NORTHEAST AREA MONITORING AND ASSESSMENT PROGRAM

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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). While 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 460 m since 1963, few sites were sampled inshore of the 27.4 m contour due to the sizes of the sampling area and research vessels (NEFSC 1988, R. Brown, NMFS, pers. comm). 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; this report therefore summarizes the results of the both the spring and fall 2010 survey 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 2010 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		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 2010 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 2010 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 2010 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 2010 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 2010 cruise, five tows were truncated at 15 minutes, two due to triggering of the catch sensor, one due to fixed gear in the tow path, and one due to a buildup of mud in the net evidenced by a significant decrease in net width and height. Just two tows are shortened during the fall 2010 cruise, one due to the catch sensor activating and another due to a strong head tide that caused the net measurements to reach the predefined limits.

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, dissolved oxygen, pH.

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 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 2010).

- 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; these data were collected prior to setting the gear in earlier cruises, 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 2010.

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 is still being developed. 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, prior reports utilized the stratified geometric mean of catch per standard area swept as an appropriate form for the abundance indices generated by this survey (Bonzek *et al.* 2008, ASMFC 2009). Two changes have been implemented for indices calculated in this report.

- Previously indices for each species were calculated using data from all survey strata regardless of the species distribution. For some species this resulted in a large number of zero values being included simply because the survey may sample beyond the species' normal range. During 2010, with several NEAMAP cruises completed, species-by-species analyses were completed to determine the strata in which each species typically experiences the highest catch rates. For this (and future) reports only those strata are used (e.g. Table 7), though these data restrictions will be examined again as more cruises are completed.
- As stated above, this and many other fishery surveys have used the geometric mean for reporting indices of abundance as survey data 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 this report we have reported indices without retransforming data from the log scale. This was done on an exploratory basis and will likely not be the final methodology used for calculation of NEAMAP abundance indices.

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

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

where n_s 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 $\log_e$ 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:

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

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, 25,000 m^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.

Further analyses to determine the distribution of catch data on a species-by-species basis will be completed as more data are accumulated. While abundance indices in this report are presented overall by survey cruise, it is possible to generate these indices for particular sub-areas, by sex, etc.

One of the most useful status-of-stock indicators for assessed and managed species is a young-of-year (YOY) index of abundance. In this report, for several species for which data existed to reasonably partition out the youngest age-class present, indices of abundance were calculated for that youngest age-class captured by the survey gear. The preferred method was to develop age-length keys for spring and fall cruises from aged NEAMAP specimens. If sufficient samples have not yet been processed to develop such keys, then similar data from other VIMS surveys (e.g. the Chesapeake Bay Multispecies Monitoring and Assessment Program – ChesMMAP) were examined. Finally, if no ageing data were available but examination of length-frequency data revealed a clear year-class separation, then a single size cutoff value for each season was used. Wherever possible these data were verified by comparison with values taken from previously published literature sources (Figure 5). For most species, that is for those that spawn between late fall and spring, the YOY (Age-0) specimens typically are captured first in the NEAMAP fall survey and then are captured again as slightly larger Age-1 specimens in the subsequent spring survey (depending on the standard birth date used for assessment purposes). These analyses will be refined as more NEAMAP ageing data become available.

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.

Sex Specific Length Frequency: Several species regularly sampled by NEAMAP are known to exhibit sexually dimorphic growth patterns. For all Priority ‘A’ species sex-specific length frequencies are shown, separately for spring and fall cruises, for all years combined, under the assumption that growth patterns remain relatively stable over years. Data are treated using the expansion methods described above.

Sex Ratios: Sex ratios were generated by length group for each of the Priority 'A' species presented in this report, as well as for some of the Priority 'E' invertebrates. Either 2.5cm or 5cm length bins were used, depending on the size range of the species. These ratios were calculated by expanding the data from specimens taken for full processing (or individual measurement in the case of the invertebrates) to the catch-level and summing the result by sex for each length group, across all sites sampled.

These sex ratios were constructed using data collected during each of the seven full-scale surveys conducted to date, under the assumption that the same population(s) was(were) being sampled across cruises for a given species. While sex ratios in this report are presented by length, it would be possible to produce these ratios overall, by sub-area, by year, by cruise, etc.

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):

$$\%W_k = \frac{\sum_{i=1}^{n} M_i q_{ik}}{\sum_{i=1}^{n} M_i} * 100 \qquad (3),$$

where

$$q_{ik} = \frac{w_{ik}}{w_i}, \qquad (4),$$

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 six full-scale survey cruises (fall 2010 data are not yet available), presentations of diet by sub-area, year, cruise, size, age, etc., are possible.

The percent weight (%W), percent number (%N), and percent frequency of occurrence (%F) indices are all useful in different contexts so each is 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. 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. For %F, only prey types that reached a 2% threshold in the overall diet are shown individually. It must be noted that for %F, prey types are not additive because each predator sample may be counted multiple times if multiple prey types were consumed. Thus overall percentages for broad taxonomic categories (e.g. fish, molluscs, etc.) is not equal to the sum of its constituents. Also, the sample sizes reported under %F are larger than for %W and %N because empty stomachs are counted in the former but not for the latter two. Finally, it is worth noting that the %N and %F indices are calculated using the cluster sampling estimator as well, following the same form given in Equation 3 and Equation 4.

Results

General Cruise Information / Station Sampling

The spring 2010 survey began on 22 April and ended on 15 May, while the fall cruise spanned from 21 September to 25 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 remained fairly consistent at around 12% to15%. Among regions within a cruise, however, the frequency of alternate sampling was more variable. In particular, and as in previous years, the sampling of alternate sites in the place of primaries occurred most often in BIS and 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 begin 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 relatively low and 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 2010 NEAMAP cruises. The numbers of primary and alternate sites sampled in each region are given in parenthesis below the totals

Region	Spring 2010 Total (*Prim. / Alt.*)	Fall 2010 Total (*Prim. / Alt.*)	Region	Spring 2010 Total (*Prim. / Alt.*)	Fall 2010 Total (*Prim. / Alt.*)
RI Sound	**16** *(10 / 6)*	**16** (*11 / 5*)	**8**	**9** *(9 / 0)*	**9** (*8 / 1*)
BI Sound	**10** *(4 / 6)*	**10** (*6 / 4*)	**9**	**17** *(16 / 1)*	**17** (*14 / 3*)
1	**2** *(2 / 0)*	**2** *(2 / 0)*	**10**	**10** *(10 / 0)*	**10** (*10 / 0*)
2	**5** *(5 / 0)*	**5** *(5 / 0)*	**11**	**13** *(12 / 1)*	**13** (*13 / 0*)
3	**5** *(4 / 1)*	**5** *(4 / 1)*	**12**	**9** *(8 / 1)*	**9** (8 / 1)
4	**5** *(4 / 1)*	**5** *(4 / 1)*	**13**	**16** *(16 / 0)*	**16** (*14 / 2*)
5	**5** *(2 / 3)*	**5** *(4 / 1)*	**14**	**7** *(7 / 0)*	**7** (7 / 0)
6	**5** *(4 / 1)*	**5** (*5 / 0*)	**15**	**6** *(6 / 0)*	**6** (6 / 0)
7	**10** *(9 / 1)*	**10** (*10 / 0*)	**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 (Figure 3). Alongside each figure (except those that present data for the first fall cruise in 2007 and spring cruise in 2008) is a similar figure which presents the temperature differences between the current year and the previous year (e.g. spring 2009 vs. to spring 2008 or fall 2010 vs. to fall 2009). From these figures it is seen that in the spring of 2009 it was slightly warmer than the previous year from approximately Barnegat northward and cooler south of that point; spring 2010 temperatures were generally warmer than spring 2009 except for a small band along the coast of Long Island. Temperatures in the fall of 2008 were up to about 4 degrees C warmer in the northern portion of the sampling area, from near Fire Island, and

generally cooler south of that point. In the fall of 2009 bottom waters were somewhat warmer than 2008 from approximately the Delaware-Maryland border and a bit cooler to the south. Finally, in the fall of 2010 cold water was evident generally in 'the Sounds' but moderate temperatures were seen throughout the rest of the sampling area.

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 2010. 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 2010 cruises (Figure 4). The cruise averages for door spread (32.3 m), wing spread (13.5 m), and headline height (5.6 m) were within optimal ranges for the spring 2010 cruise. Average towing speed was 3.0 kts. Relative to the spring survey, average door spread (32.5 m), wingspread (13.4 m), and headrope height (5.2 m) were slightly lower for the fall, but still well within the optimal ranges for this gear; the average towing speed for this survey was unchanged relative to the spring. 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.

Catch Summary

Over 1,087,000 individual specimens (fishes and invertebrates) weighing approximately 78,000 kg and representing 146 species, including boreal, temperate, and tropical fishes, were collected during the two surveys conducted in 2010 (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 143,642 animals. Lab processing is proceeding on the 7,586 stomach samples and 10,434 ageing structures (otoliths, vertebrae, spines, opercles) collected in the field. As of the date of this report, stomachs from all cruises except for fall 2010 have been examined and prey contents identified and quantified. Likewise, preparation of ageing structures is nearly complete 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. As noted in previous reports the NEAMAP protocol is 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 is in place to facilitate 'blind

reading' of these samples though this does not apply to the senior readers because they must interpret otolith edge patterns in the context of the season in which the specimen was captured.

Table 5a. For each species collected during the NEAMAP spring 2010 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	3,735	209.7	1,547	273	270
American shad	1,236	43.8	942	274	273
Atlantic croaker	29,365	1,656.2	929	49	48
Atlantic herring	3,180	103.4	300	89	89
Atlantic mackerel	32	5.4	32	24	24
Atlantic menhaden	8,177	446.1	224	30	30
black seabass	114	54.7	114	112	95
blueback herring	4,992	86.6	2,436	280	274
bluefish	312	21.4	68	18	15
butterfish	64,291	2,136.2	11,212	740	
clearnose skate	1,702	2,516.4	1,353	197	183
little skate	7,802	4,262.2	3,330	337	328
monkfish	11	37.4	11	11	7
pollock	2	0.0	2	2	2
scup	4,209	928.5	2,287	465	401
silver hake (whiting)	10,483	155.3	2,378	380	374
smooth dogfish	402	1,232.6	399	188	181
spiny dogfish	249	804.1	249	125	114
spot	19,664	822.1	894	44	
striped bass	32	143.2	32	25	17
summer flounder	711	386.8	711	493	309
tautog	14	15.6	14	14	12
weakfish	18,192	864.9	1,717	259	182
winter flounder	1,498	574.7	1,498	548	494
winter skate	1,547	3,985.6	851	287	274
yellowtail flounder	36	19.3	36	21	20
TOTAL	**181,988**	**21,512.3**	**33,566**	**5,285**	**4,016**

Table 5a. continued.

Priority "D" Species					
Species	Total Number Collected	Total Species Weight (kg)	Number Measured	Number for Ageing	Number of Stomachs
American sand lance	6	0.1	6		
Atlantic cutlassfish	8,119	183.3	233		
Atlantic sturgeon	15	209.6	15		
banded drum	12	0.6	12		
bay anchovy	57,202	175.6	6,143		
blackcheek tonguefish	2	0.1	2		
bluntnose stingray	14	183.5	14		
bullnose ray	3	1.6	3		
cunner	5	0.8	5		
fawn cusk-eel	4	0.1	4		
fourspot flounder	88	23.1	88		
harvestfish	41	0.6	4		
hickory shad	257	25.7	13		
hogchoker	25	2.2	25		
jellyfish spp		22.4			
kingfish spp	13,179	1,230.9	479		
Leucoraja spp.	1,011	169.9	549		
longhorn sculpin	92	29.1	92		
northern puffer	52	6.2	52		
northern sand lance	3	0.0	3		
northern searobin	128	8.2	128		
northern stargazer	3	13.9	3		
ocean pout	50	44.0	50		
pigfish	1,912	126.8	47		
red hake	437	24.9	437		
rock crab	144	8.4	144		
rough scad	2	0.0	2		
roughtail stingray	1	3.9	1		
sand dollar	40	1.8			
sea raven	11	8.9	11		
sheepshead	5	16.7	5		
silver perch	1,780	58.8	584		
silver seatrout	6	0.8	6		
smallmouth flounder	11	0.1	11		
smooth butterfly ray	3	4.7	3		
spotted hake	4,479	67.2	2,844		
striped anchovy	4	0.1	4		
striped searobin	49	21.4	49		
windowpane	1,065	237.1	847		
TOTAL	**90,260**	**2,913.2**	**12,918**	**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	86	24.0	86		
Atlantic surfclam	4	0.3	4		
blue crab, adult female	2	0.4	2		
brief squid	491	1.6	133		
channeled whelk	8	2.5	2		
common spider crab	120	15.2	119		
grass shrimp	114	0.3			
horseshoe crab	1,432	1,220.7	979		
jonah crab	1	0.0	1		
knobbed whelk	27	10.4	7		
lady crab	218	4.7	218		
loggerhead turtle	1		1		
Loligo squid	7,502	316.2	2,396		
moon snail	67	5.0			
northern shortfin squid	35	0.3	35		
pink shrimp	2	0.0	2		
potato sponge		5.3			
sand shrimp	1,664	1.1			
sand tiger shark	2	14.8	2		
sandbar shark	3	7.3	3		
sea scallop	211	12.4	129		
six spine spider crab	7	1.4	7		
thresher shark	2	220.0	2		
unidentified sea stars	350	9.0			
unidentified rock crab	5	0.3	5		
unidentified sponge		32.7			
TOTAL	**12,354**	**1,905.8**	**4,133**	**N/A**	**N/A**
CRUISE TOTAL	**284,602**	**26,331**	**50,617**	**5,285**	**4,016**

Table 5b. For each species collected during the NEAMAP fall 2010 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	565	13.7	360	39	38
American shad	32	1.1	6	3	3
Atlantic croaker	73,685	5,715.1	4,095	275	216
Atlantic herring	4,148	34.5	456	70	69
Atlantic mackerel	1	0.1	1	1	1
Atlantic menhaden	974	29.3	229	56	56
black drum	12	2.3	12	11	4
black seabass	121	42.8	121	90	86
blueback herring	22	0.6	22	15	14
bluefish	4,432	271.6	1,967	498	379
butterfish	157,706	4,957.3	19,276	690	
clearnose skate	875	1,056.7	875	307	276
little skate	6,453	3,739.1	3,672	263	237
red drum	5	78.7	5	5	5
scup	131,471	3,959.2	14,006	727	712
silver hake (whiting)	440	18.2	409	124	120
smooth dogfish	758	691.1	602	223	212
Spanish mackerel	141	9.6	141	17	17
spiny dogfish	4	11.7	4	4	2
spot	95,990	5,060.0	6,861	181	
spotted seatrout	3	0.4	3	3	2
striped bass	814	2,853.2	59	33	29
summer flounder	826	400.1	806	607	399
tautog	25	24.3	25	24	22
weakfish	80,684	5,795.7	8,115	611	462
winter flounder	264	72.3	264	150	106
winter skate	1,178	2,169.6	807	122	103
TOTAL	**561,629**	**37,008.4**	**63,199**	**5,149**	**3,570**

Table 5b. continued.

Priority "D" Species					
Species	Total Number Collected	Total Species Weight (kg)	Number Measured	Number for Ageing	Number of Stomachs
American eel	1	0.2	1		
American sand lance	31	0.3	31		
Atlantic bumper	230	0.8	109		
Atlantic cutlassfish	1,802	28.5	398		
Atlantic moonfish	9,490	65.5	2,156		
Atlantic spadefish	425	20.2	222		
Atlantic stingray	4	3.0	4		
Atlantic sturgeon	16	261.7	16		
Atlantic thread herring	1,380	17.2	183		
Atlantic torpedo	1	21.2	1		
banded drum	929	16.5	139		
bay anchovy	49,991	124.7	4,614		
bigeye	1	0.1	1		
bigeye scad	2	0.1	2		
blackcheek tonguefish	3	0.2	3		
blue runner	53	3.0	30		
bluespotted cornetfish	5	0.1	5		
bluntnose stingray	51	292.3	51		
bullnose ray	503	853.9	315		
cero	75	1.2	29		
cownose ray	1,113	2,627.8	49		
crevalle jack	6	0.5	6		
Etropus sp.	10	0.2	10		
fawn cusk-eel	7	0.4	7		
fourbeard rockling	14	0.5	4		
fourspot flounder	45	8.9	45		
Gulf Stream flounder	1	0.0	1		
harvestfish	1,123	47.7	225		
hogchoker	209	14.6	209		
inshore lizardfish	78	11.9	61		
jellyfish spp		945.4			
kingfish spp	18,979	2,479.4	1,925		
Leucoraja spp.	42	10.4	42		

Table 5b. continued.

Priority "D" Species (continued)					
Species	Total Number Collected	Total Species Weight (kg)	Number Measured	Number for Ageing	Number of Stomachs
lookdown	11	1.0	2		
mantis shrimp	3	0.0	3		
northern puffer	115	16.1	98		
northern searobin	102	12.7	97		
northern sennet	93	6.8	71		
northern stargazer	14	16.5	14		
orange filefish	1	0.5	1		
permit	1	0.3	1		
pigfish	441	38.7	182		
pinfish	80	3.7	24		
red goatfish	1	0.0	1		
red hake	9	1.2	9		
rock crab	13	1.2	13		
rough scad	129	9.7	103		
roughtail stingray	17	246.2	17		
round herring	526	9.2	233		
round scad	248	7.9	248		
sand dollar	2	0.0			
sea raven	3	2.0	3		
sheepshead	16	66.3	16		
silver anchovy	919	1.7	79		
silver perch	19,006	573.9	1,544		
smallmouth flounder	3	0.1	3		
smooth butterfly ray	182	581.4	171		
southern stingray	4	18.5	4		
Spanish sardine	22	0.2	22		
spiny butterfly ray	96	1,080.7	96		
spotfin mojarra	83	1.2	83		
spotted hake	5,650	442.6	1,272		
striped anchovy	67,774	849.8	4,418		
striped burrfish	51	13.0	42		
striped cusk-eel	12	0.5	12		
striped searobin	369	74.9	230		
white mullett	11	1.1	11		
windowpane	1,208	172.9	1,033		
TOTAL	**183,835**	**12,110**	**21,050**	**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	63	19.4	63		
Atlantic angel shark	12	113.3	12		
Atlantic sharpnose shark	6	25.5	6		
blue crab, adult female	13	1.9	13		
blue mussel	9	0.4			
brief squid	5,332	46.1	1,540		
brown shrimp	565	8.6	21		
cannonball jelly		95.7			
channeled whelk	2	0.8	2		
common spider crab	66	4.2	61		
eelgrass		121.7			
horseshoe crab	613	862.2	498		
hydroids		6.4			
jonah crab	1	0.3	1		
Kemp's ridley sea turtle	2		2		
knobbed whelk	6	0.8	1		
lady crab	29	1.4	29		
loggerhead turtle	1		1		
Loligo squid	46,980	962.8	5,902		
moon jelly		13.3			
moon snail	17	0.5			
purple sea urchin	3	0.1			
quahog clam	43	12.4	7		
sand tiger shark	8	407.2	8		
sandbar shark	81	202.2	81		
scalloped hammerhead	1	3.1	1		
six spine spider crab	1	0.5	1		
thresher shark	5	120.4	5		
unidentified sea stars	371	19.6			
unid. right-hand hermit crab	115	6.6			
unidentified sea grasses		23.1			
unidentified sponge		16.4			
white shrimp	3,312	87.2	521		
TOTAL	**57,657**	**3,184**	**8,776**	**N/A**	**N/A**
CRUISE TOTAL	**803,121**	**52,303**	**93,025**	**5,149**	**3,570**
YEARLY TOTAL	**1,087,723**	**78,634**	**143,642**	**10,434**	**7,586**

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.

Although this report focuses on the data collected during 2010, some information from previous years is included in these species summaries to both place the 2010 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. 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 2010 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 logarithmic mean of catch per standard area swept, for all ages/sizes combined; additionally for species for which a reasonable basis for separating the youngest age class present in the data (usually either 0 or 1) existed separate indices are presented for the youngest age class and for all other ages combined. Sample sizes and percent coefficients of variation are also given.
- Figures displaying stratified logarithmic 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 all cruises combined.
- 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.
- Bar plots of diet composition by weight, by number, and by frequency of occurrence, 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.
- 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).

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 (those with an * are managed by the Mid-Atlantic Council). Text associated with these tables and figures is provided following this list. Detailed descriptions of these data and analyses are included for the Council-managed species, while a listing of the contents of the tables and figures is given for all others.

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Alewife (*Alosa pseudoharengus*)

Figure 6. Biomass (kg) of alewife collected at each sampling site for each 2010 NEAMAP cruise.

Table 6. Sampling rates and preserved specimen analysis status of alewife for each NEAMAP cruise.

Table 7. Strata used for calculation of abundance indices for alewife.

Table 8. Preliminary abundance indices for alewife.

Figure 7. Preliminary indices of abundance, in number and biomass units, of alewife for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

Figure 8. Preliminary indices of abundance, of alewife for spring and fall NEAMAP surveys. Indices are for the youngest age class observed during each survey (count-based indices only) and for all other age classes combined (based both on count and biomass). 95% confidence intervals are provided for each abundance estimate.

Figure 9. Length-frequency distributions, by cruise, for alewife.

Figure 10. Sex-specific length-frequency distribution, by season, all cruises pooled, for alewife.

Figure 11. Sex ratio, by length group, for alewife collected all NEAMAP cruises 2007-2010.

American Lobster (*Homarus americanus*)

Figure 12. Biomass (kg) of American lobster collected at each sampling site for each 2010 NEAMAP cruise.

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

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

Table 11. Preliminary abundance indices for American lobster.

Figure 13. Preliminary indices of abundance, in number and biomass units, of American lobster for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

Figure 14. Length-frequency distributions, by cruise, for American lobster.

Figure 15. Sex-specific length-frequency distribution, by season, all cruises pooled, for American lobster.

Figure 16. Sex ratio, by length group, for American lobster collected all NEAMAP cruises 2007-2010.

American Shad (*Alosa sapidissima*)

Figure 17. Biomass (kg) of American shad collected at each sampling site for each 2010 NEAMAP cruise.

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

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

Table 14. Preliminary abundance indices for American shad.

Figure 18. Preliminary indices of overall abundance, in terms of number and biomass, of American shad for spring NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

Figure 19. Preliminary indices of abundance, of American shad for spring NEAMAP surveys. Indices are for the youngest age class observed during each survey (count-based indices only). Older age classes are not well represented in current NEAMAP data. 95% confidence intervals are provided for each abundance estimate.

Figure 20. Length-frequency distributions, by cruise, for American shad.

Figure 21. Sex-specific length-frequency distribution, by season, all cruises pooled, for American shad.

Figure 22. Sex ratio, by length group, for American shad collected all NEAMAP cruises 2007-2010.

Atlantic Croaker (*Micropogonias undulatus*)

Figure 23. Biomass (kg) of Atlantic croaker collected at each sampling site for 2010 NEAMAP cruises.

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

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

Table 17. Preliminary abundance indices for Atlantic croaker.

Figure 24. Preliminary indices of overall abundance, in terms of number and biomass, of Atlantic croaker for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

Figure 25. Preliminary indices of abundance, of Atlantic croaker for spring and fall NEAMAP surveys. Indices are for the youngest age class observed during each survey (count-based indices only) and for all other age classes combined (based both on count and biomass). 95% confidence intervals are provided for each abundance estimate.

Figure 26. Length-frequency distributions, by cruise, for Atlantic croaker.

Figure 27. Sex-specific length-frequency distribution, by season, all cruises pooled, for Atlantic croaker.

Figure 28. Sex ratio, by length group, for Atlantic croaker collected all NEAMAP cruises 2007-2010

Figure 29. Diet composition, expressed as percent by weight, by number, and by frequency of occurrence of Atlantic croaker collected during NEAMAP cruises in 2007-2009.

Atlantic Menhaden (*Brevoortia tyrannus*)

Figure 30. Biomass (kg) of Atlantic menhaden collected at each sampling site for 2010 NEAMAP cruises.

Table 18. Sampling rates and preserved specimen analysis status of Atlantic menhaden for each NEAMAP cruise.

Table 19. Strata used for calculation of abundance indices for American menhaden.

Table 20. Preliminary abundance indices for Atlantic menhaden.

Figure 31. Preliminary indices of overall abundance, in terms of number and biomass, of Atlantic menhaden for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

Figure 32. Preliminary indices of abundance, of Atlantic menhaden for spring and fall NEAMAP surveys. Indices are for the youngest age class observed during each survey

(count-based indices only) and for all other age classes combined (based both on count and biomass). 95% confidence intervals are provided for each abundance estimate.

Figure 33. Length-frequency distributions, by cruise, for Atlantic menhaden.

Figure 34. Sex-specific length-frequency distribution, by season, all cruises pooled, for Atlantic menhaden.

Figure 35. Sex ratio, by length group, for Atlantic menhaden collected all NEAMAP cruises 2007-2010.

Bay Anchovy (*Anchoa mitchilli*)

Figure 36. Biomass (kg) of bay anchovy collected at each sampling site for 2010 NEAMAP cruises.

Table 21. Sampling rates of bay anchovy for each NEAMAP cruise.

Table 22. Strata used for calculation of abundance indices for bay anchovy.

Table 23. Preliminary abundance indices for bay anchovy.

Figure 37. Preliminary indices of overall abundance, in terms of number and biomass, of bay anchovy for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

Figure 38. Length-frequency distributions, by cruise, for bay anchovy.

Black Sea Bass (*Centropristis striata*)

Figure 39. Biomass (kg) of black sea bass collected at each sampling site for 2010 NEAMAP cruises.

Table 24. Sampling rates and preserved specimen analysis status of black sea bass for each NEAMAP cruise.

Table 25. Strata used for calculation of abundance indices for black sea bass.

Table 26. Preliminary abundance indices for black sea bass.

Figure 40. Preliminary indices of overall abundance, in terms of number and biomass, of black sea bass for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

Figure 41. Preliminary indices of abundance, of black sea bass for spring and fall NEAMAP surveys. Indices are for the youngest age class observed during each survey (count-based

indices only) and for all other age classes combined (based both on count and biomass). 95% confidence intervals are provided for each abundance estimate.

Figure 42. Length-frequency distributions, by cruise, for black sea bass.

Figure 43. Sex-specific length-frequency distribution, by season, all cruises pooled, for black sea bass.

Figure 44. Sex ratio, by length group, for black sea bass collected all NEAMAP cruises 2007-2010.

Figure 45. Diet composition, expressed as percent by weight, by number, and by frequency of occurrence of black sea bass collected during NEAMAP cruises in 2007-2009.

With respect to the distribution of the catches of black sea bass, collections during the spring 2010 survey, were low and were concentrated in the northern portion of the survey area, especially in Block Island and Rhode Island Sounds. During the fall survey catches again were generally low, were somewhat more dispersed, and often occurred in clusters of nearby stations. Overall, the largest samples of black sea bass occurred along the coast of Long Island and in BIS and RIS (Figure 39).

No consistent 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 24). 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.

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 26, Figure 40). 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 24.9% (Fall 2008, 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 and then significant declines in 2010. Indices for all of the older age-classes combined showed downward trends over the time series for both surveys (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 (49.9% by weight, 57.5% 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 22.4% of the sea bass diet by weight and 16.9% by number and were represented mainly by butterfish and bay anchovy among identifiable species. *Loligo* squid accounted for approximately 10% of the diet by both weight and number. Diets as measured by %F followed similar patterns.

Blueback Herring (*Alosa aestivalis*)

Figure 46. Biomass (kg) of blueback herring collected at each sampling site for 2010 NEAMAP cruises.

Table 27. Sampling rates and preserved specimen analysis status of blueback herring for each NEAMAP cruise.

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

Table 29. Preliminary abundance indices for blueback herring.

Figure 47. Preliminary indices of overall abundance, in terms of number and biomass, of blueback herring for spring NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

Figure 48. Preliminary indices of abundance, of blueback herring for spring NEAMAP surveys. Indices are for the youngest age class observed during each survey (count-based indices only) and for all other age classes combined (based both on count and biomass). 95% confidence intervals are provided for each abundance estimate.

Figure 49. Length-frequency distributions, by cruise, for blueback herring.

Figure 50. Sex-specific length-frequency distribution, by season, all cruises pooled, for blueback herring.

Figure 51. Sex ratio, by length group, for blueback herring collected all NEAMAP cruises 2007-2010 The number sampled for sex determination is provided above each bar, and the length categories expressed in inches are given near the x-axis.

Bluefish (*Pomatomus saltatrix*)

Figure 52. Biomass (kg) of bluefish collected at each sampling site for 2010 NEAMAP cruises.

Table 30. Sampling rates and preserved specimen analysis status of bluefish for each NEAMAP cruise.

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

Table 32. Preliminary abundance indices for bluefish.

Figure 53. Preliminary indices of overall abundance, in terms of number and biomass, of bluefish for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

Figure 54. Preliminary indices of abundance, of bluefish for spring and fall NEAMAP surveys. Indices are for the youngest age class observed during each survey (count-based indices only) and for all other age classes combined (based both on count and biomass). 95% confidence intervals are provided for each abundance estimate.

Figure 55. Preliminary indices of abundance, of bluefish for fall NEAMAP surveys. Indices are for the Age-0 year classes, separately for the spring and summer cohorts. For the spring cohort, indices based both on count and biomass are shown and for the summer cohort only indices based on counts are given.

Figure 56. Length-frequency distributions, by cruise, for bluefish.

Figure 57. Sex-specific length-frequency distribution, by season, all cruises pooled, for bluefish.

Figure 58. Sex ratio, by length group, for bluefish collected all NEAMAP cruises 2007-2010.

Figure 59. Diet composition, expressed as percent by weight, by number, and by frequency of occurrence of bluefish collected during NEAMAP cruises in 2007-2009.

This species was sampled throughout the NEAMAP survey range during the fall 2010 cruise (Figure 52). Catches tended to be largest and most consistent along the coast of Long Island and in the Sounds. Collections of bluefish during the Spring 2010 were rare, occurring at only seven stations, with catches greater than 10 specimens occurring at only two widely dispersed locations.

Bluefish are a fast-swimming, coastal pelagic species, and as such survey trawls are not deemed the most effective tool for sampling this species. Nevertheless, appreciable amounts (number and biomass) of bluefish were caught on all four fall surveys and one of the three spring surveys through 2010 (few fish were sampled during the spring 2008 and spring 2010 surveys – Table 30).

Bluefish indices of overall abundance (both number and biomass) were relatively stable over the time series as measured during fall cruises, with low survey variability (Table 32 – Figure 53). Indices as measured during spring cruises are likely not representative of true abundance as the species does not usually reinvade the survey area until later in the spring after survey operations are completed. 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.

Bluefish are believed to exhibit and 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 56) shows that these two cohorts reveal themselves in NEAMAP data and cohort strength can likely be estimated separately. Therefore, the youngest age indices are first calculated for both cohorts combined (age-0 in the fall and age-1 in the spring – Figure 54), and then separately for the fall survey only (Figure 55). As estimated during fall cruises, the combined YOY indices by count show little trend over the four year series while the indices for all older age groups combined generally decline (Figure 54) measured either by count or biomass. Interestingly, the spring cohort indices exhibit a nearly straight line decline while the summer cohort increases between 2007 and 2009 before declining in 2010 (Figure 55).

Bluefish collected during the fall surveys generally ranged from 7cm to 75cm FL (Figure 56 – difficult to see full range due to scale of y-axis). 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 (up to ~72cm FL) are normally captured.

In neither the sex-specific length analyses (Figure 57) nor a plot of sex ratio by size (Figure 58) 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, 97.4% by %W, and 92.6% by %N (Figure 59). Bay anchovy accounted for more than half of the bluefish diet by weight, nearly half by number, and was present in over one-third of all stomachs examined. 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 (*Penaeus aztecus*)

Figure 60. Biomass (kg) of brown shrimp collected at each sampling site for 2010 NEAMAP cruises.

Table 33. Sampling rates of brown shrimp for each NEAMAP cruise.

Table 34. Strata used for calculation of abundance indices for brown shrimp.

Table 35. Preliminary abundance indices for brown shrimp.

Figure 61. Preliminary indices of overall abundance, in terms of number and biomass, of brown shrimp for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

Figure 62. Length-frequency distributions, by cruise, for brown shrimp.

Butterfish (*Peprilis triacantus*)

Figure 63. Biomass (kg) of butterfish collected at each sampling site for 2010 NEAMAP cruises.

Table 36. Sampling rates and preserved specimen analysis status of butterfish for each NEAMAP cruise.

Table 37. Strata used for calculation of abundance indices for butterfish.

Table 38. Preliminary abundance indices for butterfish.

Figure 64. Preliminary indices of overall abundance, in terms of number and biomass, of butterfish for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

Figure 65. Length-frequency distributions, by cruise, for butterfish.

Figure 66. Sex-specific length-frequency distribution, by season, all cruises pooled, for butterfish.

Figure 67. Sex ratio, by length group, for butterfish collected all NEAMAP cruises 2007-2010.

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 63). In the spring of 2010 catches were greatest in the Sounds but large collections were also made off of the central portion of New Jersey and near the mouth of Delaware Bay. Fall abundances were also high in the Sounds but nearly as high in nearly all areas south of Delaware Bay.

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 36). The largest collections to date 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. 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 exhibit a steady upward trend over four survey years, both in numbers and biomass (Table 38 - Figure 64). Spring index trends however are either flat or somewhat declining over a short three-year time series. Estimates of index variability are quite small.

Examination of cruise-by-cruise length frequencies (Figure 65) reveals that in most years distinct year-classes are evident. However, separate YOY indices have not been calculated here pending confirmation of age-class age-length keys or reliable distinct cutoff values.

Butterfish sampled during spring surveys ranged from 2cm and 22cm FL (Figure 65). 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. 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. When comparing among fall cruises, distinct modal groups were apparent for the fall 2007 survey, but were less so in subsequent years.

No apparent trends were evident in the butterfish sex-specific size frequencies (Figure 66) or sex ratio by size (Figure 67); 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 68. Biomass (kg) of clearnose skate collected at each sampling site for 2010 NEAMAP cruises.

Table 39. Sampling rates and preserved specimen analysis status of clearnose skate for each NEAMAP cruise.

Table 40. Strata used for calculation of abundance indices for clearnose skate.

Table 41. Preliminary abundance indices for clearnose skate.

Figure 69. Preliminary indices of overall abundance, in terms of number and biomass, of clearnose skate for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

Figure 70. Width-frequency distributions, by cruise, for clearnose skate.

Figure 71. Sex-specific length-frequency distribution, by season, all cruises pooled, for clearnose skate.

Figure 72. Sex ratio, by length group, for clearnose skate collected all NEAMAP cruises 2007-2010.

Figure 73. Diet composition, expressed as percent by weight, by number, and by frequency of occurrence of clearnose skate collected during NEAMAP cruises in 2007-2009.

Horseshoe Crab (*Limulus polyphemus*)

Figure 74. Biomass (kg) of horseshoe crab collected at each sampling site for 2010 NEAMAP cruises.

Table 42. Sampling rates of horseshoe crab for each NEAMAP cruise.

Table 43. Strata used for calculation of abundance indices for horseshoe crab.

Table 44. Preliminary abundance indices for horseshoe crab.

Figure 75. Preliminary indices of overall abundance, in terms of number and biomass, of horseshoe crab for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

Figure 76. Width-frequency distributions, by cruise, for horseshoe crab.

Figure 77. Sex-specific length-frequency distribution, by season, all cruises pooled, for horseshoe crab.

Figure 78. Sex ratio, by length group, for horseshoe crab collected both NEAMAP 2010.

Kingfish (*Menticirrhus* spp.)

Figure 79. Biomass (kg) of kingfish collected at each sampling site for 2010 NEAMAP cruises.

Table 45. Sampling rates of kingfish for each NEAMAP cruise.

Table 46. Strata used for calculation of abundance indices for kingfish.

Table 47. Preliminary abundance indices for kingfish.

Figure 80. Preliminary indices of overall abundance, in terms of number and biomass, of kingfish for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

Figure 81. Length-frequency distributions, by cruise, for kingfish.

Little Skate (*Leucoraja erinacea*)

Figure 82. Biomass (kg) of little skate collected at each sampling site for 2010 NEAMAP cruises.

Table 48. Sampling rates and preserved specimen analysis status of little skate for each NEAMAP cruise.

Table 49. Strata used for calculation of abundance indices for little skate.

Table 50. Preliminary abundance indices for little skate.

Figure 83. Preliminary indices of overall abundance, in terms of number and biomass, of little skate for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

Figure 84. Length-frequency distributions, by cruise, for little skate.

Figure 85. Sex-specific length-frequency distribution, by season, all cruises pooled, for little skate.

Figure 86. Sex ratio, by length group, for little skate collected all NEAMAP cruises 2007-2010.

Figure 87. Diet composition, expressed as percent by weight, by number, and by frequency of occurrence of little skate collected during NEAMAP cruises in 2007-2009.

***Loligo* Squid (*Loligo pealeii*)**

Figure 88. Biomass (kg) of *Loligo* squid collected at each sampling site for 2010 NEAMAP cruises.

Table 51. Sampling rates of *Loligo* squid for each NEAMAP cruise.

Table 52. Strata used for calculation of abundance indices for *Loligo* squid.

Table 53. Preliminary abundance indices for *Loligo* squid.

Figure 89. Preliminary indices of overall abundance, in terms of number and biomass, of *Loligo* squid for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

Figure 90. Length-frequency distributions, by cruise, for *Loligo* squid.

In 2010, *Loligo* squid were collected nearly throughout the NEAMAP survey area in both the spring and the fall (Figure 88). The distribution of the catches was without apparent trend during the spring cruise though there was a high concentration near Atlantic City, NJ and very few specimens collected south of Chesapeake Bay. Collections were largest in BIS and RIS in the fall and evenly distributed elsewhere in the survey samples.

The abundances of *Loligo* squid encountered during the fall cruises have consistently been greater than those observed during spring (Table 51). When comparing within seasons, no trends are evident for the fall collections with low catches followed by high, then the reverse. In the spring, each successive year has seen somewhat smaller total catches both in numbers and biomass. The greatest number and biomass of *Loligo* were collected during the fall 2009 cruise with almost a quarter of a million specimens weighing more than 3,400 kg sampled during this survey.

Abundance indices for *Loligo* squid followed similar patterns as overall catches both in terms of number and biomass (Figure 89). Abundance indices for the fall vary year by year without apparent trend while those for the spring have declined substantially.

With respect to the sizes of specimens collected, squid caught on the spring cruises ranged from 1cm mantle length (ML) to 29cm ML (Figure 90). 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 91. Biomass (kg) of scup collected at each sampling site for 2010 NEAMAP cruises.

Table 54. Sampling rates and preserved specimen analysis status of scup for each NEAMAP cruise.

Table 55. Strata used for calculation of abundance indices for scup.

Table 56. Preliminary abundance indices for scup.

Figure 92. Preliminary indices of overall abundance, in terms of number and biomass, of scup for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

Figure 93. Preliminary indices of abundance, of scup for spring and fall NEAMAP surveys. Indices are for the youngest age class observed during each survey (count-based indices only) and for all other age classes combined (based both on count and biomass). 95% confidence intervals are provided for each abundance estimate.

Figure 94. Length-frequency distributions, by cruise, for scup.

Figure 95. Sex-specific length-frequency distribution, by season, all cruises pooled, for scup.

Figure 96. Sex ratio, by length group, for scup collected all NEAMAP cruises 2007-2010.

Figure 97. Diet composition, expressed as percent by weight, by number, and by frequency of occurrence of scup collected during NEAMAP cruises in 2007-2009.

Scup were collected from throughout the survey area during the fall 2009 cruise, with the highest biomass tows being in the northern (BIS and RIS) and southern (off NC) extremes of the survey area (Figure 91). During the spring 2010 survey the highest catch rates were again in RIS and BIS but specimens were captured all the way to the southernmost stations

Scup have typically been one of the most abundant species collected by the NEAMAP Trawl Survey (Table 54). 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. 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 declines between the fall of 2007 and 2008, followed by a leveling off through 2010 (Figure 92). Steady decreases in abundance were also seen among the spring indices for 2008 through 2010. 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, when the YOYs are removed, the patterns for the older portions of the survey's catches offer a somewhat different picture. For the fall surveys, there is a generally declining trend that is more pronounced in biomass than in numbers; for the spring surveys the indices (both number and biomass) in 2009 are higher than those for 2008 and then fall again in 2010.

Scup sampled during the fall cruises ranged from 3cm to 41cm FL (Figure 94 – 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 5) assigns all specimens less than 10cm FL and a decreasing proportion up to 17cm FL to age-0. Currently the spring YOY indices are based on using a single size cutoff value of 12cm 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 95) or in the sex ratio of scup presented by size (Figure 96). 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 58% of the scup diet composition by weight and 66% by number (Figure 97). 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 5% or less. Generally similar values are seen when considering diet by %F.

Silver Hake (*Merluccius bilinearis*)

Figure 98. Biomass (kg) of silver hake collected at each sampling site for 2010 NEAMAP cruises.

Table 57. Sampling rates and preserved specimen analysis status of silver hake for each NEAMAP cruise.

Table 58. Strata used for calculation of abundance indices for silver hake.

Table 59. Preliminary abundance indices for silver hake.

Figure 99. Preliminary indices of overall abundance, in terms of number and biomass, of silver hake for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

Figure 100. Preliminary indices of abundance, of silver hake for spring and fall NEAMAP surveys. Indices are for the youngest age class observed during each survey (count-based indices only) and for all other age classes combined (based both on count and biomass). 95% confidence intervals are provided for each abundance estimate.

Figure 101. Length-frequency distributions, by cruise, for silver hake.

Figure 102. Sex-specific length-frequency distribution, by season, all cruises pooled, for silver hake.

Figure 103. Sex ratio, by length group, for silver hake collected all NEAMAP cruises 2007-2010 .

Figure 104. Diet composition, expressed as percent by weight, by number, and by frequency of occurrence of silver hake collected during NEAMAP cruises in 2007-2009.

Smooth Dogfish (*Mustelus canis*)

Figure 105. Biomass (kg) of smooth dogfish collected at each sampling site for 2010 NEAMAP cruises.

Table 60. Sampling rates and preserved specimen analysis status of smooth dogfish for each NEAMAP cruise.

Table 61. Strata used for calculation of abundance indices for smooth dogfish.

Table 62. Preliminary abundance indices for smooth dogfish.

Figure 106. Preliminary indices of overall abundance, in terms of number and biomass, of smooth dogfish for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

Figure 107. Preliminary indices of abundance, of smooth dogfish for spring and fall NEAMAP surveys. Indices are for the youngest age class observed during each survey (count-based indices only) and for all other age classes combined (based both on count and biomass). 95% confidence intervals are provided for each abundance estimate.

Figure 108. Length-frequency distributions, by cruise, for smooth dogfish.

Figure 109. Sex-specific length-frequency distribution, by season, all cruises pooled, for smooth dogfish.

Figure 110. Sex ratio, by length group, for smooth dogfish collected all NEAMAP cruises 2007-2010.

Figure 111. Diet composition, expressed as percent by weight, by number, and by frequency of occurrence of smooth dogfish collected during NEAMAP cruises in 2007-2009.

Spanish Mackerel (*Scomberomorus maculates*)

Figure 112. Biomass (kg) of Spanish mackerel collected at each sampling site for 2010 NEAMAP cruises.

Table 63. Sampling rates and preserved specimen analysis status of Spanish mackerel for each NEAMAP cruise.

Table 64. Strata used for calculation of abundance indices for Spanish mackerel.

Table 65. Preliminary abundance indices for Spanish mackerel.

Figure 113. Preliminary indices of overall abundance, in terms of number and biomass, of Spanish mackerel for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

Figure 114. Length-frequency distributions, by cruise, for Spanish mackerel.

Spiny Dogfish *(Squalus acanthias)*

Figure 115. Biomass (kg) of spiny dogfish collected at each sampling site for 2010 NEAMAP cruises.

Table 66. Sampling rates and preserved specimen workup status of spiny dogfish for each NEAMAP cruise.

Table 67. Strata used for calculation of abundance indices for spiny dogfish.

Table 68. Preliminary abundance indices for spiny dogfish.

Figure 116. Preliminary indices of overall abundance, in terms of number and biomass, of spiny dogfish for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

Figure 117. Length-frequency distributions, by cruise, for spiny dogfish.

Figure 118. Sex-specific length-frequency distribution, by season, all cruises pooled, for spiny dogfish.

Figure 119. Sex ratio, by length group, for spiny dogfish collected all NEAMAP cruises 2007-2010.

Figure 120. Diet composition, expressed as percent by weight, by number, and by frequency of occurrence of spiny dogfish collected during NEAMAP cruises in 2007-2009.

The seasonality of the NEAMAP collections of spiny dogfish is consistent with the known 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 115). In 2010 this species was largely absent from collections during the fall survey except for a small number of individuals in RIS and BIS. Spiny dogfish were collected through a large portion of the NEAMAP survey area (mid NJ and south) during the spring 2010 cruise. The mouths of Delaware and Chesapeake Bays, produced the largest catches of this species during this survey.

Catches of spiny dogfish by the NEAMAP Trawl Survey varied seasonally, and within seasons annual variability is high; spring collections exceeded fall catches (Table 66). 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 individuals (804 kg) were captured in spring 2010. 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 (only 4 specimens) in fall 2010.

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 (Table 68 - Figure 116). For the fall surveys, abundance with respect to biomass increased between 2007 and 2009 and, similarly to the spring survey, fell dramatically in 2010. 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 117). 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. Specimens collected in spring 2010 had a similar length distribution but generally compacted due to a considerably smaller sample size. 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. With only four specimens collected in fall 2010 little information can be gleaned from the length data from this cruise.

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 118 & 119).

Approximately half of the spiny dogfish diet by both weight and number was fishes (Figure 120). 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 10% 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.

Spot (*Leiostomus xanthurus*)

Figure 121. Biomass (kg) of spot collected at each sampling site for 2010 NEAMAP cruises.

Table 69. Sampling rates and preserved specimen analysis status of spot for each NEAMAP cruise.

Table 70. Strata used for calculation of abundance indices for spot.

Table 71. Preliminary abundance indices for spot.

Figure 122. Preliminary indices of overall abundance, in terms of number and biomass, of spot for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

Figure 123. Length-frequency distributions, by cruise, for spot.

Figure 124. Sex-specific length-frequency distribution, by season, all cruises pooled, for spot.

Figure 125. Sex ratio, by length group, for spot collected all NEAMAP cruises 2007-2010.

Striped Anchovy (*Anchoa hepsetus*)

Figure 126. Biomass (kg) of striped anchovy collected at each sampling site for 2010 NEAMAP cruises.

Table 72. Sampling rates and of striped anchovy for each NEAMAP cruise.

Table 73. Strata used for calculation of abundance indices for striped anchovy.

Table 74. Preliminary abundance indices for striped anchovy.

Figure 127. Preliminary indices of overall abundance, in terms of number and biomass, of striped anchovy for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

Figure 128. Length-frequency distributions, by cruise, for striped anchovy.

Striped Bass (*Morone saxatilis*)

Figure 129. Biomass (kg) of striped bass collected at each sampling site for 2010 NEAMAP cruises.

Table 75. Sampling rates and preserved specimen analysis status of striped bass for each NEAMAP cruise.

Table 76. Strata used for calculation of abundance indices for striped bass.

Table 77. Preliminary abundance indices for striped bass.

Figure 130. Preliminary indices of overall abundance, in terms of number and biomass, of striped bass for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

Figure 131. Length-frequency distributions, by cruise, for striped bass.

Figure 132. Sex-specific length-frequency distribution, by season, all cruises pooled, for striped bass.

Figure 133. Sex ratio, by length group, for striped bass collected all NEAMAP cruises 2007-2010.

Figure 134. Diet composition, expressed as percent by weight, by number, and by frequency of occurrence of striped bass collected during NEAMAP cruises in 2007-2009.

Summer Flounder (*Paralichthys dentatus*)

Figure 135. Biomass (kg) of summer flounder collected at each sampling site for 2010 NEAMAP cruises.

Table 78. Sampling rates and preserved specimen analysis status of summer flounder for each NEAMAP cruise.

Table 79. Strata used for calculation of abundance indices for summer flounder.

Table 80. Preliminary abundance indices for summer flounder.

Figure 136. Preliminary indices of overall abundance, in terms of number and biomass, of summer flounder for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

Figure 137. Preliminary indices of abundance, of summer flounder for spring and fall NEAMAP surveys. Indices are for the youngest age class observed during each survey (count-based indices only) and for all other age classes combined (based both on count and biomass). 95% confidence intervals are provided for each abundance estimate.

Figure 138. Length-frequency distributions, by cruise, for summer flounder.

Figure 139. Sex-specific length-frequency distribution, by season, all cruises pooled, for summer flounder.

Figure 140. Sex ratio, by length group, for summer flounder collected all NEAMAP cruises 2007-2010.

Figure 141. Diet composition, expressed as percent by weight, by number, and by frequency of occurrence of summer flounder collected during NEAMAP cruises in 2007-2009.

Summer flounder were collected from throughout the NEAMAP survey range on each of the 2010 cruises (Figure 135). 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). Relatively large catches of summer flounder were also encountered in scattered locations during the fall 2010 survey. 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 (683 – 1,117 specimens weighing 418 kg to 625 kg; Table 78). It is apparent that the NEAMAP survey gear samples this species well.

The numerical and biomass overall abundance indices for summer flounder exhibited declines in the brief three year time series of spring cruises (Figure 136). Decreases in abundance were also documented between the fall of 2007 and 2008, but abundance increased between 2008 and 2009 before declining again in 2010 to approximately the time series average.

Abundance indices for the youngest age class (age-0 in the fall, age-1 in the spring) however followed generally increasing trends (slight for the spring survey, larger for the fall). Indices for the older age groups followed a pattern similar to that for the overall stock abundance (Figure 137).

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 138). 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 139, 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.

Summer flounder are known piscivores, and the diet of flounder collected by NEAMAP confirmed this classification (Figure 141). Specifically, fishes accounted for 58% of the summer flounder diet by weight and 49% 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. Biomass (kg) of weakfish collected at each sampling site for 2010 NEAMAP cruises.

Table 81. Sampling rates and preserved specimen analysis status of weakfish for each NEAMAP cruise.

Table 82. Strata used for calculation of abundance indices for weakfish.

Table 83. Preliminary abundance indices for weakfish.

Figure 143. Preliminary indices of overall abundance, in terms of number and biomass, of weakfish for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

Figure 144. Preliminary indices of abundance, of weakfish for spring and fall NEAMAP surveys. Indices are for the youngest age class observed during each survey (count-based indices only) and for all other age classes combined (based both on count and biomass). 95% confidence intervals are provided for each abundance estimate.

Figure 145. Length-frequency distributions, by cruise, for weakfish.

Figure 146. Sex-specific length-frequency distribution, by season, all cruises pooled, for weakfish.

Figure 147. Sex ratio, by length group, for weakfish collected all NEAMAP cruises 2007-2010.

Figure 148. Diet composition, expressed as percent by weight, by number, and by frequency of occurrence of weakfish collected during NEAMAP cruises in 2007-2009.

White Shrimp (*Penaeus setiferus*)

Figure 149. Biomass (kg) of white shrimp collected at each sampling site for 2010 NEAMAP cruises.

Table 84. Sampling rates of white shrimp for each NEAMAP cruise.

Table 85. Strata used for calculation of abundance indices for white shrimp.

Table 86. Preliminary abundance indices for white shrimp.

Figure 150. Preliminary indices of overall abundance, in terms of number and biomass, of white shrimp for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

Figure 151. Length-frequency distributions, by cruise, for white shrimp.

Windowpane Flounder (*Scopthalmus aquosus*)

Figure 152. Biomass (kg) of windowpane flounder collected at each sampling site for 2010 NEAMAP cruises.

Table 87. Sampling rates of windowpane flounder for each NEAMAP cruise.

Table 88. Strata used for calculation of abundance indices for windowpane flounder.

Table 89. Preliminary abundance indices for windowpane flounder.

Figure 153. Preliminary indices of overall abundance, in terms of number and biomass, of windowpane flounder for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

Figure 154. Length-frequency distributions, by cruise, for windowpane flounder.

Winter Flounder (*Pseudopleuronectes americanus*)

Figure 155. Biomass (kg) of winter flounder collected at each sampling site for 2010 NEAMAP cruises.

Table 90. Sampling rates and preserved specimen analysis status of winter flounder for each NEAMAP cruise.

Table 91. Strata used for calculation of abundance indices for winter flounder.

Table 92. Preliminary abundance indices for winter flounder.

Figure 156. Preliminary indices of overall abundance, in terms of number and biomass, of winter flounder for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

Figure 157. Preliminary indices of abundance, of winter flounder for spring and fall NEAMAP surveys. Indices are for the youngest age class observed during each survey (count-based indices only) and for all other age classes combined (based both on count and biomass). 95% confidence intervals are provided for each abundance estimate.

Figure 158. Length-frequency distributions, by cruise, for winter flounder.

Figure 159. Age-frequency distribution, by cruise, for winter flounder. Ages are given on the x-axis, while corresponding year-classes are in parenthesis. The number collected at a given age is provided above each corresponding bar.

Figure 160. Sex-specific length-frequency distribution, by season, all cruises pooled, for winter flounder.

Figure 161. Sex ratio, by length group, for winter flounder collected all NEAMAP cruises 2007-2010.

Figure 162. Diet composition, expressed as percent by weight, by number, and by frequency of occurrence of winter flounder collected during NEAMAP cruises in 2007-2009.

Winter Skate (*Leucoraja ocellata*)

Figure 163. Biomass (kg) of winter skate collected at each sampling site for 2010 NEAMAP cruises.

Table 93. Sampling rates and preserved specimen analysis status of winter skate for each NEAMAP cruise.

Table 94. Strata used for calculation of abundance indices for winter skate.

Table 95. Preliminary abundance indices for winter skate.

Figure 164. Preliminary indices of overall abundance, in terms of number and biomass, of winter skate for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

Figure 165. Length-frequency distributions, by cruise, for winter skate.

Figure 166. Sex-specific length-frequency distribution, by season, all cruises pooled, for winter skate.

Figure 167. Sex ratio, by length group, for winter skate collected all NEAMAP cruises 2007-2010.

Figure 168. Diet composition, expressed as percent by weight, by number, and by frequency of occurrence of winter skate collected during NEAMAP cruises in 2007-2009.

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, Cape May, New Jersey and Hampton, Virginia during the 2010 survey cruises. The demonstration in New Bedford was conducted as part of that city's annual Working Waterfront Festival. With respect to political figures, 2010 guests included U.S. Senator Sheldon Whitehouse from Rhode Island and Brent Robinson, a senior staff member of U.S. Representative Rob Wittman from Virginia. In all, we estimate that approximately 300 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. 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 2010, formal presentations of survey activities and results were made as follows:

- September 2010 – VIMS Council (advisory committee populated from outside the Institute)
- October 2010: Mid-Atlantic Fishery Management Council – combination of a presentation and demonstration tow
- November 2010: ASMFC, Management and Science Committee
- December 2010: ASMFC, NEAMAP Board

Brief news articles highlighting the NEAMAP Survey in 2010 appeared in the *East Hampton Star* (August) and on *savingseafood.org* (February and December). *National Geographic* began filming survey activities during the fall cruise as part of their upcoming 'Oceanus' series and plan to conclude filming in the spring of 2011. This footage will likely air during the late summer / early fall of 2011.

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
- *Loligo* 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.

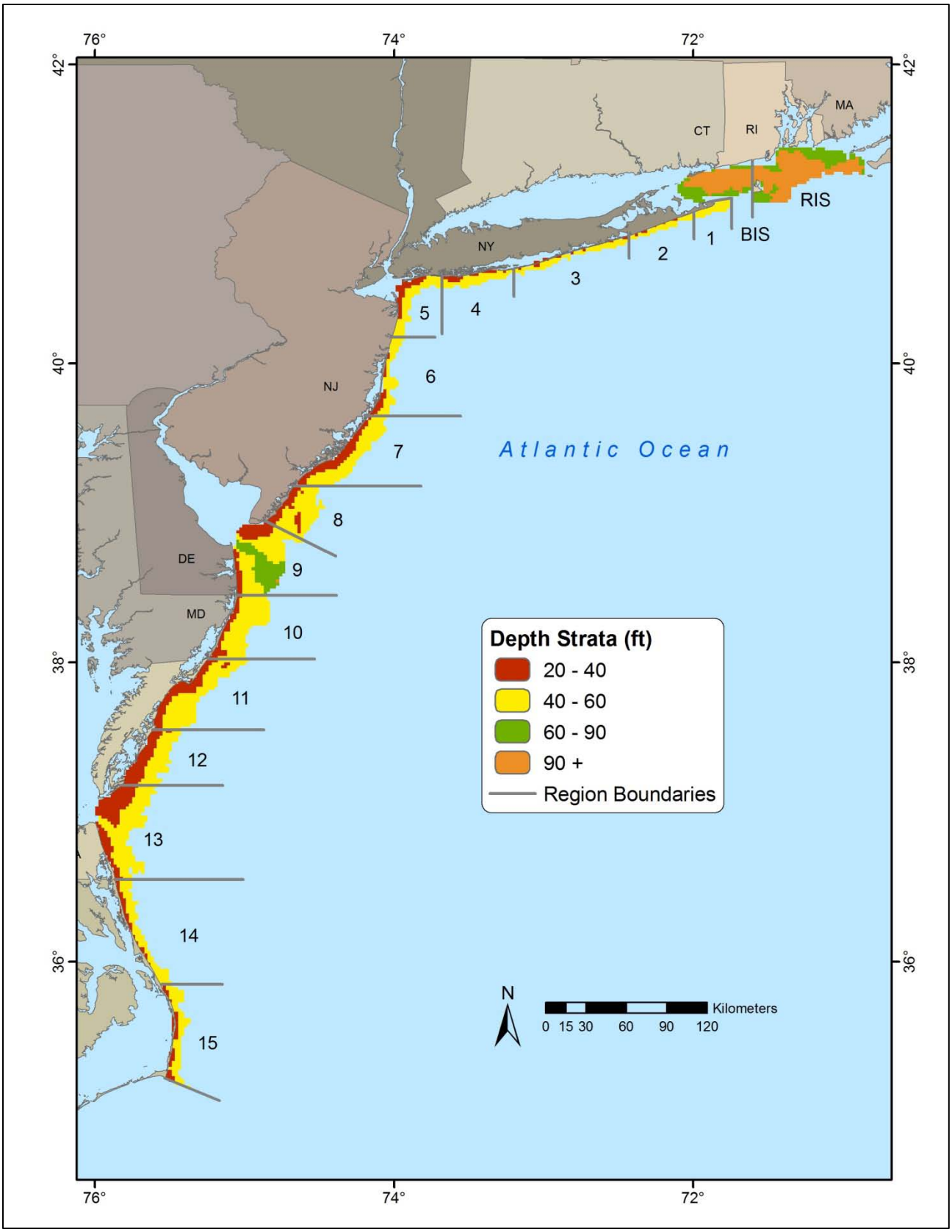
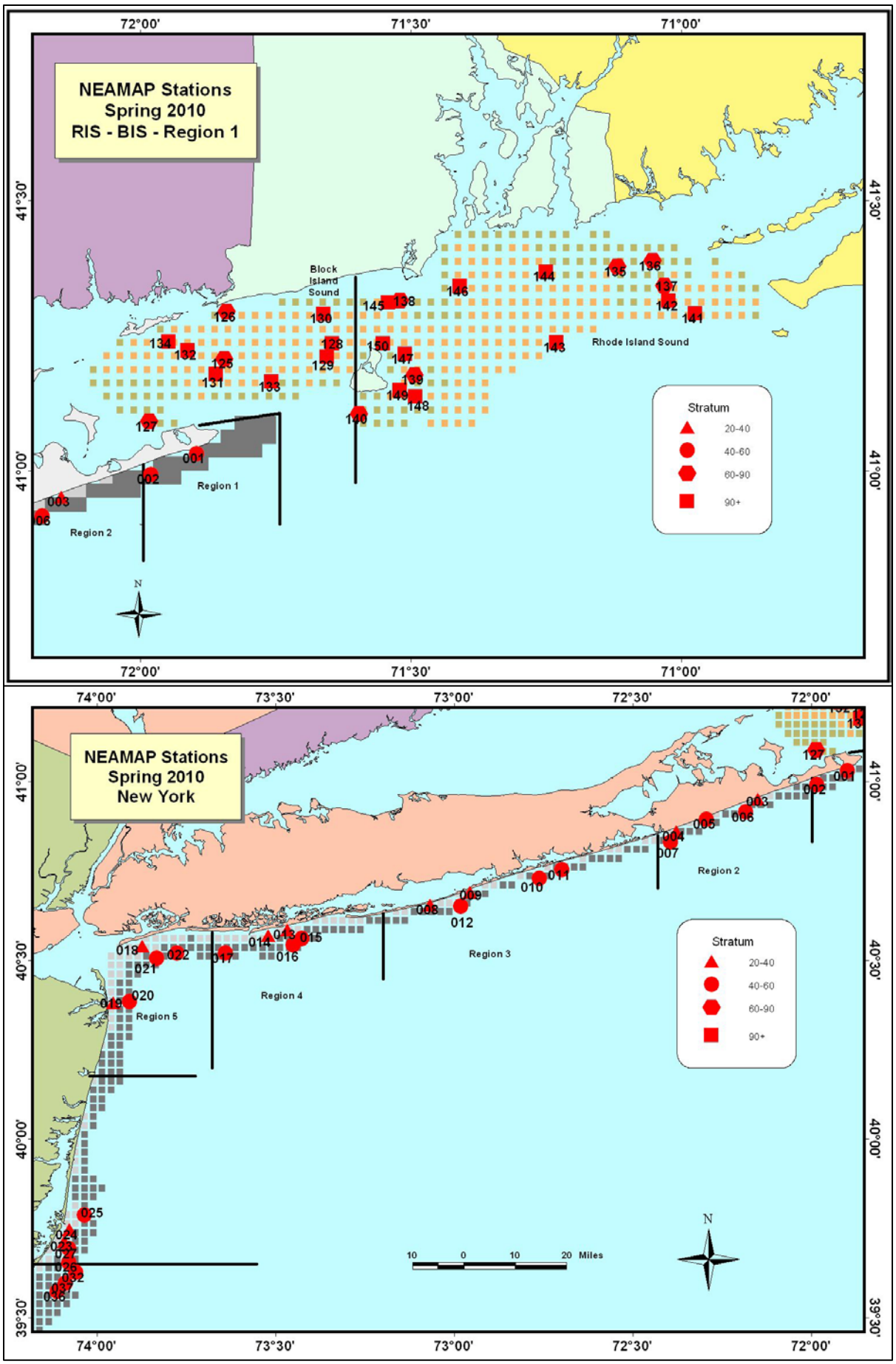


Figure 2. NEAMAP sampling sites for the Spring 2010 cruise. Regional strata are defined by black lines, while the shapes of the station symbols indicate the depth strata occupied by each.



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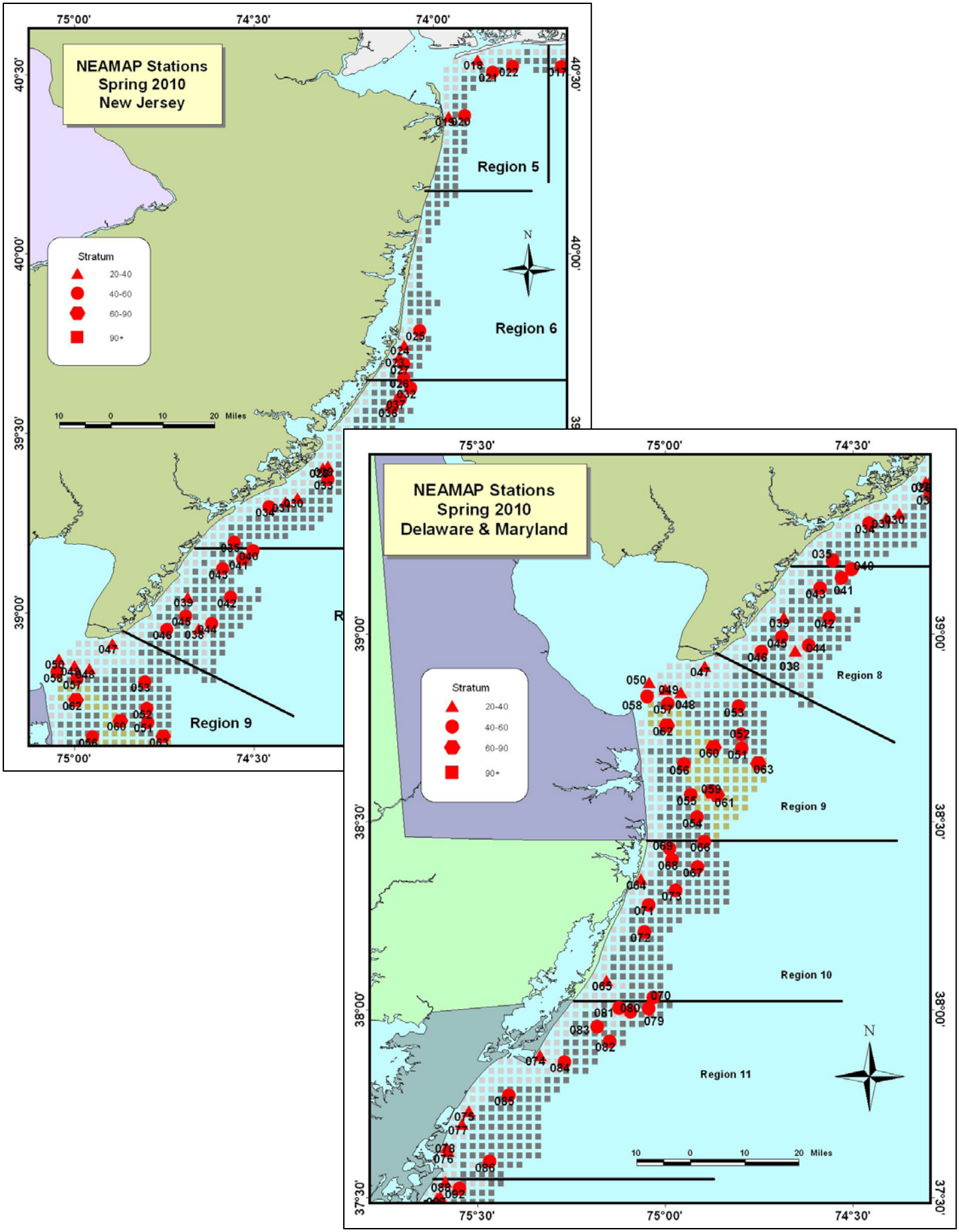

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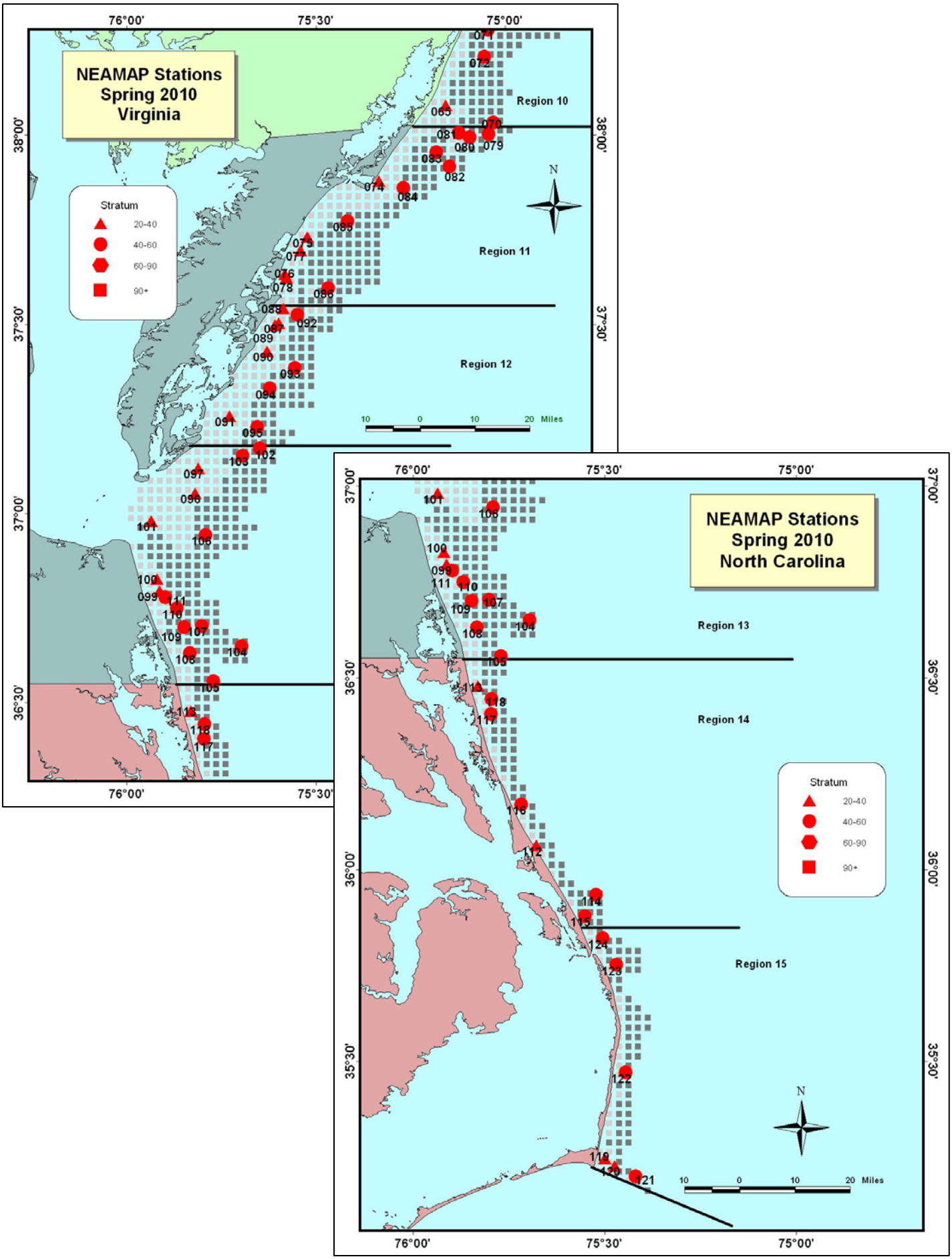

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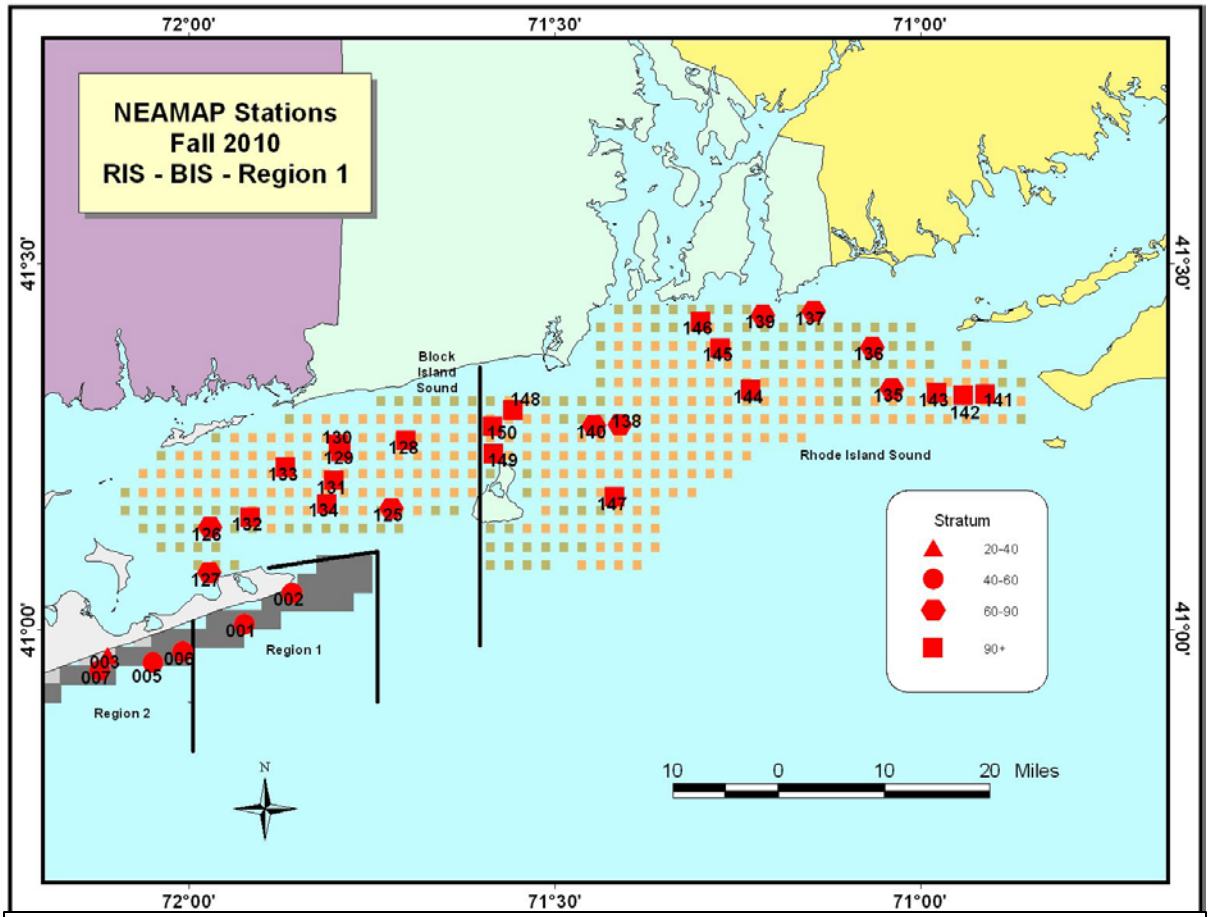

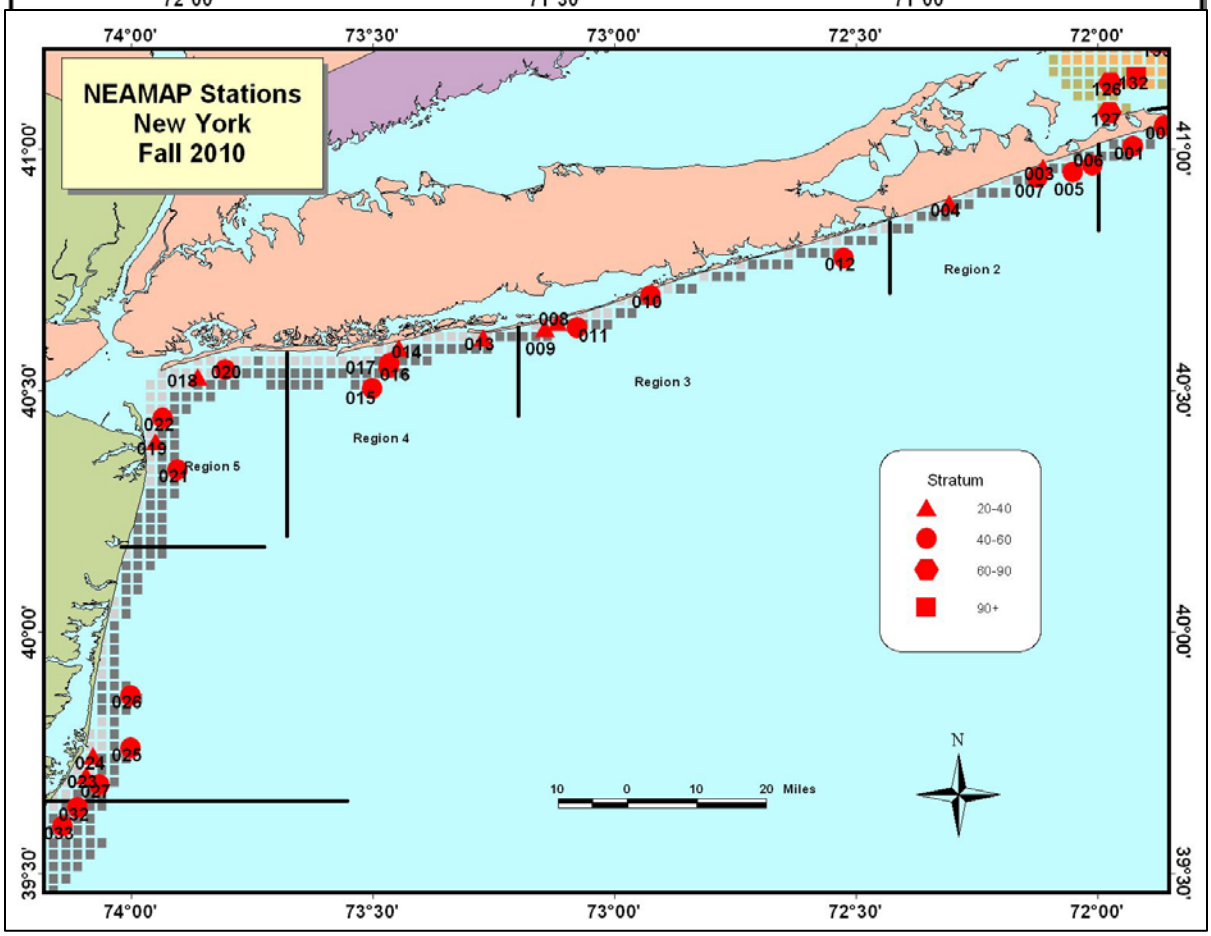

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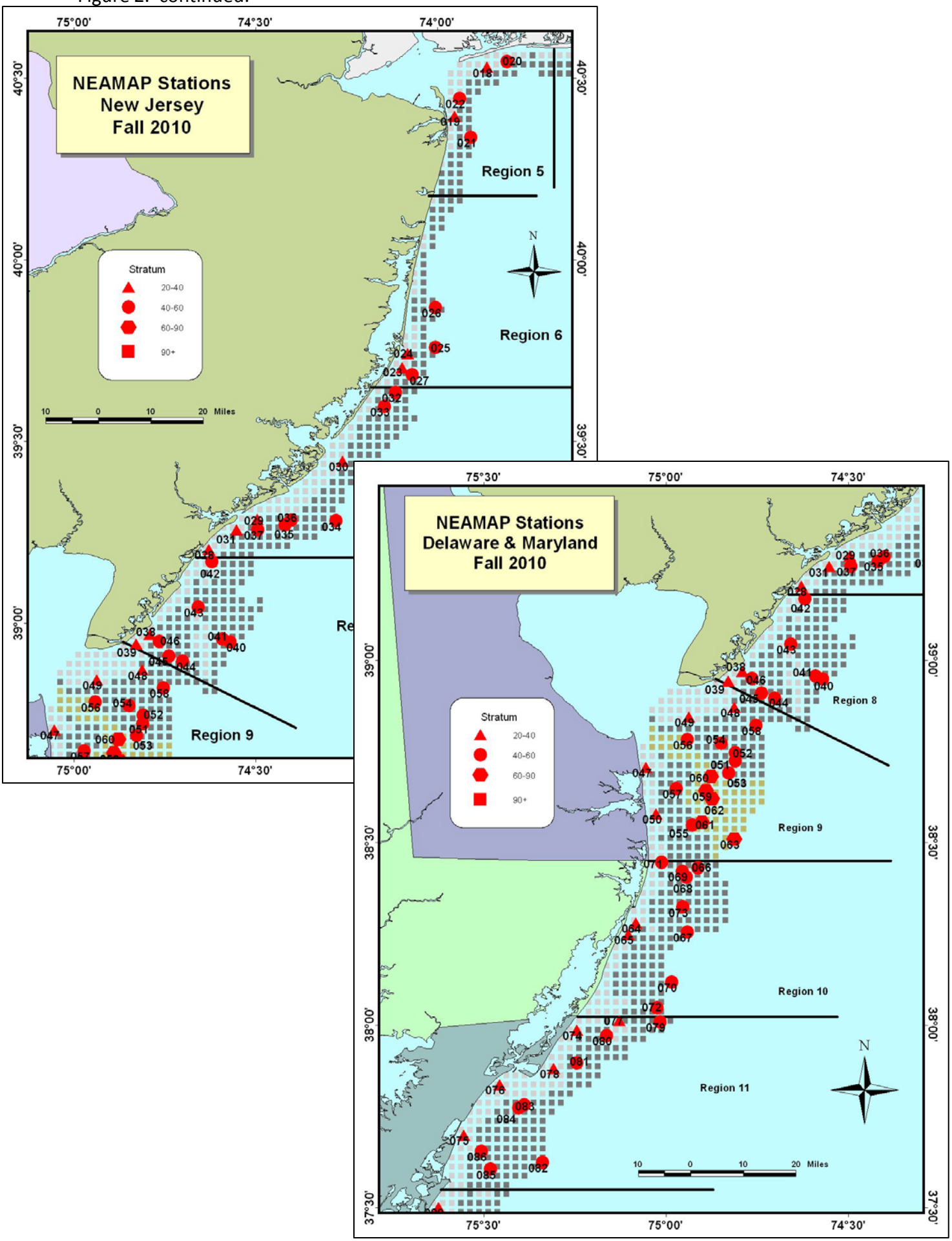

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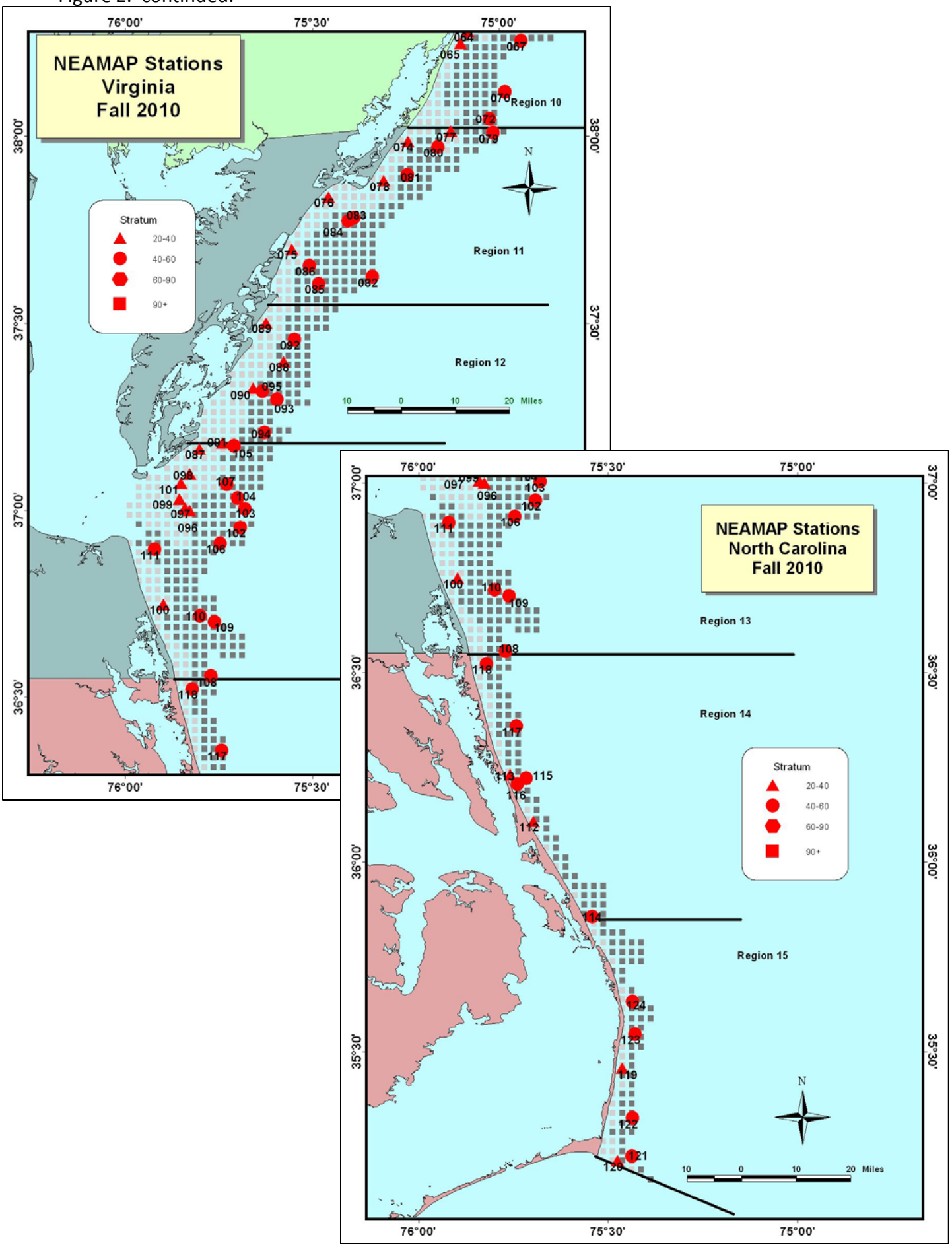


Figure 3. Bottom temperatures measured for each NEAMAP cruise and temperature differences compared to the same cruise from the previous year.

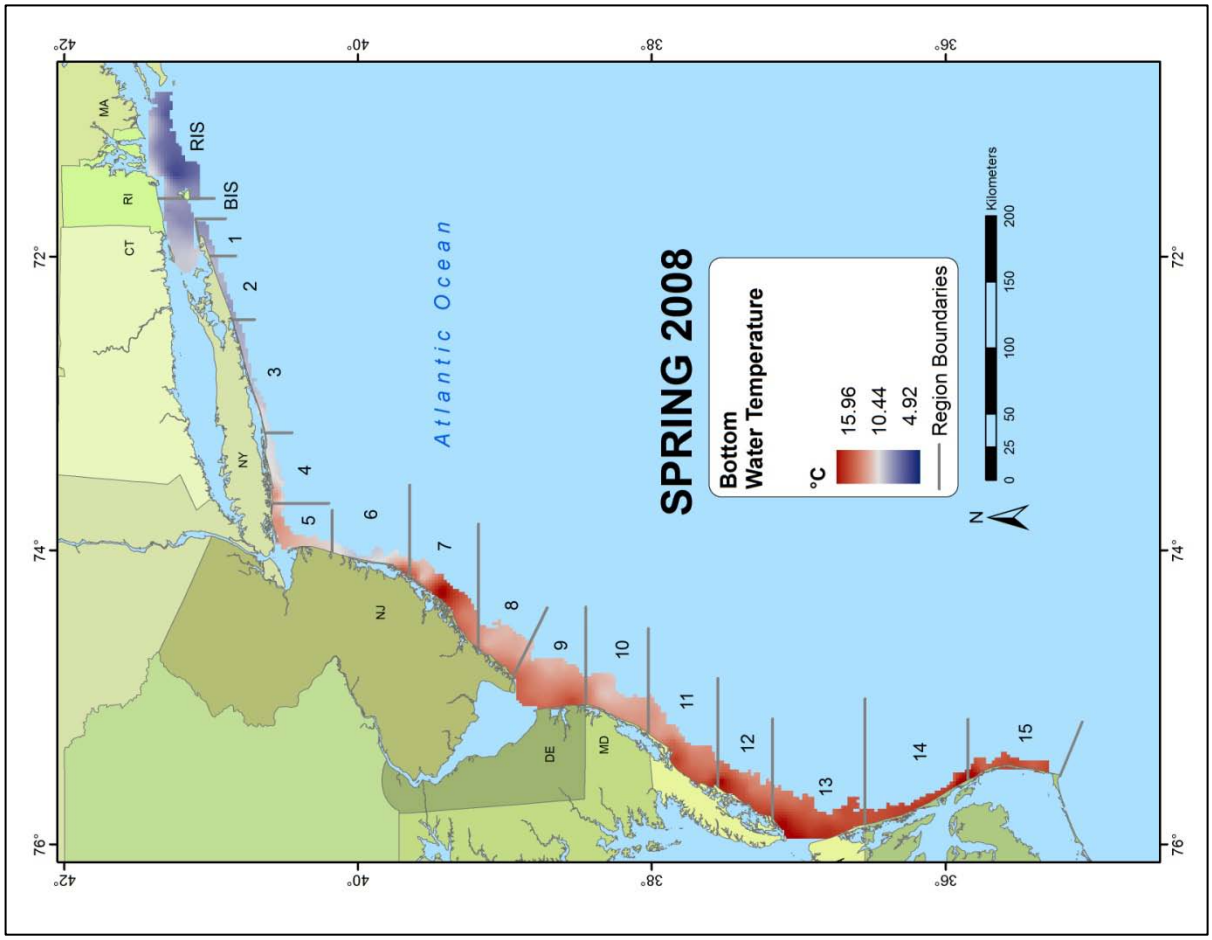
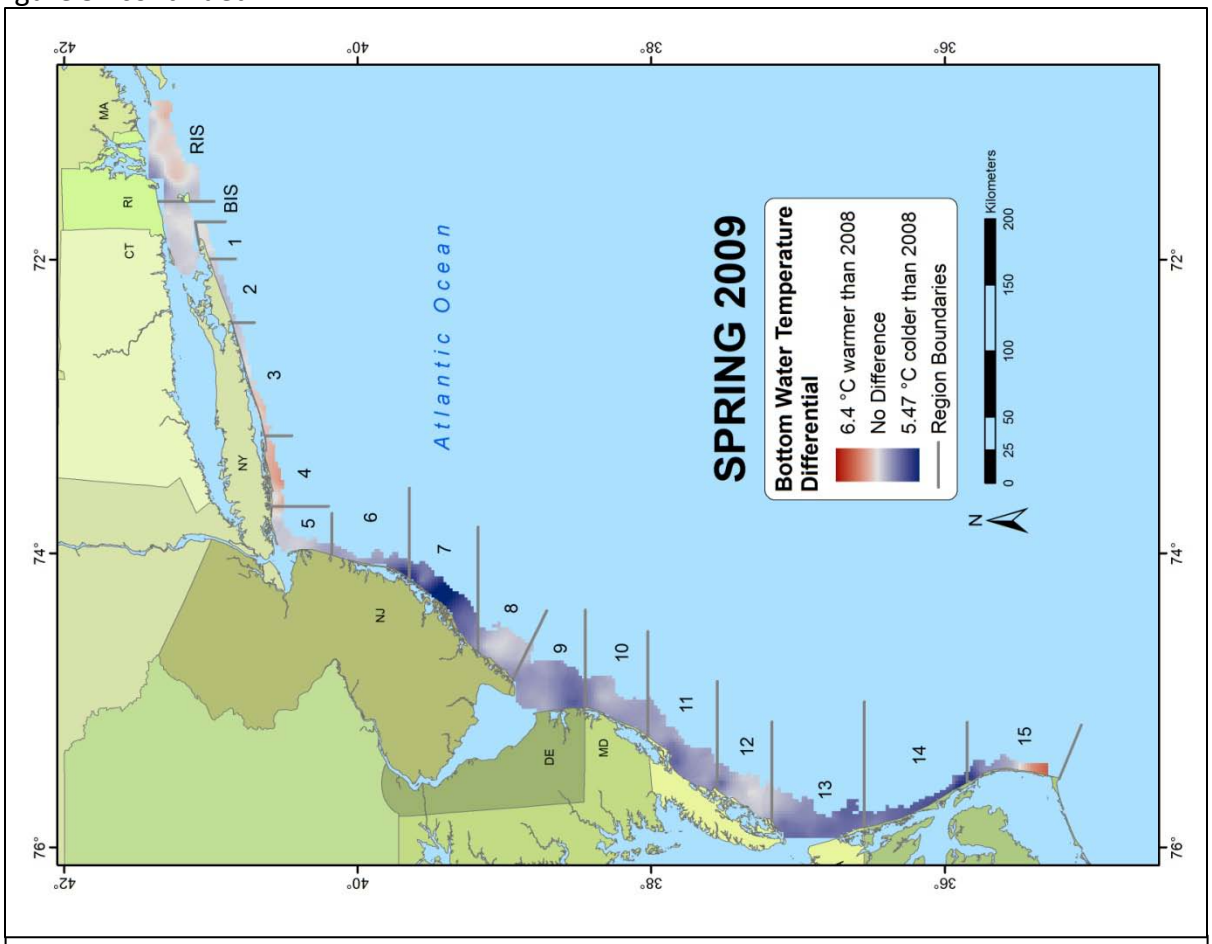


Figure 3. continued.



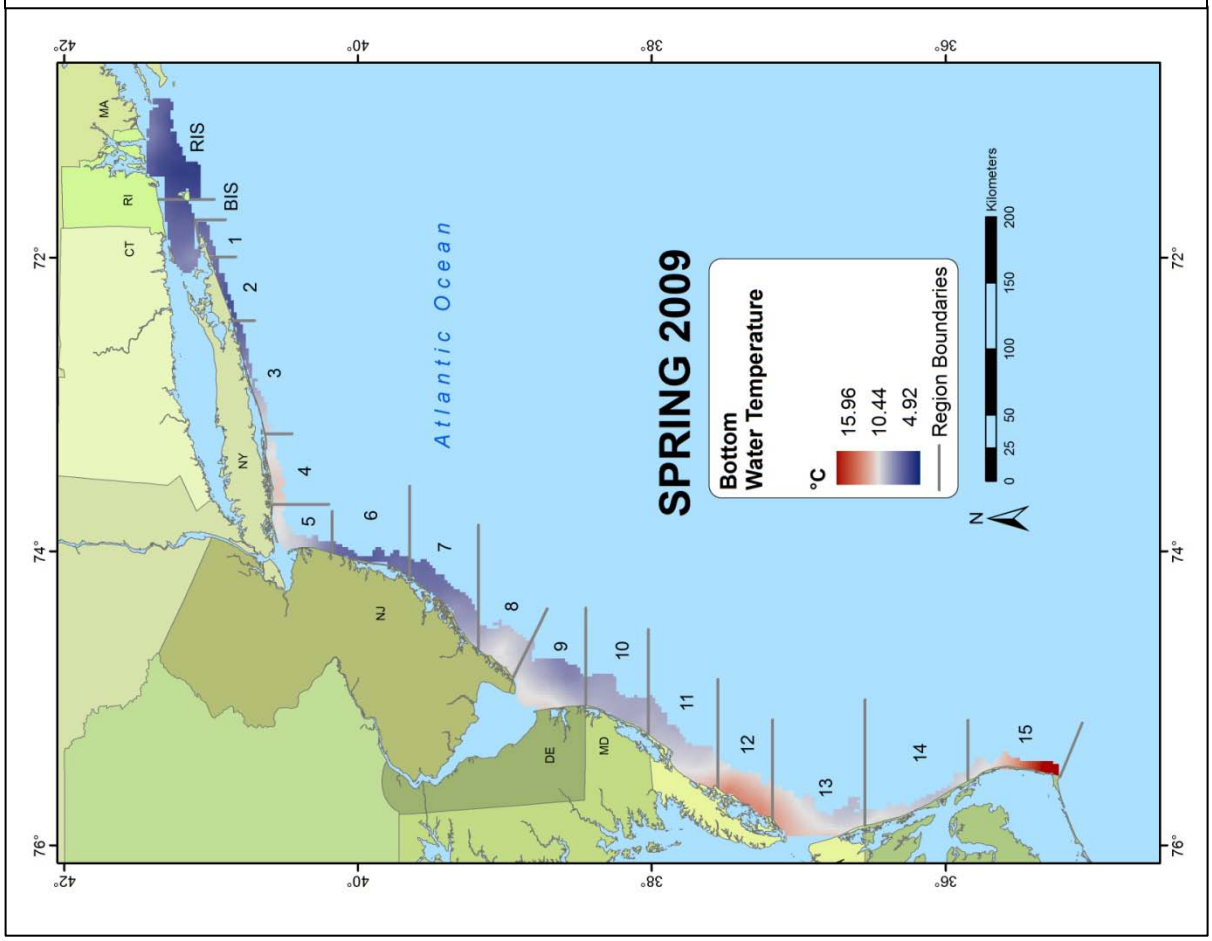
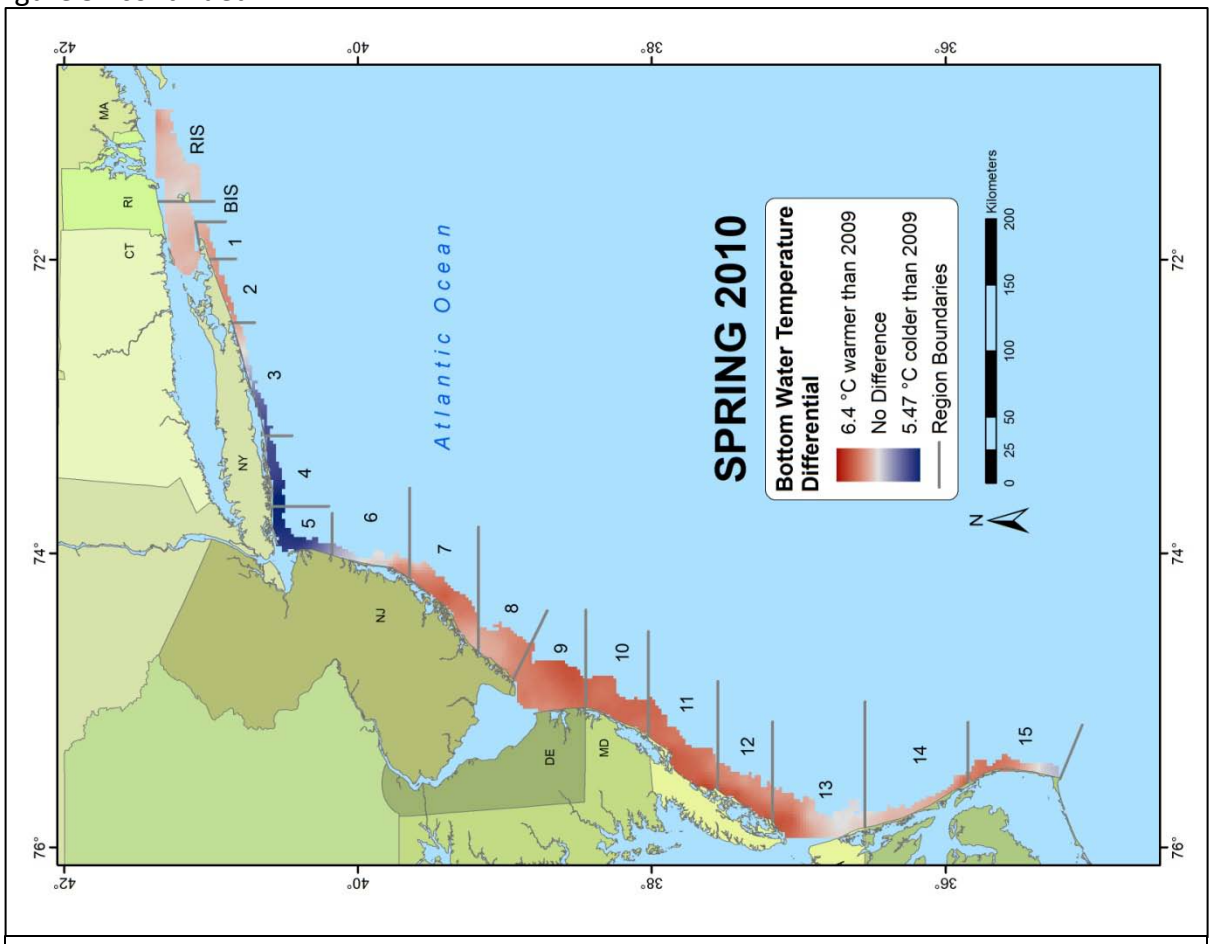
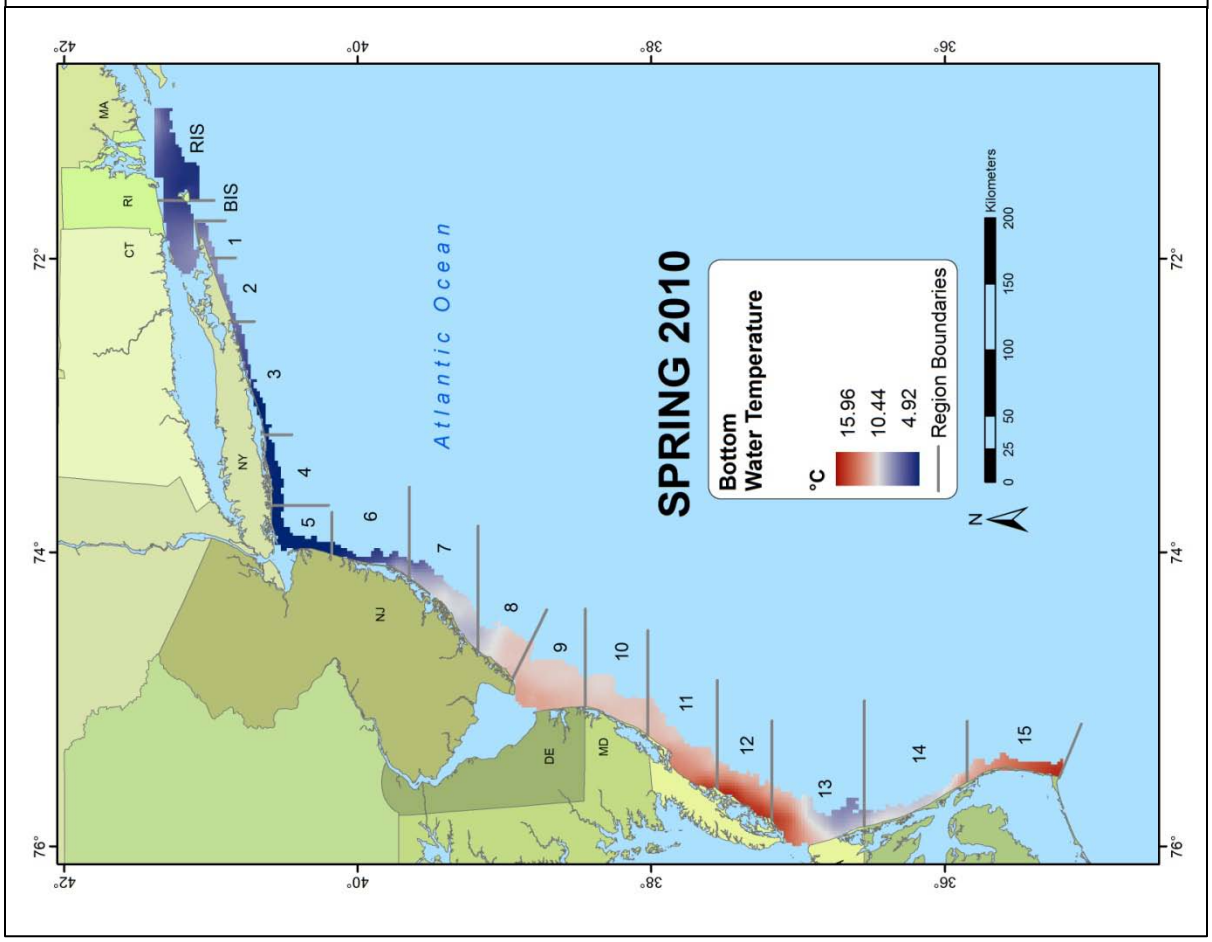


Figure 3. continued.





