P.O. Box 94183
Baton Rouge, Louisiana 70804
(225) 342-2040

Senate
State of Louisiana

February 25, 2005

Dwight Landreneau, Secretary
Department of Wildlife and Fisheries
Post Office Box 98000
Baton Rouge, Louisiana 70898-9000

Dear Secretary Landreneau:

This is to acknowledge receipt of and thank you for your recent letter and the annual reports on striped mullet, black drum, sheepshead and southern flounder which include stock assessments and spawning potential ratios.

In accordance with the Administrative Procedure Act, I have forwarded this information to the Senate Committee on Natural Resources.

If I can be of any further assistance, please do not hesitate in contacting me.

Sincerely,

Donald E. Hines

Donald E. Hines
President

DEH/et

RECEIVED
MAR 02 2005
OFFICE OF THE SECRETARY

LOUISIANA DEPARTMENT OF WILDLIFE AND FISHERIES

RECEIPT

DATE: February 18, 2005

RECEIPT OF: 2005 Reports on Striped Mullet, Black Drum, Sheepshead and Southern Flounder.

SENATE PRESIDENT (State Capitol/Senate Sub-Basement)

RECEIVED BY: _____

FOR SENATOR DON HINES, SENATE PRESIDENT

HOUSE SPEAKER (State Capitol/1st Floor)

RECEIVED BY: _____

FOR REPRESENTATIVE JOE SALTER, HOUSE SPEAKER

SENATE NATURAL RESOURCES COMMITTEE (State Capitol/Senate Sub-Basement)

RECEIVED BY: _____

FOR SENATOR MAX MALONE, CHAIRMAN, SENATE NATURAL RESOURCES COMMITTEE

HOUSE NATURAL RESOURCES COMMITTEE (State Capitol/10th Floor)

RECEIVED BY: _____

FOR REPRESENTATIVE WILFRED PIERRE, CHAIRMAN, HOUSE NATURAL RESOURCES COMMITTEE

IMPORTANT MESSAGE

FOR ~~Harry~~ Susan

DATE 2/7 TIME 2:30 A.M. P.M.

M Harry Blanchet

OF

PHONE
AREA CODE NUMBER EXTENSION

☐ FAX

☐ MOBILE
AREA CODE NUMBER TIME TO CALL

TELEPHONED		PLEASE CALL	✓
CAME TO SEE YOU		WILL CALL AGAIN	
WANTS TO SEE YOU		RUSH	
RETURNED YOUR CALL		SPECIAL ATTENTION	

MESSAGE one minor change from Comm Mtg. on document.

Cathy

SIGNED

TOPS FORM 3002P LITHO IN U.S.A.

State of Louisiana

KATHLEEN BABINEAUX BLANCO
GOVERNOR

DEPARTMENT OF WILDLIFE AND FISHERIES

DWIGHT LANDRENEAU
SECRETARY

February 16, 2005

Honorable Donald E. Hines, M.D.
Senate President
Post Office Box 94183
Baton Rouge, LA 70804

Honorable Max T. Malone, Chairman
Senate Committee on Natural Resources
Post Office Box 94183
Baton Rouge, LA 70804

Honorable Joe R. Salter
Speaker of the House
Post Office Box 94062
Baton Rouge, LA 70804

Honorable Wilfred Pierre, Chairman
House Committee on Natural Resources
Post Office Box 44486
Baton Rouge, LA 70804

Gentlemen:

In compliance with R.S. 56:325.4(D)1 and R.S. 56:333(G)1, enclosed are the annual reports on striped mullet, black drum, sheepshead and southern flounder which include stock assessments and spawning potential ratios. Bioprofiles are not included since there were no substantive changes from last year. Also included are comments received from peer review. These reports were adopted by the Louisiana Wildlife and Fisheries Commission at its February 3, 2005 meeting.

Sincerely,

Dwight Landreneau
Secretary

hb

Enclosures

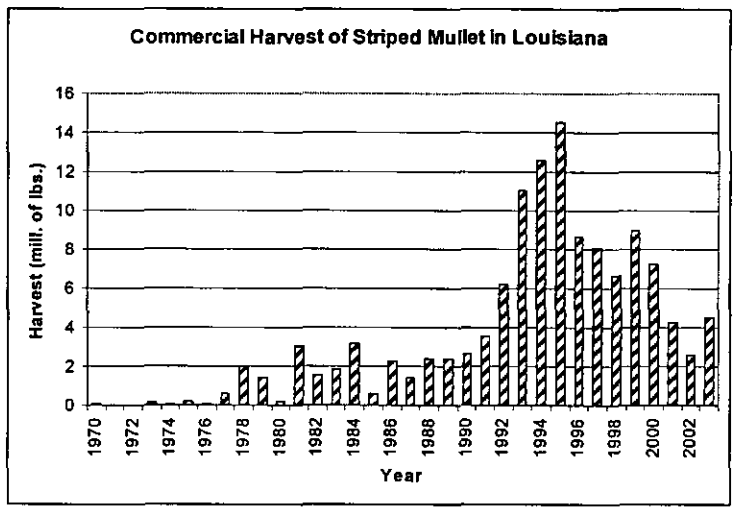
STRIPED MULLET
SUMMARY OF CHANGES FROM 2004 ASSESSMENT

This summary is intended to provide a quick reference of substantive changes in methods or corrections in this year's assessment from the 2004 assessment conducted for striped mullet.

- The method of estimating fishing rates was modified from a disappearance rate (Z') calculation to a virtual population-based calculation

2005 DOCUMENT HIGHLIGHTS

- 2003 commercial landing of 4.5 million pounds was about 57% of the average for the period since 1991.



- The conservation standard for striped mullet is 30% spawning potential ratio (SPR). The results of yield per recruit analysis indicate that if M=0.3 (the value within the range of estimates that allows the lowest allowable harvest), the current fishery is operating above $F_{0.1}$ and F_{MAX} with yield of about 98% of maximum, and SPR near 31%. An M of 0.6 would indicate a more lightly fished stock with yield being about 83% of maximum and with SPR being near 65%.

- The methods used in this assessment to determine the status of the stock, reflected in the estimates of disappearance (declines in numbers of harvested fish as they age) do not immediately respond to changes in regulations. Mullet enter the fishery at age 1 or age 2, and are fully recruited by age 5 or 6. It takes several years of consistent regulations after regulations are imposed before disappearance rates would accurately measure the impact of those regulations, since the method relies on the relative abundance of the age-classes in the fishery. In the case of mullet it would take 4 years of consistent regulations, assuming selectivities of age 5 and older is 100%.

- As a result of having several years of commercial trip ticket data, and collecting recreational fishery statistics data, the department was able to begin a program to representatively sample fishery dependent otoliths in 2002. The program uses trip ticket data and recreational survey data to weight sampling sites for the collection of otoliths for the species of interest. It is

expected that this method of otolith sampling will improve stock assessments by providing more accurate annual catch-at-age data.

STRIPED MULLET
5.0 STOCK ASSESSMENT

This assessment uses yield per recruit (YPR), spawning potential ratio (SPR) and catch curve analyses to estimate the impact of current fishing pressure on the potential yield and the spawning potential of the Louisiana striped mullet stock. Estimates of YPR and SPR are based on knowledge of the growth of the fish, and on estimates of the natural mortality rate (M) and fishing mortality rate (F) on the stock. Catch curve analysis is used to calculate the estimated effects of fishing mortality rates for ages that are predicted to be present in the population, but that are not adequately represented for the SPR analysis.

The spawning biomass of females is assumed to be the factor limiting the spawning potential of the stock. Therefore, this analysis uses growth rates for female mullet, and considers the effects of fishing on the female portion of the stock. The results of this type of assessment provide a generalized approach for estimating the impact of fishing on the spawning potential and the potential yield of the fish stock.

As with any assessment, the results are subject to the limitation of the data from which they are derived. The present analysis should be used only as guidance until more comprehensive analyses, using additional data collected consistently over an extended time span, can be conducted. In 2002, the department began a program to representatively sample biological information from harvest of fisheries important to the State. The program uses trip ticket data and recreational survey data to weight sampling sites for the collection of ages and sexes of the harvest for the species of interest. It is expected that this method of sampling will improve stock assessments by providing more accurate annual catch-at-age data.

For striped mullet, samples collected in 2003 provided the first year where there was adequate sample size to examine the variation in results of the stock assessment, compared to utilizing the age-length key used in previous assessments. However, the 2003 age-length key has a much smaller sample size than our previous age-length key, so this analysis is presented here as a sensitivity analysis.

The definition of the unit stock must be considered in the development of a stock assessment. While a unit stock is often defined as that portion of the population which is genetically similar, for our purpose in this stock assessment, the most applicable definition seems to be one which considers the unit stock as that portion of the stock which is either dependent on Louisiana waters, or which is available to Louisiana fishermen. We recognize that the geographic distribution implicit in this definition of unit stock is likely to be different from the genetically based definition, given the wide geographic distribution and offshore spawning grounds of the species (Mapes *et al.* 1998). We chose to use this definition because it provides the best picture of the Louisiana fishery, and we do not have information with which to quantitatively define fishing mortality on a regional basis. Information from tagging studies along the west coast of Florida (Mahmoudi, 1991) indicates that once recruited to an estuary, mullet have a strong tendency to return to that estuary after spawning offshore. If this tendency is also expressed in Louisiana, then fishing mortality rates in one area of the state would primarily affect the abundance of the adult population in that area, and not in other areas, unless fishing mortality rates over the entire spawning pool were high enough to affect recruitment on a wide scale.

For purposes of this assessment, we did not consider the effects of recreational harvest on the stock. The best information available at this time indicates that recreational harvest is relatively light, typically less than 200,000 pounds of fish per year (National Marine Fisheries Service, Marine Recreational Fishing Statistics Survey, 1981-2003) (Table 5.1). Based on the sparse length frequency distribution of surveyed fish, most of the recreational harvest is at a size prior to entry into the commercial fishery. The available data suggest that inclusion of recreational harvest data would not have any appreciable effect on the analyses we used.

Commercial harvest has varied over time (Table 5.1, Figure 5.1), with reduced harvest after a peak in 1995. The fishery is not evenly distributed over the state, but is concentrated in the southeastern region, and mainly east of the Mississippi River (over 80% of the harvest is typically from that region).

The estimates of fishing mortality and other portions of this analysis must assume that either the distribution of the fishery does not change, or that all fish in the state are equally available to the fishery for predictive yield calculations to be reasonably accurate. Without knowledge of movement of adult mullet over the entire year, it is difficult to infer how much of the population is actually exposed to the fishery. Only that portion exposed to the fishery is described here.

Mullet exhibit differing growth rates and variable fishing pressures across the state, creating challenges for a comprehensive assessment. For the most part, data was limited to that collected from the easternmost part of the state, approximately from Barataria Bay to the Mississippi State line, to reflect the distribution of the fishery. For data from 2002-2003, all data was included in the assessment, since the data collection protocols under the new biological data collection program are designed to represent the distribution of the fisheries being sampled (Table 5.2). No detailed examination was made of the distribution of samples compared to the distribution of the fishery, but this should be a priority for future stock assessments.

The current commercial harvest season for striped mullet runs from the 3rd Monday in October until the 3rd Monday of the following January. Prior to 1995, harvest occurred year-round, though a peak in harvest occurred during the roe fishery, which is in these months. Changes in seasonality of harvest are not considered in this analysis.

5.1 Growth and Fecundity

Thompson *et al.* (1991) described growth of striped mullet from Louisiana waters. They found significant differences in growth rates between sexes of mullet, and in growth rates from different parts of the state. For this assessment, a von Bertalanffy growth equation was developed from aged samples of female striped mullet from East of the Mississippi River provided by Thompson (pers. comm.). Growth rates from this area were used since this area of the state provides the majority of the harvest. We reanalyzed these data, combining them with juveniles assigned to age 0 by length frequency analysis from Louisiana Department of Wildlife and Fisheries' (LDWF) fishery-independent seine samples (Mapes *et al.* 1998, Figure 2.1). These data were used to estimate a three-parameter von Bertalanffy growth equation:

$$L_t = L_\infty * (1-e^{(-k(t-t_0)})$$

where L_t is the length at age (t) in years, L_∞ is the maximum length, k is a parameter describing the rate of growth, and t_0 is the intercept of the function on the time axis. The function was estimated using nonlinear approximation procedure (SAS, 1987). The parameters derived from this method were: L_∞=453.9, k=0.332, t_0=-0.05. These parameters were used in some methods of estimating natural mortality, and yield per recruit.

Fishery-dependent length samples of female mullet were assigned ages through the use of an age-length key (ALK). This key utilized fish aged from sectioned otoliths by Dr. Bruce Thompson (LSU Coastal Fisheries Institute, unpublished data, Table 5.3). The age-length key categorized fish in increments of one-inch (25.4 mm) total length. Fish with only fork length measurements available were converted to total length using the equation provided by Thompson *et al.* (1991) (TL=1.13*FL-3.40, r^2=.995). Only data from female mullet was included (males, immature fish, and fish where sex was not recorded were all deleted). Thompson's data included fishery-dependent samples from purse seine samples from Mississippi waters, and from mullet in the Sabine (LA) Refuge impoundment. These were deleted, as the length/age relationships for these fish are expected to differ from the fish harvested in the current and recent Louisiana fishery. Most fishery-independent and recreationally-based collections were deleted from analysis for the same reason. However, the age distribution for 11-inch fish was derived from fishery-independent samples since no fishery-dependent ages were available for that size class. This size class represented less than one percent of the total commercial harvest, so any error due to mis-assignment of ages should have minimal impact on the assessment. In all 3,580 female mullet were used in the development of the ALK (Table 5.2).

As noted earlier, the fishery is concentrated in the area east of the Mississippi River, and in the Mississippi River delta. Examination of fishery-dependent age-length keys and length-frequency samples from different areas of the state demonstrated substantial differences in length-frequency and in age-at-length between areas. Therefore only samples taken East of 90°W longitude were included in this assessment. Exclusion of the samples from the remainder of the state should provide a more accurate assessment of the potential yield of the area where the majority of the fishery operates. Spawning potential ratio (SPR) estimates specifically calculated by this method would not be valid for the state as a whole, but should be a more accurate representation of the status of the fished portion of the population in this region.

For a sensitivity analysis, a separate ALK was developed from fishery-dependent female mullet collected from the fishery in 2003. There were 762 female mullet sampled from the fishery for length, including 417 usable ages from the same samples (Table 5.4). Usable ages met the criteria of having the same age value from two different readers of the sampled otolith. The ages from the directly aged fish were expanded through use of two ALK's – the one developed from the 2003 samples, and the key developed from the data of Thompson et al., (1991). The purpose of this analysis was to evaluate variability in age class assignments and status of the stock depending on the source of the age-length key. With only two samples for comparison, no firm conclusions can be made, though some remarks can be made on variability between the results of the analyses.

Fecundity is estimated from the length/fecundity relationship of Thompson *et al.* (1991) where:

$$\text{Fecundity}=5.6\text{x}10^{-3}(\text{FL})^{3.18}$$

Fish were assumed to be sexually mature at age 2.

5.2 Natural Mortality

There was no change in the techniques used or the input parameters for estimation of natural mortality for striped mullet since the development of the 1997 and 1998 reports. The various estimates and the citation describing the methodology used to derive that estimate are listed below.

Citation	Input parameters	Natural Mortality estimate
Pauly (1980)	k =0.332 L_∞ =453.9 water temperature (°C)=22.7	$M_{\text{schooling fish}}$ (est.*0.8)=0.56 M_{clupeids} (est.*0.6)=0.42
Hoenig (1983)	$\text{Age}_{(\text{max})}$=10	M=0.42
Alagaraja (1984)	99% of fish die by Age 10 99.9 % of fish die by Age 10	M1%=0.46 M0.1%=0.69
Beverton and Holt (1959)	1.5 to 2.5 von Bertalanffy growth parameter (k), k=0.332	M=0.50-0.83

Two estimates of natural mortality (M) are available for striped mullet in the existing literature. Pauly (1980) cites Ih-Hsiu (1970) as reporting an M of 0.31 for male striped mullet from Taiwan. Mahmoudi (1991) estimated M as 0.30 using tagging data from southwest Florida.

Some investigators (Restrepo *et al.* 1991, Helser *et al.* 1992) have attempted to use a range of estimates of M and incorporate variation within this range as a variable in their analyses of other fish species. However, the selection of the range to be used, and the distribution of M estimates within that range remains arbitrary. We have chosen, rather, to select several point estimates of M, and to present the results of changes in the estimate. We have presented estimates based on M values of 0.3, 0.4, 0.5, and 0.6. This provides an understanding of the differences resulting from various estimates of M, without implying any additional precision.

In this report, an M of 0.3 is the most conservative estimate of natural mortality. This estimate may be low, based on the lack of mullet older than 10 years in the Western part of Louisiana, though there has never been an established mullet fishery in that area. Lack of striped mullet older than 10 years of age would indicate an M of about 0.4-0.45. A lower value of M results in higher estimates of F in the analysis. If the actual value is above estimates used here, estimates of fishing mortality from the analysis will be

lower than estimated here. Additionally estimates of spawning potential ratio at any level of fishing mortality would also be increased, and potential yield will be higher than estimated with that value. A low estimate of M would also increase the harvest age structure required to maximize yield, which could influence proposed size or gear regulations.

5.3 Disappearance Rates and Fishing Mortality

It must be recognized that any estimate of disappearance (Z or Z') from the fishery includes both the total mortality while the fish is exposed to the fishery and the availability of the fish to the gear. Availability as used here includes both changes in distribution or behavior of the fish that might change effectiveness of the fishery (e.g. migration, food preference, etc.), and size or other selectivity of the gear or fishery. The predominant gear in the Louisiana mullet fishery at the present time is 3½ -4 inches stretch gill net, though some larger mesh sizes are occasionally used (see Mapes *et al.*, 1998). Gill nets are size selective for mullet; therefore estimates of disappearance likely reflect fishing mortality confounded by some degree of gear selectivity. For the present analysis, no estimation of gear selectivity or availability to capture was available for fish beyond full recruitment.

Length frequency data from the mullet fishery was derived from Trip Intercept Program (TIP) sampling and a LDWF biological sampling program (Table 5.2). These data were available for the fishing years 1994-2003. The data from 2003 are used to estimate the current status of the stock for this report.

The length frequency samples were aged, using the base-case age-length key described above (Table 5.3) to estimate catch-at-age. The harvest at age was estimated from the application of the age-length key to the lengths of female striped mullet sampled in the year multiplied by the overall commercial harvest for the year. For ages where no fish were harvested (age 0 in all cases, ages 0-1 in some cases), one fish was added to the harvest at those ages. The resulting estimated ages were all used in the VPA analysis; no "plus" groups were used. The catch-at-age was used to derive age-specific fishing mortality rates to be used in spawning potential calculations and yield-per-recruit analysis.

The resulting estimates of harvest at age were run through a VPA (Jones, 1984) to determine age-specific mortality rates, using the Solver tool in MS © Excel to iteratively calculate B, such that Q(t) = B(t) by varying F. The estimation procedure was constrained to F=>0.00001, precision of the solution set to 0.000001, convergence set to 0.0001, de-selecting the linear models option of Solver, using the quadratic estimation procedure, central derivatives, and the quasi-Newton search methods. This process was semi-automated through development of a macro to step through the annual estimation process. A range of terminal F was input manually, from 0.1 to 1.0.

In previous assessments, the method of Sparre and Venema (1992) was used to develop selectivities. That method uses a linearized catch curve to determine the selectivity of fish not yet fully recruited to the fishery. The ratio of the observed catches to the expected catches at each age is the probability of capture or selectivity of the fishery at age. Selectivities are then regressed in the equation:

$$\ln(1 / S_t - 1) = T1 - T2 * t$$

where, S_t = the selectivity at age t, and T1 and T2 are constants corresponding to the intercept and slope of the regression. To develop theoretical or estimated selectivities at age the following equation is used:

$$S_t \text{ (estimate)} = 1 / (1 + \exp(T1 - T2 * t)$$

In these previous assessments, selectivities for ages up to full age-at-recruitment were used to describe the relative fishing mortality to that point; for age at full recruitment and older, selectivities are assumed to be 1, or 100% selected. Selectivities used were as follows:

Ages (Females)	Relative selectivity
0	0
1	0.0011
2	0.0372
3	0.2616
4	0.7780
5 and over	1.0

Disappearance rates (Z') were then derived by regression of the descending arm of the catch curve. For comparison with the current assessment, Z' values were calculated for 2003, using these same values.

For the current VPA-based assessment, a slight modification was necessary to estimate contributions of yield and spawning potential by age. The estimated F at age was input into the YPR analysis by assigning selectivities of all ages in the assessment relative to the F at age of fully recruited fish. Age at full recruitment was limited to an age class of age 6 or lower, and was age 5 or 6 in this assessment. Benchmark values were calculated by varying F at the fully recruited age, assuming that selectivities would not change for other ages.

It should be noted that there was no attempt to incorporate indices of recruitment or abundance into the current VPA assessment.

5.4 Yield per Recruit

Yield per recruit (YPR) analysis provides basic information about the dynamics of a fish stock by estimating the impact of mortality rates on yield and spawning potential of the stock. The results can be examined as to the sensitivity of natural and fishing mortality rates on yield and spawning potential.

In general, use of YPR analysis requires:

1) information on natural and fishing mortality rates,
2) knowledge of the growth parameters of the fish.

In previous assessments, the yield per recruit (YPR) analysis included several assumptions. A fish was assumed to consistently recruit to any given fishery at a given age; that is, selectivity by age did not change over time. Partial recruitment of fish was estimated from the relative abundance of age 1 through age 4 fish in the TIP samples compared to age 5 and over fish, which are fully recruited. Once the fish are fully recruited to the fishery, fishing pressure is assumed to be at a constant rate. That YPR analysis did not take into account any variation in exploitation rates or other factors which may affect the results. The results of this methodology are presented in Table 5.5 for comparison with the results of the new assessment.

In the current analysis, the F at age was applied to the YPR analysis based on the results of the VPA for that year. Striped mullet were typically estimated to have highest values of F as ages 5 or 6, for the M=0.3 estimates. While there were occasions when even older ages were found to have higher F, these are probably due to inaccuracies in age assignment from the age-length key, since it seems improbable that such inefficiencies would exist in the fishery. However, the calculated values are carried through the YPR and SPR analyses, rather than assigning a selectivity of 1 to ages beyond full selectivity. This has the effect of lowering the estimates YPR and SPR if the estimates of F at these older ages are higher than the estimate of F at the assigned age of full recruitment.

Those age-specific mortality rates were applied to a yield per recruit model, using the von Bertalanffy growth parameters described in Section 5.1. Age-specific fishing mortality rates were selected as the average of the F at age from the $F_{terminal}$=0.4 to $F_{terminal}$=1.0. These rates were used in the analysis because all F's were very similar at younger ages, this range of $F_{terminal}$ included the estimate of maximum F seen in most cases, and the F's from this range tended to converge relatively quickly. Figure 5.2 shows the results of the base case VPA estimates of F at age, while Figure 5.3 shows the results of the sensitivity analysis using the 2003 ALK.

The YPR analysis calculated estimates of yield out to age 13. Estimates of F at ages between full recruitment and $F_{terminal}$ were directly input into the YPR analysis, though there was substantial variation between F at age depending on the analysis. Since the initial estimates of F were for age 10 fish for the base model ALK, we included VPA estimates of F from ages 9 and less. Selectivities for ages equal to the terminal ages in the VPA and older were set to the same as selectivity at full recruitment. For the base case ALK, ages 10-13 were assumed to be fully recruited, with F at the same level as seen for ages 5 or 6, whichever was the maximum F for that assessment run. For the 2003 ALK, ages 2-8 were represented, so

ages older than 7 were assumed to be fully recruited for those YPR analyses, and assumed to be harvested at the same rate as the fully recruited age 5 or 6 fish.

Methods used for estimation of natural mortality (M) and fishing mortality (F) rates in this analysis are presented in Sections 5.2 and 5.3 above. The existing mullet fishery is mainly a roe fishery, targeting female fish (Thompson, 1989). Therefore, we have used the growth parameters for female mullet to calculate yield per recruit.

The results of this analysis are presented in Table 5.6, which contains estimates of F_{MAX} (fishing mortality rate that produces maximum yield), $F_{0.1}$ (fishing mortality rate representing 10% of the slope at the origin of a yield-per-recruit curve), $F_{20\%SPR}$ (fishing mortality that produces 20% SPR), $F_{30\%SPR}$ (fishing mortality that produces 30% SPR), and annual estimates of F from the year-specific and ALK-specific VPA calculated in Section 5.3.

Selectivity patterns of the fishery varied, depending on the estimate of M. As a result, stock benchmarks are recalculated for the estimated harvest at age for each estimate of natural mortality, so that the estimates of $F_{0.1}$, $F_{20\%SPR}$, $F_{30\%SPR}$, and F_{MAX} as well as the annual SPR estimate will vary. Therefore, the results of this analysis, reflected in Table 5.5 and 5.6, could change each year depending on any change in the estimated selectivity patterns of the fishery. Tables 5.5 and 5.6 represent only the values of the benchmarks $F_{0.1}$, $F_{20\%SPR}$, $F_{30\%SPR}$, and F_{MAX} compared to the estimates from the most recent year of available information.

5.5 Conservation Standard

Conservation standards are based on one of a number of biological measures of the dynamics of fish stocks, intended to protect the viability of that stock for future generations. These standards have historically been based on different measures of the dynamics of fish stocks, depending on the data available, the needs of fishery and of the resource. Conservation standards should be separated into two types: a conservation threshold which is entirely biologically based, and a conservation target which considers biological measures modified by relevant social, economic, and ecological factors.

Conservation "thresholds" are intended to provide a biological baseline for harvest of a fish stock based on stock recruit relationships, or other biological parameters specific to the stock, if possible. This baseline standard, below which the stock should not be allowed to go, has been described as a "threshold" by some researchers, and has also been referred to as an "overfishing level" (GMFMC 1995). Beyond this "threshold", management "targets" may be set, which provide for other management goals in the fishery. Such goals may be in terms of yield in weight, yield in numbers of fish, catch rate per effort, harvest rate per effort, employment, profit, or some other goal. These targets must be set at a fishing rate below the "threshold" in order to ensure that the biological integrity of the stock is not unduly compromised by fishing.

Spawning stock biomass per recruit (SSBR) or spawning potential ratio (SPR) has become widely used as a measure of stock condition. This measure compares the estimated female spawning biomass of

the stock that survives fishing with the estimated biomass of the stock under unfished conditions. The analysis does not take into account any density-dependent relationships due to the changes in the size of the fished stock. Using the Spawning Potential Ratio (SPR) concept as developed by Gabriel et al. (1984) and refined by Goodyear (1991), a "threshold" value can be defined that provides a minimum spawning stock biomass (or egg production) per recruit, below which existing data cannot evaluate impacts to future recruitment, and below which the fishery should not be allowed to operate.

Ideally, "threshold" levels should be evaluated from information on the stock in question. However, the information base necessary to adequately describe this level is often not available. In such cases, it has been recommended by Goodyear (1989) that a spawning stock biomass per recruit (SSBR) or SPR of 20% be used as a "threshold" in absence of sufficient evidence to provide a standard specific to the stock in question. This standard is also based on work on North Atlantic groundfisheries (Gabriel et al. 1984, Gabriel, 1985). A SSBR of 35% has been recommended for Spanish mackerel, and 20% for king mackerel (GMFMC 1990, 1995). A SSBR of 8-13% has been demonstrated to be sufficient for Gulf menhaden (Vaughan 1987). In prior analyses of the Louisiana spotted seatrout fisheries (LDWF 1991), we recommended an SPR of 15% after analysis of several years of available data. Mace and Sissenwine (1993) examined 90 stocks of 27 species, and recommended that 30% SPR be maintained when there is no other basis for estimating the replacement level. That level is sufficient for 80% of the stocks considered by those authors. They also noted that 30% may be overly conservative for an "average" stock. The average replacement %SPR for the stocks they considered was 18.7% while the most resilient quarter of the stocks considered required a maximum FREP of 8.6% SPR. Three-quarters of the stocks required a maximum FREP of 27.1% SPR. In a prior assessment of striped mullet (Shepard et al., 1992), a SPR of 20% was recommended as the conservation standard for the Louisiana fishery. This standard was considered, rather than 30% SPR, due to several factors: the fishery is mainly prosecuted on the stocks of mullet east of the Mississippi River, and the estimate of SPR is based on only the fished stocks. The relatively unfished stocks to the west of the Mississippi River are only minimally considered in the assessment, with the result that the SPR ratios are underestimated.

Sufficient information is not available to directly estimate a conservation threshold for striped mullet in Louisiana. However, the conservation target of 30% SPR established by Act 1316 of the 1995 Regular Session of the Louisiana Legislature for black drum sheepshead, southern flounder and striped mullet appear to be adequate to maintain the striped mullet stock and prevent recruitment overfishing.

The use of any measure of health of a fish stock as a perfect index is arguable. Intuitively it seems more logical that growth overfishing would occur at a much lower fishing rate than would threaten recruitment. However, Mace and Sissenwine (1993) provide information to suggest that some stocks may have reduced levels of recruitment at levels of fishing that would not reduce yield per recruit. The preferable position for making recommendations on appropriate levels of fishing for a stock is to base those recommendations on actual measures of spawning stock and recruitment for that species, in the same fishery. This requires a base of information on that fishery that requires monitoring of both the stock and the fishery over a variety of conditions. Without this information, inappropriate conservation standards may either underestimate or overestimate the potential of the fishery. If the potential is underestimated, the society loses the economic and social benefits of the harvest. If the potential is overestimated, the society

also loses the benefits of a sustainable fishery, which must at least go through some period of rebuilding, when effort must be reduced from the non-sustainable levels (Hilborn and Walters, 1993).

5.6 Status of the Stock

Recent Regulatory History

Harvest declined after 1995 as a direct result of regulations implemented August, 1995 eliminating the harvest of mullet outside of the period between the 3rd Monday in October through the 3rd Monday of the following January. Regulations also outlawed fishing for mullet at night, on weekends, in freshwater areas, and using gear other than strike gill nets.

Legislation allowing the use of hoop nets in freshwater areas for taking mullet was enacted in 1999. The law required that no leads be used on the hoop nets, no harvest or possession of mullet from between the hours of official sunset and official sunrise, and mullet caught in the freshwater areas of the state could not be possessed by commercial fishermen in the saltwater areas of the state.

Three legislative acts were passed in 2001. Act 51 defined certain portion of the Intracoastal waterway, from the overhead power lines at the Interharbor Navigation Canal east to the Rigolets, in Orleans Parish as saltwater and freshwater for the purposes of possessing regulated gear and allows the harvest of mullet in that area in addition to a portion of Lake Pontchartrain located south and east of the I-10 bridge as long as commercial fishing operations in these waters will not interfere with normal commercial traffic. Act 116 statutorily created a mullet task force to advise LDWF on certain issues. Act 147 adopted a "three-strikes and you are out" penalty system within the commercial mullet fishery: first conviction, one year permit suspension, second conviction two years suspension, third conviction lifetime permit ban.

Trends in Harvest and Abundance

The trends in harvest for striped mullet in the Louisiana fishery have been reviewed by Mapes *et al.* (1998). Commercial landings prior to 1991 was obtained from NMFS's General Canvass Landing Program, from 1991 through 1998 landings was collected through the LDWF's Monthly Dealer Reports and from 1999 to present LDWF's Commercial Reporting Requirement "Trip Tickets" program is utilized to gather this type of data. Recreational landings were obtained through the NMFS's Marine Recreational Fishery Statistics Survey (Table 5.1). Harvest increased in the early 1990's, as the commercial roe fishery continued to develop (Figure 5.1). Harvest declined after 1995 as a result of regulations implemented in August, 1995 which limited access to the resource through seasons, and eliminated fishing on weekends or at night. Variability is also due to market uncertainty and possibly variable stock abundance or availability factors.

Annual recruitment of mullet has been evaluated from fishery-independent seine and experimental gill net samples taken statewide since 1986. Catch/effort information are compiled for January through

May of each year, and the abundance is measured as ln((catch+1)/effort). Seine catches of fish larger than young-of-the-year (>70-100 mm, depending on month of the year) are removed from the calculation of abundance indices (Figures 5.4 and 5.5). Gill net data from 1.0", 1.25", and 1.5" (2.54, 3.175, and 3.81 cm.) bar mesh panels are used to provide relative abundance indices of mullet prior to harvest by legal saltwater commercial gears (Figure 5.6).

Seine CPUE indices show higher mean catches of young-of-the-year (YOY) from 1996 through 2001 of the seventeen years examined (1987-2003) but the 2002 and 2003 CPUE are consistent with levels prior to 1996 (Figure 5.4). Most of the fluctuations seen in recent years is due to variability in CPUE in the westernmost part of the state (Figure 5.5). As noted elsewhere, no commercial mullet fishery exists in this portion of the state, so unless there is substantial movement between estuaries, this variability in recruitment should not influence the population available for commercial harvest in the areas where the current commercial fishery is concentrated. There appears to be no long term downward trend in YOY indices for the years examined.

Gill net CPUE indices seem to cycle throughout the period examined with relatively lower mean estimates of CPUE after 1998 (Figure 5.6). There is some question however, after reviewing the relatively consistent annual pattern of different mesh sizes, whether the gill net samples actually measure relative abundance or simply measure annual availability to the sampling gear. One would expect to find more annual variation among mesh sizes as fish grew and became increasingly available to the larger mesh size. There does seem to be an annual pattern found between the mesh sizes with the last five years being relatively lower than previous years in the 1 inch and 1.25 inch bar mesh samples.

Estimates of Yield and Spawning Potential

The results of carrying forward the assessment methodology from the 2004 analysis are presented in Table 5.5. These analyses are mainly presented for comparative purposes. As in prior years, the results indicate that if M=0.3, the current estimates of yield are near maximum yield per recruit (about 99 % of maximum), and SPR is about 32%. Levels of M at M=0.4, 0.5, and 0.6 produced SPR estimates of 44%, 55%, and 65%, with YPR of 100%, 95%, and 85% respectively.

The VPA analysis (Table 5.6) produced similar results to the prior assessment. The results of the base case YPR analysis indicate that if M=0.3 (the most conservative value within the range of estimates), the current fishery is operating above $F_{0.1}$ and F_{MAX} with yield of about 98% of maximum, and SPR at about 31%. An M of 0.6 would indicate a much more lightly fished stock with the current fishery operating near $F_{0.1}$, yield being about 83% of maximum, and with SPR being about 65%.

The change in methods of calculating harvest rates in the current assessment changed the estimated parameters slightly. The VPA-based method of calculating fishing mortality resulted in slightly higher estimates of F than the previous method. However it did not change the condition of the stock relative to the conservation standard in any of the cases examined.

The sensitivity analysis conducted with the 2003 age-length key showed little variation from the base case assessment (Table 5.6). The results of these VPA's are only presented for the highest and lowest

estimates of natural mortality. In both cases, the 2003 ALK provided an estimate of SPR 2.5-3% higher than the base case ALK. It should also be noted that use of the 2003 ALK also changed the benchmark yield and SPR estimates, due to changes in age assignments.

The two age-length keys showed substantial variation (Figure 5.5). Some of this variability could be due to variability in cohort strength, the locations from which the samples were taken, gear variability, sample size, or other factors. Though no fish over 8 years old were found in the 2003 samples, that ALK showed higher overall representation of ages 4-7 than the base case ALK did.

There was substantial variation in the length frequency in the sample of the striped mullet that were aged in 2003 when compared to the non-aged sample. Aged mullet tended to be smaller than un-aged mullet, both from statewide samples and from the eastern portion of the state (Figure 5.7). Nearly all of the samples came from the eastern portion of the state, so the influence of the remainder of the state should be minimal. When the 2003 ALK was applied to the overall 2003 fishery-dependent sample of mullet lengths, there was little change in the estimated harvest at age compared to the simple age distribution of the 2003 ALK. On the other hand, there was some variation between the ages estimated by applying the 2003 ALK and the base case ALK to the length frequencies from 2003 (Figure 5.8). At this point, it is impossible to say which analysis does the best portrayal of the harvest at age. The base case ALK has the benefit of a larger sample size, while the 2003 sample is a sub-sample of the fishery in that year, so should have reduced effects from variable cohort strength.

In all of these analyses, assumptions listed in prior sections of this report have a strong influence in the results. If M is actually near or above the upper end of the range considered here then increases in yield per recruit would be possible, and SPR would be above the minimum estimated values. Estimates of potential yield presented here do not account at all for potential extension of the fishery into areas of the state that do not now have a significant fishery. Any substantive change in geographic distribution of the fishery could substantially change the overall harvest levels.

Based on this generalized assessment, for all natural mortality rates examined, if fishing mortality rates continue at the current levels, then striped mullet are not being harvested at a rate that would drive the stock below the target SPR of 30% established by the Louisiana Legislature.

5.7 Research and Data Needs

As with any analysis, the accuracy of the assessment is dependent on the accuracy of the information on which it is based. The present analyses, along with the biological data presented by Mapes *et al.* (1998) identify several areas for research to address.

Estimates of natural mortality used in the present assessment are derived from general literature sources, and show wide variation. This variation reduces the potential of the present assessment to provide a precise prediction of the yield potential of the stock, and also reduces the confidence level of the present estimate of SPR. A more precise estimate of natural mortality, based on Louisiana data, would assist in both of these problems.

Definition of sub-populations based on migratory patterns would help define exploitation rates within different areas of the state. This may help managers develop area-specific management to optimize yield from a given stock, while protecting the stock from over-harvest.

Recruitment mechanisms are poorly defined for the species. Mullet are suspected to spawn beyond the shelf break in the central Gulf of Mexico. No genetically distinct stocks have been identified within the Gulf. However, lack of genetic distinctness does not necessarily mean that stocks are homogeneously mixed by spawning and recruitment mechanisms, only that populations are not so removed from each other that gene structure is identifiably different. Better understanding of recruitment mechanisms, merged with measurement of oceanographic or other driving forces could help in understanding the sub-genetic distinctiveness of mullet populations from different regions of the state or the Gulf of Mexico.

Factors that influence the year-class strength of mullet are essentially unknown. Investigation of these factors could help better define causes of inter-annual variation in abundance, and perhaps also the underlying stock-recruit relationships in the species.

The relationship between wetlands losses or modifications and the continuation of fishery production within the state has been discussed by many authors. However, this relationship is likely to be different for any of a suite of different species. Understanding of this relationship for mullet should be an ongoing priority.

The age-length key used in the current assessment should be updated with adequate fishery-dependent age data to accurately characterize the current age structure of the commercial harvest on an ongoing, consistent basis. The distribution of fishery-dependent samples should be evaluated to ensure that those distributions accurately reflect the fishery in terms of geographic distribution, seasonality, and other descriptive parameters. Analyses to estimate adequate sample size for a given level of precision also need to be developed.

Indices of harvest effort and stock recruitment or abundance should be evaluated for possible incorporation into future stock assessments.

In the presence of changing regulations, fishery-dependent information is not a reliable source of the data necessary to assess the status of a fish stock. However, such data is necessary to measure the effects of fishing on that stock. Consistent fishery-dependent and fishery- independent data sources, in a comprehensive monitoring plan, are essential to understanding the status of fishery stocks, and to identifying causes of changes in stock abundance. Present programs should be assessed for adequacy with respect to their ability to evaluate stock status, and modified or enhanced to optimize their capabilities.

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Table 5.1. Annual commercial and recreational harvest of mullet from Louisiana waters, expressed in pounds. Commercial harvest values from dealer landings reports, recreational harvest from NMFS MRFSS estimates of fish landed plus those discarded dead.

	Commercial Harvest (lbs.)	Recreational Harvest (lbs.)	Total Harvest (lbs.)	% Commercial
1981	3,051,461	564	3,052,025	99.98%
1982	1,533,452	16,546	1,549,998	98.93%
1983	1,886,654	0	1,886,654	100.00%
1984	3,157,215	2,793	3,160,008	99.91%
1985	579,297	7,504	586,801	98.72%
1986	2,277,713	52,921	2,330,634	97.73%
1987	1,439,425	0	1,439,425	100.00%
1988	2,367,106	105,876	2,472,982	95.72%
1989	2,413,768	75,287	2,489,055	96.98%
1990	2,645,927	296,111	2,942,038	89.94%
1991	3,563,137	26,303	3,589,440	99.27%
1992	6,214,532	121,273	6,335,805	98.09%
1993	1,026,497	185,012	11,211,509	98.35%
1994	2,560,261	97,509	12,657,770	99.23%
1995	4,545,610	89,626	14,635,236	99.39%
1996	8,658,881	216,838	8,875,719	97.56%
1997	8,083,201	129,917	8,213,118	98.42%
1998	6,252,317	15,459	6,267,776	99.75%
1999	8,954,299	48,766	9,003,065	99.46%
2000	7,252,017	88,202	7,340,219	98.80%
2001	4,260,650	115,618	4,376,268	97.36%
2002	2,555,181	58,901	2,614,082	97.75%
2003	4,516,399	3,309	4,519,708	99.93%

Table 5.2. Lengths of female striped mullet measured from the fishery by year.

Year	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Length (in)										
10		3	1							
11	36	15	12	3						13
12	122	66	174	77				3	31	72
13	128	90	345	282	1	2		35	47	154
14	140	124	226	241	7	19		52	63	179
15	190	180	149	218	43	40		36	38	184
16	146	239	123	301	39	90	10	39	9	120
17	42	283	122	235	52	136	16	39	4	34
18	8	218	116	139	49	152	38	60		6
19	1	170	86	53	51	196	44	33		
20		29	40	18	14	84	19	12		
21		7	13	13		17	6			
22		1	5			8	2			
Total female fish measured	813	1425	1412	1580	256	744	135	309	192	762

Table 5.3. Base case age-length key for female striped mullet. Data from female mullet aged by Dr. Bruce Thompson (unpubl.).

	Age										
	1	2	3	4	5	6	7	8	9	10	Total
Total Length (in)											
10	18	67	7	1			1				94
11	2	76	52	12	3						145
12	9	105	153	87	18	5	1				378
13	12	110	251	195	79	22	2	3			674
14	12	74	200	225	131	34	9	3			688
15	4	46	137	151	89	41	10	9	1	1	489
16	1	49	116	122	67	26	8	1	1		391
17		30	100	111	55	18	4	2	1		321
18	1	6	47	71	34	11	5	1	1		177
19	1	2	16	47	32	7	4				109
20		1	3	15	23	14	6				62
21			1	3	4	4	2		2	1	17
22				2	3	4	5	1			15
23			1		3	2	3				9
24					5	3	3				11
	60	566	1084	1042	546	191	63	20	6	2	3580

Table 5.4. 2003 Age-length key for fishery-dependent female mullet from 2003 fishery, used for sensitivity analysis.

Ages	1	2	3	4	5	6	7	8	9	10	Total
TL (in)											
10	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0
12	0	1	1	1	0	0	0	0	0	0	3
13	0	12	3	5	5	1	0	0	0	0	26
14	0	7	19	18	7	3	0	0	0	0	54
15	0	5	34	22	4	1	0	0	0	0	66
16	0	2	32	34	20	3	0	0	0	0	91
17	0	3	16	35	31	6	0	1	0	0	92
18	0	1	6	8	22	6	7	1	0	0	51
19	0	1	4	5	11	5	3	0	0	0	29
20	0	0	0	1	1	1	2	0	0	0	5
21	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0
Total	0	32	115	129	101	26	12	2	0	0	417

Table 5.5 - Results of Yield per Recruit and SPR Analysis for Mullet - previous assessment methodology

M=0.3	F - Ratio	YPR	SPR	%SPR	%YPR	
F-max =	0.5850	85.6159	439,818	38.85%	100.00%	Benchmarks
F0.1 =	0.3053	78.9245	601,324	53.11%	92.18%	
F20% =	2.2571	68.5867	226,433	20.00%	80.11%	
F30% =	0.9735	82.1891	339,650	30.00%	96.00%	
1997 =	0.8039	83.6759	351,435	31.04%	97.73%	Estimate
1998 =	0.8527	83.6619	363,137	32.07%	97.72%	
1999 =	0.6764	85.3078	408,540	36.08%	99.64%	
2000 =	0.5976	85.6091	435,118	38.43%	99.99%	
2001 =	0.8913	83.2078	355,092	31.36%	97.19%	
2002 =	0.7581	84.6615	385,510	34.05%	98.89%	
2003 =	**0.8129**	**83.9309**	**360,868**	**31.87%**	**98.84%**	

M=0.4	F - Ratio	YPR	SPR	%SPR	%YPR	
F-max =	0.8101	50.0885	250,745	41.58%	100.00%	Benchmarks
F0.1 =	0.3859	45.6088	339,417	56.29%	91.06%	
F20% =	4.6013	39.3975	120,602	20.00%	78.66%	
F30% =	1.7469	46.7168	180,903	30.00%	93.27%	
1997 =	0.6240	49.5523	279,996	46.43%	98.93%	Estimate
1998 =	0.7527	50.0475	258,704	42.90%	99.92%	
1999 =	0.5764	49.1670	289,377	47.99%	98.16%	
2000 =	0.4976	48.1690	307,309	50.96%	96.17%	
2001 =	0.7913	50.0844	253,262	42.00%	99.99%	
2002 =	0.6581	49.7514	273,826	45.41%	99.33%	
2003 =	**0.7129**	**49.9629**	**264,737**	**43.90%**	**99.75%**	

M=0.5	F - Ratio	YPR	SPR	%SPR	%YPR	
F-max =	1.1278	30.6657	151,911	44.19%	100.00%	Benchmarks
F0.1 =	0.4801	27.5558	205,191	59.69%	89.86%	
F20% =	8.7085	24.2838	68,757	20.00%	79.19%	
F30% =	3.1856	28.2872	103,136	30.00%	92.24%	
1997 =	0.5240	28.1728	199,371	57.99%	91.87%	Estimate
1998 =	0.6527	29.4285	184,977	53.81%	95.97%	
1999 =	0.4764	27.4983	205,706	59.84%	89.67%	
2000 =	0.3976	26.0199	217,807	63.36%	84.85%	
2001 =	0.6913	29.6840	181,294	52.73%	96.80%	
2002 =	0.5581	28.5771	195,203	56.78%	93.19%	
2003 =	**0.6129**	**29.1132**	**189,058**	**54.99%**	**94.94%**	

M=0.6	F - Ratio	YPR	SPR	%SPR	%YPR	
F-max =	1.6698	19.5110	94,370	45.56%	100.00%	Benchmarks
F0.1 =	0.5889	17.2172	130,425	62.97%	88.24%	
F20% =	14.9721	15.6350	41,424	20.00%	80.13%	
F30% =	5.5549	18.3016	62,137	30.00%	93.80%	
1997 =	0.4240	15.4430	142,500	68.80%	79.15%	Estimate
1998 =	0.5527	16.9091	132,766	64.10%	86.66%	
1999 =	0.3764	14.7098	146,779	70.87%	75.39%	
2000 =	0.2976	13.1726	154,948	74.81%	67.51%	
2001 =	0.5913	17.2367	130,273	62.90%	88.34%	
2002 =	0.4581	15.8970	139,682	67.44%	81.48%	
2003 =	**0.5129**	**16.5229**	**135,527**	**65.43%**	**84.69%**	

Table 5.6 - Results of Yield per Recruit and SPR Analysis for Mullet - new assessment methodology

M=0.3	Base case	F - Ratio	YPR	SPR	%SPR	%YPR	
	F-max =	0.6065	85.2679	430,495	38.02%	100.00%	Benchmarks
	F0.1 =	0.2864	77.5541	614,604	54.29%	90.95%	
	F20% =	1.9948	71.9377	226,433	20.00%	84.37%	
	F30% =	0.9499	82.8722	339,651	30.00%	97.19%	
	Base ALK	0.8709	83.6770	355,862	31.43%	98.13%	Estimate

M=0.3 Sensitivity run							
	F-max =	0.6572	84.8767	442,669	39.10%	100.00%	Benchmarks
	F0.1 =	0.2978	76.9471	629,540	55.60%	90.66%	
	F20% =	2.4965	71.4911	226,433	20.00%	84.23%	
	F30% =	1.1272	81.9872	339,650	30.00%	96.60%	
	2003 ALK	0.8542	84.1380	389,764	34.43%	99.13%	Estimate

M=0.4	Base case	F - Ratio	YPR	SPR	%SPR	%YPR	
	F-max =	0.8991	50.2976	240,495	39.88%	100.00%	Benchmarks
	F0.1 =	0.3848	45.0976	342,361	56.78%	89.66%	
	F20% =	3.8059	41.7098	120,602	20.00%	82.93%	
	F30% =	1.6638	48.2016	180,902	30.00%	95.83%	
	Base ALK	0.7590	50.1016	259,294	43.00%	99.61%	Estimate

M=0.5	Base case	F - Ratio	YPR	SPR	%SPR	%YPR	
	F-max =	1.3660	31.0751	143,162	41.64%	100.00%	Benchmarks
	F0.1 =	0.4956	27.2691	206,815	60.16%	87.75%	
	F20% =	7.2198	25.7465	68,757	20.00%	82.85%	
	F30% =	3.0098	29.5511	103,135	30.00%	95.10%	
	Base ALK	0.6680	29.2197	187,138	54.43%	94.03%	Estimate

M=0.6	Base case	F - Ratio	YPR	SPR	%SPR	%YPR	
	F-max =	2.2283	19.9445	87,725	42.35%	100.00%	Benchmarks
	F0.1 =	0.6335	17.0148	131,635	63.55%	85.31%	
	F20% =	13.2334	16.6554	41,424	20.00%	83.51%	
	F30% =	5.4212	19.0268	62,136	30.00%	95.40%	
	Base ALK	0.5808	16.5761	134,800	65.08%	83.11%	Estimate

M=0.6 Sensitivity run							
	F-max =	3.1748	19.8147	84,775	40.93%	100.00%	Benchmarks
	F0.1 =	0.6486	16.2198	136,312	65.81%	81.86%	
	F20% =	19.2323	15.7602	41,424	20.00%	79.54%	
	F30% =	7.2967	18.7527	62,136	30.00%	94.64%	
	2003 ALK	0.5833	15.7044	139,889	67.54%	79.26%	Estimate

Figure 5.1 Commercial harvest of mullet in Louisiana, 1970-2003. Source: NMFS landing statistics.

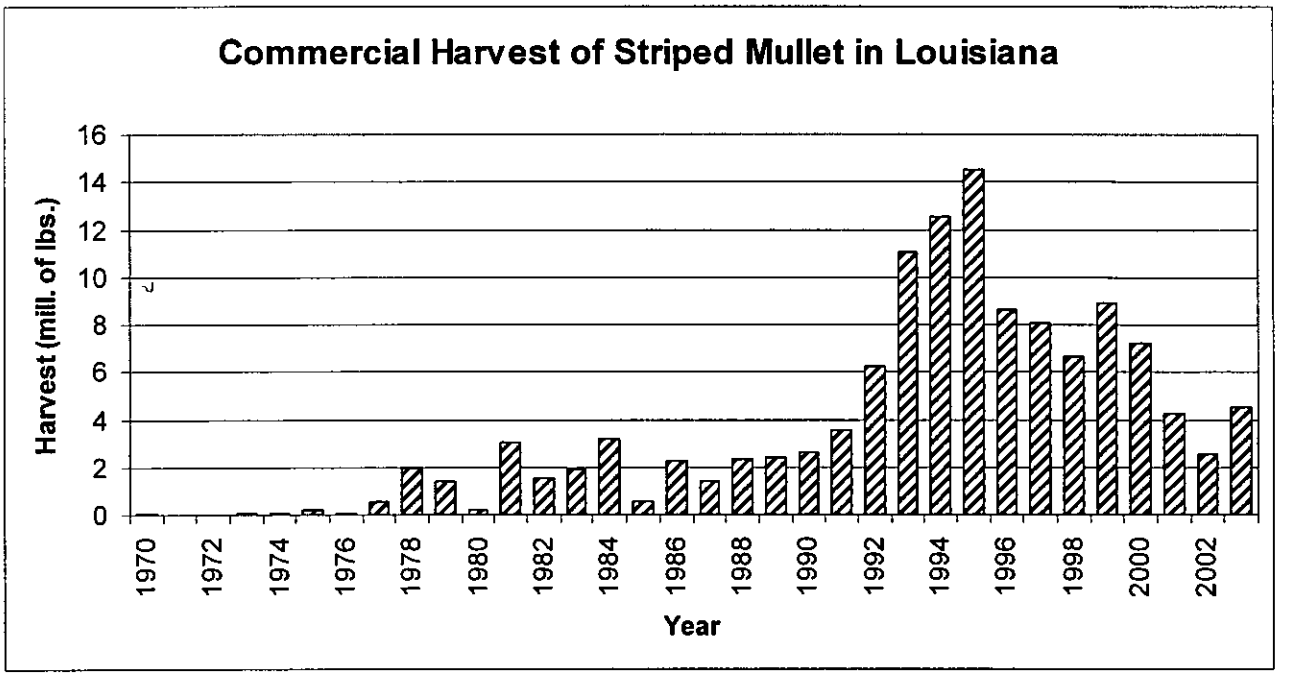


Figure 5.2. Base case estimates of F at age for Louisiana striped mullet in 2003 from VPA using various terminal F's, for M=0.3 to M=0.6 with standard ALK. Summary graph at bottom does not include data for terminal age of VPA, and is the average of the F at age for $F_{terminal}$=0.4 to 1.0 for each M.

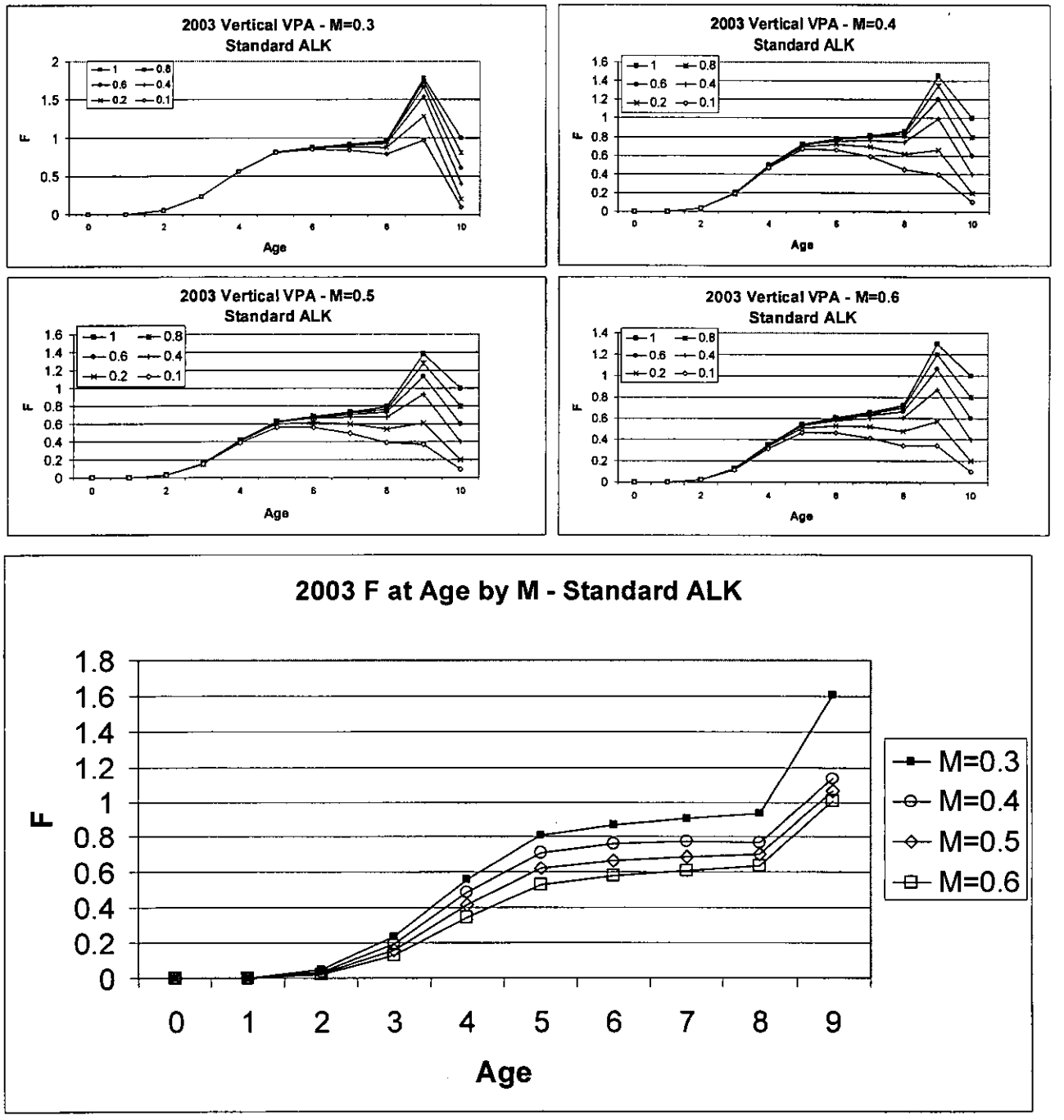


Figure 5.3. Sensitivity analysis estimates of F at age for Louisiana striped mullet in 2003 from VPA using various terminal F's, for M=0.3 to M=0.6 with ALK using 2003 age information only. Summary graph at bottom does not include data for terminal age of VPA, and is the average of the F at age for $F_{terminal}$=0.4 to 1.0 for each M.

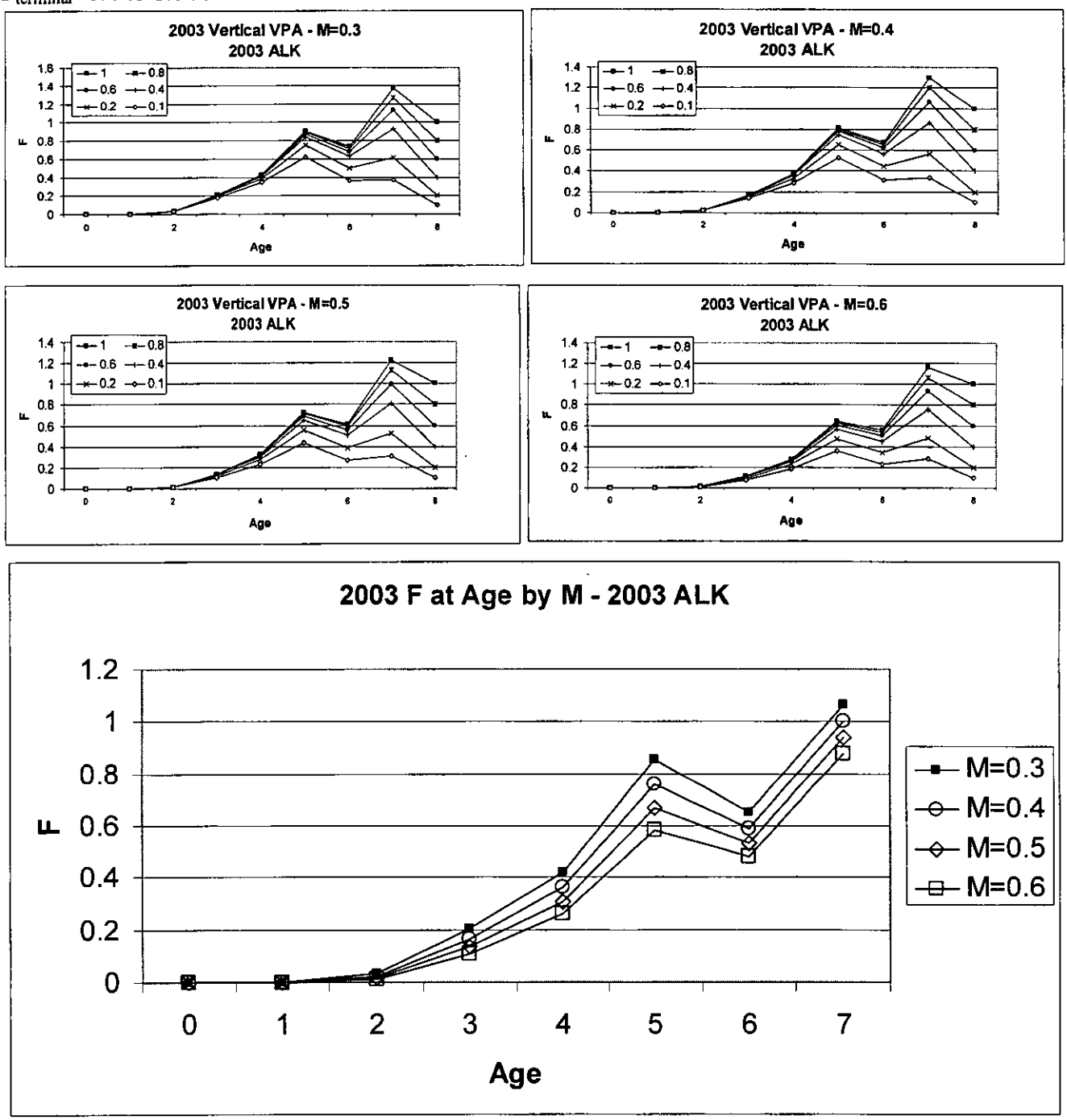


Figure 5.4. Natural log c/e of fishery-independent seine samples for striped mullet, January through May, young of the year only.

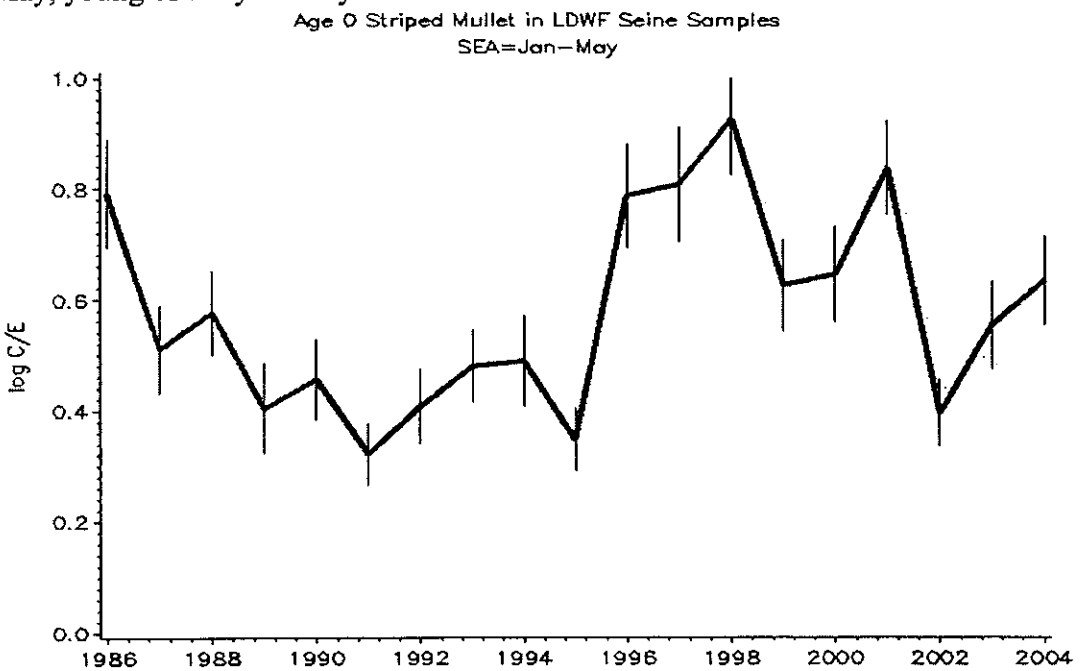


Figure 5.5. Natural Log of Catch per sample in fishery-independent seine samples in zones. 1=East of Mississippi River, 2= from Mississippi to Atchafalaya Rivers, 3= Atchafalaya River to Texas

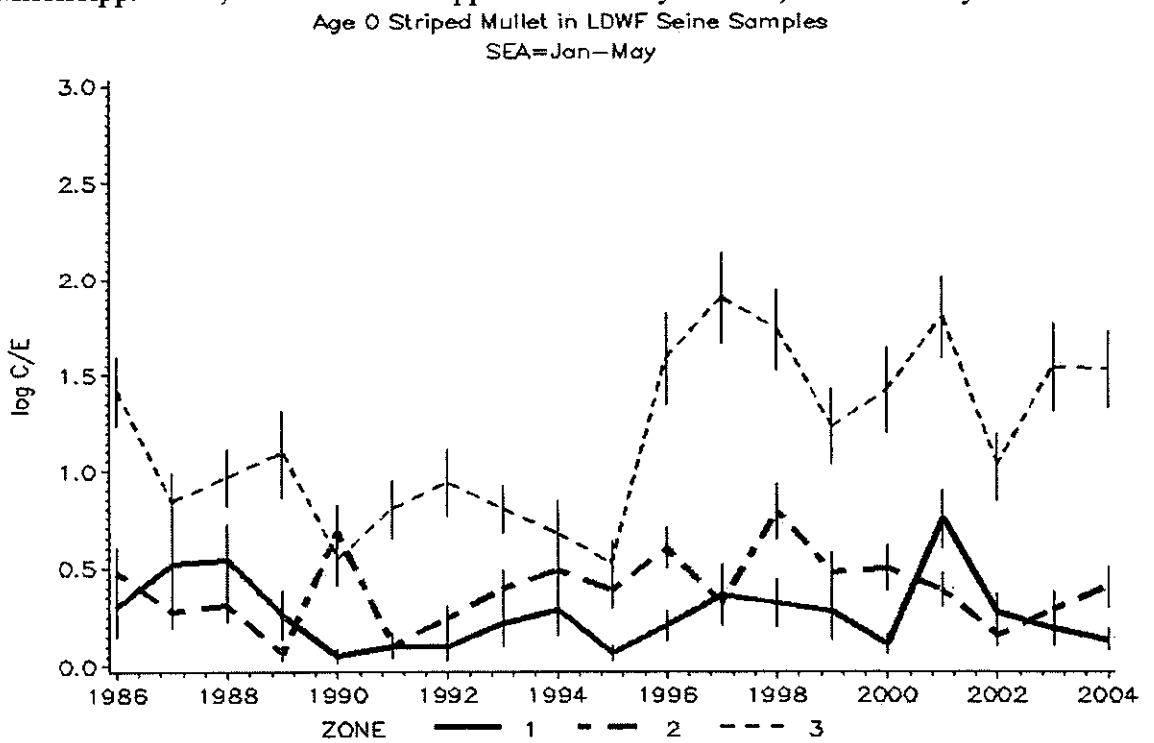


Figure 5.6. Natural log of catch per sample in fishery-independent LDWF gill net samples, January-May of each year

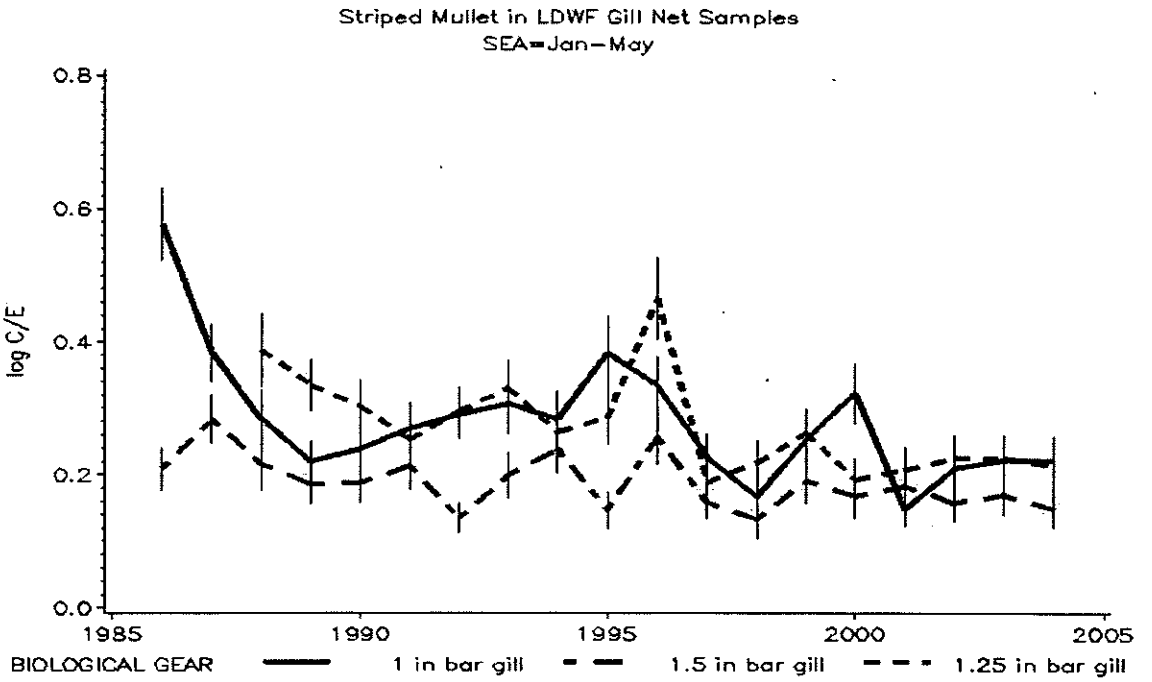


Figure 5.7. Comparison of the lengths of female striped mullet sampled from the fishery from different portions of the state. Also, the relative proportion at size for the specimens that were aged.

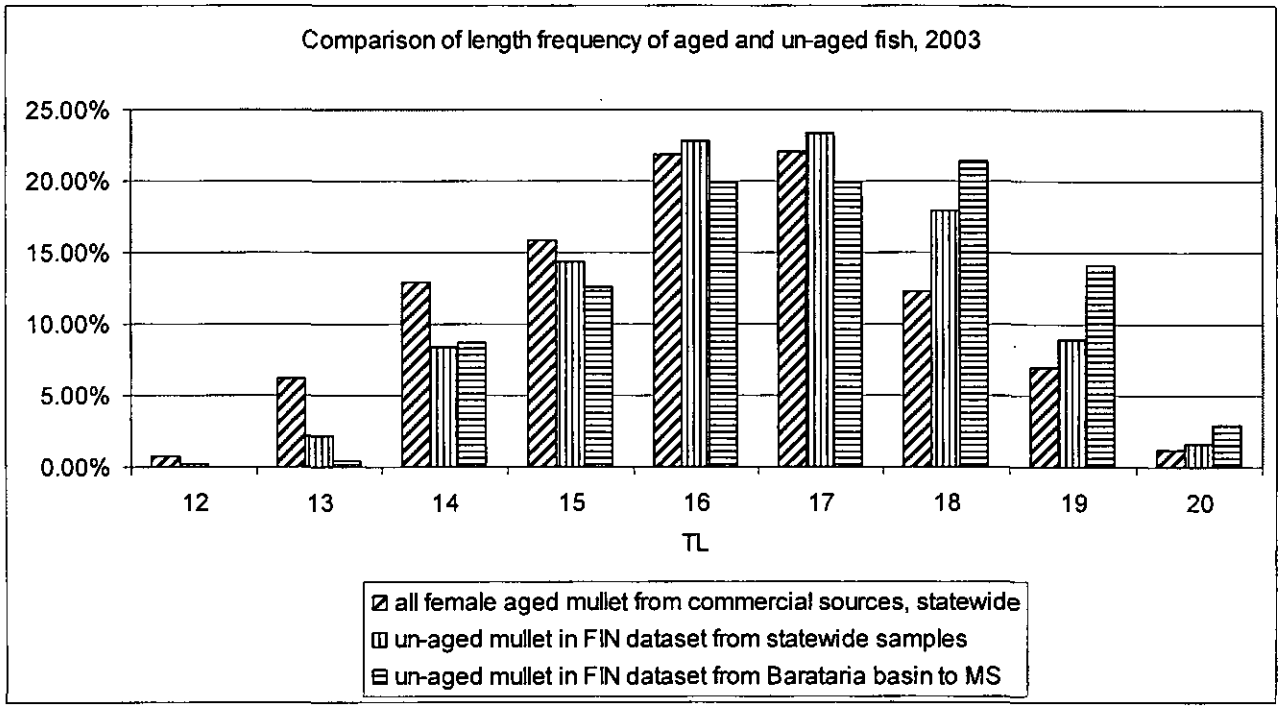
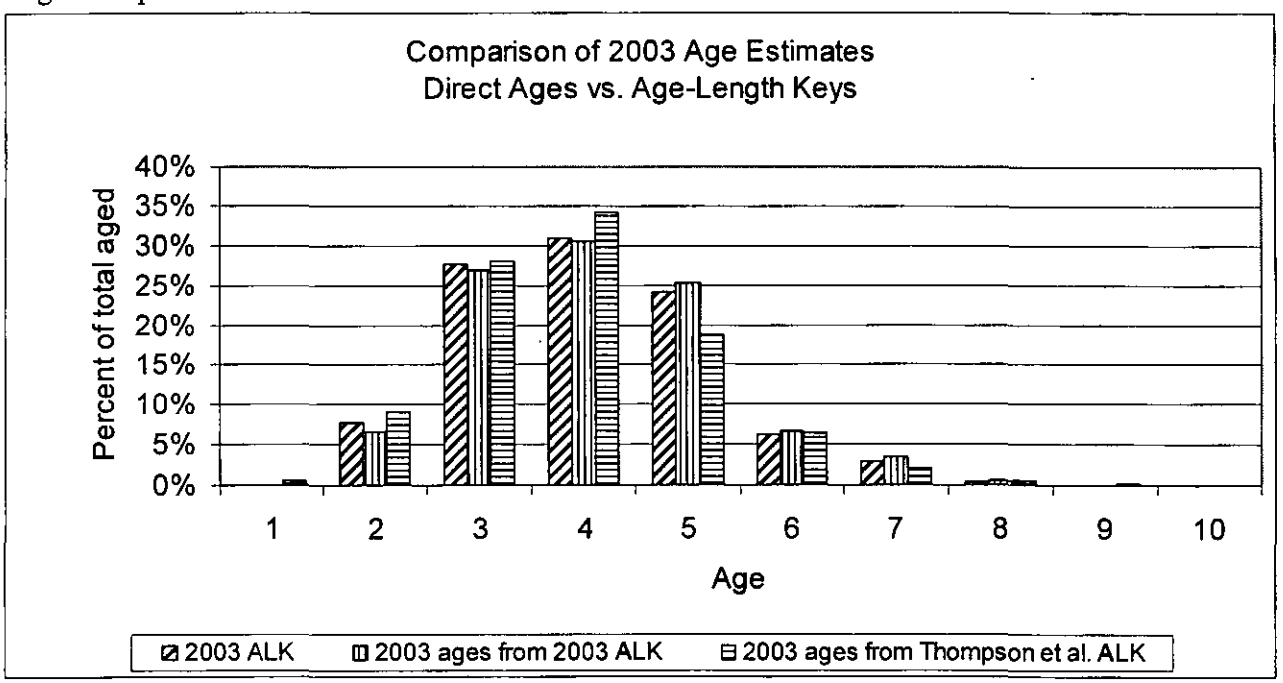


Figure 5.8. Comparison of the age structure estimates from the 2003 samples (2003), the application of the 2003 ALK to the 2003 length samples, and the application of the base case ALK to the 2003 length samples.



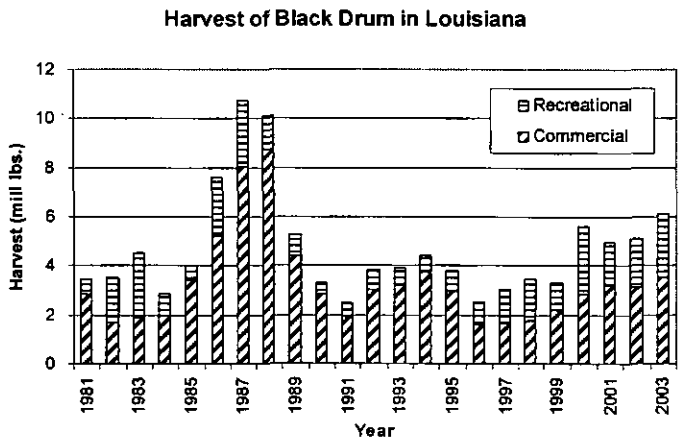
BLACK DRUM
SUMMARY OF CHANGES FROM 2004 ASSESSMENT

This summary is intended to provide a quick reference of substantive changes in methods or corrections in this year's assessment from the 2004 assessment conducted for black drum.

- There are no substantive changes in methods from the 2004 assessment.

2005 DOCUMENT HIGHLIGHTS

- The 2003 combined commercial and recreational harvest of 6,086,523 pounds was the highest recorded since 1988. It was 57% of the 1987 landings peak.



- The conservation standard for black drum in Louisiana is 30% spawning potential ratio (SPR). The results of yield per recruit analysis indicates that if the natural mortality rate (M) =0.1 (the value that provides the lowest allowable harvest within the range of estimates), the fishery prior to existing regulations (Act 1316 of 1995) was operating above $F_{0.1}$ and below F_{MAX} with yield of 92% of maximum, and spawning potential ratio (SPR) at 44%. An M of 0.15 or 0.2 would indicate a more lightly fished stock with yield being 66% to 45% of maximum and with SPR being 57% to 66% respectively.

- It should be noted that the method used in this assessment to determine the status of the stock, reflected in the estimates of disappearance (declines in numbers of harvested fish as they age) is not immediately sensitive to changes in regulations. Black drum enter the fishery at age 0 and are fully recruited by age 5. It takes several years of consistent regulations after regulations are imposed before disappearance rates would accurately measure the impact of those regulations, since the method relies on the relative abundance of the age-classes in the fishery. In the case of black drum it would take 6 years of consistent regulations assuming selectivities of age 5 and older is 100%.

- As a result of having several years of commercial trip ticket data, and collecting recreational fishery statistics data, the department was able to begin a program to representatively sample fishery dependent otoliths in 2002. The program uses trip ticket data and recreational survey data to weight sampling sites based on the volume of fish landed there for the collection of otoliths for the species of interest. It is expected that this method of otolith sampling will improve stock assessments by providing more accurate annual catch-at-age data

BLACK DRUM
5.0 STOCK ASSESSMENT

This assessment uses yield-per-recruit (YPR) and Spawning Potential Ratio (SPR) to estimate the impact of fishing pressure on potential yield and the spawning potential of the black drum stock in Louisiana waters. Estimates derived from YPR and SPR are based on information regarding the growth rate and spawning potential of the fish, and on estimated natural mortality rate (M) and fishing mortality rate (F) on the stock. The results from this assessment provide a generalized approach towards estimating the impact of fishing on the spawning potential and potential yield of the fish stock. The spawning biomass of females is assumed to be the factor limiting the spawning potential of the stock; therefore, where possible, only data on female black drum are used. Yield-per-recruit and SPR analysis, as with many other generalized assessments, should be used only as a guide until a more comprehensive assessment can be conducted.

In developing a stock assessment, the unit stock must be defined. While a unit stock is often represented by that portion of the population which is genetically similar, for our purpose, the most applicable definition seems to be one which considers the unit stock as that portion of the population which is either dependent on Louisiana waters, or which is available to Louisiana fishermen.

5.1 Growth

Luquet et al. (1996) presents several growth equations for black drum. The one chosen for this assessment was developed by Geaghan and Garson (unpublished), and is a sloped asymptote model fitted to a von Bertalanffy growth equation. The data used by Geaghan and Garson (unpublished) was from Beckman et al. (1988) who used sectioned otoliths to age fish caught in Louisiana waters. The sloped asymptote model proved to fit the data better than did other equations. The equation is as follows:

$$L_t = (610 + 9.959 * t) * (1 - e^{-0.6226(t-0.1229)})$$

where, L_t = length at age t, and t = age in years.

The length-weight regression described by Beckman et al. (1990) from fish harvested in Louisiana was used in this assessment. The equation is as follows:

$$W = (1.14 * 10^{-5})FL^{3.05}$$

where, W = weight in grams, and FL = fork length in millimeters.

5.2 Natural Mortality

Natural mortality (m) is one part of total mortality (Z) and is the mortality due to all causes other than fishing. These include predation, disease, spawning stress, starvation, and old age. Typically, natural mortality is estimated, as it is difficult to directly measure, especially on exploited fish stocks where natural mortality and fishing mortality occur simultaneously.

This assessment follows the former Louisiana Department of Wildlife and Fisheries (1990) assessment in using a range of values for natural mortality (0.1, 0.15, and 0.2) to evaluate the sensitivity of M on the resulting spawning stock.

5.3 Fishing Mortality

Fishing mortality (F) estimates derived in the former Louisiana Department of Wildlife and Fisheries (1990) assessment were used in this assessment to evaluate the impact of current fishing regulations on the spawning potential of the stock. The former assessment did not address the concept of spawning potential as a management measure. The current assessment uses yield-per-recruit and SPR analysis to estimate the impact of fishing on spawning potential.

The former assessment used the growth equation described in Section 5.1 to develop annual catch-at-age tables.

5.4 Yield-per-Recruit

Yield-per-recruit and SPR analysis provide basic information about the dynamics of a fish stock by estimating the impact of mortality on yield and the spawning potential of the stock. The results can be examined as to the sensitivity of natural and fishing mortality rates on yield and spawning potential.

The growth parameters described in Section 5.1, the age-specific fishing mortality rates described in Section 5.3, and the natural mortality rates described in Section 5.2 were incorporated into the yield-per-recruit and spawning potential analysis. Fecundity estimates derived by Nieland and Wilson (1993) were used to estimate spawning potential. The equation is as follows:

$$BF = 49{,}249 * Age + 530{,}052$$

where BF=batch fecundity. Since the fecundity estimates are in both the numerator and denominator of the YPR and SPR calculations, unless there is a trend in spawning frequency with age, either batch fecundity or annual fecundity can be used to calculate YPR and SPR. The results are presented in Table 5.1, which contains estimates of F_{MAX} (fishing mortality rate that produces maximum yield), $F_{0.1}$ (fishing mortality rate representing 10% of the slope at the origin of a yield-per-recruit curve), $F_{20\%SPR}$ (fishing mortality that produces 20% SPR), $F_{30\%SPR}$ (fishing mortality that produces 30% SPR), and estimates of F from Section 5.3.

5.5 Conservation Standards

Conservation standards are intended to protect the viability of a fish stock for future generations. These standards have historically been based on a number of biological measures of the dynamics of fish stocks, depending on the availability and adequacy of data. Conservation standards should be separated into two types: a conservation threshold which is entirely biologically based and, a conservation target which considers biological measures modified by relevant social, economic, and ecological factors. A conservation threshold is a biological baseline for the harvest of a fish stock and should not be exceeded. It is the highest level of fishing mortality that will ensure that recruitment overfishing will not occur. Beyond the conservation threshold, a conservation target may be set, providing for other management goals in the fishery. Such goals may include maximizing yield in weight or numbers of fish, economic benefits or profit, employment, or some other measurable goal. These targets should be set at a fishing mortality rate below that of the conservation threshold in order to ensure that the biological integrity of the stock is not damaged by fishing.

The spawning potential ratio (SPR) concept described by Goodyear (1989), is a species specific value expressed as the ratio of the spawning stock biomass (or egg production) per recruit (SSB/R) in a fished condition to the SSB/R in an unfished condition. The concept is based on the premise that below some level of SPR, recruitment will be reduced. Goodyear (1989), recommends that in the absence of sufficient data to provide a value specific to the stock in question an SPR of 20% be used as a threshold. Work on North Atlantic ground fisheries also resulted in the calculation of a threshold SPR of 20% (Gabriel et al. 1984, Gabriel 1985). An SPR of 20% has been recommended for Spanish and king mackerel in the Gulf of Mexico (National Oceanic and Atmospheric Administration/National Marine Fisheries Service 1995), while an SPR of 8-13% has been demonstrated to be sufficient for gulf menhaden (Vaughan 1987). In earlier analyses of Louisiana spotted seatrout fisheries (Louisiana Department of Wildlife and Fisheries 1991), an SPR threshold of 15% was recommended based on several years of data. Mace and Sissenwine (1993) examined 90 stocks of 27 species, and reported that the average replacement SPR for all these stocks was 18.7%, while the most resilient quarter of the stocks required a maximum of only 8.6%. These authors recommended that an SPR of 30% be maintained when there is no other basis for estimating the replacement level, as this level was sufficient in maintaining recruitment for 80% of the stocks examined. However, they noted that 30% may be overly conservative for an "average" stock, and reiterated the need for stock-specific evaluations of standards to enhance both safety and benefits in the fishery.

