

**SAW/SARC 48 Golden Tilefish
APPENDIX A3: Model Output**

NEFSC Weighout CPUE GLM model

The SAS System
14:00 Thursday, March 31, 2005 1

The GLM Procedure

Class Level Information

Class	Levels	Values																	
lndyear	15	1979 1980 1981 1982 1983 1985 1986 1987 1988 1989 1990 1991 1992 1993 9999																	

permit 92 delete permit numbers
Number of observations 1897
The SAS System
14:00 Thursday, March 31, 2005 2

The GLM Procedure
Dependent Variable: LNCPUE

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	105	743.569869	7.081618	23.67	<.0001
Error	1791	535.787323	0.299155		

Corrected Total 1896 1279.357192

R-Square	Coeff Var	Root MSE	LNCPUE Mean
0.581206	8.116663	0.546951	6.738619

Source	DF	Type I SS	Mean Square	F Value	Pr > F
lndyear	14	566.9637531	40.4974109	135.37	<.0001
permit	91	176.6061156	1.9407265	6.49	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
lndyear	14	281.1521083	20.0822934	67.13	<.0001
permit	91	176.6061156	1.9407265	6.49	<.0001

Parameter	Estimate	Standard Error	t Value	Pr > t
Intercept	6.232567267 B	0.11429828	54.53	<.0001
lndyear 1979	1.022878443 B	0.07430951	13.77	<.0001
lndyear 1980	0.991305758 B	0.07181247	13.80	<.0001
lndyear 1981	0.957632235 B	0.07168379	13.36	<.0001
lndyear 1982	0.461931590 B	0.07359297	6.28	<.0001
lndyear 1983	0.036989477 B	0.07511938	0.49	0.6225
lndyear 1985	-0.116577906 B	0.07301030	-1.60	0.1105
lndyear 1986	0.078237855 B	0.07992860	0.98	0.3278
lndyear 1987	0.235247667 B	0.07689409	3.06	0.0023
lndyear 1988	-0.290869711 B	0.08580020	-3.39	0.0007
lndyear 1989	-0.437414680 B	0.11355219	-3.85	0.0001
lndyear 1990	-0.412418009 B	0.10524248	-3.92	<.0001
lndyear 1991	-0.462210977 B	0.09637704	-4.80	<.0001
lndyear 1992	-0.213720208 B	0.09349023	-2.29	0.0224
lndyear 1993	-0.277906028 B	0.09113548	-3.05	0.0023
lndyear 9999	0.000000000 B	.	.	.
permit -	0.053877941 B	0.39953947	0.13	0.8927
permit -	0.290799259 B	0.40217631	0.72	0.4697
permit -	2.200653904 B	0.55660933	3.95	<.0001
permit -	-0.720065816 B	0.33062733	-2.18	0.0295
permit -	1.204048080 B	0.23673422	5.09	<.0001
permit -	-0.918838210 B	0.55660933	-1.65	0.0990
permit -	0.884977111 B	0.55660933	1.59	0.1120
permit -	0.089186369 B	0.13030426	0.68	0.4938
permit -	0.351073875 B	0.55660933	0.63	0.5283
permit -	-0.474685588 B	0.40127024	-1.18	0.2370
permit -	-1.051239079 B	0.55796370	-1.88	0.0597
permit -	0.883791874 B	0.55876605	1.58	0.1139
permit -	0.042036558 B	0.15197217	0.28	0.7821

