2005 updated stock assessments of the Tristan rock lobster resource

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Updated assessment results for the Tristan rock lobster resource, using catch, effort (and hence CPUE) data for the 2003[1] and 2004 seasons are presented here. The updated data set is reported in the Appendix.

Results in Table 1a are produced using the Schaefer Production modeling approach described in Johnston and Butterworth (2004). These models are coded in ADMB (AD Model Builder software) as well as FORTRAN. Table 1a results correspond to the reference case models described in Johnston and Butterworth (2004), but now fitted incorporating the two years' further data.

Table 1b reports the results using the above software/approach that were produced in 2004 (with two fewer seasons data than for the 2005 updated assessments of Table 1a).

Table 1c reports 2005 updated results using the CEDA software package with the Schaefer model option. Here the starting biomass value as a proportion of carrying capacity (equivalent to the α parameter of the Johnston-Butterworth model) is fixed at the values reported in Table 1a. The CEDA minimizations were then initiated using the best fit *r* and *K* values in Table 1 as the starting values. It was found that if either α was set at 1.0 (CEDA default), or if the CEDA package was left to select its own starting values of *r* and *K*, very poor fits to the data resulted; the Table 1c results generally reflect much improved fits.

The updated results in Table 1a show similar estimates to those calculated in 2004 (Table 1b), although for all four islands the RY estimates are somewhat higher. This is most likely to be attributed primarily to the consistently very large CPUE value reported for the 2003 season at three of the islands, though the continued increasing CPUE trend also contributes.

The main difference between the Johnston-Butterworth results and those produced by the CEDA package is for Tristan Island. The CEDA package estimates a RY of 139 MT, whereas the Johnston-Butterworth method produces an estimate of 242 MT. The reason for this difference is that the latter model is able to reflect the increasing CPUE trend over the last 10 years (Figure 1a); whereas the CEDA model shows systematic deviations (Figure 2a). The reasons for RY differences for Inaccessible are similar.

References

Johnston, S.J. and D.S. Butterworth. 2004. Initial report on the stock assessment of the Tristan rock lobster resource.

[1] Note 2003 refers to the 2003/2004 season.

Table 1a: 2005 updated reference case assessment results. All biomass related quantities are in MT.

	Tristan	**Gough**	**Nightingale**	**Inaccessible**
	Remove 91 and 92 CPUE from fit	1985+ CPUE; r>0.1 constraint	1975+ CPUE	1975+ CPUE
K	1311	4143	766	761
r	0.75	0.10	0.55	0.76
α	0.30	0.48	0.54	0.65
σ	0.237	0.192	0.195	0.234
MSY	245	104	105	144
B_{2005}	507	280	324	387
B_{2005}/K	0.39	0.07	0.42	0.51
RY	242	26	102	144

Table 1b: 2004 reference case assessment results. All biomass related quantities are in MT.

	Tristan	**Gough**	**Nightingale**	**Inaccessible**
	Remove 91 and 92 CPUE from fit	1985+ CPUE; r>0.1 constraint	1975+ CPUE	1975+ CPUE
K	1307	4150	856	806
r	0.75	0.09	0.49	0.70
α	0.30	0.5	0.50	0.68
σ	0.298	0.156	0.173	0.230
MSY	246	96	105	140
B_{2002}	353	286	186	172
B_{2002}/K	0.27	0.07	0.22	0.21
RY	230	14	80	114

Table 1c: 2005 CEDA Schaefer model reference case model results. All biomass related quantities are in MT. The α values are in each case fixed at the best fit values reported for each island in Table 1a.

	Tristan	**Gough**	**Nightingale**	**Inaccessible**
	Remove 91 and 92 CPUE from fit	1985+ CPUE; r>0.1 constraint	1975+ CPUE	1975+ CPUE
K	667	4171	766	1250
r	0.823	0.094	0.548	0.377
α **fixed**	0.3	0.5	0.54	0.65
R^2	-3.15	0.266	0.768	0.215
MSY	139	98	105	118
B_{2005}	338	303	249	361
B_{2005}/K	0.51	0.07	0.33	0.29
RY	139	26	90	97

Figure 1a: 2005 updated Tristan fit to CPUE (note that 1990 and 1991 data are excluded from the fit as they reflected operations from sea rather than land).

