

**PROPOSAL FOR STOCK ASSESSMENT AND
SIMULATION MODELING OF SPOTTED SEATROUT (CYNOSCION NEBULOSUS)
IN EVERGLADES NATIONAL PARK**

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for

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INTRODUCTION

Fishing has been permitted in national parks since the establishment of Yellowstone in 1872. Although 36 CFR 2.5 (e and f) disallows the killing of wildlife, in this case wildlife was interpreted to mean terrestrial organisms. In fact, 36 CFR 2.3 specifically authorized the harvest of fish from national parks. To what extent this harvest would be allowed however was not as well defined.

In 1987, President Reagan put forth the National Recreational Fishing Policy (NRFP) which was a statement of how the federal government perceived the importance of recreational fishing. Each federal agency mandated to manage recreational fisheries then responded with it's own set of guidelines outlining how they intended to fulfill these policies. The National Park Service responded with NPS-77 guidelines, designed to provide clarification for managers to carry out these policies with respect to, among other topics, extent of allowable harvest. Chapter 3 (fishing), page 2 of these guidelines state:

When harvest is permitted, the superintendent will determine a permissible harvest level based upon the species, it's biological characteristics, and reproductive potential; but in no case will

harvest be allowed to reduce the reproductive potential of the population or to radically alter it's natural (unfished) age structure. The fisheries management goal will not be to maximize sustainable harvest but to determine an optimum harvest level based upon biological balance and integrity as well as the quality of the fishing experience.

It is clear from this section that the fishery management goals of the national parks are not quite the same as those of the rest of the state of Florida, which seeks to allow the maximum sustainable yield. However in Everglades National Park (ENP) state fishing regulations have always been adopted, with the exception of an overall 10-fish bag limit per species enacted in 1980. This regulation was passed when fishing activity in the park was at an 18-year low. In many instances state regulations have been adopted solely to minimize conflicts from having two different sets of regulations; one for inside the park and one for outside in state waters. Since the prohibition of commercial fishing within ENP in 1985, the park has had the "luxury" of managing the fishery to fulfill the needs solely of the recreational/guide groups, unlike the state, which must still respond to the demands of commercial fishermen and the fish processing houses. Consequently, it is not at all certain that the states regulations are always appropriate to meet the management goals of ENP. Commercial fisheries most often operate to maximize "yield-per-recruit" where only total weight of the catch is considered important for economic

reasons. But since commercial fishing interests have been excluded from the park, I propose investigating the use of a "utility-per-yield" approach (Die et al., 1988) in which "utility" is defined by the preference of the recreational fishermen. This approach would seek to maximize the size of fish most preferred by recreational anglers (presumably larger, more sporting fish) rather than the total weight of the harvest.

OBJECTIVES OF STUDY

- 1.) Develop a stock assessment of the spotted seatrout (Cynoscion nebulosus) stock in Florida Bay and adjacent waters
- 2.) Use stock assessment data to build the simulation model
- 3.) Use the simulation model to develop a fisheries management plan that reflects the specific management goals of ENP

The first objective of this study is to develop a current stock assessment of the spotted seatrout stock using the existing data base and similar methods used by Rutherford (1989). I have chosen to model spotted seatrout for this study for three important reasons: (1) they make up almost half of the total harvest in ENP (Tilmant, 1989), (2) they are one of the few large game fish that lives out it's entire life within the estuaries of ENP, making it an excellent indicator

to conditions in Florida Bay, and (3) they are the most thoroughly described stock within the park.

The second objective is to incorporate this stock assessment data into the length-based population simulation model "LSIM" (Goodyear, 1989a). The input for the population simulation model is the basic data on spotted seatrout as well as a host of exploitation statistics. In order for the results of the model to have maximum integrity the fish and the fishery must be described as accurately as possible.

The third objective is to use the resulting simulation model to develop and evaluate a fisheries management plan. This plan will include an assignment of a numerical value to the concepts outlined in the NPS-77 guidelines that more directly reflect the intent of the Park's specific management policies, i.e "optimum yield". More specifically, I will focus on using a value for the reproductive potential of the fish stocks in order to define a desirable level of harvest. The concept of reproductive potential has been thoroughly investigated by Goodyear (1989b) who presents a mathematical formula to quantify the condition of the reproductive state of an exploited stock called the Spawning Potential Ratio (SPR).

Stated simply

$$\text{SPR} = \frac{\text{P (unfished)}}{\text{P (fished)}}$$

where P (unfished) = potential fecundity of a recruit in the absence of fishing mortality, and;

P (fished) = potential fecundity of a recruit in the exploited stock

Using the population simulation model, I will calculate historic and present values for SPR the spotted seatrout stock within ENP (more specifically in Florida Bay) and attempt to determine a target value for it that corresponds with the park management goals. The model can then be used to give predictive insight on the proper level of harvest (and thus regulations) to achieve and maintain these desired values. The model will not, however, solve all the problems associated with allocating a limited resource.

METHODS

Fisheries Monitoring Data

A fisheries monitoring program has been in place in ENP nearly continuously for thirty two years. Catch and harvest data was collected by the University of Miami from 1958 to 1967. In 1972 the park reinstated the program incorporating estimates of total effort and catch from recreational, guide, and commercial (hook & line and netting) fishing. Lengths of harvested fish have been collected by the park since 1973.

Recreational data within the park is collected in the form of fishermen intercepts (interviews) carried out at the two major access points in the park: Flamingo representing Florida Bay and the Keys, and Chokoloskee Island representing the Gulf Coast (Figure 1). Fishermen are interviewed at the end of their fishing trip as they trailer their boats and clean their harvest.

Fishermen are asked how long they fished, how many people in the boat fished, how many and of what species they kept as well as released, and exactly which area (1-6) they fished. Total lengths of harvested fish are taken (to the nearest millimeter) as they are brought to the cleaning area.

The total number of fishing boats (total effort) within the park boundaries is estimated by counting the number of empty boat trailers at the marina in Flamingo. Periodically overflights are done over the entire park and the actual number of fishing boats seen that day is plotted against the number of empty trailers. A daily count of empty trailers is used to calculate the total estimated

boats in the park for that day by linear regression.

Guides that operate within park waters are required to apply for a no-fee permit every year and to report each fishing trip they take into the park.

Guide are issued a log book that incorporates the same information as the recreational interviews. Each trip is entered in the log and returned to the park at the end of each month.

To estimate the percent of guided trips that comply with the reporting system Rangers as well as interviewers keep a list of the guides that are contacted throughout the month and exactly which days they were observed fishing.

These observations are then cross referenced against the returned reports and the percent of reports that correspond with the observations is used the compliance figure. Reported data is then extrapolated upward using this figure. A complete documentation of the ENP Fisheries Monitoring Program is given in Davis (1978).

Data from previous studies on spotted seatrout in ENP will be utilized when appropriate. The latest study on age and growth (Rutherford 1974) will be used for length-at-age calculations. Fish of a given length will be assigned ages based on, not a cut-off point but, on the distribution of that length class amongst actual observed ages from the length age key. This method helps account for the overlap of a given size between two or more ages. Methods for Virtual Population Assessment (VPA) and estimates of fishing mortality (F) will be similar to those used by Rutherford (1989), using the updated database and

verifying the terminal fishing mortality value.