permit	-	-2.501448583	B	0.55827964	-4.48	<.0001
permit	-	0.450272193	B	0.12822212	3.51	0.0005
permit	-	0.471191134	B	0.55809344	0.84	0.3986
permit	-	-0.050060896	B	0.14723604	-0.34	0.7339
permit	-	-0.138317903	B	0.24734699	-0.56	0.5761
permit	-	0.288864363	B	0.40301160	0.72	0.4736
permit	-	-0.719753788	B	0.55856606	-1.29	0.1977
permit	-	0.539895149	B	0.20257954	2.67	0.0078
permit	-	0.200325406	B	0.14810284	1.35	0.1764
permit	-	0.166798650	B	0.13012707	1.28	0.2001
permit	-	0.171959971	B	0.11302093	1.52	0.1283
permit	-	0.231976547	B	0.12244851	1.89	0.0583
permit	-	0.024125664	B	0.13432034	0.18	0.8575
permit	-	0.094051267	B	0.16446785	0.57	0.5675
permit	-	0.371090946	B	0.17507191	2.12	0.0342
permit	-	0.068525060	B	0.15621988	0.44	0.6610
permit	-	0.291237884	B	0.55606608	0.52	0.6005
permit	-	0.250774748	B	0.19444954	1.29	0.1973
permit	-	-1.365464039	B	0.19254217	-7.09	<.0001
permit	-	0.202892095	B	0.11692497	1.74	0.0829
permit	-	-0.150565146	B	0.55660933	-0.27	0.7868
permit	-	-1.227887492	B	0.55827964	-2.20	0.0280
permit	-	-1.316984788	B	0.55796370	-2.36	0.0184
permit	-	0.055682092	B	0.55606608	0.10	0.9202
permit	-	0.476788308	B	0.56089822	0.85	0.3954
permit	-	-1.513147475	B	0.22407363	-6.75	<.0001
permit	-	0.925030445	B	0.56089822	1.65	0.0993
permit	-	-0.260880622	B	0.40623775	-0.64	0.5208
permit	-	0.277147040	B	0.11033921	2.51	0.0121
permit	-	-0.894403775	B	0.26894018	-3.33	0.0009
permit	-	-0.087797738	B	0.21953680	-0.40	0.6893
permit	-	0.002668324	B	0.19877790	0.01	0.9893
permit	-	0.496364007	B	0.10872728	4.57	<.0001
permit	-	-0.163600190	B	0.55796370	-0.29	0.7694
permit	-	0.467983305	B	0.12033347	3.89	0.0001
permit	-	0.024708856	B	0.13276574	0.19	0.8524
permit	-	-1.665756882	B	0.40275435	-4.14	<.0001
permit	-	-0.008289609	B	0.21203679	-0.04	0.9688
permit	-	0.422212817	B	0.56253472	0.75	0.4530
permit	-	-0.994541917	B	0.41068120	-2.42	0.0155
permit	-	0.640814312	B	0.17122800	3.74	0.0002
permit	-	0.289229697	B	0.11245469	2.57	0.0102
permit	-	0.232020794	B	0.11406216	2.03	0.0421
permit	-	0.435287696	B	0.23285239	1.87	0.0617
permit	-	-0.093362255	B	0.55876605	-0.17	0.8673
permit	-	0.565119319	B	0.29382393	1.92	0.0546
permit	-	0.185883996	B	0.10864670	1.71	0.0873
permit	-	0.383628924	B	0.26777330	1.43	0.1521
permit	-	-0.429338431	B	0.15476255	-2.77	0.0056
permit	-	0.941153790	B	0.26751142	3.52	0.0004
permit	-	-0.144900138	B	0.55876605	-0.26	0.7954
permit	-	-0.018365360	B	0.39831869	-0.05	0.9632
permit	-	0.233109656	B	0.24325318	0.96	0.3380
permit	-	0.579583698	B	0.55656992	1.04	0.2979
permit	-	0.280357477	B	0.14815327	1.89	0.0586
permit	-	-0.220190021	B	0.33549831	-0.66	0.5117
permit	-	0.477244382	B	0.17126647	2.79	0.0054
permit	-	0.586558492	B	0.29544304	1.99	0.0473
permit	-	1.003951166	B	0.55606608	1.81	0.0712
permit	-	0.882877530	B	0.33498687	2.64	0.0085
permit	-	0.191509700	B	0.24286878	0.79	0.4305
permit	-	0.297364159	B	0.29099874	1.02	0.3070
permit	-	0.283495433	B	0.12957609	2.19	0.0288
permit	-	1.042813481	B	0.56089822	1.86	0.0632
permit	-	-0.065468315	B	0.19188028	-0.34	0.7330
permit	-	-0.153684912	B	0.40328873	-0.38	0.7032
permit	-	0.036432483	B	0.15621610	0.23	0.8156
permit	-	0.099929826	B	0.29223882	0.34	0.7324
permit	-	0.224377910	B	0.11753056	1.91	0.0564
permit	-	0.334472400	B	0.29263852	1.14	0.2532
permit	-	0.346528767	B	0.39933585	0.87	0.3856
permit	-	0.131354900	B	0.17613902	0.75	0.4559
permit	-	0.056859718	B	0.15272950	0.37	0.7097
permit	-	-1.420176111	B	0.55660933	-2.55	0.0108
permit	-	-1.054505031	B	0.33062733	-3.19	0.0015
permit	-	1.290671749	B	0.56253472	2.29	0.0219

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permit - -0.545675103 B 0.55660933 -0.98 0.3270
permit - 0.722755358 B 0.12789264 5.65 <.0001
permit - 0.000000000 B . . .

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NEFSC VTR CPUE GLM model

The SAS System
14:33 Monday, March 9, 2009

The GLM Procedure
Class Level Information

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Class      Levels  Values
lndyear    14 1995 1996 1997 1998 1999 2001 2002 2003 2004 2005 2006 2007
           2008 9999

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permit     28 delete permit numbers

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Number of observations 1644

The SAS System
14:33 Monday, March 9, 2009

The GLM Procedure

Dependent Variable: LNCPUE

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	40	486.8316755	12.1707919	56.67	<.0001
Error	1603	344.2626234	0.2147615		
Corrected Total	1643	831.0942989			

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R-Square      Coeff Var      Root MSE      LNCPUE Mean
0.585772      6.982976      0.463424      6.636478

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Source	DF	Type I SS	Mean Square	F Value	Pr > F
lndyear	13	349.5367440	26.8874418	125.20	<.0001
permit	27	137.2949315	5.0849975	23.68	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
lndyear	13	300.7498197	23.1346015	107.72	<.0001
permit	27	137.2949315	5.0849975	23.68	<.0001