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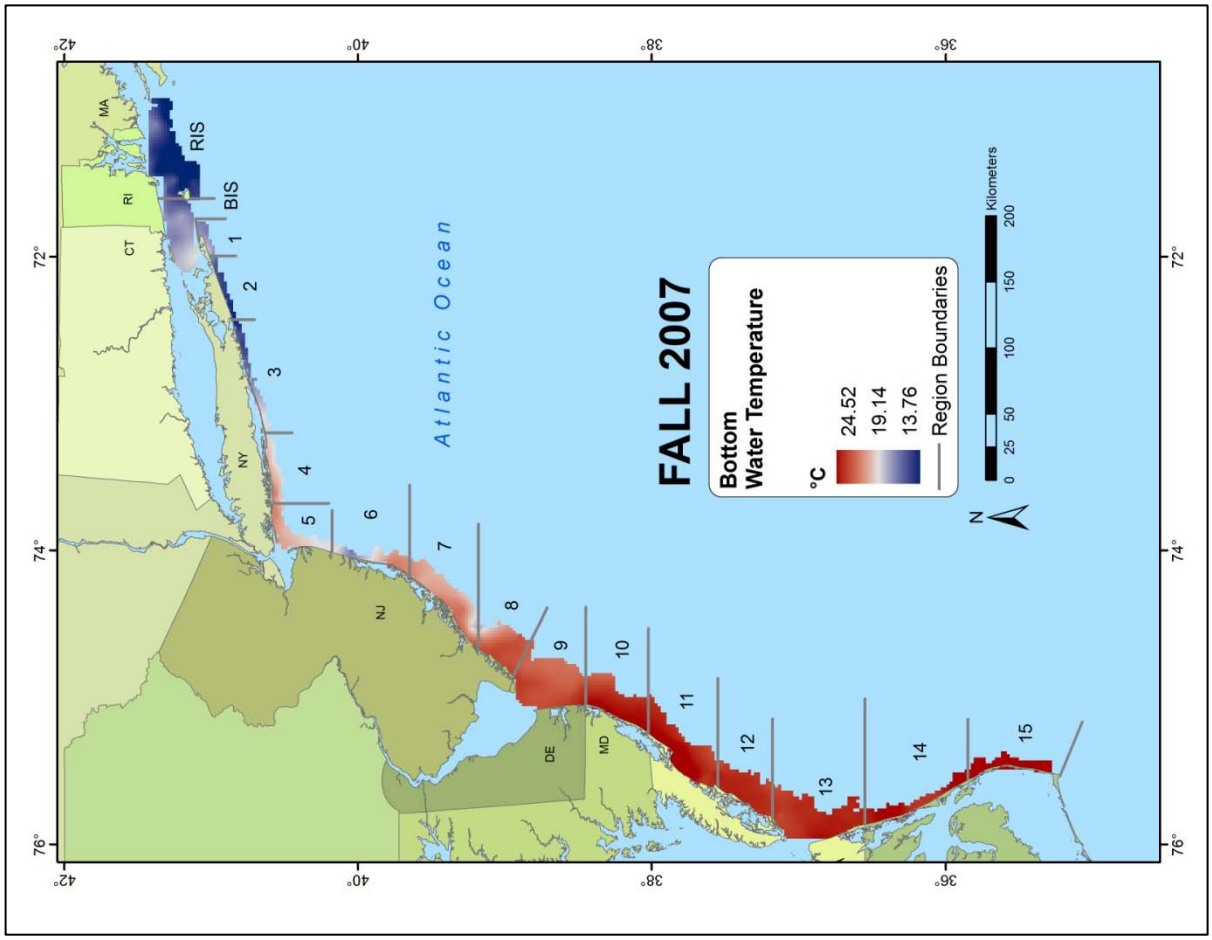

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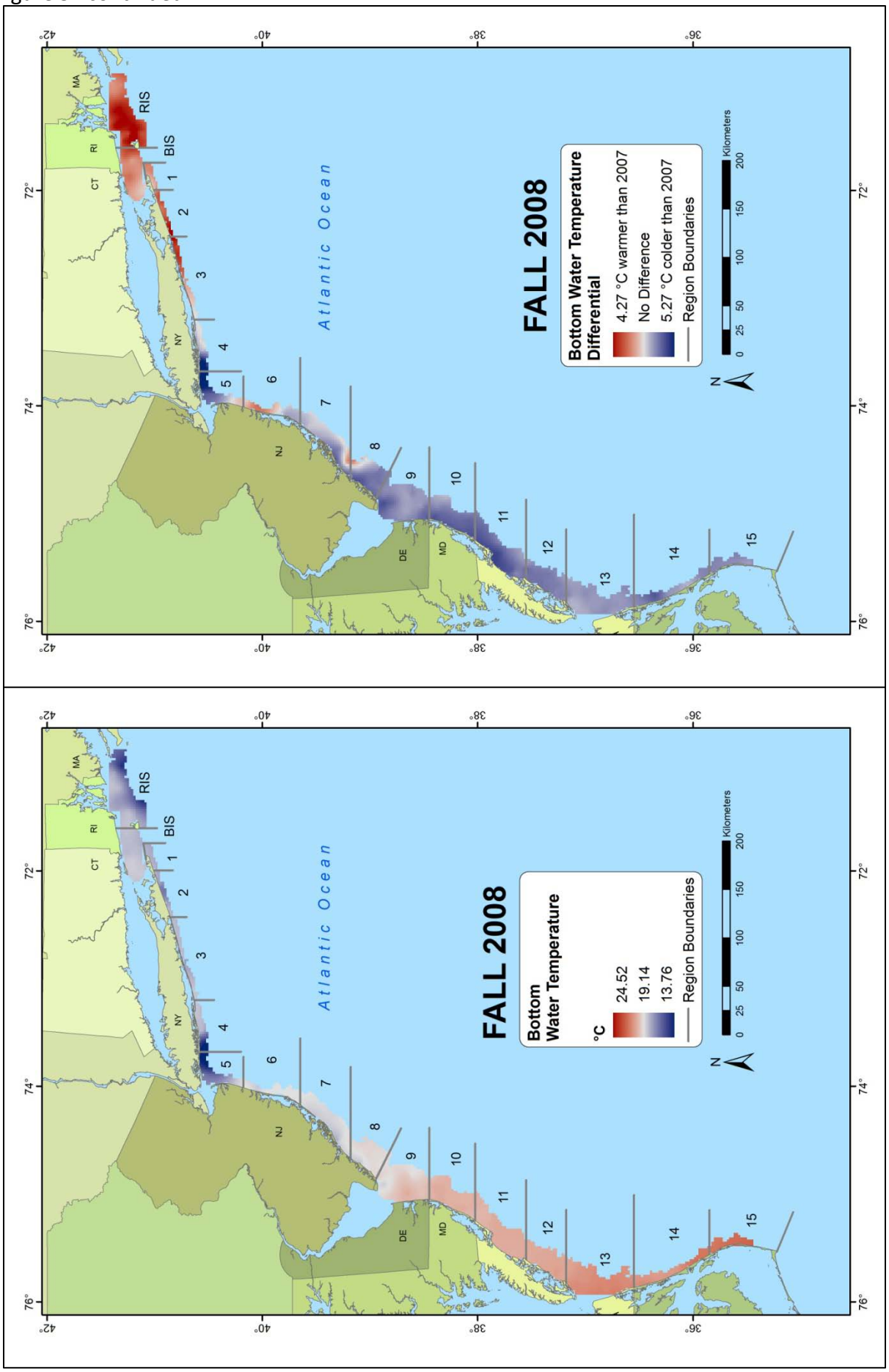

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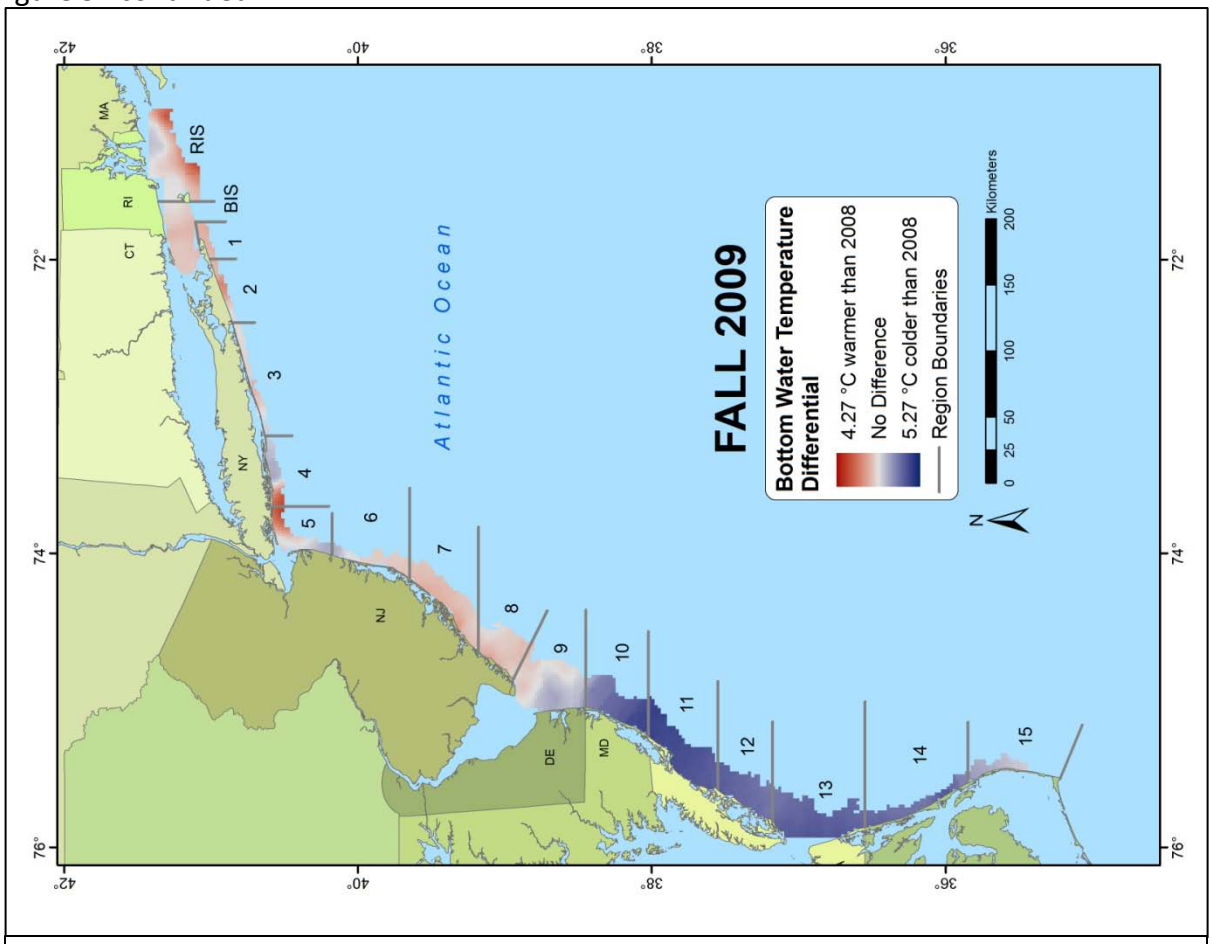

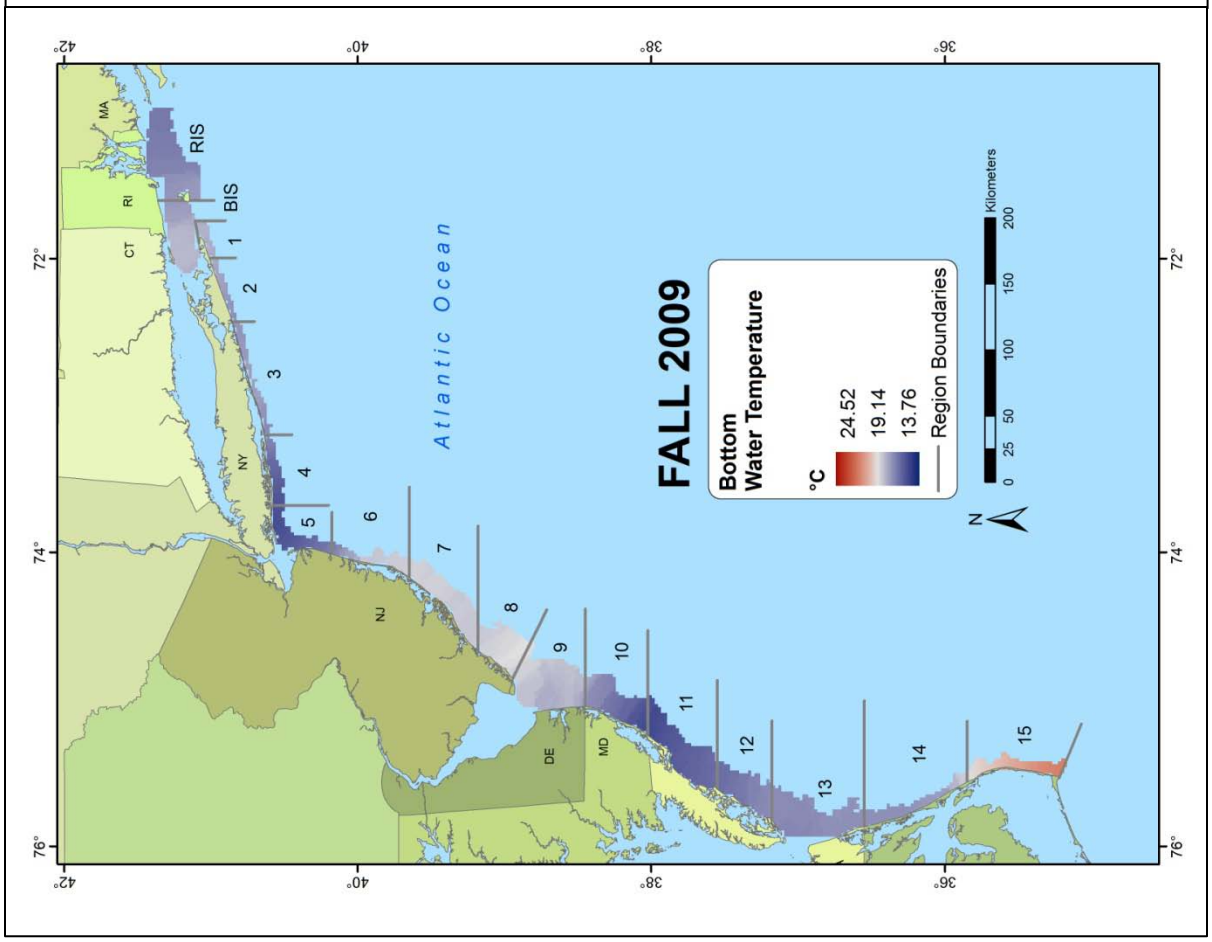

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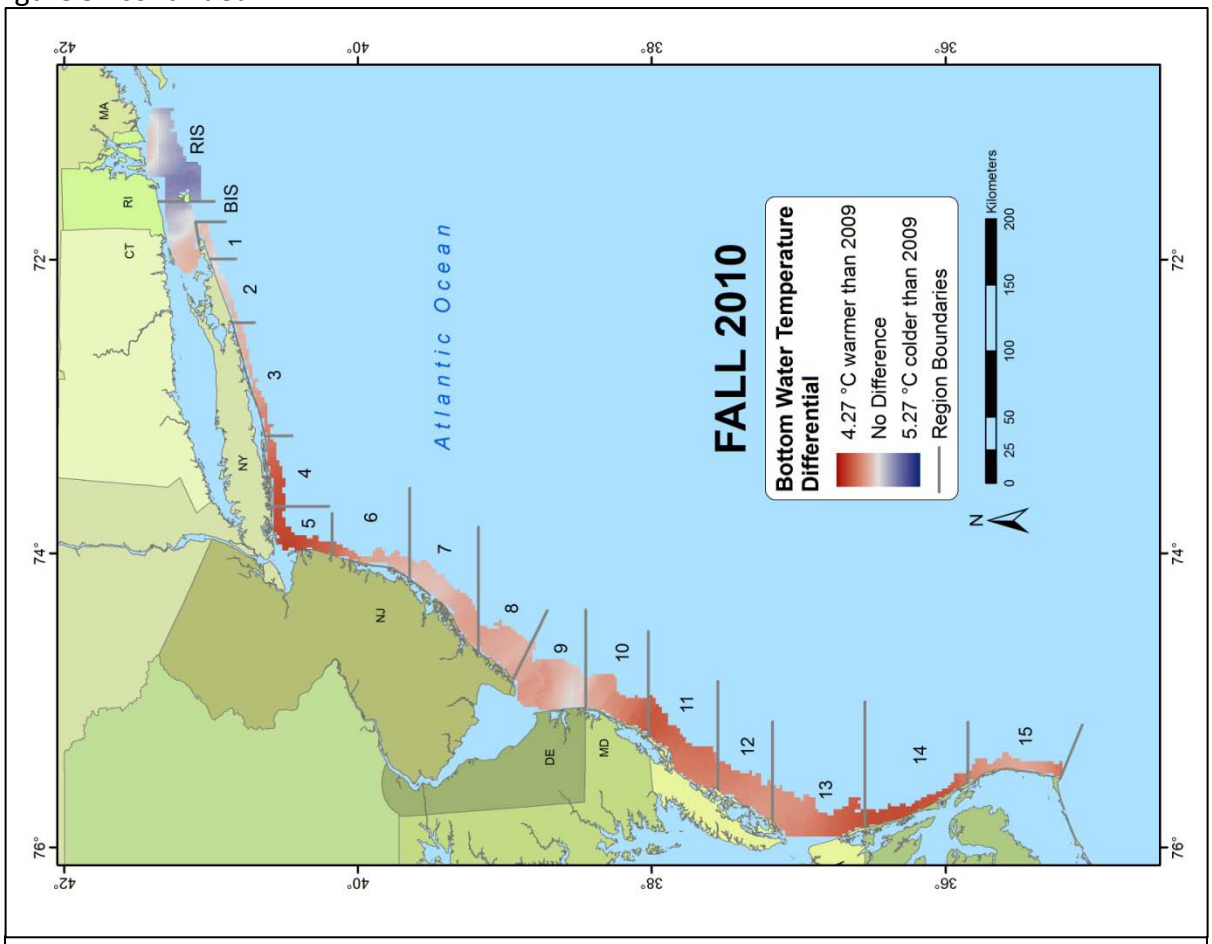


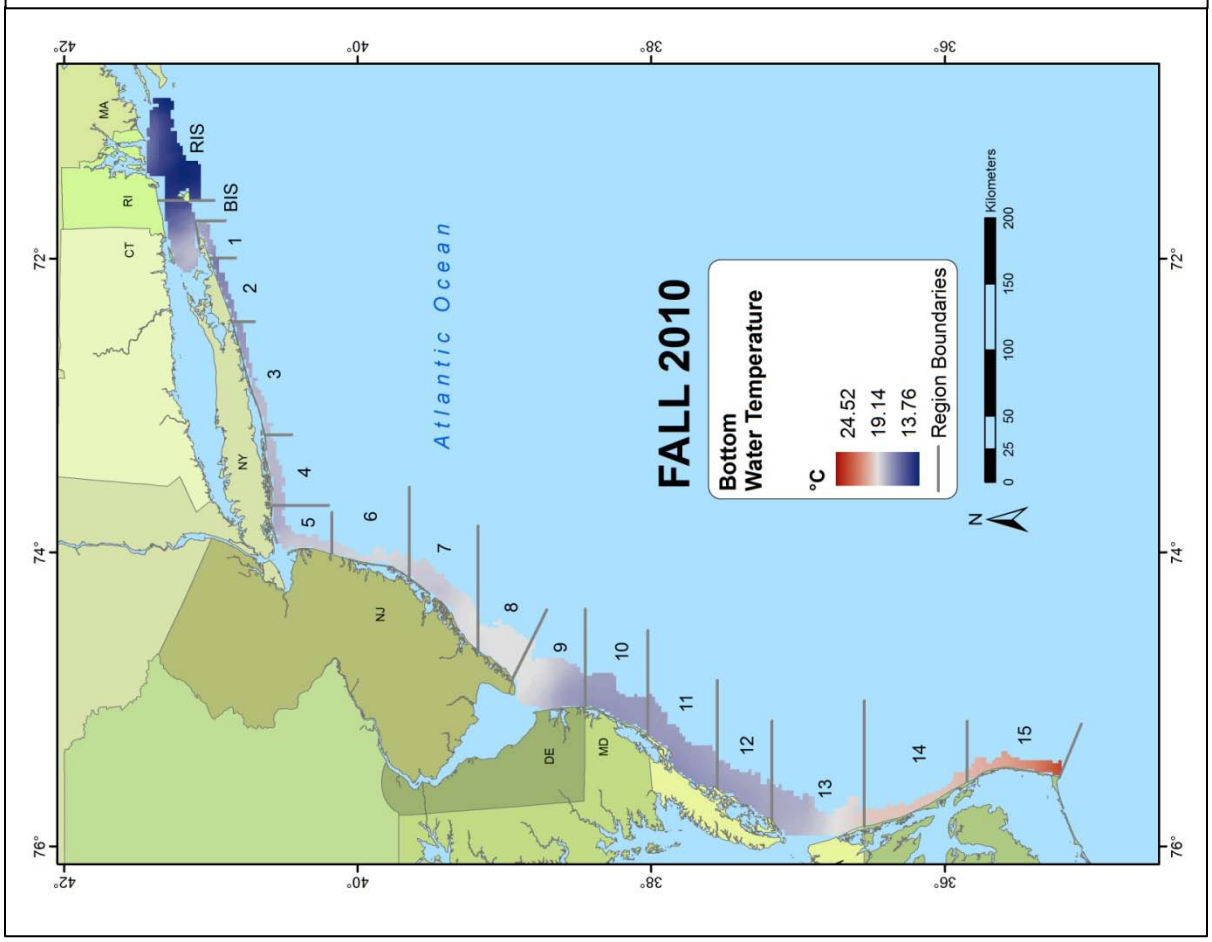
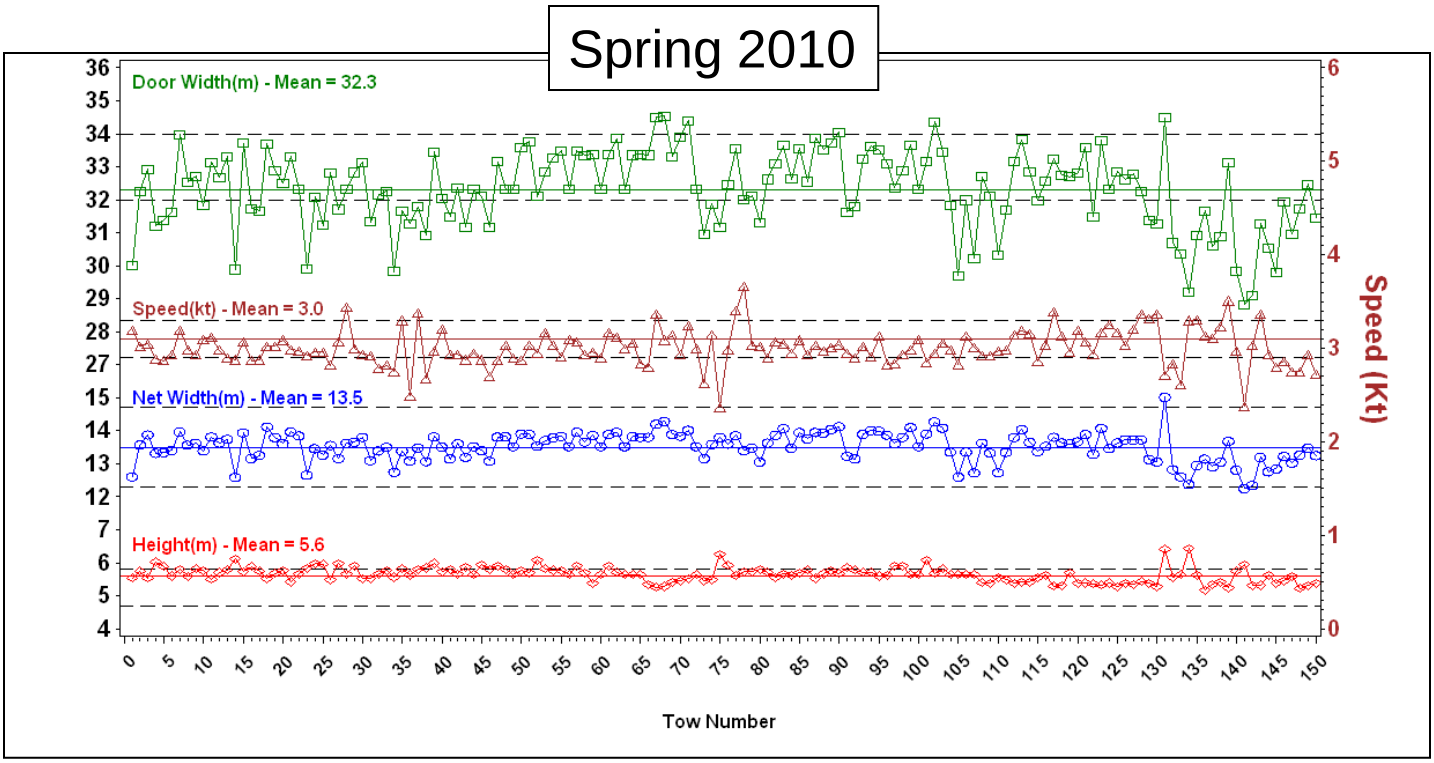


Figure 4. Performance of the NEAMAP Trawl Survey sampling gear during the Spring and Fall 2010 cruises. Tows are numbered chronologically along the x-axis. Points on the graph are tow averages for each of the respective parameters. Average door spreads (m) for each tow are given in green, average vessel 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.



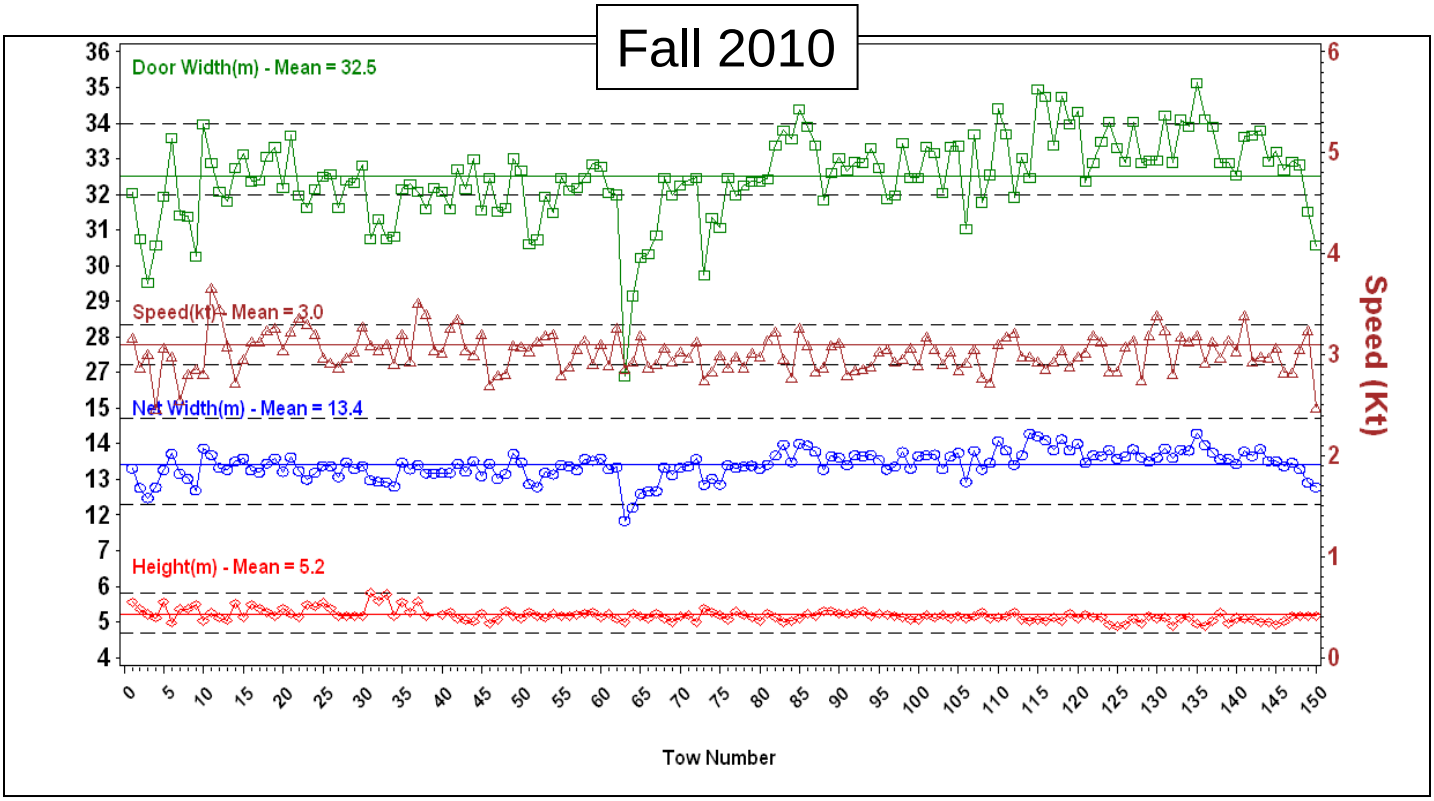


Figure 5. Age-length keys and size cutoffs used for calculation of youngest-age abundance indices for each appropriate species.

Alewife

Separation Method: Single Size Cutoff Value

Data Source: NEAMAP length frequency inspection

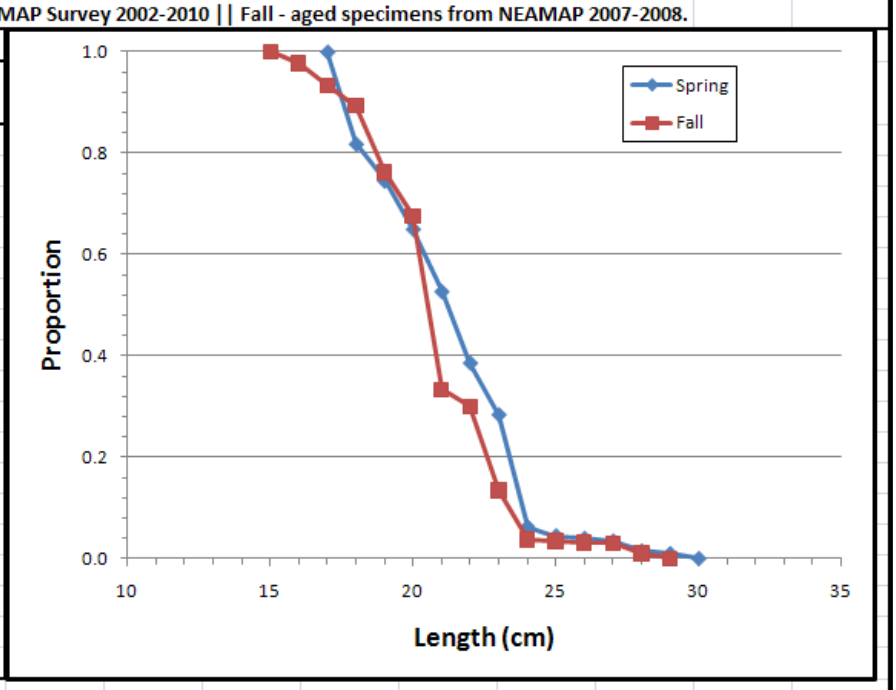
Spring (Age 1)	Fall (Age 0)
Max. Cohort Size (cm)	Max. Cohort Size (cm)
16	14

Atlantic Croaker

Separation Method: Age-Length Key

Data Sources: Spring - aged specimens from ChesMMAP Survey 2002-2010 || Fall - aged specimens from NEAMAP 2007-2008.

Spring (Age 1)		Fall (Age 0)	
Length (cm)	Proportion at Age	Length (cm)	Proportion at Age
<= 13	excluded		
14	1.000		
15	1.000	<= 15	1.000
16	1.000	16	0.977
17	1.000	17	0.933
18	0.818	18	0.893
19	0.745	19	0.762
20	0.650	20	0.676
21	0.527	21	0.333
22	0.386	22	0.300
23	0.284	23	0.135
24	0.063	24	0.038
25	0.045	25	0.035
26	0.040	26	0.032
27	0.035	27	0.031
28	0.015	28	0.010
29	0.010	>=29	0.000
>=30	0.000		



Atlantic Menhaden

Separation Method: Single Size Cutoff Value

Data Source: http://www.asmfc.org/speciesDocuments/menhaden/reports/stockAssessments/04MenhadenPeerReviewReport.pdf

Spring (Age 1)	Fall (Age 0)
Max. Cohort Size (cm)	Max. Cohort Size (cm)
17	15

Black Sea Bass

Separation Method: Single Size Cutoff Value

Data Source: http://mrl.cofc.edu/pdf/tr40s/Techreport43.pdf

Spring (Age 1)	Fall (Age 0)
Max. Cohort Size (cm)	Max. Cohort Size (cm)
16	12

Blueback Herring

Separation Method: Single Size Cutoff Value

Data Source: NEAMAP length frequency inspection

Spring (Age 1)	Fall (Age 0)
Max. Cohort Size (cm)	Max. Cohort Size (cm)
14	N/A

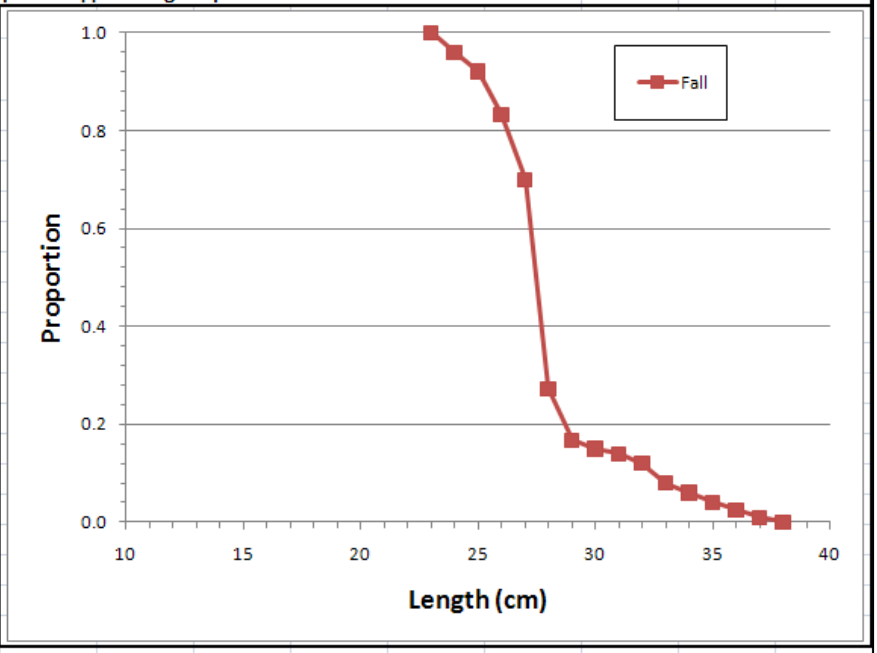
Figure 5. continued.

Bluefish - Spring and Summer Cohorts Combined

Separation Method: Spring - Single Size Cutoff Value || Fall - Age-Length Key

Data Sources: Spring - NEAMAP length frequency inspection || Fall - aged specimens from NEAMAP 2007.

Spring (Age 1 - summer cohort only)	Fall (Age 0 - both cohorts)	
Max. Cohort Size (cm)	Length (cm)	Proportion at Age
19	<= 23	1.000
	24	0.960
	25	0.920
	26	0.833
	27	0.700
	28	0.273
	29	0.167
	30	0.150
	31	0.140
	32	0.120
	33	0.080
	34	0.060
	35	0.040
	36	0.025
	37	0.010
	>=38	0.000

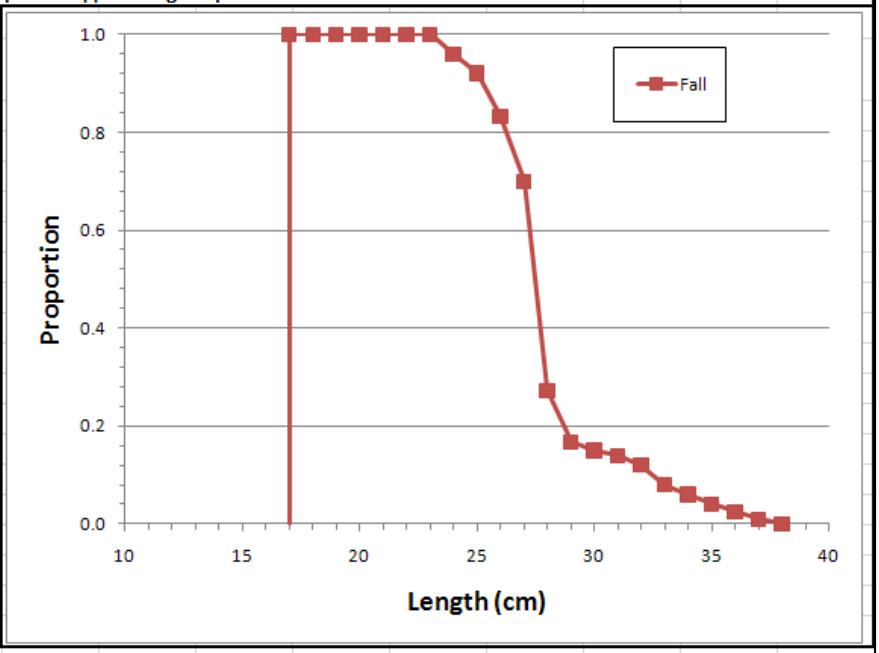


Bluefish - Spring Cohort Only

Separation Method: Age-Length Key

Data Sources: Spring - NEAMAP length frequency inspection || Fall - aged specimens from NEAMAP 2007.

Spring - N/A	Fall (Age 0)	
Max. Cohort Size (cm)	Length (cm)	Proportion at Age
N/A	<= 17	excluded
	<=23	1.000
	24	0.960
	25	0.920
	26	0.833
	27	0.700
	28	0.273
	29	0.167
	30	0.150
	31	0.140
	32	0.120
	33	0.080
	34	0.060
	35	0.040
	36	0.025
	37	0.010
	>=38	0.000



Bluefish - Summer Cohort Only

Separation Method: Single Size Cutoff Value

Data Source: NEAMAP length frequency inspection

Spring - N/A	Fall (Age 0)
Max. Cohort Size (cm)	Max. Cohort Size (cm)
N/A	17

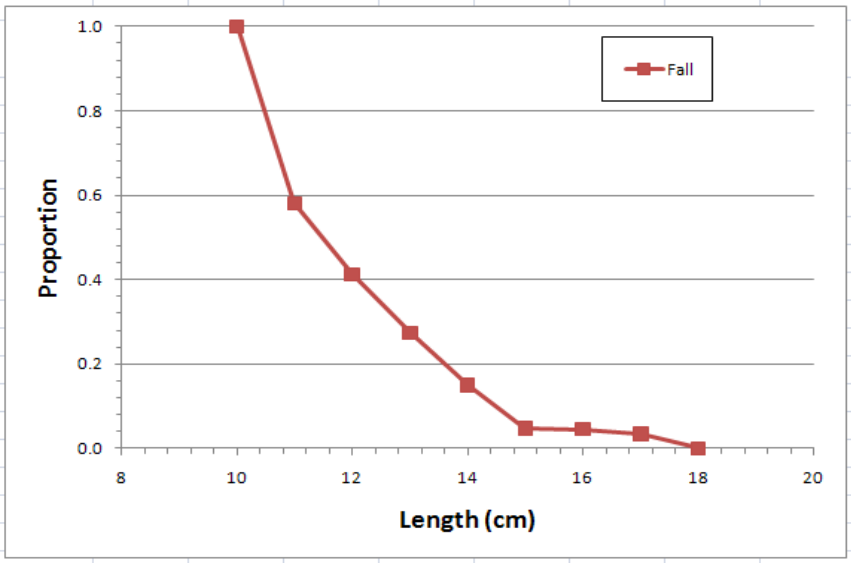
Figure 5. continued.

Scup

Separation Method: Spring - Single Size Cutoff Value || Fall - Age-Length Key

Data Sources: Spring - NEAMAP length frequency inspection || Fall - aged specimens from NEAMAP 2008.

Spring (Age 1 - summer cohort only)	Fall (Age 0 - both cohorts)	
Max. Cohort Size (cm)	Length (cm)	Proportion at Age
12	10	1.000
	11	0.581
	12	0.413
	13	0.274
	14	0.150
	15	0.048
	16	0.045
	17	0.034
	18	0.000



Silver Hake

Separation Method: Single Size Cutoff Value

Data Source: NEAMAP length frequency inspection

Spring - (Age 1)	Fall (Age 0)
Max. Cohort Size (cm)	Max. Cohort Size (cm)
14	17

Smooth Dogfish

Separation Method: Single Size Cutoff Value

Data Source: NEAMAP length frequency inspection (Consistent with Conrath et al. (2002).

Spring - N/A	Fall (Age 0)
Max. Cohort Size (cm)	Max. Cohort Size (cm)
N/A	47

Summer Flounder

Separation Method: Age-Length Key

Data Sources: Aged specimens from NEAMAP 2007-2008

Spring (Age 1)		Fall (Age 0)	
Length (cm)	Proportion at Age	Length (cm)	Proportion at Age
		<= 20	1
		21	0.98
		22	0.976
		23	0.970
		24	0.970
<= 25	1.000	25	0.970
26	0.970	26	0.966
27	0.950	27	0.913
28	0.940	28	0.733
29	0.926	29	0.474
30	0.650	30	0.330
31	0.450	31	0.125
32	0.300	32	0.030
33	0.150	33	0.020
34	0.048	34	0.020
35	0.030	35	0.010
>=36	0.010	36	0.010
		37	0.010
		>=38	0

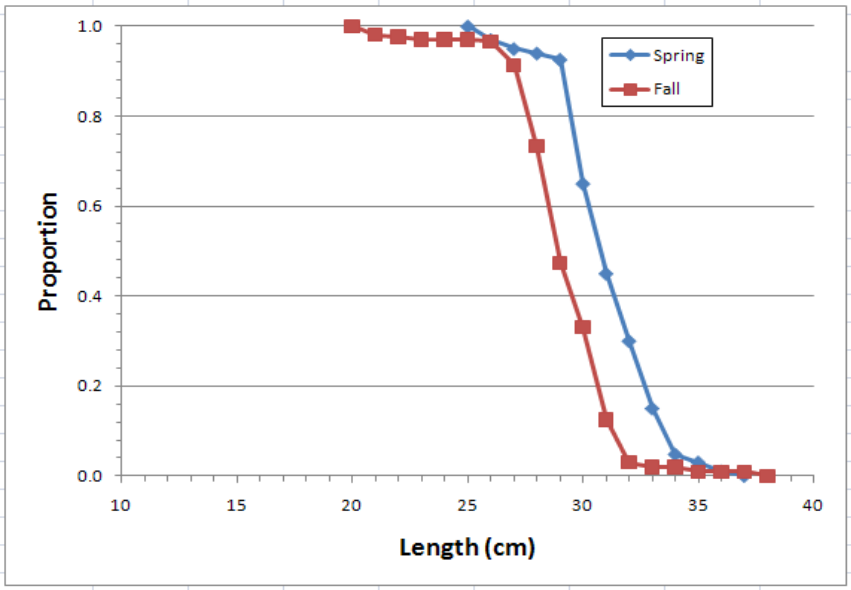


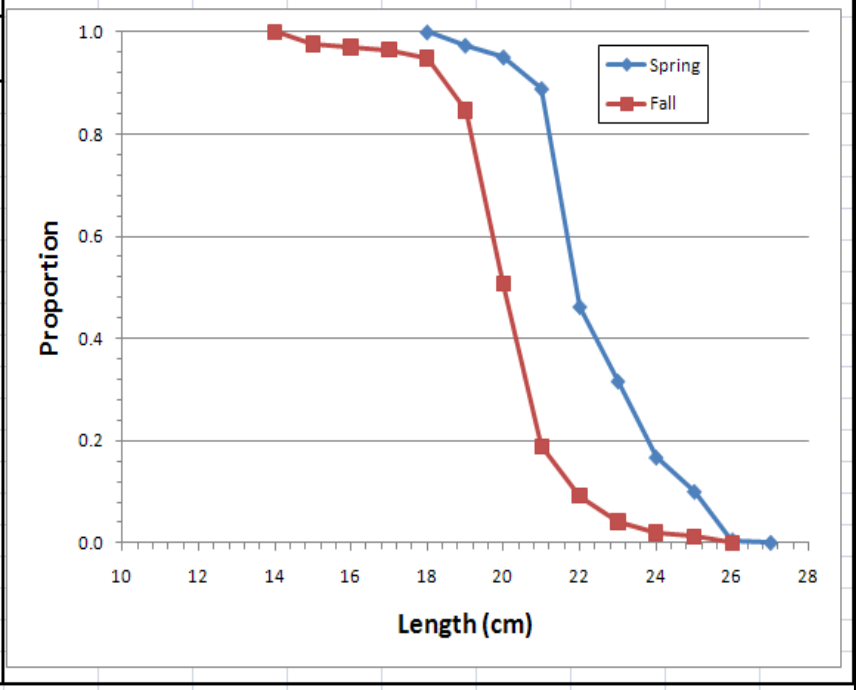
Figure 5. continued.

Weakfish

Separation Method: Age-Length Key

Data Sources: Aged specimens from NEAMAP 2007-2008

Spring (Age 1)		Fall (Age 0)	
Length (cm)	Proportion at Age	Length (cm)	Proportion at Age
		<= 14	1
		15	0.976
		16	0.970
		17	0.965
<= 18	1.000	18	0.948
19	0.974	19	0.846
20	0.951	20	0.508
21	0.889	21	0.189
22	0.462	22	0.092
23	0.316	23	0.041
24	0.167	24	0.020
25	0.100	25	0.013
26	0.005	>=26	0.000
>=27	0.000		

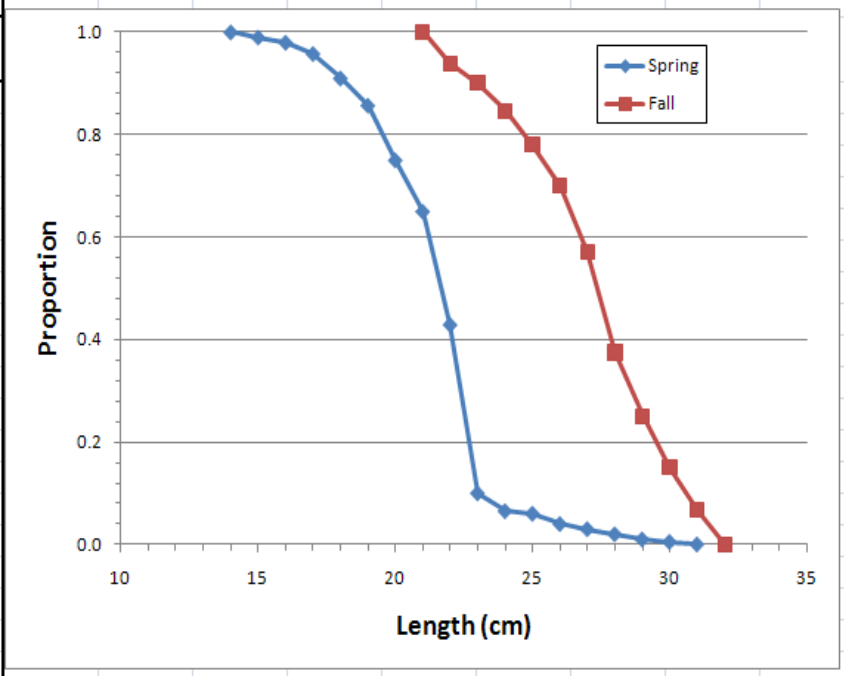


Winter Flounder

Separation Method: Age-Length Key

Data Sources: Aged specimens from NEAMAP 2007-2008

Spring (Age 1)		Fall (Age 1)	
Length (cm)	Proportion at Age	Length (cm)	Proportion at Age
<= 9	excluded		
<= 14	1.000		
15	0.990		
16	0.980		
17	0.958		
18	0.910		
19	0.857		
20	0.750	<= 20	excluded
21	0.650	<= 21	1.000
22	0.429	22	0.938
23	0.100	23	0.900
24	0.065	24	0.846
25	0.060	25	0.780
26	0.040	26	0.700
27	0.030	27	0.571
28	0.020	28	0.375
29	0.010	29	0.250
30	0.005	30	0.150
>=31	0.000	31	0.067
		>=32	0



Alewife

Sampling Priority: A

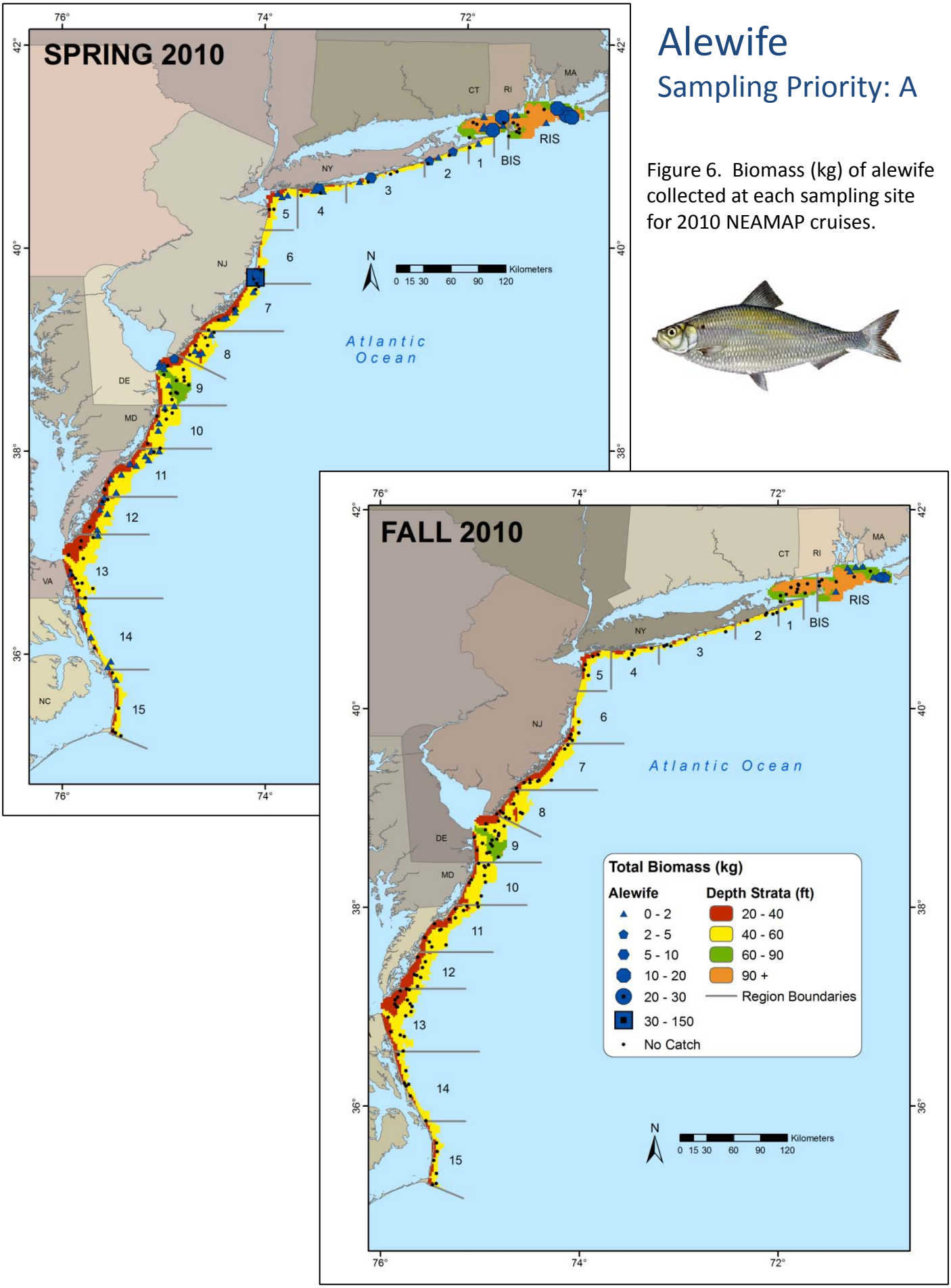


Figure 6. Biomass (kg) of alewife collected at each sampling site for 2010 NEAMAP cruises.

Table 6. Sampling rates and preserved specimen analysis status of alewife for each NEAMAP cruise (Note: elements in this table were incorrect in a previous report).

Season	Year	Number Caught	Biomass Caught	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	
	2010	3,735	209.7	1,547	273	0	270	21
Fall	2007	56	3.1	56	24	0	24	
	2008	5	0.3	5	5	0	5	
	2009	87	3.9	87	17	0	16	16
	2010	565	13.7	360	39	0	38	

Table 7. Strata used for calculation of abundance indices for alewife.

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							
	08	20-40							
		40-60							

= used for abundance indices

= not used for abundance indices

Table 8. Preliminary abundance indices for alewife.

		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	150	1.18	8.5	150	0.32	14.1	1	150	0.84	10.6	150	0.12	22.1	>1	150	0.72	11.9	150	0.23	16.9
	2009	160	0.80	11.4	160	0.24	19.6		160	0.56	13.0	160	0.07	21.7		160	0.51	15.0	160	0.20	23.7
	2010	150	0.89	12.3	150	0.24	20.5		150	0.74	13.2	150	0.15	23.7		150	0.35	19.9	150	0.13	27.8
Fall	2007	17	0.49	44.1	17	0.10	62.7	0	17	0.00		17	0.00		>0	17	0.49	44.1	17	0.10	63.2
	2008	16	0.06	100.0	16	0.01	100.0		16	0.00		16	0.00			16	0.06	100.0	16	0.01	100.0
	2009	16	0.31	87.8	16	0.10	98.3		16	0.09	70.8	16	0.00	100.0		16	0.27	100.0	16	0.10	100.0
	2010	16	1.90	27.5	16	0.41	36.9		16	1.75	30.6	16	0.35	37.2		16	0.75	30.6	16	0.26	49.3

Figure 7. Preliminary indices of abundance, in number and biomass units, of alewife for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

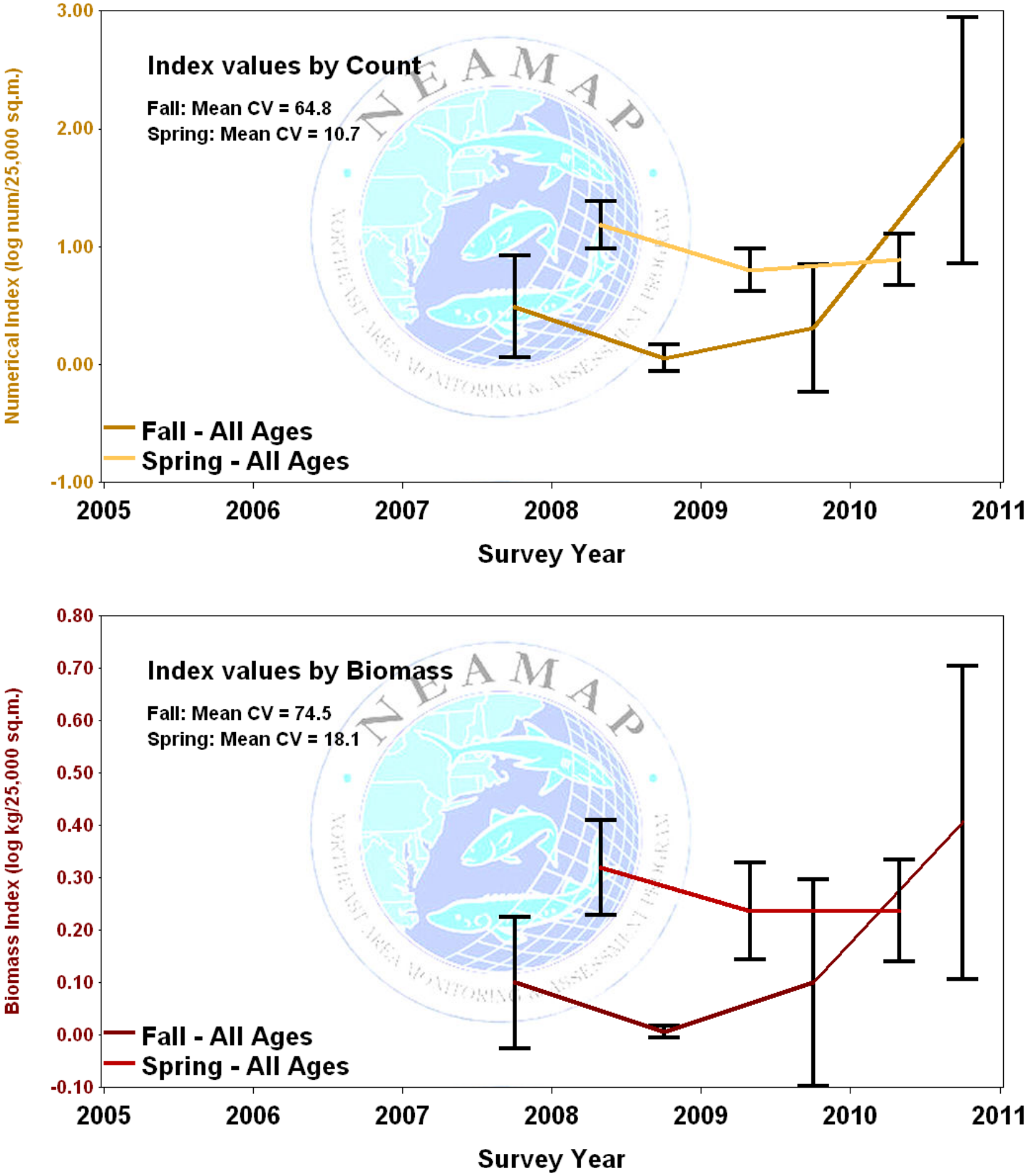


Figure 8. Preliminary indices of abundance, of alewife for spring and fall NEAMAP surveys. Indices are for the youngest age class observed during each survey (count-based indices only) and for all other age classes combined (based both on count and biomass). 95% confidence intervals are provided for each abundance estimate.

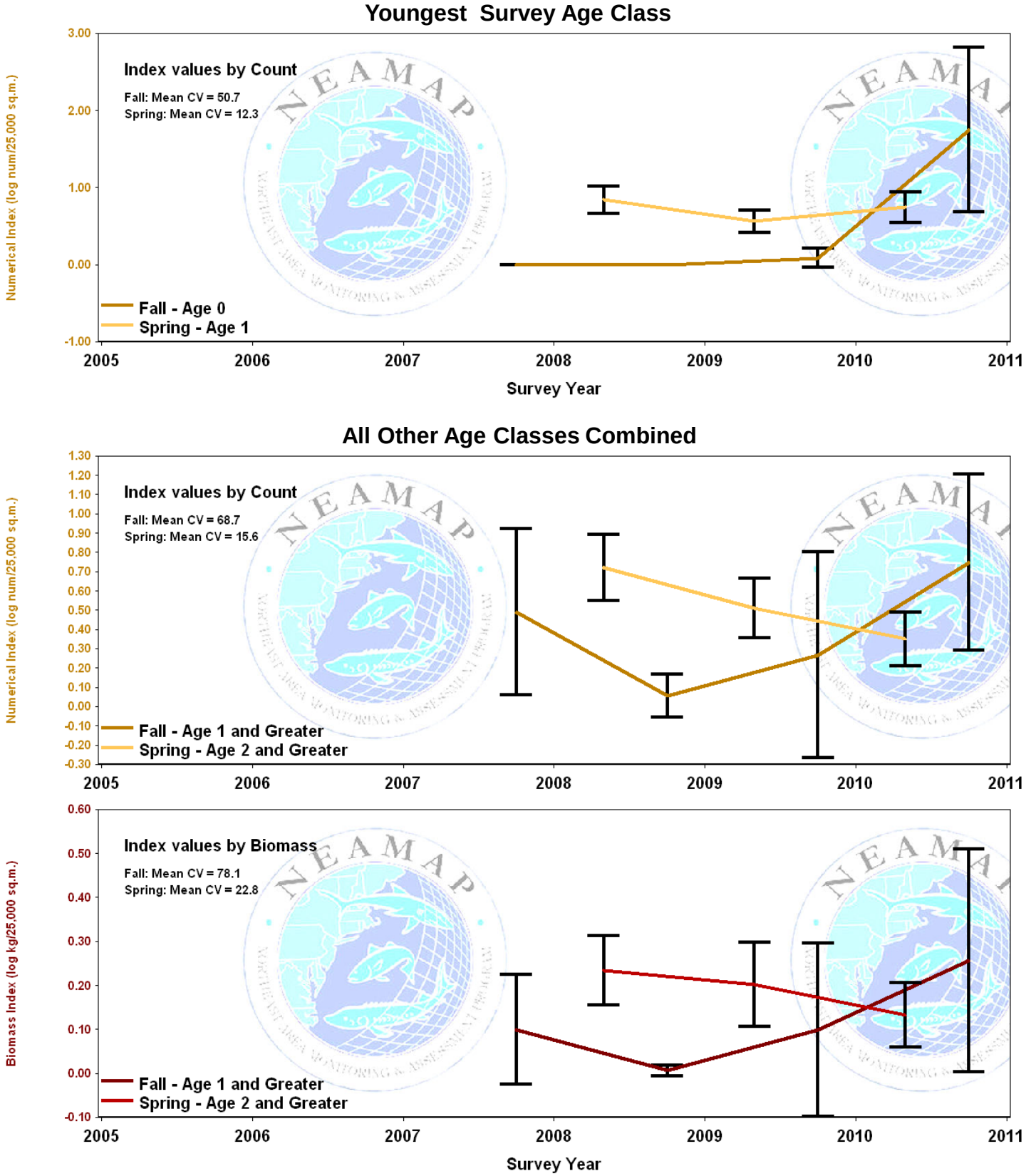


Figure 9. Length-frequency distributions, by cruise, for alewife.

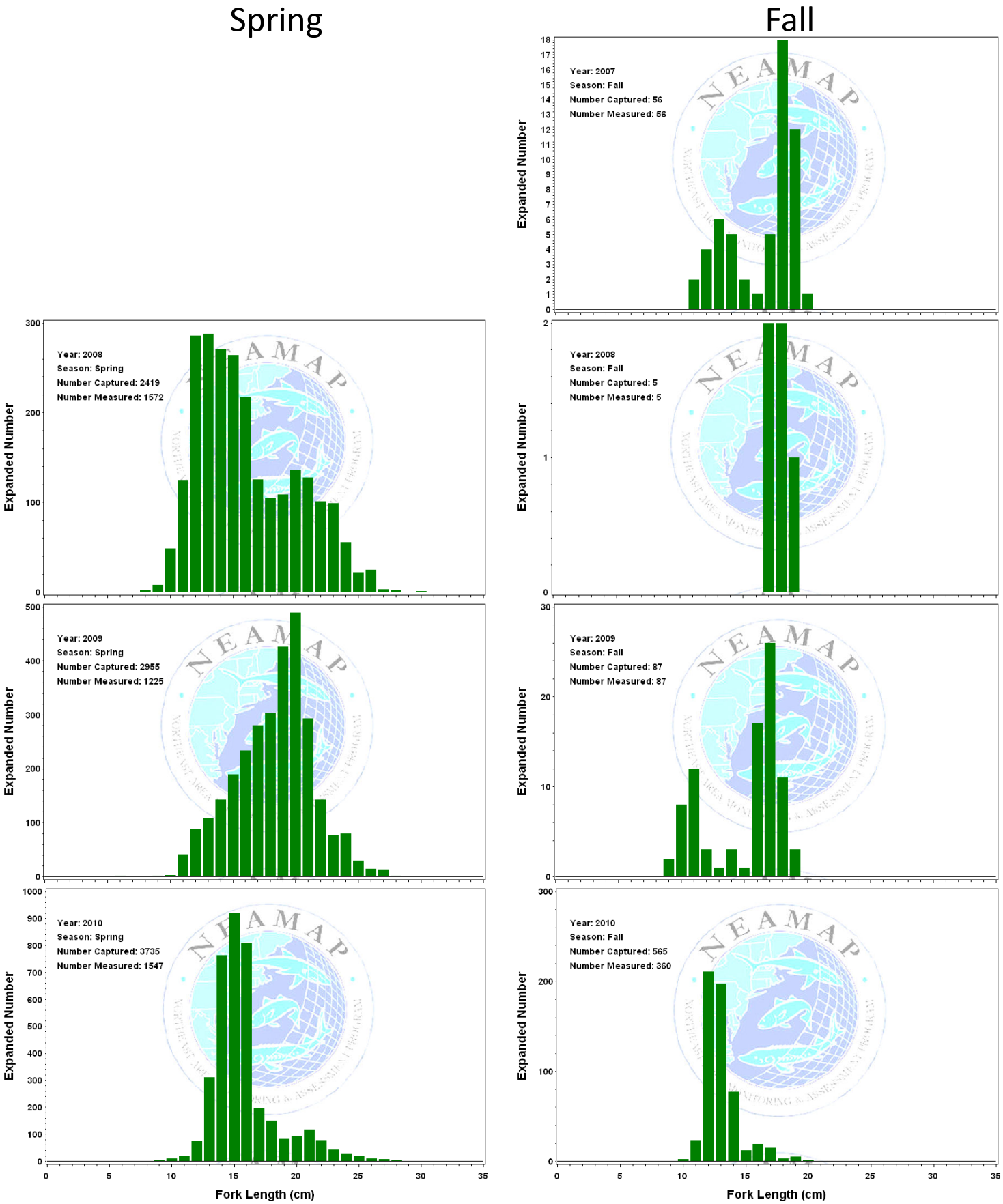


Figure 10. Sex-specific length-frequency distribution, by season, all cruises pooled, for alewife.

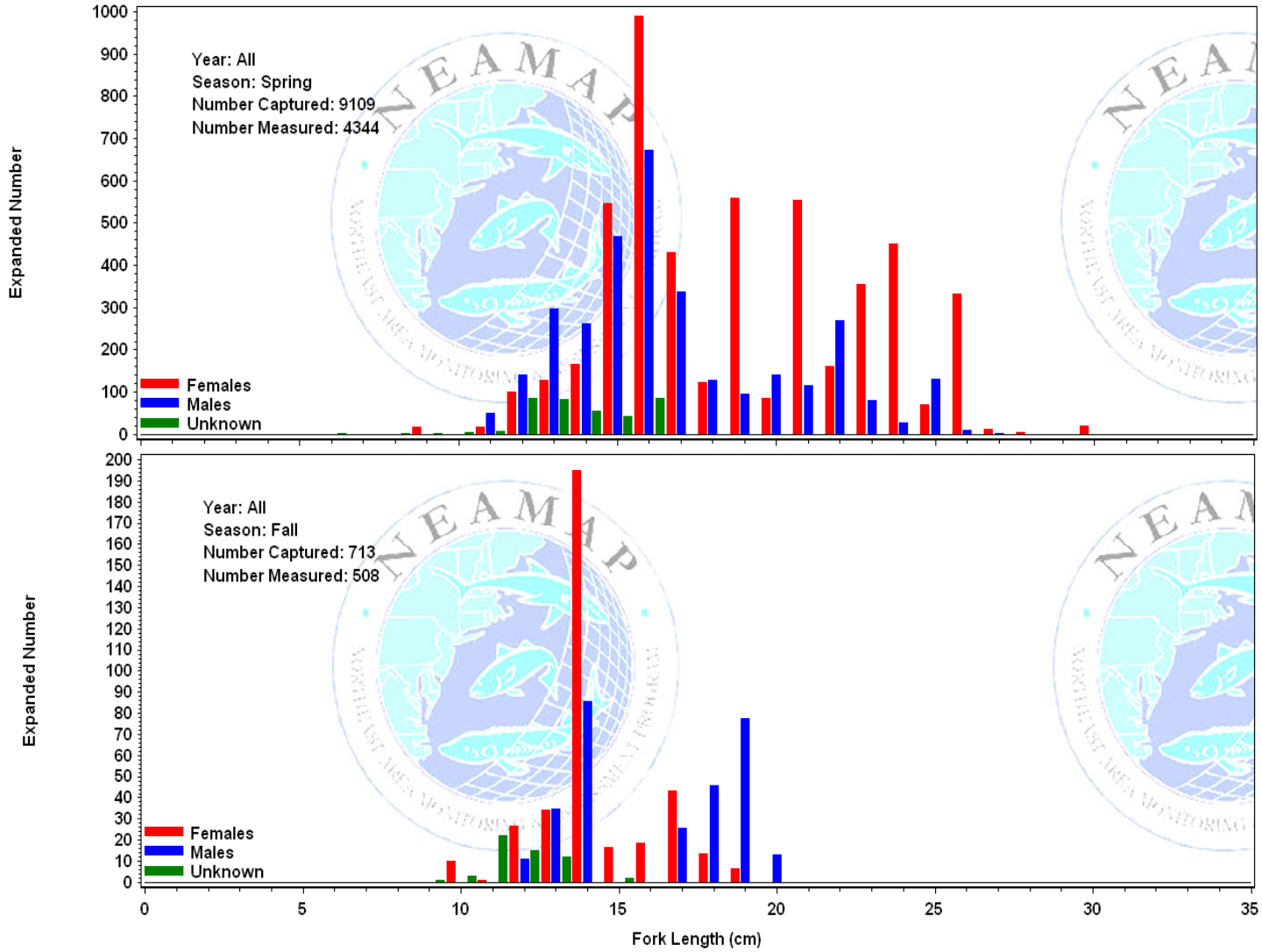
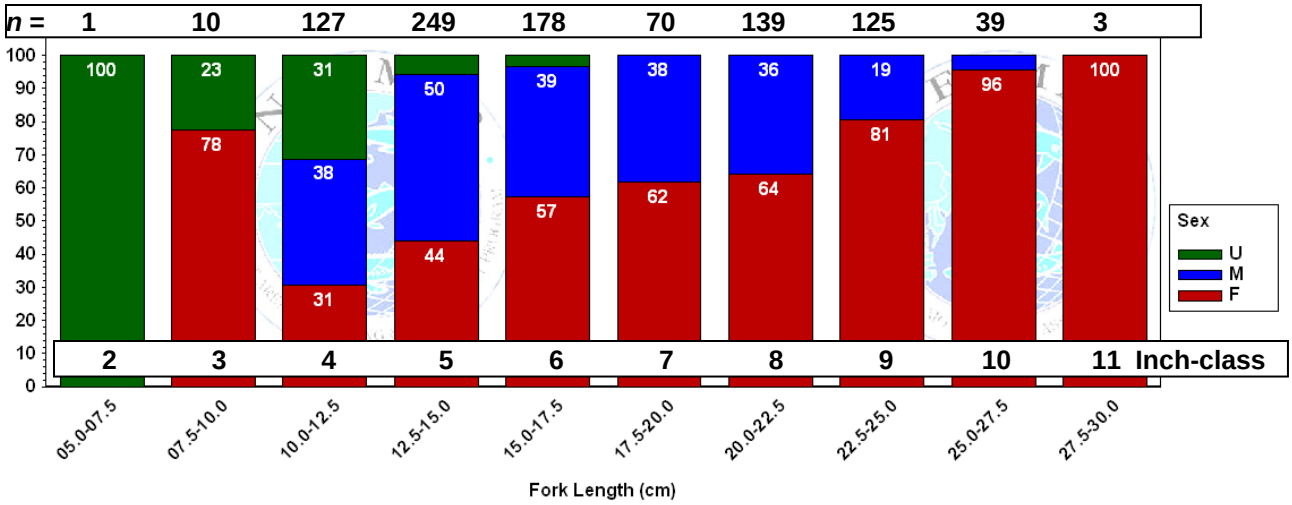


Figure 11. Sex ratio, by length group, for alewife collected all NEAMAP cruises 2007-2010 (The percentages for each category are given in their respective bars. The number sampled for sex determination is provided above each bar, and the length categories expressed in inches are given near the x-axis.).



American Lobster

Sampling Priority: E

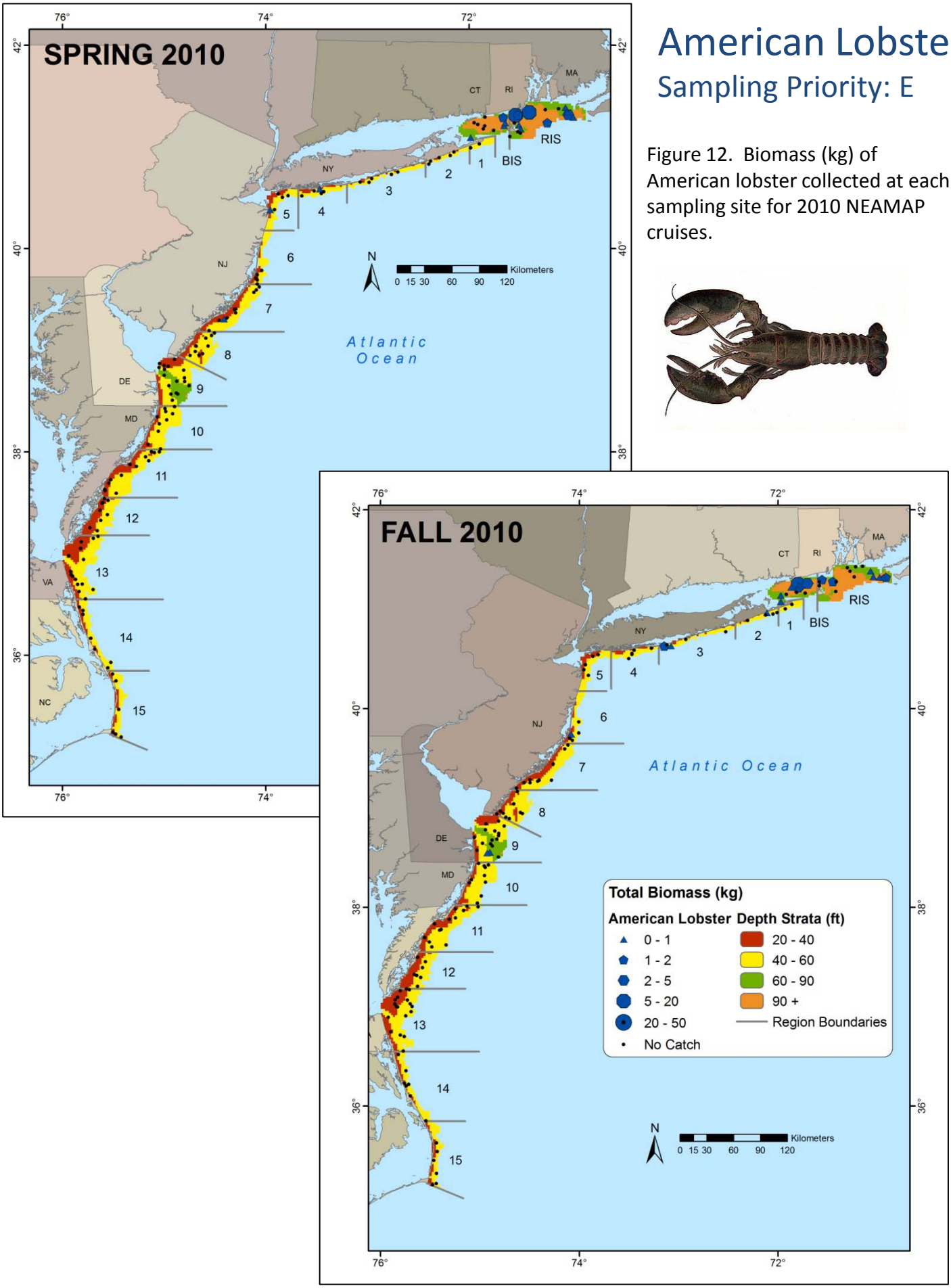


Figure 12. Biomass (kg) of American lobster collected at each sampling site for 2010 NEAMAP cruises.

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

Season	Year	Number Caught	Biomass Caught	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
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

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		
		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		

= used for abundance indices

= not used for abundance indices

Table 11. Preliminary abundance indices for American lobster.

		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	27	1.69	16.0	27	0.82	21.0	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	26	1.57	14.4	26	0.95	17.5	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	26	0.83	23.8	26	0.43	26.4	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	26	1.23	22.1	26	0.63	27.0	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	26	1.44	14.9	26	0.72	21.8	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	26	0.95	19.4	26	0.45	24.2	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	26	0.69	22.4	26	0.31	28.7	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 13. Preliminary indices of abundance, in number and biomass units, of American lobster for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

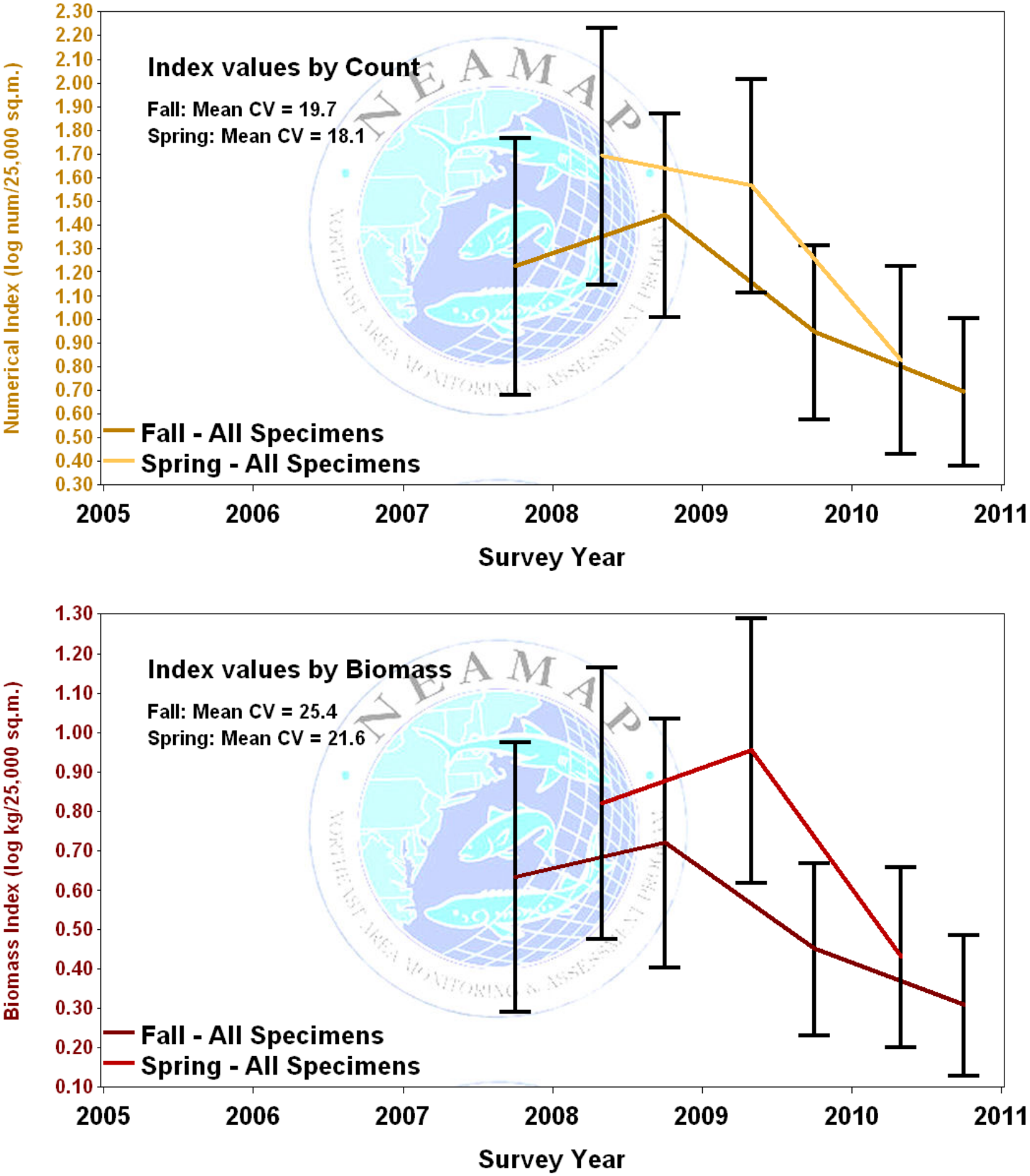


Figure 14. Length-frequency distributions, by cruise, for American lobster.

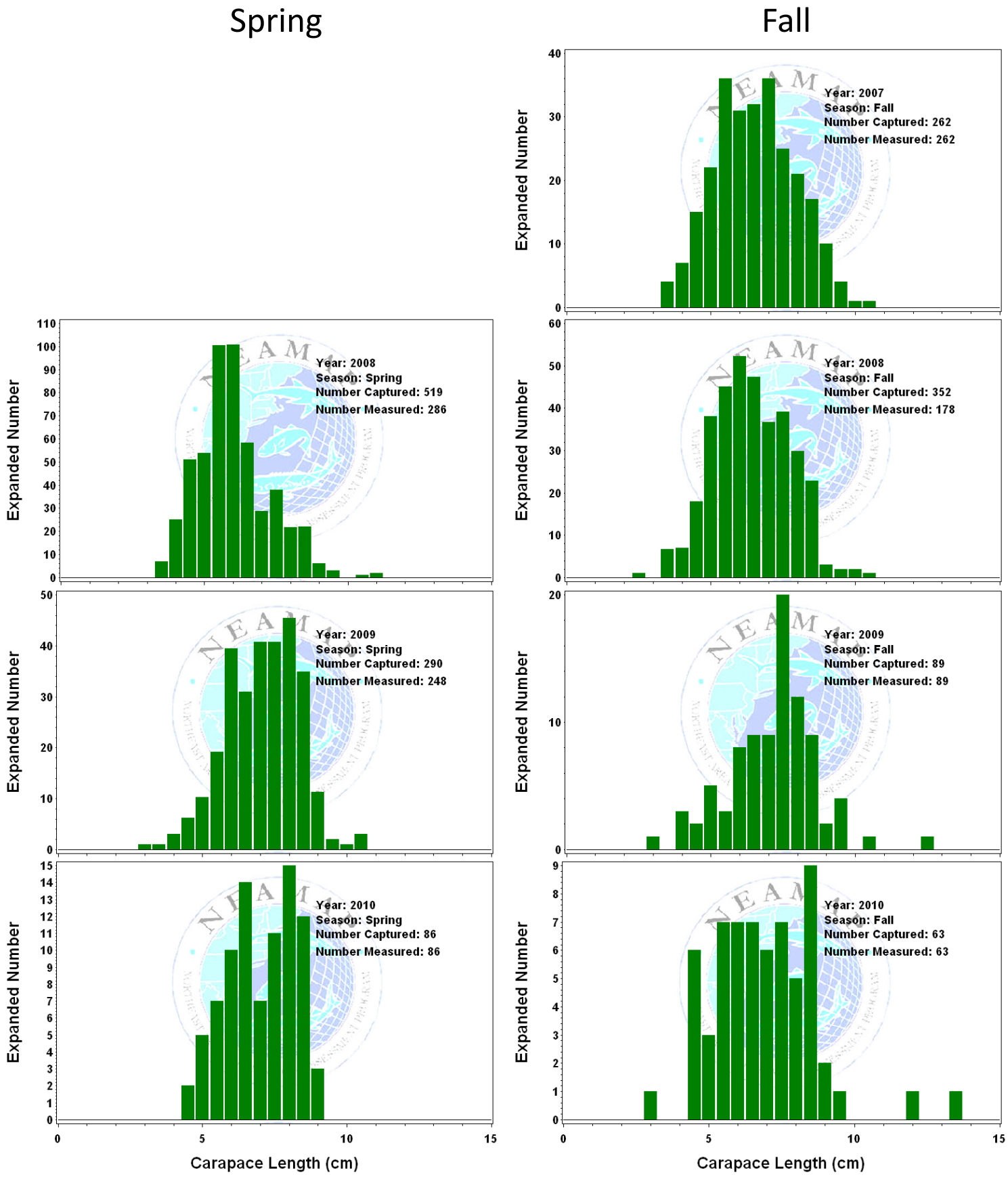


Figure 15. Sex-specific length-frequency distribution, by season, all cruises pooled, for American lobster.

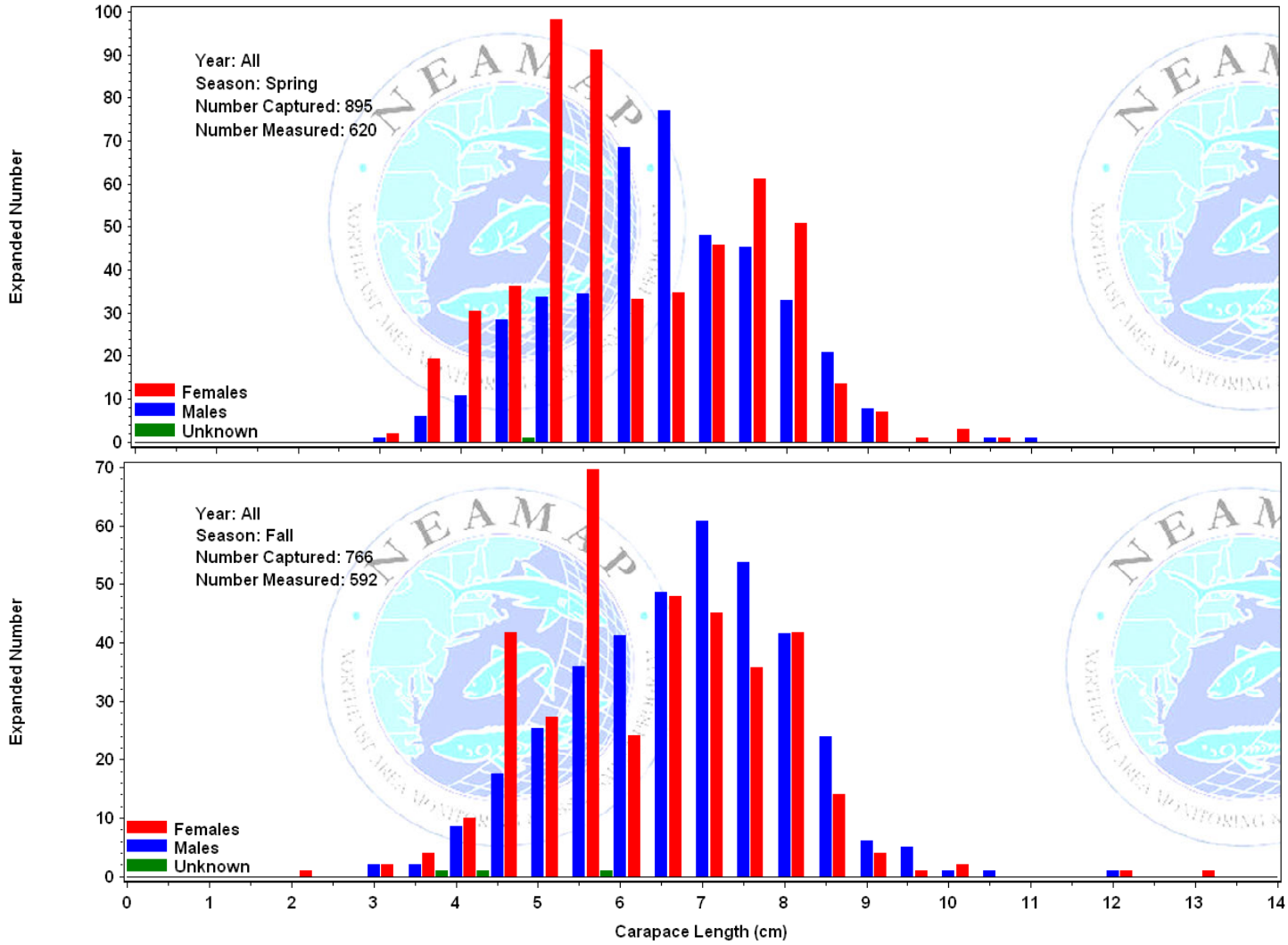
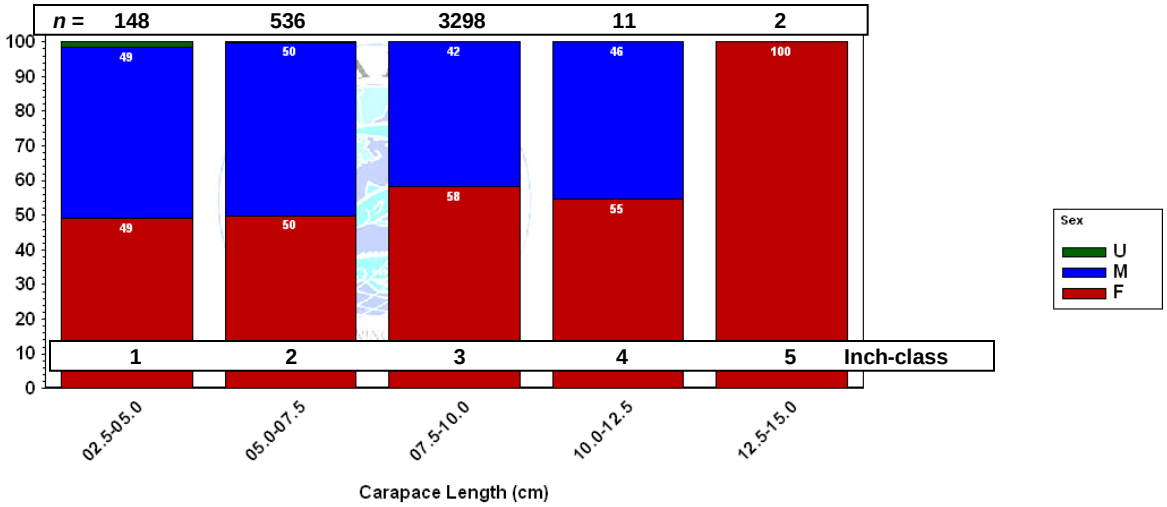


Figure 16. Sex ratio, by length group, for American lobster collected all NEAMAP cruises 2007-2010 (The percentages for each category are given in their respective bars. The number sampled for sex determination is provided above each bar, and the length categories expressed in inches are given near the x-axis.).



American Shad

Sampling Priority: A

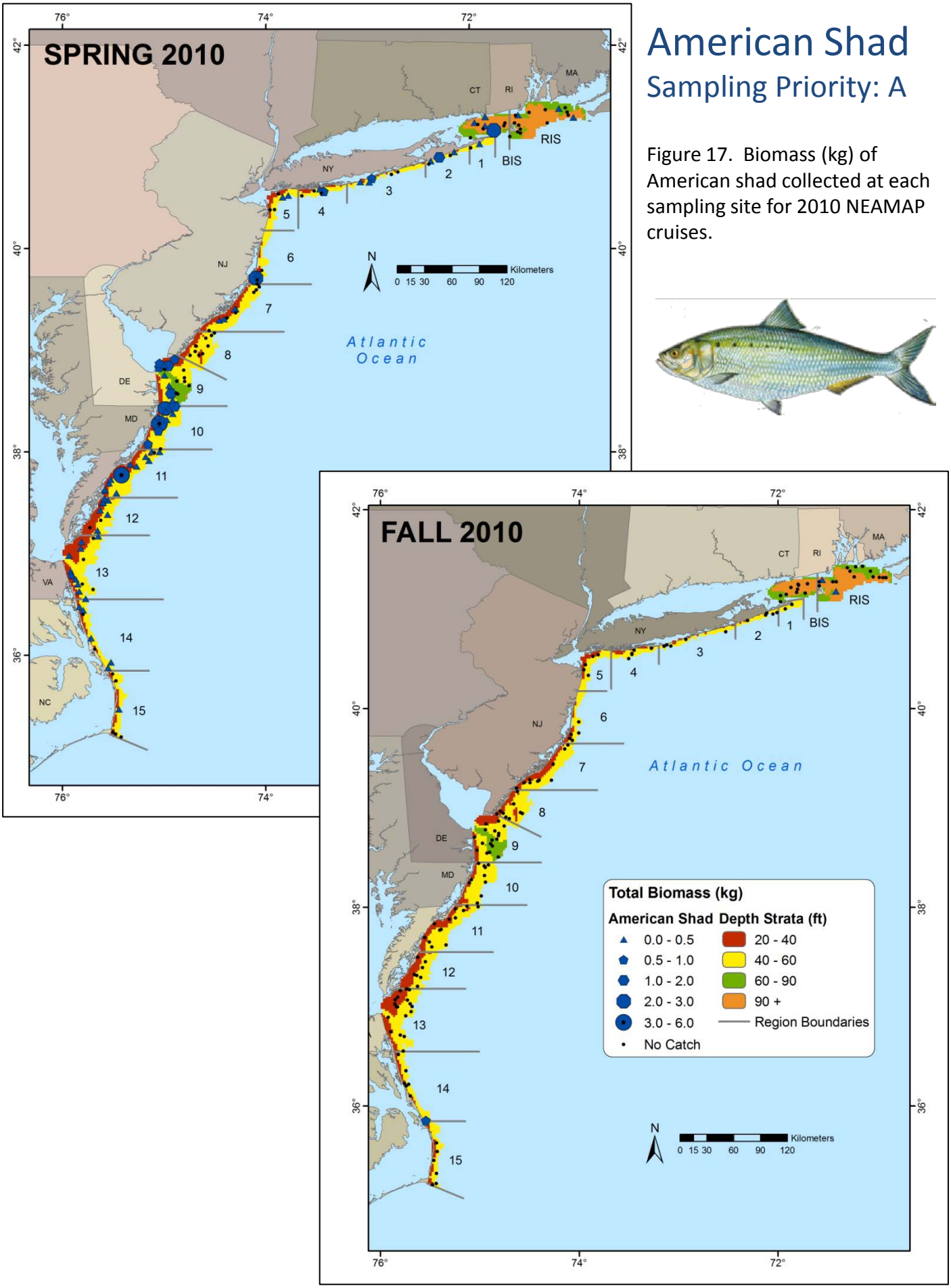


Figure 17. Biomass (kg) of American shad collected at each sampling site for 2010 NEAMAP cruises.

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

Season	Year	Number Caught	Biomass Caught	Number Measured	Age Specimens	Ages Read	Stomach Specimens	Stomachs Analyzed
Spring	2008	1,205	40.8	1,205	327	0	321	
	2009	1,141	33.2	859	260	0	260	9
	2010	1,236	43.8	942	274	0	273	22
Fall	2007	9	0.8	9	9	0	9	
	2008	9	0.5	9	5	0	5	
	2009	28	3.1	28	10	0	10	9
	2010	32	1.1	6	3	0	3	

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							
	08	20-40							
		40-60							

= used for abundance indices

= not used for abundance indices

Table 14. Preliminary abundance indices for American shad.

		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	150	1.21	7.4	150	0.18	10.3	1	150	1.19	7.4	150	0.16	10.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	2009	160	0.91	9.4	160	0.13	16.5		160	0.88	9.5	160	0.13	17.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	2010	150	0.99	8.9	150	0.16	16.3		150	0.98	9.0	150	0.16	16.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fall	2007	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	N/A	N/A	N/A	N/A	N/A	N/A
	2008	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	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	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	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Figure 18. Preliminary indices of overall abundance, in terms of number and biomass, of American shad for spring NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

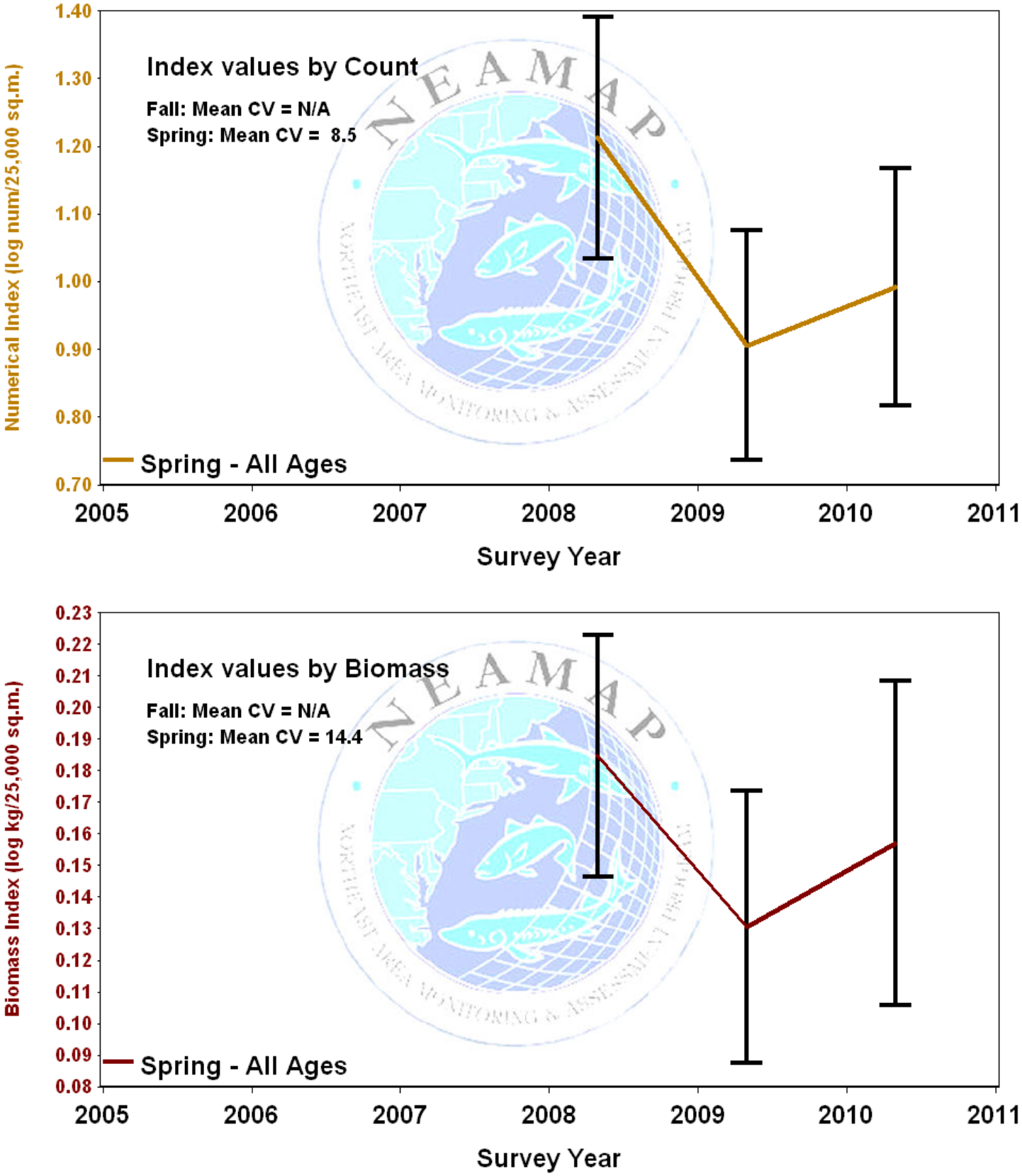


Figure 19. Preliminary indices of abundance, of American shad for spring NEAMAP surveys. Indices are for the youngest age class observed during each survey (count-based indices only). Older age classes are not well represented in current NEAMAP data. 95% confidence intervals are provided for each abundance estimate.

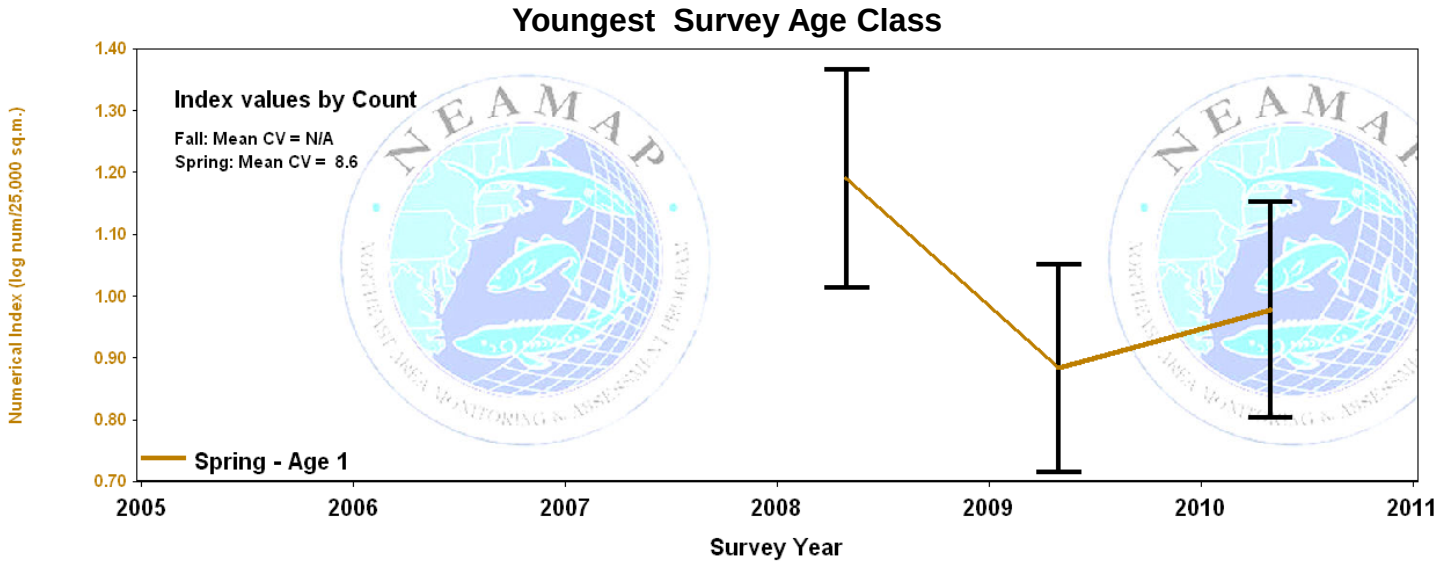


Figure 20. Length-frequency distributions, by cruise, for American shad.

