H

VIRGINIA RECREATIONAL FISHING DEVELOPMENT FUND
SUMMARY PROJECT APPLICATION*

NAME AND ADDRESS OF APPLICANT:

Virginia Institute of Marine Science
P. O. Box 1346
Gloucester Point, VA 23062-1346

PROJECT LEADER (name, phone, e-mail):

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PRIORITY AREA OF CONCERN:

Chesapeake Bay mainstem and the major tributaries including the James, York and Rappahannock Rivers.

PROJECT LOCATION:

Sampling will continue in the Virginia portion of the Chesapeake Bay mainstem and the major tributaries (James, York and Rappahannock Rivers, VA).

DESCRIPTIVE TITLE OF PROJECT:

Estimating Relative Juvenile Abundance of Recreationally Important Finfish and Crustaceans in the Virginia Portion of Chesapeake Bay.

PROJECT SUMMARY:

The fisheries trawl survey conducted by the Virginia Institute of Marine Science (VIMS) is the oldest continuing survey (51 years) of marine and estuarine fishes in the United States. This survey provides a monthly baseline assessment for the abundance of juvenile marine and estuarine fishes and blue crabs in the tidal and mainstem areas of the Chesapeake Bay. Annual indices of juvenile abundance generated for species of key recreational (as well as commercial and ecological) importance include spot, croaker, weakfish, summer flounder, black sea bass, striped bass, white perch, scup, northern puffer, silver perch, channel catfish, white catfish, blue catfish, bay anchovy, American eel, Atlantic menhaden and blue crabs.

EXPECTED BENEFITS:

Indices of juvenile abundance are generated from VIMS trawl survey data for species of key recreational (as well as commercial and ecological) importance. These indices are critical to stock assessments and provide a measure of annual recruitment strength. Thus, annual surveys are necessary to effectively assess the status and condition of stocks. The VIMS trawl survey provides these crucial indices and related information to VMRC, the Atlantic States Marine Fisheries Commission, the Mid-Atlantic Fisheries Management Council, and the National Marine Fisheries Service. VIMS trawl survey juvenile indices are also essential for current Baywide multispecies modeling efforts.

COSTS:

VMRC Funding:	469,568
Recipient Funding:	177,331
Total Costs:	646,899

Detailed budget must be included with proposal.

Updated 6/1/05

***This form alone does not constitute a complete application, see application instructions or contact Sonya Davis at 757-247-8155 or sonya.davis@mrc.virginia.gov : Due dates are June 15 (Jul. – Nov. Cycle) and December 15 (Jan. – May Cycle)**

Estimating Relative Juvenile Abundance of Recreationally Important Finfish and Crustaceans in the Virginia Portion of Chesapeake Bay.

Proposal Submitted to:

Virginia Marine Resources Commission
Marine Recreational Fishing Advisory Board

1 June 07 – 31 May 08

Principal Investigators

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Dr. John Olney
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Director of Sponsored Programs

7 December 2006

Foreword:

The Virginia Institute of Marine Science (VIMS) Trawl Survey is the oldest continuous survey (51 years) of marine and estuarine fishes and blue crabs in the United States. The program is vital since it represents one of only a few surveys targetting juvenile recruitment of species in the Mid-Atlantic region. Over the years, this work has been supported by a combination of institutional and external funds**.** From 1991-2001, external support was obtained from U.S. Fish and Wildlife Service Wallop-Breaux (W-B) apportionments. When a sudden reduction in available W-B funds occurred, the trawl survey was supported by the Virginia Marine Resources Commission's Marine Recreational Fishing Advisory Board (VMRC MRFAB). Funding by VMRC occurred from June 2001 through May 2003 and then again from June 2005 through May 2006. When not funded by VMRC MRFAB, the survey was funded by the NOAA Chesapeake Bay Office.

During the last two decades, VIMS has submitted a number of requests to the Virginia General Assembly seeking state appropriations for the trawl survey. Unfortunately, these applications have not been funded. Consequently, VIMS has requested an earmark of $500K from NOAA-NMFS to continue the trawl survey, but will not know if funding will be approved for the coming fiscal year (FY08). To maintain program continuity, this proposal is being submitted to the VMRC MRFAB to request emergency funding to continue this critically important finfish and blue crab monitoring program for an additional year. Should NOAA funding be received after the initiation of this segment, the unused funds would be returned to VMRC. Similarly, if the Commonwealth of Virginia appropriates funds for this project in 2007, we will return unused funds to VMRC.