Biological Data

For preliminary study, a total of 69 spotted seatrout samples were obtained from either sport fishermen catches from Everglades National Park Flamingo boat ramp (Florida Bay), or from independent sampling (West Lake) from May to June 1990. Data collected from all fish included date caught, area caught, total length, and sex. Total weight was taken from 57 of the fish. Scales and otoliths were taken from all fish to verify age. Gonads were taken from all fish and either processed immediately or kept on ice for further measurements. Gonads were weighed, measured (total length), and assigned a stage of ripeness according to Tabb (1961), and then preserved in 10% formalin. The relation of gonad weight to total length of females agreed well with that of Sundararaj and Suttkus (1962). The total number of eggs per gonad was estimated by using the conversion of eggs/gm of gonad weight calculated by Sundararaj et al (1962). Only gonads in the ripe stage (V) were used to estimate fecundity. The estimated number of eggs was regressed against total length. Estimates of fecundity were calculated by using the average length at each age derived from Rutherford et. al. (1982). To better quantify developmental stage of the gonads, a gonadosomatic index (GSI) was calculated by dividing gonad weight by total weight of the fish.

Mortality

Annual estimates of instantaneous rate of total mortality (Z) were calculated from catch curves as well as from the Virtual Population Assessment (VPA) from the formula described by Ricker (1975):

$$Z = (\log e N_{t+1} - \log e N_t)$$

where N_{t+1} equals the number of individuals of a given cohort during a given year, and N_t is the number of individuals of the same cohort the previous year. The instantaneous rate of fishing mortality (F) was calculated as:

$$F = Z - M,$$

which states that total mortality equals fishing mortality plus natural mortality. The procedure assumes recruitment and annual survival to be constant and that all ages in catch are equally susceptible to sampling gear. As recruitment is known not to be constant from year to year, F values from the VPA were chosen for use in the model.

Virtual Population Assessment

A Virtual Population Assessment (VPA) was used to provide estimates of abundance, fishing mortality rate, and exploitation rates. The program COHORT, written by Fox (1976), used to run the VPA requires estimates of

total removal from the population by age (harvest), natural mortality rate (M) (i.e. the natural instantaneous rate of death due to factors other than fishing), and estimates of the fishing mortality rate (F) of the oldest age under investigation.

The total number of fishing boats within ENP on any given day is determined by a regression of the number of empty boat trailers at the Flamingo marina against a known number of boats in the park that day established by aerial counts (Davis 1978). The number of seatrout observed harvested per boat (via sport fishermen interviews) was then extrapolated to estimate the total number of seatrout harvested. In the same way, fish are measured during the interviewing process and assigned an age (Rutherford et. al., 1982). The resulting age frequency distribution is then applied to the total estimated harvest.

Estimates of natural mortality rate were estimated from the literature ($M=0.30$, Tanaka, 1960, as cited in Rutherford et al, 1982; $M=0.35$, Rutherford et al 1982). The latter uses Pauly's (1980) equation relating M to von Bertalanffy growth parameters and ambient temperature.

Fishing mortality for the oldest cohort ($F = 1.5$) in 1989 was obtained from previous work (Rutherford, 1989), which was derived from an iterative procedure fitting VPA calculated F to standardized effort. The VPA is then run

several times until the best fit between F and effort is obtained. Terminal F values will have to be searched again for this work to assure current accuracy. The F values for the terminal ages in 1974-1988 were obtained by averaging the VPA-generated mortality rates of age at recruitment through the terminal age-1 for each year starting in 1985 and sequentially working backward in time to 1974.

RESULTS

Biological Data

Spotted seatrout sampled in this study varied in total length from 223 mm to 560 mm and in weight from 100.7 gms. to 1064.2 gms. A scatter plot was created from this data (Fig. 1A), log transformed (Fig. 1B) and linear regression applied. The resulting equation agreed well with Rutherford (1979) and is given below in inches and pounds ($r^2 = 0.91$, $p < 0.001$):

$$\text{Weight} = (5.90\text{E-}04) \text{ Length}^{2.75154}$$

This equation will be used later in LSIM to estimate the yield in (in pounds) of a given length frequency.

Gonad weight of spotted seatrout ranged from 0.25 gm (immature) to 12.71 gm for males, and from 0.58 gm to 50.571 gm for females. Resulting GSIs ranged from 0.20% (immature) to 2.15% for males, and from 0.26% to 4.19% for

females.

The regression equation of female spotted seatrout gonad weight (gm) to total length (mm) ($r^2 = 0.73$, $p < 0.0001$) is:

$$\text{Female Gonad Weight} = (2.24\text{E-}08) \text{ Length}^{3.405}$$

Estimates of total number of eggs produced at each age along with the age frequency distribution, show that age three fish contribute most to the egg production within the population (Fig. 1, Table 1).

Spotted seatrout taken from West Lake had lower GSI than those taken from Florida Bay despite the fact that they were sampled at virtually the same time (Fig. 3). Gonad development was noticeably poorer, as well as the overall condition of the from West Lake. The fact that hypersaline conditions (45 - 65 ppt) existed at the time of sampling may have contributed to this condition.

Mortality

Annual instantaneous total mortality rates (Z) for fully recruited fish (4+ years) within the Florida Bay area varied from a low of 0.63 in 1978 to a high of 1.36 in 1978 with an overall average of 0.61 (Fig. 4). The assumptions associated with these calculations however (constant year to year recruitment), are probably violated so much as to render these estimates inaccurate.

Virtual Population Assessment

The results of the VPA will be given in two forms: population abundance and instantaneous rate of fishing mortality. Initial runs of the VPA resulted in spotted seatrout populations within Florida Bay varying from 590,542 to 786,017 individuals (Table 2). The total recruited population steadily decreased from 1982 (Figure 4). Recruitment (measured by the number of 1 year olds) ranged from 212,988 to 317,538 individuals, however this too has also steadily decreased. Annual estimates of fishing mortality (F) from the VPA varied from 0.14 to 0.50 with an average of 0.30 (Table 3) and has been increasing, coinciding with the relative decrease in the population.

DISCUSSION

As stated previously, the short term objectives of this work are to compile the data necessary to run LSIM. Ultimately, I will want to be able to predict the outcome of a number of different management scenarios and to know how confident I can be about these predictions. In light of the fact that LSIM will without a doubt generate some numbers, regardless of the accuracy of the baseline data, it becomes increasingly apparent that knowing the confidence limits of these numbers is in fact more important than the numbers themselves. I will devote much of the remainder of this section to discussing both the strengths and the limitations of the presented data and how it might

effect the overall performance of the modeling procedure.

The procedure used to obtain the length/weight equation is very straightforward and uses continuous variables. The resulting equation, due to the extremely significant F value, has a very high confidence associated with it. This part of the data will be used with practically no reservations regarding its accuracy.

The derived equation for the linear regression of fish length against gonad weight, despite the statistical significance, suffers from low sample size. Furthermore, due to the short duration of the sample period, it is not known if GSIs ever reached their actual peak. Much more could be inferred about the spawning cycle of the fish if GSIs were calculated over the entire year and separated by area. This would also help determine, however not conclusively, whether in fact seatrout spawn twice per season.

Calculation of total instantaneous rate of mortality from the catch curve as well as in the VPA uses the widely accepted methods of Ricker (1975), however the assumptions of constant recruitment and survival may well be violated.

