Abundance Indices of Gray Triggerfish and Vermilion Snapper Collected in Summer and Fall SEAMAP Groundfish Surveys (1987-2004)

G. Walter Ingram, Jr.
Southeast Fisheries Science Center
Mississippi Laboratories
Pascagoula, MS

This purpose of this document is to serve as a comparison to the document entitled "SEAMAP Trawl Indexes for the SEDAR9 Species" by Scott Nichols in which a Bayesian approach was used to develop annual abundance indices for gray triggerfish and vermilion snapper. The survey methodologies and descriptions of the data sets used herein have been previously presented in detail in SEDAR7-DW1 concerning juvenile red snapper. In this document I present the results of a frequentist approach to develop annual abundance indices for gray triggerfish and vermilion snapper collected during Summer (1987-2004) and Fall (1988-2004) SEAMAP Groundfish Surveys.

In order to develop standardized indices of annual average CPUE (number of fish per trawl-hour) for gray triggerfish and vermilion snapper in the U.S. Gulf of Mexico, a delta-lognormal model, as described by Lo et al. (1992), was employed. This index is a mathematical combination of yearly CPUE estimates from two distinct generalized linear models: a binomial (logistic) model which describes proportion of positive CPUE values (i.e., presence/absence) and lognormal model which describes variability in only the nonzero CPUE data. The GLMMIX and MIXED procedures in SAS were employed to provide yearly index values for both the binomial and lognormal sub-models, respectively. The parameters included in each sub-model were year and depth zone. The night-day and statistical zone strata were collapsed within each depth zone. Also, the estimates from each model were weighted using the depth zone area, and separate covariance structures were developed for each survey year. For the binomial models, a logistic-type mixed model was employed, and all models converged for both Summer and Fall Surveys for both species. The fit of each model was evaluated using the fit statistics provided by the GLMMIX macro. Initially, several model types were used to describe the nonzero CPUE data. These included lognormal, Poisson and negative binomial. Based on analyses of residual scatter and QQ plots, the lognormal model was more fitting than the others in describing the variability in the nonzero data in most of the models. Also, due to a lack of convergence of the initial lognormal models for nonzero vermilion CPUE, the models were simplified to have only year as a variable with no separate covariance structures within each year.

The following figures and tables summarize the findings of these analyses.

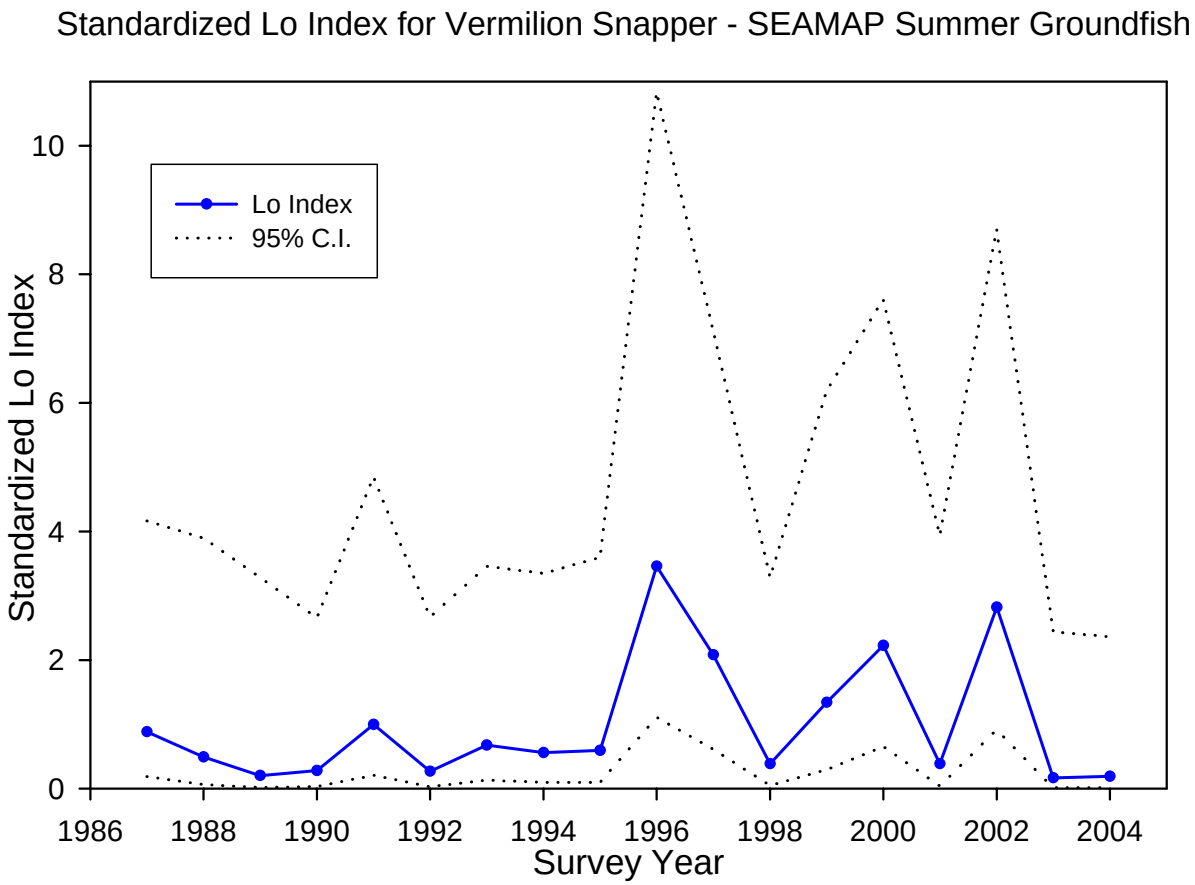
Literature Cited:

