Spanish mackerel preliminary data summary: SEAMAP-SA Coastal Survey

Boylan and Webster

SEDAR28-DW21

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Spanish Mackerel
Preliminary Data Summary
SEAMAP-SA Coastal Survey

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SEDAR28

Abstract:

The Spanish mackerel is a priority species for SEAMAP-South Atlantic Coastal Survey trawl survey. Data are available from 1990-2010. Samples were taken from two depth-zones, inner and outer. Due to the difference in seasonal sampling frequency and the discontinuation of outer sampling, data from outer (deeper) strata were excluded from the dataset. From 1990-2010, only centimeter lengths were taken on individual specimens. As individual weights were not taken for Spanish mackerel, length/weight relationships are not available. In 2011, the Spanish mackerel was added to a group of species receiving more detailed life history processing, including millimeter lengths, individual weights, sex, age, and maturity for a subset of specimens. Although, the 2011 data will not be used in the index, it may be useful as an indication of ages present in Coastal Survey catches by season.

Introduction:

The Southeast Area Monitoring and Assessment Program - South Atlantic (SEAMAP-SA) Coastal Survey provides long-term, fishery-independent data on seasonal abundance and biomass of all finfish, elasmobranchs, decapod and stomatopod crustaceans, sea turtles, horseshoe crabs, and cephalopods that are accessible by high-rise trawls in coastal nearshore waters. Samples are taken by trawl from the coastal zone of the South Atlantic Bight between Cape Hatteras, North Carolina, and Cape Canaveral, Florida. Multi-legged cruises are conducted in spring (early April - mid-May), summer (mid-July - early August), and fall (October - mid-November).

Stations were randomly established within each of twenty-four strata along the coast. From 2001 to 2008, a total of 102 stations were randomly selected from a pool of stations within each of twenty-four strata and sampled each season (306 stations/year), representing an increase from 78 stations previously sampled in those strata by the trawl survey (1990-2000). In 2009, the number of stations sampled each season increased to 112 (336 total). Strata are delineated by the 4 m depth contour inshore and the 10 m depth contour offshore. In 1990-2000, stations were also sampled in deeper strata, with station depths ranging from 10 to 19 m, in order to gather data on the reproductive condition of commercial penaeid shrimp. Twenty-seven stations located within ten outer strata in the southern half of the SAB were sampled in spring; sixteen additional stations in the seven outer strata off North Carolina were sampled in fall. No stations in the outer strata were sampled in summer. Outer strata were abandoned in 2001 in order to intensify sampling in the more shallow depth-zone. Data from the outer strata are not included in this assessment due to differences in sampling frequency that make direct comparisons with inner strata difficult.

