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Examination of Yellowtail Flounder Ages in NEFSC Scallop Survey: Can Age-Length Keys be Borrowed from Other Surveys?

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ABSTRACT

The Northeast Fisheries Science Center (NEFSC) scallop survey has provided a tuning index for age 1 yellowtail flounder in the Transboundardy Resources Assessment Committee (TRAC) assessment for many years. The age 1 yellowtail flounder are identified by length in the scallop survey. Recently, attempts have been made to include all ages from the survey by using age-length keys from the NEFSC spring and fall surveys in the same year as a given scallop survey. This approach has been questioned due to growth of yellowtail during the year. In 2011, scales were collected during the NEFSC scallop survey. This provided an opportunity to compare the resulting indices at age from age-length keys generated directly from the NEFSC scallop survey with age-length keys generated from the NEFSC spring and fall surveys. Results indicate that using only the NEFSC spring survey age-length key provides the best match to direct application of the age-length key derived from the scallop survey. Application of the NEFSC spring survey age-length key is recommended to create tuning indices for all ages of Georges Bank yellowtail flounder from the NEFSC scallop survey.

RÉSUMÉ

Le relevé sur les pétoncles du Northeast Fisheries Center (NEFSC) a fourni un indice de rajustement pour la limande à queue jaune d'âge 1 dans l'évaluation par le Comité d'évaluation des ressources transfrontalières (CERT) depuis de nombreuses années. La limande à queue jaune d'âge 1 est identifiée par sa longueur dans le relevé sur les pétoncles. Des tentatives ont été faites récemment afin d'inclure tous les âges du relevé en utilisant des correspondances âge/longueur des relevés de printemps et d'automne effectués par le Northeast Fisheries Science Center pendant la même année comme un relevé donné sur les pétoncles Des questions ont été soulevées à propos de cette méthode en raison de la croissance de la limande à queue jaune pendant l'année. En 2011, des écailles ont été prélevées lors du relevé sur les pétoncles par le Northeast Fisheries Science Center. Ces relevés ont fourni une occasion permettant de comparer les résultats des indices de l'âge des correspondances âge/longueur générées directement à partir du relevé des pétoncles du Northeast Fisheries Science Center (NEFSC) avec les correspondances âge/longueur générées à partir des relevés de printemps et d'automne du NEFSC. Les résultats démontrent qu'en utilisant seulement la correspondance âge/longueur du relevé de printemps du Northeast Fisheries Science Center, cela correspond le mieux à l'application directe de la correspondance âge/longueur dérivée du relevé des pétoncles. L'application de la correspondance âge/longueur du relevé de printemps du Northeast Fisheries Science Center (NEFSC) est recommandée pour créer des indices de mesure pour tous les âges de limande à queue jaune du banc de Georges du relevé des pétoncles du NEFSC.

INTRODUCTION

Yellowtail flounder are caught during the NEFSC scallop survey and measured for length. The length distributions allow age 1 yellowtail flounder to be distinguished from other ages. The stratified mean catch per tow of age 1 yellowtail flounder has been used as a tuning index in the Georges Bank yellowtail flounder for many years (e.g., Legault et al. 2006, 2007, 2008, 2009, 2010, and 2011). For the past few years, sensitivity runs have been presented which use all ages of yellowtail flounder from the scallop survey as tuning indices. These age-specific indices were derived using an age-length key based on scales collected during the NEFSC spring and fall surveys. While this process allowed the calculation of tuning indices for all ages, questions were raised because it required borrowing of age-length keys (O'Brien and Worcester 2010; Porter and O'Brien 2011).

In 2011, for the first time, scales were collected from a sample of yellowtail flounder during the NEFSC scallop survey. The 2011 NEFSC scallop survey did not sample in Canadian waters (Figure 1), so the information cannot be used as a tuning index for the assessment for any ages for this year. However, the collection of the age information allows comparison of the direct application of the survey specific age-length key with the results of using borrowed age-length keys to determine the best approach to use for earlier years in the NEFSC scallop survey. This working paper describes these comparisons and recommends a way that indices for all ages can be used from the NEFSC scallop survey to calibrate the Georges Bank yellowtail flounder assessment.

