

LARGE PELAGIC LOGBOOK CATCH RATE INDICES FOR BILLFISHJean Cramer¹**SUMMARY**

Indices of abundance for blue marlin, white marlin and sailfish in the combined areas (Atlantic, Caribbean and Gulf of Mexico) were developed using mandatory reports from longline vessels.

RÉSUMÉ

Les indices d'abondance du makaire bleu, du makaire blanc et du voilier dans les zones associées (Atlantique, Caraïbes, et Golf du Mexique) ont été élaborés à partir des déclarations obligatoires provenant des palangriers.

RESUMEN

Se desarrollaron índices de abundancia de aguja azul, aguja blanca y pez vela en las áreas combinadas (Atlántico, Caribe y Golfo de México) utilizando los informes obligatorios de los barcos palangreros.

1. METHODS

The Large Pelagic Logbook (LPL) contains the daily records of effort and catch from U.S. Atlantic, Caribbean and Gulf of Mexico fishing vessels that land swordfish. These reports have been mandatory since October 1986. Although a variety of gear types are represented, the predominant gear type (90% of vessels reporting) is longline gear. For these analyses, gear type was limited to pelagic longline or bottom longline. The nine full years of data (1987 to 1995) were used.

1.1. Model Variables

Model variables included year (1986 to 1995), gear (pelagic longline or bottom longline), target (swordfish, tuna, or other), light sticks (presence or absence), and area/quarter. Area/quarter combinations were limited to seasons and areas where a species was normally reported to be caught.

For blue marlin and white marlin, all four quarters of the year were included for the Caribbean, Gulf of Mexico, and Florida East Coast; the first two quarters for the Sargasso, North Central Atlantic and Tuna North areas; and quarters two and three for the South Atlantic Bight, Mid Atlantic Bight, and Northeast Coastal areas (figure 1). The Sargasso and the North Central Atlantic areas were combined.

For sailfish, all four quarters of the year were included for the Caribbean, Gulf of Mexico, Florida East Coast, and South Atlantic Bight; and the first two quarters for Tuna North and Tuna South areas. Tuna North and Tuna South were combined.

1.2. Modeling Methods

A delta-lognormal approach described by Lo *et al.* (1992) was used to estimate indices of abundance.

2. RESULTS

The catch per unit effort series and 80% confidence areas are shown in Table 1. The GLM output is shown in Appendix 1.

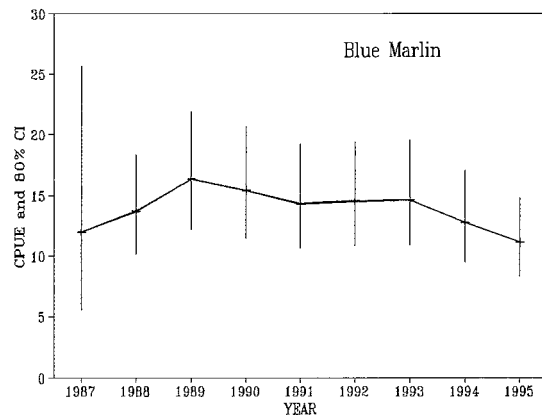
3. LITERATURE CITED

LO, N.C., L.D. Jacobson, and J.L. Squire. 1992. Indices of relative abundance from fish spotter data based on delta-lognormal models. *Can. J. Fish. Aquat. Sci.* 49:2515-2526.

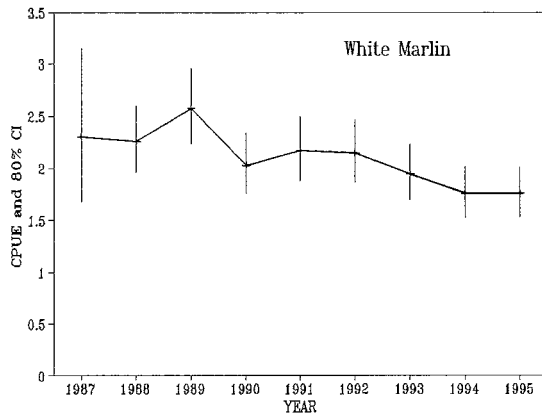
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Table 1. Catch per unit of effort series for blue marlin, white marlin and sailfish

Blue Marlin		Lo method output 80% CI		
Year	Index	CV_I	Upper	Lower
1987	11.9510	0.6695	25.7292	5.5511
1988	13.6828	0.2378	18.3868	10.1823
1989	16.3642	0.2373	21.9767	12.1850
1990	15.4042	0.2376	20.6962	11.4653
1991	14.3188	0.2388	19.2652	10.6424
1992	14.5286	0.2352	19.4625	10.8455
1993	14.6503	0.2351	19.6232	10.9376
1994	12.7448	0.2352	17.0729	9.5139
1995	11.1105	0.2348	14.8770	8.2976