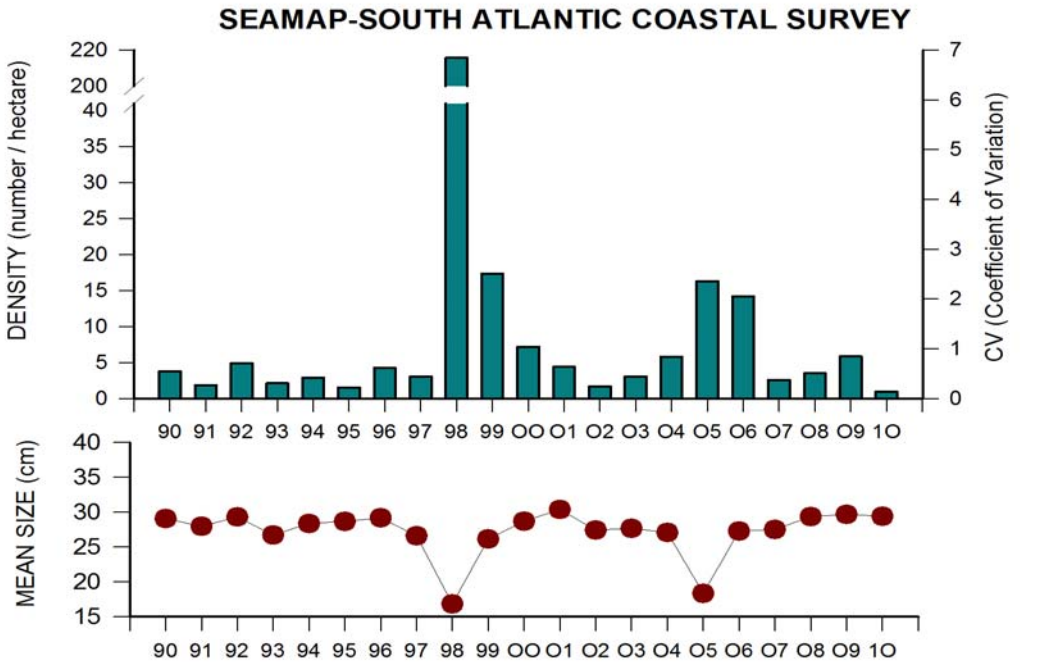
While the Spanish mackerel is a priority species in SEAMAP samples, core processing only records centimeter lengths from individual specimens and does not capture individual weights. Thus, length/weight relationships are not available from 1990-2010 data. In 2011, life history processing was initiated to acquire millimeter lengths, individual weights, gonads, otoliths, and stomachs for a length-based subset of Spanish mackerel. Age, sex, and maturity data are now available from these samples and diet data will become available as processing is completed.

Spanish mackerel summary:

A total of 29,709 (5.2 individuals/tow) Spanish mackerel were taken in shallow strata over all seasons in 1990-2010 Fork lengths ranged from 2 to 58 cm (mean=21.8 cm). Ages are not available for the 1990-2010 dataset. The recommendation from SEDAR 17 was to filter the overall dataset utilizing seasonal and length criteria to generate two indices based on presumed age classes present in seasonal plots. The 1990-2010 dataset was filtered in similar manner to create an Age 1 dataset from spring catches and an Age 0 dataset from summer and fall catches (specimens 10-22 cm). Density of abundance and mean length varied annually for Age 1 (Figure 1) and Age 0 (Figure 2). Indices for Age 1 and Age 0 are provided in Table 1. Figures 3 and 4 give an indication of the spatial distribution of those datasets.

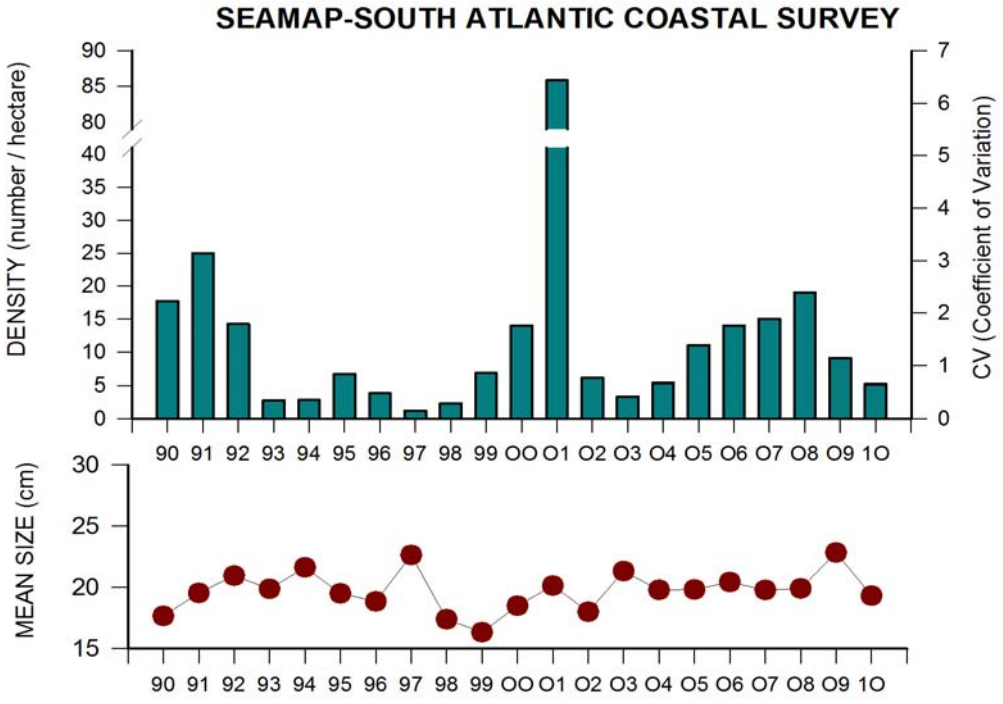
Though not included in the time period being considered in this assessment, data from a length-based subset of Spanish mackerel taken in 2011, which were aged, are available for reference. Number of samples and size range by sex and season are summarized in Table 2. The majority of the 2011 Spanish mackerel processed for life-history in spring catches were age 1; in summer, Age 0 individuals were most abundant; and in fall, all aged Spanish mackerel were age 0. This would appear to substantiate the general assumptions employed in SEDAR 17.