Parameter	Estimate	Standard Error	t Value	Pr > t
Intercept	5.105961941 B	0.27514746	18.56	<.0001
lndyear 1995	-0.000311337 B	0.06567651	-0.00	0.9962
lndyear 1996	0.333314839 B	0.06159706	5.41	<.0001
lndyear 1997	0.849015959 B	0.06047455	14.04	<.0001
lndyear 1998	0.322043216 B	0.05885335	5.47	<.0001
lndyear 1999	-0.010958858 B	0.06068052	-0.18	0.8567
lndyear 2001	0.340009452 B	0.06244886	5.44	<.0001
lndyear 2002	0.541877218 B	0.06287945	8.62	<.0001
lndyear 2003	1.021480120 B	0.06520389	15.67	<.0001
lndyear 2004	1.324952771 B	0.06417921	20.64	<.0001
lndyear 2005	1.517578755 B	0.06802508	22.31	<.0001
lndyear 2006	1.193859874 B	0.06813050	17.52	<.0001
lndyear 2007	0.778697695 B	0.06658842	11.69	<.0001
lndyear 2008	0.358006552 B	0.06567768	5.45	<.0001
lndyear 9999	0.000000000 B	.	.	.
permit -	0.971373595 B	0.53879108	1.80	0.0716
permit -	-1.049233248 B	0.34106397	-3.08	0.0021

```

permit - -0.211985376 B 0.42788650 -0.50 0.6204
permit - 0.637114469 B 0.29088986 2.19 0.0287
permit - 1.043620837 B 0.53836635 1.94 0.0527
permit - -0.207701079 B 0.32349487 -0.64 0.5209
permit - 0.199074689 B 0.29734291 0.67 0.5033
permit - 0.795214347 B 0.33240705 2.39 0.0169
permit - 0.631300722 B 0.29044120 2.17 0.0299
permit - 0.056104033 B 0.28182625 0.20 0.8422
permit - 0.900218135 B 0.27302248 3.30 0.0010
permit - -0.029499084 B 0.29005518 -0.10 0.9190
permit - 0.710693173 B 0.28013526 2.54 0.0113
permit - 0.490335540 B 0.31508786 1.56 0.1199
permit - 0.841245620 B 0.28298212 2.97 0.0030
permit - 1.922829272 B 0.53861803 3.57 0.0004
permit - 0.967713437 B 0.27304640 3.54 0.0004
permit - 0.370539541 B 0.30374715 1.22 0.2227
permit - -1.091964427 B 0.53895045 -2.03 0.0429
permit - -0.084261747 B 0.35851162 -0.24 0.8142
permit - 0.953641916 B 0.27327679 3.49 0.0005
permit - 0.929799416 B 0.28667927 3.24 0.0012
permit - 1.158830352 B 0.27203468 4.26 <.0001
permit - 0.552623254 B 0.35951185 1.54 0.1245
permit - -1.584154615 B 0.53917468 -2.94 0.0033
permit - 0.944499945 B 0.28519020 3.31 0.0009
permit - 1.066086228 B 0.27210354 3.92 <.0001
permit - 0.000000000 B . . .

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NOTE: The X'X matrix has been found to be singular, and a generalized inverse was used to solve the normal equations. Terms whose estimates are followed by the letter 'B' are not uniquely estimable.

ASPIC Base Bootstrap run 1

TILEFISH 2009 BASE Bootstrap

Wednesday, 11 Mar 2009 at 11:09:35

ASPIC -- A Surplus-Production Model Including Covariates (Ver. 5.33)

BOT program mode
 Author: Michael H. Prager; NOAA Center for Coastal Fisheries and Habitat Research
 LOGISTIC model mode 101 Pivers Island Road; Beaufort, North Carolina 28516 USA
 YLD conditioning
 Mike.Prager@noaa.gov
 SSE optimization

Reference: Prager, M. H. 1994. A suite of extensions to a nonequilibrium ASPIC User's Manual is available surplus-production model. Fishery Bulletin 92: 374-389. gratis from the author.

CONTROL PARAMETERS (FROM INPUT FILE) Input file:
 c:\tile2009\aspic\f73fix1_v5_2008_base_boot.inp

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Operation of ASPIC: Fit logistic (Schaefer) model by direct optimization with bootstrap.
Number of years analyzed: 36 Number of bootstrap trials: 1000
Number of data series: 3 Bounds on MSY (min, max): 3.750E-02 3.000E+02
Objective function: Least squares Bounds on K (min, max): 8.000E-01 2.000E+03
Relative conv. criterion (simplex): 1.000E-08
Monte Carlo search mode, trials: 1 50000
Relative conv. criterion (restart): 3.000E-08
Random number seed: 973142085
Relative conv. criterion (effort): 1.000E-04
Identical convergences required in fitting: 6
Maximum F allowed in fitting: 5.000

```

PROGRAM STATUS INFORMATION (NON-BOOTSTRAPPED ANALYSIS)
 error code 0

Normal convergence

CORRELATION AMONG INPUT SERIES EXPRESSED AS CPUE (NUMBER OF PAIRWISE OBSERVATIONS BELOW)