White Marlin		Lo method output 80% CI		
Year	Index	CV_I	Upper	Lower
1987	2.3030	0.2542	3.1566	1.6803
1988	2.2609	0.1142	2.6095	1.9588
1989	2.5755	0.1124	2.9660	2.2363
1990	2.0294	0.1148	2.3439	1.7570
1991	2.1753	0.1139	2.5097	1.8854
1992	2.1523	0.1101	2.4713	1.8744
1993	1.9502	0.1116	2.2436	1.6951
1994	1.7597	0.1108	2.0224	1.5311
1995	1.7607	0.1094	2.0202	1.5345



Sailfish		Lo method output 80% CI		
Year	Index	CV_I	Upper	Lower
1887	1.2708	0.3676	1.9902	0.8115
1988	1.5509	0.1300	1.8257	1.3174
1989	1.4078	0.1313	1.6598	1.1940
1990	1.6779	0.1277	1.9696	1.4295
1991	1.6885	0.1262	1.9782	1.4411
1992	1.6591	0.1257	1.9427	1.4169
1993	2.0866	0.1242	2.4388	1.7853
1994	1.7953	0.1243	2.0985	1.5358
1995	1.2128	0.1304	1.4284	1.0298

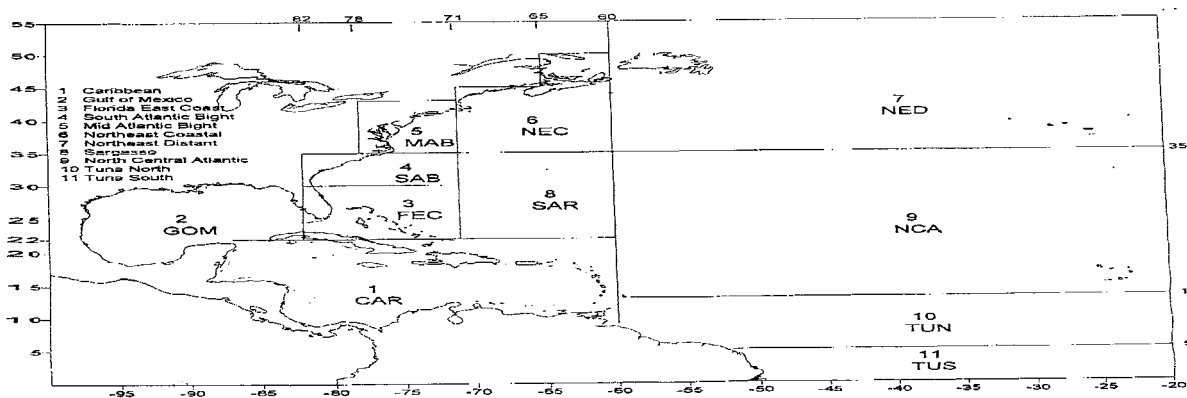
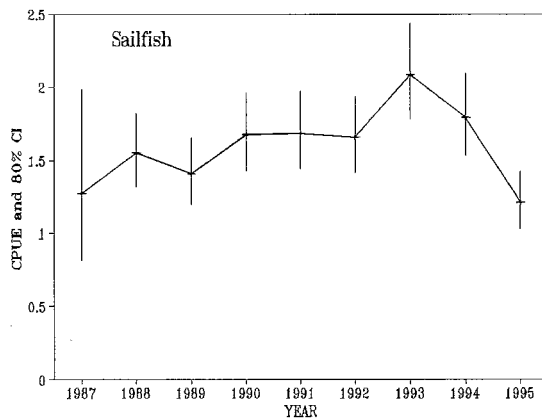


Figure 1. Areas used in analyses.

Appendix 1: GLM output

1a. Blue Marlin - GLM on proportion positives

Dependent Variable: POS
Weight: N

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	402.4884956	12.9834999	37.12	0.0001
Error	519	181.5520962	0.3498114		
Corrected Total	550	584.0405918			

R-Square 0.689145
C.V. 571.9827
Root MSE 0.591449
POS Mean 0.103403

Source	DF	Type III SS	Mean Square	F Value	Pr > F
YEAR	8	17.6373300	2.2046662	6.30	0.0001
AQ	21	312.6308373	14.8871827	42.56	0.0001
TARGET	2	31.1199441	15.5599721	44.48	0.0001