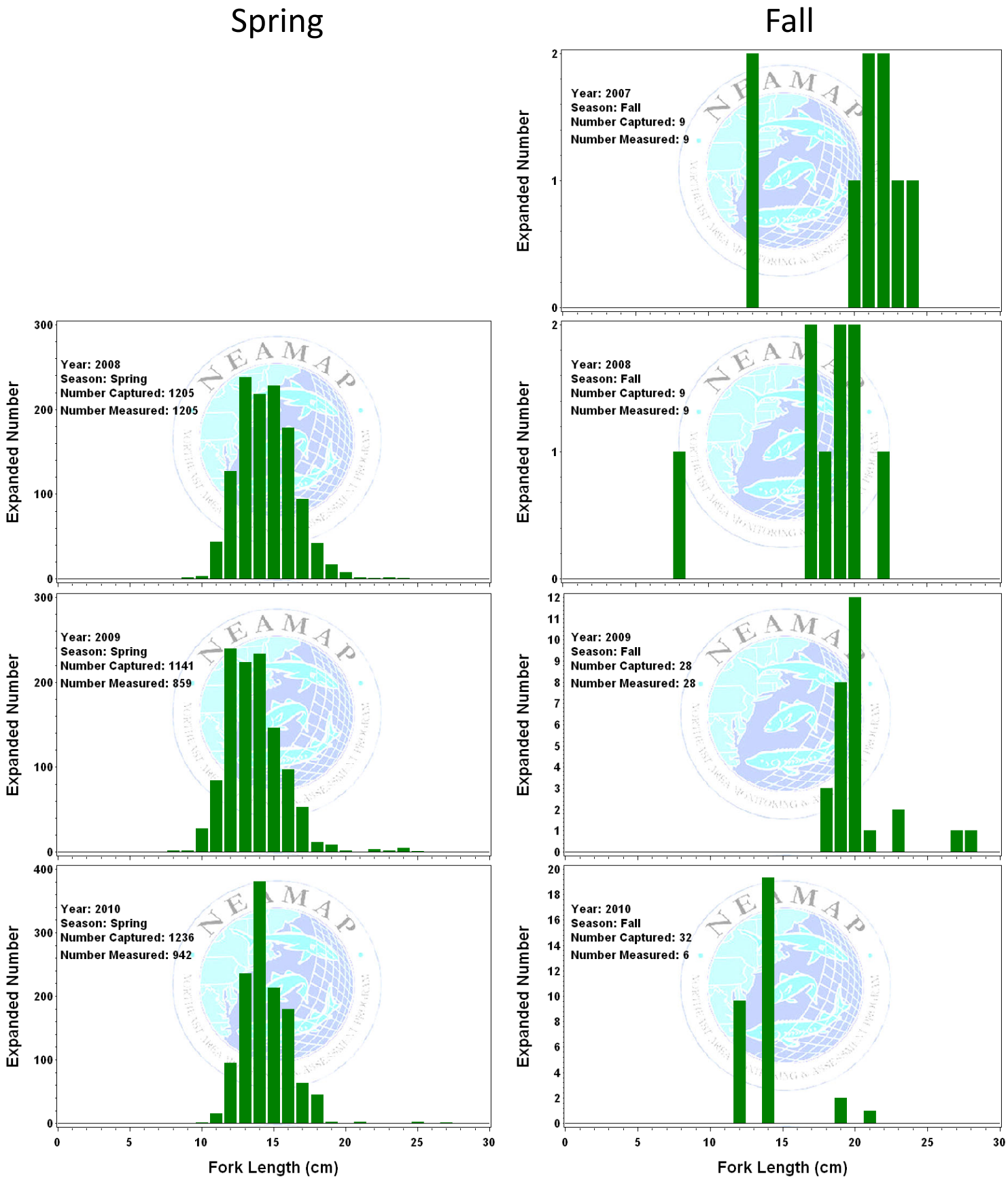


Figure 21. Sex-specific length-frequency distribution, by season, all cruises pooled, for American shad.

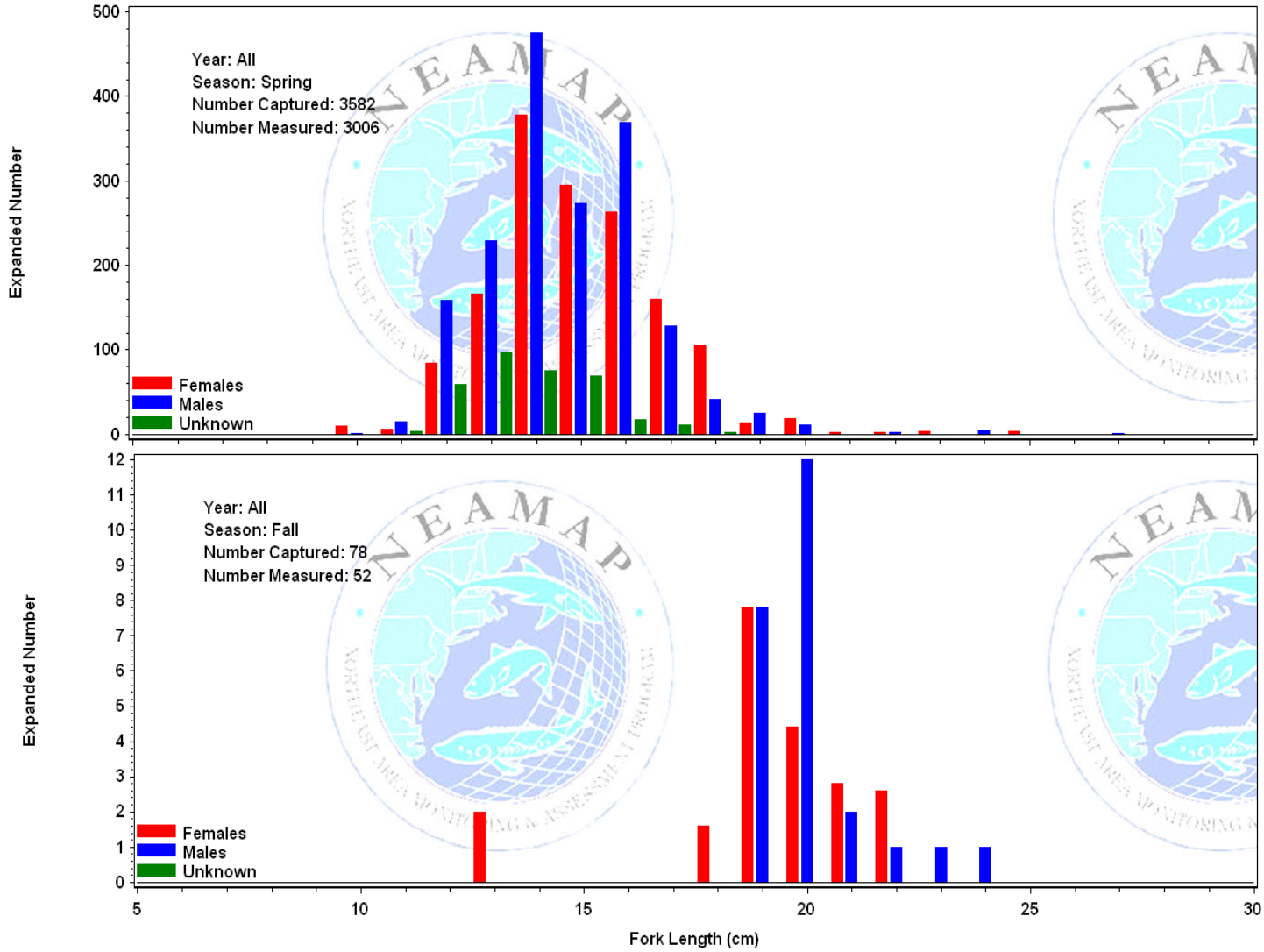
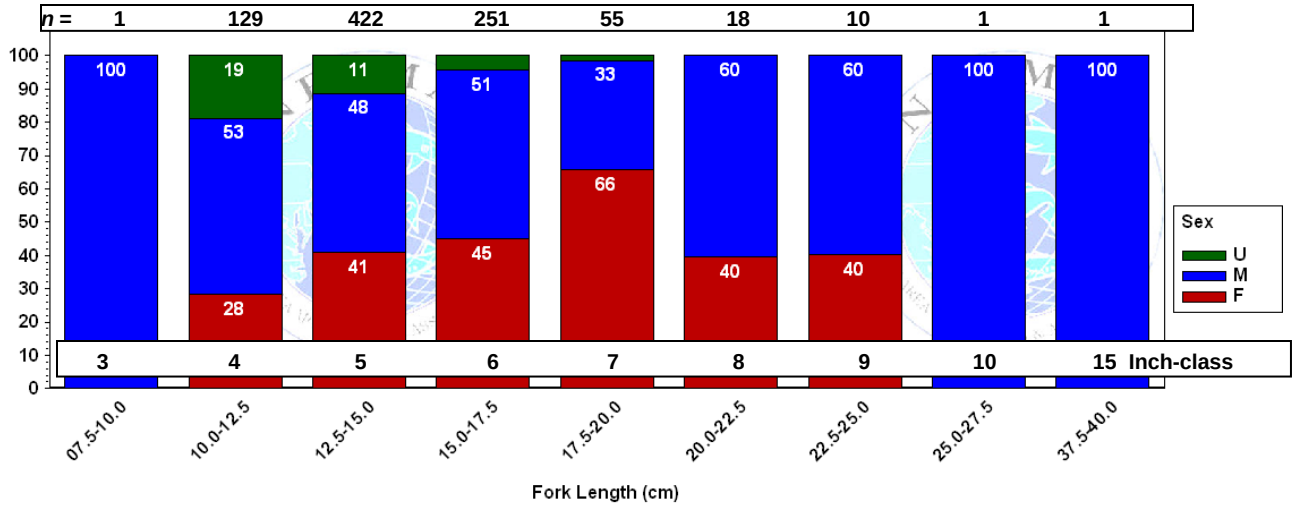


Figure 22. Sex ratio, by length group, for American shad collected all NEAMAP cruises 2007-2010 (The percentages for each category are given in their respective bars. The number sampled for sex determination is provided above each bar, and the length categories expressed in inches are given near the x-axis.).



Atlantic Croaker

Sampling Priority: A

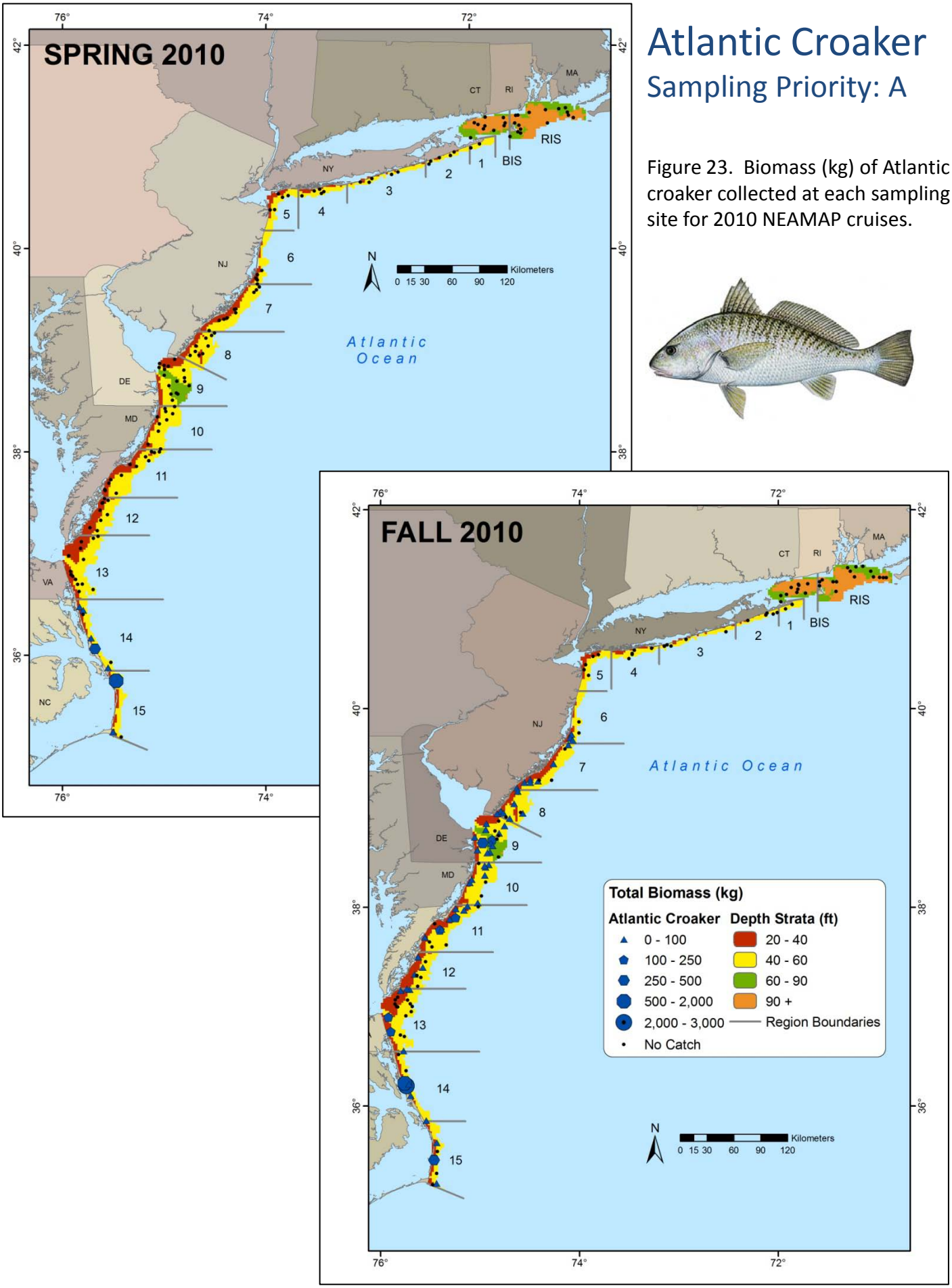


Figure 23. Biomass (kg) of Atlantic croaker collected at each sampling site for 2010 NEAMAP cruises.

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

Season	Year	Number Caught	Biomass Caught	Number Measured	Age Specimens	Ages Read	Stomach Specimens	Stomachs Analyzed
Spring	2008	467	25.0	212	41	41	38	37
	2009	17,040	1,004.3	1,225	80	0	66	60
	2010	29,365	1,656.2	929	49	0	48	13
Fall	2007	58,763	7,616.5	2,843	211	211	194	188
	2008	66,823	5,123.2	3,591	307	307	283	278
	2009	45,730	5,685.3	5,277	415	0	335	280
	2010	73,685	5,715.1	4,095	275	0	216	

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		
		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		

= used for abundance indices

= not used for abundance indices

Table 17. Preliminary abundance indices for Atlantic croaker.

		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	13	1.16	52.4	13	0.42	67.8	1	13	0.86	65.7	13	0.35	69.8	>1	13	0.32	91.5	13	0.14	97.9
	2009	15	3.88	17.9	15	1.64	24.2		15	3.14	20.3	15	1.32	28.1		15	1.57	29.4	15	0.52	51.4
	2010	13	3.04	33.1	13	1.58	45.8		13	2.75	35.9	13	1.41	49.7		13	1.63	46.1	13	0.79	63.0
Fall	2007	102	2.99	8.1	102	2.02	9.2	0	102	1.65	12.8	102	0.93	16.0	>0	102	2.75	8.0	102	1.85	8.9
	2008	102	2.53	10.9	102	1.41	13.6		102	2.21	12.3	102	1.17	15.6		102	1.64	13.3	102	0.88	16.0
	2009	107	3.41	7.5	107	2.12	9.1		107	2.66	8.8	107	1.49	11.1		107	2.86	8.1	107	1.75	9.5
	2010	102	2.25	11.1	102	1.44	12.5		102	1.69	13.8	102	1.02	15.9		102	1.91	11.0	102	1.16	12.2

Figure 24. Preliminary indices of overall abundance, in terms of number and biomass, of Atlantic croaker for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

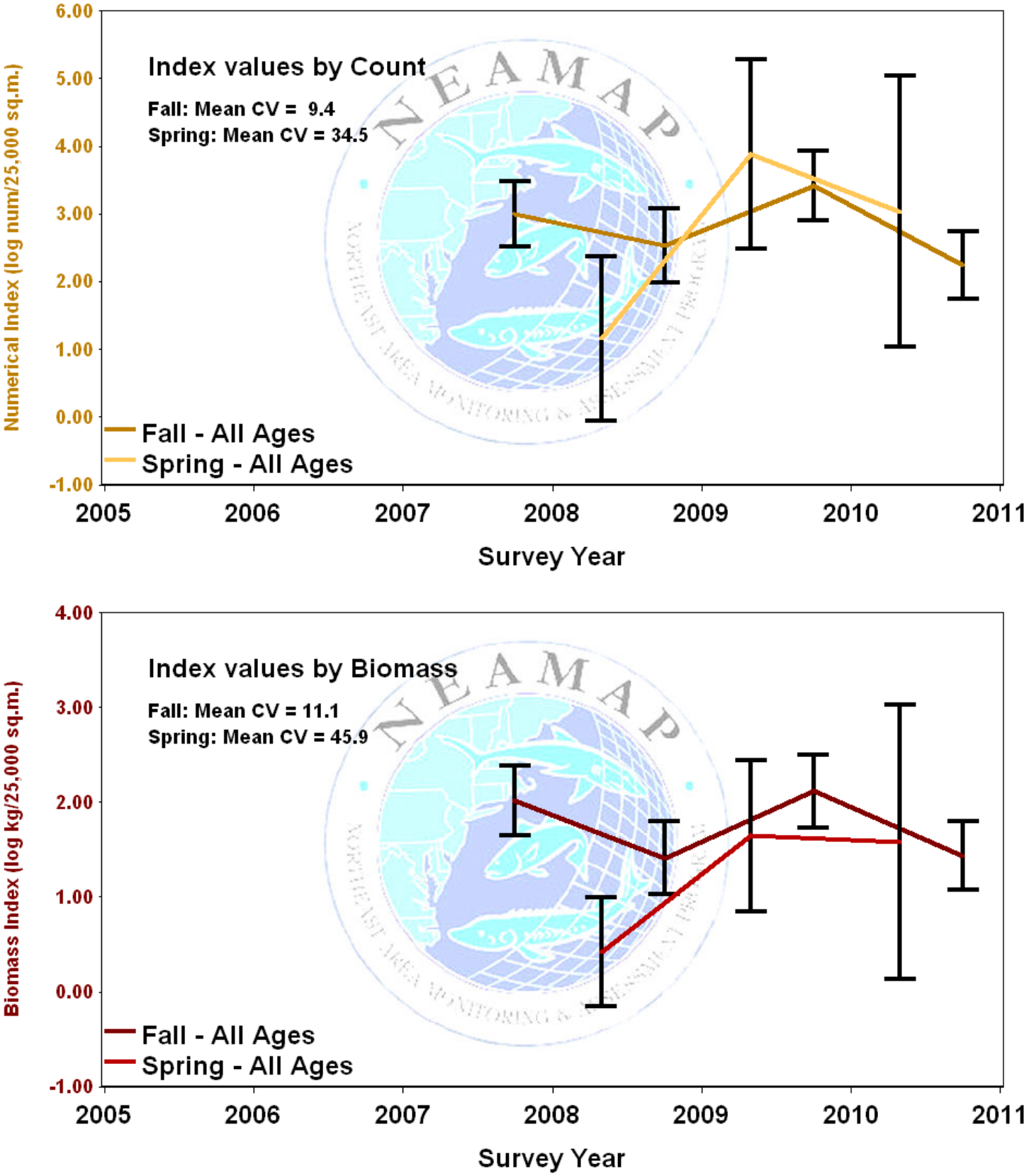


Figure 25. Preliminary indices of abundance, of Atlantic croaker for spring and fall NEAMAP surveys. Indices are for the youngest age class observed during each survey (count-based indices only) and for all other age classes combined (based both on count and biomass). 95% confidence intervals are provided for each abundance estimate.

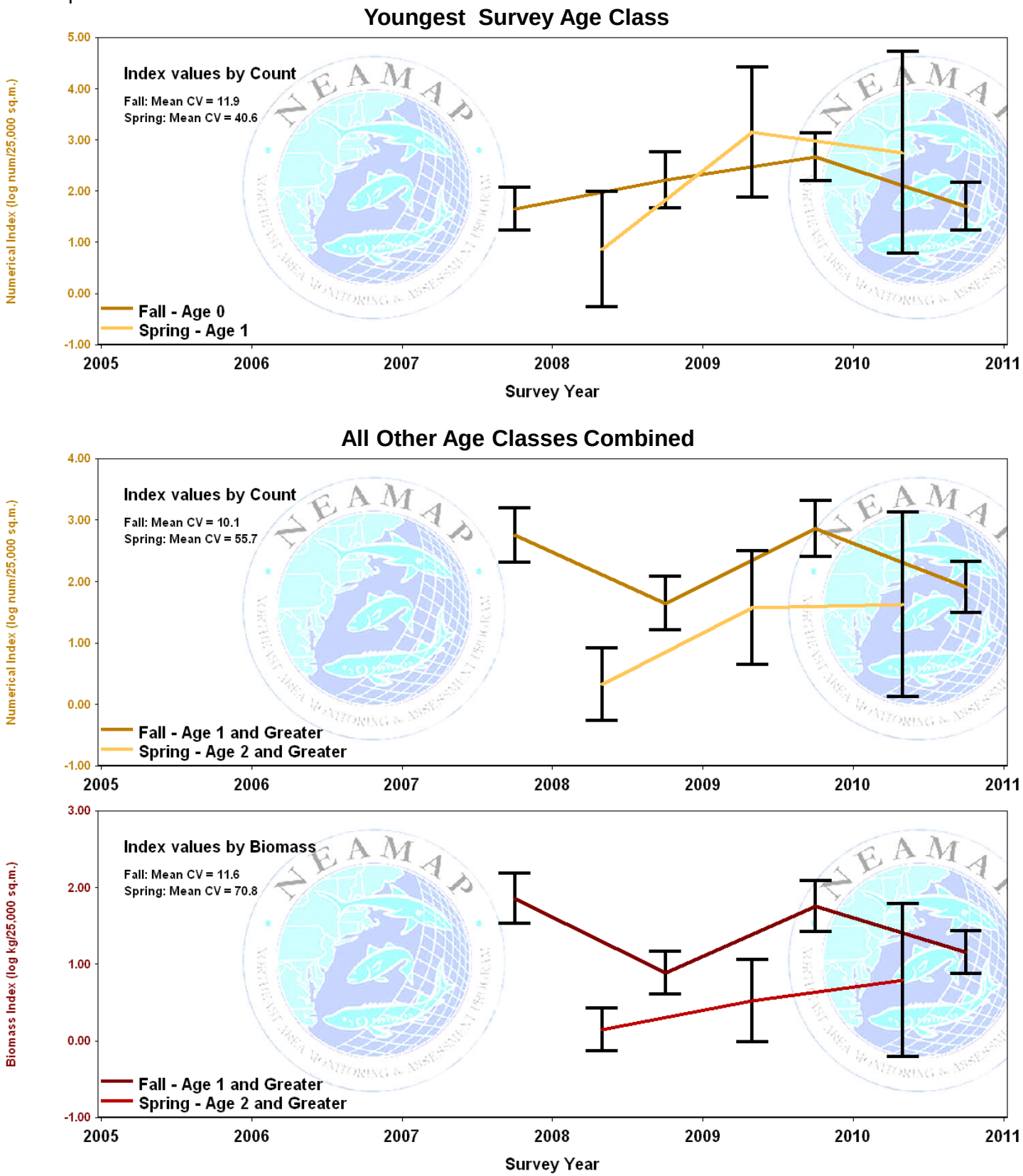


Figure 26. Length-frequency distributions, by cruise, for Atlantic croaker.

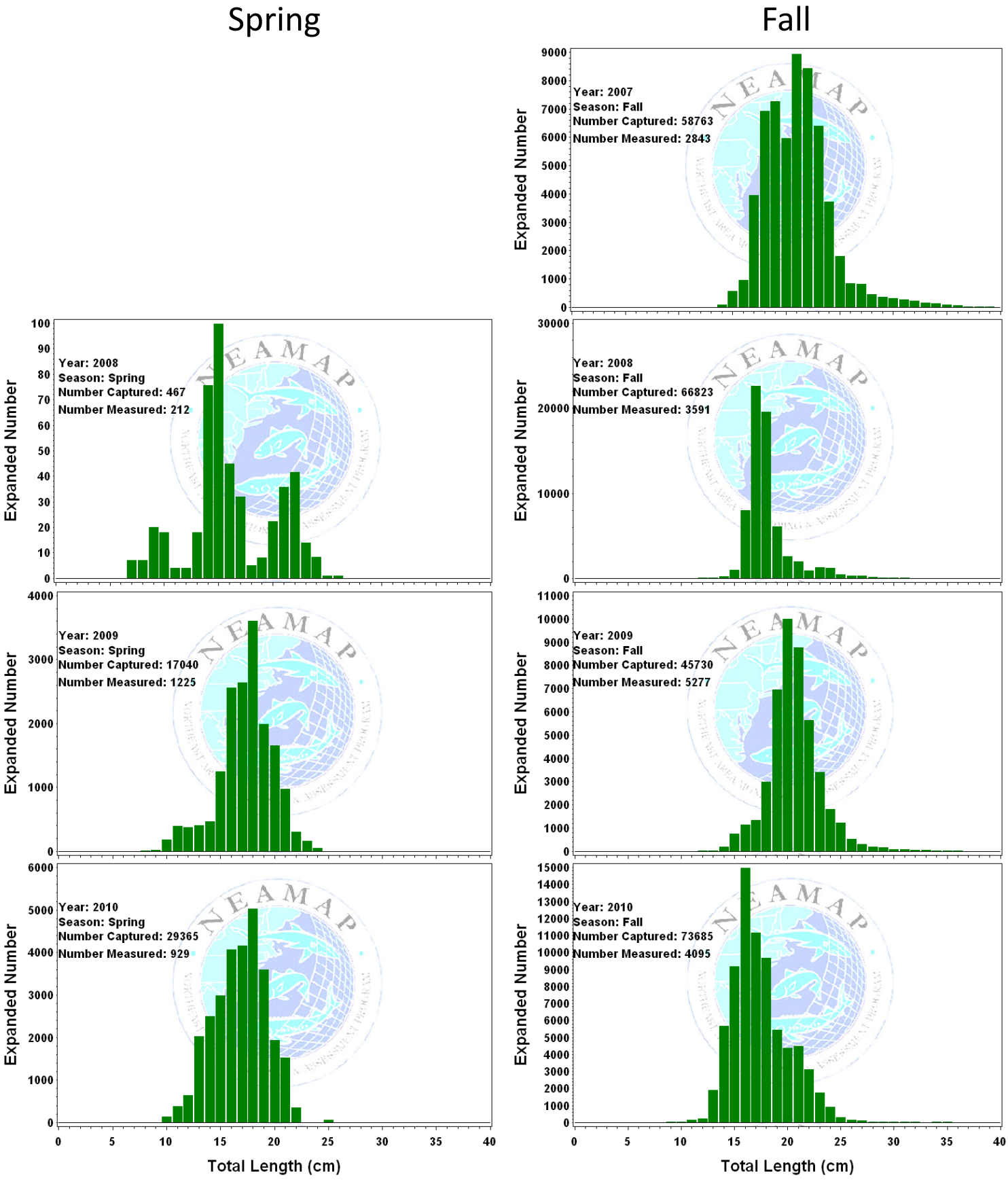


Figure 27. Sex-specific length-frequency distribution, by season, all cruises pooled, for Atlantic croaker.

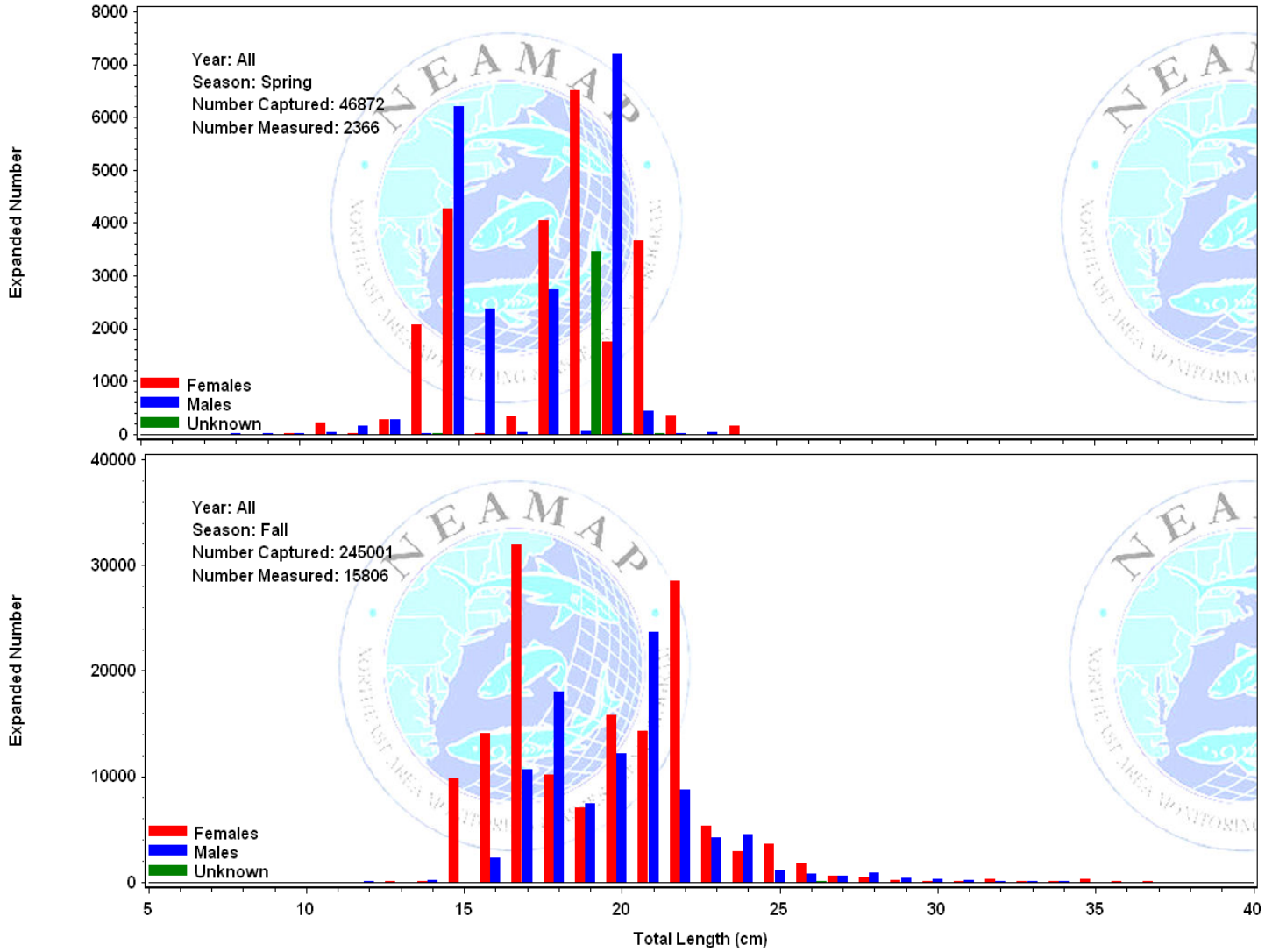


Figure 28. Sex ratio, by length group, for Atlantic croaker collected all NEAMAP cruises 2007-2010 (The percentages for each category are given in their respective bars. The number sampled for sex determination is provided above each bar, and the length categories expressed in inches are given near the x-axis.).

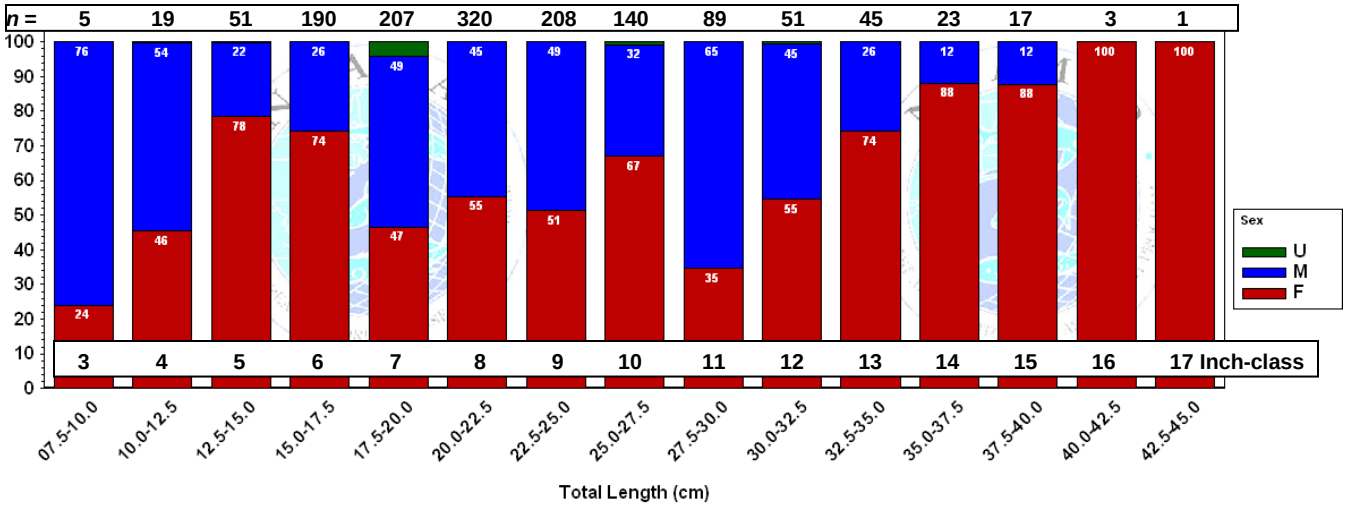
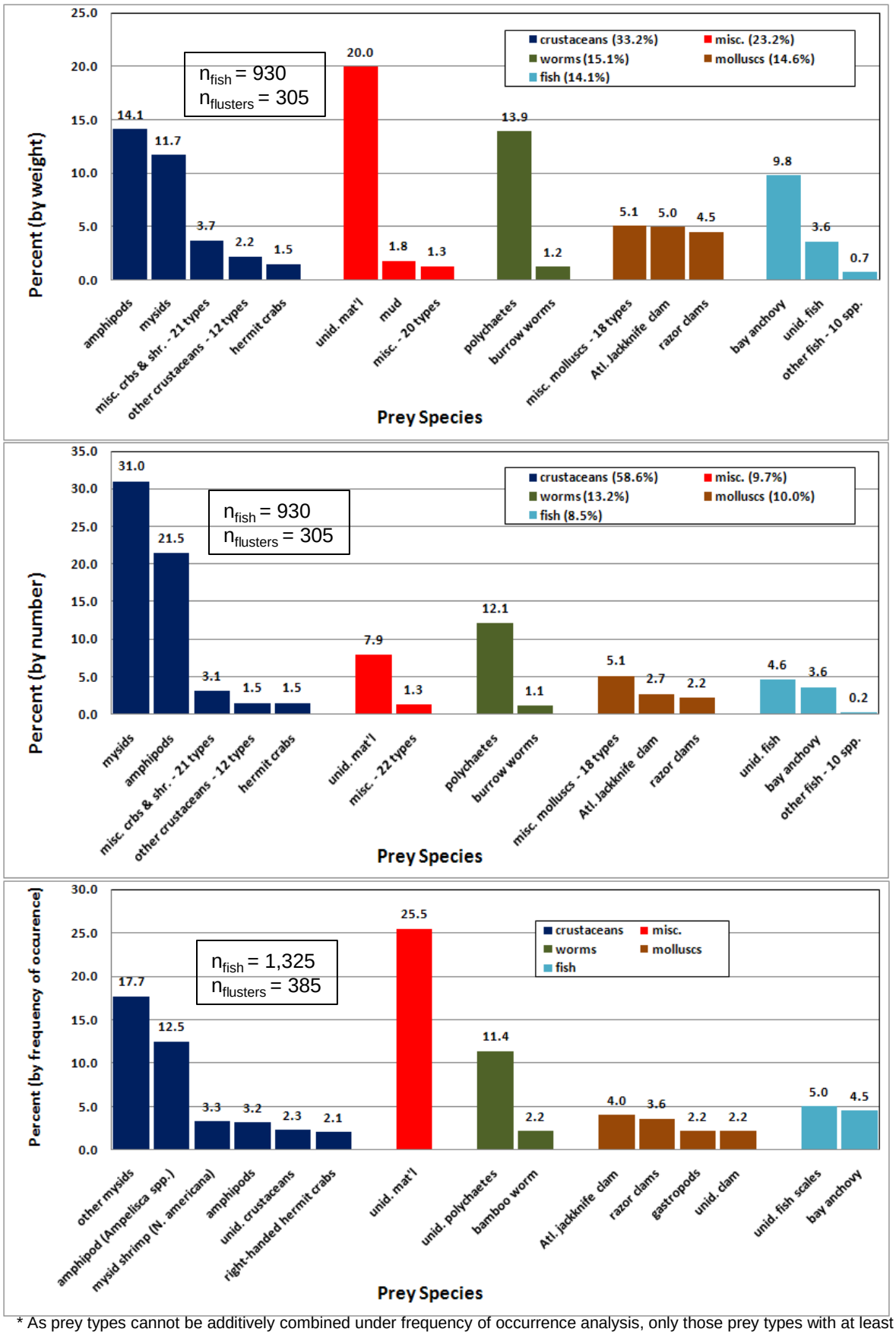


Figure 29. Diet composition, expressed as percent by weight, by number, and by frequency of occurrence* of Atlantic croaker collected during NEAMAP cruises in 2007-2009 (The number of fish sampled for diet is given by n_{fish}, while $n_{clusters}$ indicates the number of clusters of croaker sampled.)



* As prey types cannot be additively combined under frequency of occurrence analysis, only those prey types with at least a 2% value are shown here: 109 other prey types were observed in stomachs for this species. Similarly, sums for broad taxonomic groups are not calculated.

Atlantic Menhaden

Sampling Priority: A

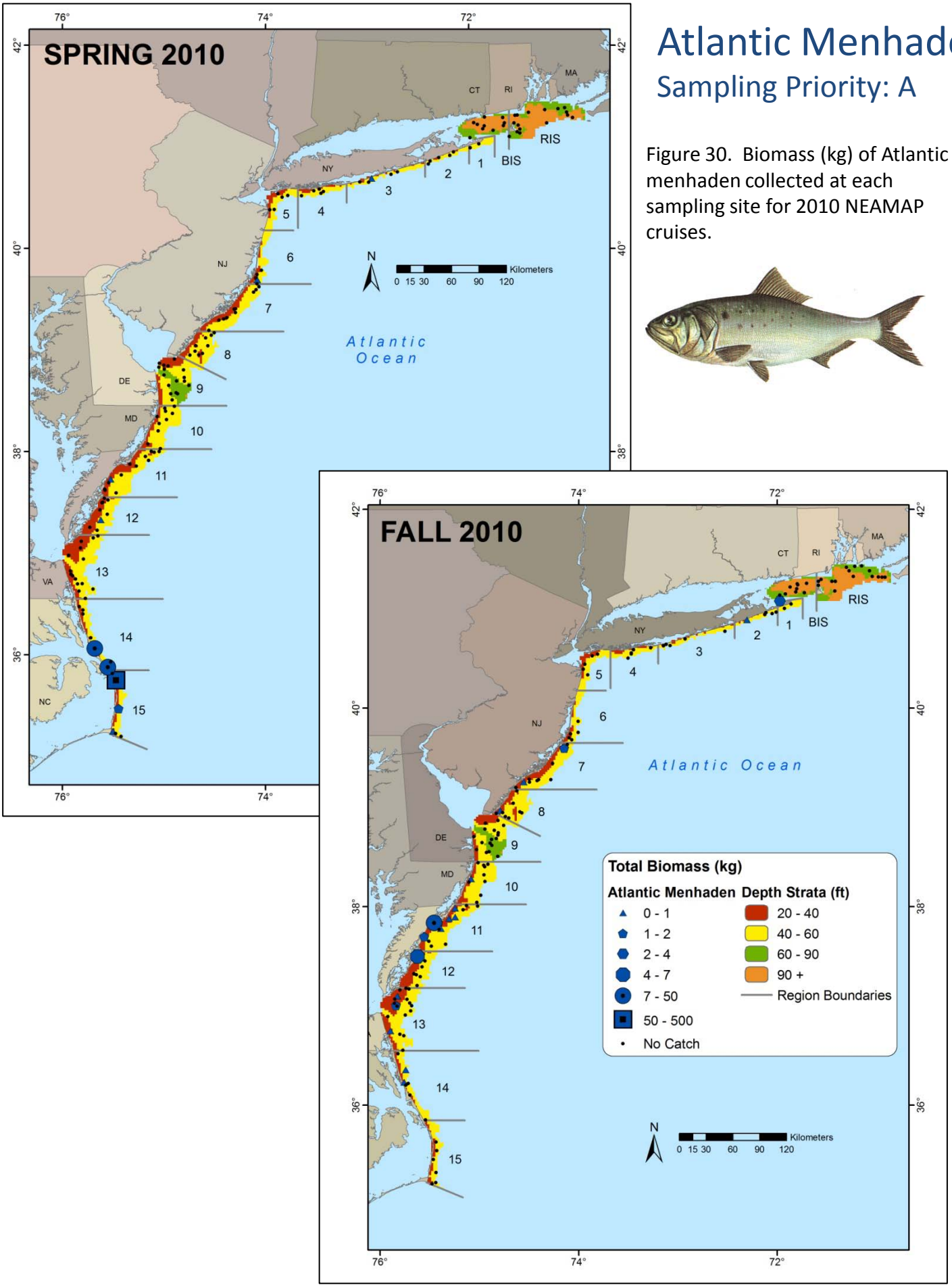


Figure 30. Biomass (kg) of Atlantic menhaden collected at each sampling site for 2010 NEAMAP cruises.

Table 18. Sampling rates and preserved specimen analysis status of Atlantic menhaden for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught	Number Measured	Age Specimens	Ages Read	Stomach Specimens	Stomachs Analyzed
Spring	2008	32	2.0	32	10	0	10	
	2009	24,566	786.0	2,146	78	0	78	
	2010	8,177	446.1	224	30	0	30	
Fall	2007	740	30.2	288	78	0	78	1
	2008	208	25.0	208	68	0	68	
	2009	146	11.9	146	59	0	58	6
	2010	974	29.3	229	56	0	56	

Table 19. Strata used for calculation of abundance indices for American menhaden.

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		

= used for abundance indices

= not used for abundance indices

Table 20. Preliminary abundance indices for Atlantic menhaden.

		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	13	0.20	100.0	13	0.07	100.0	1	13	0.00		13	0.00		>1	13	0.20	100.0	13	0.07	100.0
	2009	15	3.57	22.9	15	1.65	30.7		15	3.50	23.5	15	1.63	31.0		15	0.06	100.0	15	0.01	100.0
	2010	13	2.10	46.7	13	1.08	56.7		13	2.08	46.8	13	1.06	57.1		13	0.87	62.7	13	0.36	74.4
Fall	2007	150	0.26	22.0	150	0.09	25.0	0	150	0.14	33.9	150	0.02	62.2	>0	150	0.15	22.1	150	0.08	24.7
	2008	150	0.19	18.6	150	0.07	24.1		150	0.09	30.1	150	0.02	49.2		150	0.13	22.9	150	0.06	25.2
	2009	160	0.18	23.7	160	0.05	28.0		160	0.09	38.4	160	0.01	52.4		160	0.09	27.8	160	0.04	31.9
	2010	150	0.24	23.3	150	0.08	30.4		150	0.15	32.7	150	0.04	48.5		150	0.10	29.7	150	0.04	37.0

Figure 31. Preliminary indices of overall abundance, in terms of number and biomass, of Atlantic menhaden for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

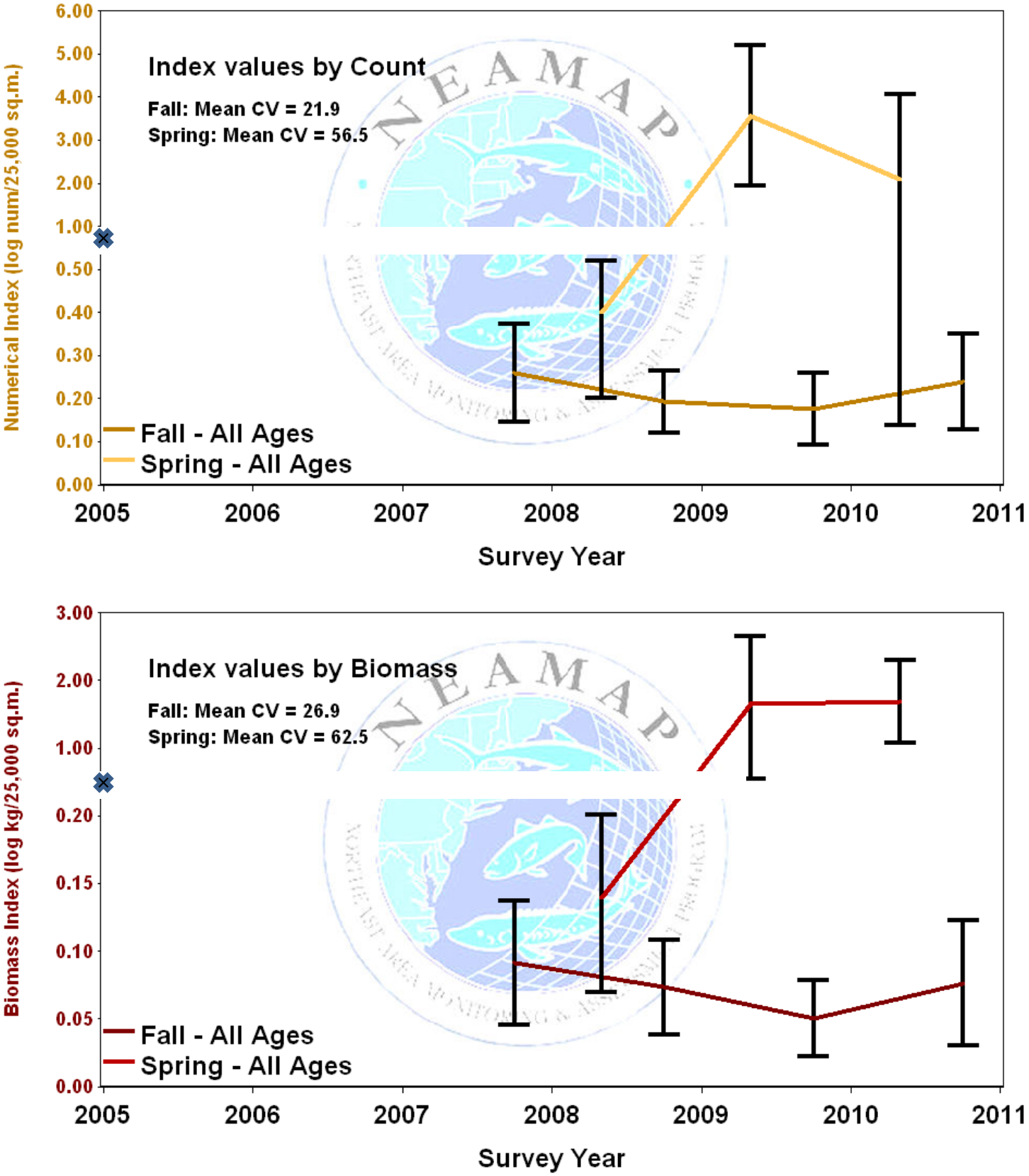


Figure 32. Preliminary indices of abundance, of Atlantic menhaden for spring and fall NEAMAP surveys. Indices are for the youngest age class observed during each survey (count-based indices only) and for all other age classes combined (based both on count and biomass). 95% confidence intervals are provided for each abundance estimate.

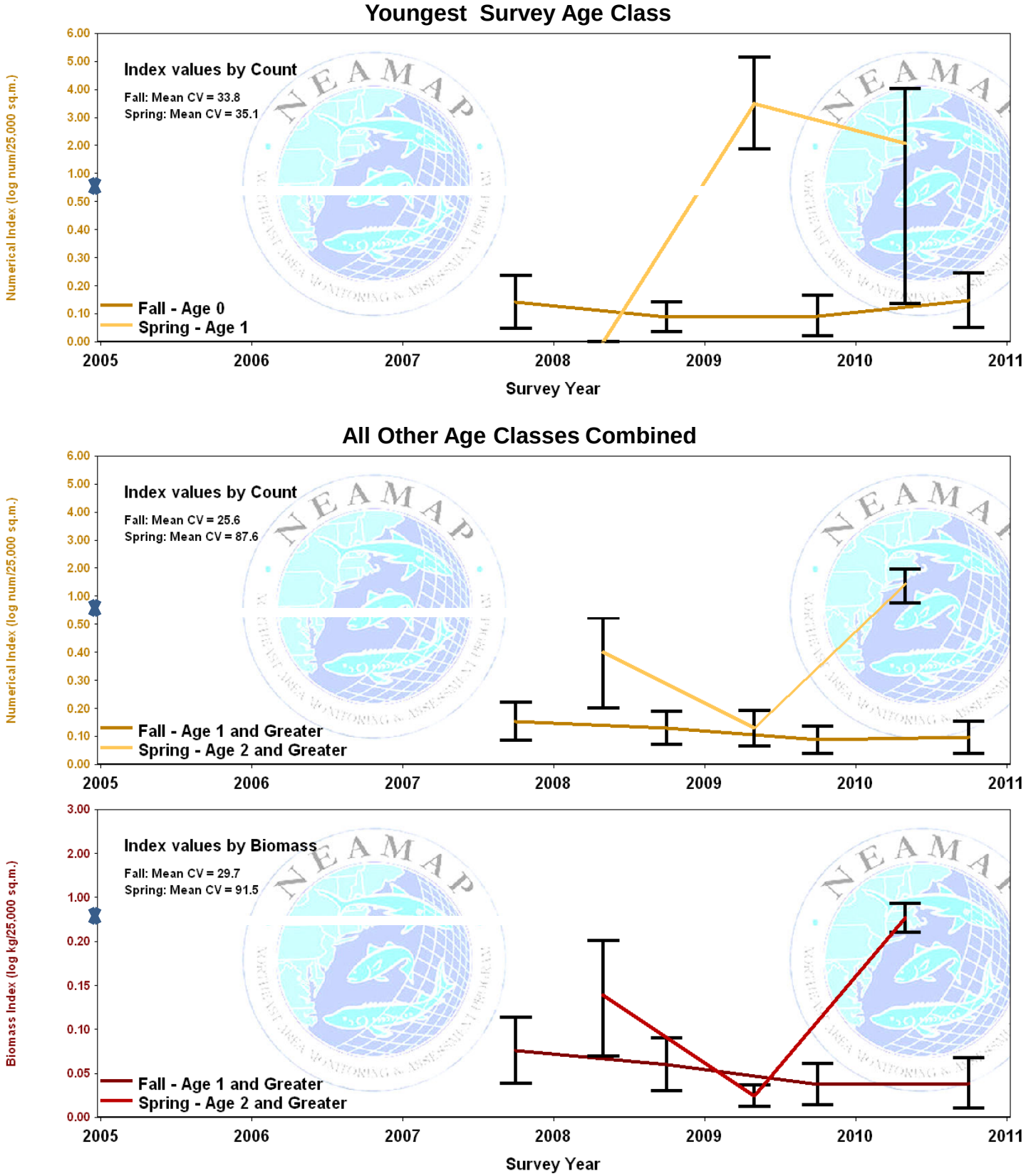


Figure 33. Length-frequency distributions, by cruise, for Atlantic menhaden.

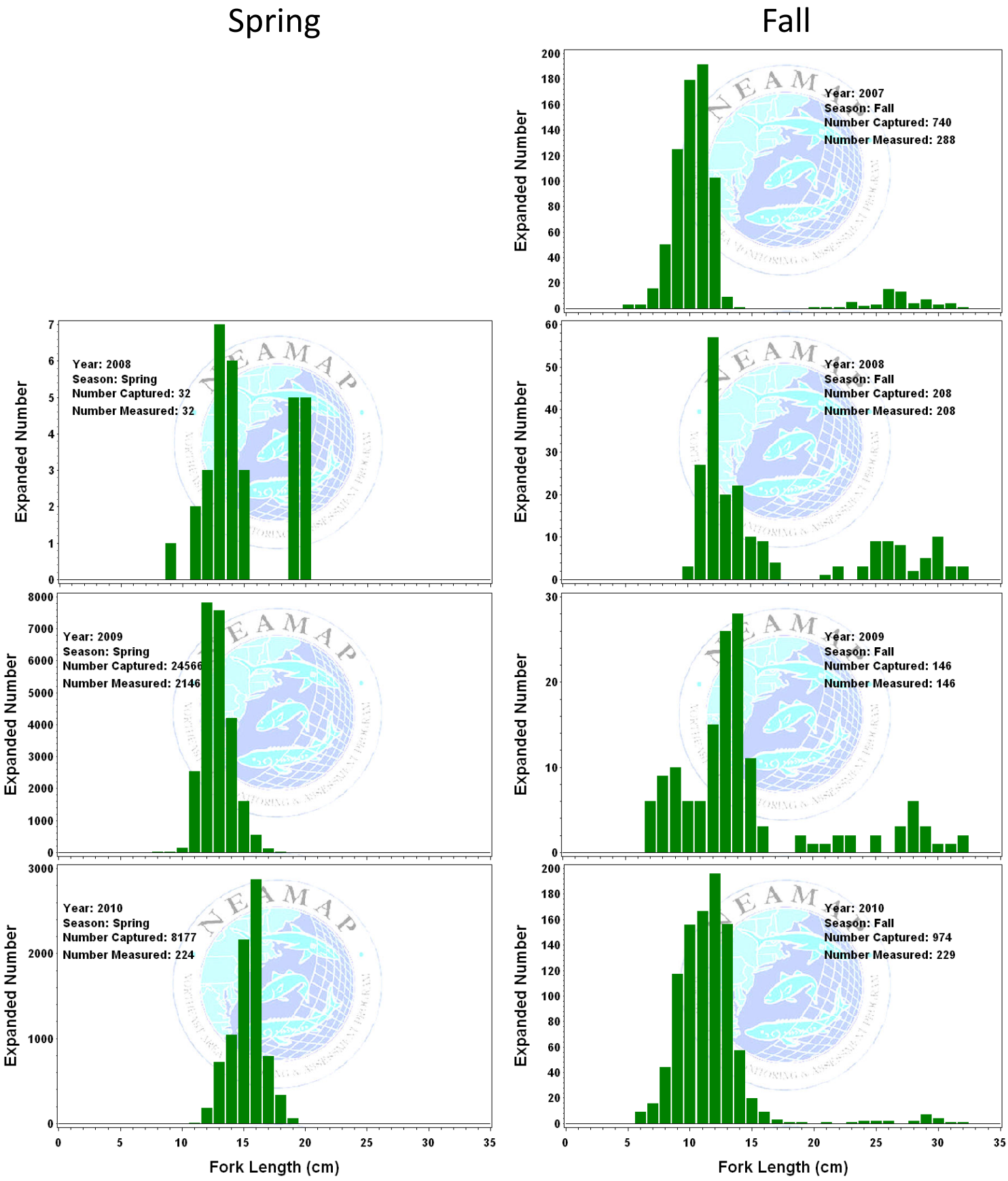


Figure 34. Sex-specific length-frequency distribution, by season, all cruises pooled, for Atlantic menhaden.

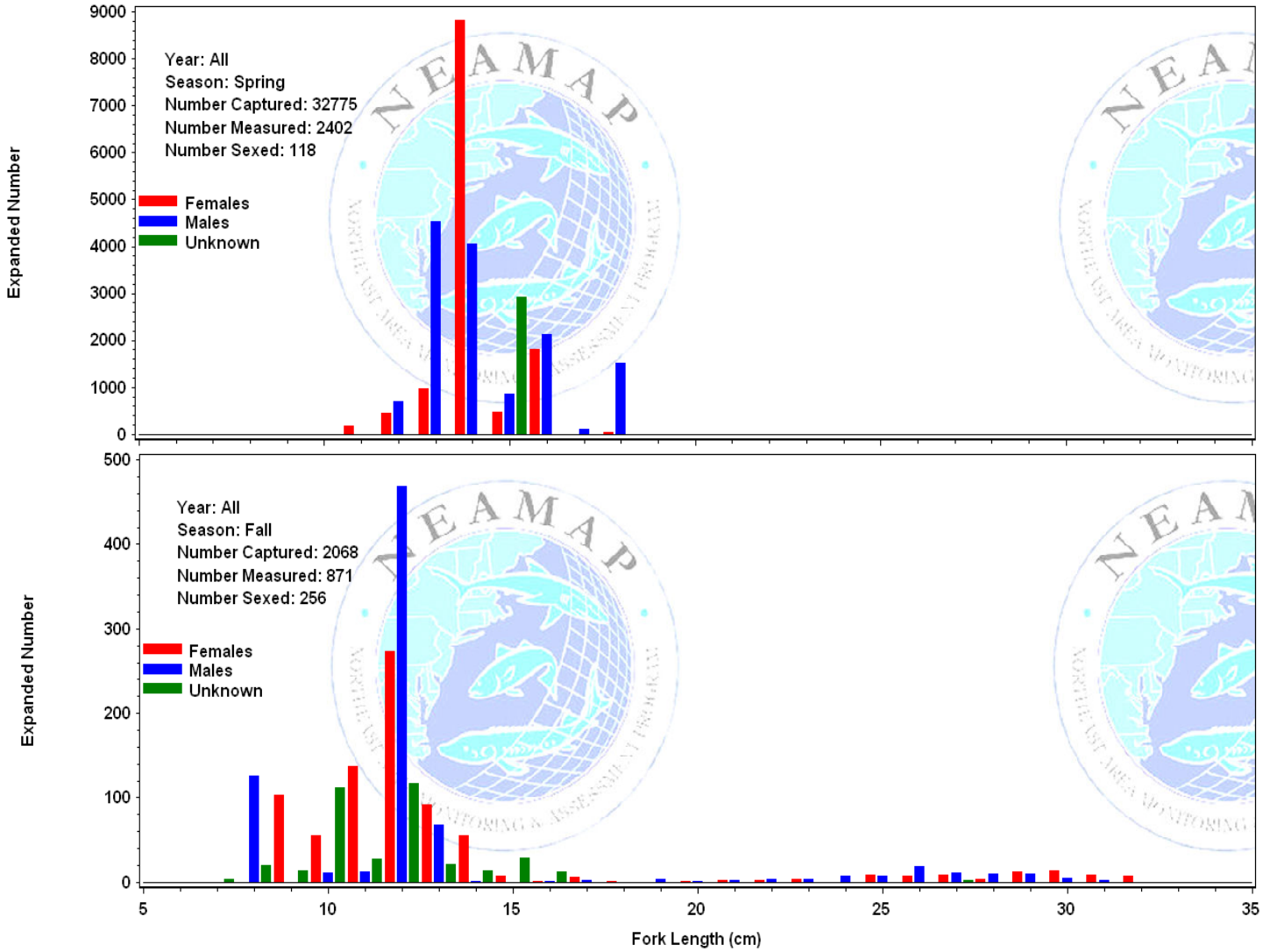
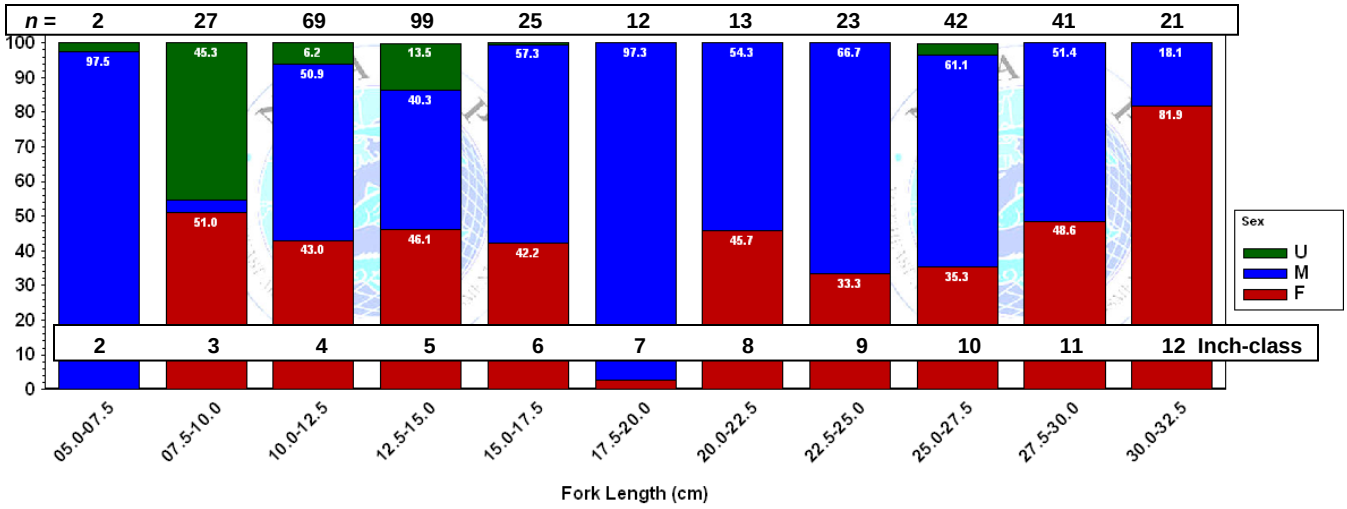


Figure 35. Sex ratio, by length group, for Atlantic menhaden collected all NEAMAP cruises 2007-2010 (The percentages for each category are given in their respective bars. The number sampled for sex determination is provided above each bar, and the length categories expressed in inches are given near the x-axis.).



Bay Anchovy

Sampling Priority: D

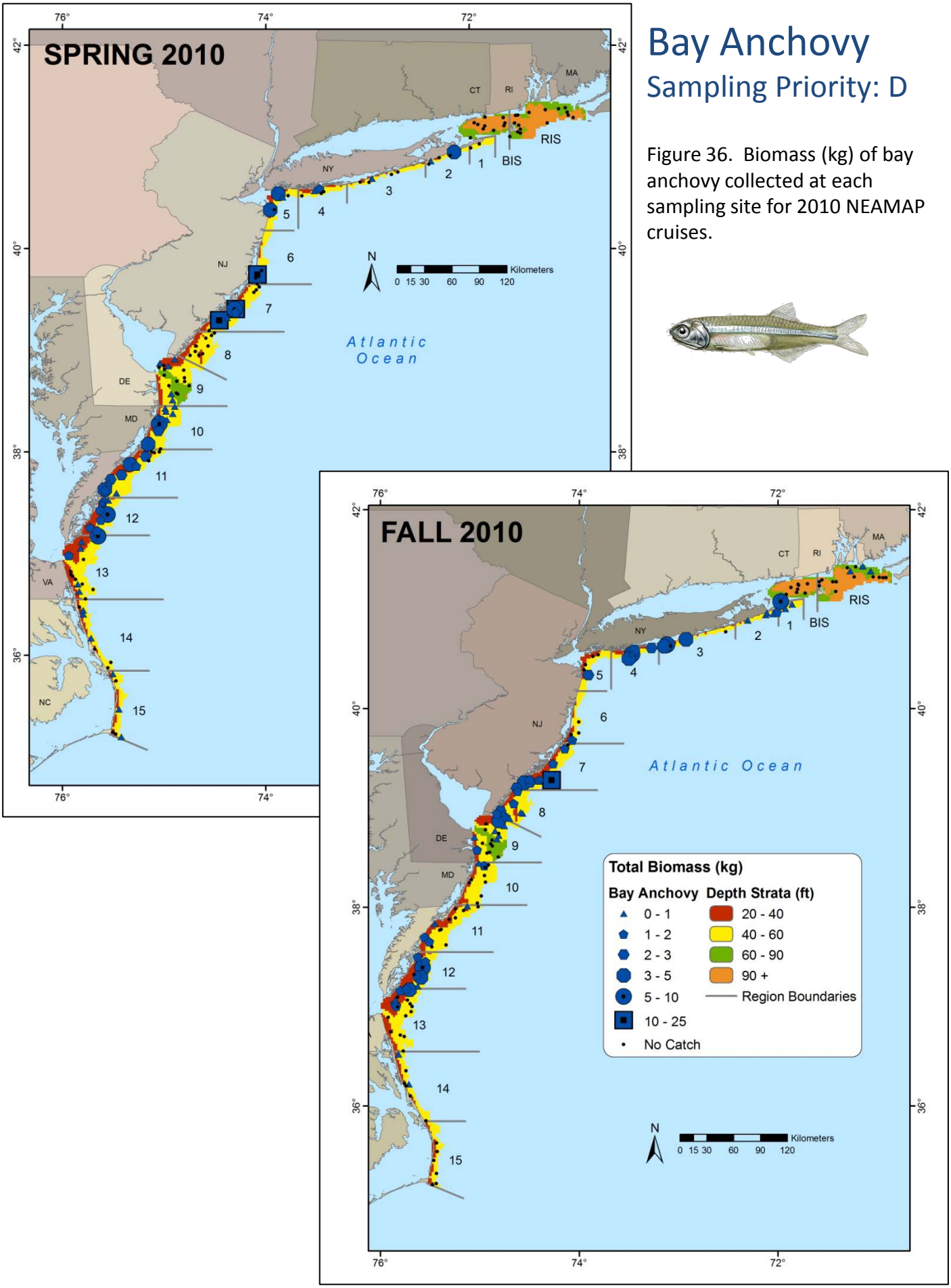


Figure 36. Biomass (kg) of bay anchovy collected at each sampling site for 2010 NEAMAP cruises.

Table 21. Sampling rates of bay anchovy for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught	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	
Fall	2007	119,741	203.4	3,961	0		0	
	2008	35,358	72.6	2,299	0		0	
	2009	48,912	194.3	4,647	0		0	
	2010	49,991	124.7	4,614	0		0	

Table 22. Strata used for calculation of abundance indices for bay anchovy.

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		

= used for abundance indices

= not used for abundance indices

Table 23. Preliminary abundance indices for bay anchovy.

		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	43	4.21	8.5	43	0.55	15.5	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	51	4.92	8.0	51	0.79	11.4	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
	2010	42	4.27	8.2	42	0.74	13.9	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
Fall	2007	118	2.91	8.3	118	0.53	11.4	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
	2008	113	2.32	11.1	113	0.28	16.1	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	122	2.84	7.7	122	0.43	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
	2010	113	3.20	7.6	113	0.46	10.0	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 37. Preliminary indices of overall abundance, in terms of number and biomass, of bay anchovy for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

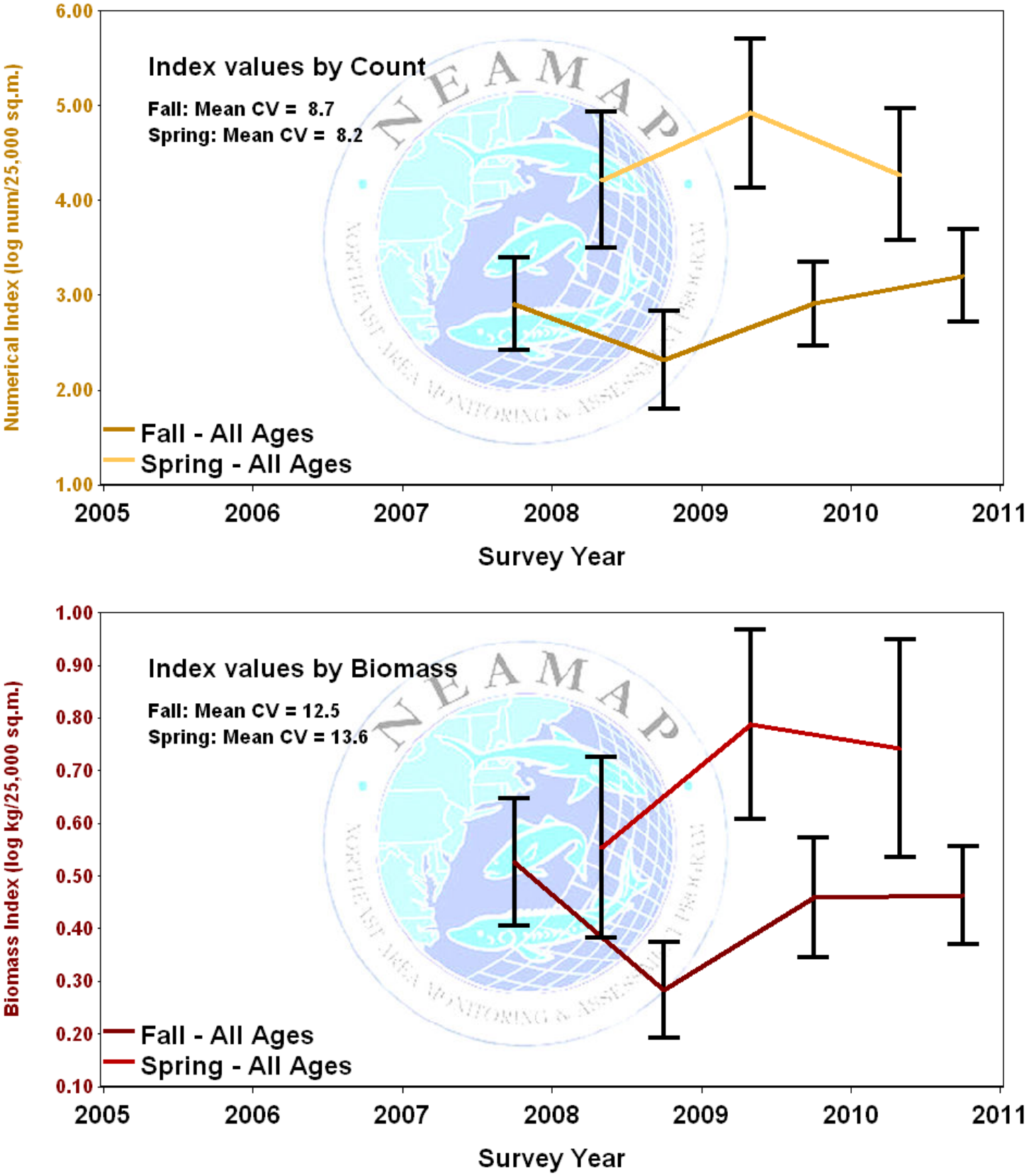
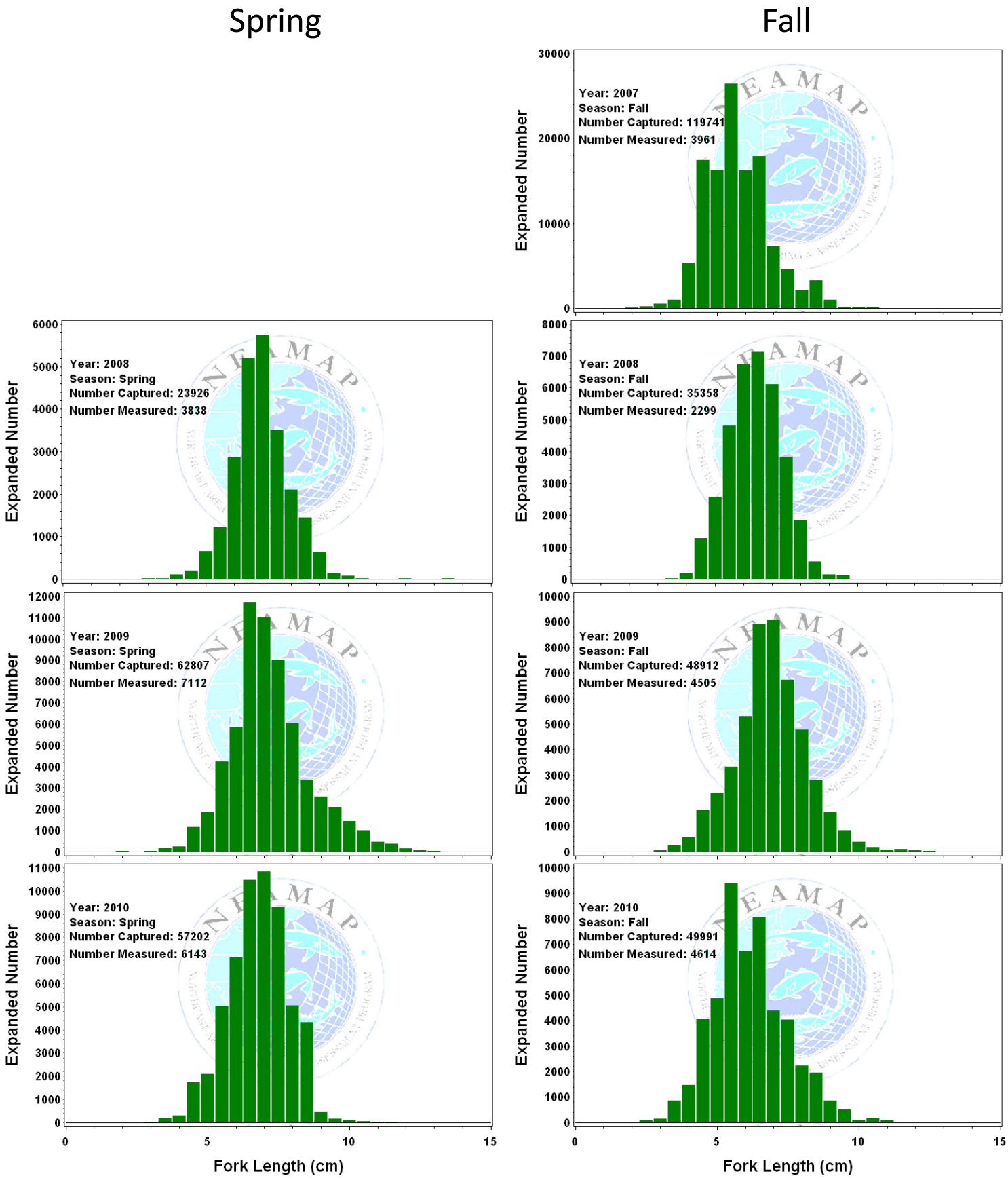


Figure 38. Length-frequency distributions, by cruise, for bay anchovy.



Black Sea Bass

Sampling Priority: A

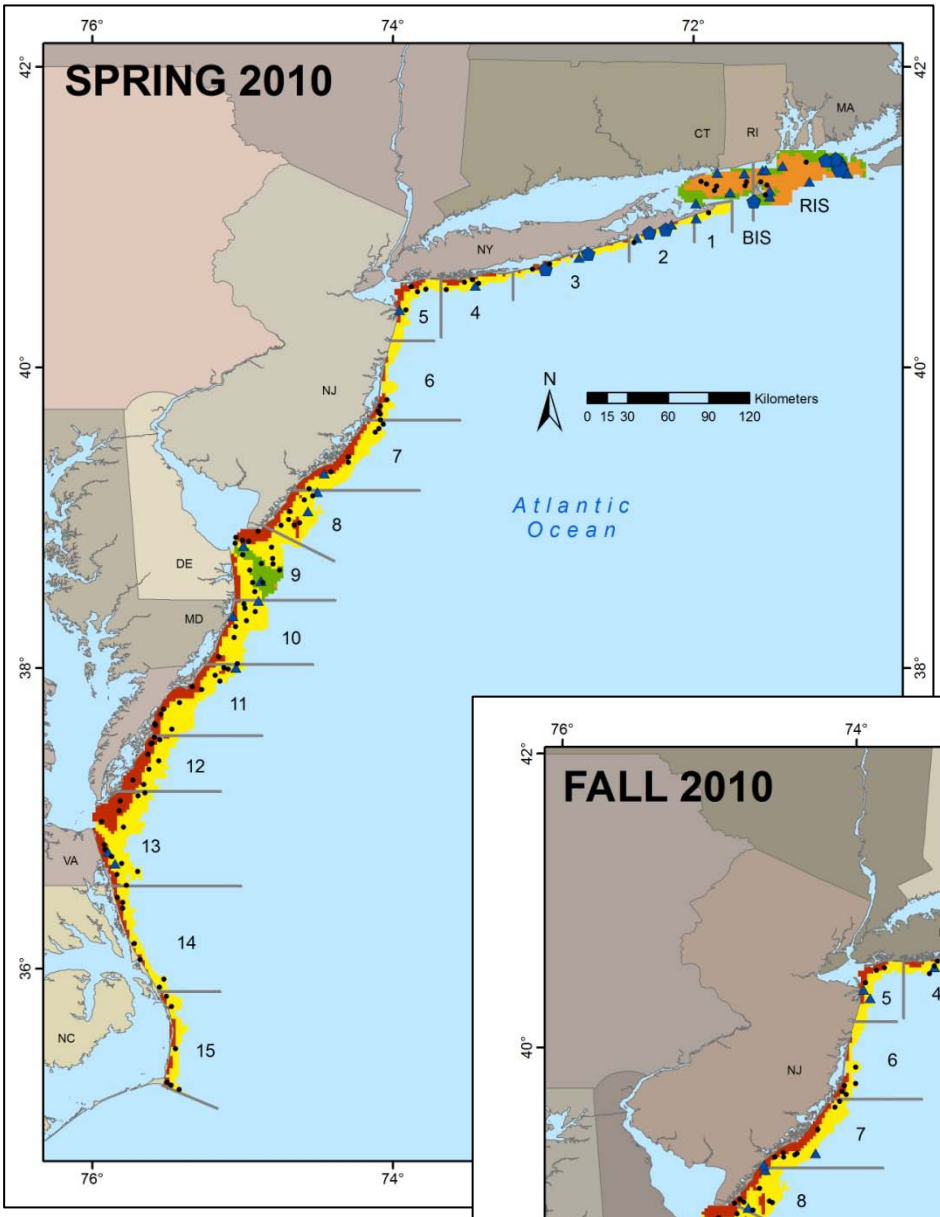
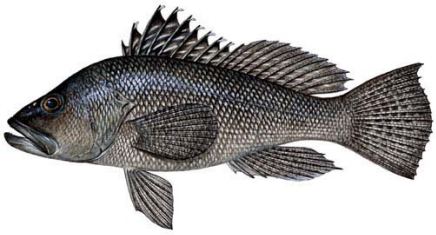


Figure 39. Biomass (kg) of black sea bass collected at each sampling site for 2010 NEAMAP cruises.



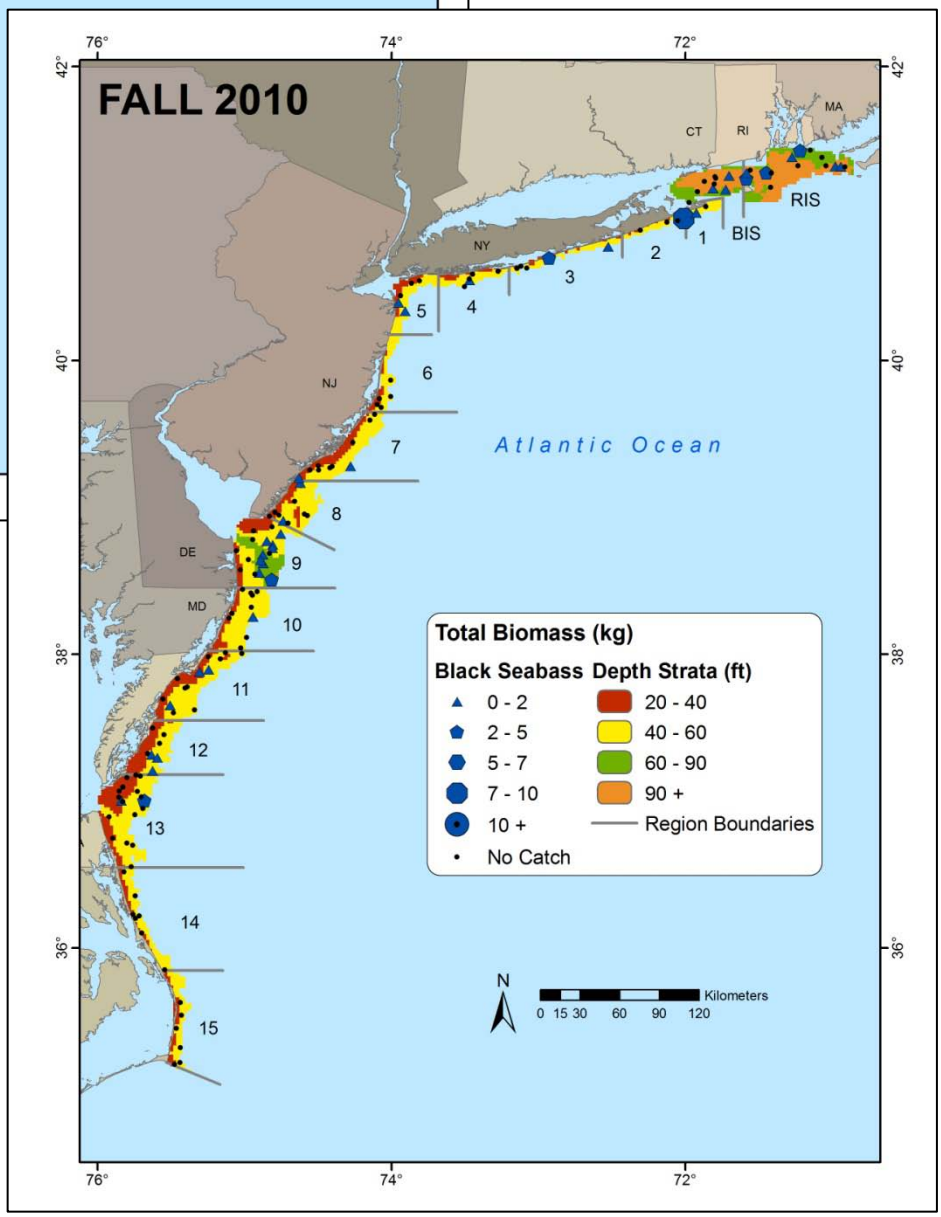


Table 24. Sampling rates and preserved specimen analysis status of black sea bass for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught	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	95	88
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	

Table 25. Strata used for calculation of abundance indices for black sea bass.

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		

= used for abundance indices

= not used for abundance indices

Table 26. Preliminary abundance indices for black sea bass.

		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	44	1.00	11.4	44	0.78	12.8	1	44	0.05	45.8	44	0.00	49.0	>1	44	0.97	11.6	44	0.78	12.9
	2009	47	0.99	9.7	47	0.61	13.5		47	0.20	27.4	47	0.01	28.8		47	0.86	10.1	47	0.60	13.8
	2010	43	0.84	13.5	43	0.59	15.1		43	0.02	44.2	43	0.00	49.6		43	0.83	13.6	43	0.59	15.1
Fall	2007	150	0.61	11.5	150	0.24	16.7	0	150	0.04	46.1	150	0.00	61.1	>0	150	0.60	11.7	150	0.24	16.8
	2008	150	0.38	13.8	150	0.14	24.9		150	0.08	25.6	150	0.00	47.6		150	0.31	15.8	150	0.14	25.4
	2009	160	0.50	14.7	160	0.23	19.6		160	0.10	25.2	160	0.00	57.1		160	0.44	16.3	160	0.22	19.7
	2010	150	0.31	14.6	150	0.15	17.7		150	0.02	44.8	150	0.00	41.9		150	0.30	15.2	150	0.15	17.7

Figure 40. Preliminary indices of overall abundance, in terms of number and biomass, of black sea bass for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

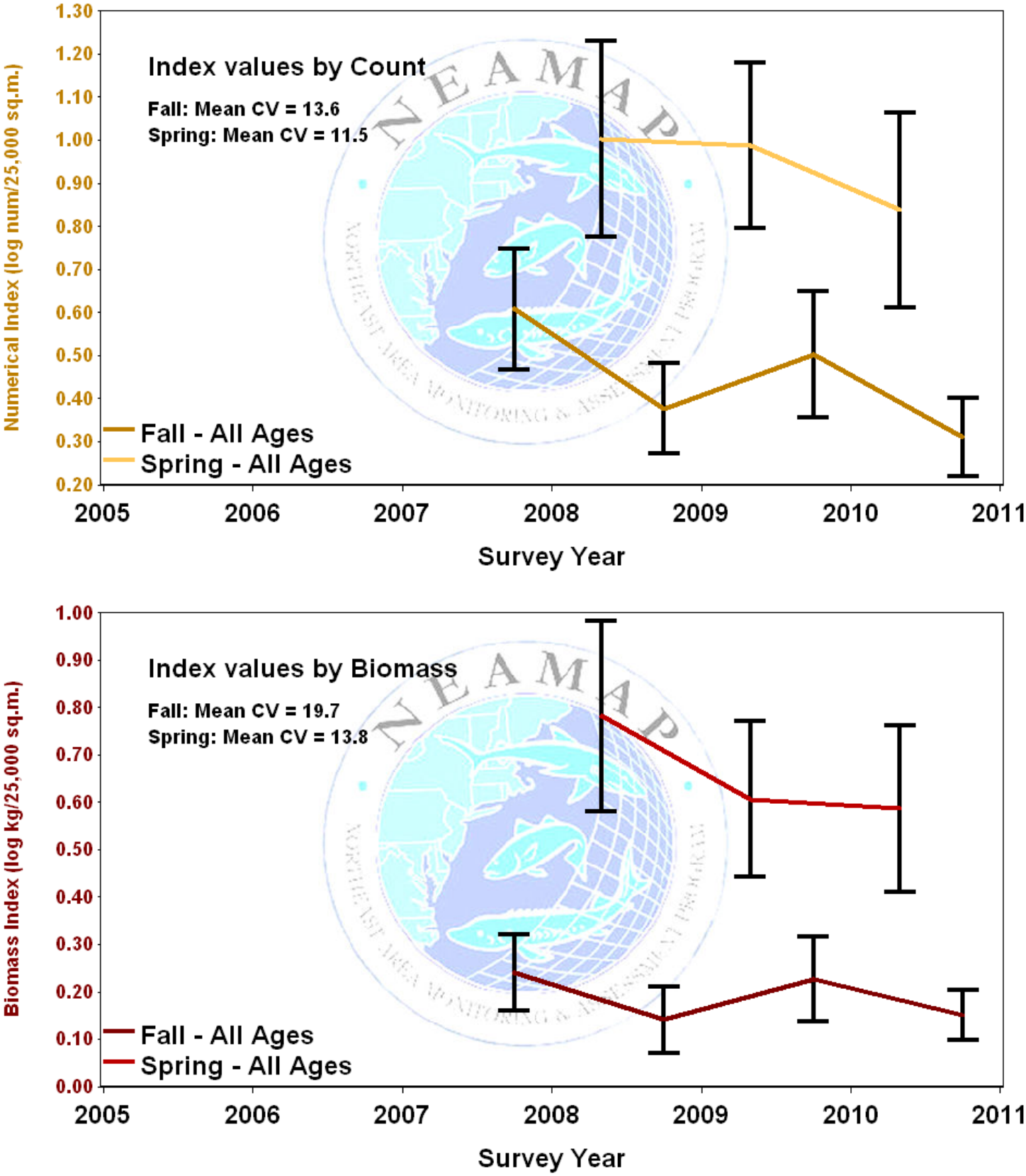


Figure 41. Preliminary indices of abundance, of black sea bass for spring and fall NEAMAP surveys. Indices are for the youngest age class observed during each survey (count-based indices only) and for all other age classes combined (based both on count and biomass). 95% confidence intervals are provided for each abundance estimate.

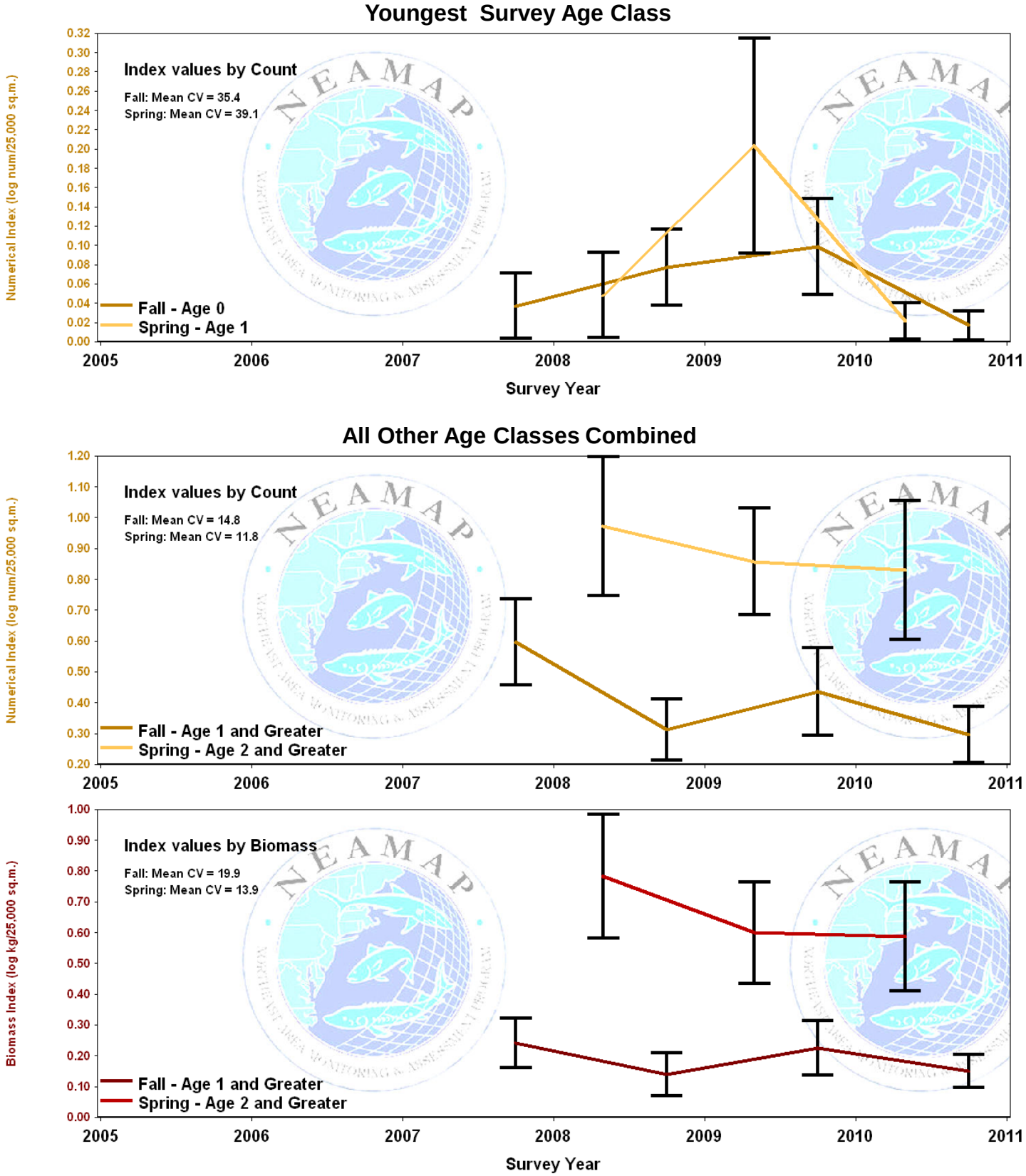


Figure 42. Length-frequency distributions, by cruise, for black sea bass.

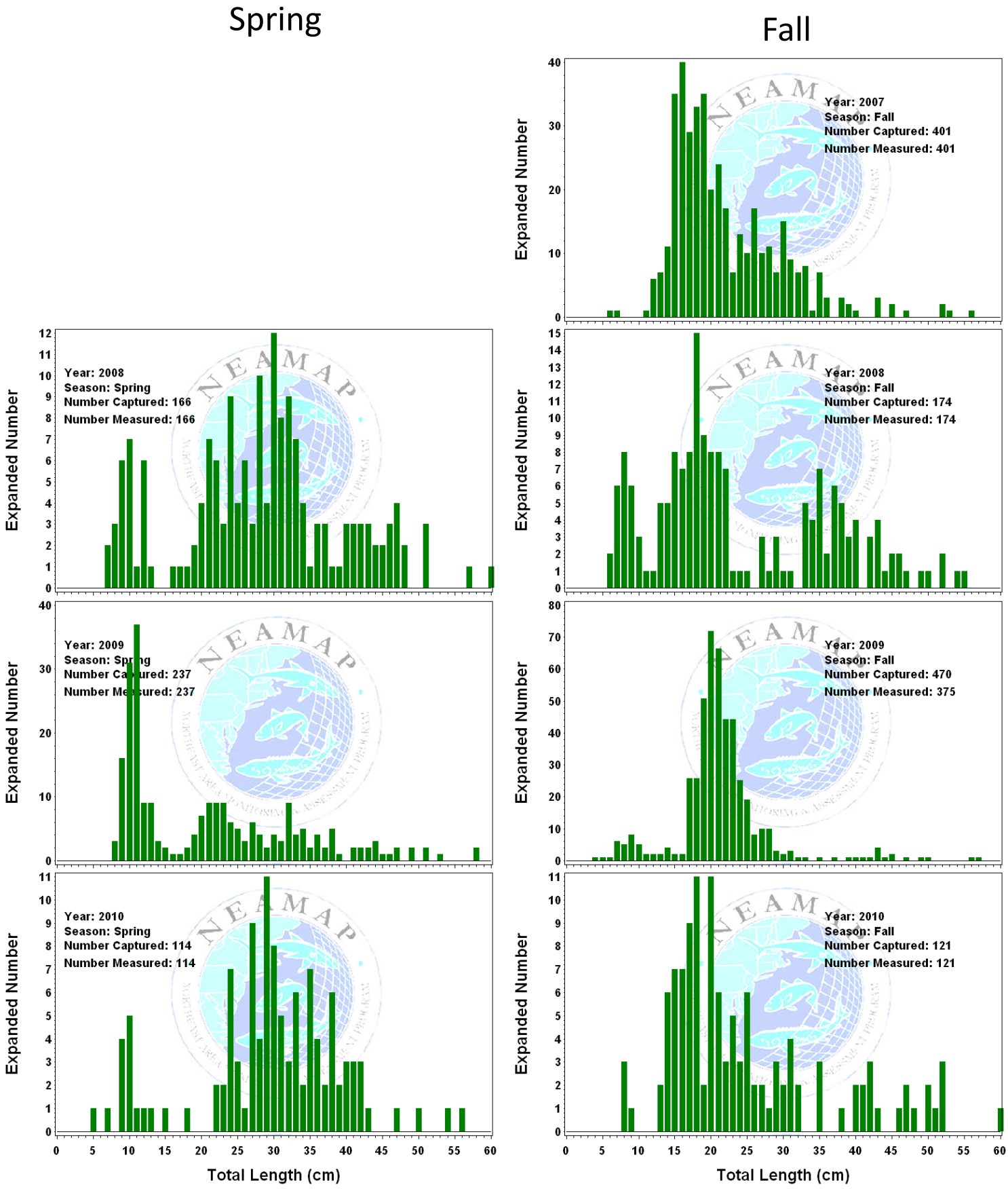


Figure 43. Sex-specific length-frequency distribution, by season, all cruises pooled, for black sea bass.

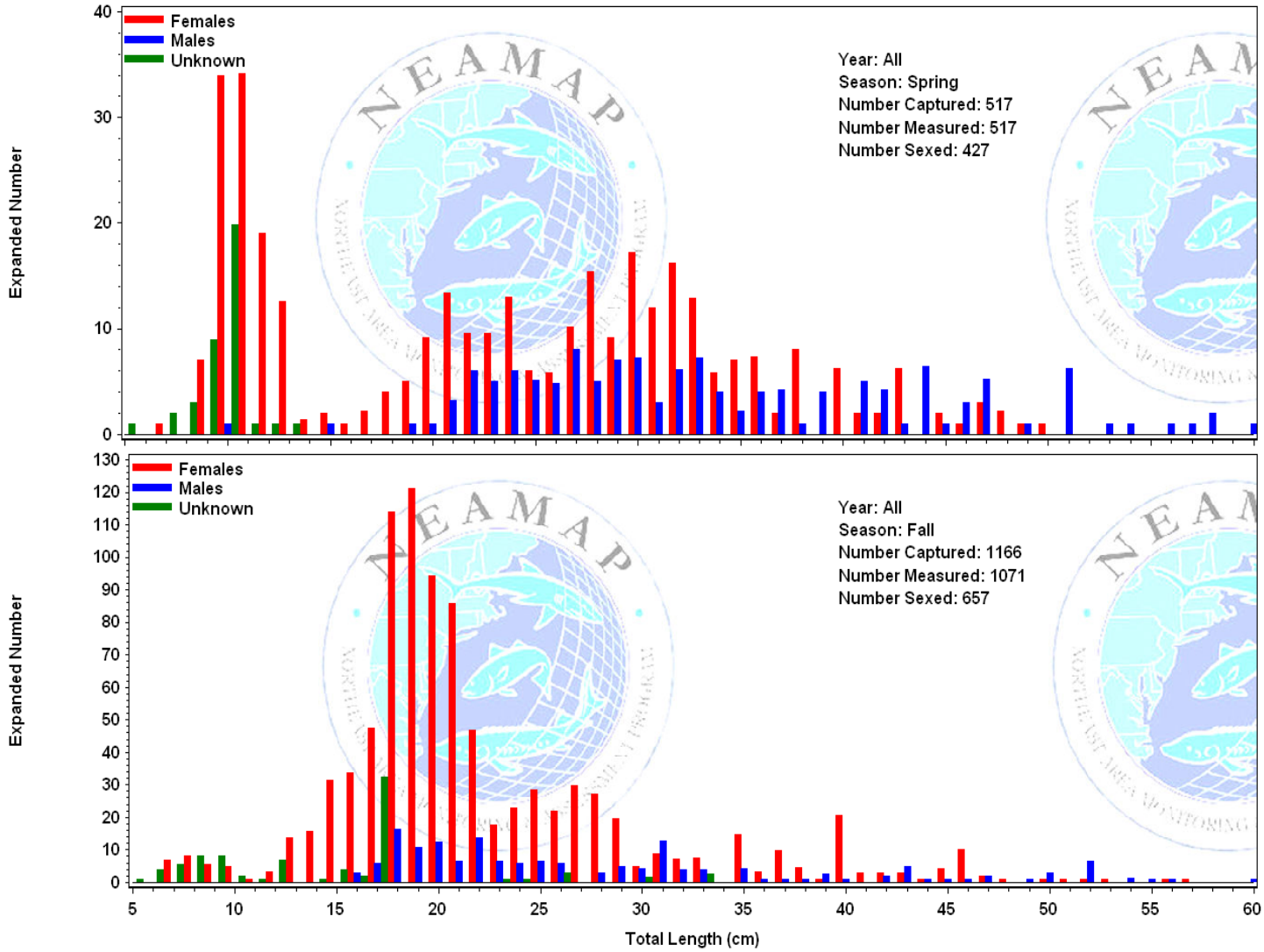


Figure 44. Sex ratio, by length group, for black sea bass collected all NEAMAP cruises 2007-2010 (The percentages for each category are given in their respective bars. The number sampled for sex determination is provided above each bar, and the length categories expressed in inches are given near the x-axis).

