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EVALUATION OF THE RELATIONSHIP BETWEEN BIOLOGICAL INDICATORS AND THE POSITION OF X2

Prepared for

The California Urban Water Agencies
Sacramento, California

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<u>NOTICE</u>

This draft report was prepared as a technical document for reference use by California Urban Water Agencies and others in preparing their comments to the U.S. Environmental Protection Agency on "Water Quality Standards for Surface Waters of the Sacramento River, San Joaquin River, and San Francisco Bay and Delta of the State of California, January 6, 1994." This draft technical report is not part of the CUWA formal comments to EPA.

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SUMMARY

The proposed X2 standard assumes that the position of the 2 ppt isohaline ("X2") is closely associated with the abundance of a number of estuarine organisms. The evidence for this association is a series of correlations between abundance indices and the position of X2 prepared by the San Francisco Estuary Project ("SFEP"), which indicate that the position of X2 explains a large percentage of the variability in abundance. The biological indicators included in SFEP's analyses are particulate organic carbon, bay shrimp, opossum shrimp, molluscs, striped bass, starry flounder, and longfin smelt.

This report evaluates the abundance data used in these analyses and explores the relationship between the abundance indices and the position of X2. This report addresses the following scientific questions:

1) Are there systematic biases in the raw data and methods used to calculate abundance indices that could account for the reported relationships between abundance and the location of X2?

2) Will compliance with the proposed X2 standard increase the abundance of fish and other organisms in the San Francisco estuary?

Only partial answers are possible because several of the data files used to calculate the SFEP abundance indices were not available for analysis. Considerable additional work is required to fully answer these questions. However, based on the analyses presented below, the answer to the first question is "probably not" and to the second question, "probably yes, but the predicted change is uncertain." Individual conclusions based on the work completed are as follows:

1) No systematic biases were identified in the abundance indices calculated from the fall midwater trawl data set that could account for the reported relationships between abundance and the location of X2. However, several potential sources of bias, including turbidity, tidal phase and tidal velocity, were not quantified due to the shortness of time.

2) Particulate organic carbon, one of the eight indicators evaluated by SFEP, is primarily controlled by upstream watershed factors rather than X2.

3) The reported relationship between delta smelt abundance and the number of days that X2 is in Suisun Bay from February to June is not statistically significant when the nonuniform variance in the data is accounted for.

4) Compliance with the proposed X2 standard is not likely to substantially increase the abundance of longfin smelt, striped bass, and 12 other fish, and it may decrease the abundance of some fish.

5) There has been a statistically significant decline in the abundance of delta smelt and striped bass since 1967. However, the decline is less severe than suggested by the total abundance index. The reported decline in longfin smelt is not statistically different from zero, and splittail abundance appears to have increased since 1967.

6) Longfin smelt would benefit from a Roe Island standard. However, there does not appear to be any biological advantage to a Roe Island compliance point as compared to a Chipps Island compliance point for eight other indicators.

7) Entrainment at the pumps is probably not responsible for the decline in delta smelt, but may be a factor in the decline of striped bass and longfin smelt.

8) Entrainment in the cooling water system at PG&E's Contra Costa Power Plant does not significantly effect the abundance of nine biological indicators.

EVALUATION OF THE RELATIONSHIP BETWEEN BIOLOGICAL INDICATORS AND THE POSITION OF X2

The proposed X2 standard assumes that the position of the 2 ppt isohaline ("X2") is closely associated with the abundance of a number of estuarine organisms. The evidence for this association is a series of correlations between abundance indices and the position of X2 prepared by Jassby,[1] which indicate that the position of X2 explains a large percentage of the variability in abundance. The biological indicators included in Jassby's analyses are particulate organic carbon, bay shrimp, opossum shrimp, molluscs, striped bass, starry flounder, and longfin smelt. This report evaluates the abundance data used in these analyses and explores the relationship between the abundance indices and the position of X2.

The abundance indices used in Jassby's correlations were derived from a number of sources, including the California Department of Fish and Game's ("CDFG's") fall midwater trawl survey, the Interagency Ecological Studies Program's ("IESP's") Bay Study survey, and other sources. The raw data and the methods used to calculate the abundance indices were evaluated to determine whether systematic biases are present that could account for the reported relationships between abundance and the location of X2.

The work reported here is exploratory and incomplete because several of the data files used to estimate abundance indices had not been received by the report deadline and the data that was received arrived late in the review process. Considerable additional work is required to determine whether the abundance indices are a reasonable basis for an X2 standard.

I. FALL MIDWATER TRAWL

Among the eight indicator species studied by Jassby, striped bass and longfin smelt abundance indices were calculated from the fall midwater trawl data base. In addition, the abundance indices used for delta smelt, a federally listed threatened species, and splittail, which has been proposed for federal listing, are derived from this data base.

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[1] Alan D. Jassby, Isohaline Position as a Habitat Indicator for Estuarine Resources: San Francisco Estuary, In: Managing Freshwater Discharge to the San Francisco Bay/Sacramento-San Joaquin Delta Estuary: The Scientific Basis for an Estuarine Standard, 1993, Appendix B.

The fall midwater trawl has been conducted monthly each September to December since 1967, except November 1969, 1974, September and December 1976, and 1979. Although it was originally designed to index the abundance of young striped bass, catches of numerous other species are recorded. Except when inclement weather or other problems prevented sampling, each monthly survey consisted of one 12-minute, depth-integrated tow at up to 87 fixed sampling stations in San Pablo Bay, Suisun Bay, and the Delta. The survey is conducted with a 17.6-m long trawl with a mouth opening of 3.7 m^2 that is dragged at about 70 cm/sec and is most effective in catching fish less than 10 cm long.

I.A. Calculation of Abundance Indices

The sampling stations are grouped into 17 subareas as shown in Figure 1. Not all stations were sampled in all years, and subareas 2, 6, and 9 in San Pablo Bay were rarely sampled after 1978. Monthly indices are calculated by multiplying the mean catch within each subarea by a weighting factor, which is the volume of the subarea in 10,000 acre feet (Table 1) and summing over the 17 areas. The annual abundance index is calculated by summing the four monthly indices. The index for November 1969 (no trawl) is estimated from the average of the preceding and following month. The September 1976 index (no trawl) is estimated from the ratio of the September to October index over all years that were sampled multiplied by the October 1976 index. The December 1976 index (no trawl) is estimated from the average of the November 1976 and January 1977 indices.

We calculated annual abundance indices for 1967-1992 for striped bass, longfin smelt, delta smelt, splittail, and nine other species using these procedures. The resulting spreadsheets, which tabulate the index for each subarea and month, are included in Tab 1. CDFG's indices are included in Tab 1n where available. Our calculations agree with CDFG's except for minor differences in the units place, presumably due to rounding errors. We use our estimates of abundance indices in the analyses described in this report.

I.B. Modified Calculations Of Abundance Indices

Abundance indices calculated from the midwater trawl are estimated by summing the four monthly indices. However, the midwater trawl program makes four independent estimates of essentially the same population. Thus, some measure of central tendency would be a more appropriate index of abundance than the sum of the monthly values. When midwater trawl indices are used as actual population estimates, rather than as "indices," the use of the total index overestimates the population compared to one based on central tendency. For example, the total index would overestimate the population by a factor four compared to an average index.

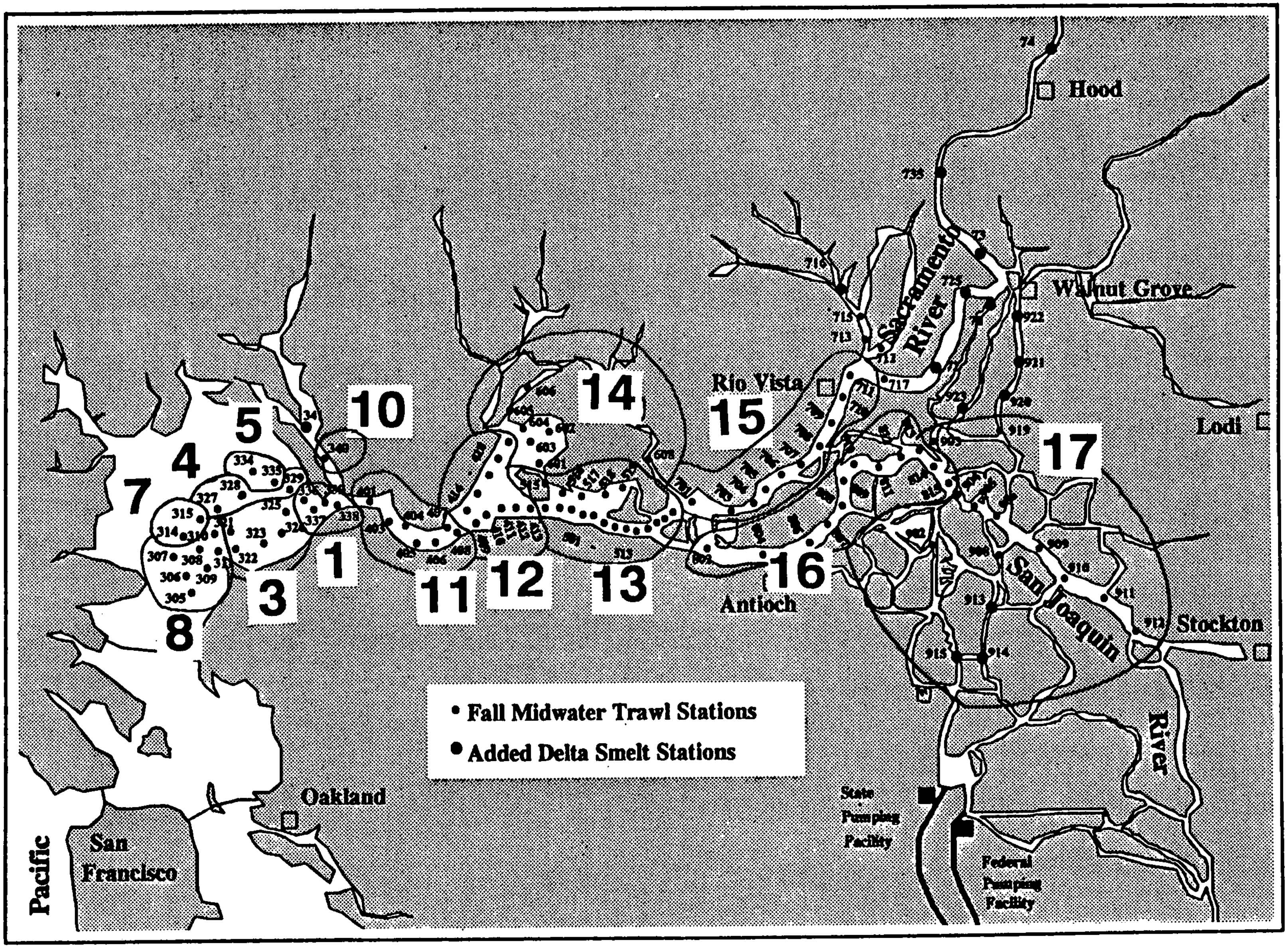

Figure 1. Stations and Subareas Used in the Fall Midwater Trawl.

Table 1. Subareas, Stations, and Weighting Factors Used to Calculate Abundance Indices

Subarea	Station	Weighting Factor (x 10,000 acre feet)
1	336 -339	8.1
2	320	2.8
3	321 - 326	11.3
4	327 - 329	6.5
5	330 - 335	12.2
6	317 - 319	5.9
7	312 - 316	10.2
8	303 - 311	18.5
9	301 - 302	3.0
10	340	4.8
11	401 - 408	16.0
12	409 - 419	14.0
13	501 - 520	18.0
14	601 - 608	5.0
15	701 - 711	12.0
16	801 - 815	14.0
17	901 - 919	20.0

Although mortality would cause small changes in the population estimate, this effect is small compared to experimental error. For example, if populations substantially declined over the September to December period due to mortality, the monthly abundance indices would decline over this period. The data included in Tab 1 indicate that there is no consistent monthly pattern in the indices, suggesting that mortality is small compared to experimental error.[2]

We evaluated the mean and median as alternative methods to calculate the index.

I.B.1. Average Abundance Index

Other Bay sampling programs use an average monthly index as a measure of abundance rather than the total index calculated from the midwater trawl. We calculated the arithmetic average and one standard deviation for each year from the four monthly indices in Tab 1. The standard deviation is a reasonable estimate of the experimental error associated with the sampling program because the four monthly indices summarized in Tab 1 do not display a consistent trend (i.e., increasing or decreasing from September to December) that suggests shifts in fish populations over the sampling period.

Time series plots that compare the total index to the average index and its associated standard deviation[3] are included in Tab 2. These figures indicate that when the average index with its associated experimental error is considered, the claimed decline in abundance appears to be less severe than suggested by the total index alone. This means that the proposed standards would produce fewer fish than the relationships developed by Jassby suggest. The total and average indices are tested in Section IV.E to determine if the time trends are statistically significant.

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[2] Populations would also appear to increase as fish grow, due to increased catch efficiency (i.e., more larger fish would be retained by the net than smaller fish). However, the monthly abundance indices in Tab 1 also do not display a consistent increasing trend. In this work, changes in catch efficiency work over the 4-month sampling period are considered to be part of the overall experimental error.

[3] The error bars on the figures in Tab 2 are +/- one standard deviation of the four monthly trawls and are intended to represent the experimental error. They are not the standard error of the arithmetic mean.

I.B.2. Median Abundance Index

The distribution of catch data used to calculate abundance indices is highly skewed. We attempted to recalculate the indices using the median catch instead of the average catch. However, because this typically yielded zero annual abundance indices, we abandoned this approach.

Alternatively, we calculated the annual indices as the median of the four monthly values. Time series plots that compare the total index to the median index are included in Tab 3. These figures indicate that when the median index is used, the claimed decline in abundance appears to be less severe than suggested by the total index. The total, average, and median indices are tested statistically in Section IV.E to determine if the time trends are statistically significant.

I.C. Sampling And Analysis Biases

We evaluated the midwater trawl data to determine whether systematic biases are present in the calculated indices that could account for the reported relationships between abundance and the location of X2. A systematic bias, for example, that resulted in fewer fish being caught upstream than downstream would cause abundance to decline as X2 increases. The factors that we evaluated are as follows:

- weighting factor
- station depth
- turbidity
- sampling time

I.C.1. Weighting Factor

The abundance index is calculated by multiplying the mean catch for each subarea by a <u>constant</u> weighting factor that is an estimate of the volume of water in the subarea in 10,000 acre feet. The actual volume of water in a subarea would fluctuate in response to the tides and Delta outflow. Because subarea volume would increase for high Delta outflows and decrease for low outflows, the use of a constant factor decreases the index for high outflows and increases it for low outflows. Thus, the use of this factor would probably tend to inflate abundances when X2 is upstream.

The weighting factor could also introduce an X2 bias if the factor varied uniformly along the estuary (i.e., if it increased or decreased between San Pablo Bay and the Delta) because the same fish caught in different subareas could contribute from 4.8 to 20 units to the overall index (Table 1). The average weighting factor increases in the upstream direction from 10 in San Pablo Bay, to 12 in Carquinez Strait and Suisun Bay, to 16 in the Delta. Therefore, on average, when X2 is upstream, a fish caught in the Delta contributes 25 percent more to the index than the same fish caught in Suisun Bay when X2 is farther downstream. However, because the number of stations per unit volume is higher in Suisun Bay than in the Delta, this same fish would be less likely to be caught in the Delta. Thus, the use of this factor, on average, probably does not substantially bias abundance estimates.

To evaluate the effect of the weighting factor on abundance, we recalculated the delta smelt abundance index as described above, except we set the weighting factor equal to 1. A time series plot of the total index and the raw catch index is included in Tab 4. This figure suggests that the weighting factor does not affect the trend nor pattern in the delta smelt abundance index, confirming that the weighting factor does not substantially bias the index.

In sum, the use of a constant weighting factor is unlikely to explain the abundance-X2 relationships reported by Jassby and may actually slightly underestimate abundance for high outflows and overstate abundance for low outflows.

I.C.2. <u>Station Depth</u>

Water depth at each sampling station has been measured during each trawl since 1978. Minimum, maximum, and average depths at each station are summarized in Table 2. Midwater trawls are brought upward over a constant 12 minute period. Therefore, at shallow stations, they sample at the surface (or the bottom) a longer time than at deeper stations. Thus, the catch at shallow stations would have proportionately more surface-oriented fish (or bottom-oriented fish). In other words, more fish that tend to prefer a particular zone of the water column would be caught at the shallower stations because the trawl would spend more time in the zone where the fish are located. If upstream stations were deeper than downstream stations, this would result in fewer fish being caught as X2 moved upstream.

As a first approximation, the indices were proportionately adjusted for this factor by multiplying the catch at each station by the ratio of the station depth to 10 feet, the depth over which it was assumed the fish were distributed. These calculations were performed for delta smelt, longfin smelt, and striped bass. The spreadsheet calculations and time series plots comparing the total index with the depth adjusted index are included in Tab 5. The time series plots demonstrate that

Table 2. Station Depth

		Midwater Trawl, Depth to Bottom (feet; 1978-1992)		
Subarea	Station	Minimum	Maximum	Average
1	336	15	50	25.0
	337	10	65	38.6
	338	30	75	45.8
	339	10	37	21.0
2	320	10	10	10.0
3	321	20	43	33.3
	322	8	15	11.1
	323	8	14	10.6
	324	25	30	28.8
	325	20	55	34.3
	326	9	70	11.9
4	327	6	25	11.1
	328	5	15	8.9
	329	4	50	10.4
5	330	10	10	10.0
	331	9	10	9.8
	332	8	10	9.6
	333	8	10	9.7
	334	5	10	8.2
	335	4	12	8.3
6	318	10	11	10.2
	319	8	10	9.7
7	312	13	20	16.5
	313	10	10	10.0
	314	6	15	11.6
	315	6	16	11.3
	316	10	10	10.0
8	303	40	40	40.0
	305	15	45	31.9
	306	20	55	39.6
	307	12	45	30.9
	308	10	45	27.8
	309	20	55	37.5
	310	20	46	37.3
	311	15	50	27.4
9	302	15	15	15.0
10	340	10	50	17.7
11	401	15	75	50.8
	402	20	20	20.0
	403	7	55	16.8
	404	10	70	45.8
	405	20	75	31.5
	406	20	60	40.9
	407	20	55	39.7
	408	25	60	43.8

Table 2. Station Depth

Subarea	Station	Midwater Trawl, Depth to Bottom (feet; 1978-1992)		
		Minimum	Maximum	Average
12	409	15	50	36.3
	410	25	60	40.4
	411	20	45	32.9
	412	10	50	34.3
	413	25	49	33.9
	414	25	45	34.7
	415	25	37	30.5
	416	20	45	29.5
	417	15	40	28.2
	418	12	33	23.3
13	501	25	47	34.9
	502	25	45	35.3
	503	25	60	33.8
	504	25	41	33.9
	505	20	45	32.4
	507	25	70	37.3
	508	25	60	39.5
	509	25	60	40.0
	510	23	75	36.8
	511	25	55	37.4
	512	30	65	47.5
	513	30	60	45.3
	514	30	30	30.0
	515	12	35	27.4
	516	10	50	20.4
	517	10	27	17.3
	518	8	25	11.6
	519	4	12	7.9
14	601	5	21	12.3
	602	4	11	7.5
	603	5	15	8.8
	604	4	50	11.6
	605	15	35	24.9
	606	15	50	25.8
	608	10	40	26.0
15	701	20	40	31.6
	702	30	35	34.0
	703	25	40	32.8
	704	25	40	29.7
	705	25	35	29.4
	706	25	35	30.8
	707	25	40	30.9
	708	25	35	29.9
	709	25	40	31.1
	710	25	40	30.9
	711	25	75	42.7

Table 2. Station Depth

Subarea	Station	Midwater Trawl, Depth to Bottom (feet; 1978-1992)		
		Minimum	Maximum	Average
16	802	15	27	21.0
	804	20	50	34.2
	805	30	30	30.0
	806	30	55	36.3
	807	20	45	33.4
	808	25	40	32.7
	809	10	50	38.1
	810	25	45	34.6
	811	25	60	44.1
	812	30	65	40.9
	813	30	60	43.8
	814	20	55	35.9
	815	30	55	38.4
17	901	20	25	21.7
	902	10	28	21.9
	903	8	17	11.6
	904	10	55	36.5
	905	25	55	40.7
	906	30	45	34.7
	908	10	37	18.9
	909	25	40	32.6
	910	25	40	32.7
	911	15	40	32.6
	912	25	40	33.1
	913	20	35	26.3
	914	12	20	15.8
	915	10	15	13.3
	919	15	25	20.0

station depth does not affect the trend nor pattern in the abundance indices, suggesting that station depth does not bias the index.

In sum, varying station depths are unlikely to explain the abundance-X2 relationships reported by Jassby.

I.C.3. Turbidity

Generally, when the water is clear, fish can see the net and avoid it, while when the water is turbid, fish may not see the net and thus may be more efficiently captured. Alternatively, fish that may not otherwise be caught because they are in shallows or along edges may venture out of these relatively protected areas into more turbid waters in search of food, where they could be more easily caught. In either case, more fish would be caught in turbid waters even though the abundance had not changed. These types of factors would tend to increase catch when turbidity is high and decrease it when turbidity is low. Because turbidity is related to Delta outflow, and hence X2, this could introduce a flow bias into the abundance indices, which would cause abundance to decline as X2 increases.

Turbidity (expressed as Secchi disk depth in meters) has been measured since 1978 in the midwater trawl sampling program. We explored this potential bias by first plotting longfin smelt catch against Secchi disk for each of the subareas. These plots, included in Tab 6, indicate that more longfin smelt are caught in Subareas 11-14 (Carquinez Strait and Suisun Bay) when turbidity is high (Secchi disk <0.4 m) than when turbidity is low. The same trend is not clearly evident in other subareas. According to the abundance index spreadsheet for longfin smelt in Tab 1e, most of the longfin smelt are usually caught in subareas 11 to 14. Next, we plotted Secchi disk against Dayflow for subareas 11 to 14 (Tab 7a) and regressed turbidity on Dayflow for several subareas and individual stations (Tabs 7b, 7c) to verify that turbidity is related to outflow. Finally, we regressed Delta outflow during the sampling period (September - December) against outflow during the compliance period (February - June) and found a significant relationship ($r^2 = 0.76$, $p<0.01$) (Tab 7d).

In sum, catch is related to turbidity at the time of sampling, which is related to Delta outflow during the compliance period. When outflows are high and X2 is downstream, more fish may be caught because they are less able to avoid the net or because they venture out of areas that are not sampled (e.g., shallows, edges) into turbid areas in search of food. This suggests that a flow bias may be present. However, it is not obvious how to correct the data for this bias nor how significant it may be.

I.C.4. Sampling Time

Generally, more fish should be caught before sunrise than after. If downstream stations were consistently sampled prior to sunrise and upstream stations after sunrise, this would underestimate catch at upstream stations, resulting in higher catches and abundance indices when X2 is downstream and lower values when X2 is upstream. Alternatively, if fish were only caught before sunrise when turbidity was low, as in dry years, abundance would be consistently underestimated during these years, suggesting that abundance declines as X2 moves upstream.

Sampling time has been recorded since 1978. Plots of catch against sampling time for all years of record (1978-1992) (Tab 8a) indicate that catches can be large between 7 AM and 2 PM for all four species. No time trend or threshold is apparent in the data. We also prepared similar plots for critical years only (1988, 1990-1992) with similar results (Tab 8b). Therefore, sampling time does not appear to systematically bias the abundance indices. This analysis should be repeated with reference to sunrise, rather than time of day.

I.C.5. Other Sources Of Bias

Other potential sources of error and bias may effect the reliability of abundance indices estimated from the midwater trawl data base. These include:[4]

- catch is not corrected for tidal phase;
- catch is not corrected for tidal velocity;
- catch is not corrected for changes in catch efficiency as fish age;
- catch is not corrected for changes in distribution caused by changes in salinity;
- shallows and other protected habitats are not sampled;
- the catch is predominantly immature fish and does not represent the total population;

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[4] Personal communication, Randy Bailey, February 15, 1994.

- the indices combine different age fish that have different environmental requirements; and
- bias may result from the use of fixed rather than random stations as fish are not randomly distributed.

These additional factors were not evaluated due to the shortness of time for these analyses and should be considered in future studies.

II. IESP BAY STUDY

Among the eight indicator species studied by Jassby, starry flounder and bay shrimp abundance indices were calculated from the IESP Bay Study data base. This program was developed to determine the effects of freshwater outflow on the distribution and abundance of fish, shrimp, and crabs in the San Francisco estuary. The program uses both midwater and otter trawls and has sampled in all months of the year since February 1980 from 35 or more stations located throughout the Bay from the Dumbarton Bridge to the confluence of the Sacramento and San Joaquin Rivers.

The methods used to convert catch data from this data set into abundance indices are different from those used to reduce the midwater trawl data set. The IESP methods are more sophisticated and are believed to be less likely to contain biases than the midwater trawl indices. The starry flounder abundance index used by Jassby was calculated from the otter trawls by multiplying monthly catch per unit effort for five subareas by a weighting factor. The catch per unit effort was calculated by multiplying the distance towed by the spread of the otter trawl. Catch data was separated by year class and the index based on the young of the year. The annual index was calculated by averaging the monthly indices over all months sampled. The bay shrimp index was calculated directly from catch per unit effort for the otter trawl data using the May through October period and immature shrimp.

This data set had not been received at the time this report was prepared and therefore could not be analyzed. Because the standard is based on correlations with abundance indices calculated from the IESP Bay Study data set, it is recommended that both the sampling and calculation methods used to develop the indices be reviewed to determine if there are systematic biases in the data that could explain the abundance-X2 relationships reported by Jassby.

III. **PARTICULATE ORGANIC CARBON**

Particulate organic carbon ("POC") is the sum of annual primary production in Suisun Bay and the amount of organic carbon carried in by river water flowing out of the Delta ("riverine POC").[5] Jassby fit a straight line to the POC data and average January to December X2 using generalized linear models. He found that X2 explained 72 percent of the variability in POC[6] and concluded that "the supply of energy to the base of the food web, as represented by phytoplankton carbon (POC) is also associated with X2."[7] As discussed below, POC is controlled by upstream factors, not X2.

Jassby calculated the POC series for the period 1975 to 1989 from the sum of riverine and Suisun Bay POC. Annual riverine POC was estimated by multiplying the chlorophyll concentrations at DWR monitoring stations D-24 and D-14A by the flow in the Sacramento River and QWEST, respectively, and summing. Suisun-derived POC was scaled from Alpine and Cloern's relationship[8] between incident solar radiation and productivity for 1980.[9] The amount of POC derived from each of these sources is plotted against Delta outflow in Figure 2.

Figure 2 indicates that the riverine component of POC controls the relationship between POC and X2. About 20 to 90 percent of the POC is derived from riverine sources.[10] As shown by Figure 2, this component is a strong function of flow because it was calculated by multiplying chlorophyll concentrations by flow. This component of POC originates from upstream sources and clearly has nothing to do with the location of X2. One reason that POC increases in high flow years is that water is diverted through flood control bypasses (e.g., Yolo Bypass) and flows over

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[5] Jassby, 1993, Table 1.

[6] Id., Table 2 and Figure 1.

[7] Id., p. B-5.

[8] Andrea E. Alpine and James E. Cloern, Trophic Interactions and Direct Physical Effects Control Phytoplankton Biomass and Production in an Estuary, Limnology & Oceanography, v. 37, no. 5, 1992, pp. 946-955.

[9] Alan D. Jassby, James E. Cloern, and Thomas M. Powell, Organic Carbon Sources and Sinks in San Francisco Bay: Variability Induced By River Flows, Marine Ecology Progress Series, v. 95, 1993, pp. 39-54.

[10] Id., p. 51 and Figure 6.

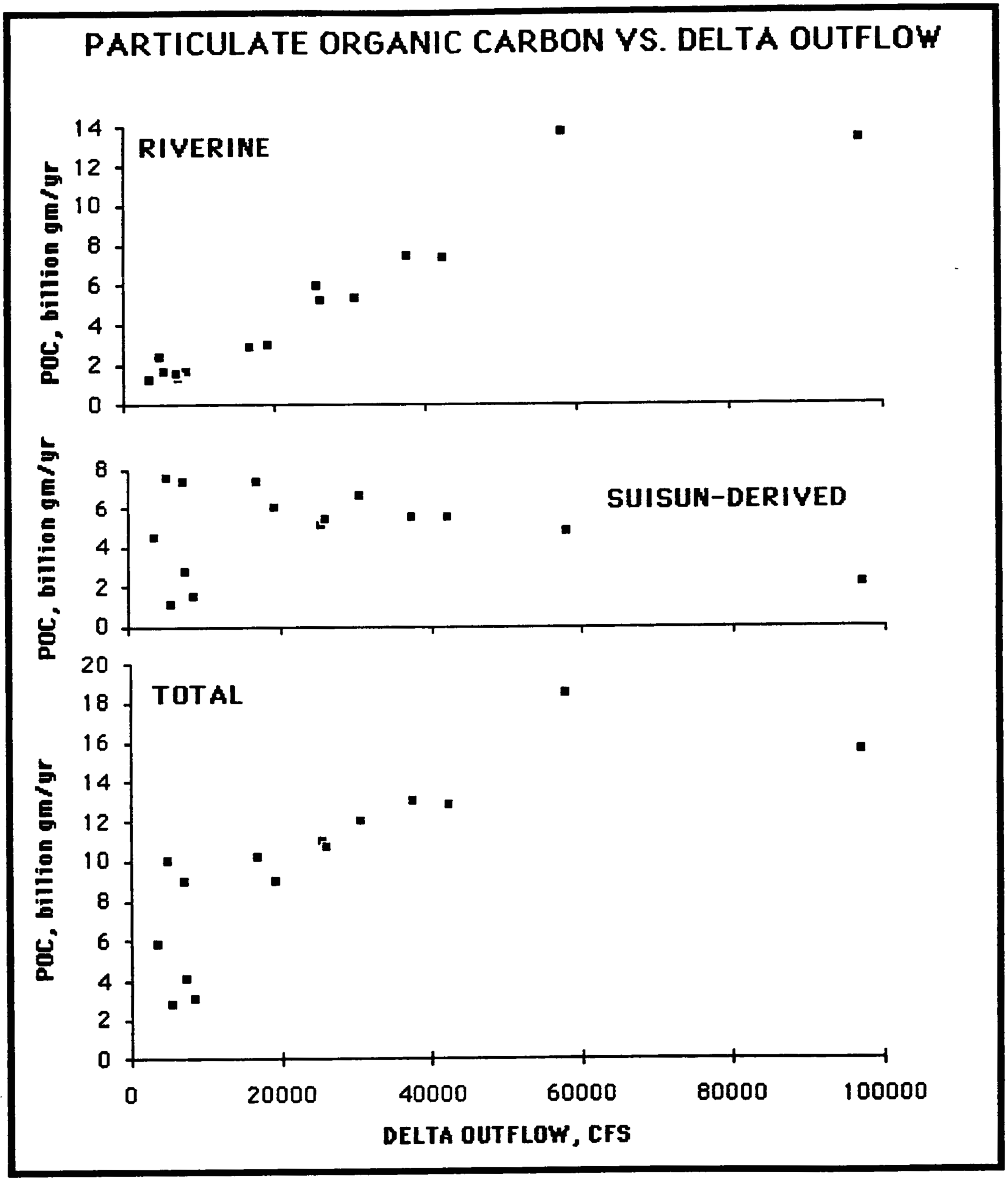

Figure 2. Relationship Between Particulate Organic Carbon ("POC") and Delta Outflow (Jassby et al., 1993)

agricultural fields where it picks up organic carbon. If the supply of upstream POC were to change, for example, due to changes in land use, farming practices, or wastewater treatment efficiency, the POC supply would shift independent of X2. The Suisun-derived component of POC, on the other hand, is inversely related to flow, suggesting that locating X2 at Roe Island would actually decrease the supply of locally derived POC.

In sum, the supposition that primary productivity, the base of the food web, is controlled by X2 is unfounded. Primary productivity in Suisun Bay, as represented by the POC time series, is primarily influenced by upstream factors, not X2. Locally derived POC declines as X2 moves downstream.

IV. **EVALUATION OF ABUNDANCE RELATIONSHIPS**

We evaluated the relationships between the abundance of selected indicators and X2 plus other factors to determine whether the proposed standards would improve the ecological health of the estuary. This work is exploratory and incomplete because much of the data had not been received by the report deadline, and the data that was received arrived late in the review process.

IV.A. The Relationship Between X2 And The Abundance Of Delta Smelt

In their recent Biological Assessment, DWR and USBR failed to identify a relationship between delta smelt abundance and any of the environmental variables considered.[11] Jassby and coworkers also failed to identify a relationship between delta smelt abundance and the location of X2 during the biologically critical period.[12] However, Herbold has reported a statistically significant relationship between the total delta smelt index and the number of days when X2 is in Suisun Bay (59-74 km) between February and June by fitting a straight line to the data ($r^2 = 0.25$, $p<0.005$).[13]

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[11] California Department of Water Resources and U.S. Bureau of Reclamation, Biological Assessment, Effects of the Central Valley Project and the State Water Project on Delta Smelt, October 1993, pp. 61-63.

[12] Alan D. Jassby, William J. Kimmerer, and others, Isohaline Position as a Habitat Indicator for Estuarine Populations, Accepted for Publication in Environmental Management, February 1994.

[13] Memorandum from Bruce Herbold, U.S. EPA, to Delta Smelt Workgroup Re: Relationship of Delta Smelt to EPA Estuarine Standard, November 14, 1993 and Bruce Herbold, Habitat

Sometimes, some observations used in a regression analysis are less reliable than others due to experimental error. This is the case here. The variance (s^2) in the delta smelt index is plotted against the average index in Figure 3 using data from Tab 2. This figure shows that the variance increases as the average index increases. When this occurs, the ordinary least squares estimation formula does not apply, and it is necessary to amend the procedures for fitting the data. Weighted least squares is normally used with the weights being inversely proportional to the variance.[14]

Herbold's analysis does not take into account the nonuniform variance in the data. We repeated his analysis using weighted least squares with weights inversely proportional to the variance. The variance associated with the total index is simply four times the variance of the average index, or

$$\overline{Y}=\frac{1}{4}(Y_1+Y_2+Y_3+Y_4)$$

$$Var(\overline{Y})=\frac{1}{16}Var(Y_1+Y_2+Y_3+Y_4)$$

$$Y_T=Y_1+Y_2+Y_3+Y_4$$

$$Var(\overline{Y})=\frac{1}{16}Var(Y_T)$$

$$s_T^2 = 16 s_{\overline{Y}}^2$$

$$s_{\overline{Y}} = \frac{s}{\sqrt{n}}$$

$$s_T^2 = 4s^2$$

Requirements of Delta Smelt, IESP Newsletter, Winter 1994, pp. 1-3.

[14] Norman Draper and Harry Smith, Applied Regression Analysis, 2nd Ed., John Wiley & Sons, 1981, pp. 108-115.

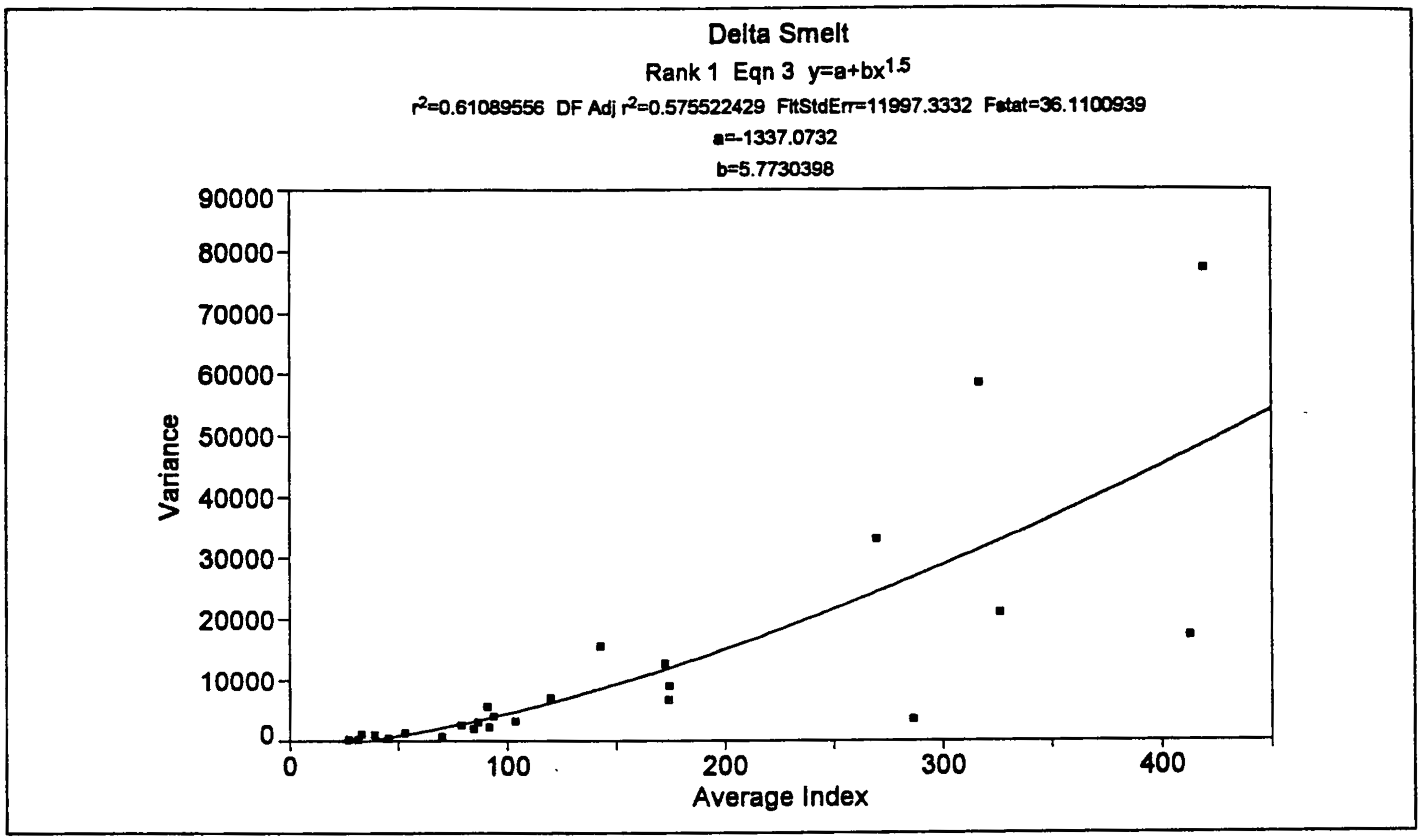

Figure 3. Relationship Between Variance and the Average Abundance Index for Delta Smelt

where:

$\overline{Y}$ = *monthly average index*
Y_T = *total index*
Y_i = *monthly abundance indices*
$s^2_{\overline{Y}}$ = *variance of average index* $\overline{Y}$
s^2_T = *variance of total index* Y_T.
s^2 = *variance of a single observation*
n = *number of observations=4*

We estimated the number of days that X2 was in Suisun Bay (59-74 km inclusive) using both the actual X2 series constructed from electrical conductivity data (actual) by Kimmerer and Monismith[15,16] and the autoregression equation with adjusted Delta outflow (predicted).[17] A straight line was fit to the total index and the number of days using ordinary least squares to check Herbold's results and using weighted least squares to correct for nonuniform variance. The data that we used in our analyses and the resulting fits are summarized in Tab 9.

Using ordinary least squares, the relationship is significant at the 0.05 level and accounts for 23 percent of the variability ($r^2 = 0.23$, $p<0.05$) when actual X2 is used and 29 percent when predicted X2 is used ($r^2 = 0.29$, $p<0.05$). These results are consistent with those reported by Herbold ($r^2 = 0.25$, $p<0.05$). However, using weighted least squares, the relationship is not statistically significant and accounts for only 2 percent of the variability when actual X2 is used and 13 percent when predicted X2 is used.

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[15] Wim Kimmerer and Stephen Monismith, An Estimate of the Historical Position of 2 ppt Salinity in the San Francisco Bay Estuary, In: Managing Freshwater Discharge to the San Francisco Bay/Sacramento-San Joaquin Delta Estuary: The Scientific Basis for an Estuarine Standard, 1993, Appendix A.

[16] An actual value was not available for 1967 and 1993. The 1967 value (11 days) was estimated using the Kimmerer and Monismith autoregression equation. The 1993 value was taken from Herbold (1994) (150 days).

[17] The autoregression equation was fit using adjusted Dayflow. Daily Dayflow was corrected by replacing gross Delta consumption with DWR-revised estimates of Delta consumption (Kimmerer and Monismith, 1993, p. A-6). We used the adjusted Dayflow to estimate predicted X2, except 1993 which was taken from Herbold (1994).

In sum, the relationship reported between delta smelt abundance and the number of days that X2 is in Suisun Bay from February to June is not statistically valid because it did not account for nonuniform variance. When variance is accounted for, the relationship is no longer statistically significant and X2 accounts for very little of the variability in the abundance of delta smelt.

IV.B. The Relationship Between X2 And The Abundance Of Striped Bass And Longfin Smelt

The San Francisco Estuary Project and subsequent analyses by Jassby and coworkers report statistically significant relationships between several habitat indicators and the position of X2 during the biologically critical period.[18] These relationships indicate that the location of X2 during the biologically critical period accounts for 72 percent of the variability in the abundance of striped bass and 79 percent of the variability in the abundance of longfin smelt,[19] suggesting than an X2 standard would benefit these two species. In this work, we address only the relationships for striped bass and longfin smelt because these indices were derived from the midwater trawl data set that we reviewed.

Our review and re-analysis of these relationships indicates that the location of X2 explains much less of the variability in abundance in the February to June compliance period than suggested by Jassby's analysis. There is substantial uncertainty in the predictions made from these relationships, suggesting that compliance with the proposed standards would not necessarily guarantee a substantial increase in the abundance of longfin smelt and striped bass. We speculate that the same is true for other species, but our analyses are incomplete at this writing.

We reviewed the data and statistical procedures used by Jassby and found a number of areas where changes are warranted as follows:

- CDFG corrected indices;
- X2 averaging period;
- omitted years;

[18] Jassby 1993, Figures 1-8 and Jassby et al., 1994, Figure 5.

[19] Jassby et al. 1994, Table 2.

- variance assumptions; and

- confidence intervals for prediction.

Abundance Indices. The data used in the Jassby analyses are included in Tab 10a. If these data are compared with the most recent CDFG abundance indices, which are included in Tab 1n, it is apparent that there are discrepancies. The discrepancies are due to an error in CDFG's computer program used to calculate abundance indices, which has subsequently been corrected. The abundance indices in Tab 1 are the correct indices. In our re-analysis of the abundance relationships, we used the corrected abundance indices (Tab 10b).

X2 Averaging Period. The Jassby relationships were determined for X2 averaged over the biologically critical period. For striped bass, this was July to November, and for longfin smelt, this was January to June. However, the proposed regulatory period over which the standard would be imposed is February to June. Therefore, to evaluate the efficacy of the proposed standard, we used the February to June compliance period.

Omitted Years. The year 1967 was omitted from Jassby's analyses for striped bass and longfin smelt. Although this is the year of highest abundance in the available record, it is not a statistical outlier. It apparently was omitted because a corresponding X2 location was not available. We used the autoregression equation[20] to estimate the February to June X2 location in 1967 using adjusted Dayflow as discussed in Section IV.A and included this year in our analyses.

The year 1983 also was omitted from the analysis for striped bass because "...a significant portion of the population may have been seaward of the sampling stations, causing an underestimate of the annual abundance."[21] However, examination of the 1983 longfin smelt catch data summarized by area in Tab 1e indicates that the catch distribution in 1983 was quite similar to that in 1982 and other years. If a significant portion had been seaward, one would expect to see abundance increasing in the seaward direction, with the highest catch in San Pablo Bay. The data do not support this theory. Therefore, we believe there is no biological justification for omitting 1983 and included it in our analyses.

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[20] Kimmerer and Monismith, 1993, p. A-6.

[21] Jassby 1993, p. B-3.

Variance Assumptions. Jassby used generalized linear models to fit relationships to the abundance-X2 data sets. Generalized linear models are an extension of ordinary least squares regression that use an iterative weighted least squares regression procedure to fit data with nonuniform variance.[22] In his analyses, Jassby assumed that the variance (s^2) was proportional to mean abundance.

We determined the actual relationship between variance and average abundance by calculating the average index and the standard deviation from the four monthly estimates (Section I.B.1). The resulting data, plotted in Tab 10c, indicate that the standard deviation (s) is proportional to average abundance and that the variance (s^2) is roughly proportional to the average index squared. Because the assumed variance is used as weights in GLM, large abundances, which have the largest variance, are weighted less in the regression, which tends to reduce the slope of the fitted relationships. In our work, we analyzed two variance scenarios: (1) actual variance calculated from the four monthly values and (2) variance proportional to the average index squared.

Confidence Intervals. Jassby's work did not include any estimate of the error associated with predictions made from the resulting relationships. Because Jassby's relationships are used as evidence that the proposed standards would increase the abundance of biological resources, it is important to quantify the uncertainty associated with such a prediction. In our work, we have reported the fit +/- the standard error of prediction and the 95 percent confidence intervals estimated as +/- two standard deviations.

Results. We repeated Jassby's analyses using the same procedures and the same models[23] for the relationship of abundance and X2, except we addressed the five issues discussed above. We refit models to the corrected data using generalized linear models and natural spline curves in S-Plus for four cases for striped bass and longfin smelt: (1) average index with variance proportional to square of the average index; (2) average index with variance proportional to the square of the standard deviation; (3) total index with variance proportional to square of the total index; and (4) total index with variance proportional to 4 times the standard deviation squared (Section

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[22] P. McCullagh and J.A. Nelder, Generalized Linear Models, Chapman & Hall, 2nd Ed., 1989.

[23] Jassby fit striped bass and longfin smelt using the log link function and cubic splines with 1 interior knot (Jassby et al. 1994, Table 2).

IV.A). The data used in our analyses is included in Tab 10b and commands used to perform the analyses, plots of the resulting fits, and summary statistics for these four cases are included in Tab 10d.

The results for the average index with variance proportional to the square of the mean are summarized in Figure 4. The results for the total and average indices are comparable, except for a factor of four scaler, because the same variance structure was used in both analyses. The best fits were obtained for variance proportional to the square of the mean. The longfin smelt regression did not converge when actual variance was used. The striped bass model fit using actual variances underestimated abundance in the 60 to 75 km region where compliance points are located.

The results indicate that when corrected abundance data are used, all years are included in the regression, the February to June compliance period is used, and variance is assumed proportional to the average index squared, X2 accounts for only 50 percent of the variability in striped bass abundance and 27 of the variability in longfin smelt abundance. This suggests that other factors may affect the abundance. This is consistent with Jassby's work, who stated that "[m]odels based on X2 alone may lead to misleading management conclusions if additional variables not highly correlated with X2 have large enough effects" and concluded that "...X2 or net Delta outflow is not the only variable affecting estuarine resources....other environmental forces may exert some influence. In some cases, the unexplained variability is high, and predictions based on X2 alone would be uncertain."[24]

Further, the anticipated increase in abundance as X2 is moved downstream would be smaller than Jassby's relationships suggest. For striped bass, for example, instead of a total index of about 11,000 when X2 is at Roe Island (64 km), the total index would be about 6,000. The difference is even greater when the average index is used instead of the total index.

Finally, the 95 percent confidence intervals are large downstream of Chipps Island and generally increase as X2 moves downstream. Thus, for any given location of X2, the uncertainty in the actual number of fish that may result is large. Further, because the standard error of prediction is large, the actual number of fish that would be produced for any location of X2 in any given year would vary over a wide range but over the long term should approximate the fitted line. Thus, substantial uncertainty is associated with using the fitted relationships to set management goals or to predict the likely result of the

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[24] Jassby et al. 1994.

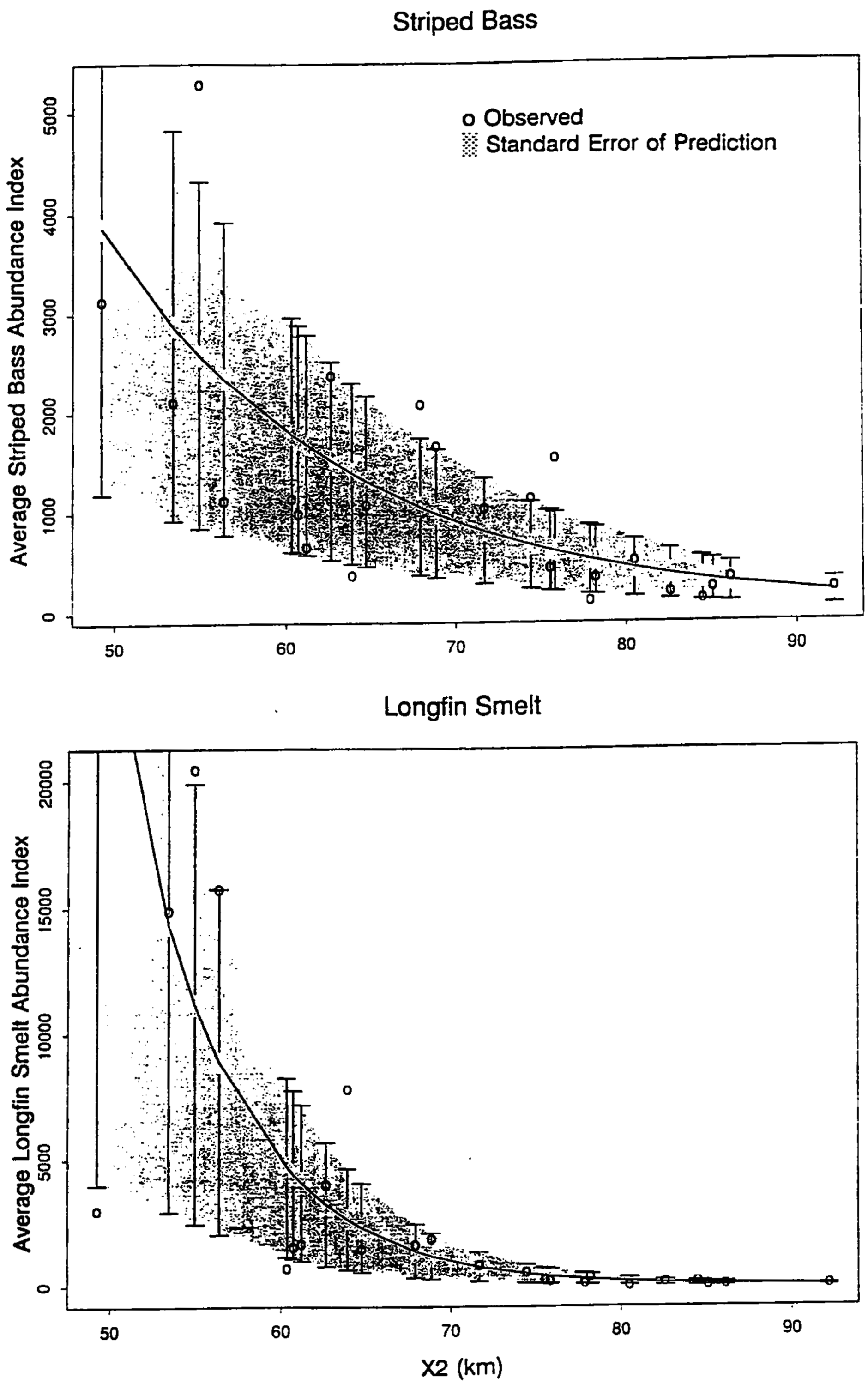

Figure 4. Generalized Linear Model Fit With Variance Proportional To Square Of The Mean

proposed standard. Jassby also noted that "statistical models with fairly low residual variance may nevertheless have high uncertainty for setting management goals."[25]

In sum, there is a relationship between abundance and X2. However, it does not account for the majority of the variability in abundance of striped bass and longfin smelt, suggesting that other factors are important. Uncertainties in the abundance-X2 relationships suggest that compliance with an X2 standard may not substantially increase the abundance of striped bass and longfin smelt.

IV.C. The Relationship Between X2 And The Abundance Of Other Organisms

We also determined the relationship between the abundance of 12 additional fish and the location of X2 during the February to June compliance period using abundance indices calculated from the midwater trawl data set. Among the 12 species that were selected, seven are anadromous or euryhaline (american shad, chinook salmon, splittail, threadfin shad, white sturgeon, delta smelt, inland silversides) and may reasonably be anticipated to respond to freshwater, and hence X2. The remaining five species are marine and would not necessarily respond to X2 (jacksmelt, northern anchovy, Pacific herring, topsmelt, white croaker). The abundance indices for these 12 additional fish are summarized in Tab 11a. CDFG indices were used for american shad (Tab 1n). Scatter plots showing the relationship between the abundance indices for each fish and the location of X2 are included in Tab 11b.

We used TableCurve[26] and weighted least squares using weights inversely proportional to the variance to fit equations to the average abundance data and actual X2. We selected the equation with the highest F statistic that made biological sense and required that the model and fitted coefficients be individually statistically significant at the 0.05 level and residuals consistent with model assumptions. Splittail and delta smelt were fit with generalized linear models using the log link function, cubic splines with one interior knot, and variance proportional to mean abundance squared. The statistics for the weighted least squares fits are included in Tab 11c and the GLM fits in Tab 11d.

The results, which are summarized and compared with Jassby's eight indicators in Table 3, indicate that X2 is generally a poor

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[25] Jassby et al. 1994.

[26] Jandel Scientific, TableCurve™, Curve Fitting Software, 1993.

Table 3. Summary Statistics for the Relationship Between Abundance Indices and the Location of X2 During the February to June Period

INDICATOR	r^2	SLOPE[1]
Jassby et al. 1994		
Bay Shrimp	0.86	
Longfin Smelt	0.79	
Opossum Shrimp	0.62	
POC	0.72	
Starry Flounder	0.58	
Striped Bass Survival	0.35	
Striped Bass MWT	0.72	
Others		
American Shad	0.36	
Chinook Salmon	0.36	
Delta Smelt	NM[2]	
Inland Silversides	0.16	—
Jacksmelt	0.17	
Northern Anchovy	0.43	
Pacific Herring	0.27	
Splittail	0.61	
Threadfin Shad	NM	—
Topsmelt	NM	—
White Croaker	NM	
White Sturgeon	NM	

[1] A minus sign (—) indicates that abundance decreases as X2 moves downstream. Otherwise, the reverse is true.

[2] All fitted models and coefficients are individually statistically significant at the 0.05 level. NM indicates that a well-behaved model could not be fit to the data.

predictor of abundance for 12 additional fish except splittail. The GLM model fit to splittail suggests that X2 accounts for 61 percent of the variability in abundance. However, the abundance indices on which the model is based may not be a good population indicator because splittail are rarely caught in the midwater trawl survey. Between 1967 and 1992, only 494 splittail were caught in the midwater trawl, and the maximum catch in any single year (1983) was 69. Further, length-frequency data indicate that they are all juveniles.

The models for other species account for only 16 to 43 percent of the variability. Statistically significant models with coefficients individually different from zero could not be fit for five species (topsmelt, threadfin shad, white croaker, white sturgeon, and delta smelt). Jassby also was unable to fit a statistically significant model to the delta smelt data.[27] These results suggest that for 11 of the 12 species that we tested, factors other than X2 account for the majority of the variability in abundance.

Table 3 also indicates that for three of the species, abundance decreases as X2 moves downstream (inland silversides, threadfin shad, and topsmelt) (also see scatter plots in Tab 11b). This suggests that an X2 standard may adversely affect the abundance of these three species. For the remaining nine fish, abundance generally increases as X2 moves downstream, suggesting that the proposed standard may enhance their abundance. This is generally consistent with the ecological risk assessment,[28] with four exceptions.

First, the ecological risk assessment indicates that two estuarine species, inland silversides and threadfin shad, would benefit from an X2 standard. While the models fit here suggest that these two species would be adversely impacted, correlation does not prove causation. According to the midwater trawl data, both of these species are predominately caught in the Delta (Tabs 1c, 1j). Both of these species live in the Delta and upstream areas, and the majority of the population may be upstream of the midwater trawl sampling network. Therefore, it is likely that the indices calculated from the midwater trawl are poor indicators of abundance. Alternatively, some factor within the Delta that is inversely related to X2, such as exports, may affect the abundance of these species rather than X2.

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[27] Jassby et al. 1994.

[28] Dudley W. Reiser, Evaluation of Potential Effects of the Proposed EPA Salinity Standard on the Biological Resources of the San Francisco Bay/Sacramento-San Joaquin Estuary, 1994, Reference #5.

Second, the ecological risk assessment indicates that two marine species, jacksmelt and Pacific herring, would be adversely impacted while this work suggests that these species would benefit very slightly (e.g., the slope of the fitted line is very small). These two species are predominantly caught in San Pablo Bay in the midwater trawl (Tabs 1d, 1g), and the majority of the population is probably downstream of the midwater trawl sampling network. Therefore, it is likely that the abundance indices calculated from the midwater trawl are poor indicators of abundance and that the ecological risk assessment provides a more realistic indication of population response to X2.

IV.D. The Presence Of An X2 Discontinuity

The proposed X2 standard assumes a continuous functional relationship between the location of X2 and abundance indices. However, visual inspection of the scatter plots of abundance versus X2 (Tab 12a) reveals abrupt changes in both mean abundance and variability in abundance between 68 and 80 km, roughly from the middle of Honker Bay to the confluence of the rivers. Downstream of this area, average abundance is high and variability is large, while upstream, average abundance is low and variability is small. It appears that when X2 is downstream of the discontinuity, an opportunity is created for high abundance. Other factors, such as wind, tides and water quality, may control abundance downstream of this point.

We explored the existence of a discontinuity in this region using a number of exploratory techniques including nonparametric statistical tests, regression analysis, and cluster analysis.

Nonparametric Statistical Tests. We used nonparametric statistics, which are distribution free, to explore the existence of a discontinuity in the abundance data. We used a two-sided Mann-Whitney U test[29] to locate the discontinuity. This is the nonparametric equivalent to the Student's t test and is used to determine if the means of two populations are the same. First, we located the X2 discontinuity by visual inspection to be the point where there was a noticeable change in mean abundance. We then used the U test to determine whether there was a statistically significant difference in mean abundance upstream and downstream of this point. We repeated this test for at least 6 km upstream and downstream of the starting point at 1 to 2 km intervals. The discontinuity was selected from the resulting determinations to maximize the probability that the upstream and downstream mean abundances were significantly different.

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[29] E.L. Lehmann and H.J.M. D'Abrera, Nonparametrics. Statistical Methods Based on Ranks, Holden-Day, Inc., Oakland, CA, 1975, pp. 204-209.

A variation on this procedure was used for delta smelt because the mean abundances upstream and downstream of X2 at 67 to 81 km were statistically equal. For delta smelt, we located the discontinuity by maximizing the probability that the variance (discussed below) in abundance upstream and downstream of the discontinuity were significantly different. The results of this analysis are shown in Figure 5.

We also tested whether the variability in abundance upstream and downstream of the X2 discontinuity as identified above was significantly different. The quantity

$$|Y_i - \bar{Y}|$$

where

Y_i = *annual abundance index for years i*
$\bar{Y}$ = *average abundance index*

was tested using the two-sided Mann-Whitney U test.[30] This test is the equivalent of the parametric F-test.

The results of the Mann-Whitney tests are summarized in Table 4. They indicate that there is a statistically significant difference ($p<0.05$) in mean abundance of eight indicators and in the variability of five of the indicators when X2 is downstream of discontinuities between 71 and 80 km compared to upstream.

The differences in abundance upstream and downstream of the discontinuities as determined above are graphically summarized in Figure 6 in box and whisker plots. The elements of a box and whisker plot are as follows:

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[30] H. Levene, Robust Tests for Equality of Variances, In: I. Olkin and others (Eds.), Contributions to Probability and Statistics. Essays in Honor of Harold Hotelling, Stanford, 1960, pp. 278-292; M.B. Brown and A.B. Forsythe, Robust Tests for the Equality of Variances, Journal of the American Statistical Association, v. 69, no. 346, pp. 364-367; L. Sachs, Applied Statistics. A Handbook of Techniques, 2nd Ed., Springer-Verlag, 1984, pp. 261-262.

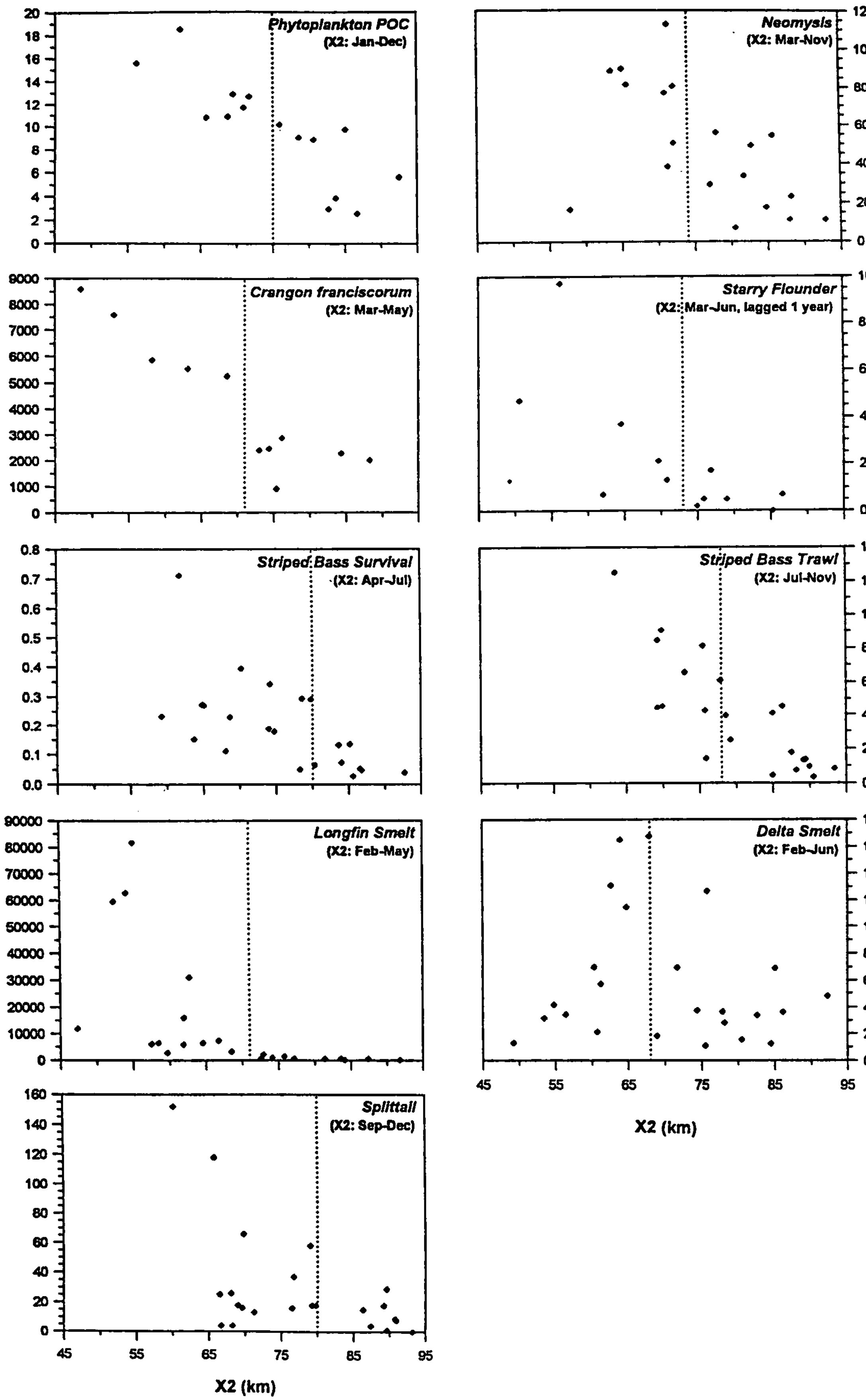


Figure 5. Scatter Plots Of Abundance Versus X2 Showing Location Of Discontinuity In km (---)

Table 4. The Statistical Significance of the Mean and Variability Upstream and Downstream of the X2 Discontinuity

Indicator	Location of X2 Discontinuity (km)	Mann-Whitney U Test Probability	
		Mean[1]	Variability[2]
Bay Shrimp	71	0.0062*	0.045*
Delta Smelt	68	0.11	0.0050*
Longfin Smelt	71	< 0.001*	< 0.001*
Opossum Shrimp	74	0.0070*	0.37
Particulate Organic Carbon	75	0.0012*	0.16
Splittail	80	0.021*	< 0.001*
Striped Bass Midwater Trawl	78	< 0.001*	0.11
Striped Bass Survival	80	0.0022*	0.048*
Starry Flounder	73	0.013*	0.076

[1] The asterisk (*) indicates that the means of abundance upstream and downstream of the X2 discontinuity are not equal at the 0.05 level in a two-sided Mann-Whitney U test.

[2] The asterisk (*) indicates that the variability in abundance expressed as $|y_i - \bar{y}|$ upstream and downstream of the X2 discontinuity are not equal at the 0.05 level in a two-sided Mann-Whitney U test.

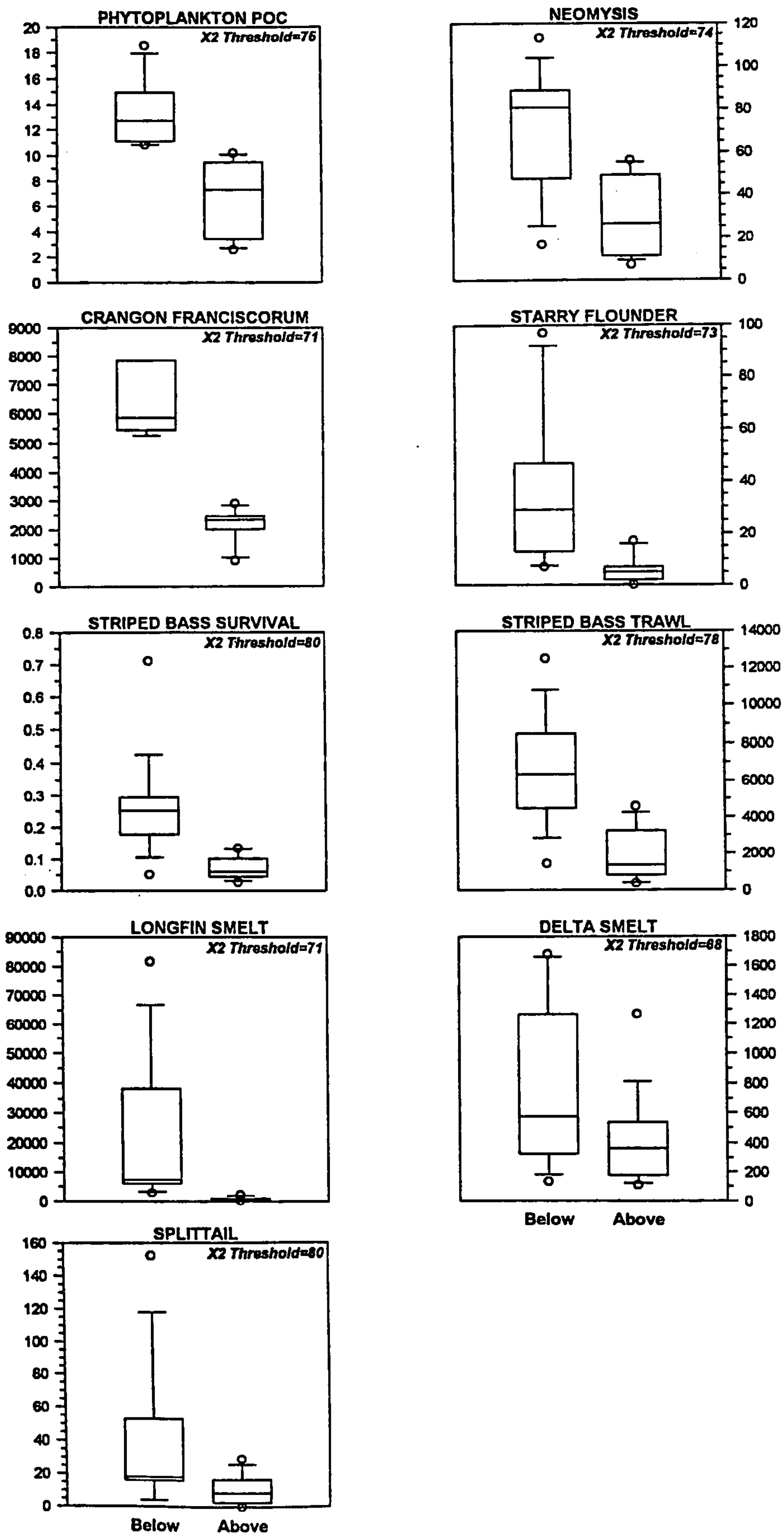
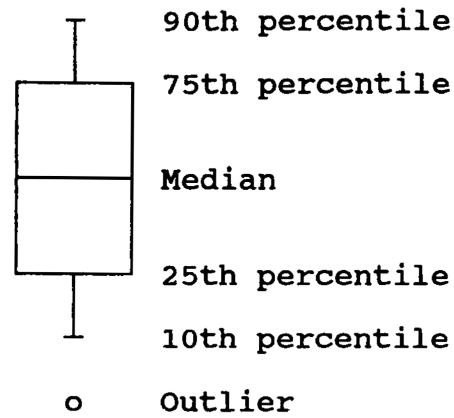


Figure 6. Box And Wisker Plots Of Abundance Above And Below The X2 Discontinuities Shown In Figure 5.



These box and whisker plots illustrate the significant differences in abundance (reflected by the height of the box and the position of the median line) and its variability (reflected by the length of the whiskers and location of outliers).

Regression Analysis. Inspection of the data on either side of the discontinuities shown in Figure 5 suggests that the functional relationship between abundance and X2 shifts across the discontinuity. We tested this by fitting a straight line to the data on each side (Tab 12b) and using a t test to determine whether the slopes of the regression line upstream of the discontinuity are significantly different from the slopes downstream, or

$$t = \frac{b_1 - b_2}{s_{b_1 - b_2}}$$

$$s_{b_1 - b_2} = \sqrt{s_{b_1}^2 + s_{b_1}^2}$$

where s_{b1-b2} is the standard error of the difference of two regression slopes b_1 and b_2. The resulting value of t is compared with the critical value of t corresponding to $\gamma = n_1 + n_2 - 4$ degrees of freedom.[31]

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[31] Stanton A. Glantz and Bryan K. Slinker, Primer of Applied Regression and Analysis of Variance, McGraw-Hill, Inc., 1990, pp. 27-28.

The results are shown in Table 5. Most of the regressions are not statistically significant and account for less of the variability in the data than a continuous function. Further, there was no statistically significant difference in the slopes of the fitted lines upstream and downstream of the discontinuity with the exception of bay shrimp. For bay shrimp, there is a statistically significant difference at the 0.05 level between the fitted slopes upstream and downstream of a discontinuity at 71 km. Further, X2 accounts for 89 percent of the variability in bay shrimp abundance when X2 is downstream of the discontinuity, but is apparently unrelated when it is upstream. Other functional relationships, besides a straight line, were also fit to upstream and downstream data sets with little success.

These results suggest that the continuous functions previously fit to the data[32] are more appropriate than discontinuous functions, with the exception of bay shrimp. Although there are not enough data to statistically prove that there is a discontinuity in the vicinity of Chipps Island, the data are not inconsistent with this theory, particularly the substantial shift in variability.

Cluster Analysis. We further explored the existence of a discontinuity by testing the data sets to determine if statistically significant clusters could be found. We used the k-means algorithm[33] to divide the data sets into clusters. k-means clustering splits a data set into a selected number of groups k by maximizing between-relative to within-cluster variation. It is similar to a one-way analysis of variance where the group members are unknown and the largest F-value is sought by reassigning members to each group. k-means is iterative and begins by picking "seed" data points, one for each group, which are spread apart from the center of all data points as much as possible. It then assigns data points to the nearest seed. Next, it attempts to reassign each data point to a different cluster to reduce the within-groups sum of squares. This process continues until the within-groups sum of squares can no longer be reduced.

First, the abundance of longfin smelt, splittail, and starry flounder were logged. Then, the data were standardized to make overall level and variation comparable by subtracting the means and dividing by standard deviations. The resulting data were

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[32] Jassby 1993 and Jassby et al. 1994.

[33] J.A. Hartigan, Clustering Algorithms, John Wiley & Sons, Inc., New York, 1975; J.A. Hartigan and M.A. Wong, Algorithm AS 136. A K-Means Algorithm, Applied Statistics, v. 28, 1979, pp. 100-108.

Table 5. Linear Regression of Abundance on X2 Upstream and Downstream from the X2 Discontinuity Location

	DOWNSTREAM GROUP			UPSTREAM GROUP		
Indicator	X2 Slope (no./km)	r^2	Regression Significance (probability)	X2 Slope (no./km)	r^2	Regression Significance (probability)
Bay Shrimp	-172*	0.89	0.015	-6.4	< 0.01	0.91
Delta Smelt	-86	0.03	< 0.01	-2.2	0.22	0.88
Longfin Smelt	-2,220*	0.24	0.086	-67*	0.51	0.02
Opossum Shrimp	2.0	0.11	0.38	-1.6	0.17	0.23
Particulate Organic Carbon	-0.33	0.42	0.12	-0.32	0.27	0.18
Splittail	-3.3	0.20	0.094	-1.5	0.10	0.45
Striped Bass Midwater Trawl	-446*	0.39	0.054	-209*	0.38	0.034
Striped Bass Survival	-0.0069	0.08	0.31	-0.0044	0.15	0.34
Starry Flounder	-2.6	0.38	0.19	-0.28	0.05	0.66

* An asterisk (*) in the slope column indicates that the fitted slope is significant at the 0.10 level.

then clustered on abundance and X2 simultaneously using k-means for k equal to 2, 3, and 4 (i.e., for two, three, and four groups). We were able to fit statistically significant (F-ratio: $p < 0.05$) two, three, and four clusters to all data sets except two clusters for opossum shrimp and striped bass survival.

Figure 7 summarizes the smallest number of clusters that is statistically significant for each indicator. Clusters of one point (opossum shrimp, striped bass survival) are outliers and should be ignored as they have no biological significance. This figure shows that there are at least two clusters for each indicator -- one in the lower right-hand corner which is characterized by typically low abundance and variability and one in the middle to upper left-hand corner characterized by high abundance and variability. Delta smelt is the exception.

Summary. These analyses suggest that there is a discontinuity in the data in the vicinity of Chipps Island. However, this theory cannot be proven statistically because there are too few data points. The evidence for a noncontinuous relationship is particularly compelling for bay shrimp, which appear to do well only when X2 is downstream of Chipps Island.

IV.E. Time Trends In The Total, Average, And Median Indices

It has been claimed that there has been a large decline in the abundance of many estuarine species, including delta smelt, longfin smelt, splittail, and striped bass. We tested the change over time or the time trend in the total, average, and median abundance indices for these species to determine if there had been a statistically significant decline since 1967. The trend was estimated for the period 1967 - 1992, except delta smelt, which was estimated for the period 1967 - 1993. The data are included in Tab 13a and the regression statistics in Tabs 13b to 13d. The results are summarized in Table 6.

We tested the time trend in the unweighted total indices, which have been widely relied on in assessing the health of the estuary, by fitting a straight line to the data using least squares regression. The results for the total indices suggest that there has been a statistically significant decline in delta smelt ($p=0.04$), longfin smelt ($p=0.04$), and striped bass ($p<0.01$) since 1967 and no significant trend in splittail ($p>0.9$). However, as discussed below, consideration of the average and median indices suggest that the longfin smelt decline is not statistically different from zero and that there has been a significant increase in splittail.

We also tested the time trend in the average index by fitting a straight line to the data using weighted least squares regression with weights inversely proportional to variance. This accounts for the large experimental error associated with the

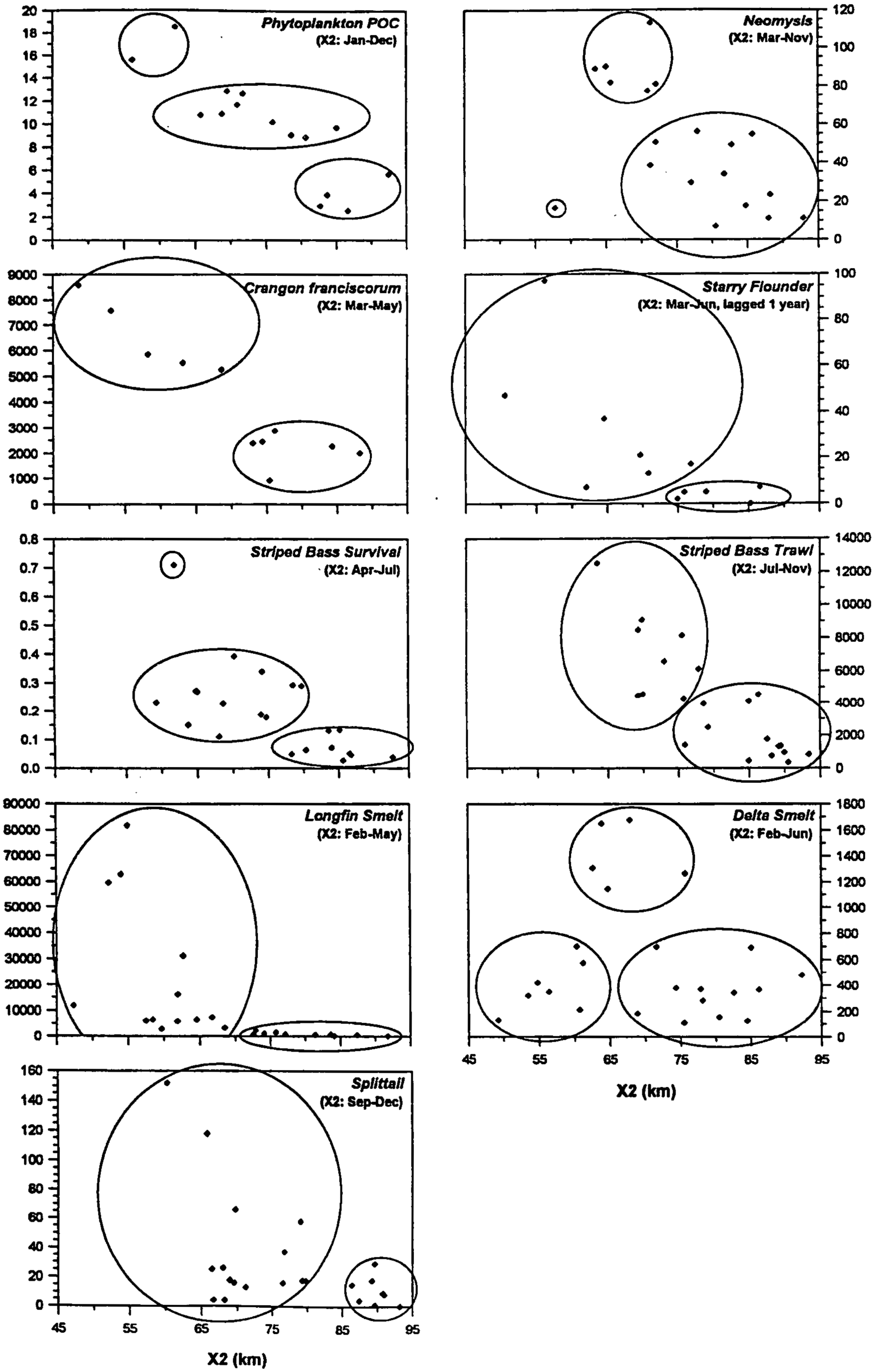

Figure 7. The Minimum Number Of Statistically Significant Groups Determined By k-Means Clustering

Table 6. Summary of Time Trend Analyses for 1967-1992[1]

	Total Index		Average Index		Median Index	
	Slope	p	Slope	p	Slope	p
Delta Smelt	-24	0.04*	-5	< 0.01*	-6	0.04*
Longfin Smelt	-1192	0.04*	-4	0.13	-175	0.09
Splittail	+0.006	> 0.9	+0.04	0.04*	+0.05	0.8
Striped Bass	-345	< 0.01*	-10	< 0.01*	-66	< 0.01*

[1] The delta smelt trend was estimated for the period 1967-1993.

* An asterisk indicates that when a straight line is fit to the data, the overall regression is significant at the 0.05 level.

indices, providing the most accurate estimate of actual trends in the data among the three estimates of abundance. The results indicate that splittail abundance has increased since 1967 ($p=0.04$), that the decline in longfin smelt is not statistically significant ($p=0.13$), and that the decline in delta smelt and striped bass are statistically significant ($p<0.01$).

Unweighted, ordinary least squares regression was used to fit a straight line to the median index time series data. The results indicate that there has been no statistically significant change in the abundance of splittail ($p=0.8$) and longfin smelt ($p=0.09$) and that the decline in delta smelt ($p=0.01$) and striped bass ($p<0.01$) are statistically significant.

The slopes of the fitted lines indicate that the unweighted total index overstates the magnitude of the decline in delta smelt, longfin smelt, and striped bass. For example, for longfin smelt, the total index suggests that abundance has declined at the rate of 1,192 index units per year while the weighted average index indicates that the decline is only 4 units per year and the median index estimates the decline at 175 units per year.

We also inspected time series plots of the indices for each of the 17 subareas in the midwater trawl for delta smelt, longfin smelt, and striped bass to determine whether the declines were local or occurred throughout the survey area. These plots, included in Tab 13e, indicate that longfin smelt declined throughout the survey area and were rarely caught after 1987. Delta smelt primarily declined in Suisun Bay (subareas 12,13,14) and in the central Delta (subarea 17) and appear to have increased along the Sacramento River, suggesting a change in distribution. Striped bass declined everywhere except along the Sacramento River (subarea 15), where the population appears to have been stable. Splittail trends by subarea were not inspected because so few fish have been caught in the midwater trawl.

In sum, there has been a statistically significant decline in the abundance of delta smelt and striped bass since 1967. The declines are widespread, but the delta smelt decline may be due in part to a shift in distribution of the population outside of the survey area. However, the declines are less severe than suggested by the total index that has been used to assess the population. The reported decline in longfin smelt is not statistically different from zero and splittail abundance has increased since 1967.

IV.F. Evaluation Of The Effect Of Compliance Point On Abundance

The Chipps (64 km) and Roe (74 km) Island compliance points were evaluated to determine if there was any biological benefit in locating X2 at Roe as compared to Chipps. We determined the number of days that X2 was downstream of Roe Island and Chipps Island and regressed them against abundance indices for nine indicator organisms. The actual X2 series, calculated directly from electrical conductivity, was used rather than X2 estimated from the autoregression model.[34] Weighted least squares using weights inversely proportional to the variance was used to fit a straight line for longfin smelt, striped bass, delta smelt and splittail, and ordinary least squares was used to fit a straight line for the remaining indicators. The data are included in Tab 14a and statistics for the resulting fits in Tabs 14b and 14c.

The slope and squared correlation coefficients (r^2) for each fitted line are summarized in Table 7. The number of days that X2 is at or below Chipps Island explains slightly more of the variability in the abundance of opossum shrimp, POC, splittail and striped bass survival, and slightly less for the other indicators than at or below Roe Island. However, the differences in r^2 are not large for any indicator except longfin smelt. For longfin smelt, the number of days that X2 is at or below Roe Island explains 56 percent of the variability in abundance while the number of days that X2 is at or below Chipps Island only explains 11 percent of the variability.

The slopes of the fitted lines, which measure the number of abundance units per number of days that X2 is downstream of the compliance points ("AU/days"), is a measure of the biological benefit of locating X2 at each point. The larger the slope, the greater the abundance as X2 is moved downstream. The slopes at or below Roe Island are larger than the slopes at or below Chipps Island for all indicators except splittail, suggesting a small benefit for eight of the nine indicators. However, the differences are small and are not statistically significant (i.e., not significantly different from zero) for any indicator except longfin smelt.

The longfin smelt slope for Roe Island (12 AU/day) is significantly larger than the slope for Chipps Island (2.1 AU/day) at the 5 percent level, suggesting that this species would benefit from a Roe Island compliance point. However, there is no statistically significant difference between the slopes for the other eight indicators, indicating that there is no significant benefit in locating X2 at or downstream of Roe compared to at or downstream of Chipps.

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[34] Kimmerer and Monismith 1993, p. A-6.

Table 7. Comparison of Biological Benefit of Locating X2 at or Below Roe Island and Chipps Island

	NUMBER OF DAYS X2 IS LOCATED			
	at or below Roe Island < / = 64 km		at or below Chipps Island < / = 74 km	
INDICATOR	Slope[1]	r^2	Slope	r^2
Bay Shrimp	48	0.94*	38	0.76*
Delta Smelt	0.37	0.13	0.27	0.08
Longfin Smelt	12	0.56*	2.1	0.11
Opossum shrimp	0.33	0.27*	0.35	0.39*
POC	0.065	0.56*	0.061	0.63*
Splittail	0.012	0.13	0.013	0.23*
Striped Bass MWT	7.1	0.40*	3.8	0.31*
Striped Bass Survival	0.0019	0.35*	0.0017	0.39*
Starry Flounder	0.34	0.37*	0.26	0.28

[1] AU/days = number of abundance units per number of days that X2 is downstream of the compliance point.

* An asterisk indicates that when a straight line is fit to the data, the overall regression is significant at the 0.05 level.

These results generally do not agree with the ecological risk assessment,[35] which indicates that juvenile and adult life stages[36] of splittail would benefit more than those of longfin smelt and striped bass and that bay shrimp and starry flounder would be adversely impacted by a Roe Island compliance point compared to one at Chipps. These result suggest that longfin smelt is the only indicator that would significantly benefit from a Roe Island compliance point among the nine tested. However, the risk assessment is based on habitat determined from salinity tolerances alone. Other factors, such as currents, substrate and food supply, are important in defining suitable habitat. Further, an increase in habitat would not necessarily result in an increase in abundance.

IV.G. Evaluation Of The Effect Of Entrainment Losses On Biological Indicators

Entrainment of fish in the State Water Project ("SWP") and Central Valley Project ("CVP") pumps and in the cooling-water system of local power plants have been widely advanced as potential causes for the decline in abundance of the Bay-Delta fishery.

IV.G.1. Salvage Loss At The SWP And CVP Pumps

Daily fish salvage data were obtained from CDFG for the period 1979 to 1991 and used to estimate total salvage by year for delta smelt, longfin smelt, splittail, starry flounder, and striped bass. Total abundance indices for all subareas and for the Delta subareas (15-17) (Tab 1) were individually regressed against annual salvage the same year and one year later to determine if entrainment at the pumps effects abundance of these species.

TableCurve was used to fit simple and polynomial equations to the data. We selected the equation with the highest F statistic that made biological sense and required that the model and fitted coefficients be individually statistically significant at the 0.05 level and residuals consistent with model assumptions. When these conditions were not met, the equation with the highest F statistic and no more than three fitted coefficients that made sense (e.g., abundance uniformly increased or decreased with salvage loss) was selected. The resulting r^2 and F statistic were used to screen the data. In most cases, a

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[35] Reiser, 1994, Reference 5.

[36] Because the indices calculated from the various Bay monitoring programs are based on juvenile and adult life stages, we use these in our comparison.

model with fitted constants individually significantly different from zero and residuals consistent with model assumptions could not be fit to the data.

The salvage loss data are included in Tab 15a, unlagged regressions in Tab 15b, and lagged regressions in Tab 15c. The results of these analyses are summarized in Table 8 in terms of r^2 and the F-statistic, which is a measure of the significance of the resulting fit. Shading indicates that the regression is statistically significant at the 5 percent level. An asterisk indicates that abundance increases as salvage loss increases and no asterisk the reverse.

Table 8 indicates that the highest r^2s were found for the total index for salvage and abundance measured in the same year, except starry flounder where a 1 year lag gave the best fit. For these conditions, salvage loss accounts for 70 percent of the variability in longfin smelt abundance, 73 percent of the variability in starry flounder abundance, and 69 percent of the variability in striped bass abundance, roughly comparable to the amount of variability in abundance that is explained by the location of X2. The regression equations for these species are significant at the 5 percent level and indicate that abundance declines as salvage loss increases, suggesting that the pumps have adversely affected the populations of these fish. However, in most cases, a single point dominates, casting the relationships in doubt. For example, for striped bass, when 1983 is eliminated from the regression, the resulting relationships account for much less of the variability.

Within the Delta (subareas 15-17), longfin smelt abundance is not significantly correlated with salvage loss, probably because longfin smelt are rarely caught there in the midwater trawl. Striped bass abundance, on the other hand, is significantly correlated with salvage loss within the Delta and its abundance increases with salvage loss, probably because significant numbers are present in this area and are entrained by the pumps. This increasing within-Delta trend for striped bass appears to be largely controlled by 1986, which was a wet year.

Salvage loss accounts for very little (3-11%) of the variability in the abundance of delta smelt when regressed on same year and previous year's salvage loss, suggesting that the pumps are not an important factor in the decline of delta smelt. Splittail abundance, on the other hand, increases with increasing salvage loss when regressed on same year and previous year's salvage loss everywhere except in subarea 16, suggesting that splittail are abundant in the Delta and are entrained by the pumps.

Table 8. The Relationship Between Abundance and Salvage

INDICATOR	SALVAGE SAME YEAR							
	Total Index		Subarea 15 Index		Subarea 16 Index		Subarea 17 Index	
	r^2	F	r^2	F	r^2	F	r^2	F
Delta Smelt	0.08*	0.89	0.05	0.52	0.03*	0.27	0.08*	0.91
Longfin Smelt	0.70	23.7	0.04*	0.37	0.06	0.57	0.19	2.34
Splittail	0.33*	4.95	0.51*	10.25	0.11	1.20	0.45*	8.26
Starry Flounder	0.28	1.74	N/A	N/A	N/A	N/A	N/A	N/A
Striped Bass	0.69	21.81	0.67*	20.60	0.72*	11.53	0.07*	0.80

INDICATOR	SALVAGED LAGGED 1 YEAR							
	Total Index		Subarea 15 Index		Subarea 16 Index		Subarea 17 Index	
	r^2	F	r^2	F	r^2	F	r^2	F
Delta Smelt	0.04*	0.38	0.11	1.24	0.03*	0.29	N/A	N/A
Longfin Smelt	0.14	1.57	0.15	1.78	0.51	4.71	0.42	3.29
Splittail	0.15*	1.82	0.27*	3.63	0.54*	11.63	0.45*	8.26
Starry Flounder	0.73	23.9	N/A	N/A	N/A	N/A	N/A	N/A
Striped Bass	0.36	5.58	0.02	0.09	0.11	1.20	0.14	1.59

[shaded] Fitted equation is statistically significant at the 0.05 level.

* Abundance increases as salvage loss increases. All other relationships indicate that abundance decreases as salvaged loss increases.

IV.G.2. Entrainment At PG&E's Power Plants

Pacific Gas and Electric ("PG&E) operates two power plants in the Sacramento-San Joaquin estuary near Antioch and Pittsburg. The Contra Costa plant is located on the south bank of the lower San Joaquin River about 2.5 miles east of Antioch. The Pittsburg plant is on the south shore of Suisun Bay near Pittsburg, about 6 miles west of the Contra Costa plant and just west of the confluence of the Sacramento and San Joaquin Rivers. The Contra Costa plant has a gross generating capacity of 1,298 MWe and a once-through cooling water flow rate of 1,525 cfs. The Pittsburg plant has a gross generating capacity of 2,060 MWe and a once-through cooling water flow rate of 1,596 cfs.

Cooling water for these units is withdrawn from the lower San Joaquin River and Suisun Bay, passed through the condensers where waste heat generated during electrical power production is transferred to the cooling water, and discharged into the estuary. Splittail, delta smelt, striped bass, and other fish are commonly found in the vicinity of these power plants.[37,38] Large numbers of fish are drawn into the cooling water systems and subjected to mechanical and thermal stress.[39] The combined cooling water flow rate for these two plants is 3,122 cfs or about 2.3 million acre-feet per year, which can be a substantial fraction of Delta outflow. Both plants operate under NPDES permits and report daily cooling water flow rates and discharge water temperatures to the local Regional Water Quality Control Boards ("RWQCBs"). The Contra Costa plant reports to the Central Valley Region and the Pittsburg plant to the San Francisco Bay Region.

We obtained cooling water flow rates and discharge temperatures for the Contra Costa plant and analyzed them to determine if there is any relationship between either flow or temperature and the abundance of nine indicator organisms. Similar work was not performed for the Pittsburg plant because the San Francisco RWQCB has misplaced the monitoring records prior to 1984.

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[37] Johnson C.S. Wang, Fishes of the Sacramento-San Joaquin Estuary and Adjacent Waters, California: A Guide to the Early Life Histories, IESP Technical Report 9, January 1986, pp. 6-6, 10-25, 24-4.

[38] PG&E, Contra Costa and Pittsburg Power Plants Thermal Effects Assessment, 1991-1992, Submitted to Central Valley and San Francisco Bay RWQCB, December 15, 1992.

[39] PG&E, Best Technology Available 1992 Technical Report for the Contra Costa and Pittsburg Power Plants, Submitted to Central Valley and San Francisco Bay RWQCB, November 1, 1992.

Cooling water flow rate for the Contra Costa plant is plotted against time in Figure 8. This figure shows that flow rate has decreased since January 1975 when the record starts. Because abundances have also generally decreased and a reduction in cooling water flow should enhance abundance, this suggests that this plant alone is not a major contributor to the declines. This was further explored by regressing annual abundance indices against cooling water flow rate for the critical biological period. The results of this analysis are summarized in Table 9. This table shows that flow accounts for very little of the variability in the abundance of the nine indicators, ranging from 1 percent for opossum shrimp to 22 percent for starry flounder. None of the relationships is statistically significant.

Abundance indices were also regressed against X2 alone (last column of Table 9) and cooling water flow plus X2 (third column of Table 9) to determine if cooling water flow rate improved the relationship between abundance and X2. Comparing the last column with the third column, it is evident that cooling water flow does not substantially improve the relationship between abundance and X2. These results indicate that the circulating water flow rate of the Contra Costa plant does not significantly effect the abundance of the nine indicators tested in this work.

Cooling water discharge temperature is plotted against time in Figure 9. This figure indicates that discharge temperature is cyclical, reaching a minimum in January and a maximum in the summer months. There is no evident trend in the data. Annual abundance indices were regressed against temperature for the critical biological period. The results, summarized in Table 9, indicate that temperature accounts for very little of the variability in abundance of the nine indicators, ranging from 1 percent for delta smelt to 28 percent for bay shrimp. However, the relationships between bay shrimp abundance and temperature and between splittail abundance and temperature were statistically significant.

Abundance indices were also regressed against X2 alone (last column of Table 9) and temperature plus X2 (fourth column of Table 9) to determine if discharge temperature improved the relationship between abundance and X2. Comparing the last column with the fourth column, it is evident that temperature does not substantially improve the relationship between abundance and X2. These results indicate that discharge temperature does not significantly effect the abundance of the nine indicators tested in this work.

In sum, the Contra Costa plant considered alone does not significantly effect the abundance of the nine indicators, as measured by the indices used here.

Figure 8. Time Series Plot of Cooling Water Flow Rate for PGandE's Contra Costa Power Plant

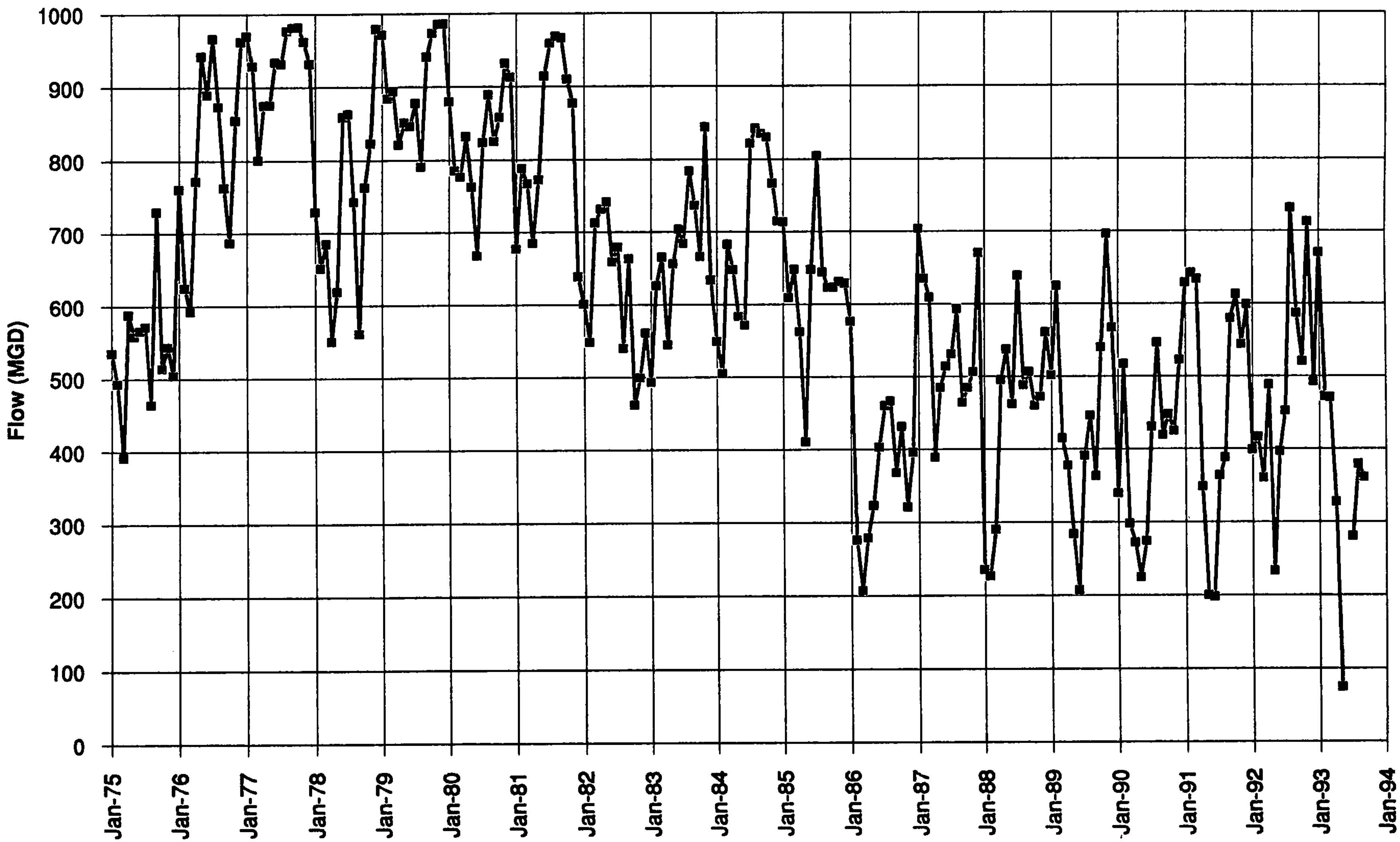
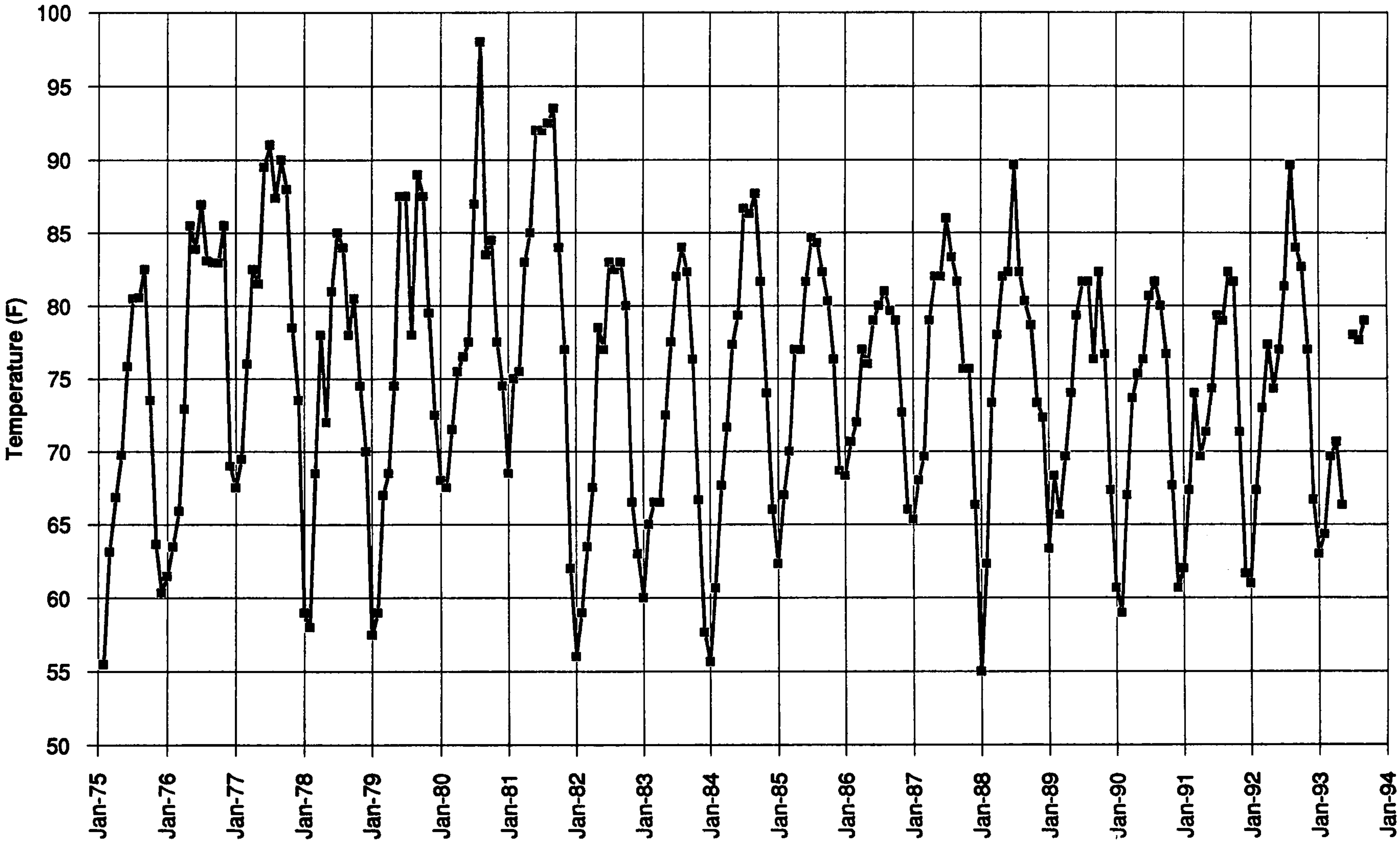


Table 9
Linear Regression of Abundance on Cooling Water Flow Rate ("Flow") and Cooling Water Discharge Temperature ("Temperature") for PGandE's Contra Costa Plant

Abundance Indicator (dependent variable)	SQUARED CORRELATION COEFFICIENT (r^2) (independent variables)				
	Flow	Temperature	Flow+X2	Temperature +X2	X2
Bay Shrimp	0.15	0.28*	0.84*	0.85*	0.84*
Delta Smelt	0.08	0.01	0.09	0.01	0.01
Longfin Smelt	0.10	0.08	0.38*	0.30*	0.30*
Opossum Shrimp	0.01	0.05	0.28	0.28	0.27*
POC	0.03	0.16	0.79*	0.77*	0.71*
Splittail	0.02	0.22*	0.53*	0.53*	0.49*
Striped Bass MWT	0.03	0.04	0.67*	0.65*	0.65*
Striped Bass Survival	0.02	0.04	0.45*	0.51*	0.43*
Starry Flounder	0.22	0.02	0.53*	0.59*	0.53*

* An asterisk (*) indicates that when a straight line is fit to the data, the overall regression is significant at the 0.10 level.

