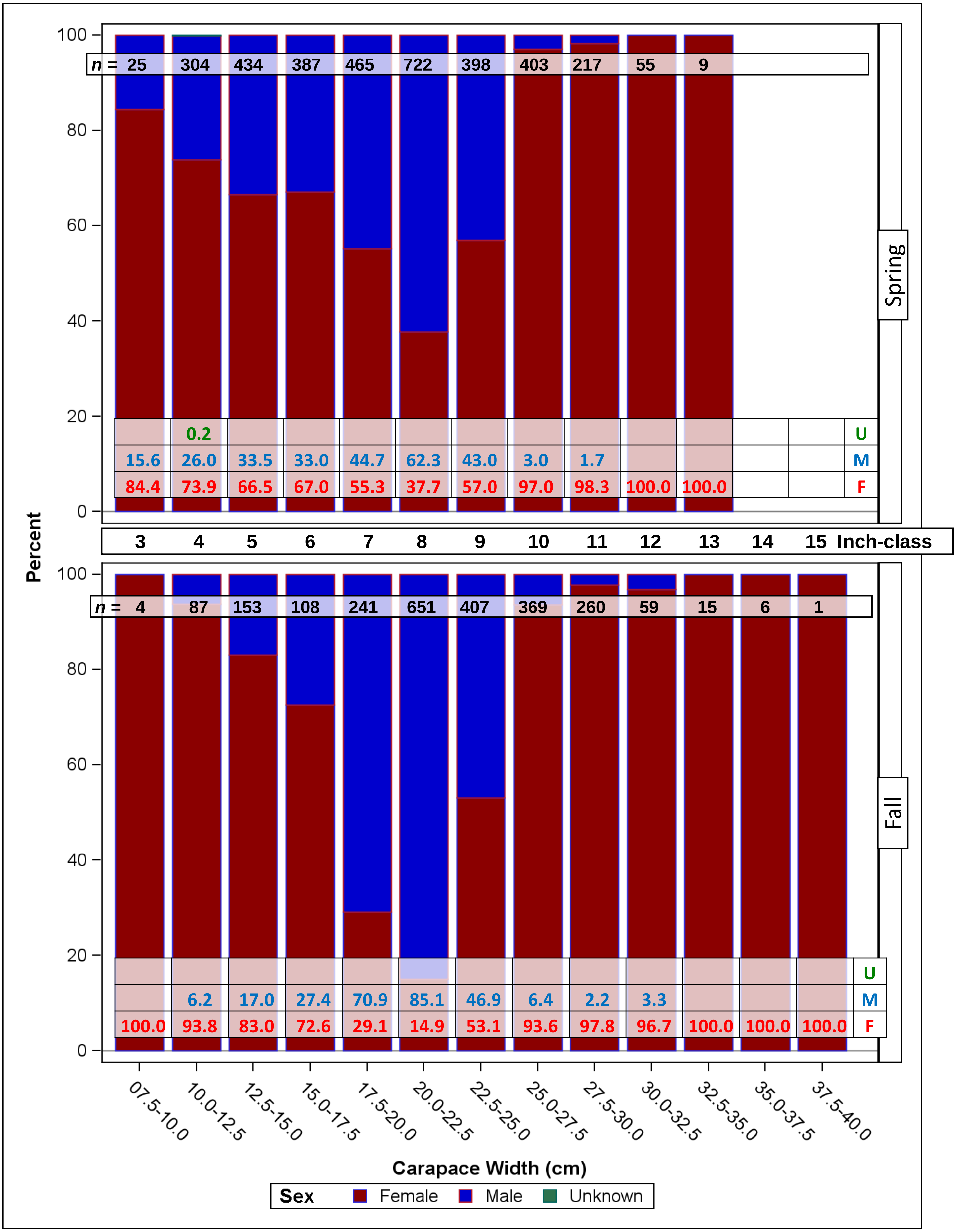


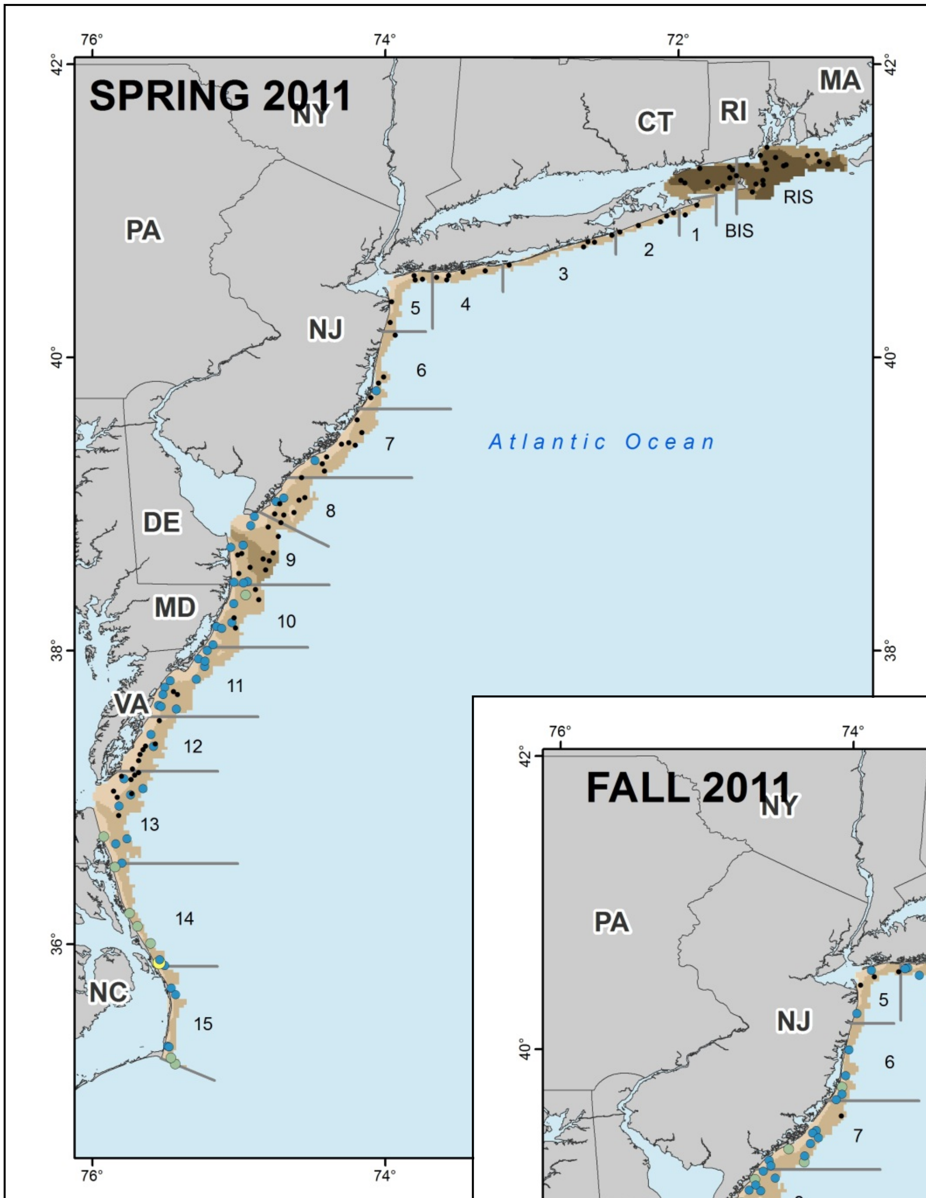
Figure 76. Horseshoe crab sex ratio, by length group, for NEAMAP Spring and Fall cruises 2007-2011. (The percentages for each category are given near the bottom of each bar. The number sampled for sex determination is provided near the top of each bar, and the length categories expressed in inches are shown between the two figures.).



Kingfish

Sampling Priority: D

Figure 77. Kingfish biomass (kg) at each sampling site for 2011 NEAMAP cruises.



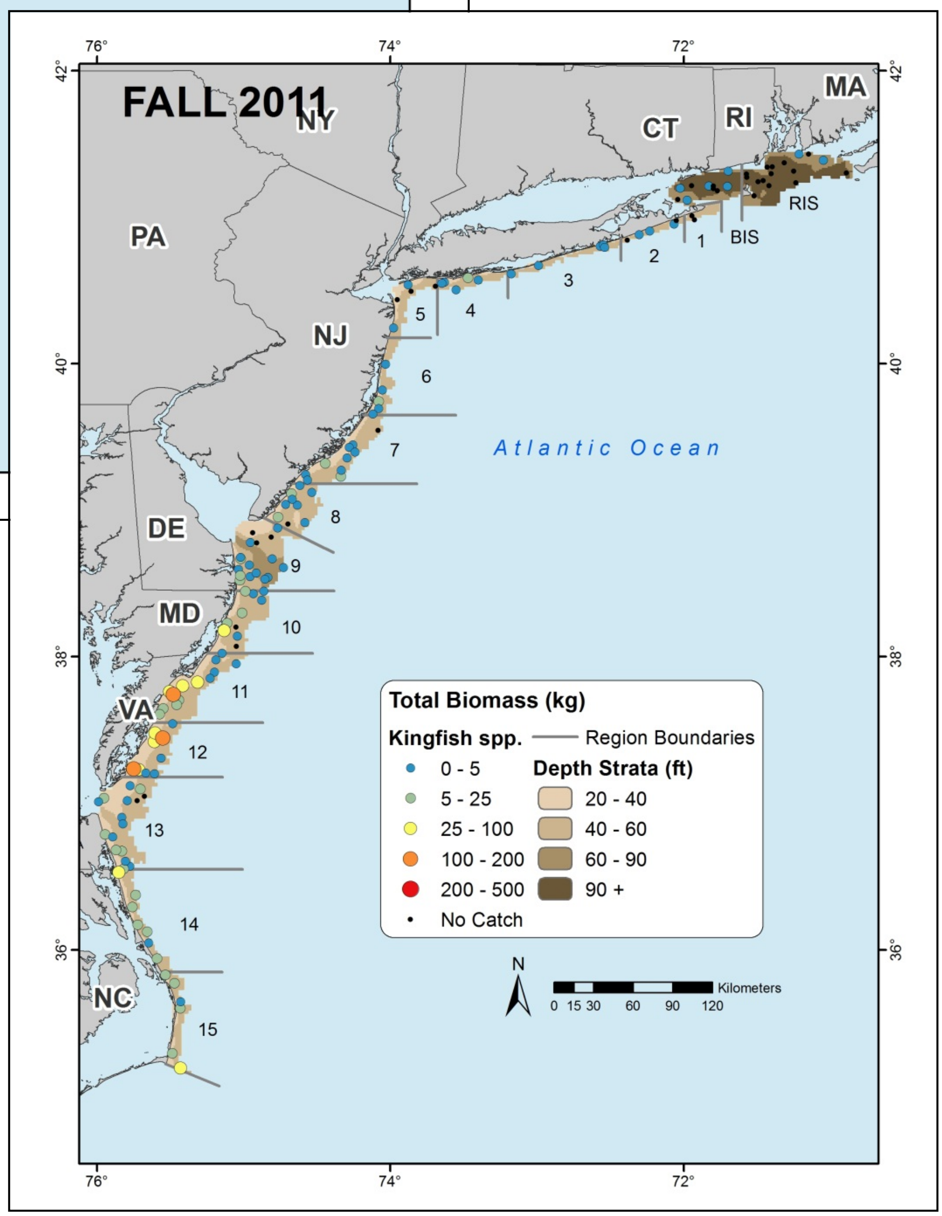


Table 46. Kingfish sampling rates for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught (kg)	Number Measured	Age Specimens	Ages Read	Stomach Specimens	Stomachs Analyzed
Spring	2008	6,638	699.8	759	N/A	N/A	N/A	N/A
	2009	1,742	207.8	483	N/A	N/A	N/A	N/A
	2010	13,179	1230.9	479	N/A	N/A	N/A	N/A
	2011	2,098	147.2	1,216	N/A	N/A	N/A	N/A
Fall	2007	9,124	1398.8	1,707	N/A	N/A	N/A	N/A
	2008	8,026	1254.4	1,502	N/A	N/A	N/A	N/A
	2009	7,969	888.9	3,303	N/A	N/A	N/A	N/A
	2010	18,979	2479.4	1,925	N/A	N/A	N/A	N/A
	2011	10,644	1398.8	3,245	N/A	N/A	N/A	N/A

Table 47. Strata used for calculation of abundance indices for kingfish.

State (Nominal)	Region	Depth Stratum	Spring Index	Fall Index
RI	RIS	60-90	not used	not used
		90+	not used	not used
	BIS	60-90	not used	not used
		90+	not used	not used
NY	01	40-60	not used	not used
	02	20-40	not used	not used
		40-60	not used	not used
	03	20-40	not used	not used
		40-60	not used	not used
	04	20-40	not used	not used
		40-60	not used	not used
	05	20-40	not used	not used
		40-60	not used	not used
NJ	06	20-40	not used	not used
		40-60	not used	not used
	07	20-40	not used	not used
		40-60	not used	not used
	08	20-40	not used	not used
		40-60	not used	not used
DE	09	20-40	not used	not used
		40-60	not used	not used
		60-90	not used	not used
MD	10	20-40	not used	used
		40-60	not used	used
VA	11	20-40	not used	used
		40-60	not used	used
	12	20-40	not used	used
		40-60	not used	used
	13	20-40	not used	used
		40-60	not used	used
NC	14	20-40	used	used
		40-60	used	used
	15	20-40	used	used
		40-60	used	used

= used for abundance indices (red)

= not used for abundance indices (grey)

Table 48. Kingfish preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

Season	Year	Age	Numerical Index					Biomass Index				
			n	LCI	**Index**	UCI	CV (%)	n	LCI	**Index**	UCI	CV (%)
Spring	2008	All	13	30.00	**97.90**	314.51	12.6	13	3.51	**10.78**	29.74	19.5
	2009		15	5.49	**12.97**	29.08	14.5	15	1.23	**2.42**	4.27	17.5
	2010		13	3.14	**19.21**	97.60	26.4	13	0.35	**3.69**	15.27	40.2
	2011		13	16.50	**40.97**	99.66	11.7	13	1.89	**4.27**	8.62	18.1
Fall	2007	All	66	7.86	**13.23**	21.87	8.9	66	2.11	**3.37**	5.13	11.5
	2008		61	17.21	**28.12**	45.58	7.0	61	4.59	**6.89**	10.13	8.3
	2009		64	29.79	**39.21**	51.50	3.6	64	4.56	**5.84**	7.42	5.4
	2010		61	12.30	**20.51**	33.80	7.8	61	2.92	**4.63**	7.08	10.5
	2011		61	21.08	**33.41**	52.62	6.3	61	4.25	**6.32**	9.21	8.3

Figure 78. Kingfish preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

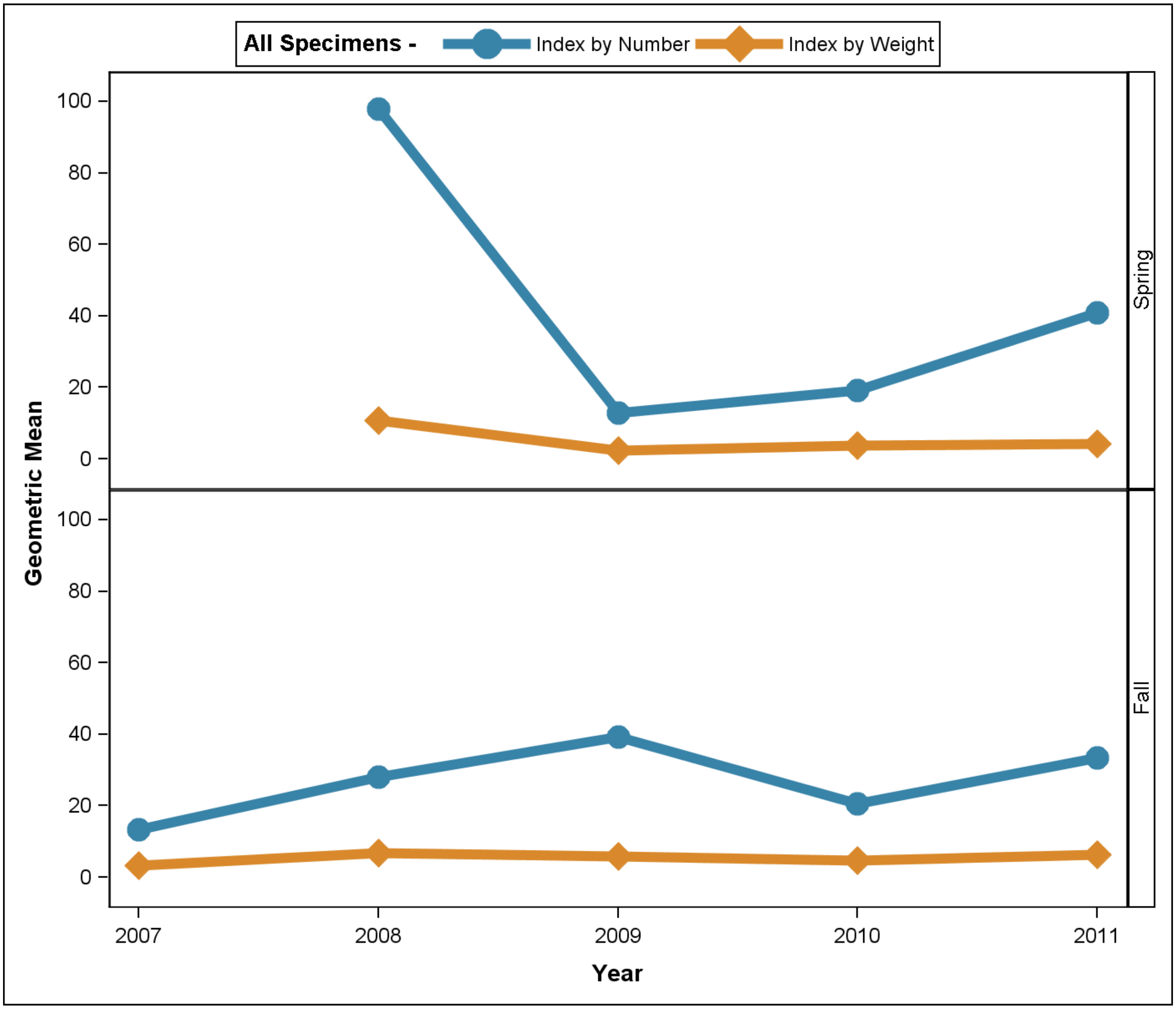
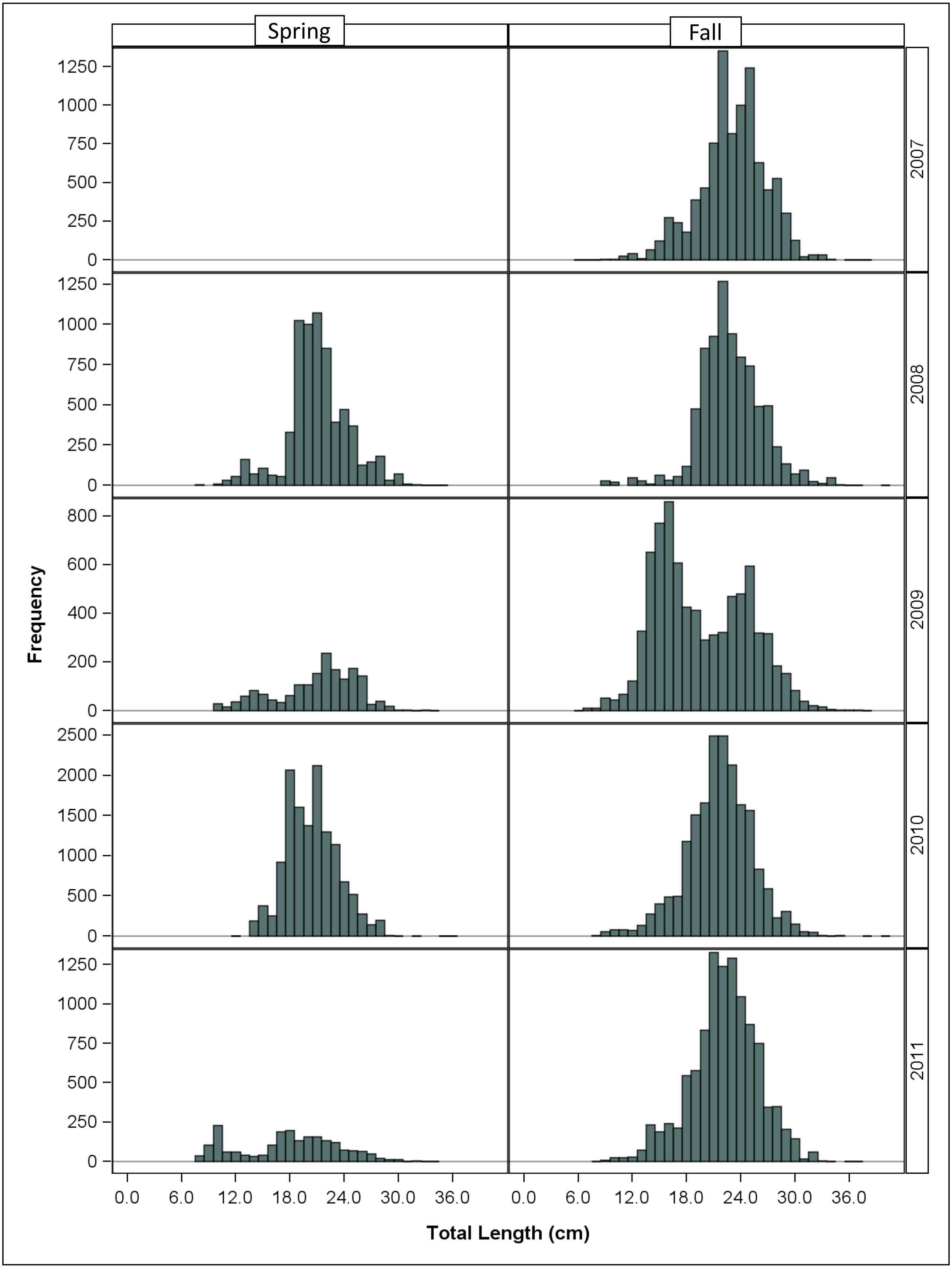


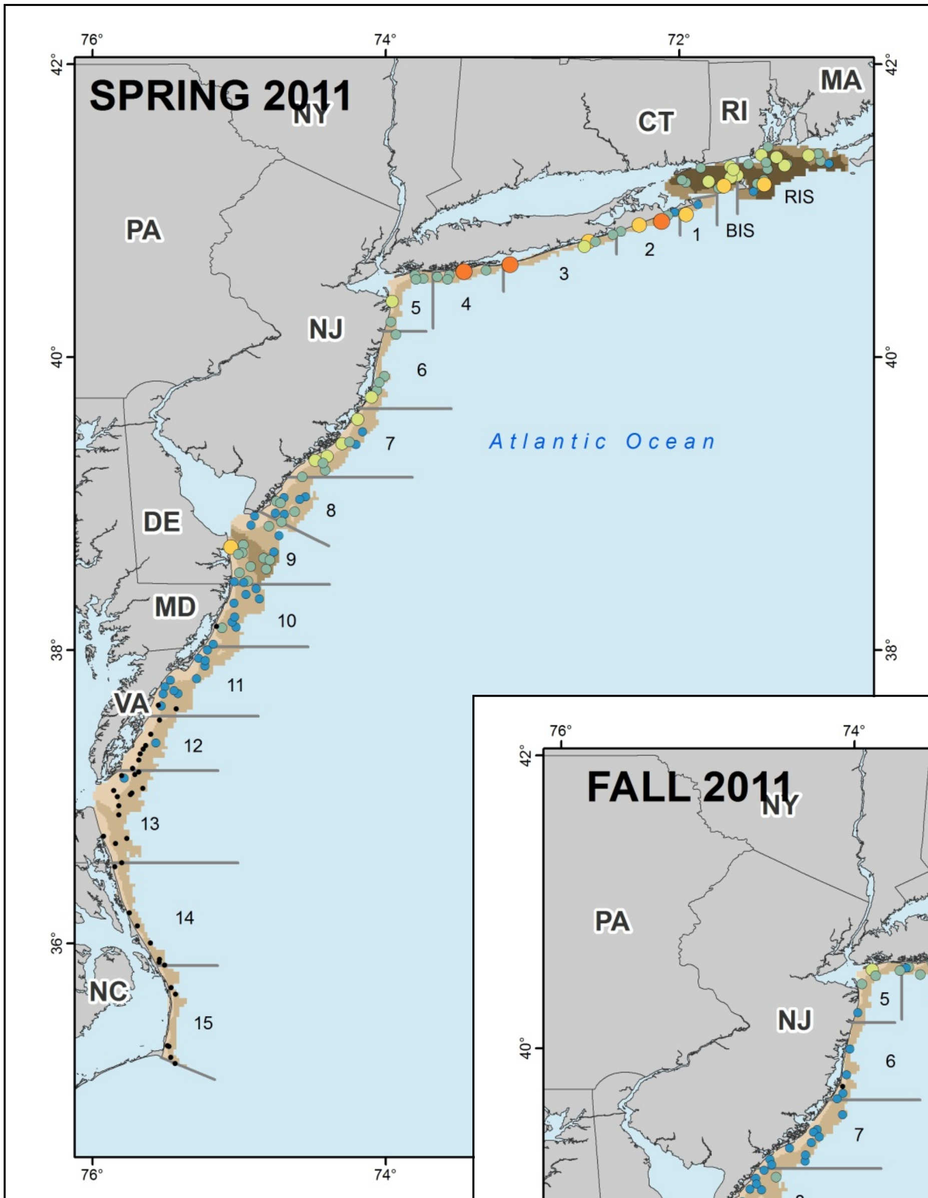
Figure 79. Kingfish length-frequency distributions, by cruise.



Little Skate

Sampling Priority: A

Figure 80. Little skate biomass (kg) at each sampling site for 2011 NEAMAP cruises.



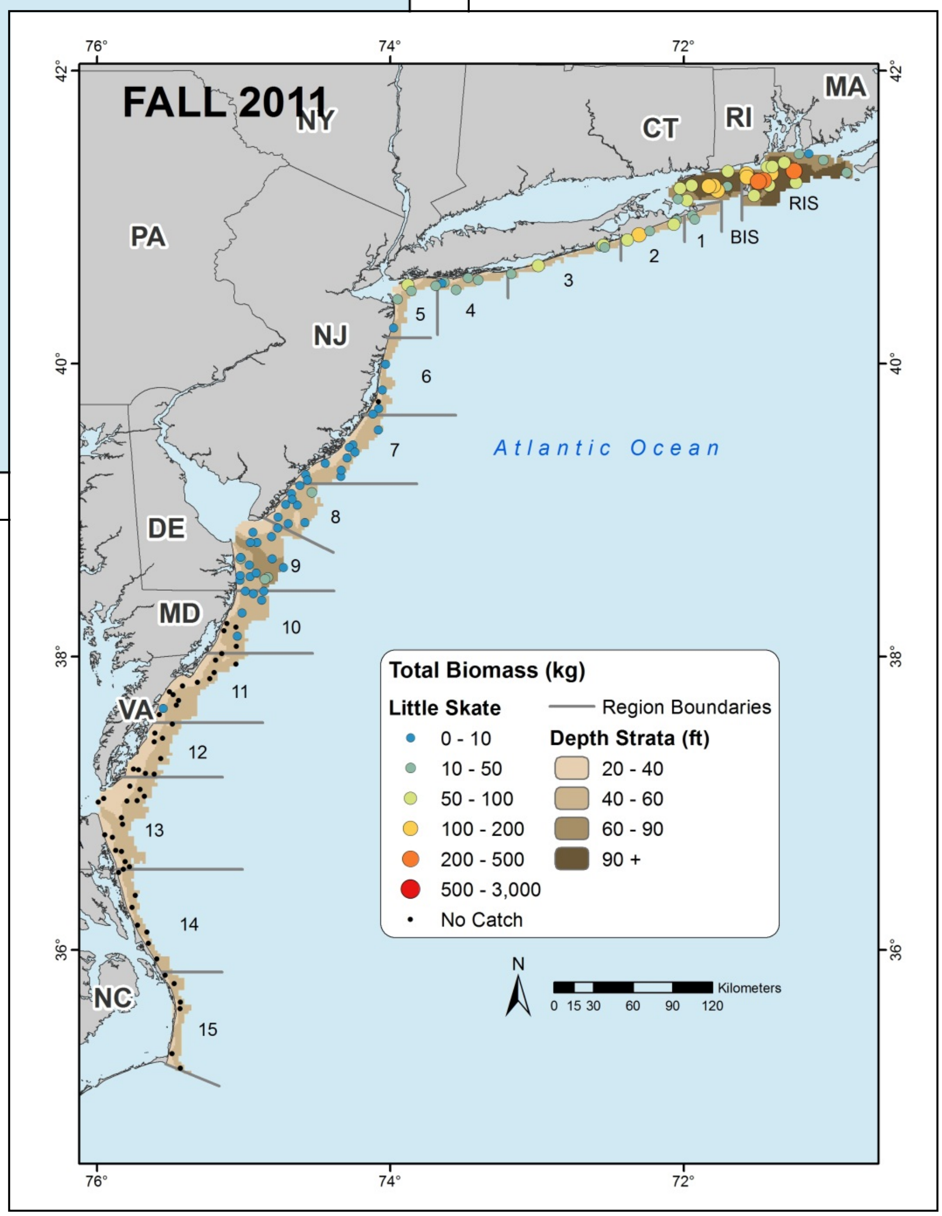


Table 49. Little skate sampling rates and preserved specimen analysis status for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught (kg)	Number Measured	Age Specimens	Ages Read	Stomach Specimens	Stomachs Analyzed
Spring	2008	9,873	5862.5	2,991	312	0	301	300
	2009	23,391	12463.6	5,115	397	0	383	382
	2010	7,802	4262.2	3,330	337	0	328	318
	2011	7,800	4323.0	4,880	322	0	291	287
Fall	2007	5,288	3026.2	2,659	194	0	188	181
	2008	7,014	4104.8	2,247	263	0	259	256
	2009	8,442	4964.9	4,371	304	0	284	277
	2010	6,453	3739.1	3,672	263	0	238	236
	2011	6,293	3729.9	3,553	259	0	218	0

Table 50. Strata used for calculation of abundance indices for little skate.

State (Nominal)	Region	Depth Stratum	Spring Index	Fall Index
RI	RIS	60-90	used	used
		90+	used	used
	BIS	60-90	used	used
		90+	used	used
NY	01	40-60	used	used
	02	20-40	used	used
		40-60	used	used
	03	20-40	used	used
		40-60	used	used
	04	20-40	used	used
		40-60	used	used
	05	20-40	used	used
		40-60	used	used
NJ	06	20-40	used	used
		40-60	used	used
	07	20-40	used	used
		40-60	used	used
	08	20-40	used	used
		40-60	used	used
DE	09	20-40	used	used
		40-60	used	used
		60-90	used	used
MD	10	20-40	used	not used
		40-60	used	not used
VA	11	20-40	used	not used
		40-60	used	not used
	12	20-40	not used	not used
		40-60	not used	not used
	13	20-40	not used	not used
		40-60	not used	not used
NC	14	20-40	not used	not used
		40-60	not used	not used
	15	20-40	not used	not used
		40-60	not used	not used

(red) = used for abundance indices
(grey) = not used for abundance indices

Table 51. Little skate preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

Season	Year	Age	Numerical Index					Biomass Index				
			n	LCI	**Index**	UCI	CV (%)	n	LCI	**Index**	UCI	CV (%)
Spring	2008	All	109	33.72	**40.16**	47.80	2.3	109	21.16	**25.11**	29.76	2.5
	2009		120	42.22	**49.59**	58.23	2.0	120	23.97	**28.19**	33.13	2.3
	2010		112	25.00	**29.32**	34.35	2.2	112	14.71	**17.25**	20.20	2.6
	2011		112	22.21	**26.10**	30.64	2.3	112	13.43	**15.72**	18.37	2.6
Fall	2007	All	84	10.38	**13.18**	16.67	4.2	84	7.12	**8.91**	11.09	4.3
	2008		89	23.53	**29.28**	36.36	3.1	89	14.39	**17.76**	21.87	3.4
	2009		96	33.57	**38.60**	44.37	1.8	96	19.86	**22.70**	25.93	2.0
	2010		89	20.53	**26.31**	33.65	3.6	89	12.62	**16.01**	20.24	3.9
	2011		89	20.47	**24.21**	28.61	2.5	89	12.64	**14.91**	17.56	2.8

Figure 81. Little skate preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

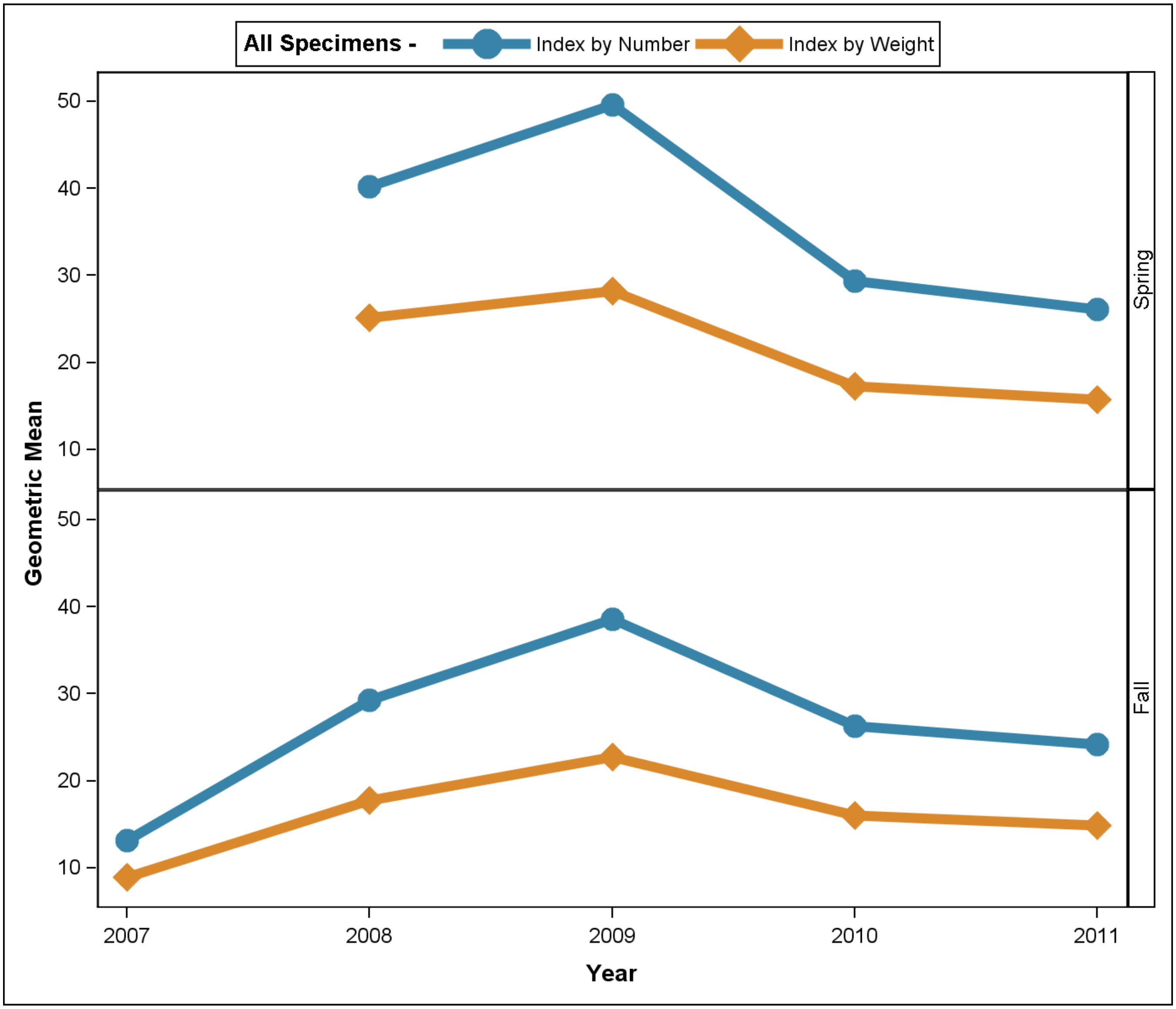


Figure 82. Little skate width-frequency distributions, by cruise.

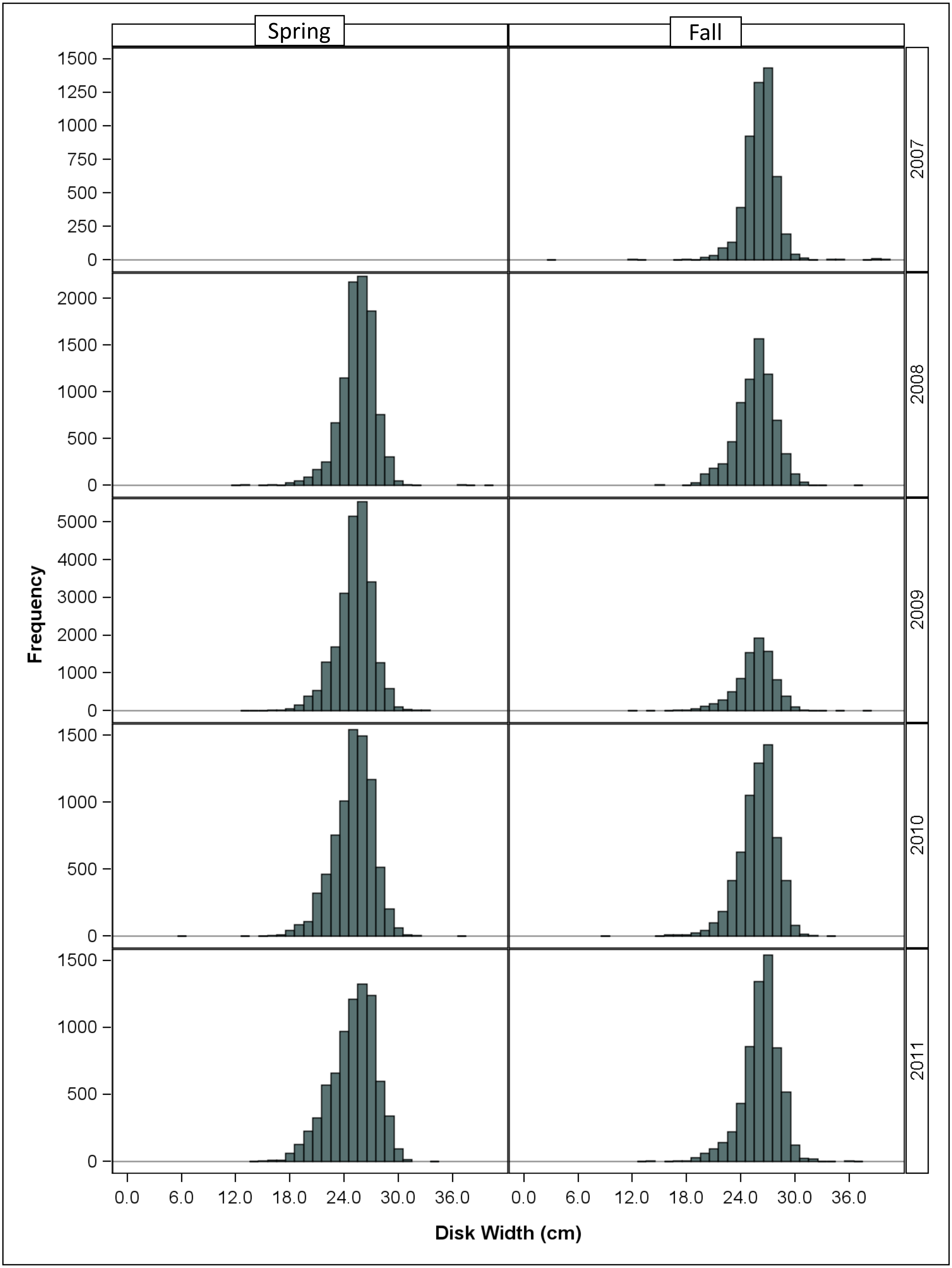


Figure 83. Little skate width-frequency distributions, by cruise and sex.

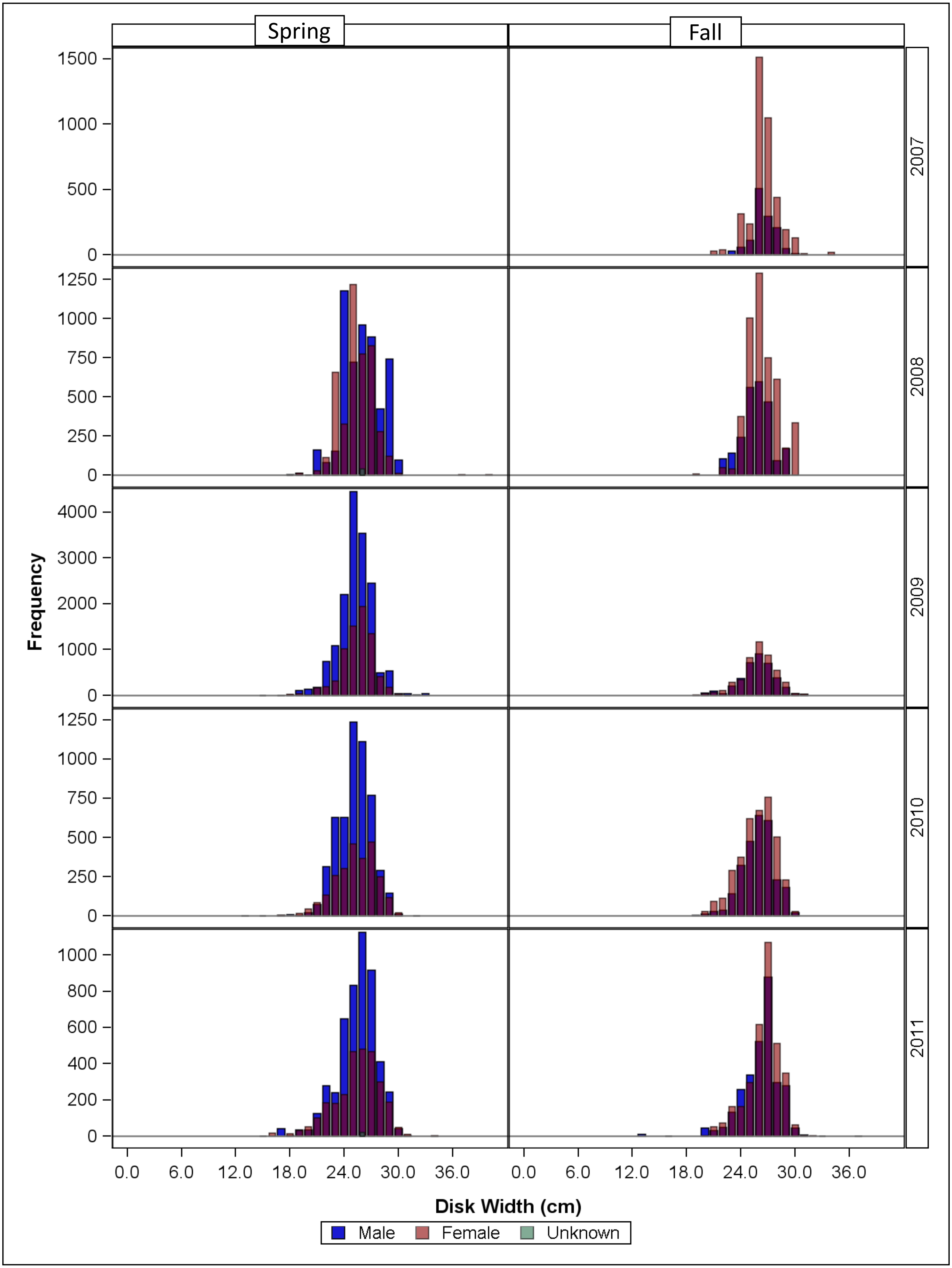


Figure 84. Little skate sex ratio, by length group, for NEAMAP Spring and Fall cruises 2007-2011.
(The percentages for each category are given near the bottom of each bar. The number sampled for sex determination is provided near the top of each bar, and the length categories expressed in inches are shown between the two figures.).

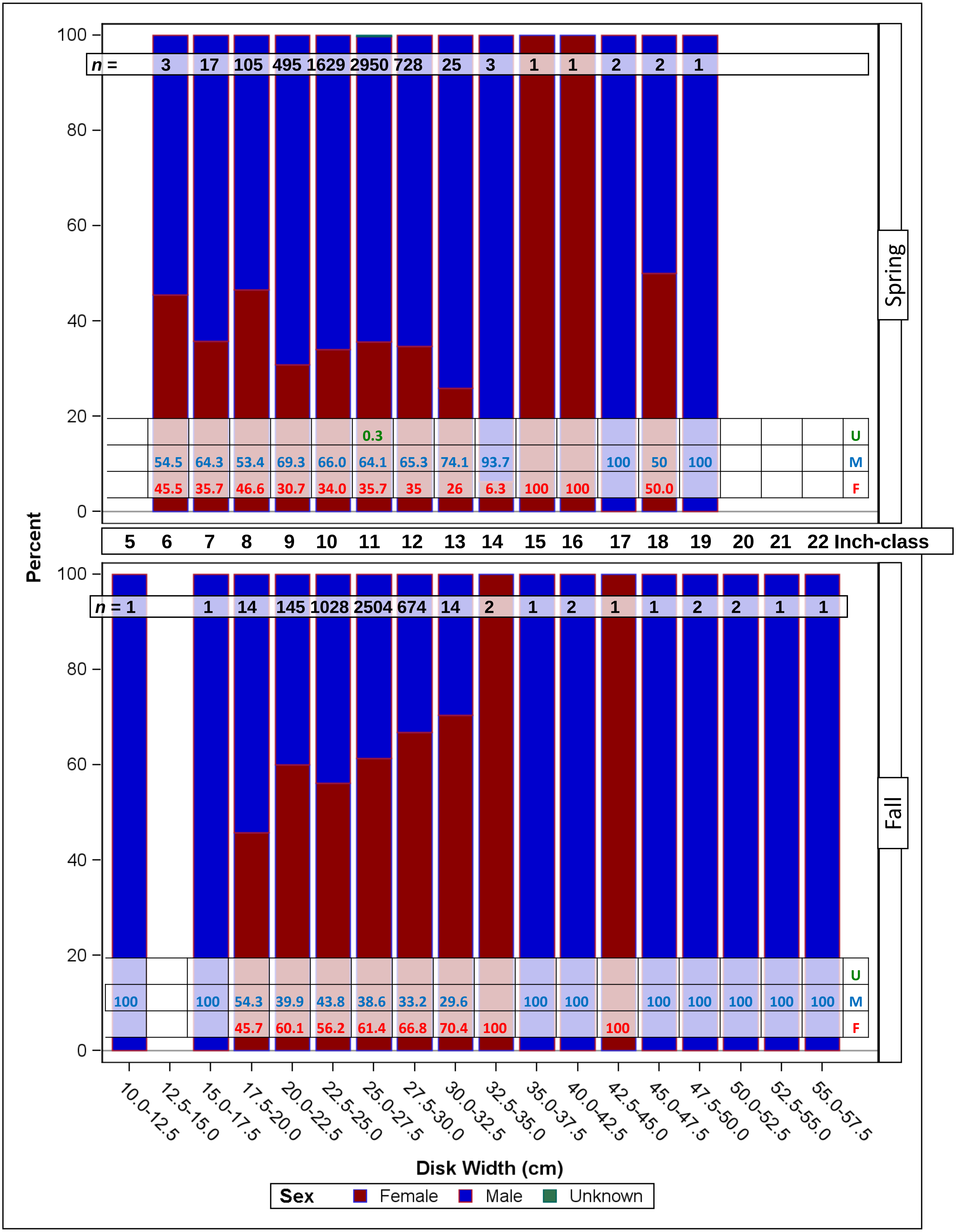
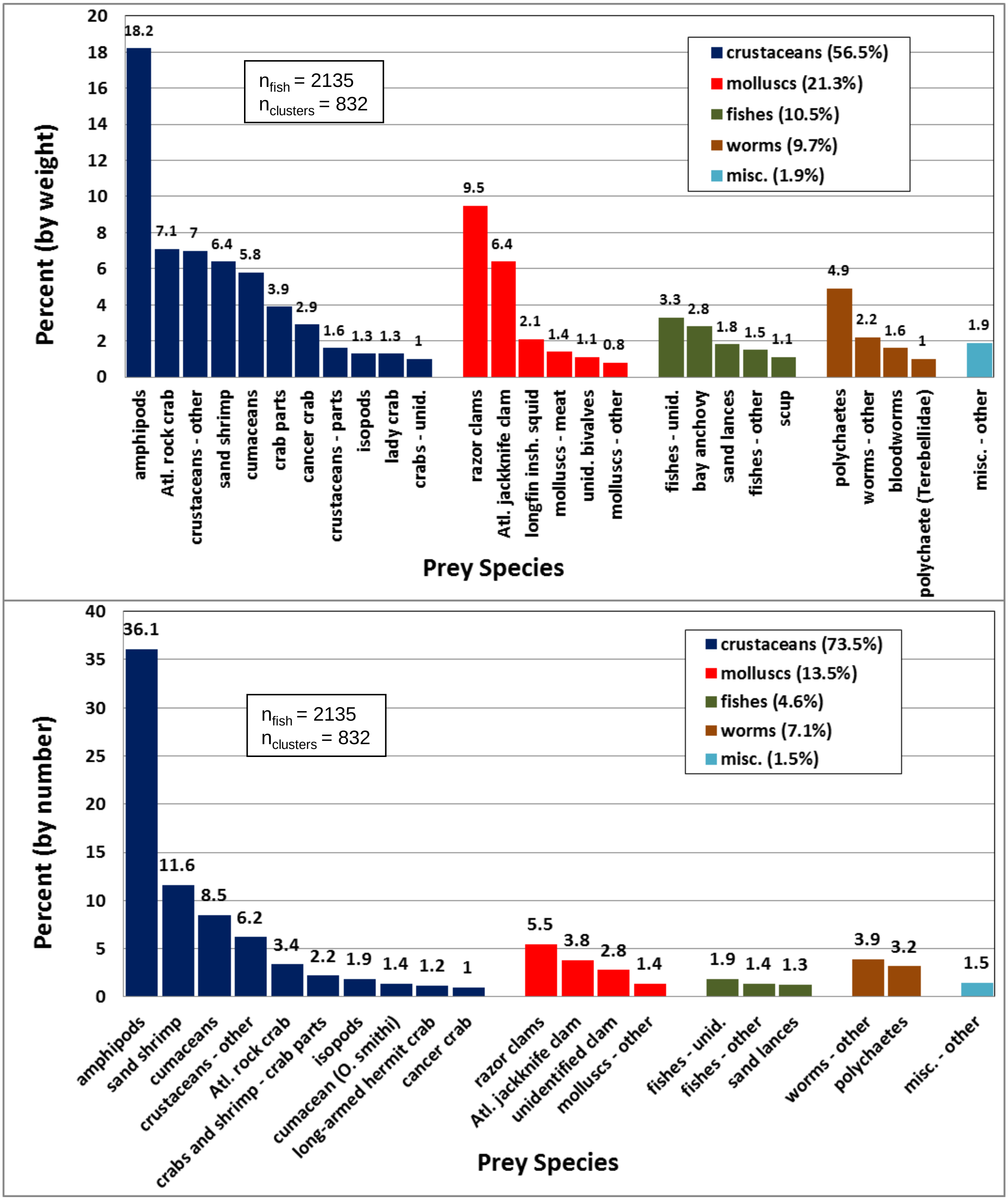


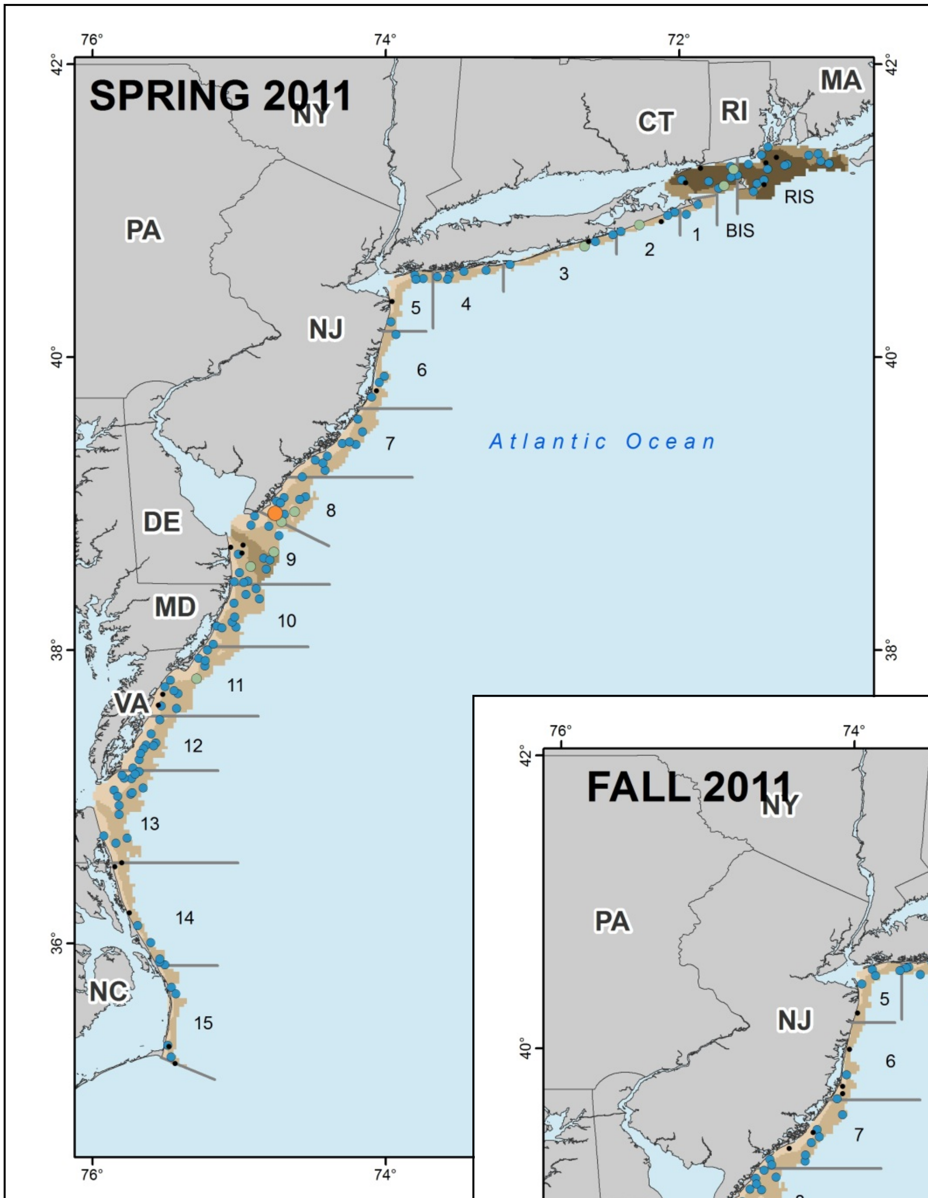
Figure 85. Little skate diet composition, expressed as percent by weight and number collected during NEAMAP cruises in 2007 through Spring 2011. (The number of fish sampled for diet is given by n_{fish}, while $n_{clusters}$ indicates the number of clusters of this species sampled.)



Longfin Inshore Squid

Sampling Priority: E

Figure 86. Longfin inshore squid biomass (kg) at each sampling site for 2011 NEAMAP cruises.



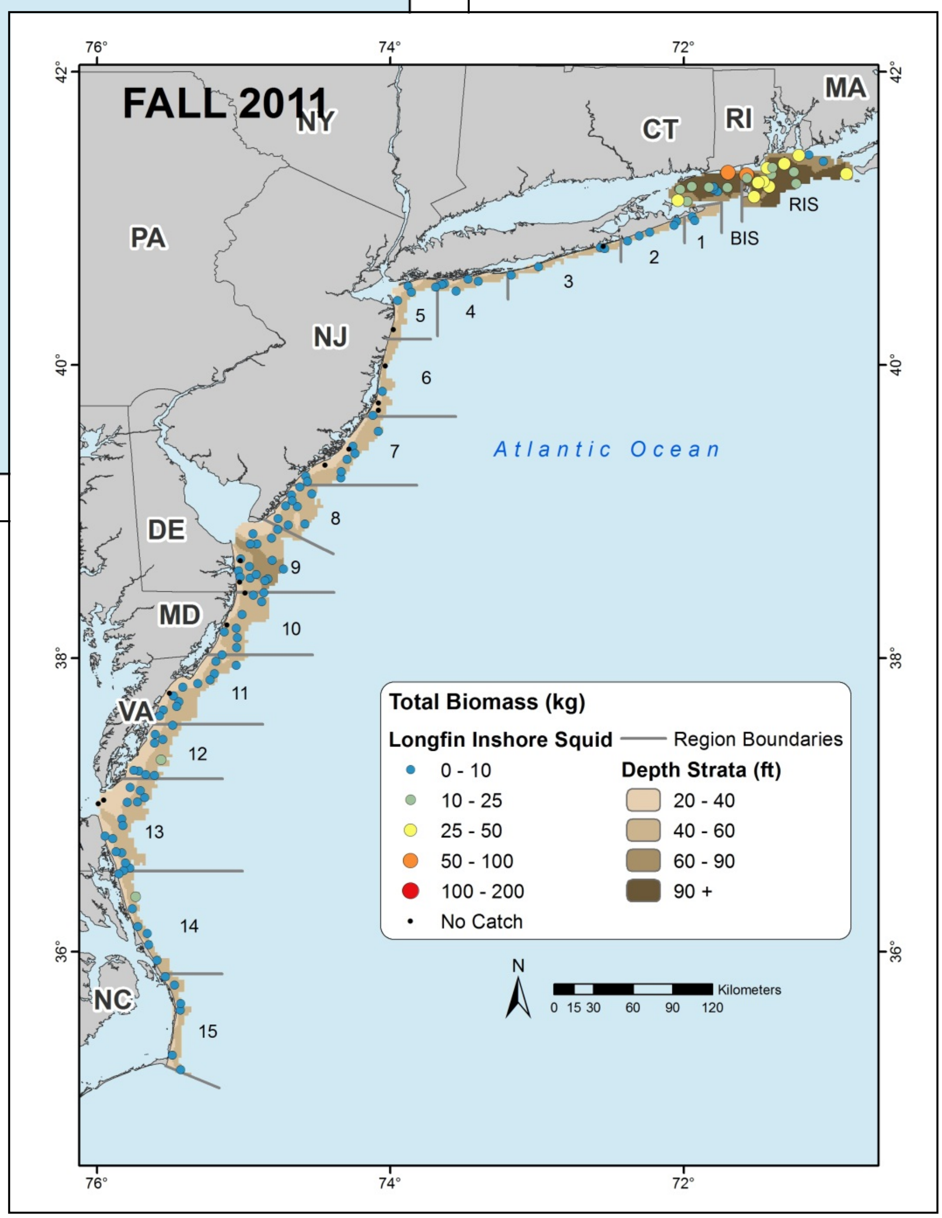


Table 52. Longfin inshore squid sampling rates for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught (kg)	Number Measured	Age Specimens	Ages Read	Stomach Specimens	Stomachs Analyzed
Spring	2008	19,549	776.2	5,127	N/A	N/A	N/A	N/A
	2009	12,451	501.6	5,710	N/A	N/A	N/A	N/A
	2010	7,502	316.2	2,396	N/A	N/A	N/A	N/A
	2011	9,579	416.4	6,492	N/A	N/A	N/A	N/A
Fall	2007	119,512	2278.6	9,625	N/A	N/A	N/A	N/A
	2008	93,383	1357.9	5,998	N/A	N/A	N/A	N/A
	2009	242,495	3406.4	10,005	N/A	N/A	N/A	N/A
	2010	46,980	962.8	5,902	N/A	N/A	N/A	N/A
	2011	56,026	948.7	6,087	N/A	N/A	N/A	N/A

Table 53. Strata used for calculation of abundance indices for longfin inshore squid.

State (Nominal)	Region	Depth Stratum	Spring Index	Fall Index
RI	RIS	60-90	used	used
		90+	used	used
	BIS	60-90	used	used
		90+	used	used
NY	01	40-60	used	used
	02	20-40	not used	used
		40-60	used	used
	03	20-40	not used	used
		40-60	used	used
	04	20-40	not used	used
		40-60	used	used
	05	20-40	not used	used
		40-60	used	used
NJ	06	20-40	not used	used
		40-60	used	used
	07	20-40	not used	used
		40-60	used	used
	08	20-40	not used	used
		40-60	used	used
DE	09	20-40	not used	used
		40-60	used	used
		60-90	used	used
MD	10	20-40	not used	used
		40-60	used	used
VA	11	20-40	not used	used
		40-60	used	used
	12	20-40	not used	used
		40-60	used	used
	13	20-40	not used	used
		40-60	used	used
NC	14	20-40	not used	used
		40-60	used	used
	15	20-40	not used	used
		40-60	used	used

(red) = used for abundance indices

(grey) = not used for abundance indices

Table 54. Longfin inshore squid preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

Season	Year	Age	Numerical Index					Biomass Index				
			n	LCI	**Index**	UCI	CV (%)	n	LCI	**Index**	UCI	CV (%)
Spring	2008	All	107	45.70	**59.96**	78.58	3.2	107	2.80	**3.47**	4.26	5.4
	2009		109	28.19	**35.45**	44.51	3.1	109	1.66	**2.03**	2.44	5.8
	2010		108	5.48	**7.35**	9.77	6.0	108	0.51	**0.69**	0.90	11.0
	2011		108	19.68	**27.22**	37.51	4.7	108	1.14	**1.48**	1.87	8.0
Fall	2007	All	150	120.10	**147.07**	180.04	2.0	150	4.24	**5.03**	5.95	3.9
	2008		150	38.26	**48.24**	60.76	2.9	150	2.40	**2.83**	3.32	4.5
	2009		160	90.28	**115.15**	146.78	2.5	160	4.90	**5.74**	6.70	3.5
	2010		150	28.55	**36.68**	47.05	3.3	150	2.80	**3.33**	3.94	4.5
	2011		150	36.79	**44.58**	53.98	2.5	150	2.58	**2.93**	3.32	3.5

Figure 87. Longfin inshore squid preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

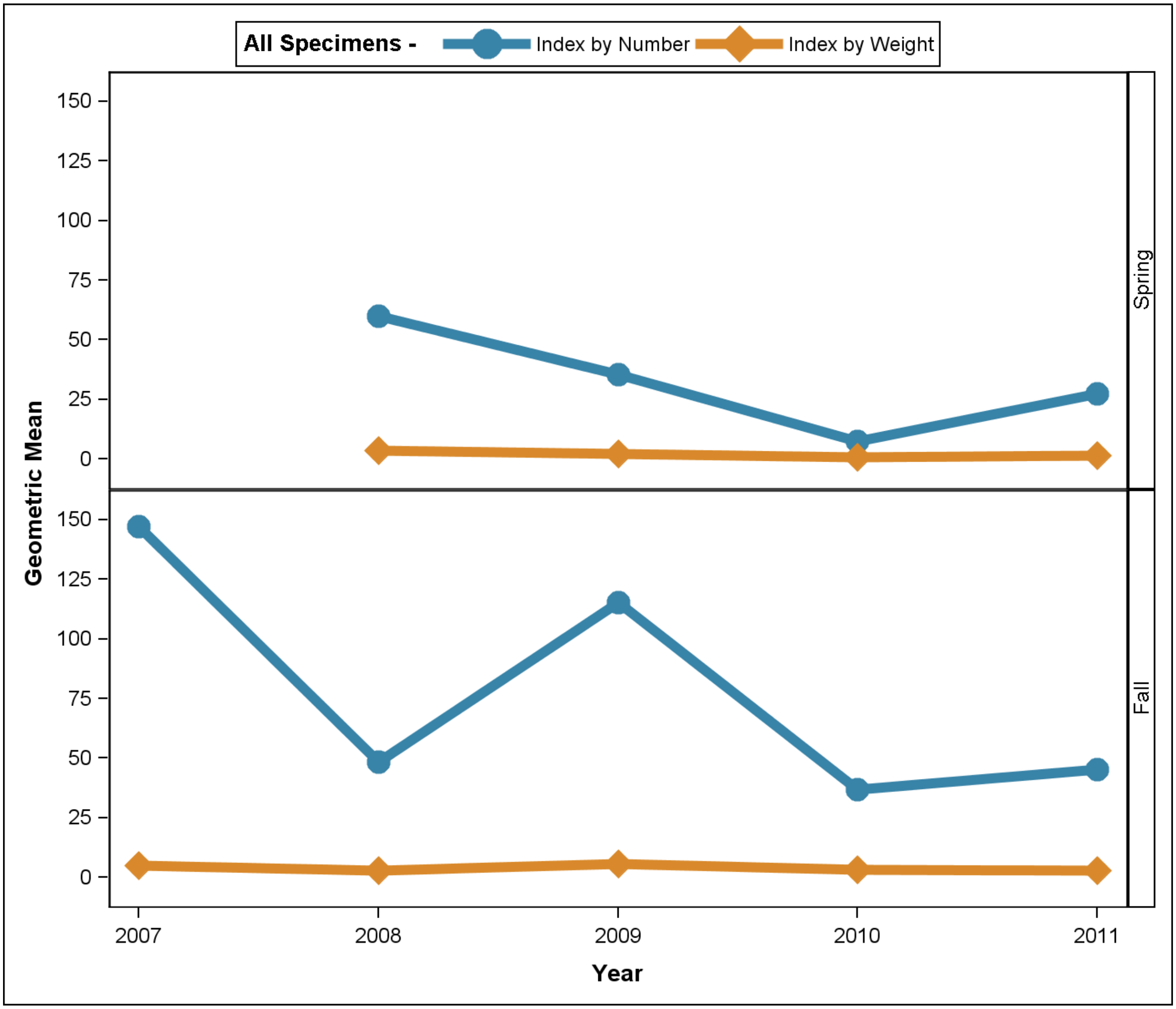
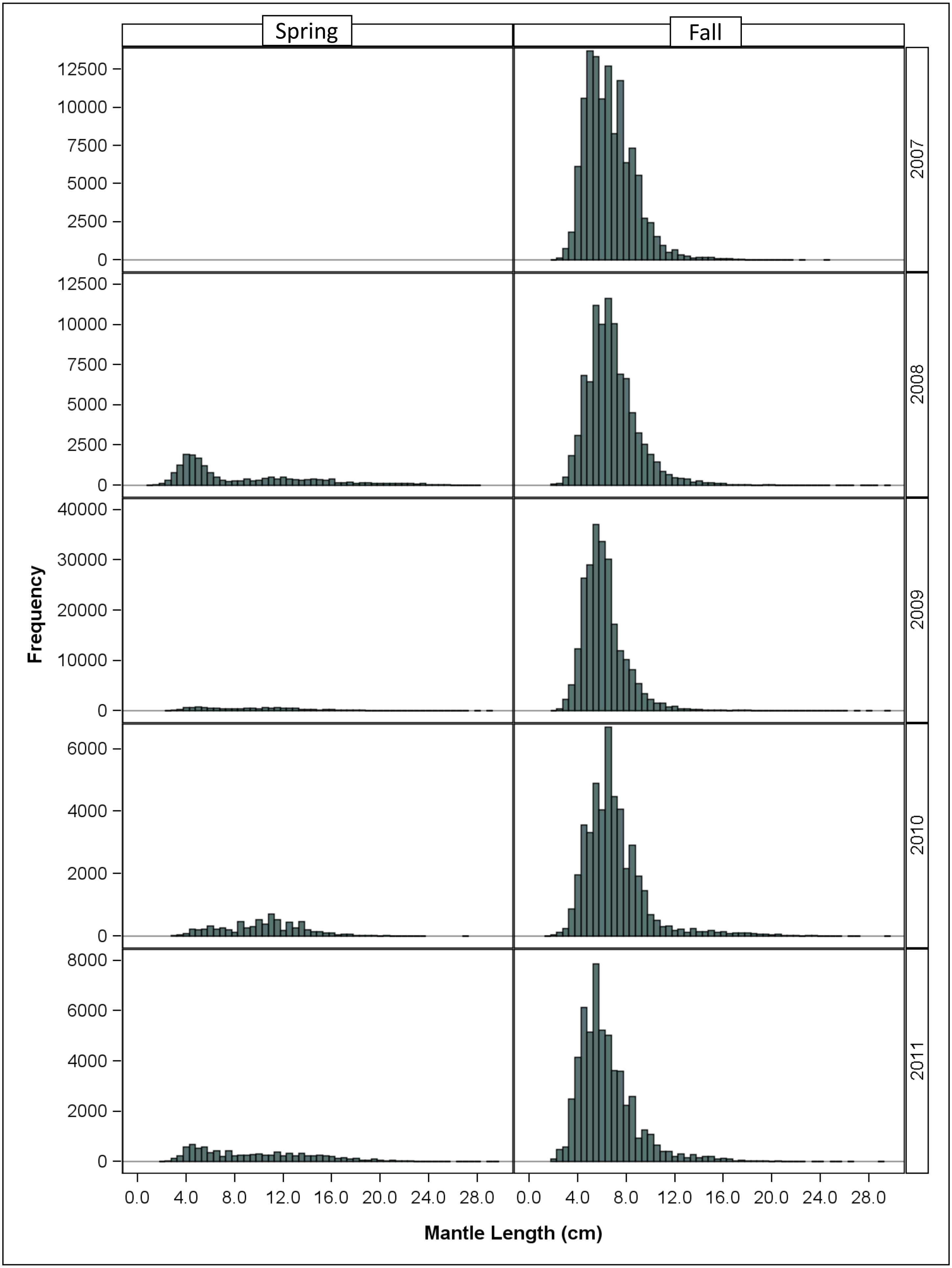


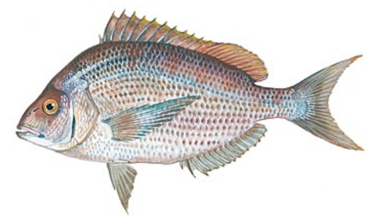
Figure 88. Longfin inshore squid length-frequency distributions, by cruise.

