PACIFIC SALMON COMMISSION
JOINT CHINOOK TECHNICAL COMMITTEE
ISBM SUBGROUP

TECHNICAL NOTE

New developments for the computation of postseason ISBM indices and Calendar Year Exploitation Rates

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Membership of the Chinook Technical Committee ISBM Subgroup

Canadian Members	**United States Members**
Dr. Antonio Velez-Espino, DFO	Mr. Ethan Clemons, ODFW Mr. Timothy Dalton, ODFW Mr. Larrie LaVoy, NMFS Mr. Randy Peterson, ADF&G

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1. INTRODUCTION

The Pacific Salmon Treaty (PST) requires the Chinook Technical Committee (CTC) to report annual estimates of exploitation rates for all Chinook salmon stocks harvested within the Treaty area. Two of the exploitation rate metrics the CTC reports on annually are the individual stock-based management (ISBM) index and calendar year exploitation rate (CYER). Limitations in how these two metrics are calculated was identified over the course of the 2018 negotiations of the Chinook Chapter of the PST. A small group of the CTC (hereafter referred to as the ISBM subgroup) was created to address these issues. Specifically, the ISBM Subgroup was tasked to modify two CTC programs:

1. Postseason ISBM Program
2. Mortality Distribution Table (CYER) Program

In addition to correcting errors in these programs, the Bilateral Concept Paper Drafting Group, which assisted with the 2018 negotiations, requested additional features to be added to both the CTC's ISBM and Mortality Distribution programs to enable selective exclusion of the first and second mature ages (Appendix A).

Both CTC programs are used to calculate management performance metrics, the results of which can be found in many CTC reports. The postseason ISBM program is used to calculate the 'pass through' index, which is used to assess ISBM compliance under the 2009 Agreement. The mortality distribution table program is used to calculate the 'calendar year exploitation rates', which will be used to assess ISBM compliance under the 2019 Agreement. Both metrics are computed using results from the CTC's annual exploitation rate analysis; however, due to unique aspects of each metric, the two programs often rely on auxiliary data. This report documents the methods and equations used to compute the ISBM index, summarizes the changes made to both CTC programs, and provides a user guide for how to operate these programs.

2. METHODS

2.1 MODEL

Annual CTC reports define the postseason ISBM index as being calculated using the following two equations:

$$ISBMIdx_{CY} = \frac{\sum_{f\in(F)}\sum_{a=Minage}^{Maxage}(TotMorts_{CY,f,a} * AEQ_{BY=CY-a,a,f})}{\sum_{f\in(F)}\sum_{a=Minage}^{Maxage}(BPISBMER_{f,a} * Cohort_{BY=CY-a,a})} \quad \text{Eq. 1}$$

where

$$BPISBMER_{f,a} = \frac{\sum_{BPER=79}^{82}\frac{(TotMorts_{BPER,f,a} * AEQ_{BY=BPER-a,a,f})}{Cohort_{BY=BPER-a,a}}}{4} \quad \text{Eq. 2}$$

However, these equations assume 1) the available cohort size is the same for all fisheries and 2) no auxiliary data is required (i.e. complete base period data and no external harvest rate adjustments). To have complete data base period data, a stock must have been coded wire tagged in 4 or 5 consecutive years beginning in 1973 or 1974. If a coded wire tagged stock experiences a different terminal harvest than the escapement stock it is supposed to represent, then an external harvest rate adjustment may be used. In practice, most of the ISBM stocks do not use Eq. 1 or Eq. 2 as reported, thus Eq. 1 and Eq. 2 represent an idealized, simplified form of the postseason ISBM index.

The following variations of equations 1 and 2 are the actual calculations used in the implementation of the ISBM index. Some of these equations help with the identification and correction of issues identified by the CTC in the last couple of years.

Assumption 1, available cohort size, is undoubtedly a nuance; however, it's non-trivial because ignoring it can change results. Consider for instance a harvest of 10 fish in a fishery where the vulnerable cohort size is 1,000. If that fishery is pre-terminal, then the exploitation rate = 10/1,000 = 1%. If that fishery is terminal and the terminal run size is 100, then the harvest rate = 10/100 = 10%. A simple modification to Eq. 1 and Eq. 2 is all that is needed to fix the issue:

$$ISBMIdx_{CY} = \frac{\sum_{f\in(F)}\sum_{a=Minage}^{Maxage}(TotMorts_{CY,f,a} * AEQ_{BY=CY-a,a,f})}{\sum_{f\in(F)}\sum_{a=Minage}^{Maxage}(BPISBMER_{f,a} * Cohort_{BY=CY-a,a,f})} \quad \text{Eq. 3}$$

where

$$BPISBMER_{f,a} = \frac{\sum_{BPER=79}^{82}\frac{(TotMorts_{BPER,f,a}*AEQ_{BY=BPER-a,a,f})}{Cohort_{BY=BPER-a,a,f}}}{4} \quad \text{Eq. 4}$$

Adding a subscript for fishery, *f*, allows cohort to be defined for each of the two relevant fishery strata (pre-terminal or terminal; but see Section 1.3.1), thus correcting Eq. 1 and Eq. 2.

Assumption 2, no external information is required, is a difficult problem to fix because there are three separate situations that might require external information: incomplete base period data, external harvest rates, or both. The extent of this problem is that 16 of 18 ISBM stocks have incomplete base period data and/or use external harvest rates.

If there's incomplete base period data, Eq. 4 needs to be modified and is case specific:

$$BPISBMER_{f,a} = \frac{\sum_{BPER=79}^{82}\frac{(TotMorts_{BPER,f,a}*AEQ_{BY=BPER-a,a,f})}{Cohort_{BY=BPER-a,a,f}}}{\sum_{BPER=79}^{82} I(.)} \quad \text{Eq. 5a}$$

$$BPISBMER_{f,a} = STKBPER_{f,a} \quad \text{Eq. 5b}$$

$$BPISBMER_{f,a} = \frac{\sum_{BPER=79}^{82} HRT_{BPER,a,f}}{\sum_{BPER=79}^{82} I(.)} \quad \text{Eq. 5c}$$

where $I(.)$ is an indicator function which is age, fishery, and year specific that allows the ISBM metric to evaluate whether data exists $(I(.) = 1)$ or not $(I(.) = 0)$. Note that stocks with incomplete base period data may have sufficient data to estimate a base period exploitation rate, but it might be preferred to use external base period data. No hard and fast rule has been developed for what constitutes "sufficient". A general rule for selecting Eq. 5a over Eq. 5b is that the base period exploitation rate should be calculable for all ages (i.e. base period exploitation rates, $BPISBMER_{f,a}$, is defined for all *a*). If no or insufficient base period data exists, Eq. 5b is used to specify external base period exploitation rates, $BPISBMER_{f,a}$. External $BPISBMER_{f,a}$ values are from the Chinook Model. If external harvest rate adjustments are required, Eq. 5c is used to compute $BPISBMER_{f,a}$. Note that if Eq. 5c is used, the value from Eq. 5c supersedes values from Eq. 5a or Eq. 5b. And if external harvest rates are used, Eq. 3 is further modified:

$$ISBMIdx_{CY} = \frac{\left[\sum_{f\in(F\ not\ HRT)}\sum_{a=Minage}^{Maxage}(TotMorts_{CY,f,a} * AEQ_{BY=CY-a,a,f})\right] + \left[\sum_{f\in(F\ in\ HRT)}\sum_{a=Minage}^{Maxage}(TermRun_{CY,a,f} * HRT_{CY,a,f})\right]}{\left[\sum_{f\in(F\ not\ HRT)}\sum_{a=Minage}^{Maxage}(BPISBMER_{f,a} * Cohort_{BY=CY-a,a,f})\right] + \left[\sum_{f\in(F\ in\ HRT)}\sum_{a=Minage}^{Maxage}(BPISBMER_{f,a} * TermRun_{CY,a})\right]} \quad \text{Eq. 6}$$

where

$$TermRun_{CY,a} = \sum_{f\in(F\ in\ HRT)}(TotMorts_{CY,a.f}) \quad \text{Eq. 7}$$

where $f \in (F\ in\ HRT)$ denotes that a fishery has external harvest rate data and $f \in (F\ not\ HRT)$ denotes that a fishery does not have external harvest rate data. Note that in Eq. 7, terminal run is defined solely in terms of terminal harvest: hitherto this report, Eq. 7 was used in the postseason ISBM program (i.e. ERA reports < 2017). This had to be corrected in the ISBM program. Terminal run is terminal harvest *plus* escapement:

$$TermRun_{CY,a} = \sum_{f\in(F\ in\ HRT)}(TotMorts_{CY,a.f} + Escapement_{CY,a}) \quad \text{Eq. 8}$$

The postseason ISBM index program now correctly uses Equations 5a–c, Eq. 6, and Eq. 8.

2.2 DATA

Two to four input files are required to compute the postseason ISBM index:

1. Exploitation rate indicator stock's (ERIS) exploitation rate analysis (ERA) HRJ files
2. Mapping file
3. Optional external harvest rate (HRT) file
4. Optional base period exploitation rate (STK) file

Three input files are required to compute calendar year exploitation rates (CYER):

1. ERIS ERA HRJ files
2. Mapping file
3. Stock definition file

All computations require an HRJ file and a mapping file. The HRJ file is generated from the CTC's annual ERA, which is specific for each ERIS. An ERIS is a coded-wire-tag (CWT) indicator stock as defined by the CTC. For the postseason ISBM index program, the mapping file links together the ERA, ISBM, and STK fisheries because each defines fisheries differently. For the CYER program, the mapping file summarizes the ERA fisheries according to reporting needs identified by the CTC (see Appendix B for fishery mappings). The STK and HRT files are specific to the postseason ISBM index program. The BPER file is from the Chinook Model. The HRT file is optional, and is used in the case if terminal harvest on an ERIS differs from its associated escapement indicator stocks (EIS). Data used as input for HRT files can be found in Appendix C. Source data and methods used to generate a HRT file can be explained by the agency that supplied the file. The STK file is used in the case if an ERIS has no (or limited) base period data (see Eq. 5a and Eq. 5b). The STK file is well documented, as it is a key input into the current PSC Chinook Model. The stock definition file is specific to the CYER program, which is used to define which stocks are to be included in the analysis.