Need:

Measures of juvenile abundance are necessary as a key element in the management of many Atlantic states coastal fishery resources. Estimates of the fluctuations in relative abundance of early juveniles (age 0) generated from fishery independent surveys provide a reliable and early estimator of future year class strength (Goodyear,1985; Lipcius and Van Engel, 1990). For example, the current Interstate Fisheries Management Plan for striped bass relies heavily on estimates of juvenile abundance, both as 'action levels' for the intensification and relaxation of restrictions and as a measure of year class strength in mathematical population models (USDOI and USDOC, 1989). In addition to providing management plan input, juvenile indices can be an "early warning" of year class failure. Evidence of a very poor year class of summer flounder in 1988 was first noted in scientific collecting programs and these data were instrumental in shaping more protective regulations for flounder in Virginia (Austin, 1994). Later, poor year classes were monitored by the VIMS Trawl Survey and these data were reported to the MAFMC for use in establishing realistic recreational quotas for 1994 and 1995 (Austin, 1994).

Most recently trawl data have been used to describe Baywide recruitment patterns reflective of climate variability (Wood, 2000). Blue crab indices generated by the VIMS Trawl Survey have been instrumental in recent blue crab stock assessments (Miller et al., 2005) and trawl survey menhaden data were recently used to tune a stock assessment by NOAA scientists using virtual population analyses (D. Vaughn and others). The present survey data collection is recognized as essential, and often mandated, by several fishery management councils (Table 1). The ASMFC recognizes the VIMS Trawl Survey as essential for such species as weakfish, croaker, spot, summer flounder, scup, and American eel (see recent ASMFC eel stock assessment review, ASMFC, 2006). The Mid-Atlantic Fisheries Management Council (MAFMC) recognizes the VIMS Trawl Survey as the only available predictor of recruitment of summer flounder consistent with past virtual population analysis (VPA) estimates. Additionally, there are many bi-state fishery management plans utilizing these data, and it has been the pillar of the CBSAC effort to understand blue crab population dynamics. Further, the trawl survey was the sole basis for the blue crab sanctuary/corridor recommendations. These juvenile indices of abundance are critical to stock assessments and provide a measure of annual recruitment strength. Thus, annual surveys are necessary to effectively assess the status and condition of stocks.

Objectives:

1. to produce annual estimates of recruitment for important recreational finfish species for the major Virginia nursery areas of the Chesapeake Bay, and

2. to provide distribution information on various life stages (juveniles and adults) of ecologically important species including information describing essential fish habitat.

Expected Results or Benefits:

The VIMS Trawl Survey has been identified as a key element for the future management of fisheries resources using the Chesapeake Bay as spawning and nursery grounds. A primary benefit will be to insure that species recruitment is properly monitored in all the major spawning and/or nursery areas of the Chesapeake Bay. Because the Chesapeake Bay also constitutes a major nursery area for important coastal migratory fish species, monitoring annual recruitment in this region constitutes a key element in multi-state efforts to manage the Atlantic coastal fisheries of the United States (Austin 1994; Bonzek et. al. 1995; see Table 1). This need was further emphasized by the Atlantic Coastal Cooperative Fishery Management Act (PL-103-206) which requires Maryland and Virginia to provide estimates of juvenile abundance indices for the Chesapeake Bay. The NMFS Marine Recreational Fisheries Statistics Survey (or NMFS MRFSS, DOC, 2005) indicates that Virginia marine recreational catches are dominated by seven species (croaker, summer flounder, spot, black sea bass, striped bass, kingfishes and weakfish) which constitute over 87% of the total estimated catch by numbers and 85% by weight (Table 2). These species also constitute a major portion of the VIMS Trawl Survey catch (Table 3).