Sufficient information is not available to directly estimate a conservation threshold for black drum in Louisiana. However, the conservation target of 30% SPR established by the 1995 Regular Session of the Louisiana Legislature for black drum, southern flounder, sheepshead, and striped mullet appears to be adequate to maintain the black drum stock and prevent recruitment overfishing.

The use of any measure of the health of a fish stock as a perfect index is arguable. It is logical to conclude that growth overfishing should occur at a much lower fishing rate than that which would threaten recruitment. However, Mace and Sissenwine (1993) provide information to suggest that some stocks may have reduced recruitment at levels of fishing that would not reduce yield-per-recruit. The preferable position for making recommendations on appropriate levels of fishing for a stock is to base those recommendations on actual measures of spawning stock size and recruitment for both the species and fishery in question. This requires a base of information resulting from monitoring of both the stock and the fishery over a variety of conditions. Without this information, conservation standards may either underestimate or overestimate the potential of a fishery. If the potential is underestimated, society loses the economic and social benefits of the harvest. If the potential is overestimated and the fishery is allowed to operate beyond sustainable levels, society loses the benefits of a sustainable fishery, and recovery will require some period of rebuilding, when effort must be reduced from the non-sustainable levels (Hilborn and Walters, 1993).

5.6 Status of the Stock

Recent Regulatory History

Regulations were implemented by the Wildlife and Fisheries Commission in 1989 as follows: 16 inches minimum total length and 5 fish per person daily bag and possession limit with not more than one exceeding 27 inches for recreationally harvested black drum. For commercially harvested black drum there is a 16 inch minimum total length and an annual harvest quota of 3.25 million pounds for black drum measuring 16-27 inches total length and annual harvest of 300,000 fish measuring longer than 27 inches total length with the fishing year beginning September 1.

Commercial harvest methods were changed on August 15, 1995 when Act 1316 of the 1995 Regular Legislative Session, the Marine Resources Conservation Act of 1995, became effective. This act outlawed the use of "set" gill nets or trammel nets in saltwater areas of Louisiana, and restricted black drum harvest by the use of "strike" nets to the period between the third Monday in October and March 1 of the following year. A "Restricted Species Permit" was required in order to harvest black drum , and several criteria were established in order to qualify for that permit. After March 1, 1997, all harvest by gill or trammel nets was banned, and legal commercial gear to harvest black drum was limited to trawl, set lines and hook and line. This set of regulations had the effect of reducing the harvest of black drum by this segment of the commercial fishing industry.

Current recreational regulations are as follows: 16 inches minimum total length (TL) and 5 fish per person daily bag and possession limit with not more than one exceeding 27 inches TL. For commercially harvested black drum there is a 16 inch minimum TL and annual harvest quotas of 3.25 million pounds for black drum measuring 16-27 inches TL and 300,000 fish for black drum measuring longer than 27 inches TL, with the fishing year beginning September 1.

Trends in Harvest and Abundance

Commercial landings prior to 1991 were obtained from the National Marine Fisheries Service's (NMFS) General Canvass Landing Program. From 1991 through 1998 landings were collected by the LDWF Monthly Dealer Reports and from 1999 to present LDWF's "Trip Tickets" program has been utilized to gather these data. Landings by gear are available for the "Trip Ticket" program, and for the General Canvass Landing Program.

Black drum were lightly exploited by the commercial fisheries until the early 1980s when commercial harvest began to increase dramatically (Figure 5.1). Commercial landings went from 0.4 million pounds in 1980 to 8.7 million pounds in 1988. The regulations implemented in 1989 (and possibly other factors such as market forces, fishing effort, and variations in available stock) reduced the commercial harvest from the 1988 peak of 8.7 million pounds to between 2 and 4 million pounds annually for the 1989-1995 period. Regulations implemented by Act 1316 may have reduced harvest even further as evidenced by reduced landings from 1996 to 1999, but commercial landings have increased since that time and 2003 landings are slightly above the 1995 level.

Recreational landings or harvest information has been consistently collected since 1981 (Figure 5.2). Fisheries dependent recreational landings data are collected by the NMFS Marine Recreational Fisheries Statistical Survey (MRFSS) and are currently collected by LDWF biologists. In the earlier years of the survey, estimates of harvest were relatively broad, due to lower numbers of samples in the MRFSS survey from Louisiana. Increased effort in the survey in recent years has increased the precision of the harvest estimates. The harvest values have fluctuated between 0.4 and 2.7 million pounds from 1981 through 2003. There seems to be some cyclic variation in recreational harvest estimates, and recent estimates (1990-2003) show an increasing trend.

Mean catch-per-trip from the recreational fishery was calculated by selecting those trips that had black drum in their catch. Black drum are seldom a primary target species for Louisiana angling trips, they are more often reported as a secondary target species. Therefore, many of the black drum encountered by MRFSS samplers are likely to have been incidentally captured by an angler targeting other species, or fishing with no target species in mind. We did not attempt to select trips targeting black drum in our calculations of catch-per-trip due to concerns for post-trip reporting bias (anglers who harvest drum are more likely to report them as a target species, inducing bias into estimates). These issues create challenges for developing a fishery-dependent index of abundance from the recreational fishery.

The results of the recreational catch-per-unit-effort (CPUE) analysis are presented in Figure 5.3 along with 95% confidence limits around the mean. The CPUE index cycled throughout the period examined (1981-2003), with no indication of a long-term downward trend. The increased sampling effort in the MRFSS survey in recent years has contributed to the more precise estimates of CPUE seen in those years. The years 1985, 1991, 1996, and 2003 showed the lowest mean CPUE and these years were significantly lower than 1982, 1986, 1993, and 2000.

Catch-per-effort data from the Department's, fishery-independent trammel net (750' x 6' - 1 5/8" inner, 6" outer wall) and small mesh bag seine (50' length, 1/4" delta mesh) samples were calculated as follows:

$$\text{Mean CPUE} = (\exp (\Sigma \ln (\text{catch} + 1) / N)) - 1$$

where catch is the total number caught in each set and N is the number of samples taken annually. Trammel net and seine data were used for the period 1986-2003. The CPUE fluctuated throughout the time period in both the seine and trammel net samples with no indication of a long-term downward trend (Figures 5.4 and 5.5). The year 1988 was the only year where CPUE in seines showed any significant difference at the 95% confidence level and that year was lower than 1986, 1992, 1996 1997, 1998, 1999 and 2000. Trammel net CPUE was highly variable throughout the period as indicated by the wide confidence limits associated with the years examined. The years 1986, 1988 and 1989 had the lowest CPUE, and were significantly lower than 1996, 1998, 1999, 2000, 2001, and 2002.

Estimates of Yield and Spawning Potential

It should be noted that the following results of YPR and SPR analysis do not reflect the impact of current regulations described above. With this type of general assessment, it will take several years before the impact of regulations will be observed in the disappearance rates from the fishery.

The results of YPR analysis indicate that if M=0.1 (the most conservative value within the range of estimates), the fishery prior to existing regulations (Act 1316) was operating above $F_{0.1}$ and below F_{MAX} with yield of 92% of maximum, and SPR at 44%. An M of 0.15 or 0.2 would indicate a more lightly fished stock with yield being 66% to 45% of maximum and with SPR being 57% to 66% respectively (Table 5.1).

5.7 Research and Data Needs

Estimates of natural mortality used in the present assessment vary widely. This variation lessens the ability of the present assessment to provide an accurate estimate of the potential yield of the stock, and also reduces the confidence level of the present estimate of SPR. A more accurate estimate of natural mortality would improve both estimates.

Annual age-length keys should continue to be developed to provide catch-at-age data necessary to conduct age-based population assessments. The department is in the process of collecting otoliths for development of annual age-length keys.

The assessment faces challenges in that harvest of adult black drum currently comprises only a small fraction of the current overall drum harvest. Characterization of the age structure of the adult

harvest is difficult, since these fish are seldom encountered as part of the sampled harvest. A project to determine the current age frequency of the adult population should provide valuable insight into the impact of existing regulations, and greatly assist in refining our estimate of the status of the black drum stock in Louisiana. The project should attempt to collect samples representative of the adult black drum population in Louisiana waters, recognizing that populations exist inshore, offshore and in various parts of the state that all may have different age structures. Such a project could be either fishery-dependent or fishery-independent in nature. When age data are sufficient, the Department intends to conduct VPA analyses and to explore other statistical methods of evaluating the status of the black drum stock.

The relationship between wetlands losses or modifications and the continuation of fishery production within the state has been discussed by many authors. However, this relationship is likely to be different for the various fishery species. Understanding this relationship for black drum should be an ongoing priority.

In the presence of changing regulations, fishery-dependent information is not a reliable source of data for assessing the status of a fish stock. However, such data are necessary to measure the effects of fishing on that stock. Consistent fishery-dependent and fishery-independent data sources, in a comprehensive monitoring plan, are essential to understanding the status of fishery stocks, and to identifying causes of changes in stock abundance. Current programs should be assessed for adequacy with respect to their ability to evaluate stock status, and modified or enhanced to optimize their capabilities.

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Table 5.1. Results of yield per recruit and spawning potential ratio analyses for black drum. Estimates reflect the status of the stock including the impact of regulations prior to1995.

M=0.1

	F Ratio	YPR	SPR	%SPR	%YPR	
Fmax =	0.982	3.0260	1,659,670	23.80%	100.00%	Benchmarks
F0.1 =	0.260	2.4809	3,902,316	55.96%	81.99%	
F20% =	1.156	3.0159	1,394,714	20.00%	99.67%	
F30% =	0.760	3.0022	2,092,071	30.00%	99.21%	
* Regulations =	0.426	2.7925	3,089,373	44.30%	92.28%	Estimate

M=0.15

	F Ratio	YPR	SPR	%SPR	%YPR	
Fmax =	2.100	2.1766	373,755	11.48%	100.00%	Benchmarks
F0.1 =	0.605	1.7506	1,466,963	45.05%	80.43%	
F20% =	1.462	2.1353	651,218	20.00%	98.10%	
F30% =	1.019	2.0185	976,828	30.00%	92.74%	
* Regulations =	0.376	1.4562	1,880,508	57.75%	66.90%	Estimate

M=0.2

	F Ratio	YPR	SPR	%SPR	%YPR	
Fmax =	3.822	1.8101	61,480	3.52%	100.00%	Benchmarks
F0.1 =	1.153	1.5197	545,318	31.22%	83.96%	
F20% =	1.671	1.6792	349,286	20.00%	92.77%	
F30% =	1.199	1.5388	523,929	30.00%	85.01%	
* Regulations =	0.326	0.8173	1,375,910	66.71%	45.36%	Estimate

Figure 5.1. Commercial harvest of black drum in Louisiana, in pounds, 1950-2003.

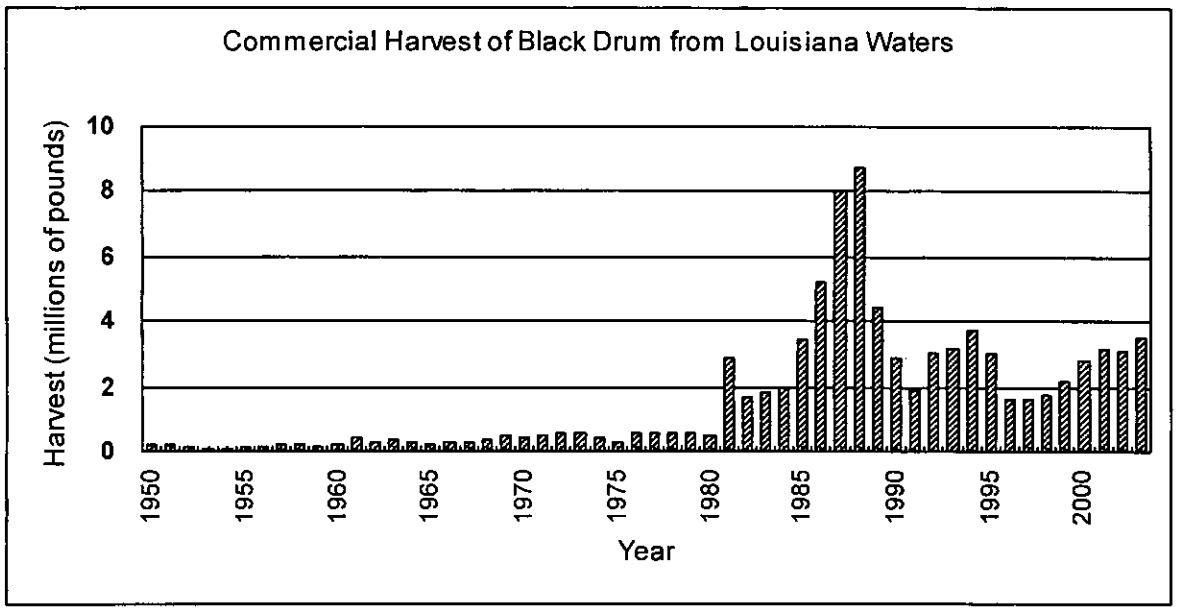


Figure 5.2. Recreational harvest of black drum in Louisiana in pounds, including 95% confidence limits on the estimates.

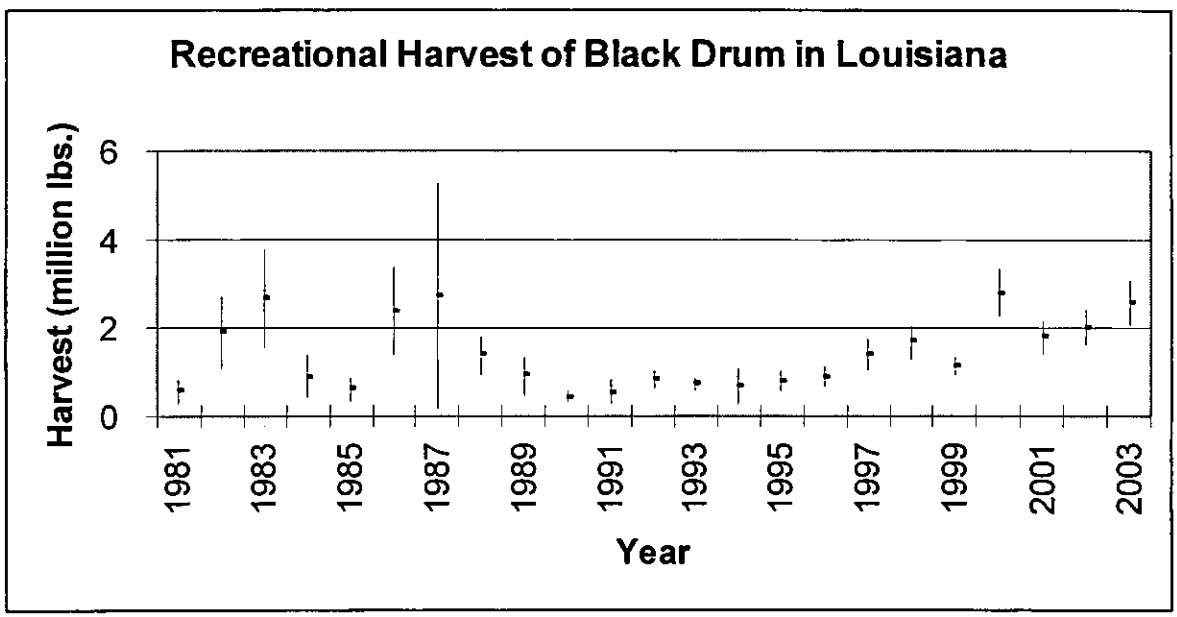


Figure 5.3. Standardized catch per unit of effort from the Louisiana recreational fishery, based on MRFSS intercept survey information.

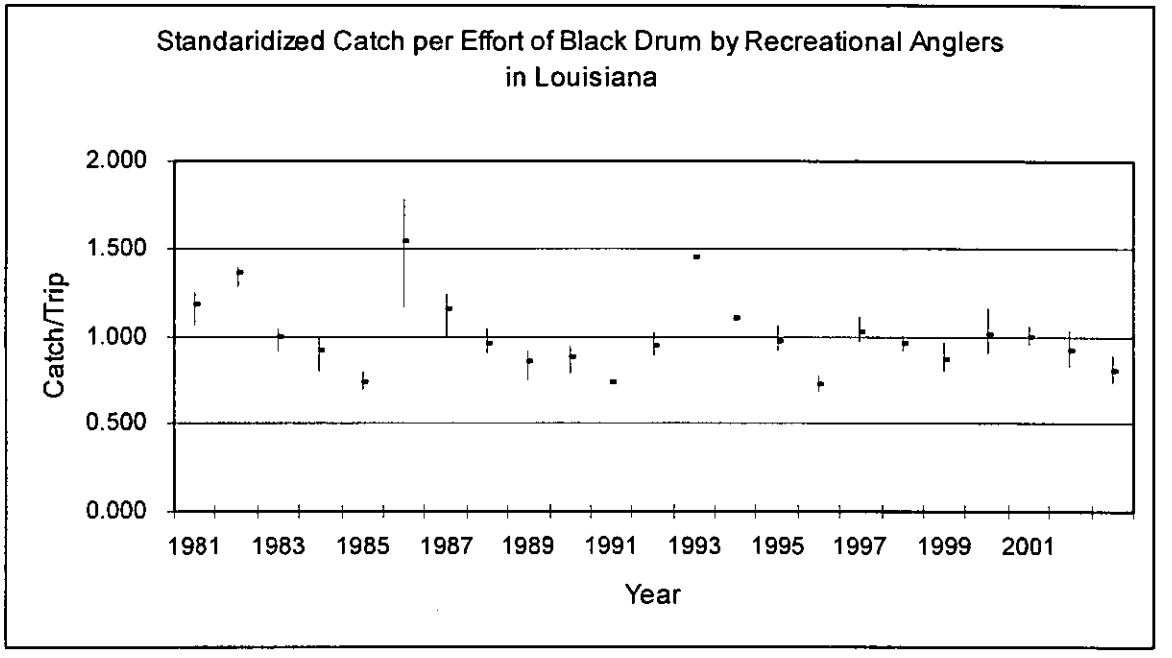


Figure 5.4. Standardized catch per unit of effort of black drum from seine samples in the LDWF fishery-independent sampling program.

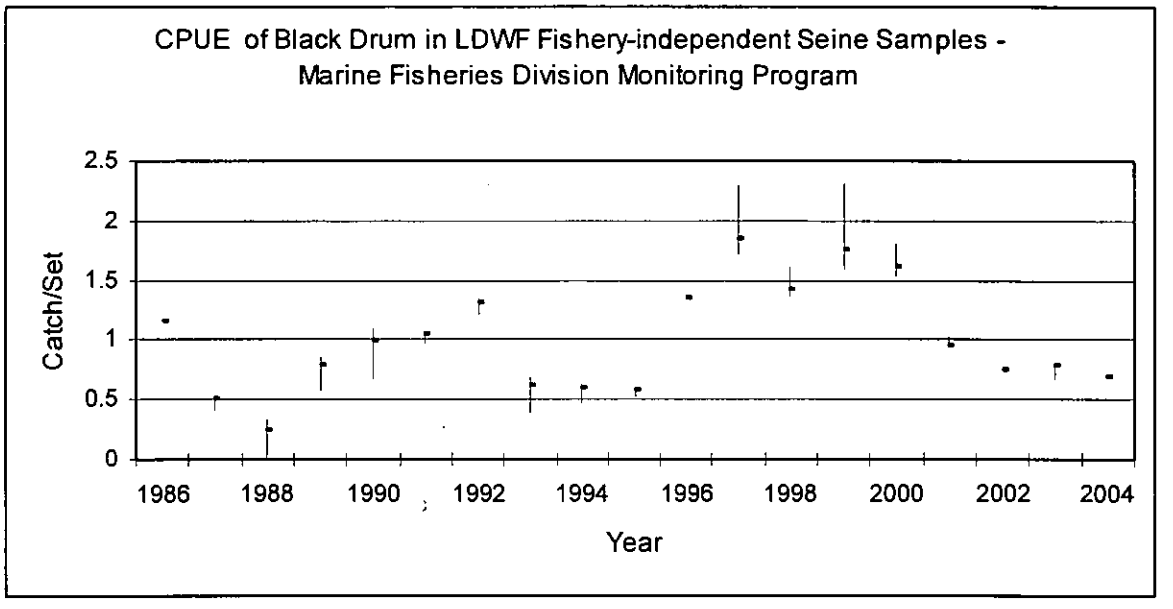
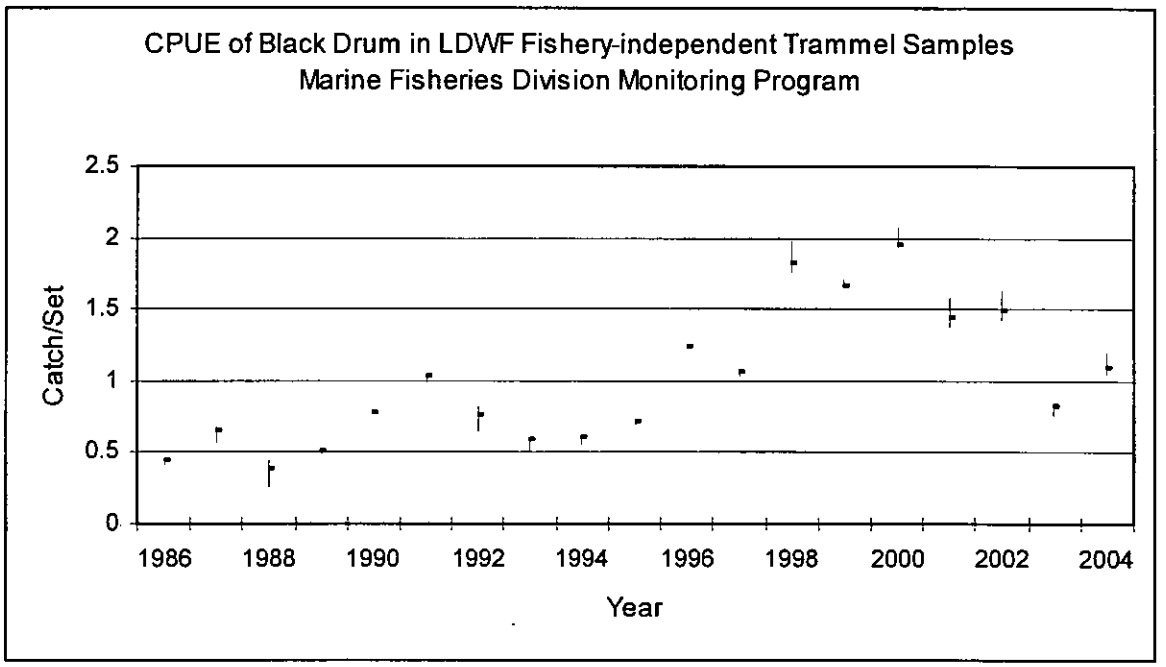


Figure 5.5. Standardized catch per unit of effort of black drum from trammel net samples in the LDWF fishery-independent sampling program.



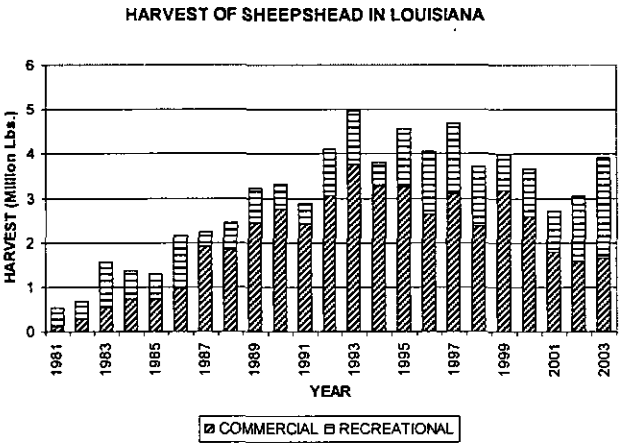
SHEEPSHEAD
SUMMARY OF CHANGES FROM 2004 ASSESSMENT

This summary is intended to provide a quick reference of substantive changes in methods or corrections in this year's assessment from the 2004 assessment conducted for sheepshead.

This year's assessment differs from last year's in that ages were based on an age-length key of aged fish from Louisiana, rather than calculating the ages from a von Bertalanffy growth equation. A virtual population analysis was compared to the disappearance rate analysis used in prior reports for estimation of stock and yield parameters.

2005 DOCUMENT HIGHLIGHTS

- 2003 combined commercial and recreational harvest of 3,903,128 pounds is 842,214 pounds higher than 2002 and is the median of the 14 year period since 1992.



- The conservation standard for sheepshead is 30% spawning potential ratio (SPR). The results of YPR analysis indicate that if M=0.2 (the most conservative value within the range of estimates), the fishery in the years assessed (1999 - 2003) was operating near F0.1 and well below FMAX, with yield of 69% to 81% of maximum, and SPR at 47% to 57%. An M of 0.3 (the highest value examined) would indicate a more lightly fished stock with yield being 32% to 50% of maximum and with SPR being 66% to 78%.

- It should be noted that the method used in this assessment to determine the status of the stock, reflected in the estimates of disappearance, is not immediately sensitive to changes in regulations. Sheepshead enter the fishery at age 1 and are fully recruited by age 5 It takes several years of consistent regulations after regulations are imposed before disappearance rates would accurately measure the impact of those regulations, since the method relies on the relative abundance of the age-classes in the fishery. In the case of sheepshead it would take 4 years of consistent regulations assuming selectivities of age 5 and older is 100%.

- As a result of having several years of commercial trip ticket data, and collecting recreational fishery statistics data, the department was able to begin a program to representatively sample fishery dependent otoliths in 2002. The program uses trip ticket data and recreational survey data to weight sampling sites so that otolith collections reflect harvest from the fisheries for the species of interest. It is expected that this method of otolith sampling will improve stock assessments by providing more accurate annual catch-at-age data.

SHEEPSHEAD
5.0 STOCK ASSESSMENT

This assessment uses yield-per-recruit (YPR), catch curve analyses, virtual population analysis (VPA), and Spawning Potential Ratio (SPR) to estimate the impact of fishing pressure on potential yield and the spawning potential of the sheepshead stock in Louisiana waters. Estimates derived from YPR and SPR are based on information regarding the growth rate and spawning potential of the fish, and on estimates of the natural mortality rate (M) and fishing mortality rate (F) on the stock. Catch curve analysis and virtual population analysis estimate fishing mortality rates (F) from the fishery based on the estimated numbers of each age class in the total harvest, using somewhat different techniques for calculation of F. The spawning biomass of females is assumed to be the factor limiting the spawning potential of the stock; therefore, where possible, only data on female sheepshead should be used. Yield-per-recruit and SPR analysis, as with many other generalized assessments, should be used only as a guide until a more comprehensive assessment can be conducted.

In developing a stock assessment, the unit stock must be defined. While a unit stock is often represented by that portion of the population which is genetically similar, for our purpose, the most applicable definition seems to be one which considers the unit stock as that portion of the population which is either dependent on Louisiana waters, or which is available to Louisiana fishermen.

5.1 Age and Growth

Ages of the harvest were estimated from age-length keys (ALKs). Ages were available from fishery-independent samples (n=2,207) and fishery-dependent samples from the commercial (n=777) and recreational (n=132) fisheries, collected between 1994 and 2003 (Table 5.1). The oldest fish sampled were aged as 23 years old, from fishery-independent samples. The oldest ages from fishery-dependent samples were age 14 for recreational samples, and age 17 for commercial samples. Fish over age 15 were rare in the aged dataset, so fish with assigned ages of 15 and over were included in a 15+ age group for further analyses. The age-length key included fishery-dependent information on sheepshead between 8 and 21 inches fork length, and fishery-independent samples between 4 and 21 inches. Sex information was not available for many of the fish that were aged from fishery-dependent samples, especially from earlier years, so the ALK does not include sex information.

The largest fish aged, a 25 inch fish from the commercial fishery, was aged at 17 years. This fish was not included in the ALK since it was pre-selected for size when sampled. When the ALK was applied to length measurements, fish over 21.99 inches fork length (FL) were combined into the 21-21.99 inch group, since there were no data to provide age distribution for sheepshead that large. The oldest fish sampled were 4 fish aged at 23 years old from fishery-independent samples.

We considered the fishery-dependent age samples from the commercial fishery adequate to characterize that fishery, so the age-length key for the commercial harvest was derived from those samples alone.

There were fewer age samples available to characterize the age distribution of the

recreational fishery. Examination of the commercial age data indicated that there were larger proportions of fish sampled for each age beyond age 4 in the commercial fishery than were found in the recreational samples (see Figure 5.1). Therefore, we did not use the commercial age data alone to describe the recreational harvest age distribution. To provide a better representation of the age structure of the recreational harvest, we combined all samples available, whether fishery-dependent or fishery-independent.

The fishery-independent age samples tended to have more representation of ages 2-3, compared to either recreational or commercial fishery-dependent samples (Figure 5.1). We presumed that if this had any effect on age assignments, it would increase estimates of the fraction of the recreational harvest from younger age classes, thereby increasing overall estimated fishing mortality rates. The additional representation of ages 2-3 is at least partially attributable to the larger numbers of small fish in the fishery-independent dataset (Table 5.1, right-hand portion of table). Due to the relatively large number of samples available compared to fishery-dependent samples, we elected to include these age samples in the ALK used to estimate ages for the recreational fishery.

Where available, fork lengths were used for analysis. Where these were not available, fork lengths were derived from total length, inverting the conversion for maximum total length to fork length provided by Joe O'Hop, Fish and Wildlife Research Institute, Florida Fish and Wildlife Conservation Commission (pers. comm.).

$$FL(mm) = (TL - 4.233) / 1.090$$

Weights were estimated from fork lengths, using the parameters reported by Beckman et al. (1991), then converted to pounds for this report. Their fork length - weight regression equation was:

$$\text{Female } W(gm) = 5.75 \times 10^{-5}\, FL(mm)^{2.85}$$

Von Bertalanffy growth parameters developed by Beckman et al. (1991) from fish harvested in Louisiana were used to calculate length and weight at age for female sheepshead for some analyses, including YPR and SPR. The equations are as follows:

$$\text{Female } L_t = 447(1-e^{-0.367\,(t+1.025)})$$

$$\text{Female } W_t = 2557(1-e^{-0.219\,(t+3.061)})^{2.85}$$

where, L_t = length at age t, W_t = weight at age t and t = age in years. Age at length is calculated as:

$$t = 1.025 + \ln(1-L_t/446)/-0.367$$

5.2 Natural Mortality

Natural mortality is one part of total mortality (Z) and is the mortality due to all causes other than fishing. These include predation, disease, spawning stress, starvation, and old age. Typically, natural mortality is estimated, as it is difficult to directly measure, especially on

exploited fish stocks where natural mortality and fishing mortality occur simultaneously. No direct measure of natural mortality for sheepshead is available; therefore, several established estimation procedures were used to derive an estimate. The procedures are presented below and are taken from Sparre and Venema (1992).

Pauly (1980) provides a method of estimating natural mortality from a set of parameters including the asymptotic length and growth rate of the fish, and the average water temperature of the environment. The growth parameters from the von Bertalanffy growth equation described in Section 5.1 and the mean annual water temperature, derived from readings from a set of four constant recorders located throughout the Barataria Bay system, were used in the calculation. The mean water temperature was 22.7°C for the period 1989 - 1992 (pers. comm., M. Kasprzak, 4/13/92). These values were incorporated into the length-based function of Pauly (1980):

$$\ln(M) = -0.0152 - 0.279 * \ln(L_\infty) + 0.6543 * \ln(K) + 0.463 * \ln(T)$$

where, ln(M) = natural log of natural mortality, $\ln(L_\infty)$ = natural log of the asymptotic length, ln(K) = natural log of the growth coefficient and ln(T) = natural log of the mean annual temperature in degrees Celsius.

Use of Louisiana data on growth and water temperature applied to Pauly's function results in a natural mortality estimate of M=0.4.

Alagaraja (1984) and Hoenig (1983) provide methods of estimating M based on the fishes lifespan or longevity, and with the assumption that M=Z. Longevity is also difficult to determine for exploited fish stocks, since the age distribution is usually truncated by fishing, but these methods are as useful as any in providing provisional estimates of natural mortality. The functions described by Alagaraja (1984) are:

$$M1\% = -\ln(0.01)/Tm$$
$$M0.1\% = -\ln(0.001)/Tm$$

where, M1% and M0.1% are the natural mortality rates corresponding to 99% and 99.9% mortality, respectively, given a fish's lifespan (Tm) in years. Sheepshead in Louisiana have been aged to 20- years-old (Beckman et al. 1991), and to 23 years (this report). If it is assumed that 99% or 99.9% of the fish die by age 20 then the corresponding natural mortality rates for M1% and M0.1% would be 0.23 and 0.35 respectively. For a maximum age of 23, the estimates are 0.20 and 0.30 respectively.

The function described by Hoenig(1983) is:

$$\ln(Z) = 1.46 - 1.01 * \ln(Tm)$$

where, when M=Z, longevity (Tm) can be defined as the maximum survival age. If we assume that the maximum age of sheepshead has been truncated due to fishing from 25 years to 20 or 23 years, the resulting estimate of natural mortality, given Tm=25, would be 0.2.

Another method of estimating M is described by Rikhter and Efanov (1976) and utilizes population age at sexual maturity. The function is:

$$M = 1.521/(Tm50\%^{0.720}) - 0.155$$

where, Tm50% is the age at which 50% of the population is mature. Age 2 is reported as the age at 50% maturity for the sheepshead population (Render and Wilson 1992) resulting in an M estimate of 0.77.

In summary, the estimated rates of natural mortality for sheepshead in Louisiana using a variety of estimation procedures are as follow:

Pauly (1980)	0.40
Alagaraja (1984)	0.20 to 0.35
Hoenig (1983)	0.20
Rikhter and Efanov (1976)	0.77

5.3 Disappearance Rates and Fishing Mortality

The disappearance rate (Z') from the fishery comprises the total mortality (natural + fishing) and some unknown rate of decreasing availability of the fish to the fishery. If the unknown rate of availability is small or nonexistent, then the disappearance rate will be a reasonable estimate of total mortality. However, if a large portion of the disappearance rate is due to fish not being available to the fishery, then assuming Z'=Z will overestimate the impact of fishing.

Length frequency information was available from recreational and commercial fisheries for the period from 1994-2003 (Table 5.2). An annual catch-at-age matrix was developed by applying the ALK presented in Section 5.1 to the years where length frequency data for the commercial and recreational fishery was available (Table 5.3). Length frequency data were obtained from the Trip Interview Program (TIP) and from a LDWF biological sampling program for the commercial fishery, and from the National Marine Fisheries Services (NMFS) Marine Recreational Fishery Statistics Survey (MRFSS) samples for the recreational fishery. The data from both of the surveys did not consistently distinguish between sexes. Therefore, we assumed for this assessment that all fish sampled were female.

In prior assessments, we calculated the status of the stock based on estimation of disappearance rates. In the current assessment, we continue to use that methodology, but also include a VPA analysis for comparison of results.

Disappearance rates were calculated by regressing the natural log of the catch-at-age, beginning with the age at full recruitment to the fishery. In prior assessments, the age at full recruitment was estimated to be 7, based on age assignments from the von Bertalanffy growth equation. In the present assessment, due to the use of an ALK rather than a growth curve, we estimate the age at full recruitment to be 5 (Figures 5.1, 5.2).

Disappearance rate estimation assumes that recruitment is constant and the fishery is in equilibrium. A range of natural mortality rates were used in the assessment. After reviewing estimates of M in Section 5.2, we chose not to assume any method of estimating M was better

than another, but rather to present results for the range of estimates. The range of M was from 0.20 - 0.77. We chose to use an M of 0.2 as the lowest estimate of M since it was the lowest estimate derived from the methods examined. Resulting disappearance rates using an M of 0.2 indicated a SPR values well above 30%; therefore, assessing the impact of an upper range of M was of little value in evaluating the status of the stock compared to the conservation standard. However, we did use an upper range of 0.3 to evaluate how a change in M impacted resulting yield and SPR. Disappearance rates were calculated from the combined commercial and recreational catch-at-age data by year for 1994 - 2003. The calculated disappearance rates ranged from 0.41 to 0.55 (Table 5.4).

In prior assessments, selectivities were based on ages derived from the growth equation. These were modified by use of the ALK. The new selectivities were utilized in the estimation of stock benchmarks and annual estimates of spawning potential ratio and yield per recruit. As a result, estimates of stock benchmark values (e.g. YPR at 30% SPR) differ from previous reports. Also, annual estimates of SPR and YPR have changed from previous reports because of this change in analytical procedure. Therefore the annual estimates from the 2004 report are presented in the current report for comparison.

Catch-at-age from the fishery for the years 1994-2003 was used to derive age-specific selectivities to be used in yield-per-recruit analysis. The method presented in Sparre and Venema (1992) was used to develop selectivities. This method uses a linearized catch curve to determine the selectivity of fish not yet fully recruited to the fishery. The ratio of the observed catches to the expected catches at each age is the probability of capture or selectivity of the fishery at age. This selection is then regressed in the equation:

$$\ln(1 / S_t - 1) = T1 - T2 * t$$

where, S_t = the selectivity at age t, and T1 and T2 are constants corresponding to the intercept and slope of the regression. To develop theoretical or estimated selectivities at age the following equation is used.

$$S_t \text{ (estimate)} = 1 / (1 + \exp(T1 - T2 * t)$$

Selectivities for ages up to full age-at-recruitment were used to describe the relative fishing mortality to that point; for age at full recruitment and older, selectivities are assumed to be 1, or 100% selected. Regulatory changes in the commercial fishery in 1995 and 1997 were evident in the selectivity patterns observed. Therefore, selectivities were grouped into 3 time periods to reflect those changes in the fishery. Prior to 1995, gillnets and trammel nets were fished in inshore waters of the state on primarily younger fish and were a significant contribution to the commercial landings of sheepshead. Currently, the fishery is primarily an otter trawl fishery on larger fish in offshore waters and large bays and sounds. It is evident that the commercial selectivity pattern in the most recent years has moved toward larger fish (Table 5.2).

Selectivities in the previous and current assessment are as follows:

	Previous Assessment			Current Selectivities		
Age	**1994-1995**	**1996**	**1997-2002**	**1994-95**	**1996**	**1997-2003**
0	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.01	0.01	0.00
2	0.03	0.03	0.01	0.07	0.09	0.04
3	0.34	0.13	0.09	0.36	0.39	0.21
4	1.00	0.68	0.26	0.86	0.93	.62
5	1.00	1.00	0.57	1.00	1.00	1.00
6	1.00	1.00	0.96	1.00	1.00	1.00
7+	1.00	1.00	1.00	1.00	1.00	1.00

Disappearance rates (Z') were derived by regression of the descending arm of the catch curve. These values were re-calculated for each year, using the values derived from the new catch-at-age estimates (Table 5.4).

The estimates of harvest at age were also evaluated using a VPA (Jones, 1984) to determine age-specific mortality rates by year. We used the Solver tool in MS © Excel to iteratively calculate B, such that Q(t) = B(t) by varying F. The estimation procedure was constrained to F=>0.00001, precision of the solution set to 0.000001, convergence set to 0.0001, de-selecting the linear models option of Solver, using the quadratic estimation procedure, central derivatives, and the quasi-Newton search methods. This process was semi-automated through development of a macro to step through the annual estimation process. A range of terminal F was input manually, from 0.01 to 0.8 (Figure 5.3).

The VPA analysis was run for the years 1999-2003. Ages over 14 were combined into a 15+ age group. The results of this analysis were used to derive age-specific fishing mortality rates to be used in spawning potential calculations and yield-per-recruit analysis for comparison to estimates from the disappearance rate procedures used in this and prior assessments.

Examination of the estimates of F at age from various terminal F's in the VPA showed consistent patterns of selectivity across the range of terminal F's used for each year of input data (Figure 5.3). Sheepshead were estimated to be fully recruited to the fishery by age 5, based on inspection of the F at age for various years. Highest estimates of F were found for age 5 or age 7 sheepshead, with either a slight decline in F or an increase in F with older fish, depending on the year and M estimates. Another characteristic noted in the analysis was the relatively slow convergence of estimated F at age over the range of initial F considered. Very low values of initial F resulted in substantially lower estimates of F over all ages.

5.4 Yield-per-Recruit

Yield-per-recruit and SPR analysis provide basic information on fish stock dynamics by estimating the impact of mortality on yield and the spawning potential of the stock. The results can be examined as to the sensitivity of natural and fishing mortality rates on yield and spawning potential.

The growth parameters described in Section 5.1, sexual maturity described in Section 5.2 and the age-specific selectivities described in Section 5.3 were incorporated into the yield-per-recruit and spawning potential analysis. Mean weight for adult fish at each age was used as a surrogate of spawning potential, since we had no direct estimate of spawning potential at age. Natural mortality rates of 0.2 and 0.3 were used in the analysis because they are on the lower end of the range of estimates and would provide the most conservative results. These rates are also used to describe the sensitivity of M on yield and spawning potential. The results are presented in Table 5.5, which contains estimates of F_{MAX} (fishing mortality rate that produces maximum yield), $F_{0.1}$ (fishing mortality rate representing 10% of the slope at the origin of a yield-per-recruit curve), $F_{20\%SPR}$ (fishing mortality that produces 20% SPR), $F_{30\%SPR}$ (fishing mortality that produces 30% SPR), and annual estimates of F based on the disappearance rates calculated in Section 5.3. Selectivities patterns of the overall fishery are recalculated with each additional year of data. Therefore, the results of this analysis, reflected in Table 5.2, could change each year depending on any change in selectivity patterns in the fishery.

In prior assessments, the status of the stock was based on disappearance rates calculated using a von Bertalanffy growth equation. In the current assessment, we continue to use disappearance rates, but based on an age-length key. We also include a VPA analysis based on that same ALK for comparison of results.

In the current analysis, the F at age was also incorporated into the YPR analysis based on the results of the VPA for that year. Yield analyses are presented for the years 1999-2003. Age specific selectivities were based on F at age indexed to F at age 5. The analysis was carried out to age 20, but the VPA contained no information on F for fish older than age 14. Estimates of F at age 15+ carried no predictive power (these were the terminal years of the VPA). Therefore, fish ages 15 and older were assigned selectivities equal to the selectivities of age 5.

For the VPA-based YPR analysis, fishing mortality rates at age were selected as the average of the F at age from the $F_{terminal}$=0.1 to $F_{terminal}$=0.6. These rates were used in the analysis because they included a range of reasonable values, and the lowest terminal values were still above the F's estimated for slightly younger ages (Figure 5.3). Those age-specific mortality rates were applied to a yield per recruit model, using the von Bertalanffy parameters described in Section 5.1. Selectivities at age were assigned based on the annual estimated F profile for each value of M.

5.5 Conservation Standards

Conservation standards are intended to protect the viability of a fish stock for future generations. These standards have historically been based on a number of biological measures of the dynamics of fish stocks, depending on the availability and adequacy of data. Conservation standards should be separated into two types: a conservation threshold which is entirely biologically based and, a conservation target which considers biological measures modified by relevant social, economic, and ecological factors. A conservation threshold is a biological baseline for the harvest of a fish stock and should not be exceeded. It is the highest level of fishing mortality that will ensure that recruitment overfishing will not occur. Beyond the conservation threshold, a conservation target may be set, providing for other management goals

in the fishery. Such goals may include maximizing yield in weight or numbers of fish, economic benefits or profit, employment, or some other measurable goal. These targets should be set at a fishing mortality rate below that of the conservation threshold in order to ensure that the biological integrity of the stock is not damaged by fishing.

The spawning potential ratio (SPR) concept described by Goodyear (1989), is a species specific value expressed as the ratio of the spawning stock biomass (or egg production) per recruit (SSB/R) in a fished condition to the SSB/R in an unfished condition. The concept is based on the premise that below some level of SPR, recruitment would be expected to be reduced. Goodyear (1989), recommends that in the absence of sufficient data to provide a value specific to the stock in question an SPR of 20% be used as a threshold. Work on North Atlantic ground fisheries also resulted in the calculation of a threshold SPR of 20% (Gabriel et al. 1984, Gabriel 1985). An SPR of 20% has been recommended for Spanish and king mackerel in the Gulf of Mexico (National Oceanic and Atmospheric Administration/National Marine Fisheries Service 1995), while an SPR of 8-13% has been demonstrated to be sufficient for gulf menhaden (Vaughan 1987). In earlier analyses of Louisiana spotted seatrout fisheries (Louisiana Department of Wildlife and Fisheries 1991), an SPR threshold of 15% was recommended, based on several years of data. A more recent reassessment of threshold SPR for spotted seatrout by the department resulted in a median SPR of 18%. The change from 15% to 18% was due to changes in the methodology of the assessment, specifically the use of an improved maturity schedule with additional data from Louisiana specimens and the incorporation of the method used by Gabriel (Gabriel *et al.* 1984, Gabriel, 1985) to estimate median SPR. Mace and Sissenwine (1993) examined 90 stocks of 27 species, and reported that the average replacement SPR for all these stocks was 18.7%, while the most resilient quarter of the stocks required a maximum of only 8.6% SPR. These authors recommended an SPR of 30% be maintained when there is no other basis for estimating the replacement level, as this level was sufficient in maintaining recruitment for 80% of the stocks they examined. However, they noted that 30% may be overly conservative for an "average" stock, and reiterated the need for stock-specific evaluations of standards to enhance both safety and benefits in the fishery.

Sufficient information is not available to directly estimate a conservation threshold for sheepshead in Louisiana. However, the conservation target of 30% SPR established by the 1995 Regular Session of the Louisiana Legislature for black drum, sheepshead, southern flounder, and striped mullet appears to be adequate to maintain the sheepshead stock and prevent recruitment overfishing.

The use of any measure of the health of a fish stock as a perfect index is arguable. It is logical to conclude that growth overfishing should occur at a much lower fishing rate than that which would threaten recruitment. However, Mace and Sissenwine (1993) provide information to suggest that some stocks may have reduced recruitment at levels of fishing that would not reduce yield per recruit. The preferable position for making recommendations on appropriate levels of fishing for a stock is to base those recommendations on actual measures of spawning stock size and recruitment for both the species and fishery in question. This requires a base of information resulting from monitoring of both the stock and the fishery over a variety of conditions. Without this information, conservation standards may either underestimate or overestimate the potential of a fishery. If the potential is underestimated, society loses the economic and social benefits of the harvest. If the potential is overestimated and the fishery is allowed to operate beyond sustainable levels, society loses the benefits of a sustainable fishery,

and recovery will require some period of rebuilding, when effort must be reduced from the non-sustainable levels (Hilborn and Walters, 1993).

5.6 Status of the Stock

Recent Regulatory History

There are no size or creel limits for sheepshead taken recreationally. Commercial harvesters are limited to a 10 inch minimum size limit.

Rules for the commercial harvest of sheepshead changed on August 15, 1995 when Act 1316 of the 1995 Regular Legislative Session, the Marine Resources Conservation Act of 1995, became effective. This act outlawed the use of "set" gill nets or trammel nets in saltwater areas of Louisiana, and restricted sheepshead harvest by the use of "strike" nets to the period between the third Monday in October and March 1 of the following year. A "Restricted Species Permit" was required in order to harvest sheepshead, and several criteria were established in order to qualify for that permit. After March 1, 1997, all harvest by gill or trammel nets was banned, and legal commercial gear to harvest sheepshead is limited to trawls, set lines and hook and line. This set of regulations had the effect of reducing the harvest of sheepshead by this segment of the commercial fishing industry.

Trends in Harvest and Abundance

Sheepshead were lightly exploited by the commercial fisheries until the early to mid-1980s when commercial harvest began to increase (Figure 5.4). Commercial landings have gone from 0.2 million pounds in the early1980s to 2.4 - 3.7 million pounds in the 1990s. Landings then generally declined from a high of 3.7 million pounds in 1993 to about 1.6 million pounds in 2002 and 2003. Fishery dependent commercial data prior to 1991 was obtained from NMFS's General Canvass Landing Program, from 1991 through 1998 it was collected by the Louisiana Department of Wildlife and Fisheries' (LDWF) Monthly Dealer Reports and from 1999 to present LDWF's Commercial Reporting Requirement "Trip Tickets" program is utilized to gather this type of data.

Harvest from the recreational fishery obtained by the NMFS'S MRFSS fluctuated from a low of 0.4 million pounds in 1981 to a high of 1.5 million pounds in 1997. This was followed by a decline, with increases in 2002 and 2003, with 2003 being a record year with 2.2 million pounds of sheepshead being landed. Recreational harvests for the years examined (1981-2003), were equal to those of the commercial fishery until 1987 when the commercial fishery began to expand (Figure 5.4).

Mean catch-per-trip from the recreational fishery was calculated by selecting those trips that had sheepshead in their catch. The arithmetic average CPUE values were indexed to the long-term mean. The results are presented in Figure 5.5. The catch-per-unit-effort (CPUE) indices fluctuated with no indication of a long-term downward trend. Fisheries-dependent recreational landings data are collected through NMFS's MRFSS and are currently being collected by LDWF biologists.

Catch-per-effort data from the Department's, fishery-independent trammel net (750' x 6' - 1 5/8" inner, 6" outer wall) samples were calculated as follows:

$$\text{Mean CPUE} = (\exp (\Sigma \ln (\text{catch} + 1) / N)) - 1$$

where, catch is the total number caught in each set and, N is the number of samples taken annually. Trammel net data were used for the period 1986-2004. Trammel net samples are collected from October through March. In order to use the most recent data available to us in this report, trammel net CPUE was estimated for October-December only. This allowed the use of 2004 data through December. Trammel net CPUE fluctuated throughout the time period with no indication of a long-term downward trend. Mean CPUE for 2003 fell below the high years of 2000 and 2001, but was not significantly lower than any of the years examined (Figure 5.6).

Estimates of Yield and Spawning Potential

It should be noted that the following results of YPR and SPR analysis may not reflect the impact of current regulations described above. With this type of general assessment, it takes several years of consistent regulations before disappearance rates would accurately measure the impact of those regulations, since the method relies on the relative abundance of the age-classes in the fishery.

The results of the YPR and SPR from the disappearance rate calculations and from the VPA calculations were remarkably close (Table 5.5). The major change seen was the result of the application of the age-length key to the length-frequency information, which changed estimated values from the previous assessment. Those previous values are also presented for comparative purposes in Table 5.5. We selected to use the results from the disappearance rate assessment based on the ALK simply because this method had been used in previous analyses, and the selection did not make any difference in the results of this analysis.

The results of YPR analysis indicate that if M=0.2 (the value within the range of estimates that allows the lowest harvest rates within the conservation standard), the fishery in the years assessed (1999 - 2003) was operating near $F_{0.1}$ and well below F_{MAX}, with yield of 69% to 81% of maximum, and SPR at 47% to 57%. An M of 0.3 (the highest value examined) would indicate a more lightly fished stock with yield being 32% to 50% of maximum and with SPR being 66% to 78% (Table 5.5).

5.7 Research and Data Needs

Estimates of natural mortality used in the present assessment vary widely. This variation lessens the ability of the present assessment to provide an accurate estimate of the potential yield of the stock, and also reduces the confidence level of the present estimate of SPR. A more accurate estimate of natural mortality would improve both estimates.

Annual sex-specific age-length keys should continue to be developed to provide catch-at-age data necessary to conduct age-based population assessments. Due to the preliminary information on potential differential availability to recreational and commercial fisheries, efforts need to be made to collect adequate age samples from each fishery to

independently characterize the age structure of these harvests. Interannual variation in cohort strength or changes in fishing patterns could create significant problems in future assessments, so that annual collections of age information are required for accurate assessments. The department is in the process of collecting otoliths for development of annual age-length keys. When age data are sufficient, the Department intends to conduct more extensive VPA analyses and to explore other statistical methods of evaluating the status of the sheepshead stock.

Sex-specific fishery dependent length frequency data is essential in adequately partitioning catch from the fishery. There can be significant improvement in the accuracy of this assessment if sex is collected.

The relationship between wetlands losses or modifications and the continuation of fishery production within the state has been discussed by many authors. However, this relationship is likely to be different for the various fishery species. Understanding of this relationship for sheepshead should be an ongoing priority.

In the presence of changing regulations, fishery-dependent information is not a reliable source of data necessary to assess the status of a fish stock. However, such data are necessary to measure the effects of fishing on that stock. Consistent fishery-dependent and fishery-independent data sources, in a comprehensive monitoring plan, are essential to understanding the status of fishery stocks, and to identifying causes of changes in stock abundance. Present programs should be assessed for adequacy with respect to their ability to evaluate stock status, and modified or enhanced to optimize their capabilities.

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Table 5.1. Age-length key used for assessment of sheepshead in Louisiana. Right-hand columns are total numbers of fish aged from each of the fisheries, as well as the total numbers of age samples at each length interval.

	AGES FROM ALL SOURCES																								NUMBER OF AGED FISH BY SOURCE			
Fork Length	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	Fishery Ind	Rec	Com	Total
4	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2			2
5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1			1
6	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5			5
7	1	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6			6
8	1	7	47	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	57	1		58
9	0	12	46	6	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	58	6	2	66
10	0	16	43	29	14	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	86	8	12	106
11	0	7	60	105	42	10	5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	173	14	43	230
12	0	2	56	148	81	35	9	1	2	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	245	11	81	337
13	0	0	26	150	155	83	18	3	2	2	0	0	1	0	0	1	0	0	0	0	0	0	0	1	315	19	108	442
14	0	1	21	101	175	109	36	16	1	3	0	1	0	0	0	1	0	0	0	0	0	0	0	0	316	23	126	465
15	0	0	7	47	168	183	72	33	14	11	4	0	0	1	0	1	3	0	0	0	0	0	1	0	384	18	143	545
16	0	1	6	18	68	131	100	58	13	12	1	5	1	0	1	1	2	0	0	0	0	0	0	1	286	11	122	419
17	0	0	1	6	27	50	59	33	19	18	5	8	5	1	3	2	0	0	0	3	0	0	0	1	159	12	70	241
18	0	0	1	0	5	21	28	15	15	9	4	3	4	6	1	1	2	0	0	0	1	0	0	1	74	3	40	117
19	0	0	0	2	7	6	5	7	3	9	5	1	1	0	1	0	0	1	0	1	0	0	1	0	33	3	14	50
20	0	0	0	2	0	1	1	3	4	2	1	2	1	0	0	1	0	0	0	1	0	0	0	0	5	3	11	19
21	0	0	0	0	0	0	0	0	0	0	1	4	0	1	0	0	0	0	0	0	0	0	0	0	2	0	4	6
																									2207	132	776	3115

Table 5.2. Length frequency of recreationally and commercially harvested sheepshead from Louisiana waters

Recreational Length frequency by year										
len	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
.	18	16	69	87	109	81	80	110	101	336
5	0	3	0	0	0	0	0	0	0	0
6	3	12	0	1	0	0	0	0	0	0
7	4	2	6	5	0	1	0	1	0	0
8	7	2	8	4	1	1	0	0	2	8
9	15	11	15	9	0	4	1	5	6	16
10	13	23	18	20	2	8	3	1	13	52
11	42	44	27	24	18	13	6	7	33	140
12	45	26	15	43	23	31	3	11	50	144
13	35	61	55	62	35	30	5	17	40	208
14	27	35	70	82	47	51	13	10	63	200
15	22	38	49	63	62	51	10	14	72	220
16	11	8	22	40	50	47	9	17	47	288
17	6	12	13	18	38	31	11	20	28	308
18	4	8	7	10	21	19	4	11	19	156
19	1	4	2	5	6	7	4	8	9	72
20	2	5	1	2	3	9	1	9	3	60
21	0	1	3	0	0	0	1	3	1	8
22	1	0	0	0	1	1	0	0	0	0
23	2	0	0	0	0	1	0	1	0	0
24	0	0	0	1	0	1	0	0	0	0
25	0	0	0	0	0	0	1	0	0	0

Commercial length frequency by year										
len (in)	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
8	5	0	0	0	0	0	0	0	0	0
9	14	12	10	4	0	0	0	0	0	0
10	17	42	44	5	3	0	0	0	0	0
11	25	152	132	18	8	1	5	2	2	2
12	67	247	210	65	30	4	15	7	1	13
13	67	285	194	144	71	12	27	15	9	17
14	52	291	138	186	99	24	65	36	26	58
15	48	223	110	142	90	8	83	48	66	125
16	28	136	100	91	36	2	62	28	63	109
17	16	81	58	32	9	0	27	13	36	59
18	12	53	35	13	1	0	13	7	24	20
19	7	23	15	3	3	0	5	0	5	17
20	1	9	7	3	0	0	1	1	2	13
21	0	4	2	0	0	0	0	0	0	2
22	0	0	0	0	0	0	0	0	1	1
Total	359	1558	1055	706	350	51	303	157	235	436

Table 5.3. Estimates of total harvest at age of sheepshead in Louisiana waters.

	TOTAL CATCH-AT-AGE BY YEAR										
AGE	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	**1994-2003 Average**
0	1,680	6,070	2,175	1,899	27	194	1	403	54	59	1,256
1	14,006	45,839	20,115	16,705	2,067	3,536	4,773	4,591	7,617	7,687	12,693
2	90,991	118,077	110,606	84,381	35,110	37,853	33,222	27,057	56,230	57,037	65,056
3	299,464	337,484	306,216	247,886	155,025	168,265	109,065	81,868	138,862	149,901	199,404
4	445,443	483,651	442,803	451,497	333,497	435,601	240,884	175,280	210,419	231,784	345,086
5	419,283	463,700	405,659	495,613	400,030	510,065	330,537	242,896	247,506	291,414	380,670
6	143,748	172,109	148,901	197,581	169,189	183,939	159,308	118,306	131,269	173,043	159,739
7	131,549	147,667	114,597	177,321	155,542	179,710	156,175	117,036	107,582	136,915	142,409
8	44,982	54,306	43,743	54,166	46,679	49,185	53,665	42,604	42,010	59,569	49,091
9	54,492	61,720	50,531	63,242	49,986	54,845	63,792	47,110	48,695	61,991	55,640
10	19,083	22,496	17,178	22,204	18,304	24,745	24,100	18,457	16,928	22,461	20,596
11	21,782	27,806	26,362	24,259	17,192	12,730	28,147	24,141	20,209	40,831	24,346
12	12,798	14,286	11,727	13,124	10,469	5,541	17,104	12,173	13,584	18,821	12,963
13	5,014	6,736	6,071	7,092	5,993	6,611	8,172	6,680	6,079	8,571	6,702
14	3,383	3,967	3,119	5,131	4,794	3,408	5,994	4,438	4,095	6,018	4,435
15 +	14,012	17,605	13,859	15,898	15,359	15,834	14,540	13,507	12,277	22,830	15,572
TOTAL	1,721,711	1,983,519	1,723,662	1,877,998	1,419,264	1,692,061	1,249,477	936,545	1,063,417	1,288,933	1,495,659

Table 5.4. Natural log of Louisiana harvest of sheepshead, and estimates of regression of age vs. harvest of age 5-14 fish. Also listed are the estimated F values for M=0.2 and M=0.3 for each year calculated.

	Natural log of catch at age by year										1994-2003
AGE	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	**average**
0	7.43	8.71	7.68	7.55	3.29	5.27	0.00	6.00	3.99	4.08	7.14
1	9.55	10.73	9.91	9.72	7.63	8.17	8.47	8.43	8.94	8.95	9.45
2	11.42	11.68	11.61	11.34	10.47	10.54	10.41	10.21	10.94	10.95	11.08
3	12.61	12.73	12.63	12.42	11.95	12.03	11.60	11.31	11.84	11.92	12.20
4	13.01	13.09	13.00	13.02	12.72	12.98	12.39	12.07	12.26	12.35	12.75
5	12.95	13.05	12.91	13.11	12.90	13.14	12.71	12.40	12.42	12.58	12.85
6	11.88	12.06	11.91	12.19	12.04	12.12	11.98	11.68	11.79	12.06	11.98
7	11.79	11.90	11.65	12.09	11.95	12.10	11.96	11.67	11.59	11.83	11.87
8	10.71	10.90	10.69	10.90	10.75	10.80	10.89	10.66	10.65	10.99	10.80
9	10.91	11.03	10.83	11.05	10.82	10.91	11.06	10.76	10.79	11.03	10.93
10	9.86	10.02	9.75	10.01	9.81	10.12	10.09	9.82	9.74	10.02	9.93
11	9.99	10.23	10.18	10.10	9.75	9.45	10.25	10.09	9.91	10.62	10.10
12	9.46	9.57	9.37	9.48	9.26	8.62	9.75	9.41	9.52	9.84	9.47
13	8.52	8.82	8.71	8.87	8.70	8.80	9.01	8.81	8.71	9.06	8.81
14	8.13	8.29	8.05	8.54	8.48	8.13	8.70	8.40	8.32	8.70	8.40
15 +	9.55	9.78	9.54	9.67	9.64	9.67	9.58	9.51	9.42	10.04	9.65
Overall disappearance (Z') - ages 5-14 estimated for each year of data											
Y-intercept	15.12	15.21	15.02	15.29	15.09	15.64	14.72	14.41	14.49	14.59	14.97
Slope	-0.50	-0.49	-0.49	-0.49	-0.49	-0.55	-0.43	-0.42	-0.44	-0.41	-0.47
R^2	0.96	0.97	0.96	0.97	0.97	0.97	0.97	0.97	0.97	0.95	0.97
Fishing mortality rate at full selectivity											
M=0.2	0.30	0.29	0.29	0.29	0.29	0.35	0.23	0.22	0.24	0.21	0.27
M=0.3	0.20	0.19	0.19	0.19	0.19	0.25	0.13	0.12	0.14	0.11	0.17

Table 5.5. Results of Yield per Recruit and SPR analysis for Sheepshead, comparing estimates from different assessment techniques. Base case values are the estimates from disappearance rate estimates (Z'), using age-length key (ALK) to assign ages to harvest. Values from 2004 provided for comparison with estimates from growth equation, VPA estimates used for sensitivity analysis.

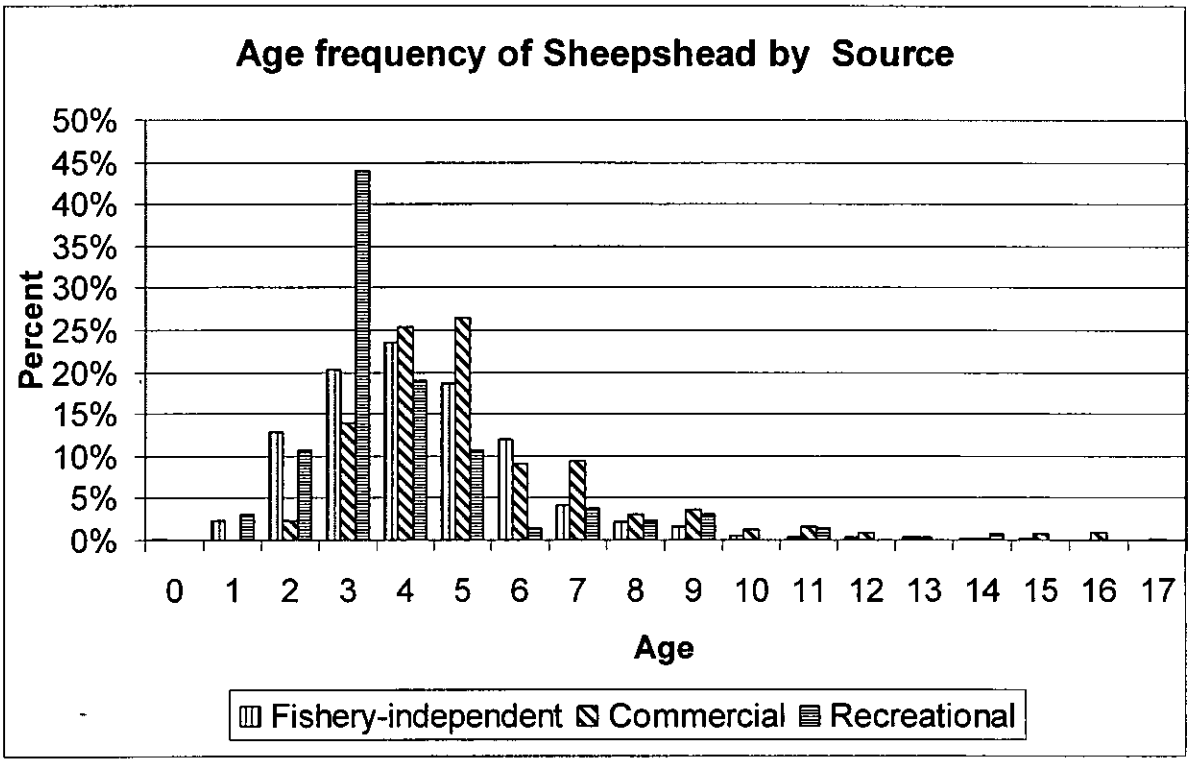
M=0.2

	F Ratio	YPR	SPR	%SPR	%YPR	
Fmax =	**51.6724**	**542.6297**	**594**	**11.36%**	**100.00%**	**Benchmarks**
F0.1 =	**0.3437**	**394.6224**	**2,877**	**55.02%**	**72.72%**	
F20% =	**9.1205**	**536.5425**	**1,046**	**20.00%**	**98.88%**	
F30% =	**2.4540**	**517.3649**	**1,569**	**30.00%**	**95.34%**	
1999 =	0.3739	404.2018	2,800	53.56%	74.49%	**2004 Assessment Estimates Based on Z' and growth equation**
2000 =	0.1303	260.9248	3,802	72.72%	48.09%	
2001 =	0.0778	188.1420	4,236	81.02%	34.67%	
2002 =	0.2560	357.8359	3,154	60.32%	65.94%	
1999 =	0.3818	408.1999	2,644	50.53%	76.47%	**Estimates Based on VPA**
2000 =	0.2505	369.7108	2,975	56.87%	69.85%	
2001 =	0.2352	359.9959	3,043	58.16%	68.23%	
2002 =	0.2458	375.3996	2,875	54.96%	71.61%	
2003 =	0.2011	348.1533	3,098	59.22%	66.34%	
1999 =	**0.3491**	**430.8855**	**2,477**	**47.35%**	**81.12%**	**Estimates Based on Z' and ALK**
2000 =	**0.2294**	**377.1908**	**2,922**	**55.85%**	**71.01%**	
2001 =	**0.2248**	**374.3485**	**2,944**	**56.26%**	**70.48%**	
2002 =	**0.2365**	**381.4875**	**2,888**	**55.21%**	**71.82%**	
2003 =	**0.2123**	**366.0479**	**3,007**	**57.48%**	**68.91%**	

M=0.3

	F Ratio	YPR	SPR	%SPR	%YPR	
Fmax =	**53687092**	**448.1602**	**0**	**0.00%**	**100.00%**	**Benchmarks**
F0.1 =	**0.5570**	**240.7092**	**1,601**	**60.96%**	**53.71%**	
F20% =	**33.4831**	**394.4429**	**525**	**20.00%**	**88.01%**	
F30% =	**8.6460**	**366.4702**	**788**	**30.00%**	**81.77%**	
1999 =	0.2739	182.0656	1,881	71.63%	40.63%	**2004 Assessment Estimates Based on Z' and growth equation**
2000 =	0.0303	36.9478	2,485	94.65%	8.24%	
2001 =	0.0000	0.0000	2,626	100.00%	0.00%	
2002 =	0.1560	133.4234	2,095	79.77%	29.77%	
1999 =	0.2400	175.2232	1,883	71.65%	43.29%	**Estimates Based on VPA**
2000 =	0.1507	145.1772	2,028	77.17%	36.25%	
2001 =	0.1375	137.0038	2,063	78.50%	34.62%	
2002 =	0.1461	149.3738	1,997	75.98%	37.24%	
2003 =	0.1130	127.9357	2,096	79.78%	31.89%	
1999 =	**0.2491**	**206.1612**	**1,743**	**66.38%**	**51.35%**	**Estimates Based on Z' and ALK**
2000 =	**0.1294**	**142.1729**	**2,038**	**77.60%**	**35.41%**	
2001 =	**0.1248**	**138.8822**	**2,052**	**78.16%**	**34.59%**	
2002 =	**0.1365**	**147.1630**	**2,016**	**76.76%**	**36.66%**	
2003 =	**0.1123**	**129.3165**	**2,094**	**79.76%**	**32.21%**	

Figure 5.1. Age frequency of sheepshead included in age-length keys from fishery-independent, commercial and recreational fisheries. Top figure shows percent in each age class for each fishery, bottom shows the same information on a logarithmic scale.



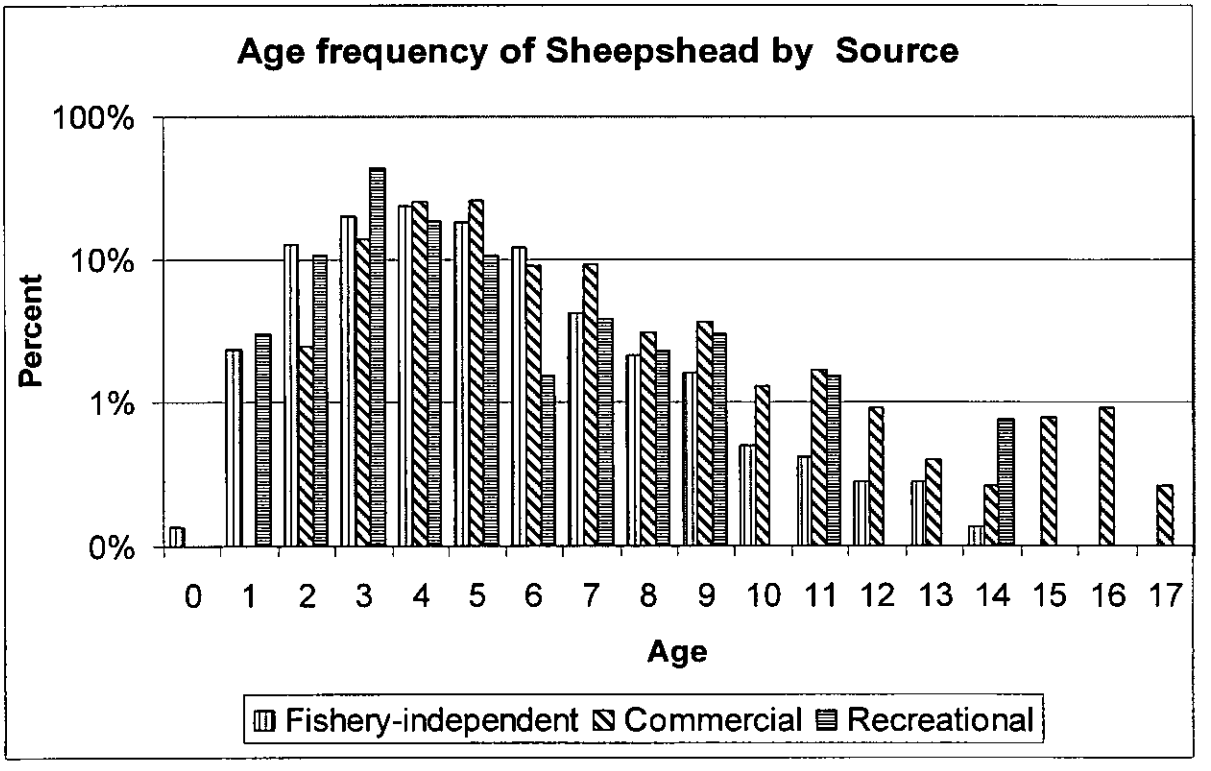


Figure 5.2. Overall age frequency of sheepshead harvest as estimated from length frequency information from commercial and recreational fisheries and age assignments from the ALKs as described in the text. The age distribution of each sector was calculated independently against the total for that sector and equals 100%.

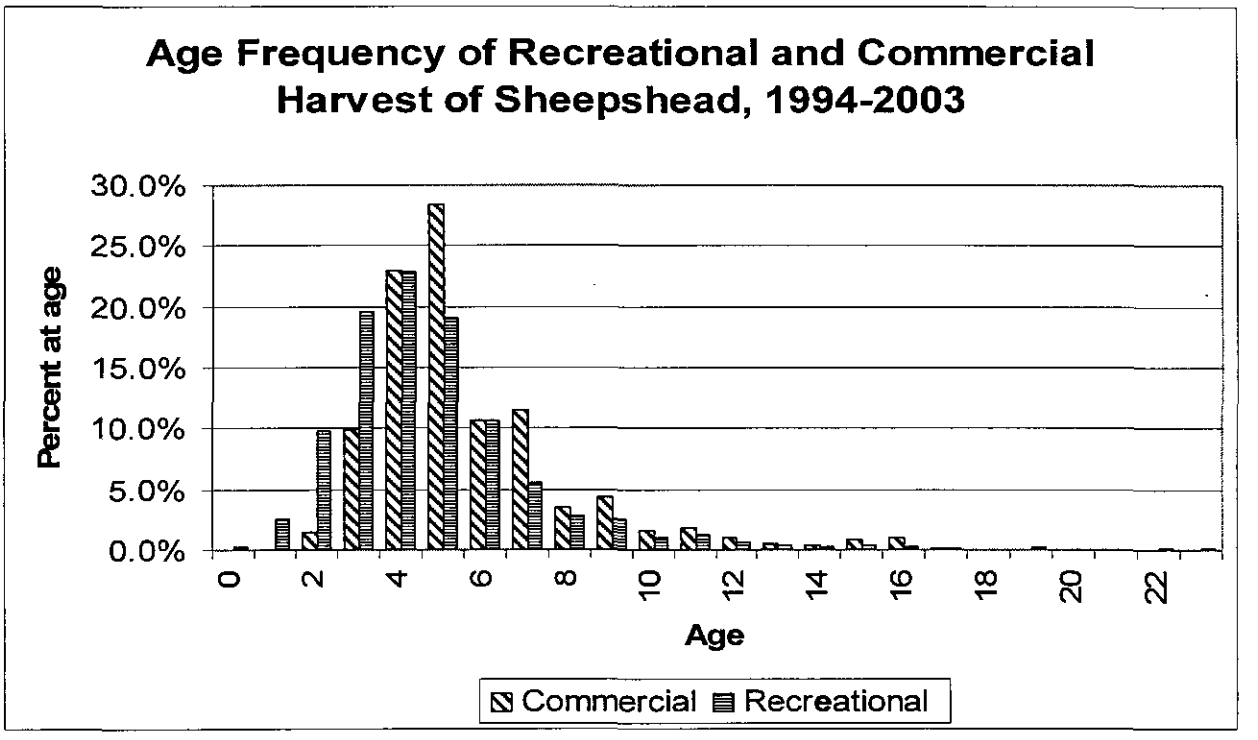


Figure 5.3. Estimates of F at age for Louisiana sheepshead from VPA using various terminal F's, for M=0.2 and M=0.3.

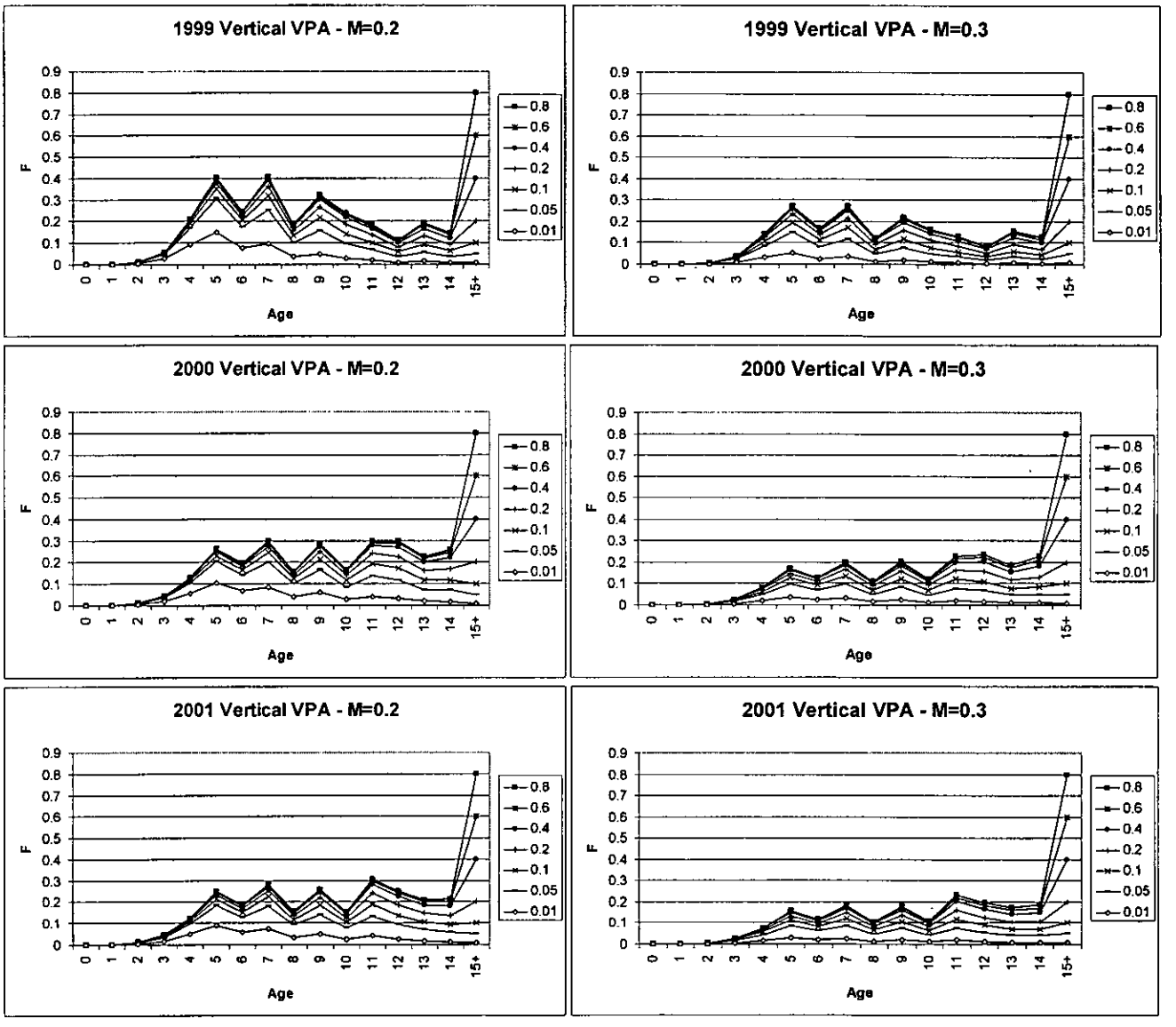


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Figure 5.3 (continued). Estimates of F at age for Louisiana sheepshead from VPA using various terminal F's, for M=0.2 and M=0.3.

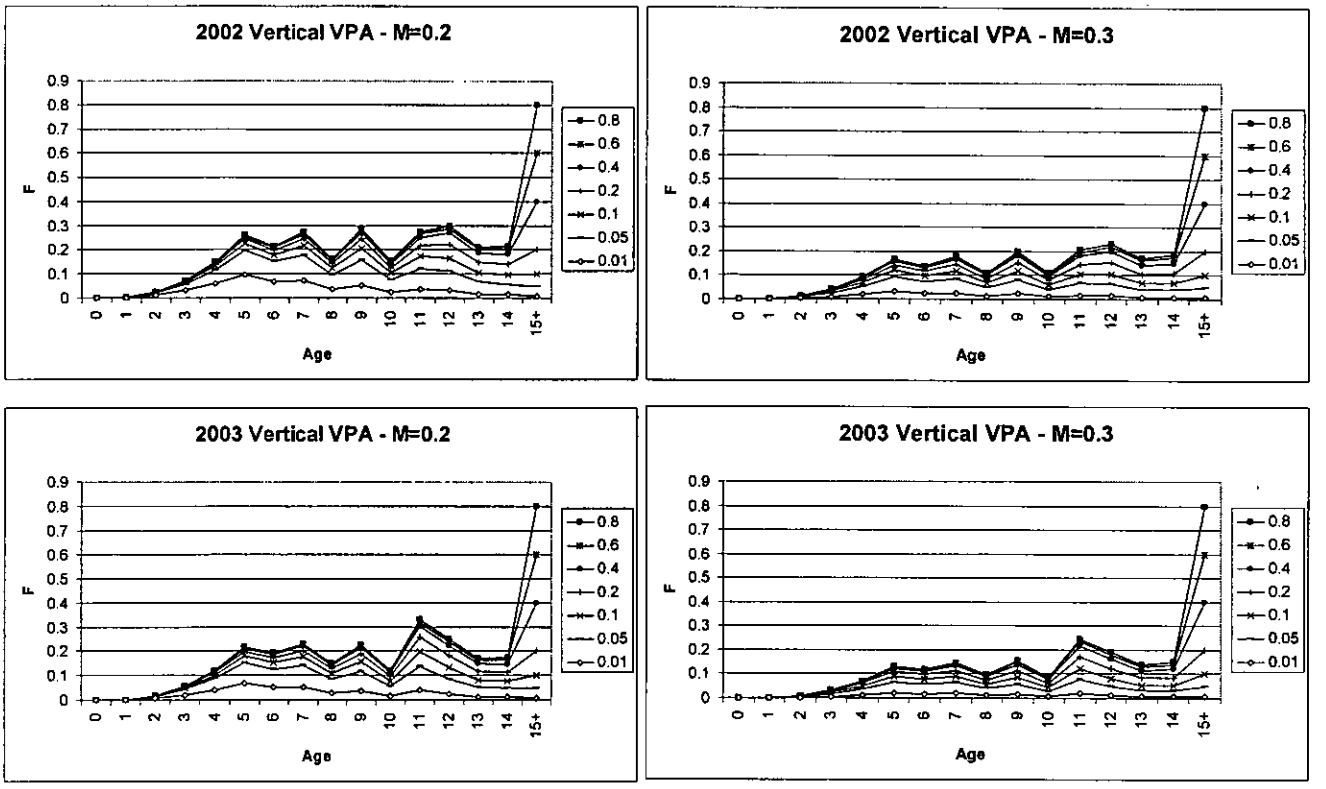


Figure 5.4. Recreational and commercial landings of sheepshead in Louisiana. Source of landings data described in text.