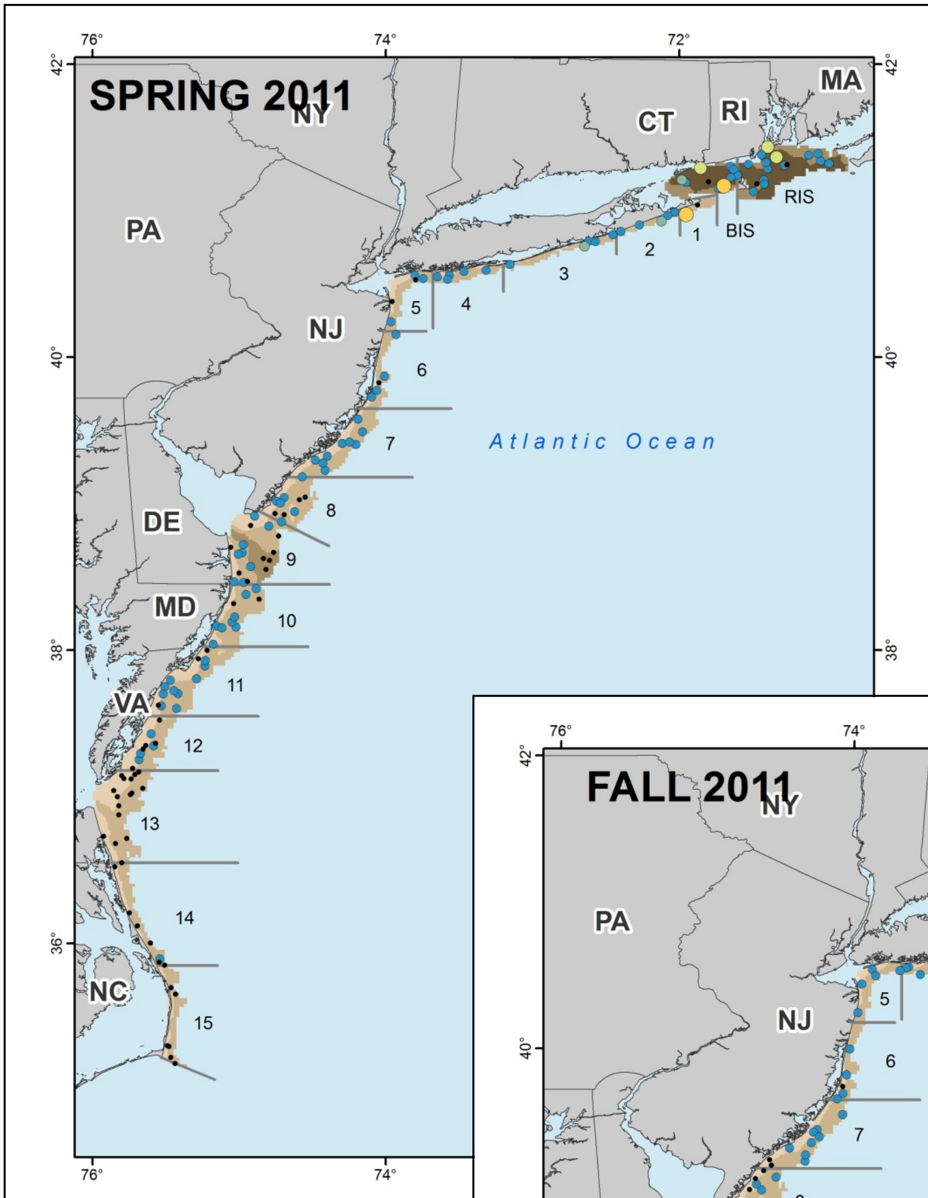


Scup

Sampling Priority: A

Figure 89. Scup biomass (kg) at each sampling site for 2011 NEAMAP cruises.





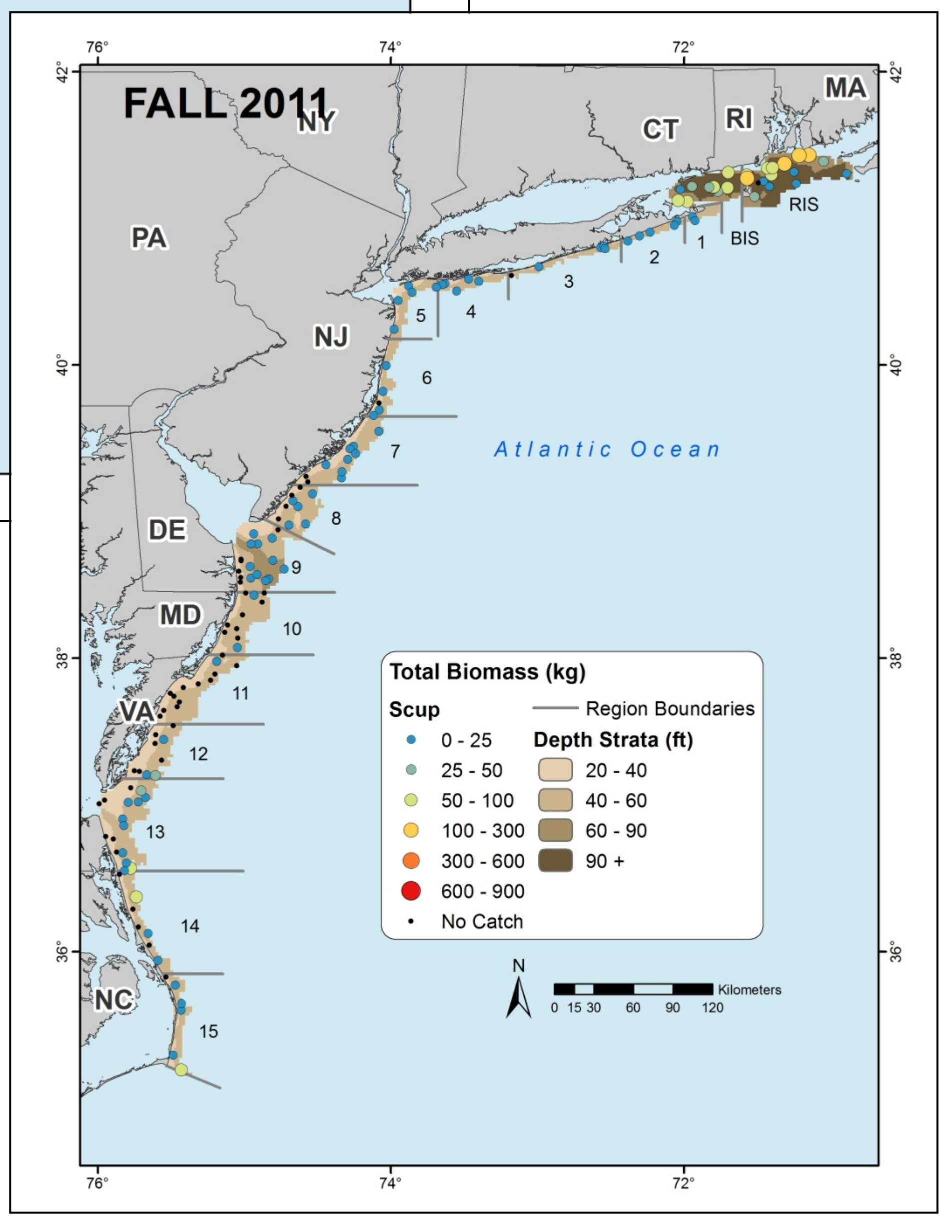


Table 55. Scup sampling rates and preserved specimen analysis status for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught (kg)	Number Measured	Age Specimens	Ages Read	Stomach Specimens	Stomachs Analyzed
Spring	2008	51,629	1256.1	7,167	869	0	754	744
	2009	16,884	2827.3	7,043	740	0	709	702
	2010	4,209	928.5	2,287	465	0	404	321
	2011	3,007	755.9	1,812	451	0	369	353
Fall	2007	276,237	3928.8	13,721	811	808	802	795
	2008	77,858	2503.2	6,946	670	0	668	666
	2009	158,567	2577.8	12,792	897	0	892	729
	2010	131,471	3959.2	14,006	727	0	717	699
	2011	64,928	1906.3	7,944	619	0	586	0

Table 56. Strata used for calculation of abundance indices for scup.

State (Nominal)	Region	Depth Stratum	Spring Index	Fall Index
RI	RIS	60-90	(red)	(red)
		90+	(red)	(red)
	BIS	60-90	(red)	(red)
		90+	(red)	(red)
NY	01	40-60	(red)	(red)
	02	20-40	(red)	(red)
		40-60	(red)	(red)
	03	20-40	(red)	(red)
		40-60	(red)	(red)
	04	20-40	(red)	(red)
		40-60	(red)	(red)
	05	20-40	(red)	(red)
		40-60	(red)	(red)
NJ	06	20-40	(red)	(red)
		40-60	(red)	(red)
	07	20-40	(red)	(red)
		40-60	(red)	(red)
	08	20-40	(red)	(red)
		40-60	(red)	(red)
DE	09	20-40	(red)	(red)
		40-60	(red)	(red)
		60-90	(red)	(red)
MD	10	20-40	(red)	(red)
		40-60	(red)	(red)
VA	11	20-40	(red)	(red)
		40-60	(red)	(red)
	12	20-40	(red)	(red)
		40-60	(red)	(red)
	13	20-40	(red)	(red)
		40-60	(red)	(red)
NC	14	20-40	(grey)	(red)
		40-60	(grey)	(red)
	15	20-40	(grey)	(red)
		40-60	(grey)	(red)

(red) = used for abundance indices

(grey) = not used for abundance indices

Table 57. Scup preliminary geometric mean indices of abundance, for all specimens captured (by number and biomass) and by age-class (numbers only) for spring and fall NEAMAP surveys. Age-specific indices for ages 1 and older calculated using fall survey data only.

Season	Year	Age	Numerical Index					Biomass Index				
			n	LCI	**Index**	UCI	CV (%)	n	LCI	**Index**	UCI	CV (%)
Spring	2008	All	137	24.51	**32.54**	43.10	3.9	137	1.88	**2.36**	2.93	6.4
	2009		145	6.00	**8.28**	11.29	6.3	145	1.04	**1.49**	2.03	10.8
	2010		137	1.76	**2.27**	2.88	7.2	137	0.58	**0.79**	1.03	10.7
	2011		137	1.84	**2.45**	3.18	7.8	137	0.41	**0.62**	0.87	14.6
Fall	2007	All	150	79.72	**117.20**	172.07	4.0	150	5.68	**7.49**	9.79	5.6
	2008		150	17.57	**24.82**	34.91	5.1	150	2.44	**3.16**	4.02	6.6
	2009		160	28.07	**39.11**	54.33	4.4	160	3.05	**3.82**	4.75	5.6
	2010		150	20.18	**28.50**	40.11	4.9	150	2.35	**3.15**	4.13	7.5
	2011		150	9.04	**12.85**	18.12	6.1	150	1.66	**2.21**	2.86	8.0
Spring	2008	0	137	10.45	**13.70**	17.86	4.6	137	0.69	**0.91**	1.15	9.2
	2009		145	3.02	**3.97**	5.14	6.6	145	0.29	**0.39**	0.49	11.5
	2010		137	0.37	**0.56**	0.79	15.0	137	0.02	**0.04**	0.07	31.9
	2011		137	0.62	**0.78**	0.96	8.2	137	0.03	**0.04**	0.05	13.8
Fall	2007	0	150	39.65	**58.14**	85.03	4.6	150	2.75	**3.62**	4.70	6.8
	2008		150	9.49	**13.13**	18.05	5.6	150	1.23	**1.59**	2.00	7.8
	2009		160	20.27	**28.02**	38.60	4.6	160	1.92	**2.42**	3.00	6.4
	2010		150	13.32	**19.19**	27.46	5.7	150	1.40	**1.92**	2.55	9.2
	2011		150	4.88	**6.94**	9.73	7.3	150	0.77	**1.05**	1.37	10.2
Fall	2007	1	150	15.97	**22.18**	30.66	5.0	150	2.25	**2.92**	3.74	6.9
	2008		150	6.55	**9.10**	12.52	6.3	150	1.17	**1.54**	1.97	8.5
	2009		160	7.03	**9.52**	12.79	5.7	160	1.09	**1.45**	1.86	8.7
	2010		150	4.38	**6.05**	8.23	6.9	150	0.65	**0.94**	1.28	12.1
	2011		150	4.01	**5.57**	7.63	7.2	150	0.91	**1.22**	1.58	9.5
Fall	2007	2+	150	2.22	**2.90**	3.73	7.1	150	0.35	**0.47**	0.60	11.4
	2008		150	1.45	**1.95**	2.56	8.7	150	0.35	**0.51**	0.68	13.1
	2009		160	1.12	**1.49**	1.92	8.8	160	0.23	**0.33**	0.44	13.6
	2010		150	0.88	**1.26**	1.70	11.1	150	0.26	**0.42**	0.60	16.6
	2011		150	1.06	**1.43**	1.87	9.4	150	0.32	**0.48**	0.66	14.7

Figure 90. Scup preliminary geometric mean indices of abundance, for all specimens captured (A - by number and biomass) and by age-class (B – numbers only) for spring and fall NEAMAP surveys. Age-specific indices for ages 1 and older calculated using fall survey data only.

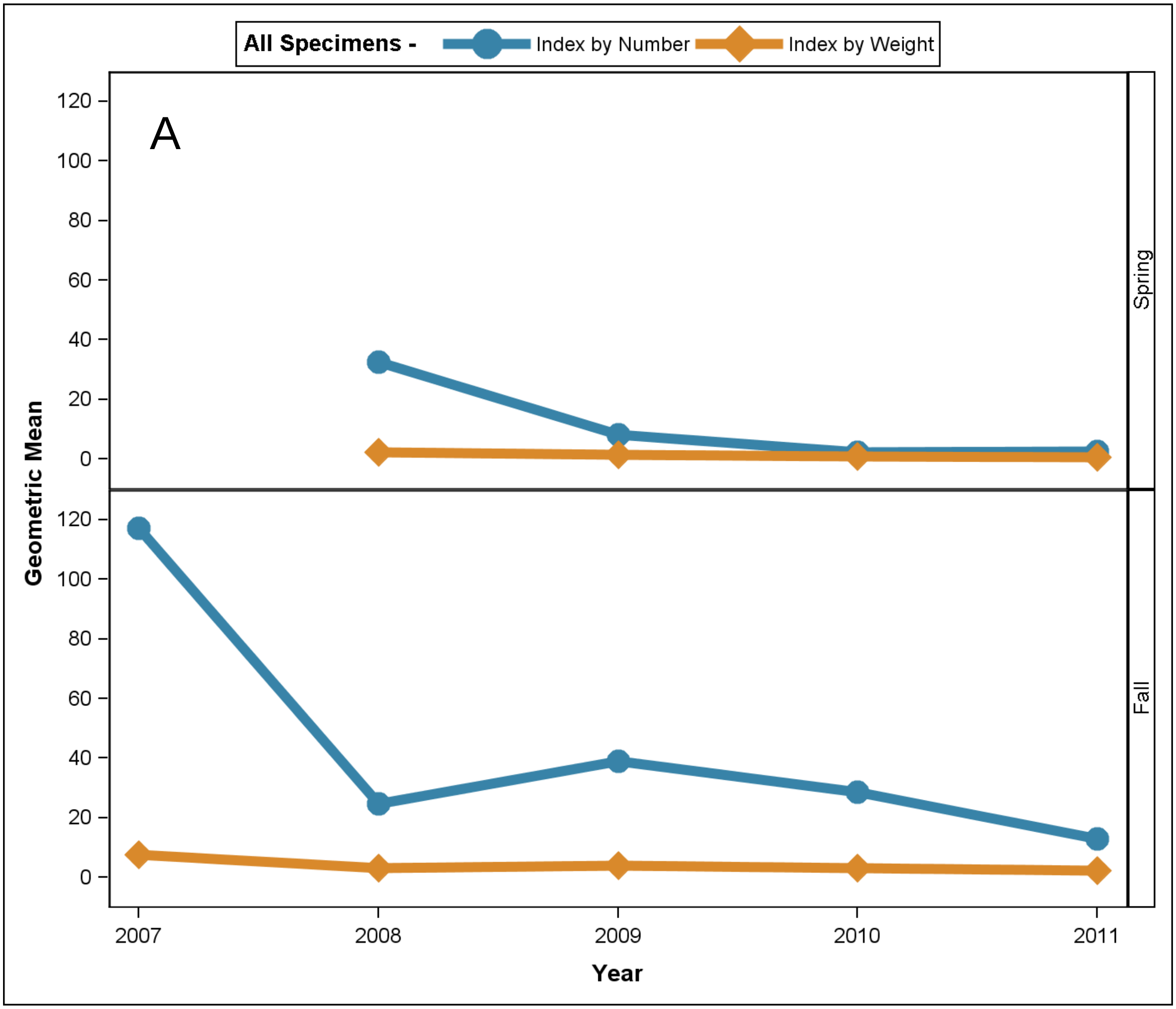


Figure 90. cont.

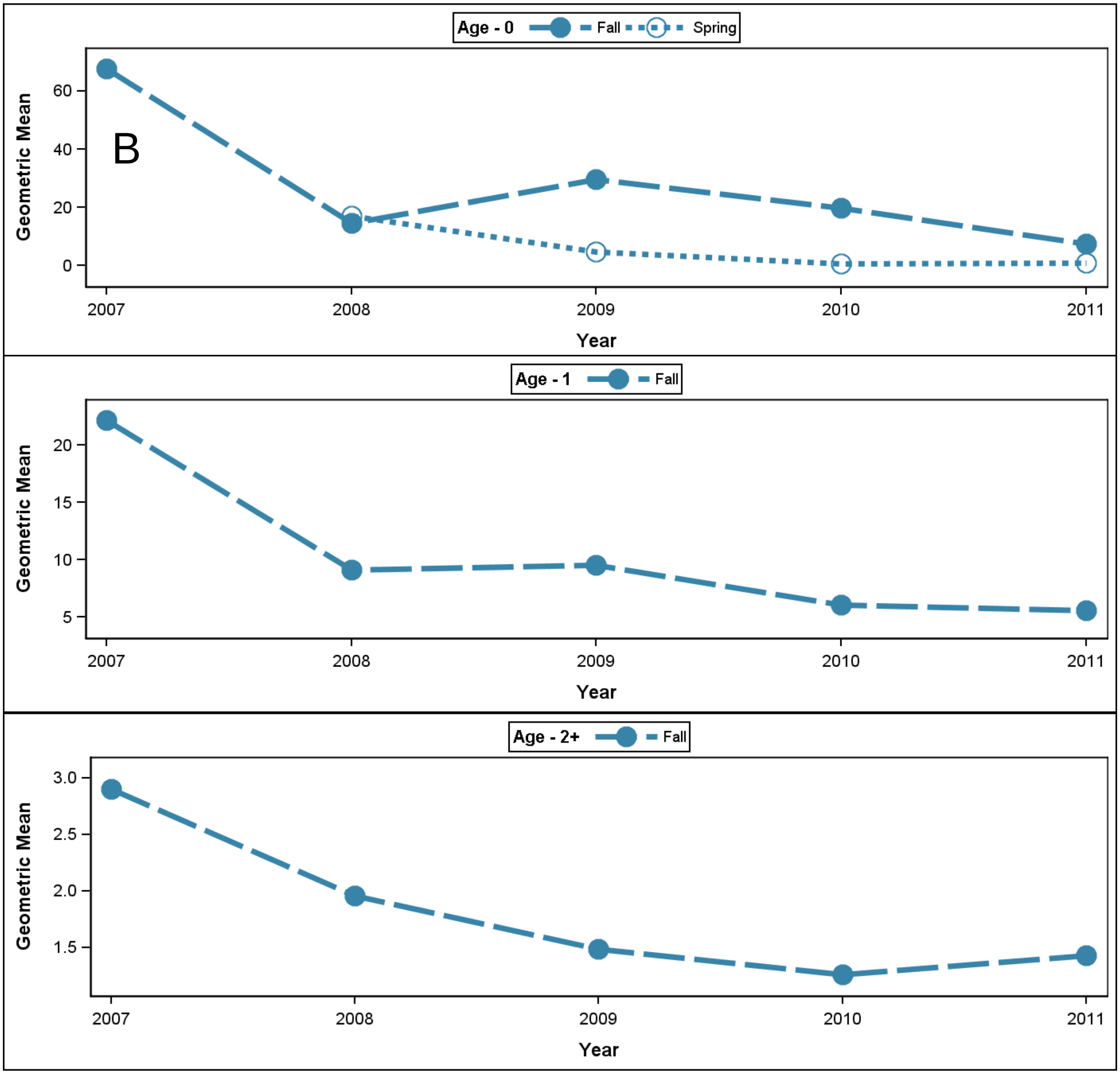


Figure 91. Scup length-frequency distributions, by cruise (Blue reference line is placed at the size cutoff value used to separate recruits from older specimens, 14cm for Spring - estimated by examination of these length frequency figures. Age-class separation for Fall is by age-length key).

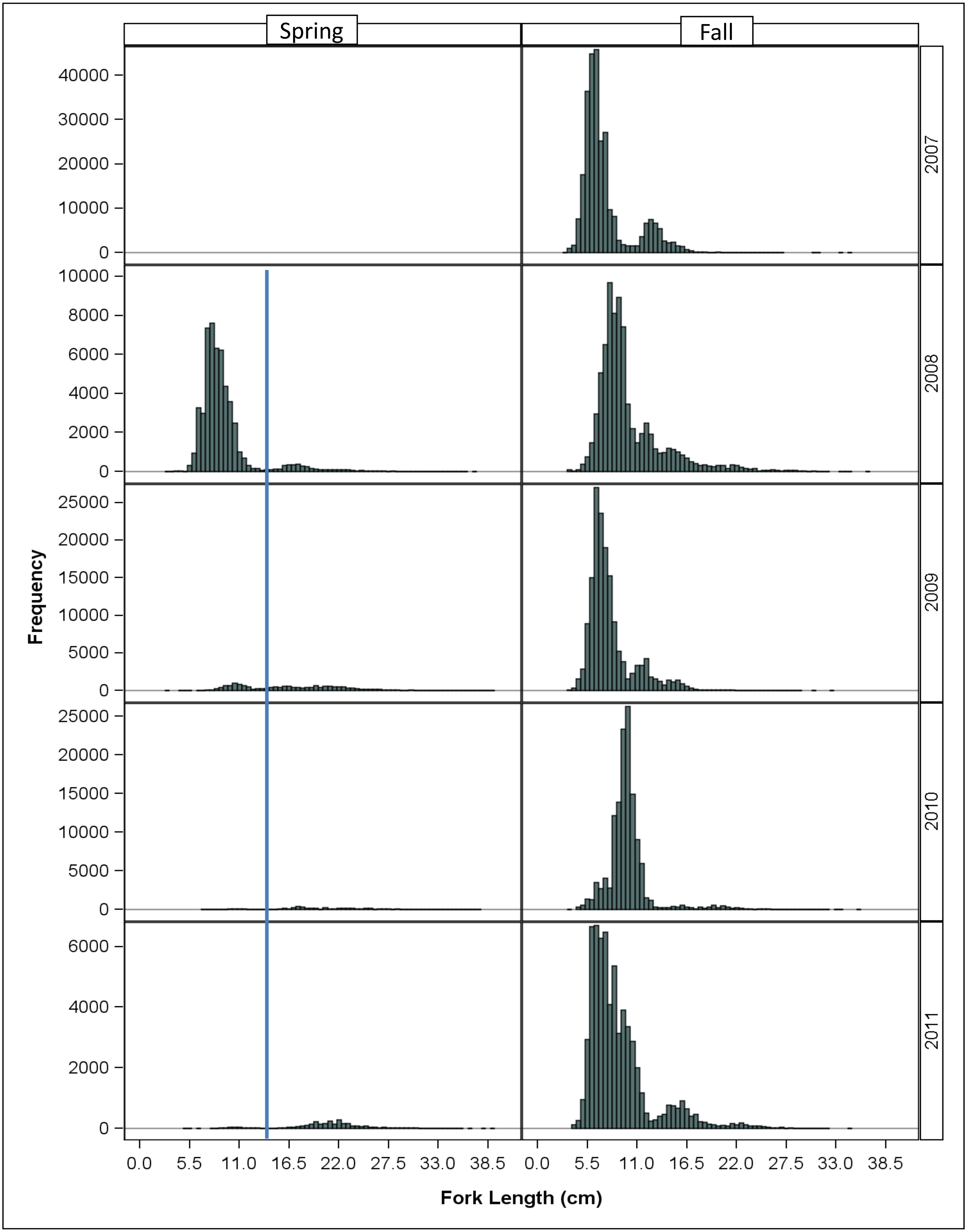


Figure 92. Scup length-frequency distributions, by cruise and sex.

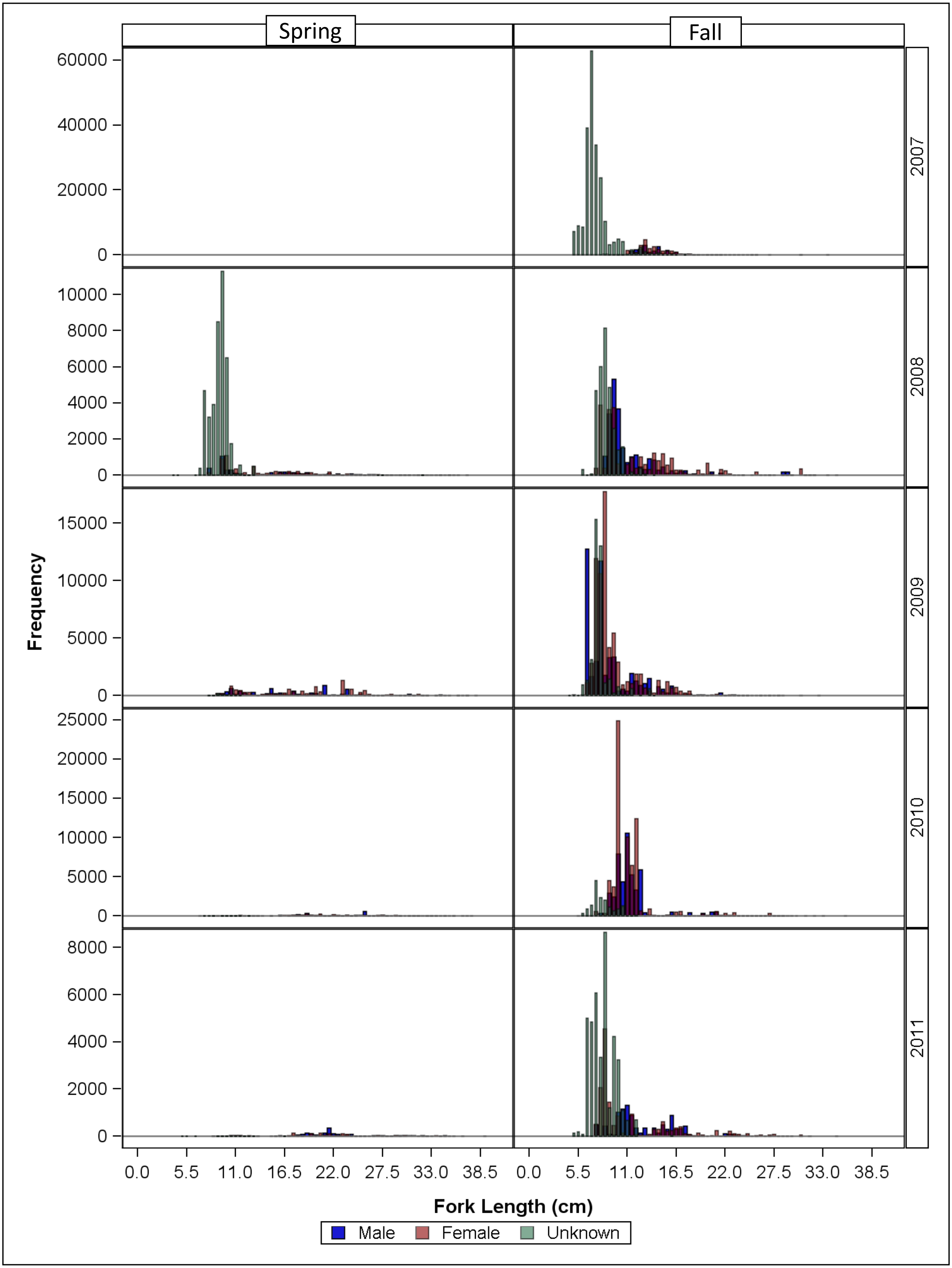


Figure 93. Scup age-at-length proportions for all spring vs. all fall cruises combined, showing actual and loess smoothed proportions at each 1cm length bin.

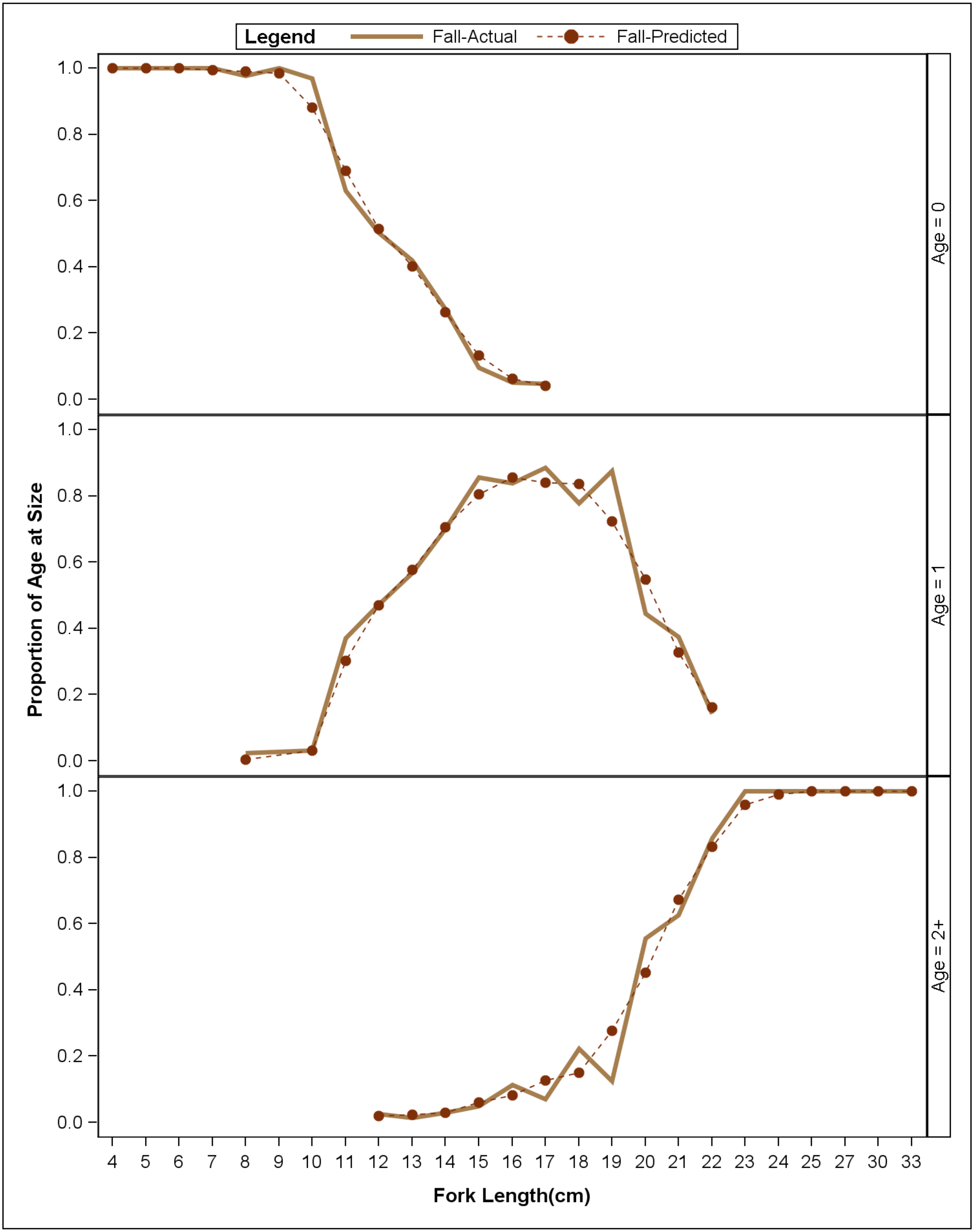


Table 58. Scup loess-smoothed age-at-length proportions for all spring vs. all fall cruises combined.
(Greyed values assigned rather than calculated due to lack of data in particular cells. Arrows indicate the same value used for all length bins covered. Struck-through values are from actual data but are not used. Note that within a Season and a Length bin proportions may not add to exactly 1.0 due to the smoothing algorithm. Smoothing is done within an age-class rather than across all age-classes at any given length.)

	Spring			Fall		
Total Length(cm)	**Age-0**	**Age-1**	**Age-2**	**Age-0**	**Age-1**	**Age-2+**
4				↑	↑	↑
5						
6				1.000		
7				0.993	0.000	
8				0.990	0.005	
9				0.984	0.016	
10				0.881	0.031	0.000
11				0.691	0.302	0.007
12				0.515	0.470	0.019
13				0.401	0.578	0.024
14				0.264	0.706	0.030
15				0.133	0.806	0.061
16				0.062	0.856	0.082
17				0.042	0.840	0.126
18				0.013	0.836	0.151
19				0.000	0.724	0.276
20					0.548	0.452
21					0.328	0.672
22					0.163	0.832
23					0.041	0.959
24					0.009	0.991
25					0.000	1.000
26						
27						
28						
29						
30						
31						
32						
33				↓	↓	↓

Figure 94. Scup sex ratio, by length group, for NEAMAP Spring and Fall cruises 2007-2011.
(The percentages for each category are given near the bottom of each bar. The number sampled for sex determination is provided near the top of each bar, and the length categories expressed in inches are shown between the two figures.).

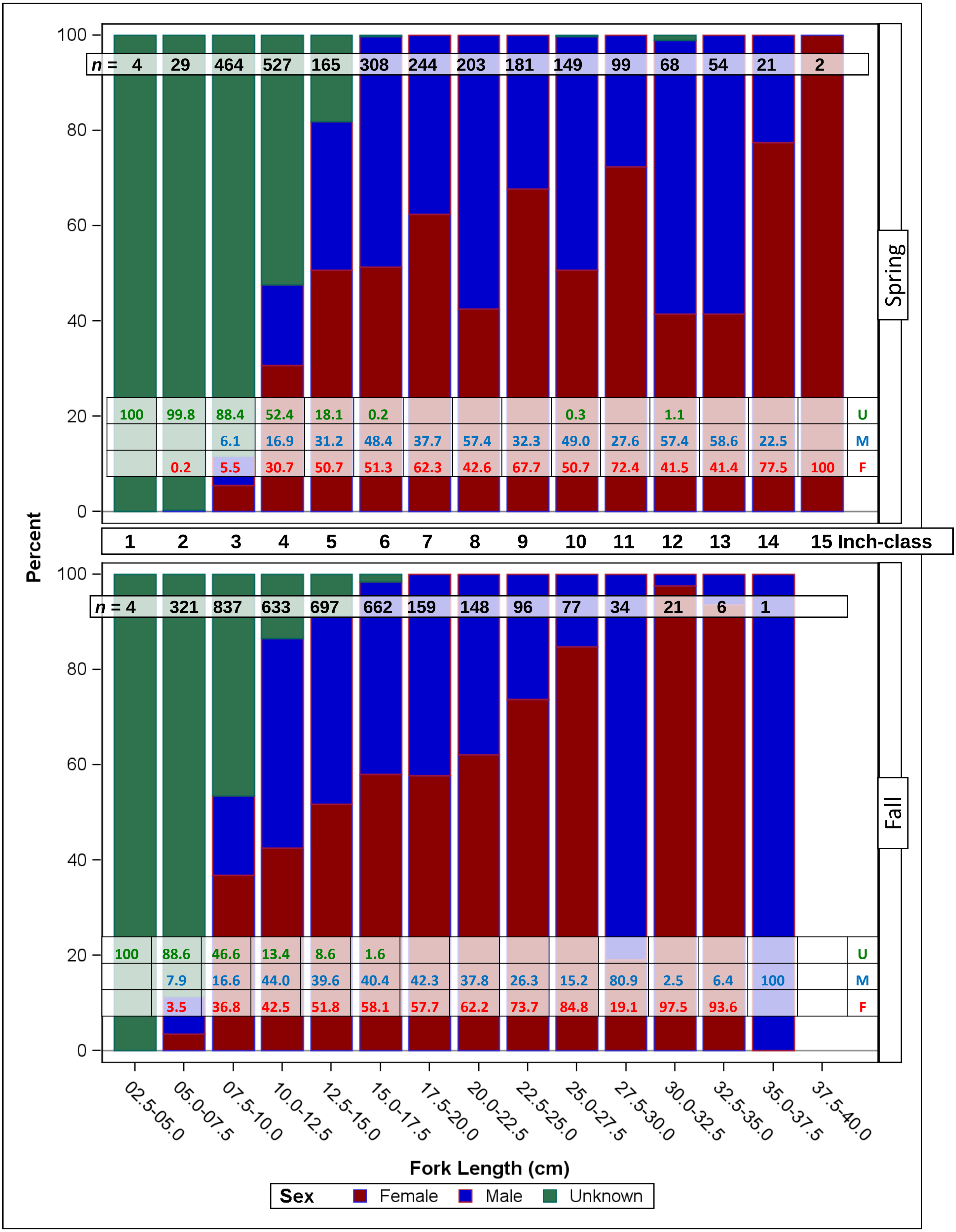
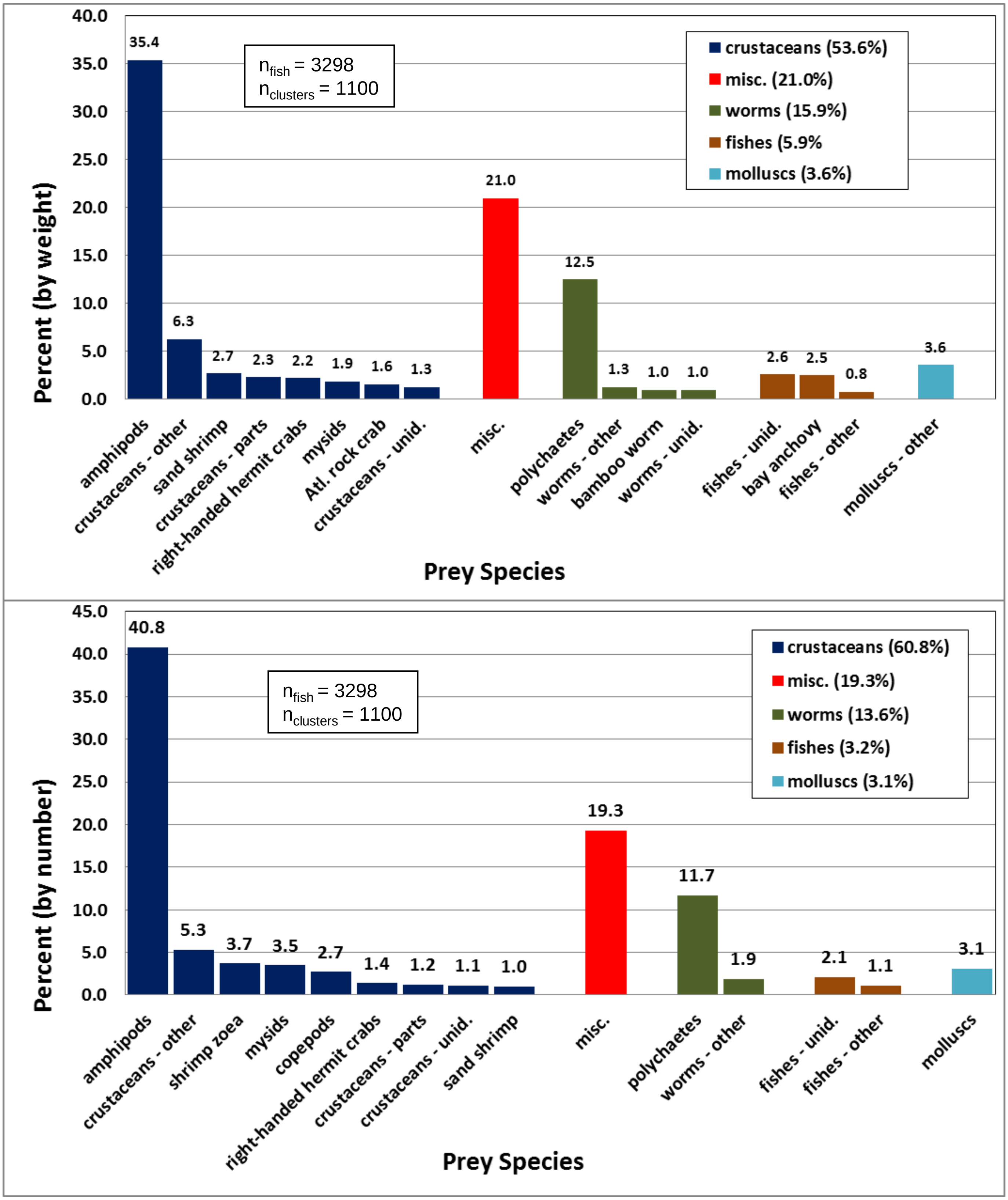


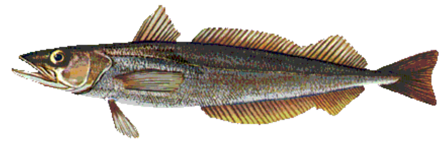
Figure 95. Scup diet composition, expressed as percent by weight and number collected during NEAMAP cruises in 2007 through Spring 2011. (The number of fish sampled for diet is given by n_{fish}, while $n_{clusters}$ indicates the number of clusters of this species sampled.)

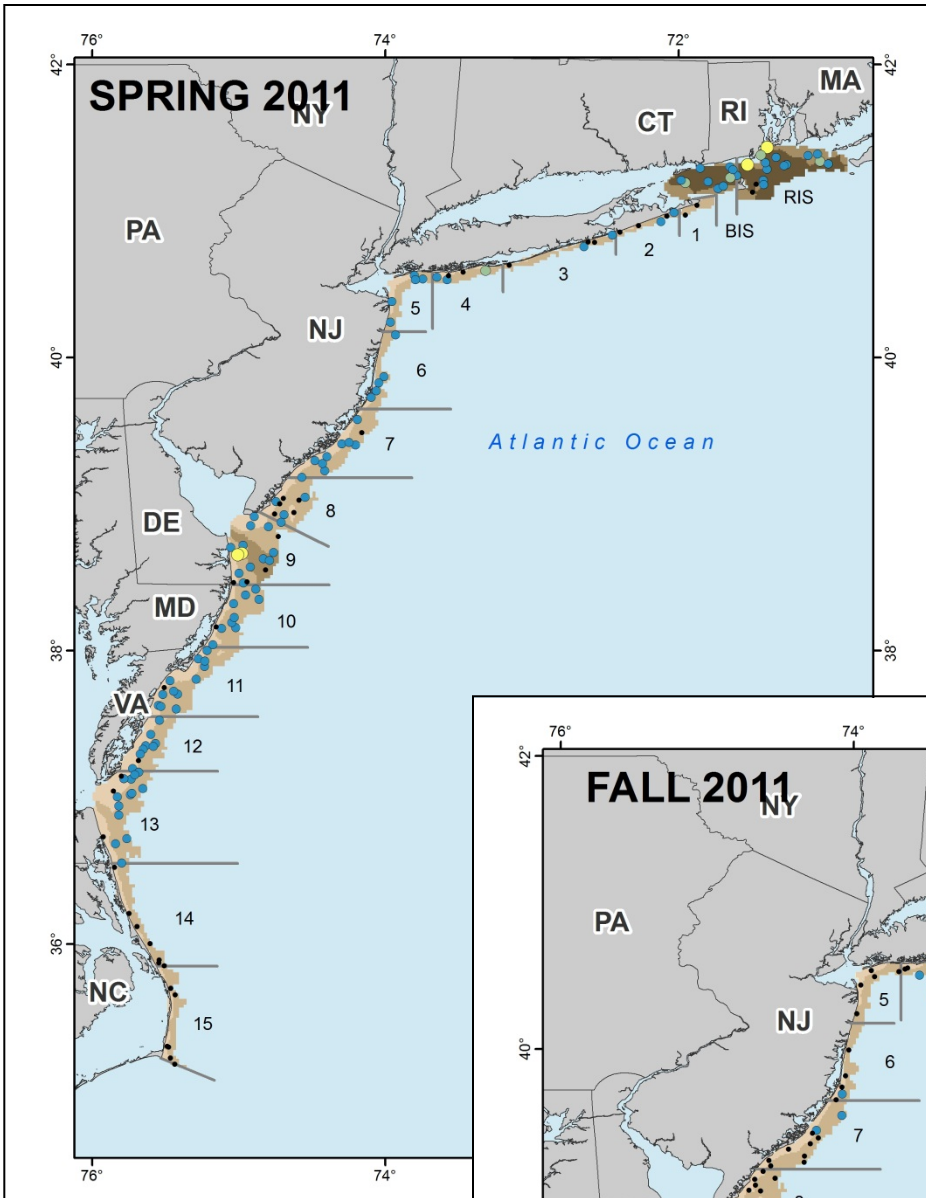


Silver Hake (Whiting)

Sampling Priority: A

Figure 96. Silver hake biomass (kg) at each sampling site for 2011 NEAMAP cruises.





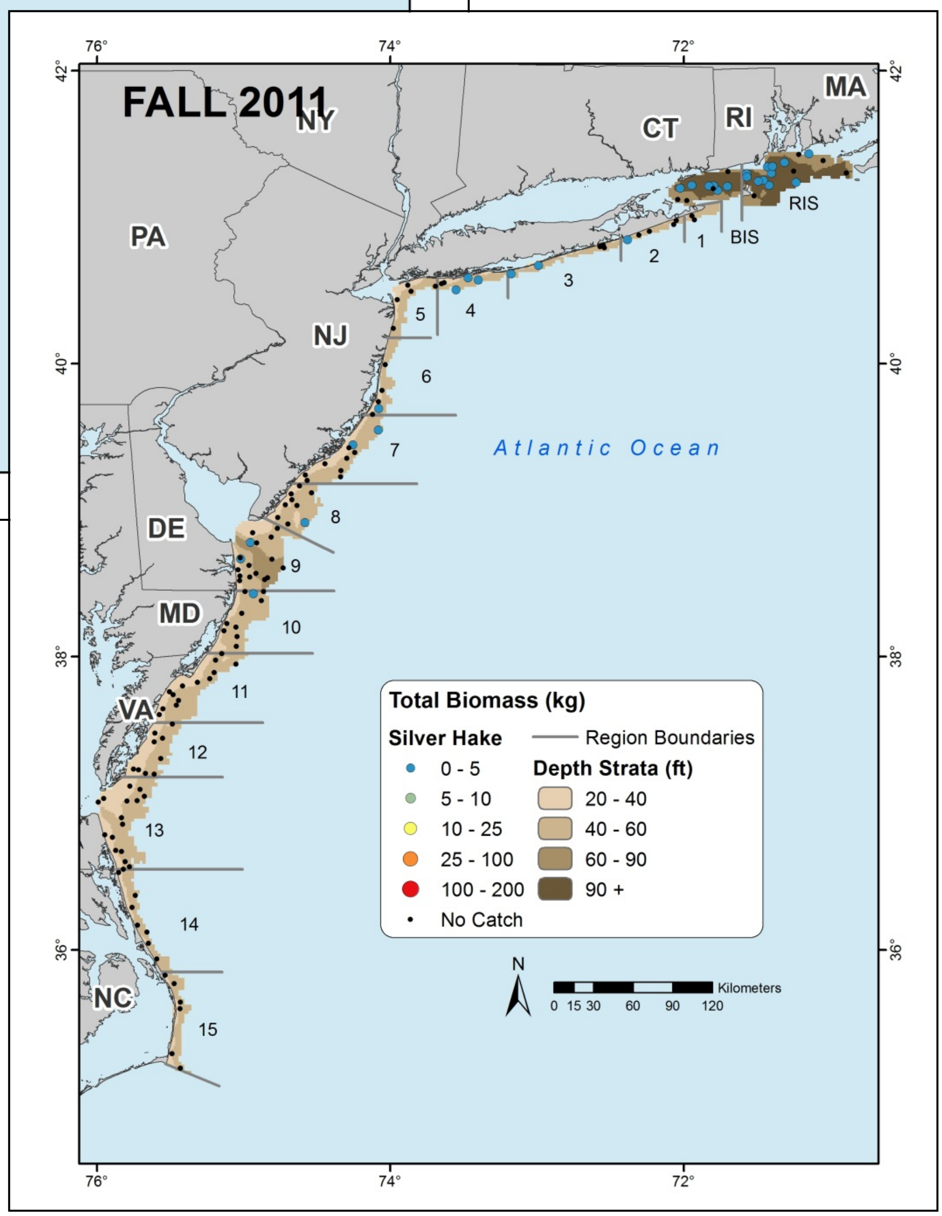


Table 59. Silver hake sampling rates and preserved specimen analysis status for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught (kg)	Number Measured	Age Specimens	Ages Read	Stomach Specimens	Stomachs Analyzed
Spring	2008	28,765	549.8	3,063	409	0	398	392
	2009	5,153	105.7	1,789	406	0	402	398
	2010	10,483	155.3	2,378	380	0	376	314
	2011	8,675	174.6	5,631	572	0	527	519
Fall	2007	346	24.8	346	59	0	59	59
	2008	3,133	199.9	523	96	0	88	87
	2009	1,470	17.3	499	125	0	122	116
	2010	440	18.2	409	124	0	122	119
	2011	1,057	35.8	503	135	0	130	0

Table 60. Strata used for calculation of abundance indices for silver hake.

State (Nominal)	Region	Depth Stratum	Spring Index	Fall Index
RI	RIS	60-90	[red]	[red]
		90+	[red]	[red]
	BIS	60-90	[red]	[red]
		90+	[red]	[red]
NY	01	40-60	[red]	[red]
	02	20-40	[red]	[red]
		40-60	[red]	[red]
	03	20-40	[red]	[red]
		40-60	[red]	[red]
	04	20-40	[red]	[red]
		40-60	[red]	[red]
	05	20-40	[red]	[red]
		40-60	[red]	[red]
NJ	06	20-40	[red]	[red]
		40-60	[red]	[red]
	07	20-40	[red]	[red]
		40-60	[red]	[red]
	08	20-40	[red]	[red]
		40-60	[red]	[red]
DE	09	20-40	[red]	[red]
		40-60	[red]	[red]
		60-90	[red]	[red]
MD	10	20-40	[red]	[grey]
		40-60	[red]	[grey]
VA	11	20-40	[red]	[grey]
		40-60	[red]	[grey]
	12	20-40	[red]	[grey]
		40-60	[red]	[grey]
	13	20-40	[red]	[grey]
		40-60	[red]	[grey]
NC	14	20-40	[grey]	[grey]
		40-60	[grey]	[grey]
	15	20-40	[grey]	[grey]
		40-60	[grey]	[grey]

[red] = used for abundance indices
[grey] = not used for abundance indices

Table 61. Silver hake preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured and for the youngest year class captured (numbers only).

Season	Year	Age	Numerical Index					Biomass Index				
			n	LCI	**Index**	UCI	CV (%)	n	LCI	**Index**	UCI	CV (%)
Spring	2008	All	137	5.61	**7.48**	9.87	5.8	137	0.61	**0.81**	1.03	9.7
	2009		145	2.64	**3.62**	4.85	7.7	145	0.20	**0.31**	0.42	15.8
	2010		137	3.35	**4.54**	6.06	7.0	137	0.24	**0.35**	0.47	14.1
	2011		137	9.23	**12.39**	16.53	5.2	137	0.55	**0.69**	0.85	8.6
Fall	2007	All	84	0.33	**0.65**	1.04	21.3	84	0.03	**0.11**	0.21	37.9
	2008		89	0.43	**0.87**	1.45	21.4	89	0.00	**0.16**	0.35	48.9
	2009		96	0.56	**1.00**	1.55	17.7	96	0.01	**0.08**	0.17	46.6
	2010		89	0.65	**1.04**	1.52	14.7	89	0.07	**0.14**	0.22	25.0
	2011		89	0.88	**1.31**	1.83	12.3	89	0.15	**0.24**	0.35	18.2
Fall	2007	0	137	4.30	**5.69**	7.46	6.2	137	0.48	**0.65**	0.83	10.6
	2008		145	1.86	**2.59**	3.51	8.9	145	0.07	**0.15**	0.23	25.0
	2009		137	2.48	**3.37**	4.50	7.7	137	0.17	**0.26**	0.36	16.6
	2010		137	6.85	**9.39**	12.74	6.0	137	0.32	**0.42**	0.52	10.4
	2011		84	0.13	**0.29**	0.48	26.4	84	0.00	**0.01**	0.02	45.0
Spring	2008	1	89	0.25	**0.49**	0.79	22.5	89	0.00	**0.06**	0.12	54.4
	2009		96	0.48	**0.89**	1.40	19.1	96	0.00	**0.06**	0.14	56.1
	2010		89	0.29	**0.48**	0.69	17.1	89	0.01	**0.02**	0.02	21.9
	2011		89	0.41	**0.68**	1.00	16.8	89	0.02	**0.06**	0.10	35.7

Figure 97. Silver hake preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured (A) and for the youngest year class captured (B – numbers only).

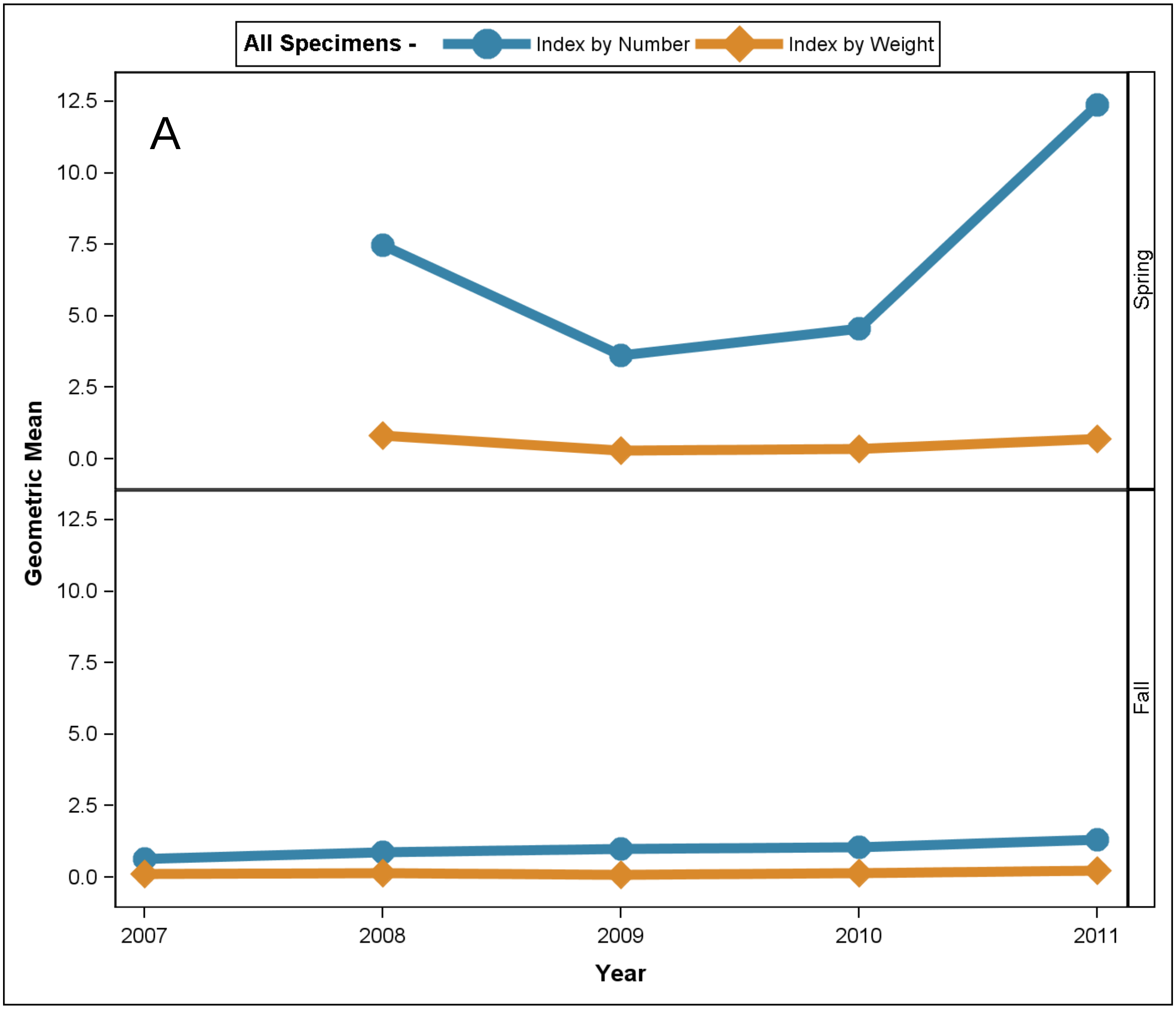


Figure 98. Silver hake length-frequency distributions, by cruise (Blue reference lines are placed at the size cutoff values used to separate recruits from older specimens. Cutoff values - Spring 14cm, Fall 17cm - estimated by examination of these length frequency figures.).

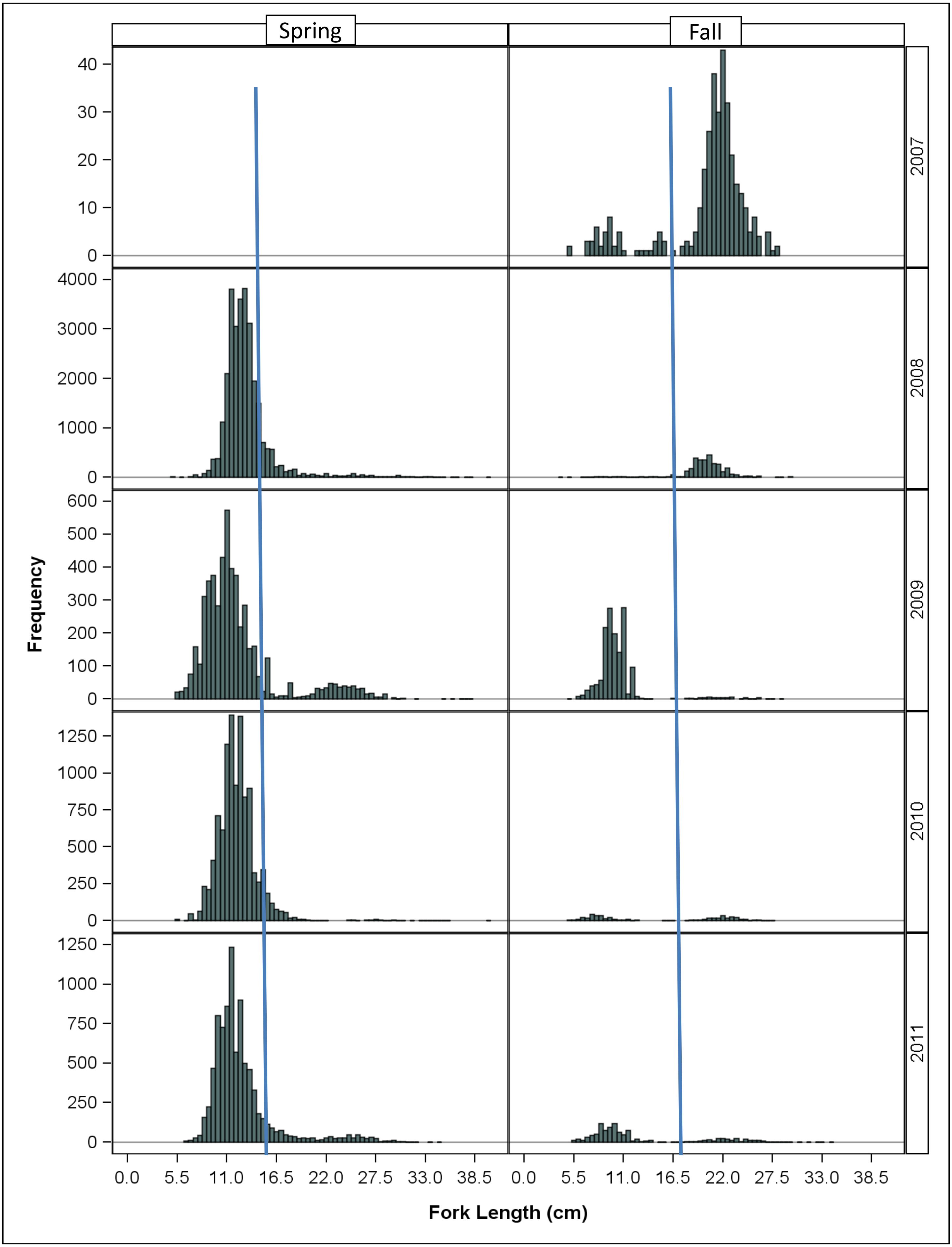


Figure 99. Silver hake length-frequency distributions, by cruise and sex.

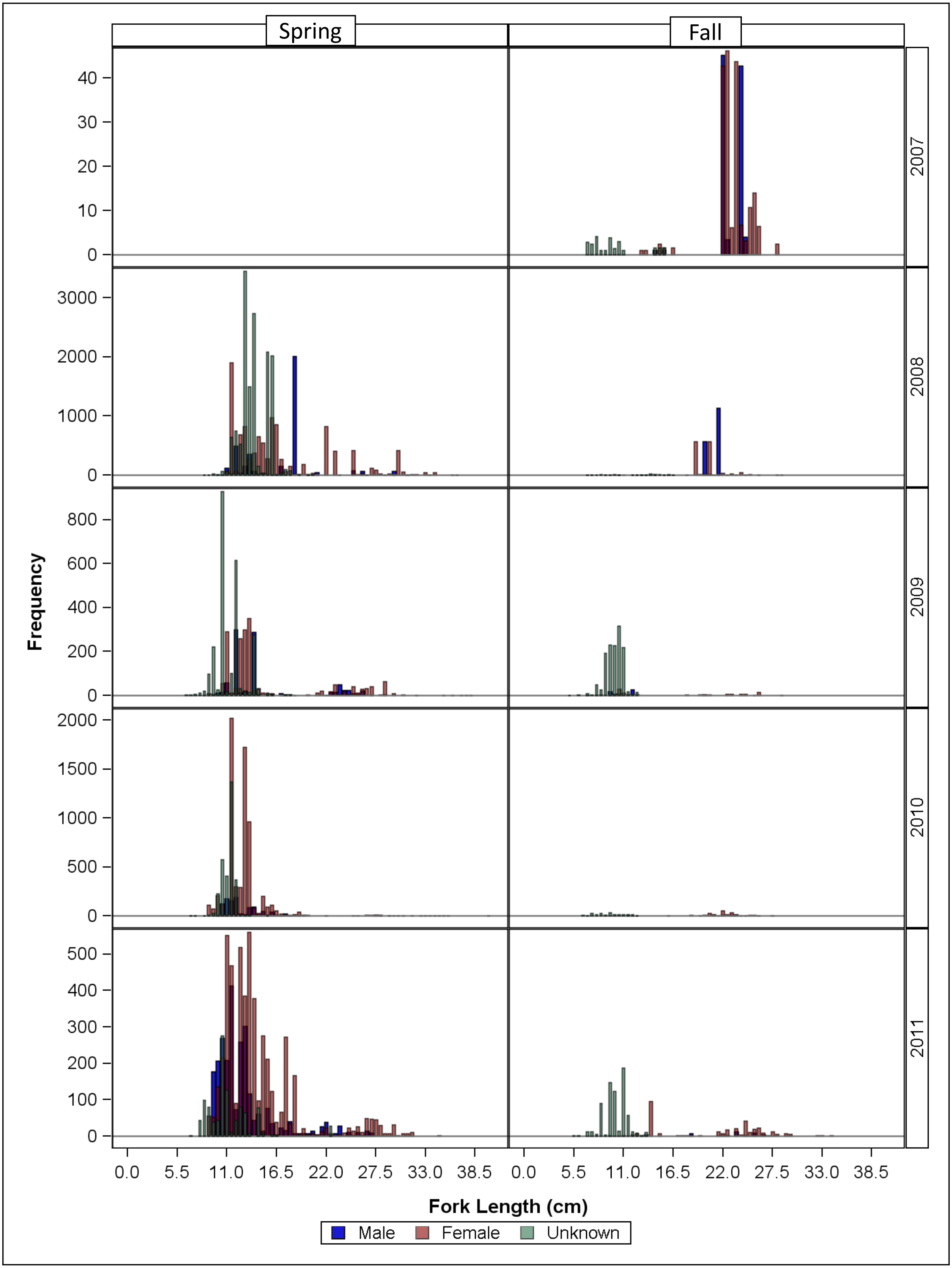


Figure 100. Silver hake sex ratio, by length group, for NEAMAP Spring and Fall cruises 2007-2011.
(The percentages for each category are given near the bottom of each bar. The number sampled for sex determination is provided near the top of each bar, and the length categories expressed in inches are shown between the two figures.).