Figure 9. Time Series Plot of Cooling Water Discharge Temperature for PGandE's Contra Costa Power Plant



Tab 1.
Abundance Indices By Month And Subarea

1a. Delta Smelt
1b. Chinook Salmon
1c. Inland Silversides
1d. Jacksmelt
1e. Longfin Smelt
1f. Northern Anchovy
1g. Pacific Herring
1h. California Splittail
1i. Striped Bass
1j. Threadfin Shad
1k. Topsmelt
1l. White Croaker
1m. White Sturgeon
1n. CDFG Indices

1a. DELTA SMELT

DELTA SMELT FALL MIDWATER TRAWL ABUNDANCE

YEAR	MONTH	AREA 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1967	9	0.00		0.00	0.00				0.00			0.00	0.00	28.59	53.13	10.80	0.93	0.00	93.45
	10	0.00		3.77	0.00				0.00		0.00	0.00	0.00	106.11	0.71	39.60	12.13	2.86	165.18
	11	0.00		3.77	0.00				0.00		0.00	16.00	1.56	1.89	2.50	1.20	2.80	1.43	31.15
	12	0.00		0.00					0.00			16.00	0.00	7.58	8.13	84.00	3.73	5.71	125.15
		0.00	0.00	7.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	32.00	1.56	144.17	64.46	135.60	19.60	10.00	414.92
1968	9	0.00		0.00	0.00			0.00	0.00			0.00	0.00	121.26	4.29	93.60	9.33	6.15	234.64
	10	0.00		0.00	0.00			0.00	0.00			0.00	0.00	22.74	0.63	198.00	17.73	14.29	253.38
	11	0.00		0.00	0.00			0.00	0.00			0.00	3.11	8.53	1.25	51.60	26.13	29.23	119.85
	12	0.00		0.00	0.00			0.00	0.00			0.00	1.56	19.89	3.75	37.20	19.60	6.67	88.67
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.67	172.42	9.91	380.40	72.80	56.34	696.54
1969	9	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00		0.00	26.44	65.37	30.00	28.00	0.00	0.00	149.81
	10	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00		0.00	12.44	34.11	6.25	24.00	0.00	0.00	76.80
	11		*data missing*																55.30
	12	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	2.84	0.63	4.80	12.13	13.33	33.73
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	38.89	102.32	36.88	56.80	12.13	13.33	315.65
1970	9	0.00	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	148.40	417.60	117.50	28.00	30.00	0.00	741.50
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	14.00	207.00	27.50	88.80	0.00	5.71	343.01
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00	0.00	36.00	13.75	4.80	12.00	8.57	83.12
	12	0.00	0.00	0.00	34.67	10.17	0.00	0.00	0.00	0.00	4.80	88.00	64.40	98.18	113.75	9.00	64.00	22.86	509.82
		0.00	0.00	0.00	34.67	10.17	0.00	0.00	0.00	0.00	4.80	96.00	226.80	758.78	272.50	130.60	106.00	37.14	1677.46
1971	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.14	53.20	79.20	16.25	21.60	2.00	0.00	197.39
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.57	5.60	302.40	66.25	62.00	18.00	14.29	473.11
	11	0.00	0.00	0.00	2.17	4.07	0.00	0.00	0.00	0.00	0.00	0.00	2.80	86.40	6.25	192.00	130.00	4.00	427.68
	12	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	2.67	0.00	66.60	12.50	79.20	26.00	20.00	206.97
		0.00	0.00	0.00	2.17	4.07	0.00	0.00	0.00	0.00	0.00	32.38	61.60	534.60	101.25	354.80	176.00	38.29	1305.15

DELTA SMELT FALL MIDWATER TRAWL ABUNDANCE

		AREA																	
YEAR	MONTH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1972	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	30.80	397.80	42.50	72.00	16.00	12.50	571.60
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	350.00	7.50	52.00	40.00	22.50	472.00
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	37.80	11.25	0.00	32.00	0.00	81.05
	12	0.00	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	5.60	41.40	61.25	4.00	26.00	4.00	142.25
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36.40	827.00	122.50	128.00	114.00	39.00	1266.90
1973	9	2.70		0.00	0.00	0.00			0.00		0.00	5.33	3.11	196.00	60.71	28.00	12.00	0.00	307.86
	10	0.00		0.00	0.00	0.00			0.00		0.00	0.00	4.67	116.47	119.29	30.00	42.00		312.42
	11	0.00		0.00	0.00	0.00			0.00		0.00	0.00	18.20	103.50	52.14	8.00	16.33		198.18
	12	0.00		2.26	0.00	0.00					0.00	106.67	90.22	20.57	86.67	0.00	21.00		327.39
		2.70	0.00	2.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	112.00	116.20	436.54	318.81	66.00	91.33	0.00	1145.84
1975	9	0.00		0.00	0.00	0.00			0.00		0.00	0.00	127.40	123.75	32.86	4.00	0.00	2.50	290.51
	10	0.00		0.00	0.00	0.00			0.00		4.80	0.00	89.60	73.13	25.00	7.20	14.00		213.73
	11	0.00		0.00	0.00	0.00			0.00		0.00	0.00	4.20	33.75	32.14	12.00	20.22		102.32
	12	0.00		0.00	0.00	0.00					0.00	0.00	2.80	33.75	24.29	6.00	24.50		91.34
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.80	0.00	224.00	264.38	114.29	29.20	58.72	2.50	697.88
1976	9		*data missing*																49.80
	10	0.00	0.00	0.00	0.00	0.00			0.00		0.00	2.67	0.00	6.75	6.43	20.00	6.36	0.00	42.21
	11	0.00	0.00	2.26	0.00	0.00			0.00		0.00	0.00	1.40	11.57	1.43	52.00	52.18	0.00	120.84
	12		*data missing*																125.00
		0.00	0.00	2.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.67	1.40	18.32	7.86	72.00	58.55	0.00	337.85
1977	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	82.91	8.91	5.71	97.53
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	234.55	5.09	2.86	242.49
	11	0.00	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	2.25	0.00	16.36	33.09	0.00	51.70
	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	51.43	2.14	8.73	25.45	0.00	87.75
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	53.68	2.14	342.55	72.55	8.57	479.48
1978	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	37.80	108.00	17.86	3.27	0.00	0.00	166.93
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	2.80	43.88	11.43	6.55	0.00	0.00	64.65
	11	2.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	14.82	6.43	4.36	2.80	0.00	31.12
	12	0.00	0.00	0.00	0.00	0.00		0.00	0.00		278.40	3.20	5.60	3.86	11.43	3.60	2.80	0.00	308.89
		2.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	278.40	3.20	46.20	170.56	47.14	17.78	5.60	0.00	571.58

DELTA SMELT FALL MIDWATER TRAWL ABUNDANCE

		AREA																	
YEAR	MONTH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1980	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	4.20	261.00	22.14	73.50	7.78	0.00	368.62
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	3.50	77.14	9.29	148.00	35.78	0.00	273.71
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	137.25	37.86	316.00	52.50	42.50	586.11
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	4.20	174.00	54.29	36.00	136.89	17.50	422.87
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.90	649.39	123.57	573.50	232.94	60.00	1651.31
1981	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	1.40	113.63	6.67	10.67	0.00	0.00	132.36
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	5.29	3.33	18.67	0.00	0.00	27.29
	11	0.00		0.00	0.00			0.00	0.00		0.00	0.00	0.00	13.20	11.67	6.00	23.33	0.00	54.20
	12	0.00		0.00	3.25	0.00		0.00	0.00		0.00	0.00	61.60	29.25	55.83	3.43	7.78	0.00	161.14
		0.00	0.00	0.00	3.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	63.00	161.37	77.50	38.76	31.11	0.00	374.99
1982	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	4.57	30.80	1.06	0.00	8.40	0.00	0.00	44.83
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	1.40	24.35	7.14	13.20	1.27	0.00	47.37
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	5.60	67.76	5.71	0.00	12.73	0.00	91.81
	12	2.03		0.00	0.00	0.00		0.00	0.00		0.00	8.00	0.00	7.41	127.86	2.67	14.00	0.00	161.96
		2.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.57	37.80	100.59	140.71	24.27	28.00	0.00	345.97
1983	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	2.14	0.00	0.00	0.00	2.14
	10	0.00		0.00	0.00	0.00		0.00	0.00		4.80	0.00	5.60	13.50	2.86	1.20	0.00	0.00	27.96
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	31.50	46.43	0.00	0.00	0.00	77.93
	12	0.00	0.00	0.00	6.50	4.07	0.00	0.00	0.00		0.00	8.00	0.00	0.00	5.71	0.00	0.00		24.28
		0.00	0.00	0.00	6.50	4.07	0.00	0.00	0.00	0.00	4.80	8.00	5.60	45.00	57.14	1.20	0.00	0.00	132.31
1984	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	11.20	28.59	3.57	3.60	0.00	0.00	46.96
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	20.25	2.14	21.33	0.00		43.73
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	55.13	1.43	8.00	2.00		66.55
	12	0.00		0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	4.50	5.71	0.00	14.00		24.21
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.20	108.46	12.86	32.93	16.00	0.00	181.45
1985	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	19.06	0.00	21.60	0.00	0.00	40.66
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	3.18	0.00	20.40	0.00	0.00	23.58
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	28.00	0.00		28.00
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	6.00	10.89		16.89
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	22.24	0.00	76.00	10.89	0.00	109.12
1986	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	6.22	30.71	3.57	51.60	0.00	0.00	92.10
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	8.47	1.43	1.33	3.82	0.00	15.05
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	11.65	6.43	14.40	1.27	0.00	33.75
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	1.40	36.00	4.29	25.20	4.00		70.89
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.62	86.82	15.71	92.53	9.09	0.00	211.78

DELTA SMELT FALL MIDWATER TRAWL ABUNDANCE

		AREA														
YEAR	MONTH	1	3	4	5	7	8	10	11	12	13	14	15	16	17	Total
1987	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.40	0.00	0.00	69.60	0.00	0.00	71.00
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	38.40	1.17	0.00	39.57
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	64.80	4.67	0.00	69.47
	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.18	3.57	82.80	10.50	0.00	100.05
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.40	3.18	3.57	255.60	16.33	0.00	280.08
1988	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.65	0.00	28.80	1.17	0.00	41.61
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.06	0.00	39.60	0.00	0.00	40.66
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.80	2.33	0.00	19.13
	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.60	1.20	0.00	16.00	2.00		24.80
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.60	13.91	0.00	101.20	5.50	0.00	126.21
1989	9	0.00	0.00	0.00	0.00		0.00	0.00	0.00	7.00	42.35	2.14	16.80	19.83	0.00	88.13
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.80	19.06	1.43	45.60	5.83	0.00	74.72
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	70.94	0.00	78.00	8.91	0.00	157.85
	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.40	12.71	0.00	28.80	2.55	0.00	45.45
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.20	145.06	3.57	169.20	37.12	0.00	366.15
1990	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	33.88	0.00	75.60	0.00	0.00	109.48
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.59	0.71	38.40	0.00	0.00	49.70
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.29	0.00	178.80	3.50	0.00	187.59
	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.12	1.43	9.60	3.50	0.00	16.65
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	51.88	2.14	302.40	7.00	0.00	363.43
1991	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.40	0.00	0.00	115.20	9.33	0.00	125.93
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	37.06	0.71	176.40	35.00	0.00	249.17
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.47	2.86	184.80	82.83	0.00	278.96
	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.18	0.71	28.80	2.33	0.00	35.02
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.40	48.71	4.29	505.20	129.50	0.00	689.09
1992	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.14	64.80	4.67	0.00	71.61
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.29	0.00	0.00	0.00	1.20	0.00	0.00	3.49
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.06	0.00	56.40	0.00	0.00	57.46
	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.06	2.86	20.40	0.00	0.00	24.32
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.29	0.00	2.12	5.00	142.80	4.67	0.00	156.87

1b. CHINOOK SALMON

CHINOOK SALMON FALL MIDWATER TRAWL ABUNDANCE

		AREA																	
YEAR	MO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1967	9	0.00		0.00	6.50				0.00			0.00	0.00	0.00	0.00	1.20	0.93	1.43	10.06
	10	0.00		0.00	0.00				18.50		0.00	0.00	0.00	2.84	0.71	3.60	0.00	0.00	25.66
	11	0.00		0.00	0.00				0.00		0.00	0.00	0.00	0.00	0.00	1.20	0.93	0.00	2.13
	12	0.00		0.00					0.00			0.00	0.00	0.95	0.63	4.80	1.87	0.00	8.24
		0.00	0.00	0.00	6.50	0.00	0.00	0.00	18.50	0.00	0.00	0.00	0.00	3.79	1.34	10.80	3.73	1.43	46.09
1968	9	0.00		0.00	0.00			0.00	0.00			0.00	0.00	0.95	0.00	0.00	0.00	0.00	0.95
	10	0.00		0.00	0.00			0.00	0.00			0.00	1.56	0.95	0.00	1.20	0.00	1.43	5.13
	11	0.00		0.00	0.00			0.00	0.00			0.00	3.11	0.95	0.00	0.00	2.80	13.85	20.70
	12	0.00		0.00	0.00			0.00	0.00			0.00	1.56	1.89	0.00	0.00	0.93	0.00	4.38
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.22	4.74	0.00	1.20	3.73	15.27	31.17
1969	9	0.00	0.00	0.00	0.00	0.00		0.00	0.00	1.50		0.00	3.11	1.89	0.00	26.67	0.93	1.54	35.64
	10	0.00	0.00	0.00	0.00	0.00		3.40	0.00	0.00		0.00	0.00	0.00	0.00	1.50	0.00	0.00	4.90
	11		*data missing*																9.82
	12	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.95	0.00	3.60	1.87	8.33	14.75
		0.00	0.00	0.00	0.00	0.00	0.00	3.40	0.00	1.50	0.00	0.00	3.11	2.84	0.00	31.77	2.80	9.87	65.12
1970	9	0.00	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	1.80	0.00	2.00	10.00	8.57	22.37
	10	2.70	0.00	0.00	0.00	0.00	0.00	10.20	0.00		0.00	0.00	0.00	1.80	0.00	7.20	0.00	0.00	21.90
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.40	19.80	1.25	21.60	14.00	14.29	79.34
	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	2.00
		2.70	0.00	0.00	0.00	0.00	0.00	10.20	0.00	0.00	0.00	0.00	8.40	23.40	1.25	30.80	26.00	22.86	125.61
1971	9	0.00	0.00	2.26	0.00	0.00	5.90	0.00	2.31	0.00	0.00	0.00	0.00	3.60	1.25	0.00	0.00	0.00	15.32
	10	2.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.80	0.00	2.80	9.00	0.00	6.00	2.00	0.00	26.63
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.60	0.00	0.00	4.00	4.00	11.60
	12	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	3.60	0.00	2.40	4.00	12.00	22.00
		2.03	0.00	2.26	0.00	0.00	5.90	0.00	2.31	0.00	4.80	0.00	2.80	19.80	1.25	8.40	10.00	16.00	75.55
1972	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.29	2.80	5.40	0.00	2.00	0.00	2.50	14.99
	10	0.00	0.00	0.00	2.17	2.03	0.00	0.00	0.00	0.00	0.00	2.67	0.00	4.00	0.00	2.00	4.00	0.00	16.87
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.29	0.00	1.80	0.00	0.00	4.00	2.86	10.94
	12	0.00	0.00	0.00	0.00	0.00			0.00	0.00	0.00	2.67	0.00	0.00	0.00	0.00	0.00	4.00	6.67
		0.00	0.00	0.00	2.17	2.03	0.00	0.00	0.00	0.00	0.00	9.90	2.80	11.20	0.00	4.00	8.00	9.36	49.46
1973	9	2.70		6.78	0.00	0.00			2.31		0.00	0.00	4.67	3.00	0.71	4.00	0.00	0.00	24.17
	10	2.03		0.00	0.00	0.00			0.00		0.00	2.67	0.00	0.00	0.00	0.00	0.00		4.69
	11	2.03		0.00	0.00	0.00			2.64		0.00	0.00	0.00	4.50	0.00	8.00	0.00		17.17
	12	0.00		0.00	3.25	0.00					0.00	2.67	6.22	5.14	0.00	6.00	2.33		25.62
		6.75	0.00	6.78	3.25	0.00	0.00	0.00	4.96	0.00	0.00	5.33	10.89	12.64	0.71	18.00	2.33	0.00	71.65

CHINOOK SALMON FALL MIDWATER TRAWL ABUNDANCE

YEAR	MO.	AREA 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1975	9	0.00		0.00	0.00	0.00			0.00		0.00	0.00	0.00	1.13	0.00	0.00	1.27	0.00	2.40
	10	0.00		0.00	0.00	0.00			0.00		0.00	0.00	0.00	1.13	0.00	2.40	1.40		4.93
	11	4.05		0.00	0.00	0.00			0.00		0.00	0.00	0.00	2.25	0.00	0.00	0.00		6.30
	12	0.00		0.00	0.00	0.00					0.00	0.00	0.00	2.25	0.00	3.00	0.00		5.25
		4.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.75	0.00	5.40	2.67	0.00	18.87
1976	9	*data missing*																	11.03
	10	0.00	0.00	0.00	0.00	0.00			0.00		0.00	0.00	1.40	3.38	0.00	0.00	2.55	0.00	7.32
	11	0.00	0.00	0.00	0.00	0.00			0.00		0.00	0.00	1.40	0.00	0.00	2.00	1.27	6.67	11.34
	12	*data missing*																	7.86
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.80	3.38	0.00	2.00	3.82	6.67	37.55
1977	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00	0.00	1.88	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.88
	11	0.00	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	1.13	0.00	0.00	0.00	0.00	1.13
	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.71	0.00	0.00	0.00	0.71
		0.00	0.00	1.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.13	0.71	0.00	0.00	0.00	3.72
1978	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	1.20	0.00	0.00	0.00	0.00	1.20
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	2.67	0.00	7.88	0.00	1.09	0.00	0.00	11.63
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	1.06	0.00	1.09	0.00	0.00	2.15
	12	0.00	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	1.29	0.00	16.80	4.20	0.00	22.29
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.67	0.00	11.42	0.00	18.98	4.20	0.00	37.27
1980	9	0.00		0.00	2.17	0.00		0.00	0.00		0.00	0.00	1.40	0.00	0.00	0.00	0.00	0.00	3.57
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	1.56	3.38	0.00	0.00	0.00	0.00	4.93
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	3.60	0.00	6.67	4.67	5.00	19.93
		0.00	0.00	0.00	2.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.96	6.98	0.00	6.67	4.67	5.00	28.43
1981	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	1.40	0.00	0.83	0.00	0.00	0.00	2.23
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	1.40	8.47	0.00	0.00	9.33	0.00	19.20
	11	2.70		0.00	0.00			0.00	0.00		0.00	2.29	2.80	4.80	0.00	18.00	4.67	0.00	35.25
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	12.38	0.00	10.29	10.89	5.00	38.55
		2.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.29	5.60	25.65	0.83	28.29	24.89	5.00	95.24
1982	9	2.70		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.70
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	2.80	0.00	0.00	0.00	0.00	0.00	2.80
	11	2.03		2.26	0.00	0.00		0.00	0.00		0.00	0.00	0.00	1.06	1.43	1.33	1.27	0.00	9.38
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	1.40	0.00	0.00	6.67	0.00	0.00	8.07
		4.73	0.00	2.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.20	1.06	1.43	8.00	1.27	0.00	22.95

CHINOOK SALMON FALL MIDWATER TRAWL ABUNDANCE

YEAR	MO.	AREA 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1983	9	0.00		0.00	0.00	0.00		0.00	7.93		0.00	0.00	0.00	0.00	0.00	1.20	0.00	0.00	9.13
	10	0.00		2.26	0.00	0.00		0.00	5.29		0.00	0.00	1.40	3.38	0.71	1.20	0.00	1.82	16.05
	11	0.00		0.00	0.00	0.00		5.10	0.00		0.00	0.00	1.40	0.00	0.00	12.00	0.00	0.00	18.50
	12	0.00	0.00	0.00	2.17	0.00	0.00	0.00	0.00		0.00	2.67	0.00	0.00	0.00	0.00	0.00		4.83
		0.00	0.00	2.26	2.17	0.00	0.00	5.10	13.21	0.00	0.00	2.67	2.80	3.38	0.71	14.40	0.00	1.82	48.52
1984	9	0.00		2.26	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.26
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00		2.00
	12	0.00		0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	3.38	0.00	1.33	1.40		6.11
		0.00	0.00	2.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.38	0.00	1.33	3.40	0.00	10.37
1985	9	22.28		6.78	0.00	0.00		10.20	5.29		0.00	59.43	0.00	1.06	0.00	0.00	0.00	0.00	105.03
	10	2.03		0.00	0.00	0.00		0.00	0.00		0.00	4.57	0.00	0.00	0.00	3.60	1.27	2.22	13.69
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	2.29	0.00	3.38	0.71	0.00	1.27		7.65
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	2.29	2.80	2.40	0.71	4.80	1.56		14.56
		24.30	0.00	6.78	0.00	0.00	0.00	10.20	5.29	0.00	0.00	68.57	2.80	6.83	1.43	8.40	4.10	2.22	140.92
1986	9	10.13		0.00	0.00	0.00		0.00	5.29		0.00	4.57	0.00	1.06	1.43	0.00	1.27	0.00	23.74
	10	0.00		0.00	2.17	6.10		0.00	0.00		0.00	2.29	0.00	4.24	2.86	4.00	3.82	6.00	31.46
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	1.40	4.24	0.00	1.20	0.00	0.00	6.84
	12	2.03		0.00	2.17	0.00		0.00	3.08		0.00	2.29	1.40	1.06	0.00	4.80	0.00		16.82
		12.15	0.00	0.00	4.33	6.10	0.00	0.00	8.37	0.00	0.00	9.14	2.80	10.59	4.29	10.00	5.09	6.00	78.86
1987	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	9.14	4.20	2.12	0.71	0.00	0.00	0.00	16.17
	10	0.00		0.00	0.00	0.00		0.00	2.64		4.80	0.00	0.00	0.00	0.71	1.20	0.00	0.00	9.36
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	9.14	2.80	0.00	0.00	0.00	1.17	0.00	13.11
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	1.40	8.47	0.00	6.00	2.33	0.00	18.20
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.64	0.00	4.80	18.29	8.40	10.59	1.43	7.20	3.50	0.00	56.85
1988	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	4.57	1.40	0.00	0.00	0.00	0.00	0.00	5.97
	10	2.03		0.00	4.33	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.71	0.00	0.00	0.00	7.07
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
		2.03	0.00	0.00	4.33	0.00	0.00	0.00	0.00	0.00	0.00	4.57	1.40	0.00	0.71	0.00	0.00	0.00	13.04
1989	9	0.00		2.26	0.00	0.00			0.00		0.00	0.00	1.40	1.06	0.71	0.00	0.00	0.00	5.43
	10	2.03		0.00	0.00	0.00		0.00	0.00		0.00	2.29	0.00	0.00	0.00	0.00	1.17	0.00	5.48
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	1.27	0.00	1.27
	12	0.00		2.26	0.00	0.00		0.00	0.00		0.00	0.00	0.00	1.06	0.00	0.00	0.00	0.00	3.32
		2.03	0.00	4.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.29	1.40	2.12	0.71	0.00	2.44	0.00	15.50

CHINOOK SALMON FALL MIDWATER TRAWL ABUNDANCE

		AREA																	
YEAR	MO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1990	9	8.10		2.26	0.00	0.00		5.10	2.64		0.00	2.29	0.00	1.06	1.43	0.00	0.00	0.00	22.88
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	1.06	0.00	0.00	0.00	0.00	1.06
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		8.10	0.00	2.26	0.00	0.00	0.00	5.10	2.64	0.00	0.00	2.29	0.00	2.12	1.43	0.00	0.00	0.00	23.93
1991	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	1.40	0.00	0.00	0.00	0.00	0.00	1.40
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	17.14	17.14
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.40	0.00	0.00	0.00	0.00	17.14	18.54
1992	9	5.40		0.00	0.00	0.00		5.10	7.93		0.00	9.14	0.00	0.00	0.00	1.20	0.00	0.00	28.77
	10	0.00		0.00	0.00	0.00		0.00	0.00		4.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.80
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	2.40	0.00	0.00	2.40
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		5.40	0.00	0.00	0.00	0.00	0.00	5.10	7.93	0.00	4.80	9.14	0.00	0.00	0.00	3.60	0.00	0.00	35.97

1c. INLAND SILVERSIDES

INLAND SILVERSIDES FALL MIDWATER TRAWL ABUNDANCE

YEAR	MO.	AREA 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1967	9	0.00		0.00	0.00				0.00			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00		0.00	0.00				0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00		0.00	0.00				0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	0.00		0.00					0.00			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1968	9	0.00		0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00		0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00		0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	0.00		0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1969	9	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	*data missing*																	0.00
	12	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1970	9	0.00	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1971	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1972	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	0.00	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1973	9	0.00		0.00	0.00	0.00			0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00		0.00	0.00	0.00			0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
	11	0.00		0.00	0.00	0.00			0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
	12	0.00		0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

INLAND SILVERSIDES FALL MIDWATER TRAWL ABUNDANCE

YEAR	MO.	AREA 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1975	9	0.00		0.00	0.00	0.00			0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00		0.00	0.00	0.00			0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
	11	0.00		0.00	0.00	0.00			0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
	12	0.00		0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1976	9		*data missing*																0.00
	10	0.00	0.00	0.00	0.00	0.00			0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00	0.00	0.00	0.00	0.00			0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12		*data missing*																0.00
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1977	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1978	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	0.00	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1980	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	1.56	0.00	1.56
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.56	0.00	1.56
1981	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	4.00
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00		0.00	0.00			0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	4.00
1982	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

INLAND SILVERSIDES FALL MIDWATER TRAWL ABUNDANCE

YEAR	MO.	AREA 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1983	9	0.00		0.00	2.17	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.17
	10	0.00		0.00	2.17	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.17
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
		0.00	0.00	0.00	4.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.33
1984	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.71	0.00	1.27	0.00	1.99
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	2.14	0.00	0.00		2.14
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.13	0.71	0.00	0.00		1.84
	12	0.00		0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.71	0.00	0.00		0.71
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.13	4.29	0.00	1.27	0.00	6.68
1985	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1986	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	2.00
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	1.33	0.00	0.00	1.33
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.71	0.00	0.00		0.71
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.71	1.33	0.00	2.00	4.05
1987	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	3.82	0.00	3.82
	10	0.00		0.00	4.33	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	1.17	2.00	7.50
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	2.00
	12	0.00		0.00	2.17	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	6.17
		0.00	0.00	0.00	6.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.98	8.00	19.48
1988	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1989	9	0.00		0.00	0.00	0.00			0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	2.00
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	9.60	2.33	10.00	21.93
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.60	2.33	12.00	23.93

INLAND SILVERSIDES FALL MIDWATER TRAWL ABUNDANCE

		AREA																	
YEAR	MO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1990	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	1.20	1.27	0.00	2.47
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	2.14	0.00	1.17	0.00	3.31
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	46.00	46.00
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.14	1.20	2.44	46.00	51.78
1991	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	3.50	0.00	3.50
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	7.20	1.17	1.43	9.80
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	3.60	0.00	0.00	3.60
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.80	4.67	1.43	16.90
1992	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	2.12	0.00	0.00	0.00	0.00	2.12
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.71	0.00	0.00	1.43	2.14
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.12	0.71	0.00	0.00	1.43	4.26

1d. JACKSMELT

JACKSMELT FALL MIDWATER TRAWL ABUNDANCE

		AREA																	
YEAR	MONTH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1967	9	0.00		7.53	0.00				0.00			0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.53
	10	0.00		0.00	0.00				0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00		18.83	0.00				18.50		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	37.33
	12	0.00		3.77					0.00			0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.77
		0.00	0.00	30.13	0.00	0.00	0.00	0.00	18.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	48.63
1968	9	0.00		241.07	13.00			122.40	481.00			0.00	0.00	0.00	0.00	0.00	0.00	0.00	857.47
	10	8.10		116.77	13.00			0.00	166.50			0.00	0.00	0.00	0.00	0.00	0.00	0.00	304.37
	11	0.00		0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	0.00		0.00	0.00			40.80	0.00			0.00	0.00	0.00	0.00	0.00	0.00	0.00	40.80
		8.10	0.00	357.83	26.00	0.00	0.00	163.20	647.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1202.63
1969	9	0.00	165.20	0.00	0.00	18.30		0.00	0.00	4.50		0.00	0.00	0.00	0.00	0.00	0.00	0.00	188.00
	10	0.00	0.00	0.00	0.00	6.10		0.00	18.50	6.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	30.60
	11		*data missing*																15.30
	12	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	165.20	0.00	0.00	24.40	0.00	0.00	18.50	10.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	233.90
1970	9	32.40	11.20	76.28	3.25	31.72		5.10	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	159.95
	10	2.70	0.00	2.26	2.17	4.07	5.90	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17.09
	11	0.00	0.00	1.88	0.00	2.03	2.95	2.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.91
	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.64
		35.10	11.20	80.42	5.42	37.82	8.85	7.14	2.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	188.59
1971	9	0.00	2.80	56.50	0.00	2.03	0.00	6.80	13.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	82.01
	10	0.00	0.00	0.00	0.00	2.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.03
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	2.80	56.50	0.00	4.07	0.00	6.80	13.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	84.04
1972	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	0.00	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1973	9	0.00		235.04	0.00	0.00			9.25		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	244.29
	10	0.00		27.12	0.00	0.00			0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00		27.12
	11	0.00		0.00	0.00	0.00			0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
	12	0.00		0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
		0.00	0.00	262.16	0.00	0.00	0.00	0.00	9.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	271.41

JACKSMELT FALL MIDWATER TRAWL ABUNDANCE

		AREA																	
YEAR	MONTH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1975	9	0.00		0.00	0.00	0.00			0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00		0.00	0.00	0.00			0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
	11	0.00		0.00	0.00	0.00			0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
	12	0.00		0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1976	9	*data missing*																	4.65
	10	0.00	0.00	0.00	2.17	0.00			0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.17
	11	0.00	0.00	6.78	9.75	12.20			0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	28.73
	12	*data missing*																	14.37
		0.00	0.00	2.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.67	1.40	18.32	7.86	72.00	58.55	0.00	49.91
1977	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1978	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	0.00	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1980	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00		15.82	2.17	24.40		5.10	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	47.49
	11	0.00		0.00	0.00	0.00		5.10	3.70		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.80
	12	0.00		11.30	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.30
		0.00	0.00	27.12	2.17	24.40	0.00	10.20	3.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	67.59
1981	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00		0.00	0.00			5.10	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.10
	12	0.00		2.26	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.26
		0.00	0.00	2.26	0.00	0.00	0.00	5.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.36
1982	9	0.00		2.26	4.33	0.00		0.00	3.08		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.68
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	2.26	4.33	0.00	0.00	0.00	3.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.68

JACKSMELT FALL MIDWATER TRAWL ABUNDANCE

YEAR	MONTH	AREA 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1983	9	0.00		0.00	0.00	0.00		0.00	2.64		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.64
	10	0.00		0.00	0.00	6.10		0.00	5.29		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.39
	11	0.00		15.82	0.00	6.10		10.20	10.57		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	42.69
	12	0.00	2.80	2.26	0.00	0.00	0.00	2.04	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00		7.10
		0.00	2.80	18.08	0.00	12.20	0.00	12.24	18.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	63.82
1984	9	4.05		133.34	8.67	6.10		30.60	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	182.76
	10	0.00		0.00	0.00	12.20		5.10	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00		17.30
	11	0.00	0.00	2.26	0.00	0.00	0.00	8.16	44.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		55.35
	12	0.00		0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
		4.05	0.00	135.60	8.67	18.30	0.00	43.86	44.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	255.41
1985	9	20.25		22.60	54.17	158.60		530.40	89.86		0.00	4.57	0.00	0.00	0.71	0.00	0.00	0.00	881.16
	10	2.03		431.66	169.00	18.30		45.90	60.79		0.00	2.29	0.00	0.00	1.43	0.00	0.00	0.00	731.39
	11	0.00		0.00	4.33	0.00		10.20	39.64		0.00	0.00	0.00	3.38	0.71	0.00	0.00		58.27
	12	0.00		2.26	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00		2.26
		22.28	0.00	456.52	227.50	176.90	0.00	586.50	190.29	0.00	0.00	6.86	0.00	3.38	2.86	0.00	0.00	0.00	1673.07
1986	9	0.00		0.00	0.00	0.00		0.00	2.64		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.64
	10	0.00		0.00	0.00	36.60		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36.60
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	0.00		0.00	13.00	6.10		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00		19.10
		0.00	0.00	0.00	13.00	42.70	0.00	0.00	2.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	58.34
1987	9	0.00		4.52	0.00	6.10		0.00	10.57		0.00	4.57	0.00	0.00	0.00	0.00	0.00	0.00	25.76
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	4.57	0.00	0.00	0.00	0.00	0.00	0.00	4.57
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	2.29	0.00	0.00	0.00	0.00	0.00	0.00	2.29
		0.00	0.00	4.52	0.00	6.10	0.00	0.00	10.57	0.00	0.00	11.43	0.00	0.00	0.00	0.00	0.00	0.00	32.62
1988	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1989	9	0.00		27.12	0.00	0.00			0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	27.12
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	0.00		0.00	0.00	6.10		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.10
		0.00	0.00	27.12	0.00	6.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	33.22

JACKSMELT FALL MIDWATER TRAWL ABUNDANCE

		AREA																	
YEAR	MONTH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1990	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00		0.00	0.00	12.20		0.00	0.00		0.00	4.57	0.00	0.00	0.00	0.00	0.00	0.00	16.77
	11	0.00		2.26	4.33	18.30		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	24.89
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	2.26	4.33	30.50	0.00	0.00	0.00	0.00	0.00	4.57	0.00	0.00	0.00	0.00	0.00	0.00	41.66
1991	9	0.00		2.26	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.26
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	2.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.26
1992	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

1e. LONGFIN SMELT

LONGFIN SMELT FALL MIDWATER TRAWL ABUNDANCE

YEAR	MONTH	AREA 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1967	9	623.70		7051.20	1274.00				740.00			1840.00	3080.00	592.94	270.00	12.00	0.00	0.00	15483.84
	10	6318.00		937.90	65.00				13616.00		172.80	14512.00	8113.78	4962.32	1077.86	0.00	0.00	0.00	49775.65
	11	24.30		1310.80	390.00				0.00		187.20	480.00	2280.44	2267.05	675.00	36.00	5.60	0.00	7656.40
	12	413.10		1126.23					296.00			0.00	1690.89	4032.00	881.88	117.60	229.60	28.57	8815.87
		7379.10	0.00	10426.13	1729.00	0.00	0.00	0.00	14652.00	0.00	360.00	16832.00	15165.11	11854.31	2904.73	165.60	235.20	28.57	81731.76
1968	9	48.60		0.00	0.00			0.00	0.00			0.00	222.44	1039.26	118.57	0.00	0.00	0.00	1428.88
	10	0.00		0.00	0.00			0.00	0.00			0.00	3.11	496.42	259.38	13.20	0.00	0.00	772.11
	11	0.00		26.37	0.00			0.00	0.00			80.00	32.67	267.16	25.00	15.60	6.53	0.00	453.32
	12	0.00		33.90	0.00			0.00	0.00			0.00	119.78	310.74	83.75	37.20	57.87	20.00	663.23
		48.60	0.00	60.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	80.00	378.00	2113.58	486.70	66.00	64.40	20.00	3317.54
1969	9	0.00	0.00	15025.23	52.00	0.00		6.80	2682.50	4.50		9344.00	6527.11	1265.68	139.38	1.33	0.00	0.00	35048.54
	10	0.00	2.80	493.43	0.00	134.20		0.00	425.50	130.50		112.00	5475.56	1896.63	954.38	4.50	0.93	0.00	9630.43
	11	*data missing*																	8148.27
	12	32.40	207.20	862.57	61.75	24.40		40.80	536.50	219.00	4.80	1360.00	1367.33	1340.53	427.50	67.20	100.80	13.33	6666.11
		32.40	210.00	16381.23	113.75	158.60	0.00	47.60	3644.50	354.00	4.80	10816.00	13370.00	4502.84	1521.25	73.03	101.73	13.33	59493.34
1970	9	16.20	0.00	42.38	61.75	2.44		0.00	148.00		0.00	96.00	352.80	169.20	0.00	0.00	0.00	0.00	888.77
	10	2.70	0.00	0.00	0.00	0.00	0.00	0.00	4.63		4.80	4.57	257.60	122.40	13.75	0.00	0.00	0.00	410.45
	11	0.00	0.00	1.88	2.17	24.40	8.85	8.16	0.00	1.50	24.00	178.67	526.40	208.80	80.00	0.00	2.00	0.00	1066.83
	12	238.95	0.00	30.13	541.67	492.07	0.00	132.60	29.07	9.00	2020.80	450.67	126.00	37.64	40.00	6.00	14.00	0.00	4168.59
		257.85	0.00	74.39	605.58	518.91	8.85	140.76	181.70	10.50	2049.60	729.90	1262.80	538.04	133.75	6.00	16.00	0.00	6534.63
1971	9	8.10	0.00	137.86	2.17	4.07	0.00	0.00	166.50	54.00	0.00	571.43	1321.60	135.00	41.25	0.00	0.00	0.00	2441.97
	10	87.08	0.00	111.12	10.83	8.13	0.00	0.00	302.94	0.00	86.40	365.71	2511.60	1776.60	461.25	0.00	0.00	0.00	5721.66
	11	643.95	0.00	97.93	45.50	46.77	2.95	47.60	48.56	0.00	163.20	539.43	400.40	2734.20	245.00	2.40	4.00	0.00	5021.89
	12	285.53	0.00	47.08	136.50	26.84		40.80	9.25	27.00	196.80	224.00	495.60	1038.60	172.50	74.40	14.00	12.00	2800.90
		1024.65	0.00	393.99	195.00	85.81	2.95	88.40	527.25	81.00	446.40	1700.57	4729.20	5684.40	920.00	76.80	18.00	12.00	15986.42

LONGFIN SMELT FALL MIDWATER TRAWL ABUNDANCE

		AREA																	
YEAR	MONTH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1972	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.14	86.80	34.20	7.50	0.00	0.00	0.00	137.64
	10	0.00	0.00	0.00	0.00	0.00	0.00	5.10	0.00	0.00	0.00	34.67	25.20	52.00	1.25	0.00	0.00	0.00	118.22
	11	0.00	0.00	0.00	3.25	0.00	0.00	0.00	0.00	0.00	0.00	9.14	8.40	54.00	31.25	0.00	0.00	0.00	106.04
	12	4.05	0.00	1.88	0.00	0.00			0.00	0.00	14.40	74.67	168.00	102.60	10.00	16.00	6.00	0.00	397.60
		4.05	0.00	1.88	3.25	0.00	0.00	5.10	0.00	0.00	14.40	127.62	288.40	242.80	50.00	16.00	6.00	0.00	759.50
1973	9	10.80		0.00	48.75	73.20			111.00		0.00	69.33	927.11	1340.00	212.14	2.00	0.00	0.00	2794.34
	10	8.10		0.00	35.75	0.00			4.63		0.00	74.67	301.78	716.82	95.00	0.00	0.00		1236.74
	11	62.78		24.86	0.00	0.00			0.00		0.00	109.33	435.40	140.63	35.00	0.00	0.00		807.99
	12	229.50		113.00	9.75	24.40					278.40	72.00	186.67	108.00	13.33	15.00	7.00		1057.05
		311.18	0.00	137.86	94.25	97.60	0.00	0.00	115.63	0.00	278.40	325.33	1850.96	2305.45	355.48	17.00	7.00	0.00	5896.12
1975	9	6.08		40.68	6.50	0.00			2.31		4.80	13.33	147.00	91.13	5.71	0.00	0.00	0.00	317.54
	10	4.05		0.00	0.00	0.00			2.31		0.00	5.33	337.40	200.25	48.57	0.00	0.00		597.92
	11	85.05		2.26	0.00	12.20			0.00		28.80	93.71	379.40	443.25	132.86	16.00	4.67		1198.20
	12	46.58		0.00	0.00	12.20					28.80	41.14	340.20	146.25	38.57	36.00	5.25		694.99
		141.75	0.00	42.94	6.50	24.40	0.00	0.00	4.63	0.00	62.40	153.52	1204.00	880.88	225.71	52.00	9.92	0.00	2808.64
1976	9		*data missing*																11.00
	10	0.00	0.00	0.00	2.17	0.00			0.00		0.00	2.67	0.00	4.50	2.86	0.00	0.00	0.00	12.19
	11	6.08	0.00	0.00	0.00	0.00			0.00		0.00	0.00	2.80	20.57	1.43	58.00	1.27	0.00	90.15
	12		*data missing*																540.62
		6.08	0.00	0.00	2.17	0.00	0.00	0.00	0.00	0.00	0.00	2.67	2.80	25.07	4.29	58.00	1.27	0.00	653.96
1977	9	0.00	0.00	0.00	2.17	4.07	0.00	0.00	0.00		0.00	0.00	0.00	6.00	0.00	16.36	0.00	0.00	28.60
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	1.20	0.00	14.18	1.27	0.00	16.65
	11	0.00	0.00	0.00	0.00	0.00		0.00	2.31		0.00	0.00	0.00	3.38	2.86	56.73	10.18	2.22	77.68
	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	2.67	4.67	2.57	0.71	63.27	2.55	5.00	81.44
		0.00	0.00	0.00	2.17	4.07	0.00	0.00	2.31	0.00	0.00	2.67	4.67	13.15	3.57	150.55	14.00	7.22	204.36
1978	9	176.18	2.80	310.75	47.67	75.23	53.10	98.60	25.44		57.60	56.00	142.80	691.20	55.00	7.64	0.00	0.00	1800.00
	10	32.40	0.00	0.00	0.00	8.13	0.00	2.55	0.00		4.80	80.00	296.80	650.25	97.14	1.09	0.00	0.00	1173.17
	11	37.80	0.00	9.42	0.00	12.20	0.00	10.20	62.44		28.80	61.33	174.00	779.29	92.86	144.00	37.80	0.00	1450.14
	12	205.20	0.00	137.86	107.25	8.13		0.00	0.00		105.60	275.20	579.60	601.71	110.00	93.60	21.00	6.67	2251.82
		451.58	2.80	458.03	154.92	103.70	53.10	111.35	87.88	0.00	196.80	472.53	1193.20	2722.46	355.00	246.33	58.80	6.67	6675.13

LONGFIN SMELT FALL MIDWATER TRAWL ABUNDANCE

		AREA																	
YEAR	MONTH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1980	9	1215.00		508.50	866.67	0.00		612.00	7402.64		0.00	181.33	1442.00	1918.29	426.43	375.00	253.56	0.00	15201.41
	10	21.60		24.86	2.17	24.40		5.10	0.00		4.80	373.33	1505.00	2599.71	1205.71	182.67	121.33	0.00	6070.69
	11	0.00		0.00	6.50	0.00		0.00	0.00		24.00	41.60	570.89	1437.75	597.14	801.33	47.25	0.00	3526.47
	12	2430.00		11.30	97.50	183.00		20.40	61.67		48.00	220.80	1369.20	1498.80	190.00	124.00	99.56	0.00	6354.22
		3666.60	0.00	544.66	972.83	207.40	0.00	637.50	7464.31	0.00	76.80	817.07	4887.09	7454.55	2419.29	1483.00	521.69	0.00	31152.79
1981	9	0.00		0.00	0.00	0.00		5.10	0.00		0.00	5.33	49.00	111.38	32.50	18.67	0.00	0.00	221.98
	10	4.05		0.00	2.17	0.00		0.00	3.08		0.00	0.00	4.20	84.71	16.67	278.67	4.67	0.00	398.21
	11	2.70		0.00	6.50			0.00	0.00		4.80	9.14	19.60	86.40	10.00	39.60	0.00	0.00	178.74
	12	0.00		13.56	16.25	0.00		0.00	0.00		4.80	373.33	677.60	240.75	43.33	17.14	10.89	5.00	1402.66
		6.75	0.00	13.56	24.92	0.00	0.00	5.10	3.08	0.00	9.60	387.81	750.40	523.23	102.50	354.08	15.56	5.00	2201.58
1982	9	542.70		203.40	1421.33	292.80		2284.80	6.17		0.00	400.00	1909.60	668.12	169.17	0.00	0.00	0.00	7898.08
	10	731.03		418.10	450.67	414.80		10.20	1504.67		9.60	2610.29	2804.20	3611.65	1347.86	44.40	3.82	0.00	13961.27
	11	20.25		571.78	2.17	732.00		0.00	5.29		105.60	7474.67	11289.60	6511.76	1405.00	70.67	1.27	0.00	28190.05
	12	3086.10		25.43	17.33	0.00		81.60	373.70		4.80	2730.67	5798.80	536.82	153.57	38.67	21.00	6.67	12875.15
		4380.08	0.00	1218.71	1891.50	1439.60	0.00	2376.60	1889.82	0.00	120.00	13215.62	21802.20	11328.35	3075.60	153.73	26.09	6.67	62924.56
1983	9	12.15		0.00	0.00	0.00		0.00	0.00		33.60	11.43	82.60	10.59	1.43	0.00	0.00	0.00	151.80
	10	133.65		49.72	0.00	0.00		0.00	5.29		1377.60	240.00	1290.80	6.75	0.71	1.20	0.00	0.00	3105.72
	11	803.93		92.66	162.50	280.60		5.10	7.93		748.80	681.14	1841.00	586.13	193.57	3.60	0.00	0.00	5406.95
	12	95.18	5.60	248.60	184.17	105.73	5.90	8.16	743.08		19.20	1245.33	439.60	15.60	78.57	15.43	0.00		3210.15
		1044.90	5.60	390.98	346.67	386.33	5.90	13.26	756.30	0.00	2179.20	2177.90	3654.00	619.06	274.29	20.23	0.00	0.00	11874.62
1984	9	0.00		0.00	4.33	0.00		0.00	0.00		14.40	66.67	168.00	64.59	7.86	2.40	0.00	0.00	328.25
	10	127.58		0.00	296.83	1043.10		0.00	0.00		28.80	240.00	424.20	317.25	61.43	65.33	7.00		2611.52
	11	70.88	0.00	76.84	21.67	22.37	50.15	6.12	0.00	0.00	24.00	184.00	760.20	1022.63	77.86	234.67	50.00		2601.37
	12	40.50		2.26	2.17	14.23	0.00	0.00	92.50		446.40	157.33	691.60	277.88	106.43	26.67	58.80		1916.76
		238.95	0.00	79.10	325.00	1079.70	50.15	6.12	92.50	0.00	513.60	648.00	2044.00	1682.34	253.57	329.07	115.80	0.00	7457.90
1985	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	4.57	4.20	6.35	2.14	2.40	0.00	0.00	19.67
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	2.80	4.24	0.00	24.00	0.00	0.00	31.04
	11	0.00		0.00	0.00	0.00		0.00	15.86		0.00	11.43	7.00	3.38	10.00	168.00	3.82		219.48
	12	6.08		0.00	0.00	0.00		0.00	5.29		0.00	102.86	93.80	298.80	22.86	171.60	20.22		721.50
		6.08	0.00	0.00	0.00	0.00	0.00	0.00	21.14	0.00	0.00	118.86	107.80	312.76	35.00	366.00	24.04	0.00	991.68
1986	9	30.38		4.52	36.83	73.20		0.00	7.93		0.00	16.00	289.33	397.06	95.71	15.60	5.09	0.00	971.65
	10	34.43		27.12	19.50	48.80		15.30	224.64		4.80	22.86	698.60	227.65	172.86	37.33	8.91	0.00	1542.79
	11	208.58		74.58	30.33	97.60		0.00	9.25		24.00	54.86	450.80	438.35	151.43	301.20	14.00	2.00	1856.98
	12	184.28		20.34	4.33	0.00		0.00	49.33		0.00	155.43	285.60	558.00	235.71	217.20	78.00		1788.22
		457.65	0.00	126.56	91.00	219.60	0.00	15.30	291.15	0.00	28.80	249.14	1724.33	1621.06	655.71	571.33	106.00	2.00	6159.65

LONGFIN SMELT FALL MIDWATER TRAWL ABUNDANCE

		AREA														
YEAR	MONTH	1	3	4	5	7	8	10	11	12	13	14	15	16	17	Total
1987	9	2.03	9.04	2.17	0.00	0.00	2.64	0.00	6.86	5.60	5.29	0.71	99.60	0.00	0.00	133.94
	10	10.13	0.00	0.00	0.00	5.10	7.93	0.00	9.14	8.40	10.13	0.00	19.20	0.00	0.00	70.02
	11	6.08	9.04	0.00	0.00	15.30	13.21	0.00	54.86	32.20	73.06	0.71	174.00	5.83	0.00	384.29
	12	81.00	65.54	45.50	36.60	0.00	208.79	33.60	77.71	95.20	95.29	7.14	151.20	11.67	10.00	919.24
		99.23	83.62	47.67	36.60	20.40	232.57	33.60	148.57	141.40	183.77	8.57	444.00	17.50	10.00	1507.50
1988	9	0.00	0.00	0.00	0.00	5.10	0.00	0.00	0.00	0.00	2.12	0.71	8.40	0.00	0.00	16.33
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.29	7.00	7.41	0.71	0.00	0.00	0.00	17.41
	11	0.00	0.00	4.33	0.00	5.10	0.00	0.00	2.29	11.20	11.65	0.00	151.20	3.50	0.00	189.27
	12	52.65	13.56	8.67	42.70	61.20	24.67	14.40	22.86	109.20	66.00	5.71	76.00	22.00		519.61
		52.65	13.56	13.00	42.70	71.40	24.67	14.40	27.43	127.40	87.18	7.14	235.60	25.50	0.00	742.62
1989	9	0.00	0.00	0.00	0.00		0.00	0.00	2.29	4.20	3.18	0.00	1.20	0.00	0.00	10.86
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.12	0.00	30.00	0.00	0.00	32.12
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.71	7.00	6.35	0.00	7.20	2.55	0.00	36.81
	12	16.20	2.26	2.17	0.00	0.00	15.86	0.00	38.86	56.00	22.24	1.43	212.40	8.91	0.00	376.31
		16.20	2.26	2.17	0.00	0.00	15.86	0.00	54.86	67.20	33.88	1.43	250.80	11.45	0.00	456.11
1990	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.40	3.18	0.71	4.80	0.00	0.00	10.09
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.43	0.00	0.00	0.00	1.43
	11	4.05	2.26	4.33	0.00	0.00	3.08	0.00	4.57	2.80	3.18	1.43	45.60	5.83	0.00	77.14
	12	12.15	11.30	4.33	6.10	0.00	7.93	0.00	13.71	9.80	20.12	2.86	60.00	2.33	0.00	150.63
		16.20	13.56	8.67	6.10	0.00	11.01	0.00	18.29	14.00	26.47	6.43	110.40	8.17	0.00	239.29
1991	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.18	0.00	4.80	0.00	0.00	7.98
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.40	2.12	2.14	1.20	0.00	0.00	6.86
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.60	8.47	0.71	12.00	0.00	0.00	26.78
	12	2.03	0.00	4.33	0.00	0.00	7.93	0.00	25.14	16.80	9.53	2.86	19.20	4.67	0.00	92.48
		2.03	0.00	4.33	0.00	0.00	7.93	0.00	25.14	23.80	23.29	5.71	37.20	4.67	0.00	134.10
1992	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.80	0.00	0.00	0.00	0.00	0.00	2.80
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.29	1.40	4.24	0.00	3.60	0.00	0.00	11.52
	12	8.10	2.83	4.33	0.00	5.10	0.00	0.00	4.00	12.60	7.41	0.71	14.40	0.00	0.00	59.48
		8.10	2.83	4.33	0.00	5.10	0.00	0.00	6.29	16.80	11.65	0.71	18.00	0.00	0.00	73.81

1f. NORTHERN ANCHOVY

NORTHERN ANCHOVY FALL MIDWATER TRAWL ABUNDANCE

YEAR	MO.	AREA 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1967	9	2114.10		8346.93	15600.00				20350.00			192.00	63.00	0.00	0.00	0.00	0.00	0.00	46666.03
	10	3078.00		16027.17	33150.00				30525.00		0.00	960.00	217.78	0.00	0.00	0.00	0.00	0.00	83957.94
	11	607.50		14678.70	9620.00				3996.00		4.80	80.00	6.22	0.00	0.00	0.00	0.00	0.00	28993.22
	12	40.50		463.30					4736.00			32.00	4.67	0.00	0.00	0.00	0.00	0.00	5276.47
		5840.10	0.00	39516.10	58370.00	0.00	0.00	0.00	59607.00	0.00	4.80	1264.00	291.67	0.00	0.00	0.00	0.00	0.00	164893.67
1968	9	275.40		26630.33	994.50			40.80	12025.00			1024.00	553.78	350.53	100.71	0.00	0.00	0.00	41995.05
	10	0.00		30.13	0.00			10.20	277.50			5952.00	147.78	108.00	35.00	0.00	0.00	0.00	6560.61
	11	7508.70		2794.87	52.00			0.00	0.00			1168.00	85.56	22.74	5.00	0.00	0.00	0.00	11636.86
	12	16.20		7.53	468.00			469.20	0.00			304.00	1.56	0.00	0.00	0.00	0.00	0.00	1266.49
		7800.30	0.00	29462.87	1514.50	0.00	0.00	520.20	12302.50	0.00	0.00	8448.00	788.67	481.26	140.71	0.00	0.00	0.00	61459.01
1969	9	234.90	1974.00	1819.30	5850.00	2641.30		6623.20	13449.50	4099.50		896.00	96.44	0.00	0.00	0.00	0.00	0.00	37684.14
	10	0.00	8.40	930.37	958.75	1543.30		3097.40	388.50	244.50		64.00	0.00	0.00	0.00	0.00	0.00	0.00	7235.22
	11	*data missing*																	4696.87
	12	16.20	56.00	184.57	9.75	18.30		10.20	1461.50	402.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2158.52
		251.10	2038.40	2934.23	6818.50	4202.90	0.00	9730.80	15299.50	4746.00	0.00	960.00	96.44	0.00	0.00	0.00	0.00	0.00	51774.74
1970	9	166.05	120.40	7161.38	786.50	1525.00		6737.10	407.00		4.80	411.43	257.60	0.00	0.00	0.00	0.00	0.00	17577.25
	10	318.60	42.00	4691.76	257.83	679.13	383.50	19905.30	1160.88		0.00	102.86	56.00	0.00	0.00	0.00	0.00	0.00	27597.86
	11	329.40	0.00	613.97	4.33	10.17	11.80	3388.44	254.38	21.00	0.00	5.33	2.80	0.00	0.00	0.00	0.00	0.00	4641.62
	12	72.90	5.60	15.07	10.83	0.00	0.00	30.60	185.00	22.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	342.50
		886.95	168.00	12482.17	1059.50	2214.30	395.30	30061.44	2007.25	43.50	4.80	519.62	316.40	0.00	0.00	0.00	0.00	0.00	50159.23
1971	9	2401.65	5040.00	19074.40	3564.17	2263.10	501.50	14252.80	19878.25	12712.50	4.80	550.86	333.20	0.00	0.00	0.00	0.00	0.00	80577.22
	10	1470.15	260.40	3851.42	409.50	1895.07	218.30	1420.35	16922.88	2533.50	0.00	242.29	302.40	0.00	0.00	0.00	0.00	0.00	29526.24
	11	127.58	3253.60	9441.15	2537.17	681.17	625.40	3553.00	24003.75	1357.50	14.40	121.14	0.00	0.00	0.00	0.00	0.00	0.00	45715.85
	12	540.68	14.00	1118.70	6.50	29.28		102.00	693.75	94.50	14.40	26.67	0.00	0.00	0.00	0.00	0.00	0.00	2640.47
		4540.05	8568.00	33485.67	6517.33	4868.61	1345.20	19328.15	61498.63	16698.00	33.60	940.95	635.60	0.00	0.00	0.00	0.00	0.00	158459.79
1972	9	18.90	11.20	35.78	0.00	0.00	584.10	10.20	7.40	4.50	0.00	669.71	226.80	5.40	107.50	0.00	0.00	0.00	1681.50
	10	129.60	0.00	2201.62	93.17	248.07	2817.25	311.10	12.33	1.50	0.00	1674.67	476.00	74.00	8.75	0.00	0.00	0.00	8048.05
	11	4.05	0.00	1.88	3.25	582.55	230.10	0.00	0.00	4.50	0.00	84.57	50.40	1.80	0.00	0.00	0.00	0.00	963.10
	12	40.50	140.00	593.25	0.00	30.50			513.38	336.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1653.63
		193.05	151.20	2832.53	96.42	861.12	3631.45	321.30	533.11	346.50	0.00	2428.95	753.20	81.20	116.25	0.00	0.00	0.00	12346.28
1973	9	634.50		6176.58	2372.50	610.00			25060.56		28.80	338.67	455.78	32.00	8.57	0.00	0.00	0.00	35717.96
	10	779.63		452.00	455.00	658.80			11005.19		4.80	61.33	180.44	10.59	2.86	0.00	0.00		13610.64
	11	929.48		2427.24	2073.50	146.40			4212.71		4.80	218.67	2.80	0.00	0.00	0.00	0.00		10015.60
	12	0.00		63.28	6.50	0.00					0.00	0.00	0.00	0.00	0.00	0.00	0.00		69.78
		2343.60	0.00	9119.10	4907.50	1415.20	0.00	0.00	40278.46	0.00	38.40	618.67	639.02	42.59	11.43	0.00	0.00	0.00	59413.97

NORTHERN ANCHOVY FALL MIDWATER TRAWL ABUNDANCE

YEAR	MO.	AREA 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1975	9	58.73		1792.18	11843.00	451.40			5355.75		4.80	1210.67	72.80	0.00	0.00	0.00	0.00	0.00	20789.32
	10	271.35		210.18	110.50	12.20			1165.50		0.00	109.33	1.40	0.00	0.00	0.00	0.00		1880.46
	11	8.10		58.76	52.00	0.00			1480.00		0.00	91.43	1.40	1.13	0.00	0.00	0.00		1692.81
	12	20.25		0.00	0.00	0.00					0.00	59.43	16.80	0.00	0.00	0.00	0.00		96.48
		358.43	0.00	2061.12	12005.50	463.60	0.00	0.00	8001.25	0.00	4.80	1470.86	92.40	1.13	0.00	0.00	0.00	0.00	24459.08
1976	9		*data missing*																224.59
	10	2.03	0.00	2.26	60.67	0.00			0.00		0.00	21.33	60.20	12.38	12.14	0.00	0.00	0.00	171.00
	11	40.50	0.00	13.56	13.00	36.60			13.88		0.00	58.67	11.20	11.57	0.00	0.00	0.00	0.00	198.97
	12		*data missing*																157.37
		42.53	0.00	15.82	73.67	36.60	0.00	0.00	13.88	0.00	0.00	80.00	71.40	23.95	12.14	0.00	0.00	0.00	751.93
1977	9	2112.08	58.80	2162.07	1215.50	1110.20	342.20	476.00	14194.79		24.00	1413.33	1255.80	1243.20	40.71	39.27	19.09	0.00	25707.04
	10	12480.08	182.00	1561.28	1100.67	902.80	805.35	1884.45	12096.69		187.20	893.33	12.60	514.80	6.43	55.64	3.82	0.00	32687.13
	11	105.30	137.20	209.05	54.17	1482.30		377.40	709.94		0.00	109.33	60.20	99.00	4.29	2.18	0.00	0.00	3350.36
	12	20.25	0.00	13.18	30.33	34.57	0.00	17.00	228.17		0.00	5.33	4.67	5.14	3.57	0.00	0.00	0.00	362.21
		14717.70	378.00	3945.58	2400.67	3529.87	1147.55	2754.85	27229.58	0.00	211.20	2421.33	1333.27	1862.14	55.00	97.09	22.91	0.00	62106.74
1978	9	251.10	1624.00	6164.15	234.00	721.83	277.30	867.00	23610.63		33.60	557.33	456.40	81.60	86.43	0.00	0.00	0.00	34965.37
	10	305.10	103.60	1534.92	2656.33	3198.43	247.80	5326.95	7450.88		100.80	584.00	450.80	14.63	21.43	0.00	0.00	0.00	21995.66
	11	51.30	0.00	107.35	97.50	8.13	0.00	283.05	1734.38		4.80	61.33	24.00	2.12	0.00	0.00	0.00	0.00	2373.96
	12	24.30	0.00	106.22	13.00	0.00		0.00	218.30		4.80	54.40	5.60	1.29	0.00	0.00	0.00	0.00	427.91
		631.80	1727.60	7912.64	3000.83	3928.40	525.10	6477.00	33014.18	0.00	144.00	1257.07	936.80	99.63	107.86	0.00	0.00	0.00	59762.90
1980	9	1316.25		1231.70	4766.67	2440.00		2550.00	14007.14		172.80	624.00	1594.60	79.71	51.43	0.00	0.00	0.00	28834.30
	10	5940.00		17402.00	9750.00	6100.00		32640.00	8417.50		43.20	1626.67	2045.75	52.71	30.00	0.00	0.00	0.00	84047.83
	11	340.20		11.30	30.33	24.40		76.50	14.80		9.60	22.40	93.33	5.63	1.43	0.00	0.00	0.00	629.92
	12	0.00		357.08	101.83	73.20		647.70	308.33		0.00	19.20	5.60	0.00	0.00	0.00	0.00	0.00	1512.95
		7596.45	0.00	19002.08	14648.83	8637.60	0.00	35914.20	22747.78	0.00	225.60	2292.27	3739.28	138.05	82.86	0.00	0.00	0.00	115025.00
1981	9	8294.40		8945.08	10487.75	106140.00		4029.00	37540.20		124.80	7509.33	2468.20	897.75	215.83	0.00	0.00	0.00	186652.35
	10	621.68		3943.70	693.33	646.60		3641.40	5932.33		48.00	86.86	299.60	188.47	110.83	2.67	0.00	0.00	16215.47
	11	48.60		992.14	424.67			188.70	2479.00		72.00	178.29	47.60	91.20	21.67	0.00	0.00	0.00	4543.86
	12	0.00		0.00	13.00	0.00		0.00	345.33		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	358.33
		8964.68	0.00	13880.92	11618.75	106786.60	0.00	7859.10	46296.87	0.00	244.80	7774.48	2815.40	1177.42	348.33	2.67	0.00	0.00	207770.01
1982	9	189.00		35418.72	218.83	158.60		9271.80	60010.92		192.00	219.43	37.80	0.00	0.00	0.00	0.00	0.00	105717.10
	10	236.93		3331.24	429.00	1378.60		504.90	19773.42		0.00	123.43	5.60	0.00	0.00	0.00	0.00	0.00	25783.11
	11	696.60		4138.06	3143.83	744.20		9894.00	10077.21		0.00	8.00	2.80	0.00	0.00	0.00	0.00	0.00	28704.71
	12	0.00		14.13	41.17	12.20		10.20	3.70		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	81.39
		1122.53	0.00	42902.15	3832.83	2293.60	0.00	19680.90	89865.25	0.00	192.00	350.86	46.20	0.00	0.00	0.00	0.00	0.00	160286.31

NORTHERN ANCHOVY FALL MIDWATER TRAWL ABUNDANCE

		AREA																	
YEAR	MO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1983	9	1111.73		5256.76	4352.83	11943.80		11964.60	7320.71		24.00	1092.57	1.40	0.00	0.00	0.00	0.00	0.00	43068.40
	10	13308.30		17053.96	33063.33	43554.00		26132.40	22385.00		0.00	397.71	2.80	0.00	0.00	0.00	0.00	0.00	155897.51
	11	22.28		759.36	470.17	122.00		800.70	444.00		4.80	2.29	0.00	0.00	0.00	0.00	0.00	0.00	2625.59
	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.08		0.00	0.00	0.00	0.00	0.00	0.00	0.00		3.08
		14442.30	0.00	23070.08	37886.33	55619.80	0.00	38897.70	30152.80	0.00	28.80	1492.57	4.20	0.00	0.00	0.00	0.00	0.00	201594.58
1984	9	2559.60		16344.32	6809.83	7789.70		9588.00	71106.60		331.20	392.00	637.00	28.59	92.86	0.00	0.00	0.00	115679.70
	10	271.35		632.80	346.67	219.60		606.90	9421.79		48.00	181.33	96.60	3.38	7.14	0.00	0.00		11835.55
	11	637.88	224.00	870.10	1287.00	636.43	483.80	3557.76	3073.64	192.00	67.20	178.67	190.40	13.50	32.86	0.00	0.00		11445.24
	12	62.78		83.62	2.17	61.00	14.75	95.20	471.75		0.00	2.67	0.00	0.00	0.00	0.00	0.00		793.93
		3531.60	224.00	17930.84	8445.67	8706.73	498.55	13847.86	84073.78	192.00	446.40	754.67	924.00	45.46	132.86	0.00	0.00	0.00	139754.42
1985	9	301.73		9901.06	29267.33	12.20		0.00	4944.79		38.40	2893.71	919.80	379.06	113.57	0.00	0.00	0.00	48771.65
	10	253.13		1139.04	754.00	1970.30		5.10	7400.00		4.80	340.57	305.20	1542.71	344.29	9.60	0.00	0.00	14068.73
	11	0.00		2.26	6.50	0.00		0.00	5764.07		0.00	2.29	92.40	181.13	29.29	72.00	0.00		6149.93
	12	10.13		0.00	0.00	6.10		0.00	18.50		0.00	29.71	7.00	0.00	0.00	0.00	0.00		71.44
		564.98	0.00	11042.36	30027.83	1988.60	0.00	5.10	18127.36	0.00	43.20	3266.29	1324.40	2102.89	487.14	81.60	0.00	0.00	69061.74
1986	9	607.50		8402.68	5260.67	30.50		10302.00	21174.57		28.80	9051.43	488.44	129.18	34.29	0.00	0.00	0.00	55510.05
	10	3383.78		7910.00	6591.00	2348.50		26754.60	19314.00		0.00	413.71	231.00	10.59	0.00	0.00	0.00	0.00	66957.18
	11	360.45		3200.16	320.67	103.70		810.90	17063.17		0.00	27.43	11.20	1.06	0.00	0.00	0.00	0.00	21898.73
	12	159.98		517.54	316.33	122.00		550.80	1695.83		0.00	256.00	26.60	1.06	0.00	0.00	0.00		3646.14
		4511.70	0.00	20030.38	12488.67	2604.70	0.00	38418.30	59247.57	0.00	28.80	9748.57	757.24	141.88	34.29	0.00	0.00	0.00	148012.10
1987	9	206.55		1005.70	240.50	414.80		1856.40	2082.57		38.40	134.86	35.00	46.59	21.43	2.40	0.00	0.00	6085.20
	10	293.63		9903.32	279.50	128.10		1953.30	5996.64		14.40	34.29	85.40	91.13	5.71	6.00	2.33	0.00	18793.75
	11	40.50		305.10	62.83	18.30		45.90	414.93		4.80	178.29	25.20	50.82	7.14	0.00	4.67	0.00	1158.48
	12	0.00		2.26	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.26
		540.68	0.00	11216.38	582.83	561.20	0.00	3855.60	8494.14	0.00	57.60	347.43	145.60	188.54	34.29	8.40	7.00	0.00	26039.68
1988	9	321.98		901.74	80.17	18.30		719.10	11073.57		28.80	43.43	12.60	2.12	2.14	0.00	0.00	0.00	13203.94
	10	947.70		2734.60	3187.17	695.40		4794.00	4384.50		0.00	13.71	1.40	1.06	0.71	0.00	0.00	0.00	16760.25
	11	30.38		194.36	2.17	0.00		107.10	317.14		0.00	4.57	1.40	1.06	0.00	0.00	0.00	0.00	658.17
	12	2.03		13.56	0.00	0.00		5.10	27.75		0.00	0.00	0.00	0.00	0.00	0.00	0.00		48.44
		1302.08	0.00	3844.26	3269.50	713.70	0.00	5625.30	15802.96	0.00	28.80	61.71	15.40	4.24	2.86	0.00	0.00	0.00	30670.81
1989	9	2150.55		4628.48	74.75	250.10			17945.00		0.00	70.86	30.80	1.06	17.14	0.00	0.00	0.00	25168.74
	10	783.68		166.68	567.67	396.50		61.20	787.57		0.00	0.00	1.40	0.00	0.00	0.00	0.00	0.00	2764.69
	11	50.63		115.26	134.33	0.00		30.60	145.36		0.00	22.86	2.80	0.00	0.71	0.00	0.00	0.00	502.55
	12	0.00		22.60	4.33	0.00		66.30	126.86		0.00	4.57	4.20	0.00	0.00	0.00	0.00	0.00	228.86
		2984.85	0.00	4933.02	781.08	646.60	0.00	158.10	19004.79	0.00	0.00	98.29	39.20	1.06	17.86	0.00	0.00	0.00	28664.84

NORTHERN ANCHOVY FALL MIDWATER TRAWL ABUNDANCE

		AREA																	
YEAR	MO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1990	9	793.80		1396.68	604.50	24.40		2060.40	35514.71		9.60	98.29	1.40	0.00	1.43	0.00	0.00	0.00	40505.21
	10	1364.85		18066.44	7795.67	48.80		11673.90	34079.64		91.20	160.00	42.00	3.18	7.86	1.20	0.00	0.00	73334.73
	11	97.20		2449.84	234.00	24.40		831.30	8796.75		19.20	310.86	8.40	0.00	0.71	0.00	0.00	0.00	12772.66
	12	277.43		467.82	136.50	18.30		76.50	906.50		0.00	25.14	1.40	0.00	0.00	0.00	0.00	0.00	1909.59
		2533.28	0.00	22380.78	8770.67	115.90	0.00	14642.10	79297.61	0.00	120.00	594.29	53.20	3.18	10.00	1.20	0.00	0.00	128522.19
1991	9	4323.38		4181.00	1698.67	1714.10		1422.90	3633.93		806.40	420.57	54.60	20.12	16.43	0.00	0.00	0.00	18292.09
	10	7593.75		3168.52	710.67	1122.40		749.70	16903.71		192.00	1654.86	163.80	1.06	0.71	0.00	0.00	0.00	32261.18
	11	747.23		431.66	62.83	42.70		45.90	2270.21		91.20	381.71	32.20	86.82	2.86	0.00	0.00	0.00	4195.33
	12	78.98		262.16	45.50	12.20		76.50	895.93		0.00	9.14	5.60	0.00	0.00	0.00	0.00	0.00	1386.01
		12743.33	0.00	8043.34	2517.67	2891.40	0.00	2295.00	23703.79	0.00	1089.60	2466.29	256.20	108.00	20.00	0.00	0.00	0.00	56134.60
1992	9	10133.10		17216.68	4942.17	4263.90		2346.00	98671.07		72.00	370.29	184.80	96.35	102.86	3.60	3.50	0.00	138406.31
	10	1941.98		39231.34	962.00	207.40		29784.00	65207.21		0.00	971.43	46.20	113.29	1.43	1.20	0.00	0.00	138467.48
	11	224.78		1430.58	548.17	146.40		8792.40	4577.43		48.00	50.29	0.00	26.47	0.71	0.00	0.00	0.00	15845.22
	12	10.13		149.73	84.50	0.00		142.80	1868.50		0.00	14.00	1.40	0.00	0.00	0.00	0.00	0.00	2271.05
		12309.98	0.00	58028.33	6536.83	4617.70	0.00	41065.20	170324.21	0.00	120.00	1406.00	232.40	236.12	105.00	4.80	3.50	0.00	294990.07

1g. PACIFIC HERRING

PACIFIC HERRING FALL MIDWATER TRAWL ABUNDANCE

YEAR	MONTH	AREA 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1967	9	16.20		90.40	13.00				333.00			16.00	0.00	0.00	0.00	0.00	0.00	0.00	468.60
	10	0.00		0.00	0.00				0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00		3.77	0.00				18.50		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	22.27
	12	0.00		3.77					0.00			240.00	1.56	1.89	0.00	0.00	0.00	0.00	247.22
		16.20	0.00	97.93	13.00	0.00	0.00	0.00	351.50	0.00	0.00	256.00	1.56	1.89	0.00	0.00	0.00	0.00	738.08
1968	9	0.00		94.17	13.00			0.00	0.00			16.00	0.00	0.00	0.00	0.00	0.00	0.00	123.17
	10	0.00		0.00	0.00			0.00	0.00			0.00	4.67	0.00	0.00	0.00	0.00	0.00	4.67
	11	0.00		0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	8.10		3.77	6.50			0.00	0.00			0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.37
		8.10	0.00	97.93	19.50	0.00	0.00	0.00	0.00	0.00	0.00	16.00	4.67	0.00	0.00	0.00	0.00	0.00	146.20
1969	9	0.00	28.00	3.77	13.00	42.70		122.40	462.50	165.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	837.37
	10	0.00	0.00	308.87	0.00	0.00		0.00	18.50	25.50		0.00	0.00	0.00	0.00	0.00	0.00	0.00	352.87
	11		*data missing*																176.43
	12	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	28.00	312.63	13.00	42.70	0.00	122.40	481.00	190.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1366.67
1970	9	0.00	0.00	90.40	9.75	0.00		0.00	18.50		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	118.65
	10	5.40	0.00	85.88	0.00	0.00	0.00	0.00	462.50		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	553.78
	11	0.00	0.00	1.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.88
	12	0.00	0.00	1.88	0.00	0.00	0.00	0.00	2.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.53
		5.40	0.00	180.05	9.75	0.00	0.00	0.00	483.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	678.84
1971	9	0.00	509.60	838.46	28.17	0.00	29.50	74.80	185.00	121.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1787.03
	10	26.33	2.80	203.40	0.00	0.00	0.00	0.00	476.38	217.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	926.40
	11	2.03	0.00	54.62	4.33	0.00	0.00	10.20	62.44	31.50	0.00	2.29	0.00	1.80	0.00	0.00	0.00	0.00	169.20
	12	2.03	0.00	24.48	6.50	2.44		0.00	185.00	27.00	0.00	2.67	0.00	0.00	0.00	0.00	0.00	0.00	250.12
		30.38	512.40	1120.96	39.00	2.44	29.50	85.00	908.81	397.50	0.00	4.95	0.00	1.80	0.00	0.00	0.00	0.00	3132.74
1972	9	2.70	0.00	1.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.86	0.00	0.00	0.00	0.00	0.00	0.00	11.44
	10	0.00	0.00	0.00	0.00	0.00	0.00	5.10	0.00	0.00	0.00	2.67	0.00	0.00	0.00	0.00	0.00	0.00	7.77
	11	0.00	0.00	1.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	8.00	0.00	11.88
	12	0.00	0.00	0.00	0.00	0.00			4.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.63
		2.70	0.00	3.77	0.00	0.00	0.00	5.10	4.63	0.00	0.00	9.52	0.00	0.00	0.00	2.00	8.00	0.00	35.72
1973	9	70.20		174.02	26.00	12.20			1112.31		4.80	13.33	17.11	0.00	0.71	0.00	0.00	0.00	1430.69
	10	6.08		513.02	19.50	24.40			906.50		0.00	21.33	3.11	0.00	0.00	0.00	0.00		1493.94
	11	0.00		18.08	0.00	12.20			124.21		0.00	0.00	0.00	0.00	0.00	0.00	0.00		154.49
	12	0.00		0.00	3.25	0.00					0.00	0.00	0.00	0.00	0.00	0.00	0.00		3.25
		76.28	0.00	705.12	48.75	48.80	0.00	0.00	2143.03	0.00	4.80	34.67	20.22	0.00	0.71	0.00	0.00	0.00	3082.37

PACIFIC HERRING FALL MIDWATER TRAWL ABUNDANCE

YEAR	MONTH	AREA 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1975	9	0.00		42.94	3.25	0.00			113.31		0.00	16.00	0.00	0.00	0.00	0.00	0.00	0.00	175.50
	10	2.03		4.52	6.50	0.00			4.63		0.00	18.67	1.40	0.00	0.00	0.00	0.00		37.74
	11	2.03		11.30	3.25	0.00			2.64		0.00	2.29	0.00	0.00	0.00	0.00	0.00		21.50
	12	0.00		0.00	0.00	12.20					4.80	0.00	1.40	0.00	0.00	0.00	0.00		18.40
		4.05	0.00	58.76	13.00	12.20	0.00	0.00	120.58	0.00	4.80	36.95	2.80	0.00	0.00	0.00	0.00	0.00	253.14
1976	9		***data missing***																16.67
	10	0.00	0.00	0.00	0.00	0.00			0.00		0.00	2.67	2.80	0.00	0.00	0.00	0.00	0.00	5.47
	11	2.03	0.00	0.00	0.00	0.00			0.00		0.00	0.00	2.80	3.86	0.00	0.00	0.00	0.00	8.68
	12		***data missing***																12.08
		2.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.67	5.60	3.86	0.00	0.00	0.00	0.00	42.90
1977	9	2.03	0.00	15.07	15.17	8.13	11.80	20.40	18.50		0.00	2.67	0.00	1.20	0.00	0.00	0.00	0.00	94.96
	10	4.05	5.60	5.65	0.00	2.03	0.00	0.00	30.06		0.00	2.67	0.00	0.00	0.00	0.00	0.00	0.00	50.06
	11	4.05	2.80	0.00	0.00	2.03		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.88
	12	8.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	21.33	3.11	1.29	0.00	0.00	0.00	0.00	33.83
		18.23	8.40	20.72	15.17	12.20	11.80	20.40	48.56	0.00	0.00	26.67	3.11	2.49	0.00	0.00	0.00	0.00	187.73
1978	9	4.05	11.20	50.85	8.67	6.10	200.60	10.20	87.88		0.00	5.33	0.00	0.00	0.00	0.00	0.00	0.00	384.88
	10	0.00	0.00	1.88	0.00	2.03	0.00	0.00	2.31		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.23
	11	0.00	2.80	1.88	0.00	0.00	0.00	5.10	13.88		0.00	5.33	0.00	0.00	0.00	0.00	0.00	0.00	28.99
	12	5.40	0.00	2.26	0.00	8.13		0.00	3.70		0.00	0.00	0.00	1.29	0.00	0.00	0.00	0.00	20.78
		9.45	14.00	56.88	8.67	16.27	200.60	15.30	107.76	0.00	0.00	10.67	0.00	1.29	0.00	0.00	0.00	0.00	440.87
1980	9	16.20		27.12	0.00	0.00		0.00	21.14		0.00	10.67	19.60	2.57	0.00	0.00	0.00	0.00	97.30
	10	0.00		15.82	2.17	0.00		5.10	58.58		0.00	72.00	1.75	0.00	0.00	0.00	0.00	0.00	155.42
	11	0.00		0.00	15.17	0.00		0.00	74.00		0.00	44.80	180.44	4.50	0.71	0.00	0.00	0.00	319.63
	12	24.30		210.18	23.83	24.40		56.10	314.50		4.80	48.00	109.20	13.20	0.00	0.00	0.00	0.00	828.51
		40.50	0.00	253.12	41.17	24.40	0.00	61.20	468.23	0.00	4.80	175.47	310.99	20.27	0.71	0.00	0.00	0.00	1400.86
1981	9	0.00		2.26	0.00	0.00		25.50	7.40		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35.16
	10	0.00		6.78	0.00	36.60		0.00	92.50		0.00	2.29	1.40	1.06	0.00	0.00	0.00	0.00	140.62
	11	0.00		0.00	0.00			0.00	21.58		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	21.58
	12	0.00		0.00	0.00	0.00		10.20	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.20
		0.00	0.00	9.04	0.00	36.60	0.00	35.70	121.48	0.00	0.00	2.29	1.40	1.06	0.00	0.00	0.00	0.00	207.57
1982	9	89.10		800.04	69.33	36.60		122.40	4347.50		9.60	6.86	4.20	0.00	0.00	0.00	0.00	0.00	5485.63
	10	18.23		65.54	0.00	0.00		0.00	80.17		0.00	162.29	19.60	0.00	0.00	0.00	0.00	0.00	345.82
	11	8.10		0.00	0.00	0.00		0.00	737.36		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	745.46
	12	0.00		59.33	34.67	0.00		0.00	55.50		0.00	2.67	0.00	0.00	0.00	0.00	0.00	0.00	152.16
		115.43	0.00	924.91	104.00	36.60	0.00	122.40	5220.52	0.00	9.60	171.81	23.80	0.00	0.00	0.00	0.00	0.00	6729.06

PACIFIC HERRING FALL MIDWATER TRAWL ABUNDANCE

		AREA																	
YEAR	MONTH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1983	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00		2.26	2.17	0.00		0.00	29.07		0.00	20.57	8.40	0.00	0.00	0.00	0.00	0.00	62.47
	11	0.00		6.78	0.00	0.00		0.00	18.50		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.28
	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.08		0.00	0.00	0.00	0.00	0.00	0.00	0.00		3.08
		0.00	0.00	9.04	2.17	0.00	0.00	0.00	50.65	0.00	0.00	20.57	8.40	0.00	0.00	0.00	0.00	0.00	90.83
1984	9	2.03		9.04	0.00	0.00		0.00	37.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	48.07
	10	0.00		2.26	0.00	0.00		0.00	10.57		0.00	0.00	0.00	0.00	0.00	0.00	0.00		12.83
	11	0.00	0.00	0.00	2.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		2.17
	12	0.00		0.00	0.00	0.00	2.95	0.00	6.17		0.00	0.00	0.00	0.00	0.00	0.00	0.00		9.12
		2.03	0.00	11.30	2.17	0.00	2.95	0.00	53.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	72.18
1985	9	0.00		38.42	4.33	0.00		0.00	18.50		0.00	0.00	7.00	3.18	0.00	0.00	0.00	0.00	71.43
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.71	0.00	0.00	0.00	0.71
	11	0.00		0.00	0.00	0.00		0.00	7.93		0.00	0.00	0.00	2.25	0.00	0.00	0.00		10.18
	12	2.03		13.56	0.00	0.00		0.00	2.64		0.00	0.00	2.80	0.00	0.71	0.00	0.00		21.74
		2.03	0.00	51.98	4.33	0.00	0.00	0.00	29.07	0.00	0.00	0.00	9.80	5.43	1.43	0.00	0.00	0.00	104.06
1986	9	2.03		0.00	0.00	0.00		0.00	7.93		0.00	4.57	0.00	0.00	0.00	0.00	0.00	0.00	14.53
	10	0.00		0.00	0.00	30.50		5.10	0.00		0.00	0.00	1.40	0.00	0.00	0.00	0.00	0.00	37.00
	11	0.00		2.26	0.00	0.00		5.10	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.36
	12	0.00		0.00	0.00	0.00		0.00	24.67		4.80	4.57	0.00	0.00	0.00	0.00	0.00		34.04
		2.03	0.00	2.26	0.00	30.50	0.00	10.20	32.60	0.00	4.80	9.14	1.40	0.00	0.00	0.00	0.00	0.00	92.92
1987	9	0.00		4.52	0.00	0.00		0.00	5.29		0.00	2.29	0.00	0.00	0.00	0.00	0.00	0.00	12.09
	10	2.03		6.78	0.00	6.10		0.00	42.29		0.00	9.14	0.00	0.00	0.00	0.00	0.00	0.00	66.33
	11	0.00		0.00	0.00	0.00		0.00	5.29		0.00	2.29	2.80	1.06	0.00	0.00	0.00	0.00	11.43
	12	6.08		4.52	0.00	0.00		0.00	26.43		0.00	0.00	1.40	0.00	0.00	0.00	0.00	0.00	38.42
		8.10	0.00	15.82	0.00	6.10	0.00	0.00	79.29	0.00	0.00	13.71	4.20	1.06	0.00	0.00	0.00	0.00	128.28
1988	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	2.03		4.52	4.33	6.10		10.20	10.57		0.00	4.57	0.00	0.00	0.00	0.00	0.00	0.00	42.32
	11	0.00		0.00	4.33	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.33
	12	0.00		0.00	0.00	6.10		0.00	3.08		0.00	4.57	4.20	1.20	0.00	0.00	0.00		19.15
		2.03	0.00	4.52	8.67	12.20	0.00	10.20	13.65	0.00	0.00	9.14	4.20	1.20	0.00	0.00	0.00	0.00	65.81
1989	9	0.00		101.70	0.00	0.00			1865.86		0.00	0.00	0.00	0.00	0.71	0.00	0.00	0.00	1968.27
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00		0.00	0.00	0.00		5.10	0.00		0.00	2.29	0.00	0.00	0.00	0.00	0.00	0.00	7.39
	12	0.00		0.00	0.00	0.00		0.00	5.29		0.00	2.29	0.00	0.00	0.00	0.00	0.00	0.00	7.57
		0.00	0.00	101.70	0.00	0.00	0.00	5.10	1871.14	0.00	0.00	4.57	0.00	0.00	0.71	0.00	0.00	0.00	1983.23

PACIFIC HERRING FALL MIDWATER TRAWL ABUNDANCE

		AREA																	
YEAR	MONTH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1990	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00		0.00	0.00	0.00		0.00	5.29		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.29
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	0.00		0.00	0.00	0.00		0.00	2.64		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.64
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.93
1991	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.71	0.00	0.00	0.00	0.71
	10	0.00		2.26	0.00	0.00		0.00	5.29		0.00	2.29	0.00	0.00	0.00	0.00	0.00	0.00	9.83
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	2.03		0.00	0.00	0.00		5.10	0.00		0.00	6.86	0.00	0.00	0.00	0.00	0.00	0.00	13.98
		2.03	0.00	2.26	0.00	0.00	0.00	5.10	5.29	0.00	0.00	9.14	0.00	0.00	0.71	0.00	0.00	0.00	24.53
1992	9	0.00		2.26	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.26
	10	0.00		4.52	0.00	0.00		0.00	2.64		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.16
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	6.78	0.00	0.00	0.00	0.00	2.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.42

SPLITTAIL FALL MIDWATER TRAWL ABUNDANCE

YEAR	MONTH	AREA 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1967	9	0.00		0.00	0.00				0.00			16.00	11.20	4.24	11.88	0.00	0.00	0.00	43.31
	10	0.00		0.00	0.00				0.00		0.00	0.00	4.67	0.95	5.71	0.00	0.00	0.00	11.33
	11	0.00		0.00	0.00				0.00		0.00	0.00	0.00	0.00	2.50	0.00	0.00	0.00	2.50
	12	0.00		0.00					0.00			0.00	0.00	4.74	4.38	0.00	0.00	0.00	9.11
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.00	15.87	9.92	24.46	0.00	0.00	0.00	66.25
1968	9	0.00		0.00	0.00			0.00	0.00			0.00	0.00	1.89	4.29	0.00	0.00	0.00	6.18
	10	0.00		0.00	0.00			0.00	0.00			0.00	0.00	0.95	6.25	0.00	0.00	0.00	7.20
	11	0.00		0.00	0.00			0.00	0.00			0.00	0.00	0.00	3.13	0.00	0.00	0.00	3.13
	12	0.00		0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.63	0.00	0.93	0.00	1.56
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.84	14.29	0.00	0.93	0.00	18.06
1969	9	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00		0.00	4.67	0.95	0.63	0.00	0.00	0.00	6.24
	10	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00		0.00	7.78	1.89	0.63	0.00	0.00	0.00	10.30
	11		*data missing*																6.56
	12	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.95	1.88	0.00	0.00	0.00	2.82
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.44	3.79	3.13	0.00	0.00	0.00	25.92
1970	9	0.00	8.40	0.00	6.50	0.00		0.00	0.00		0.00	4.57	0.00	0.00	0.00	0.00	2.00	0.00	21.47
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.80	0.00	0.00	0.00	0.00	1.80
	12	0.00	0.00	0.00	2.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.17
		0.00	8.40	0.00	8.67	0.00	0.00	0.00	0.00	0.00	0.00	4.57	0.00	1.80	0.00	0.00	2.00	0.00	25.44
1971	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.29	0.00	0.00	1.25	0.00	0.00	0.00	3.54
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.57	0.00	0.00	0.00	0.00	0.00	0.00	4.57
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.80	0.00	1.25	0.00	0.00	4.00	8.05
	12	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.25	0.00	0.00	0.00	1.25
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.86	2.80	0.00	3.75	0.00	0.00	4.00	17.41

SPLITTAIL FALL MIDWATER TRAWL ABUNDANCE

		AREA																	
YEAR	MONTH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1972	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.50	0.00	0.00	0.00	2.50
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.25	0.00	0.00	0.00	1.25
	12	0.00	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00	0.00	8.75	0.00	0.00	0.00	8.75
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.50	0.00	0.00	0.00	12.50
1973	9	0.00		0.00	0.00	0.00			0.00		0.00	0.00	0.00	1.00	1.43	0.00	0.00	0.00	2.43
	10	0.00		0.00	0.00	0.00			0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
	11	0.00		0.00	0.00	0.00			0.00		0.00	0.00	0.00	0.00	0.00	2.00	0.00		2.00
	12	0.00		0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.43	2.00	0.00	0.00	4.43
1975	9	0.00		0.00	0.00	0.00			0.00		0.00	0.00	0.00	0.00	2.14	0.00	0.00	0.00	2.14
	10	0.00		0.00	0.00	0.00			0.00		0.00	0.00	0.00	0.00	0.71	0.00	0.00		0.71
	11	0.00		0.00	0.00	0.00			0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
	12	0.00		0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.71	0.00	0.00		0.71
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.57	0.00	0.00	0.00	3.57
1976	9	*data missing*																	0.00
	10	0.00	0.00	0.00	0.00	0.00			0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00	0.00	0.00	0.00	0.00			0.00		0.00	0.00	0.00	0.00	0.71	0.00	0.00	0.00	0.71
	12	*data missing*																	0.00
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.71	0.00	0.00	0.00	0.71
1977	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1978	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	1.40	3.60	9.29	0.00	0.00	0.00	14.29
	10	2.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	5.33	0.00	2.25	3.57	1.09	1.27	0.00	16.22
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	2.12	0.71	1.09	0.00	0.00	3.92
	12	0.00	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	2.80	0.00	0.00	0.00	0.00	0.00	2.80
		2.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.33	4.20	7.97	13.57	2.18	1.27	0.00	37.23

SPLITTAIL FALL MIDWATER TRAWL ABUNDANCE

YEAR	MONTH	AREA 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1980	9	0.00		2.26	0.00	0.00		0.00	0.00		0.00	0.00	1.40	5.14	0.71	0.00	1.56	0.00	11.07
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	1.75	1.29	1.43	0.00	0.00	0.00	4.46
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	1.43	0.00	0.00	0.00	1.43
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	2.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.15	6.43	3.57	0.00	1.56	0.00	16.97
1981	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	1.13	7.50	0.00	0.00	0.00	8.63
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	1.40	0.00	1.67	0.00	0.00	0.00	3.07
	11	0.00		0.00	0.00			0.00	0.00		0.00	0.00	0.00	2.40	0.83	0.00	0.00	0.00	3.23
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	3.33	0.00	0.00	0.00	3.33
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.40	3.53	13.33	0.00	0.00	0.00	18.26
1982	9	0.00		0.00	0.00	0.00		0.00	0.00		19.20	41.14	8.40	3.18	2.50	0.00	1.40	0.00	75.82
	10	0.00		0.00	2.17	0.00		0.00	0.00		14.40	0.00	1.40	1.06	1.43	0.00	0.00	0.00	20.45
	11	0.00		0.00	0.00	0.00		0.00	0.00		4.80	0.00	5.60	0.00	1.43	0.00	0.00	0.00	11.83
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	2.67	0.00	2.12	5.71	0.00	0.00	0.00	10.50
		0.00	0.00	0.00	2.17	0.00	0.00	0.00	0.00	0.00	38.40	43.81	15.40	6.35	11.07	0.00	1.40	0.00	118.60
1983	9	0.00		0.00	2.17	36.60		0.00	0.00		0.00	2.29	2.80	2.12	7.14	0.00	1.17	0.00	54.28
	10	0.00		0.00	0.00	18.30		0.00	0.00		0.00	0.00	2.80	2.25	2.86	0.00	0.00	0.00	26.21
	11	2.03		0.00	32.50	18.30		0.00	0.00		0.00	0.00	4.20	1.13	4.29	0.00	0.00	0.00	62.44
	12	2.03	0.00	0.00	2.17	2.03	0.00	0.00	0.00		0.00	0.00	2.80	1.20	0.00	0.00	0.00		10.23
		4.05	0.00	0.00	36.83	75.23	0.00	0.00	0.00	0.00	0.00	2.29	12.60	6.69	14.29	0.00	1.17	0.00	153.15
1984	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	1.40	7.41	0.71	0.00	0.00	0.00	9.53
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	1.43	0.00	0.00		1.43
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.38	0.71	0.00	0.00		4.09
	12	0.00		0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	1.13	0.00	0.00	0.00		1.13
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.40	11.91	2.86	0.00	0.00	0.00	16.17
1985	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	3.18	0.00	0.00	0.00	0.00	3.18
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	3.57	0.00	0.00	0.00	3.57
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	1.20	1.43	2.40	3.11		8.14
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.38	5.00	2.40	3.11	0.00	14.89
1986	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	4.67	5.29	2.14	0.00	0.00	2.00	14.10
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	4.57	5.60	5.29	4.29	4.00	1.27	0.00	25.02
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	1.40	0.00	1.43	4.80	0.00	0.00	7.63
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	7.41	3.57	0.00	0.00		10.98
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.57	11.67	18.00	11.43	8.80	1.27	2.00	57.74

SPLITTAIL FALL MIDWATER TRAWL ABUNDANCE

YEAR	MONTH	AREA (note 2, 6, 9 missing) 1	3	4	5	7	8	10	11	12	13	14	15	16	17	Total
1987	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.29	5.00	0.00	0.00	0.00	10.29
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.13	0.71	0.00	1.17	0.00	3.01
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.60	0.00	0.00	3.60
	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.43	3.60	4.67	2.00	11.70
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.42	7.14	7.20	5.83	2.00	28.60
1988	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.43	0.00	1.17	0.00	2.60
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.71	2.40	1.17	0.00	4.28
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.12	0.00	0.00	0.00	0.00	2.12
	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.12	2.14	2.40	2.33	0.00	8.99
1989	9	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	2.86	0.00	0.00	0.00	2.86
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.20	0.00	0.00	1.20
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.86	1.20	0.00	0.00	4.06
1990	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.12	0.71	1.20	1.27	0.00	5.30
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.06	1.43	0.00	0.00	0.00	2.49
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.20	0.00	0.00	1.20
	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.18	2.14	2.40	1.27	0.00	8.99
1991	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.35	1.43	0.00	2.33	0.00	10.11
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.71	0.00	1.17	0.00	1.88
	11	0.00	0.00	0.00	0.00	0.00	2.64	0.00	0.00	0.00	0.00	2.14	1.20	0.00	0.00	5.99
	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	2.64	0.00	0.00	0.00	6.35	4.29	1.20	3.50	0.00	17.98
1992	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.40	0.00	0.00	2.40
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.20	0.00	0.00	1.20
	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.60	0.00	0.00	3.60

1i STRIPED BASS

STRIPED BASS FALL MIDWATER TRAWL ABUNDANCE

		AREA																	
YEAR	MONTH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1967	9	16.20		0.00	0.00				0.00			768.00	2557.80	5376.71	2340.63	474.00	505.87	71.43	12110.63
	10	0.00		7.53	0.00				0.00		0.00	16.00	1003.33	1589.68	1367.14	301.20	237.07	50.00	4571.96
	11	8.10		7.53	13.00				0.00		72.00	144.00	855.56	161.05	625.63	63.60	204.40	50.00	2204.87
	12	16.20		3.77					18.50			112.00	854.00	831.79	201.25	66.00	87.73	2.86	2194.10
		40.50	0.00	18.83	13.00	0.00	0.00	0.00	18.50	0.00	72.00	1040.00	5270.69	7959.23	4534.64	904.80	1035.07	174.29	21081.55
1968	9	0.00		0.00	0.00			0.00	0.00			0.00	7.78	994.74	100.71	339.60	226.80	30.77	1700.40
	10	0.00		0.00	0.00			0.00	0.00			0.00	7.78	101.37	106.88	646.80	564.67	15.71	1443.20
	11	0.00		0.00	0.00			0.00	0.00			16.00	65.33	126.00	93.13	153.60	173.60	7.69	635.35
	12	0.00		0.00	0.00			0.00	0.00			16.00	63.78	79.58	27.50	52.80	92.40	6.67	338.72
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	32.00	144.67	1301.68	328.21	1192.80	1057.47	60.84	4117.67
1969	9	0.00	2.80	0.00	6.50	0.00		13.60	0.00	0.00		16.00	175.78	2156.21	936.88	104.00	303.33	250.77	3965.87
	10	0.00	5.60	3.77	52.00	0.00		10.20	0.00	0.00		32.00	496.22	228.32	434.38	115.50	227.73	40.00	1645.71
	11		***data missing***																1486.24
	12	0.00	36.40	90.40	19.50	6.10		0.00	0.00	21.00	33.60	112.00	612.89	65.37	147.50	99.60	45.73	36.67	1326.76
		0.00	44.80	94.17	78.00	6.10	0.00	23.80	0.00	21.00	33.60	160.00	1284.89	2449.89	1518.75	319.10	576.80	327.44	8424.57
1970	9	0.00	11.20	0.00	94.25	19.52		0.00	0.00		4.80	4.57	70.00	468.00	707.50	436.00	428.00	45.71	2289.56
	10	0.00	5.60	2.26	437.67	20.33	0.00	0.00	0.00		19.20	25.14	128.80	145.80	805.00	72.00	158.00	2.86	1822.66
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	81.60	1290.67	988.40	109.80	196.25	26.40	32.00	25.71	2750.83
	12	0.00	0.00	5.65	32.50	8.13	0.00	5.10	7.93	0.00	62.40	864.00	196.00	24.55	53.75	3.00	146.00	25.71	1434.72
		0.00	16.80	7.91	564.42	47.99	0.00	5.10	7.93	0.00	168.00	2184.38	1383.20	748.15	1762.50	537.40	764.00	100.00	8297.77
1971	9	0.00	5.60	20.34	2.17	0.00	5.90	0.00	0.00	0.00	0.00	93.71	1414.00	1446.00	643.75	84.00	174.00	80.00	3969.47
	10	0.00	0.00	0.00	0.00	2.03	17.70	0.00	0.00	0.00	4.80	153.14	215.60	702.00	446.25	26.00	282.00	5.71	1855.24
	11	36.45	0.00	1.88	34.67	0.00	2.95	0.00	0.00	0.00	28.80	114.29	336.00	376.20	336.25	24.00	46.00	16.00	1353.49
	12	26.33	0.00	3.77	257.83	0.00		10.20	0.00	0.00	542.40	389.33	571.20	201.60	168.75	96.00	28.00	0.00	2295.41
		62.78	5.60	25.99	294.67	2.03	26.55	10.20	0.00	0.00	576.00	750.48	2536.80	2725.80	1595.00	230.00	530.00	101.71	9473.61

STRIPED BASS FALL MIDWATER TRAWL ABUNDANCE

		AREA																	
YEAR	MONTH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1972	9	0.00	0.00	5.65	0.00	0.00	11.80	0.00	0.00	0.00	0.00	96.00	1229.20	1094.40	293.75	150.00	262.00	27.50	3170.30
	10	0.00	0.00	0.00	0.00	10.17	2.95	0.00	0.00	0.00	0.00	5.33	154.00	324.00	143.75	80.00	250.00	7.50	977.70
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	28.80	22.86	210.00	745.20	265.00	34.00	60.00	11.43	1377.29
	12	4.05	0.00	0.00	6.50	0.00			0.00	0.00	33.60	61.33	117.60	306.00	16.25	4.00	54.00	0.00	603.33
		4.05	0.00	5.65	6.50	10.17	14.75	0.00	0.00	0.00	62.40	185.52	1710.80	2469.60	718.75	268.00	626.00	46.43	6128.62
1973	9	0.00		0.00	100.75	61.00			0.00		0.00	77.33	34.22	446.00	417.14	270.00	80.00	30.00	1516.45
	10	0.00		0.00	3.25	0.00			0.00		9.60	26.67	45.11	75.18	207.86	40.00	30.80		438.46
	11	18.23		20.34	0.00	0.00			0.00		57.60	122.67	502.60	114.75	85.71	44.00	39.67		1005.56
	12	642.60		79.10	3.25	12.20					148.80	240.00	85.56	64.29	31.67	0.00	16.33		1323.79
		660.83	0.00	99.44	107.25	73.20	0.00	0.00	0.00	0.00	216.00	466.67	667.49	700.21	742.38	354.00	166.80	30.00	4284.26
1975	9	2.03		0.00	3.25	0.00			0.00		19.20	8.00	441.00	430.88	553.57	110.00	176.91	27.50	1772.33
	10	8.10		2.26	0.00	0.00			0.00		14.40	0.00	418.60	41.63	157.86	0.00	37.80		680.64
	11	24.30		4.52	3.25	0.00			0.00		158.40	203.43	425.60	214.88	187.86	24.00	37.33		1283.56
	12	0.00		0.00	0.00	0.00					0.00	6.86	680.40	56.25	54.29	6.00	7.00		810.79
		34.43	0.00	6.78	6.50	0.00	0.00	0.00	0.00	0.00	192.00	218.29	1965.60	743.63	953.57	140.00	259.04	27.50	4547.33
1976	9	*data missing*																	223.56
	10	16.20	0.00	0.00	13.00	4.07			0.00		4.80	2.67	2.80	5.63	7.14	42.00	5.09	12.50	115.89
	11	0.00	0.00	0.00	0.00	0.00			0.00		0.00	2.67	23.80	72.00	33.57	66.00	30.55	13.33	241.92
	12	*data missing*																	176.11
		16.20	0.00	0.00	13.00	4.07	0.00	0.00	0.00	0.00	4.80	5.33	26.60	77.63	40.71	108.00	35.64	25.83	757.48
1977	9	0.00	0.00	0.00	4.33	4.07	0.00	0.00	0.00		0.00	0.00	4.20	10.80	17.14	244.36	2.55	20.00	307.45
	10	0.00	0.00	0.00	0.00	2.03	0.00	0.00	0.00		0.00	0.00	2.80	15.60	14.29	132.00	14.00	22.86	203.58
	11	0.00	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	4.20	11.25	3.57	128.73	25.45	6.67	179.87
	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	1.56	14.14	16.43	106.91	39.45	15.00	193.49
		0.00	0.00	0.00	4.33	6.10	0.00	0.00	0.00	0.00	0.00	0.00	12.76	51.79	51.43	612.00	81.45	64.52	884.39
1978	9	0.00	0.00	3.77	4.33	0.00	2.95	0.00	0.00		0.00	74.67	134.40	388.80	232.14	115.64	126.00	37.50	1120.20
	10	5.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00		4.80	34.67	46.20	85.50	187.86	94.91	66.18	25.00	550.51
	11	2.70	2.80	0.00	0.00	0.00	0.00	0.00	0.00		28.80	10.67	14.00	60.35	34.29	156.00	23.80	6.67	340.07
	12	8.10	0.00	0.00	55.25	0.00		0.00	0.00		0.00	12.80	100.80	169.71	27.86	212.40	2.80	0.00	589.72
		16.20	2.80	3.77	59.58	0.00	2.95	0.00	0.00	0.00	33.60	132.80	295.40	704.37	482.14	578.95	218.78	69.17	2600.50

STRIPED BASS FALL MIDWATER TRAWL ABUNDANCE

		AREA																	
YEAR	MONTH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1980	9	0.00		0.00	2.17	0.00		0.00	2.64		0.00	5.33	7.00	99.00	37.14	262.50	205.33	90.00	711.12
	10	0.00		0.00	0.00	12.20		0.00	0.00		28.80	0.00	26.25	20.57	25.00	109.33	135.33	25.00	382.49
	11	0.00		0.00	0.00	0.00		0.00	0.00		4.80	0.00	10.89	20.25	42.86	12.00	8.75	2.50	102.05
	12	0.00		0.00	2.17	0.00		0.00	0.00		4.80	3.20	56.00	104.40	8.57	68.00	17.11	2.50	266.75
		0.00	0.00	0.00	4.33	12.20	0.00	0.00	2.64	0.00	38.40	8.53	100.14	244.22	113.57	451.83	366.53	120.00	1462.40
1981	9	0.00		0.00	9.75	12.20		0.00	0.00		14.40	96.00	72.80	133.88	84.17	76.00	59.11	26.00	584.30
	10	16.20		9.04	10.83	12.20		0.00	3.08		124.80	93.71	64.40	177.88	27.50	268.00	71.56	37.50	916.71
	11	8.10		11.30	41.17			0.00	0.00		57.60	112.00	67.20	225.60	55.83	248.40	99.56	110.00	1036.76
	12	4.05		149.16	6.50	24.40		0.00	0.00		4.80	805.33	739.20	166.50	57.50	6.86	20.22	10.00	1994.52
		28.35	0.00	169.50	68.25	48.80	0.00	0.00	3.08	0.00	201.60	1107.05	943.60	703.86	225.00	599.26	250.44	183.50	4532.29
1982	9	2.70		13.56	0.00	0.00		0.00	0.00		273.60	43.43	95.20	451.06	214.17	171.60	189.00	22.00	1476.31
	10	14.18		38.42	84.50	195.20		0.00	3.08		19.20	32.00	28.00	315.53	142.86	40.80	14.00	10.00	937.76
	11	6.08		0.00	26.00	73.20		5.10	0.00		33.60	106.67	201.60	271.06	165.71	20.00	25.45	6.00	940.47
	12	111.38		0.00	0.00	0.00		0.00	7.40		9.60	426.67	418.60	26.47	83.57	6.67	22.40	0.00	1112.75
		134.33	0.00	51.98	110.50	268.40	0.00	5.10	10.48	0.00	336.00	608.76	743.40	1064.12	606.31	239.07	250.85	38.00	4467.30
1983	9	6.08		29.38	28.17	689.30		15.30	5.29		0.00	34.29	532.00	204.35	312.14	54.00	28.00	2.00	1940.29
	10	194.40		24.86	30.33	933.30		35.70	2.64		4.80	82.29	18.20	159.75	430.00	34.80	28.00	9.09	1988.16
	11	380.70		289.28	403.00	1409.10		10.20	177.07		14.40	475.43	1533.00	328.50	195.00	43.20	11.45	14.29	5284.62
	12	471.83	0.00	226.00	132.17	109.80	2.95	6.12	64.75		201.60	1682.67	278.60	36.00	64.29	0.00	6.00		3282.76
		1053.00	0.00	569.52	593.67	3141.50	2.95	67.32	249.75	0.00	220.80	2274.67	2361.80	728.60	1001.43	132.00	73.45	25.38	12495.84
1984	9	2.03		0.00	69.33	201.30		0.00	0.00		9.60	48.00	81.20	568.59	100.00	121.20	31.82	56.36	1289.43
	10	204.53		2.26	65.00	103.70		5.10	1609.50		4.80	168.00	91.00	168.75	72.86	148.00	29.40		2672.89
	11	68.85	0.00	15.82	2.17	0.00	0.00	0.00	348.86	0.00	57.60	125.33	200.20	270.00	98.57	140.00	56.00		1383.40
	12	2.03		0.00	0.00	0.00	0.00	0.00	3.08		201.60	112.00	749.00	85.50	46.43	1.33	54.60		1255.57
		277.43	0.00	18.08	136.50	305.00	0.00	5.10	1961.44	0.00	273.60	453.33	1121.40	1092.84	317.86	410.53	171.82	56.36	6601.29
1985	9	0.00		0.00	2.17	0.00		0.00	0.00		0.00	6.86	23.80	15.88	34.29	34.80	3.82	4.00	125.61
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	2.29	98.00	271.06	429.29	9.60	10.18	4.44	824.86
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	11.43	9.80	5.63	11.43	16.00	3.82		58.10
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	9.14	92.40	264.00	20.71	219.60	144.67		750.52
		0.00	0.00	0.00	2.17	0.00	0.00	0.00	0.00	0.00	0.00	29.71	224.00	556.57	495.71	280.00	162.48	8.44	1759.09
1986	9	4.05		9.04	23.83	262.30		0.00	0.00		0.00	2.29	597.33	126.00	111.43	978.00	519.27	72.00	2705.54
	10	0.00		4.52	13.00	0.00		0.00	0.00		4.80	4.57	50.40	57.18	67.14	216.00	91.64	24.00	533.25
	11	4.05		0.00	28.17	0.00		0.00	0.00		81.60	73.14	46.20	29.65	11.43	148.80	71.27	14.00	508.31
	12	22.28		2.26	0.00	0.00		0.00	0.00		33.60	27.43	56.00	19.06	2.86	19.20	14.00		196.68
		30.38	0.00	15.82	65.00	262.30	0.00	0.00	0.00	0.00	120.00	107.43	749.93	231.88	192.86	1362.00	696.18	110.00	3943.78

STRIPED BASS FALL MIDWATER TRAWL ABUNDANCE

YEAR	MONTH	AREA (note 2, 6, 9 missing)														Total
		1	3	4	5	7	8	10	11	12	13	14	15	16	17	
1987	9	2.03	47.46	2.17	6.10	0.00	0.00	0.00	4.57	7.00	30.71	66.43	405.60	10.18	22.00	604.24
	10	8.10	13.56	4.33	18.30	0.00	0.00	14.40	4.57	4.20	15.75	9.29	37.20	26.83	12.00	168.53
	11	38.48	6.78	0.00	6.10	0.00	2.64	0.00	9.14	25.20	13.76	0.00	72.00	30.33	2.00	206.44
	12	38.48	18.08	43.33	6.10	5.10	5.29	9.60	32.00	65.80	6.35	1.43	103.20	29.17	8.00	371.92
		87.08	85.88	49.83	36.60	5.10	7.93	24.00	50.29	102.20	66.57	77.14	618.00	96.52	44.00	1351.13
1988	9	2.03	18.08	0.00	0.00	0.00	0.00	0.00	4.57	0.00	9.53	12.14	43.20	12.83	4.00	106.38
	10	0.00	2.26	0.00	0.00	0.00	0.00	0.00	0.00	9.80	4.24	19.29	46.80	11.67	4.00	98.05
	11	0.00	0.00	2.17	0.00	5.10	0.00	0.00	6.86	14.00	14.82	0.71	66.00	7.00	12.00	128.66
	12	0.00	0.00	0.00	0.00	0.00	3.08	0.00	25.14	72.80	26.40	2.86	1.33	12.00		143.62
		2.03	20.34	2.17	0.00	5.10	3.08	0.00	36.57	96.60	54.99	35.00	157.33	43.50	20.00	476.71
1989	9	0.00	0.00	0.00	0.00		0.00	0.00	20.57	11.20	3.18	8.57	62.40	33.83	14.00	153.75
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.06	0.00	123.60	7.00	20.00	151.66
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.57	7.00	6.35	2.14	37.20	16.55	2.00	75.81
	12	2.03	0.00	0.00	0.00	0.00	0.00	0.00	4.57	36.40	8.47	2.14	2.40	1.27	2.22	59.50
		2.03	0.00	0.00	0.00	0.00	0.00	0.00	29.71	54.60	19.06	12.86	225.60	58.65	38.22	440.73
1990	9	0.00	0.00	0.00	6.10	0.00	0.00	4.80	0.00	15.40	8.47	9.29	88.80	71.27	28.00	232.13
	10	28.35	0.00	0.00	0.00	0.00	0.00	9.60	22.86	0.00	2.12	3.57	102.00	58.33	8.00	234.83
	11	4.05	9.04	0.00	0.00	0.00	0.00	14.40	38.86	96.60	73.06	17.14	126.00	16.33	2.00	397.48
	12	42.53	20.34	32.50	12.20	0.00	0.00	0.00	61.71	203.00	56.12	8.57	10.80	4.67	2.00	454.44
		74.93	29.38	32.50	18.30	0.00	0.00	28.80	123.43	315.00	139.76	38.57	327.60	150.61	40.00	1318.88
1991	9	4.05	2.26	4.33	12.20	0.00	0.00	0.00	27.43	0.00	24.35	12.86	90.00	54.83	27.14	259.46
	10	0.00	0.00	4.33	12.20	0.00	2.64	0.00	2.29	1.40	7.41	2.14	69.60	21.00	4.29	127.30
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.86	5.60	21.18	2.86	18.00	40.83	18.57	113.90
	12	10.13	0.00	0.00	6.10	0.00	0.00	0.00	194.29	131.60	47.65	5.00	46.80	3.50	0.00	445.06
		14.18	2.26	8.67	30.50	0.00	2.64	0.00	230.86	138.60	100.59	22.86	224.40	120.17	50.00	945.71
1992	9	64.80	15.82	8.67	152.50	15.30	10.57	19.20	38.86	32.20	32.82	25.00	115.20	46.67	34.29	611.89
	10	0.00	2.26	13.00	85.40	0.00	0.00	4.80	20.57	18.20	22.24	0.71	60.00	5.83	12.31	245.32
	11	30.38	15.82	15.17	24.40	15.30	5.29	0.00	80.00	120.40	52.94	16.43	126.00	40.83	1.43	544.38
	12	18.23	2.83	28.17	12.20	5.10	64.75	52.80	118.00	121.80	142.94	10.00	25.20	11.67	2.86	616.53
		113.40	36.73	65.00	274.50	35.70	80.61	76.80	257.43	292.60	250.94	52.14	326.40	105.00	50.88	2018.12

1j. THREADFIN SHAD

THREADFIN SHAD FALL MIDWATER TRAWL ABUNDANCE

YEAR	MONTH	AREA 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1967	9	0.00		0.00	0.00				0.00			0.00	0.00	1.06	3.75	19.20	24.27	6755.71	6803.99
	10	0.00		0.00	0.00				0.00		62.40	240.00	73.11	33.16	97.86	225.60	419.07	2507.14	3658.34
	11	0.00		0.00	26.00				0.00		0.00	96.00	21.78	5.68	50.63	26.40	28.00	672.86	927.34
	12	16.20		56.50					18.50			0.00	49.78	86.21	81.25	273.60	347.20	418.57	1347.81
		16.20	0.00	56.50	26.00	0.00	0.00	0.00	18.50	0.00	62.40	336.00	144.67	126.11	233.48	544.80	818.53	10354.29	12737.48
1968	9	0.00		0.00	0.00			0.00	0.00			0.00	0.00	10.42	13.57	37.20	103.60	1550.77	1715.56
	10	0.00		0.00	0.00			0.00	0.00			0.00	0.00	24.63	142.50	213.60	36.40	1150.00	1567.13
	11	0.00		0.00	0.00			0.00	0.00			0.00	10.89	15.16	30.00	38.40	45.73	1467.69	1607.87
	12	0.00		0.00	84.50			0.00	0.00			0.00	7.78	1.89	28.13	73.20	81.20	320.00	596.70
		0.00	0.00	0.00	84.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.67	52.11	214.20	362.40	266.93	4488.46	5487.26
1969	9	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00		0.00	1.56	6.63	31.88	0.00	132.53	6187.69	6360.29
	10	0.00	2.80	0.00	0.00	0.00		0.00	0.00	9.00		16.00	42.00	65.37	18.75	30.00	70.93	895.38	1150.24
	11		*data missing*																841.19
	12	0.00	0.00	11.30	6.50	6.10		6.80	0.00	3.00	0.00	0.00	1.56	12.32	22.50	96.00	41.07	325.00	532.14
		0.00	2.80	11.30	6.50	6.10	0.00	6.80	0.00	12.00	0.00	16.00	45.11	84.32	73.13	126.00	244.53	7408.08	8883.85
1970	9	0.00	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	2.80	16.20	12.50	22.00	160.00	1554.29	1767.79
	10	0.00	0.00	15.82	2.17	12.20	0.00	0.00	0.00		0.00	0.00	47.60	59.40	81.25	40.80	48.00	577.14	884.38
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.33	8.40	73.80	73.75	9.60	62.00	617.14	858.03
	12	0.00	0.00	7.53	8.67	10.17	0.00	7.65	2.64	4.50	4.80	21.33	8.40	13.09	10.00	3.00	76.00	742.86	920.64
		0.00	0.00	23.35	10.83	22.37	0.00	7.65	2.64	4.50	4.80	34.67	67.20	162.49	177.50	75.40	346.00	3491.43	4430.83
1971	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	33.60	50.00	728.57	812.17
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.80	14.40	3.75	6.00	74.00	3480.00	3580.95
	11	26.33	0.00	11.30	36.83	30.50	26.55	47.60	62.44	0.00	4.80	16.00	0.00	36.00	31.25	50.40	78.00	1328.00	1786.00
	12	4.05	8.40	3.77	13.00	0.00		10.20	23.13	10.50	0.00	0.00	0.00	14.40	7.50	21.60	156.00	356.00	628.54
		30.38	8.40	15.07	49.83	30.50	26.55	57.80	85.56	10.50	4.80	16.00	2.80	64.80	42.50	111.60	358.00	5892.57	6807.66
1972	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.40	97.20	53.75	38.00	50.00	1280.00	1527.35
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	84.00	1.25	18.00	28.00	1942.50	2073.75
	11	4.05	0.00	0.00	0.00	12.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.00	35.00	36.00	64.00	945.71	1105.96
	12	0.00	0.00	0.00	0.00	0.00			0.00	0.00	4.80	0.00	0.00	21.60	51.25	34.00	126.00	384.00	621.65
		4.05	0.00	0.00	0.00	12.20	0.00	0.00	0.00	0.00	4.80	0.00	8.40	211.80	141.25	126.00	268.00	4552.21	5328.71
1973	9	0.00		0.00	6.50	0.00			0.00		0.00	0.00	0.00	5.00	16.43	2.00	6.00	1007.50	1043.43
	10	0.00		0.00	0.00	0.00			0.00		0.00	2.67	4.67	4.24	32.14	2.00	0.00		45.71
	11	0.00		0.00	0.00	0.00			0.00		14.40	2.67	8.40	15.75	7.14	6.00	58.33		112.69
	12	0.00		0.00	3.25	0.00					0.00	0.00	6.22	1.29	5.83	9.00	4.67		30.26
		0.00	0.00	0.00	9.75	0.00	0.00	0.00	0.00	0.00	14.40	5.33	19.29	26.27	61.55	19.00	69.00	1007.50	1232.09

THREADFIN SHAD FALL MIDWATER TRAWL ABUNDANCE

		AREA																	
YEAR	MONTH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1975	9	0.00		0.00	0.00	0.00			0.00		0.00	0.00	7.00	0.00	7.14	0.00	11.45	300.00	325.60
	10	0.00		0.00	0.00	0.00			0.00		0.00	5.33	5.60	3.38	2.86	2.40	4.20		23.77
	11	22.28		2.26	3.25	12.20			0.00		4.80	6.86	1.40	2.25	6.43	0.00	205.33		267.05
	12	2.03		3.77	3.25	0.00					0.00	2.29	1.40	2.25	1.43	24.00	92.75		133.16
		24.30	0.00	6.03	6.50	12.20	0.00	0.00	0.00	0.00	4.80	14.48	15.40	7.88	17.86	26.40	313.74	300.00	749.57
1976	9		***data missing***																525.35
	10	0.00	0.00	0.00	0.00	0.00			0.00		0.00	0.00	0.00	0.00	0.00	14.00	0.00	437.50	451.50
	11	0.00	0.00	4.52	0.00	0.00			0.00		0.00	0.00	0.00	2.57	0.71	26.00	89.09	200.00	322.90
	12		***data missing***																626.20
		0.00	0.00	2.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.67	1.40	18.32	7.86	72.00	58.55	0.00	1925.95
1977	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	114.55	2.55	2585.71	2702.81
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	55.64	234.18	2557.14	2846.96
	11	20.25	0.00	16.95	0.00	0.00		117.30	0.00		0.00	21.33	16.80	84.38	30.00	16.36	217.64	2360.00	2901.01
	12	12.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	13.33	0.00	57.86	6.43	22.91	71.27	385.00	568.95
		32.40	0.00	16.95	0.00	0.00	0.00	117.30	0.00	0.00	0.00	34.67	16.80	142.23	36.43	209.45	525.64	7887.86	9019.73
1978	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	1.09	0.00	982.50	983.59
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	1.13	0.71	45.82	1.27	432.50	481.43
	11	8.10	0.00	3.77	9.75	0.00	2.95	0.00	0.00		0.00	0.00	0.00	1.06	3.57	0.00	9.80	113.33	152.33
	12	0.00	0.00	2.26	0.00	12.20		0.00	11.10		0.00	9.60	0.00	1.29	5.00	32.40	18.20	393.33	485.38
		8.10	0.00	6.03	9.75	12.20	2.95	0.00	11.10	0.00	0.00	9.60	0.00	3.47	9.29	79.31	29.27	1921.67	2102.73
1980	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	4.67	1237.50	1242.17
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	1.75	10.29	4.29	0.00	76.22	3930.00	4022.54
	11	0.00		0.00	6.50	109.80		0.00	0.00		0.00	0.00	0.00	2.25	9.29	2.67	38.50	1302.50	1471.50
	12	0.00		9.04	8.67	0.00		5.10	0.00		0.00	16.00	2.80	0.00	7.86	9.33	4.67	477.50	540.96
		0.00	0.00	9.04	15.17	109.80	0.00	5.10	0.00	0.00	0.00	16.00	4.55	12.54	21.43	12.00	124.06	6947.50	7277.18
1981	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	9.33	31.11	1124.00	1164.44
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	4.20	0.00	1.67	1.33	3.11	3417.50	3427.81
	11	2.70		0.00	0.00			0.00	0.00		0.00	2.29	0.00	0.00	5.83	37.20	40.44	1735.00	1823.46
	12	4.05		13.56	9.75	48.80		0.00	12.33		0.00	5.33	0.00	4.50	1.67	8.57	15.56	135.00	259.12
		6.75	0.00	13.56	9.75	48.80	0.00	0.00	12.33	0.00	0.00	7.62	4.20	4.50	9.17	56.44	90.22	6411.50	6674.84
1982	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	6.00	0.00	298.00	304.00
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	1.06	4.29	0.00	0.00	370.00	375.34
	11	0.00		2.26	4.33	0.00		0.00	0.00		0.00	0.00	0.00	2.12	0.00	8.00	129.82	1050.00	1196.53
	12	2.03		0.00	0.00	0.00		0.00	0.00		0.00	5.33	0.00	12.71	6.43	28.00	14.00	156.67	225.16
		2.03	0.00	2.26	4.33	0.00	0.00	0.00	0.00	0.00	0.00	5.33	0.00	15.88	10.71	42.00	143.82	1874.67	2101.03

THREADFIN SHAD FALL MIDWATER TRAWL ABUNDANCE

		AREA																	
YEAR	MONTH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1983	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	253.06	9.29	2.40	38.50	280.00	583.24
	10	0.00		0.00	0.00	0.00		5.10	2.64		9.60	0.00	1.40	151.88	194.29	0.00	21.64	200.00	586.54
	11	0.00		45.20	34.67	115.90		0.00	5.29		0.00	11.43	16.80	45.00	65.71	24.00	91.64	197.14	652.77
	12	22.28	2.80	4.52	10.83	30.50	0.00	6.12	0.00		0.00	5.33	7.00	21.60	32.86	13.71	110.00		267.55
		22.28	2.80	49.72	45.50	146.40	0.00	11.22	7.93	0.00	9.60	16.76	25.20	471.53	302.14	40.11	261.77	677.14	2090.11
1984	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	6.35	0.00	0.00	10.18	329.09	345.63
	10	0.00		0.00	2.17	0.00		0.00	0.00		0.00	0.00	1.40	29.25	0.00	24.00	56.00		112.82
	11	2.03	0.00	0.00	49.83	103.70	11.80	6.12	0.00	0.00	0.00	0.00	0.00	12.38	22.14	52.00	30.00		290.00
	12	0.00		11.30	2.17	0.00	0.00	0.00	0.00		0.00	0.00	0.00	2.25	2.86	1.33	0.00		19.91
		2.03	0.00	11.30	54.17	103.70	11.80	6.12	0.00	0.00	0.00	0.00	1.40	50.23	25.00	77.33	96.18	329.09	768.35
1985	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	3.82	274.00	277.82
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	20.40	42.00	195.56	257.96
	11	4.05		0.00	0.00	0.00		0.00	0.00		0.00	0.00	1.40	1.13	1.43	24.00	28.00		60.00
	12	2.03		0.00	0.00	0.00		0.00	2.64		0.00	13.71	4.20	26.40	11.43	129.60	34.22		224.23
		6.08	0.00	0.00	0.00	0.00	0.00	0.00	2.64	0.00	0.00	13.71	5.60	27.53	12.86	174.00	108.04	469.56	820.01
1986	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	742.00	742.00
	10	0.00		0.00	2.17	0.00		0.00	0.00		4.80	4.57	0.00	11.65	2.86	5.33	2.55	308.00	341.92
	11	0.00		0.00	4.33	91.50		0.00	3.08		14.40	0.00	0.00	2.12	2.86	10.80	11.45	1516.00	1656.55
	12	2.03		4.52	10.83	0.00		0.00	6.17		4.80	2.29	4.20	5.29	10.71	1.20	36.00		88.04
		2.03	0.00	4.52	17.33	91.50	0.00	0.00	9.25	0.00	24.00	6.86	4.20	19.06	16.43	17.33	50.00	2566.00	2828.51
1987	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	2.55	888.00	890.55
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	16.33	56.00	72.33
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	1.06	0.00	9.60	23.33	1950.00	1983.99
	12	8.10		6.78	8.67	6.10		20.40	2.64		9.60	13.71	8.40	2.12	5.71	91.20	49.00	296.00	528.44
		8.10	0.00	6.78	8.67	6.10	0.00	20.40	2.64	0.00	9.60	13.71	8.40	3.18	5.71	100.80	91.21	3190.00	3475.31
1988	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	10.80	10.50	186.00	207.30
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	10.50	276.00	286.50
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	2.29	0.00	0.00	0.71	1.20	1.17	1556.00	1561.37
	12	6.08		6.78	8.67	12.20		0.00	0.00		0.00	9.14	5.60	7.20	27.86	22.67	52.00		158.19
		6.08	0.00	6.78	8.67	12.20	0.00	0.00	0.00	0.00	0.00	11.43	5.60	7.20	28.57	34.67	74.17	2018.00	2213.36
1989	9	0.00		0.00	0.00	0.00			0.00		0.00	0.00	0.00	0.00	0.00	1.20	2.33	1804.00	1807.53
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	2.86	1.20	3.50	556.00	563.56
	11	0.00		0.00	0.00	18.30		0.00	0.00		0.00	4.57	5.60	1.06	5.71	2.40	7.64	4164.00	4209.28
	12	0.00		6.78	45.50	24.40		45.90	0.00		0.00	4.57	1.40	4.24	17.86	4.80	2.55	157.78	315.77
		0.00	0.00	6.78	45.50	42.70	0.00	45.90	0.00	0.00	0.00	9.14	7.00	5.29	26.43	9.60	16.02	6681.78	6896.14

THREADFIN SHAD FALL MIDWATER TRAWL ABUNDANCE

		AREA																	
YEAR	MONTH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1990	9	0.00		0.00	0.00	24.40		15.30	0.00		0.00	0.00	0.00	0.00	0.00	21.60	28.00	316.00	405.30
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.71	6.00	5.83	882.00	894.55
	11	4.05		0.00	2.17	24.40		0.00	3.08		0.00	9.14	23.80	14.82	178.57	82.80	100.33	1264.00	1707.17
	12	4.05		4.52	6.50	6.10		5.10	2.64		0.00	20.57	11.20	13.76	5.00	105.60	7.00	2654.00	2846.05
		8.10	0.00	4.52	8.67	54.90	0.00	20.40	5.73	0.00	0.00	29.71	35.00	28.59	184.29	216.00	141.17	5116.00	5853.07
1991	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	34.80	46.67	510.00	591.47
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	4.80	11.67	374.29	390.75
	11	30.38		4.52	23.83	24.40		51.00	10.57		0.00	25.14	1.40	2.12	16.43	16.80	39.67	1070.00	1316.26
	12	62.78		18.08	32.50	30.50		25.50	2.64		0.00	22.86	8.40	21.18	2.86	25.20	5.83	564.29	822.61
		93.15	0.00	22.60	56.33	54.90	0.00	76.50	13.21	0.00	0.00	48.00	9.80	23.29	19.29	81.60	103.83	2518.57	3121.08
1992	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	111.60	73.50	517.14	702.24
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.71	18.00	43.17	916.92	978.80
	11	4.05		9.04	6.50	6.10		0.00	0.00		4.80	13.71	0.00	4.24	10.00	198.00	39.67	70.00	366.11
	12	16.20		31.08	28.17	0.00		20.40	9.25		4.80	56.00	21.00	152.47	22.86	267.60	51.33	127.14	808.30
		20.25	0.00	40.12	34.67	6.10	0.00	20.40	9.25	0.00	9.60	69.71	21.00	156.71	33.57	595.20	207.67	1631.21	2855.45

1k. TOPSMELT

TOPSMELT FALL MIDWATER TRAWL ABUNDANCE

		AREA																	
YEAR	MONTH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1967	9	0.00		0.00	0.00				0.00			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00		0.00	0.00				0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00		0.00	0.00				0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	0.00		0.00					0.00			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1968	9	0.00		0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00		0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00		0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	0.00		0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1969	9	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00	2.80	0.00	0.00	0.00		0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.80
	11		***data missing***																1.40
	12	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	2.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.20
1970	9	0.00	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	0.00	0.00	0.00	0.00	2.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.03
		0.00	0.00	0.00	0.00	2.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.03
1971	9	0.00	0.00	0.00	0.00	2.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.03
	10	0.00	0.00	0.00	0.00	0.00	2.95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.95
	11	8.10	22.40	13.18	0.00	58.97	5.90	10.20	27.75	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	149.50
	12	4.05	0.00	0.00	0.00	29.28		0.00	0.00	0.00	0.00	2.67	0.00	0.00	0.00	0.00	0.00	0.00	36.00
		12.15	22.40	13.18	0.00	90.28	8.85	10.20	27.75	3.00	0.00	2.67	0.00	0.00	0.00	0.00	0.00	0.00	190.48
1972	9	0.00	16.80	32.02	0.00	0.00	2.95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	51.77
	10	0.00	14.00	120.53	2.17	30.50	23.60	51.00	0.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	244.80
	11	0.00	2.80	1.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.68
	12	2.03	2.80	3.77	0.00	12.20			4.63	0.00	4.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	30.22
		2.03	36.40	158.20	2.17	42.70	26.55	51.00	4.63	3.00	4.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	331.47
1973	9	0.00		0.00	0.00	0.00			0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00		0.00	0.00	0.00			0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
	11	0.00		0.00	0.00	0.00			0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
	12	0.00		0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

TOPSMELT FALL MIDWATER TRAWL ABUNDANCE

YEAR	MONTH	AREA 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1975	9	0.00		11.30	9.75	0.00			0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	21.05
	10	0.00		22.60	9.75	0.00			0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00		32.35
	11	0.00		0.00	0.00	0.00			10.57		0.00	0.00	0.00	0.00	0.00	0.00	0.00		10.57
	12	0.00		0.00	0.00	0.00					0.00	2.29	0.00	0.00	0.00	0.00	0.00		2.29
		0.00	0.00	33.90	19.50	0.00	0.00	0.00	10.57	0.00	0.00	2.29	0.00	0.00	0.00	0.00	0.00	0.00	66.26
1976	9		*data missing*																27.73
	10	0.00	22.40	15.82	0.00	0.00			0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	38.22
	11	0.00	0.00	0.00	0.00	0.00			0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12		*data missing*																394.29
		0.00	0.00	2.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.67	1.40	18.32	7.86	72.00	58.55	0.00	460.24
1977	9	2.03	8.40	60.27	6.50	2.03	2.95	6.80	169.14		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	258.12
	10	0.00	2.80	45.20	2.17	4.07	0.00	0.00	108.69		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	162.92
	11	14.18	98.00	9.42	0.00	14.23		10.20	312.19		0.00	5.33	0.00	0.00	0.00	0.00	0.00	0.00	463.55
	12	0.00	0.00	0.00	2.17	6.10	0.00	10.20	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.47
		16.20	109.20	114.88	10.83	26.43	2.95	27.20	590.02	0.00	0.00	5.33	0.00	0.00	0.00	0.00	0.00	0.00	903.05
1978	9	0.00	0.00	5.65	8.67	4.07	0.00	3.40	2.31		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	24.10
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.31		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.31
	11	5.40	0.00	11.30	0.00	8.13	0.00	2.55	20.81		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	48.20
	12	0.00	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		5.40	0.00	16.95	8.67	12.20	0.00	5.95	25.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	74.60
1980	9	0.00		4.52	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.52
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	21.60		63.28	0.00	0.00		0.00	170.20		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	255.08
	12	0.00		31.64	2.17	0.00		0.00	3.08		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36.89
		21.60	0.00	99.44	2.17	0.00	0.00	0.00	173.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	296.49
1981	9	0.00		9.04	3.25	0.00		5.10	85.10		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	102.49
	10	6.08		9.04	2.17	0.00		0.00	15.42		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	32.70
	11	0.00		0.00	0.00			0.00	21.58		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	21.58
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		6.08	0.00	18.08	5.42	0.00	0.00	5.10	122.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	156.77
1982	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00		13.56	0.00	0.00		0.00	23.79		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	37.35
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	13.56	0.00	0.00	0.00	0.00	23.79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	37.35

TOPSMELT FALL MIDWATER TRAWL ABUNDANCE

YEAR	MONTH	AREA 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1983	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1984	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00		9.04	0.00	0.00		0.00	68.71		0.00	0.00	0.00	0.00	0.00	0.00	0.00		77.75
	11	0.00	0.00	0.00	0.00	2.03	0.00	2.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		4.07
	12	0.00		0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
		0.00	0.00	9.04	0.00	2.03	0.00	2.04	68.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	81.83
1985	9	0.00		2.26	0.00	12.20		10.20	0.00		0.00	0.00	0.00	4.24	0.00	0.00	0.00	0.00	28.90
	10	0.00		0.00	0.00	12.20		15.30	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	27.50
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
	12	0.00		0.00	2.17	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00		2.17
		0.00	0.00	2.26	2.17	24.40	0.00	25.50	0.00	0.00	0.00	0.00	0.00	4.24	0.00	0.00	0.00	0.00	58.56
1986	9	0.00		0.00	0.00	0.00		0.00	5.29		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.29
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00		2.26	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.26
	12	0.00		2.26	0.00	0.00		0.00	70.92		0.00	0.00	0.00	0.00	0.00	0.00	0.00		73.18
		0.00	0.00	4.52	0.00	0.00	0.00	0.00	76.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	80.72
1987	9	0.00		0.00	2.17	0.00		0.00	0.00		0.00	2.29	0.00	0.00	0.00	0.00	0.00	0.00	4.45
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	4.57	0.00	0.00	0.00	0.00	0.00	0.00	4.57
	12	0.00		0.00	0.00	12.20		15.30	2.64		0.00	2.29	0.00	0.00	0.00	0.00	0.00	0.00	32.43
		0.00	0.00	0.00	2.17	12.20	0.00	15.30	2.64	0.00	0.00	9.14	0.00	0.00	0.00	0.00	0.00	0.00	41.45
1988	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1989	9	0.00		0.00	0.00	0.00			0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00		2.83	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.83
	11	0.00		0.00	2.17	12.20		0.00	7.93		0.00	0.00	0.00	0.00	0.71	0.00	0.00	0.00	23.01
	12	0.00		2.26	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.26
		0.00	0.00	5.09	2.17	12.20	0.00	0.00	7.93	0.00	0.00	0.00	0.00	0.00	0.71	0.00	0.00	0.00	28.09

TOPSMELT FALL MIDWATER TRAWL ABUNDANCE

		AREA																	
YEAR	MONTH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1990	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	12.15		47.46	0.00	0.00		0.00	0.00		0.00	29.71	0.00	0.00	0.00	0.00	0.00	0.00	89.32
	11	2.03		2.26	0.00	30.50		10.20	9.25		0.00	2.29	0.00	0.00	0.00	0.00	0.00	0.00	56.52
	12	2.03		0.00	23.83	6.10		5.10	155.93		0.00	0.00	0.00	3.18	0.00	0.00	0.00	0.00	196.16
		16.20	0.00	49.72	23.83	36.60	0.00	15.30	165.18	0.00	0.00	32.00	0.00	3.18	0.00	0.00	0.00	0.00	342.01
1991	9	2.03		11.30	0.00	24.40		15.30	37.00		0.00	2.29	0.00	0.00	0.00	0.00	0.00	0.00	92.31
	10	16.20		2.26	0.00	128.10		0.00	29.07		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	175.63
	11	6.08		4.52	2.17	0.00		0.00	13.21		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.98
	12	0.00		2.26	0.00	6.10		0.00	0.00		0.00	0.00	0.00	1.06	0.00	0.00	0.00	0.00	9.42
		24.30	0.00	20.34	2.17	158.60	0.00	15.30	79.29	0.00	0.00	2.29	0.00	1.06	0.00	0.00	0.00	0.00	303.34
1992	9	2.70		4.52	0.00	24.40		5.10	0.00		0.00	2.29	1.40	0.00	0.00	0.00	0.00	0.00	40.41
	10	0.00		0.00	0.00	6.10		10.20	2.64		0.00	2.29	0.00	0.00	0.71	0.00	0.00	0.00	21.94
	11	0.00		4.52	0.00	0.00		0.00	2.64		48.00	2.29	1.40	5.29	0.71	0.00	0.00	0.00	64.86
	12	0.00		16.95	23.83	36.60		5.10	0.00		0.00	0.00	0.00	9.53	2.86	0.00	0.00	0.00	94.87
		2.70	0.00	25.99	23.83	67.10	0.00	20.40	5.29	0.00	48.00	6.86	2.80	14.82	4.29	0.00	0.00	0.00	222.08

11. WHITE CROAKER

WHITE CROAKER FALL MIDWATER TRAWL ABUNDANCE

YEAR	MO.	AREA 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1967	9	0.00		11.30	0.00				0.00			0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.30
	10	0.00		0.00	0.00				0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00		0.00	0.00				0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	0.00		0.00					18.50			0.00	1.56	0.95	0.00	0.00	0.00	0.00	21.00
		0.00	0.00	11.30	0.00	0.00	0.00	0.00	18.50	0.00	0.00	0.00	1.56	0.95	0.00	0.00	0.00	0.00	32.30
1968	9	0.00		0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00		0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00		0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	0.00		0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1969	9	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11		*data missing*																0.00
	12	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1970	9	0.00	0.00	0.00	6.50	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.50
	10	8.10	0.00	4.52	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.62
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.33	0.00	0.00	0.00	0.00	0.00	0.00	5.33
	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		8.10	0.00	4.52	6.50	0.00	0.00	0.00	0.00	0.00	0.00	5.33	0.00	0.00	0.00	0.00	0.00	0.00	24.45
1971	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.31
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.31
1972	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	0.00	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1973	9	0.00		0.00	58.50	0.00			305.25		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	363.75
	10	0.00		0.00	0.00	0.00			4.63		0.00	2.67	0.00	0.00	0.00	0.00	0.00		7.29
	11	0.00		0.00	0.00	0.00			0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
	12	2.70		2.26	0.00	0.00					0.00	0.00	0.00	0.00	0.00	0.00	0.00		4.96
		2.70	0.00	2.26	58.50	0.00	0.00	0.00	309.88	0.00	0.00	2.67	0.00	0.00	0.00	0.00	0.00	0.00	376.00

WHITE CROAKER FALL MIDWATER TRAWL ABUNDANCE

YEAR	MO.	AREA 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1975	9	0.00		0.00	0.00	0.00			0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00		0.00	0.00	0.00			0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
	11	0.00		0.00	0.00	0.00			0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
	12	0.00		0.00	0.00	0.00					0.00	0.00	1.40	0.00	0.00	0.00	0.00		1.40
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.40	0.00	0.00	0.00	0.00	0.00	1.40
1976	9		*data missing*																0.00
	10	0.00	0.00	0.00	0.00	0.00			0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00	0.00	0.00	0.00	0.00			0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12		*data missing*																0.78
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.78
1977	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1978	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.31		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.31
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	0.00	0.00	0.00	0.00	0.00		0.00	0.00		0.00	3.20	1.40	0.00	0.00	0.00	0.00	0.00	4.60
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.31	0.00	0.00	3.20	1.40	0.00	0.00	0.00	0.00	0.00	6.91
1980	9	0.00		72.32	39.00	61.00		0.00	237.86		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	410.18
	10	0.00		0.00	0.00	12.20		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.20
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	8.10		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.10
		8.10	0.00	72.32	39.00	73.20	0.00	0.00	237.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	430.48
1981	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00		0.00	0.00			0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	2.67	1.40	0.00	0.00	0.00	0.00	0.00	4.07
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.67	1.40	0.00	0.00	0.00	0.00	0.00	4.07
1982	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	2.03		13.56	0.00	0.00		0.00	9.25		0.00	0.00	1.40	0.00	0.00	0.00	0.00	0.00	26.24
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	2.03		0.00	0.00	0.00		0.00	0.00		0.00	8.00	0.00	0.00	0.00	0.00	0.00	0.00	10.03
		4.05	0.00	13.56	0.00	0.00	0.00	0.00	9.25	0.00	0.00	8.00	1.40	0.00	0.00	0.00	0.00	0.00	36.26

WHITE CROAKER FALL MIDWATER TRAWL ABUNDANCE

		AREA																	
YEAR	MO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1983	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	12.15		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.15
	11	2.03		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.03
	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
		14.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14.18
1984	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	4.05		0.00	0.00	0.00		0.00	2.64		0.00	0.00	0.00	0.00	0.00	0.00	0.00		6.69
	11	2.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		2.03
	12	0.00		0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
		6.08	0.00	0.00	0.00	0.00	0.00	0.00	2.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.72
1985	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1986	9	8.10		36.16	0.00	0.00		0.00	329.30		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	373.56
	10	4.05		253.12	0.00	0.00		0.00	87.21		0.00	0.00	1.40	0.00	0.00	0.00	0.00	0.00	345.78
	11	2.03		6.78	0.00	0.00		0.00	3.08		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.89
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
		14.18	0.00	296.06	0.00	0.00	0.00	0.00	419.60	0.00	0.00	0.00	1.40	0.00	0.00	0.00	0.00	0.00	731.23
1987	9	2.03		0.00	0.00	0.00		0.00	10.57		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.60
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		2.03	0.00	0.00	0.00	0.00	0.00	0.00	10.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.60
1988	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00		0.00	0.00	0.00		0.00	13.21		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.21
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	0.00		2.26	0.00	0.00		0.00	0.00		0.00	2.29	0.00	0.00	0.00	0.00	0.00		4.55
		0.00	0.00	2.26	0.00	0.00	0.00	0.00	13.21	0.00	0.00	2.29	0.00	0.00	0.00	0.00	0.00	0.00	17.76
1989	9	0.00		0.00	0.00	0.00			7.93		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.93
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	2.29	2.80	0.00	0.00	0.00	0.00	0.00	5.09
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.93	0.00	0.00	2.29	2.80	0.00	0.00	0.00	0.00	0.00	13.01

WHITE CROAKER FALL MIDWATER TRAWL ABUNDANCE

		AREA																	
YEAR	MO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1990	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00		0.00	0.00	0.00		0.00	43.17		0.00	0.00	1.40	0.00	0.00	0.00	0.00	0.00	44.57
	12	14.18		15.82	0.00	6.10		0.00	71.36		0.00	2.29	1.40	0.00	0.00	0.00	0.00	0.00	111.14
		14.18	0.00	15.82	0.00	6.10	0.00	0.00	114.52	0.00	0.00	2.29	2.80	0.00	0.00	0.00	0.00	0.00	155.70
1991	9	0.00		0.00	0.00	0.00		0.00	21.14		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	21.14
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	2.03		0.00	0.00	0.00		0.00	0.00		0.00	4.57	4.20	0.00	0.00	0.00	0.00	0.00	10.80
		2.03	0.00	0.00	0.00	0.00	0.00	0.00	21.14	0.00	0.00	4.57	4.20	0.00	0.00	0.00	0.00	0.00	31.94
1992	9	0.00		0.00	0.00	0.00		0.00	10.57		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.57
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	2.29	0.00	0.00	0.00	0.00	0.00	0.00	2.29
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	2.80	3.18	0.00	0.00	0.00	0.00	5.98
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.57	0.00	0.00	2.29	2.80	3.18	0.00	0.00	0.00	0.00	18.83

1m. WHITE STURGEON

WHITE STURGEON FALL MIDWATER TRAWL ABUNDANCE

		AREA																	
YEAR	MONTH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1967	9	0.00		0.00	0.00				0.00			0.00	1.40	10.59	3.75	0.00	2.80	1.43	19.97
	10	0.00		0.00	0.00				0.00		0.00	0.00	3.11	1.89	0.71	0.00	0.93	0.00	6.65
	11	0.00		0.00	0.00				0.00		0.00	0.00	1.56	4.74	0.00	0.00	0.00	0.00	6.29
	12	0.00		0.00					0.00			0.00	0.00	9.47	1.25	0.00	0.93	1.43	13.09
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.07	26.69	5.71	0.00	4.67	2.86	46.00
1968	9	0.00		0.00	0.00			0.00	0.00			0.00	0.00	0.95	0.71	0.00	0.00	0.00	1.66
	10	0.00		0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.63	1.20	0.00	0.00	1.83
	11	0.00		0.00	0.00			0.00	0.00			0.00	0.00	2.84	0.00	0.00	0.00	0.00	2.84
	12	0.00		0.00	0.00			0.00	0.00			0.00	0.00	2.84	0.00	0.00	0.93	0.00	3.78
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.63	1.34	1.20	0.93	0.00	10.10
1969	9	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00		0.00	0.00	1.89	0.00	0.00	0.00	0.00	1.89
	10	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00		0.00	4.67	5.68	0.63	0.00	1.87	0.00	12.84
	11		*data missing*																7.67
	12	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	1.56	0.95	0.00	0.00	0.00	0.00	2.50
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.22	8.53	0.63	0.00	1.87	0.00	24.91
1970	9	0.00	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	3.60	0.00	0.00	2.00	0.00	5.60
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.80	0.00	2.50	0.00	0.00	0.00	5.30
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.80	3.60	2.50	0.00	2.00	0.00	10.90
1971	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.80	0.00	0.00	0.00	0.00	1.80
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.29	5.60	1.80	1.25	0.00	8.00	0.00	18.94
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.80	0.00	0.00	0.00	0.00	1.80
	12	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	2.80	1.80	0.00	0.00	0.00	0.00	4.60
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.29	8.40	7.20	1.25	0.00	8.00	0.00	27.14
1972	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	2.00
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12	0.00	0.00	0.00	0.00	0.00			0.00	0.00	0.00	2.67	0.00	0.00	0.00	2.00	0.00	0.00	4.67
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.67	0.00	0.00	0.00	2.00	2.00	0.00	6.67
1973	9	0.00		0.00	0.00	0.00			0.00		0.00	0.00	0.00	0.00	1.43	0.00	0.00	0.00	1.43
	10	0.00		0.00	0.00	0.00			0.00		0.00	0.00	0.00	0.00	0.00	2.00	0.00		2.00
	11	0.00		0.00	0.00	0.00			0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
	12	0.00		0.00	0.00	0.00					0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.43	2.00	0.00	0.00	3.43

WHITE STURGEON FALL MIDWATER TRAWL ABUNDANCE

YEAR	MONTH	AREA 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1975	9	0.00		0.00	0.00	0.00			0.00		0.00	0.00	1.40	1.13	1.43	0.00	1.27	0.00	5.23
	10	0.00		0.00	0.00	0.00			0.00		0.00	0.00	2.80	3.38	0.71	0.00	2.80		9.69
	11	0.00		0.00	0.00	12.20			0.00		0.00	2.29	8.40	9.00	0.00	0.00	0.00		31.89
	12	2.03		0.00	0.00	0.00					0.00	0.00	2.80	7.88	0.00	3.00	0.00		15.70
		2.03	0.00	0.00	0.00	12.20	0.00	0.00	0.00	0.00	0.00	2.29	15.40	21.38	2.14	3.00	4.07	0.00	62.50
1976	9		*data missing*																1.98
	10	0.00	0.00	0.00	0.00	0.00			0.00		0.00	0.00	0.00	0.00	0.00	2.00	0.00	0.00	2.00
	11	0.00	0.00	0.00	0.00	0.00			0.00		0.00	0.00	0.00	3.86	0.00	8.00	1.27	0.00	13.13
	12		*data missing*																7.16
		0.00	0.00	2.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.67	1.40	18.32	7.86	72.00	58.55	0.00	24.27
1977	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	1.09	0.00	0.00	1.09
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	1.09	0.00	0.00	1.09
	11	0.00	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	1.13	0.00	0.00	0.00	0.00	1.13
	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	1.29	0.00	2.18	0.00	0.00	3.47
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.41	0.00	4.36	0.00	0.00	6.77
1978	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	11.20	0.00	0.00	0.00	0.00	0.00	11.20
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	2.25	0.00	0.00	0.00	0.00	2.25
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	4.24	0.00	1.09	0.00	0.00	5.33
	12	0.00	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	2.80	2.57	0.00	236.40	0.00	0.00	241.77
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14.00	9.06	0.00	237.49	0.00	0.00	260.55
1980	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	1.40	5.14	0.00	1.50	0.00	0.00	8.04
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.71	0.00	0.00	0.00	0.71
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	1.56	0.00	0.71	1.33	0.00	0.00	3.60
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	1.40	4.80	0.00	1.33	0.00	0.00	7.53
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.36	9.94	1.43	4.17	0.00	0.00	19.89
1981	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	1.13	2.50	0.00	0.00	0.00	3.63
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	1.06	0.00	4.00	0.00	0.00	5.06
	11	0.00		0.00	0.00			0.00	0.00		0.00	0.00	1.40	2.40	0.00	1.20	0.00	0.00	5.00
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	2.25	0.00	0.00	0.00	0.00	2.25
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.40	6.83	2.50	5.20	0.00	0.00	15.93
1982	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	1.40	3.18	1.67	0.00	0.00	0.00	6.24
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	1.06	0.71	1.20	0.00	0.00	2.97
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	5.60	9.53	4.29	0.00	0.00	0.00	19.42
	12	2.03		0.00	0.00	0.00		0.00	0.00		0.00	5.33	8.40	2.12	1.43	1.33	1.40	0.00	22.04
		2.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.33	15.40	15.88	8.10	2.53	1.40	0.00	50.67

WHITE STURGEON FALL MIDWATER TRAWL ABUNDANCE

YEAR	MONTH	AREA 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1983	9	0.00		0.00	0.00	6.10		0.00	0.00		0.00	2.29	0.00	10.59	0.71	0.00	0.00	0.00	19.69
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	2.29	5.60	1.13	2.86	0.00	0.00	0.00	11.87
	11	4.05		0.00	0.00	18.30		0.00	0.00		9.60	6.86	7.00	1.13	1.43	0.00	0.00	0.00	48.36
	12	0.00	0.00	0.00	0.00	0.00	2.95	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00		2.95
		4.05	0.00	0.00	0.00	24.40	2.95	0.00	0.00	0.00	9.60	11.43	12.60	12.84	5.00	0.00	0.00	0.00	82.87
1984	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	5.33	2.80	5.29	1.43	0.00	0.00	0.00	14.86
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	2.67	1.40	3.38	0.00	0.00	0.00		7.44
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.20	13.50	0.71	2.67	0.00		28.08
	12	0.00		0.00	0.00	0.00	0.00	0.00	0.00		0.00	2.67	14.00	2.25	0.71	1.33	2.80		23.76
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.67	29.40	24.42	2.86	4.00	2.80	0.00	74.14
1985	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.71	0.00	0.00	0.00	0.71
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	5.29	1.43	0.00	0.00	0.00	6.72
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.71	0.00	0.00		0.71
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	1.40	9.60	0.71	1.20	0.00		12.91
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.40	14.89	3.57	1.20	0.00	0.00	21.07
1986	9	0.00		0.00	4.33	0.00		0.00	0.00		0.00	0.00	6.22	2.12	2.14	0.00	0.00	0.00	14.82
	10	0.00		0.00	2.17	0.00		0.00	2.64		0.00	0.00	5.60	2.12	2.14	0.00	0.00	0.00	14.67
	11	0.00		0.00	4.33	0.00		0.00	0.00		0.00	0.00	0.00	4.24	1.43	0.00	0.00	0.00	10.00
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	1.06	0.71	2.40	0.00		4.17
		0.00	0.00	0.00	10.83	0.00	0.00	0.00	2.64	0.00	0.00	0.00	11.82	9.53	6.43	2.40	0.00	0.00	43.66
1987	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	4.24	0.71	0.00	0.00	0.00	4.95
	10	0.00		0.00	0.00	0.00		0.00	0.00		4.80	0.00	0.00	1.13	0.00	0.00	0.00	0.00	5.93
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	3.60	0.00	0.00	3.60
	12	0.00		0.00	2.17	0.00		0.00	0.00		0.00	0.00	1.40	0.00	0.00	2.40	0.00	0.00	5.97
		0.00	0.00	0.00	2.17	0.00	0.00	0.00	0.00	0.00	4.80	0.00	1.40	5.36	0.71	6.00	0.00	0.00	20.44
1988	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	1.06	0.00	0.00	0.00	0.00	1.06
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	3.18	2.14	0.00	0.00	0.00	5.32
	11	2.03		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	1.06	0.00	3.60	0.00	0.00	6.68
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	1.20	0.00	0.00	0.00		1.20
		2.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.49	2.14	3.60	0.00	0.00	14.26
1989	9	0.00		0.00	0.00	0.00			0.00		0.00	0.00	1.40	1.06	0.71	0.00	0.00	0.00	3.17
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	2.12	0.00	0.00	0.00	0.00	2.12
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	1.40	1.06	0.00	0.00	0.00	0.00	2.46
	12	2.03		0.00	0.00	0.00		0.00	0.00		0.00	2.29	0.00	0.00	0.00	0.00	0.00	0.00	4.31
		2.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.29	2.80	4.24	0.71	0.00	0.00	0.00	12.06

WHITE STURGEON FALL MIDWATER TRAWL ABUNDANCE

		AREA																	
YEAR	MONTH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1990	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	2.80	0.00	1.43	0.00	0.00	0.00	4.23
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	1.20	0.00	0.00	1.20
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	2.12	0.00	2.40	0.00	0.00	4.52
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	1.06	0.71	0.00	0.00	0.00	1.77
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.80	3.18	2.14	3.60	0.00	0.00	11.72
1991	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	2.29	0.00	0.00	0.00	0.00	0.00	0.00	2.29
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	2.12	0.71	0.00	0.00	0.00	2.83
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	1.40	2.12	0.00	1.20	0.00	0.00	4.72
	12	0.00		0.00	4.33	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.33
		0.00	0.00	0.00	4.33	0.00	0.00	0.00	0.00	0.00	0.00	2.29	1.40	4.24	0.71	1.20	0.00	0.00	14.17
1992	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	1.20	0.00	0.00	1.20
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.71	0.00	0.00	0.00	0.71
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	2.80	3.18	0.00	1.20	0.00	0.00	7.18
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	1.40	0.00	0.00	0.00	0.00	0.00	1.40
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.20	3.18	0.71	2.40	0.00	0.00	10.49

1n. CDFG INDICES

COPY

STATE OF CALIFORNIA—THE RESOURCES AGENCY PETE WILSON, Governor

DEPARTMENT OF FISH AND GAME
Bay-Delta and Special
Water Projects Division
4001 N. Wilson Way
Stockton, CA 95205-2424

BAY-DELTA AND SPECIAL
WATER PROJECTS DIVISION

TELECOPY COVER MEMO

PHONE NO. (Main Office) : (209) 948-7800

TO: KEITH BINKLEY

PHONE NO.: FAX NO.: 206-556-1290
(use complete phone number)

FROM: Lee Miller

PHONE NO.: 209-942-6107 FAX NO.: (209) 946-6355

DATE: 1/27/94

NUMBER OF PAGES: 3 (excluding cover sheet).