Project results will provide resource managers with a valuable tool for assessing the success of present management strategies. By assuring continuity with past and present trawl data, evaluation of historical trends of relative recruitment are possible as well as time-series dependent analyses of environmental (e.g. Norcross, 1983; Luo, 1991; Bodolus, 1994; Austin and Bonzek, 1996; Wood, 2000; Austin, 2002; Montane and Austin, 2005) and anthropogenic influences (Hargis et. al., 1984) on recruitment. The survey will also serve as a valuable tool for the determination of stock/recruitment relationships (through comparison with the results of egg/larval and adult spawning stock assessments), as a primary source of data and specimens for concurrent investigations of the early life history of the species, and will provide an extensive body of information on habitat utilization by juveniles and young adults of these species. Additionally, information collected from these surveys can provide information on species distribution and abundance of both juveniles and adults.

We will produce annual estimates of recruitment for important finfish species, particularly spot, croaker, weakfish, summer flounder, black sea bass, striped bass, white perch, scup, northern puffer, silver perch, channel catfish, white catfish, blue catfish, bay anchovy, American eel, Atlantic menhaden and blue crabs for the major Virginia nursery areas of the Chesapeake Bay. In addition, indices for emerging species of interest can be produced as necessary. These findings provide the basis for current Baywide multispecies modeling efforts. Quarterly progress reports will be generated as per MRFAB timelines and a detailed final report will be produced. For each species, distribution and abundance plots will be created (as an example, see Appendix Figure 1 describing Atlantic croaker). Survey results are also being used to address other aspects of the population biology of these species, such as habitat utilization, early growth and survival, and climate and pollutant interactions.

Results will be used by various fisheries management agencies to aid in stock assessments and fisheries ecosystem modelling. Research findings will be presented at meetings and submitted for peer-review publication. We also hope to continue to collaborate with the VIMS Chesapeake Bay Trophic Interaction Laboratory collecting fish for stomach analyses as in the past (Parthree et al., 2006) to help to answer additional multispecies interaction questions within the Bay. Numerous advisory data requests are routinely answered during the course of the study (see Appendix Table A-1).

Approach:

VIMS has sustained the monthly trawl survey in the tributaries since 1955 and the Virginia portion of the Chesapeake Bay since 1988, and will attempt to continue to do. Analyses of studies in Virginia indicate that the sampling design is effective for developing annual indices of abundance (Chittenden, 1991).

Virginia marine recreational catches are dominated by seven species (croaker, summer flounder, spot, black sea bass, striped bass, kingfishs, and weakfish; see Table 2). All of these species occupy nursery grounds in the lower Chesapeake Bay and tributaries, and are highly vulnerable to bottom trawls. Juvenile spot, croaker and weakfish were a dominant component of the trawl catches during earlier studies (Chittenden, 1989; Land et al., 1994). All three species are primarily estuarine-dependent as early juveniles, and the Chesapeake Bay is a major nursery ground for each. From 1988-2005, croaker, spot, and weakfish dominated the VIMS Trawl Survey catch (Table 3). Black sea bass and summer flounder are generally less abundant in the catches but are regularly taken and are often locally abundant on a seasonal basis. Neither of these species are restricted to estuarine waters as early juveniles, as black sea bass young-of-year also use near-shore continental shelf waters (Musick and Mercer, 1977). Juvenile summer flounder also frequent shallow, high salinity coastal lagoons on the eastern shore (Wyanski, 1989), but both species use the lower Chesapeake Bay as a significant and regular nursery zone; annual abundances in the Bay may reflect overall reproductive success of summer flounder.

In addition to the key species mentioned above, other species of recreational interest, such as striped bass, white perch, white catfish, channel catfish, blue catfish, northern puffer and silver perch are taken with sufficient regularity during trawling operations to provide datasets suitable for the generation of useful indices of juvenile abundance. During the winter, adult catfish are vulnerable to capture by even small bottom trawls. Additionally, catch rates of blue catfish which was introduced in the 1970's and 1980's into the James, York and Rappahannock rivers, have increased since 1991, while those of channel and white catfish have declined (Connelly, 2001; Montane and Fabrizio, 2006). The bay anchovy, an important forage fish for several recreationally valued species such as bluefish, weakfish, summer flounder and striped bass, is the most abundant species captured on a year-round basis (Table 3). Of 18 species managed by the Interstate Marine Fisheries Management Program (via Atlantic States Marine Fisheries Commission), 10 are common components of the VIMS trawl survey catch (Table 3).

