

UCRL-15343

P.O. 8947803

MASTER

SALTON SEA SAMPLING PROGRAM:
BASELINE STUDIES

R. E. Tullis
J. L. Carter
G. W. Lanlois
California State University, Hayward

April 13, 1981



Lawrence
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Salton Sea Sampling Program: Baseline Studies

Submitted by:

Dr. Richard E. Tullis, Project Director,

James L. Carter and Gregg W. Langlois

Department of Biological Science

California State University, Hayward

Hayward, Cal. 94542

UCRL # UCRL- 15343

Contract:

Period: October 1, 1977-September 30, 1977

P.O. # 8947803

Imperial Valley Environmental Project

Environmental Sciences Division

Dr. Joseph H. Shinn/Robert R. Ireland

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INTRODUCTION

This report provides baseline data on three species of fish from the Salton Sea, California. The fishes considered were the orange mouth corvina (Cynoscion xanthulus), gulf croaker (Bairdiella icistius) and sargo (Anisotremus davidsonii). Morphometric and meristic data are presented as a baseline to aid in the evaluation of any physiological stress the fish may experience as a result of geothermal development. Analyses were made on muscle, liver, and bone of the fishes sampled to provide baseline data on elemental tissue burdens. The elements measured were: As, Br, Ca, Cu, Fe, Ga, K, Mn, Ni, Pb, Rb, Se, Sr, Zn, and Zr. These data are important if an environmentally sound progression of geothermal power production is to occur at the Salton Sea.

MATERIALS AND METHODS

The fishes studied were collected from four different locations in the Salton Sea. The most northern station was 50 m off shore of Salton Sea State Park (SP). The next southern station was 100 m off the inflow of Salt Creek (SC). Our southern most station was between Red Hill Marina (RH) and Obsidian Butte. The distance from shore was approximately 1 km. In addition we sampled one deep water (11 m) station located 5 km SSW off Bombay Marina (BB).

Fish were collected on four sampling trips of approximately one week duration each. These were initiated on: December 19, 1977; April 3, 1978; July 10, 1978; and October 1, 1978.

Fish were collected with 125 ft. sinking gillnets graded from 2-in. to 5-in. stretch. The procedure for the collection and handling of gillnetted fish was as follows: gillnets at SP, SC, and RH were set in shallow water

(-2 to 4 m); gillnets at BB were set on the bottom at 11 m; the nets were set in the evening and retrieved the next morning; the set time ranged from 12-18 h.

After retrieval, fish were removed from the nets and morphometric and meristic data were recorded. If more fish were collected than needed, fish were selected to provide a representative size range of the catch. The fish were then individually placed in separate polyethylene bags and frozen on dry ice for transport to California State University, Hayward.

Acid washed plastic utensils were used to excise portions of the muscle, liver, and bone. The tissue samples were placed in acid washed beakers and weighed, then dried at 60°C for at least 48 h, cooled in a desiccator and weighed a second time. The samples were then taken from less than 200°C to 450°C in increments of 50°C/h in a muffle furnace. They remained in the muffle furnace until all organic material was ashed. For some samples (liver) it was necessary to pool the tissue from several fish to provide adequate material for analysis.

Upon completion of the ashing process each sample was transferred to an acid washed glass vial and sent to Lawrence Livermore National Laboratory for elemental analysis by x-ray fluorescence.

RESULTS AND DISCUSSION:

1. Morphometrics and Meristics

Dorsal fin ray counts were made to determine if there were any deviations from normal counts (Tables 1-4). Few abnormal dorsal fin ray counts were observed for the corvina or gulf croaker. Data from the first year's sampling indicated that abnormal fin ray counts existed in the sargo. To test if there was a significant difference in the sargo fin ray numbers, we counted fin rays from specimens in the collection at the California Academy of Sciences (CAS). The sargo in the CAS collection are from two different locations, coastal California and the Gulf of California.

Miller and Lea¹ report the range in dorsal soft rays of sargo to be 14-16. The sargo from the CAS collection had a range of 14-16 ($\bar{x}=15.59$, $S^2=0.4186$, $n=34$). The sargo from the Salton Sea had a range of 11-16 ($\bar{x}=14.02$, $S^2=0.9524$, $n=63$). The calculated t value (9.06, d.f. =95) was larger than the critical t value (1.988, $p < .05$) indicating a significant difference in the mean number of dorsal soft rays between these two populations.

Variations in the number of intraspecific meristic characters has been attributed to a number of physical parameters. These include temperature^{2,3,4,5}, salinity⁶, and light^{7,8}. In addition it has been recognized that variation in meristics may also be a function of productivity⁹.

The Salton Sea is physically different from the ocean waters of coastal southern California and the Gulf of California. Temperatures range from 13°C to over 35°C¹⁰. Hubbs² and Weisel⁵ both observed negative correlations

between temperature and the number of dorsal fin rays in populations studied in the field. The salinity of the Salton Sea in 1977 was 37-38 ‰. Heuts⁶, studying fresh water and sea water populations of Gasterosteus aculeatus, found differences in the population means of dorsal fin spine and ray counts. Taning³ suggested that the role of salinity may be obscured by the relative impermeability of the vitelline membrane. Another, though indirect, result of salinity is the bouyancy of the sargo eggs. Lasker, Tenza and Chamberlain¹¹ found that the eggs of sargo sank in sea water but floated in Salton Sea water. This would imply that the eggs are exposed to more light in the Salton Sea than in the ocean environment. Lindsey⁸ found decreasing vertebrae and anal fin ray counts in Oncorhynchus nerka with increased light. The Salton Sea is an extremely eutrophic environment. Johnson and Barnett,⁹ studying midwater fishes from different parts at the Pacific Ocean, showed highly negative correlations between productivity and meristic number.

Gonado-somatic indices were calculated for corvina, gulf croaker, and sargo (Figures 1a, b, & c). Corvina gonad weight increased in April to a maximum in July. The large range in the gonado-somatic index of corvina indicate that spawning is not strongly synchronized¹². In addition we observed several individuals that appeared to be reabsorbing the gonadal tissue. The sargo gonado-somatic indices reached a maximum in April, indicating late spring as the reproductive period. Gulf croaker gonado-somatic indices reached a maximum in April, indicating late spring as the reproductive period. Gulf croaker gonado-somatic indices showed temporal characteristics similar to sargo.

Liver indices are represented in Figures 2a,b and c. Liver indices were lowest in October for gulf croaker and sargo and lowest in July-October for corvina. These periods represent post-spawning times for all species. In addition the later periods may represent post summer temperature stress.

Macroscopic examination of stomach contents were made on corvina, gulf croaker, and sargo (Table 5). Corvina fed on fish most of the year with their diet consisting of mollies (Poecilia latapinna), gulf croaker, and sargo. In April 92% of the corvina with food present in their stomachs contained Neanthes succinea. This may indicate a shift in the diet due to the disappearance of gulf croaker and sargo during spawning. Sargo fed on barnacles (Balanus amphitrite) most of the year but switched exclusively to N. succinea in April. The gulf croaker fed almost exclusively on worms (N. succinea). However, 57% of its stomach contents in July consisted of juvenile sargo, supporting the estimate of late spring as the spawning period of sargo.

Major and Trace Elements

Mean levels of the major and trace elements detected in muscle, liver, and bone for the three species tested are listed in Table 6. Most concentrations are within the ranges reported by other researchers. There appear to be higher values in some of the major elements, ie. Ca, Sr, and K.

Patterson and Settle¹³ found Ca concentrations in tuna muscle, liver, and bone to be 78 ppm, 444 ppm, and 157,746 ppm respectively (values adjusted to dry weight). Concentrations in Salton Sea fishes were higher in all tissues except corvina liver. Sargo had the highest Ca values of all Salton Sea fishes. The diet of sargo consists predominately of the barnacle Balanus amphitrite. The stomachs of sargo are frequently full of barnacle remains.

Strontium follows a similar pattern of being much higher in muscle and liver of Salton Sea fishes, though bone concentrations are lower then reported for tuna¹³.

We found K values in muscle ($x = 21,936\text{ppm}$) to be higher than the concentrations Young¹⁴ found in Salton Sea fish ($x = 14,480\text{ ppm}$, value adjusted to dry weight). His values were similar to those found by Patterson and Settle¹³ in tuna.

Rubidium values in our samples were also higher then the values found by Patterson and Settle¹³ in tuna and Young¹⁴ in Salton Sea fish.

Arsenic concentrations in Salton Sea fish muscle were within the range reported by Heit¹⁵ for striped bass. These values are low compared to values found in shorthorn sculpins by Bohn and Fallis¹⁶.

Copper values are conspicuous in that they are much lower in all tissues than those found by Cross et. al.¹⁷ in bluefish and Bohn and Fallis¹⁶.

Zinc concentrations are the same or lower than those found by other researchers^{15,16,17}.

Lead values are higher than those reported by Patterson and Settle¹³ but lower than found by Heit¹⁵. One should be careful in interpreting Pb analyses because of the difficulty in obtaining uncontaminated samples¹⁸.

In general the frequency of highest concentration for an element per tissue is sargo > gulf croaker > corvina. Patrick and Loutit¹⁹ found that fish fed metal contaminated tubificid worms had higher metal body burdens then those fed un-contaminated worms. In addition it was shown that the body burden of fish fed metal contaminated worms increased with time. Table 5 shows that corvina fed predominately on fish while the gulf croaker and sargo fed mainly on the worm, Neanthes succinea, and the barnacle, Balanus amphitrite, respectively.

Tables 7, 8, and 9 present mean element concentrations per tissue per station for corvina, gulf croaker, and sargo. There appears to be no obvious spacial variation in elemental concentrations. Young¹⁴ also found the Salton Sea to be relatively homogeneous.

Tables 10 through 18 present elemental concentrations of the sampled tissues relative to sampling period. There appears to be no temporal variation in elemental concentrations.

Summary:

1. There appeared to be no significant variations in observed meristic characters for corvina or gulf croaker.
2. Sargo showed reduced dorsal soft ray frequencies that were significantly ($p < .05$) lower than fish analyzed from other locations.
3. Major elements were generally higher in concentration than reported by other researchers.
4. In general, most trace elements were within the same concentration range, or lower, when compared to other studies on fish.

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Table 1. Morphometric and meristic data for first sampling period (12-19-77).

Fish species	Location	Fish No.	Body Wt. g	Std Length cm	Go-So Index	Liver Index	Fin-Ray Count
<u>Cynosion xanthulus</u>	SSSP	A	603.5	33.0	-	0.027	DX+I, 20
	SSSP	B	621.3	33.5	-	0.031	DIX+I, 20
	SSSP	C	687.8	34.5	-	0.029	DIX+I, 21
	SSSP	D	730.4	34.5	-	0.032	DVIII+I, 20
	SSSP	E	785.7	35.0	-	0.042	DIX+I, 20
	S-SSSP	F	844.7	35.5	0.001	0.038	DIX+I, 20
	S-SSSP	G	906.5	38.0	0.001	0.024	DIX+I, 22
	S-SSSP	H	1142.9	41.0	0.003	0.021	DIX+I, 20
	S-SSSP	I	1202.5	44.5	0.007	0.014	DIX+I, 21
	S-SSSP	J	1315.2	44.5	0.001	0.017	DIX+I, 20
	S-SSSP	K	1422.7	45.0	0.001	0.022	DIX+I, 20
	S-SSSP	L	1469.7	45.5	0.001	0.018	DIX+I, 20
	S-SSSP	M	1515.0	47.0	0.001	0.013	DIX+I, 20
	SC	N	1738.6	40.5	0.001	0.012	DVIII+I, 22
	S-SSSP	P	1879.0	49.5	0.001	0.017	DIX+I, 20
	S-SSSP	Q	1973.2	50.5	0.001	0.017	DIX+I, 20
<u>Anisotremus davidsonii</u>	SSSP	A	296.6	20.5	0.014	0.021	DXI, 13
	SSSP	B	289.8	21.0	0.003	0.011	DXI, 14
	SC	C	247.1	19.5	0.010	0.011	DXI, 12
<u>Bairdiella icistius</u>	SSSP	A	106.6	17.0	0.013	0.016	DX, 28
	SSSP	B	108.3	17.0	.005	.012	DXI, 26
	SSSP	C	189.6	21.0	.003	.019	DX, 28
	SSSP	D	221.1	22.0	.012	.018	DXI, 29
	SSSP	E	231.1	22.0	.011	.020	DXI, 28
	SSSP	F	232.8	21.0	.014	.017	DXI, 27
	SSSP	G	252.0	22.5	.014	.019	DXII, 28
	SSSP	H	317.3	24.5	.013	.018	DXI, 28
		I	105.4	16.5	.005	.018	DXI, 27
		J	115.2	17.5	.008	.018	DXI, 28
		K	138.1	18.0	.011	.012	DXI, 27
		L	210.0	21.0	.002	.012	DXI, 25
		M	246.3	22.0	.005	.025	DXI, 28
		N	249.1	22.5	.013	.019	DXI, 23
		P	274.9	23.5	.017	.023	DXI, 25
		Q	344.1	23.5	.014	.013	DXI, 25

Table 2. Morphometric and meristic data for second sampling period (4-3-78).