Figure 1.



Annual density and mean size of *Scomberomorus maculatus* taken in spring trawls.

Figure 2.



Annual density and mean size of presumed Age 0 *Scomberomorus maculatus*

Table 1.

Numerical values and number of tows associated with SEAMAP spring (Age 1) index and summer/fall (Age 0) recruitment index scaled to its means.

Year	Index Age1	SE Age1	N Age1	Index Age0	SE Age0	N Age0
1989				0.78	0.32	106
1990	0.90	0.18	78	1.39	0.48	153
1991	0.69	0.12	78	1.94	0.36	155
1992	1.78	0.07	78	1.20	0.49	156
1993	0.55	0.17	78	0.66	0.13	156
1994	1.12	0.07	78	0.71	0.18	156
1995	0.56	0.11	78	1.24	0.12	156
1996	1.06	0.18	78	0.69	0.23	156
1997	0.73	0.17	78	0.36	0.45	156
1998	2.50	2.24	78	0.60	0.11	156
1999	1.77	0.31	78	0.76	0.44	156
2000	1.82	0.10	78	1.15	0.34	156
2001	0.81	0.30	102	1.78	1.38	204
2002	0.64	0.10	102	1.03	0.15	204
2003	0.65	0.21	102	0.57	0.18	204
2004	0.90	0.24	102	0.62	0.38	204
2005	0.65	1.32	102	0.91	0.24	204
2006	1.24	0.26	102	1.21	0.29	204
2007	0.78	0.11	102	1.20	0.24	204
2008	0.65	0.18	102	1.43	0.28	204
2009	0.85	0.27	112	0.90	0.53	224
2010	0.35	0.15	112	0.62	0.17	224

Figure 3.