Lo, N. C. H., 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: 2515-1526.

Delta-lognormal CPUE indices for vermilion snapper collected during Summer SEAMAP Groundfish Surveys.

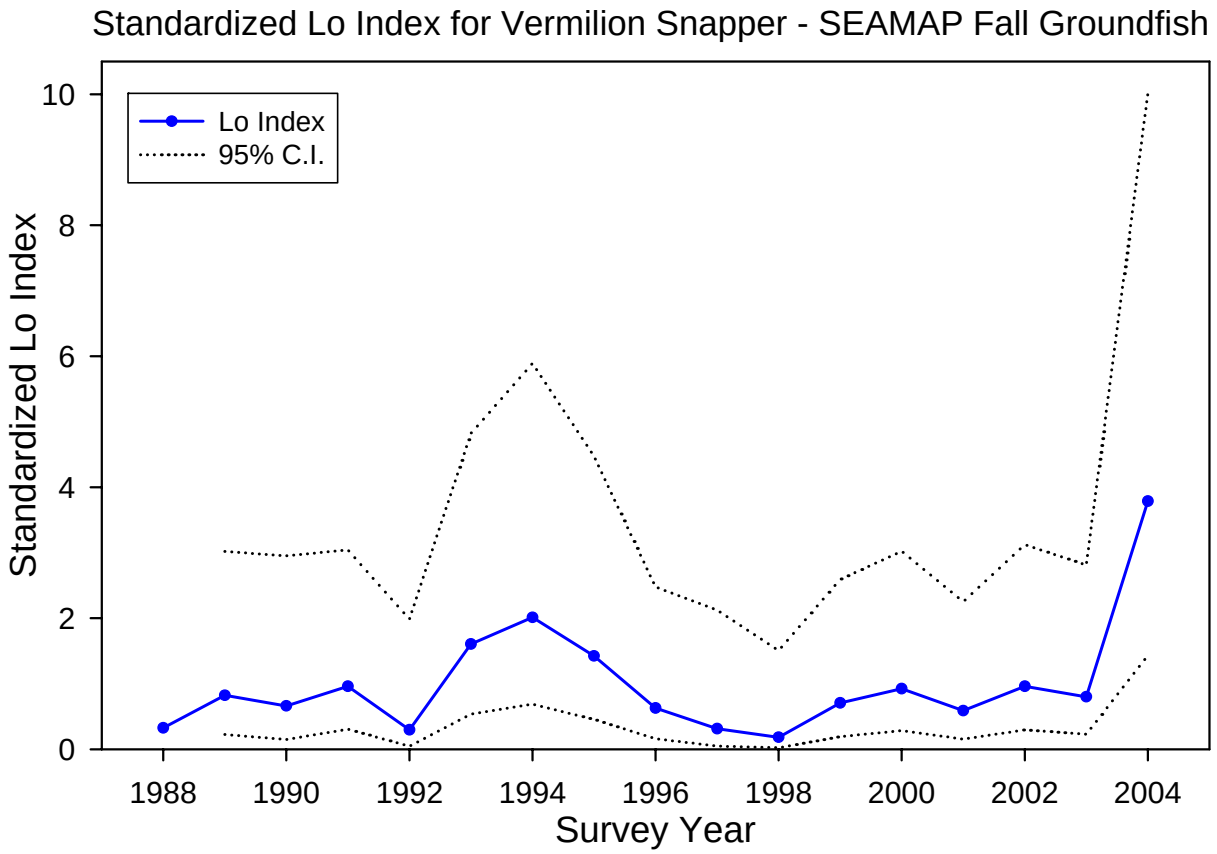
SurveyYear	Frequency	N	LoIndex	StdIndex	CV	LCL	UCL
1987	0.074510	255	0.07370	0.88422	0.90717	0.18771	4.1651
1988	0.028037	214	0.04089	0.49056	1.38659	0.06183	3.8923
1989	0.021164	189	0.01686	0.20222	2.44296	0.01246	3.2813
1990	0.039474	228	0.02327	0.27917	1.59715	0.02938	2.6524
1991	0.045977	261	0.08290	0.99452	0.93422	0.20399	4.8486
1992	0.026820	261	0.02248	0.26967	1.64832	0.02726	2.6674
1993	0.051471	272	0.05627	0.67512	0.97303	0.13196	3.4540
1994	0.035971	278	0.04648	0.55764	1.10953	0.09295	3.3454
1995	0.039841	251	0.04935	0.59205	1.12096	0.09745	3.5970
1996	0.077491	271	0.28831	3.45882	0.62038	1.10482	10.8284
1997	0.074510	255	0.17350	2.08152	0.67823	0.60820	7.1238
1998	0.030435	230	0.03225	0.38689	1.46257	0.04556	3.2854
1999	0.037594	266	0.11174	1.34059	0.89143	0.29044	6.1877
2000	0.067925	265	0.18559	2.22647	0.67708	0.65169	7.6067
2001	0.021858	183	0.03213	0.38544	1.69110	0.03772	3.9391
2002	0.097015	268	0.23519	2.82159	0.61042	0.91553	8.6959
2003	0.025510	196	0.01373	0.16470	2.26585	0.01114	2.4350
2004	0.024896	241	0.01574	0.18883	1.98182	0.01511	2.3604