Parameter	Estimate	T for H0: Parameter=0	Pr > T	Std error of estimate
INTERCEPT	0.3729160010 B	16.51	0.0001	0.02258562
YEAR 87	0.0049860674 B	0.67	0.5023	0.00742718
88	-.0079645795 B	-1.07	0.2831	0.00741237
89	-.0020088017 B	-0.28	0.7814	0.00723378
90	-.0047192526 B	-0.65	0.5180	0.00729619
91	-.0001625567 B	-0.02	0.9828	0.00753053
92	0.0258205500 B	3.40	0.0007	0.00758377
93	0.0291480863 B	3.91	0.0001	0.00744525
94	0.0152129832 B	2.05	0.0406	0.00741251
95	0.0000000000 B	.	.	.
AQ 11	-.1844433142 B	-7.80	0.0001	0.02364722
12	-.1319059896 B	-5.26	0.0001	0.02505935
13	-.1703677329 B	-5.92	0.0001	0.02875701
14	-.1972533199 B	-7.84	0.0001	0.02514609
21	-.3302267625 B	14.40	0.0001	0.02292556
22	-.2960774948 B	12.88	0.0001	0.02299019
23	-.2702033078 B	11.76	0.0001	0.02298343
24	-.3090784855 B	13.31	0.0001	0.02321584
31	-.2728511222 B	11.66	0.0001	0.02340968
32	-.2426629425 B	10.40	0.0001	0.02334020
33	-.2450788820 B	10.28	0.0001	0.02385194
34	-.2764509335 B	11.53	0.0001	0.02397689
42	-.2602479156 B	10.92	0.0001	0.02383957
43	-.1808123867 B	-7.31	0.0001	0.02475136
52	-.2927488878 B	11.87	0.0001	0.02466083
53	-.3150759042 B	13.65	0.0001	0.02307474
62	-.3214855052 B	12.83	0.0001	0.02506225
63	-.2996689797 B	12.83	0.0001	0.02335453
91	-.2604351730 B	10.21	0.0001	0.02550139
92	-.1019376613 B	-3.11	0.0020	0.03277557
101	-.0432763768 B	-1.24	0.2153	0.03488084
102	0.0000000000 B	.	.	.
TARGET 0th	-.0789069413 B	-9.39	0.0001	0.00840375
swo	-.0061759884 B	-1.35	0.1772	0.00457006
tun	0.0000000000 B	.	.	.

Least Squares Means

YEAR	POS LSMEAN	Std Err LSMEAN	Pr > T	LSMEAN
87	0.12216432	0.00632424	0.0001	1
88	0.10921367	0.00625792	0.0001	2
89	0.11516945	0.00609948	0.0001	3
90	0.11245900	0.00604793	0.0001	4
91	0.11701569	0.00636135	0.0001	5
92	0.14299880	0.00637884	0.0001	6
93	0.14632633	0.00620821	0.0001	7
94	0.13239123	0.00608358	0.0001	8
95	0.11717825	0.00575528	0.0001	9

1b. Blue Marlin - GLM on positive catches

Dependent Variable: LCPUE
Weight: NOBS

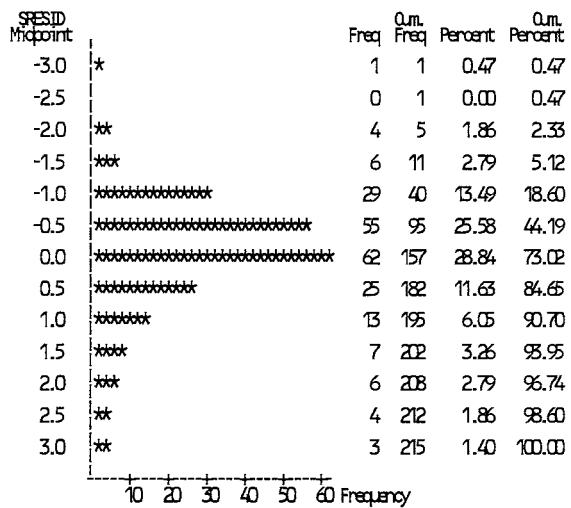
Source	DF	Squares	Sum of Square	Mean F Value	Pr > F
Model	30	1389.400596	46.313353	10.95	0.0001
Error	184	778.109044	4.228853		
Corrected Total	214	2167.509640			

R-Square 0.641012
C.V. 148.3445
Root MSE 2.056418
LCPUE Mean 1.386245

Source	DF	Type III SS	Mean Square	F Value	Pr > F
YEAR	8	159.034131	19.879266	4.70	0.0001
AQ	21	1117.395735	53.209321	12.58	0.0001
GEAR	1	38.626866	38.626866	9.13	0.0029