A brief description of the sampling protocol follows (for further detail, see Montane and Fabrizio, 2006). The gear remains a lined 30' (9.14 m) semi-balloon otter trawl, 1.5" (38.1 mm) stretched mesh, with 0.25" (6.35 mm) cod-end liner. The trawl is towed on the bottom for five minutes during daylight hours. Beginning in May 1998, data on habitat or substrate type collected in the trawl has been recorded. Fish distribution and abundance may be influenced by various substrates, such as shell, sponge, hydroids, or sea squirts. The three-dimensional structure of these substrates may be used by fish for shelter, spawning, or feeding. Categories of substrates are measured at each station based on the quantity (volume in a standard container) observed in the net. Maps of substrate distribution can be developed and compared to catch rates and distribution of various fish species to determine whether any habitat/abundance relationships exist .

Sampling in the Bay occurs monthly except during January and March, when few target species are available to the gear. Sampling in the tributaries also occurs monthly, with both the random stratified stations as well as the historical fixed stations located in the channel. The survey stratification system is based on depth and latitudinal regions in the Bay, and on depth and longitudinal regions in the rivers. Each Bay region is 15 latitudinal miles and consists of 6 strata; western shore and eastern shore shallow (4-12 ft), western and eastern shoal (12-30 ft), central plain (30-42 ft), and deep channel (> 42 ft). Each tributary is divided into four regions of approximately ten longitudinal miles, with four depth strata in each; (4-12 ft, 12-30 ft, 30-42 ft, and > 42 ft). Strata are collapsed in areas where certain depths are limited. The fixed stations have been assigned a stratum according to their location and depth.

Juvenile index calculation uses the following approach: a standard monthly cutoff value is applied to the length frequency data collected for each target species to separate cohorts into either young-of-year or older components. Cutoff values vary among months for each species and are based on modal analyses of historical composite monthly length frequency data and reviews of ageing studies for each species (Colvocoresses and Geer, 1991). For the earlier months of the biological year, cutoff values fall within discrete modal size ranges. In the latter part of the biological year, when early spawned, rapidly growing individuals of the most recent year class may overtake late spawned, slow growing individuals of the previous year class, cutoff values are selected

so as to preserve the correct numeric proportionality between year classes despite possible misclassification of individuals. The extent of the zone of overlapping lengths and the proportion within that range attributable to each year class is estimated based on the shapes of each modal curve during the months prior to the occurrence of overlap. A length value is then selected from within that range which will result in the appropriate proportional separation.

After removing non-young-of-year individuals from consideration, monthly catch rates of the target species are used to calculate strata-specific abundances. Numbers of individuals caught are logarithmically transformed (ln(n+1)) prior to abundance calculations (Chittenden, 1991). Average catch rates (and the 95% confidence intervals as estimated by $\pm$ 2 standard errors) are then back-transformed to geometric means. Coefficient of variation is expressed as the standard deviation divided by the log transformed mean catch (Cochran, 1977). The area-time combinations which consistently include the highest abundance of the target species are used to define the index period.

After area-time combinations are determined, annual juvenile indices are calculated as the weighted geometric mean catch per tow. Strata-specific means and variances are calculated and then combined, weighing by stratum (Cochran, 1977). Because strata are quite variable, use of a weighted mean provides an index that more closely mirrors actual abundance of juvenile fishes.

Extensive gear comparisons were performed in the early 1990's to standardize the various configurations of fishing gear used throughout the history of the program. Nearly 1000 alternate paired samples were performed. In addition, historical gear comparison data (1969 - 1985) were examined. These data were thoroughly analyzed, with the goal of size-specific efficiency ratios for historical gears (and/or vessels, see Hata, 1997). These analyses provide a standard fishing effort for comparing juvenile abundance estimates as far back as 1955.

To maintain consistency over the years, three indices are produced for each species: the original index, based on the present bay strata and the fixed tributary stations (Bay & River Index - BRI, 1979 to present); a post-stratified gear and/or vessel converted index using all spatially appropriate data (Random Stratified Converted Index - RSCI, 1955 to present); and an unconverted post-stratified index, also based on all spatially appropriate data (Random Stratified Index - RSI, 1955 to present). Results from the longer time series must be considered provisional, because concerns about missing data and conversion factors are still being addressed. Distribution and abundance plots for each species (e.g. Atlantic croaker) are also generated (see Figure 1).