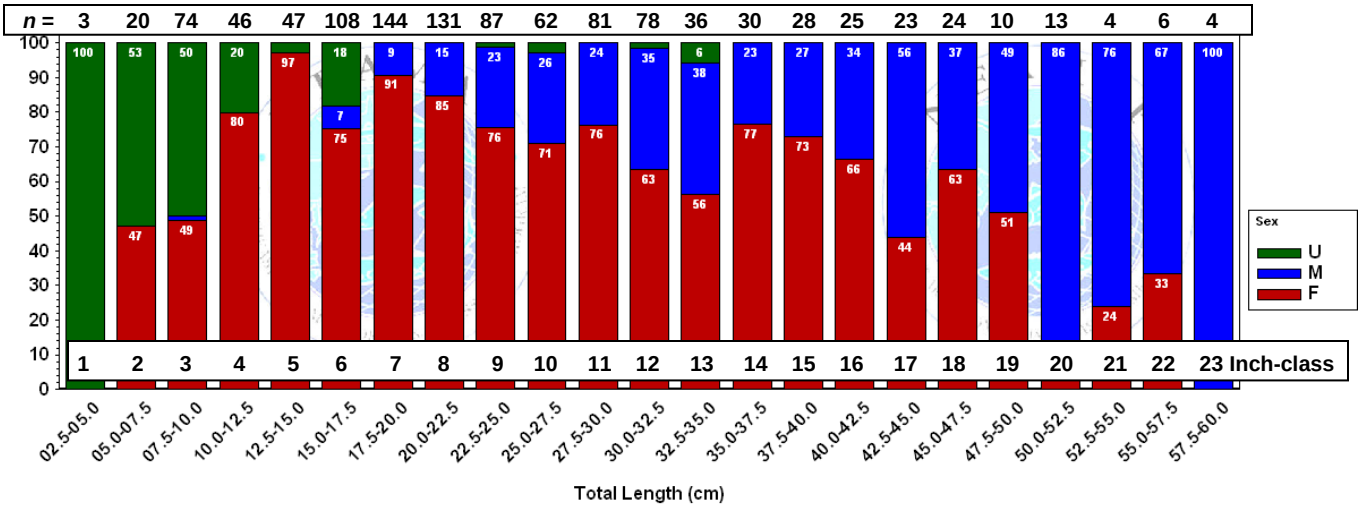
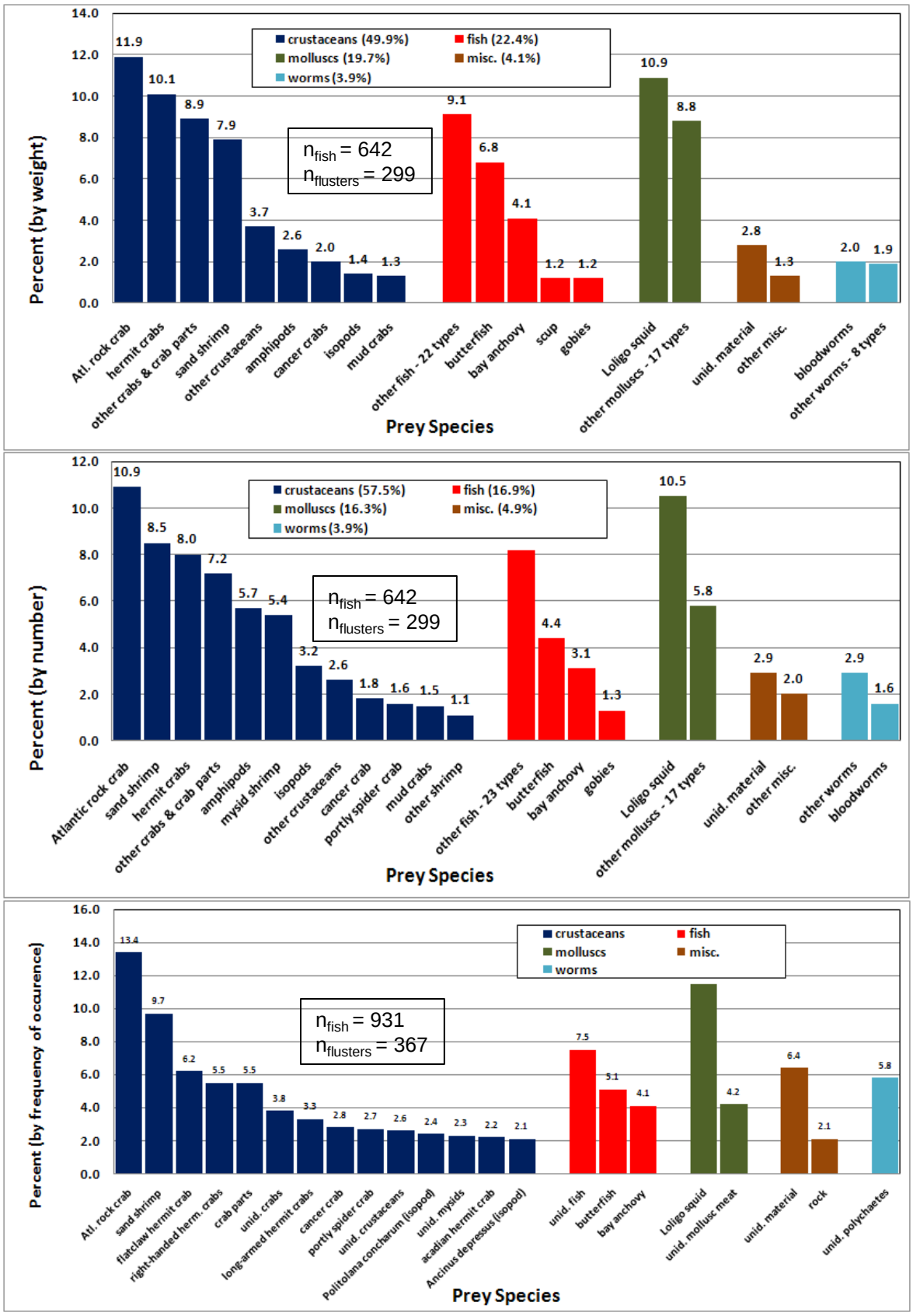


Figure 45. Diet composition, expressed as percent by weight, by number, and by frequency of occurrence* of black sea bass collected during NEAMAP cruises in 2007-2009 (The number of fish sampled for diet is given by n_{fish}, while $n_{clusters}$ indicates the number of clusters of the black sea bass sampled.)



* As prey types cannot be additively combined under frequency of occurrence analysis, only those prey types with at least a 2% value are shown here: 106 other prey types were observed in stomachs for this species. Similarly, sums for broad taxonomic groups are not calculated.

Blueback Herring

Sampling Priority: A

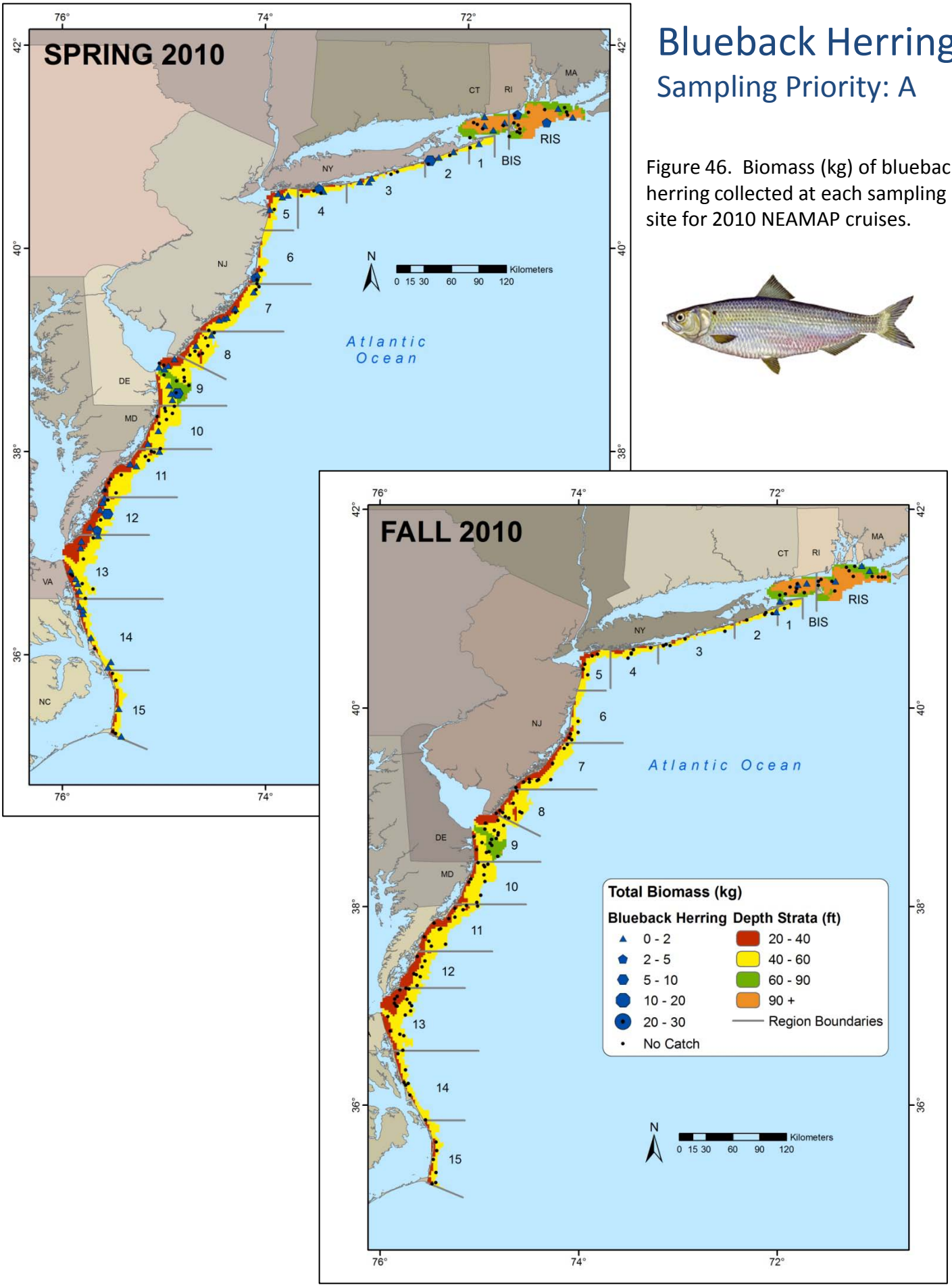


Figure 46. Biomass (kg) of blueback herring collected at each sampling site for 2010 NEAMAP cruises.

Table 27. Sampling rates and preserved specimen analysis status of blueback herring for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught	Number Measured	Age Specimens	Ages Read	Stomach Specimens	Stomachs Analyzed
Spring	2008	3,693	62.2	1,774	237	0	235	
	2009	5,603	160.3	2,808	315	0	315	
	2010	4,992	86.6	2,436	280	0	274	19
Fall	2007	50	1.6	50	18	0	18	
	2008	20	0.7	20	9	0	9	
	2009	15	0.6	15	6	0	6	6
	2010	22	0.6	22	15	0	14	

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

State (Nominal)	Region	Depth Stratum	Spring Index	Fall Index
RI	RIS	60-90		N/A
		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		N/A
		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 29. Preliminary abundance indices for blueback herring.

		All Ages							Youngest Survey Age Class							All Other Age Classes						
Season	Year	Numerical Index			Biomass Index			Age	Numerical Index			Biomass Index			Age	Numerical Index			Biomass Index			
		n	Index	CV (%)	n	Index	CV (%)		n	Index	CV (%)	n	Index	CV (%)		n	Index	CV (%)	n	Index	CV (%)	
Spring	2008	150	1.02	11.9	150	0.18	18.5	1	150	0.87	13.1	150	0.13	21.1	>1	150	0.31	21.7	150	0.07	26.7	
	2009	160	1.19	10.7	160	0.29	15.4		160	0.79	13.8	160	0.14	21.3		160	0.71	13.6	160	0.19	18.4	
	2010	150	1.10	12.0	150	0.19	20.2		150	0.98	13.1	150	0.16	22.3		150	0.26	20.9	150	0.04	32.4	
Fall	2007	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	N/A	N/A	N/A	N/A	N/A	N/A	
	2008		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	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	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	N/A	N/A		N/A	N/A	N/A	N/A	N/A	N/A	

Figure 47. Preliminary indices of overall abundance, in terms of number and biomass, of blueback herring for spring NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

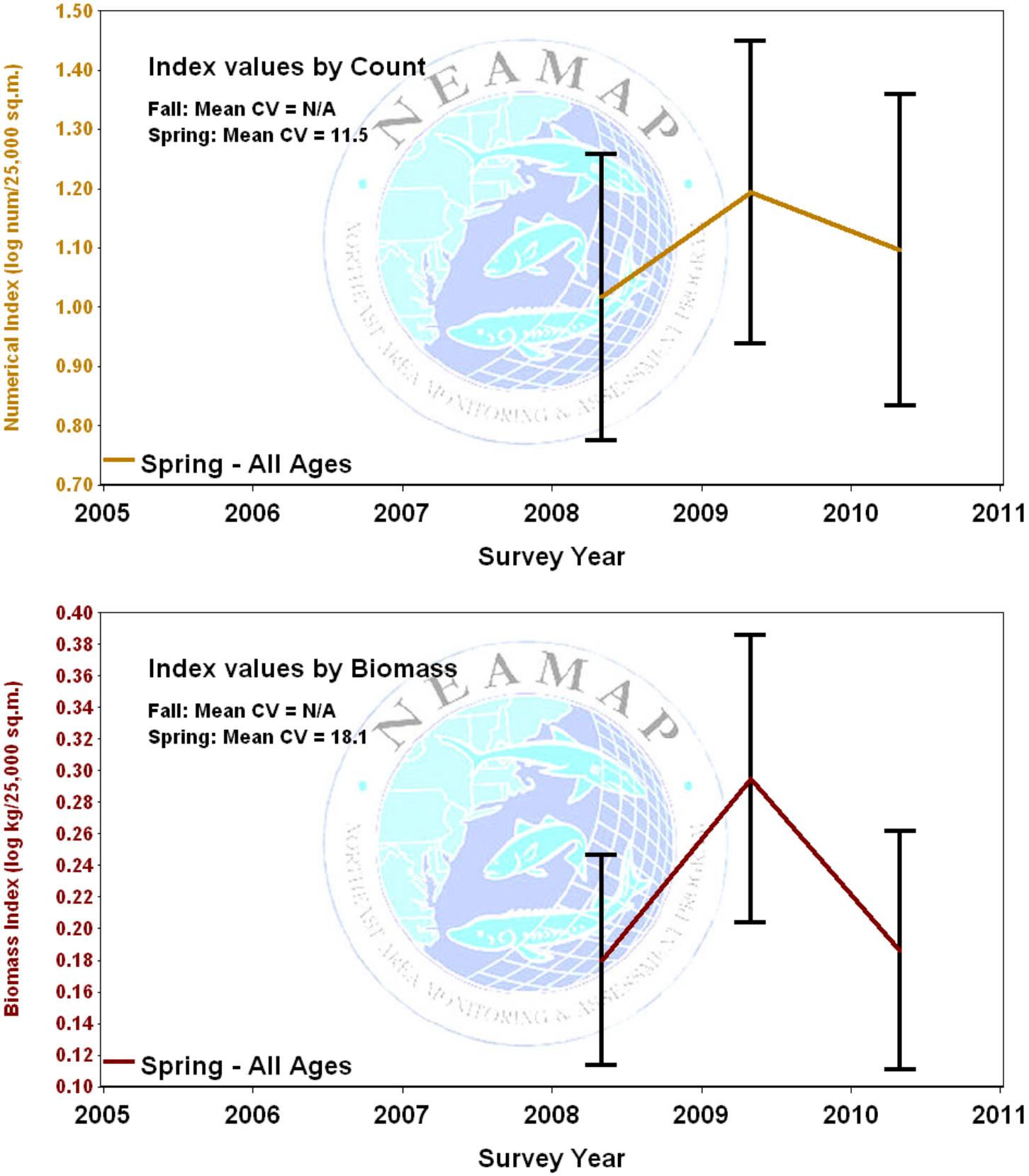


Figure 48. Preliminary indices of abundance, of blueback herring for spring NEAMAP surveys. Indices are for the youngest age class observed during each survey (count-based indices only) and for all other age classes combined (based both on count and biomass). 95% confidence intervals are provided for each abundance estimate.

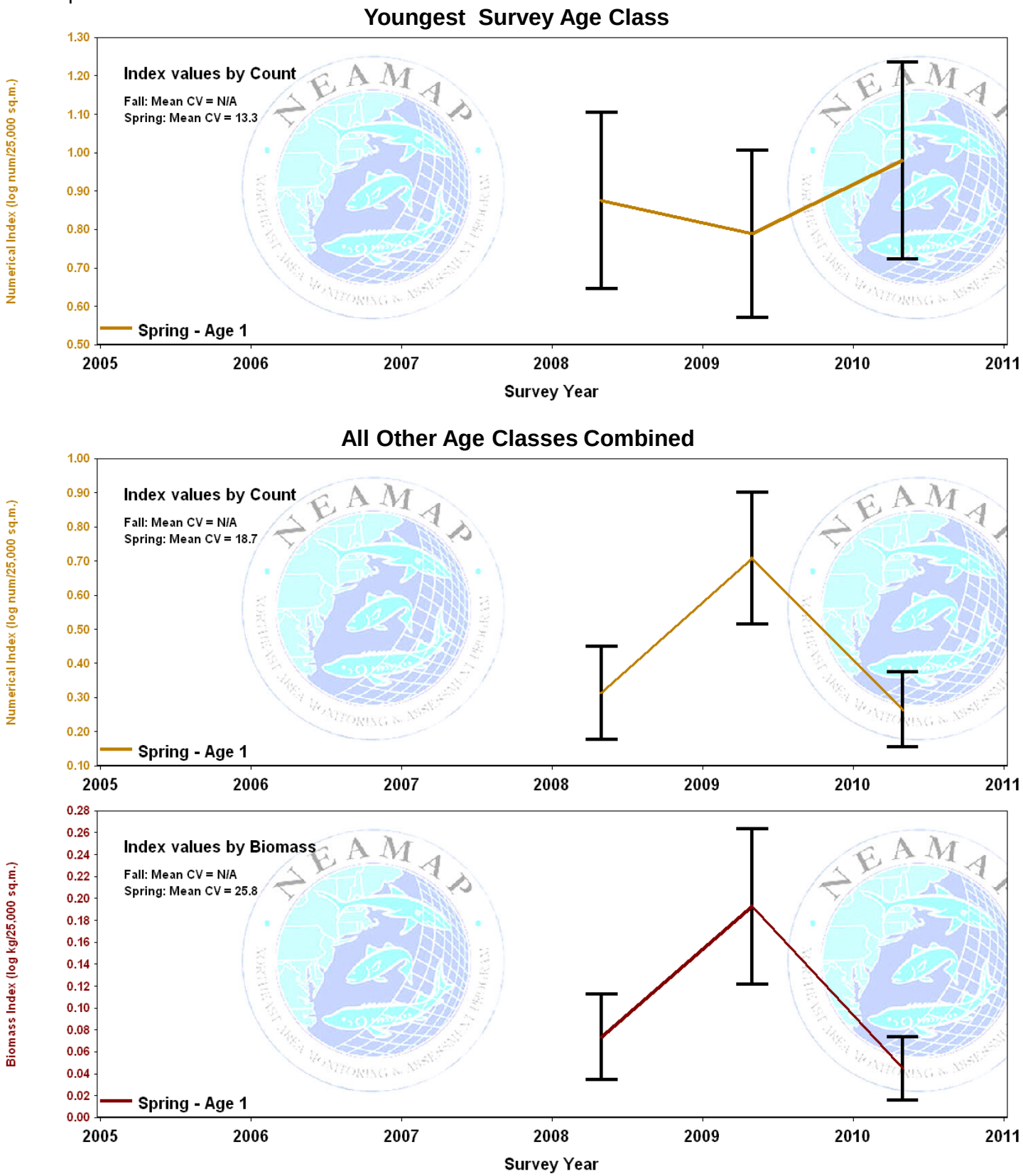


Figure 49. Length-frequency distributions, by cruise, for blueback herring.

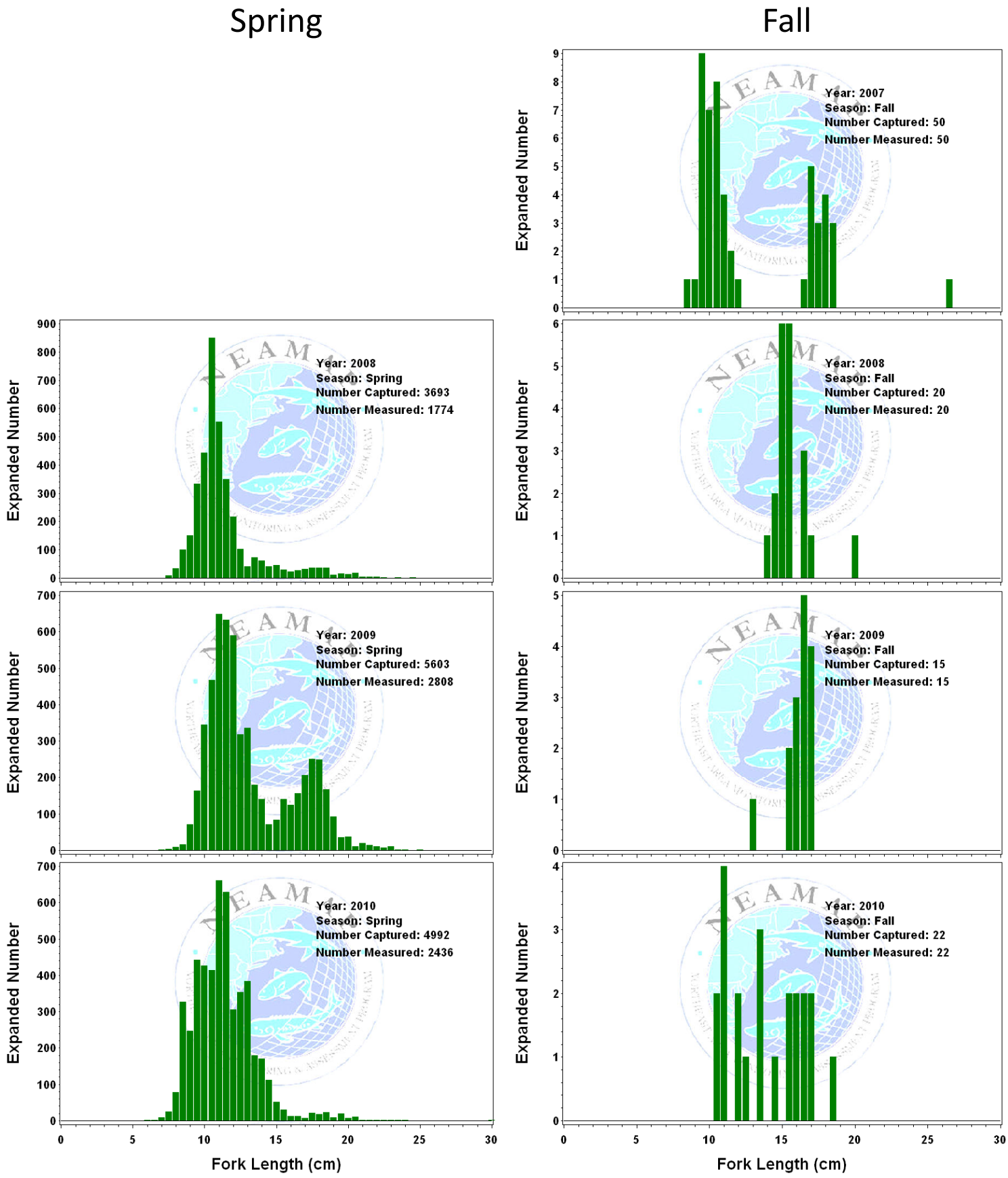


Figure 50. Sex-specific length-frequency distribution, by season, all cruises pooled, for blueback herring.

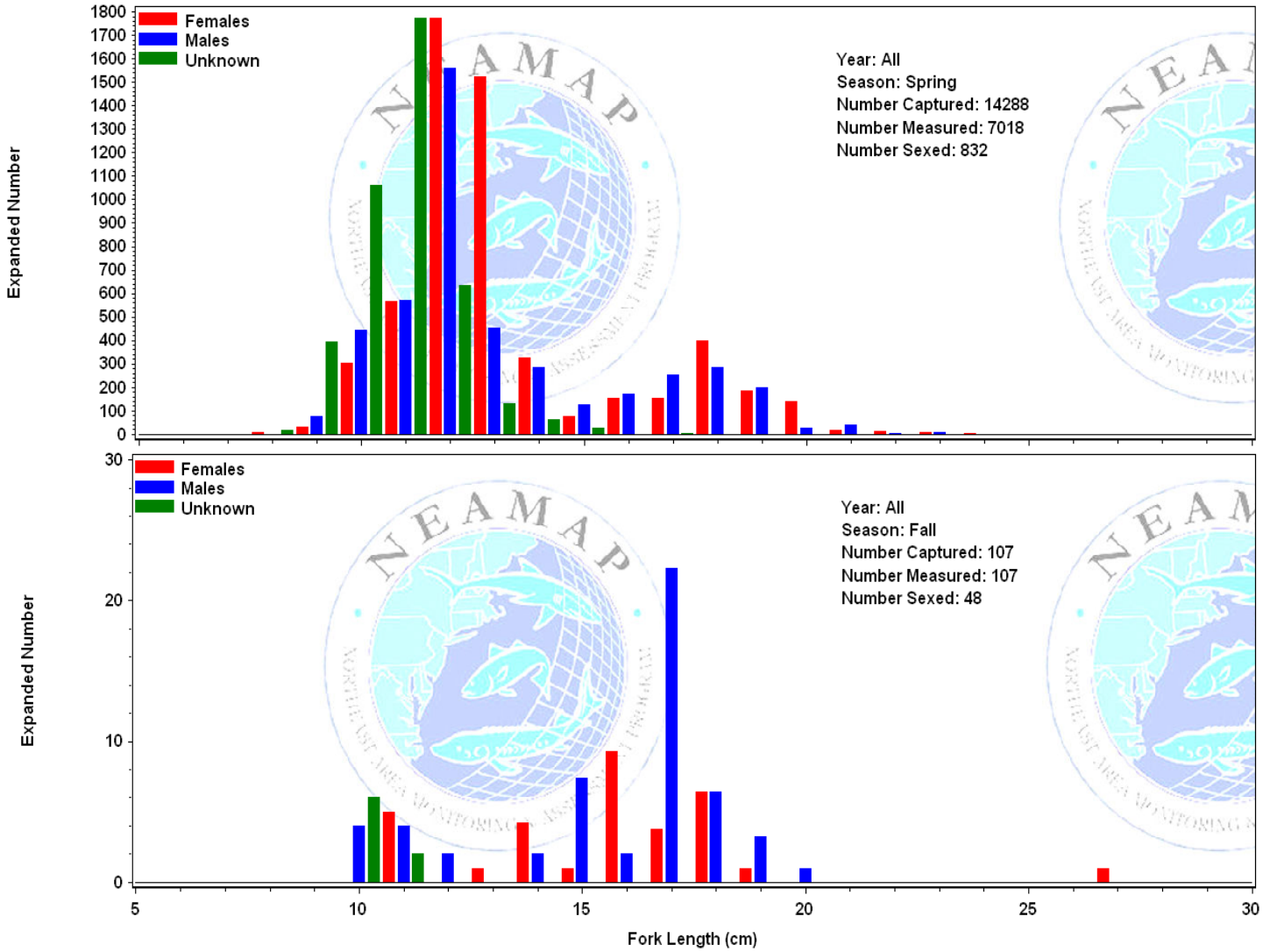
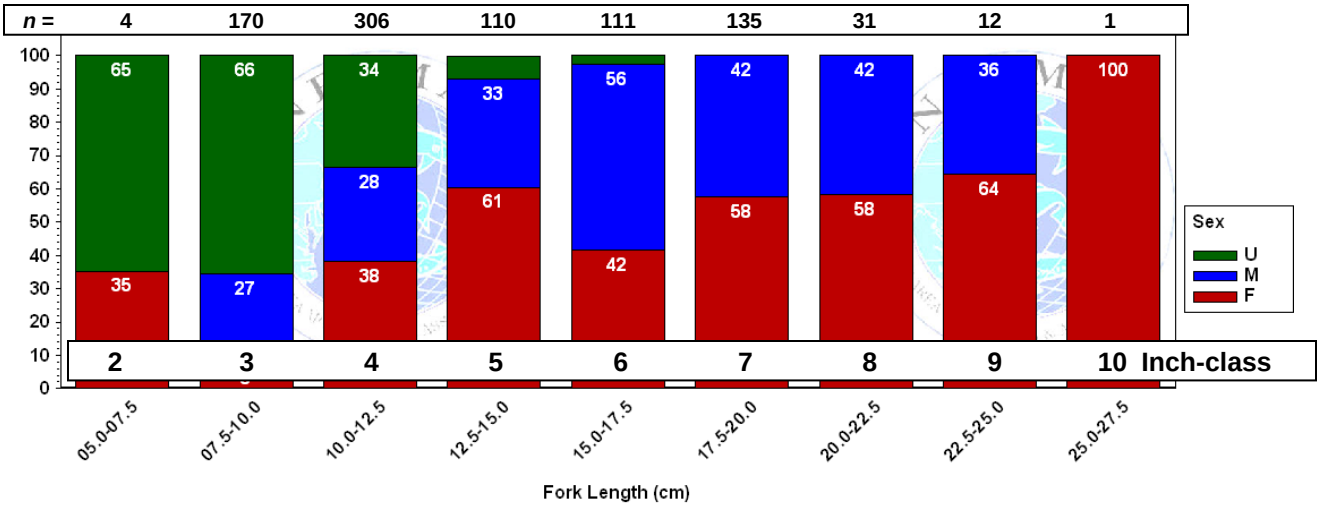


Figure 51. Sex ratio, by length group, for blueback herring collected all NEAMAP cruises 2007-2010 (The percentages for each category are given in their respective bars. The number sampled for sex determination is provided above each bar, and the length categories expressed in inches are given near the x-axis.).



Bluefish

Sampling Priority: A

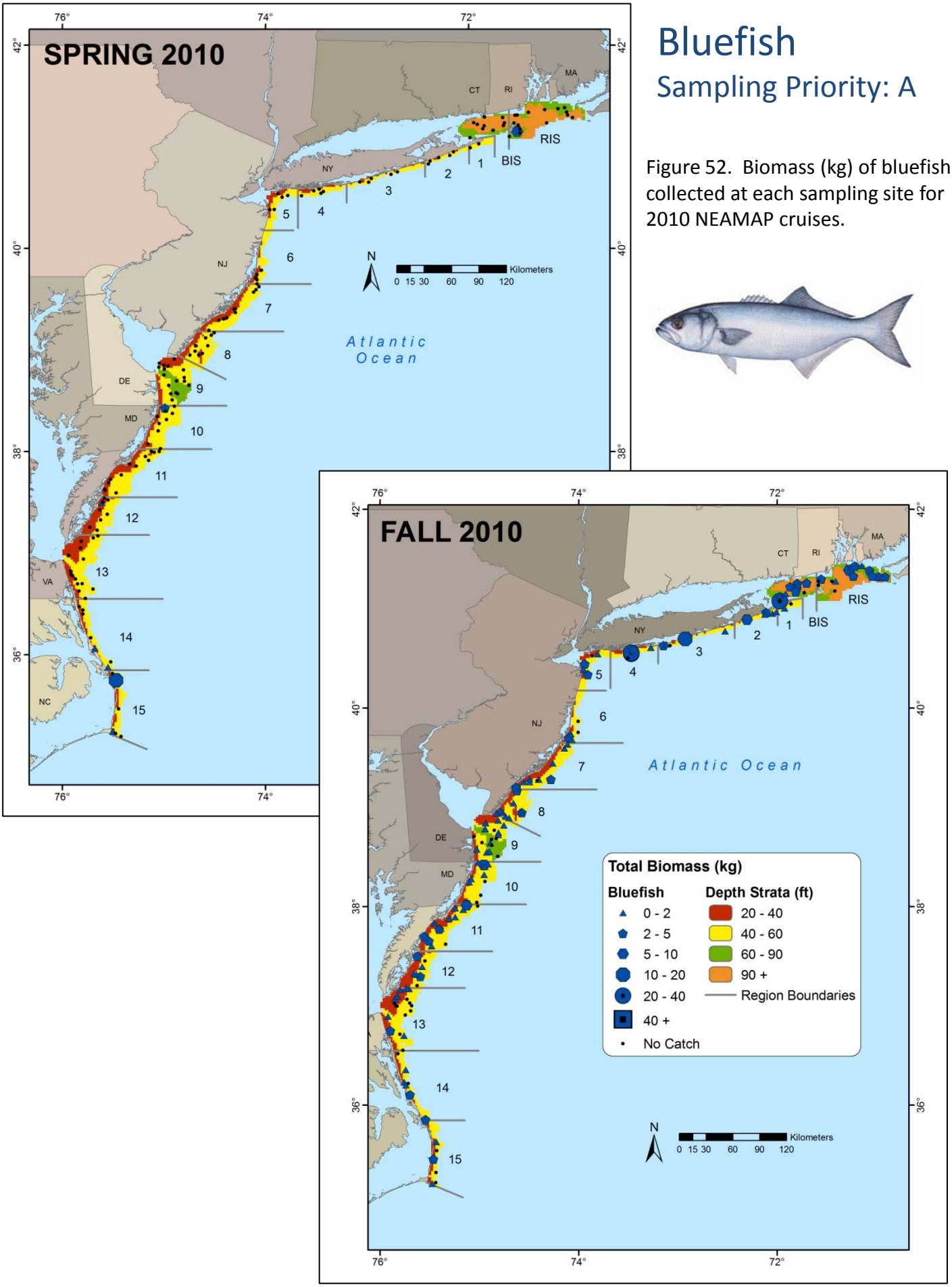


Figure 52. Biomass (kg) of bluefish collected at each sampling site for 2010 NEAMAP cruises.

Table 30. Sampling rates and preserved specimen analysis status of bluefish for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught	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
Fall	2007	4,635	394.5	2,613	588	588	485	476
	2008	7,120	908.7	2,214	529	0	409	401
	2009	18,075	910.7	4,016	632	0	432	416
	2010	4,432	271.6	1,967	498	0	379	

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

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							
	08	20-40							
		40-60							

= used for abundance indices

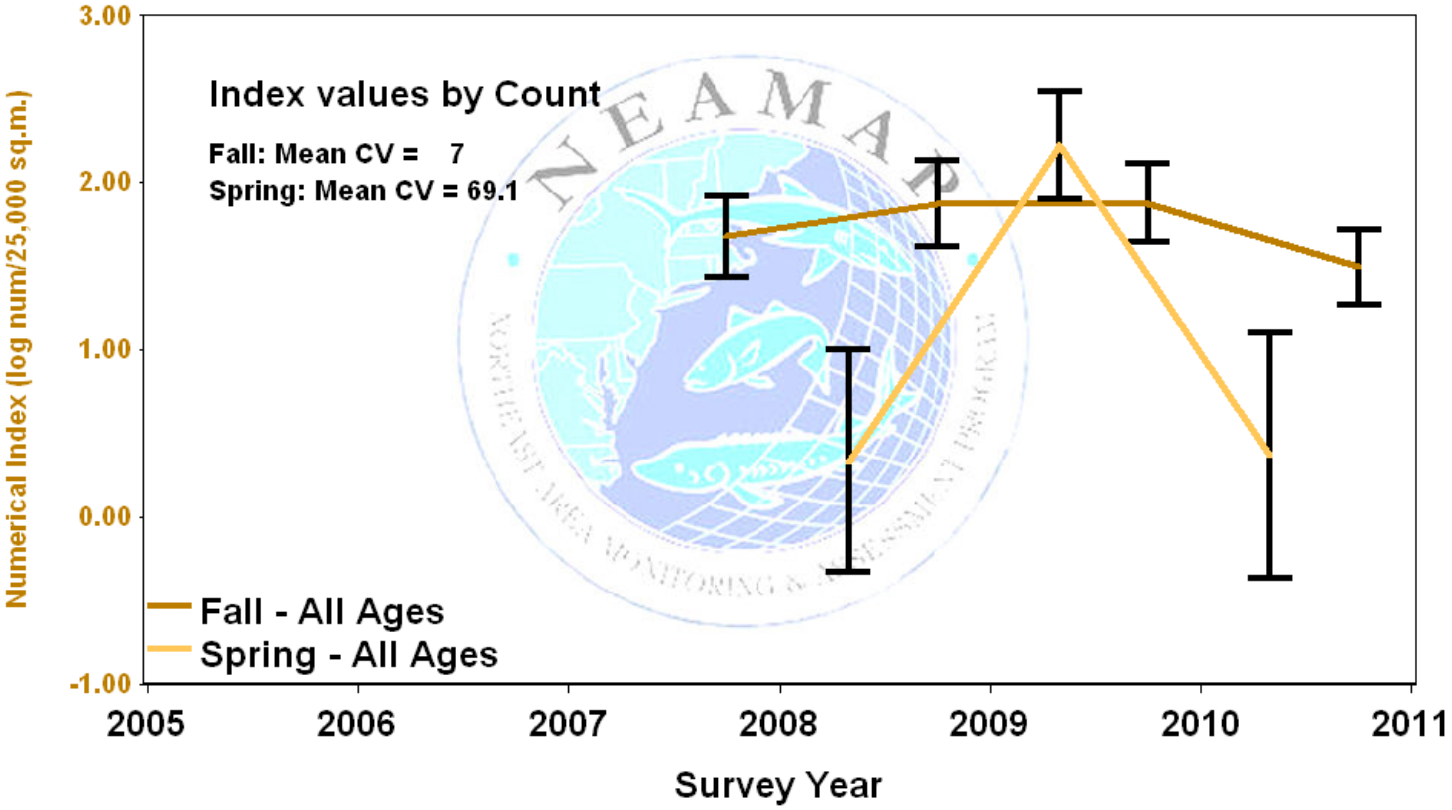
= not used for abundance indices

Table 32. Preliminary abundance indices for bluefish.

		All Ages							Youngest Survey Age Class							All Other Age Classes					
Season	Year	Numerical Index			Biomass Index			Age	Numerical Index			Biomass Index			Age	Numerical Index			Biomass Index		
		n	Index	CV (%)	n	Index	CV (%)		n	Index	CV (%)	n	Index	CV (%)		n	Index	CV (%)	n	Index	CV (%)
Spring	2008	5	0.33	100.0	5	0.04	100.0	1	5	0.33	100.0	5	0.04	100.0	>1	5	0.00		5	0.00	
	2009	6	2.22	7.3	6	1.62	20.8		6	1.90	1.4	6	0.95	3.1		6	0.52	49.6	6	0.69	48.5
	2010	5	0.37	100.0	5	0.05	100.0		5	0.37	100.0	5	0.05	100.0		5	0.00		5	0.00	
Fall	2007	150	1.68	7.2	150	0.83	7.9	0	150	1.48	8.3	150	0.56	10.2	>0	150	0.51	9.4	150	0.39	10.9
	2008	150	1.87	6.9	150	0.85	9.8		150	1.73	7.3	150	0.59	11.5		150	0.36	17.9	150	0.35	17.3
	2009	160	1.88	6.3	160	0.67	9.1		160	1.80	6.6	160	0.53	10.3		160	0.21	15.6	160	0.19	17.8
	2010	150	1.49	7.5	150	0.61	9.0		150	1.37	8.2	150	0.40	11.7		150	0.28	11.9	150	0.27	13.2

		Spring Cohort Age 0						Summer Cohort Age 0					
Season	Year	Numerical Index			Biomass Index			Numerical Index			Biomass Index		
		n	Index	CV (%)	n	Index	CV (%)	n	Index	CV (%)	n	Index	CV (%)
Fall	2007	150	1.11	8.7	150	0.42	10.7	150	0.83	12.1	150	0.24	16.7
	2008	150	1.11	9.4	150	0.35	16.9	150	1.32	8.7	150	0.38	12.8
	2009	160	0.96	10.2	160	0.29	15.3	160	1.39	7.2	160	0.33	11.1
	2010	150	0.72	10.4	150	0.22	14.2	150	1.02	10.0	150	0.23	15.6

Figure 53. Preliminary indices of overall abundance, in terms of number and biomass, of bluefish for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.



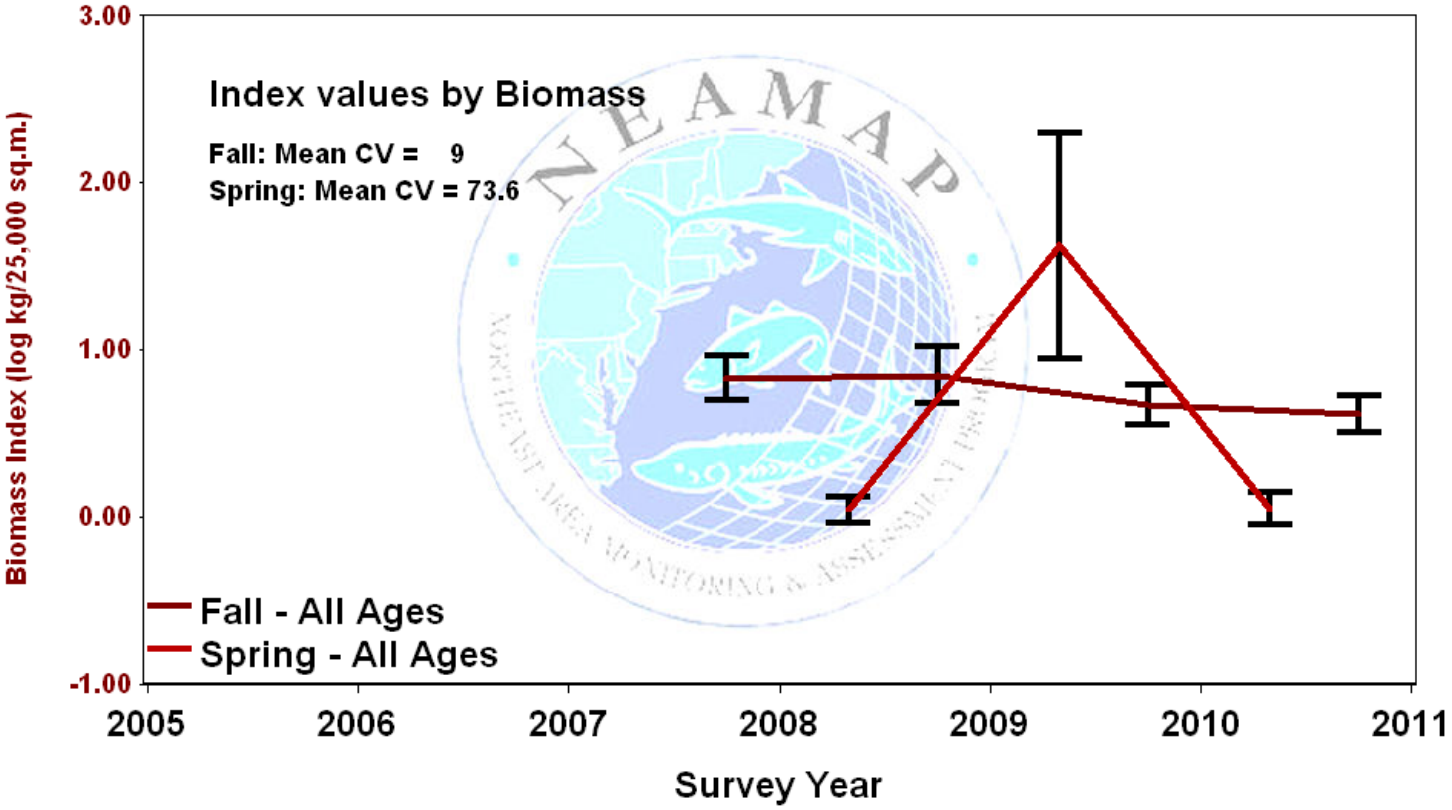


Figure 54. Preliminary indices of abundance, of bluefish for spring and fall NEAMAP surveys. Indices are for the youngest age class observed during each survey (count-based indices only) and for all other age classes combined (based both on count and biomass). 95% confidence intervals are provided for each abundance estimate.

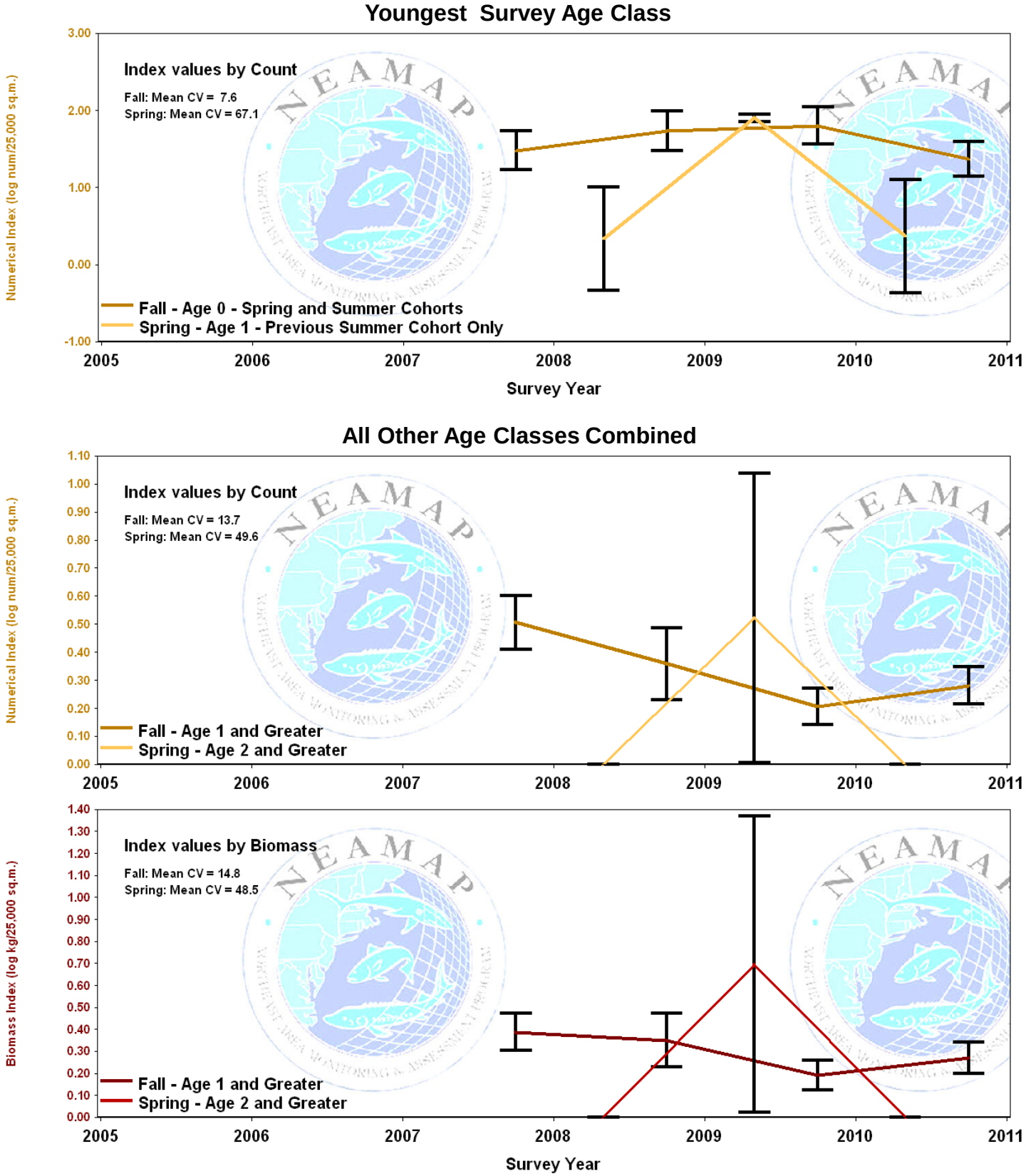


Figure 55. Preliminary indices of abundance, of bluefish for fall NEAMAP surveys. Indices are for the Age-0 year classes, separately for the spring and summer cohorts. For the spring cohort, indices based both on count and biomass are shown and for the summer cohort only indices based on counts are given.

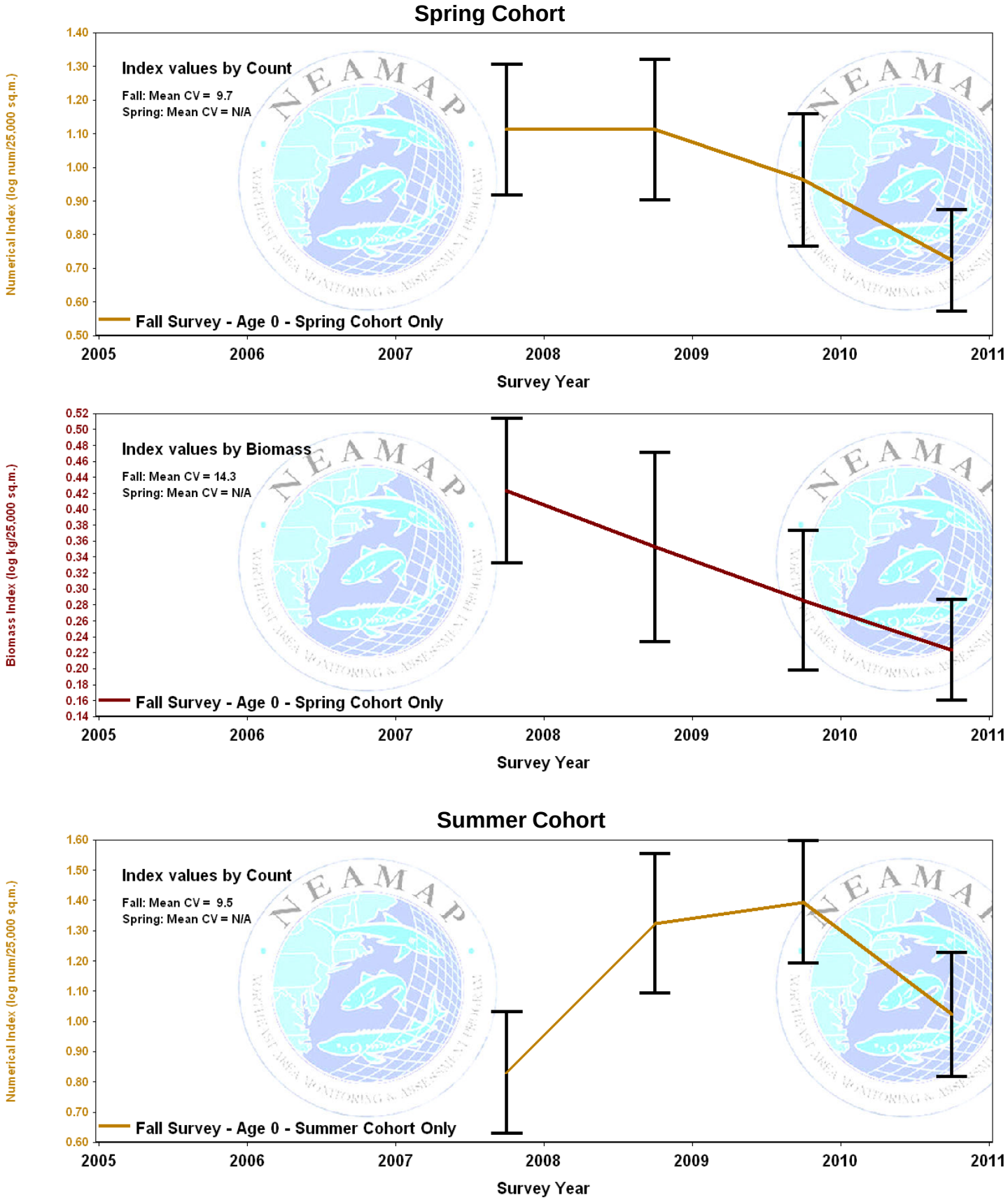


Figure 56. Length-frequency distributions, by cruise, for bluefish.

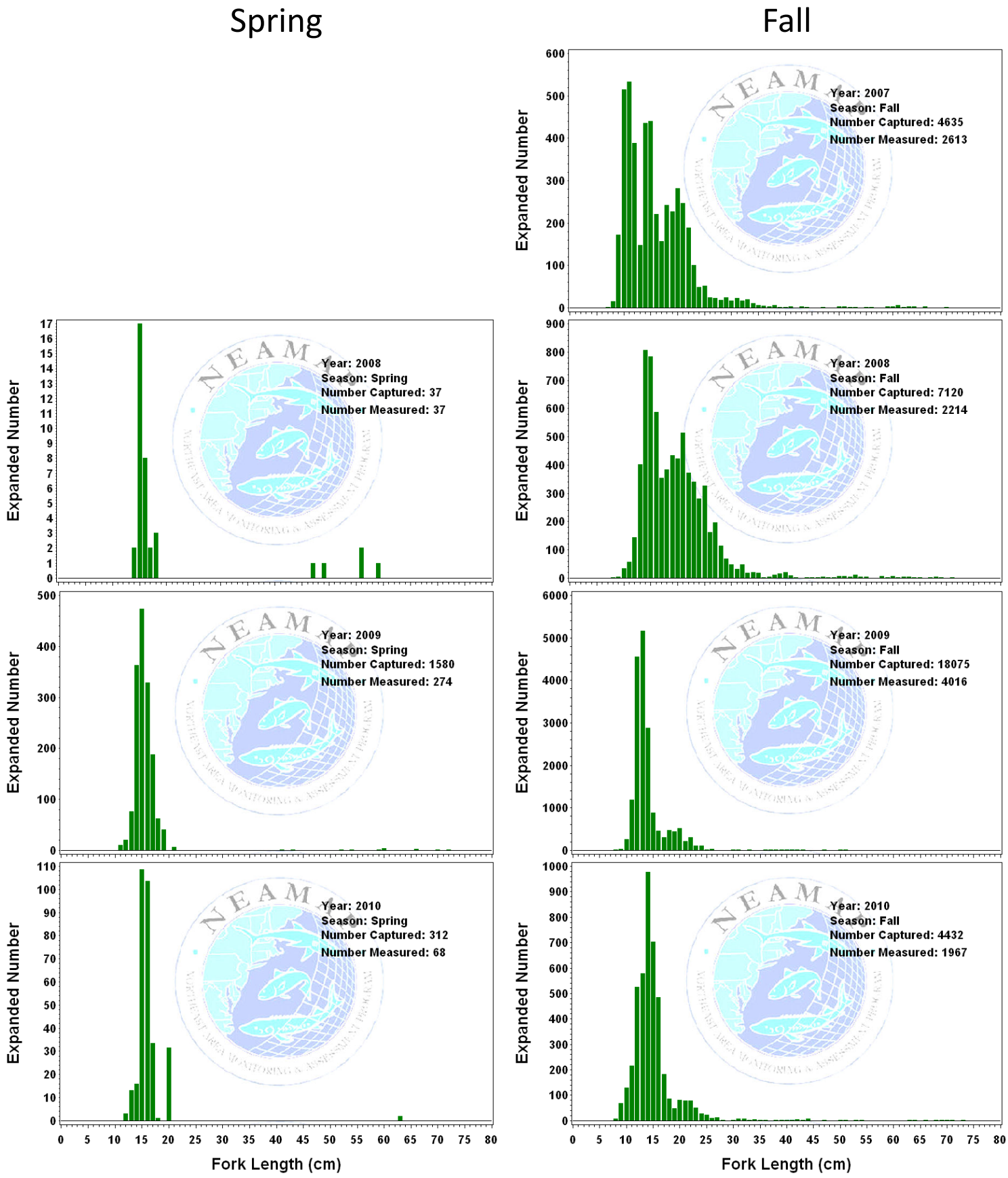


Figure 57. Sex-specific length-frequency distribution, by season, all cruises pooled, for bluefish.

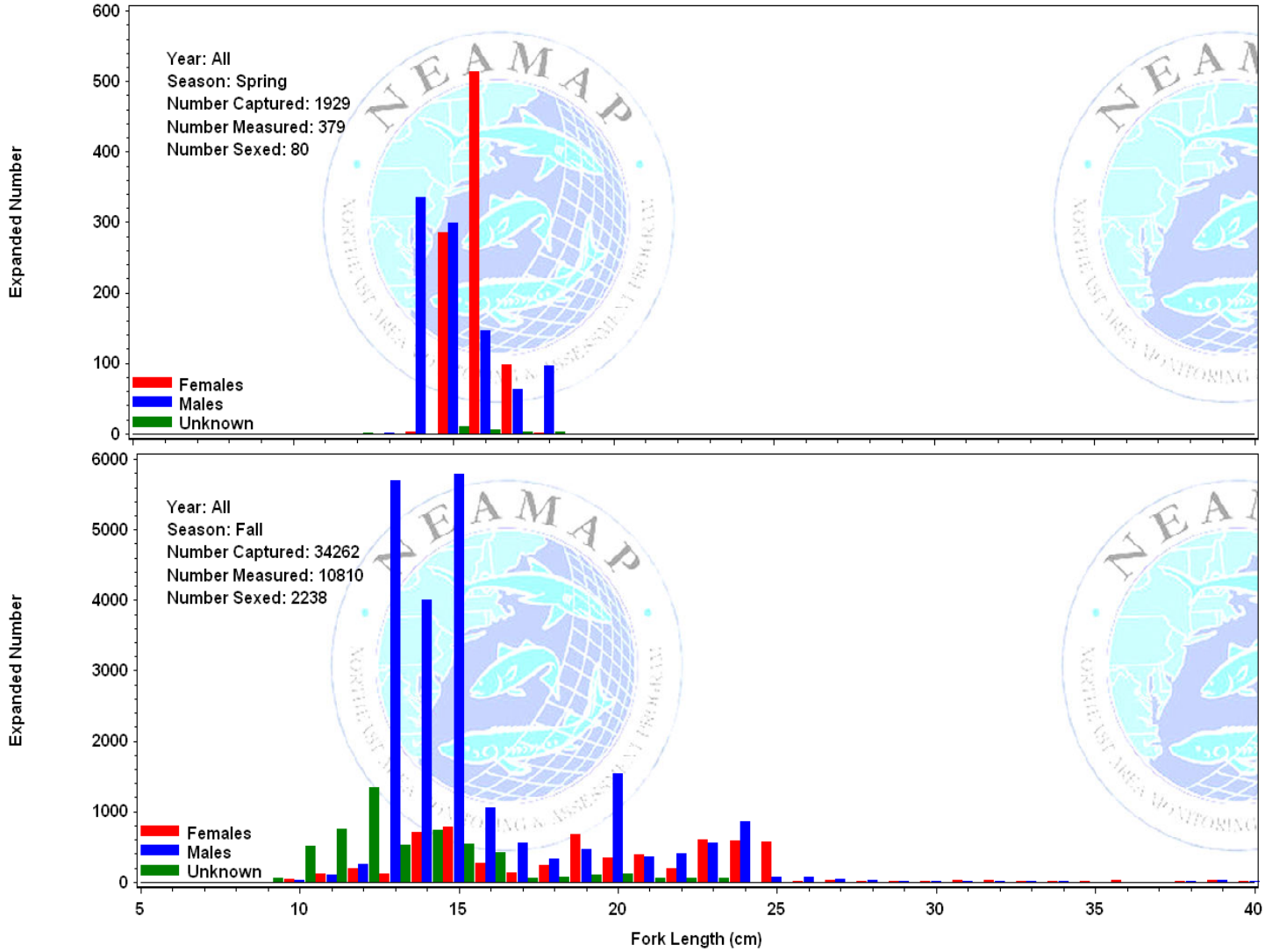


Figure 58. Sex ratio, by length group, for bluefish collected all NEAMAP cruises 2007-2010 (The percentages for each category are given in their respective bars. The number sampled for sex determination is provided above each bar, and the length categories expressed in inches are given near the x-axis.).

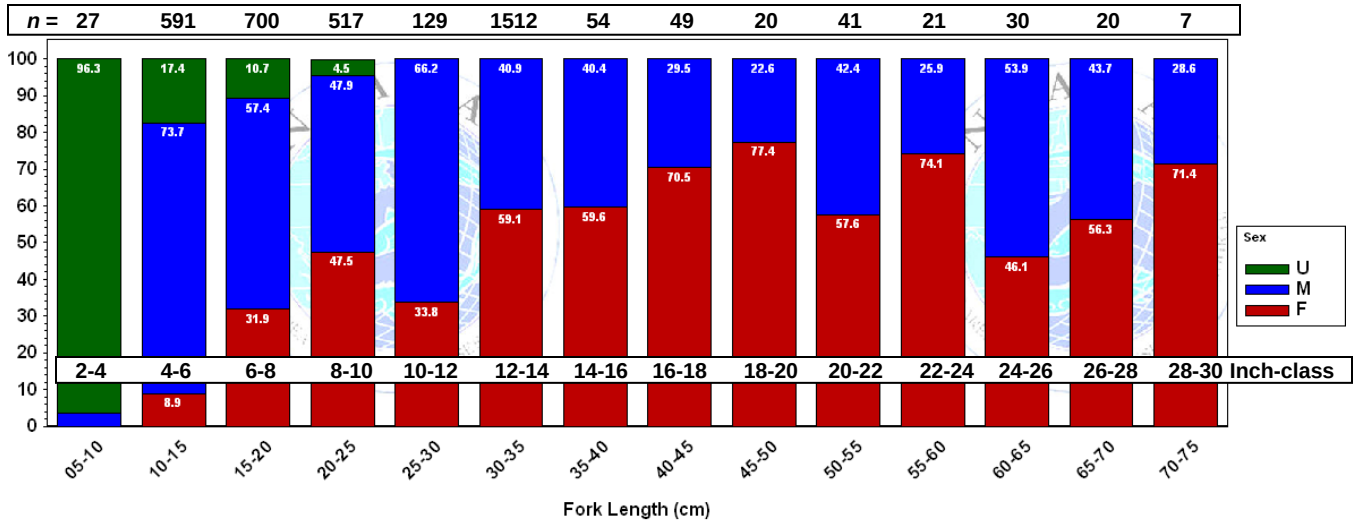
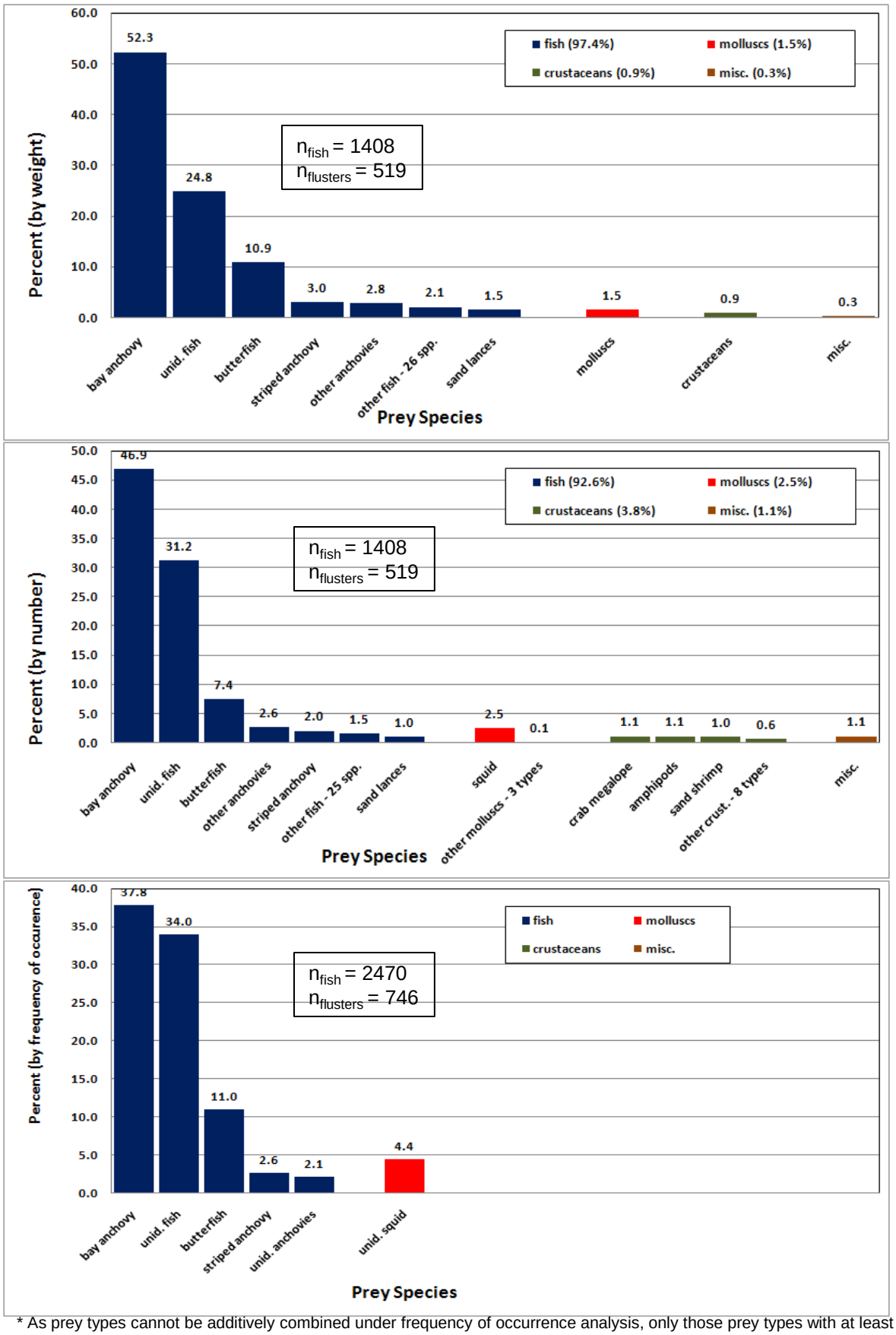


Figure 59. Diet composition, expressed as percent by weight, by number, and by frequency of occurrence* of bluefish collected during NEAMAP cruises in 2007-2009 (The number of fish sampled for diet is given by n_{fish}, while $n_{clusters}$ indicates the number of clusters of bluefish sampled.).



* As prey types cannot be additively combined under frequency of occurrence analysis, only those prey types with at least a 2% value are shown here: 65 other prey types were observed in stomachs for this species. Similarly, sums for broad taxonomic groups are not calculated.

Brown Shrimp

Sampling Priority: E

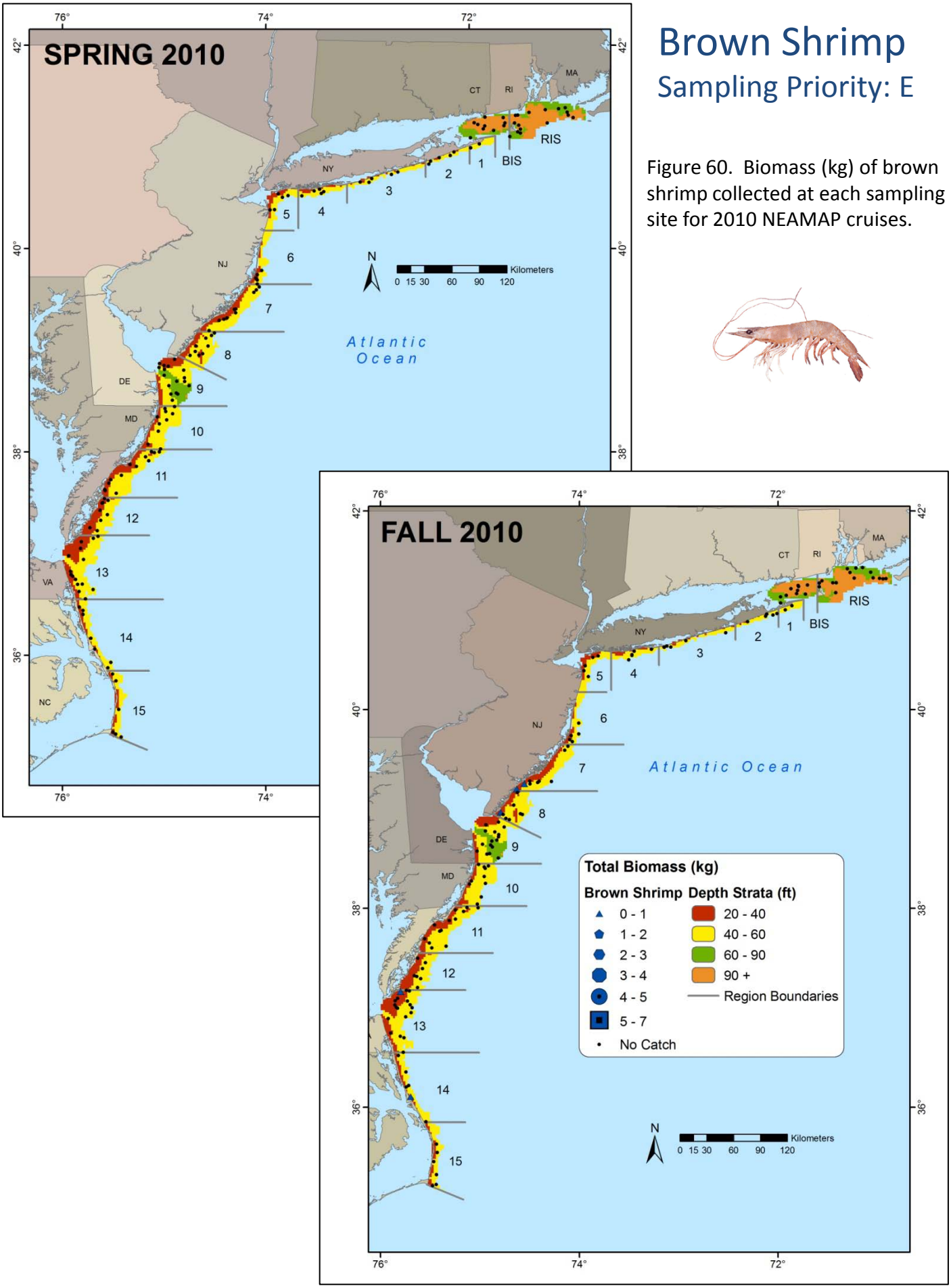


Figure 60. Biomass (kg) of brown shrimp collected at each sampling site for 2010 NEAMAP cruises.

Table 33. Sampling rates of brown shrimp for each NEAMAP cruise.

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

Table 34. Strata used for calculation of abundance indices for brown 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		

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		

= used for abundance indices

= not used for abundance indices

Table 35. Preliminary abundance indices for brown shrimp.

		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	5	0.17	100.0	5	0.01	100.0	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	6	0.22	57.6	6	0.01	69.3	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
	2010	5	0.00		5	0.00		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	23	1.29	25.2	23	0.20	37.3	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	22	1.26	26.4	22	0.20	40.1	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	25	0.38	43.7	25	0.02	47.5	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	22	0.07	100.0	22	0.00	100.0	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 61. Preliminary indices of overall abundance, in terms of number and biomass, of brown shrimp for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

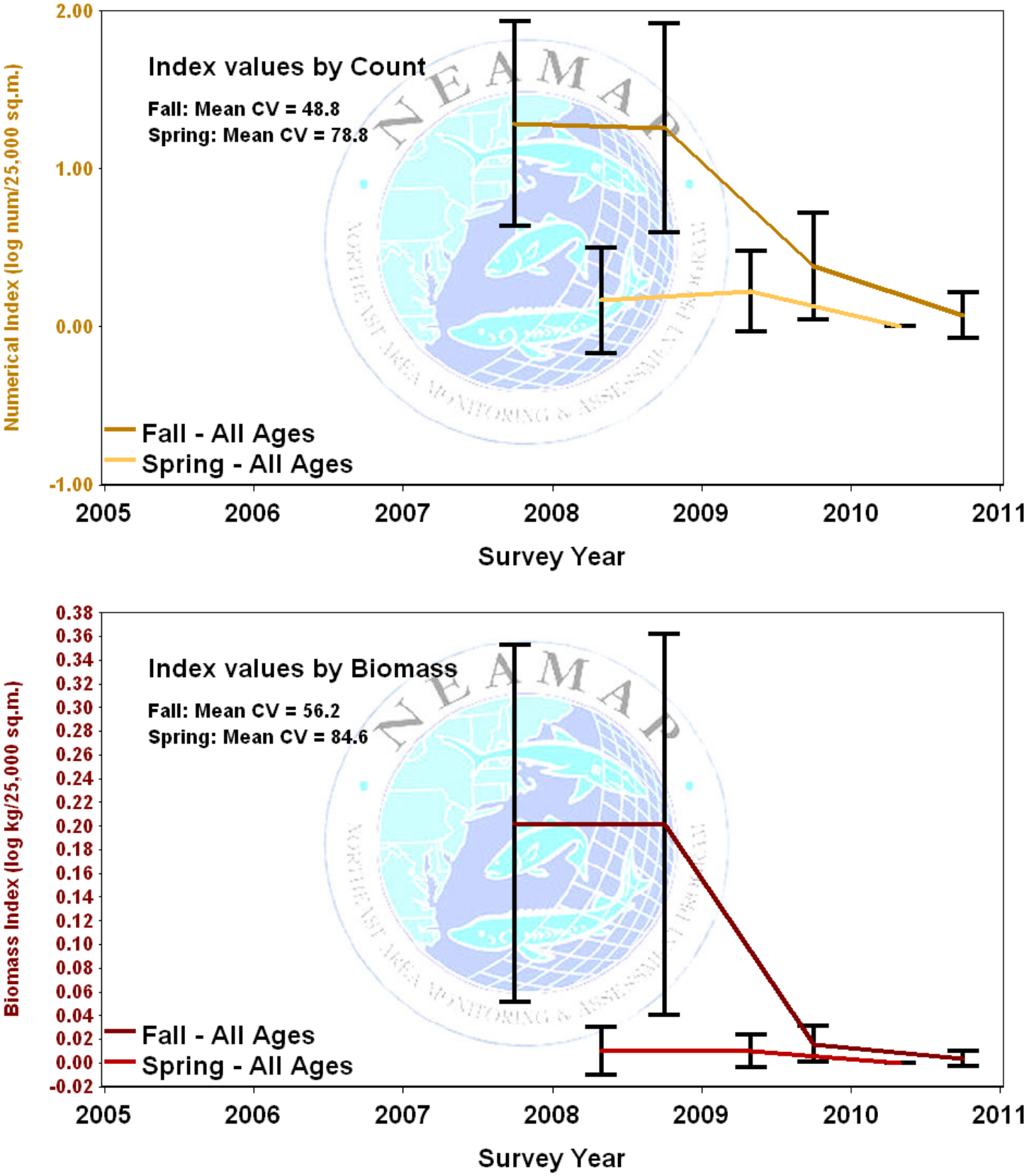
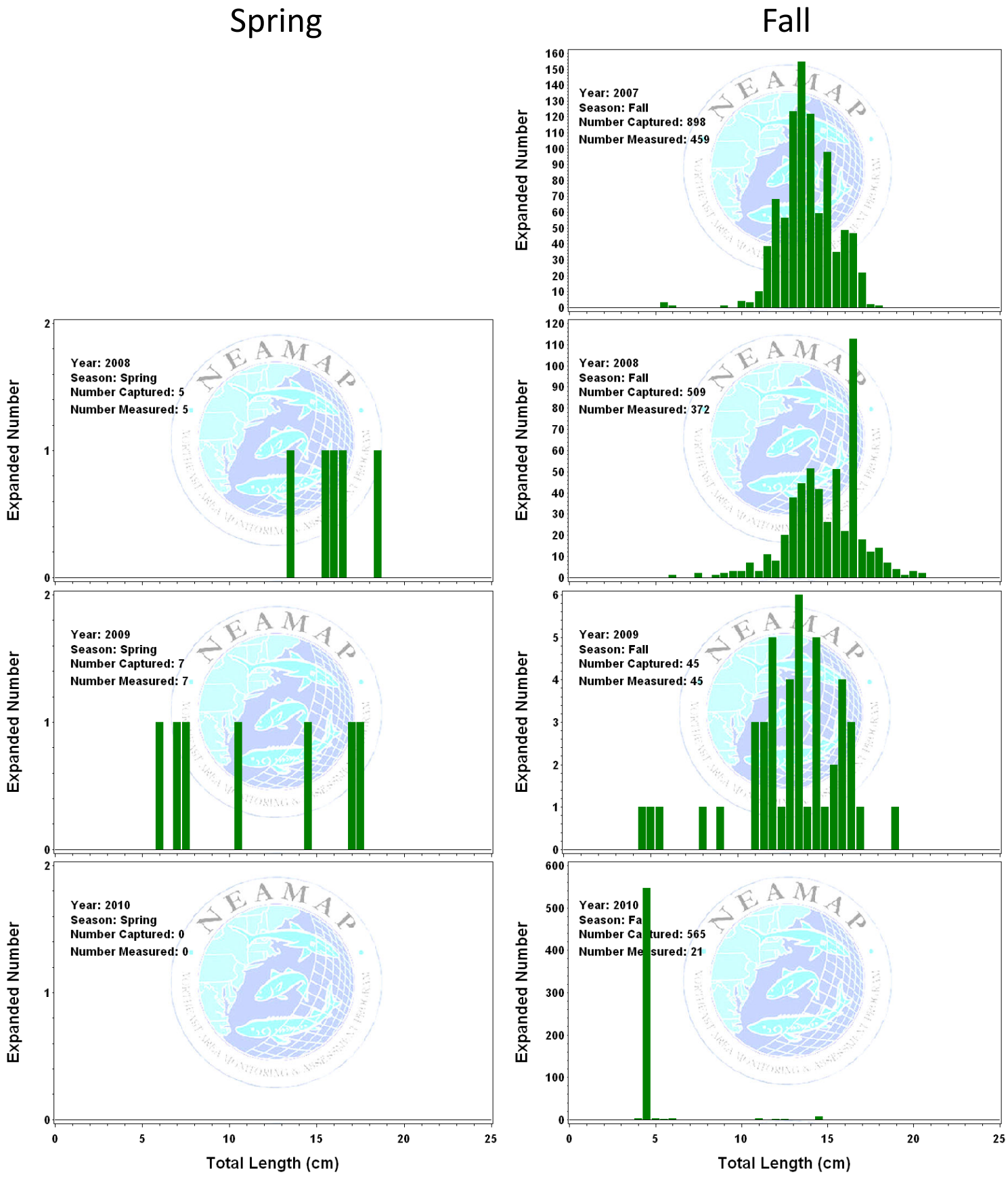


Figure 62. Length-frequency distributions, by cruise, for brown shrimp.



Butterfish

Sampling Priority: A

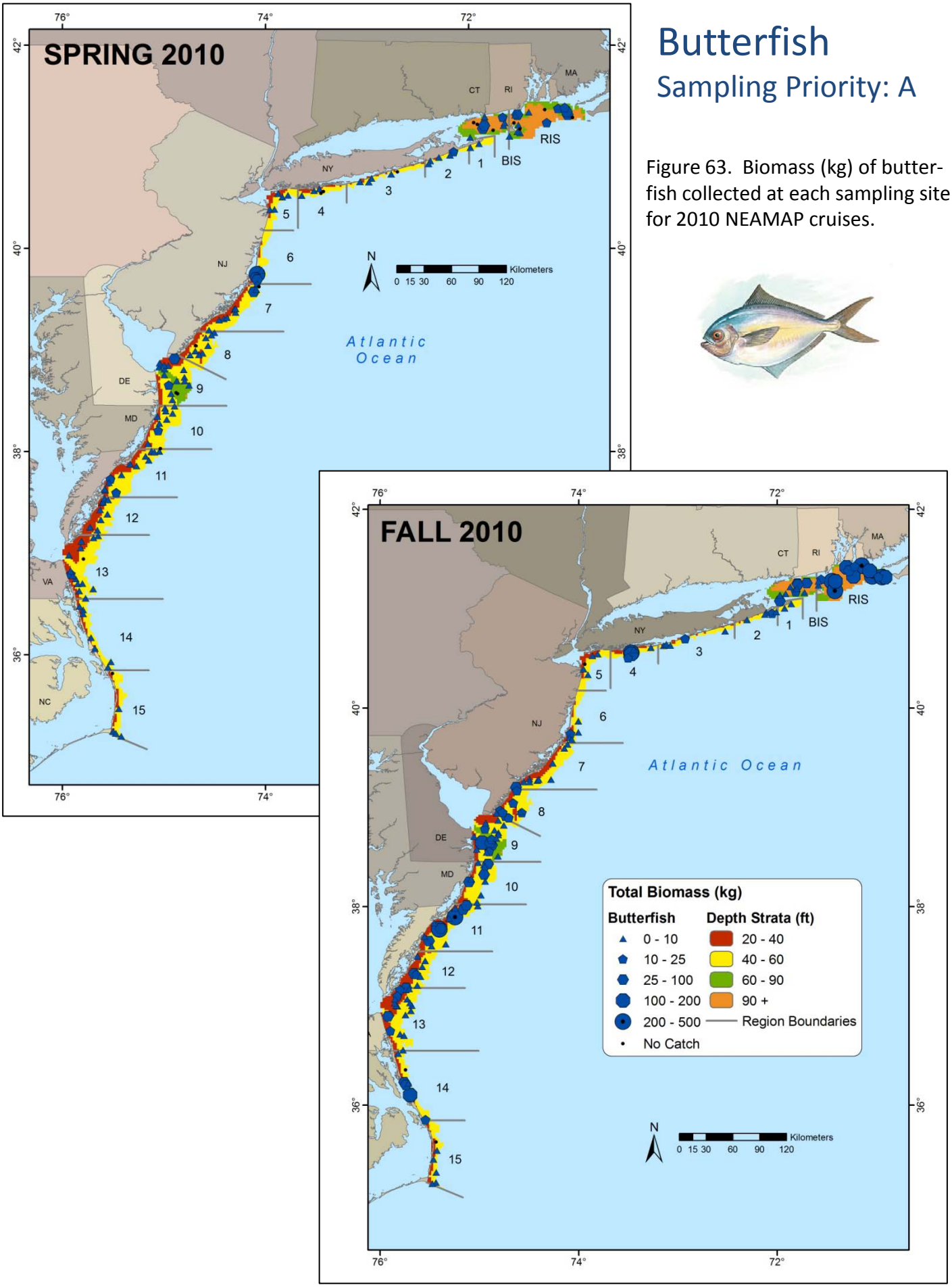


Figure 63. Biomass (kg) of butterfish collected at each sampling site for 2010 NEAMAP cruises.

Table 36. Sampling rates and preserved specimen analysis status of butterfish for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught	Number Measured	Age Specimens	Ages Read	Stomach Specimens	Stomachs Analyzed
Spring	2008	47742	689.2	8315	746	0		
	2009	35588	816.5	16089	1045	0		
	2010	64291	2136.2	11212	740	0		
Fall	2007	148182	1904.9	6015	538	0	11	
	2008	168270	2120.7	10091	551	0	8	
	2009	544718	8677.5	20670	774	0		
	2010	157706	4957.3	19276	690	0		

Table 37. 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		

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		

= used for abundance indices

= not used for abundance indices

Table 38. Preliminary abundance indices for butterfish.

		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	150	3.82	4.1	150	1.19	6.6	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	160	4.19	2.5	160	1.10	5.7	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	150	3.59	4.8	150	1.14	9.0	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	150	4.27	3.4	150	1.34	6.8	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	150	5.34	2.7	150	1.74	5.6	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	160	5.12	2.4	160	1.93	4.6	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	150	5.40	2.4	150	2.16	5.1	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 64. Preliminary indices of overall abundance, in terms of number and biomass, of butterfish for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

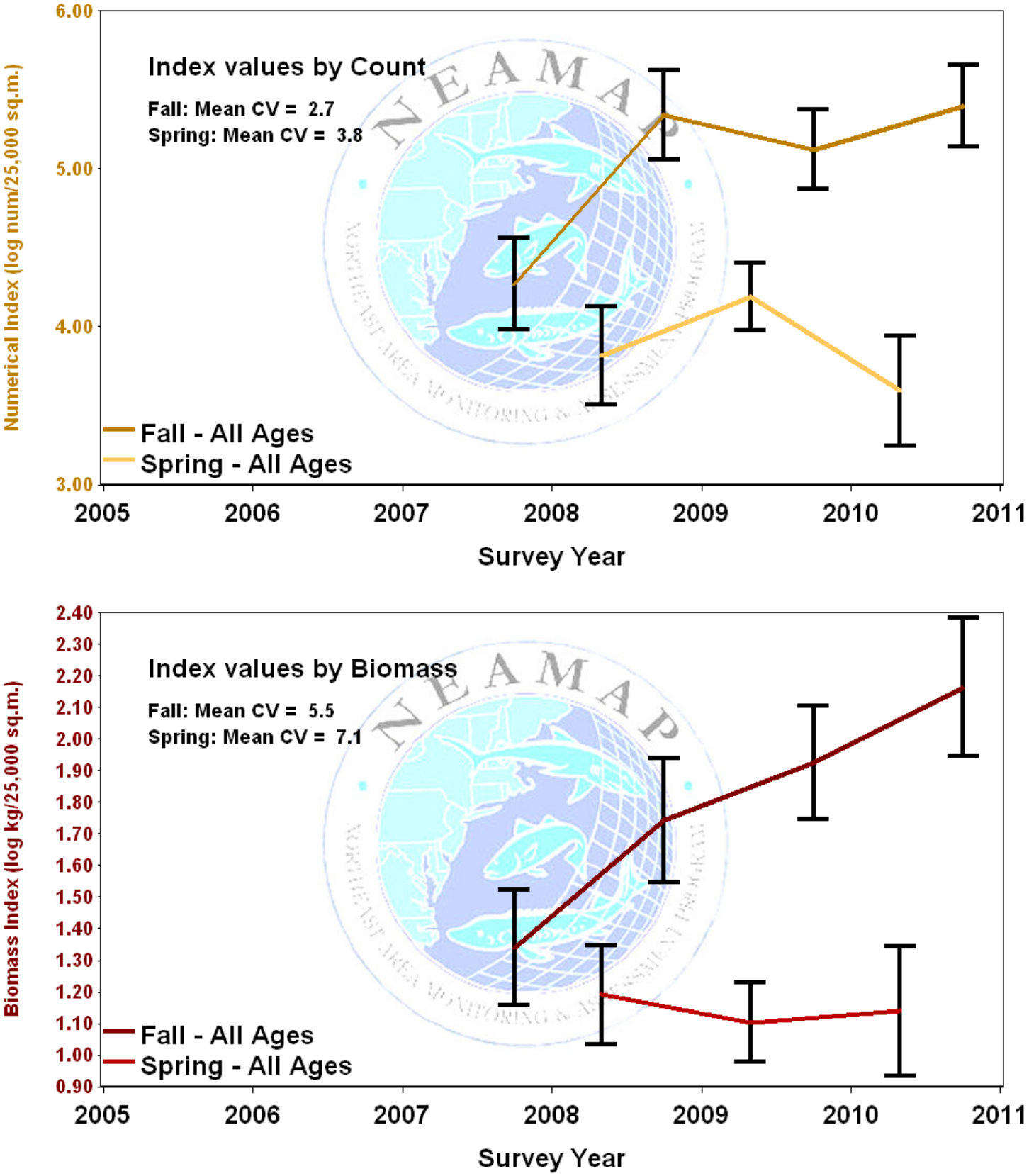


Figure 65. Length-frequency distributions, by cruise, for butterfish.

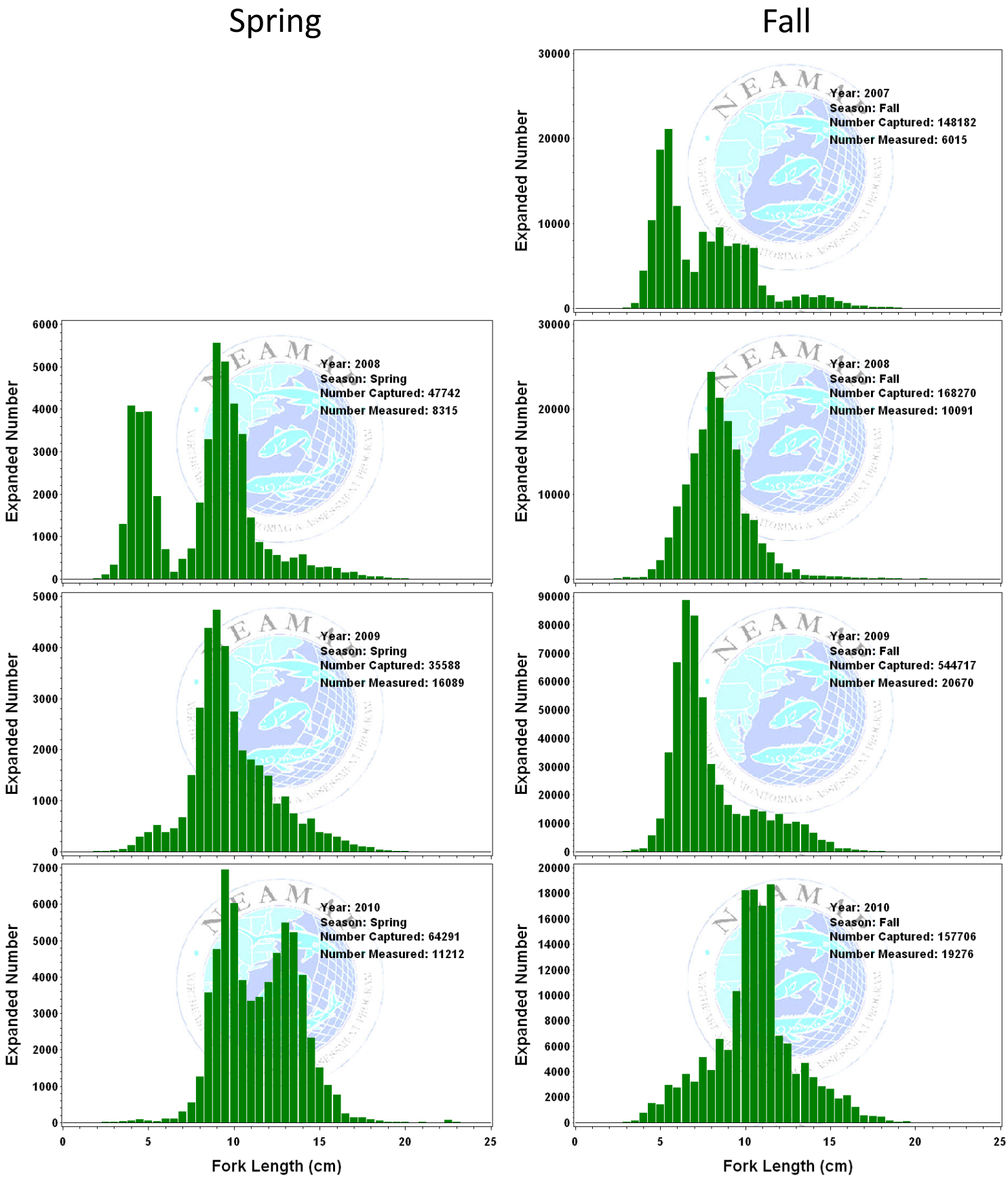


Figure 66. Sex-specific length-frequency distribution, by season, all cruises pooled, for butterfish.

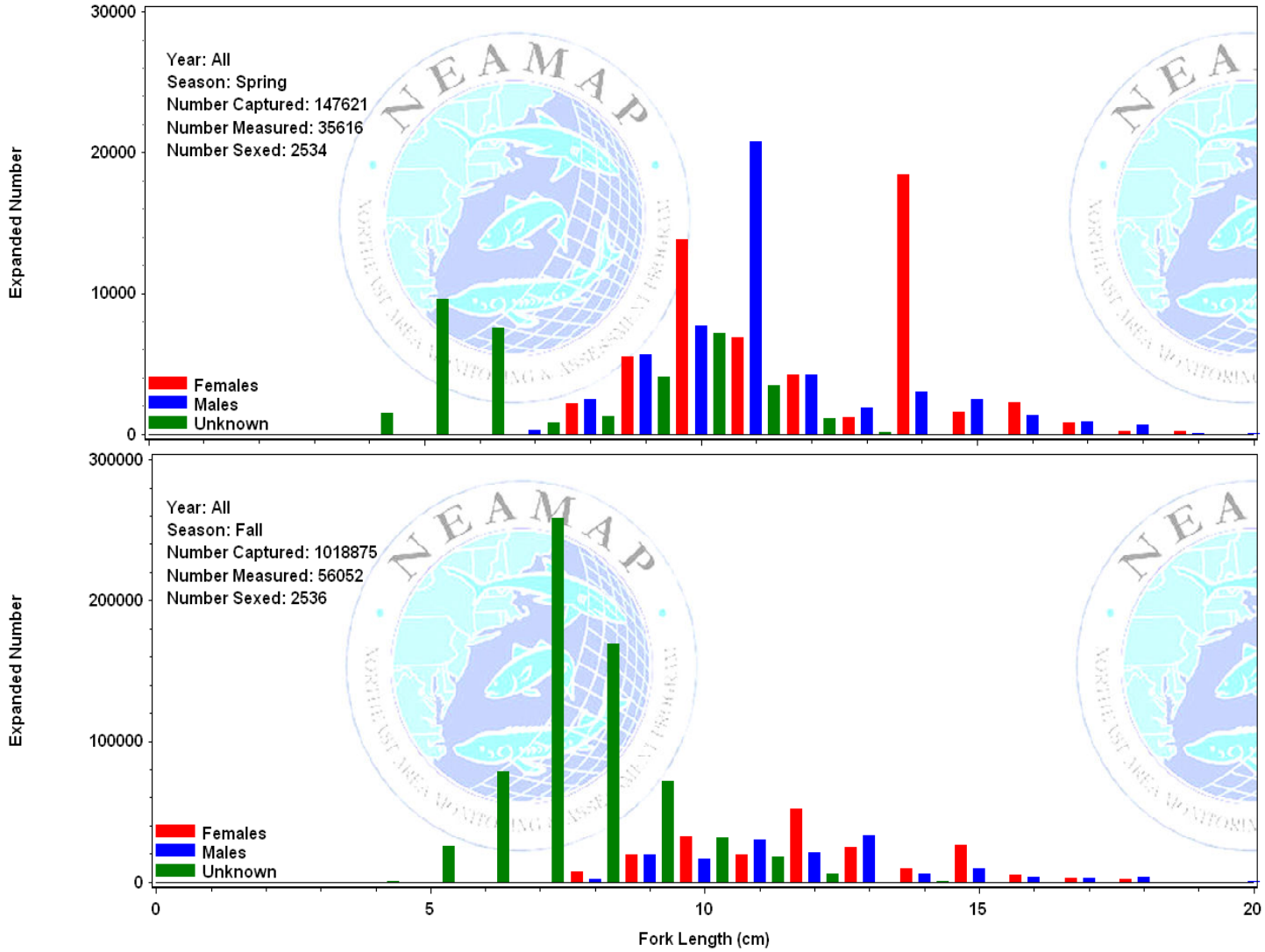
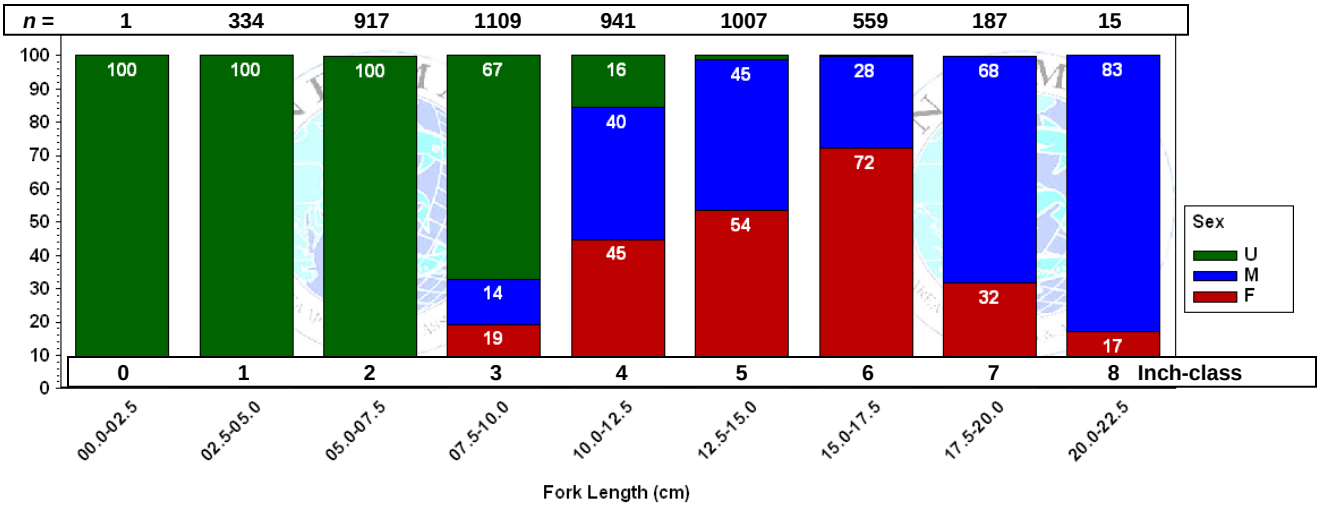


Figure 67. Sex ratio, by length group, for butterfish collected all NEAMAP cruises 2007-2010 (The percentages for each category are given in their respective bars. The number sampled for sex determination is provided above each bar, and the length categories expressed in inches are given near the x-axis.).



Clearnose Skate

Sampling Priority: A

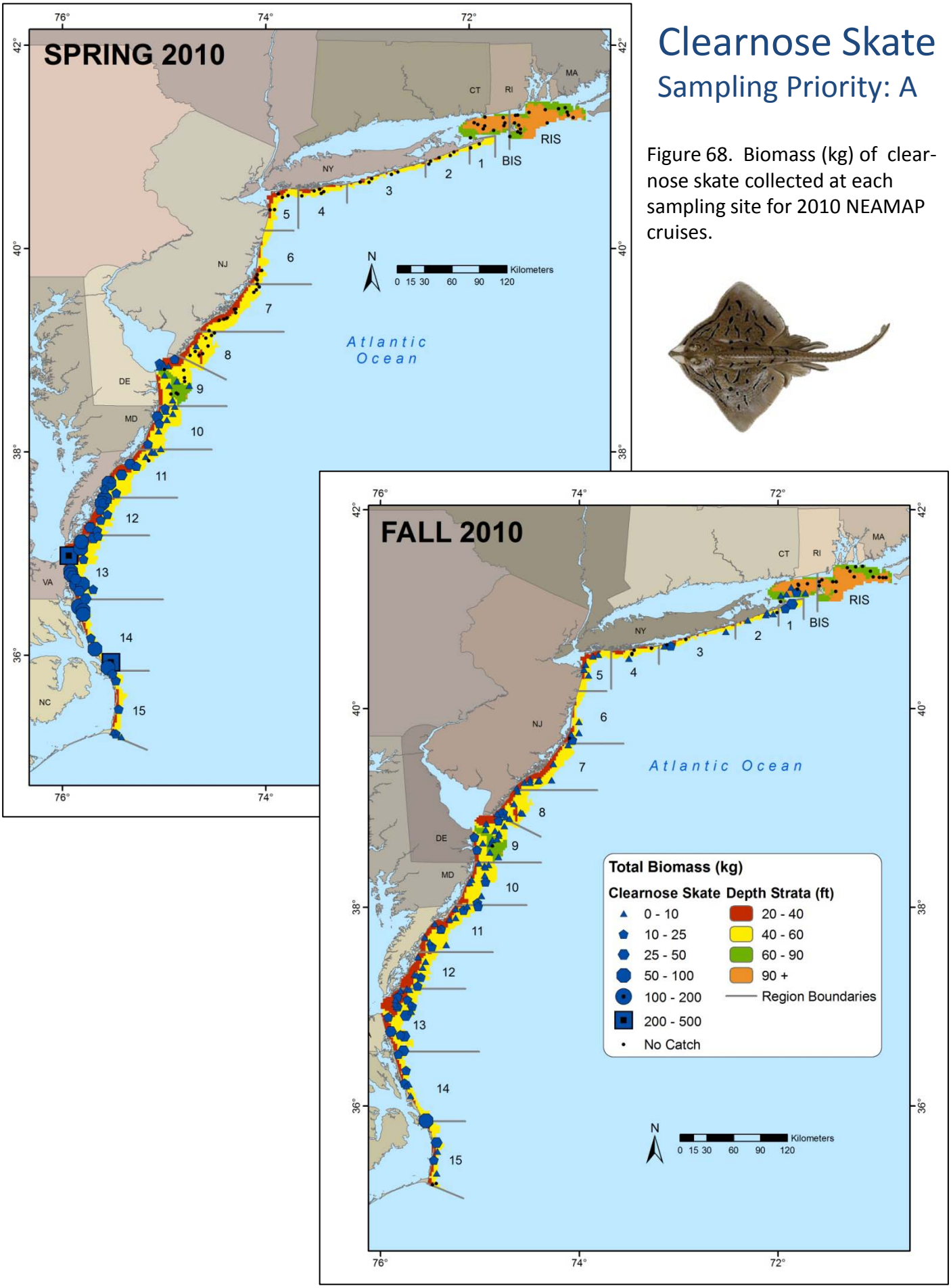


Figure 68. Biomass (kg) of clearnose skate collected at each sampling site for 2010 NEAMAP cruises.

Table 39. Sampling rates and preserved specimen analysis status of clearnose skate for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught	Number Measured	Age Specimens	Ages Read	Stomach Specimens	Stomachs Analyzed
Spring	2008	3219	4237.3	1050	212	0	207	205
	2009	2429	3382.1	1431	205	0	188	181
	2010	1702	2516.4	1353	197	0	183	176
Fall	2007	1505	1854.6	1361	346	0	330	294
	2008	885	1196.2	806	289	0	287	286
	2009	1107	1352.1	1007	335	0	306	302
	2010	875	1056.7	875	307	0	276	

Table 40. Strata used for calculation of abundance indices for clearnose skate.

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		

= used for abundance indices

= not used for abundance indices

Table 41. Preliminary abundance indices for clearnose skate.