Parameter	Estimate	T for H0: Parameter=0	Pr > T	StdError of Estimate
INTERCEPT	1.412011237 B	11.87	0.0001	0.11894919
YEAR87	0.219426606 B	2.78	0.0060	0.07892906
88	0.240711637 B	2.99	0.0032	0.08048131
89	0.395684053 B	5.01	0.0001	0.07891348
90	0.346128420 B	4.29	0.0001	0.08064236
91	0.255268053 B	3.05	0.0026	0.08370308
92	0.170096659 B	2.17	0.0316	0.07852178
93	0.166274124 B	2.17	0.0312	0.07658382
94	0.078609903 B	1.02	0.3104	0.07727892
95	0.000000000 B	.	.	.
AQ 11	-0.206707281 B	-1.64	0.1028	0.12608162
12	0.112296029 B	0.83	0.4080	0.13541969
13	0.131156727 B	0.75	0.4548	0.17508540
14	0.056066332 B	0.39	0.6992	0.14485375
21	0.713115530 B	4.86	0.0001	0.14685379
22	0.427788022 B	3.19	0.0017	0.13403328
23	0.258975180 B	2.01	0.0461	0.12894266
24	0.703343361 B	4.87	0.0001	0.14432162
31	0.031830312 B	0.23	0.8156	0.13626801
32	0.015851785 B	0.12	0.9020	0.12856068
33	0.118570743 B	0.86	0.3891	0.13735906
34	0.084971431 B	0.58	0.5640	0.14702261
42	0.340939983 B	2.43	0.0160	0.14022591

43	0.069075352 B	0.50	0.6167	0.13776750
52	0.629235177 B	3.64	0.0004	0.17301887
53	0.691669889 B	4.86	0.0001	0.14230644
62	0.830635185 B	4.05	0.0001	0.20505936
63	0.667590457 B	4.65	0.0001	0.14353988
91	0.817552133 B	5.01	0.0001	0.16327079
92	0.557640894 B	2.98	0.0032	0.18696422
101	0.001411848 B	0.01	0.9939	0.18419983
102	0.000000000 B	.	.	.
GR BLL	0.577799061 B	3.02	0.0029	0.19118042
LL	0.000000000 B	.	.	.



Least Squares Means

YEAR	LCPUE LSMEAN	Std Err LSMEAN	Pr > T H0:LSMEAN=0	LSMEAN Number
87	1.62316730	0.11146906	0.0001	1
88	1.64445233	0.11200876	0.0001	2
89	1.79942475	0.11105209	0.0001	3
90	1.74986911	0.11185073	0.0001	4
91	1.65900875	0.11478780	0.0001	5
92	1.57383735	0.10763652	0.0001	6
93	1.57001482	0.10769437	0.0001	7
94	1.48235060	0.10753568	0.0001	8
95	1.40374069	0.10622752	0.0001	9

1c. Blue Marlin - Proportion positive and positive catches combined

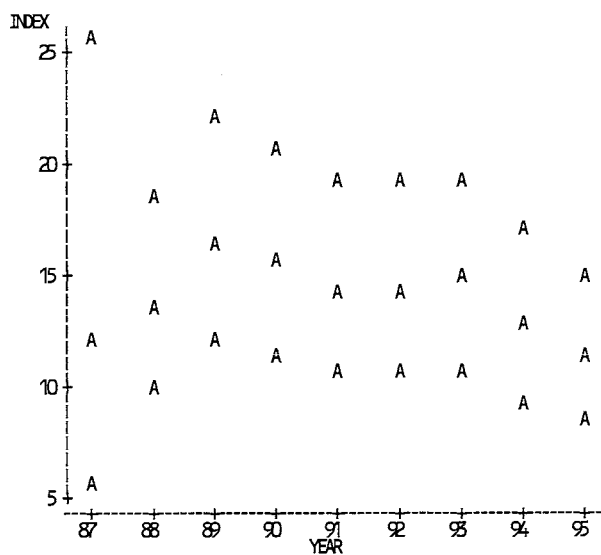
YEAR	BC_CPU	BC_POS	INDEX	SE_I	CV_I
87	34.5644	0.34576	11.9510	8.00152	0.66983
88	41.6540	0.32849	13.6828	3.25354	0.23778
89	48.6414	0.33642	16.3642	3.88287	0.23728
90	46.2857	0.33281	15.4042	3.66048	0.23763
91	42.2518	0.33889	14.3188	3.41933	0.23880
92	38.8323	0.37414	14.5286	3.41706	0.23520
93	38.6839	0.37872	14.6503	3.44423	0.23510
94	35.4377	0.35964	12.7448	2.99760	0.23520
95	32.7631	0.33911	11.1105	2.60902	0.23483

2a. White Marlin - GLM on proportion positives

Dependent Variable: POS
Weight: N

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	32	317.9407734	9.9356492	42.20	0.0001
Error	649	152.7982766	0.2354365		
Corrected Total	681	470.7390499			

Source	DF	Type III SS	Mean Square	F Value	Pr > F
YEAR	8	13.1435584	1.6429448	6.98	0.0001
AQ	21	217.3160585	10.3483837	43.95	0.0001
GEAR	1	1.4164045	1.4164045	6.02	0.0144
TARGET	2	28.0263732	14.0131866	59.52	0.0001