Fish species	Location	Fish No.	Body Wt. g	Std Length cm	Go-So Index	Liver Index	Fin-Ray Count
<u>Cynosion xanthulus</u>	SSSP	A	1032.5	42.0	0.004	.037	IX+I, 19
	SSSP	B	1430.8	46.0	0.019	.020	IX+I, 20
	SSSP	C	1871.9	50.0	.011	.015	IX+I, 21
	SSSP	D	2326.8	52.0	.010	.014	IX+I, 20
	SSSP	E	3690.0	66.5	.003	.001	IX+I, 18
	SC	F	752.1	35.5	.002	.027	IX+I, 21
	SC	G	788.2	26.0	.003	.032	IX+I, 19
	SC	H	987.3	39.0	.003	.041	IX+I, 22
	SC	I	1609.2	47.0	.012	.019	IX+I, 22
	SC	J	1701.2	48.0	.012	.015	IX+I, 21
	SC	K	2823.0	50.0	.023	.011	IX+I, 20
	RHM	L	1120.7	40.0	.004	.036	IX+I, 20
	RHM	M	1272.1	42.5	.012	.014	IX+I, 21
	RHM	N	1411.2	43.0	.012	.024	IX+I, 20
	RHM	P	1578.8	47.0	.013	.024	IX+I, 20
	RHM	Q	1914.2	51.0	.009	.017	IX+I, 9
<u>Anisotremus davidsonii</u>	SSSP	A	100.2	14.0	.057	.015	DXII, 12
	SSSP	B	76.3	12.5	.088	.006	DXII, 13
	SSSP	C	75.0	13.5	.056	.005	DXII, 13
	SSSP	D	319.3	20.5	.089	.019	DXII, 13
	SSSP	E	390.0	21.5	.085	.028	DXII, 12
<u>Bairdiella icistius</u>	SSSP	A	140.9	17.5	-	.006	XI, 29
	SSSP	B	209.1	21.0	.068	.024	XI, 26
	SSSP	C	316.0	23.5	.069	.029	XI, 25
	SSSP	D	431.9	25.5	.085	.027	XI, 27
	SC	E	98.6	16.0	.055	.010	XI, 24
	SC	F	253.9	22.0	.083	.028	XI, 30
	SC	G	384.0	25.5	.094	.041	XI, 26
	SC	H	443.0	26.5	.099	.026	XI, 27
	BBAY	I	37.2	11.2	-	.010	XI, 25
	BBAY	J	204.8	20.5	.067	.020	XI, 27
	BBAY	K	344.5	24.0	.088	.025	XI, 26
	BBAY	L	442.2	26.0	.079	.030	XI, 25
	RHM	M	99.8	16.0	-	.013	XI, 25
	RHM	N	160.3	18.0	.051	.018	XI, 26
	RHM	P	243.9	21.0	.061	.022	XI, 28
	RHM	Q	423.0	25.5	.079	.047	XII, 26

Table 3. Morphometric and meristic data for third sampling period (7-10-78).

Fish species	Location	Fish No.	Body Wt. g	Std Length cm	Go-So Index	Liver Index	Fin-Ray Count
<u>Cynosion xanthulus</u>	SSSP	A	1609.0	47.5	.041	.019	IX+I, 21
	SSSP	B	2184.0	51.5	.024	.021	IX+I, 21
	RHM	C	166.0	20.5	.002	.015	IX+I, 19
	RHM	D	214.0	22.0	.004	.011	IX+I, 20
	RHM	E	252.0	22.5	.004	.006	IX+I, 20
	SC	F	955.0	39.0	.027	.023	IX+I, 20
	SC	G	1550.0	46.5	.039	.013	IX+I, 20
	SC	H	1633.0	49.0	.030	.015	VIII+I, 21
	SC	I	1640.0	45.0	.109	.022	IX+I, 21
	SC	J	2002.0	50.5	.026	.023	IX+I, 20
	SC	K	2078.0	50.0	.033	.020	IX+I, 19
	RHM	L	5100.0	70.0	.054	.011	IX+I, 21
<u>Anisotremus davidsonii</u>	SSSP	A	432.0	22.5	.013	.016	XI, 12
<u>Bairdiella icistius</u>	SSSP	A	69.0	15.0	.003	.003	X, 25
	SSSP	B	125.0	17.0	.005	.006	X, 25
	SSSP	C	194.0	20.5	.023	.007	X, 27
	SSSP	D	271.0	22.0	.030	.017	X, 29
	SSSP	E	394.0	26.0	.053	.016	X, 26
	RHM	F	81.0	15.0	-	.001	X, 27
	RHM	G	213.0	19.0	.023	.005	XI, 26
	RHM	H	230.0	20.0	.008	.008	X, 28
	RHM	I	289.0	21.0	.012	.008	XI, 27
	RHM	J	415.0	25.0	.036	.013	XI, 28
	SC	K	79.0	14.5	.002	.009	XI, 26
	SC	L	93.0	15.5	.006	.007	XI, 26
	SC	M	161.0	19.0	.008	.003	XI, 27
	SC	N	252.0	22.0	.044	.004	XI, 25
	SC	P	352.0	24.5	.031	.013	X, 28

Table 4. Morphometric and meristic data for fourth sampling period (10-1-78).

Fish species	Location	Fish No.	Body Wt. g	Std Length cm	Go-So Index	Liver Index	Fin-Ray Count
<u>Cynosion xanthulus</u>	SC	A	501	31.5	.001	.017	IX+I, 19
	SC	B	600	33.5	.001	.010	IX+I, 19
	SC	C	785	35.0	.004	.020	IX+I, 20
	SC	D	2700	56.0	.006	.010	VIII+I, 20
	SC	E	5700	75.0	.010	.009	IX+I, 20
	SSSP	F	436	30.5	.003	.017	IX+I, 20
	SSSP	G	604	32.0	.001	.019	IX+I, 20
	SSSP	H	724	33.5	-	.014	IX+I, 21
	SSSP	I	1402	40.5	-	.013	IX+I, 21
	SSSP	J	1776	49.5	.004	.013	IX+I, 18
	SSSP	K	2450	56.5	.011	.016	IX+I, 20
	RHM	L	338	26.5	.007	.031	IX+I, 18
	RHM	M	372	27.5	.010	.025	IX+I, 20
	RHM	N	508	31.0	.011	.017	IX+I, 20
	RHM	P	517	31.0	.014	.016	IX+I, 21
	RHM	Q	536	32.5	.010	.020	IX+I, 20
<u>Anisotremus davidsonii</u>	SC	A	160	17.0	.027	.021	XI, 13
	SSSP	B	294	21.0	.015	.013	X, 14
	SSSP	C	354	23.5	.002	.011	XII, 14
	SSSP	D	394	21.5	.003	.012	XII, 13
	RHM	E	111	15.0	.011	.013	XII, 13
	RHM	F	282	21.0	.007	.009	XI, 14
	RHM	G	292	20.9	.005	.017	XI, 14
	RHM	H	350	22.5	.018	.006	XI, 14
	RHM	I	401	23.0	.017	.011	XI, 14
	RHM	J	472	24.5	.004	.017	XI, 13
<u>Bairdiella icistius</u>	SC	A	110	18.0	.001	.011	XI, 28
	SC	B	230	22.5	.002	.001	X, 29
	SC	C	246	23.5	.012	.006	XI, 28
	SC	D	262	23.5	.012	.006	XI, 27
	SC	E	318	25.0	.014	.008	XII, 26
	SC	F	416	27.0	.016	.006	XI, 26
	SSSP	G	112.5	18.5	-	.006	XI, 27
	SSSP	H	166	20.5	.011	.005	XI, 24
	SSSP	I	221	22.5	.004	.009	XI, 29
	RHM	J	180	19.5	.012	.006	X, 27
	RHM	K	188	20.0	.001	.009	XI, 26
	RHM	L	193	19.5	.001	.004	X, 29
	RHM	M	274	23.5	.010	.006	XI, 26
	RHM	N	284	24.0	.010	.004	XI, 26
	RHM	P	301	25.5	.014	.008	XI, 27
	RHM	Q	309	24.0	.010	.006	XI, 25

Table 5. Percent frequency of food items in stomach of corvina, gulf croaker, and sargo.

Fish species	Sample date	(n) Total # of fish sampled	Percent (n) w/o food in stomach	Fish	Percent of food type in stomachs with food	
					<u>Balanus</u> <u>amphitrite</u>	<u>Neanthes</u> <u>succinea</u>
Corvina	DEC	16	12	93	-	7
	APR	16	19	8	-	92
	JUL	12	8	100	-	-
	OCT	16	37	100	-	-
Gulf croaker	DEC	16	6	-	-	100
	APR	16	19	-	-	100
	JUL	15	66	57	29	14
	OCT	16	94	-	-	100
Sargo	DEC	3	33	-	100	-
	APR	5	60	-	-	100
	JUL	1	100	-	-	-
	OCT	10	30	-	100	-

Table 6. Mean concentration of elements, in muscle, liver, and bone of corvina, gulf croaker, and sargo.

CORVINA				GULF CROAKER				SARGO			
	n	mean	Std. Dev.	n	mean	Std. Dev.		n	mean	Std. Dev.	
Muscle											
AS	59.000	0.390	0.146	63.000	0.572	0.241		17.000	0.646	0.192	
BR	59.000	0.613	1.113	63.000	3.097	1.005		17.000	3.918	1.576	
CA	59.000	294.973	197.491	63.000	585.170	319.592		17.000	2693.781	7228.660	
CU	59.000	0.455	0.215	63.000	0.603	0.247		17.000	0.639	0.261	
FE	59.000	13.249	7.644	63.000	18.311	6.574		17.000	17.705	3.674	
FISHWEIGHT	60.000	1408.012	1036.851	63.000	231.802	104.574		19.000	280.858	122.976	
GA	11.000	0.101	0.028	19.000	0.094	0.027		5.000	0.097	0.014	
K	59.000	22692.237	4011.819	63.000	21903.958	3938.390		17.000	19436.176	5816.478	
NI	16.000	0.302	0.093	1.000	0.000			1.000	3.132		
PB	14.000	0.396	0.525	15.000	0.316	0.156		3.000	0.229	0.020	
RB	59.000	6.207	1.934	6.000	0.176	0.129		1.000	0.155		
SE	57.000	0.136	0.009	63.000	5.281	1.136		17.000	5.692	1.806	
SR	59.000	1.790	1.136	63.000	0.180	0.118		17.000	0.145	0.111	
WEIGHT:D/A	60.000	19.594	5.788	63.000	4.775	2.418		17.000	11.978	22.817	
ZN	59.000	12.670	2.764	63.000	18.068	1.629		19.000	17.709	2.098	
ZR	1.000	0.069		63.000	16.148	2.774		17.000	14.814	3.325	
				2.000	0.243	0.197		1.000	0.833		
Liver											
AS	49.000	0.268	0.141	11.000	0.718	0.551		6.000	0.773	0.388	
BR	47.000	2.380	2.272	10.000	5.803	5.009		5.000	2.244	1.171	
CA	49.000	261.403	218.889	11.000	1117.591	1280.325		6.000	6284.458	14212.813	
CU	49.000	11.884	11.570	11.000	4.920	2.363		6.000	1.991	1.488	
FE	49.000	354.348	301.390	11.000	978.691	1078.596		6.000	366.995	287.933	
FISHWEIGHT	60.000	1408.012	1036.851	63.000	231.802	104.574		19.000	280.858	122.976	
GA	28.000	0.108	0.065	6.000	0.125	0.080		3.000	0.112	0.065	
K	49.000	5574.776	2990.533	11.000	9364.132	2486.480		6.000	4677.667	2490.598	
MN	49.000	1.792	1.522	11.000	3.593	2.094		6.000	3.250	3.178	
NI	1.000	0.294		2.000	0.323	0.135		1.000	0.350		
PB	18.000	0.222	0.243	2.000	0.136	0.014		1.000	0.128		
RB	49.000	1.501	0.962	11.000	2.642	0.630		6.000	1.327	0.946	
SE	43.000	0.038	0.041	10.000	0.104	0.122		6.000	0.211	0.245	
SR	49.000	3.315	2.780	11.000	12.987	12.081		6.000	23.359	42.788	
WEIGHT	66.000	26.179	14.766	75.000	6.266	8.071		23.000	5.775	5.109	
WEIGHT:D/A	50.000	59.561	31.316	12.000	23.255	7.572		6.000	34.513	15.600	
ZN	49.000	64.585	45.105	11.000	46.986	10.036		6.000	40.400	33.811	
ZR	9.000	0.055	0.054	5.000	0.291	0.218		4.000	0.396	0.517	
Bone											
AS	59.000	1.308	0.250	62.000	2.645	0.461		19.000	3.025	1.519	
BR	60.000	3.484	0.749	62.000	2.455	0.583		18.000	4.162	5.001	
CA	60.000	158993.333	17483.279	62.000	150308.548	27160.774		19.000	165647.313	62177.727	
CU	7.000	0.881	0.116	22.000	13.150	55.944		9.000	3.793	5.406	
FE	60.000	34.697	13.262	62.000	101.338	52.774		19.000	276.215	316.212	
FISHWEIGHT	60.000	1408.012	1036.851	63.000	231.802	104.574		19.000	280.858	122.976	
GA	50.000	0.628	0.156	53.000	0.731	0.196		18.000	0.818	0.214	
K	60.000	5473.417	2559.945	62.000	13370.016	3092.051		19.000	23406.368	34133.499	
MN	60.000	19.460	5.924	62.000	12.316	3.702		18.000	24.377	5.788	
NI	12.000	1.353	0.218	20.000	1.747	0.518		7.000	1.953	0.380	
PB	3.000	12.265	17.317	1.000	1.004			19.000	4.618	7.770	
RB	60.000	1.002	0.645	62.000	2.050	0.622		19.000	1.446	0.422	
SE	60.000	1.051	0.334	62.000	2.388	0.893		19.000	580.567	235.589	
SR	60.000	413.345	27.674	62.000	572.544	119.774		19.000	2.916	0.318	
WEIGHT:D/A	60.000	3.373	0.381	63.000	3.240	0.368		19.000	85.633	107.377	
ZN	60.000	33.376	5.956	62.000	42.778	19.312		6.000	2.306	2.410	
ZR	60.000	2.057	1.711	49.000	4.346	2.073					