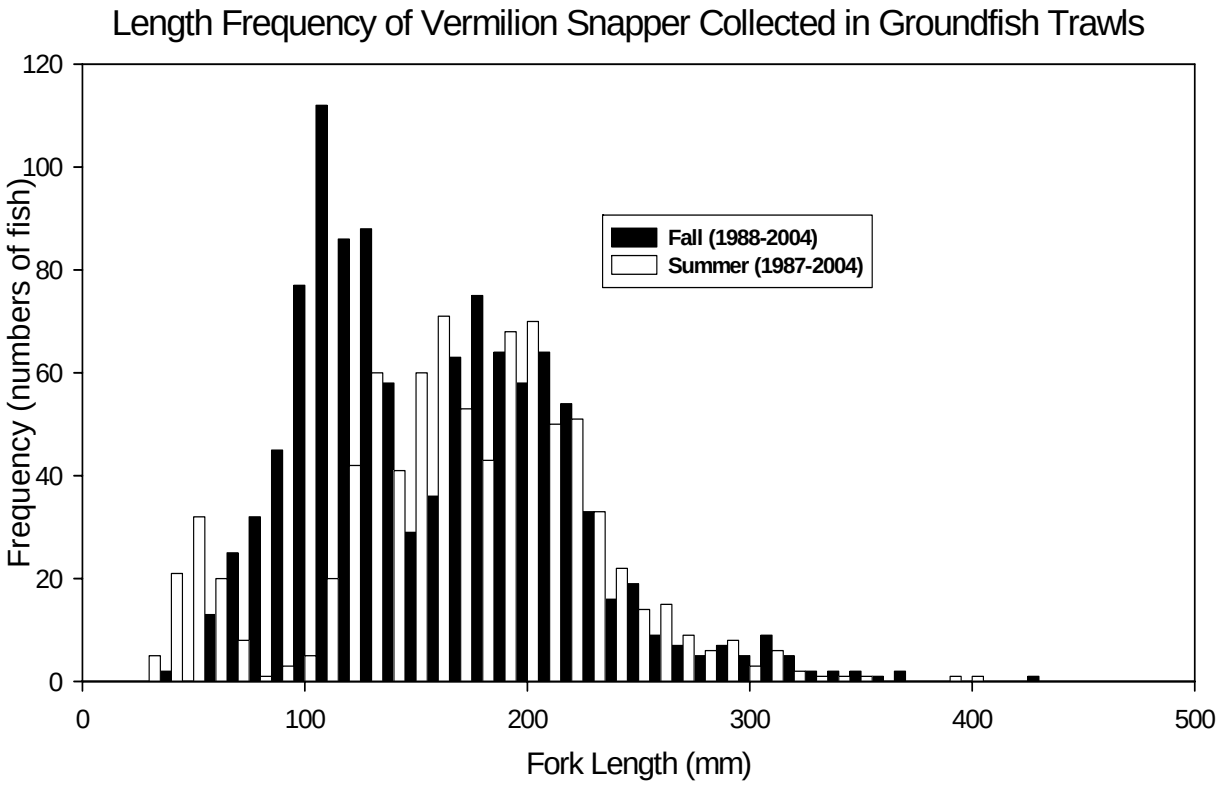
Delta-lognormal CPUE indices for vermilion snapper collected during Summer SEAMAP Groundfish Surveys.



