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UPDATED INDEX OF BLUEFIN TUNA *(THUNNUS THYNNUS)* SPAWNING BIOMASS FROM GULF OF MEXICO ICHTHYOPLANKTON SURVEYS

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SUMMARY

An updated index of spawning biomass for west Atlantic bluefin tuna is presented. The index utilizes larval survey data through 1994.

RESUMÉ

Ce document présente un indice actualisé de la biomasse reproductrice du thon rouge de l'Atlantique ouest. Cet indice utilise les données de la prospection larvaire jusqu'à 1994.

RESUMEN

Se presenta un índice actualizado de biomasa reproductora para el atún rojo del Atlántico oeste. El índice emplea datos de prospección larvaria durante 1994.

Introduction. ICCAT assessment working groups have applied this index to infer information on abundance of large bluefin tuna in the west Atlantic Ocean. That the index is based on the results of spawning in the Gulf of Mexico is considered useful; other indices available for large bluefin in the west Atlantic are derived from fishery data which could conceivably include catches of fish which had migrated from the eastern Atlantic.

Larval Survey Data. The data used for previous larval survey indices were reviewed and 1993-1994 data were incorporated into the updated analysis. Data from 1982-1994 were collected through SEAMAP. The methods described in Scott and Turner (1994) were employed in this analysis. Only data from sampling stations conducted during May were used for indexing biomass. The summary data table for the updated analysis is presented in Table 1. For 1994, additional tow information will become available from the joint U.S.-Japanese survey in the Gulf of Mexico after collaborative analyses are completed. Thus, the 1994 values should be considered preliminary.

Larval Index Estimates. Based on the methods of Scott *et. al.* (1993) and Scott and Turner (1994), estimates of larval abundance per 100m^2 at first daily increment formation were used to index total abundance. The larval index values were estimated as:

$$I_{s,y} = \{^{n}\textstyle\sum_{i} R(exp(-Z(D_{s,y,i}-1))\}/A_{s,y},$$

where y indexes year, s indexes sampling station, i (= $1,..., n$) indexes individual larvae, A the surface area sampled, Z the larval daily loss rate, D the larval daily ring count, and R, the gear efficiency estimate applied. Estimates were constructed using the preferred method as described in Scott and Turner (1994), which adjusts the density estimates from May sampling stations for estimated larval loss rates and gear efficiency. Variability in $I_{s,y}$ was estimated as described in Scott *et. al.* (1993). The calculated values are shown in Table 1. The time-series of larval index values with approximate 95% confidence intervals are shown in Figure 1.

References. Scott, G. P., S.C. Turner, C.B. Grimes, W.J. Richards, and E.B. Brothers. 1993. Indices of larval bluefin tuna, *Thunnus thynnus*, abundance in the Gulf of Mexico; modelling variability in growth, mortality, and gear selectivity. Bull. Mar. Sci. 53(2):912-929.

Scott, G.P. and S.C. Turner. 1994. An updated index of west Atlantic bluefin spawning biomass based on larval surveys in the Gulf of Mexico. ICCAT Coll. Vol. Sci. Pap. XLII(1):211-213.

Figure 1.

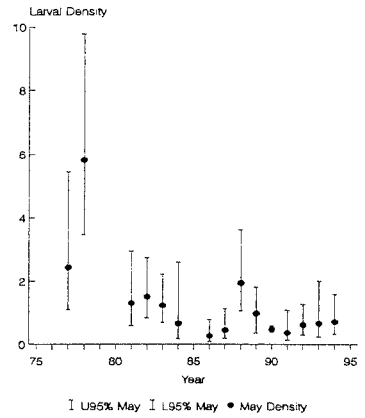

Table 1. Summary of the updated larval survey data used in estimating the annual larval index values and associated variances.

	Year														
YEAR	77	78	81	82	83	84	86	87	88	89	90	91	92	93	94
DATE	502-512	502-530	501-526	415-525	422-523	421-512	423-522	418-521	420-525	426-519	421-630	417-521	422-521	426-615	428-531
LEN	3.4- 8.1	2.4- 9.5	2.7- 7.0	2.0-10.7	2.0- 6.8	2.9- 6.0	3.5- 6.0	2.3- 9.2	2.3- 7.0	2.5- 8.0	2.6- 7.5	2.4- 6.0	2.5- 9.0	3.0- 6.2	2.3-8.9

YEAR	77	78	81	82	83	84	86	87	88	89	90	91	92	93	94
STATS	19	70	32	127	92	75	74	78	73	76	144	79	83	113	74
TOWS	19	91	32	127	92	97	74	78	73	76	144	79	83	113	74
POS STAT	8	35	6	22	16	9	7	5	15	10	10	4	13	6	9
POS TOWS	8	44	6	22	16	9	7	5	15	10	10	4	13	6	9
TOT CATCH	22	281	20	76	68	16	12	10	71	36	23	7	36	23	24
MEAN LEN	4.7	4.1	4.6	4.1	3.5	4.2	4.9	5.0	3.5	4.1	3.9	3.8	3.5	5.1	4.4

YEAR	77	78	81	82	83	84	86	87	88	89	90	91	92	93	94
MAY STATIONS															
STATS	19	70	32	69	70	33	51	48	42	63	53	50	57	75	67
POS STATS	8	35	6	15	16	4	3	4	14	10	8	4	12	6	9
LN(I_s)	1.367	1.765	1.815	1.660	1.377	0.623	1.414	1.620	1.426	1.151	1.105	1.272	0.671	1.456	1.330
V(LN(I_s))	0.925	1.448	0.328	0.612	0.672	3.439	0.231	0.132	0.743	1.074	0.088	0.690	0.897	1.707	0.783
L/100m²	**2.435**	**5.824**	**1.317**	**1.514**	**1.235**	**0.653**	**0.261**	**0.445**	**1.946**	**0.798**	**0.474**	**0.365**	**0.614**	**0.658**	**0.711**
V(L/100)	1.113	2.518	0.323	0.222	0.145	0.274	0.025	0.051	0.403	0.123	0.003	0.047	0.055	0.163	0.092

Notes: DATE, range of sampling dates in mdd format (502-512 indicates sampling between May 02 and May 12)
LEN, length range (mm) of bluefin larvae sampled
STATS, Stations sampled in year
TOWS, Number of net tows made in year
POS STAT, Number of stations with bluefin larvae
POS TOWS, Number of tows with bluefin larvae
TOT CATCH, Number of bluefin larvae captured over all stations
MEAN LEN, Mean length (mm) of larvae measured
LN(I), Mean of ln(larvae/100m) for positive stations
V(LN(I)), Variance of ln(larrvae/100m) over positive stations
L/100m², Delta distribution mean larval density, the index value applied
V(L/100m), Estimated variance of the index