Table 7. Mean concentration of elements in corvina muscle, liver, and bone relative to station sampled.

	MUSCLE			LIVER			BONE		
	n	mean	Std. Dev.	n	mean	Std. Dev.	n	mean	Std. Dev.
SP									
AS	28.000	0.325	0.145	24.000	0.227	0.111	28.000	1.213	0.231
BR	28.000	2.431	1.363	22.000	2.034	2.255	28.000	3.632	0.473
CA	28.000	305.979	215.245	24.000	217.365	172.526	28.000	15466.714	15466.203
CU	28.000	0.497	0.233	24.000	6.983	6.470	2.000	0.636	0.012
FE	28.000	13.987	10.274	24.000	268.695	192.123	28.000	31.274	11.144
FISHWEIGHT	28.000	1379.896	724.878	28.000	1379.896	724.878	28.000	1379.896	724.878
GA	6.000	0.090	0.033	9.000	0.073	0.039	25.000	0.635	0.151
K	28.000	22309.286	3963.807	24.000	4866.252	2905.974	28.000	4614.500	1360.427
NI	7.000	0.319	0.120	24.000	1.575	1.601	28.000	18.451	3.255
PB	13.000	0.419	0.538	11.000	0.317	0.270	1.000	2.178	
RB	28.000	5.647	1.710	24.000	1.248	0.883	28.000	0.775	0.393
SE	27.000	0.130	0.034	22.000	0.044	0.055	28.000	1.028	0.213
SR	28.000	1.861	1.440	24.000	2.743	2.374	28.000	420.554	92.080
WEIGHT:D/A	28.000	19.307	3.256	30.000	28.532	14.223	28.000	3.601	0.414
ZN	28.000	12.687	2.974	25.000	68.010	31.214	28.000	31.126	5.530
ZR	1.000	0.089		24.000	46.717	31.939	16.000	2.637	1.680
				7.000	0.030	0.014			
SC									
AS	18.000	0.458	0.123	17.000	0.313	0.153	18.000	1.344	0.245
BR	18.000	2.712	0.610	17.000	2.884	2.640	19.000	3.525	1.073
CA	18.000	230.070	106.830	17.000	296.400	255.154	19.000	166321.053	21493.534
CU	18.000	0.409	0.102	17.000	19.129	14.716	4.000	1.050	0.101
FE	18.000	14.809	4.703	17.000	522.129	396.809	19.000	34.939	11.525
FISHWEIGHT	19.000	1875.979	1409.981	19.000	1875.979	1409.981	19.000	1875.979	1409.981
GA	4.000	0.118	0.010	14.000	0.140	0.072	13.000	0.693	0.192
K	18.000	23990.000	2841.180	17.000	6635.000	3204.139	19.000	5011.526	2546.337
NI	8.000	0.288	0.050	17.000	2.302	1.611	19.000	18.997	4.763
PB	1.000	0.089		1.000	0.294		6.000	1.402	0.292
RB	18.000	6.719	1.478	4.000	0.084	0.075	2.000	17.308	21.145
SE	18.000	0.156	0.093	17.000	1.843	1.058	19.000	0.938	0.531
SK	18.000	1.660	0.685	14.000	0.035	0.017	19.000	0.934	0.198
WEIGHT:D/A	19.000	18.223	1.350	17.000	4.032	3.297	19.000	457.521	104.843
ZN	18.000	13.007	1.048	20.000	30.049	13.921	19.000	3.440	0.386
ZR				17.000	46.539	27.969	19.000	32.666	5.032
				17.000	95.268	52.607	16.000	3.468	1.841
				1.000	0.171				
RH									
AS	13.000	0.438	0.115	8.000	0.293	0.176	13.000	1.385	0.240
BR	13.000	2.866	1.052	8.000	2.260	1.414	13.000	3.107	0.554
CA	13.000	330.980	233.261	8.000	314.893	261.935	13.000	156933.231	11953.757
CU	13.000	0.226	0.143	8.000	11.192	9.664	1.000	0.559	
FE	13.000	9.498	2.901	8.000	254.775	191.941	13.000	41.713	17.471
FISHWEIGHT	13.000	784.615	593.122	13.000	784.615	593.122	13.000	784.615	593.122
GA	1.000	0.098		5.000	0.090	0.041	12.000	0.547	0.078
K	13.000	21720.154	5200.880	8.000	5344.750	2099.129	13.000	7996.462	3060.031
NI	1.000	0.286		8.000	1.360	0.728	13.000	22.311	10.141
RB	13.000	6.702	2.648	3.000	0.057	0.046	6.000	1.304	0.117
SE	12.000	0.120	0.071	8.000	1.533	0.851	13.000	1.563	0.679
SR	13.000	1.816	0.934	7.000	0.028	0.020	13.000	1.243	0.577
WEIGHT:D/A	12.000	22.215	11.239	8.000	3.510	2.689	13.000	360.946	73.459
ZN	13.000	13.074	3.914	16.000	16.826	13.020	13.000	3.576	0.240
				8.000	60.831	32.673	13.000	25.907	7.672
ZR				8.000	52.991	27.132	7.000	2.065	1.167
				1.000	0.116				

Table 8. Mean concentration of elements in gulf croaker muscle, liver, and bone relative to station sampled.

	MUSCLE			LIVER			BONE		
	n	mean	Std. Dev.	n	mean	Std. Dev.	n	mean	Std. Dev.
SP									
AS	20.000	0.575	0.250	4.000	0.924	0.792	20.000	2.651	0.492
BR	20.000	3.182	0.691	4.000	3.080	2.853	20.000	2.387	0.723
CA	20.000	565.555	260.973	4.000	1832.150	1839.675	20.000	150935.000	19824.846
CU	20.000	3.652	0.253	4.000	5.210	2.678	4.000	33.907	92.810
FE	20.000	17.961	6.003	4.000	795.225	592.108	20.000	118.127	71.225
FISHWEIGHT	20.000	215.460	96.511	20.000	215.460	96.511	20.000	215.460	96.511
GA	4.000	0.096	0.010	1.000	0.174	0.071	18.000	0.671	0.189
K	20.000	22036.000	2613.242	4.000	10274.000	1666.529	20.000	13682.500	2375.301
NI	3.000	0.356	0.232	4.000	3.401	1.574	20.000	11.421	3.551
PB	4.000	0.188	0.165	1.000	0.227	0.071	6.000	1.036	0.735
RB	20.000	5.312	1.046	4.000	2.942	0.439	1.000	1.004	0.535
SE	20.000	0.162	0.117	3.000	0.076	0.041	20.000	1.890	0.535
SR	20.000	4.106	1.687	4.000	18.899	16.756	20.000	2.421	1.032
WEIGHT:D/A	20.000	18.050	1.506	24.000	6.102	7.644	20.000	563.515	108.919
ZN	20.000	1.511	1.640	4.000	20.955	5.342	20.000	3.250	0.328
				4.000	53.085	6.630	20.000	48.624	33.134
				2.000	0.464	0.240	15.000	3.516	1.524

SC

AS	23.000	0.543	0.214	4.000	0.642	0.432	23.000	2.650	0.375
BR	23.000	2.747	1.023	3.000	7.889	7.927	23.000	2.494	0.464
CA	23.000	566.039	299.323	4.000	777.050	910.141	23.000	154050.870	29774.372
CU	23.000	0.546	0.232	4.000	5.031	2.006	9.000	1.276	0.233
FE	23.000	17.742	5.974	4.000	1096.800	1464.053	23.000	85.987	26.619
FISHWEIGHT	23.000	233.883	108.605	23.000	233.883	108.605	23.000	233.883	108.605
GA	7.000	0.086	0.043	3.000	0.108	0.095	18.000	0.775	0.198
K	23.000	22103.217	5246.879	4.000	8119.000	3351.095	23.000	12747.130	3069.896
NI	1.000	0.000	0.221	1.000	0.418	3.133	23.000	12.892	3.732
NI	5.000	0.343	0.221	1.000	0.418	3.133	9.000	1.643	0.409
RB	23.000	5.265	1.463	1.000	0.146	0.072	23.000	2.060	0.772
SE	23.000	0.175	0.099	4.000	2.403	0.836	23.000	2.462	0.772
SR	23.000	5.290	2.771	4.000	0.151	0.194	23.000	578.978	133.637
WEIGHT:D/A	23.000	17.780	1.384	4.000	10.054	10.814	23.000	3.279	0.426
ZN	23.000	15.865	4.053	27.000	6.240	8.556	23.000	40.323	4.465
ZR	1.000	0.104		4.000	24.437	10.632	15.000	4.564	2.394
				4.000	44.532	11.960			
				1.000	0.241				

BB

AS	4.000	0.804	0.524						
BR	4.000	3.745	0.833						
CA	4.000	434.975	189.549						
CU	4.000	0.855	0.431						
FE	4.000	26.932	12.858						
FISHWEIGHT	4.000	257.175	176.061						
K	4.000	22065.000	529.685						
NI	4.000	0.885	0.539						
SE	4.000	0.091	0.011						
SR	4.000	5.028	2.365						
WEIGHT:D/A	4.000	17.272	1.985						
ZN	4.000	15.707	0.785						
ZN	1.000	0.302							

RH

AS	16.000	0.553	0.151	2.000	0.684	0.441	15.000	2.732	0.520
BR	16.000	3.294	1.241	2.000	5.856	6.822	15.000	2.623	0.553
CA	15.000	619.694	412.902	2.000	753.900	828.052	15.000	151463.373	23775.871
CU	16.000	0.517	0.130	2.000	3.534	1.827	3.000	0.890	0.042
FE	16.000	17.409	5.119	2.000	1432.700	1718.694	15.000	87.907	23.532
FISHWEIGHT	16.000	242.750	96.130	16.000	242.750	96.130	16.000	242.750	96.130
GA	8.000	0.100	0.012	1.000	0.200	0.075	14.000	0.785	0.197
K	15.000	21184.375	3753.789	2.000	10842.000	1821.507	15.000	13823.600	3803.266
NI	7.000	0.279	0.058	2.000	5.042	1.237	15.000	12.520	4.075
PD	2.000	0.152	0.009	1.000	0.126	0.075	5.000	1.826	0.407
RB	16.000	5.363	0.839	2.000	2.821	0.575	15.000	2.116	0.536
SE	16.000	0.235	0.129	2.000	0.090	0.018	15.000	2.502	0.735
SR	16.000	4.708	2.677	2.000	10.184	6.866	15.000	578.527	97.740
WEIGHT:D/A	16.000	16.704	2.604	19.000	25.348	7.604	16.000	3.159	0.353
ZN	16.000	16.069	1.971	3.000	22.260	7.768	15.000	39.520	5.264
				2.000	45.730	10.720	15.000	5.092	1.753
				1.000	0.128				

Table 9. Mean concentration of elements in surgo muscle, liver, and bone relative to station sampled.