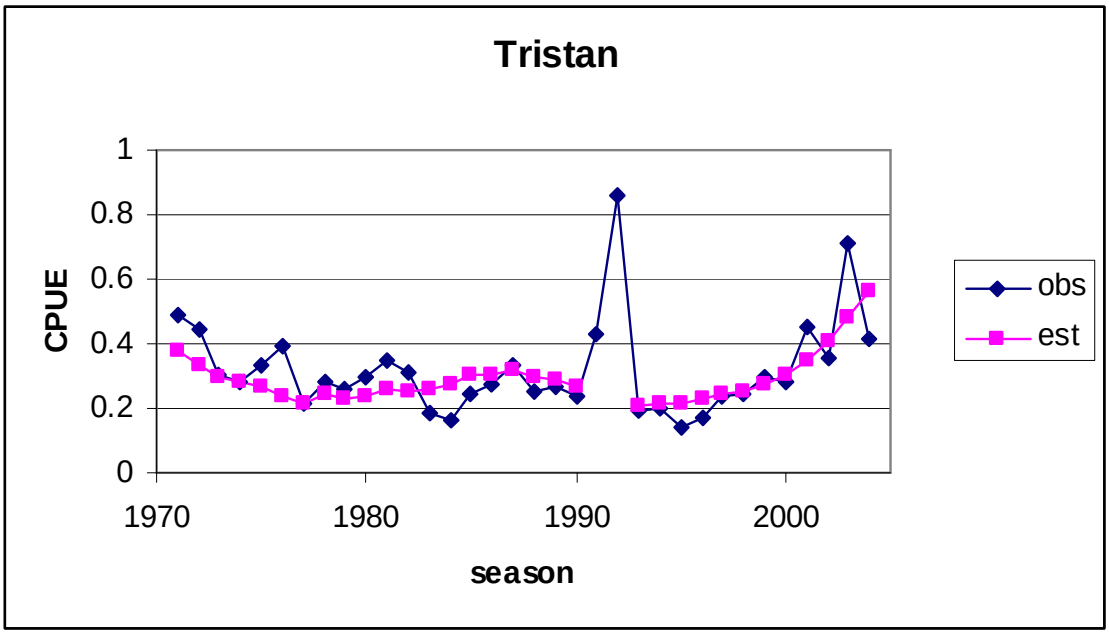


Figure 1b: 2005 updated Gough fit to CPUE.