The postseason ISBM index is computed for 18 ISBM stocks (4 Canada, 14 US) (Table 1 and Table 2). The CYER is currently computed for 56 stocks.

Table 1. Postseason ISBM Index Stock Definitions

Stock Group	ISBM Stock	CTC Exploitation Rate Indicator Stock	Postseason ISBM Index	External Harvest Rate	Base Period Data	Model Stock Base Period Exploitation Rate
North/Central BC	Yakoun	N/A	Not calculated			
	Nass		Not calculated			
	Skeena		Not calculated			
	Area 8		Not calculated			
Lower Strait of Georgia	Cowichan	Cowichan (COW)	Yes	Yes	0%	GST
	Nanaimo	Big Qualicum River (BQR)	Not calculated			
Fraser Late	Harrison	Chilliwac (CHI)	Yes	Yes	0%	FRL
Upper Strait of Georgia	Klinaklini, Kakweikan, Wakeman, Kingcome, Nimpkish	Quinsam (QUI)	Yes		100%	
Fraser Early (springs and summers)	Upper Fraser	N/A	Not calculated			
	Mid Fraser		Not calculated			
	Thompson		Not calculated			
West Coast Vancouver Island Falls	Artlish, Burman, Gold, Tahsis, Tashish, Marble, Kauok	Robertson Creek (RBT)	Yes		100%	
North Puget Sound Natural Spring	Nooksack Spring	Nooksack Spring (NSF)	Yes		0%	NKS
	Skagit Spring	N/A	Not calculated			
Puget Sound Natural Summer/Falls	Skagit	N/A	Not calculated			
	Stillaguamish	Stillaguamish Fall Fing (STL)	Yes		6%	STL
	Snohomish	N/A	Not calculated			
	Lake Washington	N/A	Not calculated			
	Green River	South PS Fall Fingerlings (SPS)	Yes		56%	
WA Coast Fall Naturals	Hoko	Hoko (HOK)	Not calculated			
	Grays Harbor	Queets (QUE)	Yes	Yes	63%	
	Queets	Queets (QUE)	Yes		63%	
	Hoh	Queets (QUE)	Yes	Yes	63%	
	Quillayute	Queets (QUE)	Yes	Yes	63%	
Col River Falls	Upriver Brights	Upriver Bright (URB)	Yes		94%	
	Lewis	Lewis River Wild (LRW)	Yes		56%	
	Deschutes	Upriver Bright (URB)	Yes	Yes	94%	
Col River Summers	Mid-Columbia Summers	Columbia Summers (SUM)	Yes		56%	
N Oregon Coastal Falls	Nehalem	Salmon River Hatchery (SRH)	Yes	Yes	81%	
	Siletz	Salmon River Hatchery (SRH)	yes	Yes	81%	
	Siuslaw	Salmon River Hatchery (SRH)	Yes	Yes	81%	

Table 2. Fisheries included or not included in the postseason ISBM index by country

Fisheries Included in ISBM Index	
United States	Canada
Washington/Oregon Ocean Troll	Central BC Troll
Puget Sound Northern Net	Strait of Georgia Troll
Puget Sound Southern Net	North BC Net
Washington Coastal Net	Central BC Net
Freshwater Terminal Net	West Coast Vancouver Island Net
Washington/Oregon Ocean Sport	Strait of Juan de Fuca Net
Puget Sound Northern Sport	Johnstone Strait Net
Puget Sound Southern Sport	Fraser Net
Freshwater Terminal Sport	Freshwater BC Net
	Strait of Georgia Sport
	Strait of Juan de Fuca Sport
	Freshwater BC Sport
Fisheries **Not** Included in ISBM Index	
United States	Canada
Alaska Troll	NBC Troll
Alaska Net	WCVI Troll
Alaska Transboundary Net	NBC Terminal Net
Alaska Sport	WCVI Terminal Net
Alaska Transboundary Sport	NBC AABM Sport
	NBC ISBM Sport
	CBC Sport
	WCVI AABM Sport
	WCVI ISBM Sport
	WCVI Terminal Sport
	CBC Terminal Sport

2.3 PROGRAMS

2.3.1 Postseason ISBM Index

The postseason ISBM index is calculated using a VB.NET program. Names and descriptions of the postseason ISBM programs that were developed for this report are found in Table 3. The first version of the program developed was the annual update to the code, which began with the 2016ERA's version of the postseason ISBM program (CompISBMCWT80Fishery14Nov2016.exe).

Table 3. Description of the postseason ISBM program versions

Version	Name	Description
1	CompISBMCWT 10Aug2017 V1.exe	Annual update to the program that updates default values
2	CompISBMCWT 10Aug2017 V2.exe	Fixes the wrong cohort size being referenced issue (Assumption 1)
3	CompISBMCWT 14Aug2017 V3c.exe	Fixes the terminal run being defined as terminal catch issue (Assumption 2)
4	CompISBMCWT 14Aug2017 V4c.exe	Adds capability to select range of ages

The second version of the program fixes the issue in which the wrong cohort size was referenced. The CTC recognizes three types of cohorts: ocean (or pre-terminal), terminal, or ocean net (hybrid pre-terminal and terminal). Prior to the 2011 ERA (circa the 2013 CTC reports), this issue would not have been present because the postseason ISBM program did not combine multiple fisheries and therefore need to select the correct type of cohort. Post the 2011 ERA, fisheries were redefined such that multiple fisheries had to be combined and the type of cohort had to be associated with each fishery grouping. The second version now recognizes the three types of cohorts per CTC methods. The outcome of this modification is expected to be minimal for stocks that have limited to no harvest in ocean net fisheries or if the ocean net fishery is considered terminal for that stock (e.g. WA Coast Net is considered terminal for WA Coast stocks and Fraser Net is considered terminal for Harrison).

The third version of the program fixes the issue that terminal run was defined as terminal harvest instead of, properly being defined as terminal harvest plus escapement. It is unclear how long this issue has existed because documentation on the original postseason ISBM program is sparse, amounting to a rough description of how external harvest rates are applied to preseason ISBM index calculations. The outcome of this modification is expected to improve ISBM calculations for stocks that reference external harvest rates. Additionally, version 3 of the program also fixes another issue that was discovered while the fix for version 3 was being made: base-period exploitation rates were not correctly calculated when 1) base period data was incomplete and 2) external harvest rates were being specified. Versions 1 and 2 of the

program computed the denominator for Eq. 5a from the HRJ files, but if external harvest rates were specified, the program computed the denominator for Eq. 5a a second time, but it did this using the external harvest rate file when computing the denominator for Eq. 5c. The issue was that the denominators in Eq. 5a and Eq. 5c do not have to be the same. Version 3 of the program fixed this issue by calculating the denominators of Eq. 5a and Eq. 5c separately.

The fourth version of the program adds in the flexibility of selecting different start and end ages into the program. A description of how to use this program can be found in Appendix D.

Versions 1-4 incrementally fix individual problems and add functionality. In all cases, updated mappings file (Appendix B) and revised HRT files (Appendix C) were used for the computations. The time series of ISBM indices in Version 3 (V3) would be the most relevant for our annual assessment because these series show the correction inclusive of ages 2-5. These corrections include: new mapping file, updated HRT file usage (NOC streams HRTs were revised), correction for the ocean net issue, and correction for the terminal run issue described above.

NOTE: Input files used for ISBM program testing may not be final for some stocks because some ERA updates took place after the completion of this work; therefore, ISBM data reported in this document are intended only to show the relative magnitude of changes in the ISBM time series as corrections and changes to range of ages and base period years take place. ISBM indices produced during this testing phase, including those from Version 3, should not be considered 'final'. Final ISBM indices will be reported in upcoming Calibration and Exploitation rate Reports and based on updated information and the application of the corrected and enhanced ISBM program.

2.3.2 Mortality Distribution Table (CYER) Program

The CYER values are calculated using a VB.NET program. A description of how to use this program can be found in Appendix E. The CYER program was modified for this report to allow users to select certain ranges of age-specific data. The latest version of the CYER program is V1.5.04 and the program's name is DistributionTables_V1.5.04 21Aug2017.exe.

3. RESULTS

3.1 POSTSEASON ISBM INDEX RESULTS

This section summarizes the ISBM indices for the 4 Canadian stocks and the 14 U.S. stocks for which ISBM calculations are annually reported, illustrating the changes in time series from program version 1 (V1) to program version 4 (V4a) (Tables 4-21). Ages 3-5 (as opposed to 2-5 in the original computations) were used to test the performance of V4a. In addition, base-period years 90-93 were used to test the response of the ISBM indices to a different base period (V4b); noting that Eq. 5b – use of the Chinook Model base period exploitation rates – was not used in any of these computations. The 90-93 results presented as V4b in tables demonstrate the program's capability to use a different set of base-period years in the calculations although these years are different than the agreed base period years.

Testing the response of the ISBM program CompISBMCWT80Fishery14Nov2016.exe to changes in the base period years showed that this capability of the GUI is successfully implemented in the ISBM calculations for all cases: (1) stocks that do not require STK data; (2) stocks requiring STK data; and, (3) stocks requiring both STK and HRT data. The successful implementation of alternative base period years was tracked in the csv files the program produces documenting each of the steps involved in the ISBM calculations.