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1 weighout cpue | 1.000

```

		15		
2	turner	0.994	1.000	
		4	10	
3	vtr	0.000	0.000	1.000
		0	0	14
		1	2	3

GOODNESS-OF-FIT AND WEIGHTING (NON-BOOTSTRAPPED ANALYSIS)

Loss component number and title	Weighted SSE	N	Weighted MSE	Current weight	Inv. var. weight	R-squared in CPUE
Loss(-1) SSE in yield	0.000E+00					
Loss(0) Penalty for B1 > K	0.000E+00	1	N/A	0.000E+00	N/A	
Loss(1) weighout cpue	1.255E+00	15	9.653E-02	1.000E+00	1.141E+00	0.652
Loss(2) turner	6.429E-01	10	8.037E-02	1.000E+00	1.370E+00	0.224
Loss(3) vtr	2.258E+00	14	1.881E-01	1.000E+00	5.852E-01	0.201
TOTAL OBJECTIVE FUNCTION, MSE, RMSE:			4.15554979E+00		1.222E-01	3.496E-01
Estimated contrast index (ideal = 1.0):			0.5261		C* = (Bmax-Bmin)/K	
Estimated nearness index (ideal = 1.0):			1.0000		N* = 1 - min(B-Bmsy) /K	
TILEFISH	2009			BASE		Bootstrap

MODEL PARAMETER ESTIMATES (NON-BOOTSTRAPPED)

Parameter	Estimate	User/pgm	guess	2nd guess	Estimated	User guess
B1/K Starting relative biomass (in 1973)	5.000E-01	5.000E-01	9.000E-01	0		1
MSY Maximum sustainable yield	1.868E+00	3.000E+00	1.271E+00	1		1
K Maximum population size	2.279E+01	4.000E+01	7.629E+00	1		1
phi Shape of production curve (Bmsy/K)	0.5000	0.5000	----	0		1

----- Catchability Coefficients by Data Series -----						
q(1) weighout cpue	1.754E-01	3.000E-02	4.750E-01	1		1
q(2) turner	8.791E-03	3.000E-02	4.750E-01	1		1
q(3) vtr	2.604E-01	3.000E-02	4.750E-01	1		1

MANAGEMENT and DERIVED PARAMETER ESTIMATES (NON-BOOTSTRAPPED)

Parameter	Estimate	Logistic formula	General formula
MSY Maximum sustainable yield	1.868E+00	----	----
Bmsy Stock biomass giving MSY	1.140E+01	K/2	$K*n^{**}(1/(1-n))$
Fmsy Fishing mortality rate at MSY	1.639E-01	MSY/Bmsy	MSY/Bmsy
n Exponent in production function	2.0000	----	----
g Fletcher's gamma	4.000E+00	----	$[n^{**}(n/(n-1))]/[n-1]$
B./Bmsy Ratio: B(2009)/Bmsy	1.143E+00	----	----
F./Fmsy Ratio: F(2008)/Fmsy	3.598E-01	----	----
Fmsy/F. Ratio: Fmsy/F(2008)	2.779E+00	----	----
Y.(Fmsy) Approx. yield available at Fmsy in 2009	2.136E+00	MSY*B./Bmsy	MSY*B./Bmsy
...as proportion of MSY	1.143E+00	----	----
Ye. Equilibrium yield available in 2009	1.830E+00	$4*MSY*(B/K-(B/K)**2)$	$g*MSY*(B/K-(B/K)**n)$
...as proportion of MSY	9.795E-01	----	----
----- Fishing effort rate at MSY in units of each CE or CC series -----			
fmsy(1) weighout cpue	9.349E-01	Fmsy/q(1)	Fmsy/q(1)

TILEFISH 2009 BASE Bootstrap

ESTIMATED POPULATION TRAJECTORY (NON-BOOTSTRAPPED)

Obs	Year or ID	Estimated total F mort	Estimated starting biomass	Estimated average biomass	Observed total yield	Model total yield	Estimated surplus production	Ratio of F mort to Fmsy	Ratio of biomass to Bmsy
1	1973	0.031	1.140E+01	1.259E+01	3.940E-01	3.940E-01	1.872E+00	1.908E-01	9.999E-01
2	1974	0.043	1.287E+01	1.349E+01	5.860E-01	5.860E-01	1.803E+00	2.649E-01	1.130E+00
3	1975	0.049	1.409E+01	1.461E+01	7.100E-01	7.100E-01	1.719E+00	2.965E-01	1.236E+00
4	1976	0.065	1.510E+01	1.542E+01	1.010E+00	1.010E+00	1.635E+00	3.995E-01	1.325E+00
5	1977	0.134	1.573E+01	1.549E+01	2.082E+00	2.082E+00	1.627E+00	8.200E-01	1.380E+00
6	1978	0.225	1.527E+01	1.447E+01	3.257E+00	3.257E+00	1.730E+00	1.373E+00	1.340E+00
7	1979	0.314	1.374E+01	1.262E+01	3.968E+00	3.968E+00	1.842E+00	1.918E+00	1.206E+00