		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	86	2.57	3.7	86	2.73	3.6	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	91	2.11	5.4	91	2.31	5.4	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
	2010	87	2.15	3.9	87	2.35	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
Fall	2007	124	2.17	3.1	124	2.32	3.2	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	124	1.71	3.7	124	1.88	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
	2009	134	1.88	3.4	134	2.02	3.4	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
	2010	124	1.73	3.7	124	1.86	3.5	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 69. Preliminary indices of overall abundance, in terms of number and biomass, of clearnose skate for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

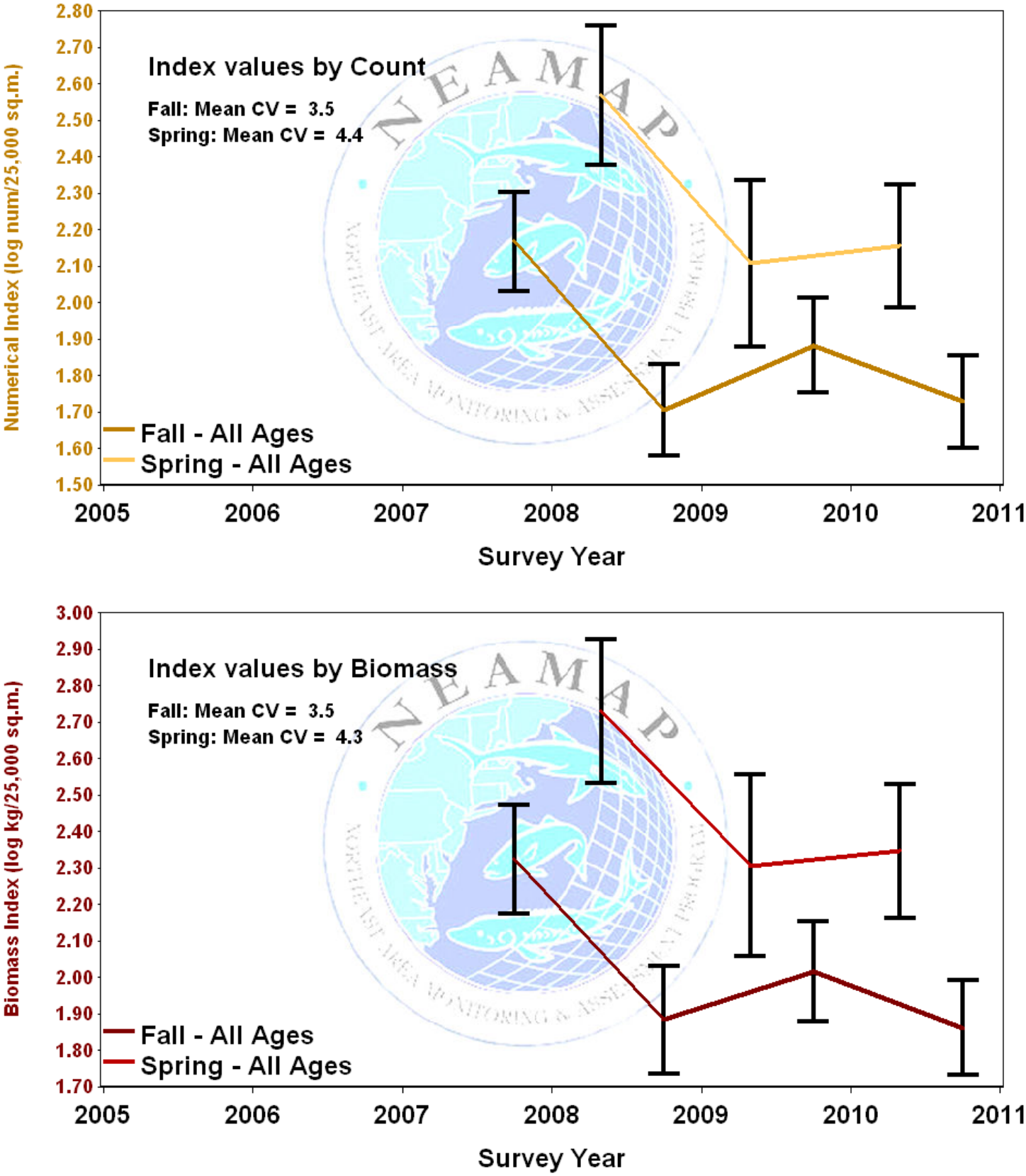


Figure 70. Width-frequency distributions, by cruise, for clearnose skate.

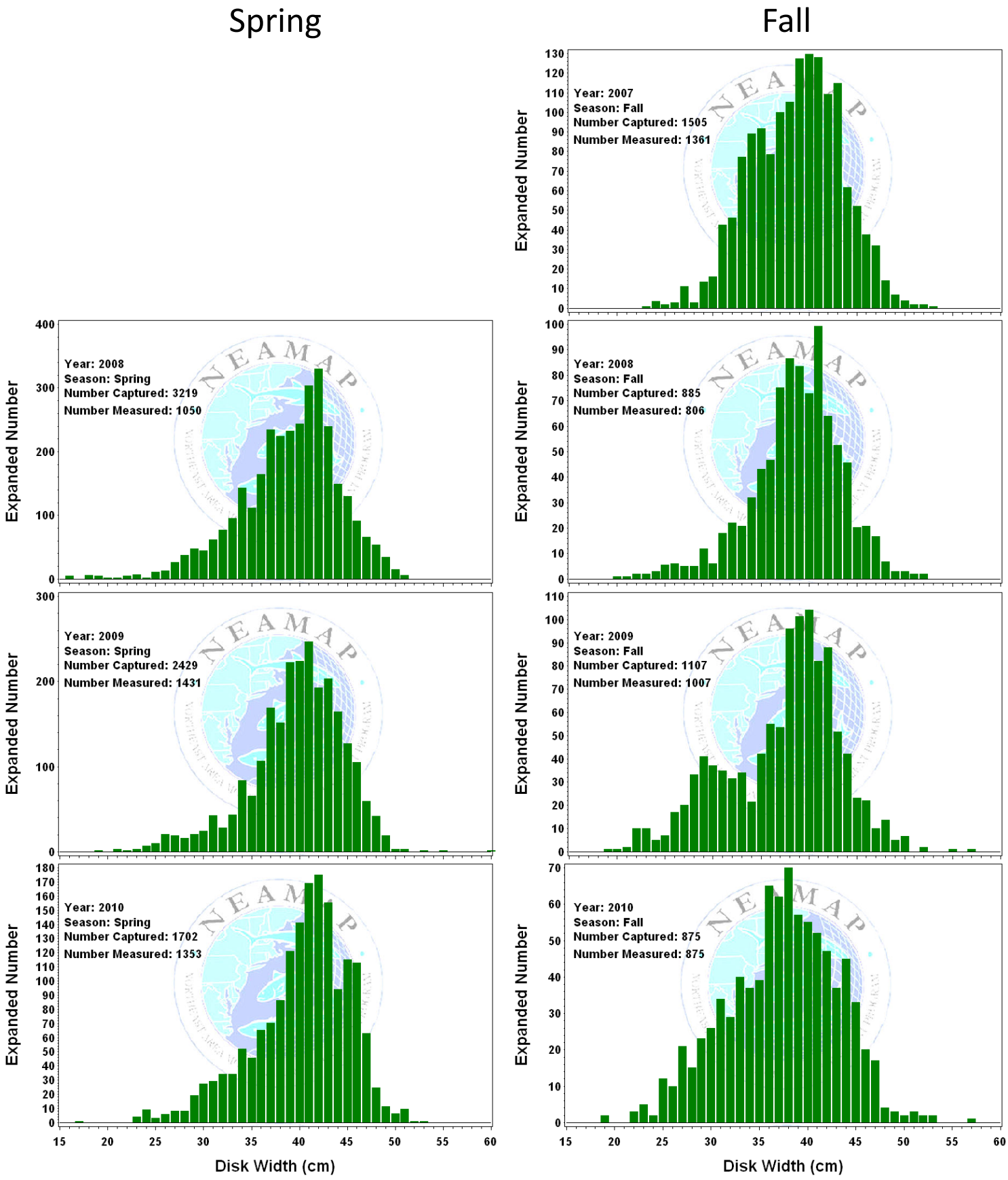


Figure 71. Sex-specific length-frequency distribution, by season, all cruises pooled, for clearnose skate.

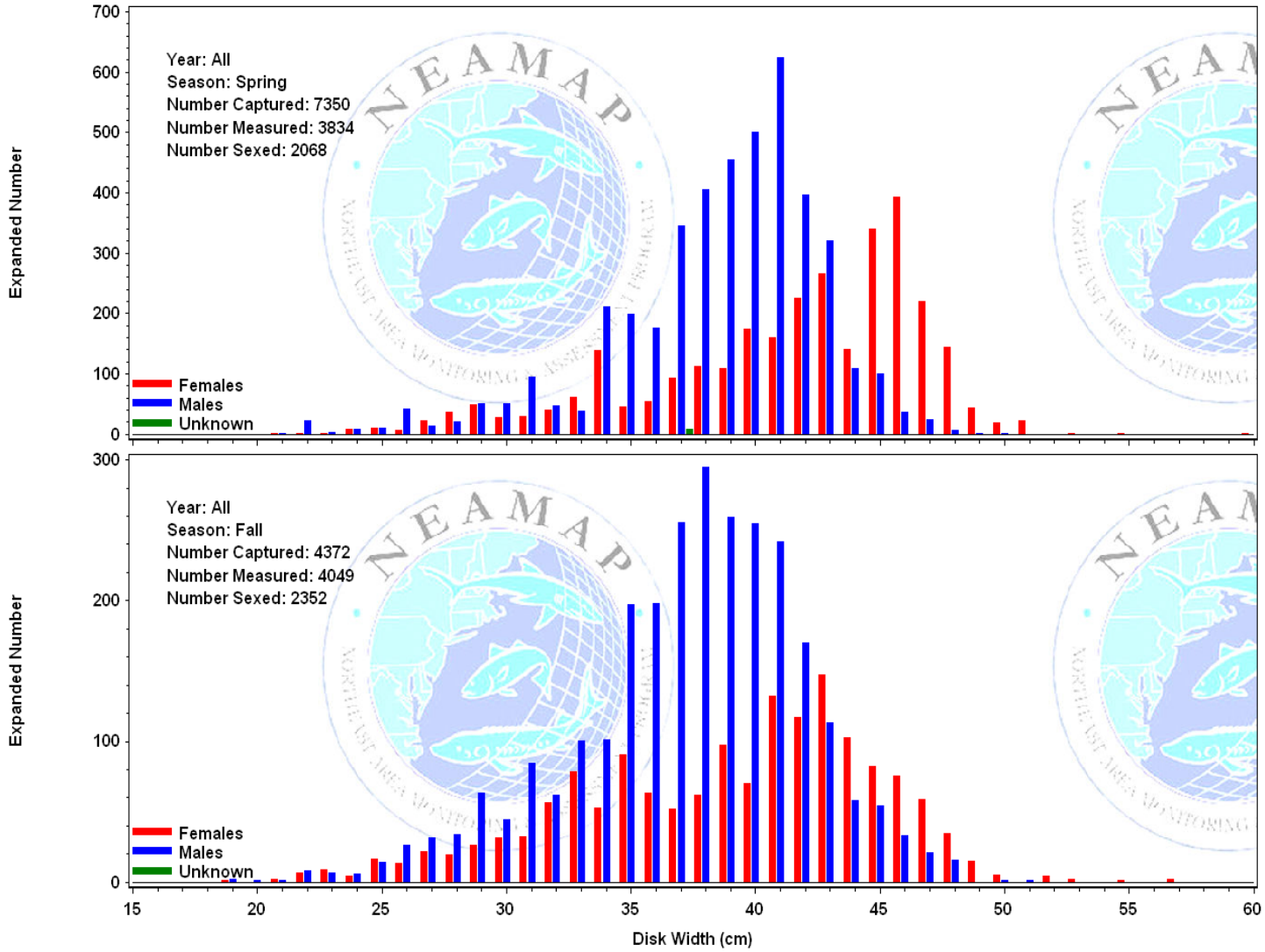


Figure 72. Sex ratio, by length group, for clearnose skate collected all NEAMAP cruises 2007-2010 (The percentages for each category are given in their respective bars. The number sampled for sex determination is provided above each bar, and the length categories expressed in inches are given near the x-axis.).

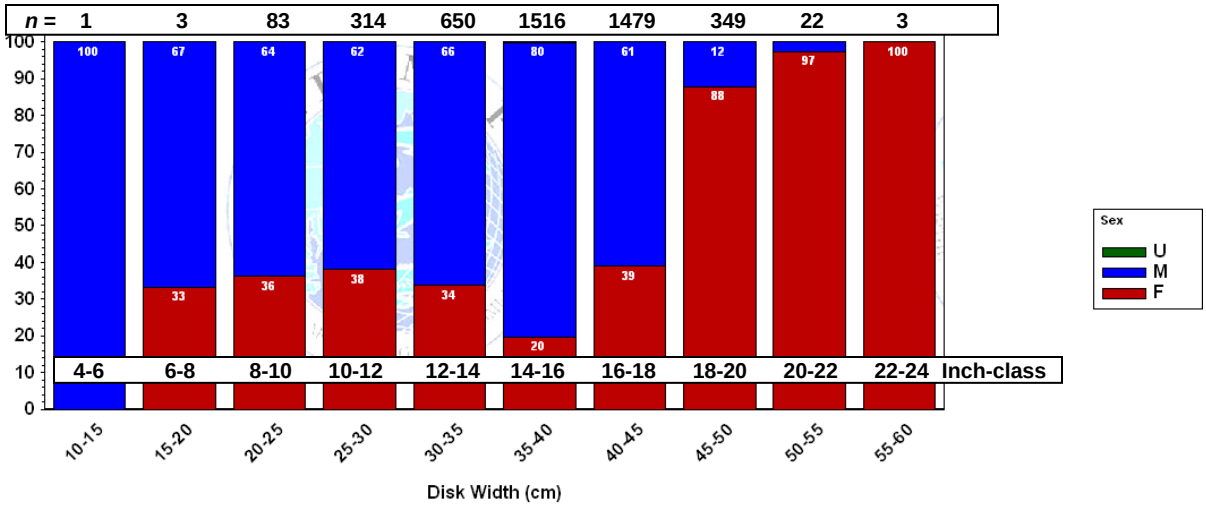
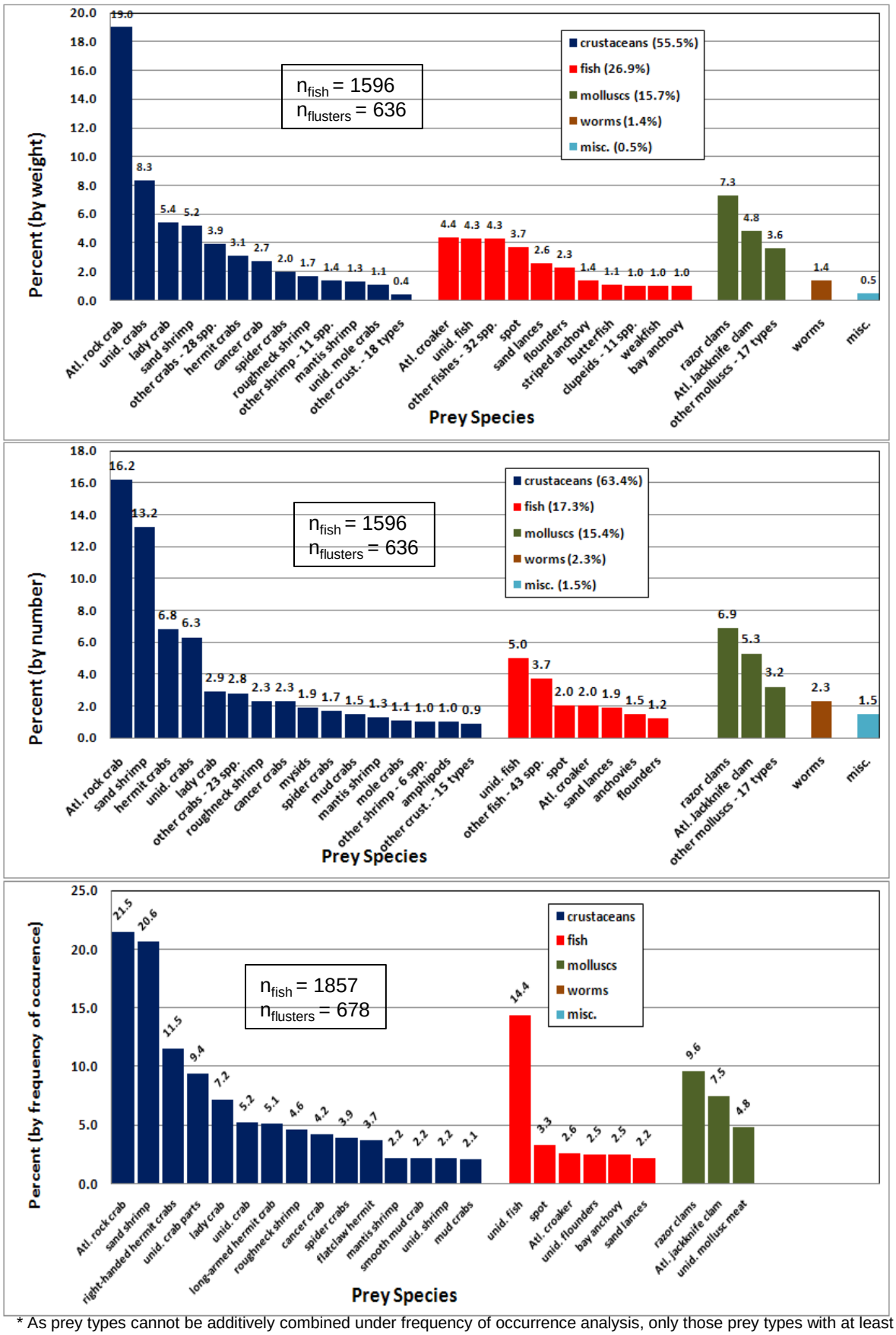


Figure 73. Diet composition, expressed as percent by weight, by number, and by frequency of occurrence* of clearnose skate collected during NEAMAP cruises in 2007-2009 (The number of fish sampled for diet is given by n_{fish}, while $n_{clusters}$ indicates the number of clusters of clearnose skate sampled.).



* As prey types cannot be additively combined under frequency of occurrence analysis, only those prey types with at least a 2% value are shown here: 158 other prey types were observed in stomachs for this species. Similarly, sums for broad taxonomic groups are not calculated.

Horseshoe Crab

Sampling Priority: E

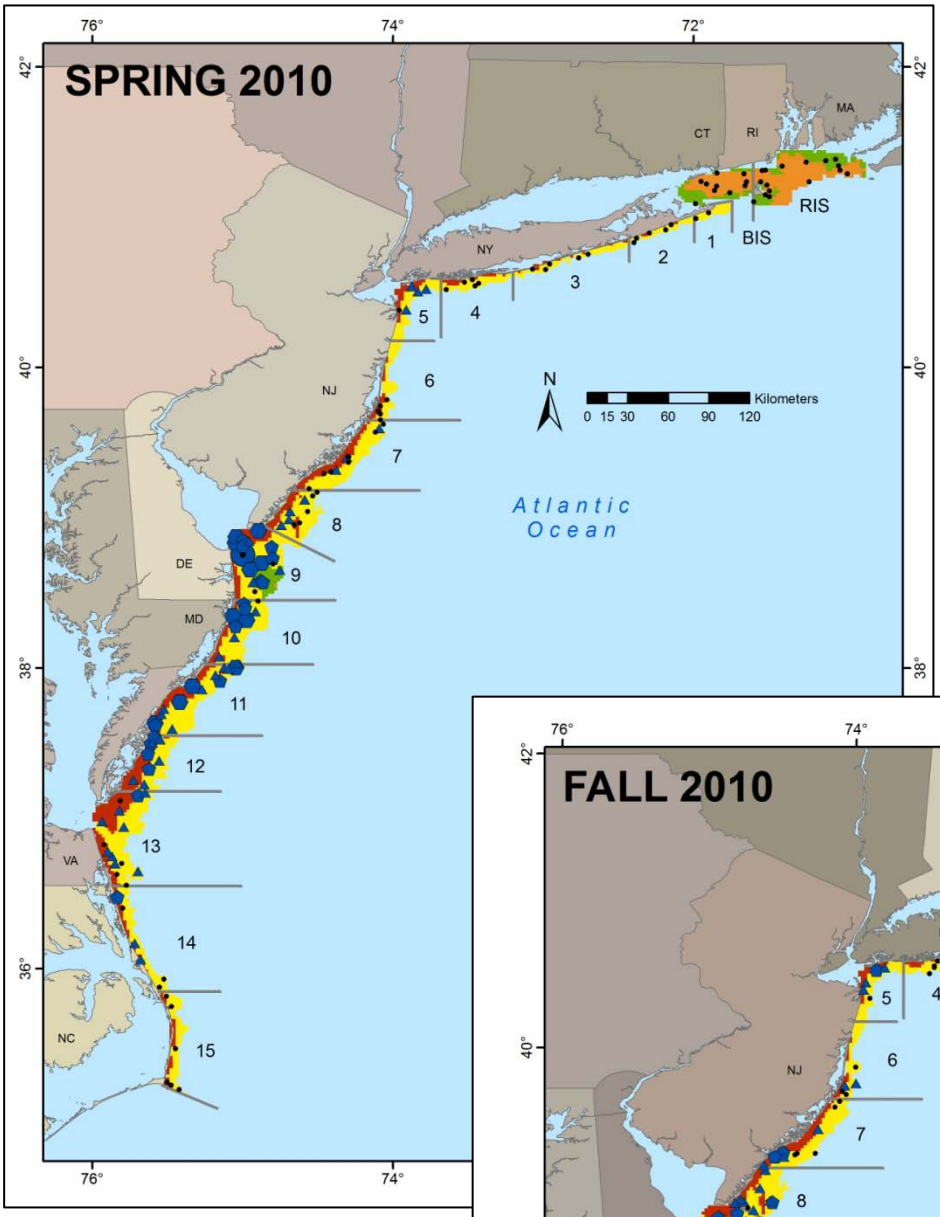


Figure 74. Biomass (kg) of horseshoe crab collected at each sampling site for 2010 NEAMAP cruises.

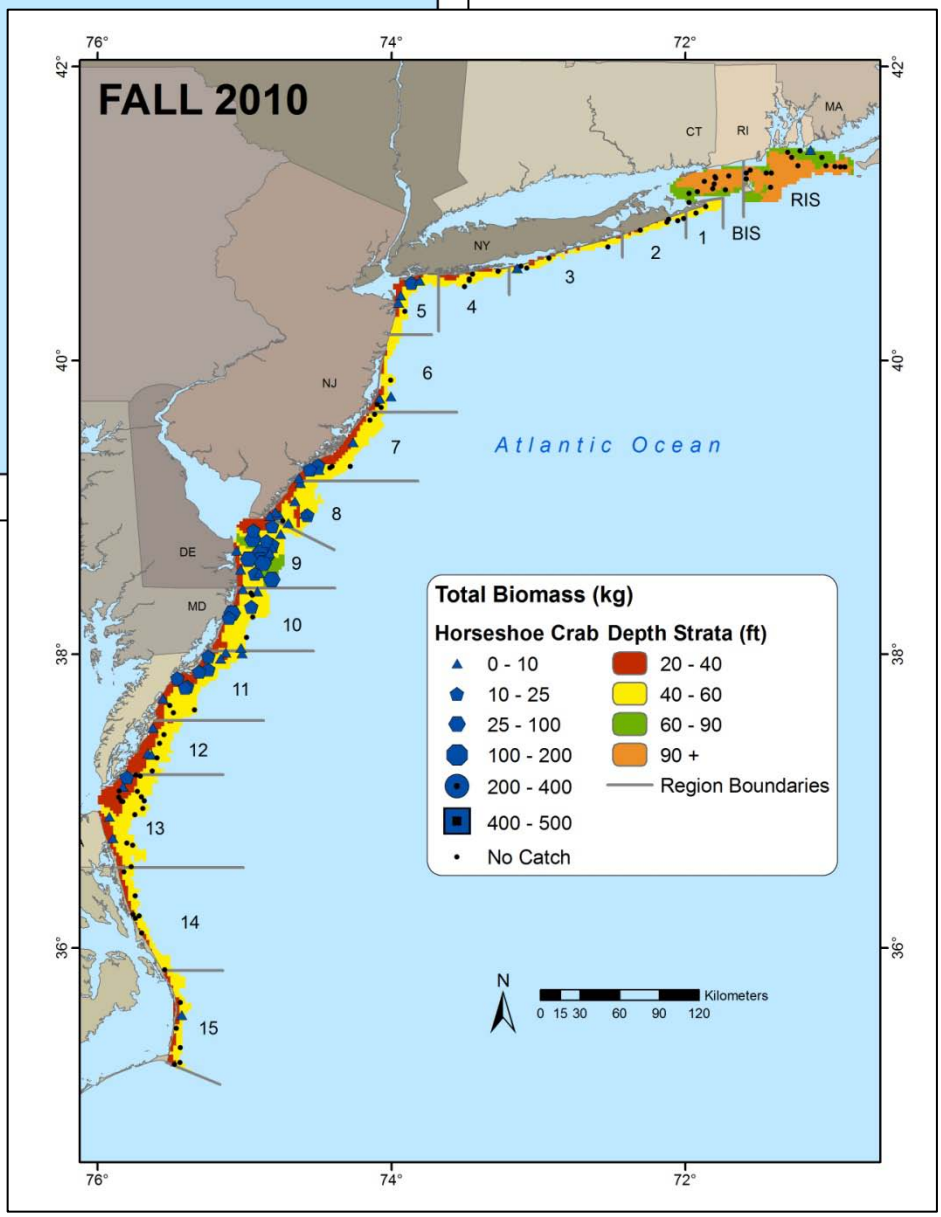


Table 42. Sampling rates of horseshoe crab for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught	Number Measured	Age Specimens	Ages Read	Stomach Specimens	Stomachs Analyzed
Spring	2008	1201	1229.6	774	0		0	
	2009	2388	2702.1	1673	0		0	
	2010	1432	1220.7	979	0		0	
Fall	2007	795	1447.9	342	0		0	
	2008	1149	1839.4	473	0		0	
	2009	1931	2164.4	1092	0		0	
	2010	613	862.2	498	0		0	

Table 43. Strata used for calculation of abundance indices for horseshoe crab.

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							
	08	20-40							
		40-60							

= used for abundance indices

= not used for abundance indices

Table 44. Preliminary abundance indices for horseshoe crab.

		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 75. Preliminary indices of overall abundance, in terms of number and biomass, of horseshoe crab for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

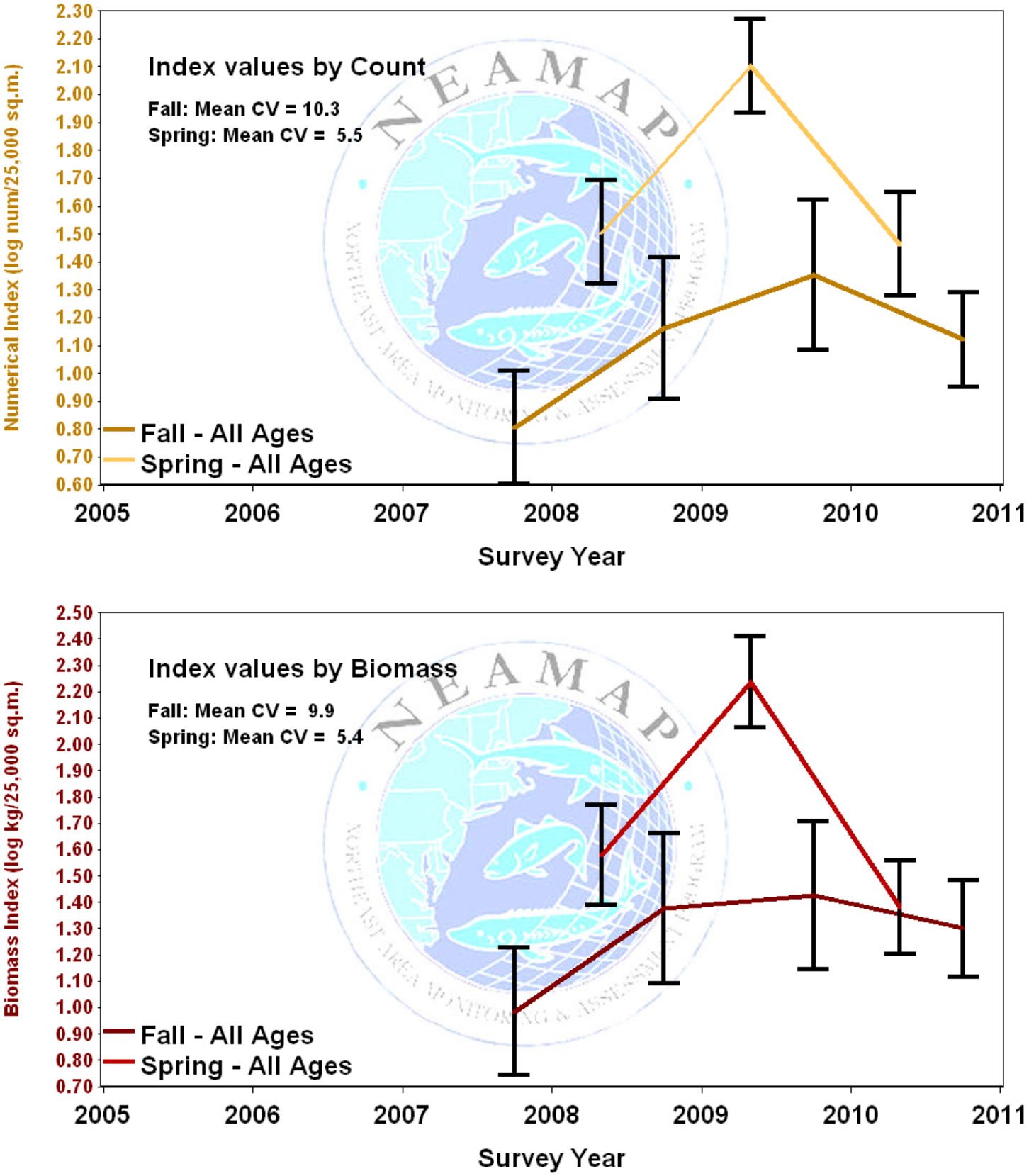


Figure 76. Width-frequency distributions, by cruise, for horseshoe crab.

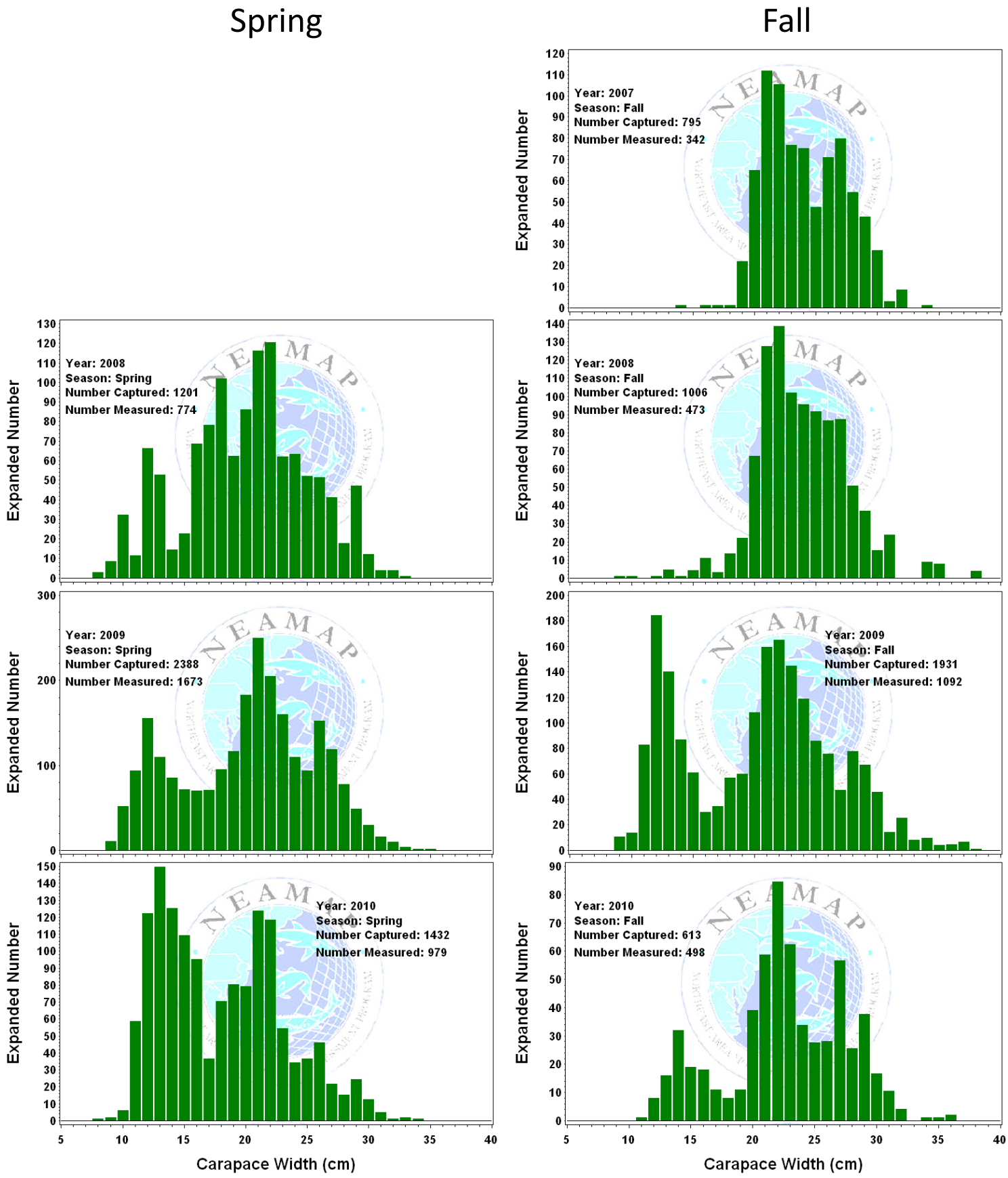


Figure 77. Sex-specific length-frequency distribution, by season, all cruises pooled, for horseshoe crab (Only data from 2010 are presented here because of likely incorrect sex assignment of small specimens in prior years.).

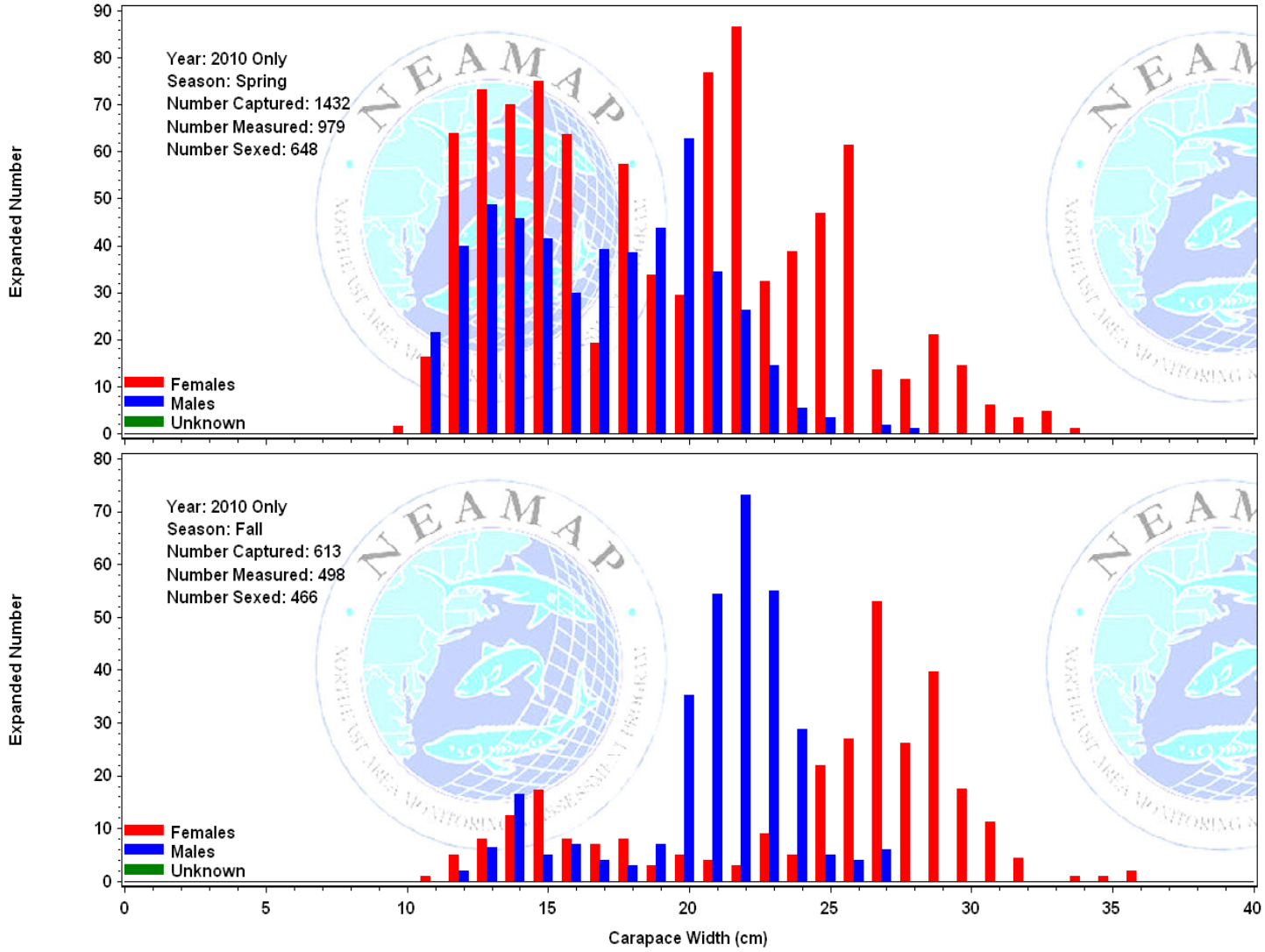
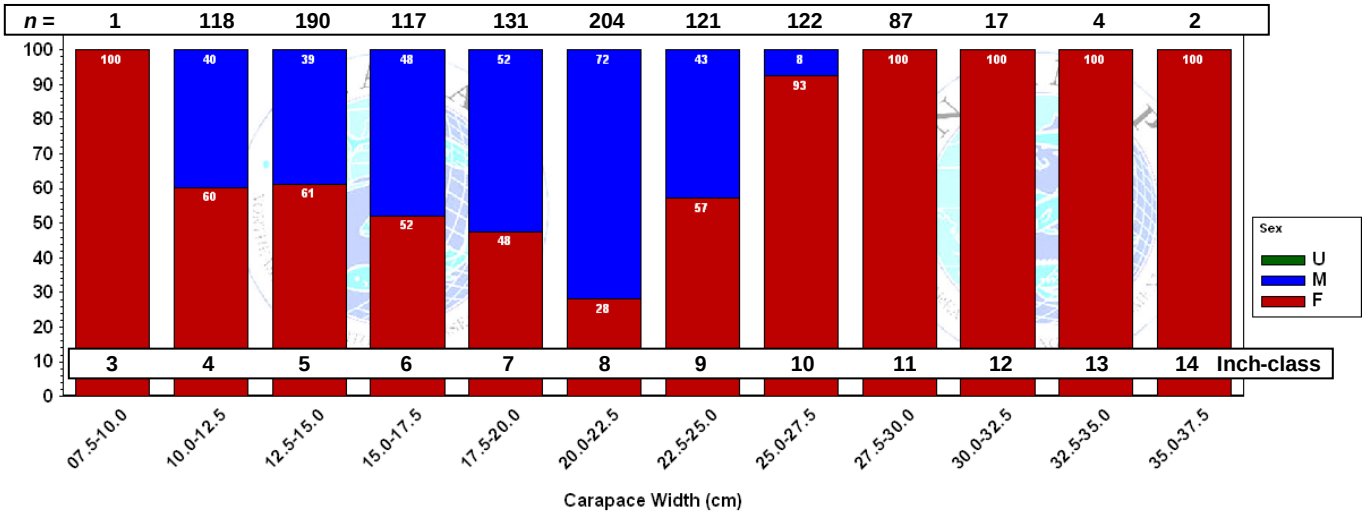


Figure 78. Sex ratio, by length group, for horseshoe crab collected both NEAMAP 2010 (The percentages for each category are given in their respective bars. The number sampled for sex determination is provided above each bar, and the length categories expressed in inches are given near the x-axis. Only data from 2010 are presented here because of likely incorrect sex assignment of small specimens in prior years.).



Kingfish

Sampling Priority: D

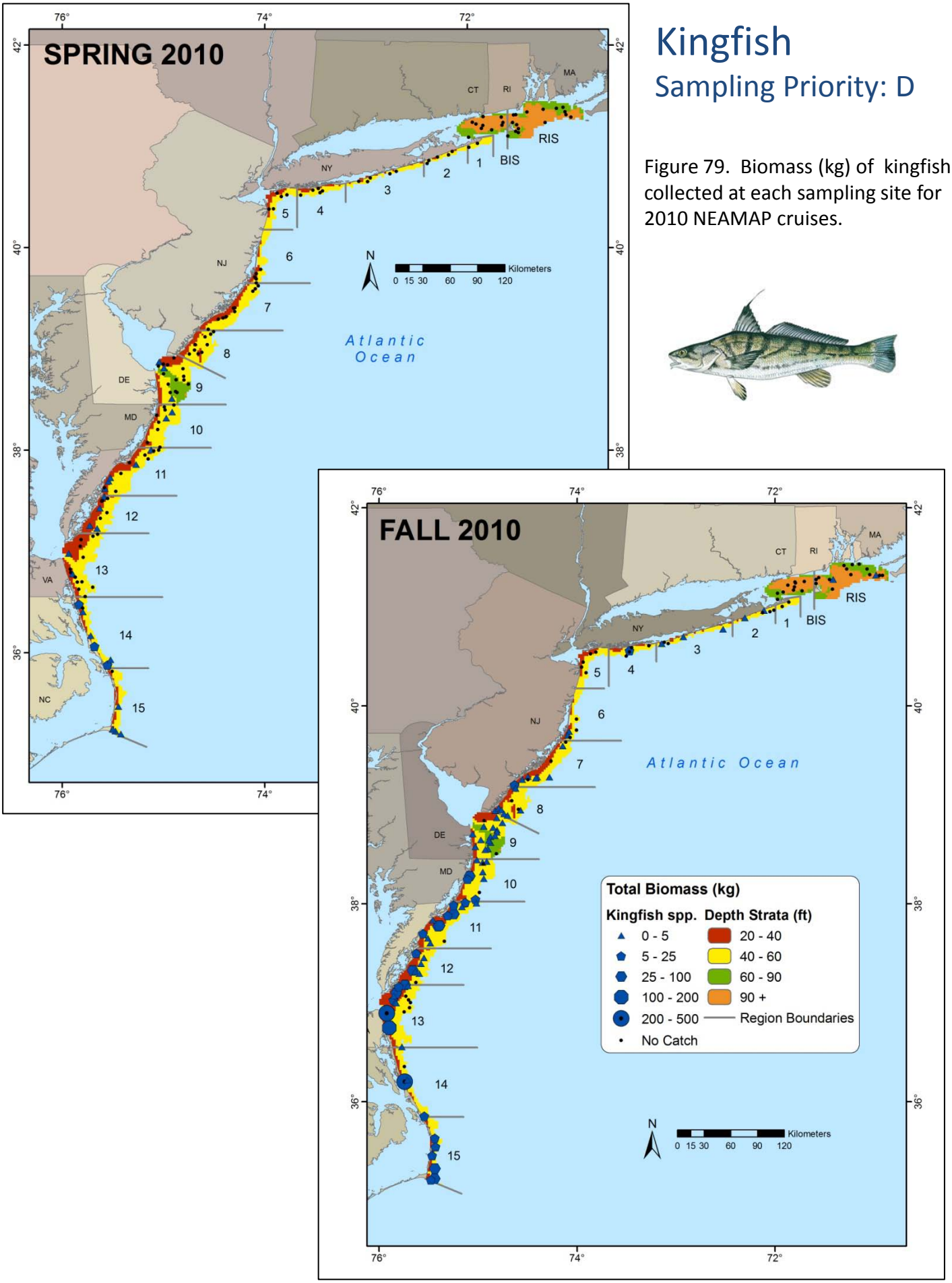


Figure 79. Biomass (kg) of kingfish collected at each sampling site for 2010 NEAMAP cruises.

Table 45. Sampling rates of kingfish for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught	Number Measured	Age Specimens	Ages Read	Stomach Specimens	Stomachs Analyzed
Spring	2008	9124	1398.8	1707	0		0	
	2009	6638	699.8	759	0		0	
	2010	8026	1254.4	1502	0		0	
Fall	2007	1742	207.8	483	0		0	
	2008	7969	888.9	3303	0		0	
	2009	13179	1230.9	479	0		0	
	2010	18979	2479.4	1925	0		0	

Table 46. Strata used for calculation of abundance indices for kingfish.

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		

= used for abundance indices

= not used for abundance indices

Table 47. Preliminary abundance indices for kingfish.

		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	13	4.59	12.6	13	2.46	19.4	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	15	2.65	14.4	15	1.24	17.3	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
	2010	13	3.02	26.1	13	1.55	39.7	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	66	2.66	8.9	66	1.48	11.5	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	61	3.37	7.0	61	2.07	8.3	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
	2009	64	3.70	3.6	64	1.92	5.4	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
	2010	61	3.08	7.8	61	1.73	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

Figure 80. Preliminary indices of overall abundance, in terms of number and biomass, of kingfish for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

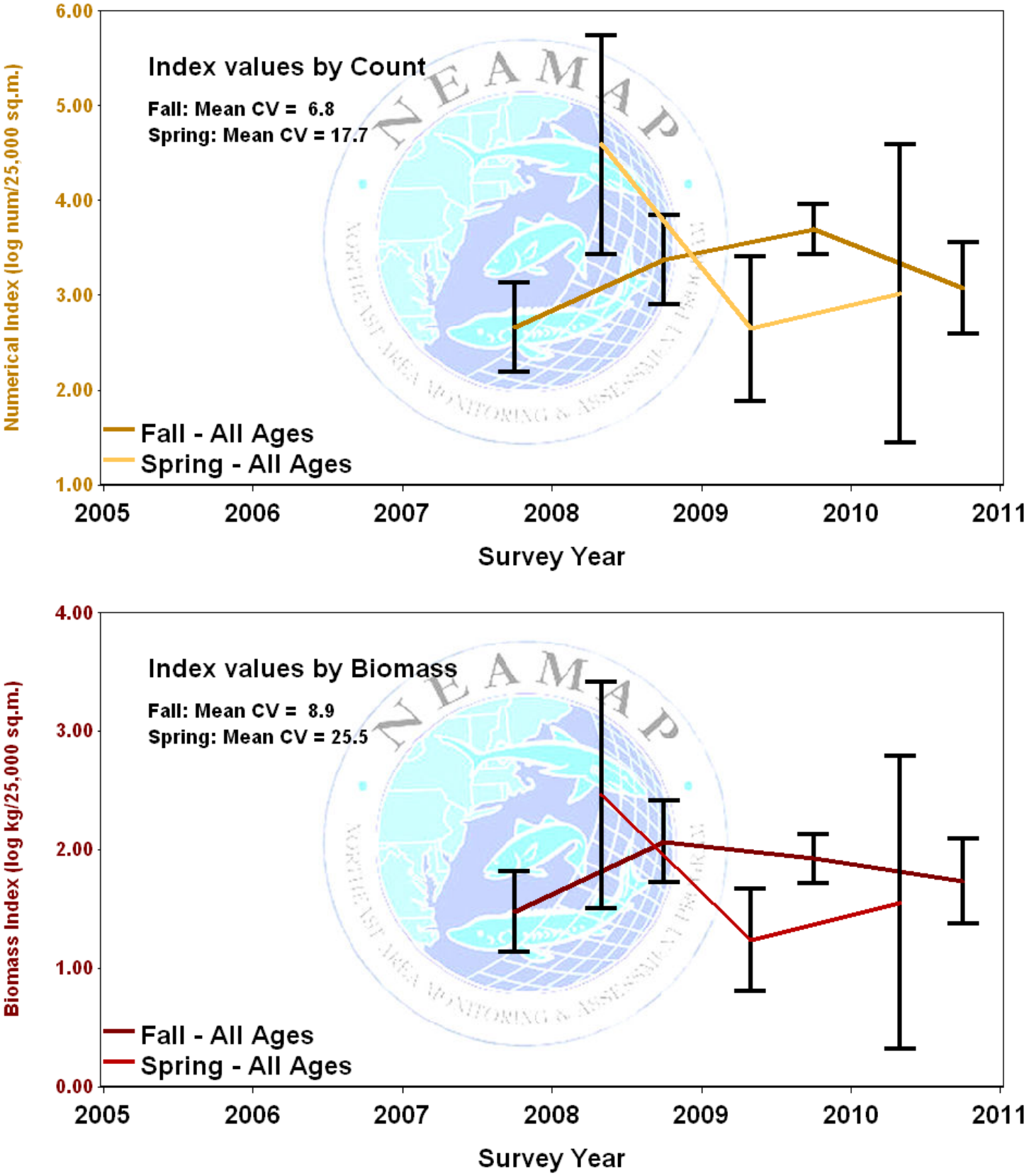
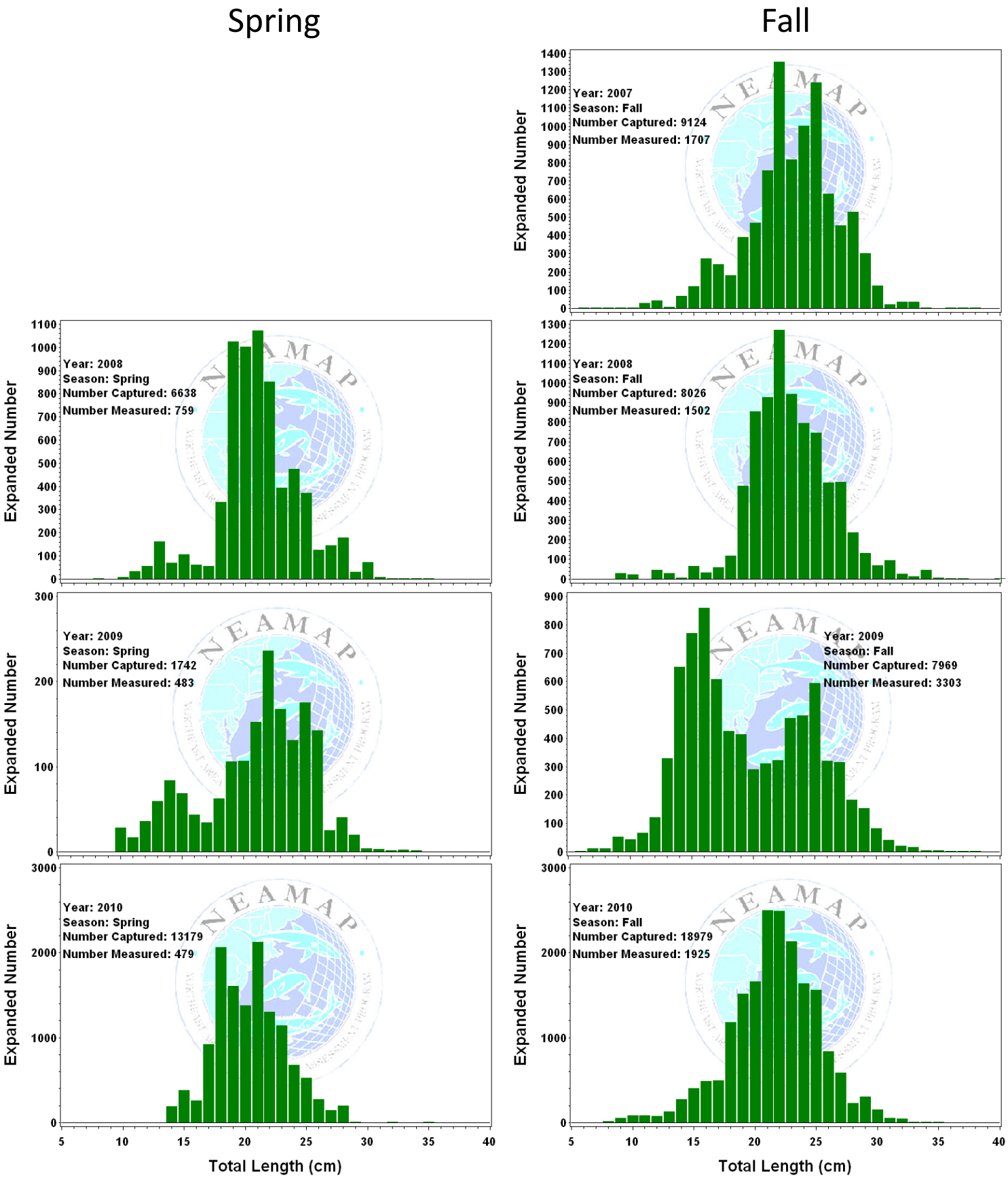


Figure 81. Length-frequency distributions, by cruise, for kingfish.



Little Skate

Sampling Priority: A

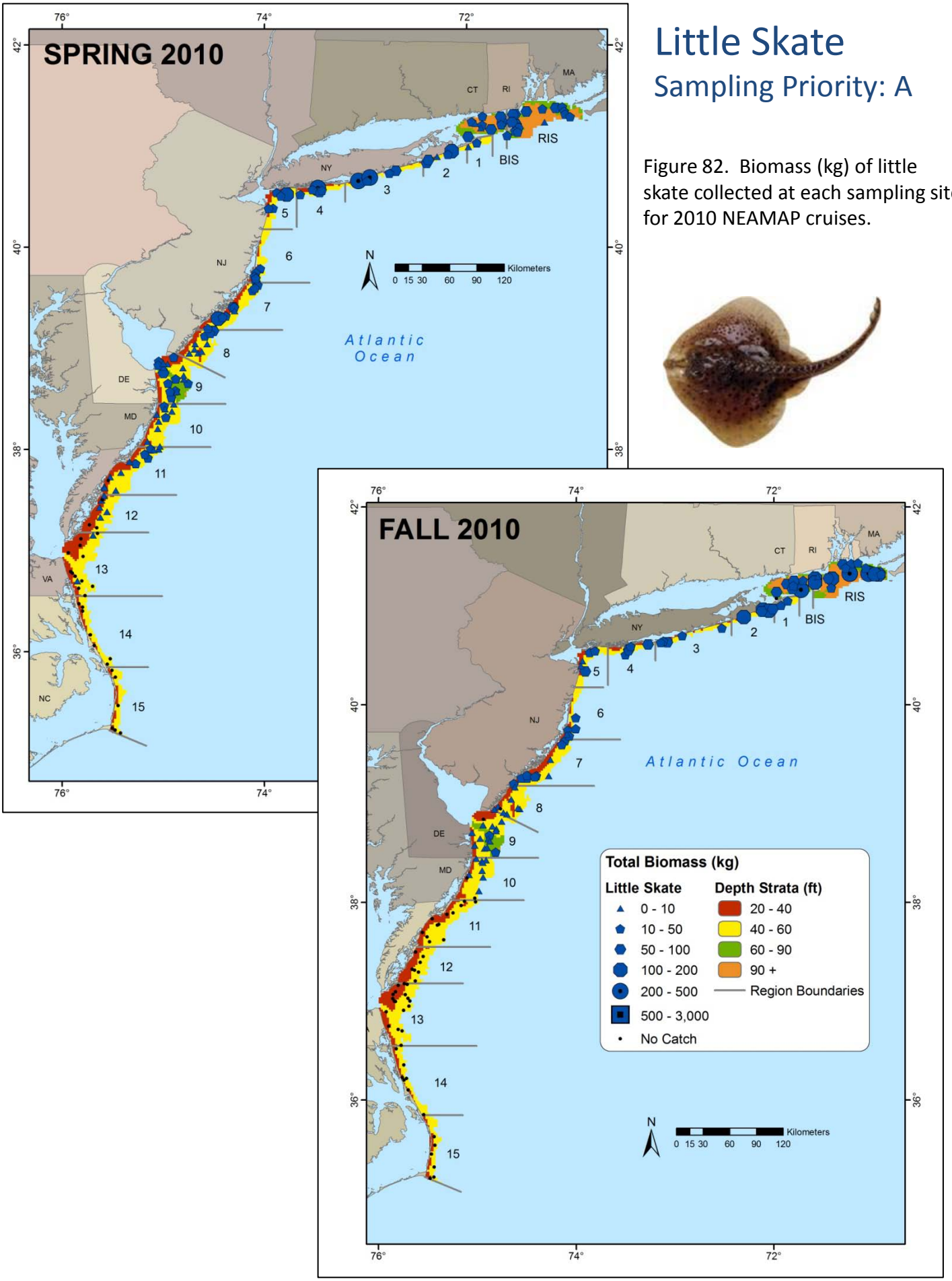


Figure 82. Biomass (kg) of little skate collected at each sampling site for 2010 NEAMAP cruises.

Table 48. Sampling rates and preserved specimen analysis status of little skate for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught	Number Measured	Age Specimens	Ages Read	Stomach Specimens	Stomachs Analyzed
Spring	2008	5288	3026.2	2659	194	0	188	181
	2009	9873	5862.5	2991	312	0	301	299
	2010	7014	4104.8	2247	263	0	259	256
Fall	2007	23391	12463.6	5115	397	0	383	377
	2008	8442	4964.9	4371	304	0	284	277
	2009	7802	4262.2	3330	337	0	328	315
	2010	6453	3739.1	3672	263	0	237	3

Table 49. Strata used for calculation of abundance indices for little skate.

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		

= used for abundance indices

= not used for abundance indices

Table 50. Preliminary abundance indices for little skate.

		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	109	3.72	2.3	109	3.26	2.5	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	120	3.92	2.0	120	3.37	2.3	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
	2010	112	3.41	2.2	112	2.90	2.6	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	84	2.65	4.2	84	2.29	4.3	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	89	3.41	3.1	89	2.93	3.4	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	96	3.68	1.8	96	3.17	2.0	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	89	3.31	3.6	89	2.83	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

Figure 83. Preliminary indices of overall abundance, in terms of number and biomass, of little skate for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

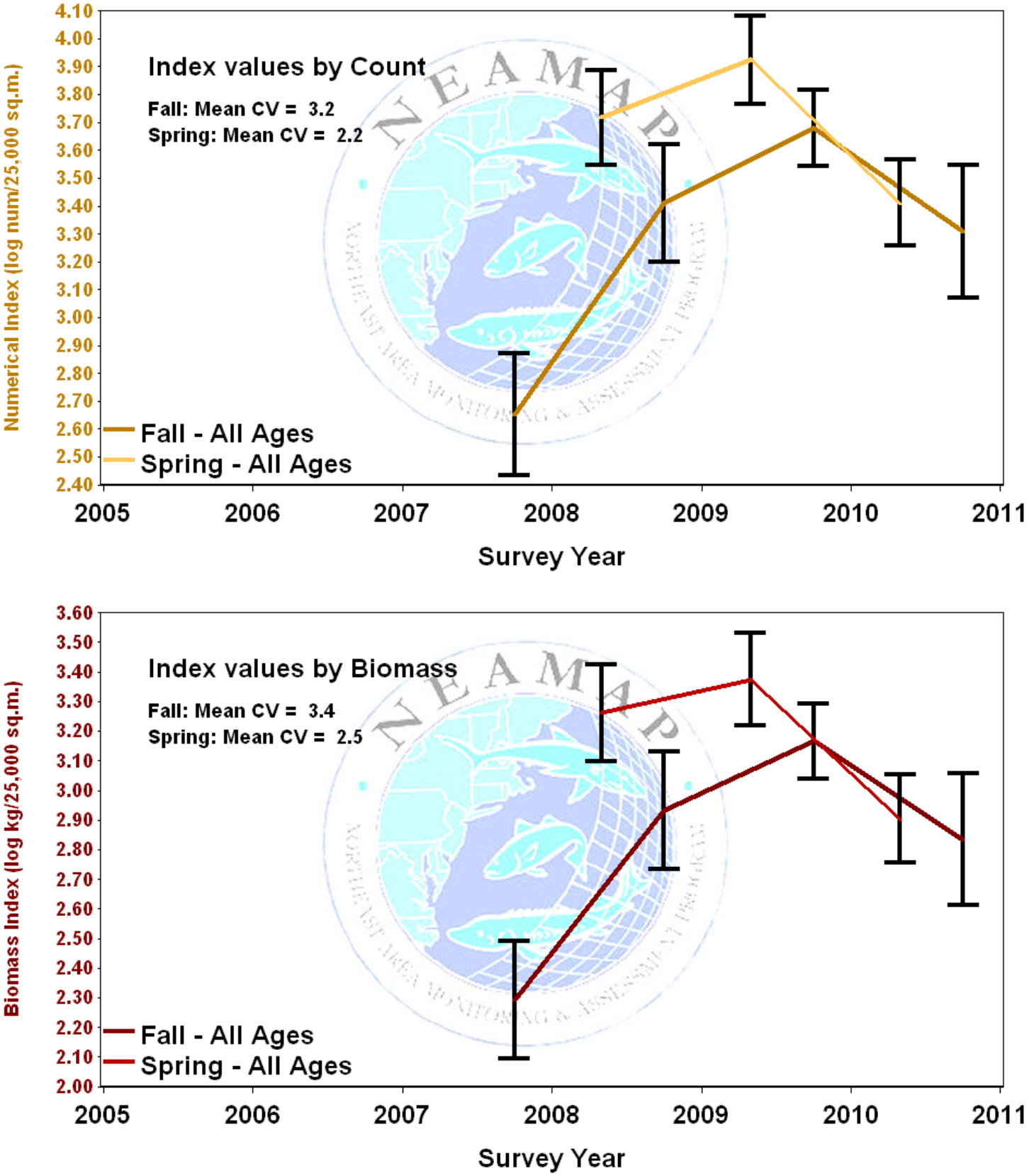


Figure 84. Length-frequency distributions, by cruise, for little skate.

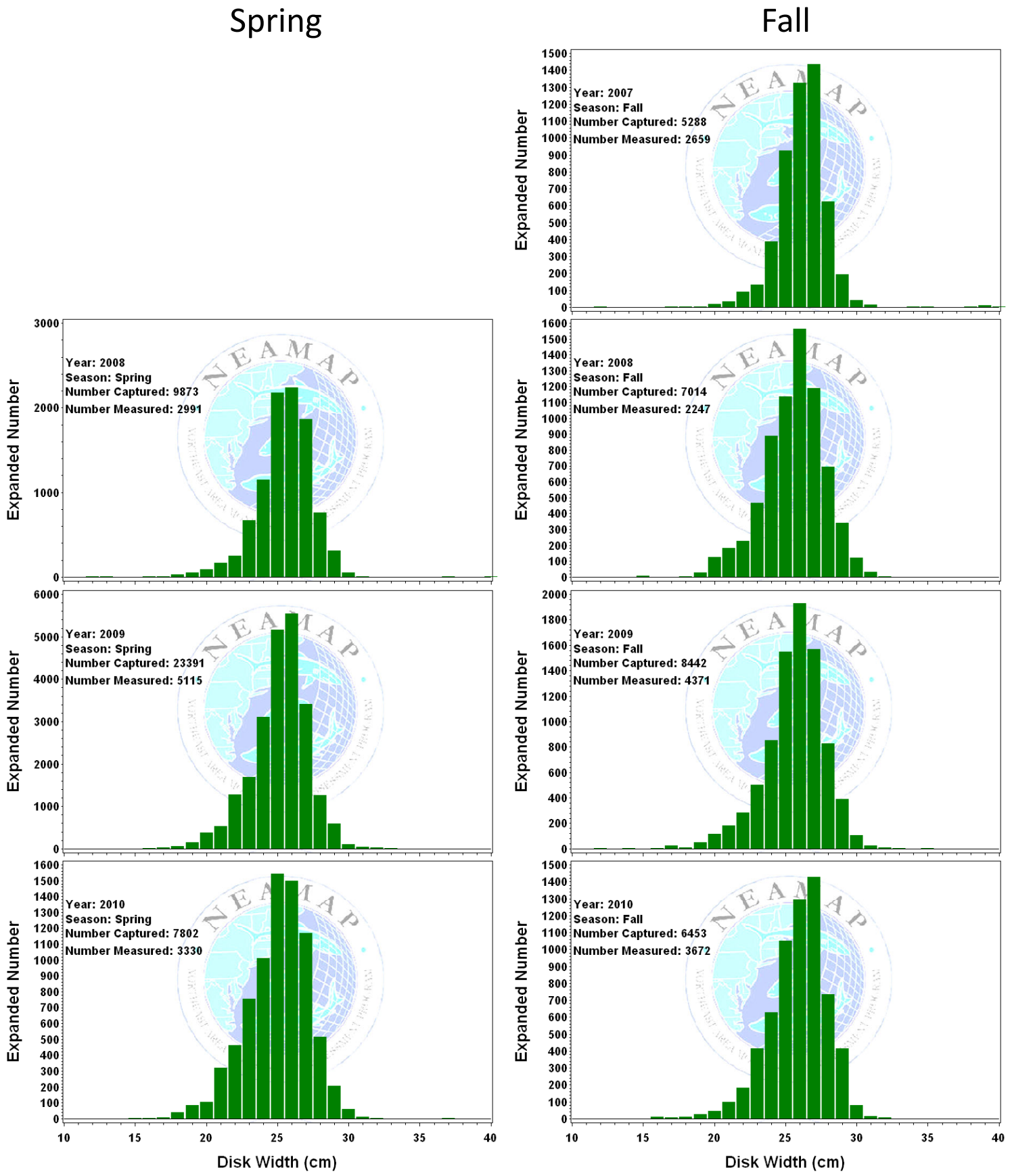


Figure 85. Sex-specific length-frequency distribution, by season, all cruises pooled, for little skate.

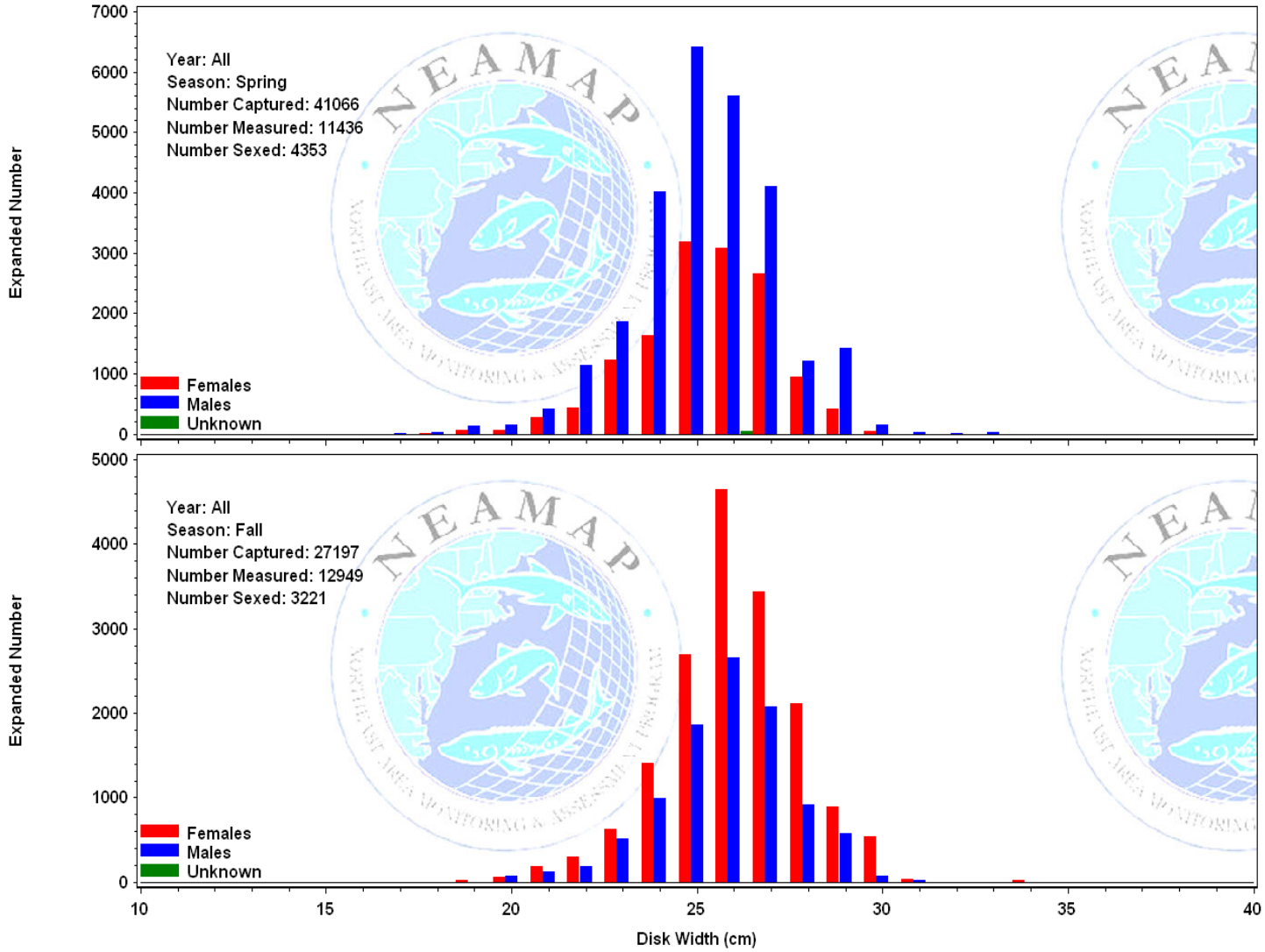


Figure 86. Sex ratio, by length group, for little skate collected all NEAMAP cruises 2007-2010 (The percentages for each category are given in their respective bars. The number sampled for sex determination is provided above each bar, and the length categories expressed in inches are given near the x-axis.).

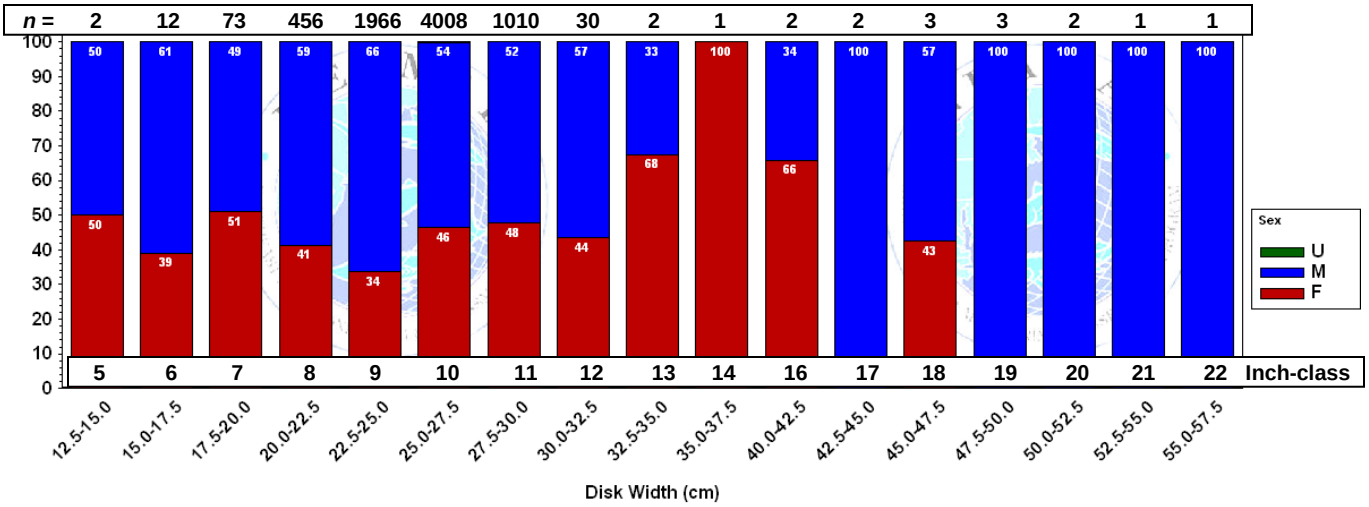
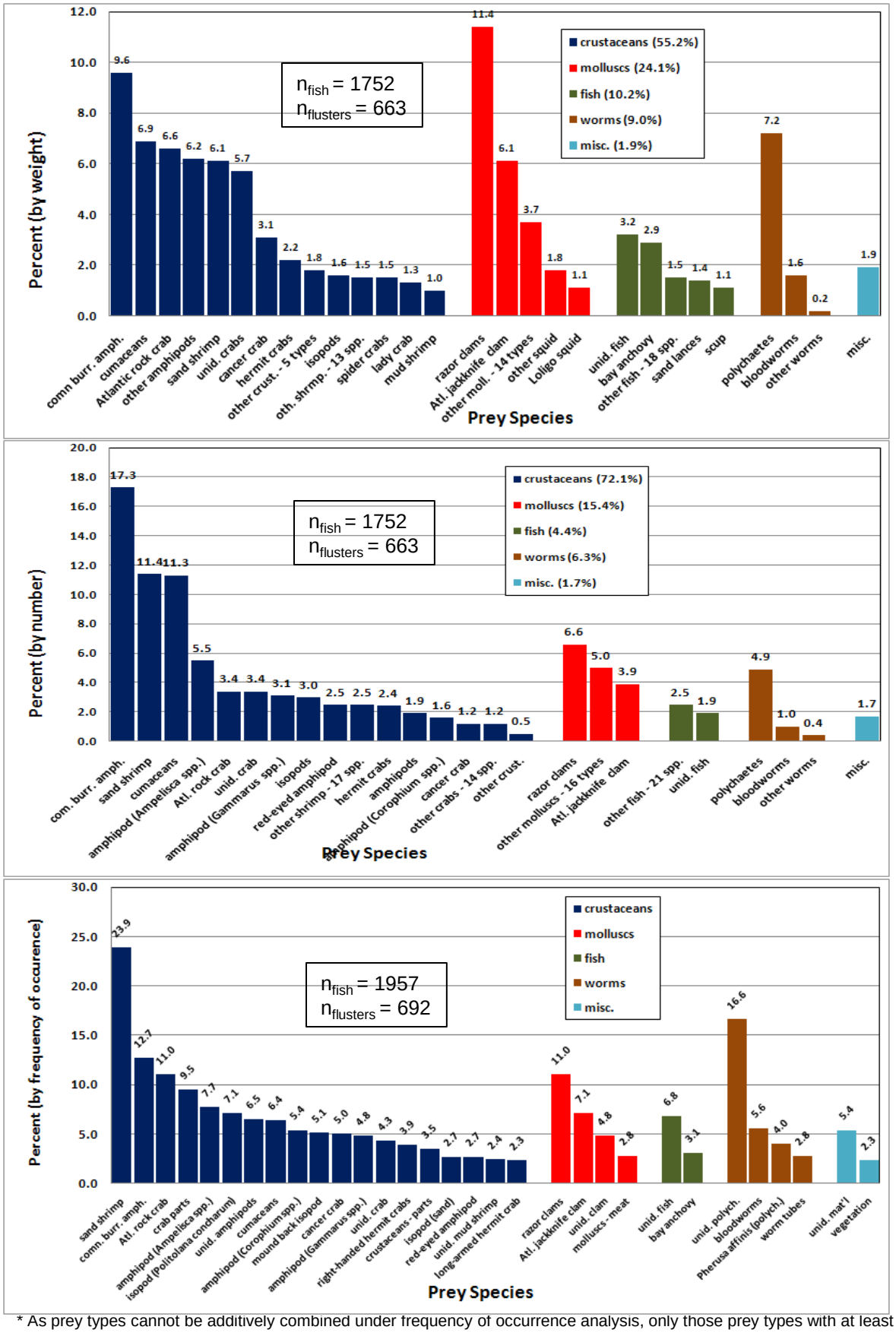


Figure 87. Diet composition, expressed as percent by weight, by number, and by frequency of occurrence* of little skate collected during NEAMAP cruises in 2007-2009 (The number of fish sampled for diet is given by n_{fish}, while $n_{clusters}$ indicates the number of clusters of little skate sampled.).



* As prey types cannot be additively combined under frequency of occurrence analysis, only those prey types with at least a 2% value are shown here: 135 other prey types were observed in stomachs for this species. Similarly, sums for broad taxonomic groups are not calculated.

Loligo Squid

Sampling Priority: E

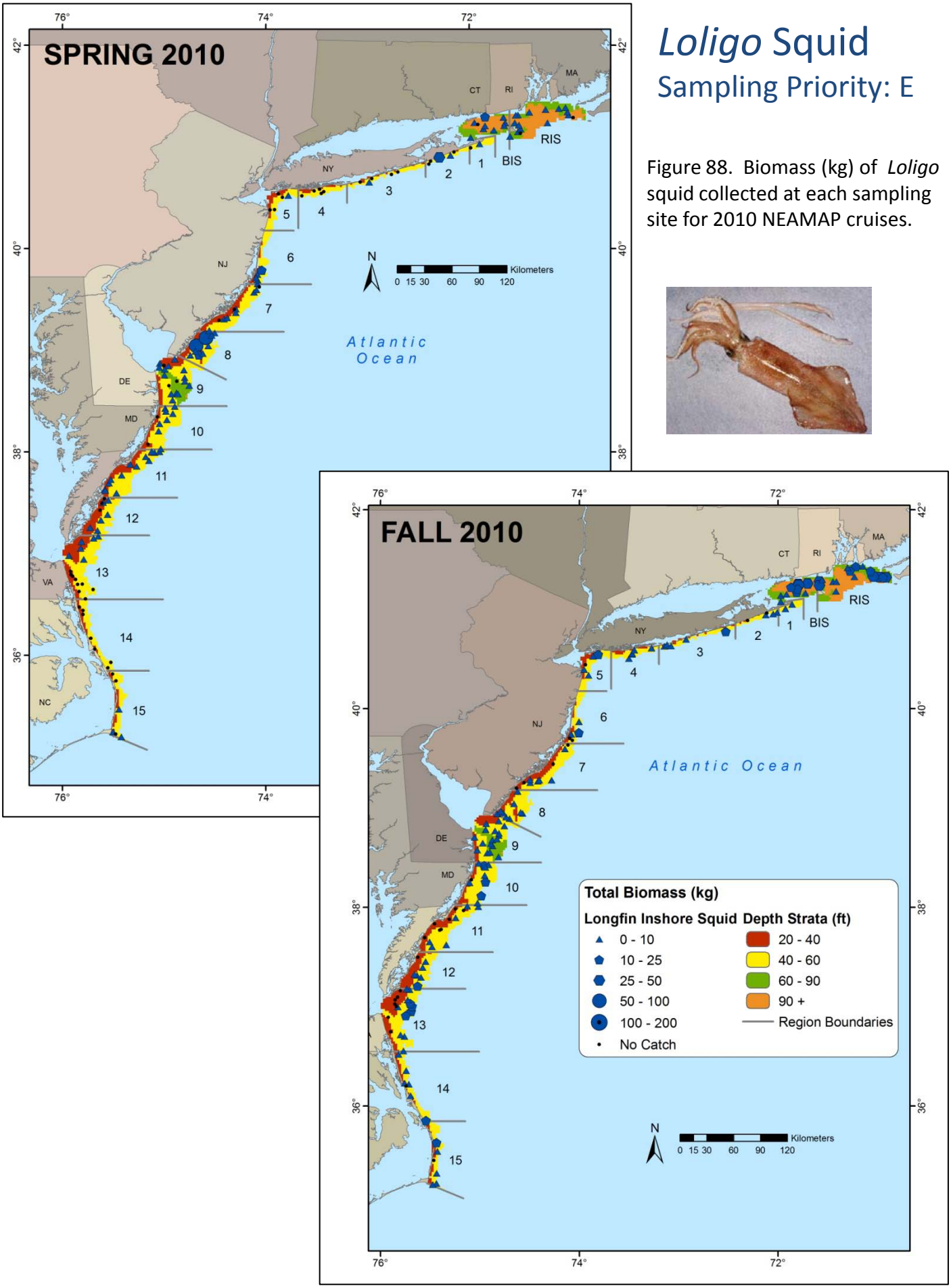


Figure 88. Biomass (kg) of *Loligo* squid collected at each sampling site for 2010 NEAMAP cruises.

Table 51. Sampling rates of *Loligo* squid for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught	Number Measured	Age Specimens	Ages Read	Stomach Specimens	Stomachs Analyzed
Spring	2008	19549	776.2	5127	0		0	
	2009	12451	501.6	5710	0		0	
	2010	7502	316.2	2396	0		0	
Fall	2007	119512	2278.6	9625	0		0	
	2008	93383	1357.9	5998	0		0	
	2009	242495	3406.4	10005	0		0	
	2010	46980	962.8	5902	0		0	

Table 52. Strata used for calculation of abundance indices for *Loligo* squid.

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		

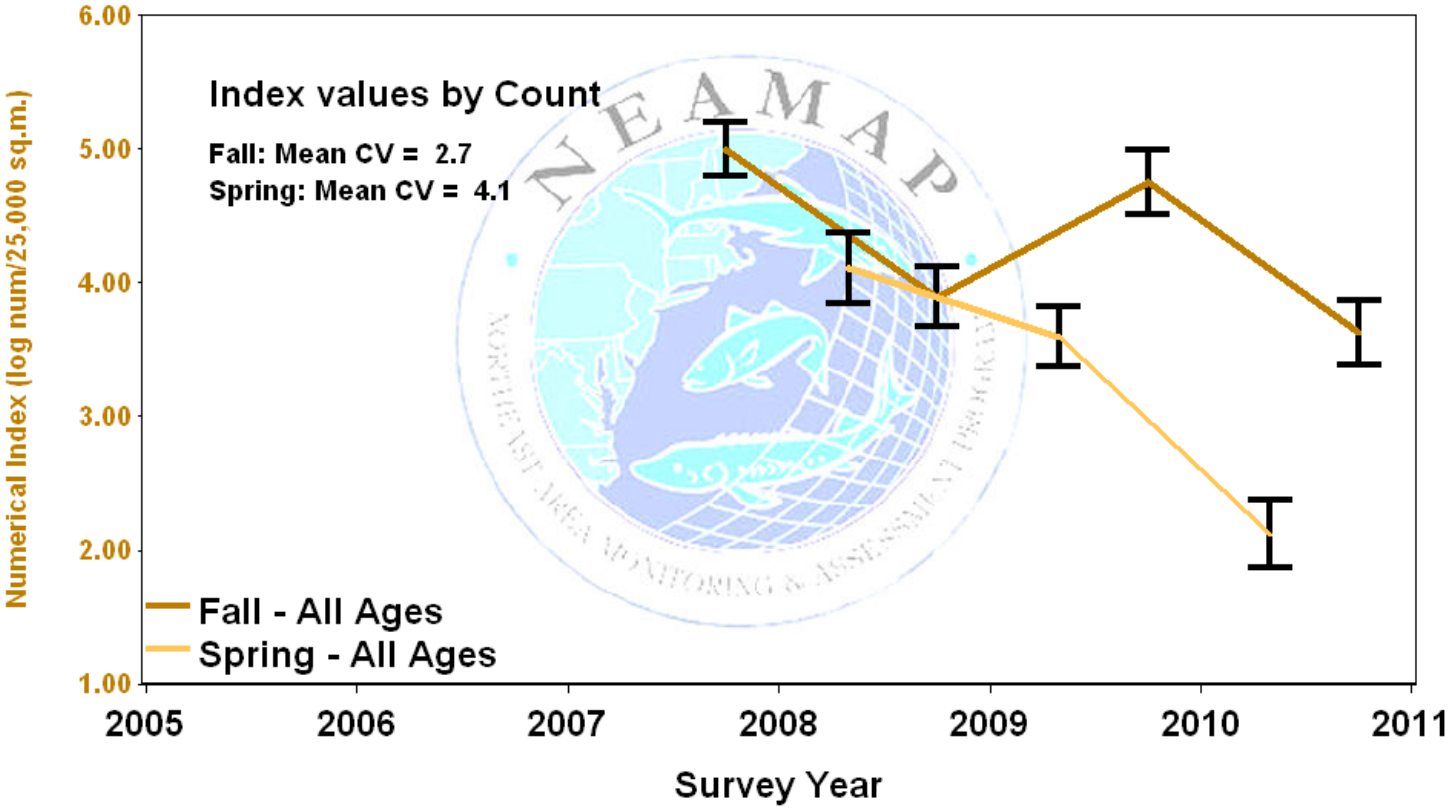
= used for abundance indices

= not used for abundance indices

Table 53. Preliminary abundance indices for *Loligo* squid.

		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	107	4.11	3.2	107	1.50	5.4	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	109	3.60	3.1	109	1.11	5.8	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	108	2.12	6.0	108	0.53	11.0	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	150	5.00	2.0	150	1.80	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
	2008	150	3.90	2.9	150	1.34	4.5	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	160	4.75	2.5	160	1.91	3.5	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	150	3.63	3.3	150	1.47	4.5	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 89. Preliminary indices of overall abundance, in terms of number and biomass, of *Loligo* squid for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.



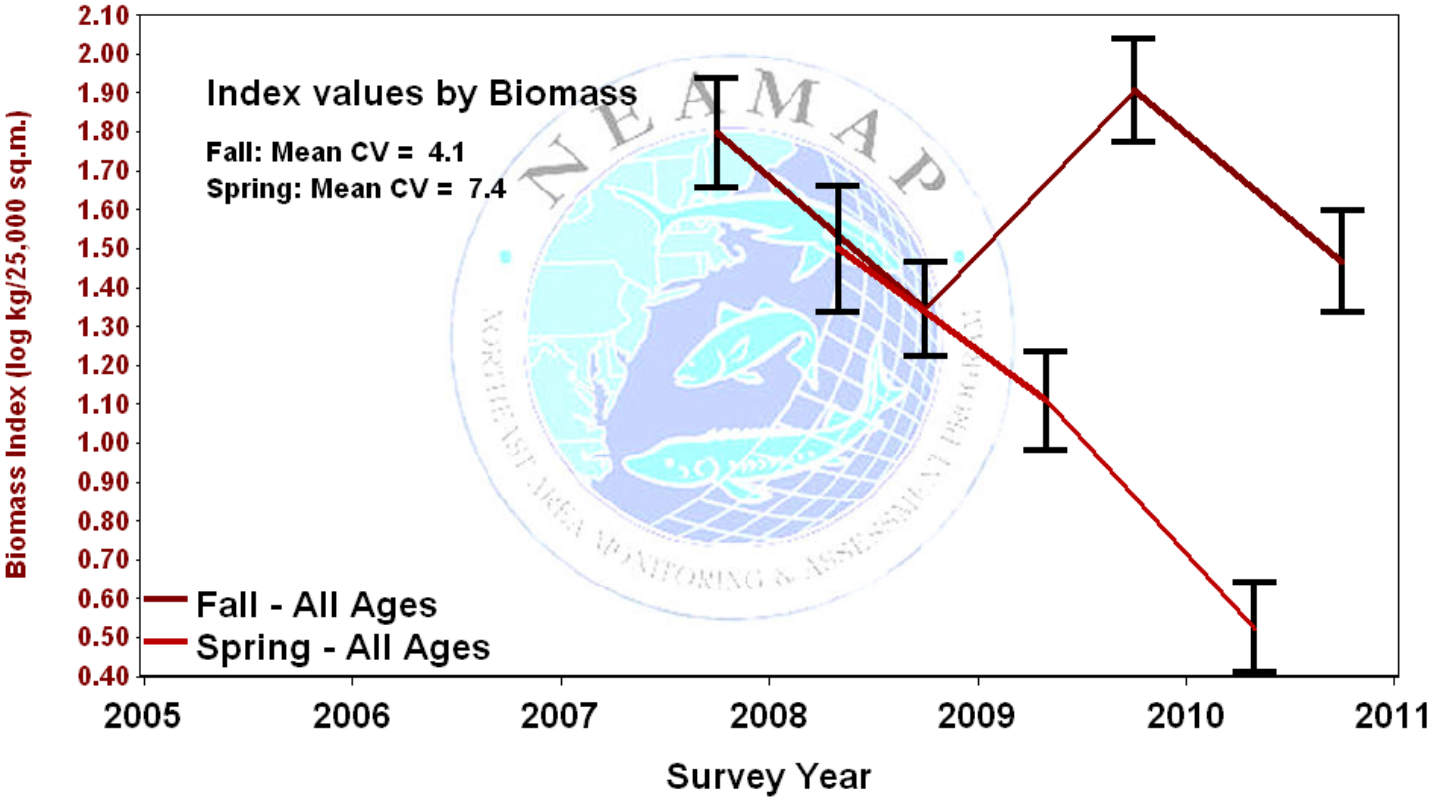
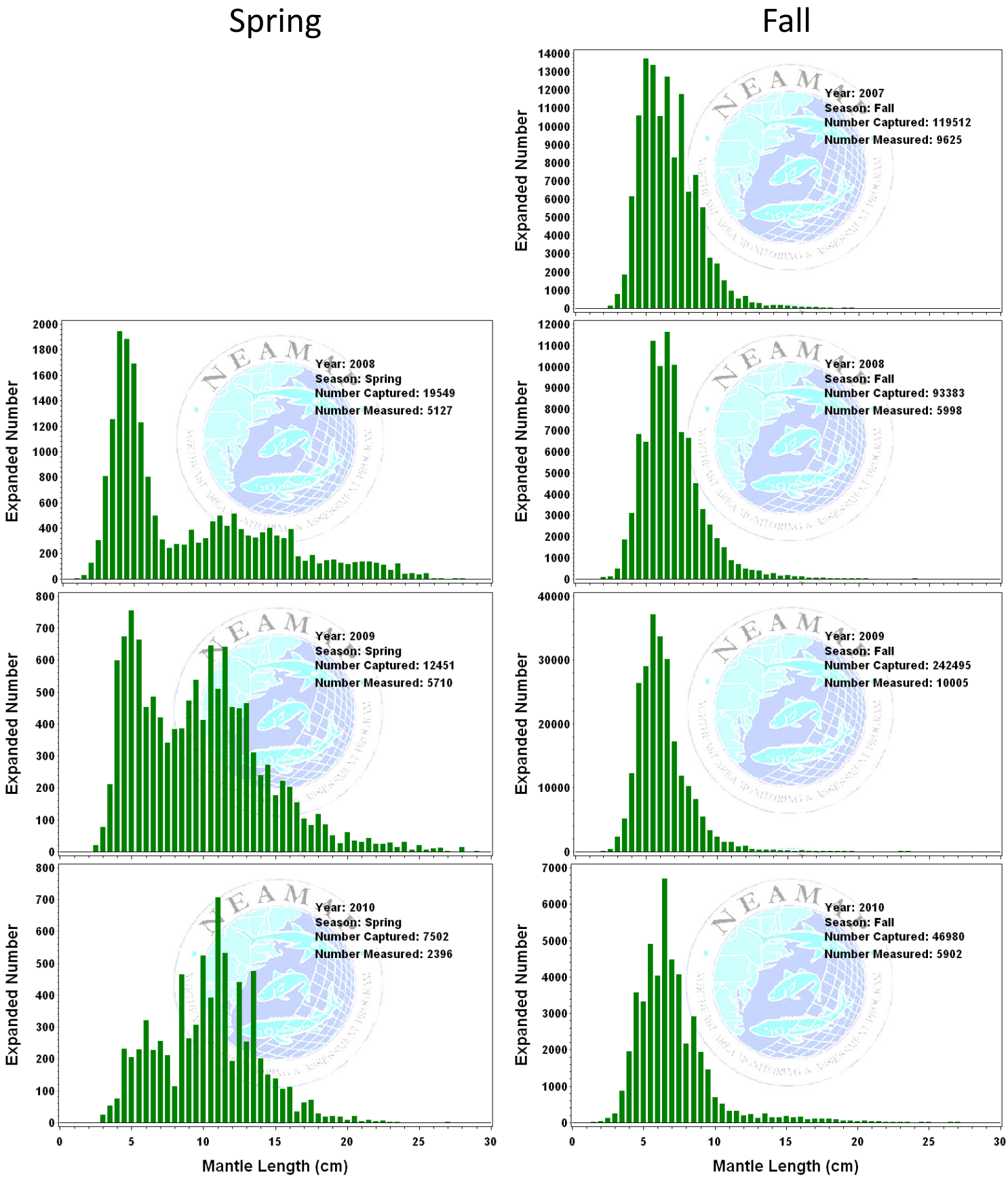


Figure 90. Length-frequency distributions, by cruise, for *Loligo* squid.



Scup

Sampling Priority: A

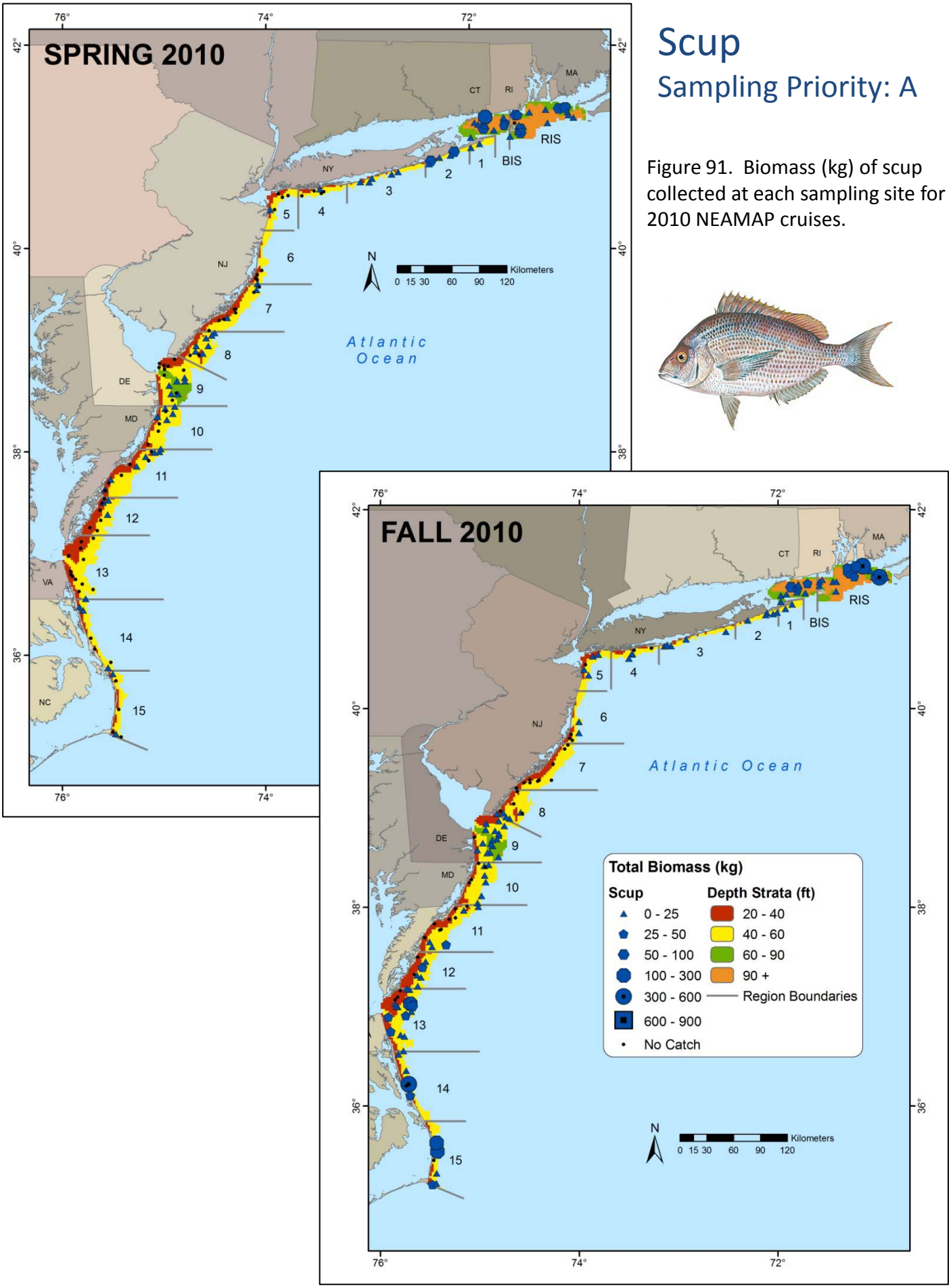


Figure 91. Biomass (kg) of scup collected at each sampling site for 2010 NEAMAP cruises.

Table 54. Sampling rates and preserved specimen analysis status of scup for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught	Number Measured	Age Specimens	Ages Read	Stomach Specimens	Stomachs Analyzed
Spring	2008	51629	1256.1	7167	869	0	754	744
	2009	16884	2827.3	7043	740	0	708	698
	2010	4209	928.5	2287	465	0	401	318
Fall	2007	276237	3928.8	13721	811	808	802	795
	2008	77858	2503.2	6946	670	0	668	661
	2009	158567	2577.8	12792	897	0	892	721
	2010	131471	3959.2	14006	727	0	712	

Table 55. Strata used for calculation of abundance indices for scup.

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		

= used for abundance indices

= not used for abundance indices

Table 56. Preliminary abundance indices for scup.

		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	137	3.51	3.9	137	1.21	6.4	1	137	2.69	4.6	137	0.65	9.2	>1	137	1.31	6.7	137	0.65	8.6
	2009	145	2.23	6.3	145	0.91	10.8		145	1.60	6.6	145	0.33	11.5		145	1.44	8.7	145	0.75	12.8
	2010	137	1.18	7.2	137	0.58	10.7		137	0.45	15.0	137	0.04	31.9		137	0.88	8.3	137	0.56	11.1
Fall	2007	150	4.77	4.0	150	2.14	5.6	0	150	4.08	4.6	150	1.53	6.8	>0	150	3.23	5.0	150	1.50	6.7
	2008	150	3.25	5.1	150	1.42	6.6		150	2.65	5.6	150	0.95	7.8		150	2.36	6.7	150	1.05	8.4
	2009	160	3.69	4.4	160	1.57	5.6		160	3.37	4.6	160	1.23	6.4		160	2.41	6.1	160	1.00	8.4
	2010	150	3.38	4.9	150	1.42	7.5		150	3.01	5.7	150	1.07	9.2		150	2.02	7.2	150	0.77	11.4

Figure 92. Preliminary indices of overall abundance, in terms of number and biomass, of scup for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

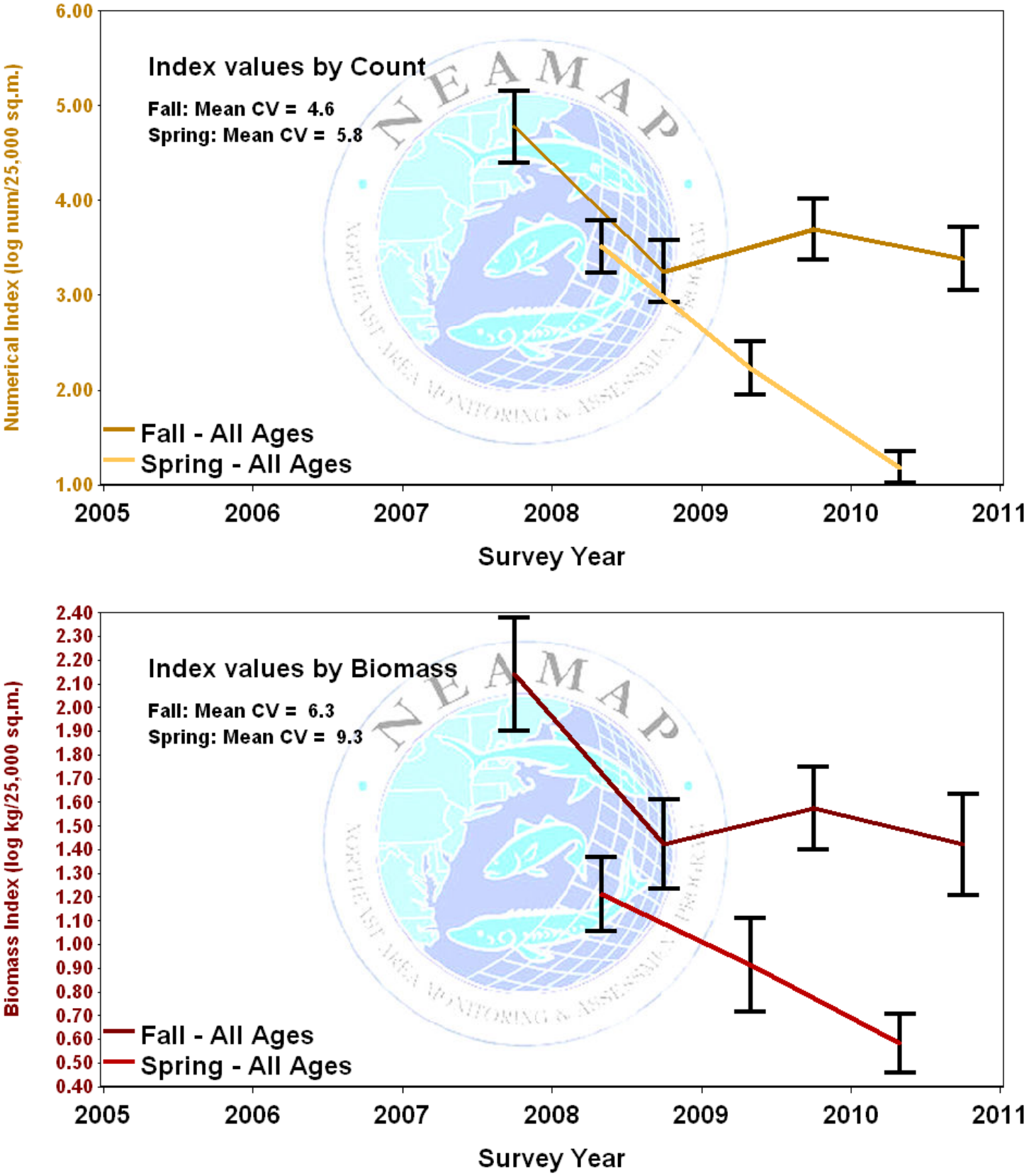


Figure 93. Preliminary indices of abundance, of scup for spring and fall NEAMAP surveys. Indices are for the youngest age class observed during each survey (count-based indices only) and for all other age classes combined (based both on count and biomass). 95% confidence intervals are provided for each abundance estimate.