Parameter	Estimate	T for H0: Parameter=0	Pr > T Estimate	Std Error of Estimate
INTERCEPT	0.2307917462 B	12.45	0.0001	0.01853022
YEAR 87	0.0260783654 B	4.27	0.0001	0.00610981
88	0.0025363123 B	0.42	0.6775	0.00609623
89	0.0064718028 B	1.09	0.2771	0.00594927
90	-.0092832239 B	-1.55	0.1224	0.00600136
91	0.0046439040 B	0.75	0.4547	0.00620791
92	0.0244661458 B	3.93	0.0001	0.00622173
93	0.0126897014 B	2.08	0.0382	0.00610980
94	0.0076886489 B	1.26	0.2066	0.00608136
95	0.0000000000 B	.	.	.
AQ 11	-.0878425071 B	-4.53	0.0001	0.01940015
12	-.0879755767 B	-4.28	0.0001	0.02055864
13	-.1411455366 B	-5.98	0.0001	0.02359202
14	-.1402486420 B	-6.80	0.0001	0.02062991
21	-.1816416001 B	-9.66	0.0001	0.01881145
22	-.1396748447 B	-7.40	0.0001	0.01886470
23	-.1045988032 B	-5.55	0.0001	0.01885942
24	-.1550354012 B	-8.14	0.0001	0.01904745
31	-.1420010575 B	-7.39	0.0001	0.01920626
32	-.1387379780 B	-7.25	0.0001	0.01914823
33	-.1640905941 B	-8.39	0.0001	0.01956831
34	-.1684967115 B	-8.57	0.0001	0.01967046
42	-.1283548522 B	-6.56	0.0001	0.01955775
43	-.1471097387 B	-7.24	0.0001	0.02030611
52	-.1138834787 B	-5.63	0.0001	0.02023148
53	-.0428023767 B	-2.26	0.0241	0.01893027
62	-.1304264811 B	-6.34	0.0001	0.02056080
63	-.0579856886 B	-3.03	0.0026	0.01915985

91	-.0607321215 B	-2.90	0.0038	0.02092108
92	0.0014446351 B	0.05	0.9572	0.02688883
10	0.0500218373 B	1.75	0.0809	0.02861586
10	0.0000000000 B	.	.	.
GEAR BLL	-.0251373308 B	-2.45	0.0144	0.01024855
LL	0.0000000000 B	.	.	.
TARGET oth	-.0832836496 B	-10.10	0.0001	0.00824210
swo	-.0225847118 B	-6.02	0.0001	0.00374924
tun	0.0000000000 B	.	.	.

Least Squares Means

YEAR	POS LSMEAN	Std Err LSMEAN	Pr > T H0:LSMEAN=0	LSMEAN Number
87	0.10531574	0.00640276	0.0001	1
88	0.08177369	0.00634682	0.0001	2
89	0.08570918	0.00623529	0.0001	3
90	0.06995415	0.00620997	0.0001	4
91	0.08388128	0.00652126	0.0001	5
92	0.10370352	0.00620467	0.0001	6
93	0.09192708	0.00615148	0.0001	7
94	0.08692603	0.00601283	0.0001	8
95	0.07923738	0.00576128	0.0001	9

2b. White Marlin - GLM on positive catches

Dependent Variable: LCPUE

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	32	642.9597531	20.0924923	13.15	0.0001
Error	409	624.7760458	1.5275698		
Corrected Total	441	1267.7357989			

R-Square	C.V.	Root MSE	LCPUE Mean
0.507172	98.81915	1.235949	1.250718

Source	DF	Type III SS	Mean Square	F Value	Pr > F
YEAR	8	158.1886119	19.7735765	12.94	0.0001
AQ	21	369.3757520	17.5893215	11.51	0.0001
GEAR	1	8.2152680	8.2152680	5.38	0.0209
TARGET	2	25.5915695	12.7957848	8.38	0.0003