MESSAGE: MIDWATER TRAWL INDICES AS PER YOUR REQUEST

LONGFIN SMELT MIDWATER TRAWL ABUNDANCE INDICES

YEAR	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	TOTAL ABUNDANCE
1967	15485.0	49779.0	7657.0	8816.0	81737.0
1968	1429.0	772.0	453.0	663.0	3317.0
1969	35051.0	9531.0	8149.0	6667.0	59498.0
1970	889.0	410.0	1067.0	4169.0	6535.0
1971	2442.0	5722.0	5022.0	2801.0	15987.0
1972	138.0	118.0	106.0	398.0	760.0
1973	2795.0	1237.0	808.0	1057.0	5897.0
1974	.	.	.	.	.
1975	318.0	598.0	1198.0	695.0	2809.0
1976	11.0	12.0	90.0	541.0	654.0
1977	29.0	17.0	78.0	81.0	205.0
1978	1800.0	1173.0	1450.0	2252.0	6675.0
1979	.	.	.	.	.
1980	15202.0	6071.0	3527.0	6355.0	31155.0
1981	222.0	398.0	179.0	1403.0	2202.0
1982	7899.0	13962.0	28192.0	12876.0	62929.0
1983	152.0	3106.0	5407.0	3210.0	11875.0
1984	328.0	2612.0	2602.0	1917.0	7459.0
1985	20.0	31.0	219.0	722.0	992.0
1986	972.0	1543.0	1857.0	1788.0	6160.0
1987	134.0	70.0	384.0	919.0	1507.0
1988	16.0	17.0	189.0	520.0	742.0
1989	11.0	32.0	37.0	376.0	456.0
1990	10.0	1.0	77.0	151.0	239.0
1991	8.0	7.0	27.0	92.0	134.0
1992	3.0	0.0	12.0	59.0	74.0
1993	98.5	107.5	127.9	459.4	793.3

Midwater trawl abundance indices for splittail.

Year	September	October	November	December	Total
1967	43	11	3	9	66
1968	6	7	3	2	18
1969	6	10	7	3	26
1970	21	0	2	2	25
1971	4	5	8	1	18
1972	3	0	1	9	13
1973	2	0	2	0	4
1974	.	.	.	.	.
1975	2	1	0	1	4
1976	0	0	1	0	1
1977	0	0	0	0	0
1978	14	16	4	3	37
1979	.	.	.	.	.
1980	11	4	1	0	16
1981	9	3	3	3	18
1982	76	20	12	10	118
1983	54	26	62	10	152
1984	10	1	4	1	16
1985	3	4	0	8	15
1986	14	25	8	11	58
1987	10	3	4	12	29
1988	3	4	2	0	9
1989	3	1	0	0	4
1990	5	2	1	0	8
1991	10	2	6	0	18
1992	2	0	2	0	4

Midwater trawl abundance indices for Striped bass 1967–1992

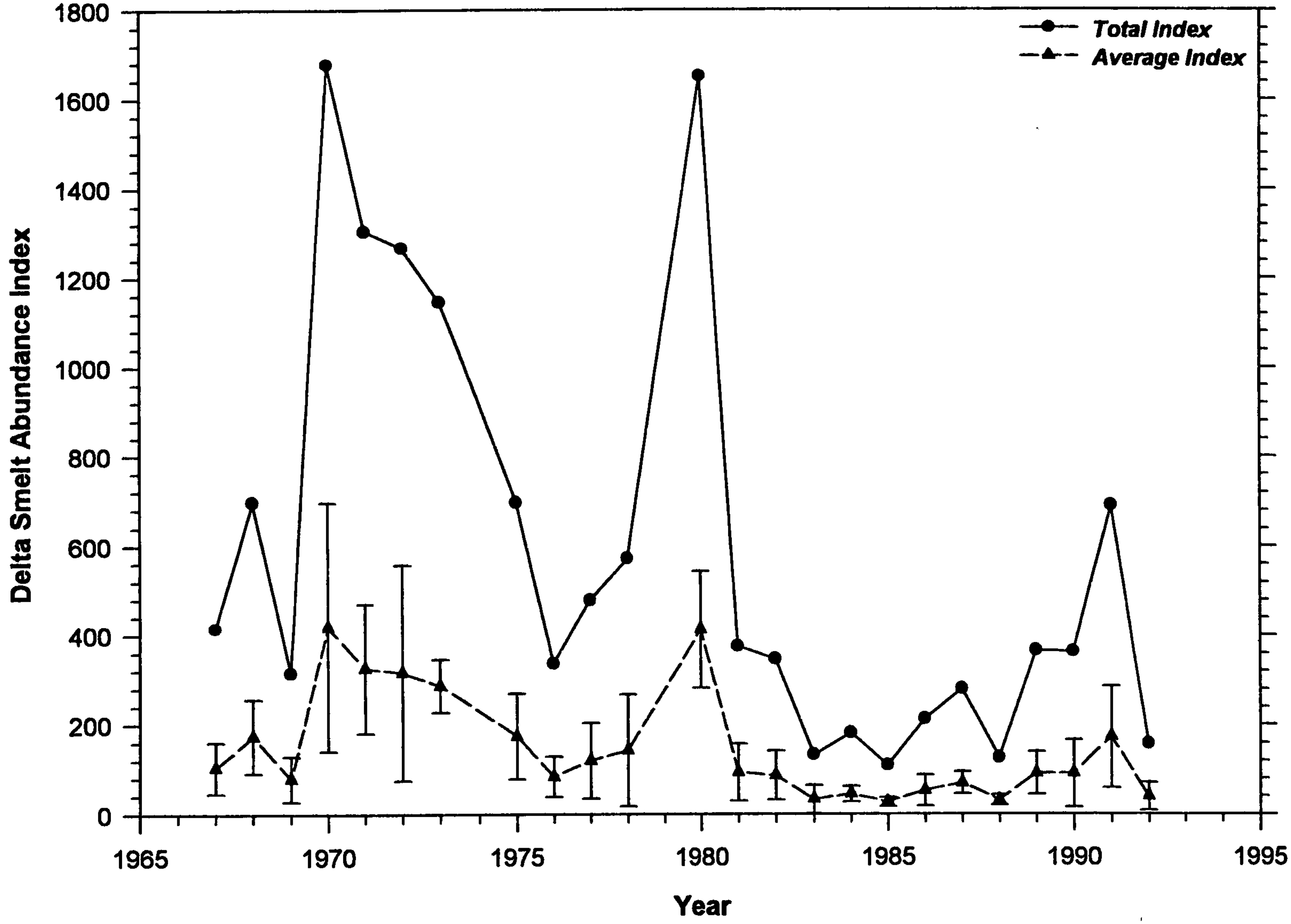
Year	September	October	November	December	Total
1967	12111	4572	2205	2194	21082
1968	1701	1443	635	339	4118
1969	3966	1646	1486	1327	8425
1970	2290	1823	2751	1435	8299
1971	4005	1855	1354	2296	9510
1972	3171	978	1377	603	6129
1973	1517	438	1006	1324	4285
1974	.	.	.	.	.
1975	1772	681	1284	811	4548
→1976	212	116	242	176	746
1977	307	204	180	194	885
1978	1120	551	340	590	2601
1979	.	.	.	.	.
1980	711	383	102	267	1463
1981	584	917	1037	1995	4533
1982	1476	938	941	1113	4468
1983	1940	1988	5285	3283	12496
1984	1290	2673	1383	1256	6602
1985	126	825	58	751	1760
1986	2706	533	508	197	3944
1987	604	169	206	372	1351
1988	106	98	129	144	477
1989	154	152	76	60	442
1990	232	235	398	454	1319
1991	262	128	115	445	950
1992	611	246	545	615	2017

AMERICAN SHAD MIDWATER TRAWL ABUNDANCE INDICES

OBS	YEAR	SEPT	OCT	NOV	DEC	TOTAL
1	1967	1505	1160	620	217	3502
2	1968	275	288	140	69	772
3	1969	1584	1178	824	473	4059
4	1970	376	259	170	67	872
5	1971	377	506	403	258	1544
6	1972	137	57	110	30	334
7	1973	599	193	211	82	1085
8	1974	.	.	.	.	.
9	1975	1236	587	486	178	2487
10	1976	87	72	102	77	338
11	1977	126	147	233	139	645
12	1978	830	1061	332	221	2444
13	1979	.	.	.	.	.
14	1980	1284	1697	523	401	3905
15	1981	286	522	349	277	1434
16	1982	2246	1609	1321	210	5386
17	1983	962	852	938	177	2929
18	1984	292	172	290	92	846
19	1985	316	332	562	386	1596
20	1986	694	567	313	286	1860
21	1987	261	292	222	124	899
22	1988	751	304	271	133	1459
23	1989	569	339	592	378	1878
24	1990	1494	947	1369	507	4317
25	1991	1116	778	863	259	3016
26	1992	757	524	462	262	2005

Tab 2.
Data Summary Table And Time Series Plots ComparingThe Total Indices With The Average Indices

Year	STRIPED BASS Total Index	STRIPED BASS Average Index	STRIPED BASS Standard Deviation	LONGFIN SMELT Total Index	LONGFIN SMELT Average Index	LONGFIN SMELT Standard Deviation	DELTA SMELT Total Index	DELTA SMELT Average Index	DELTA SMELT Standard Deviation	SPLITTAIL Total Index	SPLITTAIL Average Index	SPLITTAIL Standard Deviation
1967	21,081.55	5,270.39	4,695.30	81,731.76	20,432.94	19,863.57	414.92	103.73	56.59	66.25	16.56	18.22
1968	4,117.67	1,029.42	646.47	3,317.54	829.39	420.99	696.54	174.13	82.04	18.06	4.52	2.62
1969	8,424.57	2,106.14	1,246.63	59,493.34	14,873.34	13,504.47	315.65	78.91	50.43	25.92	6.48	3.06
1970	8,297.77	2,074.44	570.50	6,534.63	1,633.66	1,712.53	1,677.46	419.36	277.39	25.44	6.36	10.12
1971	9,473.61	2,368.40	1,134.63	15,986.42	3,996.61	1,620.04	1,305.15	326.29	144.55	17.41	4.35	2.83
1972	6,128.62	1,532.15	1,136.90	759.50	189.88	139.09	1,266.90	316.73	241.56	12.50	3.13	3.89
1973	4,284.26	1,071.07	471.42	5,896.12	1,474.03	897.59	1,145.84	286.46	59.44	4.43	1.11	1.29
1975	4,547.33	1,136.83	496.59	2,808.64	702.16	367.38	697.88	174.47	95.08	3.57	0.89	0.90
1976	757.48	189.37	56.29	653.96	163.49	254.13	337.85	84.46	44.55	1.00	0.33	0.36
1977	884.39	221.10	58.38	204.36	51.09	33.26	479.48	119.87	84.09	0.00	0.00	0.00
1978	2,600.50	650.13	332.00	6,675.13	1,668.78	465.69	571.58	142.90	124.83	37.23	9.31	6.93
1980	1,462.40	365.60	257.49	31,152.79	7,788.20	5,103.08	1,651.31	412.83	130.94	16.97	4.24	4.92
1981	4,532.29	1,133.07	605.35	2,201.58	550.40	576.05	374.99	93.75	63.28	18.26	4.56	2.71
1982	4,467.30	1,116.82	253.25	62,924.56	15,731.14	8,715.32	345.97	86.49	54.74	118.60	29.65	31.09
1983	12,495.84	3,123.96	1,568.95	11,874.62	2,968.65	2,156.93	132.31	33.08	32.00	153.15	38.29	24.31
1984	6,601.29	1,650.32	683.85	7,457.90	1,864.47	1,074.53	181.45	45.36	17.34	16.17	4.04	3.89
1985	1,759.09	439.77	403.83	991.68	247.92	328.75	109.12	27.28	10.02	14.89	3.72	3.35
1986	3,943.78	985.94	1,156.58	6,159.65	1,539.91	402.13	211.78	52.95	34.93	57.74	14.43	7.54
1987	1,351.13	337.78	198.38	1,507.50	376.87	386.18	280.08	70.02	24.70	28.60	7.15	4.48
1988	476.71	119.18	20.80	742.62	185.66	237.01	126.21	31.55	11.31	8.99	2.25	1.76
1989	440.73	110.18	49.56	456.11	114.03	175.22	366.15	91.54	47.66	4.06	1.01	1.35
1990	1,318.88	329.72	113.54	239.29	59.82	69.35	363.43	90.86	75.07	8.99	2.25	2.28
1991	945.71	236.43	153.82	134.10	33.53	40.35	689.09	172.27	112.96	17.98	4.50	4.50
1992	2,018.12	504.53	175.92	73.81	18.45	27.79	156.87	39.22	30.99	3.60	0.90	1.15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Average Index
Delta Smelt Abundance Index
Year
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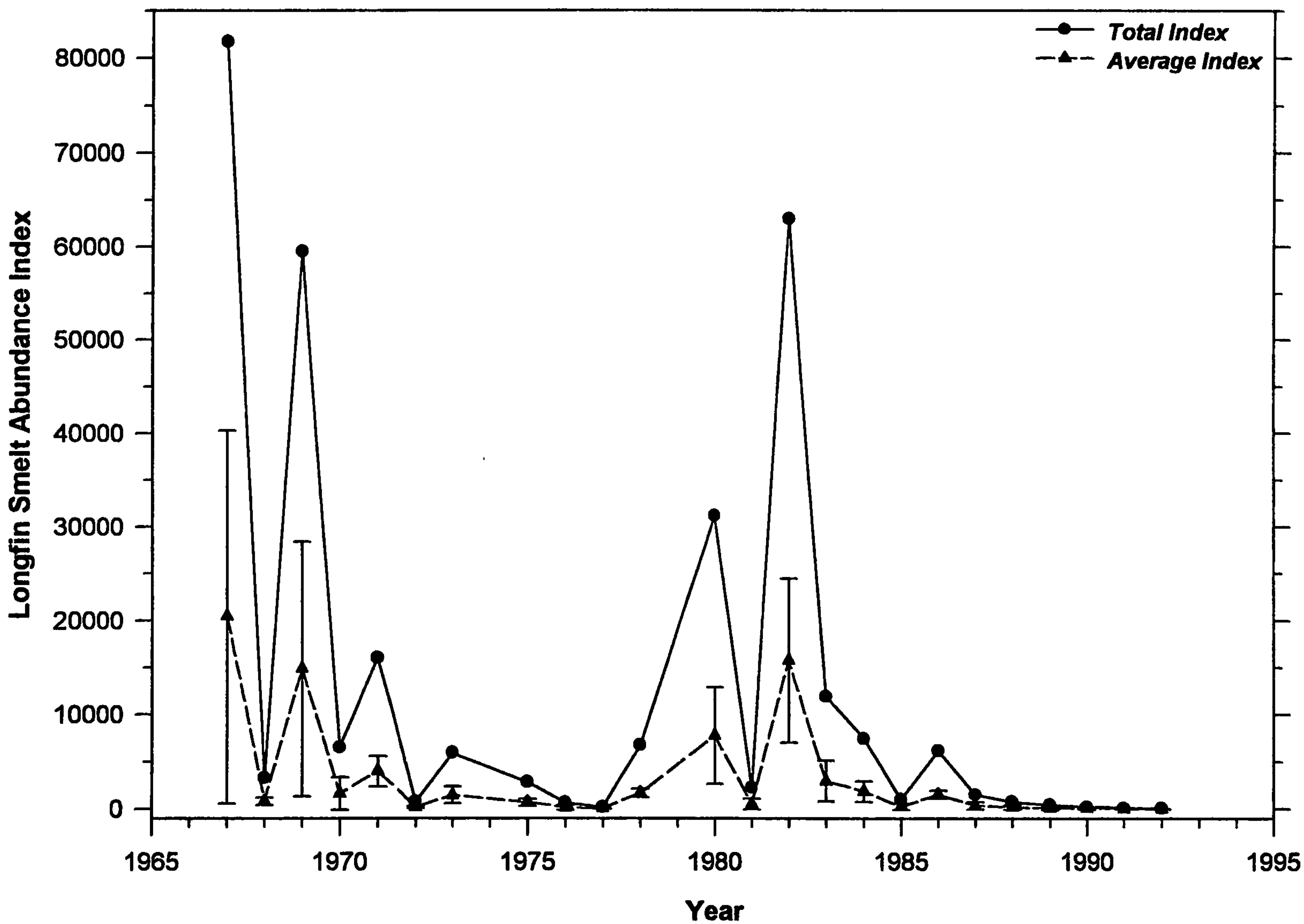
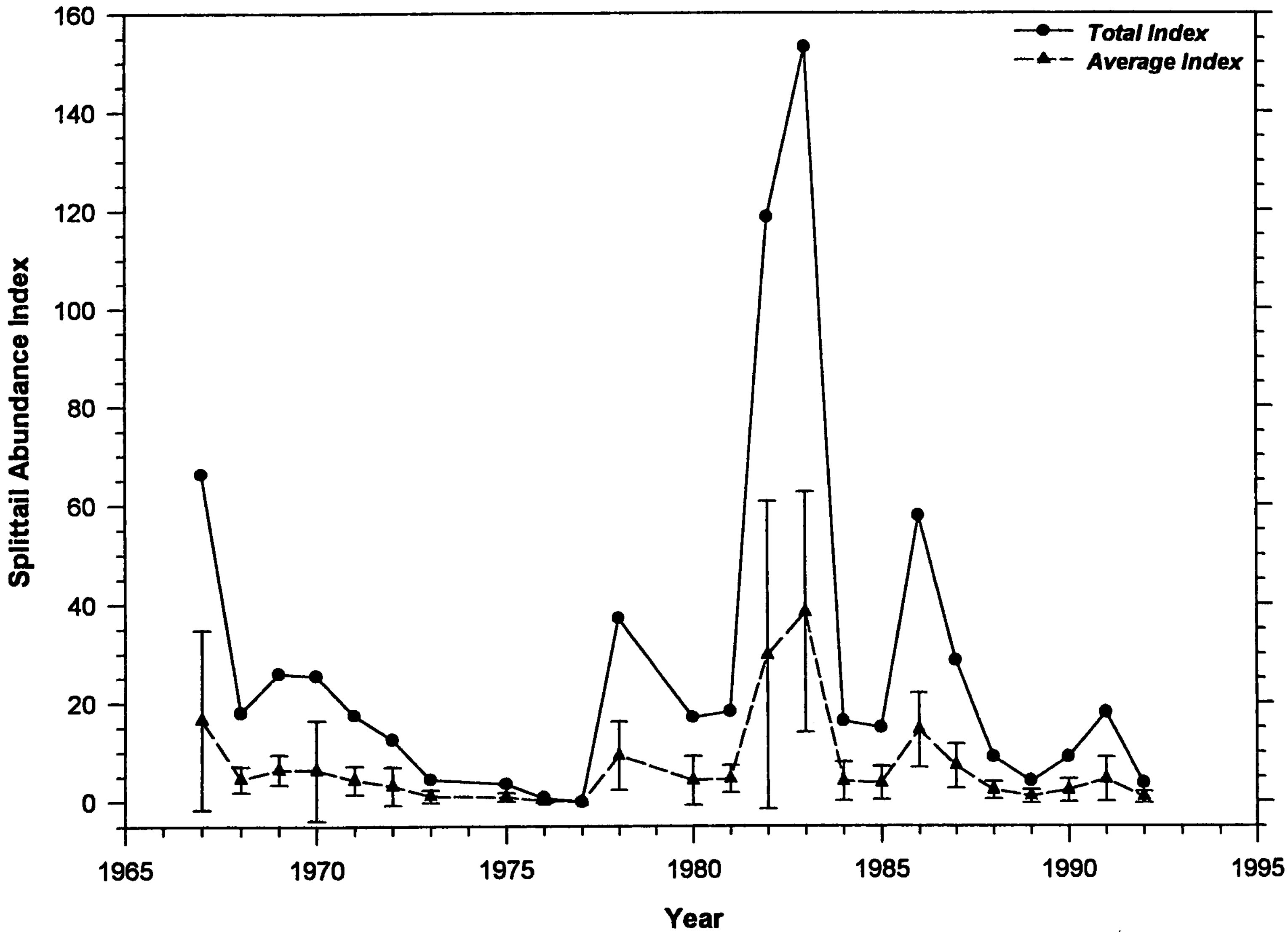
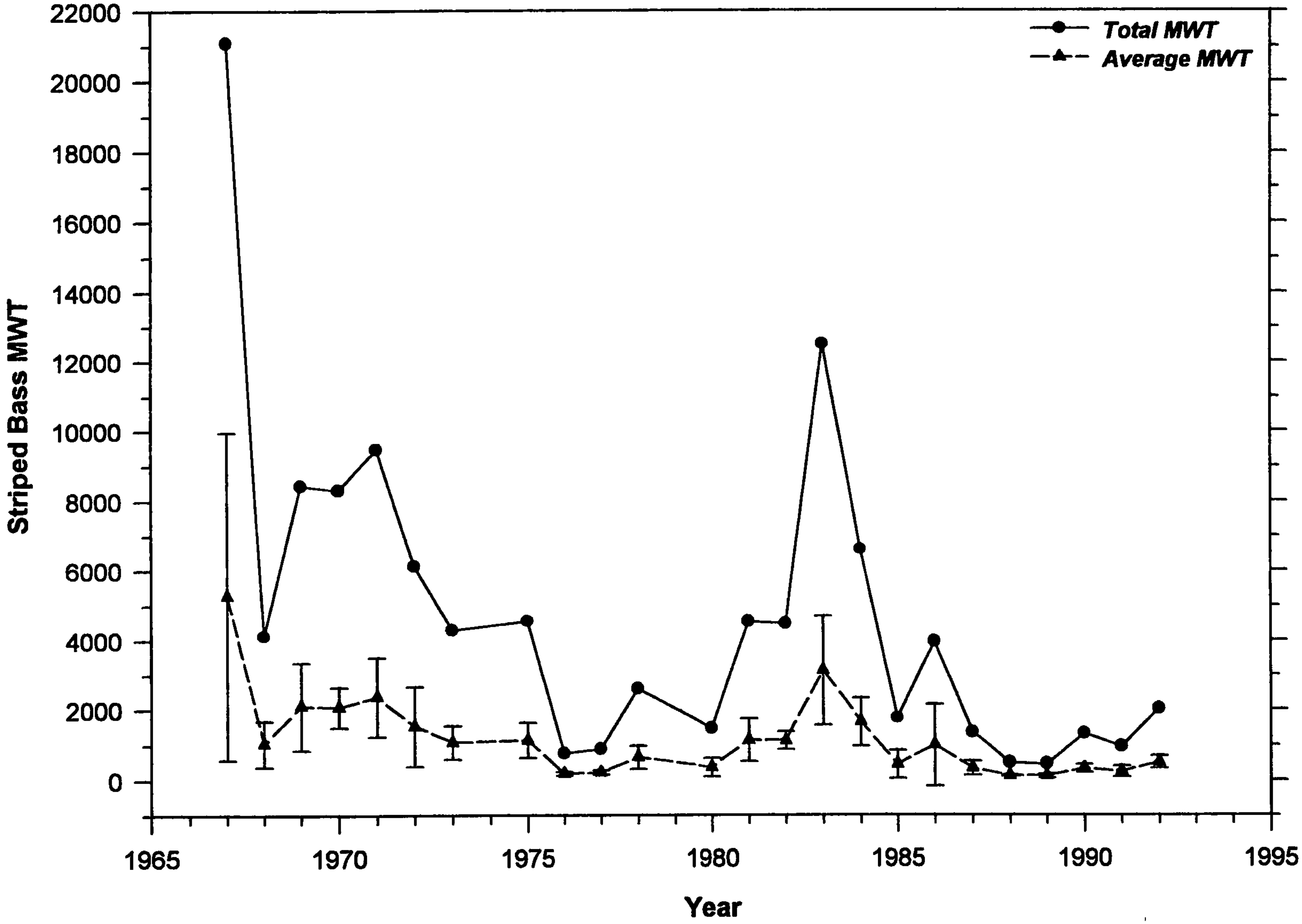
200
400
600
800
1000
1200
1400
1600
1800
1965
1970
1975
1980
1985
1990
1995


Longfin Smelt Abundance Index
80000
70000
60000
50000
40000
30000
20000
10000
0
1965
1970
1975
1980
1985
1990
1995
Year
Total Index
Average Index

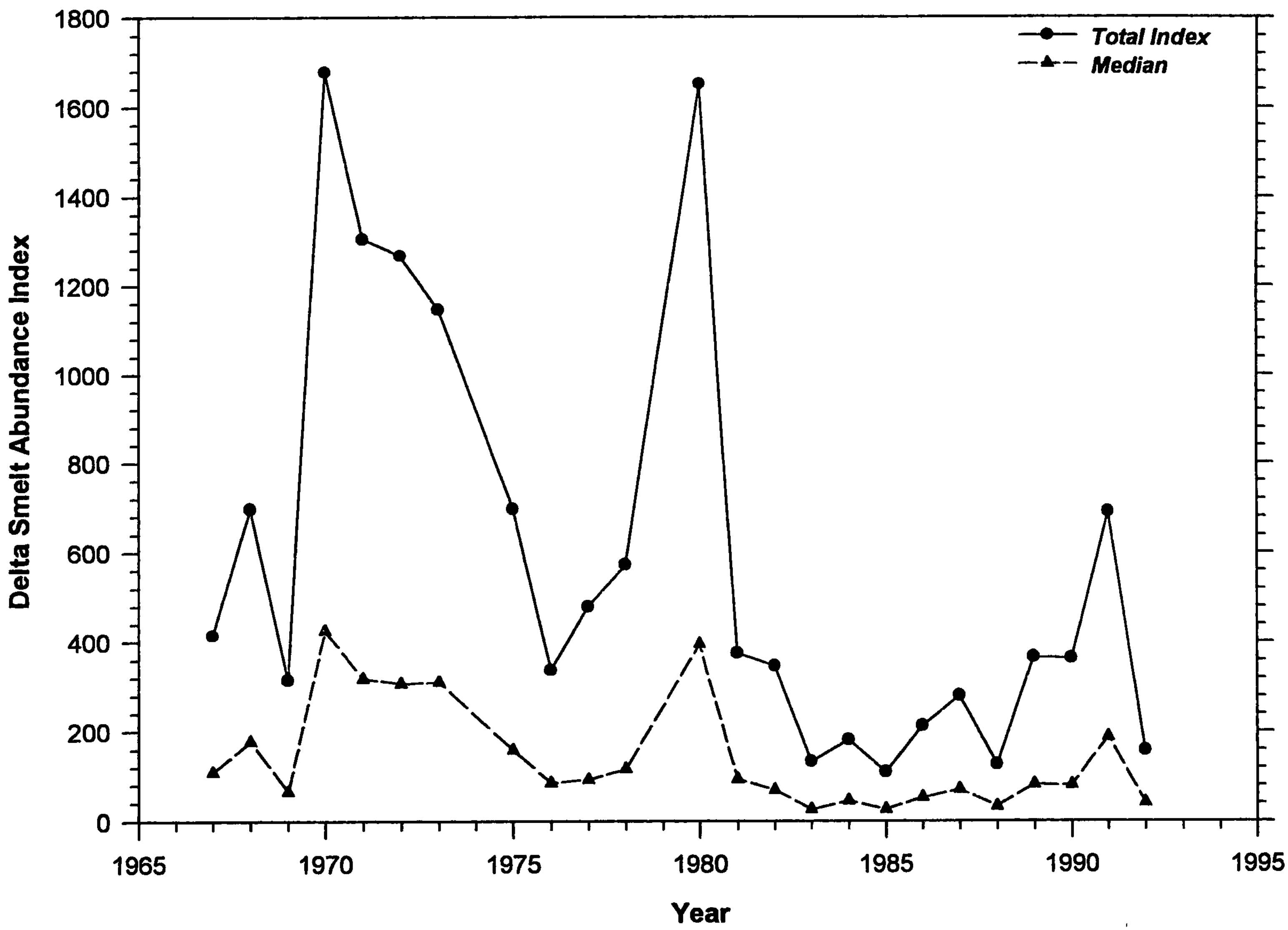


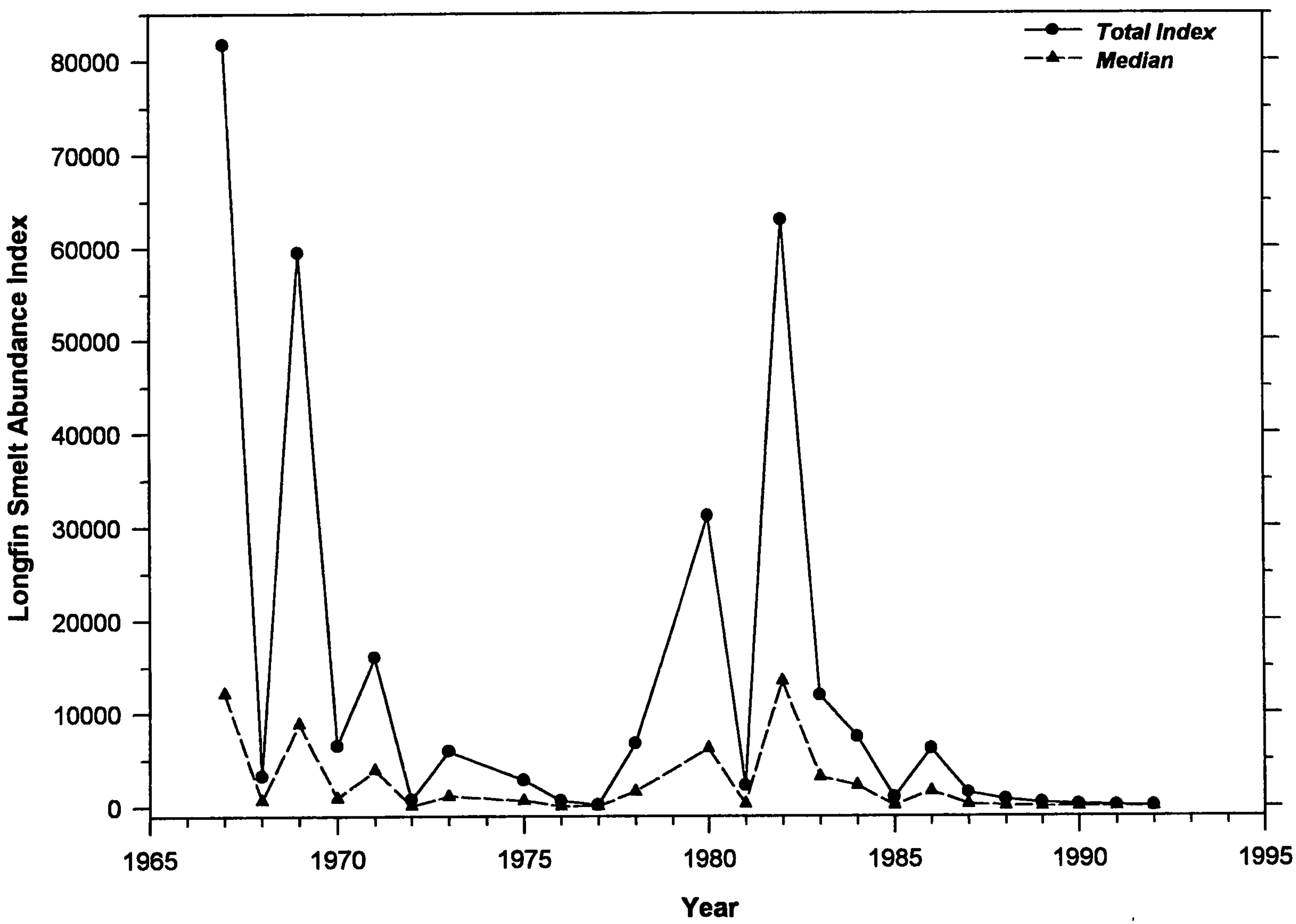
Total Index
Average Index
Splittail Abundance Index
Year
160
140
120
100
80
60
40
20
0
1965
1970
1975
1980
1985
1990
1995

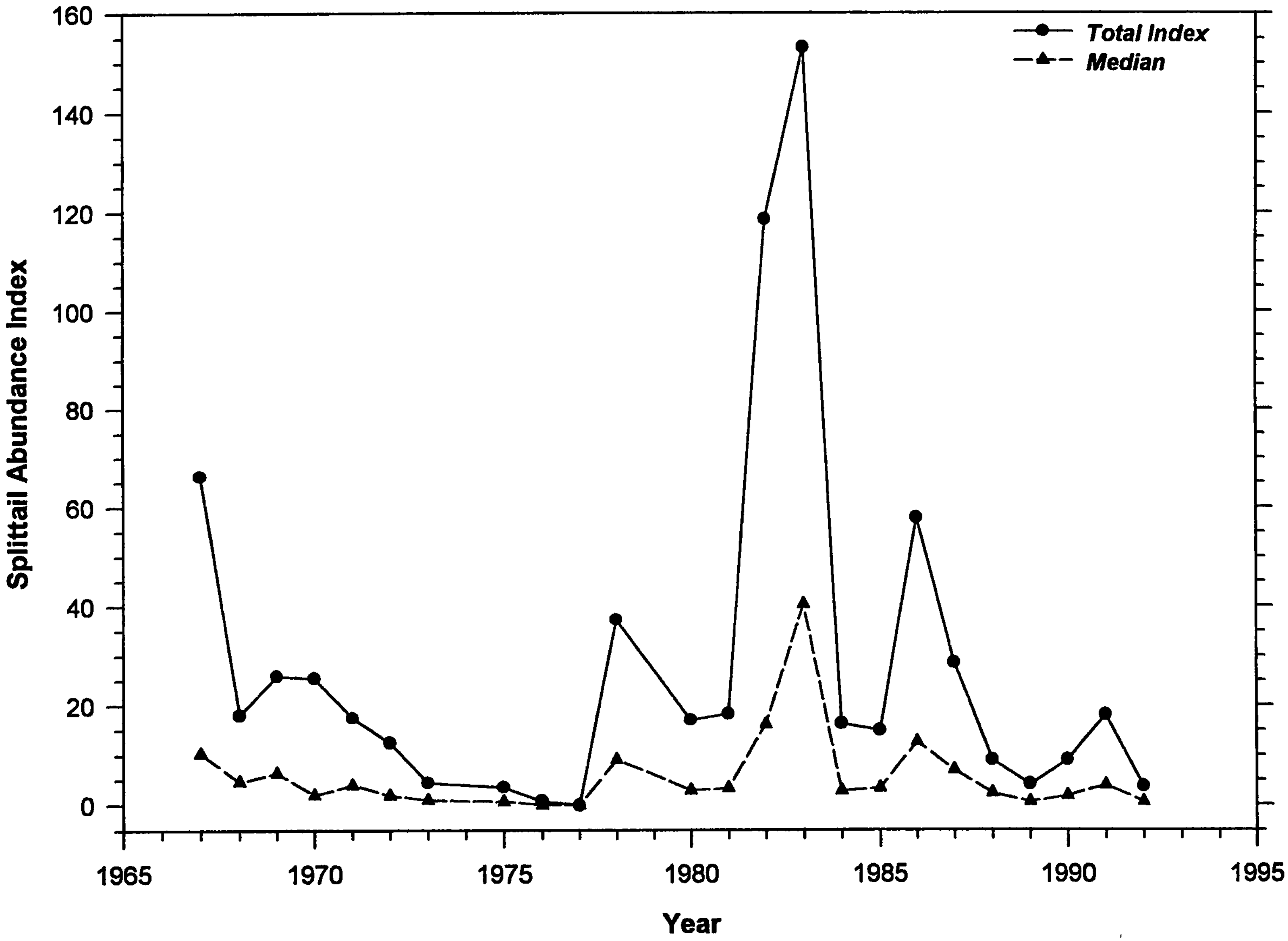

Total MWT
Average MWT
Striped Bass MWT
Year
22000
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
1965
1970
1975
1980
1985
1990
1995

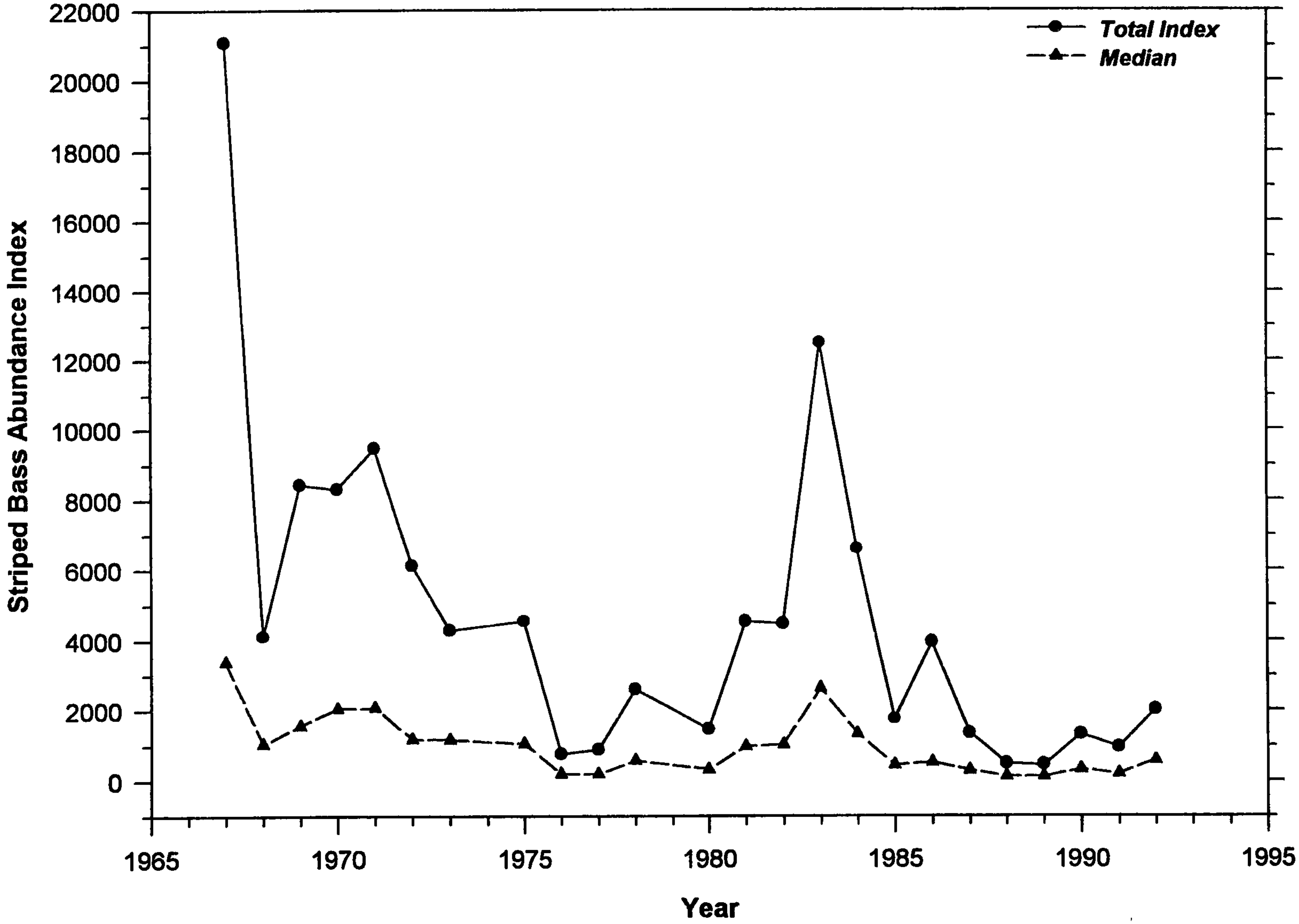
Tab 3.
Data Summary Table And Time Series Plots Comparing The Total Indices With The Median Indices

	STRIPED BASS		LONGFIN SMELT		DELTA SMELT		SPLITTAIL	
Year	Total Index	Median	Total Index	Median	Total Index	Median	Total Index	Median
1967	21,081.55	3,388.41	81,731.76	12,149.85	414.92	109.30	66.25	10.22
1968	4,117.67	1,039.28	3,317.54	717.67	696.54	177.24	18.06	4.65
1969	8,424.57	1,565.97	59,493.34	8,889.35	315.65	66.05	25.92	6.40
1970	8,297.77	2,056.11	6,534.63	977.80	1,677.46	426.42	25.44	1.98
1971	9,473.61	2,075.32	15,986.42	3,911.39	1,305.15	317.33	17.41	4.05
1972	6,128.62	1,177.49	759.50	127.93	1,266.90	307.13	12.50	1.88
1973	4,284.26	1,164.68	5,896.12	1,146.90	1,145.84	310.14	4.43	1.00
1975	4,547.33	1,047.18	2,808.64	646.45	697.88	158.02	3.57	0.71
1976	757.48	199.84	653.96	51.17	337.85	85.32	1.00	0.00
1977	884.39	198.53	204.36	53.14	479.48	92.64	0.00	0.00
1978	2,600.50	570.12	6,675.13	1,625.07	571.58	115.79	37.23	9.10
1980	1,462.40	324.62	31,152.79	6,212.46	1,651.31	395.75	16.97	2.95
1981	4,532.29	976.73	2,201.58	310.09	374.99	93.28	18.26	3.28
1982	4,467.30	1,026.61	62,924.56	13,418.21	345.97	69.59	118.60	16.14
1983	12,495.84	2,635.46	11,874.62	3,157.94	132.31	26.12	153.15	40.24
1984	6,601.29	1,336.41	7,457.90	2,259.07	181.45	45.34	16.17	2.76
1985	1,759.09	438.07	991.68	125.26	109.12	25.79	14.89	3.37
1986	3,943.78	520.78	6,159.65	1,665.51	211.78	52.32	57.74	12.54
1987	1,351.13	289.18	1,507.50	259.12	280.08	70.23	28.60	6.95
1988	476.71	117.52	742.62	103.34	126.21	32.73	8.99	2.36
1989	440.73	113.74	456.11	34.47	366.15	81.42	4.06	0.60
1990	1,318.88	316.16	239.29	43.61	363.43	79.59	8.99	1.84
1991	945.71	193.38	134.10	17.38	689.09	187.55	17.98	3.93
1992	2,018.12	578.14	73.81	7.16	156.87	40.89	3.60	0.60


Total Index
Median
Delta Smelt Abundance Index
1800
1600
1400
1200
1000
800
600
400
200
0
1965
1970
1975
1980
1985
1990
1995
Year


Total Index
Median
Longfin Smelt Abundance Index
0
10000
20000
30000
40000
50000
60000
70000
80000
1965
1970
1975
1980
1985
1990
1995
Year

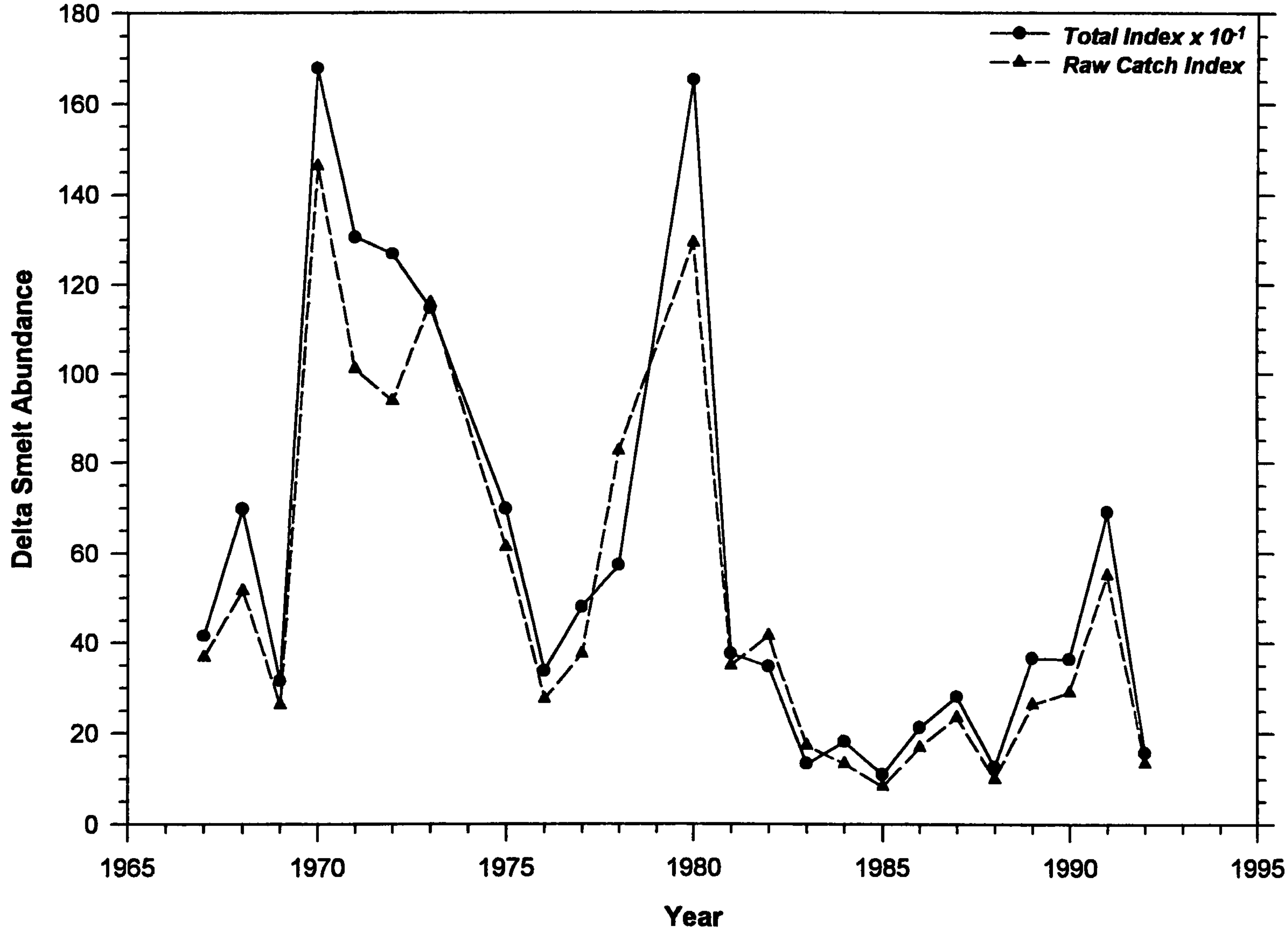

Splittail Abundance Index
Year
Total Index
Median
0
20
40
60
80
100
120
140
160
1965
1970
1975
1980
1985
1990
1995



Total Index
Median
Striped Bass Abundance Index
22000
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
1965
1970
1975
1980
1985
1990
1995
Year

Tab 4.

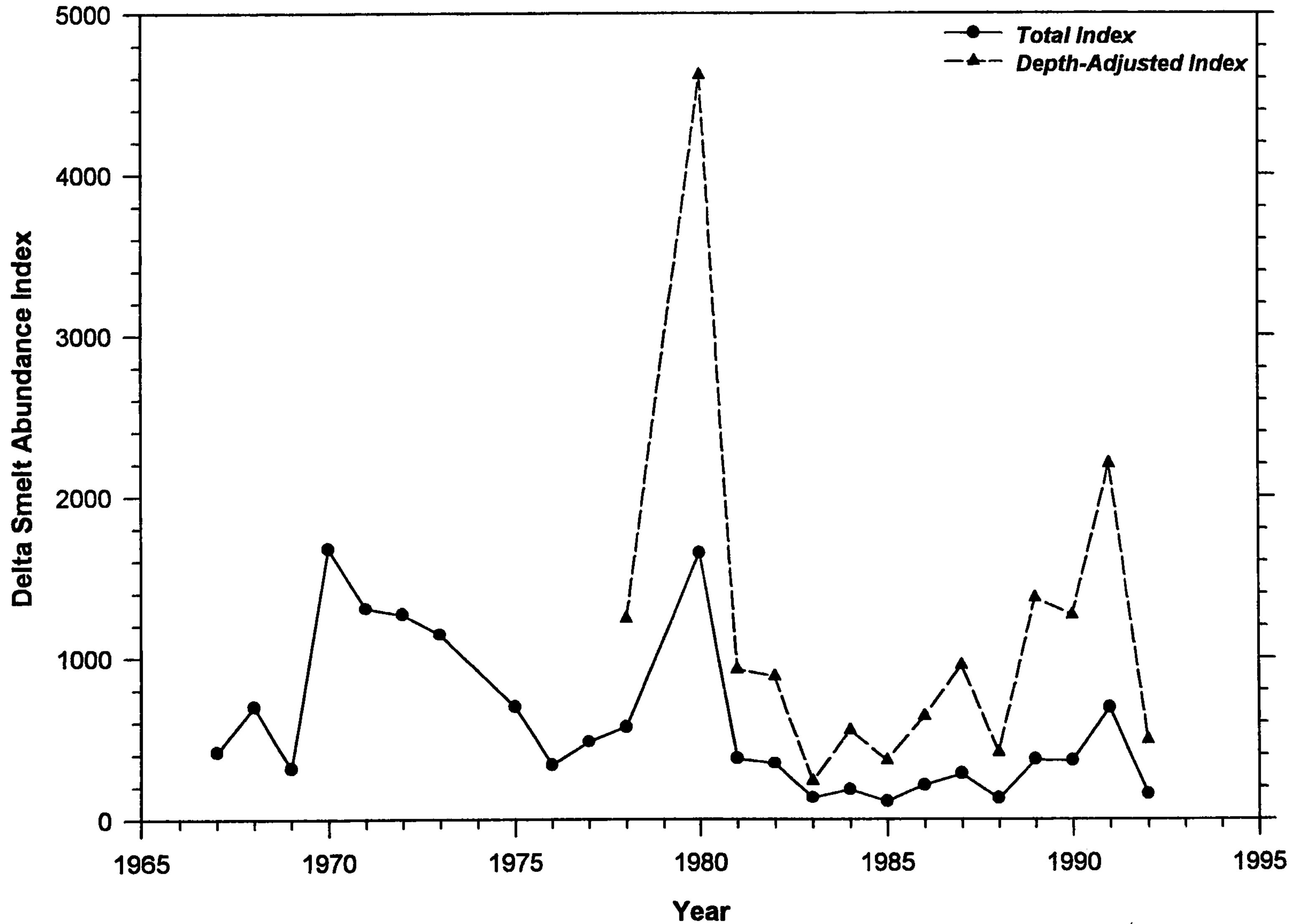
Time Series Plot Comparing The Total Index With The Raw Catch Index For Delta Smelt

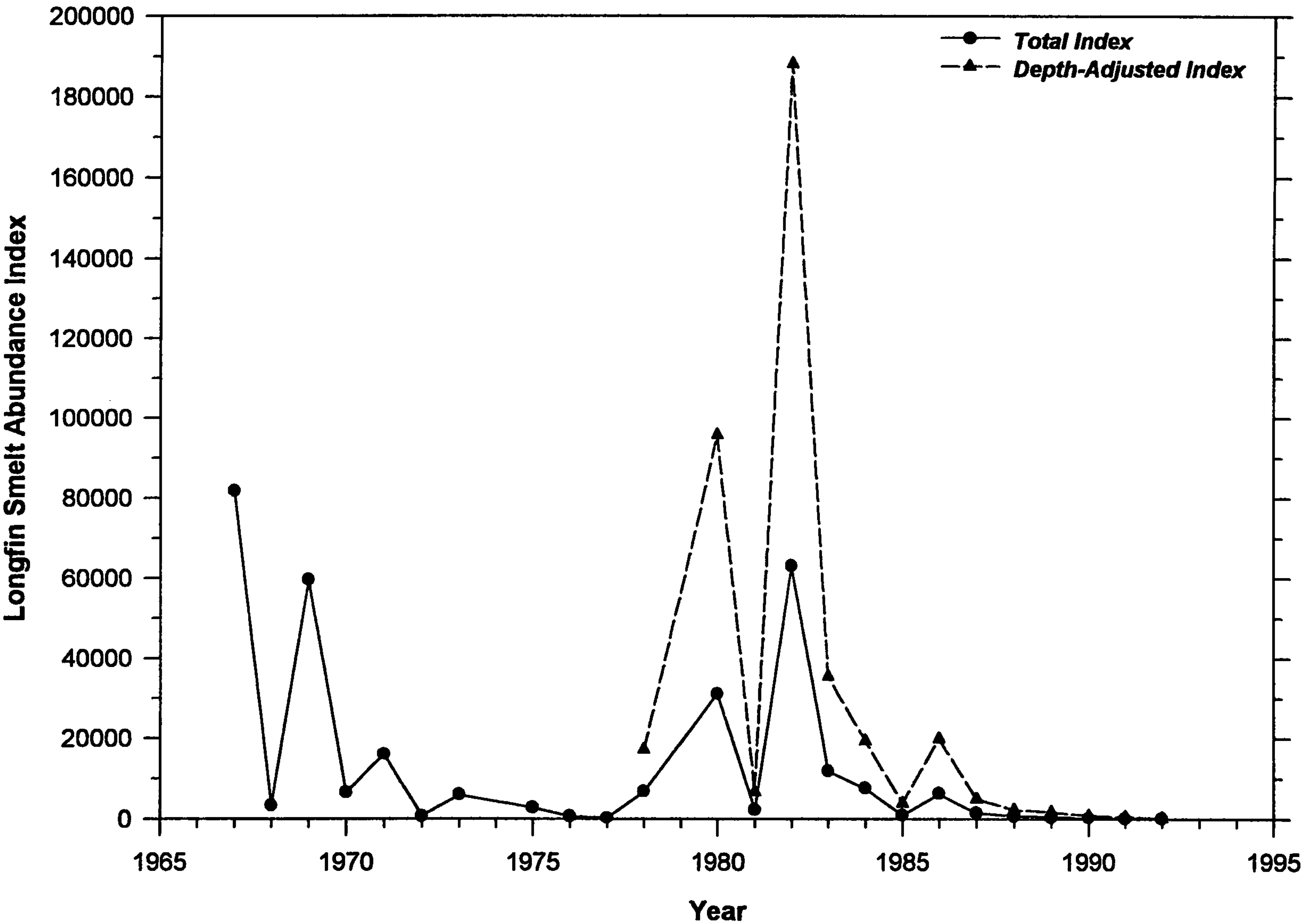

Delta Smelt Abundance
180
160
140
120
100
80
60
40
20
0
1965
1970
1975
1980
1985
1990
1995
Year
Total Index x 10-1
Raw Catch Index

Tab 5.
Depth-Adjusted Abundance Indices

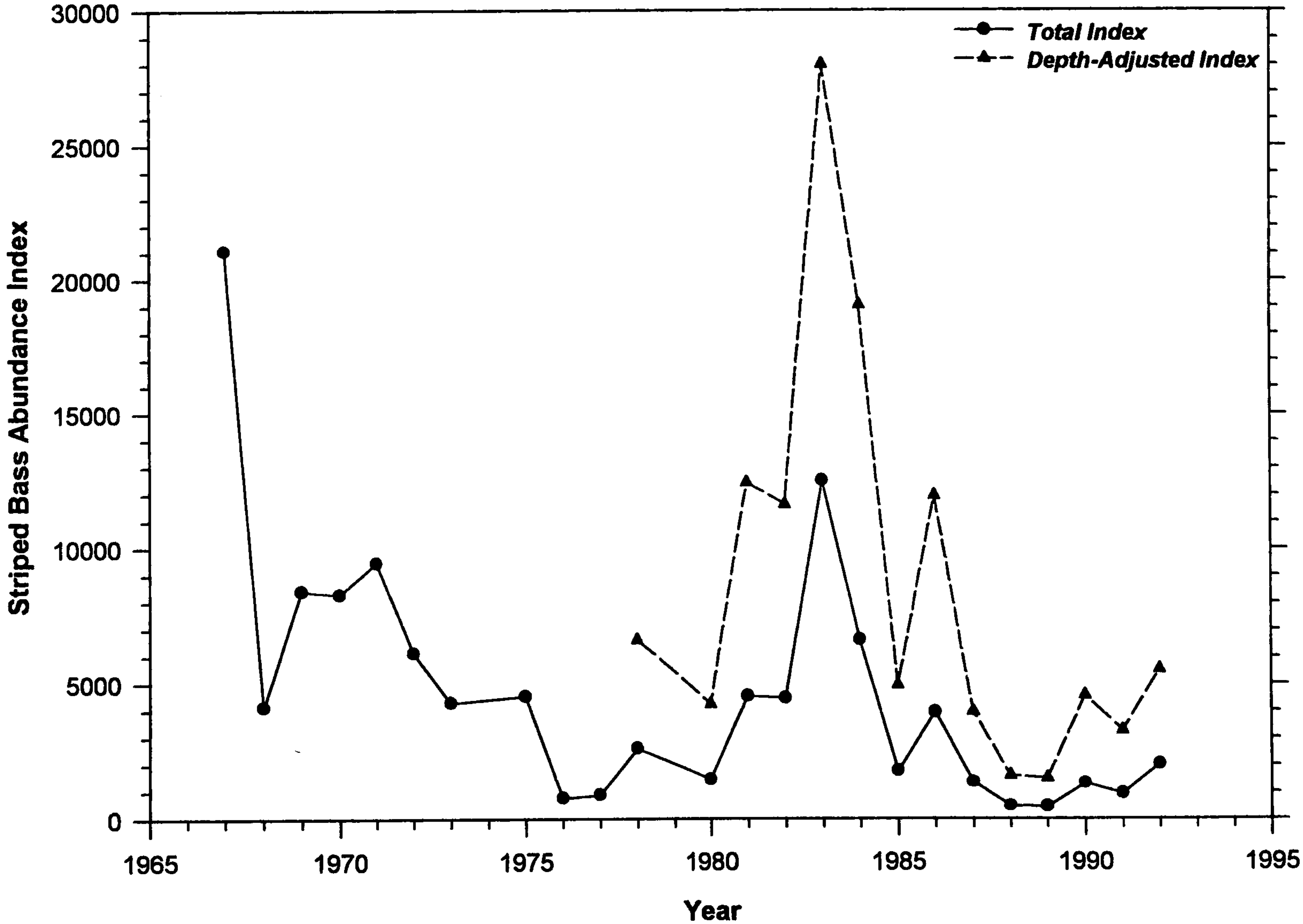
5a. Plots Comparing Depth-Adjusted And Total Indices
5b. Delta Smelt Depth-Adjusted Spreadsheet
5c. Longfin Smelt Depth-Adjusted Spreadsheet
5d. Striped Bass Depth-Adjusted Spreadsheet

5a. PLOTS COMPARING DEPTH-ADJUSTED AND TOTAL INDICES


Delta Smelt Abundance Index
0
1000
2000
3000
4000
5000
1965
1970
1975
1980
1985
1990
1995
Year
Total Index
Depth-Adjusted Index



Total Index
Depth-Adjusted Index
Longfin Smelt Abundance Index
200000
180000
160000
140000
120000
100000
80000
60000
40000
20000
0
1965
1970
1975
1980
1985
1990
1995
Year



Total Index
Depth-Adjusted Index
Striped Bass Abundance Index
30000
25000
20000
15000
10000
5000
0
1965
1970
1975
1980
1985
1990
1995
Year

5b. DELTA SMELT DEPTH-ADJUSTED SPREADSHEET

DELTA SMELT FALL MIDWATER TRAWL ABUNDANCE (depth adjustment)

		AREA																	
YEAR	MONTH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1978	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	93.80	235.80	26.43	9.27	0.00	0.00	365.30
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	8.40	113.06	18.21	19.64	0.00	0.00	159.31
	11	8.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	49.76	17.14	12.00	7.00	0.00	94.01
	12	0.00	0.00	0.00	0.00	0.00		0.00	0.00		556.80	6.40	14.00	9.64	18.57	10.80	8.40	0.00	624.61
		8.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	556.80	6.40	116.20	408.27	80.36	51.71	15.40	0.00	1243.24
1980	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	14.70	704.57	26.43	220.50	29.56	0.00	995.76
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	8.75	196.07	12.86	444.00	125.22	0.00	786.90
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	249.19	63.57	1003.33	189.88	96.25	1602.22
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	11.90	454.80	98.21	123.33	497.78	46.25	1232.28
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35.35	1604.63	201.07	1791.17	842.43	142.50	4617.15
1981	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	3.50	250.65	8.42	26.67	0.00	0.00	289.23
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	6.46	7.08	48.67	0.00	0.00	62.21
	11	0.00		0.00	0.00			0.00	0.00		0.00	0.00	0.00	36.00	25.83	15.00	76.22	0.00	153.06
	12	0.00		0.00	3.25	0.00		0.00	0.00		0.00	0.00	201.60	68.06	110.42	11.14	27.22	0.00	421.69
		0.00	0.00	0.00	3.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	205.10	361.17	151.75	101.48	103.44	0.00	926.19
1982	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	22.86	77.70	1.59	0.00	22.20	0.00	0.00	124.35
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	4.20	65.96	11.07	40.20	2.55	0.00	123.98
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	19.60	178.41	7.86	0.00	39.45	0.00	245.32
	12	4.05		0.00	0.00	0.00		0.00	0.00		0.00	16.00	0.00	13.76	304.79	8.00	43.40	0.00	390.00
		4.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	38.86	101.50	259.73	323.71	70.40	85.40	0.00	883.65
1983	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	3.21	0.00	0.00	0.00	3.21
	10	0.00		0.00	0.00	0.00		0.00	0.00		14.40	0.00	16.80	37.69	3.14	3.00	0.00	0.00	75.03
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	65.25	42.14	0.00	0.00	0.00	107.39
	12	0.00	0.00	0.00	6.50	4.07	0.00	0.00	0.00		0.00	32.00	0.00	0.00	7.14	0.00	0.00		49.71
		0.00	0.00	0.00	6.50	4.07	0.00	0.00	0.00	0.00	14.40	32.00	16.80	102.94	55.64	3.00	0.00	0.00	235.35
1984	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	30.80	76.76	5.50	10.80	0.00	0.00	123.86
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	50.06	2.64	64.00	0.00		116.71
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	204.30	2.50	24.00	4.00		234.80
	12	0.00		0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	7.88	15.71	0.00	51.80		75.39
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	30.80	339.00	26.36	98.80	55.80	0.00	550.76
1985	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	70.94	0.00	61.80	0.00	0.00	132.74
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	10.06	0.00	54.00	0.00	0.00	64.06
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	84.00	0.00		84.00
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	25.80	56.78		82.58
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	81.00	0.00	225.60	56.78	0.00	363.38

DELTA SMELT FALL MIDWATER TRAWL ABUNDANCE (depth adjustment)

		AREA (note 2, 6, 9 missing)														
YEAR	MONTH	1	3	4	5	7	8	10	11	12	13	14	15	16	17	Total
1986	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	23.64	126.74	4.57	171.60	0.00	0.00	326.56
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.53	1.71	4.27	9.67	0.00	25.18
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17.26	4.50	49.20	4.45	0.00	75.41
	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.66	96.35	4.00	90.24	15.60		208.85
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	26.30	249.88	14.79	315.31	29.73	0.00	636.01
1987	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.42	0.00	0.00	239.40	0.00	0.00	246.82
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	117.24	3.50	0.00	120.74
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	198.24	18.32	0.00	216.56
	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.82	14.64	303.72	43.52	0.00	367.70
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.42	5.82	14.64	858.60	65.33	0.00	951.82
1988	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	54.95	0.00	83.52	4.67	0.00	143.14
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.24	0.00	114.60	0.00	0.00	118.84
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	64.20	8.17	0.00	72.37
	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19.60	3.60	0.00	48.00	8.00		79.20
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19.60	62.79	0.00	310.32	20.83	0.00	413.54
1989	9	0.00	0.00	0.00	0.00		0.00	0.00	0.00	28.00	160.41	4.71	51.00	74.20	0.00	318.33
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.80	81.74	3.21	149.40	13.42	0.00	257.57
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	375.14	0.00	237.48	35.38	0.00	648.00
	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.80	40.24	0.00	94.80	7.64	0.00	145.47
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	40.60	657.53	7.93	532.68	130.63	0.00	1369.37
1990	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	135.21	0.00	252.00	0.00	0.00	387.21
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	33.56	2.50	129.60	0.00	0.00	165.66
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	29.12	0.00	613.80	11.67	0.00	654.58
	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.88	3.93	31.80	14.00	0.00	56.61
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	204.78	6.43	1027.20	25.67	0.00	1264.07
1991	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.50	0.00	0.00	339.60	32.67	0.00	375.77
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	158.82	1.79	559.80	113.17	0.00	833.58
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.88	7.14	561.60	289.92	0.00	874.54
	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.84	2.14	95.40	9.33	0.00	114.71
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.50	182.54	11.07	1556.40	445.08	0.00	2198.60
1992	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.29	214.20	15.75	0.00	231.24
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.29	0.00	0.00	0.00	4.20	0.00	0.00	14.49
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.71	0.00	174.60	0.00	0.00	178.31
	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.24	5.71	57.00	0.00	0.00	66.95
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.29	0.00	7.94	7.00	450.00	15.75	0.00	490.98

5c. LONGFIN SMELT DEPTH-ADJUSTED SPREADSHEET

LONGFIN SMELT FALL MIDWATER TRAWL ABUNDANCE (depth adjustment)

		AREA																	
YEAR	MONTH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1978	9	507.26	2.80	932.25	47.67	75.23	53.10	98.60	95.97	115.20	196.00	368.90	1381.20	71.07	22.36	0.00	0.00	0.00	3967.62
	10	120.15	0.00	0.00	0.00	8.13	0.00	2.55	0.00	9.60	264.00	746.20	1604.25	180.71	3.27	0.00	0.00	0.00	2938.87
	11	121.50	0.00	28.25	0.00	12.20	0.00	10.20	191.94	57.60	185.33	471.00	2239.94	209.29	409.09	109.20	0.00	0.00	4045.54
	12	676.35	0.00	381.94	107.25	8.13		0.00	0.00	211.20	844.80	1672.30	1689.43	256.79	294.60	56.00	26.67	0.00	6225.45
		1425.26	2.80	1342.44	154.92	103.70	53.10	111.35	287.91	393.60	1490.13	3258.40	6914.82	717.86	729.33	165.20	26.67	0.00	17177.48
1980	9	5467.50		1000.05	866.67	0.00		612.00	26172.21		0.00	634.67	4898.60	5391.00	710.71	1125.00	523.44	0.00	47401.86
	10	56.70		24.86	2.17	24.40		5.10	0.00		7.20	1266.67	4143.13	7201.29	2349.29	548.00	261.33	0.00	15890.12
	11	0.00		0.00	6.50	0.00		0.00	0.00		48.00	147.20	1657.44	4530.38	1085.71	2595.33	165.38	0.00	10235.94
	12	10935.00		33.90	97.50	183.00		20.40	180.38		96.00	760.00	4263.00	4533.00	341.07	423.33	337.56	0.00	22204.14
		16459.20	0.00	1058.81	972.83	207.40	0.00	637.50	26352.59	0.00	151.20	2808.53	14962.17	21655.66	4486.79	4691.67	1287.71	0.00	95732.06
1981	9	0.00		0.00	0.00	0.00		5.10	0.00		0.00	24.00	149.10	265.16	38.83	49.33	0.00	0.00	531.53
	10	14.18		0.00	1.52	0.00		0.00	9.25		0.00	0.00	6.30	290.01	29.17	699.33	14.00	0.00	1063.75
	11	9.45		0.00	6.50			0.00	0.00		7.20	29.71	53.20	226.80	14.58	99.00	0.00	0.00	446.45
	12	0.00		27.12	16.25	0.00		0.00	0.00		7.20	1444.00	2245.60	786.94	61.25	52.29	28.78	5.00	4674.42
		23.63	0.00	27.12	24.27	0.00	0.00	5.10	9.25	0.00	14.40	1497.71	2454.20	1568.91	143.83	899.95	42.78	5.00	6716.15
1982	9	1952.10		488.16	1421.33	292.80		2284.80	9.25		0.00	1484.57	4886.70	1845.00	202.08	0.00	0.00	0.00	14866.80
	10	2614.28		1423.80	450.67	414.80		10.20	5254.00		9.60	8376.00	8215.90	9950.61	2113.79	138.00	10.18	0.00	38981.82
	11	45.56		1620.42	2.17	732.00		0.00	10.57		158.40	27790.67	38557.40	20997.00	2135.36	209.33	3.82	0.00	92262.70
	12	11684.25		64.98	17.33	0.00		81.60	1306.10		4.80	8122.67	18428.20	1812.71	341.71	110.67	63.70	20.00	42058.71
		16296.19	0.00	3597.36	1891.50	1439.60	0.00	2376.60	6579.92	0.00	172.80	45773.90	70088.20	34605.32	4792.94	458.00	77.70	20.00	188170.03
1983	9	35.44		0.00	0.00	0.00		0.00	0.00		84.00	37.71	257.60	41.29	1.43	0.00	0.00	0.00	457.47
	10	430.31		149.16	0.00	0.00		0.00	15.86		4132.80	790.86	3954.30	21.38	1.79	3.60	0.00	0.00	9500.05
	11	1971.34		198.88	162.50	280.60		5.10	15.86		2246.40	2470.86	5441.80	1680.75	403.36	10.80	0.00	0.00	14888.24
	12	336.15	5.60	820.38	184.17	105.73	5.90	10.20	2784.25		57.60	4532.00	1438.50	45.60	191.43	46.29	0.00		10563.79
		2773.24	5.60	1168.42	346.67	386.33	5.90	15.30	2815.96	0.00	6520.80	7831.43	11092.20	1789.02	598.00	60.69	0.00	0.00	35409.56
1984	9	0.00		0.00	2.17	0.00		0.00	0.00		36.00	258.67	473.20	162.00	8.50	7.20	0.00	0.00	947.73
	10	478.91		0.00	292.72	521.55		0.00	0.00		86.40	522.00	1255.80	914.51	116.57	194.67	16.10		4399.23
	11	283.10	0.00	268.94	20.80	18.71	46.32	8.16	0.00	0.00	72.00	741.33	2368.10	3489.08	127.57	704.00	136.00		8284.10
	12	144.79		2.26	2.17	14.23	0.00	0.00	277.50		1562.40	530.67	1983.80	764.44	186.43	79.33	182.00		5730.01
		906.80	0.00	271.20	317.85	554.49	46.32	8.16	277.50	0.00	1756.80	2052.67	6080.90	5330.03	439.07	985.20	334.10	0.00	19361.07
1985	9	0.00		0.00	0.00	0.00		0.00	0.00		0.00	14.86	12.60	18.00	6.07	6.60	0.00	0.00	58.13
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	0.00	5.88	14.82	0.00	69.60	0.00	0.00	90.30
	11	0.00		0.00	0.00	0.00		0.00	47.57		0.00	42.29	18.20	10.13	13.93	504.00	9.55		645.66
	12	30.38		0.00	0.00	0.00		0.00	21.14		0.00	564.57	364.00	1276.20	53.71	664.80	84.00		3058.80
		30.38	0.00	0.00	0.00	0.00	0.00	0.00	68.71	0.00	0.00	621.71	400.68	1319.15	73.71	1245.00	93.55	0.00	3852.89

LONGFIN SMELT FALL MIDWATER TRAWL ABUNDANCE (depth adjustment)

		AREA (note 2, 6, 9 missing)														
YEAR	MONTH	1	3	4	5	7	8	10	11	12	13	14	15	16	17	Total
1986	9	97.20	14.01	29.47	48.80	0.00	27.75	0.00	65.60	955.58	1287.85	170.86	54.60	12.73	0.00	2764.44
	10	78.98	100.34	16.03	29.28	15.30	589.36	5.76	93.03	2290.12	759.39	311.43	131.47	26.60	0.00	4447.08
	11	549.18	290.86	24.27	70.76	0.00	33.30	36.00	238.86	1667.96	1775.01	314.43	1000.56	47.09	7.00	6055.28
	12	783.07	80.23	4.33	0.00	0.00	185.93	0.00	836.34	1090.04	1989.64	537.21	785.28	283.40		6575.47
		1508.42	485.45	74.10	148.84	15.30	836.33	41.76	1233.83	6003.70	5811.88	1333.93	1971.91	369.82	7.00	19842.26
1987	9	5.47	28.02	2.17	0.00	0.00	6.61	0.00	13.71	21.14	20.33	0.43	313.44	0.00	0.00	411.32
	10	29.36	0.00	0.00	0.00	6.12	25.37	0.00	50.97	28.42	37.80	0.00	56.64	0.00	0.00	234.69
	11	25.31	30.06	0.00	0.00	16.83	48.10	0.00	294.63	107.94	314.26	0.57	556.44	18.20	0.00	1412.34
	12	335.34	199.56	49.83	25.62	0.00	700.62	53.76	294.86	317.24	343.80	12.00	528.12	46.78	17.40	2924.93
		395.48	257.64	52.00	25.62	22.95	780.70	53.76	654.17	474.74	716.19	13.00	1454.64	64.98	17.40	4983.28
1988	9	0.00	0.00	0.00	0.00	6.12	0.00	0.00	0.00	0.00	7.84	1.57	25.80	0.00	0.00	41.33
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.14	24.78	25.73	1.79	0.00	0.00	0.00	61.44
	11	0.00	0.00	5.20	0.00	5.10	0.00	0.00	9.14	43.12	40.55	0.00	558.48	12.02	0.00	673.61
	12	172.33	47.46	8.67	42.70	79.56	57.04	14.40	130.97	385.00	247.80	12.71	228.00	73.00		1499.64
		172.33	47.46	13.87	42.70	90.78	57.04	14.40	149.26	452.90	321.92	16.07	812.28	85.02	0.00	2276.02
1989	9	0.00	0.00	0.00	0.00		0.00	0.00	14.86	14.28	12.60	0.00	3.36	0.00	0.00	45.10
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.47	0.00	93.00	0.00	0.00	101.47
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	64.91	25.48	27.74	0.00	23.52	9.67	0.00	151.33
	12	64.80	6.78	3.25	0.00	0.00	66.07	0.00	188.57	218.40	90.21	2.14	706.20	36.27	0.00	1382.70
		64.80	6.78	3.25	0.00	0.00	66.07	0.00	268.34	258.16	139.02	2.14	826.08	45.95	0.00	1680.60
1990	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.50	12.71	1.79	14.40	0.00	0.00	32.39
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.29	0.00	0.00	0.00	2.29
	11	6.48	9.04	3.47	0.00	0.00	10.79	0.00	27.43	9.80	14.82	3.57	164.40	21.82	0.00	271.62
	12	52.04	15.82	3.03	4.27	0.00	31.19	0.00	53.71	38.22	94.45	7.29	216.00	8.75	0.00	524.77
		58.52	24.86	6.50	4.27	0.00	41.98	0.00	81.14	51.52	121.98	14.93	394.80	30.57	0.00	831.06
1991	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.00	0.00	13.20	0.00	0.00	22.20
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.20	5.82	3.71	4.20	0.00	0.00	17.94
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	21.00	26.26	1.43	41.40	0.00	0.00	90.09
	12	10.13	0.00	3.47	0.00	0.00	38.32	0.00	133.71	64.12	36.42	7.50	63.60	20.42	0.00	377.69
		10.13	0.00	3.47	0.00	0.00	38.32	0.00	133.71	89.32	77.51	12.64	122.40	20.42	0.00	507.91
1992	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.50	0.00	0.00	0.00	0.00	0.00	10.50
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.29	4.90	15.35	0.00	10.80	0.00	0.00	41.34
	12	22.28	7.06	4.33	0.00	7.65	0.00	0.00	16.00	46.90	29.12	2.14	46.20	0.00	0.00	181.68
		22.28	7.06	4.33	0.00	7.65	0.00	0.00	26.29	62.30	44.47	2.14	57.00	0.00	0.00	233.52

5d. STRIPED BASS DEPTH-ADJUSTED SPREADSHEET

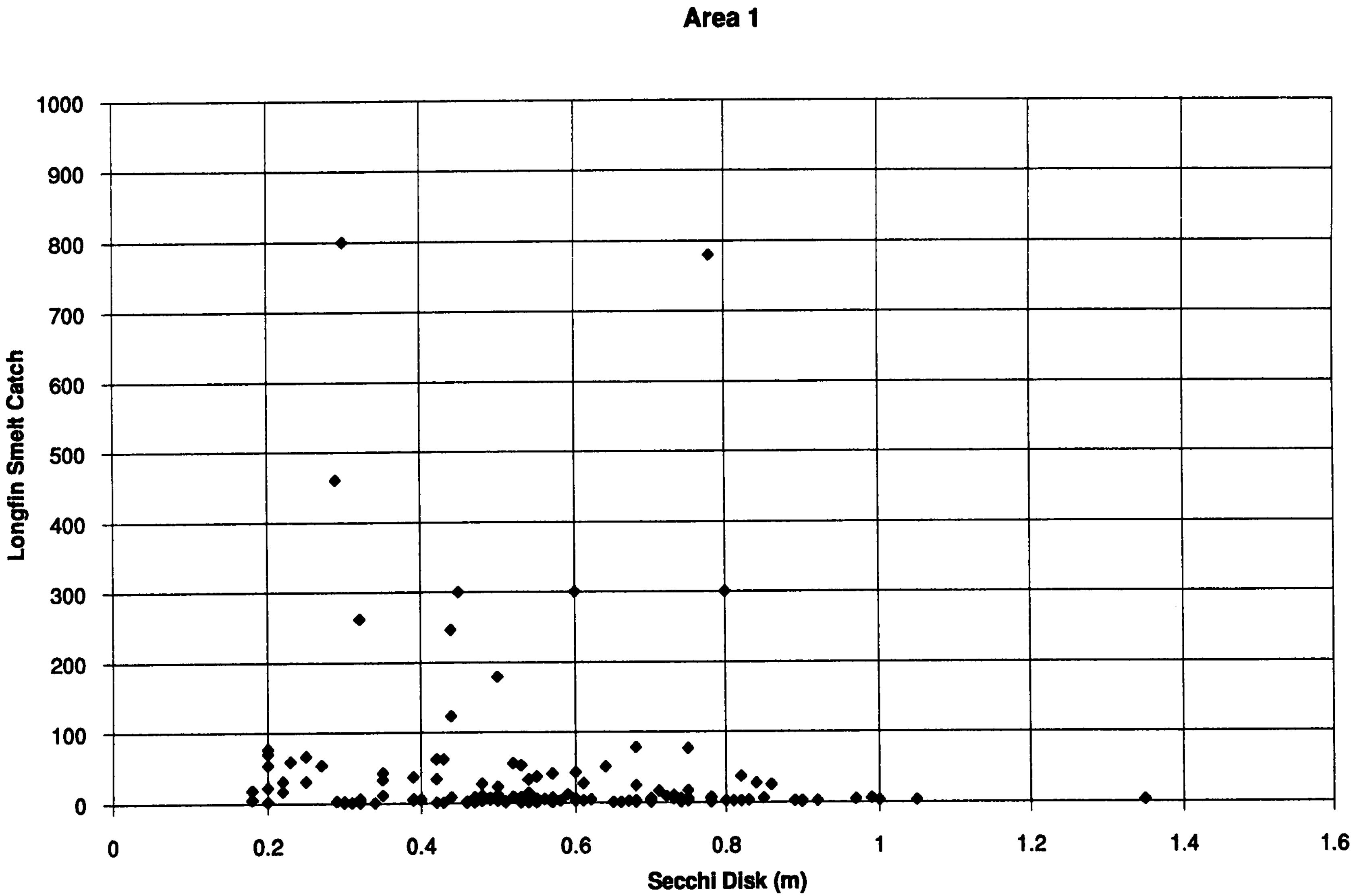
STRIPED BASS FALL MIDWATER TRAWL ABUNDANCE (depth adjustment)

YEAR	MONTH	AREA 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1978	9	0.00	0.00	7.53	4.33	0.00	2.95	0.00	0.00		0.00	208.00	317.80	842.40	361.79	351.82	357.64	112.50	2566.76
	10	20.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00		9.60	104.00	116.20	229.50	383.93	303.82	226.55	75.00	1468.84
	11	8.10	2.80	0.00	0.00	0.00	0.00	0.00	0.00		57.60	36.00	37.00	182.12	92.50	441.82	76.30	20.00	954.24
	12	27.00	0.00	0.00	55.25	0.00		0.00	0.00		0.00	43.20	281.40	490.50	74.29	655.80	9.10	0.00	1636.54
		55.35	2.80	7.53	59.58	0.00	2.95	0.00	0.00	0.00	67.20	391.20	752.40	1744.52	912.50	1753.25	669.58	207.50	6626.37
1980	9	0.00		0.00	2.17	0.00		0.00	7.93		0.00	16.00	23.80	172.93	92.86	787.50	703.89	255.00	2062.07
	10	0.00		0.00	0.00	12.20		0.00	0.00		43.20	0.00	68.25	40.50	57.14	328.00	415.33	77.50	1042.13
	11	0.00		0.00	0.00	0.00		0.00	0.00		9.60	0.00	18.67	67.50	100.71	38.00	33.25	7.50	275.23
	12	0.00		0.00	2.17	0.00		0.00	0.00		9.60	8.00	167.30	355.80	19.29	228.00	65.33	8.75	864.24
		0.00	0.00	0.00	4.33	12.20	0.00	0.00	7.93	0.00	62.40	24.00	278.02	636.73	270.00	1381.50	1217.81	348.75	4243.66
1981	9	0.00		0.00	6.83	12.20		0.00	0.00		28.80	192.00	175.00	209.48	113.08	196.00	182.00	80.00	1195.38
	10	48.60		9.04	10.40	8.54		0.00	10.79		187.20	165.71	182.70	496.06	38.75	672.00	177.33	112.50	2119.63
	11	28.35		33.90	41.17			0.00	0.00		86.40	329.14	179.20	547.80	81.67	621.60	304.89	293.75	2547.87
	12	8.10		298.32	6.50	24.40		0.00	0.00		7.20	3118.67	2361.80	515.25	95.42	22.29	66.11	30.00	6554.05
		85.05	0.00	341.26	64.89	45.14	0.00	0.00	10.79	0.00	309.60	3805.52	2898.70	1768.58	328.92	1511.89	730.33	516.25	12416.93
1982	9	6.75		20.34	0.00	0.00		0.00	0.00		273.60	102.86	246.40	1180.06	304.08	501.60	677.60	62.00	3375.29
	10	44.55		83.62	84.50	195.20		0.00	4.63		19.20	98.29	81.90	1026.00	174.36	141.00	38.82	21.67	2013.72
	11	16.20		0.00	26.00	73.20		5.10	0.00		50.40	390.67	643.30	871.94	214.64	57.33	68.73	14.00	2431.51
	12	474.86		0.00	0.00	0.00		0.00	24.05		9.60	1581.33	1332.10	86.82	208.93	20.00	67.20	0.00	3804.90
		542.36	0.00	103.96	110.50	268.40	0.00	5.10	28.68	0.00	352.80	2173.14	2303.70	3164.82	902.01	719.93	852.35	97.67	11625.42
1983	9	20.25		33.90	18.20	443.47		9.18	15.86		0.00	177.14	1348.90	613.59	322.86	156.60	87.50	2.00	3249.45
	10	563.96		29.38	30.33	933.30		35.70	10.57		14.40	277.71	52.50	357.19	486.36	102.00	91.00	28.18	3012.59
	11	1061.10		398.21	403.00	1409.10		10.20	459.86		43.20	1808.00	4565.40	939.94	448.93	127.20	39.45	31.43	11745.02
	12	1617.98	0.00	803.43	132.17	109.80	2.95	8.16	251.29		604.80	5352.00	839.30	103.20	158.93	0.00	21.00		10005.00
		3263.29	0.00	1264.92	583.70	2895.67	2.95	63.24	737.58	0.00	662.40	7614.86	6806.10	2013.91	1417.07	385.80	238.95	61.61	28012.05
1984	9	6.08		0.00	35.97	176.90		0.00	0.00		24.00	138.67	211.40	1336.24	195.14	337.20	98.64	190.00	2750.22
	10	724.95		6.78	53.08	51.85		5.10	5633.25		14.40	469.33	276.50	444.38	107.36	423.33	96.60		8306.91
	11	278.24	0.00	54.24	2.17	0.00	0.00	0.00	1047.89	0.00	172.80	441.33	613.20	955.91	107.21	420.00	160.00		4252.99
	12	3.04		0.00	0.00	0.00	0.00	0.00	12.33		705.60	341.33	2101.40	258.19	110.36	4.67	195.30		3732.22
		1012.30	0.00	61.02	91.22	228.75	0.00	5.10	6693.48	0.00	916.80	1390.67	3202.50	2994.71	520.07	1185.20	550.54	190.00	19042.35
1985	9	0.00		0.00	1.95	0.00		0.00	0.00		0.00	10.29	39.20	37.59	66.79	107.40	10.18	12.00	285.39
	10	0.00		0.00	0.00	0.00		0.00	0.00		0.00	4.57	240.10	563.29	501.64	27.00	32.45	8.89	1377.95
	11	0.00		0.00	0.00	0.00		0.00	0.00		0.00	40.00	25.90	15.75	14.36	48.00	15.27		159.28
	12	0.00		0.00	0.00	0.00		0.00	0.00		0.00	41.14	373.80	1167.00	63.21	847.20	623.00		3115.36
		0.00	0.00	0.00	1.95	0.00	0.00	0.00	0.00	0.00	0.00	96.00	679.00	1783.63	646.00	1029.60	680.91	20.89	4937.98

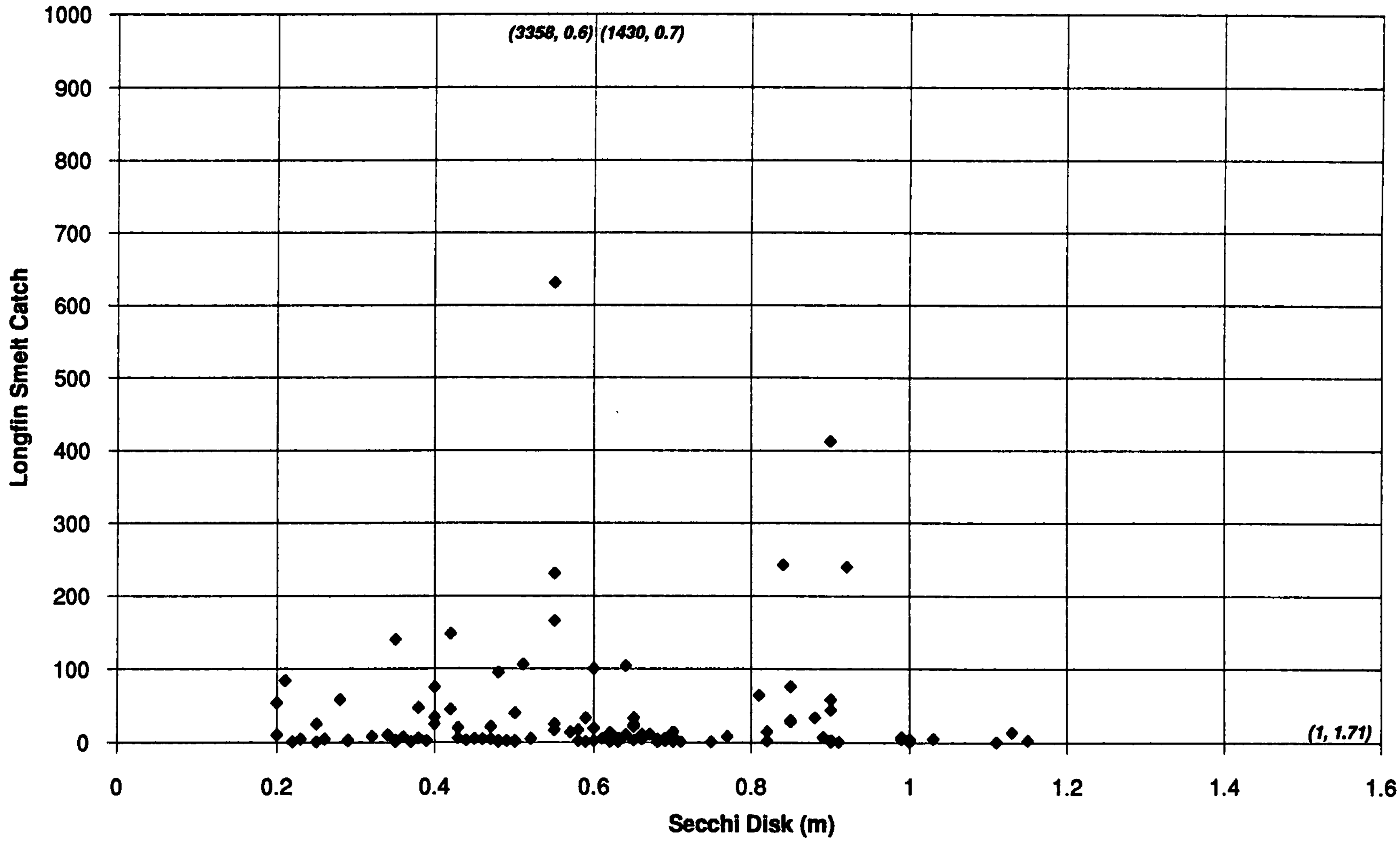
STRIPED BASS MIDWATER TRAWL ABUNDANCE (depth adjustment)

YEAR	MONTH	AREA (note 2, 6, 9 missing) 1	3	4	5	7	8	10	11	12	13	14	15	16	17	Total
1986	9	13.57	19.44	19.07	172.02	0.00	0.00	0.00	5.26	1873.20	559.48	249.57	2868.48	1824.07	290	7894.15
	10	0.00	5.42	13.00	0.00	0.00	0.00	5.76	5.49	161.00	281.75	176.14	734.53	374.436	60.8	1818.34
	11	9.32	0.00	22.53	0.00	0.00	0.00	122.40	277.26	135.24	94.13	33.93	503.28	244.745	47.4	1490.23
	12	84.24	2.49	0.00	0.00	0.00	0.00	57.12	178.97	201.60	74.96	6.71	72.96	55.6		734.66
		107.12	27.35	54.60	172.02	0.00	0.00	185.28	466.97	2371.04	1010.33	466.36	4179.25	2498.85	398.20	11937.37
1987	9	8.71	56.73	1.52	2.44	0.00	0.00	0.00	17.83	17.08	106.84	70.36	1284.24	39.96	74.60	1680.29
	10	27.14	16.27	3.90	9.15	0.00	0.00	24.48	19.43	13.72	63.45	19.93	109.44	85.52	40.80	433.22
	11	124.74	27.80	0.00	4.27	0.00	7.93	0.00	41.60	82.04	68.29	0.00	232.92	116.32	7.00	712.91
	12	95.38	27.12	52.00	4.27	7.65	13.21	15.36	114.06	211.26	28.16	6.07	405.00	127.75	14.60	1121.90
		255.96	127.92	57.42	20.13	7.65	21.14	39.84	192.91	324.10	266.74	96.36	2031.60	369.55	137.00	3948.32
1988	9	3.04	18.08	0.00	0.00	0.00	0.00	0.00	13.71	0.00	31.34	16.21	131.52	47.13	15.80	276.84
	10	0.00	2.26	0.00	0.00	0.00	0.00	0.00	0.00	31.92	16.84	20.86	147.96	45.03	14.80	279.67
	11	0.00	0.00	2.60	0.00	6.12	0.00	0.00	21.71	54.04	52.94	2.07	239.52	27.53	46.60	453.14
	12	0.00	0.00	0.00	0.00	0.00	10.79	0.00	126.40	300.30	95.16	7.86	4.00	36.00		580.51
		3.04	20.34	2.60	0.00	6.12	10.79	0.00	161.83	386.26	196.28	47.00	523.00	155.70	77.20	1590.16
1989	9	0.00	0.00	0.00	0.00		0.00	0.00	33.14	40.74	8.05	12.57	192.84	143.15	47.60	478.09
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.53	0.00	394.20	26.83	70.00	491.56
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19.43	20.58	27.74	5.29	125.28	72.16	7.40	277.88
	12	8.10	0.00	0.00	0.00	0.00	0.00	0.00	24.00	149.10	36.64	7.14	8.40	5.09	7.78	246.25
		8.10	0.00	0.00	0.00	0.00	0.00	0.00	76.57	210.42	72.95	25.00	720.72	247.24	132.78	1493.78
1990	9	0.00	0.00	0.00	6.10	0.00	0.00	5.76	0.00	51.80	29.86	12.36	283.80	281.27	94.00	764.95
	10	42.53	0.00	0.00	0.00	0.00	0.00	11.52	47.09	0.00	4.87	6.21	360.00	237.77	29.20	739.18
	11	9.11	9.94	0.00	0.00	0.00	0.00	21.60	181.94	351.40	318.18	42.86	402.60	60.90	7.00	1405.53
	12	113.20	28.70	22.75	8.54	0.00	0.00	0.00	268.57	861.98	256.98	22.86	40.20	12.83	11.00	1647.61
		164.84	38.65	22.75	14.64	0.00	0.00	38.88	497.60	1265.18	609.88	84.29	1086.60	592.77	141.20	4557.27
1991	9	20.25	2.71	2.82	6.71	0.00	0.00	0.00	43.43	0.00	51.35	12.86	284.40	224.00	95.00	743.53
	10	0.00	0.00	3.03	8.54	0.00	10.57	0.00	3.20	4.20	27.74	1.29	214.20	79.33	14.29	366.39
	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	37.71	25.20	76.66	5.36	64.20	86.92	56.43	352.48
	12	20.86	0.00	0.00	4.88	0.00	0.00	0.00	850.29	556.78	189.11	11.93	151.20	14.00	0.00	1799.04
		41.11	2.71	5.85	20.13	0.00	10.57	0.00	934.63	586.18	344.86	31.43	714.00	404.25	165.71	3261.43
1992	9	93.15	22.60	6.72	87.23	16.83	19.03	19.20	104.91	99.54	56.44	24.57	376.20	168.58	135.00	1230.00
	10	0.00	2.26	13.00	90.28	0.00	0.00	5.76	52.11	60.20	85.76	0.36	187.80	29.17	39.23	565.93
	11	110.36	47.46	17.55	24.40	15.30	7.93	0.00	392.00	417.20	183.18	25.71	412.20	131.25	5.00	1789.54
	12	49.61	7.06	28.17	12.20	7.65	129.50	79.20	481.40	423.50	572.82	18.57	78.00	33.83	7.14	1928.66
		253.13	79.38	65.43	214.11	39.78	156.46	104.16	1030.43	1000.44	898.20	69.21	1054.20	362.83	186.37	5514.14

Tab 6.
Plots Of Longfin Smelt Catch Versus Secchi Disk Depth For Each Subarea

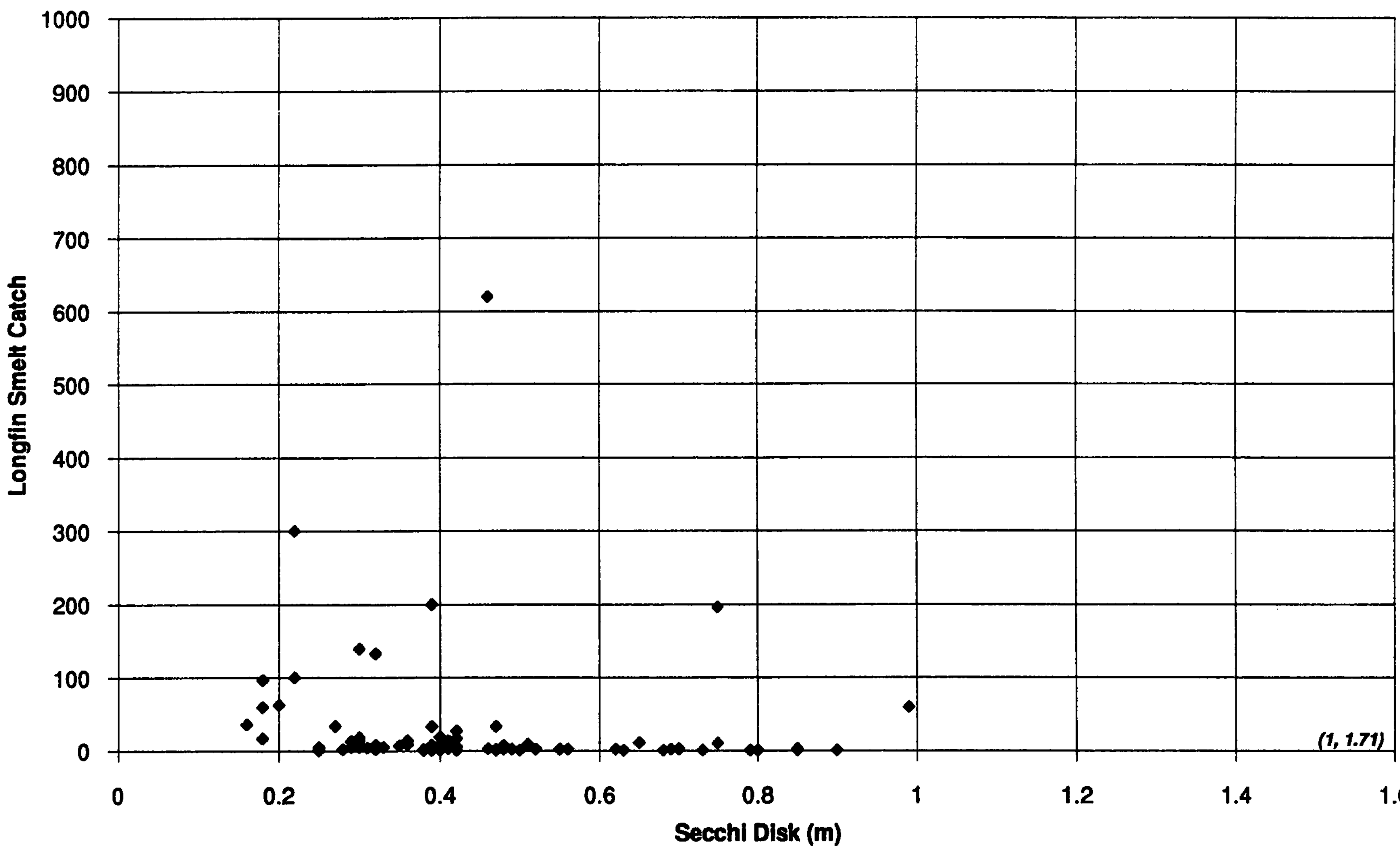

Area 1
Longfin Smelt Catch
1000
900
800
700
600
500
400
300
200
100
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
Secchi Disk (m)

Area 3

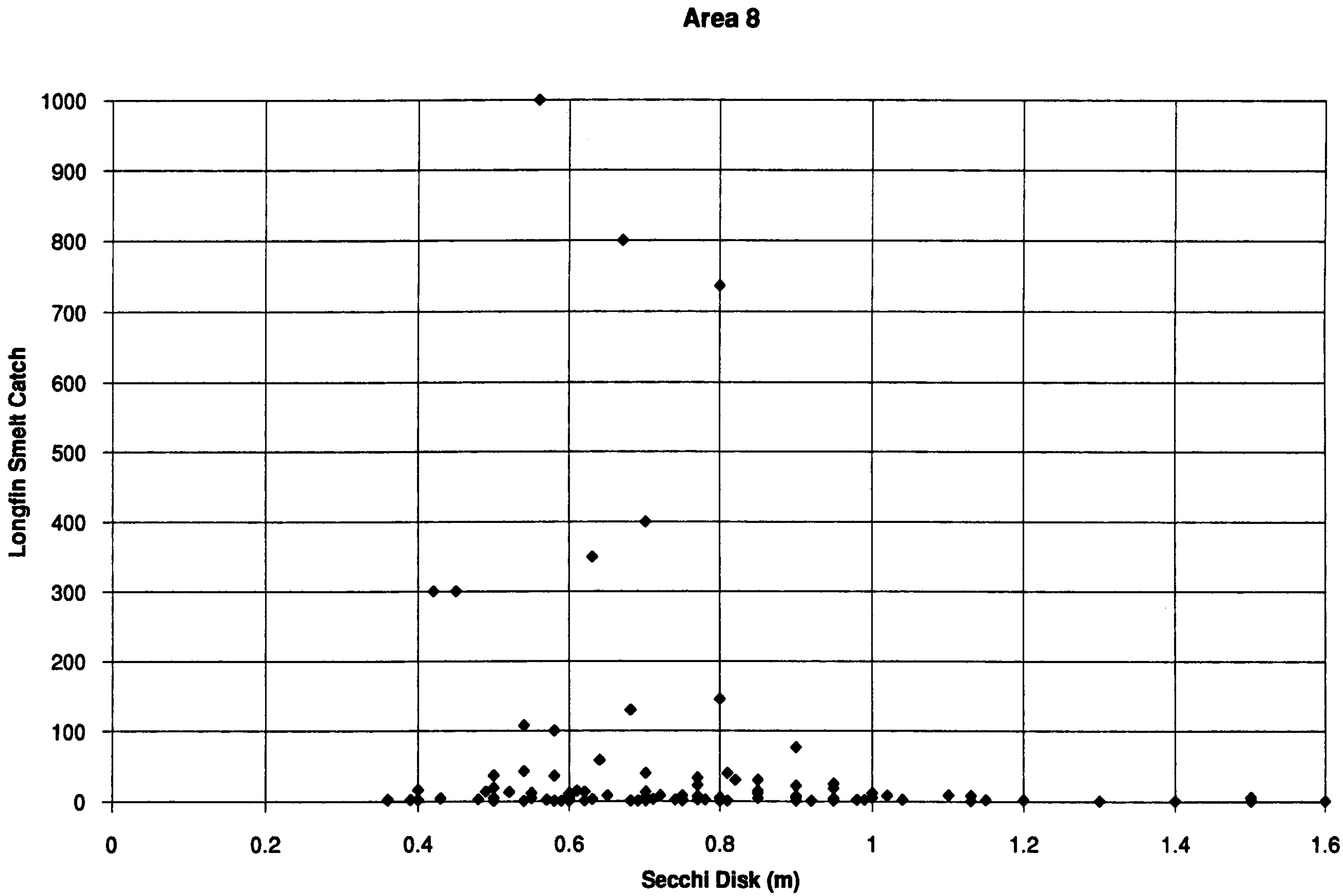


Longfin Smelt Catch
Secchi Disk (m)
(3358, 0.6)
(1430, 0.7)
(1, 1.71)
1000
900
800
700
600
500
400
300
200
100
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6