METHODS

A total of 49 scales were aged from the 2011 NEFSC scallop survey. A total of 537 scales were aged from the NEFSC spring (222 scales) and fall (315 scales) surveys. These scale readings were used to form age-length keys for the spring and fall combined, scallop only, spring only, and fall only surveys (Table 1). The catch of yellowtail flounder during the 2011 scallop survey was low, which meant many lengths were not observed (Table 1). Only ages within the length range observed during the 2011 NEFSC scallop survey were used to create the four age-length keys. The stratified mean catch per tow at length was converted to catch at age with each of the four age-length keys using standard calculations.

Catches at length with no age information were converted to ages by filling the holes in the age-length keys according to rules which varied by the key. The scallop survey had missing age information for only one length bin (34 cm) and it was filled by assuming the same proportions at age as the 33 cm length bin. There were ages observed in the scallop survey without corresponding lengths because five scales were collected from stations just to the west of the Georges Bank yellowtail flounder stock area. These scales were included in the scallop age-length key to increase the sample size due to the low catch this year. The spring+fall, spring only, and fall only keys were only missing ages for lengths which were clearly age 1 based on their size. For earlier years, a rule was applied for the spring+fall and the fall only keys to fill according to the nearest observation in the direction towards the center of the length range, while the spring only key was filled according the nearest observation in the direction of smaller sizes due to expected growth between the time of the spring and scallop surveys.

RESULTS AND DISCUSSION

The yellowtail catch at age in the 2011 NEFSC scallop survey was most similar between the age-length key from the spring only survey compared to the direct application of the scallop survey age-length key (Table 2; Figure 2). Application of the scallop survey age-length key resulted in the highest catch at age 4, while the other three age-length keys resulted in the highest catch at age 3. The fall only age-length key resulted in the lowest catch at age 4 and the highest catch at age 2. The spring+fall was intermediate between the spring only and fall only results, as expected. This is because growth in the majority of yellowtail scales occurs starting as early as April in younger fish (age 1 and some age 2) through August, meaning the mean length at age would be higher at any given age in the fall compared to the spring or even early summer when yellowtail are caught in the scallop survey.

The sample size used for the scallop survey is relatively limited, which should be considered when comparing the results from the different age-length keys. Given these results, the spring only age-length key is recommended for converting yellowtail flounder length distributions in the scallop survey into catch at age tuning indices.

The differences between the tuning indices using the spring only and the spring+fall survey age-length keys is not great though (Figure 3). The trends are quite similar between the two approaches. This demonstrates that it is the catch at length driving the changes over time. The tuning indices are robust to the choice of which age-length key is used to generate the catch at age indices.

During previous TRAC meetings, the suggestion was made to use the age information collected from the commercial fishery during May-June to create the age-length key (O'Brien and Worcester 2010; Porter and O'Brien 2011). This was examined and found to be a problem because the commercial fishery only lands fish 33 cm and above in length. This means there is range of fish lengths between the lengths associated with age 1 and the minimum commercial size that have no information about ages. Examination of this problem for the 2011 data demonstrated that there are a number of possible ages (2-4) that can occur within this size range, and that there can be a substantial portion of the yellowtail catch in the scallop survey within this size range. For this reason, the use of commercial age-length keys was not attempted to age the NEFSC scallop survey.

CONCLUSIONS

The NEFSC scallop survey should be used to provide tuning indices for the Georges Bank yellowtail flounder stock assessment by using the annual age-length keys from the NEFSC spring survey to convert the observed stratified mean catch per tow at length into catch at age.

ACKNOWLEDGEMENTS

We thank the scientists on the 2011 scallop survey for collecting yellowtail flounder scales, which enabled this study to be completed.

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Table 1. Stratified mean catch per tow at length and four age-length keys used to convert these catches at length to catch at age.