3.1.1 Canadian Stocks

Table 4. Time series of Cowichan Chinook ISBM Index produced with the four versions of the program and testing the base-period change capability of version V4a (V4b).

	COW_GST (Canada)				
Catch Year	V1	V2	V3	V4a (3-5)	V4b (90-93)
1985	0.000	0.000			
1986	0.000	0.000			
1987	0.380	0.380	0.386		0.766
1988	0.755	0.755	0.753	0.753	0.861
1989	0.467	0.480	0.487	1.216	0.831
1990	0.600	0.600	0.600	0.761	0.962
1991	0.698	0.711	0.699	0.929	0.961
1992	0.746	0.769	0.758	0.921	0.967
1993	0.968	1.020	0.986	1.066	1.099
1994	0.561	0.584	0.567	0.716	0.751
1995	0.570	0.585	0.546	0.633	0.684
1996	0.738	0.762	0.724	0.901	0.943
1997	0.419	0.425	0.381	0.440	0.498
1998	0.389	0.406	0.429	0.469	0.549
1999	0.483	0.492	0.475	0.631	0.665
2000	0.263	0.265	0.250	0.310	0.331
2001	0.347	0.355	0.376	0.477	0.479
2002	0.473	0.480	0.537	0.641	0.636
2003	0.351	0.365	0.386	0.541	0.483
2004	0.239	0.251	0.265	0.233	0.309
2005	0.107	0.115	0.184	0.209	0.220
2006	0.208	0.221	0.275	0.275	0.284
2007	0.249	0.255	0.271	0.057	0.436
2008	0.341	0.341	0.372	0.438	0.523
2009	0.424	0.426	0.461	0.595	0.754
2010	0.350	0.350	0.372	0.553	0.582
2011	0.168	0.170	0.182	0.200	0.253
2012	0.317	0.326	0.412	0.515	0.542
2013	0.376	0.380	0.375	0.471	0.515
2014	0.436	0.445	0.436	0.519	0.547
2015	0.263	0.275	0.269	0.293	0.302
2016	0.313	0.324	0.319	0.695	0.502

Table 5. Time series of Harrison Chinook ISBM Index produced with the four versions of the program and testing the base-period change capability of version V4a (V4b).

	Harrison_CHI_FRL (Canada)						Harrison_CHI_FRL (US)				
Catch Year	V1	V2	V3	V4a (3-5)	V4b (90-93)		V1	V2	V3	V4a (3-5)	V4b (90-93)
1985	0.531	0.537	0.539	0.603	1.706		0.513	0.525	0.525	1.010	0.849
1986	0.457	0.458	0.472	0.542	1.264		0.363	0.364	0.364	0.654	0.720
1987	0.473	0.474	0.478	0.494	1.245		0.445	0.448	0.448	0.476	0.602
1988	0.443	0.447	0.839	0.898	3.170		0.716	0.736	0.736	1.067	0.908
1989	0.404	0.404	0.404	0.404	1.119		0.418	0.419	0.419	0.561	0.735
1990	0.296	0.296	0.296	0.346	0.906		0.516	0.518	0.518	0.670	1.215
1991	0.333	0.334	0.335	0.343	0.866		0.673	0.674	0.674	0.850	1.196
1992	0.328	0.329	0.328	0.323	0.984		0.826	0.835	0.835	0.980	1.048
1993	0.298	0.299	0.300	0.305	0.997		0.714	0.722	0.722	0.873	0.789
1994	0.201	0.202	0.206	0.190	0.703		0.262	0.263	0.263	0.405	0.574
1995	0.136	0.136	0.161	0.159	0.582		0.214	0.214	0.214	0.283	0.376
1996	0.256	0.256	0.279	0.279	0.888		0.232	0.232	0.232	0.504	0.486
1997	0.186	0.186	0.207	0.207	0.579		0.378	0.380	0.380	0.469	0.569
1998	0.054	0.054	0.057	0.066	0.213		0.161	0.162	0.162	0.387	0.277
1999	0.131	0.131	0.137	0.137	0.418		0.660	0.662	0.662	0.767	0.939
2000	0.053	0.053	0.066	0.083	0.275		0.209	0.210	0.210	0.539	0.347
2001	0.124	0.124	0.123	0.126	0.393		0.384	0.384	0.384	0.709	0.774
2002	0.048	0.049	0.054	0.058	0.167		0.368	0.369	0.369	0.574	0.606
2003	0.035	0.035	0.038	0.040	0.114		0.346	0.348	0.348	0.523	0.511
2004	0.035	0.035	0.053	0.056	0.185		0.470	0.473	0.473	0.642	0.619
2005	0.055	0.055	0.085	0.090	0.300		0.358	0.360	0.360	0.421	0.467
2006	0.043	0.043	0.076	0.074	0.278		0.396	0.398	0.398	0.482	0.457
2007	0.022	0.022	0.037	0.048	0.180		0.147	0.147	0.147	0.398	0.321
2008	0.033	0.033	0.053	0.053	0.170		0.467	0.467	0.467	0.540	0.691
2009	0.049	0.049	0.060	0.082	0.254		0.134	0.134	0.134	0.461	0.306
2010	0.078	0.078	0.107	0.112	0.372		0.295	0.295	0.295	0.398	0.479
2011	0.052	0.052	0.091	0.100	0.347		0.285	0.285	0.285	0.428	0.427
2012	0.127	0.128	0.132	0.142	0.473		0.351	0.351	0.351	0.805	0.770
2013	0.132	0.132	0.149	0.156	0.517		0.440	0.441	0.441	0.668	0.749
2014	0.175	0.175	0.274	0.286	0.963		0.378	0.379	0.379	0.517	0.548
2015	0.155	0.156	0.168	0.175	0.564		0.254	0.255	0.255	0.373	0.363
2016	0.169	0.169	0.167	0.176	0.633		0.211	0.212	0.212	0.357	0.332

Table 6. Time series of Quinsam Chinook ISBM Index produced with the four versions of the program and testing the base-period change capability of version V4a (V4b).

Catch Year	QUI_GSQ (Canada)				
	V1	V2	V3	V4a (3-5)	V4b (90-93)
1985	0.691	0.647	0.647	0.593	0.887
1986	0.925	0.896	0.896	0.881	1.248
1987	0.889	0.763	0.763	0.754	0.812
1988	0.429	0.362	0.362	0.356	0.521
1989	0.699	0.600	0.600	0.611	0.836
1990	0.859	0.670	0.670	0.661	0.913
1991	1.017	0.853	0.853	0.859	1.086
1992	0.828	0.706	0.706	0.733	1.081
1993	1.138	0.969	0.969	0.965	1.183
1994	0.646	0.483	0.483	0.513	0.607
1995	0.773	0.603	0.603	0.485	0.819
1996	0.643	0.444	0.444	0.509	0.538
1997	0.495	0.359	0.359	0.407	0.440
1998	0.213	0.156	0.156	0.193	0.206
1999	0.364	0.240	0.240	0.287	0.304
2000	0.141	0.100	0.100	0.112	0.123
2001	0.079	0.052	0.052	0.055	0.075
2002	0.158	0.122	0.122	0.132	0.180
2003	0.080	0.072	0.072	0.089	0.092
2004	0.152	0.114	0.114	0.118	0.147
2005	0.276	0.209	0.209	0.232	0.284
2006	0.167	0.118	0.118	0.128	0.167
2007	0.242	0.182	0.182	0.201	0.252
2008	0.123	0.086	0.086	0.089	0.109
2009	0.255	0.200	0.200	0.266	0.298
2010	0.488	0.367	0.367	0.412	0.415
2011	0.129	0.091	0.091	0.100	0.120
2012	0.177	0.139	0.139	0.150	0.199
2013	0.104	0.069	0.069	0.079	0.098
2014	0.057	0.046	0.046	0.063	0.061
2015	0.236	0.187	0.187	0.251	0.211
2016	0.292	0.206	0.206	0.247	0.262

Table 7. Time series of WCVI Chinook ISBM Index produced with the four versions of the program and testing the base-period change capability of version V4a (V4b).

Catch Year	WCVI_RBT (Canada)				
	V1	V2	V3	V4a (3-5)	V4b (90-93)
1985	1.236	0.961	0.961	0.960	1.722
1986	1.236	1.085	1.085	1.300	2.330
1987	0.983	0.895	0.895	0.950	1.584
1988	0.545	0.507	0.507	0.529	1.083
1989	0.673	0.625	0.625	0.676	1.338
1990	0.457	0.422	0.422	0.422	0.859
1991	0.731	0.646	0.646	0.671	1.229
1992	0.415	0.392	0.392	0.401	0.803
1993	0.708	0.624	0.624	0.630	1.195
1994	0.835	0.709	0.709	0.709	1.305
1995	0.454	0.334	0.334	0.341	0.613
1996	0.146	0.146	0.146	0.182	0.262
1997	0.715	0.629	0.629	0.634	1.163
1998	0.805	0.604	0.604	0.606	1.072
1999	0.928	0.707	0.707	0.709	1.251
2000	0.128	0.126	0.126	0.139	0.314
2001	0.106	0.100	0.100	0.128	0.176
2002	0.473	0.396	0.396	0.427	0.796
2003	0.523	0.459	0.459	0.502	0.851
2004	0.742	0.558	0.558	0.575	0.896
2005	0.358	0.287	0.287	0.302	0.547
2006	0.569	0.433	0.433	0.437	0.732
2007	0.618	0.493	0.493	0.509	0.918
2008	0.695	0.523	0.523	0.540	0.792
2009	0.617	0.489	0.489	0.545	0.953
2010	0.226	0.207	0.207	0.218	0.390
2011	0.800	0.635	0.635	0.645	1.124
2012	0.830	0.619	0.619	0.672	1.138
2013	0.389	0.328	0.328	0.333	0.546
2014	0.359	0.290	0.290	0.345	0.582
2015	0.747	0.653	0.653	0.719	0.975
2016	0.449	0.392	0.392	0.444	0.747

3.1.2 U.S. Stocks

Table 8. Time series of Green River Chinook ISBM Index produced with the four versions of the program and testing the base-period change capability of version V4a (V4b).