8	1980	0.369	1.162E+01	1.054E+01	3.889E+00	3.889E+00	1.853E+00	2.251E+00	1.019E+00
9	1981	0.404	9.581E+00	8.663E+00	3.499E+00	3.499E+00	1.757E+00	2.464E+00	8.407E-01
10	1982	0.259	7.839E+00	7.675E+00	1.990E+00	1.990E+00	1.669E+00	1.582E+00	6.878E-01
11	1983	0.254	7.518E+00	7.396E+00	1.877E+00	1.877E+00	1.638E+00	1.548E+00	6.597E-01
12	1984	0.284	7.279E+00	7.069E+00	2.009E+00	2.009E+00	1.599E+00	1.734E+00	6.387E-01
13	1985	0.295	6.869E+00	6.656E+00	1.961E+00	1.961E+00	1.545E+00	1.797E+00	6.027E-01
14	1986	0.314	6.453E+00	6.212E+00	1.950E+00	1.950E+00	1.482E+00	1.915E+00	5.662E-01
15	1987	0.650	5.984E+00	4.936E+00	3.210E+00	3.210E+00	1.264E+00	3.967E+00	5.251E-01
16	1988	0.351	4.038E+00	3.882E+00	1.361E+00	1.361E+00	1.056E+00	2.139E+00	3.543E-01
17	1989	0.085	3.733E+00	5.323E+00	4.540E-01	4.540E-01	1.206E+00	5.203E-01	3.275E-01
18	1990	0.153	4.485E+00	5.717E+00	8.740E-01	8.740E-01	1.380E+00	9.325E-01	3.936E-01
19	1991	0.236	4.991E+00	5.041E+00	1.189E+00	1.189E+00	1.287E+00	1.439E+00	4.380E-01
20	1992	0.338	5.090E+00	4.888E+00	1.653E+00	1.653E+00	1.259E+00	2.063E+00	4.466E-01
21	1993	0.424	4.696E+00	4.340E+00	1.838E+00	1.838E+00	1.152E+00	2.583E+00	4.120E-01
22	1994	0.146	4.009E+00	5.374E+00	7.860E-01	7.860E-01	1.299E+00	8.922E-01	3.518E-01
23	1995	0.139	4.522E+00	4.808E+00	6.660E-01	6.660E-01	1.244E+00	8.450E-01	3.967E-01
24	1996	0.216	5.099E+00	5.197E+00	1.121E+00	1.121E+00	1.315E+00	1.316E+00	4.474E-01
25	1997	0.360	5.294E+00	5.023E+00	1.810E+00	1.810E+00	1.284E+00	2.198E+00	4.645E-01
26	1998	0.285	4.767E+00	4.708E+00	1.342E+00	1.342E+00	1.225E+00	1.739E+00	4.183E-01
27	1999	0.104	4.650E+00	5.024E+00	5.250E-01	5.250E-01	1.284E+00	6.374E-01	4.080E-01
28	2000	0.086	5.409E+00	5.864E+00	5.060E-01	5.060E-01	1.427E+00	5.264E-01	4.746E-01
29	2001	0.131	6.330E+00	6.665E+00	8.740E-01	8.740E-01	1.546E+00	7.998E-01	5.554E-01
30	2002	0.115	7.002E+00	7.395E+00	8.510E-01	8.510E-01	1.637E+00	7.020E-01	6.144E-01
31	2003	0.140	7.788E+00	8.080E+00	1.130E+00	1.130E+00	1.710E+00	8.531E-01	6.834E-01
32	2004	0.141	8.368E+00	8.643E+00	1.215E+00	1.215E+00	1.759E+00	8.575E-01	7.342E-01
33	2005	0.092	8.912E+00	9.385E+00	8.680E-01	8.680E-01	1.809E+00	5.642E-01	7.820E-01
34	2006	0.088	9.853E+00	1.033E+01	9.070E-01	9.070E-01	1.851E+00	5.356E-01	8.645E-01
35	2007	0.066	1.080E+01	1.136E+01	7.510E-01	7.510E-01	1.867E+00	4.032E-01	9.474E-01
36	2008	0.059	1.191E+01	1.248E+01	7.360E-01	7.360E-01	1.850E+00	3.598E-01	1.045E+00
37	2009		1.303E+01						1.143E+00

TILEFISH 2009 BASE Bootstrap

RESULTS FOR DATA SERIES # 1 (NON-BOOTSTRAPPED)
 weighout cpue

Data		type	CC:		CPUE-catch		series	
Series weight:		1.000						
Obs	Year	Observed CPUE	Estimated CPUE	Estim F	Observed yield	Model yield	Resid in log scale	Statistic weight
1	1973	*	2.209E+00	0.0313	3.940E-01	3.940E-01	0.00000	1.000E+00
2	1974	*	2.366E+00	0.0434	5.860E-01	5.860E-01	0.00000	1.000E+00
3	1975	*	2.562E+00	0.0486	7.100E-01	7.100E-01	0.00000	1.000E+00
4	1976	*	2.705E+00	0.0655	1.010E+00	1.010E+00	0.00000	1.000E+00
5	1977	*	2.716E+00	0.1344	2.082E+00	2.082E+00	0.00000	1.000E+00
6	1978	*	2.537E+00	0.2251	3.257E+00	3.257E+00	0.00000	1.000E+00
7	1979	2.789E+00	2.213E+00	0.3145	3.968E+00	3.968E+00	-0.23140	1.000E+00
8	1980	2.702E+00	1.848E+00	0.3690	3.889E+00	3.889E+00	-0.37962	1.000E+00
9	1981	2.612E+00	1.519E+00	0.4039	3.499E+00	3.499E+00	-0.54194	1.000E+00