MUSCLE				LIVER				BONE			
SP											
PARAMETER	N	A-MEAN	STD DEV	PARAMETER	N	A-MEAN	STD DEV	PARAMETER	N	A-MEAN	STD DEV
AS	10.000	0.584	0.185	AS	4.000	0.828	0.210	AS	11.000	3.304	1.983
BR	10.000	3.797	1.797	BR	4.000	2.141	1.325	BR	10.000	5.129	6.681
CA	10.000	4089.540	9344.053	CA	4.000	9361.375	17285.735	CA	11.000	149181.727	77004.462
CU	10.000	0.690	0.329	CU	4.000	2.368	1.651	CU	8.000	4.089	5.701
FE	10.000	17.319	2.601	FE	4.000	459.442	310.764	FE	11.000	313.185	383.984
FISHWEIGHT	11.000	274.655	130.889	FISHWEIGHT	11.000	274.655	130.889	FISHWEIGHT	11.000	274.655	130.889
GA	4.000	0.096	0.015	GA	2.000	0.148	0.039	GA	8.000	0.786	0.167
K	10.000	17160.500	6110.517	K	4.000	5655.250	2254.753	K	11.000	29844.636	44547.617
MN	1.000	3.132	0.023	MN	4.000	4.459	3.284	MN	10.000	22.650	4.956
NI	2.000	0.236		NI	1.000	0.350		NI	5.000	1.975	0.289
PB	1.000	0.155		PB	1.000	0.128		PB	11.000	6.238	10.082
RB	10.000	5.033	2.047	RB	4.000	1.598	1.017	RB	11.000	1.357	0.497
SE	10.000	0.165	0.139	SE	4.000	0.293	0.270	SE	11.000	521.979	290.269
SR	10.000	17.178	29.069	SR	4.000	34.112	50.862	SR	11.000	2.949	0.365
WEIGHT:D/A	11.000	17.857	2.610	WEIGHT	14.000	5.930	4.566	WEIGHT:D/A	11.000	108.708	139.100
ZN	10.000	14.393	3.872	WEIGHT:D/A	4.000	27.900	11.801	ZN	11.000	108.708	139.100
ZR	1.000	0.833		ZN	4.000	50.035	38.574	ZR	5.000	2.559	2.603
				ZR	3.000	0.517	0.559				
SC											
PARAMETER	N	A-MEAN	STD DEV	PARAMETER	N	A-MEAN	STD DEV	PARAMETER	N	A-MEAN	STD DEV
AS	2.000	0.602	0.110	AS	1.000	0.123		AS	2.000	2.695	0.115
BR	10.000	2.654	1.055	CA	1.000	27.450		BR	2.000	2.901	0.528
CA	10.000	1625.000	571.342	CU	1.000	0.489		CA	2.000	184900.000	3111.270
CU	2.000	0.709	0.132	FE	1.000	76.600		FE	2.000	105.125	16.652
FE	2.000	13.371	4.905	FISHWEIGHT	2.000	203.550	61.589	FISHWEIGHT	2.000	203.550	61.539
FISHWEIGHT	2.000	203.550	61.589	K	1.000	1257.000		GA	2.000	0.699	0.018
K	2.000	25860.000	4299.209	MN	1.000	0.289		K	2.000	14020.000	4157.798
RB	2.000	6.878	1.633	RB	1.000	0.291		MN	2.000	33.245	0.417
SE	2.000	0.121	0.078	SE	1.000	0.013		RB	2.000	2.222	0.602
SR	2.000	8.405	4.434	SR	1.000	0.223		SE	2.000	1.846	0.459
WEIGHT:D/A	2.000	16.010	0.636	WEIGHT	2.000	2.553	0.090	SR	2.000	584.400	26.304
ZN	2.000	15.415	3.924	WEIGHT:D/A	1.000	36.030		WEIGHT:D/A	2.000	2.843	0.128
				ZN	1.000	12.820		ZN	2.000	54.285	2.284
				ZR	1.000	0.031					
RH											
SEE OTHER				SEE OTHER				SEE OTHER			

Table 10. Mean concentration of elements in corvina muscle relative to sampling period and station.

		JANUARY			FEBRUARY			MARCH			APRIL			MAY			JUNE			JULY			AUGUST			SEPTEMBER			OCTOBER		
SP	PARAMETER	N	A-MEAN	STD DEV	N	A-MEAN	STD DEV	N	A-MEAN	STD DEV	N	A-MEAN	STD DEV	N	A-MEAN	STD DEV	N	A-MEAN	STD DEV	N	A-MEAN	STD DEV	N	A-MEAN	STD DEV	N	A-MEAN	STD DEV			
	AS	15,000	0.236	0.132	5,000	0.339	0.083	2,000	0.455	0.120	6,000	0.440	0.138																		
	BR	15,000	1.819	0.837	5,000	4.257	1.884	2,000	3.033	0.646	6,000	2.240	0.725																		
	CA	15,000	332.247	269.311	5,000	264.320	172.917	2,000	246.950	164.261	6,000	277.867	113.647																		
	CU	15,000	0.418	0.079	5,000	0.549	0.079	2,000	0.361	0.068	6,000	0.665	0.384																		
	FE	15,300	10.665	3.718	5,000	14.733	5.135	2,000	9.262	0.242	6,000	23.244	17.862																		
	FISHWEIGHT	15,000	1140.007	447.261	5,000	2070.400	1026.471	2,000	1896.500	406.586	6,000	1232.000	786.692																		
	KA	15,000	0.070	0.023	5,000	26184.000	5322.451	2,000	23775.000	3698.168	3,000	0.109	0.033																		
	K	15,000	20370.667	3035.246	2,000	0.309	0.042	2,000	6.561	0.809	3,000	2343.940	2229.948																		
	RB	10,000	0.499	0.596	2,000	0.136	0.044	2,000	0.174	0.064	5,000	0.324	0.148																		
	SR	15,000	4.680	0.948	5,000	5.120	1.136	2,000	2.007	1.103	1,000	0.184																			
	SE	14,000	0.094	0.061	5,000	0.268	0.108	2,000	18.010	2.531	6,000	8.193	0.848																		
	WT	15,000	1.814	1.711	5,000	2.116	1.715	2,000	13.450	0.594	6,000	0.065	0.021																		
	ZN	15,000	20.470	3.603	5,000	17.438	3.445	1,000	0.089		6,000	1.718	0.551																		
		15,000	11.417	1.939	5,000	14.600	3.620				6,000	18.390	0.945																		
											6,000	14.465	3.922																		
SC	AS	199			5,000	0.458	0.087	7,000	0.464	0.139	5,000	0.502	0.110																		
	BR	2.316			5,000	2.455	0.885	7,000	2.322	0.680	5,000	2.755	0.468																		
	CA	238.3			5,000	204.580	63.522	7,000	218.057	105.711	5,000	270.660	156.819																		
	CU	302			5,000	0.452	0.115	7,000	0.453	0.067	5,000	0.385	0.086																		
	FE	17.51			5,000	15.827	4.587	7,000	14.918	6.081	5,000	13.099	3.273																		
	FW	1738.6			6,000	1443.500	788.981	7,000	2136.857	1356.699	5,000	2057.200	2227.491																		
	K	22390.			1,000	0.109		1,000	0.112		2,000	0.070																			
	RB	5.033			5,000	23610.000	1437.220	7,000	25315.714	2071.166	5,000	22834.000	4498.948																		
	SE	0.178			2,000	0.240	0.004	3,000	0.304	0.074	3,000	0.305	0.016																		
	SR	1.371			1,000	0.069		7,000	7.552	0.809	5,000	7.766	0.635																		
	WT	19.470			5,000	4.844	0.463	7,000	0.147	0.097	5,000	0.102	0.049																		
	ZN	12.280			3,000	0.219	0.107	7,000	1.695	0.749	5,000	1.863	0.874																		
					5,000	1.463	0.515	7,000	17.276	0.993	5,000	17.860	1.124																		
					6,000	19.422	1.019	7,000	13.407	0.794	5,000	12.442	1.561																		
					5,000	13.156	0.654																								
RH	PARAMETER	N	A-MEAN	STD DEV	N	A-MEAN	STD DEV	N	A-MEAN	STD DEV	N	A-MEAN	STD DEV	N	A-MEAN	STD DEV	N	A-MEAN	STD DEV	N	A-MEAN	STD DEV	N	A-MEAN	STD DEV	N	A-MEAN	STD DEV			
	AS	5,000	0.428	0.147	3,000	0.459	0.064	5,000	0.437	0.126																					
	BR	5,000	2.172	0.963	3,000	4.106	1.005	5,000	2.615	0.361																					
	CA	5,000	161.169	111.856	3,000	649.233	221.509	5,000	367.840	141.896																					
	CU	5,000	0.300	0.153	3,000	0.521	0.075	5,000	0.495	0.085																					
	FE	5,000	7.729	2.432	3,000	8.574	1.848	5,000	11.820	2.518																					
	FISHWEIGHT	5,000	1459.400	305.459	3,000	210.667	43.097	5,000	454.200	91.909																					
	K	5,000	17968.400	6419.717	3,000	21916.667	2322.392	5,000	25354.000	1815.277																					
	RB	5,000	3.780	1.248	3,000	8.998	0.647	5,000	8.253	1.294																					
	SE	5,000	0.146	0.101	2,000	0.081	0.018	5,000	0.109	0.042																					
	SR	5,000	1.262	0.617	3,000	2.011	1.019	5,000	0.772	0.767																					
	WEIGHT: D/A	5,000	29.606	16.430	3,000	16.800	0.980	5,000	0.109	0.042																					
	ZN	5,000	9.613	4.279	3,000	16.393	0.476	5,000	14.544	1.253																					

Table 11. Mean concentration of elements in corvina liver relative to sampling period and station.

	December				April				July				October			
	PARAMETER	N	A-MEAN	STD DEV	N	A-MEAN	STD DEV	N	A-MEAN	STD DEV	N	A-MEAN	STD DEV			
SP	AS	13.000	0.199	0.123	5.000	0.252	0.094	2.000	0.328	0.122	4.000	0.237	0.078			
	BR	12.000	1.991	2.373	5.000	2.972	2.913	1.000	0.463		4.000	1.335	0.334			
	CA	13.000	134.933	89.518	5.000	311.476	306.827	2.000	366.550	260.710	4.000	227.975	39.030			
	CU	13.000	4.632	3.638	5.000	11.037	8.817	2.000	18.365	6.300	4.000	2.666	0.699			
	FE	13.000	226.967	142.976	5.000	352.520	272.239	2.000	496.750	336.229	4.000	185.500	39.470			
	FISHWEIGHT	15.000	1140.007	447.261	5.000	2070.400	1026.471	2.000	1896.500	406.586	6.000	1232.000	786.692			
	GA	3.000	0.038	0.004	5.000	5052.400	3193.503	2.000	0.132	0.030	4.000	0.070	0.012			
	K	13.000	4344.231	2589.514	5.000	1.482	1.077	2.000	9372.500	5073.491	4.000	4197.250	610.351			
	MN	13.000	1.143	0.581	2.000	0.061	0.034	2.000	5.525	3.910	4.000	1.102	0.374			
	PB	9.000	0.374	0.266	5.000	1.112	0.630	2.000	2.935	1.622	4.000	1.290	0.282			
	RB	13.000	1.028	0.768	4.000	0.048	0.049	2.000	0.063	0.055	4.000	0.017	0.007			
	SE	12.000	0.048	0.067	5.000	4.881	4.164	2.000	4.476	2.054	4.000	2.370	0.315			
	SR	13.000	1.769	1.078	5.000	46.236	21.372	2.000	38.412	12.215	7.000	19.657	11.714			
	WEIGHT	16.000	25.555	6.520	5.000	68.778	42.717	2.000	28.545	15.414	4.000	67.230	9.942			
	WEIGHT:D/A	14.000	73.597	30.445	5.000	61.153	30.227	2.000	120.030	18.738	4.000	32.007	5.259			
ZN	13.000	34.406	19.873								4.000	0.038	0.013			
	ZP	3.000	0.019	0.006												
SC	AS	164			6.000	0.239	0.096	7.000	0.378	0.186	3.000	0.360	0.116			
	BR	716			6.000	1.468	1.414	7.000	3.708	2.058	3.000	4.514	4.831			
	CA	98.5			6.000	200.400	230.049	7.000	383.537	313.752	3.000	362.200	155.638			
	CU	1.474			6.000	16.406	11.620	7.000	26.369	16.302	3.000	13.338	13.712			
	FE	256.9			6.000	302.467	200.438	7.000	658.306	409.017	3.000	731.933	588.560			
	FW	1738.6			6.000	1443.500	788.981	7.000	2136.857	1356.699	5.000	2057.200	2227.491			
	K	4861.			4.000	0.069	0.020	7.000	0.160	0.052	3.000	0.189	0.102			
	MN	1.032			6.000	4877.500	2854.034	7.000	8689.429	3406.040	3.000	6060.000	2240.066			
	RB	.962			6.000	1.213	0.683	7.000	3.146	1.650	1.000	2.936	1.955			
	SE	.047			3.000	0.104	0.078	7.000	2.648	1.020	1.000	0.294				
	SR	1.45			6.000	1.019	0.544	6.000	0.044	0.014	1.000	0.026				
	WT	20.093			4.000	0.020	0.009	7.000	5.249	3.699	3.000	1.903	0.630			
	WT	65.79			6.000	3.263	3.483	7.000	35.430	13.598	3.000	0.035	0.019			
	ZN	17.94			6.000	31.964	10.932	7.000	26.947	9.842	3.000	3.589	2.243			
					6.000	70.020	29.824	7.000	133.341	49.318	6.000	23.517	16.684			
RH	AS				5.000	0.246	0.143	1.000	0.631		2.000	0.242	0.067			
	BR				5.000	2.110	1.804	1.000	2.969		2.000	0.276	0.604			
	CA				5.000	236.374	254.601	1.000	716.800		2.000	310.250	169.069			
	CU				5.000	14.205	9.823	1.000	3.267		2.000	7.623	2.406			
	FE				5.000	304.180	236.867	1.000	194.100		2.000	161.600	14.708			
	FISHWEIGHT				5.000	1459.400	305.459	3.000	210.667	43.097	5.000	454.200	91.909			
	GA				5.000	0.050	0.041	1.000	6651.000		2.000	5853.000	342.240			
	K				5.000	4840.200	2582.101	1.000	1.846		2.000	1.210	0.345			
	MN				5.000	1.323	0.909	1.000	2.680		2.000	1.936	0.321			
	PB				3.000	0.037	0.046	1.000	4.757		2.000	0.017	0.001			
	RB				5.000	1.142	0.800	4.000	3.115	2.124	2.000	2.859	1.521			
	SE				5.000	0.033	0.022	1.000	31.530		7.000	13.465	7.442			
	SR				5.000	3.520	3.988	1.000	37.740		2.000	49.255	7.474			
	WEIGHT				5.000	32.722	9.334	1.000	0.116		2.000	33.803	2.694			
	WEIGHT:D/A				5.000	71.322	37.389									
ZN				5.000	63.716	30.037										