Many of the above points pertain directly to the limitations of the VPA as well. The assumption of a constant natural mortality in VPA analysis has the greatest bias on the most current years of the analysis, however, the bias

decreases as one moves towards the earlier years of data. By incorporating sensitivity analysis to the factors with the widest variance (i.e. natural mortality and recruitment) a subsequent range of outcomes can be analyzed and a "worst case scenario" can be evaluated. The other potential weakness of the VPA is the assumption of the consistent accuracy of the length-age key used throughout the study period. By assuming this key is constant we must accept the assumption that growth has remained constant for the same time period, and strictly speaking, this is unlikely to be the case. This assumption not only affects the VPA results but also the mortality calculations from the catch curve.

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List of Figures

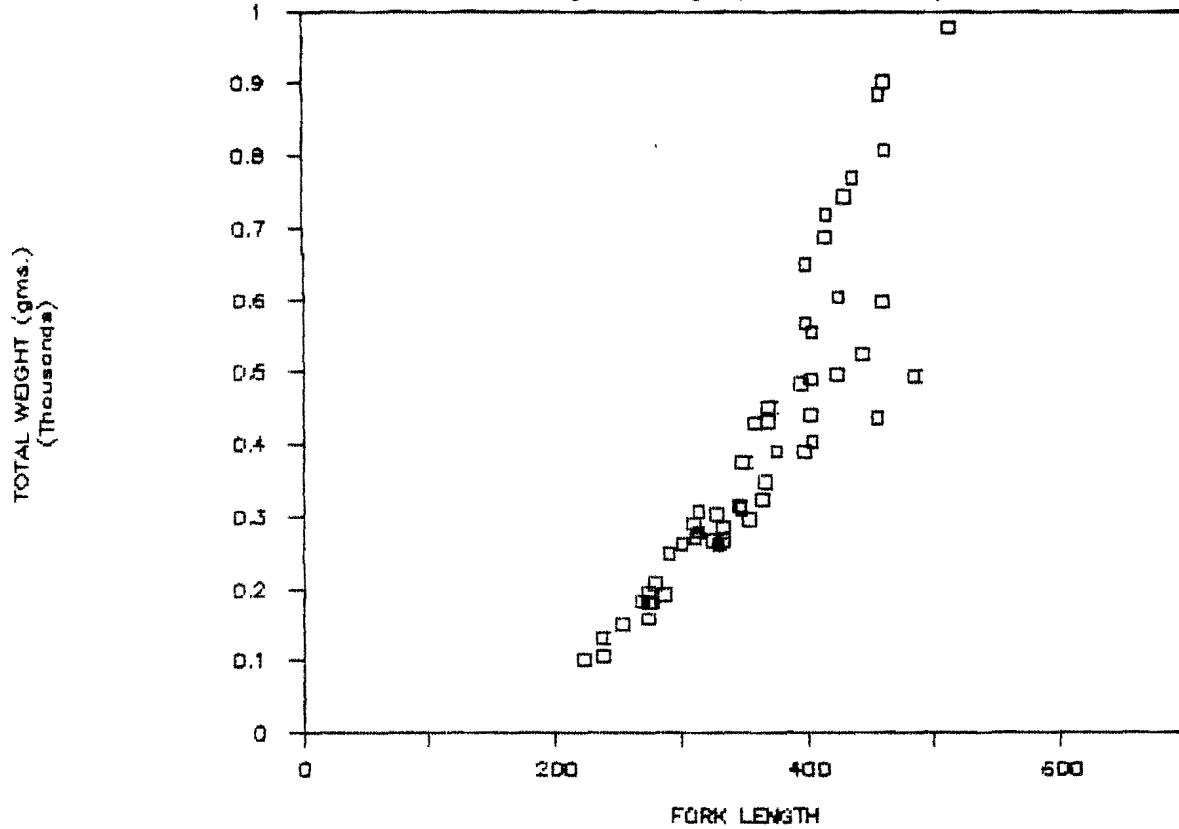
1. A) Length-weight relationship (untransformed data) B) (log transformed data) for spotted seatrout in Everglades National Park, Florida. Weight predicted by this figure is in grams.
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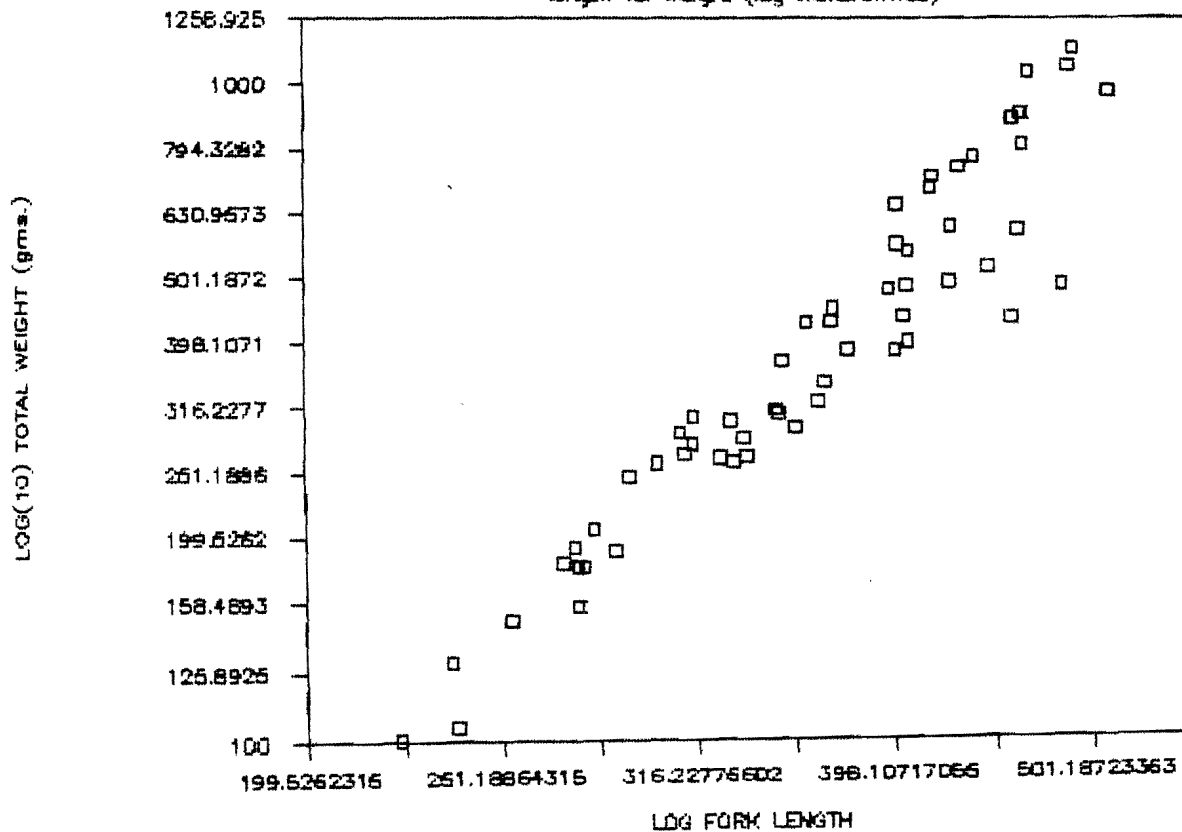
SPOTTED SEATROUT (ALL AREAS)

length vs. weight (non-transformed)