Catch Year	GRN_SPS (US)						GRN_SPS (Canada)				
	V1	V2	V3	V4a (3-5)	V4b (90-93)		V1	V2	V3	V4a (3-5)	V4b (90-93)
1985	1.277	1.277	1.277	1.309	1.060		0.723	0.713	0.713	0.685	2.089
1986	0.954	0.954	0.954	1.005	0.997		0.909	0.907	0.907	0.831	2.435
1987	0.459	0.459	0.459	0.625	0.680		0.729	0.727	0.727	0.808	1.815
1988	0.577	0.577	0.577	0.612	0.923		0.769	0.769	0.769	0.660	1.881
1989	0.884	0.884	0.884	0.914	0.991		0.431	0.429	0.429	0.410	1.350
1990	1.131	1.131	1.131	1.207	0.961		0.412	0.409	0.409	0.371	1.201
1991	1.078	1.078	1.078	1.146	0.954		0.177	0.176	0.176	0.184	0.522
1992	1.054	1.054	1.054	1.353	1.139		0.531	0.529	0.529	0.498	1.408
1993	0.865	0.865	0.865	0.928	0.987		0.385	0.384	0.384	0.381	1.184
1994	0.411	0.411	0.411	0.553	0.493		0.537	0.529	0.529	0.470	1.343
1995	0.325	0.325	0.325	0.325	0.456		0.243	0.243	0.243	0.177	0.693
1996	0.452	0.452	0.452	0.465	0.524		0.377	0.371	0.371	0.369	1.104
1997	0.366	0.366	0.366	0.367	0.350		0.176	0.172	0.172	0.169	0.503
1998	0.258	0.258	0.258	0.288	0.290		0.116	0.113	0.113	0.125	0.299
1999	0.276	0.276	0.276	0.294	0.358		0.186	0.185	0.185	0.186	0.555
2000	0.322	0.322	0.322	0.378	0.402		0.111	0.109	0.109	0.118	0.285
2001	0.460	0.460	0.460	0.473	0.583		0.189	0.188	0.188	0.178	0.566
2002	0.542	0.542	0.542	0.582	0.546		0.302	0.298	0.298	0.316	0.868
2003	0.581	0.581	0.581	0.622	0.564		0.226	0.223	0.223	0.234	0.660
2004	0.720	0.720	0.720	0.886	0.763		0.198	0.197	0.197	0.199	0.544
2005	0.353	0.353	0.353	0.405	0.427		0.275	0.274	0.274	0.288	0.794
2006	0.518	0.518	0.518	0.602	0.603		0.187	0.185	0.185	0.195	0.535
2007	0.656	0.656	0.656	0.755	0.802		0.143	0.142	0.142	0.148	0.397
2008	0.536	0.536	0.536	0.609	0.679		0.160	0.158	0.158	0.166	0.472
2009	0.483	0.483	0.483	0.621	0.578		0.275	0.270	0.270	0.289	0.726
2010	0.285	0.285	0.285	0.288	0.352		0.132	0.130	0.130	0.134	0.399
2011	0.408	0.408	0.408	0.526	0.465		0.266	0.261	0.261	0.280	0.693
2012	0.514	0.514	0.514	0.513	0.649		0.301	0.300	0.300	0.300	0.918
2013	0.299	0.299	0.299	0.368	0.351		0.283	0.277	0.277	0.312	0.758
2014	0.400	0.400	0.400	0.409	0.485		0.407	0.406	0.406	0.417	1.243
2015	0.598	0.598	0.598	0.773	0.721		0.974	0.970	0.970	1.093	2.612
2016											

Table 9. Time series of Nooksack Chinook ISBM Index produced with the four versions of the program and testing the base-period change capability of version V4a (V4b).

Catch Year	Nooksack_NSF_NKS (US)						Nooksack_NSF_NKS (Canada)				
	V1	V2	V3	V4a (3-5)	V4b (90-93)		V1	V2	V3	V4a (3-5)	V4b (90-93)
1985											
1986											
1987											
1988											
1989											
1990					0.880		0.041	0.041	0.041		0.564
1991	0.928	0.928	0.928	0.361	1.148		0.125	0.125	0.125	0.168	1.241
1992	1.046	1.046	1.046	1.046	1.408		0.143	0.143	0.143	0.143	0.892
1993	1.667	1.667	1.667	1.667	0.828		0.475	0.475	0.475	0.475	2.000
1994	0.574	0.574	0.574		1.052		0.093	0.093	0.093	0.000	1.423
1995	0.780	0.780	0.780	1.507	1.192		0.142	0.142	0.142	0.081	1.378
1996	0.602	0.602	0.602	0.688	0.852		0.113	0.113	0.113	0.169	0.931
1997	0.941	0.941	0.941	0.930	1.248		0.108	0.108	0.108	0.109	0.659
1998	0.238	0.238	0.238	0.480	0.186		0.049	0.049	0.049	0.120	0.406
1999	0.257	0.257	0.257	0.245	0.418		0.034	0.034	0.034	0.037	0.271
2000	0.117	0.117	0.117	0.108	0.105		0.089	0.089	0.089	0.130	0.650
2001	0.328	0.328	0.328	0.461	0.446		0.042	0.042	0.042	0.047	0.291
2002	0.225	0.225	0.225	0.287	0.250		0.020	0.02	0.020	0.022	0.124
2003	0.443	0.443	0.443	0.591	0.552		0.060	0.06	0.060	0.104	0.531
2004	0.434	0.434	0.434	0.537	0.625		0.059	0.059	0.059	0.065	0.407
2005	0.476	0.476	0.476	0.431	0.411		0.109	0.109	0.109	0.134	0.723
2006	0.812	0.812	0.812	1.169	1.029		0.068	0.068	0.068	0.058	0.509
2007	0.935	0.935	0.935	0.985	0.854		0.060	0.06	0.060	0.098	0.543
2008	1.482	1.482	1.482	1.446	2.028		0.122	0.122	0.122	0.135	0.828
2009	0.585	0.585	0.585	1.027	0.738		0.148	0.148	0.148	0.138	1.149
2010	0.758	0.758	0.758	0.885	1.122		0.029	0.029	0.029	0.032	0.199
2011	0.890	0.890	0.890	1.274	1.020		0.135	0.135	0.135	0.158	0.993
2012	1.866	1.866	1.866	2.317	1.995		0.057	0.057	0.057	0.073	0.472
2013	0.872	0.872	0.872	1.551	1.230		0.059	0.059	0.059	0.083	0.501
2014	1.298	1.298	1.298	1.512	1.585		0.084	0.084	0.084	0.104	0.626
2015	0.547	0.547	0.547	0.721	0.683		0.059	0.059	0.059	0.085	0.447
2016											

Table 10. Time series of Stillaguamish Chinook ISBM Index produced with the four versions of the program and testing the base-period change capability of version V4a (V4b).

Catch Year	STL (US)						STL (Canada)				
	V1	V2	V3	V4a (3-5)	V4b (90-93)		V1	V2	V3	V4a (3-5)	V4b (90-93)
1985	0.447	0.447	0.447	1.102	0.860		0.475	0.475	0.475	0.470	1.740
1986	3.035	3.035	3.035	3.035	1.399		0.749	0.749	0.749	0.749	2.078
1987	2.110	2.110	2.110	2.110	1.421		2.334	2.334	2.334	2.334	2.801
1988	0.437	0.437	0.437		1.253		0.528	0.528	0.528		2.047
1989	0.274	0.274	0.274	2.649	0.717		0.408	0.408	0.408	0.610	1.588
1990	0.446	0.446	0.446	0.783	0.568		0.350	0.35	0.350	0.334	1.294
1991	0.396	0.396	0.396	0.556	0.570		0.215	0.215	0.215	0.220	0.523
1992	0.666	0.666	0.666	2.275	1.514		0.240	0.240	0.240	0.185	0.860
1993	1.130	1.130	1.130	1.618	1.135		0.337	0.337	0.337	0.353	1.175
1994	0.200	0.200	0.200	0.397	0.267		0.428	0.428	0.428	0.532	0.973
1995	0.224	0.224	0.224	0.687	0.511		0.360	0.360	0.360	0.199	1.293
1996	0.273	0.273	0.273	0.866	0.540		0.304	0.304	0.304	0.321	1.110
1997	0.613	0.613	0.613	0.749	0.492		0.131	0.131	0.131	0.134	0.400
1998	0.069	0.069	0.069	0.124	0.115		0.104	0.104	0.104	0.143	0.238
1999	0.107	0.107	0.107	0.173	0.130		0.135	0.135	0.135	0.146	0.505
2000	0.074	0.074	0.074	0.123	0.090		0.088	0.088	0.088	0.115	0.188
2001	0.612	0.612	0.612	0.612	0.516		0.124	0.124	0.124	0.124	0.384
2002	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000
2003	0.000	0.000	0.000	0.000	0.000						
2004	0.047	0.047	0.047		0.129		0.079	0.079	0.079		0.306
2005	0.240	0.240	0.240	0.441	0.358		0.068	0.068	0.068	0.075	0.266
2006	0.132	0.132	0.132	0.282	0.173		0.135	0.135	0.135	0.160	0.343
2007	0.133	0.133	0.133	0.553	0.300		0.252	0.252	0.252	0.221	0.866
2008	0.411	0.411	0.411	0.562	0.477		0.121	0.121	0.121	0.127	0.422
2009	0.219	0.219	0.219	0.693	0.395		0.220	0.220	0.220	0.250	0.563
2010	0.198	0.198	0.198	0.556	0.373		0.147	0.147	0.147	0.147	0.531
2011	0.218	0.218	0.218	0.361	0.249		0.210	0.210	0.210	0.241	0.610
2012	0.170	0.170	0.170	0.261	0.194		0.257	0.257	0.257	0.301	0.629
2013	0.299	0.299	0.299	1.294	0.672		0.200	0.200	0.200	0.196	0.670
2014	1.211	1.211	1.211	2.280	1.375		0.588	0.588	0.588	0.585	2.012
2015	0.765	0.765	0.765	1.433	0.789		0.682	0.682	0.682	0.809	1.809
2016											

Table 11. Time series of Grays Harbor Chinook ISBM Index produced with the four versions of the program and testing the base-period change capability of version V4a (V4b).

