Northwest Atlantic Fisheries Organization

Serial No. N1076

NAFO SCR Doc. 85/100

SCIENTIFIC COUNCIL MEETING - SEPTEMBER 1985

A Stratagem for Handling Zero Catches in Fish Survey Results

by

R. Wells

Department of Fisheries and Oceans, Fisheries Research Branch
P. O. Box 5667, St. John's, Newfouundland, Canada A1C 5X1

The Problem

There appears to be little difficulty in calculating mean abundance values arithmetically when zero values are included from fish survey catches per tow. If the distribution is not normally distributed but appears amenable to logarithmic transformation, there is a difficulty in the treatment of zero values. The use of n+1 values may introduce a systematic bias when low catch numbers are included.

Proposed Solution

Survey results are first examined to determine if fish are present or not present. Fish are not present if the catch is zero and only values greater than zero need be considered. For calculation of abundance estimates, the area of a stratum is reduced in the same proportion as the proportion of the number of zero catches to the total number of catches. For example, where a stratum has area equivalent to 100 fishing tows, and 1 out of 5 tows has a zero catch, the area where fish are present is equivalent to 80 fishing tows.

From Table 1 it is clear that in such a case, the abundance estimates from the arithmetic means are equal whether zero values are included or not. For logarithmically transformed values, the abundance estimates differ if zero values are included or not. For strata where there are no zero values, estimates of mean abundance will also differ slightly depending on whether

log n or log n+1 values are used.

Variances will differ, since on the one hand, the number of observations are different and on the other hand, minmum values (zero's) are excluded. In surveys where only 2 catch values are available for a stratum, the deletion of a zero value would necessitate the use of a variance estimate for that stratum from previous surveys or from similar strata in the same survey.

Table 1. Abundance estimates for a stratum with area sufficient for 100 tows. Catch in numbers for 5 tows are available, one result being 0. A values are calculated using all tows - arithmetically and logarithmetically. B values are calculated deleting the 0 value.

	Tow number	A Catch in numbers (n)	B Catch in numbers (n)		A Log (n+1)	B Log (n)
	1	0	-		0.0000	-
	2	4	4		.6990	.6021
	3	7	7		.9031	.8451
	4	9	9		1.0000	.9542
	5	1,000	1,000		3.0004	3.0000
	Total	1,020	1,020		5.6061	5.4014
	# Tows	5	4		5	4
	Average	204	255		1.1212	1.3504
				n+1	13.2197	
Expected tows with fish		80	80		80	80
Expected tows without fish		20	-		20	-
Totals tows possible		100	80		100	80
	n	204	255		12.2197	22.4053
Abundance estimate		20,400	20,400		1,222	1,792