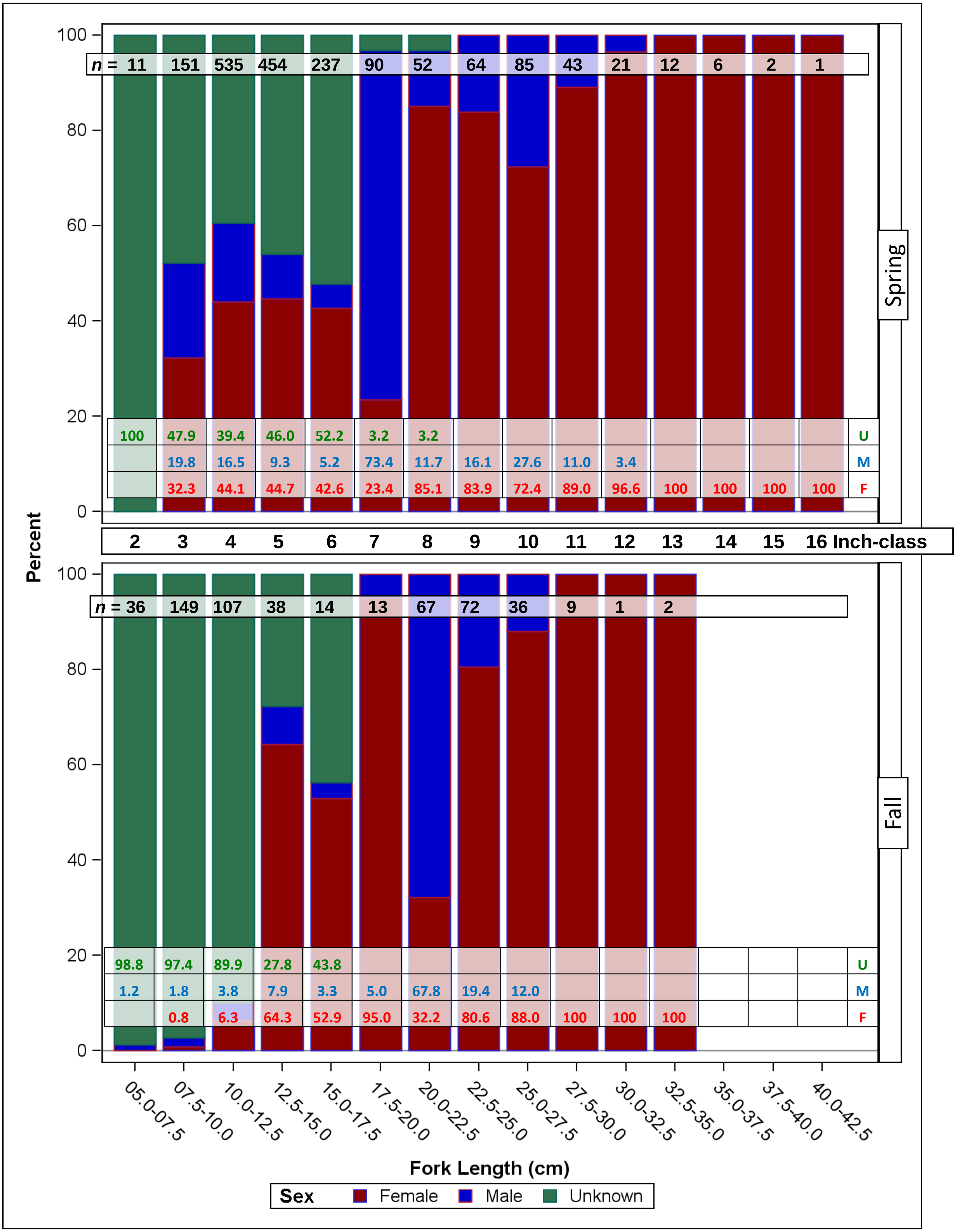
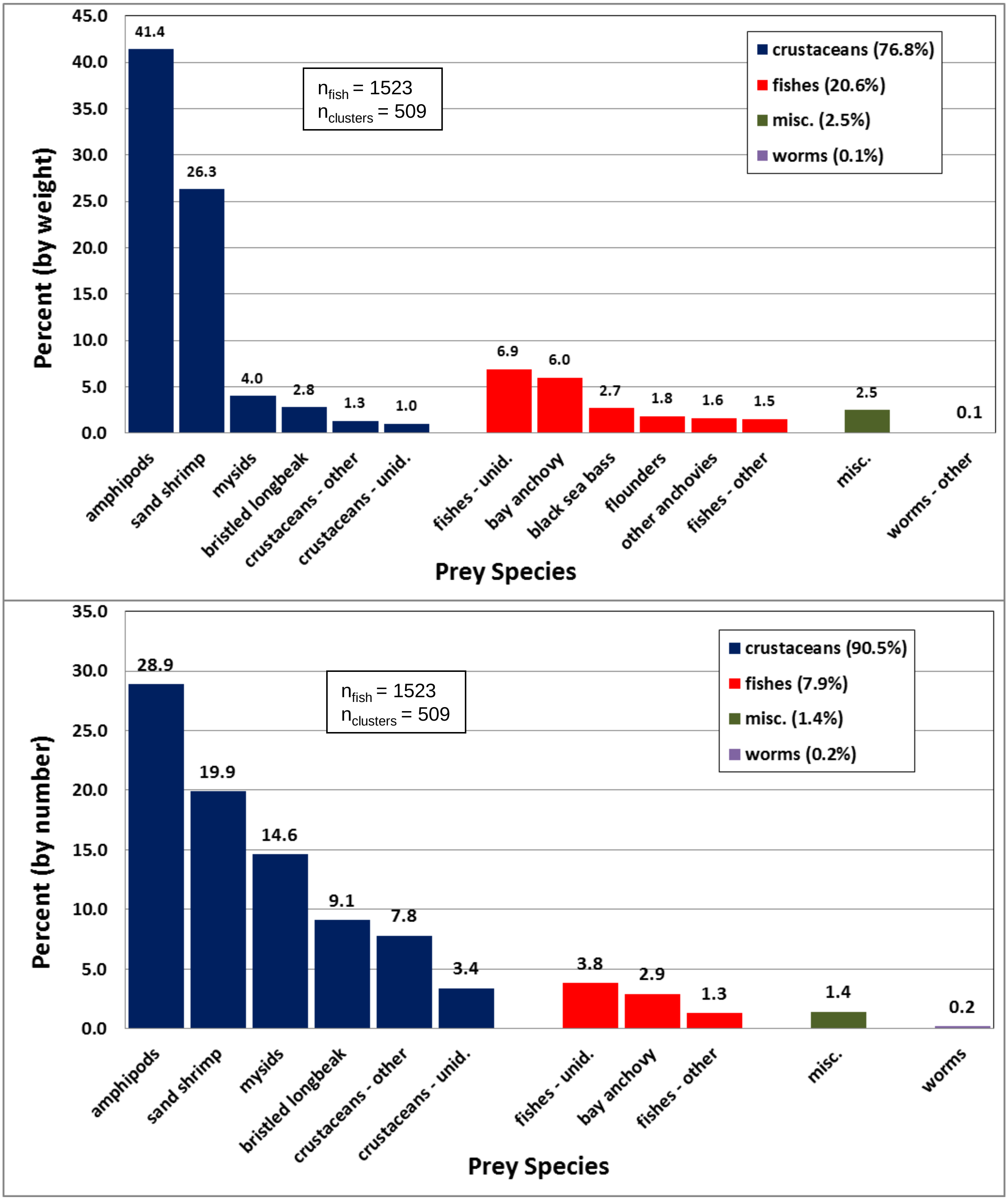


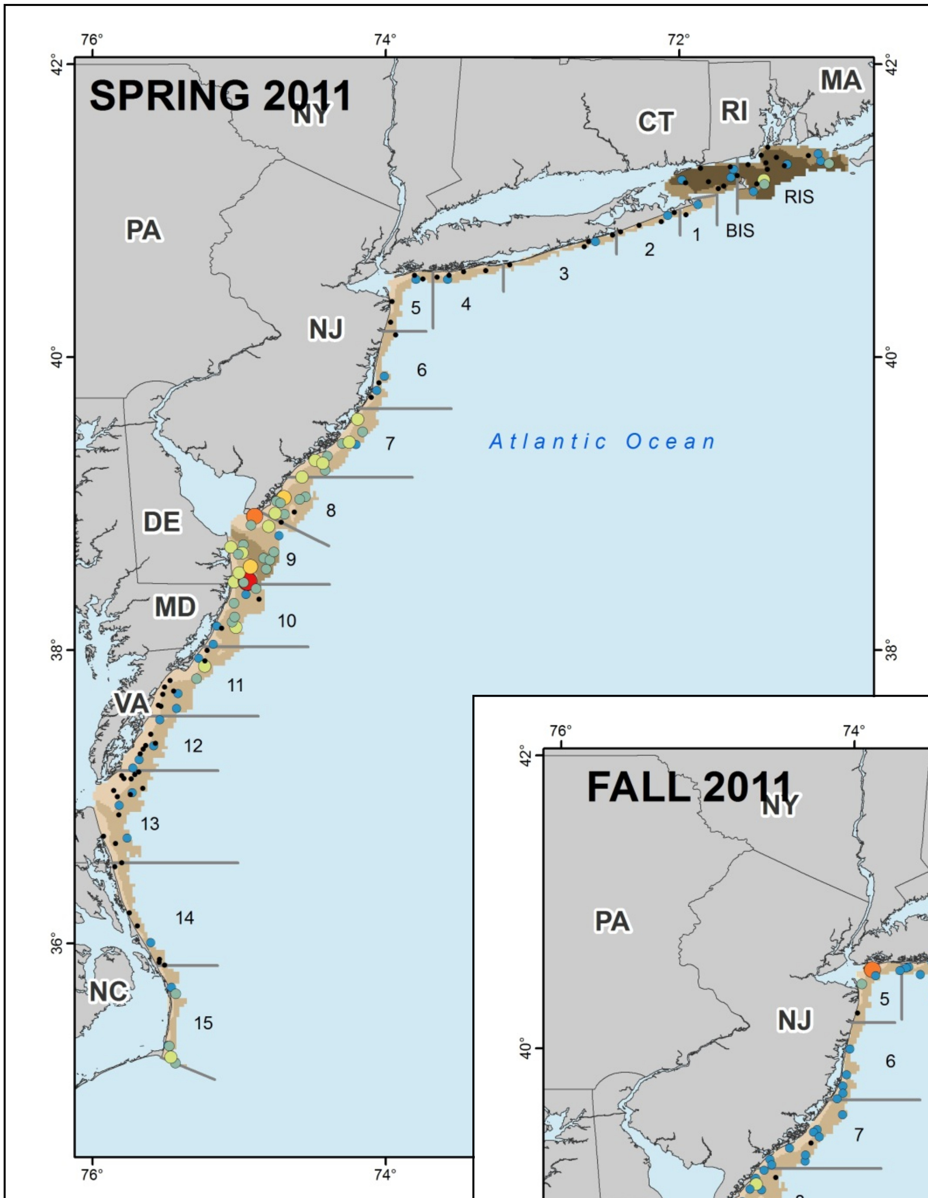
Figure 101. Silver hake diet composition, expressed as percent by weight and number collected during NEAMAP cruises in 2007 through Spring 2011. (The number of fish sampled for diet is given by n_{fish}, while $n_{clusters}$ indicates the number of clusters of this species sampled.)



Smooth Dogfish

Sampling Priority: A

Figure 102. Smooth dogfish biomass (kg)at each sampling site for 2011 NEAMAP cruises.



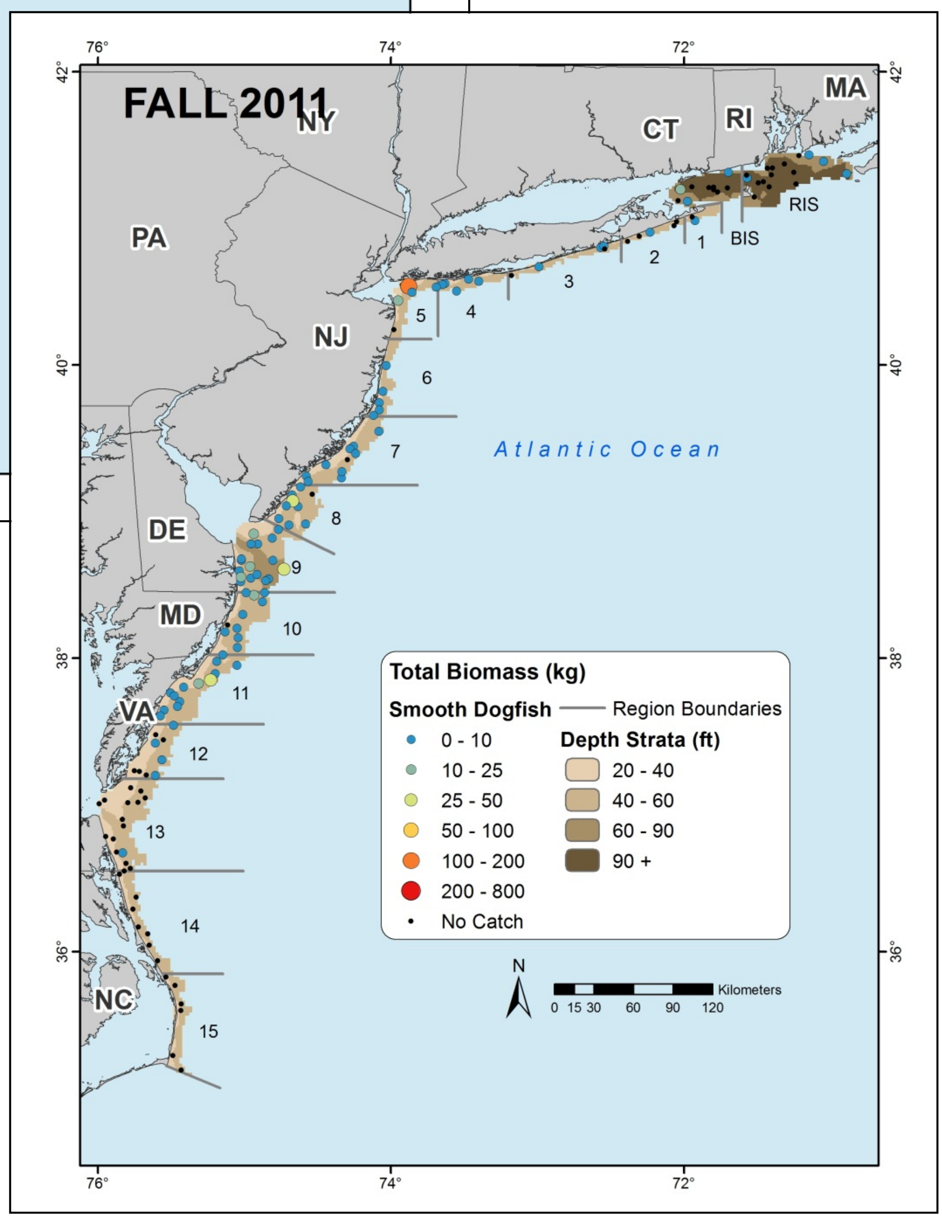


Table 62. Smooth dogfish sampling rates and preserved specimen analysis status for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught (kg)	Number Measured	Age Specimens	Ages Read	Stomach Specimens	Stomachs Analyzed
Spring	2008	927	2501.7	688	297	0	288	286
	2009	947	2741.4	725	236	0	221	216
	2010	402	1232.6	399	188	0	181	174
	2011	521	1741.5	458	186	0	169	165
Fall	2007	1,684	1548.7	759	196	0	194	192
	2008	414	365.4	386	162	0	161	161
	2009	1,156	843.5	1,156	333	0	330	323
	2010	758	691.1	602	223	0	215	215
	2011	606	616.9	606	205	0	200	0

Table 63. Strata used for calculation of abundance indices for smooth dogfish.

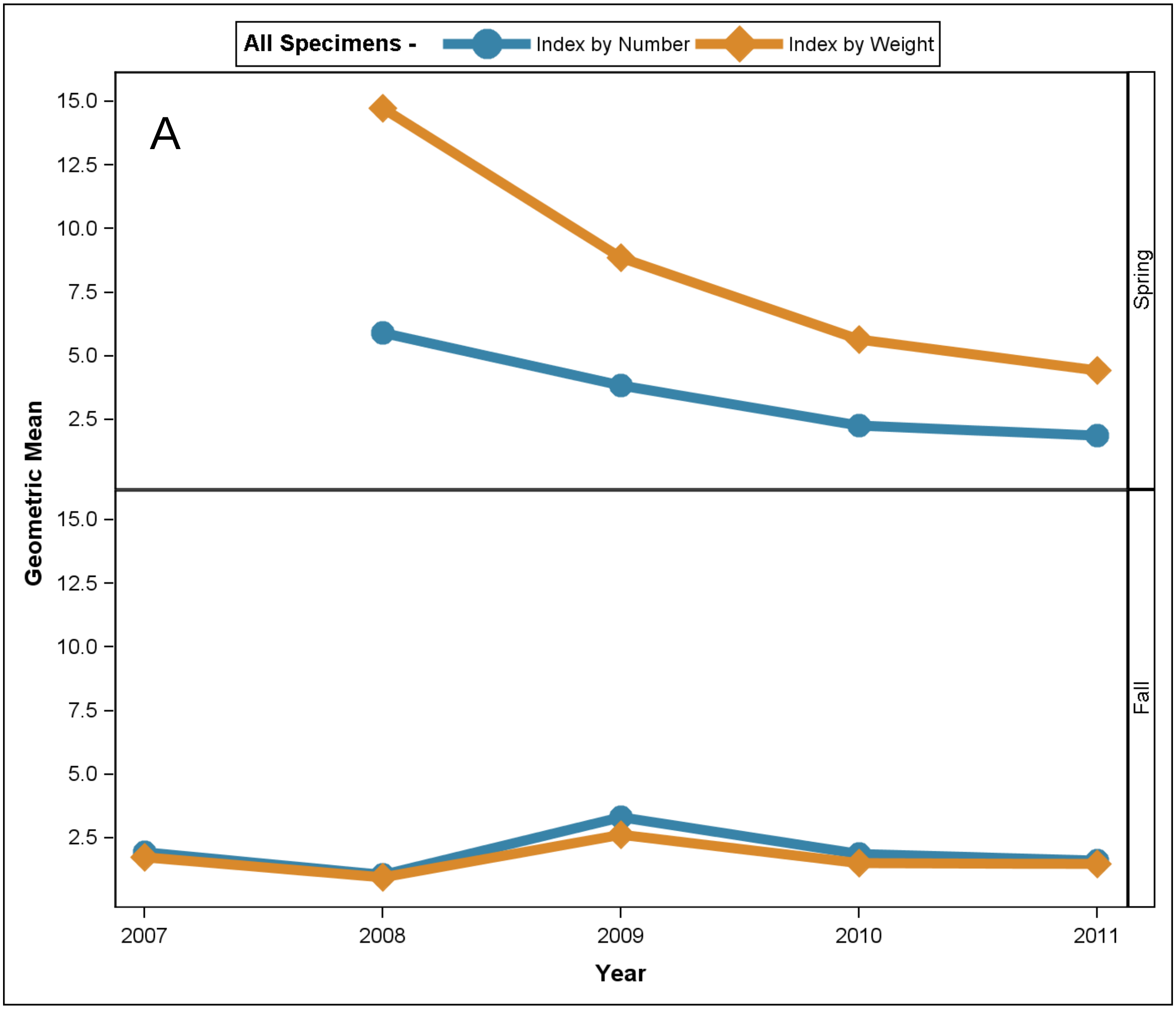
State (Nominal)	Region	Depth Stratum	Spring Index	Fall Index
RI	RIS	60-90	not used	used
		90+	not used	used
	BIS	60-90	not used	used
		90+	not used	used
NY	01	40-60	not used	used
	02	20-40	not used	used
		40-60	not used	used
	03	20-40	not used	used
		40-60	not used	used
	04	20-40	not used	used
		40-60	not used	used
	05	20-40	not used	used
		40-60	not used	used
NJ	06	20-40	used	used
		40-60	used	used
	07	20-40	used	used
		40-60	used	used
	08	20-40	used	used
		40-60	used	used
DE	09	20-40	used	used
		40-60	used	used
		60-90	used	used
MD	10	20-40	used	used
		40-60	used	used
VA	11	20-40	used	used
		40-60	used	used
	12	20-40	used	used
		40-60	used	used
	13	20-40	used	used
		40-60	used	used
NC	14	20-40	used	used
		40-60	used	used
	15	20-40	used	used
		40-60	used	used

= used for abundance indices (red)
= not used for abundance indices (grey)

Table 64. Smooth dogfish preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured and for the youngest year class captured (numbers only).

Season	Year	Age	Numerical Index					Biomass Index				
			n	LCI	**Index**	UCI	CV (%)	n	LCI	**Index**	UCI	CV (%)
Spring	2008	All	101	4.82	**5.92**	7.23	4.5	101	11.75	**14.74**	18.43	3.8
	2009		107	3.03	**3.85**	4.85	5.9	107	6.70	**8.87**	11.66	5.4
	2010		102	1.79	**2.28**	2.86	6.9	102	4.31	**5.64**	7.31	5.9
	2011		102	1.52	**1.87**	2.27	6.2	102	3.50	**4.43**	5.56	5.5
Fall	2007	All	150	1.46	**1.94**	2.52	8.4	150	1.30	**1.74**	2.26	8.7
	2008		150	0.79	**1.07**	1.38	9.7	150	0.69	**0.95**	1.25	10.6
	2009		160	2.77	**3.33**	3.98	4.7	160	2.14	**2.64**	3.23	5.7
	2010		150	1.50	**1.86**	2.27	6.4	150	1.19	**1.53**	1.91	7.6
	2011		150	1.34	**1.61**	1.92	5.8	150	1.17	**1.47**	1.82	7.2
Fall	2007	0	150	0.84	**1.15**	1.52	10.2	150	0.56	**0.78**	1.02	11.1
	2008		150	0.44	**0.64**	0.86	12.8	150	0.23	**0.34**	0.45	14.3
	2009		160	2.11	**2.52**	2.99	5.0	160	1.22	**1.46**	1.73	5.7
	2010		150	1.09	**1.35**	1.64	6.9	150	0.65	**0.81**	0.99	8.0
	2011		150	0.88	**1.09**	1.31	7.1	150	0.54	**0.67**	0.82	8.2

Figure 103. Smooth dogfish preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured (A) and for the youngest year class captured (B – numbers only).



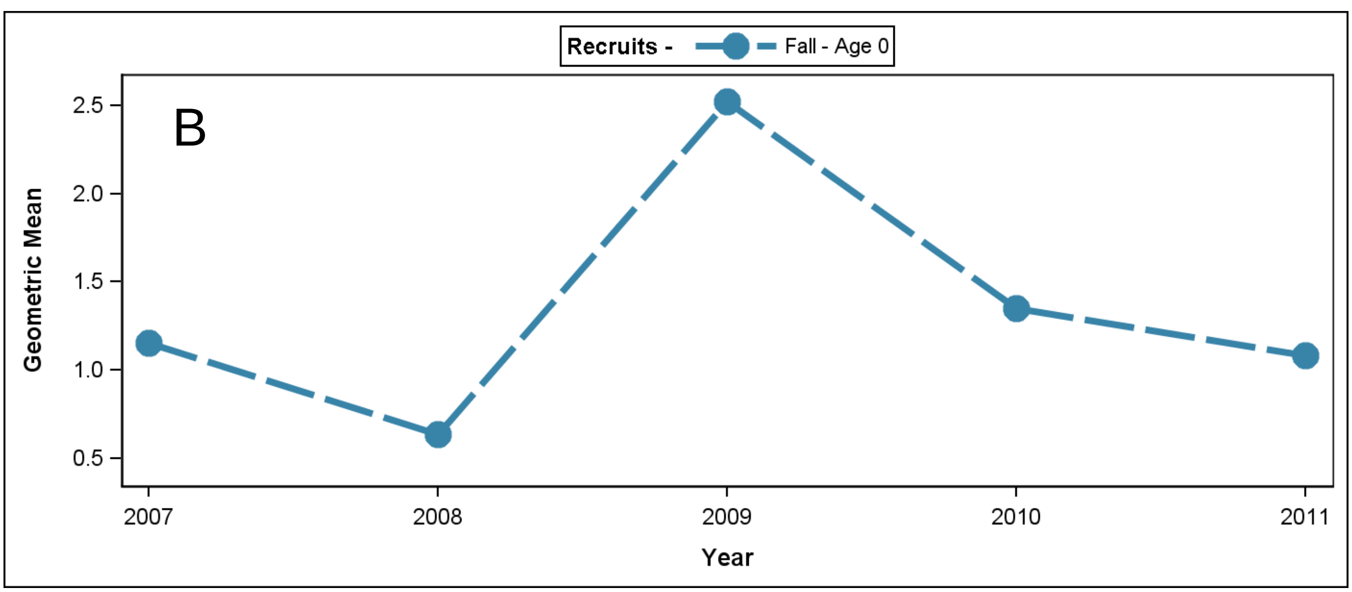


Figure 104. Smooth dogfish length-frequency distributions, by cruise (Blue reference line is placed at the size cutoff value used to separate recruits from older specimens. Cutoff value - Fall 47cm - estimated by examination of these length frequency figures and from Conrath et al., (2002)).

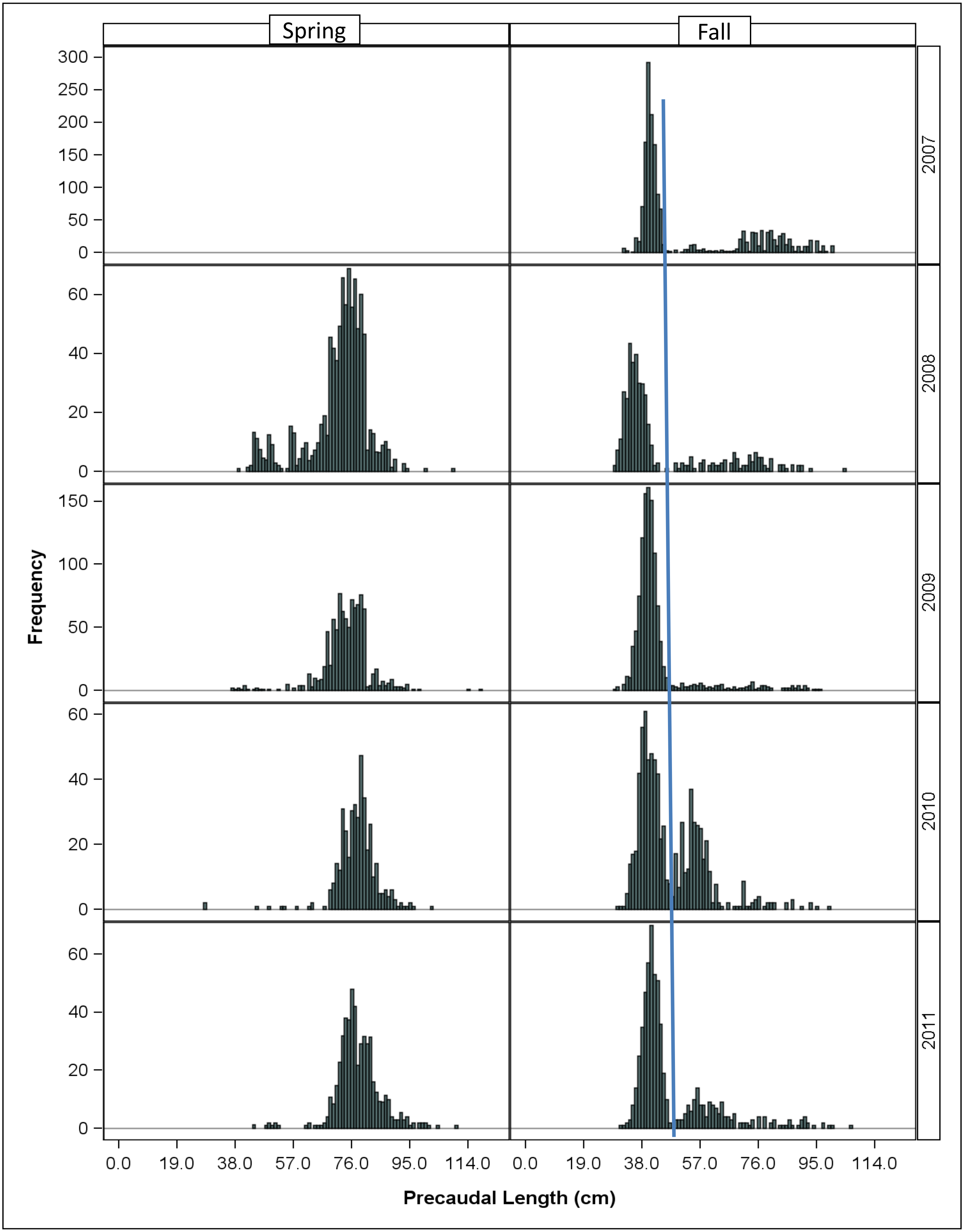


Figure 105. Smooth dogfish length-frequency distributions, by cruise and sex.

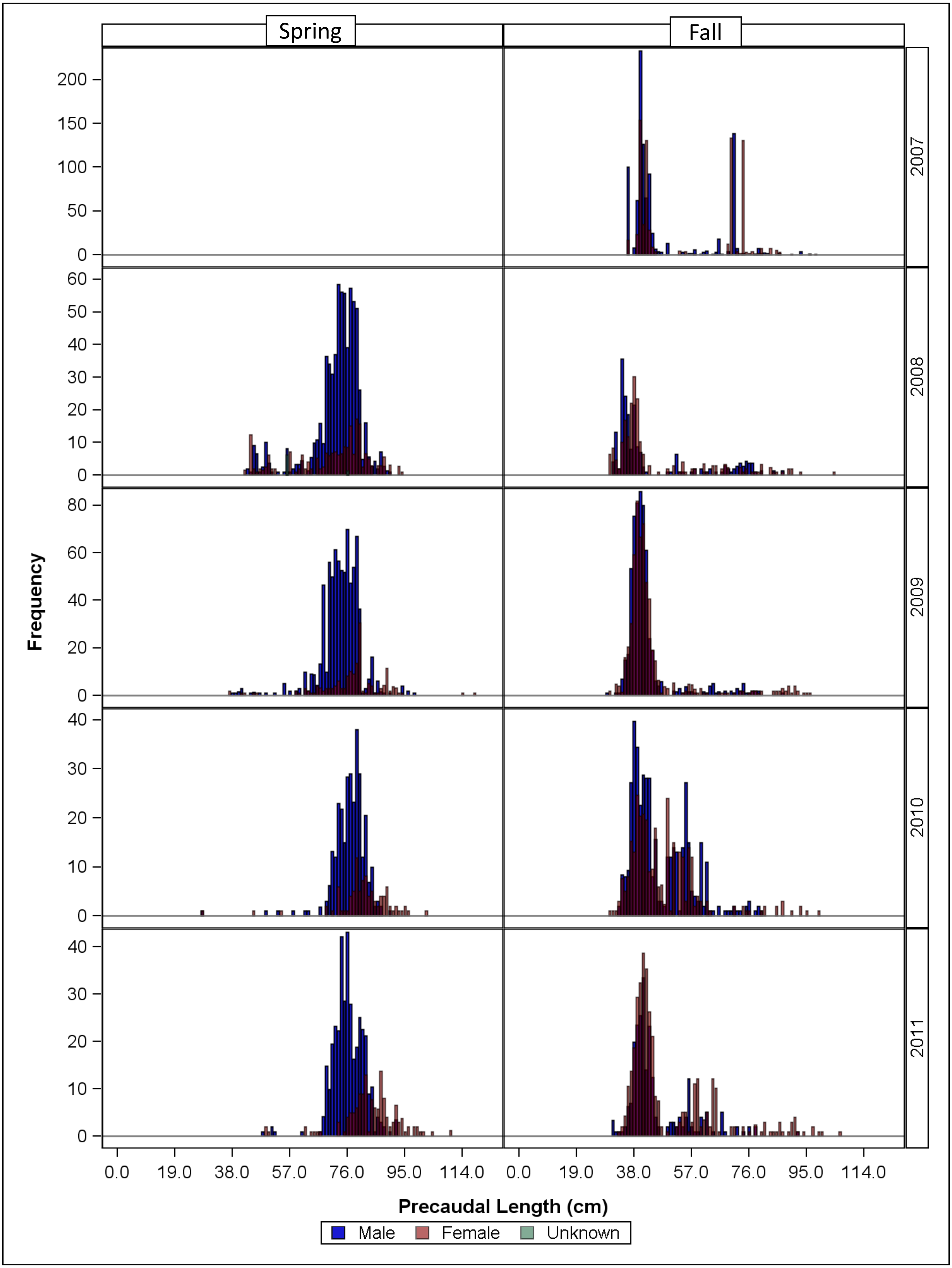


Figure 106. Smooth dogfish sex ratio, by length group, for NEAMAP Spring and Fall cruises 2007-2011. (The percentages for each category are given near the bottom of each bar. The number sampled for sex determination is provided near the top of each bar, and the length categories expressed in inches are shown between the two figures.).

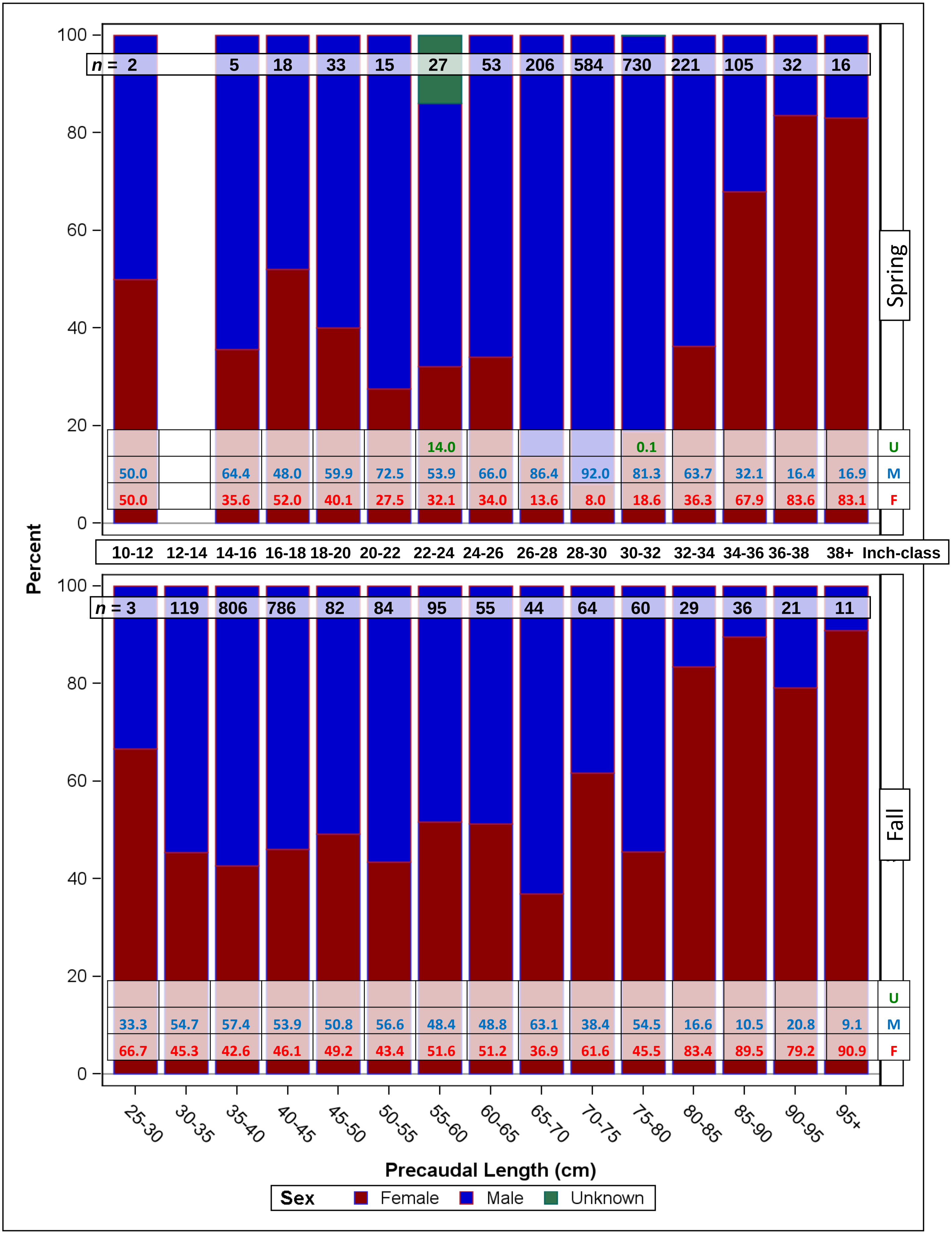
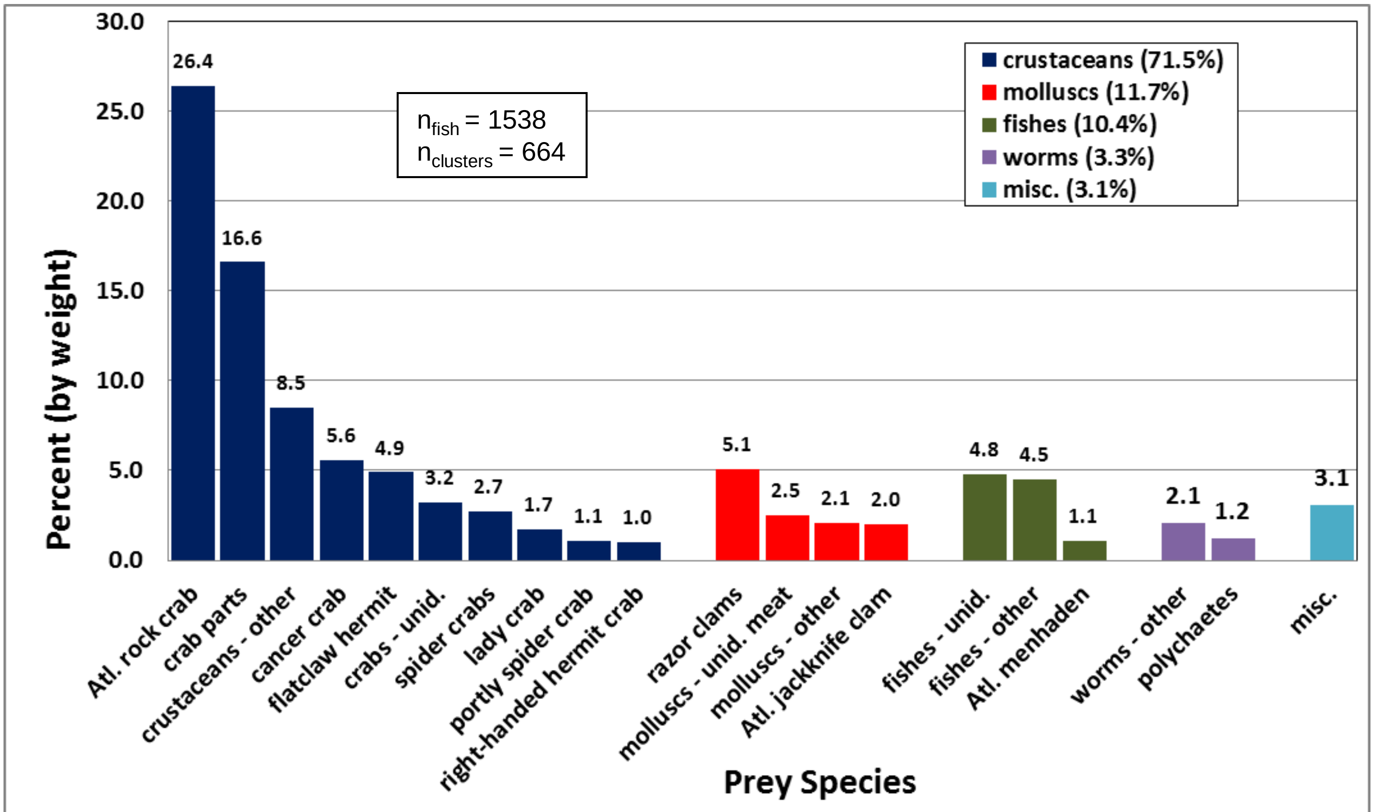
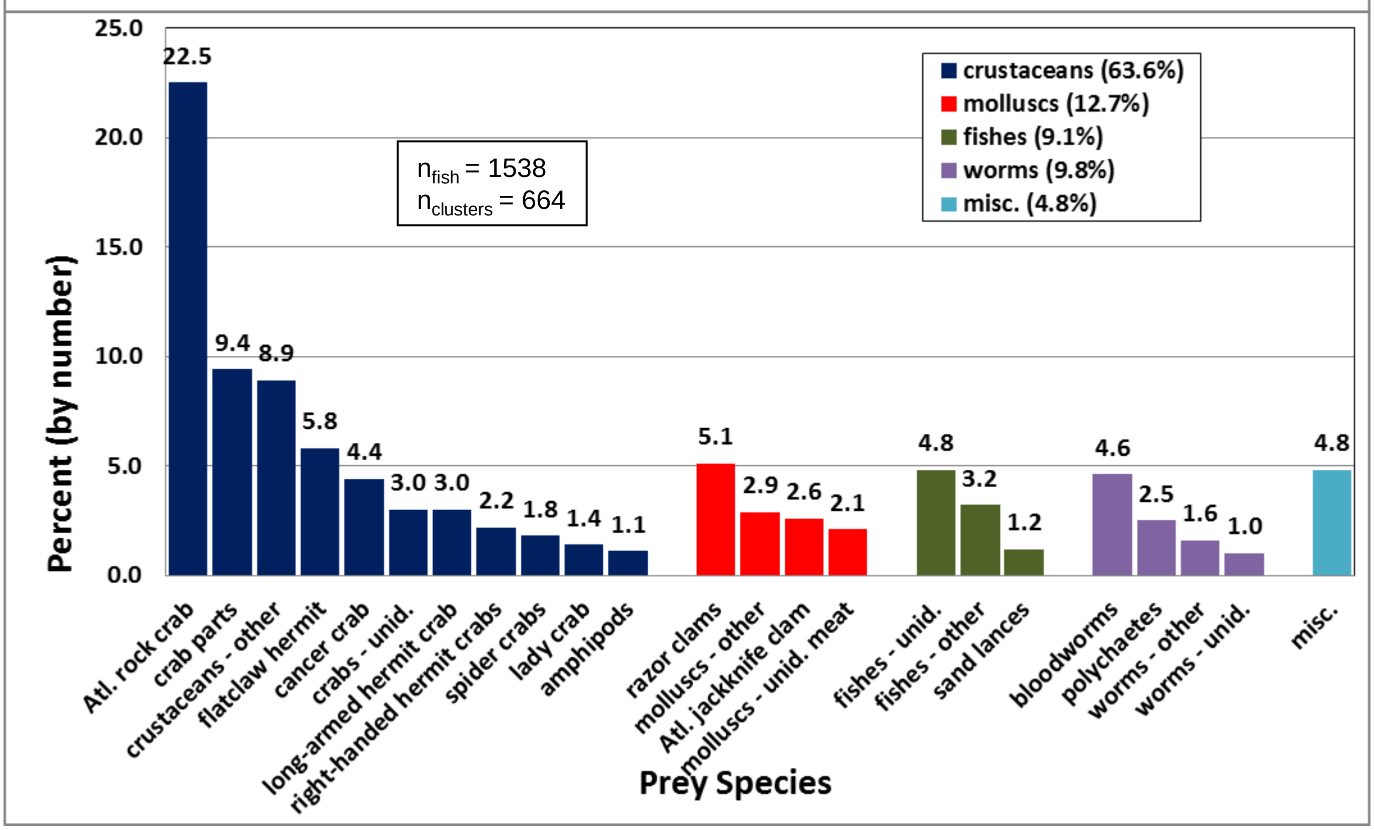


Figure 107. Smooth dogfish diet composition, expressed as percent by weight and number collected during NEAMAP cruises in 2007 through Spring 2011. (The number of fish sampled for diet is given by n_{fish}, while $n_{clusters}$ indicates the number of clusters of this species sampled.)

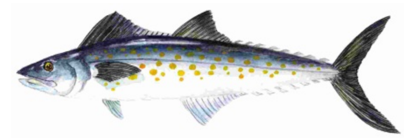


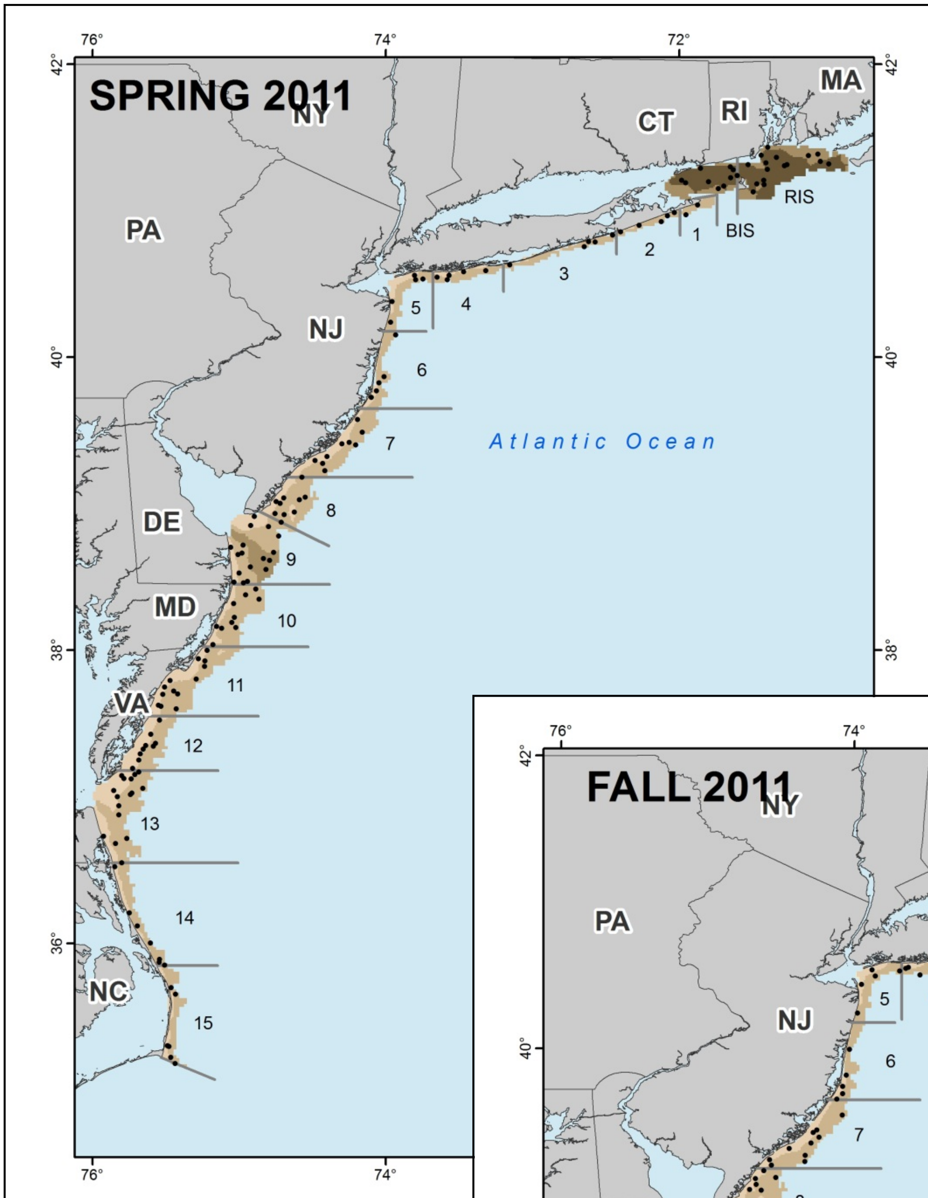


Spanish Mackerel

Sampling Priority: A

Figure 108. Spanish mackerel biomass (kg) at each sampling site for 2011 NEAMAP cruises.





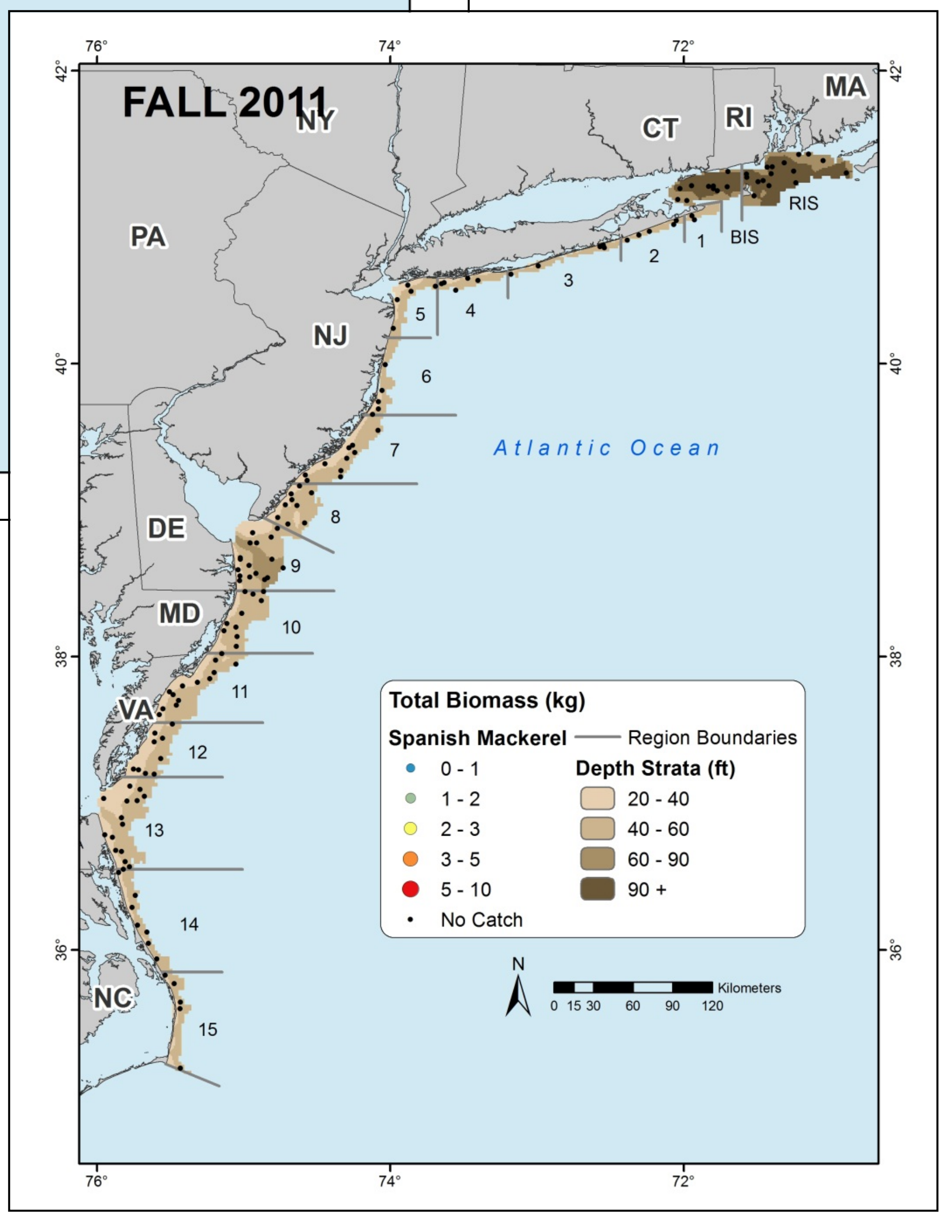


Table 65. Spanish mackerel sampling rates and preserved specimen analysis status for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught (kg)	Number Measured	Age Specimens	Ages Read	Stomach Specimens	Stomachs Analyzed
Spring	2008	0	0.0	0	0	0	0	0
	2009	0	0.0	0	0	0	0	0
	2010	0	0.0	0	0	0	0	0
	2011	0	0.0	0	0	0	0	0
Fall	2007	161	42.5	161	0	0	0	0
	2008	14	2.0	14	0	0	0	0
	2009	31	3.9	31	12	0	10	10
	2010	141	9.6	141	17	0	17	17
	2011	9	0.6	9	6	0	5	0

Table 66. Strata used for calculation of abundance indices for Spanish mackerel.

State (Nominal)	Region	Depth Stratum	Spring Index	Fall Index
RI	RIS	60-90	not used	not used
		90+	not used	not used
	BIS	60-90	not used	not used
		90+	not used	not used
NY	01	40-60	not used	not used
	02	20-40	not used	not used
		40-60	not used	not used
	03	20-40	not used	not used
		40-60	not used	not used
	04	20-40	not used	not used
		40-60	not used	not used
	05	20-40	not used	not used
		40-60	not used	not used
NJ	06	20-40	not used	not used
		40-60	not used	not used
	07	20-40	not used	not used
		40-60	not used	not used
	08	20-40	not used	not used
		40-60	not used	not used
DE	09	20-40	not used	not used
		40-60	not used	not used
		60-90	not used	not used
MD	10	20-40	not used	not used
		40-60	not used	not used
VA	11	20-40	not used	not used
		40-60	not used	not used
	12	20-40	not used	not used
		40-60	not used	not used
	13	20-40	not used	not used
		40-60	not used	not used
NC	14	20-40	not used	used
		40-60	not used	used
	15	20-40	not used	used
		40-60	not used	used

(red) = used for abundance indices
(grey) = not used for abundance indices

Table 67. Spanish mackerel preliminary geometric mean indices of abundance, by number and biomass, for fall NEAMAP surveys, for all specimens captured.

Season	Year	Age	Numerical Index					Biomass Index				
			n	LCI	**Index**	UCI	CV (%)	n	LCI	**Index**	UCI	CV (%)
Fall	2007	All	13	0.63	**1.74**	3.60	25.8	13	0.32	**0.73**	1.25	24.5
	2008		13	0.00	**0.27**	1.05	100.0	13	0.00	**0.10**	0.33	100.0
	2009		15	0.00	**0.35**	1.06	71.8	15	0.00	**0.11**	0.28	70.8
	2010		13	0.12	**1.47**	4.45	43.9	13	0.00	**0.33**	0.96	69.2
	2011		13	0.00	**0.20**	0.73	100.0	13	0.00	**0.03**	0.10	100.0

Figure 109. Spanish mackerel preliminary geometric mean indices of abundance, by number and biomass, for fall NEAMAP surveys, for all specimens captured.

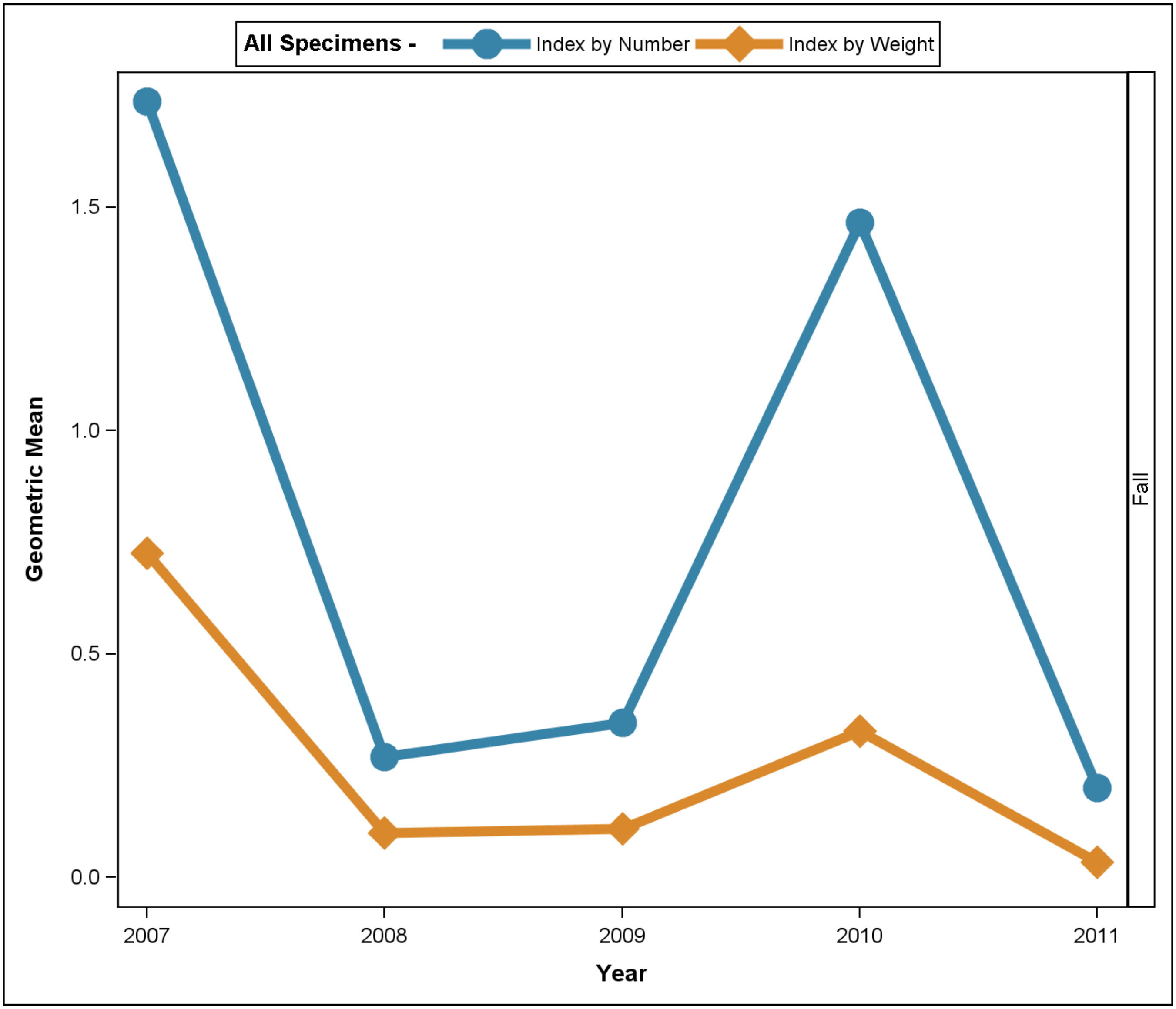


Figure 110. Spanish mackerel length-frequency distributions, by cruise .

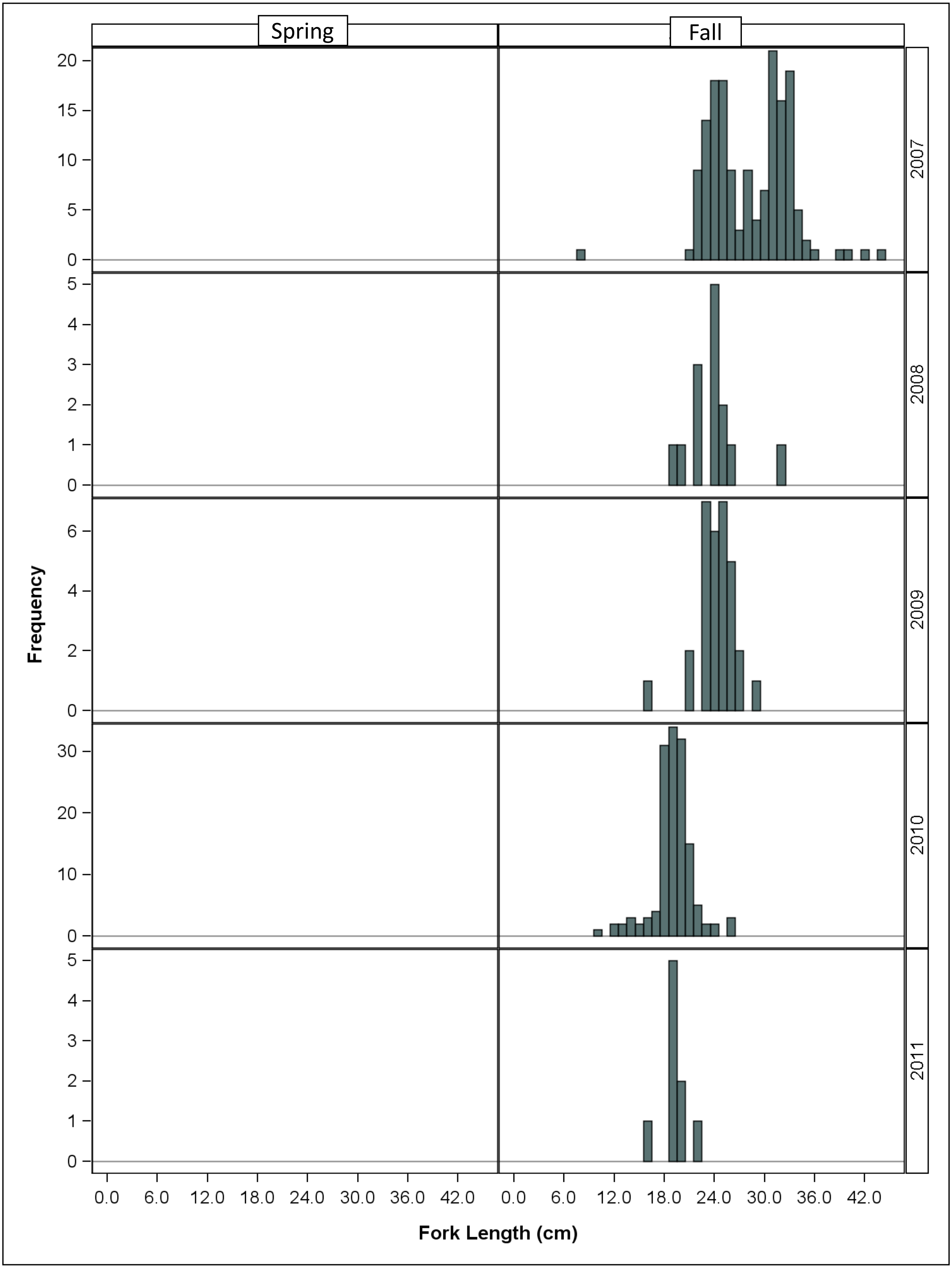


Figure 111. Spanish mackerel length-frequency distributions, by cruise and sex.

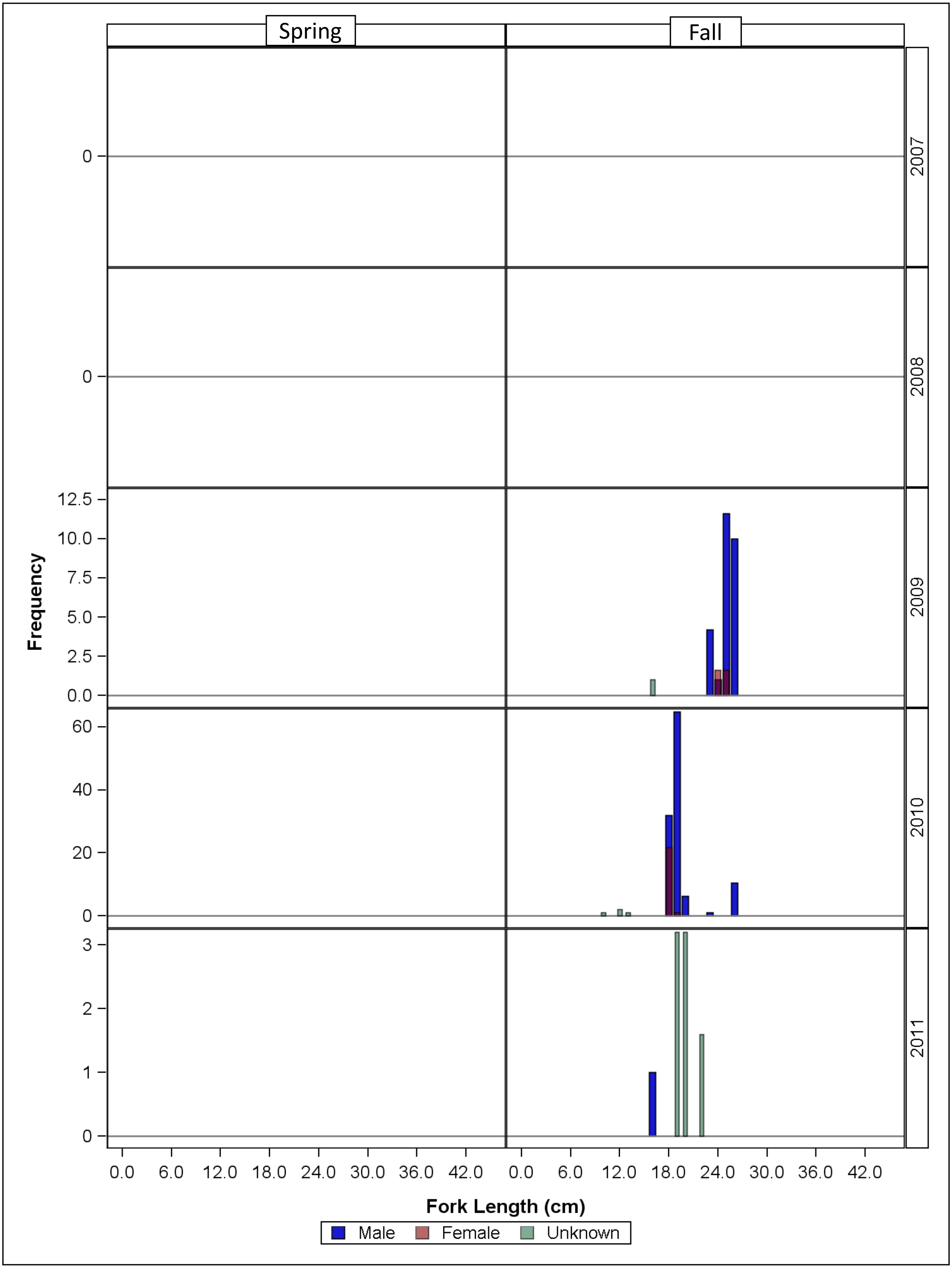
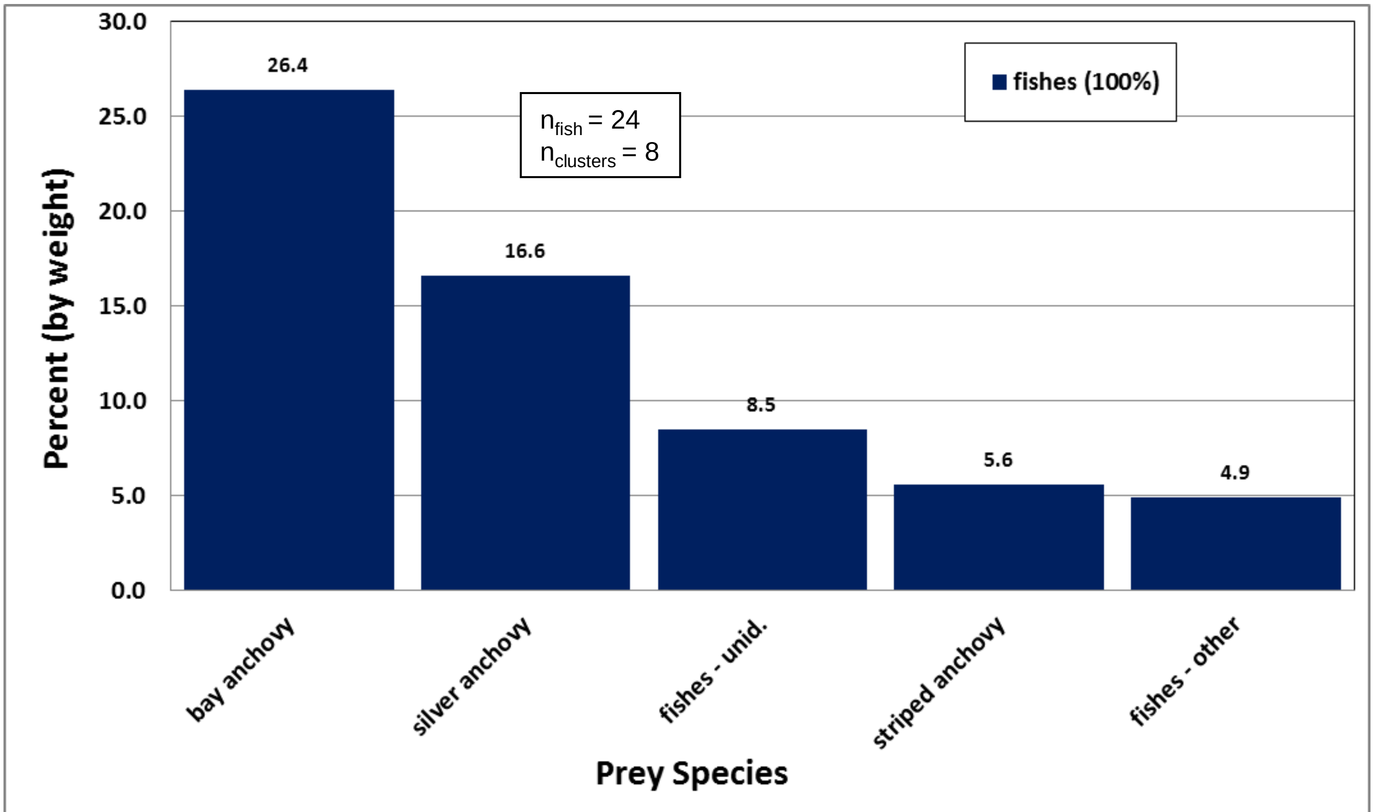
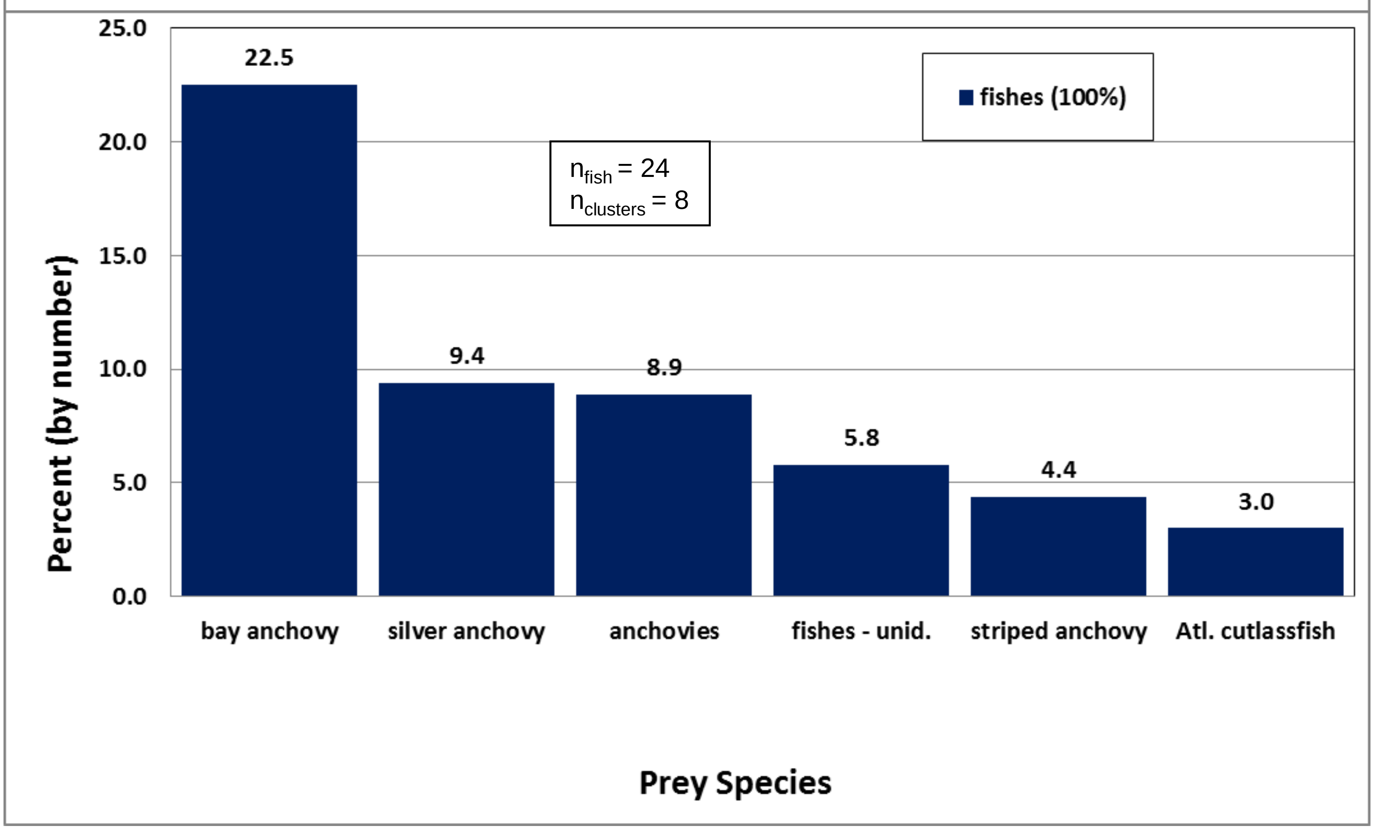


Figure 112. Spanish mackerel diet composition, expressed as percent by weight and number collected during NEAMAP cruises in 2007 through Spring 2011. (The number of fish sampled for diet is given by n_{fish}, while $n_{clusters}$ indicates the number of clusters of this species sampled. Note the very small sample size.)