Delta-lognormal CPUE indices for vermilion snapper collected during Fall SEAMAP Groundfish Surveys.

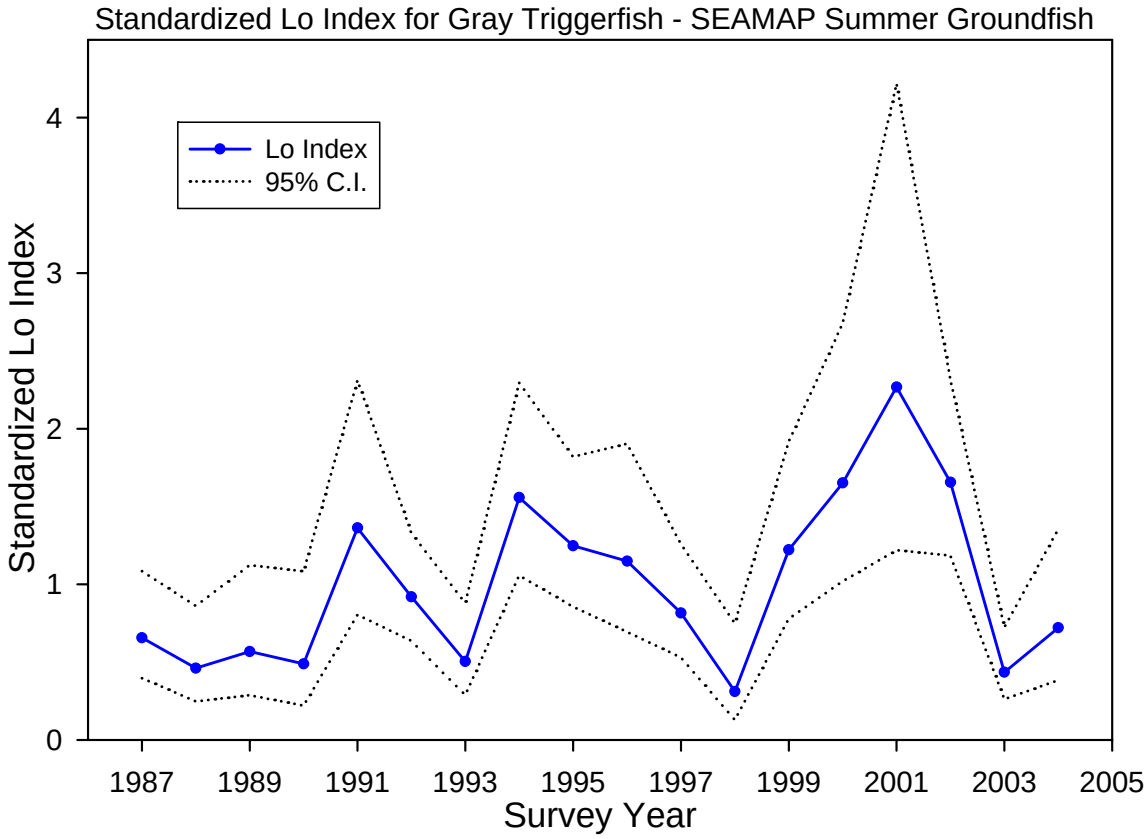
SurveyYear	Frequency	N	LoIndex	StdIndex	CV	LCL	UCL
1988	0.00905	221	0.05501	0.32492	.	.	.
1989	0.06550	229	0.13950	0.82394	0.72408	0.22489	3.0188
1990	0.04453	247	0.11200	0.66153	0.86539	0.14830	2.9509
1991	0.12791	258	0.16273	0.96112	0.62725	0.30372	3.0415
1992	0.03043	230	0.05023	0.29670	1.21278	0.04428	1.9880
1993	0.11250	240	0.27181	1.60536	0.59398	0.53468	4.8200
1994	0.10163	246	0.34064	2.01189	0.57812	0.68737	5.8887
1995	0.07851	242	0.24125	1.42490	0.62231	0.45377	4.4744
1996	0.05691	246	0.10660	0.62958	0.77325	0.16010	2.4757
1997	0.03252	246	0.05311	0.31371	1.22202	0.04638	2.1220
1998	0.02715	221	0.03069	0.18129	1.43585	0.02186	1.5037
1999	0.06564	259	0.11961	0.70642	0.72501	0.19255	2.5917
2000	0.09960	251	0.15643	0.92390	0.64850	0.28248	3.0217
2001	0.07037	270	0.09953	0.58788	0.75447	0.15355	2.2508
2002	0.09350	246	0.16252	0.95986	0.64503	0.29505	3.1226
2003	0.06642	271	0.13559	0.80080	0.69536	0.22805	2.8121
2004	0.15652	230	0.64105	3.78620	0.51619	1.43235	10.0082