	Catch at Length		Spring+Fall ALK							Scallop Survey ALK							Spring Only Survey ALK							Fall Only Survey ALK					
Length	Yr2011		Age1	Age2	Age3	Age4	Age5	Age6		Age1	Age2	Age3	Age4	Age5	Age6		Age1	Age2	Age3	Age4	Age5	Age6		Age1	Age2	Age3	Age4	Age5	Age6
13	0.03357		1							1							1												
14	0		2														2												
15	0									1																			
16	0.01195									1																			
17	0																												
18	0.02162		2							1														2					
19	0.01195		2							2														2					
20	0																												
21	0		2																					2					
22	0		1																					1					
23	0		1	1														1						1					
24	0			1																					1				
25	0.01195		5	2							1							1						5	1				
26	0			3																					3				
27	0		4	8	2													3	2					4	5				
28	0.03067		1	8	1							2						4	1					1	4				
29	0		1	8	6						1							3	6					1	5				
30	0.04364			8	13						2	1						1	10						7	3			
31	0.06899			14	12	4	1					3	1						7	4	1				14	5			
32	0.08763			10	26	7						7	2						15	6					10	11	1		
33	0.0408			15	20	13						2	3						7	12					15	13	1		
34	0.01291			14	17	11												1	8	8					13	9	3		
35	0.05694			5	27	3						1	1						15	3					5	12			
36	0.04712			5	18	9	1						1						5	6	1				5	13	3		
37	0.07038			3	24	12	3					2	4						5	8	3				3	19	4		
38	0.05356			1	19	12	1						4						3	10	1				1	16	2		
39	0.01716			1	18	17	3							1					1	11	3				1	17	6		
40	0.02162			1	16	18	9						1						2	9	6				1	14	9	3	
41	0.02162				9	21	7	1					1						1	8	6	1				8	13	1	
42	0.01336				1	15	9	1					1	1						2	7	1				1	13	2	
sum	0.67744		22	108	229	142	34	2		6	4	18	19	2	0		3	14	88	87	28	2		19	94	141	55	6	0
								537							49							222							315

Table 2. Stratified mean catch per tow at age for yellowtail flounder caught in the 2011 scallop survey using four different age-length keys.

Age	Spring+Fall	Scallop	Spring Only	Fall Only
1	0.0907	0.0791	0.0791	0.0952
2	0.1360	0.0410	0.0412	0.2160
3	0.2941	0.2385	0.2753	0.2960
4	0.1309	0.2949	0.2239	0.0653
5	0.0247	0.0238	0.0552	0.0051
6	0.0011	0.0000	0.0027	0.0000
sum	0.6774	0.6774	0.6774	0.6774