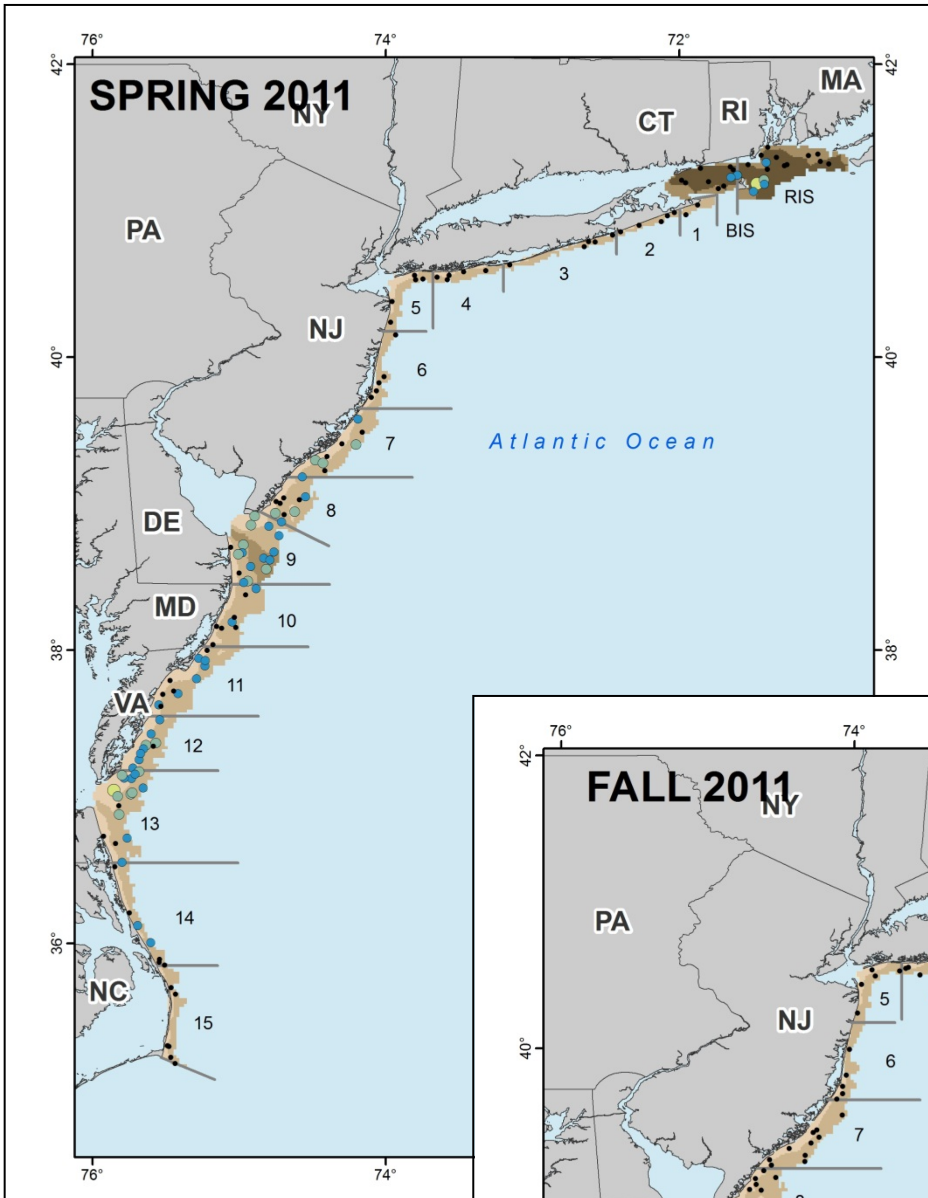




Spiny Dogfish

Sampling Priority: A

Figure 113. Spiny dogfish biomass (kg) at each sampling site for 2011 NEAMAP cruises.



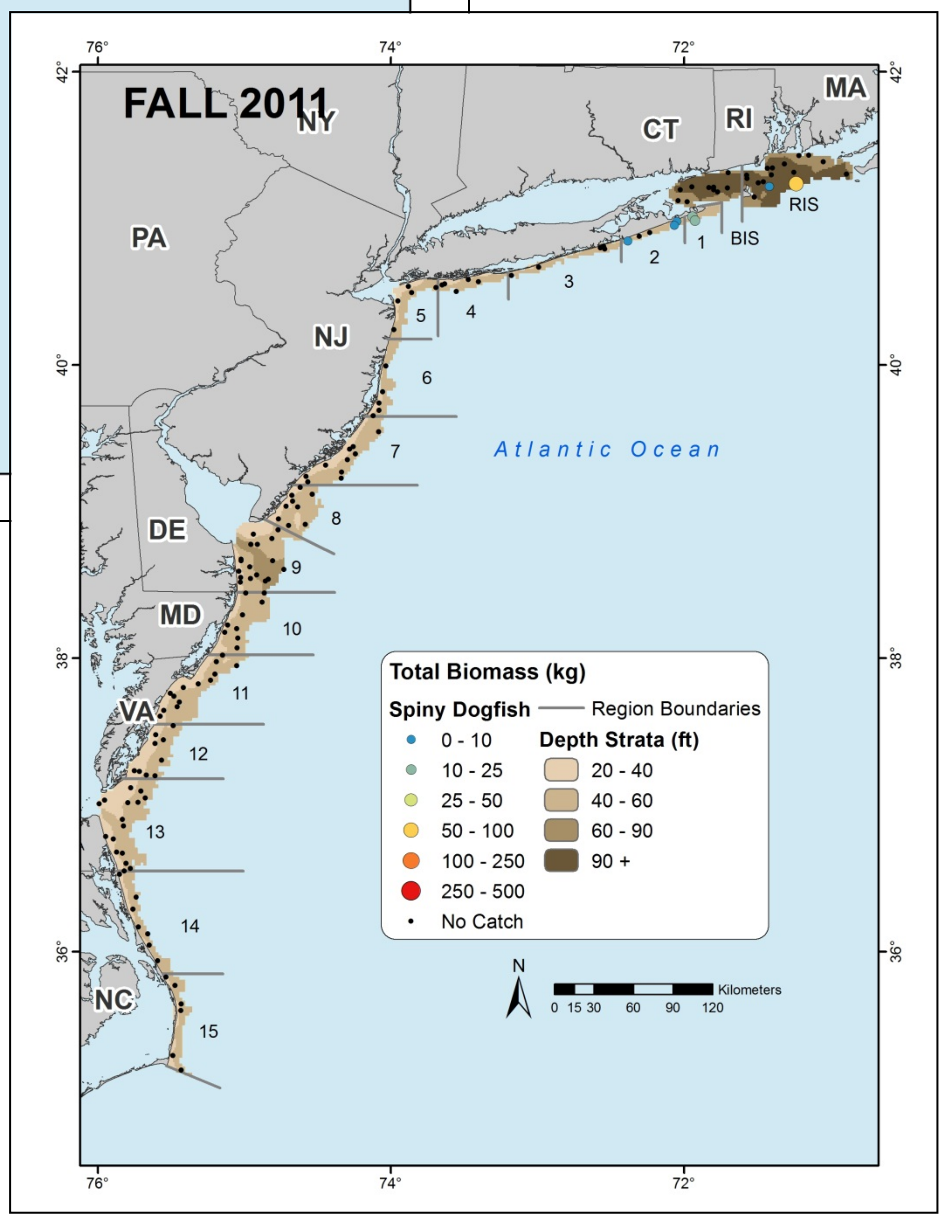


Table 68. Spiny dogfish sampling rates and preserved specimen workup status for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught (kg)	Number Measured	Age Specimens	Ages Read	Stomach Specimens	Stomachs Analyzed
Spring	2008	1,332	3396.0	950	325	0	247	247
	2009	1,271	3562.7	1,137	359	0	261	250
	2010	249	804.1	249	125	0	114	108
	2011	180	548.1	180	139	0	120	113
Fall	2007	17	51.3	17	13	0	12	12
	2008	735	1621.1	161	41	0	39	39
	2009	795	1750.0	483	52	0	45	45
	2010	4	11.7	4	4	0	2	2
	2011	40	104.4	40	18	0	6	0

Table 69. Strata used for calculation of abundance indices for spiny dogfish.

State (Nominal)	Region	Depth Stratum	Spring Index	Fall Index
RI	RIS	60-90	Used	Used
		90+	Used	Used
	BIS	60-90	Used	Not used
		90+	Used	Not used
NY	01	40-60	Used	Used
	02	20-40	Used	Not used
		40-60	Used	Used
	03	20-40	Used	Not used
		40-60	Used	Not used
	04	20-40	Used	Not used
		40-60	Used	Not used
	05	20-40	Used	Not used
		40-60	Used	Not used
NJ	06	20-40	Used	Not used
		40-60	Used	Not used
	07	20-40	Used	Not used
		40-60	Used	Not used
	08	20-40	Used	Not used
		40-60	Used	Not used
DE	09	20-40	Used	Not used
		40-60	Used	Not used
		60-90	Used	Not used
MD	10	20-40	Used	Not used
		40-60	Used	Not used
VA	11	20-40	Used	Not used
		40-60	Used	Not used
	12	20-40	Used	Not used
		40-60	Used	Not used
	13	20-40	Used	Not used
		40-60	Used	Not used
NC	14	20-40	Used	Not used
		40-60	Used	Not used
	15	20-40	Used	Not used
		40-60	Used	Not used

(red) = used for abundance indices
(grey) = not used for abundance indices

Table 70. Spiny dogfish preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

Season	Year	Age	Numerical Index					Biomass Index				
			n	LCI	**Index**	UCI	CV (%)	n	LCI	**Index**	UCI	CV (%)
Spring	2008	All	150	4.23	**4.95**	5.78	3.6	150	8.87	**10.73**	12.94	3.5
	2009		160	4.22	**4.98**	5.86	3.8	160	10.28	**12.40**	14.90	3.3
	2010		150	0.58	**0.75**	0.94	9.0	150	1.13	**1.47**	1.87	8.3
	2011		150	0.60	**0.76**	0.93	8.4	150	1.17	**1.53**	1.96	8.4
Fall	2007	All	22	0.02	**0.35**	0.79	47.2	22	0.05	**0.61**	1.48	45.3
	2008		21	0.61	**3.35**	10.74	33.8	21	0.94	**5.35**	19.73	32.0
	2009		22	1.00	**3.14**	7.57	25.6	22	1.58	**5.15**	13.69	23.9
	2010		21	0.00	**0.15**	0.34	58.0	21	0.00	**0.29**	0.72	57.3
	2011		21	0.07	**0.52**	1.17	42.1	21	0.11	**0.84**	2.03	41.1

Figure 114. Spiny dogfish preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

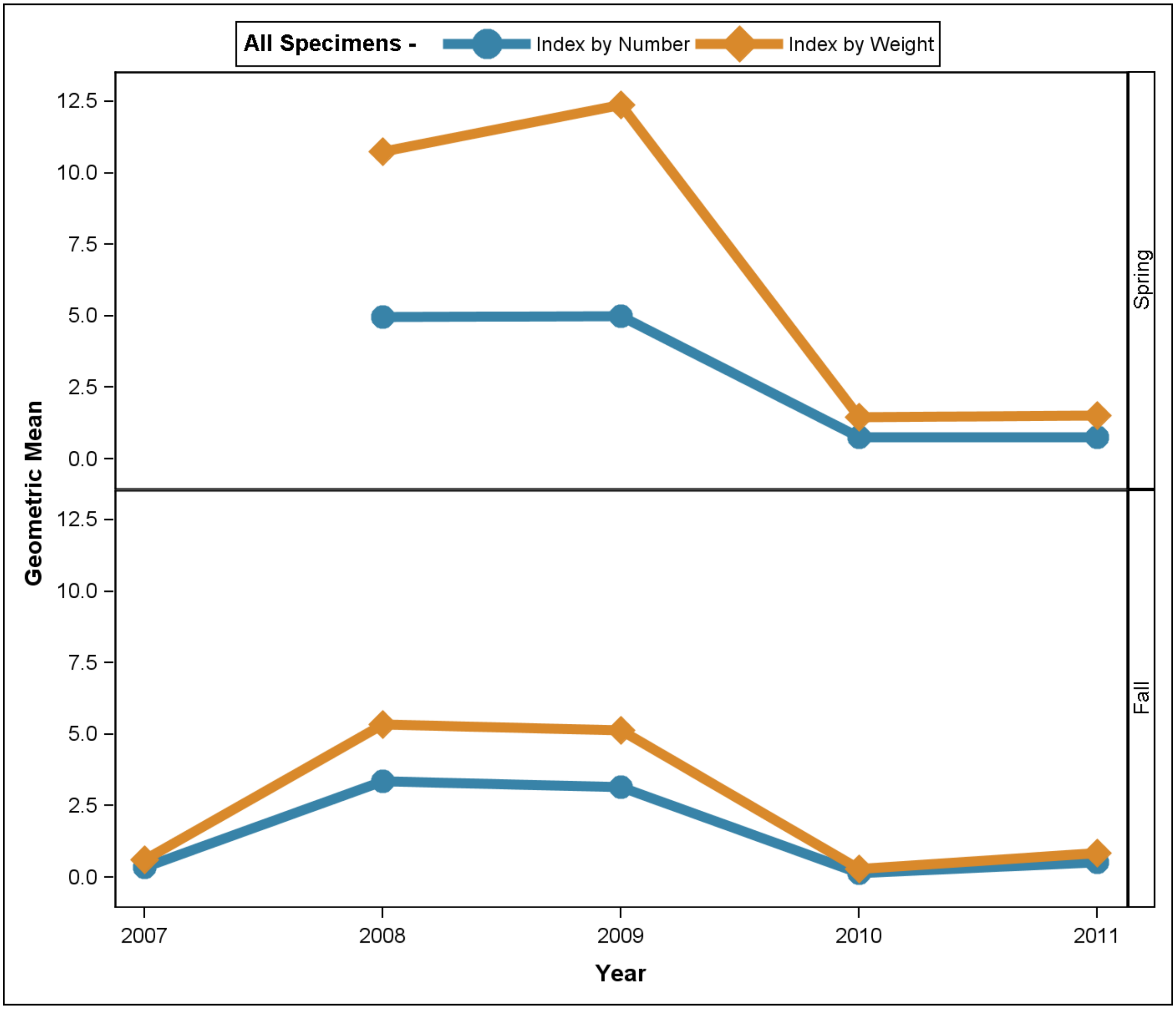


Figure 115. Spiny dogfish length-frequency distributions, by cruise.

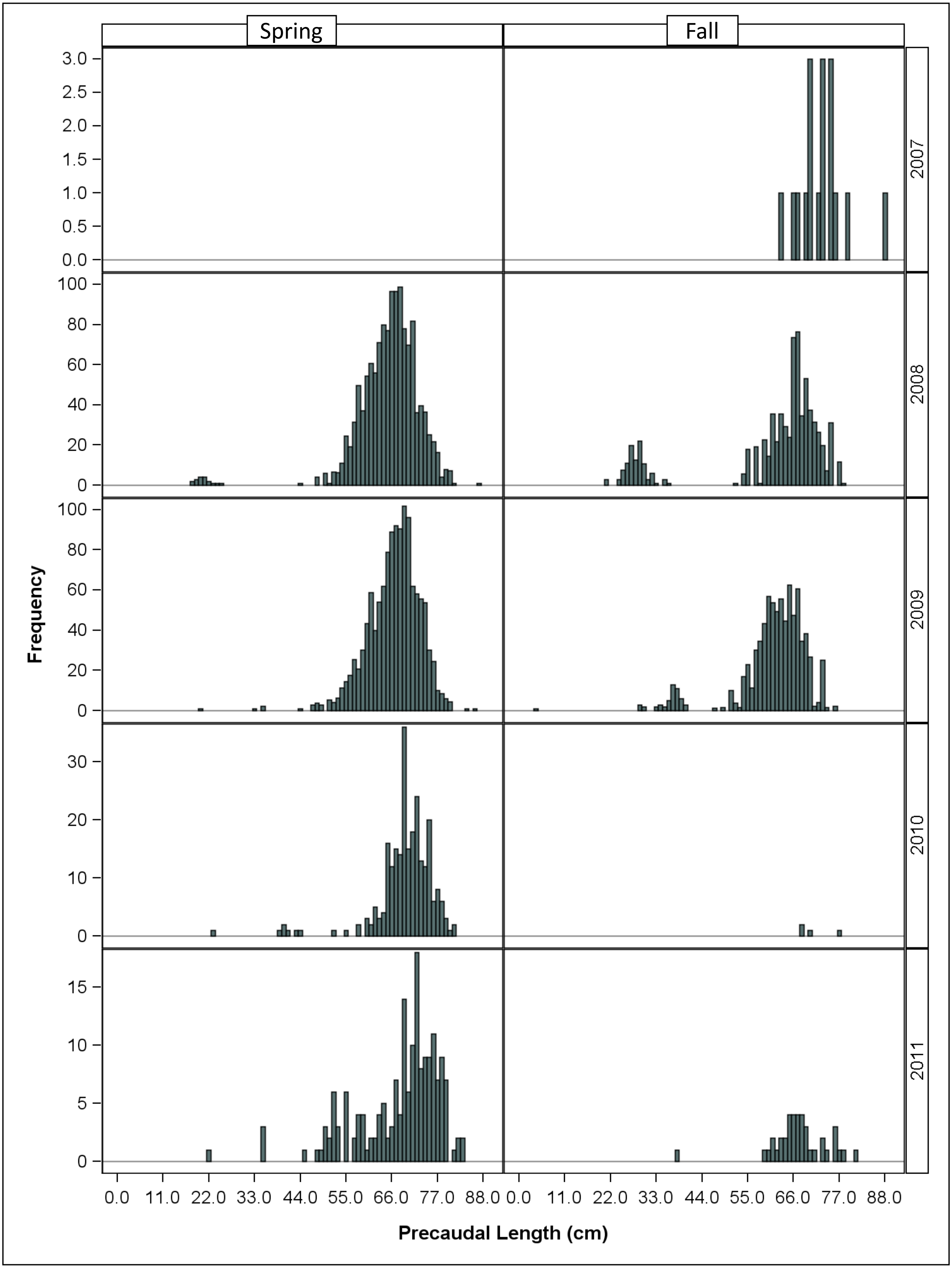


Figure 116. Spiny dogfish length-frequency distributions, by cruise and sex.

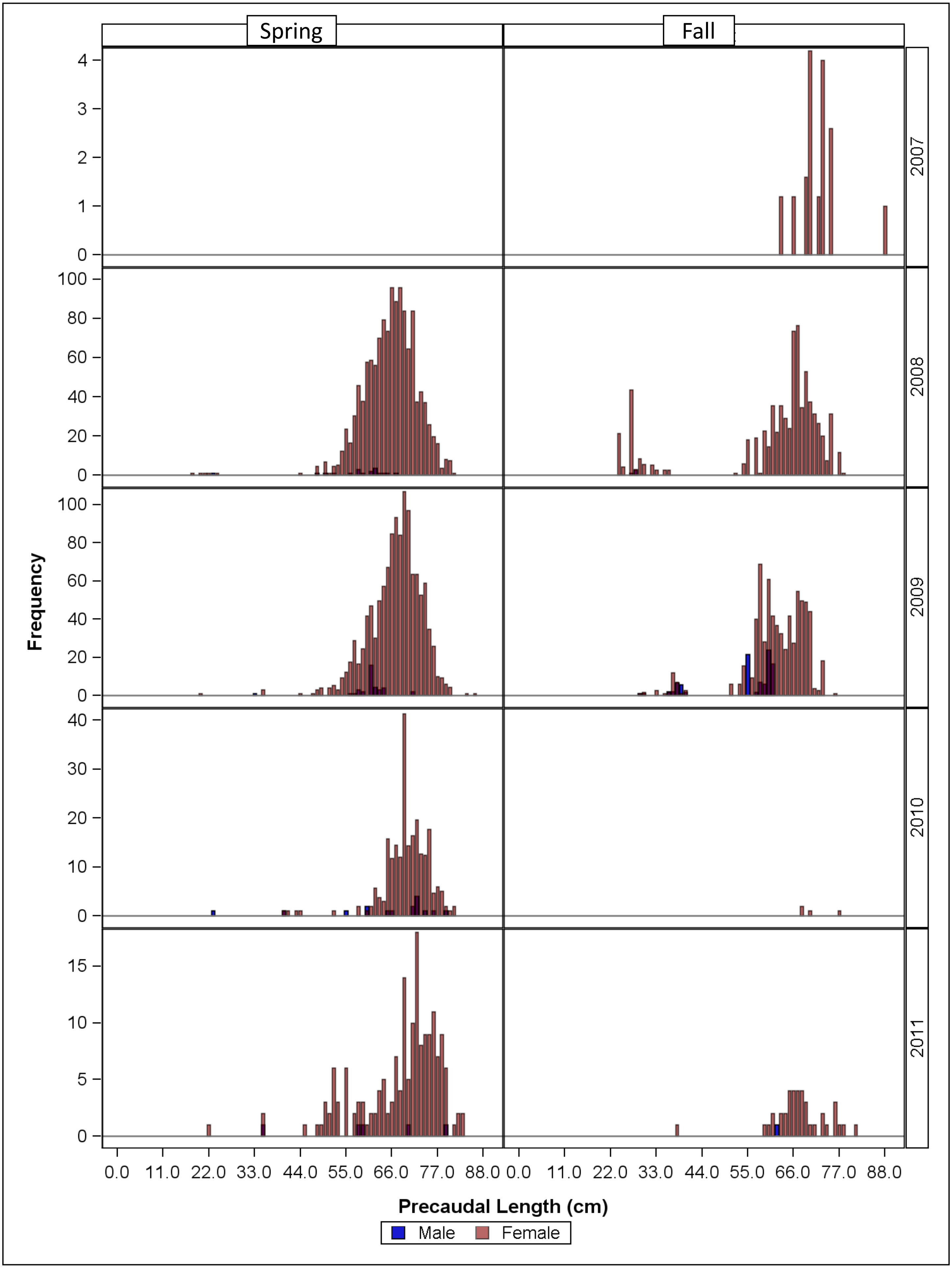


Figure 117. Spiny dogfish sex ratio, by length group, for NEAMAP Spring and Fall cruises 2007-2011.
(The percentages for each category are given near the bottom of each bar. The number sampled for sex determination is provided near the top of each bar, and the length categories expressed in inches are shown between the two figures.).

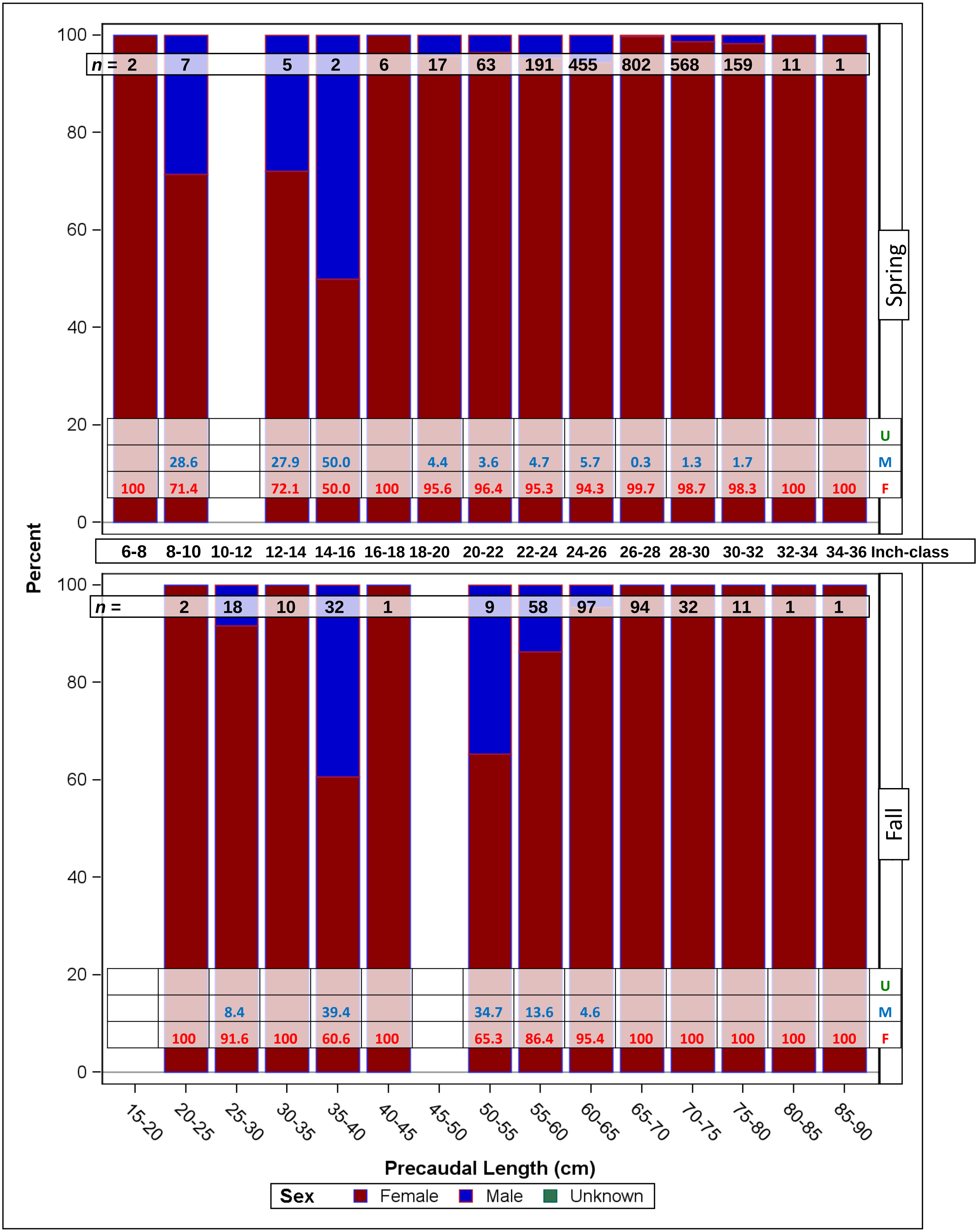
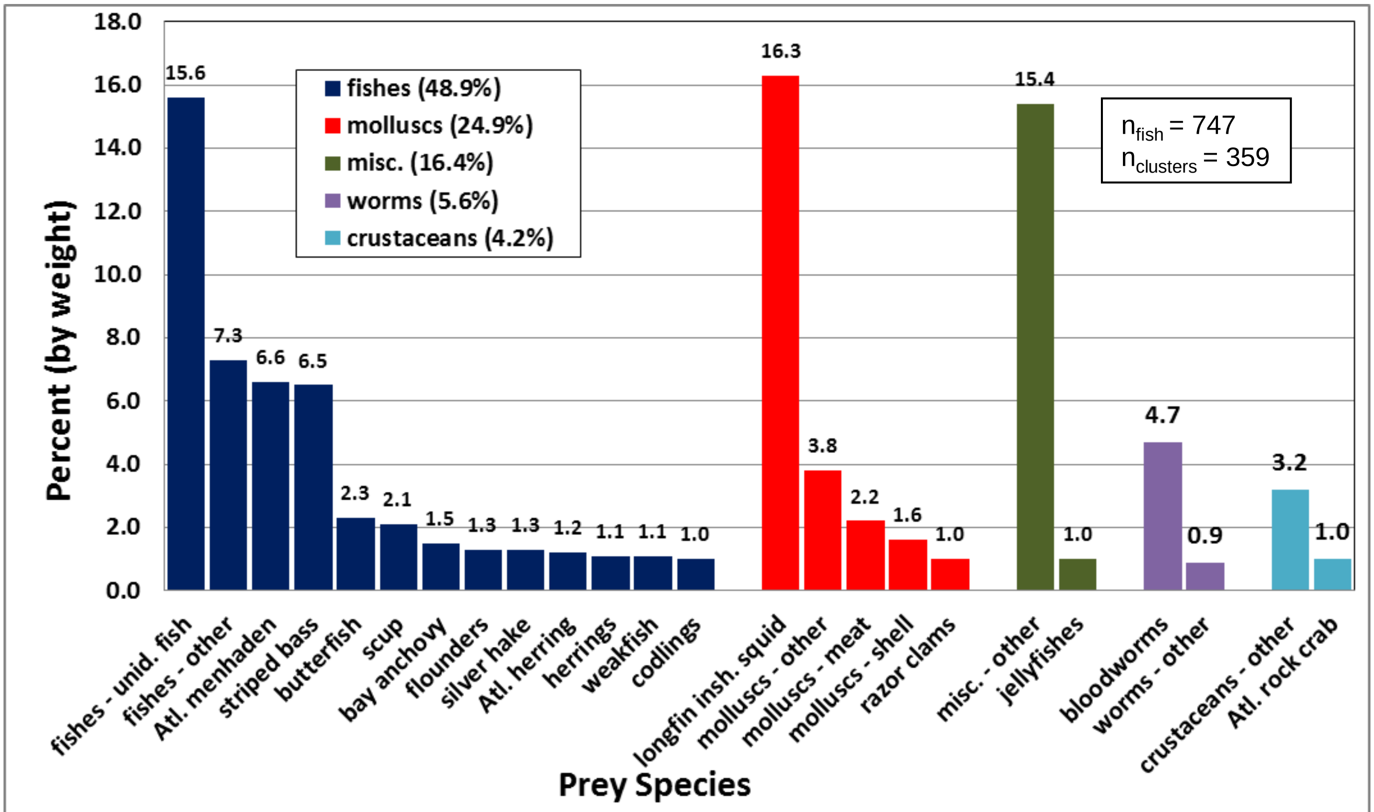


Figure 118. Spiny dogfish diet composition, expressed as percent by weight and number collected during NEAMAP cruises in 2007 through Spring 2011. (The number of fish sampled for diet is given by n_{fish}, while $n_{clusters}$ indicates the number of clusters of this species sampled.)



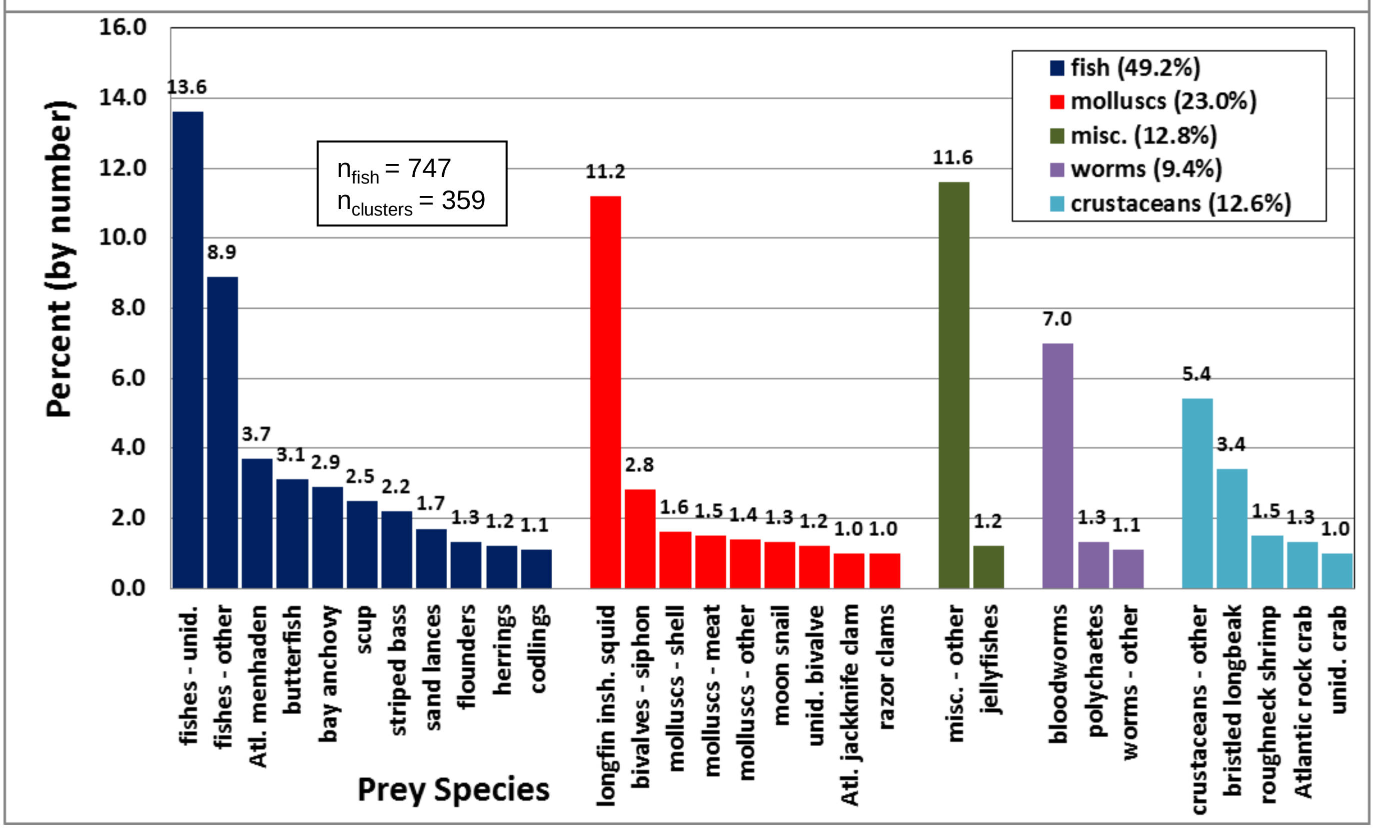
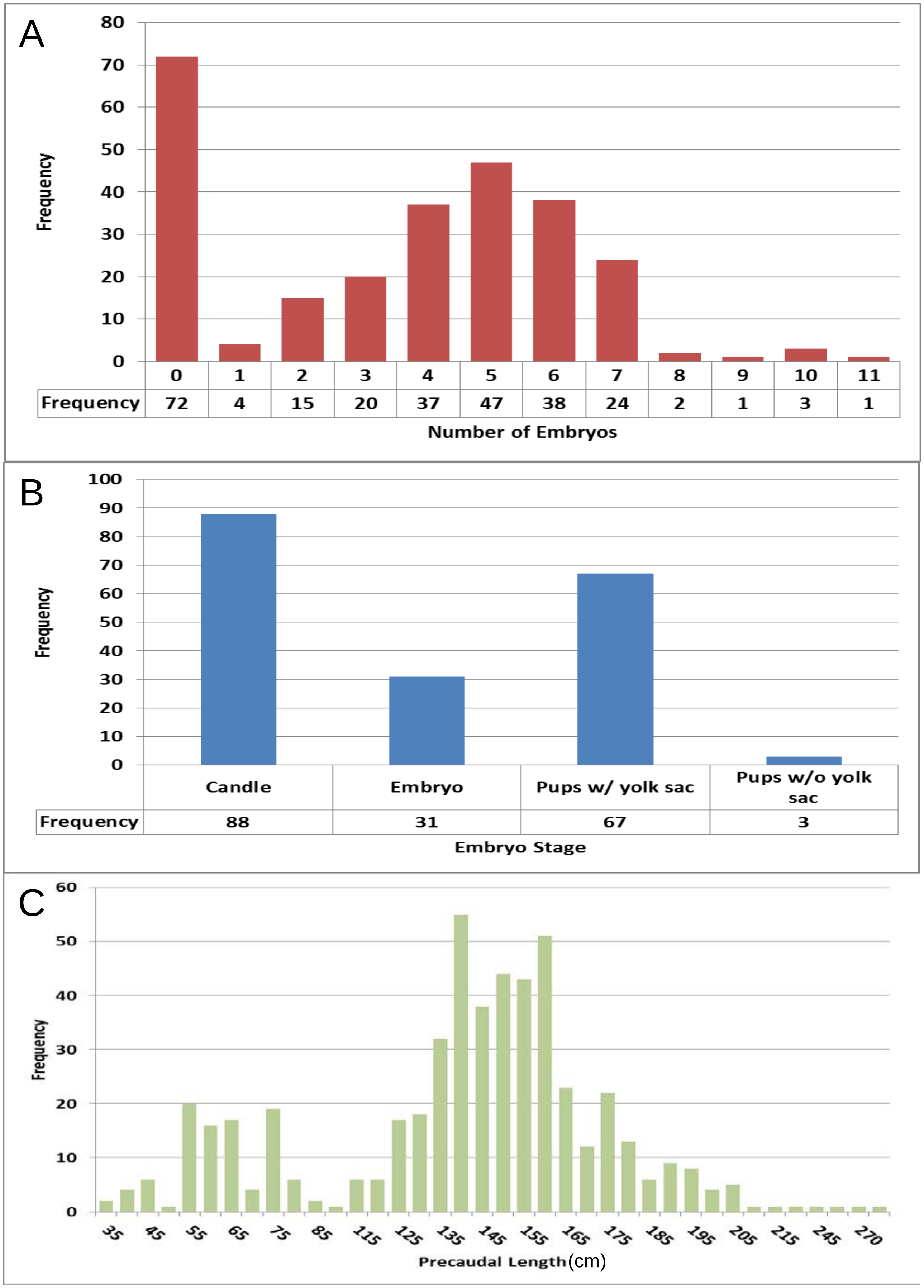


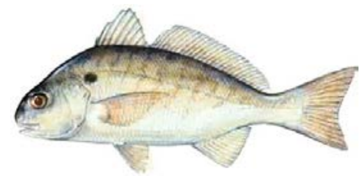
Figure 119. Spiny dogfish reproductive data; A – frequency histogram of number of embryos found in females, B – frequency histogram of embryo stages, C – length-frequency histogram of embryos.

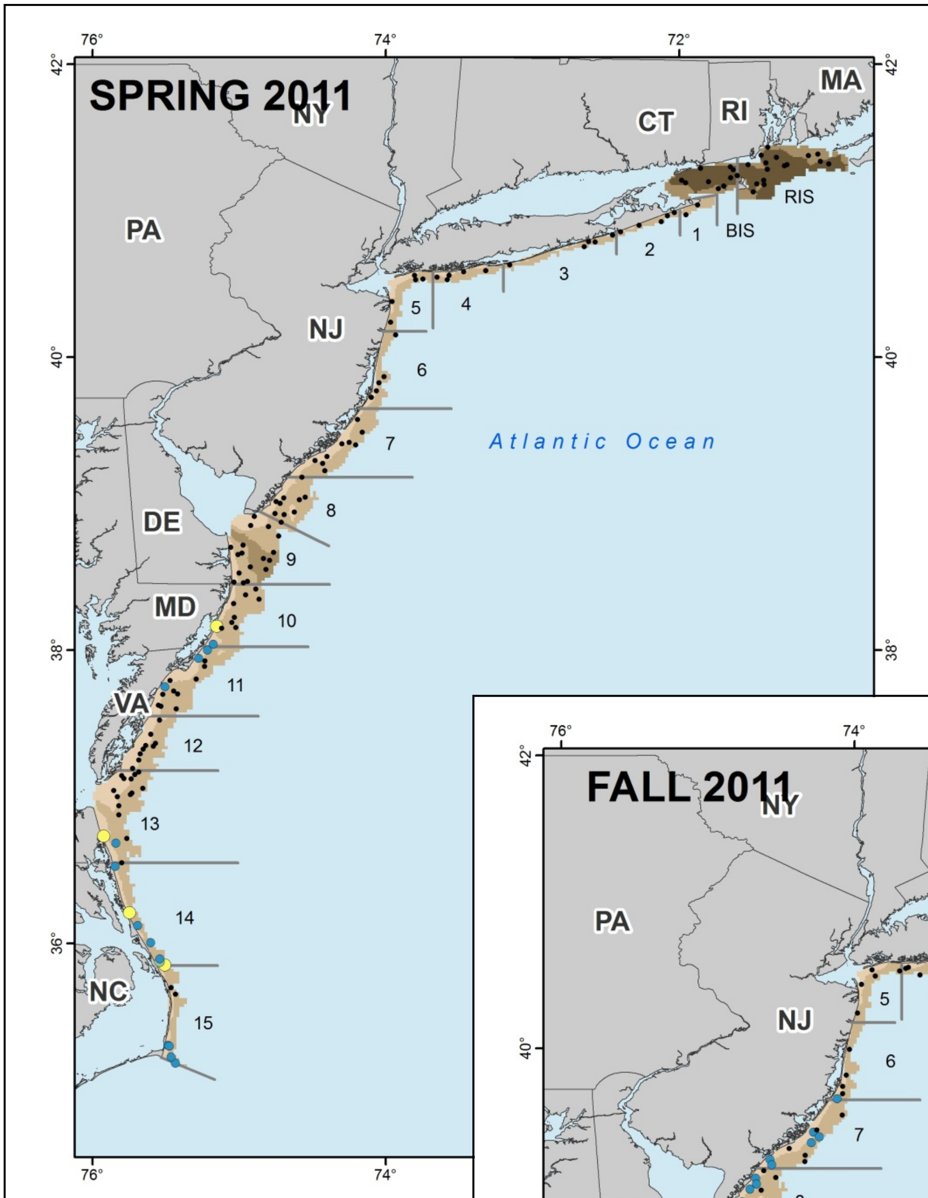


Spot

Sampling Priority: A

Figure 120. Spot biomass (kg) at each sampling site for 2011 NEAMAP cruises.





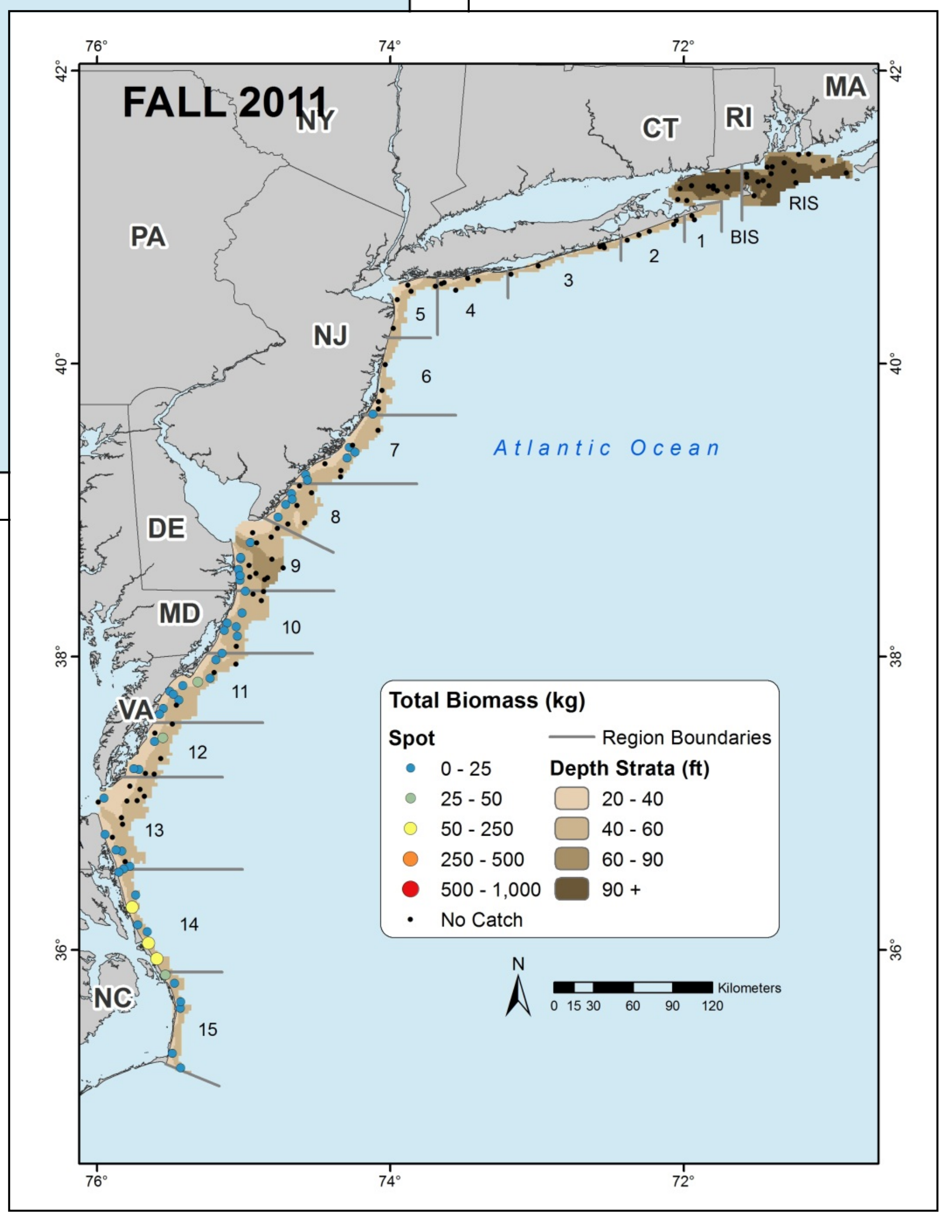


Table 71. Spot sampling rates and preserved specimen analysis status for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught (kg)	Number Measured	Age Specimens	Ages Read	Stomach Specimens	Stomachs Analyzed
Spring	2008	28,561	1059.2	1,220	61	0	N/A	N/A
	2009	29,643	824.9	3,454	59	0	N/A	N/A
	2010	19,664	822.1	894	44	0	N/A	N/A
	2011	15,390	557.0	2,416	52	0	N/A	N/A
Fall	2007	44,437	3942.0	2,507	160	0	N/A	N/A
	2008	56,878	3872.0	3,435	213	0	N/A	N/A
	2009	8,428	593.0	2,699	169	0	N/A	N/A
	2010	95,990	5060.0	6,861	181	0	N/A	N/A
	2011	6,407	538.3	1,394	147	0	N/A	N/A

Table 72. Strata used for calculation of abundance indices for spot.

State (Nominal)	Region	Depth Stratum	Spring Index	Fall Index
RI	RIS	60-90	[grey]	[grey]
		90+	[grey]	[grey]
	BIS	60-90	[grey]	[grey]
		90+	[grey]	[grey]
NY	01	40-60	[grey]	[grey]
	02	20-40	[grey]	[grey]
		40-60	[grey]	[grey]
	03	20-40	[grey]	[grey]
		40-60	[grey]	[grey]
	04	20-40	[grey]	[grey]
		40-60	[grey]	[grey]
	05	20-40	[grey]	[grey]
		40-60	[grey]	[grey]
NJ	06	20-40	[grey]	[grey]
		40-60	[grey]	[grey]
	07	20-40	[grey]	[grey]
		40-60	[grey]	[grey]
	08	20-40	[grey]	[red]
		40-60	[grey]	[red]
DE	09	20-40	[grey]	[red]
		40-60	[grey]	[red]
		60-90	[grey]	[red]
MD	10	20-40	[grey]	[red]
		40-60	[grey]	[red]
VA	11	20-40	[grey]	[red]
		40-60	[grey]	[red]
	12	20-40	[grey]	[red]
		40-60	[grey]	[red]
	13	20-40	[red]	[red]
		40-60	[red]	[red]
NC	14	20-40	[red]	[red]
		40-60	[red]	[red]
	15	20-40	[red]	[red]
		40-60	[red]	[red]

[red] = used for abundance indices
[grey] = not used for abundance indices

Table 73. Spot preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

Season	Year	Age	Numerical Index					Biomass Index				
			n	LCI	**Index**	UCI	CV (%)	n	LCI	**Index**	UCI	CV (%)
Spring	2008	All	31	8.25	**19.62**	44.98	13.2	31	1.59	**3.06**	5.35	16.0
	2009		31	7.43	**25.09**	79.79	17.3	31	1.27	**3.39**	7.51	22.4
	2010		29	1.14	**3.98**	10.56	26.2	29	0.13	**0.99**	2.50	41.1
	2011		29	2.67	**7.56**	18.97	19.7	29	0.59	**1.57**	3.14	25.3
Fall	2007	All	87	8.19	**14.66**	25.68	9.7	87	2.42	**3.92**	6.09	11.4
	2008		87	26.14	**49.17**	91.74	7.8	87	5.09	**8.09**	12.56	9.1
	2009		91	4.06	**5.93**	8.49	8.1	91	0.77	**1.13**	1.57	12.4
	2010		87	9.05	**17.07**	31.49	10.1	87	2.08	**3.44**	5.38	12.2
	2011		87	3.09	**4.70**	6.95	9.5	87	0.80	**1.17**	1.61	12.1

Figure 121. Spot preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

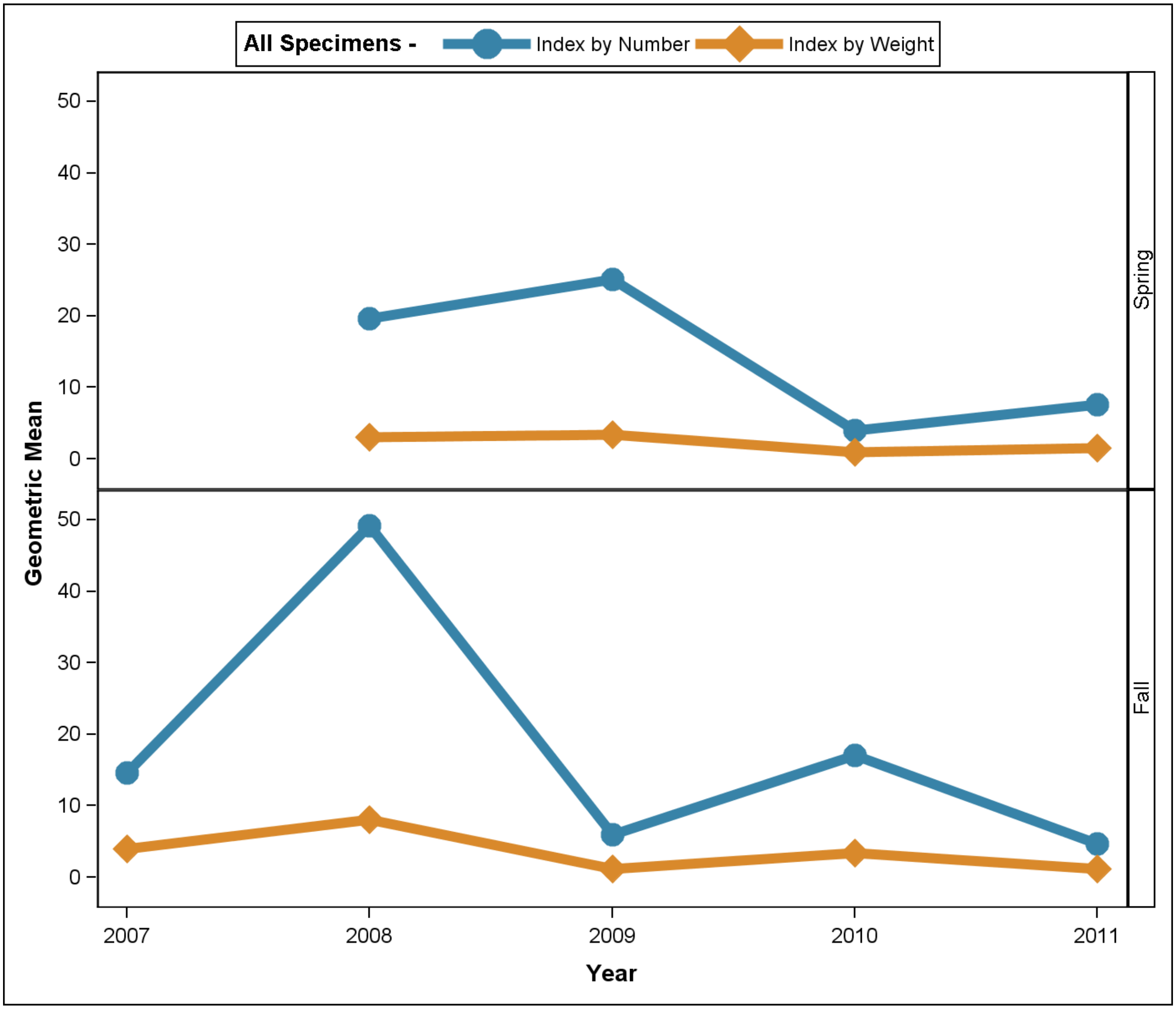


Figure 122. Spot length-frequency distributions, by cruise.

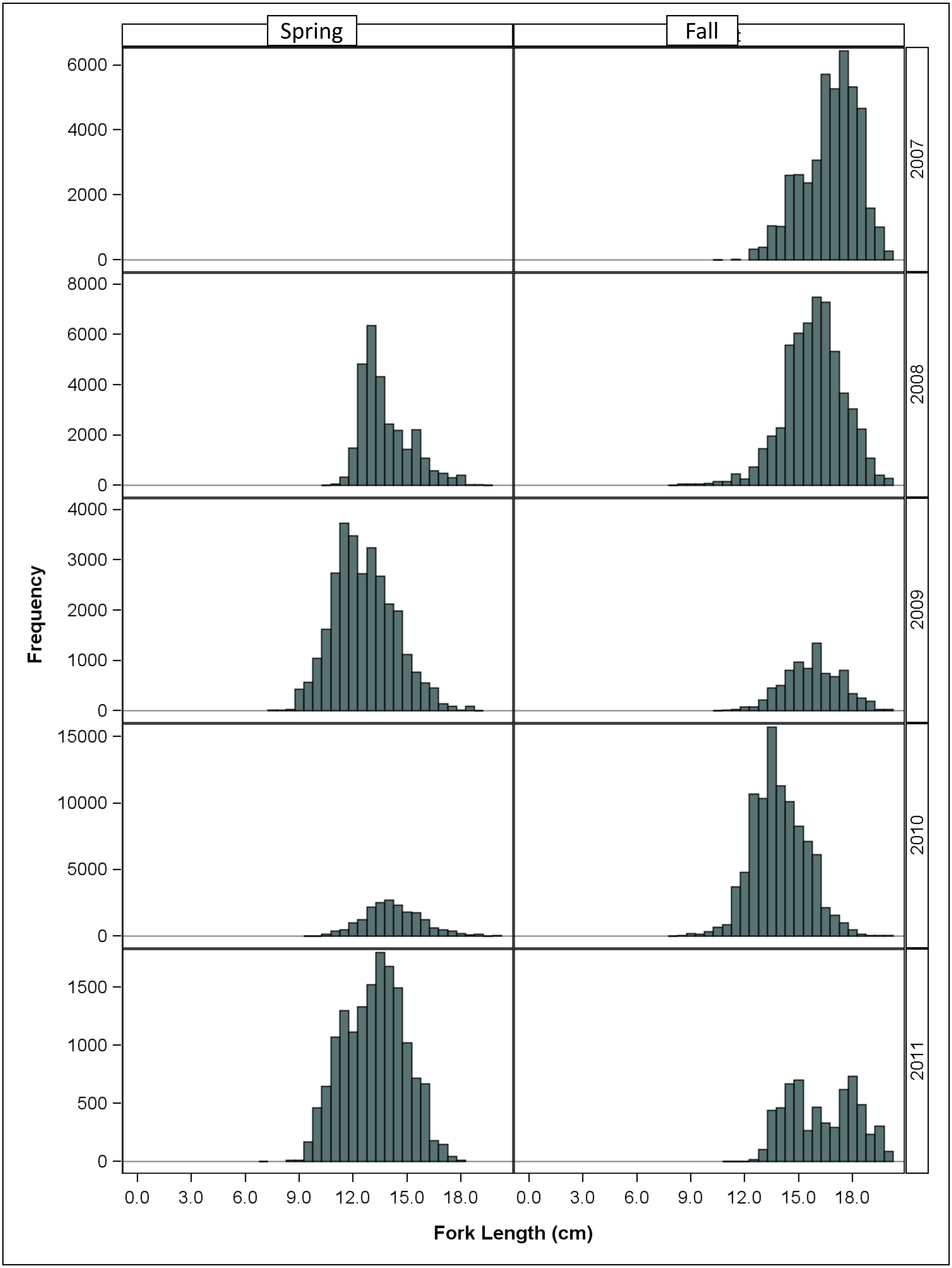


Figure 123. Spot length-frequency distributions, by cruise and sex.

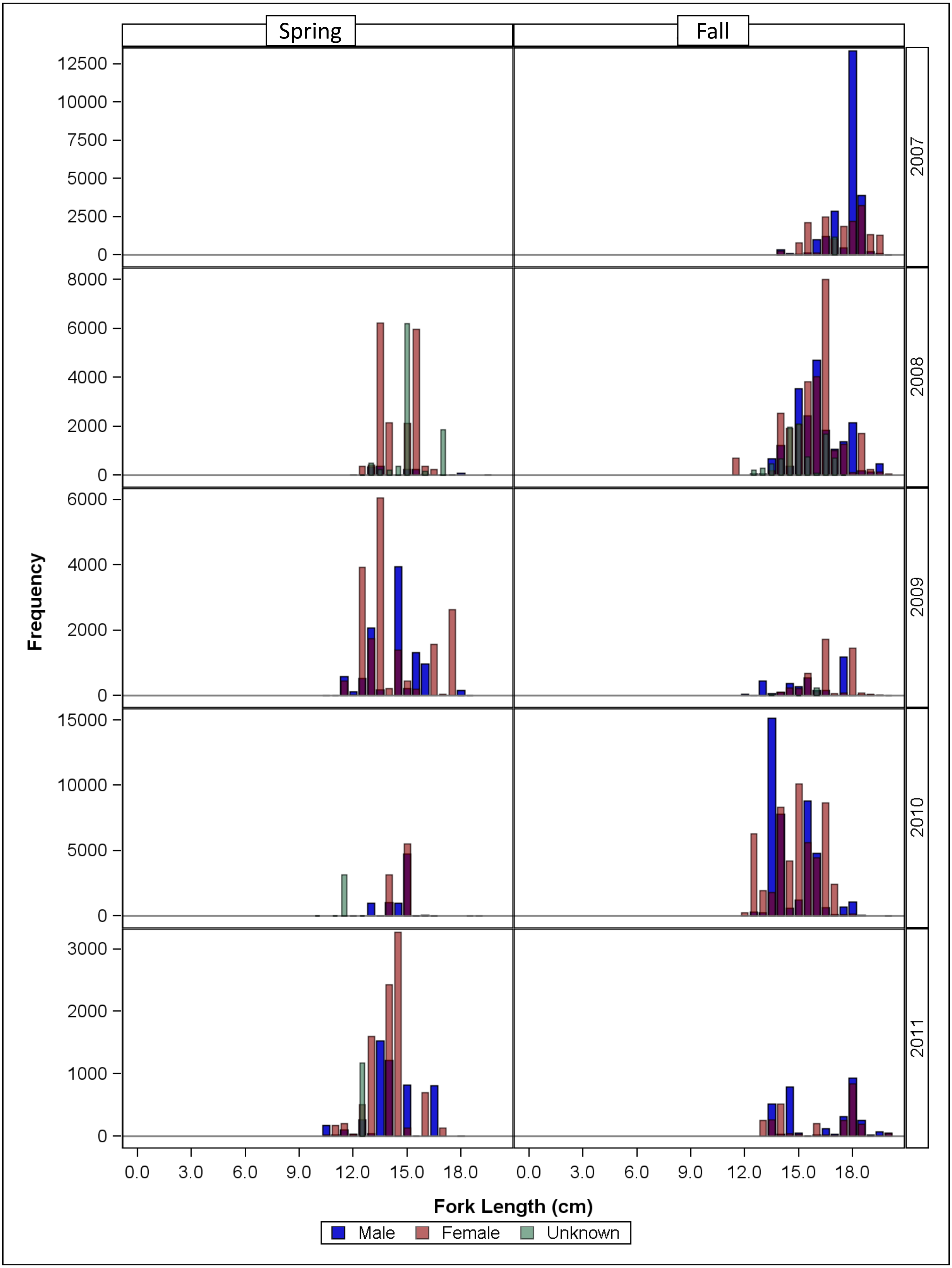
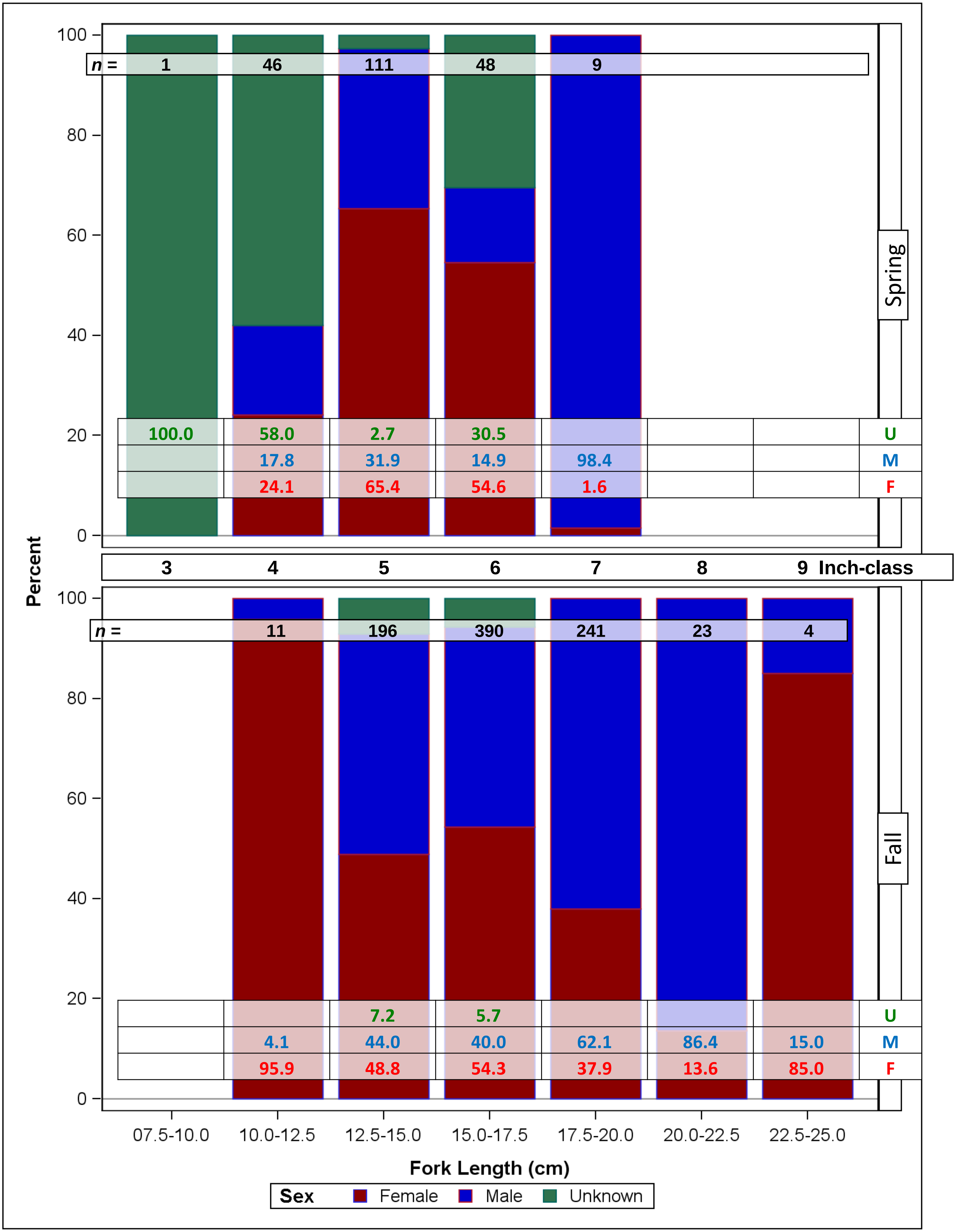


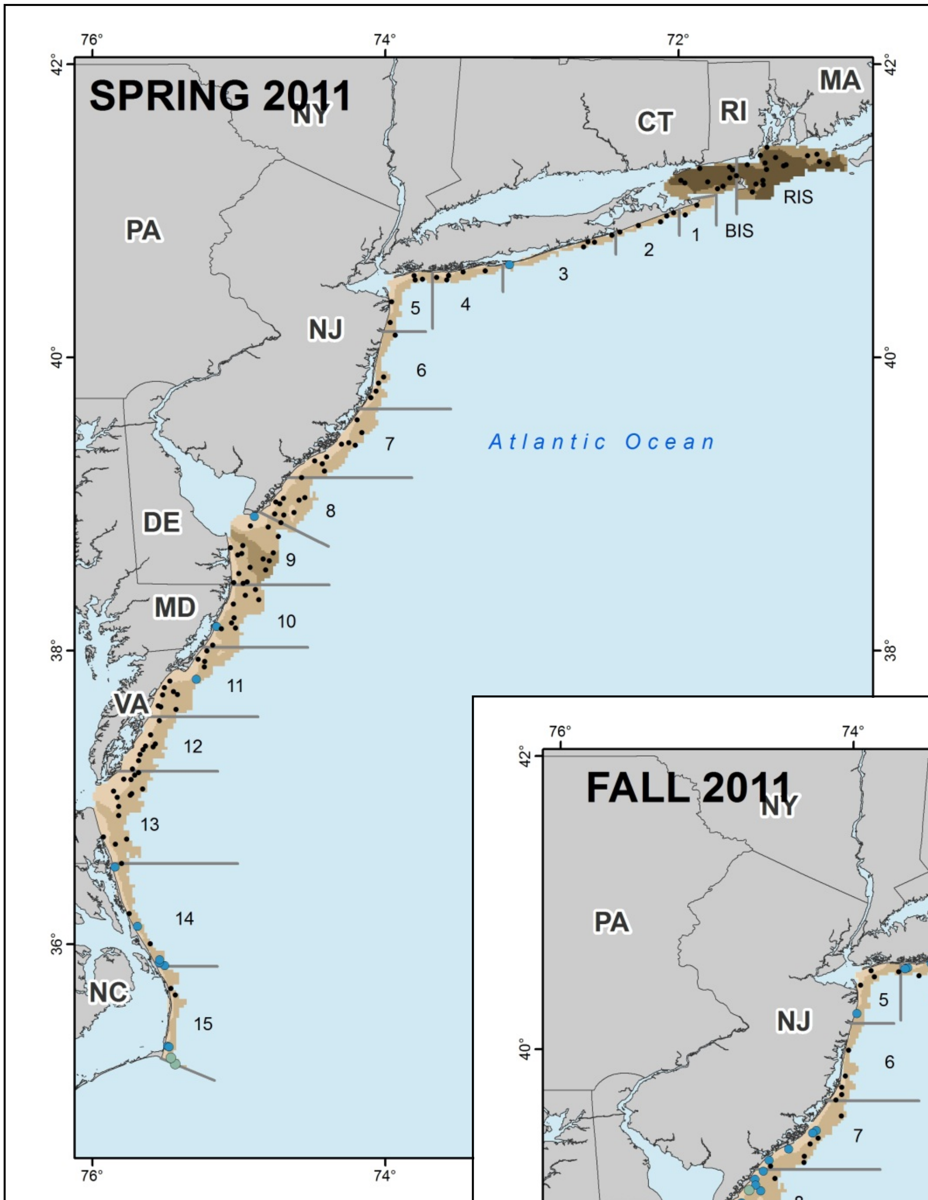
Figure 124. Spot sex ratio, by length group, for NEAMAP Spring and Fall cruises 2007-2011.
(The percentages for each category are given near the bottom of each bar. The number sampled for sex determination is provided near the top of each bar, and the length categories expressed in inches are shown between the two figures.).