10	1982	1.591E+00	1.346E+00	0.2593	1.990E+00	1.990E+00	-0.16731	1.000E+00
11	1983	1.041E+00	1.297E+00	0.2538	1.877E+00	1.877E+00	0.21989	1.000E+00
12	1984	1.000E+00	1.240E+00	0.2842	2.009E+00	2.009E+00	0.21482	1.000E+00
13	1985	8.920E-01	1.167E+00	0.2946	1.961E+00	1.961E+00	0.26888	1.000E+00
14	1986	1.085E+00	1.089E+00	0.3139	1.950E+00	1.950E+00	0.00409	1.000E+00
15	1987	1.269E+00	8.656E-01	0.6503	3.210E+00	3.210E+00	-0.38250	1.000E+00
16	1988	7.500E-01	6.808E-01	0.3506	1.361E+00	1.361E+00	-0.09680	1.000E+00
17	1989	6.500E-01	9.335E-01	0.0853	4.540E-01	4.540E-01	0.36198	1.000E+00
18	1990	6.660E-01	1.003E+00	0.1529	8.740E-01	8.740E-01	0.40913	1.000E+00
19	1991	6.330E-01	8.840E-01	0.2359	1.189E+00	1.189E+00	0.33403	1.000E+00
20	1992	8.110E-01	8.572E-01	0.3382	1.653E+00	1.653E+00	0.05536	1.000E+00
21	1993	7.610E-01	7.611E-01	0.4235	1.838E+00	1.838E+00	0.00008	1.000E+00
22	1994	*	9.424E-01	0.1463	7.860E-01	7.860E-01	0.00000	1.000E+00
23	1995	*	8.432E-01	0.1385	6.660E-01	6.660E-01	0.00000	1.000E+00
24	1996	*	9.114E-01	0.2157	1.121E+00	1.121E+00	0.00000	1.000E+00
25	1997	*	8.808E-01	0.3604	1.810E+00	1.810E+00	0.00000	1.000E+00
26	1998	*	8.256E-01	0.2851	1.342E+00	1.342E+00	0.00000	1.000E+00
27	1999	*	8.811E-01	0.1045	5.250E-01	5.250E-01	0.00000	1.000E+00
28	2000	*	1.028E+00	0.0863	5.060E-01	5.060E-01	0.00000	1.000E+00
29	2001	*	1.169E+00	0.1311	8.740E-01	8.740E-01	0.00000	1.000E+00
30	2002	*	1.297E+00	0.1151	8.510E-01	8.510E-01	0.00000	1.000E+00
31	2003	*	1.417E+00	0.1398	1.130E+00	1.130E+00	0.00000	1.000E+00
32	2004	*	1.516E+00	0.1406	1.215E+00	1.215E+00	0.00000	1.000E+00
33	2005	*	1.646E+00	0.0925	8.680E-01	8.680E-01	0.00000	1.000E+00
34	2006	*	1.811E+00	0.0878	9.070E-01	9.070E-01	0.00000	1.000E+00
35	2007	*	1.992E+00	0.0661	7.510E-01	7.510E-01	0.00000	1.000E+00
36	2008	*	2.188E+00	0.0590	7.360E-01	7.360E-01	0.00000	1.000E+00

* Asterisk indicates missing value(s).

TILEFISH 2009 BASE Bootstrap

RESULTS FOR DATA SERIES # 2 (NON-BOOTSTRAPPED)
turner

Data type I1: Abundance index (annual average)
Series weight: 1.000

Obs	Year	Observed effort	Estimated effort	Estim F	Observed index	Model index	Resid in log index	Statistic weight
1	1973	1.000E+00	1.000E+00	--	2.060E-01	1.107E-01	0.62086	1.000E+00
2	1974	1.000E+00	1.000E+00	--	1.350E-01	1.186E-01	0.12930	1.000E+00
3	1975	1.000E+00	1.000E+00	--	9.600E-02	1.284E-01	-0.29099	1.000E+00
4	1976	1.000E+00	1.000E+00	--	1.140E-01	1.356E-01	-0.17339	1.000E+00
5	1977	1.000E+00	1.000E+00	--	1.250E-01	1.362E-01	-0.08555	1.000E+00
6	1978	1.000E+00	1.000E+00	--	1.320E-01	1.272E-01	0.03715	1.000E+00
7	1979	1.000E+00	1.000E+00	--	1.000E-01	1.109E-01	-0.10375	1.000E+00
8	1980	1.000E+00	1.000E+00	--	9.100E-02	9.267E-02	-0.01815	1.000E+00
9	1981	1.000E+00	1.000E+00	--	9.000E-02	7.616E-02	0.16699	1.000E+00
10	1982	1.000E+00	1.000E+00	--	5.100E-02	6.747E-02	-0.27987	1.000E+00
11	1983	0.000E+00	0.000E+00	--	*	6.502E-02	0.00000	1.000E+00
12	1984	0.000E+00	0.000E+00	--	*	6.214E-02	0.00000	1.000E+00
13	1985	0.000E+00	0.000E+00	--	*	5.851E-02	0.00000	1.000E+00
14	1986	0.000E+00	0.000E+00	--	*	5.462E-02	0.00000	1.000E+00
15	1987	0.000E+00	0.000E+00	--	*	4.340E-02	0.00000	1.000E+00
16	1988	0.000E+00	0.000E+00	--	*	3.413E-02	0.00000	1.000E+00
17	1989	0.000E+00	0.000E+00	--	*	4.680E-02	0.00000	1.000E+00
18	1990	0.000E+00	0.000E+00	--	*	5.027E-02	0.00000	1.000E+00