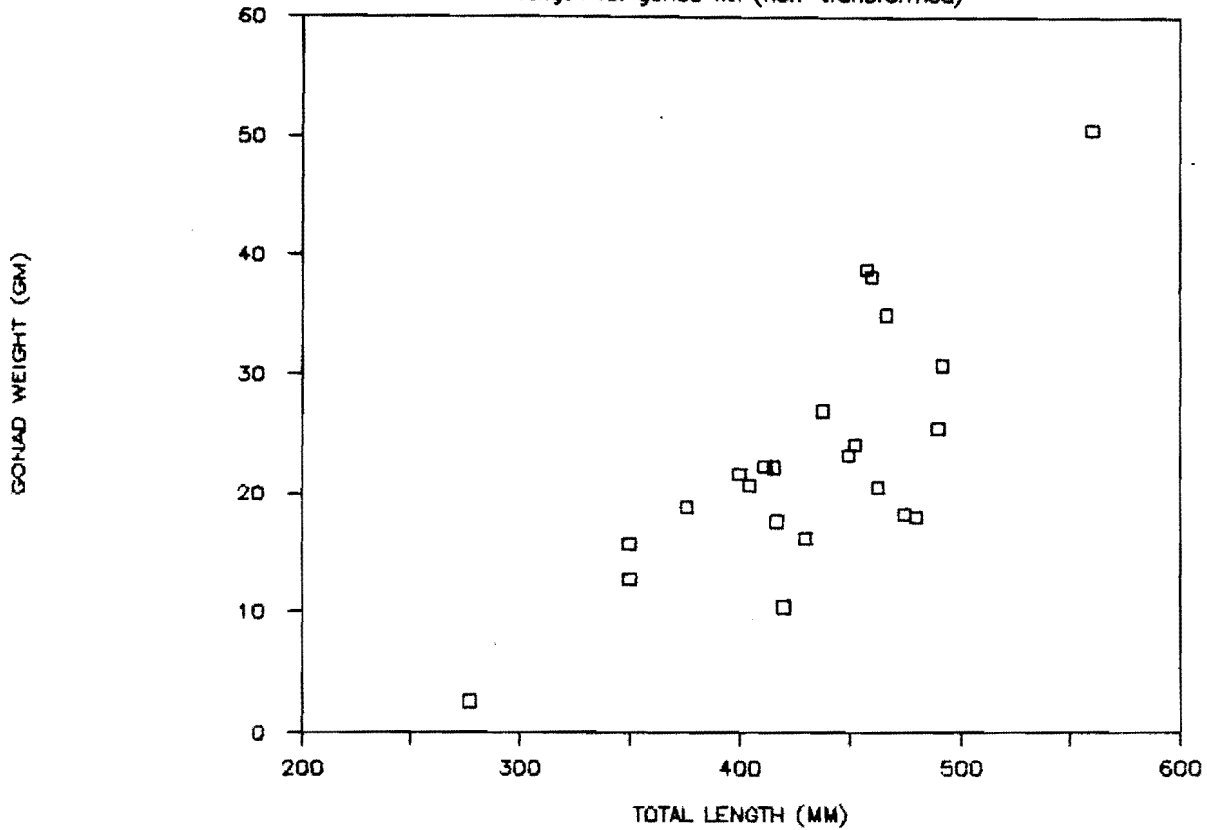
SPOTTED SEATROUT (ALL AREAS)

length vs. weight (log transformed)



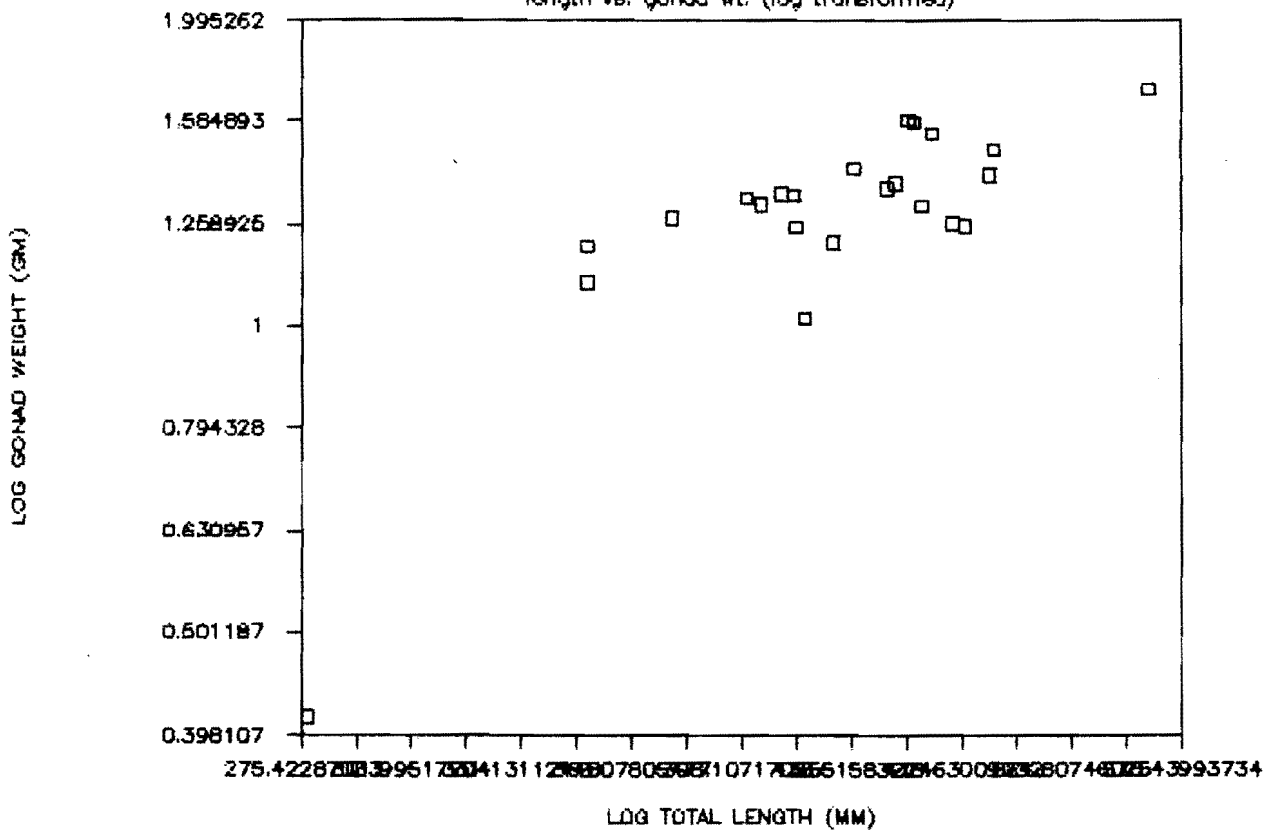
SPOTTED SEATROUT — FEMALES

length vs. gonad wt. (non-transformed)