Striped Anchovy

Sampling Priority: D

Figure 125. Striped anchovy biomass (kg) at each sampling site for 2011 NEAMAP cruises.



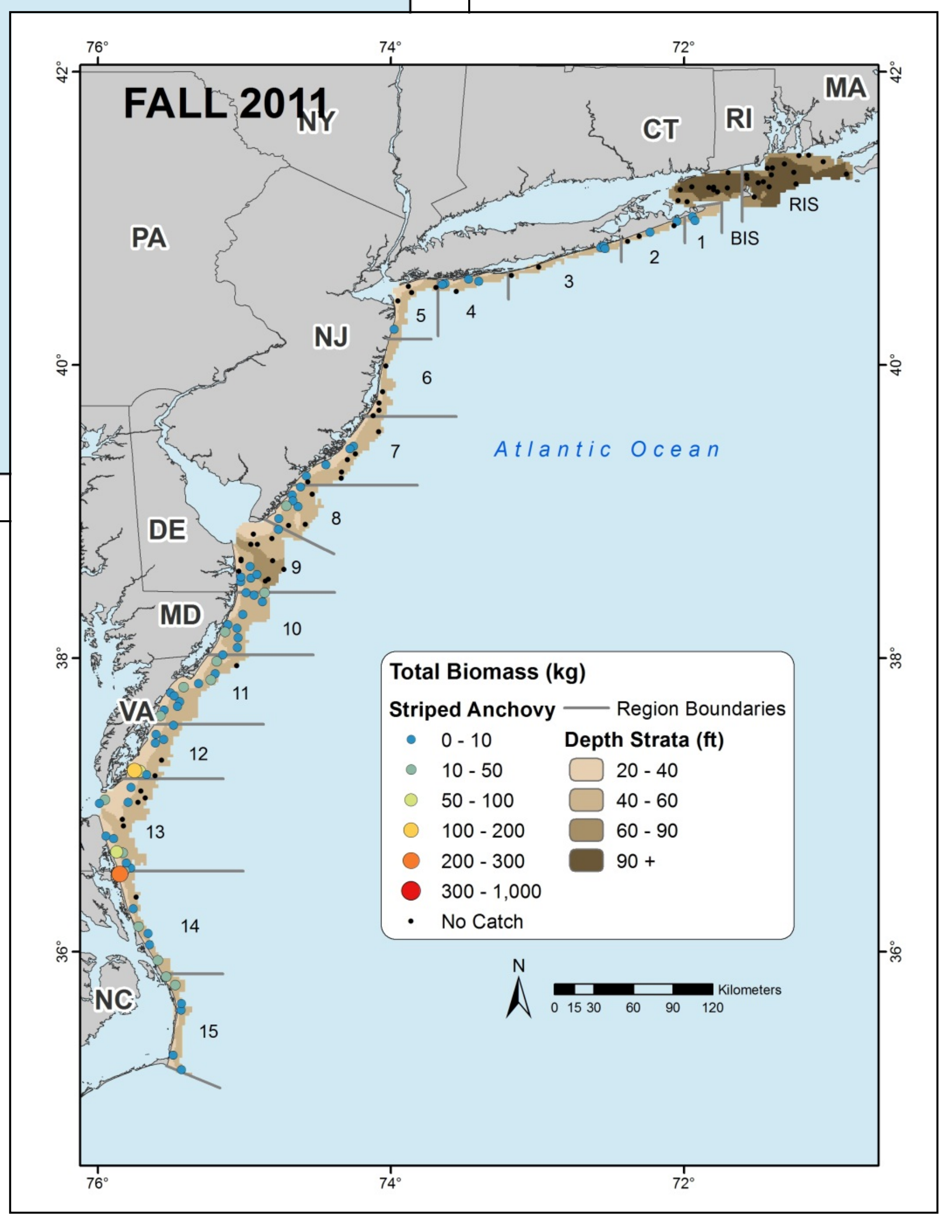


Table 74. Striped anchovy sampling rates for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught (kg)	Number Measured	Age Specimens	Ages Read	Stomach Specimens	Stomachs Analyzed
Spring	2008	1,198	19.0	471	N/A	N/A	N/A	N/A
	2009	104	1.5	104	N/A	N/A	N/A	N/A
	2010	4	0.1	4	N/A	N/A	N/A	N/A
	2011	4,381	68.9	665	N/A	N/A	N/A	N/A
Fall	2007	224,369	2519.3	4,990	N/A	N/A	N/A	N/A
	2008	84,833	1009.1	3,357	N/A	N/A	N/A	N/A
	2009	9,726	130.1	2,313	N/A	N/A	N/A	N/A
	2010	67,774	849.8	4,418	N/A	N/A	N/A	N/A
	2011	73,546	932.5	5,704	N/A	N/A	N/A	N/A

Table 75. Strata used for calculation of abundance indices for striped anchovy.

State (Nominal)	Region	Depth Stratum	Spring Index	Fall Index
RI	RIS	60-90	[grey]	[grey]
		90+	[grey]	[grey]
	BIS	60-90	[grey]	[grey]
		90+	[grey]	[grey]
NY	01	40-60	[grey]	[grey]
	02	20-40	[grey]	[grey]
		40-60	[grey]	[grey]
	03	20-40	[grey]	[grey]
		40-60	[grey]	[grey]
	04	20-40	[grey]	[grey]
		40-60	[grey]	[grey]
	05	20-40	[grey]	[grey]
		40-60	[grey]	[grey]
NJ	06	20-40	[grey]	[grey]
		40-60	[grey]	[grey]
	07	20-40	[grey]	[grey]
		40-60	[grey]	[grey]
	08	20-40	[grey]	[grey]
		40-60	[grey]	[grey]

State (Nominal)	Region	Depth Stratum	Spring Index	Fall Index
DE	09	20-40	[grey]	[grey]
		40-60	[grey]	[grey]
		60-90	[grey]	[grey]
MD	10	20-40	[grey]	[red]
		40-60	[grey]	[red]
VA	11	20-40	[grey]	[red]
		40-60	[grey]	[red]
	12	20-40	[grey]	[red]
		40-60	[grey]	[red]
	13	20-40	[red]	[red]
		40-60	[red]	[red]
NC	14	20-40	[red]	[red]
		40-60	[red]	[red]
	15	20-40	[red]	[red]
		40-60	[red]	[red]

[red] = used for abundance indices
[grey] = not used for abundance indices

Table 76. Striped anchovy preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

Season	Year	Age	Numerical Index					Biomass Index				
			n	LCI	**Index**	UCI	CV (%)	n	LCI	**Index**	UCI	CV (%)
Spring	2008	All	31	3.79	**7.67**	14.70	13.7	31	0.11	**0.33**	0.60	32.0
	2009		31	0.00	**0.18**	0.65	100.0	31	0.00	**0.03**	0.11	100.0
	2010		29	0.00	**0.05**	0.14	70.9	29	0.00	**0.00**	0.01	81.4
	2011		29	0.58	**1.80**	3.96	27.8	29	0.06	**0.35**	0.73	40.3
Fall	2007	All	66	54.63	**106.94**	208.43	7.1	66	2.74	**4.49**	7.06	11.3
	2008		61	78.90	**158.64**	317.98	6.8	61	2.88	**4.64**	7.18	10.8
	2009		64	6.24	**10.34**	16.79	9.3	64	0.37	**0.60**	0.88	16.8
	2010		61	5.34	**10.49**	19.80	12.2	61	0.62	**1.10**	1.73	17.7
	2011		61	59.60	**118.21**	233.49	7.1	61	2.52	**3.91**	5.85	10.5

Figure 126. Striped anchovy preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

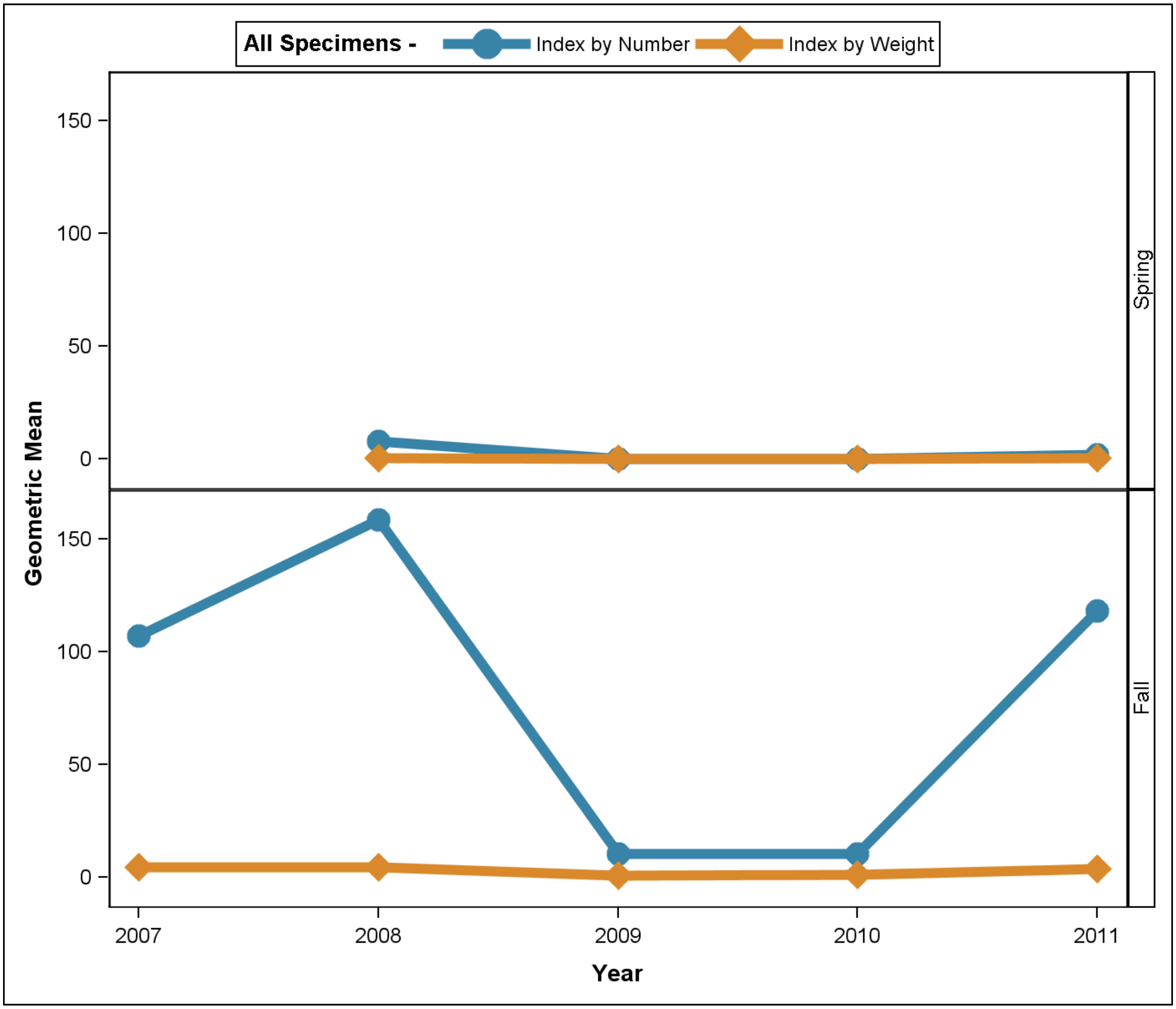
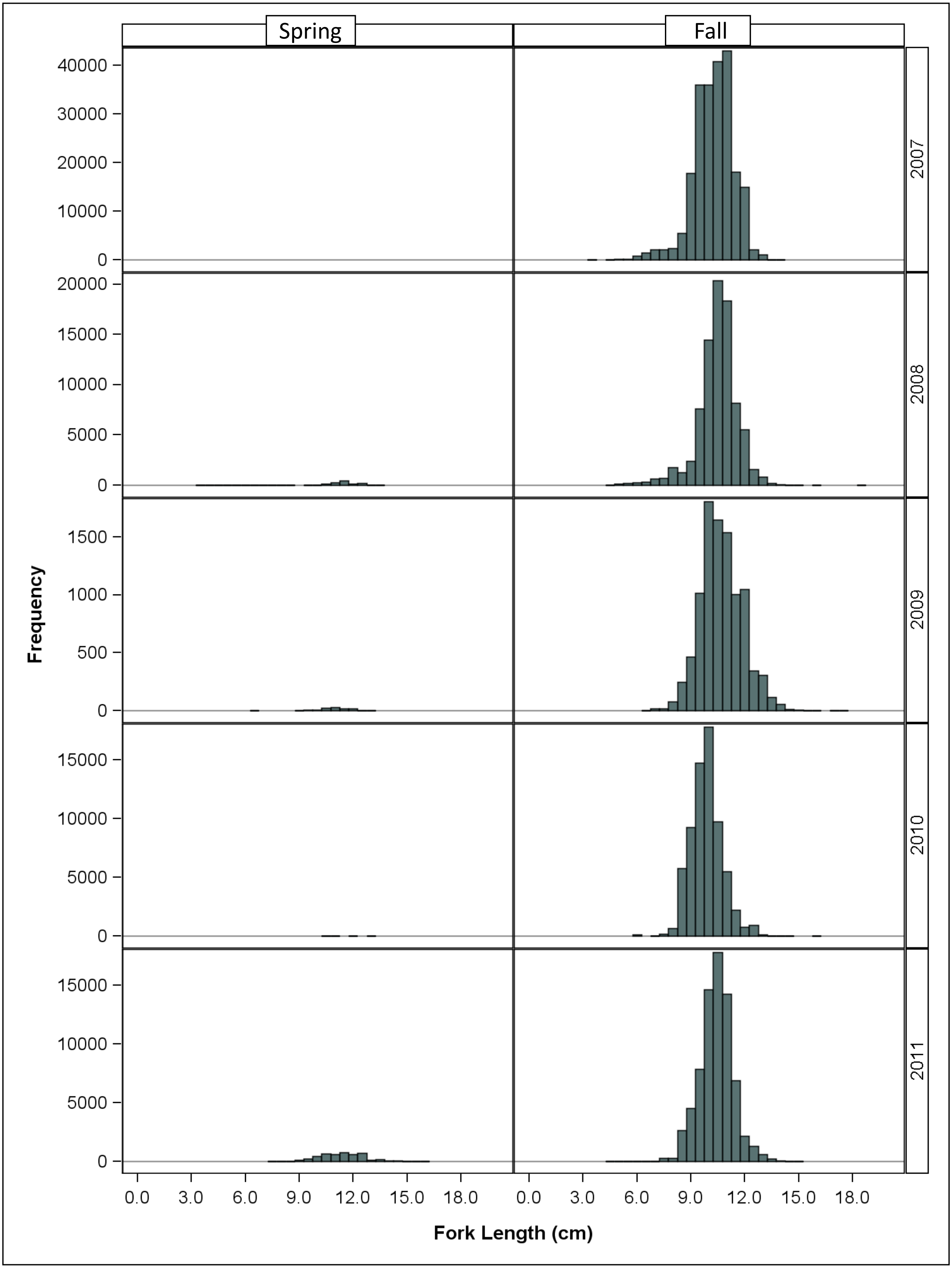


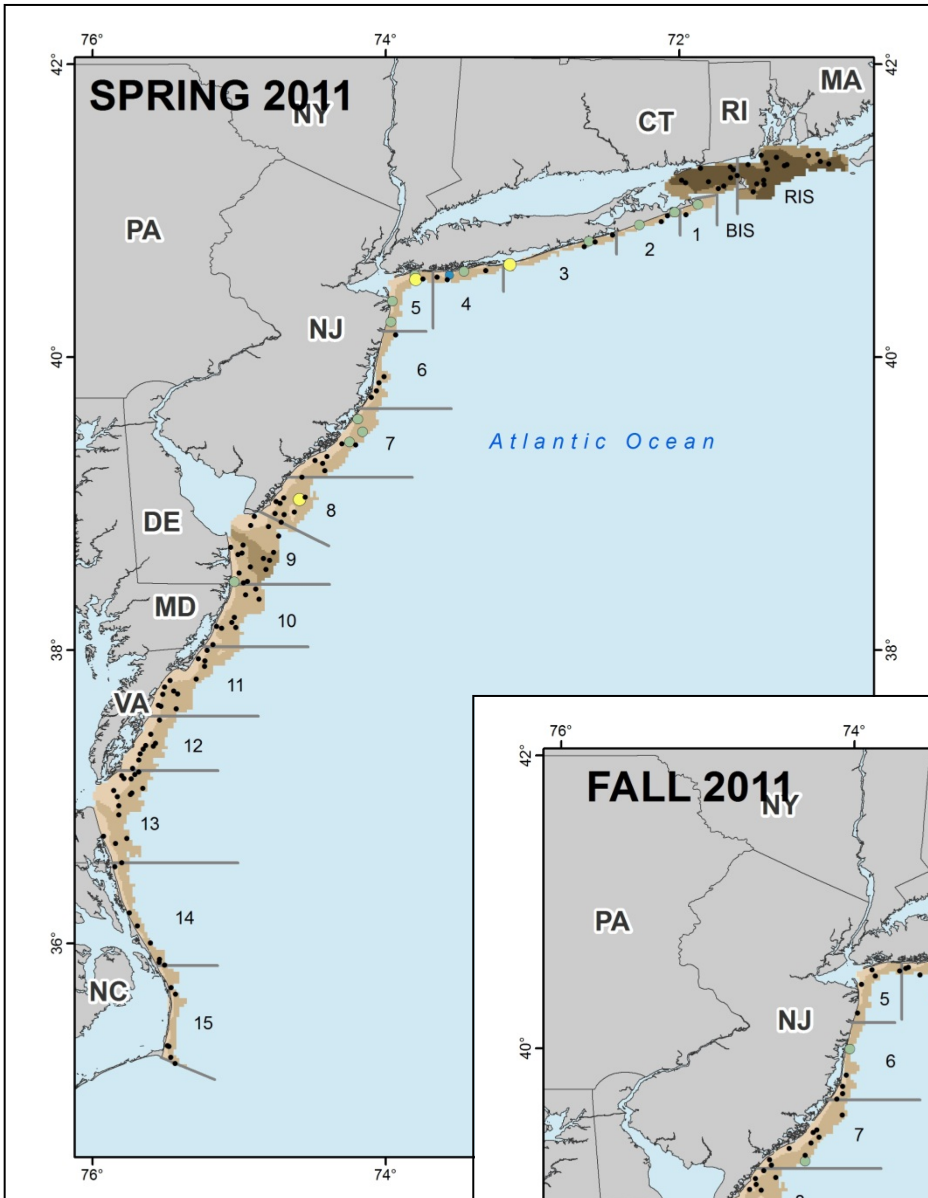
Figure 127. Striped anchovy length-frequency distributions, by cruise.



Striped Bass

Sampling Priority: A

Figure 128. Striped bass biomass (kg) at each sampling site for 2011 NEAMAP cruises.



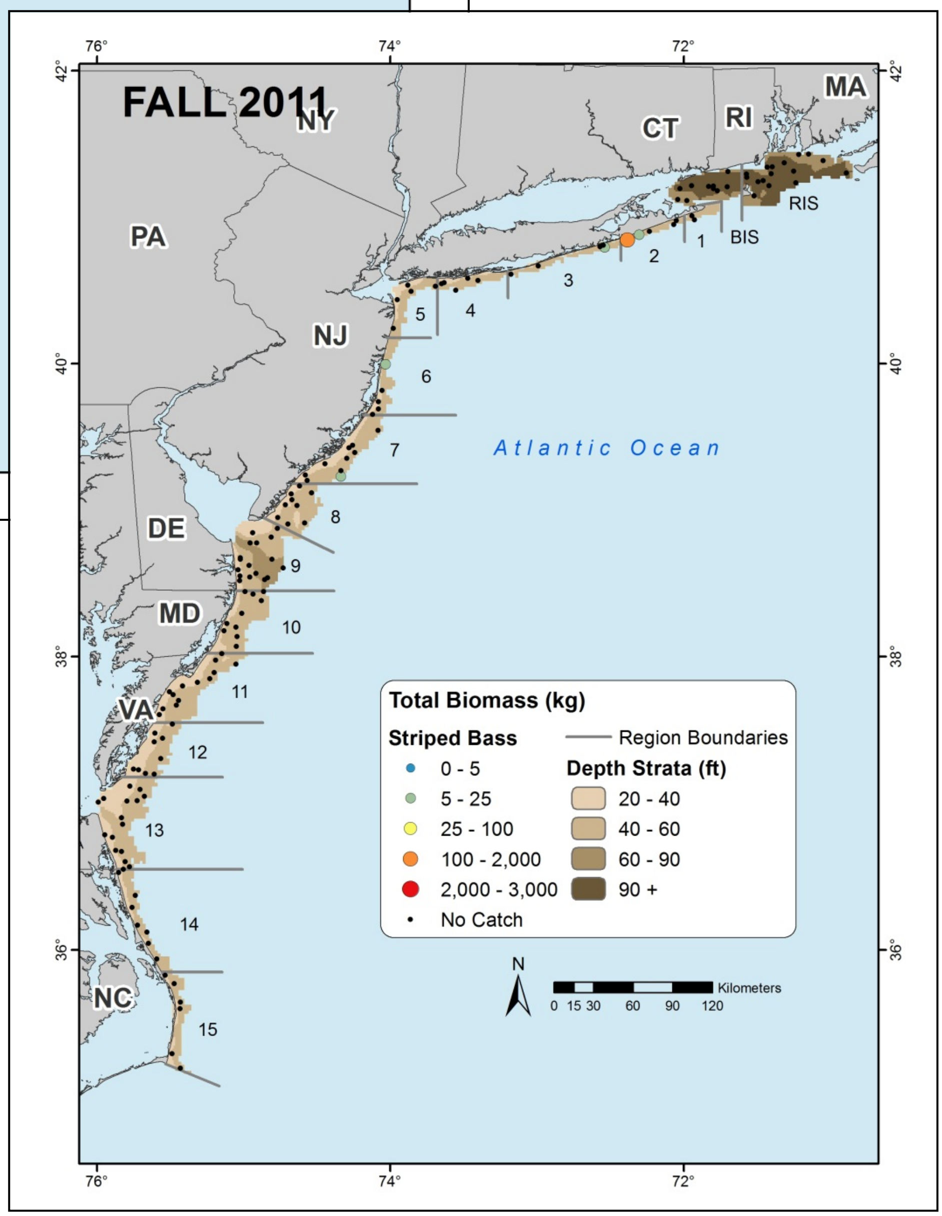


Table 77. Striped bass sampling rates and preserved specimen analysis status for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught (kg)	Number Measured	Age Specimens	Ages Read	Stomach Specimens	Stomachs Analyzed
Spring	2008	40	171.1	40	39	40	33	32
	2009	162	388.9	162	78	0	48	46
	2010	32	143.2	32	25	0	17	17
	2011	43	284.3	43	42	0	23	23
Fall	2007	17	66.3	17	16	16	16	16
	2008	1,559	4611.9	95	43	59	21	20
	2009	352	1523.7	127	32	0	22	21
	2010	814	2853.2	59	33	0	29	29
	2011	153	721.9	63	12	0	8	0

Table 78. Strata used for calculation of abundance indices for striped bass.

State (Nominal)	Region	Depth Stratum	Spring Index	Fall Index	State (Nominal)	Region	Depth Stratum	Spring Index	Fall Index
RI	RIS	60-90	red	red	DE	09	20-40	grey	grey
		90+	grey	grey			40-60	grey	grey
	BIS	60-90	red	red			60-90	grey	grey
		90+	grey	grey	MD	10	20-40	grey	grey
NY	01	40-60	red	red			40-60	grey	grey
	02	20-40	red	red	VA	11	20-40	grey	grey
		40-60	red	red			40-60	grey	grey
	03	20-40	red	red		12	20-40	grey	grey
		40-60	red	red			40-60	grey	grey
	04	20-40	red	red		13	20-40	grey	grey
		40-60	red	red			40-60	grey	grey
	05	20-40	red	red	NC	14	20-40	grey	grey
		40-60	red	red			40-60	grey	grey
NJ	06	20-40	red	red		15	20-40	grey	grey
		40-60	red	red			40-60	grey	grey
	07	20-40	grey	grey					
		40-60	grey	grey	red	= used for abundance indices			
	08	20-40	grey	grey	grey	= not used for abundance indices			
		40-60	grey	grey					

Table 79. Striped bass preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

Season	Year	Age	Numerical Index					Biomass Index				
			n	LCI	**Index**	UCI	CV (%)	n	LCI	**Index**	UCI	CV (%)
Spring	2008	All	36	0.32	**0.64**	1.02	21.6	36	0.73	**1.56**	2.79	20.9
	2009		42	0.43	**0.94**	1.63	23.0	42	0.80	**1.75**	3.22	21.0
	2010		36	0.06	**0.33**	0.67	40.3	36	0.18	**0.72**	1.50	34.8
	2011		36	0.20	**0.43**	0.71	24.6	36	0.52	**1.11**	1.92	21.8
Fall	2007	All	37	0.00	**0.19**	0.43	52.2	37	0.01	**0.39**	0.92	48.6
	2008		36	0.18	**1.10**	2.75	38.8	36	0.45	**1.86**	4.62	32.3
	2009		42	0.07	**0.17**	0.29	29.7	42	0.10	**0.35**	0.65	34.2
	2010		36	0.05	**0.70**	1.77	45.8	36	0.31	**1.37**	3.27	34.3
	2011		36	0.00	**0.16**	0.40	61.4	36	0.00	**0.35**	0.86	54.2

Figure 129. Striped bass preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

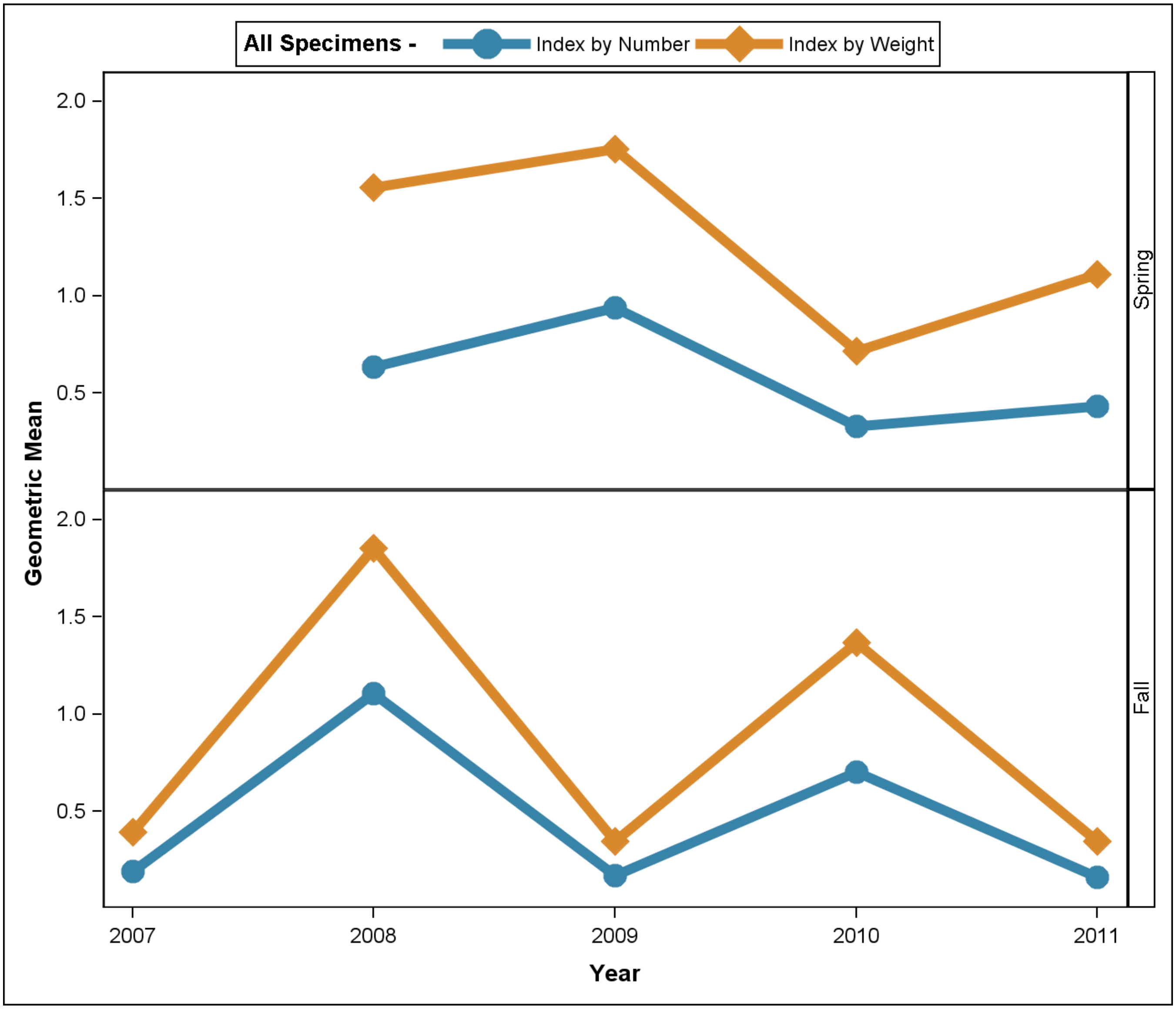


Figure 130. Striped bass length-frequency distributions, by cruise.

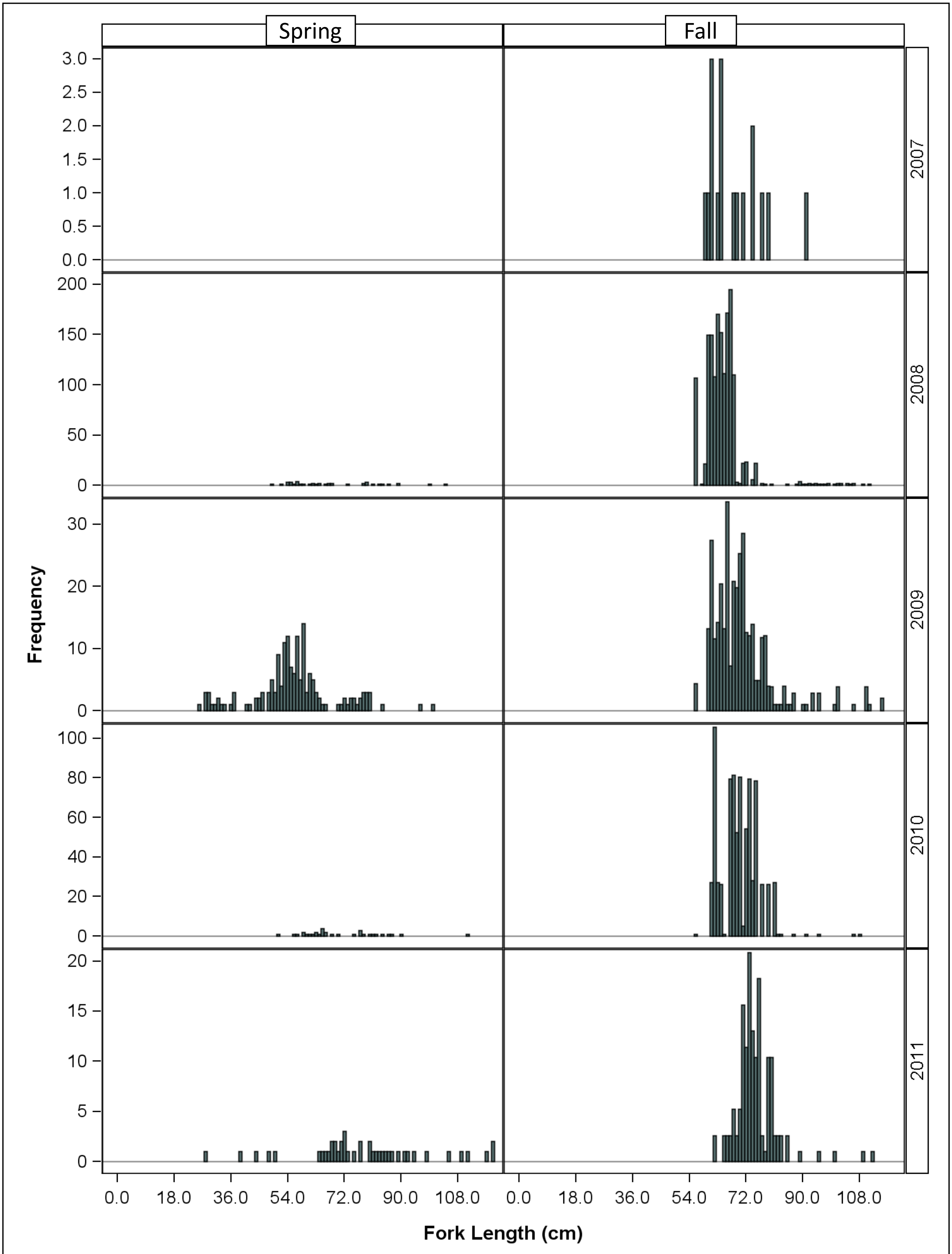


Figure 131. Striped bass length-frequency distributions, by cruise and sex.

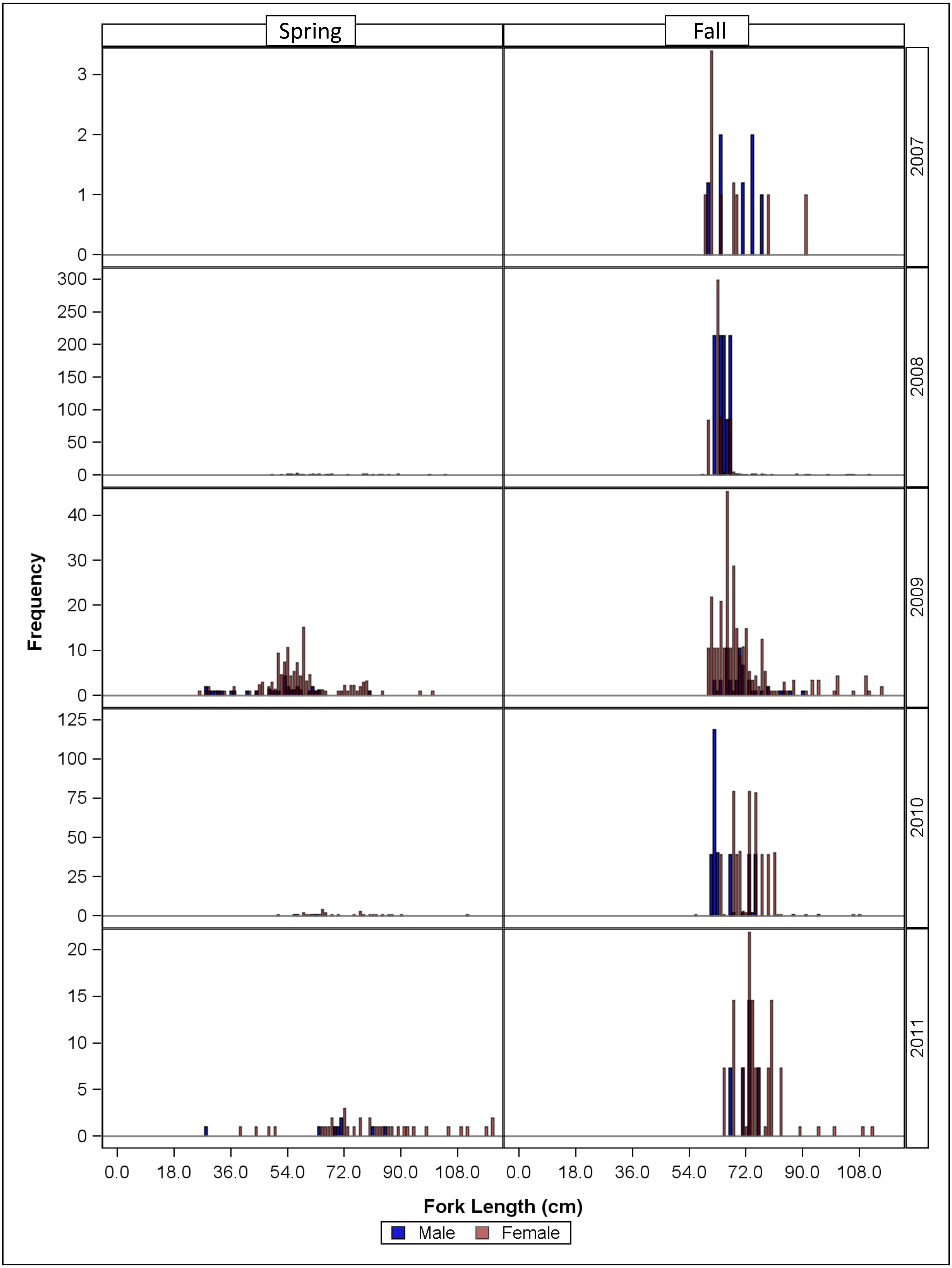


Figure 132. Striped bass sex ratio, by length group, for NEAMAP Spring and Fall cruises 2007-2011.
(The percentages for each category are given near the bottom of each bar. The number sampled for sex determination is provided near the top of each bar, and the length categories expressed in inches are shown between the two figures.).

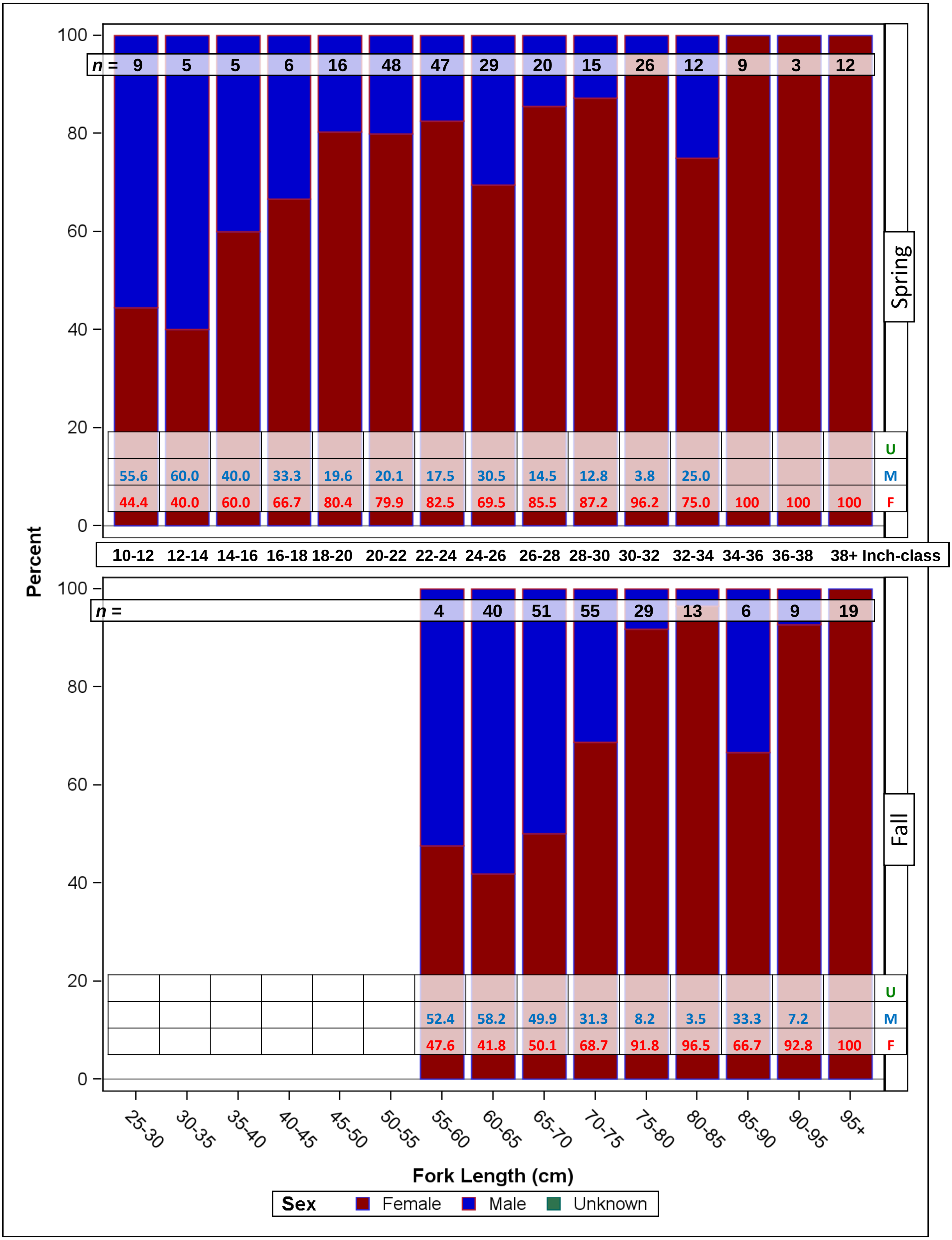
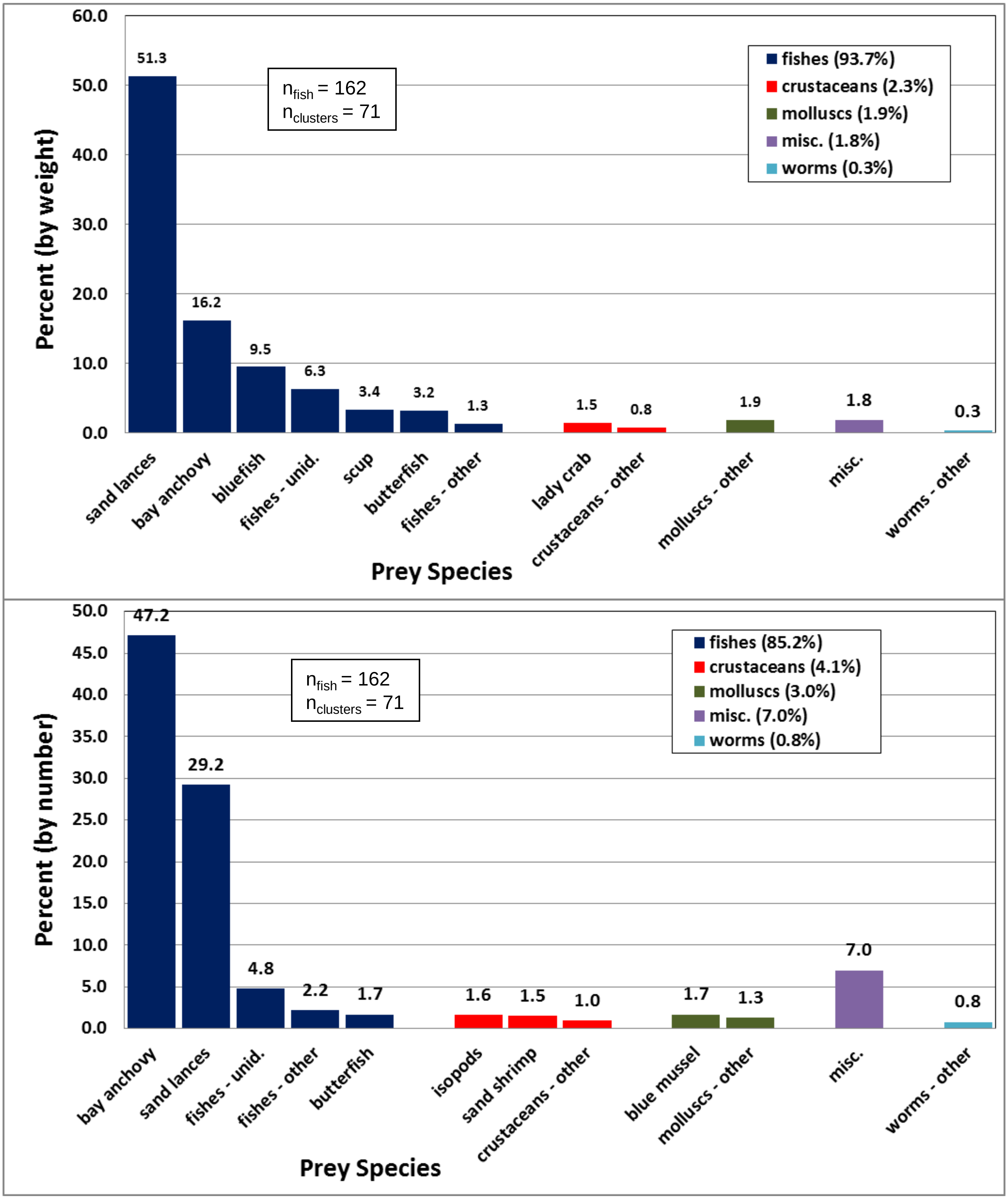


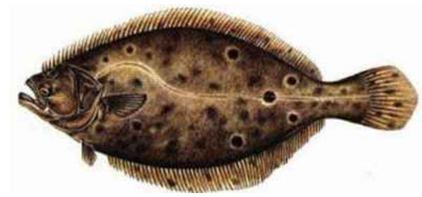
Figure 133. Striped bass diet composition, expressed as percent by weight and number collected during NEAMAP cruises in 2007 through Spring 2011. (The number of fish sampled for diet is given by n_{fish}, while $n_{clusters}$ indicates the number of clusters of this species sampled.)

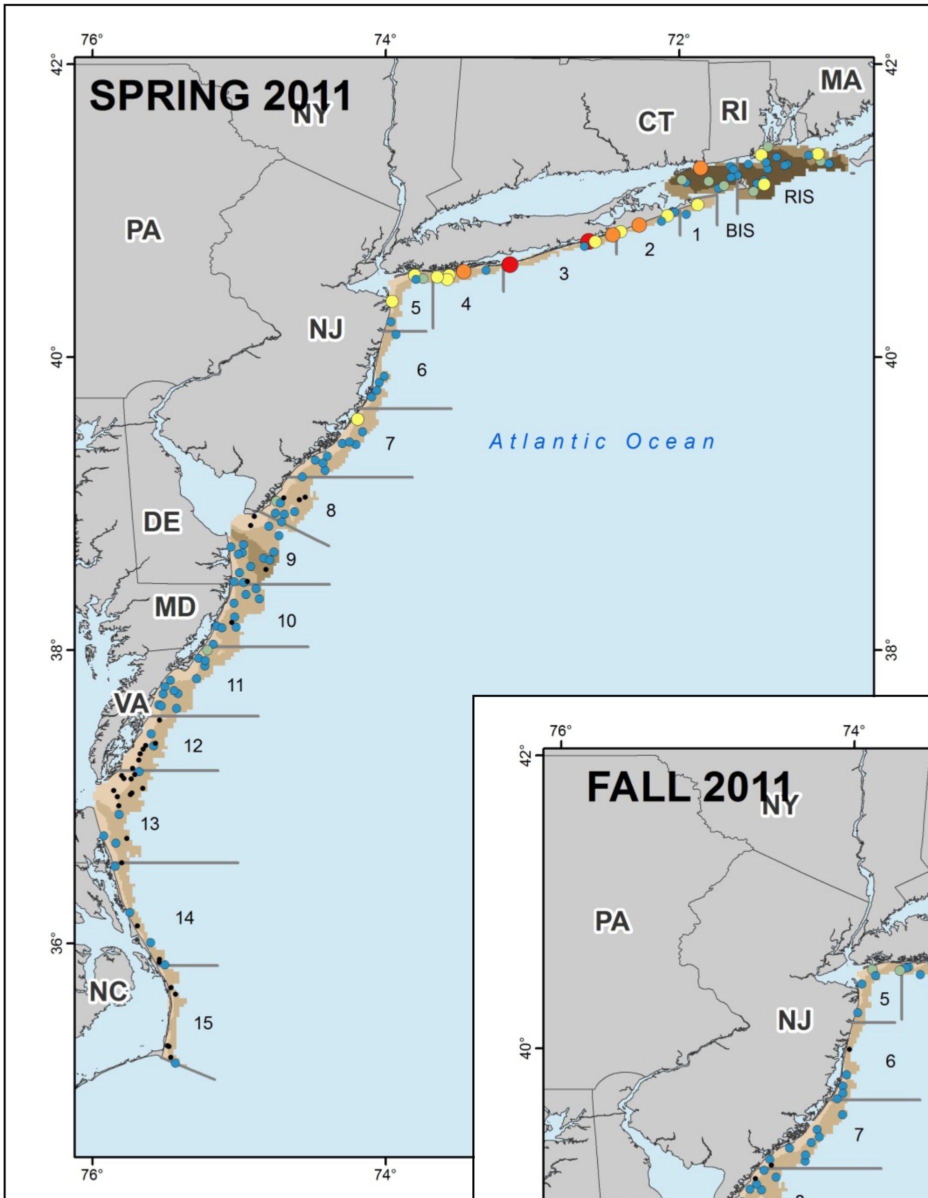


Summer Flounder

Sampling Priority: A

Figure 134. Summer flounder biomass (kg) at each sampling site for 2011 NEAMAP cruises.





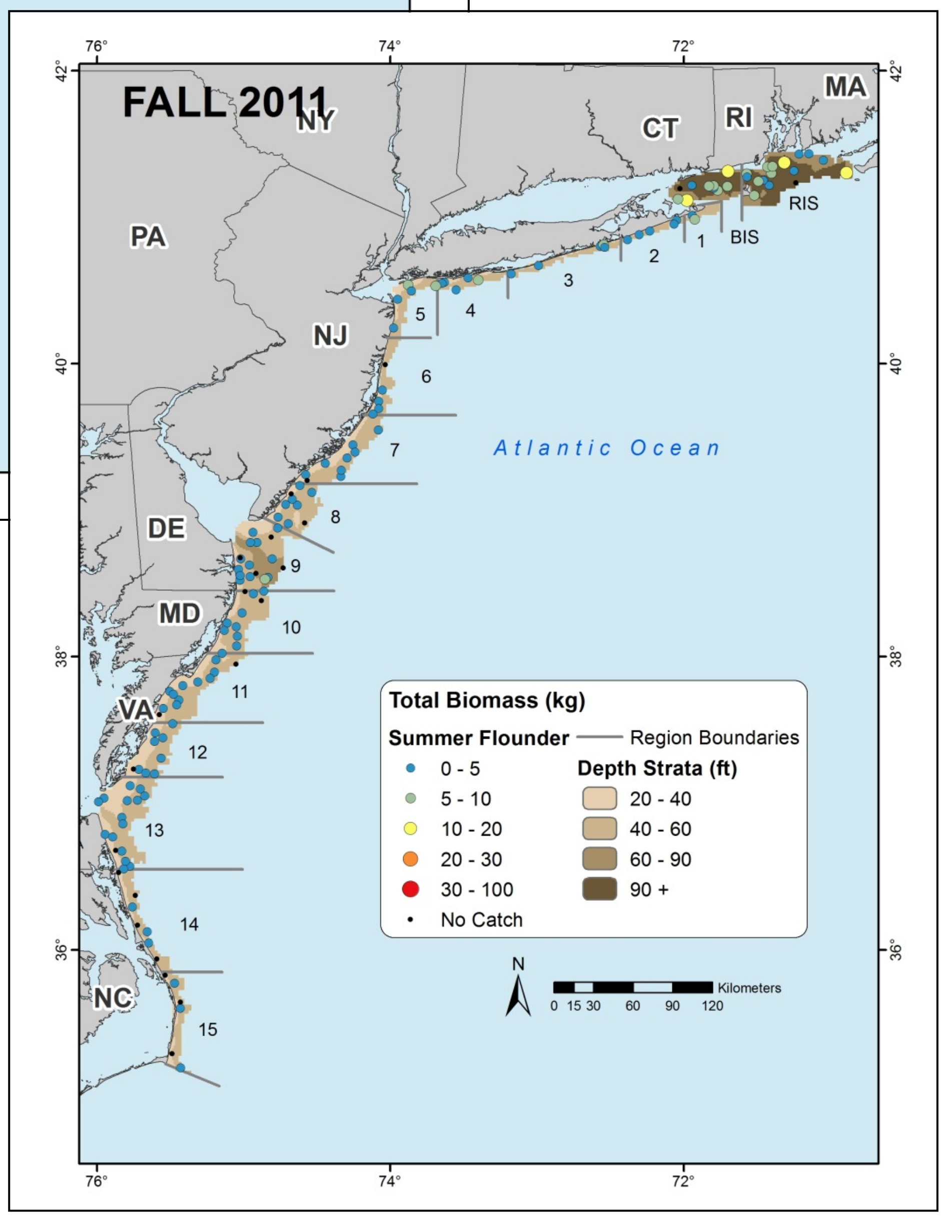


Table 80. Summer flounder sampling rates and preserved specimen analysis status for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught (kg)	Number Measured	Age Specimens	Ages Read	Stomach Specimens	Stomachs Analyzed
Spring	2008	768	527.0	768	522	522	375	366
	2009	977	519.3	977	623	623	362	349
	2010	711	386.8	711	493	493	310	265
	2011	1,352	636.4	1,246	547	547	254	248
Fall	2007	957	625.4	923	713	713	446	438
	2008	683	418.0	676	440	440	310	304
	2009	1,117	545.8	1,117	745	745	536	527
	2010	826	400.1	806	607	607	403	391
	2011	500	314.2	500	403	403	226	0

Table 81. Strata used for calculation of abundance indices for summer flounder.

State (Nominal)	Region	Depth Stratum	Spring Index	Fall Index
RI	RIS	60-90		
		90+		
	BIS	60-90		
		90+		
NY	01	40-60		
	02	20-40		
		40-60		
	03	20-40		
		40-60		
	04	20-40		
		40-60		
	05	20-40		
		40-60		
NJ	06	20-40		
		40-60		
	07	20-40		
		40-60		
	08	20-40		
		40-60		
DE	09	20-40		
		40-60		
		60-90		
MD	10	20-40		
		40-60		
VA	11	20-40		
		40-60		
	12	20-40		
		40-60		
	13	20-40		
		40-60		
NC	14	20-40		
		40-60		
	15	20-40		
		40-60		

= used for abundance indices

= not used for abundance indices

Table 82. Summer flounder preliminary geometric mean indices of abundance, for all specimens captured (by number and biomass) and by age-class for spring and fall NEAMAP surveys.

Season	Year	Age	Numerical Index					Biomass Index				
			n	LCI	**Index**	UCI	CV (%)	n	LCI	**Index**	UCI	CV (%)
Spring	2008	All	137	2.61	**3.09**	3.63	4.4	137	1.64	**1.93**	2.26	5.0
	2009		145	2.13	**2.56**	3.05	5.1	145	1.26	**1.52**	1.81	5.9
	2010		137	1.92	**2.36**	2.86	5.8	137	1.11	**1.34**	1.59	6.0
	2011		137	2.70	**3.22**	3.81	4.6	137	1.41	**1.68**	1.97	5.3
Fall	2007	All	137	3.74	**4.31**	4.96	3.4	137	2.25	**2.65**	3.09	4.4
	2008		137	2.28	**2.76**	3.31	5.1	137	1.44	**1.71**	2.02	5.4
	2009		145	4.17	**4.99**	5.94	4.1	145	2.07	**2.42**	2.81	4.4
	2010		137	3.38	**3.99**	4.67	4.0	137	1.70	**2.02**	2.37	5.0
	2011		137	2.15	**2.55**	2.99	4.7	137	1.23	**1.48**	1.77	6.0
Spring	2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	2009		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	2010		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	2011		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fall	2007	0	137	0.69	**0.84**	1.01	7.1	137	0.18	**0.22**	0.27	9.5
	2008		137	0.37	**0.52**	0.68	12.0	137	0.09	**0.13**	0.18	16.9
	2009		145	1.13	**1.43**	1.78	7.5	145	0.24	**0.30**	0.37	9.6
	2010		137	0.87	**1.11**	1.37	7.9	137	0.21	**0.27**	0.33	10.1
	2011		137	0.33	**0.43**	0.54	10.5	137	0.07	**0.09**	0.11	11.0
Spring	2008	1	137	0.54	**0.67**	0.83	8.4	137	0.17	**0.22**	0.26	9.6
	2009		145	0.67	**0.86**	1.07	8.5	145	0.19	**0.25**	0.30	10.5
	2010		137	0.59	**0.78**	0.99	9.6	137	0.17	**0.23**	0.29	11.5
	2011		137	0.89	**1.12**	1.38	7.5	137	0.29	**0.36**	0.44	9.0
Fall	2007	1	137	1.22	**1.44**	1.67	5.2	137	0.52	**0.63**	0.74	6.8
	2008		137	0.78	**0.97**	1.17	7.2	137	0.41	**0.51**	0.61	8.1
	2009		145	1.11	**1.33**	1.58	5.9	145	0.50	**0.60**	0.71	6.8
	2010		137	1.10	**1.30**	1.52	5.4	137	0.47	**0.56**	0.65	6.3
	2011		137	0.79	**0.96**	1.14	6.6	137	0.38	**0.45**	0.53	7.2
Spring	2008	2	137	1.02	**1.19**	1.38	5.2	137	0.55	**0.64**	0.74	5.6
	2009		145	0.69	**0.84**	1.00	7.0	145	0.37	**0.45**	0.53	7.3
	2010		137	0.78	**0.94**	1.12	6.6	137	0.37	**0.45**	0.53	7.3
	2011		137	1.26	**1.51**	1.79	5.7	137	0.63	**0.76**	0.89	6.4
Fall	2007	2	137	0.79	**0.93**	1.08	5.8	137	0.59	**0.69**	0.80	6.1
	2008		137	0.70	**0.84**	1.00	6.6	137	0.50	**0.61**	0.72	7.2
	2009		145	0.79	**0.92**	1.07	5.7	145	0.59	**0.69**	0.80	5.9
	2010		137	0.68	**0.81**	0.95	6.4	137	0.46	**0.56**	0.66	7.1
	2011		137	0.57	**0.68**	0.81	7.0	137	0.39	**0.48**	0.58	7.8
Spring	2008	3	137	0.57	**0.67**	0.77	6.1	137	0.41	**0.50**	0.59	7.3
	2009		145	0.40	**0.48**	0.56	7.1	145	0.31	**0.37**	0.43	7.5
	2010		137	0.34	**0.41**	0.48	7.5	137	0.24	**0.29**	0.35	8.4
	2011		137	0.50	**0.60**	0.70	6.6	137	0.34	**0.41**	0.48	7.4
Fall	2007	3	137	0.51	**0.61**	0.72	6.6	137	0.55	**0.66**	0.78	7.0
	2008		137	0.33	**0.40**	0.48	7.9	137	0.30	**0.38**	0.45	8.7
	2009		145	0.43	**0.52**	0.60	6.7	145	0.43	**0.52**	0.63	7.6
	2010		137	0.32	**0.39**	0.47	8.3	137	0.30	**0.38**	0.47	9.6
	2011		137	0.27	**0.33**	0.40	8.3	137	0.26	**0.32**	0.39	9.2
Spring	2008	4	137	0.21	**0.26**	0.31	8.8	137	0.24	**0.30**	0.37	9.1
	2009		145	0.16	**0.20**	0.24	8.5	145	0.20	**0.25**	0.31	9.5
	2010		137	0.11	**0.14**	0.17	10.4	137	0.13	**0.17**	0.21	11.6
	2011		137	0.11	**0.15**	0.19	11.2	137	0.11	**0.16**	0.21	13.6
Fall	2007	4	137	0.12	**0.16**	0.20	10.4	137	0.19	**0.25**	0.32	11.8
	2008		137	0.06	**0.08**	0.10	12.2	137	0.08	**0.11**	0.15	15.9
	2009		145	0.09	**0.12**	0.15	10.8	145	0.13	**0.19**	0.24	13.1
	2010		137	0.06	**0.09**	0.11	13.3	137	0.09	**0.13**	0.18	16.5
	2011		137	0.06	**0.08**	0.10	12.8	137	0.09	**0.13**	0.18	16.5
Spring	2008	5	137	0.35	**0.42**	0.50	7.6	137	0.32	**0.40**	0.48	8.5
	2009		145	0.26	**0.32**	0.37	7.4	145	0.26	**0.32**	0.38	8.2
	2010		137	0.20	**0.25**	0.30	8.9	137	0.18	**0.23**	0.29	10.1
	2011		137	0.25	**0.31**	0.36	8.1	137	0.20	**0.26**	0.31	9.6
Fall	2007	5	137	0.19	**0.24**	0.29	9.6	137	0.27	**0.34**	0.43	10.1
	2008		137	0.08	**0.11**	0.14	11.8	137	0.10	**0.13**	0.17	13.7
	2009		145	0.14	**0.18**	0.22	10.1	145	0.19	**0.25**	0.31	10.9
	2010		137	0.10	**0.13**	0.17	13.0	137	0.13	**0.18**	0.24	14.8
	2011		137	0.08	**0.11**	0.13	11.1	137	0.11	**0.16**	0.20	13.4
Spring	2008	6	137	0.14	**0.17**	0.21	9.0	137	0.17	**0.22**	0.27	10.3
	2009		145	0.11	**0.13**	0.15	8.7	145	0.13	**0.17**	0.21	10.7
	2010		137	0.09	**0.11**	0.13	8.9	137	0.10	**0.13**	0.17	11.7
	2011		137	0.09	**0.12**	0.15	10.9	137	0.09	**0.13**	0.17	15.1
Fall	2007	6	137	0.05	**0.06**	0.08	11.8	137	0.08	**0.11**	0.14	13.9
	2008		137	0.03	**0.04**	0.05	14.4	137	0.04	**0.06**	0.09	20.4
	2009		145	0.04	**0.05**	0.07	14.1	145	0.06	**0.09**	0.13	17.7
	2010		137	0.03	**0.04**	0.05	14.4	137	0.04	**0.06**	0.08	19.0
	2011		137	0.03	**0.04**	0.05	14.6	137	0.04	**0.07**	0.10	19.6
Spring	2008	7+	137	0.11	**0.15**	0.19	12.6	137	0.16	**0.22**	0.29	13.8
	2009		145	0.08	**0.10**	0.13	12.0	145	0.12	**0.17**	0.22	14.1
	2010		137	0.07	**0.09**	0.12	13.9	137	0.10	**0.15**	0.20	16.5
	2011		137	0.05	**0.08**	0.12	17.5	137	0.08	**0.13**	0.20	20.8
Fall	2007	7+	137	0.04	**0.07**	0.10	18.5	137	0.09	**0.15**	0.22	19.9
	2008		137	0.02	**0.03**	0.05	27.6	137	0.03	**0.07**	0.12	29.3
	2009		145	0.03	**0.06**	0.08	21.9	145	0.06	**0.12**	0.18	22.6
	2010		137	0.02	**0.04**	0.06	26.6	137	0.04	**0.08**	0.13	27.9
	2011		137	0.02	**0.05**	0.08	25.1	137	0.06	**0.12**	0.19	26.1

Figure 135. Summer flounder preliminary geometric mean indices of abundance, for all specimens captured (A - by number and biomass) and by age-class (B – numbers only) for spring and fall NEAMAP surveys.

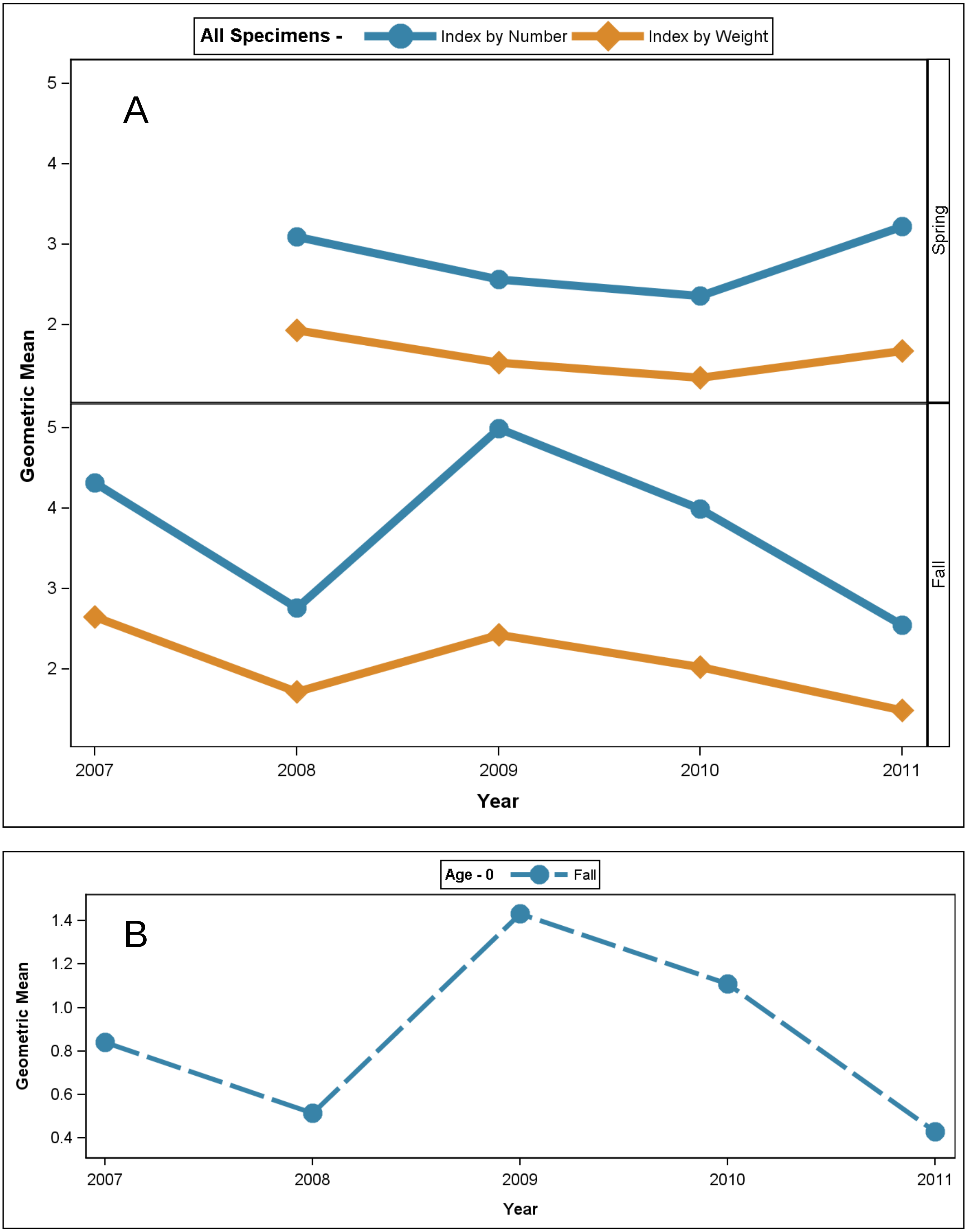


Figure 135. Cont.