Catch Year	Grays_QUE (US)				
	V1	V2	V3	V4a (3-5)	V4b (90-93)
1985	0.348	0.348	0.243	0.223	0.221
1986	0.598	0.598	0.765	0.765	0.687
1987	0.971	0.971	0.925	0.934	0.800
1988	0.982	0.982	0.691	0.709	0.610
1989	1.141	1.141	1.157	1.162	1.024
1990	1.157	1.157	1.230	1.234	1.053
1991	1.196	1.196	1.215	1.226	1.043
1992	0.789	0.789	0.899	0.924	0.808
1993	1.454	1.454	1.286	1.293	1.124
1994	1.032	1.032	1.070	1.074	0.910
1995	1.200	1.200	1.218	1.231	1.047
1996	0.663	0.663	0.761	0.765	0.666
1997	0.820	0.820	0.846	0.850	0.723
1998	0.815	0.815	0.772	0.777	0.659
1999	0.301	0.301	0.332	0.338	0.288
2000	0.261	0.261	0.796	0.818	0.710
2001	0.990	0.990	1.090	1.119	0.975
2002	0.516	0.516	0.534	0.539	0.464
2003	0.269	0.269	0.229	0.232	0.197
2004	0.504	0.504	0.518	0.519	0.444
2005	0.299	0.299	0.270	0.270	0.230
2006	0.535	0.535	0.514	0.520	0.442
2007	0.815	0.815	0.651	0.665	0.590
2008	0.285	0.285	0.311	0.316	0.274
2009	0.636	0.636	0.692	0.705	0.605
2010	0.624	0.624	0.619	0.627	0.540
2011	0.732	0.732	0.740	0.744	0.639
2012	0.964	0.964	0.939	0.949	0.812
2013	0.813	0.813	0.771	0.777	0.670
2014	0.833	0.833	0.760	0.762	0.652
2015	1.090	1.090	0.895	0.895	0.765
2016					

Table 12. Time series of Hoh River Chinook ISBM Index produced with the four versions of the program and testing the base-period change capability of version V4a (V4b).

Catch Year	Hoh_QUE (US)				
	V1	V2	V3	V4a (3-5)	V4b (90-93)
1985	1.460	1.460	1.559	1.696	1.267
1986	0.405	0.405	0.665	0.665	0.529
1987	1.648	1.648	1.609	1.669	1.191
1988	2.062	2.062	1.839	1.931	1.415
1989	1.607	1.607	1.737	1.758	1.340
1990	1.286	1.286	1.452	1.460	1.051
1991	1.874	1.874	2.033	2.074	1.480
1992	0.704	0.704	0.888	0.939	0.708
1993	1.435	1.435	1.092	1.105	0.825
1994	0.336	0.336	0.363	0.366	0.260
1995	1.064	1.064	1.086	1.113	0.794
1996	0.813	0.813	1.069	1.081	0.809
1997	1.680	1.680	1.818	1.835	1.314
1998	1.050	1.050	0.952	0.961	0.687
1999	1.052	1.052	1.487	1.534	1.110
2000	0.310	0.310	1.344	1.417	1.056
2001	1.276	1.276	1.546	1.625	1.220
2002	0.891	0.891	0.974	0.990	0.726
2003	1.188	1.188	1.306	1.329	0.955
2004	1.073	1.073	1.194	1.197	0.868
2005	1.002	1.002	0.973	0.977	0.697
2006	1.438	1.438	1.508	1.540	1.101
2007	1.635	1.635	1.588	1.688	1.284
2008	0.816	0.816	0.956	0.983	0.732
2009	0.867	0.867	1.011	1.049	0.763
2010	0.806	0.806	0.828	0.848	0.621
2011	1.657	1.657	1.754	1.773	1.292
2012	1.581	1.581	1.590	1.627	1.178
2013	2.523	2.523	2.598	2.633	1.935
2014	1.361	1.361	1.254	1.263	0.911
2015	1.663	1.663	1.359	1.359	0.981
2016					

Table 13. Time series of Queets River Chinook ISBM Index produced with the four versions of the program and testing the base-period change capability of version V4a (V4b).

Catch Year	Queets_QUE (US)				
	V1	V2	V3	V4a (3-5)	V4b (90-93)
1985	0.670	0.670	0.670	0.678	1.775
1986	0.276	0.276	0.276	0.276	0.506
1987	1.026	1.026	1.026	1.036	2.979
1988	0.547	0.547	0.547	0.555	1.219
1989	0.507	0.507	0.507	0.506	0.953
1990	0.278	0.278	0.278	0.279	0.691
1991	0.339	0.339	0.339	0.336	0.900
1992	0.553	0.553	0.553	0.571	1.375
1993	0.408	0.408	0.408	0.410	1.030
1994	0.381	0.381	0.381	0.383	1.056
1995	0.438	0.438	0.438	0.443	1.165
1996	0.350	0.350	0.350	0.352	0.791
1997	0.451	0.451	0.451	0.453	1.272
1998	0.256	0.256	0.256	0.248	0.676
1999	0.180	0.180	0.180	0.184	0.457
2000	0.052	0.052	0.052	0.053	0.118
2001	0.459	0.459	0.459	0.471	1.183
2002	0.524	0.524	0.524	0.528	1.283
2003	0.275	0.275	0.275	0.277	0.712
2004	0.256	0.256	0.256	0.256	0.612
2005	0.421	0.421	0.421	0.422	1.190
2006	0.465	0.465	0.465	0.470	1.233
2007	0.684	0.684	0.684	0.699	1.660
2008	0.544	0.544	0.544	0.552	1.327
2009	0.545	0.545	0.545	0.555	1.326
2010	0.522	0.522	0.522	0.529	1.255
2011	0.530	0.530	0.530	0.532	1.211
2012	0.801	0.801	0.801	0.809	2.075
2013	0.706	0.706	0.706	0.711	1.614
2014	0.437	0.437	0.437	0.437	1.199
2015	0.427	0.427	0.427	0.427	1.064
2016					

Table 14. Time series of Quillayute Chinook ISBM Index produced with the four versions of the program and testing the base-period change capability of version V4a (V4b).

Catch Year	Quillayute_QUE (US)				
	V1	V2	V3	V4a (3-5)	V4b (90-93)
1985	1.165	1.165	1.112	1.112	1.823
1986	0.586	0.586	0.941	0.941	1.510
1987	1.739	1.739	1.696	1.696	2.554
1988	1.675	1.675	1.408	1.408	2.212
1989	1.572	1.572	1.696	1.696	2.679
1990	0.702	0.702	0.778	0.778	1.163
1991	0.773	0.773	0.739	0.739	1.107
1992	0.596	0.596	0.691	0.691	1.108
1993	0.964	0.964	0.471	0.471	0.719
1994	0.508	0.508	0.551	0.551	0.811
1995	0.778	0.778	0.744	0.744	1.120
1996	0.691	0.691	0.839	0.839	1.301
1997	0.422	0.422	0.438	0.438	0.650
1998	0.772	0.772	0.641	0.641	0.951
1999	0.918	0.918	1.206	1.206	1.855
2000	0.153	0.153	0.844	0.844	1.353
2001	1.037	1.037	1.235	1.235	1.975
2002	1.313	1.313	1.448	1.448	2.203
2003	0.868	0.868	0.908	0.908	1.364
2004	1.378	1.378	1.539	1.539	2.301
2005	1.002	1.002	0.973	0.973	1.443
2006	1.049	1.049	1.091	1.091	1.634
2007	1.280	1.280	1.136	1.136	1.843
2008	1.027	1.027	1.205	1.205	1.883
2009	1.596	1.596	1.835	1.835	2.826
2010	1.273	1.273	1.361	1.361	2.090
2011	1.603	1.603	1.692	1.692	2.572
2012	1.941	1.941	1.957	1.957	2.966
2013	1.748	1.748	1.762	1.762	2.687
2014	2.608	2.608	2.597	2.597	3.891
2015	2.314	2.314	2.094	2.094	3.096
2016					

Table 15. Time series of Deschutes River Chinook ISBM Index produced with the four versions of the program and testing the base-period change capability of version V4a (V4b).