Parameter	Estimate	T for H0: Parameter=0	Pr > T	Std Error of Estimate
INTERCEPT	1.188824532 B	12.90	0.0001	0.09216395
YEAR 87	0.138431783 B	2.98	0.0031	0.04646602
88	0.236395757 B	4.75	0.0001	0.04973510
89	0.344939569 B	7.31	0.0001	0.04716312
90	0.195521866 B	3.94	0.0001	0.04960071
91	0.186177868 B	3.80	0.0002	0.04900218
92	0.071261199 B	1.53	0.1267	0.04655991
93	0.033505502 B	0.72	0.4702	0.04635072
94	-0.042640109 B	-0.91	0.3647	0.04699165
95	0.000000000 B	.	.	.
AQ 11	-0.230892146 B	-2.25	0.0247	0.10243021
12	.051016642 B	.45	0.6496	0.11220709
13	-0.158745909 B	-0.98	0.3276	0.16197617
14	-0.192173025 B	-1.54	0.1254	0.12512698
21	-0.378094904 B	-3.52	0.0005	0.10726445
22	-0.104549212 B	-1.05	0.2926	0.09921373
23	0.062698859 B	0.65	0.5171	0.09669764
24	-0.397991183 B	-3.84	0.0001	0.10358513
31	-0.068821347 B	-0.65	0.5150	0.10560977
32	0.133783616 B	1.28	0.2008	0.10441079
33	0.096545403 B	0.82	0.4151	0.11834511
34	0.053643832 B	0.44	0.6593	0.12160333

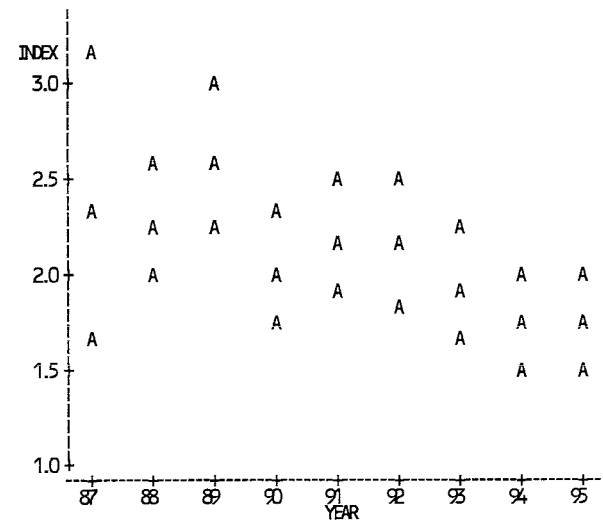
42	-0.276443547 B	-2.55	0.0110	0.10822171
43	0.113207016 B	0.91	0.3651	0.12484762
52	-0.320397859 B	-2.87	0.0044	0.11180810
53	-0.069159477 B	-0.73	0.4654	0.09465313
62	-0.274201920 B	-2.33	0.0205	0.11786190
63	-0.229569449 B	-2.37	0.0183	0.09688789
91	-0.452189844 B	-4.08	0.0001	0.11094706
92	-0.373812650 B	-2.74	0.0065	0.13663904
101	0.301486726 B	2.28	0.0233	0.13244249
102	0.000000000 B	.	.	.
GEAR BLL	0.332865370 B	2.32	0.0209	0.14353515
LL	0.000000000 B	.	.	.
TARGET oth	0.185913465 B	1.58	0.1151	0.11773245
swo	0.113976407 B	3.92	0.0001	0.02907873
tun	0.000000000 B	.	.	.

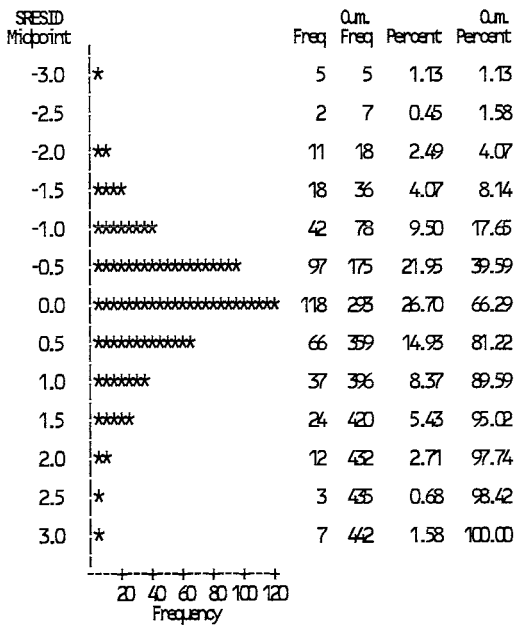
Least Squares Means

YEAR	LCPUE LSMEAN	Std Err LSMEAN	Pr > T H0:LSMEAN=0	LSMEAN Number
87	1.47025864	0.08848780	0.0001	1
88	1.56822261	0.09007053	0.0001	2
89	1.67676642	0.08829004	0.0001	3
90	1.52734872	0.08968757	0.0001	4
91	1.51800472	0.08959557	0.0001	5
92	1.40308805	0.08737386	0.0001	6
93	1.36533236	0.08847494	0.0001	7
94	1.28918674	0.08728653	0.0001	8
95	1.33182685	0.08512058	0.0001	9