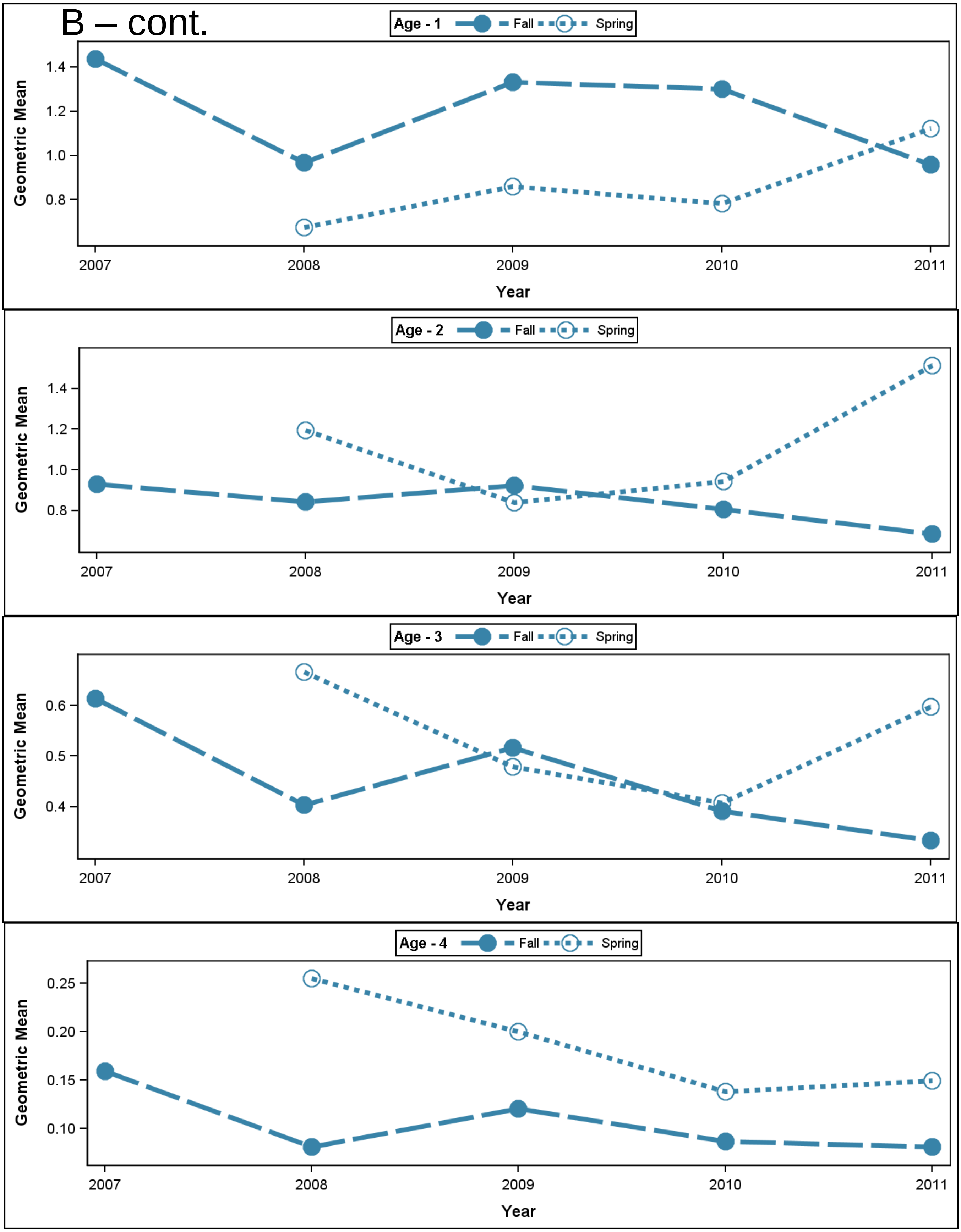


Figure 135. Cont.

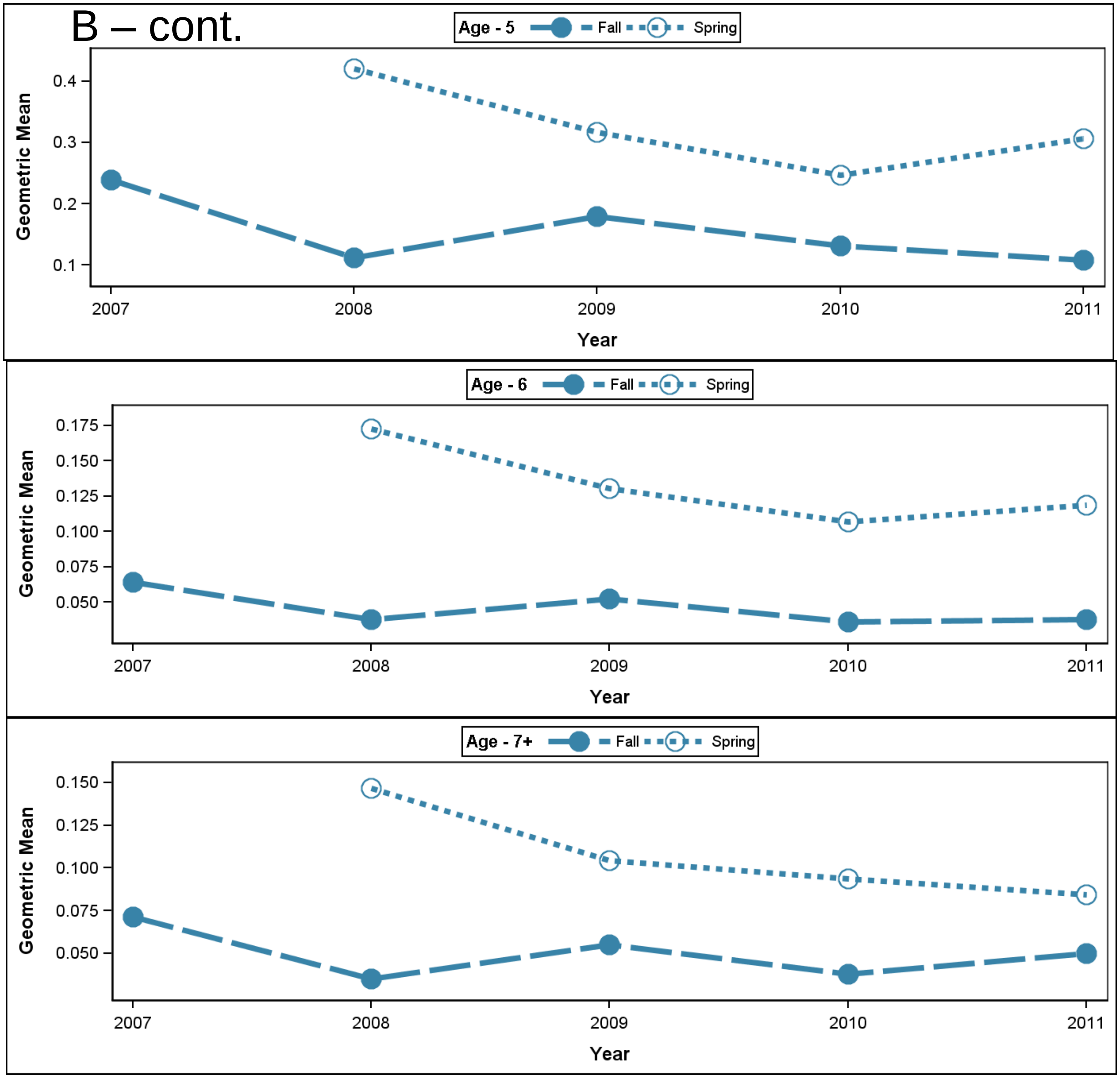


Figure 136. Summer flounder length-frequency distributions, by cruise.

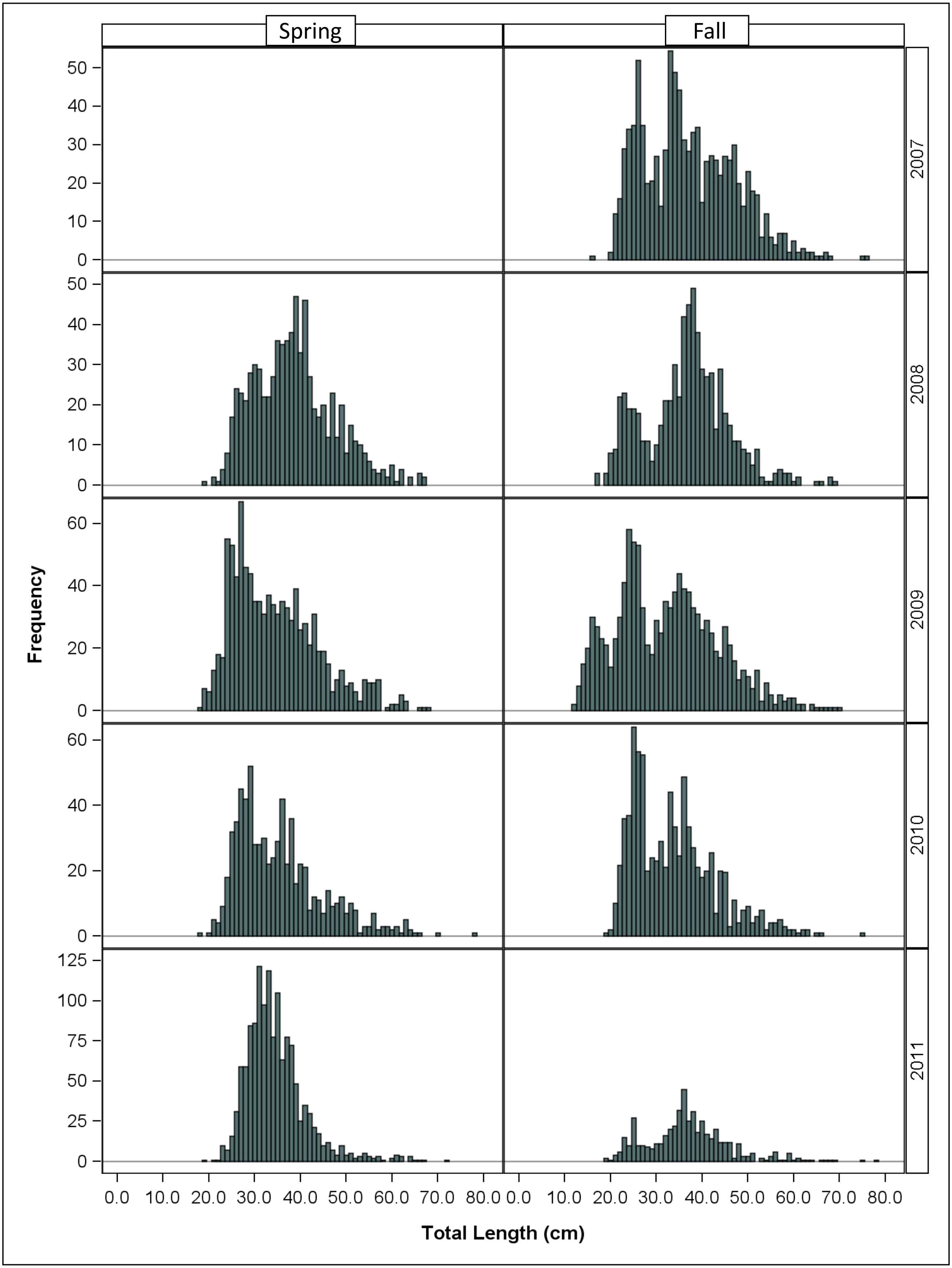


Figure 137. Summer flounder length-frequency distributions, by cruise and sex.

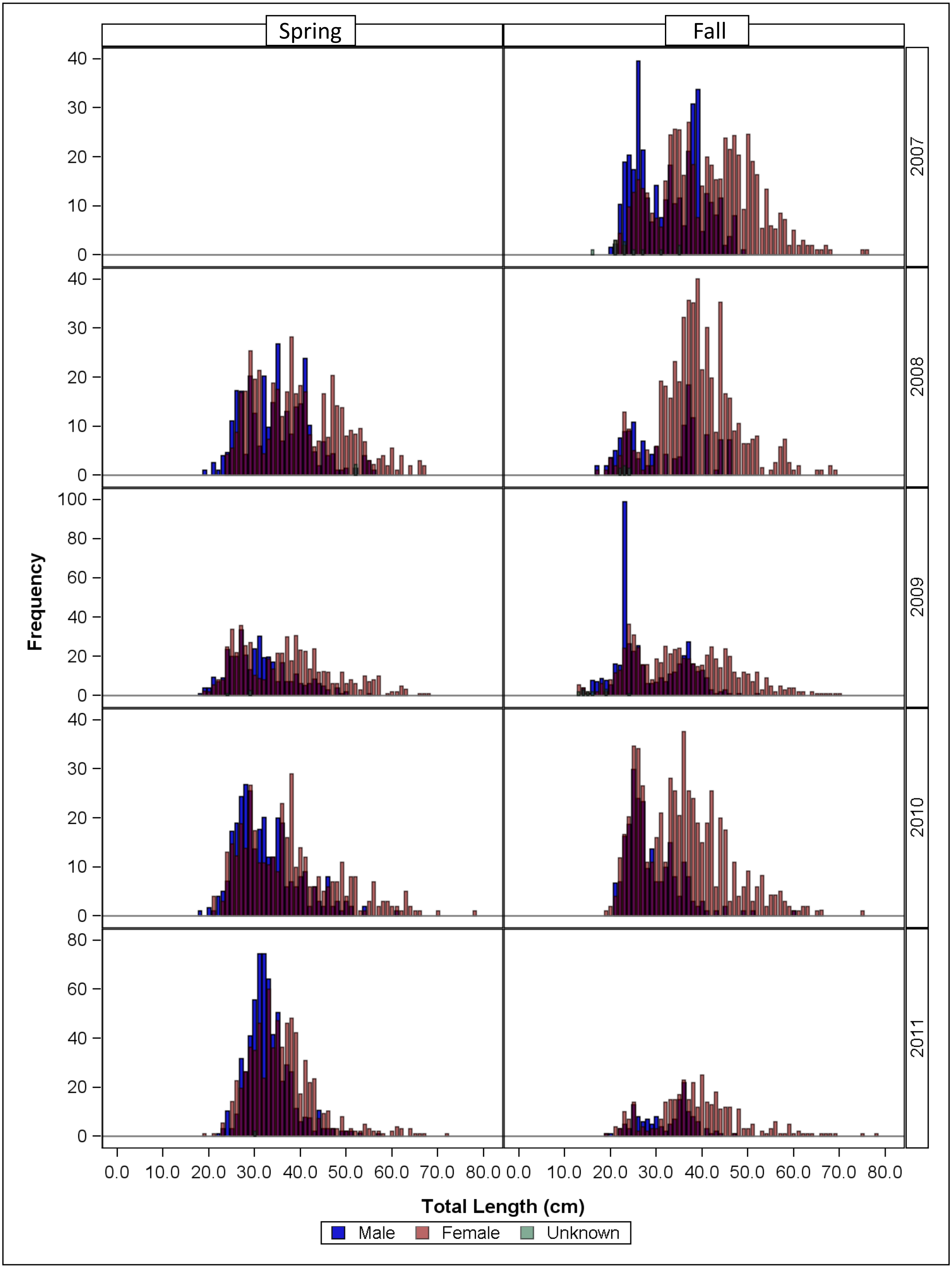


Figure 138. Summer flounder age-frequency distribution, by cruise. The estimated total number collected at a given age is provided above each corresponding bar.

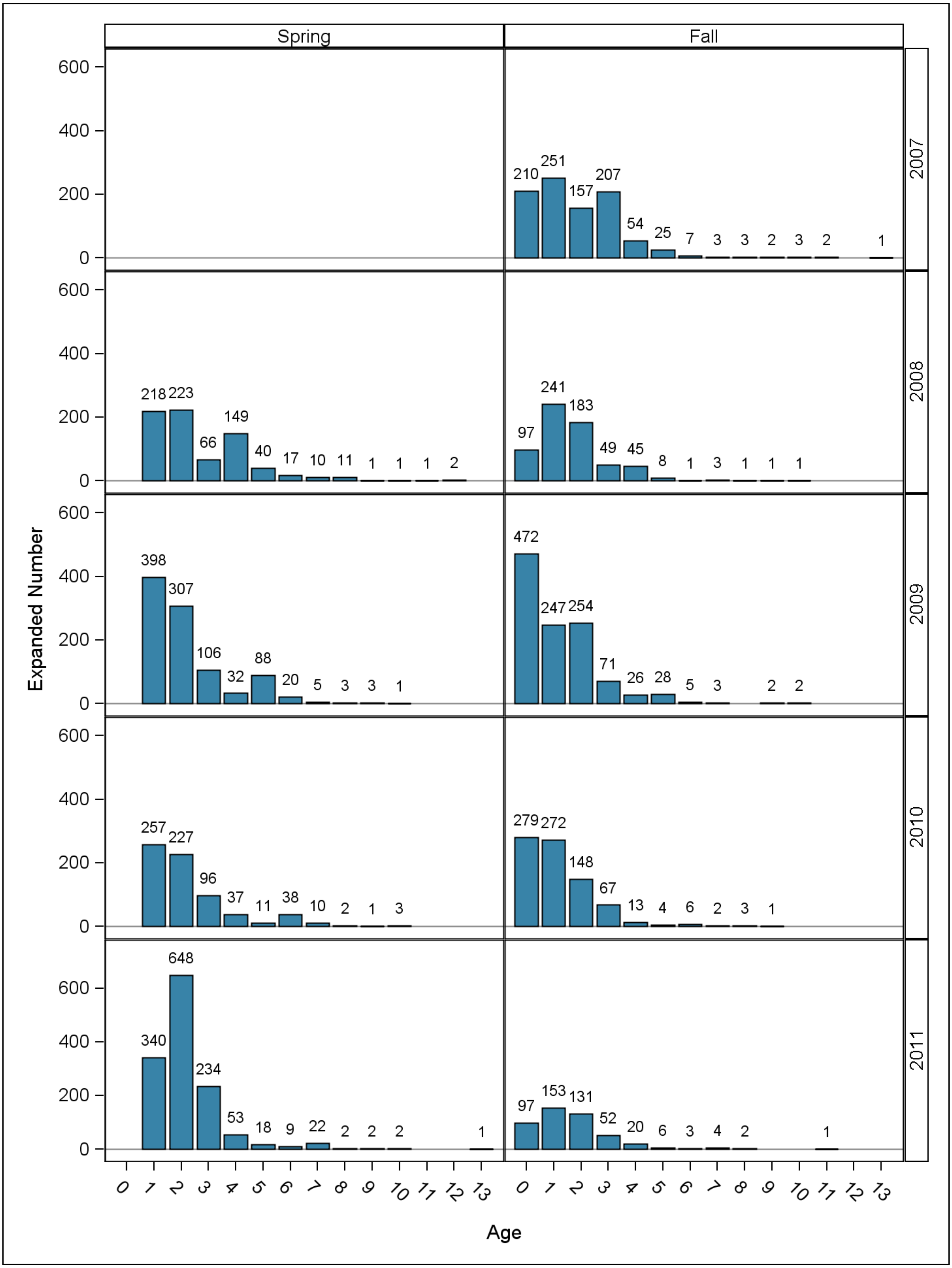


Figure 139. Summer flounder age-at-length proportions for all spring vs. all fall cruises combined, showing actual and loess smoothed proportions at each 1cm length bin.

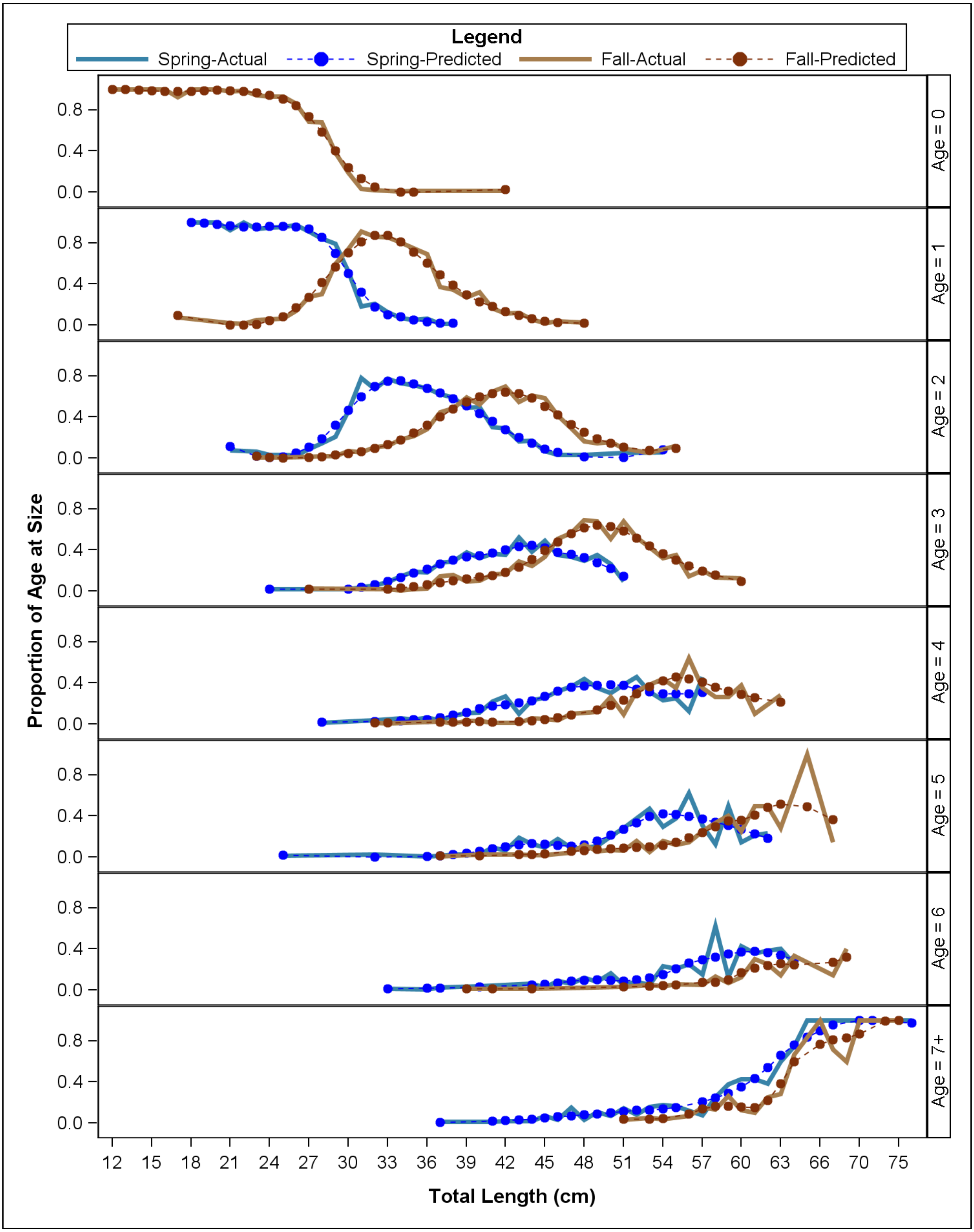


Table 83. Summer flounder loess-smoothed age-at-length proportions for all spring vs. all fall cruises combined. (Greyed values assigned rather than calculated due to lack of data in particular cells. Arrows indicate the same value used for all length bins covered. Struck-through values are from actual data but are not used. Note that within a Season and a Length bin proportions may not add to exactly 1.0 due to the smoothing algorithm. Smoothing is done within an age-class rather than across all age-classes at any given length.)

	Spring							Fall							
Total Length(cm)	**Age-1**	**Age-2**	**Age-3**	**Age-4**	**Age-5**	**Age-6**	**Age-7+**	**Age-0**	**Age-1**	**Age-2**	**Age-3**	**Age-4**	**Age-5**	**Age-6**	**Age-7+**
12								1.000							
13								0.999							
14								0.992							
15								0.987							
16								0.983							
17								0.981	~~0.097~~						
18	1.000							0.983							
19	0.992							0.989							
20	0.979							0.993							
21	0.968	~~0.111~~						0.990							
22	0.958	0.000						0.980	0.000						
23	0.955	0.018						0.966	0.010	~~0.016~~					
24	0.961	0.005	~~0.017~~					0.943	0.044	~~0.008~~					
25	0.960	0.016		~~0.020~~				0.906	0.083	~~0.003~~					
26	0.953	0.050						0.842	0.170	0.000					
27	0.934	0.105						0.733	0.268	0.007	~~0.021~~				
28	0.855	0.187			~~0.020~~			0.584	0.413	0.016					
29	0.697	0.319	0.000					0.402	0.568	0.030					
30	0.504	0.463	0.018					0.241	0.707	0.047					
31	0.318	0.595	0.038		0.000			0.132	0.813	0.066					
32	0.174	0.695	0.065		0.023	0.000		0.052	0.874	0.092	0.000		~~0.011~~		
33	0.103	0.750	0.097		0.030	0.012		0.000	0.875	0.131	0.019		~~0.012~~		
34	0.081	0.754	0.133		0.034	0.014			0.813	0.178	0.030				
35	0.052	0.723	0.173	0.000	0.042	0.016			0.712	0.246	0.043				
36	0.032	0.680	0.217	0.008	0.047	0.018			0.601	0.321	0.064	0.000	0.000		
37	0.020	0.635	0.263	0.016	0.066	0.021	~~0.009~~		0.492	0.400	0.080	0.013	0.017		
38	0.017	0.577	0.304	0.025	0.086	0.024			0.388	0.480	0.101	0.013	0.019	0.000	
39	0.000	0.509	0.331	0.038	0.117	0.028			0.298	0.548	0.123	0.013	0.021	0.012	
40		0.434	0.348	0.057	0.151	0.031	0.000		0.230	0.598	0.139	0.013	0.023	0.012	
41		0.357	0.372	0.079	0.175	0.035	0.019		0.180	0.628	0.154	0.013	0.022	~~0.011~~	
42		0.278	0.401	0.101	0.192	0.041	0.025	~~0.028~~	0.134	0.639	0.181	0.013	0.025		
43		0.204	0.434	0.121	0.207	0.045	0.032		0.094	0.628	0.230	0.023	0.027		
44		0.142	0.448	0.131	0.229	0.048	0.040		0.063	0.583	0.306	0.028	0.033	~~0.012~~	
45		0.090	0.424	0.126	0.268	0.060	0.051		0.040	0.503	0.394	0.035	0.046		
46		0.056	0.380	0.114	0.318	0.073	0.061		0.026	0.420	0.480	0.040	0.067		
47		0.020	0.361	0.106	0.356	0.088	0.072		0.023	0.329	0.557	0.056	0.087		
48		0.012	0.327	0.118	0.371	0.096	0.082		0.022	0.251	0.616	0.066	0.100		
49		0.010	0.278	0.159	0.380	0.102	0.089		0.000	0.191	0.644	0.077	0.138		
50		0.010	0.219	0.213	0.384	0.092	0.100			0.144	0.630	0.082	0.182		0.000
51		0.008	0.147	0.269	0.375	0.088	0.114			0.109	0.584	0.087	0.232	0.033	0.035
52		0.000	0.000	0.337	0.340	0.100	0.124			0.100	0.517	0.094	0.295	0.035	0.035
53				0.395	0.312	0.118	0.129			0.075	0.443	0.103	0.368	0.040	0.036
54		~~0.080~~		0.420	0.298	0.149	0.137			0.075	0.366	0.114	0.418	0.046	0.047
55				0.418	0.293	0.208	0.151			0.050	0.301	0.143	0.456	0.051	0.060
56				0.397	0.296	0.262	0.200			0.000	0.246	0.189	0.439	0.060	0.091
57				0.370	0.310	0.298	0.211				0.197	0.238	0.407	0.078	0.138
58				0.340	0.000	0.323	0.245				0.155	0.294	0.357	0.078	0.166
59				0.306		0.352	0.287				0.100	0.355	0.321	0.104	0.166
60				0.269		0.372	0.351				0.095	0.360	0.289	0.171	0.157
61				0.227		0.375	0.437				0.000	0.407	0.260	0.217	0.153
62				0.183		0.363	0.539					0.487	0.230	0.236	0.221
63				0.000		0.337	0.657					0.519	0.215	0.259	0.384
64						0.298	0.759					0.519	0.000	0.243	0.600
65						0.000	0.834					0.492		0.250	0.700
66							0.898					0.420		0.260	0.770
67							0.957					0.363		0.272	0.809
68							0.980					0.000		0.322	0.832
70							1.000							0.000	0.870
71															0.890
74															0.994
75															1.000
78							~~0.977~~								

Figure 140. Summer flounder sex ratio, by length group, for NEAMAP Spring and Fall cruises 2007-2011. (The percentages for each category are given near the bottom of each bar. The number sampled for sex determination is provided near the top of each bar, and the length categories expressed in inches are shown between the two figures.).

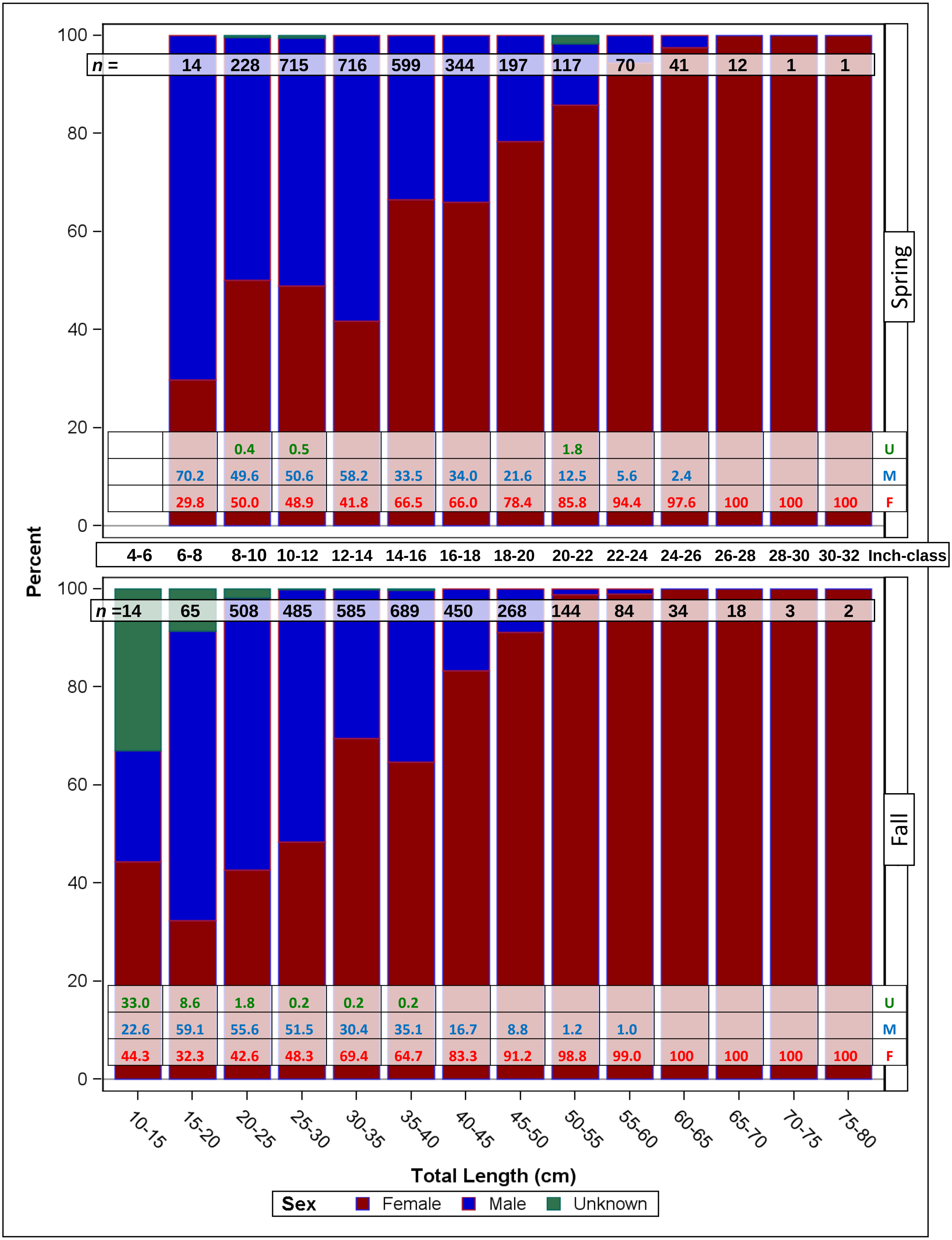
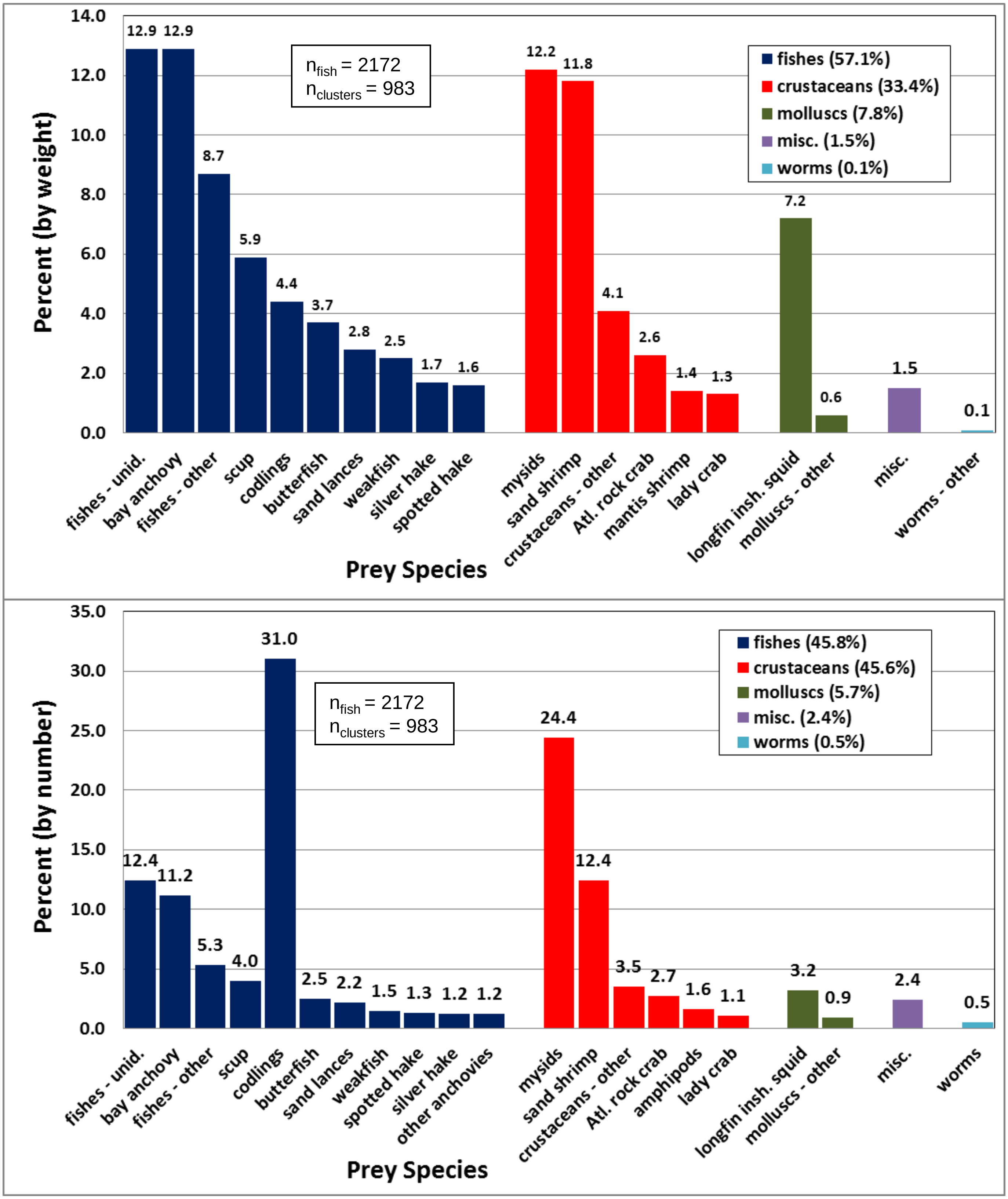


Figure 141. Summer flounder diet composition, expressed as percent by weight and number collected during NEAMAP cruises in 2007 through Spring 2011. (The number of fish sampled for diet is given by n_{fish}, while $n_{clusters}$ indicates the number of clusters of this species sampled.)



Weakfish

Sampling Priority: A

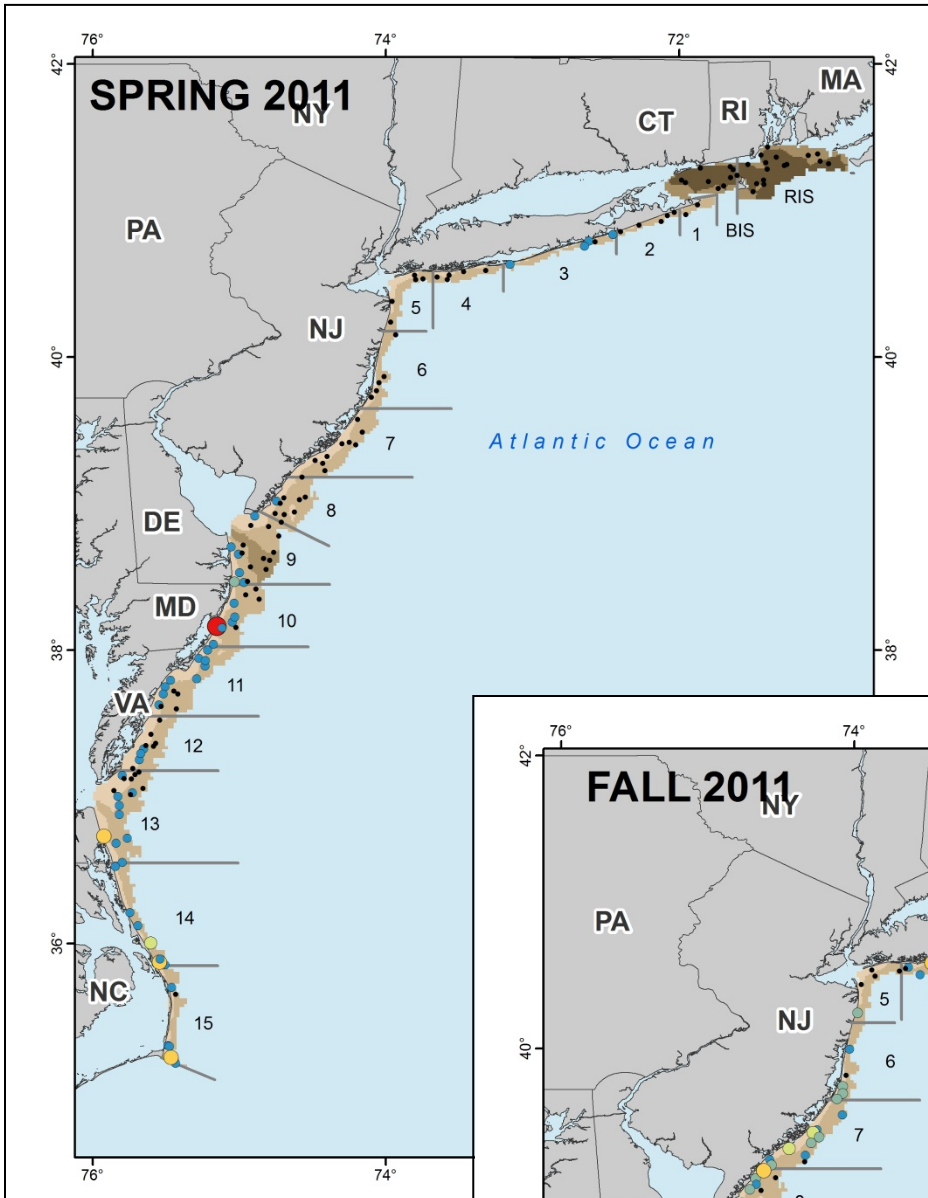
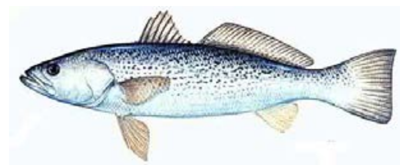


Figure 142. Weakfish biomass (kg) at each sampling site for 2011 NEAMAP cruises.



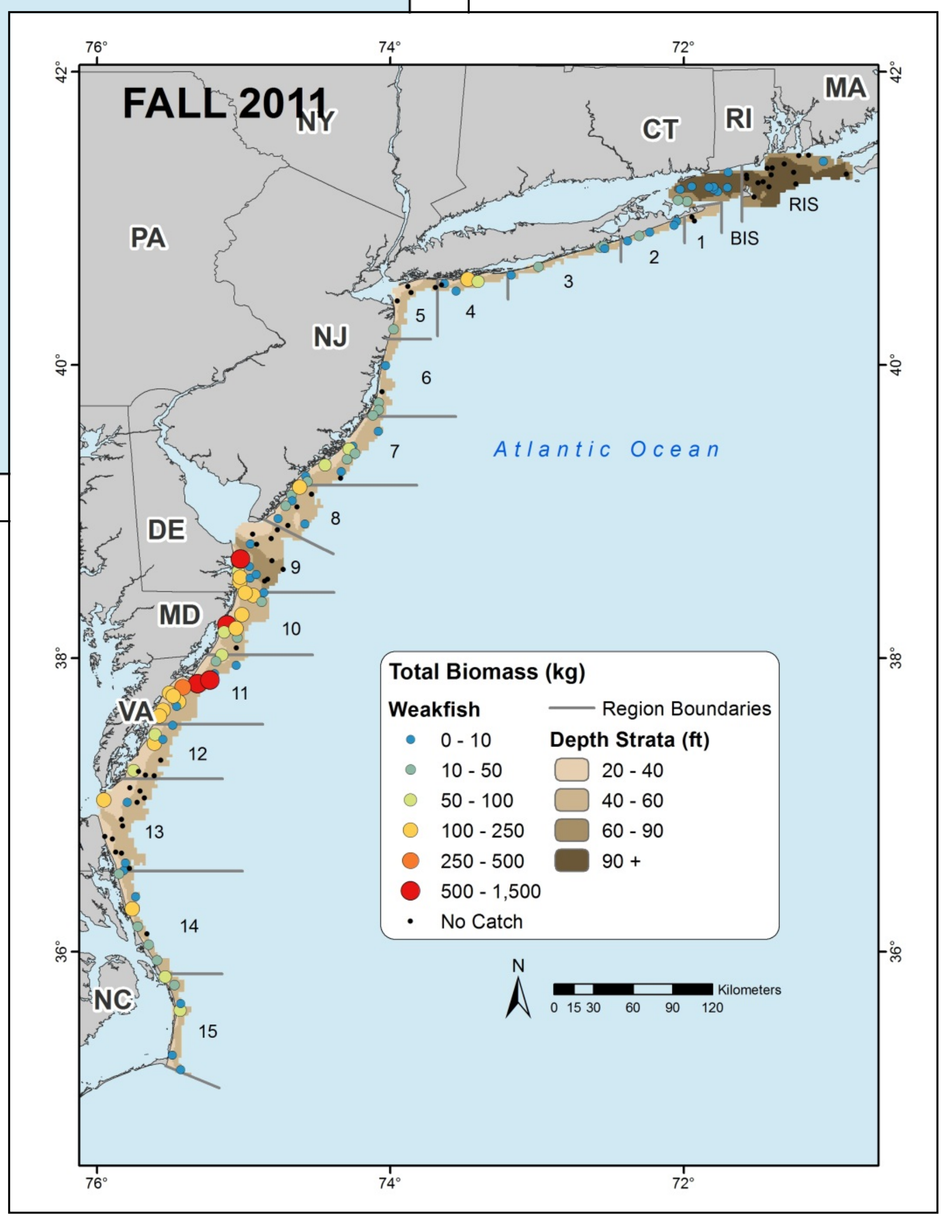


Table 84. Weakfish sampling rates and preserved specimen analysis status for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught (kg)	Number Measured	Age Specimens	Ages Read	Stomach Specimens	Stomachs Analyzed
Spring	2008	39,580	2198.8	2,174	305	305	279	277
	2009	8,785	339.3	1,654	189	189	143	136
	2010	18,192	864.9	1,717	259	259	184	164
	2011	28,701	1476.6	2,633	227	0	110	107
Fall	2007	60,990	4168.1	5,747	572	572	472	468
	2008	44,779	3990.4	3,879	464	464	333	320
	2009	96,394	5556.9	13,012	872	872	648	628
	2010	80,684	5795.7	8,115	611	611	464	455
	2011	115,593	7556.9	10,061	796	0	636	0

Table 85. Strata used for calculation of abundance indices for weakfish.

State (Nominal)	Region	Depth Stratum	Spring Index	Fall Index
RI	RIS	60-90		
		90+		
	BIS	60-90		
		90+		
NY	01	40-60		
	02	20-40		
		40-60		
	03	20-40		
		40-60		
	04	20-40		
		40-60		
	05	20-40		
		40-60		
NJ	06	20-40		
		40-60		
	07	20-40		
		40-60		
	08	20-40		
		40-60		

State (Nominal)	Region	Depth Stratum	Spring Index	Fall Index
DE	09	20-40		
		40-60		
		60-90		
MD	10	20-40		
		40-60		
VA	11	20-40		
		40-60		
	12	20-40		
		40-60		
	13	20-40		
		40-60		
NC	14	20-40		
		40-60		
	15	20-40		
		40-60		

(red) = used for abundance indices
(grey) = not used for abundance indices

Table 86. Weakfish preliminary geometric mean indices of abundance, for all specimens captured and by age-class for spring and fall NEAMAP surveys.

Season	Year	Age	Numerical Index					Biomass Index				
			n	LCI	**Index**	UCI	CV (%)	n	LCI	**Index**	UCI	CV (%)
Spring	2008	All	77	8.14	**12.02**	17.56	6.9	77	1.33	**1.94**	2.70	10.7
	2009		81	1.85	**2.97**	4.51	11.9	81	0.35	**0.57**	0.82	16.7
	2010		78	3.77	**5.96**	9.16	9.7	78	0.53	**0.95**	1.47	17.9
	2011		78	2.59	**4.47**	7.33	12.4	78	0.51	**0.98**	1.60	19.9
Fall	2007	All	150	7.43	**11.24**	16.76	7.4	150	2.17	**3.04**	4.15	8.7
	2008		150	6.39	**9.64**	14.31	7.7	150	1.98	**2.82**	3.90	9.3
	2009		160	18.46	**26.64**	38.26	5.3	160	4.11	**5.55**	7.39	6.6
	2010		150	7.17	**11.09**	16.89	7.9	150	2.10	**3.04**	4.27	9.5
	2011		150	15.31	**23.01**	34.33	6.1	150	3.83	**5.30**	7.21	7.2
Fall	2007	0	150	4.45	**6.59**	9.58	8.2	150	1.25	**1.74**	2.33	9.7
	2008		150	4.44	**6.53**	9.43	8.1	150	1.30	**1.84**	2.49	10.0
	2009		160	13.12	**18.72**	26.55	5.6	160	2.75	**3.63**	4.73	6.9
	2010		150	5.12	**7.89**	11.92	8.6	150	1.43	**2.09**	2.91	10.5
	2011		150	10.10	**15.21**	22.69	6.8	150	2.48	**3.45**	4.71	8.3
Spring	2008	1	77	6.27	**9.27**	13.51	7.4	77	1.09	**1.61**	2.27	11.7
	2009		81	1.61	**2.60**	3.97	12.5	81	0.31	**0.51**	0.75	17.6
	2010		78	3.37	**5.36**	8.25	10.1	78	0.47	**0.86**	1.36	18.9
	2011		78	2.25	**3.91**	6.43	13.0	78	0.44	**0.88**	1.47	21.3
Fall	2007	1	150	5.60	**8.30**	12.10	7.7	150	1.65	**2.27**	3.05	8.9
	2008		150	4.78	**7.08**	10.30	8.0	150	1.45	**2.06**	2.82	9.9
	2009		160	14.91	**21.33**	30.33	5.5	160	3.32	**4.42**	5.79	6.7
	2010		150	5.65	**8.58**	12.81	8.1	150	1.63	**2.32**	3.19	9.7
	2011		150	10.86	**16.11**	23.66	6.4	150	2.67	**3.66**	4.91	7.7
Spring	2008	2	77	2.39	**3.44**	4.82	9.1	77	0.42	**0.64**	0.90	14.5
	2009		81	0.39	**0.68**	1.01	17.8	81	0.05	**0.11**	0.17	25.8
	2010		78	0.69	**1.15**	1.72	15.5	78	0.08	**0.22**	0.38	31.1
	2011		78	0.72	**1.25**	1.94	16.7	78	0.14	**0.30**	0.49	25.9
Fall	2007	2	150	1.18	**1.66**	2.25	10.2	150	0.41	**0.58**	0.77	12.3
	2008		150	0.91	**1.36**	1.92	12.3	150	0.26	**0.42**	0.61	17.5
	2009		160	1.44	**2.00**	2.70	9.5	160	0.48	**0.67**	0.88	11.5
	2010		150	0.92	**1.34**	1.84	11.4	150	0.30	**0.45**	0.61	14.4
	2011		150	1.43	**1.90**	2.47	8.3	150	0.38	**0.51**	0.65	11.0
Spring	2008	3+	77	0.12	**0.25**	0.38	23.7	77	0.01	**0.05**	0.09	43.7
	2009		81	0.01	**0.06**	0.11	39.7	81	0.00	**0.01**	0.01	33.5
	2010		78	0.02	**0.08**	0.15	36.6	78	0.00	**0.01**	0.03	53.5
	2011		78	0.05	**0.11**	0.17	25.9	78	0.01	**0.02**	0.02	31.8
Fall	2007	3+	150	0.32	**0.46**	0.60	12.7	150	0.08	**0.12**	0.17	16.5
	2008		150	0.29	**0.44**	0.62	15.6	150	0.05	**0.11**	0.18	27.7
	2009		160	0.35	**0.49**	0.65	12.3	160	0.09	**0.13**	0.17	14.5
	2010		150	0.27	**0.40**	0.54	14.5	150	0.06	**0.10**	0.15	19.6
	2011		150	0.39	**0.53**	0.69	11.7	150	0.08	**0.12**	0.16	15.8

Figure 143. Weakfish preliminary geometric mean indices of abundance, for all specimens captured (A - by number and biomass) and by age-class (B – numbers only) for spring and fall NEAMAP surveys.

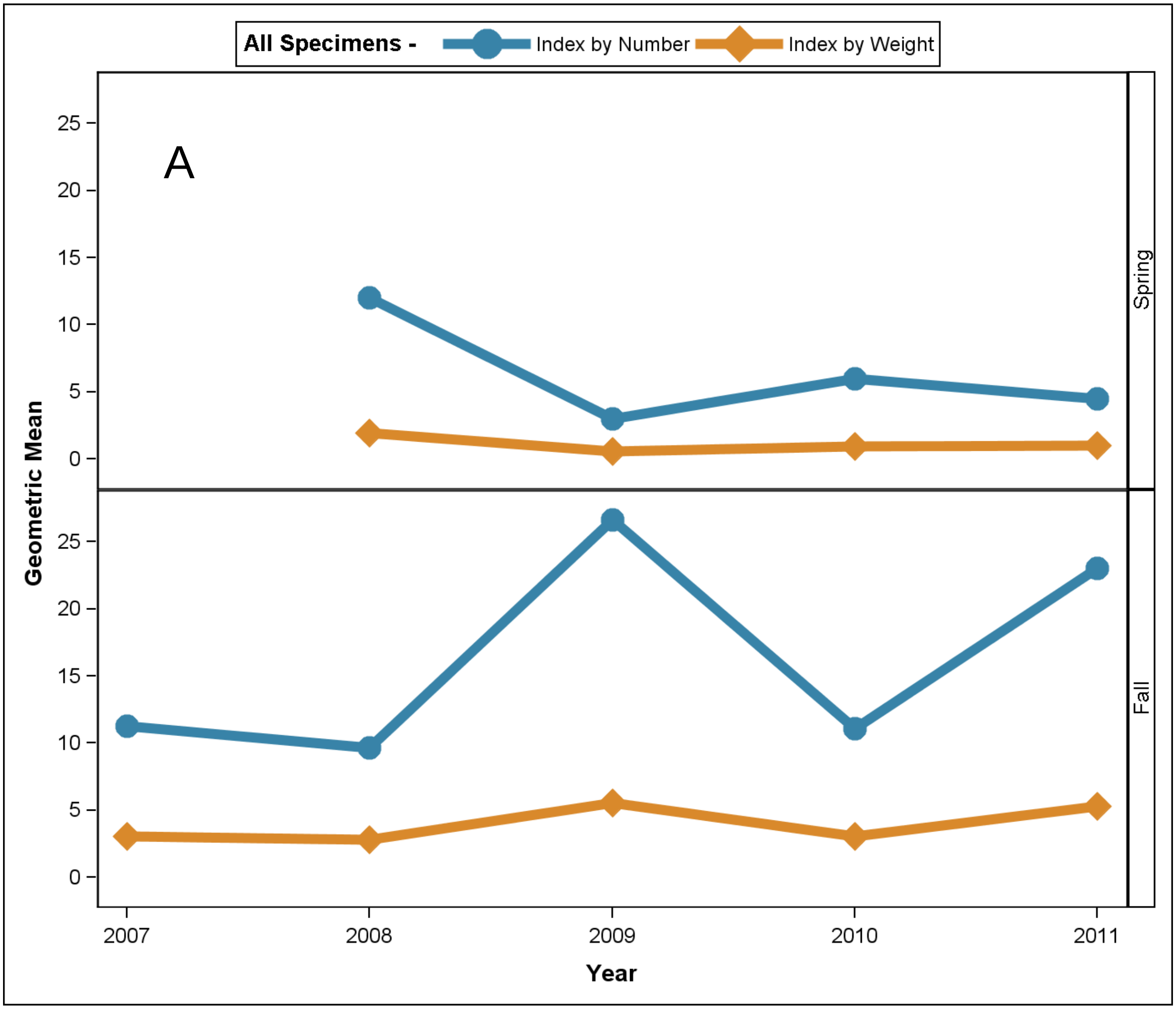


Figure 143. cont.

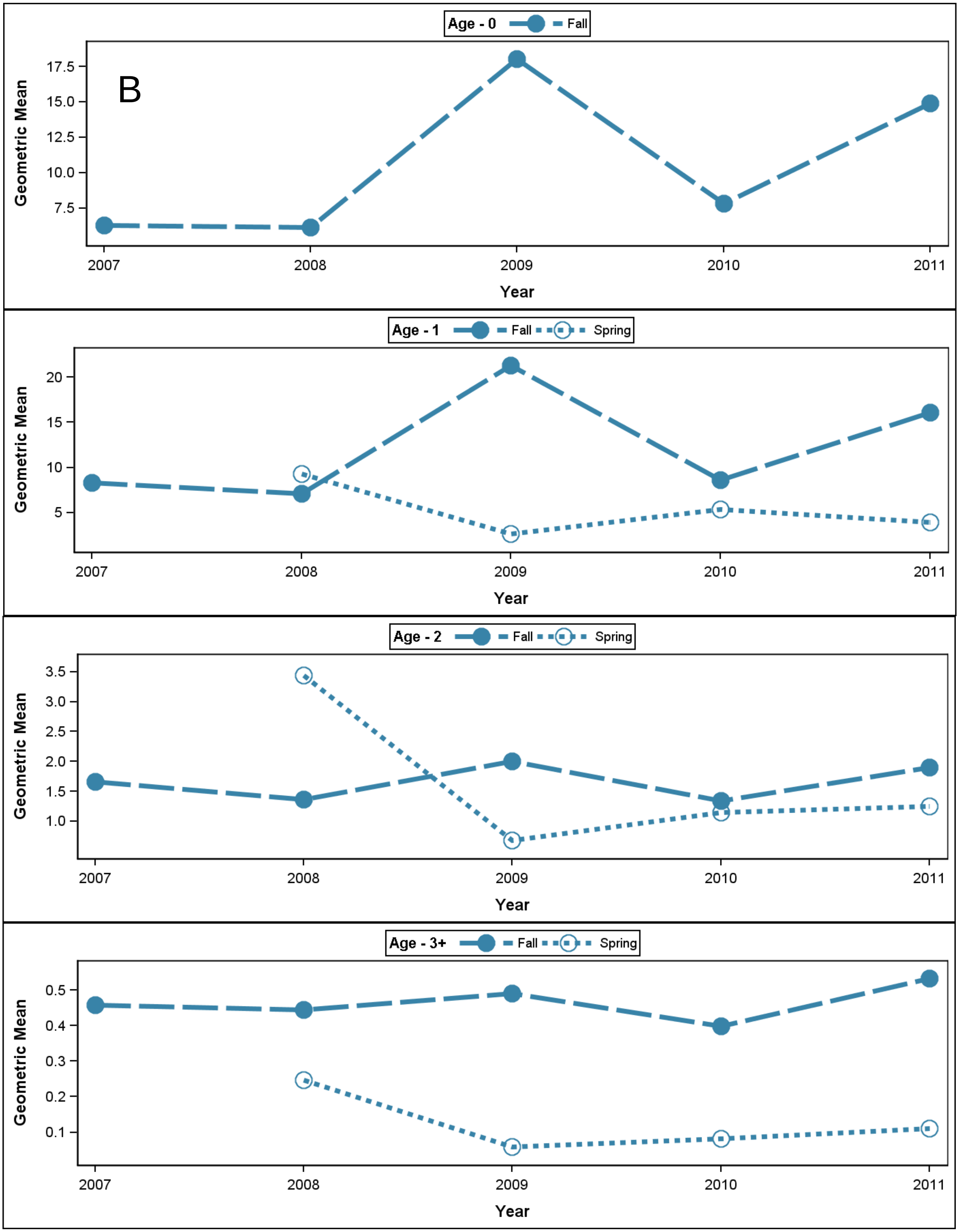


Figure 144. Weakfish length-frequency distributions, by cruise.

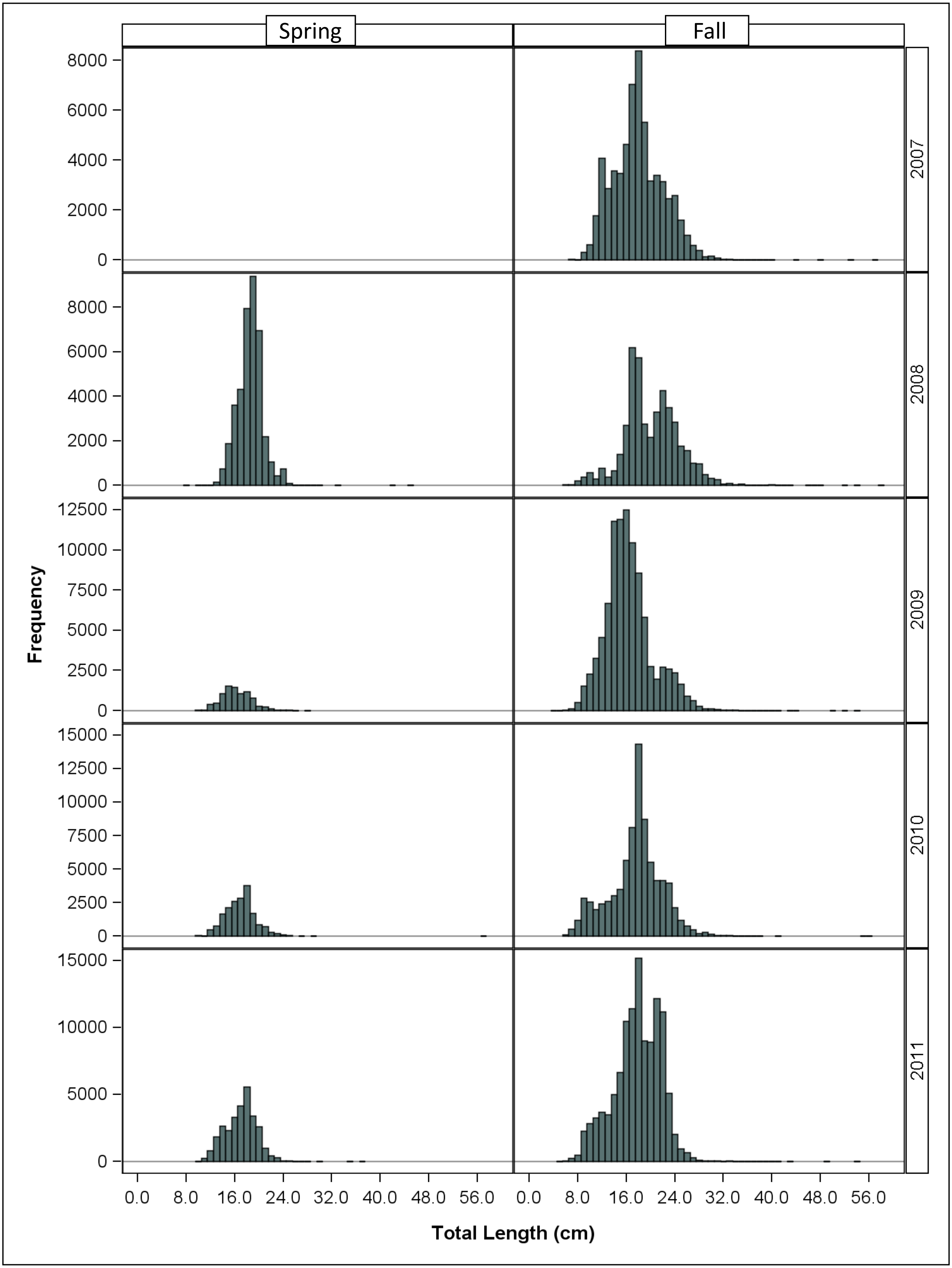


Figure 145. Weakfish length-frequency distributions, by cruise and sex.

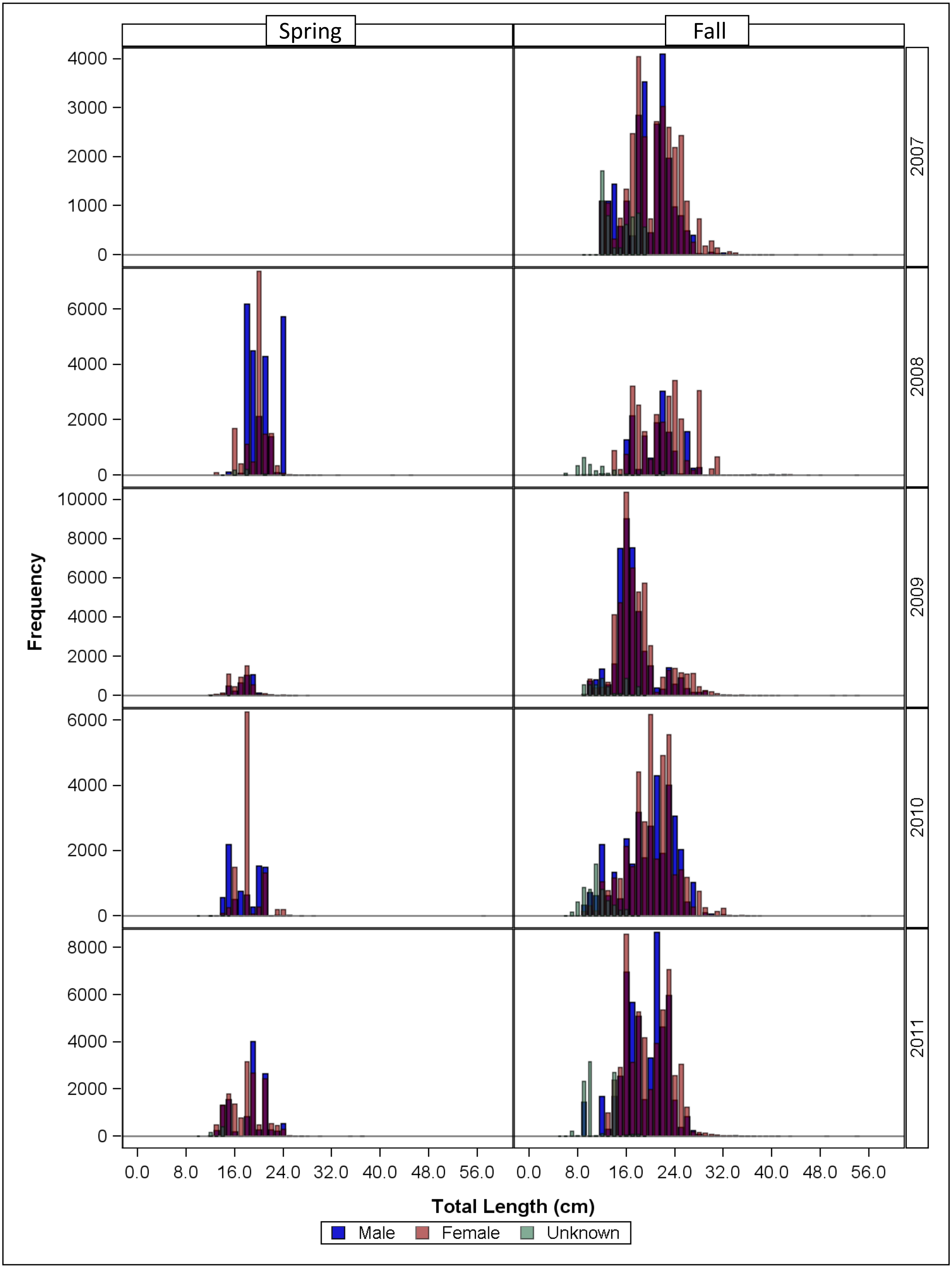


Figure 146. Weakfish age-frequency distribution, by cruise. The estimated total number collected at a given age is provided above each corresponding bar.

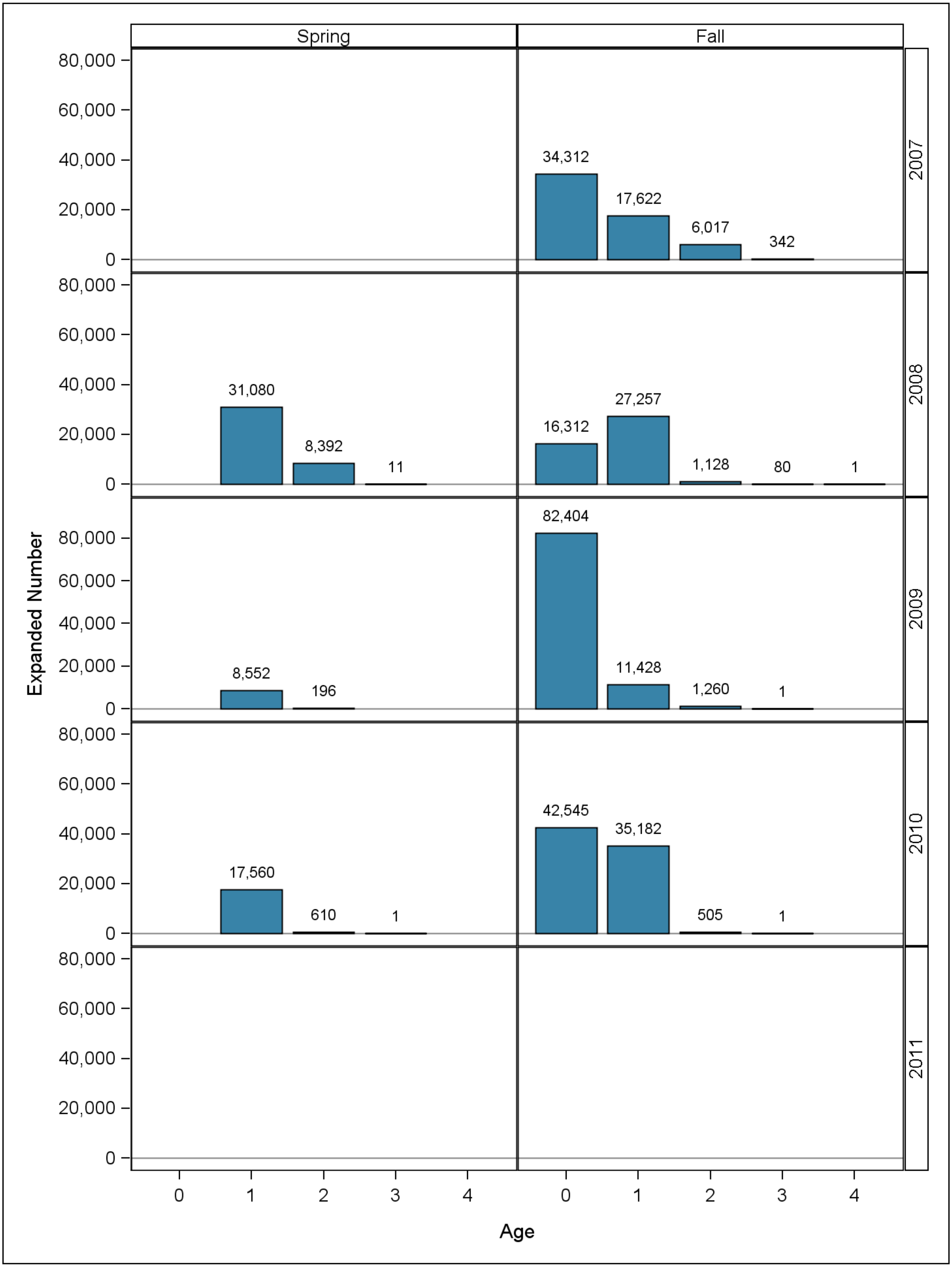


Figure 147. Weakfish age-at-length proportions for all spring vs. all fall cruises combined (A: for data including all 1cm length groups and B: for data with all specimens greater than 37cm pooled).