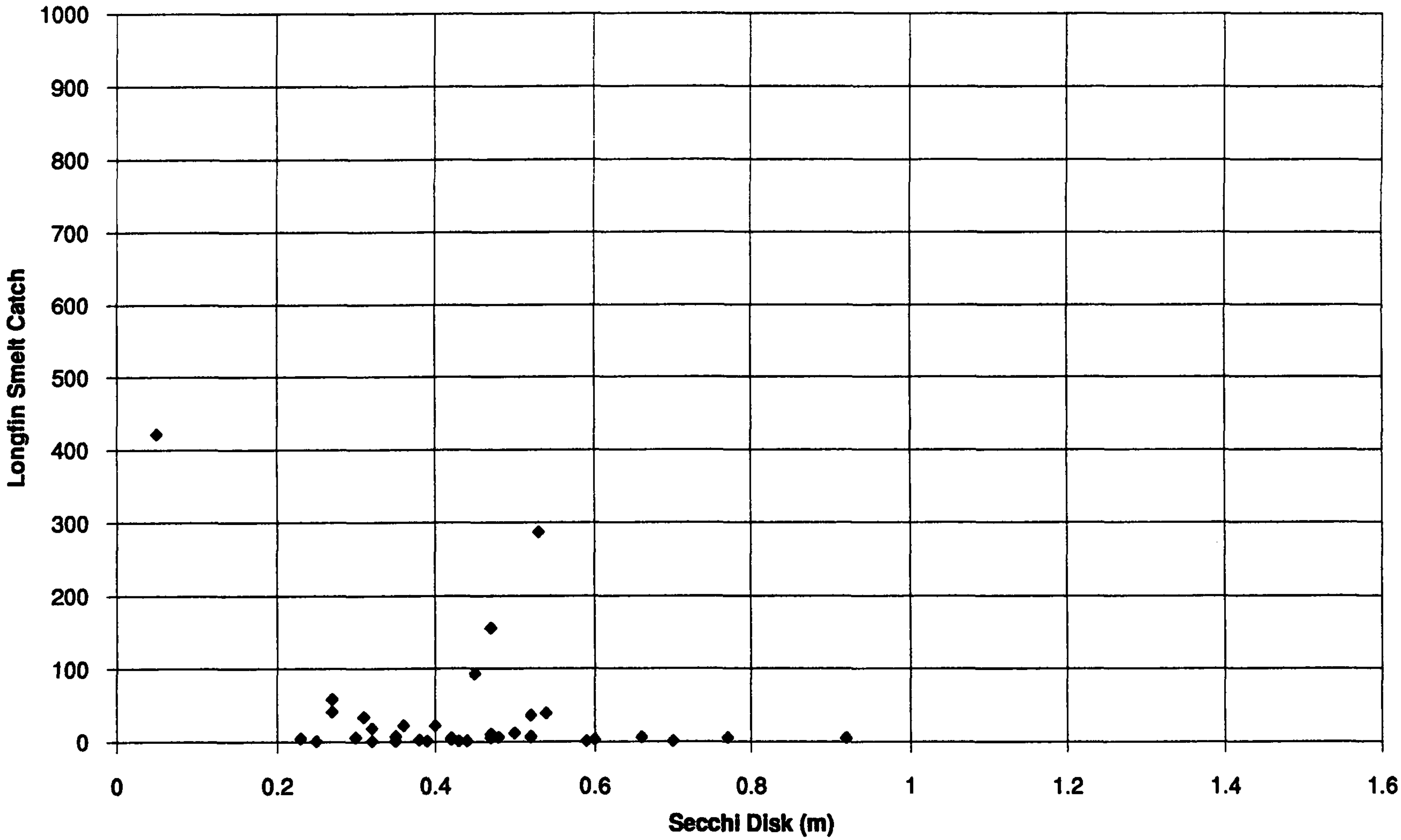
Area 4



1000
900
800
700
600
500
400
300
200
100
0
Longfin Smelt Catch
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
Secchi Disk (m)
(1, 1.71)

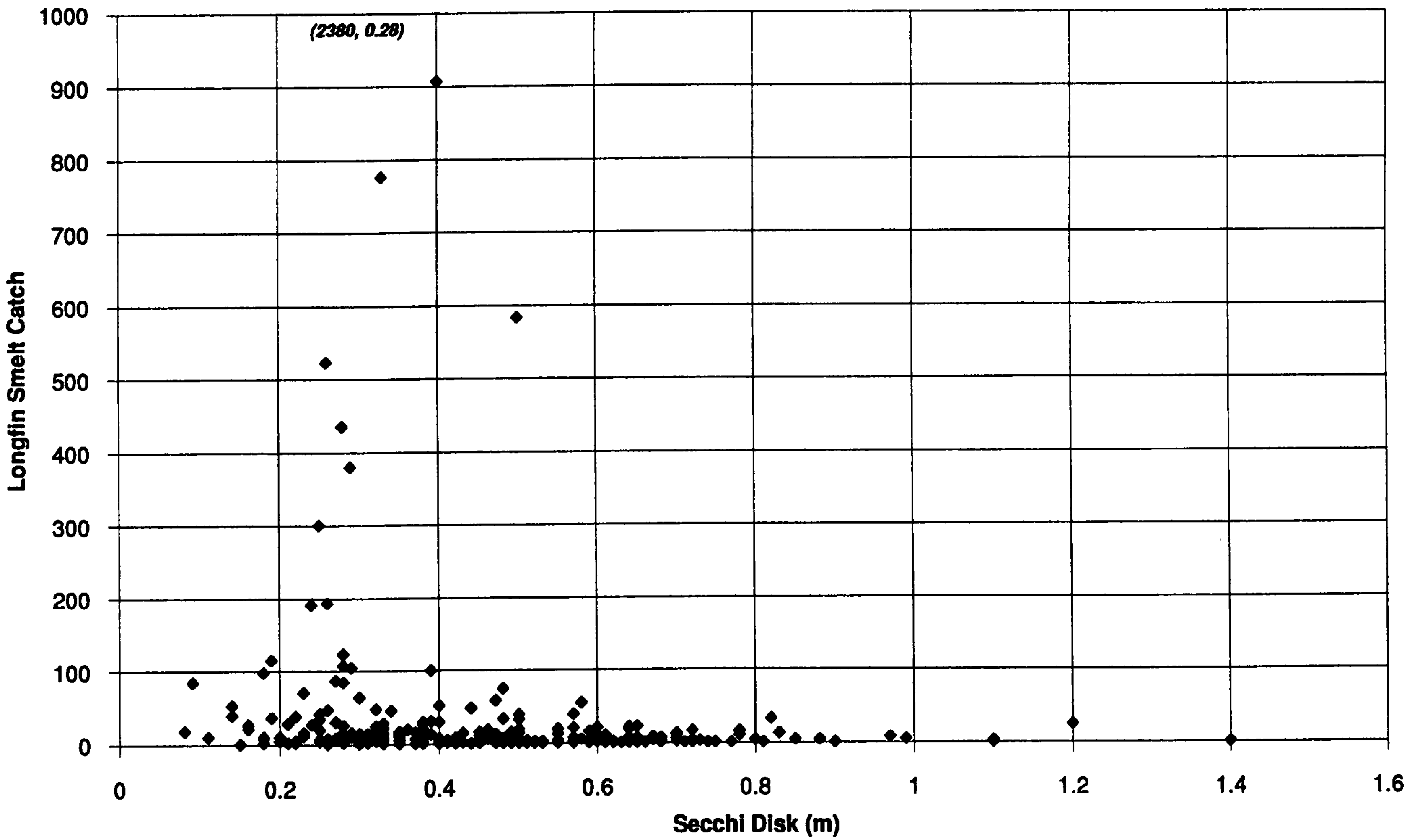

Area 8
Longfin Smelt Catch
Secchi Disk (m)
1000
900
800
700
600
500
400
300
200
100
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6

Area 10

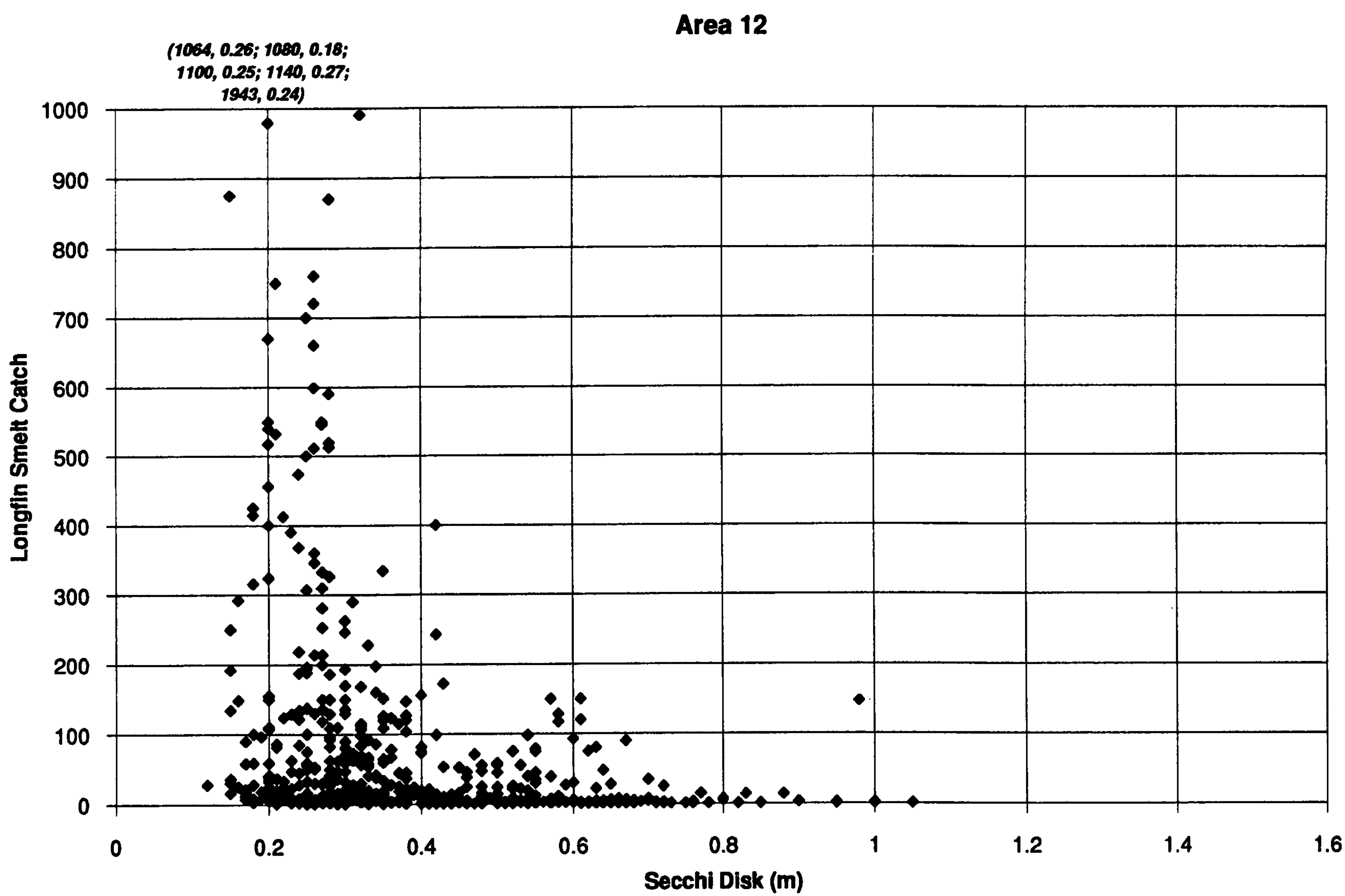


Longfin Smelt Catch
1000
900
800
700
600
500
400
300
200
100
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
Secchi Disk (m)

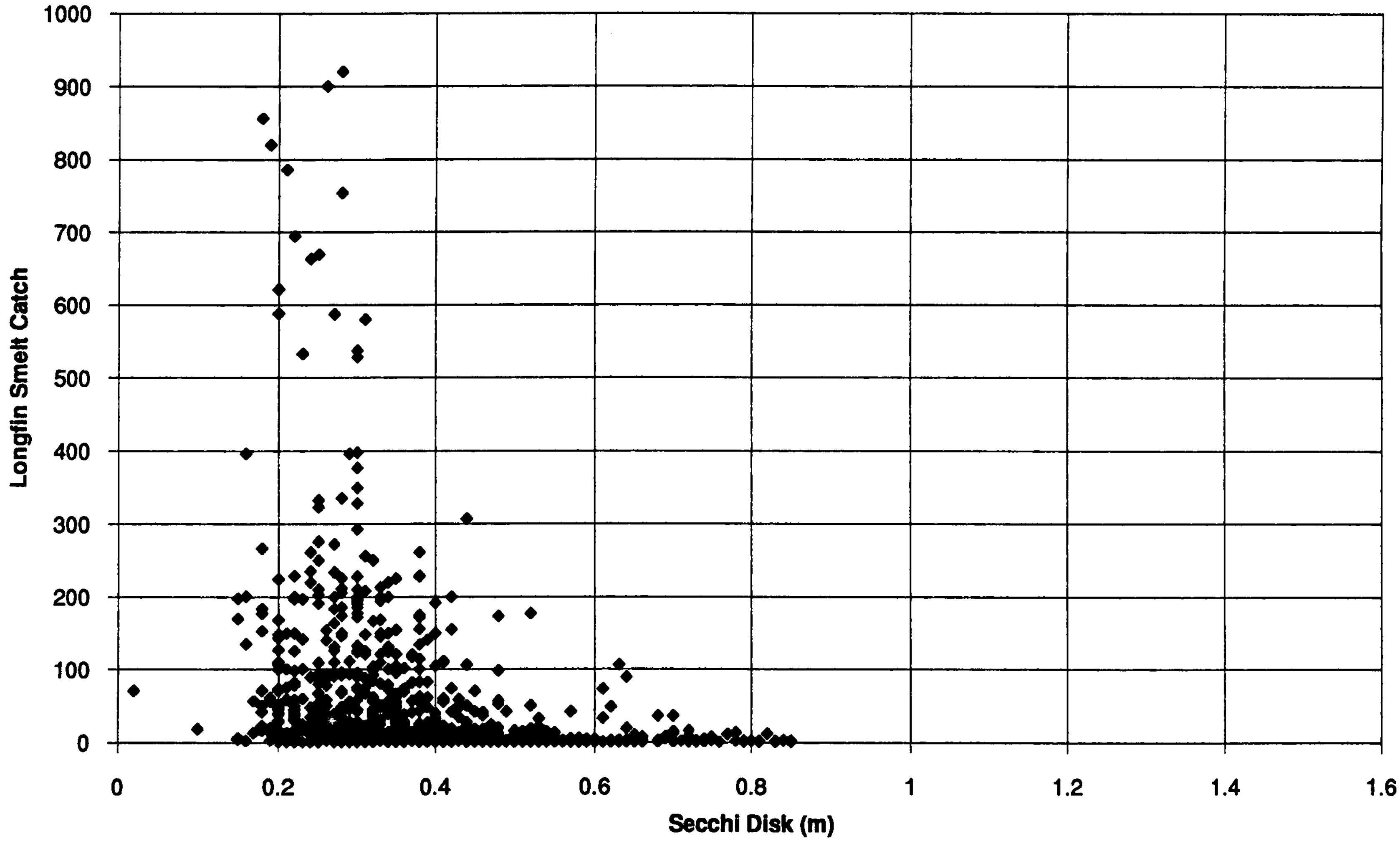
Area 11



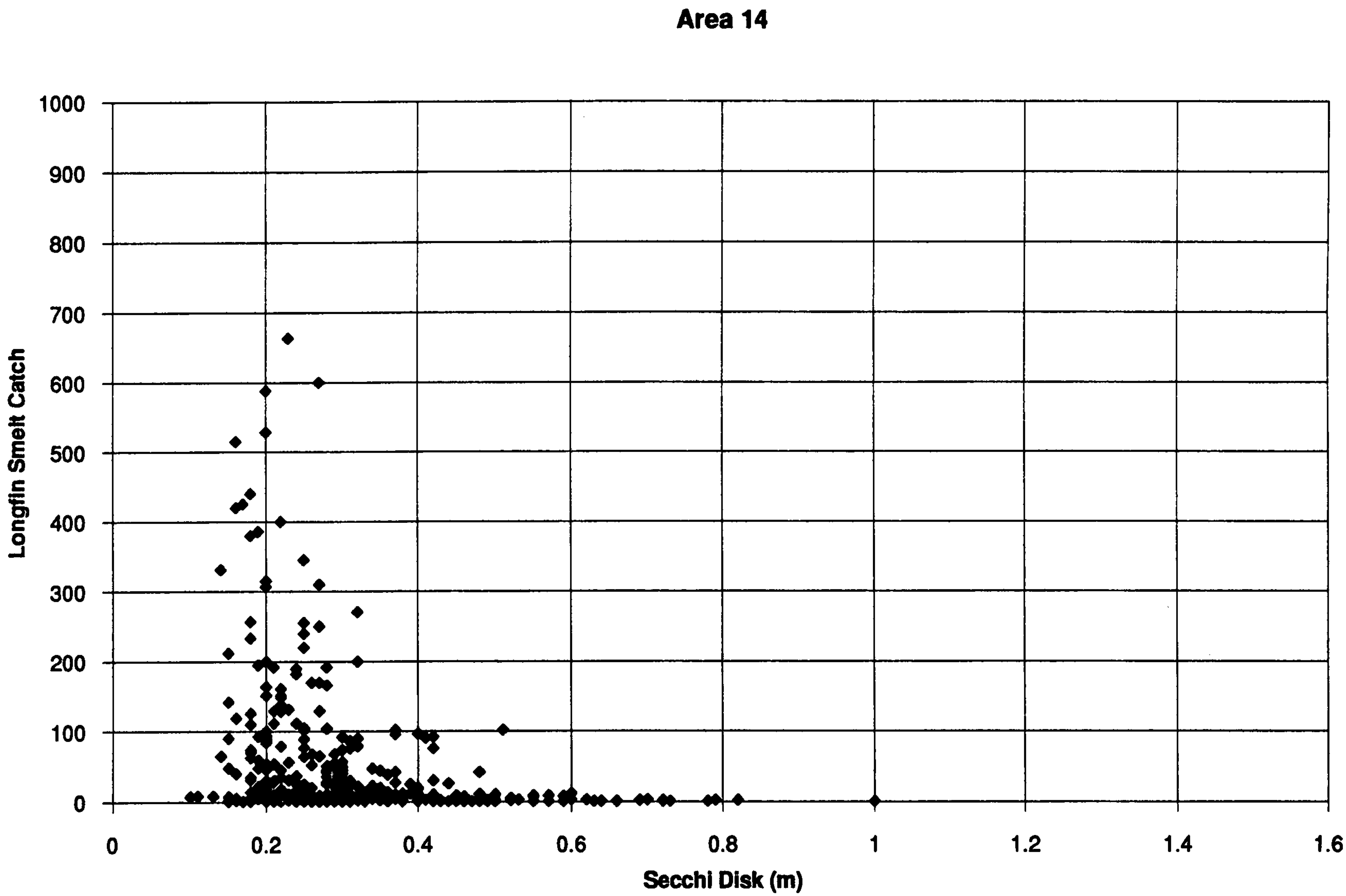
(2380, 0.28)
Longfin Smelt Catch
1000
900
800
700
600
500
400
300
200
100
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
Secchi Disk (m)


Area 12
(1064, 0.26; 1080, 0.18;
1100, 0.25; 1140, 0.27;
1943, 0.24)
Longfin Smelt Catch
1000
900
800
700
600
500
400
300
200
100
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
Secchi Disk (m)

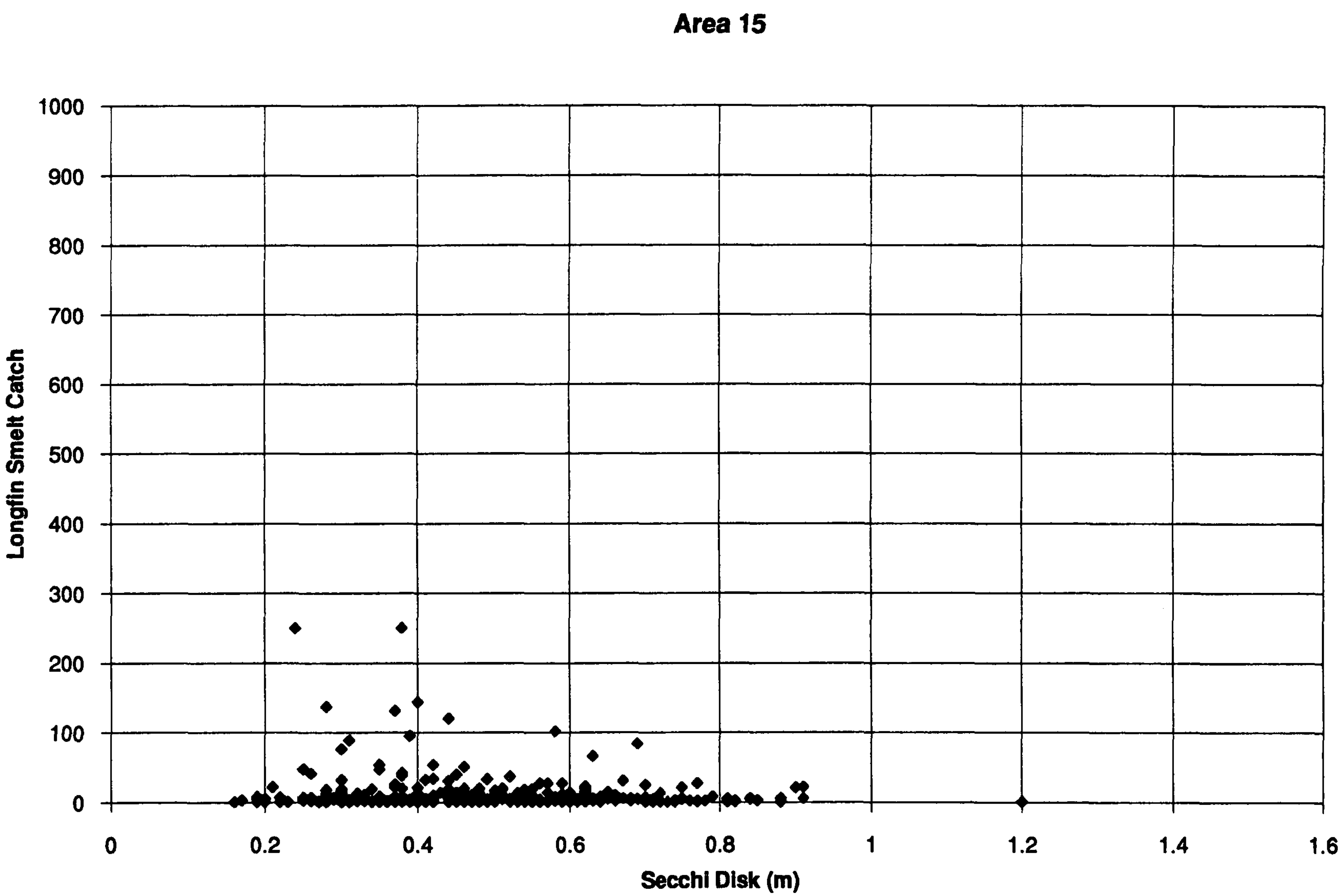
Area 13



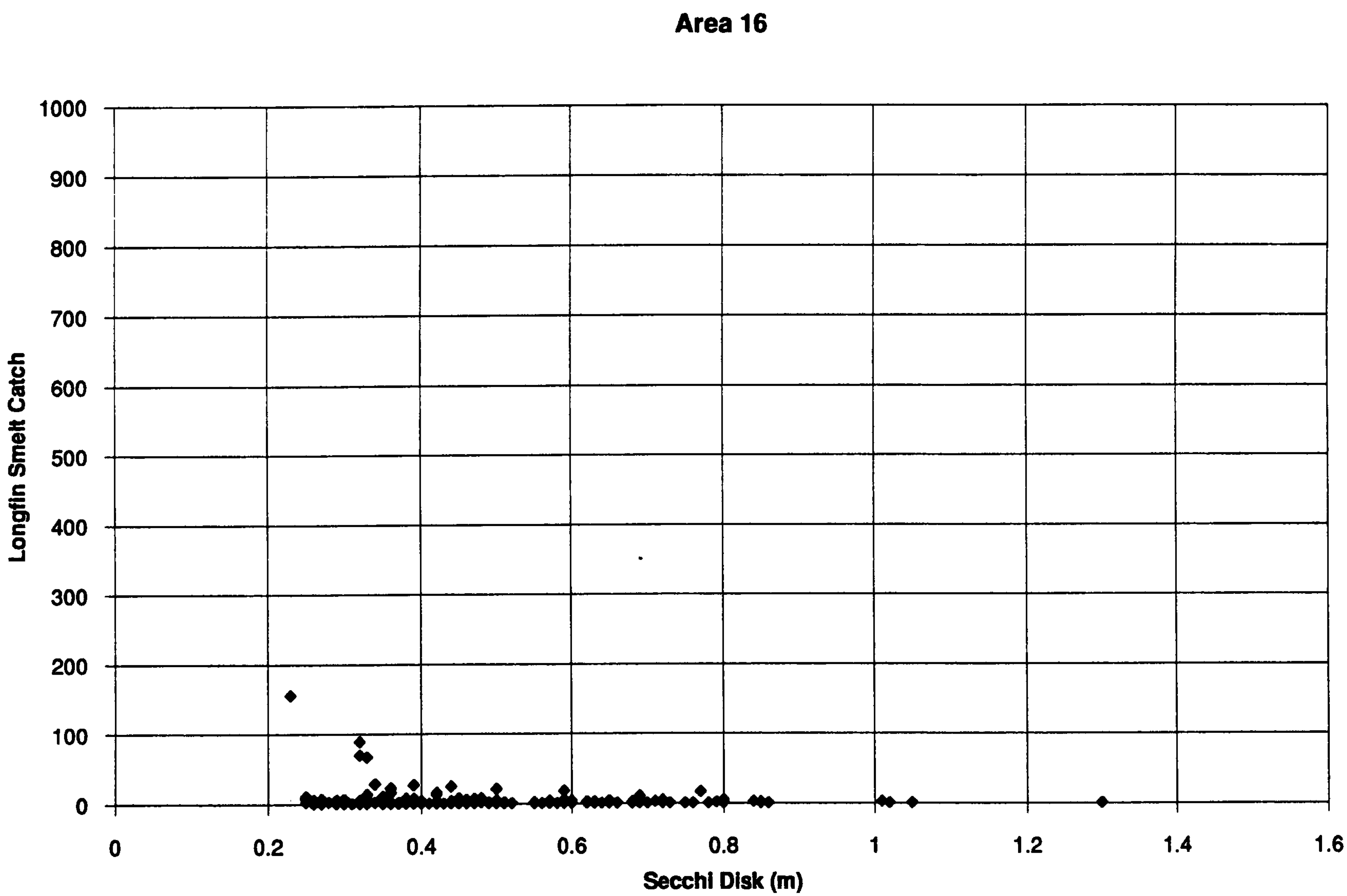
Longfin Smelt Catch
1000
900
800
700
600
500
400
300
200
100
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
Secchi Disk (m)



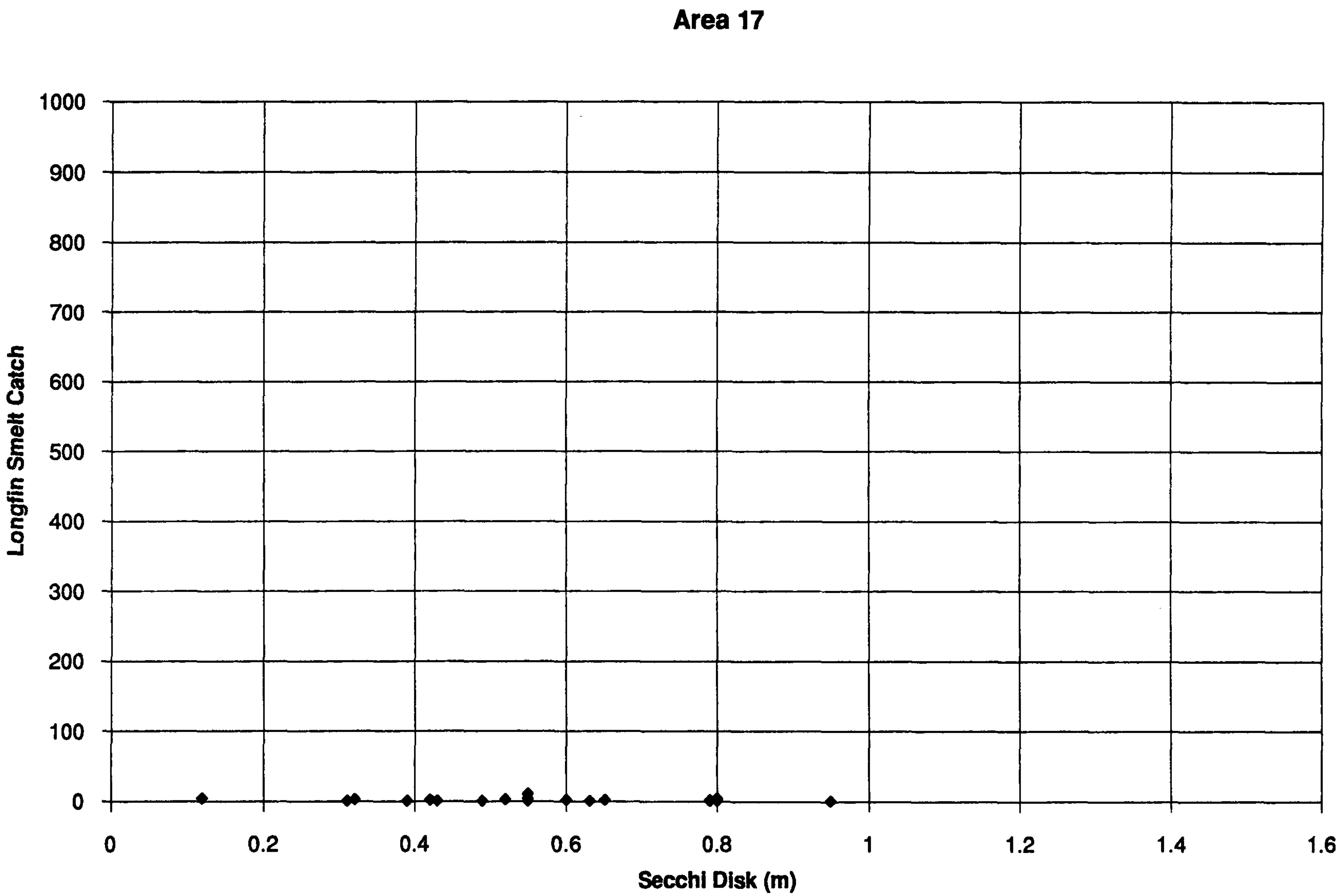
Area 14
Longfin Smelt Catch
Secchi Disk (m)
0
100
200
300
400
500
600
700
800
900
1000
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6



Area 15
1000
900
800
700
600
500
400
300
200
100
0
Longfin Smelt Catch
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
Secchi Disk (m)



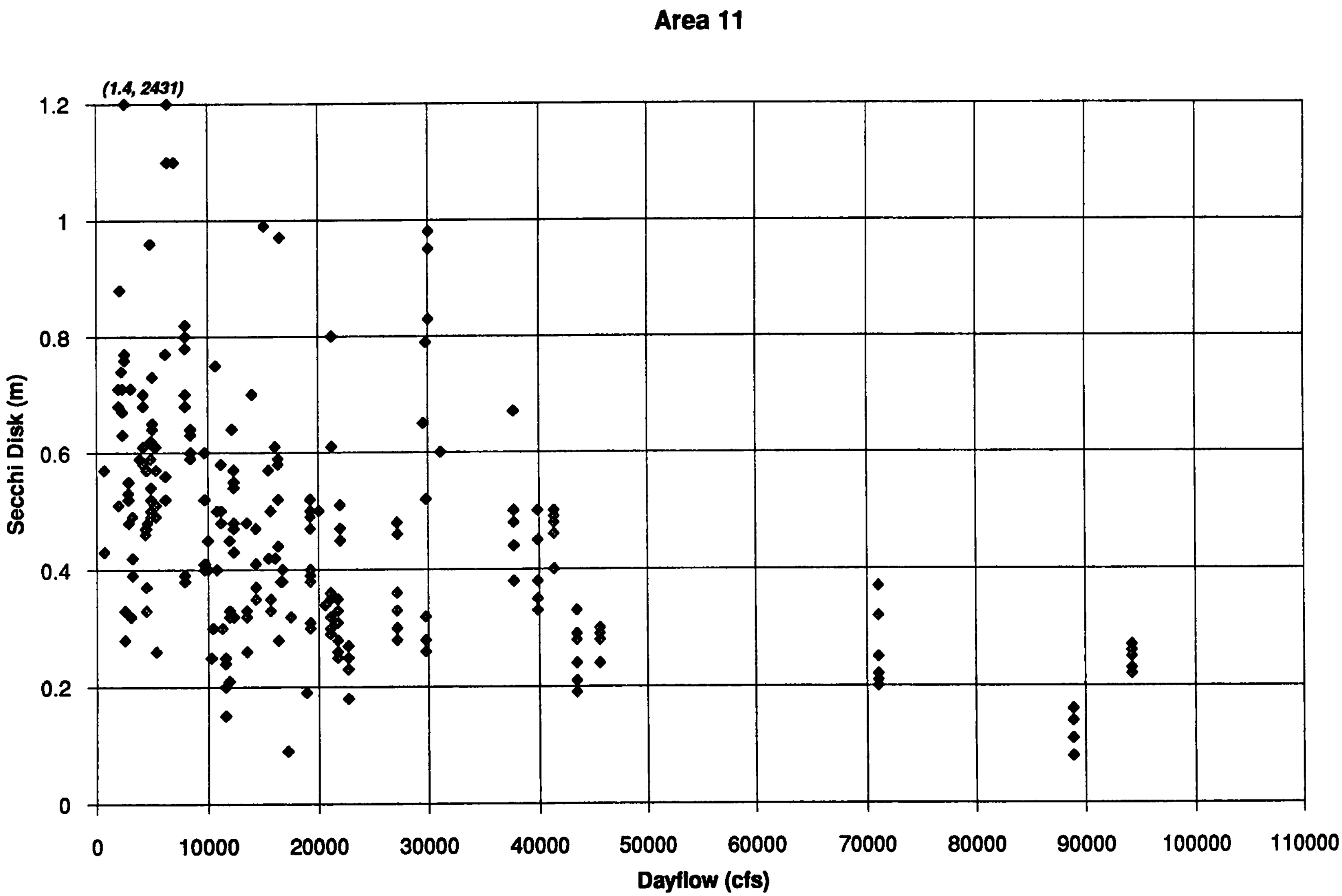
Area 16
Longfin Smelt Catch
1000
900
800
700
600
500
400
300
200
100
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
Secchi Disk (m)

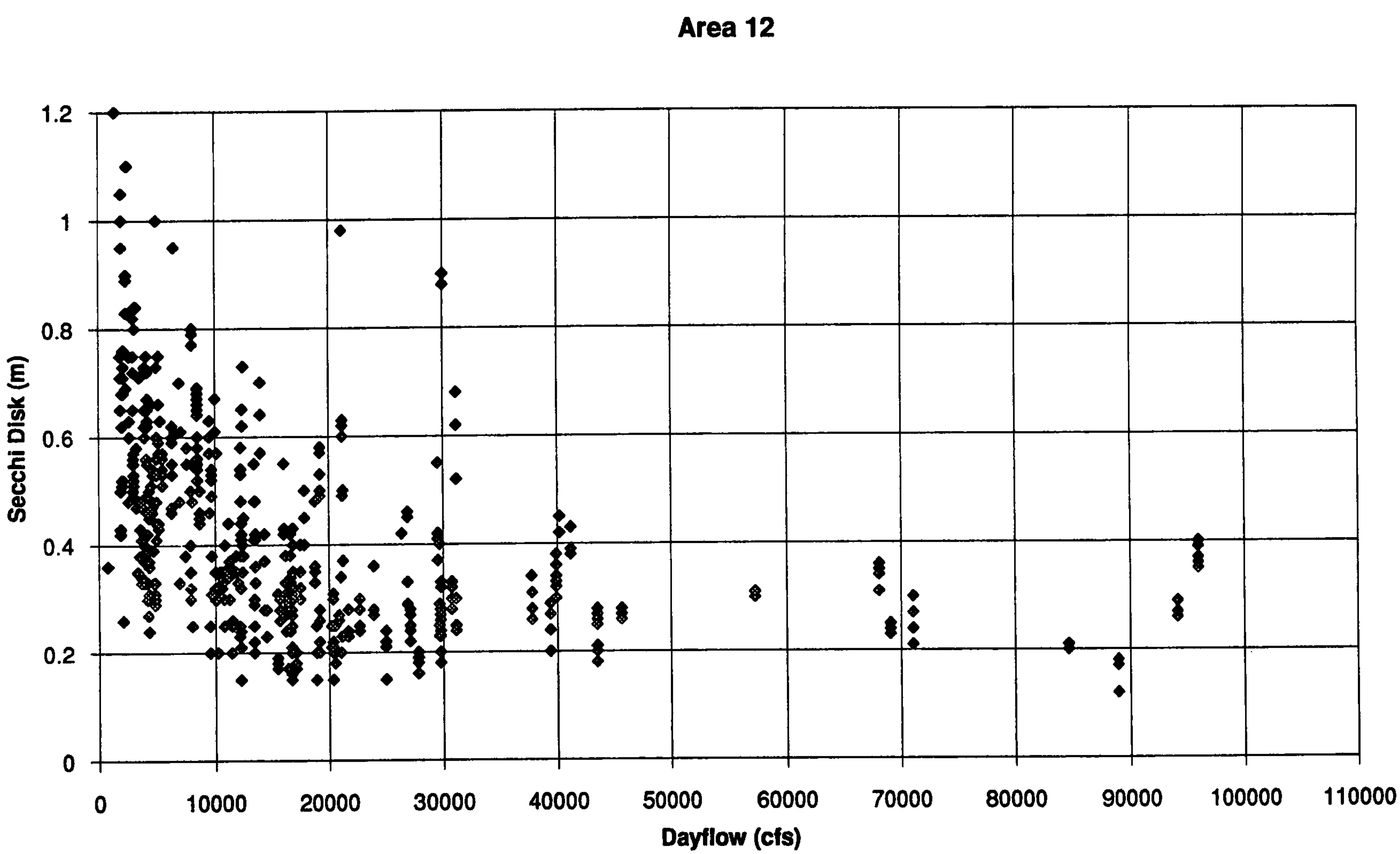

Area 17
Longfin Smelt Catch
1000
900
800
700
600
500
400
300
200
100
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
Secchi Disk (m)

Tab 7.
Plots Of Secchi Disk Depth Versus Delta Outflow For Subareas 11-14 And Select Regression Analyses

7a. Plots Of Secchi Disk Versus Dayflow
7b. Regressions Of Secchi Disk On Outflow (Areas 11-14)
7c. Regressions Of Secchi Disk On Outflow
(Stations 409, 410, 414, 505, 509)
Tab 7d. Regression Of Sept-Dec Dayflow On Feb-Jun Dayflow

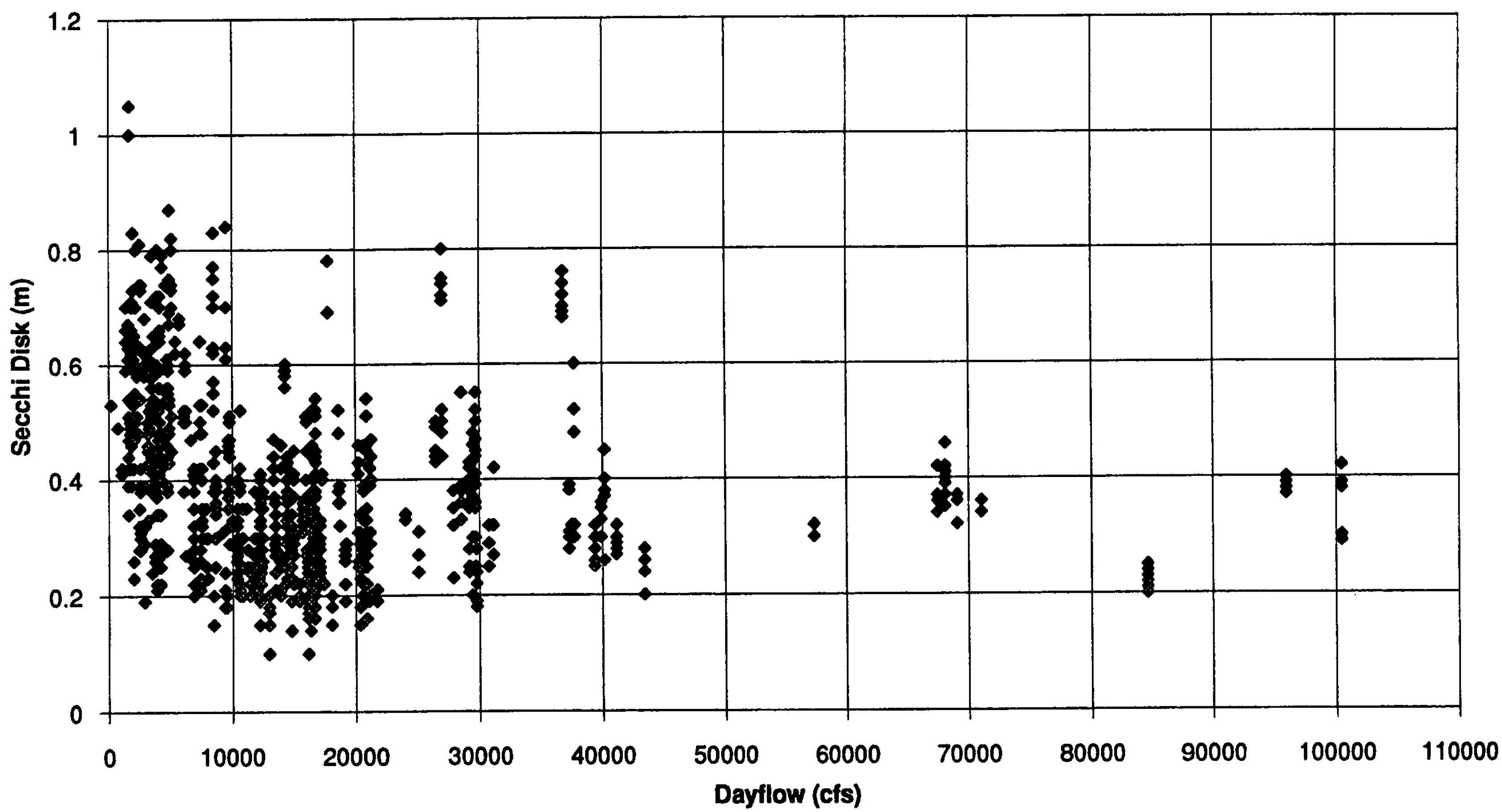
7a. PLOTS OF SECCHI DISK VERSUS DAYFLOW


Area 11
(1.4, 2431)
1.2
1
0.8
0.6
0.4
0.2
0
Secchi Disk (m)
0
10000
20000
30000
40000
50000
60000
70000
80000
90000
100000
110000
Dayflow (cfs)

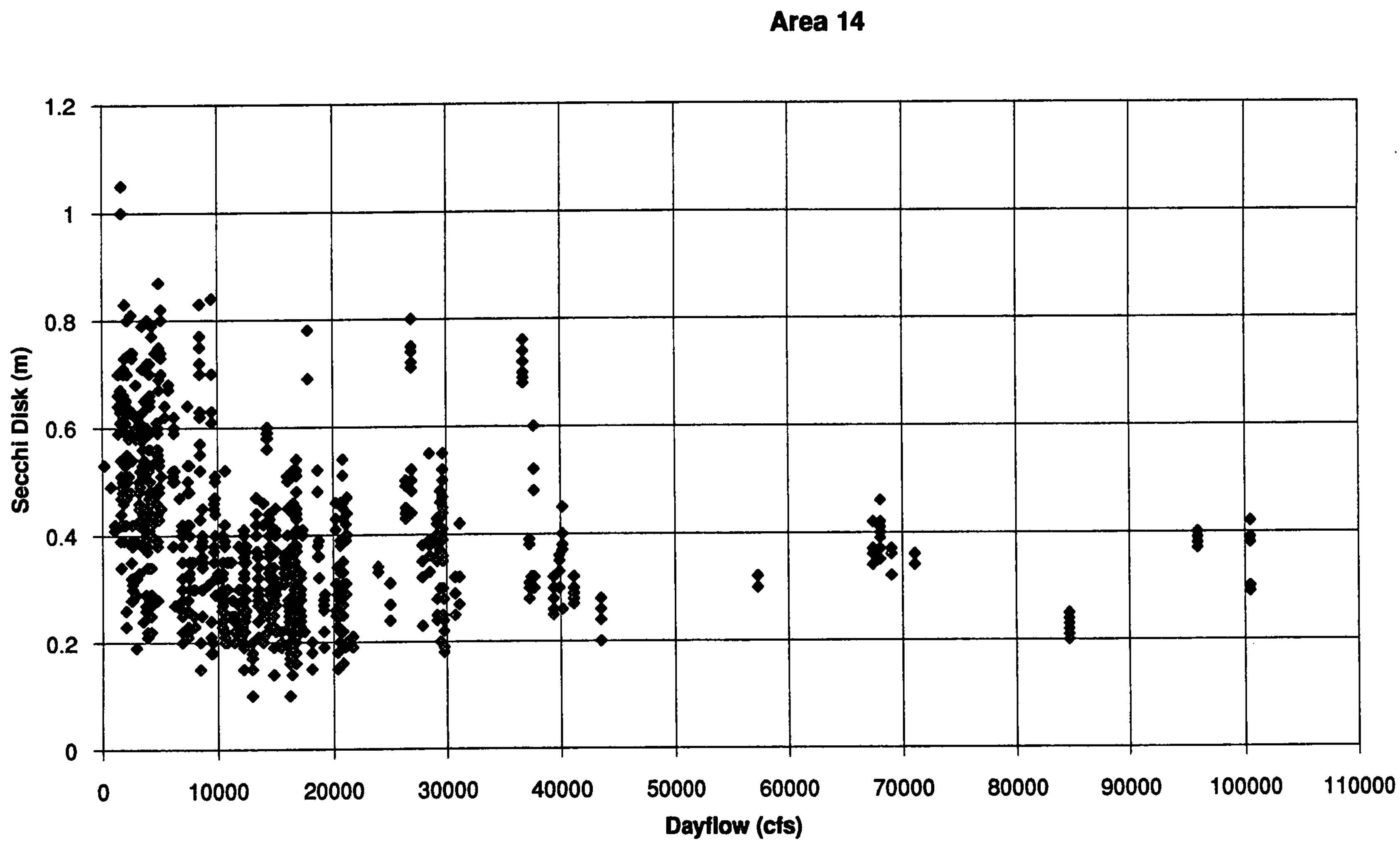


Area 12
Secchi Disk (m)
1.2
1
0.8
0.6
0.4
0.2
0
0
10000
20000
30000
40000
50000
60000
70000
80000
90000
100000
110000
Dayflow (cfs)

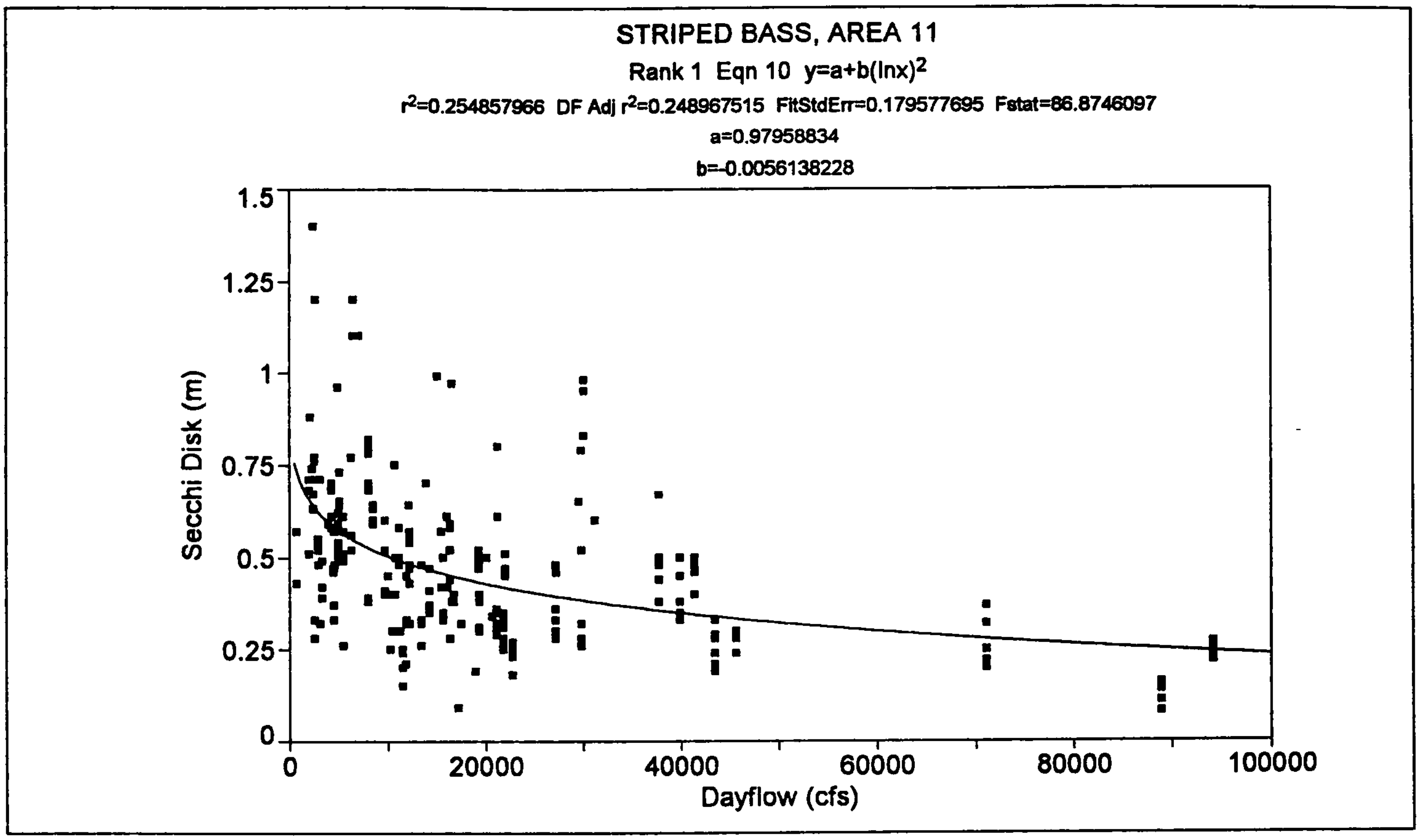
Area 13



Secchi Disk (m)
1.2
1
0.8
0.6
0.4
0.2
0
0
10000
20000
30000
40000
50000
60000
70000
80000
90000
100000
110000
Dayflow (cfs)


Area 14
Secchi Disk (m)
1.2
1
0.8
0.6
0.4
0.2
0
0
10000
20000
30000
40000
50000
60000
70000
80000
90000
100000
110000
Dayflow (cfs)

7b. REGRESSIONS OF SECCHI DISK ON DAYFLOW (AREAS 11-14)

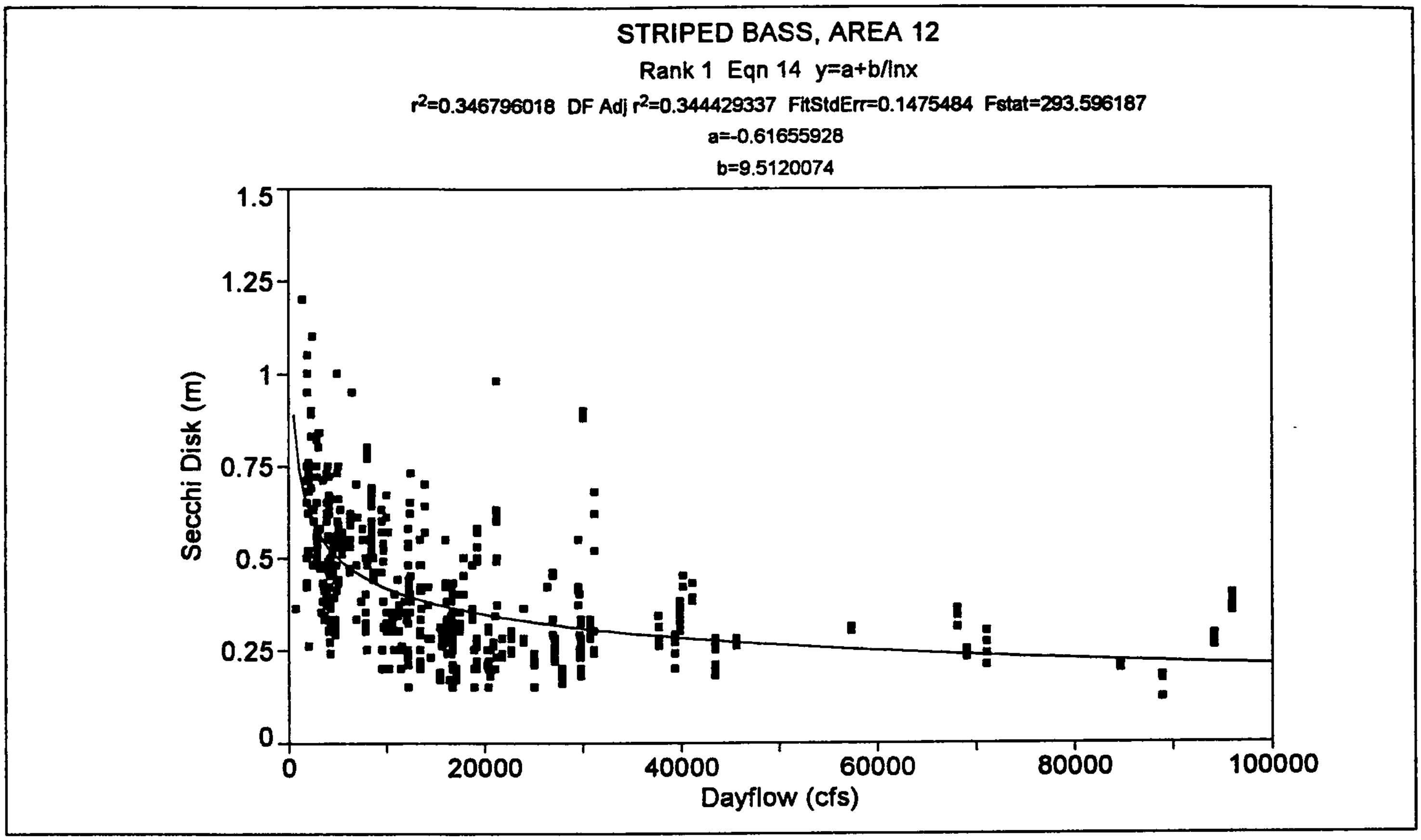


Rank 1 Eqn 10 $y=a+b(\ln x)^2$

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.2548579660	0.2489675152	0.1795776946	86.874609705

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	0.979588345	0.055911687	17.52027872	0.869474310	1.089702380
b	-0.00561382	0.000602299	-9.32065500	-0.00680001	-0.00442764

Date	Time	File Source
Feb 12, 1994	9:31:11 PM	c:\tcwin\bass-sc.xls

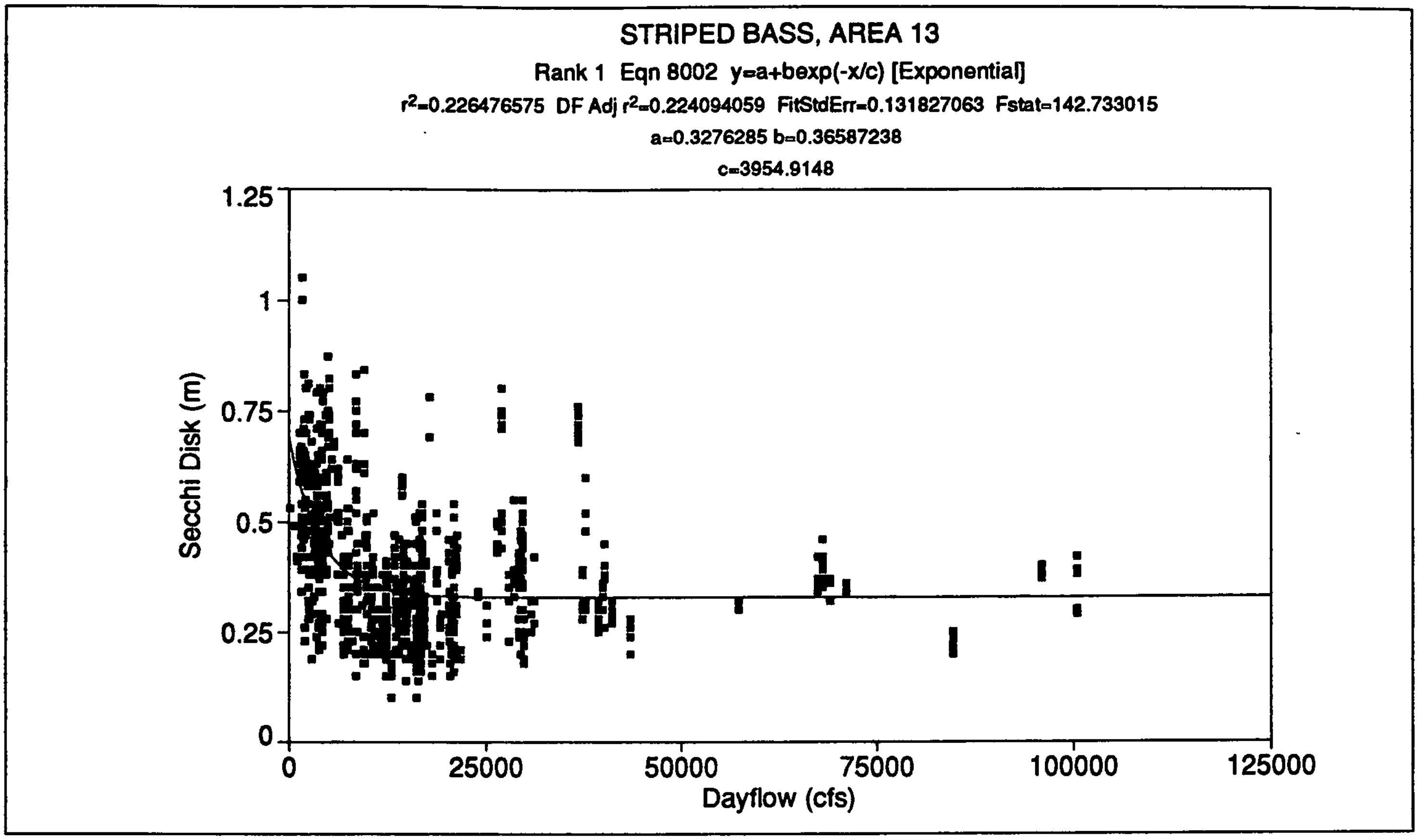


Rank 1 Eqn 14 $y=a+b/\ln x$

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.3467960185	0.3444293374	0.1475483998	293.59618688

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	-0.61655928	0.059984700	-10.2786091	-0.73433992	-0.49877864
b	9.512007361	0.555132907	17.13464872	8.421997604	10.60201712

Date	Time	File Source
Feb 12, 1994	9:37:07 PM	c:\tcwin\bass-sc.xls

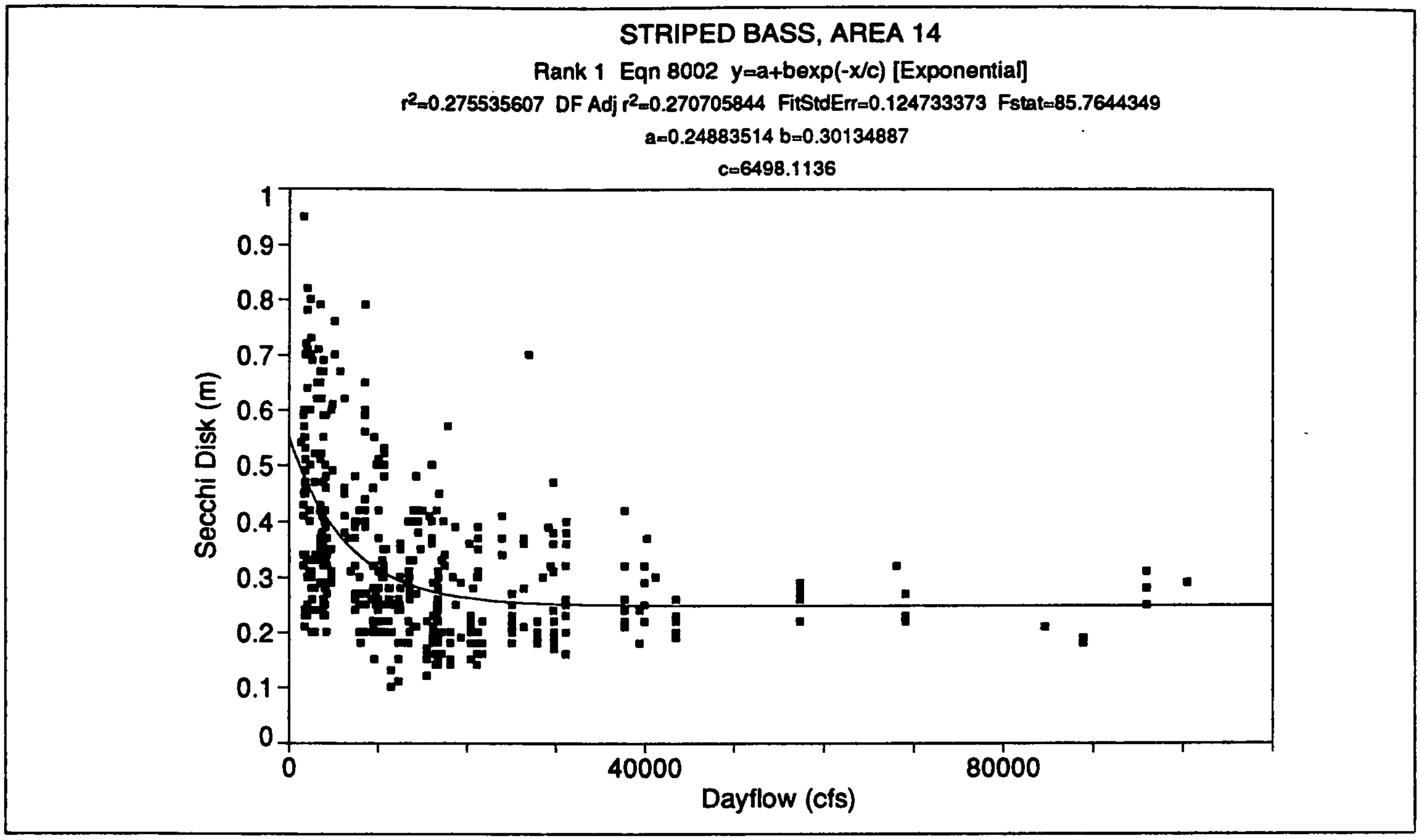


Rank 1 Eqn 8002 y=a+bexp(-x/c) [Exponential]

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.2264765751	0.2240940594	0.1318270632	142.73301466

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	0.327628497	0.006713206	48.80358405	0.314469588	0.340787406
b	0.365872380	0.034886055	10.48763971	0.297490380	0.434254380
c	3954.914764	553.7530021	7.142019544	2869.474259	5040.355268

Date	Time	File Source
Feb 4, 1994	5:22:21 PM	c:\tcwin\bass-sc.xls



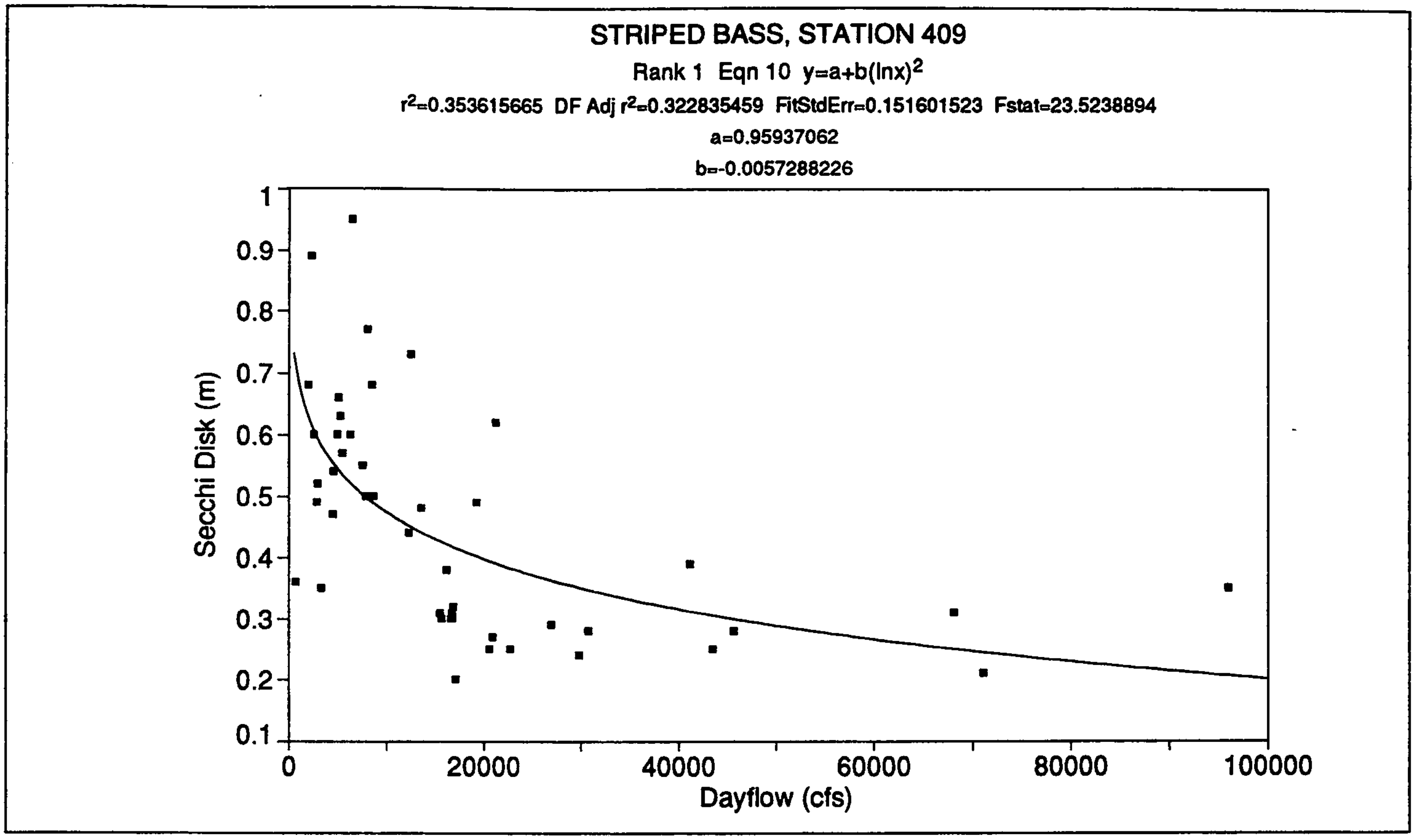
Rank 1 Eqn 8002 y=a+bexp(-x/c) [Exponential]

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.2755356067	0.2707058440	0.1247333731	85.764434908

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	0.248835145	0.013104248	18.98889154	0.223087732	0.274582557
b	0.301348872	0.027104415	11.11807308	0.248093731	0.354604012
c	6498.113557	1335.841644	4.864434032	3873.432922	9122.794192

Date	Time	File Source
Feb 4, 1994	5:31:03 PM	c:\tcwin\bass-sc.xls

7c. REGRESSIONS OF SECCHI DISK ON DAYFLOW (STATIONS 409, 410, 414, 501, 505, 509)

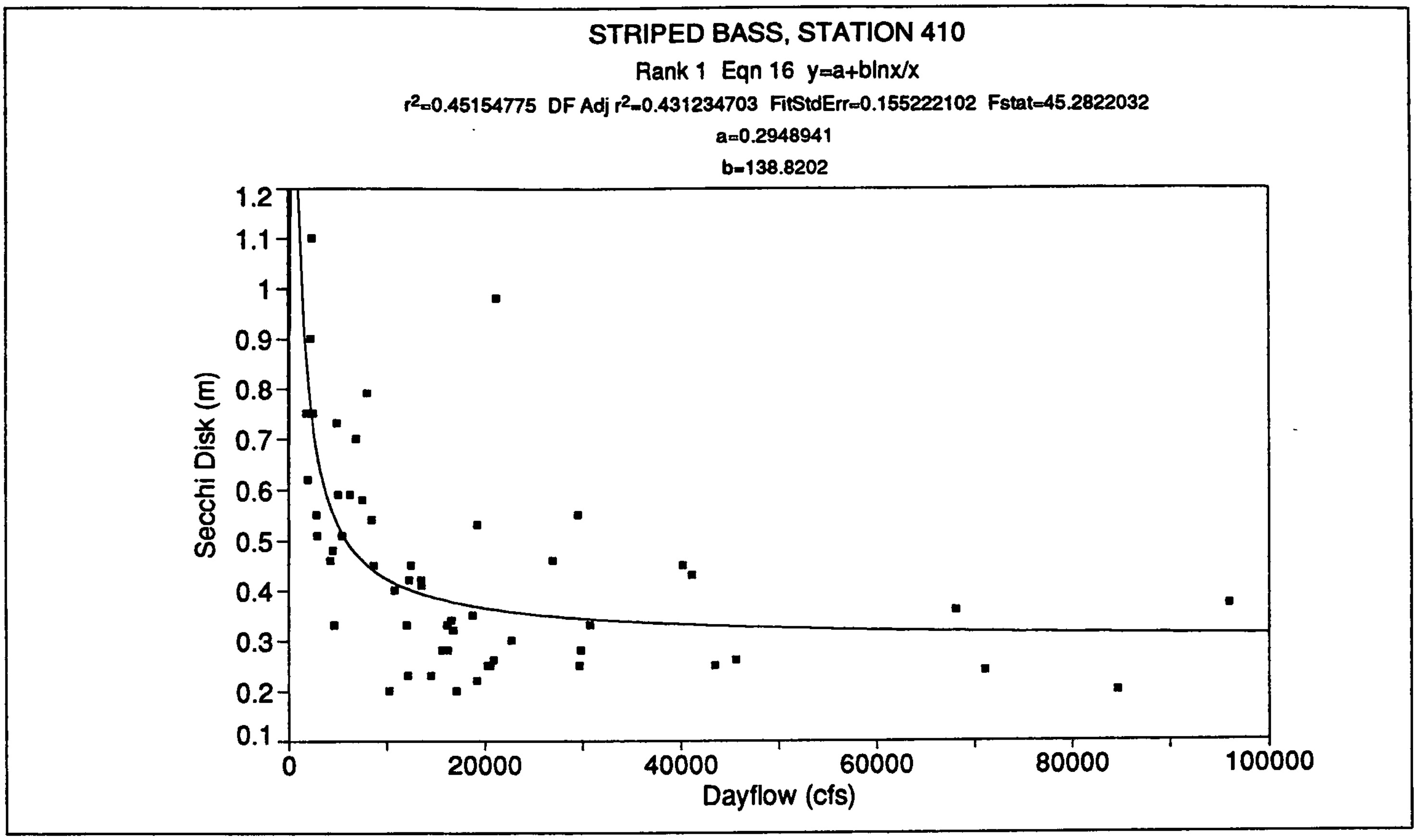


Rank 1 Eqn 10 $y=a+b(\ln x)^2$

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.3536156653	0.3228354588	0.1516015231	23.523889408

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	0.959370618	0.106485368	9.009412624	0.744659322	1.174081914
b	-0.00572882	0.001181166	-4.85014324	-0.00811046	-0.00334718

Date	Time	File Source
Feb 4, 1994	10:23:02 PM	c:\tcwin\stnsecch.xls

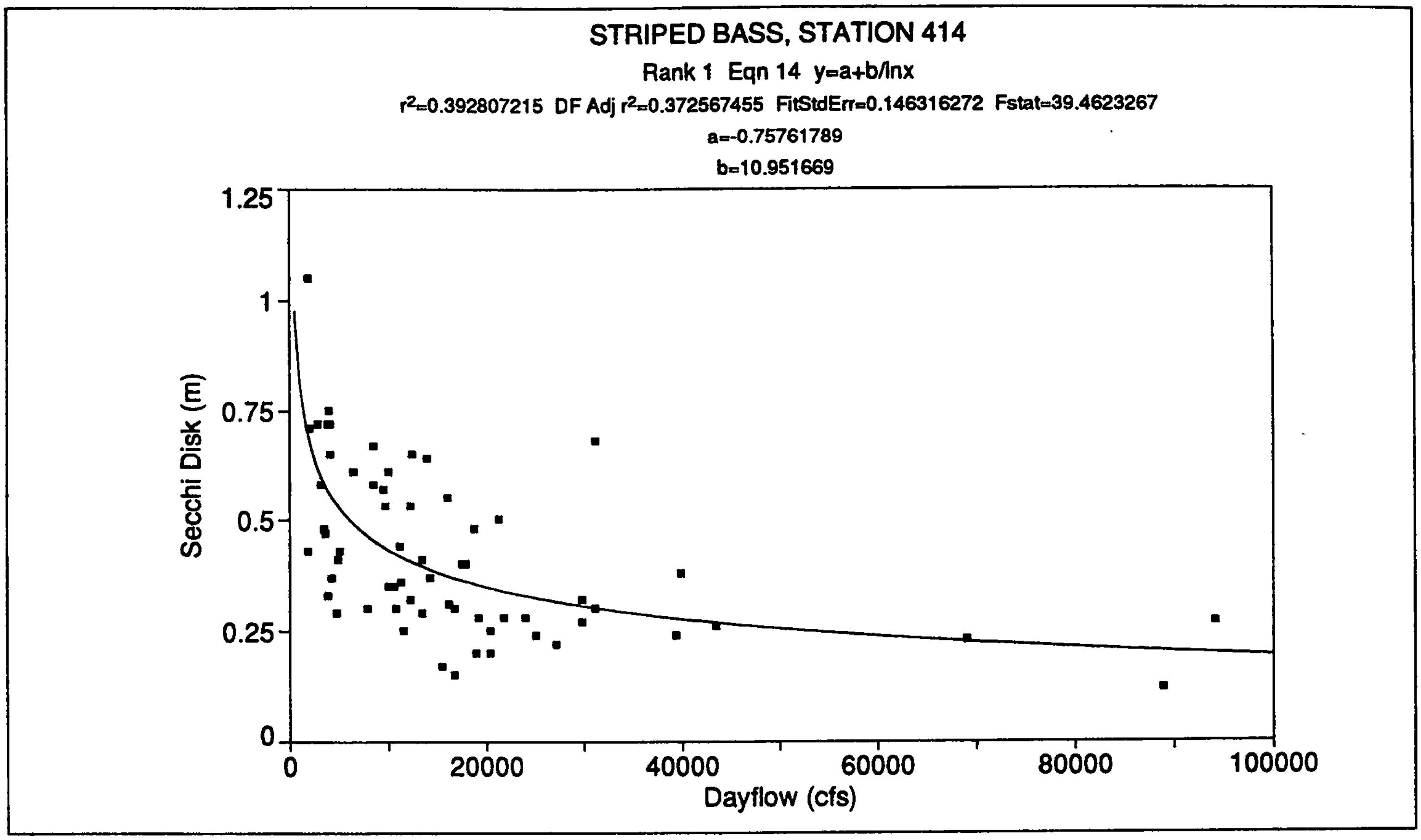


Rank 1 Eqn 16 y=a+blnx/x

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.4515477497	0.4312347034	0.1552221021	45.282203180

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	0.294894099	0.030422584	9.693262624	0.233935338	0.355852861
b	138.8202038	20.62950956	6.729205241	97.48415767	180.1562500

Date	Time	File Source
Feb 4, 1994	10:24:15 PM	c:\tcwin\stnsecch.xls

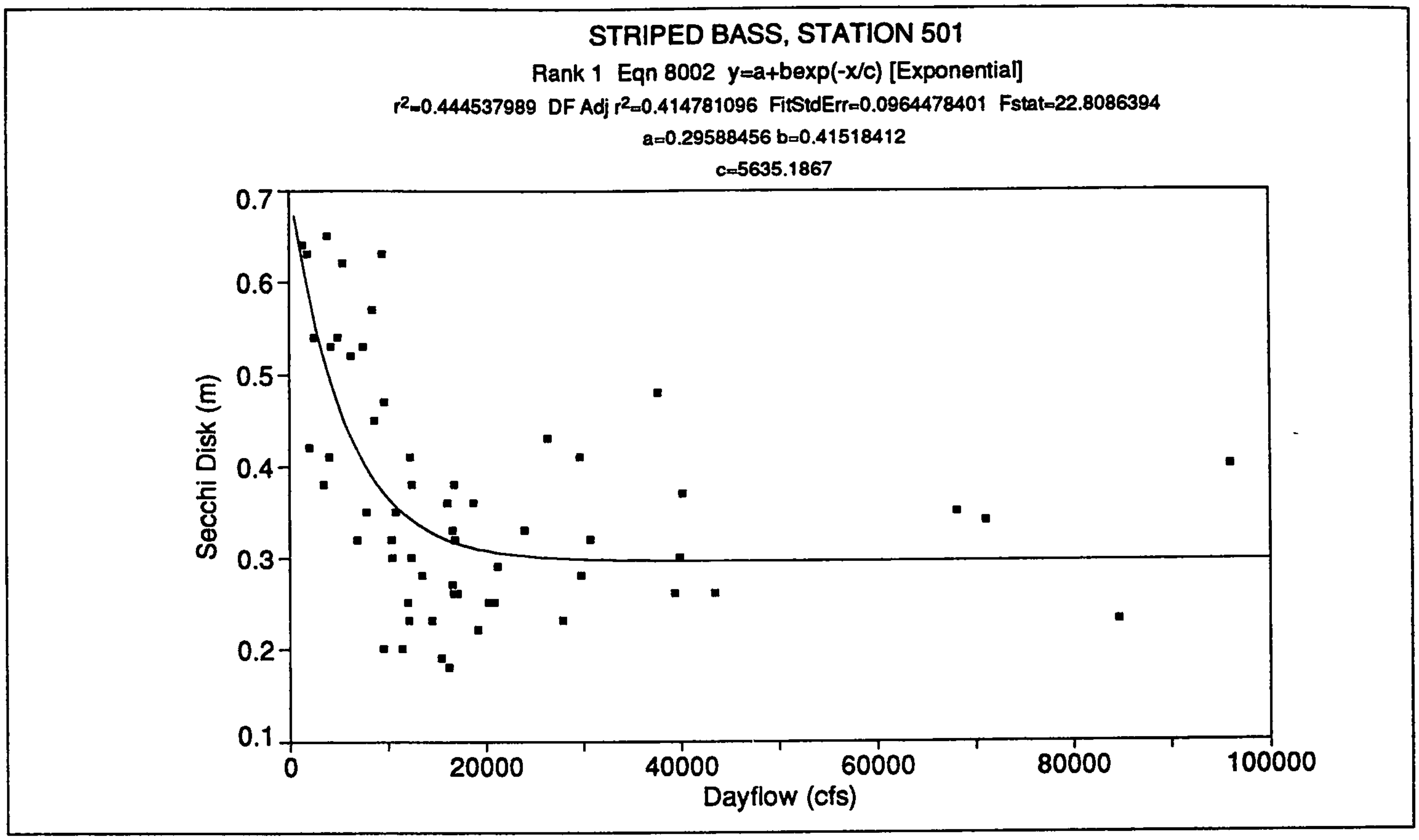


Rank 1 Eqn 14 y=a+b/lnx

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.3928072145	0.3725674550	0.1463162724	39.462326730

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	-0.75761789	0.188516977	-4.01883111	-1.13453015	-0.38070563
b	10.95166892	1.743367566	6.281904706	7.466059181	14.43727866

Date	Time	File Source
Feb 4, 1994	10:25:35 PM	c:\tcwin\stnsecch.xls

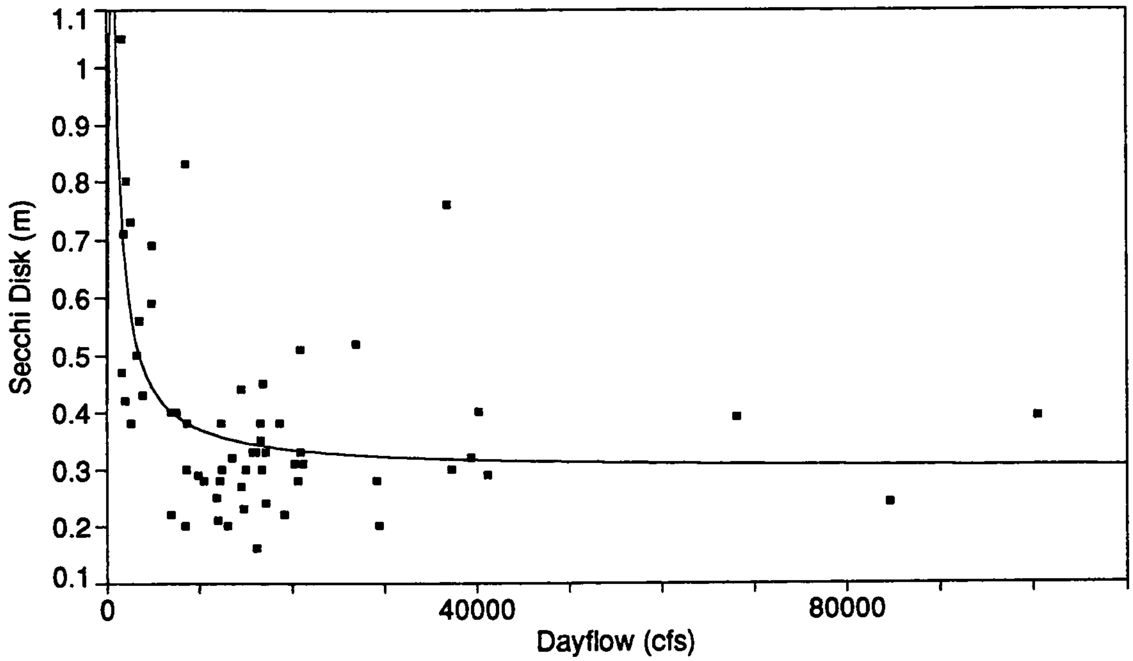


Rank 1 Eqn 8002 y=a+bexp(-x/c) [Exponential]

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.4445379890	0.4147810956	0.0964478401	22.808639362

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	0.295884556	0.022512749	13.14297753	0.250810257	0.340958855
b	0.415184115	0.081774533	5.077181122	0.251457788	0.578910443
c	5635.186735	1800.509494	3.129773408	2030.264808	9240.108663

Date	Time	File Source
Feb 4, 1994	10:21:47 PM	c:\tcwin\stnsecch.xls



Rank 1 Eqn 17 y=a+b/x

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.3635570647	0.3412257337	0.1434740883	33.131501015

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	0.298667110	0.024674433	12.10431480	0.249283041	0.348051178
b	710.2714944	123.3967806	5.755996961	463.3018904	957.2410983

Date	Time	File Source
Feb 4, 1994	10:26:50 PM	c:\tcwin\stnsecch.xls

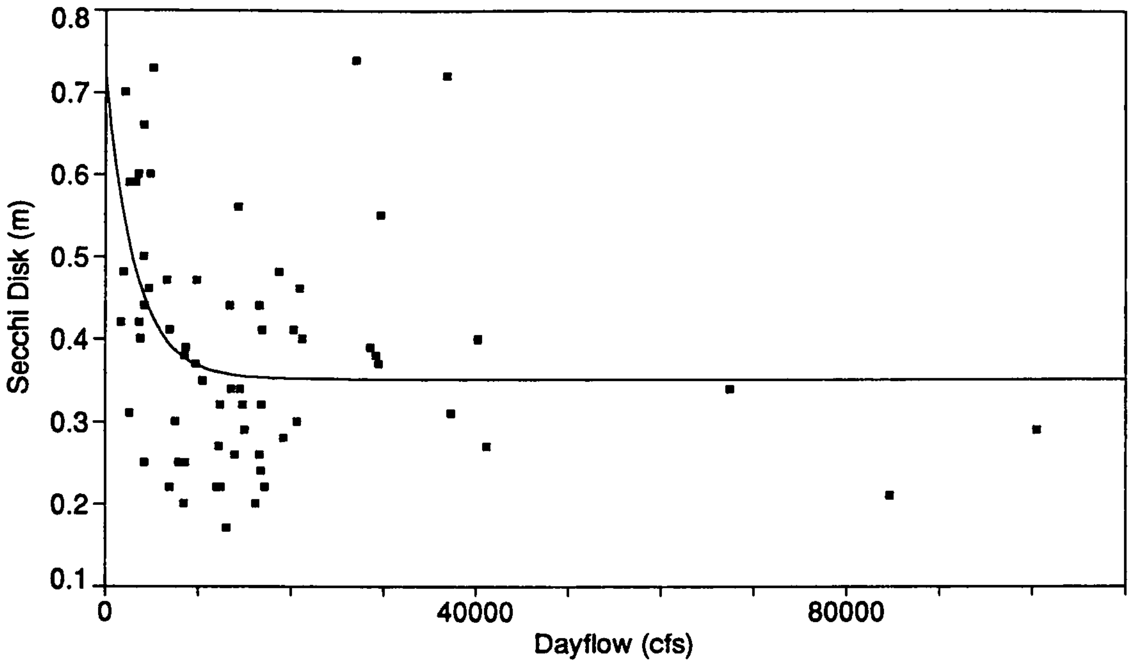
STRIPED BASS, STATION 509

Rank 1 Eqn 8002 y=a+bexp(-x/c) [Exponential]

r^2=0.163163774 DF Adj r^2=0.122007894 FitStdErr=0.132402301 Fstat=6.04428542

a=0.35161846 b=0.37329059

c=3172.7132



Rank 1 Eqn 8002 y=a+bexp(-x/c) [Exponential]

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.1631637741	0.1220078941	0.1324023006	6.0442854158

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	0.351618458	0.024077182	14.60380424	0.303495156	0.399741760
b	0.373290593	0.225723182	1.653753907	-0.07786456	0.824445744
c	3172.713173	2116.107699	1.499315547	-1056.77217	7402.198512

Date	Time	File Source
Feb 4, 1994	10:29:29 PM	c:\tcwin\stnsecch.xls

7d. REGRESSION OF SEPT-DEC DAYFLOW ON FEB-JUN DAYFLOW

THU 3/03/94 5:29:31 PM

SYSTAT VERSION 5.0
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SYSTAT, INC.

Welcome to SYSTAT!
WORKSPACE CLEAR FOR CREATING NEW DATASET

> Successful import of file C:\TCWIN\FLOW-R2.XLS
>USE 'D:\CURRENT\FISH\FLOWAVG.SYS'
Imported from: C:\TCWIN\FLOW-R2.XLS
SYSTAT FILE VARIABLES AVAILABLE TO YOU ARE:
YEAR FEBJUN SEPDEC

>PAGE NARROW
>FORMAT 5

>MGLH
>MODEL SEPDEC = FEBJUN
>ESTIMATE

THU 3/03/94 5:59:45 PM D:\CURRENT\FISH\FLOWAVG.SYS

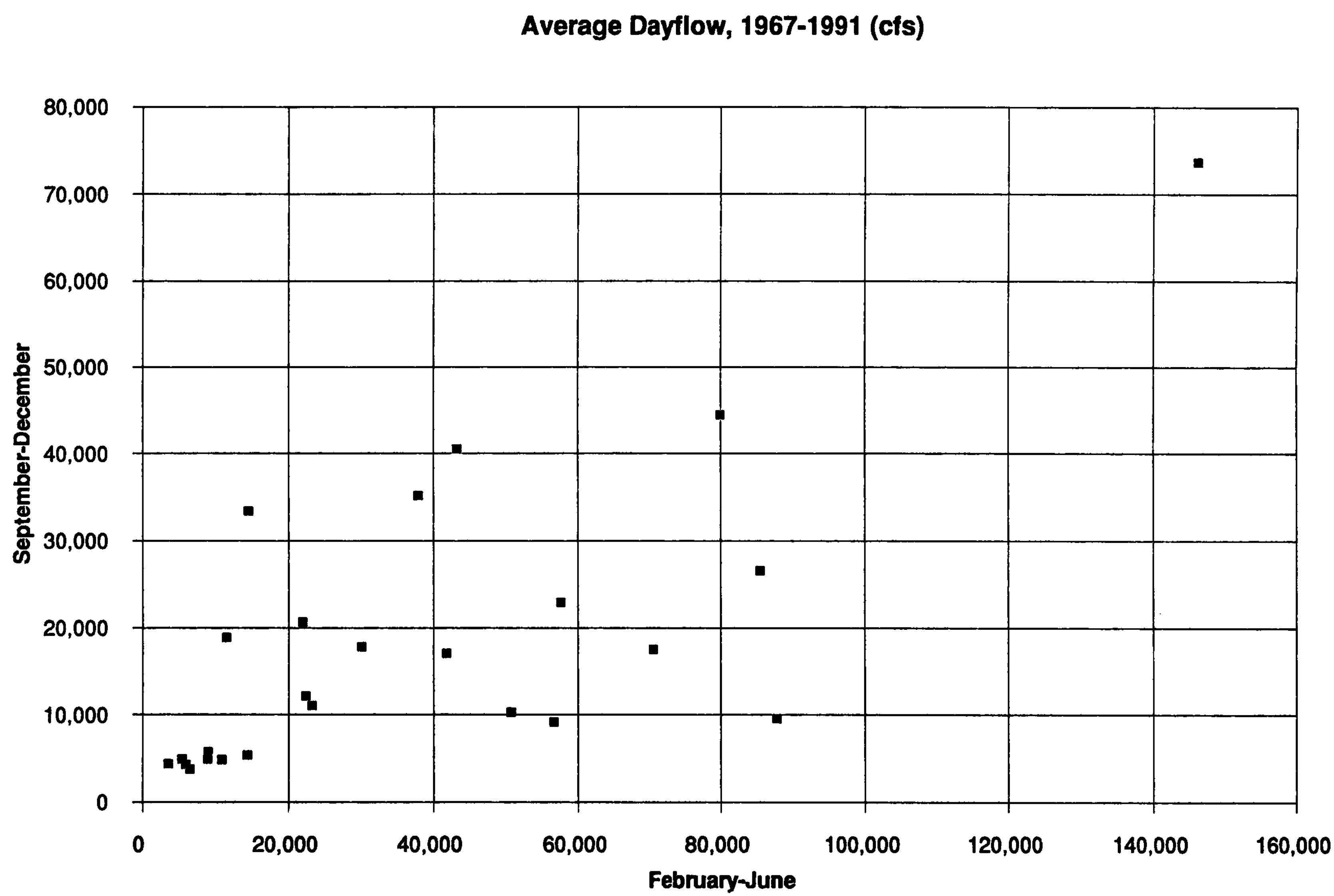
MODEL CONTAINS NO CONSTANT.

DEP VAR: SEPDEC N: 25 MULTIPLE R: 0.873 SQUARED MULTIPLE R: 0.762
ADJUSTED SQUARED MULTIPLE R: .762 STANDARD ERROR OF ESTIMATE: 12220.01139

VARIABLE	COEFFICIENT	STD ERROR	STD COEF	TOLERANCE	T	P(2 TAIL)
FEBJUN	0.41895	0.04781	0.87284	1.00000	8.76222	0.00000

ANALYSIS OF VARIANCE

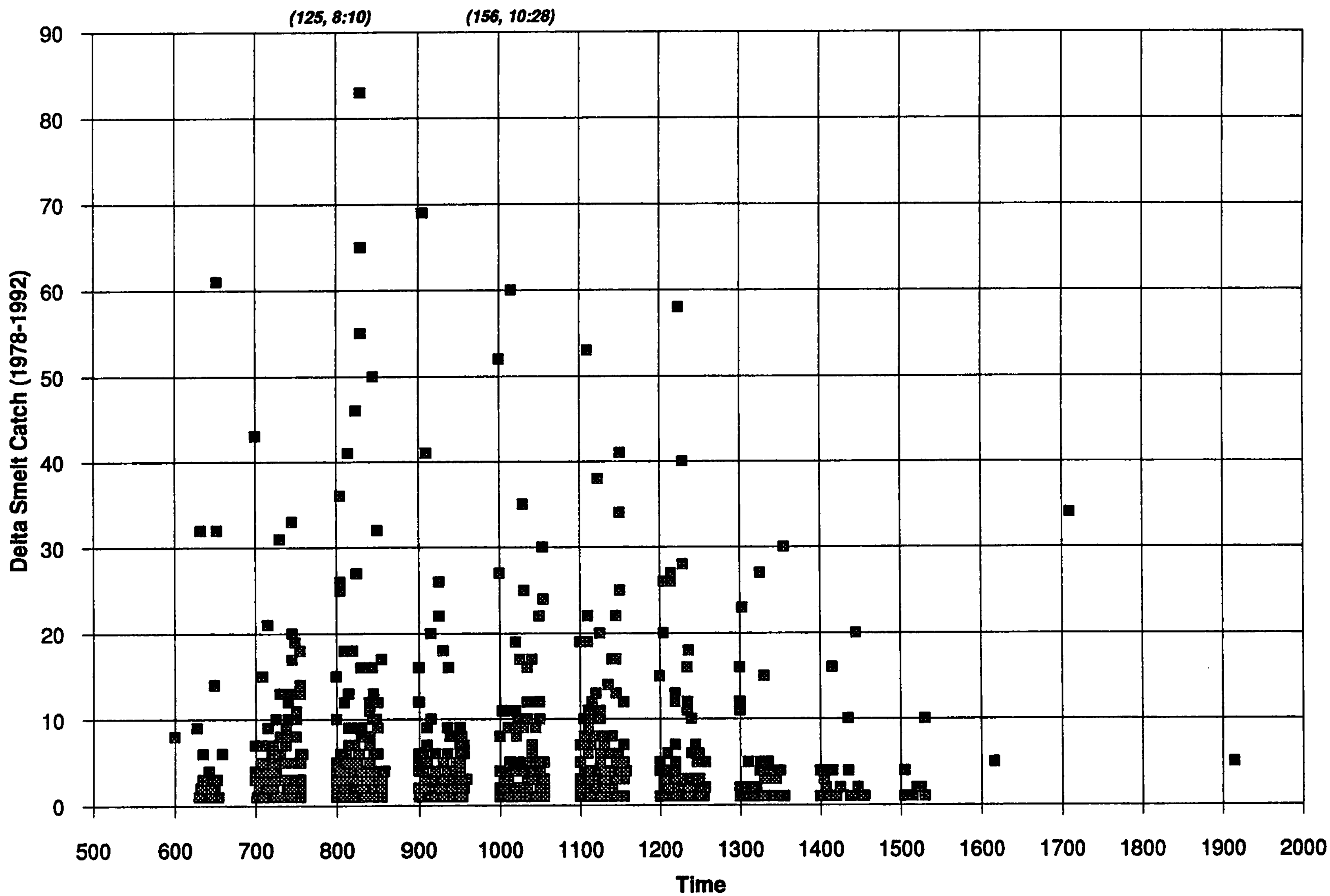
SOURCE	SUM-OF-SQUARES	DF	MEAN-SQUARE	F-RATIO	P
REGRESSION	.114649E+11	1	.114649E+11	76.77642	0.00000
RESIDUAL	.358389E+10	24	.149329E+09		


Average Dayflow, 1967-1991 (cfs)
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
September-December
0
20,000
40,000
60,000
80,000
100,000
120,000
140,000
160,000
February-June

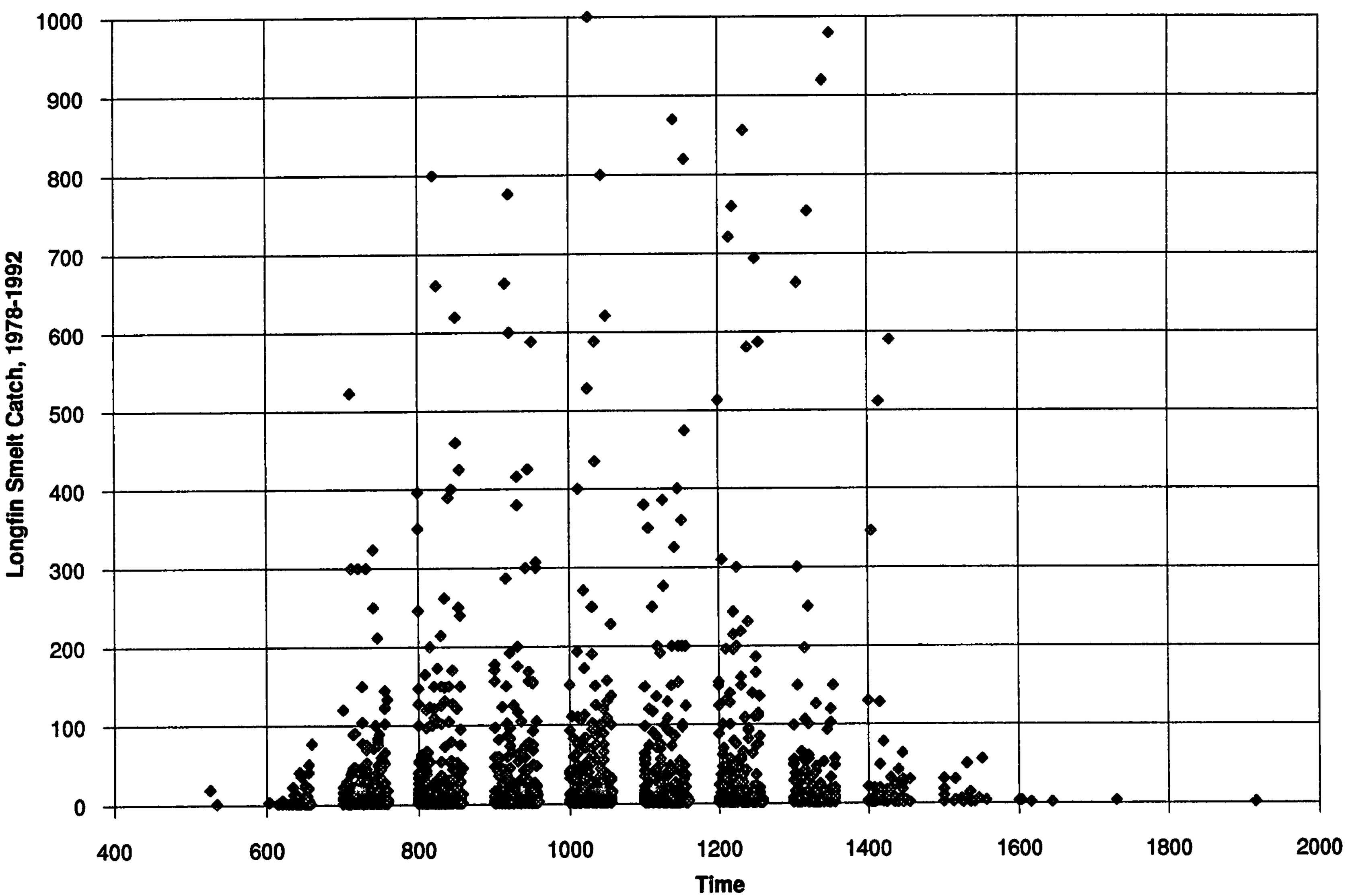
Tab 8.
Plots Of Catch Versus Sampling Time

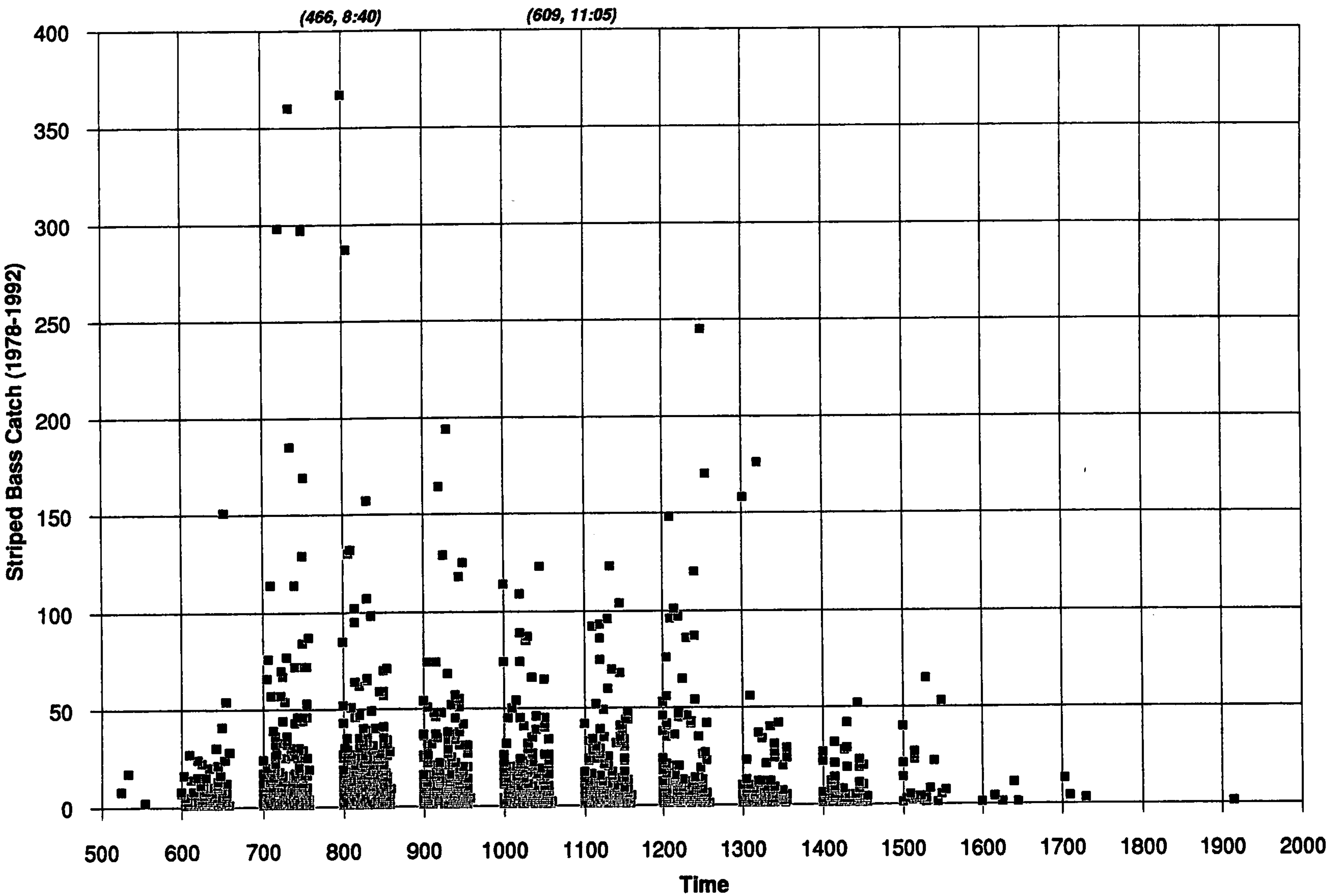
8a. Plots Of Catch Versus Sampling Time (1978-1992)
8b. Plots Of Catch Versus Sampling Time
Critical Years (1988, 1990-1992)

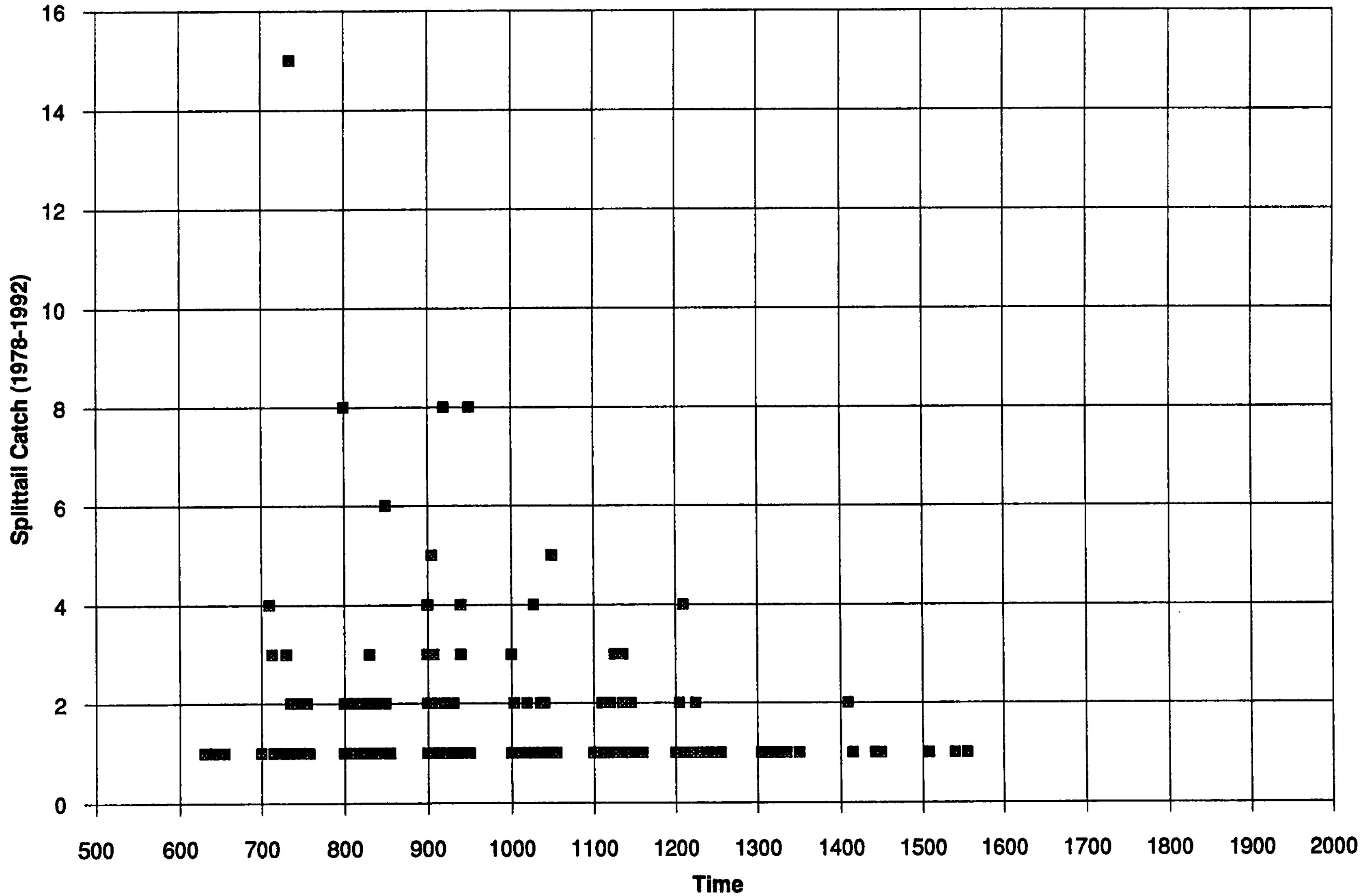
8a. PLOTS OF CATCH VERSUS SAMPLING TIME (1978-1992)



(125, 8:10)
(156, 10:28)
Delta Smelt Catch (1978-1992)
0
10
20
30
40
50
60
70
80
90
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
1700
1800
1900
2000
Time

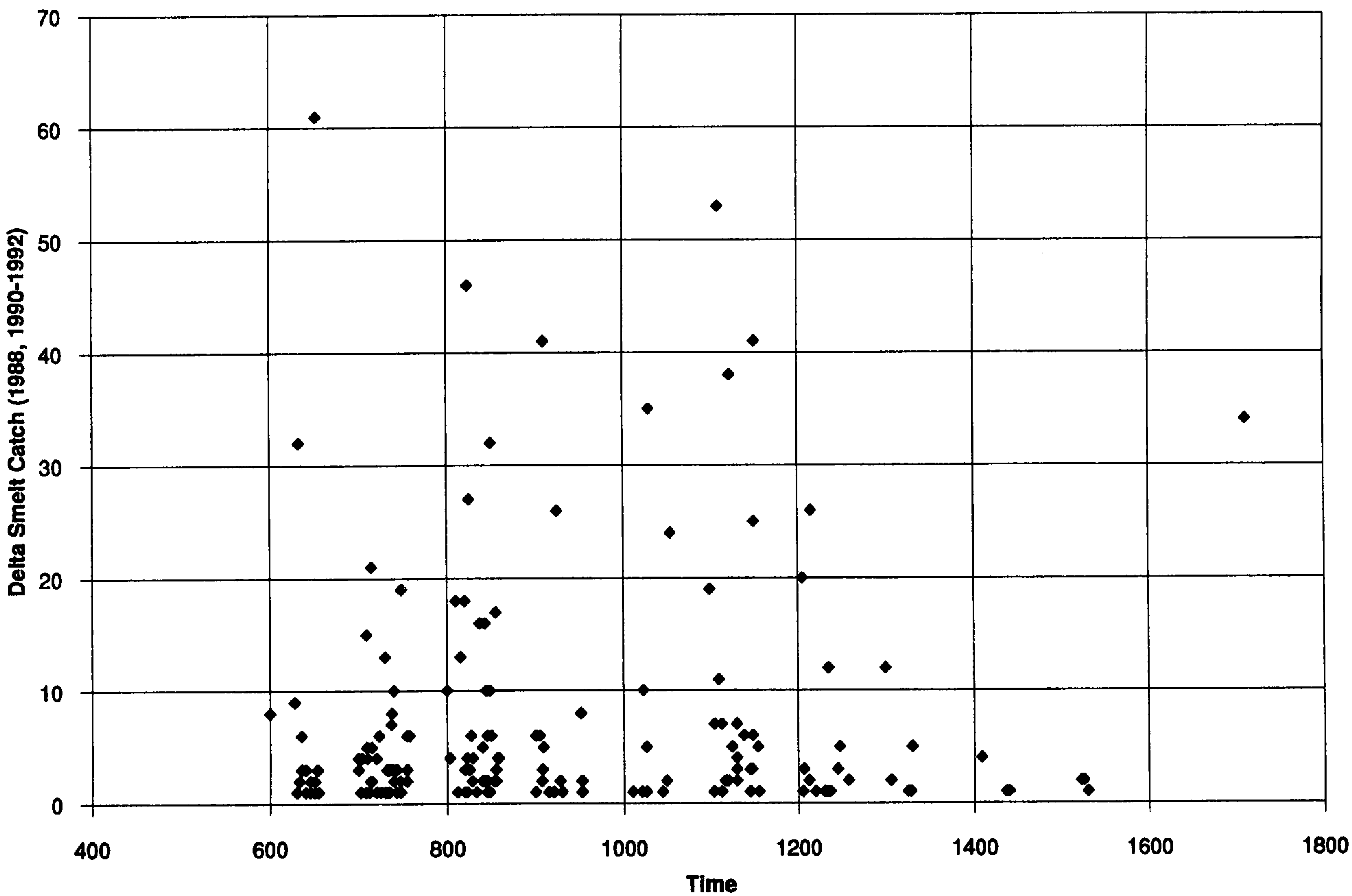

Longfin Smelt Catch, 1978-1992
1000
900
800
700
600
500
400
300
200
100
0
400
600
800
1000
1200
1400
1600
1800
2000
Time


(466, 8:40)
(609, 11:05)
Striped Bass Catch (1978-1992)
400
350
300
250
200
150
100
50
0
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
1700
1800
1900
2000
Time

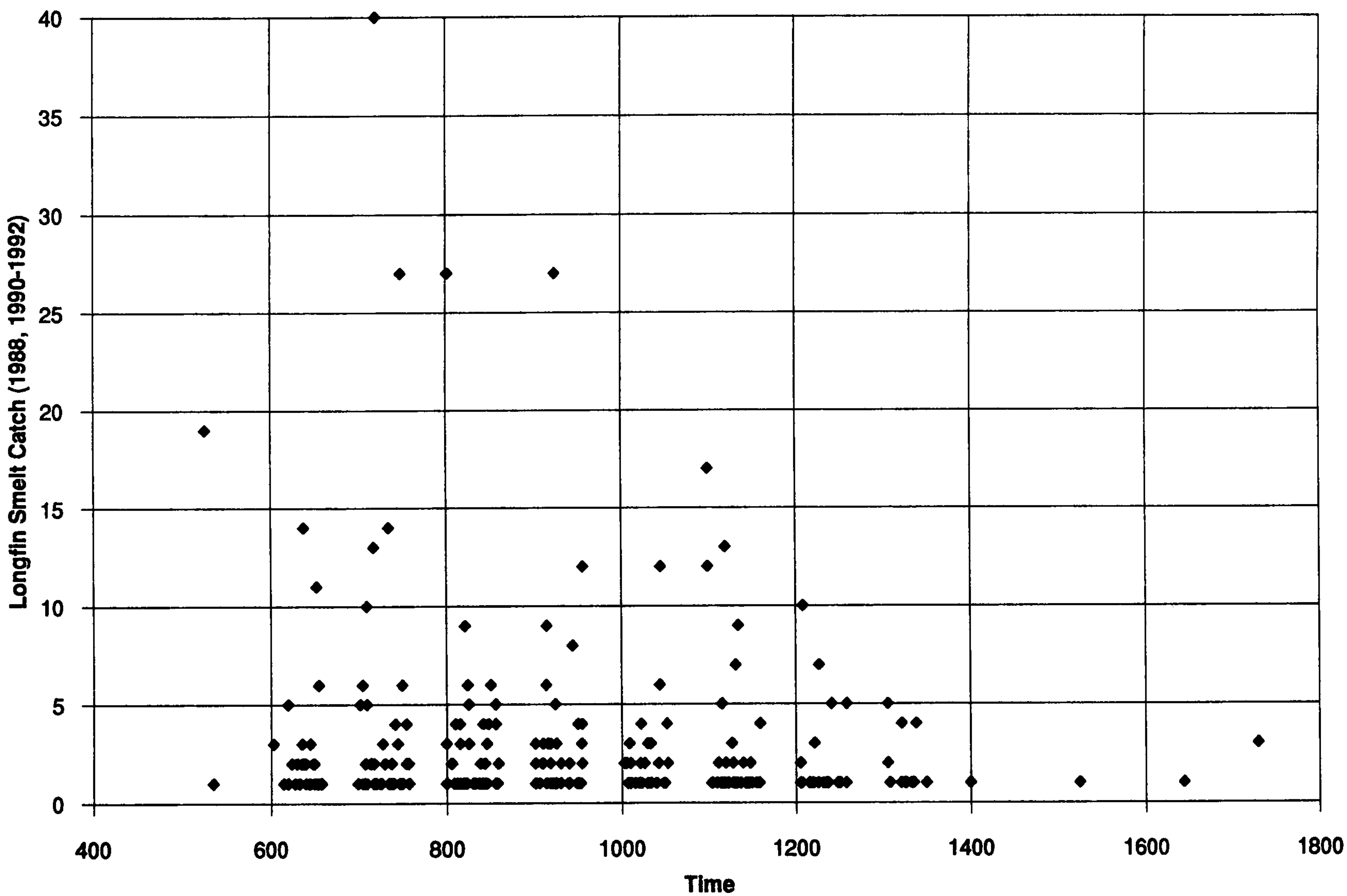


Splittail Catch (1978-1992)
16
14
12
10
8
6
4
2
0
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
1700
1800
1900
2000
Time

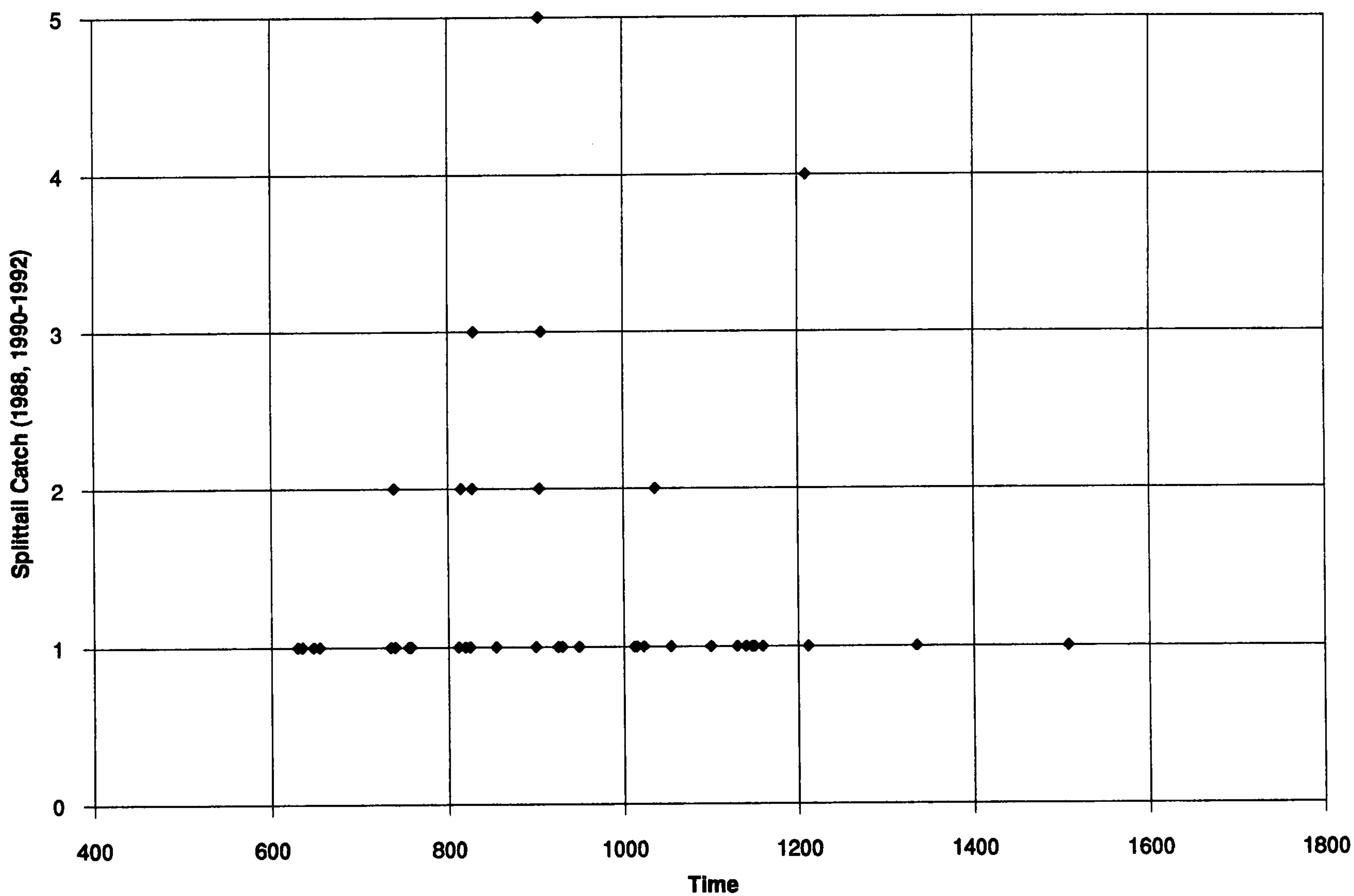
8b. PLOTS OF CATCH VERSUS SAMPLING TIME, CRITICAL YEARS (1988, 1990-1992)

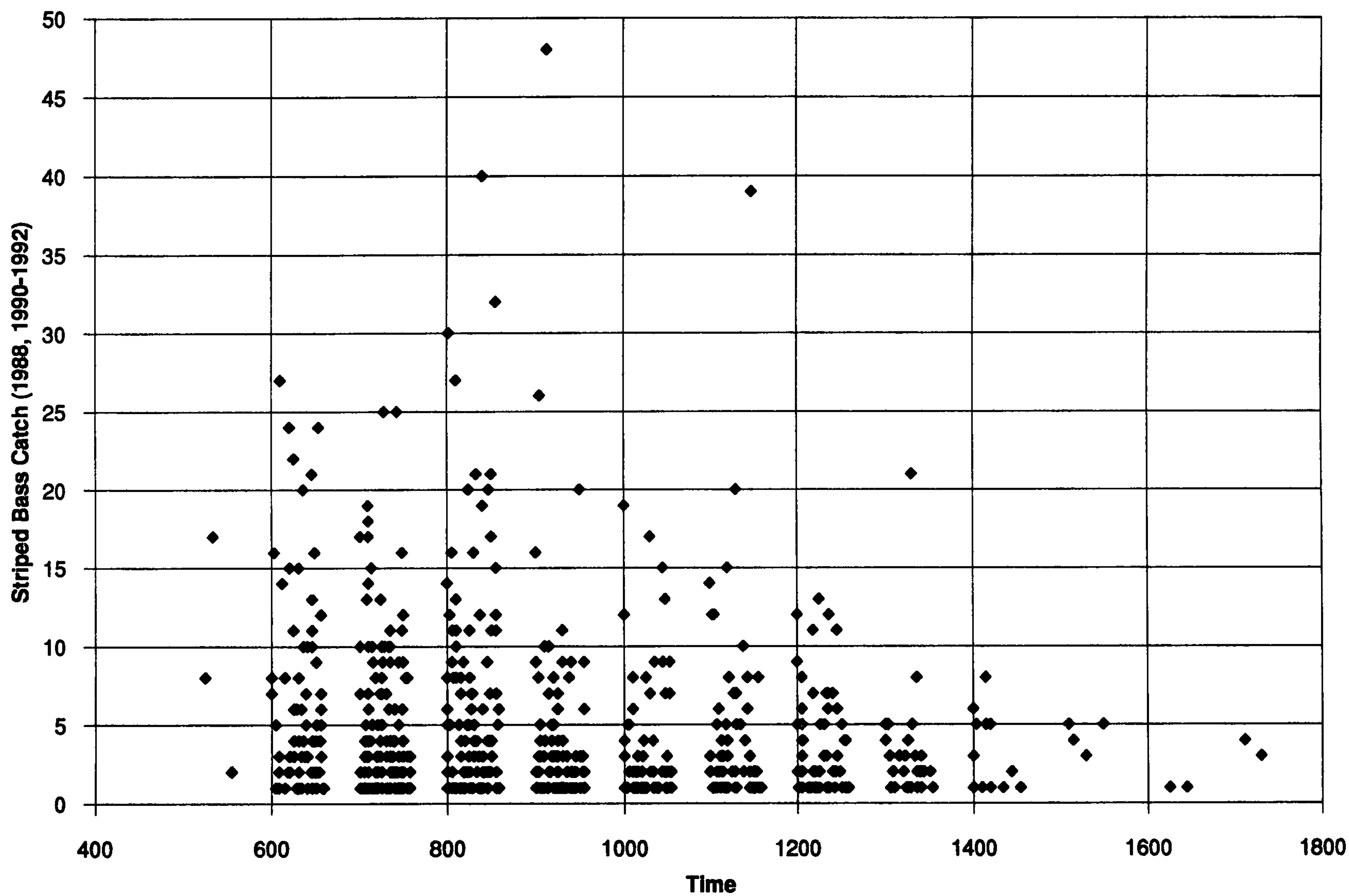


Delta Smelt Catch (1988, 1990-1992)
70
60
50
40
30
20
10
0
400
600
800
1000
1200
1400
1600
1800
Time



Longfin Smelt Catch (1988, 1990-1992)
40
35
30
25
20
15
10
5
0
400
600
800
1000
1200
1400
1600
1800
Time


Splittail Catch (1988, 1990-1992)
5
4
3
2
1
0
400
600
800
1000
1200
1400
1600
1800
Time



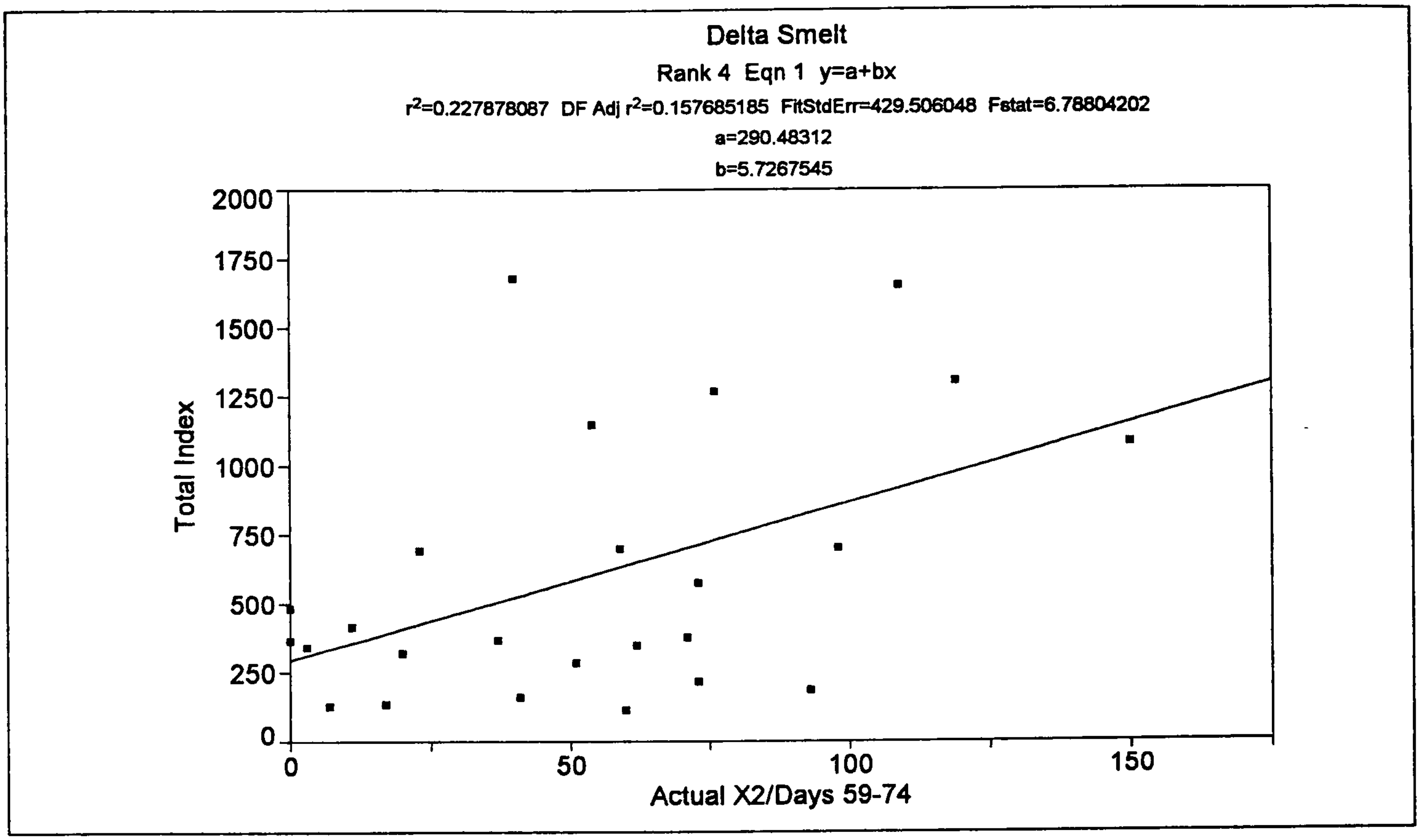
50
45
40
35
30
25
20
15
10
5
0
Striped Bass Catch (1988, 1990-1992)
400
600
800
1000
1200
1400
1600
1800
Time

Tab 9.