Target dates:
Fieldwork will be performed from June 2007 through May 2008. Progress reports will be completed during the course of the study and a final report will be due by August 2008.

Project management and personnel required:
Principal Investigator: Mary Fabrizio, Associate Professor of Marine Science
Co-Principal Investigator: Marcel Montane, Marine Scientist Supervisor and Project Manager
Mary Fabrizio and Marcel Montane will coordinate all aspects of the project with Marcel Montane taking the lead in the management, analysis and report writing.
Boat Captains: Wendy Lowery, Hank Brooks and Deane Estes (hourly);
Field and Laboratory Support: Wendy Lowery, Hank Brooks, Aimee Halvorson, Courtney Ford, Julia Ellis, Amanda Hewitt (half-time), Ashleigh Rhea (half-time), and student workship (hourly).
Data Analyst: Chris Bonzek

Location:

Sampling will continue monthly in the Virginia portion of the Chesapeake Bay mainstem and in the major tributaries (James, York and Rappahannock rivers).

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Estimating Relative Juvenile Abundance of Recreationally Important Finfish in the Virginia Portion of Chesapeake Bay.
(1 June 07 – 31 May 08)

Budget:

Personnel	Time	MRFAB	VIMS	TOTAL
Principal Investigator (Fabrizio)*	10%	11,466		11,466
Principal Investigator (Montane)	85%	51,277		51,277
Marine Scientist (Lowery)	100%	36,937		36,937
Marine Scientist (Hewitt)	50%	16,143		16,143
Marine Scientist. (Ellis)	75%	24,215		24,215
Data Analyst (Bonzek)	0%			
Lab. Spec. (Brooks)	86%	31,693		31,693
Lab. Spec. (Halvorson)	90%	30,360		30,360
Lab. Spec. (Ford)	100%	23,298		23,298
Lab. Spec. (Rhea)	50%	12,115		12,115
Marine Scientist Sr. (Estes):hourly	15 hrs/wk	16,500		16,500
Student workship (hourly)		10,000		10,000
Fringe (30% full time)		71,251		71,251
Fringe (7.65% hourly)		2,027		2,027
Graduate Student (Woodward)		17,100		17,100
Supplies				
Field and lab supplies including Gear, nets, rope, sampling bags, hardware, fuel		33,686		33,686
Travel				
Field Sites		1,500		1,500
Regional and national meeting attendance		3,000		3,000
Vessel Rental		75,000		75,000
Vessel Communications		1,500		1,500
Final Report Printing/Poster Preparation		500		500
F&A Costs (45%)			**177,331**	**177,331**
Total		**469,568**	**177,331**	**646,899**

*if multiple projects are funded by MRFAB, support for Fabrizio will not exceed 15% of annual salary.

Budget Justification

Personnel

Each month, a minimum of 10-12 days of field activity (usually 60 hours per week), will be performed and the remaining 2 weeks will include archiving specimens, entering data, and managing information. Minimum crew includes a boat captain and three scientific staff.

Vessel Rental

$70/hr X 1071 hours = $75,000.

Supplies

Field and laboratory supplies including:
LIMNOTERRA Electronic Fish Measuring Board (1@$6000)= $6000
YSI Hydrographic Meter (Temp, DO, Sal.) (1 meter @ $3500, YSI cable $210, Battery pack $250, membrane kit, $20)= $3980
Misc gear (trawl doors, cable, hardware, shackles, sample bags, foul weather gear, gloves etc.)= $2106
Trawl Nets (2 @ $800)=$1600
Vessel Fuel ($2.50/gal. X 8000 gals)=$20,000

Travel

To field sites where boat is berthed: ($0.58/mi X 25867 mi) = $1500
To local and regional meetings (2 people at $750 ea.)=$1500
To national meetings (1 person @$1500)=$1500

Facilities and Administrative Costs

F & A costs are normally assessed at 25% for funds provided by Marine Recreational Advisory Board. Due to the critical nature of funding shortfall, VIMS will provide all F & A costs (45%) associated with this project.