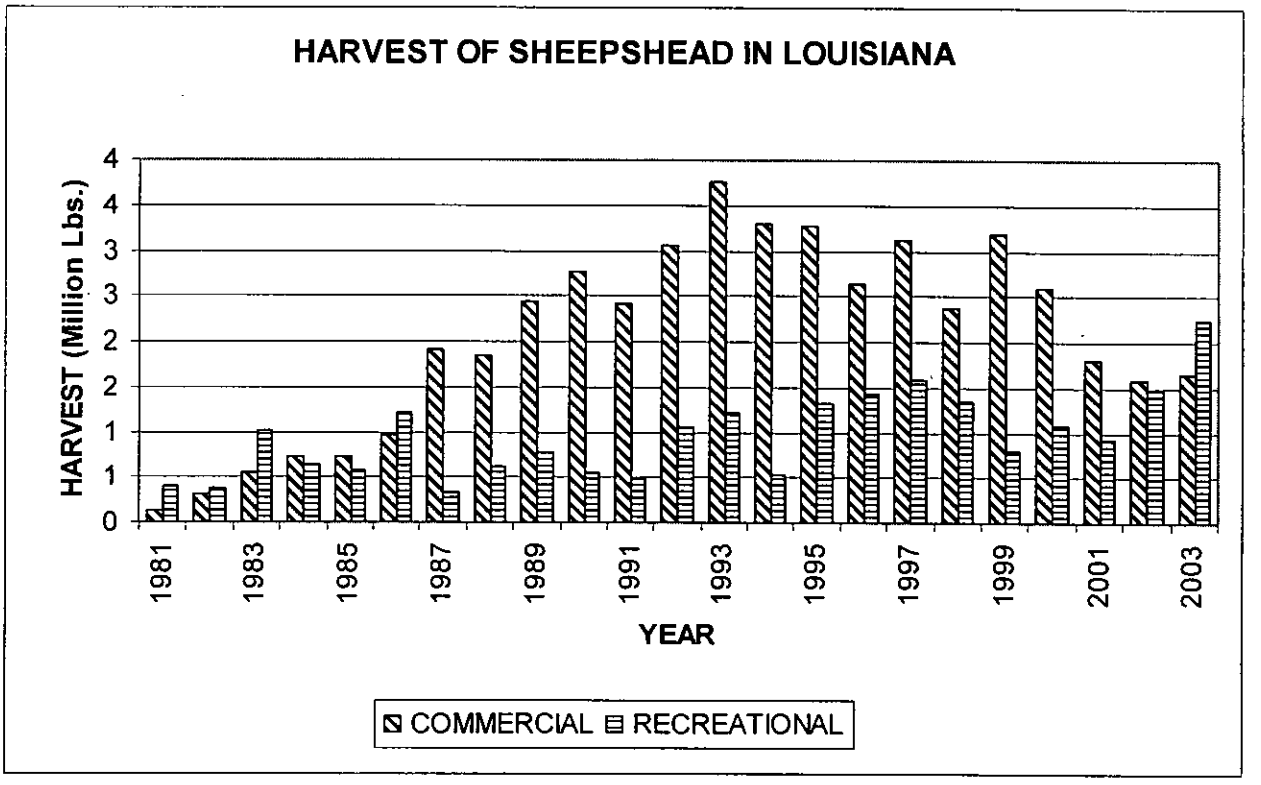


Figure 5.5. Standardized catch per effort for the recreational fishery for sheepshead in Louisiana. Derivation of estimates described in text.

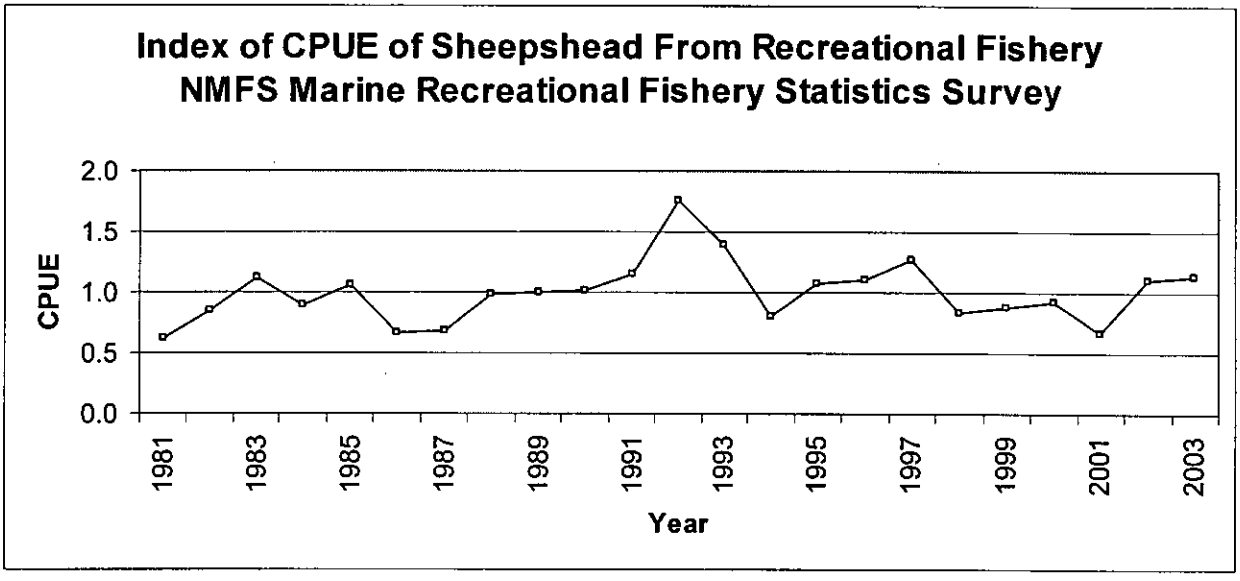
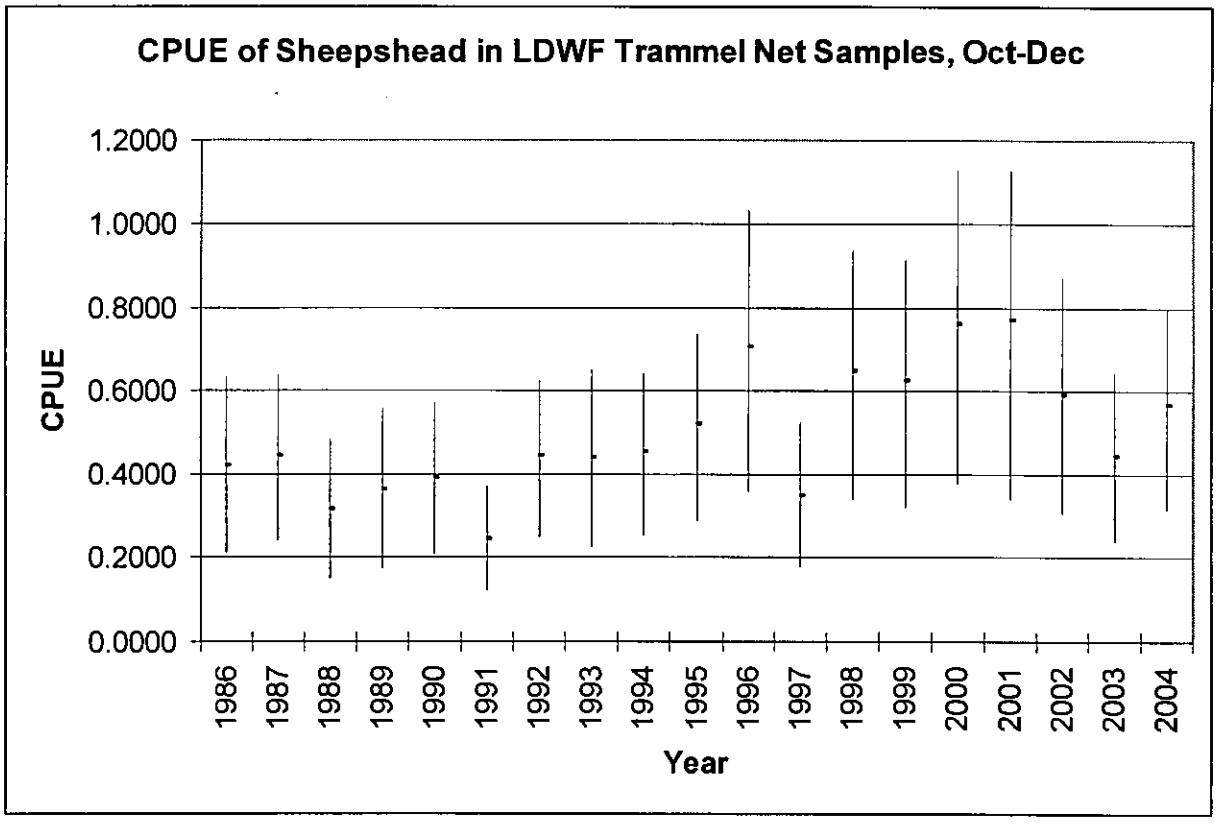


Figure 5.6. Catch per Unit Effort (CPUE) of sheepshead in LDWF fishery-independent trammel net samples, Oct-December of each year. Details of calculations of the CPUE index are described in text.



SOUTHERN FLOUNDER
SUMMARY OF CHANGES FROM 2004 ASSESSMENT

This summary is intended to provide a quick reference of substantive changes in methods or corrections in this year's assessment from the 2004 assessment conducted for southern flounder.

- A sex-ratio-at-size function was added to the estimates of harvest at size to better describe the harvest of female flounder.

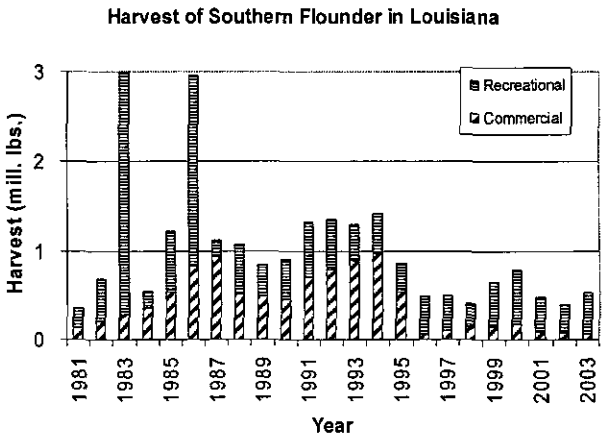
- The age-length key was modified to include additional age data added to the matrix from ongoing age studies, and was limited to fishery-dependent samples.

- Disappearance rates were recalculated based on ages from the modified age-length key. Estimates from those calculations were compared to results from equilibrium virtual population analysis based on the most recent years of information.

- Indices of abundance were updated.

2005 DOCUMENT HIGHLIGHTS

- The 2003 combined commercial and recreational harvest of 518,032 pounds was about 92% of the average of all years from 1995 through 2003. Regulations implemented between 1995 and 1997 have caused significant reductions in commercial harvest.



- The conservation standard for southern flounder is 30% spawning potential ratio (SPR). The results of yield per recruit analysis based on the disappearance rate calculations indicate that if the natural mortality rate (M) equals 0.5 (the value that provides the lowest allowable harvest within the conservation standard), the fishery in the years assessed (1997 - 2003) was operating between $F_{0.1}$ and F_{MAX}, with yields of 96% to 100% of maximum and spawning potential ratio (SPR) at 16% to 30%. An M of 0.8 (the highest value within the range examined) would produce YPR of 63% to 85% of maximum with SPR at 27% to 52%. The results of the YPR analyses based on VPA results were very similar to those based on disappearance rates.

- It should be noted that the methods used in this assessment to determine the status of the stock, catch curve and virtual population analyses, are not immediately sensitive to changes in regulations. Southern flounder enter the fishery at age 0 and are fully recruited by age 2. It takes several years of consistent regulations after they are imposed before disappearance rates would accurately measure the impact of those regulations, since the methods rely on the

relative abundance of the age-classes measured. In the case of southern flounder it would take 3 years of consistent regulations assuming selectivities of age 2 and older is 100%.

- As a result of acquiring several years of commercial trip ticket data, and collecting recreational fishery statistics data, the department was able to begin a program to representatively sample fishery dependent otoliths in 2002. The program uses trip ticket data and recreational survey data to weight sampling sites so that otolith collections reflect harvest from the fisheries for the species of interest. It is expected that this method of otolith sampling will improve stock assessments by providing more accurate annual catch-at-age data.

SOUTHERN FLOUNDER
5.0 STOCK ASSESSMENT

This assessment uses yield-per-recruit (YPR), Spawning Potential Ratio (SPR) and catch curve analyses to estimate the impact of fishing pressure on potential yield and the spawning potential of the southern flounder stock in Louisiana waters. Estimates derived from YPR and SPR are based on information regarding the growth rate and spawning potential of the fish, and on estimates of the natural mortality rate (M) and fishing mortality rate (F) on the stock. Catch-curve analysis estimates disappearance rates (Z') from the fishery based on the relative abundance of each age class in the harvest. The results from this assessment provide a generalized approach towards estimating the impact of fishing on the spawning potential and potential yield of the fish stock. The spawning biomass of females is assumed to be the factor limiting the spawning potential of the stock; therefore, where possible, only data on female southern flounder are used. Yield-per-recruit and SPR analysis, as with many other generalized assessments, should be used only as a guide until a more comprehensive assessment can be conducted.

In developing a stock assessment, the unit stock must be defined. While a unit stock is often represented by that portion of the population which is genetically similar, for our purpose, the most applicable definition seems to be one which considers the unit stock as that portion of the population which is either dependent on Louisiana waters, or which is available to Louisiana fishermen.

The total harvest of southern flounder from Louisiana waters was obtained from National Marine Fisheries Service (NMFS) commercial landings datasets, NMFS Marine Recreational Fishery Statistics Survey (MRFSS) recreational datasets, and Louisiana Department of Wildlife and Fisheries (LDWF) commercial landings data (Table 5.1, Figure 5.1).

5.1 Growth

Growth curves in terms of length and weight were used in order to calculate yield and spawning potential estimates. Egg production was assumed to be directly related to the weight of the mature female biomass.

Von Bertalanffy growth parameters were calculated for female southern flounder in Louisiana by using aged samples collected by Thompson (B. Thompson, Coastal Fisheries Institute, Louisiana State University, unpublished data) combined with juveniles assigned to age 0 (< 100 mm total length) by length frequency analysis from LDWF fishery-independent trawl samples. From the combined data, a three-parameter von Bertalanffy growth equation was estimated using nonlinear approximation (SAS, 1987). The equation is as follows:

$$\text{Female } L_t = 509(1-e^{-0.8846(t-0.0954)})$$

where, L_t = length at age t.

A length-weight regression for female southern flounder was derived using fish collected in Louisiana by Thompson (unpublished data) and LDWF fishery-independent surveys. The length-weight regression used is as follows:

$$\log W = 3.18369 * \log L - 5.386116$$

where, W = body weight in grams, and L = total length in millimeters

An age-length key (ALK) was developed from the otolith aging of female fish from fishery-dependent sampling provided by Thompson (unpublished data) and LDWF's ongoing fishery-dependent sampling programs. (Table 5.2). Data from both programs were combined to develop a single age-length key (ALK). Only female southern flounder sampled from recreational or commercial fisheries were included in the ALK (fishery-independent data was excluded to reduce concerns of variable size at age between fishery-dependent and fishery-independent samples). This new age-length key has different proportions of fish at age, especially for age classes beyond age 3 compared to the prior ALK. This change in ALK influenced the estimates of catch at age.

An annual estimate of catch-at-age was developed by applying the single ALK to the years where length frequency data for the commercial and recreational fishery were available (1994 – 2003, Table 5.3). Length frequency data were obtained from the Trip Interview Program (TIP) for the commercial fishery, and from MRFSS for the recreational fishery. Commercial length information was not available for the years 1997-2001, so cumulative length frequency information from 1994-96 was utilized for that time period.

There is a striking difference in growth between sexes in flounder, with nearly all large flounder being female. Neither TIP nor MRFSS systematically collected information on sex of the fish sampled. In order to reduce bias from the variable proportion of males at size, we developed a length-based sex ratio to estimate total numbers of females harvested from the estimate of total harvest at a length interval. From 1996-2002, sex information had been collected on 522 southern flounder along with length and age information. These fish were used to generate a function of sex ratio at size. For each inch increment in total length, the ratio of males to females was calculated, and an asymptotic function was estimated based on those ratios:

$$\% \text{ Females} = 1 - e^{(-0.3*(TL-4.))}$$

The proportion of the population that is female at a given size was estimated from the function and that estimate is compared to the actual proportions at size from the original sample in Figure 5.2. The function was used to estimate the number of female flounder harvested at each length interval, based on the estimate of the total number harvested.

5.2 Natural Mortality

Natural mortality is one part of total mortality (Z) and can be defined as the mortality due to all causes other than fishing. These include predation, disease, spawning stress, starvation, and old age. Typically, natural mortality is estimated as it is difficult to directly measure, especially on exploited fish stocks where natural mortality and fishing mortality occur simultaneously. No direct measure of natural mortality for southern flounder is available; therefore, several established estimation procedures were used to derive an estimate. The procedures presented below are taken from Sparre and Venema (1992).

Pauly (1980) provides a method of estimating natural mortality from a set of parameters including the asymptotic length and growth rate of the fish, and the average water temperature of the environment. The growth parameters from the von Bertalanffy growth equation described in Section 5.1 and the mean annual water temperature, derived from readings from a set of four data collection platforms located in the Barataria Bay system, were used in the calculation. Mean water temperature was 22.7°C for the period 1989 - 1992 (pers. comm., M. Kasprzak, 4/13/92). These values were incorporated into the length-based function of Pauly (1980):

$$\ln(M) = -0.0152 - 0.279 * \ln(L_\infty) + 0.6543 * \ln(K) + 0.463 * \ln(T).$$

where, ln(M) = natural log of natural mortality, $\ln(L_\infty)$ = natural log of the asymptotic length, ln(K) = natural log of the growth coefficient and ln(T) = natural log of the mean annual water temperature in degrees Celsius.

Use of Louisiana data on growth and water temperature applied to Pauly's function results in a natural mortality estimate of M=0.68.

Alagaraja (1984) and Hoenig (1983) provide methods of estimating M based on the fish's lifespan or longevity with the assumption that M=Z. Longevity is also difficult to determine for exploited fish stocks, since the age distribution is usually truncated by fishing, but these methods are as useful as any in providing provisional estimates of natural mortality. The functions described by Alagaraja (1984) are:

$$M1\% = -\ln(0.01)/Tm$$
$$M0.1\% = -\ln(0.001)/Tm$$

where, M1% and M0.1% are the natural mortality rates corresponding to 99% and 99.9% mortality, respectively, given a fish's lifespan (Tm) in years. Female southern flounder in Louisiana have been aged to 8 years old (Fischer and Thompson, 2004). In the LDWF fishery-dependent age information, no flounder were aged over 6 years old (Table 5.2). If it is assumed that 99% or 99.9% of the fish would die of natural causes by age 8 then corresponding natural mortality rates for M1% and M0.1% would be 0.58 and 0.86 respectively.

The function described by Hoenig(1983) is :

$$\ln(Z) = 1.46 - 1.01 * \ln(Tm)$$

where, when M=Z, longevity (Tm) can be defined as the maximum survival age. If we assume that the maximum age of southern flounder has been truncated due to fishing from 9 to 7 years, the resulting estimate of natural mortality, given Tm=7, would be 0.60. However, if our assumption is incorrect and the maximum age is 9 years then the estimate of natural mortality would be 0.47.

Another method of estimating M is described by Rikhter and Efanov (1976) and utilizes population age at sexual maturity. The function is:

$$M = 1.521/(Tm50\%^{0.720}) - 0.155$$

where, Tm50% is the age at which 50% of the population is mature.

Age 1 is assumed to be the age at 50% maturity, based on the length at sexual maturity found by several researchers (Adkins et al. 1996), and results in an M of 1.37. However, if 50% maturity occurs at age 2 rather than age 1, the estimate of natural mortality would be 0.77.

In summary, the estimated rates of natural mortality for southern flounder in Louisiana using a variety of estimation procedures are as follows:

Pauly (1980)	0.68
Alagaraja (1984)	0.58 and 0.86
Hoenig (1983)	
1) Longevity 9 years	0.47
2) Longevity 7 years	0.60
Rikhter and Efanov (1976)	
1) 50% maturity age 1	1.37
2) 50% maturity age 2	0.77

5.3 Disappearance Rates and Fishing Mortality

The disappearance rate (Z') from the fishery is an estimate of total mortality (Z). It is composed of natural mortality (M) plus fishing mortality (F) plus some unknown rate of decreasing availability of the fish to the fishery. If the unknown rate of availability is small or nonexistent, then the disappearance rate will be a reasonable estimate of total mortality. However, if a large portion of the disappearance rate is due to fish not being available to the fishery, then assuming Z'=Z will overestimate the impact of fishing.

In prior assessments, calculated disappearance rates were used to evaluate the condition of the stock. In the current assessment, we continue to use those methods, and compare those results to calculations from a virtual population assessment (VPA). For both sets of calculations, we used the sex ratio calculations described earlier to remove the male portion of the harvest from the estimates

of harvest at size. Therefore, the calculations of disappearance rate and fishing mortality should be considered to apply only to the female portion of the population.

To calculate disappearance rates, we regressed the natural log of the female catch-at-age, beginning with the age at full recruitment to the fishery. This method assumes that recruitment is constant and the fishery is in equilibrium. A range of natural mortality rates were used in the assessment. After reviewing estimates of M in Section 5.2, we chose not to assume that any method of estimating M was better than another, but rather to present results for a range of estimates. The range of M was from 0.47 - 1.37. We chose to use an M of 0.5 - 0.8 that encompass most of the estimates. Disappearance rates were calculated from the combined commercial and recreational catch-at-age data by year for 1997 - 2003.

Female catch-at-age from the fishery for the average of the years 2000-2003 (Table 5.4) was used to derive age-specific selectivities to be used in yield-per-recruit analysis, using the method of Sparre and Venema (1992). This method uses a linearized catch curve to determine the selectivity of fish not yet fully recruited to the fishery. The ratio of the observed catches to the expected catches at each age is the probability of capture or selectivity of the fishery at age. Selectivities are then regressed in the equation:

$$\ln (1 / S_t - 1) = T1 - T2 * t$$

where, S_t = the selectivity at age t, and T1 and T2 are constants corresponding to the intercept and slope of the regression. To develop theoretical or estimated selectivities at age, the following equation is used:

$$S_t \text{ (estimate)} = 1 / (1 + \exp (T1 - T2 * t)$$

Selectivities for ages up to full age-at-recruitment were used to describe the relative fishing mortality to that point; for age at full recruitment and older, selectivities are assumed to be 1, or 100% selected. Selectivities used in this assessment are as follows:

age 0 = 0.01312
age 1 = 0.5780
ages 2 and older = 1.

For M=0.5, the estimated harvest rates (F) ranged from 0.97 to 2.24, with an average of the last three years being 1.07 (Table 5.4). For M=0.8, the estimated F ranged from 0.67 to 1.94, with an average of 0.771 for the years 2001-2003.

In the current assessment, the same estimates of female harvest at age used in the previous analysis were also evaluated using a VPA (Jones, 1984) to determine age-specific mortality rates. We used the Solver tool in MS © Excel to iteratively calculate B, such that Q(t) = B(t) by varying F. The estimation procedure was constrained to F=>0.00001, precision of the solution set to 0.000001, convergence set to 0.0001, de-selecting the linear models option of Solver, using the quadratic estimation procedure, central derivatives, and the quasi-Newton search methods. This process was semi-automated through development of a macro to step through the annual estimation process. A range of terminal F was input manually, from 0.1 to 1.0.

This analysis was run for the years 2001-03 and for an average of the catch at age over those years. All estimated ages were used in the VPA analysis; no "plus" groups were used. The results of this analysis were used to derive age-specific fishing mortality rates to be used in spawning potential calculations and yield-per-recruit analysis.

Examination of the estimates of F at age from various terminal F's showed consistent patterns of selectivity across the range of terminal F's used for each year of input data (Figure 5.3). Highest estimates of F were found for age 2 and 3 flounder, with a substantial reduction in F for older fish. Another characteristic noted in the analysis was the relatively slow convergence of estimated F at age for younger fish, over the range of F considered.

5.4 Yield per Recruit

Yield-per-recruit (YPR) and spawning potential ratio (SPR) analyses provide basic information on fish stock dynamics by estimating the impact of mortality on yield and the spawning potential of the stock. The results can be examined as to the sensitivity of natural and fishing mortality rates on yield and spawning potential.

In general, use of YPR analysis requires:

1) information on natural and fishing mortality rates,
2) knowledge of the growth parameters of the fish.

In previous assessments, and in the estimates based on disappearance rates in the current assessment, the yield per recruit (YPR) analysis included several assumptions. A fish was assumed to consistently recruit to any given fishery at a given age; that is, selectivity by age did not change over time. Partial recruitment of fish was estimated from the relative abundance of age 0 and 1 fish in the harvest samples compared to age 2 and over fish, which are considered fully recruited. Once the fish are fully recruited to the fishery, fishing pressure was assumed to be at a constant rate. The YPR analysis did not take into account any variation in exploitation rates or other factors which may affect the results.

The growth parameters described in Section 5.1, sexual maturity described in Section 5.2 and the age-specific selectivities described in Section 5.3 were incorporated into the yield-per-recruit and spawning potential analysis. Fecundity estimates were not available, therefore; mean weight at age was used in the estimation of spawning potential. A range of natural mortality rate inputs, from M=0.5 to M=0.8 by 0.1, were used in the analysis because they are on the lower end of the range of estimates. Lower estimates of M will provide higher estimates of fishing mortality in the analysis, allow the least amount of harvest from the stock, thus would provide the most conservative results. These rates are also used to describe the sensitivity of M on yield and spawning potential. The results are presented in Table 5.5, which contains estimates of F_{MAX} (fishing mortality rate that produces maximum yield), $F_{0.1}$ (fishing mortality rate representing 10% of the slope at the origin of a yield-per-recruit curve), $F_{20\%SPR}$ (fishing mortality that produces 20% SPR), $F_{30\%SPR}$ (fishing mortality that produces 30% SPR), and annual estimates of F from the disappearance rates calculated

in Section 5.3. Selectivity patterns of the fishery are recalculated with each additional year of data. Therefore, the results of this analysis, reflected in Table 5.5, could change each year depending on changes in selectivity patterns in the fishery.

In the current analysis, the F at age was also incorporated into the YPR analysis based on the results of a VPA for that year. Southern flounder were typically estimated to have highest values of F as ages 2 or 3, with lower F for estimated for older fish (Figure 5.3). Yield analyses are presented for the years 2001-2003. There was concern that the low estimated numbers of older fish harvested in some years might strongly influence the outcome of the analysis (estimates are provided in Table 5.4). Therefore, a comparison analysis of average catch-at-age for the last three years was examined, to reduce the potential for influence from a few samples.

Fishing mortality rates at age were selected as the average of the F at age from the $F_{terminal}$=0.2 to $F_{terminal}$=0.8. These rates were used in the analysis because they were near or above the F at age=5 for the selected $F_{terminal}$, and did not converge rapidly toward any F (Figure 5.3). Those age-specific mortality rates were applied to a yield per recruit model, using the von Bertalanffy parameters described in Section 5.1. Selectivities at age were assigned based on the 3-year average VPA for each value of M.

The yield analysis was carried out to age 8, but no fish older than age 6 were represented in the ALK. Estimates of F at age 6 carried no predictive power (these were the terminal years of the VPA). Therefore, fish ages 6 and older were assigned selectivities equal to the average of the selectivities of ages 4-5 for the 3-year average VPA.

5.5 Conservation Standards

Conservation standards are intended to protect the viability of a fish stock for future generations. These standards have historically been based on a number of biological measures of the dynamics of fish stocks, depending on the availability and adequacy of data. Conservation standards should be separated into two types: a conservation threshold which is entirely biologically based and, a conservation target which considers biological measures modified by relevant social, economic, and ecological factors. A conservation threshold is a biological baseline for the harvest of a fish stock and should not be exceeded. It is the highest level of fishing mortality that will ensure that recruitment overfishing will not occur. Beyond the conservation threshold, a conservation target may be set, providing for other management goals in the fishery. Such goals may include maximizing yield in weight or numbers of fish, economic benefits or profit, employment, or some other measurable goal. These targets should be set at a fishing mortality rate below that of the conservation threshold in order to ensure that the biological integrity of the stock is not damaged by fishing.

The spawning potential ratio (SPR) concept described by Goodyear (1989), is a species specific value expressed as the ratio of the spawning stock biomass (or egg production) per recruit (SSB/R) in a fished condition to the SSB/R in an unfished condition. The concept is based on the premise that below some level of SPR, recruitment will be reduced. Goodyear (1989), recommends that in the absence of sufficient data to provide a value specific to the stock in question an SPR of

20% be used as a threshold. Work on North Atlantic ground fisheries also resulted in the calculation of a threshold SPR of 20% (Gabriel et al. 1984, Gabriel 1985). An SPR of 20% has been recommended for Spanish and king mackerel in the Gulf of Mexico (National Oceanic and Atmospheric Administration/National Marine Fisheries Service 1995), while an SPR of 8-13% has been demonstrated to be sufficient for gulf menhaden (Vaughan 1987). In earlier analyses of Louisiana spotted seatrout fisheries (Louisiana Department of Wildlife and Fisheries 1991), an SPR threshold of 15% was recommended based on several years of data. Mace and Sissenwine (1993) examined 90 stocks of 27 species, and reported that the average replacement SPR for all these stocks was 18.7%, while the most resilient quarter of the stocks required a maximum of only 8.6%. These authors recommended that an SPR of 30% be maintained when there is no other basis for estimating the replacement level, as this level was sufficient in maintaining recruitment for 80% of the stocks examined. However, they noted that 30% may be overly conservative for an "average" stock, and reiterated the need for stock-specific evaluations of standards to enhance both safety and benefits in the fishery.

Sufficient information is not available to directly estimate a conservation threshold for southern flounder in Louisiana. However, the conservation target of 30% SPR established by the 1995 Regular Session of the Louisiana Legislature for black drum, southern flounder, sheepshead, and striped mullet appears to be adequate to maintain the southern flounder stock and prevent recruitment overfishing.

The use of any measure of the health of a fish stock as a perfect index is arguable. It is logical to conclude that growth overfishing should occur at a much lower fishing rate than that which would threaten recruitment. However, Mace and Sissenwine (1993) provide information to suggest that some stocks may have reduced recruitment at levels of fishing that would not reduce yield-per-recruit. The preferable position for making recommendations on appropriate levels of fishing for a stock is to base those recommendations on actual measures of spawning stock size and recruitment for both the species and fishery in question. This requires a base of information resulting from monitoring of both the stock and the fishery over a variety of conditions. Without this information, conservation standards may either underestimate or overestimate the potential of a fishery. If the potential is underestimated, society loses the economic and social benefits of the harvest. If the potential is overestimated and the fishery is allowed to operate beyond sustainable levels, society loses the benefits of a sustainable fishery, and recovery will require some period of rebuilding, when effort must be reduced from the non-sustainable levels (Hilborn and Walters, 1993).

5.6 Status of the Stock

Recent Regulatory History

Rules for the harvest of southern flounder in Louisiana have changed substantially from 1995 through 1999. Commercial harvest methods were restricted on August 15, 1995 when Act 1316 of the 1995 Regular Legislative Session, the Marine Resources Conservation Act of 1995, became effective. This act prohibited the use of "set" gill nets or trammel nets in saltwater areas of Louisiana, and restricted flounder harvest by the use of "strike" nets to the period between the third Monday in October and March 1 of the following year. A "Restricted Species Permit" issued by

LDWF was required in order to harvest flounder, and several criteria were established in order to qualify for that permit. After March 1, 1997, all flounder harvest by gill or trammel nets was banned, and commercial harvesters must utilize other legal commercial gear to harvest flounder. These regulations substantially reduced the harvest of flounder by this segment of the commercial fishing industry.

More restrictive regulations became effective on May 1, 1996. Recreational harvesters in Louisiana were restricted to a creel limit of ten (10) southern flounder, with one day's limit in possession. At the same time, the use of strike nets for the harvest of southern flounder was outlawed, and other commercial harvesters were limited to a possession limit of ten (10) fish per person aboard a commercial vessel. This set of regulations reduced the ability of some recreational harvesters to retain southern flounder, and also reduced the harvest potential of the commercial fishing industry.

In 1997, regulations were changed by Acts 1163 and 1352 of the 1997 Regular Legislative Session. Recreational and commercial harvesters continued to be restricted to daily take limits of 10 fish, but were allowed take limits for each day on the water. Additionally, commercial shrimping vessels were limited to 100 pounds of southern flounder per shrimping trip.

In 1999, regulations were changed by Acts 220 of the 1999 Regular Legislative Session. The act eliminated the 100 pound harvest limit on commercial shrimping when southern flounder are harvested as by-catch. The Act became effective in August of 1999.

In 2004, regulations were changed by Act 460 of the 2003 Regular Legislative session, which allowed the recreational harvest of southern flounder with barbed gigs. Only barbless gigs were allowed previously. The act became effective August 15, 2004.

Trends in Harvest and Abundance

Annual commercial landings have fluctuated widely from 1950-2003 with the highest landings in the mid-1980s and mid-1990s at 0.94 and 0.97 million pounds, respectively (Figure 5.4). Regulatory measures implemented in 1995, 1996 and 1997 had much to do with the reduction in commercial harvest from 1996 to present. Recreational landings were equal to or greater than those of the commercial fishery until 1991 when the commercial fishery began harvesting a greater percentage of the total annual harvest (Figure 5.1). As a result of the regulatory measures described above, the recreational harvest was greater than the commercial harvest in 1996 - 2003. Fishery dependent commercial data prior to 1991 were obtained from NMFS's General Canvass Landing Program. From 1991 through 1998 these data were collected by LDWF Monthly Dealer Reports. From 1999 to present, the LDWF Commercial Reporting Requirement (Trip Tickets) program is utilized to gather this type of data.

We reviewed the recreational harvest information to develop fishery-dependent indices of abundance. It should be recognized that southern flounder are not a primary target species for a large fraction Louisiana angling trips, though they are often reported as a secondary target species. Also it should be noted that a significant portion of the targeted harvest occurs at night, using gigs and lights. These night-fishing activities would be unlikely to be encountered in a standard MRFSS

sampling trip. Therefore, many of the flounder encountered by MRFSS samplers are likely to have been incidentally captured by an angler targeting other species. We did not consider targeted trips targeting flounder in our calculations of catch-per-trip due to concerns for post-trip reporting bias (anglers who harvest flounder are more likely to report them as a target species, inducing bias into estimates). These issues create challenges for developing a fishery-dependent index of abundance for southern flounder from the recreational fishery.

Fisheries dependent recreational landings data are collected through the NMFS MRFSS program and are currently being collected by LDWF biologists. Harvests from the recreational fishery for the years examined (1981-2003) have fluctuated, but has been relatively stable since 1988.

Mean catch-per-trip from the recreational fishery was calculated by selecting those trips that had southern flounder in the observed harvest (catch type A), and in the non-observed harvest (Catch type B1). This method varies slightly from the indices used in previous assessments, in that prior indices only considered observed harvest, due to concerns over identification of non-observed fish. To reduce those concerns, only the fish reported as southern flounder that were categorized as "eaten or planned to be eaten" (MRFSS disposition code 3) were included from the B1 catch in the catch per effort (CPUE) calculations. The change in methodology made very little difference in earlier years of the survey, but has shown some difference in recent years of the survey, as more southern flounder have been reported in the "eaten or planned to be eaten" category in those years. The catch per effort was log-transformed, and adjusted to the long-term mean with 95% confidence limits (Figure 5.5). The CPUE indices seem to cycle over the years examined, with 1987, 1995, and 2001 having the lowest mean CPUE.

Catch-per-effort data from the Department's, fishery-independent trammel net (750' x 6' - 1 5/8" inner, 6" outer wall) and 16-foot flat otter trawl samples were calculated as follows:

$$\text{Mean CPUE} = (\exp (\Sigma \ln (\text{catch} + 1) / N)) - 1$$

where catch is the total number caught in each set and, N is the number of samples taken annually. Each annual CPUE was adjusted to the long-term mean for that gear type to examine potential trends in the data. Trammel net data were available for the period October 1985-December 2004, and 16-foot trawl data were used for the period 1967-2004. Trawl data were used to provide an index of young-of-the-year recruitment by selecting specific sizes of southern flounder from the samples, eliminating larger specimens, and by selecting the samples taken April through September, when length can be used to separate young of the year. Trammel net samples collect several year-classes, and are used as an index of abundance in the system.

Trammel net samples are collected from October through March. In order to use the most recent data available to us in this report, trammel net CPUE was estimated for two periods (October-December of one year and January-March of the next year). This allowed the use of 2004 data through December. CPUE estimates from trammel nets fluctuated throughout the period examined with January-March and October-December estimates being relatively consistent over the years examined (Figure 5.6). CPUE estimates indicate a possible long-term variation in flounder

abundance, with recent years being near or below average, similar to the earliest years in the time-line.

The long-term database provided by 16-foot trawl data shows how CPUE cycles over time and represents natural fluctuations in recruitment. Whatever the cause of the cyclic nature of the indices, no evidence from the 16-foot trawl data indicates a long-term downward trend in CPUE for southern flounder (Figure 5.6).

We compared the CPUE indices for the trawl dataset and the trammel dataset, using the October-December trammel, since it had the most current information (Figure 5.7). The trawl index should reflect abundance of young-of-the-year, while the trammel net index should reflect abundance of all ages available to the gear. The two indices both show long-term variation around their average values, but do not necessarily reflect consistent estimates of recruitment or abundance that would be expected to derive from that recruitment. These comparisons need further investigation before any broad conclusions can be derived from the information.

Estimates of Yield and Spawning Potential

It should be noted that the following results of YPR and SPR analysis do not reflect the impact of all current regulations. With this type of general assessment, it will take several years before the impact of regulations will be observed in the disappearance rates from the fishery, or in the fishing mortality rates estimated in the VPA analyses.

The results of YPR analysis based on the disappearance rate calculations indicate that if M=0.5 (the value that provides the lowest allowable harvest within the conservation standard), the fishery in the years assessed (1997 - 2003) was operating between $F_{0.1}$ and F_{MAX}, with yields of 96% to 100% of maximum and SPR at 16% to 30%. An M of 0.8 (the highest value within the range examined) would produce yields of 60% to 71% of maximum with SPR at 44% to 52% (Table 5.5).

Comparison of the estimates of disappearance rates over time (Table 5.4) show no trend in the slope of the catch curve, though there is some interannual variation. This indicates that the changes in overall harvest are not being reflected by changes in estimated survival of fish in the stock. The first two years of the estimation and 1999 do have higher values for the intercept of the disappearance rate, indicating higher recruitment estimates. Both the unresponsiveness of the survival estimate and the variation in the recruitment estimates should be examined further.

The results of the YPR analyses based on the VPA results were very similar to those based on disappearance rates. In the years assessed for this analysis (2001-2003 plus the average of those years) if M=0.5, the fishery was operating between $F_{0.1}$ and F_{MAX}, with yields of 94% to 95% of maximum and SPR at 28% to 30%. An M of 0.8 (the highest value within the range examined) would produce yields of 54% to 61% of maximum with SPR at 43% to 52% (Table 5.6).

The primary difference between the two estimates of YPR is that the dome-shaped selectivity used for the VPA estimates that maximum yield will be obtained at slightly lower fishing mortality rates than the disappearance rates would calculate. Both methods provide maximum yield estimates at high fishing mortality rates, due to the estimated high natural mortality rates and to the rapid

growth rates of flounder to near their maximum sizes (k=0.8846). That rapid growth, combined with relatively high natural mortality, greatly influence the yield function.

5.7 Research and Data Needs

Estimates of natural mortality presented in the present assessment vary widely. This variation lessens the ability of the present assessment to provide an accurate estimate of the potential yield of the stock, and also reduces the confidence level of the present estimate of SPR. A more accurate estimate of natural mortality would improve both of these estimates.

The current assessment does not show measurable responses in the stock to changes in harvest rates over the time period examined. Both the unresponsiveness of the survival estimate and the variation in the recruitment estimates should be examined further.

Indices of harvest effort and stock recruitment or abundance should be further developed and evaluated for possible incorporation into future stock assessments.

Annual sex-specific age-length keys should continue to be developed to provide catch-at-age data necessary to conduct age-based population assessments. The department is in the process of collecting otoliths for development of annual age-length keys.

Sex-specific fishery dependent length frequency data is essential in adequately partitioning catch from the fishery. In the case of flounder, males grow slower and do not get as large as females. There can be significant improvement in the accuracy of this assessment if sex is collected as a consistent part of all fishery-dependent sampling programs.

The relationship between wetlands losses or modifications and the continuation of fishery production within the state has been discussed by many authors. However, this relationship is likely to be different for the various fishery species. Better understanding of this relationship for southern flounder should be an ongoing priority.

In the presence of changing regulations, fishery-dependent information is not a reliable source of data necessary to assess the status of a fish stock. However, such data is necessary to measure the effects of fishing on that stock. Consistent fishery-dependent and fishery-independent data sources, in a comprehensive monitoring plan, are essential to understanding the status of fishery stocks, and to identifying causes of changes in stock abundances. Present programs should be assessed for adequacy with respect to their ability to evaluate stock status, and modified or enhanced to optimize their capabilities.

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Table 5.1. Harvest of southern flounder from Louisiana waters. Source: NMFS Commercial Landings datasets, MRFSS recreational landings datasets, and LDWF commercial harvest data.

Harvest of Southern Flounder in Louisiana waters (pounds)

Year	Commercial	Recreational	Combined
1981	136,962	213,075	350,037
1982	199,742	471,798	671,540
1983	276,151	2,722,214	2,998,365
1984	353,263	194,571	547,834
1985	529,979	686,402	1,216,381
1986	825,034	2,130,256	2,955,290
1987	938,076	183,835	1,121,911
1988	510,285	564,651	1,074,936
1989	492,047	345,575	837,622
1990	455,718	452,492	908,210
1991	692,338	622,306	1,314,644
1992	784,560	565,736	1,350,296
1993	898,874	393,459	1,292,333
1994	974,689	441,204	1,415,893
1995	533,172	328,591	861,763
1996	61,755	422,463	484,218
1997	94,898	398,883	493,781
1998	139,938	271,309	411,247
1999	141,667	498,484	640,151
2000	177,384	606,091	783,475
2001	90,278	380,984	471,262
2002	81,831	317,961	399,792
2003	63,649	454,383	518,032

Table 5.2 – Age-length key used in current assessment, with comparison to summary of age distribution in previous assessments.

Len				Age				
(in)	0	1	2	3	4	5	6	total
7	2							2
8	8	4						12
9	12	28	5					45
10	44	135	19					198
11	73	256	27	2				358
12	77	485	118	5				685
13	39	464	223	6				732
14	11	474	271	14		2		772
15	1	318	247	30				596
16		200	175	43	1	1		420
17		132	141	43	5	1		322
18		83	80	30	4	2	1	200
19		53	32	14	3		1	103
20		18	26	19	6			69
21		7	15	4	5	1	1	33
22		2	6	4				12
23			6	6	2	1		15
24				4				4
25			1	1				2
26				1				1
Total #	267	2659	1392	226	26	8	3	4581

Age-length key used in previous assessments - total number of fish in each age group

	AGE								
	0	1	2	3	4	5	6	7	Total
Total #	305	1572	583	137	30	9	4	1	2641

Table 5.3. Length frequency of recreational and commercial samples of southern flounder harvested in Louisiana. Commercial length frequency information was not available for 1997-2001, so cumulative length-frequency data for 1994-96 was used in that time period.

Recreational Length Frequency by Year

	Year									
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
TL (in)										
9	5	8	5	5	2		3	1	6	4
10	19	26	4	10	11	10	2	3	16	17
11	20	26	13	13	22	32	7	2	26	28
12	47	27	27	37	27	55	17	14	32	41
13	59	37	41	41	49	78	25	19	30	63
14	62	18	34	45	51	77	34	28	35	71
15	36	24	32	35	30	64	36	29	41	34
16	34	15	26	14	29	47	30	24	38	30
17	24	25	16	23	19	36	19	21	19	17
18	13	5	9	9	14	17	10	12	10	9
19	8	10	5	7	3	13	11	9	4	
20	2	1	4		1	5	2	1		1
21	3	1	1	1	2		1	3		4
22	1		1	2	1		1			
23		1					1			
24	1									
25				1						
	334	224	218	243	261	434	199	166	257	319

Commercial Length Frequency by Year

	Year					
	1994	1995	1996	1997-2001	2002	2003
Len (in)						
9	3			3	6	10
10	4	6		10	34	26
11	7	28	3	38	61	67
12	19	50	9	78	42	83
13	33	70	7	110	39	60
14	63	148	18	229	44	83
15	87	215	22	324	36	56
16	89	181	9	279	35	32
17	69	110	9	188	31	32
18	43	47	7	97	41	11
19	42	23	4	69	50	1
20	26	22	1	49	13	3
21	13	16	2	31	5	
22	7	5		12	2	2
23	5	1		6	4	1
24	1			1	1	
25	2	1		3		
26	1			1		
	514	923	91	1528	444	467

Table 5.4. Estimates of female harvest at age, the natural log of that harvest, and estimates of regression of age vs. harvest of age 2-6 fish. Also listed are the estimated F values for M=0.5 and M=0.8 for each year calculated. Age-specific selectivities for YPR were derived from the 2000-2003 mean values listed in the right-hand column.

COMBINED CATCH-AT-AGE BY YEAR

AGE	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
0	67,768	46,452	16,144	20,386	18,306	23,466	20,220	10,888	31,227	16,015
1	645,496	420,900	191,670	222,238	197,329	279,769	285,385	178,304	217,793	136,575
2	333,914	205,800	105,376	118,438	104,590	151,852	169,698	111,510	95,788	83,087
3	47,640	27,828	16,316	17,511	14,758	22,486	29,095	19,759	13,638	12,844
4	3,848	2,114	1,582	1,361	1,219	1,818	2,802	2,341	837	651
5	1,483	835	474	525	528	637	930	701	393	432
6	480	234	175	201	163	1	377	381	110	212
TOTAL	1,100,630	704,164	331,737	380,661	336,893	480,030	508,505	323,884	359,786	249,815

Natural log of catch at age by year

AGE	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2000-03 3 yr mean
0	11.12	10.75	9.69	9.92	9.81	10.06	9.91	9.30	10.35	9.68	9.78
1	13.38	12.95	12.16	12.31	12.19	12.54	12.56	12.09	12.29	11.82	12.07
2	12.72	12.23	11.57	11.68	11.56	11.93	12.04	11.62	11.47	11.33	11.47
3	10.77	10.23	9.70	9.77	9.60	10.02	10.28	9.89	9.52	9.46	9.62
4	8.26	7.66	7.37	7.22	7.11	7.51	7.94	7.76	6.73	6.48	6.99
5	7.30	6.73	6.16	6.26	6.27	6.46	6.84	6.55	5.97	6.07	6.20
6	6.17	5.46	5.16	5.31	5.09	0.00	5.93	5.94	4.70	5.35	5.33
Ages 2-6 regression											
Y-intercept	15.6676	15.2864	14.5292	14.5515	14.4302	18.1513	14.8707	14.2329	14.5110	13.8734	14.2057
Slope	-1.6558	-1.7061	-1.6346	-1.6260	-1.6264	-2.7423	-1.5665	-1.4699	-1.7079	-1.5339	-1.5706
R^2	0.9661	0.9684	0.9737	0.9589	0.9638	0.9082	0.9684	0.9619	0.9588	0.9081	0.9468
F(M=0.5)	-1.156	-1.206	-1.135	-1.126	-1.126	-2.242	-1.066	-0.970	-1.208	-1.034	-1.071
F(M=0.8)	-0.856	-0.906	-0.835	-0.826	-0.826	-1.942	-0.766	-0.670	-0.908	-0.734	-0.771

Table 5.5 Results of Yield per Recruit and SPR Analysis for Southern Flounder from disappearance calculations.

M=0.5	F Ratio	YPR	SPR	%SPR	%YPR	
F-max =	1.9364	0.6444	0.4881	17.74%	100.00%	Benchmarks
F0.1 =	0.6209	0.5642	1.1229	40.80%	87.55%	
F30% =	0.9823	0.6192	0.8256	30.00%	96.08%	
F20% =	1.6706	0.6435	0.5504	20.00%	99.86%	
1997 =	1.1260	0.6292	0.7471	27.15%	97.63%	Estimates
1998 =	1.1264	0.6292	0.7469	27.14%	97.64%	
1999 =	2.2423	0.6437	0.4321	15.70%	99.89%	
2000 =	1.0665	0.6256	0.7777	28.26%	97.07%	
2001 =	0.9699	0.6181	0.8331	30.27%	95.92%	
2002 =	1.2079	0.6332	0.7088	25.76%	98.26%	
2003 =	1.0339	0.6233	0.7955	28.91%	96.72%	

M=0.6	F Ratio	YPR	SPR	%SPR	%YPR	
F-max =	9.8154	0.5752	0.0967	4.89%	100.00%	Benchmarks
F0.1 =	0.7519	0.4709	0.8031	40.63%	81.86%	
F30% =	1.1961	0.5202	0.5931	30.00%	90.43%	
F20% =	2.0616	0.5491	0.3954	20.00%	95.45%	
1997 =	1.0260	0.5066	0.6588	33.32%	88.07%	Estimates
1998 =	1.0264	0.5067	0.6586	33.32%	88.08%	
1999 =	2.1423	0.5502	0.3836	19.40%	95.65%	
2000 =	0.9665	0.5006	0.6855	34.67%	87.03%	
2001 =	0.8699	0.4890	0.7337	37.12%	85.01%	
2002 =	1.1079	0.5138	0.6254	31.63%	89.31%	
2003 =	0.9339	0.4970	0.7010	35.46%	86.40%	

M=0.7	F Ratio	YPR	SPR	%SPR	%YPR	
F-max =	11.1385	0.5146	0.0756	5.18%	100.00%	Benchmarks
F0.1 =	0.8976	0.3986	0.5919	40.56%	77.47%	
F30% =	1.4383	0.4431	0.4377	30.00%	86.11%	
F20% =	2.5009	0.4740	0.2918	20.00%	92.12%	
1997 =	0.9260	0.4021	0.5810	39.82%	78.15%	Estimates
1998 =	0.9264	0.4022	0.5809	39.81%	78.16%	
1999 =	2.0423	0.4648	0.3405	23.34%	90.33%	
2000 =	0.8665	0.3945	0.6043	41.41%	76.67%	
2001 =	0.7699	0.3802	0.6464	44.30%	73.88%	
2002 =	1.0079	0.4113	0.5519	37.82%	79.93%	
2003 =	0.8339	0.3900	0.6179	42.34%	75.79%	

M=0.8	F Ratio	YPR	SPR	%SPR	%YPR	
F-max =	12.2931	0.4613	0.0608	5.52%	100.00%	Benchmarks
F0.1 =	1.0643	0.3428	0.4453	40.41%	74.30%	
F30% =	1.7063	0.3831	0.3306	30.00%	83.04%	
F20% =	2.9817	0.4155	0.2204	20.00%	90.07%	
1997 =	0.8260	0.3155	0.5126	46.52%	68.40%	Estimates
1998 =	0.8264	0.3156	0.5125	46.50%	68.41%	
1999 =	1.9423	0.3918	0.3024	27.44%	84.94%	
2000 =	0.7665	0.3069	0.5329	48.36%	66.52%	
2001 =	0.6699	0.2906	0.5696	51.69%	63.00%	
2002 =	0.9079	0.3261	0.4872	44.21%	70.69%	
2003 =	0.7339	0.3017	0.5447	49.43%	65.40%	

Table 5.6 Results of Yield per Recruit and SPR Analysis for Southern Flounder from VPA calculations.

M=0.5	F Ratio	YPR	SPR	%SPR	%YPR	
F-max =	1.8761	0.6348	0.5535	20.11%	100.00%	Benchmarks
F0.1 =	0.8451	0.5783	1.0115	36.76%	91.09%	
F30% =	1.1195	0.6125	0.8256	30.00%	96.47%	
F20% =	1.8896	0.6348	0.5504	20.00%	100.00%	
2001 =	0.8375	0.6062	0.7693	27.96%	95.03%	Estimates
2002 =	0.7753	0.5989	0.8189	29.76%	94.89%	
2003 =	0.8007	0.6021	0.7979	29.00%	93.95%	
2001-03 avg =	0.8407	0.6066	0.7669	27.87%	94.46%	

M=0.6	F Ratio	YPR	SPR	%SPR	%YPR	
F-max =	2.5894	0.5340	0.3697	18.70%	100.00%	Benchmarks
F0.1 =	0.9705	0.4784	0.7495	37.91%	89.59%	
F30% =	1.3701	0.5130	0.5931	30.00%	96.06%	
F20% =	2.3750	0.5337	0.3954	20.00%	99.94%	
2001 =	1.0314	0.4858	0.7202	36.43%	90.98%	Estimates
2002 =	1.3359	0.5111	0.6037	30.54%	95.70%	
2003 =	1.1985	0.5017	0.6509	32.93%	93.95%	
2001-03 avg =	1.1628	0.4988	0.6645	33.61%	93.41%	

M=0.7	F Ratio	YPR	SPR	%SPR	%YPR	
F-max =	4.2551	0.4593	0.2176	14.91%	86.02%	Benchmarks
F0.1 =	1.1113	0.4013	0.5693	39.02%	75.16%	
F30% =	1.6701	0.4360	0.4377	30.00%	81.64%	
F20% =	2.9427	0.4567	0.2918	20.00%	85.53%	
2001 =	0.9092	0.3776	0.6413	43.95%	70.72%	Estimates
2002 =	1.2176	0.4107	0.5380	36.87%	76.91%	
2003 =	1.0695	0.3971	0.5828	39.94%	74.37%	
2001-03 avg =	1.0381	0.3938	0.5933	40.66%	73.74%	

M=0.8	F Ratio	YPR	SPR	%SPR	%YPR	
F-max =	6.9861	0.4049	0.1259	11.42%	75.83%	Benchmarks
F0.1 =	1.2710	0.3408	0.4407	39.99%	63.82%	
F30% =	2.0207	0.3752	0.3306	30.00%	70.27%	
F20% =	3.5875	0.3969	0.2204	20.00%	74.33%	
2001 =	0.7886	0.2880	0.5694	51.67%	53.93%	Estimates
2002 =	1.0973	0.3262	0.4792	43.48%	61.10%	
2003 =	0.9398	0.3091	0.5210	47.28%	57.89%	
2001-03 avg =	0.9132	0.3058	0.5289	47.99%	57.27%	

Figure 5.1. Harvest of southern flounder from Louisiana waters.

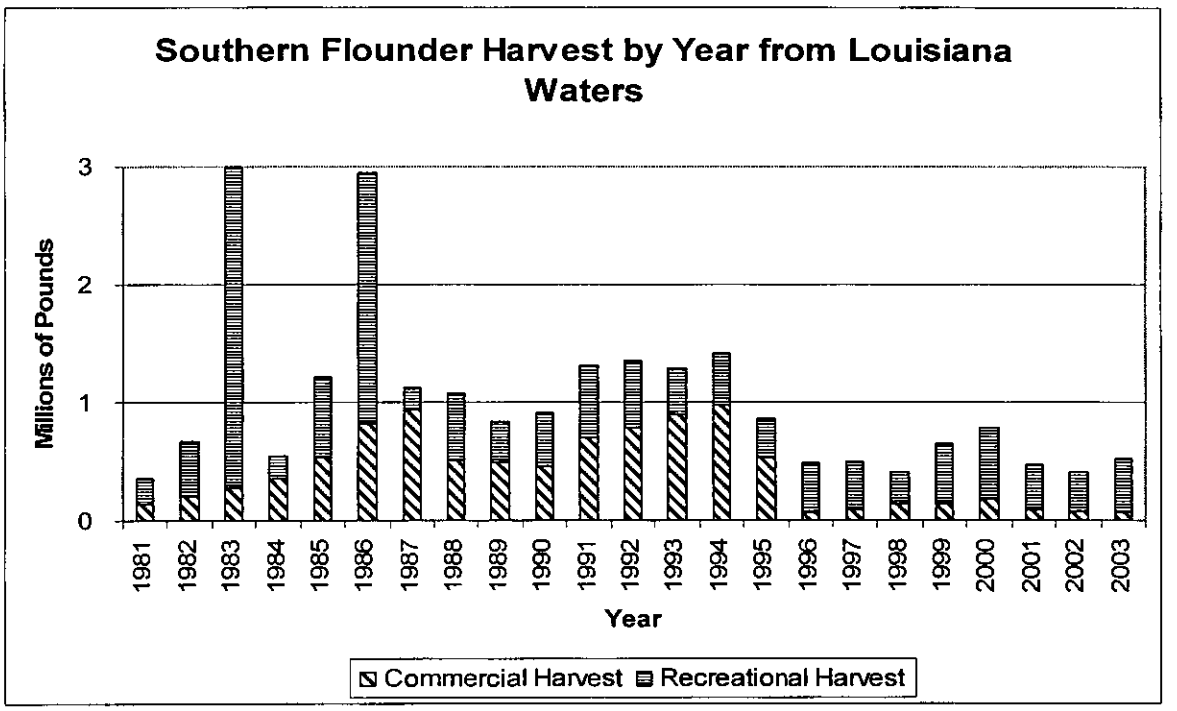


Figure 5.2. Proportion female southern flounder as calculated from function compared to actual proportions at size from the original sample.

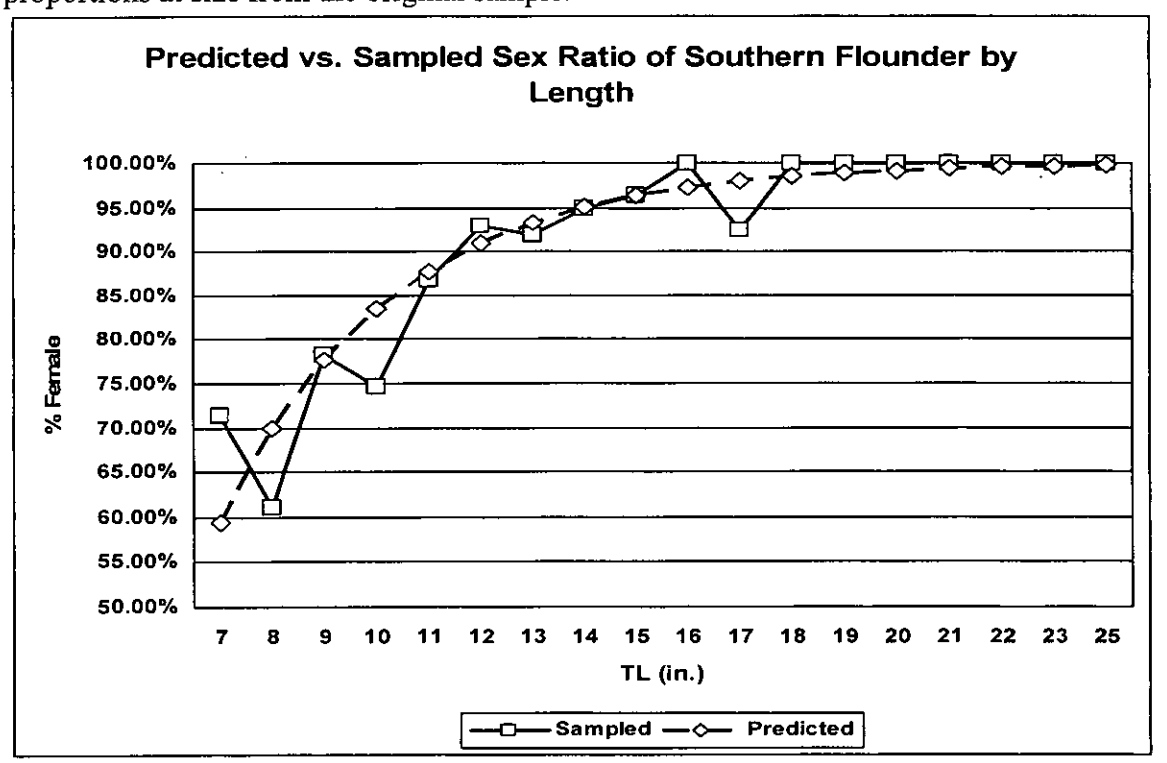


Figure 5.3. Estimates of F at age from various terminal F's used in VPA analysis. Presented values or for highest and lowest values of M (0.5 and 0.8), for each run (2001, 2002, 2003, average of 2001-2003).

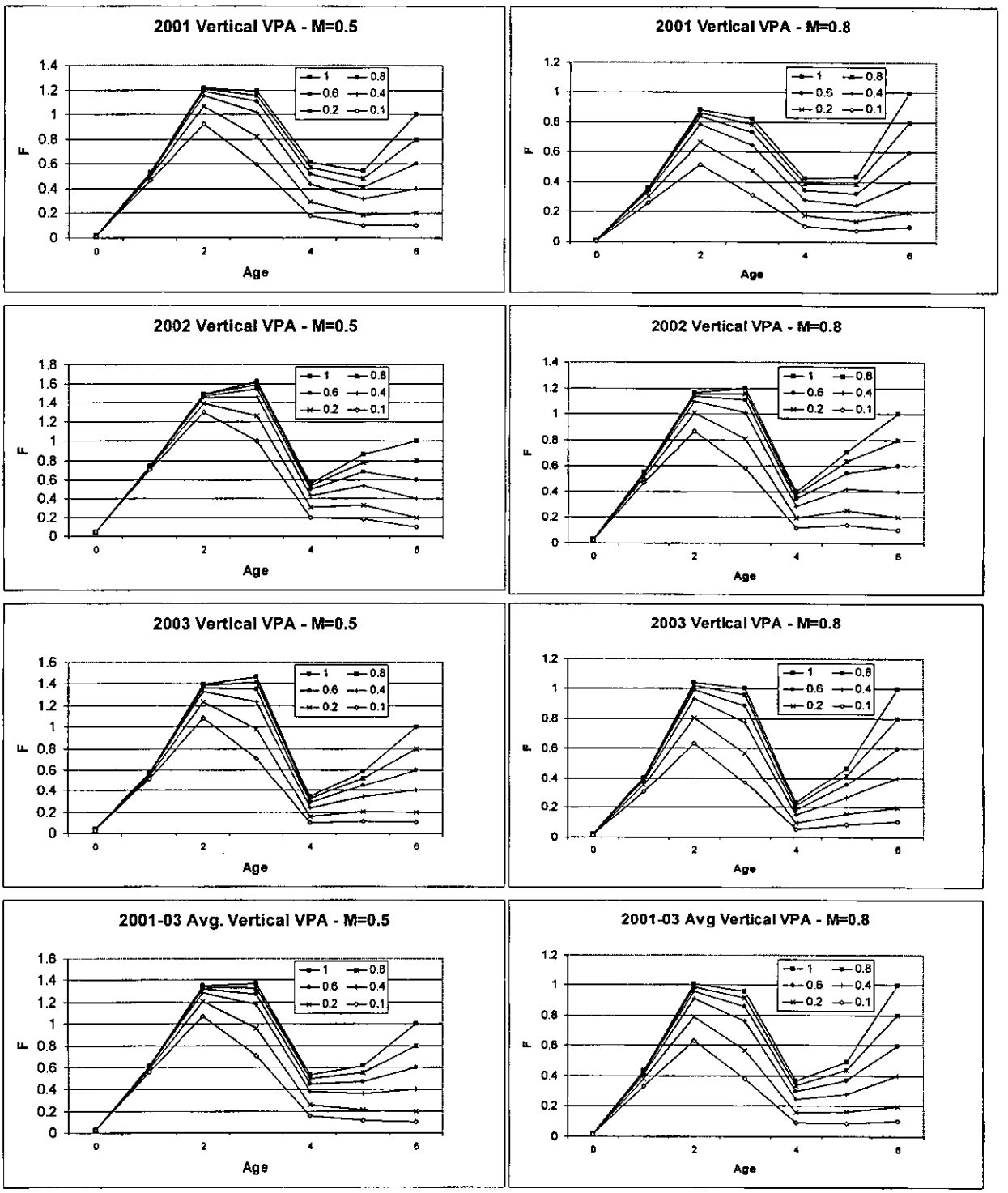


Figure 5.4. Louisiana commercial landings of southern flounder, 1950-2003

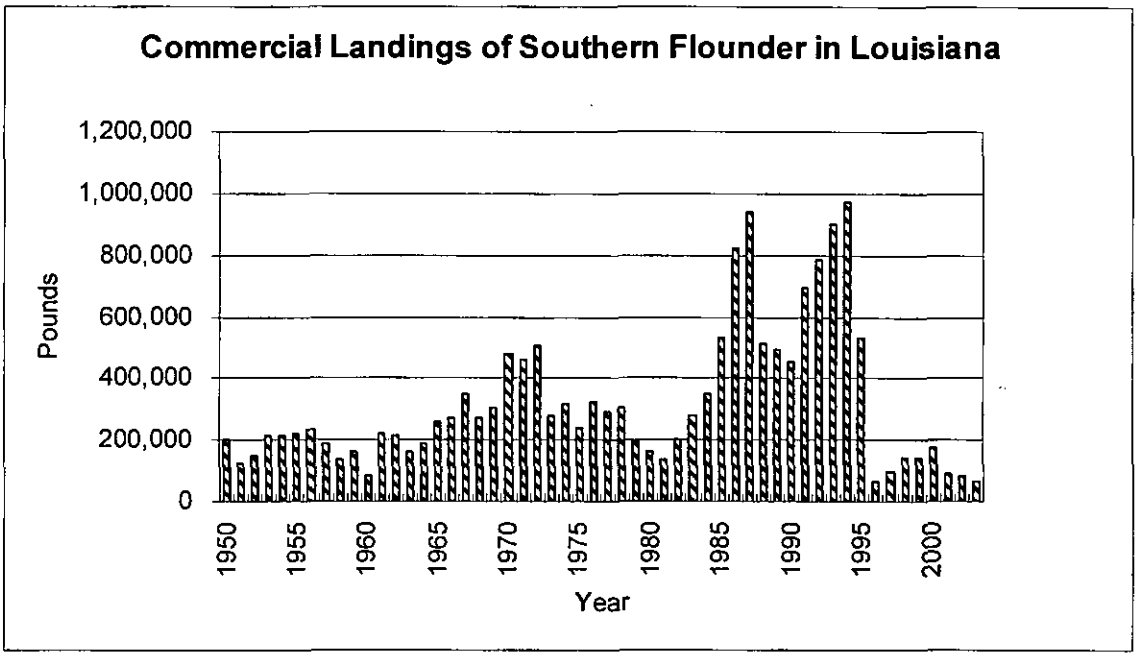


Figure 5.5. Standardized, log-transformed catch per unit of effort for recreational harvest of southern flounder in Louisiana. MRFSS survey data.

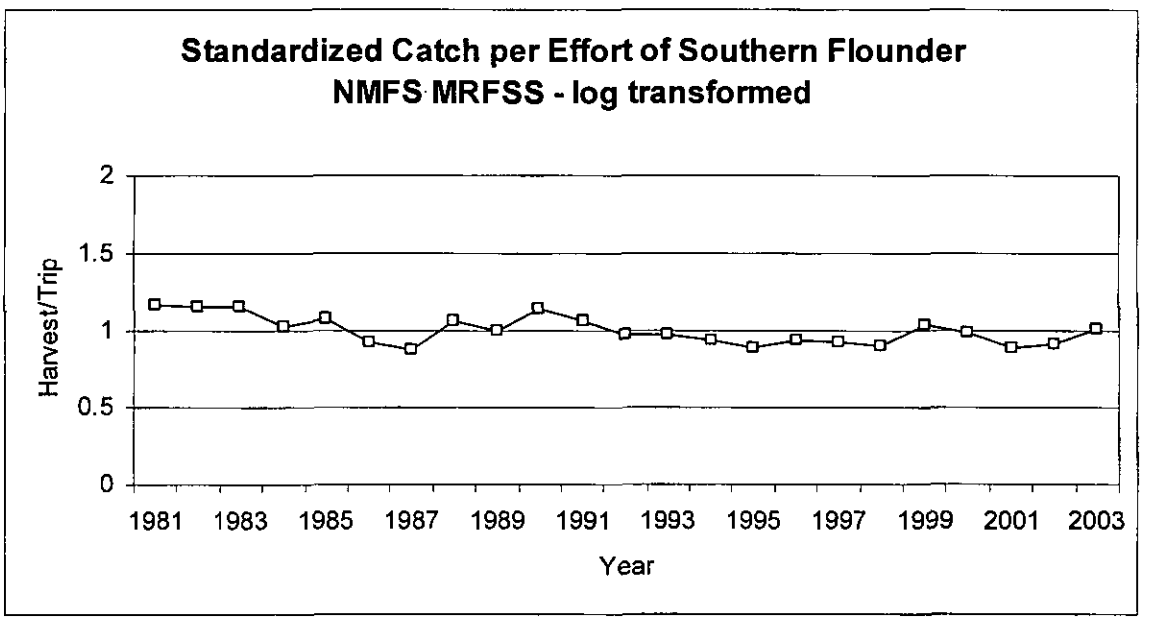
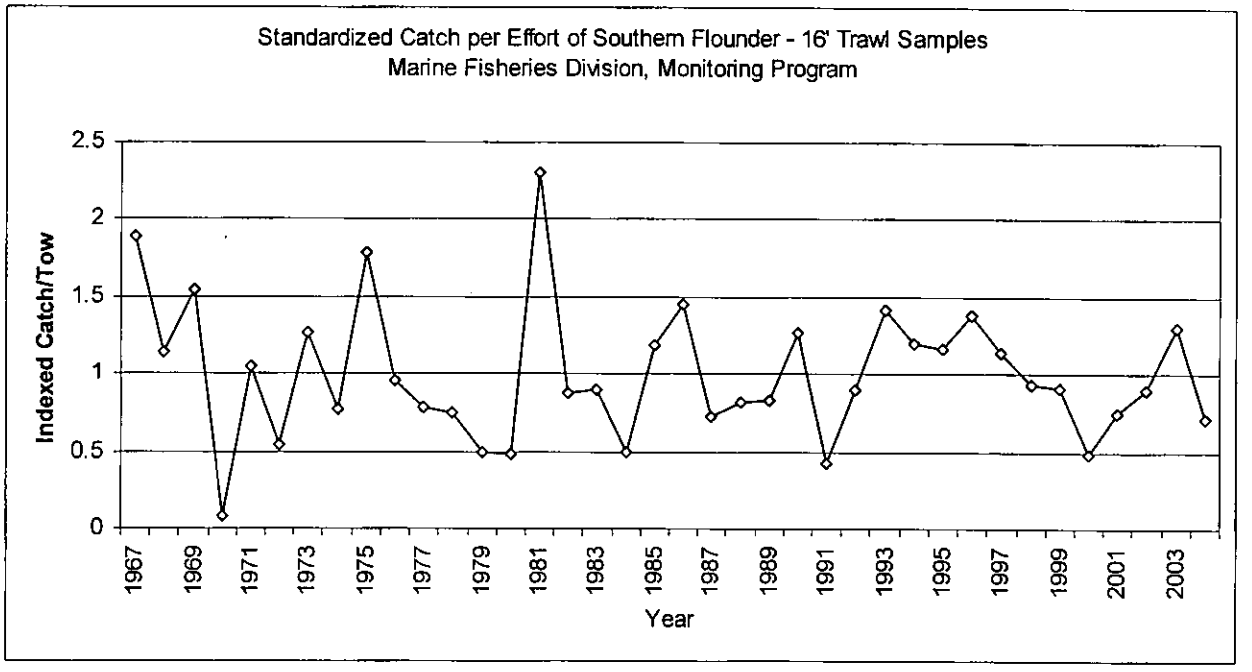


Figure 5.6. Catch per effort for southern flounder in fishery-independent samples. Trammel net samples are available for 1986-2004, 16-foot trawl samples for 1967-2004. All are indexed to their respective long-term means. Derivation of each index is described in the text.



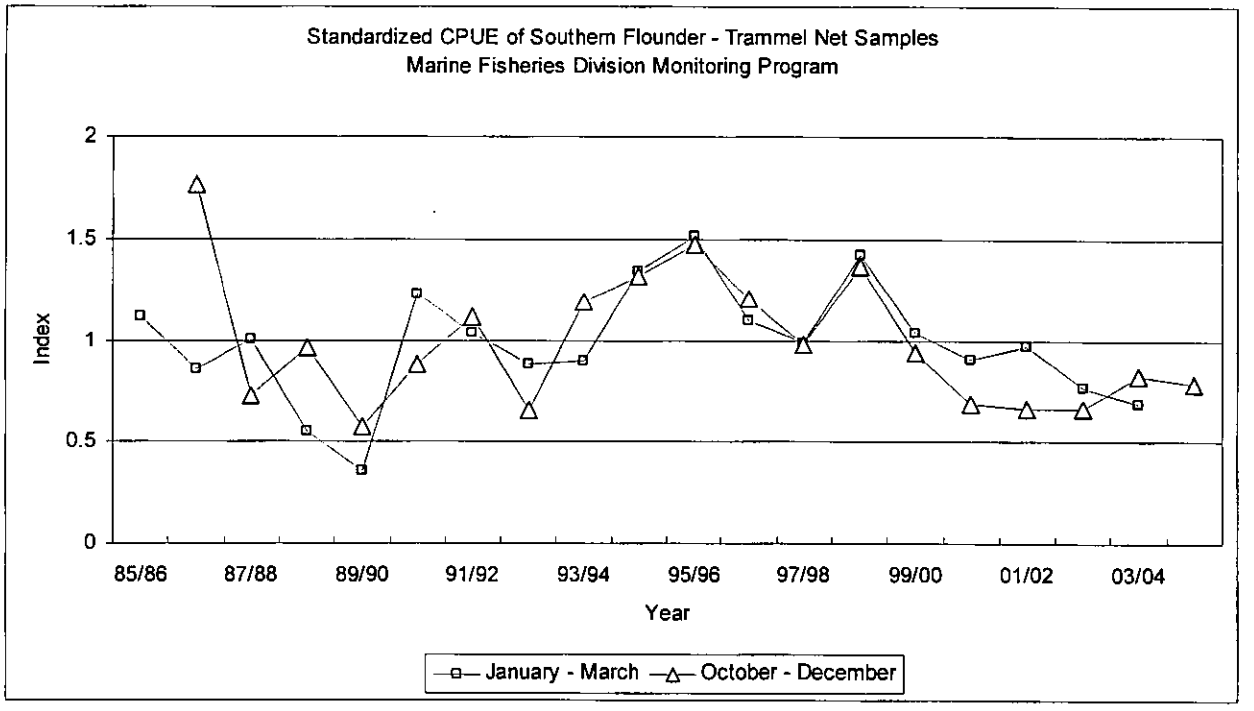
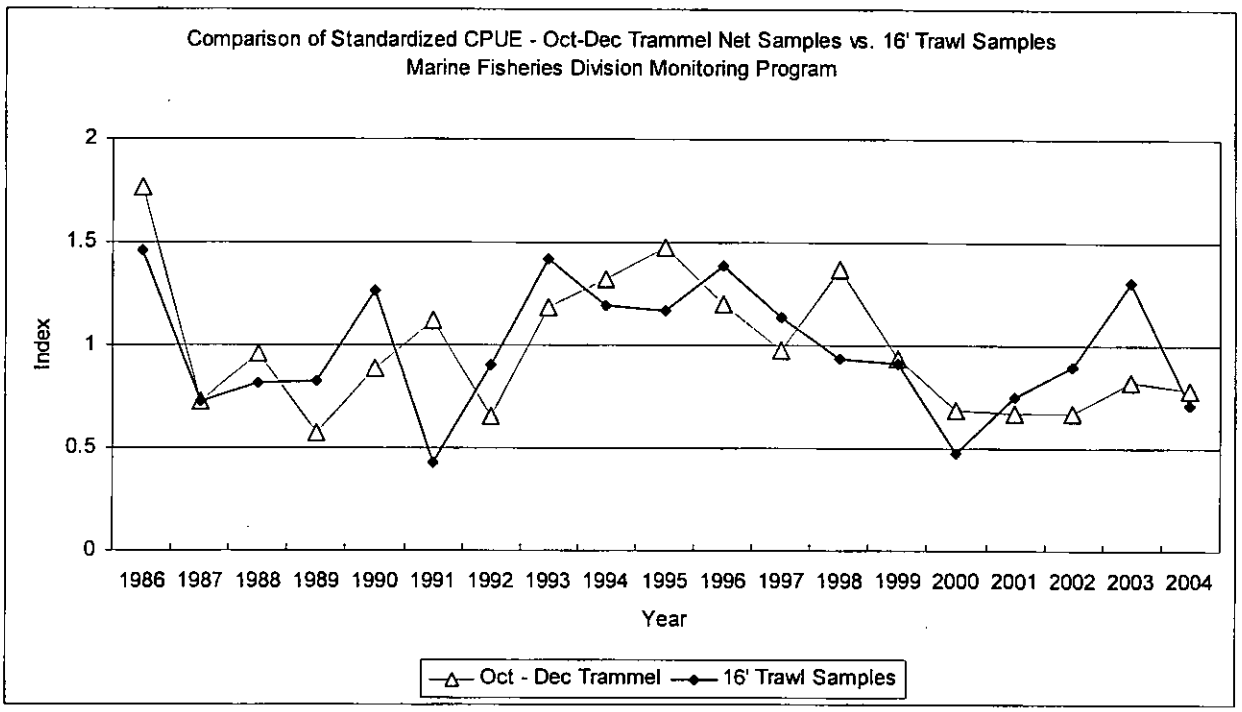


Figure 5.7. Comparison of the standardized fishery-independent CPUE indices over the time period where both were available.



LOUISIANA WILDLIFE AND FISHERIES COMMISSION

MINUTES

FEBRUARY 3, 2005

WAYNE J. SAGRERA
CHAIRMAN

BATON ROUGE, LOUISIANA

The following constitute minutes of the Commission Meeting
and are not a verbatim transcript of the proceedings.
Tapes of the meetings are kept at the
Louisiana Department of Wildlife and Fisheries
2000 Quail Drive
Baton Rouge, Louisiana 70808
For more information, call (225) 765-2806

AGENDA
LOUISIANA WILDLIFE AND FISHERIES COMMISSION
BATON ROUGE, LOUISIANA
FEBRUARY 3, 2005

		Page
1.	Roll Call	1
2.	Approval of Minutes of January 4, 2005	1
3.	Commission Special Announcements	1
4.	Public Information Activities Report for September 2004 - January 2005	1
5.	Employee Recognition Awards	2
6.	Delta Waterfowl Presentation, "Predator Management Program Update"	3
7.	Enforcement & Aviation Reports/January	4
8.	Discuss the Concept of Deer and Turkey Tags for 2006	5
9.	Consideration of Permit Application for Purple Loosestrife, Aquatic Plant	7
10.	Presentation of Stock Assessments for Black Drum, Striped Mullet, Southern Flounder and Sheepshead	8
11.	Set June 2005 Meeting Date	9
12.	Public Comments	9
13.	Adjournment	9

MINUTES OF THE MEETING

OF

LOUISIANA WILDLIFE AND FISHERIES COMMISSION

Thursday, February 3, 2005

Chairman Wayne Sagrera presiding.

Terry Denmon
Earl King
Frederic Miller
Henry Mouton
Robert Samanie, III

Secretary Dwight Landreneau was also present.

Chairman Sagrera called for a motion for approval of the **January 4, 2005 Commission Minutes**. A motion for approval was made by Commissioner Denmon and seconded by Commissioner Miller. The motion passed with no opposition.

Under **Commission Special Announcements** for this month, Chairman Sagrera asked for a moment of silence for Commissioner Stone who recently passed away. The Chairman also extended his condolences to the Stone family. "Doc" was a very sobering person that held the Commission in line and would certainly be missed, commented Chairman Sagrera.

Public Information Activities Report for September 2004 - January 2005 began with Ms. Marianne Burke stating this report was usually done quarterly. But with their busy schedules, they have not had a chance to prepare the report. The video included activities such as special promotions, hosting conferences, regulation pamphlets and working with other divisions on special events. The activities of the News and Media Relations Unit included publishing three pamphlets and three booklets; three issues of the Louisiana Conservationist magazine and the 2005 calendar; hosting the Association for Conservation Information Conference, representing the Department at the Louisiana Food Service Expo, hosting National Hunting and Fishing Day events, and participating in the Sportsman's Paradise Outdoor Expo. Media Coverage included the Ouachita Wildlife Management Area Reforestation 20th Anniversary Field Day; National Hunting and Fishing Day; a Safe Hunting Interview with WBRZ Channel 2; the Red River Fish Stocking Video News Release; and the Red Cockaded Woodpecker Safe Harbor Program Video News Release. The Audio Visual Unit produced a video highlighting the Gulf of Mexico Cooperative Law Enforcement Strategic Plan. The Information and Resource Library staff

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Major Sandy Dares stated it was a pleasure and honor to help Secretary Landreneau with the **Employee Recognition Awards**. He acknowledged the support of the administrative staff and the employees who nominated their fellow employees. Major Dares congratulated all award recipients and expressed a special thanks to the committee which made the selections. Customer Service Award recipients were Sandy Cannon, Alvin Henry, Kenneth King, Roy Moffett, Lisa Rickards, Halane Ricketts, and Brenda Sutton. Recipients of the Professional Employees of the Year were Angie Dowdy, Todd Laviolette, Kenneth Ribbeck and Bobby Reed. Support Employees of the Year were Tina Faul, Susan Falcon and Jennifer Voisin. In the Technician/Maintenance Category of Employee of the Year, recipients were Harold Hall and Jeff Thompson. Two employees were selected for the Secretary's Award which represented outstanding service to the Department and those recipients were Retired Lt. Col. Charlie Clark and Greg Linscombe. Next came Team Awards and the first was for the Dewey Wills Enforcement Team consisting of Sr. Agent Kevin Hill, Sgt. Brian McDowell, Sr. Agent Rick Markway and Sgt. James Parish. The recipients of the Euthanasia/Immobilization Team were Jonathan Bordelon, David Breithaupt, Bill Burns, Chris Davis, Pat Deshotels, John Hanks, David Hayden, Leslie Johnson, Jeff Johnson, Emile LeBlanc, Lowery Moak, Mike Perot, John Robinette, Larry Savage, Wendell Smith, Jeff Taverner, and Tony Vidrine. For the Derelict Crab Trap Removal Team, Gene Arcement, Paul Cook, Emma Diaz, Willard Dupre, Aimee Fortier, Ken Gautreau, Donna Gautreau, Jim Gray, Vince Guillory, Steve Hein, Kenny King, Heath Kramer, David LeBlanc, Albert Lefort, Roy Moffett, Wayne Primeaux, Evan Thames, John Venissat, and Jennifer Voisin were award recipients. Then the last team award was multi-divisional for the Wetshop Event Team and those winners were from the Education Section Todd Buffington, Angela Capello, Travis Dufour, Jonathan LeBlanc, Dana Permenter, and Mitch Samaha; from Natural Heritage Section Patricia Faulkner and Chris Reid and from Marine Fisheries Division John Damier, Brian Hardcastle, and Patrick Banks. Major Dares concluded encouraging all employees to nominate a person if they feel they deserve to be recognized. Chairman Sagrera congratulated all of the employees for their awards.

Commissioner Denmon began the next item, **Delta Waterfowl Presentation, "Predator Management Program Update"** stating this originated with discussions with Mr. Rob Olson, President of Delta Waterfowl. A video that Commissioner Denmon saw talked about factors that were affecting duck hunting, such as weather, population, hunting pressure, refuges and whether ducks have turned nocturnal. He then indicated he contacted Mr. Olson and invited him to make a presentation before the Commission and to also give a report on the money being given for predator control. Commissioner Denmon announced that Dr. Frank Rohwer, from LSU, would report on the predator management and then Mr. Olson would make a presentation at the March meeting and discuss "where are the ducks and how could we have more". Commissioner Denmon recalled that duck numbers for December was 1.3 million and 1.6 million in January, which was equal to or greater than the 5 year average. He then commented that those numbers tell him that the ducks are here, but there are other factors affecting where they are. If the Commission wants the duck hunters to stay, Commissioner Denmon felt they needed an answer that would make sense and hope for the future. He added he was encouraged that Delta Waterfowl was thinking about new waterfowl managements. Commissioner Denmon then turned the program over to Dr. Rohwer.