Table 12. Mean concentration of elements in corvina bone relative to sampling period and station.

	December				April				July				October			
	PARAMETER	N	A-MEAN	STD DEV	N	A-MEAN	STD DEV	N	A-MEAN	STD DEV	N	A-MEAN	STD DEV			
SP	AS	15.000	1.245	0.219	5.000	1.162	0.353	2.000	1.434	0.139	6.000	1.252	0.196			
	BR	15.000	3.690	0.403	5.000	4.015	0.319	2.000	3.695	0.579	6.000	3.081	0.264			
	CA	15.000	150973.333	18847.867	5.000	158620.000	9354.785	2.000	159150.000	9404.520	6.000	160483.333	10390.268			
	CU	1.000	0.847		5.000	39.600	6.256	2.000	43.720	13.308	1.000	0.864				
	FE	15.000	24.965	7.522	5.000	2070.400	1026.471	2.000	1936.500	406.536	6.000	35.958	12.980			
	FISHWEIGHT	15.000	1140.007	447.261	5.000	0.618	0.160	1.000	0.580		6.000	1232.000	786.692			
	GA	13.000	0.598	0.154	5.000	3691.600	1320.514	2.000	4237.500	1218.345	6.000	0.736	0.125			
	K	15.000	4379.133	1150.759	5.000	16.686	1.842	2.000	23.200	1.669	6.000	6097.667	937.984			
	MN	15.000	13.273	3.261	5.000	0.494	0.193	2.000	0.834	0.099	6.000	18.783	3.380			
	FB	1.000	2.178		5.000	0.842	0.065	2.000	0.976	0.006	6.000	1.414	0.311			
	RB	15.000	0.605	0.157	5.000	492.380	144.157	2.000	488.850	9.122	6.000	0.928	0.156			
	SE	15.000	1.136	0.215	5.000	3.362	0.541	2.000	3.444	0.240	6.000	324.800	60.060			
	SR	15.000	397.807	73.977	5.000	20.300	3.364	2.000	31.990	2.107	6.000	3.463	0.154			
	WEIGHT:D/A	15.000	3.854	0.393	3.000	3.816	0.202	2.000	3.199	1.971	6.000	34.293	1.862			
	ZN	15.000	30.323	3.753							5.000	4.366	0.725			
	ZR	5.000	0.933	0.166												
SC	AS	1.152			5.000	1.250	0.160	7.000	1.496	0.270	5.000	1.262	0.226			
	BR	3.910			6.000	3.363	0.582	7.000	3.423	1.257	5.000	3.783	1.487			
	CA	152200.			6.000	154016.667	12644.907	7.000	175357.143	24912.772	5.000	171260.000	22309.482			
	FE	21.77			1.000	0.975		7.000	36.967	11.313	3.000	1.074	0.107			
	FW	1738.6			6.000	30.630	8.595	7.000	2136.657	1356.699	5.000	39.906	14.293			
	K	2959.			6.000	1443.500	788.981	7.000	0.707	0.189	5.000	2057.200	2227.491			
	MN	21.03			1.000	0.493		7.000	5065.714	3366.090	5.000	0.712	0.215			
	RB	.410			6.000	4462.667	1665.262	7.000	19.826	6.010	5.000	6004.800	2443.915			
	SE	1.25			6.000	17.953	4.777	1.000	1.879		5.000	18.682	4.032			
	SR	4446.5			3.000	1.352	0.249	7.000	1.026	0.658	2.000	1.237	0.112			
	WT	3.785			2.000	17.308	21.145	7.000	0.989	0.215	5.000	1.297	0.403			
	ZN	27.74			6.000	0.624	0.222	7.000	528.529	78.740	5.000	1.044	0.075			
					6.000	0.709	0.136	7.000	3.243	0.172	5.000	432.700	147.871			
					6.000	397.200	49.257	7.000	35.560	4.027	5.000	3.278	0.338			
					6.000	3.747	0.226	7.000	3.095	1.296	5.000	35.294	3.563			
					6.000	28.530	4.183									
				4.000	2.315	1.131				5.000	4.912	2.248				
RH	AS				5.000	1.242	0.198	3.000	1.236	0.179	5.000	1.616	0.267			
	BR				5.000	3.572	0.454	3.000	2.387	0.209	5.000	3.073	0.223			
	CA				5.000	155500.000	6757.218	3.000	144400.000	16352.064	5.000	165980.000	5161.589			
	FE				5.000	31.532	9.086	1.000	0.959		5.000	37.192	9.291			
	FISHWEIGHT				5.000	1459.400	305.459	3.000	66.237	15.962	5.000	454.200	91.909			
	GA				5.000	0.542	0.091	3.000	210.667	43.097	4.000	0.603	0.056			
	K				5.000	4708.600	1354.708	3.000	0.479	0.026	5.000	9117.400	1001.372			
	MN				5.000	12.710	3.910	3.000	11616.667	825.611	5.000	26.540	5.406			
	NI				3.000	1.286	0.098	3.000	31.267	11.514	3.000	1.323	0.154			
	RB				5.000	0.672	0.261	3.000	2.713	0.355	5.000	1.817	0.350			
	SE				5.000	0.914	0.140	3.000	0.835	0.069	5.000	1.917	0.232			
	SR				5.000	424.060	25.937	3.000	257.167	27.233	5.000	360.100	45.688			
	WEIGHT:D/A				5.000	3.766	0.164	3.000	3.509	0.285	5.000	3.405	0.103			
	ZN				5.000	20.112	2.603	3.000	47.527	1.199	5.000	42.684	2.861			
	ZR				5.000	2.260	1.370	2.000	1.577	0.033						

Table 13. Mean concentration of elements in Bairdiella Muscle relative to sampling period and station.

December

April

July

October

SP

AS	8.000	0.520	0.207	AS	4.000	0.780	0.379	AS	5.000	0.523	0.224	AS	3.000	0.509	0.072
BR	8.000	2.825	0.497	BR	4.000	3.791	0.531	BR	5.000	3.629	0.973	BR	3.000	3.110	0.250
CA	8.000	511.425	157.391	CA	4.000	776.375	513.331	CA	5.000	581.000	280.512	CA	3.000	533.735	231.395
CU	8.000	0.613	0.140	CU	4.000	0.978	0.401	CU	5.000	0.701	0.119	CU	3.000	0.484	0.050
FE	8.000	16.025	7.915	FE	4.000	20.030	3.708	FE	5.000	17.538	3.748	FE	3.000	21.070	6.008
FISHWEIGHT	8.000	207.330	71.474	FISHWEIGHT	4.000	274.475	127.310	FISHWEIGHT	5.000	210.600	127.414	FISHWEIGHT	3.000	166.500	54.252
K	8.000	20973.730	1373.212	K	4.000	23200.000	3600.343	K	2.000	0.090	0.004	K	2.000	0.101	0.014
PB	3.000	0.209	0.155	PB	1.000	0.123		PB	2.000	2134.000	2401.172	PB	3.000	24470.000	3161.313
RB	0.000	4.674	0.384	RB	4.000	5.343	1.010	RB	2.000	0.222	0.027	RB	1.000	0.623	0.387
SE	0.000	0.101	0.049	SE	4.000	0.176	0.135	SE	5.000	6.054	1.569	SE	3.000	5.733	0.387
SR	8.000	3.631	1.118	SR	4.000	5.612	2.808	SR	5.000	0.157	0.114	SR	3.000	0.318	0.129
WEIGHT:D/A	8.000	18.954	0.913	WEIGHT:D/A	4.000	17.245	2.138	WEIGHT:D/A	5.000	3.574	1.322	WEIGHT:D/A	3.000	4.251	1.070
ZN	8.000	16.574	1.712	ZN	4.000	15.320	1.632	ZN	5.000	17.766	1.814	ZN	3.000	17.160	1.230

AS	8.000	0.550	0.168	AS	4.000	0.542	0.044	AS	5.000	0.660	0.390	AS	6.000	0.437	0.108
BR	8.000	2.502	0.693	BR	4.000	2.657	0.778	BR	5.000	2.442	1.558	BR	6.000	3.378	0.987
CA	3.000	620.187	307.663	CA	4.000	552.950	307.023	CA	5.000	496.180	417.083	CA	6.000	627.567	227.677
CU	8.000	0.610	0.160	CU	4.000	0.784	0.240	CU	5.000	0.445	0.253	CU	6.000	0.386	0.054
FE	8.000	16.260	2.043	FE	4.000	21.022	4.132	FE	5.000	13.530	8.673	FE	6.000	21.575	5.041
FISHWEIGHT	8.000	210.387	84.632	FISHWEIGHT	4.000	294.875	152.848	FISHWEIGHT	5.000	187.400	114.701	FISHWEIGHT	6.000	263.667	101.212
K	8.000	22445.000	1523.276	K	4.000	23615.000	3161.629	K	5.000	19394.000	10947.277	K	5.000	0.104	0.022
RB	8.000	5.037	0.463	RB	4.000	4.744	0.575	RB	1.000	0.041	0.058	RB	6.000	22903.000	2420.395
SE	8.000	0.133	0.057	SE	4.000	0.124	0.074	SE	3.000	0.145	0.071	SE	3.000	0.371	0.064
SR	8.000	5.158	3.535	SR	4.000	6.043	2.078	SR	2.000	0.302	0.426	SR	6.000	5.700	0.503
WEIGHT:D/A	8.000	15.842	1.261	WEIGHT:D/A	4.000	17.377	1.173	WEIGHT:D/A	5.000	5.523	3.177	WEIGHT:D/A	6.000	0.264	0.065
ZN	3.000	17.010	1.311	ZN	4.000	14.530	1.422	ZN	5.000	0.172	0.147	ZN	6.000	0.313	1.771
					1.000	0.104			5.000	3.673	2.788		6.000	17.260	0.584
									5.000	17.024	1.638		6.000	17.680	2.637
										13.124	7.571				