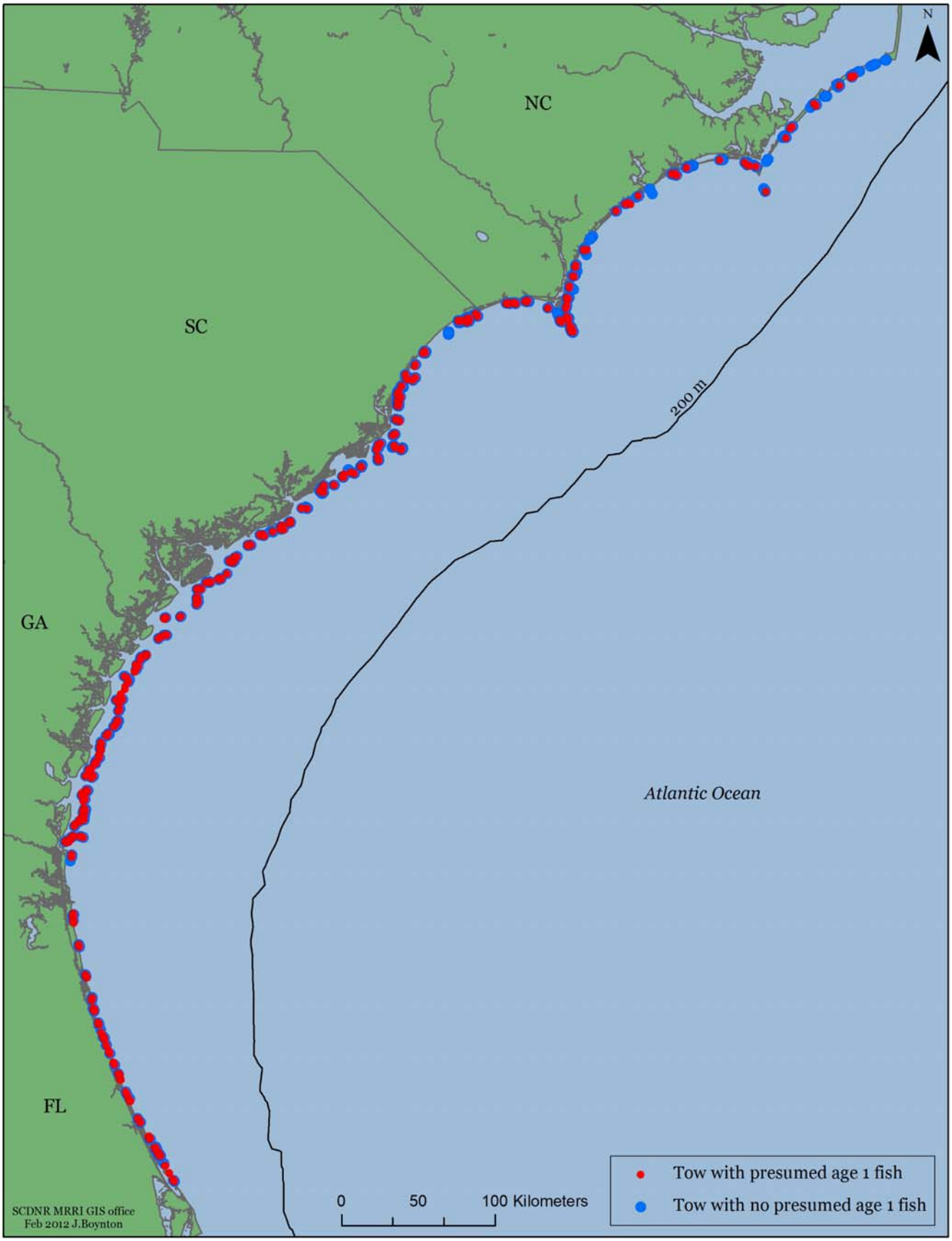

N
NC
SC
GA
FL
200 m
Atlantic Ocean
0
50
100 Kilometers
Tow with presumed age 1 fish
Tow with no presumed age 1 fish
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Figure 4