Dr. Rohwer began stating his presentation was on the funding provided Delta Waterfowl by the Commission for trapping. Delta Waterfowl did some research over the last few years and it looked as if predator trapping was an effective way to increase nest success. They selected a 36 square block of duck habitat and hired a professional trapper to see if the eggs would hatch. To date, there have been 21 trap sites with 47 percent nest success versus the non-trap sites having only 22 percent success. A brood survival study was then discussed by Dr. Rohwer. Within the 36 square miles of good habitat, you can find 80 pairs per square mile which equals to about 3000 pairs. The production showed more ducklings hatched on the trapped area rather than on the non-trapped which could be misleading since female mallards will renest if they fail. The difference becomes less dramatic when females renest and thus the percentage increases to 55 percent on land that was trapped. Brood survival has a bigger effect than nest success due to the fact that females do not renest. When you combine the two, there are about 24,000 incremental ducks per year off the four trapped sites that the Department was providing funding for. Since 1989, Delta Waterfowl has done a lot of programs in Prairie Canada and the focus has been on dense nesting cover. Now there are 188,000 acres purchased since the onset of the program. These numbers are from the Prairie Habitat Joint Venture's plan. Per year, there has been an increase of 6,000 new nests and this could equal to 27,000 incremental ducks. Switching to "where we are going", Dr. Rohwer stated everyone wants better data. There are two PhD projects and the first will look at pair numbers and since birds come back home, and trapping continues, there should be more

pairs next year. The other project would reexamine brood survival and the question is, how many ducklings survive and what is the effect of trapping on brood survival. The study is pretty straight forward and has gotten better with the improvements in radio telemetry. Another model to explore was to test for density dependence in reproduction and a question to ask was whether hunting was having an effect on the population. Another question to ask, when the ducks go back to the prairies, do they do poorer since there may competition for space, food or some other resource. Dr. Rohwer explained the science behind trapping and density dependence. He then added the predator program would continue for another three years and several new students were coming on to do some "cool" research. Dr. Rohwer concluded stating Mr. Olson would be at the next meeting to give a bigger view on waterfowl management. Commissioner Samanie asked what percentage does Delta Waterfowl put into improving the habitat to make it more conducive for ducks. Dr. Rohwer stated they have done a lot on habitat but could not give numbers. In Canada, the biggest problem for ducks is the lose of wetlands. Then Commissioner Samanie asked if they studied another 36 square mile area where the habitat was improved to see what the results were. Dr. Rohwer stated a lot of other people have done that type study in Prairie Canada. It also takes a lot of grass area to do this study and would require Farm Bill type money. Commissioner Miller asked if ducks in the trap site were philopatric to their wintering sites? Dr. Rohwer restated that they learned ducks are philopatric from other studies, not from the trap study. He added that banding studies on ducks show strong philopatry to wintering sites but it differs with the various species.

The **Monthly Law Enforcement Report for January** began with Lt. Col. Keith LaCaze stating there were 1,201 citations and 124 written warnings issued and agents helped with 66 public assists. Main activities for the month were on deer and waterfowl. The Aviation Report showed two planes flew Enforcement Division 30 hours, Wildlife Division 48.6 hours, Marine Fisheries Division 8.2 hours, and Fur & Refuge 7 hours for a total of 93.9 hours. The Boating Accident Report for January consisted of 5 reports during the month with 2 injuries and 2 fatalities. The boating accidents occurred in Lafourche, St. Mary, Iberville, St. Bernard and Iberia Parishes. The Operation Game Thief group held their annual meeting during January, reviewed 18 cases from the last quarter and paid $6,400 in cash rewards for those cases. Overall for the year, there were 48 cases reviewed and paid out $18,600 in cash rewards. Lt. Col. LaCaze stated the group was self-funding except for some funds from court fees and noted, over their 21 years, they have paid out in excess of $193,000. He then focused on search and rescue efforts that occurred during the month. One such instance was a group of three men from Arkansas went to Pass-a-Loutre and got lost. Fur & Refuge and Enforcement personnel located them, guided them to a camping area and gave directions for hunting. One of those

gentlemen sent a thank you note expressing his appreciation for the assistance. Then Lt. Col. LaCaze explained of an incident that occurred when a hunter, participating in nighttime raccoon hunting, got lost on Russell Sage WMA. The last case highlighted was a boating accident on Lake Fausse Pointe where two stepbrothers in a boat struck a stump and the older brother sustained fatal chest injuries and the 14 year old suffered ankle injuries. The younger brother called for help on his cell phone. Agents responding to the call in which the brothers were located were Lt. Darryl Moore, Sgt. Mitch Darby and Sr. Agent Brian Theriot. Those agents would be recognized for Life Saving Awards for their efforts.

Mr. Dave Moreland handled the next item, **Discuss the Concept of Deer and Turkey Tags for 2006**. He reminded the Commission staff came last year with a recommendation for a 2 buck limit in order to develop the older age class of bucks. Also, he noted this year concluded the three year study on antler restriction in the three parish region of Pointe Coupee, West Baton Rouge and Iberville. The restriction required a harvested buck to have 6 or more points with each point being one inch long. Bucks with spikes less than three inches were allowed to be harvested also. From data gathered on Sherburne WMA, staff knew that a large percent of the 2 ½ year old bucks would not produce 6 points and thus would not be legal. The concept was to reduce the 1 ½ year old harvest. But the question was, did those deer move up to the older age class? Mr. Moreland reported there were about 200 of the 2 year old bucks that have been lost since they were not 6 points or better. Total kill shows that female kill has remained fairly consistent, but the total antlered buck harvest has been below the pre-experimental level. Next, a slide was shown of the body weights for the 2 and 3 year old bucks in the tri-parish area. It was found that deer growth and development was not the same in Iberville Parish as in Pointe Coupee and West Baton Rouge Parishes. Again, Mr. Moreland stated, the best approach to develop the older age class of bucks was to utilize a buck limit rather than antler restriction. From the 2004 Legislative Session, the Commission could establish deer tagging if there was a buck limit. The Commission could also establish turkey tagging. During the upcoming setting of the 2005-06 hunting seasons, staff wanted to begin talking with hunters at the public meetings and get their input. The idea was to issue the tags through the point of sale system to deer hunters and turkey hunters. The general proposal was to issue three antlerless tags, two bucks of choice tags and one 6 point or better tag. Turkey hunters would be issued two gobbler tags. Things to be worked out included validation and reporting, and program cost which would not be cheap. These would be discussed with the public, then put a final proposal together and present it to the Commission as a recommendation.

Commissioner Mouton stated he liked the idea of where the Department was headed but wanted to make certain the deer tags were

available when the season opens. He would want to see a dry run performed and be convinced it worked before he could support the idea. Commissioner Denmon stated he was in favor of the tagging system this year as he was the buck limit presented last year. But noted the other members of the Commission did not support the proposal last year since most of the hunters did not support it as discovered during the public meetings. Commissioner Denmon felt some type of procedure to measure what the hunters wanted needed to be developed. Commissioner Mouton agreed with Commissioner Denmon and asked that a poll be established on the website where hunters could vote one time on whether they want tags or not. Mr. Moreland stated they would take advantage of all of the media resources to get the message out and then receive the public comments. Commissioner Miller stated, of the comments he has received, a tagging system was ranked number 2. He added he had the opportunity to hunt in Texas with tags and never had a problem. Commissioner Miller felt, from the comments supporting the tags, hunters did not think the honor system worked and knew the Enforcement agents did not know how many deer a hunter killed in a year. A tagging system not only would help the deer herd and increase the quality of the herd but also would help Enforcement as well, stated Commissioner Miller. He wanted to do what was best for the resource and management. Chairman Sagrera stated he voted against the buck limit last year after talking with agents and finding the biggest problem was the honor system and how it was to be enforced. He felt the tagging system was a win-win situation that would help the quality of the deer and Enforcement agents. Commissioner King stated he was in favor of evaluating the pros and cons with the tagging system and doing what was best for the resource. Commissioner Denmon asked when would the hunting regulations be introduced? Mr. Moreland stated next month. Then Commissioner Denmon asked if the tagging system would be included? Mr. Moreland answered no, they would present the proposal at the public hearings and get their input, work with the license section, and then develop the best program that can be incorporated in the point of sale contract for 2006. Commissioner Denmon asked if the three year plan would be included in the hunting regulations? Again Mr. Moreland answered yes, when the 2005 dates are presented, hopefully the 2006 and 2007 dates would be included. Chairman Sagrera understood that when the dates were set, it would be for three years. Commissioner Miller asked when would the public be notified of the tagging proposal? Mr. Moreland stated it would start with the public meetings that will occur right after the March 3rd Commission Meeting. Commissioner Denmon encouraged the Department to follow Commissioner Mouton's suggestion of gathering public input from the website in addition to the hearings. Mr. Parke Moore commented the Department would progressively pursue involvement of any interested groups or individuals.

Mr. Ray Bordelon, President of Avoyelles Wildlife Federation, stated they support the tagging system with validation. The public meeting held in Avoyelles Parish last year had only four members

but they represented 80 percent of the deer hunters in that parish. Again he supported the system wishing it would happen in the 2005 season since it was needed in the state of Louisiana.

Consideration of Permit Application for Purple Loosestrife, Aquatic Plant was handled by Mr. Bennie Fontenot. He stated this permit would allow Dr. Beth Middleton from the National Wetlands Center in Lafayette, to conduct research on a prohibited aquatic plant called purple loosestrife. This plant is a problem in the mid-west and areas with colder temperatures. It was not known how well the plant would tolerate warm temperatures. Dr. Middleton would research the chances of hurting the state if it was introduced. The proper permits have already been obtained from USDA and the State Department of Agriculture. Mr. Fontenot added that staff has visited Dr. Middleton's facilities and are satisfied with the constraints on the permit that good information could be obtained.

Commissioner Miller asked if this plant was in Louisiana now? Mr. Fontenot stated a small amount was found on the banks at the mouth of the Mississippi River. It also had been sold for water gardens, but those businesses are not selling the plant any longer since they found it was prohibited. Commissioner Denmon asked if the Commission was only being asked to grant a permit and that there would be no participation? Mr. Fontenot stated the Commission has the authority to write and issue a permit and the Resolution would give the Secretary or his designee authority to approve the permit. Again, Commissioner Denmon asked if the Department was participating in any way? Mr. Fontenot answered no, it was just granting Dr. Middleton a permit.

Dr. Beth Middleton expressed appreciation on being given a chance to speak on the application. She wanted to explore the potential for the purple loosestrife invading Louisiana. The furthest south she has seen it growing was in northern Alabama. Dr. Middleton again stated she would like to know what the invasive potential was and whether or not it can be grown in the State. She reassured the Commission, that within the confines of the National Wetlands Center, they could keep it from escaping. Commissioner Mouton asked that the Department be notified if an escape happens. Dr. Middleton requested several items be added to the permit and one dealt with making sure it does not invade the area. She noted there would be full cooperation.

Mr. Fontenot added staff would visit and inspect the project from time to time. He then read the Therefore Be It Resolved portion of the Resolution. Commissioner Mouton made a motion to accept the Resolution and it was seconded by Commissioner Denmon. The motion passed with no opposition.

(The full text of the Resolution is made a part of the record.)

RESOLUTION
LOUISIANA WILDLIFE AND FISHERIES COMMISSION
LOUISIANA DEPARTMENT OF WILDLIFE AND FISHERIES
February 3, 2005

The following was adopted by the Louisiana Wildlife and Fisheries Commission at its regular Commission meeting held in Baton Rouge, Louisiana, February 3, 2005.

WHEREAS, R.S. 56:328 gives the Louisiana Wildlife and Fisheries Commission the authority to issue permits for the importation of any of the noxious plants listed in that section for the purpose of conducting scientific investigations, and

WHEREAS, purple loosestrife, *Lythrum salicaria*, is a listed plant, and

WHEREAS, Dr. Beth Middleton, of the National Wetlands Research Center, has requested a permit for the importation of purple loosestrife for the purpose of conducting scientific investigations, and

WHEREAS, the scientific investigation will determine if this plant is capable of invading wetlands in southern climates and is considered to be important research in view of the recent invasions by other exotic plants, and

WHEREAS, the permit will be issued subject to the necessary restrictions and safeguards to insure that the plant will not escape and alter the natural flora of the state, and

WHEREAS, the staff of the Inland Fisheries Division recommends that the permit be issued.

THEREFORE BE IT RESOLVED that the Commission approves the issuance of the permit, and

BE IT FURTHER RESOLVED that the Commission hereby delegates to the Secretary of the Department of Wildlife and Fisheries the authority to perform all administrative functions necessary to effectuate this permit.

_____
Wayne J. Sagrera, Chairman
Wildlife and Fisheries Commission

Presentation of Stock Assessments for Black Drum, Striped Mullet, Southern Flounder and Sheepshead are annual requirements began Mr. Harry Blanchet. The Commission transmits the four stock assessments to the Legislature prior to March 1 of each year. This

procedure has been followed since 1996. Included in the packets with the stock assessments were a list of peer reviewers and their comments. All of the species are required to be at or above 30 percent spawning potential ratio (SPR) as a conservation standard set by the Legislature. Mr. Blanchet reported there has been no change in the status over the last year. For Black Drum when the natural mortality rate is at the lowest of .1, the SPR was 44 percent. With Striped Mullet, SPR was estimated to be near 31 percent at the same lowest yield. For Southern Flounder, the range was between 16 and 30 percent and the range for sheepshead was between 47 and 57 percent. He then asked for an oral motion to transmit the documents to the Legislature. Commissioner Miller made a motion to transmit the documents to the Legislature. Commissioner Samanie seconded the motion and it passed with no opposition.

The Commissioners agreed to hold the **June 2005 Meeting** on Thursday, June 2, 2005, beginning at 9:30 a.m. at the Baton Rouge Headquarters.

Chairman Sagrera then asked for **Public Comments**. Mr. Don Puckett stated, on the Notice of Intent approved at the last meeting on license fee waivers, staff has recommended some technical, non-substantive changes to help with clarification. He added there was no formal action required, it was just notification for the record.

There being no further business, Commissioner Samanie made a motion to **Adjourn** the meeting and it was seconded by Commissioner Denmon.

Dwight Landreneau
Secretary

DL:scf

2/15/2005

Marianne,
Please review.
Thanks,
Susan Falcon
MB 2/16/05

INUTES OF THE MEETING

OF

LDLIFE AND FISHERIES COMMISSION

sday, February 3, 2005

presiding.

Frederic Miller
Henry Mouton
Robert Samanie, III

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Major Sandy Dares stated it was a pleasure and honor to help Secretary Landreneau with the **Employee Recognition Awards**. He acknowledged the support of the administrative staff and the employees who nominated their fellow employees. Major Dares congratulated all award recipients and expressed a special thanks to the committee which made the selections. Customer Service Award recipients were Sandy Cannon, Alvin Henry, Kenneth King, Roy Moffett, Lisa Rickards, Halane Ricketts, and Brenda Sutton. Recipients of the Professional Employees of the Year were Angie Dowdy, Todd Laviolette, Kenneth Ribbeck and Bobby Reed. Support Employees of the Year were Tina Faul, Susan Falcon and Jennifer Voisin. In the Technician/Maintenance Category of Employee of the Year, recipients were Harold Hall and Jeff Thompson. Two employees were selected for the Secretary's Award which represented outstanding service to the Department and those recipients were Retired Lt. Col. Charlie Clark and Greg Linscombe. Next came Team Awards and the first was for the Dewey Wills Enforcement Team consisting of Sr. Agent Kevin Hill, Sgt. Brian McDowell, Sr. Agent Rick Markway and Sgt. James Parish. The recipients of the Euthanasia/Immobilization Team were Jonathan Bordelon, David Breithaupt, Bill Burns, Chris Davis, Pat Deshotels, John Hanks, David Hayden, Leslie Johnson, Jeff Johnson, Emile LeBlanc, Lowery Moak, Mike Perot, John Robinette, Larry Savage, Wendell Smith, Jeff Taverner, and Tony Vidrine. For the Derelict Crab Trap Removal Team, Gene Arcement, Paul Cook, Emma Diaz, Willard Dupre, Aimee Fortier, Ken Gautreau, Donna Gautreau, Jim Gray, Vince Guillory, Steve Hein, Kenny King, Heath Kramer, David LeBlanc, Albert Lefort, Roy Moffett, Wayne Primeaux, Evan Thames, John Venissat, and Jennifer Voisin were award recipients. Then the last team award was multi-divisional for the Wetshop Event Team and those winners were from the Education Section Todd Buffington, Angela Capello, Travis Dufour, Jonathan LeBlanc, Dana Permenter, and Mitch Samaha; from Natural Heritage Section Patricia Faulkner and Chris Reid and from Marine Fisheries Division John Damier, Brian Hardcastle, and Patrick Banks. Major Dares concluded encouraging all employees to nominate a person if they feel they deserve to be recognized. Chairman Sagrera congratulated all of the employees for their awards.

Commissioner Denmon began the next item, **Delta Waterfowl Presentation, "Predator Management Program Update"** stating this originated with discussions with Mr. Rob Olson, President of Delta Waterfowl. A video that Commissioner Denmon saw talked about factors that were affecting duck hunting, such as weather, population, hunting pressure, refuges and whether ducks have turned nocturnal. He then indicated he contacted Mr. Olson and invited him to make a presentation before the Commission and to also give a report on the money being given for predator control. Commissioner Denmon announced that Dr. Frank Rohwer, from LSU, would report on the predator management and then Mr. Olson would make a presentation at the March meeting and discuss "where are the ducks and how could we have more". Commissioner Denmon recalled that duck numbers for December was 1.3 million and 1.6 million in January, which was equal to or greater than the 5 year average. He then commented that those numbers tell him that the ducks are here, but there are other factors affecting where they are. If the Commission wants the duck hunters to stay, Commissioner Denmon felt they needed an answer that would make sense and hope for the future. He added he was encouraged that Delta Waterfowl was thinking about new waterfowl managements. Commissioner Denmon then turned the program over to Dr. Rohwer.

Dr. Rohwer began stating his presentation was on the funding provided Delta Waterfowl by the Commission for trapping. Delta Waterfowl did some research over the last few years and it looked as if predator trapping was an effective way to increase nest success. They selected a 36 square block of duck habitat and hired a professional trapper to see if the eggs would hatch. To date, there have been 21 trap sites with 47 percent nest success versus the non-trap sites having only 22 percent success. A brood survival study was then discussed by Dr. Rohwer. Within the 36 square miles of good habitat, you can find 80 pairs per square mile which equals to about 3000 pairs. The production showed more ducklings hatched on the trapped area rather than on the non-trapped which could be misleading since female mallards will renest if they fail. The difference becomes less dramatic when females renest and thus the percentage increases to 55 percent on land that was trapped. Brood survival has a bigger effect than nest success due to the fact that females do not renest. When you combine the two, there are about 24,000 incremental ducks per year off the four trapped sites that the Department was providing funding for. Since 1989, Delta Waterfowl has done a lot of programs in Prairie Canada and the focus has been on dense nesting cover. Now there are 188,000 acres purchased since the onset of the program. These numbers are from the Prairie Habitat Joint Venture's plan. Per year, there has been an increase of 6,000 new nests and this could equal to 27,000 incremental ducks. Switching to "where we are going", Dr. Rohwer stated everyone wants better data. There are two PhD projects and the first will look at pair numbers and since birds come back home, and trapping continues, there should be more

pairs next year. The other project would reexamine brood survival and the question is, how many ducklings survive and what is the effect of trapping on brood survival. The study is pretty straight forward and has gotten better with the improvements in radio telemetry. Another model to explore was to test for density dependence in reproduction and a question to ask was whether hunting was having an effect on the population. Another question to ask, when the ducks go back to the prairies, do they do poorer since there may competition for space, food or some other resource. Dr. Rohwer explained the science behind trapping and density dependence. He then added the predator program would continue for another three years and several new students were coming on to do some "cool" research. Dr. Rohwer concluded stating Mr. Olson would be at the next meeting to give a bigger view on waterfowl management. Commissioner Samanie asked what percentage does Delta Waterfowl put into improving the habitat to make it more conducive for ducks. Dr. Rohwer stated they have done a lot on habitat but could not give numbers. In Canada, the biggest problem for ducks is the lose of wetlands. Then Commissioner Samanie asked if they studied another 36 square mile area where the habitat was improved to see what the results were. Dr. Rohwer stated a lot of other people have done that type study in Prairie Canada. It also takes a lot of grass area to do this study and would require Farm Bill type money. Commissioner Miller asked if ducks in the trap site were philopatric to their wintering sites? Dr. Rohwer restated that they learned ducks are philopatric from other studies, not from the trap study. He added that banding studies on ducks show strong philopatry to wintering sites but it differs with the various species.

The **Monthly Law Enforcement Report for January** began with Lt. Col. Keith LaCaze stating there were 1,201 citations and 124 written warnings issued and agents helped with 66 public assists. Main activities for the month were on deer and waterfowl. The Aviation Report showed two planes flew Enforcement Division 30 hours, Wildlife Division 48.6 hours, Marine Fisheries Division 8.2 hours, and Fur & Refuge 7 hours for a total of 93.9 hours. The Boating Accident Report for January consisted of 5 reports during the month with 2 injuries and 2 fatalities. The boating accidents occurred in Lafourche, St. Mary, Iberville, St. Bernard and Iberia Parishes. The Operation Game Thief group held their annual meeting during January, reviewed 18 cases from the last quarter and paid $6,400 in cash rewards for those cases. Overall for the year, there were 48 cases reviewed and paid out $18,600 in cash rewards. Lt. Col. LaCaze stated the group was self-funding except for some funds from court fees and noted, over their 21 years, they have paid out in excess of $193,000. He then focused on search and rescue efforts that occurred during the month. One such instance was a group of three men from Arkansas went to Pass-a-Loutre and got lost. Fur & Refuge and Enforcement personnel located them, guided them to a camping area and gave directions for hunting. One of those

gentlemen sent a thank you note expressing his appreciation for the assistance. Then Lt. Col. LaCaze explained of an incident that occurred when a hunter, participating in nighttime raccoon hunting, got lost on Russell Sage WMA. The last case highlighted was a boating accident on Lake Fausse Pointe where two stepbrothers in a boat struck a stump and the older brother sustained fatal chest injuries and the 14 year old suffered ankle injuries. The younger brother called for help on his cell phone. Agents responding to the call in which the brothers were located were Lt. Darryl Moore, Sgt. Mitch Darby and Sr. Agent Brian Theriot. Those agents would be recognized for Life Saving Awards for their efforts.

Mr. Dave Moreland handled the next item, **Discuss the Concept of Deer and Turkey Tags for 2006.** He reminded the Commission staff came last year with a recommendation for a 2 buck limit in order to develop the older age class of bucks. Also, he noted this year concluded the three year study on antler restriction in the three parish region of Pointe Coupee, West Baton Rouge and Iberville. The restriction required a harvested buck to have 6 or more points with each point being one inch long. Bucks with spikes less than three inches were allowed to be harvested also. From data gathered on Sherburne WMA, staff knew that a large percent of the 2 ½ year old bucks would not produce 6 points and thus would not be legal. The concept was to reduce the 1 ½ year old harvest. But the question was, did those deer move up to the older age class? Mr. Moreland reported there were about 200 of the 2 year old bucks that have been lost since they were not 6 points or better. Total kill shows that female kill has remained fairly consistent, but the total antlered buck harvest has been below the pre-experimental level. Next, a slide was shown of the body weights for the 2 and 3 year old bucks in the tri-parish area. It was found that deer growth and development was not the same in Iberville Parish as in Pointe Coupee and West Baton Rouge Parishes. Again, Mr. Moreland stated, the best approach to develop the older age class of bucks was to utilize a buck limit rather than antler restriction. From the 2004 Legislative Session, the Commission could establish deer tagging if there was a buck limit. The Commission could also establish turkey tagging. During the upcoming setting of the 2005-06 hunting seasons, staff wanted to begin talking with hunters at the public meetings and get their input. The idea was to issue the tags through the point of sale system to deer hunters and turkey hunters. The general proposal was to issue three antlerless tags, two bucks of choice tags and one 6 point or better tag. Turkey hunters would be issued two gobbler tags. Things to be worked out included validation and reporting, and program cost which would not be cheap. These would be discussed with the public, then put a final proposal together and present it to the Commission as a recommendation.

Commissioner Mouton stated he liked the idea of where the Department was headed but wanted to make certain the deer tags were

available when the season opens. He would want to see a dry run performed and be convinced it worked before he could support the idea. Commissioner Denmon stated he was in favor of the tagging system this year as he was the buck limit presented last year. But noted the other members of the Commission did not support the proposal last year since most of the hunters did not support it as discovered during the public meetings. Commissioner Denmon felt some type of procedure to measure what the hunters wanted needed to be developed. Commissioner Mouton agreed with Commissioner Denmon and asked that a poll be established on the website where hunters could vote one time on whether they want tags or not. Mr. Moreland stated they would take advantage of all of the media resources to get the message out and then receive the public comments. Commissioner Miller stated, of the comments he has received, a tagging system was ranked number 2. He added he had the opportunity to hunt in Texas with tags and never had a problem. Commissioner Miller felt, from the comments supporting the tags, hunters did not think the honor system worked and knew the Enforcement agents did not know how many deer a hunter killed in a year. A tagging system not only would help the deer herd and increase the quality of the herd but also would help Enforcement as well, stated Commissioner Miller. He wanted to do what was best for the resource and management. Chairman Sagrera stated he voted against the buck limit last year after talking with agents and finding the biggest problem was the honor system and how it was to be enforced. He felt the tagging system was a win-win situation that would help the quality of the deer and Enforcement agents. Commissioner King stated he was in favor of evaluating the pros and cons with the tagging system and doing what was best for the resource. Commissioner Denmon asked when would the hunting regulations be introduced? Mr. Moreland stated next month. Then Commissioner Denmon asked if the tagging system would be included? Mr. Moreland answered no, they would present the proposal at the public hearings and get their input, work with the license section, and then develop the best program that can be incorporated in the point of sale contract for 2006. Commissioner Denmon asked if the three year plan would be included in the hunting regulations? Again Mr. Moreland answered yes, when the 2005 dates are presented, hopefully the 2006 and 2007 dates would be included. Chairman Sagrera understood that when the dates were set, it would be for three years. Commissioner Miller asked when would the public be notified of the tagging proposal? Mr. Moreland stated it would start with the public meetings that will occur right after the March 3rd Commission Meeting. Commissioner Denmon encouraged the Department to follow Commissioner Mouton's suggestion of gathering public input from the website in addition to the hearings. Mr. Parke Moore commented the Department would progressively pursue involvement of any interested groups or individuals.

Mr. Ray Bordelon, President of Avoyelles Wildlife Federation, stated they support the tagging system with validation. The public meeting held in Avoyelles Parish last year had only four members

but they represented 80 percent of the deer hunters in that parish. Again he supported the system wishing it would happen in the 2005 season since it was needed in the state of Louisiana.

Consideration of Permit Application for Purple Loosestrife, Aquatic Plant was handled by Mr. Bennie Fontenot. He stated this permit would allow Dr. Beth Middleton from the National Wetlands Center in Lafayette, to conduct research on a prohibited aquatic plant called purple loosestrife. This plant is a problem in the mid-west and areas with colder temperatures. It was not known how well the plant would tolerate warm temperatures. Dr. Middleton would research the chances of hurting the state if it was introduced. The proper permits have already been obtained from USDA and the State Department of Agriculture. Mr. Fontenot added that staff has visited Dr. Middleton's facilities and are satisfied with the constraints on the permit that good information could be obtained.

Commissioner Miller asked if this plant was in Louisiana now? Mr. Fontenot stated a small amount was found on the banks at the mouth of the Mississippi River. It also had been sold for water gardens, but those businesses are not selling the plant any longer since they found it was prohibited. Commissioner Denmon asked if the Commission was only being asked to grant a permit and that there would be no participation? Mr. Fontenot stated the Commission has the authority to write and issue a permit and the Resolution would give the Secretary or his designee authority to approve the permit. Again, Commissioner Denmon asked if the Department was participating in any way? Mr. Fontenot answered no, it was just granting Dr. Middleton a permit.

Dr. Beth Middleton expressed appreciation on being given a chance to speak on the application. She wanted to explore the potential for the purple loosestrife invading Louisiana. The furthest south she has seen it growing was in northern Alabama. Dr. Middleton again stated she would like to know what the invasive potential was and whether or not it can be grown in the State. She reassured the Commission, that within the confines of the National Wetlands Center, they could keep it from escaping. Commissioner Mouton asked that the Department be notified if an escape happens. Dr. Middleton requested several items be added to the permit and one dealt with making sure it does not invade the area. She noted there would be full cooperation.

Mr. Fontenot added staff would visit and inspect the project from time to time. He then read the Therefore Be It Resolved portion of the Resolution. Commissioner Mouton made a motion to accept the Resolution and it was seconded by Commissioner Denmon. The motion passed with no opposition.

(The full text of the Resolution is made a part of the record.)

RESOLUTION
LOUISIANA WILDLIFE AND FISHERIES COMMISSION
LOUISIANA DEPARTMENT OF WILDLIFE AND FISHERIES
February 3, 2005

The following was adopted by the Louisiana Wildlife and Fisheries Commission at its regular Commission meeting held in Baton Rouge, Louisiana, February 3, 2005.

WHEREAS, R.S. 56:328 gives the Louisiana Wildlife and Fisheries Commission the authority to issue permits for the importation of any of the noxious plants listed in that section for the purpose of conducting scientific investigations, and

WHEREAS, purple loosestrife, *Lythrum salicaria*, is a listed plant, and

WHEREAS, Dr. Beth Middleton, of the National Wetlands Research Center, has requested a permit for the importation of purple loosestrife for the purpose of conducting scientific investigations, and

WHEREAS, the scientific investigation will determine if this plant is capable of invading wetlands in southern climates and is considered to be important research in view of the recent invasions by other exotic plants, and

WHEREAS, the permit will be issued subject to the necessary restrictions and safeguards to insure that the plant will not escape and alter the natural flora of the state, and

WHEREAS, the staff of the Inland Fisheries Division recommends that the permit be issued.

THEREFORE BE IT RESOLVED that the Commission approves the issuance of the permit, and

BE IT FURTHER RESOLVED that the Commission hereby delegates to the Secretary of the Department of Wildlife and Fisheries the authority to perform all administrative functions necessary to effectuate this permit.

_____
Wayne J. Sagrera, Chairman
Wildlife and Fisheries Commission

Presentation of Stock Assessments for Black Drum, Striped Mullet, Southern Flounder and Sheepshead are annual requirements began Mr. Harry Blanchet. The Commission transmits the four stock assessments to the Legislature prior to March 1 of each year. This

procedure has been followed since 1996. Included in the packets with the stock assessments were a list of peer reviewers and their comments. All of the species are required to be at or above 30 percent spawning potential ratio (SPR) as a conservation standard set by the Legislature. Mr. Blanchet reported there has been no change in the status over the last year. For Black Drum when the natural mortality rate is at the lowest of .1, the SPR was 44 percent. With Striped Mullet, SPR was estimated to be near 31 percent at the same lowest yield. For Southern Flounder, the range was between 16 and 30 percent and the range for sheepshead was between 47 and 57 percent. He then asked for an oral motion to transmit the documents to the Legislature. Commissioner Miller made a motion to transmit the documents to the Legislature. Commissioner Samanie seconded the motion and it passed with no opposition.

The Commissioners agreed to hold the **June 2005 Meeting** on Thursday, June 2, 2005, beginning at 9:30 a.m. at the Baton Rouge Headquarters.

Chairman Sagrera then asked for **Public Comments.** Mr. Don Puckett stated, on the Notice of Intent approved at the last meeting on license fee waivers, staff has recommended some technical, non-substantive changes to help with clarification. He added there was no formal action required, it was just notification for the record.

There being no further business, Commissioner Samanie made a motion to **Adjourn** the meeting and it was seconded by Commissioner Denmon.

_____
Dwight Landreneau
Secretary

DL:scf

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Outdoors

Hunters need to speak up about tagging

By JOE MACALUSO
jmacaluso@theadvocate.com
Advocate outdoors writer

Forewarned is forearmed: It's a simple saying that carries loads of meaning. It's why our military trains as hard as it does, why sports teams spend many more hours practicing than playing games, why school is important.

It's also why David Moreland outlined a proposal to the Wildlife and Fisheries Commission that will dramatically alter the way we hunt deer and turkey. His presentation, and the reaction from the commission members, was a call to hunters to ready their responses to a tagging system for next season.

This is a different way to hunt deer and turkey, especially deer.

Moreland, a Wildlife and Fisheries biologist who knows as much about whitetail deer as anyone around here, has worked with his staff to develop a plan to meet hunters' demands for a management program. Within a few points, the annual survey's numbers show 85 percent of hunters want to take bigger deer.

Boiled down it means only one thing: If Moreland, biologists and game managers in the state Wildlife Division are to be responsive to hunters' wishes, they have to come up with a plan that will allow the whitetail bucks in Louisiana to get older, because older bucks generally are heavier and have larger antlers.

With the state's "honor" system of six deer per season, there's no way to monitor how many deer a hunter takes and to increase the age of the bucks in the state's deer herd.

So there are two ways to get older bucks: Either use antler restrictions or limit the number of bucks taken during a season.

The former method drew complaints because it means you cannot cull inferior bucks: "Cowhorn" spikes, bucks with two single antlers (spikes) hunters see year after year.

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The latter method restricts the number of bucks a hunter can take within the season. When the LDWF proposed a two buck-four doe tagging system last year, hunters complained there wasn't enough room in the months-long deer season to allow for taking a quality buck, a first buck of the season and the opportunity to take a "cull" buck.

The new tagging structure Moreland outlined would have three doe tags, two "bucks of choice" tags and one tag for a six-points-or-better buck.

This is not a trophy program, only a method Moreland and his staff say will yield older bucks.

Come March 3, when the plan is laid out for discussion at the commission's monthly meeting, hunters will be called on to tell the LWFC and the Wildlife Division how they feel about the plan. It'll be your chance to let these folks know the proposal's strength and weaknesses.

And, at that meeting, another important step will be taken: The LDWF will outline the proposed 2005-06 resident-game hunting seasons and continue the dates for deer, squirrel, rabbit and quail through the 2006-07 and 2007-08 seasons.

Missing Dr. Stone

LWFC commission member Jerry Stone died 10 days ago, and his empty chair at Thursday's commission meeting was a stark reminder how transient we are on this earth.

The Baton Rouge physician was a true sportsman, a believer in how much outdoor experiences add to the treasury of a man's life. Hours spent talking to him during the last four years left no doubt he believed in Louisiana's rich outdoors heritage and he was going to spend however much time it took to maintain that heritage.

To his wife, Kay, and his family my most heartfelt condolences.

Dr. Stone will be missed.

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Outdoors

LDWC to hear deer, turkey hunting plan March 3

By JOE MACALUSO
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Advocate outdoors writer

Louisiana deer and turkey hunters will operate under an entirely different system for their 2005-2006 seasons if the Wildlife and Fisheries Commission approves a plan in July.

At Thursday's LWFC meeting,□Department of Wildlife and Fisheries' Wildlife Division administrator David Moreland said LDWF game biologists and managers are moving on a plan that would add a tagging system for hunters taking deer and turkeys.

Moreland said the plan being considered would give deer hunters six tags, the same number as the current season limit for whitetails in the state, and would include:

- three doe tags
- two "bucks of choice" tags
- one tag for a buck with six or more points in its antlers.

Turkey hunters would be issued two tags to meet the current season limit for the spring hunting season.

Moreland said the annual LDWF deer-hunter surveys consistently point out that Louisiana hunters "want some form of quality deer management.

"To do that, we want to get bucks into an older age class," Moreland said. "We want to do that through a buck limit rather than antler restrictions."

By limiting the take of bucks, called "antlered deer" in the state hunting pamphlets, Moreland said data shows there would be an increase in the number of bucks advancing through the 1‰-year-old age class to an age class where antler spread in bucks would be larger. In previous meetings, Moreland said more 1‰-year-old bucks are taken during a season than all other age classes of bucks.

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The Legislature approved the tagging program in its 2004 session, and the LDWF pushed for a two buck-four doe tagging plan before the 2004-05 season. The plan met with opposition from hunters during March through June public-comment periods last year.

The commission decided against implementing the tagging system for the 2004-05 deer season because of that opposition as well as time constraints that didn't allow it to fully outline the program, including decisions on the tagging format and how hunters would report when and where their tags were used.

Moreland said the LDWF staff continues to work out the details of the validation and reporting systems. He said issues are whether to require a hunter to report when each tag was used, or to require a hunter to report using any or all tags after the deer season, or to leave reporting to a survey of a percentage of the hunters issued tags.

He said the program's cost is another factor, "It's going to be expensive. We know that, and we have to find out where the money is going to come from to implement the system. We are exploring the possibility of a hunter being able to purchase additional tags to offset the cost. We are putting our final proposal with the (LDWF) Licensing Section and will come to the commission in March (March 3 meeting) to outline the program."

LWFC vice-chairman Terry Denmon of Monroe said he supports the tagging system and said the comments he received last year supported the plan. Denmon said he didn't understand reports from last year's public meetings that came out against the plan.

"We need to develop some type of measure to better ascertain if the hunters want tagging," Denmon said at Thursday's meeting. "We heard from a vocal few at those meetings, but hunters who stopped me on the street last year supported tagging."

Newly appointed commission member Fred Miller of Shreveport said he found "overwhelming support for the tagging system. The people contacting me want tagging. The consensus I'm hearing is that the honor system (the current six-bucks-per-season limit) is not working. (The) Enforcement (division) does not know if a man has killed one deer or 20 deer that year."

Lafayette commission member Henry Mouton said the tagging program faces another obstacle.

He voiced his concern about the current licensing system handling the increased workload of issuing tags. Mouton has been critical of the slow operation of the current on-line system run by Great Lodge, a Tennessee firm.

Mouton said he was irked about the performance of a system that had trouble handling the pressure fishermen put on the system when fishing licenses expired on June 30. Mouton cited the problems Grand had in September when hunters sought hunting licenses when the dove season opened Labor Day weekend.

The LDWF tagging plan and the proposals for the 2005-2006 through the 2007-2008 resident-game hunting season will be outlined at the

commission's March 3 meeting set for 9:30 a.m. in the Louisiana Room of Wildlife and Fisheries headquarters on Quail Drive.

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Outdoors

Hunters get chance to comment on tagging proposal

By JOE MACALUSO
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Advocate outdoors writer

Louisiana deer and turkey hunters will have several chances to comment on a proposal that will institute a tagging system that could come as early as the 2005-06 hunting season.

At Thursday's Wildlife and Fisheries Commission meeting, State Wildlife Division administrator David Moreland said tagging system plans call for each deer hunter to receive six tags, three limited to taking antlerless deer, one tag for taking a buck with six or more points in its antlers and two tags for "bucks of choice," which is for taking any antlered whitetail deer.

Moreland said the Legislature approved the program during its 2004 session, and that the tags will be issued through the Department of Wildlife and Fisheries point-of-sale licensing system.

He said the LDWF will seek hunters' comments during the next months, when the department and the commission take public comment about the 2005-06 resident-game hunting seasons that will be proposed at an early March commission meeting.

Moreland also cited the LDWF's need to work out "validation and reporting" details.

"We need to figure out if it would be better for the hunter to report when he takes an animal, or wait until the season is over," Moreland said. "Or, do we want to take a survey of hunters?

"We also know program development will be expensive," he said.

He mentioned the staff is considering a move that will allow hunters to purchase an extra tag, and revenue from that sale could fund the overall tagging program.

Turkey hunters would receive two tags for their spring season.

Moreland also mentioned the early results from the recently concluded

three-year experimental season in Pointe Coupee, Iberville and West Baton Rouge parishes. Hunters in the three parishes were limited to taking bucks with six or more points in their antlers since the 2002 season.

He said reports showed the overall take of does was about the same as years prior to 2002, but the take of bucks had dropped during the experimental period.

The LWFC also heard a report from LSU professor Frank Rohwer that outlined higher nesting and higher brood survival counts of ducks in northern nesting areas where Delta Waterfowl's Predator Management Program were instituted in 2003.

In other action, the commission held its annual Employee Recognition Awards program, learned that LDWF enforcement agents issued 1,201 citations and 124 written warnings in January; heard a report on two fatal boating accidents in the state during January; approved a permit for National Wetlands Research Center professor Beth Middleton to conduct research on the non-native purple loosestrife; passed along a report to the Legislature indicating a positive stock assessment report on black drum, flounder, sheepshead and mullet in state waters; and voted to hold its June meeting June 3 in Baton Rouge.

LWFC chairman Wayne Segrera also asked for a moment of silence to honor commission member Dr. Jerry Stone who died last week.

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COMMISSION MEETING
ROLL CALL

Thursday, February 3, 2005
Baton Rouge, LA
Wildlife and Fisheries Building

	Attended	Absent
Wayne Sagrera (Chairman)	✓	___
Terry Denmon	✓	___
Fred Miller	✓	___
Henry Mouton	✓	___
Earl King	✓	___
Bobby Samanie	✓	___
	___	___

Mr. Chairman:

There are 6 Commissioners in attendance and we have a quorum.

Secretary Landreneau is also present.

AGENDA
LOUISIANA WILDLIFE AND FISHERIES COMMISSION
BATON ROUGE, LA
February 3, 2005
9:30 AM

1. Roll Call

2. Approval of Minutes of January 4, 2005

3. Commission Special Announcements

4. Public Information Activities Report for September 2004 - January 2005 - Marianne Burke

5. Employee Recognition Awards - Secretary Dwight Landreneau and Major Sandy Dares

6. Delta Waterfowl Presentation, "Predator Management Program Update" - Commissioner Terry Denmon

7. Enforcement & Aviation Reports/January - Lt. Col. Keith LaCaze

8. Discuss the Concept of Deer and Turkey Tags for 2006 - Dave Moreland

9. Consideration of Permit Application for Purple Loosestrife, Aquatic Plant - Bennie Fontenot

10. Presentation of Stock Assessments for Black Drum, Striped Mullet, Southern Flounder and Sheepshead - Harry Blanchet

11. Set June 2005 Meeting Date

12. Public Comments

13. Adjournment

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11. Set June 2005 Meeting Date

12. Public Comments

13. Adjournment

LaCaze, B "Keith"

From: DeGraff, Jeffrey
Sent: Tuesday, February 01, 2005 4:26 PM
To: Burke, Marianne
Subject: LDWF Region 2 News (February 1, 2005)

NEWS FROM THE LA. DEPT. OF WILDLIFE & FISHERIES

The Public Information Section of the Louisiana Department of Wildlife and Fisheries is responsible for the distribution of LDWF news releases and the department's biweekly newsletter.

If you have questions, please contact one of the following Public Information Section staff members:

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Media Relations Manager
(tgresham@wlf.louisiana.gov)

Jeffrey DeGraff
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2005-035

LOST HUNTER FOUND ON RUSSELL SAGE WILDLIFE MANAGEMENT AREA

Frank McHan, 63, of Monroe spent 10 hours lost in the woods near Monroe in Russell Sage Wildlife Management Area. McHan and a hunting partner had gone to the area to hunt raccoons on the night of January 17 when the two men separated to look for their hunting dog. McHan's hunting partner reported him missing after searching for him. Enforcement agents from the Louisiana Department of Wildlife and Fisheries were notified of the missing hunter at 3 a.m. They immediately responded and were joined by deputies from the Ouachita Parish Sheriff's Office and troopers from Louisiana State Police Troop F. At daybreak, a K-9 unit from the Union Parish Sheriff's Office was brought in to join the search while an aerial search was being planned with a state police helicopter. Much of the 16,000-acre WMA was covered with backwater, and with temperatures dipping into the low 20s, it was imperative to locate the missing hunter.

LDWF Wildlife Division technicians and officers from the West Monroe Police Department also joined in the search. The morning brought good news as McHan and his dog walked out of the area at around 8 a.m., very cold but otherwise unharmed. McHan later told LDWF Agent Jason Mouliere who regularly patrols Russell Sage WMA that when he realized he was lost he stopped walking and sat down by a tree. Mouliere commented, "This situation could have ended in tragedy but Mr. McHan made good decisions in stopping, staying dry and waiting for daylight."

EDITORS: For more information, contact Lt. Col. Keith LaCaze at 225/765-2469 (klacaze@wlf.louisiana.gov).

-30-

LaCaze, B "Keith"

From: DeGraff, Jeffrey
Sent: Tuesday, February 01, 2005 4:26 PM
To: Burke, Marianne
Subject: LDWF Region 5 News (February 1, 2005)

NEWS FROM THE LA. DEPT. OF WILDLIFE & FISHERIES

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2005-036

BOAT AND PLANE PATROLS HALT ILLEGAL OYSTER HARVESTING FROM CLOSED AREAS

Louisiana Department of Wildlife and Fisheries Enforcement Division agents issued citations on January 14 and January 24 for the alleged illegal harvest of oysters from unapproved areas in Calcasieu Parish.

On January 14, Steven Guidry, 34, of Cameron was spotted dredging oysters in the Calcasieu Lake Estuary. He was cited for taking oysters from an unapproved area.

On January 24, agents were patrolling by floatplane when they observed Todd Griffin, 23, and Jason Mathis, 27, both of Cameron, dredging oysters in the West Cove Conditional Unit. As the plane circled the fisherman, they immediately ceased their dredging operations and tried to evade the plane. The airborne agent and pilot were able to track the vessel and radio its location to agents patrolling by boat, who apprehended the men. They were also cited for taking oysters from an unapproved area. Two oyster dredges were seized in connection with the violations.

Portions of the oyster harvesting waters are closed by the Department of Health and Hospitals under a water-monitoring program that identifies areas having high bacteria counts. Consuming oysters taken from closed areas may cause illness. Maps are posted in numerous locations for the convenience of oyster harvesters.

If convicted, the three face penalties of up to $700 in fines, up to six months jail, or both, plus court costs.

Participating in the cases were Sergeant Edwin Broussard, Senior Agent Layne Picard, Agent Wayne Matirne, Agent Wendell Vaughn, and Enforcement Pilot Russell Johnson.

EDITORS: For more information, contact Lt. Col. Keith LaCaze at 225/765-2469 (klacaze@wlf.louisiana.gov).

2005-037

ALLEN PARISH MEN CITED FOR NIGHT HUNTING

Richard Dean Sonnier II, 21, Bryan Scott Mills, 21, and Jacob Daniel Lovejoy, 22, all from Kinder, were cited by an enforcement agent from the Louisiana Department of Wildlife and Fisheries for allegedly hunting wild quadrupeds during illegal hours, hunting from a moving vehicle, hunting from a public road and spotlighting from a public road.

During the late evening hours of January 5, Senior Agent Keith Aucoin saw Sonnier, Mills and Lovejoy shining a light from their vehicle along the roadway and adjacent fields off of Parish Line Road in Allen Parish. The manner in which they were traveling and shining the light was consistent with night hunting. Upon stopping them, Agent Aucoin found a .22-caliber rifle in the front seat and a freshly shot rabbit in the bed of the pickup truck. The agent determined that they were hunting with the intent to take wild quadrupeds during illegal hours. Seized in connection with the case were the rifle, one spotlight and the rabbit. The light and rifle are being held for evidence and the rabbit was donated to charity.

Hunting wild quadrupeds during illegal hours, hunting from a moving vehicle and hunting from a public road carry a penalty for each violation of fines of up to $500, jail for not more than 90 days, or both, plus court costs. Spotlighting from a public road carries a fine of up to $350, jail for not more than 60 days in jail, or both, plus court costs.

EDITORS: For more information, contact Lt. Col. Keith LaCaze at 225/765-2469 (klacaze@wlf.louisiana.gov).

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LaCaze, B "Keith"

From: DeGraff, Jeffrey
Sent: Tuesday, February 01, 2005 4:26 PM
To: Burke, Marianne
Subject: LDWF Region 6 News (February 1, 2005)

NEWS FROM THE LA. DEPT. OF WILDLIFE & FISHERIES

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2005-038

CRAWFISH THIEVES NABBED IN ST. LANDRY PARISH

Louisiana Department of Wildlife and Fisheries Enforcement Division agents cited Jeff Scott Lee, 36, and Walter Ryder Jr., 50, both of Melville, for allegedly stealing crawfish from a private pond on January 14.

The agents watched both men running crawfish traps at 10:30 p.m. in a private crawfish pond north of Krotz Springs in St. Landry Parish.

The penalty for theft of pond-raised crawfish is a fine of not more than $300, jail for not more than one year, or both, plus court costs.

Agents participating in the case were Senior Agent Brad Guidroz and Agent Donnie Bozeman.

EDITORS: For more information, contact Lt. Col. Keith LaCaze at 225/765-2469 (klacaze@wlf.louisiana.gov).

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LaCaze, B "Keith"

From: DeGraff, Jeffrey
Sent: Tuesday, February 01, 2005 4:26 PM
To: Burke, Marianne
Subject: LDWF Weekly News (February 1, 2005)

NEWS FROM THE LA. DEPT. OF WILDLIFE & FISHERIES

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2005-034

AGENTS RESCUE INJURED BOATER FROM FATAL BOAT CRASH

Agents from the Louisiana Department of Wildlife and Fisheries Enforcement Division, responding to a fatal boating accident in Lake Fausse Point in Iberia Parish, rescued injured 14-year-old Joshua Leger, of New Iberia on January 23. Joshua's stepbrother, 30-year-old Galan A. Delcambre of New Iberia, perished in the accident.

On the evening of January 23, Lieutenant Darryl C. Moore and Sergeant Mitch Darby responded to an emergency cell phone call from a boating accident victim, and began a search of Lake Fausse Point. Joshua called to report that he and his brother had sustained serious injuries in the accident. He was unable to give an exact location, and further information was unavailable because the cell phone battery went dead.

Lt. Moore and Sgt. Darby were the first to arrive, and immediately began searching for the accident victims. Because nightfall was fast approaching and the temperature was quickly dropping the agents knew time was of the essence. Due to the constant north wind, the lake level had dropped dramatically, making the search difficult by outboard motorboat. Senior Agent Brian Theriot was called to the area with an airboat to assist in the search.

With nightfall, temperatures approached the freezing mark and agents continued to search the perimeter of the lake by airboat. Due to the low water level and remoteness of the location, the airboat was the only vessel able to conduct the search. A recording of the 911 call was delivered from the Iberia Parish Sheriff's Office. Reviewing the tape, it was learned Joshua had referenced their location as near the "R.T. thing". The agents determined that this was the area of a hunting club that had just changed its name. Lt. Moore and Senior Agent Theriot contacted members of the hunting club and were able to determine a more exact location where the R.T. signs were located.

Using this information, Senior Agent Theriot and Sgt. Darby immediately went to this area. At the same time, coordinates were relayed to an approaching Coast Guard helicopter.

The agents located the accident site within a short time. Joshua had sustained broken bones and other injuries, but his stepbrother had already died as a result of his injuries. Because of the serious injuries, extreme cold temperatures, the possibility of shock and the threat of hypothermia, Darby and Theriot immediately transported Joshua by airboat to the nearest land area accessible by vehicle where Lt. Moore had an ambulance waiting.

The Coast Guard helicopter arrived and hovered overhead providing light for the rescue operation.

Joshua received medical treatment and is expected to make a full recovery.

Agents participating in the search were Lt. Darryl Moore, Sgt. Mitch Darby and Senior Agents Brian Theriot, Dylan Bertrand, Jason Romero and Winston Michelle. The U.S. Coast Guard and deputies with the Iberia Parish Sheriff's Office assisted in the search.

EDITORS: For more information, contact Lt. Col. Keith LaCaze at 225/765-2469 (klacaze@wlf.louisiana.gov).

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MONTHLY BOATING ACCIDENT REPORT

JANUARY 2005

Number of Boating Accidents Reported:	**5**
Number of Injuries:	**2**
Number of Fatalities:	**2**

1/03 Lafourche Parish
Operator looked down to check fuel tank and struck moored vessel in Bayou Lafourche. No injuries reported.

1/13 St. Mary Parish
Vessel struck submerged object in Wax Lake Outlet, causing damage to prop and lower unit. No injuries reported.

1/17 Iberville Parish
Vessel struck a bridge on Ramah Levee Canal, injuring the operator.

1/21 St. Bernard Parish
Airboat with 2 occupants was traveling on marsh grass and struck a short stump. Collision caused airboat to roll over, pinning the passenger under the roll cage causing death.

1/23 Iberia Parish
Operator in Lake Fausse Pointe lost control of his vessel and slammed into the bank, colliding with a tree. Collision caused fatal injuries to the operator and injured his passenger.

Notice: This report only represents accidents reported to and investigated by the Enforcement Division. Some or all of these accidents are still under investigation and cause or fault may or may not have been determined. Information provided is for informational purposes only. For more information contact Lt. Colonel Brian Spillman, Boating Law Administrator at 225-765-2987.

ENFORCEMENT AVIATION REPORT
JANUARY 2005

185 – Amph. – 61092 Hrs. - 0	185 – Amph. – 1322R Hrs. - 67.3	210 – 9467Y Hrs. - 26.6

Enforcement Hours -	30.1
Wildlife Hours-	48.6
Marine Fish Hours-	8.2
Fur & Refuge Hours-	7.0
Total Plane Use -	93.9

ENFORCEMENT CASE REPORT

JANUARY, 2005

REGION 1: MINDEN

PARISHES: BIENVILLE, BOSSIER, CADDO, CLAIBORNE, WEBSTER, RED RIVER, DESOTO

TOTAL CASES	61

TOTAL	DESCRIPTION OF CITATION
4	Boating Safety
6	Angling W/O Non-Resident License
1	Angling W/O License – Non-Resident
2	Taking/Possessing Over Limit Freshwater Game Fish (Striped Bass)
1	Hunting W/O Resident License
3	Hunting From Moving Vehicle
1	Hunt, Stand, Or Loiter From Public Road
1	Hunt W/O Resident Big Game License
2	Hunt Or Take Deer Illegal Hours Or With Artificial Light
3	Hunt Or Take Deer From Public Road
4	Hunt Or Take Illegal Deer Open Season
2	Hunt Or Take Deer With Illegal Weapon
5	Possession Of Illegally Taken Deer (Open Season)
1	Hunt W/O Muzzleloader License (Resident)
2	Hunt Ducks W/O Federal Stamp
4	Hunt MGB Illegal Hours

2	Hunting MGB Over Bait
1	Placing Bait To Take MGB
2	Violate Non-Toxic Shot Requirements
2	Hunt Doves Closed Season
1	Take/Possess Over Limit Ducks
2	Hunt MGB Without State Migratory License
2	Violating National Wildlife Regulations
3	Failure To Abide By R&R On WMA
1	Hunt On WMA W/O WMA Hunting Permit
1	Illegal Spotlighting From Public Road
1	Operate ATV On Public Road
1	Discharge Firearm From Public Road

WRITTEN WARNINGS:

TOTAL 10	DESCRIPTION OF CITATION
4	Failure To Wear Hunter Orange
6	Not Abiding By R&R On WMA

CONFISCATIONS:

CONFISCATION DESCRIPTION
3 Wood Duck Drakes (Being Held At R-1 Office); 3 Doe Deer (Donated); 1 Remington Model 700.270 Cal W/Leopold Scope (Being Held At R-1 Office); 1 Mallard Hen, 1 Gadwall Drake, 4 Hooded Mergansers (Being Held At R-1 Office); 1 Remington Model 4 .270 Cal & 1 Remington Model 700 .270 Cal (Being Held At R-1 Office); 1 Night Guard Two Million Candle Power Spotlight (Being Held At R-1 Office); 70 Yellow Bass (Returned To Water); 1 New England 280 Cal Rifle W/6x18 Power Bushnell Scope (Being Held At R-1 Office); 1 Smith & Wesson 12 Ga. Shotgun (Being Held At R-1 Office); 1 Antlerless Buck Deer (Donated); 11 Doves (Donated)

TOTAL OF EACH CATEGORY FOR REGION 1:

TOTAL	DESCRIPTION
4	Boating
0	Commercial Fishing
18	Federal Migratory
0	Littering
7	Miscellaneous
9	Recreational Fishing
23	State Hunting/Trapping
10	Written Warnings

TOTAL NUMBER FOR PUBLIC ASSISTANCE:

TOTAL	DESCRIPTION
00	Public Assistance

REGION 2: MONROE

PARISHES: E. CARROLL, JACKSON, LINCOLN, MOREHOUSE, OUACHITA, RICHALND, UNION, W. CARROLL

TOTAL CASES	71

TOTAL	DESCRIPTION OF CITATION
7	Boating
1	Resisting An Officer
1	Flight From An Officer
3	Hunt, Stand, Or Loiter From A Pubic Road
6	Take Deer Illegal Hours
5	Illegal Possession Of Marijuana
6	Operate ATV On Public Road
1	Possession Of An Illegally Taken Deer
4	Hunt Without A Resident License
2	Hunt Without A Big Game License
2	Hunt Under Revocation
1	Take An Illegal Deer Open Season
9	Hunt Deer From A Public Road
5	Hunt From A Moving Vehicle
2	Hunt MGB Without A Federal Duck Stamp
1	Hunt MGB With An Illegal Weapon

1	Hunt MGB From A Moving Vehicle
1	Fail To Wear Hunter's Orange
1	Take Over The Limit Of Deer
2	Hunt MGB Illegal Hours
5	Not Abiding By WMA Rules And Regulations
1	Hunt On WMA Without WMA Permit
1	Violate Non-Toxic Shot Requirement-Federal
1	Violate Open Container Law
1	Operate Vehicle While Intoxicated
1	Hunt On DMAP Without Permit

WRITTEN WARNINGS: (6)

TOTAL	DESCRIPTION OF CITATION
1	Improper Running Lights
1	Angle Without A Resident Pole License
1	Fail To Wear Hunter's Orange
1	No Boat Numbers
1	Failure To Display Valid Certificate Decal
1	Expired Boat Registration Certificate

CONFISCATIONS:

CONFISCATION DESCRIPTION
48 – Lead Shot; 1- 9 Point Buck; 1- 8 Point Buck; 1- Spike Buck; 1-Federal Duck Stamp; 1-Remington Model 11-87 12 Gauge; 1-Remington Model 870 12 Gauge; 1-Remington Model 700 .2780 Rifle; 1-Illuma Spotlight; 1-Vector Spotlight; 1-Snow Goose

TOTAL OF EACH CATEGORY FOR REGION 2:

TOTAL	DESCRIPTION
7	Boating
-0-	Commercial Fishing
7	Federal Migratory
-0-	Littering
15	Miscellaneous
-0-	Recreational Fishing
42	State Hunting/Trapping
6	Written Warnings

TOTAL NUMBER FOR PUBLIC ASSISTANCE:

TOTAL	DESCRIPTION
21	Public Assistance - Plane Crash (2 Fatalities) Wham Brake- (Ouachita Parish)

REGION 3: ALEXANDRIA

PARISHES: AVOYELLES, GRANT, NATCHITOCHES, RAPIDES, SABINE, VERNON, WINN

TOTAL CASES	147

TOTAL	DESCRIPTION OF CITATION
7	Boating
4	Angling W/O A License
3	Hunt, Stand, Loiter From Public Road
22	Hunt Deer From Public Road
1	Take Illegal Deer Open Season
7	Fail To Wear Hunters Orange
1	Take Foxes Illegally
2	Discharge Firearm From Public Road
10	Hunt W/O Resident License
4	Hunt W/O State MGB License
3	Hunt/Take Deer Illegal Hours
6	Possession Of Illegally Taken Deer
5	Hunt From Moving Vehicle
3	Take Wild Quads. Illegal Hours
1	Take Deer With Illegal Weapon
5	Hunt W/O Resident Big Game License

1	Hunt W/O Non Resident License
1	Hunt W/O Non Resident Big Game License
2	Hunting With Unplugged Gun
1	Hunt Deer Closed Area
3	Hunt Deer Illegal Method
2	Hunt Raccoons Illegally
1	Possess High Powered Rifle During Closed Deer Season
1	Hunt On WMA W/O WMA Hunt Permit
3	Hunt W/O Muzzleloader License
16	Not Abiding By Rules And Regulations
2	Hunt MGB Illegal Hours
6	Hunt Ducks W/O Federal Stamp
3	Take Over Limit Of Ducks
4	Violate Non Toxic Shot Requirement
2	Violate MGB Tagging Requirement
2	Littering
1	Obtain License Fraudulently
2	Possession Of Cocaine
6	Simple Criminal Damage To Property
3	Criminal Trespass

1	Operate ATV On Public Road

WRITTEN WARNINGS:

TOTAL - 7	DESCRIPTION OF CITATION
2	Fail To Wear Hunter's Orange
1	Hunt On WMA W/O WMA Hunt Permit
4	Loaded Gun In Vehicle

CONFISCATIONS:

CONFISCATION DESCRIPTION
4 Deer, 2 Shotguns, 2 Rifles, 16 Ducks, 2 Rabbits, 1 Fox.

TOTAL OF EACH CATEGORY FOR REGION 3:

TOTAL	DESCRIPTION
7	Boating
0	Commercial Fishing
17	Federal Migratory
2	Littering
13	Miscellaneous
4	Recreational Fishing
104	State Hunting/Trapping

7	**Written Warnings**

TOTAL NUMBER FOR PUBLIC ASSISTANCE:

TOTAL	DESCRIPTION
4	**Public Assistance**

REGION 4: FERRIDAY

PARISHES: CALDWELL, CATAHOULA, CONCORDIA, FRANKLLIN, LASALLE, MADISON, TENSAS

TOTAL CASES	68

TOTAL	DESCRIPTION OF CITATION
4	Boating Safety Violations
1	Hunting W/O Resident License
3	Hunting W/O Non-Resident License
1	Hunting From Moving Vehicle
1	Possess Over Limit of Wild Birds (Wood Ducks)
2	Hunt From Public Road Or Road Right-Of-Way
1	Hunt Or Discharge Firearm From Levee Road
1	Hunt MGB W/O State Migratory License
1	Hunt W/O Resident Big Game License
3	Hunt W/O Non-Resident Big Game License
2	Hunt Or Take Deer Illegal Hours
1	Hunt Or Take Deer From Public Road
4	Hunt Or Take Illegal Deer Open Season
3	Fail Comply W/Hunters Orange Regulations
1	Hunt W/O Muzzleloader License
2	Hunt On DMAP Lands W/O Permit From Owner/Lessee

1	Hunting W/Unsigned And Unattached Duck Stamp
1	Violate Non-Toxic Shot Requirement
2	Take Over Limit Of Ducks
25	Not Abiding By Rules And Regulations On WMA
6	Hunt On WMA Without WMA Hunting Permit
1	Criminal Trespass
1	Violation Of License Revocation

WRITTEN WARNINGS:

TOTAL 3	DESCRIPTION OF CITATION
2	Fail To Comply W/Hunters Orange Regulations
1	Not Abiding By Rules And Regulations On WMA

CONFISCATIONS:

CONFISCATION DESCRIPTION
3 Deer; 13 Ducks; 5 Guns

TOTAL OF EACH CATEGORY FOR REGION 4:

TOTAL	DESCRIPTION
4	Boating
0	Commercial Fishing

4	Federal Migratory
0	Littering
0	Miscellaneous
0	Recreational Fishing
61	State Hunting/Trapping
3	Written Warnings

TOTAL NUMBER FOR PUBLIC ASSISTANCE:

TOTAL	DESCRIPTION
8	Public Assistance

REGION 5: LAKE CHARLES

PARISHES: BEAUREGARD, CALCASIEU, EVANGELINE, ALLEN, CAMERON, ACADIA, VERMILION, JEFF DAVIS

TOTAL CASES	76

TOTAL	DESCRIPTION OF CITATION
9	Boating
12	Angling W/O A License
1	Take Comm. Fish W/O Comm. Gear Lic. (Oyster Dredge)
1	Take Or Poss. Comm. Fish W/O Vessel License
2	Sell And/Or Buy Fish W/O Retail Seafood License
3	Fail To Maintain Records
3	Hntg. From Moving Vehicle And/Or Aircraft
3	Hntg. Wild Quadrupeds And/Or Wild Birds Illegal Hours
3	Hunt, Stand, Loiter From Public Road
1	Hunt W/O Res. Big Game License
1	Fail To Wear Hunter's Orange
2	Frog Closed Season (Illegal Method)
1	Poss. F.B.A. W/O A License
1	Take Non Game Quadrupeds Illegally
4	Hntg. MGB Illegal Hours

5	Hntg. MGB From Moving Motorboat
2	Hntg. MGB W/O State Migratory License
3	Not Abiding By R/R On WMA
1	Resisting An Officer
7	Illegal Spotlighting From Public Road
1	Other Than Wildlife & Fisheries
3	Operate ATV On Public Road
1	Flight From An Officer
1	Driving W/O Operator's License
1	Misrepresentation During Issuance Of Misdemeanor
3	Gross Littering
1	Intentional Littering

WRITTEN WARNINGS: 6

TOTAL 6	DESCRIPTION OF CITATION
1	Angling W/O A License
2	Failure To Comply W/PFD Requirements
2	Not Abiding by Rules/Regulations On WMA
1	Hunting On WMA W/O WMA Hunting Permit

CONFISCATIONS:

CONFISCATION DESCRIPTION
6 Frogs; 13 Ducks; 1 Rabbit; Scale; Pan; Litter; 3 Spotlights; 2 Rifles; 1 Scope

TOTAL OF EACH CATEGORY FOR REGION 5:

TOTAL	DESCRIPTION
9	Boating
7	Commercial Fishing
11	Federal Migratory
4	Littering
15	Miscellaneous
12	Recreational Fishing
15	State Hunting/Trapping
3	Wildlife Management Areas
6	Warnings

TOTAL NUMBER FOR PUBLIC ASSISTANCE: 3

TOTAL	DESCRIPTION
3	Public Assistance

REGION 6: OPELOUSAS

PARISHES: IBERIA, IBERVILLE, PT.COUPEE, LAFAYETTE, ST. LANDRY, ST. MARTIN, W.B.R.

TOTAL CASES	104

TOTAL	DESCRIPTION OF CITATION
16	Boating
15	Not Abiding By Rules/Regulations On WMA
2	Hunt W/O Resident License
2	Hunt W/O Big Game License
3	Operate ATV On Public Road
5	Hunt/Discharge Firearm From Levee Road
9	Hunt From A Moving Vehicle
3	Hunt/Take Deer Illegal Hours With Artificial Light
2	Fail To Wear Hunter's Orange
2	Failure To Abide By Commission Rules/Regulations
4	Hunt Raccoons Illegally
3	Hunt On WMA W/O WMA Hunting Permit
2	Hunt Or Take Deer With Illegal Weapon
5	Angling W/O License
1	Hunt W/O State Migratory License
5	Hunt W/O Muzzleloader License

6	Hunt Raccoons Or Opossums Illegally
4	Hunt Wild Quadrupeds And/Or Wild Birds Illegal Hours
2	Hunt, Stand, Loiter From A Public Road
3	Hunt/Take Illegal Deer Open Season
1	Operate Vehicle Under Influence
1	No Driver's License
1	Improper Lane Usage
1	DWI – 3rd Offense
2	Theft Of Pond Raised Crawfish
1	Possess Over Limit Of Deer
1	Hunt MGB W/O State MGB License
1	Possession Of Turkey Closed Season Or Illegally Taken
1	Field Possession Of Deer Meat W/O A Tag

WRITTEN WARNINGS:

TOTAL	DESCRIPTION OF CITATION
1	Boating
9	Not Abiding By Rules/Regulations On WMA
3	Use WMA W/O License Or Stamp
1	Angling W/O License
6	Fail To Wear Hunter's Orange

1	Hunt W/O Resident License
1	Hunt MGB W/O State MGB License
1	Hunt W/O Big Game Resident License

CONFISCATIONS:

CONFISCATION DESCRIPTION
1 Opossum, 1 Blue Bucket Containing Four Crawfish Sacks, 1 Set Of LADT Records, 8 LADT Tags, 1 Turkey, 14 - .22 Rifle Cartridges, 1 Flashlight, 1 Shotgun, 1 Spotlight, 7 Deer, 2 Antlers, 3 Raccoons, 4 Rifles, 2 Rabbits, 21 Unused Deer Tags, 3 Data Sheets, 2 Ice Chests

TOTAL OF EACH CATEGORY FOR REGION 6:

TOTAL	DESCRIPTION
16	Boating
2	Commercial Fishing
0	Federal Migratory
0	Littering
25	Miscellaneous
5	Recreational Fishing
56	State Hunting/Trapping
23	Written Warnings

TOTAL NUMBER FOR PUBLIC ASSISTANCE:

TOTAL	DESCRIPTION
2	Public Assistance

REGION 7: BATON ROUGE

PARISHES: ASCENSION, E.B. ROUGE, E. FELICIANA, LIVINGSTON ST. HELENA, ST. TAMMANY, TANGIPAHOA, WASHINGTON, W. FELICIANA

TOTAL CASES	204

TOTAL	DESCRIPTION OF CITATION
20	Boating
14	Angling Without Resident License
4	Angling Without Non-Resident License
2	Sell/Buy Fish Without Wholesale/Retail Dealers License
1	Sell/Buy Fish Without Retail Seafood License
1	Retail Dealer Buy From Other Than Wholesale/Retail Dealer
2	Failure To Maintain Records
1	Theft By Fraud
1	Forgery
1	Filing False Public Records
1	Injuring Public Records
1	Unauthorized Use Of A Moveable
1	Possession Of Drug Paraphernalia
17	Hunt Without Basic Resident License
10	Hunt Without Resident Big Game License

1	Hunt Without Resident Muzzleloader License
2	Hunt Without Non-Resident License
1	Hunt Without Non-Resident Big Game License
6	Hunt On WMA Without WMA Permit
1	Use WMA Without License
20	Violate Rules And Regulations on WMA
4	Hunt With Unplugged Gun
25	Failure To Wear Hunters Orange
2	Hunt Wild Quadrupeds Illegal
10	Hunt From A Moving Vehicle
3	Hunting From Public Road
13	Hunt Deer From A Public Road
1	Take Deer From A Public Road
3	Take Deer From A Moving Vehicle
11	Hunt Deer Illegal Hours
3	Take Deer Illegal Hours
1	Hunt Deer Illegal Methods
1	Take Deer With Illegal Weapon
2	Take Illegal Deer Open Season

2	Take Over Limit Of Deer
1	Possess Illegally Taken Deer
1	Discharge Weapon From Public Road
2	Hunt Raccoon Illegal Methods
1	Hunt In State Park
2	Hunt on D-Map Land Without Permit
8	Littering

WRITTEN WARNINGS:

TOTAL 4	DESCRIPTION OF CITATION
1	Angling Without Non-Resident License
2	Violate WMA Rules And Regulations
1	Boating

CONFISCATIONS:

CONFISCATION DESCRIPTION	
12—Rifles 1—Pistol 6—Q-Beams 1—Nite Vision 1—Crack Pipe	4—Deer 1—Rabbit

TOTAL OF EACH CATEGORY FOR REGION 7:

TOTAL	DESCRIPTION
20	Boating

11	Commercial Fishing
0	Federal Migratory
8	Littering
1	Miscellaneous
18	Recreational Fishing
146	State Hunting/Trapping
4	Written Warnings

TOTAL NUMBER FOR PUBLIC ASSISTANCE:

TOTAL	DESCRIPTION
7	Public Assistance 6—Assist Motorist; 1—Assist Boater

REGION 8: NEW ORLEANS

PARISHES: PLAQUEMINES, ST. BERNARD, ORLEANS, JEFFERSON, ST. CHARLES

TOTAL CASES	205

TOTAL	DESCRIPTION OF CITATION
37	Boating
30	Angling W/O A License
6	Angling W/O A License Non-Resident
2	Angling W/O Saltwater License
3	Angling W/O Saltwater License Non-Resident
1	Take Or Poss. Game Fish Illegally
2	Take/Poss. O/L Red Drum
3	Poss. O/L Of Red Drum In Excess of 27"(Recreational)
1	Fail To Have Fish Intact(Saltwater)
1	Take Or Poss. Undersized Red Drum(Recreational) 16" Minimum
2	Take Or Poss. Undersized Spotted Sea Trout(Recreational)
1	Take Or Poss. Undersized Black Drum(Recreational)
2	Take/Poss. O/L Spotted Seatrout(On Water)
1	Not Abiding by Commission Rules (Rec.) Finfish
1	Fail To Comply with Charter Boat Regulations
1	Take Or Sell Commercial Fish W/O Comm. License

1	Take Or Poss. Commercial Fish W/O Vessel License
1	Sell And/Or Buy Fish W/O Wholesale/Retail Dealer's License
4	Fail To Maintain Records
2	Use Saltwater Net Illegally
1	Sell And/Or Purchase Game Fish
1	Take/Possess/Sell Spotted Sea Trout
1	Take/Possess Undersized Black Drum Commercial
2	Failure To Have Written Permission
2	Unlawfully Take Oysters From State Water Bottoms
3	Unlawfully Take Oysters Off A Private Lease
5	Take Undersize Oysters From Natural Reef
2	Violate Sanitation Code (Log Book)
5	Possess Wild Quadrupeds W/O A License
4	Hunting From Moving Vehicle
1	Hunting W/Unplugged Gun
3	Hunt Wild Quadrupeds Illegal Hours
2	Discharge Firearm From Levee Road
1	Hunt MGB W/O State Migratory License
2	Fail Comply W/Hunter's Orange Regulations
4	Trespass on Marshlands To Take F.B.A.

2	Violate Migratory Bird Treaty Act
3	Hunting Geese W/O Federal Stamp
19	Hunting MGB Illegal Hours
3	Hunting MGB From Moving Motorboat
1	Rallying MGB
1	Possession Over The Two-Day Limit Of MGB
2	Violate Non-Toxic Shot Requirement
4	Hunting MGB W/Electronic Calling Device
1	Possession Of Live MGB Illegally
2	Hunting MGB Over Baited Area
1	Hunting MGB With Unplugged Gun
2	Hunting Coots Closed Season
1	Hunting Ducks Closed Season
6	Take/Possess Over Limit Of Ducks
2	Violate Migratory Bird Treaty Act
1	Taking Or Possession Of Other Non-Game Birds – No Season
1	Taking Robins – No Season
1	Not Abiding By Rules And Regulations On WMA
2	Hunt On WMA Without WMA Hunting Permit
1	Operating A Vessel While Intoxicated

4	Intentional Littering
2	Lacey Act
1	Reckless Operation Of A Vehicle
1	Poss. Red Drum Illegally W/Gillnet

WRITTEN WARNINGS:

TOTAL 25	DESCRIPTION OF CITATION
12	Boating
4	Angling W/O A License
3	Take Or Poss. Undersized Black Drum(Recreational) Commission Action
2	Hunt MGB W/O State Migratory License
2	Not Abiding By Rules And Regulations On WMA
2	Other Than Wildlife And Fisheries

CONFISCATIONS:

CONFISCATION DESCRIPTION
Returned to Water Or Released Alive....Crab(1)...Garfish(3)....Boats(2)....Dredges(4)...Black Drum(1)....Oysters Sacks(20)....Wood Ducks(13); Donated.....Cormorant(1).....Coots(22).....Ducks(37) .....Squirrel(2).....Robin(1).....Bass(21).....Perch(40).....Spotted Sea Trout(93)..... Sheepshead(1).....Flounder(6).....Spotted Sea Trout Filets(8 Lbs.).....Red Drum Filets (2.4 Lbs.).....Red Drum(23).....Black Drum(175).....Rabbit(1).....Oyster Sacks(243).....Nutria (25).....Raccoon(1).....Blue Snow Goose(1).....Gadwall(1).....Widgeon Hen(1)..... Canvasback Duck(1).....Dove Breast(23).....Doves(2).....;Hardware Confiscated.....Rifle (3) .....Rod And Reel(6).....Spotlight(2).....Unattended Nets(1).....Mullet Strike Net(1).....Lead Shot Shells(3).....Electronic Game Call(1).....Goose Tape(1).....Speaker(1).....12 Gauge Spent Shotgun Shells(4).....12 Gauge Unspent Shotgun Shells(3).....20 Gauge Spent Shotgun Shells(3).....20 Gauge Unspent Shotgun Shells(2).....Sample Of Wheat(1)

TOTAL OF EACH CATEGORY FOR REGION 8:

TOTAL	DESCRIPTION
37	Boating
32	Commercial Fishing
50	Federal Migratory
4	Littering
8	Miscellaneous
56	Recreational Fishing
18	State Hunting/Trapping
25	Written Warnings

TOTAL NUMBER FOR PUBLIC ASSISTANCE:

TOTAL	DESCRIPTION
10	Public Assistance

REGION 9: SCHRIEVER

PARISHES: ASSUMPTION, ST. JAMES, ST. JOHN, ST. MARY, TERREBONNE, LAFOURCHE, JEFFERSON-GRAND ISLE, LOWER ST. MARTIN

TOTAL CASES	151

TOTAL	DESCRIPTION OF CITATION
29	Boating
24	Angling Without Basic License
3	Angling Without A Non-Resident License
1	Violate Recreational Gear License Requirement
9	Angling Without Saltwater License
1	Take Undersized Bowfin
1	Take Over Limit Of Red Drum (On Water)
3	Take Illegal Size Black Bass
4	Take Undersized Red Drum (Recreational)
6	Take Undersized Black Drum (Recreational)
2	Take Over Limit Black Drum (Recreational)
2	Not Abiding By Commission Rules Over Limit Black Drum In Excess Of 27 Inches (Recreational)
1	Remove Contents Of Legal Crab Trap
1	Violate Crab Trap Escape Ring Requirements
1	Failure To Have Written Permission

3	Take Oysters Closed Season
1	Violate Sanitary Code (Refrigeration)
7	Hunting Without Resident License
1	Possess Wild Quadrupeds Without A License
1	Hunting Without Non-Resident License
1	Hunt Wild Quadrupeds Illegal Hours
2	Hunt MGB Without State Stamp
2	Hunt Without Resident Big Game License
6	Fail To Wear Hunter's Orange
4	Littering
1	Not Abiding By WMA Rules And Regulations By Loaded Gun In Moving Vessel
1	Not Abiding By WMA Rules And Regulations By Hunting Without License
1	Not Abiding By WMA Rules And Regulations By Hunting From Permanent Stand
4	Not Abiding By WMA Rules And Regulations By Hunting Without WMA Permit
1	Reckless Operation Of Motor Vehicle
1	No Seat Belt (Vehicle)
1	Following Too Close (Vehicle)
3	Not Abiding By WMA Rules And Regulations By Camping In Unauthorized Area
3	Not Abiding By WMA Rules And Regulations By Cutting Trees

3	Not Abiding By WMA Rules And Regulations By No Self-Clearing Permit
1	Hit And Run (Boat)
1	Not Abiding By Rules And Regulations By Shooting Target Practice
2	Hunting Ducks Without Federal Stamp
1	Hunting MGB With Unplugged Gun
1	Possess Untagged MGB
1	Take Commercial Fish Without Commercial License
2	Take Over Limit Freshwater Game Fish (Black Bass)
2	Take Commercial Fish Without Commercial Gear License (Gill Net)
1	Take Commercial Fish Without Vessel License
2	Leave Nets Unattended
2	Use Saltwater Nets Illegally (Gill Nets)

WRITTEN WARNINGS:

TOTAL 37	DESCRIPTION OF CITATION
13	Boating
9	Angling Without A License
9	Angling Without Saltwater License
4	Take Undersized Black Drum (Recreational)
2	Hunt WMA Without Permit

CONFISCATIONS:

CONFISCATION DESCRIPTION
20 Red Drum, 37 Black Drum, 3 Wood Ducks, 49 Black Bass, 82 Sacks Oysters, 1 Bowfin, 5 Rabbits, 5 Sheephead, 1 Speckled Trout, 2 Mallards, 1 Scaup, 19 Raccoons, 5 Garfish, 1 Oyster Dredge, 1 Boat And Motor (Paper Seizure), 1 Muzzleloader, 3 Rods And Reels, 1 Rifle, 1 Crab Trap, 1 Head Light, 800 Ft. Gill Net

TOTAL OF EACH CATEGORY FOR REGION 9:

TOTAL 188	DESCRIPTION
29	Boating
15	Commercial Fishing
4	Federal Migratory
4	Littering
14	Miscellaneous
58	Recreational Fishing
27	State Hunting/Trapping
37	Written Warnings

TOTAL NUMBER FOR PUBLIC ASSISTANCE:

TOTAL	DESCRIPTION
6	Public Assistance

OYSTER STRIKE FORCE COASTAL WATERS

TOTAL CASES	28

TOTAL	DESCRIPTION OF CITATION
4	Fail To Have Commercial License In Possession
1	Take Or Possess Commercial Fish Without A Commercial License
1	Take Or Possess Commercial Fish Without A Commercial Gear License
2	Failure To Have Written Permission
8	Unlawfully Take Oysters From Un-leased State Water Bottoms
3	Unlawfully Take Oysters From A Private Lease
3	Take Oysters Closed Season
1	Violate Sanitary Code (Log Book)
1	Violate Sanitary Code (Refrigeration)
2	Violate Commission Rules (Finfish)
1	Angling Without A Basic License
1	Improper Or No Running Lights

WRITTEN WARNINGS:

TOTAL	DESCRIPTION OF CITATION
2	Fail To Display Proper Number On Vessel

CONFISCATIONS:

CONFISCATION DESCRIPTION
133 Sacks Of Oysters, 75 Pounds Of Crabs

TOTAL OF EACH CATEGORY FOR OSF:

TOTAL	DESCRIPTION
1	Boating
24	Commercial Fishing
	Federal Migratory
	Littering
	Miscellaneous
3	Recreational Fishing
	State Hunting/Trapping
2	Written Warnings

TOTAL NUMBER FOR PUBLIC ASSISTANCE:

TOTAL	DESCRIPTION
0	Public Assistance

SPECIAL INVESTIGATIONS UNIT STATEWIDE

TOTAL CASES	25

TOTAL	DESCRIPTION OF CITATION
1	Buy /Sell Fish Without Retail Seafood License
2	Buy/Sell Fish Without Wholesale/Retail Dealer's License
2	Fail To Maintain Records
4	Lacey Act (Fed)
4	Conspiracy (Fed)
3	Obstruction Of Justice (Fed)
4	Give False Statements (Fed)
2	Sell Tuna Without Federal Permits
2	Buy Tuna From Un-Permitted Vessel
1	Fail To Comply With Traversing Regulations

WRITTEN WARNINGS:

TOTAL	DESCRIPTION OF CITATION
0	

CONFISCATIONS:

CONFISCATION DESCRIPTION
None

TOTAL OF EACH CATEGORY FOR SIU:

TOTAL	DESCRIPTION
0	Boating
25	Commercial Fishing
0	Federal Migratory
0	Littering
0	Miscellaneous
0	Recreational Fishing
0	State Hunting/Trapping
0	Written Warnings

TOTAL NUMBER FOR PUBLIC ASSISTANCE:

TOTAL	DESCRIPTION
0	Public Assistance

S.W.E.P. COASTAL WATERS

TOTAL CASES	37
TOTAL	DESCRIPTION OF CITATION
2	Boating
1	Hunt Ducks Or Geese W/O Federal Stamp
4	Hunt MGB Illegal Hours
4	Hunt Ducks (Pintail) Closed Season
1	Take/Possess Over Limit Canvasback
1	Hunt On WMA W/O WMA Hunting Permit
1	Fail To Comply W/Charter Boat Regulations
1	Take/Possess Spotted Sea Trout Closed Season
2	Take Commercial Fish W/O Commercial License
1	Take/Possess Undersize Black Drum (Commercial)
2	Take/Possess Commercial Fish W/O Vessel License
1	Use Saltwater Net Illegally (No Permit)
1	Possess Red Drum Illegally W/Gill Net On Vessel
1	Take/Possess Game Fish Illegally
1	Take/Possess Commercial Fish (Crabs) W/O Gear License
8	Take Oysters From Unleased State Water Bottoms
3	Take Oysters From Private Lease Unlawfully

1	No Written Permission (Oysters)
1	Violate Sanitation Code (Log Book)

WRITTEN WARNINGS:

TOTAL	DESCRIPTION OF CITATION
0	

CONFISCATIONS:

CONFISCATION DESCRIPTION
1 Pirogue, 1 Gill Net @ 300 Ft., 1 Red Drum, 3 Spotted Sea Trout, 115 Black Drum(53 U/S), 21 Ducks, 60 Sacks Oysters(Returned To Water), 75 Lbs. Crabs(Returned To Water)

TOTAL OF EACH CATEGORY FOR SWEP:

TOTAL	DESCRIPTION
2	Boating
23	Commercial Fishing
10	Federal Migratory
0	Littering
0	Miscellaneous
2	Recreational Fishing
0	State Hunting/Trapping
0	Written Warnings

TOTAL NUMBER FOR PUBLIC ASSISTANCE:

TOTAL	DESCRIPTION
0	Public Assistance

Note:

17 Hours Run **96 Boats Checked**

REFUGE PATROL

MARSH ISLAND, ROCKEFELLER, STATE WILDLIFE

TOTAL CASES	24

TOTAL	DESCRIPTION OF CITATION
1	Angling Without A License
1	Angling Without A License Non-Resident
2	Theft Of Pond Raised Crawfish
1	Hunting From Moving Vehicle And/Or Aircraft
1	Hunt Wild Quadrupeds And/Or Wild Birds Illegal Hours
1	Hunt, Stand, Loiter From Public Road
3	Hunt Raccoons Or Opossums Illegally
1	Expired Boat Registration Certificate
1	Failure To Comply With PFD Requirements
1	Hunting Ducks Or Geese Without Federal Stamp
3	Hunting MGB Illegal Hours
1	Violate Non-Toxic Shot Requirements
1	Take/Possess Over Limit Of Geese (Field Possession)
1	Taking Or Possessing Other Non-Game Birds No Season
1	Hunt MGB Without State Migratory License
1	Hunt MGB Without State Hunting License
2	Criminal Trespass On Crawfish Ponds

1	Misrepresentation During Issuance Of Misdemeanor

WRITTEN WARNINGS:

TOTAL	DESCRIPTION OF CITATION
1	Angling Without A License

CONFISCATIONS:

CONFISCATION DESCRIPTION
2 Ducks Retained For Education; 1 Crawfish Sack; 1 Inca Dove Retained For Education; 3 White Fronted Geese Retained For Education; 3 Lead Shotgun Shells; 3 Raccoons Destroyed; 1 Remington .22 Cal. Rifle; 2 Marlin .22 Cal. Rifles; 1 Shakespeare Rod And Reel; 1 Crosman .177 Cal. Pellet Rifle

TOTAL OF EACH CATEGORY FOR REFUGE:

TOTAL	DESCRIPTION
2	Boating
2	Commercial Fishing
9	Federal Migratory
0	Littering
3	Miscellaneous
2	Recreational Fishing
6	State Hunting/Trapping
1	Written Warnings

TOTAL NUMBER FOR PUBLIC ASSISTANCE:

TOTAL	DESCRIPTION
5	Public Assistance

TOTAL CASES: 1,201

WRITTEN WARNINGS: 124

PUBLIC ASSISTANCE: 66

RESOLUTION
LOUISIANA WILDLIFE AND FISHERIES COMMISSION
LOUISIANA DEPARTMENT OF WILDLIFE AND FISHERIES
February 3, 2005

The following was adopted by the Louisiana Wildlife and Fisheries Commission at its regular Commission meeting held in Baton Rouge, Louisiana, February 3, 2005.