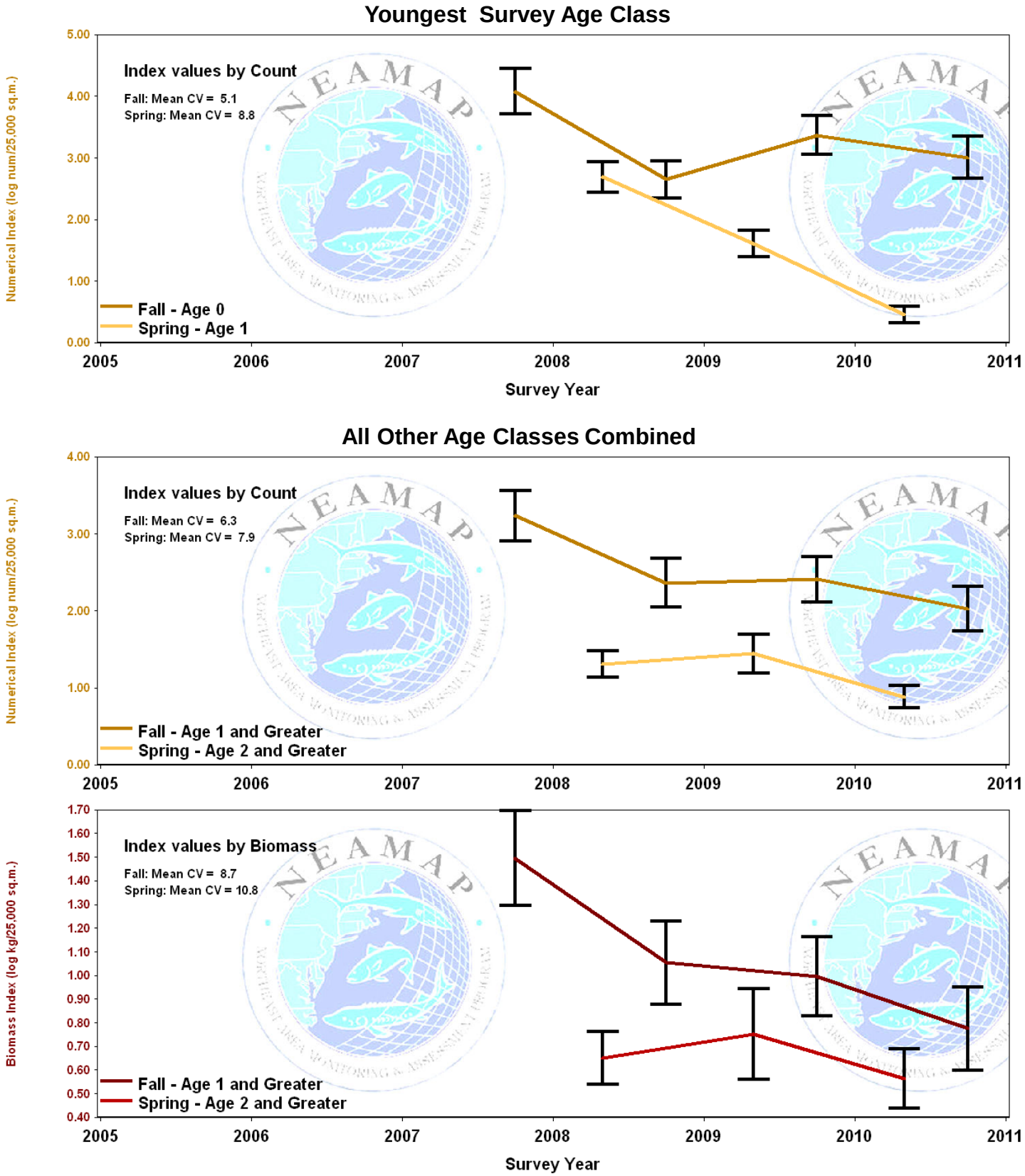


Figure 94. Length-frequency distributions, by cruise, for scup.

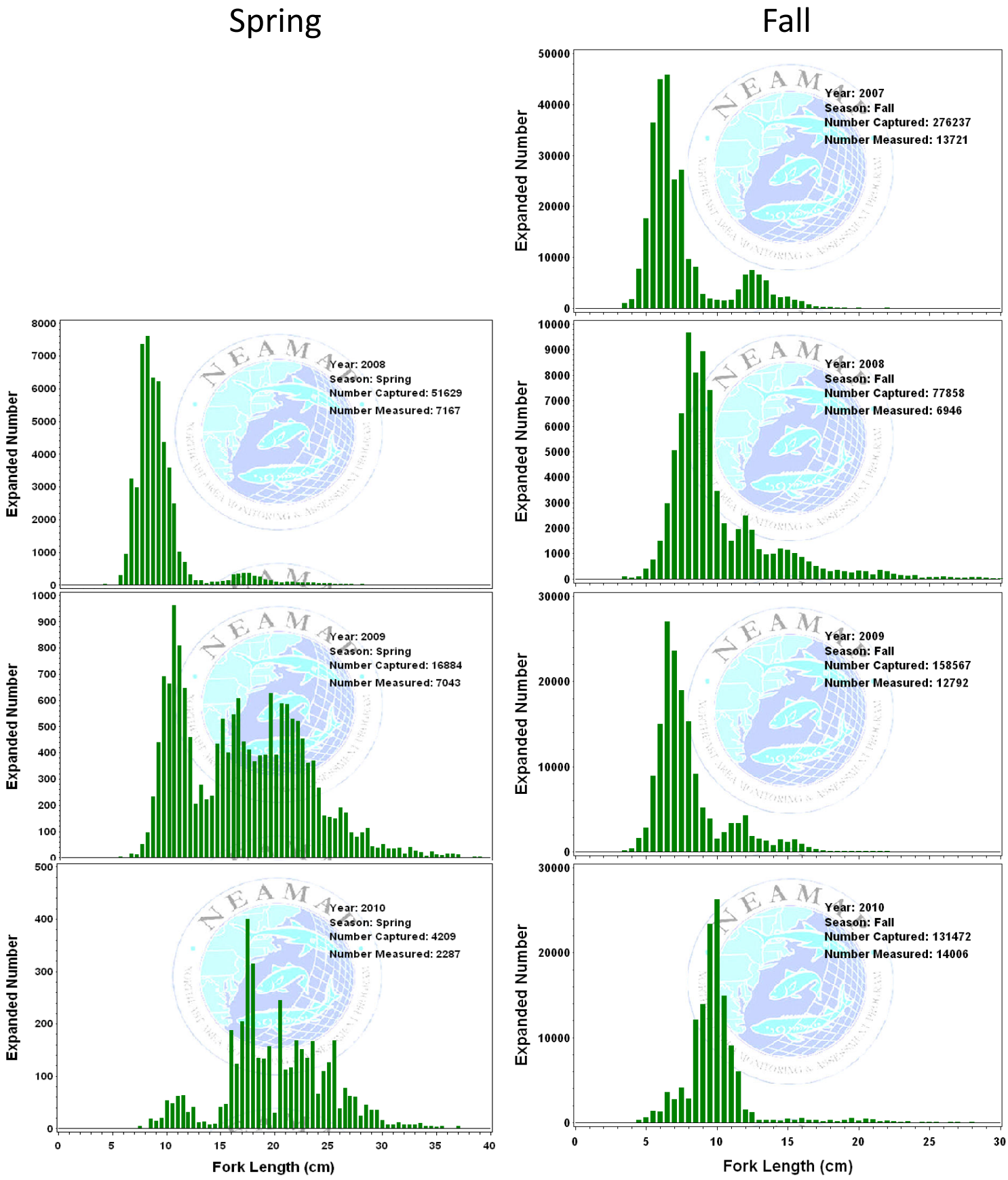


Figure 95. Sex-specific length-frequency distribution, by season, all cruises pooled, for scup.

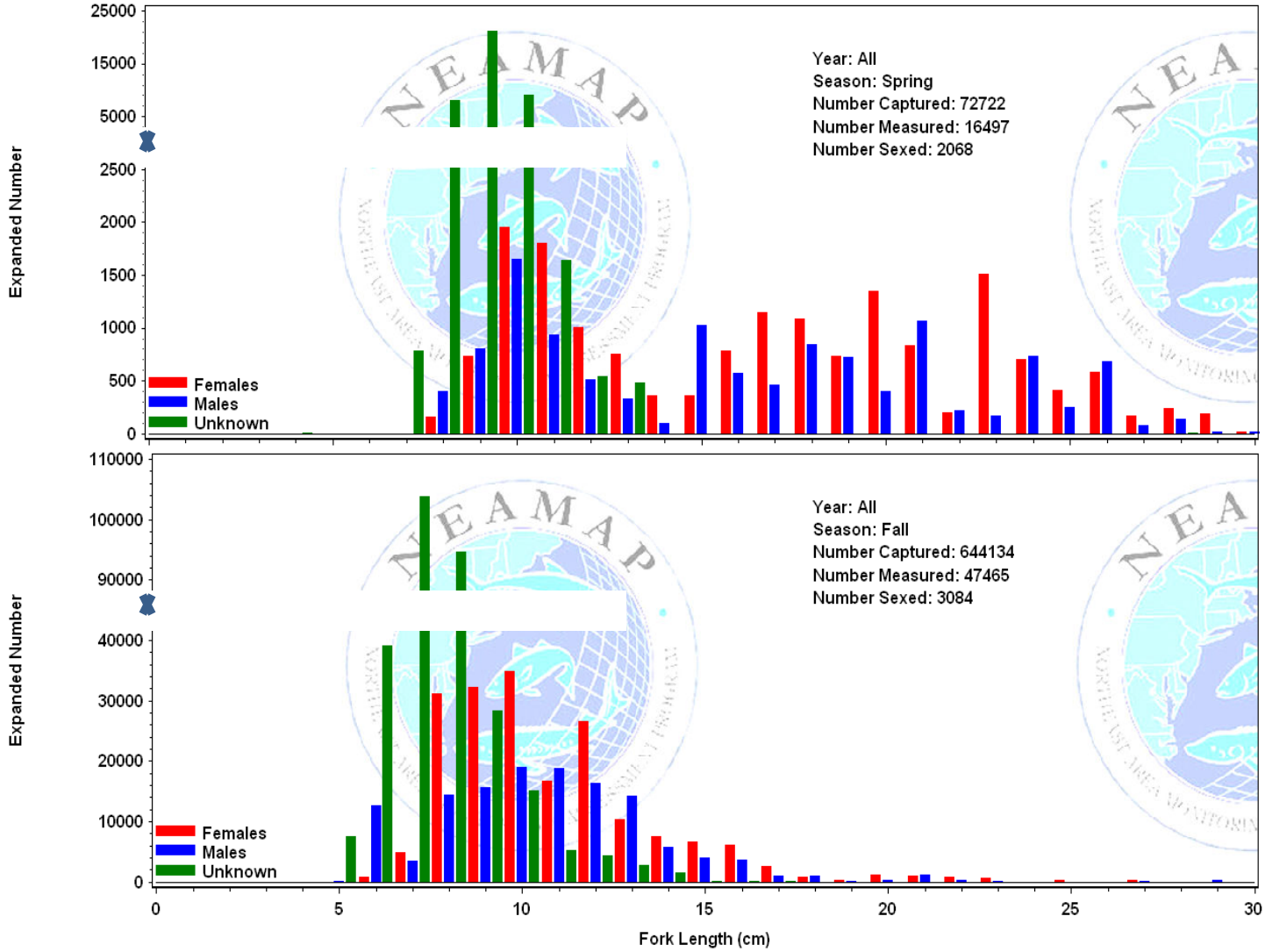


Figure 96. Sex ratio, by length group, for scup collected all NEAMAP cruises 2007-2010 (The percentages for each category are given in their respective bars. The number sampled for sex determination is provided above each bar, and the length categories expressed in inches are given near the x-axis.).

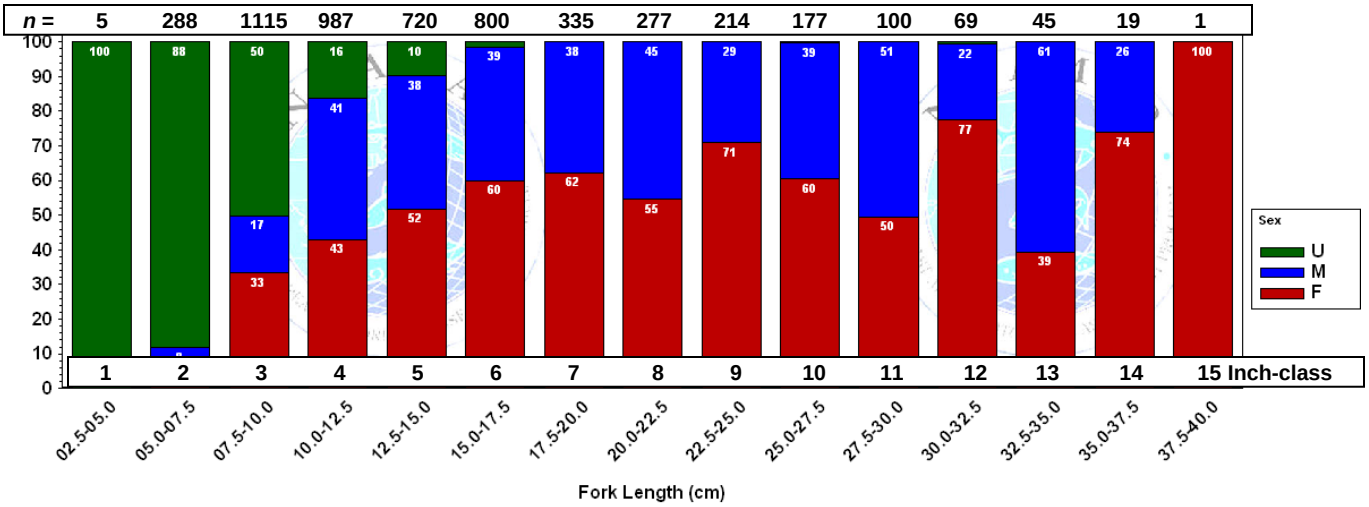
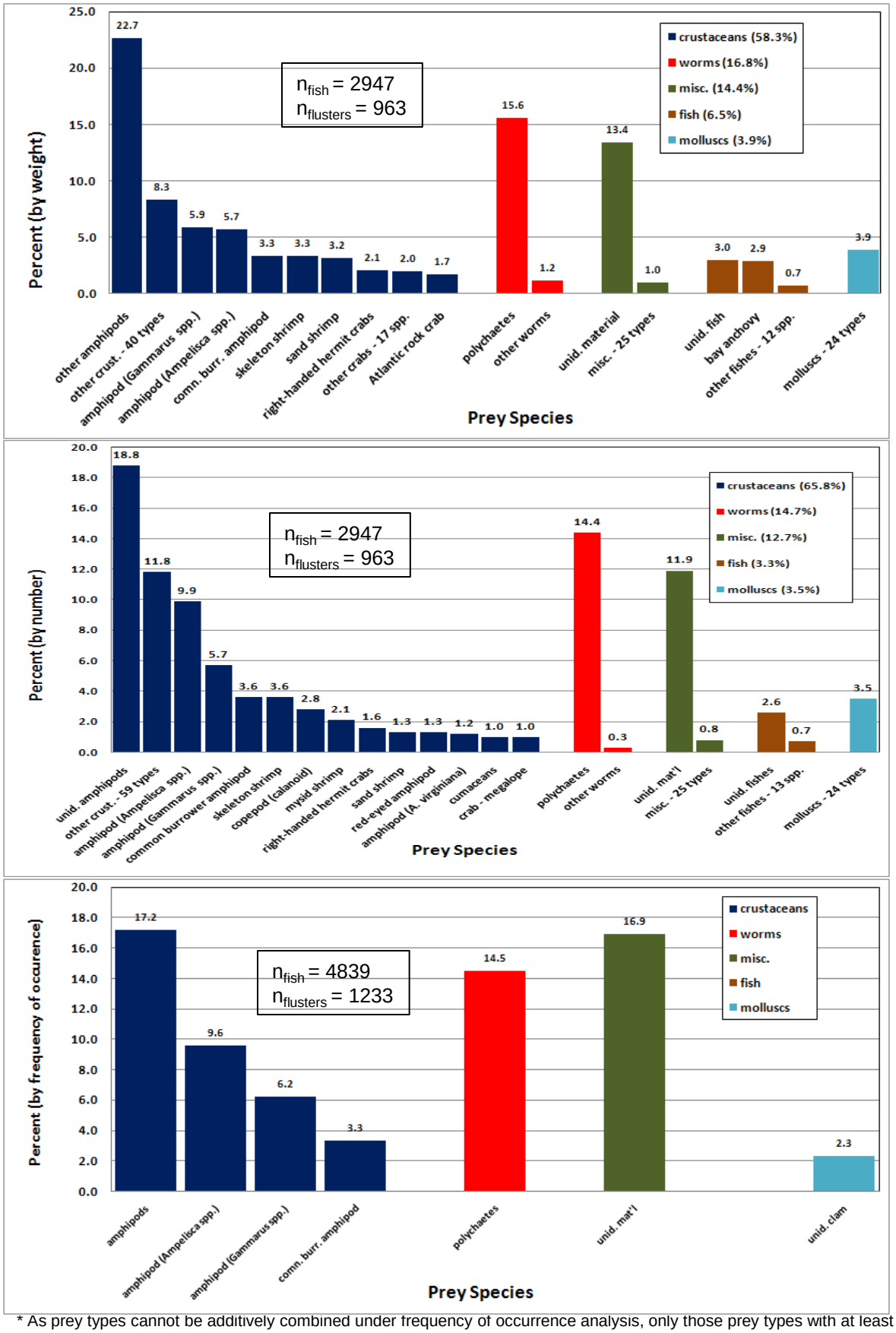


Figure 97. Diet composition, expressed as percent by weight, by number, and by frequency of occurrence* of scup collected during NEAMAP cruises in 2007-2009 (The number of fish sampled for diet is given by n_{fish}, while $n_{clusters}$ indicates the number of clusters of scup sampled.).



* As prey types cannot be additively combined under frequency of occurrence analysis, only those prey types with at least a 2% value are shown here: 147 other prey types were observed in stomachs for this species. Similarly, sums for broad taxonomic groups are not calculated.

Silver Hake (Whiting)

Sampling Priority: A

Figure 98. Biomass (kg) of silver hake collected at each sampling site for 2010 NEAMAP cruises.

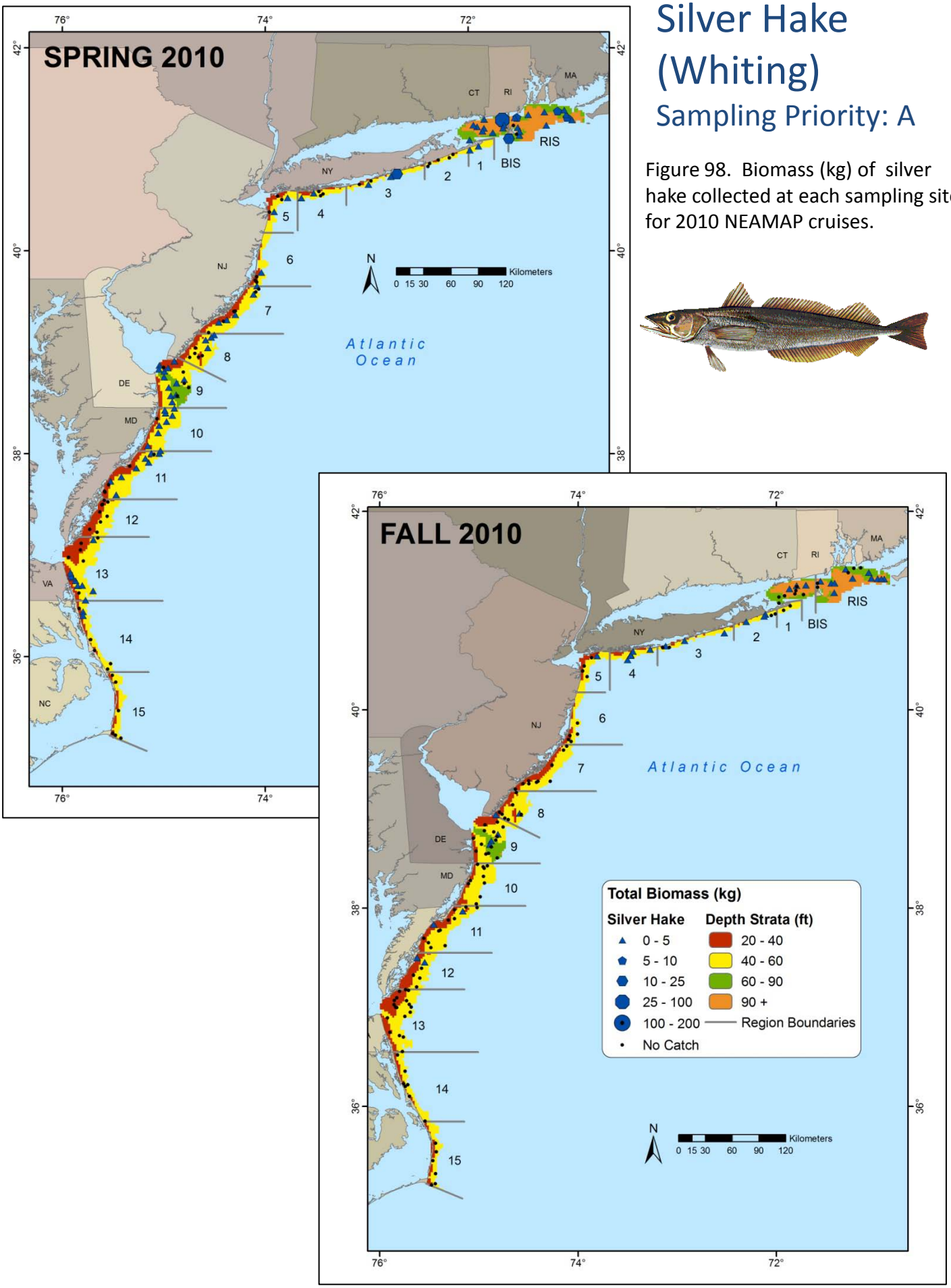


Table 57. Sampling rates and preserved specimen analysis status of silver hake for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught	Number Measured	Age Specimens	Ages Read	Stomach Specimens	Stomachs Analyzed
Spring	2008	28765	549.8	3063	409	0	398	391
	2009	5153	105.7	1789	406	0	402	398
	2010	10483	155.3	2378	380	0	374	307
Fall	2007	346	24.8	346	59	0	59	59
	2008	3125	183.9	515	96	0	88	87
	2009	1470	17.3	499	125	0	122	116
	2010	440	18.2	409	124	0	120	

Table 58. Strata used for calculation of abundance indices for silver hake.

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		

= used for abundance indices

= not used for abundance indices

Table 59. Preliminary abundance indices for silver hake.

		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	137	2.14	5.8	137	0.59	9.7	1	137	1.90	6.2	137	0.50	10.6	>1	137	1.24	8.4	137	0.33	13.3
	2009	145	1.53	7.7	145	0.27	15.8		145	1.28	8.9	145	0.14	25.0		145	0.62	12.3	145	0.17	17.4
	2010	137	1.71	7.0	137	0.30	14.1		137	1.48	7.7	137	0.23	16.6		137	0.90	10.0	137	0.12	19.4
Fall	2007	84	0.50	21.3	84	0.11	37.9	0	84	0.26	26.4	84	0.01	45.0	>0	84	0.29	29.9	84	0.10	39.7
	2008	89	0.63	21.4	89	0.15	48.9		89	0.40	22.5	89	0.05	54.4		89	0.35	35.2	89	0.14	53.4
	2009	96	0.69	17.7	96	0.08	46.6		96	0.63	19.1	96	0.06	56.1		96	0.14	41.6	96	0.04	58.0
	2010	89	0.71	14.7	89	0.13	25.0		89	0.39	17.1	89	0.02	21.9		89	0.37	23.8	89	0.12	27.7

Figure 99. Preliminary indices of overall abundance, in terms of number and biomass, of silver hake for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

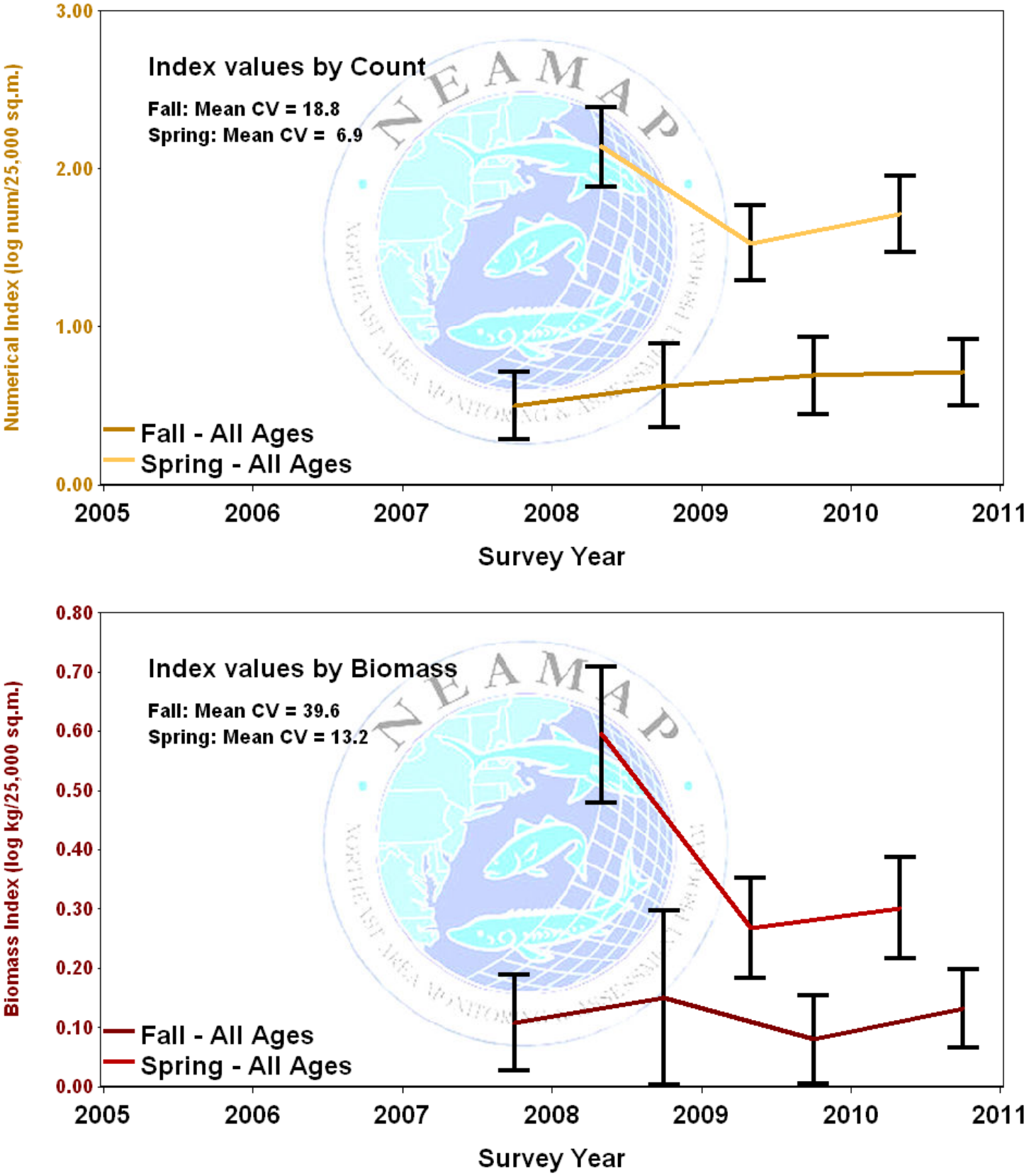


Figure 100. Preliminary indices of abundance, of silver hake for spring and fall NEAMAP surveys. Indices are for the youngest age class observed during each survey (count-based indices only) and for all other age classes combined (based both on count and biomass). 95% confidence intervals are provided for each abundance estimate.

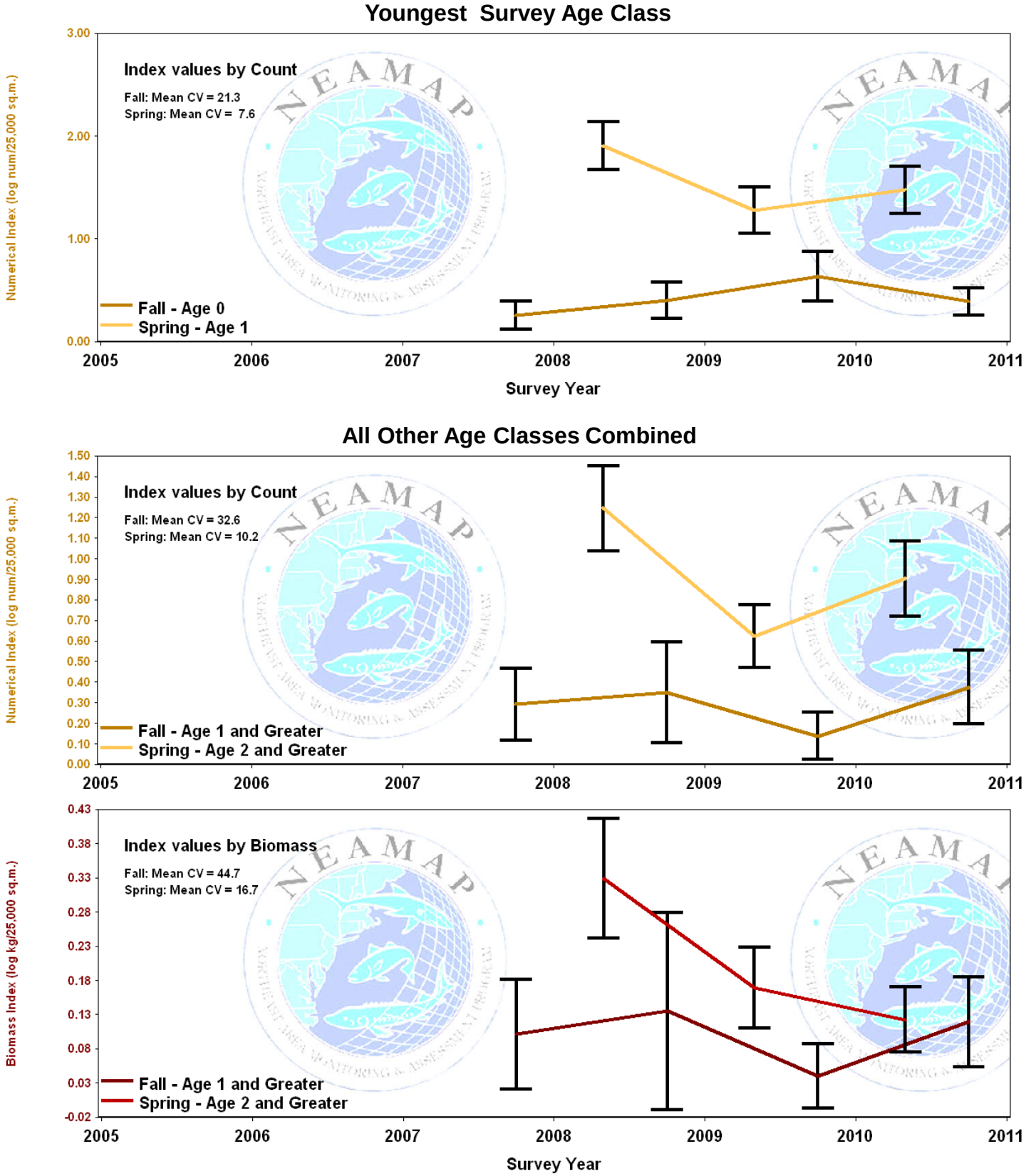


Figure 101. Length-frequency distributions, by cruise, for silver hake.

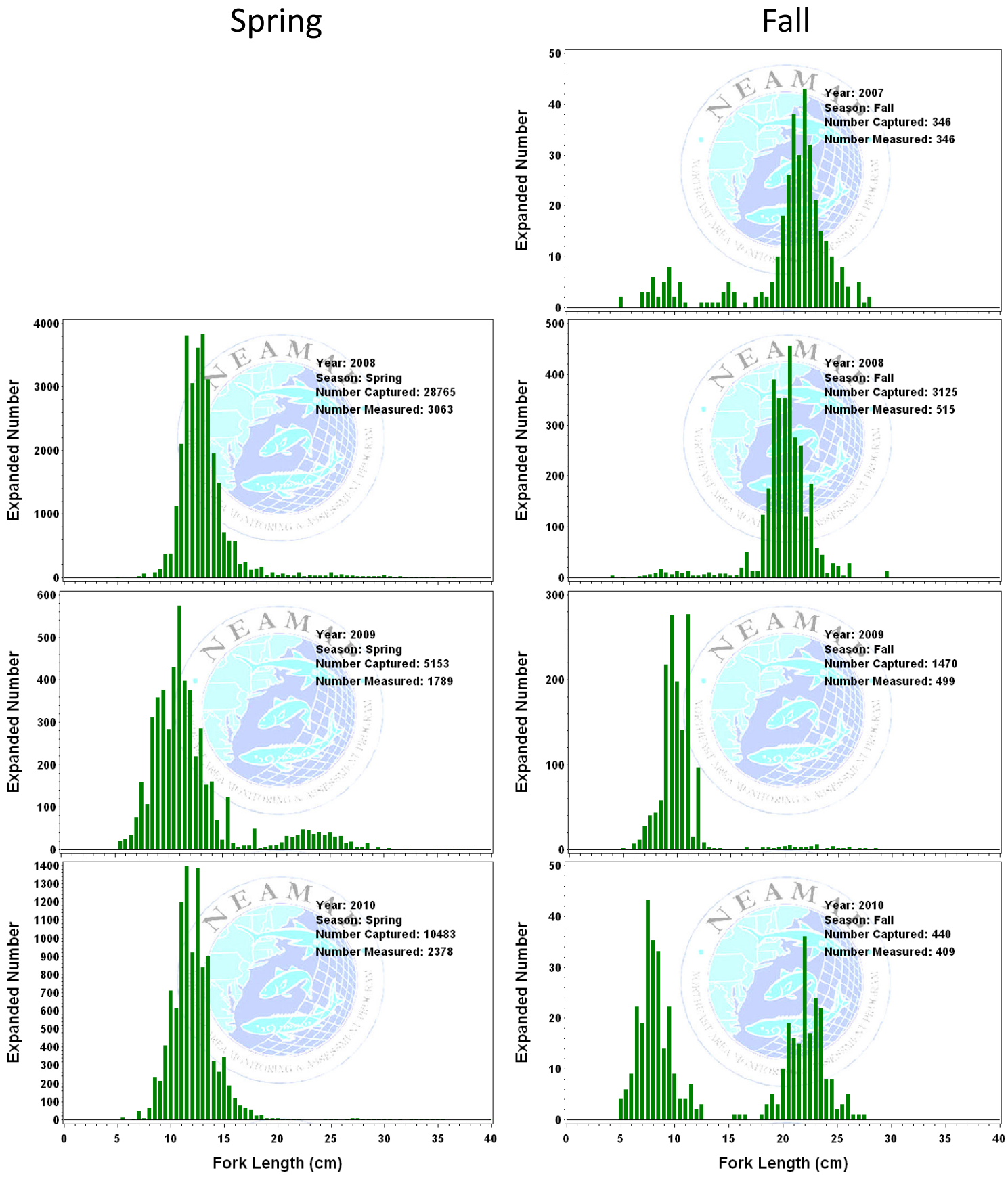


Figure 102. Sex-specific length-frequency distribution, by season, all cruises pooled, for silver hake.

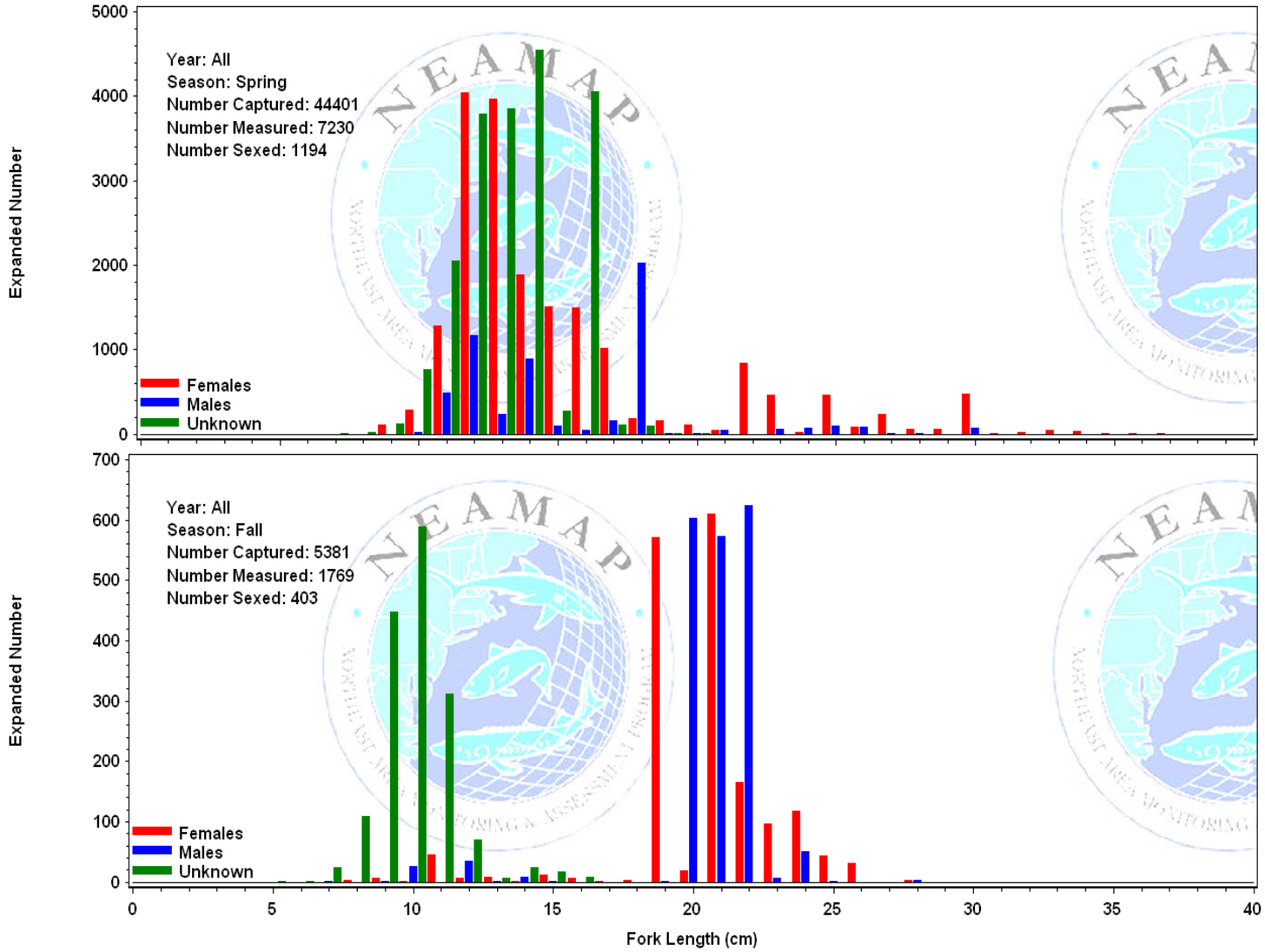


Figure 103. Sex ratio, by length group, for silver hake collected all NEAMAP cruises 2007-2010 (The percentages for each category are given in their respective bars. The number sampled for sex determination is provided above each bar, and the length categories expressed in inches are given near the x-axis.).

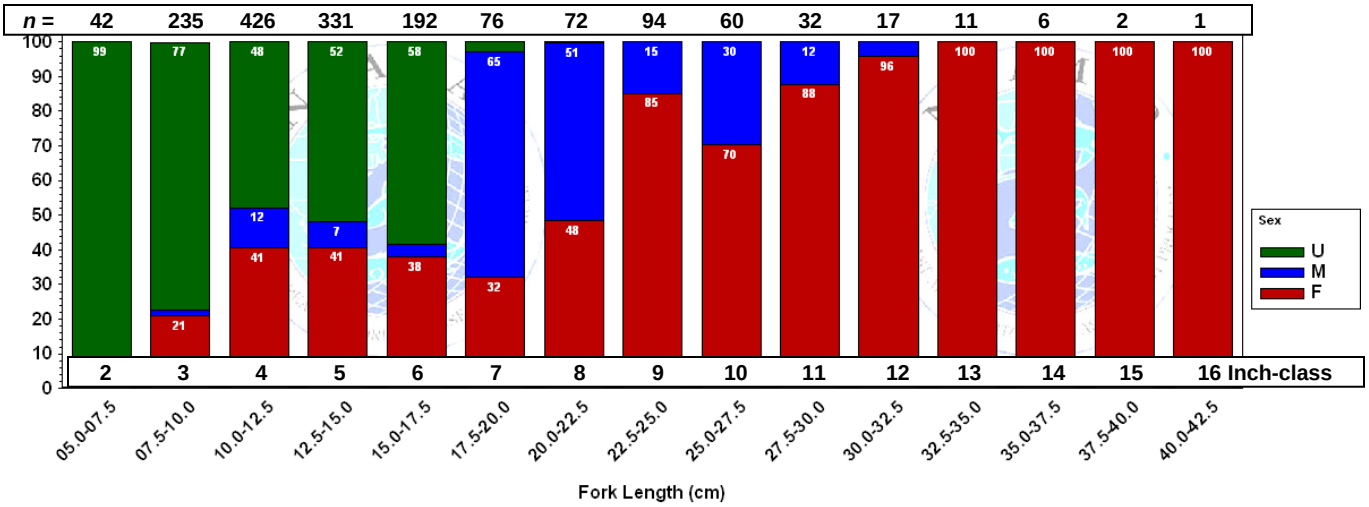
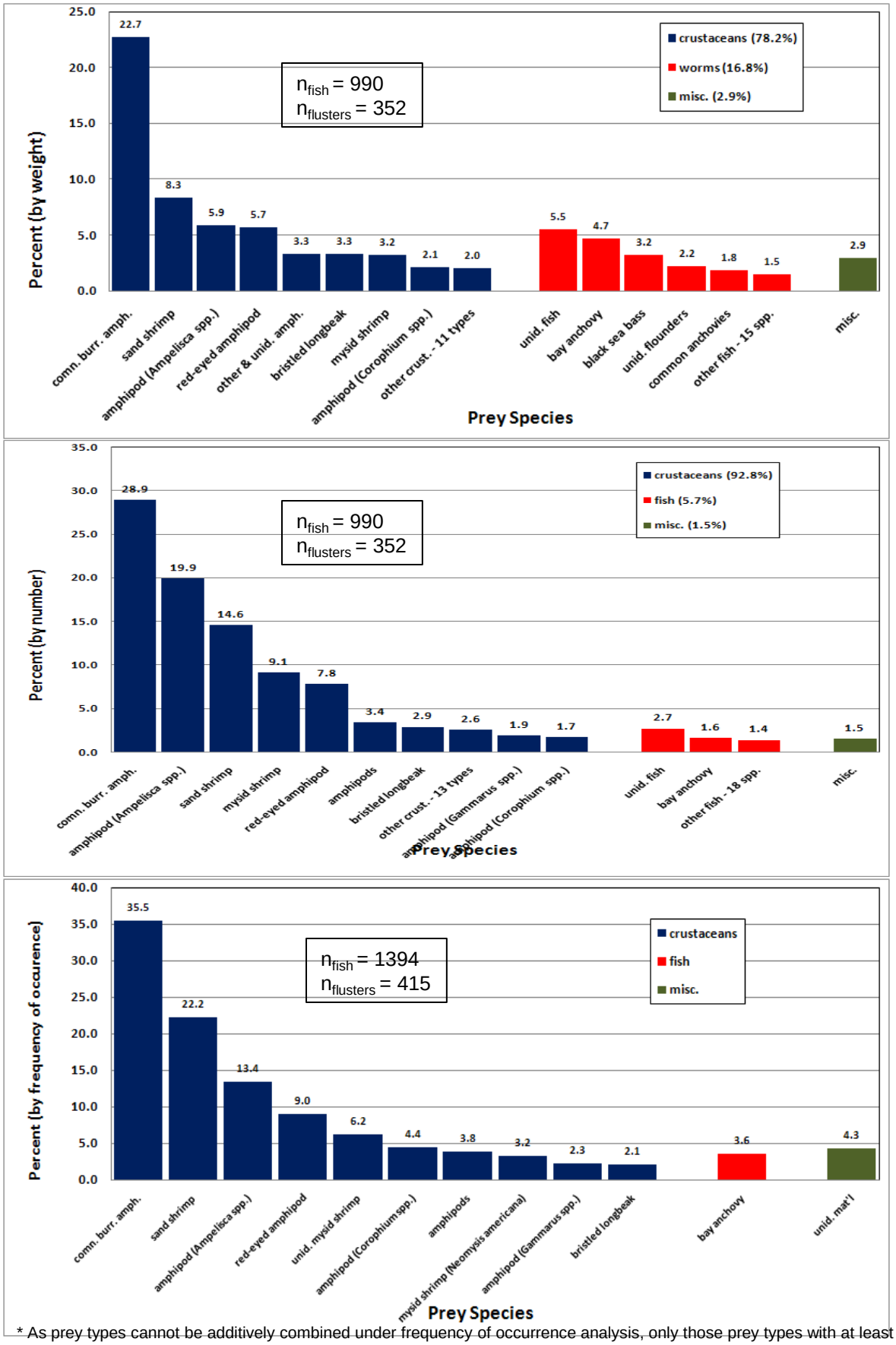


Figure 104. Diet composition, expressed as percent by weight, by number, and by frequency of occurrence* of silver hake collected during NEAMAP cruises in 2007-2009 (The number of fish sampled for diet is given by n_{fish}, while $n_{clusters}$ indicates the number of clusters of silver hake sampled.).



* As prey types cannot be additively combined under frequency of occurrence analysis, only those prey types with at least a 2% value are shown here: 43 other prey types were observed in stomachs for this species. Similarly, sums for broad taxonomic groups are not calculated.

Smooth Dogfish

Sampling Priority: A

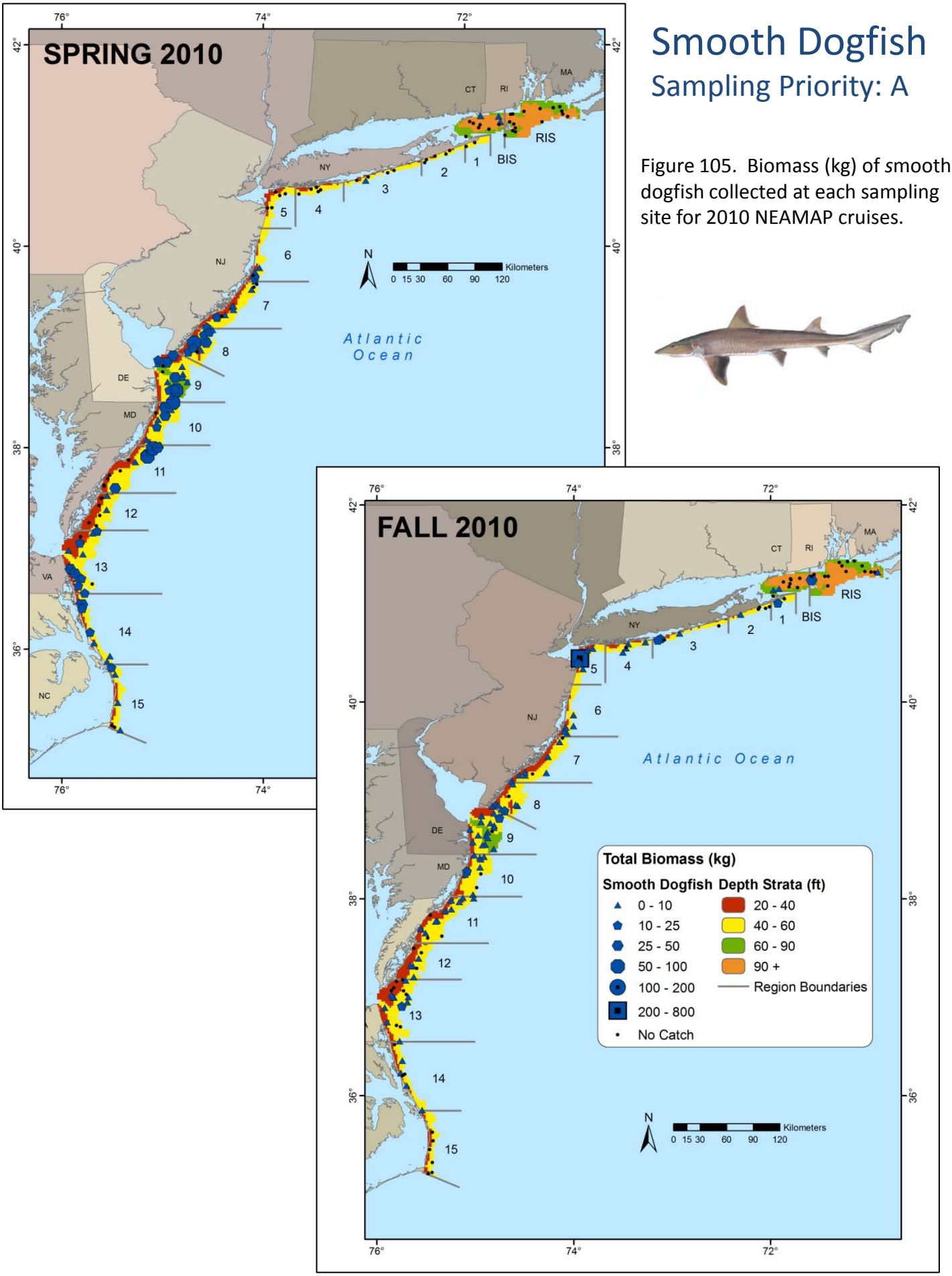


Figure 105. Biomass (kg) of *smooth* dogfish collected at each sampling site for 2010 NEAMAP cruises.

Table 60. Sampling rates and preserved specimen analysis status of smooth dogfish for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught	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	212
	2010	402	1232.6	399	188	0	181	173
Fall	2007	1684	1548.7	759	196	0	194	192
	2008	414	365.4	386	162	0	161	161
	2009	1156	843.5	1156	333	0	330	322
	2010	758	691.1	602	223	0	212	

Table 61. Strata used for calculation of abundance indices for smooth dogfish.

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		

= used for abundance indices

= not used for abundance indices

Table 62. Preliminary abundance indices for smooth dogfish.

		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	101	1.93	4.5	101	2.76	3.8	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	107	1.58	5.9	107	2.29	5.4	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
	2010	102	1.19	6.9	102	1.89	5.9	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
Fall	2007	150	1.08	8.4	150	1.01	8.7	0	150	0.77	10.2	150	0.57	11.1	>0	150	0.37	14.2	150	0.51	13.5
	2008	150	0.73	9.7	150	0.67	10.6		150	0.49	12.8	150	0.29	14.3		150	0.26	15.8	150	0.41	16.1
	2009	160	1.47	4.7	160	1.29	5.7		160	1.26	5.0	160	0.90	5.7		160	0.34	13.0	160	0.57	12.4
	2010	150	1.05	6.4	150	0.93	7.6		150	0.86	6.9	150	0.59	8.0		150	0.30	14.5	150	0.43	14.4

Figure 106. Preliminary indices of overall abundance, in terms of number and biomass, of smooth dogfish for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

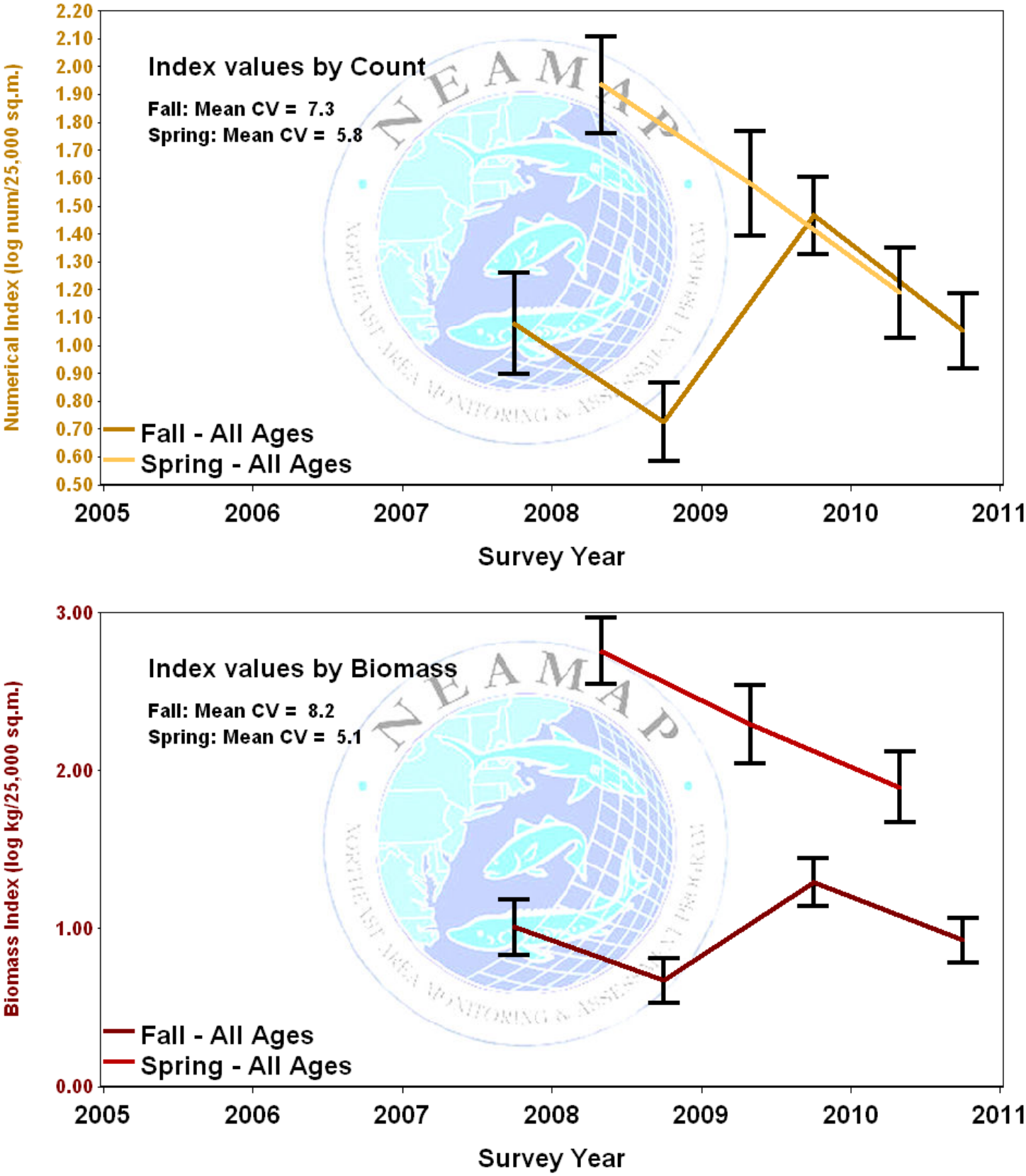


Figure 107. Preliminary indices of abundance, of smooth dogfish for spring and fall NEAMAP surveys. Indices are for the youngest age class observed during each survey (count-based indices only) and for all other age classes combined (based both on count and biomass). 95% confidence intervals are provided for each abundance estimate.

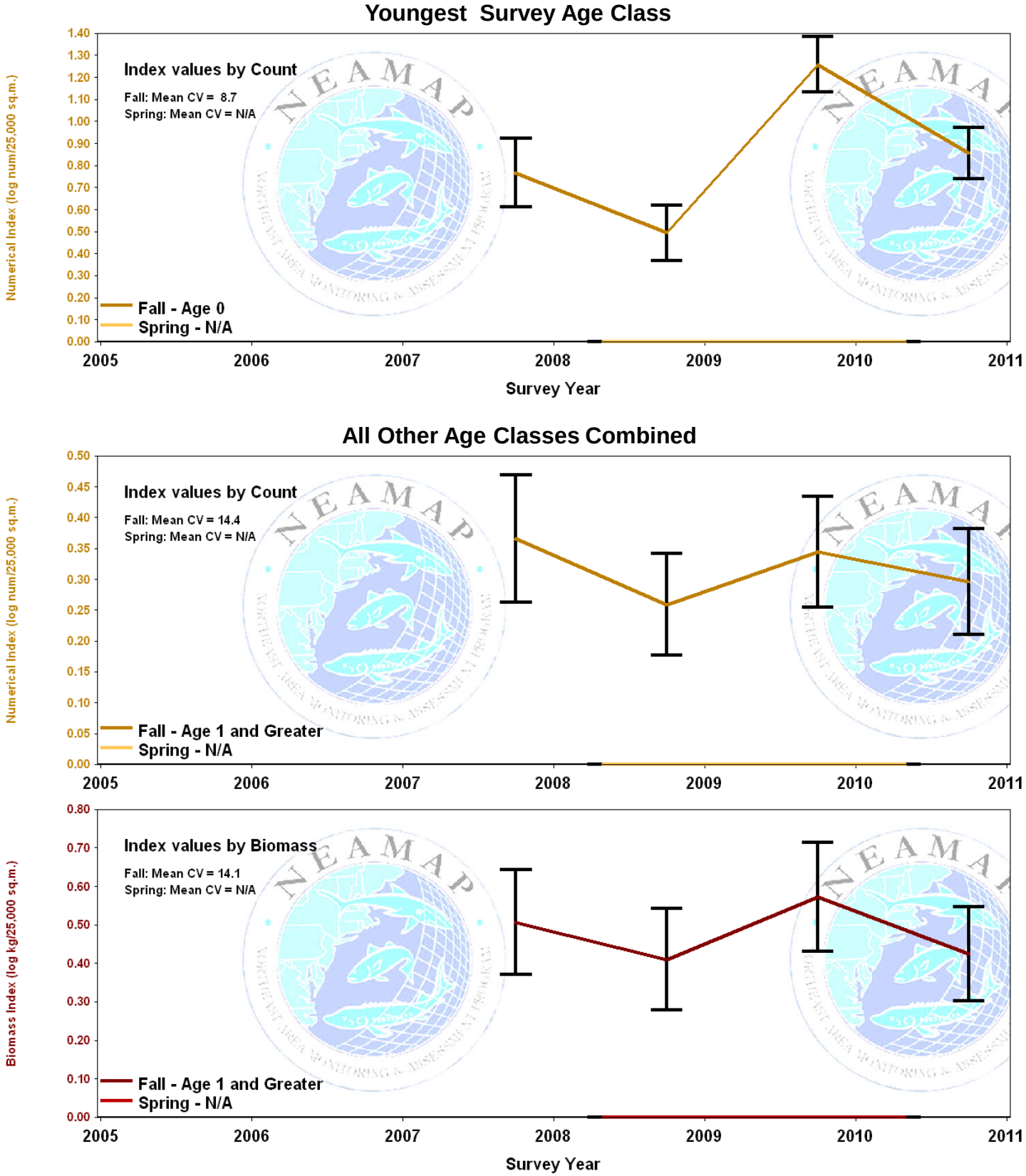


Figure 108. Length-frequency distributions, by cruise, for smooth dogfish.

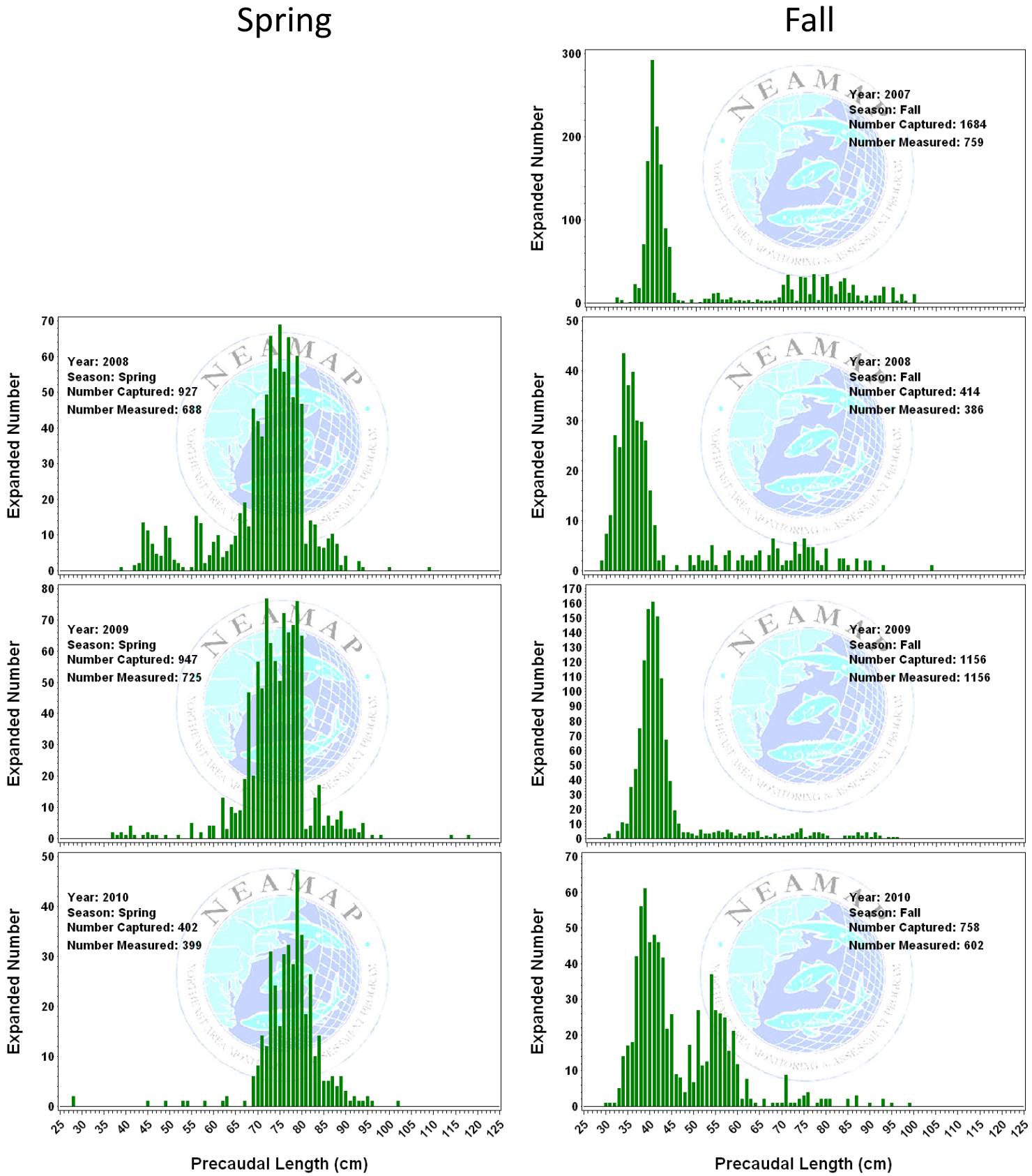


Figure 109. Sex-specific length-frequency distribution, by season, all cruises pooled, for smooth dogfish.

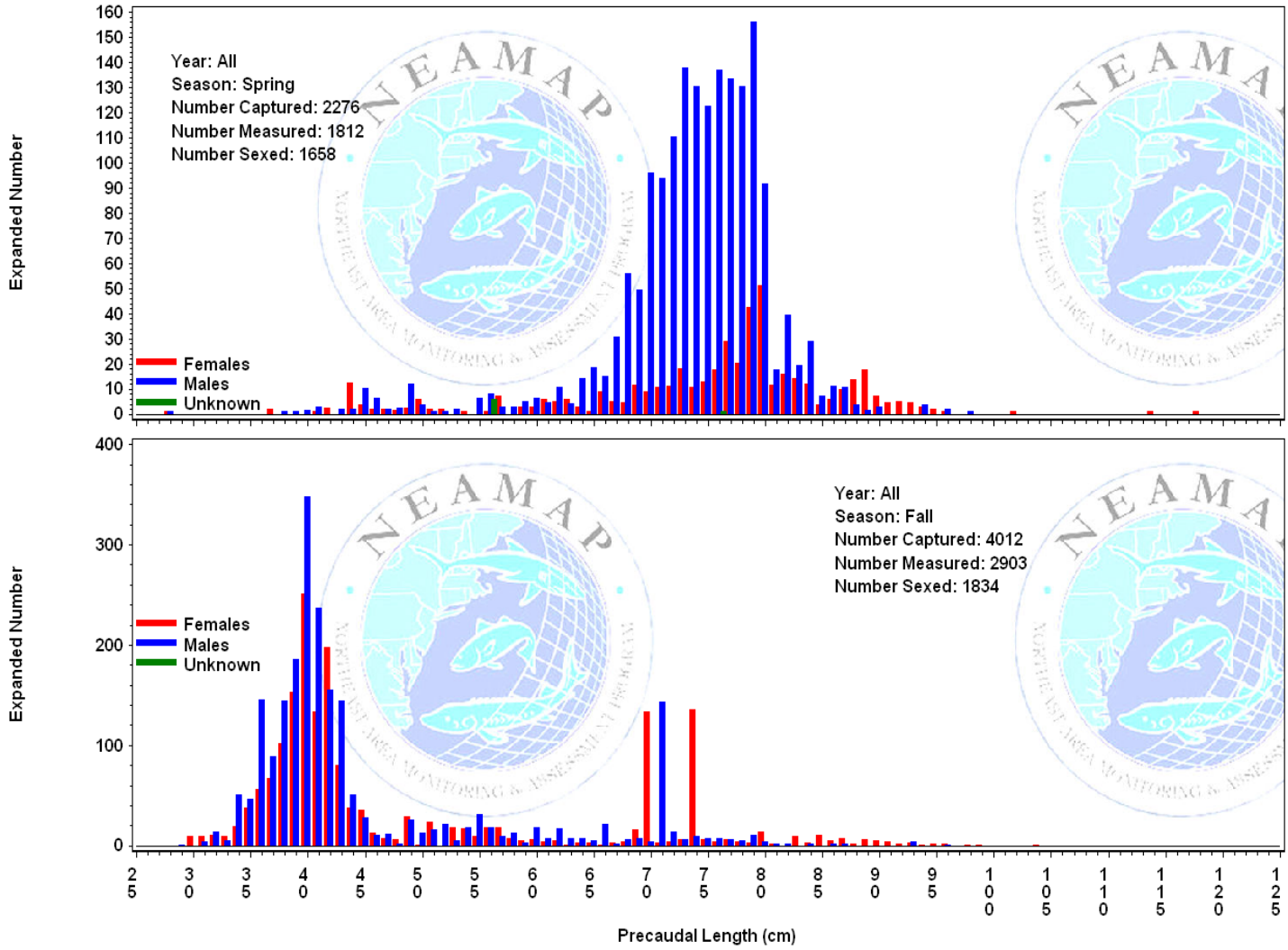


Figure 110. Sex ratio, by length group, for smooth dogfish collected all NEAMAP cruises 2007-2010 (The percentages for each category are given in their respective bars. The number sampled for sex determination is provided above each bar, and the length categories expressed in inches are given near the x-axis.).

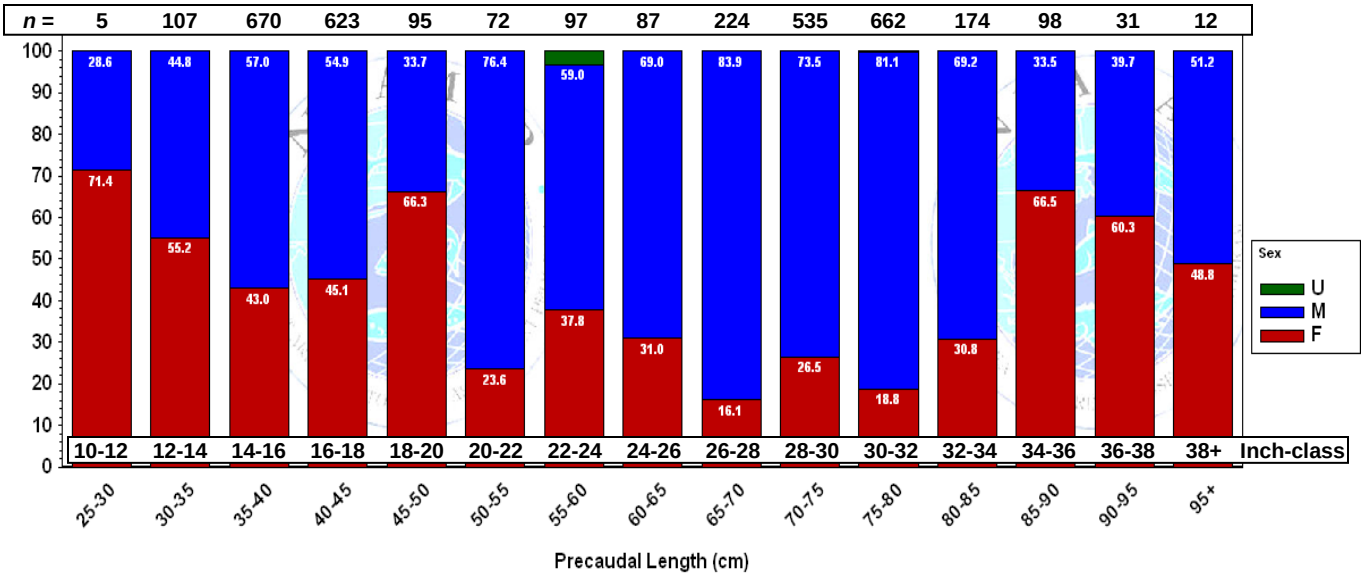
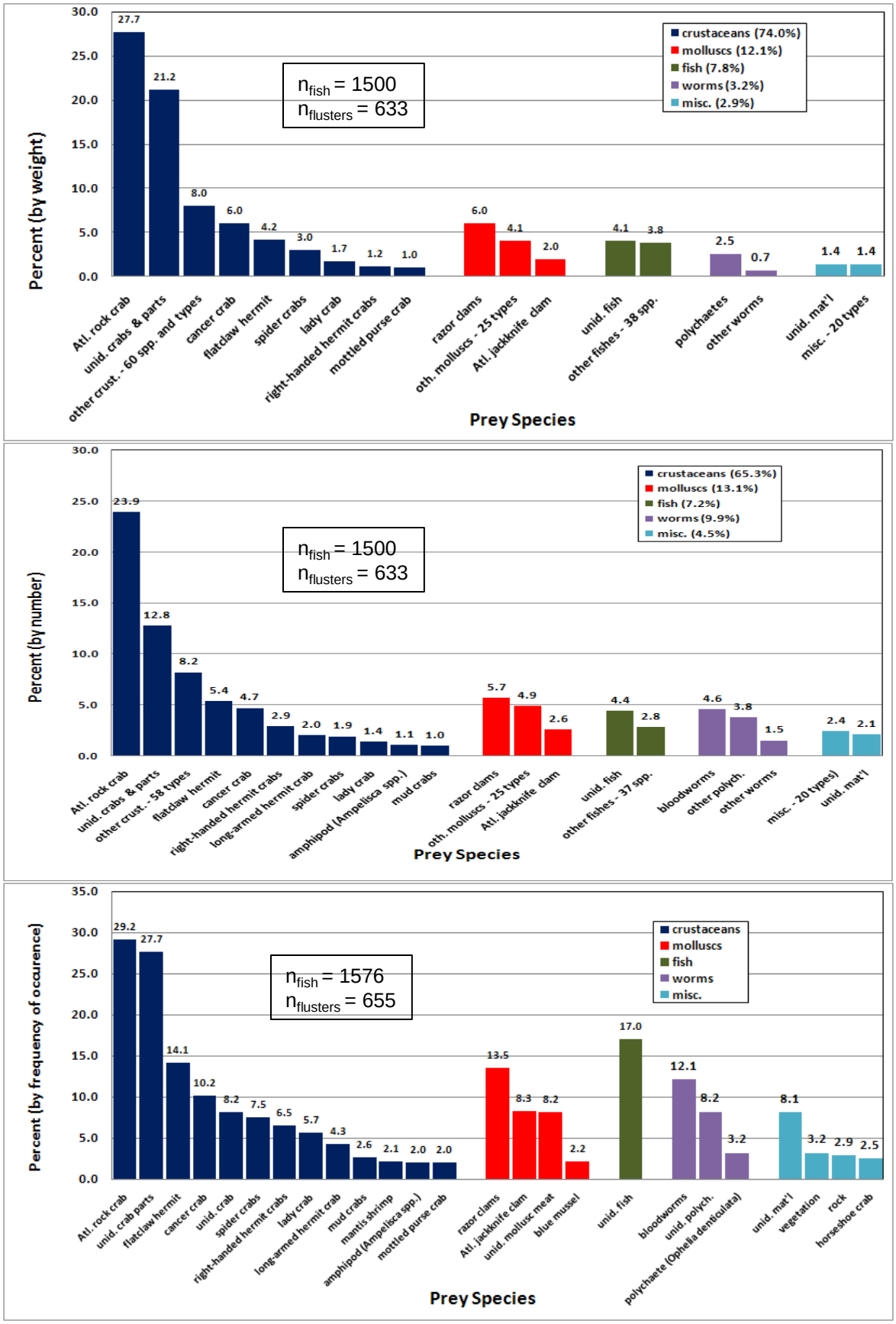


Figure 111. Diet composition, expressed as percent by weight, by number, and by frequency of occurrence* of smooth dogfish collected during NEAMAP cruises in 2007-2009 (The number of fish sampled for diet is given by n_{fish}, while $n_{clusters}$ indicates the number of clusters of smooth dogfish sampled.).



* As prey types cannot be additively combined under frequency of occurrence analysis, only those prey types with at least a 2% value are shown here: 147 other prey types were observed in stomachs for this species. Similarly, sums for broad taxonomic groups are not calculated.

Spanish Mackerel

Sampling Priority: A

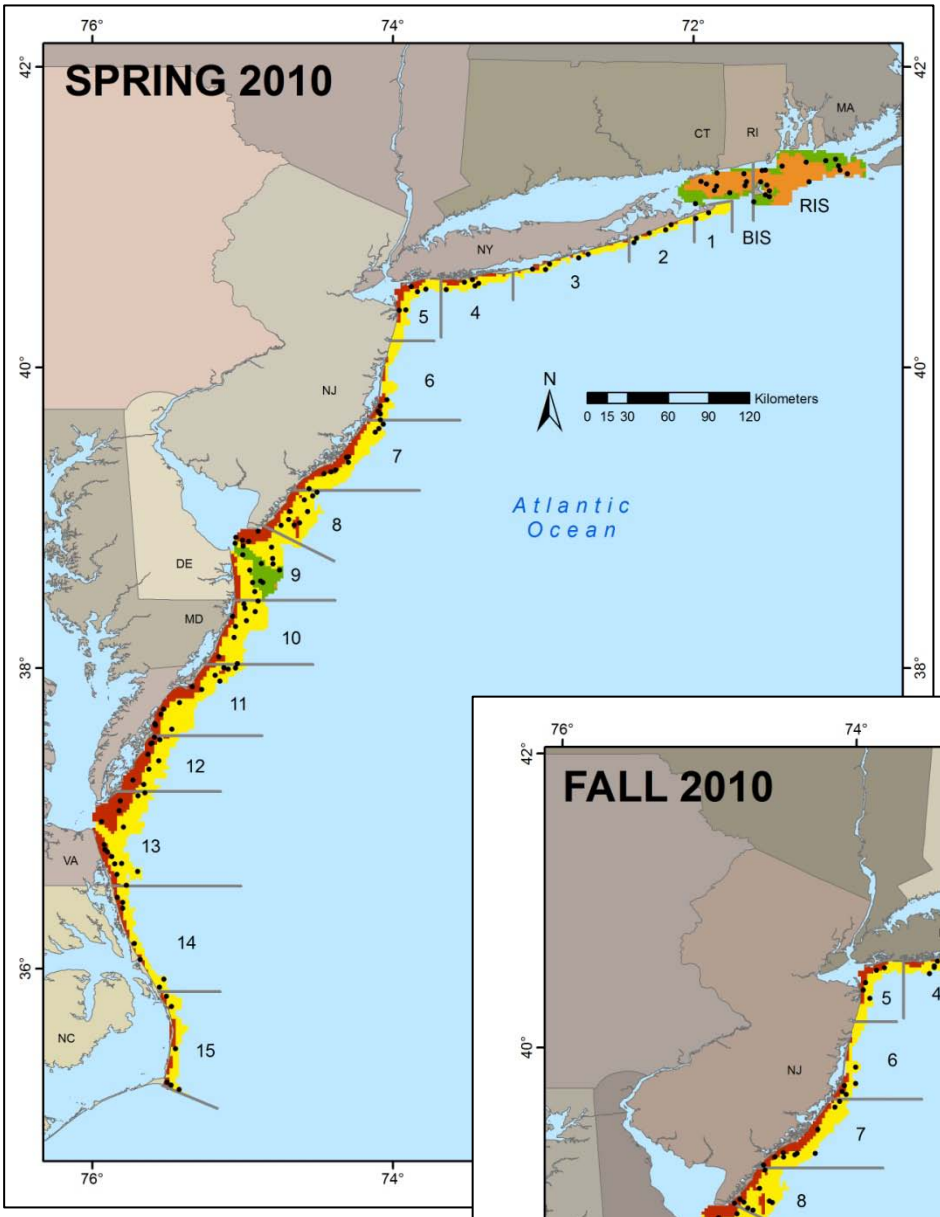


Figure 112. Biomass (kg) of Spanish mackerel collected at each sampling site for 2010 NEAMAP cruises.

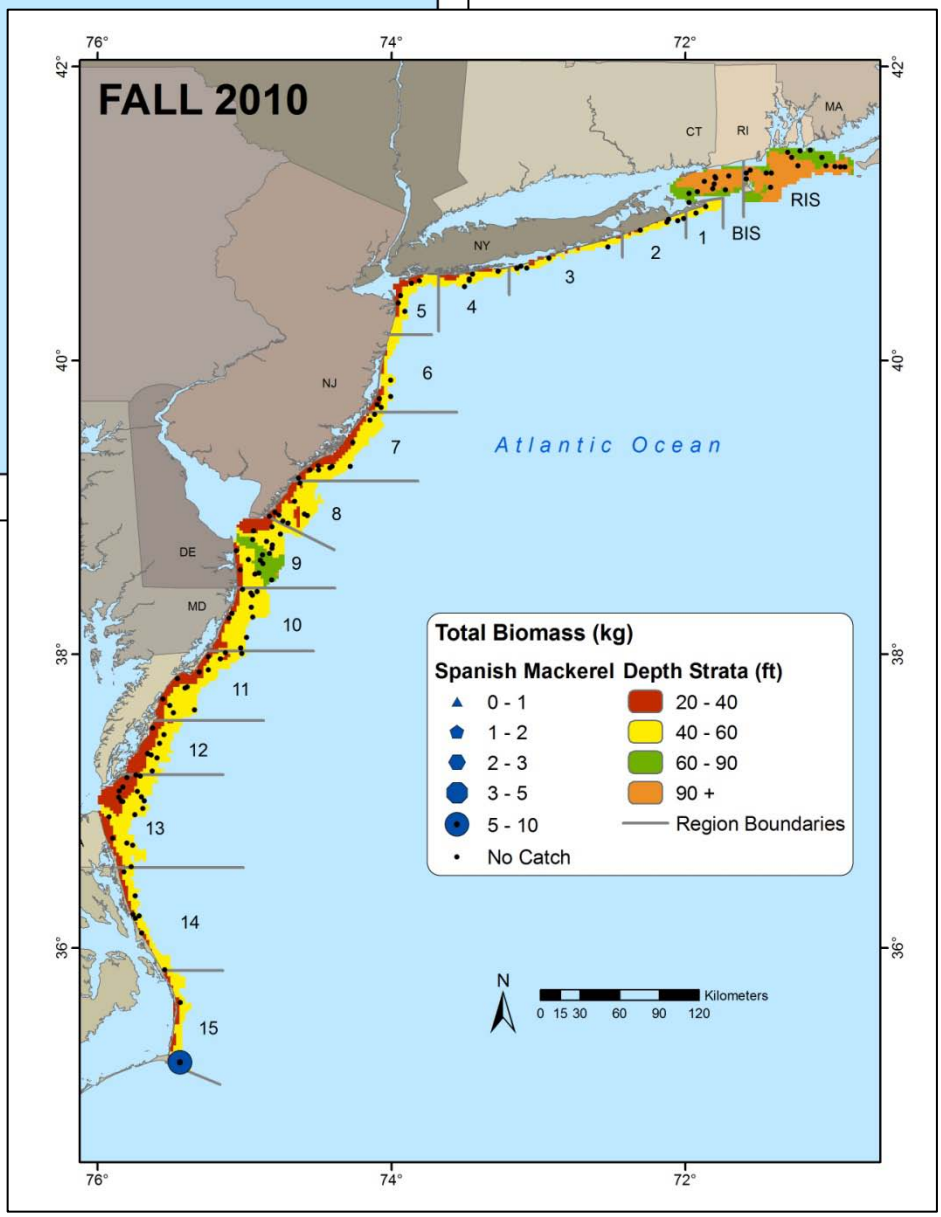


Table 63. Sampling rates and preserved specimen analysis status of Spanish mackerel for each NEAMAP cruise.

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

Table 64. Strata used for calculation of abundance indices for Spanish mackerel.

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		

= used for abundance indices

= not used for abundance indices

Table 65. Preliminary abundance indices for Spanish mackerel.

		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	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	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	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	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fall	2007	13	1.02	25.3	13	0.56	23.9	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
	2008	13	0.24	100.0	13	0.09	100.0	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	15	0.29	71.8	15	0.10	70.8	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	13	0.90	43.9	13	0.28	69.2	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 113. Preliminary indices of overall abundance, in terms of number and biomass, of Spanish mackerel for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

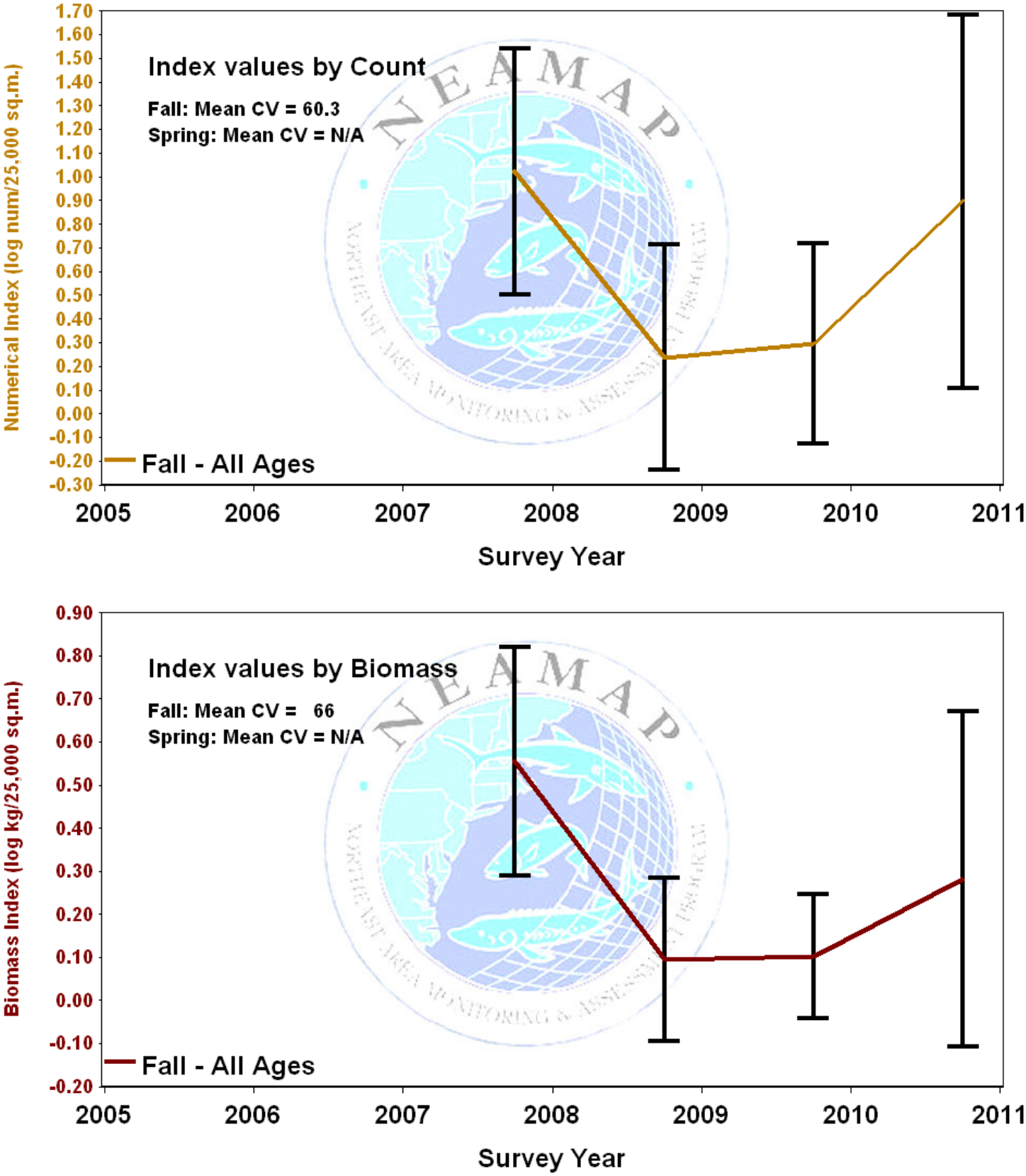
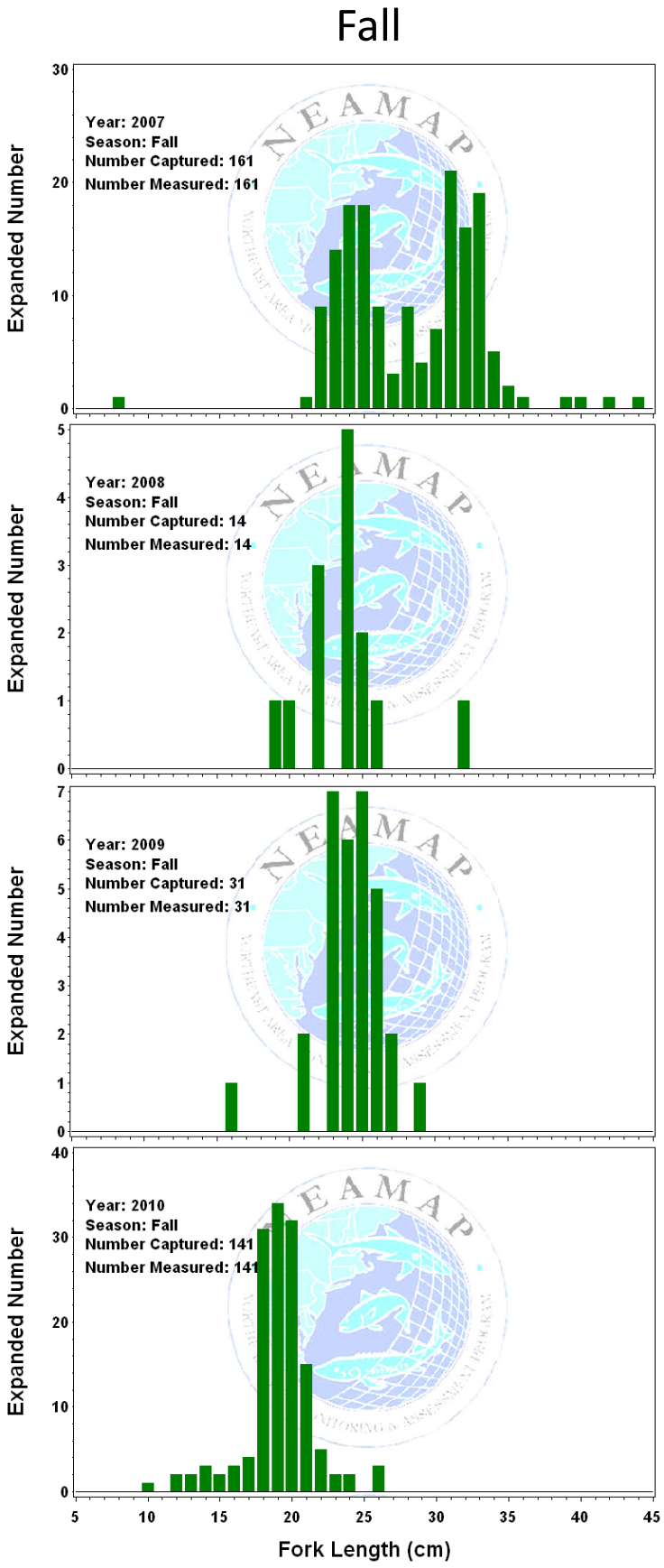


Figure 114. Length-frequency distributions, by cruise, for Spanish mackerel (This species was absent from spring survey collections.).



Spiny Dogfish

Sampling Priority: A

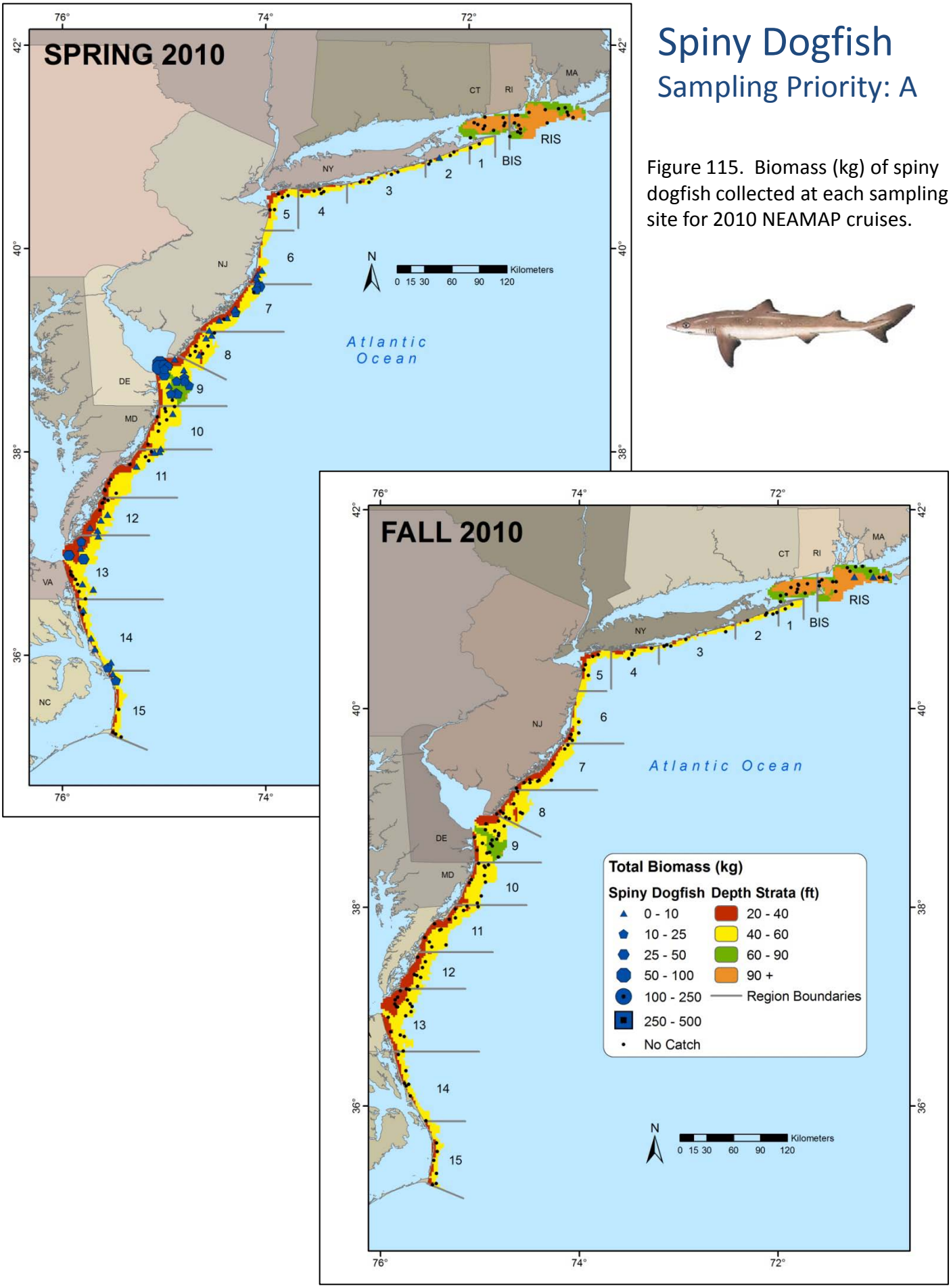


Figure 115. Biomass (kg) of spiny dogfish collected at each sampling site for 2010 NEAMAP cruises.

Table 66. Sampling rates and preserved specimen workup status of spiny dogfish for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught	Number Measured	Age Specimens	Ages Read	Stomach Specimens	Stomachs Analyzed
Spring	2008	1332	3396.0	950	325	0	247	247
	2009	1271	3562.7	1137	359	0	261	248
	2010	249	804.1	249	125	0	114	108
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	

Table 67. Strata used for calculation of abundance indices for spiny dogfish.

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		

= used for abundance indices

= not used for abundance indices

Table 68. Preliminary abundance indices for spiny dogfish.

		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	150	1.78	3.6	150	2.46	3.5	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	160	1.79	3.8	160	2.59	3.3	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
	2010	150	0.56	9.0	150	0.90	8.3	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
Fall	2007	22	0.30	47.2	22	0.48	45.3	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	21	1.47	33.8	21	1.85	32.0	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	22	1.42	25.6	22	1.82	23.9	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	21	0.14	58.0	21	0.25	57.3	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

Figure 116. Preliminary indices of overall abundance, in terms of number and biomass, of spiny dogfish for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

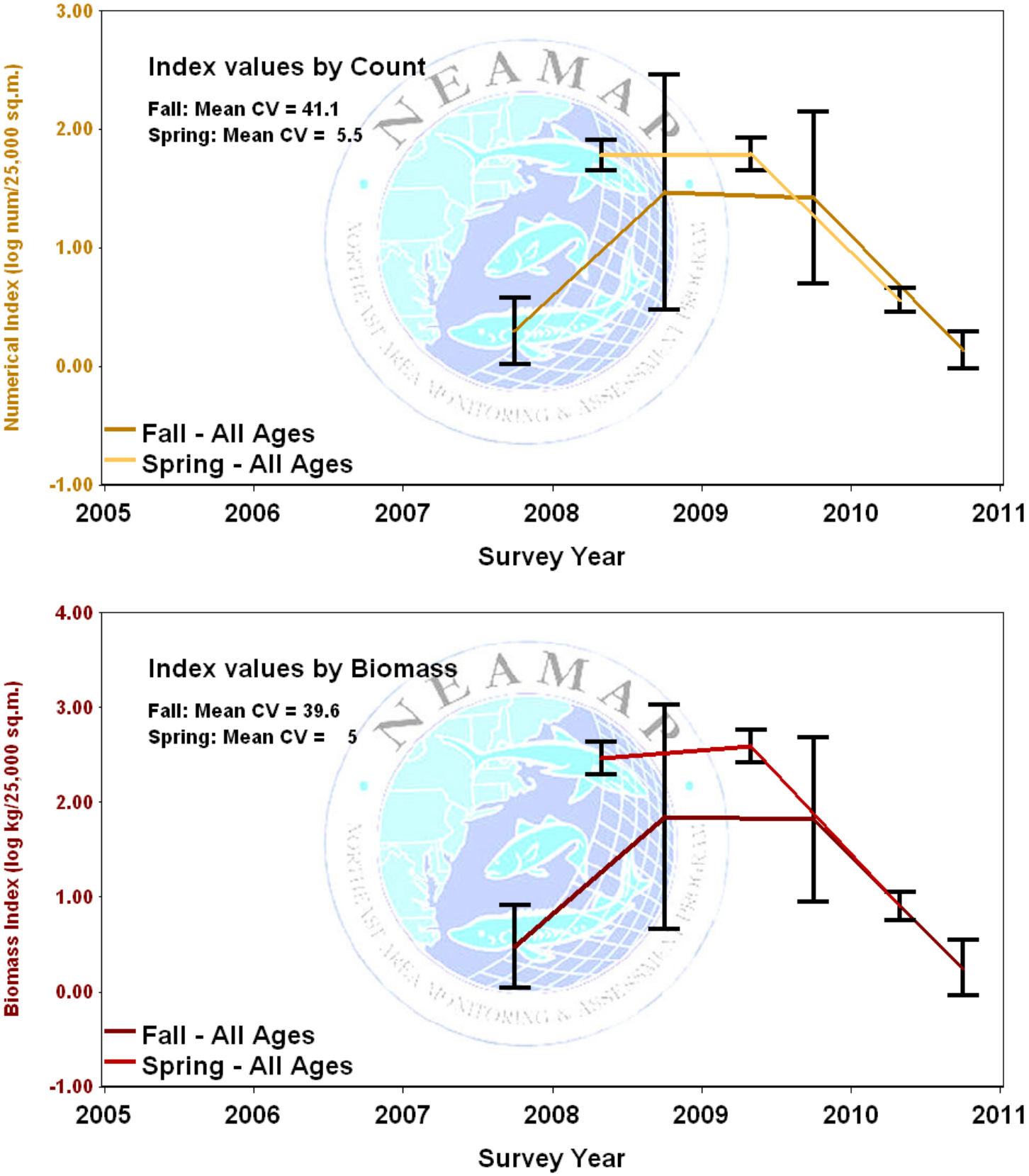


Figure 117. Length-frequency distributions, by cruise, for spiny dogfish.

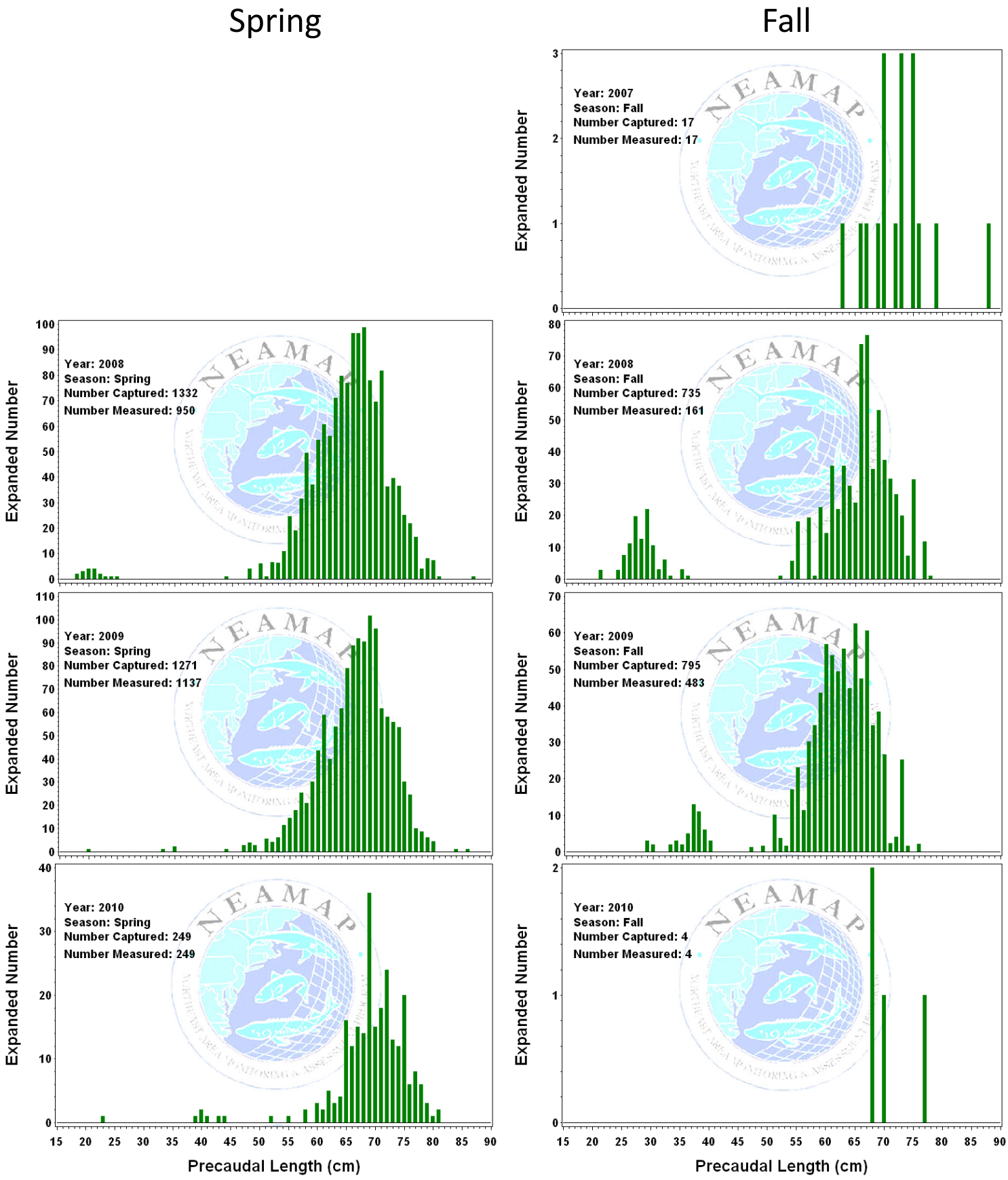


Figure 118. Sex-specific length-frequency distribution, by season, all cruises pooled, for spiny dogfish.