Table 1. Management agencies using VIMS trawl survey data in fisheries management plans (FMP's) for species of interest.

Species	Organization				
	ASMFC	CBSAC	MAFMC	VMRC	CBP
American eel	M	P		P	M
Atlantic croaker	M	M		P	M
Atlantic herring		P			M
Atlantic menhaden	P	M			M
Atlantic sturgeon	P			P	
bay anchovy				P	M
black drum					M
black seabass	M	M	M	P	M
blue crabs		M		P	M
bluefish		M			M
butterfish			M	P	M
catfish species		M		P	M
horseshoe crab	M			P	M
red drum		M			M
river herring spp		M			M
scup	M		M	P	
Spanish mackerel					
spiny dogfish					
spot	M	M		P	M
spotted seatrout					M
striped bass	P	M		P	M
summer flounder	M	M	M	P	M
tautog	P	M		P	M
weakfish	M	M		P	M
white perch		M		P	M

Key:
P=Provide, M=Mandate for data
ASMFC = Atlantic States Marine Fisheries Commission
CBSAC = Chesapeake Bay Stock Assessment Committee - NOAA
MAFMC = Mid-Atlantic Fisheries Management Council
VMRC = Virginia Marine Resources Commission
CBP= Chesapeake Bay Program - EPA / NOAA

Table 2. National Marine Fisheries Service's Marine Recreational Fisheries Statistic Survey for Virginia Waters for 2004.

SPECIES	Total Number of Fish (A + B1 + B2)	Rank by Number Caught	Number of Harvested Fish (A + B1)	Weight in kilograms (A + B1)	Rank by Weight
ATLANTIC CROAKER	13,238,716	1	6,695,192	2,573,760	1
SUMMER FLOUNDER	3,036,650	2	451,348	587,001	3
SPOT	2,374,844	3	1,441,002	397,228	4
BLACK SEA BASS	2,006,661	4	264,983	177,095	6
STRIPED BASS	1,372,499	5	401,945	1,265,420	2
KINGFISHES	1,187,866	6	720,328	137,237	9
WEAKFISH	590,241	7	86,112	97,760	11
PIGFISH	547,954	8	98,568	10,381	18
BLUEFISH	511,905	9	171,573	147,534	7
OTHER FISHES	431,784	10	156,354	191,826	5
TOADFISHES	318,743	11	1,899	0	
SPOTTED SEATROUT	309,754	12	102,484	98,912	10
FRESHWATER CATFISHES	204,813	13	109,676	72,186	13
SCUP	186,251	14	7,724	1,371	27
WHITE PERCH	173,648	15	51,915	7,695	21
SKATES/RAYS	163,042	16	8,191	659	29
HERRINGS	159,142	17	143,065	16,336	16
TAUTOG	131,348	18	76,236	140,088	8
PUFFERS	129,415	19	19,648	5,620	23
OTHER SHARKS	105,872	20	7,172	7,965	20
SEAROBINS	60,711	21	0	0	
RED DRUM	56,986	22	13,607	25,952	15
SPANISH MACKEREL	37,602	23	17,063	9,993	19
BLACK DRUM	32,019	24	11,431	43,876	14
PINFISHES	28,612	25	1,385	0	
FLORIDA POMPANO	19,937	26	17,300	7,231	22
EELS	18,749	27	3,837	0	
DOGFISH SHARKS	13,474	28	5,935	2,941	26
SILVER PERCH	11,671	29	7,041	84	30
OTHER FLOUNDERS	10,118	30	0	0	
SHEEPSHEAD	8,513	31	3,907	13,594	17
TRIGGERFISHES/FILEFISHES	8,385	32	3,533	3,792	24
MULLETS	8,131	33	7,260	0	
OTHER TUNAS/MACKERELS	6,465	34	5,835	78,072	12
OTHER JACKS	2,496	35	0	0	
OTHER PORGIES	1,974	36	0	0	
ATLANTIC MACKEREL	1,819	37	1,819	1,334	28
DOLPHINS	1,294	38	1,294	3,188	25
LITTLE TUNNY/ATLANTIC BONITO	987	39	0	0	
OTHER CODS/HAKES	871	40	0	0	
KING MACKEREL	580	41	0	0	
GREATER AMBERJACK	239	42	239	0	
RED HAKE	46	43	46	18	31
Total	27,512,827		11,116,947	6,126,149	