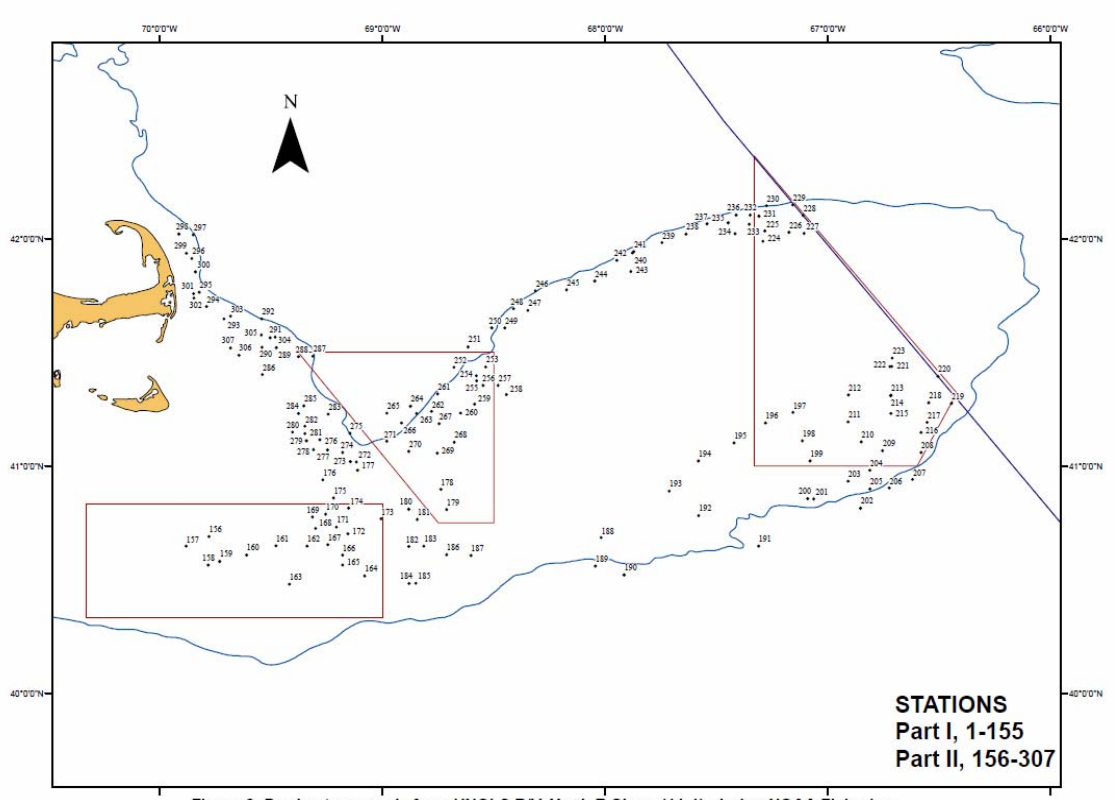

Figure 1. Location of NEFSC scallop survey tows during the 2011 survey in the Georges Bank region. No stations were located in Canadian waters in 2011. Source: Resource Survey Report available at http://www.nefsc.noaa.gov/femad/ecosurvey/mainpage/rsr/scallop/scallop_2011/large_file.pdf. (Accessed September 20, 2012).

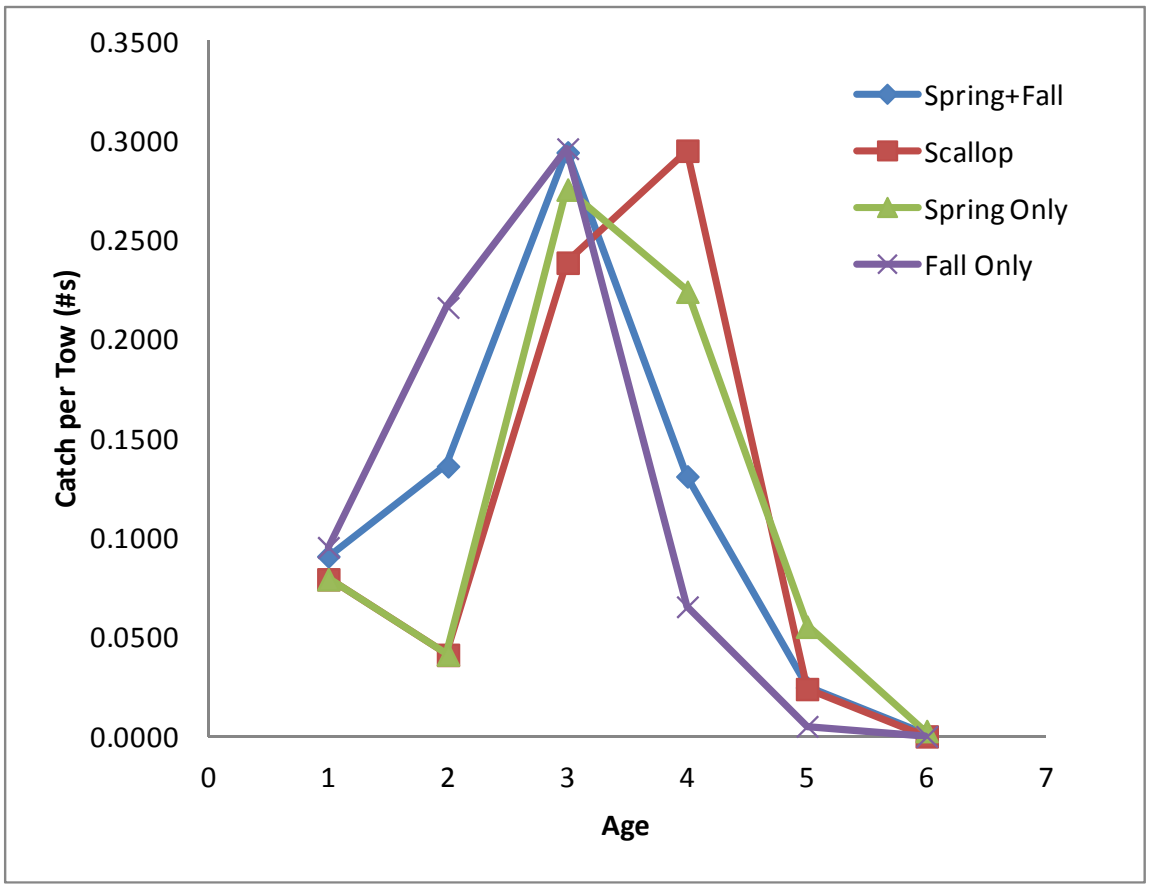

Figure 2. The 2011 scallop survey catch per tow (numbers of fish) at age from four different age-length keys. See Table 2 for the values.