Standardized Lo Index for Vermilion Snapper - SEAMAP Fall Groundfish
Lo Index
95% C.I.
Standardized Lo Index
Survey Year
0
2
4
6
8
10
1988
1990
1992
1994
1996
1998
2000
2002
2004


Length Frequency of Vermilion Snapper Collected in Groundfish Trawls
Fall (1988-2004)
Summer (1987-2004)
Frequency (numbers of fish)
Fork Length (mm)
0
20
40
60
80
100
120
0
100
200
300
400
500

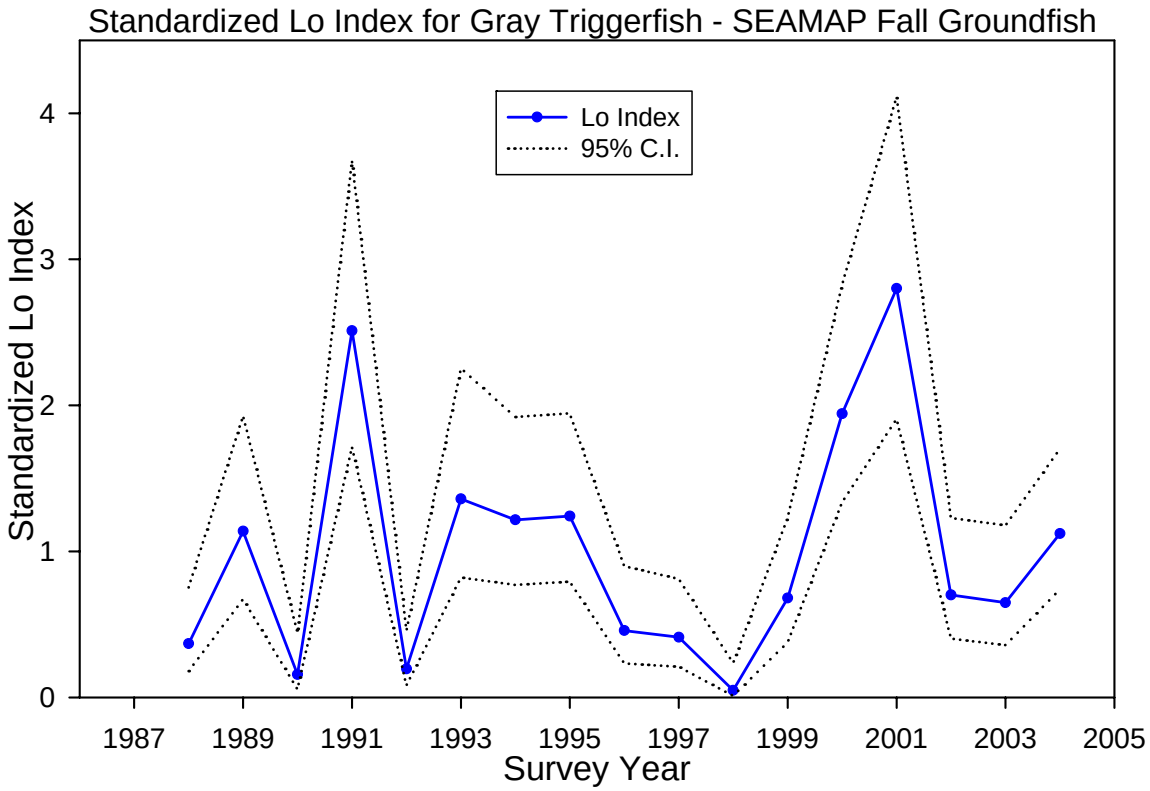
Delta-lognormal CPUE indices for gray triggerfish collected during Summer SEAMAP Groundfish Surveys.