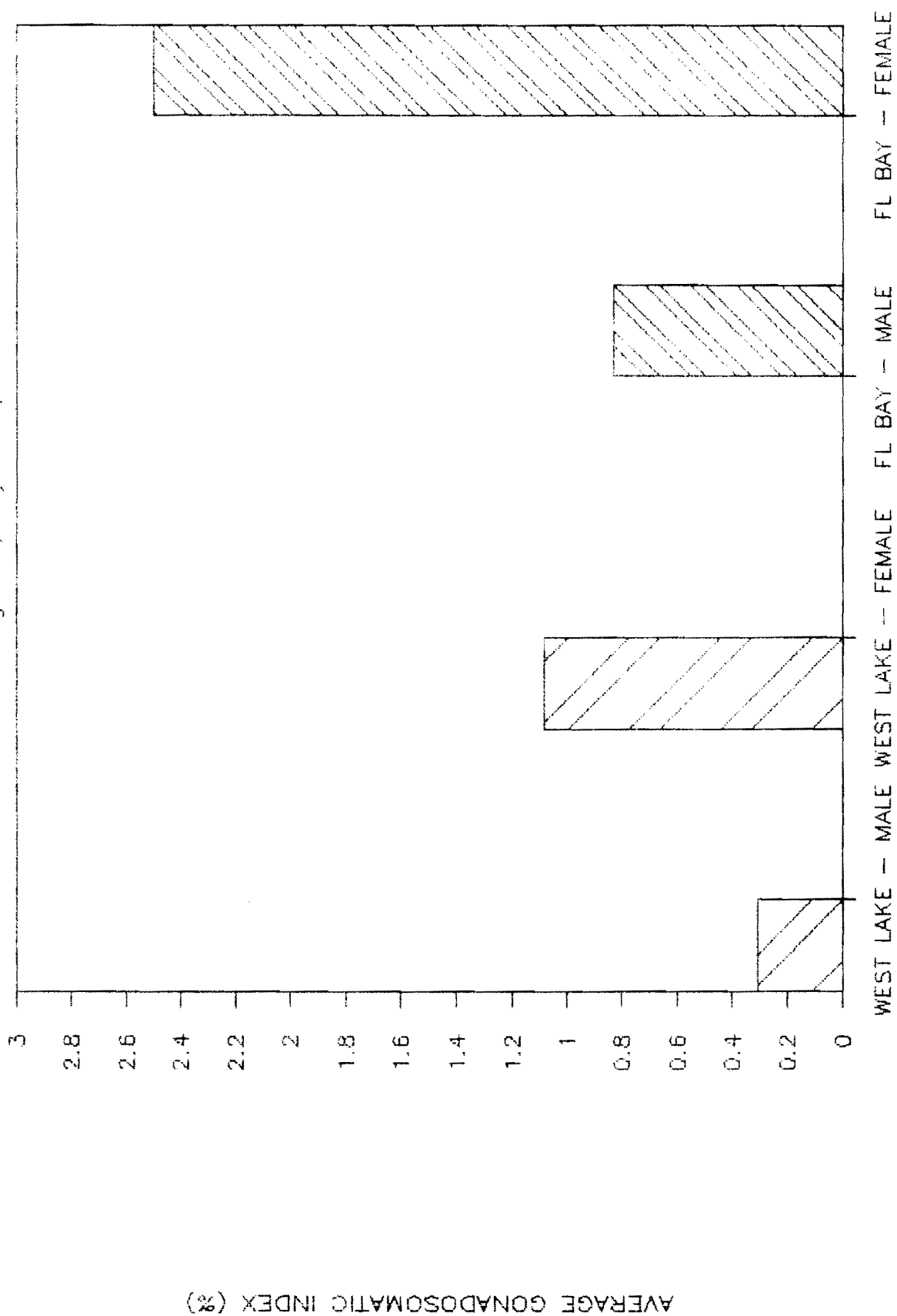
SPOTTED SEATROUT — FEMALES

length vs. gonad wt. (log transformed)



SPOTTED SEATROUT -- BOTH SEXES

Average GSI, May-June, 1990



AGE	N	OBSERVED MEAN GONAD WT. (GMS.)	S.D.	CALULATED MEAN GONAD WT. (GMS.)	EST. NO. EGGS/INDV
I	0	-	-		140,000
II	0	-	-	6.81	160,000
III	3	15.77	3.07	11.88	350,000
IV	5	20.81	1.88	17.65	480,000
V	5	25.74	8.22	24.23	660,000
VI	5	29.82	7.14	32.39	1,000,000
VII	0	-	-	42.31	1,200,000
VII+	1	50.57	0	68.28	1,400,000

Table 2.

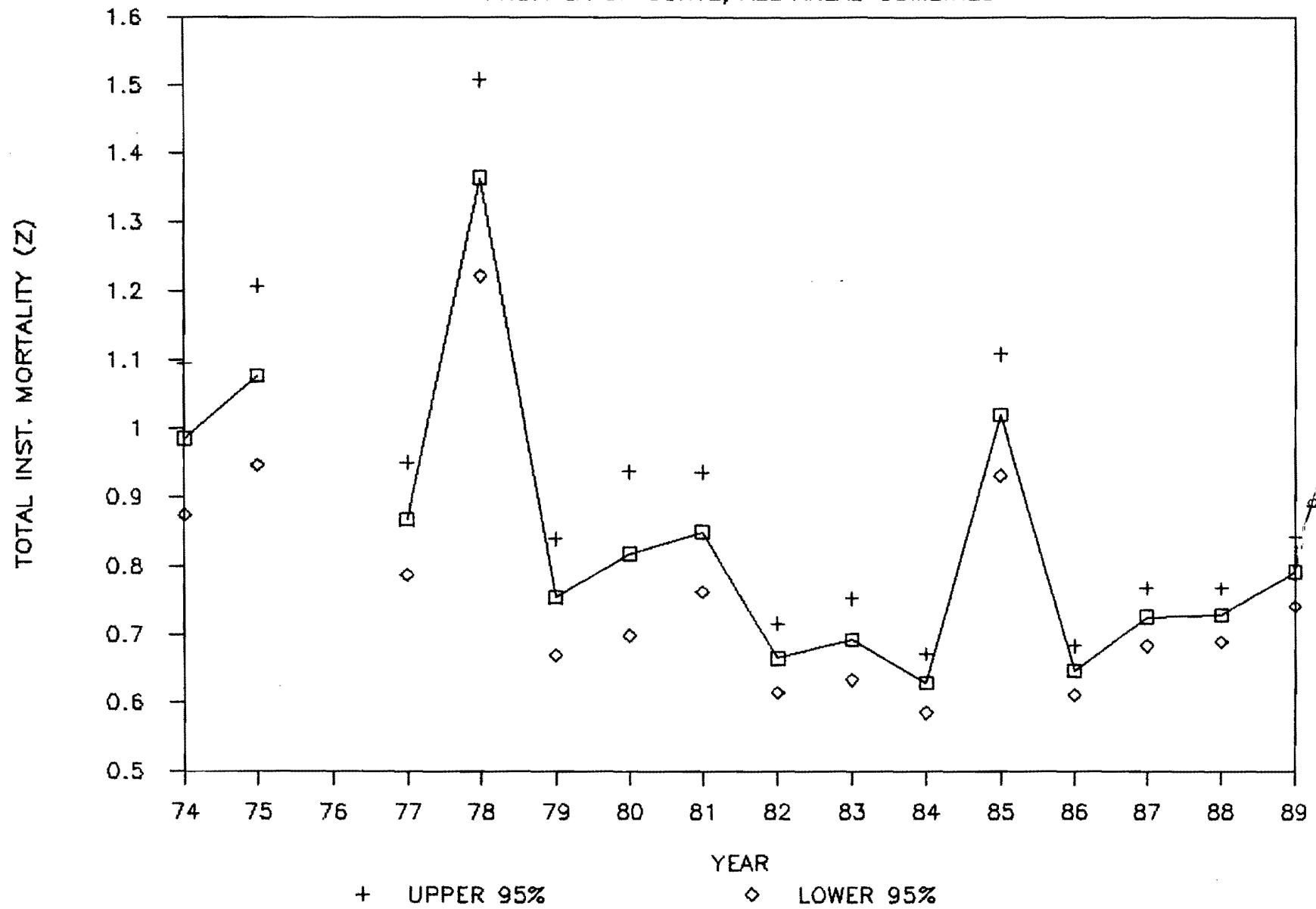
AGE	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	AVG
I	239751	274046	284944	364251	376692	314034	317094	377609	304241	270328	263212	256882	208533	192850	180928	152675	396629
II	148915	177603	202855	210270	269639	278606	231539	234693	205442	224181	199974	193472	166937	154382	144838	122221	197848
III	117289	109388	131409	144768	152114	194785	199033	162107	155515	133853	145173	122230	113196	98028	91968	77607	134279
IV	87400	77280	72815	80645	89841	96880	116828	134931	102846	95196	79165	84264	67853	58489	47510	40091	83252
V	74784	42502	39032	40425	40190	54094	62318	73411	85210	61569	47741	35921	40668	34911	28886	14828	48494
VI	36674	30358	17479	21055	15393	21564	29315	38801	45927	48939	37212	29234	20488	20429	17072	10812	27560
VII	39289	17389	13433	9513	10996	7954	11519	18513	25488	25836	33361	25358	17908	11437	9284	3634	17557
VII+	35828	17019	9740	8898	4296	5284	4376	7999	12411	14884	15391	21471	14870	11157	6370	3826	12114
TOTAL	780130	745585	771707	879825	959161	973201	972022	1048064	937080	874806	821229	768832	649853	581683	526856	425693	919733