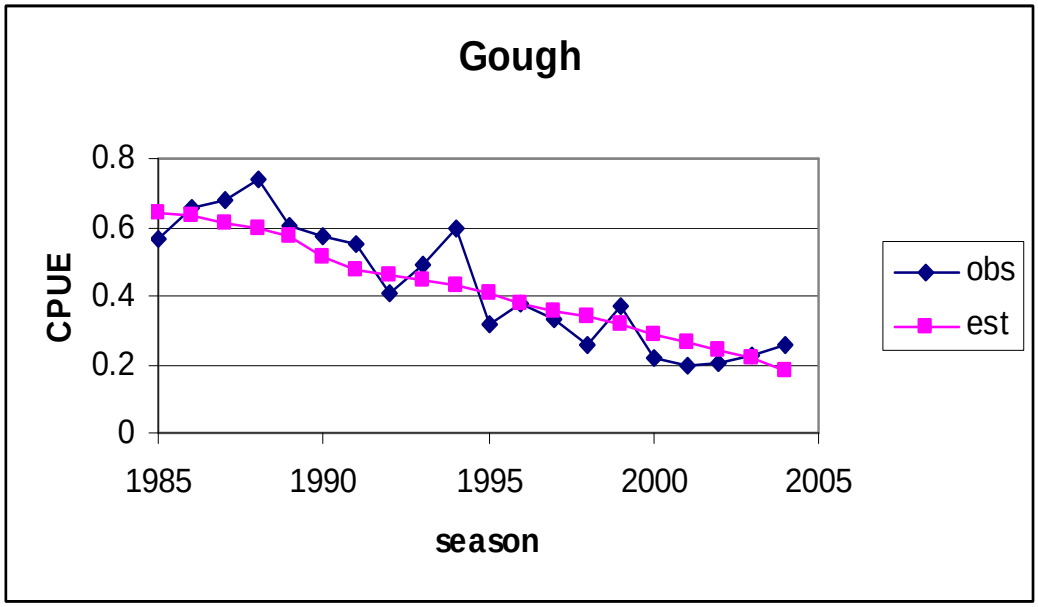


Figure 1c: 2005 updated Nightingale fit to CPUE.

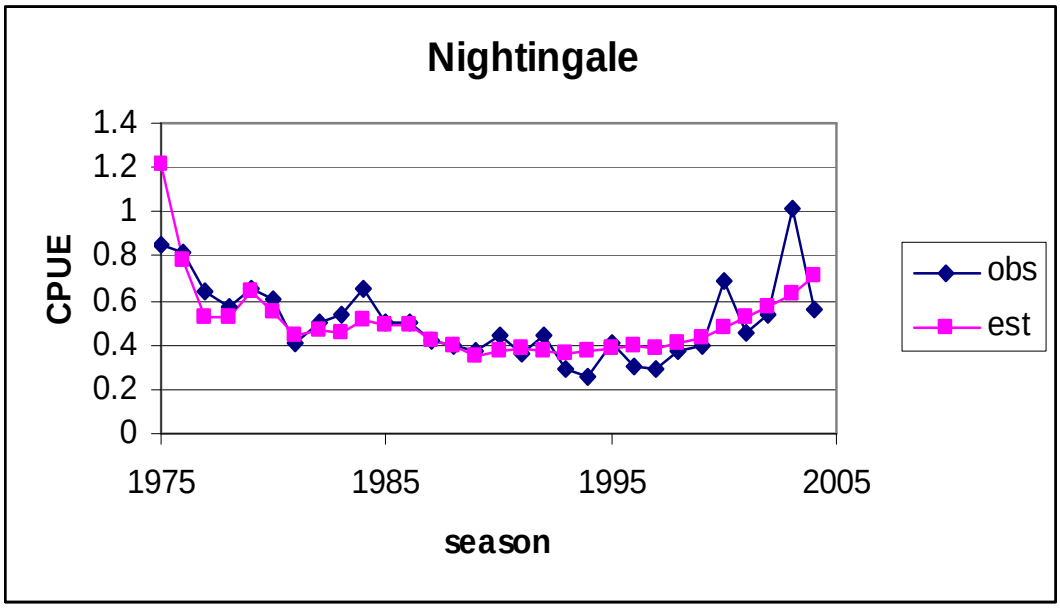


Figure 1d: 2005 updated Inaccessible fit to CPUE.