Catch Year	Deschutes_URB (US)				
	V1	V2	V3	V4a (3-5)	V4b (90-93)
1985	0.947	0.947	0.969	0.956	1.332
1986	1.098	1.098	1.114	1.092	1.560
1987	1.163	1.163	1.189	1.190	1.620
1988	1.311	1.311	1.305	1.303	1.737
1989	1.183	1.183	1.185	1.186	1.569
1990	1.289	1.289	1.247	1.257	1.653
1991	0.671	0.671	0.724	0.731	1.004
1992	0.393	0.393	0.447	0.441	0.637
1993	0.556	0.556	0.512	0.514	0.718
1994	0.219	0.219	0.265	0.265	0.350
1995	0.368	0.368	0.282	0.294	0.387
1996	0.348	0.348	0.360	0.363	0.502
1997	0.396	0.396	0.388	0.391	0.521
1998	0.263	0.263	0.330	0.329	0.471
1999	0.435	0.435	0.453	0.454	0.604
2000	0.550	0.550	0.569	0.573	0.783
2001	0.478	0.478	0.417	0.416	0.584
2002	0.621	0.621	0.590	0.590	0.814
2003	0.489	0.489	0.495	0.497	0.666
2004	0.675	0.675	0.631	0.630	0.877
2005	0.687	0.687	0.637	0.635	0.845
2006	0.616	0.616	0.553	0.555	0.739
2007	0.663	0.663	0.599	0.567	0.821
2008	0.651	0.651	0.652	0.650	0.921
2009	0.890	0.890	0.821	0.796	1.119
2010	0.830	0.830	0.696	0.700	0.985
2011	0.804	0.804	0.768	0.778	1.046
2012	0.805	0.805	0.775	0.791	1.110
2013	0.849	0.849	0.796	0.794	1.107
2014	0.799	0.799	0.758	0.760	1.028
2015	0.724	0.724	0.685	0.686	0.944
2016					

Table 16. Time series of Lewis River Chinook ISBM Index produced with the four versions of the program and testing the base-period change capability of version V4a (V4b).

Catch Year	LRW (US)				
	V1	V2	V3	V4a (3-5)	V4b (90-93)
1985	0.823	0.823	0.823	0.872	1.337
1986	1.147	1.146	1.146	1.272	1.439
1987	1.026	1.029	1.029	1.307	1.405
1988	1.188	1.197	1.197	1.508	1.765
1989	0.668	0.671	0.671	0.763	0.946
1990	0.461	0.464	0.464	0.542	0.628
1991	0.889	0.890	0.890	0.878	1.334
1992	0.941	0.948	0.948	0.807	1.282
1993	0.506	0.507	0.507	0.524	1.004
1994	0.059	0.059	0.059	0.069	0.071
1995	0.832	0.835	0.835	0.845	1.215
1996	0.257	0.258	0.258	0.271	0.401
1997	0.108	0.108	0.108	0.108	0.159
1998	0.147	0.148	0.148	0.154	0.216
1999	0.045	0.045	0.045	0.000	0.120
2000	0.334	0.333	0.333	0.283	0.534
2001	0.330	0.333	0.333	0.563	0.505
2002	0.311	0.312	0.312	0.303	0.669
2003	0.503	0.533	0.533	0.563	0.596
2004	0.183	0.183	0.183	0.187	0.319
2005	0.730	0.745	0.745	0.762	1.029
2006	1.287	1.288	1.288	1.299	1.794
2007	0.659	0.663	0.663	0.715	1.187
2008	0.552	0.551	0.551	0.610	0.865
2009	0.213	0.217	0.217	0.246	0.274
2010	0.554	0.554	0.554	0.621	0.909
2011	1.356	1.374	1.374	1.448	1.635
2012	0.866	0.870	0.870	0.750	1.347
2013	1.108	1.106	1.106	1.106	1.681
2014	0.775	0.793	0.793	0.846	0.863
2015	0.472	0.472	0.472	0.484	0.864
2016					

Table 17. Time series of Columbia River Summer Chinook ISBM Index produced with the four versions of the program and testing the base-period change capability of version V4a (V4b).

Catch Year	SUM (US) V1	V2	V3	V4a (3-5)	V4b (90-93)
1985	10.222	10.222	10.222		
1986	3.450	3.450	3.450	3.450	2.856
1987	5.932	5.932	5.932	5.033	3.215
1988	3.050	3.053	3.053	3.002	1.777
1989	4.250	4.248	4.248	4.149	1.755
1990	5.521	5.535	5.535	5.535	1.558
1991	3.335	3.331	3.331	3.480	0.871
1992	2.792	2.804	2.804	2.914	0.689
1993	7.236	7.373	7.373	7.373	1.087
1994	0.781	0.782	0.782	0.782	0.244
1995	0.250	0.250	0.250	0.654	0.375
1996	0.466	0.466	0.466	0.466	0.268
1997	0.657	0.656	0.656	0.616	0.215
1998	1.884	1.846	1.846	1.694	0.239
1999	1.390	1.390	1.390	1.073	0.707
2000	0.986	0.987	0.987	0.875	0.435
2001	3.548	3.550	3.550	3.498	1.620
2002	4.770	4.851	4.851	4.668	1.438
2003	7.590	7.887	7.887	7.781	1.673
2004	4.772	4.784	4.784	4.715	2.049
2005	11.934	12.064	12.064	12.011	1.956
2006	5.808	5.802	5.802	5.747	1.766
2007	10.352	10.331	10.331	10.461	2.763
2008	6.217	6.206	6.206	6.152	2.155
2009	5.240	5.230	5.230	5.229	1.814
2010	6.961	6.958	6.958	6.872	2.365
2011	12.504	12.439	12.439	12.356	2.903
2012	7.883	7.888	7.888	7.859	3.280
2013	8.732	8.717	8.717	8.530	2.603
2014	13.967	13.993	13.993	14.077	3.923
2015	10.371	10.374	10.374	10.329	4.509
2016					

Table 18. Time series of Columbia Upriver Bright Chinook ISBM Index produced with the four versions of the program and testing the base-period change capability of version V4a (V4b).

Catch Year	URB (US)				
	V1	V2	V3	V4a (3-5)	V4b (90-93)
1985	2.931	2.931	2.931	2.939	1.513
1986	2.793	2.792	2.792	2.696	1.479
1987	2.997	2.997	2.997	3.015	1.631
1988	3.986	3.985	3.985	4.009	1.871
1989	4.426	4.427	4.427	4.464	1.727
1990	4.173	4.174	4.174	4.253	1.390
1991	2.163	2.162	2.162	2.187	0.926
1992	1.393	1.393	1.393	1.265	0.824
1993	1.528	1.529	1.529	1.538	0.899
1994	1.635	1.634	1.634	1.623	0.809
1995	1.459	1.459	1.459	1.465	0.488
1996	1.426	1.425	1.425	1.430	0.734
1997	2.004	2.002	2.002	2.069	1.115
1998	1.420	1.420	1.420	1.235	0.673
1999	1.398	1.397	1.397	1.407	0.789
2000	2.304	2.303	2.303	2.352	0.881
2001	1.459	1.458	1.458	1.475	0.806
2002	1.737	1.737	1.737	1.717	0.988
2003	1.574	1.574	1.574	1.548	0.771
2004	1.651	1.651	1.651	1.628	0.727
2005	1.730	1.730	1.730	1.731	0.924
2006	2.904	2.903	2.903	2.917	1.040
2007	3.164	3.163	3.163	2.246	1.582
2008	1.823	1.823	1.823	1.728	0.918
2009	2.669	2.668	2.668	2.662	1.585
2010	1.669	1.669	1.669	1.647	0.830
2011	2.618	2.616	2.616	2.634	1.482
2012	2.714	2.713	2.713	2.213	1.472
2013	2.228	2.227	2.227	2.224	1.167
2014	1.933	1.931	1.931	1.948	1.070
2015	1.541	1.541	1.541	1.539	0.757
2016					

Table 19. Time series of Nehalem Chinook ISBM Index produced with the four versions of the program and testing the base-period change capability of version V4a (V4b).

Catch Year	Nehalem_SRH (US)				
	V1	V2	V3	V4a (3-5)	V4b (90-93)
1985	0.145	0.145	0.319	0.328	0.148
1986	0.718	0.718	0.874	0.715	0.420
1987	1.356	1.356	1.609	1.601	0.691
1988	2.176	2.176	2.110	2.301	0.641
1989	1.114	1.114	1.328	1.206	0.601
1990	1.636	1.636	1.951	1.932	0.874
1991	2.175	2.175	2.656	2.726	0.835
1992	1.714	1.714	2.424	2.477	0.903
1993	1.815	1.815	2.660	2.645	1.418
1994	3.432	3.432	3.553	3.650	1.009
1995	2.849	2.849	3.875	3.915	1.260
1996	2.211	2.211	2.576	2.616	1.245
1997	1.979	1.979	2.476	2.499	0.815
1998	2.492	2.492	2.816	2.865	0.833
1999	1.779	1.779	2.103	2.233	0.727
2000	1.009	1.009	1.600	1.629	0.644
2001	2.875	2.875	3.447	3.604	1.234
2002	2.033	2.033	2.330	2.386	0.918
2003	2.145	2.145	2.305	2.349	0.855
2004	2.653	2.653	3.342	3.367	1.097
2005	2.502	2.502	2.271	2.284	0.679
2006	4.164	4.164	3.838	4.132	1.177
2007	0.570	0.570	1.195	1.219	0.604
2008	1.179	1.179	1.835	1.883	0.693
2009	0.384	0.384	0.234	0.260	0.087
2010	1.664	1.664	1.950	1.964	0.727
2011	1.878	1.878	1.861	1.949	0.641
2012	1.709	1.709	1.690	1.743	0.851
2013	2.155	2.155	2.525	2.591	0.941
2014	2.598	2.598	3.668	3.908	1.301
2015	2.512	2.512	3.759	3.768	1.557
2016					

Table 20. Time series of Siletz Chinook ISBM Index produced with the four versions of the program and testing the base-period change capability of version V4a (V4b).