Table 3.

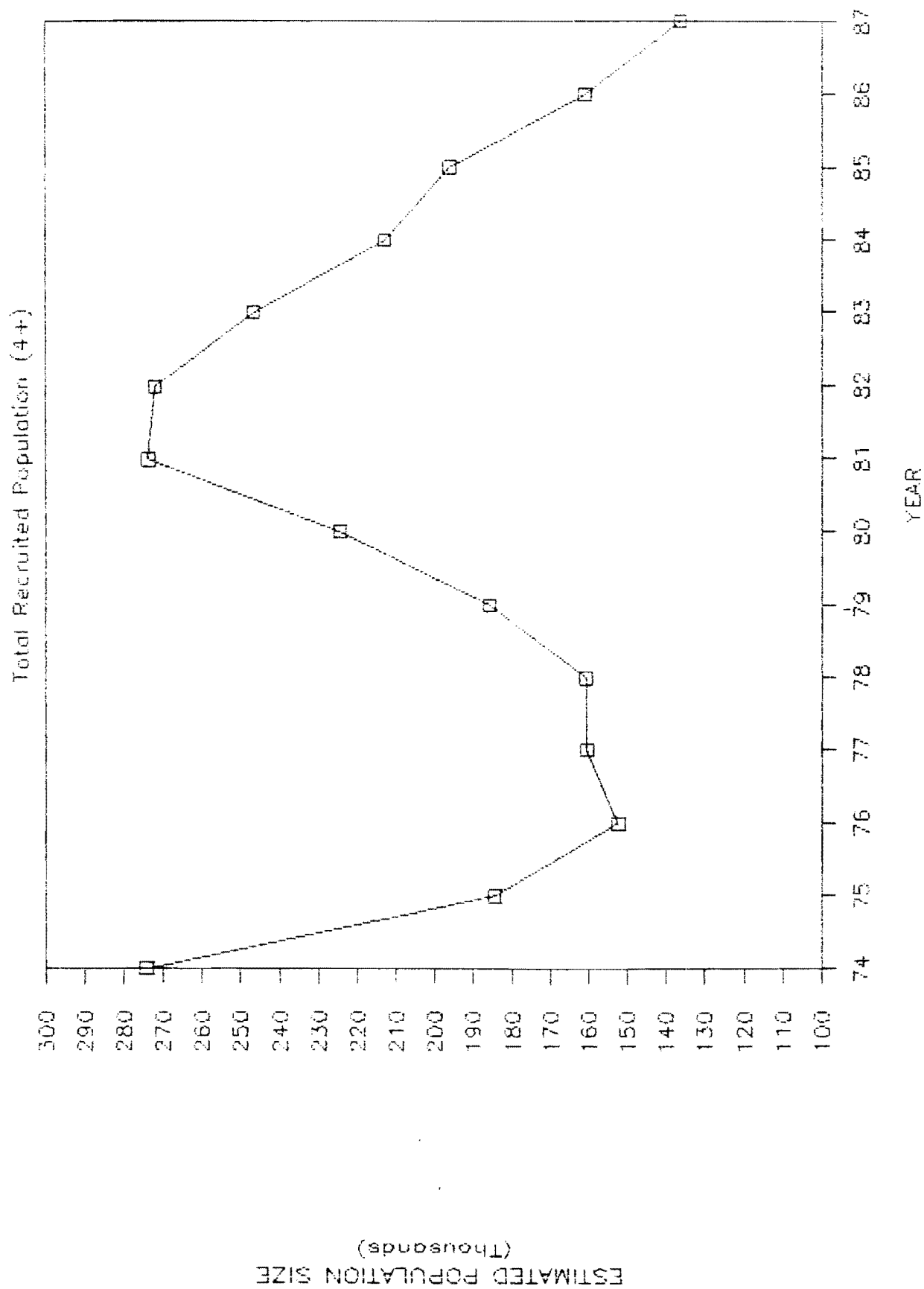
AGE	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	AVG (74-87)
I	0.0000	0.0008	0.0039	0.0008	0.0016	0.0048	0.0009	0.001	0.005	0.0014	0.0078	0.0015	0.00672				0.0028
II	0.0085	0.0012	0.0374	0.0238	0.0252	0.0363	0.0566	0.1115	0.1284	0.1345	0.1923	0.236	0.2324	0.218			0.1030
III	0.1172	0.1070	0.1883	0.1771	0.1512	0.2112	0.0887	0.155	0.1908	0.2252	0.244	0.2886	0.3603	0.4243	0.5303		0.2092
IV	0.4209	0.3830	0.2885	0.3965	0.2073	0.1412	0.1646	0.1596	0.2127	0.3901	0.4902	0.4434	0.3645	0.4055	0.8644	1.5	0.3191
V	0.6016	0.5885	0.3172	0.6655	0.3226	0.3126	0.1736	0.169	0.2545	0.2039	0.1905	0.2615	0.3736	0.4154	0.6827	1.5	0.3464
VI	0.4517	0.5153	0.3084	0.3496	0.3603	0.3271	0.1597	0.1202	0.2753	0.0832	0.0835	0.19	0.293	0.4887	1.24	1.5	0.2854
VII	0.5366	0.2796	0.1119	0.4949	0.4329	0.2974	0.0647	0.0999	0.2379	0.218	0.1407	0.2337	0.1731	0.2853	0.5865	1.5	0.2576
VII+	0.5027	0.4416	0.2565	0.4766	0.3308	0.2696	0.1407	0.1372	0.2451	0.2238	0.2262	0.2822	0.2986	0.3987	0.8434	1.5	0.3022
AVG 4+	0.5027	0.4416	0.2565	0.4766	0.3308	0.2696	0.1407	0.1372	0.2451	0.2238	0.2262	0.2822	0.2986	0.3987	0.8434	1.5000	0.3022