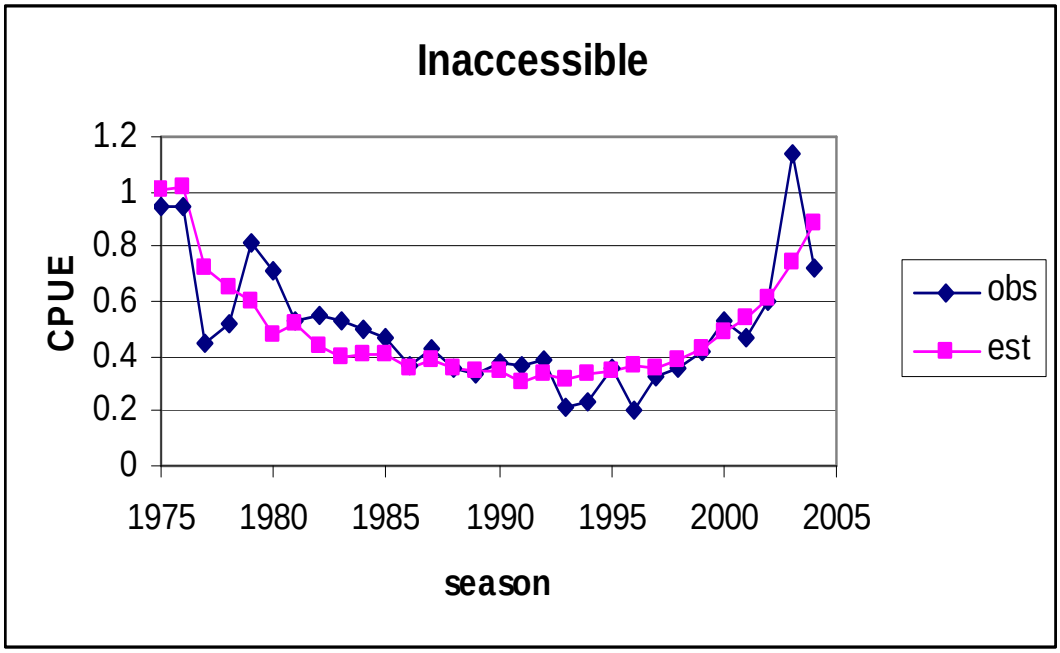


Figure 2a: 2005 CEDA Tristan fit to CPUE.