WHEREAS, R.S. 56:328 gives the Louisiana Wildlife and Fisheries Commission the authority to issue permits for the importation of any of the noxious plants listed in that section for the purpose of conducting scientific investigations, and

WHEREAS, purple loosestrife, *Lythrum salicaria*, is a listed plant, and

WHEREAS, Dr. Beth Middleton, of the National Wetlands Research Center, has requested a permit for the importation of purple loosestrife for the purpose of conducting scientific investigations, and

WHEREAS, the scientific investigation will determine if this plant is capable of invading wetlands in southern climates and is considered to be important research in view of the recent invasions by other exotic plants, and

WHEREAS, the permit will be issued subject to the necessary restrictions and safeguards to insure that the plant will not escape and alter the natural flora of the state, and

WHEREAS, the staff of the Inland Fisheries Division recommends that the permit be issued.

THEREFORE BE IT RESOLVED that the Commission approves the issuance of the permit, and

BE IT FURTHER RESOLVED that the Commission hereby delegates to the Secretary of the Department of Wildlife and Fisheries the authority to perform all administrative functions necessary to effectuate this permit.

Wayne J. Sagrera, Chairman
Wildlife and Fisheries
Commission

State of Louisiana

KATHLEEN BABINEAUX BLANCO
GOVERNOR

DEPARTMENT OF WILDLIFE AND FISHERIES

DWIGHT LANDRENEAU
SECRETARY

PURPLE LOOSESTRIFE IMPORTATION, POSSESSION AND TRANSPORTATION
INLAND FISHERIES DIVISION

PERMIT NUMBER:

ISSUED TO: Dr. Beth Middleton, Research Ecologist
ADDRESS: National Wetlands Research Center
700 Cajundome Boulevard
Lafayette, LA 70506

ISSUE DATE: February 4, 2005 EXPIRATION DATE: September 30, 2008

PERMITTED ACTIVITIES:

(1) Permittee is authorized to import and/or transport purple loosestrife to and possess same at the National Wetlands Research Center, located at the above address in Lafayette Parish, Louisiana.

RESTRICTIONS:

(1) Permits are not transferable from person to person or from site location to site location. Permit must identify all persons working with specimens. Only persons listed on permit may work with specimens.
(2) Specimens of this plant shall be handled deliberately, cautiously and in controlled settings to avoid contamination of state habitats. Permittee shall notify LDWF immediately upon any contamination, release or violation of any permit regulation.
(3) Specimens shall be processed and grown within the confines of growth chambers and greenhouses at the National Wetlands Research Center in Lafayette, LA.
(4) Leaves and/or seeds that are collected in the field shall be transported in double zip lock bags such that the seeds cannot escape enroute.
(5) Materials from other countries shall be sent in the mail through a U.S. Department of Agriculture (USDA) inspection center at a port of entry, as described by USDA permit # 37-86751.
(6) Before processing of the seeds and leaf materials in the growth chamber or greenhouse, the invasive materials shall be stored in a locked office or laboratory. Only qualified individuals shall have access to these materials.
(7) Leaves of specimens to be used for molecular work shall be dried in silica gel, or subjected to some other procedure that will render the plant material incapable of further growth.
(8) Specimens to be used for environmental studies (e.g., climate, shading) shall be grown from seed in pots within the confines of growth chambers or greenhouses.
(9) After the experimental work is completed, all plant materials, and the soil within the growth pots, and the pots shall be autoclaved to kill any remaining seeds or living plant material to render the plant material incapable of further growth.
(10) All collections by and shipments to or from the Wetland Center shall be reported to the LDWF. Information to be included shall be the type of material (whole plant, leaves, seeds), and the quantity collected or shipped.
(11) The disposition of plant material at the conclusion of the experimental work shall be reported to LDWF.
(12) Personnel from LDWF shall have the authority to inspect the facility and operation.

LEGAL AUTHORITY: **R.S. 56:328**

APPROVED -

PERMIT IS NOT VALID UNLESS SIGNED ON BACK BY PERMITTEE.

cc: Col. Winton Vidrine, Enforcement

RESOLUTION
LOUISIANA WILDLIFE AND FISHERIES COMMISSION
LOUISIANA DEPARTMENT OF WILDLIFE AND FISHERIES
February 3, 2005

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WHEREAS, Dr. Beth Middleton, of the National Wetlands Research Center, has requested a permit for the importation of purple loosestrife for the purpose of conducting scientific investigations, and

WHEREAS, the scientific investigation will determine if this plant is capable of invading wetlands in southern climates and is considered to be important research in view of the recent invasions by other exotic plants, and

WHEREAS, the permit will be issued subject to the necessary restrictions and safeguards to insure that the plant will not escape and alter the natural flora of the state, and

WHEREAS, the staff of the Inland Fisheries Division recommends that the permit be issued.

THEREFORE BE IT RESOLVED that the Commission approves the issuance of the permit, and

BE IT FURTHER RESOLVED that the Commission hereby delegates to the Secretary of the Department of Wildlife and Fisheries the authority to perform all administrative functions necessary to effectuate this permit.

_____

Wayne J. Sagrera, Chairman
Wildlife and Fisheries
Commission

State of Louisiana

KATHLEEN BABINEAUX BLANCO
GOVERNOR

DEPARTMENT OF WILDLIFE AND FISHERIES

DWIGHT LANDRENEAU
SECRETARY

PURPLE LOOSESTRIFE IMPORTATION, POSSESSION AND TRANSPORTATION
INLAND FISHERIES DIVISION

PERMIT NUMBER:

ISSUED TO: Dr. Beth Middleton, Research Ecologist
ADDRESS: National Wetlands Research Center
700 Cajundome Boulevard
Lafayette, LA 70506

ISSUE DATE: February 4, 2005 EXPIRATION DATE: September 30, 2008

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(1) Permits are not transferable from person to person or from site location to site location. Permit must identify all persons working with specimens. Only persons listed on permit may work with specimens.
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(3) Specimens shall be processed and grown within the confines of growth chambers and greenhouses at the National Wetlands Research Center in Lafayette, LA.
(4) Leaves and/or seeds that are collected in the field shall be transported in double zip lock bags such that the seeds cannot escape enroute.
(5) Materials from other countries shall be sent in the mail through a U.S. Department of Agriculture (USDA) inspection center at a port of entry, as described by USDA permit # 37-86751.
(6) Before processing of the seeds and leaf materials in the growth chamber or greenhouse, the invasive materials shall be stored in a locked office or laboratory. Only qualified individuals shall have access to these materials.
(7) Leaves of specimens to be used for molecular work shall be dried in silica gel, or subjected to some other procedure that will render the plant material incapable of further growth.
(8) Specimens to be used for environmental studies (e.g., climate, shading) shall be grown from seed in pots within the confines of growth chambers or greenhouses.
(9) After the experimental work is completed, all plant materials, and the soil within the growth pots, and the pots shall be autoclaved to kill any remaining seeds or living plant material to render the plant material incapable of further growth.
(10) All collections by and shipments to or from the Wetland Center shall be reported to the LDWF. Information to be included shall be the type of material (whole plant, leaves, seeds), and the quantity collected or shipped.
(11) The disposition of plant material at the conclusion of the experimental work shall be reported to LDWF.
(12) Personnel from LDWF shall have the authority to inspect the facility and operation.

LEGAL AUTHORITY: **R.S. 56:328**
APPROVED -

PERMIT IS NOT VALID UNLESS SIGNED ON BACK BY PERMITTEE.

cc: Col. Winton Vidrine, Enforcement

State of Louisiana

KATHLEEN BABINEAUX BLANCO
GOVERNOR

DEPARTMENT OF WILDLIFE AND FISHERIES

DWIGHT LANDRENEAU
SECRETARY

January 24, 2005

Dear Commissioner:

Attached please find drafts of the 2005 Louisiana Department of Wildlife and Fisheries annual stock assessments on black drum, sheepshead, striped mullet, and southern flounder, which will be presented to you at the February 3 meeting of the Wildlife and Fisheries Commission.

These draft reports are also being sent to the administrators of the marine fisheries management agencies of all Gulf states, the Gulf States Marine Fisheries Commission, the Gulf of Mexico Fishery Management Council, university fishery scientists, and the regional office of National Marine Fisheries Service, among others, for review at this time. If substantive changes are needed in the documents as a result of these reviews, we will attempt to incorporate them into the documents prior to your February meeting.

Sincerely,

Harry Blanchet

Harry Blanchet
Marine Fisheries Division
Finfish Programs Manager

cc. Dwight Landreneau, Secretary
John Roussel
Karen Foote

P.O. BOX 98000 • BATON ROUGE, LOUISIANA 70898-9000 • PHONE (225) 765-2800
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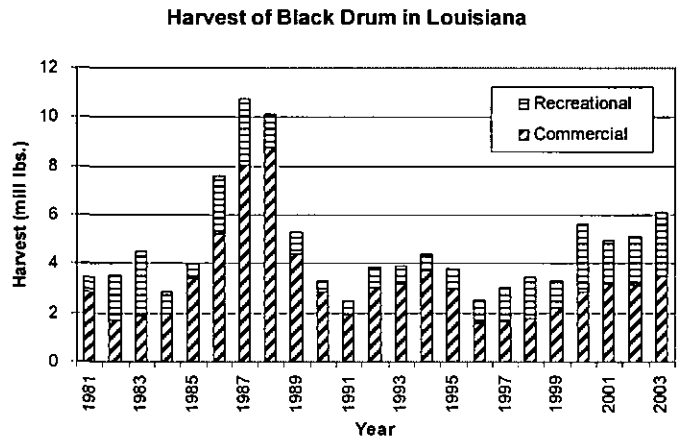
BLACK DRUM
SUMMARY OF CHANGES FROM 2004 ASSESSMENT

This summary is intended to provide a quick reference of substantive changes in methods or corrections in this year's assessment from the 2004 assessment conducted for black drum.

- There are no substantive changes in methods from the 2004 assessment.

2005 DOCUMENT HIGHLIGHTS

- The 2003 combined commercial and recreational harvest of 6,086,523 pounds was the highest recorded since 1988. It was 57% of the 1987 landings peak.



- The conservation standard for black drum in Louisiana is 30% spawning potential ratio (SPR). The results of yield per recruit analysis indicates that if the natural mortality rate (M) =0.1 (the value that provides the lowest allowable harvest within the range of estimates), the fishery prior to existing regulations (Act 1316 of 1995) was operating above $F_{0.1}$ and below F_{MAX} with yield of 92% of maximum, and spawning potential ratio (SPR) at 44%. An M of 0.15 or 0.2 would indicate a more lightly fished stock with yield being 66% to 45% of maximum and with SPR being 57% to 66% respectively.

- It should be noted that the method used in this assessment to determine the status of the stock, reflected in the estimates of disappearance (declines in numbers of harvested fish as they age) is not immediately sensitive to changes in regulations. Black drum enter the fishery at age 0 and are fully recruited by age 5. It takes several years of consistent regulations after regulations are imposed before disappearance rates would accurately measure the impact of those regulations, since the method relies on the relative abundance of the age-classes in the fishery. In the case of black drum it would take 6 years of consistent regulations assuming selectivities of age 5 and older is 100%.

- As a result of having several years of commercial trip ticket data, and collecting recreational fishery statistics data, the department was able to begin a program to representatively sample fishery dependent otoliths in 2002. The program uses trip ticket data and recreational survey data to weight sampling sites based on the volume of fish landed there for the collection of otoliths for the species of interest. It is expected that this method of otolith sampling will improve stock assessments by providing more accurate annual catch-at-age data

BLACK DRUM
5.0 STOCK ASSESSMENT

This assessment uses yield-per-recruit (YPR) and Spawning Potential Ratio (SPR) to estimate the impact of fishing pressure on potential yield and the spawning potential of the black drum stock in Louisiana waters. Estimates derived from YPR and SPR are based on information regarding the growth rate and spawning potential of the fish, and on estimated natural mortality rate (M) and fishing mortality rate (F) on the stock. The results from this assessment provide a generalized approach towards estimating the impact of fishing on the spawning potential and potential yield of the fish stock. The spawning biomass of females is assumed to be the factor limiting the spawning potential of the stock; therefore, where possible, only data on female black drum are used. Yield-per-recruit and SPR analysis, as with many other generalized assessments, should be used only as a guide until a more comprehensive assessment can be conducted.

In developing a stock assessment, the unit stock must be defined. While a unit stock is often represented by that portion of the population which is genetically similar, for our purpose, the most applicable definition seems to be one which considers the unit stock as that portion of the population which is either dependent on Louisiana waters, or which is available to Louisiana fishermen.

5.1 Growth

Luquet et al. (1996) presents several growth equations for black drum. The one chosen for this assessment was developed by Geaghan and Garson (unpublished), and is a sloped asymptote model fitted to a von Bertalanffy growth equation. The data used by Geaghan and Garson (unpublished) was from Beckman et al. (1988) who used sectioned otoliths to age fish caught in Louisiana waters. The sloped asymptote model proved to fit the data better than did other equations. The equation is as follows:

$$L_t = (610 + 9.959 * t) * (1 - e^{-0.6226(t-0.1229)})$$

where, L_t = length at age t, and t = age in years.

The length-weight regression described by Beckman et al. (1990) from fish harvested in Louisiana was used in this assessment. The equation is as follows:

$$W = (1.14 * 10^{-5})FL^{3.05}$$

where, W = weight in grams, and FL = fork length in millimeters.

5.2 Natural Mortality

Natural mortality (m) is one part of total mortality (Z) and is the mortality due to all causes other than fishing. These include predation, disease, spawning stress, starvation, and old age. Typically, natural mortality is estimated, as it is difficult to directly measure, especially on exploited fish stocks where natural mortality and fishing mortality occur simultaneously.

This assessment follows the former Louisiana Department of Wildlife and Fisheries (1990) assessment in using a range of values for natural mortality (0.1, 0.15, and 0.2) to evaluate the sensitivity of M on the resulting spawning stock.

5.3 Fishing Mortality

Fishing mortality (F) estimates derived in the former Louisiana Department of Wildlife and Fisheries (1990) assessment were used in this assessment to evaluate the impact of current fishing regulations on the spawning potential of the stock. The former assessment did not address the concept of spawning potential as a management measure. The current assessment uses yield-per-recruit and SPR analysis to estimate the impact of fishing on spawning potential.

The former assessment used the growth equation described in Section 5.1 to develop annual catch-at-age tables.

5.4 Yield-per-Recruit

Yield-per-recruit and SPR analysis provide basic information about the dynamics of a fish stock by estimating the impact of mortality on yield and the spawning potential of the stock. The results can be examined as to the sensitivity of natural and fishing mortality rates on yield and spawning potential.

The growth parameters described in Section 5.1, the age-specific fishing mortality rates described in Section 5.3, and the natural mortality rates described in Section 5.2 were incorporated into the yield-per-recruit and spawning potential analysis. Fecundity estimates derived by Nieland and Wilson (1993) were used to estimate spawning potential. The equation is as follows:

$$BF = 49{,}249 * Age + 530{,}052$$

where BF=batch fecundity. Since the fecundity estimates are in both the numerator and denominator of the YPR and SPR calculations, unless there is a trend in spawning frequency with age, either batch fecundity or annual fecundity can be used to calculate YPR and SPR. The results are presented in Table 5.1, which contains estimates of F_{MAX} (fishing mortality rate that produces maximum yield), $F_{0.1}$ (fishing mortality rate representing 10% of the slope at the origin of a yield-per-recruit curve), $F_{20\%SPR}$ (fishing mortality that produces 20% SPR), $F_{30\%SPR}$ (fishing mortality that produces 30% SPR), and estimates of F from Section 5.3.

5.5 Conservation Standards

Conservation standards are intended to protect the viability of a fish stock for future generations. These standards have historically been based on a number of biological measures of the dynamics of fish stocks, depending on the availability and adequacy of data. Conservation standards should be separated into two types: a conservation threshold which is entirely biologically based and, a conservation target which considers biological measures modified by relevant social, economic, and ecological factors. A conservation threshold is a biological baseline for the harvest of a fish stock and should not be exceeded. It is the highest level of fishing mortality that will ensure that recruitment overfishing will not occur. Beyond the conservation threshold, a conservation target may be set, providing for other management goals in the fishery. Such goals may include maximizing yield in weight or numbers of fish, economic benefits or profit, employment, or some other measurable goal. These targets should be set at a fishing mortality rate below that of the conservation threshold in order to ensure that the biological integrity of the stock is not damaged by fishing.

The spawning potential ratio (SPR) concept described by Goodyear (1989), is a species specific value expressed as the ratio of the spawning stock biomass (or egg production) per recruit (SSB/R) in a fished condition to the SSB/R in an unfished condition. The concept is based on the premise that below some level of SPR, recruitment will be reduced. Goodyear (1989), recommends that in the absence of sufficient data to provide a value specific to the stock in question an SPR of 20% be used as a threshold. Work on North Atlantic ground fisheries also resulted in the calculation of a threshold SPR of 20% (Gabriel et al. 1984, Gabriel 1985). An SPR of 20% has been recommended for Spanish and king mackerel in the Gulf of Mexico (National Oceanic and Atmospheric Administration/National Marine Fisheries Service 1995), while an SPR of 8-13% has been demonstrated to be sufficient for gulf menhaden (Vaughan 1987). In earlier analyses of Louisiana spotted seatrout fisheries (Louisiana Department of Wildlife and Fisheries 1991), an SPR threshold of 15% was recommended based on several years of data. Mace and Sissenwine (1993) examined 90 stocks of 27 species, and reported that the average replacement SPR for all these stocks was 18.7%, while the most resilient quarter of the stocks required a maximum of only 8.6%. These authors recommended that an SPR of 30% be maintained when there is no other basis for estimating the replacement level, as this level was sufficient in maintaining recruitment for 80% of the stocks examined. However, they noted that 30% may be overly conservative for an "average" stock, and reiterated the need for stock-specific evaluations of standards to enhance both safety and benefits in the fishery.

Sufficient information is not available to directly estimate a conservation threshold for black drum in Louisiana. However, the conservation target of 30% SPR established by the 1995 Regular Session of the Louisiana Legislature for black drum, southern flounder, sheepshead, and striped mullet appears to be adequate to maintain the black drum stock and prevent recruitment overfishing.

The use of any measure of the health of a fish stock as a perfect index is arguable. It is logical to conclude that growth overfishing should occur at a much lower fishing rate than that which would threaten recruitment. However, Mace and Sissenwine (1993) provide information to suggest that some stocks may have reduced recruitment at levels of fishing that would not reduce yield-per-recruit. The preferable position for making recommendations on appropriate levels of fishing for a stock is to base those recommendations on actual measures of spawning stock size and recruitment for both the species and fishery in question. This requires a base of information resulting from monitoring of both the stock and the fishery over a variety of conditions. Without this information, conservation standards may either underestimate or overestimate the potential of a fishery. If the potential is underestimated, society loses the economic and social benefits of the harvest. If the potential is overestimated and the fishery is allowed to operate beyond sustainable levels, society loses the benefits of a sustainable fishery, and recovery will require some period of rebuilding, when effort must be reduced from the non-sustainable levels (Hilborn and Walters, 1993).

5.6 Status of the Stock

Recent Regulatory History

Regulations were implemented by the Wildlife and Fisheries Commission in 1989 as follows: 16 inches minimum total length and 5 fish per person daily bag and possession limit with not more than one exceeding 27 inches for recreationally harvested black drum. For commercially harvested black drum there is a 16 inch minimum total length and an annual harvest quota of 3.25 million pounds for black drum measuring 16-27 inches total length and annual harvest of 300,000 fish measuring longer than 27 inches total length with the fishing year beginning September 1.

Commercial harvest methods were changed on August 15, 1995 when Act 1316 of the 1995 Regular Legislative Session, the Marine Resources Conservation Act of 1995, became effective. This act outlawed the use of "set" gill nets or trammel nets in saltwater areas of Louisiana, and restricted black drum harvest by the use of "strike" nets to the period between the third Monday in October and March 1 of the following year. A "Restricted Species Permit" was required in order to harvest black drum , and several criteria were established in order to qualify for that permit. After March 1, 1997, all harvest by gill or trammel nets was banned, and legal commercial gear to harvest black drum was limited to trawl, set lines and hook and line. This set of regulations had the effect of reducing the harvest of black drum by this segment of the commercial fishing industry.

Current recreational regulations are as follows: 16 inches minimum total length (TL) and 5 fish per person daily bag and possession limit with not more than one exceeding 27 inches TL. For commercially harvested black drum there is a 16 inch minimum TL and annual harvest quotas of 3.25 million pounds for black drum measuring 16-27 inches TL and 300,000 fish for black drum measuring longer than 27 inches TL, with the fishing year beginning September 1.

Trends in Harvest and Abundance

Commercial landings prior to 1991 were obtained from the National Marine Fisheries Service's (NMFS) General Canvass Landing Program. From 1991 through 1998 landings were collected by the LDWF Monthly Dealer Reports and from 1999 to present LDWF's "Trip Tickets" program has been utilized to gather these data. Landings by gear are available for the "Trip Ticket" program, and for the General Canvass Landing Program.

Black drum were lightly exploited by the commercial fisheries until the early 1980s when commercial harvest began to increase dramatically (Figure 5.1). Commercial landings went from 0.4 million pounds in 1980 to 8.7 million pounds in 1988. The regulations implemented in 1989 (and possibly other factors such as market forces, fishing effort, and variations in available stock) reduced the commercial harvest from the 1988 peak of 8.7 million pounds to between 2 and 4 million pounds annually for the 1989-1995 period. Regulations implemented by Act 1316 may have reduced harvest even further as evidenced by reduced landings from 1996 to 1999, but commercial landings have increased since that time and 2003 landings are slightly above the 1995 level.

Recreational landings or harvest information has been consistently collected since 1981 (Figure 5.2). Fisheries dependent recreational landings data are collected by the NMFS Marine Recreational Fisheries Statistical Survey (MRFSS) and are currently collected by LDWF biologists. In the earlier years of the survey, estimates of harvest were relatively broad, due to lower numbers of samples in the MRFSS survey from Louisiana. Increased effort in the survey in recent years has increased the precision of the harvest estimates. The harvest values have fluctuated between 0.4 and 2.7 million pounds from 1981 through 2003. There seems to be some cyclic variation in recreational harvest estimates, and recent estimates (1990-2003) show an increasing trend.

Mean catch-per-trip from the recreational fishery was calculated by selecting those trips that had black drum in their catch. Black drum are seldom a primary target species for Louisiana angling trips, they are more often reported as a secondary target species. Therefore, many of the black drum encountered by MRFSS samplers are likely to have been incidentally captured by an angler targeting other species, or fishing with no target species in mind. We did not attempt to select trips targeting black drum in our calculations of catch-per-trip due to concerns for post-trip reporting bias (anglers who harvest drum are more likely to report them as a target species, inducing bias into estimates). These issues create challenges for developing a fishery-dependent index of abundance from the recreational fishery.

The results of the recreational catch-per-unit-effort (CPUE) analysis are presented in Figure 5.3 along with 95% confidence limits around the mean. The CPUE index cycled throughout the period examined (1981-2003), with no indication of a long-term downward trend. The increased sampling effort in the MRFSS survey in recent years has contributed to the more precise estimates of CPUE seen in those years. The years 1985, 1991, 1996, and 2003 showed the lowest mean CPUE and these years were significantly lower than 1982, 1986, 1993, and 2000.

Catch-per-effort data from the Department's, fishery-independent trammel net (750' x 6' - 1 5/8" inner, 6" outer wall) and small mesh bag seine (50' length, 1/4" delta mesh) samples were calculated as follows:

$$\text{Mean CPUE} = (\exp (\Sigma \ln (\text{catch} + 1) / N)) - 1$$

where catch is the total number caught in each set and N is the number of samples taken annually. Trammel net and seine data were used for the period 1986-2003. The CPUE fluctuated throughout the time period in both the seine and trammel net samples with no indication of a long-term downward trend (Figures 5.4 and 5.5). The year 1988 was the only year where CPUE in seines showed any significant difference at the 95% confidence level and that year was lower than 1986, 1992, 1996 1997, 1998, 1999 and 2000. Trammel net CPUE was highly variable throughout the period as indicated by the wide confidence limits associated with the years examined. The years 1986, 1988 and 1989 had the lowest CPUE, and were significantly lower than 1996, 1998, 1999, 2000, 2001, and 2002.

Estimates of Yield and Spawning Potential

It should be noted that the following results of YPR and SPR analysis do not reflect the impact of current regulations described above. With this type of general assessment, it will take several years before the impact of regulations will be observed in the disappearance rates from the fishery.

The results of YPR analysis indicate that if M=0.1 (the most conservative value within the range of estimates), the fishery prior to existing regulations (Act 1316) was operating above $F_{0.1}$ and below F_{MAX} with yield of 92% of maximum, and SPR at 44%. An M of 0.15 or 0.2 would indicate a more lightly fished stock with yield being 66% to 45% of maximum and with SPR being 57% to 66% respectively (Table 5.1).

5.7 Research and Data Needs

Estimates of natural mortality used in the present assessment vary widely. This variation lessens the ability of the present assessment to provide an accurate estimate of the potential yield of the stock, and also reduces the confidence level of the present estimate of SPR. A more accurate estimate of natural mortality would improve both estimates.

Annual age-length keys should continue to be developed to provide catch-at-age data necessary to conduct age-based population assessments. The department is in the process of collecting otoliths for development of annual age-length keys.

The assessment faces challenges in that harvest of adult black drum currently comprises only a small fraction of the current overall drum harvest. Characterization of the age structure of the adult

harvest is difficult, since these fish are seldom encountered as part of the sampled harvest. A project to determine the current age frequency of the adult population should provide valuable insight into the impact of existing regulations, and greatly assist in refining our estimate of the status of the black drum stock in Louisiana. The project should attempt to collect samples representative of the adult black drum population in Louisiana waters, recognizing that populations exist inshore, offshore and in various parts of the state that all may have different age structures. Such a project could be either fishery-dependent or fishery-independent in nature. When age data are sufficient, the Department intends to conduct VPA analyses and to explore other statistical methods of evaluating the status of the black drum stock.

The relationship between wetlands losses or modifications and the continuation of fishery production within the state has been discussed by many authors. However, this relationship is likely to be different for the various fishery species. Understanding this relationship for black drum should be an ongoing priority.

In the presence of changing regulations, fishery-dependent information is not a reliable source of data for assessing the status of a fish stock. However, such data are necessary to measure the effects of fishing on that stock. Consistent fishery-dependent and fishery-independent data sources, in a comprehensive monitoring plan, are essential to understanding the status of fishery stocks, and to identifying causes of changes in stock abundance. Current programs should be assessed for adequacy with respect to their ability to evaluate stock status, and modified or enhanced to optimize their capabilities.

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Table 5.1. Results of yield per recruit and spawning potential ratio analyses for black drum. Estimates reflect the status of the stock including the impact of regulations prior to1995.

M=0.1

	F Ratio	YPR	SPR	%SPR	%YPR	
Fmax =	0.982	3.0260	1,659,670	23.80%	100.00%	Benchmarks
F0.1 =	0.260	2.4809	3,902,316	55.96%	81.99%	
F20% =	1.156	3.0159	1,394,714	20.00%	99.67%	
F30% =	0.760	3.0022	2,092,071	30.00%	99.21%	
* Regulations =	0.426	2.7925	3,089,373	44.30%	92.28%	Estimate

M=0.15

	F Ratio	YPR	SPR	%SPR	%YPR	
Fmax =	2.100	2.1766	373,755	11.48%	100.00%	Benchmarks
F0.1 =	0.605	1.7506	1,466,963	45.05%	80.43%	
F20% =	1.462	2.1353	651,218	20.00%	98.10%	
F30% =	1.019	2.0185	976,828	30.00%	92.74%	
* Regulations =	0.376	1.4562	1,880,508	57.75%	66.90%	Estimate

M=0.2

	F Ratio	YPR	SPR	%SPR	%YPR	
Fmax =	3.822	1.8101	61,480	3.52%	100.00%	Benchmarks
F0.1 =	1.153	1.5197	545,318	31.22%	83.96%	
F20% =	1.671	1.6792	349,286	20.00%	92.77%	
F30% =	1.199	1.5388	523,929	30.00%	85.01%	
* Regulations =	0.326	0.8173	1,375,910	66.71%	45.36%	Estimate

Figure 5.1. Commercial harvest of black drum in Louisiana, in pounds, 1950-2003.

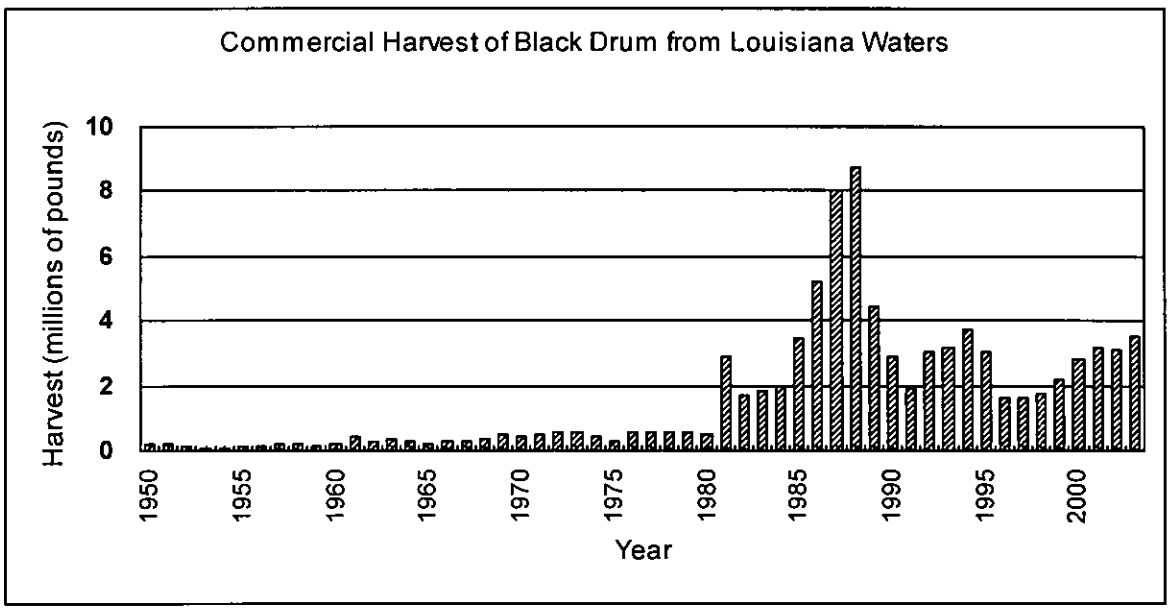


Figure 5.2. Recreational harvest of black drum in Louisiana in pounds, including 95% confidence limits on the estimates.

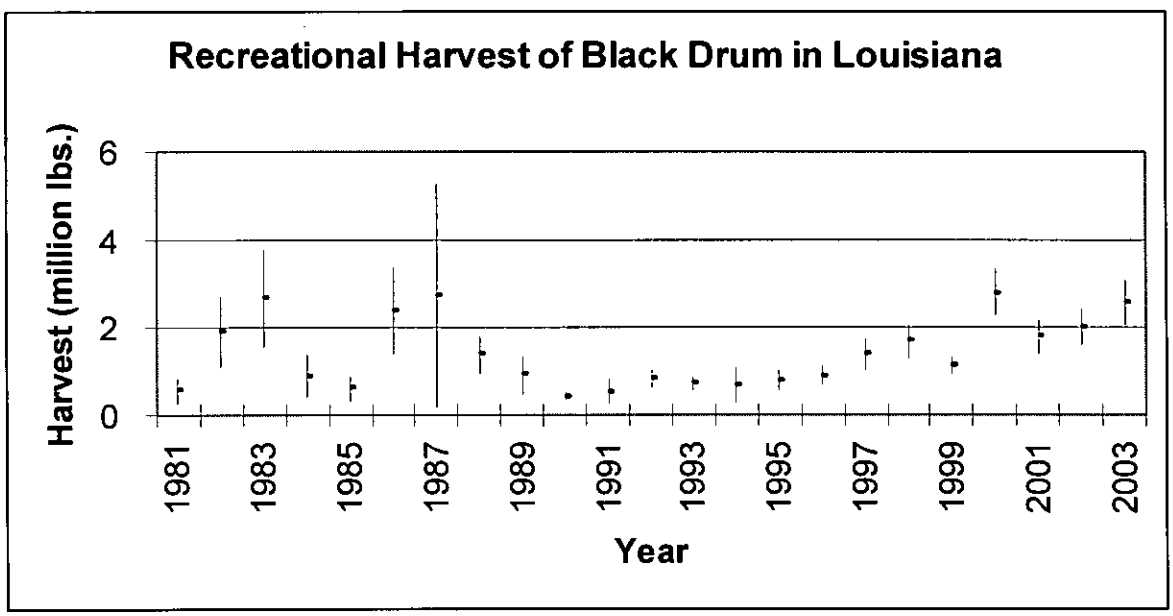


Figure 5.3. Standardized catch per unit of effort from the Louisiana recreational fishery, based on MRFSS intercept survey information.

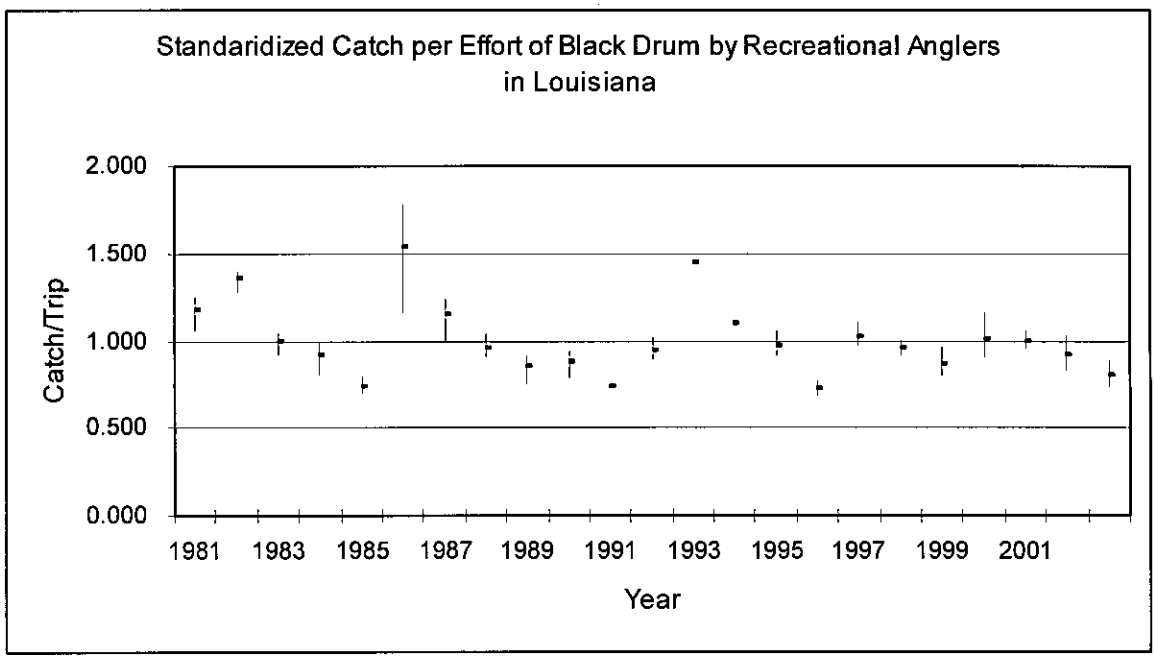


Figure 5.4. Standardized catch per unit of effort of black drum from seine samples in the LDWF fishery-independent sampling program.

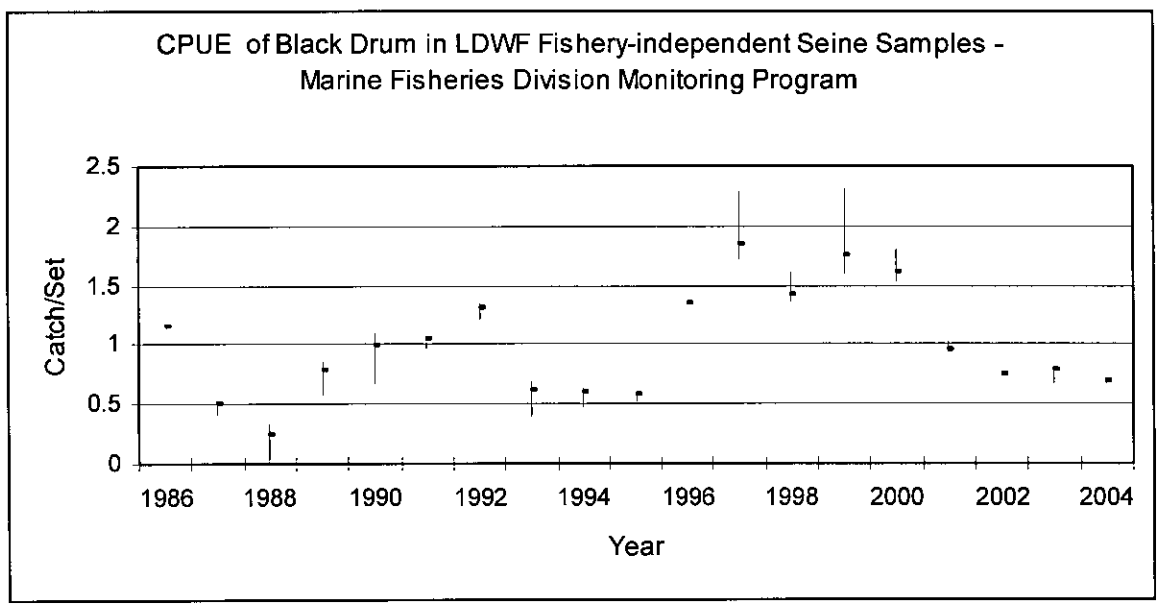
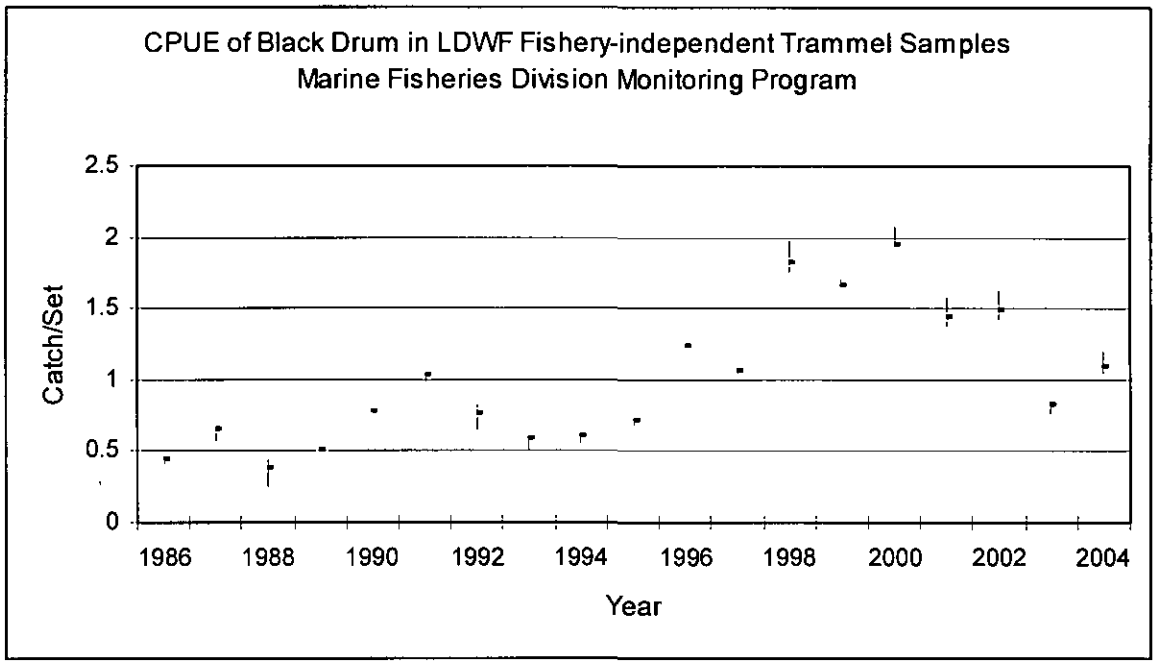


Figure 5.5. Standardized catch per unit of effort of black drum from trammel net samples in the LDWF fishery-independent sampling program.



STRIPED MULLET
SUMMARY OF CHANGES FROM 2004 ASSESSMENT

This summary is intended to provide a quick reference of substantive changes in methods or corrections in this year's assessment from the 2004 assessment conducted for striped mullet.

- The method of estimating fishing rates was modified from a disappearance rate (Z') calculation to a virtual population-based calculation

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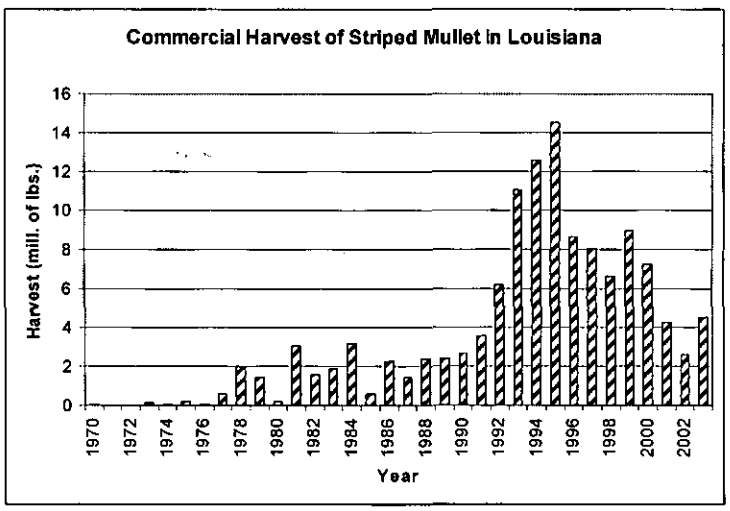
2005 DOCUMENT HIGHLIGHTS

- 2003 commercial landing of 4.5 million pounds was about 57% of the average for the period since 1991.



- The conservation standard for striped mullet is 30% spawning potential ratio (SPR). The results of yield per recruit analysis indicate that if M=0.3 (the value within the range of estimates that allows the lowest allowable harvest), the current fishery is operating above $F_{0.1}$ and F_{MAX} with yield of about 98% of maximum, and SPR near 31%. An M of 0.6 would indicate a more lightly fished stock with yield being about 83% of maximum and with SPR being near 65%.

- The methods used in this assessment to determine the status of the stock, reflected in the estimates of disappearance (declines in numbers of harvested fish as they age) do not immediately respond to changes in regulations. Mullet enter the fishery at age 1 or age 2, and are fully recruited by age 5 or 6. It takes several years of consistent regulations after regulations are imposed before disappearance rates would accurately measure the impact of those regulations, since the method relies on the relative abundance of the age-classes in the fishery. In the case of mullet it would take 4 years of consistent regulations, assuming selectivities of age 5 and older is 100%.

- As a result of having several years of commercial trip ticket data, and collecting recreational fishery statistics data, the department was able to begin a program to representatively sample fishery dependent otoliths in 2002. The program uses trip ticket data and recreational survey data to weight sampling sites for the collection of otoliths for the species of interest. It is

expected that this method of otolith sampling will improve stock assessments by providing more accurate annual catch-at-age data.

STRIPED MULLET
5.0 STOCK ASSESSMENT

This assessment uses yield per recruit (YPR), spawning potential ratio (SPR) and catch curve analyses to estimate the impact of current fishing pressure on the potential yield and the spawning potential of the Louisiana striped mullet stock. Estimates of YPR and SPR are based on knowledge of the growth of the fish, and on estimates of the natural mortality rate (M) and fishing mortality rate (F) on the stock. Catch curve analysis is used to calculate the estimated effects of fishing mortality rates for ages that are predicted to be present in the population, but that are not adequately represented for the SPR analysis.

The spawning biomass of females is assumed to be the factor limiting the spawning potential of the stock. Therefore, this analysis uses growth rates for female mullet, and considers the effects of fishing on the female portion of the stock. The results of this type of assessment provide a generalized approach for estimating the impact of fishing on the spawning potential and the potential yield of the fish stock.

As with any assessment, the results are subject to the limitation of the data from which they are derived. The present analysis should be used only as guidance until more comprehensive analyses, using additional data collected consistently over an extended time span, can be conducted. In 2002, the department began a program to representatively sample biological information from harvest of fisheries important to the State. The program uses trip ticket data and recreational survey data to weight sampling sites for the collection of ages and sexes of the harvest for the species of interest. It is expected that this method of sampling will improve stock assessments by providing more accurate annual catch-at-age data.

For striped mullet, samples collected in 2003 provided the first year where there was adequate sample size to examine the variation in results of the stock assessment, compared to utilizing the age-length key used in previous assessments. However, the 2003 age-length key has a much smaller sample size than our previous age-length key, so this analysis is presented here as a sensitivity analysis.

The definition of the unit stock must be considered in the development of a stock assessment. While a unit stock is often defined as that portion of the population which is genetically similar, for our purpose in this stock assessment, the most applicable definition seems to be one which considers the unit stock as that portion of the stock which is either dependent on Louisiana waters, or which is available to Louisiana fishermen. We recognize that the geographic distribution implicit in this definition of unit stock is likely to be different from the genetically based definition, given the wide geographic distribution and offshore spawning grounds of the species (Mapes *et al.* 1998). We chose to use this definition because it provides the best picture of the Louisiana fishery, and we do not have information with which to quantitatively define fishing mortality on a regional basis. Information from tagging studies along the west coast of Florida (Mahmoudi, 1991) indicates that once recruited to an estuary, mullet have a strong tendency to return to that estuary after spawning offshore. If this tendency is also expressed in Louisiana, then fishing mortality rates in one area of the state would primarily affect the abundance of the adult population in that area, and not in other areas, unless fishing mortality rates over the entire spawning pool were high enough to affect recruitment on a wide scale.

For purposes of this assessment, we did not consider the effects of recreational harvest on the stock. The best information available at this time indicates that recreational harvest is relatively light, typically less than 200,000 pounds of fish per year (National Marine Fisheries Service, Marine Recreational Fishing Statistics Survey, 1981-2003) (Table 5.1). Based on the sparse length frequency distribution of surveyed fish, most of the recreational harvest is at a size prior to entry into the commercial fishery. The available data suggest that inclusion of recreational harvest data would not have any appreciable effect on the analyses we used.

Commercial harvest has varied over time (Table 5.1, Figure 5.1), with reduced harvest after a peak in 1995. The fishery is not evenly distributed over the state, but is concentrated in the southeastern region, and mainly east of the Mississippi River (over 80% of the harvest is typically from that region).

The estimates of fishing mortality and other portions of this analysis must assume that either the distribution of the fishery does not change, or that all fish in the state are equally available to the fishery for predictive yield calculations to be reasonably accurate. Without knowledge of movement of adult mullet over the entire year, it is difficult to infer how much of the population is actually exposed to the fishery. Only that portion exposed to the fishery is described here.

Mullet exhibit differing growth rates and variable fishing pressures across the state, creating challenges for a comprehensive assessment. For the most part, data was limited to that collected from the easternmost part of the state, approximately from Barataria Bay to the Mississippi State line, to reflect the distribution of the fishery. For data from 2002-2003, all data was included in the assessment, since the data collection protocols under the new biological data collection program are designed to represent the distribution of the fisheries being sampled (Table 5.2). No detailed examination was made of the distribution of samples compared to the distribution of the fishery, but this should be a priority for future stock assessments.

The current commercial harvest season for striped mullet runs from the 3rd Monday in October until the 3rd Monday of the following January. Prior to 1995, harvest occurred year-round, though a peak in harvest occurred during the roe fishery, which is in these months. Changes in seasonality of harvest are not considered in this analysis.

5.1 Growth and Fecundity

Thompson *et al.* (1991) described growth of striped mullet from Louisiana waters. They found significant differences in growth rates between sexes of mullet, and in growth rates from different parts of the state. For this assessment, a von Bertalanffy growth equation was developed from aged samples of female striped mullet from East of the Mississippi River provided by Thompson (pers. comm.). Growth rates from this area were used since this area of the state provides the majority of the harvest. We reanalyzed these data, combining them with juveniles assigned to age 0 by length frequency analysis from Louisiana Department of Wildlife and Fisheries' (LDWF) fishery-independent seine samples (Mapes *et al.* 1998, Figure 2.1). These data were used to estimate a three-parameter von Bertalanffy growth equation:

$$L_t = L_\infty * (1-e^{(-k(t-t_0))})$$

where L_t is the length at age (t) in years, L_∞ is the maximum length, k is a parameter describing the rate of growth, and t_0 is the intercept of the function on the time axis. The function was estimated using nonlinear approximation procedure (SAS, 1987). The parameters derived from this method were: L_∞=453.9, k=0.332, t_0=-0.05. These parameters were used in some methods of estimating natural mortality, and yield per recruit.

Fishery-dependent length samples of female mullet were assigned ages through the use of an age-length key (ALK). This key utilized fish aged from sectioned otoliths by Dr. Bruce Thompson (LSU Coastal Fisheries Institute, unpublished data, Table 5.3). The age-length key categorized fish in increments of one-inch (25.4 mm) total length. Fish with only fork length measurements available were converted to total length using the equation provided by Thompson *et al.* (1991) (TL=1.13*FL-3.40, r^2=.995). Only data from female mullet was included (males, immature fish, and fish where sex was not recorded were all deleted). Thompson's data included fishery-dependent samples from purse seine samples from Mississippi waters, and from mullet in the Sabine (LA) Refuge impoundment. These were deleted, as the length/age relationships for these fish are expected to differ from the fish harvested in the current and recent Louisiana fishery. Most fishery-independent and recreationally-based collections were deleted from analysis for the same reason. However, the age distribution for 11-inch fish was derived from fishery-independent samples since no fishery-dependent ages were available for that size class. This size class represented less than one percent of the total commercial harvest, so any error due to mis-assignment of ages should have minimal impact on the assessment. In all 3,580 female mullet were used in the development of the ALK (Table 5.2).

As noted earlier, the fishery is concentrated in the area east of the Mississippi River, and in the Mississippi River delta. Examination of fishery-dependent age-length keys and length-frequency samples from different areas of the state demonstrated substantial differences in length-frequency and in age-at-length between areas. Therefore only samples taken East of 90°W longitude were included in this assessment. Exclusion of the samples from the remainder of the state should provide a more accurate assessment of the potential yield of the area where the majority of the fishery operates. Spawning potential ratio (SPR) estimates specifically calculated by this method would not be valid for the state as a whole, but should be a more accurate representation of the status of the fished portion of the population in this region.

For a sensitivity analysis, a separate ALK was developed from fishery-dependent female mullet collected from the fishery in 2003. There were 762 female mullet sampled from the fishery for length, including 417 usable ages from the same samples (Table 5.4). Usable ages met the criteria of having the same age value from two different readers of the sampled otolith. The ages from the directly aged fish were expanded through use of two ALK's – the one developed from the 2003 samples, and the key developed from the data of Thompson et al., (1991). The purpose of this analysis was to evaluate variability in age class assignments and status of the stock depending on the source of the age-length key. With only two samples for comparison, no firm conclusions can be made, though some remarks can be made on variability between the results of the analyses.

Fecundity is estimated from the length/fecundity relationship of Thompson *et al.* (1991) where:

$$\text{Fecundity}=5.6\text{x}10^{-3}(\text{FL})^{3.18}$$

Fish were assumed to be sexually mature at age 2.

5.2 Natural Mortality

There was no change in the techniques used or the input parameters for estimation of natural mortality for striped mullet since the development of the 1997 and 1998 reports. The various estimates and the citation describing the methodology used to derive that estimate are listed below.

Citation	Input parameters	Natural Mortality estimate
Pauly (1980)	k =0.332 L_∞ =453.9 water temperature (°C)=22.7	$M_{\text{schooling fish}}$ (est.*0.8)=0.56 M_{clupeids} (est.*0.6)=0.42
Hoenig (1983)	$\text{Age}_{(max)}$=10	M=0.42
Alagaraja (1984)	99% of fish die by Age 10 99.9 % of fish die by Age 10	M1%=0.46 M0.1%=0.69
Beverton and Holt (1959)	1.5 to 2.5 von Bertalanffy growth parameter (k), k=0.332	M=0.50-0.83

Two estimates of natural mortality (M) are available for striped mullet in the existing literature. Pauly (1980) cites Ih-Hsiu (1970) as reporting an M of 0.31 for male striped mullet from Taiwan. Mahmoudi (1991) estimated M as 0.30 using tagging data from southwest Florida.

Some investigators (Restrepo *et al.* 1991, Helser *et al.* 1992) have attempted to use a range of estimates of M and incorporate variation within this range as a variable in their analyses of other fish species. However, the selection of the range to be used, and the distribution of M estimates within that range remains arbitrary. We have chosen, rather, to select several point estimates of M, and to present the results of changes in the estimate. We have presented estimates based on M values of 0.3, 0.4, 0.5, and 0.6. This provides an understanding of the differences resulting from various estimates of M, without implying any additional precision.

In this report, an M of 0.3 is the most conservative estimate of natural mortality. This estimate may be low, based on the lack of mullet older than 10 years in the Western part of Louisiana, though there has never been an established mullet fishery in that area. Lack of striped mullet older than 10 years of age would indicate an M of about 0.4-0.45. A lower value of M results in higher estimates of F in the analysis. If the actual value is above estimates used here, estimates of fishing mortality from the analysis will be

lower than estimated here. Additionally estimates of spawning potential ratio at any level of fishing mortality would also be increased, and potential yield will be higher than estimated with that value. A low estimate of M would also increase the harvest age structure required to maximize yield, which could influence proposed size or gear regulations.

5.3 Disappearance Rates and Fishing Mortality

It must be recognized that any estimate of disappearance (Z or Z') from the fishery includes both the total mortality while the fish is exposed to the fishery and the availability of the fish to the gear. Availability as used here includes both changes in distribution or behavior of the fish that might change effectiveness of the fishery (e.g. migration, food preference, etc.), and size or other selectivity of the gear or fishery. The predominant gear in the Louisiana mullet fishery at the present time is 3½ -4 inches stretch gill net, though some larger mesh sizes are occasionally used (see Mapes *et al.,* 1998). Gill nets are size selective for mullet; therefore estimates of disappearance likely reflect fishing mortality confounded by some degree of gear selectivity. For the present analysis, no estimation of gear selectivity or availability to capture was available for fish beyond full recruitment.

Length frequency data from the mullet fishery was derived from Trip Intercept Program (TIP) sampling and a LDWF biological sampling program (Table 5.2). These data were available for the fishing years 1994-2003. The data from 2003 are used to estimate the current status of the stock for this report.

The length frequency samples were aged, using the base-case age-length key described above (Table 5.3) to estimate catch-at-age. The harvest at age was estimated from the application of the age-length key to the lengths of female striped mullet sampled in the year multiplied by the overall commercial harvest for the year. For ages where no fish were harvested (age 0 in all cases, ages 0-1 in some cases), one fish was added to the harvest at those ages. The resulting estimated ages were all used in the VPA analysis; no "plus" groups were used. The catch-at-age was used to derive age-specific fishing mortality rates to be used in spawning potential calculations and yield-per-recruit analysis.

The resulting estimates of harvest at age were run through a VPA (Jones, 1984) to determine age-specific mortality rates, using the Solver tool in MS © Excel to iteratively calculate B, such that Q(t) = B(t) by varying F. The estimation procedure was constrained to F=>0.00001, precision of the solution set to 0.000001, convergence set to 0.0001, de-selecting the linear models option of Solver, using the quadratic estimation procedure, central derivatives, and the quasi-Newton search methods. This process was semi-automated through development of a macro to step through the annual estimation process. A range of terminal F was input manually, from 0.1 to 1.0.

In previous assessments, the method of Sparre and Venema (1992) was used to develop selectivities. That method uses a linearized catch curve to determine the selectivity of fish not yet fully recruited to the fishery. The ratio of the observed catches to the expected catches at each age is the probability of capture or selectivity of the fishery at age. Selectivities are then regressed in the equation:

$$\ln(1 / S_t - 1) = T1 - T2 * t$$

where, S_t = the selectivity at age t, and T1 and T2 are constants corresponding to the intercept and slope of the regression. To develop theoretical or estimated selectivities at age the following equation is used:

$$S_t \text{ (estimate)} = 1 / (1 + \exp(T1 - T2 * t)$$

In these previous assessments, selectivities for ages up to full age-at-recruitment were used to describe the relative fishing mortality to that point; for age at full recruitment and older, selectivities are assumed to be 1, or 100% selected. Selectivities used were as follows:

Ages (Females)	Relative selectivity
0	0
1	0.0011
2	0.0372
3	0.2616
4	0.7780
5 and over	1.0

Disappearance rates (Z') were then derived by regression of the descending arm of the catch curve. For comparison with the current assessment, Z' values were calculated for 2003, using these same values.

For the current VPA-based assessment, a slight modification was necessary to estimate contributions of yield and spawning potential by age. The estimated F at age was input into the YPR analysis by assigning selectivities of all ages in the assessment relative to the F at age of fully recruited fish. Age at full recruitment was limited to an age class of age 6 or lower, and was age 5 or 6 in this assessment. Benchmark values were calculated by varying F at the fully recruited age, assuming that selectivities would not change for other ages.

It should be noted that there was no attempt to incorporate indices of recruitment or abundance into the current VPA assessment.

5.4 Yield per Recruit

Yield per recruit (YPR) analysis provides basic information about the dynamics of a fish stock by estimating the impact of mortality rates on yield and spawning potential of the stock. The results can be examined as to the sensitivity of natural and fishing mortality rates on yield and spawning potential.

In general, use of YPR analysis requires:

1) information on natural and fishing mortality rates,
2) knowledge of the growth parameters of the fish.

In previous assessments, the yield per recruit (YPR) analysis included several assumptions. A fish was assumed to consistently recruit to any given fishery at a given age; that is, selectivity by age did not change over time. Partial recruitment of fish was estimated from the relative abundance of age 1 through age 4 fish in the TIP samples compared to age 5 and over fish, which are fully recruited. Once the fish are fully recruited to the fishery, fishing pressure is assumed to be at a constant rate. That YPR analysis did not take into account any variation in exploitation rates or other factors which may affect the results. The results of this methodology are presented in Table 5.5 for comparison with the results of the new assessment.

In the current analysis, the F at age was applied to the YPR analysis based on the results of the VPA for that year. Striped mullet were typically estimated to have highest values of F as ages 5 or 6, for the M=0.3 estimates. While there were occasions when even older ages were found to have higher F, these are probably due to inaccuracies in age assignment from the age-length key, since it seems improbable that such inefficiencies would exist in the fishery. However, the calculated values are carried through the YPR and SPR analyses, rather than assigning a selectivity of 1 to ages beyond full selectivity. This has the effect of lowering the estimates YPR and SPR if the estimates of F at these older ages are higher than the estimate of F at the assigned age of full recruitment.

Those age-specific mortality rates were applied to a yield per recruit model, using the von Bertalanffy growth parameters described in Section 5.1. Age-specific fishing mortality rates were selected as the average of the F at age from the $F_{terminal}$=0.4 to $F_{terminal}$=1.0. These rates were used in the analysis because all F's were very similar at younger ages, this range of $F_{terminal}$ included the estimate of maximum F seen in most cases, and the F's from this range tended to converge relatively quickly. Figure 5.2 shows the results of the base case VPA estimates of F at age, while Figure 5.3 shows the results of the sensitivity analysis using the 2003 ALK.

The YPR analysis calculated estimates of yield out to age 13. Estimates of F at ages between full recruitment and $F_{terminal}$ were directly input into the YPR analysis, though there was substantial variation between F at age depending on the analysis. Since the initial estimates of F were for age 10 fish for the base model ALK, we included VPA estimates of F from ages 9 and less. Selectivities for ages equal to the terminal ages in the VPA and older were set to the same as selectivity at full recruitment. For the base case ALK, ages 10-13 were assumed to be fully recruited, with F at the same level as seen for ages 5 or 6, whichever was the maximum F for that assessment run. For the 2003 ALK, ages 2-8 were represented, so

ages older than 7 were assumed to be fully recruited for those YPR analyses, and assumed to be harvested at the same rate as the fully recruited age 5 or 6 fish.

Methods used for estimation of natural mortality (M) and fishing mortality (F) rates in this analysis are presented in Sections 5.2 and 5.3 above. The existing mullet fishery is mainly a roe fishery, targeting female fish (Thompson, 1989). Therefore, we have used the growth parameters for female mullet to calculate yield per recruit.

The results of this analysis are presented in Table 5.6, which contains estimates of F_{MAX} (fishing mortality rate that produces maximum yield), $F_{0.1}$ (fishing mortality rate representing 10% of the slope at the origin of a yield-per-recruit curve), $F_{20\%SPR}$ (fishing mortality that produces 20% SPR), $F_{30\%SPR}$ (fishing mortality that produces 30% SPR), and annual estimates of F from the year-specific and ALK-specific VPA calculated in Section 5.3.

Selectivity patterns of the fishery varied, depending on the estimate of M. As a result, stock benchmarks are recalculated for the estimated harvest at age for each estimate of natural mortality, so that the estimates of $F_{0.1}$, $F_{20\%SPR}$, $F_{30\%SPR}$, and F_{MAX} as well as the annual SPR estimate will vary. Therefore, the results of this analysis, reflected in Table 5.5 and 5.6, could change each year depending on any change in the estimated selectivity patterns of the fishery. Tables 5.5 and 5.6 represent only the values of the benchmarks $F_{0.1}$, $F_{20\%SPR}$, $F_{30\%SPR}$, and F_{MAX} compared to the estimates from the most recent year of available information.

5.5 Conservation Standard

Conservation standards are based on one of a number of biological measures of the dynamics of fish stocks, intended to protect the viability of that stock for future generations. These standards have historically been based on different measures of the dynamics of fish stocks, depending on the data available, the needs of fishery and of the resource. Conservation standards should be separated into two types: a conservation threshold which is entirely biologically based, and a conservation target which considers biological measures modified by relevant social, economic, and ecological factors.

Conservation "thresholds" are intended to provide a biological baseline for harvest of a fish stock based on stock recruit relationships, or other biological parameters specific to the stock, if possible. This baseline standard, below which the stock should not be allowed to go, has been described as a "threshold" by some researchers, and has also been referred to as an "overfishing level" (GMFMC 1995). Beyond this "threshold", management "targets" may be set, which provide for other management goals in the fishery. Such goals may be in terms of yield in weight, yield in numbers of fish, catch rate per effort, harvest rate per effort, employment, profit, or some other goal. These targets must be set at a fishing rate below the "threshold" in order to ensure that the biological integrity of the stock is not unduly compromised by fishing.

Spawning stock biomass per recruit (SSBR) or spawning potential ratio (SPR) has become widely used as a measure of stock condition. This measure compares the estimated female spawning biomass of

the stock that survives fishing with the estimated biomass of the stock under unfished conditions. The analysis does not take into account any density-dependent relationships due to the changes in the size of the fished stock. Using the Spawning Potential Ratio (SPR) concept as developed by Gabriel et al. (1984) and refined by Goodyear (1991), a "threshold" value can be defined that provides a minimum spawning stock biomass (or egg production) per recruit, below which existing data cannot evaluate impacts to future recruitment, and below which the fishery should not be allowed to operate.

Ideally, "threshold" levels should be evaluated from information on the stock in question. However, the information base necessary to adequately describe this level is often not available. In such cases, it has been recommended by Goodyear (1989) that a spawning stock biomass per recruit (SSBR) or SPR of 20% be used as a "threshold" in absence of sufficient evidence to provide a standard specific to the stock in question. This standard is also based on work on North Atlantic groundfisheries (Gabriel et al. 1984, Gabriel, 1985). A SSBR of 35% has been recommended for Spanish mackerel, and 20% for king mackerel (GMFMC 1990, 1995). A SSBR of 8-13% has been demonstrated to be sufficient for Gulf menhaden (Vaughan 1987). In prior analyses of the Louisiana spotted seatrout fisheries (LDWF 1991), we recommended an SPR of 15% after analysis of several years of available data. Mace and Sissenwine (1993) examined 90 stocks of 27 species, and recommended that 30% SPR be maintained when there is no other basis for estimating the replacement level. That level is sufficient for 80% of the stocks considered by those authors. They also noted that 30% may be overly conservative for an "average" stock. The average replacement %SPR for the stocks they considered was 18.7% while the most resilient quarter of the stocks considered required a maximum FREP of 8.6% SPR. Three-quarters of the stocks required a maximum FREP of 27.1% SPR. In a prior assessment of striped mullet (Shepard et al., 1992), a SPR of 20% was recommended as the conservation standard for the Louisiana fishery. This standard was considered, rather than 30% SPR, due to several factors: the fishery is mainly prosecuted on the stocks of mullet east of the Mississippi River, and the estimate of SPR is based on only the fished stocks. The relatively unfished stocks to the west of the Mississippi River are only minimally considered in the assessment, with the result that the SPR ratios are underestimated.

Sufficient information is not available to directly estimate a conservation threshold for striped mullet in Louisiana. However, the conservation target of 30% SPR established by Act 1316 of the 1995 Regular Session of the Louisiana Legislature for black drum sheepshead, southern flounder and striped mullet appear to be adequate to maintain the striped mullet stock and prevent recruitment overfishing.

The use of any measure of health of a fish stock as a perfect index is arguable. Intuitively it seems more logical that growth overfishing would occur at a much lower fishing rate than would threaten recruitment. However, Mace and Sissenwine (1993) provide information to suggest that some stocks may have reduced levels of recruitment at levels of fishing that would not reduce yield per recruit. The preferable position for making recommendations on appropriate levels of fishing for a stock is to base those recommendations on actual measures of spawning stock and recruitment for that species, in the same fishery. This requires a base of information on that fishery that requires monitoring of both the stock and the fishery over a variety of conditions. Without this information, inappropriate conservation standards may either underestimate or overestimate the potential of the fishery. If the potential is underestimated, the society loses the economic and social benefits of the harvest. If the potential is overestimated, the society

also loses the benefits of a sustainable fishery, which must at least go through some period of rebuilding, when effort must be reduced from the non-sustainable levels (Hilborn and Walters, 1993).

5.6 Status of the Stock

Recent Regulatory History

Harvest declined after 1995 as a direct result of regulations implemented August, 1995 eliminating the harvest of mullet outside of the period between the 3rd Monday in October through the 3rd Monday of the following January. Regulations also outlawed fishing for mullet at night, on weekends, in freshwater areas, and using gear other than strike gill nets.

Legislation allowing the use of hoop nets in freshwater areas for taking mullet was enacted in 1999. The law required that no leads be used on the hoop nets, no harvest or possession of mullet from between the hours of official sunset and official sunrise, and mullet caught in the freshwater areas of the state could not be possessed by commercial fishermen in the saltwater areas of the state.

Three legislative acts were passed in 2001. Act 51 defined certain portion of the Intracoastal waterway, from the overhead power lines at the Interharbor Navigation Canal east to the Rigolets, in Orleans Parish as saltwater and freshwater for the purposes of possessing regulated gear and allows the harvest of mullet in that area in addition to a portion of Lake Pontchartrain located south and east of the I-10 bridge as long as commercial fishing operations in these waters will not interfere with normal commercial traffic. Act 116 statutorily created a mullet task force to advise LDWF on certain issues. Act 147 adopted a "three-strikes and you are out" penalty system within the commercial mullet fishery: first conviction, one year permit suspension, second conviction two years suspension, third conviction lifetime permit ban.

Trends in Harvest and Abundance

The trends in harvest for striped mullet in the Louisiana fishery have been reviewed by Mapes *et al.* (1998). Commercial landings prior to 1991 was obtained from NMFS's General Canvass Landing Program, from 1991 through 1998 landings was collected through the LDWF's Monthly Dealer Reports and from 1999 to present LDWF's Commercial Reporting Requirement "Trip Tickets" program is utilized to gather this type of data. Recreational landings were obtained through the NMFS's Marine Recreational Fishery Statistics Survey (Table 5.1). Harvest increased in the early 1990's, as the commercial roe fishery continued to develop (Figure 5.1). Harvest declined after 1995 as a result of regulations implemented in August, 1995 which limited access to the resource through seasons, and eliminated fishing on weekends or at night. Variability is also due to market uncertainty and possibly variable stock abundance or availability factors.

Annual recruitment of mullet has been evaluated from fishery-independent seine and experimental gill net samples taken statewide since 1986. Catch/effort information are compiled for January through

May of each year, and the abundance is measured as ln((catch+1)/effort). Seine catches of fish larger than young-of-the-year (>70-100 mm, depending on month of the year) are removed from the calculation of abundance indices (Figures 5.4 and 5.5). Gill net data from 1.0", 1.25", and 1.5" (2.54, 3.175, and 3.81 cm.) bar mesh panels are used to provide relative abundance indices of mullet prior to harvest by legal saltwater commercial gears (Figure 5.6).

Seine CPUE indices show higher mean catches of young-of-the-year (YOY) from 1996 through 2001 of the seventeen years examined (1987-2003) but the 2002 and 2003 CPUE are consistent with levels prior to 1996 (Figure 5.4). Most of the fluctuations seen in recent years is due to variability in CPUE in the westernmost part of the state (Figure 5.5). As noted elsewhere, no commercial mullet fishery exists in this portion of the state, so unless there is substantial movement between estuaries, this variability in recruitment should not influence the population available for commercial harvest in the areas where the current commercial fishery is concentrated. There appears to be no long term downward trend in YOY indices for the years examined.

Gill net CPUE indices seem to cycle throughout the period examined with relatively lower mean estimates of CPUE after 1998 (Figure 5.6). There is some question however, after reviewing the relatively consistent annual pattern of different mesh sizes, whether the gill net samples actually measure relative abundance or simply measure annual availability to the sampling gear. One would expect to find more annual variation among mesh sizes as fish grew and became increasingly available to the larger mesh size. There does seem to be an annual pattern found between the mesh sizes with the last five years being relatively lower than previous years in the 1 inch and 1.25 inch bar mesh samples.

Estimates of Yield and Spawning Potential

The results of carrying forward the assessment methodology from the 2004 analysis are presented in Table 5.5. These analyses are mainly presented for comparative purposes. As in prior years, the results indicate that if M=0.3, the current estimates of yield are near maximum yield per recruit (about 99 % of maximum), and SPR is about 32%. Levels of M at M=0.4, 0.5, and 0.6 produced SPR estimates of 44%, 55%, and 65%, with YPR of 100%, 95%, and 85% respectively.

The VPA analysis (Table 5.6) produced similar results to the prior assessment. The results of the base case YPR analysis indicate that if M=0.3 (the most conservative value within the range of estimates), the current fishery is operating above $F_{0.1}$ and F_{MAX} with yield of about 98% of maximum, and SPR at about 31%. An M of 0.6 would indicate a much more lightly fished stock with the current fishery operating near $F_{0.1}$, yield being about 83% of maximum, and with SPR being about 65%.

The change in methods of calculating harvest rates in the current assessment changed the estimated parameters slightly. The VPA-based method of calculating fishing mortality resulted in slightly higher estimates of F than the previous method. However it did not change the condition of the stock relative to the conservation standard in any of the cases examined.

The sensitivity analysis conducted with the 2003 age-length key showed little variation from the base case assessment (Table 5.6). The results of these VPA's are only presented for the highest and lowest

estimates of natural mortality. In both cases, the 2003 ALK provided an estimate of SPR 2.5-3% higher than the base case ALK. It should also be noted that use of the 2003 ALK also changed the benchmark yield and SPR estimates, due to changes in age assignments.

The two age-length keys showed substantial variation (Figure 5.5). Some of this variability could be due to variability in cohort strength, the locations from which the samples were taken, gear variability, sample size, or other factors. Though no fish over 8 years old were found in the 2003 samples, that ALK showed higher overall representation of ages 4-7 than the base case ALK did.

There was substantial variation in the length frequency in the sample of the striped mullet that were aged in 2003 when compared to the non-aged sample. Aged mullet tended to be smaller than un-aged mullet, both from statewide samples and from the eastern portion of the state (Figure 5.7). Nearly all of the samples came from the eastern portion of the state, so the influence of the remainder of the state should be minimal. When the 2003 ALK was applied to the overall 2003 fishery-dependent sample of mullet lengths, there was little change in the estimated harvest at age compared to the simple age distribution of the 2003 ALK. On the other hand, there was some variation between the ages estimated by applying the 2003 ALK and the base case ALK to the length frequencies from 2003 (Figure 5.8). At this point, it is impossible to say which analysis does the best portrayal of the harvest at age. The base case ALK has the benefit of a larger sample size, while the 2003 sample is a sub-sample of the fishery in that year, so should have reduced effects from variable cohort strength.

In all of these analyses, assumptions listed in prior sections of this report have a strong influence in the results. If M is actually near or above the upper end of the range considered here then increases in yield per recruit would be possible, and SPR would be above the minimum estimated values. Estimates of potential yield presented here do not account at all for potential extension of the fishery into areas of the state that do not now have a significant fishery. Any substantive change in geographic distribution of the fishery could substantially change the overall harvest levels.

Based on this generalized assessment, for all natural mortality rates examined, if fishing mortality rates continue at the current levels, then striped mullet are not being harvested at a rate that would drive the stock below the target SPR of 30% established by the Louisiana Legislature.

5.7 Research and Data Needs

As with any analysis, the accuracy of the assessment is dependent on the accuracy of the information on which it is based. The present analyses, along with the biological data presented by Mapes *et al.* (1998) identify several areas for research to address.

Estimates of natural mortality used in the present assessment are derived from general literature sources, and show wide variation. This variation reduces the potential of the present assessment to provide a precise prediction of the yield potential of the stock, and also reduces the confidence level of the present estimate of SPR. A more precise estimate of natural mortality, based on Louisiana data, would assist in both of these problems.

Definition of sub-populations based on migratory patterns would help define exploitation rates within different areas of the state. This may help managers develop area-specific management to optimize yield from a given stock, while protecting the stock from over-harvest.

Recruitment mechanisms are poorly defined for the species. Mullet are suspected to spawn beyond the shelf break in the central Gulf of Mexico. No genetically distinct stocks have been identified within the Gulf. However, lack of genetic distinctness does not necessarily mean that stocks are homogeneously mixed by spawning and recruitment mechanisms, only that populations are not so removed from each other that gene structure is identifiably different. Better understanding of recruitment mechanisms, merged with measurement of oceanographic or other driving forces could help in understanding the sub-genetic distinctiveness of mullet populations from different regions of the state or the Gulf of Mexico.

Factors that influence the year-class strength of mullet are essentially unknown. Investigation of these factors could help better define causes of inter-annual variation in abundance, and perhaps also the underlying stock-recruit relationships in the species.

The relationship between wetlands losses or modifications and the continuation of fishery production within the state has been discussed by many authors. However, this relationship is likely to be different for any of a suite of different species. Understanding of this relationship for mullet should be an ongoing priority.

The age-length key used in the current assessment should be updated with adequate fishery-dependent age data to accurately characterize the current age structure of the commercial harvest on an ongoing, consistent basis. The distribution of fishery-dependent samples should be evaluated to ensure that those distributions accurately reflect the fishery in terms of geographic distribution, seasonality, and other descriptive parameters. Analyses to estimate adequate sample size for a given level of precision also need to be developed.

Indices of harvest effort and stock recruitment or abundance should be evaluated for possible incorporation into future stock assessments.

In the presence of changing regulations, fishery-dependent information is not a reliable source of the data necessary to assess the status of a fish stock. However, such data is necessary to measure the effects of fishing on that stock. Consistent fishery-dependent and fishery- independent data sources, in a comprehensive monitoring plan, are essential to understanding the status of fishery stocks, and to identifying causes of changes in stock abundance. Present programs should be assessed for adequacy with respect to their ability to evaluate stock status, and modified or enhanced to optimize their capabilities.

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Table 5.1. Annual commercial and recreational harvest of mullet from Louisiana waters, expressed in pounds. Commercial harvest values from dealer landings reports, recreational harvest from NMFS MRFSS estimates of fish landed plus those discarded dead.

	Commercial Harvest (lbs.)	Recreational Harvest (lbs.)	Total Harvest (lbs.)	% Commercial
1981	3,051,461	564	3,052,025	99.98%
1982	1,533,452	16,546	1,549,998	98.93%
1983	1,886,654	0	1,886,654	100.00%
1984	3,157,215	2,793	3,160,008	99.91%
1985	579,297	7,504	586,801	98.72%
1986	2,277,713	52,921	2,330,634	97.73%
1987	1,439,425	0	1,439,425	100.00%
1988	2,367,106	105,876	2,472,982	95.72%
1989	2,413,768	75,287	2,489,055	96.98%
1990	2,645,927	296,111	2,942,038	89.94%
1991	3,563,137	26,303	3,589,440	99.27%
1992	6,214,532	121,273	6,335,805	98.09%
1993	1,026,497	185,012	11,211,509	98.35%
1994	2,560,261	97,509	12,657,770	99.23%
1995	4,545,610	89,626	14,635,236	99.39%
1996	8,658,881	216,838	8,875,719	97.56%
1997	8,083,201	129,917	8,213,118	98.42%
1998	6,252,317	15,459	6,267,776	99.75%
1999	8,954,299	48,766	9,003,065	99.46%
2000	7,252,017	88,202	7,340,219	98.80%
2001	4,260,650	115,618	4,376,268	97.36%
2002	2,555,181	58,901	2,614,082	97.75%
2003	4,516,399	3,309	4,519,708	99.93%

Table 5.2. Lengths of female striped mullet measured from the fishery by year.

Year	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Length (in)										
10		3	1							
11	36	15	12	3						13
12	122	66	174	77				3	31	72
13	128	90	345	282	1	2		35	47	154
14	140	124	226	241	7	19		52	63	179
15	190	180	149	218	43	40		36	38	184
16	146	239	123	301	39	90	10	39	9	120
17	42	283	122	235	52	136	16	39	4	34
18	8	218	116	139	49	152	38	60		6
19	1	170	86	53	51	196	44	33		
20		29	40	18	14	84	19	12		
21		7	13	13		17	6			
22		1	5			8	2			
Total female fish measured	813	1425	1412	1580	256	744	135	309	192	762

Table 5.3. Base case age-length key for female striped mullet. Data from female mullet aged by Dr. Bruce Thompson (unpubl.).

	Age										
	1	2	3	4	5	6	7	8	9	10	Total
Total Length (in)											
10	18	67	7	1			1				94
11	2	76	52	12	3						145
12	9	105	153	87	18	5	1				378
13	12	110	251	195	79	22	2	3			674
14	12	74	200	225	131	34	9	3			688
15	4	46	137	151	89	41	10	9	1	1	489
16	1	49	116	122	67	26	8	1	1		391
17		30	100	111	55	18	4	2	1		321
18	1	6	47	71	34	11	5	1	1		177
19	1	2	16	47	32	7	4				109
20		1	3	15	23	14	6				62
21			1	3	4	4	2		2	1	17
22				2	3	4	5	1			15
23			1		3	2	3				9
24					5	3	3				11
	60	566	1084	1042	546	191	63	20	6	2	3580

Table 5.4. 2003 Age-length key for fishery-dependent female mullet from 2003 fishery, used for sensitivity analysis.