AS	4.000	0.804	0.524	AS	4.000	0.804	0.524	AS	5.000	0.666	0.173	AS	7.000	0.535	0.123
BR	4.000	3.745	0.833	BR	4.000	3.745	0.833	BR	5.000	3.891	1.951	BR	7.000	2.939	0.823
CA	4.000	434.975	189.509	CA	4.000	434.975	189.509	CA	5.000	734.240	700.369	CA	7.000	590.614	221.545
CU	4.000	0.855	0.431	CU	4.000	0.855	0.431	CU	5.000	0.536	0.116	CU	7.000	0.438	0.086
FE	4.000	26.932	12.858	FE	4.000	26.932	12.858	FE	5.000	18.032	4.825	FE	7.000	20.089	4.066
FISHWEIGHT	4.000	257.175	176.061	FISHWEIGHT	4.000	257.175	176.061	FISHWEIGHT	5.000	245.600	121.428	FISHWEIGHT	7.000	247.000	57.364
K	4.000	22965.000	529.685	K	4.000	22965.000	529.685	K	3.000	0.087	0.003	K	5.000	0.107	0.003
RB	4.000	4.885	0.538	RB	4.000	4.885	0.538	RB	5.000	4.732	4.608.451	RB	7.000	23270.000	1738.841
SE	4.000	0.081	0.011	SE	4.000	0.081	0.011	SE	1.000	0.212		SE	6.000	0.291	0.055
SR	4.000	5.028	2.365	SR	4.000	5.028	2.365	SR	1.000	0.159		SR	1.000	0.145	
WEIGHT:D/A	4.000	17.272	1.985	WEIGHT:D/A	4.000	17.272	1.985	WEIGHT:D/A	5.000	5.568	0.509	WEIGHT:D/A	7.000	5.663	0.573
ZN	4.000	15.707	0.786	ZN	4.000	15.707	0.786	ZN	5.000	0.238	0.238	ZN	7.000	0.308	0.136
	1.000	0.302			1.000	0.302			5.000	4.367			7.000	5.028	1.673

AS	4.000	0.443	0.070	AS	5.000	0.686	0.173	AS	5.000	0.686	0.173	AS	7.000	0.535	0.123
BR	4.000	3.134	0.978	BR	5.000	3.891	1.951	BR	5.000	734.240	700.369	BR	7.000	2.939	0.823
CA	4.000	527.400	255.061	CA	5.000	734.240	700.369	CA	5.000	0.536	0.116	CA	7.000	590.614	221.545
CU	4.000	0.629	0.141	CU	5.000	0.536	0.116	CU	5.000	18.032	4.825	CU	7.000	0.438	0.086
FE	4.000	11.942	3.482	FE	5.000	18.032	4.825	FE	5.000	245.600	121.428	FE	7.000	20.089	4.066
FISHWEIGHT	4.000	231.750	140.523	FISHWEIGHT	5.000	245.600	121.428	FISHWEIGHT	5.000	0.087	0.003	FISHWEIGHT	7.000	247.000	57.364
K	4.000	19925.000	4210.665	K	5.000	19272.000	4608.451	K	3.000	0.087	0.003	K	5.000	0.107	0.003
RB	4.000	4.583	1.195	RB	5.000	4.732	4.608.451	RB	5.000	0.212		RB	7.000	23270.000	1738.841
SE	4.000	0.104	0.019	SE	5.000	0.212		SE	1.000	0.159		SE	6.000	0.291	0.055
SR	4.000	4.518	1.771	SR	5.000	0.159		SR	1.000	0.159		SR	1.000	0.145	
WEIGHT:D/A	4.000	19.690	5.597	WEIGHT:D/A	5.000	5.568	0.509	WEIGHT:D/A	5.000	0.238	0.238	WEIGHT:D/A	7.000	5.663	0.573
ZN	4.000	14.737	3.135	ZN	5.000	4.367		ZN	5.000	18.486	1.786	ZN	7.000	5.028	1.673
					5.000	15.936	0.937		5.000	15.936	0.937		7.000	18.297	1.005

AS	4.000	0.443	0.070	AS	5.000	0.686	0.173	AS	5.000	0.686	0.173	AS	7.000	0.535	0.123
BR	4.000	3.134	0.978	BR	5.000	3.891	1.951	BR	5.000	734.240	700.369	BR	7.000	2.939	0.823
CA	4.000	527.400	255.061	CA	5.000	734.240	700.369	CA	5.000	0.536	0.116	CA	7.000	590.614	221.545
CU	4.000	0.629	0.141	CU	5.000	0.536	0.116	CU	5.000	18.032	4.825	CU	7.000	0.438	0.086
FE	4.000	11.942	3.482	FE	5.000	18.032	4.825	FE	5.000	245.600	121.428	FE	7.000	20.089	4.066
FISHWEIGHT	4.000	231.750	140.523	FISHWEIGHT	5.000	245.600	121.428	FISHWEIGHT	5.000	0.087	0.003	FISHWEIGHT	7.000	247.000	57.364
K	4.000	19925.000	4210.665	K	5.000	19272.000	4608.451	K	3.000	0.087	0.003	K	5.000	0.107	0.003
RB	4.000	4.583	1.195	RB	5.000	4.732	4.608.451	RB	5.000	0.212		RB	7.000	23270.000	1738.841
SE	4.000	0.104	0.019	SE	5.000	0.212		SE	1.000	0.159		SE	6.000	0.291	0.055
SR	4.000	4.518	1.771	SR	5.000	0.159		SR	1.000	0.159		SR	1.000	0.145	
WEIGHT:D/A	4.000	19.690	5.597	WEIGHT:D/A	5.000	5.568	0.509	WEIGHT:D/A	5.000	0.238	0.238	WEIGHT:D/A	7.000	5.663	0.573
ZN	4.000	14.737	3.135	ZN	5.000	4.367		ZN	5.000	18.486	1.786	ZN	7.000	5.028	1.673
					5.000	15.936	0.937		5.000	15.936	0.937		7.000	18.297	1.005

AS	4.000	0.443	0.070	AS	5.000	0.686	0.173	AS	5.000	0.686	0.173	AS	7.000	0.535	0.123
BR	4.000	3.134	0.978	BR	5.000	3.891	1.951	BR	5.000	734.240	700.369	BR	7.000	2.939	0.823
CA	4.000	527.400	255.061	CA	5.000	734.240	700.369	CA	5.000	0.536	0.116	CA	7.000	590.614	221.545
CU	4.000	0.629	0.141	CU	5.000	0.536	0.116	CU	5.000	18.032	4.825	CU	7.000	0.438	0.086
FE	4.000	11.942	3.482	FE	5.000	18.032	4.825	FE	5.000	245.600	121.428	FE	7.000	20.089	4.066
FISHWEIGHT	4.000	231.750	140.523	FISHWEIGHT	5.000	245.600	121.428	FISHWEIGHT	5.000	0.087	0.003	FISHWEIGHT	7.000	247.000	57.364
K	4.000	19925.000	4210.665	K	5.000	19272.000	4608.451	K	3.000	0.087	0.003	K	5.000	0.107	0.003
RB	4.000	4.583	1.195	RB	5.000	4.732	4.608.451	RB	5.000	0.212		RB	7.000	23270.000	1738.841
SE	4.000	0.104	0.019	SE	5.000	0.212		SE	1.000	0.159		SE	6.000	0.291	0.055
SR	4.000	4.518	1.771	SR	5.000	0.159		SR	1.000	0.159		SR	1.000	0.145	
WEIGHT:D/A	4.000	19.690	5.597	WEIGHT:D/A	5.000	5.568	0.509	WEIGHT:D/A	5.000	0.238	0.238	WEIGHT:D/A	7.000	5.663	0.573
ZN	4.000	14.737	3.135	ZN	5.000	4.367		ZN	5.000	18.486	1.786	ZN	7.000	5.028	1.673
					5.000	15.936	0.937		5.000	15.936	0.937		7.000	18.297	1.005

AS	4.000	0.443	0.070	AS	5.000	0.686	0.173	AS	5.000	0.686	0.173	AS	7.000	0.535	0.123
BR	4.000	3.134	0.978	BR	5.000	3.891	1.951	BR	5.000	734.240	700.369	BR	7.000	2.939	

Table 14. Mean concentration of elements in Bairdiella Liver relative to sampling period and station.

	December				April				July				October			
SP	PARAMETER	N	A-MEAN	STD DEV	N	A-MEAN	STD DEV	N	A-MEAN	STD DEV	N	A-MEAN	STD DEV			
	AS	1.000	0.295		1.000	0.429		1.000	0.935		1.000	2.037				
	BR	1.000	4.597		1.000	1.910		1.000	0.909		1.000	2.037				
	CA	1.000	471.500		1.000	198.100		1.000	2572.000		1.000	4087.000				
	CU	1.000	5.173		1.000	3.123		1.000	5.708		1.000	4.637				
	FE	1.000	412.600		1.000	312.700		1.000	841.600		1.000	1614.000				
	FISHWEIGHT	8.000	207.350	71.474	4.000	274.473	127.310	5.000	210.600	127.414	3.000	168.300	54.252			
	K	1.000	11200.000		1.000	10680.000		1.000	0.174		1.000	7818.000				
	MN	1.000	1.513		1.000	2.694		1.000	11400.000		1.000	4.715				
	RB	1.000	2.778		1.000	2.865		1.000	4.681		1.000	2.556				
	SE	1.000	0.052		1.000	0.053		1.000	0.227		1.000	38.690				
	SR	1.000	6.090		1.000	3.338		1.000	3.571		1.000	1.679	1.253			
	WEIGHT	5.000	6.659	8.651	5.000	10.680	9.867	1.000	0.123		1.000	15.610				
	WEIGHT:D/A	1.000	25.450		1.000	25.650		1.000	26.880		1.000	47.850				
	ZN	1.000	51.060		1.000	50.200		1.000	17.110	4.893	1.000	0.653				
								1.000	63.120							
								1.000	11.914							
SC	PARAMETER	N	A-MEAN	STD DEV	N	A-MEAN	STD DEV	N	A-MEAN	STD DEV	N	A-MEAN	STD DEV			
	AS	1.000	0.292		1.000	0.246		1.000	0.983		1.000	1.048				
	BR	1.000	2.130		1.000	260.800		1.000	2.902		1.000	3.493				
	CA	1.000	406.200		1.000	2.049		1.000	304.400		1.000	17.030				
	CU	1.000	5.965		1.000	239.100		1.000	5.713		1.000	2140.000				
	FE	1.000	449.800		4.000	294.875	152.848	1.000	379.300		1.000	6.376				
	FISHWEIGHT	8.000	210.387	84.632	1.000	0.051		5.000	167.400	114.701	1.000	3319.000				
	K	1.000	10030.000		1.000	5807.000		1.000	167.400		6.000	263.667	101.212			
	MN	1.000	2.104		1.000	1.354		1.000	0.056		1.000	0.217				
	RB	1.000	2.222		1.000	1.718		1.000	4799.000		1.000	11789.000				
	SE	1.000	0.037		1.000	0.106		1.000	1.504		1.000	7.886				
	SR	1.000	5.513		1.000	3.626		1.000	1.778		1.000	0.418				
	WEIGHT	5.000	6.691	8.958	5.000	14.143	13.042	1.000	0.024		1.000	0.146				
	WEIGHT:D/A	1.000	27.570		1.000	36.850		1.000	4.936		1.000	3.493				
	ZN	1.000	51.510		1.000	34.740		1.000	21.890	2.859	1.000	0.438				
								1.000	34.140		1.000	25.940	3.608			
											7.000	3.242				
											1.000	11.450				
											1.000	57.820				
											1.000	0.241				
BB	PARAMETER	N	A-MEAN	STD DEV	N	A-MEAN	STD DEV	N	A-MEAN	STD DEV	N	A-MEAN	STD DEV			
	AS	1.000	0.268		1.000	0.372		1.000	0.998		1.000	10.780				
	BR	1.000	2.130		1.000	1.132		1.000	1195.000		1.000	4.888				
	CA	1.000	351.700		1.000	306.800		1.000	2548.000		1.000	2548.000				
	CU	1.000	1.973		1.000	2.302		1.000	2548.000		1.000	2548.000				
	FE	1.000	332.100		1.000	217.400		1.000	2548.000		1.000	2548.000				
	FISHWEIGHT	4.000	257.175	176.061	4.000	231.750	140.523	4.000	247.000	57.364	4.000	247.000				
	KA	1.000	0.053		1.000	0.053		1.000	0.053		1.000	0.053				
	K	1.000	7750.000		1.000	9554.000		1.000	12130.000		1.000	12130.000				
	MN	1.000	2.875		1.000	4.168		1.000	5.917		1.000	5.917				
	RB	1.000	2.042		1.000	2.443		1.000	0.126		1.000	0.126				
	SE	1.000	0.024		1.000	0.077		1.000	0.126		1.000	0.126				
	SR	1.000	6.675		1.000	5.258		1.000	3.199		1.000	3.199				
	WEIGHT	5.000	10.686	10.217	5.000	11.790	12.282	5.000	11.790		5.000	11.790				
	WEIGHT:D/A	1.000	30.710		1.000	31.190		1.000	31.190		1.000	31.190				
	ZN	1.000	34.840		1.000	38.150		1.000	38.150		1.000	38.150				
	ZN	1.000	0.120		1.000	0.120		1.000	0.120		1.000	0.120				
RH	PARAMETER	N	A-MEAN	STD DEV	N	A-MEAN	STD DEV	N	A-MEAN	STD DEV	N	A-MEAN	STD DEV			
	AS	1.000	0.372		1.000	0.372		1.000	0.998		1.000	10.780				
	BR	1.000	1.132		1.000	1.132		1.000	1195.000		1.000	4.888				
	CA	1.000	306.800		1.000	306.800		1.000	2548.000		1.000	2548.000				
	CU	1.000	2.302		1.000	2.302		1.000	2548.000		1.000	2548.000				
	FE	1.000	217.400		1.000	217.400		1.000	2548.000		1.000	2548.000				
	FISHWEIGHT	4.000	231.750	140.523	4.000	231.750	140.523	4.000	247.000	57.364	4.000	247.000				
	K	1.000	9554.000		1.000	9554.000		1.000	12130.000		1.000	12130.000				
	MN	1.000	4.168		1.000	4.168		1.000	5.917		1.000	5.917				
	RB	1.000	2.443		1.000	2.443		1.000	0.126		1.000	0.126				
	SE	1.000	0.077		1.000	0.077		1.000	0.126		1.000	0.126				
	SR	1.000	5.258		1.000	5.258		1.000	3.199		1.000	3.199				
	WEIGHT	5.000	11.790	12.282	5.000	11.790	12.282	5.000	11.790		5.000	11.790				
	WEIGHT:D/A	1.000	31.190		1.000	31.190		1.000	31.190		1.000	31.190				
	ZN	1.000	38.150		1.000	38.150		1.000	38.150		1.000	38.150				
	ZN	1.000	0.120		1.000	0.120		1.000	0.120		1.000	0.120				

Table 15. Mean concentration of elements in Bairdiella Bone relative to sampling period and station.