TOTAL INSTANTANEOUS RATE OF MORTALITY

FROM CATCH CURVE; ALL AREAS COMBINED

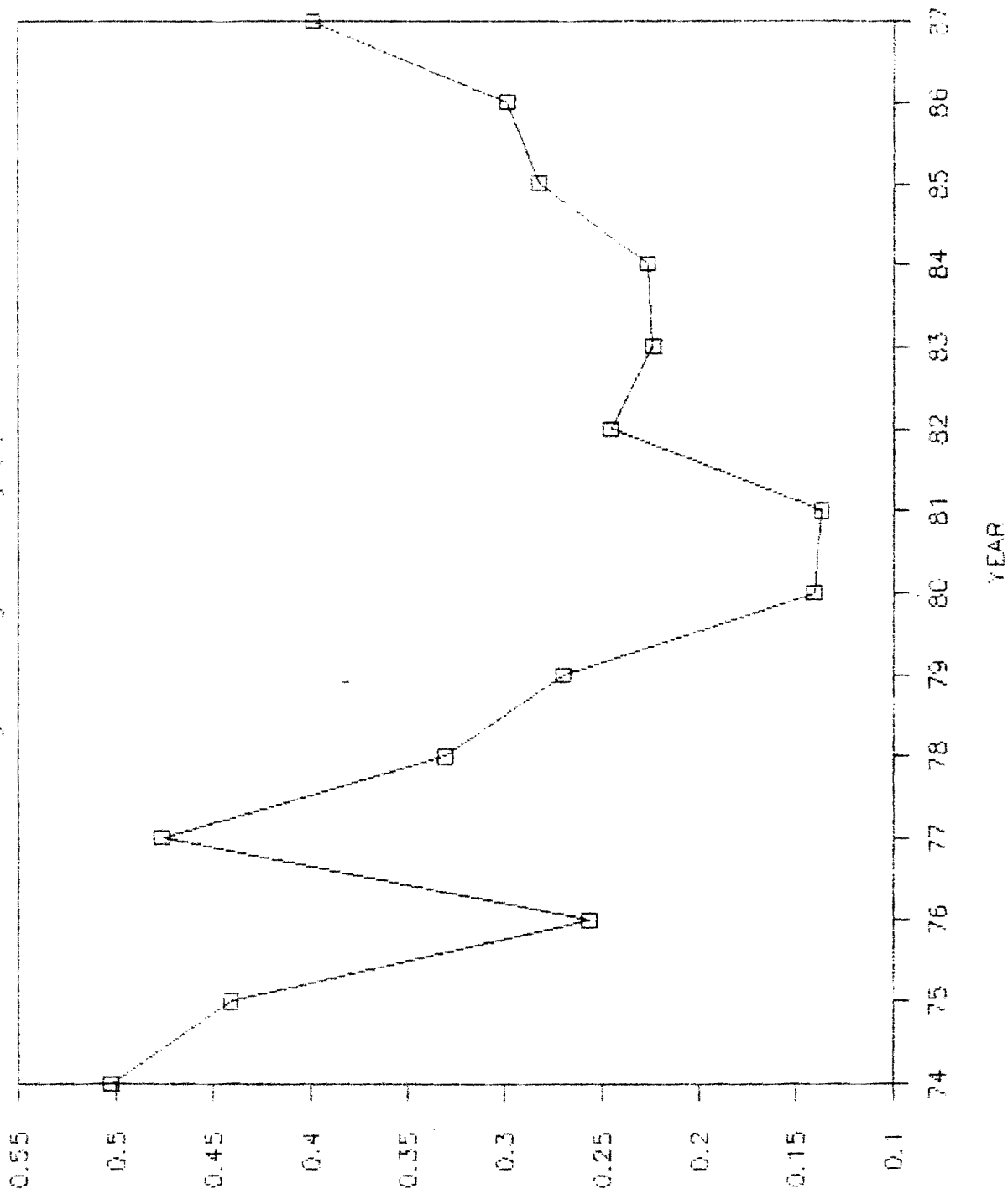


SPOTTED SEATROUT - ENP



SPOTTED SEATRUT -- ENP

Average Fishing Mortality (F) From VPA



AVG. FISHING MORTALITY (F)

COMMAND: REGR

*** MULTIPLE LINEAR REGRESSION ***

DEPENDENT VARIABLE: 2 WEIGHT

57 VALID CASES

 $\ln W - \ln L = C$ COEFF OF DETERM: r^2 0.913513

ESTIMATED CONSTANT TERM:

-9.99197

MULTIPLE CORR COEFF: 0.955779

STANDARD ERR OF ESTIMATE:

0.176242

ANALYSIS OF VARIANCE FOR THE REGRESSION:

SOURCE OF VARIANCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARES	F TEST	PROB
REGRESSION	1	18.0444	18.0444	580.932	0.0000
RESIDUALS	55	1.70836	0.0310612		
TOTAL	56	19.7528			

VARIABLE	REGRESSION COEFFICIENT	STANDARDIZED COEFFICIENT	STANDARD ERROR	T	PROB
1 LENGTH	$\ln L = 2.70619$	0.955779	0.112278	24.1025	0.0000

$$\ln W = \ln(4.57 \times 10^{-9}) + 2.70 \ln L$$

$$W = (4.57 \times 10^{-9}) L^{2.70619}$$

MISSING VALUE TREATMENT: LISTWISE

*** MULTIPLE LINEAR REGRESSION ***

DEPENDENT VARIABLE: 4 LOG B

23 VALID CASES

COEFF OF DETERM: $R^2=0.727513$ ESTIMATED CONSTANT TERM: -17.7133
MULTIPLE CORR COEFF: 0.852944 STANDARD ERR OF ESTIMATE: 0.318520

ANALYSIS OF VARIANCE FOR THE REGRESSION:

SOURCE OF VARIANCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARES	F TEST	PROB
REGRESSION	1	5.68837	5.68837	56.0680	0.0000
RESIDUALS	21	2.13055	0.101455		
TOTAL	22	7.81892			

VARIABLE	REGRESSION COEFFICIENT	STANDARDIZED COEFFICIENT	STANDARD ERROR	T	PROB
3 LOG A	<u>3.40585</u>	0.852944	0.454850	7.46782	0.0000

WHICH COMMANDS

$$\ln \text{ Gonad Weight} = \ln (2.24 \times 10^{-8}) + 3.405 \ln \text{ Length}$$

$$GW = (2.24 \times 10^{-8}) L^{3.405}$$

SEATRACK REJUNTY DATA FILE

SEATRACK DATA BLOCK #1 "REJUNTY.WRI"