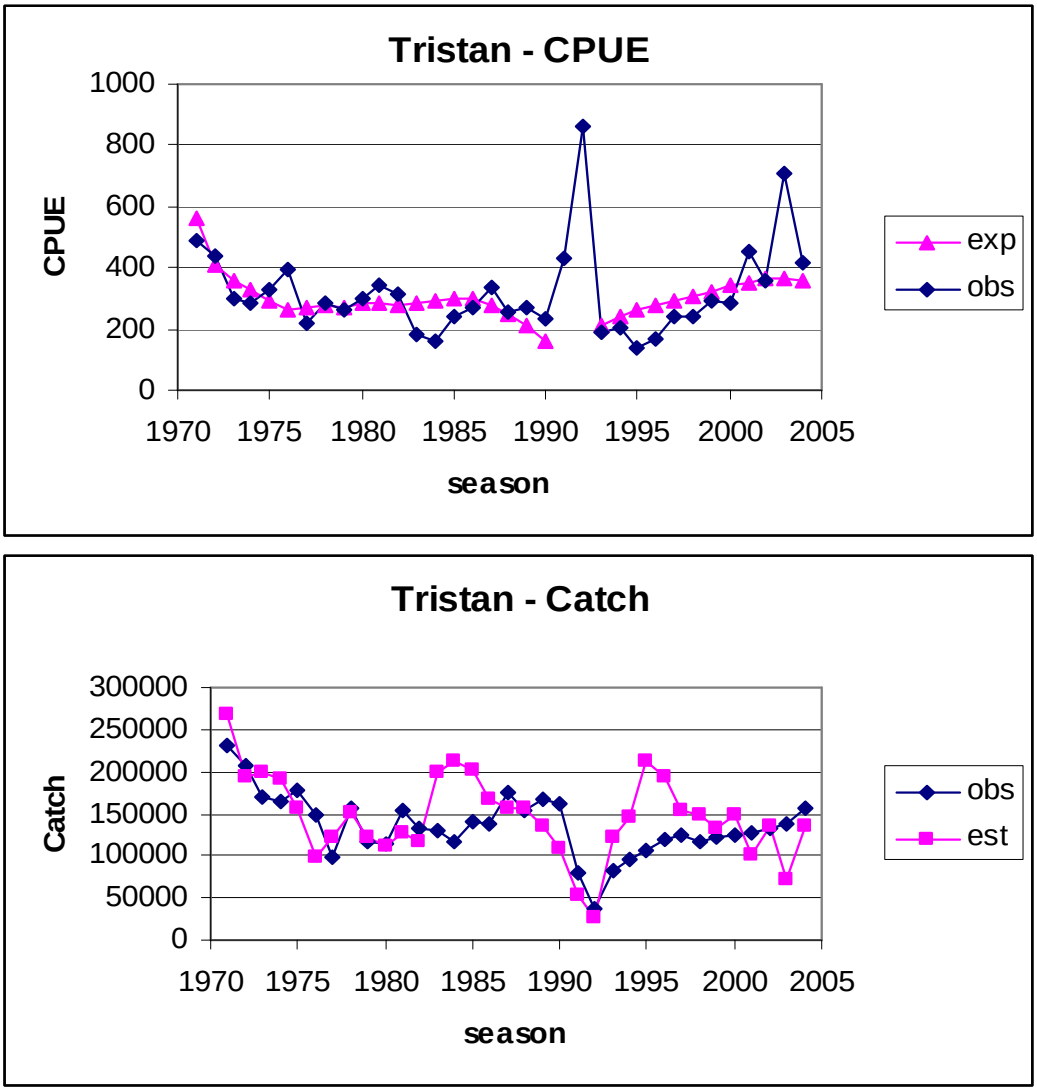


Figure 2b: 2005 CEDA Gough fit to CPUE.