19	1991	0.000E+00	0.000E+00	--	*	4.432E-02	0.00000	1.000E+00
20	1992	0.000E+00	0.000E+00	--	*	4.297E-02	0.00000	1.000E+00
21	1993	0.000E+00	0.000E+00	--	*	3.815E-02	0.00000	1.000E+00
22	1994	0.000E+00	0.000E+00	--	*	4.724E-02	0.00000	1.000E+00
23	1995	0.000E+00	0.000E+00	--	*	4.227E-02	0.00000	1.000E+00
24	1996	0.000E+00	0.000E+00	--	*	4.569E-02	0.00000	1.000E+00
25	1997	0.000E+00	0.000E+00	--	*	4.416E-02	0.00000	1.000E+00
26	1998	0.000E+00	0.000E+00	--	*	4.139E-02	0.00000	1.000E+00
27	1999	0.000E+00	0.000E+00	--	*	4.417E-02	0.00000	1.000E+00
28	2000	0.000E+00	0.000E+00	--	*	5.155E-02	0.00000	1.000E+00
29	2001	0.000E+00	0.000E+00	--	*	5.860E-02	0.00000	1.000E+00
30	2002	0.000E+00	0.000E+00	--	*	6.501E-02	0.00000	1.000E+00
31	2003	0.000E+00	0.000E+00	--	*	7.104E-02	0.00000	1.000E+00
32	2004	0.000E+00	0.000E+00	--	*	7.598E-02	0.00000	1.000E+00
33	2005	0.000E+00	0.000E+00	--	*	8.251E-02	0.00000	1.000E+00
34	2006	0.000E+00	0.000E+00	--	*	9.081E-02	0.00000	1.000E+00
35	2007	0.000E+00	0.000E+00	--	*	9.988E-02	0.00000	1.000E+00
36	2008	0.000E+00	0.000E+00	--	*	1.097E-01	0.00000	1.000E+00

* Asterisk indicates missing value(s).

TILEFISH 2009 BASE Bootstrap

RESULTS FOR DATA SERIES # 3 (NON-BOOTSTRAPPED)
vtr

-----Data Series
type I1: Abundance index (annual average)
weight: 1.000

Obs	Year	Observed effort	Estimated effort	Estim F	Observed index	Model index	Resid in log index	Statistic weight
1	1973	0.000E+00	0.000E+00	--	*	3.279E+00	0.00000	1.000E+00
2	1974	0.000E+00	0.000E+00	--	*	3.513E+00	0.00000	1.000E+00
3	1975	0.000E+00	0.000E+00	--	*	3.803E+00	0.00000	1.000E+00
4	1976	0.000E+00	0.000E+00	--	*	4.015E+00	0.00000	1.000E+00
5	1977	0.000E+00	0.000E+00	--	*	4.032E+00	0.00000	1.000E+00
6	1978	0.000E+00	0.000E+00	--	*	3.767E+00	0.00000	1.000E+00
7	1979	0.000E+00	0.000E+00	--	*	3.285E+00	0.00000	1.000E+00
8	1980	0.000E+00	0.000E+00	--	*	2.744E+00	0.00000	1.000E+00
9	1981	0.000E+00	0.000E+00	--	*	2.255E+00	0.00000	1.000E+00
10	1982	0.000E+00	0.000E+00	--	*	1.998E+00	0.00000	1.000E+00
11	1983	0.000E+00	0.000E+00	--	*	1.926E+00	0.00000	1.000E+00
12	1984	0.000E+00	0.000E+00	--	*	1.840E+00	0.00000	1.000E+00
13	1985	0.000E+00	0.000E+00	--	*	1.733E+00	0.00000	1.000E+00
14	1986	0.000E+00	0.000E+00	--	*	1.617E+00	0.00000	1.000E+00
15	1987	0.000E+00	0.000E+00	--	*	1.285E+00	0.00000	1.000E+00
16	1988	0.000E+00	0.000E+00	--	*	1.011E+00	0.00000	1.000E+00
17	1989	0.000E+00	0.000E+00	--	*	1.386E+00	0.00000	1.000E+00
18	1990	0.000E+00	0.000E+00	--	*	1.489E+00	0.00000	1.000E+00
19	1991	0.000E+00	0.000E+00	--	*	1.312E+00	0.00000	1.000E+00
20	1992	0.000E+00	0.000E+00	--	*	1.273E+00	0.00000	1.000E+00
21	1993	0.000E+00	0.000E+00	--	*	1.130E+00	0.00000	1.000E+00
22	1994	0.000E+00	0.000E+00	--	*	1.399E+00	0.00000	1.000E+00
23	1995	1.000E+00	1.000E+00	--	1.002E+00	1.252E+00	-0.22256	1.000E+00
24	1996	1.000E+00	1.000E+00	--	1.398E+00	1.353E+00	0.03267	1.000E+00
25	1997	1.000E+00	1.000E+00	--	2.342E+00	1.308E+00	0.58275	1.000E+00
26	1998	1.000E+00	1.000E+00	--	1.382E+00	1.226E+00	0.12002	1.000E+00
27	1999	1.000E+00	1.000E+00	--	9.910E-01	1.308E+00	-0.27765	1.000E+00
28	2000	1.000E+00	1.000E+00	--	1.000E+00	1.527E+00	-0.42307	1.000E+00
29	2001	1.000E+00	1.000E+00	--	1.408E+00	1.735E+00	-0.20906	1.000E+00
30	2002	1.000E+00	1.000E+00	--	1.723E+00	1.925E+00	-0.11101	1.000E+00