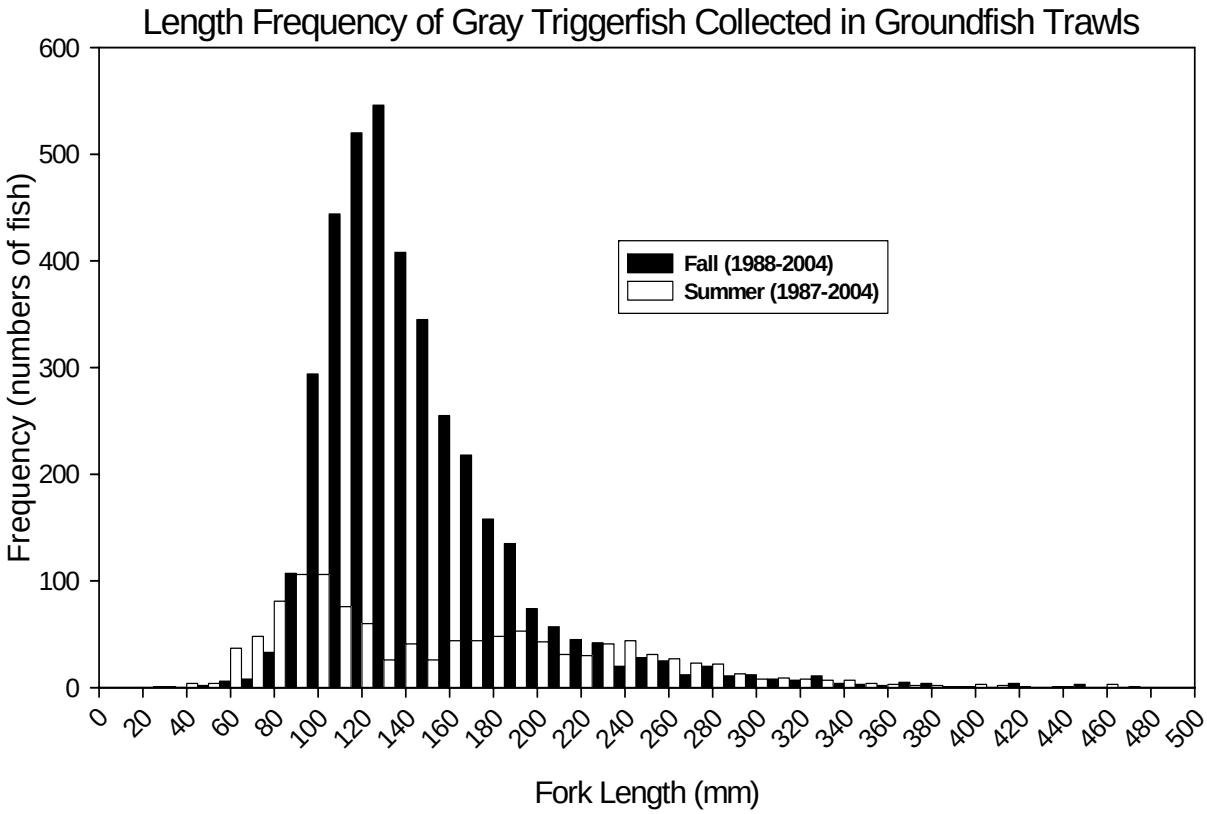
SurveyYear	Frequency	N	LoIndex	StdIndex	CV	LCL	UCL
1987	0.09412	255	0.19493	0.65651	0.25501	0.39739	1.08458
1988	0.08879	214	0.13711	0.46177	0.31927	0.24764	0.86108
1989	0.08995	189	0.16870	0.56817	0.35091	0.28740	1.12324
1990	0.11404	228	0.14523	0.48913	0.41407	0.22075	1.08381
1991	0.15000	260	0.40469	1.36294	0.26867	0.80384	2.31092
1992	0.15589	263	0.27318	0.92002	0.18570	0.63660	1.32964
1993	0.09191	272	0.14962	0.50390	0.28403	0.28867	0.87958
1994	0.19643	280	0.46252	1.55769	0.19581	1.05682	2.29596
1995	0.18972	253	0.37055	1.24797	0.19025	0.85589	1.81965
1996	0.08487	271	0.34133	1.14957	0.25618	0.69429	1.90339
1997	0.14510	255	0.24240	0.81638	0.21921	0.52932	1.25913
1998	0.06522	230	0.09244	0.31133	0.46129	0.12933	0.74941
1999	0.19476	267	0.36301	1.22256	0.22795	0.77943	1.91761
2000	0.22264	265	0.49044	1.65174	0.24505	1.01904	2.67727
2001	0.16304	184	0.67340	2.26791	0.31788	1.21936	4.21813
2002	0.20225	267	0.49184	1.65644	0.16897	1.18425	2.31691
2003	0.09184	196	0.12916	0.43499	0.25858	0.26152	0.72352
2004	0.08299	241	0.21408	0.72098	0.32312	0.38389	1.35407