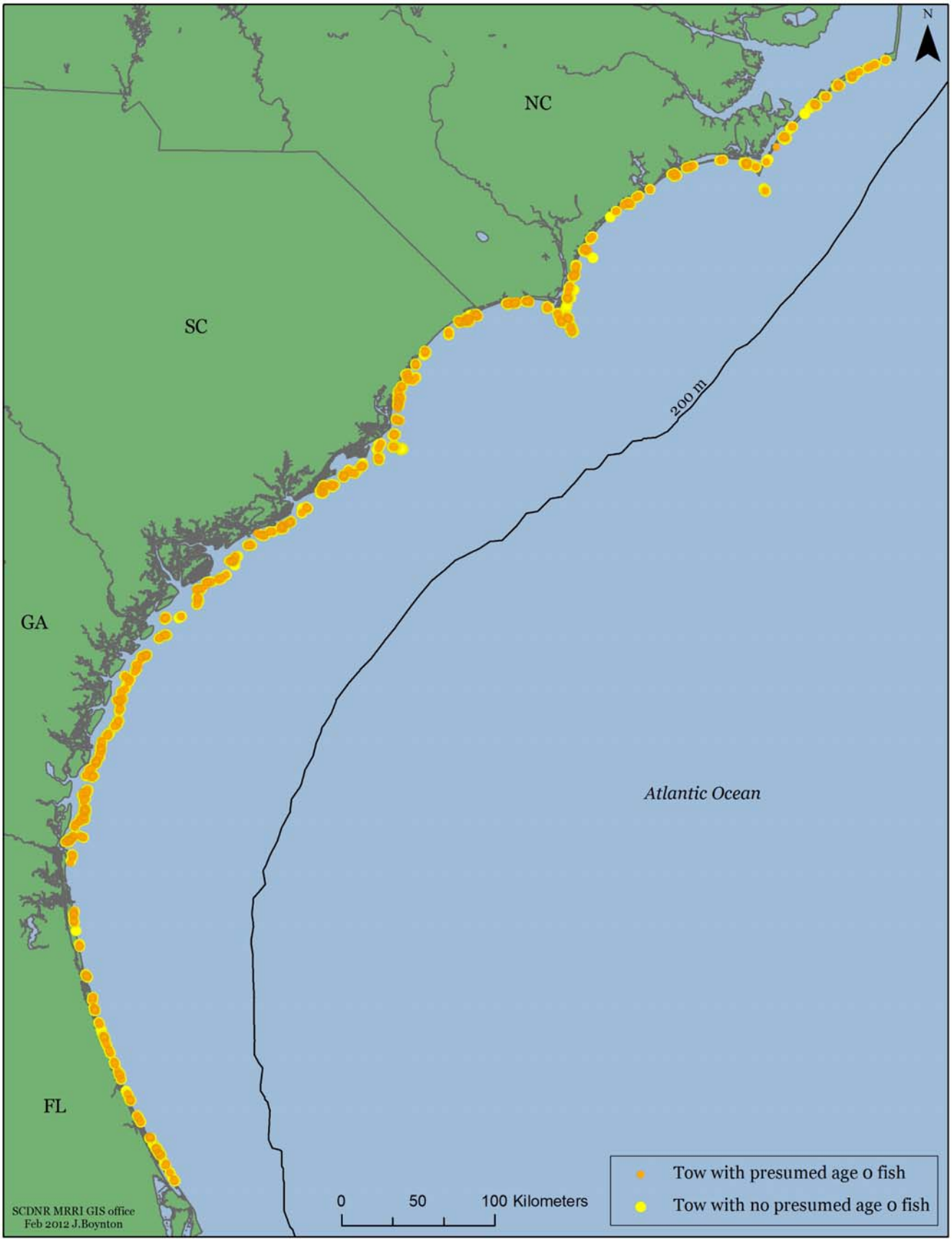
N
NC
SC
GA
FL
200 m
Atlantic Ocean
0
50
100 Kilometers
Tow with presumed age 0 fish
Tow with no presumed age 0 fish
SCDNR MRRI GIS office
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Table 2. Summary of age data resulting from Spanish mackerel collected in 2011.

SEASON	SEX	AGE	N	MIN FL (mm)	MAX FL (mm)
SPRING	Male	0	0		
		1	58	233	358
		2	5	347	403
	Female	0	0		
		1	61	178	361
		2	2	374	394
SUMMER	Male	0	20	134	269
		1	4	333	396
		2	2	347	384
	Female	0	9	163	278
		1	14	327	388
		2	0		
FALL	Male	0	37	135	320
		1	0		
		2	0		
	Female	0	45	125	390
		1	0		
		2	0		

Evaluation of Abundance Indices of list species:
List data set (SEDAR28-DW-##)