Ages	1	2	3	4	5	6	7	8	9	10	Total
TL (in)											
10	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0
12	0	1	1	1	0	0	0	0	0	0	3
13	0	12	3	5	5	1	0	0	0	0	26
14	0	7	19	18	7	3	0	0	0	0	54
15	0	5	34	22	4	1	0	0	0	0	66
16	0	2	32	34	20	3	0	0	0	0	91
17	0	3	16	35	31	6	0	1	0	0	92
18	0	1	6	8	22	6	7	1	0	0	51
19	0	1	4	5	11	5	3	0	0	0	29
20	0	0	0	1	1	1	2	0	0	0	5
21	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0
Total	0	32	115	129	101	26	12	2	0	0	417

Table 5.5 - Results of Yield per Recruit and SPR Analysis for Mullet - previous assessment methodology

M=0.3	F - Ratio	YPR	SPR	%SPR	%YPR	
F-max =	0.5850	85.6159	439,818	38.85%	100.00%	Benchmarks
F0.1 =	0.3053	78.9245	601,324	53.11%	92.18%	
F20% =	2.2571	68.5867	226,433	20.00%	80.11%	
F30% =	0.9735	82.1891	339,650	30.00%	96.00%	
1997 =	0.8039	83.6759	351,435	31.04%	97.73%	Estimate
1998 =	0.8527	83.6619	363,137	32.07%	97.72%	
1999 =	0.6764	85.3078	408,540	36.08%	99.64%	
2000 =	0.5976	85.6091	435,118	38.43%	99.99%	
2001 =	0.8913	83.2078	355,092	31.36%	97.19%	
2002 =	0.7581	84.6615	385,510	34.05%	98.89%	
2003 =	**0.8129**	**83.9309**	**360,868**	**31.87%**	**98.84%**	

M=0.4	F - Ratio	YPR	SPR	%SPR	%YPR	
F-max =	0.8101	50.0885	250,745	41.58%	100.00%	Benchmarks
F0.1 =	0.3859	45.6088	339,417	56.29%	91.06%	
F20% =	4.6013	39.3975	120,602	20.00%	78.66%	
F30% =	1.7469	46.7168	180,903	30.00%	93.27%	
1997 =	0.6240	49.5523	279,996	46.43%	98.93%	Estimate
1998 =	0.7527	50.0475	258,704	42.90%	99.92%	
1999 =	0.5764	49.1670	289,377	47.99%	98.16%	
2000 =	0.4976	48.1690	307,309	50.96%	96.17%	
2001 =	0.7913	50.0844	253,262	42.00%	99.99%	
2002 =	0.6581	49.7514	273,826	45.41%	99.33%	
2003 =	**0.7129**	**49.9629**	**264,737**	**43.90%**	**99.75%**	

M=0.5	F - Ratio	YPR	SPR	%SPR	%YPR	
F-max =	1.1278	30.6657	151,911	44.19%	100.00%	Benchmarks
F0.1 =	0.4801	27.5558	205,191	59.69%	89.86%	
F20% =	8.7085	24.2838	68,757	20.00%	79.19%	
F30% =	3.1856	28.2872	103,136	30.00%	92.24%	
1997 =	0.5240	28.1728	199,371	57.99%	91.87%	Estimate
1998 =	0.6527	29.4285	184,977	53.81%	95.97%	
1999 =	0.4764	27.4983	205,706	59.84%	89.67%	
2000 =	0.3976	26.0199	217,807	63.36%	84.85%	
2001 =	0.6913	29.6840	181,294	52.73%	96.80%	
2002 =	0.5581	28.5771	195,203	56.78%	93.19%	
2003 =	**0.6129**	**29.1132**	**189,058**	**54.99%**	**94.94%**	

M=0.6	F - Ratio	YPR	SPR	%SPR	%YPR	
F-max =	1.6698	19.5110	94,370	45.56%	100.00%	Benchmarks
F0.1 =	0.5889	17.2172	130,425	62.97%	88.24%	
F20% =	14.9721	15.6350	41,424	20.00%	80.13%	
F30% =	5.5549	18.3016	62,137	30.00%	93.80%	
1997 =	0.4240	15.4430	142,500	68.80%	79.15%	Estimate
1998 =	0.5527	16.9091	132,766	64.10%	86.66%	
1999 =	0.3764	14.7098	146,779	70.87%	75.39%	
2000 =	0.2976	13.1726	154,948	74.81%	67.51%	
2001 =	0.5913	17.2367	130,273	62.90%	88.34%	
2002 =	0.4581	15.8970	139,682	67.44%	81.48%	
2003 =	**0.5129**	**16.5229**	**135,527**	**65.43%**	**84.69%**	

Table 5.6 - Results of Yield per Recruit and SPR Analysis for Mullet - new assessment methodology

M=0.3	Base case	F - Ratio	YPR	SPR	%SPR	%YPR	
	F-max =	0.6065	85.2679	430,495	38.02%	100.00%	Benchmarks
	F0.1 =	0.2864	77.5541	614,604	54.29%	90.95%	
	F20% =	1.9948	71.9377	226,433	20.00%	84.37%	
	F30% =	0.9499	82.8722	339,651	30.00%	97.19%	
	Base ALK	0.8709	83.6770	355,862	31.43%	98.13%	Estimate

M=0.3 Sensitivity run							
	F-max =	0.6572	84.8767	442,669	39.10%	100.00%	Benchmarks
	F0.1 =	0.2978	76.9471	629,540	55.60%	90.66%	
	F20% =	2.4965	71.4911	226,433	20.00%	84.23%	
	F30% =	1.1272	81.9872	339,650	30.00%	96.60%	
	2003 ALK	0.8542	84.1380	389,764	34.43%	99.13%	Estimate

M=0.4	Base case	F - Ratio	YPR	SPR	%SPR	%YPR	
	F-max =	0.8991	50.2976	240,495	39.88%	100.00%	Benchmarks
	F0.1 =	0.3848	45.0976	342,361	56.78%	89.66%	
	F20% =	3.8059	41.7098	120,602	20.00%	82.93%	
	F30% =	1.6638	48.2016	180,902	30.00%	95.83%	
	Base ALK	0.7590	50.1016	259,294	43.00%	99.61%	Estimate

M=0.5	Base case	F - Ratio	YPR	SPR	%SPR	%YPR	
	F-max =	1.3660	31.0751	143,162	41.64%	100.00%	Benchmarks
	F0.1 =	0.4956	27.2691	206,815	60.16%	87.75%	
	F20% =	7.2198	25.7465	68,757	20.00%	82.85%	
	F30% =	3.0098	29.5511	103,135	30.00%	95.10%	
	Base ALK	0.6680	29.2197	187,138	54.43%	94.03%	Estimate

M=0.6	Base case	F - Ratio	YPR	SPR	%SPR	%YPR	
	F-max =	2.2283	19.9445	87,725	42.35%	100.00%	Benchmarks
	F0.1 =	0.6335	17.0148	131,635	63.55%	85.31%	
	F20% =	13.2334	16.6554	41,424	20.00%	83.51%	
	F30% =	5.4212	19.0268	62,136	30.00%	95.40%	
	Base ALK	0.5808	16.5761	134,800	65.08%	83.11%	Estimate

M=0.6 Sensitivity run							
	F-max =	3.1748	19.8147	84,775	40.93%	100.00%	Benchmarks
	F0.1 =	0.6486	16.2198	136,312	65.81%	81.86%	
	F20% =	19.2323	15.7602	41,424	20.00%	79.54%	
	F30% =	7.2967	18.7527	62,136	30.00%	94.64%	
	2003 ALK	0.5833	15.7044	139,889	67.54%	79.26%	Estimate

Figure 5.1 Commercial harvest of mullet in Louisiana, 1970-2003. Source: NMFS landing statistics.

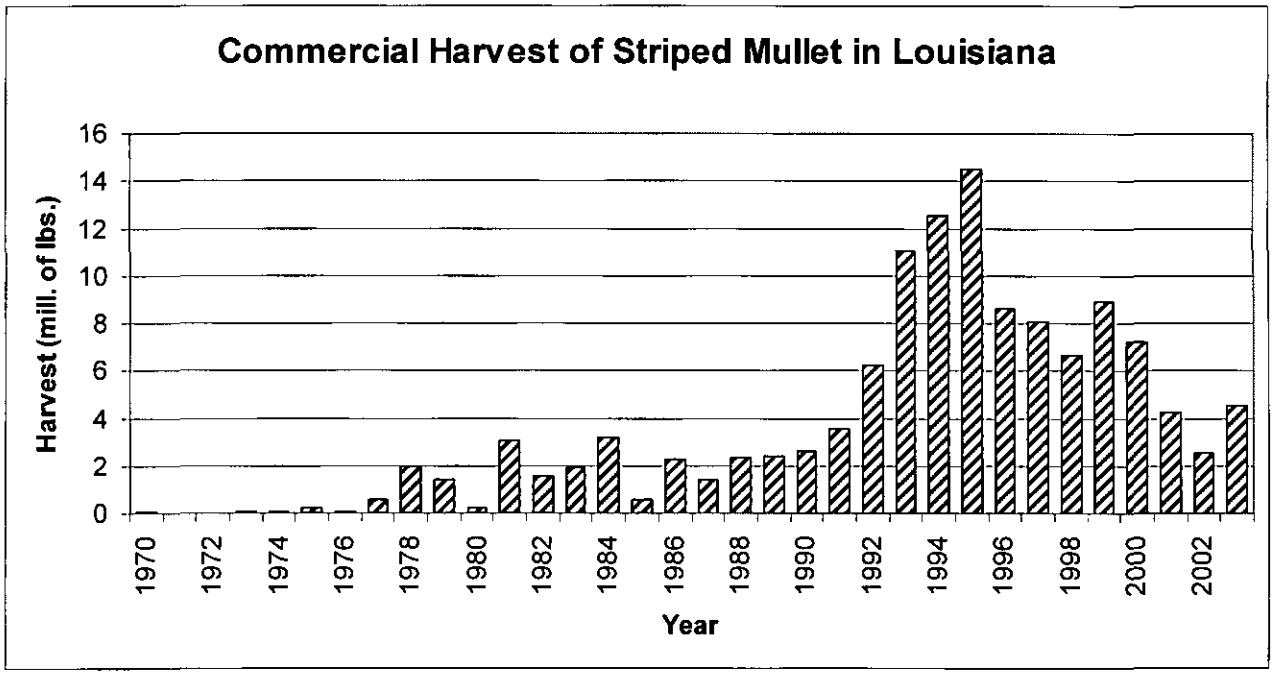


Figure 5.2. Base case estimates of F at age for Louisiana striped mullet in 2003 from VPA using various terminal F's, for M=0.3 to M=0.6 with standard ALK. Summary graph at bottom does not include data for terminal age of VPA, and is the average of the F at age for $F_{terminal}$=0.4 to 1.0 for each M.

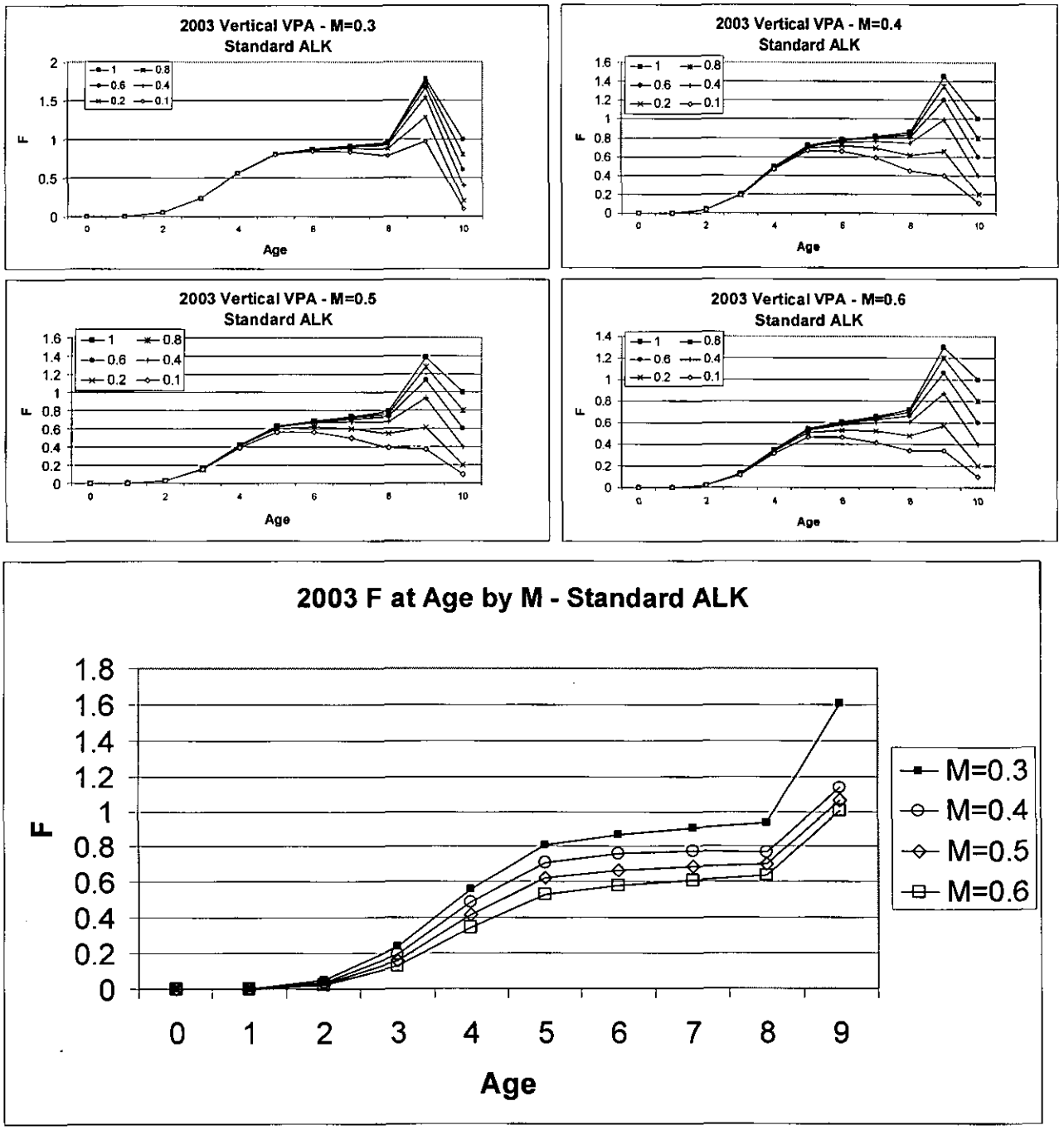


Figure 5.3. Sensitivity analysis estimates of F at age for Louisiana striped mullet in 2003 from VPA using various terminal F's, for M=0.3 to M=0.6 with ALK using 2003 age information only. Summary graph at bottom does not include data for terminal age of VPA, and is the average of the F at age for $F_{terminal}$=0.4 to 1.0 for each M.

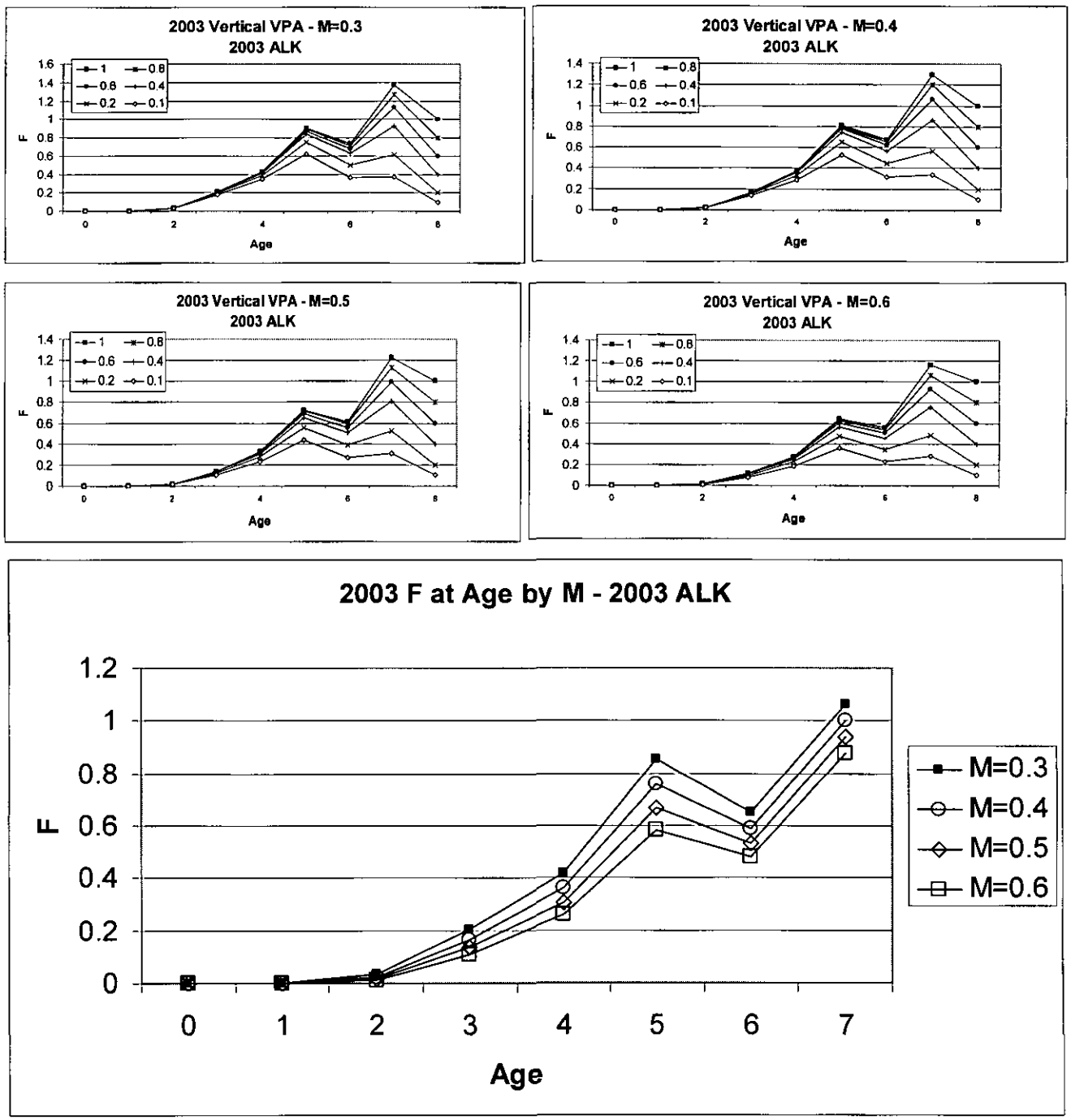


Figure 5.4. Natural log c/e of fishery-independent seine samples for striped mullet, January through May, young of the year only.

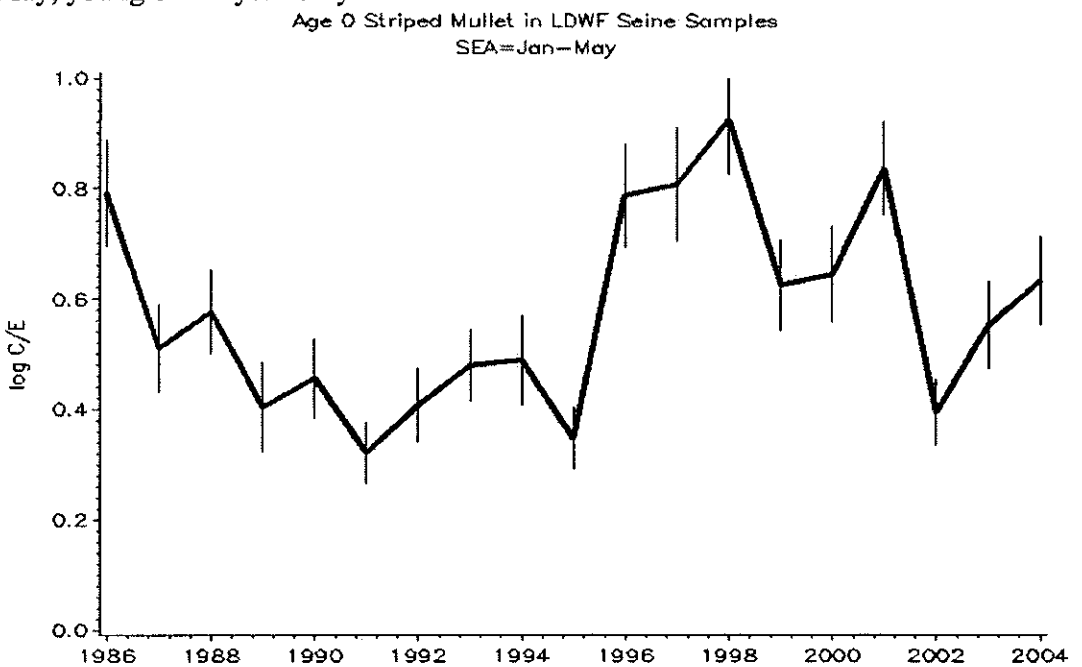


Figure 5.5. Natural Log of Catch per sample in fishery-independent seine samples in zones. 1=East of Mississippi River, 2= from Mississippi to Atchafalaya Rivers, 3= Atchafalaya River to Texas

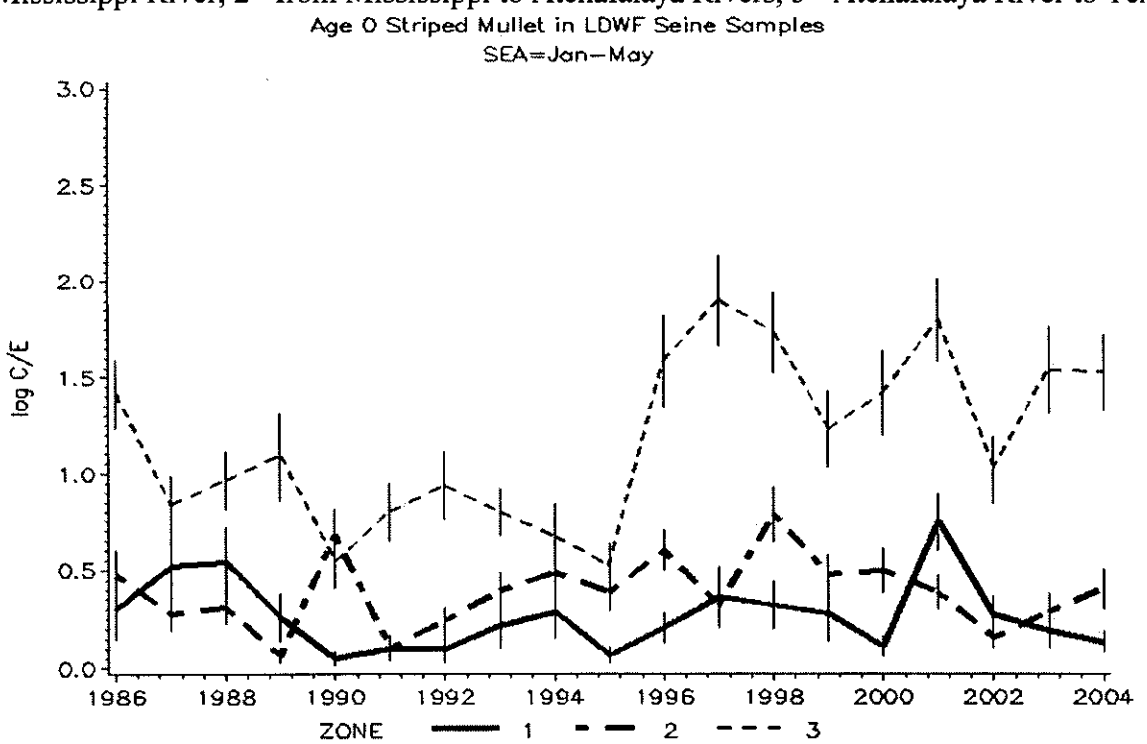


Figure 5.6. Natural log of catch per sample in fishery-independent LDWF gill net samples, January-May of each year

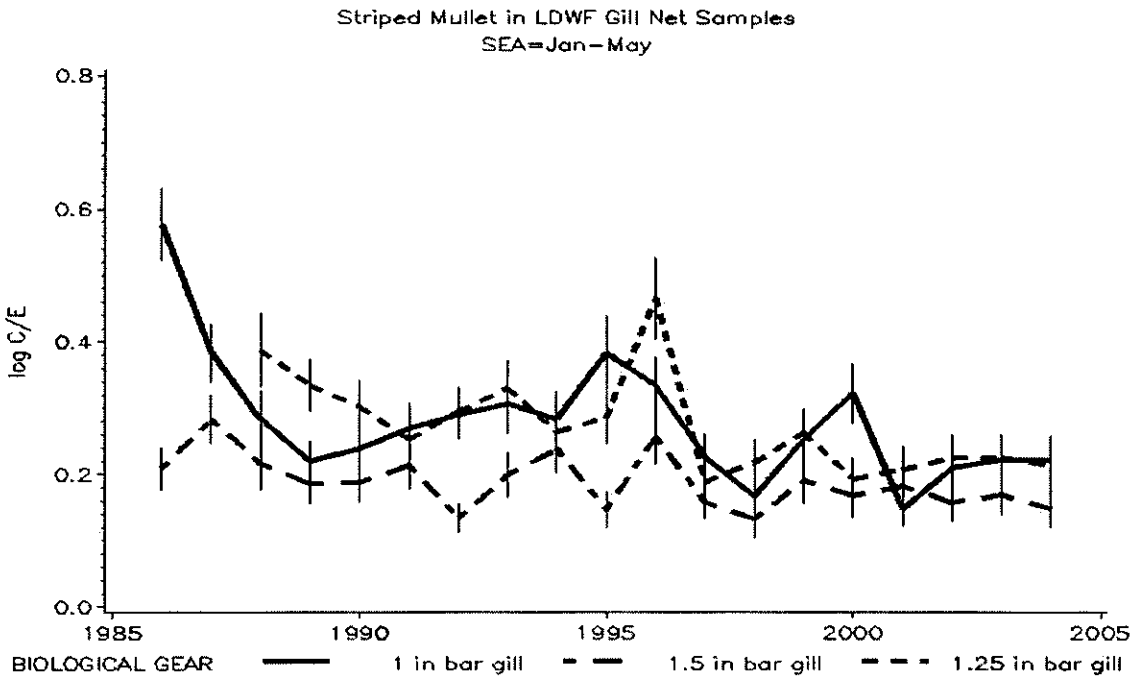


Figure 5.7. Comparison of the lengths of female striped mullet sampled from the fishery from different portions of the state. Also, the relative proportion at size for the specimens that were aged.

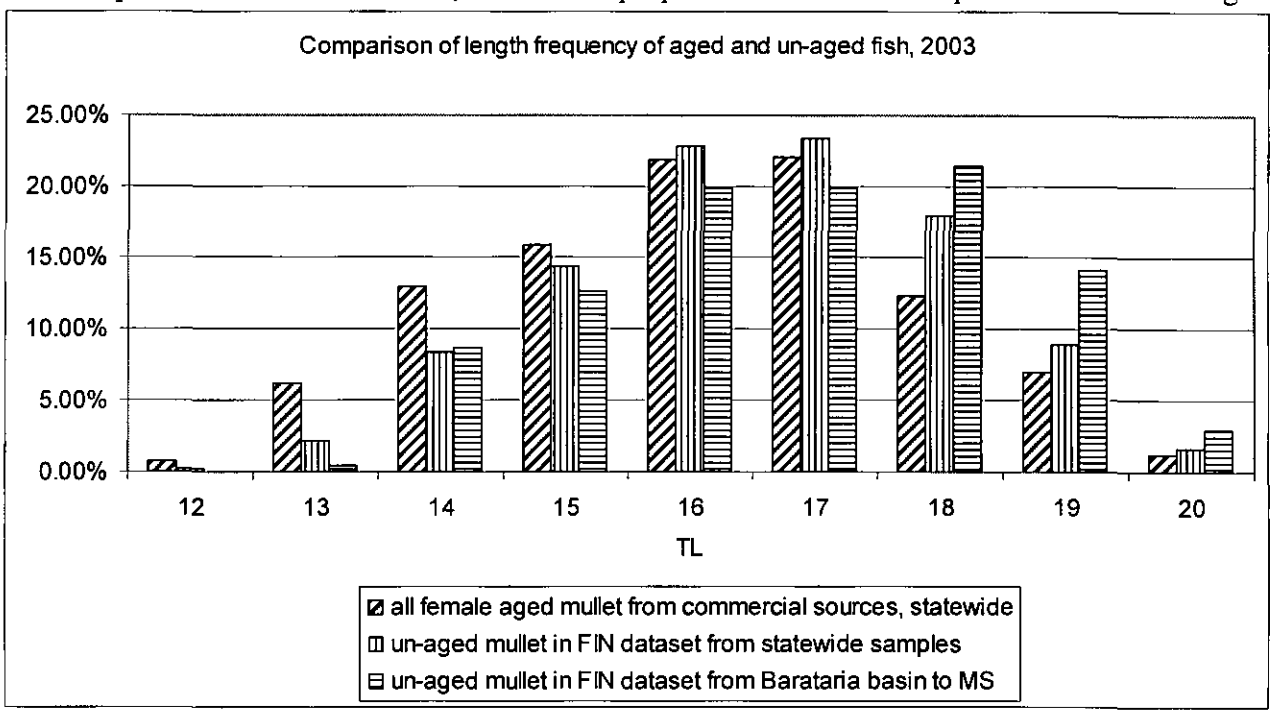
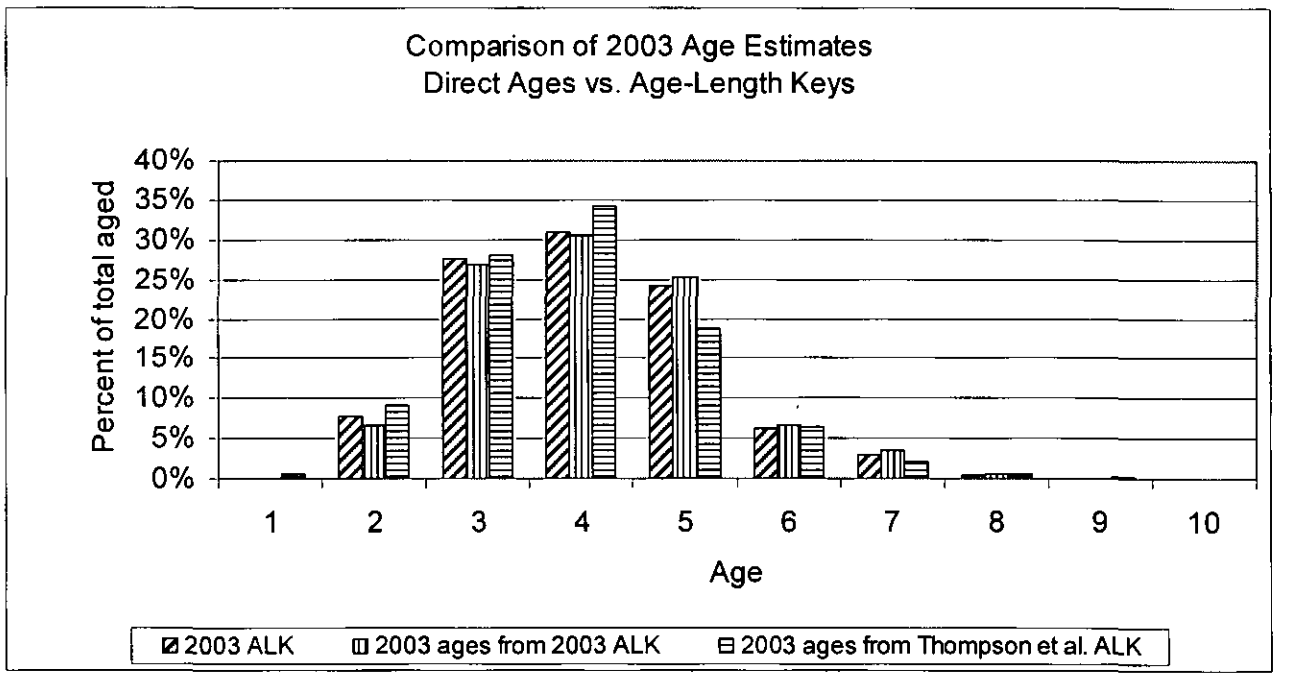


Figure 5.8. Comparison of the age structure estimates from the 2003 samples (2003), the application of the 2003 ALK to the 2003 length samples, and the application of the base case ALK to the 2003 length samples.



SOUTHERN FLOUNDER
SUMMARY OF CHANGES FROM 2004 ASSESSMENT

This summary is intended to provide a quick reference of substantive changes in methods or corrections in this year's assessment from the 2004 assessment conducted for southern flounder.

- A sex-ratio-at-size function was added to the estimates of harvest at size to better describe the harvest of female flounder.

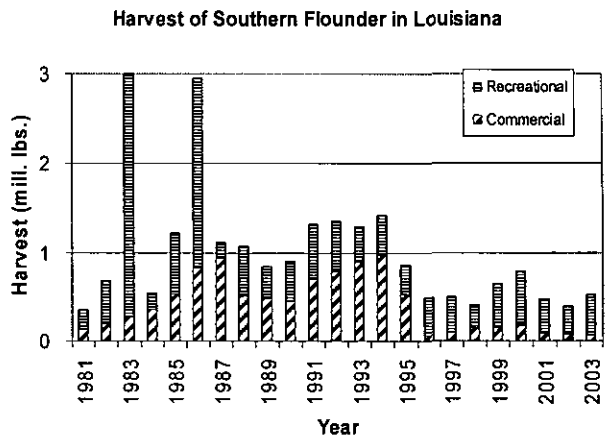
- The age-length key was modified to include additional age data added to the matrix from ongoing age studies, and was limited to fishery-dependent samples.

- Disappearance rates were recalculated based on ages from the modified age-length key. Estimates from those calculations were compared to results from equilibrium virtual population analysis based on the most recent years of information.

- Indices of abundance were updated.

2005 DOCUMENT HIGHLIGHTS

- The 2003 combined commercial and recreational harvest of 518,032 pounds was about 92% of the average of all years from 1995 through 2003. Regulations implemented between 1995 and 1997 have caused significant reductions in commercial harvest.



- The conservation standard for southern flounder is 30% spawning potential ratio (SPR). The results of yield per recruit analysis based on the disappearance rate calculations indicate that if the natural mortality rate (M) equals 0.5 (the value that provides the lowest allowable harvest within the conservation standard), the fishery in the years assessed (1997 - 2003) was operating between $F_{0.1}$ and F_{MAX}, with yields of 96% to 100% of maximum and spawning potential ratio (SPR) at 16% to 30%. An M of 0.8 (the highest value within the range examined) would produce YPR of 60% to 71% of maximum with SPR at 44% to 52%. The results of the YPR analyses based on VPA results were very similar to those based on disappearance rates.

- It should be noted that the methods used in this assessment to determine the status of the stock, catch curve and virtual population analyses, are not immediately sensitive to changes in regulations. Southern flounder enter the fishery at age 0 and are fully recruited by age 2. It takes several years of consistent regulations after they are imposed before disappearance rates would accurately measure the impact of those regulations, since the methods rely on the

relative abundance of the age-classes measured. In the case of southern flounder it would take 3 years of consistent regulations assuming selectivities of age 2 and older is 100%.

- As a result of acquiring several years of commercial trip ticket data, and collecting recreational fishery statistics data, the department was able to begin a program to representatively sample fishery dependent otoliths in 2002. The program uses trip ticket data and recreational survey data to weight sampling sites so that otolith collections reflect harvest from the fisheries for the species of interest. It is expected that this method of otolith sampling will improve stock assessments by providing more accurate annual catch-at-age data.

SOUTHERN FLOUNDER
5.0 STOCK ASSESSMENT

This assessment uses yield-per-recruit (YPR), Spawning Potential Ratio (SPR) and catch curve analyses to estimate the impact of fishing pressure on potential yield and the spawning potential of the southern flounder stock in Louisiana waters. Estimates derived from YPR and SPR are based on information regarding the growth rate and spawning potential of the fish, and on estimates of the natural mortality rate (M) and fishing mortality rate (F) on the stock. Catch-curve analysis estimates disappearance rates (Z') from the fishery based on the relative abundance of each age class in the harvest. The results from this assessment provide a generalized approach towards estimating the impact of fishing on the spawning potential and potential yield of the fish stock. The spawning biomass of females is assumed to be the factor limiting the spawning potential of the stock; therefore, where possible, only data on female southern flounder are used. Yield-per-recruit and SPR analysis, as with many other generalized assessments, should be used only as a guide until a more comprehensive assessment can be conducted.

In developing a stock assessment, the unit stock must be defined. While a unit stock is often represented by that portion of the population which is genetically similar, for our purpose, the most applicable definition seems to be one which considers the unit stock as that portion of the population which is either dependent on Louisiana waters, or which is available to Louisiana fishermen.

The total harvest of southern flounder from Louisiana waters was obtained from National Marine Fisheries Service (NMFS) commercial landings datasets, NMFS Marine Recreational Fishery Statistics Survey (MRFSS) recreational datasets, and Louisiana Department of Wildlife and Fisheries (LDWF) commercial landings data (Table 5.1, Figure 5.1).

5.1 Growth

Growth curves in terms of length and weight were used in order to calculate yield and spawning potential estimates. Egg production was assumed to be directly related to the weight of the mature female biomass.

Von Bertalanffy growth parameters were calculated for female southern flounder in Louisiana by using aged samples collected by Thompson (B. Thompson, Coastal Fisheries Institute, Louisiana State University, unpublished data) combined with juveniles assigned to age 0 (< 100 mm total length) by length frequency analysis from LDWF fishery-independent trawl samples. From the combined data, a three-parameter von Bertalanffy growth equation was estimated using nonlinear approximation (SAS, 1987). The equation is as follows:

$$\text{Female } L_t = 509(1-e^{-0.8846(t-0.0954)})$$

where, L_t = length at age t.

A length-weight regression for female southern flounder was derived using fish collected in Louisiana by Thompson (unpublished data) and LDWF fishery-independent surveys. The length-weight regression used is as follows:

$$\log W = 3.18369 * \log L - 5.386116$$

where, W = body weight in grams, and L = total length in millimeters

An age-length key (ALK) was developed from the otolith aging of female fish from fishery-dependent sampling provided by Thompson (unpublished data) and LDWF's ongoing fishery-dependent sampling programs. (Table 5.2). Data from both programs were combined to develop a single age-length key (ALK). Only female southern flounder sampled from recreational or commercial fisheries were included in the ALK (fishery-independent data was excluded to reduce concerns of variable size at age between fishery-dependent and fishery-independent samples). This new age-length key has different proportions of fish at age, especially for age classes beyond age 3 compared to the prior ALK. This change in ALK influenced the estimates of catch at age.

An annual estimate of catch-at-age was developed by applying the single ALK to the years where length frequency data for the commercial and recreational fishery were available (1994 – 2003, Table 5.3). Length frequency data were obtained from the Trip Interview Program (TIP) for the commercial fishery, and from MRFSS for the recreational fishery. Commercial length information was not available for the years 1997-2001, so cumulative length frequency information from 1994-96 was utilized for that time period.

There is a striking difference in growth between sexes in flounder, with nearly all large flounder being female. Neither TIP nor MRFSS systematically collected information on sex of the fish sampled. In order to reduce bias from the variable proportion of males at size, we developed a length-based sex ratio to estimate total numbers of females harvested from the estimate of total harvest at a length interval. From 1996-2002, sex information had been collected on 522 southern flounder along with length and age information. These fish were used to generate a function of sex ratio at size. For each inch increment in total length, the ratio of males to females was calculated, and an asymptotic function was estimated based on those ratios:

$$\% \text{ Females} = 1 - e^{(-0.3*(TL-4.))}$$

The proportion of the population that is female at a given size was estimated from the function and that estimate is compared to the actual proportions at size from the original sample in Figure 5.2. The function was used to estimate the number of female flounder harvested at each length interval, based on the estimate of the total number harvested.

5.2 Natural Mortality

Natural mortality is one part of total mortality (Z) and can be defined as the mortality due to all causes other than fishing. These include predation, disease, spawning stress, starvation, and old age. Typically, natural mortality is estimated as it is difficult to directly measure, especially on exploited fish stocks where natural mortality and fishing mortality occur simultaneously. No direct measure of natural mortality for southern flounder is available; therefore, several established estimation procedures were used to derive an estimate. The procedures presented below are taken from Sparre and Venema (1992).

Pauly (1980) provides a method of estimating natural mortality from a set of parameters including the asymptotic length and growth rate of the fish, and the average water temperature of the environment. The growth parameters from the von Bertalanffy growth equation described in Section 5.1 and the mean annual water temperature, derived from readings from a set of four data collection platforms located in the Barataria Bay system, were used in the calculation. Mean water temperature was 22.7°C for the period 1989 - 1992 (pers. comm., M. Kasprzak, 4/13/92). These values were incorporated into the length-based function of Pauly (1980):

$$\ln(M) = -0.0152 - 0.279 * \ln(L_\infty) + 0.6543 * \ln(K) + 0.463 * \ln(T).$$

where, ln(M) = natural log of natural mortality, $\ln(L_\infty)$ = natural log of the asymptotic length, ln(K) = natural log of the growth coefficient and ln(T) = natural log of the mean annual water temperature in degrees Celsius.

Use of Louisiana data on growth and water temperature applied to Pauly's function results in a natural mortality estimate of M=0.68.

Alagaraja (1984) and Hoenig (1983) provide methods of estimating M based on the fish's lifespan or longevity with the assumption that M=Z. Longevity is also difficult to determine for exploited fish stocks, since the age distribution is usually truncated by fishing, but these methods are as useful as any in providing provisional estimates of natural mortality. The functions described by Alagaraja (1984) are:

$$M1\% = -\ln(0.01)/Tm$$
$$M0.1\% = -\ln(0.001)/Tm$$

where, M1% and M0.1% are the natural mortality rates corresponding to 99% and 99.9% mortality, respectively, given a fish's lifespan (Tm) in years. Female southern flounder in Louisiana have been aged to 8 years old (Fischer and Thompson, 2004). In the LDWF fishery-dependent age information, no flounder were aged over 6 years old (Table 5.2). If it is assumed that 99% or 99.9% of the fish would die of natural causes by age 8 then corresponding natural mortality rates for M1% and M0.1% would be 0.58 and 0.86 respectively.

The function described by Hoenig(1983) is :

$$\ln(Z) = 1.46 - 1.01 * \ln(Tm)$$

where, when M=Z, longevity (Tm) can be defined as the maximum survival age. If we assume that the maximum age of southern flounder has been truncated due to fishing from 9 to 7 years, the resulting estimate of natural mortality, given Tm=7, would be 0.60. However, if our assumption is incorrect and the maximum age is 9 years then the estimate of natural mortality would be 0.47.

Another method of estimating M is described by Rikhter and Efanov (1976) and utilizes population age at sexual maturity. The function is:

$$M = 1.521/(Tm50\%^{0.720}) - 0.155$$

where, Tm50% is the age at which 50% of the population is mature.

Age 1 is assumed to be the age at 50% maturity, based on the length at sexual maturity found by several researchers (Adkins et al. 1996), and results in an M of 1.37. However, if 50% maturity occurs at age 2 rather than age 1, the estimate of natural mortality would be 0.77.

In summary, the estimated rates of natural mortality for southern flounder in Louisiana using a variety of estimation procedures are as follows:

Pauly (1980)	0.68
Alagaraja (1984)	0.58 and 0.86
Hoenig (1983)	
1) Longevity 9 years	0.47
2) Longevity 7 years	0.60
Rikhter and Efanov (1976)	
1) 50% maturity age 1	1.37
2) 50% maturity age 2	0.77

5.3 Disappearance Rates and Fishing Mortality

The disappearance rate (Z') from the fishery is an estimate of total mortality (Z). It is composed of natural mortality (M) plus fishing mortality (F) plus some unknown rate of decreasing availability of the fish to the fishery. If the unknown rate of availability is small or nonexistent, then the disappearance rate will be a reasonable estimate of total mortality. However, if a large portion of the disappearance rate is due to fish not being available to the fishery, then assuming Z'=Z will overestimate the impact of fishing.

In prior assessments, calculated disappearance rates were used to evaluate the condition of the stock. In the current assessment, we continue to use those methods, and compare those results to calculations from a virtual population assessment (VPA). For both sets of calculations, we used the sex ratio calculations described earlier to remove the male portion of the harvest from the estimates

of harvest at size. Therefore, the calculations of disappearance rate and fishing mortality should be considered to apply only to the female portion of the population.

To calculate disappearance rates, we regressed the natural log of the female catch-at-age, beginning with the age at full recruitment to the fishery. This method assumes that recruitment is constant and the fishery is in equilibrium. A range of natural mortality rates were used in the assessment. After reviewing estimates of M in Section 5.2, we chose not to assume that any method of estimating M was better than another, but rather to present results for a range of estimates. The range of M was from 0.47 - 1.37. We chose to use an M of 0.5 - 0.8 that encompass most of the estimates. Disappearance rates were calculated from the combined commercial and recreational catch-at-age data by year for 1997 - 2003.

Female catch-at-age from the fishery for the average of the years 2000-2003 (Table 5.4) was used to derive age-specific selectivities to be used in yield-per-recruit analysis, using the method of Sparre and Venema (1992). This method uses a linearized catch curve to determine the selectivity of fish not yet fully recruited to the fishery. The ratio of the observed catches to the expected catches at each age is the probability of capture or selectivity of the fishery at age. Selectivities are then regressed in the equation:

$$\ln (1 / S_t - 1) = T1 - T2 * t$$

where, S_t = the selectivity at age t, and T1 and T2 are constants corresponding to the intercept and slope of the regression. To develop theoretical or estimated selectivities at age, the following equation is used:

$$S_t \text{ (estimate)} = 1 / (1 + \exp (T1 - T2 * t)$$

Selectivities for ages up to full age-at-recruitment were used to describe the relative fishing mortality to that point; for age at full recruitment and older, selectivities are assumed to be 1, or 100% selected. Selectivities used in this assessment are as follows:

age 0 = 0.01312
age 1 = 0.5780
ages 2 and older = 1.

For M=0.5, the estimated harvest rates (F) ranged from 0.97 to 2.24, with an average of the last three years being 1.07 (Table 5.4). For M=0.8, the estimated F ranged from 0.67 to 1.94, with an average of 0.771 for the years 2001-2003.

In the current assessment, the same estimates of female harvest at age used in the previous analysis were also evaluated using a VPA (Jones, 1984) to determine age-specific mortality rates. We used the Solver tool in MS © Excel to iteratively calculate B, such that Q(t) = B(t) by varying F. The estimation procedure was constrained to F=>0.00001, precision of the solution set to 0.000001, convergence set to 0.0001, de-selecting the linear models option of Solver, using the quadratic estimation procedure, central derivatives, and the quasi-Newton search methods. This process was semi-automated through development of a macro to step through the annual estimation process. A range of terminal F was input manually, from 0.1 to 1.0.

This analysis was run for the years 2001-03 and for an average of the catch at age over those years. All estimated ages were used in the VPA analysis; no "plus" groups were used. The results of this analysis were used to derive age-specific fishing mortality rates to be used in spawning potential calculations and yield-per-recruit analysis.

Examination of the estimates of F at age from various terminal F's showed consistent patterns of selectivity across the range of terminal F's used for each year of input data (Figure 5.3). Highest estimates of F were found for age 2 and 3 flounder, with a substantial reduction in F for older fish. Another characteristic noted in the analysis was the relatively slow convergence of estimated F at age for younger fish, over the range of F considered.

5.4 Yield per Recruit

Yield-per-recruit (YPR) and spawning potential ratio (SPR) analyses provide basic information on fish stock dynamics by estimating the impact of mortality on yield and the spawning potential of the stock. The results can be examined as to the sensitivity of natural and fishing mortality rates on yield and spawning potential.

In general, use of YPR analysis requires:

1) information on natural and fishing mortality rates,
2) knowledge of the growth parameters of the fish.

In previous assessments, and in the estimates based on disappearance rates in the current assessment, the yield per recruit (YPR) analysis included several assumptions. A fish was assumed to consistently recruit to any given fishery at a given age; that is, selectivity by age did not change over time. Partial recruitment of fish was estimated from the relative abundance of age 0 and 1 fish in the harvest samples compared to age 2 and over fish, which are considered fully recruited. Once the fish are fully recruited to the fishery, fishing pressure was assumed to be at a constant rate. The YPR analysis did not take into account any variation in exploitation rates or other factors which may affect the results.

The growth parameters described in Section 5.1, sexual maturity described in Section 5.2 and the age-specific selectivities described in Section 5.3 were incorporated into the yield-per-recruit and spawning potential analysis. Fecundity estimates were not available, therefore; mean weight at age was used in the estimation of spawning potential. A range of natural mortality rate inputs, from M=0.5 to M=0.8 by 0.1, were used in the analysis because they are on the lower end of the range of estimates. Lower estimates of M will provide higher estimates of fishing mortality in the analysis, allow the least amount of harvest from the stock, thus would provide the most conservative results. These rates are also used to describe the sensitivity of M on yield and spawning potential. The results are presented in Table 5.5, which contains estimates of F_{MAX} (fishing mortality rate that produces maximum yield), $F_{0.1}$ (fishing mortality rate representing 10% of the slope at the origin of a yield-per-recruit curve), $F_{20\%SPR}$ (fishing mortality that produces 20% SPR), $F_{30\%SPR}$ (fishing mortality that produces 30% SPR), and annual estimates of F from the disappearance rates calculated

in Section 5.3. Selectivity patterns of the fishery are recalculated with each additional year of data. Therefore, the results of this analysis, reflected in Table 5.5, could change each year depending on changes in selectivity patterns in the fishery.

In the current analysis, the F at age was also incorporated into the YPR analysis based on the results of a VPA for that year. Southern flounder were typically estimated to have highest values of F as ages 2 or 3, with lower F for estimated for older fish (Figure 5.3). Yield analyses are presented for the years 2001-2003. There was concern that the low estimated numbers of older fish harvested in some years might strongly influence the outcome of the analysis (estimates are provided in Table 5.4). Therefore, a comparison analysis of average catch-at-age for the last three years was examined, to reduce the potential for influence from a few samples.

Fishing mortality rates at age were selected as the average of the F at age from the $F_{terminal}$=0.2 to $F_{terminal}$=0.8. These rates were used in the analysis because they were near or above the F at age=5 for the selected $F_{terminal}$, and did not converge rapidly toward any F (Figure 5.3). Those age-specific mortality rates were applied to a yield per recruit model, using the von Bertalanffy parameters described in Section 5.1. Selectivities at age were assigned based on the 3-year average VPA for each value of M.

The yield analysis was carried out to age 8, but no fish older than age 6 were represented in the ALK. Estimates of F at age 6 carried no predictive power (these were the terminal years of the VPA). Therefore, fish ages 6 and older were assigned selectivities equal to the average of the selectivities of ages 4-5 for the 3-year average VPA.

5.5 Conservation Standards

Conservation standards are intended to protect the viability of a fish stock for future generations. These standards have historically been based on a number of biological measures of the dynamics of fish stocks, depending on the availability and adequacy of data. Conservation standards should be separated into two types: a conservation threshold which is entirely biologically based and, a conservation target which considers biological measures modified by relevant social, economic, and ecological factors. A conservation threshold is a biological baseline for the harvest of a fish stock and should not be exceeded. It is the highest level of fishing mortality that will ensure that recruitment overfishing will not occur. Beyond the conservation threshold, a conservation target may be set, providing for other management goals in the fishery. Such goals may include maximizing yield in weight or numbers of fish, economic benefits or profit, employment, or some other measurable goal. These targets should be set at a fishing mortality rate below that of the conservation threshold in order to ensure that the biological integrity of the stock is not damaged by fishing.

The spawning potential ratio (SPR) concept described by Goodyear (1989), is a species specific value expressed as the ratio of the spawning stock biomass (or egg production) per recruit (SSB/R) in a fished condition to the SSB/R in an unfished condition. The concept is based on the premise that below some level of SPR, recruitment will be reduced. Goodyear (1989), recommends that in the absence of sufficient data to provide a value specific to the stock in question an SPR of

20% be used as a threshold. Work on North Atlantic ground fisheries also resulted in the calculation of a threshold SPR of 20% (Gabriel et al. 1984, Gabriel 1985). An SPR of 20% has been recommended for Spanish and king mackerel in the Gulf of Mexico (National Oceanic and Atmospheric Administration/National Marine Fisheries Service 1995), while an SPR of 8-13% has been demonstrated to be sufficient for gulf menhaden (Vaughan 1987). In earlier analyses of Louisiana spotted seatrout fisheries (Louisiana Department of Wildlife and Fisheries 1991), an SPR threshold of 15% was recommended based on several years of data. Mace and Sissenwine (1993) examined 90 stocks of 27 species, and reported that the average replacement SPR for all these stocks was 18.7%, while the most resilient quarter of the stocks required a maximum of only 8.6%. These authors recommended that an SPR of 30% be maintained when there is no other basis for estimating the replacement level, as this level was sufficient in maintaining recruitment for 80% of the stocks examined. However, they noted that 30% may be overly conservative for an "average" stock, and reiterated the need for stock-specific evaluations of standards to enhance both safety and benefits in the fishery.

Sufficient information is not available to directly estimate a conservation threshold for southern flounder in Louisiana. However, the conservation target of 30% SPR established by the 1995 Regular Session of the Louisiana Legislature for black drum, southern flounder, sheepshead, and striped mullet appears to be adequate to maintain the southern flounder stock and prevent recruitment overfishing.

The use of any measure of the health of a fish stock as a perfect index is arguable. It is logical to conclude that growth overfishing should occur at a much lower fishing rate than that which would threaten recruitment. However, Mace and Sissenwine (1993) provide information to suggest that some stocks may have reduced recruitment at levels of fishing that would not reduce yield-per-recruit. The preferable position for making recommendations on appropriate levels of fishing for a stock is to base those recommendations on actual measures of spawning stock size and recruitment for both the species and fishery in question. This requires a base of information resulting from monitoring of both the stock and the fishery over a variety of conditions. Without this information, conservation standards may either underestimate or overestimate the potential of a fishery. If the potential is underestimated, society loses the economic and social benefits of the harvest. If the potential is overestimated and the fishery is allowed to operate beyond sustainable levels, society loses the benefits of a sustainable fishery, and recovery will require some period of rebuilding, when effort must be reduced from the non-sustainable levels (Hilborn and Walters, 1993).

5.6 Status of the Stock

Recent Regulatory History

Rules for the harvest of southern flounder in Louisiana have changed substantially from 1995 through 1999. Commercial harvest methods were restricted on August 15, 1995 when Act 1316 of the 1995 Regular Legislative Session, the Marine Resources Conservation Act of 1995, became effective. This act prohibited the use of "set" gill nets or trammel nets in saltwater areas of Louisiana, and restricted flounder harvest by the use of "strike" nets to the period between the third Monday in October and March 1 of the following year. A "Restricted Species Permit" issued by

LDWF was required in order to harvest flounder, and several criteria were established in order to qualify for that permit. After March 1, 1997, all flounder harvest by gill or trammel nets was banned, and commercial harvesters must utilize other legal commercial gear to harvest flounder. These regulations substantially reduced the harvest of flounder by this segment of the commercial fishing industry.

More restrictive regulations became effective on May 1, 1996. Recreational harvesters in Louisiana were restricted to a creel limit of ten (10) southern flounder, with one day's limit in possession. At the same time, the use of strike nets for the harvest of southern flounder was outlawed, and other commercial harvesters were limited to a possession limit of ten (10) fish per person aboard a commercial vessel. This set of regulations reduced the ability of some recreational harvesters to retain southern flounder, and also reduced the harvest potential of the commercial fishing industry.

In 1997, regulations were changed by Acts 1163 and 1352 of the 1997 Regular Legislative Session. Recreational and commercial harvesters continued to be restricted to daily take limits of 10 fish, but were allowed take limits for each day on the water. Additionally, commercial shrimping vessels were limited to 100 pounds of southern flounder per shrimping trip.

In 1999, regulations were changed by Acts 220 of the 1999 Regular Legislative Session. The act eliminated the 100 pound harvest limit on commercial shrimping when southern flounder are harvested as by-catch. The Act became effective in August of 1999.

In 2004, regulations were changed by Act 460 of the 2003 Regular Legislative session, which allowed the recreational harvest of southern flounder with barbed gigs. Only barbless gigs were allowed previously. The act became effective August 15, 2004.

Trends in Harvest and Abundance

Annual commercial landings have fluctuated widely from 1950-2003 with the highest landings in the mid-1980s and mid-1990s at 0.94 and 0.97 million pounds, respectively (Figure 5.4). Regulatory measures implemented in 1995, 1996 and 1997 had much to do with the reduction in commercial harvest from 1996 to present. Recreational landings were equal to or greater than those of the commercial fishery until 1991 when the commercial fishery began harvesting a greater percentage of the total annual harvest (Figure 5.1). As a result of the regulatory measures described above, the recreational harvest was greater than the commercial harvest in 1996 - 2003. Fishery dependent commercial data prior to 1991 were obtained from NMFS's General Canvass Landing Program. From 1991 through 1998 these data were collected by LDWF Monthly Dealer Reports. From 1999 to present, the LDWF Commercial Reporting Requirement (Trip Tickets) program is utilized to gather this type of data.

We reviewed the recreational harvest information to develop fishery-dependent indices of abundance. It should be recognized that southern flounder are not a primary target species for a large fraction Louisiana angling trips, though they are often reported as a secondary target species. Also it should be noted that a significant portion of the targeted harvest occurs at night, using gigs and lights. These night-fishing activities would be unlikely to be encountered in a standard MRFSS

sampling trip. Therefore, many of the flounder encountered by MRFSS samplers are likely to have been incidentally captured by an angler targeting other species. We did not consider targeted trips targeting flounder in our calculations of catch-per-trip due to concerns for post-trip reporting bias (anglers who harvest flounder are more likely to report them as a target species, inducing bias into estimates). These issues create challenges for developing a fishery-dependent index of abundance for southern flounder from the recreational fishery.

Fisheries dependent recreational landings data are collected through the NMFS MRFSS program and are currently being collected by LDWF biologists. Harvests from the recreational fishery for the years examined (1981-2003) have fluctuated, but has been relatively stable since 1988.

Mean catch-per-trip from the recreational fishery was calculated by selecting those trips that had southern flounder in the observed harvest (catch type A), and in the non-observed harvest (Catch type B1). This method varies slightly from the indices used in previous assessments, in that prior indices only considered observed harvest, due to concerns over identification of non-observed fish. To reduce those concerns, only the fish reported as southern flounder that were categorized as "eaten or planned to be eaten" (MRFSS disposition code 3) were included from the B1 catch in the catch per effort (CPUE) calculations. The change in methodology made very little difference in earlier years of the survey, but has shown some difference in recent years of the survey, as more southern flounder have been reported in the "eaten or planned to be eaten" category in those years. The catch per effort was log-transformed, and adjusted to the long-term mean with 95% confidence limits (Figure 5.5). The CPUE indices seem to cycle over the years examined, with 1987, 1995, and 2001 having the lowest mean CPUE.

Catch-per-effort data from the Department's, fishery-independent trammel net (750' x 6' - 1 5/8" inner, 6" outer wall) and 16-foot flat otter trawl samples were calculated as follows:

$$\text{Mean CPUE} = (\exp (\Sigma \ln (\text{catch} + 1) / N)) - 1$$

where catch is the total number caught in each set and, N is the number of samples taken annually. Each annual CPUE was adjusted to the long-term mean for that gear type to examine potential trends in the data. Trammel net data were available for the period October 1985-December 2004, and 16-foot trawl data were used for the period 1967-2004. Trawl data were used to provide an index of young-of-the-year recruitment by selecting specific sizes of southern flounder from the samples, eliminating larger specimens, and by selecting the samples taken April through September, when length can be used to separate young of the year. Trammel net samples collect several year-classes, and are used as an index of abundance in the system.

Trammel net samples are collected from October through March. In order to use the most recent data available to us in this report, trammel net CPUE was estimated for two periods (October-December of one year and January-March of the next year). This allowed the use of 2004 data through December. CPUE estimates from trammel nets fluctuated throughout the period examined with January-March and October-December estimates being relatively consistent over the years examined (Figure 5.6). CPUE estimates indicate a possible long-term variation in flounder

abundance, with recent years being near or below average, similar to the earliest years in the time-line.

The long-term database provided by 16-foot trawl data shows how CPUE cycles over time and represents natural fluctuations in recruitment. Whatever the cause of the cyclic nature of the indices, no evidence from the 16-foot trawl data indicates a long-term downward trend in CPUE for southern flounder (Figure 5.6).

We compared the CPUE indices for the trawl dataset and the trammel dataset, using the October-December trammel, since it had the most current information (Figure 5.7). The trawl index should reflect abundance of young-of-the-year, while the trammel net index should reflect abundance of all ages available to the gear. The two indices both show long-term variation around their average values, but do not necessarily reflect consistent estimates of recruitment or abundance that would be expected to derive from that recruitment. These comparisons need further investigation before any broad conclusions can be derived from the information.

Estimates of Yield and Spawning Potential

It should be noted that the following results of YPR and SPR analysis do not reflect the impact of all current regulations. With this type of general assessment, it will take several years before the impact of regulations will be observed in the disappearance rates from the fishery, or in the fishing mortality rates estimated in the VPA analyses.

The results of YPR analysis based on the disappearance rate calculations indicate that if M=0.5 (the value that provides the lowest allowable harvest within the conservation standard), the fishery in the years assessed (1997 - 2003) was operating between $F_{0.1}$ and F_{MAX}, with yields of 96% to 100% of maximum and SPR at 16% to 30%. An M of 0.8 (the highest value within the range examined) would produce yields of 60% to 71% of maximum with SPR at 44% to 52% (Table 5.5).

Comparison of the estimates of disappearance rates over time (Table 5.4) show no trend in the slope of the catch curve, though there is some interannual variation. This indicates that the changes in overall harvest are not being reflected by changes in estimated survival of fish in the stock. The first two years of the estimation and 1999 do have higher values for the intercept of the disappearance rate, indicating higher recruitment estimates. Both the unresponsiveness of the survival estimate and the variation in the recruitment estimates should be examined further.

The results of the YPR analyses based on the VPA results were very similar to those based on disappearance rates. In the years assessed for this analysis (2001-2003 plus the average of those years) if M=0.5, the fishery was operating between $F_{0.1}$ and F_{MAX}, with yields of 94% to 95% of maximum and SPR at 28% to 30%. An M of 0.8 (the highest value within the range examined) would produce yields of 54% to 61% of maximum with SPR at 43% to 52% (Table 5.6).

The primary difference between the two estimates of YPR is that the dome-shaped selectivity used for the VPA estimates that maximum yield will be obtained at slightly lower fishing mortality rates than the disappearance rates would calculate. Both methods provide maximum yield estimates at high fishing mortality rates, due to the estimated high natural mortality rates and to the rapid

growth rates of flounder to near their maximum sizes (k=0.8846). That rapid growth, combined with relatively high natural mortality, greatly influence the yield function.

5.7 Research and Data Needs

Estimates of natural mortality presented in the present assessment vary widely. This variation lessens the ability of the present assessment to provide an accurate estimate of the potential yield of the stock, and also reduces the confidence level of the present estimate of SPR. A more accurate estimate of natural mortality would improve both of these estimates.

The current assessment does not show measurable responses in the stock to changes in harvest rates over the time period examined. Both the unresponsiveness of the survival estimate and the variation in the recruitment estimates should be examined further.

Indices of harvest effort and stock recruitment or abundance should be further developed and evaluated for possible incorporation into future stock assessments.

Annual sex-specific age-length keys should continue to be developed to provide catch-at-age data necessary to conduct age-based population assessments. The department is in the process of collecting otoliths for development of annual age-length keys.

Sex-specific fishery dependent length frequency data is essential in adequately partitioning catch from the fishery. In the case of flounder, males grow slower and do not get as large as females. There can be significant improvement in the accuracy of this assessment if sex is collected as a consistent part of all fishery-dependent sampling programs.

The relationship between wetlands losses or modifications and the continuation of fishery production within the state has been discussed by many authors. However, this relationship is likely to be different for the various fishery species. Better understanding of this relationship for southern flounder should be an ongoing priority.

In the presence of changing regulations, fishery-dependent information is not a reliable source of data necessary to assess the status of a fish stock. However, such data is necessary to measure the effects of fishing on that stock. Consistent fishery-dependent and fishery-independent data sources, in a comprehensive monitoring plan, are essential to understanding the status of fishery stocks, and to identifying causes of changes in stock abundances. Present programs should be assessed for adequacy with respect to their ability to evaluate stock status, and modified or enhanced to optimize their capabilities.

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Table 5.1. Harvest of southern flounder from Louisiana waters. Source: NMFS Commercial Landings datasets, MRFSS recreational landings datasets, and LDWF commercial harvest data.

Harvest of Southern Flounder in Louisiana waters (pounds)

Year	Commercial	Recreational	Combined
1981	136,962	213,075	350,037
1982	199,742	471,798	671,540
1983	276,151	2,722,214	2,998,365
1984	353,263	194,571	547,834
1985	529,979	686,402	1,216,381
1986	825,034	2,130,256	2,955,290
1987	938,076	183,835	1,121,911
1988	510,285	564,651	1,074,936
1989	492,047	345,575	837,622
1990	455,718	452,492	908,210
1991	692,338	622,306	1,314,644
1992	784,560	565,736	1,350,296
1993	898,874	393,459	1,292,333
1994	974,689	441,204	1,415,893
1995	533,172	328,591	861,763
1996	61,755	422,463	484,218
1997	94,898	398,883	493,781
1998	139,938	271,309	411,247
1999	141,667	498,484	640,151
2000	177,384	606,091	783,475
2001	90,278	380,984	471,262
2002	81,831	317,961	399,792
2003	63,649	454,383	518,032

Table 5.2 – Age-length key used in current assessment, with comparison to summary of age distribution in previous assessments.

Len				Age				
(in)	0	1	2	3	4	5	6	total
7	2							2
8	8	4						12
9	12	28	5					45
10	44	135	19					198
11	73	256	27	2				358
12	77	485	118	5				685
13	39	464	223	6				732
14	11	474	271	14		2		772
15	1	318	247	30				596
16		200	175	43	1	1		420
17		132	141	43	5	1		322
18		83	80	30	4	2	1	200
19		53	32	14	3		1	103
20		18	26	19	6			69
21		7	15	4	5	1	1	33
22		2	6	4				12
23			6	6	2	1		15
24				4				4
25			1	1				2
26				1				1
Total #	267	2659	1392	226	26	8	3	4581

Age-length key used in previous assessments - total number of fish in each age group

	AGE								
	0	1	2	3	4	5	6	7	Total
Total #	305	1572	583	137	30	9	4	1	2641

Table 5.3. Length frequency of recreational and commercial samples of southern flounder harvested in Louisiana. Commercial length frequency information was not available for 1997-2001, so cumulative length-frequency data for 1994-96 was used in that time period.

Recreational Length Frequency by Year

	Year									
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
TL (in)										
9	5	8	5	5	2		3	1	6	4
10	19	26	4	10	11	10	2	3	16	17
11	20	26	13	13	22	32	7	2	26	28
12	47	27	27	37	27	55	17	14	32	41
13	59	37	41	41	49	78	25	19	30	63
14	62	18	34	45	51	77	34	28	35	71
15	36	24	32	35	30	64	36	29	41	34
16	34	15	26	14	29	47	30	24	38	30
17	24	25	16	23	19	36	19	21	19	17
18	13	5	9	9	14	17	10	12	10	9
19	8	10	5	7	3	13	11	9	4	
20	2	1	4		1	5	2	1		1
21	3	1	1	1	2		1	3		4
22	1		1	2	1		1			
23		1					1			
24	1									
25				1						
	334	224	218	243	261	434	199	166	257	319

Commercial Length Frequency by Year

	Year					
	1994	1995	1996	1997-2001	2002	2003
Len (in)						
9	3			3	6	10
10	4	6		10	34	26
11	7	28	3	38	61	67
12	19	50	9	78	42	83
13	33	70	7	110	39	60
14	63	148	18	229	44	83
15	87	215	22	324	36	56
16	89	181	9	279	35	32
17	69	110	9	188	31	32
18	43	47	7	97	41	11
19	42	23	4	69	50	1
20	26	22	1	49	13	3
21	13	16	2	31	5	
22	7	5		12	2	2
23	5	1		6	4	1
24	1			1	1	
25	2	1		3		
26	1			1		
	514	923	91	1528	444	467

Table 5.4. Estimates of female harvest at age, the natural log of that harvest, and estimates of regression of age vs. harvest of age 2-6 fish. Also listed are the estimated F values for M=0.5 and M=0.8 for each year calculated. Age-specific selectivities for YPR were derived from the 2000-2003 mean values listed in the right-hand column.

COMBINED CATCH-AT-AGE BY YEAR

AGE	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
0	67,768	46,452	16,144	20,386	18,306	23,466	20,220	10,888	31,227	16,015
1	645,496	420,900	191,670	222,238	197,329	279,769	285,385	178,304	217,793	136,575
2	333,914	205,800	105,376	118,438	104,590	151,852	169,698	111,510	95,788	83,087
3	47,640	27,828	16,316	17,511	14,758	22,486	29,095	19,759	13,638	12,844
4	3,848	2,114	1,582	1,361	1,219	1,818	2,802	2,341	837	651
5	1,483	835	474	525	528	637	930	701	393	432
6	480	234	175	201	163	1	377	381	110	212
TOTAL	1,100,630	704,164	331,737	380,661	336,893	480,030	508,505	323,884	359,786	249,815

Natural log of catch at age by year

AGE	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2000-03 3 yr mean
0	11.12	10.75	9.69	9.92	9.81	10.06	9.91	9.30	10.35	9.68	9.78
1	13.38	12.95	12.16	12.31	12.19	12.54	12.56	12.09	12.29	11.82	12.07
2	12.72	12.23	11.57	11.68	11.56	11.93	12.04	11.62	11.47	11.33	11.47
3	10.77	10.23	9.70	9.77	9.60	10.02	10.28	9.89	9.52	9.46	9.62
4	8.26	7.66	7.37	7.22	7.11	7.51	7.94	7.76	6.73	6.48	6.99
5	7.30	6.73	6.16	6.26	6.27	6.46	6.84	6.55	5.97	6.07	6.20
6	6.17	5.46	5.16	5.31	5.09	0.00	5.93	5.94	4.70	5.35	5.33
Ages 2-6 regression											
Y-intercept	15.6676	15.2864	14.5292	14.5515	14.4302	18.1513	14.8707	14.2329	14.5110	13.8734	14.2057
Slope	-1.6558	-1.7061	-1.6346	-1.6260	-1.6264	-2.7423	-1.5665	-1.4699	-1.7079	-1.5339	-1.5706
R^2	0.9661	0.9684	0.9737	0.9589	0.9638	0.9082	0.9684	0.9619	0.9588	0.9081	0.9468
F(M=0.5)	-1.156	-1.206	-1.135	-1.126	-1.126	-2.242	-1.066	-0.970	-1.208	-1.034	-1.071
F(M=0.8)	-0.856	-0.906	-0.835	-0.826	-0.826	-1.942	-0.766	-0.670	-0.908	-0.734	-0.771

Table 5.5 Results of Yield per Recruit and SPR Analysis for Southern Flounder from disappearance calculations.

M=0.5	F Ratio	YPR	SPR	%SPR	%YPR	
F-max =	1.9364	0.6444	0.4881	17.74%	100.00%	Benchmarks
F0.1 =	0.6209	0.5642	1.1229	40.80%	87.55%	
F30% =	0.9823	0.6192	0.8256	30.00%	96.08%	
F20% =	1.6706	0.6435	0.5504	20.00%	99.86%	
1997 =	1.1260	0.6292	0.7471	27.15%	97.63%	Estimates
1998 =	1.1264	0.6292	0.7469	27.14%	97.64%	
1999 =	2.2423	0.6437	0.4321	15.70%	99.89%	
2000 =	1.0665	0.6256	0.7777	28.26%	97.07%	
2001 =	0.9699	0.6181	0.8331	30.27%	95.92%	
2002 =	1.2079	0.6332	0.7088	25.76%	98.26%	
2003 =	1.0339	0.6233	0.7955	28.91%	96.72%	

M=0.6	F Ratio	YPR	SPR	%SPR	%YPR	
F-max =	9.8154	0.5752	0.0967	4.89%	100.00%	Benchmarks
F0.1 =	0.7519	0.4709	0.8031	40.63%	81.86%	
F30% =	1.1961	0.5202	0.5931	30.00%	90.43%	
F20% =	2.0616	0.5491	0.3954	20.00%	95.45%	
1997 =	1.0260	0.5066	0.6588	33.32%	88.07%	Estimates
1998 =	1.0264	0.5067	0.6586	33.32%	88.08%	
1999 =	2.1423	0.5502	0.3836	19.40%	95.65%	
2000 =	0.9665	0.5006	0.6855	34.67%	87.03%	
2001 =	0.8699	0.4890	0.7337	37.12%	85.01%	
2002 =	1.1079	0.5138	0.6254	31.63%	89.31%	
2003 =	0.9339	0.4970	0.7010	35.46%	86.40%	

M=0.7	F Ratio	YPR	SPR	%SPR	%YPR	
F-max =	11.1385	0.5146	0.0756	5.18%	100.00%	Benchmarks
F0.1 =	0.8976	0.3986	0.5919	40.56%	77.47%	
F30% =	1.4383	0.4431	0.4377	30.00%	86.11%	
F20% =	2.5009	0.4740	0.2918	20.00%	92.12%	
1997 =	0.9260	0.4021	0.5810	39.82%	78.15%	Estimates
1998 =	0.9264	0.4022	0.5809	39.81%	78.16%	
1999 =	2.0423	0.4648	0.3405	23.34%	90.33%	
2000 =	0.8665	0.3945	0.6043	41.41%	76.67%	
2001 =	0.7699	0.3802	0.6464	44.30%	73.88%	
2002 =	1.0079	0.4113	0.5519	37.82%	79.93%	
2003 =	0.8339	0.3900	0.6179	42.34%	75.79%	

M=0.8	F Ratio	YPR	SPR	%SPR	%YPR	
F-max =	12.2931	0.4613	0.0608	5.52%	100.00%	Benchmarks
F0.1 =	1.0643	0.3428	0.4453	40.41%	74.30%	
F30% =	1.7063	0.3831	0.3306	30.00%	83.04%	
F20% =	2.9817	0.4155	0.2204	20.00%	90.07%	
1997 =	0.8260	0.3155	0.5126	46.52%	68.40%	Estimates
1998 =	0.8264	0.3156	0.5125	46.50%	68.41%	
1999 =	1.9423	0.3918	0.3024	27.44%	84.94%	
2000 =	0.7665	0.3069	0.5329	48.36%	66.52%	
2001 =	0.6699	0.2906	0.5696	51.69%	63.00%	
2002 =	0.9079	0.3261	0.4872	44.21%	70.69%	
2003 =	0.7339	0.3017	0.5447	49.43%	65.40%	

Table 5.6 Results of Yield per Recruit and SPR Analysis for Southern Flounder from VPA calculations.

M=0.5	F Ratio	YPR	SPR	%SPR	%YPR	
F-max =	1.8761	0.6348	0.5535	20.11%	100.00%	Benchmarks
F0.1 =	0.8451	0.5783	1.0115	36.76%	91.09%	
F30% =	1.1195	0.6125	0.8256	30.00%	96.47%	
F20% =	1.8896	0.6348	0.5504	20.00%	100.00%	
2001 =	0.8375	0.6062	0.7693	27.96%	95.03%	Estimates
2002 =	0.7753	0.5989	0.8189	29.76%	94.89%	
2003 =	0.8007	0.6021	0.7979	29.00%	93.95%	
2001-03 avg =	0.8407	0.6066	0.7669	27.87%	94.46%	

M=0.6	F Ratio	YPR	SPR	%SPR	%YPR	
F-max =	2.5894	0.5340	0.3697	18.70%	100.00%	Benchmarks
F0.1 =	0.9705	0.4784	0.7495	37.91%	89.59%	
F30% =	1.3701	0.5130	0.5931	30.00%	96.06%	
F20% =	2.3750	0.5337	0.3954	20.00%	99.94%	
2001 =	1.0314	0.4858	0.7202	36.43%	90.98%	Estimates
2002 =	1.3359	0.5111	0.6037	30.54%	95.70%	
2003 =	1.1985	0.5017	0.6509	32.93%	93.95%	
2001-03 avg =	1.1628	0.4988	0.6645	33.61%	93.41%	

M=0.7	F Ratio	YPR	SPR	%SPR	%YPR	
F-max =	4.2551	0.4593	0.2176	14.91%	86.02%	Benchmarks
F0.1 =	1.1113	0.4013	0.5693	39.02%	75.16%	
F30% =	1.6701	0.4360	0.4377	30.00%	81.64%	
F20% =	2.9427	0.4567	0.2918	20.00%	85.53%	
2001 =	0.9092	0.3776	0.6413	43.95%	70.72%	Estimates
2002 =	1.2176	0.4107	0.5380	36.87%	76.91%	
2003 =	1.0695	0.3971	0.5828	39.94%	74.37%	
2001-03 avg =	1.0381	0.3938	0.5933	40.66%	73.74%	

M=0.8	F Ratio	YPR	SPR	%SPR	%YPR	
F-max =	6.9861	0.4049	0.1259	11.42%	75.83%	Benchmarks
F0.1 =	1.2710	0.3408	0.4407	39.99%	63.82%	
F30% =	2.0207	0.3752	0.3306	30.00%	70.27%	
F20% =	3.5875	0.3969	0.2204	20.00%	74.33%	
2001 =	0.7886	0.2880	0.5694	51.67%	53.93%	Estimates
2002 =	1.0973	0.3262	0.4792	43.48%	61.10%	
2003 =	0.9398	0.3091	0.5210	47.28%	57.89%	
2001-03 avg =	0.9132	0.3058	0.5289	47.99%	57.27%	

Figure 5.1. Harvest of southern flounder from Louisiana waters.

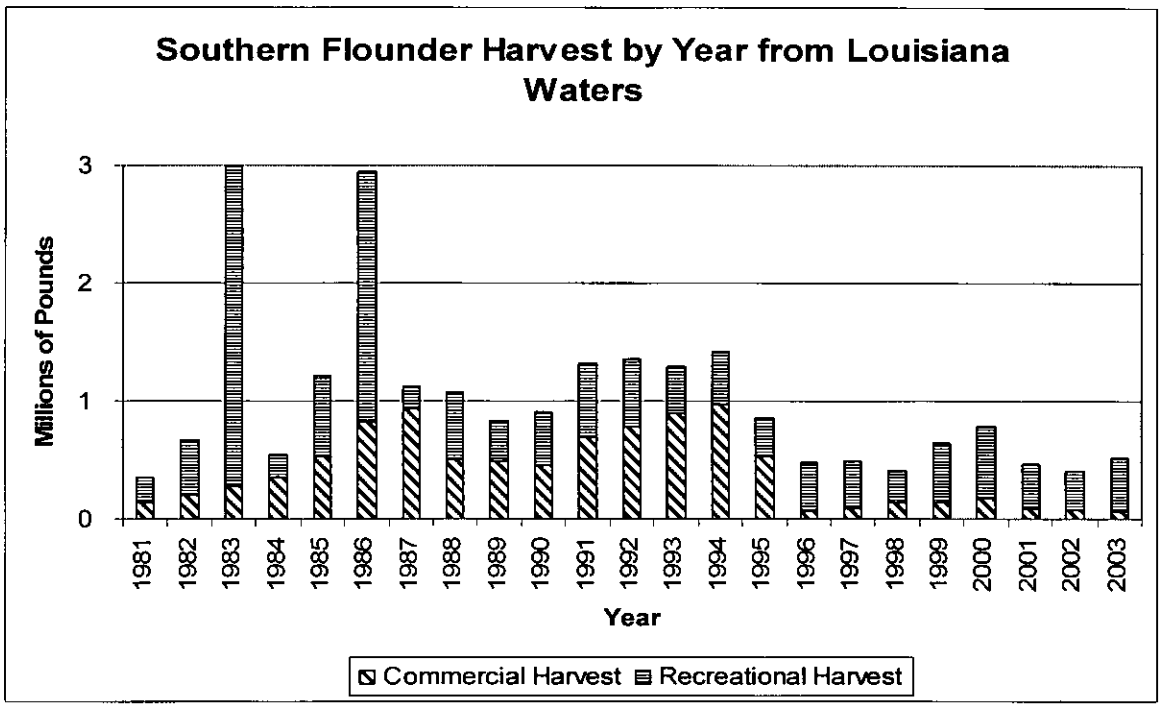


Figure 5.2. Proportion female southern flounder as calculated from function compared to actual proportions at size from the original sample.

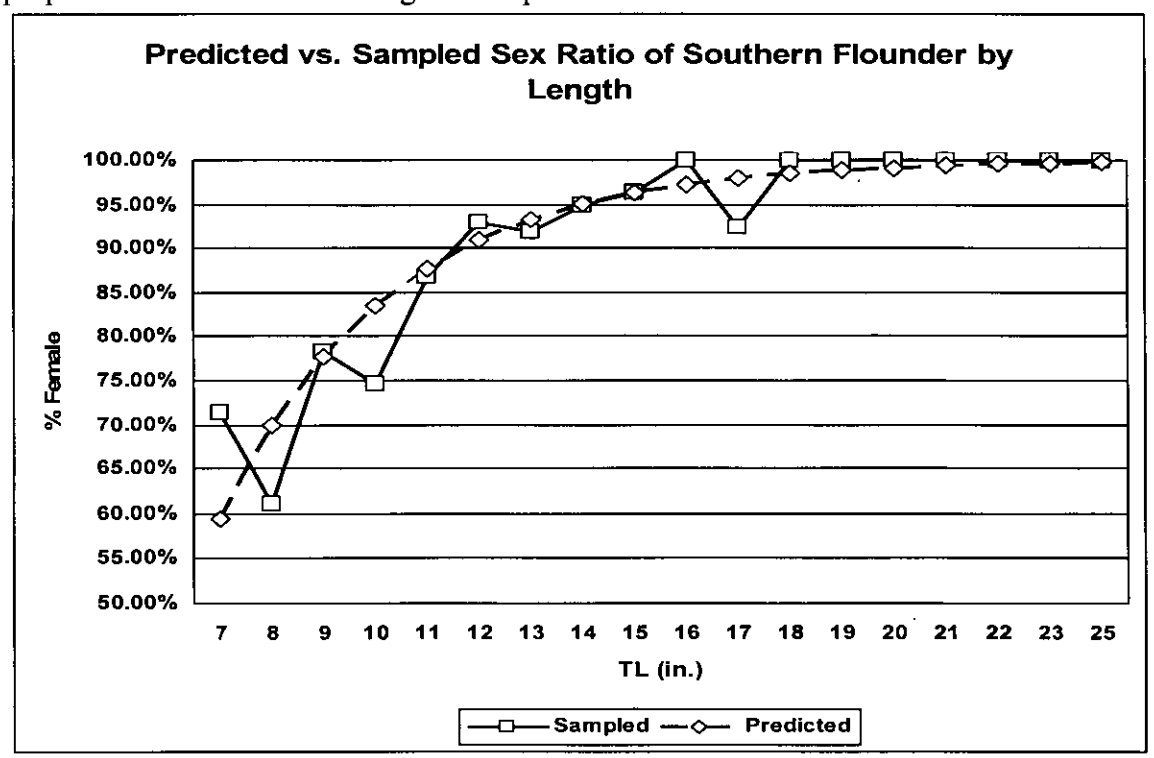


Figure 5.3. Estimates of F at age from various terminal F's used in VPA analysis. Presented values or for highest and lowest values of M (0.5 and 0.8), for each run (2001, 2002, 2003, average of 2001-2003).