Standardized Lo Index for Gray Triggerfish - SEAMAP Summer Groundfish
Lo Index
95% C.I.
Standardized Lo Index
0
1
2
3
4
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
Survey Year

Delta-lognormal CPUE indices for gray triggerfish collected during Fall SEAMAP Groundfish Surveys.

SurveyYear	Frequency	N	LoIndex	StdIndex	CV	LCL	UCL
1988	0.23077	221	0.30517	0.36824	0.36932	0.18011	0.75288
1989	0.34061	229	0.94350	1.13853	0.26802	0.67232	1.92803
1990	0.14980	247	0.12989	0.15673	0.55562	0.05554	0.44228
1991	0.51938	258	2.08043	2.51045	0.19227	1.71499	3.67487
1992	0.14719	231	0.16190	0.19536	0.44722	0.08317	0.45890
1993	0.42105	247	1.12653	1.35939	0.25670	0.82020	2.25302
1994	0.41767	249	1.00734	1.21556	0.23140	0.76984	1.91934
1995	0.32520	246	1.02853	1.24112	0.22728	0.79228	1.94423
1996	0.23077	247	0.37899	0.45733	0.34719	0.23292	0.89797
1997	0.21138	246	0.34132	0.41188	0.34864	0.20921	0.81087
1998	0.04525	221	0.04033	0.04867	0.92941	0.01004	0.23584
1999	0.31660	259	0.56395	0.68052	0.30210	0.37683	1.22896
2000	0.43254	252	1.61041	1.94328	0.18914	1.33564	2.82738
2001	0.45387	271	2.32047	2.80011	0.19401	1.90641	4.11277
2002	0.26721	247	0.58183	0.70210	0.28490	0.40156	1.22756
2003	0.22878	271	0.53762	0.64874	0.30480	0.35742	1.17750
2004	0.37826	230	0.92980	1.12199	0.21054	0.73977	1.70169


Standardized Lo Index for Gray Triggerfish - SEAMAP Fall Groundfish
Lo Index
95% C.I.
Standardized Lo Index
Survey Year
0
1
2
3
4
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005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Fall (1988-2004)
Summer (1987-2004)
Frequency (numbers of fish)
Fork Length (mm)
0
100
200
300
400
500
600
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
360
380
400
420
440
460
480
500