31	2003	1.000E+00	1.000E+00	--	2.783E+00	2.104E+00	0.27984	1.000E+00
32	2004	1.000E+00	1.000E+00	--	3.770E+00	2.250E+00	0.51608	1.000E+00
33	2005	1.000E+00	1.000E+00	--	4.572E+00	2.443E+00	0.62654	1.000E+00
34	2006	1.000E+00	1.000E+00	--	3.307E+00	2.689E+00	0.20676	1.000E+00
35	2007	1.000E+00	1.000E+00	--	2.183E+00	2.958E+00	-0.30376	1.000E+00
36	2008	1.000E+00	1.000E+00	--	1.434E+00	3.249E+00	-0.81780	1.000E+00

* Asterisk indicates missing value(s)

TILEFISH 2009 BASE Bootstrap
ESTIMATES FROM BOOTSTRAPPED ANALYSIS

Param name	Point estimate	Estimated bias in pt estimate	Estimated relative bias	Bias-corrected approximate confidence limits				Inter-quartile range	Relative IQ range
				80% lower	80% upper	50% lower	50% upper		
B1/K	5.000E-01	1.223E-09	0.00%	5.000E-01	5.000E-01	5.000E-01	5.000E-01	6.215E-11	0.000
K	2.279E+01	-2.125E+00	-9.32%	2.037E+01	3.705E+01	2.275E+01	3.026E+01	7.509E+00	0.329
q(1)	1.754E-01	2.847E-02	16.23%	9.546E-02	2.078E-01	1.194E-01	1.797E-01	6.030E-02	0.344
q(2)	8.791E-03	1.139E-03	12.95%	6.002E-03	1.012E-02	6.967E-03	9.109E-03	2.142E-03	0.244
q(3)	2.604E-01	2.603E-02	10.00%	1.629E-01	3.851E-01	1.931E-01	3.145E-01	1.214E-01	0.466
MSY	1.868E+00	8.060E-02	4.31%	1.577E+00	1.927E+00	1.699E+00	1.869E+00	1.699E-01	0.091
Ye(2009)	1.830E+00	-2.391E-01	-13.06%	1.640E+00	2.010E+00	1.806E+00	1.973E+00	1.670E-01	0.091
Y.@Fmsy	2.136E+00	3.323E-01	15.56%	1.190E+00	3.115E+00	1.514E+00	2.518E+00	1.004E+00	0.470
Bmsy	1.140E+01	-1.062E+00	-9.32%	1.019E+01	1.853E+01	1.138E+01	1.513E+01	3.755E+00	0.329
Fmsy	1.639E-01	3.430E-02	20.92%	8.329E-02	1.899E-01	1.130E-01	1.653E-01	5.230E-02	0.319
fmsy(1)	9.349E-01	5.018E-02	5.37%	8.046E-01	1.060E+00	8.588E-01	9.864E-01	1.276E-01	0.136
fmsy(2)	1.865E+01	1.288E+00	6.90%	1.459E+01	2.134E+01	1.609E+01	1.954E+01	3.450E+00	0.185
fmsy(3)	6.296E-01	1.366E-01	21.69%	4.375E-01	1.150E+00	5.026E-01	8.316E-01	3.291E-01	0.523
B./Bmsy	1.143E+00	1.063E-01	9.30%	6.972E-01	1.597E+00	8.432E-01	1.317E+00	4.743E-01	0.415
F./Fmsy	3.598E-01	-1.037E-02	-2.88%	2.404E-01	6.314E-01	3.019E-01	5.095E-01	2.076E-01	0.577
Ye./MSY	9.795E-01	-1.528E-01	-15.60%	9.078E-01	1.000E+00	9.768E-01	9.999E-01	2.303E-02	0.024
q2/q1	5.013E-02	-3.456E-04	-0.69%	4.188E-02	6.291E-02	4.625E-02	5.674E-02	1.050E-02	0.209
q3/q1	1.485E+00	-3.899E-02	-2.63%	8.846E-01	2.096E+00	1.145E+00	1.827E+00	6.825E-01	0.460

INFORMATION FOR REPAST (Prager, Porch, Shertzer, & Caddy. 2003. NAJFM 23: 349-361)

Unitless limit reference point in F (Fmsy/F.): 2.779
CV of above (from bootstrap distribution): 0.4376

NOTES ON BOOTSTRAPPED ESTIMATES:

- Bootstrap results were computed from 1000 trials.
- Results are conditional on bounds set on MSY and K in the input file.
- All bootstrapped intervals are approximate. The statistical literature recommends using at least 1000 trials for accurate 95% intervals. The default 80% intervals used by ASPIC should require fewer trials for equivalent accuracy. Using at least 500 trials is recommended.
- Bias estimates are typically of high variance and therefore may be misleading.

Trials replaced for lack of convergence: 0
Trials replaced for MSY out of bounds: 0
Trials replaced for q out-of-bounds: 139
Trials replaced for K out-of-bounds: 0
Residual-adjustment factor: 1.0710
Elapsed time: 0 hours, 8 minutes, 23 seconds.