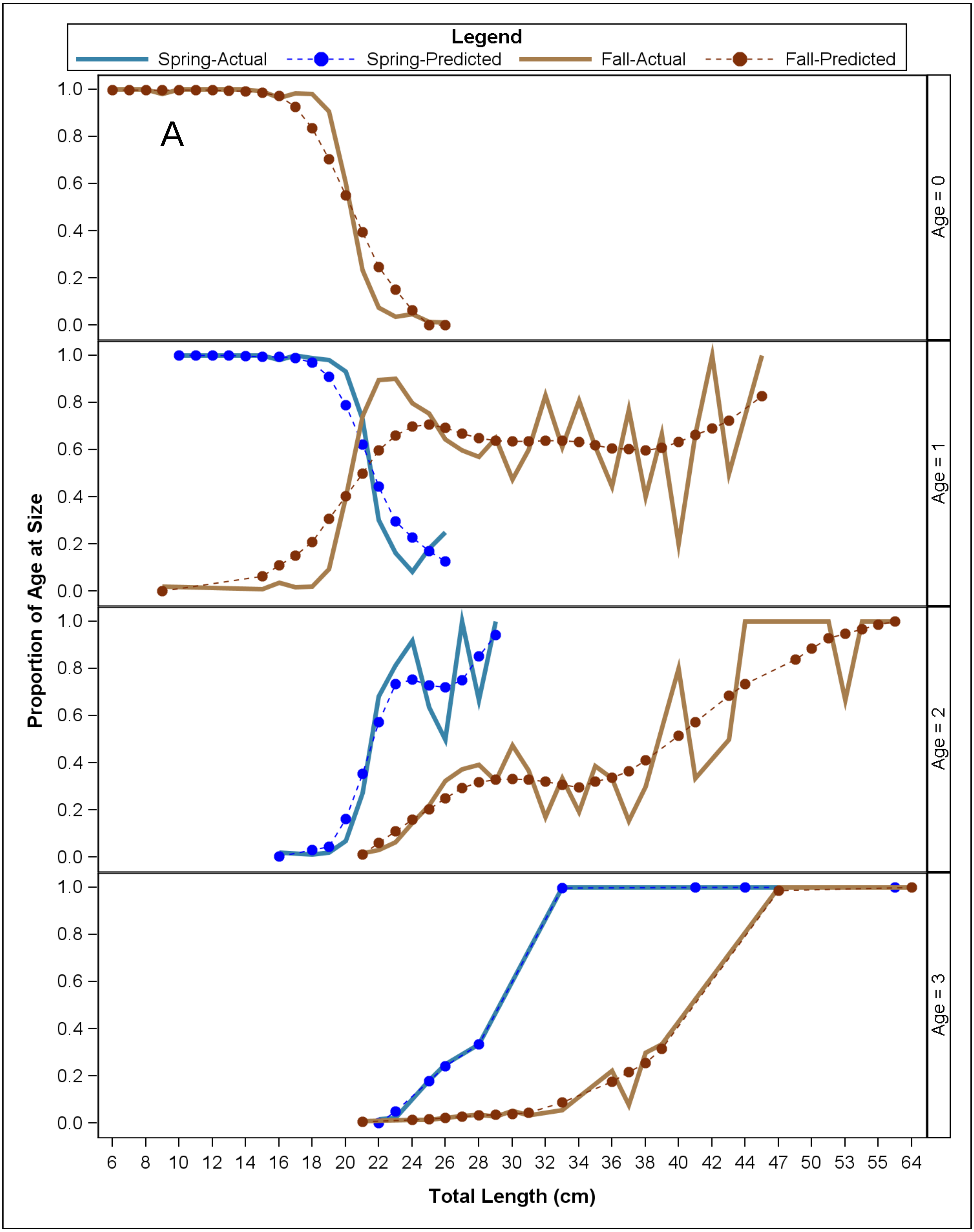


Figure 147. cont.

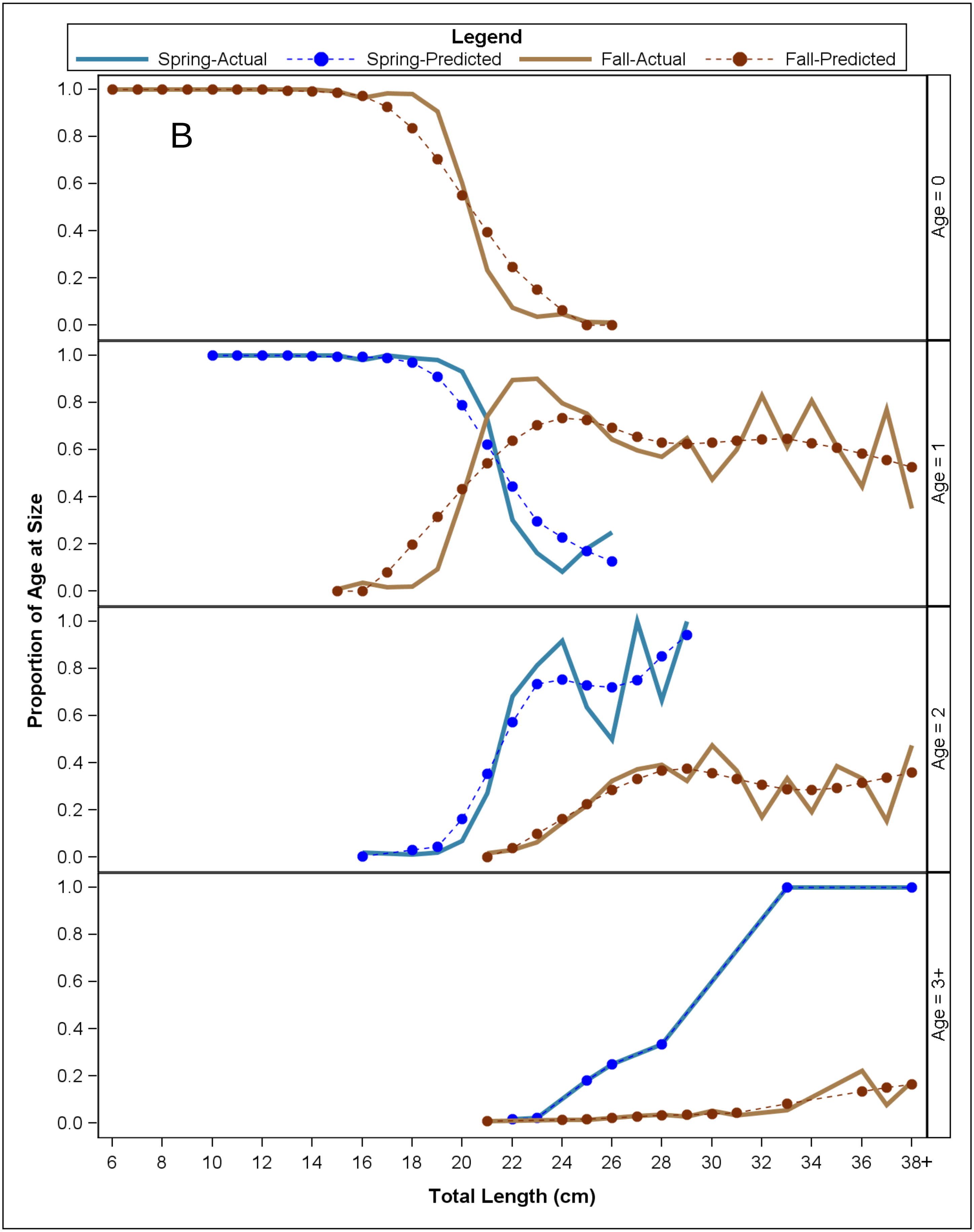


Table 87. Weakfish loess-smoothed age-at-length proportions for all spring vs. all fall cruises combined.
(Greyed values assigned rather than calculated due to lack of data in particular cells. Arrows indicate the same value used for all length bins covered. Struck-through values are from actual data but are not used. Note that within a Season and a Length bin proportions may not add to exactly 1.0 due to the smoothing algorithm. Smoothing is done within an age-class rather than across all age-classes at any given length.)

	Spring			Fall			
Total Length(cm)	**Age-1**	**Age-2**	**Age-3**	**Age-0**	**Age-1**	**Age-2**	**Age-3+**
6	↑	↑	↑	1.000	↑	↑	↑
7				1.000			
8				1.000			
9				1.000			
10				1.000			
11	1.000			0.999			
12	0.999			0.997			
13	0.998			0.994			
14	0.997			0.991			
15	0.995			0.981			
16	0.992			0.952	~~0.000~~		
17	0.981	0.000		0.890	0.092		
18	0.946	0.039		0.795	0.203		
19	0.869	0.074		0.675	0.311		
20	0.751	0.196		0.545	0.416		0.000
21	0.609	0.353		0.411	0.519	0.000	0.006
22	0.468	0.573	0.000	0.294	0.598	0.040	
23	0.359	0.735	0.050	0.177	0.659	0.101	↓
24	0.249	0.753	0.050	0.062	0.698	0.161	0.015
25	0.144	0.727	0.178	0.000	0.707	0.220	0.017
26	0.049	0.721	0.240		0.693	0.274	0.022
27		0.771	0.229		0.669	0.322	0.028
28		0.848	0.336		0.649	0.353	0.033
29		0.927	0.073		0.639	0.359	0.036
30					0.637	0.347	0.039
31					0.636	0.329	0.044
32					0.637	0.316	0.047
33			~~0.887~~		0.627	0.302	0.088
34					0.615	0.288	0.097
35					0.602	0.299	0.099
36					0.588	0.315	0.133
37					0.572	0.333	0.151
38+	↓	↓	~~1.000~~ ↓	↓	0.553	0.350	0.168

Figure 148. Weakfish sex ratio, by length group, for NEAMAP Spring and Fall cruises 2007-2011.
(The percentages for each category are given near the bottom of each bar. The number sampled for sex determination is provided near the top of each bar, and the length categories expressed in inches are shown between the two figures.).

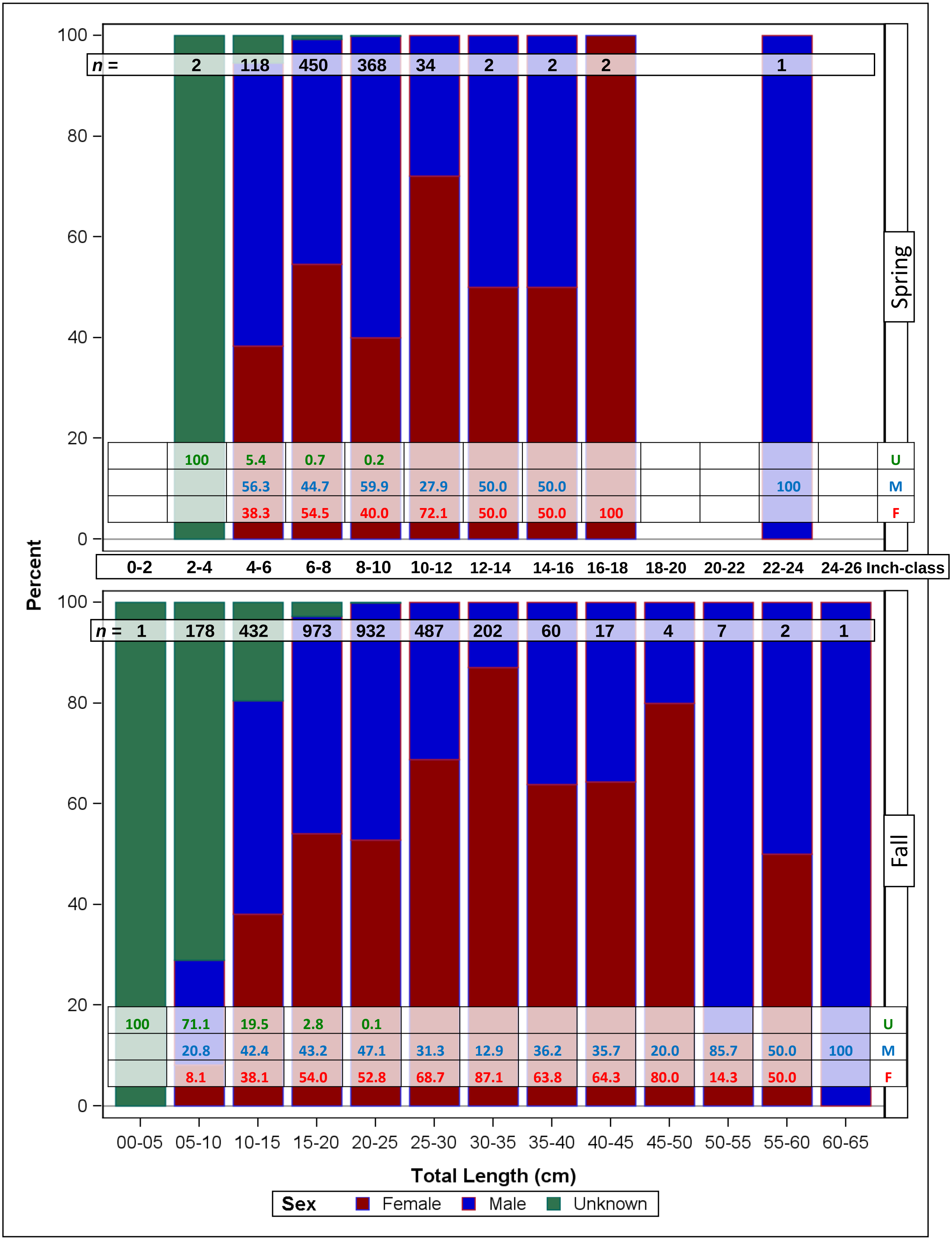
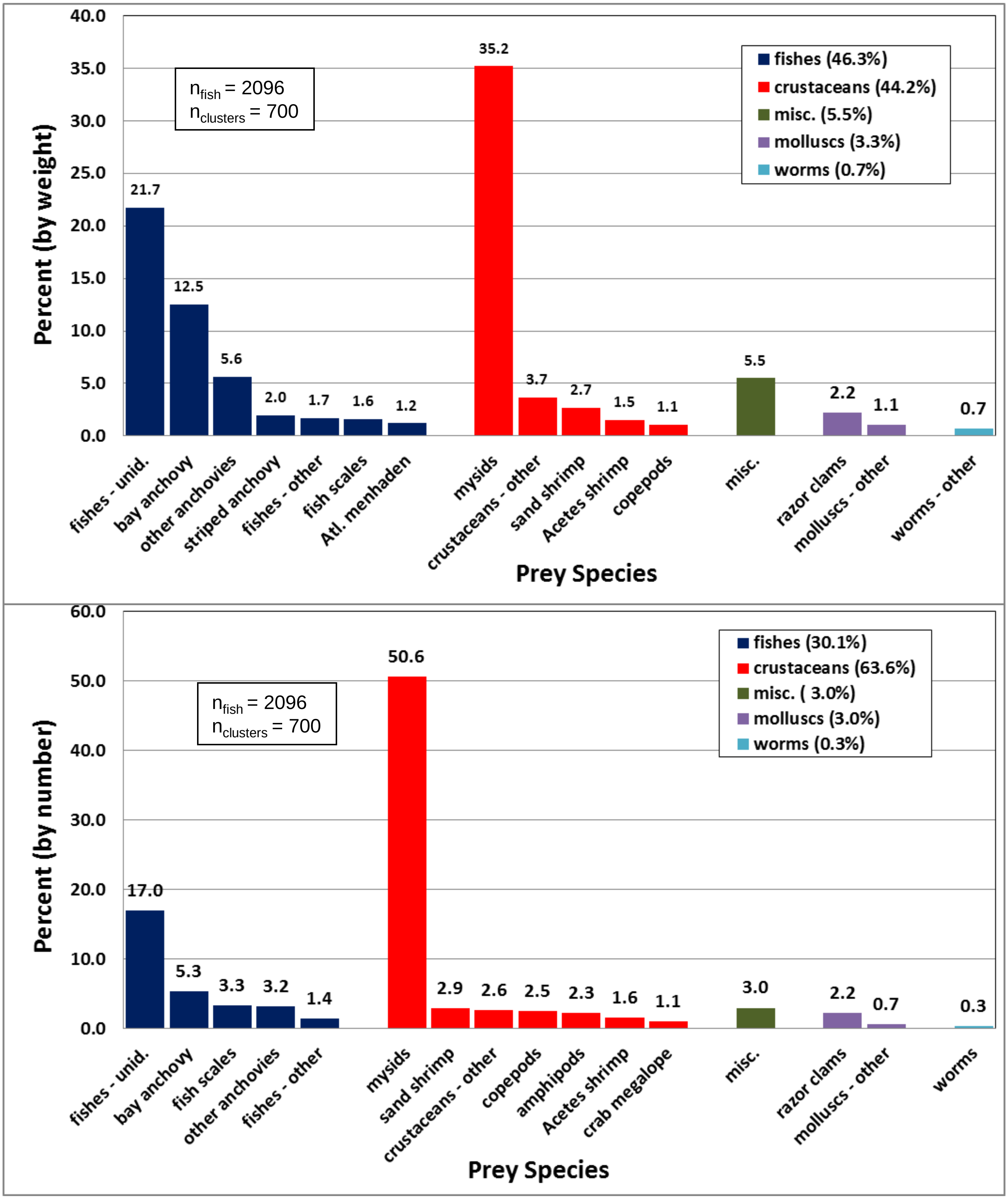


Figure 149. Weakfish diet composition, expressed as percent by weight and number collected during NEAMAP cruises in 2007 through Spring 2011. (The number of fish sampled for diet is given by n_{fish}, while $n_{clusters}$ indicates the number of clusters of this species sampled.)



White Shrimp

Sampling Priority: E

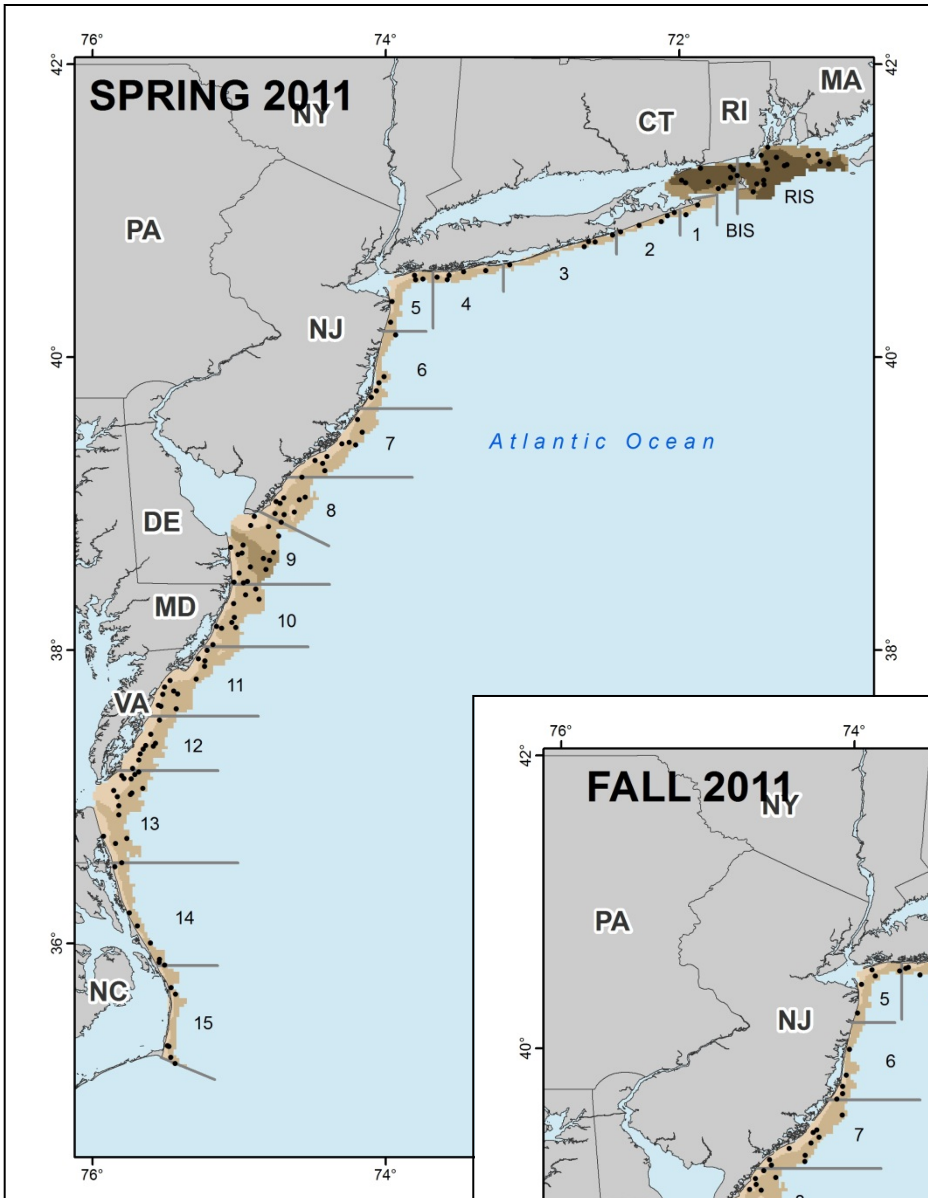


Figure 150. White shrimp biomass (kg) at each sampling site for 2011 NEAMAP cruises.

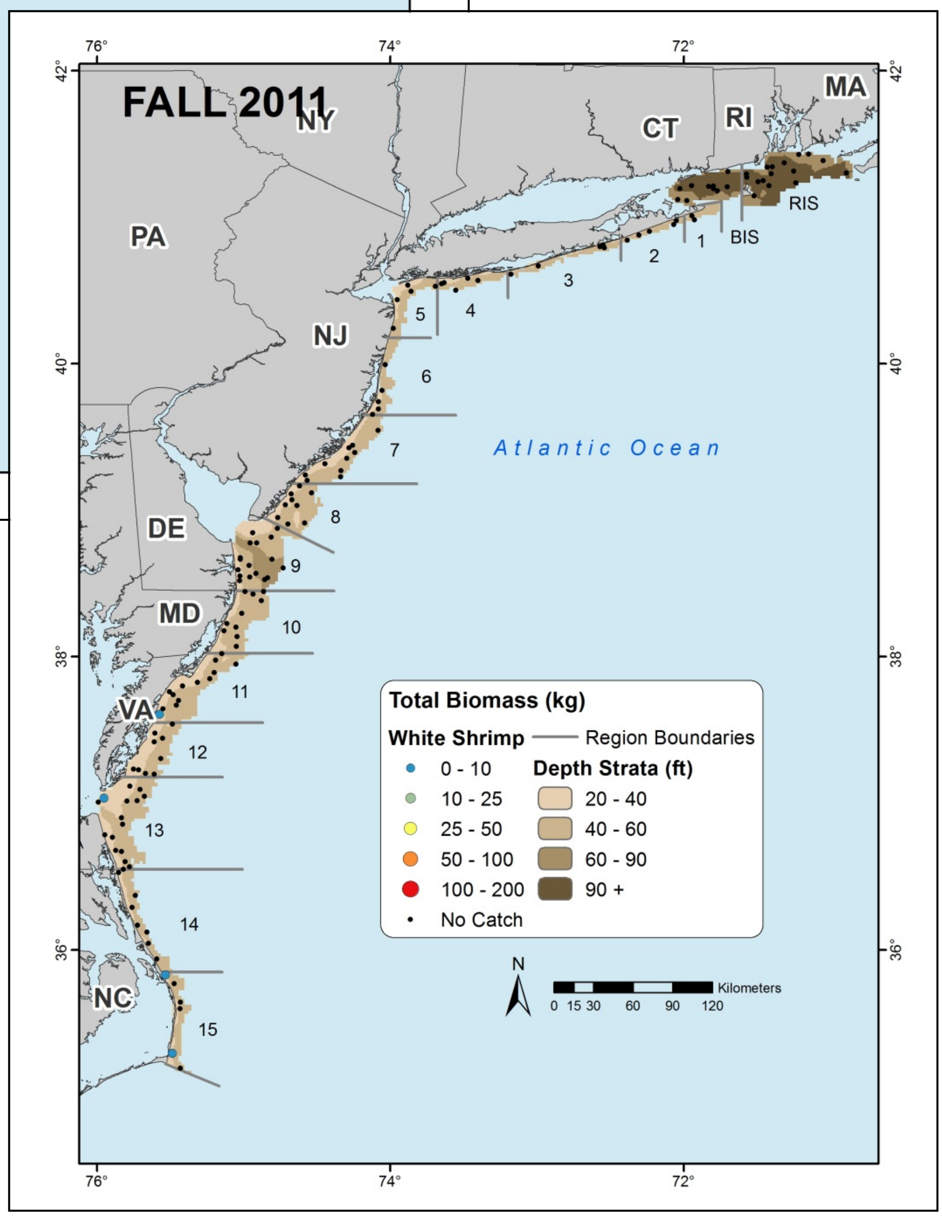


Table 88. White shrimp sampling rates for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught (kg)	Number Measured	Age Specimens	Ages Read	Stomach Specimens	Stomachs Analyzed
Spring	2008	0	0.0	0	N/A	N/A	N/A	N/A
	2009	23	0.7	23	N/A	N/A	N/A	N/A
	2010	0	0.0	0	N/A	N/A	N/A	N/A
	2011	0	0.0	0	N/A	N/A	N/A	N/A
Fall	2007	48	1.8	20	N/A	N/A	N/A	N/A
	2008	753	19.7	267	N/A	N/A	N/A	N/A
	2009	451	6.6	451	N/A	N/A	N/A	N/A
	2010	3,312	87.2	521	N/A	N/A	N/A	N/A
	2011	16	0.5	16	N/A	N/A	N/A	N/A

Table 89. Strata used for calculation of abundance indices for white shrimp.

State (Nominal)	Region	Depth Stratum	Spring Index	Fall Index
RI	RIS	60-90		
		90+		
	BIS	60-90		
		90+		
NY	01	40-60		
	02	20-40		
		40-60		
	03	20-40		
		40-60		
	04	20-40		
		40-60		
	05	20-40		
		40-60		
NJ	06	20-40		
		40-60		
	07	20-40		
		40-60		
	08	20-40		
		40-60		
DE	09	20-40		
		40-60		
		60-90		
MD	10	20-40		
		40-60		
VA	11	20-40		
		40-60		
	12	20-40		
		40-60		
	13	20-40		
		40-60		
NC	14	20-40		
		40-60		
	15	20-40		
		40-60		

= used for abundance indices

= not used for abundance indices

Table 90. White shrimp preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

Season	Year	Age	Numerical Index					Biomass Index				
			n	LCI	**Index**	UCI	CV (%)	n	LCI	**Index**	UCI	CV (%)
Spring	2008	All	13	0.00	**0.00**	0.00		13	0.00	**0.00**	0.00	
	2009		15	0.00	**0.27**	0.73	62.7	15	0.00	**0.03**	0.08	90.4
	2010		13	0.00	**0.00**	0.00		13	0.00	**0.00**	0.00	
	2011		13	0.00	**0.00**	0.00		13	0.00	**0.00**	0.00	
Fall	2007	All	56	0.07	**0.19**	0.32	30.9	56	0.00	**0.02**	0.04	45.1
	2008		51	0.42	**1.06**	2.00	25.9	51	0.04	**0.17**	0.31	36.7
	2009		53	0.52	**1.05**	1.78	21.1	53	0.02	**0.07**	0.13	33.4
	2010		51	0.73	**1.53**	2.69	20.4	51	0.11	**0.33**	0.59	31.5
	2011		51	0.00	**0.10**	0.22	55.9	51	0.00	**0.01**	0.02	63.1

Figure 151. White shrimp preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

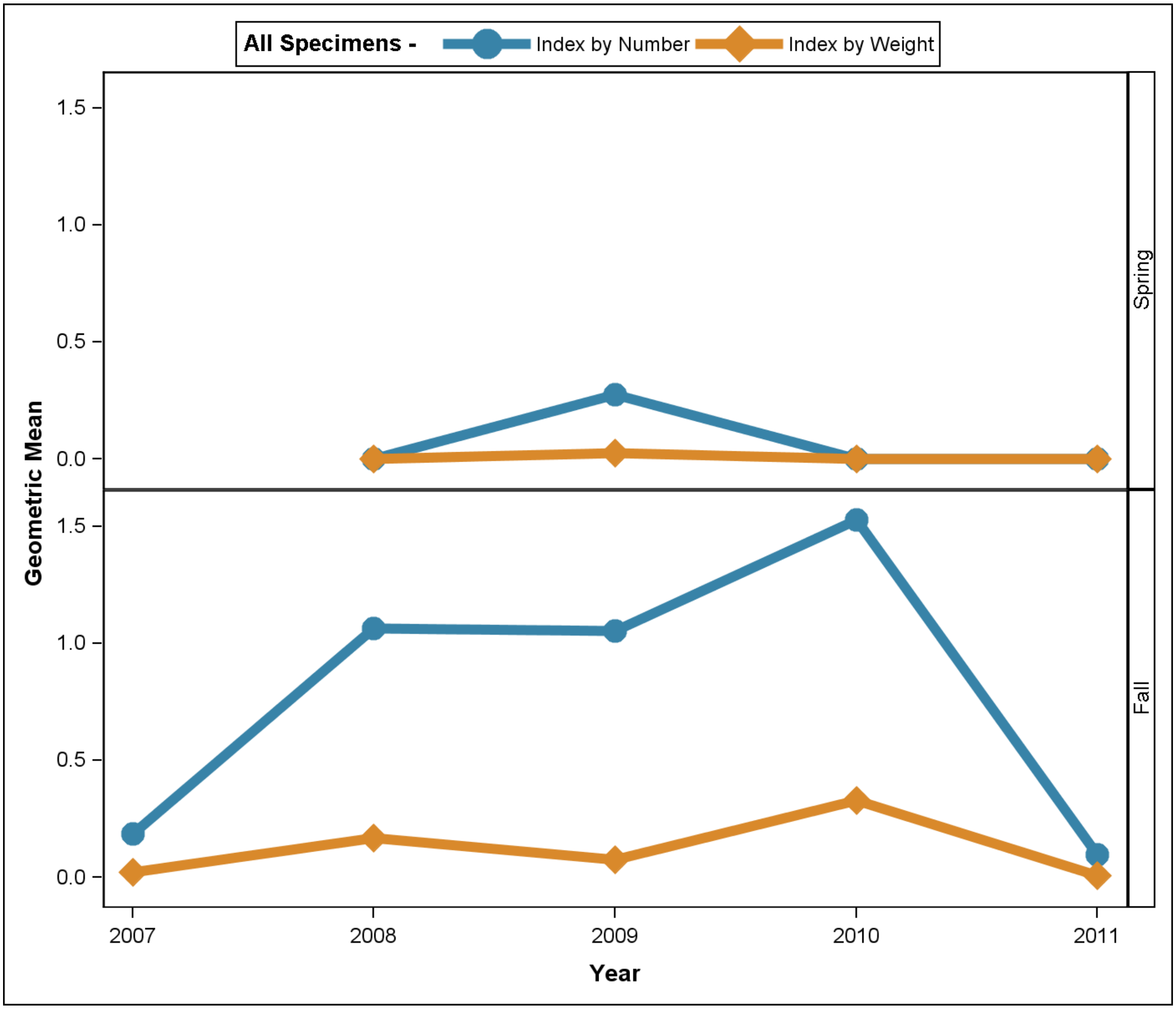
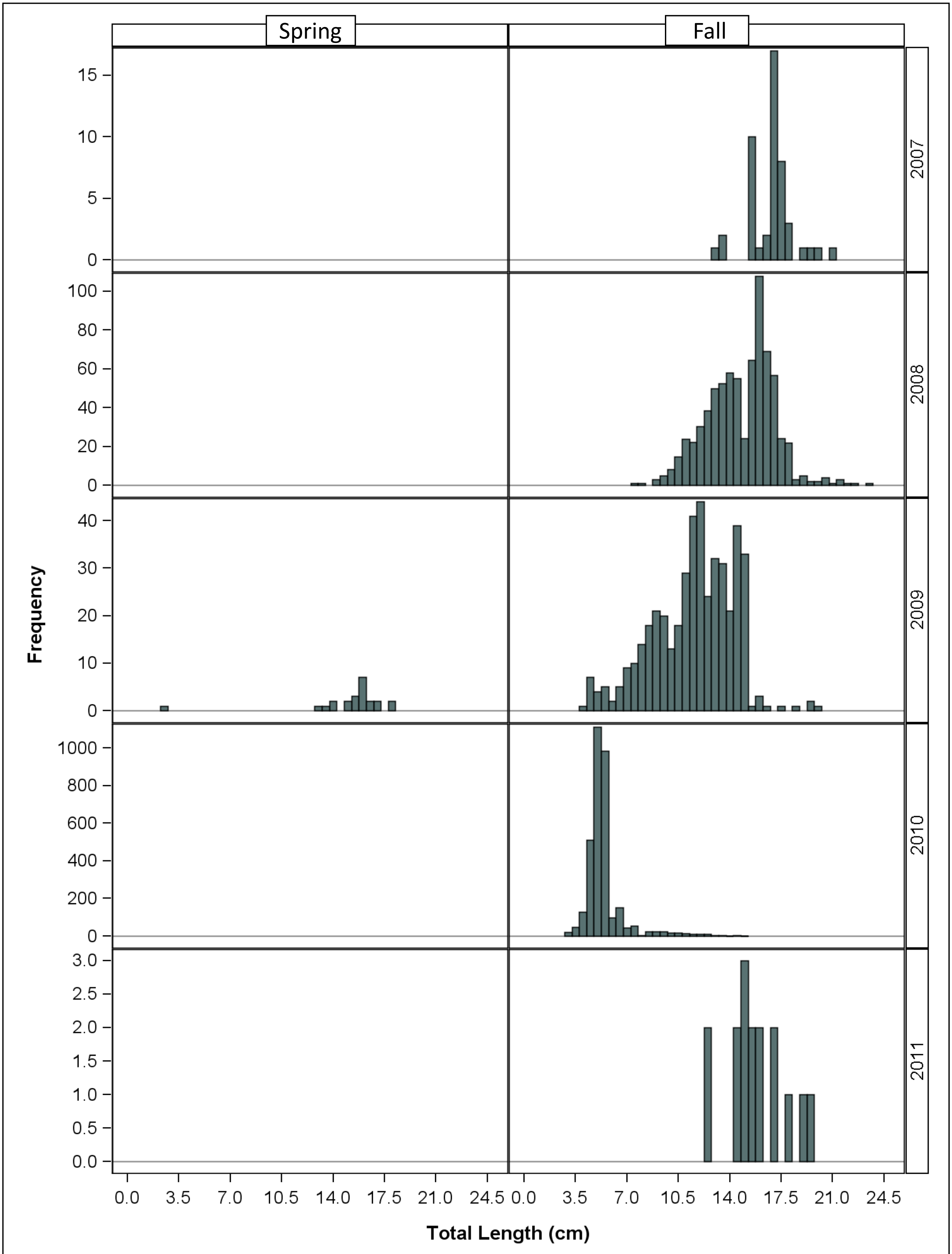


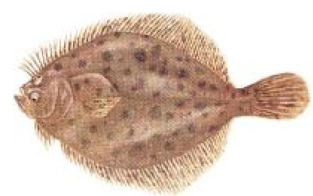
Figure 152. White shrimp length-frequency distributions, by cruise.

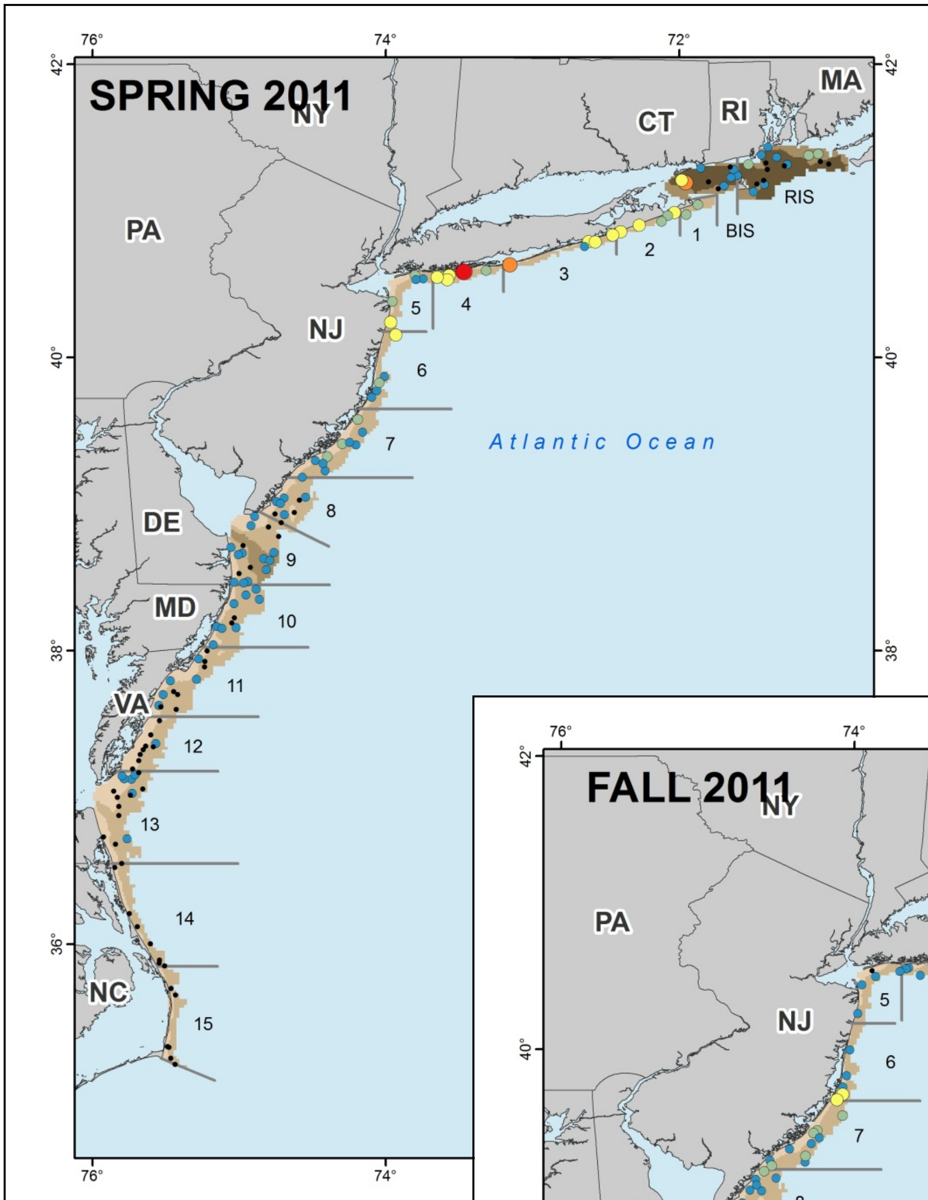


Windowpane Flounder

Sampling Priority: E

Figure 153. Windowpane flounder biomass (kg) collected at each sampling site for 2011 NEAMAP cruises.





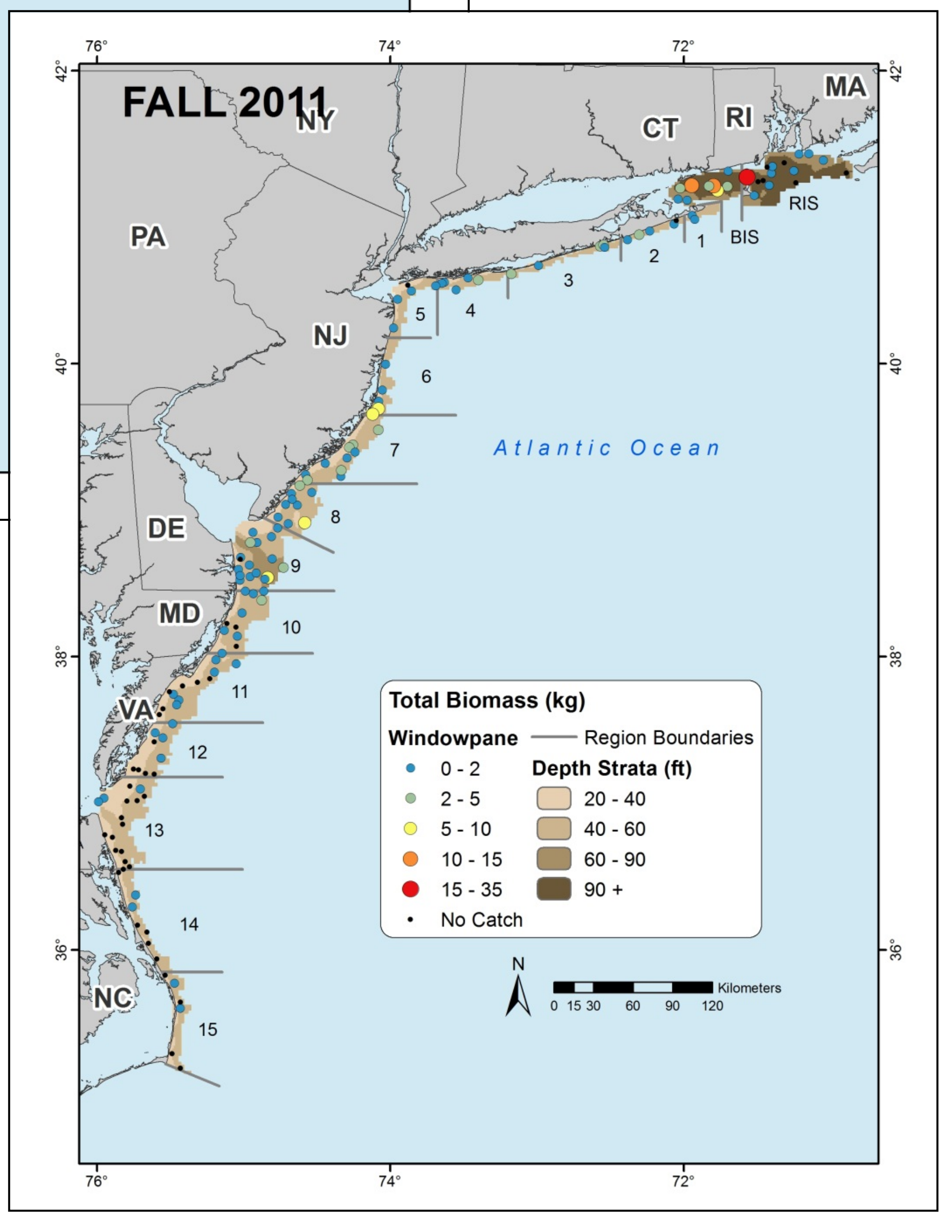


Table 91. Windowpane flounder sampling rates for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught (kg)	Number Measured	Age Specimens	Ages Read	Stomach Specimens	Stomachs Analyzed
Spring	2008	756	191.0	697	N/A	N/A	N/A	N/A
	2009	1,067	268.2	868	N/A	N/A	N/A	N/A
	2010	1,065	237.1	847	N/A	N/A	N/A	N/A
	2011	936	214.0	936	N/A	N/A	N/A	N/A
Fall	2007	744	114.0	694	N/A	N/A	N/A	N/A
	2008	475	79.4	410	N/A	N/A	N/A	N/A
	2009	1,155	211.2	1,155	N/A	N/A	N/A	N/A
	2010	1,208	172.9	1,033	N/A	N/A	N/A	N/A
	2011	1,202	189.3	1,202	N/A	N/A	N/A	N/A

Table 92. Strata used for calculation of abundance indices for windowpane flounder.

State (Nominal)	Region	Depth Stratum	Spring Index	Fall Index
RI	RIS	60-90	used	used
		90+	used	used
	BIS	60-90	used	used
		90+	used	used
NY	01	40-60	used	used
	02	20-40	used	used
		40-60	used	used
	03	20-40	used	used
		40-60	used	used
	04	20-40	used	used
		40-60	used	used
	05	20-40	used	used
		40-60	used	used
NJ	06	20-40	used	used
		40-60	used	used
	07	20-40	used	used
		40-60	used	used
	08	20-40	used	used
		40-60	used	used
DE	09	20-40	used	used
		40-60	used	used
		60-90	used	used
MD	10	20-40	not used	used
		40-60	not used	used
VA	11	20-40	not used	not used
		40-60	not used	not used
	12	20-40	not used	not used
		40-60	not used	not used
	13	20-40	not used	not used
		40-60	not used	not used
NC	14	20-40	not used	not used
		40-60	not used	not used
	15	20-40	not used	not used
		40-60	not used	not used

(red) = used for abundance indices
(grey) = not used for abundance indices

Table 93. Windowpane flounder preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

Season	Year	Age	Numerical Index					Biomass Index				
			n	LCI	**Index**	UCI	CV (%)	n	LCI	**Index**	UCI	CV (%)
Spring	2008	All	85	3.01	**3.84**	4.85	6.0	85	0.95	**1.18**	1.44	7.2
	2009		96	2.61	**3.24**	3.98	5.5	96	0.82	**1.01**	1.22	7.2
	2010		89	2.21	**2.94**	3.83	7.4	89	0.71	**0.89**	1.08	7.6
	2011		89	2.55	**3.27**	4.12	6.3	89	0.80	**1.00**	1.23	7.8
Fall	2007	All	94	3.27	**4.16**	5.24	5.8	94	0.64	**0.80**	0.98	7.8
	2008		99	1.32	**1.74**	2.24	8.3	99	0.31	**0.42**	0.53	11.5
	2009		107	3.74	**4.83**	6.16	5.9	107	0.88	**1.11**	1.37	7.9
	2010		99	4.23	**5.50**	7.08	5.8	99	0.85	**1.07**	1.31	7.6
	2011		99	4.53	**5.83**	7.44	5.5	99	0.97	**1.22**	1.50	7.4

Figure 154. Windowpane flounder preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

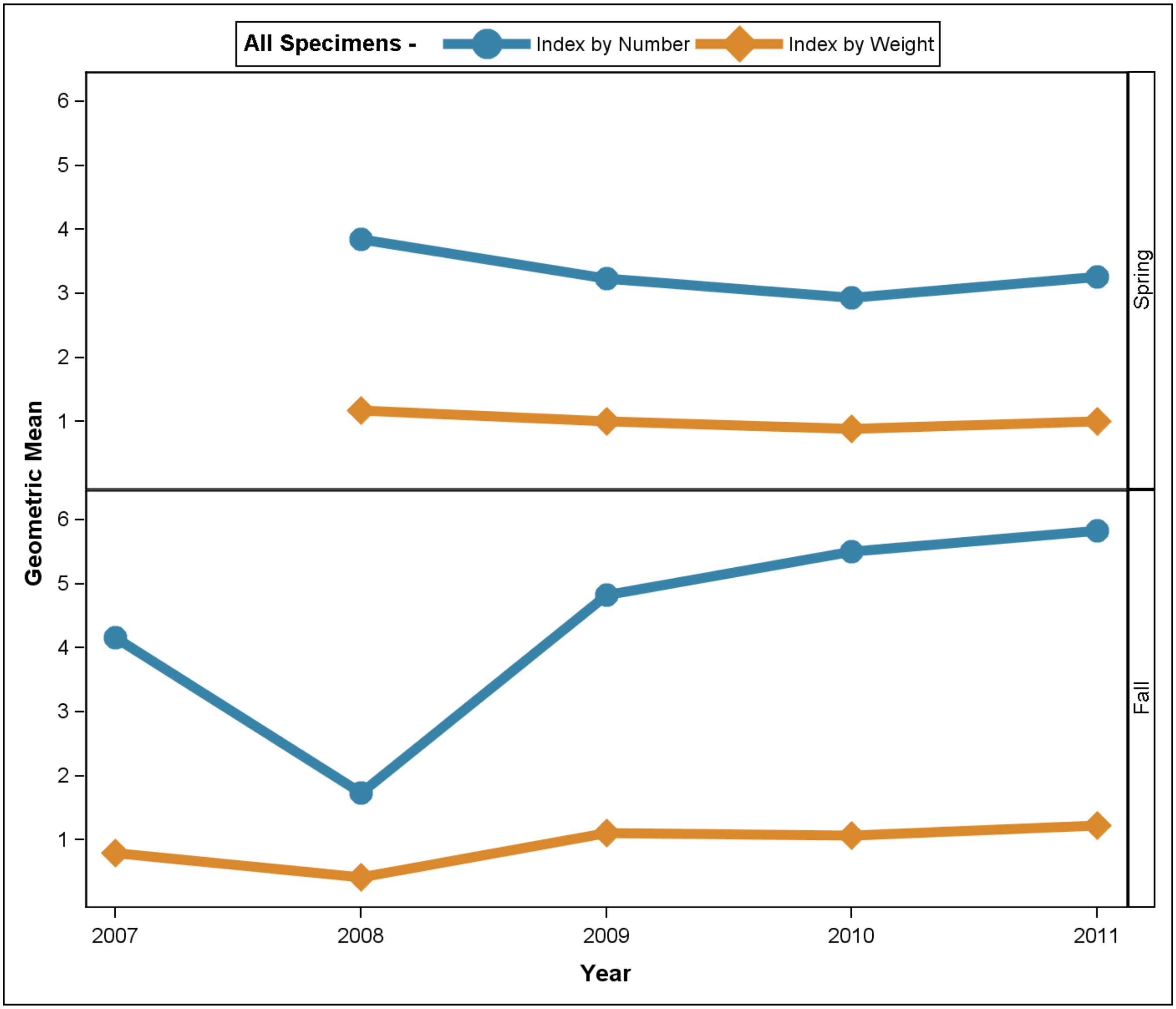
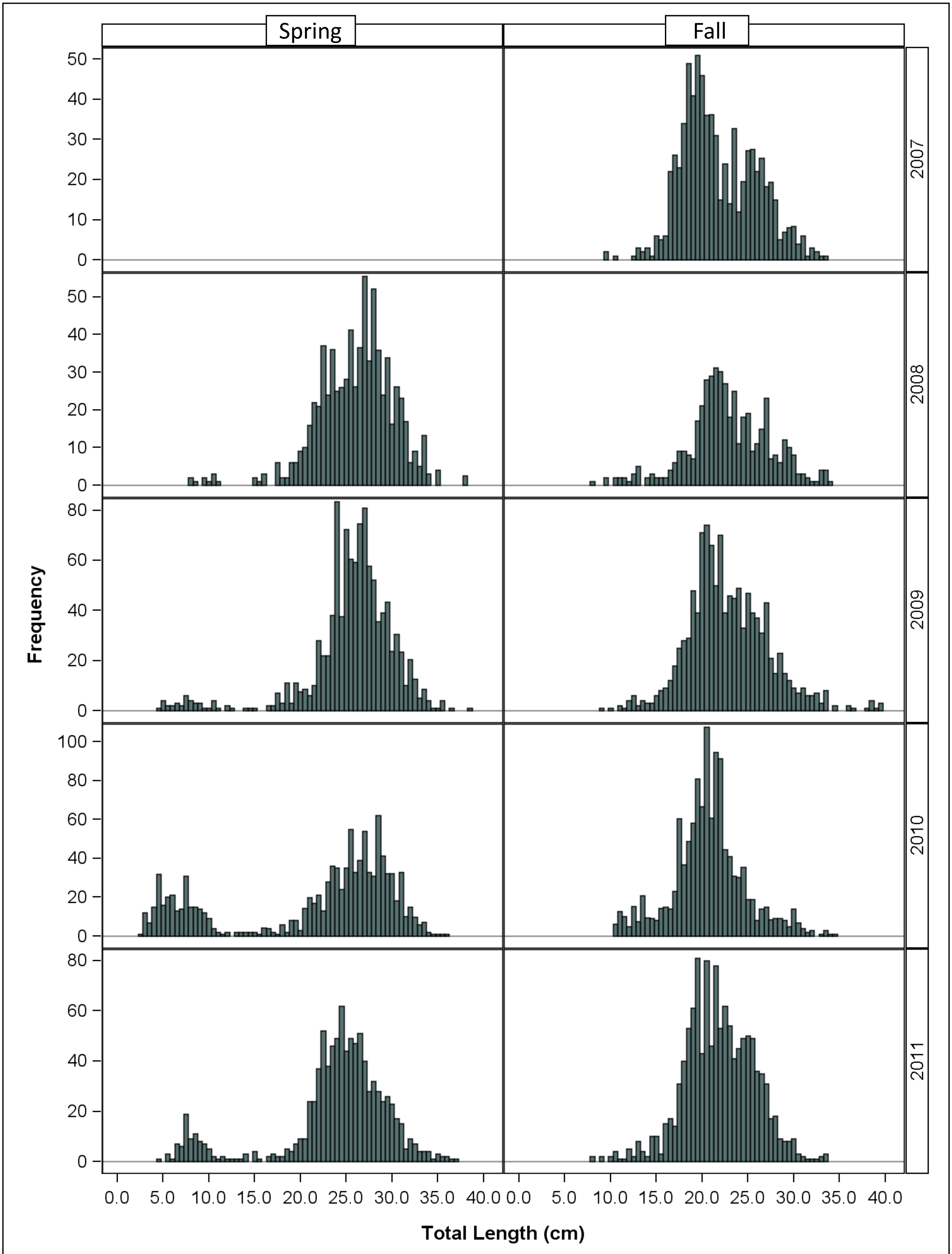


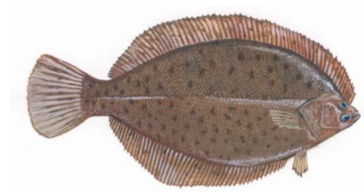
Figure 155. Windowpane flounder length-frequency distributions, by cruise.

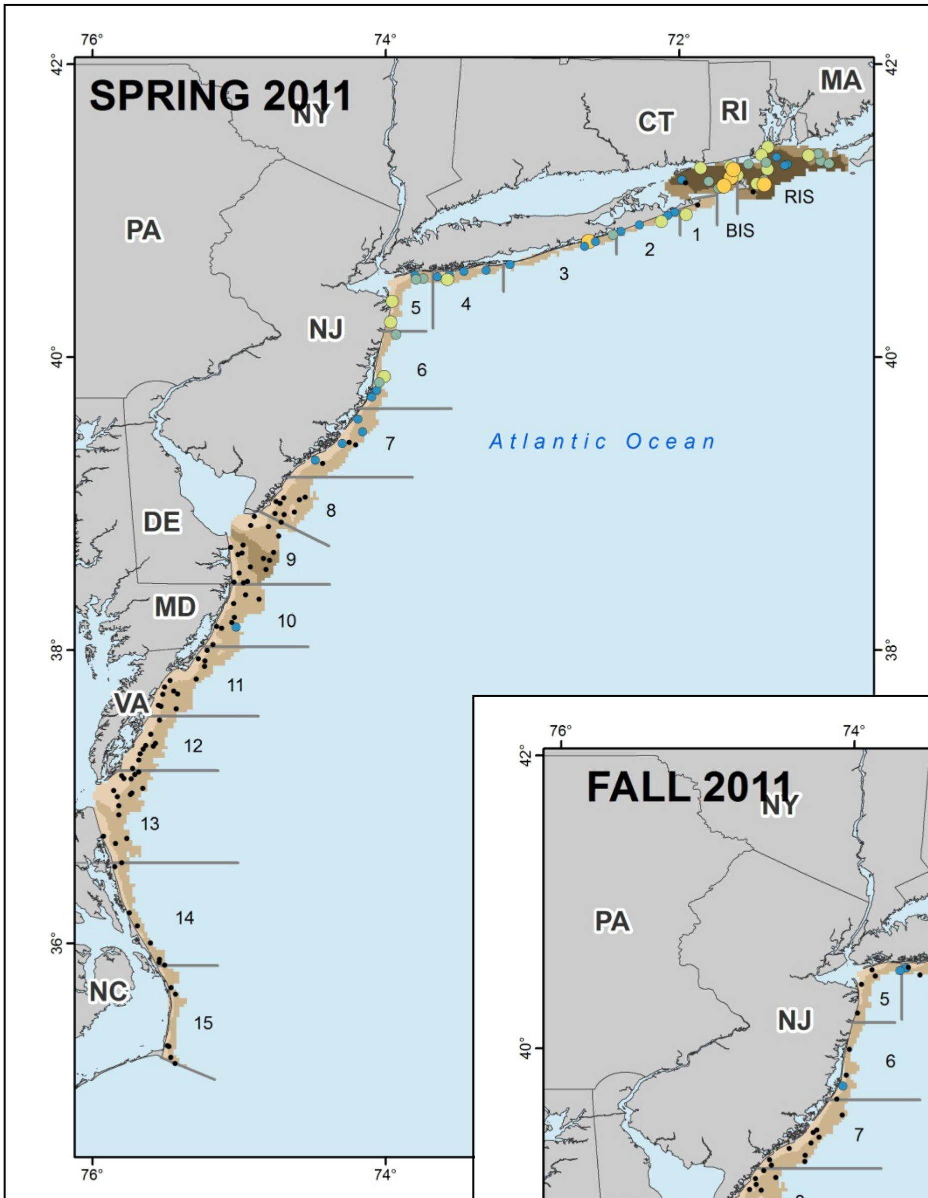


Winter Flounder

Sampling Priority: A

Figure 156. Winter flounder biomass (kg) collected at each sampling site for 2011 NEAMAP cruises.





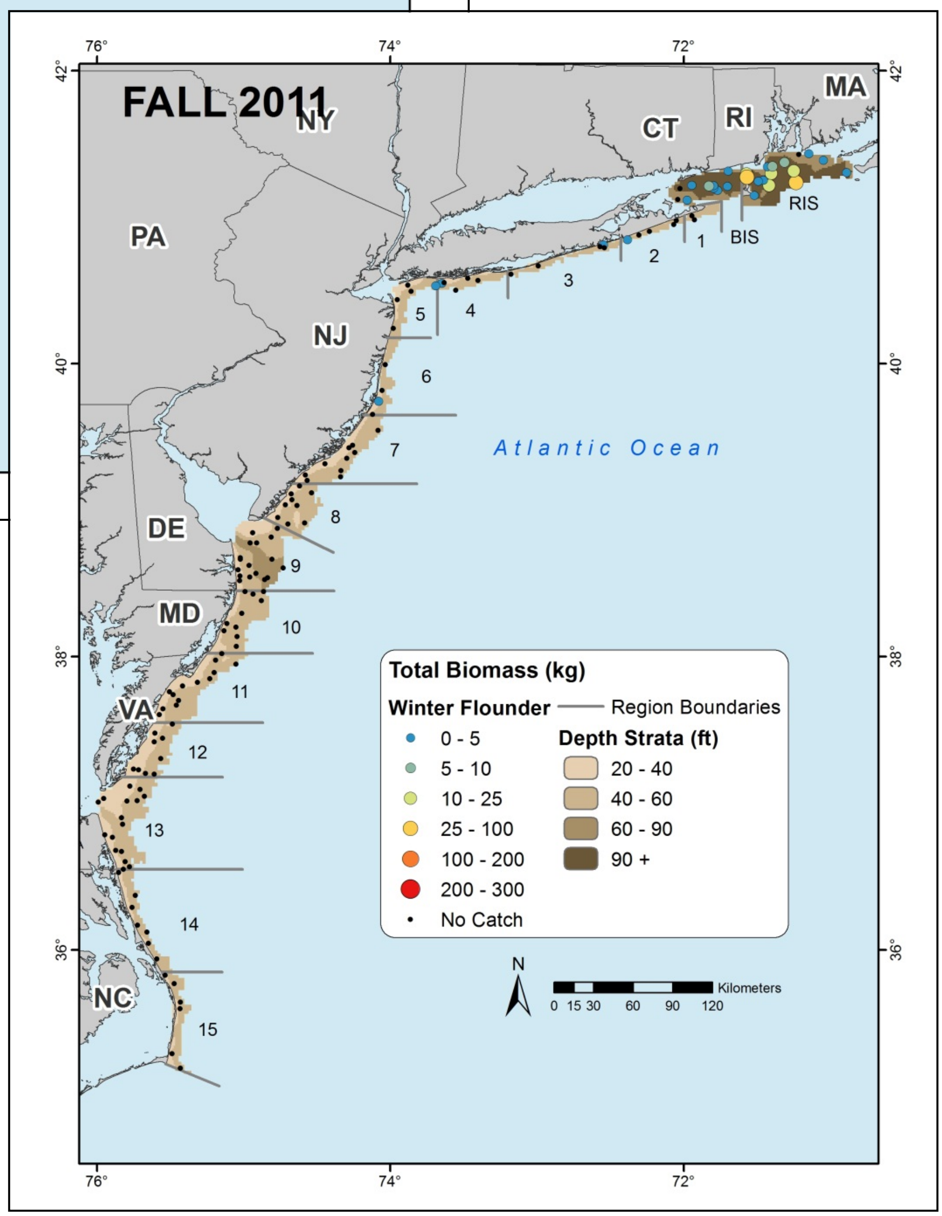


Table 94. Winter flounder sampling rates and preserved specimen analysis status for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught (kg)	Number Measured	Age Specimens	Ages Read	Stomach Specimens	Stomachs Analyzed
Spring	2008	1,863	554.1	1,525	466	466	450	444
	2009	1,954	628.2	1,746	543	531	526	513
	2010	1,498	574.7	1,498	548	536	495	444
	2011	1,672	589.5	1,549	464	464	424	409
Fall	2007	392	99.1	392	119	117	116	116
	2008	670	142.0	522	137	137	133	131
	2009	558	127.4	558	214	211	178	178
	2010	264	72.3	264	150	145	108	106
	2011	572	186.3	572	173	173	126	0

Table 95. Strata used for calculation of abundance indices for winter flounder.

State (Nominal)	Region	Depth Stratum	Spring Index	Fall Index
RI	RIS	60-90	used	used
		90+	used	used
	BIS	60-90	used	used
		90+	used	used
NY	01	40-60	used	not used
	02	20-40	used	not used
		40-60	used	not used
	03	20-40	used	not used
		40-60	used	not used
	04	20-40	used	not used
		40-60	used	not used
	05	20-40	used	not used
		40-60	used	not used
NJ	06	20-40	used	not used
		40-60	used	not used
	07	20-40	used	not used
		40-60	used	not used
	08	20-40	not used	not used
		40-60	not used	not used
DE	09	20-40	not used	not used
		40-60	not used	not used
		60-90	not used	not used
MD	10	20-40	not used	not used
		40-60	not used	not used
VA	11	20-40	not used	not used
		40-60	not used	not used
	12	20-40	not used	not used
		40-60	not used	not used
	13	20-40	not used	not used
		40-60	not used	not used
NC	14	20-40	not used	not used
		40-60	not used	not used
	15	20-40	not used	not used
		40-60	not used	not used

(red) = used for abundance indices
(gray) = not used for abundance indices

Table 96. Winter flounder preliminary geometric mean indices of abundance, for all specimens captured and by age-class for spring and fall NEAMAP surveys.