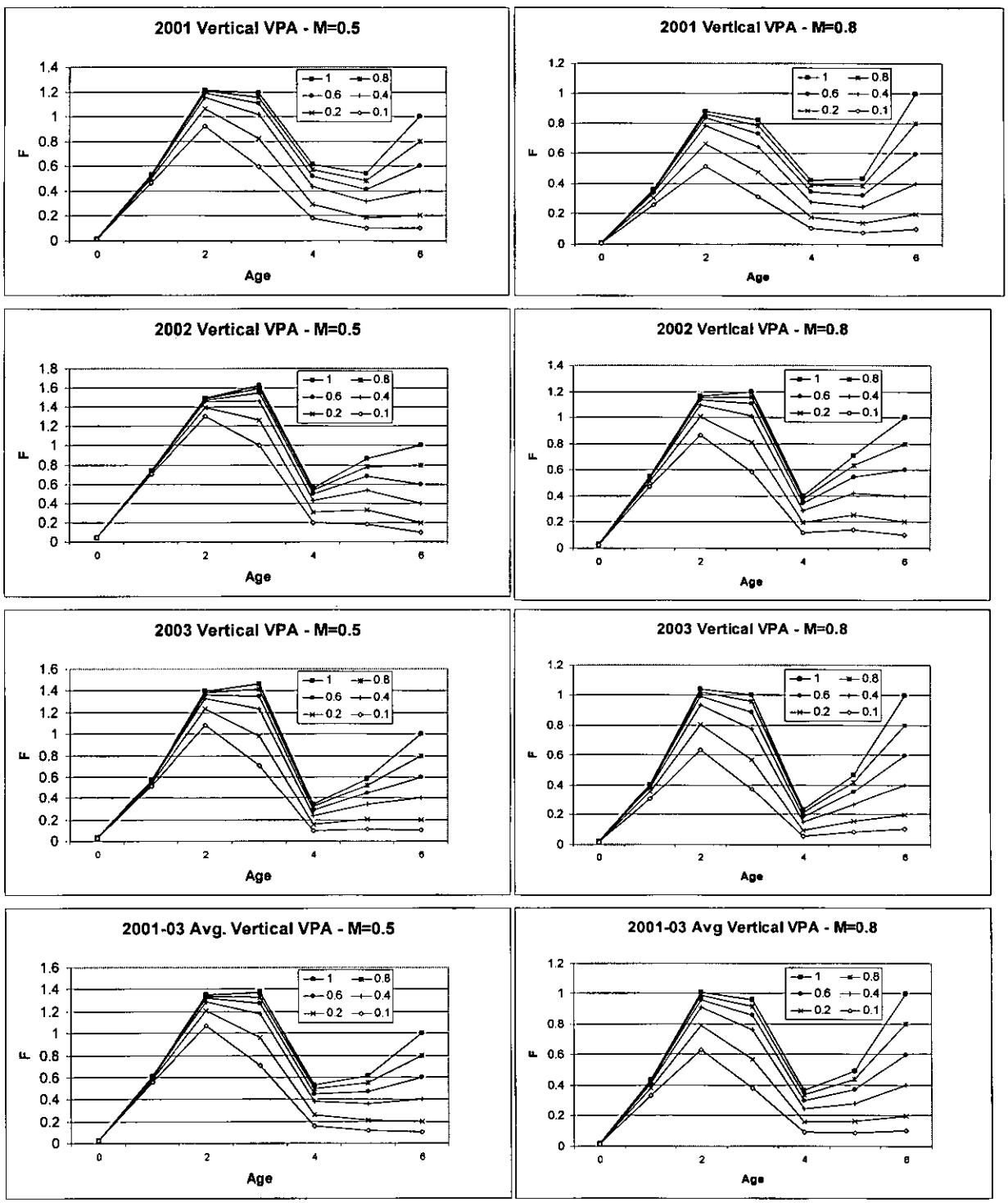


Figure 5.4. Louisiana commercial landings of southern flounder, 1950-2003

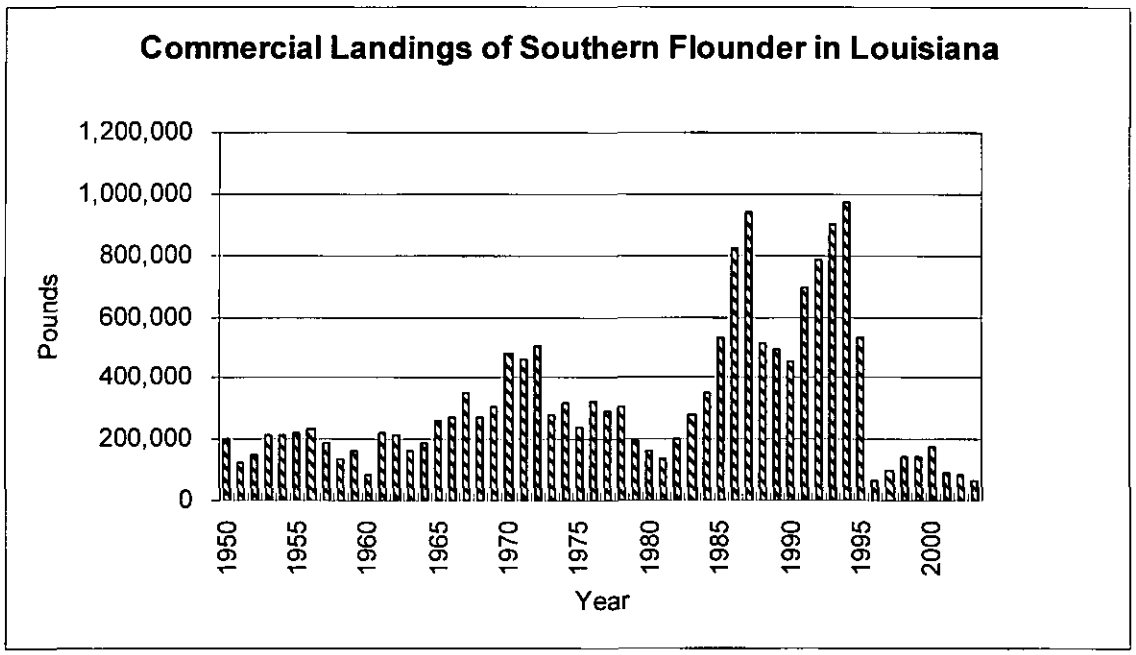


Figure 5.5. Standardized, log-transformed catch per unit of effort for recreational harvest of southern flounder in Louisiana. MRFSS survey data.

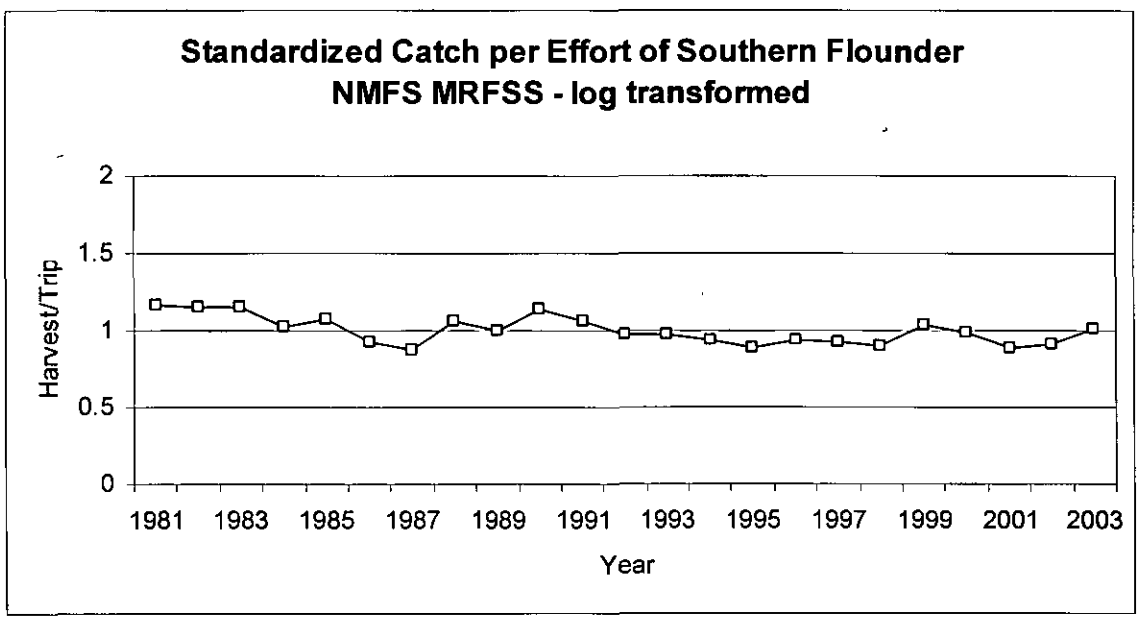
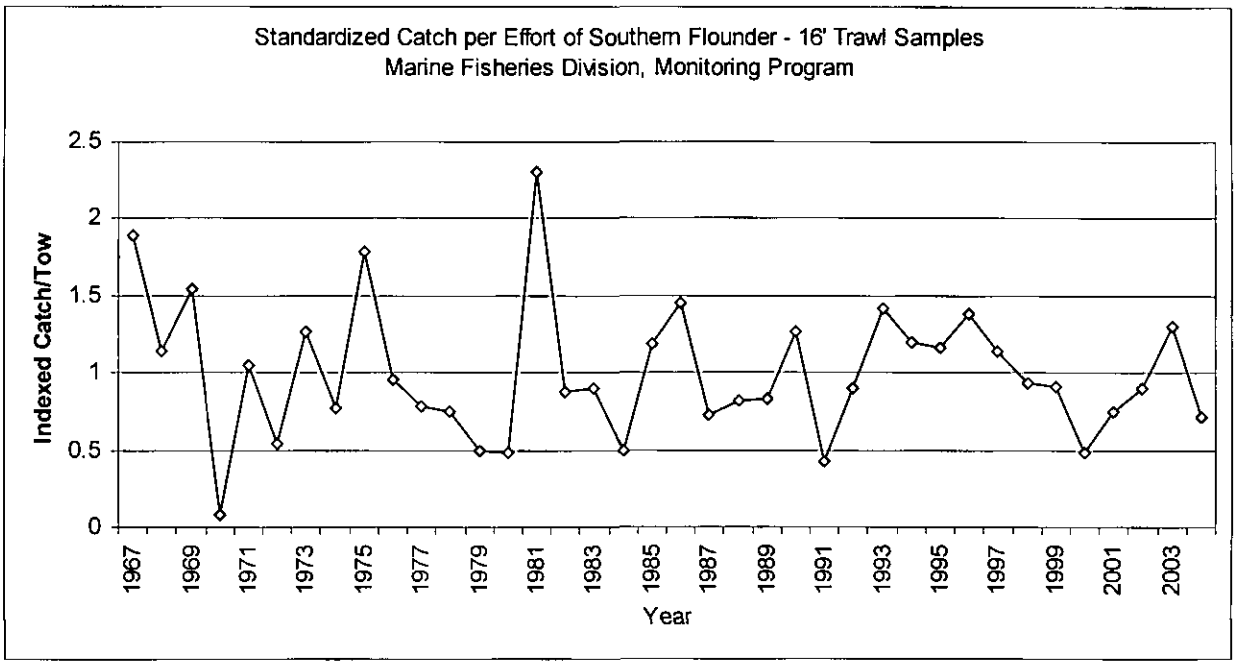


Figure 5.6. Catch per effort for southern flounder in fishery-independent samples. Trammel net samples are available for 1986-2004, 16-foot trawl samples for 1967-2004. All are indexed to their respective long-term means. Derivation of each index is described in the text.



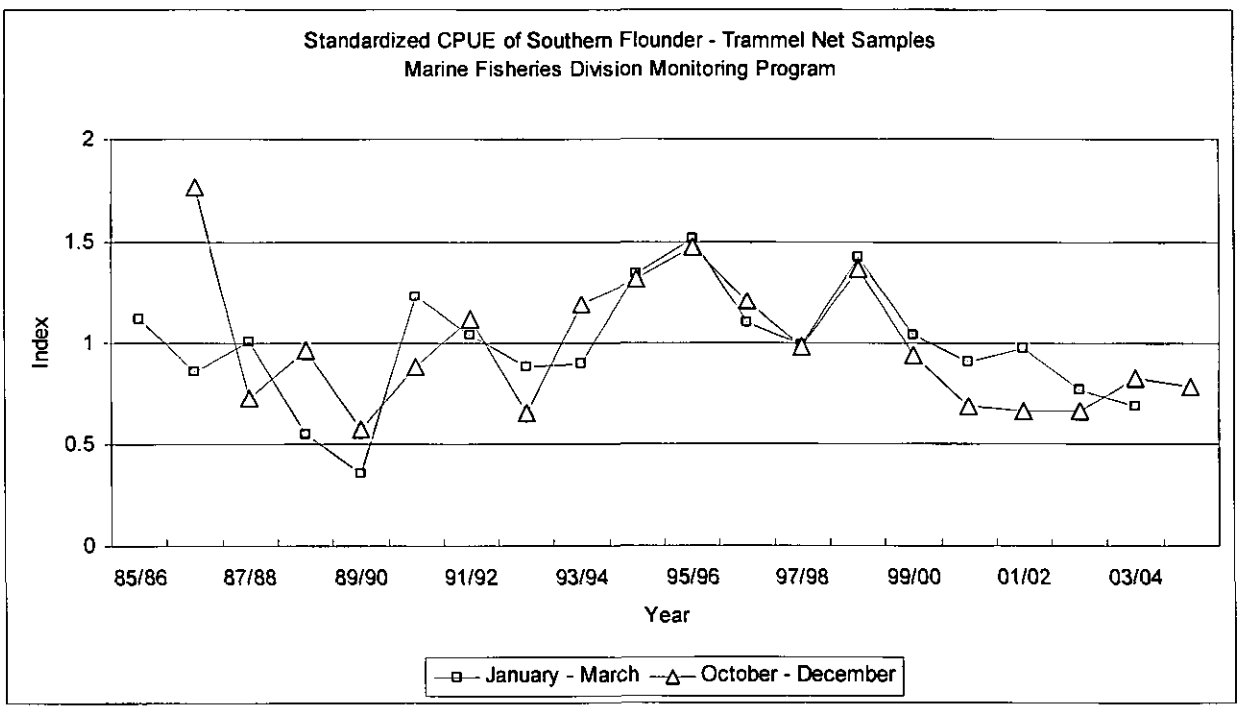
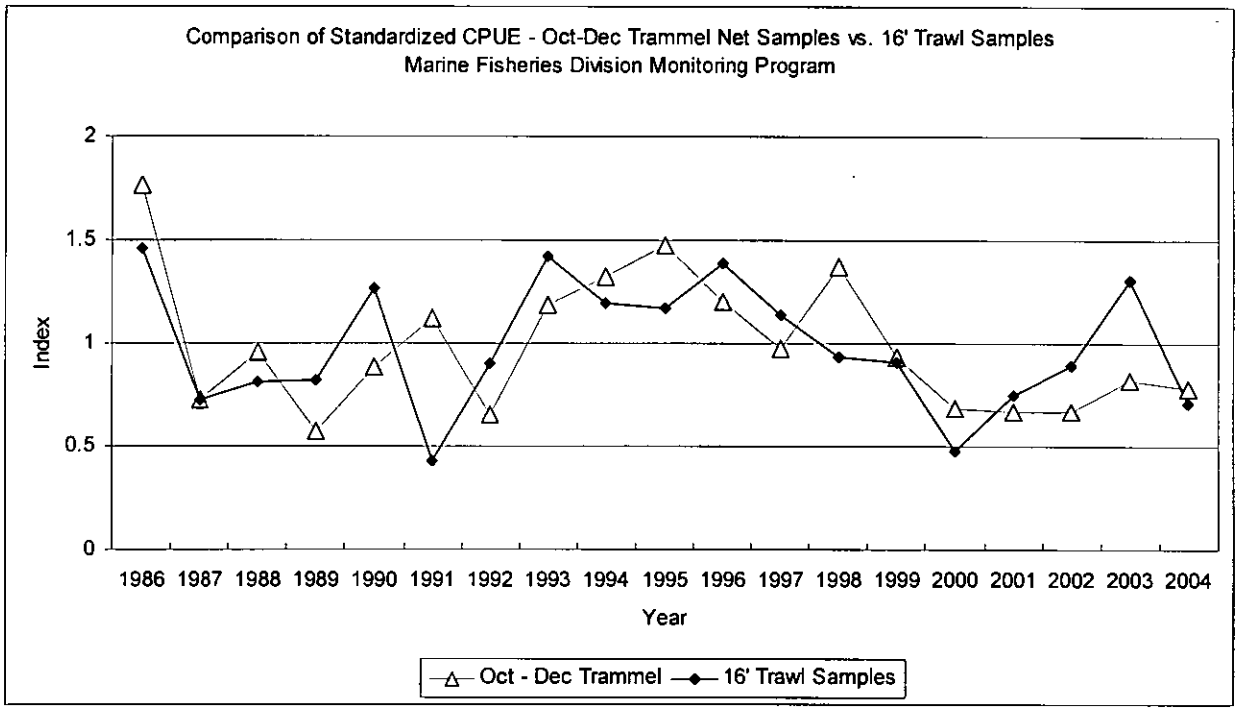


Figure 5.7. Comparison of the standardized fishery-independent CPUE indices over the time period where both were available.



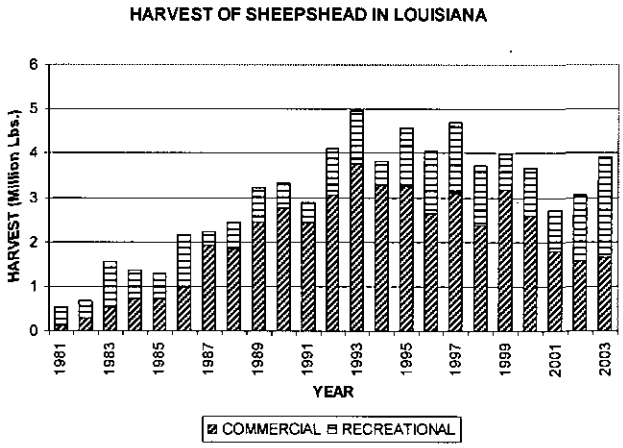
SHEEPSHEAD
SUMMARY OF CHANGES FROM 2004 ASSESSMENT

This summary is intended to provide a quick reference of substantive changes in methods or corrections in this year's assessment from the 2004 assessment conducted for sheepshead.

This year's assessment differs from last year's in that ages were based on an age-length key of aged fish from Louisiana, rather than calculating the ages from a von Bertalanffy growth equation. A virtual population analysis was compared to the disappearance rate analysis used in prior reports for estimation of stock and yield parameters.

2005 DOCUMENT HIGHLIGHTS

- 2003 combined commercial and recreational harvest of 3,903,128 pounds is 842,214 pounds higher than 2002 and is the median of the 14 year period since 1992.



- The conservation standard for sheepshead is 30% spawning potential ratio (SPR). The results of YPR analysis indicate that if M=0.2 (the most conservative value within the range of estimates), the fishery in the years assessed (1999 - 2003) was operating near F0.1 and well below FMAX, with yield of 69% to 81% of maximum, and SPR at 47% to 57%. An M of 0.3 (the highest value examined) would indicate a more lightly fished stock with yield being 32% to 50% of maximum and with SPR being 66% to 78%.

- It should be noted that the method used in this assessment to determine the status of the stock, reflected in the estimates of disappearance, is not immediately sensitive to changes in regulations. Sheepshead enter the fishery at age 1 and are fully recruited by age 5 It takes several years of consistent regulations after regulations are imposed before disappearance rates would accurately measure the impact of those regulations, since the method relies on the relative abundance of the age-classes in the fishery. In the case of sheepshead it would take 4 years of consistent regulations assuming selectivities of age 5 and older is 100%.

- As a result of having several years of commercial trip ticket data, and collecting recreational fishery statistics data, the department was able to begin a program to representatively sample fishery dependent otoliths in 2002. The program uses trip ticket data and recreational survey data to weight sampling sites so that otolith collections reflect harvest from the fisheries for the species of interest. It is expected that this method of otolith sampling will improve stock assessments by providing more accurate annual catch-at-age data.

SHEEPSHEAD
5.0 STOCK ASSESSMENT

This assessment uses yield-per-recruit (YPR), catch curve analyses, virtual population analysis (VPA), and Spawning Potential Ratio (SPR) to estimate the impact of fishing pressure on potential yield and the spawning potential of the sheepshead stock in Louisiana waters. Estimates derived from YPR and SPR are based on information regarding the growth rate and spawning potential of the fish, and on estimates of the natural mortality rate (M) and fishing mortality rate (F) on the stock. Catch curve analysis and virtual population analysis estimate fishing mortality rates (F) from the fishery based on the estimated numbers of each age class in the total harvest, using somewhat different techniques for calculation of F. The spawning biomass of females is assumed to be the factor limiting the spawning potential of the stock; therefore, where possible, only data on female sheepshead should be used. Yield-per-recruit and SPR analysis, as with many other generalized assessments, should be used only as a guide until a more comprehensive assessment can be conducted.

In developing a stock assessment, the unit stock must be defined. While a unit stock is often represented by that portion of the population which is genetically similar, for our purpose, the most applicable definition seems to be one which considers the unit stock as that portion of the population which is either dependent on Louisiana waters, or which is available to Louisiana fishermen.

5.1 Age and Growth

Ages of the harvest were estimated from age-length keys (ALKs). Ages were available from fishery-independent samples (n=2,207) and fishery-dependent samples from the commercial (n=777) and recreational (n=132) fisheries, collected between 1994 and 2003 (Table 5.1). The oldest fish sampled were aged as 23 years old, from fishery-independent samples. The oldest ages from fishery-dependent samples were age 14 for recreational samples, and age 17 for commercial samples. Fish over age 15 were rare in the aged dataset, so fish with assigned ages of 15 and over were included in a 15+ age group for further analyses. The age-length key included fishery-dependent information on sheepshead between 8 and 21 inches fork length, and fishery-independent samples between 4 and 21 inches. Sex information was not available for many of the fish that were aged from fishery-dependent samples, especially from earlier years, so the ALK does not include sex information.

The largest fish aged, a 25 inch fish from the commercial fishery, was aged at 17 years. This fish was not included in the ALK since it was pre-selected for size when sampled. When the ALK was applied to length measurements, fish over 21.99 inches fork length (FL) were combined into the 21-21.99 inch group, since there were no data to provide age distribution for sheepshead that large. The oldest fish sampled were 4 fish aged at 23 years old from fishery-independent samples.

We considered the fishery-dependent age samples from the commercial fishery adequate to characterize that fishery, so the age-length key for the commercial harvest was derived from those samples alone.

There were fewer age samples available to characterize the age distribution of the

recreational fishery. Examination of the commercial age data indicated that there were larger proportions of fish sampled for each age beyond age 4 in the commercial fishery than were found in the recreational samples (see Figure 5.1). Therefore, we did not use the commercial age data alone to describe the recreational harvest age distribution. To provide a better representation of the age structure of the recreational harvest, we combined all samples available, whether fishery-dependent or fishery-independent.

The fishery-independent age samples tended to have more representation of ages 2-3, compared to either recreational or commercial fishery-dependent samples (Figure 5.1). We presumed that if this had any effect on age assignments, it would increase estimates of the fraction of the recreational harvest from younger age classes, thereby increasing overall estimated fishing mortality rates. The additional representation of ages 2-3 is at least partially attributable to the larger numbers of small fish in the fishery-independent dataset (Table 5.1, right-hand portion of table). Due to the relatively large number of samples available compared to fishery-dependent samples, we elected to include these age samples in the ALK used to estimate ages for the recreational fishery.

Where available, fork lengths were used for analysis. Where these were not available, fork lengths were derived from total length, inverting the conversion for maximum total length to fork length provided by Joe O'Hop, Fish and Wildlife Research Institute, Florida Fish and Wildlife Conservation Commission (pers. comm.).

$$FL(mm) = (TL - 4.233) / 1.090$$

Weights were estimated from fork lengths, using the parameters reported by Beckman et al. (1991), then converted to pounds for this report. Their fork length - weight regression equation was:

$$\text{Female } W(gm) = 5.75 \times 10^{-5}\, FL(mm)^{2.85}$$

Von Bertalanffy growth parameters developed by Beckman et al. (1991) from fish harvested in Louisiana were used to calculate length and weight at age for female sheepshead for some analyses, including YPR and SPR. The equations are as follows:

$$\text{Female } L_t = 447(1-e^{-0.367\,(t+1.025)})$$

$$\text{Female } W_t = 2557(1-e^{-0.219\,(t+3.061)})^{2.85}$$

where, L_t = length at age t, W_t = weight at age t and t = age in years. Age at length is calculated as:

$$t = 1.025 + \ln(1-L_t/446)/-0.367$$

5.2 Natural Mortality

Natural mortality is one part of total mortality (Z) and is the mortality due to all causes other than fishing. These include predation, disease, spawning stress, starvation, and old age. Typically, natural mortality is estimated, as it is difficult to directly measure, especially on

exploited fish stocks where natural mortality and fishing mortality occur simultaneously. No direct measure of natural mortality for sheepshead is available; therefore, several established estimation procedures were used to derive an estimate. The procedures are presented below and are taken from Sparre and Venema (1992).

Pauly (1980) provides a method of estimating natural mortality from a set of parameters including the asymptotic length and growth rate of the fish, and the average water temperature of the environment. The growth parameters from the von Bertalanffy growth equation described in Section 5.1 and the mean annual water temperature, derived from readings from a set of four constant recorders located throughout the Barataria Bay system, were used in the calculation. The mean water temperature was 22.7°C for the period 1989 - 1992 (pers. comm., M. Kasprzak, 4/13/92). These values were incorporated into the length-based function of Pauly (1980):

$$\ln(M) = -0.0152 - 0.279 * \ln(L_\infty) + 0.6543 * \ln(K) + 0.463 * \ln(T)$$

where, ln(M) = natural log of natural mortality, $\ln(L_\infty)$ = natural log of the asymptotic length, ln(K) = natural log of the growth coefficient and ln(T) = natural log of the mean annual temperature in degrees Celsius.

Use of Louisiana data on growth and water temperature applied to Pauly's function results in a natural mortality estimate of M=0.4.

Alagaraja (1984) and Hoenig (1983) provide methods of estimating M based on the fishes lifespan or longevity, and with the assumption that M=Z. Longevity is also difficult to determine for exploited fish stocks, since the age distribution is usually truncated by fishing, but these methods are as useful as any in providing provisional estimates of natural mortality. The functions described by Alagaraja (1984) are:

$$M1\% = -\ln(0.01)/Tm$$
$$M0.1\% = -\ln(0.001)/Tm$$

where, M1% and M0.1% are the natural mortality rates corresponding to 99% and 99.9% mortality, respectively, given a fish's lifespan (Tm) in years. Sheepshead in Louisiana have been aged to 20- years-old (Beckman et al. 1991), and to 23 years (this report). If it is assumed that 99% or 99.9% of the fish die by age 20 then the corresponding natural mortality rates for M1% and M0.1% would be 0.23 and 0.35 respectively. For a maximum age of 23, the estimates are 0.20 and 0.30 respectively.

The function described by Hoenig(1983) is:

$$\ln(Z) = 1.46 - 1.01 * \ln(Tm)$$

where, when M=Z, longevity (Tm) can be defined as the maximum survival age. If we assume that the maximum age of sheepshead has been truncated due to fishing from 25 years to 20 or 23 years, the resulting estimate of natural mortality, given Tm=25, would be 0.2.

Another method of estimating M is described by Rikhter and Efanov (1976) and utilizes population age at sexual maturity. The function is:

$$M = 1.521/(Tm50\%^{0.720}) - 0.155$$

where, Tm50% is the age at which 50% of the population is mature. Age 2 is reported as the age at 50% maturity for the sheepshead population (Render and Wilson 1992) resulting in an M estimate of 0.77.

In summary, the estimated rates of natural mortality for sheepshead in Louisiana using a variety of estimation procedures are as follow:

Pauly (1980)	0.40
Alagaraja (1984)	0.20 to 0.35
Hoenig (1983)	0.20
Rikhter and Efanov (1976)	0.77

5.3 Disappearance Rates and Fishing Mortality

The disappearance rate (Z') from the fishery comprises the total mortality (natural + fishing) and some unknown rate of decreasing availability of the fish to the fishery. If the unknown rate of availability is small or nonexistent, then the disappearance rate will be a reasonable estimate of total mortality. However, if a large portion of the disappearance rate is due to fish not being available to the fishery, then assuming Z'=Z will overestimate the impact of fishing.

Length frequency information was available from recreational and commercial fisheries for the period from 1994-2003 (Table 5.2). An annual catch-at-age matrix was developed by applying the ALK presented in Section 5.1 to the years where length frequency data for the commercial and recreational fishery was available (Table 5.3). Length frequency data were obtained from the Trip Interview Program (TIP) and from a LDWF biological sampling program for the commercial fishery, and from the National Marine Fisheries Services (NMFS) Marine Recreational Fishery Statistics Survey (MRFSS) samples for the recreational fishery. The data from both of the surveys did not consistently distinguish between sexes. Therefore, we assumed for this assessment that all fish sampled were female.

In prior assessments, we calculated the status of the stock based on estimation of disappearance rates. In the current assessment, we continue to use that methodology, but also include a VPA analysis for comparison of results.

Disappearance rates were calculated by regressing the natural log of the catch-at-age, beginning with the age at full recruitment to the fishery. In prior assessments, the age at full recruitment was estimated to be 7, based on age assignments from the von Bertalanffy growth equation. In the present assessment, due to the use of an ALK rather than a growth curve, we estimate the age at full recruitment to be 5 (Figures 5.1, 5.2).

Disappearance rate estimation assumes that recruitment is constant and the fishery is in equilibrium. A range of natural mortality rates were used in the assessment. After reviewing estimates of M in Section 5.2, we chose not to assume any method of estimating M was better

than another, but rather to present results for the range of estimates. The range of M was from 0.20 - 0.77. We chose to use an M of 0.2 as the lowest estimate of M since it was the lowest estimate derived from the methods examined. Resulting disappearance rates using an M of 0.2 indicated a SPR values well above 30%; therefore, assessing the impact of an upper range of M was of little value in evaluating the status of the stock compared to the conservation standard. However, we did use an upper range of 0.3 to evaluate how a change in M impacted resulting yield and SPR. Disappearance rates were calculated from the combined commercial and recreational catch-at-age data by year for 1994 - 2003. The calculated disappearance rates ranged from 0.41 to 0.55 (Table 5.4).

In prior assessments, selectivities were based on ages derived from the growth equation. These were modified by use of the ALK. The new selectivities were utilized in the estimation of stock benchmarks and annual estimates of spawning potential ratio and yield per recruit. As a result, estimates of stock benchmark values (e.g. YPR at 30% SPR) differ from previous reports. Also, annual estimates of SPR and YPR have changed from previous reports because of this change in analytical procedure. Therefore the annual estimates from the 2004 report are presented in the current report for comparison.

Catch-at-age from the fishery for the years 1994-2003 was used to derive age-specific selectivities to be used in yield-per-recruit analysis. The method presented in Sparre and Venema (1992) was used to develop selectivities. This method uses a linearized catch curve to determine the selectivity of fish not yet fully recruited to the fishery. The ratio of the observed catches to the expected catches at each age is the probability of capture or selectivity of the fishery at age. This selection is then regressed in the equation:

$$\ln(1 / S_t - 1) = T1 - T2 * t$$

where, S_t = the selectivity at age t, and T1 and T2 are constants corresponding to the intercept and slope of the regression. To develop theoretical or estimated selectivities at age the following equation is used.

$$S_t \text{ (estimate)} = 1 / (1 + \exp(T1 - T2 * t)$$

Selectivities for ages up to full age-at-recruitment were used to describe the relative fishing mortality to that point; for age at full recruitment and older, selectivities are assumed to be 1, or 100% selected. Regulatory changes in the commercial fishery in 1995 and 1997 were evident in the selectivity patterns observed. Therefore, selectivities were grouped into 3 time periods to reflect those changes in the fishery. Prior to 1995, gillnets and trammel nets were fished in inshore waters of the state on primarily younger fish and were a significant contribution to the commercial landings of sheepshead. Currently, the fishery is primarily an otter trawl fishery on larger fish in offshore waters and large bays and sounds. It is evident that the commercial selectivity pattern in the most recent years has moved toward larger fish (Table 5.2).

Selectivities in the previous and current assessment are as follows:

	Previous Assessment			Current Selectivities		
Age	**1994-1995**	**1996**	**1997-2002**	**1994-95**	**1996**	**1997-2003**
0	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.01	0.01	0.00
2	0.03	0.03	0.01	0.07	0.09	0.04
3	0.34	0.13	0.09	0.36	0.39	0.21
4	1.00	0.68	0.26	0.86	0.93	.62
5	1.00	1.00	0.57	1.00	1.00	1.00
6	1.00	1.00	0.96	1.00	1.00	1.00
7+	1.00	1.00	1.00	1.00	1.00	1.00

Disappearance rates (Z') were derived by regression of the descending arm of the catch curve. These values were re-calculated for each year, using the values derived from the new catch-at-age estimates (Table 5.4).

The estimates of harvest at age were also evaluated using a VPA (Jones, 1984) to determine age-specific mortality rates by year. We used the Solver tool in MS © Excel to iteratively calculate B, such that Q(t) = B(t) by varying F. The estimation procedure was constrained to F=>0.00001, precision of the solution set to 0.000001, convergence set to 0.0001, de-selecting the linear models option of Solver, using the quadratic estimation procedure, central derivatives, and the quasi-Newton search methods. This process was semi-automated through development of a macro to step through the annual estimation process. A range of terminal F was input manually, from 0.01 to 0.8 (Figure 5.3).

The VPA analysis was run for the years 1999-2003. Ages over 14 were combined into a 15+ age group. The results of this analysis were used to derive age-specific fishing mortality rates to be used in spawning potential calculations and yield-per-recruit analysis for comparison to estimates from the disappearance rate procedures used in this and prior assessments.

Examination of the estimates of F at age from various terminal F's in the VPA showed consistent patterns of selectivity across the range of terminal F's used for each year of input data (Figure 5.3). Sheepshead were estimated to be fully recruited to the fishery by age 5, based on inspection of the F at age for various years. Highest estimates of F were found for age 5 or age 7 sheepshead, with either a slight decline in F or an increase in F with older fish, depending on the year and M estimates. Another characteristic noted in the analysis was the relatively slow convergence of estimated F at age over the range of initial F considered. Very low values of initial F resulted in substantially lower estimates of F over all ages.

5.4 Yield-per-Recruit

Yield-per-recruit and SPR analysis provide basic information on fish stock dynamics by estimating the impact of mortality on yield and the spawning potential of the stock. The results can be examined as to the sensitivity of natural and fishing mortality rates on yield and spawning potential.

The growth parameters described in Section 5.1, sexual maturity described in Section 5.2 and the age-specific selectivities described in Section 5.3 were incorporated into the yield-per-recruit and spawning potential analysis. Mean weight for adult fish at each age was used as a surrogate of spawning potential, since we had no direct estimate of spawning potential at age. Natural mortality rates of 0.2 and 0.3 were used in the analysis because they are on the lower end of the range of estimates and would provide the most conservative results. These rates are also used to describe the sensitivity of M on yield and spawning potential. The results are presented in Table 5.5, which contains estimates of F_{MAX} (fishing mortality rate that produces maximum yield), $F_{0.1}$ (fishing mortality rate representing 10% of the slope at the origin of a yield-per-recruit curve), $F_{20\%SPR}$ (fishing mortality that produces 20% SPR), $F_{30\%SPR}$ (fishing mortality that produces 30% SPR), and annual estimates of F based on the disappearance rates calculated in Section 5.3. Selectivities patterns of the overall fishery are recalculated with each additional year of data. Therefore, the results of this analysis, reflected in Table 5.2, could change each year depending on any change in selectivity patterns in the fishery.

In prior assessments, the status of the stock was based on disappearance rates calculated using a von Bertalanffy growth equation. In the current assessment, we continue to use disappearance rates, but based on an age-length key. We also include a VPA analysis based on that same ALK for comparison of results.

In the current analysis, the F at age was also incorporated into the YPR analysis based on the results of the VPA for that year. Yield analyses are presented for the years 1999-2003. Age specific selectivities were based on F at age indexed to F at age 5. The analysis was carried out to age 20, but the VPA contained no information on F for fish older than age 14. Estimates of F at age 15+ carried no predictive power (these were the terminal years of the VPA). Therefore, fish ages 15 and older were assigned selectivities equal to the selectivities of age 5.

For the VPA-based YPR analysis, fishing mortality rates at age were selected as the average of the F at age from the $F_{terminal}$=0.1 to $F_{terminal}$=0.6. These rates were used in the analysis because they included a range of reasonable values, and the lowest terminal values were still above the F's estimated for slightly younger ages (Figure 5.3). Those age-specific mortality rates were applied to a yield per recruit model, using the von Bertalanffy parameters described in Section 5.1. Selectivities at age were assigned based on the annual estimated F profile for each value of M.

5.5 Conservation Standards

Conservation standards are intended to protect the viability of a fish stock for future generations. These standards have historically been based on a number of biological measures of the dynamics of fish stocks, depending on the availability and adequacy of data. Conservation standards should be separated into two types: a conservation threshold which is entirely biologically based and, a conservation target which considers biological measures modified by relevant social, economic, and ecological factors. A conservation threshold is a biological baseline for the harvest of a fish stock and should not be exceeded. It is the highest level of fishing mortality that will ensure that recruitment overfishing will not occur. Beyond the conservation threshold, a conservation target may be set, providing for other management goals

in the fishery. Such goals may include maximizing yield in weight or numbers of fish, economic benefits or profit, employment, or some other measurable goal. These targets should be set at a fishing mortality rate below that of the conservation threshold in order to ensure that the biological integrity of the stock is not damaged by fishing.

The spawning potential ratio (SPR) concept described by Goodyear (1989), is a species specific value expressed as the ratio of the spawning stock biomass (or egg production) per recruit (SSB/R) in a fished condition to the SSB/R in an unfished condition. The concept is based on the premise that below some level of SPR, recruitment would be expected to be reduced. Goodyear (1989), recommends that in the absence of sufficient data to provide a value specific to the stock in question an SPR of 20% be used as a threshold. Work on North Atlantic ground fisheries also resulted in the calculation of a threshold SPR of 20% (Gabriel et al. 1984, Gabriel 1985). An SPR of 20% has been recommended for Spanish and king mackerel in the Gulf of Mexico (National Oceanic and Atmospheric Administration/National Marine Fisheries Service 1995), while an SPR of 8-13% has been demonstrated to be sufficient for gulf menhaden (Vaughan 1987). In earlier analyses of Louisiana spotted seatrout fisheries (Louisiana Department of Wildlife and Fisheries 1991), an SPR threshold of 15% was recommended, based on several years of data. A more recent reassessment of threshold SPR for spotted seatrout by the department resulted in a median SPR of 18%. The change from 15% to 18% was due to changes in the methodology of the assessment, specifically the use of an improved maturity schedule with additional data from Louisiana specimens and the incorporation of the method used by Gabriel (Gabriel *et al.* 1984, Gabriel, 1985) to estimate median SPR. Mace and Sissenwine (1993) examined 90 stocks of 27 species, and reported that the average replacement SPR for all these stocks was 18.7%, while the most resilient quarter of the stocks required a maximum of only 8.6% SPR. These authors recommended an SPR of 30% be maintained when there is no other basis for estimating the replacement level, as this level was sufficient in maintaining recruitment for 80% of the stocks they examined. However, they noted that 30% may be overly conservative for an "average" stock, and reiterated the need for stock-specific evaluations of standards to enhance both safety and benefits in the fishery.

Sufficient information is not available to directly estimate a conservation threshold for sheepshead in Louisiana. However, the conservation target of 30% SPR established by the 1995 Regular Session of the Louisiana Legislature for black drum, sheepshead, southern flounder, and striped mullet appears to be adequate to maintain the sheepshead stock and prevent recruitment overfishing.

The use of any measure of the health of a fish stock as a perfect index is arguable. It is logical to conclude that growth overfishing should occur at a much lower fishing rate than that which would threaten recruitment. However, Mace and Sissenwine (1993) provide information to suggest that some stocks may have reduced recruitment at levels of fishing that would not reduce yield per recruit. The preferable position for making recommendations on appropriate levels of fishing for a stock is to base those recommendations on actual measures of spawning stock size and recruitment for both the species and fishery in question. This requires a base of information resulting from monitoring of both the stock and the fishery over a variety of conditions. Without this information, conservation standards may either underestimate or overestimate the potential of a fishery. If the potential is underestimated, society loses the economic and social benefits of the harvest. If the potential is overestimated and the fishery is allowed to operate beyond sustainable levels, society loses the benefits of a sustainable fishery,

and recovery will require some period of rebuilding, when effort must be reduced from the non-sustainable levels (Hilborn and Walters, 1993).

5.6 Status of the Stock

Recent Regulatory History

There are no size or creel limits for sheepshead taken recreationally. Commercial harvesters are limited to a 10 inch minimum size limit.

Rules for the commercial harvest of sheepshead changed on August 15, 1995 when Act 1316 of the 1995 Regular Legislative Session, the Marine Resources Conservation Act of 1995, became effective. This act outlawed the use of "set" gill nets or trammel nets in saltwater areas of Louisiana, and restricted sheepshead harvest by the use of "strike" nets to the period between the third Monday in October and March 1 of the following year. A "Restricted Species Permit" was required in order to harvest sheepshead, and several criteria were established in order to qualify for that permit. After March 1, 1997, all harvest by gill or trammel nets was banned, and legal commercial gear to harvest sheepshead is limited to trawls, set lines and hook and line. This set of regulations had the effect of reducing the harvest of sheepshead by this segment of the commercial fishing industry.

Trends in Harvest and Abundance

Sheepshead were lightly exploited by the commercial fisheries until the early to mid-1980s when commercial harvest began to increase (Figure 5.4). Commercial landings have gone from 0.2 million pounds in the early1980s to 2.4 - 3.7 million pounds in the 1990s. Landings then generally declined from a high of 3.7 million pounds in 1993 to about 1.6 million pounds in 2002 and 2003. Fishery dependent commercial data prior to 1991 was obtained from NMFS's General Canvass Landing Program, from 1991 through 1998 it was collected by the Louisiana Department of Wildlife and Fisheries' (LDWF) Monthly Dealer Reports and from 1999 to present LDWF's Commercial Reporting Requirement "Trip Tickets" program is utilized to gather this type of data.

Harvest from the recreational fishery obtained by the NMFS'S MRFSS fluctuated from a low of 0.4 million pounds in 1981 to a high of 1.5 million pounds in 1997. This was followed by a decline, with increases in 2002 and 2003, with 2003 being a record year with 2.2 million pounds of sheepshead being landed. Recreational harvests for the years examined (1981-2003), were equal to those of the commercial fishery until 1987 when the commercial fishery began to expand (Figure 5.4).

Mean catch-per-trip from the recreational fishery was calculated by selecting those trips that had sheepshead in their catch. The arithmetic average CPUE values were indexed to the long-term mean. The results are presented in Figure 5.5. The catch-per-unit-effort (CPUE) indices fluctuated with no indication of a long-term downward trend. Fisheries-dependent recreational landings data are collected through NMFS's MRFSS and are currently being collected by LDWF biologists.

Catch-per-effort data from the Department's, fishery-independent trammel net (750' x 6' - 1 5/8" inner, 6" outer wall) samples were calculated as follows:

$$\text{Mean CPUE} = (\exp (\Sigma \ln (\text{catch} + 1) / N)) - 1$$

where, catch is the total number caught in each set and, N is the number of samples taken annually. Trammel net data were used for the period 1986-2004. Trammel net samples are collected from October through March. In order to use the most recent data available to us in this report, trammel net CPUE was estimated for October-December only. This allowed the use of 2004 data through December. Trammel net CPUE fluctuated throughout the time period with no indication of a long-term downward trend. Mean CPUE for 2003 fell below the high years of 2000 and 2001, but was not significantly lower than any of the years examined (Figure 5.6).

Estimates of Yield and Spawning Potential

It should be noted that the following results of YPR and SPR analysis may not reflect the impact of current regulations described above. With this type of general assessment, it takes several years of consistent regulations before disappearance rates would accurately measure the impact of those regulations, since the method relies on the relative abundance of the age-classes in the fishery.

The results of the YPR and SPR from the disappearance rate calculations and from the VPA calculations were remarkably close (Table 5.5). The major change seen was the result of the application of the age-length key to the length-frequency information, which changed estimated values from the previous assessment. Those previous values are also presented for comparative purposes in Table 5.5. We selected to use the results from the disappearance rate assessment based on the ALK simply because this method had been used in previous analyses, and the selection did not make any difference in the results of this analysis.

The results of YPR analysis indicate that if M=0.2 (the value within the range of estimates that allows the lowest harvest rates within the conservation standard), the fishery in the years assessed (1999 - 2003) was operating near $F_{0.1}$ and well below F_{MAX}, with yield of 69% to 81% of maximum, and SPR at 47% to 57%. An M of 0.3 (the highest value examined) would indicate a more lightly fished stock with yield being 32% to 50% of maximum and with SPR being 66% to 78% (Table 5.5).

5.7 Research and Data Needs

Estimates of natural mortality used in the present assessment vary widely. This variation lessens the ability of the present assessment to provide an accurate estimate of the potential yield of the stock, and also reduces the confidence level of the present estimate of SPR. A more accurate estimate of natural mortality would improve both estimates.

Annual sex-specific age-length keys should continue to be developed to provide catch-at-age data necessary to conduct age-based population assessments. Due to the preliminary information on potential differential availability to recreational and commercial fisheries, efforts need to be made to collect adequate age samples from each fishery to

independently characterize the age structure of these harvests. Interannual variation in cohort strength or changes in fishing patterns could create significant problems in future assessments, so that annual collections of age information are required for accurate assessments. The department is in the process of collecting otoliths for development of annual age-length keys. When age data are sufficient, the Department intends to conduct more extensive VPA analyses and to explore other statistical methods of evaluating the status of the sheepshead stock.

Sex-specific fishery dependent length frequency data is essential in adequately partitioning catch from the fishery. There can be significant improvement in the accuracy of this assessment if sex is collected.

The relationship between wetlands losses or modifications and the continuation of fishery production within the state has been discussed by many authors. However, this relationship is likely to be different for the various fishery species. Understanding of this relationship for sheepshead should be an ongoing priority.

In the presence of changing regulations, fishery-dependent information is not a reliable source of data necessary to assess the status of a fish stock. However, such data are necessary to measure the effects of fishing on that stock. Consistent fishery-dependent and fishery-independent data sources, in a comprehensive monitoring plan, are essential to understanding the status of fishery stocks, and to identifying causes of changes in stock abundance. Present programs should be assessed for adequacy with respect to their ability to evaluate stock status, and modified or enhanced to optimize their capabilities.

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Table 5.1. Age-length key used for assessment of sheepshead in Louisiana. Right-hand columns are total numbers of fish aged from each of the fisheries, as well as the total numbers of age samples at each length interval.

	AGES FROM ALL SOURCES																								NUMBER OF AGED FISH BY SOURCE			
Fork Length	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	Fishery Ind	Rec	Com	Total
4	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2			2
5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1			1
6	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5			5
7	1	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6			6
8	1	7	47	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	57	1		58
9	0	12	46	6	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	58	6	2	66
10	0	16	43	29	14	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	86	8	12	106
11	0	7	60	105	42	10	5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	173	14	43	230
12	0	2	56	148	81	35	9	1	2	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	245	11	81	337
13	0	0	26	150	155	83	18	3	2	2	0	0	1	0	0	1	0	0	0	0	0	0	0	1	315	19	108	442
14	0	1	21	101	175	109	36	16	1	3	0	1	0	0	0	1	0	0	0	0	0	0	0	0	316	23	126	465
15	0	0	7	47	168	183	72	33	14	11	4	0	0	1	0	1	3	0	0	0	0	0	1	0	384	18	143	545
16	0	1	6	18	68	131	100	58	13	12	1	5	1	0	1	1	2	0	0	0	0	0	0	1	286	11	122	419
17	0	0	1	6	27	50	59	33	19	18	5	8	5	1	3	2	0	0	0	3	0	0	0	1	159	12	70	241
18	0	0	1	0	5	21	28	15	15	9	4	3	4	6	1	1	2	0	0	0	1	0	0	1	74	3	40	117
19	0	0	0	2	7	6	5	7	3	9	5	1	1	0	1	0	0	1	0	1	0	0	1	0	33	3	14	50
20	0	0	0	2	0	1	1	3	4	2	1	2	1	0	0	1	0	0	0	1	0	0	0	0	5	3	11	19
21	0	0	0	0	0	0	0	0	0	0	1	4	0	1	0	0	0	0	0	0	0	0	0	0	2	0	4	6
																									2207	132	776	3115

Table 5.2. Length frequency of recreationally and commercially harvested sheepshead from Louisiana waters

Recreational Length frequency by year										
len	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
.	18	16	69	87	109	81	80	110	101	336
5	0	3	0	0	0	0	0	0	0	0
6	3	12	0	1	0	0	0	0	0	0
7	4	2	6	5	0	1	0	1	0	0
8	7	2	8	4	1	1	0	0	2	8
9	15	11	15	9	0	4	1	5	6	16
10	13	23	18	20	2	8	3	1	13	52
11	42	44	27	24	18	13	6	7	33	140
12	45	26	15	43	23	31	3	11	50	144
13	35	61	55	62	35	30	5	17	40	208
14	27	35	70	82	47	51	13	10	63	200
15	22	38	49	63	62	51	10	14	72	220
16	11	8	22	40	50	47	9	17	47	288
17	6	12	13	18	38	31	11	20	28	308
18	4	8	7	10	21	19	4	11	19	156
19	1	4	2	5	6	7	4	8	9	72
20	2	5	1	2	3	9	1	9	3	60
21	0	1	3	0	0	0	1	3	1	8
22	1	0	0	0	1	1	0	0	0	0
23	2	0	0	0	0	1	0	1	0	0
24	0	0	0	1	0	1	0	0	0	0
25	0	0	0	0	0	0	1	0	0	0

Commercial length frequency by year										
len (in)	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
8	5	0	0	0	0	0	0	0	0	0
9	14	12	10	4	0	0	0	0	0	0
10	17	42	44	5	3	0	0	0	0	0
11	25	152	132	18	8	1	5	2	2	2
12	67	247	210	65	30	4	15	7	1	13
13	67	285	194	144	71	12	27	15	9	17
14	52	291	138	186	99	24	65	36	26	58
15	48	223	110	142	90	8	83	48	66	125
16	28	136	100	91	36	2	62	28	63	109
17	16	81	58	32	9	0	27	13	36	59
18	12	53	35	13	1	0	13	7	24	20
19	7	23	15	3	3	0	5	0	5	17
20	1	9	7	3	0	0	1	1	2	13
21	0	4	2	0	0	0	0	0	0	2
22	0	0	0	0	0	0	0	0	1	1
Total	359	1558	1055	706	350	51	303	157	235	436

Table 5.3. Estimates of total harvest at age of sheepshead in Louisiana waters.

	TOTAL CATCH-AT-AGE BY YEAR										
AGE	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	**1994-2003 Average**
0	1,680	6,070	2,175	1,899	27	194	1	403	54	59	1,256
1	14,006	45,839	20,115	16,705	2,067	3,536	4,773	4,591	7,617	7,687	12,693
2	90,991	118,077	110,606	84,381	35,110	37,853	33,222	27,057	56,230	57,037	65,056
3	299,464	337,484	306,216	247,886	155,025	168,265	109,065	81,868	138,862	149,901	199,404
4	445,443	483,651	442,803	451,497	333,497	435,601	240,884	175,280	210,419	231,784	345,086
5	419,283	463,700	405,659	495,613	400,030	510,065	330,537	242,896	247,506	291,414	380,670
6	143,748	172,109	148,901	197,581	169,189	183,939	159,308	118,306	131,269	173,043	159,739
7	131,549	147,667	114,597	177,321	155,542	179,710	156,175	117,036	107,582	136,915	142,409
8	44,982	54,306	43,743	54,166	46,679	49,185	53,665	42,604	42,010	59,569	49,091
9	54,492	61,720	50,531	63,242	49,986	54,845	63,792	47,110	48,695	61,991	55,640
10	19,083	22,496	17,178	22,204	18,304	24,745	24,100	18,457	16,928	22,461	20,596
11	21,782	27,806	26,362	24,259	17,192	12,730	28,147	24,141	20,209	40,831	24,346
12	12,798	14,286	11,727	13,124	10,469	5,541	17,104	12,173	13,584	18,821	12,963
13	5,014	6,736	6,071	7,092	5,993	6,611	8,172	6,680	6,079	8,571	6,702
14	3,383	3,967	3,119	5,131	4,794	3,408	5,994	4,438	4,095	6,018	4,435
15 +	14,012	17,605	13,859	15,898	15,359	15,834	14,540	13,507	12,277	22,830	15,572
TOTAL	1,721,711	1,983,519	1,723,662	1,877,998	1,419,264	1,692,061	1,249,477	936,545	1,063,417	1,288,933	1,495,659

Table 5.4. Natural log of Louisiana harvest of sheepshead, and estimates of regression of age vs. harvest of age 5-14 fish. Also listed are the estimated F values for M=0.2 and M=0.3 for each year calculated.

	Natural log of catch at age by year										1994-2003
AGE	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	**average**
0	7.43	8.71	7.68	7.55	3.29	5.27	0.00	6.00	3.99	4.08	7.14
1	9.55	10.73	9.91	9.72	7.63	8.17	8.47	8.43	8.94	8.95	9.45
2	11.42	11.68	11.61	11.34	10.47	10.54	10.41	10.21	10.94	10.95	11.08
3	12.61	12.73	12.63	12.42	11.95	12.03	11.60	11.31	11.84	11.92	12.20
4	13.01	13.09	13.00	13.02	12.72	12.98	12.39	12.07	12.26	12.35	12.75
5	12.95	13.05	12.91	13.11	12.90	13.14	12.71	12.40	12.42	12.58	12.85
6	11.88	12.06	11.91	12.19	12.04	12.12	11.98	11.68	11.79	12.06	11.98
7	11.79	11.90	11.65	12.09	11.95	12.10	11.96	11.67	11.59	11.83	11.87
8	10.71	10.90	10.69	10.90	10.75	10.80	10.89	10.66	10.65	10.99	10.80
9	10.91	11.03	10.83	11.05	10.82	10.91	11.06	10.76	10.79	11.03	10.93
10	9.86	10.02	9.75	10.01	9.81	10.12	10.09	9.82	9.74	10.02	9.93
11	9.99	10.23	10.18	10.10	9.75	9.45	10.25	10.09	9.91	10.62	10.10
12	9.46	9.57	9.37	9.48	9.26	8.62	9.75	9.41	9.52	9.84	9.47
13	8.52	8.82	8.71	8.87	8.70	8.80	9.01	8.81	8.71	9.06	8.81
14	8.13	8.29	8.05	8.54	8.48	8.13	8.70	8.40	8.32	8.70	8.40
15 +	9.55	9.78	9.54	9.67	9.64	9.67	9.58	9.51	9.42	10.04	9.65
Overall disappearance (Z') - ages 5-14 estimated for each year of data											
Y-intercept	15.12	15.21	15.02	15.29	15.09	15.64	14.72	14.41	14.49	14.59	14.97
Slope	-0.50	-0.49	-0.49	-0.49	-0.49	-0.55	-0.43	-0.42	-0.44	-0.41	-0.47
R^2	0.96	0.97	0.96	0.97	0.97	0.97	0.97	0.97	0.97	0.95	0.97
Fishing mortality rate at full selectivity											
M=0.2	0.30	0.29	0.29	0.29	0.29	0.35	0.23	0.22	0.24	0.21	0.27
M=0.3	0.20	0.19	0.19	0.19	0.19	0.25	0.13	0.12	0.14	0.11	0.17

Table 5.5. Results of Yield per Recruit and SPR analysis for Sheepshead, comparing estimates from different assessment techniques. Base case values are the estimates from disappearance rate estimates (Z'), using age-length key (ALK) to assign ages to harvest. Values from 2004 provided for comparison with estimates from growth equation, VPA estimates used for sensitivity analysis.

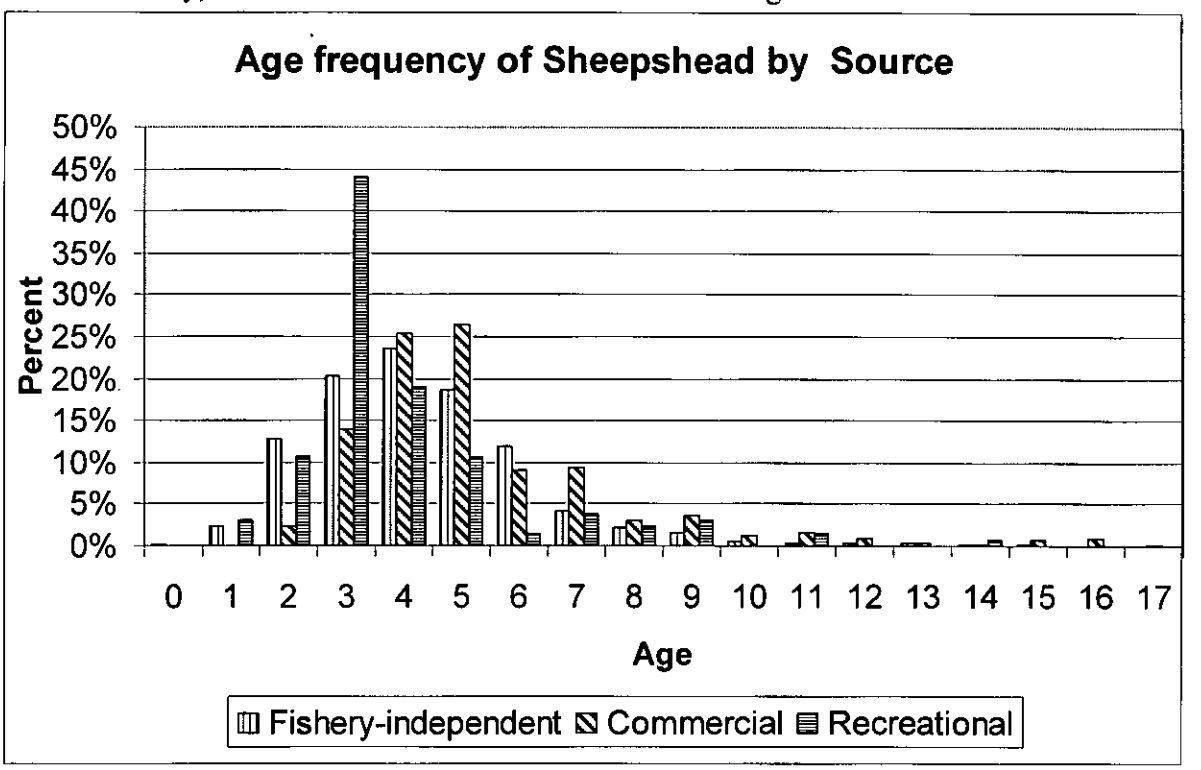
M=0.2

	F Ratio	YPR	SPR	%SPR	%YPR	
Fmax =	**51.6724**	**542.6297**	**594**	**11.36%**	**100.00%**	**Benchmarks**
F0.1 =	**0.3437**	**394.6224**	**2,877**	**55.02%**	**72.72%**	
F20% =	**9.1205**	**536.5425**	**1,046**	**20.00%**	**98.88%**	
F30% =	**2.4540**	**517.3649**	**1,569**	**30.00%**	**95.34%**	
1999 =	0.3739	404.2018	2,800	53.56%	74.49%	**2004 Assessment Estimates Based on Z' and growth equation**
2000 =	0.1303	260.9248	3,802	72.72%	48.09%	
2001 =	0.0778	188.1420	4,236	81.02%	34.67%	
2002 =	0.2560	357.8359	3,154	60.32%	65.94%	
1999 =	0.3818	408.1999	2,644	50.53%	76.47%	**Estimates Based on VPA**
2000 =	0.2505	369.7108	2,975	56.87%	69.85%	
2001 =	0.2352	359.9959	3,043	58.16%	68.23%	
2002 =	0.2458	375.3996	2,875	54.96%	71.61%	
2003 =	0.2011	348.1533	3,098	59.22%	66.34%	
1999 =	**0.3491**	**430.8855**	**2,477**	**47.35%**	**81.12%**	**Estimates Based on Z' and ALK**
2000 =	**0.2294**	**377.1908**	**2,922**	**55.85%**	**71.01%**	
2001 =	**0.2248**	**374.3485**	**2,944**	**56.26%**	**70.48%**	
2002 =	**0.2365**	**381.4875**	**2,888**	**55.21%**	**71.82%**	
2003 =	**0.2123**	**366.0479**	**3,007**	**57.48%**	**68.91%**	

M=0.3

	F Ratio	YPR	SPR	%SPR	%YPR	
Fmax =	**53687092**	**448.1602**	**0**	**0.00%**	**100.00%**	**Benchmarks**
F0.1 =	**0.5570**	**240.7092**	**1,601**	**60.96%**	**53.71%**	
F20% =	**33.4831**	**394.4429**	**525**	**20.00%**	**88.01%**	
F30% =	**8.6460**	**366.4702**	**788**	**30.00%**	**81.77%**	
1999 =	0.2739	182.0656	1,881	71.63%	40.63%	**2004 Assessment Estimates Based on Z' and growth equation**
2000 =	0.0303	36.9478	2,485	94.65%	8.24%	
2001 =	0.0000	0.0000	2,626	100.00%	0.00%	
2002 =	0.1560	133.4234	2,095	79.77%	29.77%	
1999 =	0.2400	175.2232	1,883	71.65%	43.29%	**Estimates Based on VPA**
2000 =	0.1507	145.1772	2,028	77.17%	36.25%	
2001 =	0.1375	137.0038	2,063	78.50%	34.62%	
2002 =	0.1461	149.3738	1,997	75.98%	37.24%	
2003 =	0.1130	127.9357	2,096	79.78%	31.89%	
1999 =	**0.2491**	**206.1612**	**1,743**	**66.38%**	**51.35%**	**Estimates Based on Z' and ALK**
2000 =	**0.1294**	**142.1729**	**2,038**	**77.60%**	**35.41%**	
2001 =	**0.1248**	**138.8822**	**2,052**	**78.16%**	**34.59%**	
2002 =	**0.1365**	**147.1630**	**2,016**	**76.76%**	**36.66%**	
2003 =	**0.1123**	**129.3165**	**2,094**	**79.76%**	**32.21%**	

Figure 5.1. Age frequency of sheepshead included in age-length keys from fishery-independent, commercial and recreational fisheries. Top figure shows percent in each age class for each fishery, bottom shows the same information on a logarithmic scale.



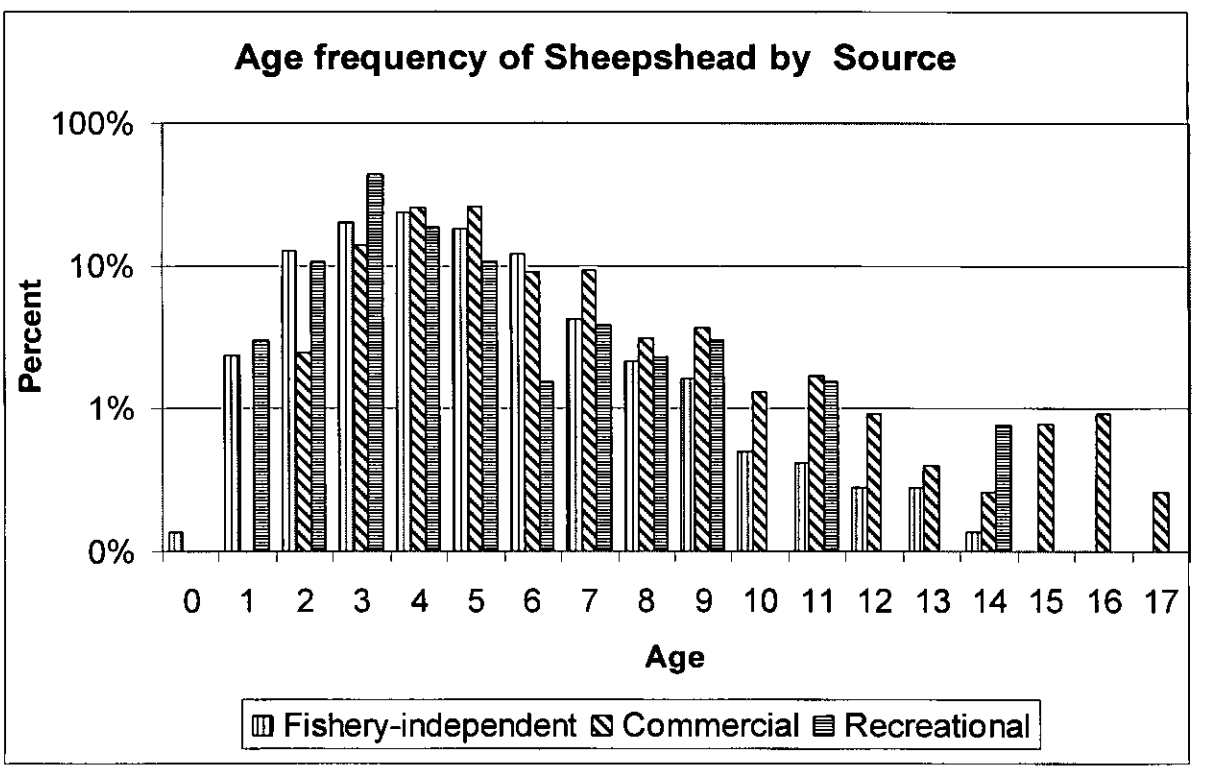


Figure 5.2. Overall age frequency of sheepshead harvest as estimated from length frequency information from commercial and recreational fisheries and age assignments from the ALKs as described in the text. The age distribution of each sector was calculated independently against the total for that sector and equals 100%.

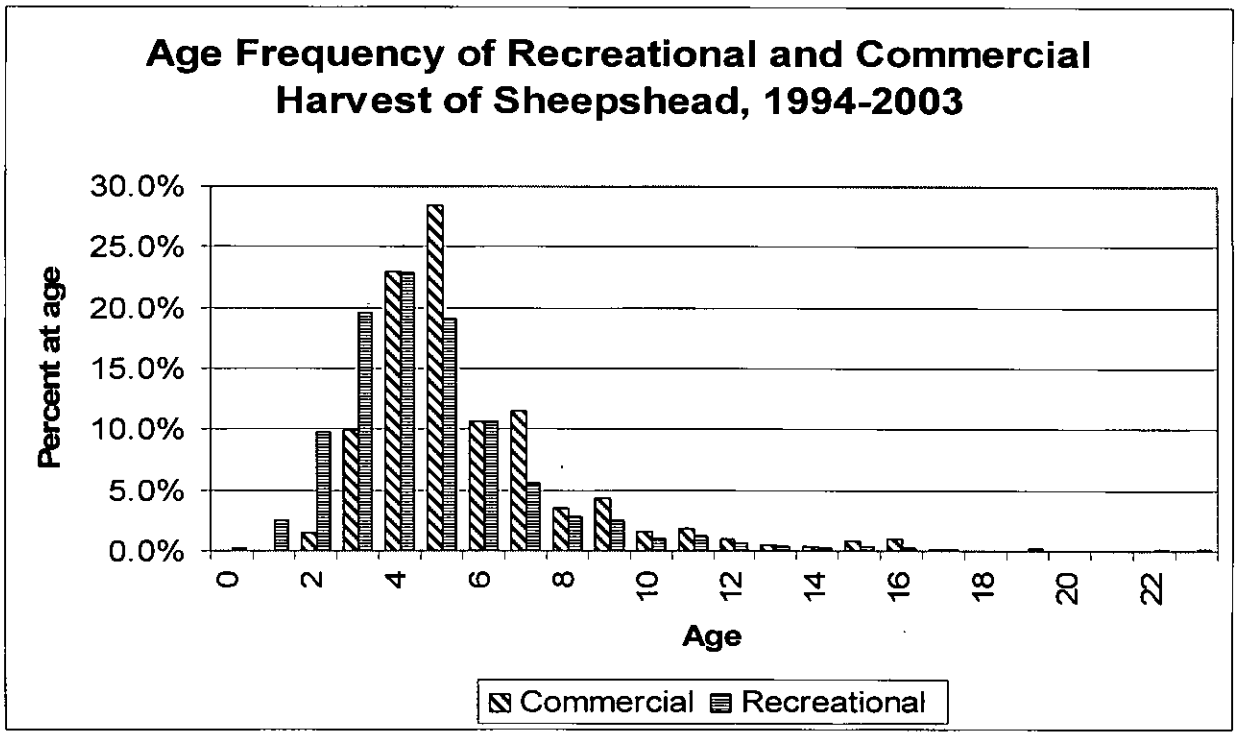


Figure 5.3. Estimates of F at age for Louisiana sheepshead from VPA using various terminal F's, for M=0.2 and M=0.3.

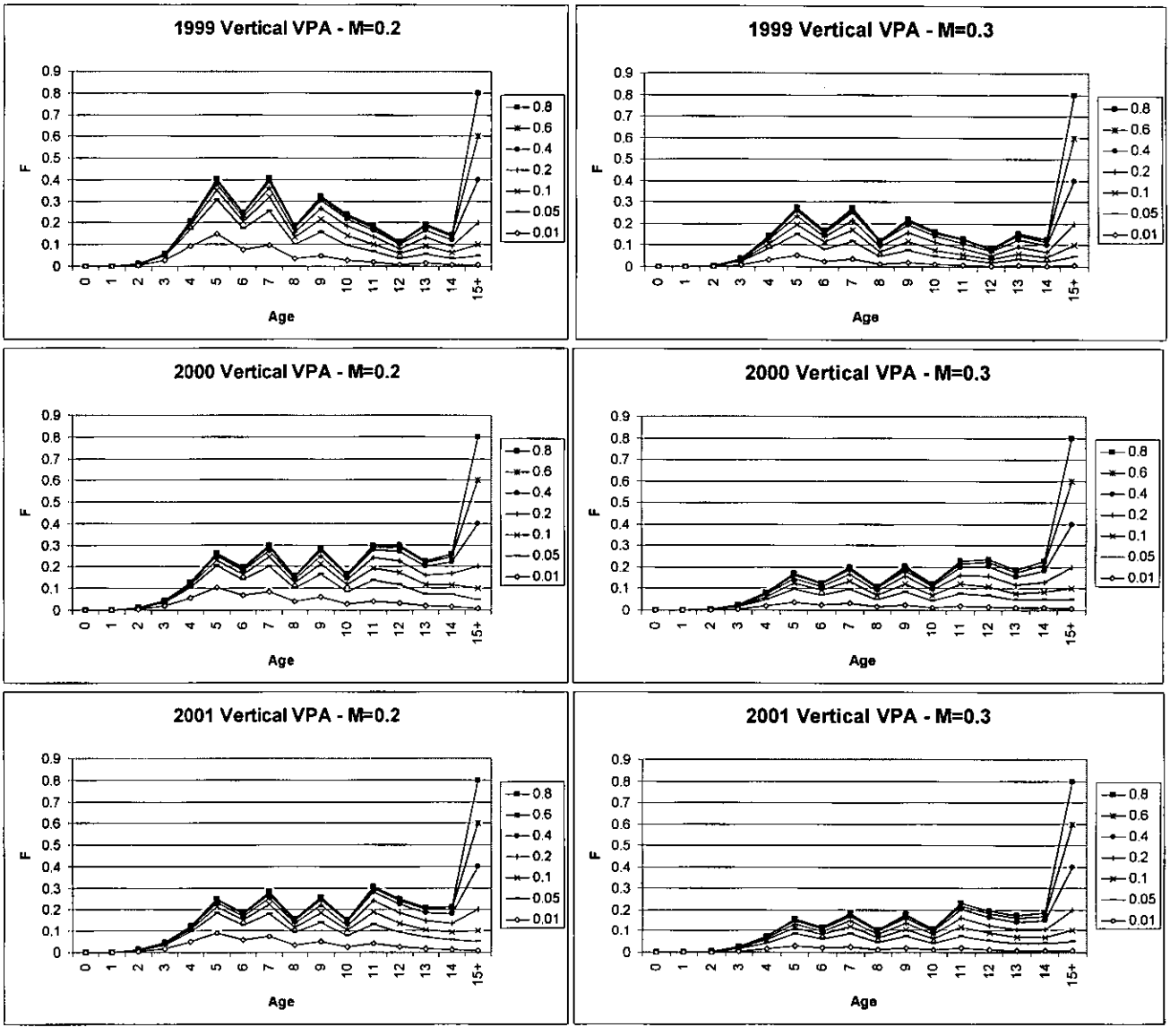


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Figure 5.3 (continued). Estimates of F at age for Louisiana sheepshead from VPA using various terminal F's, for M=0.2 and M=0.3.

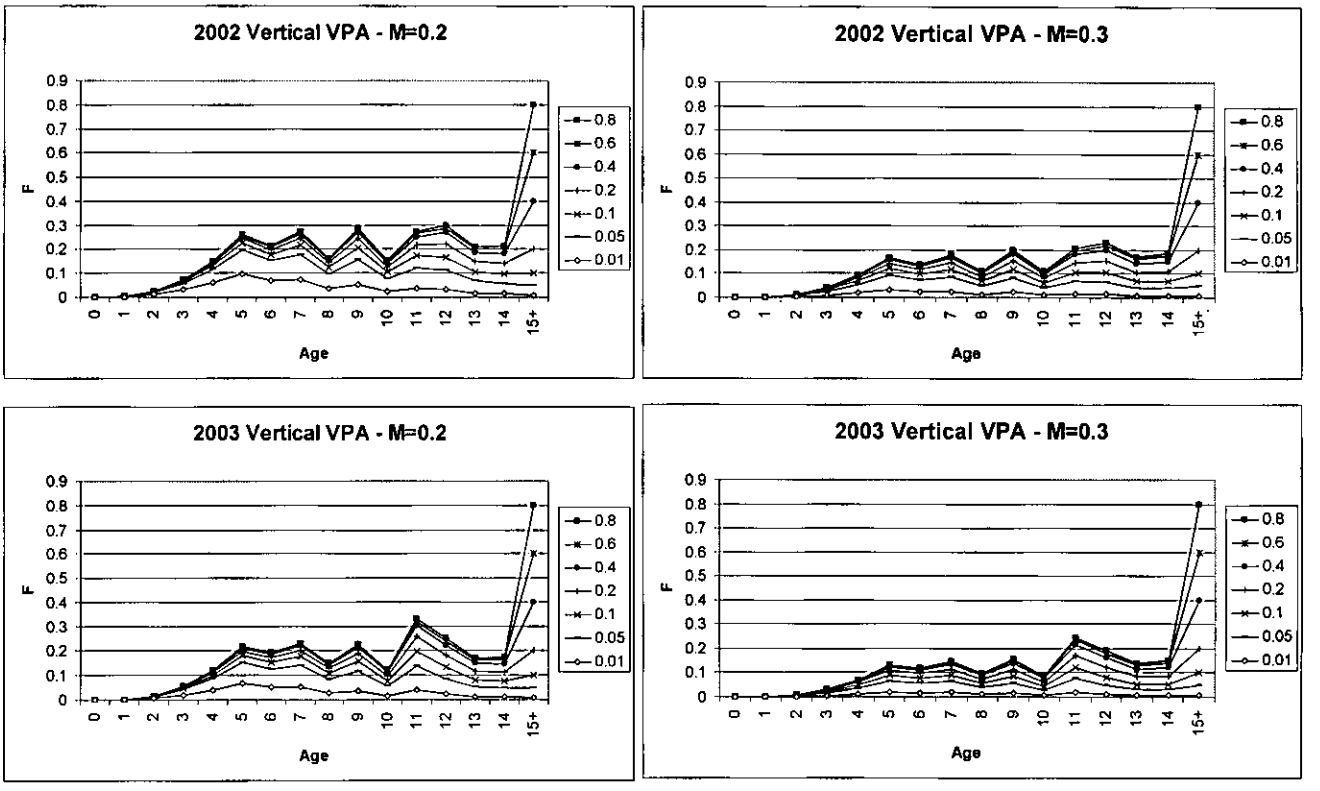


Figure 5.4. Recreational and commercial landings of sheepshead in Louisiana. Source of landings data described in text.

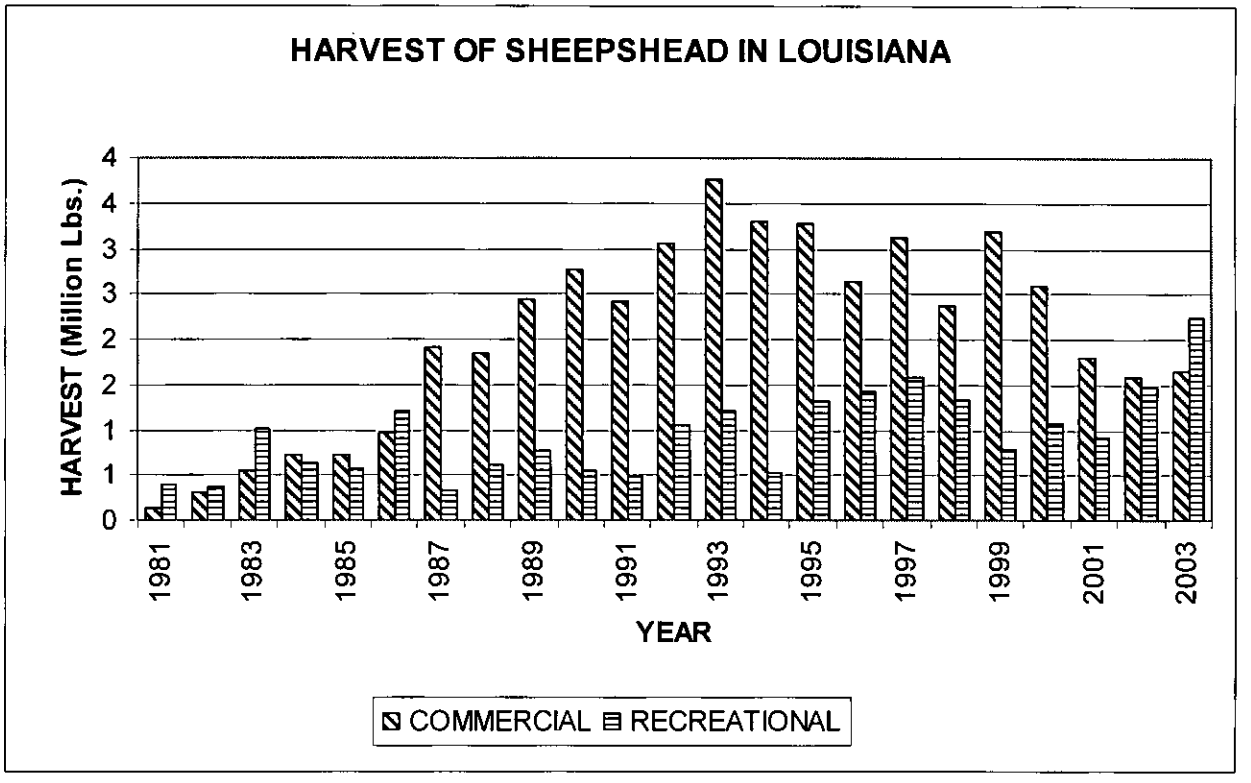


Figure 5.5. Standardized catch per effort for the recreational fishery for sheepshead in Louisiana. Derivation of estimates described in text.

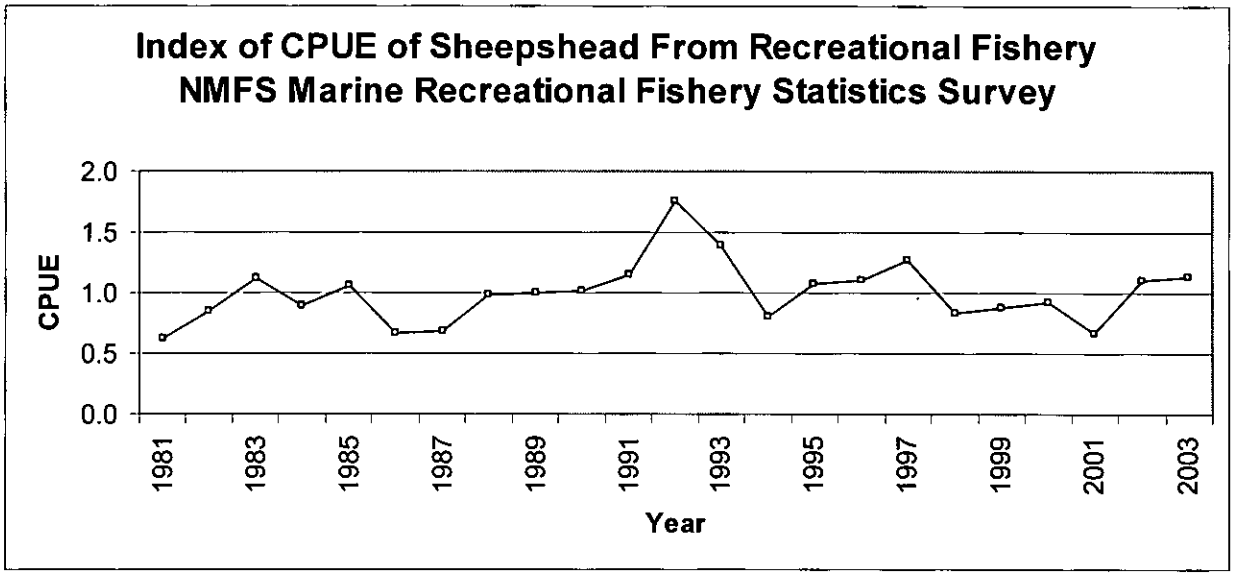
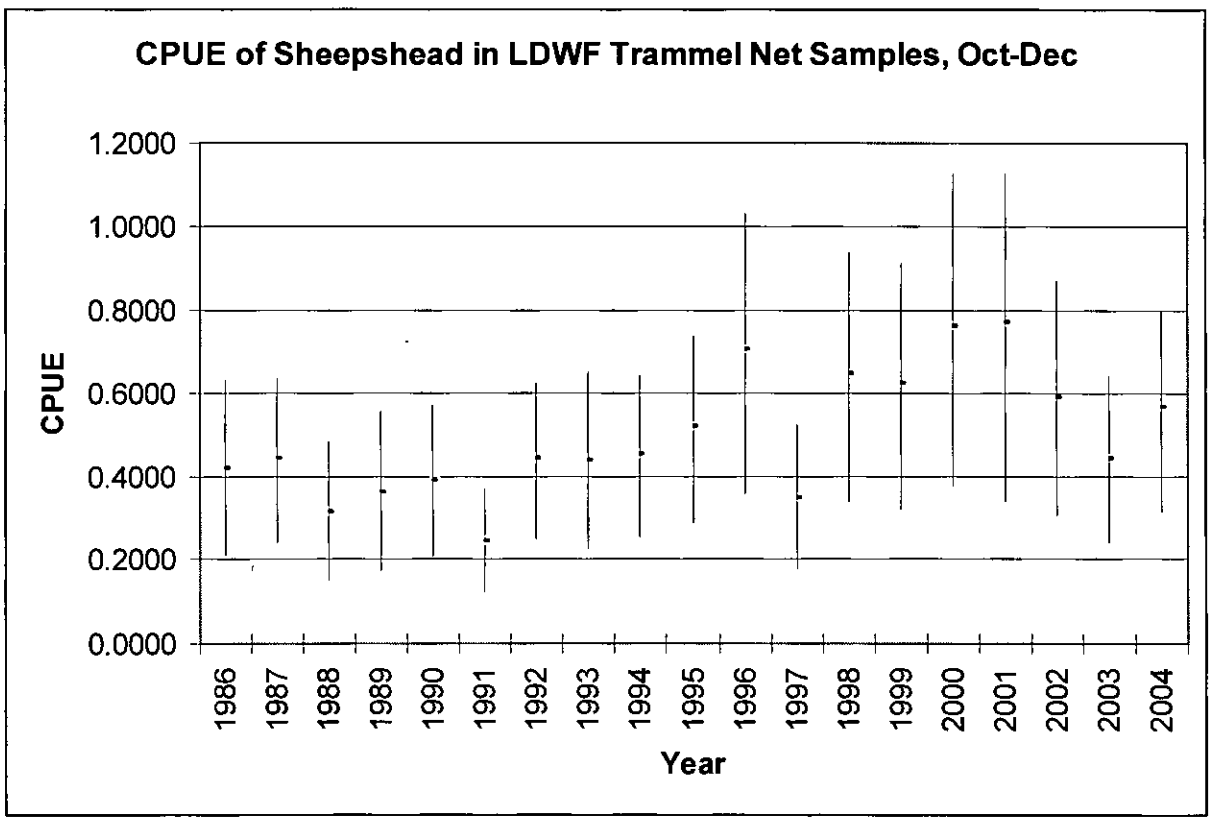


Figure 5.6. Catch per Unit Effort (CPUE) of sheepshead in LDWF fishery-independent trammel net samples, Oct-December of each year. Details of calculations of the CPUE index are described in text.