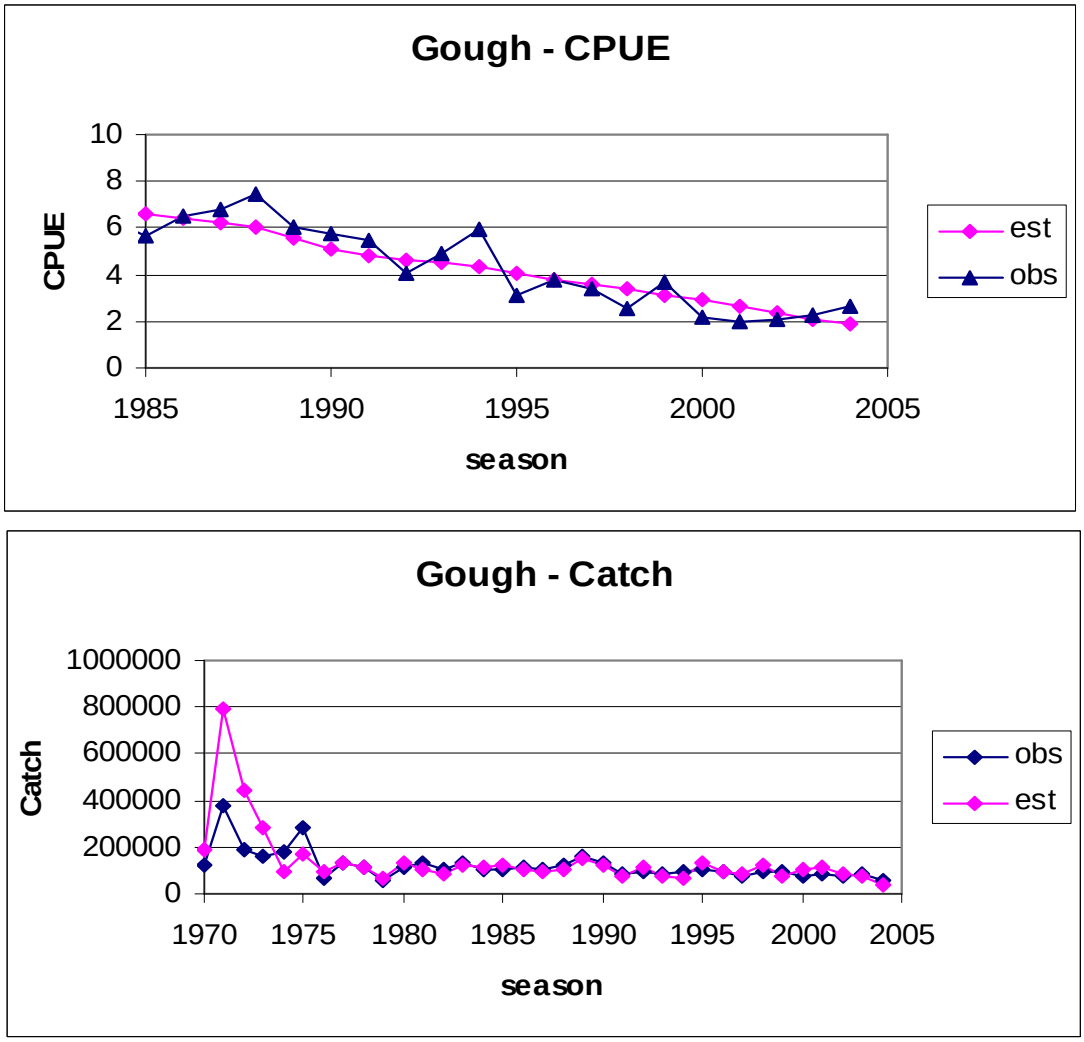
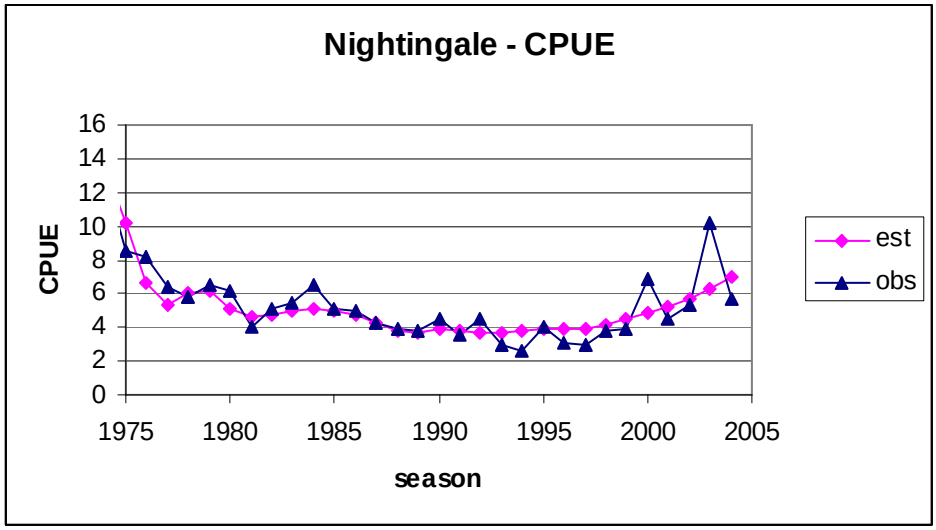