Season	Year	Age	Numerical Index					Biomass Index				
			n	LCI	Index	UCI	CV (%)	n	LCI	Index	UCI	CV (%)
Spring	2008	All	137	2.61	**3.09**	3.63	4.4	137	1.64	**1.93**	2.26	5.0
	2009		145	2.13	**2.56**	3.05	5.1	145	1.26	**1.52**	1.81	5.9
	2010		137	1.92	**2.36**	2.86	5.8	137	1.11	**1.34**	1.59	6.0
	2011		137	2.70	**3.22**	3.81	4.6	137	1.41	**1.68**	1.97	5.3
Fall	2007	All	137	3.74	**4.31**	4.96	3.4	137	2.25	**2.65**	3.09	4.4
	2008		137	2.28	**2.76**	3.31	5.1	137	1.44	**1.71**	2.02	5.4
	2009		145	4.17	**4.99**	5.94	4.1	145	2.07	**2.42**	2.81	4.4
	2010		137	3.38	**3.99**	4.67	4.0	137	1.70	**2.02**	2.37	5.0
	2011		137	2.15	**2.55**	2.99	4.7	137	1.23	**1.48**	1.77	6.0
Spring	2008	1	64	2.37	3.22	4.29	7.8	64	0.27	0.41	0.56	15.4
	2009		69	1.28	1.90	2.70	11.4	69	0.20	0.34	0.50	19.2
	2010		63	1.36	1.88	2.53	9.5	63	0.16	0.23	0.30	14.7
	2011		63	1.11	1.61	2.23	11.0	63	0.17	0.27	0.39	18.3
Fall	2007	1	26	1.15	**2.42**	4.46	19.0	26	0.34	**0.71**	1.19	23.0
	2008		26	3.77	**6.71**	11.46	11.8	26	0.93	**1.58**	2.46	15.4
	2009		26	3.53	**6.30**	10.76	12.0	26	0.72	**1.32**	2.13	17.8
	2010		26	1.41	**2.64**	4.48	15.9	26	0.34	**0.61**	0.93	19.3
	2011		26	2.92	**4.82**	7.65	11.2	26	0.73	**1.23**	1.88	15.8
Spring	2008	2	64	3.13	**4.34**	5.92	7.7	64	1.10	**1.53**	2.05	10.0
	2009		69	4.00	**5.31**	6.96	6.3	69	1.37	**1.81**	2.33	8.3
	2010		63	3.64	**4.79**	6.23	6.3	63	1.22	**1.60**	2.05	8.3
	2011		63	3.46	**4.79**	6.52	7.4	63	1.28	**1.75**	2.32	9.3
Fall	2007	2	26	0.95	**1.81**	3.05	17.7	26	0.41	**0.77**	1.22	20.0
	2008		26	1.52	**2.57**	4.07	13.8	26	0.50	**0.90**	1.42	18.7
	2009		26	1.61	**2.82**	4.60	14.2	26	0.53	**0.99**	1.58	19.1
	2010		26	0.90	**1.62**	2.60	16.6	26	0.36	**0.64**	0.99	19.3
	2011		26	2.15	**3.65**	5.85	12.6	26	0.93	**1.54**	2.33	14.7
Spring	2008	3	64	1.79	**2.50**	3.40	9.0	64	0.89	**1.23**	1.64	10.5
	2009		69	2.22	**2.86**	3.63	6.7	69	1.03	**1.33**	1.68	8.3
	2010		63	2.36	**3.12**	4.06	7.2	63	1.14	**1.51**	1.94	8.7
	2011		63	2.04	**2.72**	3.55	7.6	63	0.98	**1.31**	1.70	9.2
Fall	2007	3	26	0.38	**0.78**	1.29	22.0	26	0.21	**0.46**	0.75	24.5
	2008		26	0.35	**0.73**	1.21	22.6	26	0.16	**0.40**	0.68	28.1
	2009		26	0.35	**0.70**	1.13	21.4	26	0.17	**0.35**	0.56	23.7
	2010		26	0.39	**0.71**	1.11	19.5	26	0.21	**0.39**	0.60	21.2
	2011		26	0.84	**1.47**	2.32	16.2	26	0.47	**0.85**	1.33	18.7

Season	Year	Age	Numerical Index					Biomass Index				
			n	LCI	Index	UCI	CV (%)	n	LCI	Index	UCI	CV (%)
Spring	2008	4	64	1.12	**1.55**	2.06	9.8	64	0.61	**0.85**	1.13	11.4
	2009		69	1.22	**1.62**	2.09	8.7	69	0.68	**0.93**	1.20	10.3
	2010		63	1.46	**1.94**	2.51	8.2	63	0.83	**1.11**	1.43	9.6
	2011		63	1.13	**1.52**	1.99	9.2	63	0.65	**0.89**	1.17	10.7
Fall	2007	4	26	0.11	**0.28**	0.47	28.4	26	0.07	**0.18**	0.30	30.1
	2008		26	0.09	**0.27**	0.47	32.0	26	0.05	**0.16**	0.29	34.5
	2009		26	0.06	**0.17**	0.29	30.9	26	0.03	**0.11**	0.19	35.0
	2010		26	0.13	**0.25**	0.39	23.6	26	0.08	**0.16**	0.25	25.4
	2011		26	0.26	**0.54**	0.88	23.2	26	0.17	**0.38**	0.63	25.2
Spring	2008	5	64	0.70	**0.97**	1.28	10.8	64	0.41	**0.59**	0.79	12.6
	2009		69	0.76	**1.04**	1.37	10.4	69	0.51	**0.71**	0.93	11.5
	2010		63	0.97	**1.30**	1.69	9.4	63	0.63	**0.87**	1.13	10.7
	2011		63	0.72	**1.00**	1.32	11.0	63	0.49	**0.69**	0.92	12.0
Fall	2007	5	26	0.04	**0.13**	0.22	34.0	26	0.03	**0.09**	0.16	35.6
	2008		26	0.02	**0.13**	0.26	41.5	26	0.01	**0.08**	0.16	43.9
	2009		26	0.00	**0.08**	0.18	50.5	26	0.00	**0.07**	0.15	53.1
	2010		26	0.03	**0.10**	0.18	33.8	26	0.02	**0.08**	0.14	36.4
	2011		26	0.11	**0.31**	0.54	29.9	26	0.09	**0.26**	0.46	31.4
Spring	2008	6	64	0.40	**0.57**	0.76	12.9	64	0.23	**0.35**	0.48	15.1
	2009		69	0.45	**0.63**	0.83	12.0	69	0.31	**0.44**	0.59	12.9
	2010		63	0.58	**0.79**	1.04	11.0	63	0.39	**0.55**	0.74	12.5
	2011		63	0.44	**0.62**	0.82	12.3	63	0.32	**0.45**	0.60	13.0
Fall	2007	6	26	0.02	**0.07**	0.12	37.7	26	0.01	**0.05**	0.09	37.9
	2008		26	0.00	**0.06**	0.13	50.5	26	0.00	**0.04**	0.08	52.0
	2009		26	0.00	**0.04**	0.09	58.0	26	0.00	**0.04**	0.08	58.8
	2010		26	0.00	**0.04**	0.08	46.3	26	0.00	**0.03**	0.07	46.5
	2011		26	0.04	**0.16**	0.28	35.1	26	0.04	**0.14**	0.26	35.4
Spring	2008	7+	64	0.28	**0.42**	0.57	14.9	64	0.18	**0.29**	0.42	17.5
	2009		69	0.36	**0.51**	0.68	12.5	69	0.30	**0.42**	0.56	13.1
	2010		63	0.48	**0.69**	0.93	12.7	63	0.39	**0.58**	0.79	13.8
	2011		63	0.38	**0.56**	0.76	13.8	63	0.31	**0.47**	0.65	14.7
Fall	2007	7+	26	0.02	**0.10**	0.18	38.7	26	0.02	**0.08**	0.14	39.9
	2008		26	0.00	**0.10**	0.20	51.2	26	0.00	**0.06**	0.13	53.0
	2009		26	0.00	**0.07**	0.16	58.5	26	0.00	**0.07**	0.15	58.8
	2010		26	0.01	**0.07**	0.13	45.5	26	0.00	**0.06**	0.12	46.7
	2011		26	0.11	**0.32**	0.57	31.1	26	0.11	**0.33**	0.59	31.6

Figure 157. Winter flounder preliminary geometric mean indices of abundance, for all specimens captured (A - by number and biomass) and by age-class (B – numbers only) for spring and fall NEAMAP surveys.

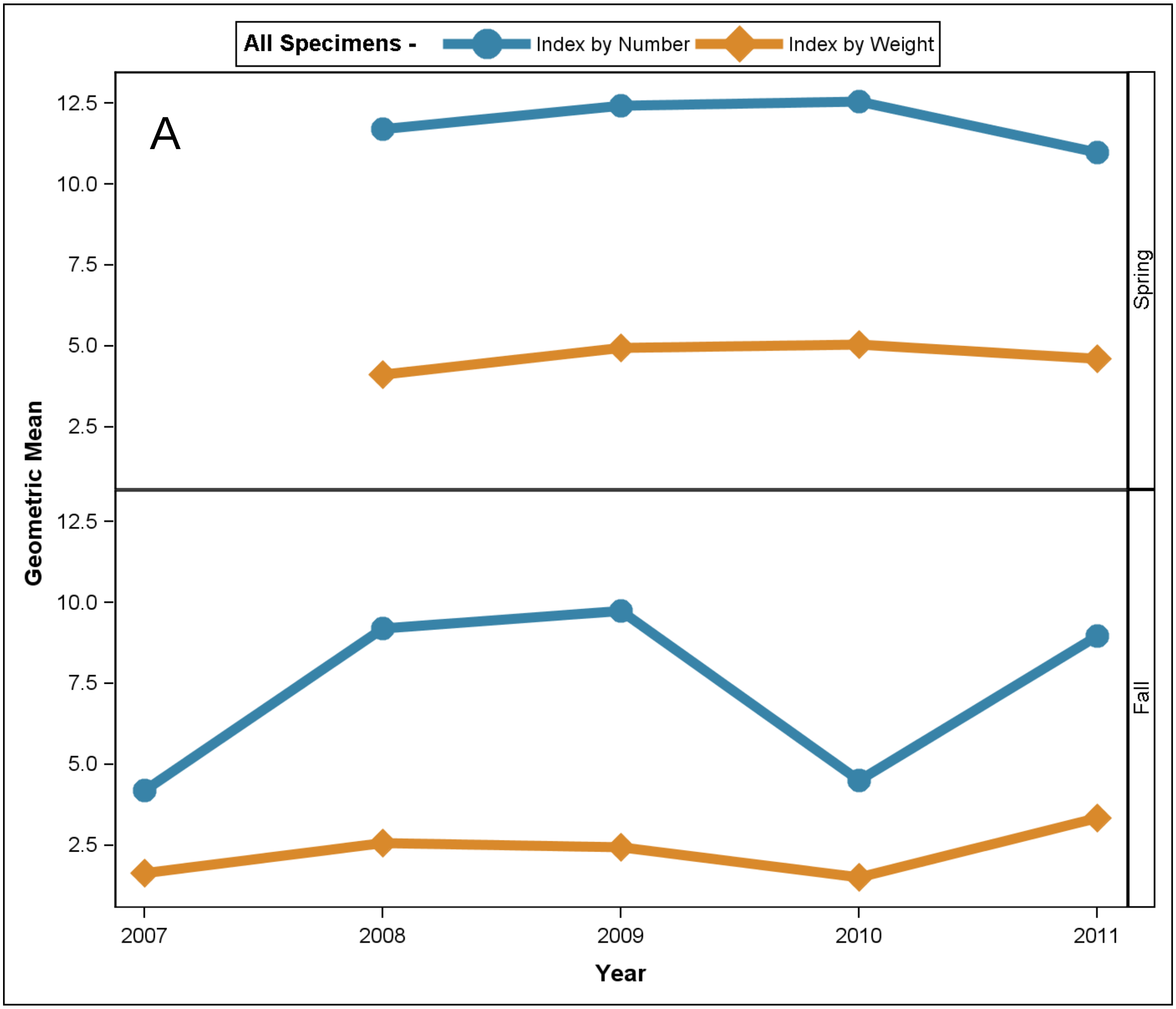


Figure 157. cont.

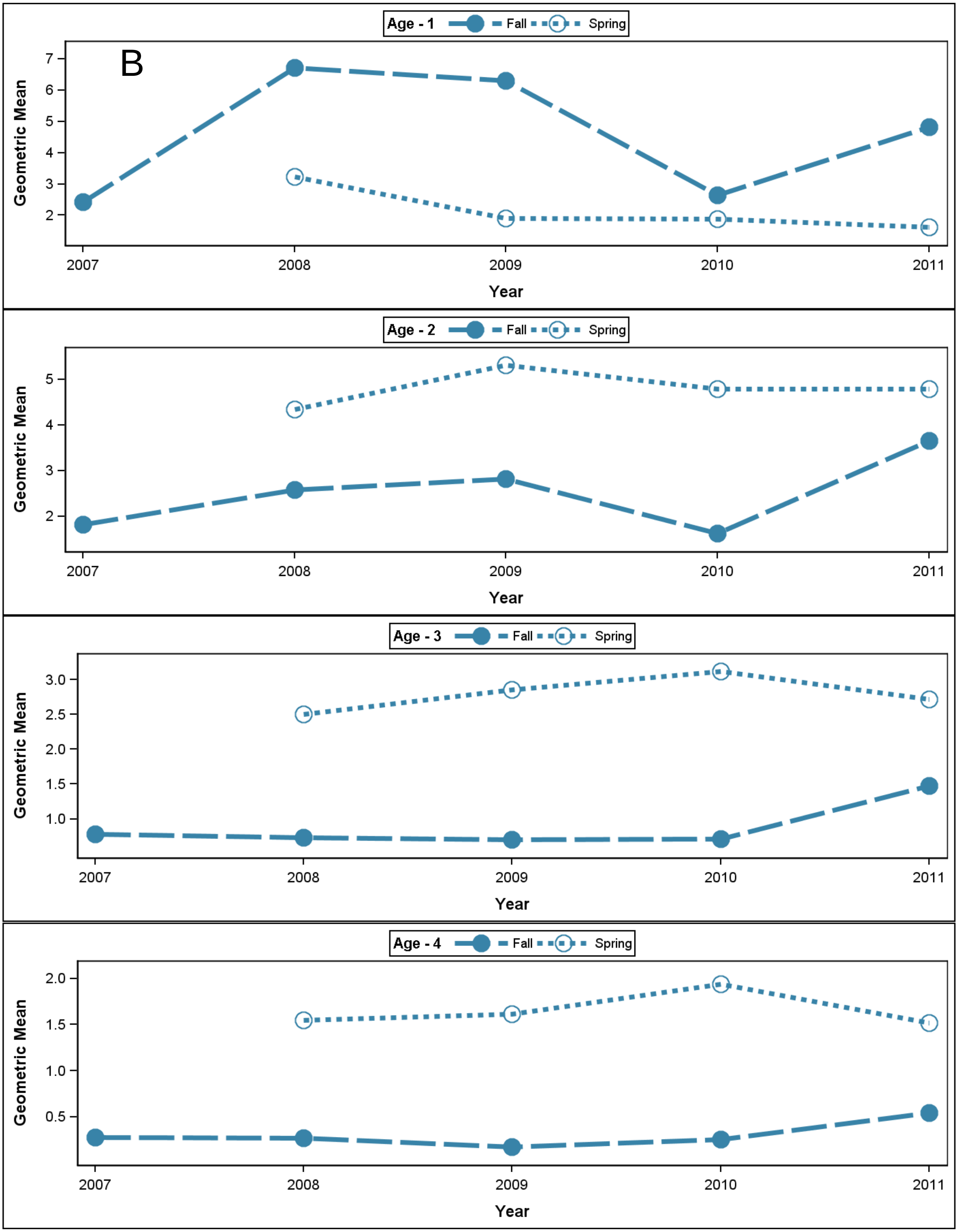


Figure 157. cont.

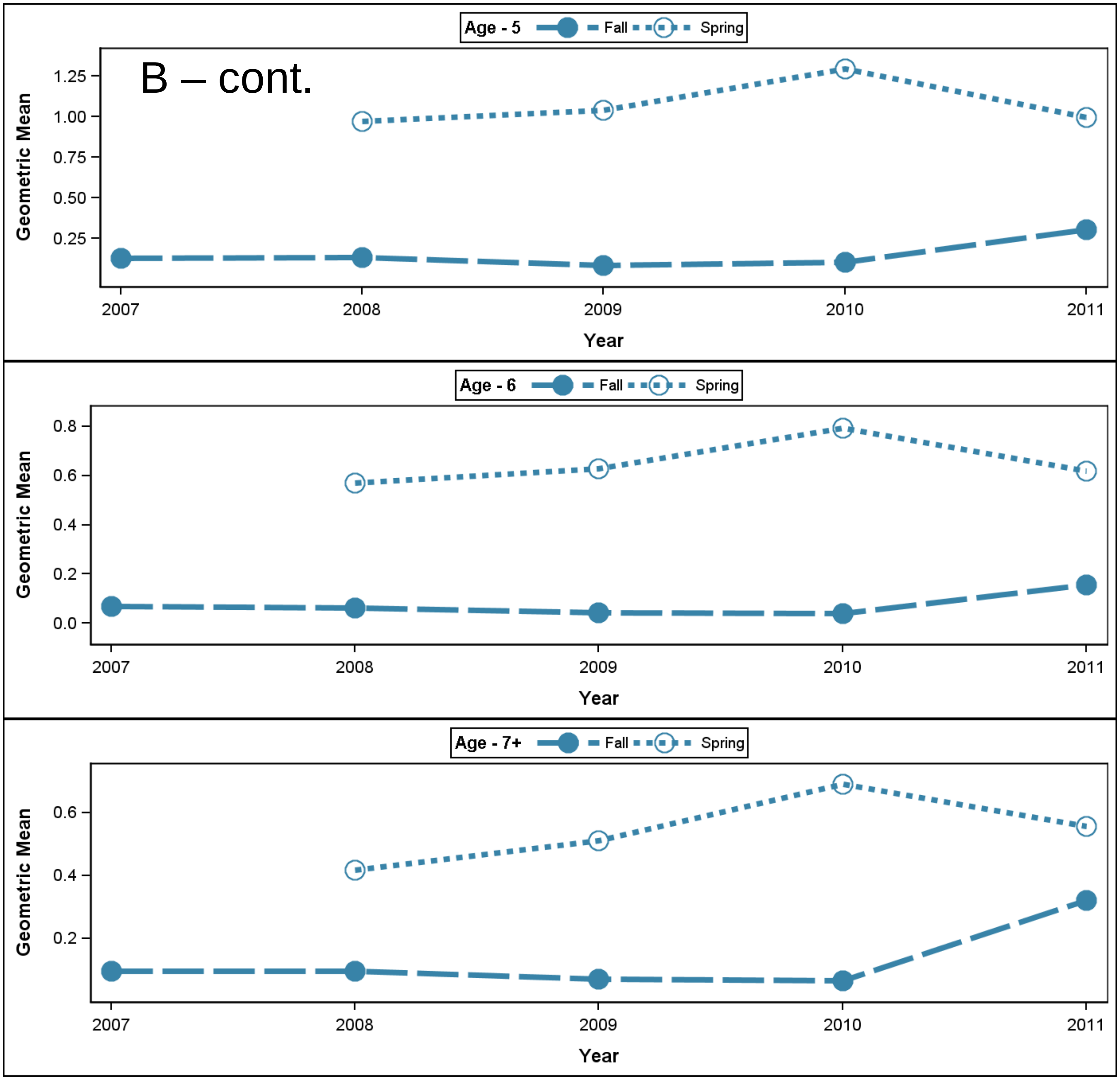


Figure 158. Winter flounder length-frequency distributions, by cruise.

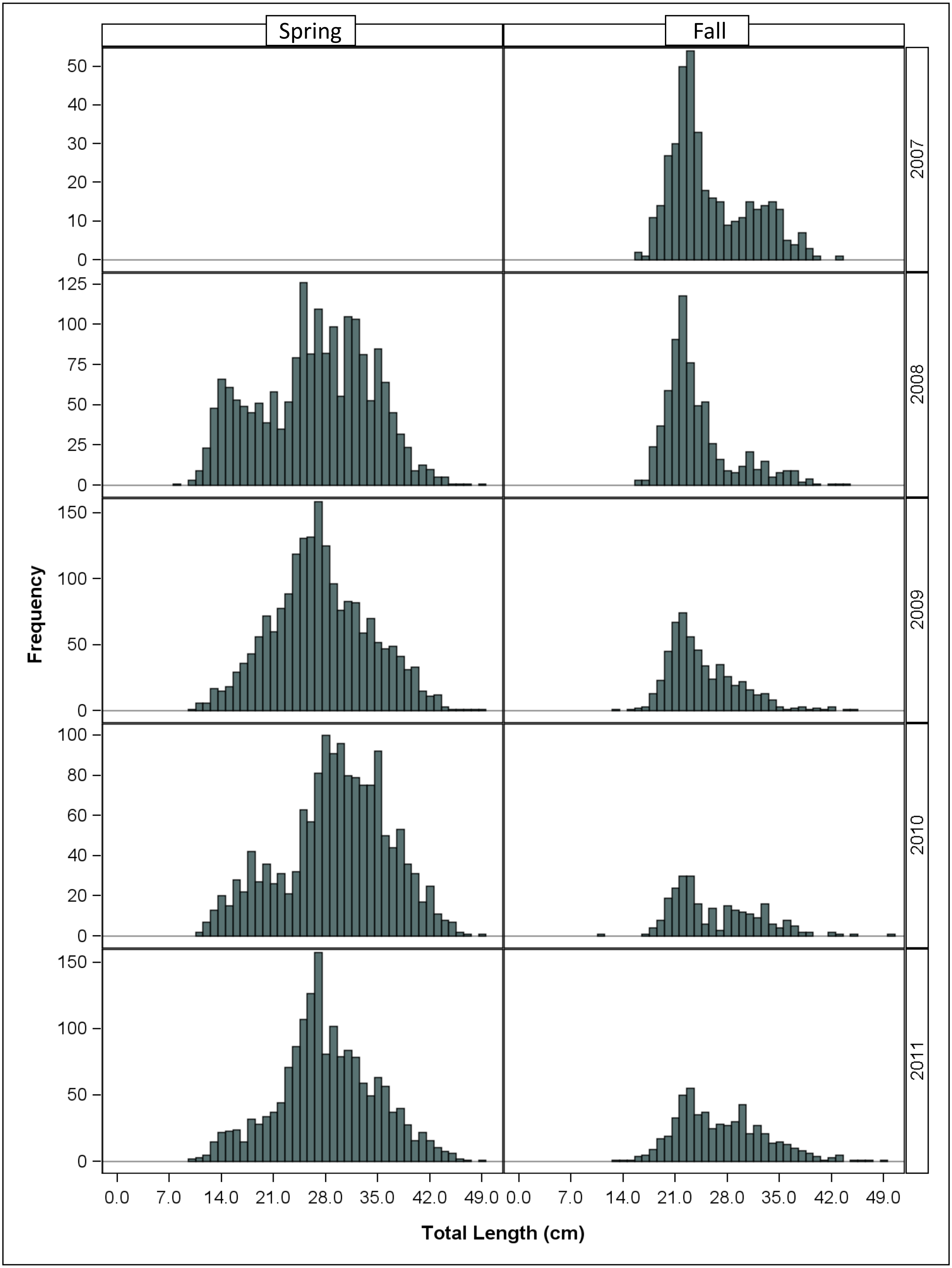


Figure 159. Winter flounder length-frequency distributions, by cruise and sex.

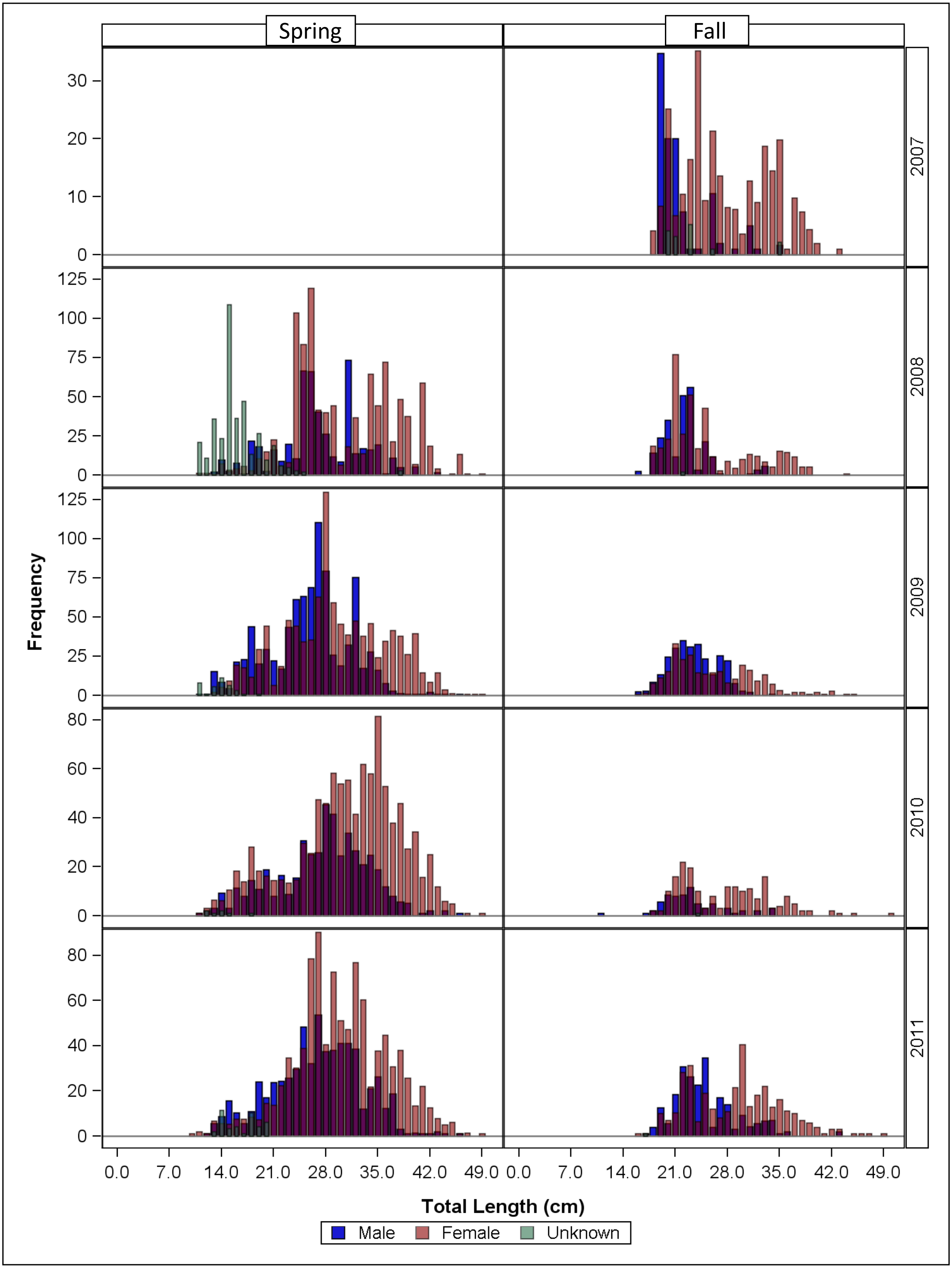


Figure 160. Winter flounder age-frequency distribution, by cruise. The estimated total number collected at a given age is provided above each corresponding bar.

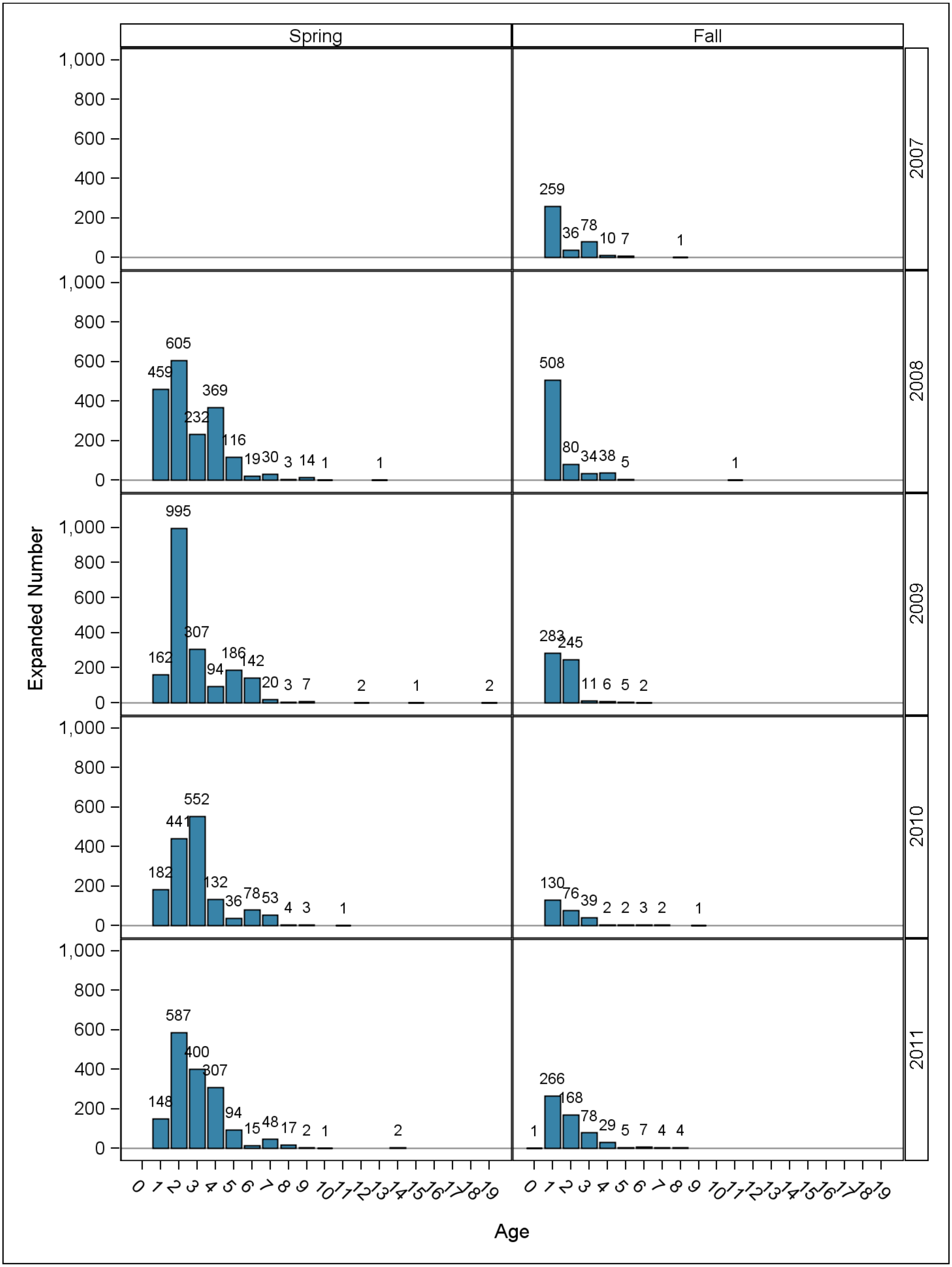


Figure 161. Winter flounder age-at-length proportions for all spring vs. all fall cruises combined.

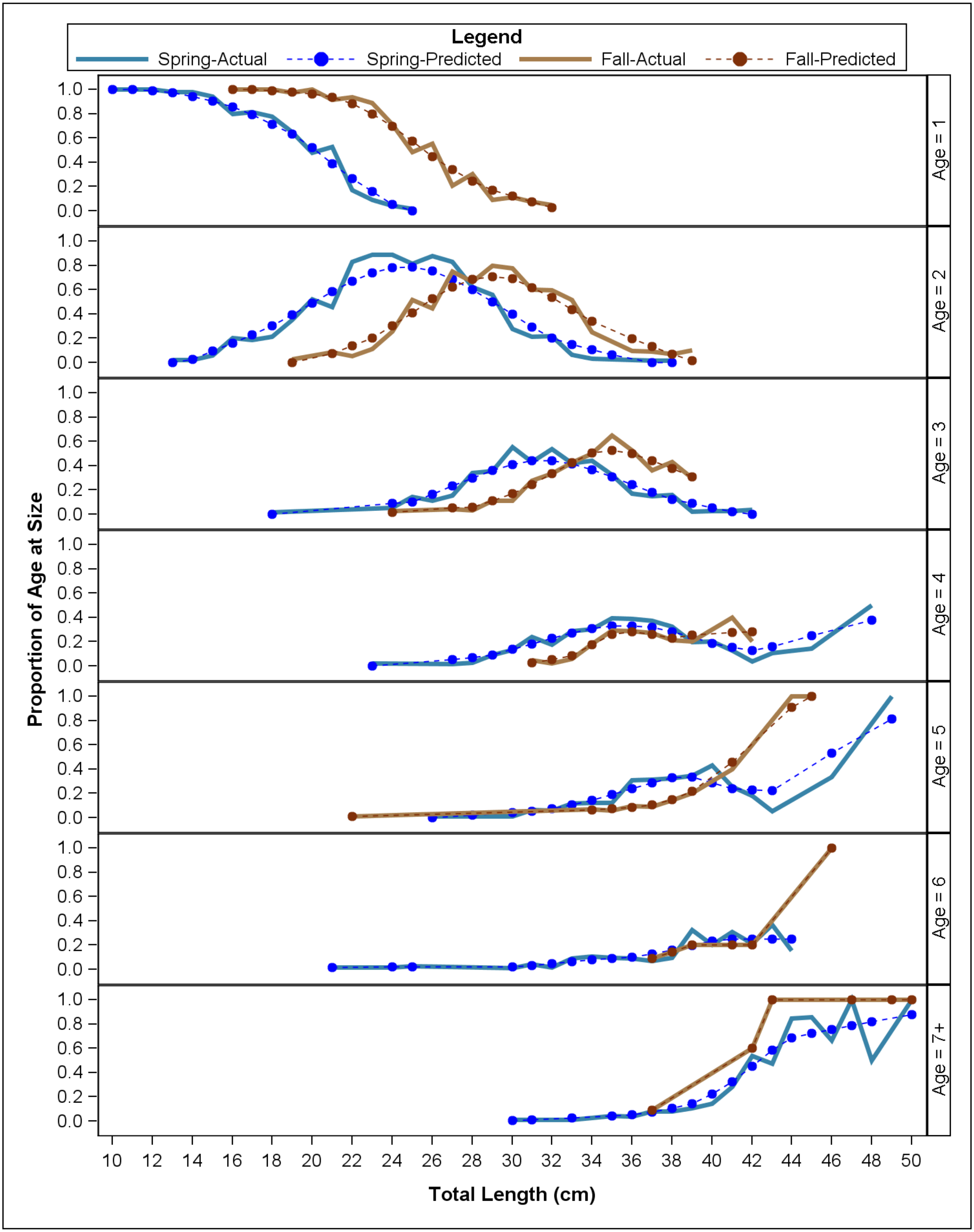


Table 97. Winter flounder age-at-length proportions for all spring vs. all fall cruises combined.

	Spring							Fall						
Total Length(cm)	**Age-1**	**Age-2**	**Age-3**	**Age-4**	**Age-5**	**Age-6**	**Age-7+**	**Age-1**	**Age-2**	**Age-3**	**Age-4**	**Age-5**	**Age-6**	**Age-7+**
10														
11	1.000													
12	0.988													
13	0.974	0.000												
14	0.942	0.029												
15	0.903	0.094												
16	0.856	0.161						1.000						
17	0.791	0.230						0.999						
18	0.715	0.301						0.990						
19	0.632	0.393						0.979						
20	0.520	0.491						0.963	0.000					
21	0.388	0.584				~~0.016~~		0.936	0.076					
22	0.267	0.669						0.881	0.140			~~0.013~~		
23	0.160	0.737	0.000					0.798	0.203	0.000				
24	0.054	0.779	0.088			~~0.020~~		0.698	0.301	0.016				
25	0.000	0.787	0.099			~~0.022~~		0.575	0.411	0.030				
26		0.755	0.166	0.000				0.449	0.529	0.040				
27		0.686	0.234	0.056	0.000			0.338	0.624	0.052				
28		0.598	0.299	0.070	0.019			0.246	0.686	0.060				
29		0.500	0.361	0.093	0.030	0.000	0.000	0.171	0.708	0.111				
30		0.397	0.412	0.138	0.042	0.020	0.003	0.121	0.690	0.168	0.000			
31		0.293	0.443	0.183	0.054	0.030	0.011	0.072	0.619	0.247	0.029			
32		0.200	0.444	0.230	0.076	0.050	0.020	0.027	0.539	0.336	0.052			
33		0.151	0.415	0.273	0.109	0.066	0.027	0.000	0.438	0.428	0.084	0.000		
34		0.108	0.365	0.307	0.144	0.081	0.035		0.343	0.504	0.178	0.064		
35		0.064	0.307	0.328	0.193	0.089	0.041		0.275	0.527	0.259	0.074		
36		0.000	0.243	0.332	0.240	0.100	0.055		0.195	0.503	0.285	0.084	0.000	0.000
37			0.179	0.317	0.289	0.127	0.074		0.132	0.443	0.260	0.107	0.091	0.091
38			0.124	0.284	0.328	0.161	0.109		0.072	0.376	0.227	0.149	0.143	0.200
39			0.090	0.238	0.333	0.199	0.146		0.016	0.310	0.253	0.219	0.200	0.300
40			0.056	0.187	0.287	0.237	0.224		0.000	0.000	0.262	0.310	0.200	0.400
41			0.024	0.155	0.242	0.250	0.324				0.276	0.456	0.200	0.500
42			0.000	0.129	0.229	0.252	0.455				0.282	0.456	0.200	0.600
43				0.200	0.223	0.251	0.585				0.000			0.700
44				0.249	0.223	0.249	0.684							0.700
45				0.249		0.000	0.722							0.800
46				0.300			0.755					0.000	~~1.000~~	0.800
47				0.345			0.788						0.000	0.900
48				0.378			0.821							0.900
49				0.000	0.000		0.855							0.900
50							0.877							1.000

Figure 162. Winter flounder sex ratio, by length group, for NEAMAP Spring and Fall cruises 2007-2011. (The percentages for each category are given near the bottom of each bar. The number sampled for sex determination is provided near the top of each bar, and the length categories expressed in inches are shown between the two figures.).

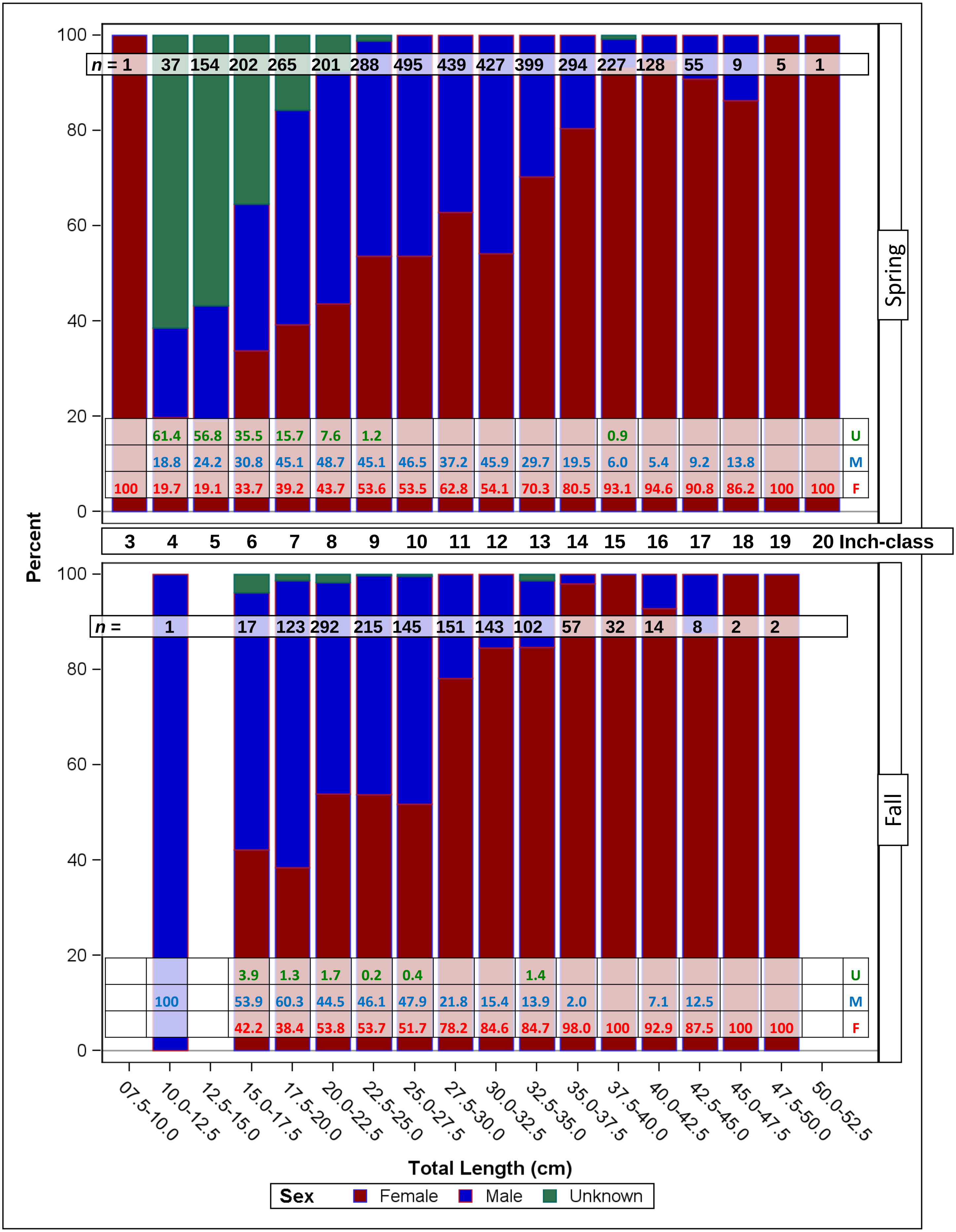
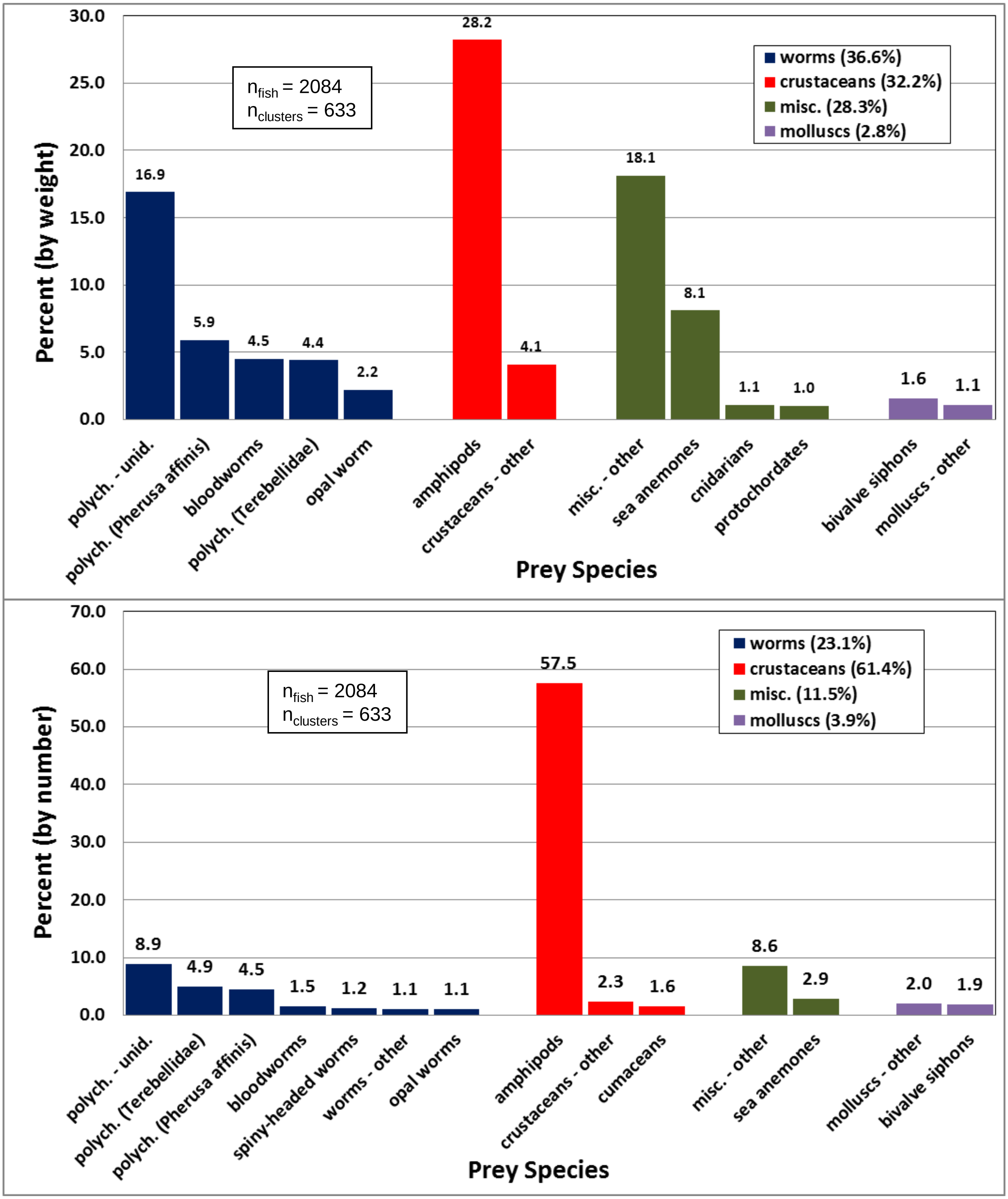


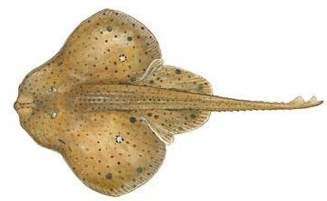
Figure 163. Winter flounder diet composition, expressed as percent by weight and number collected during NEAMAP cruises in 2007 through Spring 2011. (The number of fish sampled for diet is given by n_{fish}, while $n_{clusters}$ indicates the number of clusters of this species sampled.)

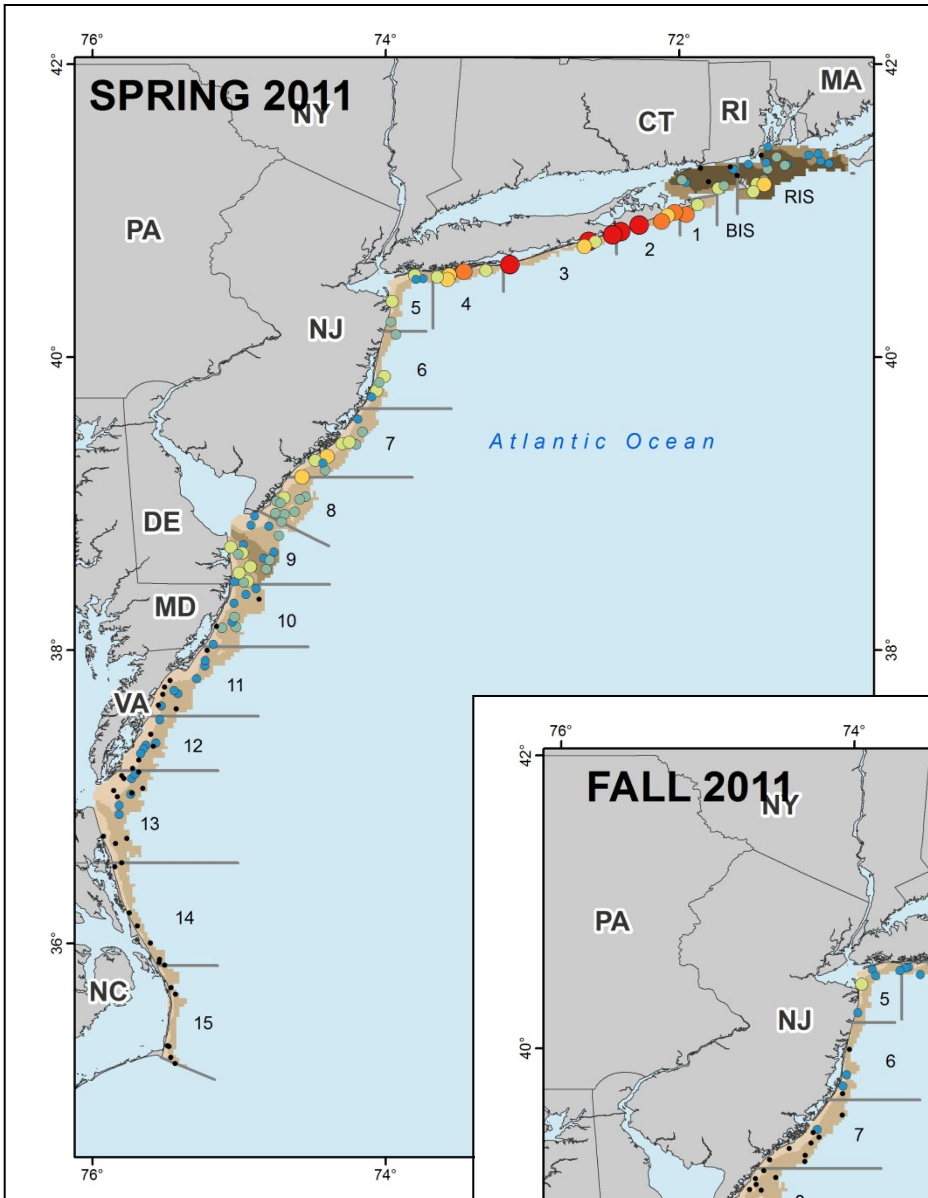


Winter Skate

Sampling Priority: A

Figure 164. Winter skate biomass (kg) at each sampling site for 2011 NEAMAP cruises.





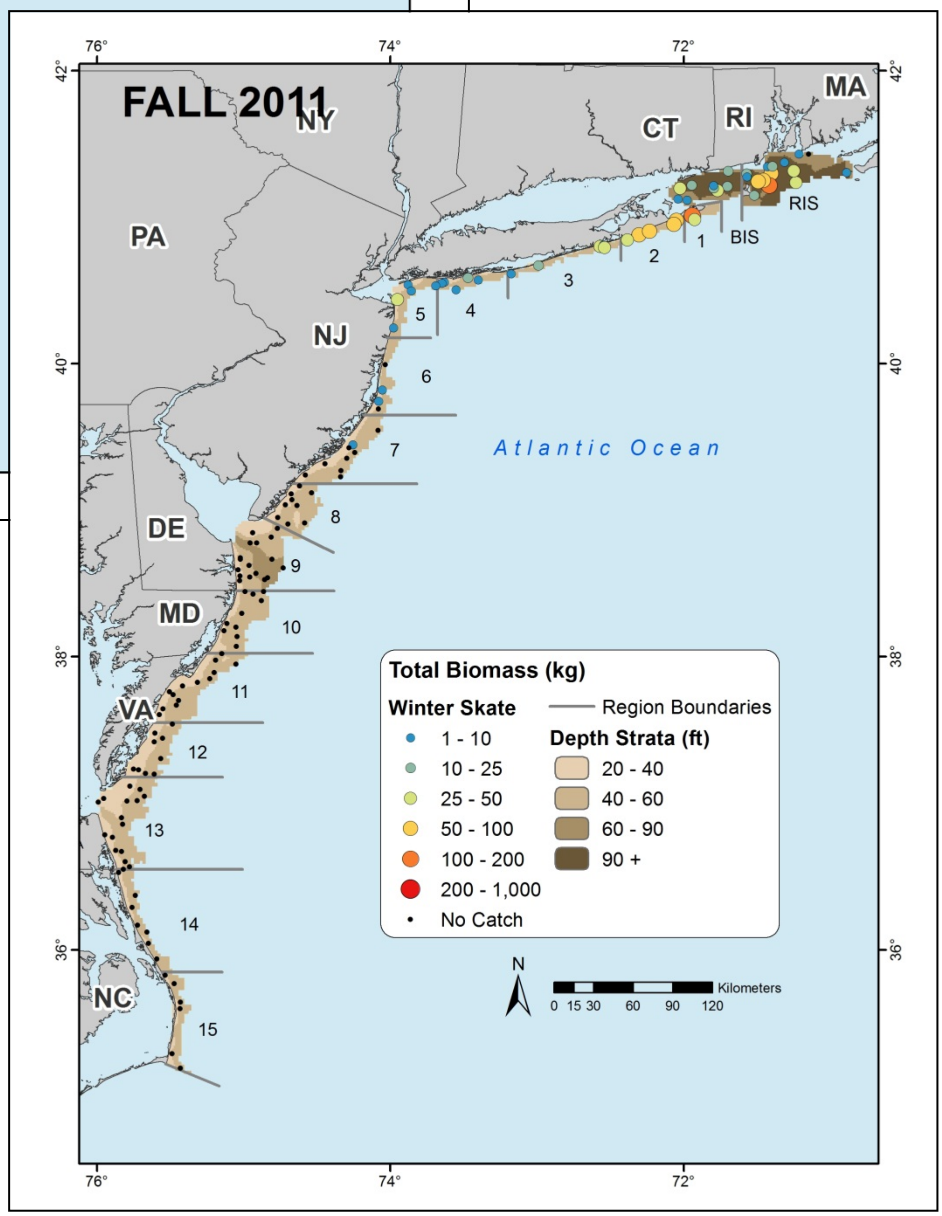


Table 98. Winter skate sampling rates and preserved specimen analysis status for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught (kg)	Number Measured	Age Specimens	Ages Read	Stomach Specimens	Stomachs Analyzed
Spring	2008	1,716	3174.2	1,217	320	0	302	300
	2009	3,595	6843.0	1,778	374	0	346	338
	2010	1,547	3985.6	851	287	0	276	268
	2011	2,271	4413.2	1,540	275	0	222	221
Fall	2007	951	925.3	735	171	0	160	159
	2008	619	921.0	399	120	0	115	115
	2009	1,787	4040.3	623	123	0	108	108
	2010	1,177	2169.6	806	122	0	104	102
	2011	1,301	1451.7	1,018	129	0	97	0

Table 99. Strata used for calculation of abundance indices for winter skate.

State (Nominal)	Region	Depth Stratum	Spring Index	Fall Index
RI	RIS	60-90	red	red
		90+	red	red
	BIS	60-90	red	grey
		90+	red	grey
NY	01	40-60	red	red
	02	20-40	red	red
		40-60	red	red
	03	20-40	red	red
		40-60	red	red
	04	20-40	red	grey
		40-60	red	grey
	05	20-40	red	grey
		40-60	red	grey
NJ	06	20-40	red	grey
		40-60	red	grey
	07	20-40	red	grey
		40-60	red	grey
	08	20-40	red	grey
		40-60	red	grey
DE	09	20-40	grey	grey
		40-60	grey	grey
		60-90	grey	grey
MD	10	20-40	grey	grey
		40-60	grey	grey
VA	11	20-40	grey	grey
		40-60	grey	grey
	12	20-40	grey	grey
		40-60	grey	grey
	13	20-40	grey	grey
		40-60	grey	grey
NC	14	20-40	grey	grey
		40-60	grey	grey
	15	20-40	grey	grey
		40-60	grey	grey

(red) = used for abundance indices

(grey) = not used for abundance indices

Table 100. Winter skate preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

Season	Year	Age	Numerical Index					Biomass Index				
			n	LCI	**Index**	UCI	CV (%)	n	LCI	**Index**	UCI	CV (%)
Spring	2008	All	73	8.21	**10.15**	12.50	4.0	73	10.69	**13.43**	16.81	3.9
	2009		79	8.83	**11.00**	13.65	4.0	79	13.22	**17.10**	22.02	4.2
	2010		72	4.56	**5.72**	7.13	5.0	72	9.80	**12.33**	15.47	4.1
	2011		72	6.17	**8.00**	10.31	5.2	72	11.50	**14.83**	19.05	4.3
Fall	2007	All	29	8.70	**13.76**	21.46	7.8	29	9.61	**14.25**	20.91	6.6
	2008		28	7.01	**10.11**	14.40	6.8	28	9.73	**13.37**	18.24	5.5
	2009		31	5.65	**8.28**	11.94	7.5	31	8.88	**13.45**	20.13	7.1
	2010		28	7.28	**13.09**	22.99	10.1	28	8.80	**16.47**	30.14	10.1
	2011		28	10.59	**18.53**	31.89	8.8	28	11.10	**18.78**	31.33	8.2

Figure 165. Winter skate preliminary geometric mean indices of abundance, by number and biomass, for spring and fall NEAMAP surveys, for all specimens captured.

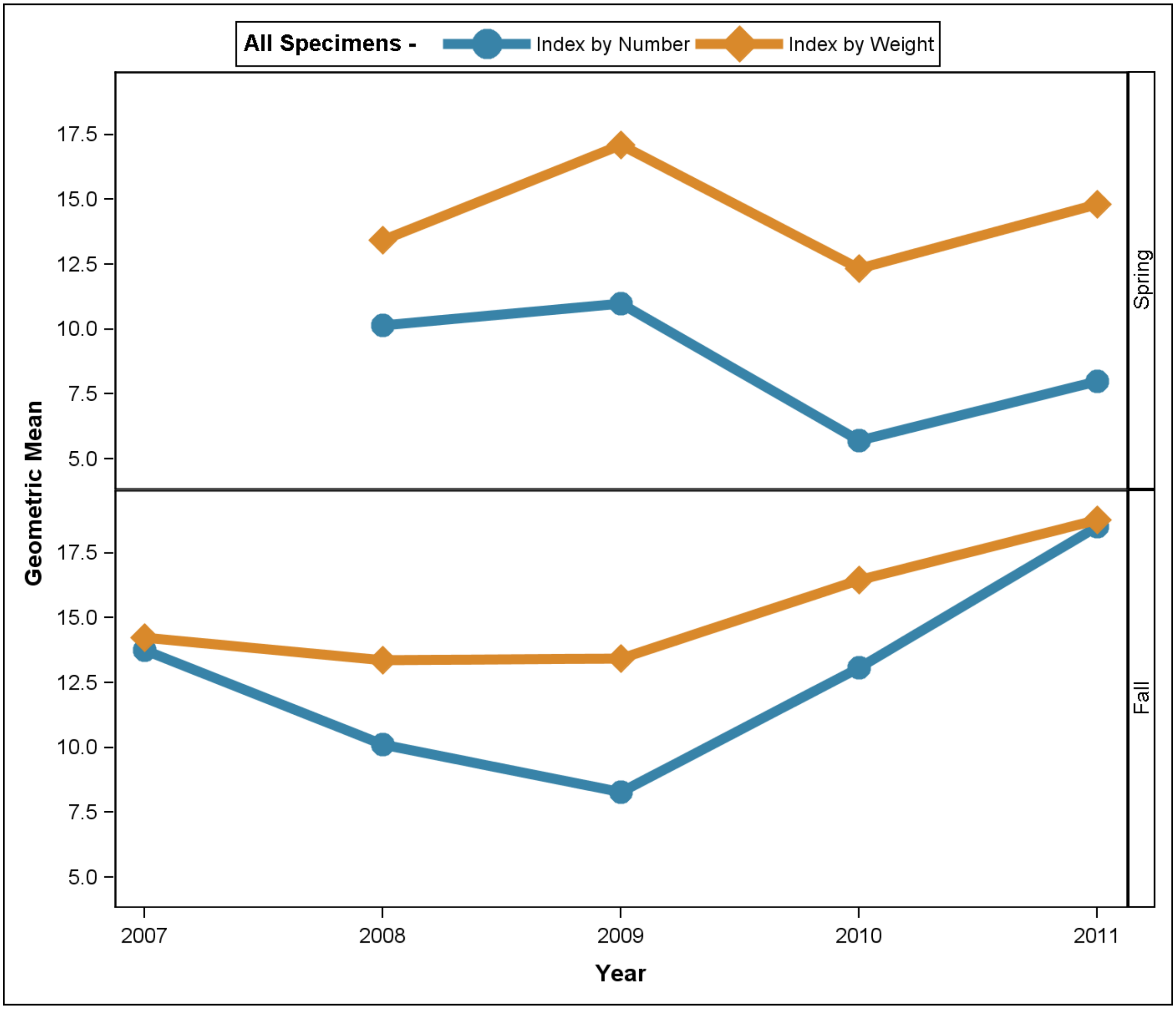


Figure 166. Winter skate length-frequency distributions, by cruise.

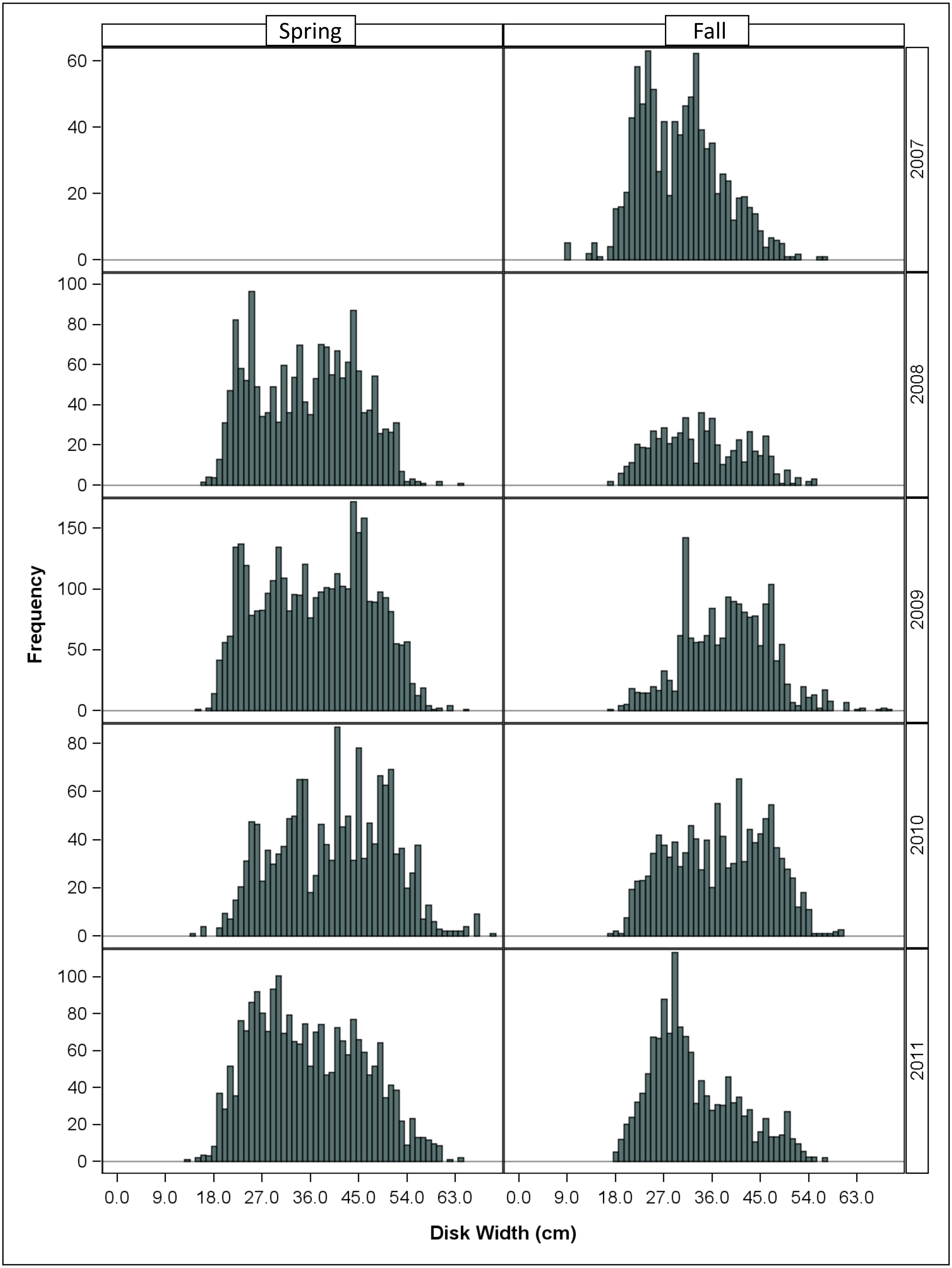


Figure 167. Winter skate length-frequency distributions, by cruise and sex.

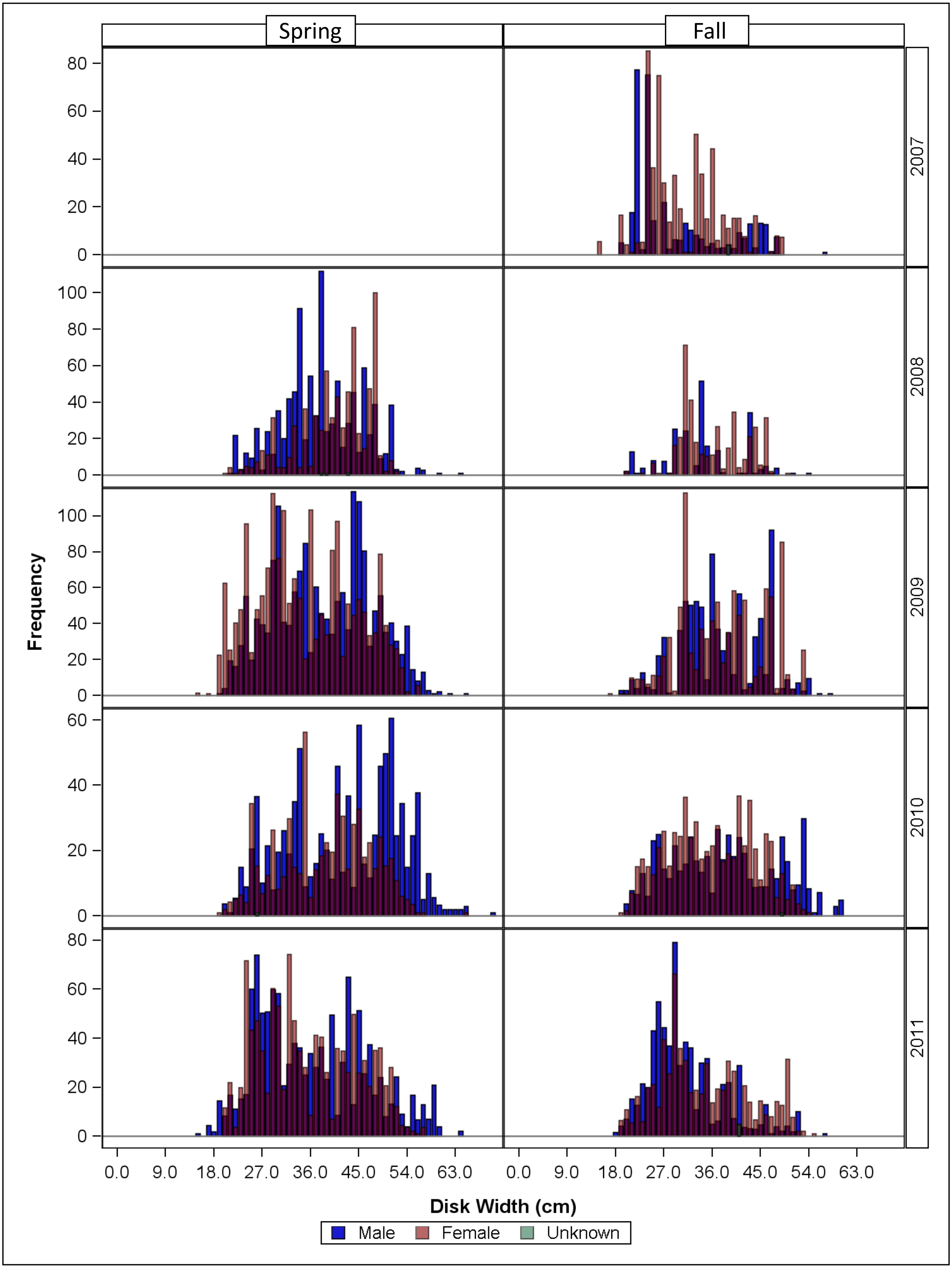


Figure 168. Winter skate sex ratio, by length group, for NEAMAP Spring and Fall cruises 2007-2011.
(The percentages for each category are given near the bottom of each bar. The number sampled for sex determination is provided near the top of each bar, and the length categories expressed in inches are shown between the two figures.).

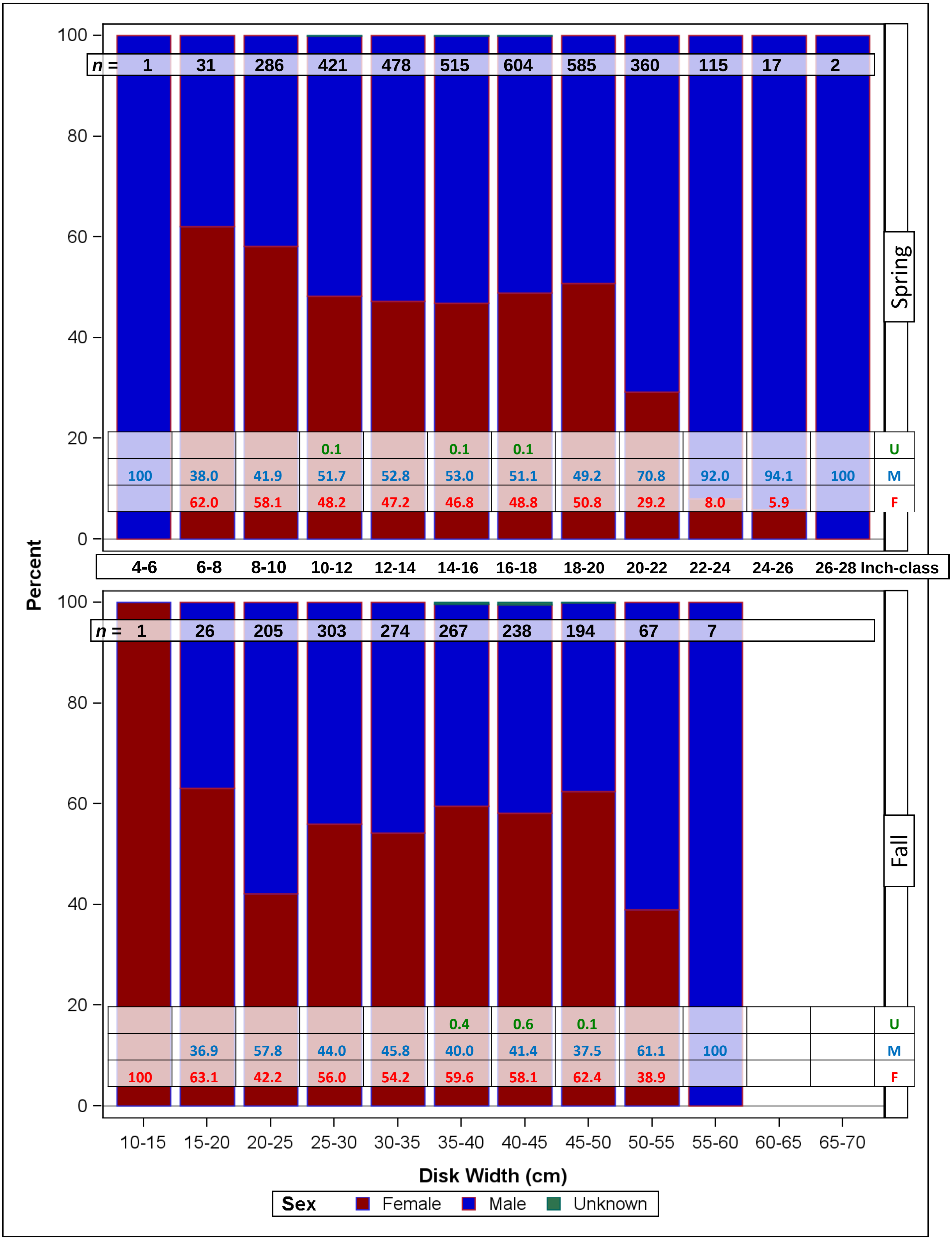


Figure 169. Winter skate diet composition, expressed as percent by weight and number collected during NEAMAP cruises in 2007 through Spring 2011. (The number of fish sampled for diet is given by n_{fish}, while $n_{clusters}$ indicates the number of clusters of this species sampled.)