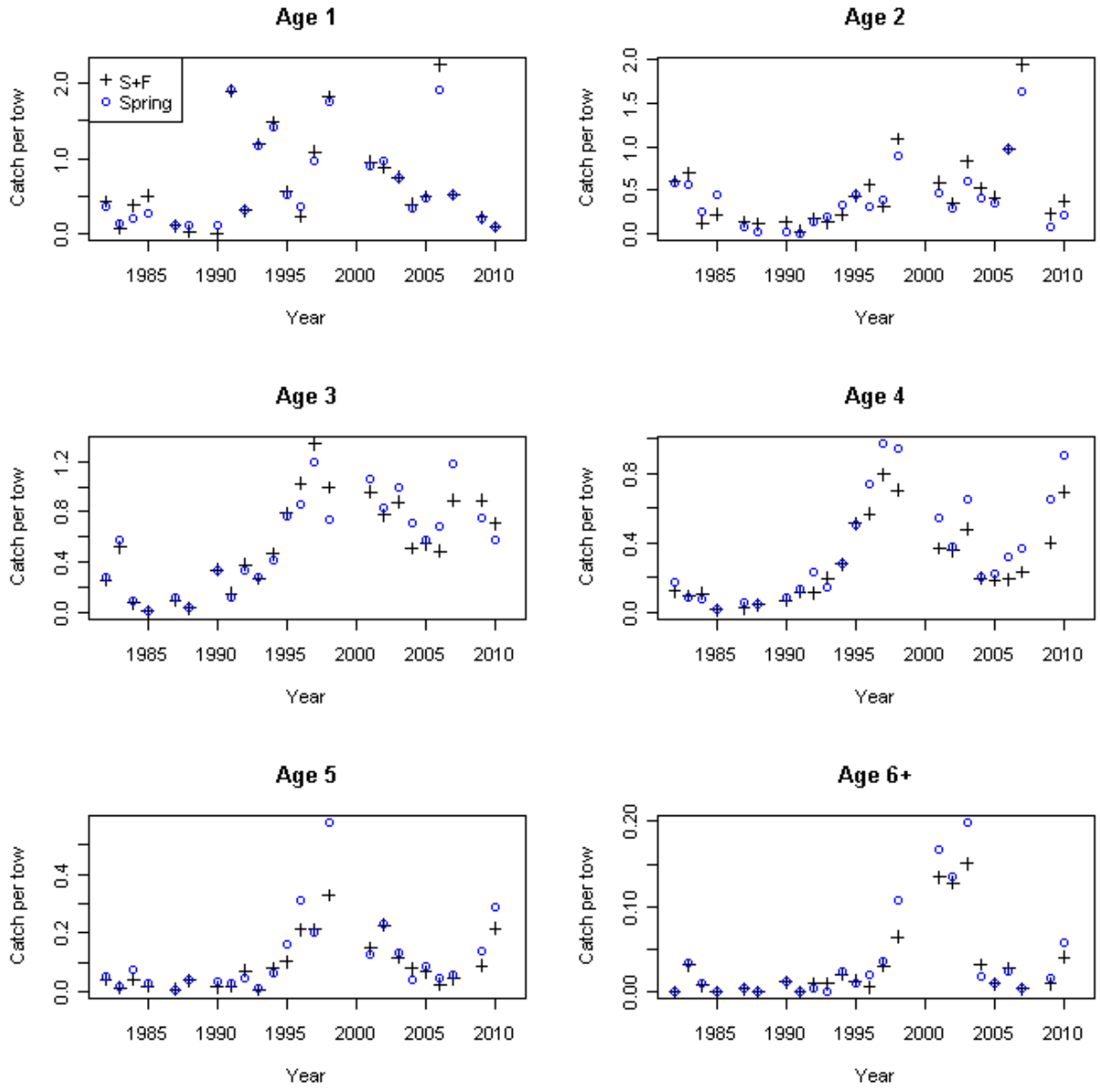

Figure 3. Comparison of age specific catch per tow of yellowtail flounder in the NEFSC scallop survey based on using two different age-length keys: the NEFSC spring and fall combined (S+F) or the NEFSC spring only (Spring).