A = Caught and Landed

B1 = Caught by Anglers & filleted or released dead

B2 = Caught and released alive

Table 3. VIMS TRAWL SURVEY CATCH SUMMARY 1988 TO 2005

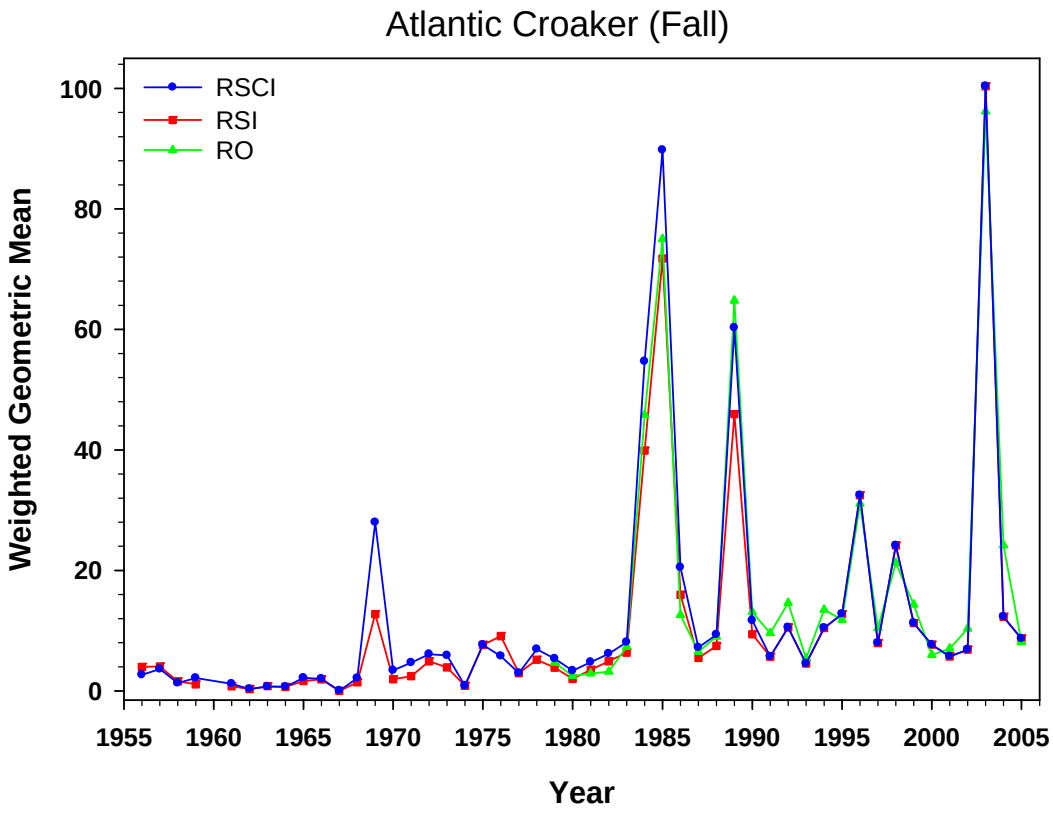
No. of tows = 18866 Status: R=Recreational C=Commercial F= Forage P=Protected