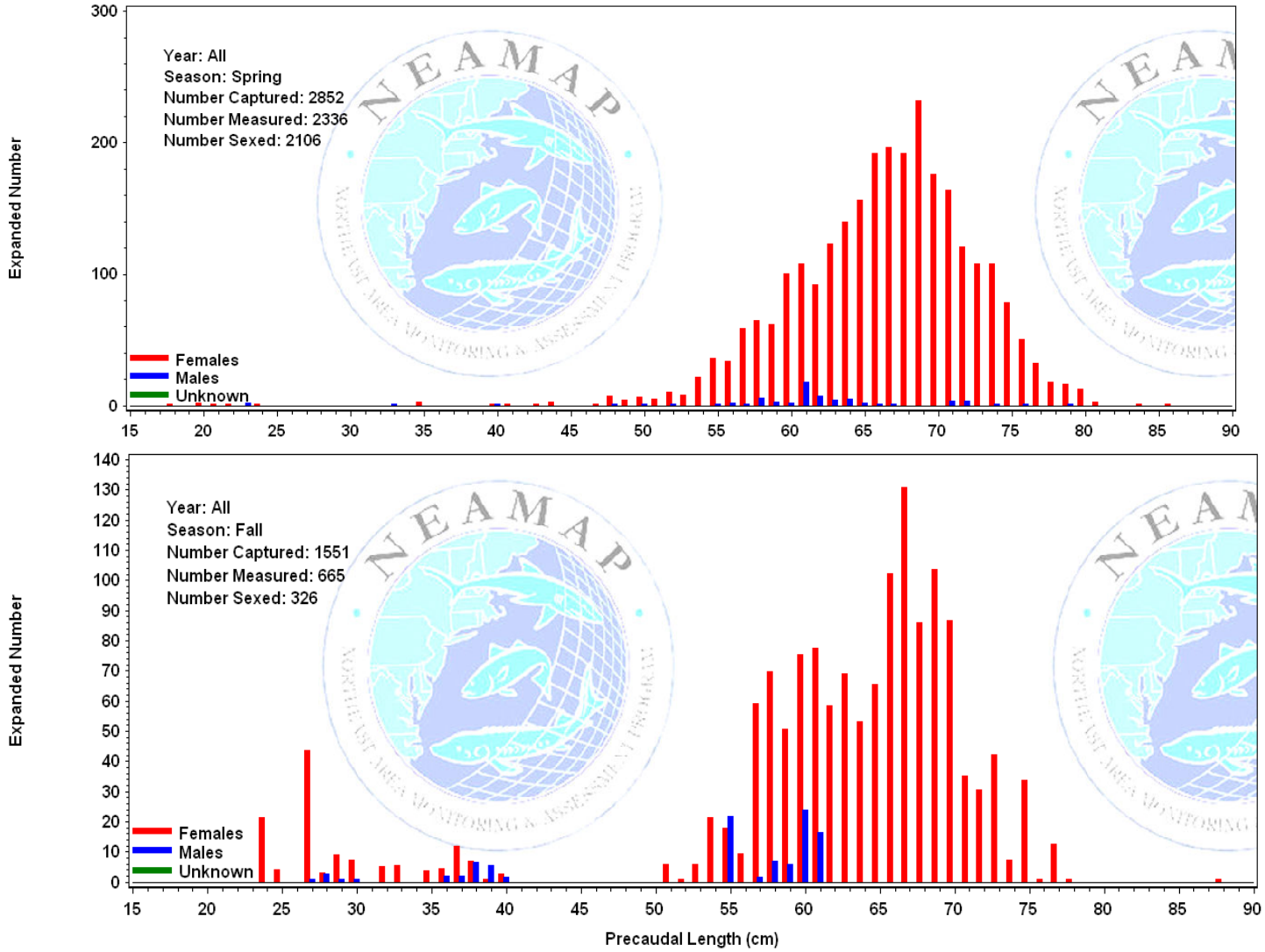


Figure 119. Sex ratio, by length group, for spiny dogfish collected all NEAMAP cruises 2007-2010 (The percentages for each category are given in their respective bars. The number sampled for sex determination is provided above each bar, and the length categories expressed in inches are given near the x-axis.).

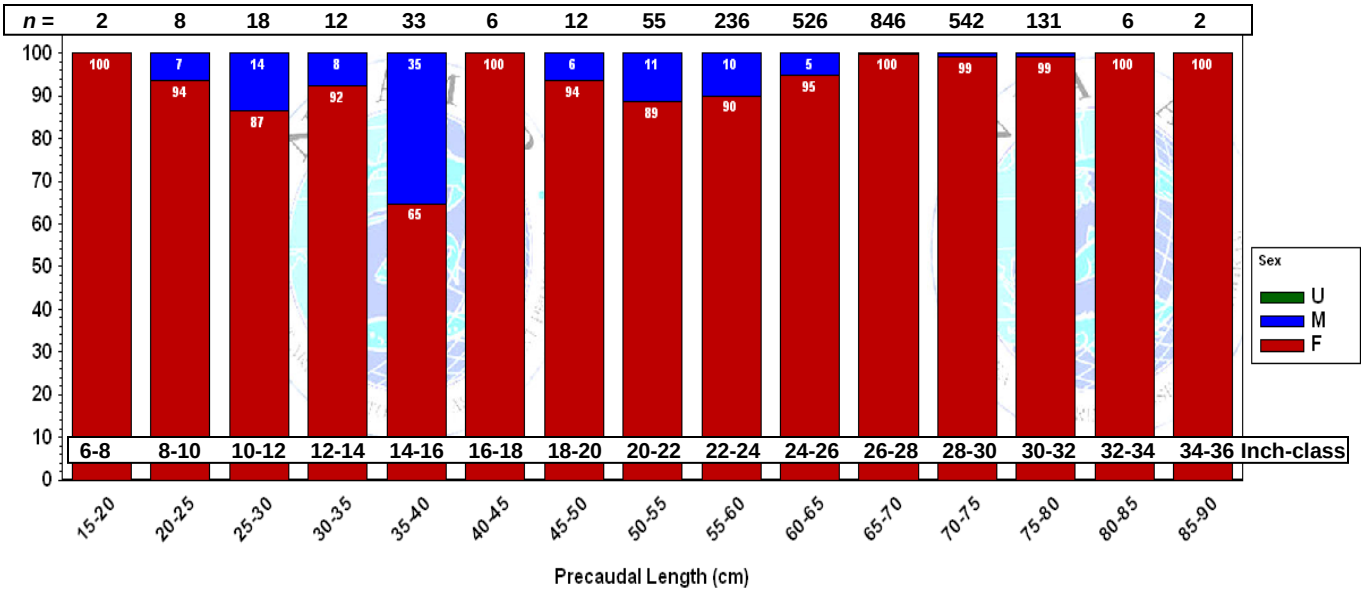
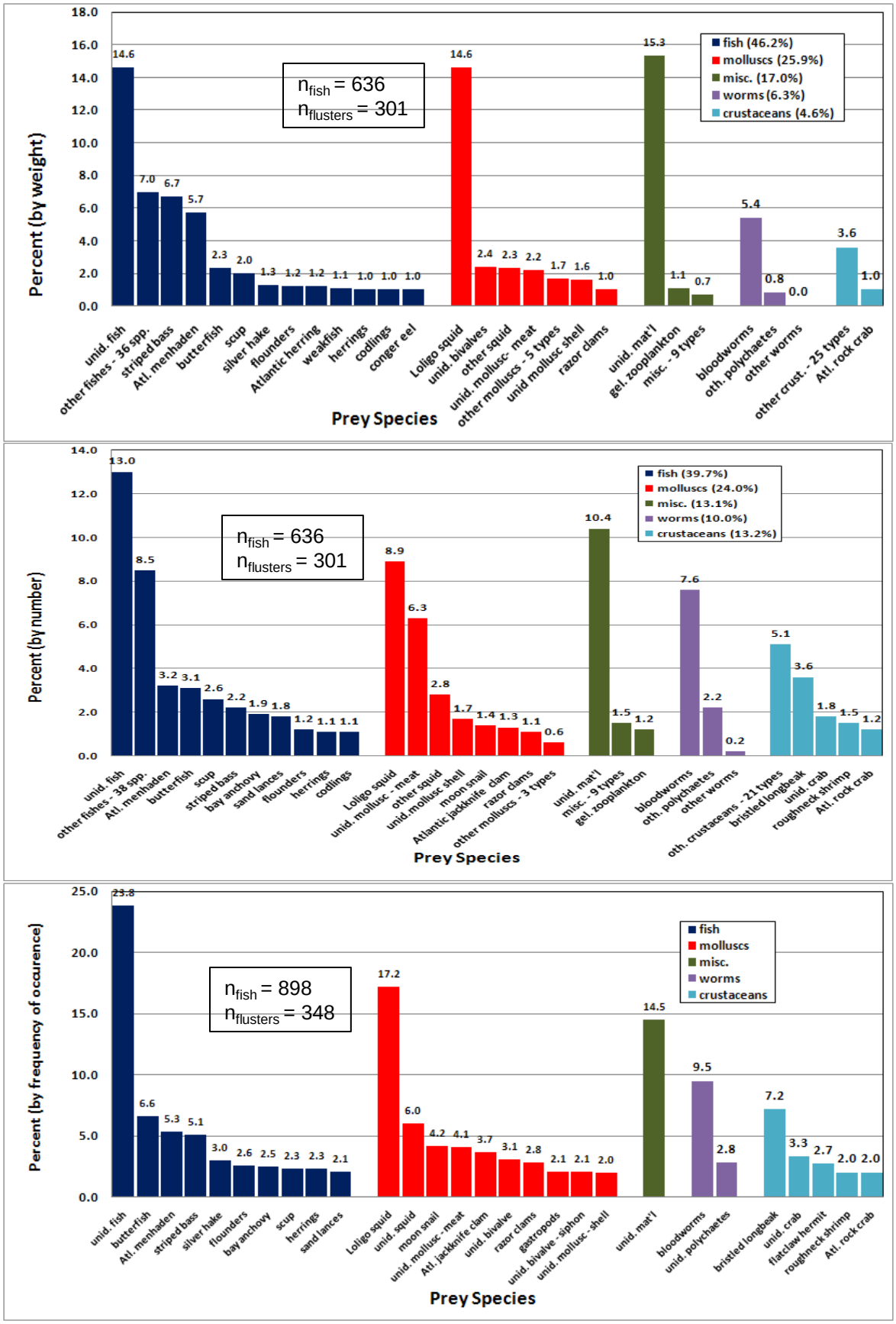


Figure 120. Diet composition, expressed as percent by weight, by number, and by frequency of occurrence* of spiny dogfish collected during NEAMAP cruises in 2007-2009 (The number of fish sampled for diet is given by n_{fish}, while $n_{clusters}$ indicates the number of clusters of spiny dogfish sampled.).



* As prey types cannot be additively combined under frequency of occurrence analysis, only those prey types with at least a 2% value are shown here: 84 other prey types were observed in stomachs for this species. Similarly, sums for broad taxonomic groups are not calculated.

Spot

Sampling Priority: A

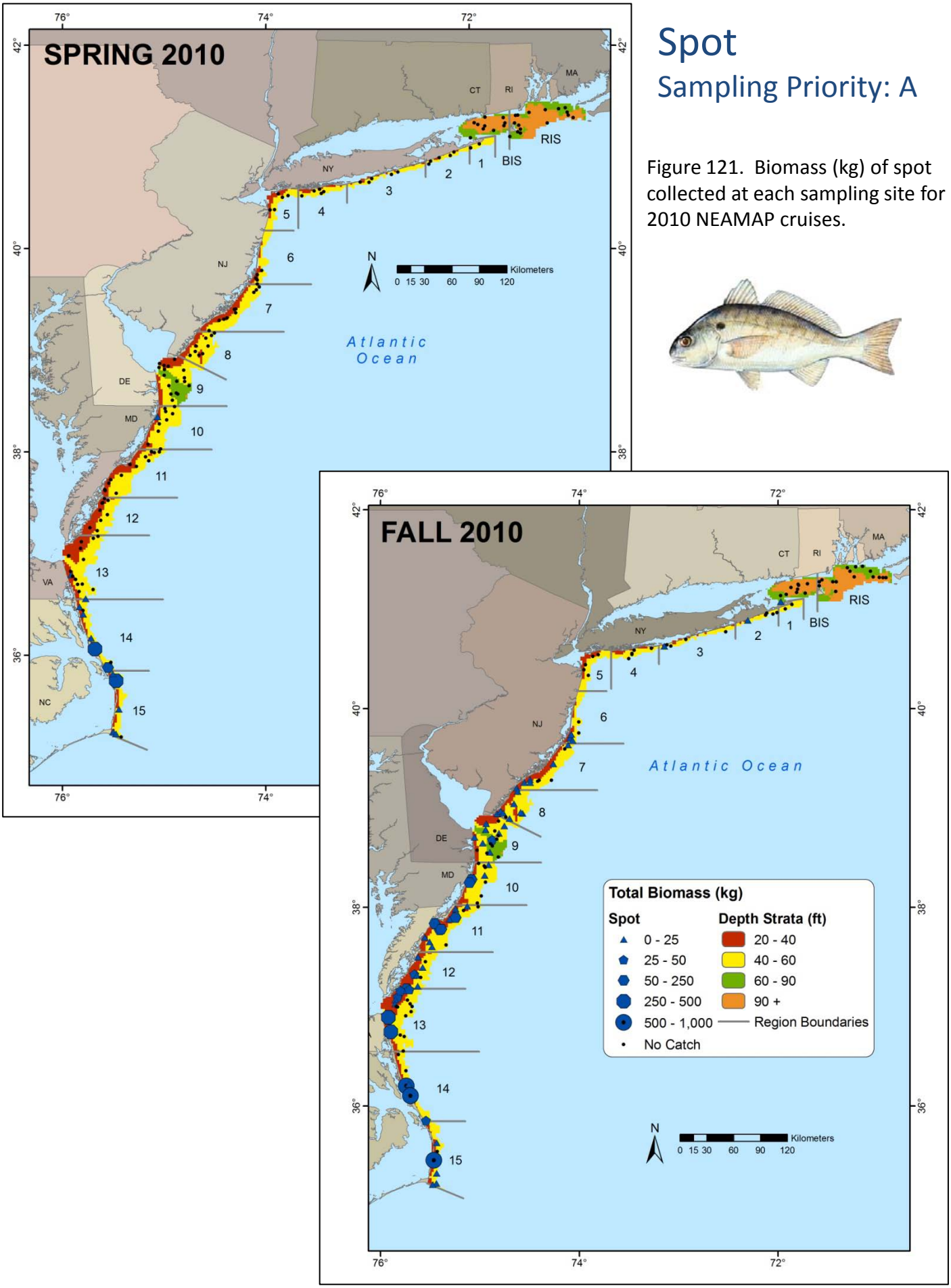


Figure 121. Biomass (kg) of spot collected at each sampling site for 2010 NEAMAP cruises.

Table 69. Sampling rates and preserved specimen analysis status of spot for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught	Number Measured	Age Specimens	Ages Read	Stomach Specimens	Stomachs Analyzed
Spring	2008	28561	1059.2	1220	61	0	0	
	2009	29643	824.9	3454	59	0	0	
	2010	19664	822.1	894	44	0	0	
Fall	2007	44437	3942.0	2507	160	0	9	
	2008	56878	3872.0	3435	213	0	0	
	2009	8428	593.0	2699	169	0	0	
	2010	95990	5060.0	6861	181	0	0	

Table 70. Strata used for calculation of abundance indices for spot.

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		

= used for abundance indices

= not used for abundance indices

Table 71. Preliminary abundance indices for spot.

		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	31	3.03	13.2	31	1.40	15.9	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
	2009	31	3.27	17.2	31	1.48	22.2	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	29	1.62	26.0	29	0.70	40.8	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	87	2.75	9.7	87	1.60	11.4	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
	2008	87	3.92	7.8	87	2.21	9.1	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	91	1.94	8.1	91	0.76	12.4	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
	2010	87	2.90	10.1	87	1.49	12.2	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 122. Preliminary indices of overall abundance, in terms of number and biomass, of spot for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

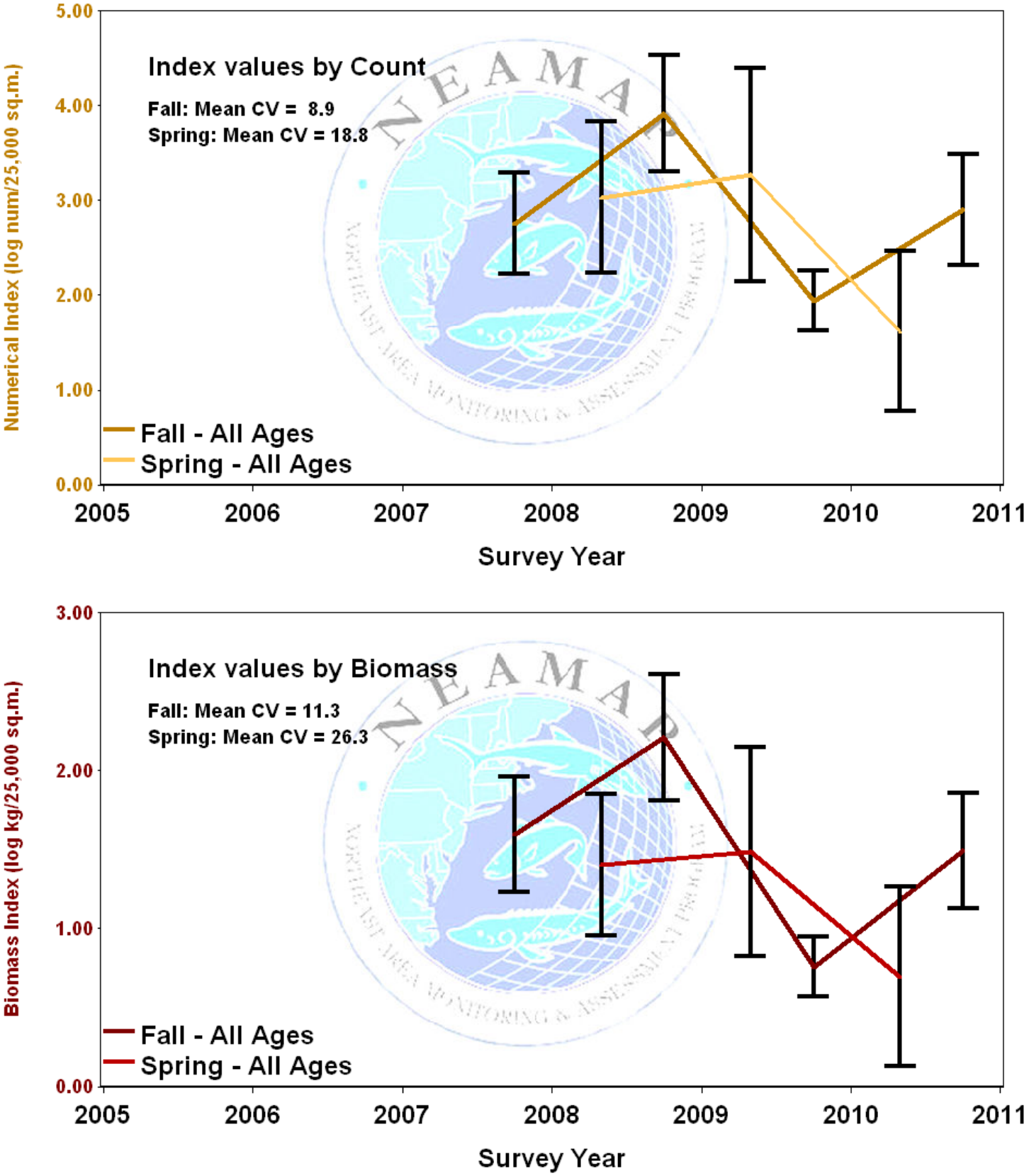


Figure 123. Length-frequency distributions, by cruise, for spot.

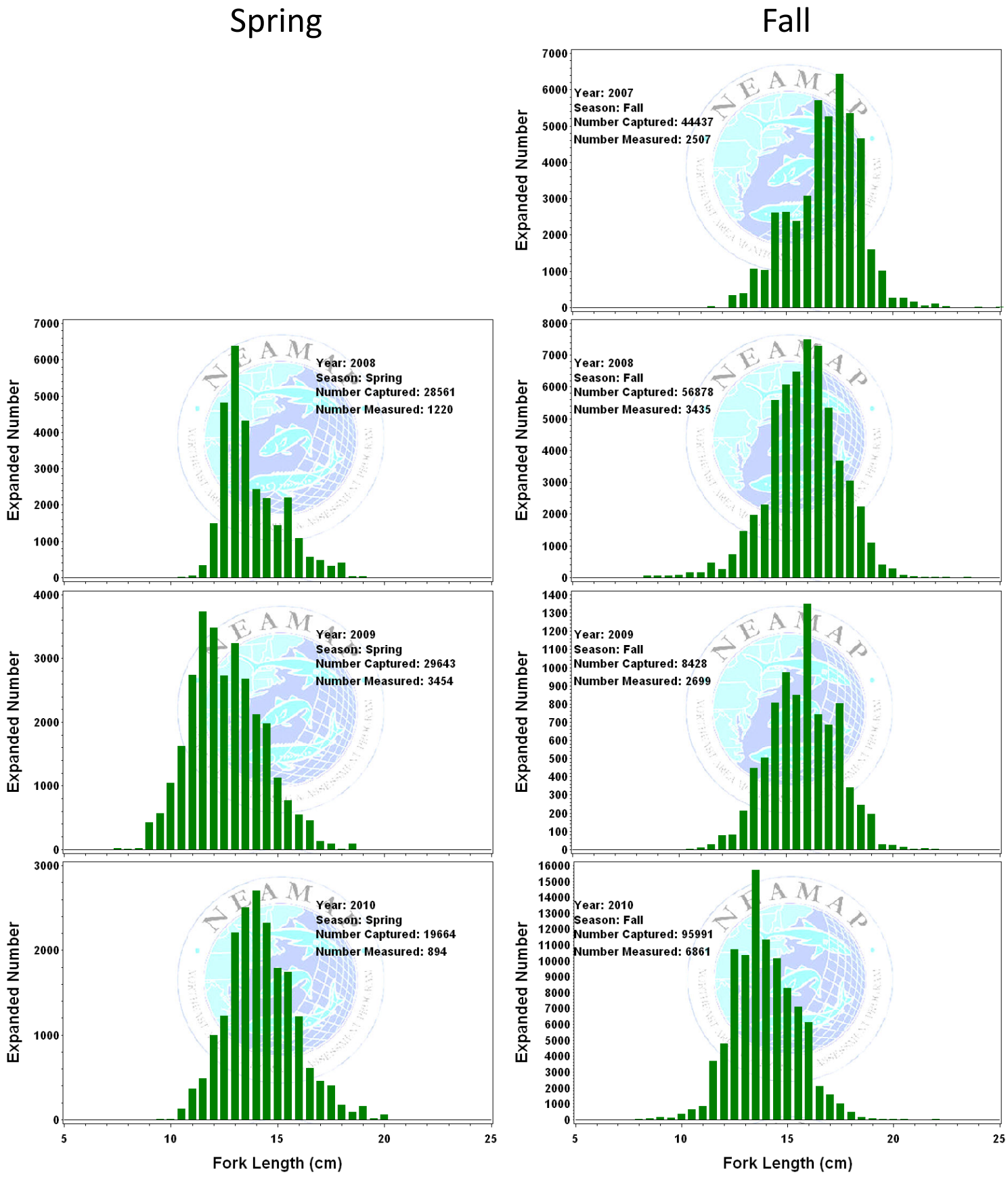


Figure 124. Sex-specific length-frequency distribution, by season, all cruises pooled, for spot.

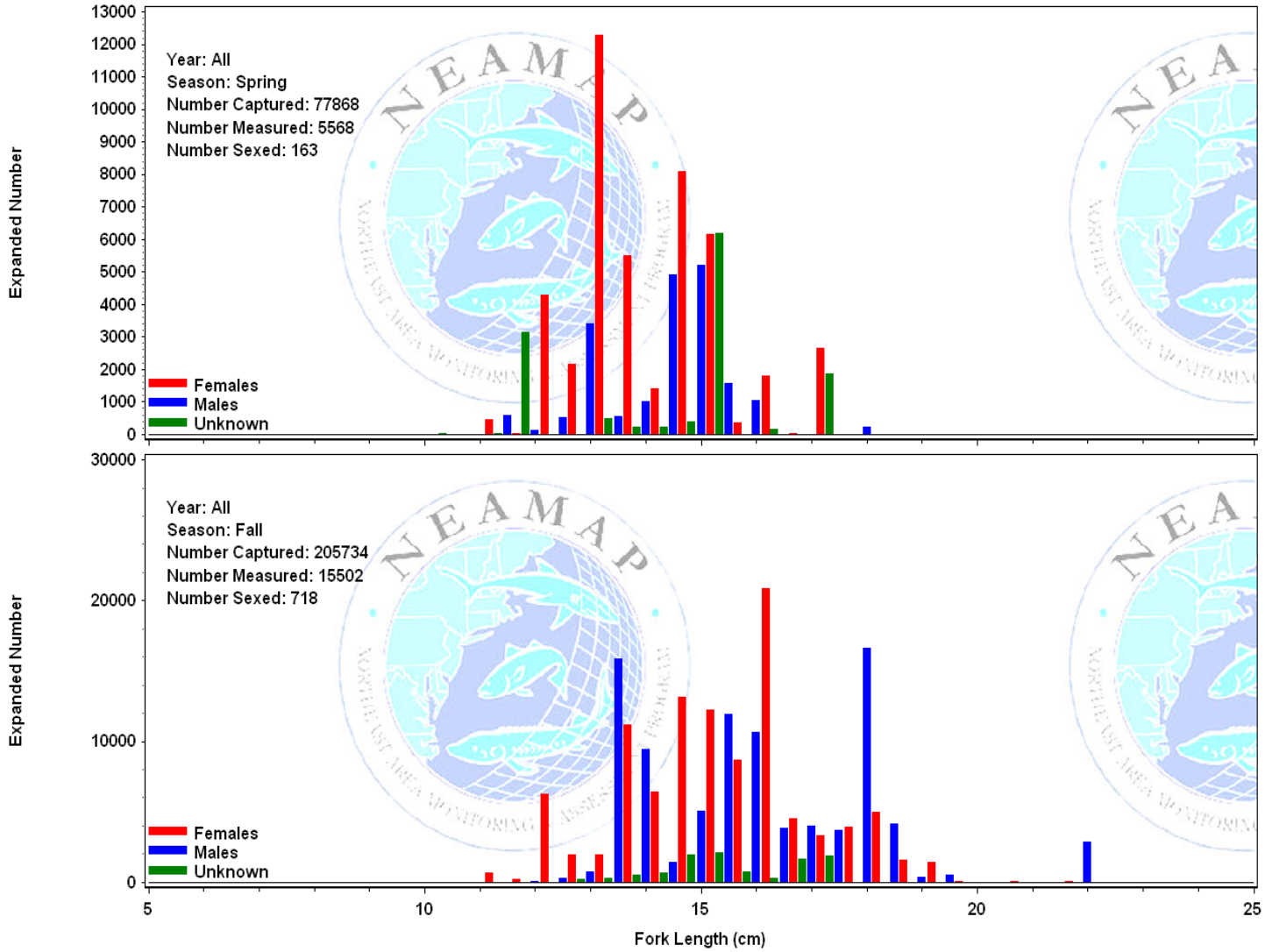
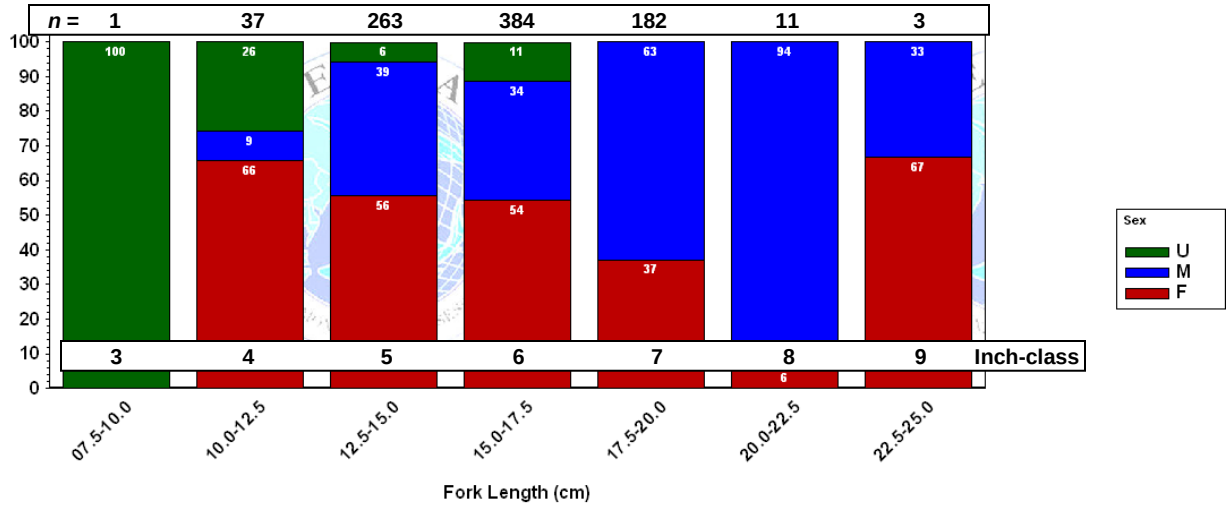


Figure 125. Sex ratio, by length group, for spot collected all NEAMAP cruises 2007-2010 (The percentages for each category are given in their respective bars. The number sampled for sex determination is provided above each bar, and the length categories expressed in inches are given near the x-axis.).



Striped Anchovy

Sampling Priority: D

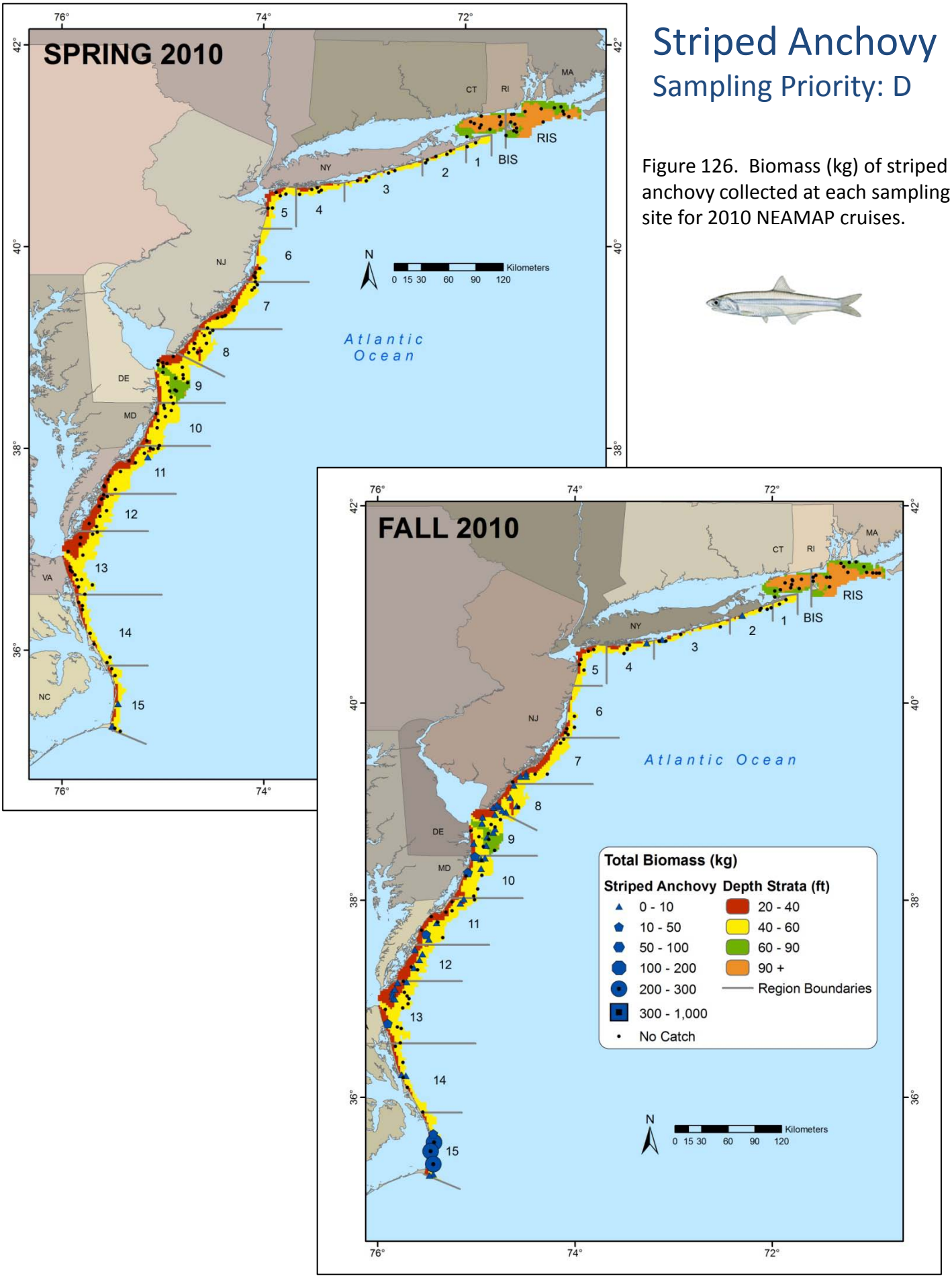


Figure 126. Biomass (kg) of striped anchovy collected at each sampling site for 2010 NEAMAP cruises.

Table 72. Sampling rates and of striped anchovy for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught	Number Measured	Age Specimens	Ages Read	Stomach Specimens	Stomachs Analyzed
Spring	2008	1198	19.0	471	0		0	
	2009	104	1.5	104	0		0	
	2010	4	0.1	4	0		0	
Fall	2007	224369	2519.3	4990	0		0	
	2008	84833	1009.1	3357	0		0	
	2009	9726	130.1	2313	0		0	
	2010	67774	849.8	4418	0		0	

Table 73. Strata used for calculation of abundance indices for striped anchovy.

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		

= used for abundance indices

= not used for abundance indices

Table 74. Preliminary abundance indices for striped anchovy.

		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	31	2.16	13.7	31	0.29	32.0	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	31	0.17	100.0	31	0.03	100.0	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	29	0.05	70.9	29	0.00	81.4	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	66	4.69	7.1	66	1.71	11.2	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	61	5.07	6.8	61	1.73	10.8	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	64	2.43	9.2	64	0.47	16.8	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	61	2.44	12.2	61	0.74	17.7	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 127. Preliminary indices of overall abundance, in terms of number and biomass, of striped anchovy for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

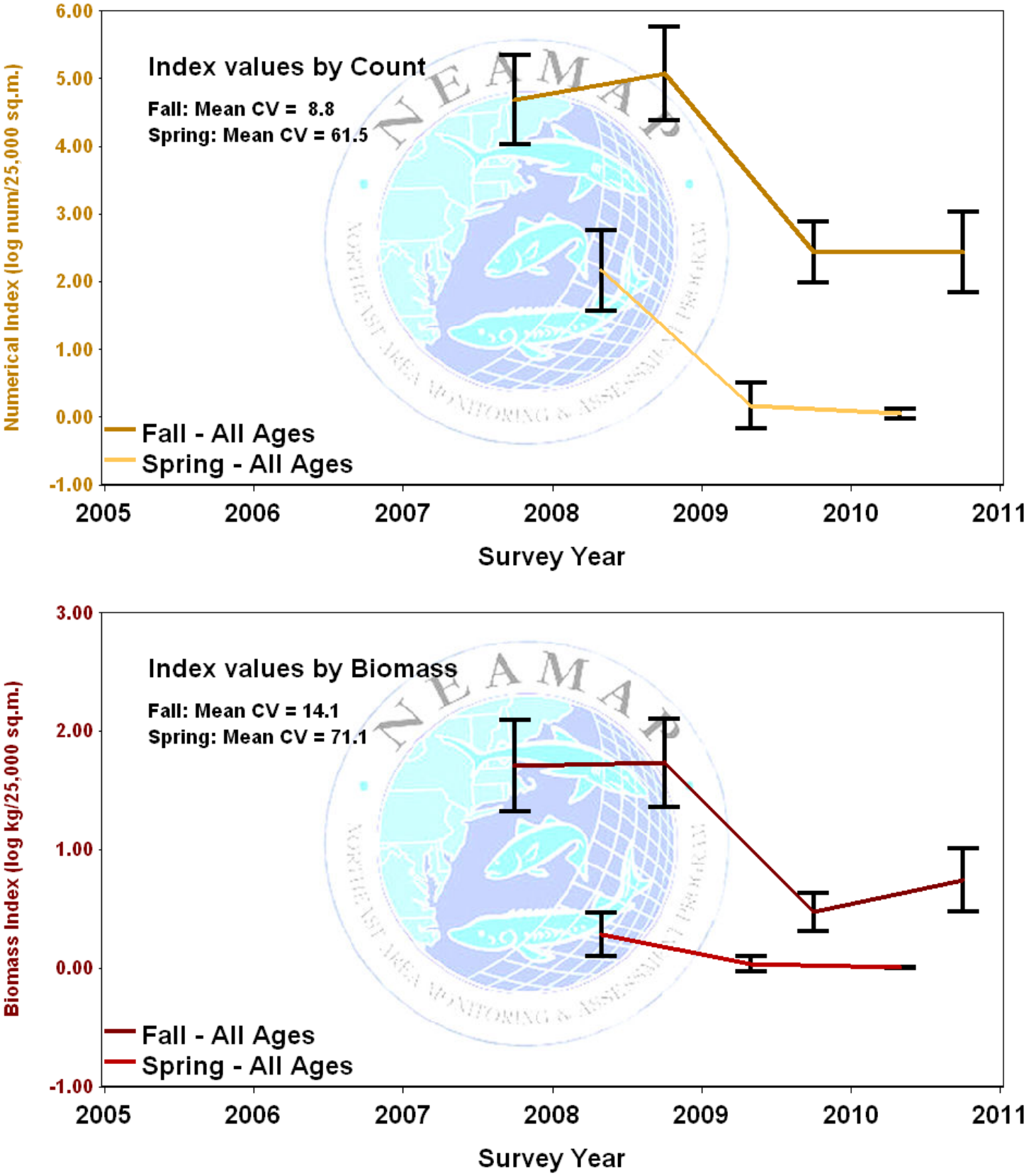
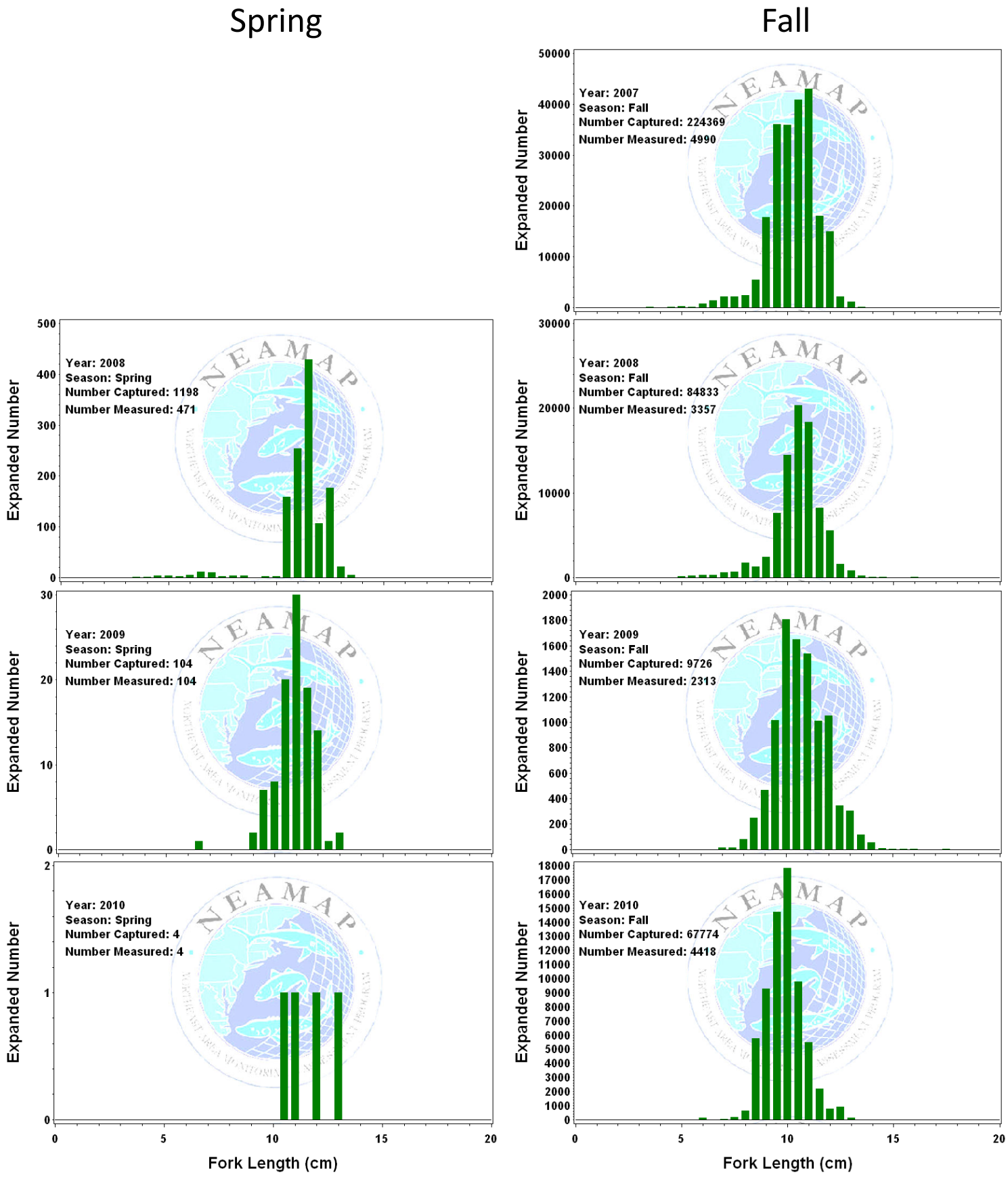


Figure 128. Length-frequency distributions, by cruise, for striped anchovy.



Striped Bass

Sampling Priority: A

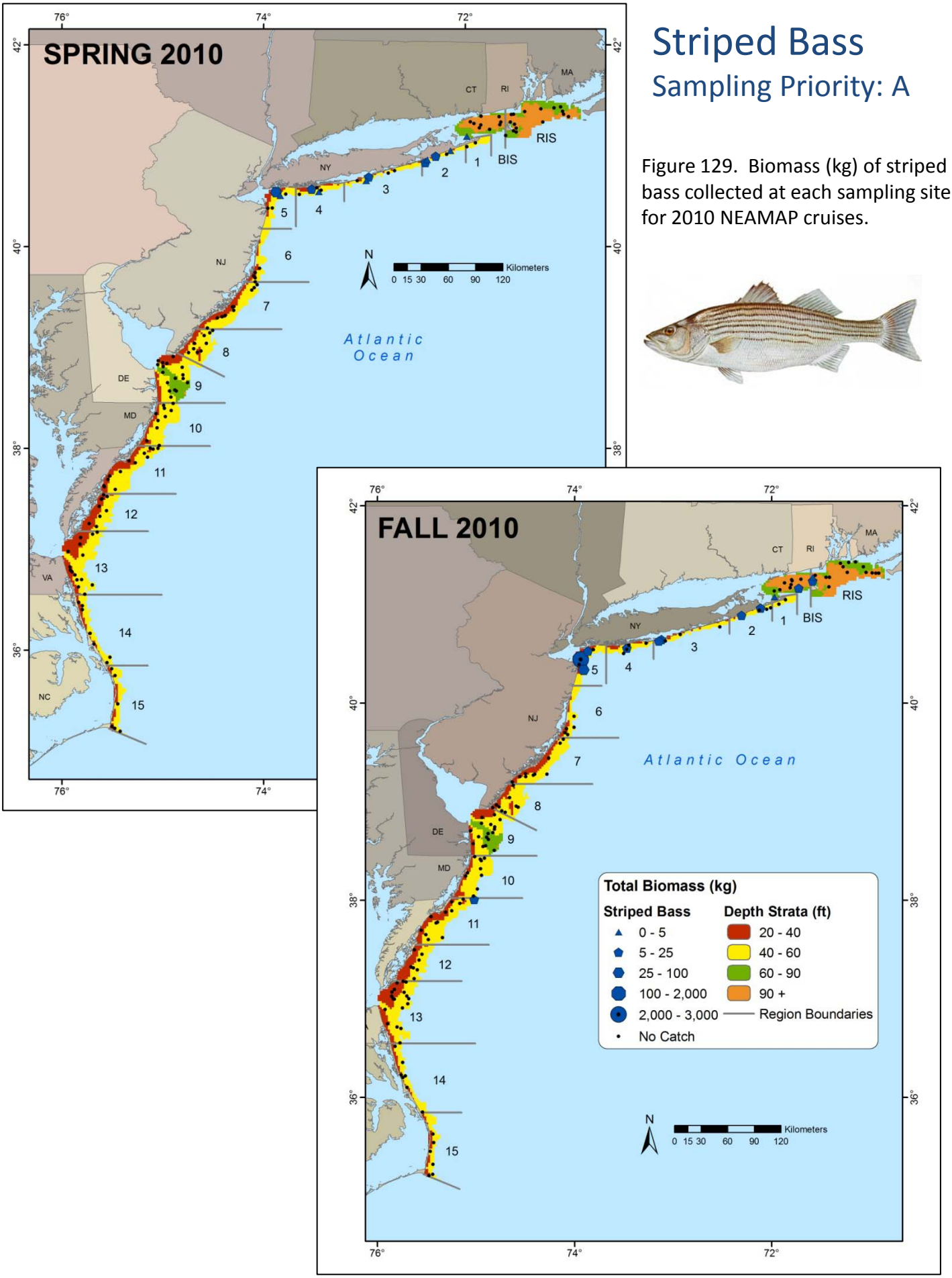


Figure 129. Biomass (kg) of striped bass collected at each sampling site for 2010 NEAMAP cruises.

Table 75. Sampling rates and preserved specimen analysis status of striped bass for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught	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	3
Fall	2007	17	66.3	17	16	16	16	16
	2008	1559	4611.9	95	43	59	21	20
	2009	352	1523.7	127	32	0	22	21
	2010	814	2853.2	59	33	0	29	

Table 76. Strata used for calculation of abundance indices for striped bass.

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		

= used for abundance indices

= not used for abundance indices

Table 77. Preliminary abundance indices for striped bass.

		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	36	0.49	21.6	36	0.94	20.9	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
	2009	42	0.66	23.0	42	1.01	21.0	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	36	0.28	40.3	36	0.54	34.8	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	37	0.18	52.2	37	0.33	48.6	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	36	0.74	38.8	36	1.05	32.3	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
	2009	42	0.16	29.7	42	0.30	34.2	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	36	0.53	45.8	36	0.86	34.3	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

Figure 130. Preliminary indices of overall abundance, in terms of number and biomass, of striped bass for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

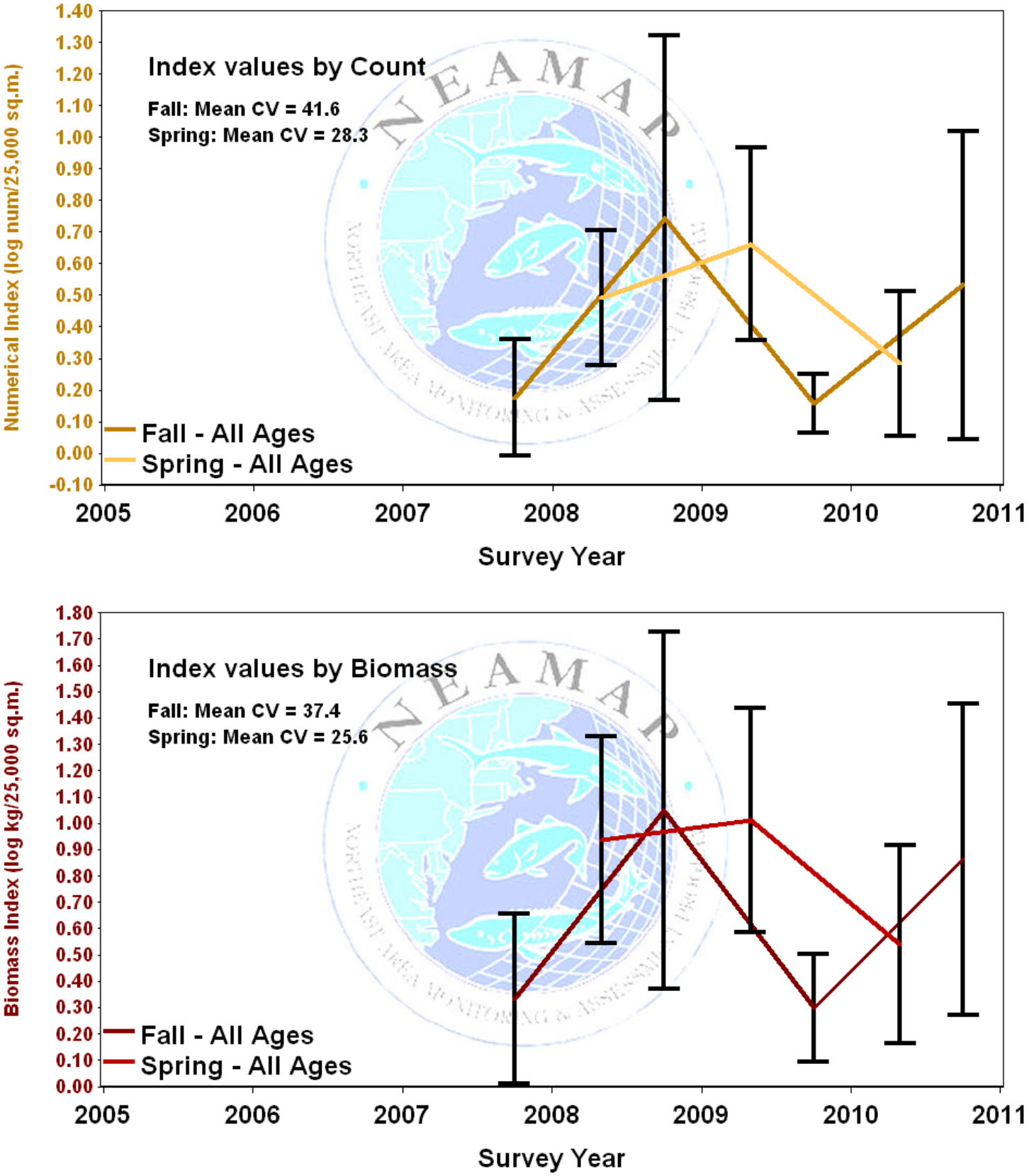


Figure 131. Length-frequency distributions, by cruise, for striped bass.

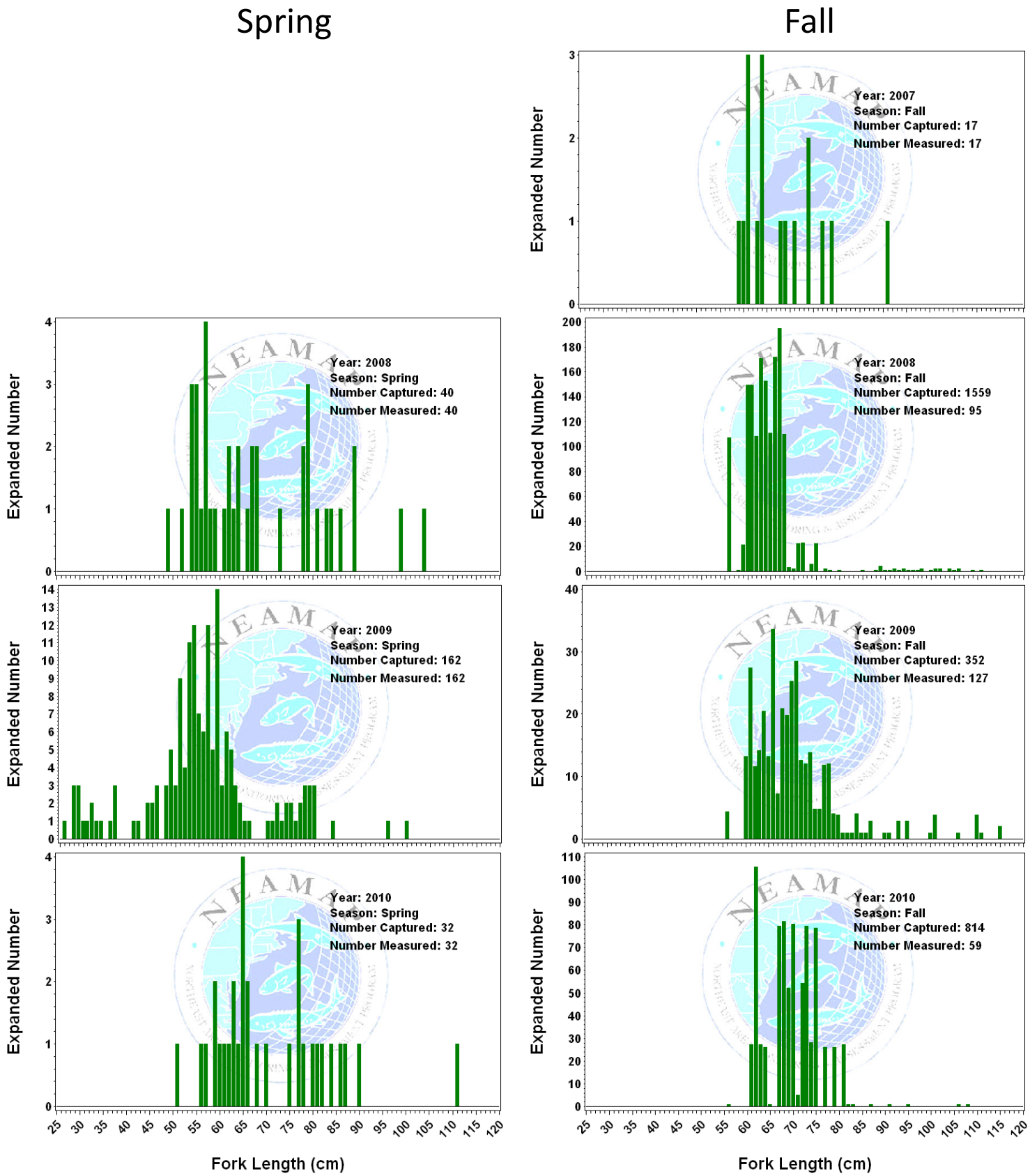


Figure 132. Sex-specific length-frequency distribution, by season, all cruises pooled, for striped bass.

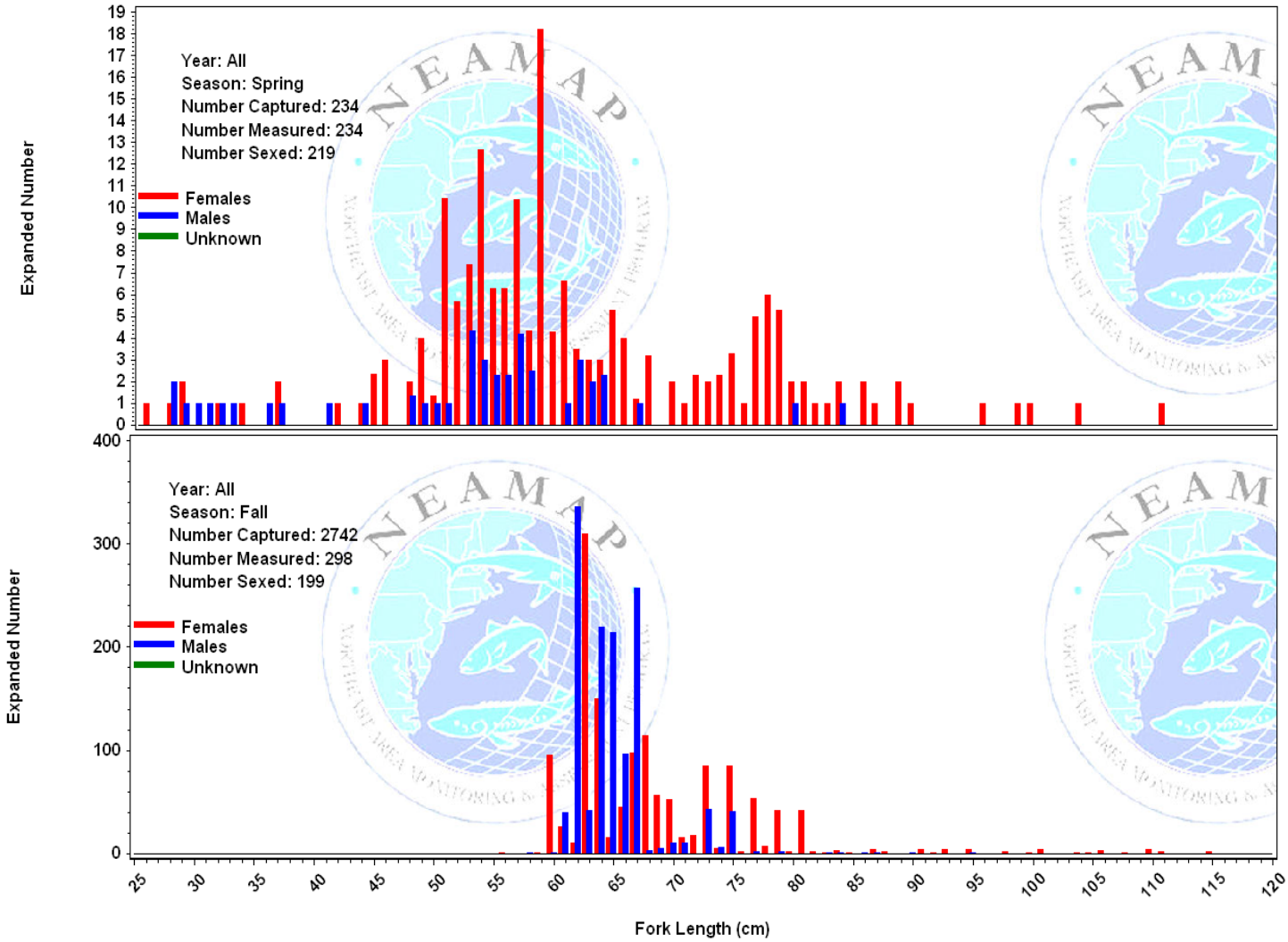


Figure 133. Sex ratio, by length group, for striped bass collected all NEAMAP cruises 2007-2010 (The percentages for each category are given in their respective bars. The number sampled for sex determination is provided above each bar, and the length categories expressed in inches are given near the x-axis.).

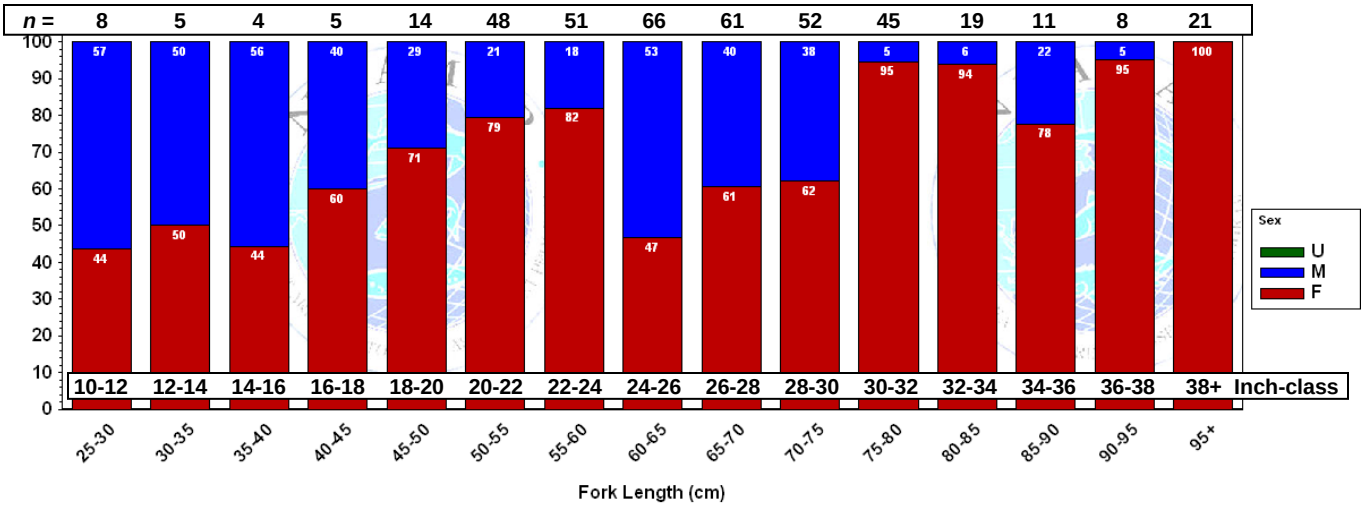
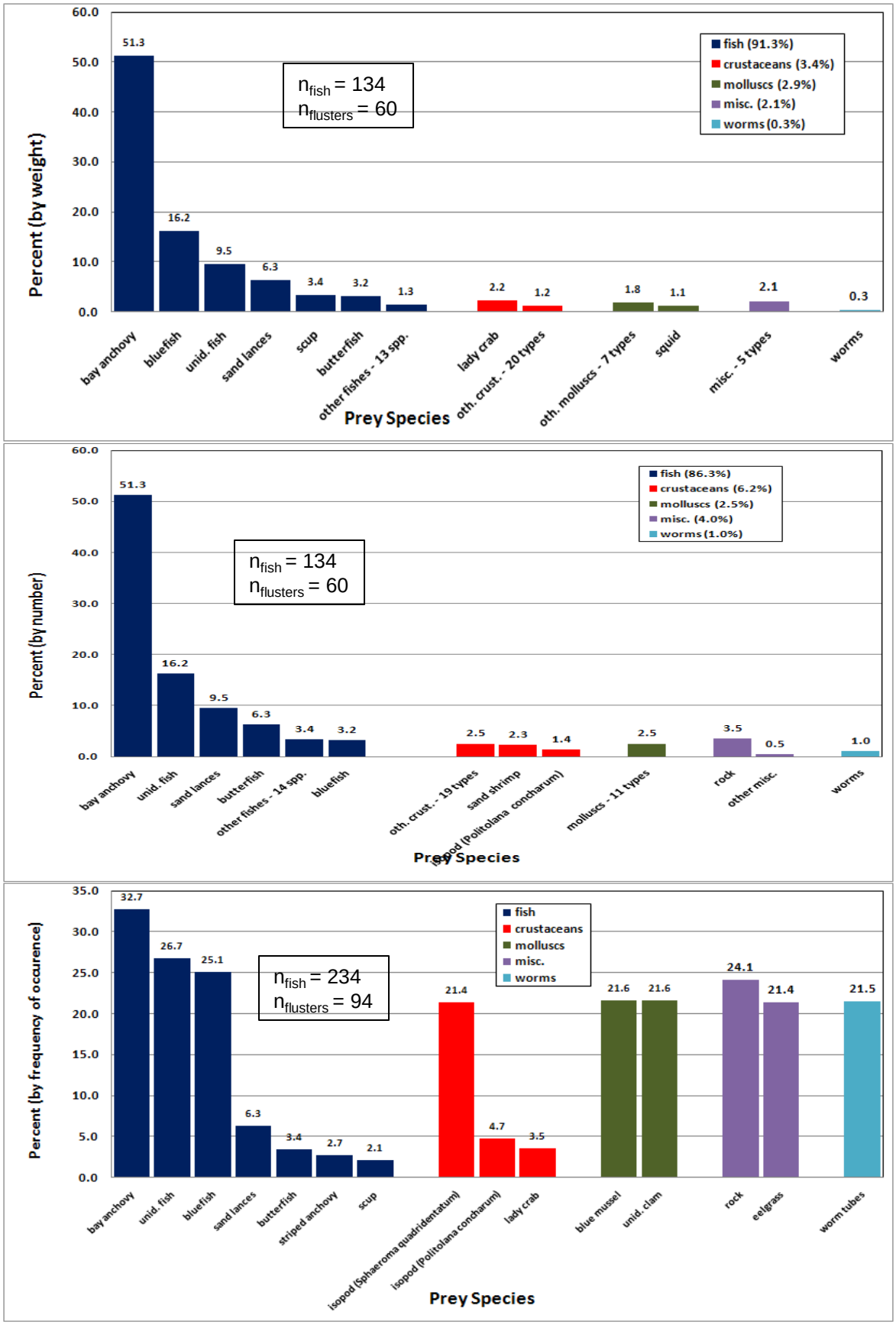


Figure 134. Diet composition, expressed as percent by weight, by number, and by frequency of occurrence* of striped bass collected during NEAMAP cruises in 2007-2009 (The number of fish sampled for diet is given by n_{fish}, while $n_{clusters}$ indicates the number of clusters of striped bass sampled.).



* As prey types cannot be additively combined under frequency of occurrence analysis, only those prey types with at least a 2% value are shown here: 42 other prey types were observed in stomachs for this species. Similarly, sums for broad taxonomic groups are not calculated.

Summer Flounder

Sampling Priority: A

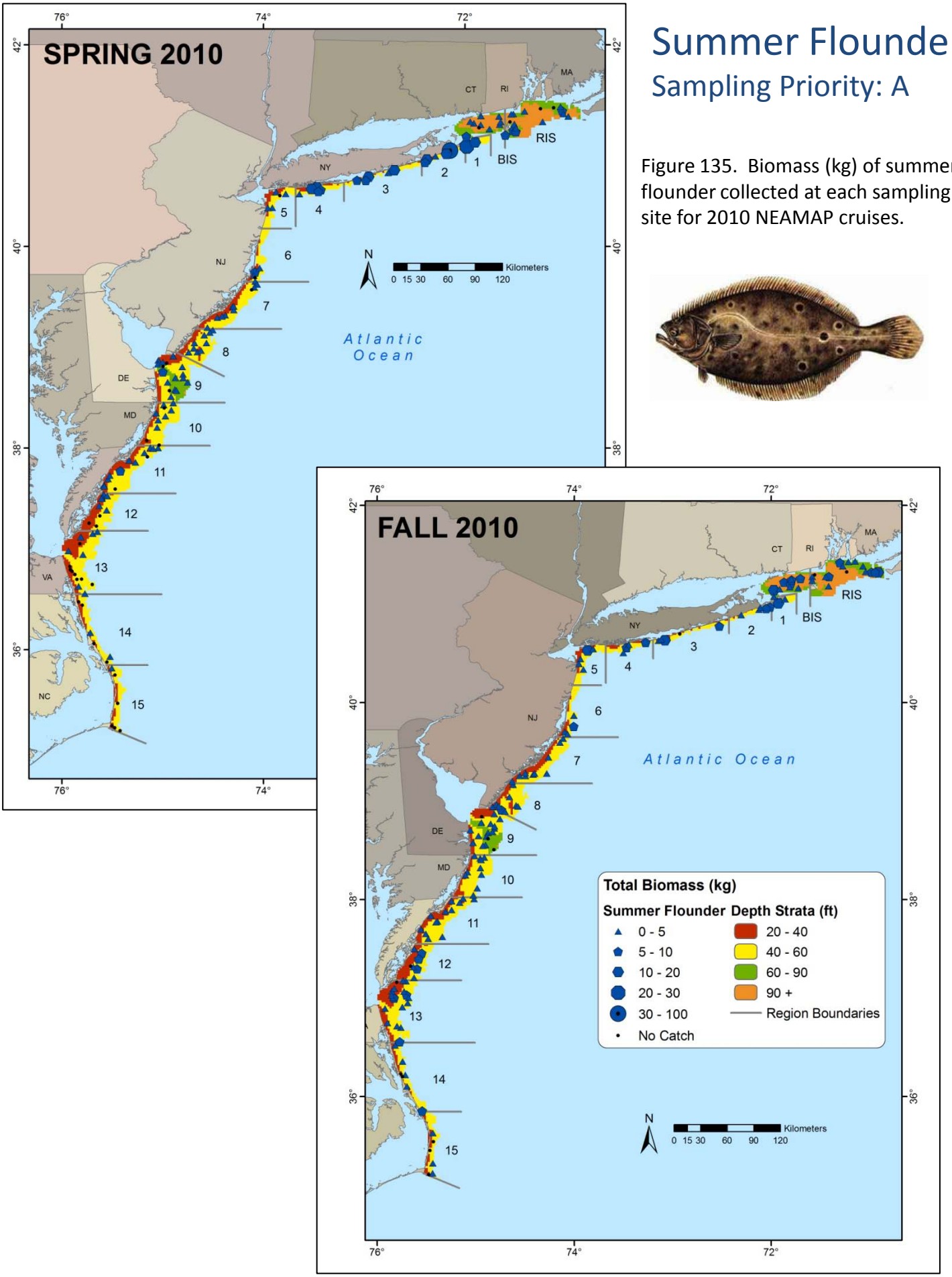


Figure 135. Biomass (kg) of summer flounder collected at each sampling site for 2010 NEAMAP cruises.

Table 78. Sampling rates and preserved specimen analysis status of summer flounder for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught	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	0	362	349
	2010	711	386.8	711	493	0	309	263
Fall	2007	957	625.4	923	713	713	446	438
	2008	683	418.0	676	440	440	310	304
	2009	1117	545.8	1117	745	0	535	525
	2010	826	400.1	806	607	0	399	

Table 79. 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		

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		

= used for abundance indices

= not used for abundance indices

Table 80. Preliminary abundance indices for summer flounder.

		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	137	1.41	4.4	137	1.08	5.0	1	137	0.56	8.2	137	0.21	9.6	>1	137	1.15	4.7	137	0.98	5.2
	2009	145	1.27	5.1	145	0.93	5.9		145	0.65	8.4	145	0.23	10.4		145	0.95	5.9	145	0.83	6.3
	2010	137	1.21	5.8	137	0.85	6.0		137	0.61	9.5	137	0.22	11.5		137	0.94	5.8	137	0.75	6.3
Fall	2007	137	1.67	3.4	137	1.29	4.4	0	137	0.60	7.2	137	0.20	9.6	>0	137	1.44	3.9	137	1.22	4.8
	2008	137	1.32	5.1	137	1.00	5.4		137	0.42	11.9	137	0.13	16.5		137	1.16	5.1	137	0.96	5.5
	2009	145	1.79	4.1	145	1.23	4.4		145	0.89	7.7	145	0.26	9.8		145	1.35	4.3	145	1.10	4.7
	2010	137	1.61	4.0	137	1.10	5.0		137	0.73	8.2	137	0.24	10.4		137	1.27	4.5	137	0.99	5.6

Figure 136. Preliminary indices of overall abundance, in terms of number and biomass, of summer flounder for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

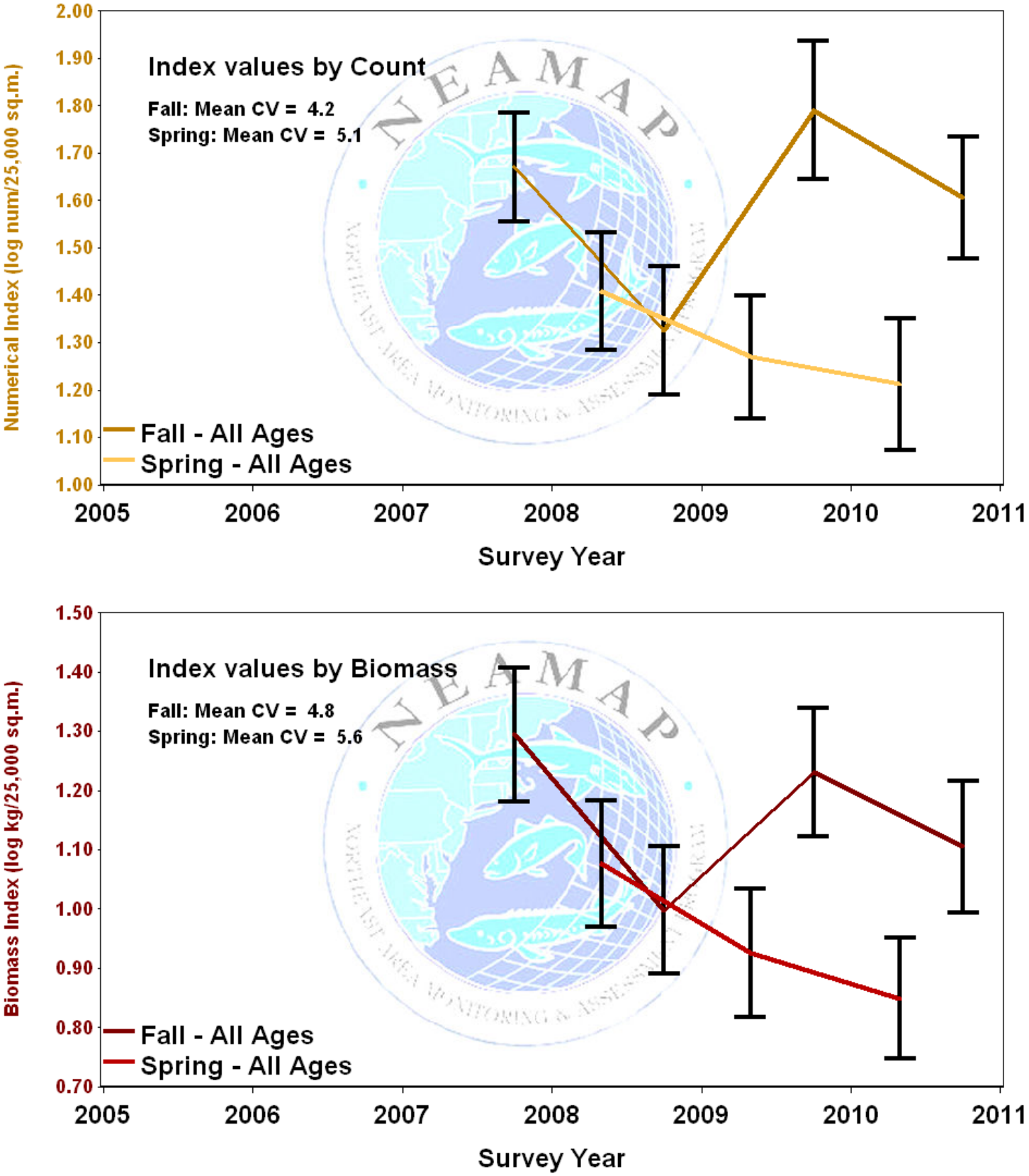


Figure 137. Preliminary indices of abundance, of summer flounder for spring and fall NEAMAP surveys. Indices are for the youngest age class observed during each survey (count-based indices only) and for all other age classes combined (based both on count and biomass). 95% confidence intervals are provided for each abundance estimate.

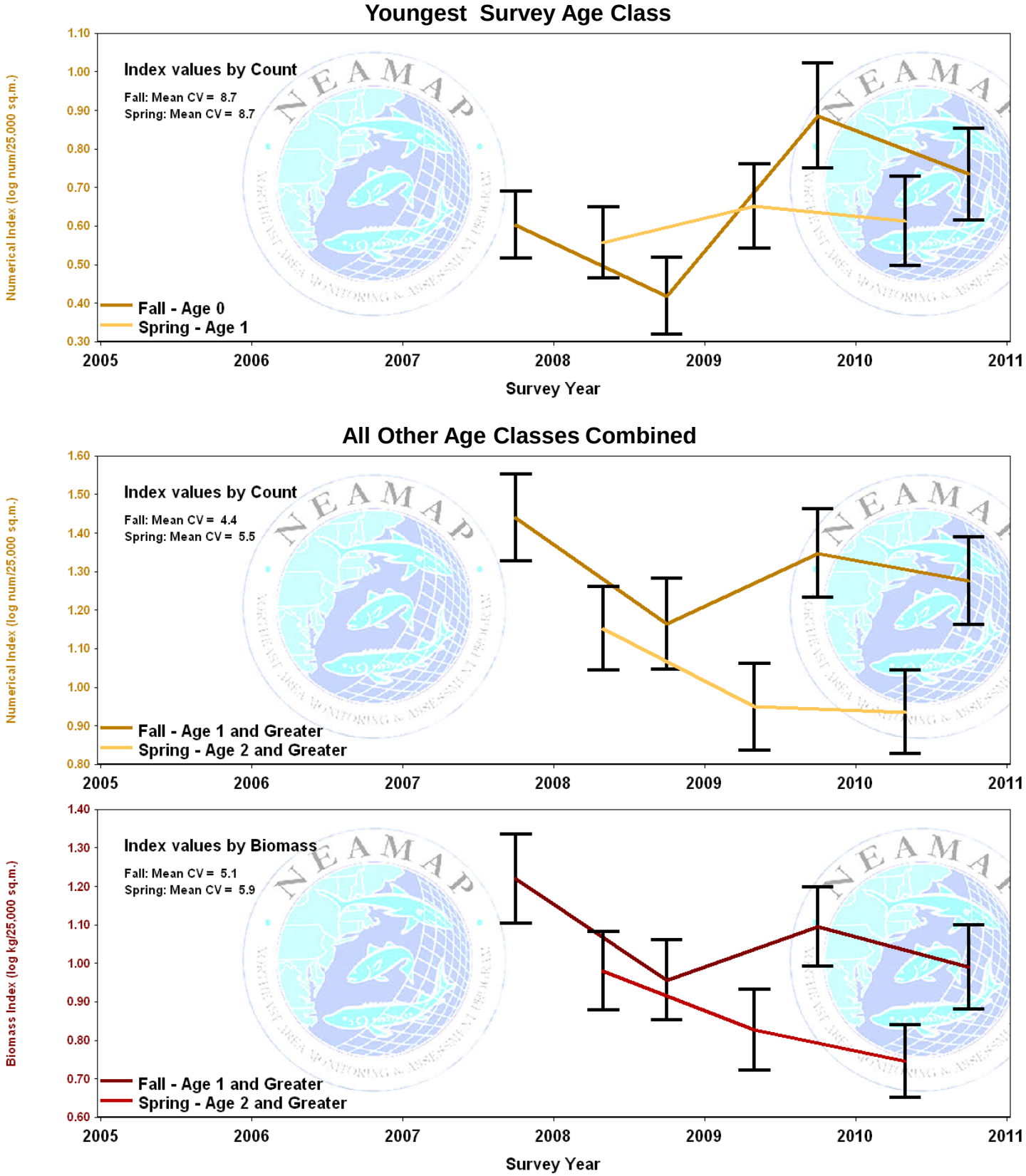


Figure 138. Length-frequency distributions, by cruise, for summer flounder.

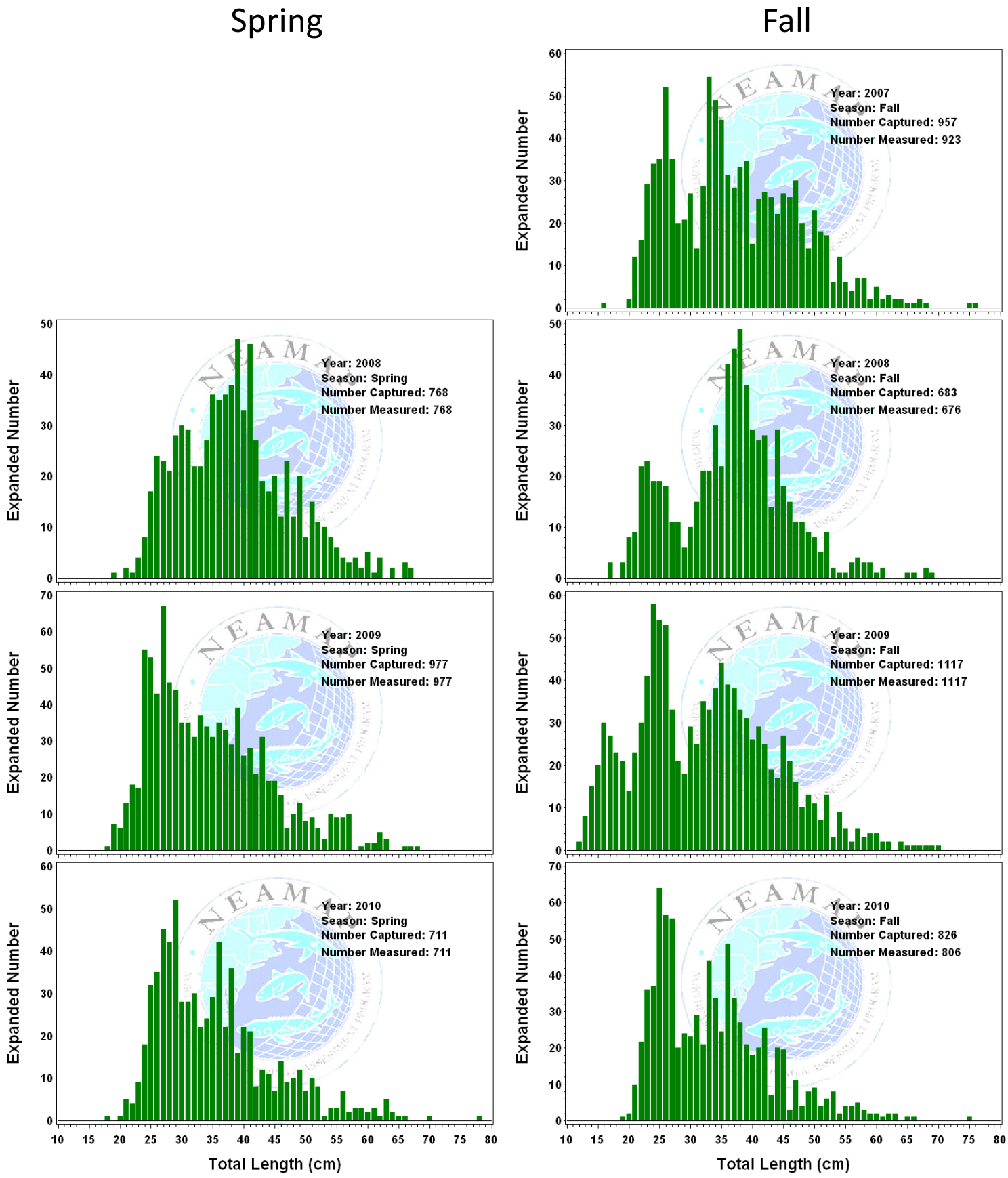


Figure 139. Sex-specific length-frequency distribution, by season, all cruises pooled, for summer flounder.

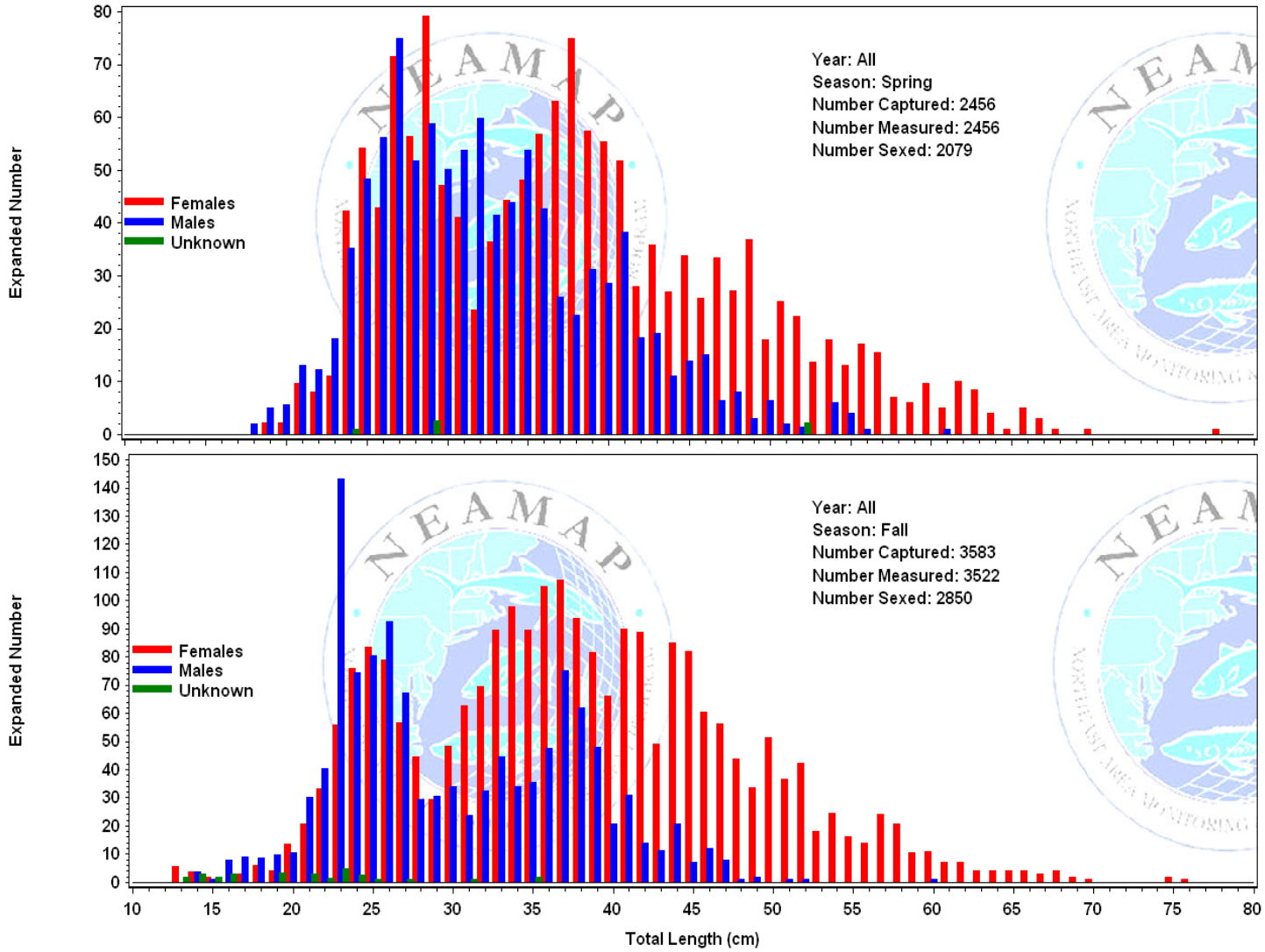


Figure 140. Sex ratio, by length group, for summer flounder collected all NEAMAP cruises 2007-2010 (The percentages for each category are given in their respective bars. The number sampled for sex determination is provided above each bar, and the length categories expressed in inches are given near the x-axis.).

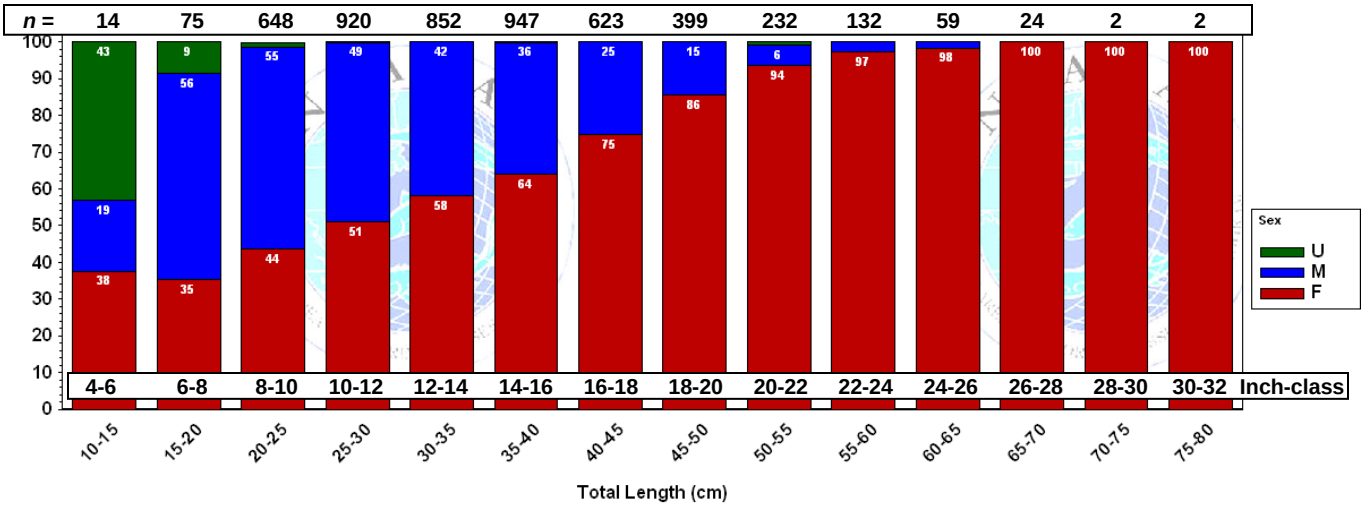
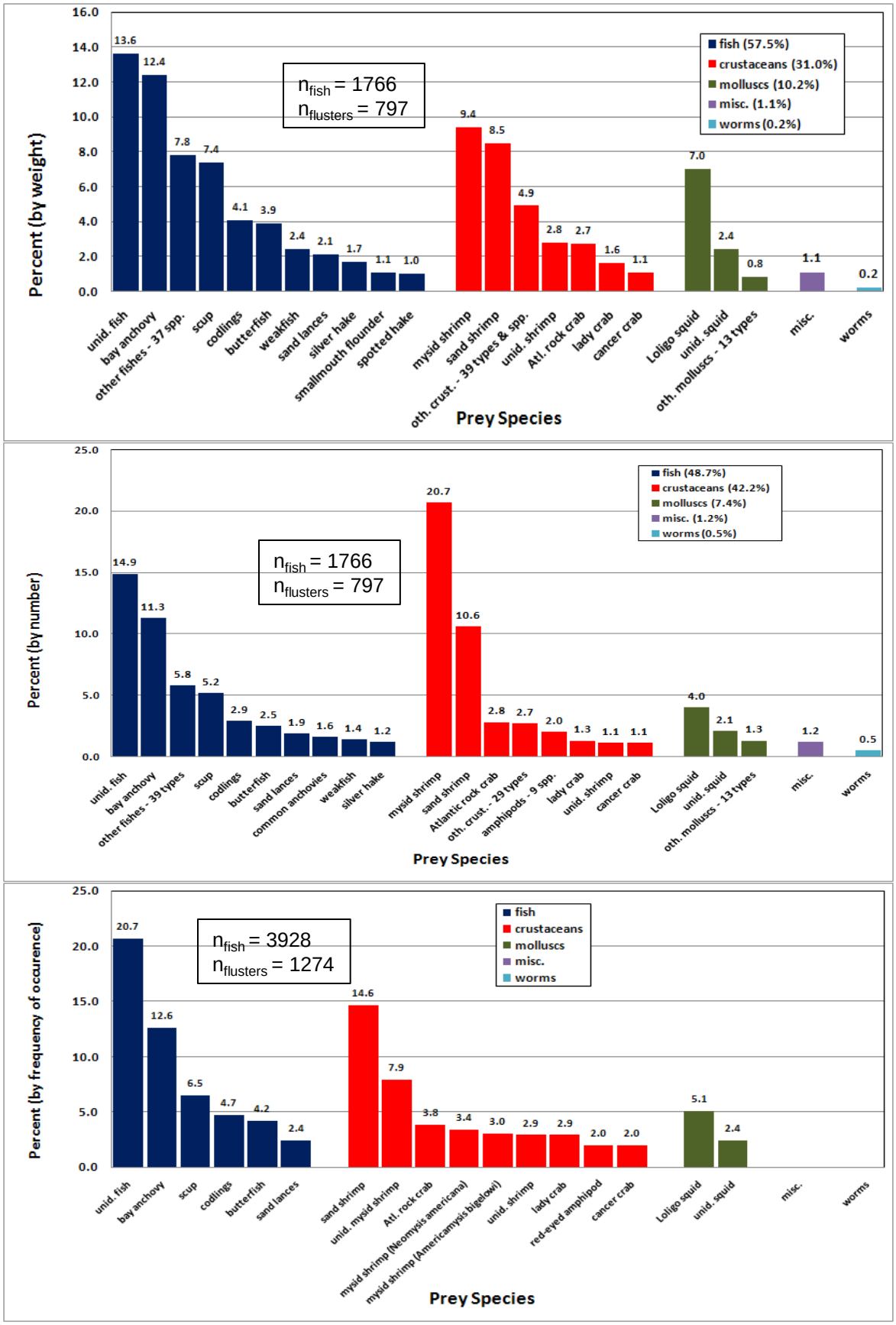


Figure 141. Diet composition, expressed as percent by weight, by number, and by frequency of occurrence* of summer flounder collected during NEAMAP cruises in 2007-2009 (The number of fish sampled for diet is given by n_{fish}, while $n_{clusters}$ indicates the number of clusters of summer flounder sampled.).



* As prey types cannot be additively combined under frequency of occurrence analysis, only those prey types with at least a 2% value are shown here: 115 other prey types were observed in stomachs for this species. Similarly, sums for broad taxonomic groups are not calculated.

Weakfish

Sampling Priority: A

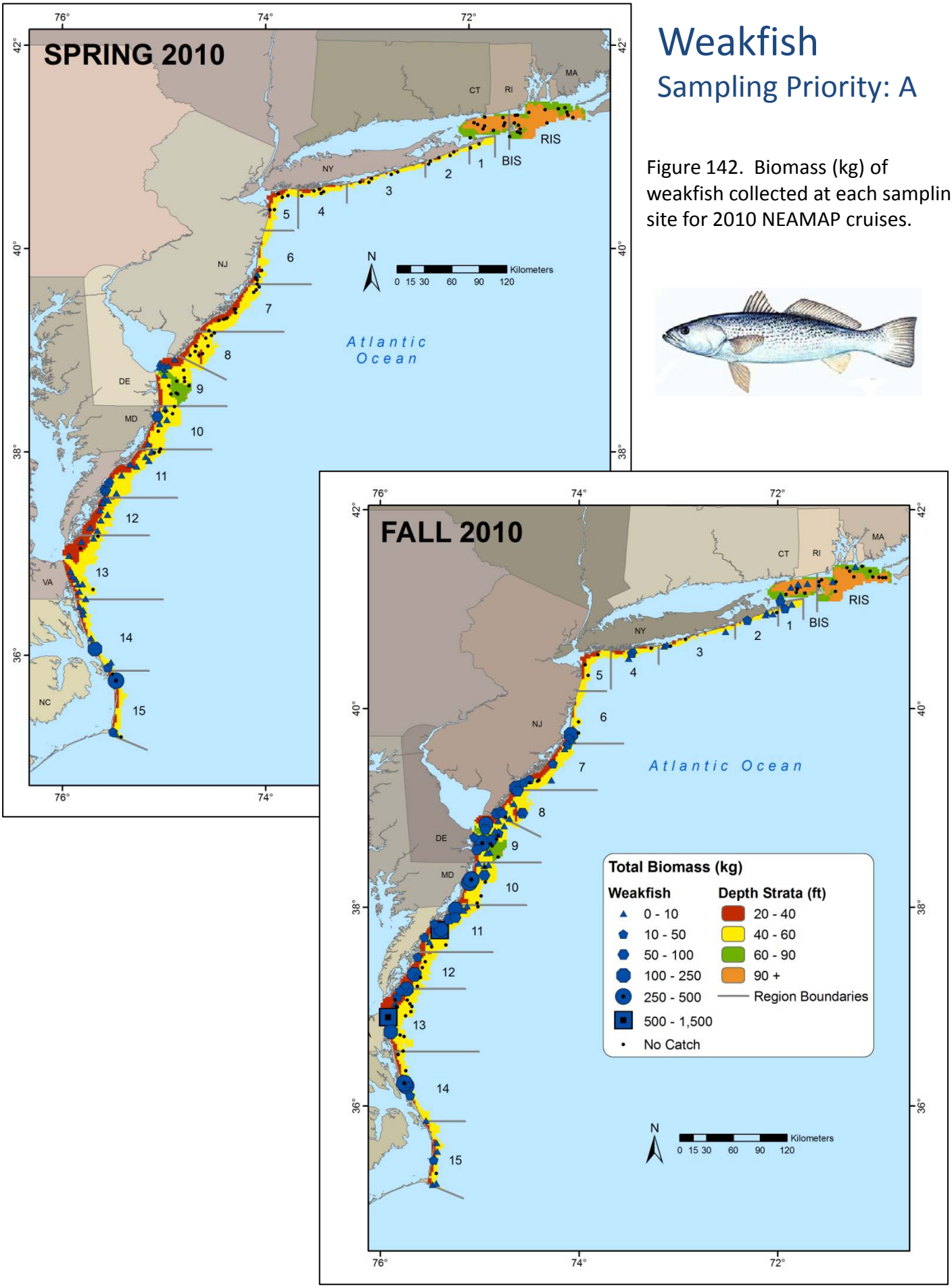


Figure 142. Biomass (kg) of weakfish collected at each sampling site for 2010 NEAMAP cruises.

Table 81. Sampling rates and preserved specimen analysis status of weakfish for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught	Number Measured	Age Specimens	Ages Read	Stomach Specimens	Stomachs Analyzed
Spring	2008	39580	2198.8	2174	305	305	279	277
	2009	8785	339.3	1654	189	0	143	136
	2010	18192	864.9	1717	259	0	182	161
Fall	2007	60990	4168.1	5747	572	572	472	466
	2008	44779	3990.4	3879	464	464	333	320
	2009	96394	5556.9	13012	872	0	647	626
	2010	80684	5795.7	8115	611	0	462	

Table 82. 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		

= used for abundance indices

= not used for abundance indices

Table 83. Preliminary abundance indices for weakfish.

		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	13	6.45	7.1	13	3.47	12.7	1	13	6.41	7.2	13	3.43	12.9	>1	13	2.72	15.4	13	1.08	25.3
	2009	15	3.60	12.7	15	1.26	13.9		15	3.58	12.8	15	1.24	14.0		15	0.55	33.2	15	0.09	58.8
	2010	13	3.47	27.6	13	1.66	41.2		13	3.45	27.8	13	1.63	41.7		13	1.20	47.3	13	0.47	71.9
Fall	2007	150	2.51	7.4	150	1.40	8.7	0	150	1.97	8.3	150	0.97	9.8	>0	150	1.96	8.3	150	1.08	9.7
	2008	150	2.37	7.7	150	1.34	9.3		150	1.95	8.3	150	0.99	10.3		150	1.95	8.5	150	1.06	10.4
	2009	160	3.32	5.3	160	1.88	6.6		160	2.94	5.7	160	1.48	7.0		160	2.28	6.9	160	1.26	8.9
	2010	150	2.49	7.9	150	1.40	9.5		150	2.17	8.6	150	1.12	10.6		150	1.78	9.1	150	1.01	10.9

Figure 143. Preliminary indices of overall abundance, in terms of number and biomass, of weakfish for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

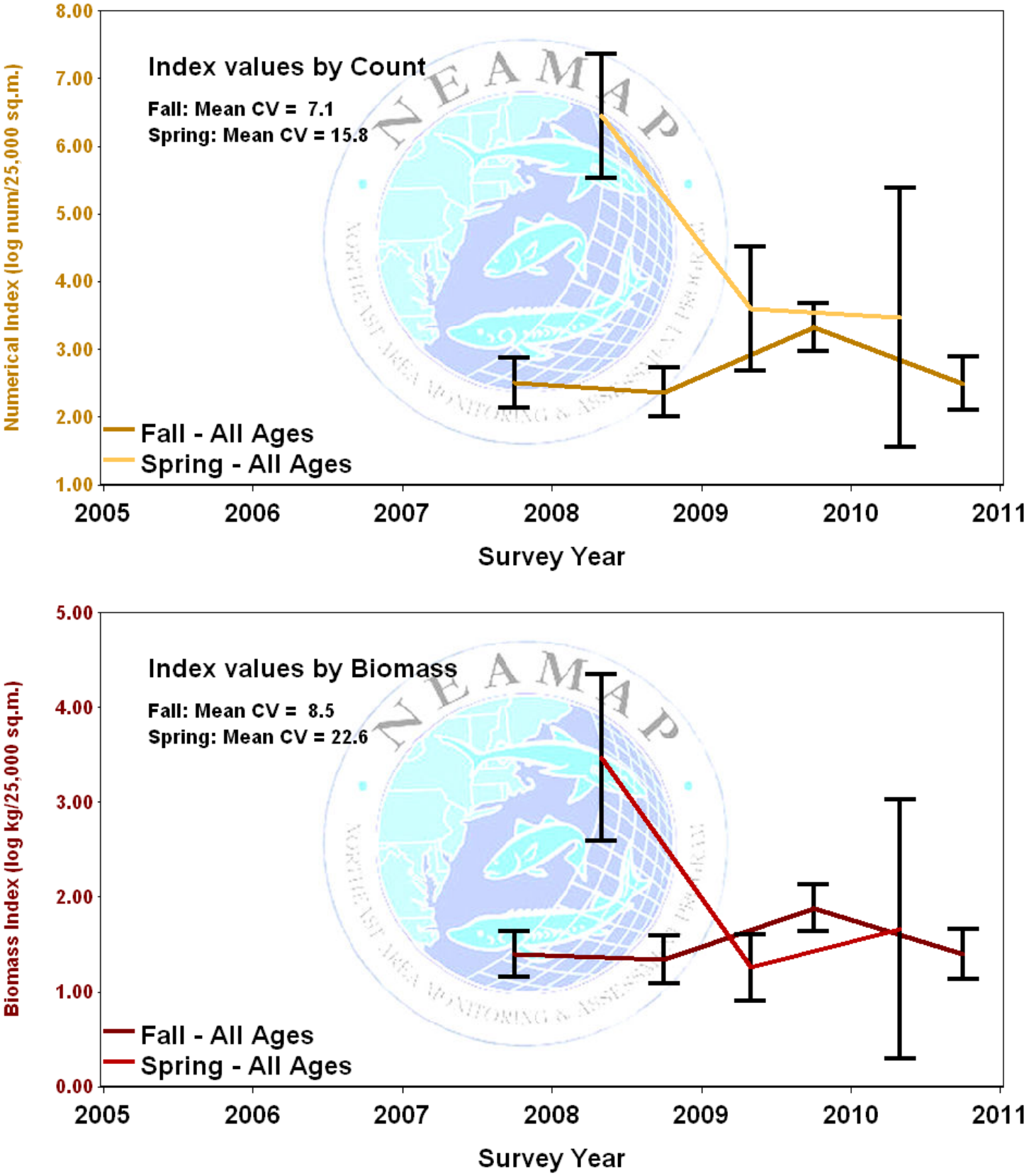


Figure 144. Preliminary indices of abundance, of weakfish for spring and fall NEAMAP surveys. Indices are for the youngest age class observed during each survey (count-based indices only) and for all other age classes combined (based both on count and biomass). 95% confidence intervals are provided for each abundance estimate.