Relationship Between Delta Smelt Abundance And The Location Of X2 (Herbold Analysis)

Year	DELTA SMELT Total Index	Average Index	Standard Deviation	Weight*	February-June X2, Days at 59-74 Actual	Predicted
1967	415	103.73	56.59	0.0000781	11	11
1968	697	174.13	82.04	0.0000371	59	63
1969	316	78.91	50.43	0.0000983	20	2
1970	1,677	419.36	277.39	0.0000032	40	48
1971	1,305	326.29	144.55	0.0000120	119	131
1972	1,267	316.73	241.56	0.0000043	76	62
1973	1,146	286.46	59.44	0.0000707	54	56
1975	698	174.47	95.08	0.0000277	98	118
1976	338	84.46	44.55	0.0001260	3	0
1977	479	119.87	84.09	0.0000354	0	0
1978	572	142.90	124.83	0.0000160	73	52
1980	1,651	412.83	130.94	0.0000146	109	75
1981	375	93.75	63.28	0.0000624	71	76
1982	346	86.49	54.74	0.0000834	62	19
1983	132	33.08	32.00	0.0002441	17	0
1984	181	45.36	17.34	0.0008319	93	58
1985	109	27.28	10.02	0.0024900	60	29
1986	212	52.95	34.93	0.0002049	73	66
1987	280	70.02	24.70	0.0004098	51	31
1988	126	31.55	11.31	0.0019532	7	0
1989	366	91.54	47.66	0.0001100	37	39
1990	363	90.86	75.07	0.0000444	0	0
1991	689	172.27	112.96	0.0000196	23	14
1992	157	39.22	30.99	0.0002603	41	41
1993	1,078	269.50	181.63	0.0000076	150	150

* *Weight=1/(4 x StDev²)*

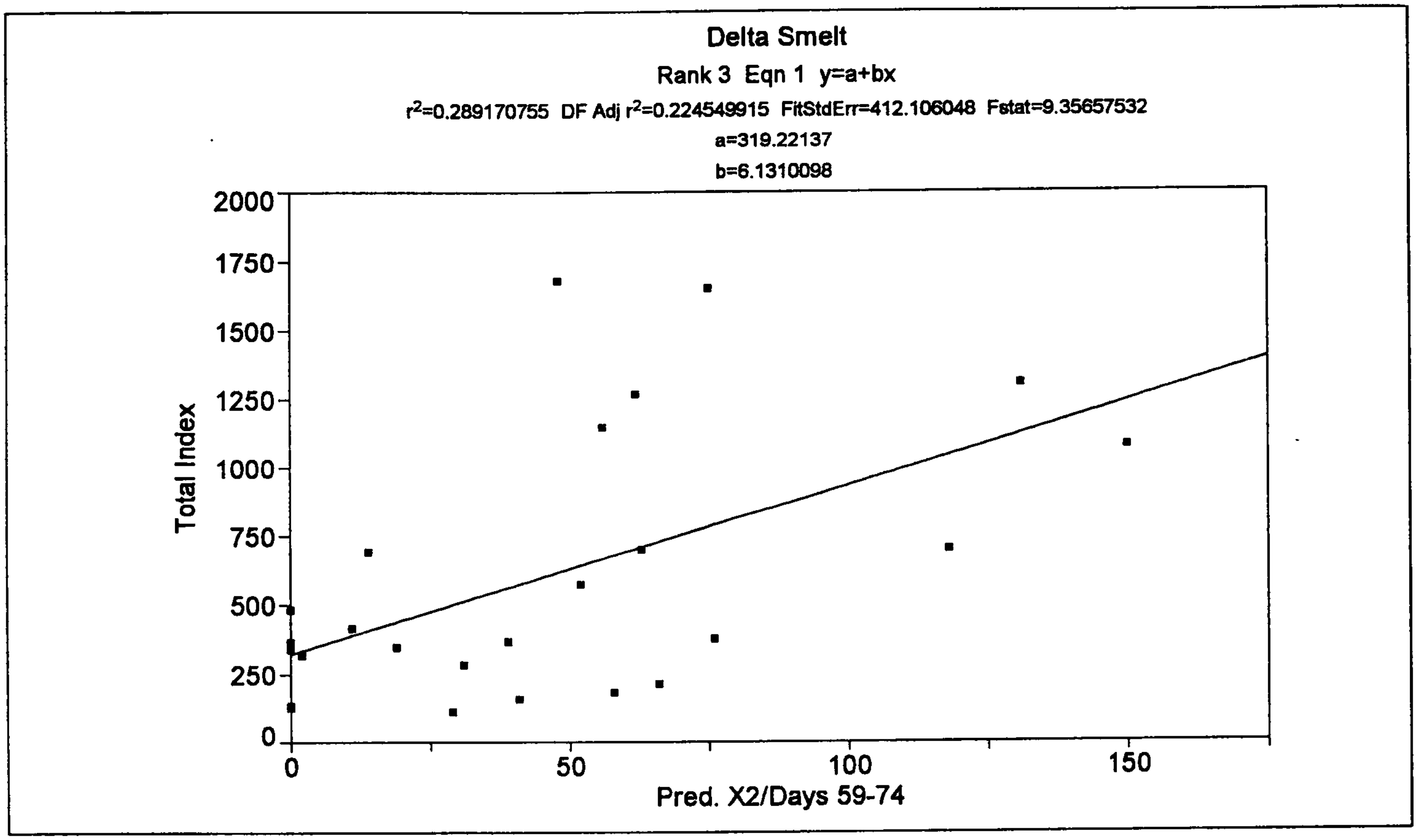


Rank 4 Eqn 1 y=a+bx

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.2278780866	0.1576851854	429.50604838	6.7880420191

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	290.4831195	146.3038707	1.985478020	-12.2558270	593.2220659
b	5.726754538	2.198043625	2.605387115	1.178457846	10.27505123

Date	Time	File Source
Feb 16, 1994	2:23:41 PM	c:\tcwin\smeltepa.xls

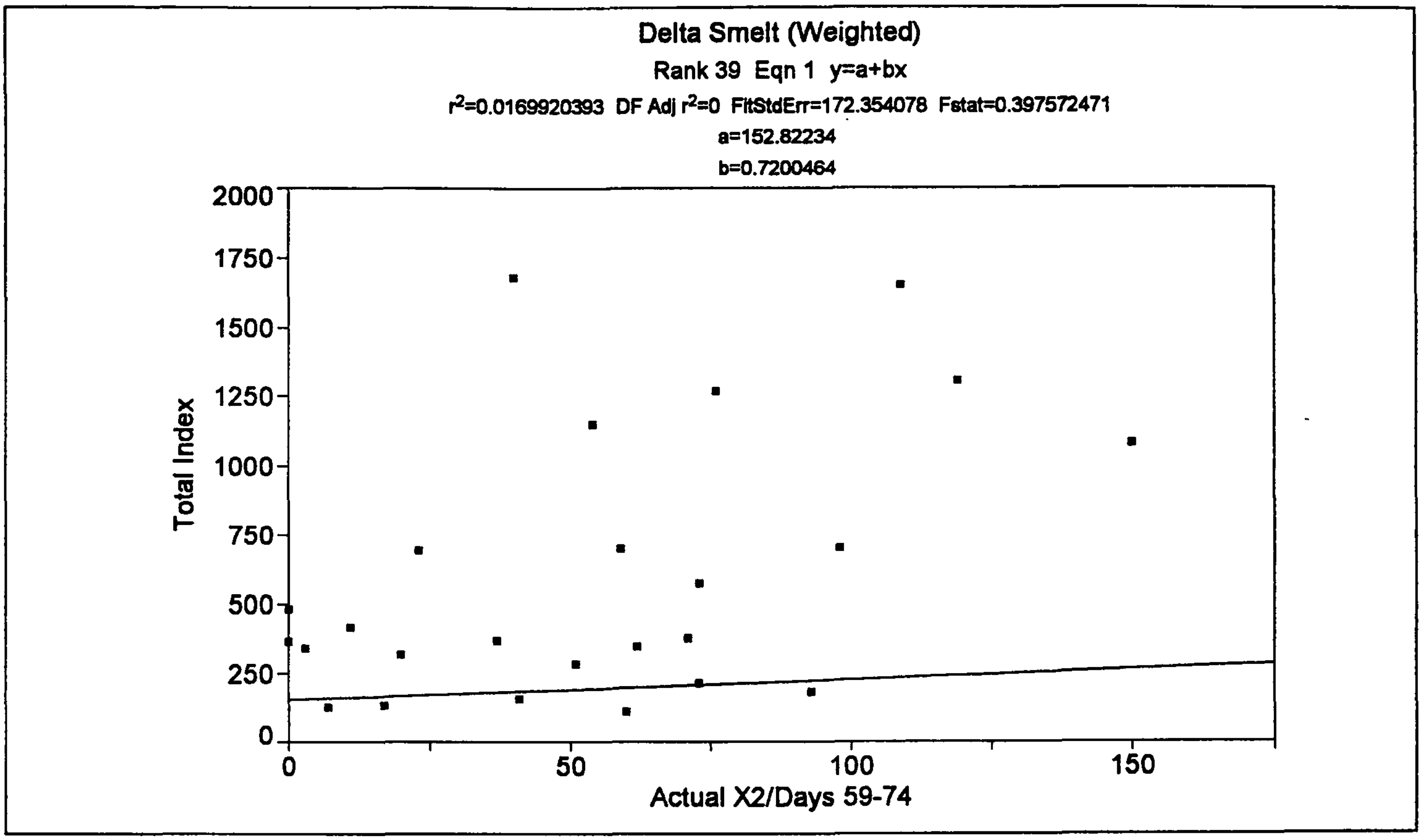


Rank 3 Eqn 1 y=a+bx

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.2891707552	0.2245499147	412.10604827	9.3565753205

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	319.2213677	123.1323579	2.592505926	64.43002053	574.0127149
b	6.131009778	2.004349951	3.058851961	1.983513273	10.27850628

Date	Time	File Source
Feb 16, 1994	2:31:58 PM	c:\tcwin\smeltepa.xls

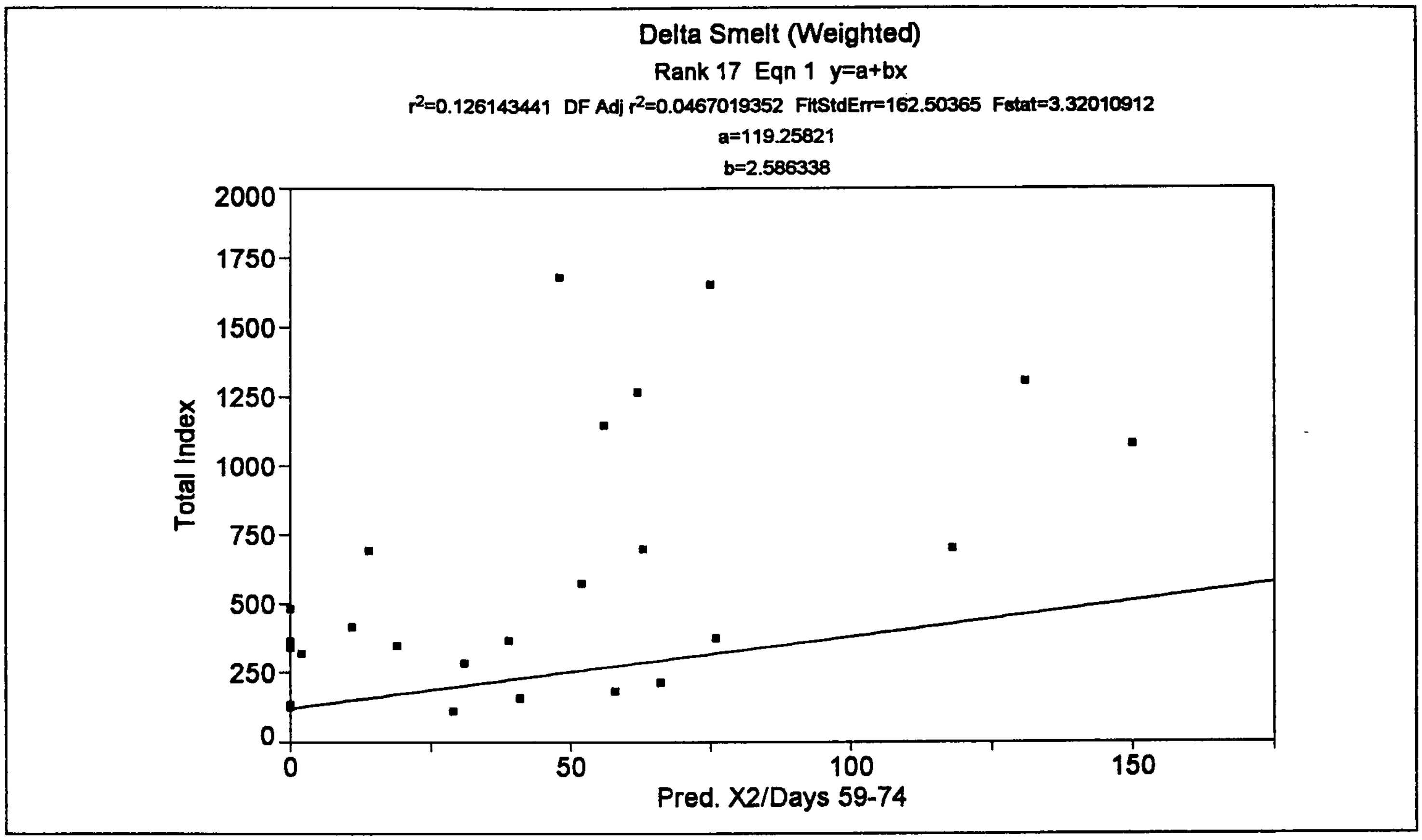


Rank 39 Eqn 1 y=a+bx

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.0169920393	0.0000000000	172.35407759	0.3975724713

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	152.8223363	61.47684831	2.485851837	25.61150998	280.0331626
b	0.720046398	1.141963781	0.630533482	-1.64295952	3.083052313

Date	Time	File Source
Feb 16, 1994	4:45:57 PM	c:\tcwin\smeltepa.xls



Rank 17 Eqn 1 y=a+bx

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.1261434406	0.0467019352	162.50365007	3.3201091211

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	119.2582144	48.52668008	2.457580329	18.84449375	219.6719350
b	2.586337966	1.419414038	1.822116660	-0.35078125	5.523457186

Date	Time	File Source
Feb 16, 1994	4:52:54 PM	c:\tcwin\smeltepa.xls

Tab 10.
Relationship Between Longfin Smelt And Striped Bass Abundance And X2 Estimated Using Generalized Linear Models (Jassby Analysis)

10a. DATA USED IN JASSBY ET AL. (1994) ANALYSES

86	0.39333	70.650
87	0.07159	83.825
88	0.02614	85.650
89	0.04904	78.825
90	0.04694	86.625
91	0.05189	86.800

```
Coefficients:
 (Intercept)  x2.apr.jul
    2.372016  0.05469959
```

Striped bass MWT

	sb.mwt	x2.jul.nov
68	4109	84.66
69	8461	69.30
70	8144	75.44
71	9069	69.84
72	6101	77.82
73	4274	75.64
75	4538	69.96
76	747	88.16
77	844	93.40
78	2503	79.16
80	1431	75.88
81	4526	86.30
82	4456	69.26
83	12510	63.00
84	6584	72.24
85	1757	87.40
86	3960	77.56
87	1350	89.52
88	341	90.30
89	431	85.00
90	1329	89.08
91	946	90.12

```
Coefficients:
 (Intercept)  x2.jul.nov
    14.25636 -0.07718052
```

(Note: The responce variable for this model in **ln(sb.mwt)**.)

Molluscs

	mollusc.cy	x2.3cy
81	287.66667	74.75000
82	26.30769	70.24444

Chen (X2)
08/10/93

Crangon

	crangon	x2mar.may
80	5523	63.56667
81	2444	74.36667
82	7579	53.56667
83	8584	49.23333
84	5253	69.60000
85	910	74.36667
86	5850	59.50000
87	2865	76.16667
88	2265	84.30000
89	2387	74.16667
90	1985	88.16667

Coefficients:

(Intercept)	x2mar.may
11.26768	-0.04399012

ln(Crang) = 11.26768 − .0439 x

(Note: The response variable for this model in **ln(crangon)**.)

Longfin smelt

	longfin	x2jan.jun
68	3318	71.31667
69	59497	53.81667
70	6535	65.20000
71	15988	61.58333
72	760	74.38333
73	5897	63.10000
75	2809	61.95000
76	654	81.35000
77	190	91.91667
78	6646	61.96667
80	31155	63.83333
81	2202	75.05000
82	62929	56.83333
84	7459	65.63333
85	992	73.81667
86	6160	64.80000
87	1508	78.35000
88	743	82.71667
89	799	80.45000
90	531	85.58333
91	134	86.63333

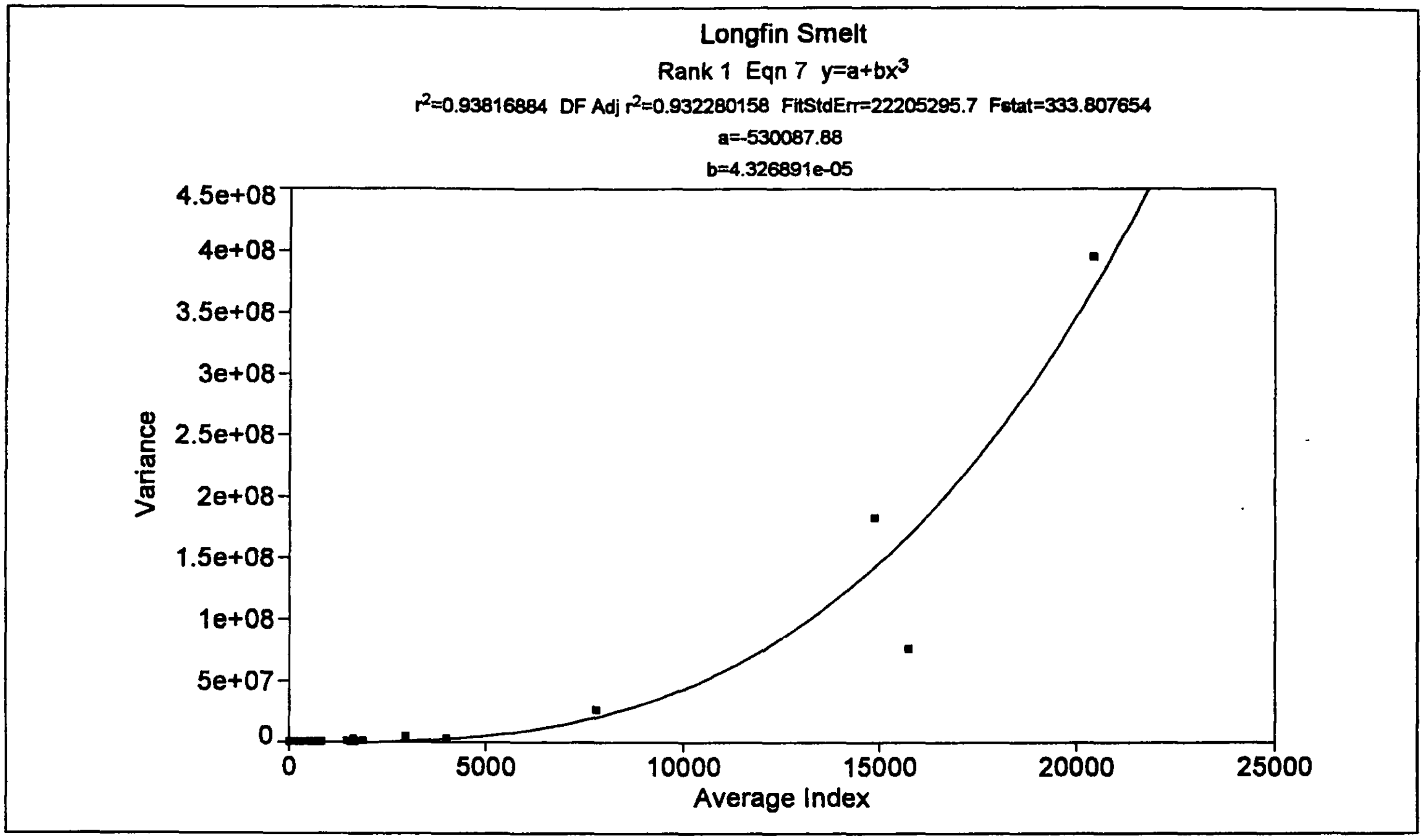
Coefficients:
(Intercept) ns(x2jan.jun, 2)1 ns(x2jan.jun, 2)2

10b. DATA USED IN OUR ANALYSES

Table 10b. Data Used in Our Re-analysis of Jassby et al. (1994) Abundance-X2 Relationships

		STRIPED BASS			LONGFIN SMELT		
Year	X2 Feb-Jun	Total Index	Average Index	Standard Deviation	Total Index	Average Index	Standard Deviation
1967	55.0	21,081.5	5,270.4	4,695.3	81,731.8	20,432.9	19,863.6
1968	71.7	4,117.7	1,029.4	646.5	3,317.5	829.4	421.0
1969	53.5	8,424.6	2,106.1	1,246.6	59,493.3	14,873.3	13,504.5
1970	67.9	8,297.8	2,074.4	570.5	6,534.6	1,633.7	1,712.5
1971	62.7	9,473.6	2,368.4	1,134.6	15,986.4	3,996.6	1,620.0
1972	75.8	6,128.6	1,532.2	1,136.9	759.5	189.9	139.1
1973	64.8	4,284.3	1,071.1	471.4	5,896.1	1,474.0	897.6
1975	60.3	4,547.3	1,136.8	496.6	2,808.6	702.2	367.4
1976	82.6	757.5	189.4	56.3	654.0	163.5	254.1
1977	92.2	884.4	221.1	58.4	204.4	51.1	33.3
1978	61.2	2,600.5	650.1	332.0	6,675.1	1,668.8	465.7
1980	63.9	1,462.4	365.6	257.5	31,152.8	7,788.2	5,103.1
1981	74.4	4,532.3	1,133.1	605.3	2,201.6	550.4	576.0
1982	56.4	4,467.3	1,116.8	253.3	62,924.6	15,731.1	8,715.3
1983	49.2	12,495.8	3,124.0	1,568.9	11,874.6	2,968.7	2,156.9
1984	68.9	6,601.3	1,650.3	683.9	7,457.9	1,864.5	1,074.5
1985	75.5	1,759.1	439.8	403.8	991.7	247.9	328.7
1986	60.7	3,943.8	985.9	1,156.6	6,159.6	1,539.9	402.1
1987	78.2	1,351.1	337.8	198.4	1,507.5	376.9	386.2
1988	84.5	476.7	119.2	20.8	742.6	185.7	237.0
1989	77.9	440.7	110.2	49.6	456.1	114.0	175.2
1990	86.2	1,318.9	329.7	113.5	239.3	59.8	69.4
1991	85.1	945.7	236.4	153.8	134.1	33.5	40.4
1992	80.5	2,018.1	504.5	175.9	73.8	18.5	27.8
1993					793.3	198.3	174.5

10c. PLOTS OF VARIANCE VERSUS AVERAGE INDEX

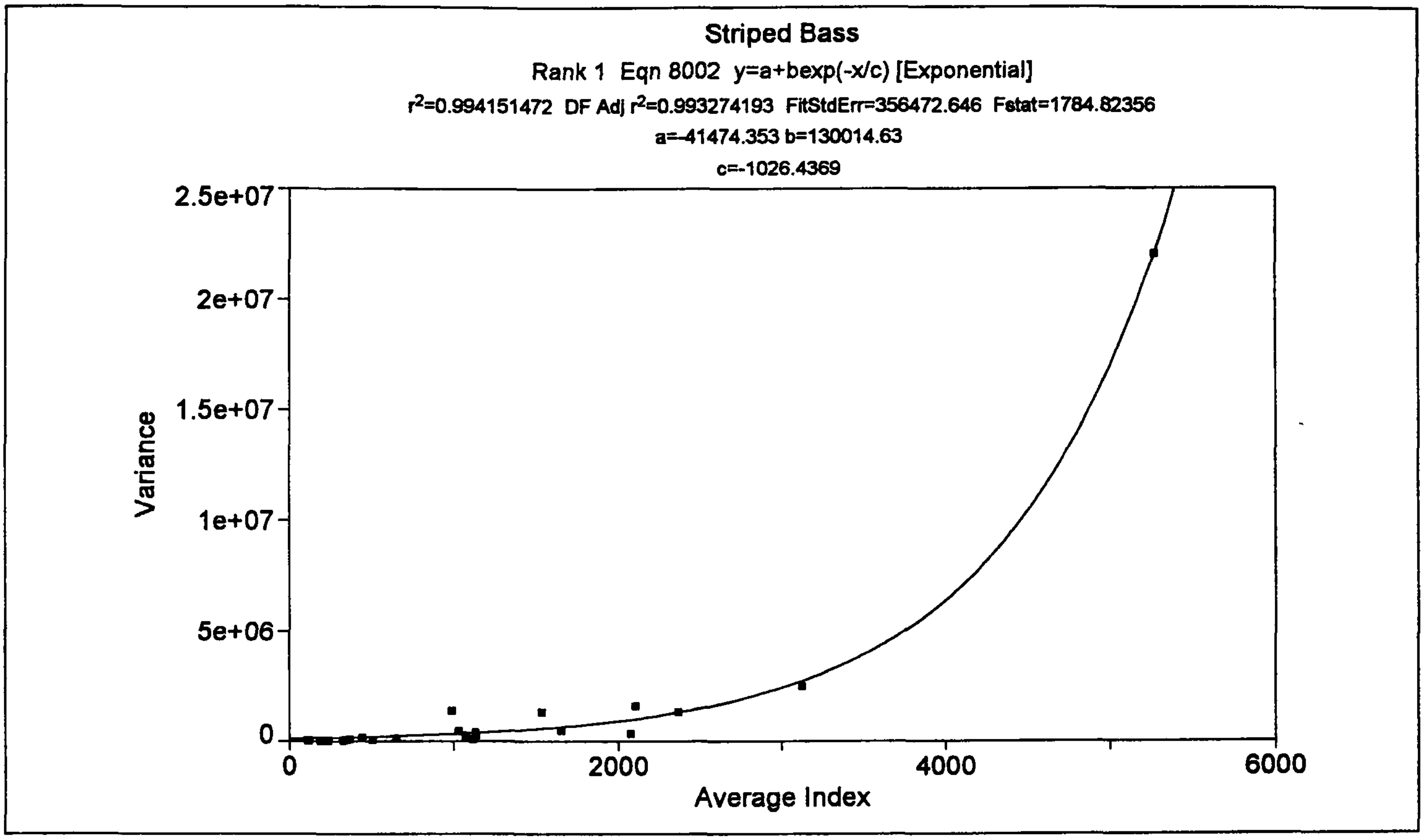


Rank 1 Eqn 7 $y=a+bx^3$

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.9381688400	0.9322801581	2.22053e+07	333.80765412

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	-530087.877	4.80956e+06	-0.11021549	-1.0508e+07	9.448e+06
b	4.32689e-05	2.36825e-06	18.27040378	3.83556e-05	4.81822e-05

Date	Time	File Source
Feb 15, 1994	11:22:42 PM	c:\tcwin\4fstdev2.xls



Rank 1 Eqn 8002 y=a+bexp(-x/c) [Exponential]

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.9941514721	0.9932741929	356472.64641	1784.8235604

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	-41474.3527	127043.3547	-0.32645826	-305799.240	222850.5343
b	130014.6281	41038.47027	3.168115851	44630.47687	215398.7794
c	-1026.43688	62.48644625	-16.4265524	-1156.44544	-896.428329

Date	Time	File Source
Feb 15, 1994	11:25:25 PM	c:\tcwin\4fstdev2.xls

10d. OUR GLM ANALYSES FOR STRIPED BASS AND LONGFIN SMELT

These are the commands I used to produce the figures on 2-24-94. The data were abundances from 1967-1992 and X2 was X2.F.J

John Rice

DATA INPUT:

```
fish467.92 _ read.table("4fish67_92", header=T, sep = ",")
> dimnames(fish467.92)
[[1]]:
 [1] "1"  "2"  "3"  "4"  "5"  "6"  "7"  "8"  "9"  "10" "11" "12" "13" "14" "15"
[16] "16" "17" "18" "19" "20" "21" "22" "23" "24"

[[2]]:
 [1] "Year"     "X2.F.J"   "SBass"    "SBassAv"  "SBassSD"  "X2.J.N"
 [7] "Longfin"  "LongfAv"  "LongfSD"  "X2.F.M"   "DSmelt"   "DSmeltAv"
[13] "DSmeltSD" "Split"    "SplitAv"  "SplitSD"  "X2.S.D.

> attach(fish467.92,1)
> X2 _ X2.F.J
> ss _ sort.list(X2)
```

AVERAGE STRIPED BASS WEIGHTED ACCORDING TO SD

```
wt _ (1/SBassSD)^2
ft _ glm(SBassAv ~ X2, family=quasi(link=log, variance=constant), weights = wt)
pd _  predict(ft, type="response", se.fit=T)

> summary(ft)

Call: glm(formula = SBassAv ~ X2, family = quasi(link = log, variance = constant),
        weights = wt)
Deviance Residuals:
       Min        1Q    Median     3Q       Max
 -2.297903 0.3486911 0.6942164 1.4024 2.788447

Coefficients:
                   Value Std. Error   t value
(Intercept)  11.43905060 0.78444940  14.58227
         X2  -0.07740269 0.01050012  -7.37160

(Dispersion Parameter for Quasi-likelihood family taken to be 1.901193 )

    Null Deviance: 71.87199 on 23 degrees of freedom

Residual Deviance: 41.82625 on 22 degrees of freedom

Number of Fisher Scoring Iterations: 5

Correlation of Coefficients:
   (Intercept)
X2 -0.9870962

 plot(X2, SBassAv, pch="o", xlab= "X2", ylab=" Average Striped Bass")
lines(X2[ss], pd$fit[ss])
sepred _ sqrt(pd$se.fit^2 + (SBassSD/2)^2)
error.bar(X2, pd$fit, sepred, sepred, add =T)
title(main="Striped Bass", sub="weighted according to standard deviations")
```

NOTE that the model underpredicts in the region 60+ - 75

(2)

```
> cor(SBassAv, pd$fit)
[1] 0.7026184                  The correlation coefficient of observed and fitted va:
gives R^2 of .49
compare to proportion of deviance explained = (71.9 - 41.8)/71.9  = .42

plot(SBassAv, SBassSD, xlab="Average", ylab="Standard Deviation")
title("Striped Bass")
```

AVERAGE BASS WEIGHTED WITH GLM IN WHICH VARIANCE IS PROPORTIONAL TO MEAN^2

```
ft _ glm(SBassAv ~ X2, family=quasi(link=log, variance=mu^2))
pd _  predict(ft, type="response", se.fit=T)
> > summary(ft)

Call: glm(formula = SBassAv ~ X2, family = quasi(link = log, variance = mu^2))
Deviance Residuals:
       Min         1Q     Median        3Q      Max
 -1.243989 -0.5421673 -0.2430861 0.3067858 1.091208

Coefficients:
                  Value Std. Error   t value
(Intercept)  11.68341856 0.80595677  14.49633
         X2  -0.06956345 0.01130172  -6.15512

(Dispersion Parameter for Quasi-likelihood family taken to be 0.4049444 )

    Null Deviance: 22.72025 on 23 degrees of freedom

Residual Deviance: 9.373418 on 22 degrees of freedom

Number of Fisher Scoring Iterations: 4

Correlation of Coefficients:
   (Intercept)
X2 -0.9869269



 plot(X2, SBassAv, pch="o", xlab= "X2", ylab=" Average Striped Bass")
lines(X2[ss], pd$fit[ss])
sepred _ sqrt(pd$se.fit^2 + .405*pd$fit^2)
error.bar(X2, pd$fit, sepred, sepred, add =T)
title(main="Striped Bass", sub="GLM fit with variance proportional to square of mea

> > > cor(pd$fit, SBassAv)
[1] 0.7048019
corresponds to R^2 = .50

> (22.7 - 9.4)/22.7
[1] 0.5859031  = proportion of deviance explained
```

TOTAL BASS WEIGHTED ACCORDING TO SD'S

```
wt _ (1/SBassSD)^2
ft _ glm(SBass ~ X2, family=quasi(link=log, variance=constant), weights = wt)
pd _  predict(ft, type="response", se.fit=T)


 plot(X2, SBass, pch="o", xlab= "X2", ylab="Total Striped Bass")
lines(X2[ss], pd$fit[ss])
```

```
sepred _ sqrt(pd$se.fit^2 + (2*SBassSD^2))
error.bar(X2, pd$fit, sepred, sepred, add =T)
title(main="Striped Bass", sub="weighted according to standard deviations")


> cor(SBass, pd$fit)
[1] 0.7026184
```

```
ft _ glm(SBass ~ X2, family=quasi(link=log, variance=mu^2))
pd _  predict(ft, type="response", se.fit=T)

> summary(ft)

Call: glm(formula = SBass ~ X2, family = quasi(link = log, variance = mu^2))
Deviance Residuals:
       Min         1Q     Median        3Q       Max
 -1.243989 -0.5421673 -0.2430861 0.3067858 1.091208

Coefficients:
                  Value Std. Error    t value
(Intercept)  13.06971294 0.80595676  16.216395
         X2  -0.06956345 0.01130172  -6.155121

(Dispersion Parameter for Quasi-likelihood family taken to be 0.4049444 )

    Null Deviance: 22.72025 on 23 degrees of freedom

Residual Deviance: 9.373418 on 22 degrees of freedom

Number of Fisher Scoring Iterations: 4

Correlation of Coefficients:
   (Intercept)
X2 -0.9869269

 plot(X2, SBass, pch="o", xlab= "X2", ylab="Total Striped Bass")
lines(X2[ss], pd$fit[ss])
sepred _ sqrt(pd$se.fit^2 + .405*pd$fit^2)
error.bar(X2, pd$fit, sepred, sepred, add =T)
title(main="Striped Bass", sub="GLM fit with variance proportional to square of meai

> cor(SBass, pd$fit)
[1] 0.7048019
```

AVERAGE LONGFIN SMELT WEIGHTED ACCORDING TO SD'S

```
wt _ (1/LongfSD)^2
ft _ glm(LongfAv ~ ns(X2,2 ), family=quasi(link=log, variance=constant), weights = w
pd _  predict(ft, type="response", se.fit=T)

> > summary(ft)

Call: glm(formula = LongfAv ~ ns(X2, 2), family = quasi(link = log, variance =
      constant), weights = wt)
Deviance Residuals:
      Min          1Q    Median        3Q       Max
 -1.39292 -0.01165242 0.6167205 1.028827 1.745005

Coefficients:
```

```
                   Value Std. Error   t value
(Intercept)    4.1762538   1.261692  3.3100421
 ns(X2, 2)1    0.6967804   1.972718  0.3532083
 ns(X2, 2)2  -12.0238149   2.707739 -4.4405376

(Dispersion Parameter for Quasi-likelihood family taken to be 0.906169 )

    Null Deviance: 59.15108 on 23 degrees of freedom

Residual Deviance: 19.02945 on 21 degrees of freedom

Number of Fisher Scoring Iterations: 10

Correlation of Coefficients:
           (Intercept) ns(X2, 2)1
ns(X2, 2)1 -0.9150736
ns(X2, 2)2  0.7987159  -0.5069284
```

THIS DIDN'T CONVERGE AND THE RESULTS ARE GARBAGE

GLM FITS OF LONGFIN ARE BASED ON THE VARIANCE BEING PROPORTIONAL TO THE SQUARE OF THE MEAN - SEE FIGURE

AVERAGE LONGFIN SMELT FIT ACCORDING TO GLM AND NATURAL SPLINE WITH ONE INTERIOR KNO'

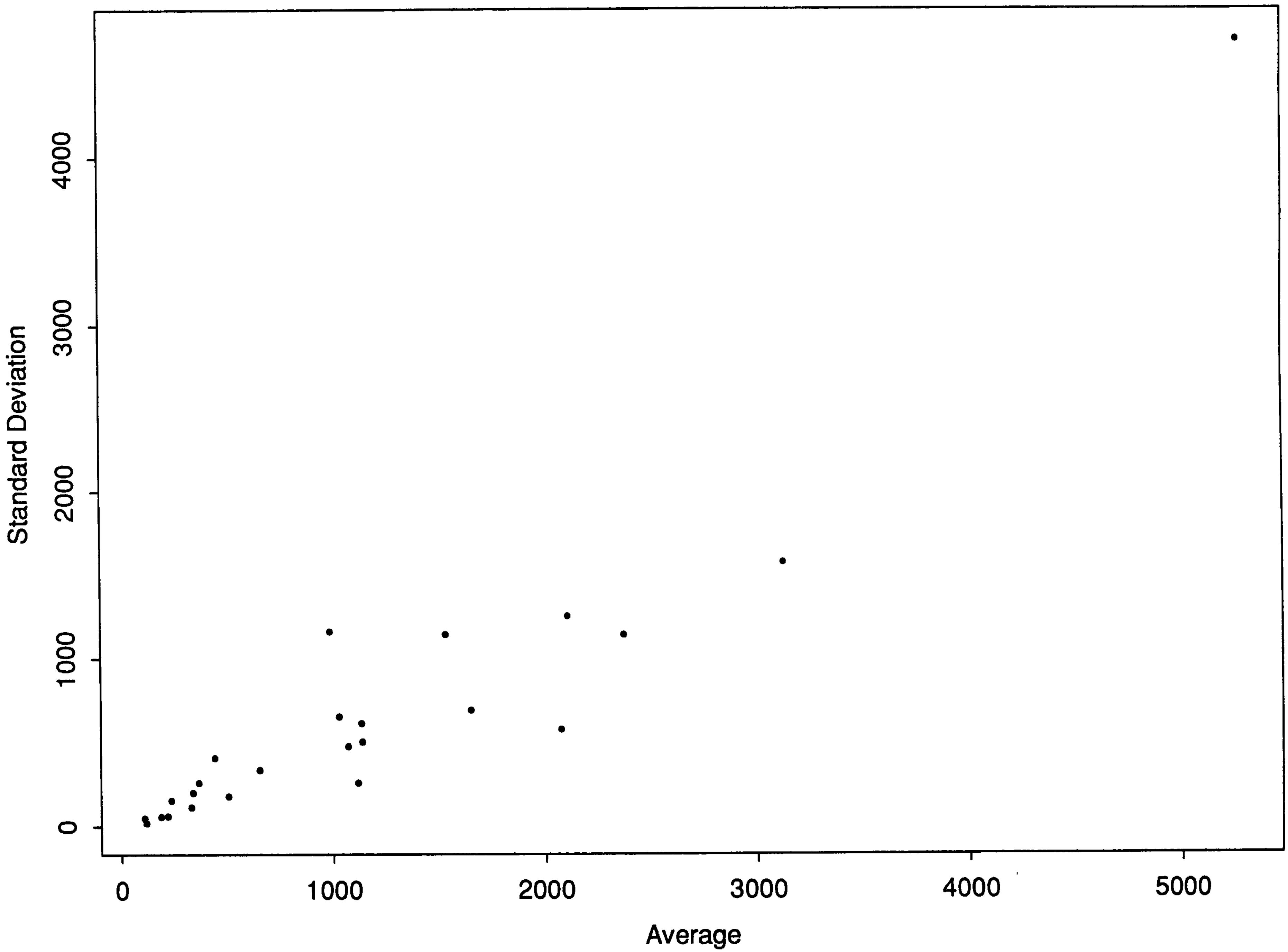
```
ft _ glm(LongfAv ~ ns(X2,2), family=quasi(link=log, variance=mu^2))
pd _  predict(ft, type="response", se.fit=T)

> > summary(ft)

Call: glm(formula = LongfAv ~ ns(X2, 2), family = quasi(link = log, variance = mu^2
Deviance Residuals:
       Min        1Q     Median        3Q      Max
 -1.697612 -0.7882569 0.05659376 0.3638015 1.313014

Coefficients:
                  Value Std. Error   t value
(Intercept)   10.254677  0.4573274  22.423052
 ns(X2, 2)1   -8.009802  0.9938378  -8.059466
 ns(X2, 2)2   -5.266840  0.5660804  -9.304050

(Dispersion Parameter for Quasi-likelihood family taken to be 0.5299603 )

    Null Deviance: 73.40382 on 23 degrees of freedom

Residual Deviance: 15.21805 on 21 degrees of freedom

Number of Fisher Scoring Iterations: 4

Correlation of Coefficients:
           (Intercept) ns(X2, 2)1
ns(X2, 2)1 -0.9454555
ns(X2, 2)2  0.0165254   0.0069822


 plot(X2, LongfAv, pch="o", xlab= "X2", ylab=" Average Longfin Smelt")
```

```
lines(X2[ss], pd$fit[ss])
sepred _ sqrt(pd$se.fit^2 + .530*pd$fit^2)
error.bar(X2, pd$fit, sepred, sepred, add =T)
 title(main="Longfin Smelt", sub="GLM fit with variance proportional to square of m
> cor(LongfAv, pd$fit)
[1] 0.5153967

> (73.4 - 15.2)/73.4
[1] 0.7929155 - proportion of deviance explained
```

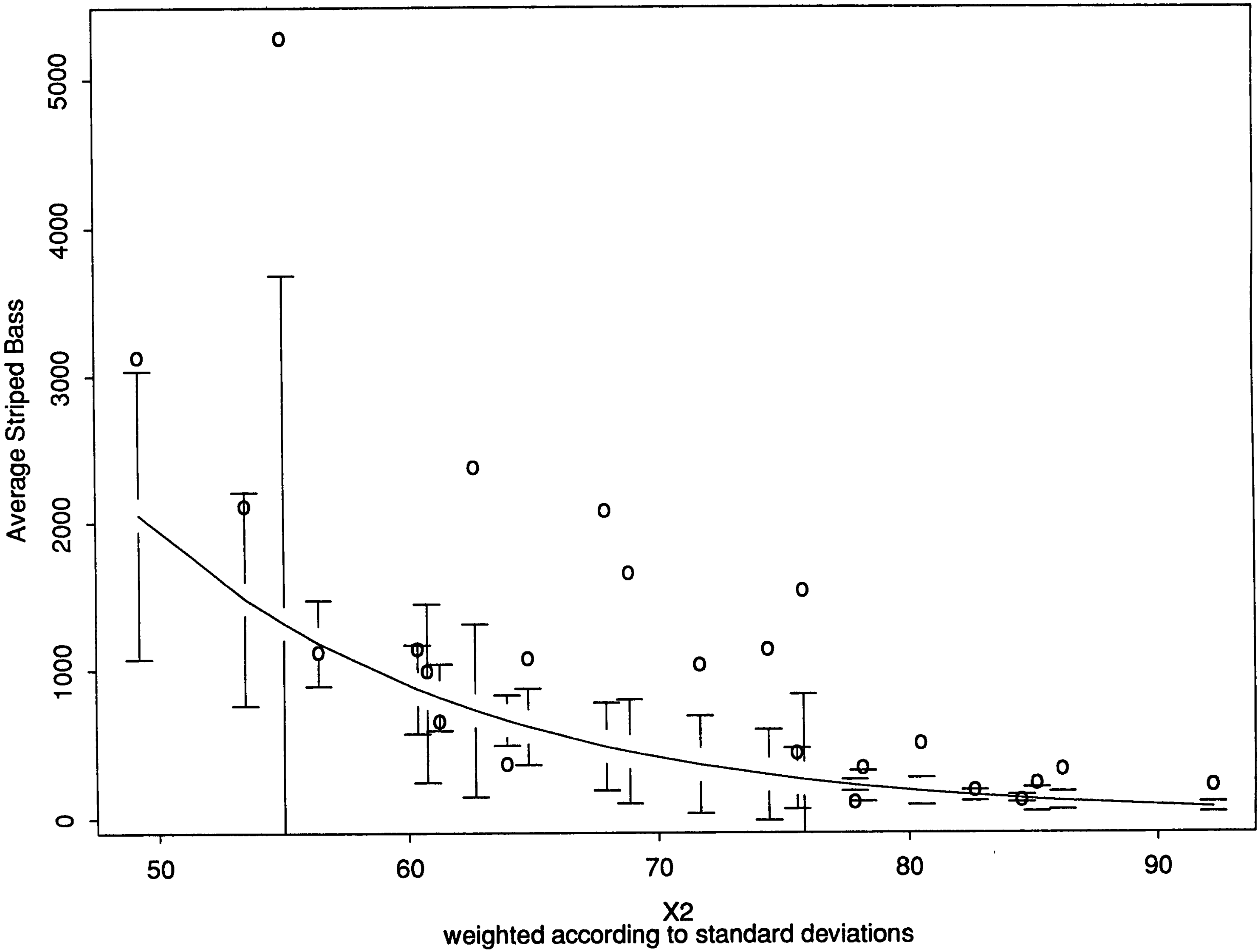
TOTAL LONGFIN SMELT FIT ACCORDING TO GLM AND NATURAL SPLINE WITH ONE INTERIOR KNOT

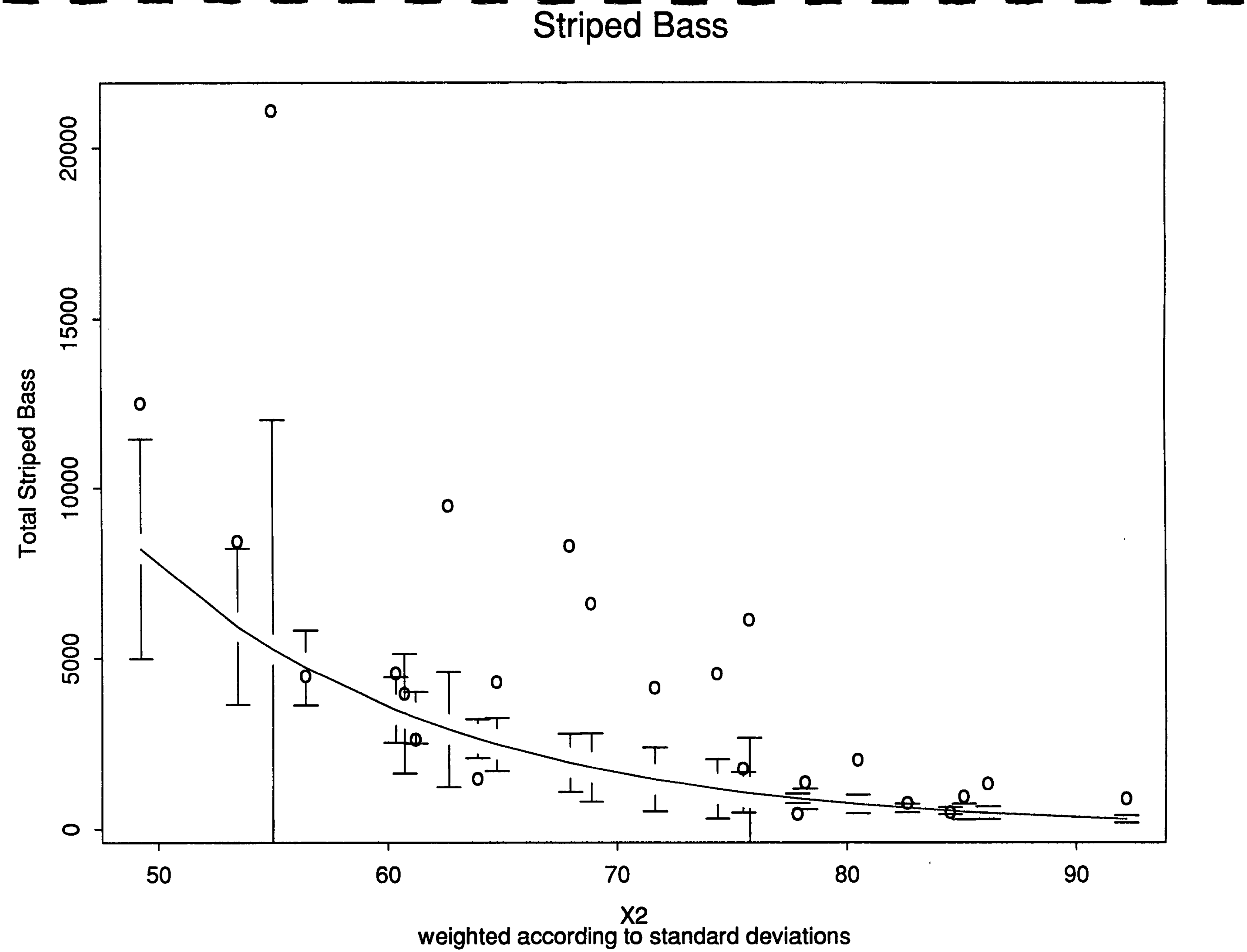
```
ft _ glm(Longfin ~ ns(X2,2), family=quasi(link=log, variance=mu^2))
pd _  predict(ft, type="response", se.fit=T)


> summary(ft)

Call: glm(formula = Longfin ~ ns(X2, 2), family = quasi(link = log, variance = mu^2
Deviance Residuals:
       Min         1Q     Median        3Q       Max
 -1.697612 -0.788257 0.05659376 0.3638015 1.313015

Coefficients:
                    Value Std. Error    t value
(Intercept)  11.640971  0.4573274  25.454347
 ns(X2, 2)1  -8.009802  0.9938378  -8.059466
 ns(X2, 2)2  -5.266840  0.5660804  -9.304050

(Dispersion Parameter for Quasi-likelihood family taken to be 0.5299603 )

    Null Deviance: 73.40382 on 23 degrees of freedom

Residual Deviance: 15.21805 on 21 degrees of freedom

Number of Fisher Scoring Iterations: 4

Correlation of Coefficients:
           (Intercept) ns(X2, 2)1
ns(X2, 2)1 -0.9454555
ns(X2, 2)2  0.0165254   0.0069822

> cor(Longfin, pd$fit)
[1] 0.5153967

 plot(X2, Longfin, pch="o", xlab= "X2", ylab=" Total Longfin Smelt")
lines(X2[ss], pd$fit[ss])
sepred _ sqrt(pd$se.fit^2 + .530*pd$fit^2)
error.bar(X2, pd$fit, sepred, sepred, add =T)
title(main="Longfin Smelt", sub="GLM fit with variance proportional to square of mea
```

Striped Bass

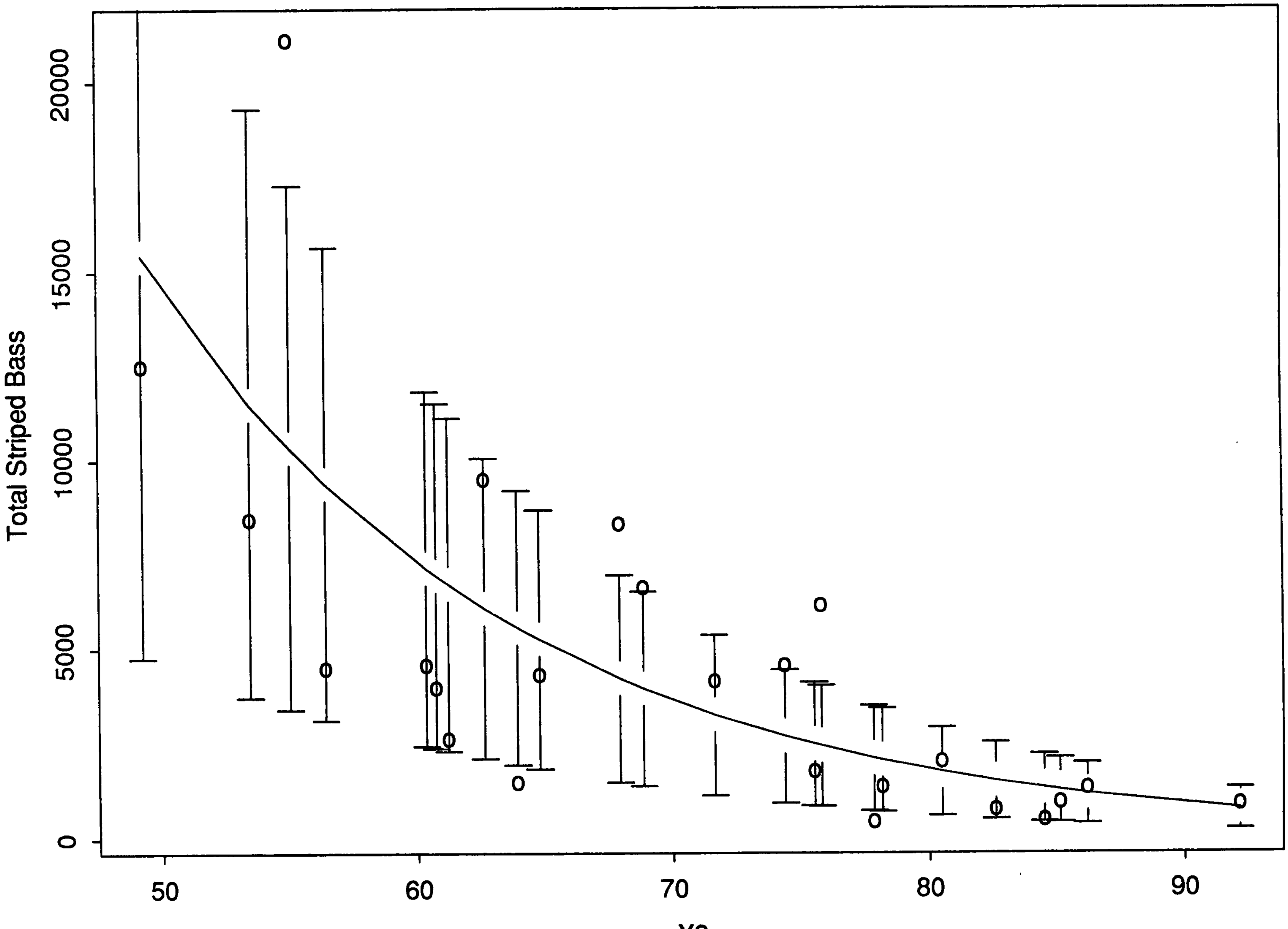


Striped Bass



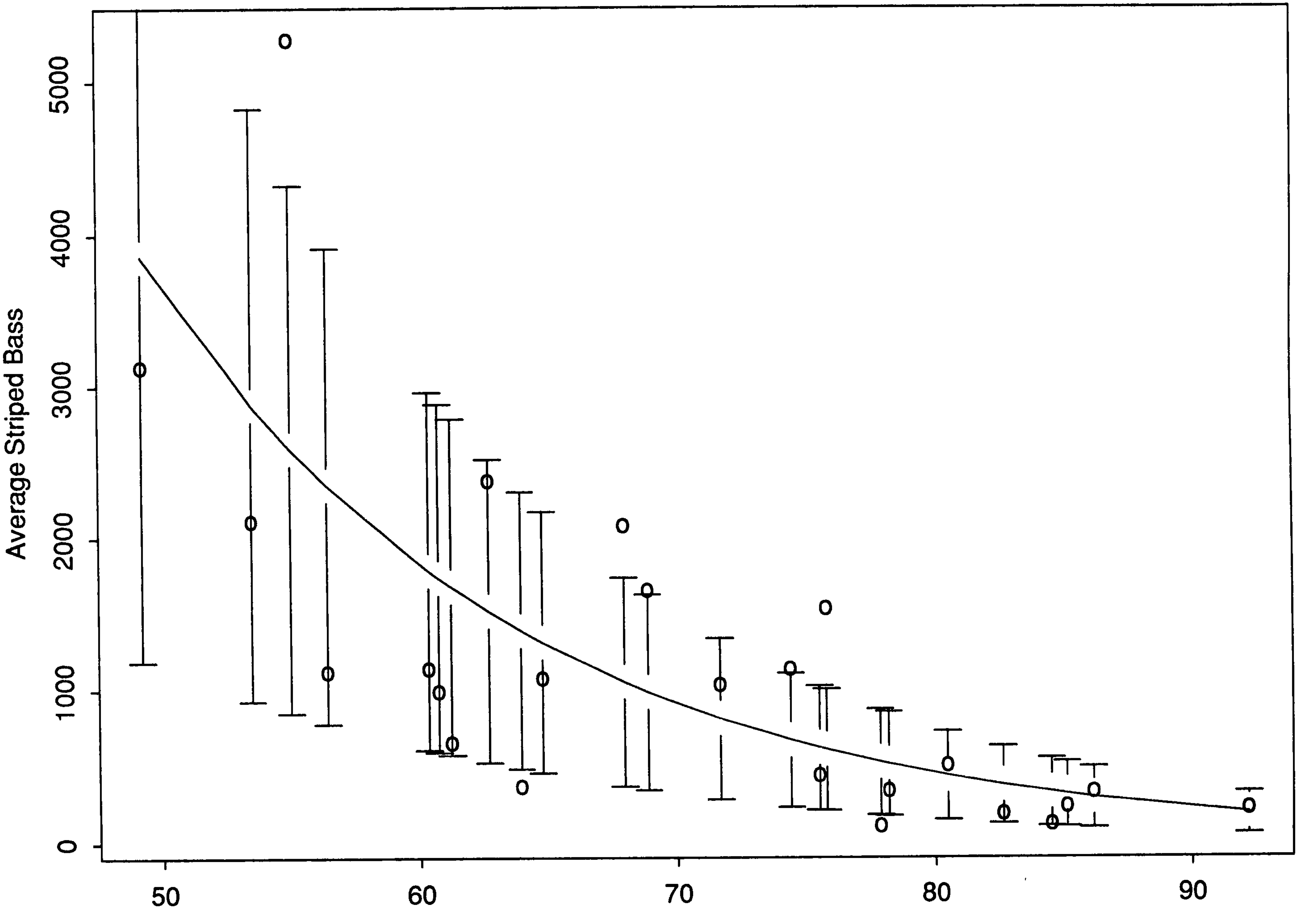

Striped Bass
Total Striped Bass
0
5000
10000
15000
20000
50
60
70
80
90
X2
weighted according to standard deviations

Striped Bass



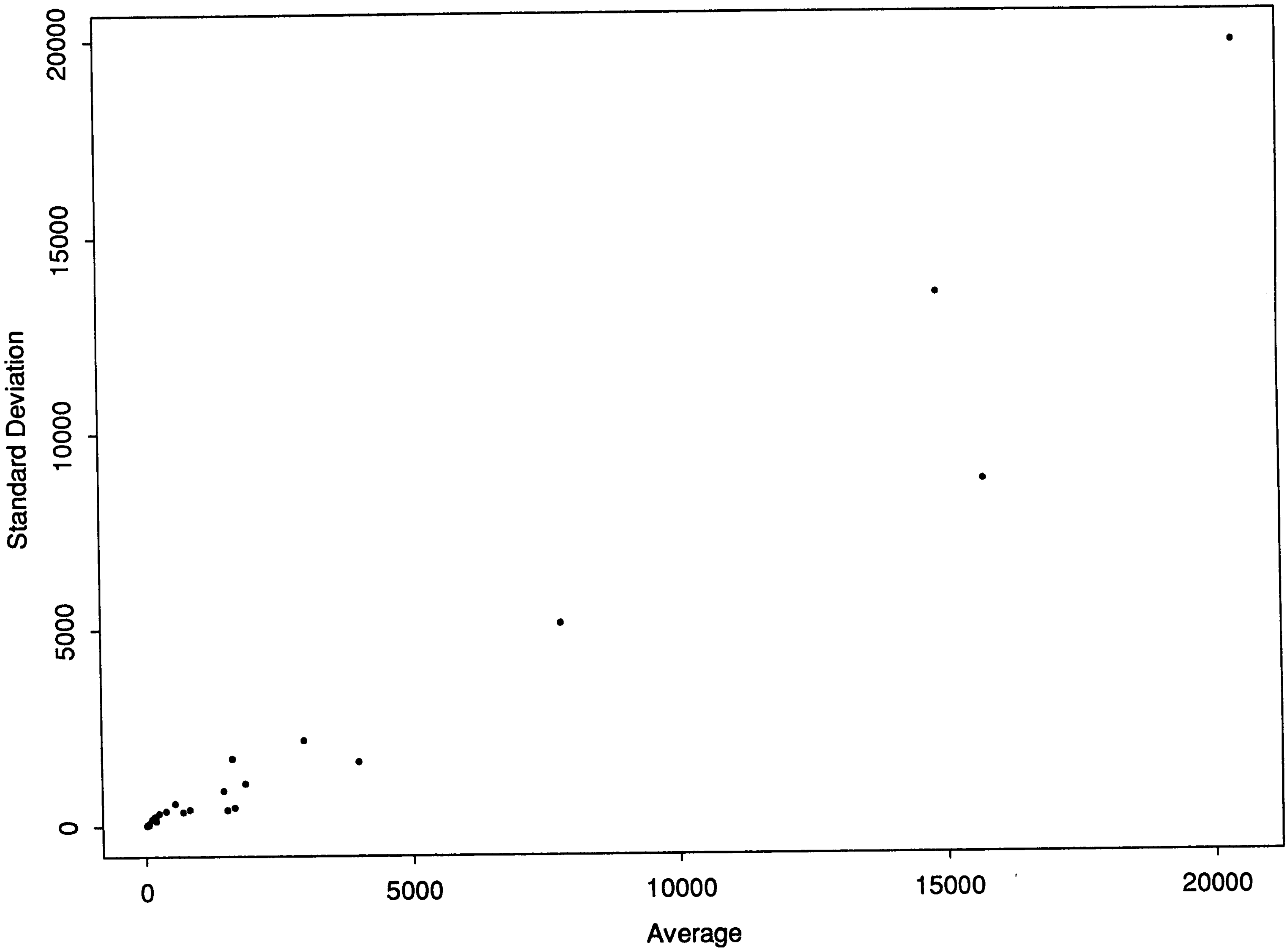
GLM fit with variance proportional to square of mean

Striped Bass

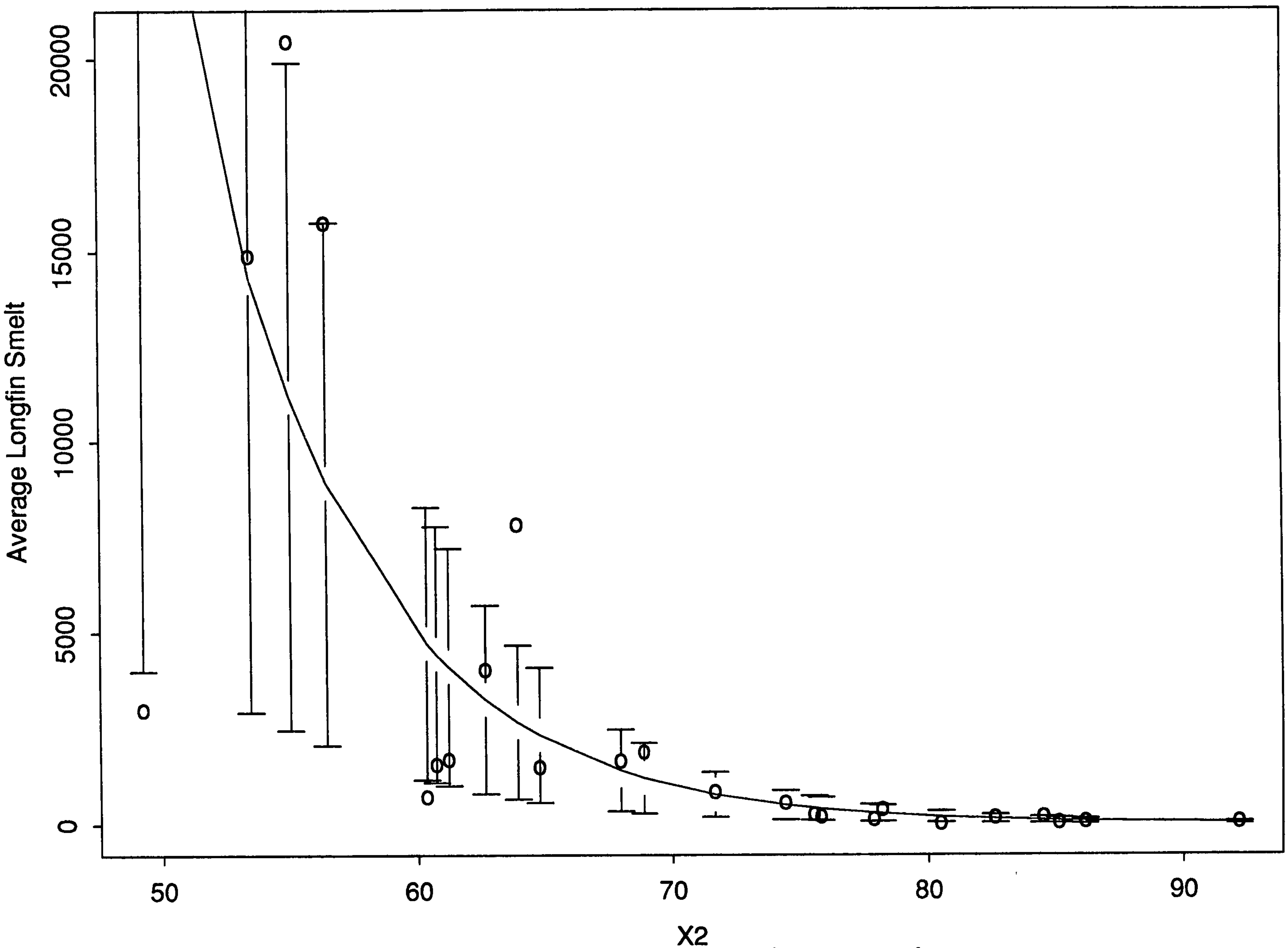


GLM fit with variance proportional to square of mean

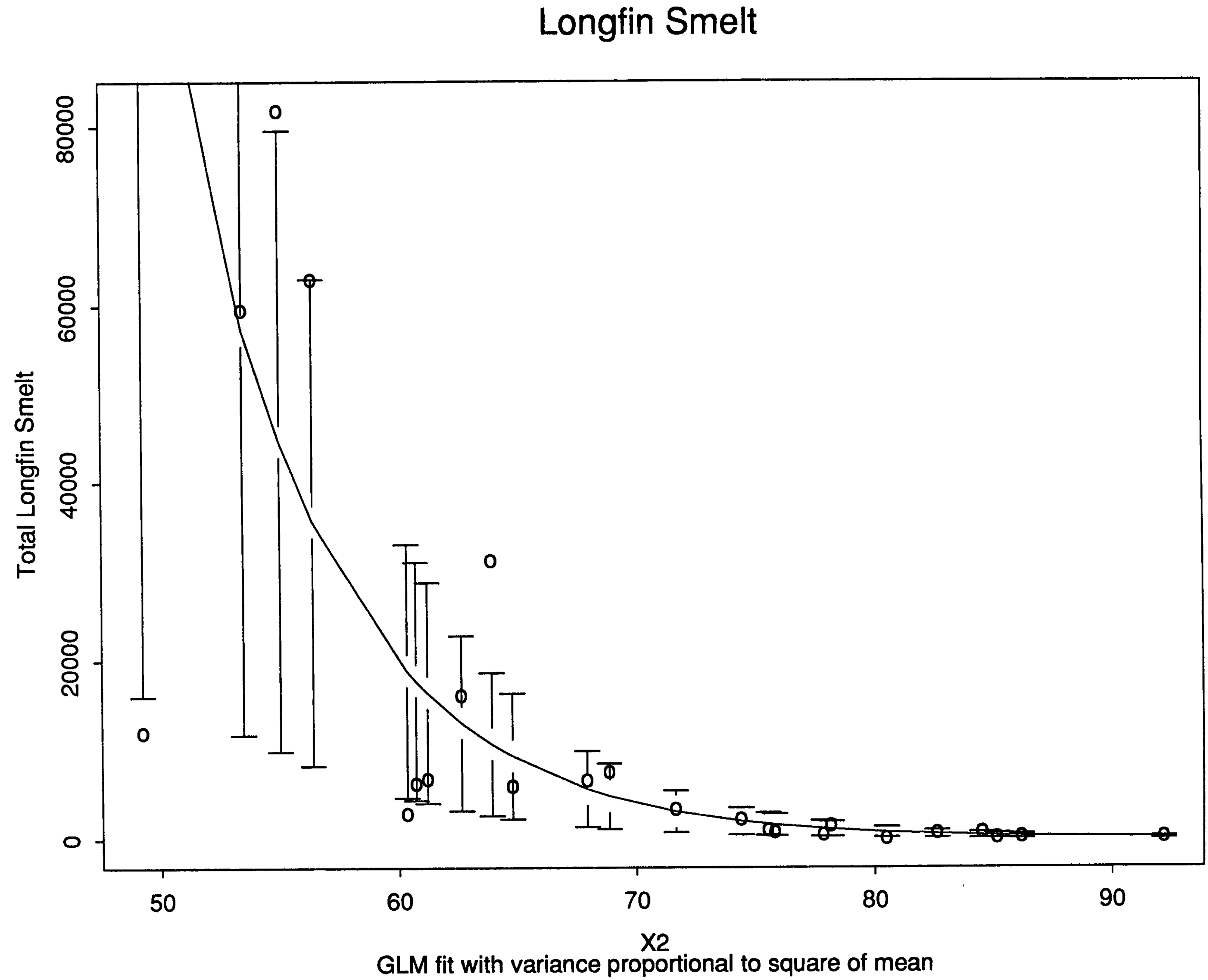
Longfin Smelt



Longfin Smelt



GLM fit with variance proportional to square of mean


Longfin Smelt
Total Longfin Smelt
0
20000
40000
60000
80000
50
60
70
80
90
X2
GLM fit with variance proportional to square of mean

These are the commands that I used to create the plots of 3/3/94

```
> attach(fish467.92,1)
>  dimnames(fish467.92)
[[1]]:
 [1] "1"  "2"  "3"  "4"  "5"  "6"  "7"  "8"  "9"  "10" "11" "12" "13" "14" "15"
[16] "16" "17" "18" "19" "20" "21" "22" "23" "24"

[[2]]:
 [1] "Year"      "X2.F.J"    "SBass"     "SBassAv"   "SBassSD"   "X2.J.N"
 [7] "Longfin"   "LongfAv"   "LongfSD"   "X2.F.M"    "DSmelt"    "DSmeltAv"
[13] "DSmeltSD"  "Split"     "SplitAv"   "SplitSD"   "X2.S.D."

X2 _ X2.F.J
 ss _ sort.list(X2)
```

Confidence Intervals for the fitted curve (mean response): striped bass:
These are +- 2 standard deviations, and are thus approximate 95% intervals

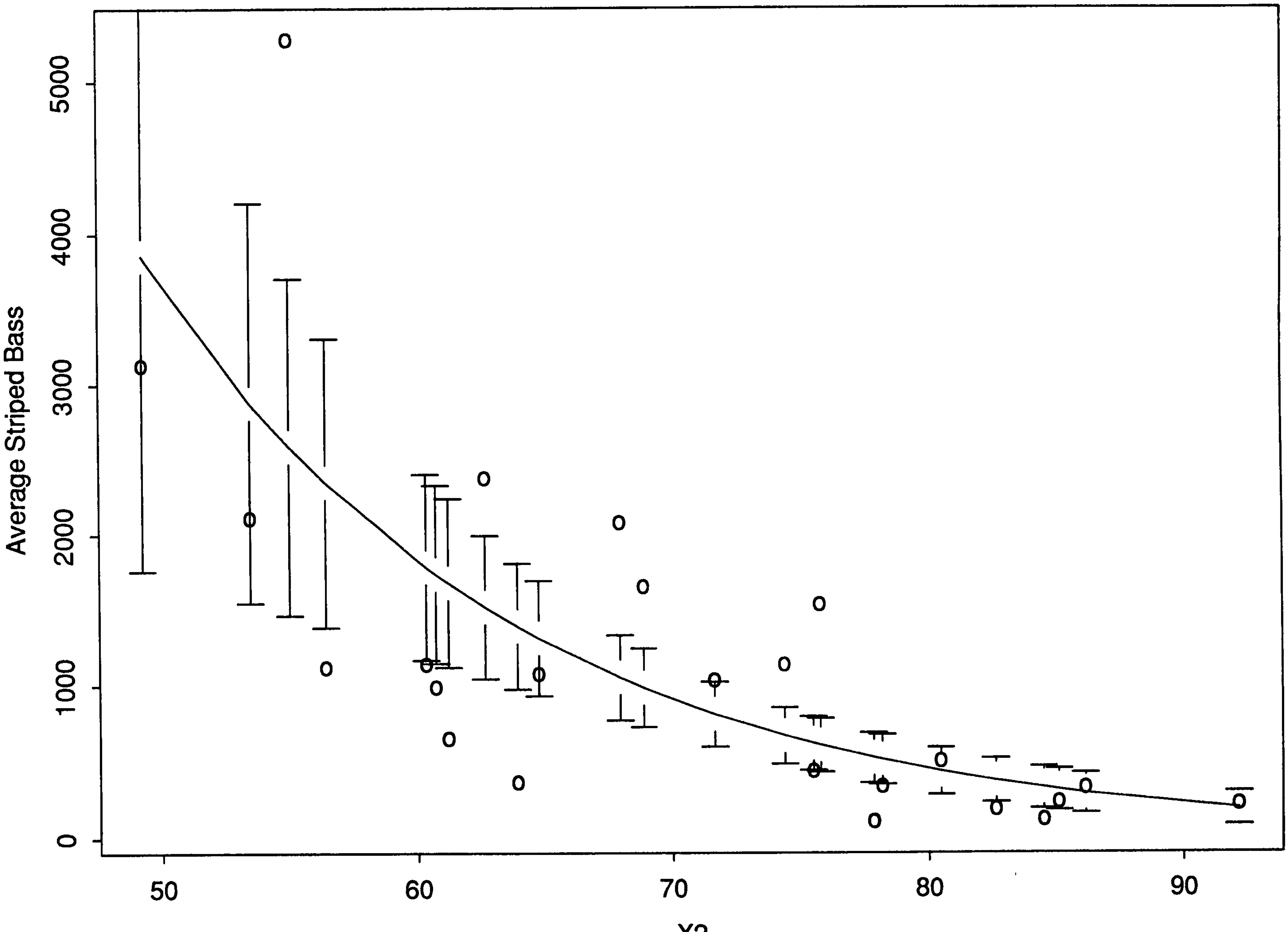
```
> ft _ glm(SBassAv ~ X2, family=quasi(link=log, variance=mu^2))
> pd _  predict(ft, type="response", se.fit=T)
>  plot(X2, SBassAv, pch="o", xlab= "X2", ylab=" Average Striped Bass")
lines(X2[ss], pd$fit[ss])
> > error.bar(X2, pd$fit, 2*pd$se.fit, 2*pd$se.fit, add = T)
Line segments out of bounds X= 49.24246 Y= 3974.44
Line segments out of bounds X= 48.72205 Y= 5956.416
> title(main="Striped Bass", sub="GLM fit with variance proportional to square of m
```

Confidence Intervals for the fitted curve (mean response): longfin smelt:
These are +- 2 standard deviations, and are thus approximate 95% intervals

```
ft _ glm(LongfAv ~ ns(X2,2), family=quasi(link=log, variance=mu^2))
pd _  predict(ft, type="response", se.fit=T)
> plot(X2, LongfAv, pch="o", xlab= "X2", ylab=" Average Longfin Smelt")
lines(X2[ss], pd$fit[ss])>
Lines out of bounds X= 53.4638 Y= 14326.07
> error.bar(X2, pd$fit, 2*pd$se.fit, 2*pd$se.fit, add=T)
Line segments out of bounds X= 53.4638 Y= 14786.13
Line segments out of bounds X= 49.24246 Y= 28875.18
Line segments out of bounds X= 49.24246 Y= 27955.07
Line segments out of bounds X= 52.9434 Y= 23593.86
Line segments out of bounds X= 48.72205 Y= 54405.16
>  title(main="Longfin Smelt", sub="GLM fit with variance proportional to square of

> plot(Year, ft$residuals, xlab="Year", ylab="residuals")
> title(main="Long Fin")
```

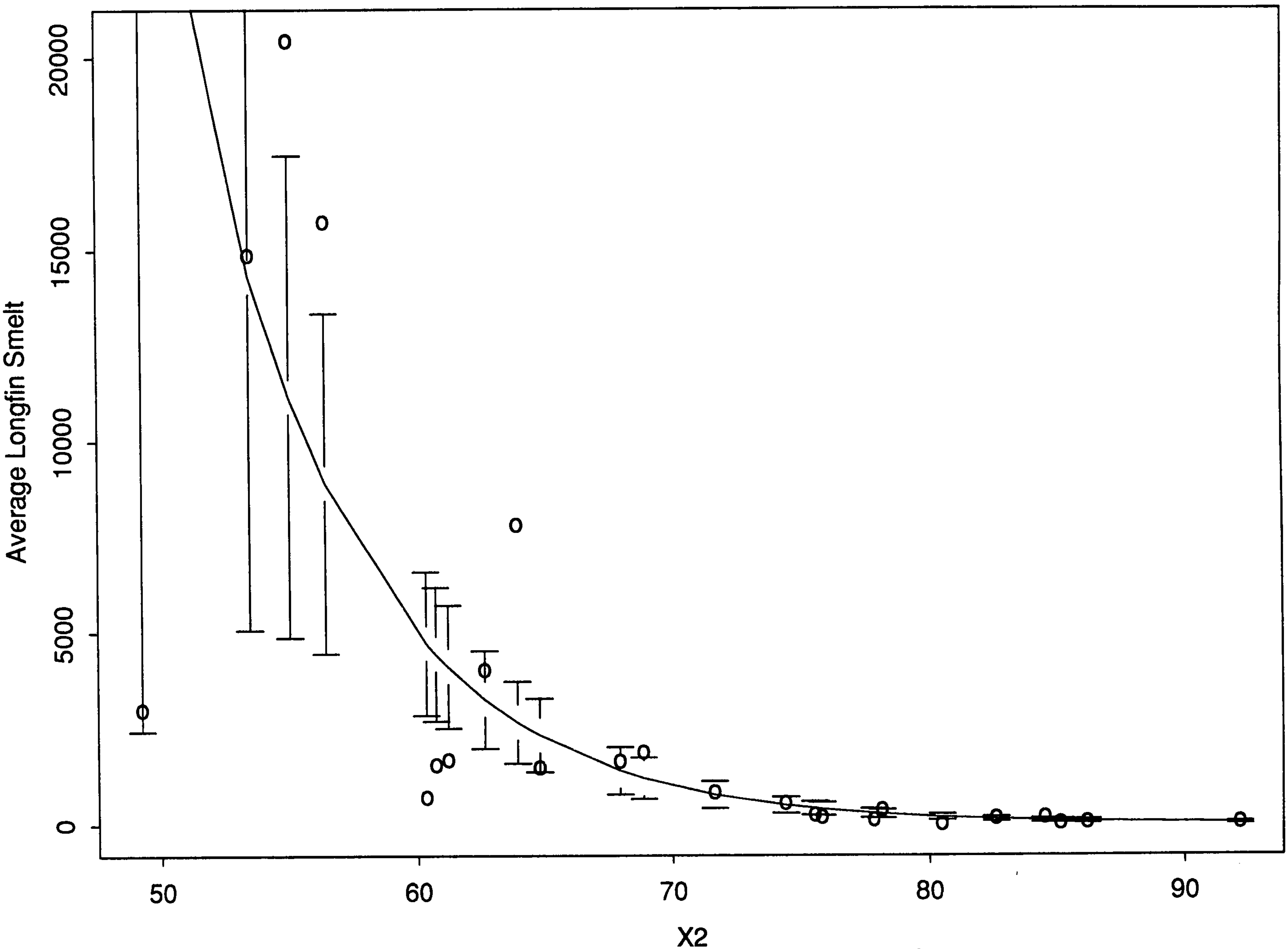
These commands produced the plot of residuals (observed -fitted)
versus year, which shows that the model tended to underfit in the
early years and overfit in the later years

Striped Bass

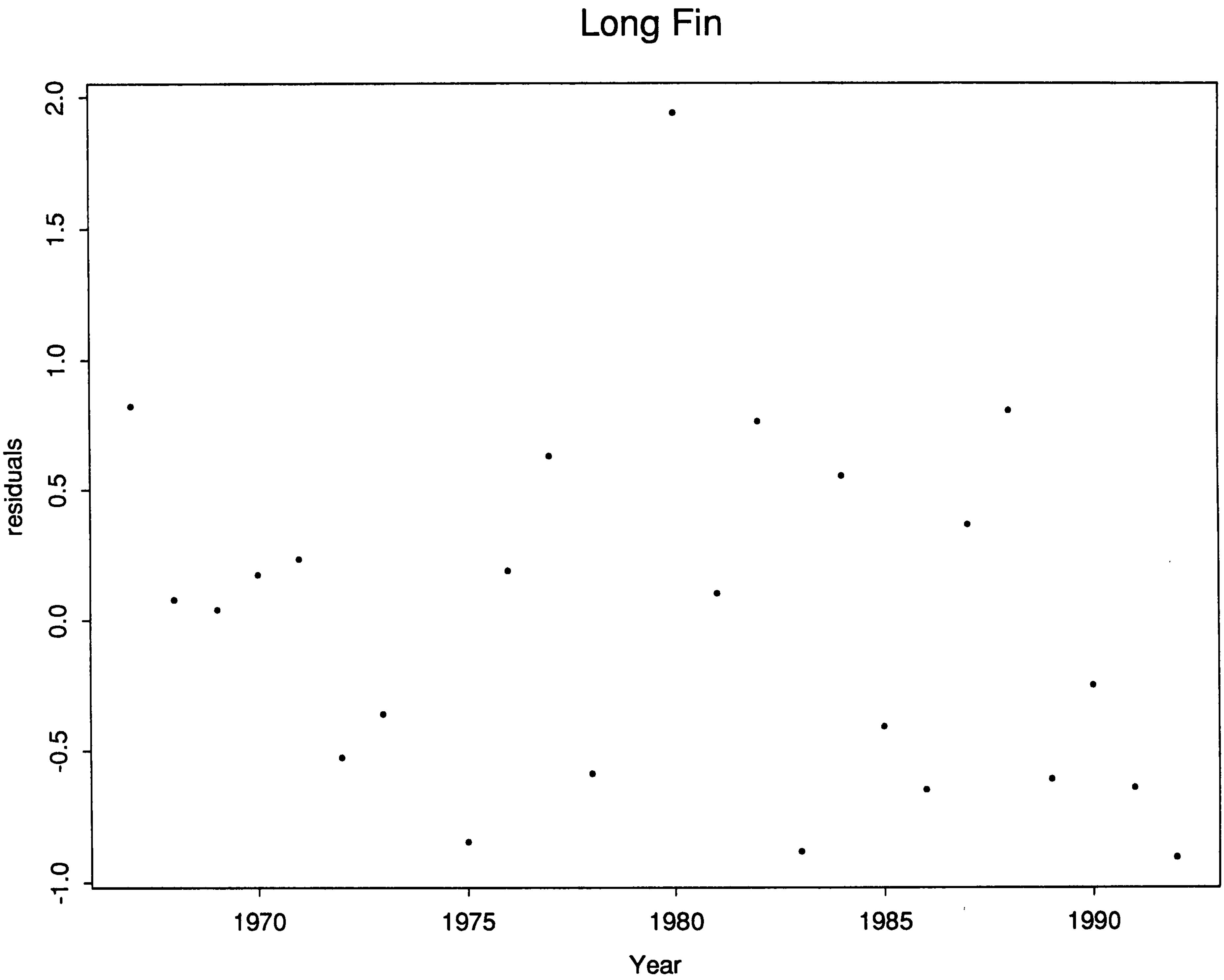


GLM fit with variance proportional to square of mean

Longfin Smelt



GLM fit with variance proportional to square of mean


Long Fin
residuals
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
1970
1975
1980
1985
1990
Year

Tab 11.
Relationship Between The Abundance Of Other Species And The Location Of X2

11a. Data For 12 Additional Fish
11b. Scatter Plots For 12 Additional Fish
11c. Weighted Least-Squares Regression Analyses
11d. GLM Regression Analyses For Delta Smelt And Splittail

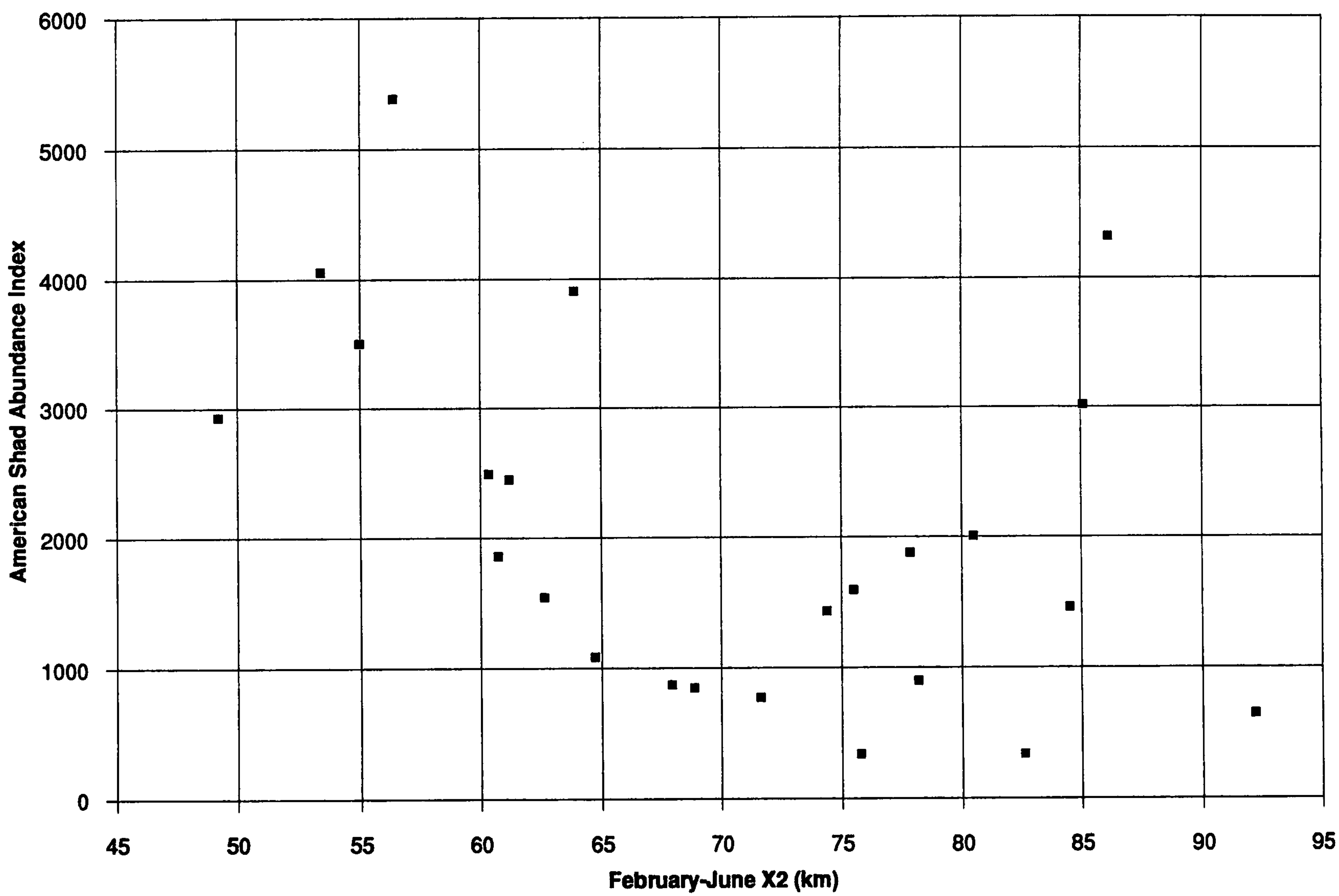
11a. DATA FOR 12 ADDITIONAL FISH

	PACIFIC HERRING				NORTHERN ANCHOVY				WHITE CROAKER				CHINOOK SALMON				INLAND SILVERSIDES			
Year	Total	Median	Average	StDev	Total	Median	Average	StDev	Total	Median	Average	StDev	Total	Median	Average	StDev	Total	Median	Average	StDev
1967	738.08	134.74	184.52	219.85	164,894	37,830	41,223	33,154	32.30	5.65	8.08	10.13	46.09	9.15	11.52	10.01	0.00	0.00	0.00	0.00
1968	146.20	11.52	36.55	58.27	61,459	9,099	15,365	18,251	0.00	0.00	0.00	0.00	31.17	4.76	7.79	8.80	0.00	0.00	0.00	0.00
1969	1,366.67	264.65	341.67	360.50	51,775	5,966	12,944	16,623	0.00	0.00	0.00	0.00	65.12	12.29	16.28	13.52	0.00	0.00	0.00	0.00
1970	678.84	61.59	169.71	261.77	50,159	11,109	12,540	12,427	24.45	5.92	6.11	5.18	125.61	22.14	31.40	33.34	0.00	0.00	0.00	0.00
1971	3,132.74	588.26	783.18	750.41	158,460	37,621	39,615	32,578	2.31	0.00	0.58	1.16	75.55	18.66	18.89	6.72	0.00	0.00	0.00	0.00
1972	35.72	9.60	8.93	3.41	12,346	1,668	3,087	3,324	0.00	0.00	0.00	0.00	49.46	12.96	12.37	4.53	0.00	0.00	0.00	0.00
1973	3,082.37	792.59	770.59	801.53	59,414	11,813	14,853	15,043	376.00	6.13	94.00	179.86	71.65	20.67	17.91	9.55	0.00	0.00	0.00	0.00
1975	253.14	29.62	63.29	75.29	24,459	1,787	6,115	9,816	1.40	0.00	0.35	0.70	18.87	5.09	4.72	1.65	0.00	0.00	0.00	0.00
1976	42.90	10.38	10.72	4.79	752	185	188	30	0.78	0.00	0.19	0.39	37.55	9.45	9.39	2.09	0.00	0.00	0.00	0.00
1977	187.73	41.95	46.93	36.22	62,107	14,529	15,527	16,087	0.00	0.00	0.00	0.00	3.72	0.92	0.93	0.79	0.00	0.00	0.00	0.00
1978	440.87	24.89	110.22	183.35	59,763	12,185	14,941	16,526	6.91	1.16	1.73	2.20	37.27	6.89	9.32	9.85	0.00	0.00	0.00	0.00
1980	1,400.86	237.52	350.21	332.47	115,025	15,174	28,756	39,117	430.48	10.15	107.62	201.77	28.43	4.25	7.11	8.80	1.56	0.00	0.39	0.78
1981	207.57	28.37	51.89	60.03	207,770	10,380	51,943	90,057	4.07	0.00	1.02	2.03	95.24	27.23	23.81	16.68	4.00	0.00	1.00	2.00
1982	6,729.06	545.64	1,682.27	2,547.58	160,286	27,244	40,072	45,614	36.26	5.01	9.07	12.38	22.95	5.43	5.74	3.49	0.00	0.00	0.00	0.00
1983	90.83	14.18	22.71	28.80	201,595	22,847	50,399	73,043	14.18	1.01	3.54	5.82	48.52	12.59	12.13	6.28	4.33	1.08	1.08	1.25
1984	72.18	10.97	18.04	20.50	139,754	11,640	34,939	54,070	8.72	1.01	2.18	3.16	10.37	2.13	2.59	2.55	6.68	1.91	1.67	0.65
1985	104.06	15.96	26.02	31.47	69,062	10,109	17,265	21,772	0.00	0.00	0.00	0.00	140.92	14.12	35.23	46.63	0.00	0.00	0.00	0.00
1986	92.92	24.28	23.23	14.54	148,012	38,704	37,003	29,329	731.23	178.84	182.81	204.60	78.86	20.28	19.72	10.46	4.05	1.02	1.01	0.85
1987	128.28	25.26	32.07	26.07	26,040	3,622	6,510	8,603	12.60	0.00	3.15	6.30	56.85	14.64	14.21	3.85	19.48	4.99	4.87	2.45
1988	65.81	11.74	16.45	19.10	30,671	6,931	7,668	8,573	17.76	2.27	4.44	6.23	13.04	2.99	3.26	3.79	0.00	0.00	0.00	0.00
1989	1,983.23	7.48	495.81	981.65	28,665	1,634	7,166	12,055	13.01	2.54	3.25	3.93	15.50	4.38	3.88	2.01	23.93	1.00	5.98	10.68
1990	7.93	1.32	1.98	2.53	128,522	26,639	32,131	31,916	155.70	22.28	38.93	52.53	23.93	0.53	5.98	11.27	51.78	2.89	12.95	22.08
1991	24.53	5.27	6.13	6.89	56,135	11,244	14,034	14,226	31.94	5.40	7.98	10.14	18.54	0.70	4.64	8.36	16.90	3.55	4.22	4.07
1992	9.42	1.13	2.36	3.38	294,990	77,126	73,748	74,902	18.83	4.13	4.71	4.62	35.97	3.60	8.99	13.33	4.26	1.06	1.07	1.23

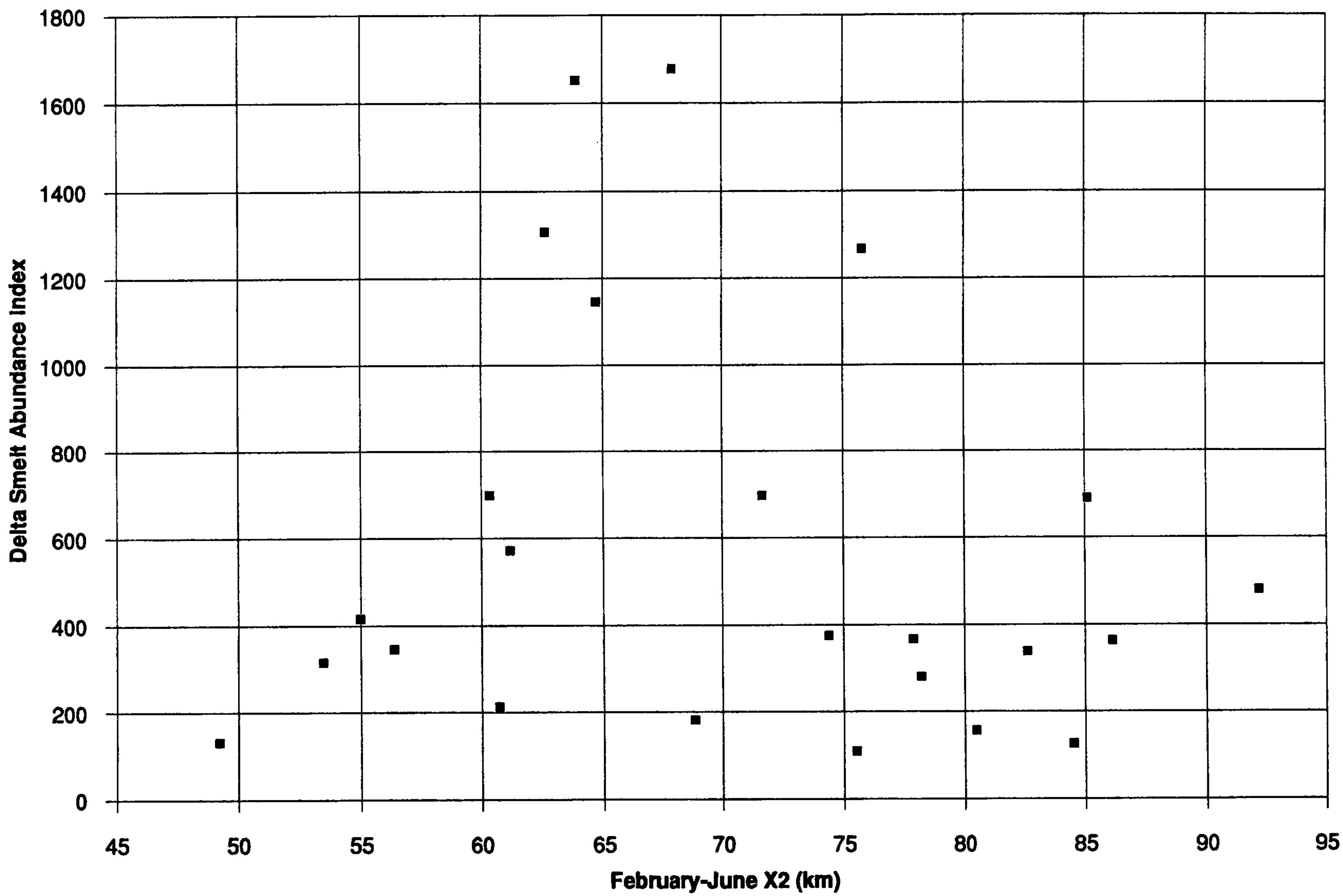
	JACKSMELT				WHITE STURGEON				THREADFIN SHAD				TOPSMELT			
Year	Total	Median	Average	StDev	Total	Median	Average	StDev	Total	Median	Average	StDev	Total	Median	Average	StDev
1967	48.63	5.65	12.16	17.06	46.00	9.87	11.50	6.45	12,737.48	2,503.07	3,184.37	2,695.27	0.00	0.00	0.00	0.00
1968	1,202.63	172.58	300.66	394.96	10.10	2.33	2.53	0.98	5,487.26	1,587.50	1,371.82	520.53	0.00	0.00	0.00	0.00
1969	233.90	22.95	58.48	87.25	24.91	5.09	6.23	5.12	8,883.85	995.71	2,220.96	2,771.06	4.20	0.70	1.05	1.34
1970	188.59	13.00	47.15	75.43	10.90	2.65	2.73	3.15	4,430.83	902.51	1,107.71	440.80	2.03	0.00	0.51	1.02
1971	84.04	1.02	21.01	40.68	27.14	3.20	6.78	8.21	6,807.66	1,299.08	1,701.91	1,351.74	190.48	19.47	47.62	69.73
1972	0.00	0.00	0.00	0.00	6.67	1.00	1.67	2.21	5,328.71	1,316.66	1,332.18	617.53	331.47	40.99	82.87	109.66
1973	271.41	13.56	67.85	118.32	3.43	0.71	0.86	1.02	1,232.09	79.20	308.02	491.57	0.00	0.00	0.00	0.00
1975	0.00	0.00	0.00	0.00	62.50	12.69	15.63	11.66	749.57	200.11	187.39	135.60	66.26	15.81	16.56	13.03
1976	49.91	9.51	12.48	12.05	24.27	4.58	6.07	5.30	1,925.95	488.43	481.49	127.69	460.24	32.97	115.06	186.85
1977	0.00	0.00	0.00	0.00	6.77	1.11	1.69	1.18	9,019.73	2,774.88	2,254.93	1,127.10	903.05	210.52	225.76	186.64
1978	0.00	0.00	0.00	0.00	260.55	8.26	65.14	117.81	2,102.73	483.40	525.68	342.86	74.60	13.20	18.65	22.49
1980	67.59	10.05	16.90	20.96	19.89	5.57	4.97	3.46	7,277.18	1,356.83	1,819.29	1,521.24	296.49	20.71	74.12	121.75
1981	7.36	1.13	1.84	2.42	15.93	4.31	3.98	1.33	6,674.84	1,493.95	1,668.71	1,336.61	156.77	27.14	39.19	44.33
1982	9.68	0.00	2.42	4.84	50.67	12.83	12.67	9.46	2,101.03	339.67	525.26	451.70	37.35	0.00	9.34	18.67
1983	63.82	9.24	15.96	18.18	82.87	15.78	20.72	19.66	2,090.11	584.89	522.53	172.97	0.00	0.00	0.00	0.00
1984	255.41	36.32	63.85	82.57	74.14	19.31	18.54	9.22	768.35	201.41	192.09	151.76	81.83	2.04	20.46	38.25
1985	1,673.07	394.83	418.27	452.76	21.07	3.72	5.27	5.83	820.01	241.09	205.00	99.16	58.56	14.83	14.64	15.69
1986	58.34	10.87	14.59	16.93	43.66	12.33	10.91	5.02	2,828.51	541.96	707.13	687.81	80.72	3.77	20.18	35.40
1987	32.62	3.43	8.16	11.89	20.44	5.44	5.11	1.11	3,475.31	709.49	868.83	815.34	41.45	4.51	10.36	14.86
1988	0.00	0.00	0.00	0.00	14.26	3.26	3.57	2.87	2,213.36	246.90	553.34	674.09	0.00	0.00	0.00	0.00
1989	33.22	3.05	8.31	12.87	12.06	2.82	3.02	0.97	6,896.14	1,185.55	1,724.03	1,780.76	28.09	2.54	7.02	10.73
1990	41.66	8.39	10.42	12.48	11.72	3.00	2.93	1.69	5,853.07	1,300.86	1,463.27	1,066.82	342.01	72.92	85.50	82.48
1991	2.26	0.00	0.57	1.13	14.17	3.58	3.54	1.17	3,121.08	707.04	780.27	398.52	303.34	59.14	75.83	75.56
1992	0.00	0.00	0.00	0.00	10.49	1.30	2.62	3.05	2,855.45	755.27	713.86	258.32	222.08	52.63	55.52	31.58

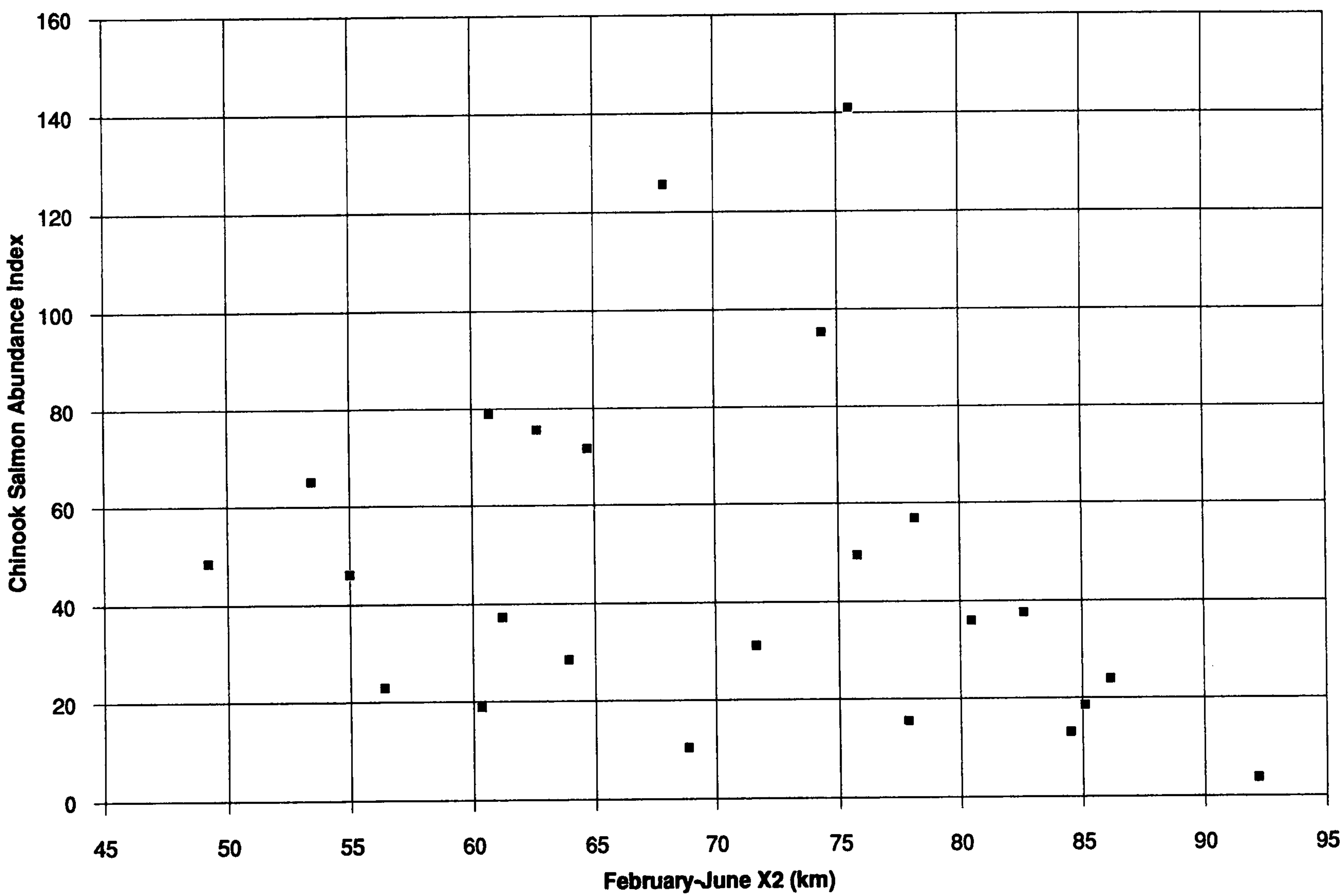
	AMERICAN SHAD				DELTA SMELT				SPLITTAIL			
Year	Total	Median	Average	StDev	Total	Median	Average	StDev	Total	Median	Average	StDev
1967	3,502	890.00	875.50	570.41	414.92	109.30	103.73	56.59	66.25	10.22	16.56	18.22
1968	772	207.50	193.00	106.35	696.54	177.24	174.13	82.04	18.06	4.65	4.52	2.62
1969	4,056	999.50	1,014.00	475.96	315.65	66.05	78.91	50.43	25.92	6.40	6.48	3.06
1970	872	214.50	218.00	131.34	1,677.46	426.42	419.36	277.39	25.44	1.98	6.36	10.12
1971	1,544	390.00	386.00	101.91	1,305.15	317.33	326.29	144.55	17.41	4.05	4.35	2.83
1972	334	83.50	83.50	48.75	1,266.90	307.13	316.73	241.56	12.50	1.88	3.13	3.89
1973	1,085	202.00	271.25	225.82	1,145.84	310.14	286.46	59.44	4.43	1.00	1.11	1.29
1975	2,487	536.50	621.75	444.92	697.88	158.02	174.47	95.08	3.57	0.71	0.89	0.90
1976	338	82.00	84.50	13.23	337.85	85.32	84.46	44.55	1.00	0.00	0.33	0.36
1977	645	143.00	161.25	48.61	479.48	92.64	119.87	84.09	0.00	0.00	0.00	0.00
1978	2,444	581.00	611.00	400.17	571.58	115.79	142.90	124.83	37.23	9.10	9.31	6.93
1980	3,905	903.50	976.25	619.28	1,651.31	395.75	412.83	130.94	16.97	2.95	4.24	4.92
1981	1,434	317.50	358.50	113.61	374.99	93.28	93.75	63.28	18.26	3.28	4.56	2.71
1982	5,386	1,465.00	1,346.50	850.55	345.97	69.59	86.49	54.74	118.60	16.14	29.65	31.09
1983	2,929	895.00	732.25	373.17	132.31	26.12	33.08	32.00	153.15	40.24	38.29	24.31
1984	846	231.00	211.50	97.44	181.45	45.34	45.36	17.34	16.17	2.76	4.04	3.89
1985	1,596	359.00	399.00	112.72	109.12	25.79	27.28	10.02	14.89	3.37	3.72	3.35
1986	1,860	440.00	465.00	198.32	211.78	52.32	52.95	34.93	57.74	12.54	14.43	7.54
1987	899	241.50	224.75	73.02	280.08	70.23	70.02	24.70	28.60	6.95	7.15	4.48
1988	1,459	287.50	364.75	267.94	126.21	32.73	31.55	11.31	8.99	2.36	2.25	1.76
1989	1,878	473.50	469.50	129.50	366.15	81.42	91.54	47.66	4.06	0.60	1.01	1.35
1990	4,317	1,158.00	1,079.25	447.56	363.43	79.59	90.86	75.07	8.99	1.84	2.25	2.28
1991	3,016	820.50	754.00	359.87	689.09	187.55	172.27	112.96	17.98	3.93	4.50	4.50
1992	2,005	493.00	501.25	203.88	156.87	40.89	39.22	30.99	3.60	0.60	0.90	1.15
1993					1,078.00	257.00	269.50	181.63				

11b. SCATTER PLOTS FOR 12 ADDITIONAL FISH

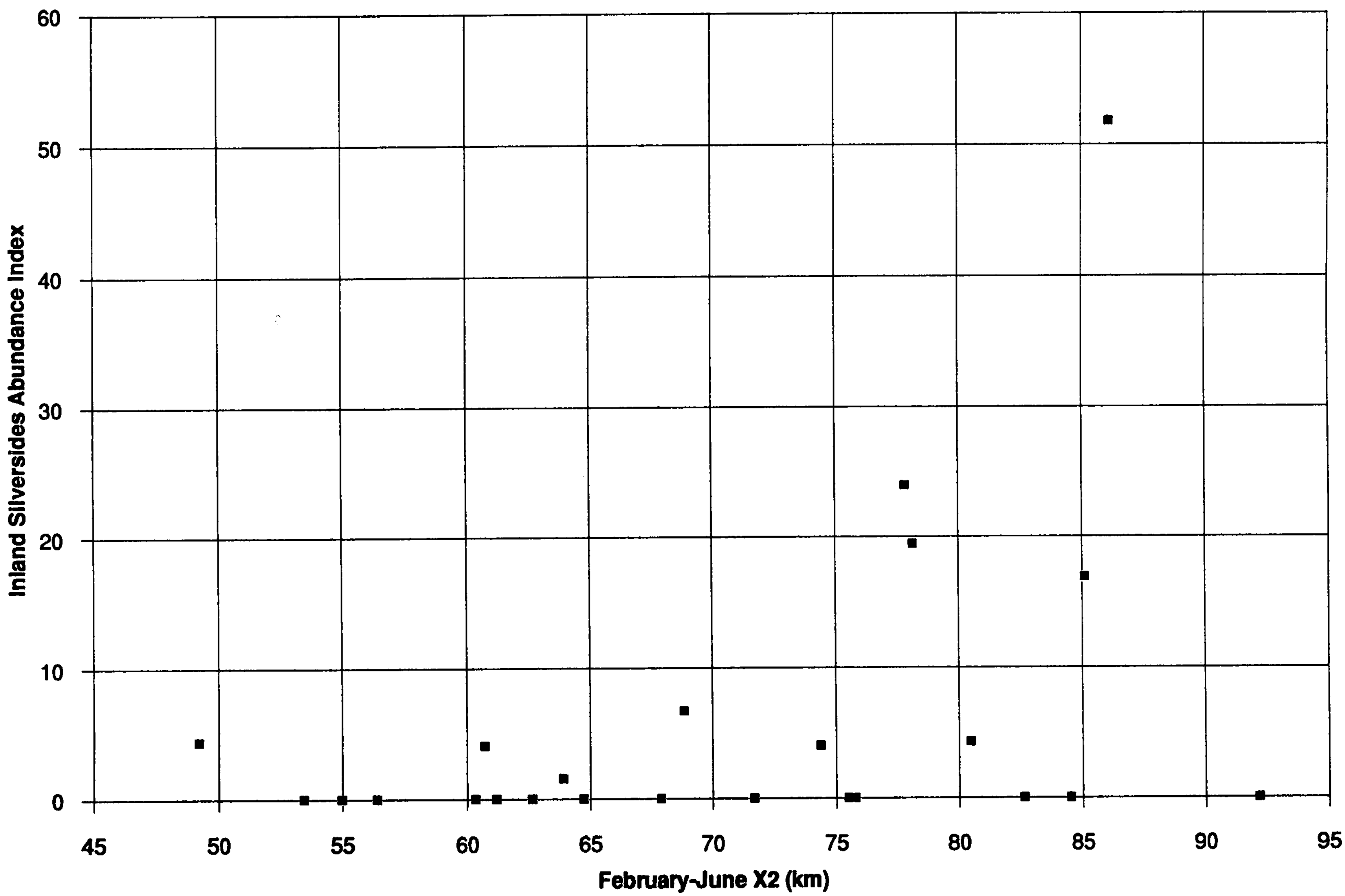


American Shad Abundance Index
6000
5000
4000
3000
2000
1000
0
45
50
55
60
65
70
75
80
85
90
95
February-June X2 (km)

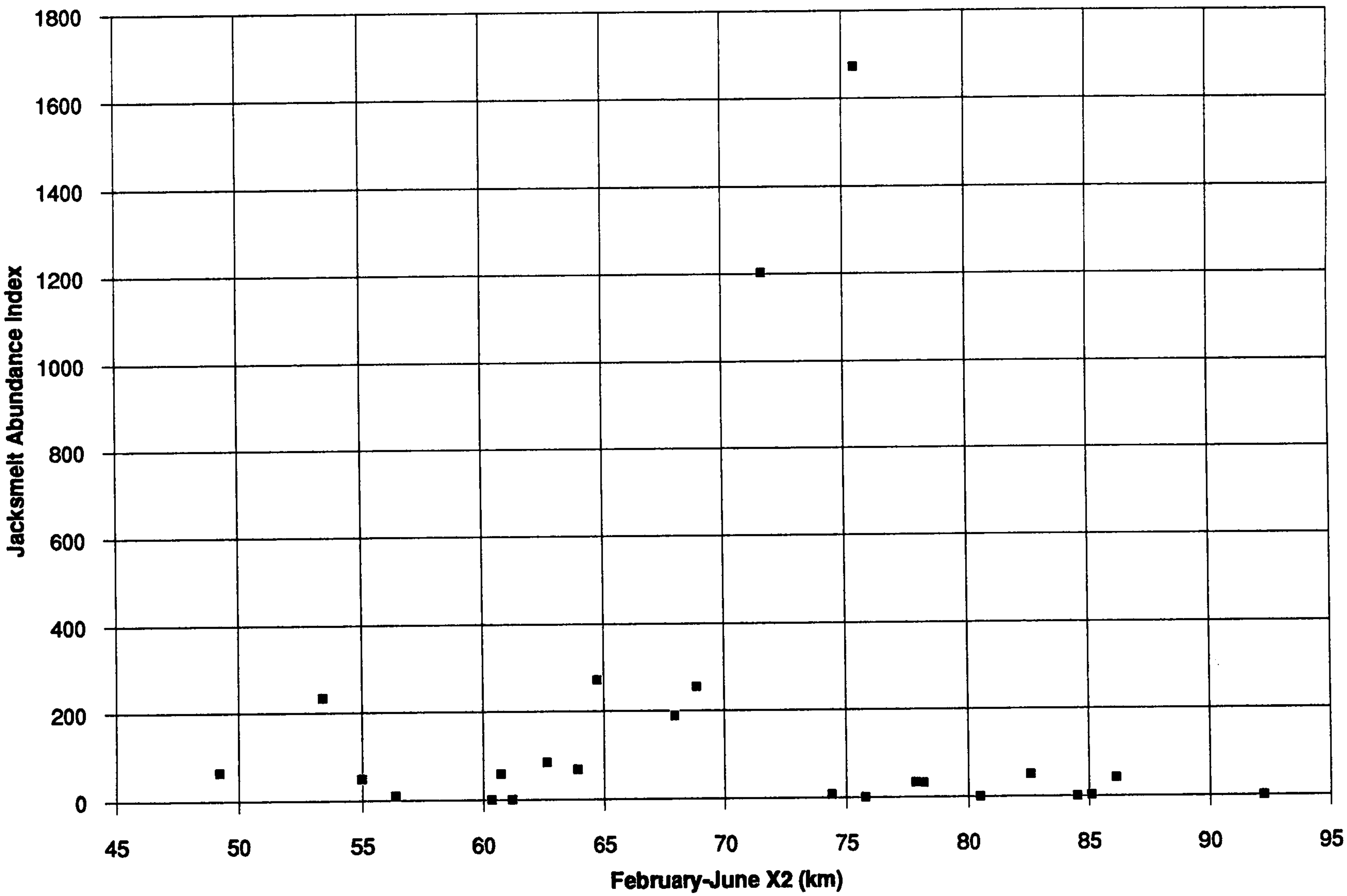

1800
1600
1400
1200
1000
800
600
400
200
0
Delta Smelt Abundance Index
45
50
55
60
65
70
75
80
85
90
95
February-June X2 (km)