Catch Year	Siletz_SRH (US)				
	V1	V2	V3	V4a (3-5)	V4b (90-93)
1985	0.190	0.190	0.338	0.328	0.335
1986	0.395	0.395	0.465	0.356	0.442
1987	1.041	1.041	1.031	1.022	0.975
1988	1.353	1.353	0.843	0.921	0.661
1989	0.987	0.987	1.062	1.013	1.058
1990	1.081	1.081	1.015	1.020	0.956
1991	0.865	0.865	0.927	0.932	0.715
1992	1.096	1.096	1.054	1.088	0.938
1993	1.114	1.114	1.361	1.355	1.433
1994	1.284	1.284	0.915	0.940	0.678
1995	1.549	1.549	1.886	1.899	1.595
1996	1.091	1.091	1.110	1.121	1.138
1997	1.536	1.536	1.691	1.702	1.358
1998	1.126	1.126	1.081	1.096	0.846
1999	1.698	1.698	1.879	1.960	1.601
2000	0.921	0.921	1.252	1.271	1.181
2001	1.491	1.491	1.294	1.336	1.115
2002	1.211	1.211	1.193	1.215	1.093
2003	1.720	1.720	1.708	1.729	1.490
2004	3.433	3.433	4.123	4.144	3.322
2005	1.895	1.895	1.684	1.692	1.309
2006	2.404	2.404	2.040	2.133	1.541
2007	0.583	0.583	1.037	1.056	1.080
2008	0.898	0.898	1.068	1.087	0.933
2009	0.820	0.820	0.871	0.911	0.757
2010	0.404	0.404	0.372	0.370	0.336
2011	1.760	1.760	1.719	1.772	1.475
2012	1.403	1.403	1.178	1.197	1.223
2013	1.939	1.939	2.076	2.110	1.832
2014	1.469	1.469	1.570	1.630	1.351
2015	2.096	2.096	2.681	2.685	2.564
2016					

Table 21. Time series of Siuslaw Chinook ISBM Index produced with the four versions of the program and testing the base-period change capability of version V4a (V4b).

Catch Year	Siuslaw_SRH (US)				
	V1	V2	V3	V4a (3-5)	V4b (90-93)
1985	0.127	0.127	0.307	0.289	0.194
1986	0.362	0.362	0.409	0.318	0.260
1987	1.372	1.372	1.525	1.524	0.914
1988	1.589	1.589	1.233	1.325	0.592
1989	1.140	1.140	1.307	1.219	0.818
1990	1.196	1.196	1.202	1.200	0.735
1991	1.155	1.155	1.293	1.306	0.626
1992	1.121	1.121	1.098	1.133	0.603
1993	2.095	2.095	2.901	2.888	2.012
1994	1.854	1.854	1.588	1.623	0.728
1995	1.770	1.770	2.163	2.177	1.099
1996	1.710	1.710	1.875	1.897	1.224
1997	2.097	2.097	2.476	2.491	1.242
1998	3.104	3.104	3.414	3.449	1.622
1999	1.462	1.462	1.611	1.679	0.843
2000	1.729	1.729	2.721	2.752	1.580
2001	2.004	2.004	2.019	2.083	1.077
2002	1.821	1.821	1.972	2.006	1.122
2003	1.848	1.848	1.876	1.900	1.021
2004	1.619	1.619	1.771	1.776	0.888
2005	1.626	1.626	1.395	1.404	0.664
2006	2.762	2.762	2.429	2.537	1.155
2007	1.337	1.337	2.506	2.537	1.684
2008	1.309	1.309	1.882	1.917	1.033
2009	1.546	1.546	1.869	1.948	1.018
2010	1.589	1.589	1.773	1.782	0.980
2011	2.486	2.486	2.646	2.728	1.385
2012	1.795	1.795	1.830	1.877	1.226
2013	2.422	2.422	2.831	2.884	1.551
2014	1.831	1.831	2.132	2.219	1.132
2015	2.336	2.336	3.099	3.104	1.832
2016					

3.2 CYER WITH AGE OFFSET

As requested by the Bilateral Concept Paper Drafting Group the program producing the calendar year exploitation rates (CYERs) was modified in a manner similar to the ISBM Index program by incorporating the ability to assess the effects of limiting the ages included in the analysis. The resulting version of this program (DistributionTables_V1.5.04 21Aug2017.exe) includes now the capability of offsetting one to three younger ages from the analysis (see Appendix E).

4. RECOMMENDATIONS

The ISBM subgroup recommends the following:

- Use of Eq. 5a–c, Eq. 6, and Eq. 8 to compute the postseason ISBM index
- Use of the newest version of the postseason ISBM program:
  CompISBMCWT 10Aug2017 V1.exe
- Use of the newest version of the Mortality Distribution Table program:
  DistributionTables_V1.5.04 21Aug2017.exe
- Continue to report Eq. 1 and Eq. 2 in annual CTC reports as they are able to simply convey the ISBM index concept, but provide a reference to this document for the actual equations. Additional text should be added to the annual reports to qualify the idealized nature of Eq. 1 and Eq. 2 and the need to address stock-specific assumptions.

5. APPENDICES

APPENDIX A. ISBM SUBGROUP CORRESPONDENCE

FROM: Gayle Brown, Chuck Parken, Bob Clark, Jim Scott
TO: Antonio Velez-Espino, Randy Peterson, Tim Dalton, Ethan Clemons, Larrie LaVoy
SUBJECT: Technical Questions Related to General Obligation & CYER Concept Paper Analyses
DATE: Aug 1, 2017

The Bilateral Concept Paper Drafting Group has identified technical analyses necessary to complete a concept paper on the General Obligation & Calendar Year Exploitation Rates. To assist in the development of a work plan, we ask that the ISBM Program Workgroup provide responses to the following questions in as timely a matter as possible, but no later than August 4.

It is our understanding that several known errors exist in the program used to compute the non-ceiling index for ISBM fisheries.

1) What are the recommended modifications to the program to address the known errors?
2) What is the soonest date that these modifications could be made to the program?

In reviewing the equation for the non-ceiling index (see equation 2.17 in TCCHINOOK (15)-01), we see that it is computed across the ages Minage to Maxage. We are interested in assessing the effect of computing the index over a more limited range of ages. For example, for a stock with complete maturation at age 5, we might wish to evaluate limiting the computation of the index to ages 4 and 5.

3) Can the Minage parameter in the ISBM program be easily changed via an input file or other method to assess the effect of limiting the computation to older age classes? How would this be done? Is the program designed to expect a specific set of ages or can it generate results from a data set which has had data for one or more ages removed from the complete set?

We are also interested in knowing whether the base period years are coded in a way that other years could be specified without disruption to the operation of ISBM program? What would be required to generate ISBM indices using a different set of years for the base period?

The concept paper is also exploring the potential for using calendar year exploitation rates (CYERs) as a metric to monitor the performance of ISBM fisheries. In a manner similar to the non-ceiling index, we are interested in assessing the effects of limiting the ages included in the analysis.

4) Can the Minage parameter in the program used to compute the CYERs be easily changed via an input file or other method to assess the effect of limiting the computation to older age classes? How would this be done?

Thanks for your assistance in providing a timely response.

Cc: John Carlile, U.S. Co-Chair, Chinook Technical Committee

Robert Kope, U.S. Co-Chair, Chinook Technical Committee
Alison Agness, U.S. National Correspondent
Karen Okahori, Canada National Correspondent
Susan Farlinger, Lead, Canadian Chinook Negotiation Team
Phil Anderson, Lead, U.S Chinook Negotiation Team

FROM: Antonio Velez-Espino, Randy Peterson, Tim Dalton, Ethan Clemons, Larrie LaVoy
TO: Gayle Brown, Chuck Parken, Bob Clark, Jim Scott
SUBJECT: Technical Questions Related to General Obligation & CYER Concept Paper Analyses
DATE: Aug 2, 2017

The ISBM subgroup had a conference call on August 2, 2017 to address the questions developed by the Bilateral Concept Paper Drafting Group collaborating on the 'General Obligation & CYER Concept Paper' in their August 1, 2017 memo (see attached).

1) What are the recommended modifications to the program to address the known errors?

   Issue 1:
   Update the ISBM program such that the correct cohort sizes for the ocean net fisheries are referenced. Currently, some ocean net fisheries are mistakenly excluded from the ISBM calculations.
   Comment: This seems to be a straightforward correction in the code; however, testing will be required to assert corrections were made correctly.

   Issue 2:
   Further investigate if there is in fact an issue with the way terminal harvest rates are calculated in the code. Currently, there seems to be an error in the algorithm.
   Comment: If the error is confirmed, correcting it should not be an onerous task; however, testing will be required to assert corrections were made correctly.

   Issue 3:
   Standardize use of .hrt files to incorporate external terminal harvest rate data in the ISBM calculations. Variations in the way these files have been constructed for different stocks seem to affect ISBM indices in non-trivial ways.
   Comment: A way forward has been identified and standardizing .hrt usage should be a straightforward task.

2) What is the soonest date that these modifications could be made to the program?

   The group estimated that issues 1-3 can be addressed by August 18.

3) a. Can the Minage parameter in the ISBM program be easily changed via an input file or other method to assess the effect of limiting the computation to older age classes? How would this be done? Is the program designed to expect a specific set of ages or can it generate results from a data set which has had data for one or more ages removed from the complete set?

   Yes. It is possible to incorporate this change into the GUI so the user can select a subset

of ages to include in the ISBM computations. This modification would take two additional days.

b. We are also interested in knowing whether the base period years are coded in a way that other years could be specified without disruption to the operation of ISBM program? What would be required to generate ISBM indices using a different set of years for the base period?