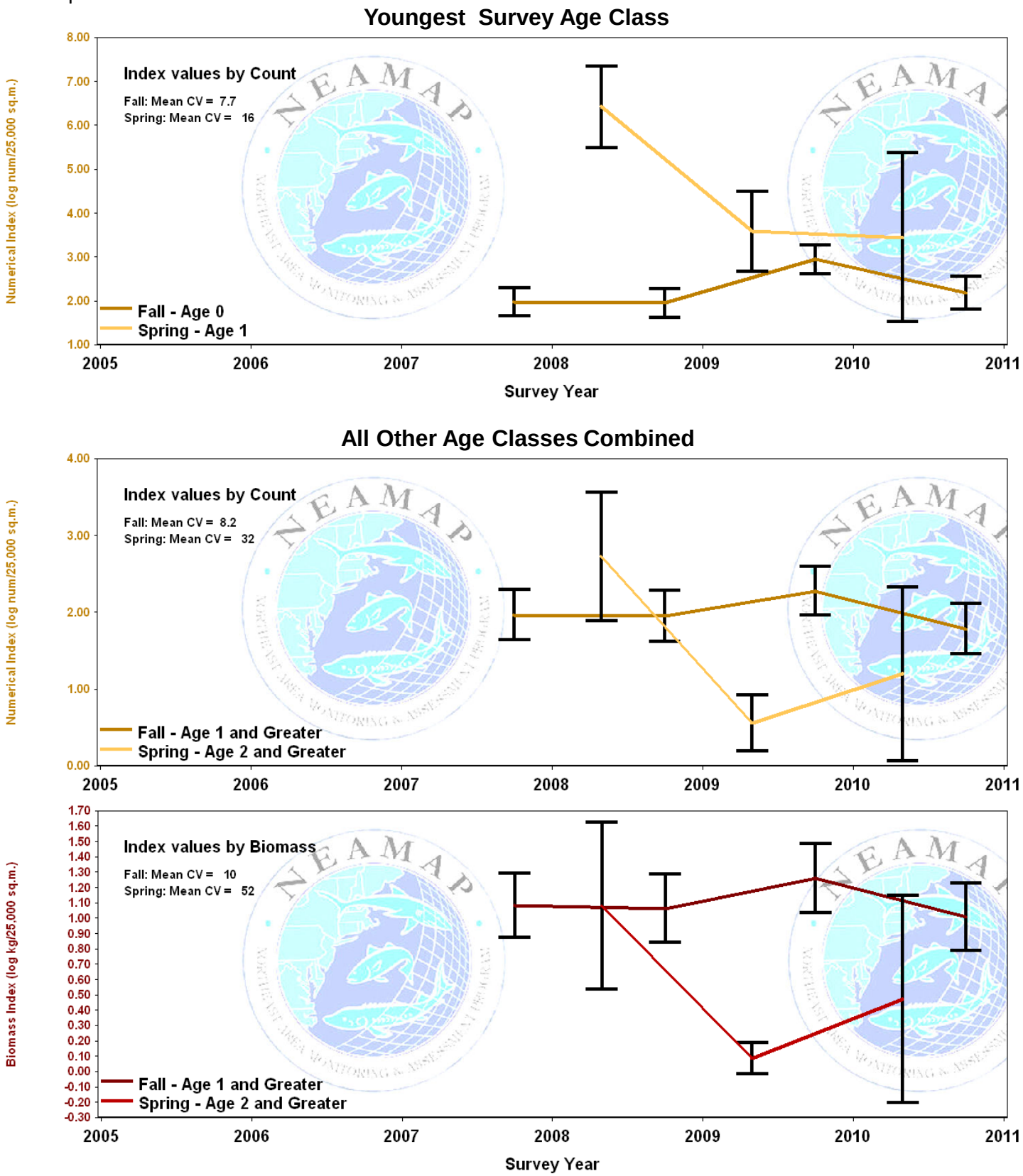


Figure 145. Length-frequency distributions, by cruise, for weakfish.

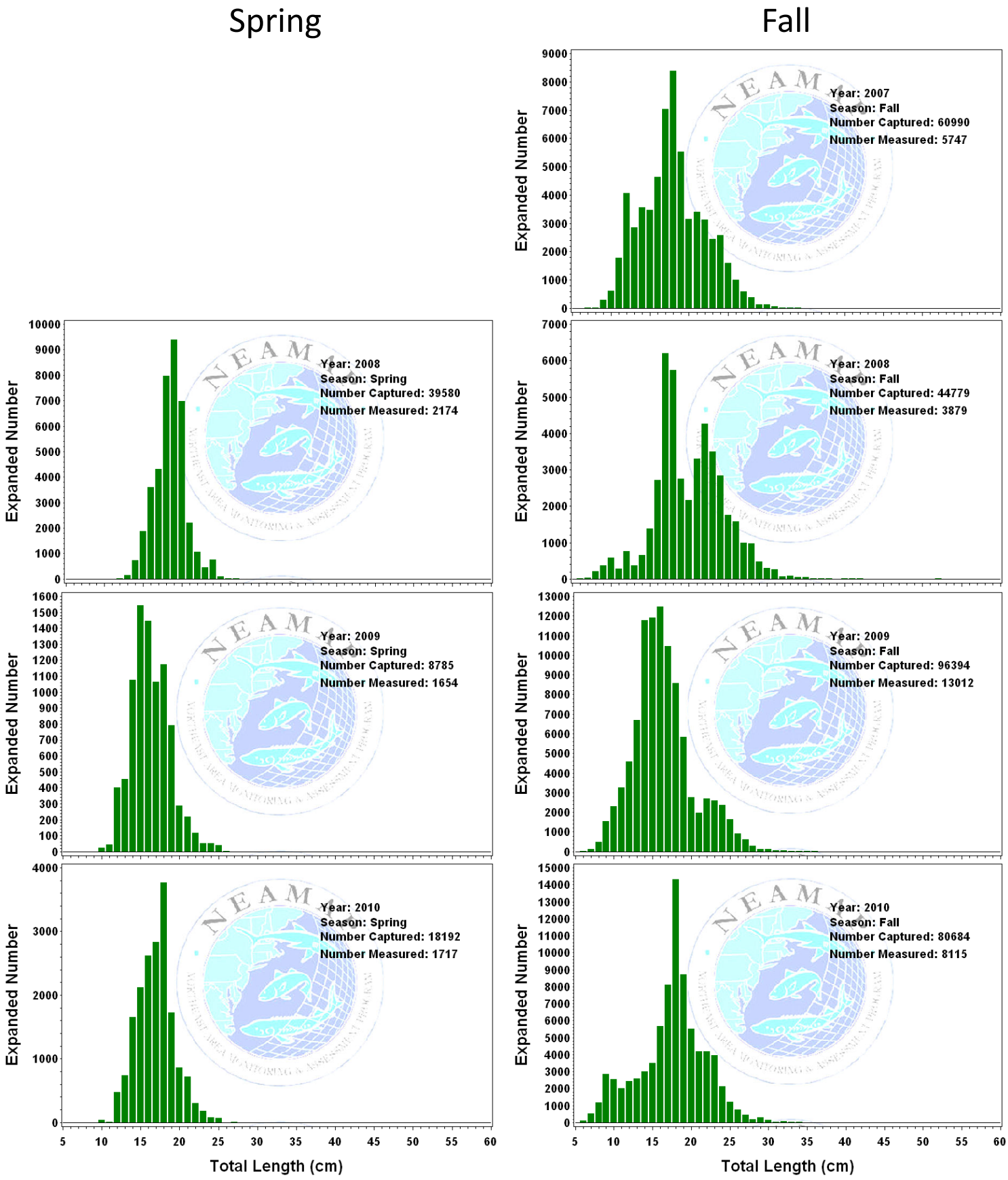


Figure 146. Sex-specific length-frequency distribution, by season, all cruises pooled, for weakfish.

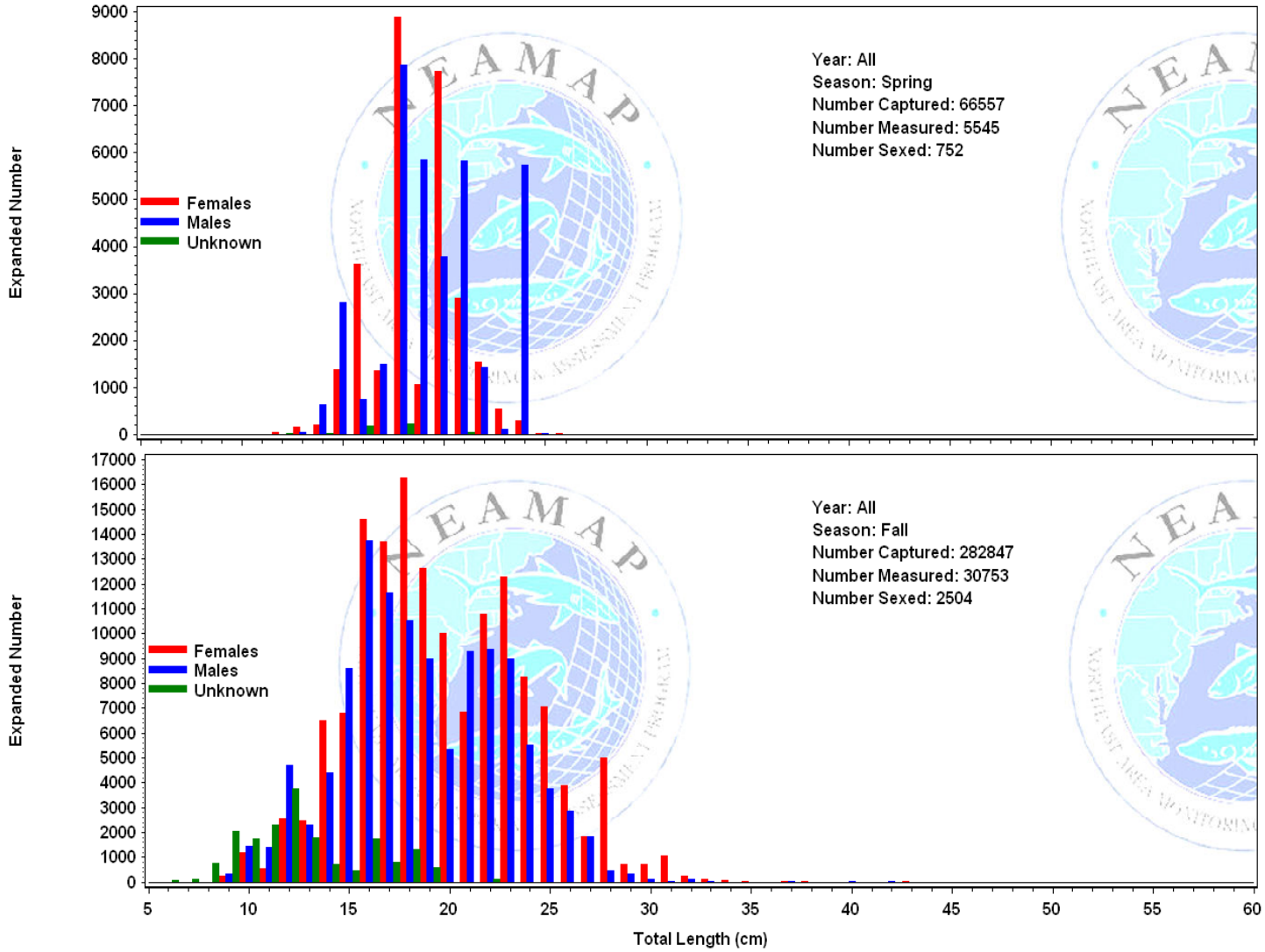


Figure 147. Sex ratio, by length group, for weakfish collected all NEAMAP cruises 2007-2010 (The percentages for each category are given in their respective bars. The number sampled for sex determination is provided above each bar, and the length categories expressed in inches are given near the x-axis.).

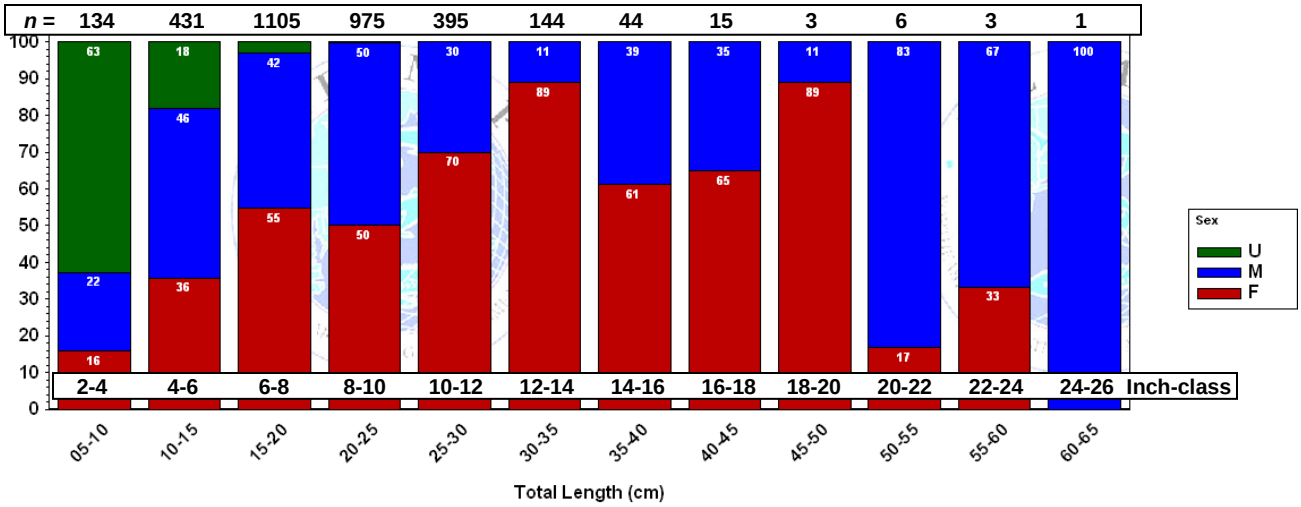
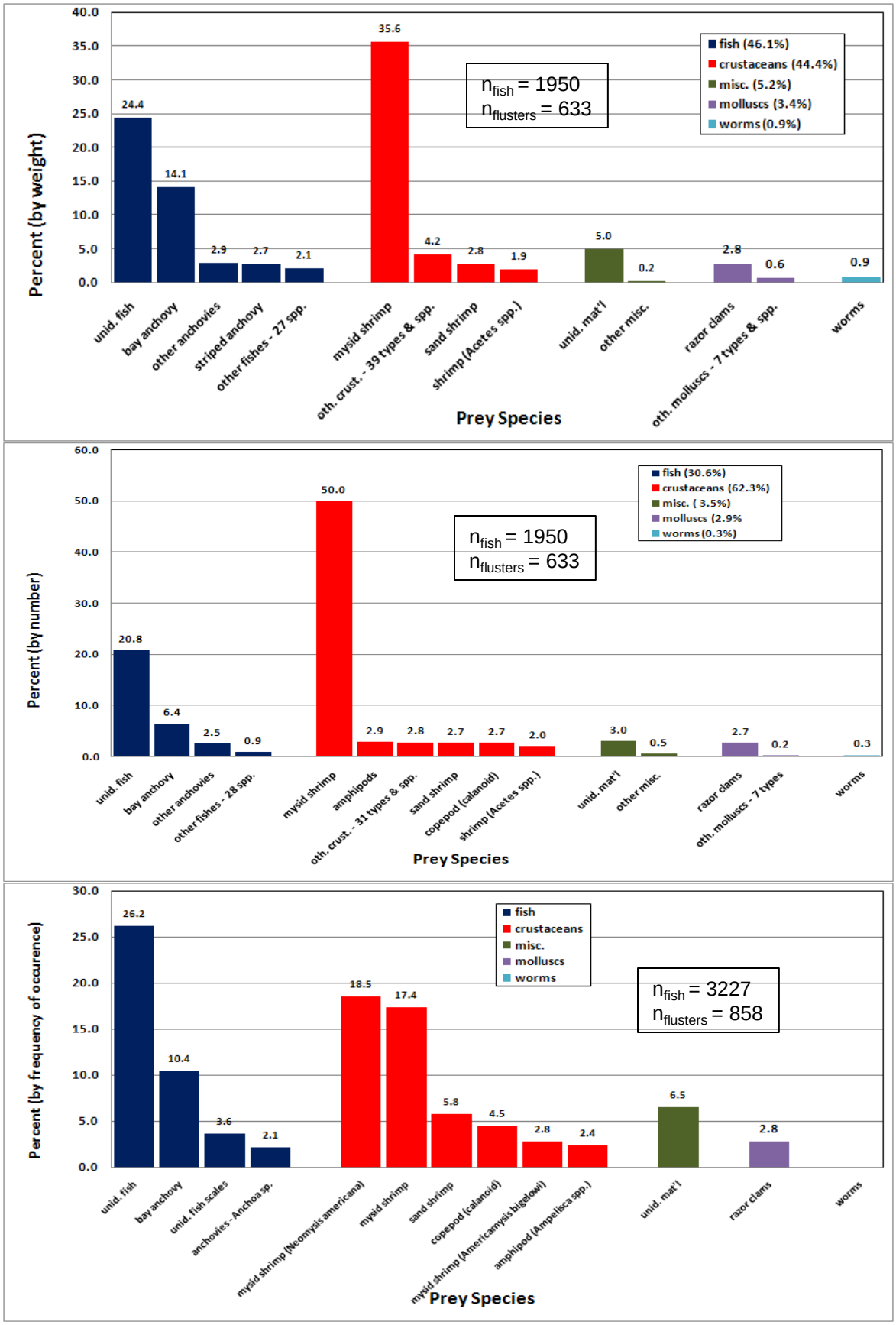


Figure 148. Diet composition, expressed as percent by weight, by number, and by frequency of occurrence* of weakfish collected during NEAMAP cruises in 2007-2009 (The number of fish sampled for diet is given by n_{fish}, while $n_{clusters}$ indicates the number of clusters of weakfish sampled.).



* As prey types cannot be additively combined under frequency of occurrence analysis, only those prey types with at least a 2% value are shown here: 92 other prey types were observed in stomachs for this species. Similarly, sums for broad taxonomic groups are not calculated.

White Shrimp

Sampling Priority: E

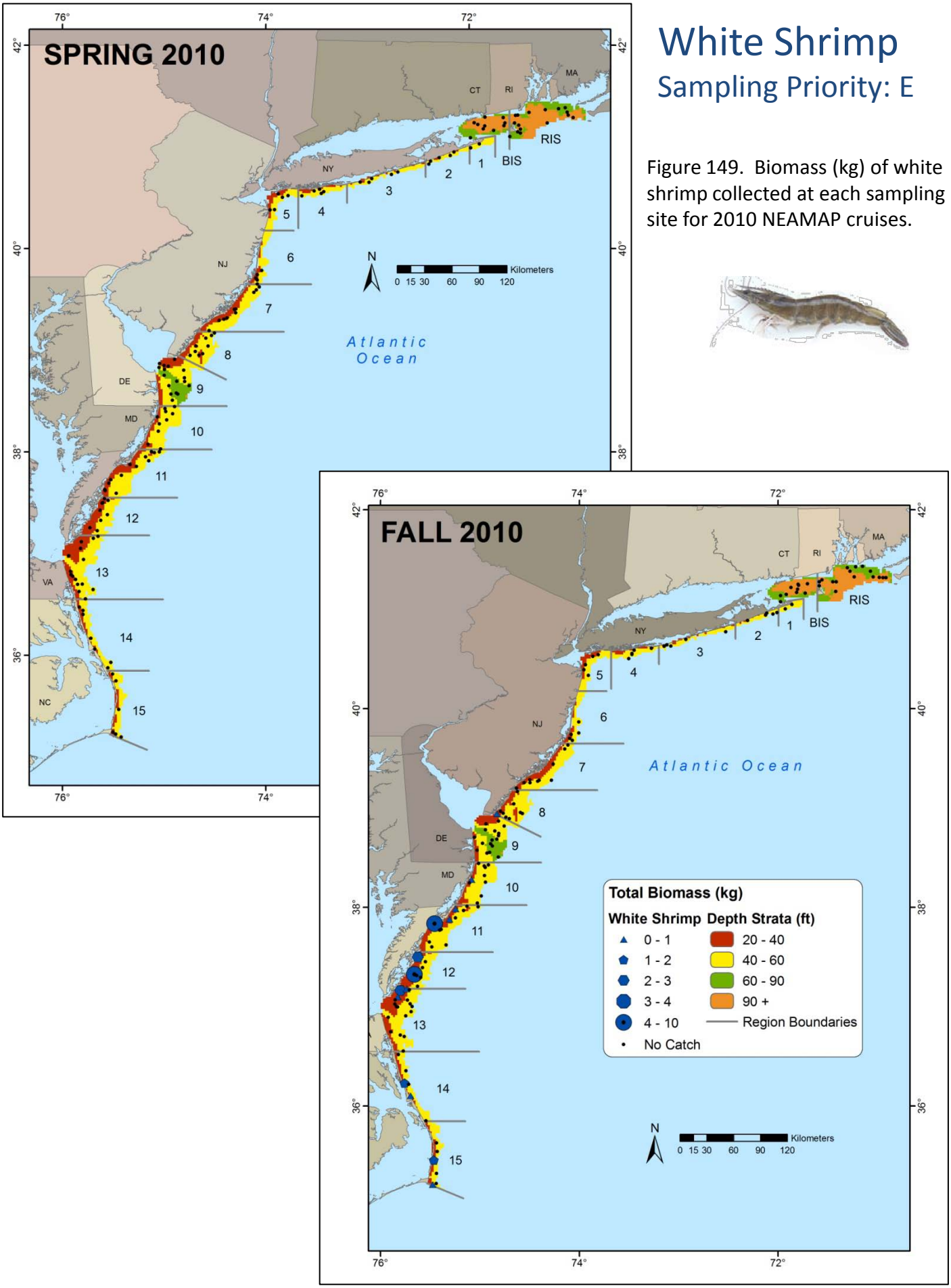


Figure 149. Biomass (kg) of white shrimp collected at each sampling site for 2010 NEAMAP cruises.

Table 84. Sampling rates of white shrimp for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught	Number Measured	Age Specimens	Ages Read	Stomach Specimens	Stomachs Analyzed
Spring	2008	0	0.0					
	2009	23	0.7	23	0		0	
	2010	0	0.0					
Fall	2007	48	1.8	20	0		0	
	2008	753	19.7	267	0		0	
	2009	451	6.6	451	0		0	
	2010	3312	87.2	521	0		0	

Table 85. 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		

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		

= used for abundance indices

= not used for abundance indices

Table 86. Preliminary abundance indices for white shrimp.

		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	13	0.00		13	0.00		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	15	0.24	62.4	15	0.03	90.0	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	13	0.00		13	0.00		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	56	0.17	30.6	56	0.02	45.5	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	51	0.72	25.9	51	0.16	36.7	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	53	0.72	21.0	53	0.07	33.3	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
	2010	51	0.93	20.3	51	0.28	31.4	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

Figure 150. Preliminary indices of overall abundance, in terms of number and biomass, of white shrimp for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

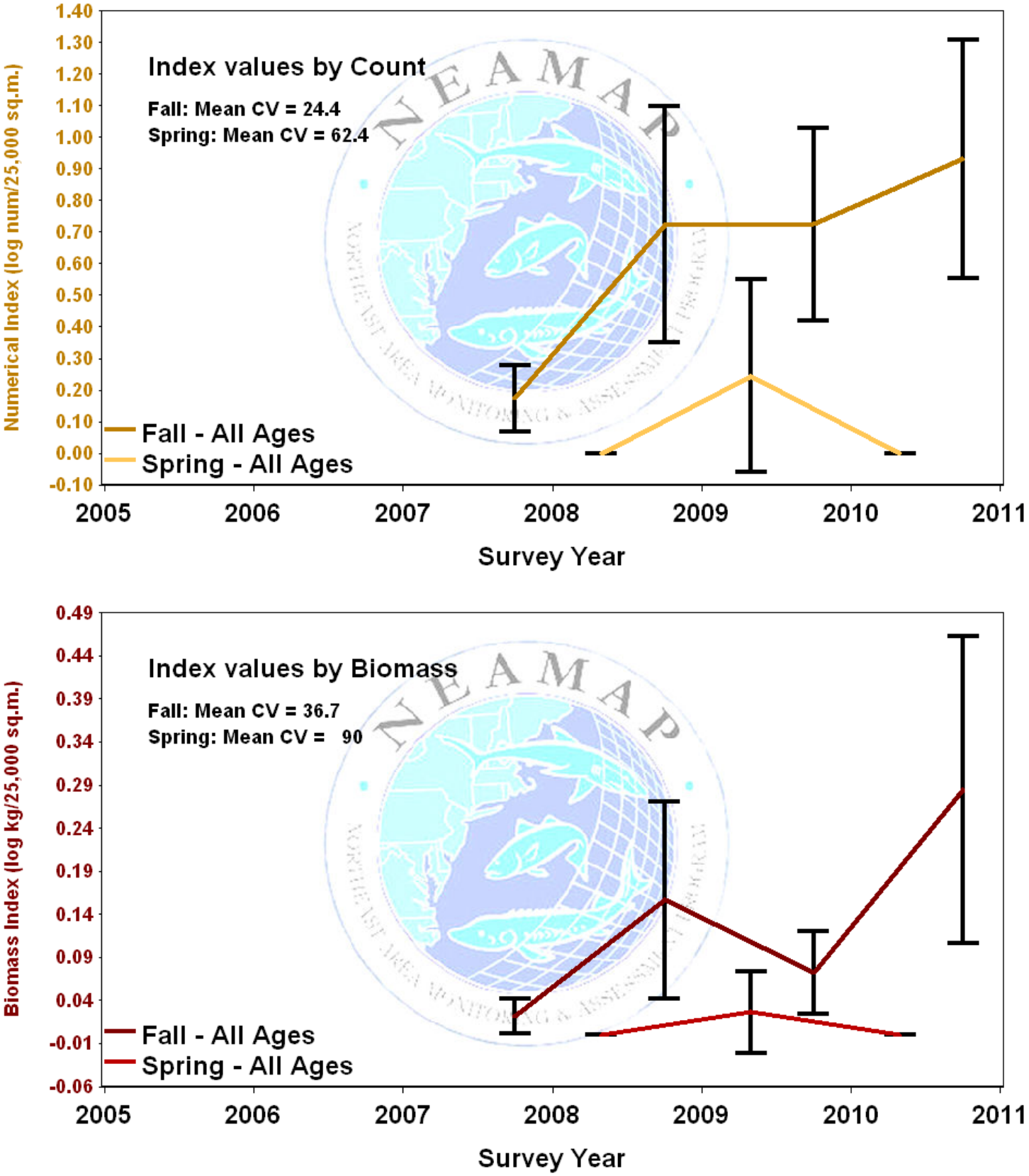
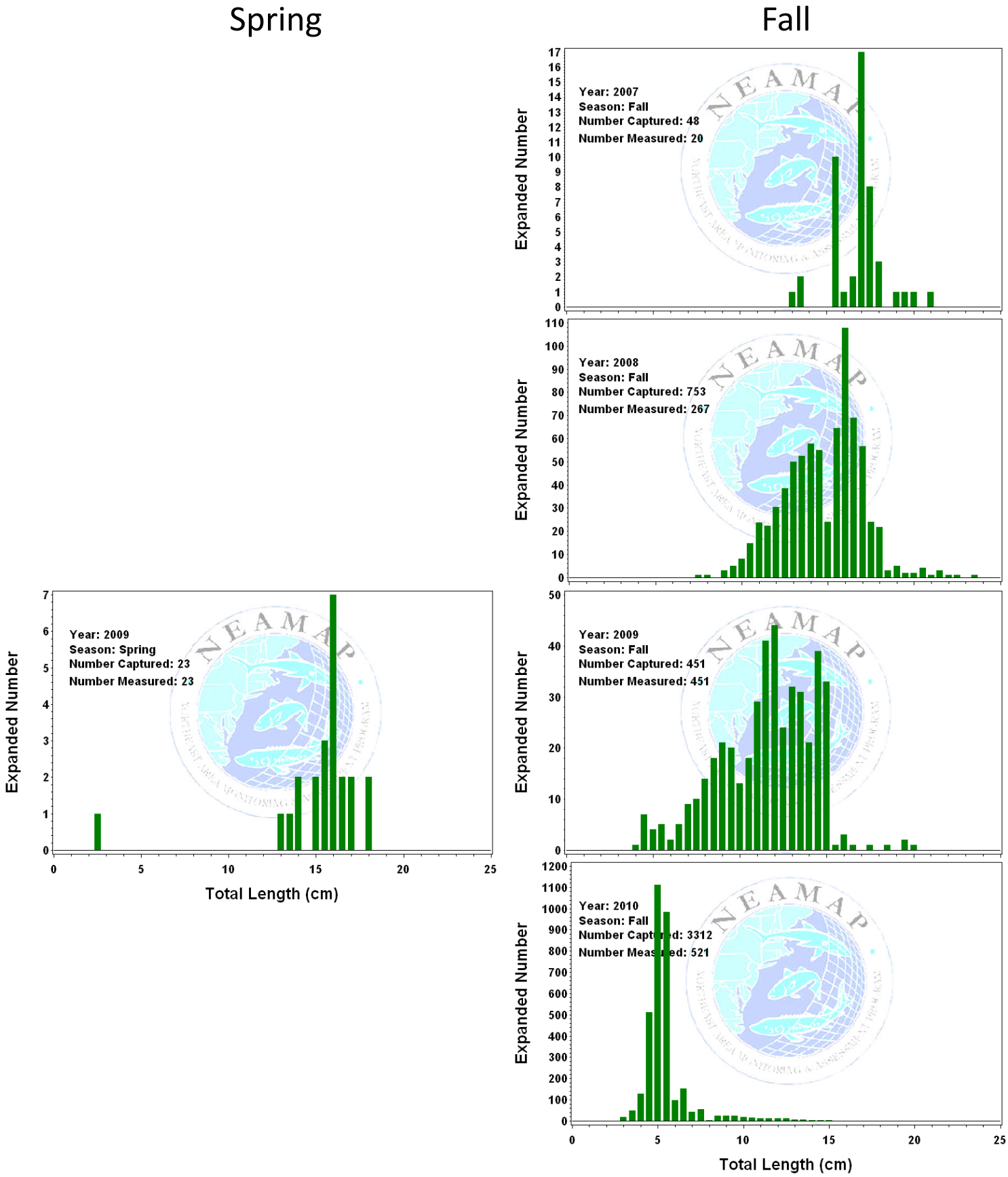


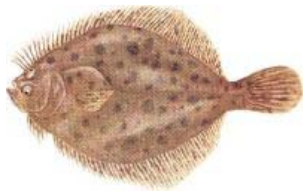
Figure 151. Length-frequency distributions, by cruise, for white shrimp (This species was absent from collections during the Spring 2008 and 2010 surveys.).

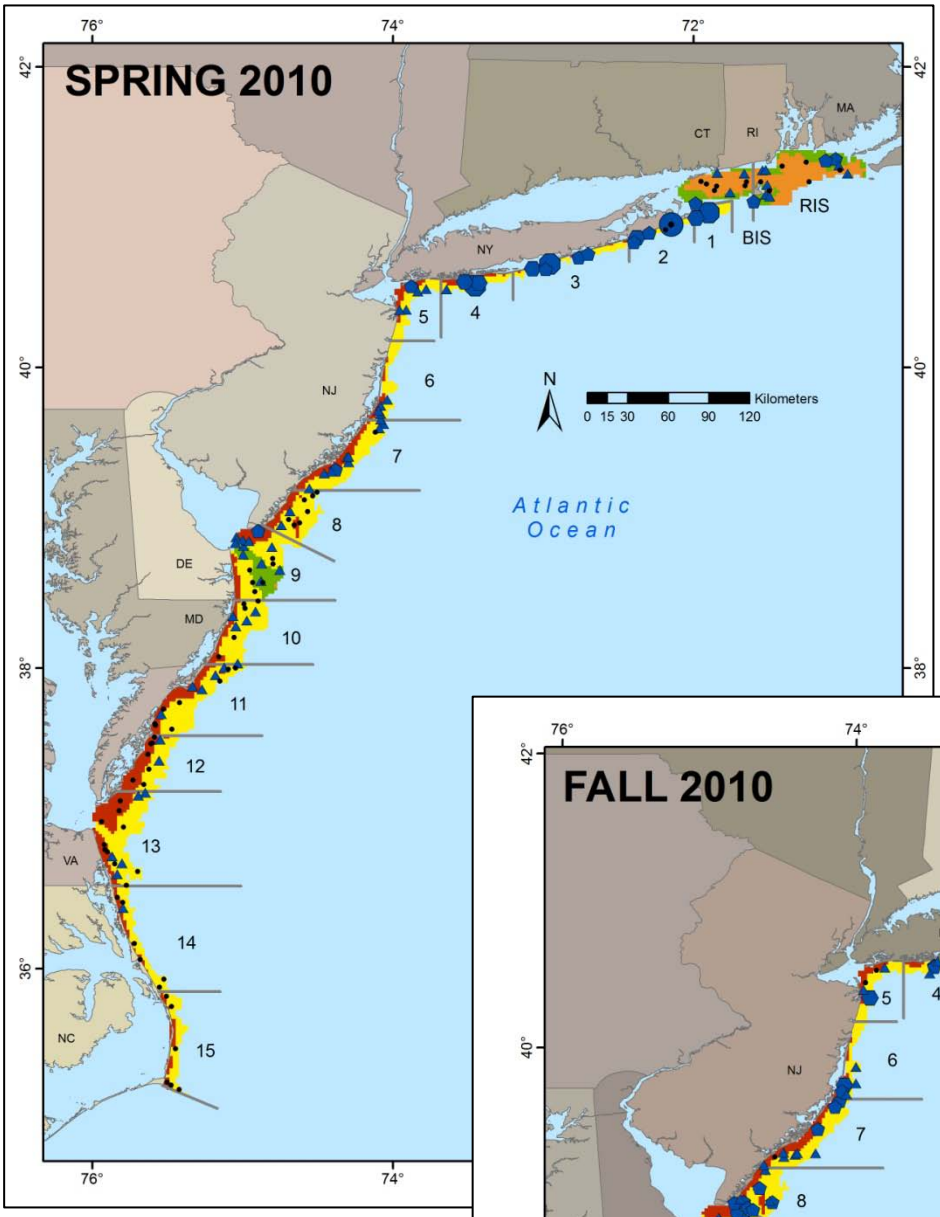


Windowpane Flounder

Sampling Priority: E

Figure 152. Biomass (kg) of windowpane flounder collected at each sampling site for 2010 NEAMAP cruises.





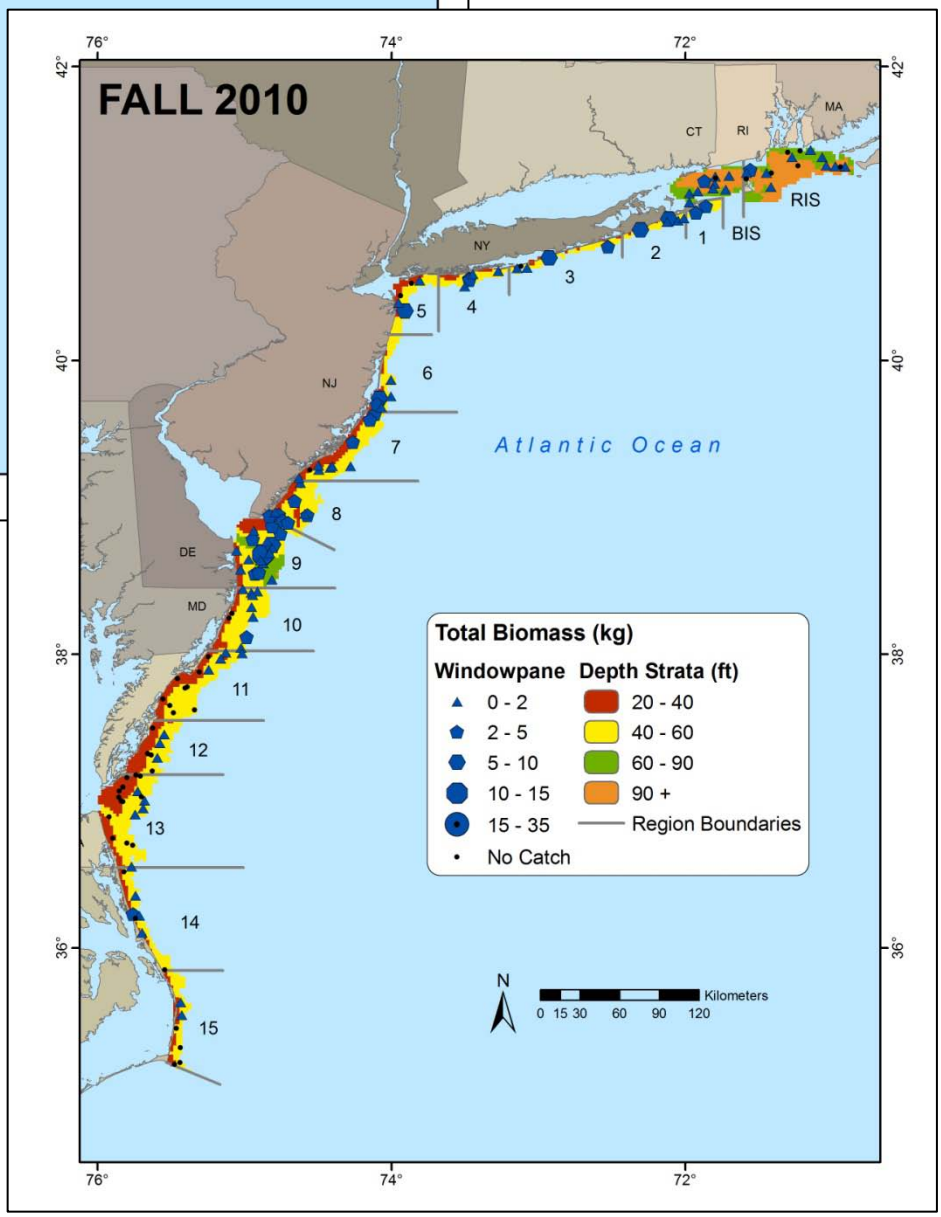


Table 87. Sampling rates of windowpane flounder for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught	Number Measured	Age Specimens	Ages Read	Stomach Specimens	Stomachs Analyzed
Spring	2008	756	191.0	697	0		0	
	2009	1067	268.2	868	0		0	
	2010	1065	237.1	847	0		0	
Fall	2007	744	114.0	694	0		0	
	2008	475	79.4	410	0		0	
	2009	1155	211.2	1155	0		0	
	2010	1208	172.9	1033	0		0	

Table 88. Strata used for calculation of abundance indices for windowpane 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		

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		

= used for abundance indices

= not used for abundance indices

Table 89. Preliminary abundance indices for windowpane flounder.

		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	85	1.58	6.0	85	0.78	7.2	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	96	1.44	5.5	96	0.70	7.2	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	89	1.37	7.4	89	0.63	7.6	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	94	1.64	5.8	94	0.59	7.8	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	99	1.01	8.3	99	0.35	11.5	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	107	1.76	5.9	107	0.75	7.9	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	99	1.87	5.8	99	0.73	7.6	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 153. Preliminary indices of overall abundance, in terms of number and biomass, of windowpane flounder for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

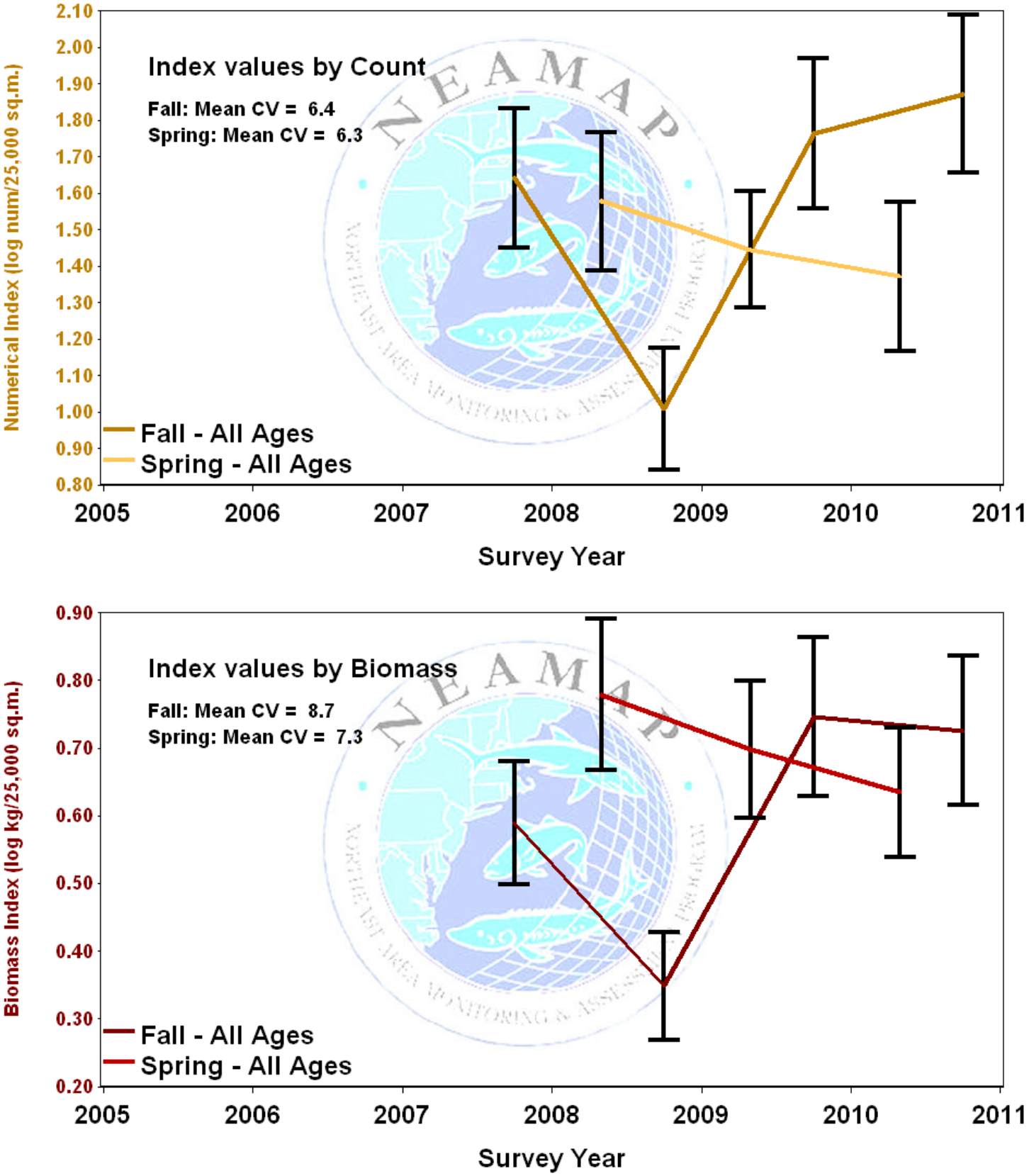
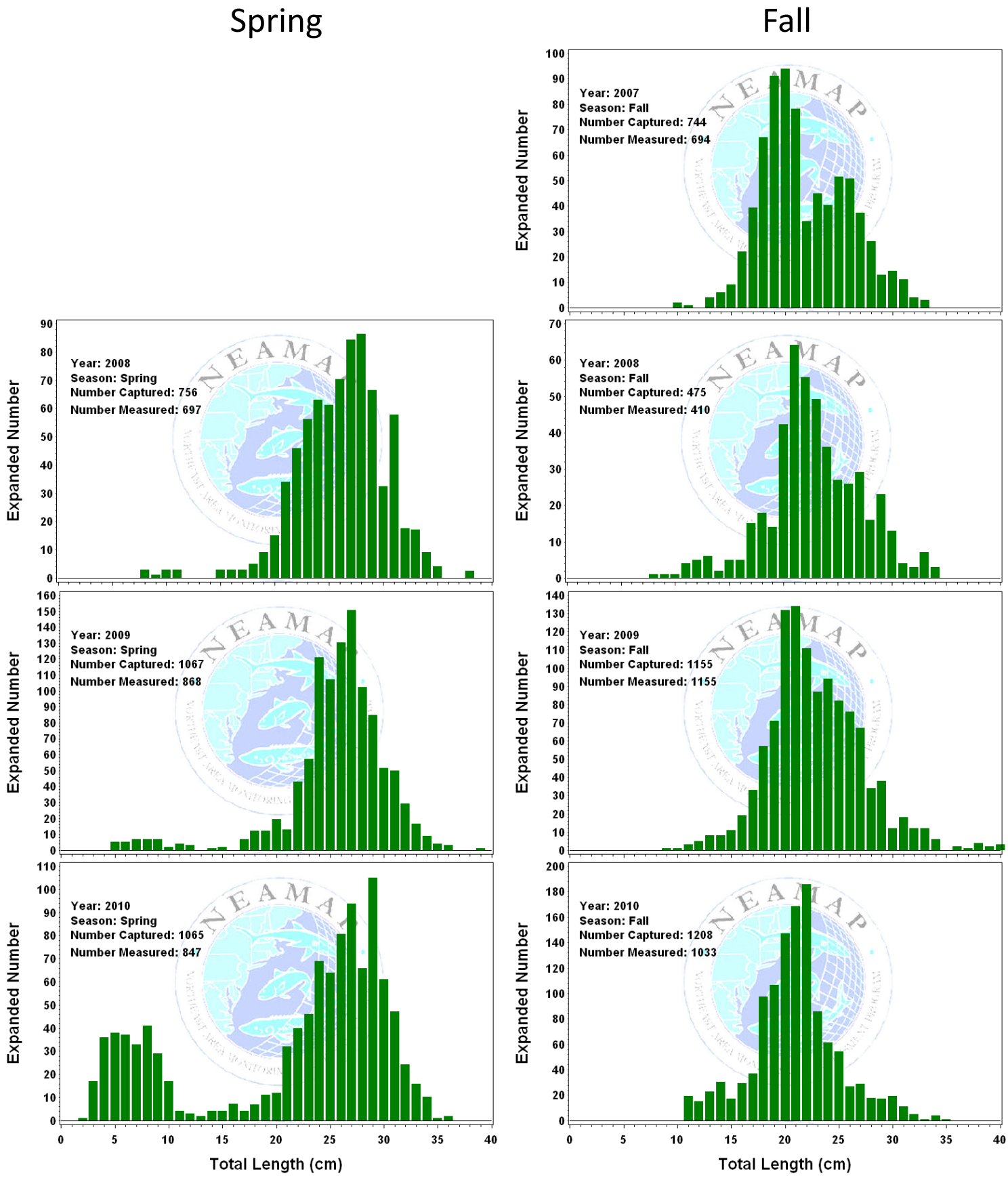


Figure 154. Length-frequency distributions, by cruise, for windowpane flounder.



Winter Flounder

Sampling Priority: A

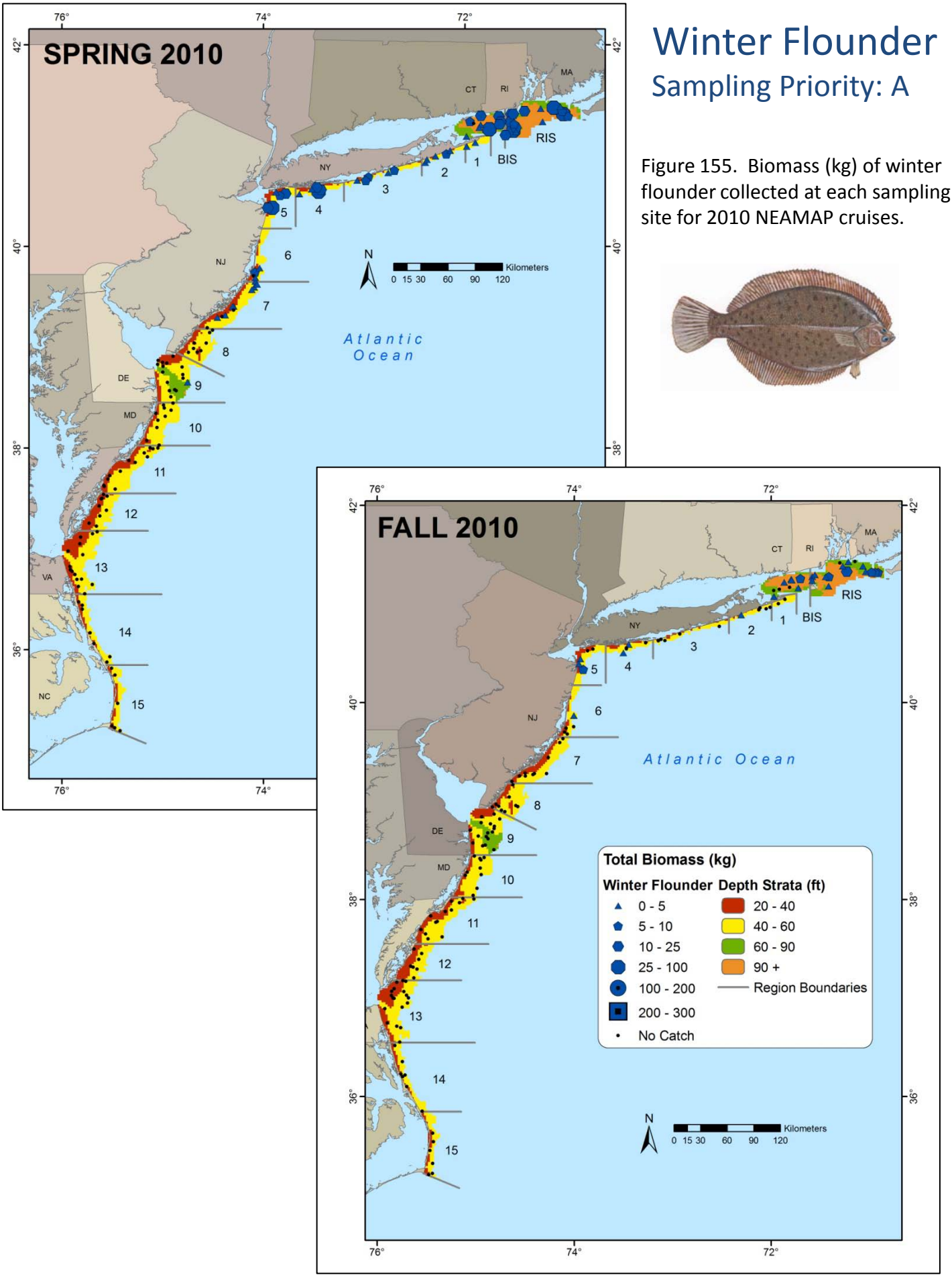


Figure 155. Biomass (kg) of winter flounder collected at each sampling site for 2010 NEAMAP cruises.

Table 90. Sampling rates and preserved specimen analysis status of winter flounder for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught	Number Measured	Age Specimens	Ages Read	Stomach Specimens	Stomachs Analyzed
Spring	2008	1863	554.1	1525	466	466	450	443
	2009	1954	628.2	1746	543	0	526	512
	2010	1498	574.7	1498	548	0	494	442
Fall	2007	392	99.1	392	119	119	116	114
	2008	670	142.0	522	137	137	133	131
	2009	558	127.4	558	214	0	177	176
	2010	264	72.3	264	150	0	106	

Table 91. Strata used for calculation of abundance indices for winter 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		

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		

= used for abundance indices

= not used for abundance indices

Table 92. Preliminary abundance indices for winter flounder.

		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	64	2.54	5.6	64	1.63	7.4	1	64	1.57	7.5	64	0.42	13.9	>1	64	2.18	6.8	64	1.56	7.6
	2009	69	2.60	4.8	69	1.78	5.9		69	1.22	10.3	69	0.38	16.9		69	2.42	4.9	69	1.73	6.1
	2010	63	2.61	4.9	63	1.80	6.3		63	1.21	8.8	63	0.29	12.9		63	2.41	5.3	63	1.76	6.4
Fall	2007	26	1.65	15.8	26	0.97	18.0	1	26	1.19	18.4	26	0.52	22.3	>1	26	1.11	17.8	26	0.73	20.5
	2008	26	2.32	11.1	26	1.27	14.1		26	1.86	11.9	26	0.86	15.3		26	1.21	15.6	26	0.71	21.1
	2009	26	2.38	10.1	26	1.23	14.9		26	1.84	12.0	26	0.82	17.8		26	1.25	15.8	26	0.73	20.0
	2010	26	1.71	13.3	26	0.92	16.4		26	1.11	18.3	26	0.45	20.5		26	1.08	16.7	26	0.69	19.0

Figure 156. Preliminary indices of overall abundance, in terms of number and biomass, of winter flounder for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

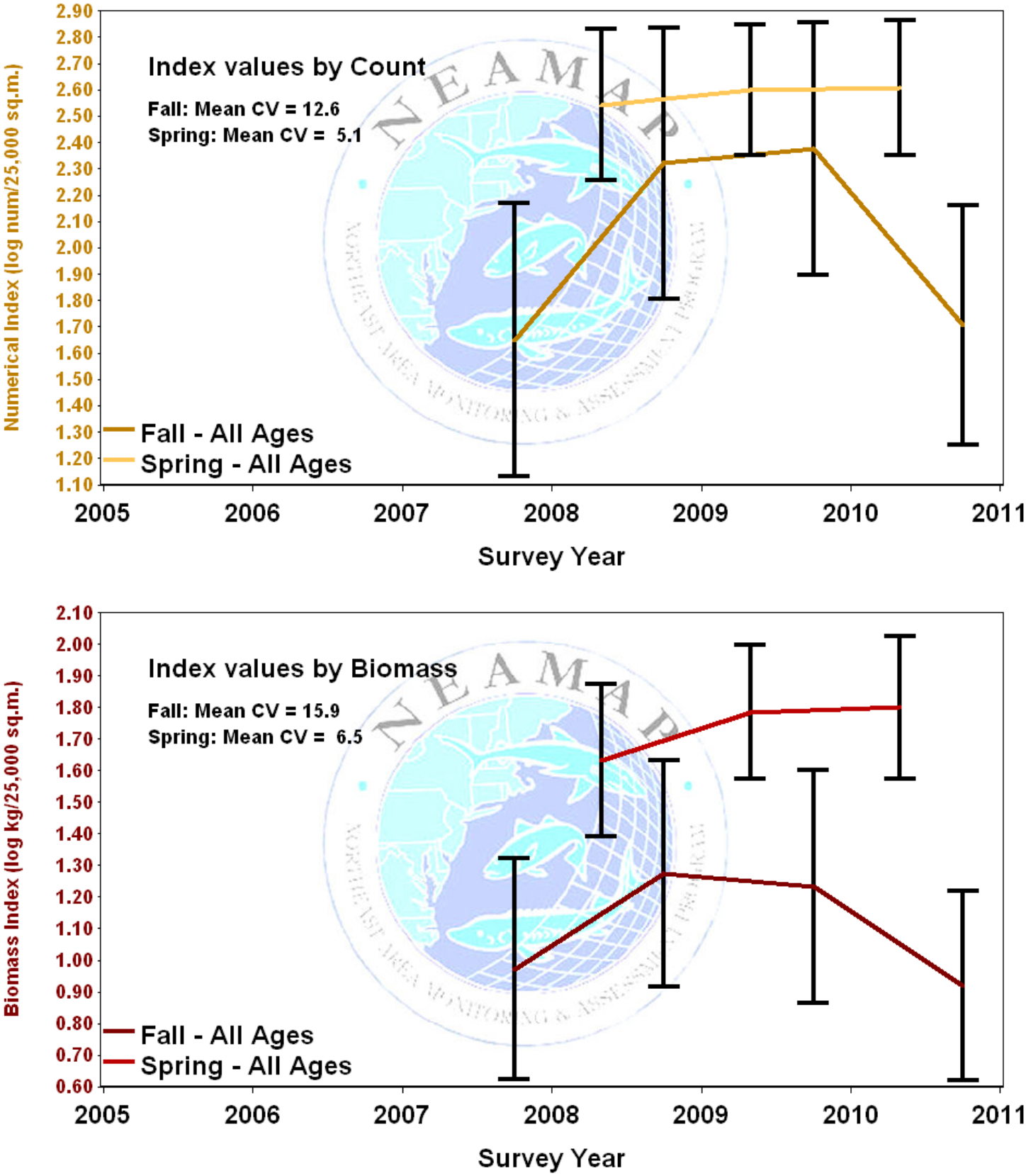


Figure 157. Preliminary indices of abundance, of winter flounder for spring and fall NEAMAP surveys. Indices are for the youngest age class observed during each survey (count-based indices only) and for all other age classes combined (based both on count and biomass). 95% confidence intervals are provided for each abundance estimate.

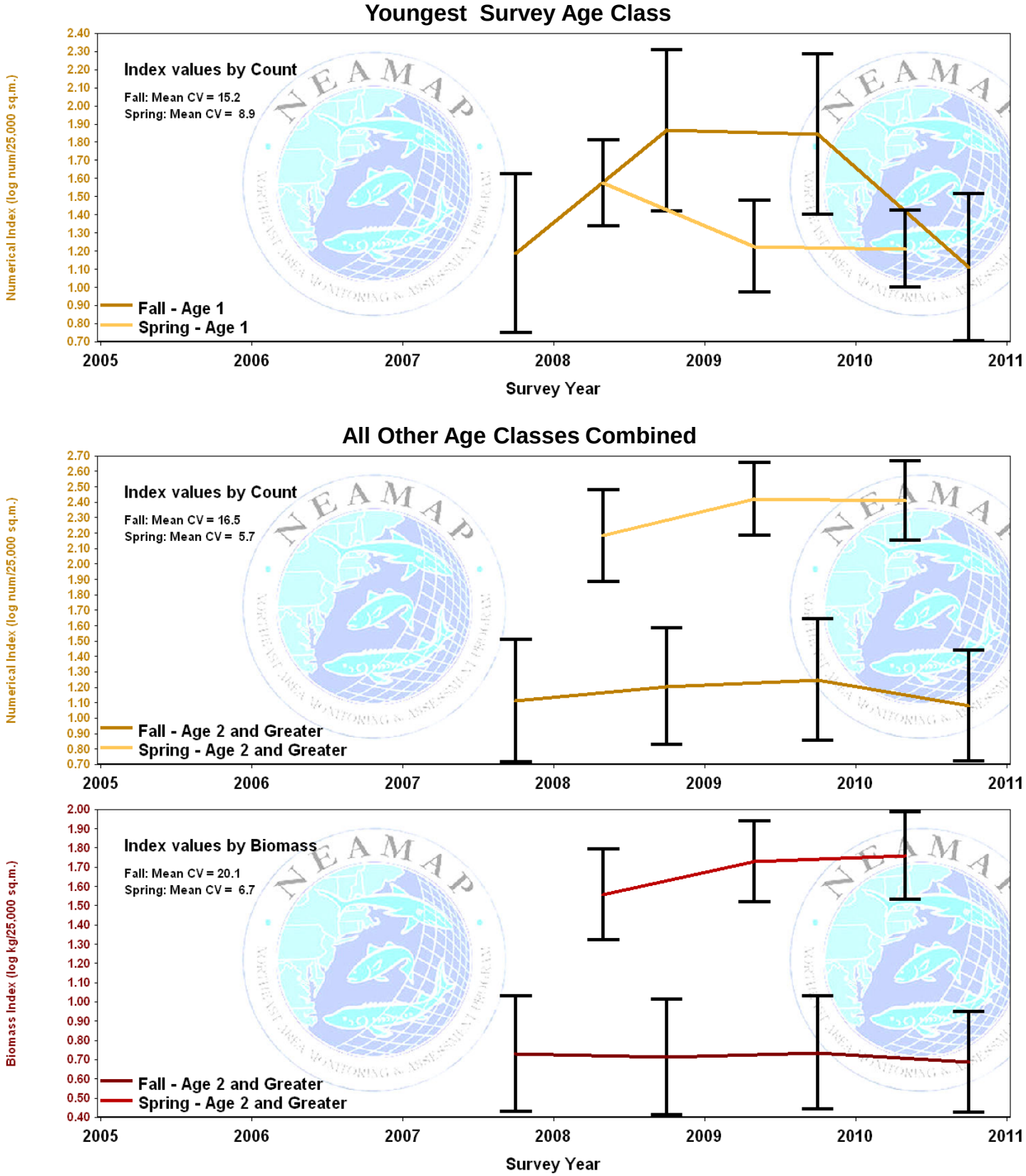


Figure 158. Length-frequency distributions, by cruise, for winter flounder.

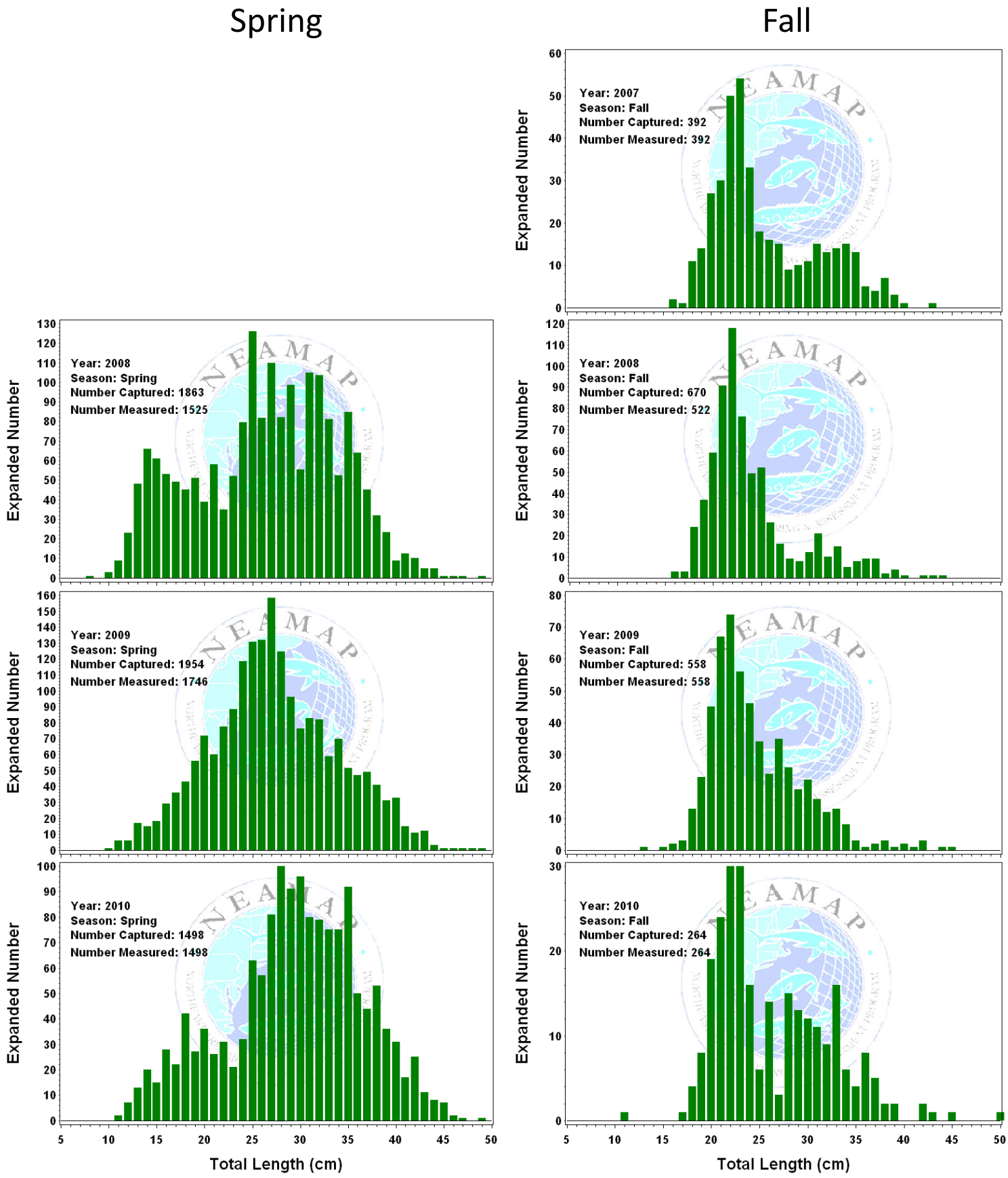


Figure 159. Age-frequency distribution, by cruise, for winter flounder. Ages are given on the x-axis, while corresponding year-classes are in parenthesis. The number collected at a given age is provided above each corresponding bar.

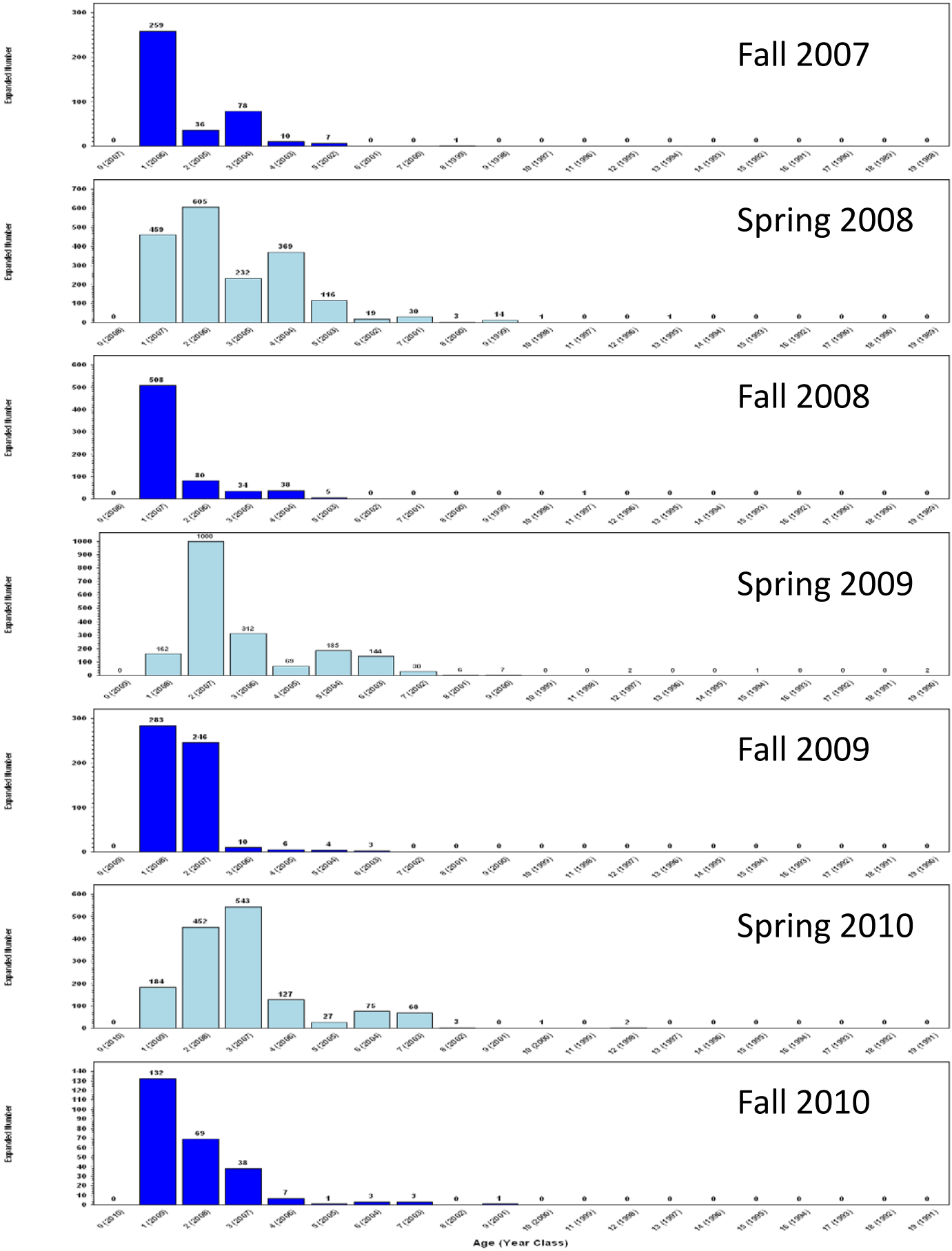


Figure 160. Sex-specific length-frequency distribution, by season, all cruises pooled, for winter flounder.

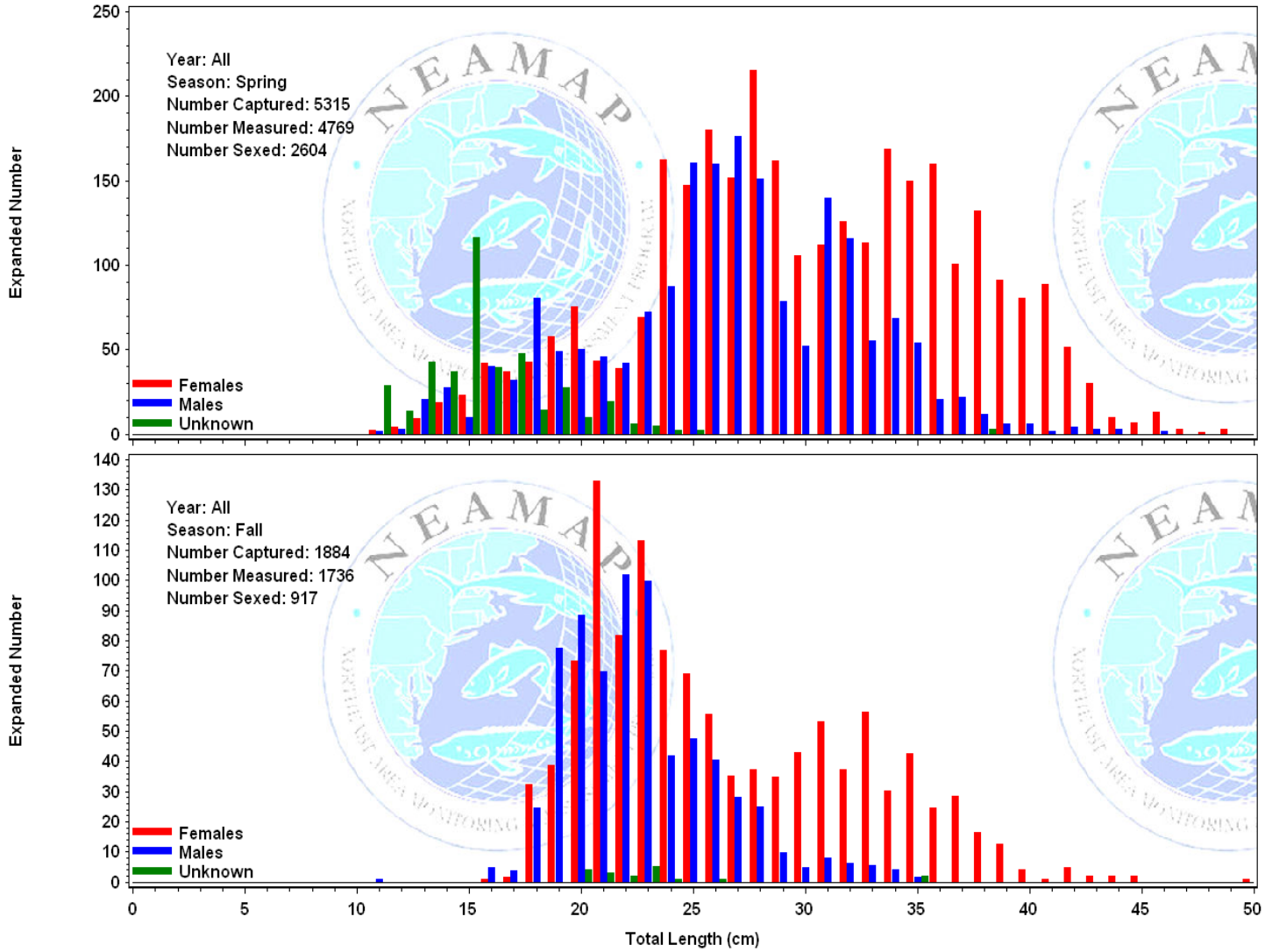


Figure 161. Sex ratio, by length group, for winter flounder collected all NEAMAP cruises 2007-2010 (The percentages for each category are given in their respective bars. The number sampled for sex determination is provided above each bar, and the length categories expressed in inches are given near the x-axis.).

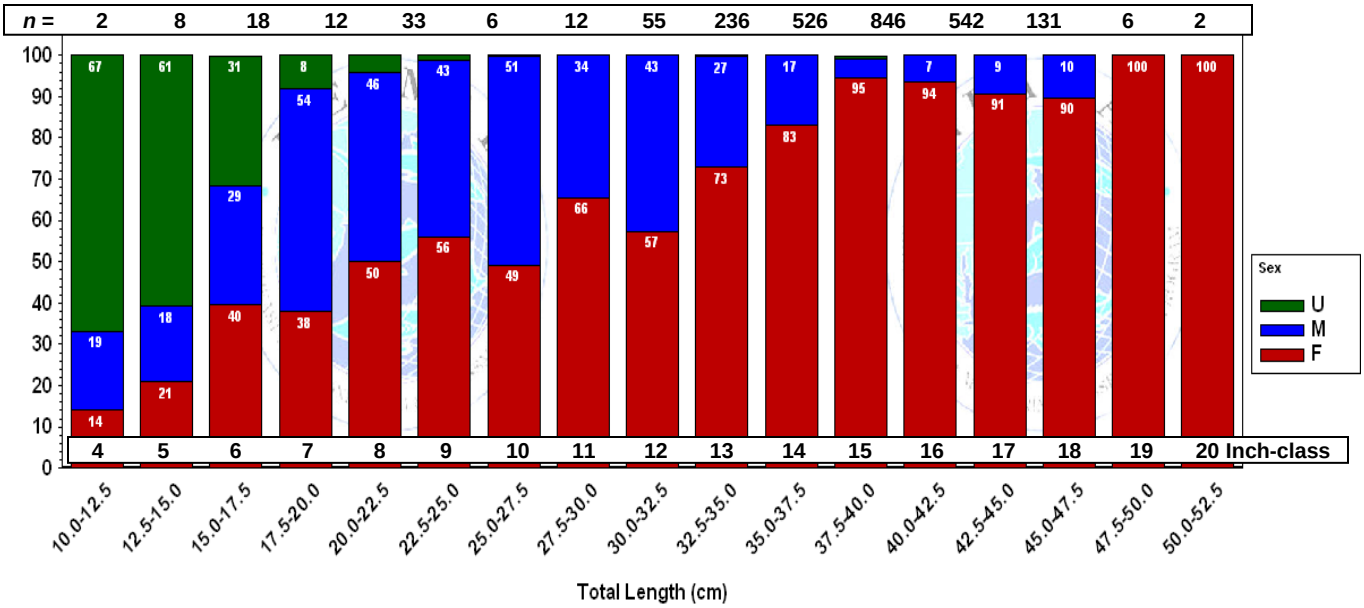
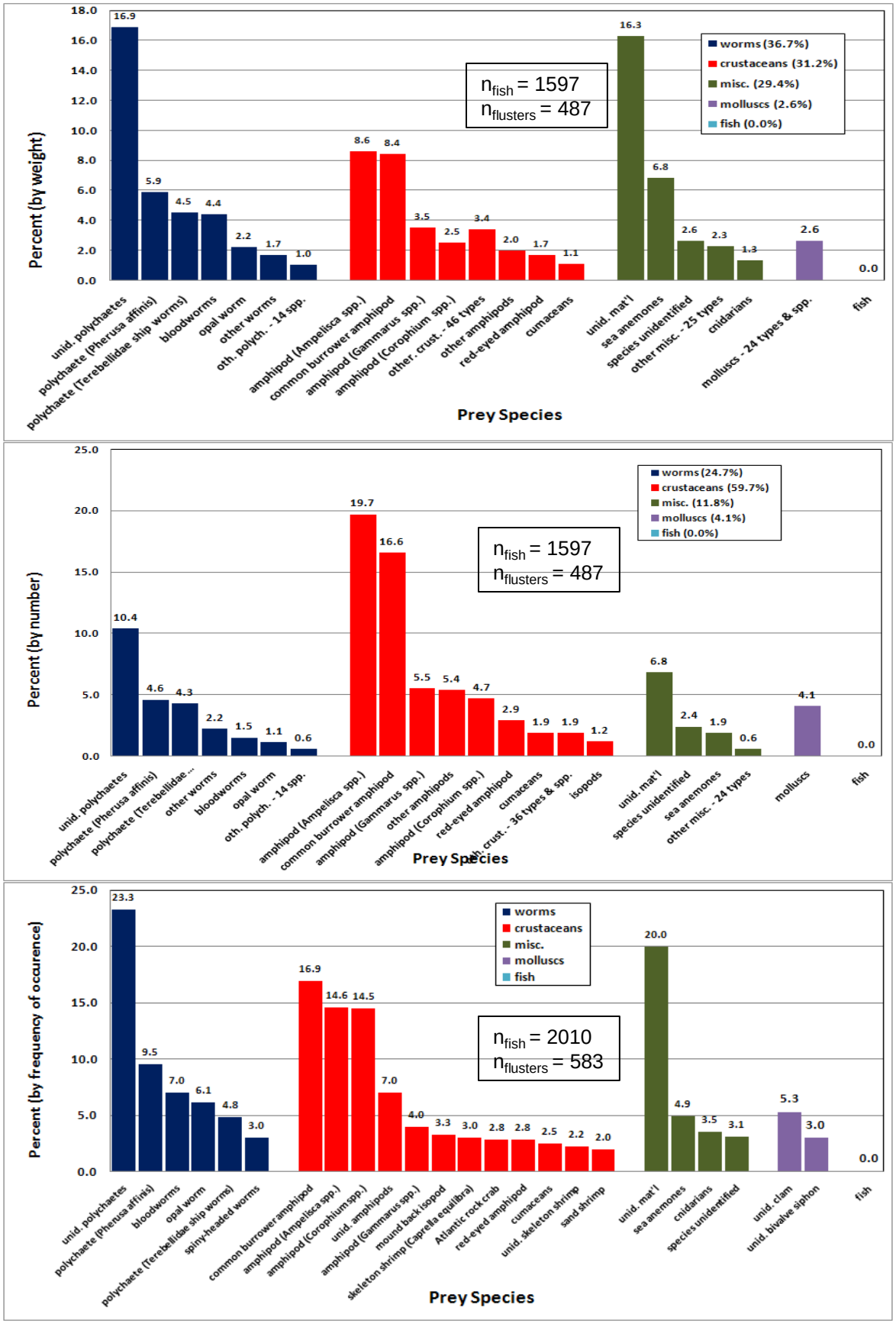


Figure 162. Diet composition, expressed as percent by weight, by number, and by frequency of occurrence* of winter flounder collected during NEAMAP cruises in 2007-2009 (The number of fish sampled for diet is given by n_{fish}, while $n_{clusters}$ indicates the number of clusters of winter flounder sampled.).



* As prey types cannot be additively combined under frequency of occurrence analysis, only those prey types with at least a 2% value are shown here: 124 other prey types were observed in stomachs for this species. Similarly, sums for broad taxonomic groups are not calculated.

Winter Skate

Sampling Priority: A

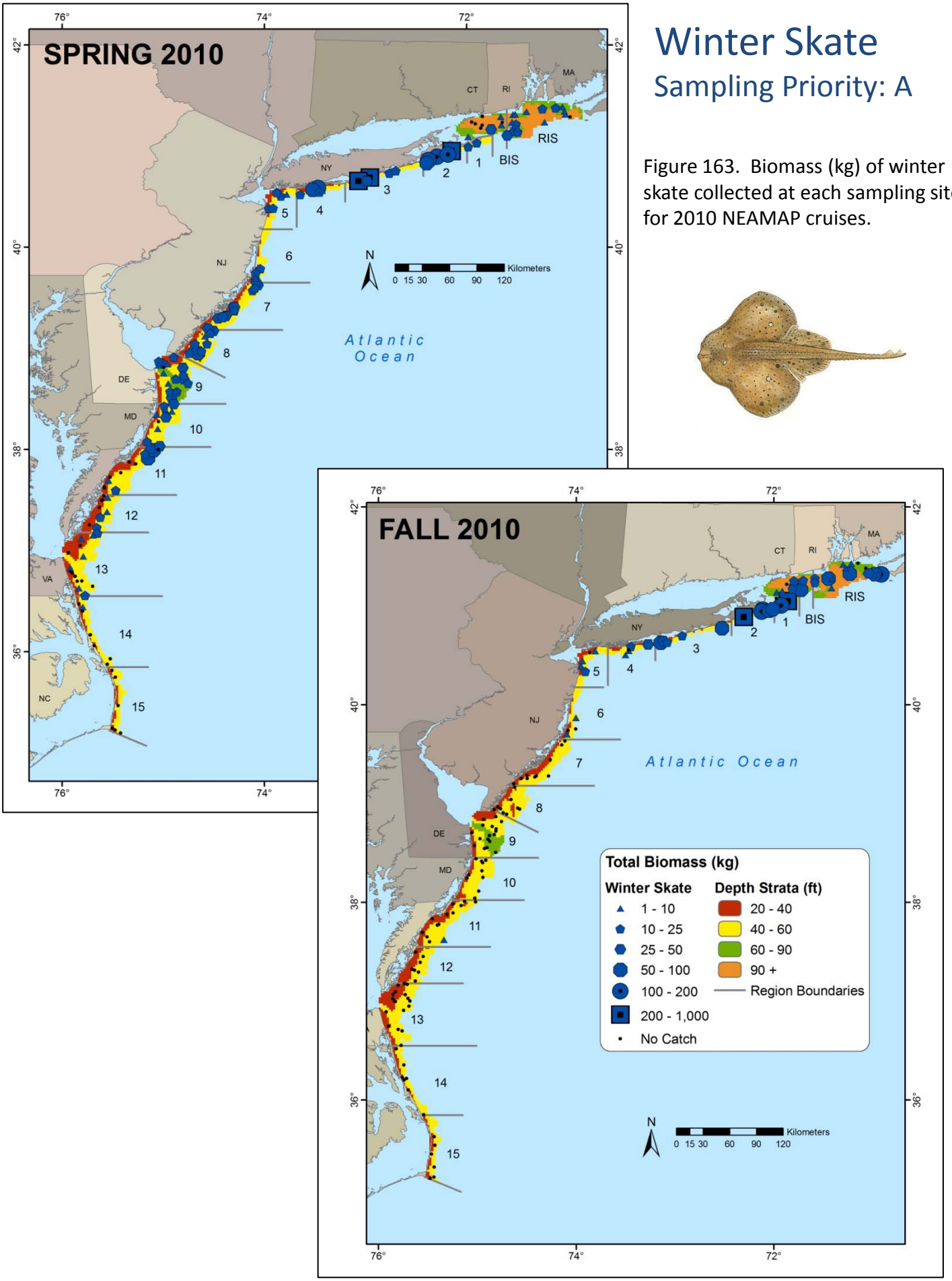


Figure 163. Biomass (kg) of winter skate collected at each sampling site for 2010 NEAMAP cruises.

Table 93. Sampling rates and preserved specimen analysis status of winter skate for each NEAMAP cruise.

Season	Year	Number Caught	Biomass Caught	Number Measured	Age Specimens	Ages Read	Stomach Specimens	Stomachs Analyzed
Spring	2008	1716	3174.2	1217	320	0	302	300
	2009	3595	6843.0	1778	374	0	345	334
	2010	1547	3985.6	851	287	0	274	260
Fall	2007	951	925.3	735	171	0	160	159
	2008	619	921.0	399	120	0	115	114
	2009	1787	4040.3	623	123	0	108	108
	2010	1178	2169.6	807	122	0	103	3

Table 94. Strata used for calculation of abundance indices for winter skate.

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		

= used for abundance indices

= not used for abundance indices

Table 95. Preliminary abundance indices for winter skate.

		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	73	2.41	4.0	73	2.67	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
	2009	79	2.48	4.0	79	2.90	4.2	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	72	1.91	5.0	72	2.59	4.1	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
Fall	2007	29	2.69	7.8	29	2.72	6.6	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	28	2.41	6.8	28	2.66	5.5	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	31	2.23	7.5	31	2.67	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
	2010	28	2.65	10.1	28	2.86	10.1	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 164. Preliminary indices of overall abundance, in terms of number and biomass, of winter skate for spring and fall NEAMAP surveys. 95% confidence intervals are provided for each abundance estimate.

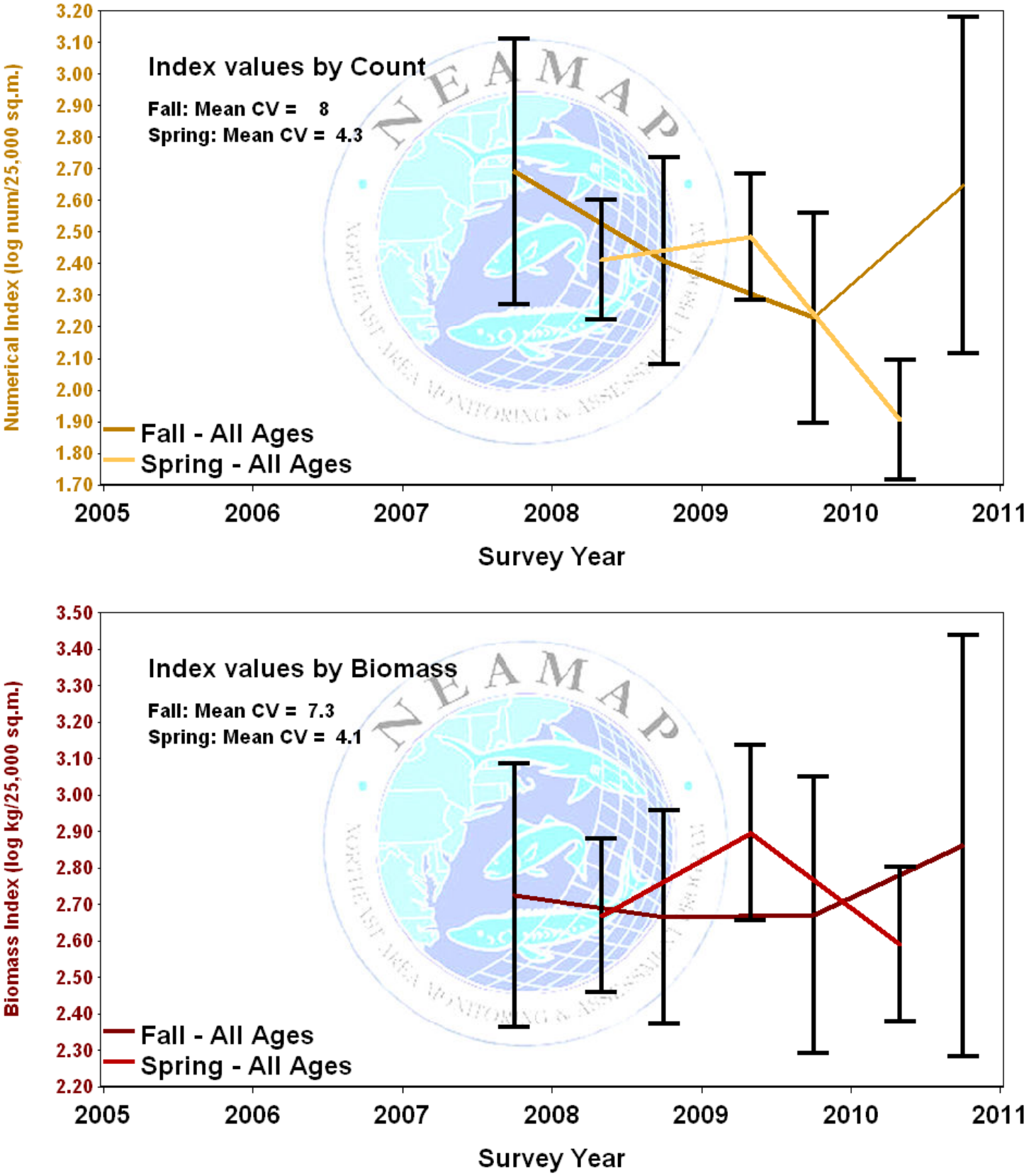


Figure 165. Length-frequency distributions, by cruise, for winter skate.

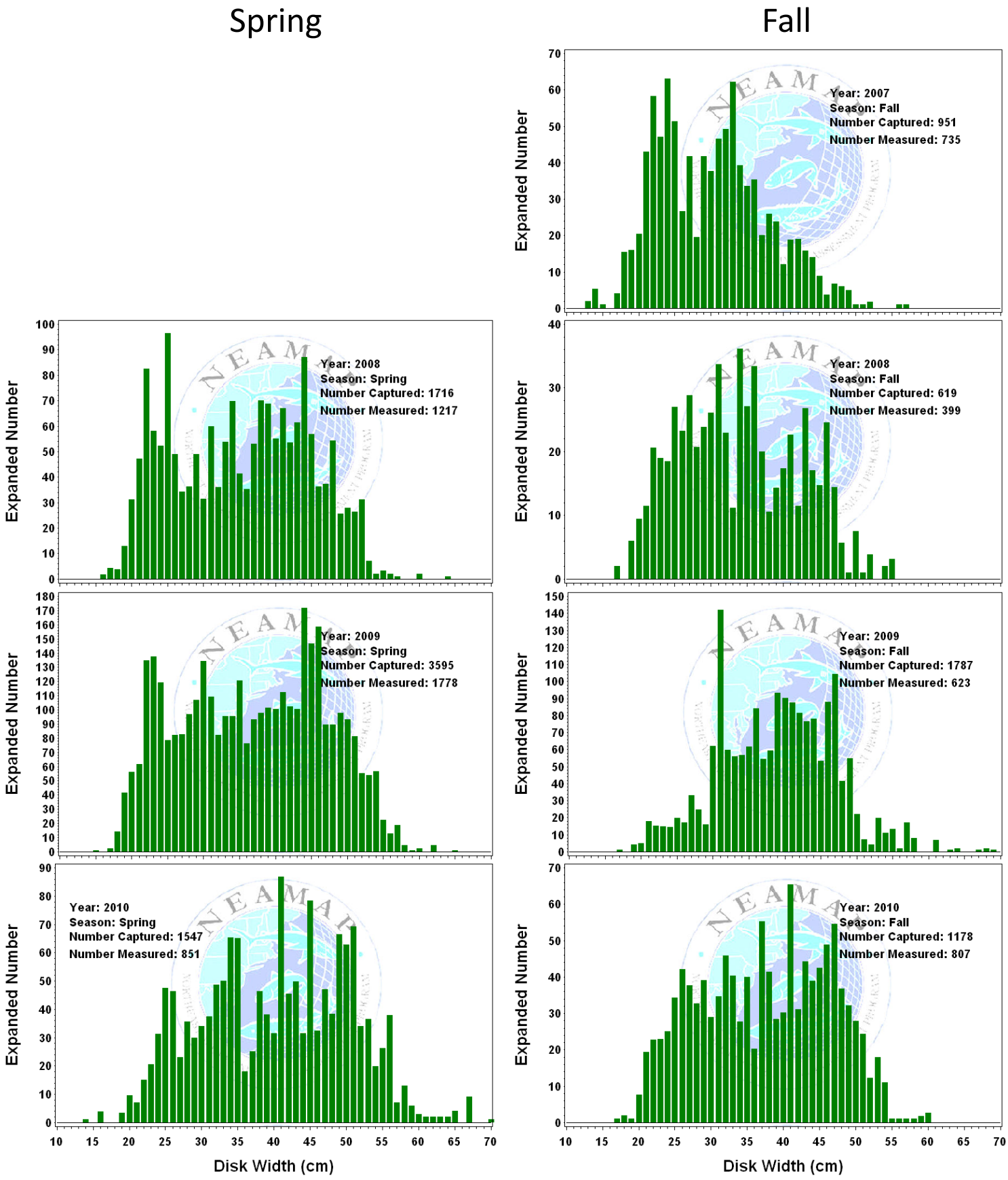


Figure 166. Sex-specific length-frequency distribution, by season, all cruises pooled, for winter skate.

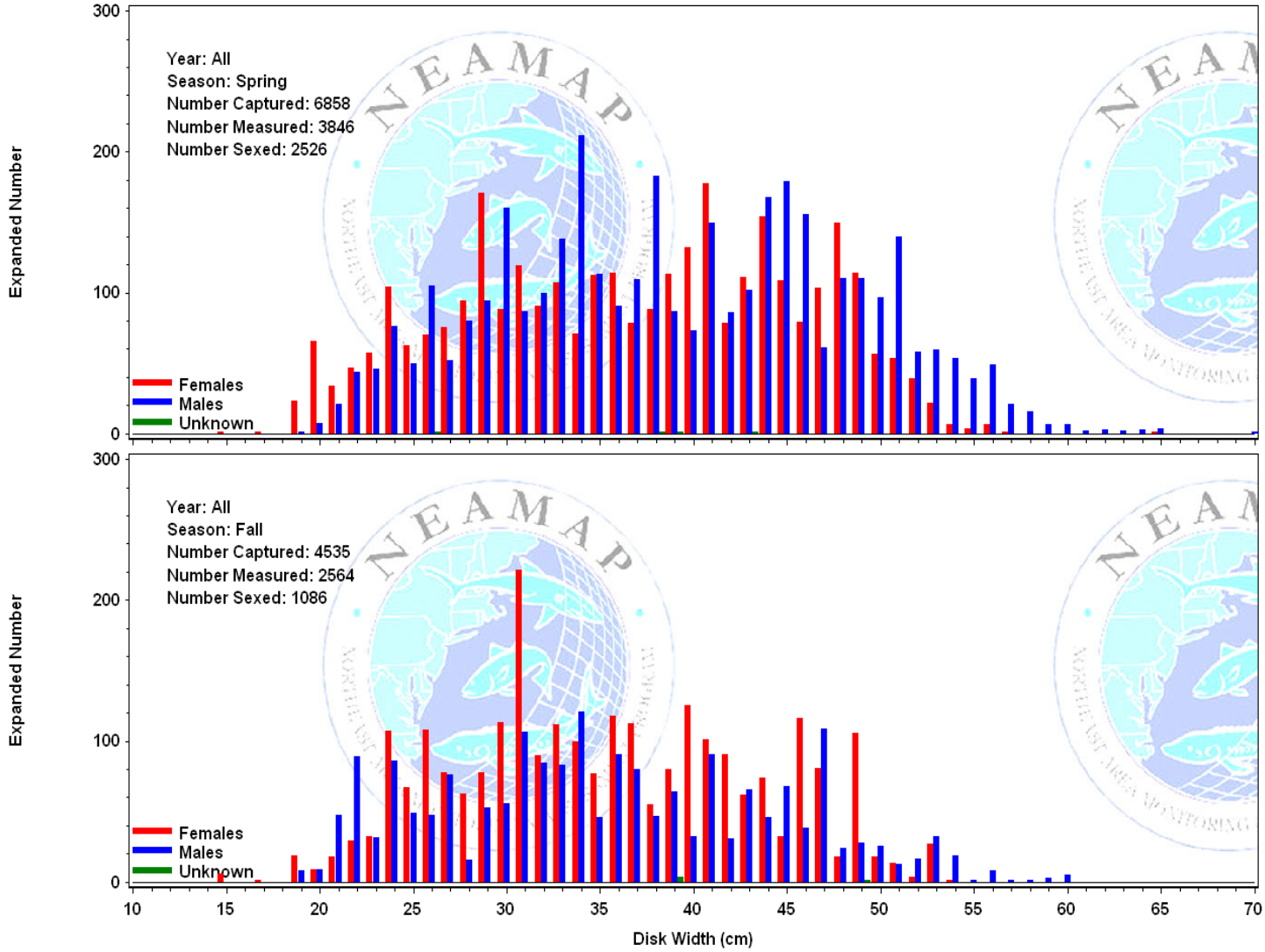


Figure 167. Sex ratio, by length group, for winter skate collected all NEAMAP cruises 2007-2010 (The percentages for each category are given in their respective bars. The number sampled for sex determination is provided above each bar, and the length categories expressed in inches are given near the x-axis.).

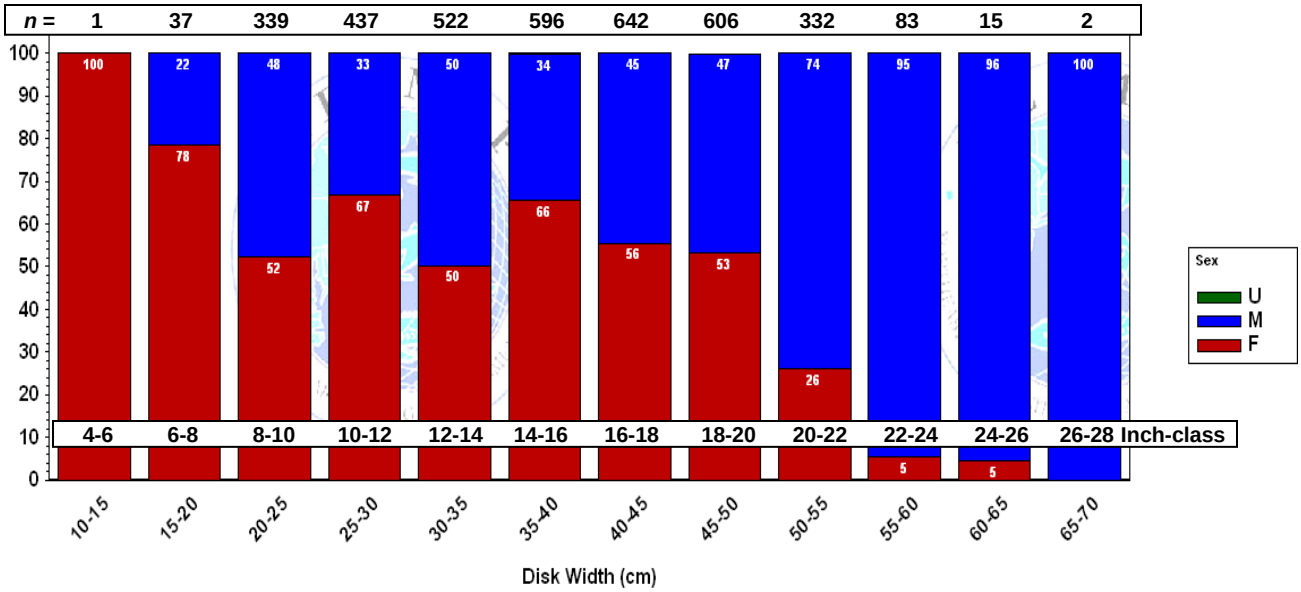
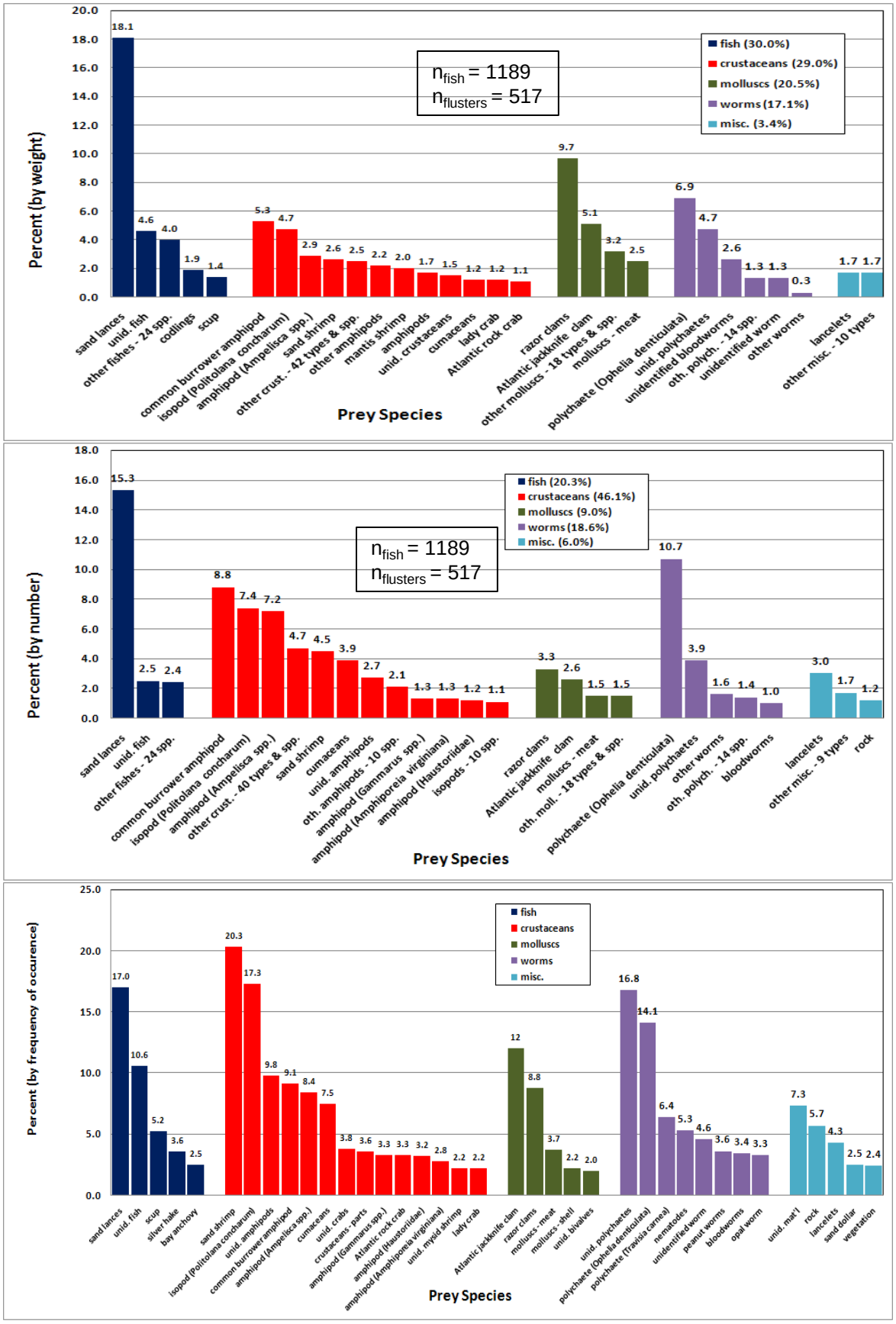


Figure 168. Diet composition, expressed as percent by weight, by number, and by frequency of occurrence* of winter skate collected during NEAMAP cruises in 2007-2009 (The number of fish sampled for diet is given by n_{fish}, while $n_{clusters}$ indicates the number of clusters of winter skate sampled.).



* As prey types cannot be additively combined under frequency of occurrence analysis, only those prey types with at least a 2% value are shown here: 117 other prey types were observed in stomachs for this species. Similarly, sums for broad taxonomic groups are not calculated.