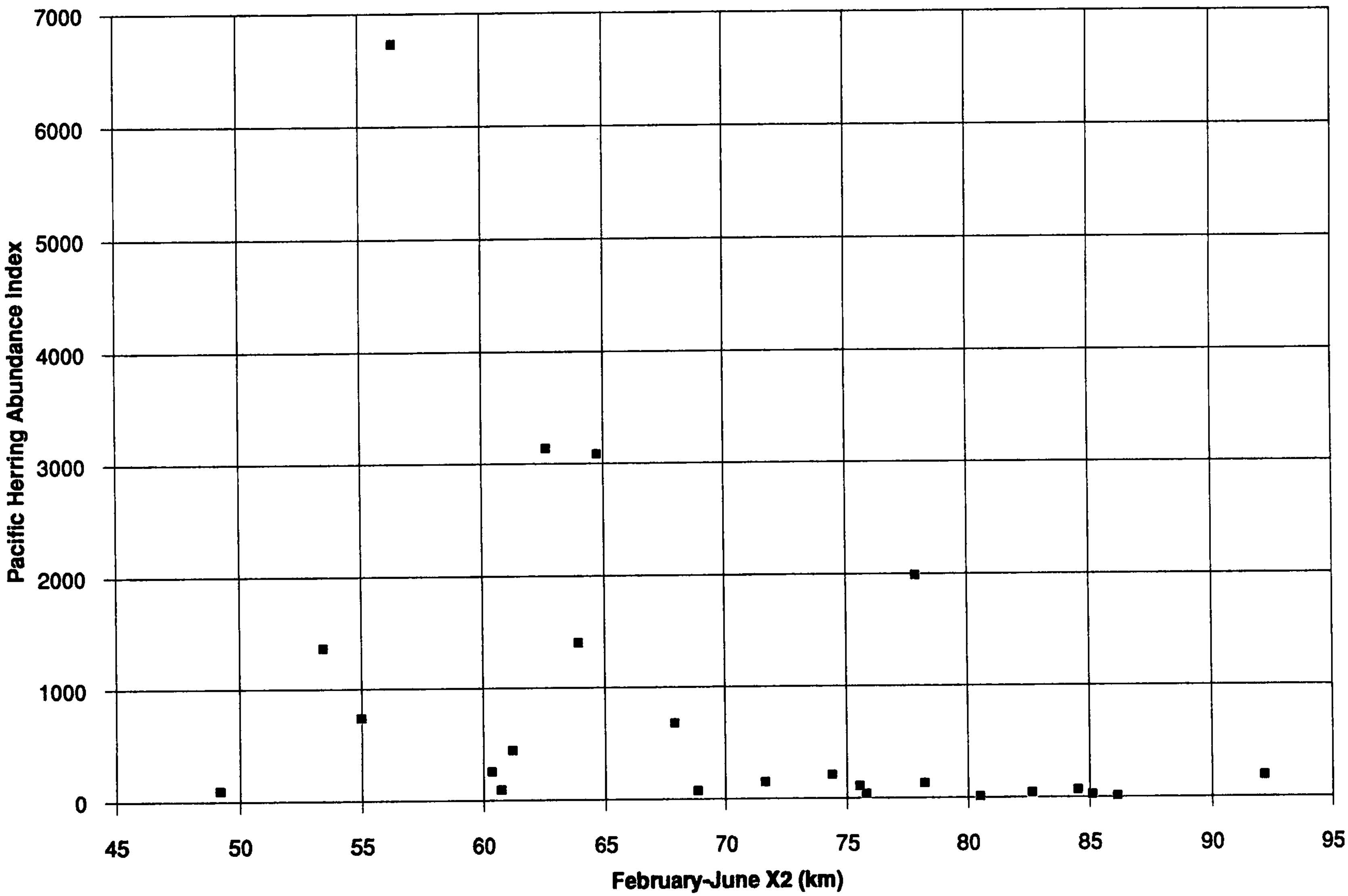
Chinook Salmon Abundance Index
0
20
40
60
80
100
120
140
160
45
50
55
60
65
70
75
80
85
90
95
February-June X2 (km)

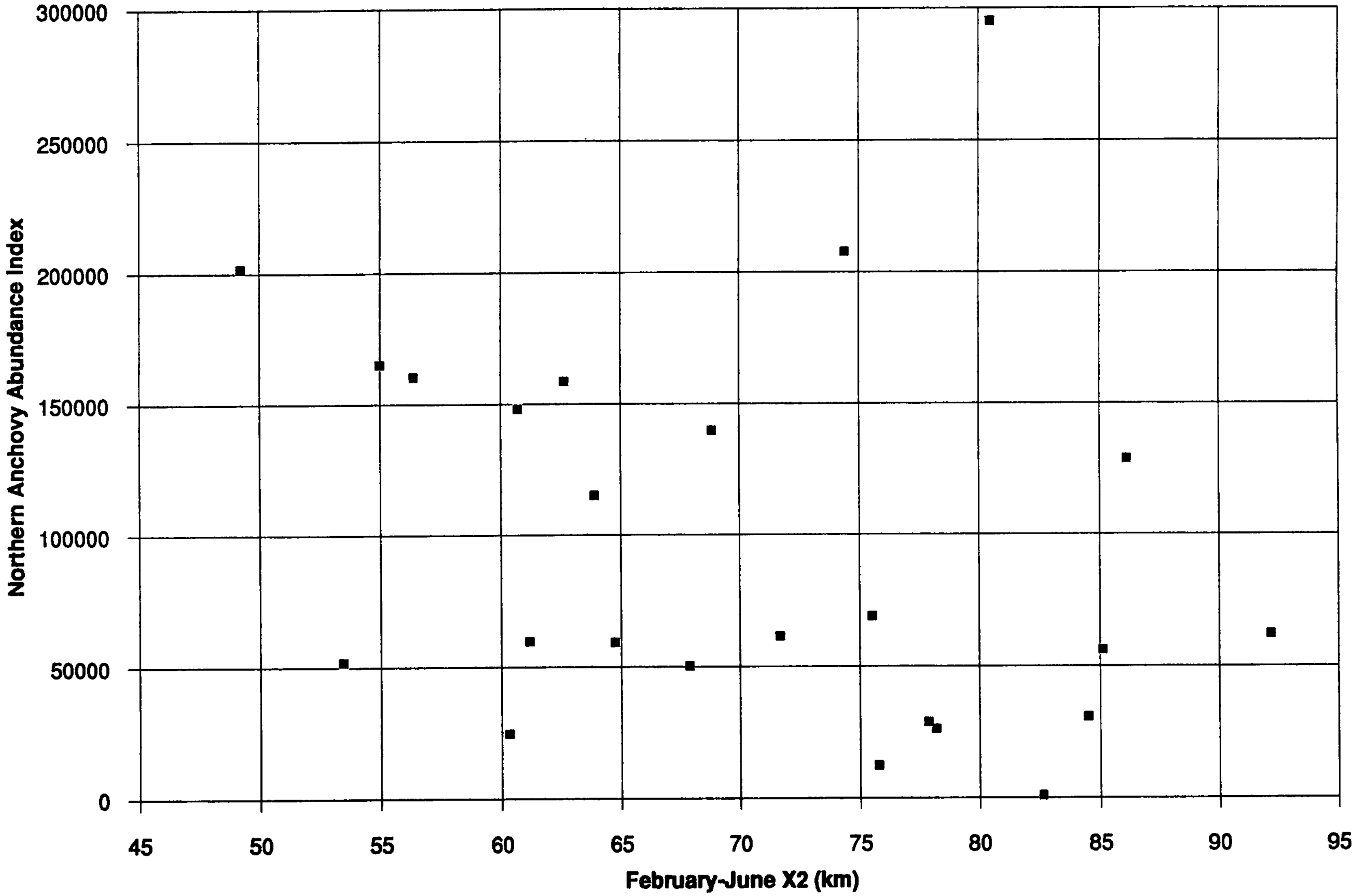


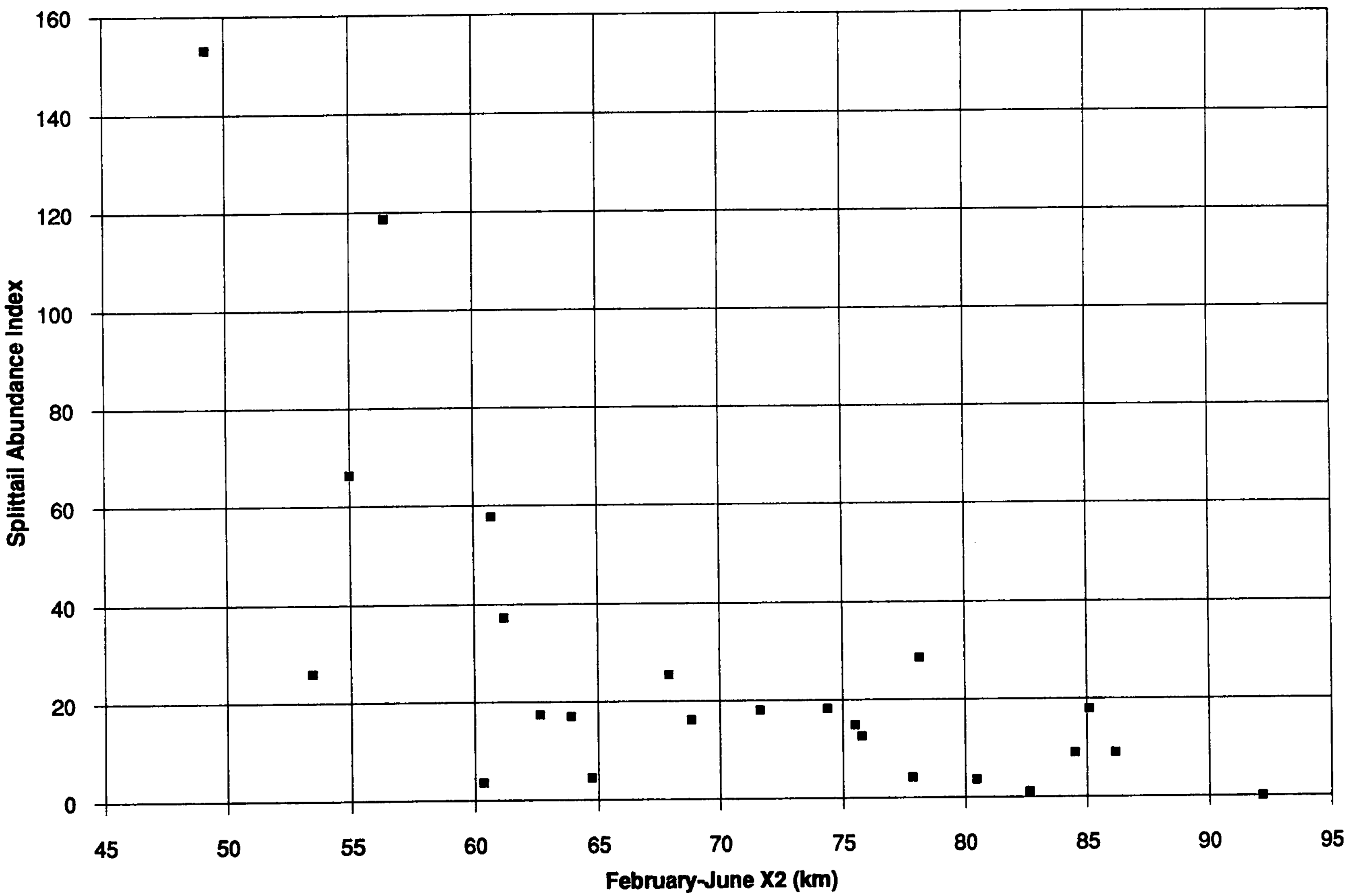
60
50
40
30
20
10
0
Inland Silversides Abundance Index
45
50
55
60
65
70
75
80
85
90
95
February-June X2 (km)



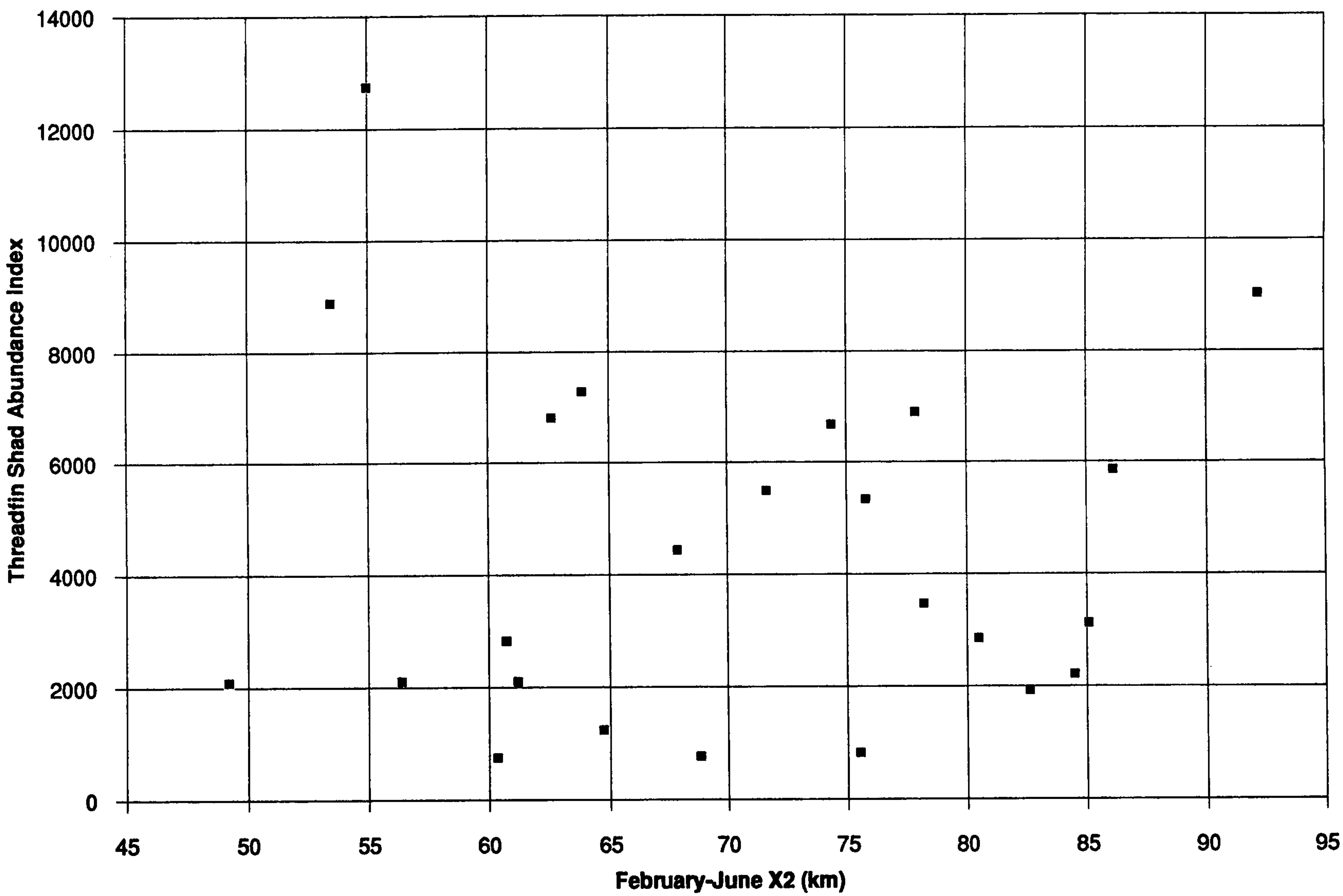
1800
1600
1400
1200
1000
800
600
400
200
0
Jacksmelt Abundance Index
45
50
55
60
65
70
75
80
85
90
95
February-June X2 (km)

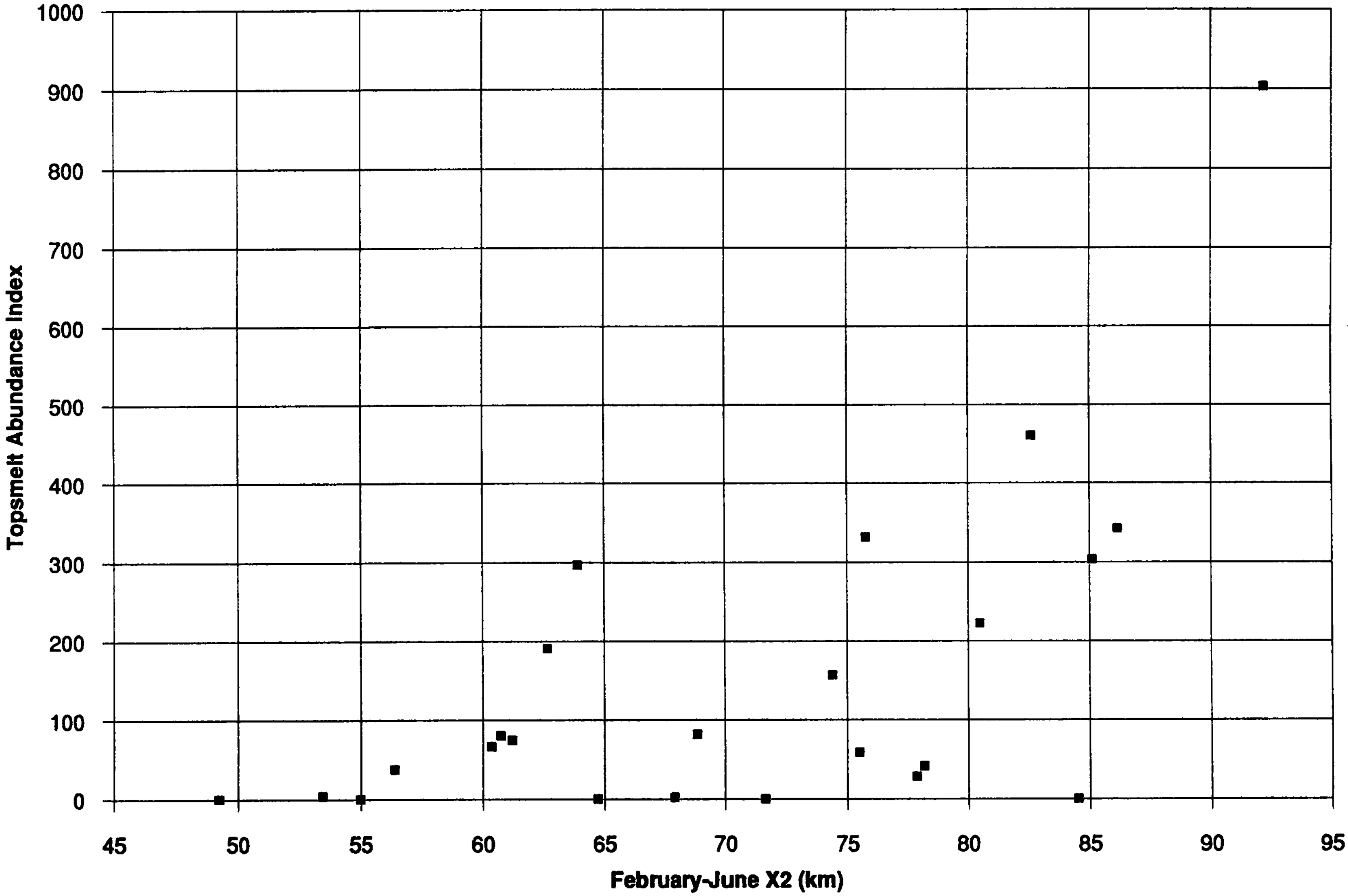

Pacific Herring Abundance Index
7000
6000
5000
4000
3000
2000
1000
0
45
50
55
60
65
70
75
80
85
90
95
February-June X2 (km)


300000
250000
200000
150000
100000
50000
0
Northern Anchovy Abundance Index
45
50
55
60
65
70
75
80
85
90
95
February-June X2 (km)

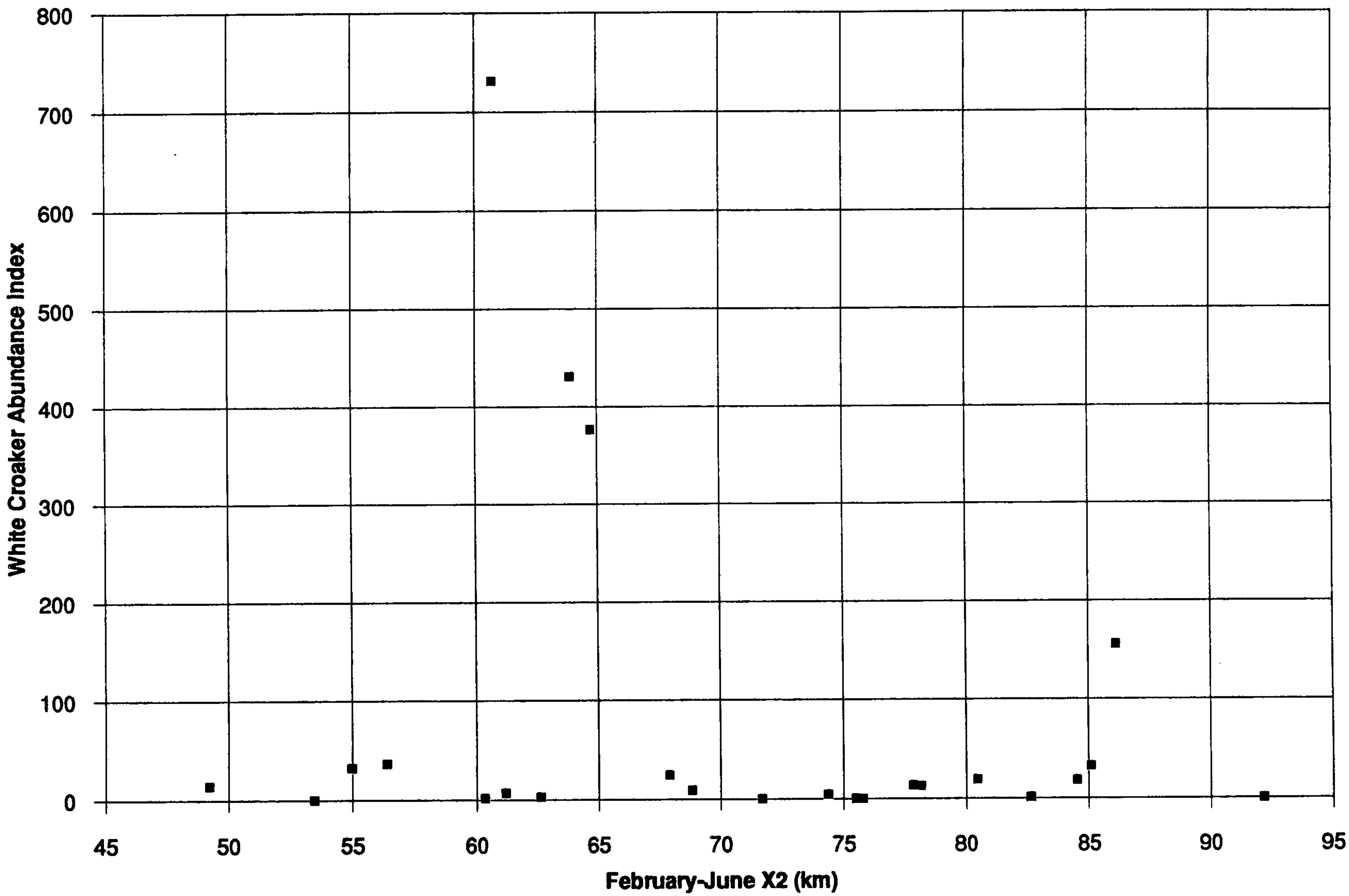


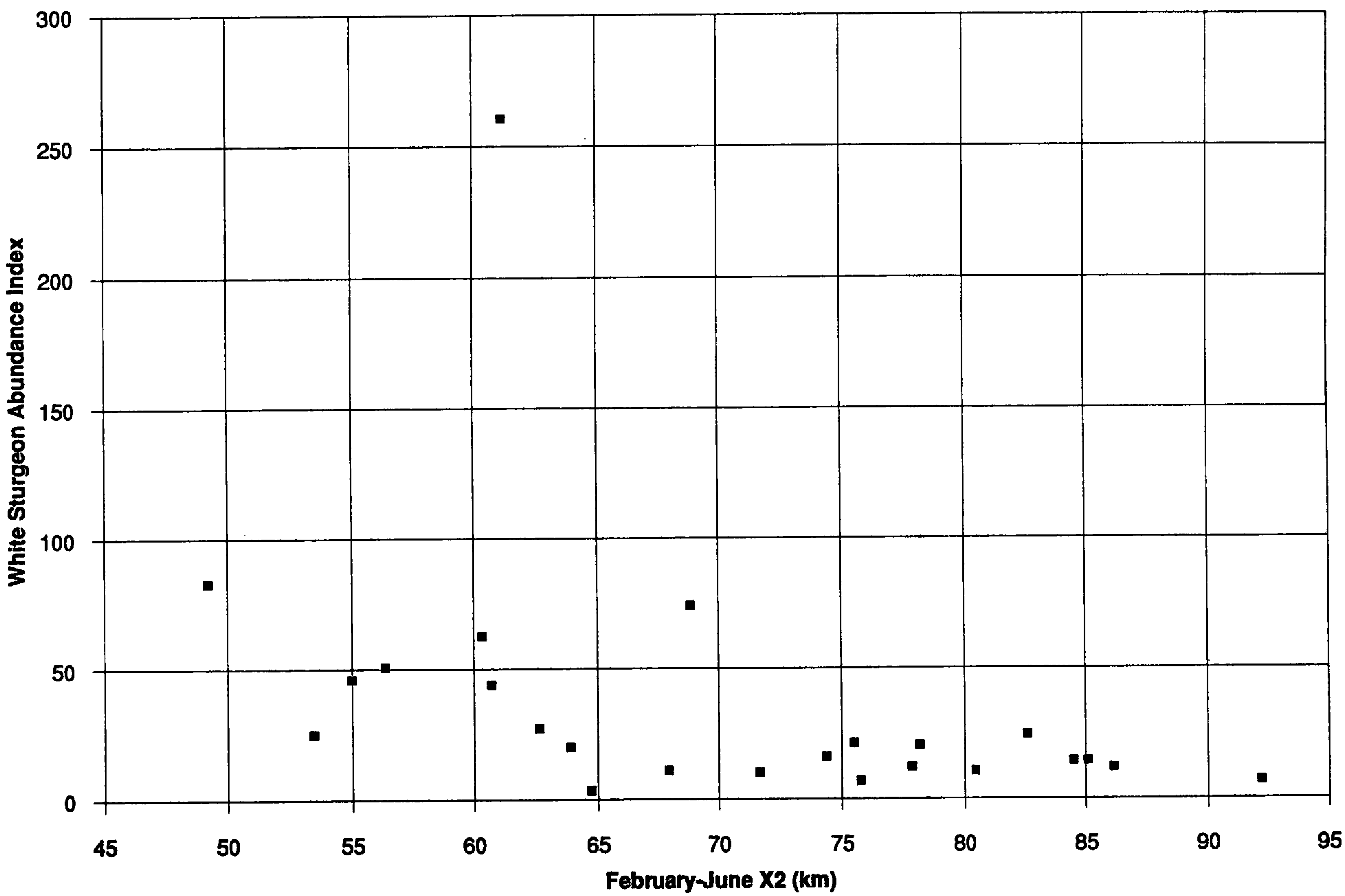
160
140
120
100
80
60
40
20
0
Splittail Abundance Index
45
50
55
60
65
70
75
80
85
90
95
February-June X2 (km)


Threadfin Shad Abundance Index
14000
12000
10000
8000
6000
4000
2000
0
45
50
55
60
65
70
75
80
85
90
95
February-June X2 (km)

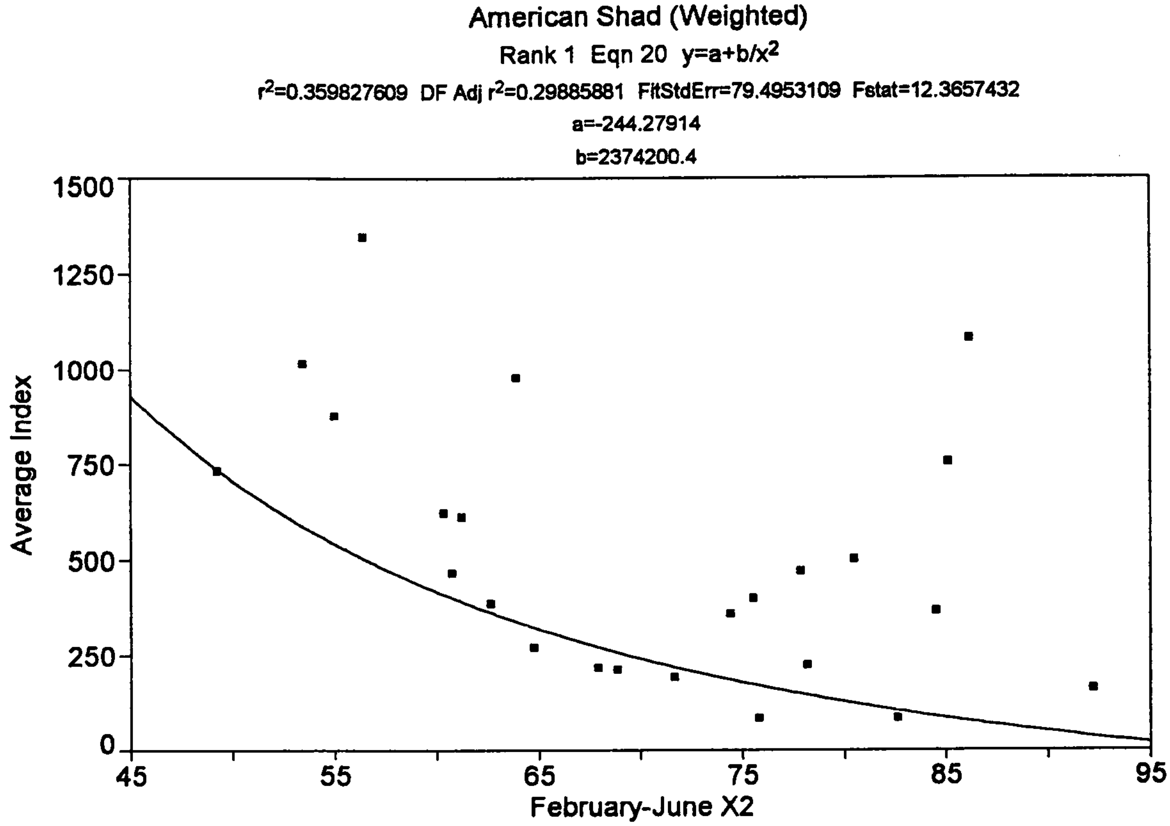


Topsmelt Abundance Index
1000
900
800
700
600
500
400
300
200
100
0
45
50
55
60
65
70
75
80
85
90
95
February-June X2 (km)


White Croaker Abundance Index
800
700
600
500
400
300
200
100
0
45
50
55
60
65
70
75
80
85
90
95
February-June X2 (km)


White Sturgeon Abundance Index
300
250
200
150
100
50
0
45
50
55
60
65
70
75
80
85
90
95
February-June X2 (km)

11c. WEIGHTED-LEAST SQUARES REGRESSION ANALYSES

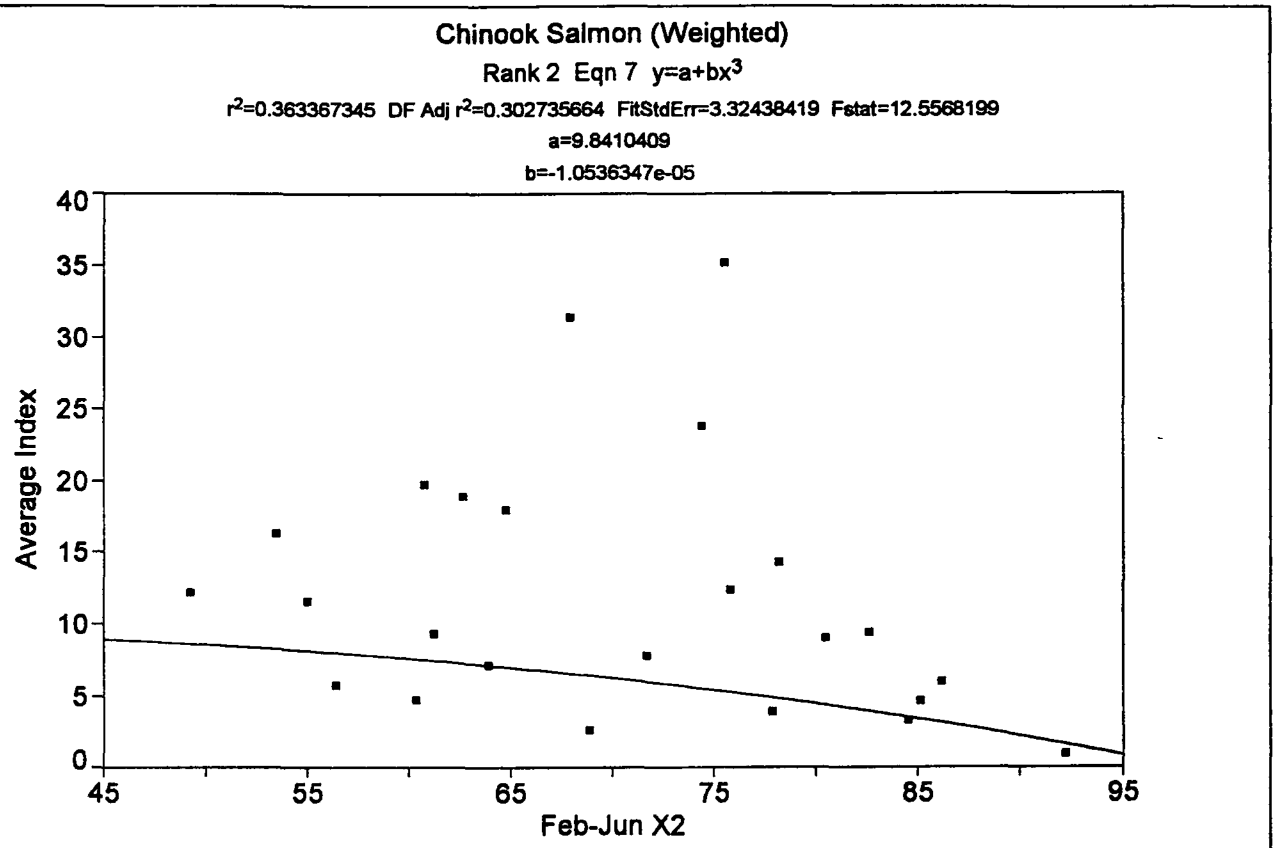


Rank 1 Eqn 20 $y=a+b/x^2$

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.3598276090	0.2988588099	79.495310943	12.365743212

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	-244.279136	104.1651978	-2.34511278	-460.384174	-28.1740985
b	2.3742e+06	675160.8804	3.516495871	973486.2872	3.77491e+06

Date	Time	File Source
Feb 18, 1994	10:58:17 AM	c:\tcwin\amshad.xls

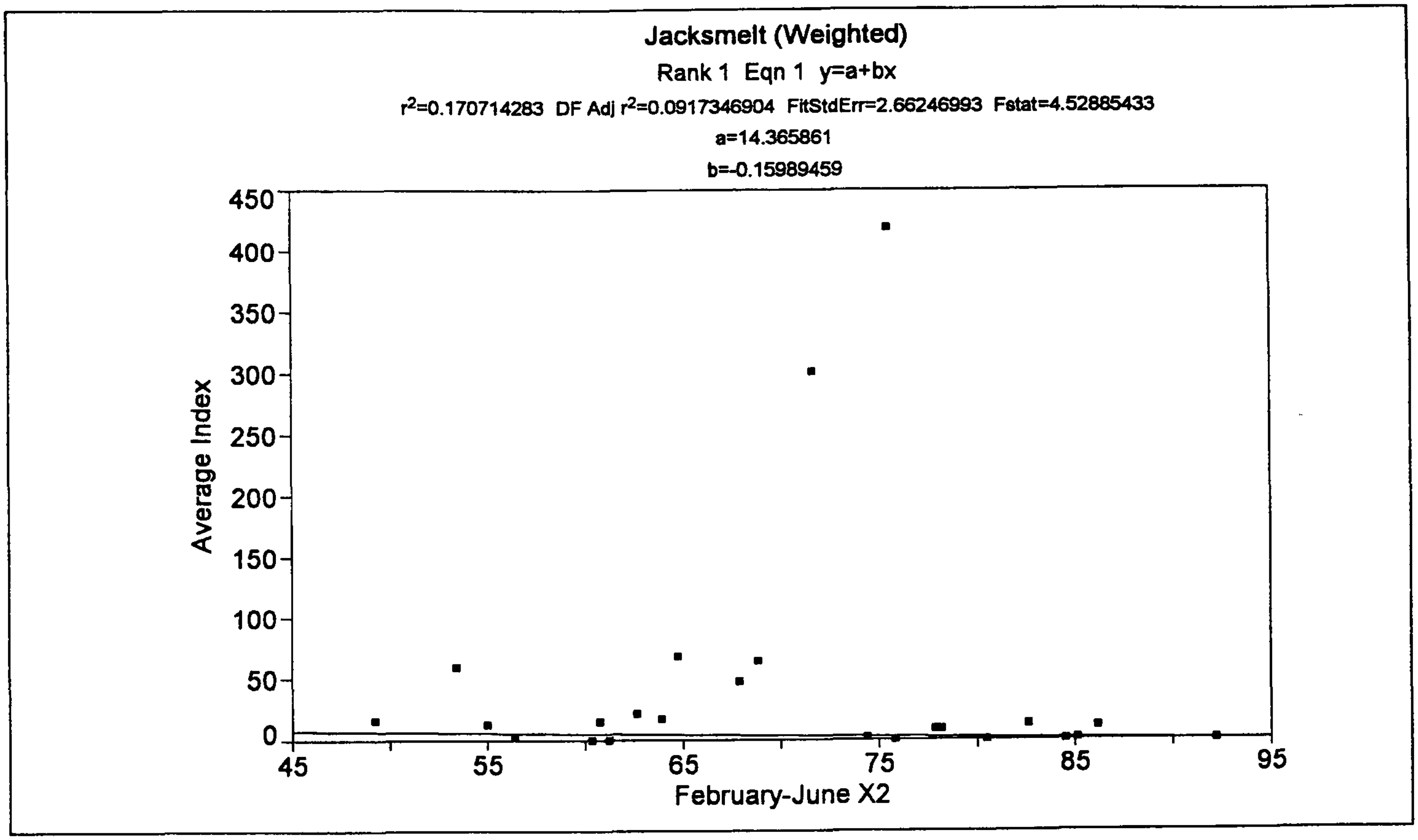


Rank 2 Eqn 7 $y=a+bx^3$

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.3633673454	0.3027356640	3.3243841901	12.556819917

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	9.841040942	1.889935723	5.207077057	5.920109194	13.76197269
b	-1.0536e-05	2.97338e-06	-3.54356034	-1.6705e-05	-4.3677e-06

Date	Time	File Source
Mar 3, 1994	12:37:17 PM	c:\tcwin\5newfish.xls

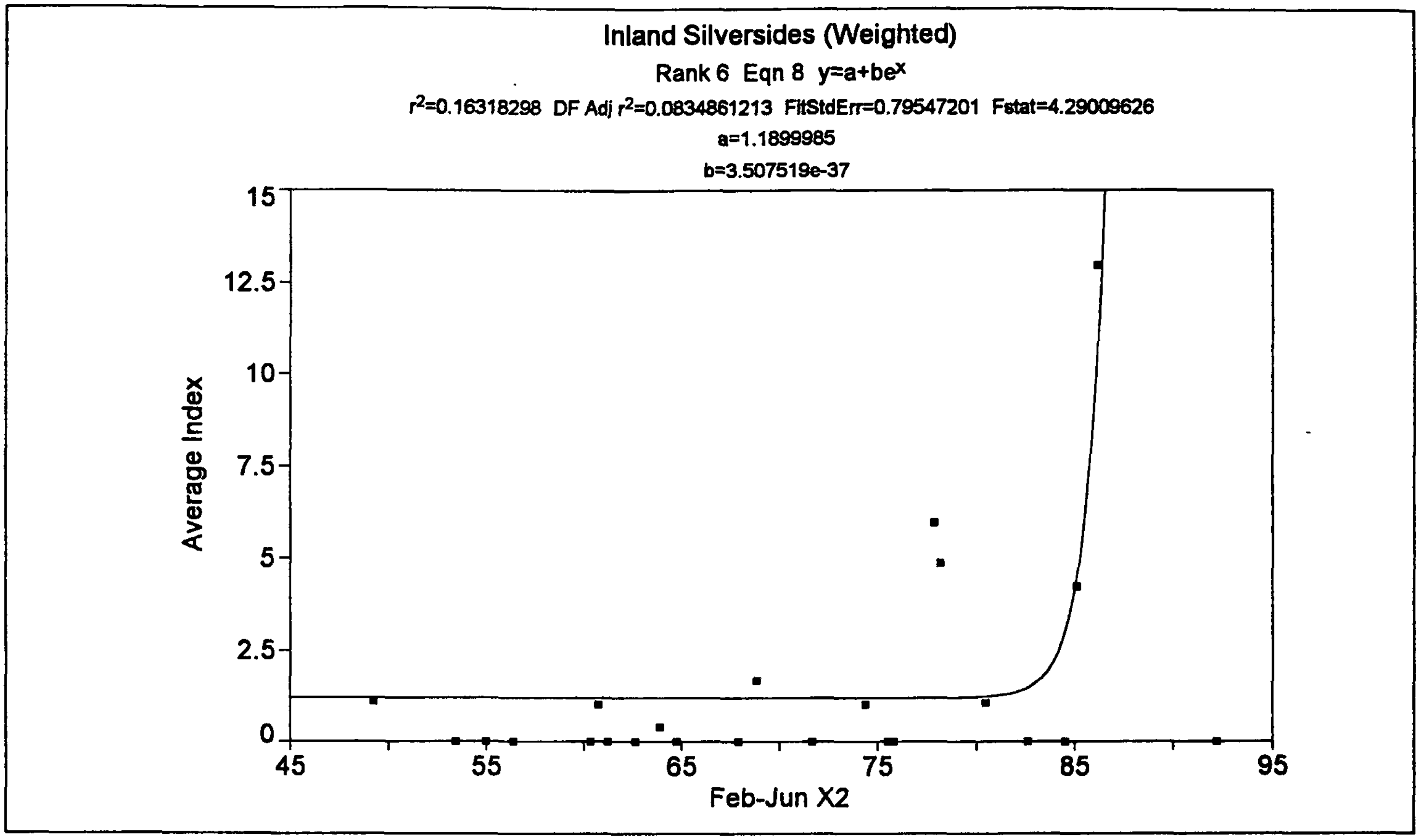


Rank 1 Eqn 1 y=a+bx

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.1707142825	0.0917346904	2.6624699334	4.5288543340

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	14.36586061	6.163837549	2.330668273	1.578131358	27.15358987
b	-0.15989459	0.075134533	-2.12811051	-0.31577152	-0.00401766

Date	Time	File Source
Feb 20, 1994	10:49:19 AM	c:\tcwin\4newfish.xls

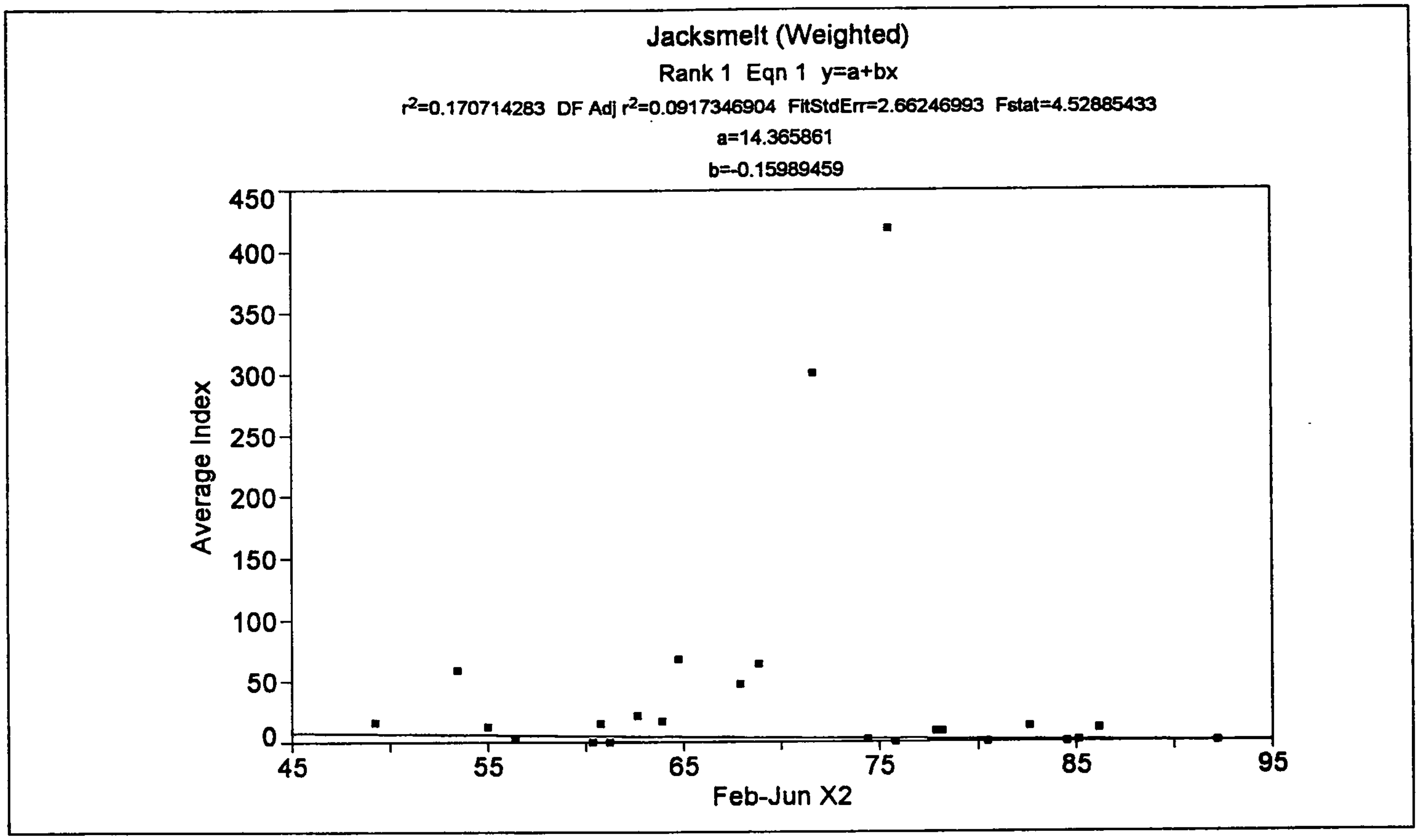


Rank 6 Eqn 8 $y=a+be^x$

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.1631829804	0.0834861213	0.7954720100	4.2900962621

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	1.189998470	0.163159543	7.293465320	0.851501544	1.528495396
b	3.50752e-37	1.69343e-37	2.071254755	-5.7286e-40	7.02077e-37

Date	Time	File Source
Mar 3, 1994	12:44:07 PM	c:\tcwin\5newfish.xls

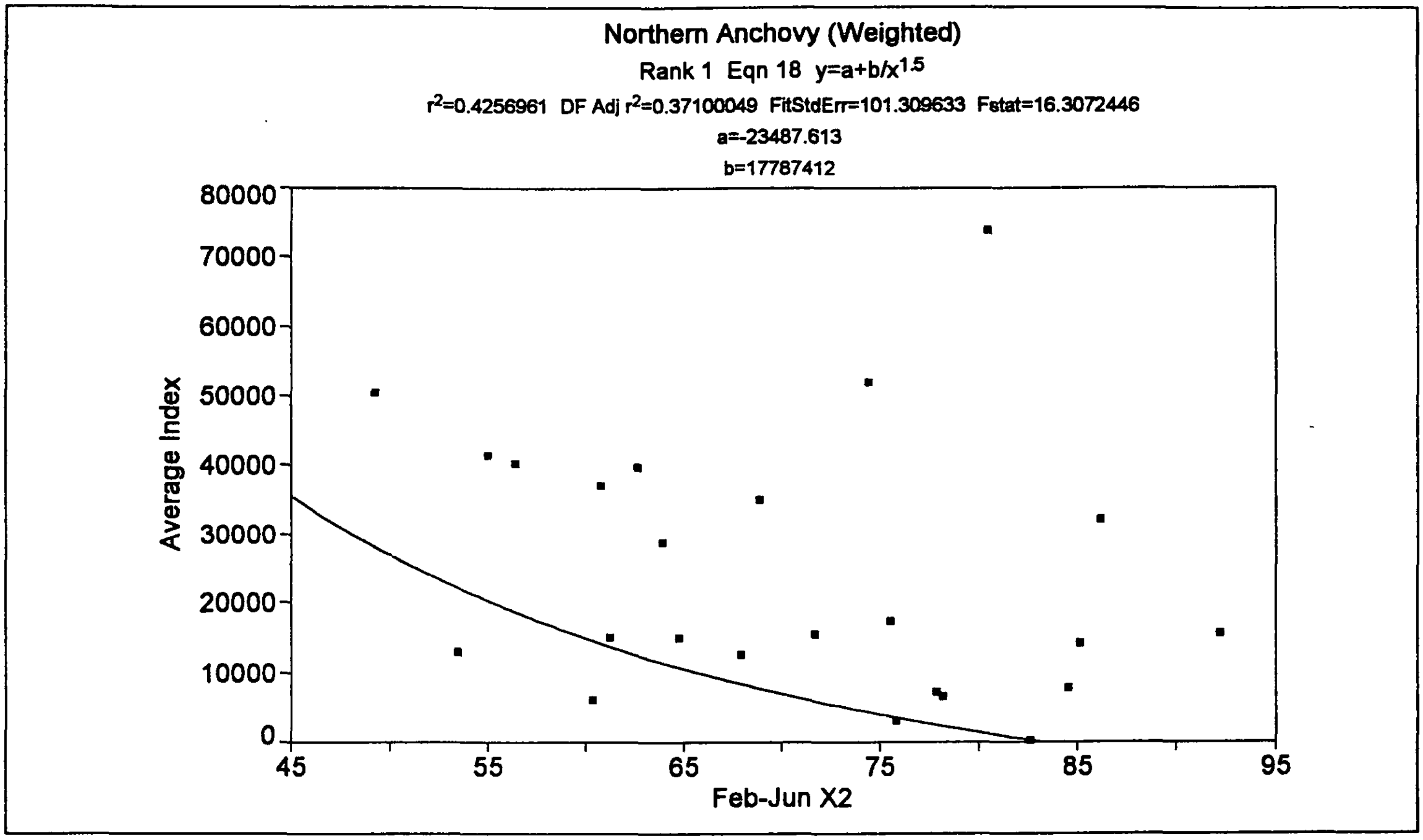


Rank 1 Eqn 1 y=a+bx

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.1707142825	0.0917346904	2.6624699334	4.5288543340

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	14.36586061	6.163837549	2.330668273	1.578131358	27.15358987
b	-0.15989459	0.075134533	-2.12811051	-0.31577152	-0.00401766

Date	Time	File Source
Mar 3, 1994	11:03:00 AM	c:\tcwin\4newfish.xls

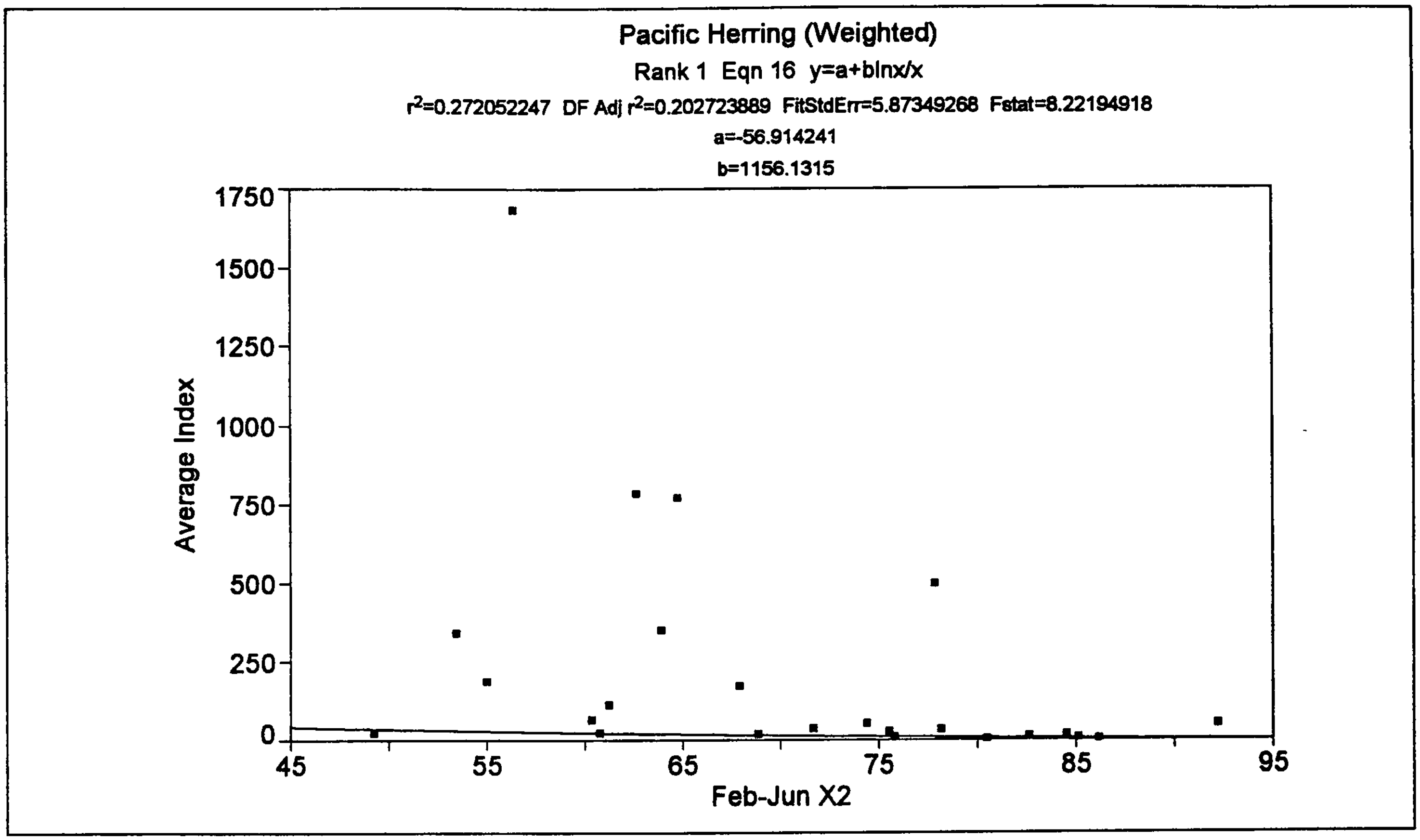


Rank 1 Eqn 18 $y=a+b/x^{1.5}$

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.4256960998	0.3710004902	101.30963284	16.307244633

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	-23487.6134	5863.186373	-4.00594692	-35651.6004	-11323.6264
b	1.77874e+07	4.40476e+06	4.038222955	8.64913e+06	2.69257e+07

Date	Time	File Source
Mar 3, 1994	12:27:51 PM	c:\tcwin\5newfish.xls



Rank 1 Eqn 16 y=a+blnx/x

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.2720522468	0.2027238894	5.8734926757	8.2219491770

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	-56.9142407	21.81392567	-2.60907833	-102.170232	-11.6582499
b	1156.131483	403.1993596	2.867394144	319.6389233	1992.624042

Date	Time	File Source
Mar 3, 1994	12:21:37 PM	c:\tcwin\5newfish.xls

11d. GLM REGRESSION ANALYSES FOR DELTA SMELT AND SPLITTAIL

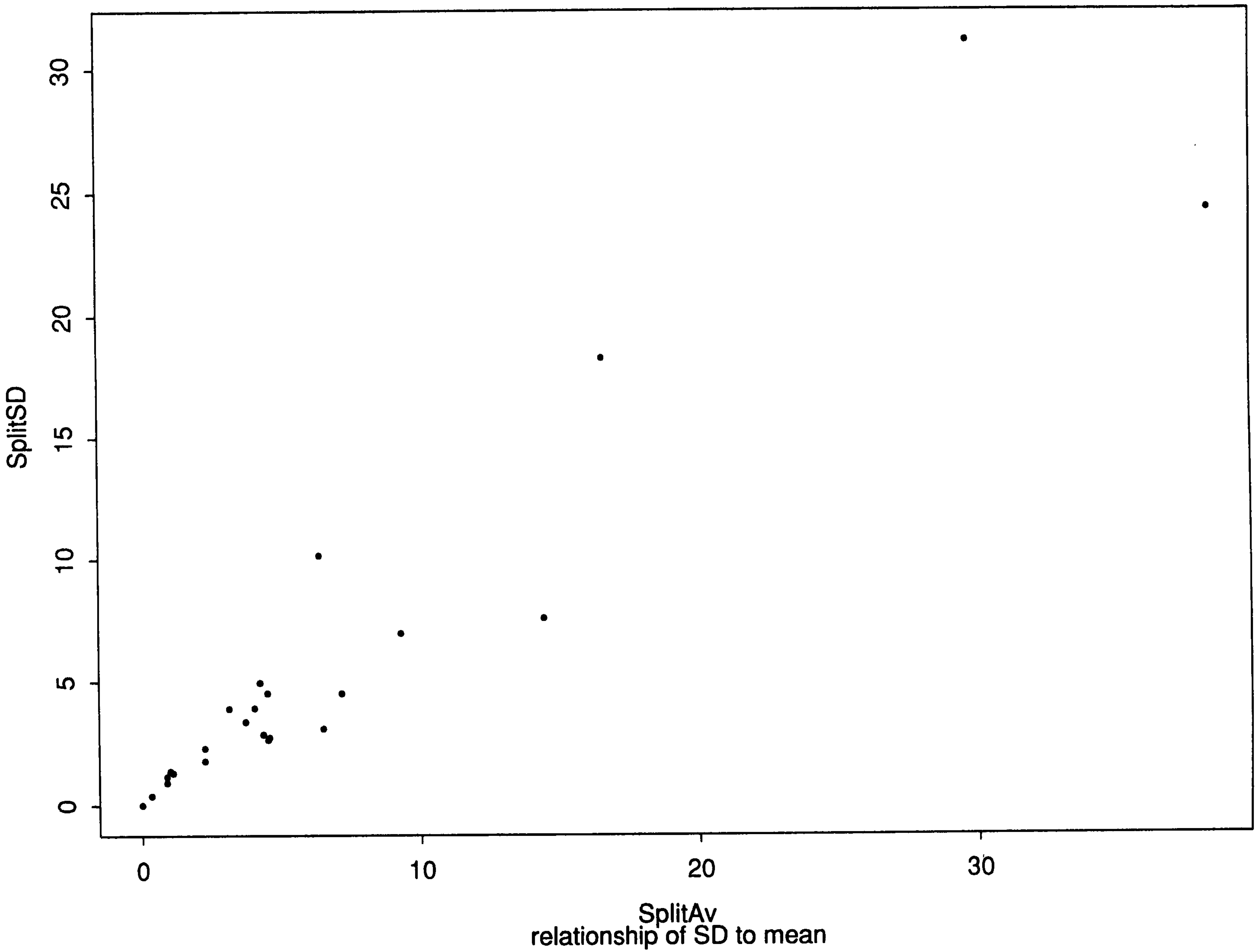
Confidence intervals for split tail. I fit the same model as for striped bass, which looks reasonable.

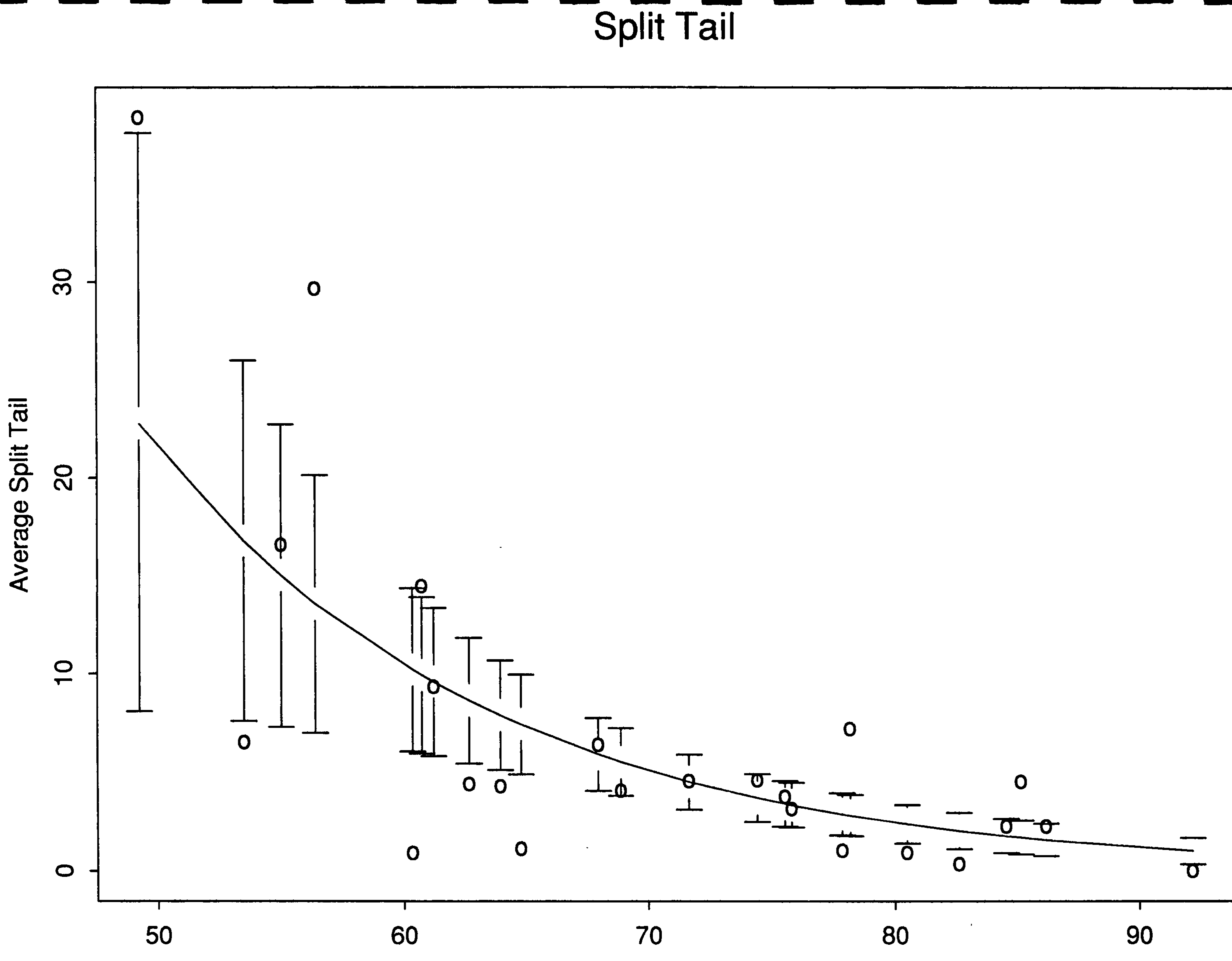
```
plot(SplitAv, SplitSD)
> title(main="Average Split Tail", sub="relationship of SD to mean")
From this plot the variance looks proportional to the square of the mean

> ft _ glm(SplitAv ~ X2,  family=quasi(link=log, variance=mu^2))
> pd _  predict(ft, type="response", se.fit=T)
> plot(X2, SplitAv)
> lines(X2[ss], pd$fit[ss])
> plot(X2, Splitv, pch="o", xlab="X2", ylab="Average Split Tail")
Error: Object "Splitv" not found
Dumped
> plot(X2, SplitAv, pch="o", xlab="X2", ylab="Average Split Tail")
> lines(X2[ss], pd$fit[ss])
> error.bar(X2, pd$fit, 2*pd$se.fit, 2*pd$se.fit, add=T)
> title(main="Split Tail", sub= "GLM fit with variance proportional to square of mea
```

Delta Smelt: I fit the same models as for longfin smelt, but it doesn't look very convincing. I suspect that there are other variables that should be incorporated in the model. Note the plot of residuals versus time (residual = observed - fitted) indicates that the model underfit in the early years and overfit in the later years.

```
> plot(DSmeltAv, DSmeltSD)
> title("Delta Smelt")
> ft _ glm(DSmeltAv ~ ns(X2,2),  family=quasi(link=log, variance=mu^2))
> pd _  predict(ft, type="response", se.fit=T)
> plot(X2, DSmeltAv, xlab="X2", ylab="Average Delta Smelt")
> lines(X2[ss], pd$fit[ss])
> error.bar(X2, pd$fit, 2*pd$se.fit, 2*pd$se.fit, add=T)
> plot(Year, ft$residuals, xlab="Year", ylab="residuals")
> title(main="Residuals versus time for Delta Smelt Model")
```

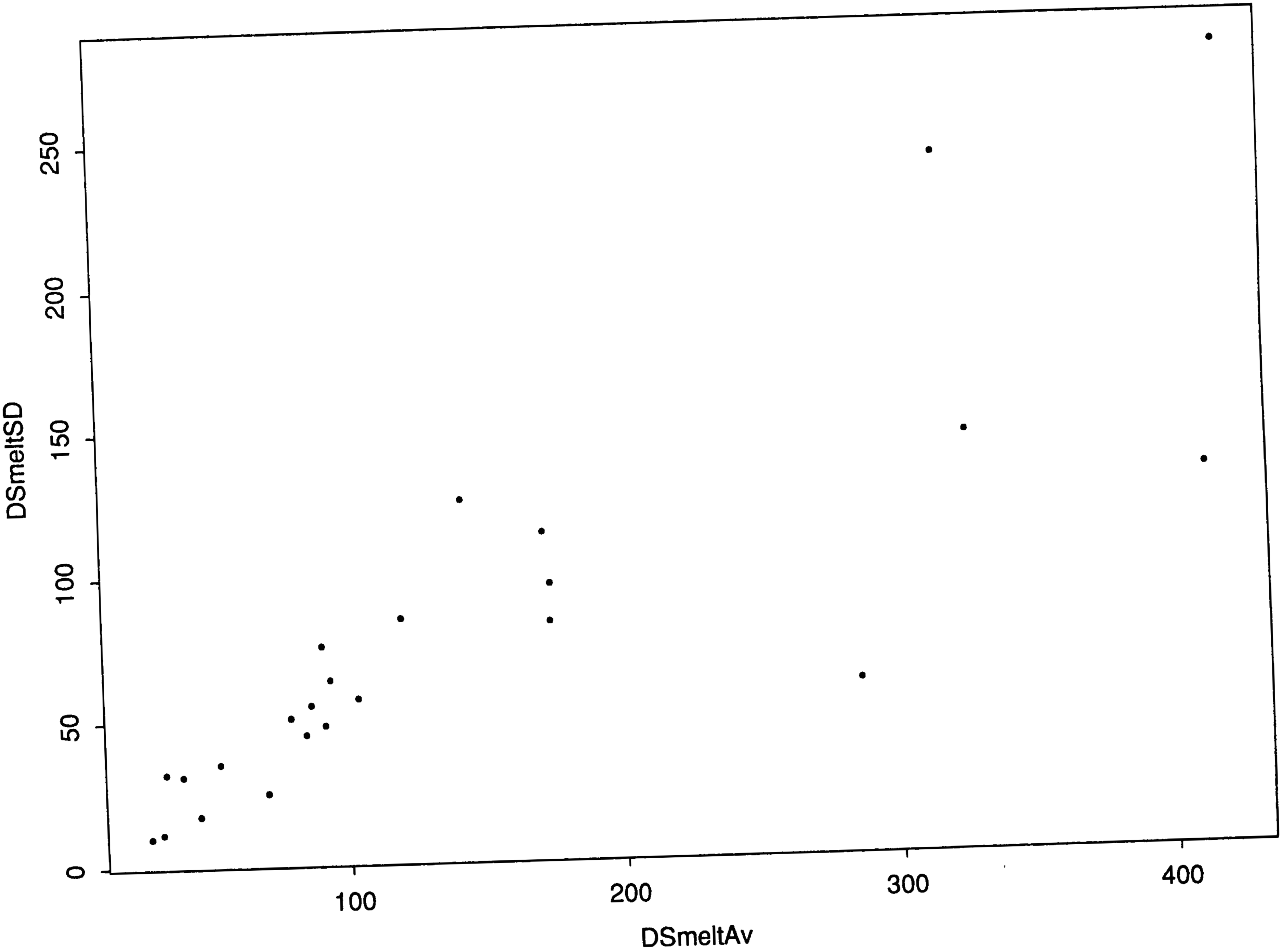
Average Split Tail

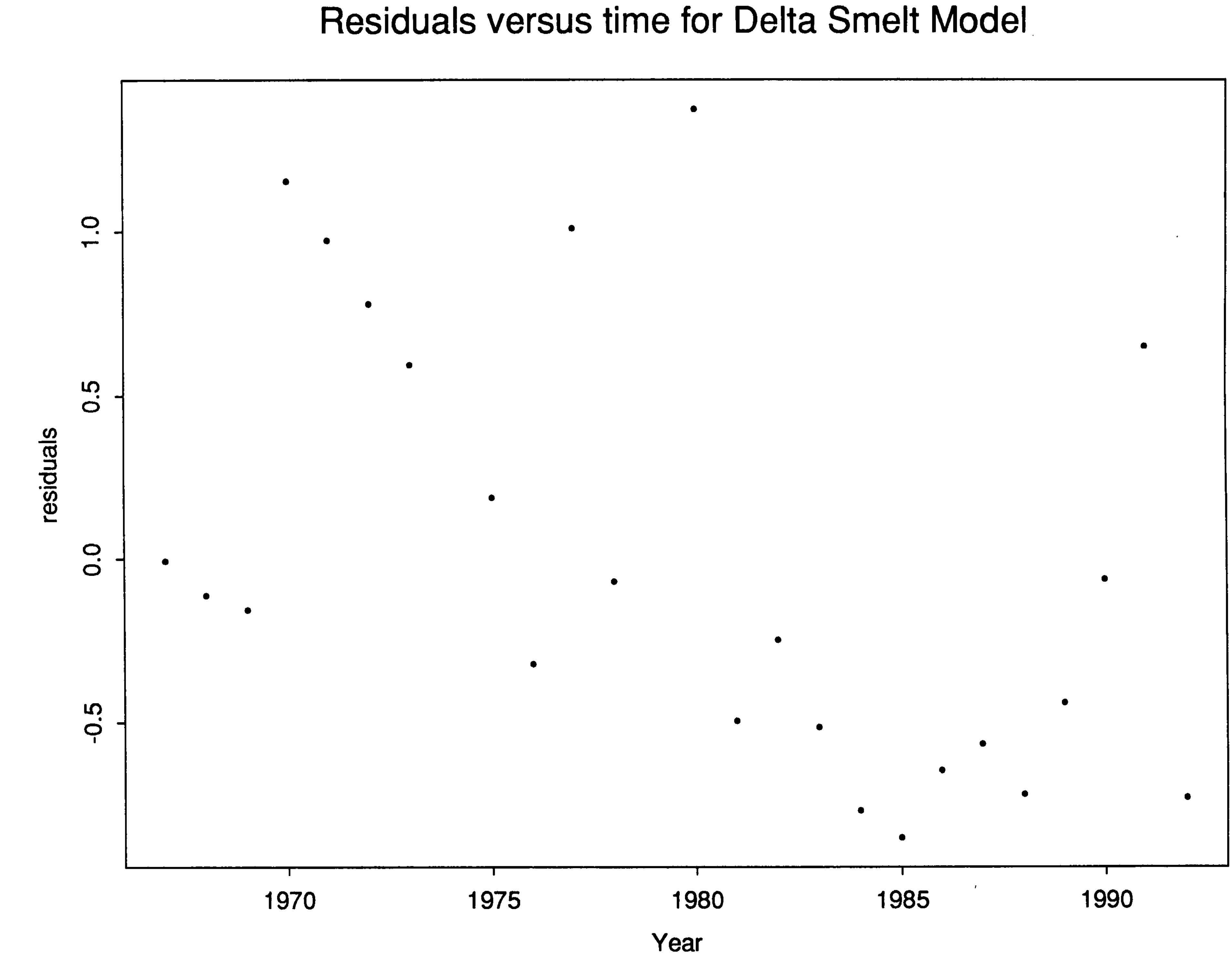




GLM fit with variance proportional to square of mean

Delta Smelt



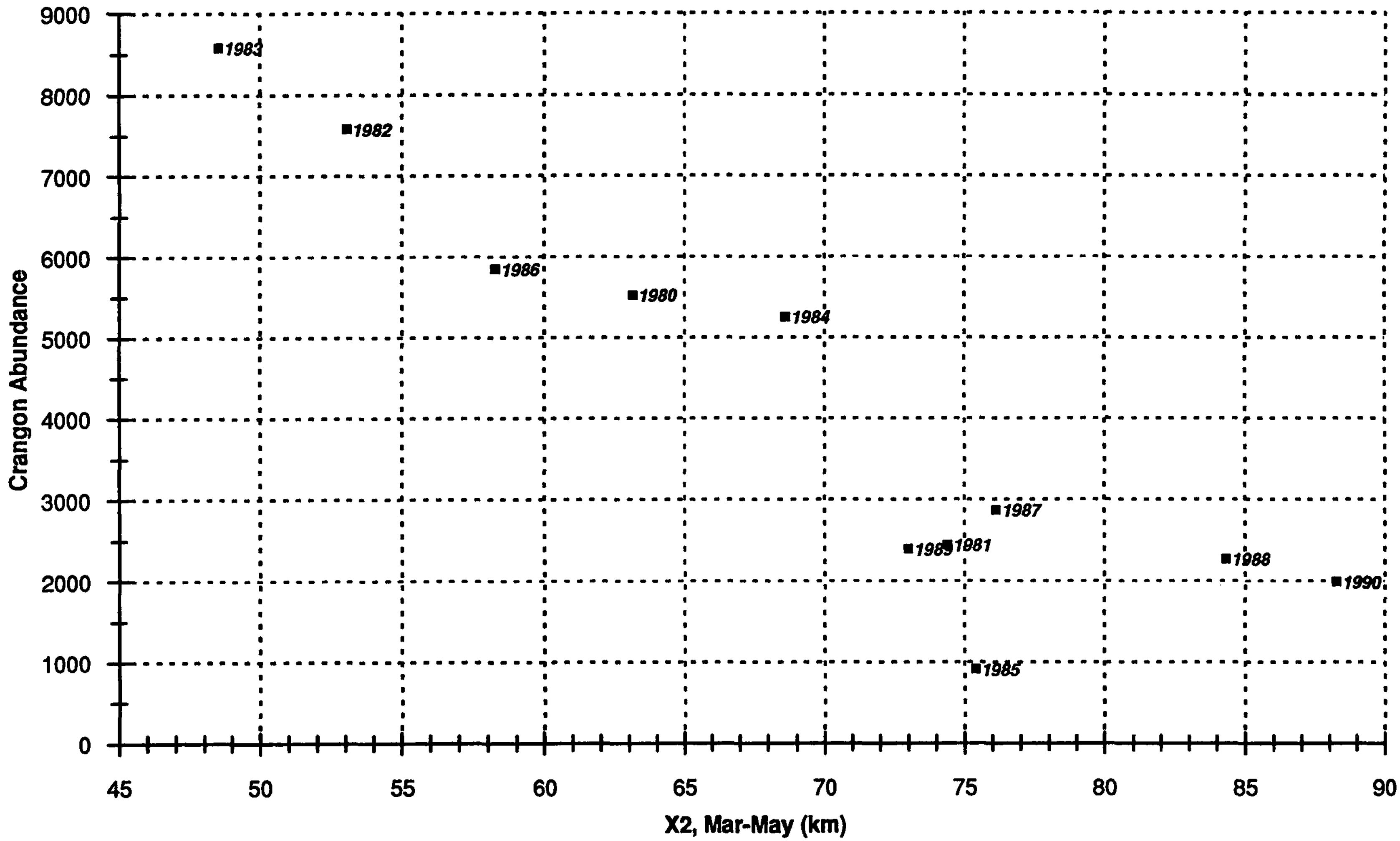

Residuals versus time for Delta Smelt Model
residuals
1.0
0.5
0.0
-0.5
1970
1975
1980
1985
1990
Year

Tab 12.
The Presence Of An X2 Discontinuity

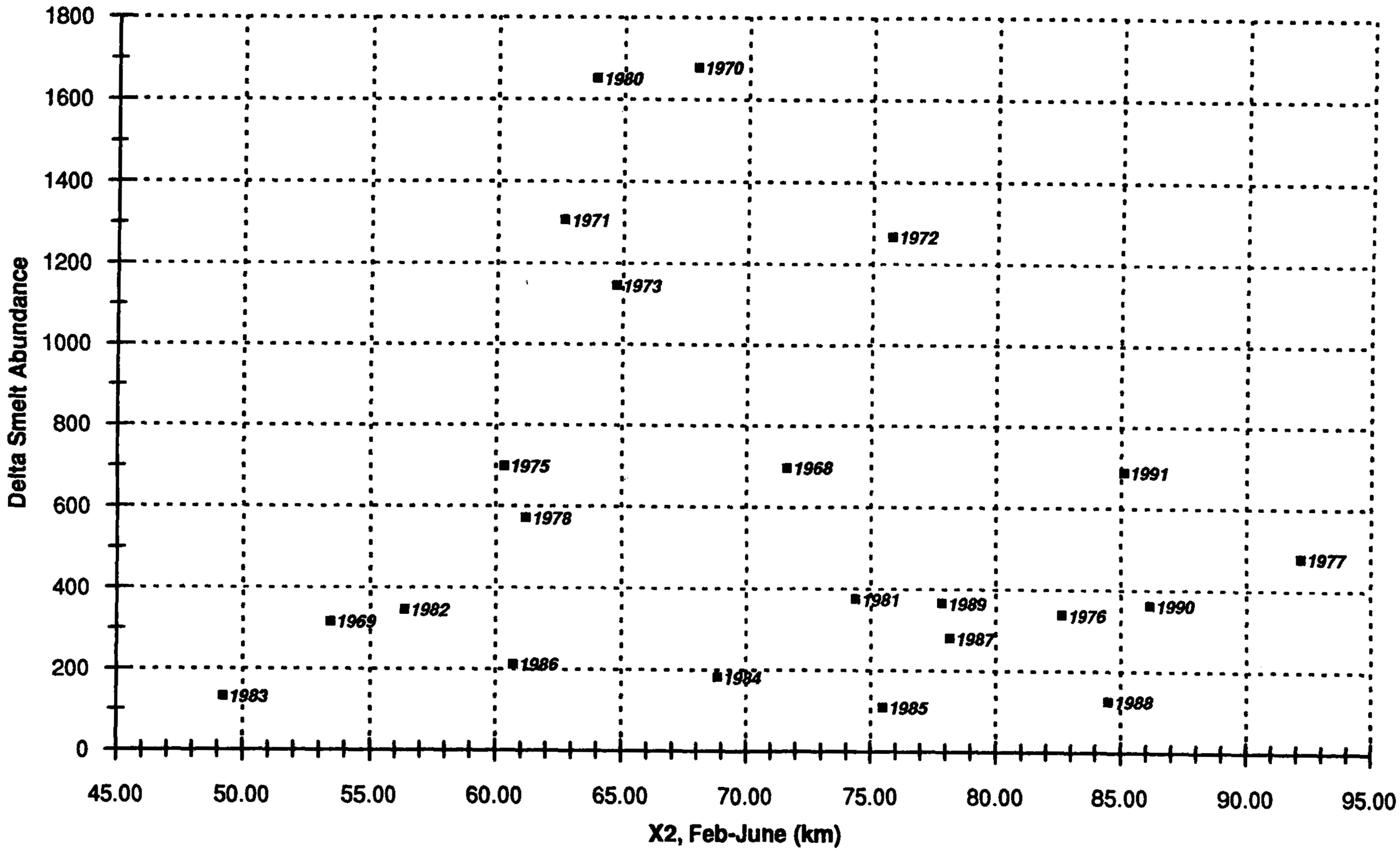
12a. Scatter Plots Of SFEP Abundance-X2 Data
12b. Regressions Of Abundance On X2
Upstream And Downstream Of Discontinuities

12a. SCATTER PLOTS OF ABUNDANCE VERSUS X2 FOR 10 INDICATORS

CRANGON.XLC

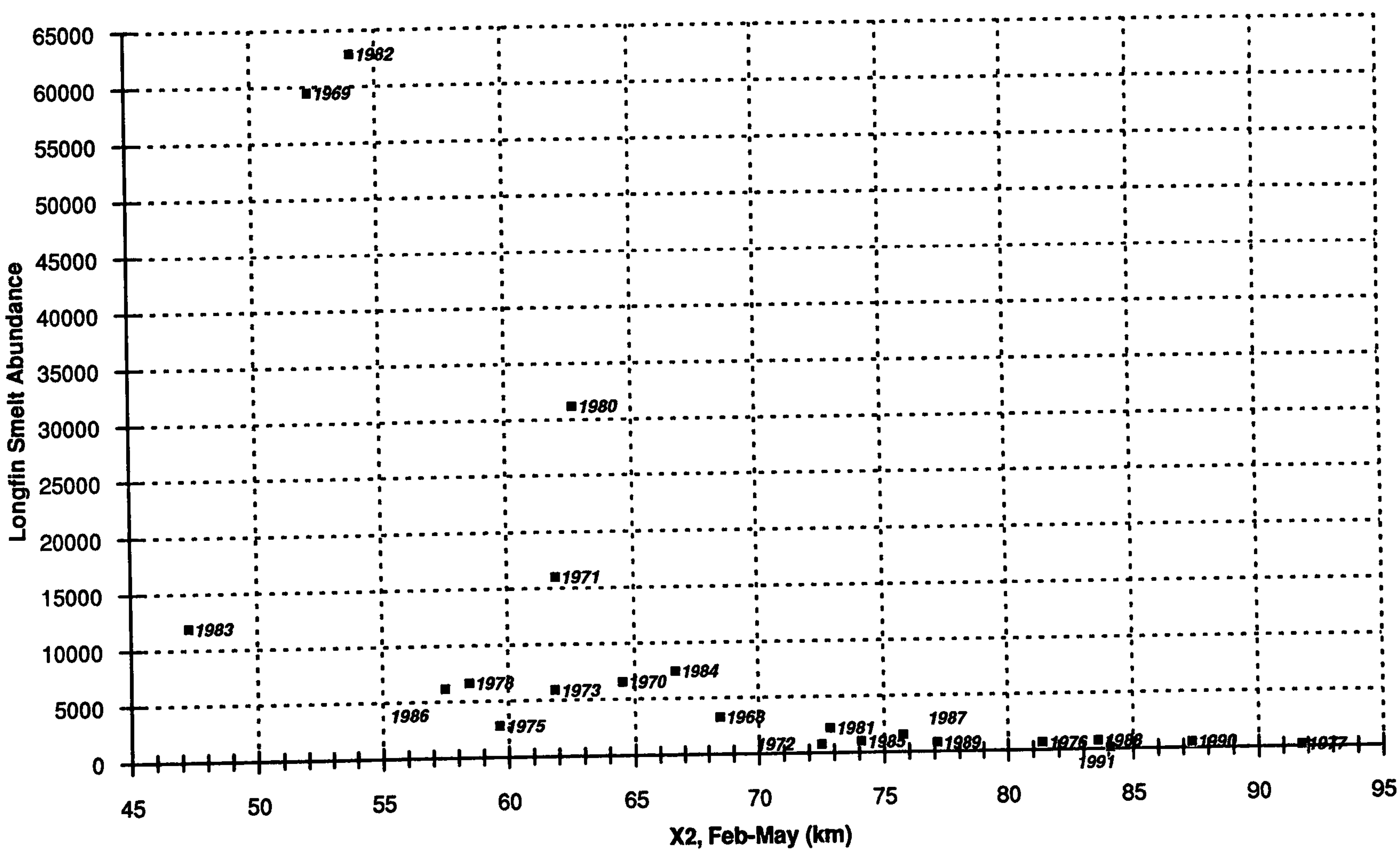


Crangon Abundance
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
45
50
55
60
65
70
75
80
85
90
X2, Mar-May (km)
1983
1982
1986
1980
1984
1987
1981
1988
1990
1985



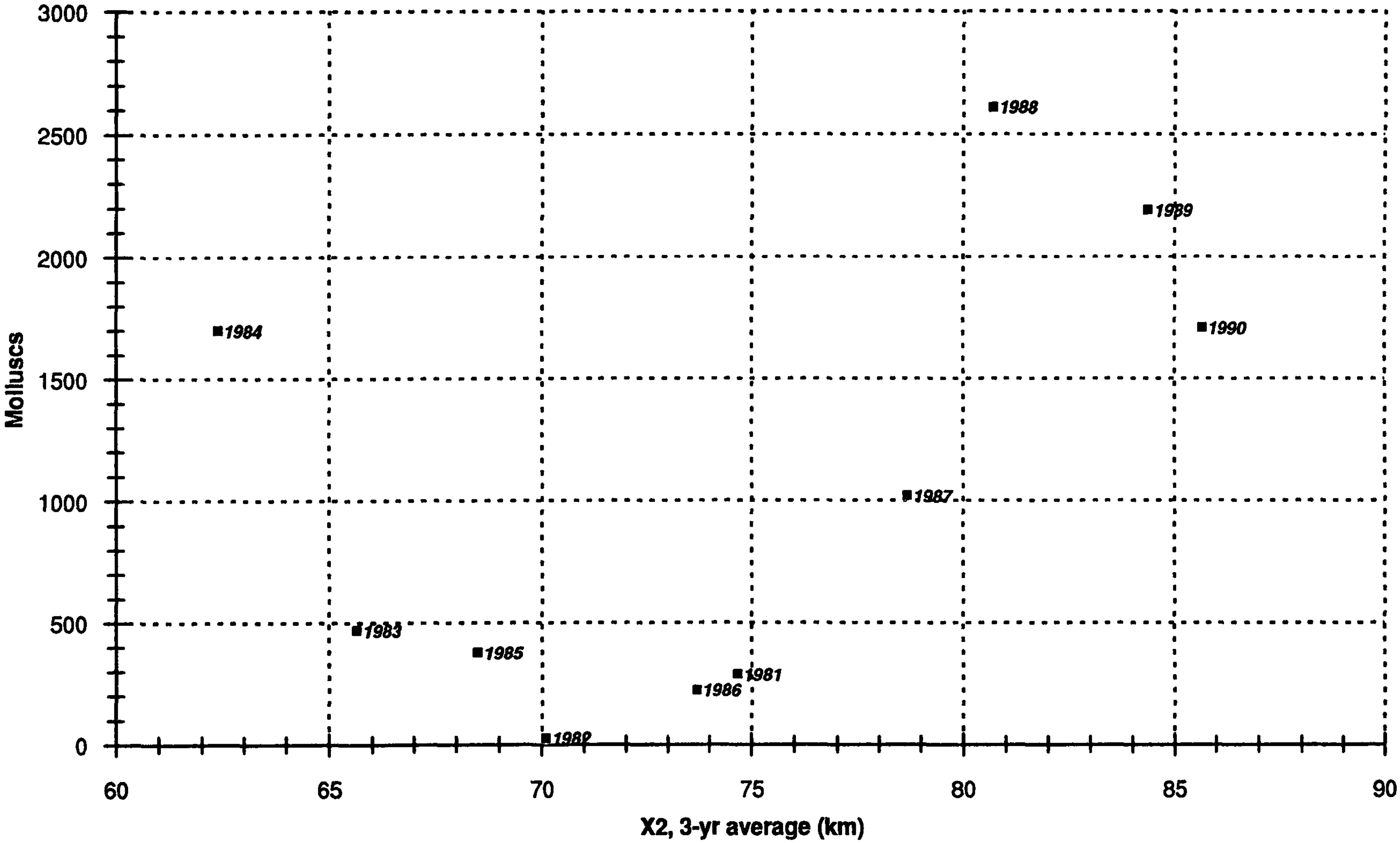
Delta Smelt Abundance
X2, Feb-June (km)
1800
1600
1400
1200
1000
800
600
400
200
0
45.00
50.00
55.00
60.00
65.00
70.00
75.00
80.00
85.00
90.00
95.00
1980
1970
1971
1972
1973
1975
1968
1991
1978
1977
1981
1989
1990
1976
1969
1982
1987
1986
1984
1983
1985
1988

LONGFIN.XLC



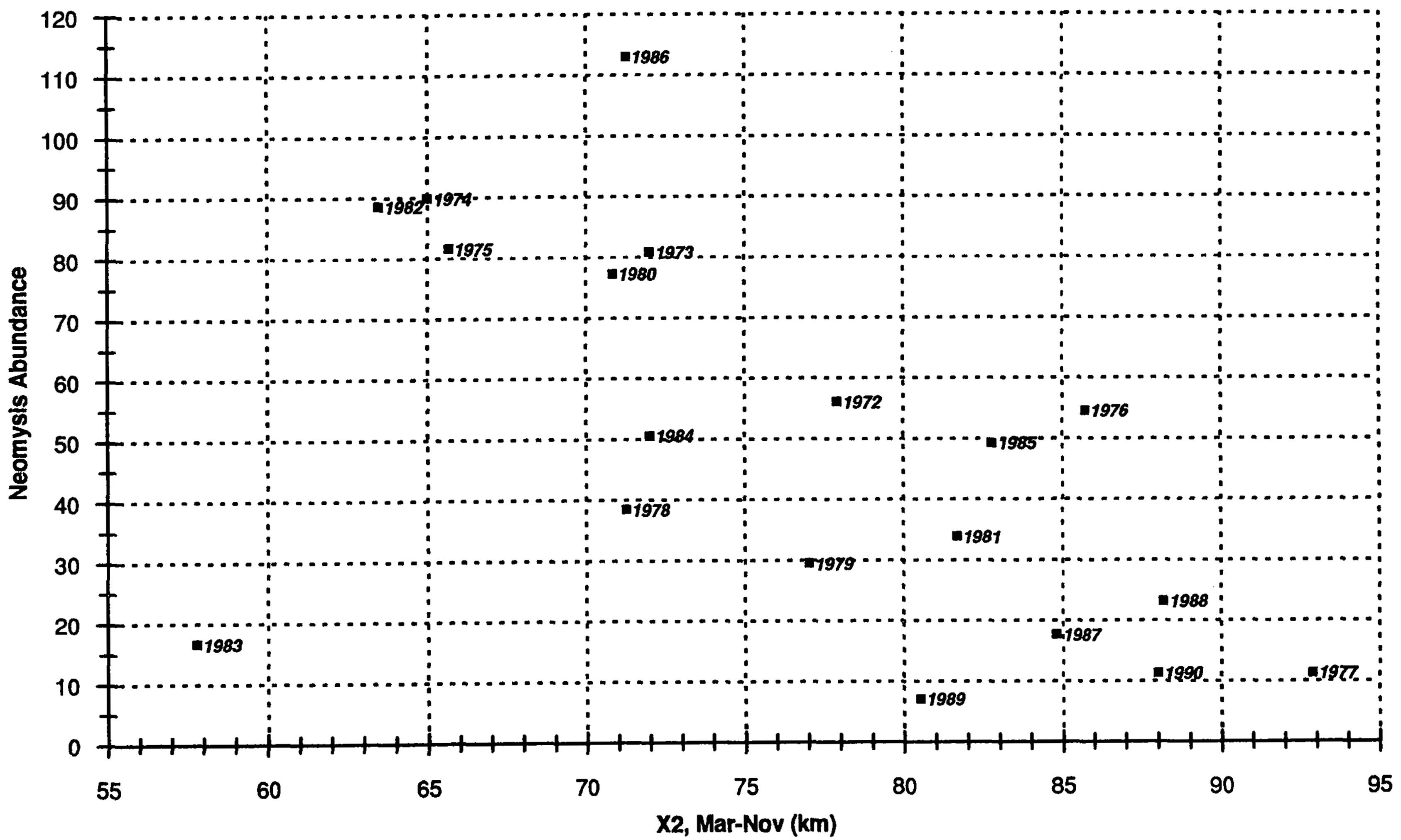
Longfin Smelt Abundance
65000
60000
55000
50000
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
45
50
55
60
65
70
75
80
85
90
95
X2, Feb-May (km)
1982
1969
1980
1971
1983
1978
1973
1970
1984
1986
1975
1968
1972
1981
1985
1987
1989
1976
1988
1991
1990

MOLLUSC.XLC

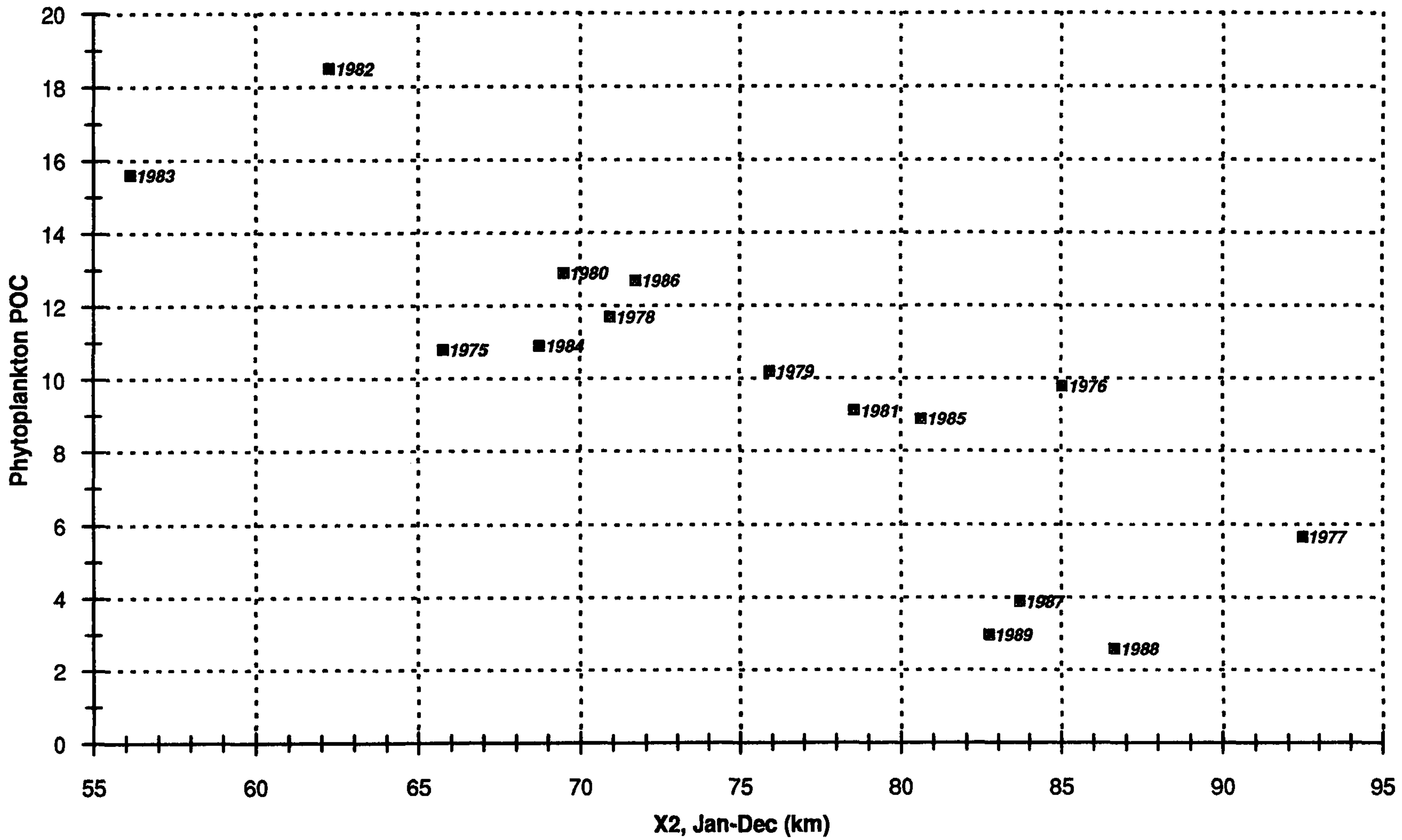


Molluscs
3000
2500
2000
1500
1000
500
0
60
65
70
75
80
85
90
X2, 3-yr average (km)
1988
1989
1984
1990
1987
1983
1985
1981
1986

NEOMYSIS.XLC

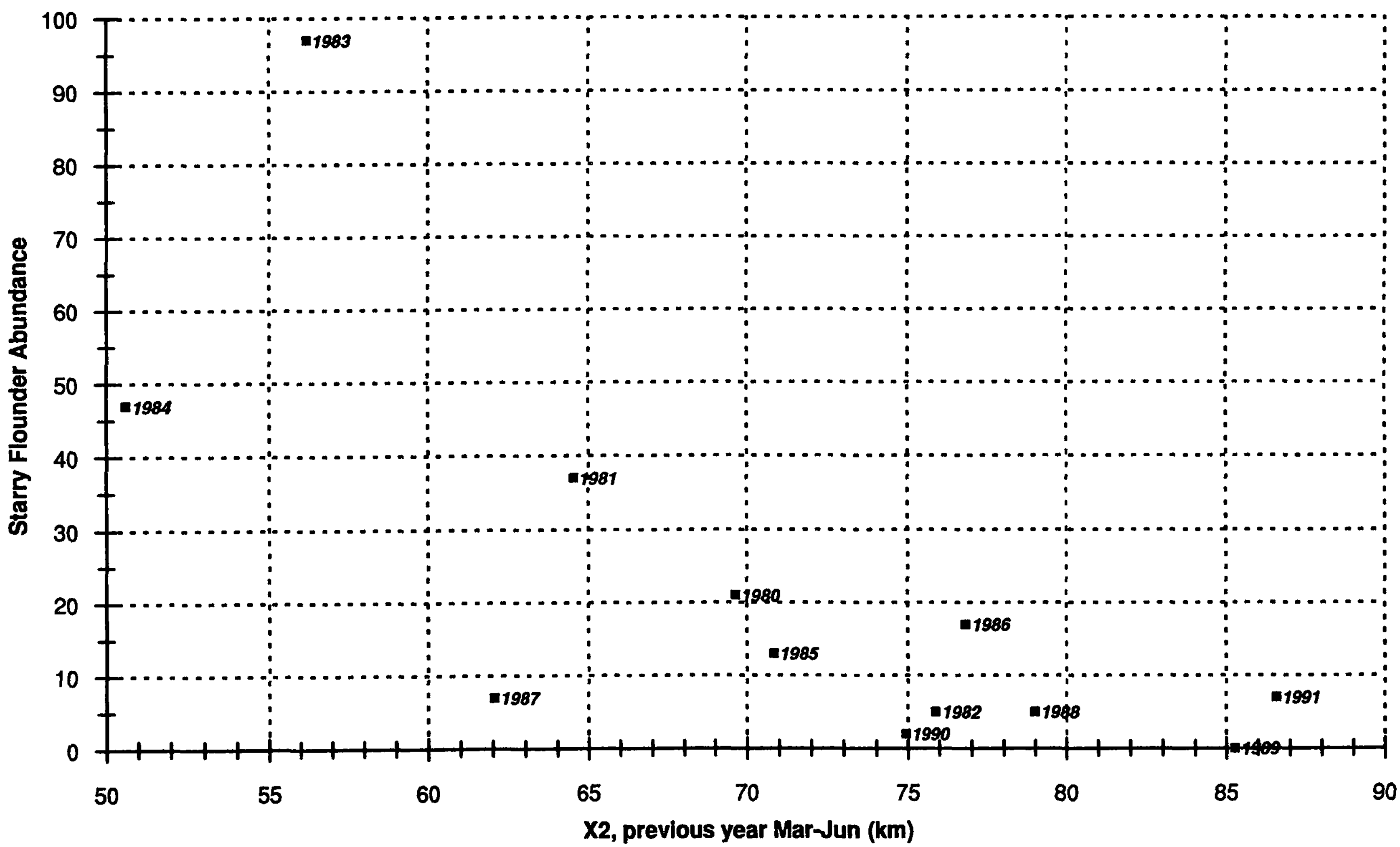


POC.XLC

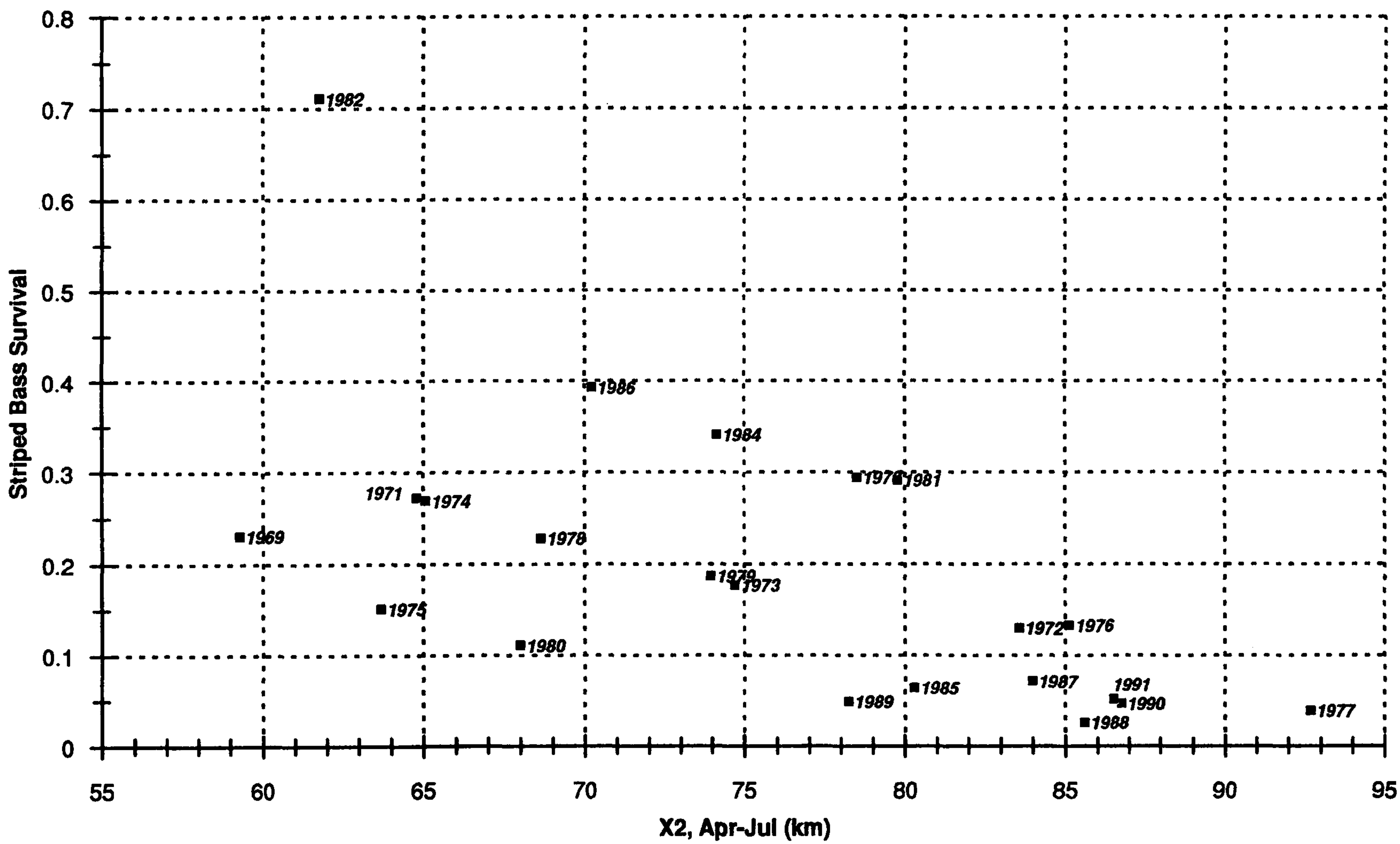


Phytoplankton POC
X2, Jan-Dec (km)
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989

STARRY.XLC

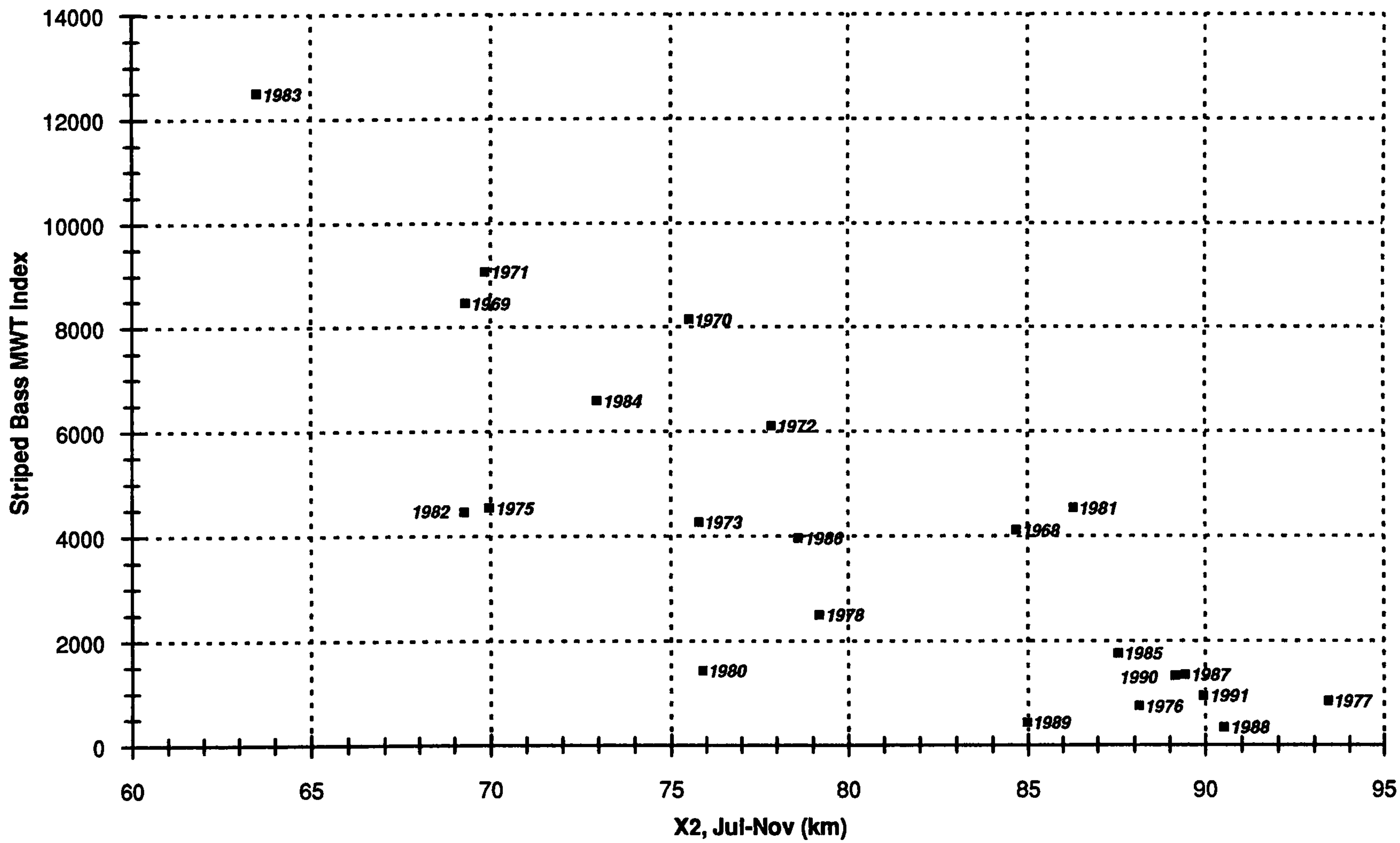

Starry Flounder Abundance
0
10
20
30
40
50
60
70
80
90
100
50
55
60
65
70
75
80
85
90
X2, previous year Mar-Jun (km)
1980
1981
1982
1983
1984
1985
1986
1987
1988
1990
1991

SBSURV.XLC



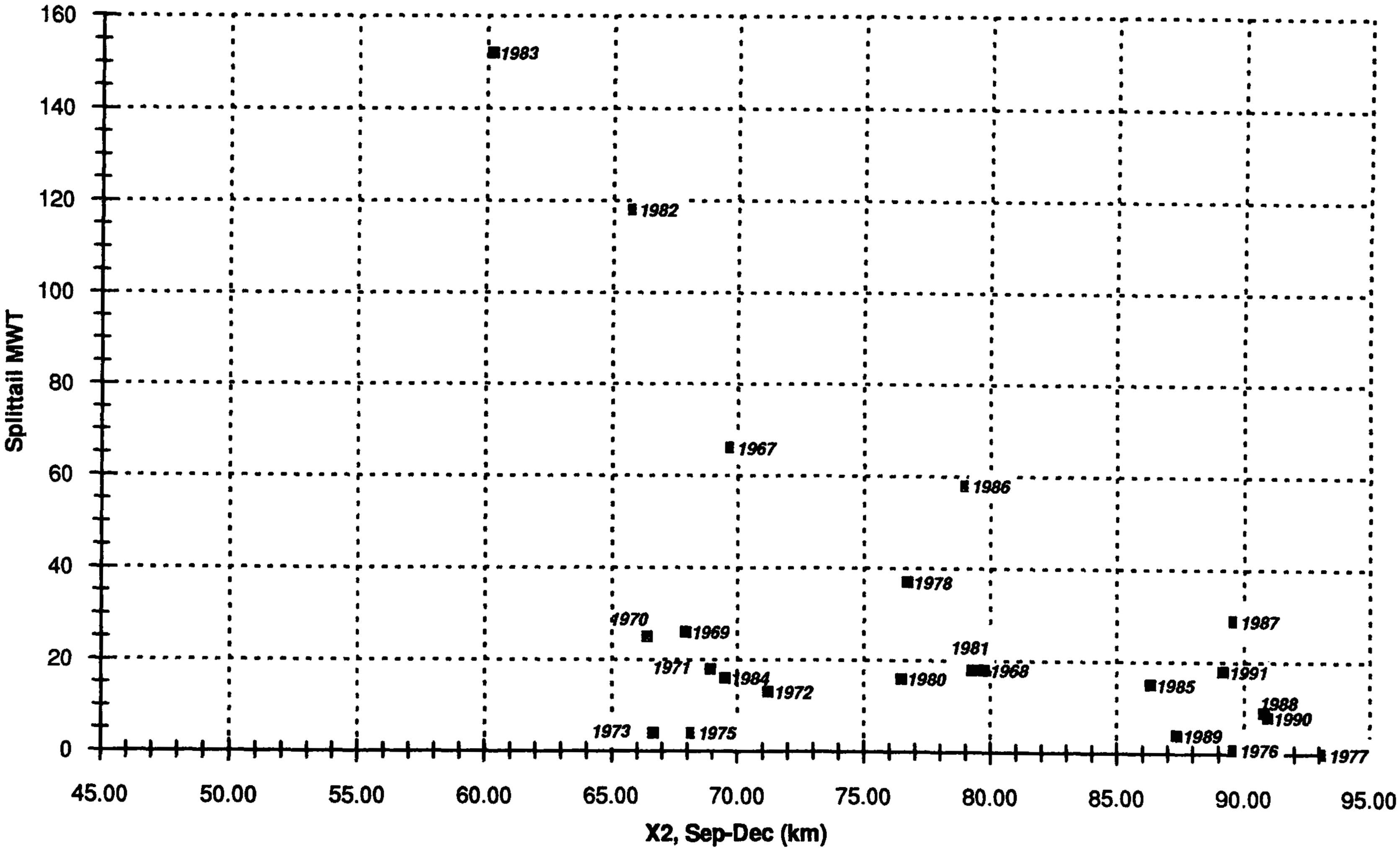
Striped Bass Survival
X2, Apr-Jul (km)
1982
1986
1984
1971
1974
1969
1978
1979
1973
1975
1980
1981
1972
1976
1987
1985
1989
1991
1990
1988
1977

SBMWT.XLC



Striped Bass MWT Index
X2, Jul-Nov (km)
14000
12000
10000
8000
6000
4000
2000
0
60
65
70
75
80
85
90
95
1983
1971
1969
1970
1984
1972
1982
1975
1973
1986
1968
1981
1978
1980
1985
1990
1987
1991
1976
1989
1977
1988

SPLIT.XLC



Splittail MWT
160
140
120
100
80
60
40
20
0
1983
1982
1967
1986
1978
1970
1969
1987
1981
1971
1984
1968
1980
1991
1972
1985
1988
1990
1973
1975
1989
1976
1977
45.00
50.00
55.00
60.00
65.00
70.00
75.00
80.00
85.00
90.00
95.00
X2, Sep-Dec (km)

12b. REGRESSIONS OF X2 ON ABUNDANCE UPSTREAM AND DOWNSTREAM OF THE DISCONTINUITIES

Crangon franciscorum

Regression Statistics	
Multiple R	0.945142
R Square	0.893293
Adjusted R Square	0.857724
Standard Error	547.3401
Observations	5

Analysis of Variance

	df	*Sum of Squares*	*Mean Square*	*F*	*Significance F*
Regression	1	7523776.523	7523776.5	25.11432	0.01529647
Residual	3	898743.4774	299581.16		
Total	4	8422520			

	Coefficients	*Standard Error*	*t Statistic*	*P-value*	*Lower 95%*	*Upper 95%*
Crangon, below 71	16622.55	2023.581466	8.2144206	0.001197	10182.60378	23062.49
X2	-172.548	34.43100274	-5.0114188	0.00743	-282.123094	-62.9733

Regression Statistics	
Multiple R	0.059155
R Square	0.003499
Adjusted R Square	-0.24563
Standard Error	746.6124
Observations	6

Analysis of Variance

	df	*Sum of Squares*	*Mean Square*	*F*	*Significance F*
Regression	1	7829.981519	7829.9815	0.014047	0.911370485
Residual	4	2229720.018	557430		
Total	5	2237550			

	Coefficients	*Standard Error*	*t Statistic*	*P-value*	*Lower 95%*	*Upper 95%*
Crangon, above 71	2647.787	4253.207863	0.6225387	0.560876	-9161.03599	14456.61
X2	-6.39671	53.97239808	-0.1185182	0.910271	-156.248425	143.455

Delta Smelt

Regression Statistics	
Multiple R	0.173738
R Square	0.030185
Adjusted R Square	-0.03447
Standard Error	539.6022
Observations	17

Analysis of Variance

	df	*Sum of Squares*	*Mean Square*	*F*	*Significance F*
Regression	1	135937.4662	135937.47	0.466865	0.504850699
Residual	15	4367558.651	291170.58		
Total	16	4503496.118			

	Coefficients	*Standard Error*	*t Statistic*	*P-value*	*Lower 95%*	*Upper 95%*
Delta Smelt, below 78	-23.2075	1029.602381	-0.0225402	0.982296	-2217.75434	2171.339
X2	10.78815	15.78887984	0.6832755	0.504208	-22.8650668	44.44138

Regression Statistics	
Multiple R	0.471764
R Square	0.222561
Adjusted R Square	0.067074
Standard Error	186.7999
Observations	7

Analysis of Variance

	df	*Sum of Squares*	*Mean Square*	*F*	*Significance F*
Regression	1	49946.70204	49946.702	1.431375	0.285172416
Residual	5	174471.0122	34894.202		
Total	6	224417.7143			

	Coefficients	*Standard Error*	*t Statistic*	*P-value*	*Lower 95%*	*Upper 95%*
Delta Smelt, above 78	-1361.95	1430.627602	-0.9519928	0.377859	-5039.48655	2315.592
X2	20.30503	16.97175813	1.196401	0.276667	-23.3221933	63.93225

Longfin Smelt

Regression Statistics	
Multiple R	0.493752
R Square	0.243791
Adjusted R Square	0.175044
Standard Error	24539.24
Observations	13

Analysis of Variance

	df	*Sum of Squares*	*Mean Square*	*F*	*Significance F*
Regression	1	2135451431	2.135E+09	3.546235	0.086376963
Residual	11	6623917477	602174316		
Total	12	8759368908			

	Coefficients	*Standard Error*	*t Statistic*	*P-value*	*Lower 95%*	*Upper 95%*
Longfin, below 71	154583.6	70081.48697	2.2057697	0.047641	335.232469	308832
X2	-2216.11	1176.810779	-1.8831449	0.08414	-4806.24957	374.0392

Regression Statistics	
Multiple R	0.716918
R Square	0.513972
Adjusted R Square	0.453218
Standard Error	453.7438
Observations	10

Analysis of Variance

	df	*Sum of Squares*	*Mean Square*	*F*	*Significance F*
Regression	1	1741762.305	1741762.3	8.459942	0.019631238
Residual	8	1647067.795	205883.47		
Total	9	3388830.1			

	Coefficients	*Standard Error*	*t Statistic*	*P-value*	*Lower 95%*	*Upper 95%*
Longfin, above 71	6188.424	1840.548753	3.3622711	0.008359	1944.108063	10432.74
X2	-66.6644	22.91977507	-2.908598	0.017351	-119.517542	-13.8113

Neomysis

Regression Statistics	
Multiple R	0.334687
R Square	0.112016
Adjusted R Square	-0.01484
Standard Error	30.01439
Observations	9

Analysis of Variance

	df	Sum of Squares	Mean Square	F	Significance F
Regression	1	795.4816613	795.48166	0.883021	0.378661141
Residual	7	6306.047228	900.86389		
Total	8	7101.528889			

	Coefficients	Standard Error	t Statistic	P-value	Lower 95%	Upper 95%
Neomysis, below 74	-64.1319	143.9279463	-0.4455833	0.66771	-404.467155	276.2034
X2	1.992327	2.120191461	0.9396919	0.374878	-3.02112576	7.005779

Regression Statistics	
Multiple R	0.417614
R Square	0.174401
Adjusted R Square	0.071202
Standard Error	17.86589
Observations	10

Analysis of Variance

	df	Sum of Squares	Mean Square	F	Significance F
Regression	1	539.4115359	539.41154	1.689938	0.22981139
Residual	8	2553.520824	319.1901		
Total	9	3092.93236			

	Coefficients	Standard Error	t Statistic	P-value	Lower 95%	Upper 95%
Neomysis, above 74	160.7216	101.1778349	1.5885057	0.146635	-72.5950923	394.0382
X2	-1.56391	1.203031012	-1.2999762	0.225914	-4.33810799	1.210285

Phytoplankton POC

Regression Statistics	
Multiple R	0.647661
R Square	0.419465
Adjusted R Square	0.303358
Standard Error	2.346443
Observations	7

Analysis of Variance

	df	Sum of Squares	Mean Square	F	Significance F
Regression	1	19.89103449	19.891034	3.612746	0.115755914
Residual	5	27.52896551	5.5057931		
Total	6	47.42			

	Coefficients	Standard Error	t Statistic	P-value	Lower 95%	Upper 95%
POC, below 75	34.98209	11.44171195	3.0574176	0.022299	5.570282319	64.3939
X2	-0.32634	0.171690629	-1.9007226	0.106064	-0.76768035	0.115008

Regression Statistics	
Multiple R	0.522089
R Square	0.272577
Adjusted R Square	0.151339
Standard Error	2.95867
Observations	8

Analysis of Variance

	df	Sum of Squares	Mean Square	F	Significance F
Regression	1	19.68092937	19.680929	2.248292	0.184423815
Residual	6	52.52235813	8.7537264		
Total	7	72.2032875			

	Coefficients	Standard Error	t Statistic	P-value	Lower 95%	Upper 95%
POC, above 75	33.9571	18.24915704	1.860749	0.105096	-10.6970098	78.61121
X2	-0.32822	0.218898414	-1.4994304	0.177442	-0.86384846	0.207403

Splittail

Regression Statistics	
Multiple R	0.448228
R Square	0.200908
Adjusted R Square	0.139439
Standard Error	39.95802
Observations	15

Analysis of Variance

	df	Sum of Squares	Mean Square	F	Significance F
Regression	1	5218.569152	5218.5692	3.268463	0.093806342
Residual	13	20756.36418	1596.6434		
Total	14	25974.93333			

	Coefficients	Standard Error	t Statistic	P-value	Lower 95%	Upper 95%
Splittail, below 80	273.7339	130.1008991	2.1040125	0.053931	-7.33193692	554.7998
X2	-3.29893	1.824743516	-1.807889	0.092151	-7.24105163	0.643184