	December				April				July				October			
	PARAMETER	N	A-MEAN	STD DEV	PARAMETER	N	A-MEAN	STD DEV	PARAMETER	N	A-MEAN	STD DEV	PARAMETER	N	A-MEAN	STD DEV
SP	AS	8.000	2.508	0.539	AS	4.000	2.378	0.222	AS	5.000	3.017	0.528	AS	3.000	2.786	0.237
	BR	8.000	1.974	0.420	BR	4.000	2.152	0.393	BR	5.000	2.675	0.885	BR	3.000	3.325	0.473
	CA	8.000	154150.000	11074.811	CA	4.000	130650.000	19232.178	CA	5.000	153820.000	25765.423	CA	3.000	164600.000	16022.172
	CU	1.000	0.877		CU	4.000	1.092	0.139	CU	1.000	1.373		CU	2.000	132.319	185.659
	FE	8.000	118.739	90.213	FE	4.000	162.162	86.215	FE	5.000	94.562	30.872	FE	3.000	97.057	26.832
	FISHWEIGHT	8.000	207.350	71.474	FISHWEIGHT	4.000	274.475	127.310	FISHWEIGHT	5.000	210.500	127.414	FISHWEIGHT	3.000	166.500	54.252
	GA	8.000	0.577	0.098	GA	4.000	0.769	0.339	GA	4.000	0.754	0.138	GA	2.000	0.686	0.036
	K	8.000	12245.000	1742.658	K	4.000	15832.500	2005.017	K	5.000	13312.000	3104.637	K	3.000	15266.657	2334.702
	MN	8.000	8.112	2.060	MN	4.000	12.532	2.028	MN	5.000	14.804	3.098	MN	3.000	13.123	0.614
	RB	8.000	1.730	0.435	NI	2.000	1.344	0.257	NI	2.000	2.415	1.189	NI	2.000	1.748	0.527
	SE	8.000	2.434	0.699	RB	4.000	1.894	0.370	RB	5.000	2.309	0.765	PB	1.000	1.004	
	SR	8.000	553.075	69.755	SE	4.000	1.645	0.340	SE	5.000	1.798	0.231	RB	3.000	2.275	0.122
	WEIGHT:D/A	8.000	3.359	0.162	SR	4.000	553.550	112.507	SR	5.000	589.940	190.274	SE	3.000	4.327	0.696
	ZN	8.000	40.555	3.522	WEIGHT:D/A	4.000	3.376	0.341	WEIGHT:D/A	5.000	3.137	0.514	SR	3.000	560.600	43.400
	ZR	4.000	1.752	0.634	ZN	4.000	40.227	7.235	ZN	5.000	43.238	1.832	WEIGHT:D/A	3.000	2.981	0.069
SC	AS	8.000	2.679	0.474	ZR	3.000	3.375	0.667	ZR	5.000	3.978	2.574	ZN	3.000	90.317	84.963
	BR	8.000	2.292	0.324	PARAMETER	N	A-MEAN	STD DEV	PARAMETER	N	A-MEAN	STD DEV	ZR	3.000	5.240	0.590
	CA	8.000	153712.500	31253.677	AS	4.000	2.431	0.430	AS	5.000	2.772	0.269	AS	6.000	2.657	0.285
	CU	1.000	1.131		BR	4.000	2.130	0.221	BR	5.000	2.369	0.255	BR	6.000	3.108	0.285
	FE	8.000	90.616	29.993	CA	4.000	113392.500	10273.829	CA	5.000	170800.000	23231.922	CA	6.000	167650.000	14585.027
	FISHWEIGHT	8.000	210.387	84.832	CU	1.000	1.183		CU	3.000	1.298	0.119	CU	4.000	1.319	0.350
	GA	5.000	0.632	0.214	FE	4.000	98.663	28.222	FE	5.000	76.414	15.590	FE	6.000	79.325	30.410
	K	8.000	11338.875	2744.228	FISHWEIGHT	4.000	294.875	152.848	FISHWEIGHT	5.000	187.400	114.701	FISHWEIGHT	6.000	263.667	101.212
	MN	8.000	10.159	1.533	GA	3.000	0.757	0.056	GA	4.000	0.813	0.181	GA	6.000	0.878	0.203
	RB	8.000	2.015	1.026	K	4.000	15850.000	2977.393	K	5.000	13930.000	2765.547	K	6.000	11570.500	2355.901
	SE	8.000	2.433	0.533	MN	4.000	12.724	3.842	MN	5.000	16.994	3.555	MN	6.000	13.230	3.176
	SR	8.000	547.775	171.906	NI	2.000	1.238	0.062	NI	4.000	1.785	0.223	NI	3.000	1.724	0.615
	WEIGHT:D/A	3.000	3.523	0.512	RB	4.000	2.003	0.712	RB	5.000	2.595	0.613	RB	6.000	1.787	0.406
	ZN	8.000	42.192	2.038	SE	4.000	1.389	0.282	SE	5.000	2.557	0.863	SE	6.000	3.085	0.862
BB	AS	8.000	2.180	0.384	SR	4.000	570.575	84.403	SR	5.000	537.420	104.279	SR	6.000	660.817	113.376
	BR	4.000	1.944	0.238	WEIGHT:D/A	4.000	3.455	0.146	WEIGHT:D/A	5.000	3.020	0.348	WEIGHT:D/A	6.000	3.054	0.270
	CA	4.000	121252.500	46143.404	ZN	4.000	38.802	4.929	ZN	5.000	39.412	6.958	ZN	6.000	39.603	4.440
	CU	2.000	1.723	0.194	ZR	4.000	2.977	1.078	ZR	5.000	2.878	0.587	ZR	6.000	7.028	1.714
	FE	4.000	156.027	89.320	PARAMETER	N	A-MEAN	STD DEV	PARAMETER	N	A-MEAN	STD DEV	PARAMETER	N	A-MEAN	STD DEV
	FISHWEIGHT	4.000	257.175	176.061	AS	4.000	2.180	0.384	AS	5.000	2.971	0.692	AS	6.000	2.523	0.426
	GA	3.000	0.579	0.098	BR	4.000	1.944	0.238	BR	5.000	2.471	0.874	BR	6.000	2.802	0.223
	K	4.000	13688.250	3315.966	CA	4.000	121252.500	46143.404	CA	5.000	165560.000	7182.409	CA	6.000	155366.667	17556.955
	MN	4.000	12.718	3.306	CU	2.000	1.723	0.194	CU	5.000	69.960	8.191	CU	6.000	0.673	0.043
	RB	4.000	1.934	0.513	FE	4.000	156.027	89.320	FE	5.000	245.600	121.428	FE	6.000	83.778	17.757
	SE	4.000	1.445	0.244	FISHWEIGHT	4.000	257.175	176.061	FISHWEIGHT	5.000	0.889	0.223	FISHWEIGHT	7.000	247.000	57.364
	SR	4.000	558.250	199.265	GA	3.000	0.579	0.098	GA	5.000	12584.800	1895.752	GA	6.000	0.769	0.217
	WEIGHT:D/A	4.000	3.279	0.343	K	4.000	13688.250	3315.966	K	5.000	13.309	4.582	K	6.000	11891.667	967.542
	ZN	4.000	39.885	4.018	MN	4.000	12.718	3.306	MN	5.000	1.500		MN	6.000	12.439	3.490
	ZR	4.000	3.845	1.867	RB	4.000	1.934	0.513	RB	5.000	2.273	0.418	NI	4.000	1.888	0.442
RH	AS	5.000	2.971	0.692	SE	4.000	1.445	0.244	SE	5.000	2.467	0.549	RB	6.000	1.819	0.328
	BR	5.000	2.471	0.874	SR	4.000	558.250	199.265	SR	5.000	566.860	87.773	SE	6.000	3.080	0.565
	CA	5.000	165560.000	7182.409	WEIGHT:D/A	4.000	3.279	0.343	WEIGHT:D/A	5.000	2.914	0.160	SR	6.000	584.789	111.673
	CU	2.000	1.723	0.194	ZN	4.000	39.885	4.018	ZN	5.000	40.466	3.006	WEIGHT:D/A	7.000	3.336	0.250
	FE	4.000	156.027	89.320	ZR	4.000	3.845	1.867	ZR	5.000	4.286	1.346	ZN	6.000	34.823	1.577
	FISHWEIGHT	5.000	245.600	121.428	PARAMETER	N	A-MEAN	STD DEV	PARAMETER	N	A-MEAN	STD DEV	ZR	6.000	6.558	1.464
	GA	4.000	0.889	0.223	AS	5.000	2.971	0.692	AS	6.000	2.523	0.426				
	K	5.000	12584.800	1895.752	BR	5.000	2.471	0.874	BR	6.000	2.802	0.223				
	MN	5.000	13.309	4.582	CA	5.000	165560.000	7182.409	CA	6.000	155366.667	17556.955				
	NI	1.000	1.500		CU	2.000	1.723	0.194	CU	6.000	0.673	0.043				
	RB	5.000	2.273	0.418	FE	4.000	156.027	89.320	FE	6.000	83.778	17.757				
	SE	5.000	2.467	0.549	FISHWEIGHT	5.000	245.600	121.428	FISHWEIGHT	6.000	247.000	57.364				
	SR	5.000	566.860	87.773	GA	4.000	0.889	0.223	GA	7.000	247.000	57.364				
	WEIGHT:D/A	5.000	2.914	0.160	K	5.000	13.309	4.582	K	6.000	11891.667	967.542				
	ZN	5.000	40.466	3.006	MN	5.000	12.439	3.490	MN	6.000	12.439	3.490				
	ZR	5.000	4.286	1.346	NI	4.000	1.888	0.442	NI	6.000	1.888	0.442				
					RB	5.000	2.273	0.418	RB	6.000	1.819	0.328				
					SE	5.000	2.467	0.549	SE	6.000	3.080	0.565				
					SR	5.000	566.860	87.773	SR	6.000	584.789	111.673				
					WEIGHT:D/A	5.000	2.914	0.160	WEIGHT:D/A	6.000	3.336	0.250				
					ZN	5.000	40.466	3.006	ZN	6.000	34.823	1.577				
					ZR	5.000	4.286	1.346	ZR	6.000	6.558	1.464				

Format OPT missed on B2B2RH Bairdiella,
Bone L - 11513E16
C - 780403 - 780404

Table 16. Mean concentration of elements in sargo muscle relative to sampling period and station.