Figure 2c: 2005 CEDA Nightingale fit to CPUE.



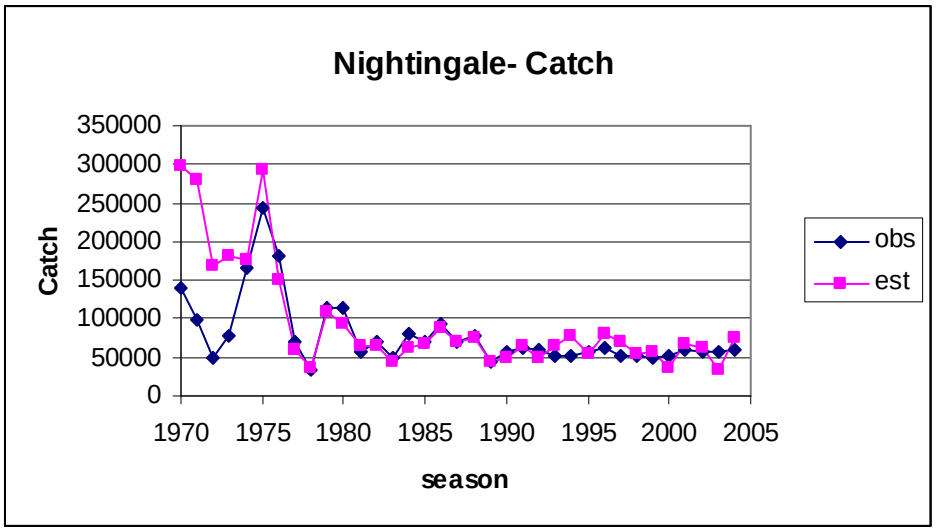
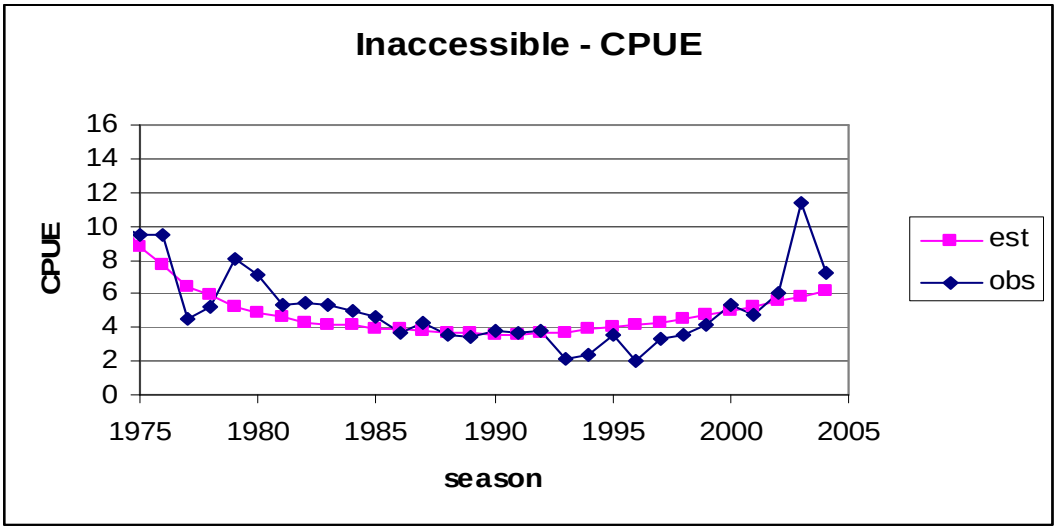
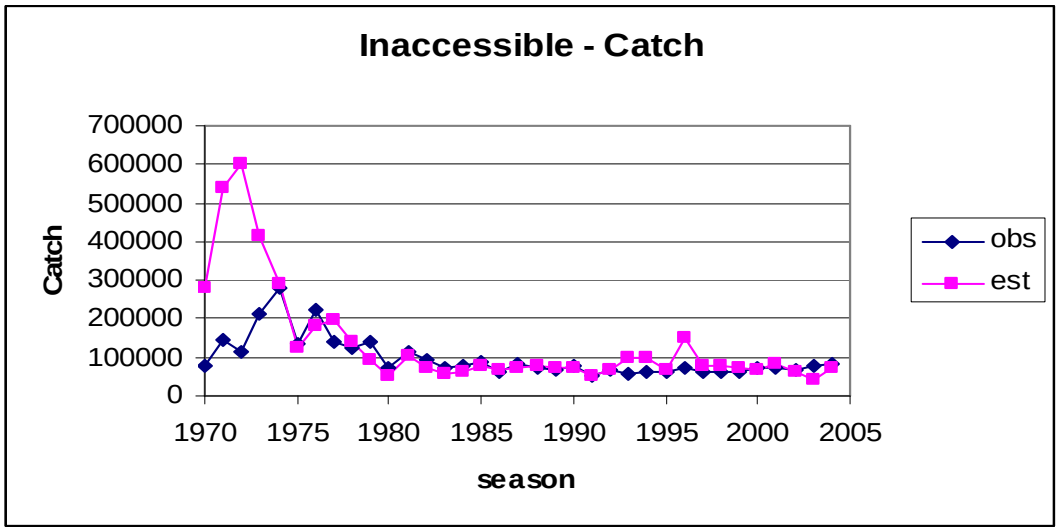


Figure 2d: 2005 CEDA Inaccessible fit to CPUE.





Appendix

Observed catch (MT), effort and resultant CPUE for Tristan, Gough, Nightingale and Inaccessible Island lobster populations. Catch and effort data were obtained from the input data files used with the CEDA package that was provided by James Glass.