Regression Statistics	
Multiple R	0.316082
R Square	0.099908
Adjusted R Square	-0.05011
Standard Error	10.02548
Observations	8

Analysis of Variance

	df	Sum of Squares	Mean Square	F	Significance F
Regression	1	66.93830312	66.938303	0.665985	0.445636757
Residual	6	603.0616969	100.51028		
Total	7	670			

	Coefficients	Standard Error	t Statistic	P-value	Lower 95%	Upper 95%
Splittail, above 80	140.7261	159.6147611	0.881661	0.407213	-249.837434	531.2896
X2	-1.4529	1.780343686	-0.8160788	0.441337	-5.80924801	2.903446

Starry Flounder

Regression Statistics	
Multiple R	0.619392
R Square	0.383647
Adjusted R Square	0.229558
Standard Error	28.93109
Observations	6

Analysis of Variance

	df	Sum of Squares	Mean Square	F	Significance F
Regression	1	2083.969119	2083.9691	2.489785	0.18972555
Residual	4	3348.030881	837.00772		
Total	5	5432			

	Coefficients	Standard Error	t Statistic	P-value	Lower 95%	Upper 95%
Starry F, below 73	199.724	103.8007672	1.9241093	0.112335	-88.4737124	487.9217
X2	-2.61082	1.654608487	-1.5779052	0.175417	-7.20475449	1.983124

Regression Statistics	
Multiple R	0.23401
R Square	0.054761
Adjusted R Square	-0.18155
Standard Error	6.449071
Observations	6

Analysis of Variance

	df	Sum of Squares	Mean Square	F	Significance F
Regression	1	9.637919877	9.6379199	0.231734	0.655391582
Residual	4	166.3620801	41.59052		
Total	5	176			

	Coefficients	Standard Error	t Statistic	P-value	Lower 95%	Upper 95%
Starry F, above 73	28.2254	46.24449626	0.6103515	0.568303	-100.170173	156.621
X2	-0.27863	0.578807538	-0.4813871	0.65057	-1.88566119	1.3284

Striped Bass Survival

Regression Statistics	
Multiple R	0.291121
R Square	0.084752
Adjusted R Square	0.008481
Standard Error	0.156805
Observations	14

Analysis of Variance

	df	*Sum of Squares*	*Mean Square*	*F*	*Significance F*
Regression	1	0.027322014	0.027322	1.111196	0.312584793
Residual	12	0.2950552	0.0245879		
Total	13	0.322377214			

	Coefficients	*Standard Error*	*t Statistic*	*P-value*	*Lower 95%*	*Upper 95%*
SB survival, below 80	0.749377	0.461747595	1.6229154	0.128596	-0.25668427	1.755439
X2	-0.00692	0.006562317	-1.0541328	0.311021	-0.02121561	0.007381

Regression Statistics	
Multiple R	0.388159
R Square	0.150668
Adjusted R Square	0.009112
Standard Error	0.040088
Observations	8

Analysis of Variance

	df	*Sum of Squares*	*Mean Square*	*F*	*Significance F*
Regression	1	0.001710453	0.0017105	1.064372	0.34200095
Residual	6	0.009642047	0.001607		
Total	7	0.0113525			

	Coefficients	*Standard Error*	*t Statistic*	*P-value*	*Lower 95%*	*Upper 95%*
SB survival, above 80	0.448712	0.367016269	1.2225952	0.261045	-0.44934478	1.346769
X2	-0.00442	0.00428507	-1.0316839	0.336542	-0.01490603	0.006064

Striped Bass Trawl

Regression Statistics	
Multiple R	0.624665
R Square	0.390207
Adjusted R Square	0.313982
Standard Error	2589.24
Observations	10

Analysis of Variance

	df	*Sum of Squares*	*Mean Square*	*F*	*Significance F*
Regression	1	34319934.68	34319935	5.119196	0.053507813
Residual	8	53633315.32	6704164.4		
Total	9	87953250			

	Coefficients	*Standard Error*	*t Statistic*	*P-value*	*Lower 95%*	*Upper 95%*
SB trawl, below 78	38652.6	14209.99198	2.7201001	0.023604	5884.279325	71420.92
X2	-445.771	197.020069	-2.2625641	0.049967	-900.099929	8.558846

Regression Statistics	
Multiple R	0.612389
R Square	0.375021
Adjusted R Square	0.312523
Standard Error	1249.842
Observations	12

Analysis of Variance

	df	*Sum of Squares*	*Mean Square*	*F*	*Significance F*
Regression	1	9373455.512	9373455.5	6.000529	0.034281366
Residual	10	15621047.4	1562104.7		
Total	11	24994502.92			

	Coefficients	*Standard Error*	*t Statistic*	*P-value*	*Lower 95%*	*Upper 95%*
SB trawl, above 78	20039.17	7412.076649	2.7035833	0.020525	3524.027868	36554.31
X2	-208.84	85.25465084	-2.4495978	0.032269	-398.798839	-18.8804

Tab 13.
Trend Analyses of Total, Average, and Median Indices

13a. DATA USED IN TREND ANALYSES

	STRIPED BASS		LONGFIN SMELT		DELTA SMELT		SPLITTAIL	
Year	Total Index	Median	Total Index	Median	Total Index	Median	Total Index	Median
1967	21,081.55	3,388.41	81,731.76	12,149.85	414.92	109.30	66.25	10.22
1968	4,117.67	1,039.28	3,317.54	717.67	696.54	177.24	18.06	4.65
1969	8,424.57	1,565.97	59,493.34	8,889.35	315.65	66.05	25.92	6.40
1970	8,297.77	2,056.11	6,534.63	977.80	1,677.46	426.42	25.44	1.98
1971	9,473.61	2,075.32	15,986.42	3,911.39	1,305.15	317.33	17.41	4.05
1972	6,128.62	1,177.49	759.50	127.93	1,266.90	307.13	12.50	1.88
1973	4,284.26	1,164.68	5,896.12	1,146.90	1,145.84	310.14	4.43	1.00
1975	4,547.33	1,047.18	2,808.64	646.45	697.88	158.02	3.57	0.71
1976	757.48	199.84	653.96	51.17	337.85	85.32	1.00	0.00
1977	884.39	198.53	204.36	53.14	479.48	92.64	0.00	0.00
1978	2,600.50	570.12	6,675.13	1,625.07	571.58	115.79	37.23	9.10
1980	1,462.40	324.62	31,152.79	6,212.46	1,651.31	395.75	16.97	2.95
1981	4,532.29	976.73	2,201.58	310.09	374.99	93.28	18.26	3.28
1982	4,467.30	1,026.61	62,924.56	13,418.21	345.97	69.59	118.60	16.14
1983	12,495.84	2,635.46	11,874.62	3,157.94	132.31	26.12	153.15	40.24
1984	6,601.29	1,336.41	7,457.90	2,259.07	181.45	45.34	16.17	2.76
1985	1,759.09	438.07	991.68	125.26	109.12	25.79	14.89	3.37
1986	3,943.78	520.78	6,159.65	1,665.51	211.78	52.32	57.74	12.54
1987	1,351.13	289.18	1,507.50	259.12	280.08	70.23	28.60	6.95
1988	476.71	117.52	742.62	103.34	126.21	32.73	8.99	2.36
1989	440.73	113.74	456.11	34.47	366.15	81.42	4.06	0.60
1990	1,318.88	316.16	239.29	43.61	363.43	79.59	8.99	1.84
1991	945.71	193.38	134.10	17.38	689.09	187.55	17.98	3.93
1992	2,018.12	578.14	73.81	7.16	156.87	40.89	3.60	0.60
1993					1,078.00	257.00		

Year	STRIPED BASS Total Index	STRIPED BASS Average Index	STRIPED BASS Standard Deviation	LONGFIN SMELT Total Index	LONGFIN SMELT Average Index	LONGFIN SMELT Standard Deviation	DELTA SMELT Total Index	DELTA SMELT Average Index	DELTA SMELT Standard Deviation	SPLITTAIL Total Index	SPLITTAIL Average Index	SPLITTAIL Standard Deviation
1967	21,081.55	5,270.39	4,695.30	81,731.76	20,432.94	19,863.57	414.92	103.73	56.59	66.25	16.56	18.22
1968	4,117.67	1,029.42	646.47	3,317.54	829.39	420.99	696.54	174.13	82.04	18.06	4.52	2.62
1969	8,424.57	2,106.14	1,246.63	59,493.34	14,873.34	13,504.47	315.65	78.91	50.43	25.92	6.48	3.06
1970	8,297.77	2,074.44	570.50	6,534.63	1,633.66	1,712.53	1,677.46	419.36	277.39	25.44	6.36	10.12
1971	9,473.61	2,368.40	1,134.63	15,986.42	3,996.61	1,620.04	1,305.15	326.29	144.55	17.41	4.35	2.83
1972	6,128.62	1,532.15	1,136.90	759.50	189.88	139.09	1,266.90	316.73	241.56	12.50	3.13	3.89
1973	4,284.26	1,071.07	471.42	5,896.12	1,474.03	897.59	1,145.84	286.46	59.44	4.43	1.11	1.29
1975	4,547.33	1,136.83	496.59	2,808.64	702.16	367.38	697.88	174.47	95.08	3.57	0.89	0.90
1976	757.48	189.37	56.29	653.96	163.49	254.13	337.85	84.46	44.55	1.00	0.33	0.36
1977	884.39	221.10	58.38	204.36	51.09	33.26	479.48	119.87	84.09	0.00	0.00	0.00
1978	2,600.50	650.13	332.00	6,675.13	1,668.78	465.69	571.58	142.90	124.83	37.23	9.31	6.93
1980	1,462.40	365.60	257.49	31,152.79	7,788.20	5,103.08	1,651.31	412.83	130.94	16.97	4.24	4.92
1981	4,532.29	1,133.07	605.35	2,201.58	550.40	576.05	374.99	93.75	63.28	18.26	4.56	2.71
1982	4,467.30	1,116.82	253.25	62,924.56	15,731.14	8,715.32	345.97	86.49	54.74	118.60	29.65	31.09
1983	12,495.84	3,123.96	1,568.95	11,874.62	2,968.65	2,156.93	132.31	33.08	32.00	153.15	38.29	24.31
1984	6,601.29	1,650.32	683.85	7,457.90	1,864.47	1,074.53	181.45	45.36	17.34	16.17	4.04	3.89
1985	1,759.09	439.77	403.83	991.68	247.92	328.75	109.12	27.28	10.02	14.89	3.72	3.35
1986	3,943.78	985.94	1,156.58	6,159.65	1,539.91	402.13	211.78	52.95	34.93	57.74	14.43	7.54
1987	1,351.13	337.78	198.38	1,507.50	376.87	386.18	280.08	70.02	24.70	28.60	7.15	4.48
1988	476.71	119.18	20.80	742.62	185.66	237.01	126.21	31.55	11.31	8.99	2.25	1.76
1989	440.73	110.18	49.56	456.11	114.03	175.22	366.15	91.54	47.66	4.06	1.01	1.35
1990	1,318.88	329.72	113.54	239.29	59.82	69.35	363.43	90.86	75.07	8.99	2.25	2.28
1991	945.71	236.43	153.82	134.10	33.53	40.35	689.09	172.27	112.96	17.98	4.50	4.50
1992	2,018.12	504.53	175.92	73.81	18.45	27.79	156.87	39.22	30.99	3.60	0.90	1.15
1993							1,078.00	269.50	181.63			

13b. REGRESSION ANALYSES FOR TOTAL INDICES

Delta Smelt -- Total Abundance/Year

Regression Statistics

Multiple R	0.4068213
R Square	0.1655036
Adjusted R Square	0.1292211
Standard Error	446.51761
Observations	25

Analysis of Variance

	df	Sum of Squares	Mean Square	F	Significance F
Regression	1	909468.8849	909468.88	4.5615313	0.04356818
Residual	23	4585693.44	199377.98		
Total	24	5495162.325			

	Coefficients	Standard Error	t Statistic	P-value	Lower 95%	Upper 95%
Intercept	47826.095	22112.56234	2.1628473	0.0407354	2082.83708	93569.35
x1	-23.848675	11.16629063	-2.1357742	0.0431033	-46.947876	-0.74947

Longfin Smelt -- Abundance/Year

Regression Statistics

Multiple R	0.4153855
R Square	0.1725451
Adjusted R Square	0.1349335
Standard Error	21055.338
Observations	24

Analysis of Variance

	df	*Sum of Squares*	*Mean Square*	*F*	*Significance F*
Regression	1	2033787109	2.034E+09	4.5875526	0.04352981
Residual	22	9753199560	443327253		
Total	23	11786986669			

	Coefficients	*Standard Error*	*t Statistic*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	2373498.1	1102127.75	2.1535599	0.0419934	87822.627	4659174
x1	-1192.3639	556.6962345	-2.1418573	0.0430237	-2346.8825	-37.8453

Splittail -- Abundance/Year

Regression Statistics

Multiple R	0.0012542
R Square	1.573E-06
Adjusted R Square	-0.0454529
Standard Error	38.107587
Observations	24

Analysis of Variance

	df	*Sum of Squares*	*Mean Square*	*F*	*Significance F*
Regression	1	0.050256212	0.0502562	3.461E-05	0.99535926
Residual	22	31948.13959	1452.1882		
Total	23	31948.18984			

	Coefficients	*Standard Error*	*t Statistic*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	16.590362	1994.716449	0.0083172	0.9934357	-4120.2028	4153.384
x1	0.0059272	1.007552106	0.0058828	0.995357	-2.0836102	2.095465

Striped Bass -- Abundance/Year

Regression Statistics

Multiple R	0.5733168
R Square	0.3286922
Adjusted R Square	0.2981782
Standard Error	3980.0248
Observations	24

Analysis of Variance

	df	*Sum of Squares*	*Mean Square*	*F*	*Significance F*
Regression	1	170632543.1	170632543	10.77185	0.00340389
Residual	22	348493146.2	15840598		
Total	23	519125689.3			

	Coefficients	*Standard Error*	*t Statistic*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	688433.81	208331.7697	3.3045071	0.0030964	256379.703	1120488
x1	-345.3719	105.2305521	-3.2820497	0.0032683	-563.60694	-127.137

13c. REGRESSION ANALYSES FOR MEDIAN INDICES

Delta Smelt -- Median/Year

Regression Statistics	
Multiple R	0.4054336
R Square	0.1643764
Adjusted R Square	0.1280449
Standard Error	112.46399
Observations	25

Analysis of Variance

	df	*Sum of Squares*	*Mean Square*	*F*	*Significance F*
Regression	1	57224.69931	57224.6993	4.5243533	0.04435964
Residual	23	290907.4519	12648.1501		
Total	24	348132.1512			

	Coefficients	*Standard Error*	*t Statistic*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	11991.382	5569.471479	2.15305563	0.041578	470.068071	23512.696
x1	-5.9822161	2.812443725	-2.1270527	0.043892	-11.8001913	-0.1642409

Longfin Smelt -- Median/Year

Regression Statistics	
Multiple R	0.3571361
R Square	0.1275462
Adjusted R Square	0.0878892
Standard Error	3697.5753
Observations	24

Analysis of Variance

	df	*Sum of Squares*	*Mean Square*	*F*	*Significance F*
Regression	1	43972574.86	43972574.9	3.2162355	0.08667075
Residual	22	300785392.4	13672063.3		
Total	23	344757967.3			

	Coefficients	*Standard Error*	*t Statistic*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	349515.13	193547.1376	1.80583984	0.0840492	-51877.4949	750907.76
x1	-175.32628	97.76268011	-1.7933866	0.086072	-378.073887	27.421327

Splittail -- Median/Year

Regression Statistics

Multiple R	0.0499781
R Square	0.0024978
Adjusted R Square	-0.0428432
Standard Error	8.6126311
Observations	24

Analysis of Variance

	df	Sum of Squares	Mean Square	F	Significance F
Regression	1	4.086398166	4.08639817	0.0550895	0.81660335
Residual	22	1631.903117	74.1774144		
Total	23	1635.989515			

	Coefficients	Standard Error	t Statistic	P-value	Lower 95%	Upper 95%
Intercept	-100.0802	450.8224848	-0.2219947	0.8262774	-1035.02981	834.86942
x1	0.0534474	0.227715144	0.23471157	0.8165096	-0.41880543	0.5257002

Striped Bass -- Median/Year

Regression Statistics	
Multiple R	0.607766
R Square	0.3693796
Adjusted R Square	0.340715
Standard Error	697.35191
Observations	24

Analysis of Variance

	df	*Sum of Squares*	*Mean Square*	*F*	*Significance F*
Regression	1	6266592.674	6266592.67	12.886278	0.00163129
Residual	22	10698593	486299.682		
Total	23	16965185.68			

	Coefficients	*Standard Error*	*t Statistic*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	132006.35	36502.42485	3.61637204	0.0014507	56304.8714	207707.83
x1	-66.186864	18.43775593	-3.5897462	0.0015485	-104.42447	-27.949257

13d. WEIGHTED REGRESSION ANALYSES FOR AVERAGE INDICES

```
TUE 2/15/94 8:53:43 PM

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Welcome to SYSTAT!
 WORKSPACE CLEAR FOR CREATING NEW DATASET

 Successful import of file  C:\SYSTATW5\TEMP\SMLTYDEV.XLS
USE 'C:\SYSTATW5\SMLTYDEV.SYS'
 Imported from: C:\SYSTATW5\TEMP\SMLTYDEV.XLS
 SYSTAT FILE VARIABLES AVAILABLE TO YOU ARE:
       YEAR          DSMELT          STDEV        WEIGHT          YEARW
    DSMELTW

>PAGE NARROW
>FORMAT 5

>MGLH
>MODEL DSMELTW = YEARW+WEIGHT
>ESTIMATE

TUE 2/15/94 8:55:28 PM   C:\SYSTATW5\SMLTYDEV.SYS

 MODEL CONTAINS NO CONSTANT.

 DEP VAR: DSMELTW      N:      25  MULTIPLE R: 0.820  SQUARED MULTIPLE R: 0.673
 ADJUSTED SQUARED MULTIPLE R:  .659   STANDARD ERROR OF ESTIMATE:      1.26350
```

VARIABLE	COEFFICIENT	STD ERROR	STD COEF	TOLERANCE	T	P(2 TAIL)
YEARW	-5.09822	1.74424	-162.58827	0.00000	-2.92289	0.00765
WEIGHT	10166.98243	3462.59481	163.33057	0.00000	2.93623	0.00742

ANALYSIS OF VARIANCE

SOURCE	SUM-OF-SQUARES	DF	MEAN-SQUARE	F-RATIO	P
REGRESSION	75.57505	2	37.78753	23.66997	0.00000
RESIDUAL	36.71796	23	1.59643		

```
>HYPOTHESIS
>EFFECT=YEARW
>TEST

TUE 2/15/94 8:56:00 PM   C:\SYSTATW5\SMLTYDEV.SYS
 TEST FOR EFFECT CALLED:      YEARW

 TEST OF HYPOTHESIS
```

SOURCE	SS	DF	MS	F	P
HYPOTHESIS	13.63876	1	13.63876	8.54327	0.00765
ERROR	36.71796	23	1.59643		

>

FRI 2/11/94 11:02:13 AM

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Welcome to SYSTAT!
WORKSPACE CLEAR FOR CREATING NEW DATASET

>PAGE NARROW
>FORMAT 5

> Successful import of file C:\SYSTATW5\TEMP\LONGYDEV.XLS
>USE 'C:\SYSTATW5\LONGYDEV.SYS'
Imported from: C:\SYSTATW5\TEMP\LONGYDEV.XLS
SYSTAT FILE VARIABLES AVAILABLE TO YOU ARE:
YEAR LONGFIN STDEV WEIGHT YEARW
LONGFINW

>MGLH
>MODEL LONGFINW = WEIGHT+YEARW
>ESTIMATE

FRI 2/11/94 11:05:30 AM C:\SYSTATW5\LONGYDEV.SYS

MODEL CONTAINS NO CONSTANT.

DEP VAR:LONGFINW N: 24 MULTIPLE R: 0.409 SQUARED MULTIPLE R: 0.167
ADJUSTED SQUARED MULTIPLE R: .129 STANDARD ERROR OF ESTIMATE: 1.59823

VARIABLE	COEFFICIENT	STD ERROR	STD COEF	TOLERANCE	T	P(2 TAIL)
WEIGHT	8810.77752	8143.65039	60.52164	0.00001	1.08192	0.29101
YEARW	-4.40893	4.09887	-60.17070	0.00001	-1.07565	0.29374

ANALYSIS OF VARIANCE

SOURCE	SUM-OF-SQUARES	DF	MEAN-SQUARE	F-RATIO	P
REGRESSION	11.28326	2	5.64163	2.20864	0.13362
RESIDUAL	56.19566	22	2.55435		

>HYPOTHESIS
>EFFECT=YEARW
>TEST

FRI 2/11/94 11:05:54 AM C:\SYSTATW5\LONGYDEV.SYS
TEST FOR EFFECT CALLED: YEARW

TEST OF HYPOTHESIS

SOURCE	SS	DF	MS	F	P
HYPOTHESIS	2.95542	1	2.95542	1.15702	0.29374
ERROR	56.19566	22	2.55435		

>

```
FRI 2/11/94 11:35:56 AM

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WORKSPACE CLEAR FOR CREATING NEW DATASET

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USE 'C:\SYSTATW5\SPLTYDEV.SYS'
Imported from: C:\SYSTATW5\TEMP\SPLTYDEV.XLS
SYSTAT FILE VARIABLES AVAILABLE TO YOU ARE:
       YEAR            SPLIT           STDEV          WEIGHT           YEARW
     SPLITW

>PAGE NARROW
>FORMAT 5

MGLH
>MODEL SPLITW = WEIGHT+YEARW
>ESTIMATE

FRI 2/11/94 11:37:35 AM    C:\SYSTATW5\SPLTYDEV.SYS

MODEL CONTAINS NO CONSTANT.

DEP VAR:  SPLITW      N:      23  MULTIPLE R: 0.506  SQUARED MULTIPLE R: 0.256
ADJUSTED SQUARED MULTIPLE R:  .221    STANDARD ERROR OF ESTIMATE:      1.12529

VARIABLE      COEFFICIENT    STD ERROR     STD COEF TOLERANCE    T   P(2 TAIL)

WEIGHT          -78.58224    113.23533    -46.33689   0.00001 -0.69397  0.49531
YEARW             0.04015      0.05725     46.82547   0.00001  0.70129  0.49082


                        ANALYSIS OF VARIANCE

SOURCE       SUM-OF-SQUARES   DF  MEAN-SQUARE     F-RATIO       P

REGRESSION          9.14771    2       4.57386    3.61207      0.04485
RESIDUAL           26.59163   21       1.26627


>HYPOTHESIS
>EFFECT=YEARW
>TEST

FRI 2/11/94 11:37:50 AM    C:\SYSTATW5\SPLTYDEV.SYS
 TEST FOR EFFECT CALLED:      YEARW

 TEST OF HYPOTHESIS

       SOURCE         SS          DF        MS              F              P

   HYPOTHESIS      0.62276       1      0.62276        0.49181        0.49082
        ERROR     26.59163      21      1.26627


>
```

FRI 2/11/94 11:02:13 AM

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WORKSPACE CLEAR FOR CREATING NEW DATASET

>PAGE NARROW
>FORMAT 5

> Successful import of file C:\SYSTATW5\TEMP\BASSYDEV.XLS
>USE 'C:\SYSTATW5\BASSYDEV.SYS'
VARIABLES IN SYSTAT RECT FILE ARE:

```
       YEAR          SBASS          STDEV          WEIGHT          YEARW
    SBASSW
```

>MODEL SBASSW = WEIGHT+YEARW
>ESTIMATE

FRI 2/11/94 11:26:34 AM C:\SYSTATW5\BASSYDEV.SYS

MODEL CONTAINS NO CONSTANT.

DEP VAR: SBASSW N: 24 MULTIPLE R: 0.780 SQUARED MULTIPLE R: 0.608
ADJUSTED SQUARED MULTIPLE R: .591 STANDARD ERROR OF ESTIMATE: 1.69991

VARIABLE	COEFFICIENT	STD ERROR	STD COEF	TOLERANCE	T	P(2 TAIL)
WEIGHT	20845.54144	12206.68351	97.81856	0.00001	1.70772	0.10176
YEARW	-10.41569	6.14608	-97.07236	0.00001	-1.69469	0.10425

ANALYSIS OF VARIANCE

SOURCE	SUM-OF-SQUARES	DF	MEAN-SQUARE	F-RATIO	P
REGRESSION	98.74124	2	49.37062	17.08516	0.00003
RESIDUAL	63.57292	22	2.88968		

>HYPOTHESIS
>EFFECT=YEARW
>TEST

FRI 2/11/94 11:26:54 AM C:\SYSTATW5\BASSYDEV.SYS
TEST FOR EFFECT CALLED: YEARW

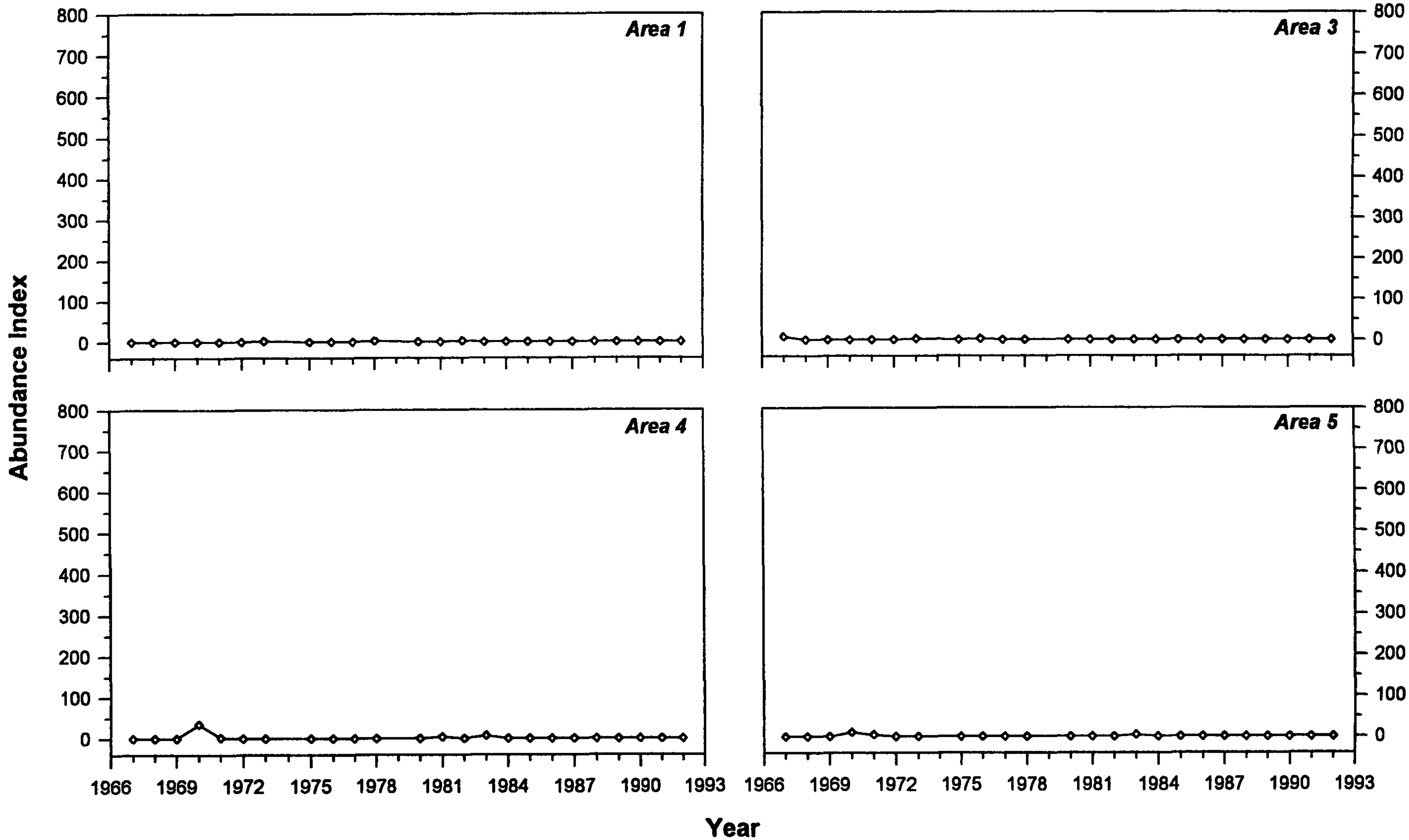
TEST OF HYPOTHESIS

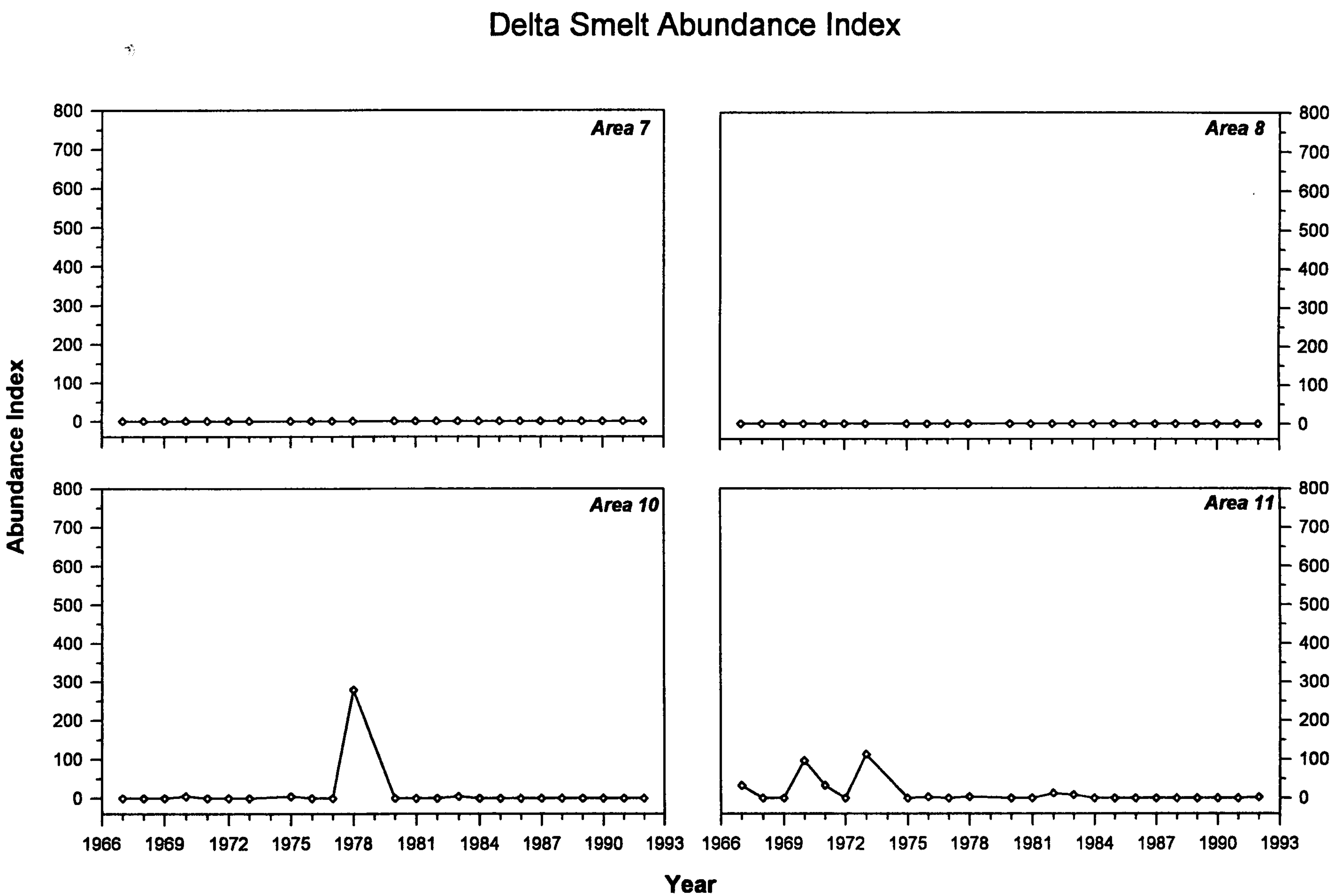
SOURCE	SS	DF	MS	F	P
HYPOTHESIS	8.29906	1	8.29906	2.87197	0.10425
ERROR	63.57292	22	2.88968		

>

13e. TIME SERIES GRAPHS BY SUBAREA

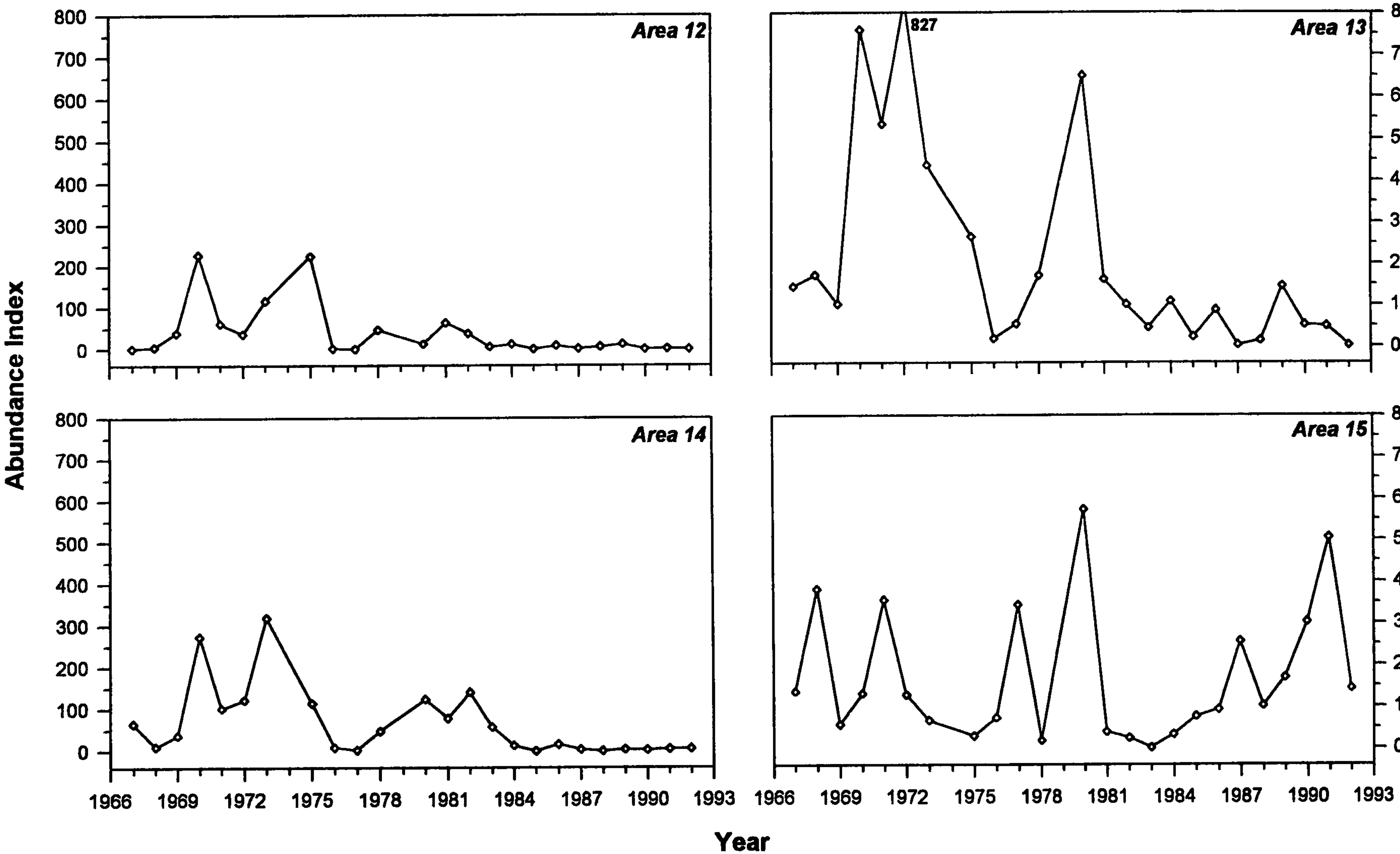
Delta Smelt Abundance Index



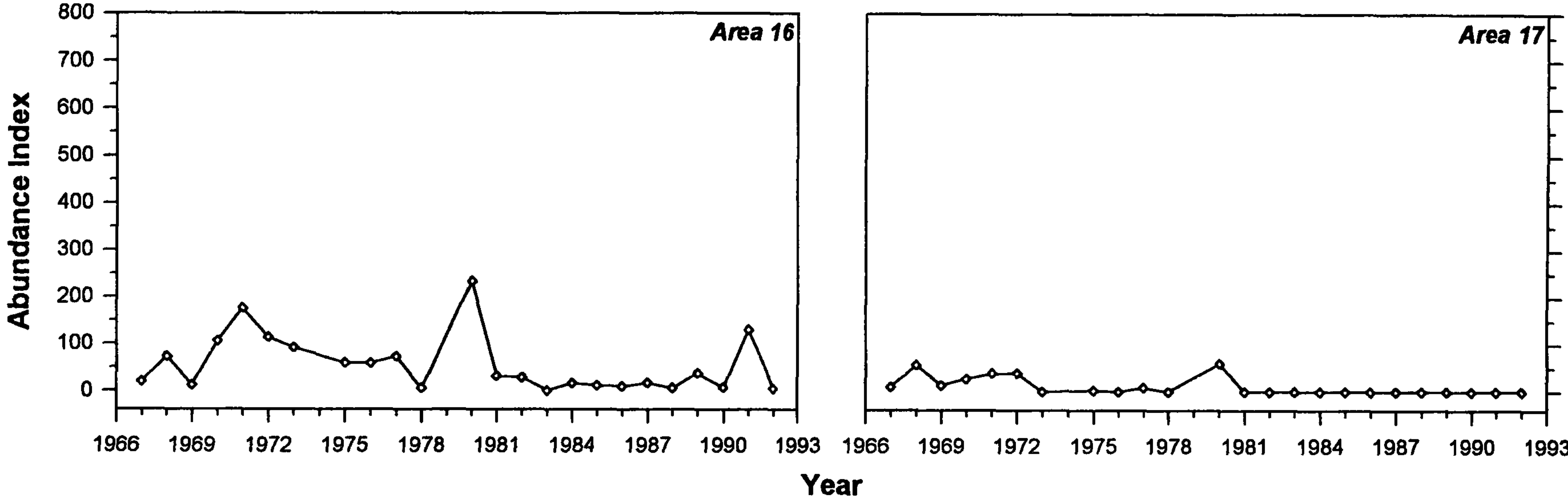


Delta Smelt Abundance Index
Area 7
Area 8
Area 10
Area 11
Abundance Index
Year
800
700
600
500
400
300
200
100
0
1966
1969
1972
1975
1978
1981
1984
1987
1990
1993

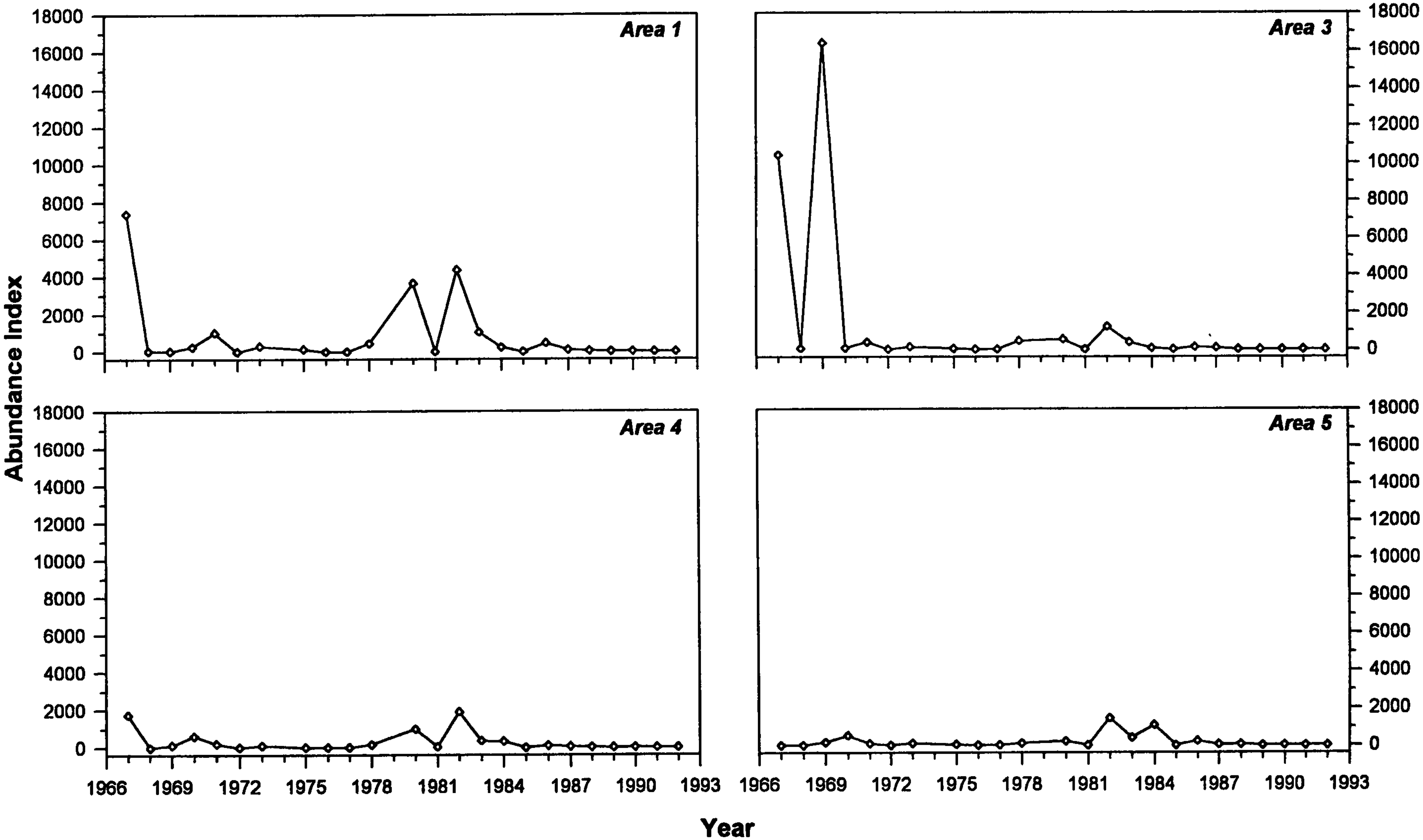
Delta Smelt Abundance Index



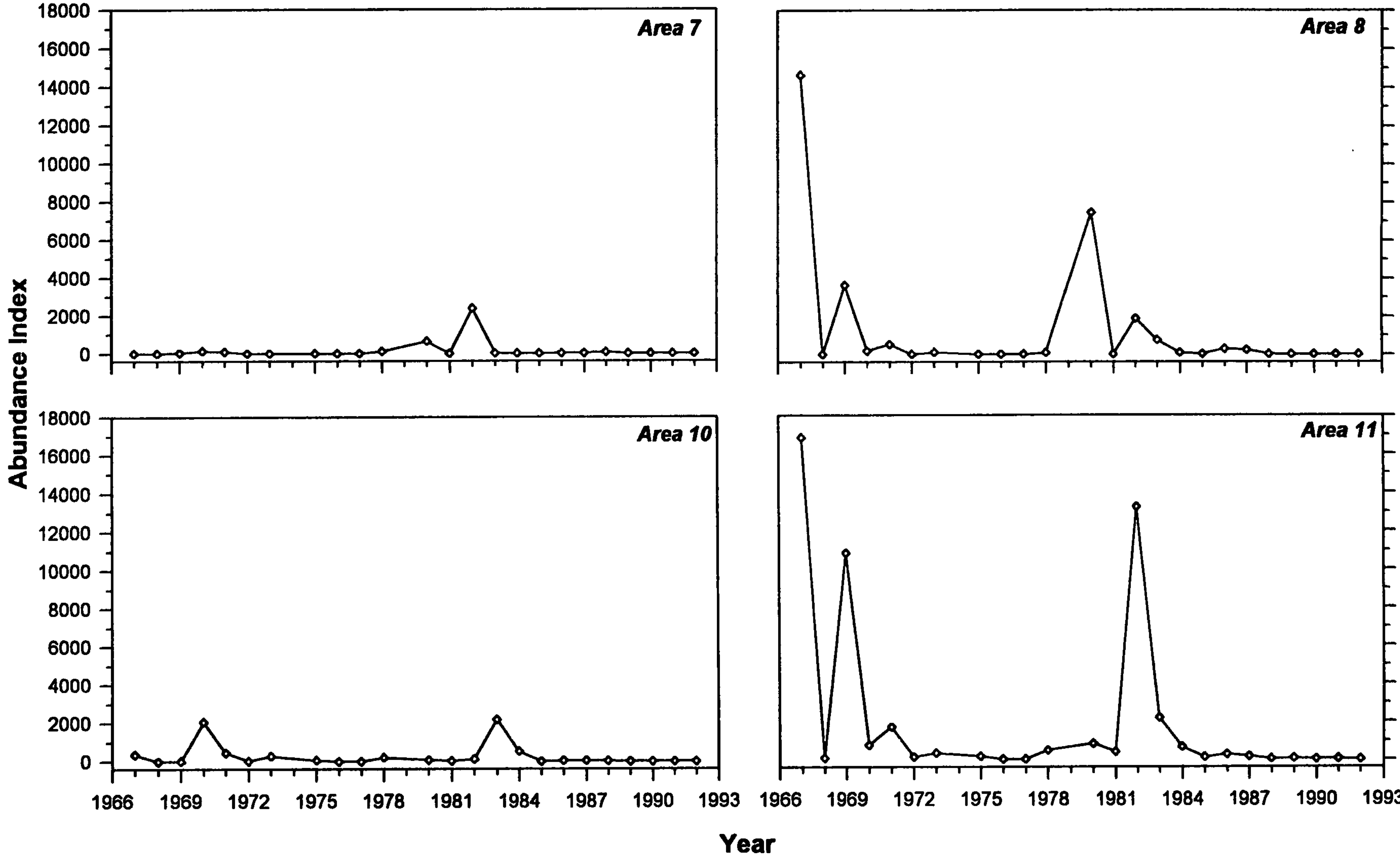
Delta Smelt Abundance Index



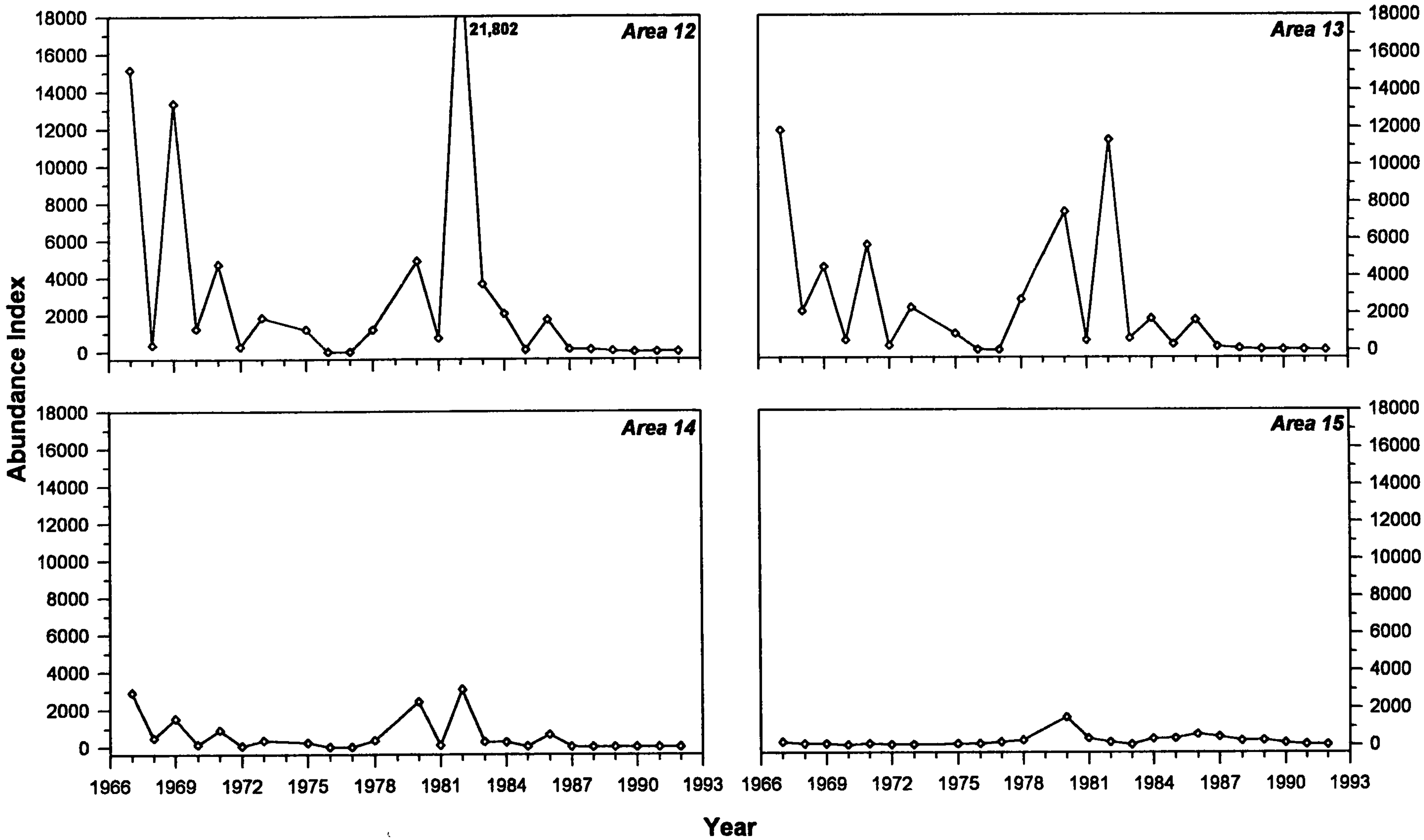
Longfin Smelt Abundance Index



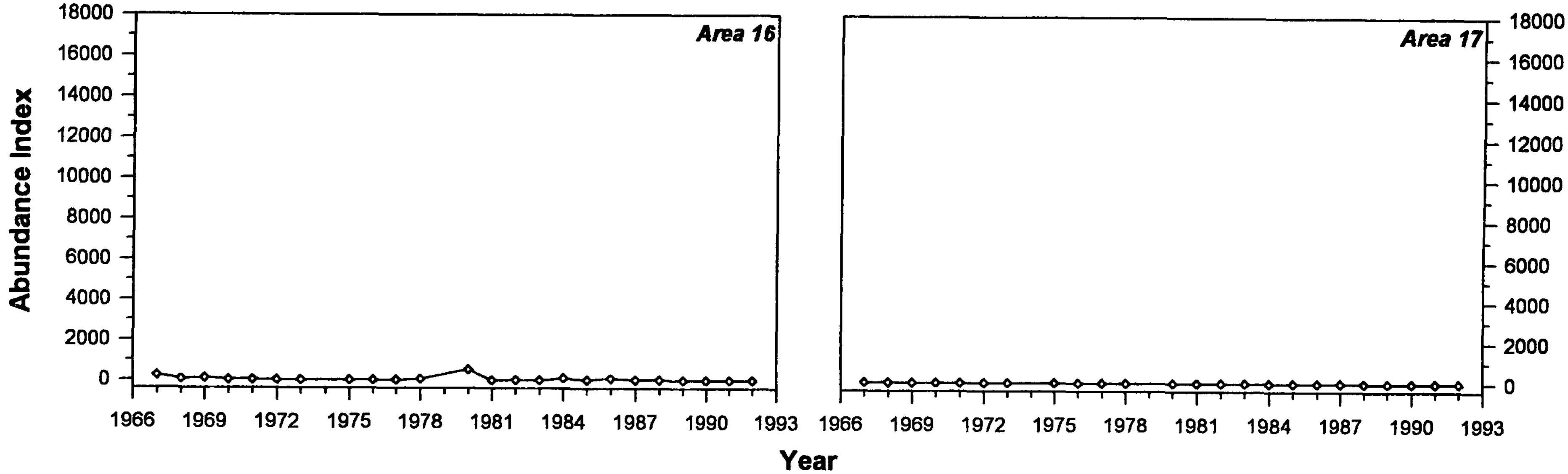
Longfin Smelt Abundance Index



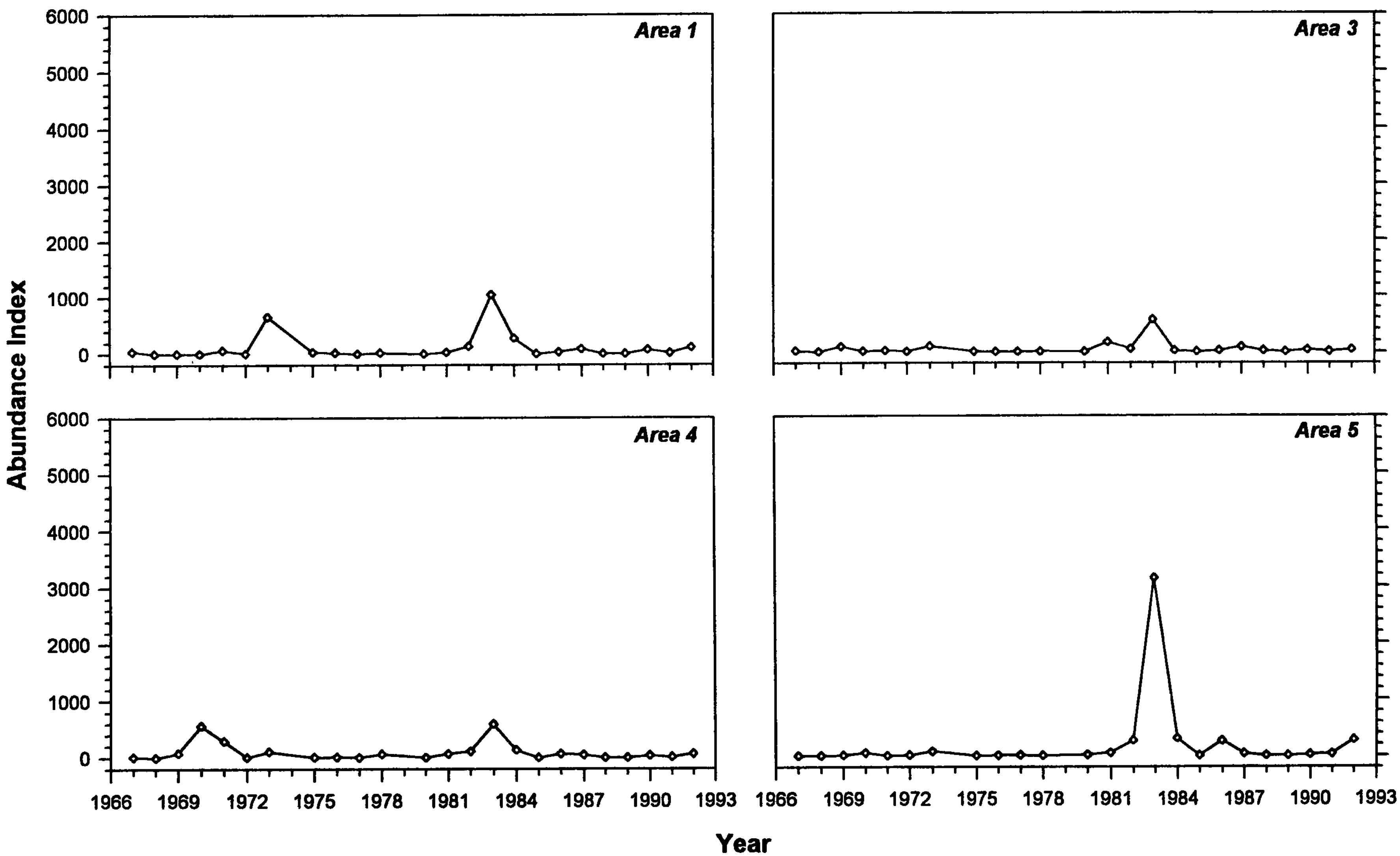
Longfin Smelt Abundance Index

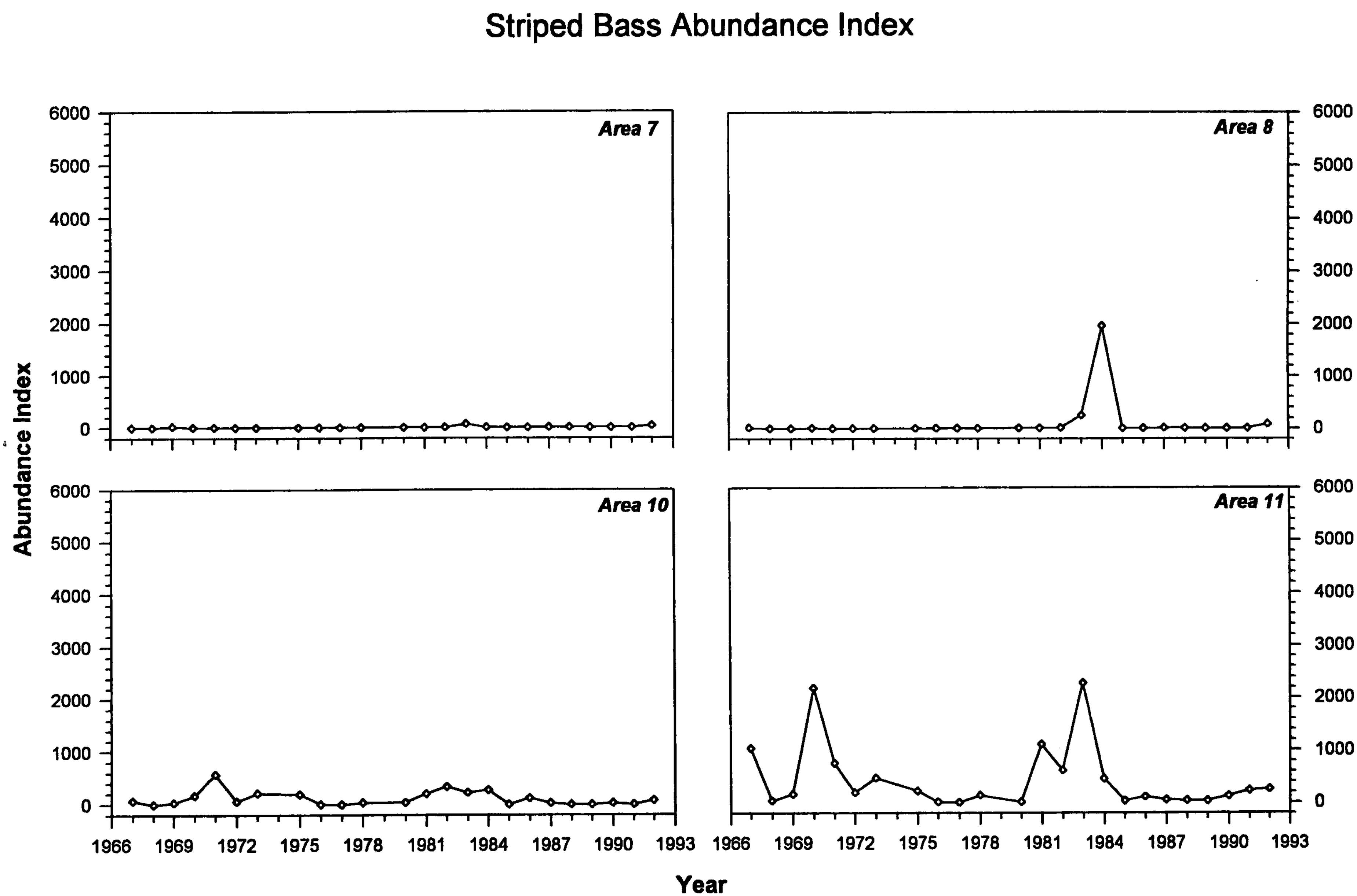


Longfin Smelt Abundance Index

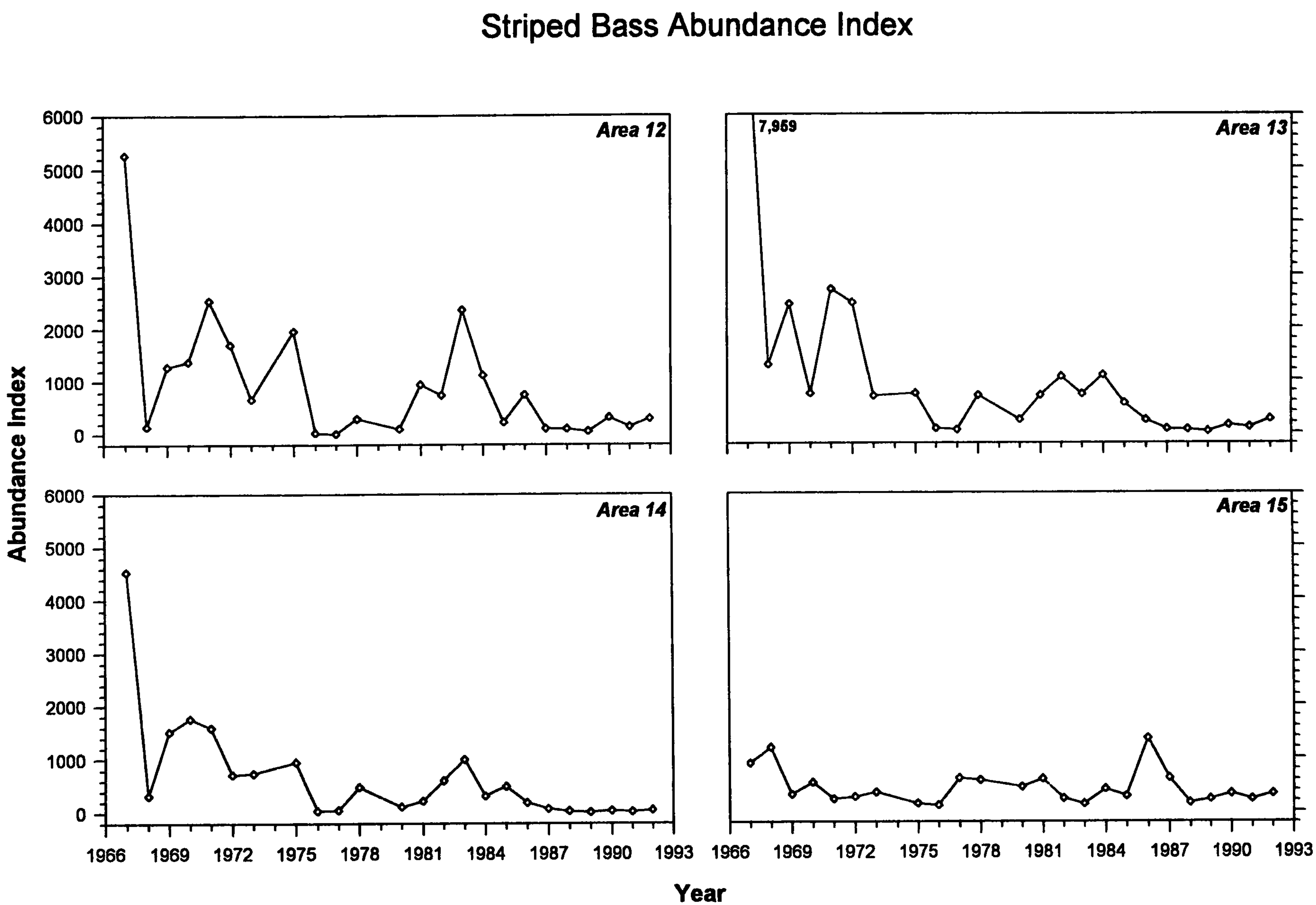


Striped Bass Abundance Index



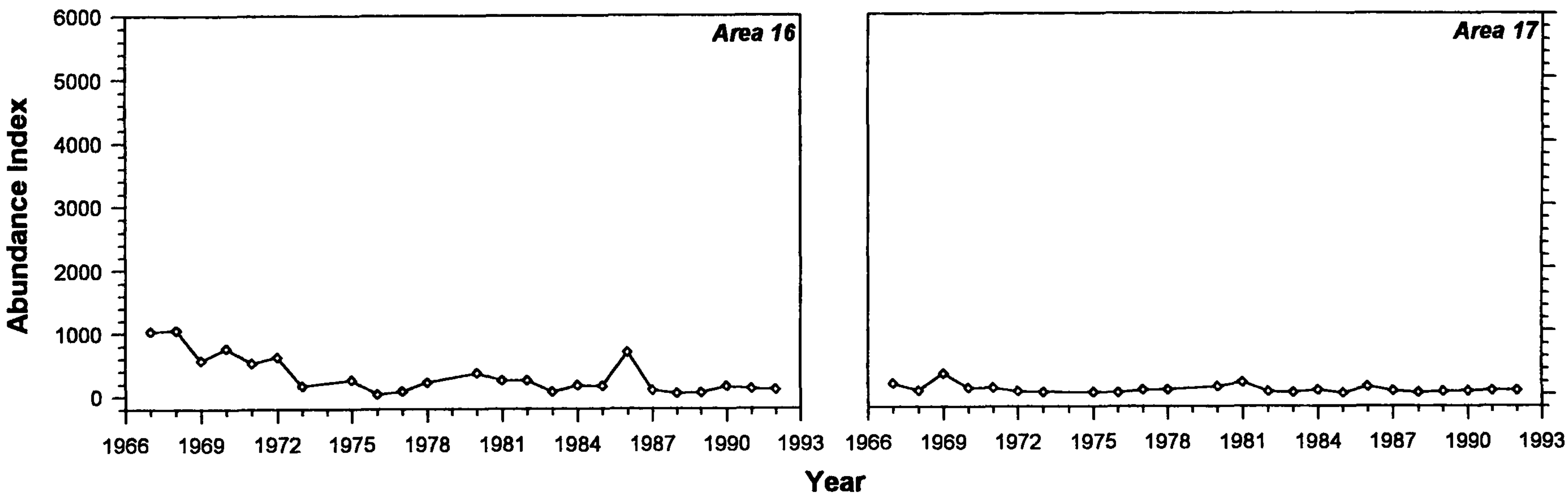


Striped Bass Abundance Index
Area 7
Area 8
Area 10
Area 11
Abundance Index
Year
0
1000
2000
3000
4000
5000
6000
1966
1969
1972
1975
1978
1981
1984
1987
1990
1993



Striped Bass Abundance Index
Area 12
Area 13
7,959
Area 14
Area 15
Abundance Index
Year
0
1000
2000
3000
4000
5000
6000
1966
1969
1972
1975
1978
1981
1984
1987
1990
1993

Striped Bass Abundance Index



Tab 14.
Evaluation Of The Effect Of Compliance Point On Abundance

14a. Data Used In Analyses
14b. Unweighted Least Squares Regression
14c. Weighted Least Squares Regression

14a. DATA USED IN ANALYSES

	February-June		INDICATOR								
YEAR	# Days X2<=64	# Days X2<=74	POC	Neomysis	Crangon	SB Surv	Starry Flounder	Longfin Smelt	SB MWT	Delta Smelt	Splittail
1967	150	150						81,732	21,082	415	66
1968	47	80						3,318	4,118	697	18
1969	148	150				0.231		59,493	8,425	316	26
1970	55	85				0.294		6,535	8,298	1,677	25
1971	91	150				0.272		15,986	9,474	1,305	17
1972	15	76		56.1		0.13		760	6,129	1,267	13
1973	76	113		80.9		0.177		5,896	4,284	1,146	4
1974	107	150		89.9		0.269					
1975	129	148	10.8	81.6		0.151		2,809	4,547	698	4
1976	0	3	9.79	54.6		0.133		654	757	338	1
1977	0	0	5.66	11.3		0.039		204	884	479	0
1978	93	138	11.7	38.5		0.228		6,675	2,601	572	37
1979	16	129	10.2	29.5		0.187					
1980	53	149	12.9	77.3	5520	0.111	21	31,153	1,462	1,651	17
1981	7	72	9.12	33.9	2440	0.291	37	2,202	4,532	375	18
1982	119	150	18.5	88.6	7580	0.711	5	62,925	4,467	346	119
1983	144	150	15.6	16.7	8580		97	11,875	12,496	132	153
1984	45	105	10.9	50.6	5250	0.341	47	7,458	6,601	181	16
1985	0	60	8.89	49.3	910	0.0643	13	992	1,759	109	15
1986	75	138	12.7	113	5850	0.393	17	6,160	3,944	212	58
1987	11	51	3.89	17.7	2870	0.0716	7	1,507	1,351	280	29
1988	0	7	2.59	23.2	2270	0.0261	5	743	477	126	9
1989	18	42	2.97	7.08	2390	0.049	0	456	441	366	4
1990	0	0		11.3	1990	0.0469	2	239	1,319	363	9
1991	4	23				0.0519	7	134	946	689	18
1992	0	41						74	2,018	157	4

14b. UNWEIGHTED LEAST SQUARES REGRESSION

Abundance/X2, Feb-Jun, # of Days <=64

Regression Statistics	
Multiple R	0.74879837
R Square	0.56069899
Adjusted R Square	0.52690661
Standard Error	3.10488023
Observations	15

Analysis of Variance

	df	Sum of Squares	Mean Square	F	Significance F
Regression	1	159.9560372	159.956037	16.5924658	0.00131726
Residual	13	125.3236562	9.64028124		
Total	14	285.2796933			

	Coefficients	Standard Error	t Statistic	P-value	Lower 95%	Upper 95%
POC	6.66781501	1.101923761	6.05106746	2.9817E-05	4.28725391	9.0483761
X2 days	0.06506025	0.015972034	4.07338506	0.0011399	0.03055477	0.09956572

Regression Statistics	
Multiple R	0.52165137
R Square	0.27212015
Adjusted R Square	0.22930369
Standard Error	27.9991832
Observations	19

Analysis of Variance

	df	Sum of Squares	Mean Square	F	Significance F
Regression	1	4982.423639	4982.42364	6.35550298	0.02198075
Residual	17	13327.22242	783.95426		
Total	18	18309.64606			

	Coefficients	Standard Error	t Statistic	P-value	Lower 95%	Upper 95%
Neomysis	33.1818767	8.980602436	3.69483862	0.0016576	14.2344353	52.1293181
X2 days	0.33108408	0.131329815	2.52101229	0.02135348	0.054002	0.60816615

Abundance/X2, Feb-Jun, # of Days <=64

Regression Statistics	
Multiple R	0.96931176
R Square	0.93956528
Adjusted R Square	0.93285031
Standard Error	654.146285
Observations	11

Analysis of Variance

	df	*Sum of Squares*	*Mean Square*	*F*	*Significance F*
Regression	1	59873233.74	59873233.7	139.921018	8.7015E-07
Residual	9	3851166.265	427907.363		
Total	10	63724400			

	Coefficients	*Standard Error*	*t Statistic*	*P-value*	*Lower 95%*	*Upper 95%*
Crangon	2074.7429	263.969922	7.85977011	1.3743E-05	1477.601	2671.88481
X2 days	48.3640425	4.088661121	11.8288215	3.3437E-07	39.1148414	57.6132436

Regression Statistics	
Multiple R	0.59269186
R Square	0.35128365
Adjusted R Square	0.31884783
Standard Error	0.13060752
Observations	22

Analysis of Variance

	df	*Sum of Squares*	*Mean Square*	*F*	*Significance F*
Regression	1	0.184743609	0.18474361	10.8301153	0.00365173
Residual	20	0.341166469	0.01705832		
Total	21	0.525910078			

	Coefficients	*Standard Error*	*t Statistic*	*P-value*	*Lower 95%*	*Upper 95%*
SB Survival	0.10126605	0.039613967	2.55632189	0.0183889	0.0186328	0.1838993
X2 days	0.00192085	0.000583684	3.29091405	0.00348292	0.00070331	0.0031384

Abundance/X2, Feb-Jun, # of Days <=64

Regression Statistics	
Multiple R	0.60752061
R Square	0.36908129
Adjusted R Square	0.30598942
Standard Error	23.1454764
Observations	12

Analysis of Variance

	df	Sum of Squares	Mean Square	F	Significance F
Regression	1	3133.86921	3133.86921	5.84990237	0.03614449
Residual	10	5357.13079	535.713079		
Total	11	8491			

	Coefficients	Standard Error	t Statistic	P-value	Lower 95%	Upper 95%
Starry Flounder	7.98215036	8.710887526	0.9163418	0.37913899	-11.42692	27.3912206
X2 days	0.34078613	0.140898898	2.41865714	0.03408787	0.02684376	0.65472849

Regression Statistics	
Multiple R	0.69422345
R Square	0.48194619
Adjusted R Square	0.45727696
Standard Error	16912.2524
Observations	23

Analysis of Variance

	df	Sum of Squares	Mean Square	F	Significance F
Regression	1	5587864717	5587864717	19.5363299	0.00023802
Residual	21	6006509908	286024281		
Total	22	11594374625			

	Coefficients	Standard Error	t Statistic	P-value	Lower 95%	Upper 95%
Longfin Smelt	-2962.4212	5129.511989	-0.577525	0.56944896	-13629.827	7704.98482
X2 days	295.850537	66.93463069	4.41999207	0.00021626	156.652328	435.048746

Abundance/X2, Feb-Jun, # of Days <=74

POC

Regression Statistics

Multiple R	0.79522364
R Square	0.63238064
Adjusted R Square	0.60410223
Standard Error	2.84029168
Observations	15

Analysis of Variance

	df	Sum of Squares	Mean Square	F	Significance F
Regression	1	180.4053544	180.405354	22.362664	0.00039411
Residual	13	104.8743389	8.06725684		
Total	14	285.2796933			

	Coefficients	Standard Error	t Statistic	P-value	Lower 95%	Upper 95%
Intercept	4.26257485	1.372235923	3.10629884	0.007735	1.29803995	7.22710976
x1	0.06130505	0.012963864	4.72891785	0.00032305	0.03329833	0.08931177

Neomysis

Regression Statistics

Multiple R	0.62716886
R Square	0.39334078
Adjusted R Square	0.35765495
Standard Error	25.5615929
Observations	19

Analysis of Variance

	df	Sum of Squares	Mean Square	F	Significance F
Regression	1	7201.930504	7201.9305	11.0223221	0.0040514
Residual	17	11107.71556	653.395033		
Total	18	18309.64606			

	Coefficients	Standard Error	t Statistic	P-value	Lower 95%	Upper 95%
Intercept	18.4502302	10.91261346	1.69072517	0.10813155	-4.5734038	41.4738642
x1	0.34534541	0.104020068	3.31998827	0.0038094	0.12588194	0.56480887

Abundance/X2, Feb-Jun, # of Days <=74

Crangon

Regression Statistics

Multiple R	0.87315209
R Square	0.76239458
Adjusted R Square	0.73599398
Standard Error	1297.05919
Observations	11

Analysis of Variance

	df	Sum of Squares	Mean Square	F	Significance F
Regression	1	48583137.18	48583137.2	28.8779238	0.00044811
Residual	9	15141262.82	1682362.54		
Total	10	63724400			

	Coefficients	Standard Error	t Statistic	P-value	Lower 95%	Upper 95%
Intercept	919.712651	717.1347876	1.28248227	0.22860356	-702.56018	2541.98548
x1	38.4558018	7.15614097	5.37381837	0.00031283	22.2674739	54.6441297

SB Survival

Regression Statistics

Multiple R	0.62123069
R Square	0.38592757
Adjusted R Square	0.35522395
Standard Error	0.1270722
Observations	22

Analysis of Variance

	df	Sum of Squares	Mean Square	F	Significance F
Regression	1	0.2029632	0.2029632	12.5694481	0.00203022
Residual	20	0.322946878	0.01614734		
Total	21	0.525910078			

	Coefficients	Standard Error	t Statistic	P-value	Lower 95%	Upper 95%
Intercept	0.04158383	0.050812759	0.81837388	0.42233341	-0.0644097	0.14757734
x1	0.00172655	0.00048699	3.54534174	0.0019159	0.0007107	0.00274239

Abundance/X2, Feb-Jun, # of Days <=74

StarryF

Regression Statistics

Multiple R	0.53257496
R Square	0.28363609
Adjusted R Square	0.2119997
Standard Error	24.6630208
Observations	12

Analysis of Variance

	df	Sum of Squares	Mean Square	F	Significance F
Regression	1	2408.354068	2408.35407	3.95938559	0.0746429
Residual	10	6082.645932	608.264593		
Total	11	8491			

	Coefficients	Standard Error	t Statistic	P-value	Lower 95%	Upper 95%
Intercept	1.00538926	12.5209074	0.08029684	0.93744344	-26.892936	28.9037143
x1	0.25887929	0.130101833	1.98982049	0.07204892	-0.0310057	0.54876429

Longfin

Regression Statistics

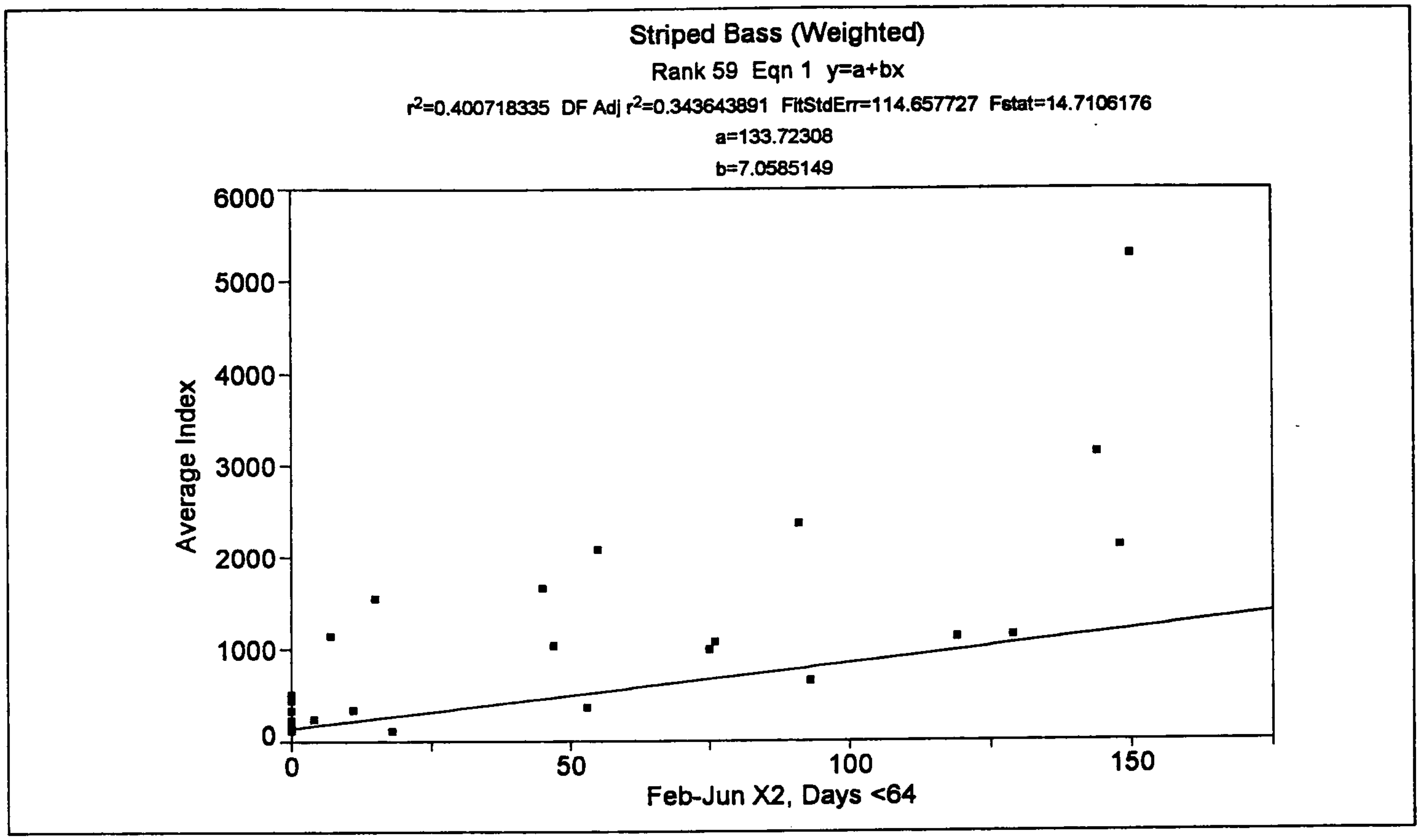
Multiple R	0.58549612
R Square	0.3428057
Adjusted R Square	0.31151074
Standard Error	19048.5056
Observations	23

Analysis of Variance

	df	Sum of Squares	Mean Square	F	Significance F
Regression	1	3974617736	3974617736	10.9540204	0.00333356
Residual	21	7619756889	362845566		
Total	22	11594374625			

	Coefficients	Standard Error	t Statistic	P-value	Lower 95%	Upper 95%
Intercept	-7618.6093	7516.650042	-1.0135644	0.32180878	-23250.341	8013.12295
x1	237.778274	71.84315506	3.30968585	0.00318796	88.3722277	387.184319

14c. WEIGHTED LEAST SQUARES REGRESSION



Rank 59 Eqn 1 y=a+bx

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.4007183354	0.3436438912	114.65772745	14.710617562

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	133.7230788	24.31982523	5.498521373	83.26825451	184.1779031
b	7.058514891	1.840339225	3.835442290	3.240477904	10.87655188

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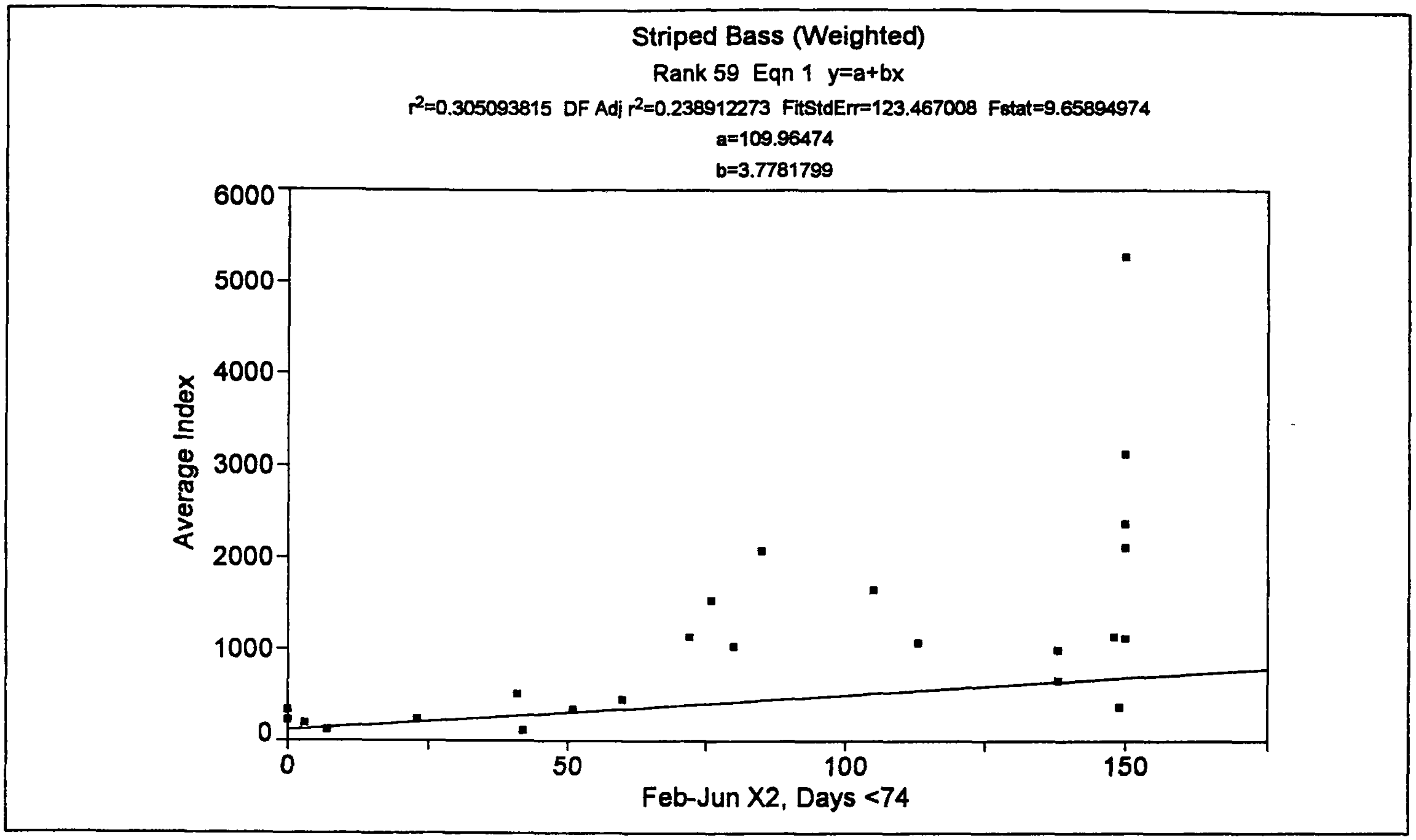

Rank 59 Eqn 1 y=a+bx

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.3050938145	0.2389122730	123.46700780	9.6589497390

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	109.9647403	29.74657171	3.696719787	48.25138355	171.6780970
b	3.778179925	1.215675552	3.107885091	1.256093692	6.300266158

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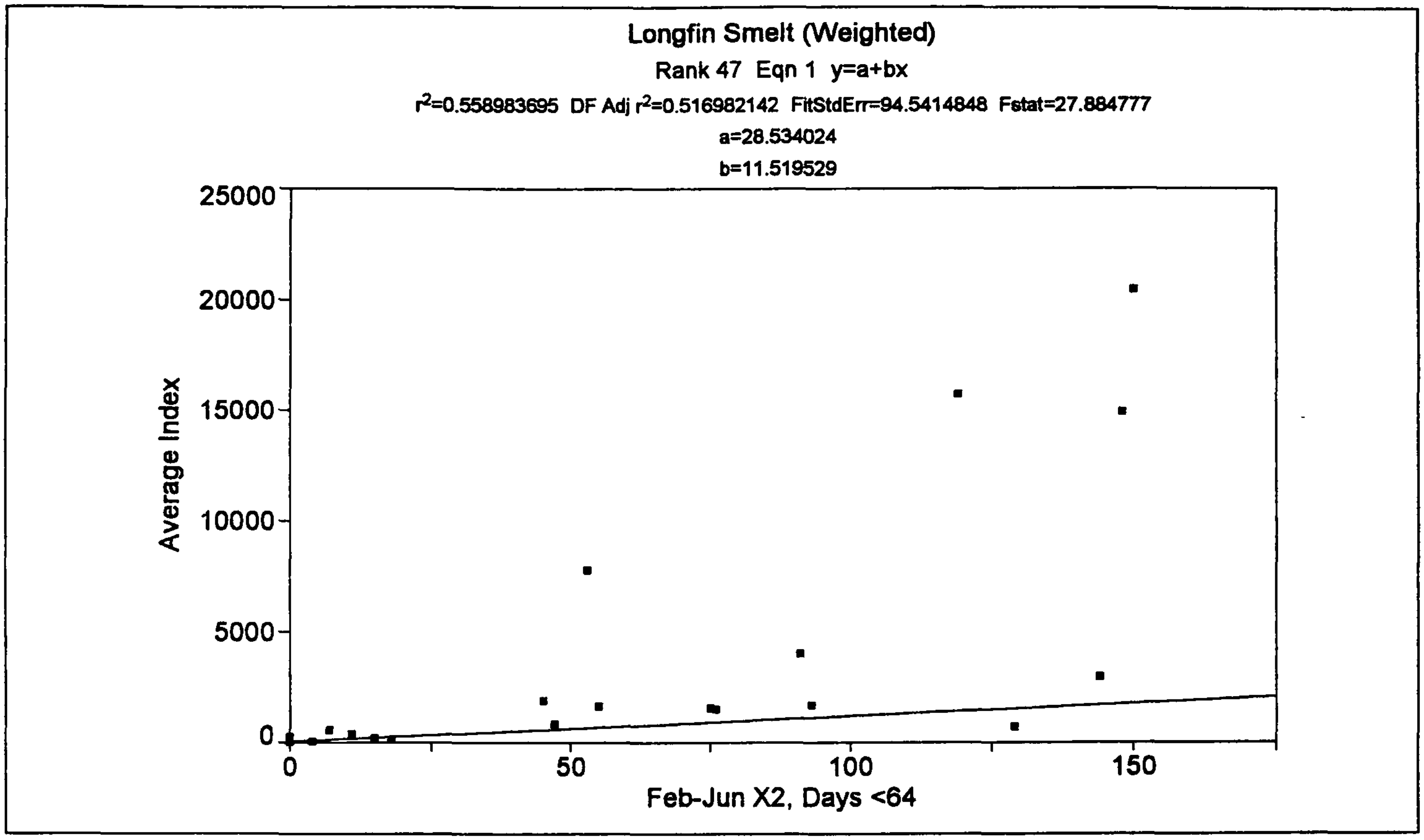

Rank 47 Eqn 1 y=a+bx

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.5589836953	0.5169821424	94.541484843	27.884776966

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	28.53402366	19.76744177	1.443485910	-12.4762547	69.54430198
b	11.51952908	2.181479508	5.280603845	6.993749624	16.04530853

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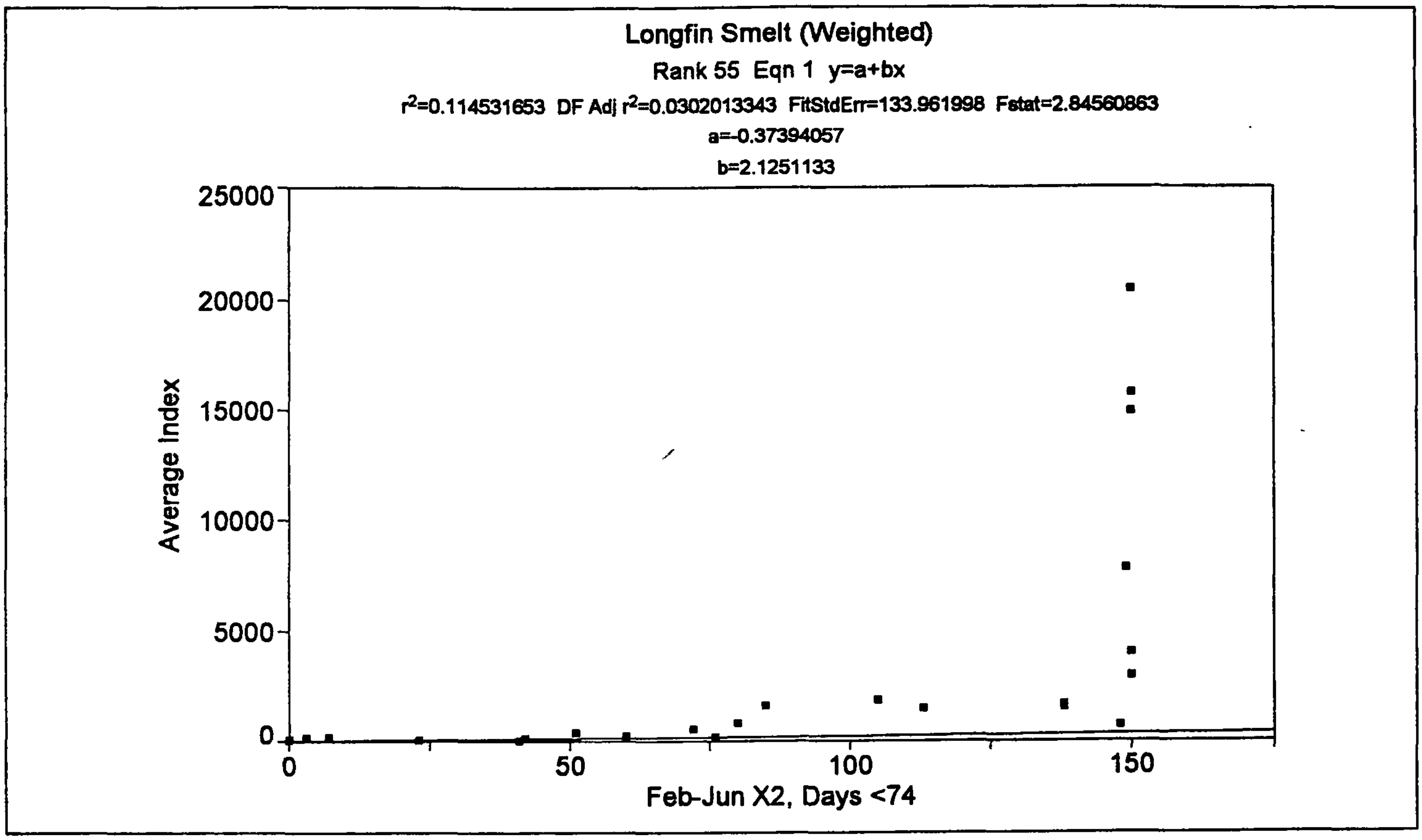

Rank 55 Eqn 1 y=a+bx

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.1145316531	0.0302013343	133.96199804	2.8456086276

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	-0.37394057	40.99272112	-0.00912212	-85.4189819	84.67110075
b	2.125113331	1.259779426	1.686893188	-0.48847246	4.738699119

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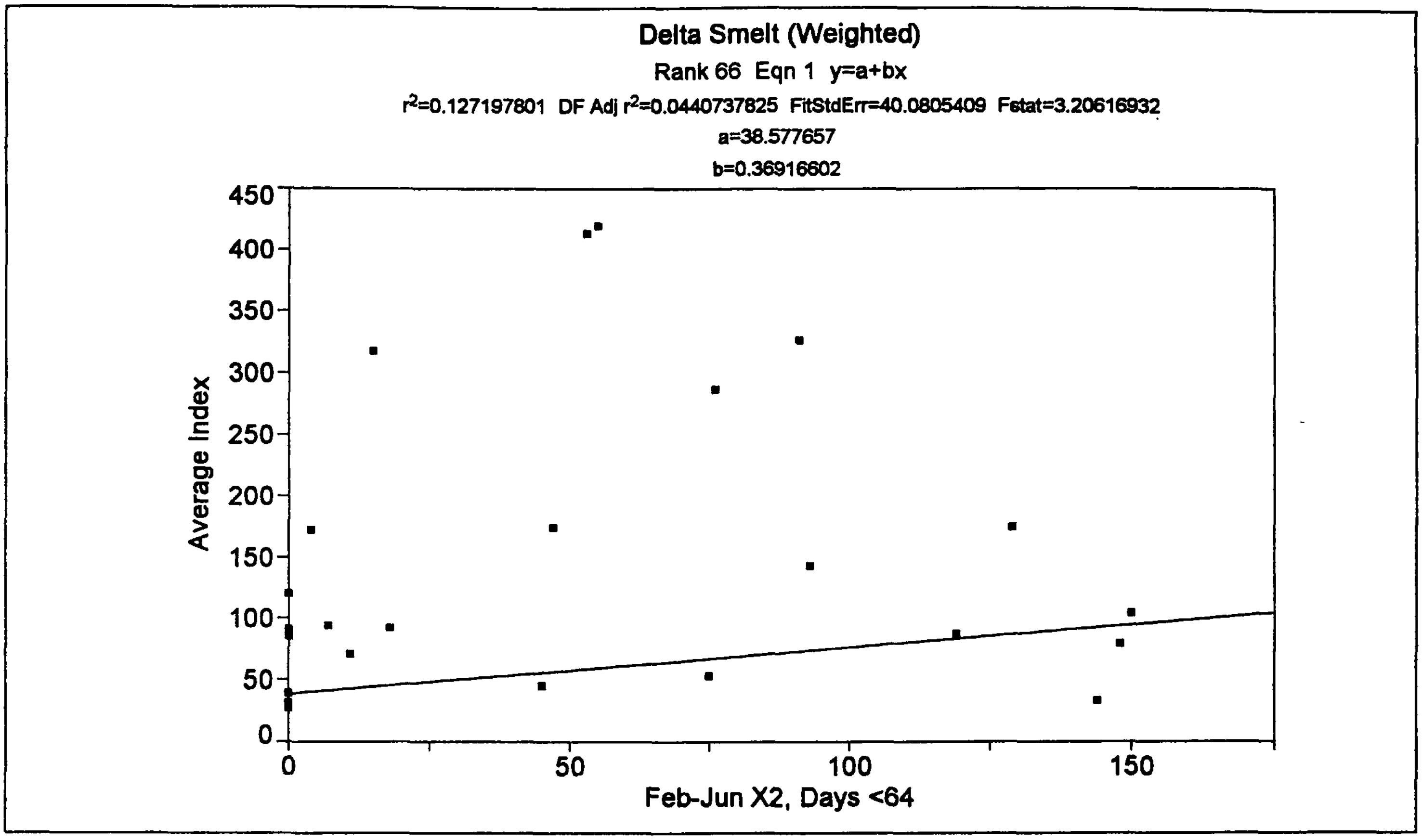

Rank 66 Eqn 1 y=a+bx

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.1271978014	0.0440737825	40.080540927	3.2061693186

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	38.57765731	9.170565080	4.206682683	19.55205801	57.60325661
b	0.369166023	0.206171436	1.790577929	-0.05856499	0.796897039

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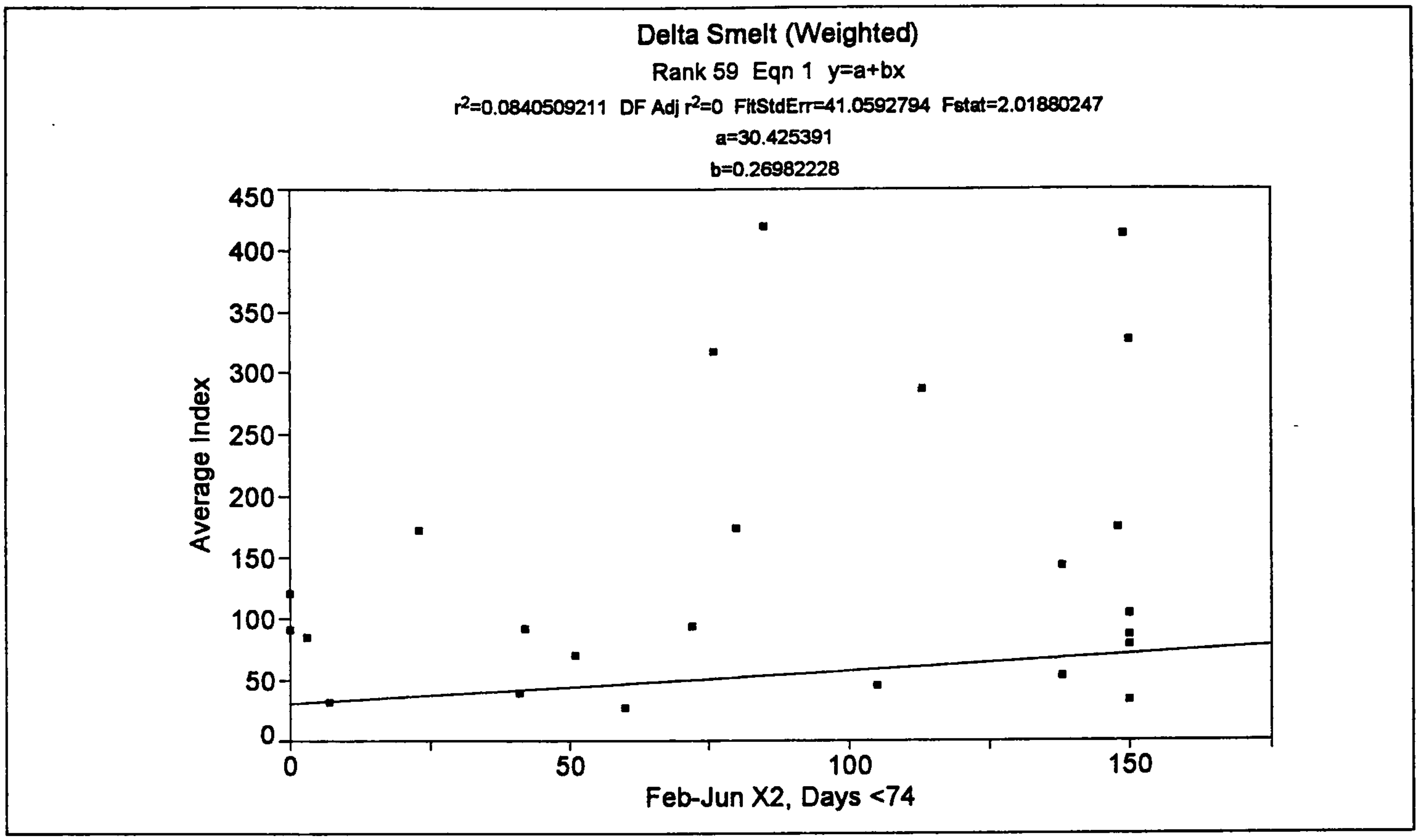

Rank 59 Eqn 1 y=a+bx

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.0840509211	0.0000000000	41.059279432	2.0188024717

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	30.42539106	13.79621768	2.205342926	1.803238868	59.04754326
b	0.269822277	0.189902590	1.420845689	-0.12415678	0.663801335

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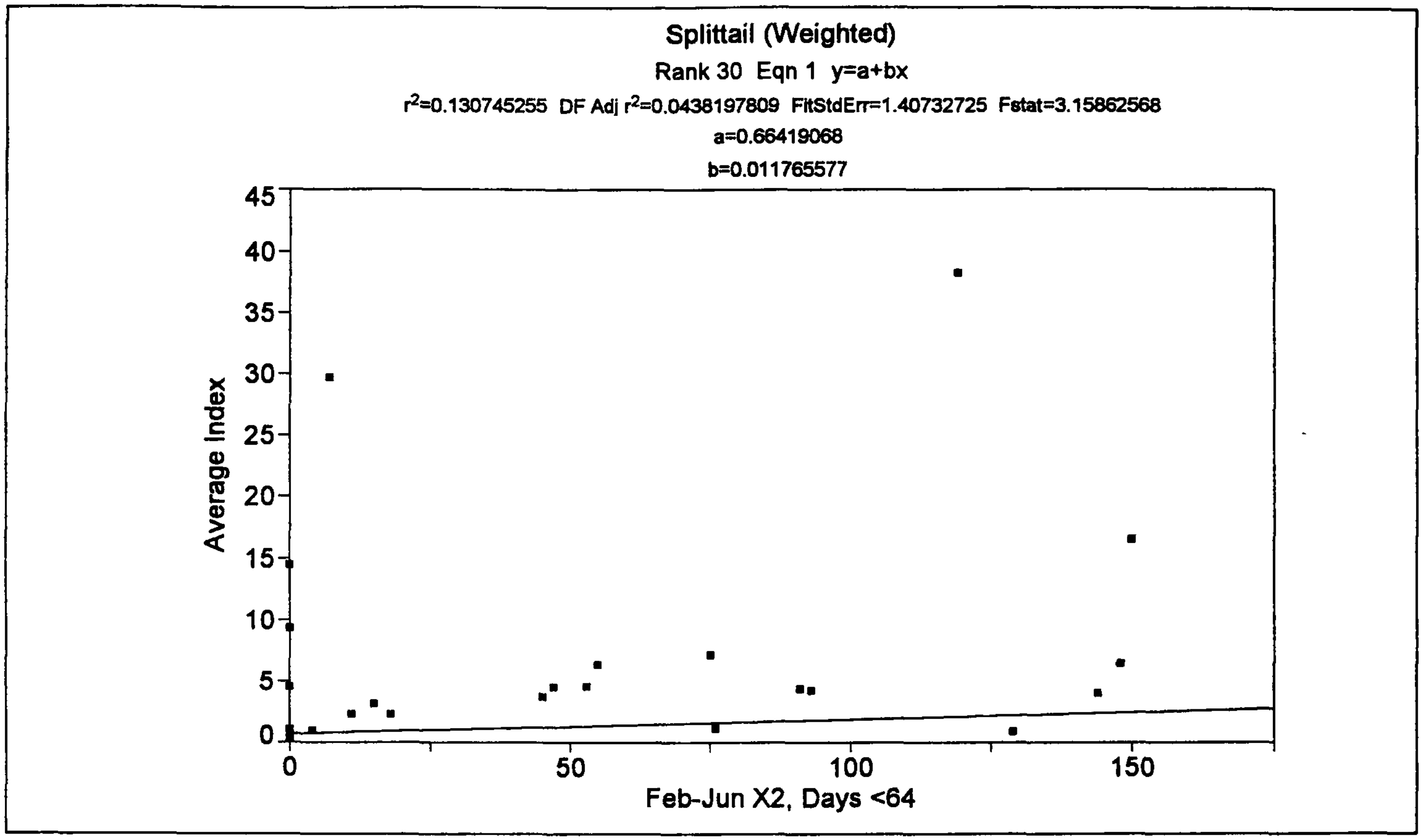

Rank 30 Eqn 1 y=a+bx

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.1307452554	0.0438197809	1.4073272523	3.1586256845

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	0.664190679	0.329668333	2.014723931	-0.02171332	1.350094677
b	0.011765577	0.006620094	1.777252285	-0.00200811	0.025539266

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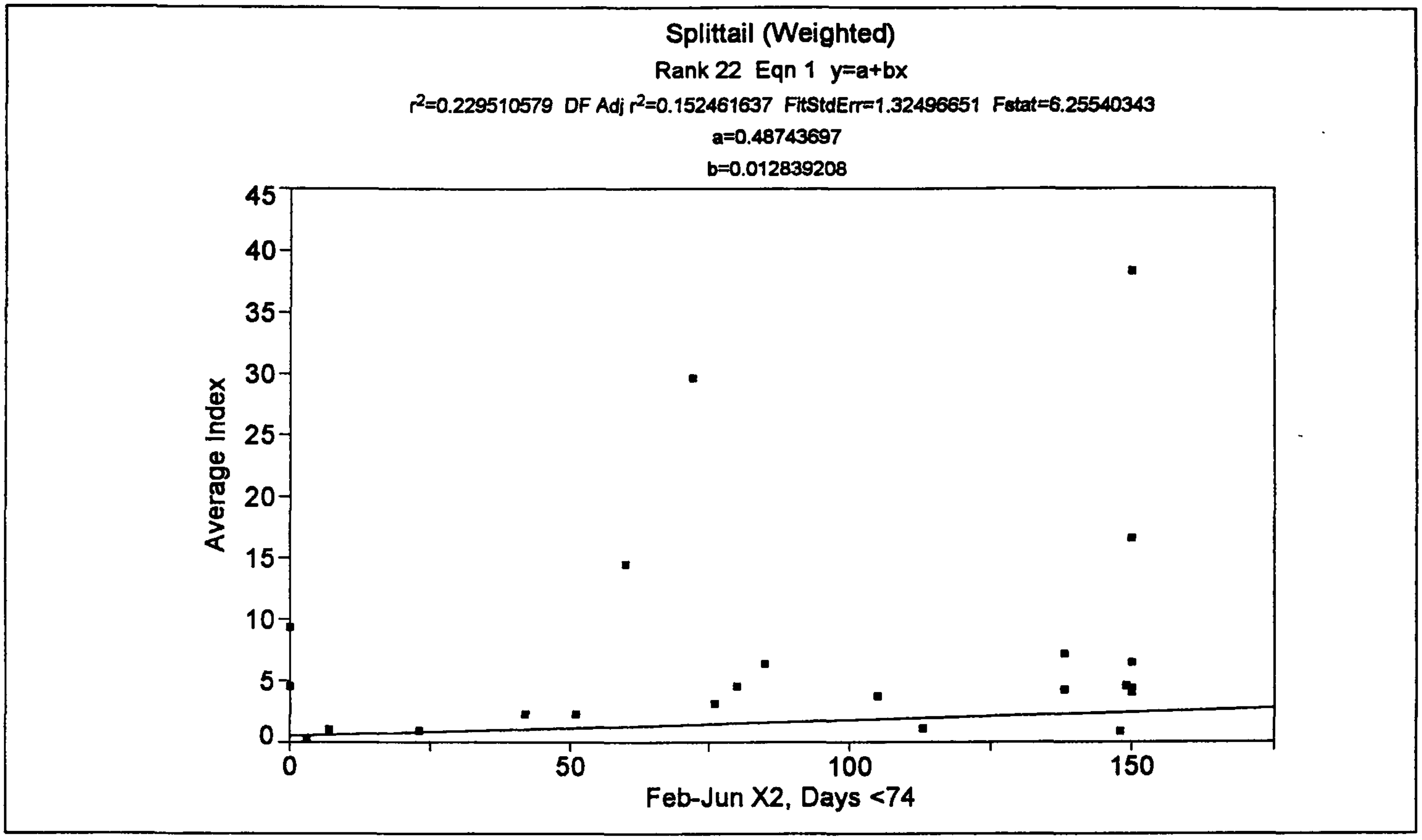

Rank 22 Eqn 1 y=a+bx

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.2295105792	0.1524616371	1.3249665149	6.2554034277

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	0.487436967	0.328339908	1.484549868	-0.19570313	1.170577059
b	0.012839208	0.005133464	2.501080452	0.002158583	0.023519832

Date	Time	File Source
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Tab 15.
Analysis of Total Abundance Index Versus Number Of Fish Salvaged At the SWP And CVP Pumps

15a. Annual Average Salvage Loss Data
15b. Unlagged Correlations
15c. Lagged Correlations

15a. ANNUAL AVERAGE SALVAGE LOSS DATA

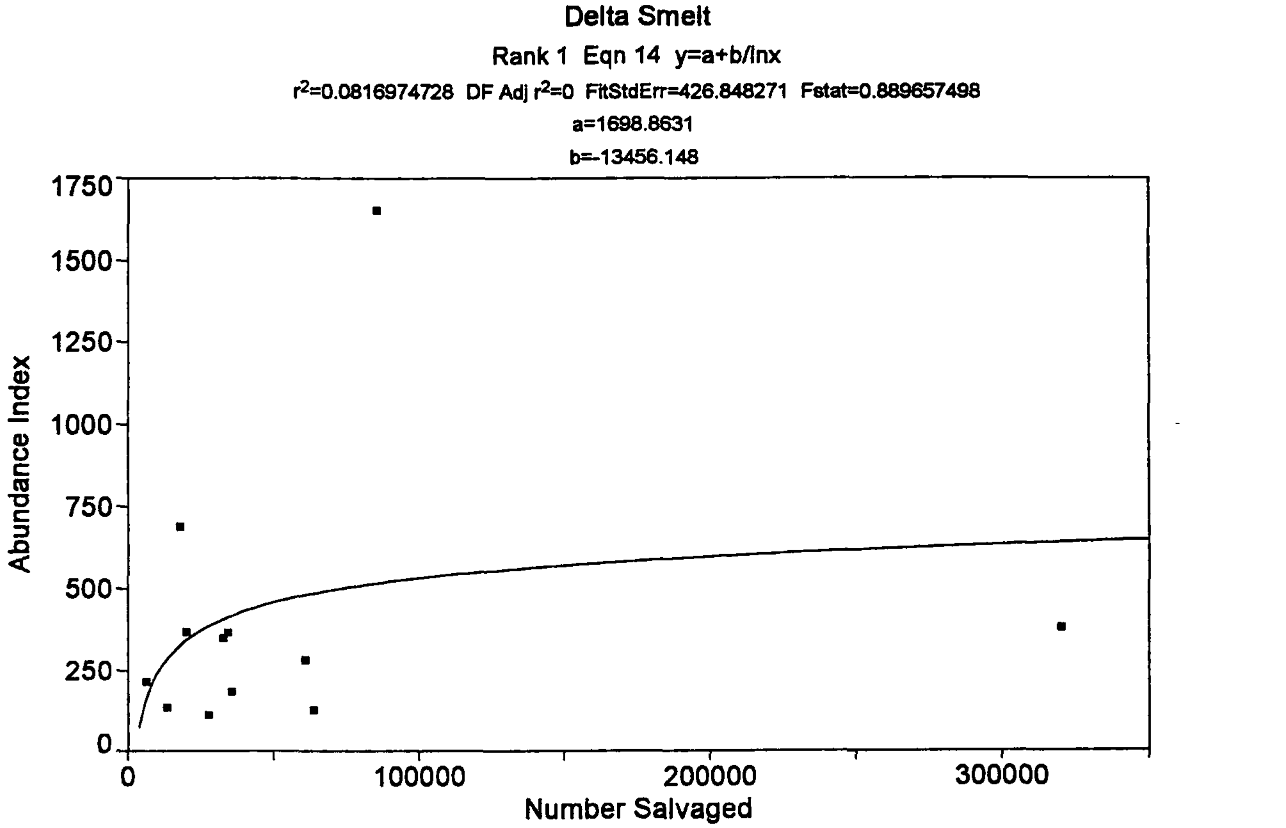
(Note: 1 = SWP; 2 = CVP)

FISH SALVAGED AT FACILITY PUMPS

YEAR	FACILITY	SPECIES: Striped Bass	Splittail	Longfin Smelt	Delta Smelt	Starry Flounder	TOTAL
1979	1	2,712,782	90,127	5,983	21,499	3,437	2,833,828
	2	2,244,503	63,464	0	46,702	4,024	2,358,693
		4,957,285	153,591	5,983	68,201	7,461	5,192,521
1980	1	2,655,625	298,923	9,291	41,776	2,606	3,008,221
	2	1,327,671	238,779	0	43,620	0	1,610,070
		3,983,296	537,702	9,291	85,396	2,606	4,618,291
1981	1	1,105,472	13,285	2,489	46,062	641	1,167,949
	2	8,341,684	128,509	251	274,288	0	8,744,732
		9,447,156	141,794	2,740	320,350	641	9,912,681
1982	1	976,498	165,410	52	12,928	0	1,154,888
	2	1,695,704	201,928	0	19,636	0	1,917,268
		2,672,202	367,338	52	32,564	0	3,072,156
1983	1	131,039	92,090	273	7,606	60	231,068
	2	204,356	346,384	57	5,728	0	556,525
		335,395	438,474	330	13,334	60	787,593
1984	1	6,376,160	63,511	829	6,392	294	6,447,186
	2	4,354,891	76,589	22,535	29,094	0	4,483,109
		10,731,051	140,100	23,364	35,486	294	10,930,295
1985	1	3,997,721	37,725	17,944	12,920	2,370	4,068,680
	2	1,617,210	33,238	3,512	14,576	291	1,668,827
		5,614,931	70,963	21,456	27,496	2,661	5,737,507
1986	1	13,854,659	1,160,305	2,128	3,625	639	15,021,356
	2	4,689,993	1,231,283	168	2,755	119	5,924,318
		18,544,652	2,391,588	2,296	6,380	758	20,945,674
1987	1	12,051,601	57,093	50,753	26,920	103	12,186,470
	2	2,275,587	11,943	6,094	34,097	129	2,327,850
		14,327,188	69,036	56,847	61,017	232	14,514,320
1988	1	13,038,135	61,163	140,040	56,110	3,536	13,298,984
	2	785,477	13,853	24,005	7,700	177	831,212
		13,823,612	75,016	164,045	63,810	3,713	14,130,196
1989	1	9,062,682	45,527	61,509	12,030	3	9,181,751
	2	1,487,195	15,057	6,036	8,044	0	1,516,332
		10,549,877	60,584	67,545	20,074	3	10,698,083
1990	1	1,594,231	13,240	26,257	22,426	352	1,656,506
	2	1,250,158	30,278	24,308	11,700	58	1,316,502
		2,844,389	43,518	50,565	34,126	410	2,973,008
1991	1	1,965,435	25,041	7,260	15,963	76	2,013,775
	2	1,835,535	11,778	2,405	1,859	230	1,851,807
		3,800,970	36,819	9,665	17,822	306	3,865,582
	Total	101,632,004	4,526,523	414,179	786,056	19,145	107,377,907

15b. UNLAGGED CORRELATIONS

14b. UNLAGGED CORRELATIONS



Rank 1 Eqn 14 y=a+b/lnx

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.0816974728	0.0000000000	426.84827105	0.8896574978

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	1698.863144	1379.752565	1.231281019	-1383.16421	4780.890493
b	-13456.1478	14266.23346	-0.94321657	-45323.3991	18411.10350

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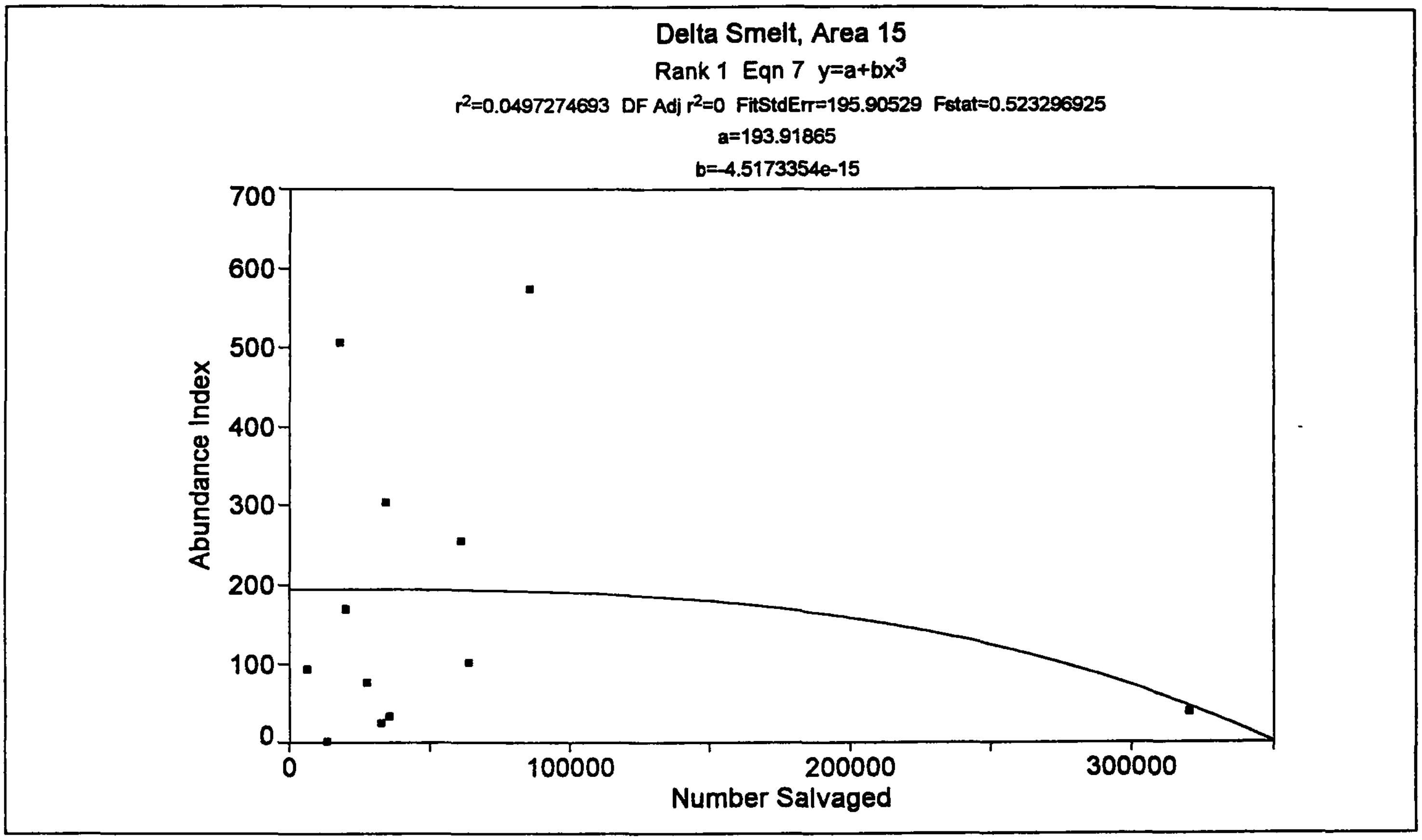

Rank 1 Eqn 7 $y=a+bx^3$

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.0497274693	0.0000000000	195.90529047	0.5232969245

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	193.9186541	59.27815784	3.271334016	61.50585174	326.3314565
b	-4.5173e-15	6.24465e-15	-0.72339265	-1.8466e-14	9.43168e-15