2c. White Marlin - Proportion positive and positive catches combined

YEAR	BC_CPU	BC_POS	INDEX	SE_I	CV_I
87	9.2194	0.24980	2.30303	0.58537	0.25417
88	10.2426	0.22073	2.26086	0.25815	0.11418
89	11.4187	0.22555	2.57545	0.28953	0.11242
90	9.8327	0.20639	2.02936	0.23286	0.11475
91	9.7413	0.22331	2.17530	0.24768	0.11386
92	8.6855	0.24780	2.15226	0.23685	0.11005
93	8.3629	0.23319	1.95015	0.21763	0.11160
94	7.7505	0.22704	1.75969	0.19492	0.11077
95	8.0897	0.21764	1.76067	0.19269	0.10944





43	-.0147947938 B	-0.85	0.3977	0.01747794
44	-.1043274399 B	-5.38	0.0001	0.01938844
101	0.0312521602 B	1.29	0.1975	0.02422124
102	0.0000000000 B	.	.	.
GR BLL	-.0333375575 B	-3.49	0.0005	0.00954521
LL	0.0000000000 B	.	.	.
TARGET oth	-.0360784839 B	-4.43	0.0001	0.00815279
swo	0.0088142469 B	2.29	0.0222	0.00384171
tun	0.0000000000 B	.	.	.

Least Squares Means

YEAR	POS LSMEAN	Std Err LSMEAN	Pr > T H0:LSMEAN=0	LSMEAN Number
87	0.02286952	0.00596912	0.0001	1
88	0.04286090	0.00585813	0.0001	2
89	0.03739150	0.00580865	0.0001	3
90	0.04295734	0.00584627	0.0001	4
91	0.06150787	0.00622249	0.0001	5
92	0.06353475	0.00593765	0.0001	6
93	0.06793268	0.00594526	0.0001	7
94	0.06436004	0.00571020	0.0001	8
95	0.04742931	0.00565500	0.0001	9

3a. Sailfish - GLM on proportion positives

Dependent Variable: POS
Weight: N

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	28	251.2154898	8.9719818	47.74	0.0001
Error	539	101.2945628	0.1879305		
Corrected Total	567	352.5100526			

R-Square 0.712648
C.V. 642.9182
Root MSE 0.433510
POS Mean 0.067428

Source	DF	Type III SS	Mean Square	F Value	Pr > F
YEAR	8	18.7234158	2.3404270	12.45	0.0001
AQ	17	208.8407922	12.2847525	65.37	0.0001
GEAR	1	2.2924169	2.2924169	12.20	0.0005
TARGET	2	5.9567919	2.9783960	15.85	0.0001

Parameter	Estimate	T for H0: Parameter=0	Pr > T	Std Error of Estimate
INTERCEPT	0.1551027402 B	9.75	0.0001	0.01590074
YEAR87	-.0245597867 B	-4.03	0.0001	0.00608744
88	-.0045684025 B	-0.76	0.4476	0.00601131
89	-.0100378032 B	-1.69	0.0919	0.00594487
90	-.0044719617 B	-0.74	0.4601	0.00604917
91	0.0140785639 B	2.24	0.0253	0.00627499
92	0.0161054417 B	2.53	0.0118	0.00637044
93	0.0205033705 B	3.24	0.0013	0.00632298
94	0.0169307304 B	2.72	0.0067	0.00621743
95	0.0000000000 B			
AQ				
11	-.1312842600 B	-7.89	0.0001	0.01664233
12	-.1229525187 B	-6.94	0.0001	0.01771718
13	-.1156481510 B	-5.64	0.0001	0.02050881
14	-.1139354475 B	-6.41	0.0001	0.01778087
21	-.1425370526 B	-8.88	0.0001	0.01604974
22	-.0836381802 B	-5.20	0.0001	0.01609679
23	-.0643608171 B	-4.00	0.0001	0.01609164
24	-.1247322245 B	-7.67	0.0001	0.01626619
31	-.1270725914 B	-7.73	0.0001	0.01644274
32	-.0374559555 B	-2.28	0.0228	0.01640439
33	0.0197956201 B	1.18	0.2391	0.01679559
34	-.1004824654 B	-5.95	0.0001	0.01687939
41	-.1340347339 B	-7.26	0.0001	0.01847398
42	-.1082895419 B	-6.46	0.0001	0.01676933