	Not Applicable	Absent	Incomplete	Complete
DESCRIPTION OF THE DATA SOURCE				
1. Fishery Independent Indices				
A. Describe the survey design (e.g. fixed sampling sites, random stratified sampling), location, seasons/months and years of sampling.				✓
B. Describe sampling methodology (e.g. gear, vessel, soak time etc.)				✓
C. Describe any changes in sampling methodology (e.g. gear, vessel, sample design etc.)				✓
D. Describe the variables reported in the data set (e.g. location, time, temperature, catch, effort etc.).				✓
E. What species or species assemblages are targeted by this survey (e.g. red snapper, reef fish, pelagic).				✓
F. Describe the size/age range that the index applies to. Include supporting figures (e.g. size comp) if available.				✓
2. Fishery Dependent Indices				
A. Describe the data source and type of fishery (e.g. commercial handline, commercial longline, recreational hook and line etc.).				✓
B. Describe any changes to reporting requirements, variables reported, etc.				✓
C. Describe the variables reported in the data set (e.g. location, time, temperature, catch, effort etc.).				✓
D Describe the size/age range that the index applies to. Include supporting figures (e.g. size comp) if available.				✓
METHODS				
1. Data Reduction and Exclusions				
A. Describe any data exclusions (e.g. gears, fishing modes, sampling areas etc.). Report the number of records removed and justify removal.				✓
B. Describe data reduction techniques (if any) used to address targeting (e.g. Stephens and MacCall, 2004; gear configuration, species assemblage etc).		✓		
C. Discuss procedures used to identify outliers. How many were identified? Were they excluded?		✓		

Working Group Comments:

	Not Applicable	Absent	Incomplete	Complete
2. Management Regulations (for FD Indices)				
A. Provide (or cite) history of management regulations (e.g. bag limits, size limits, trip limits, closures etc.).		✓		
B. Describe the effects (if any) of management regulations on CPUE		✓		
C. Discuss methods used (if any) to minimize the effects of management measures on the CPUE series.		✓		
3. Describe Analysis Dataset (after exclusions and other treatments)				
A. Provide tables and/or figures of number of observations by factors (including year, area, etc.) and interaction terms.				✓
B. Include tables and/or figures of number of positive observations by factors and interaction terms.				✓
C. Include tables and/or figures of the proportion positive observations by factors and interaction terms.		✓		
D. Include tables and/or figures of average (unstandardized) CPUE by factors and interaction terms.				✓
E. Include annual maps of locations of survey sites (or fishing trips) and associated catch rates ***OR*** supply the raw data needed to construct these maps (Observation, Year, Latitude, Longitude (or statistical grid, area), Catch, Effort).				✓
F. Describe the effort variable and the units. If more than one effort variable is present in the dataset, justify selection.				✓
G. What are the units of catch (e.g. numbers or biomass, whole weight, gutted weight, kilograms, pounds).				✓
4. Model Standardization				
A. Describe model structure (e.g. delta-lognormal)		✓		
B. Describe construction of GLM components (e.g. forward selection from null etc.)		✓		
C. Describe inclusion criteria for factors and interactions terms.		✓		
D. Were YEAR*FACTOR interactions included in the model? If so, how (e.g. fixed effect, random effect)? Were random effects tested for significance using a likelihood ratio test?		✓		
E. Provide a table summarizing the construction of the GLM components.		✓		
F. Summarize model statistics of the mixed model formulation(s) (e.g. log likelihood, AIC, BIC etc.)		✓		
G. Report convergence statistics.		✓		

Working Group Comments:

MODEL DIAGNOSTICS

Comment: Other model structures are possible and acceptable. Please provide appropriate diagnostics to the CPUE indices working group.