Date	Time	File Source
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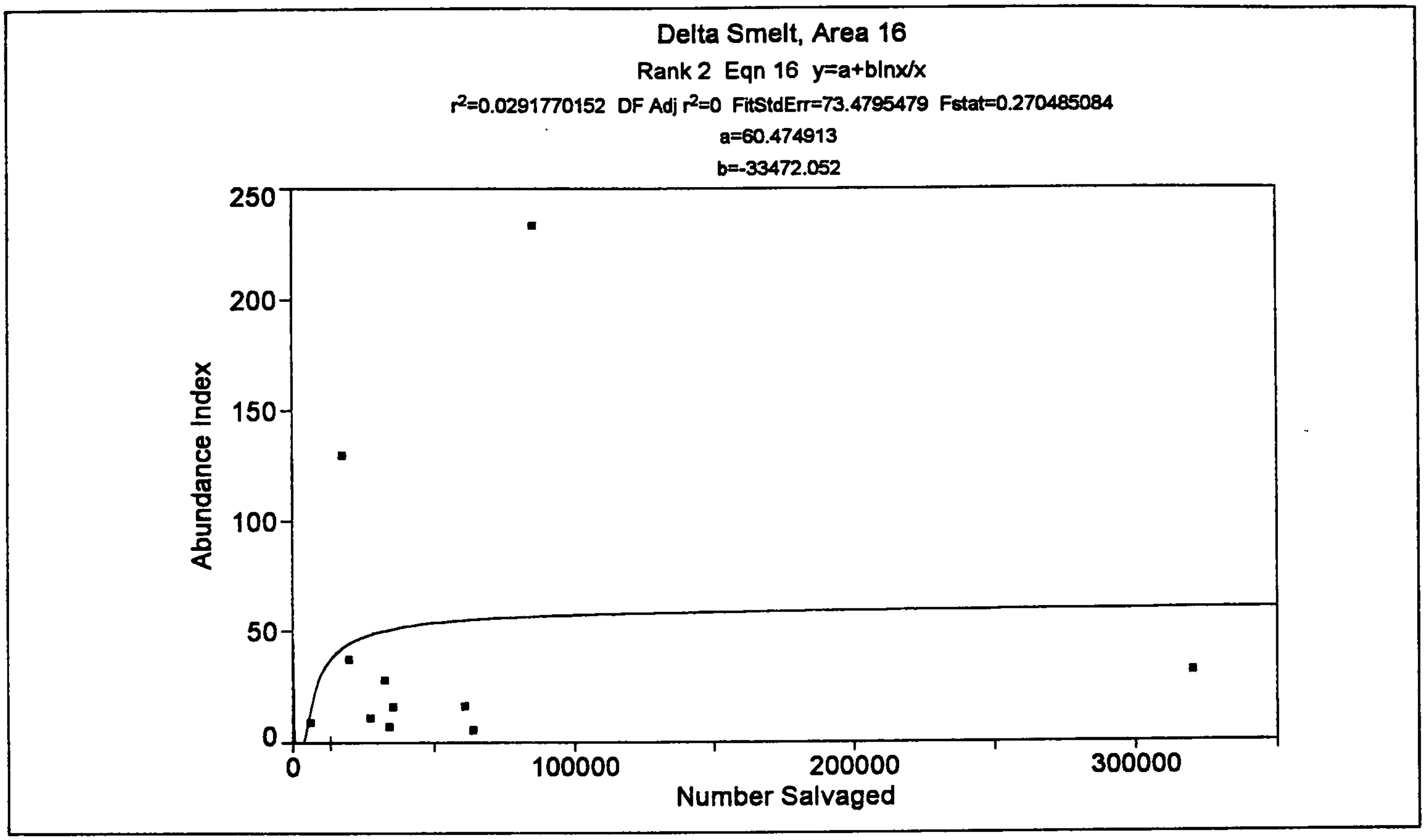

Rank 2 Eqn 16 y=a+blnx/x

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.0291770152	0.0000000000	73.479547936	0.2704850843

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	60.47491323	33.23599024	1.819561048	-14.9354823	135.8853088
b	-33472.0516	64359.20510	-0.52008181	-179499.087	112554.9835

Date	Time	File Source
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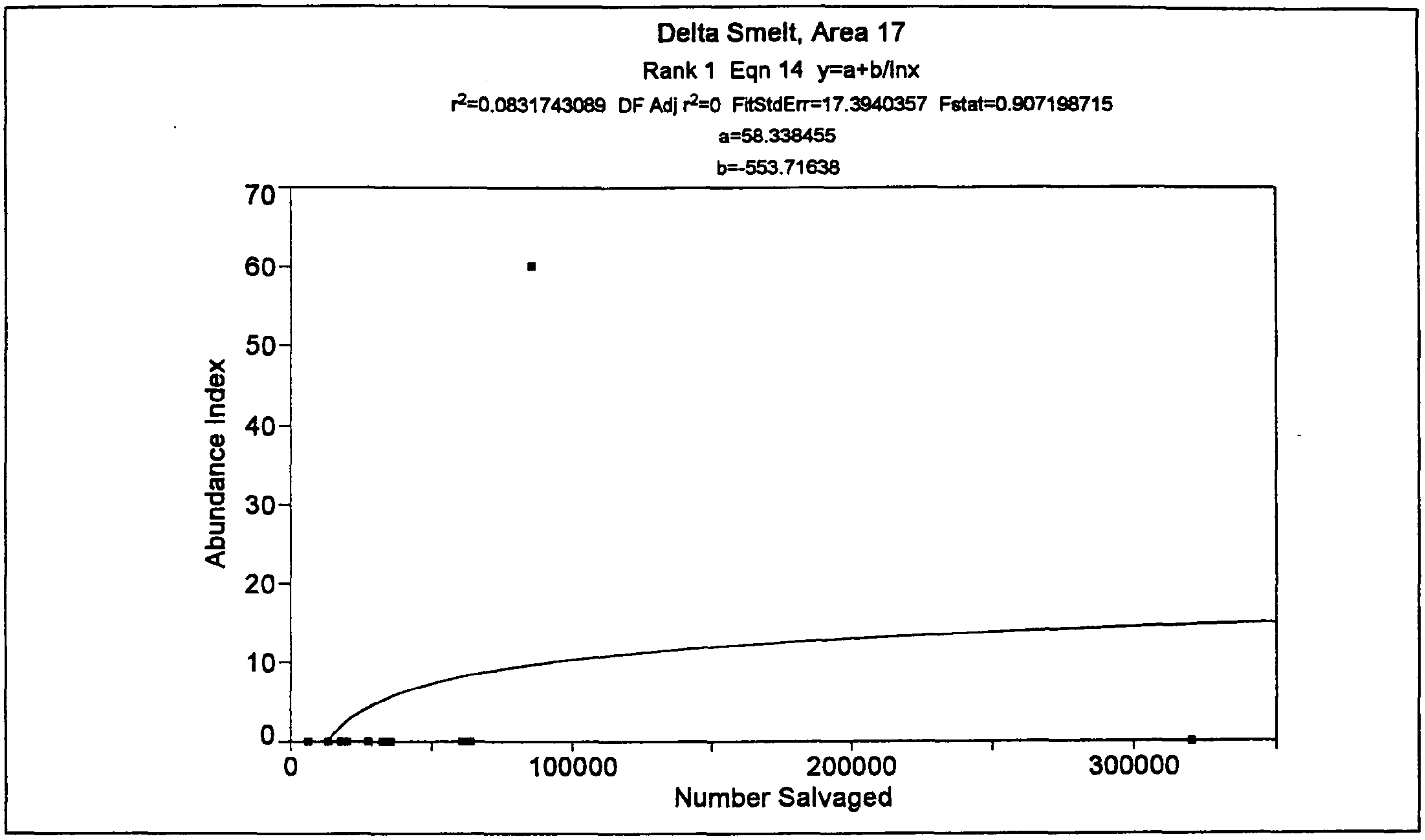

Rank 1 Eqn 14 y=a+b/lnx

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.0831743089	0.0000000000	17.394035704	0.9071987155

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	58.33845489	56.22481570	1.037592639	-67.2539333	183.9308431
b	-553.716380	581.3479660	-0.95246980	-1852.30453	744.8717707

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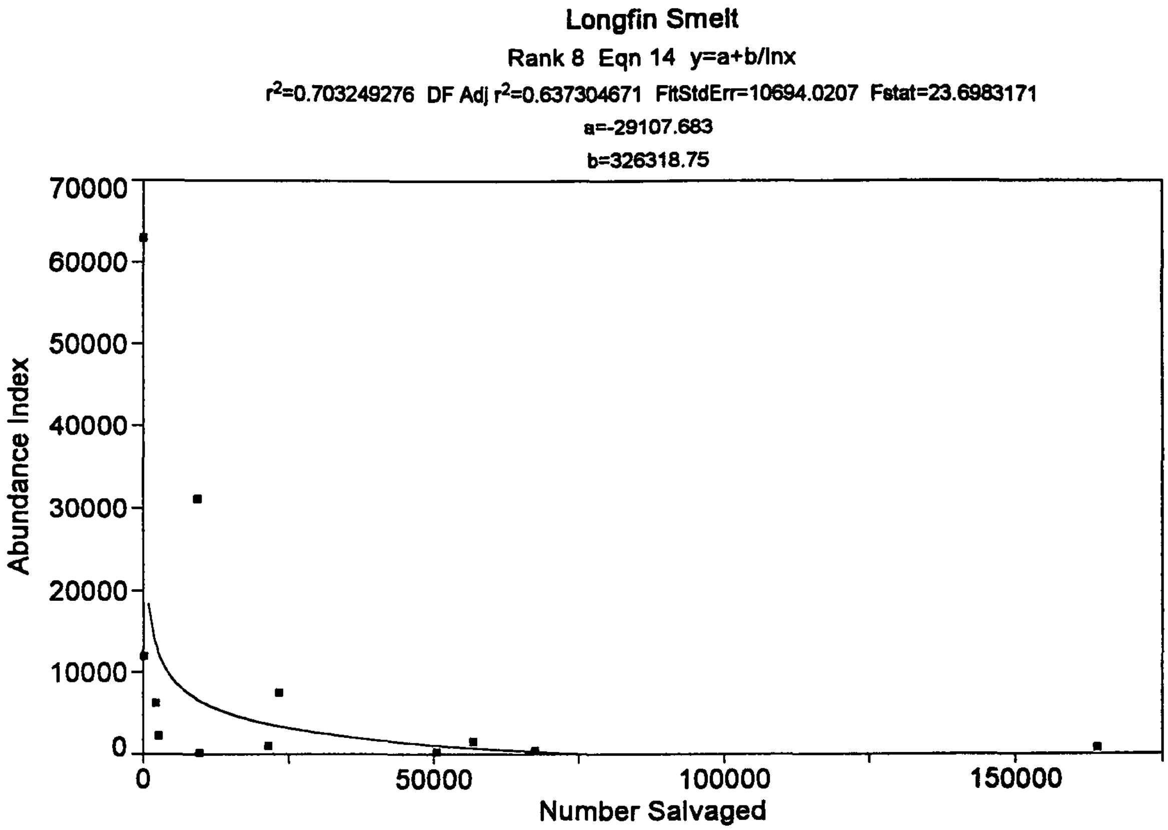

Rank 8 Eqn 14 y=a+b/lnx

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.7032492760	0.6373046706	10694.020662	23.698317108

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	-29107.6826	8699.640432	-3.34584892	-48540.5363	-9674.82887
b	326318.7519	67032.16986	4.868091732	176585.3967	476052.1070

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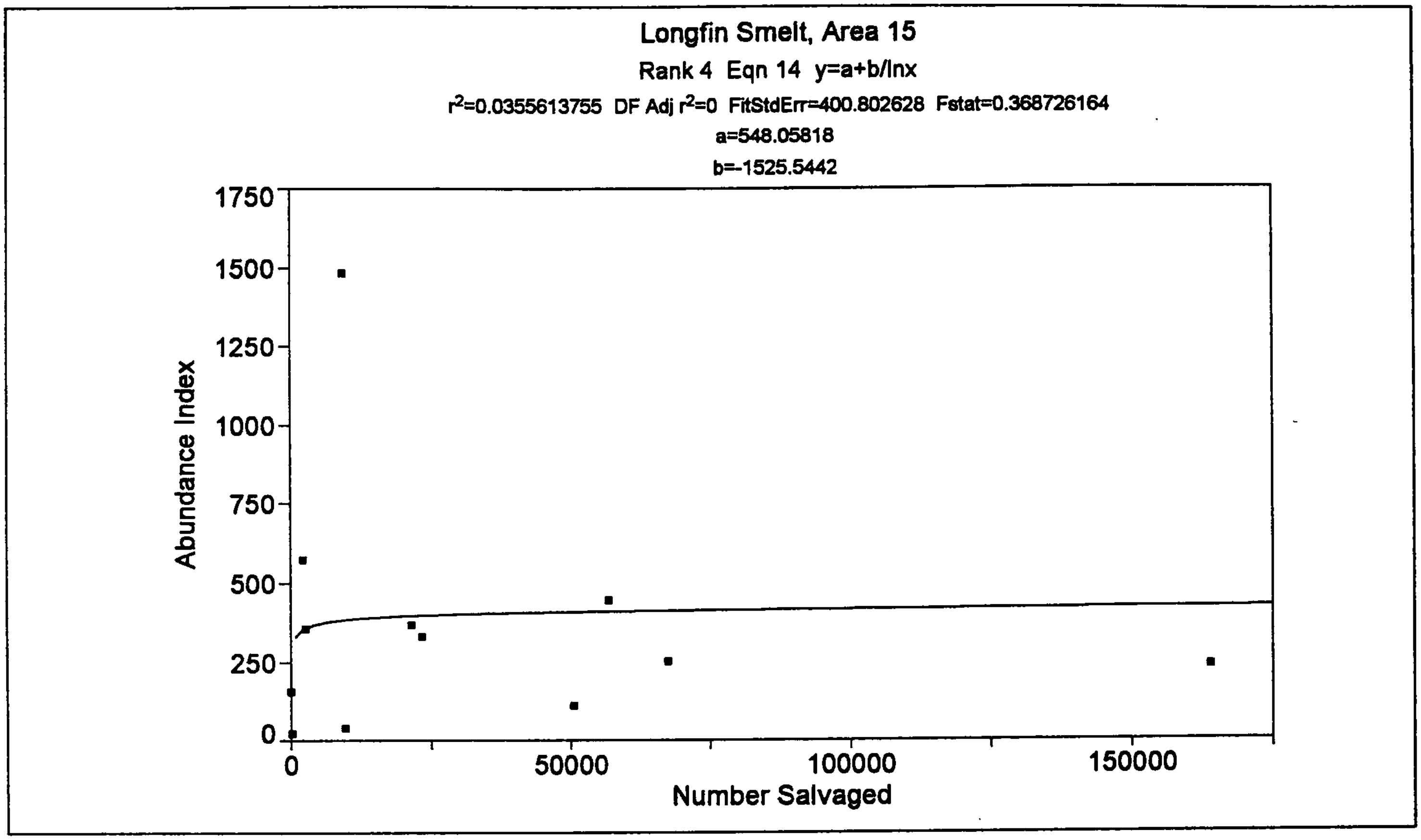

Rank 4 Eqn 14 y=a+b/lnx

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.0355613755	0.0000000000	400.80262765	0.3687261642

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	548.0581804	326.0549849	1.680876557	-180.268337	1276.384698
b	-1525.54421	2512.307641	-0.60722826	-7137.42061	4086.332196

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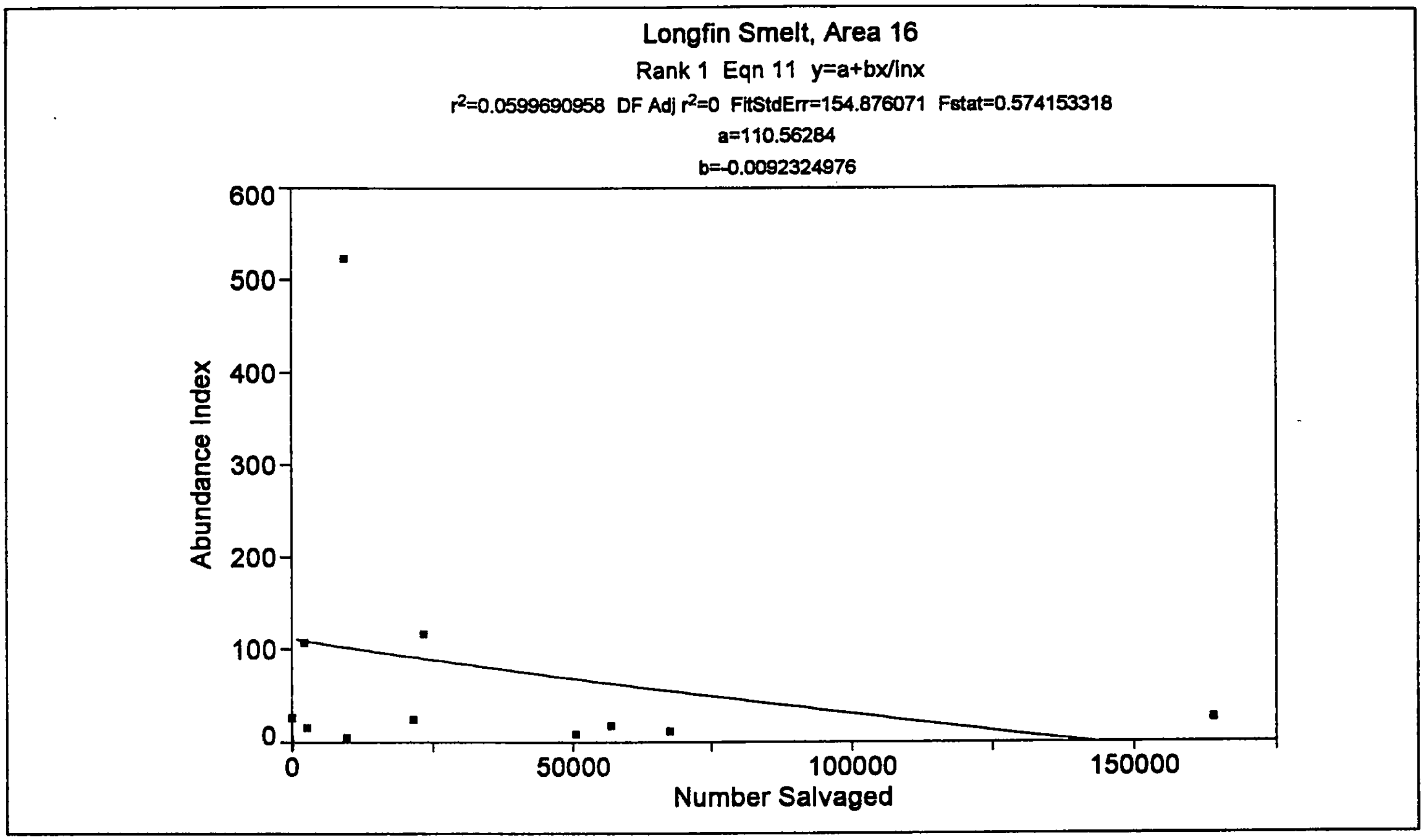

Rank 1 Eqn 11 y=a+bx/lnx

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.0599690958	0.0000000000	154.87607075	0.5741533177

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	110.5628410	61.98263378	1.783771263	-30.0719016	251.1975835
b	-0.00923250	0.012184431	-0.75772905	-0.03687821	0.018413219

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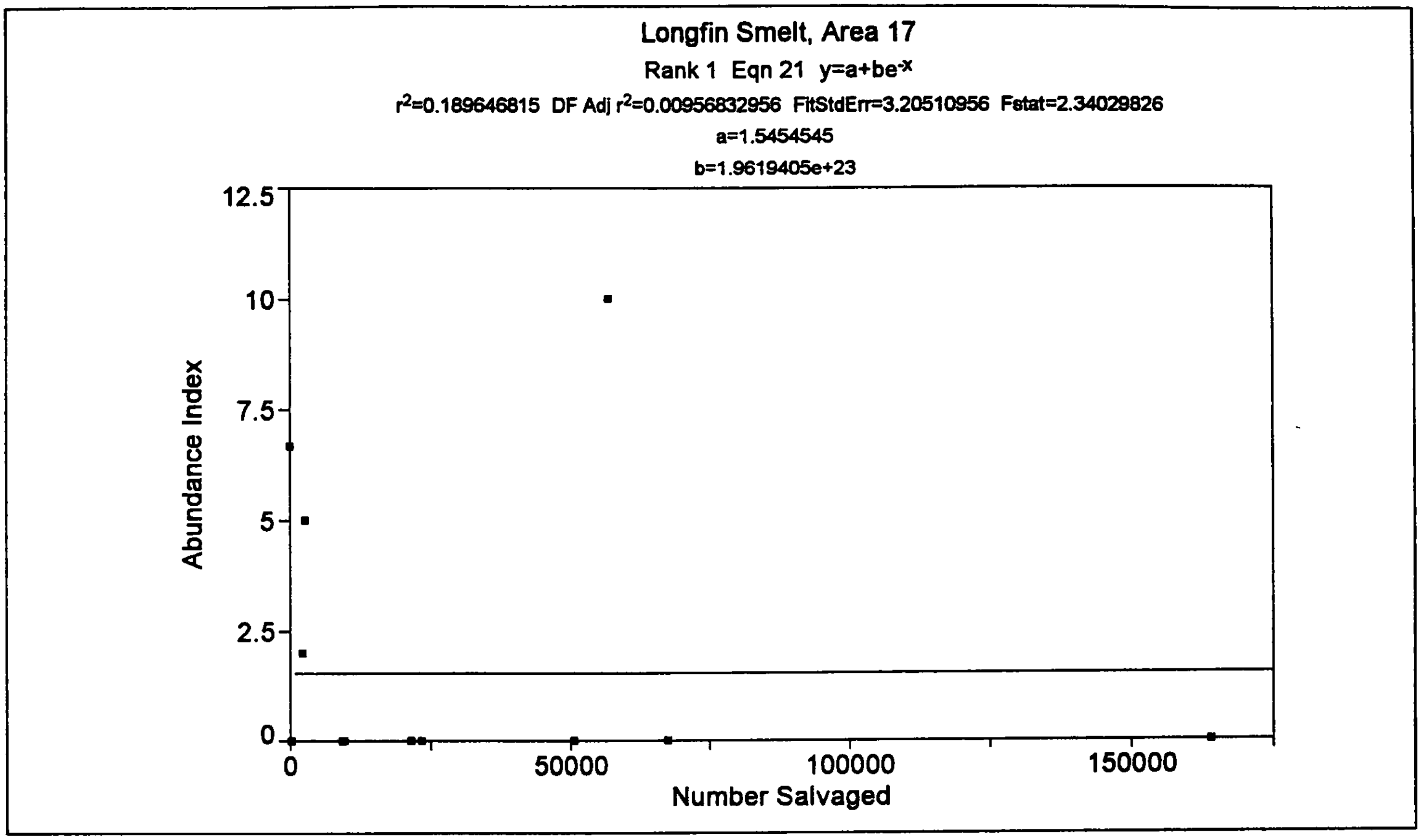

Rank 1 Eqn 21 $y=a+be^{-x}$

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.1896468151	0.0095683296	3.2051095571	2.3402982629

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	1.545454545	0.966376892	1.599225476	-0.61319338	3.704102471
b	1.96194e+23	1.28248e+23	1.529803341	-9.028e+22	4.82668e+23

Date	Time	File Source
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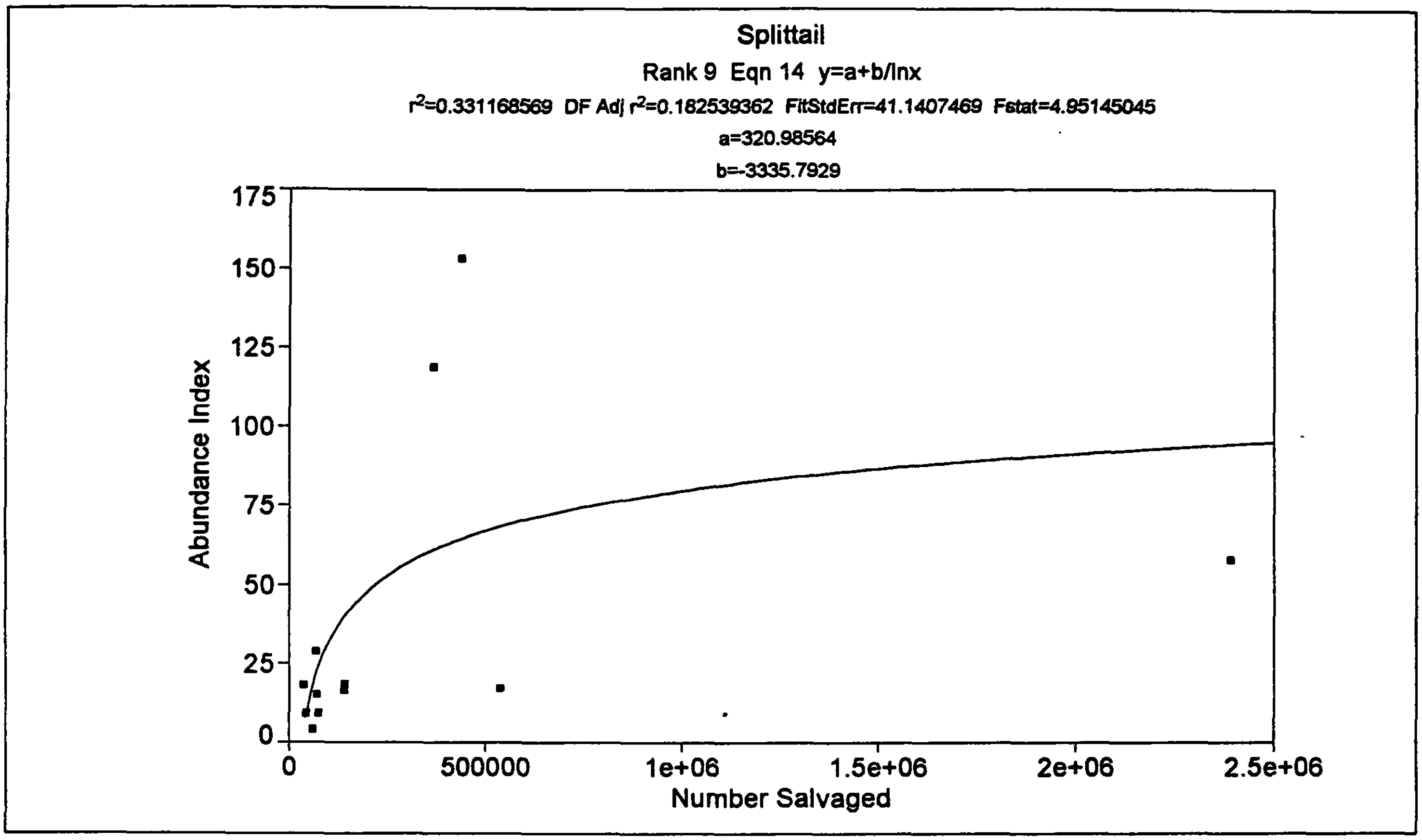

Rank 9 Eqn 14 y=a+b/lnx

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.3311685690	0.1825393622	41.140746942	4.9514504510

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	320.9856443	127.4145443	2.519222951	36.37293883	605.5983498
b	-3335.79295	1499.107811	-2.22518549	-6684.43051	12.84462426

Date	Time	File Source
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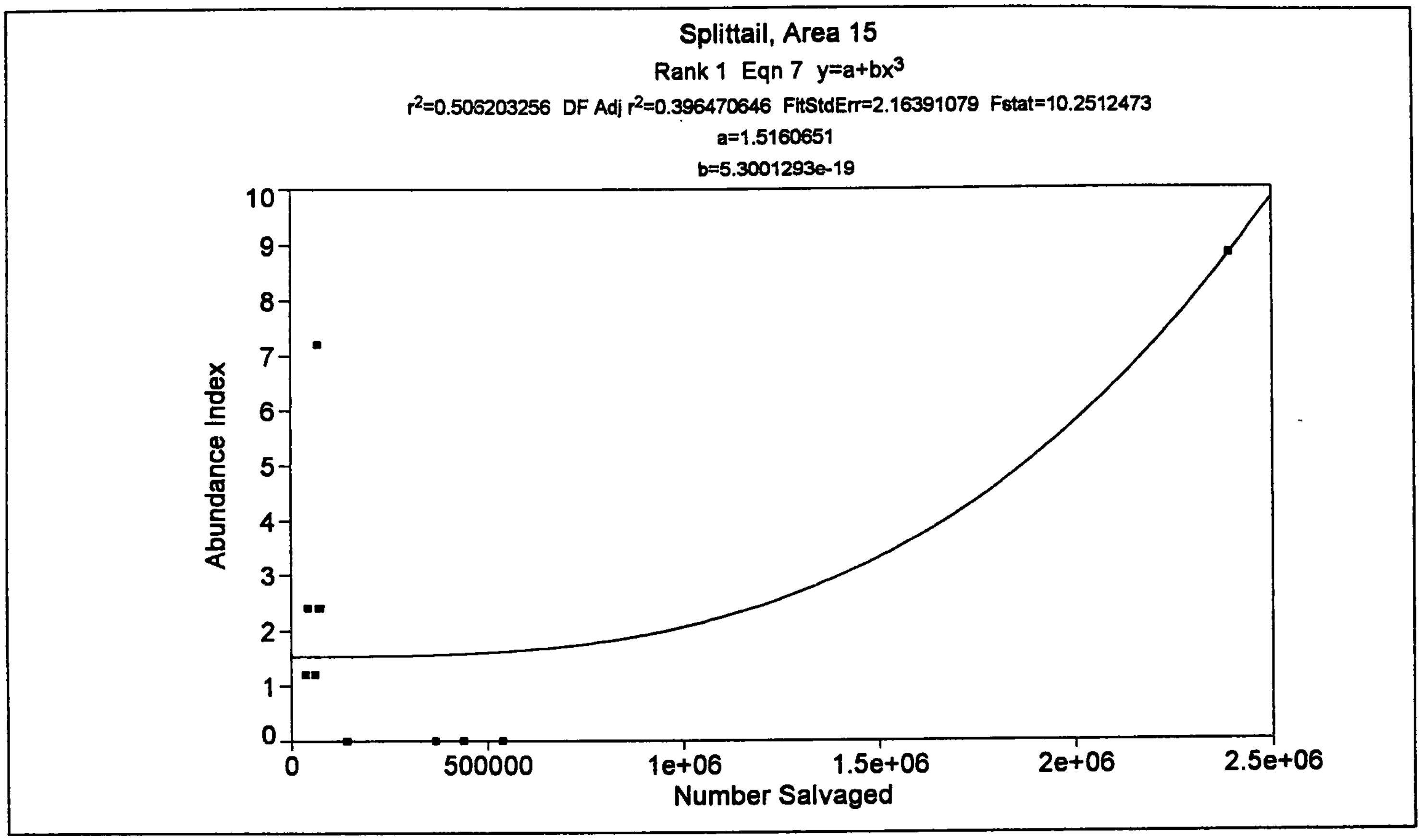

Rank 1 Eqn 7 $y=a+bx^3$

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.5062032561	0.3964706464	2.1639107937	10.251247349

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	1.516065082	0.653741026	2.319060639	0.055768668	2.976361496
b	5.30013e-19	1.65538e-19	3.201756916	1.60241e-19	8.99784e-19

Date	Time	File Source
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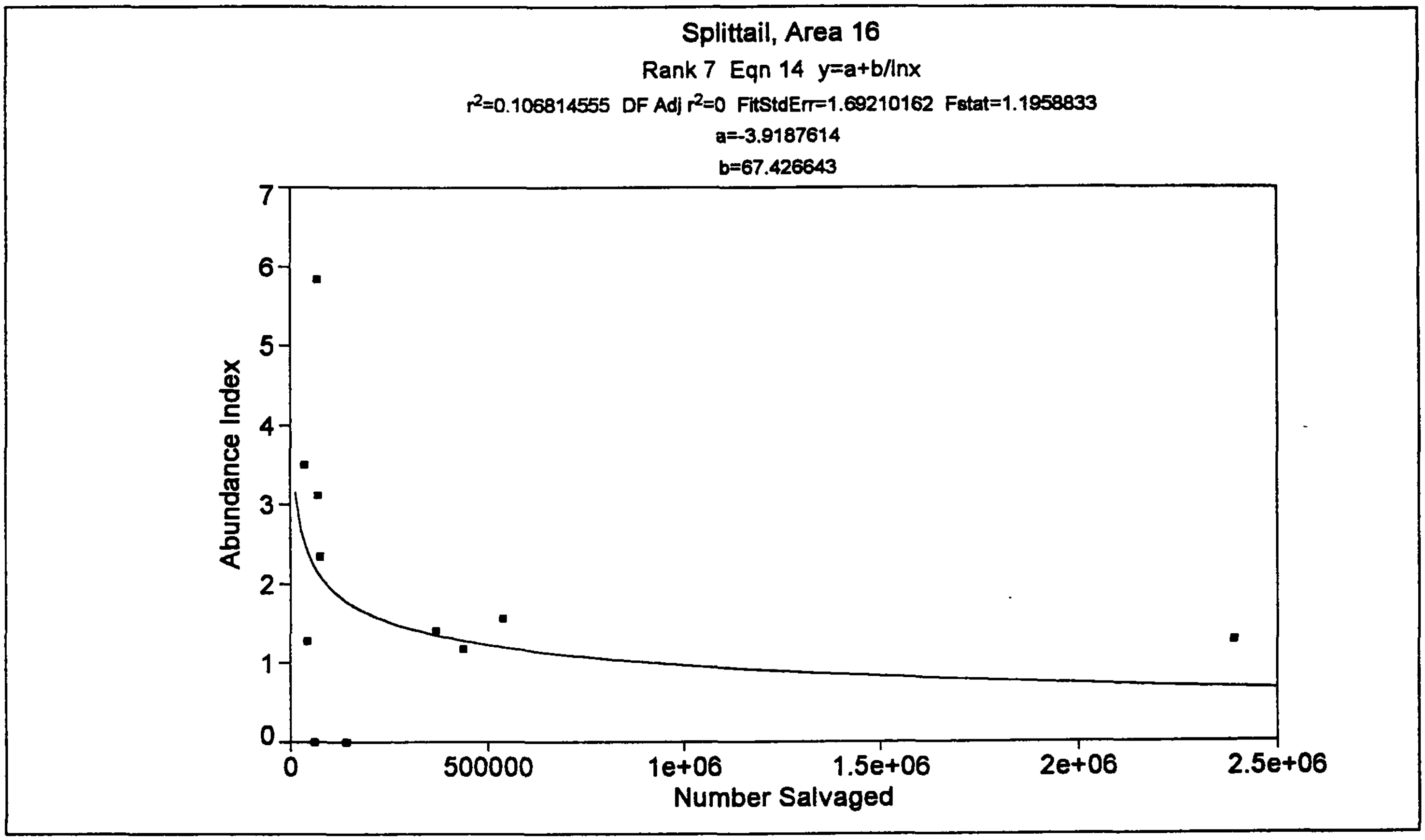

Rank 7 Eqn 14 y=a+b/lnx

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.1068145554	0.0000000000	1.6921016213	1.1958832962

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	-3.91876141	5.240506628	-0.74778293	-15.6247623	7.787239485
b	67.42664276	61.65767388	1.093564491	-70.3014123	205.1546978

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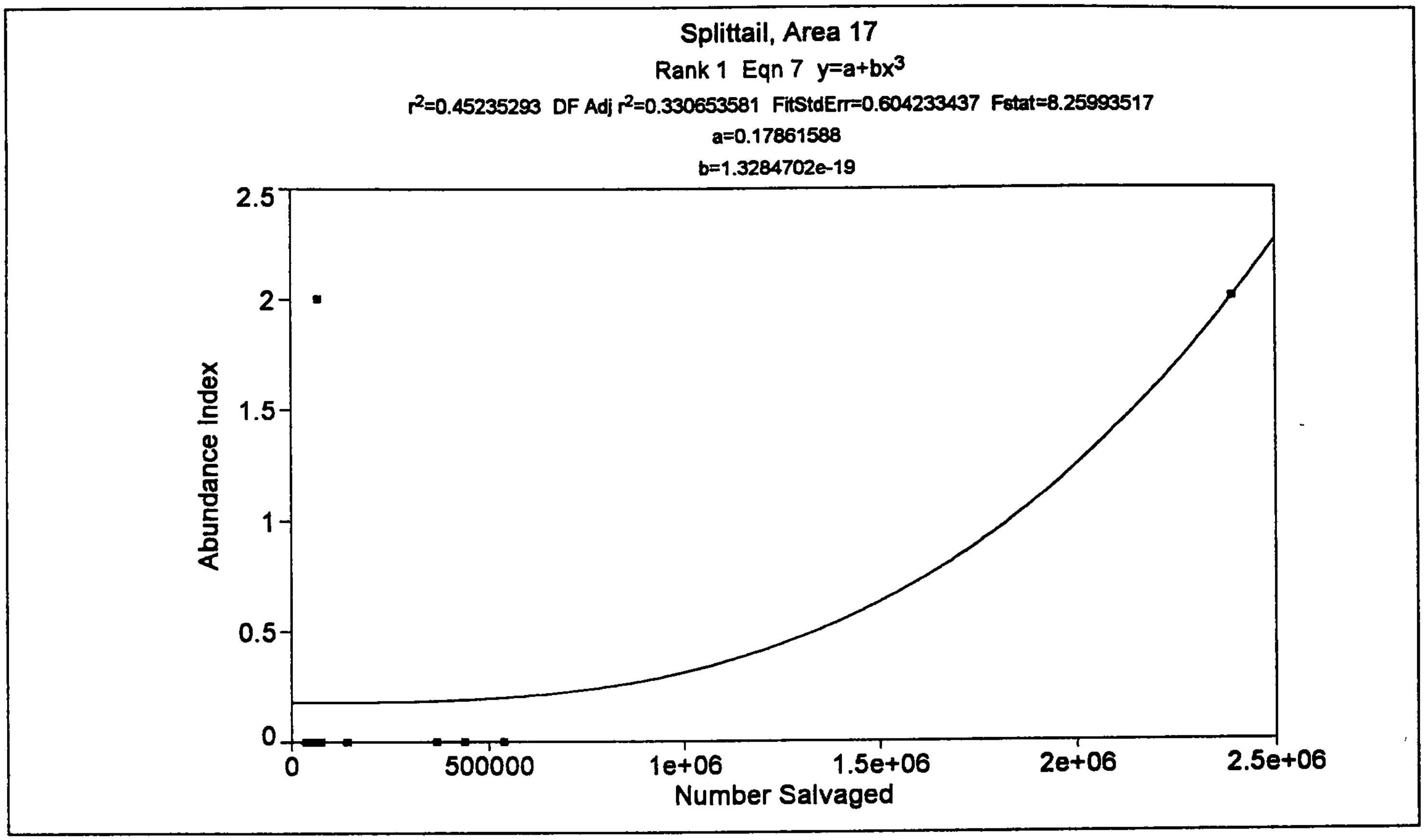

Rank 1 Eqn 7 $y=a+bx^3$

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.4523529298	0.3306535809	0.6042334373	8.2599351745

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	0.178615881	0.182545504	0.978473186	-0.22914581	0.586377571
b	1.32847e-19	4.62236e-20	2.874010295	2.95949e-20	2.36099e-19

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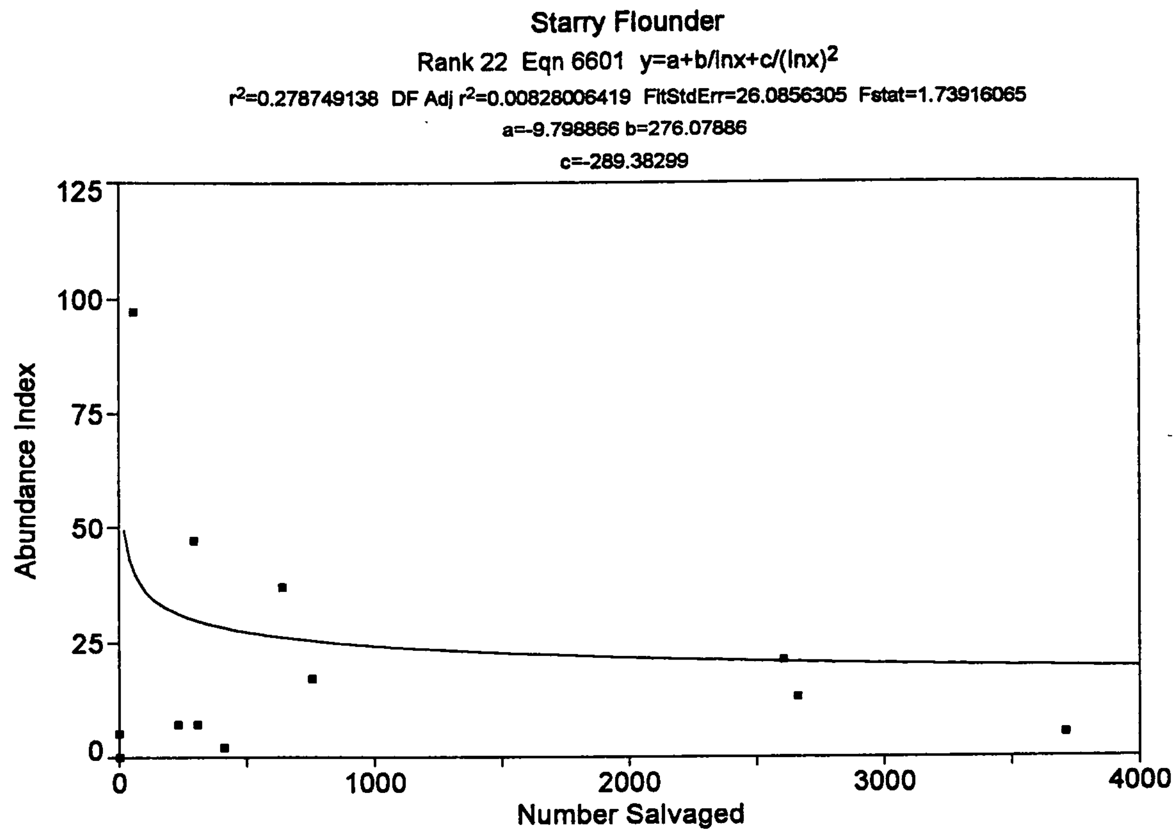

Rank 22 Eqn 6601 $y=a+b/\ln x+c/(\ln x)^2$

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.2787491376	0.0082800642	26.085630512	1.7391606507

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	-9.79886602	21.02551588	-0.46604640	-57.5044544	37.90672234
b	276.0788555	159.7870727	1.727792185	-86.4680783	638.6257893
c	-289.382994	157.4131906	-1.83836560	-646.543737	67.77774885

Date	Time	File Source
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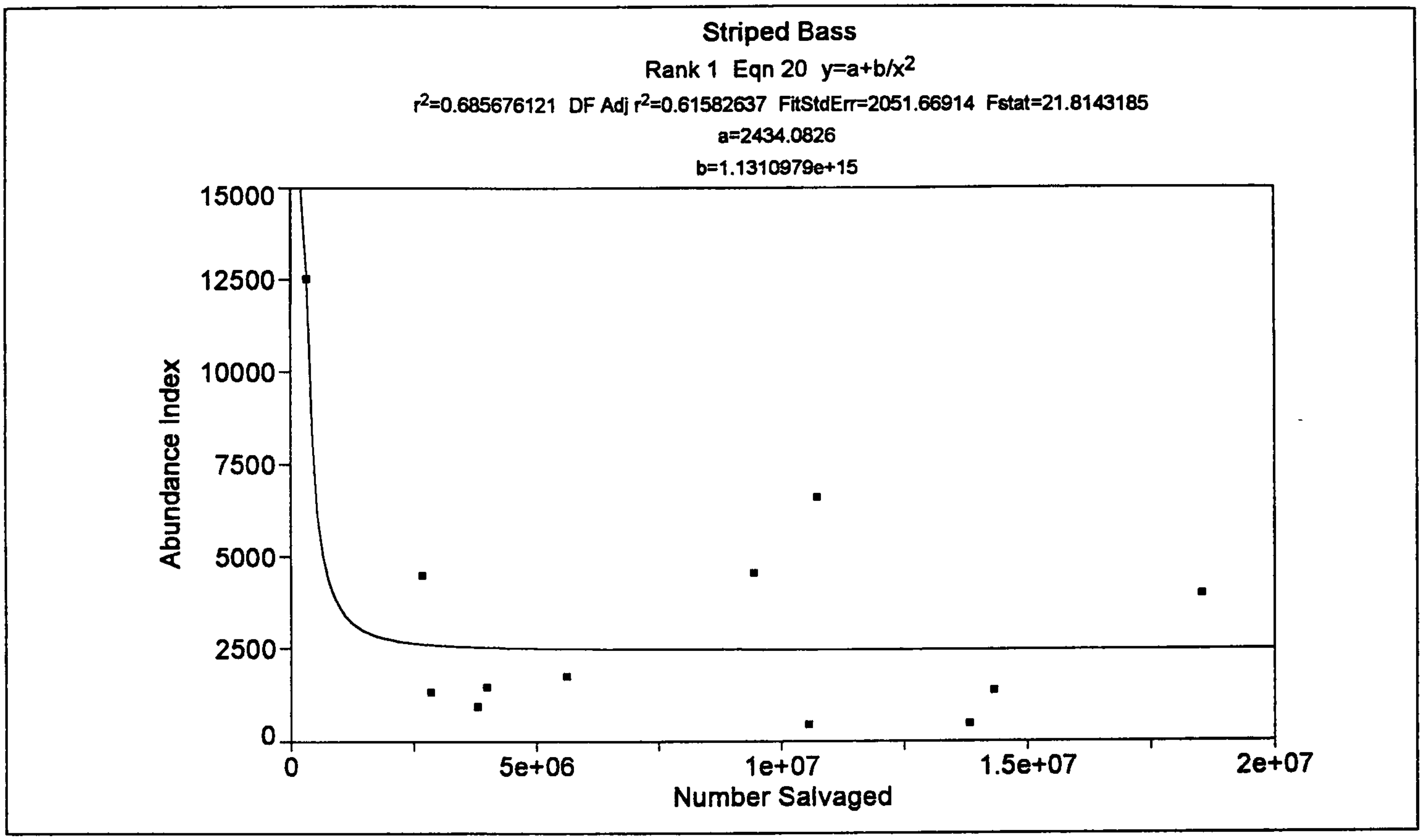

Rank 1 Eqn 20 $y=a+b/x^2$

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.6856761206	0.6158263697	2051.6691426	21.814318468

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	2434.082614	621.6546790	3.915489896	1045.459196	3822.706033
b	1.1311e+15	2.42175e+14	4.670580100	5.90139e+14	1.67206e+15

Date	Time	File Source
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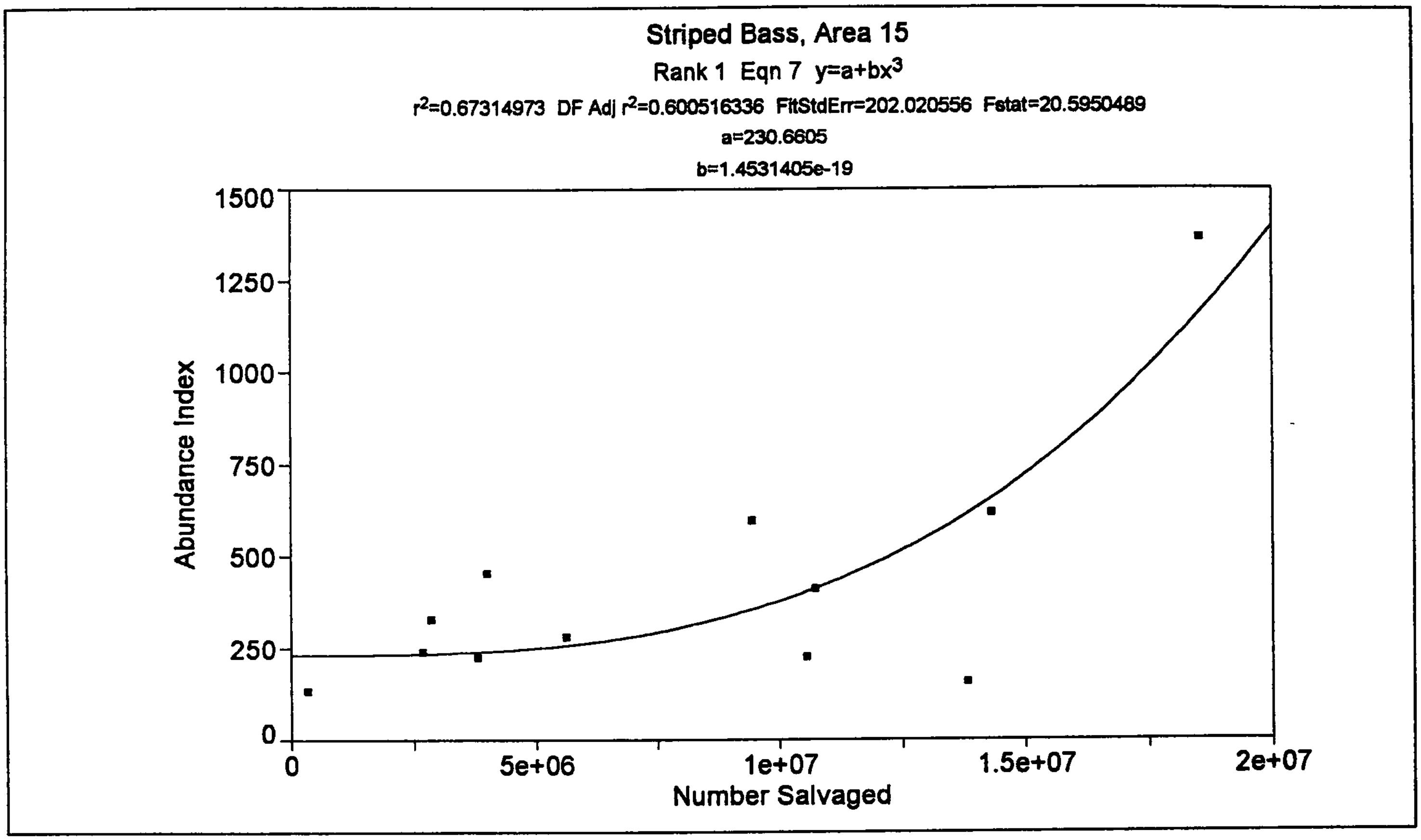

Rank 1 Eqn 7 $y=a+bx^3$

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.6731497298	0.6005163365	202.02055585	20.595048903

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	230.6604976	71.57371405	3.222698454	70.78245146	390.5385437
b	1.45314e-19	3.20204e-20	4.538176826	7.37885e-20	2.1684e-19

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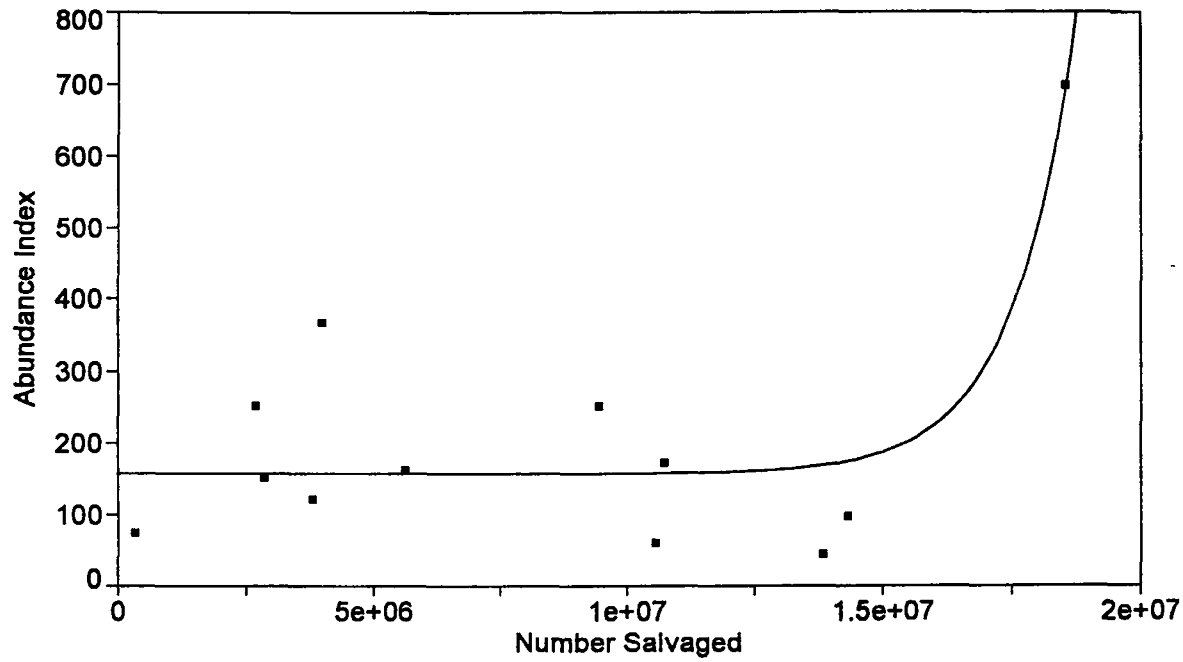

Rank 1 Eqn 8002 y=a+bexp(-x/c) [Exponential]

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.7193081263	0.6140486737	106.12637361	11.531814319

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	156.3216132	36.32622090	4.303272108	73.89967639	238.7435500
b	0.000134431	0.003372993	0.039855026	-0.00751868	0.007787543
c	-1.2208e+06	2.01428e+06	-0.60605800	-5.7911e+06	3.34951e+06

Date	Time	File Source
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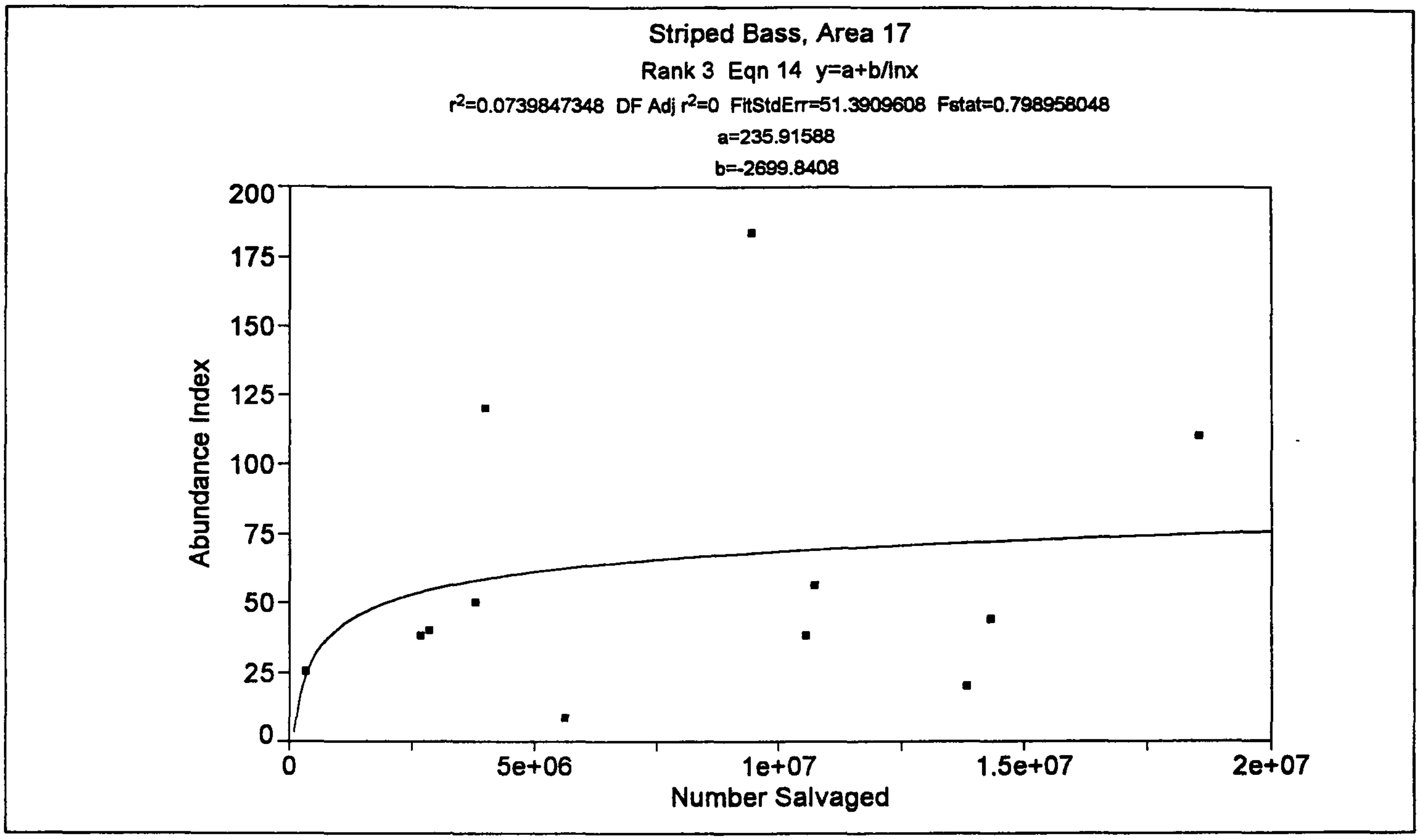


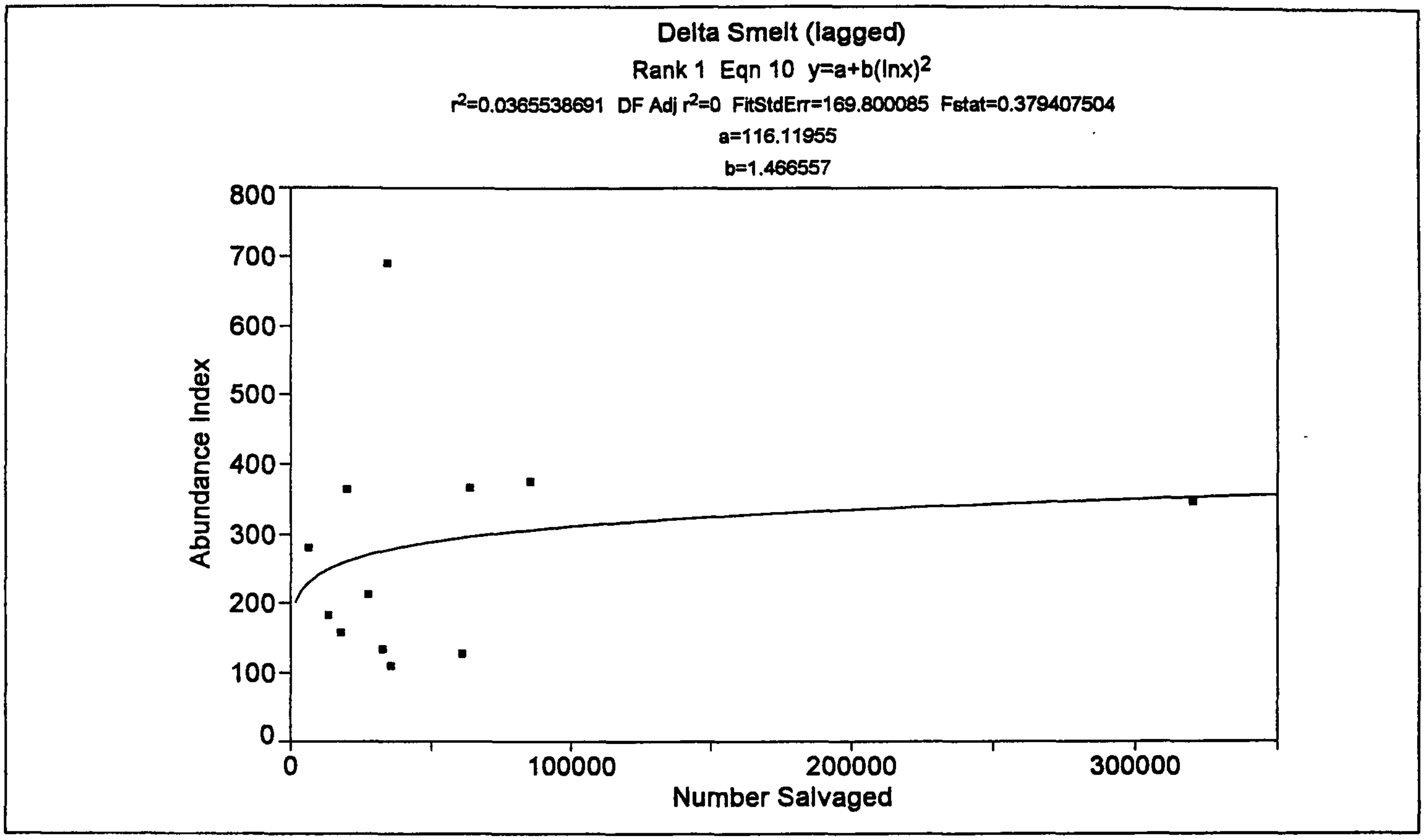
Rank 3 Eqn 14 y=a+b/lnx

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.0739847348	0.0000000000	51.390960806	0.7989580476

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	235.9158758	196.0736279	1.203200442	-202.064309	673.8960610
b	-2699.84082	3020.481444	-0.89384453	-9446.85232	4047.170675

Date	Time	File Source
Feb 13, 1994	8:24:26 PM	c:\tcwin\4fsalvg.xls

15c. LAGGED CORRELATIONS



Rank 1 Eqn 10 $y=a+b(\ln x)^2$

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.0365538691	0.0000000000	169.80008451	0.3794075037

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	116.1195531	267.5352706	0.434034559	-481.488338	713.7274447
b	1.466557026	2.380926545	0.615960635	-3.85184637	6.784960426

Date	Time	File Source
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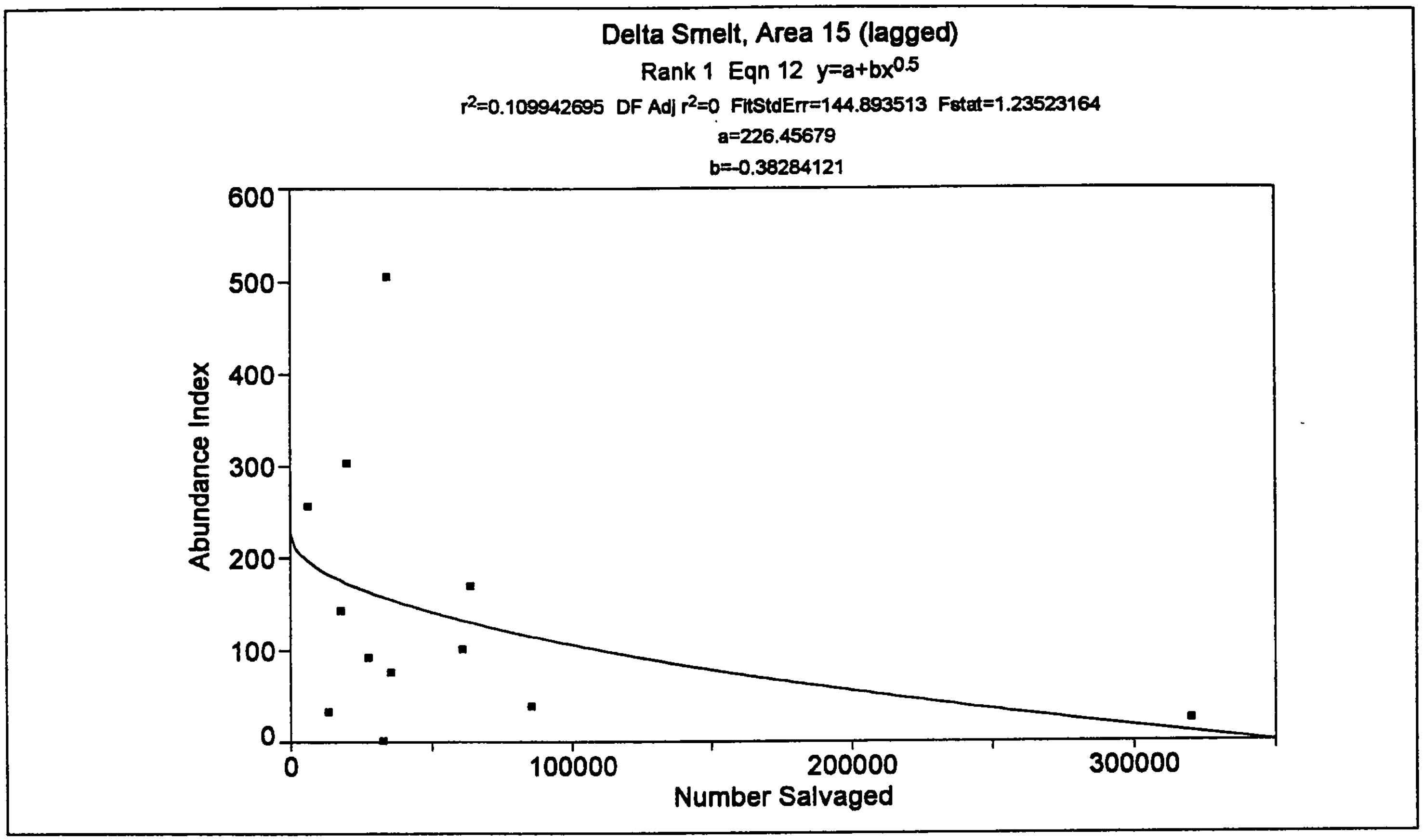

Rank 1 Eqn 12 $y=a+bx^{0.5}$

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.1099426948	0.0000000000	144.89351262	1.2352316437

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	226.4567875	84.25044789	2.687900102	38.26204066	414.6515343
b	-0.38284121	0.344464505	-1.11140976	-1.15229006	0.386607639

Date	Time	File Source
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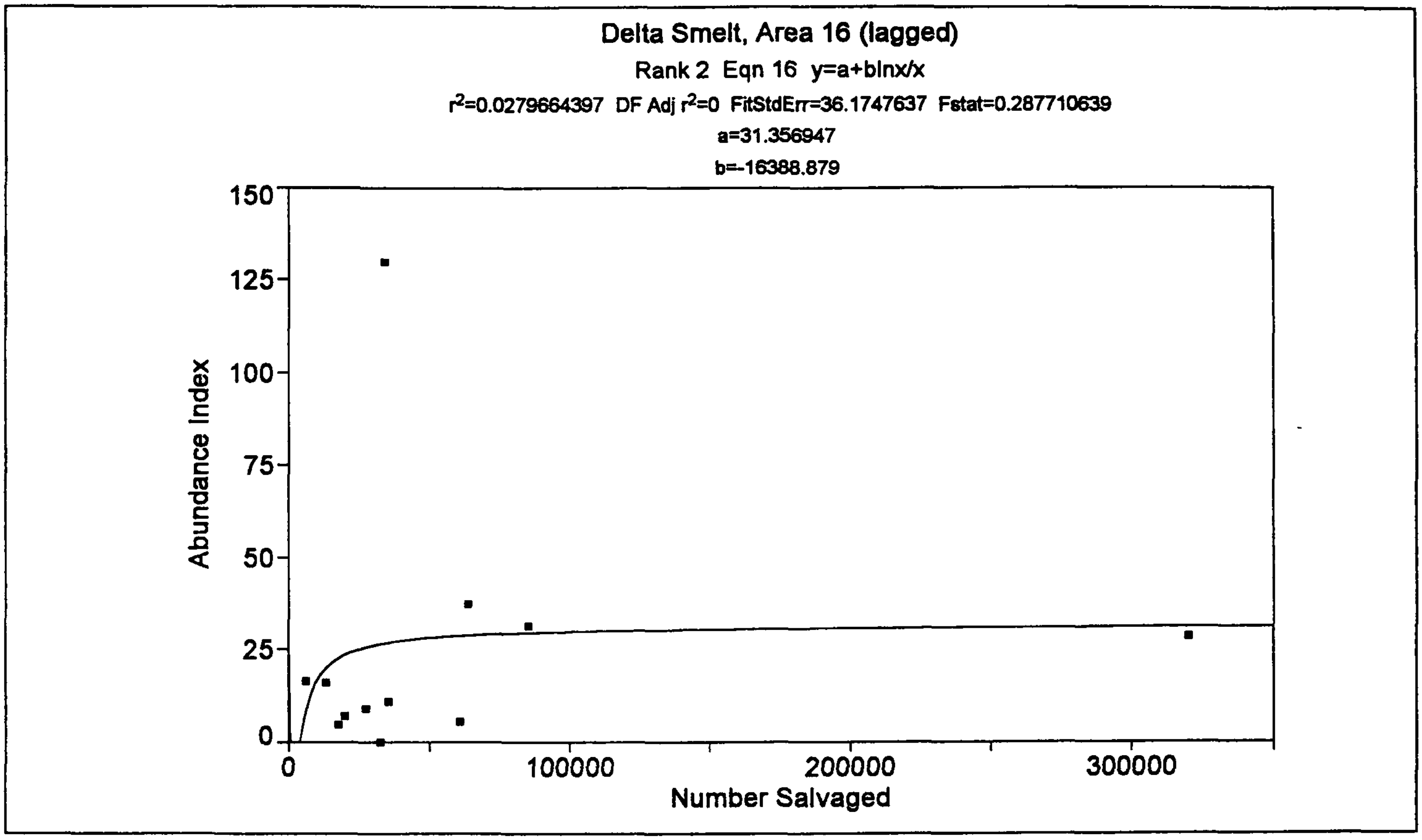

Rank 2 Eqn 16 y=a+blnx/x

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.0279664397	0.0000000000	36.174763714	0.2877106391

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	31.35694659	16.36129696	1.916531841	-5.19016048	67.90405367
b	-16388.8791	30554.22633	-0.53638665	-84639.4942	51861.73595

Date	Time	File Source
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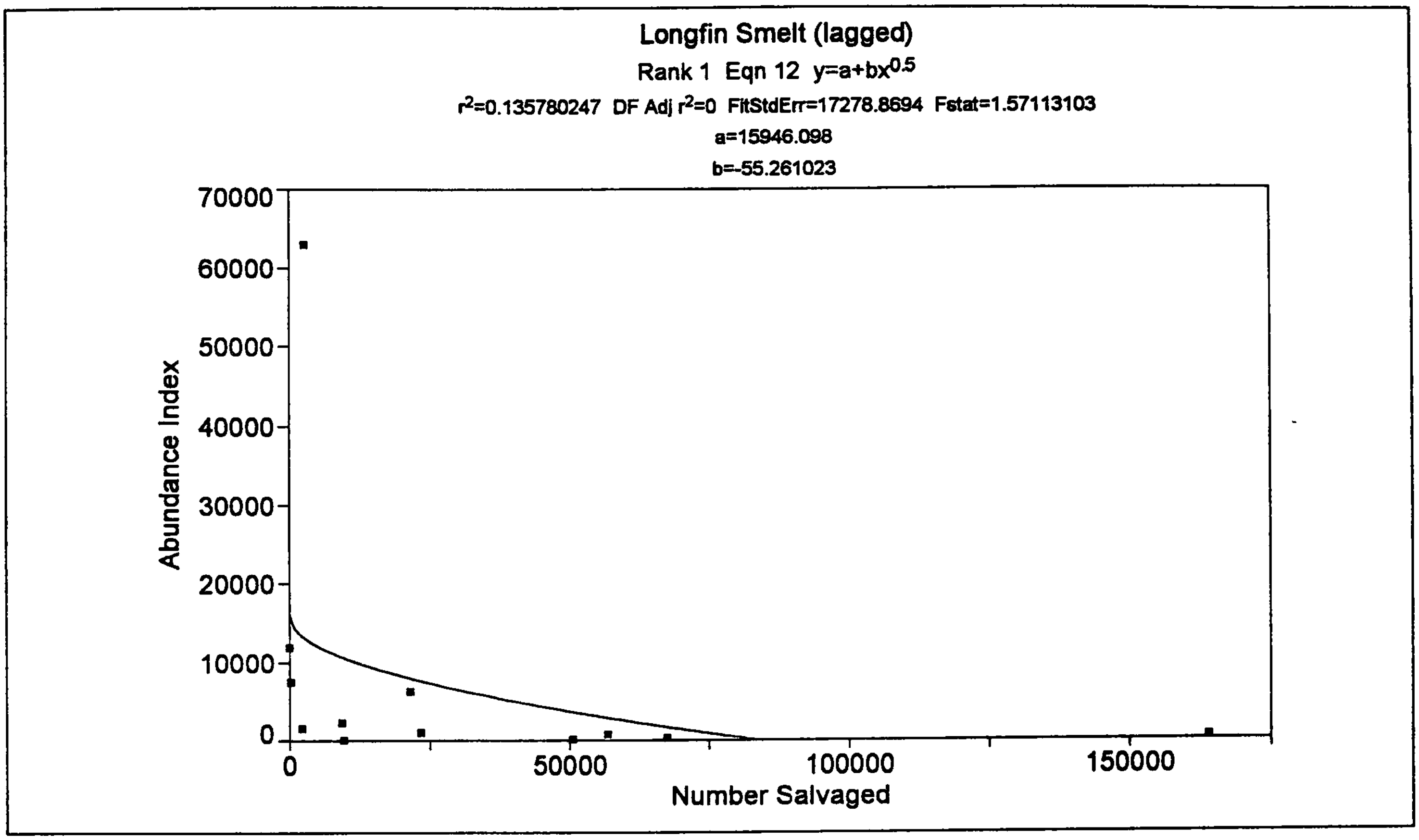

Rank 1 Eqn 12 $y=a+bx^{0.5}$

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.1357802469	0.0000000000	17278.869448	1.5711310278

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	15946.09810	8131.234211	1.961091968	-2217.07612	34109.27233
b	-55.2610235	44.08722069	-1.25344766	-153.741014	43.21896738

Date	Time	File Source
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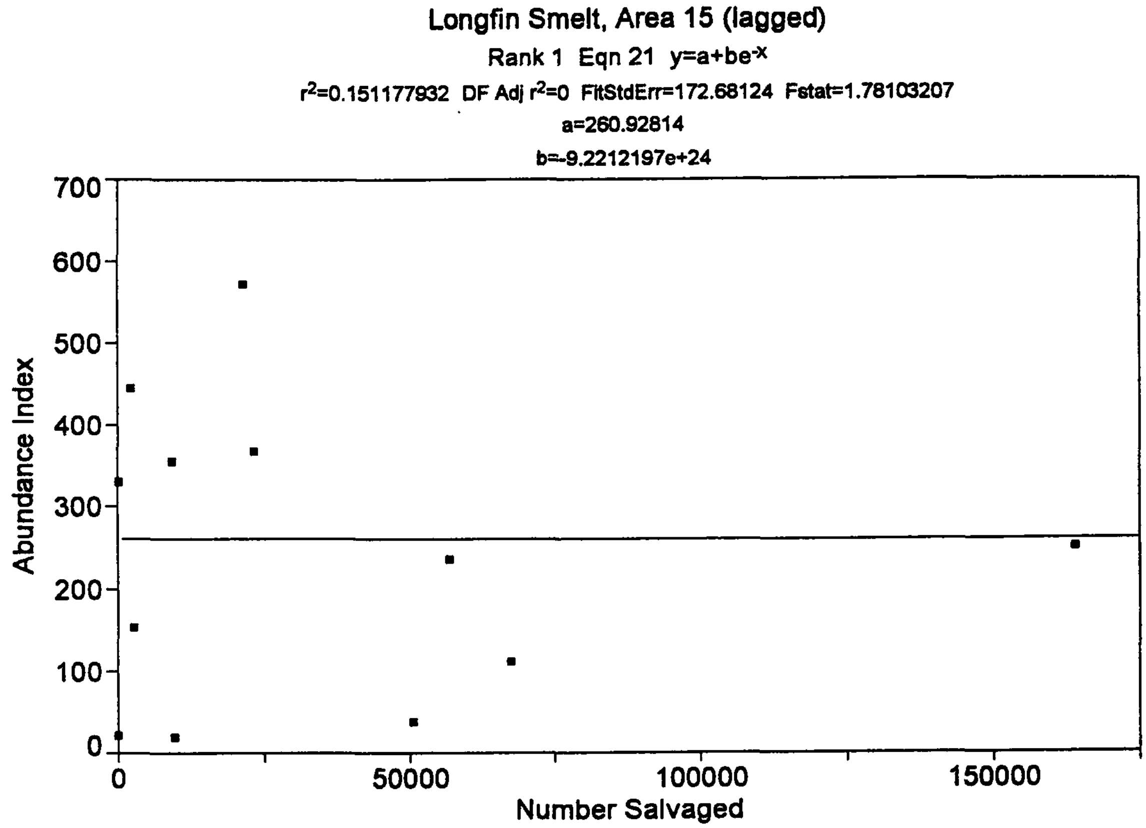

Rank 1 Eqn 21 $y=a+be^{-x}$

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.1511779323	0.0000000000	172.68124018	1.7810320691

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	260.9281385	52.06535291	5.011550368	144.6269656	377.2293115
b	-9.2212e+24	6.90959e+24	-1.33455313	-2.4656e+25	6.21311e+24

Date	Time	File Source
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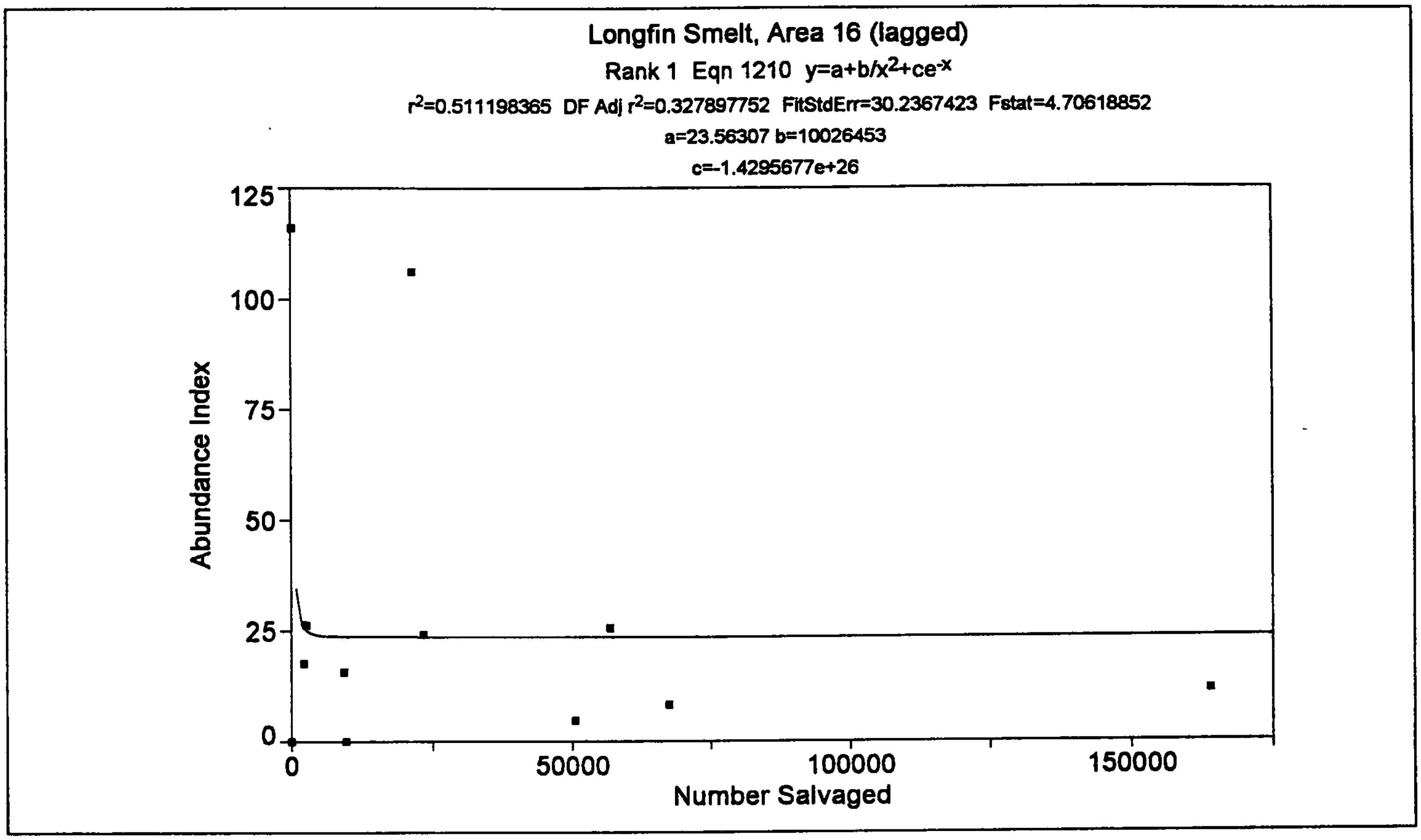

Rank 1 Eqn 1210 $y=a+b/x^2+ce^{-x}$

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.5111983651	0.3278977521	30.236742283	4.7061885211

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	23.56307006	9.598736468	2.454809562	1.784133776	45.34200635
b	1.00265e+07	3.46577e+06	2.892997042	2.16284e+06	1.78901e+07
c	-1.4296e+26	4.90026e+25	-2.91732982	-2.5414e+26	-3.1773e+25

Date	Time	File Source
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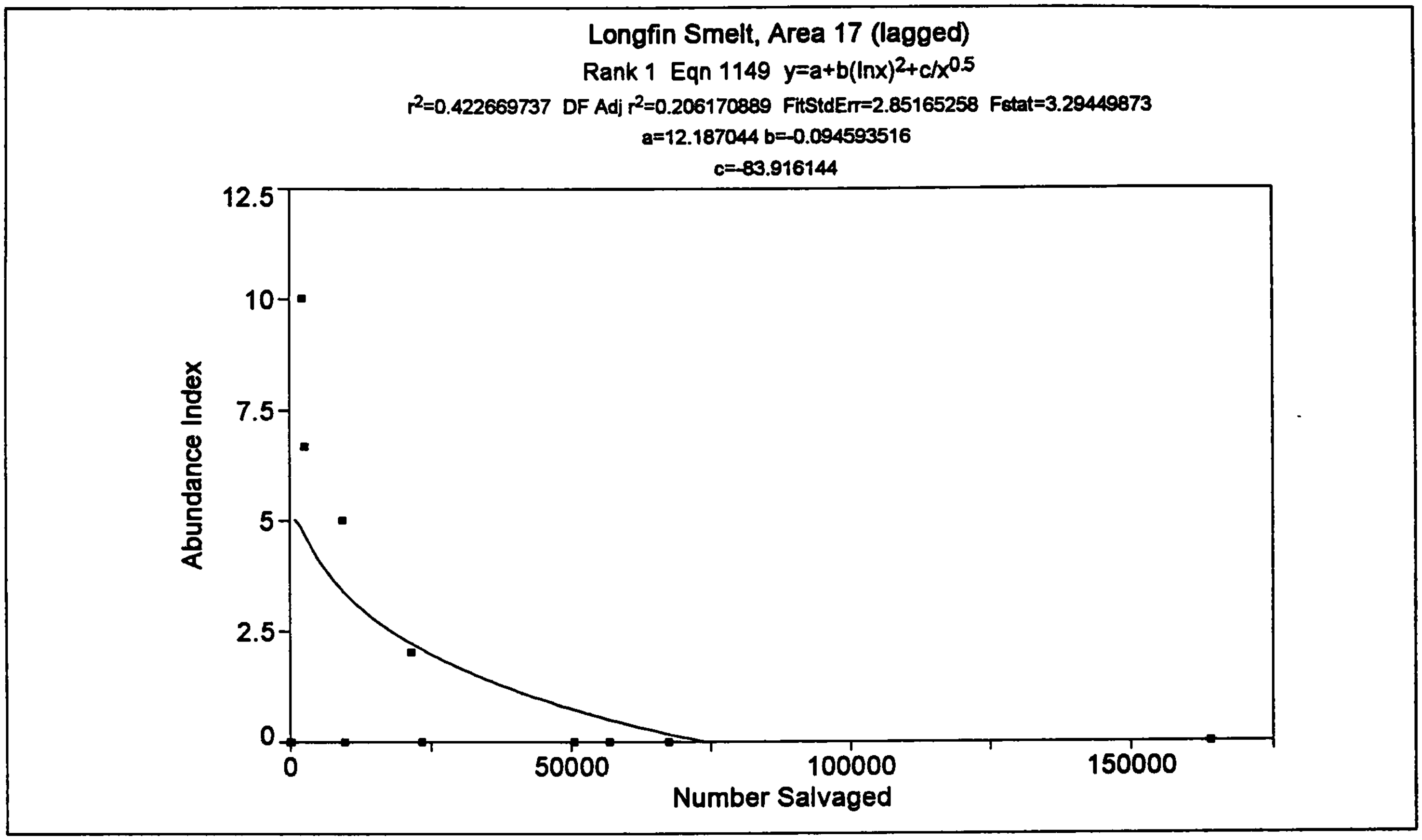

Rank 1 Eqn 1149 $y=a+b(\ln x)^2+c/x^{0.5}$

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.4226697372	0.2061708886	2.8516525835	3.2944987296

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	12.18704386	4.065995019	2.997309098	2.961553952	21.41253377
b	-0.09459352	0.037358773	-2.53202949	-0.17935825	-0.00982878
c	-83.9161440	36.79308740	-2.28075842	-167.397372	-0.43491616

Date	Time	File Source
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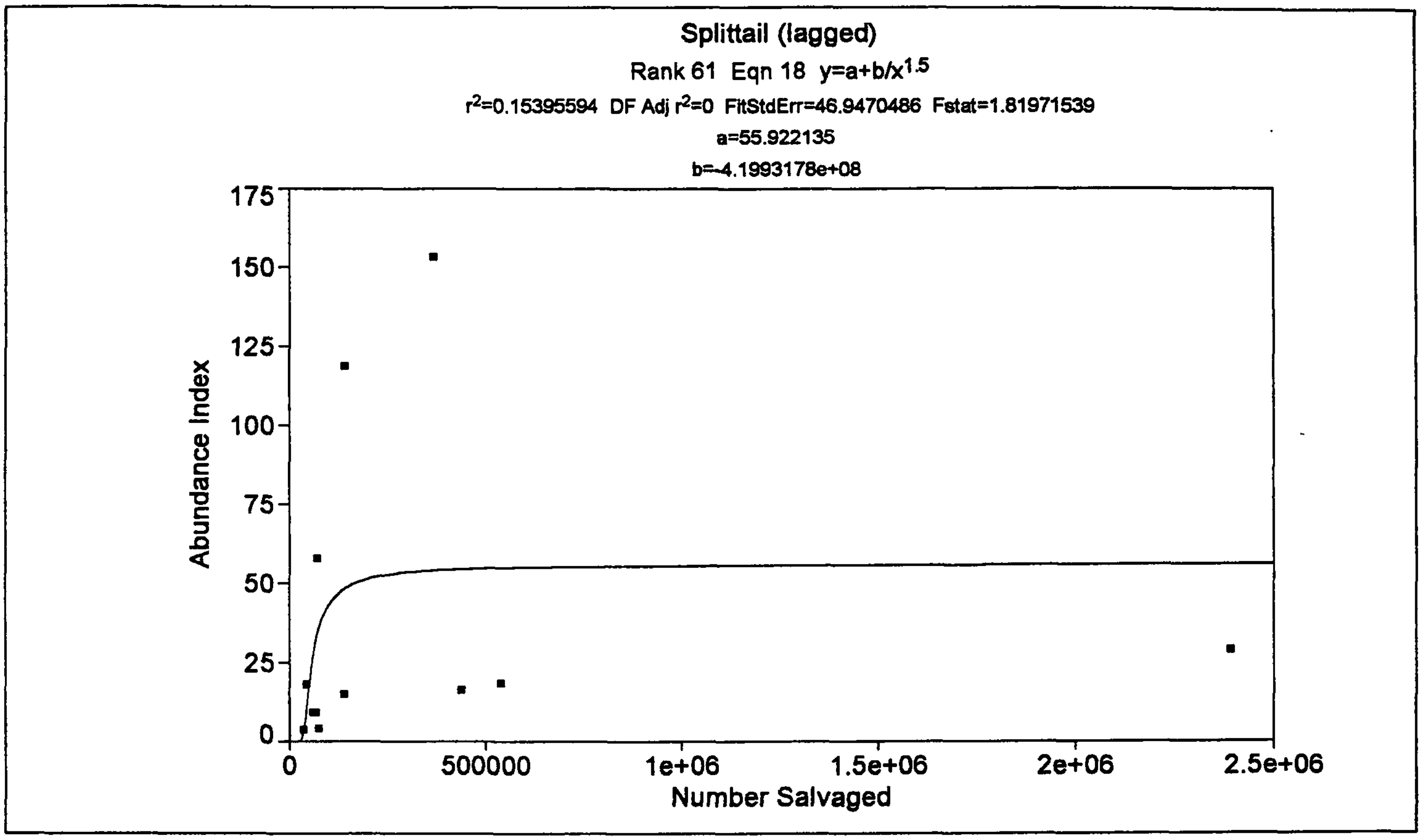

Rank 61 Eqn 18 $y=a+b/x^{1.5}$

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.1539559400	0.0000000000	46.947048579	1.8197153943

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	55.92213504	19.19498062	2.913372831	13.04527671	98.79899338
b	-4.1993e+08	3.11298e+08	-1.34896827	-1.1153e+09	2.75432e+08

Date	Time	File Source
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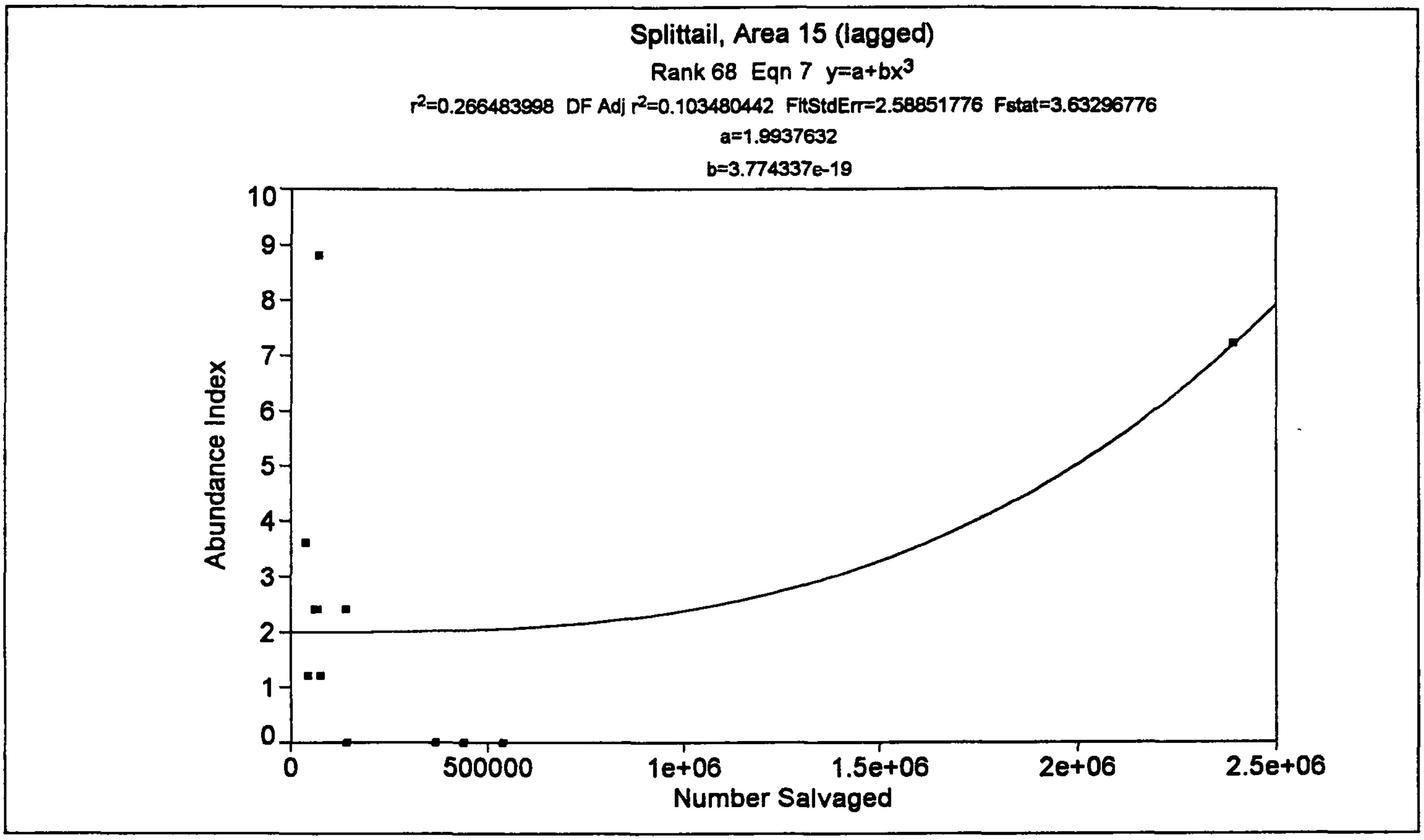

Rank 68 Eqn 7 $y=a+bx^3$

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.2664839983	0.1034804423	2.5885177555	3.6329677557

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	1.993763226	0.782019415	2.549506045	0.246924491	3.740601962
b	3.77434e-19	1.9802e-19	1.906034563	-6.4895e-20	8.19762e-19

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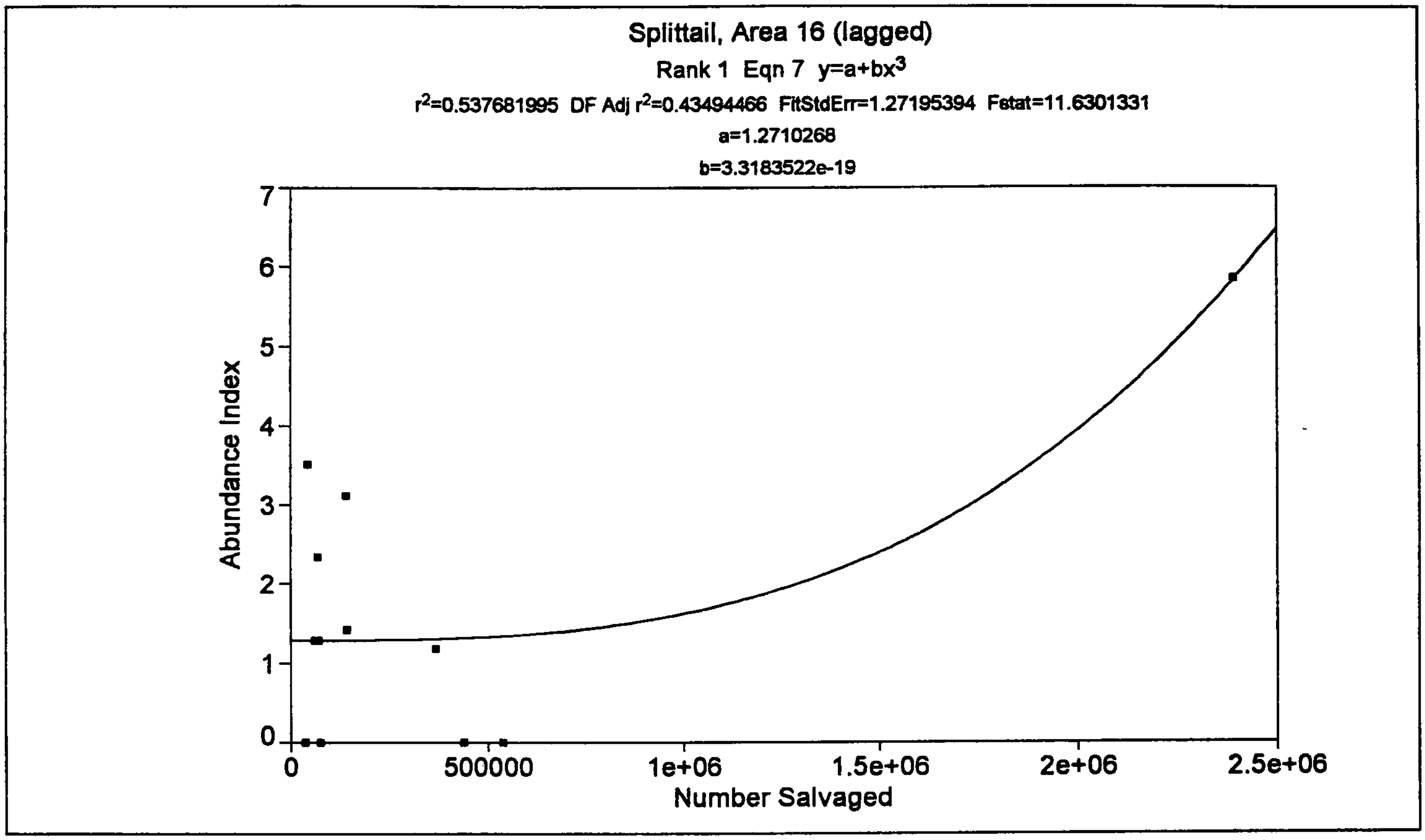

Rank 1 Eqn 7 $y=a+bx^3$

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.5376819947	0.4349446602	1.2719539425	11.630133123

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	1.271026769	0.384271144	3.307630014	0.412659693	2.129393845
b	3.31835e-19	9.73039e-20	3.410298099	1.14482e-19	5.49188e-19

Date	Time	File Source
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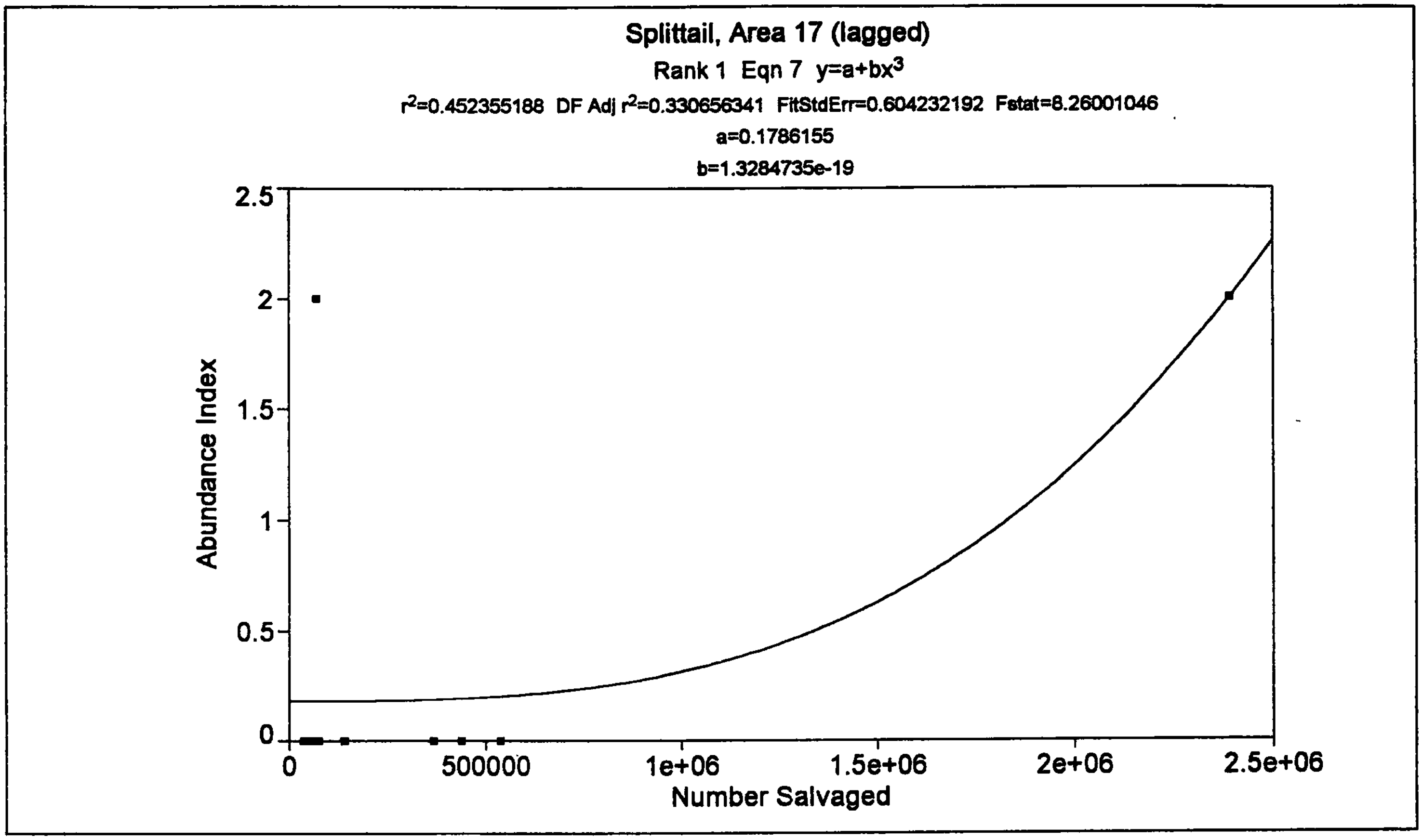

Rank 1 Eqn 7 $y=a+bx^3$

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.4523551878	0.3306563407	0.6042321917	8.2600104622

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	0.178615495	0.182545128	0.978473088	-0.22914535	0.586376344
b	1.32847e-19	4.62235e-20	2.874023393	2.95955e-20	2.36099e-19

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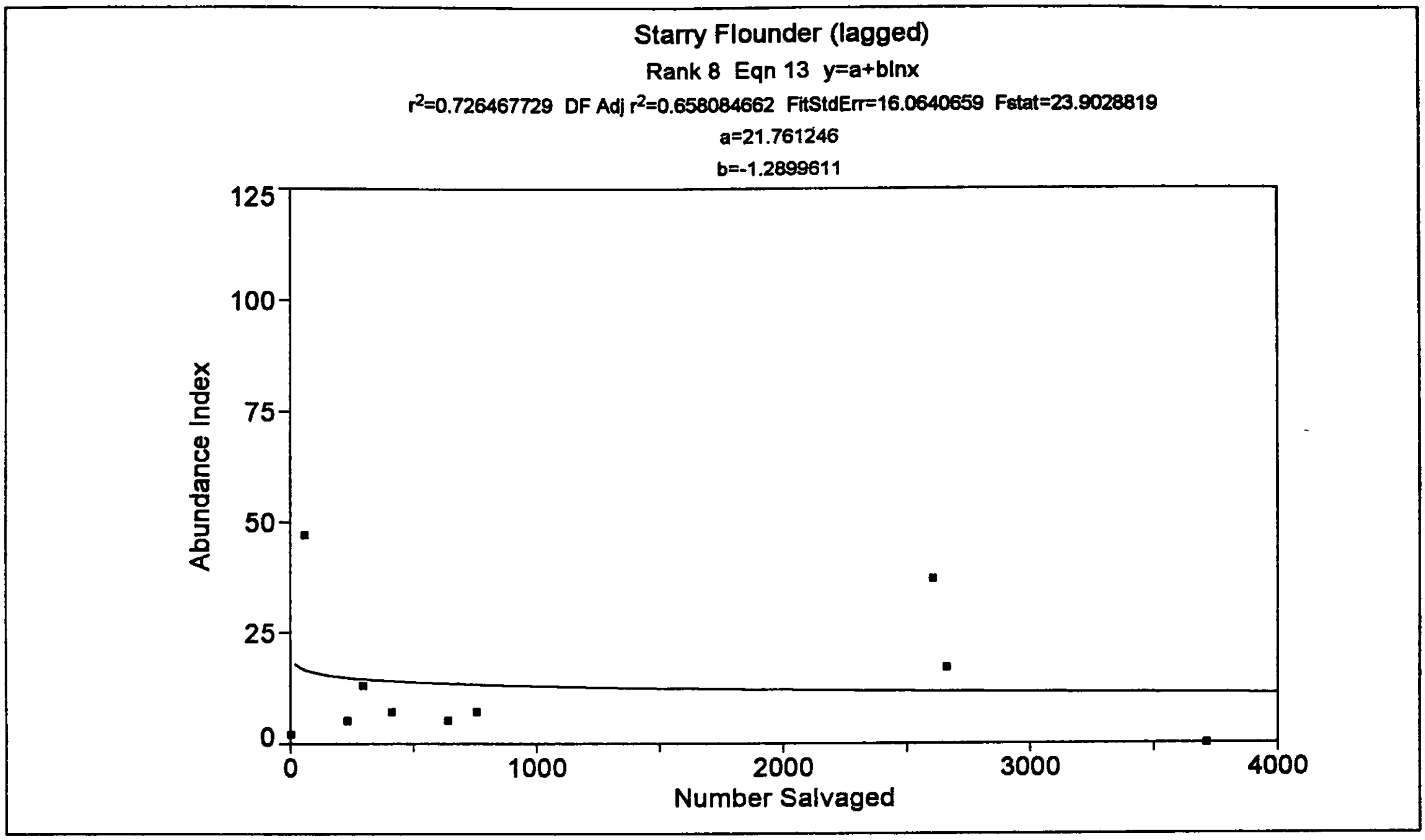

Rank 8 Eqn 13 y=a+blnx

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.7264677292	0.6580846615	16.064065874	23.902881893

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	21.76124642	4.843699206	4.492691535	10.77119406	32.75129878
b	-1.28996115	0.263846597	-4.88905736	-1.88861267	-0.69130962

Date	Time	File Source
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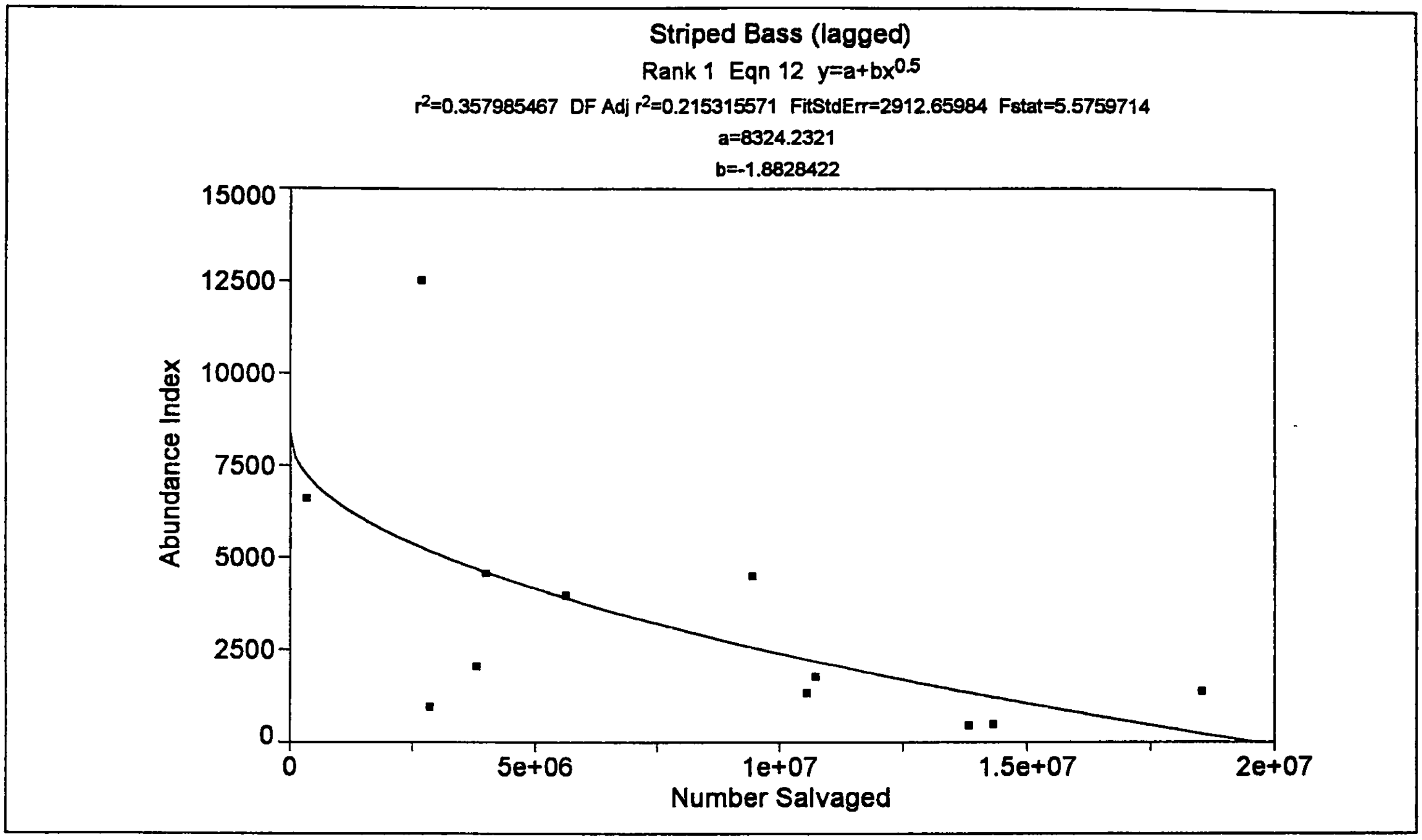

Rank 1 Eqn 12 $y=a+bx^{0.5}$

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.3579854673	0.2153155711	2912.6598443	5.5759714004

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	8324.232057	2263.182106	3.678109700	3268.840731	13379.62338
b	-1.88284224	0.797358567	-2.36134949	-3.66394486	-0.10173962

Date	Time	File Source
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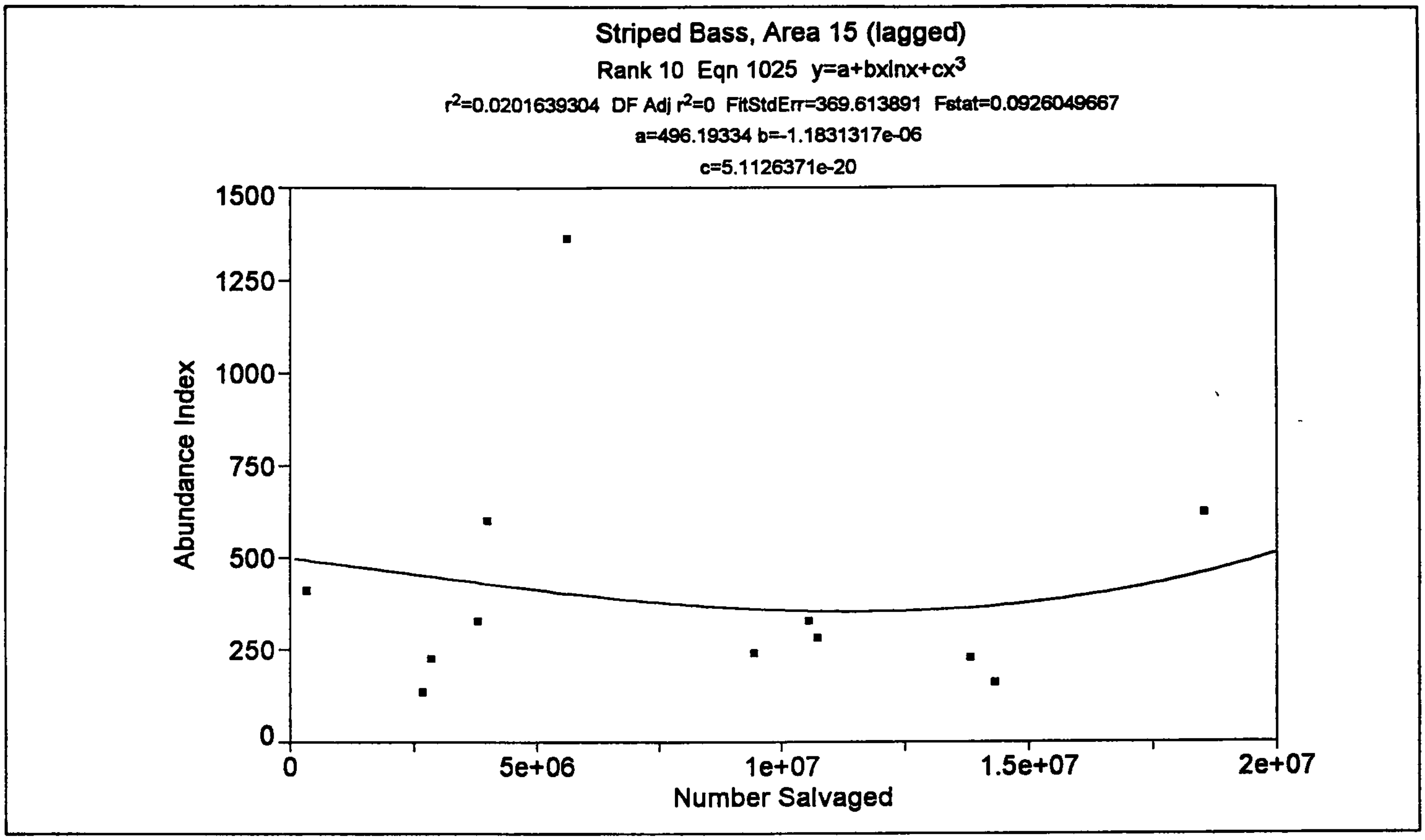

Rank 10 Eqn 1025 $y=a+bx\ln x+cx^3$

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.0201639304	0.0000000000	369.61389142	0.0926049667

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	496.1933393	235.9558459	2.102907590	-39.1758054	1031.562484
b	-1.1831e-06	2.76764e-06	-0.42748745	-7.4627e-06	5.09647e-06
c	5.11264e-20	1.39317e-19	0.366979117	-2.6497e-19	3.67228e-19

Date	Time	File Source
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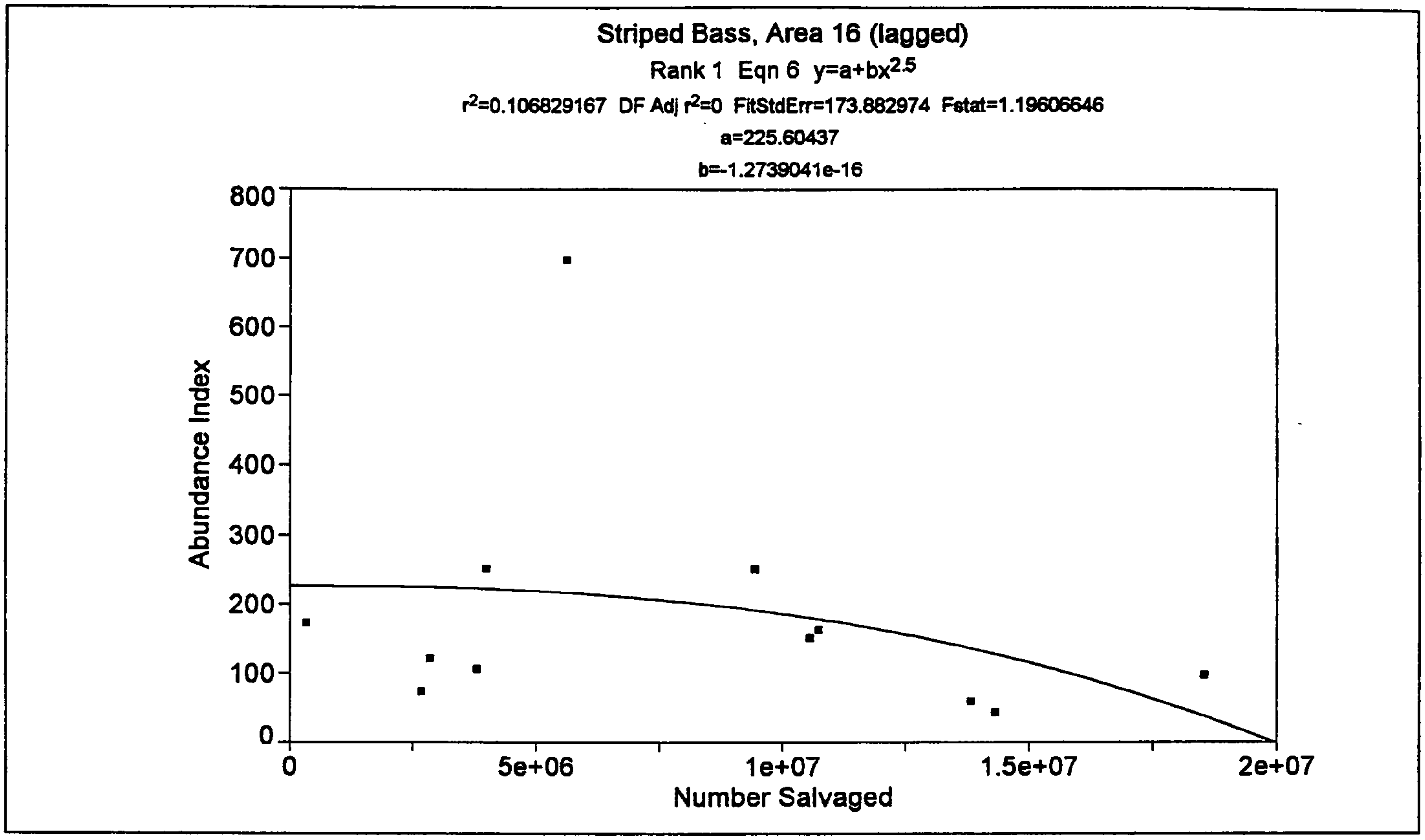

Rank 1 Eqn 6 $y=a+bx^{2.5}$

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.1068291674	0.0000000000	173.88297388	1.1960664579

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	225.6043690	64.30893935	3.508133881	81.95403997	369.2546980
b	-1.2739e-16	1.16482e-16	-1.09364823	-3.8758e-16	1.32802e-16

Date	Time	File Source
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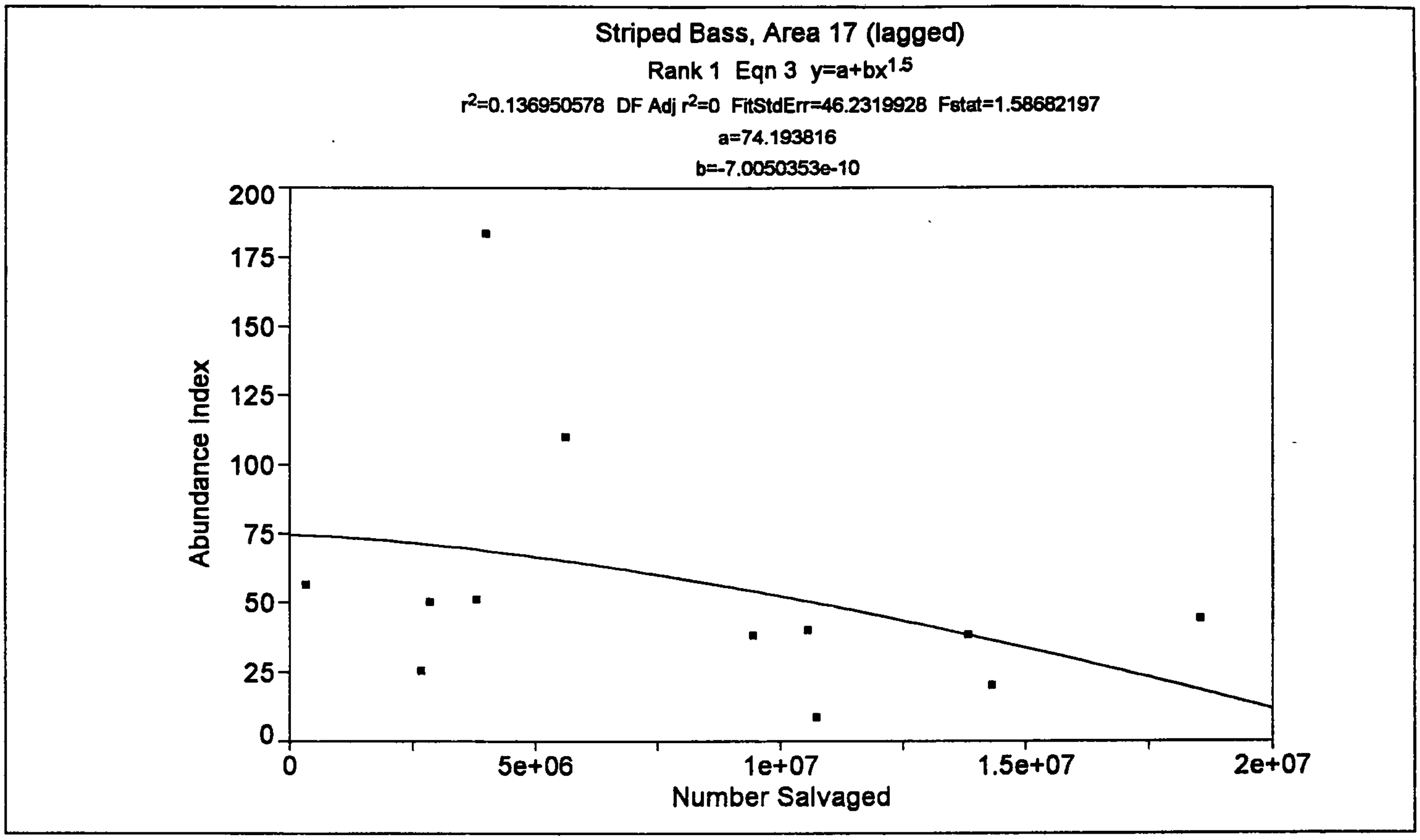

Rank 1 Eqn 3 $y=a+bx^{1.5}$

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.1369505783	0.0000000000	46.231992771	1.5868219687

Parm	Value	Std Error	t-value	95% Confidence Limits	
a	74.19381559	20.01829057	3.706301261	29.47788564	118.9097455
b	-7.005e-10	5.56091e-10	-1.25969122	-1.9427e-09	5.41668e-10

Date	Time	File Source
Feb 13, 1994	9:36:03 PM	c:\tcwin\4fsalvg.xls