3b. Sailfish - GLM on positive catches

Dependent Variable: LCPUE
Weight: NOBS

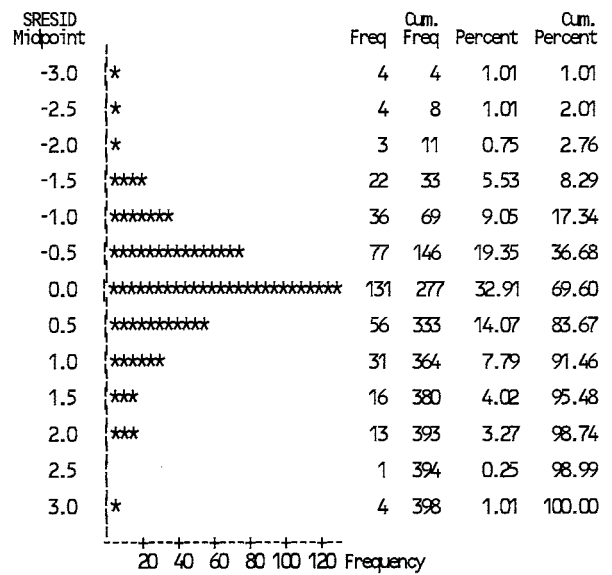
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	28	929.7955854	33.2069852	16.07	0.0001
Error	369	762.3781617	2.0660655		
Corrected Total	397	1692.1737471			

R-Square 0.549468
C.V. 89.33978
Root MSE 1.437381
LCPUE Mean 1.608893

Source	DF	Type III SS	Mean Square	F Value	Pr > F
YEAR	8	67.2040121	8.4005015	4.07	0.0001
AQ	17	466.5746765	27.4455692	13.28	0.0001
LITE	1	25.4834594	25.4834594	12.33	0.0005
TARGET	2	33.5021772	16.7510886	8.11	0.0004

Parameter	Estimate	T for H0: Parameter=0	Pr > T	Std Error of Estimate
INTERCEPT	1.046450999 B	7.50	0.0001	0.13950709
YEAR87	0.270864520 B	3.11	0.0020	0.08699155
88	0.280897636 B	3.58	0.0004	0.07841824
89	0.227687966 B	2.89	0.0041	0.07881442
90	0.358627757 B	4.51	0.0001	0.07944964
91	0.228445100 B	2.93	0.0035	0.07784176
92	0.196974895 B	2.48	0.0135	0.07932646
93	0.396373448 B	5.10	0.0001	0.07770587
94	0.270108031 B	3.46	0.0006	0.07816694
95	0.000000000 B			
AQ				
11	-0.383594064 B	-2.35	0.0195	0.16346216
12	-0.198324788 B	-1.05	0.2961	0.18953337
13	-0.199379144 B	-0.81	0.4178	0.24580853
14	-0.254213304 B	-1.43	0.1541	0.17802228
21	-0.307005292 B	-1.85	0.0650	0.16589943
22	0.207222831 B	1.55	0.1219	0.13365960
23	0.281719672 B	2.14	0.0327	0.13143631
24	-0.309166834 B	-2.03	0.0430	0.15225430
31	0.023977557 B	0.15	0.8806	0.15946612
32	0.278531716 B	2.00	0.0461	0.13917112
33	0.566318593 B	4.05	0.0001	0.13972401
34	0.166842168 B	1.08	0.2810	0.15453132
41	-0.395463156 B	-1.37	0.1715	0.28864034

42	-0.214668796 B	-1.39	0.1650	0.15431931
43	0.112116789 B	0.77	0.4425	0.14582253
44	-0.067844075 B	-0.34	0.7315	0.19753738
101	0.169640184 B	0.95	0.3436	0.17888157
102	0.000000000 B			
LITE N	-0.226271870 B	-3.51	0.0005	0.06442782
Y	0.000000000 B			
TARGET oth	0.188001488 B	1.05	0.2963	0.17974911
swo	0.253055050 B	4.02	0.0001	0.06287846
tun	0.000000000 B			



Least Squares Means

YEAR	LCPUE LSMEAN	Std Err LSMEAN	Pr > T HO:LSMEAN=0	LSMEAN Number
87	1.32212677	0.08952171	0.0001	1
88	1.33215988	0.08288165	0.0001	2
89	1.27895021	0.08265447	0.0001	3
90	1.40989000	0.07949126	0.0001	4
91	1.27970735	0.08131964	0.0001	5
92	1.24823714	0.08218243	0.0001	6
93	1.44763569	0.08139014	0.0001	7
94	1.32137028	0.08122637	0.0001	8
95	1.05126225	0.08503761	0.0001	9

3c. Sailfish - GLM on positive catches

YEAR	BC_CPU	BC_POS	INDEX	SE_I	CV_I
87	10.2575	0.12389	1.27082	0.46713	0.36758
88	10.5795	0.14659	1.55086	0.20167	0.13004
89	10.0315	0.14034	1.40779	0.18479	0.13126
90	11.4378	0.14670	1.67794	0.21430	0.12772
91	10.0402	0.16817	1.68845	0.21306	0.12619
92	9.7285	0.17054	1.65910	0.20862	0.12574
93	11.8760	0.17570	2.08662	0.25924	0.12424
94	10.4674	0.17151	1.79526	0.22323	0.12434
95	7.9872	0.15184	1.21280	0.15815	0.13040