SEAL #	COL DATE	FORK	AREA	LENGTH(MM)	FL (IN)	TOTAL	WT(GB)	WT(LBS)	SEX	SONAD	WT(GB)	SONAD	COND/STAGE	SONAD	LENGTH(MM)	AGE	EST
1	051890	MKR 4	325	12.80		265.5	0.5670		F	4.62				68		6+	1.81%
2	051890	MKR 4	302	11.89		261.6	0.5762		F	4.18				75		4+	1.60%
3	051890	MKR 4	280	11.02		207.2	0.4570		F	3.77				67		4+	1.83%
4	051890	MKR 4	437	17.20		770.8	1.6778		M	6.22				110		6+	0.81%
5	051890	MKR 4	371	14.61		451.5	0.9946		F	3.7				100		3+	0.86%
6	051890	MKR 4	462	18.19		501.7	1.0866		M	12.71				135		5+	1.41%
7	051890	MKR 4	315	12.40		306.7	0.6500		M	6.66				95		2+	1.19%
8	051890	MKR 4	287	11.30		192.5	0.4240		M	2.1				77		2+	1.35%
9	051890	MKR 4	223	8.78		100.7	0.2216		M	0.25	IMMATURE			53		3+	0.25%
10	051890	MKR 4	274	10.79		194.3	0.4220		M	1.99				73		1++	1.02%
11	051890	MKR 4	315	12.40		279	0.6145		M	2.55				53		2+	0.92%
12	051890	MKR 4	352	11.50		348.8	0.5460		M	3.1				90		3+	1.25%
13	051890	MKR 4	312	12.38		270.5	0.5956		M	3.51				77		4+	1.30%
14	051890	MKR 4	310	12.20		290.7	0.6403		M	6.25				95		4+	2.15%
15	051890	MKR 4	237	9.33		130.5	0.2874		M	0.56	IMMATURE			50		1+	0.43%
16	052590	WEST LK.	324	12.15		286	0.6300		F(?)	0.385	III(?)			65		2+	0.13%
17	052590	WEST LK.	379	15.71		370.9	0.8610		F(?)	0.56	IMM(?)			90		3+	0.15%
18	052590	WEST LK.	405	15.94		402.6	0.8872		F(?)	1.568	IMM(?)II)-II			100		3+	0.14%
19	052590	WEST LK.	330	12.99		261.9	0.5769		M(?)	0.376	II)-II			37			0.14%
20	052590	WEST LK.	457	17.99		437.2	0.9630		M	0.504	II)-II			55		6+	0.21%
21	052590	WEST LK.	335	13.19		267.2	0.5985		M	0.419	I-II			73		4+	0.16%
22	052590	WEST LK.	404	15.91		490.3	1.0600		M	2.168	IIII)-IV			110		6+	0.65%
23	052790	3E	435	17.09		492.3	1.0844		F	6.457	IV-(V)			90		6+	1.31%
24	052790	3E	400	15.75		366.5	1.2479		F	6.361	IV-(V)			83		4+	1.48%
25	052790	3E	405	15.54		554.3	1.2220		F	20.552	IV-(V)			97		6+	3.70%
26	052790	3E	458	18.03		885	1.9493		F	38.677	IV-(V)			105		5+	4.37%
27	052790	3E	400	15.75		649.3	1.4302		F	21.573	IV-(V)			94		4+	3.32%
28	052790	3E	430	15.93		744.2	1.6372		F	16.161	IV-(V)			92		4+	2.17%
29	052790	3E	260	14.17		429.3	0.9467		F	7.828	IV-(V)			75		4+	1.82%
30	052790	3E	492	19.37		1137	2.5044		F	30.585	IV-(V)			120		?	2.69%
31	052790	3E	467	18.39		1044	2.2996		F	34.317	IV-(V)			105			3.33%
32	052790	3E	416	16.38		689	1.5176		F	22.032	IV-(V)			110			3.20%
33	052790	3E	490	19.29		1064.2	2.3441		F	25.277	IV-(V)			100			2.28%
34	052790	3E	417	16.42		720	1.5959		F	17.645	IV-(V)			105			2.45%
35	052790	3E	443	18.23		307	1.7775		F	30.346	IV-(V)			105			2.52%
36	060190	WEST LK	425	16.73		496.4	1.0934		F	2.04	II)-II			90			0.41%
37	060190	WEST LK	313	20.20		977	2.1520		F*	3.025	II			140			0.92%
38	060190	WEST LK	277	10.91		182	0.4009		F	2.594	IV-(V)			59			1.43%
39	060190	WEST LK	460	13.11		597.1	1.3152		F	4.913	I			85			0.15%
40	060190	WEST LK	368	14.49		346.6	0.7683		F*	1.435	II-(IIII)			75			0.41%
41	060190	WEST LK	335	13.98		254.5	0.6531		M	0.75	II			75			0.26%
42	060190	WEST LK	343	12.70		312.5	0.6863		M	0.345	II			75			0.27%
43	060190	WEST LK	336	9.37		105.1	0.2315		M	0.534	IIII)-II			70			0.56%
44	060190	WEST LK	347	13.66		316.4	0.6969		M	1.045	IIII)-(IV)			80			0.33%
45	060190	WEST LK	275	10.83		181.4	0.3996		F	1.287	III			65			0.71%
46	060190	WEST LK	270	10.63		183.3	0.4037		F	0.875	II-(IIII)			45			0.48%
47	060190	WEST LK	254	10.00		150.3	0.3311		M	0.482	III			65			0.32%
48	060390	3E	460	18.11					F	33.098	V			125			

42	060890	3E	473	18.70			F	19.213 V	120	
50	060890	3E	450	18.90			F	17.895 V	117	
51	060890	3E	390	15.35			F	16.721 (V1-V2)	90	
52	060890	3E	453	17.83			F	23.977 V	120	
53	060890	3E	438	17.24			F	24.803 V	120	
54	060890	3E	412	16.22			F	22.238 V	105	
55	060890	3E	420	16.54			F	10.438 (V1-V2)	95	
56	060890	3E	350	13.78			F	18.715 V	70	
57	060890	3E	560	22.05			F	50.571 V	100	
58	060890	3E	450	17.72			F	22.044 V	37	
59	060890	3E	378	14.80			F	18.855 V	92	
60		WEST LK	403	15.17	440.5	0.9702	M	1.258 IIII-II	70	0.29%
61		WEST LK	445	17.52	522.7	1.1313	M	1.046 II	30	0.20%
62		WEST LK	421	16.77	604	1.13204	M	1.13 II-IIII	60	0.22%
63		WEST LK	329	12.95	304	0.6626	M	0.858 II-IIII	70	0.21%
64		WEST LK	365	14.37	325.6	0.7172	M	0.541 II	70	0.10%
65		WEST LK	377	14.84	391.2	0.8417	F	1.857 II	65	0.42%
66		WEST LK	396	15.59	483.5	1.0650	M	1.148 IIII	77	0.24%
67		WEST LK	275	10.83	153	0.3460	M	0.466 I	50	0.25%
68		WEST LK	370	14.57	431.6	0.9507	M	1.222 IIII	100	0.30%
69		WEST LK	350	13.78	375.6	0.8273	F	15.751 V	110	4.19%