	Not Applicable	Absent	Incomplete	Complete
1. Binomial Component				
A. Include plots of the chi-square residuals by factor.		✓		
B. Include plots of predicted and observed proportion of positive trips by year and factor (e.g. year*area)		✓		
C. Report overdispersion parameter and other fit statistics (e.g. chi-square / degrees of freedom).		✓		
2. Lognormal/Gamma Component				
A. Include histogram of log(CPUE) or a histogram of the residuals of the model on CPUE. Overlay the expected distribution.		✓		
B. Include plots describing error distribution (e.g. Studentized residuals vs. linear predictor.		✓		
C. Include QQ-plot – (e.g. Student deviance residuals vs. theoretical quantiles), Overlay expected distribution.		✓		
D. Include diagnostic plot for variance function (e.g. square root of std residuals vs. fitted values). Overlay expected distribution.		✓		
E. Include diagnostic plot for link function (e.g. linear response variable vs. linear predictor). Overlay expected distribution.		✓		
F. Include plots of the residuals by factor		✓		
3. Poisson Component				
A. Report overdispersion parameter and other fit statistics (e.g. chi-square / degrees of freedom).		✓		
B. Include plots describing error distribution (e.g. Studentized residuals vs. linear predictor.		✓		
C. Include QQ-plot – (e.g. Student deviance residuals vs. theoretical quantiles), Overlay expected distribution.		✓		
D. Include diagnostic plot for variance function (e.g. square root of std residuals vs. fitted values). Overlay expected distribution.		✓		
E. Include diagnostic plot for link function (e.g. linear response variable vs. linear predictor). Overlay expected distribution.		✓		
4. Zero-inflated model				
A. Include ROC curve to quantify goodness of fit.		✓		
B. Include plots describing error distribution (e.g. Studentized residuals vs. linear predictor).		✓		
C. Include QQ-plot (e.g. Student dev. residuals vs. theoretical quantiles), Overlay expected distribution.		✓		

Working Group Comments:

The feasibility of this diagnostic is still under review.

MODEL DIAGNOSTICS (CONT.)

Not Applicable	Absent	Incomplete	Complete

Working Group Comments:

D. Include diagnostic plot for variance function (e.g. square root of std residuals vs. fitted values). Overlay expected distribution.		✓		
E. Include diagnostic plot for link function (e.g. linear response variable vs. linear predictor). Overlay expected distribution.		✓		

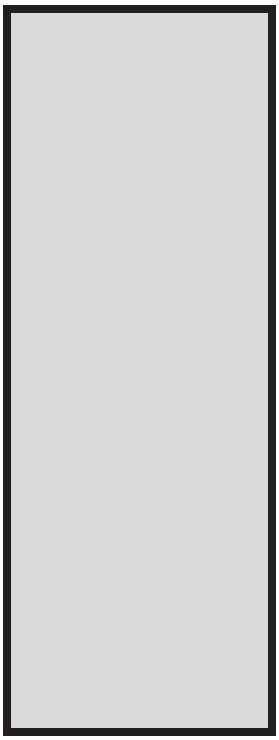
MODEL RESULTS

A. Tables of Nominal CPUE, Standardized CPUE, Observations, Positive Observations, Proportion Positive Observations and Coefficients of Variation (CVs). Other statistics may also be appropriate to report		✓		
B. Figure of Nominal and Standardized Indices with measure of variance (i.e. CVs).		✓		

IF MULTIPLE MODEL STRUCTURES WERE CONSIDERED:

(***Note: this is always recommended but required when model diagnostics are poor***.)

1. Plot of resulting indices and estimates of variance		✓		
2. Table of model statistics (e.g. AIC criteria)		✓		



	Date Received	*Workshop Recommendation*	*Revision Deadline ****	*Author and Rapporteur Signatures*
First Submission				
Revision				

*The revision deadline is negotiated by the author, the SEDAR coordinator and the CPUE rapporteur. The author **DOES NOT** commit to any **LEGAL OBLIGATION** by agreeing to submit a manuscript before this deadline. The maximum penalty for failure to submit a revised document prior to the submission deadline is rejection of the CPUE series.*

Justification of Working Group Recommendation