Table A1.1: Catch (MT whole weight), effort (thousands of traps hauled * 10) and CPUE (catch/effort) data for each of the four populations

	Tristan			Gough			Nightingale			Inaccessible		
	Catch	Effort*	CPUE	Catch	Effort	CPUE	Catch	Effort	CPUE	Catch	Effort	CPUE
1967	241.70	0										
1968	145.80	0										
1969	252.80	0										
1970	211.90	0		123	154	0.799	141	243	0.580	80	198	0.404
1971	231.90	477	0.486	380	699	0.544	98	237	0.414	147	383	0.384
1972	206.50	468	0.441	190	434	0.438	49	132	0.371	116	439	0.264
1973	169.76	564	0.301	161	295	0.546	77	129	0.597	214	326	0.656
1974	165.85	588	0.282	182	102	1.784	166	131	1.267	282	281	1.004
1975	178.30	539	0.331	283	206	1.374	245	287	0.854	133	140	0.950
1976	148.51	378	0.393	64	124	0.516	182	224	0.813	224	237	0.945
1977	97.50	450	0.217	130	164	0.793	71	110	0.645	138	310	0.445
1978	156.58	556	0.282	110	143	0.769	34	59	0.576	123	236	0.521
1979	117.56	451	0.261	60	90	0.667	114	176	0.648	141	174	0.810
1980	114.88	388	0.296	113	171	0.661	113	185	0.611	74	104	0.712
1981	153.67	445	0.345	134	143	0.937	57	141	0.404	115	217	0.530
1982	131.77	419	0.314	102	118	0.864	69	136	0.507	92	167	0.551
1983	128.93	702	0.184	135	177	0.763	48	89	0.539	72	135	0.533
1984	117.45	721	0.163	105	163	0.644	80	123	0.650	77	154	0.500
1985	161.95	666	0.243	103	181	0.569	69	136	0.507	90	194	0.464
1986	151.33	556	0.272	110	168	0.655	93	186	0.500	62	168	0.369
1987	189.94	568	0.334	101	149	0.678	70	166	0.422	81	190	0.426
1988	163.28	641	0.255	123	166	0.741	77	196	0.393	72	203	0.355
1989	174.68	651	0.268	164	272	0.603	44	117	0.376	67	197	0.340
1990	161.43	689	0.234	134	233	0.575	56	126	0.444	77	203	0.379
1991	165.35	383	0.432	86.02	157	0.548	61.39	171	0.359	53	143	0.371
1992	137.99	160	0.862	96.909	240	0.404	59.31	133	0.446	70	182	0.385
1993	112.06	586	0.191	82.043	168	0.488	50.86	175	0.291	58	266	0.218
1994	125.23	619	0.202	95.972	161.2	0.595	51.18	200.8	0.255	60.19	253.6	0.237
1995	112.32	816	0.138	103.51	329.3	0.314	56.66	140.2	0.404	60.08	166.5	0.361
1996	119.03	695	0.171	91.57	242.2	0.378	62.05	203	0.306	72.76	365.2	0.199
1997	126.04	525	0.240	77.3	230.2	0.336	51.29	175.7	0.292	61.11	185.2	0.330
1998	117.26	483	0.243	94.652	367.4	0.258	50.64	134.6	0.376	59.64	169.9	0.351
1999	122.02	414	0.295	91.057	244.7	0.372	49.99	126.9	0.394	62.59	150.1	0.417
2000	124.39	437	0.285	78.108	361.8	0.216	51.46	75.14	0.685	72.9	136.7	0.533
2001	127.55	282	0.452	87.001	435	0.200	58.35	129	0.452	72.61	153.6	0.473
2002	132.55	374	0.354	76.326	375.4	0.203	57.29	107.7	0.532	66.6	111	0.600
2003	138.40	195	0.710	84.36	377.4	0.224	56.04	55.25	1.014	76.2	67.0	1.137
2004	157.82	379	0.416	56.71	218.0	0.260	59.98	106.4	0.564	82.57	114.8	0.719

* Tristan effort in number of large-powerboat days