Species		Number of Fish (All)	Percent of Catch	Catch Per Tow	Number of Fish YOY	Average Length (mm)	Standard Error (length)	Minimum Length (mm)	Maximum Length (mm)
Atlantic croaker	R & C	889,401	8.32	47.14	760,939	107	0.15	3	555
spot	R & C	568,306	5.31	30.12	528,534	124	0.07	10	332
weakfish	R & C	279,214	2.61	14.8	248,438	108	0.15	5	608
white perch	R & C	261,491	2.45	13.86	83,014	124	0.14	11	373
blue crab	R & C	237,452	2.22	12.17	.	74	0.1	0	220
catfish species	R & C	100,767	0.94	5.34	30,469	203	0.33	15	655
spotted hake	R & C	59,171	0.55	3.14	57,466	119	0.21	21	360
kingfish species	R & C	33,821	0.32	1.79	31,802	86	0.28	6	352
silver perch	R & C	30,360	0.28	1.61	26,003	128	0.19	18	262
summer flounder	R & C	20,701	0.19	1.1	13,181	235	0.62	12	723
striped bass	R & C	18,075	0.17	0.96	15,154	127	0.72	13	880
scup	R & C	17,069	0.16	0.9	15,564	97	0.27	21	351
American eel	R & C	9,382	0.09	0.5	.	265	0.8	39	870
black seabass	R & C	8,653	0.08	0.46	6,209	109	0.44	20	354
bluefish	R & C	702	0.01	0.04	.	190	2.83	22	820
Spanish mackerel	R & C	224	0	0.01	.	90	4.17	21	384
spotted seatrout	R & C	204	0	0.01	.	137	5.3	21	271
tautog	R & C	192	0	0.01	.	291	8.16	70	562
spiny dogfish	R & C	154	0	0.01	.	794	8.41	77	1004
red drum	R & C	151	0	0.01	.	91	6.05	26	399
smooth dogfish	R & C	76	0	0	.	491	14.71	225	830
Other selected species:									
bay anchovy	F	6,525,301	61.02	345.88	5,745,515	53	0.02	8	132
river herring species	C	31,746	0.3	1.68	30,856	90	0.16	32	396
squid species*	C	27,282	0.26	1.45	.	32	0.13	5	265
Atlantic menhaden	C	11,834	0.11	0.63	5,209	103	0.48	17	344
northern puffer	R & C	3,348	0.03	0.18	2,576	101	0.76	11	280
Atlantic spadefish	R & C	1,841	0.02	0.1	.	83	1.05	13	535
clearnose skate	R	1,793	0.02	0.1	.	382	1.68	79	541
pigfish	R	1,392	0.01	0.07	.	150	0.83	26	236
black drum	R & C	295	0	0.02	.	205	3.83	61	1017
Atlantic sturgeon	P	22	0	0	.	486	36.99	161	810

* measured since 1993

Appendix Table A-1. VIMS Trawl Survey Advisory requests since 2005.

Agency	Nature of Request
ASMFC American Eel Data Workshop	VIMS eel data
Canadian Journalist/VIMS	American eel information
CBL	Menhaden data, June-October
Dalhousie University	Shark data
Ecology and Environment, Inc.	Hampton Roads marine species data
Louisiana Dept. of Wildlife & Fisheries	Eel YOY recruitment periods
MAFMC/NMFS NE Fisheries Sci. Center	2004 scup index
Malcolm Pirnie, Inc.	James River data, silver hake data
MD Sea Grant	Blue crab information and 2005 adult female index
NJ Marine Resources/ASMFC	Eel data inquiries
Smithsonian Institution	Northern puffer index and hurricanes
U-Haul Env. Education	Chesapeake Bay fishes
US EPA	Nov-Apr 1999-2005 hydro data
USFWS	VIMS American eel research
UVA Institute for Environmental Negotiation	Survey status
VA Power and DFRTAC	Eels and *Anguillicola crassus*
VIMS	Sturgeon data
VIMS	2004 York River hydro data
VIMS	Striped bass and weakfish indices
VIMS	2005 flounder index, size freq. and distribution
VIMS	York River data, May-Sept 2005
VIMS	Atlantic sturgeon data
VIMS Advisory	VA Power *Anguillicola crassus*
VIMS Wetlands	Summer flounder data
VIMS/ASMFC Spot FMP Review	2005 spot index
Virginia Aquarium	Mantis shrimp
VMRC	Horseshoe crab data
VMRC	Summer flounder data
VMRC	Trawl eel data
VMRC	Eel conservation efforts by VIMS for USFWS
VMRC	2004 Sturgeon data
VMRC	Croaker index description
VMRC	2005 Horseshoe crab Index
VMRC	2005 flounder index
VMRC	2005 YOY weakfish Index
VMRC	2005 American eel index
VMRC (for South Atlantic Fisheries Mgmt. Council)	2004/2005 Spring croaker Indices



Appendix Figure 1. Fall YOY Atlantic croaker random stratified converted (RSCI), random stratified (RSI) and fixed transect (Rivers Only) indices (**top**), and distribution of fall YOY Atlantic croaker from October 2005 to December 2005 (**bottom**).