	DECEMBER			APRIL			JULY			OCTOBER			
	PARAMETER	N	A-MEAN	STD DEV	N	A-MEAN	STD DEV	N	A-MEAN	Std Dev.	N	A-MEAN	STD DEV
SP	AS	2.000	0.402	0.279	4.000	0.587	0.226	AS	1.000	0.446	3.000	0.694	0.066
	BR	2.000	4.180	0.378	4.000	3.304	2.124	BR		1.745	3.000	4.882	1.786
	CA	2.000	2334.000	359.210	4.000	8421.250	14795.042	CA		505.300	3.000	679.023	140.836
	CU	2.000	0.815	0.079	4.000	0.823	0.461	CU		0.323	3.000	0.552	0.131
	FE	2.000	17.720	2.772	4.000	16.940	2.507	FE		15.330	3.000	18.220	3.677
	FISHWEIGHT	2.000	293.200	4.808	5.000	192.160	150.758	FW		432.000	3.000	347.333	50.332
	GA	1.000	0.094		2.000	0.108	0.005	GA		0.076	3.000	19246.667	2795.019
	K	2.000	21665.000	954.594	4.000	13018.250	8071.738	K		18470.000	1.000	0.220	
	RB	2.000	5.400	0.785	1.000	0.132		RB		4.586	3.000	6.651	0.233
	SE	2.000	0.185	0.070	1.000	0.155		SE		0.042	3.000	0.170	0.123
ZP	SR	2.000	17.185	0.573	4.000	3.248	2.037	SR		4.756	3.000	5.222	0.733
	WT	2.000	15.290	0.778	4.000	0.183	0.201	WT		23.550	3.000	17.320	1.275
	ZN	2.000	15.396	2.128	4.000	20.248	46.324	ZN		10.910	3.000	13.327	0.934
					5.000	17.686	2.526						
					4.000	14.563	5.619						
				1.000	0.633								

SC

AS	0.680
BR	1.908
CA	2029.000
CU	9.903
FE	247.100
FW	22840.000
GA	5.723
K	.176
RB	11.540
SE	16.46
SR	12.640
D/4	
ZN	

RH

PARAMETER	N	A-MEAN	STD DEV
AS	5.000	0.789	0.170
BR	5.000	4.667	0.923
CA	5.000	329.776	293.111
CU	5.000	0.158	0.158
FE	5.000	20.212	3.891
FISHWEIGHT	6.000	318.000	123.633
GA	1.000	0.102	
K	5.000	214.000	2648.728
NI	1.000	0.216	
RB	5.000	6.432	0.692
SE	5.000	0.112	0.034
SR	5.000	3.006	1.274
WEIGHT:D/A	6.000	18.003	0.913
ZN	5.000	15.414	2.363

Table 17. Mean concentration of elements in sargo liver relative to sampling period and station.

DECEMBER				APRIL			JULY			OCTOBER			
SP	PARAMETER	N	A-MEAN	STD DEV	N	A-MEAN	STD DEV		PARAMETER	N	A-MEAN	STD DEV	
AS		1.000	0.661		1.000	0.647			AS	1.000	1.075		
BR		1.000	3.683		1.000	0.688		.928	BR	1.000	2.718		
CA		1.000	1678.000		1.000	35270.000		1.474	CA	1.000	346.100		
CU		1.000	4.241		1.000	0.222		151.	CU	1.000	2.607		
FE		1.000	708.201		1.000	19.570		2.399	FE	1.000	644.700		
FISHWEIGHT		2.000	293.200	4.408	5.000	192.160	150.758	465.3	FISHWEIGHT	3.000	347.333	50.332	
GA		1.000	0.173		1.000	0.118		432.	K	1.000	1.834		
K		1.000	7890.000		1.000	2585.000		6564.	MN	1.000	5582.000		
MN		1.000	7.510		1.000	7.081		1.413	RB	1.000	1.600		
PB		1.000	0.126		1.000	0.350		1.562	SE	1.000	0.152		
RB		1.000	2.818		1.000	0.331		.032	SR	1.000	4.884		
SE		1.000	0.651		1.000	0.237		2.666	WEIGHT	4.000	5.902	3.996	
SR		1.000	19.300		1.000	109.600		6.874	WEIGHT:D/A	1.000	35.830		
WEIGHT		2.000	6.279	3.161	6.000	5.578	6.341	37.76	ZN	1.000	42.980		
WEIGHT:D/A		1.000	21.040		1.000	14.970		42.					
ZN		1.000	103.600		1.000	11.560		.090					
ZR		1.000	1.150		1.000	0.312							

SC	As	Ca	CU	FE	FW	K	MN	RB	SE	SR	WT	ST	ZN	ZR
	.123	27.45	.469	76.6	247.1	1257.	.289	.291	.013	.223	2.617	36.03	12.82	.031

Insufficient sample
for analyses.

PARAMETER	N	A-MEAN	STD DEV
AS	1.000	1.208	
BR	1.000	2.658	
CA	1.000	232.800	
CU	1.000	2.002	
FE	1.000	287.600	
FISHWEIGHT	6.000	318.000	123.653
GA	1.000	0.044	
K	1.000	4188.000	
MN	1.000	1.374	
RB	1.000	1.282	
SE	1.000	0.082	
SR	1.000	3.482	
WEIGHT	7.000	6.387	
WEIGHT:D/A	1.000	59.450	6.826
ZN	1.000	29.440	

100

[illegible]

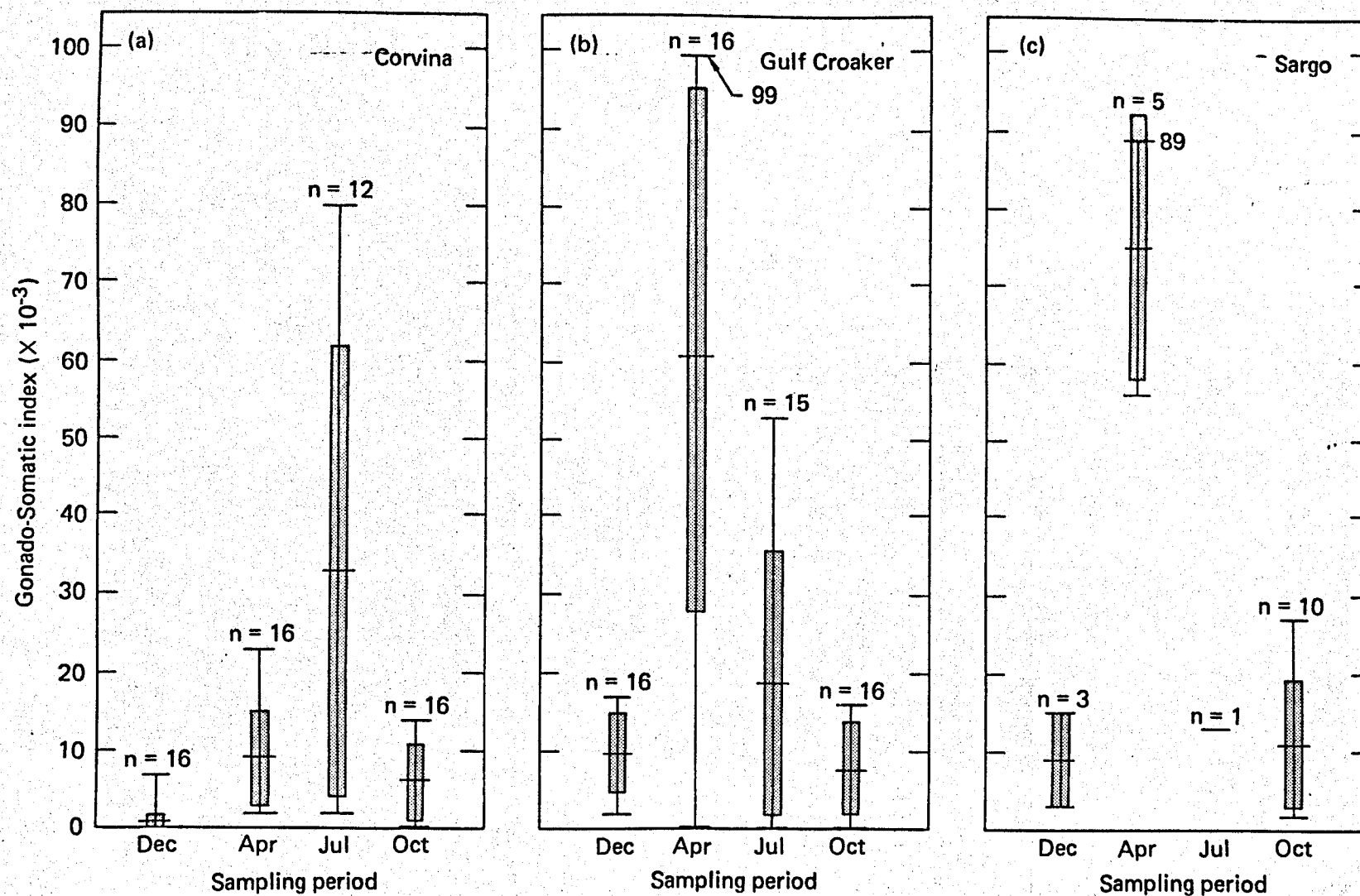


Figure 1. Gonado-Somatic index vs. sampling period for Salton Sea fishes (Go-So index = $\frac{\text{gonad wt.}}{\text{fish wt.}}$)

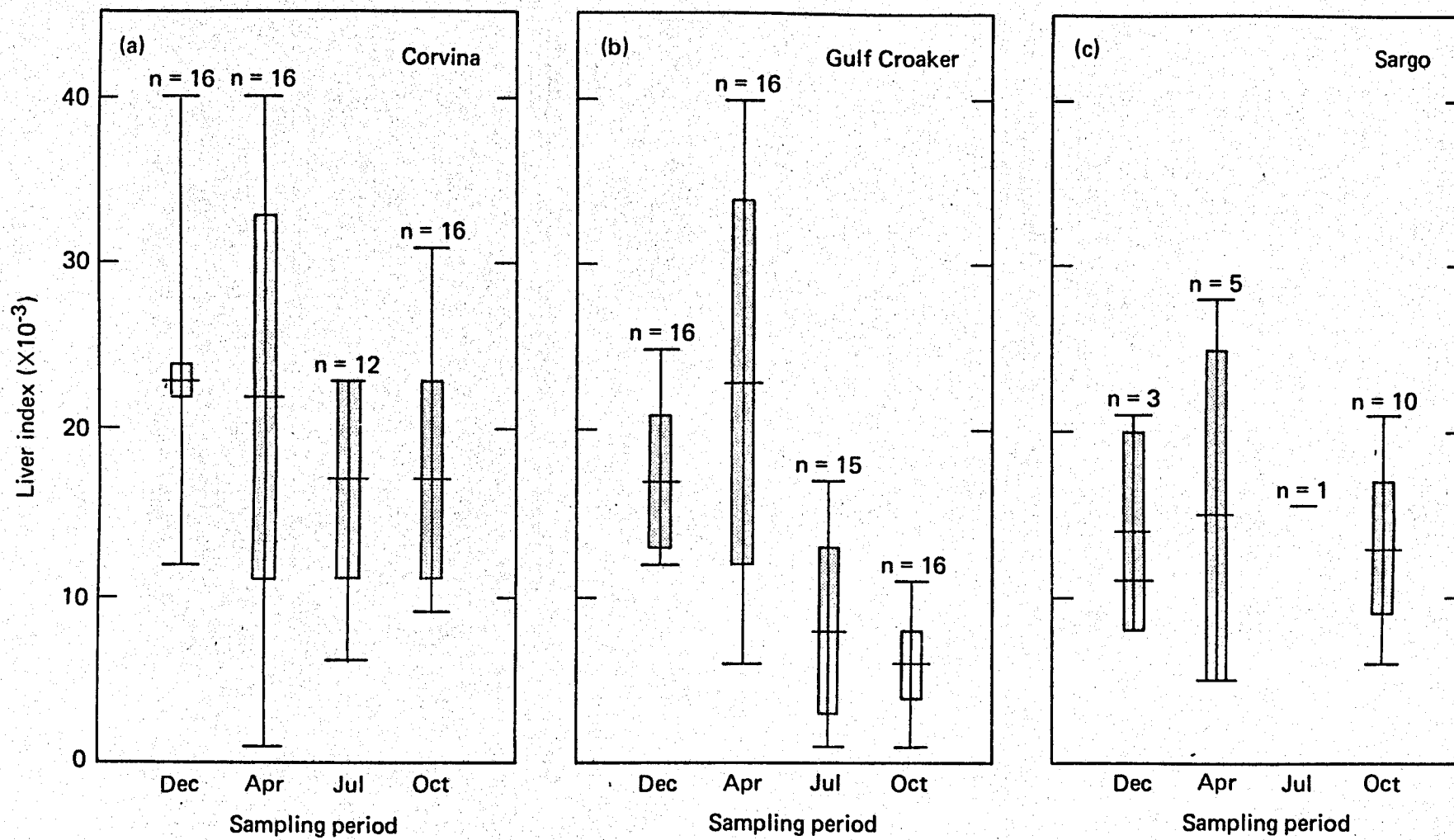


Figure 2. Liver index vs. sampling period for Salton Sea fishes (Liver index = $\frac{\text{liver wt.}}{\text{fish wt.}}$)