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From: Blanchet, Harry
Sent: Friday, January 21, 2005 9:43 AM
To: 'Mr. W. S. "Corky" Perret (Ms. Dept. Mar. Res.)'; 'Dr. Bob Shipp (U. South Al)'; 'Dr. Bruce Thompson'; 'Dr. Chuck Wilson (LSU-CFI)'; 'Dr. Jim Cowan (LSU-CFI)'; 'Dr. Richard Condrey (LSU-CFI)'; 'Dr. Rick Leard (Gulf Council)'; 'Dr. Roy Crabtree (NMFS - SERO)'; 'Dr. Tom McIllwain (U. South. Miss.)'; 'Dr. William Walker (Ms. Dept. Mar. Res.)'; 'Mr. Larry Simpson (Gulf St. Mar. Fish. Comm.)'; 'Mr. Mike Murphy'; 'Mr. Robin Riechers (Tx. Parks & Wildl.)'; 'Mr. Roy Williams (Fl. Fish & Wildl. Cons. Comm.)'; 'Mr. Vern Minton (Al. Dept. of Cons. Nat. Res.)'
Cc: Foote, Karen; Roussel, John E
Subject: Reviews of 2005 stock assessments for black drum, sheepshead, striped mullet, and southern flounder in Louisiana

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Dear All:

The Louisiana Department of Wildlife and Fisheries is charged with providing species profile information and annual stock assessments on black drum, sheepshead, striped mullet, and southern flounder at the February meeting of the Wildlife and Fisheries Commission. Enclosed are the draft stock assessment reports for these species for 2005. They will be presented to the Commission at the February 3rd meeting. I would appreciate it if a person from your office, familiar with the species, would review our documents prior to that time, and provide comments to us, so that we can review them before the Commission meeting.

We do appreciate all comments made by you and your staff and co-workers in the past. A majority of the comments relate to switching from catch curve analysis to a VPA or fine tuning the catch curve analysis. We fully agree with these comments and in this year's analyses, we have achieved that goal with some of the species. We expect to be developing further analyses as our data on the species improves with time and further efforts.

As a result of having several years of commercial trip ticket data, and collecting recreational fishery statistics data, the department was able to begin a program to representatively sample fishery dependent otoliths in 2002. The program uses trip ticket data and recreational survey data to weight sampling sites for the collection of otoliths for the species of interest. It is expected that this method of otolith sampling will improve stock assessments by providing more accurate annual catch at age data.

This request is being sent to the administrators of the marine fisheries management agencies of all Gulf states, the Gulf States Marine Fisheries Commission, the Gulf of Mexico Fishery Management Council, university fishery scientists, and the regional office of National Marine Fisheries Service, among others.

If you or your staff reviewing this document would prefer to have it in a Microsoft Word format, please let me know and I will provide it in that format. If you have any questions, please feel free to call me at (225)765-2889, FAX (225) 765-2489 or e-mail: (hblanchet@wlf.louisiana.gov). In advance, I thank you for your timely attention to this matter.

Sincerely,
Harry Blanchet
Finfish Program Manager
Marine Fisheries Division
Louisiana Dept. of Wildlife & Fisheries
P.O. Box 98000
Baton Rouge, LA 70898-9000
(225)765-2889 phone
(225)765-2489 fax

Blanchet, Harry

From: Kim Newlin [Kim.Newlin@noaa.gov]
Sent: Wednesday, February 02, 2005 11:08 AM
To: Blanchet Harry
Cc: Theo Brainerd; Peter Thompson; Kim Newlin
Subject: [Fwd: SEFSC's Comments on LA Stock Assessmets of Stripped Mullet and Sheepshead]

lasarofsheepshe
ıd&strippedmull..

Harry,

Sending to your other email to make sure you get.

Kim

-------- Original Message --------
Subject: SEFSC's Comments on LA Stock Assessmets of Stripped Mullet and Sheepshead
Date: Wed, 02 Feb 2005 12:03:24 -0500
From: Kim Newlin <kim.newlin@noaa.gov>
Reply-To: kim.newlin@noaa.gov
Organization: Southeast Fisheries Science Center/NMFS/NOAA/DOC
To: hblanchet@wlf.lousiana.gov
CC: Nancy.Thompson@noaa.gov <Nancy.Thompson@noaa.gov>, Roy Crabtree <Roy.Crabtree@noaa.gov>, Alex Chester <Alex.Chester@noaa.gov>, Peter Thompson <Peter.Thompson@noaa.gov>, Gerry Scott <Gerry.Scott@noaa.gov>, Guillermo Diaz <Guillermo.diaz@noaa.gov>, Steve Turner <Steve.Turner@noaa.gov>

Harry,

Attached is a file of SEFSC's review of Stripped Mullet and Sheepshead.

As you are aware, due to time constraints and other priotities, only two of the four assessments have were reviewed by SEFSC.

We hope this will be helpful to you.

Kim Newlin

Rec. 2/2/05 11:20
NMFS SEFSC Review

STRIPED MULLET STOCK ASSESSMENT

General comments

- Table 5.2 shows the length frequency of female striped mullet measured from the fishery from 1994 to 2003. Histograms of the length frequencies presented in Table 5.2 show notable differences between years (see Figure 1 in this document). The cause of these differences in the length frequency distributions could be one (or a combination) of the following: (1) changes in age abundances, (2) problems with the sampling protocol (i.e., length samples are not representative of the length frequency of the catch), (3) changes in the availability of the fish to the gear (migration) (4) changes in the way the fleet operates. These are important issues, if the length samples are not representative of the fishery then the Age-Length-keys (ALK) can not be used to age the catch. In addition, two of the major assumptions is the assessment are that fish availability to the gear and the area where the fleet operates remained constant. If the observed differences in length frequency distributions are caused by non-representative length samples or fish migration or changes in the way the fleet operates then the result of the present assessment might not hold.

- There is no temporal description of the data used to prepare the base Age-Length-key (ALK). Given the implementation of time closures to the fishery in 1995, the data used to build the base ALK should preferably not include any samples taken before 1995.

- It is unclear from the text if the age samples of fish age 1 and older used to develop the von Bertalanffy growth equation are the same that were used to develop the age-length-key (ALK) presented in Table 5.3. The data presented in Table 5.3 clearly show the effect of gear (or data) restrictions on the minimum size of the catch for fish ages 1-4. Plotting the expected length at age using the growth parameters presented in the assessment with the observed values presented in Table 5.3 (see Figure 2 in this document) shows that the lengths of fish in the age range 1-5 are underestimated. If fishery-independent age samples were used to develop the von Bertalanffy growth equation, then the estimated growth curve represents the female population growth. If fishery-dependent data with gear restrictions were used, then the estimated parameters not necessarily describe the female population growth and its use beyond aging the catch or as an input for YPR

analysis (within the observed levels of fishing mortality) is questionable (i.e. as SPR input) . In either case, the observed discrepancy between the expected and observed length at age should be addressed.

- The results obtained using the VPA and the catch-curve approaches are similar. However, given the restrictions and questionable quality of the data together with the assumptions used in this assessment, a simpler approach (i.e., catch curve) might be preferably over more complex techniques (i.e. VPA).

- The estimation of fishing effort should be added to the extensive list of data and research needs prepared by the authors. Estimates of catch-per-unit-of-effort (CPUE) are important components of stock assessments. For example, trends in standardized CPUE can indicate the trajectory of the fishery and be used as indices of abundance for VPA 'tunning'.

Figure 1: Length frequency histograms of length samples as presented in Table 5.2 in the assessment.

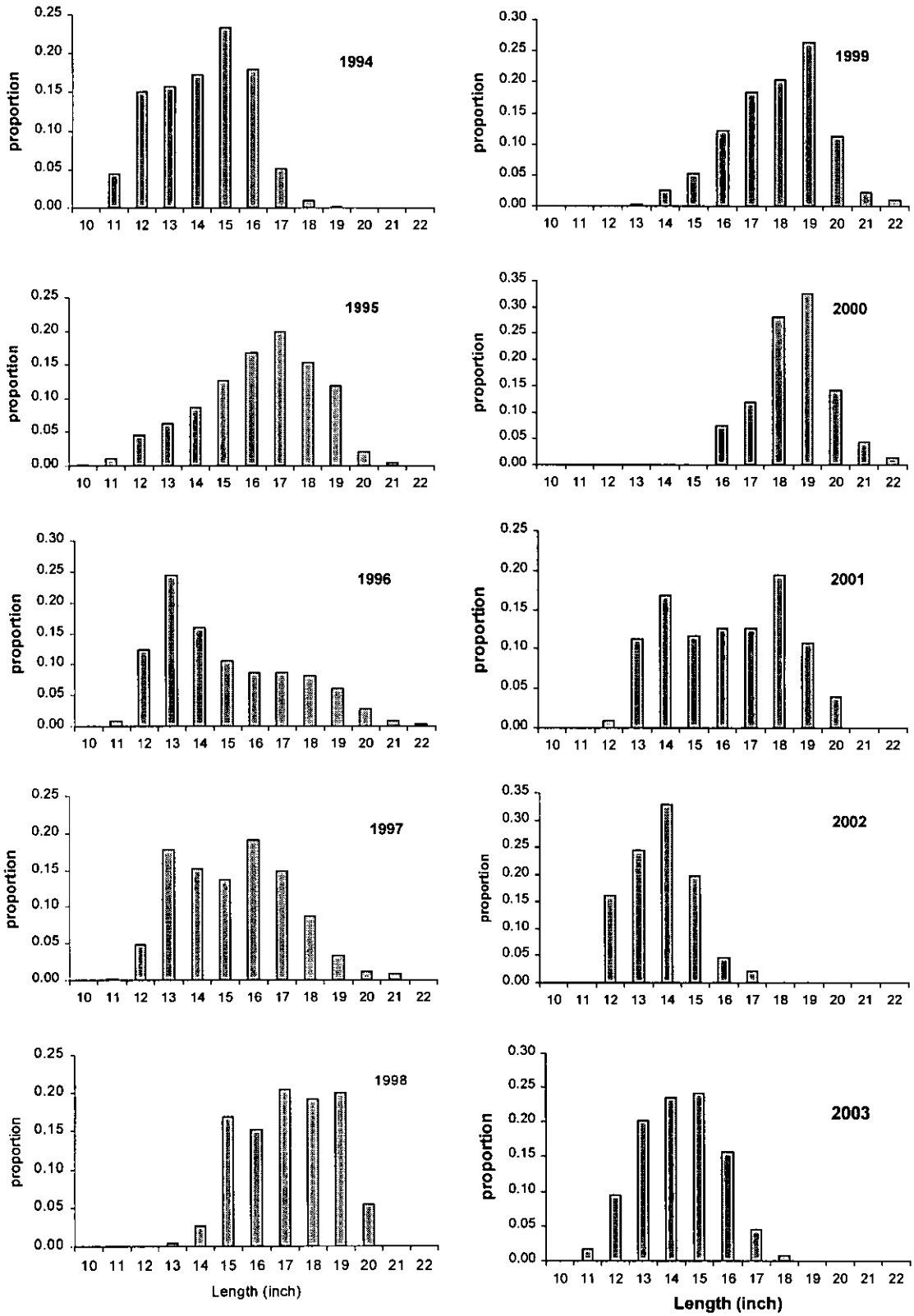
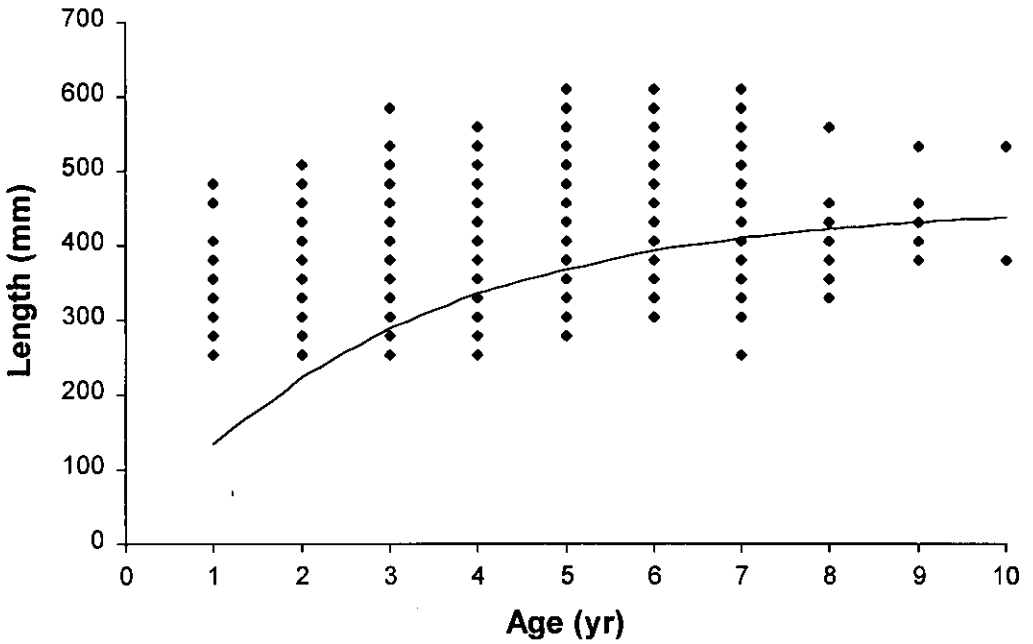


Figure 2: Observed and predicted length at age of female striped mullet. Observed catch-at-age was plotted using values presented by the authors in Table 5.3. Predicted values were estimated using the growth parameters presented in the assessment.



Received 2/2/05 11:20
NMFS SEFSC Review

SHEEPSHEADSTOCKASSESSMENT

General comments

- The text indicates that two age-length-keys (ALK) were derived for the commercial and recreational fisheries. Were the recreational and commercial harvests aged using the ALK derived for each fishery, or were they aged using the combined ALK presented in Table 5.1? When possible, the harvest from each fishery should be aged only using the ALK derived from data from that particular fishery.

- The recreational ALK was developed using both fishery-dependent and independent data. There were clear differences between the age frequencies of both data sets (Figure 5.1). It would be interesting to make a sensitivity analysis to assess the potential impact on the final results of using the developed recreational fishery-dependent and independent ALK or just an ALK derived only from the fishery-dependent data.

- Regulatory changes in the commercial fishery occurred in 1995 and 1997 which translated into changes in the length frequency of the harvest (see Table 5.2). Thus, developing period-specific ALK's might be more appropriate than developing an ALK for the entire 1994-2003 period.

- The estimation of disappearance rates using a catch curve assumes that the availability of the fish to the fishery remains fairly constant. The authors correctly conclude that any decrease in availability will result on an overestimation of the impact of fishing. However, it is also necessary to remember that sheepshead is a species with a wide geographical distribution in the Gulf of Mexico, and any potential migration into Louisiana waters will increase the availability of the fish to the fishery resulting in an underestimation of fishing mortality rates.

- Using an index of abundance based only on trips that had sheepshead in their catch and defining 'trip' as the unit of effort might not be the best approach. The MRFSS data set includes information such as number of anglers and trip duration that allows to estimate a more representative unit-of-effort than just 'trip'. In addition, a more comprehensive index of abundance can be estimated by adding to the analysis trips that targeted (or potentially target) sheepshead but did not catch one. These trips could be identified, for example, by using a species-composition approach.

Blanchet, Harry

From: Muller, Robert [Robert.Muller@MyFWC.com]
Sent: Tuesday, February 01, 2005 11:09 AM
To: hblanchet@wlf.state.la.us
Subject: Comments on southern flounder assessment

Harry,

When are you guys going to start using modern analytical techniques?

The following are my comments on Louisiana's draft southern flounder 2005 stock assessment.

General comments

Through the years, we have recommended integrating more of the data into the analyses to evaluate the condition of the stock. However, each piece of data continues to be examined separately and apparently without consideration of the underlying assumptions. The analyses could be improved markedly by dropping the catch curve approach and by incorporating the indices. Malcolm Haddon has a clear discussion of the techniques in chapter 11 of his book 'Modeling and quantitative methods in fisheries'. Overall there should be more attention to details.

Specific comments

1. Check the to term in von Bertalanffy equation because it appears to have the wrong sign. Also listing the standard errors of the parameters and including a plot would help the readers grasp how well the curve fits the data.

2. The equation for sex ratios could be easily improved by using a logistic regression that includes every fish (522 flounders) instead of estimating the parameters with the few inch categories.

3. Recreational length samples from MRFSS began in 1981 and commercial sampling by TIP sampling began in the mid-1980s so why does the catch-at-age (Table 5.4) begin in 1994?

4. There is no reason to calculate catch curves. Catch curves assume constant recruitment, constant mortality, and constant selectivity. The regulatory changes in the 1990s changed the selectivities. A cohort-based VPA alleviates these equilibrium assumptions. The use of a 'vertical' VPA makes no sense because it merely becomes another catch curve. Also fishery independent indices could be used to tune the VPAs instead of using a suite of terminal fishing mortality rates.

5. As noted above, none of the fishery independent indices were used in the analyses.

6. There is some confusion in the labeling in Table 5.4 because the disappearance rate, Z', is the row labeled 'Slope' with the sign changed. The rows labeled either 'M=0.5' or 'M=0.8' are actually fishing mortality rates (Z' - M).

7. In Tables 5.5 and 5.6, the column labeled' F-ratio' is just F and the column labeled 'SPR' should be SSB/R because it refers to biomass.

8. The F values seem very high for the benchmarks. What values did you use for average weight-at-age and maturity-at-age?

Bob

Robert G. Muller, Ph.D.
Research Scientist
Fish and Wildlife Research Institute
Florida Fish and Wildlife Conservation Commission

100 Eighth Avenue S.E.
St. Petersburg, FL 33701

Voice: 727 896-8626, Extension 4118
FAX: 727 893-1374
Visit our Web site at http://research.myFWC.com

Blanchet, Harry

From: Murphy, Mike [Mike.Murphy@MyFWC.com]
Sent: Tuesday, February 01, 2005 9:06 AM
To: Blanchet, Harry
Cc: Assess; Williams, Roy
Subject: RE: Reviews of 2005 stock assessments for black drum, sheepshead, striped mullet, and southern flounder in Louisiana

Hi Harry,

I had a chance to briefly look over the black drum and sheepshead assessments and have a few comments/questions. Black drum

1.) What is the F-ratio column in Table 5.1? In an absolute sense, I'd expect the Fmax under an M=0.1 assumption to be very low and close to F0.1 because the Y/R on F curve would show a distinct peak at low F's. This would flatten out with higher assumed M's and Fmax would move more rapidly to the right (get higher) than would F0.1 with increasing M.

2.) I know the analysis is for equilibrium but at first glance it appears likely that F is increasing in recent year with all abundance indices going down or being flat and landings going up.

Sheepshead

1.) typo on page 11 where sigma doesn't appear in equation.

2.) Why not use the VPA estimated F's to determine selectivity rather that the catch composition linearization method. This would be more appropriate for the Y/R analysis. It wouldn't carry the assumption that selection is a logistic function and opens the door to a declining selectivity at older ages. A decline would seem plausible for a fish that is caught in gill nets and spends more time offshore and away from inshore fishing pressure when large. We found a drop in selectivity after age 6 (although it is not well-estimated).

3.) What's an F-ratio again?

4.) By adding some error term to the predicted catch in the VPA you should be able to set it up the spreadhseet as a tuned-VPA and use some of your good fishery-independent data to help drive the analysis and rid yourself of the terminal F choice.

The assessments look good. See you in New Orleans in early April.

Mike

-----Original Message-----
From: Blanchet, Harry [mailto:hblanchet@wlf.state.la.us]
Sent: Friday, January 21, 2005 10:43 AM
To: 'Mr. W. S. "Corky" Perret (Ms. Dept. Mar. Res.)'; 'Dr. Bob Shipp (U. South Al)'; 'Dr. Bruce Thompson'; 'Dr. Chuck Wilson (LSU-CFI)'; 'Dr. Jim Cowan (LSU-CFI)'; 'Dr. Richard Condrey (LSU-CFI)'; 'Dr. Rick Leard (Gulf Council)'; 'Dr. Roy Crabtree (NMFS - SERO)'; 'Dr. Tom McIllwain (U. South. Miss.)'; 'Dr. William Walker (Ms. Dept. Mar. Res.)'; 'Mr. Larry Simpson (Gulf St. Mar. Fish. Comm.)'; Murphy, Mike; 'Mr. Robin Riechers (Tx. Parks & Wildl.)'; Williams, Roy; 'Mr. Vern Minton (Al. Dept. of Cons. Nat. Res.)'
Cc: Foote, Karen; Roussel, John E
Subject: Reviews of 2005 stock assessments for black drum, sheepshead, striped mullet, and southern flounder in Louisiana

Dear All:

The Louisiana Department of Wildlife and Fisheries is charged with providing species profile information and annual stock assessments on black drum, sheepshead, striped mullet, and southern flounder at the February meeting of the Wildlife and Fisheries Commission. Enclosed are the draft stock assessment reports for these species for 2005. They will be presented to the Commission at the February 3rd meeting. I would appreciate it if a person from your office, familiar with the species, would review our documents prior to that time, and provide comments to us, so that we can review them before the Commission meeting.

We do appreciate all comments made by you and your staff and co-workers in the past. A majority of the comments relate to switching from catch curve analysis to a VPA or fine tuning the catch curve analysis. We fully agree with these comments and in this year's analyses, we have achieved that goal with some of the species. We expect to be developing further analyses as our data on the species improves with time and further efforts.

As a result of having several years of commercial trip ticket data, and collecting recreational fishery statistics data, the department was able to begin a program to representatively sample fishery dependent otoliths in 2002. The program uses trip ticket data and recreational survey data to weight sampling sites for the collection of otoliths for the species of interest. It is expected that this method of otolith sampling will improve stock assessments by providing more accurate annual catch at age data.

This request is being sent to the administrators of the marine fisheries management agencies of all Gulf states, the Gulf States Marine Fisheries Commission, the Gulf of Mexico Fishery Management Council, university fishery scientists, and the regional office of National Marine Fisheries Service, among others.

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Sincerely,

Harry Blanchet
Finfish Program Manager
Marine Fisheries Division
Louisiana Dept. of Wildlife & Fisheries
P.O. Box 98000
Baton Rouge, LA 70898-9000
(225)765-2889 phone
(225)765-2489 fax

Blanchet, Harry

From: Richard E Condrey [coecnd@lsu.edu]
Sent: Friday, January 21, 2005 9:52 AM
To: Blanchet, Harry
Subject: Re: Reviews of 2005 stock assessments for black drum, sheepshead, str iped mullet, and southern flounder in Louisiana

shphd_ass05dft.pdf (151 KB) bl_drum_assmnt05_dft.pdf (97 K.. fldr_assmnt05dft.pdf (134 KB) mull_assmnt05dft.pdf (281 KB)

Thanks Harry, I'll try and meet your deadline. If not, I note that it looks like you are working on the areas I have thought needed improvement. Am happy to see that and look forward to seeing your new insights.

On another matter, can we meet sometime in the near future? I'd like to fill you in on my Ship Shoal project, especially as it relates to spotted seatrout and get your insights. Please let me know when you can fit me in.

Looking forward to being with you, Richard

"Blanchet, Harry" <hblanchet@wlf.state.la.us> on 01/21/2005 09:42:36 AM

To: "'Mr. W. S. \"Corky\" Perret (Ms. Dept. Mar. Res.)'" <corky.perret@dmr.state.ms.us>, "'Dr. Bob Shipp (U. South Al)'" <rshipp@jaguar1.usouthal.edu>, "'Dr. Bruce Thompson'" <coetho@lsu.edu>, "'Dr. Chuck Wilson (LSU-CFI)'" <cwilson@lsu.edu>, "'Dr. Jim Cowan (LSU-CFI)'" <jcowan@lsu.edu>, "'Dr. Richard Condrey (LSU-CFI)'" <coecnd@lsu.edu>, "'Dr. Rick Leard (Gulf Council)'" <rick.leard@gulfcouncil.org>, "'Dr. Roy Crabtree (NMFS - SERO)'" <roy.crabtree@noaa.gov>, "'Dr. Tom McIllwain (U. South. Miss.)'" <tom.mcilwain@usm.edu>, "'Dr. William Walker (Ms. Dept. Mar. Res.)'" <william.walker@dmr.state.ms.us>, "'Mr. Larry Simpson (Gulf St. Mar. Fish. Comm.)'" <lsimpson@gsmfc.org>, "'Mr. Mike Murphy'" <mike.murphy@myfwc.com>, "'Mr. Robin Riechers (Tx. Parks & Wildl.)'" <robin.riechers@tpwd.state.tx.us>, "'Mr. Roy Williams (Fl. Fish & Wildl. Cons. Comm.)'" <roy.williams@myfwc.com>, "'Mr. Vern Minton (Al. Dept. of Cons. Nat. Res.)'" <vminton@dcnr.state.al.us>
cc: "Foote, Karen" <kfoote@wlf.louisiana.gov>, "Roussel, John E" <jroussel@wlf.louisiana.gov>

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Harry Blanchet
Finfish Program Manager
Marine Fisheries Division
Louisiana Dept. of Wildlife & Fisheries
P.O. Box 98000
Baton Rouge, LA 70898-9000
(225)765-2889 phone
(225)765-2489 fax

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- shphd_ass05dft.pdf
- mull_assmnt05dft.pdf
- fldr_assmnt05dft.pdf

June 2005

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

Falcon, Susan

From: Puckett, Don
Sent: Tuesday, February 01, 2005 4:06 PM
To: Falcon, Susan
Subject: FW: Changes to fee waiver rule

If you will remind me on Thursday, I will make announcement at end of meeting (for the record) that we have made these technical and non-substantive changes under the Secretary's delegated authority.

-----Original Message-----
From: Falcon, Susan
Sent: Tuesday, February 01, 2005 3:58 PM
To: Puckett, Don
Subject: FW: Changes to fee waiver rule

FYI

-----Original Message-----
From: King, Su [mailto:kingsu@legis.state.la.us]
Sent: Tuesday, February 01, 2005 3:41 PM
To: Susan Falcon
Subject: Changes to fee waiver rule

I think the changes are not substantive and you guys should be good to continue without an amendment to the notice of intent.

MONTHLY CIVIL RESTITUTION REPORT

PERIOD	NO. CASES ASSESSED	AMOUNT ASSESSED	CREDIT FOR SALE GOODS	NO. CASES PAID	AMOUNT PAID	DISCOUNTS TAKEN	PERCENT DOLLARS PAID	PERCENT CASES PAID
FISCAL YEAR 1993-94								
July, 1993	25	$21,039.00	($9,778.00)	29	$4,855.00	$2,545.00		
Aug., 1993	53	$44,922.00	($1,137.00)	41	$7,950.00	$3,603.00		
Sept., 1993	42	$137,635.00	($17,938.00)	35	$6,783.00	$3,048.00		
Oct., 1993	49	$21,471.00	($11,282.00)	40	$3,285.00	$1,519.00		
Nov., 1993	57	$31,207.00	($13,260.00)	32	$3,053.00	$2,845.00		
Dec., 1993	53	$13,777.00		27	$6,507.00	$6,713.00		
Jan., 1994	38	$18,918.00		32	$4,423.00	$2,831.00		
Feb., 1994	68	$38,131.00	($8,238.00)	46	$9,124.00	$5,993.00		
Mar., 1994	38	$22,739.00	($2,482.00)	51	$10,854.00	$6,796.00		
April, 1994	14	$44,732.00	($1,404.00)	27	$7,307.00	$4,632.00		
May, 1994	10	$4,504.00	($165.00)	7	$5,447.00	$3,808.00		
June, 1994	29	$26,167.00	($2,986.00)	12	$1,886.00	$1,214.00		
Total FY 1994	**476**	**$425,242.00**	**($68,670.00)**	**379**	**$71,474.00**	**$45,547.00**	**27.5%**	**79.6%**
FISCAL YEAR 1994-95								
July, 1994	17	$2,127.00	($335.00)	23	$2,101.00	$1,437.00		
Aug., 1994	41	$96,403.00	($3,035.00)	20	$1,010.00	$605.00		
Sept., 1994	34	$14,614.00	($14,002.00)	26	$2,596.00	$2,342.00		
Oct., 1994	94	$17,426.00	($8,677.00)	38	$2,922.00	$3,179.00		
Nov., 1994	43	$103,592.00		45	$3,992.00	$2,803.00		
Dec., 1994	68	$31,400.00		35	$4,315.00	$2,329.00		
Jan., 1995	55	$27,601.00		52	$7,493.00	$4,921.00		
Feb., 1995	70	$61,119.00		41	$6,472.00	$3,973.00		
Mar., 1995	31	$25,072.00		44	$8,315.00	$4,737.00		
Apr., 1995	13	$15,353.00		16	$3,565.00	$1,538.00		
May., 1995	23	$11,632.00		16	$4,315.00	$654.00		
June 1995	45	$31,008.00		18	$2,630.00	$1,025.00		
Total FY 1995	**534**	**$437,347.00**	**($26,049.00)**	**374**	**$49,726.00**	**$29,543.00**	**18.1%**	**70.0%**
FICAL YEAR 1995-96								
July, 1995	0	$0.00						
Aug., 1995	46	$17,425.00		27	$9,028.00	$1,729.00		
Sept., 1995	1	$125.00		21	$3,093.00	$2,049.00		
Oct., 1995	122	$206,244.00		29	$2,720.00	$1,161.00		
Nov., 1995	55	$23,124.00		62	$10,151.00	$6,383.00		
Dec., 1995	50	$18,607.26		32	$4,780.66	$2,802.76		
Jan., 1996	49	$13,814.88	($15,296.45)	36	$5,296.51	$3,472.89		
Feb., 1996	50	$14,716.97		38	$5,777.53	$3,416.91		
Mar., 1996	33	$24,936.91		36	$6,035.12	$3,421.75		
Apr., 1996	30	$11,006.66		36	$7,173.12	$2,711.54		
May., 1996	23	$7,989.34		24	$3,941.69	$2,020.29		
June 1996	50	$22,151.31		16	$2,790.02	$1,182.23		
Total FY 1996	**509**	**$360,141.33**	**($15,296.45)**	**357**	**$60,786.65**	**$30,350.37**	**25.3%**	**70.1%**
FISCAL YEAR 1996-97								
July, 1996	40	$71,894.13		32	$5,249.93	$2,947.96		
Aug., 1996	32	$5,362.64		32	$6,254.59	$3,783.69		
Sept., 1996	41	$7,210.00		29	$2,259.96	$1,326.58		
Oct., 1996	29	$11,092.53		25	$3,697.89	$2,261.98		
Nov., 1996	20	$10,009.10		22	$1,624.63	$698.02		
Dec., 1996	13	$238,466.04		22	$5,877.18	$2,121.53		
Jan., 1997	27	$11,755.22		17	$4,393.30	$2,377.09		
Feb., 1997	47	$18,520.87		42	$8,579.84	$5,552.63		
Mar., 1997	26	$13,434.02		27	$4,999.59	$2,757.67		
Apr., 1997	10	$2,908.87		15	$2,322.88	$1,298.66		
May., 1997	20	$11,682.70		15	$5,198.91	$1,399.21		
June 1997	5	$8,036.58		10	$2,335.24	$765.34		
Total FY 1997	**310**	**$410,372.70**	**$0.00**	**288**	**$52,793.94**	**$27,290.36**	**19.5%**	**92.9%**
FICAL YEAR 1997 - 98								
July, 1997	10	$2,811.71		8	$1,584.67	$823.11		
Aug., 1997	14	$8,741.30		8	$1,496.49	$779.14		
Sept., 1997	29	$19,926.37		12	$2,051.78	$1,278.04		
Oct., 1997	12	$4,716.81		23	$3,184.83	$2,063.89		
Nov., 1997	23	$54,965.34		10	$2,424.86	$1,218.28		
Dec., 1997	25	$36,881.09		15	$4,376.97	$2,775.66		

MONTHLY CIVIL RESTITUTION REPORT

PERIOD	NO. CASES ASSESSED	AMOUNT ASSESSED	CREDIT FOR SALE GOODS	NO. CASES PAID	AMOUNT PAID	DISCOUNTS TAKEN	PERCENT DOLLARS PAID	PERCENT CASES PAID
Jan., 1998	42	$30,025.81		17	$5,300.40	$3,533.66		
Feb., 1998	37	$31,164.95		29	$22,961.69	$8,501.18		
Mar., 1998	9	$13,273.45		32	$9,406.56	$4,371.53		
Apr., 1998	10	$5,628.21		10	$2,602.62	$1,279.77		
May., 1998	0	$225.00		8	$2,885.02	$950.46		
June 1998	5	$2,414.03		6	$1,041.54	$98.00		
Total FY 1998	**216**	**$210,774.07**	**$0.00**	**178**	**$59,317.43**	**$27,672.72**	**41.3%**	**82.4%**
FICAL YEAR 1998 - 99								
July, 1998	9	$1,390.43		8	$1,964.20	$716.75		
Aug., 1998	10	$2,240.70		10	$1,048.28	$372.47		
Sept., 1998	8	$2,768.96		11	$2,000.36	$1,148.23		
Oct., 1998	22	$28,704.85		14	$1,860.17	$807.48		
Nov., 1998	19	$9,137.79		11	$1,765.97	$1,092.43		
Dec., 1998	23	$11,959.10		27	$4,441.02	$2,040.71		
Jan., 1999	41	$21,179.55		18	$6,621.63	$3,838.22		
Feb., 1999	45	$26,236.24		41	$12,119.09	$6,923.61		
Mar., 1999	15	$7,549.57		33	$8,281.77	$4,138.44		
Apr., 1999	9	$8,013.54		14	$3,035.82	$1,388.41		
May., 1999	5	$5,161.23		5	$905.50	$405.00		
June 1999	7	$3,719.01		13	$3,011.06	$533.83		
Total FY 1999	**213**	**$128,060.97**	**$0.00**	**205**	**$47,054.87**	**$23,405.58**	**55.0%**	**96.2%**
FISCAL YEAR 1999-2000								
July, 1999	5	$1,556.38		9	$2,287.53	$1,198.81		
Aug., 1999	10	$2,510.83		15	$2,455.38	$513.73		
Sept., 1999	6	$2,032.19	$5,324.80	28	$3,563.06	$475.93		
Oct., 1999	11	$4,452.31	$567.75	25	$2,775.48	$557.41		
Nov., 1999	14	$8,634.64		26	$3,250.96	$1,322.96		
Dec., 1999	24	$15,891.96		19	$3,862.76	$2,126.27		
Jan., 2000	49	$27,872.14		28	$7,952.94	$3,814.02		
Feb., 2000	21	$11,039.59		30	$10,159.24	$6,216.42		
Mar., 2000	19	$9,873.21		31	$6,709.07	$3,555.40		
Apr., 2000	12	$7,897.70		17	$2,932.41	$1,512.54		
May, 2000	7	$5,039.46	$293.60	20	$7,062.23	$3,164.00		
June, 2000	16	$14,566.88		18	$5,766.59	$1,852.12		
Total FY 2000	**194**	**$111,367.29**	**$6,186.15**	**266**	**$58,777.65**	**$26,309.61**	**76%**	**137%**
FISCAL YEAR 2000-01								
July, 2000	2	$865.01		14	$1,948.03	$154.01		
Aug.,2000	20	$15,837.60		17	$3,302.27	$1,063.92		
Sept.,2000	12	$3,562.26		23	$8,718.21	$1,351.41		
Oct.,2000	18	$122,696.24		29	$7,457.98	$490.16		
Nov.2000	13	$15,851.30		22	$4,038.50	$309.30		
Dec., 2000	40	$30,234.92		24	$7,189.98	$462.13		
Jan., 2001	28	$15,923.38		25	$7,811.66	$833.60		
Feb., 2001	35	$20,181.39		30	$18,568.12	$1,917.82		
Mar., 2001	8	$5,956.83		37	$15,724.02	$753.86		
Apr.,2001	20	$24,145.82		22	$4,856.39	$225.93		
May 2001	4	$1,677.36		20	$3,700.77	$313.58		
June 2001	3	$932.20		31	$8,433.81	$346.90		
Total FY 2001	**203**	**$257,864.31**	**$0.00**	**294**	**$91,549.74**	**$8,222.62**	**39%**	**145%**
FISCAL YEAR 2001-02								
July, 2001	4	$4,290.29		25	$6,328.36	$293.54		
Aug., 2001	6	$9,452.69		18	$2,984.52			
Sept., 2001	0	$175.00		25	$4,157.32	$66.29		
Oct., 2001	15	$6,439.06		18	$3,174.66	$67.32		
Nov., 2001	15	$5,913.63		24	$3,932.41	$194.66		
Dec., 2001	36	$21,868.88		20	$5,384.19	$502.17		
Jan., 2002	56	$27,650.44		38	$11,100.99	$1,008.09		
Feb., 2002	27	$14,211.31	$620.55	37	$20,017.87	$861.63		
Mar., 2002	8	$6,765.68		36	$10,061.89	$419.16		
Apr., 2002	20	$11,296.19		19	$2,196.02	$49.33		
May, 2002	3	$30,852.57	$11,887.80	27	$8,265.67	$538.72		
June, 2002	3	$8,636.08		23	$3,418.15	$87.91		

MONTHLY CIVIL RESTITUTION REPORT

PERIOD	NO. CASES ASSESSED	AMOUNT ASSESSED	CREDIT FOR SALE GOODS	NO. CASES PAID	AMOUNT PAID	DISCOUNTS TAKEN	PERCENT DOLLARS PAID	PERCENT CASES PAID
Total FY 2002	193	$147,551.82	$12,508.35	310	$81,022.05	$4,088.82	58%	161%
FISCAL YEAR 2002-03								
July, 2002	8	$6,915.26		20	$3,308.14	$111.90		
Aug., 2002	12	$11,943.66		24	$4,010.98	$47.33		
Sept., 2002	6	$1,944.83		19	$4,624.36	$85.25		
Oct., 2002	24	$12,167.99		25	$7,131.20	$442.95		
Nov., 2002	21	$11,013.41		27	$8,688.51	$624.99		
Dec., 2002	32	$15,763.99		23	$7,660.18	$689.95		
Jan.,2003	58	$32,391.55		22	$7,149.09	$562.34		
Feb.,2003	33	$18,426.48		40	$13,988.00	$1,122.57		
Mar., 2003	13	$3,668.17		28	$9,342.76	$643.57		
Apr., 2003	16	$5,661.77		23	$3,004.29	$269.02		
May, 2003	11	$5,801.24		20	$5,252.90	$293.69		
June, 2003	11	$6,700.71		24	$6,907.49	$224.85		
Total FY 2003	245	$132,399.06	$0.00	$295.00	$81,067.90	$5,118.41	65%	120%
FISCAL YEAR 2003-04								
July, 2003	7	$1,742.90		17	$3,502.99	$30.27		
Aug., 2003	13	$5,254.98		16	$3,131.76	$126.78		
Sept., 2003	13	$15,161.55		17	$3,797.61	$285.74		
Oct., 2003	14	$14,153.21		24	$6,084.13	$188.45		
Nov., 2003	17	$7,594.12		18	$4,500.13	$245.00		
Dec., 2003	45	$22,244.61		23	$8,965.74	$702.59		
Jan., 2004	32	$17,609.03		22	$7,016.24	$685.11		
Feb., 2004	19	$10,856.76		38	$14,262.81	$1,133.21		
Mar., 2004	17	$14,927.35		32	$11,840.30	$647.13		
Apr., 2004	15	$7,481.48		19	$4,666.57	$284.61		
May, 2004	13	$4,300.96		19	$3,608.61	$228.47		
June, 2004	4	$31,164.87		24	$6,629.45	$249.47		
Total FY 2004	209	$152,491.82	$0.00	269	$78,006.34	$4,806.83	54%	129%
FISCAL YEAR 2004-05								
July, 2004	3	$29,750.20		13	$1,343.60	$62.86		
Aug., 2004	8	$3,706.10		18	$2,880.20			
Sept., 2004	11	$3,623.86		24	$4,407.31	$201.50		
Oct., 2004	13	$3,560.84		31	$9,987.75	$300.45		
Nov., 2004	12	$4,627.15	($1,801.90)	26	$5,997.38	$179.42		
Dec.,2004	62	$35,332.31		29	$7,712.43	$608.33		
Jan., 2005	45	$26,627.20		45	$13,547.56	$1,187.89		
Feb., 2005								
Mar., 2005								
Apr., 2005								
May, 2005								
June, 2005								
Total FY 2005	154	107,228	(1,802)	186	45,876	2,540	45%	121%

MONTHLY CIVIL RESTITUTION REPORT

PERIOD	NO. CASES ASSESSED	AMOUNT ASSESSED	CREDIT FOR SALE GOODS	NO. CASES PAID	AMOUNT PAID	DISCOUNTS TAKEN	PERCENT DOLLARS PAID	PERCENT CASES PAID
FISCAL YEAR 1993-94								
July, 1993	25	$21,039.00	($9,778.00)	29	$4,855.00	$2,545.00		
Aug., 1993	53	$44,922.00	($1,137.00)	41	$7,950.00	$3,603.00		
Sept., 1993	42	$137,635.00	($17,938.00)	35	$6,783.00	$3,048.00		
Oct., 1993	49	$21,471.00	($11,282.00)	40	$3,285.00	$1,519.00		
Nov., 1993	57	$31,207.00	($13,260.00)	32	$3,053.00	$2,845.00		
Dec., 1993	53	$13,777.00		27	$6,507.00	$6,713.00		
Jan., 1994	38	$18,918.00		32	$4,423.00	$2,831.00		
Feb., 1994	68	$38,131.00	($8,238.00)	46	$9,124.00	$5,993.00		
Mar., 1994	38	$22,739.00	($2,482.00)	51	$10,854.00	$6,796.00		
April, 1994	14	$44,732.00	($1,404.00)	27	$7,307.00	$4,632.00		
May, 1994	10	$4,504.00	($165.00)	7	$5,447.00	$3,808.00		
June, 1994	29	$26,167.00	($2,986.00)	12	$1,886.00	$1,214.00		
Total FY 1994	476	$425,242.00	($68,670.00)	379	$71,474.00	$45,547.00	27.5%	79.6%
FISCAL YEAR 1994-95								
July, 1994	17	$2,127.00	($335.00)	23	$2,101.00	$1,437.00		
Aug., 1994	41	$96,403.00	($3,035.00)	20	$1,010.00	$605.00		
Sept., 1994	34	$14,614.00	($14,002.00)	26	$2,596.00	$2,342.00		
Oct., 1994	94	$17,426.00	($8,677.00)	38	$2,922.00	$3,179.00		
Nov., 1994	43	$103,592.00		45	$3,992.00	$2,803.00		
Dec., 1994	68	$31,400.00		35	$4,315.00	$2,329.00		
Jan., 1995	55	$27,601.00		52	$7,493.00	$4,921.00		
Feb., 1995	70	$61,119.00		41	$6,472.00	$3,973.00		
Mar., 1995	31	$25,072.00		44	$8,315.00	$4,737.00		
Apr., 1995	13	$15,353.00		16	$3,565.00	$1,538.00		
May., 1995	23	$11,632.00		16	$4,315.00	$654.00		
June 1995	45	$31,008.00		18	$2,630.00	$1,025.00		
Total FY 1995	534	$437,347.00	($26,049.00)	374	$49,726.00	$29,543.00	18.1%	70.0%
FICAL YEAR 1995-96								
July, 1995	0	$0.00						
Aug., 1995	46	$17,425.00		27	$9,028.00	$1,729.00		
Sept., 1995	1	$125.00		21	$3,093.00	$2,049.00		
Oct., 1995	122	$206,244.00		29	$2,720.00	$1,161.00		
Nov., 1995	55	$23,124.00		62	$10,151.00	$6,383.00		
Dec., 1995	50	$18,607.26		32	$4,780.66	$2,802.76		
Jan., 1996	49	$13,814.88	($15,296.45)	36	$5,296.51	$3,472.89		
Feb., 1996	50	$14,716.97		38	$5,777.53	$3,416.91		
Mar., 1996	33	$24,936.91		36	$6,035.12	$3,421.75		
Apr., 1996	30	$11,006.66		36	$7,173.12	$2,711.54		
May., 1996	23	$7,989.34		24	$3,941.69	$2,020.29		
June 1996	50	$22,151.31		16	$2,790.02	$1,182.23		
Total FY 1996	509	$360,141.33	($15,296.45)	357	$60,786.65	$30,350.37	25.3%	70.1%
FISCAL YEAR 1996-97								
July, 1996	40	$71,894.13		32	$5,249.93	$2,947.96		
Aug., 1996	32	$5,362.64		32	$6,254.59	$3,783.69		
Sept., 1996	41	$7,210.00		29	$2,259.96	$1,326.58		
Oct., 1996	29	$11,092.53		25	$3,697.89	$2,261.98		
Nov., 1996	20	$10,009.10		22	$1,624.63	$698.02		
Dec., 1996	13	$238,466.04		22	$5,877.18	$2,121.53		
Jan., 1997	27	$11,755.22		17	$4,393.30	$2,377.09		
Feb., 1997	47	$18,520.87		42	$8,579.84	$5,552.63		
Mar., 1997	26	$13,434.02		27	$4,999.59	$2,757.67		
Apr., 1997	10	$2,908.87		15	$2,322.88	$1,298.66		
May., 1997	20	$11,682.70		15	$5,198.91	$1,399.21		
June 1997	5	$8,036.58		10	$2,335.24	$765.34		
Total FY 1997	310	$410,372.70	$0.00	288	$52,793.94	$27,290.36	19.5%	92.9%
FICAL YEAR 1997 - 98								
July, 1997	10	$2,811.71		8	$1,584.67	$823.11		
Aug., 1997	14	$8,741.30		8	$1,496.49	$779.14		
Sept., 1997	29	$19,926.37		12	$2,051.78	$1,278.04		
Oct., 1997	12	$4,716.81		23	$3,184.83	$2,063.89		
Nov., 1997	23	$54,965.34		10	$2,424.86	$1,218.28		
Dec., 1997	25	$36,881.09		15	$4,376.97	$2,775.66		

MONTHLY CIVIL RESTITUTION REPORT

Jan., 1998	42	$30,025.81		17	$5,300.40	$3,533.66		
Feb., 1998	37	$31,164.95		29	$22,961.69	$8,501.18		
Mar., 1998	9	$13,273.45		32	$9,406.56	$4,371.53		
Apr., 1998	10	$5,628.21		10	$2,802.62	$1,279.77		
May., 1998	0	$225.00		8	$2,885.02	$950.46		
June 1998	5	$2,414.03		6	$1,041.54	$98.00		
Total FY 1998	**216**	**$210,774.07**	**$0.00**	**178**	**$59,317.43**	**$27,672.72**	**41.3%**	**82.4%**
FICAL YEAR 1998 - 99								
July, 1998	9	$1,390.43		8	$1,964.20	$716.75		
Aug., 1998	10	$2,240.70		10	$1,048.28	$372.47		
Sept., 1998	8	$2,768.96		11	$2,000.36	$1,148.23		
Oct., 1998	22	$28,704.85		14	$1,860.17	$807.48		
Nov., 1998	19	$9,137.79		11	$1,765.97	$1,092.43		
Dec., 1998	23	$11,959.10		27	$4,441.02	$2,040.71		
Jan., 1999	41	$21,179.55		18	$6,621.63	$3,838.22		
Feb., 1999	45	$26,236.24		41	$12,119.09	$6,923.61		
Mar., 1999	15	$7,549.57		33	$8,281.77	$4,138.44		
Apr., 1999	9	$8,013.54		14	$3,035.82	$1,388.41		
May., 1999	5	$5,161.23		5	$905.50	$405.00		
June 1999	7	$3,719.01		13	$3,011.06	$533.83		
Total FY 1999	**213**	**$128,060.97**	**$0.00**	**205**	**$47,054.87**	**$23,405.58**	**55.0%**	**96.2%**
FISCAL YEAR 1999-2000								
July, 1999	5	$1,556.38		9	$2,287.53	$1,198.81		
Aug., 1999	10	$2,510.83		15	$2,455.38	$513.73		
Sept., 1999	6	$2,032.19	($5,324.80)	28	$3,563.06	$475.93		
Oct., 1999	11	$4,452.31	($567.75)	25	$2,775.48	$557.41		
Nov., 1999	14	$8,634.64		26	$3,250.96	$1,322.96		
Dec., 1999	24	$15,891.96		19	$3,862.76	$2,126.27		
Jan., 2000	49	$27,872.14		28	$7,952.94	$3,814.02		
Feb., 2000	21	$11,039.59		30	$10,159.24	$6,216.42		
Mar., 2000	19	$9,873.21		31	$6,709.07	$3,555.40		
Apr., 2000	12	$7,897.70		17	$2,932.41	$1,512.54		
May, 2000	7	$5,039.46	($293.60)	20	$7,062.23	$3,164.00		
June, 2000	16	$14,566.88		18	$5,766.59	$1,852.12		
Total FY 2000	**194**	**$111,367.29**	**($6,186.15)**	**266**	**$58,777.65**	**$26,309.61**	**76%**	**137%**
FISCAL YEAR 2000-01								
July, 2000	2	$865.01		14	$1,948.03	$154.01		
Aug.,2000	20	$15,837.60		17	$3,302.27	$1,063.92		
Sept.,2000	12	$3,562.26		23	$8,718.21	$1,351.41		
Oct.,2000	18	$122,696.24		29	$7,457.98	$490.16		
Nov.2000	13	$15,851.30		22	$4,038.50	$309.30		
Dec., 2000	40	$30,234.92		24	$7,189.98	$462.13		
Jan., 2001	28	$15,923.38		25	$7,611.66	$833.60		
Feb., 2001	35	$20,181.39		30	$18,568.12	$1,917.82		
Mar., 2001	8	$5,956.83		37	$15,724.02	$753.86		
Apr.,2001	20	$24,145.82		22	$4,856.39	$225.93		
May 2001	4	$1,677.36		20	$3,700.77	$313.58		
June 2001	3	$932.20		31	$8,433.81	$346.90		
Total FY 2001	**203**	**$257,864.31**	**$0.00**	**294**	**$91,549.74**	**$8,222.62**	**39%**	**145%**
FISCAL YEAR 2001-02								
July, 2001	4	$4,290.29		25	$6,328.36	$293.54		
Aug., 2001	6	$9,452.69		18	$2,984.52			
Sept., 2001	0	$175.00		25	$4,157.32	$66.29		
Oct., 2001	15	$6,439.06		18	$3,174.66	$67.32		
Nov., 2001	15	$5,913.63		24	$3,932.41	$194.66		
Dec., 2001	36	$21,868.88		20	$5,384.19	$502.17		
Jan., 2002	56	$27,650.44		38	$11,100.99	$1,008.09		
Feb., 2002	27	$14,211.31	($620.55)	37	$20,017.87	$861.63		
Mar., 2002	8	$6,765.68		36	$10,061.89	$419.16		
Apr., 2002	20	$11,296.19		19	$2,196.02	$49.33		
May, 2002	3	$30,852.57	($11,887.80)	27	$8,265.67	$538.72		
June, 2002	3	$8,636.08		23	$3,418.15	$87.91		
Total FY 2002	**193**	**$147,551.82**	**($12,508.35)**	**310**	**$81,022.05**	**$4,088.82**	**58%**	**161%**

MONTHLY CIVIL RESTITUTION REPORT

FISCAL YEAR 2002-03								
July, 2002	8	$6,915.26		20	$3,308.14	$111.90		
Aug., 2002	12	$11,943.66		24	$4,010.98	$47.33		
Sept., 2002	6	$1,944.83		19	$4,624.36	$85.25		
Oct., 2002	24	$12,167.99		25	$7,131.20	$442.95		
Nov., 2002	21	$11,013.41		27	$8,688.51	$624.99		
Dec., 2002	32	$15,763.99		23	$7,660.18	$689.95		
Jan.,2003	58	$32,391.55		22	$7,149.09	$562.34		
Feb.,2003	33	$18,426.48		40	$13,988.00	$1,122.57		
Mar., 2003	13	$3,668.17		28	$9,342.76	$643.57		
Apr., 2003	16	$5,661.77		23	$3,004.29	$269.02		
May, 2003	11	$5,801.24		20	$5,252.90	$293.69		
June, 2003	11	$6,700.71		24	$6,907.49	$224.85		
Total FY 2003	**245**	**$132,399.06**	**$0.00**	**295**	**$81,067.90**	**$5,118.41**	**65%**	**120%**
FISCAL YEAR 2003-04								
July, 2003	7	$1,742.90		17	$3,502.99	$30.27		
Aug., 2003	13	$5,254.98		16	$3,131.76	$126.78		
Sept., 2003	13	$15,161.55		17	$3,797.61	$285.74		
Oct., 2003	14	$14,153.21		24	$6,084.13	$188.45		
Nov., 2003	17	$7,594.12		18	$4,500.13	$245.00		
Dec., 2003	45	$22,244.61		23	$8,965.74	$702.59		
Jan., 2004	32	$17,609.03		22	$7,016.24	$685.11		
Feb., 2004	19	$10,856.76		38	$14,262.81	$1,133.21		
Mar., 2004	17	$14,927.35		32	$11,840.30	$647.13		
Apr., 2004	15	$7,481.48		19	$4,666.57	$284.61		
May, 2004	13	$4,300.96		19	$3,608.61	$228.47		
June, 2004	4	$31,164.87		24	$6,629.45	$249.47		
Total FY 2004	**209**	**$152,491.82**	**$0.00**	**269**	**$78,006.34**	**$4,806.83**	**54%**	**129%**
FISCAL YEAR 2004-05								
July, 2004	3	$29,750.20		13	$1,343.60	$62.86		
Aug., 2004	8	$3,706.10		18	$2,880.20			
Sept., 2004	11	$3,623.86		24	$4,407.31	$201.50		
Oct., 2004	13	$3,560.84		31	$9,987.75	$300.45		
Nov., 2004	12	$4,627.15	($1,801.90)	26	$5,997.38	$179.42		
Dec.,2004	62	$35,332.31		29	$7,712.43	$608.33		
Jan., 2005								
Feb., 2005								
Mar., 2005								
Apr., 2005								
May, 2005								
June, 2005								
Total FY 2005	**109**	**$80,600.46**	**($1,801.90)**	**141**	**$32,328.67**	**$1,352.56**	**42%**	**129%**

CIVIL RESTITUTION ACTIVITY REPORT DATE: 01/03/2005

CURRENT MONTH

12/01/2004 TO 12/31/2004

	# CASES	AMOUNT
ORIG RESTITUTION VALUES ENTERED	62	$35,332.31
HEARING COSTS ASSESSED	0	$0.00
SALE OF CONFISCATED COMMODS	0	$0.00
SALES EXCEEDING RESTITUTION	0	$0.00
RESTITUTION ASSESSED	62	$35,332.31
PAYMENTS	17	$5,996.04-
PAYMENTS AFTER PAST DUE NOTICE	3	$387.82-
PAYMENTS AFTER REVOKED NOTICE	8	$579.80-
PAYMENTS FROM COLLECTION EFFORT	1	$723.77-
PAYMENTS FROM HRG COST ASSESSED	1	$25.00-
DISCOUNTS FOR TIMELY PAYMENTS	13	$608.33-
OVERPAYMENTS	0	$0.00
REFUND OF OVERPAYMENT	0	$0.00
APPLIED CONFISCATED COMMODS	0	$0.00
APPLIED EXCEEDING BALANCE DUE	0	$0.00
REFUND OF CONFISCATED COMMOD.	0	$0.00
RETURNED CHECKS	0	$0.00
MISC. ADJUSTMENTS		
DEBITS	0	$0.00
CREDITS	0	$0.00
REASSESSMENTS		
DEBITS	0	$0.00
CREDITS	0	$0.00
WRITE-OFFS	1	$0.16-
ASSESSMENTS WITHDRAWN	0	$0.00
ADJUDICATION ADJUSTMENTS	0	$0.00
FOUND NOT RESPONSIBLE	0	$0.00
DISMISSED BY D.A.	0	$0.00
CASES VOIDED BY ENFORCEMENT	0	$0.00
OVERTURNED ON APPEAL	0	$0.00
DISMISSED BY ADMIN LAW	0	$0.00

FOOTNOTE:

FORFEIT OF CONFISCATED COMMODS	0	$0.00

CIVIL RESTITUTION ACTIVITY REPORT DATE: 01/03/2005

FISCAL YEAR TO DATE

07/01/2004 TO 12/31/2004

	# CASES	AMOUNT
ORIG RESTITUTION VALUES ENTERED	109	$79,775.46
HEARING COSTS ASSESSED	34	$825.00
SALE OF CONFISCATED COMMODS	0	$0.00
SALES EXCEEDING RESTITUTION	0	$0.00
RESTITUTION ASSESSED	109	$80,600.46
PAYMENTS	67	$25,771.78-
PAYMENTS AFTER PAST DUE NOTICE	11	$1,774.70-
PAYMENTS AFTER REVOKED NOTICE	26	$2,633.88-
PAYMENTS FROM COLLECTION EFFORT	3	$1,423.31-
PAYMENTS FROM HRG COST ASSESSED	30	$725.00-
DISCOUNTS FOR TIMELY PAYMENTS	39	$1,352.56-
OVERPAYMENTS	4	$0.94
REFUND OF OVERPAYMENT	0	$0.00
APPLIED CONFISCATED COMMODS	1	$1,801.90-
APPLIED EXCEEDING BALANCE DUE	1	$510.70
REFUND OF CONFISCATED COMMOD.	0	$0.00
RETURNED CHECKS	0	$0.00
MISC. ADJUSTMENTS		
DEBITS	0	$0.00
CREDITS	0	$0.00
REASSESSMENTS		
DEBITS	0	$0.00
CREDITS	1	$1,438.37-
WRITE-OFFS	1	$0.16-
ASSESSMENTS WITHDRAWN	0	$0.00
ADJUDICATION ADJUSTMENTS	2	$324.64-
FOUND NOT RESPONSIBLE	1	$524.54-
DISMISSED BY D.A.	0	$0.00
CASES VOIDED BY ENFORCEMENT	1	$0.00
OVERTURNED ON APPEAL	0	$0.00
DISMISSED BY ADMIN LAW	1	$2,367.68-

FOOTNOTE:

FORFEIT OF CONFISCATED COMMODS	1	$1,860.00

INCEPTION TO DATE
12/31/2004

	# CASES	AMOUNT
ORIG RESTITUTION VALUES ENTERED	4,953	$3,463,504.88
HEARING COSTS ASSESSED	504	$13,125.00
SALE OF CONFISCATED COMMODS	331	$269,865.45-
SALES EXCEEDING RESTITUTION	138	$58,209.82
RESTITUTION ASSESSED	4,953	$3,264,974.25
PAYMENTS	3,371	$787,717.75-
PAYMENTS AFTER PAST DUE NOTICE	46	$10,628.00-
PAYMENTS AFTER REVOKED NOTICE	110	$37,467.05-
PAYMENTS FROM COLLECTION EFFORT	41	$28,734.48-
PAYMENTS FROM HRG COST ASSESSED	267	$6,875.00-
DISCOUNTS FOR TIMELY PAYMENTS	2,345	$267,561.04-
OVERPAYMENTS	148	$360.38
REFUND OF OVERPAYMENT	74	$12,888.01
APPLIED CONFISCATED COMMODS	18	$46,057.55-
APPLIED EXCEEDING BALANCE DUE	6	$7,291.24
REFUND OF CONFISCATED COMMOD.	8	$45,896.70
RETURNED CHECKS	1	$61.75
MISC. ADJUSTMENTS		
DEBITS	3	$55.00
CREDITS	13	$10.22-
REASSESSMENTS		
DEBITS	21	$6,881.15
CREDITS	68	$40,584.10-
WRITE-OFFS	1,059	$1,479,506.19-
ASSESSMENTS WITHDRAWN	9	$4,717.56-
ADJUDICATION ADJUSTMENTS	42	$21,406.83-
FOUND NOT RESPONSIBLE	96	$200,277.90-
DISMISSED BY D.A.	1	$2,134.47-
CASES VOIDED BY ENFORCEMENT	3	$559.32-
OVERTURNED ON APPEAL	1	$524.54-
DISMISSED BY ADMIN LAW	2	$10,524.26-
** TOTAL OUTSTANDING	328	$393,122.22

FOOTNOTE:

FORFEIT OF CONFISCATED COMMODS	40	$109,868.20 *

AGING OF SALE OF CONFISCATED COMMODITIES

VIOLATION DATE UNKNOWN	0	$0.00
1 - 30 DAYS	2	$9,765.90
31 - 60 DAYS	2	$2,724.60
61 - 90 DAYS	9	$13,607.24
91 - 120 DAYS	10	$2,707.92
121 - 150 DAYS	13	$5,701.27
151 - 180 DAYS	26	$24,900.30
181 - 365 DAYS	41	$28,728.95
OVER ONE YEAR	73	$67,025.04
OVER TWO YEARS	60	$55,074.08
OVER THREE YEARS	1,080	$777,632.41
		==========
** TOTAL AGING	1,316	$987,867.71

AGING OF OUTSTANDING CASES

COLLECTIONS WITH AGENCY:		
CAN NOT BE INVOICED	0	$0.00
CURRENT	53	$31,157.93
1 - 30 DAYS	7	$1,890.30
31 - 90 DAYS	6	$1,933.89
91 - 180 DAYS	5	$30,738.00
181 - 365 DAYS	31	$24,406.16
OVER ONE YEAR	138	$132,331.79
COLLECTIONS WITH PRIVATE COLLECTIONS FIRM:		
1 - 90 DAYS	0	$0.00
91 - 180 DAYS	0	$0.00
181 - 365 DAYS	0	$0.00
OVER ONE YEAR	83	$82,154.05
AMOUNT UNDER PROTEST:		
1 - 180 DAYS	0	$0.00
181 - 365 DAYS	0	$0.00
OVER ONE YEAR	5	$88,510.10
		==========
** TOTAL AGING	328	$393,122.22

ENF_525U LOUISIANA DEPARTMENT OF WILDLIFE AND FISHERIES PAGE: 1

CLASS I ACTIVITY REPORT DATE: 01/03/2005

CURRENT MONTH

12/01/2004-12/31/2004

	# CASES	AMOUNT
FINES	6	$450.00
HEARING COSTS		
DEBITS	41	$1,225.00
CREDITS	0	$0.00
LATE CHARGES		
DEBITS	0	$0.00
CREDITS	0	$0.00
		==========
TOTAL DUE		$1,675.00

==========

PAID IN FULL	80	$5,852.50-
PARTIAL PAYMENTS	1	$150.00-
ATTORNEY GENERAL COLLECTIONS	0	$0.00
ATTORNEY GENERAL FEES	0	$0.00
DEPT OF REVENUE COLLECTIONS	1	$30.00-
DEPT OF REVENUE FEES	1	$4.00-
WRITE-OFFS	0	$0.00
OVERPAYMENTS	1	$25.00
REFUNDS	2	$55.00
RETURNED CHECKS	0	$0.00
MISC CHANGES		
DEBITS	0	$0.00
CREDITS	0	$0.00
ADJUSTMENTS TO VIOLATION		
DEBITS	0	$0.00
CREDITS	0	$0.00
VOIDS	0	$0.00
NOT GUILTY	0	$0.00
DISMISSED BY ADMIN LAW	1	$50.00-
DISMISSED BY ENFORCEMENT	0	$0.00
GUILTY/FINE WAIVED	0	$0.00
OVERTURNED ON APPEAL	0	$0.00

FISCAL YEAR TO DATE
07/01/2004-12/31/2004

	# CASES	AMOUNT
FINES	28	$1,800.00
HEARING COSTS		
DEBITS	1,095	$30,600.00
CREDITS	7	$450.00-
LATE CHARGES		
DEBITS	140	$1,175.50
CREDITS	1	$7.50-
TOTAL DUE		$33,118.00

PAID IN FULL	1,274	$83,570.50-
PARTIAL PAYMENTS	31	$1,697.50-
ATTORNEY GENERAL COLLECTIONS	0	$0.00
ATTORNEY GENERAL FEES	0	$0.00
DEPT OF REVENUE COLLECTIONS	17	$939.00-
DEPT OF REVENUE FEES	15	$68.00-
WRITE-OFFS	1	$0.50-
OVERPAYMENTS	4	$29.50
REFUNDS	17	$502.00
RETURNED CHECKS	1	$82.50
MISC CHANGES		
DEBITS	1	$20.00
CREDITS	0	$0.00
ADJUSTMENTS TO VIOLATION		
DEBITS	3	$150.00
CREDITS	0	$0.00
VOIDS	13	$650.00-
NOT GUILTY	9	$450.00-
DISMISSED BY ADMIN LAW	15	$800.00-
DISMISSED BY ENFORCEMENT	0	$0.00
GUILTY/FINE WAIVED	0	$0.00
OVERTURNED ON APPEAL	0	$0.00

	# CASES	AMOUNT
FINES	115,437	$5,962,932.07
HEARING COSTS		
DEBITS	34,619	$880,121.30
CREDITS	8	$12,066.00-
LATE CHARGES		
DEBITS	2,032	$16,433.25
CREDITS	1	$7.50-
TOTAL DUE		$6,847,413.12

PAID IN FULL	71,641	$3,876,903.32-
PARTIAL PAYMENTS	1,822	$86,691.25-
ATTORNEY GENERAL COLLECTIONS	14	$690.00-
ATTORNEY GENERAL FEES	33	$345.00-
DEPT OF REVENUE COLLECTIONS	381	$23,200.53-
DEPT OF REVENUE FEES	339	$1,400.00-
WRITE-OFFS	11,983	$696,796.50-
OVERPAYMENTS	200	$4,318.36
REFUNDS	437	$18,911.81
RETURNED CHECKS	79	$4,207.50
MISC CHANGES		
DEBITS	76	$1,235.00
CREDITS	170	$141.88-
ADJUSTMENTS TO VIOLATION		
DEBITS	259	$15,200.00
CREDITS	46	$2,600.00-
VOIDS	5,788	$291,750.00-
NOT GUILTY	1,315	$66,900.00-
DISMISSED BY ADMIN LAW	285	$15,000.00-
DISMISSED BY ENFORCEMENT	13	$650.00-
GUILTY/FINE WAIVED	159	$8,000.00-
OVERTURNED ON APPEAL	0	$0.00
TOTAL OUTSTANDING		$1,820,217.31

AGING OF OUTSTANDING CASES FROM CITATION DATE

COLLECTIONS WITH AGENCY:		
CURRENT	0	$0.00
1 - 30 DAYS	0	$0.00
31 - 90 DAYS	0	$0.00
91 - 180 DAYS	175	$13,250.00
181 - 365 DAYS	1,347	$113,250.00
OVER ONE YEAR	14,705	$1,069,538.84
COLLECTIONS WITH DEPT OF REVENUE:		
1 - 90 DAYS	0	$0.00
91 - 180 DAYS	0	$0.00
181 - 365 DAYS	0	$0.00
OVER ONE YEAR	7,913	$623,953.47
AMOUNT UNDER PROTEST:		
1 - 180 DAYS	0	$0.00
181 - 365 DAYS	0	$0.00
OVER ONE YEAR	3	$225.00
		==========
** TOTAL AGING	24,143	$1,820,217.31

AGING OF OUTSTANDING CASES FROM HEARING DATE

PREHEARING	4	$200.00
0 - 90 DAYS	471	$35,750.00
91 - 180 DAYS	559	$48,355.00
181 - 270 DAYS	350	$28,725.00
271 - 365 DAYS	533	$45,870.00
OVER ONE YEAR	22,226	$1,661,317.31
		==========
** TOTAL AGING	24,143	$1,820,217.31

State of Louisiana

KATHLEEN BABINEAUX BLANCO
GOVERNOR

DEPARTMENT OF WILDLIFE AND FISHERIES

DWIGHT LANDRENEAU
SECRETARY

2005-033

1/28/05

AGENDA CHANGED FOR L.W.F.C. MEETING

The agenda for the next regularly scheduled public meeting of the Louisiana Wildlife and Fisheries Commission has been changed. The meeting will begin at 9:30 a.m. on Thursday, February 3 in the Louisiana Room of the Wildlife and Fisheries Building in Baton Rouge. The updated agenda is as follows:

1. Roll Call
2. Approval of Minutes of January 4, 2005
3. Commission Special Announcements
4. Public Information Activities Report for September 2004 - January 2005
5. Employee Recognition Awards
6. Delta Waterfowl Presentation, "Predator Management Program Update"
7. Enforcement & Aviation Reports/January
8. Discuss the Concept of Deer and Turkey Tags for 2006
9. Consideration of Permit Application for Purple Loosestrife, Aquatic Plant
10. Presentation of Stock Assessments for Black Drum, Striped Mullet, Southern Flounder and Sheepshead
11. Set June 2005 Meeting Date
12. Public Comments
13. Adjournment

EDITORS: For more information, contact Thomas Gresham at 225/765-2496 (tgresham@wlf.louisiana.gov).

January 28, 2005

NEWS RELEASE

APPROVED: _____

AMENDED AGENDA FOR COMMISSION MEETING

The next regular public board meeting has been scheduled by the Commission for **9:30 A.M. on Thursday, February 3, 2005**, at the Wildlife and Fisheries Building, 2000 Quail Drive, Baton Rouge, LA.

1. Roll Call

2. Approval of Minutes of January 4, 2005

3. Commission Special Announcements

4. Public Information Activities Report for September 2004 - January 2005

5. Employee Recognition Awards

6. Delta Waterfowl Presentation, "Predator Management Program Update"

7. Enforcement & Aviation Reports/January

8. Discuss the Concept of Deer and Turkey Tags for 2006

9. Consideration of Permit Application for Purple Loosestrife, Aquatic Plant

10. Presentation of Stock Assessments for Black Drum, Striped Mullet, Southern Flounder and Sheepshead

11. Set June 2005 Meeting Date

12. Public Comments

13. Adjournment

AGENDA
LOUISIANA WILDLIFE AND FISHERIES COMMISSION
BATON ROUGE, LA
February 3, 2005
9:30 AM

1. Roll Call

2. Approval of Minutes of January 4, 2005

3. Commission Special Announcements

4. Public Information Activities Report for September 2004 - January 2005 - Marianne Burke

5. Employee Recognition Awards - Secretary Dwight Landreneau

6. Delta Waterfowl Presentation, "Predator Management Program Update" - Commissioner Terry Denmon

7. Enforcement & Aviation Reports/January - Keith LaCaze

8. Discuss the Concept of Deer and Turkey Tags for 2006 - Dave Moreland

9. Consideration of Permit Application for Purple Loosestrife, Aquatic Plant - Bennie Fontenot

~~10. Notice of Intent - Oyster Lessee Out-of-State Landing Permit - Patrick Banks~~

Removed 1/28/2005 per Karen Foote

11. Presentation of Stock Assessments for Black Drum, Striped Mullet, Southern Flounder and Sheepshead - Harry Blanchet

12. Set June 2005 Meeting Date

13. Public Comments

14. Adjournment

State of Louisiana

KATHLEEN BABINEAUX BLANCO
GOVERNOR

DEPARTMENT OF WILDLIFE AND FISHERIES

DWIGHT LANDRENEAU
SECRETARY

2005-024 1/25/05

AGENDA FOR LOUISIANA WILDLIFE AND FISHERIES COMMISSION MEETING ANNOUNCED

The next regular public board meeting for the Louisiana Wildlife and Fisheries Commission has been scheduled for 9:30 a.m. on Thursday, February 3, 2005, at the Wildlife and Fisheries Building, located at 2000 Quail Drive, Baton Rouge, LA. The agenda for the meeting is as follows:

1. Roll Call
2. Approval of Minutes of January 4, 2005
3. Commission Special Announcements
4. Public Information Activities Report for September 2004 - January 2005
5. Employee Recognition Awards
6. Delta Waterfowl Presentation, "Predator Management Program Update"
7. Enforcement & Aviation Reports/January
8. Discuss the Concept of Deer and Turkey Tags for 2006
9. Consideration of Permit Application for Purple Loosestrife, Aquatic Plant
10. Notice of Intent - Oyster Lessee Out-of-State Landing Permit
11. Presentation of Stock Assessments for Black Drum, Striped Mullet, Southern Flounder and Sheepshead
12. Set June 2005 Meeting Date
13. Public Comments
14. Adjournment

EDITORS: For more information, contact Thomas Gresham at 225/765-2496 (tgresham@wlf.louisiana.gov).

State of Louisiana

KATHLEEN BABINEAUX BLANCO
GOVERNOR

DEPARTMENT OF WILDLIFE AND FISHERIES

DWIGHT LANDRENEAU
SECRETARY

January 25, 2005

MEMORANDUM

TO: Chairman and Members of Commission

FROM: Dwight Landreneau, Secretary

SUBJECT: February Commission Meeting Agenda

The next regular Commission Meeting will be held at **9:30 A.M. on Thursday, February 3, 2005**, in the Louisiana Room at the Wildlife and Fisheries Building, 2000 Quail Drive, Baton Rouge, LA.

The following items will be discussed:

1. Roll Call

2. Approval of Minutes of January 4, 2005

3. Commission Special Announcements

PUBLIC INFORMATION

4. Activities Report for September 2004 - January 2005

SECRETARY LANDRENEAU

5. Employee Recognition Awards

COMMISSIONER DENMON

6. Delta Waterfowl Presentation, "Predator Management Program Update"

WINTON VIDRINE

7. Enforcement & Aviation Reports/January

OFFICE OF WILDLIFE

8. Discuss the Concept of Deer and Turkey Tags for 2006

OFFICE OF FISHERIES

9. Consideration of Permit Application for Purple Loosestrife, Aquatic Plant

10. Notice of Intent - Oyster Lessee Out-of-State Landing Permit

11. Presentation of Stock Assessments for Black Drum, Striped Mullet, Southern Flounder and Sheepshead

12. Set June 2005 Meeting Date

13. Public Comments

DL:scf

cc: Janice Lansing
Parke Moore
John Roussel
Brandt Savoie
Bo Boehringer
Don Puckett
Dennis Kropog
Ewell Smith
Division Administrators
Marianne Burke

January 25, 2005

NEWS RELEASE

APPROVED: _____

AGENDA FOR COMMISSION MEETING

The next regular public board meeting has been scheduled by the Commission for **9:30 A.M. on Thursday, February 3, 2005**, at the Wildlife and Fisheries Building, 2000 Quail Drive, Baton Rouge, LA.

1. Roll Call

2. Approval of Minutes of January 4, 2005

3. Commission Special Announcements

4. Public Information Activities Report for September 2004 - January 2005

5. Employee Recognition Awards

6. Delta Waterfowl Presentation, "Predator Management Program Update"

7. Enforcement & Aviation Reports/January

8. Discuss the Concept of Deer and Turkey Tags for 2006

9. Consideration of Permit Application for Purple Loosestrife, Aquatic Plant

10. Notice of Intent - Oyster Lessee Out-of-State Landing Permit

11. Presentation of Stock Assessments for Black Drum, Striped Mullet, Southern Flounder and Sheepshead

12. Set June 2005 Meeting Date

13. Public Comments

14. Adjournment

Falcon, Susan

From: Lansing, Janice
Sent: Friday, January 21, 2005 12:49 PM
To: Falcon, Susan
Subject: Re: Commission Meeting

Yes, please add it. Thanks.

Sent from my BlackBerry Wireless Handheld

-----Original Message-----
From: Falcon, Susan <sfalcon@wlf.louisiana.gov>
To: Lansing, Janice <jlansing@wlf.louisiana.gov>
Sent: Fri Jan 21 12:44:16 2005
Subject: Commission Meeting

Janice, I was wondering if a decision has been made about adding the Employee Recognition Awards to the February agenda?

Thanks,
Susan Falcon

Falcon, Susan

From: Terry Denmon [tdd@denmon.com]
Sent: Friday, January 21, 2005 12:04 PM
To: sfalcon@wlf.louisiana.gov
Subject: FW: Delta Waterfowl/Commission Meetings

-----Original Message-----
From: Terry Denmon
Sent: Friday, January 21, 2005 11:54 AM
To: 'rodelta@btinet.net'
Cc: 'dlandreneau@wlf.louisiana.gov'
Subject: FW: Delta Waterfowl/Commission Meetings

Rob: You re confirmed on the Agenda for the Feb 3 meeting. You might ask Dr. Rohwer to contact me ahead of time, or send me enough info that I would talk intelligently.

Thanks

TDD

.
-----Original Message-----
From: Terry Denmon
Sent: Wednesday, January 19, 2005 8:30 AM
To: Terry Denmon
Subject: FW: Delta Waterfowl/Commission Meetings

-----Original Message-----
From: Rob Olson [mailto:rodelta@btinet.net]
Sent: Monday, January 17, 2005 7:56 PM
To: Terry Denmon
Cc: Rohwer Frank
Subject:

Terry,

Thanks for getting us on the agenda for the LDWF Commision meetings. The titles of our two presentations are as follows:

1. Feb.3, 9:30am at the LDWF headquarters - "Predator Management Program Update" - by Dr. Frank Rohwer, Professor at LSU and Delta's Scientific Director

2. March 3, 9:30am at the LDWF headquarters - "Where are the ducks and how could we have more?" - by Rob Olson, President, Delta Waterfowl Foundation

Let me know if i've got the dates and times correct. Looking forward to catching up with you again Terry.

Rob Olson
President
Delta Waterfowl Foundation

COVER SHEET

FAX

To: Wayne Sagrera

Fax #: 337-893-7703

Subject: Agenda

Date: January 20, 2005

Pages: 3, including this cover sheet.

COMMENTS:

As one of the duties of the Chairman, you get to review the agenda prior to it going out. Let me know if the attached agenda is okay. Also, I will need to know where you want each Commissioner to sit. Whenever you have a chance, please call.

From the desk of...

Susan Falcon

La. Dept. Of Wildlife & Fisheries
P. O. Box 98000
Baton Rouge, LA 70898-9000

225-765-2806
Fax: 225-765-0948

, 2005

MEMORANDUM

TO: Chairman and Members of Commission

FROM: Dwight Landreneau, Secretary

SUBJECT: February Commission Meeting Agenda

The next regular Commission Meeting will be held at **9:30 A.M. on Thursday, February 3, 2005**, in the Louisiana Room at the Wildlife and Fisheries Building, 2000 Quail Drive, Baton Rouge, LA.

The following items will be discussed:

1. Roll Call

2. Approval of Minutes of January 4, 2005

3. Commission Special Announcements

COMMISSIONER DENMON

4. Delta Waterfowl Presentation

PUBLIC INFORMATION

5. Activities Report for September 2004 - January 2005

WINTON VIDRINE

6. Enforcement & Aviation Reports/January

OFFICE OF WILDLIFE

7. Discuss the Concept of Deer and Turkey Tags for 2006

OFFICE OF FISHERIES

8. Consideration of Permit Application for Purple Loosestrife, Aquatic Plant

9. Notice of Intent - Oyster Lessee Out-of-State Landing Permit

10. Presentation of Stock Assessments for Black Drum, Striped Mullet, Southern Flounder and Sheepshead

11. Set June 2005 Meeting Date

12. Public Comments

DL:scf

cc: Janice Lansing
Parke Moore
John Roussel
Brandt Savoie
Bo Boehringer
Don Puckett
Dennis Kropog
Ewell Smith
Division Administrators
Marianne Burke

Falcon, Susan

From: Foote, Karen
Sent: Tuesday, January 18, 2005 3:30 PM
To: Roussel, John E
Cc: Blanchet, Harry; Falcon, Susan; Porch, Pat; Landrum, Sue; Hanifen, Jim
Subject: Further Marine Fisheries agenda item for Feb. 2005 Commission meeting

With your approval, Marine Fisheries will also include the following on the Feb. agenda:

Presentation of Stock Assessments for Black Drum, Striped Mullet, Southern Flounder and Sheepshead - Harry Blanchet

Falcon, Susan

From: Roussel, John E
Sent: Tuesday, January 18, 2005 2:33 PM
To: Foote, Karen
Cc: Banks, Patrick; Falcon, Susan; Porch, Pat; Hanifen, Jim; LaCaze, B "Keith"
Subject: RE: February 2005 Commission agenda

OK. Has this been run by the Oyster Task Force?

-----Original Message-----
From: Foote, Karen
Sent: Tuesday, January 18, 2005 1:20 PM
To: Roussel, John E
Cc: Banks, Patrick; Falcon, Susan; Porch, Pat; Roussel, John E; Hanifen, Jim; LaCaze, B "Keith"
Subject: February 2005 Commission agenda

John- If you approve, Marine Fisheries and Enforcement have the following agenda item for the Feb. 2005 meeting:

Notice of Intent- Oyster Lessee Out-of-State Landing Permit- Patrick Banks and Keith LaCaze

State of Louisiana

KATHLEEN BABINEAUX BLANCO
GOVERNOR

DEPARTMENT OF WILDLIFE AND FISHERIES

DWIGHT LANDRENEAU
SECRETARY

January 3, 2005

MEMORANDUM

TO: Undersecretary, Assistant Secretary-Office of Wildlife, Assistant Secretary-Office of Fisheries and Press Secretary

FROM: Dwight Landreneau, Secretary

SUBJECT: Commission Meeting Agenda - **February 3, 2005**

Please write on the bottom of this memo and return to Susan Falcon by Tuesday, January 18th any agenda items your office may have for the **Thursday, February 3rd** Commission Meeting to be held in Baton Rouge, Louisiana at the Wildlife and Fisheries Building, 2000 Quail Drive. This meeting will begin at **9:30 a.m.** on February 3rd. If you do not have anything for the agenda, please return memo and indicate so on the bottom of this memo. We cannot add anything to the agenda that requires commission action after we have published the agenda in the state journal.

Resolutions and Notices of Intent should be included with the list of items to be placed on the agenda. Thank you for your cooperation!

DL:scf

cc: Commissioners
Don Puckett
Brandt Savoie
Winton Vidrine
Dave Moreland
Bennie Fontenot ✓
Karen Foote
Phil Bowman
Wynnette Kees
Ewell Smith
Marianne Burke

Dear Susan:
I have the following item for the Feb. 3rd Commission meeting agenda:
"Consideration of permit application for purple loosestrife, aquatic plant."
Thanks.
Sincerely,
Bennie Fontenot
Adm., Inland Fisheries Div.

G. John Roussel

P.O. BOX 98000 • BATON ROUGE, LOUISIANA 70898-9000 • PHONE (225) 765-2800
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Delta Waterfowl presentation in February - not January. (Relayed to me by Sharon from Mr Denmon's office 12/20/2004 - 3:47)

KAT

State of Louisiana

ENT OF WILDLIFE AND FISHERIES

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Wildlife Division
An item to discuss the concept of deer and turkey tagging for 2006.
Dave Moreland

DL:scf

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Public Information will give an update on public activities from 9/04 - 1/05

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None

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No item from me.
Bo
1/11/05

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If you wish to speak on a particular Agenda Item or during the Public Comment Period, please fill out a Speakers Card and turn it in to our Commission Secretary who is seated on the Front Row on my right side prior to the Agenda Item or Public Comment Period. You MUST fill out one before you can speak, you can get this Speakers Card at the table near the doors at the rear of this room on my left side.

LOUISIANA WILDLIFE AND FISHERIES COMMISSION
COMMENT CARD

Meeting Date: 2/3/05 Agenda Item Number: 9

Topic: purple loosestrife

[X] I would like to speak.

[ ] I do not wish to speak.

[ ] I am IN FAVOR of the proposal.

[ ] I am AGAINST the proposal.

[ ] Other (Explain): _____

Name: Beth Middleton
(PLEASE PRINT)

Representing: National Wetlands Research Center

Address: Lafayette, LA

Telephone: 337 266 8618

LOUISIANA WILDLIFE AND FISHERIES COMMISSION
COMMENT CARD

Meeting Date: 2/3/05 Agenda Item Number: 8

Topic: Deer Tagging

- [x] I would like to speak.
- [ ] I do not wish to speak.

- [ ] I am IN FAVOR of the proposal.
- [ ] I am AGAINST the proposal.
- [x] Other (Explain): Don't know yet

Name: RAY Bordelon
(PLEASE PRINT)

Representing: Avoyelles Wildlife Federation

Address: P.O Box 887
Marksville LA 71351

Telephone: 318-964-2931