This capability seems to be already enabled in the program GUI. Testing will be conducted to identify whether or not changes in the code are needed. Testing can be done in a day. If changes in the code are required, three additional days would be needed.

4) Can the Minage parameter in the program used to compute the CYERs be easily changed via an input file or other method to assess the effect of limiting the computation to older age classes? How would this be done?

Yes. Adding Minage flexibility to the GUI would require changes in the code estimated to take one additional day.

FROM: Gayle Brown, Chuck Parken, Bob Clark, Jim Scott
TO: Antonio Velez-Espino, Randy Peterson, Tim Dalton, Ethan Clemons, Larrie LaVoy
SUBJECT: Technical Questions Related to General Obligation & CYER Concept Paper Analyses
DATE: Aug 11, 2017

Hi Randy and other intrepid ISBM AWGers working on ISBM issues ,

On behalf of the Bilateral Concept Paper Drafting Group, we ask that you implement the corrections identified for the ISBM program. We also ask that the modifications needed to enable selective exclusion of the first and second mature ages be made to both the ISBM and Mortality Distribution programs. Can you please keep us informed of progress?

We are also mindful of the ongoing base period calibration work and the upcoming CTC-AWG meeting, Sept 18-22. We ask that you inform us if the modifications to program code will take longer or are more complex than expected. This will allow an opportunity to discuss priorities and organization of CTC-AWG work.

Thanks for your efforts,

Gayle

Cc: John Carlile, U.S. Co-Chair, Chinook Technical Committee
Robert Kope, U.S. Co-Chair, Chinook Technical Committee
Alison Agness, U.S. National Correspondent
Karen Okahori, Canada National Correspondent
Susan Farlinger, Lead, Canadian Chinook Negotiation Team
Phil Anderson, Lead, U.S Chinook Negotiation Team

APPENDIX B. FISHERY DEFINITIONS

Table B1.–Postseason ISBM Index Fishery Definitions

ISBM fishery code	Chinook Model fishery name	HRJ fishery code	HRJ fishery name
1	**CENTRL TR**	9	CENTRL T
2	**GEO ST TR**	16	GEO ST T
3	**NORTH N**	18	NORTH N
4	**CENTRL N**	20	CENTRL N
5	**WCVI N**	23	WCVI N
6	**J DE F N**	41	BC JF N
7	**JNST N**	24	GEO ST N
		40	JNST N
8	**FRASER N**	42	FRASER N
9	**GEO ST SP**	61	JNST S
		63	GEO ST S
		65	BC JF S
10	**WASH/OR TR**	13	N FALCON T
		14	S FALCON T
11	**PGSDN N**	25	PGSDN N
		27	US JF N
12	**PGSDO N**	28	PGSDO N
13	**US TERM N**	39	TWAC FN
	WASH CST N	30	WA CST N
14	**US TERM N**	15	TOR TERM T
		26	TPGSDN TERM N
		29	TPGSDO TERM N
		31	TCOL R N
		38	TPS FN
15	**WASH CST SP**	53	N FALCON S
		55	S FALCON S

ISBM fishery code	Chinook Model fishery name	HRJ fishery code	HRJ fishery name
16	**PGSDN SP**	57	PGSDN S
17	**PGSDO SP**	59	PGSDO S
18	**US TERM SP**	54	TNF TERM S
		56	TSF TERM S
		58	TPGSDN TERM S
		60	TPGSDO TERM S
		67	TCOL R S
		75	TPS FS
		76	TSF TERM FS
19	**CA TERM N**	19	TNBC TERM N
		21	TCBC TERM N
		34	TNORTH FN
		35	TCENTRAL FN
		36	TGEO ST FN
		37	TFRAS FN
		43	TFRASER TERM N
20	**CA TERM SP**	52	TWCVI TERM S
		62	TJNST TERM S
		64	TGEO ST TERM S
		66	TBC JF TERM S
		70	TNORTH FS
		71	TCENTRAL FS
		72	TWCVI FS
		73	TFRASER FS
		74	TGS FS

Table B2.–Mortality Distribution Table (CYER) Fishery Definitions

CYER Fishery Number	CYER Fishery Name	HRJ Fishery Code	HRJ Fishery Name
1	**AABM SEAK Troll**	1	AK W/S T
		2	AK JNO T
		3	AK JNI T
		4	AK JLO T
		5	AK JLI T
		6	AK FALL T
2	**AABM SEAK Net**	17	ALASKA N
3	**AABM SEAK Sport**	44	ALASKA S
4	**AABM NBC Troll**	8	NORTH T
5	**AABM NBC Sport**	47	NBC AABM S
6	**AABM WCVI Troll**	10	WCVI F/W T
		11	WCVI SPR T
		12	WCVI SUM T
7	**AABM WCVI Sport**	50	WCVI AABM S
8	**ISBM NBC & CBC Troll**	9	CENTRL T
9	**ISBM NBC & CBC Net**	18	NORTH N
		19	TNBC TERM N
		20	CENTRL N
		21	TCBC TERM N
10	**ISBM NBC & CBC Sport**	45	CBC S
		46	TCBC TERM S
		48	NBC ISBM S
		49	TNBC TERM S
11	**ISBM Southern BC Troll**	16	GEO ST T
12	**ISBM Southern BC Net**	23	WCVI N
		24	GEO ST N
		40	JNST N

CYER Fishery Number	CYER Fishery Name	HRJ Fishery Code	HRJ Fishery Name
		41	BC JF N
		42	FRASER N
		43	TFRASER TERM N
13	**ISBM Southern BC Sport**	51	WCVI ISBM S
		61	JNST S
		62	TJNST TERM S
		63	GEO ST S
		64	TGEO ST TERM S
		65	BC JF S
		66	TBC JF TERM S
14	**ISBM N Falcon Troll**	13	N FALCON T
15	**ISBM N Falcon Sport**	53	N FALCON S
		54	TNF TERM S
16	**ISBM S Falcon Troll**	14	S FALCON T
17	**ISBM S Falcon Sport**	55	S FALCON S
		56	TSF TERM S
18	**ISBM WA Coast Net**	30	WA CST N
19	**ISBM Puget Sound Net**	25	PGSDN N
		26	TPGSDN TERM N
		27	US JF N
		28	PGSDO N
		29	TPGSDO TERM N
20	**ISBM Puget Sound Sport**	57	PGSDN S
		58	TPGSDN TERM S
		59	PGSDO S
		60	TPGSDO TERM S
21	**Terminal SEAK Troll**	7	TAK TERM T
22	**Terminal SEAK Net**	32	TAK TERM N
		33	TBR TERM N

CYER Fishery Number	CYER Fishery Name	HRJ Fishery Code	HRJ Fishery Name
23	**Terminal SEAK Sport**	68	TAK TERM S
		69	TBR TERM S
24	**Terminal Canada Net**	22	TWCVI TERM N
		34	TNORTH FN
		35	TCENTRAL FN
		36	TGEO ST FN
		37	TFRAS FN
		77	TCAN TBR N
25	**Terminal Canada Sport**	52	TWCVI TERM S
		70	TNORTH FS
		71	TCENTRAL FS
		72	TWCVI FS
		73	TFRASER FS
		74	TGS FS
26	**Terminal SUS Troll**	15	TOR TERM T
27	**Terminal SUS Net**	31	TCOL R N
		38	TPS FN
		39	TWAC FN
28	**Terminal SUS Sport**	67	TCOL R S
		75	TPS FS
		76	TSF TERM FS
29	**Escapement Stray**	78	XCA ESC STRAY
		79	XUS ESC STRAY
30	**Escapement Escap**	80	ESCAPEMENT

APPENDIX C. EXTERNAL HARVEST RATES

(NOTE: Some of the harvest rates in this appendix have been updated since the completion of this report)

CANADIAN STOCKS

There are four Canadian stocks for which ISBM postseason indices are currently calculated: QUI_GSQ, COW_GST, Harrison_CHI_FRL, and WCVI_RBT. Two Canadian stocks do not use an external harvest rate: QUI_GSQ and WCVI_RBT. In the past, a HRT file zeroing out net impacts for WCVI_RBT has been used, but this is no longer necessary because there are two new ERA fisheries representing terminal impacts targeting the hatchery Robertson stock. Removal of these ERA fisheries (see Appendix A) from the ISBM fishery mapping means that external harvest rates are no longer necessary for WCVI_RBT. In addition, this ERA fishery does not need to be mapped to an ISBM fishery because no other stocks are impacted. Two Canadian stocks use an external harvest rate: COW_GST and Harrison_CHI_FRL. Those external harvest rates used as additional input to the revised ISBM program are as follows in the below tables.

Table C3.–External harvest rates for COW_GST

	Fishery
Year	CA Term Net
1979	
1980	
1981	21%
1982	14%
1983	4%
1984	5%
1985	21%
1986	24%
1987	21%
1988	8%
1989	13%
1990	10%
1991	3%
1992	2%
1993	3%
1994	4%
1995	3%
1996	5%
1997	2%
1998	12%
1999	3%
2000	2%
2001	13%
2002	25%
2003	15%
2004	10%
2005	28%
2006	20%
2007	7%
2008	17%
2009	27%
2010	14%
2011	6%
2012	27%
2013	6%
2014	5%
2015	3%
2016	4%

Table C4.–External harvest rates for Harrison_CHI_FRL

	Fishery	
Year	CA Term Net	CA Term Sport
1979		
1980		
1981	5%	0%
1982	5%	0%
1983	5%	0%
1984	5%	0%
1985	3%	0%
1986	8%	0%
1987	3%	0%
1988	48%	0%
1989	2%	0%
1990	1%	0%
1991	2%	0%
1992	1%	0%
1993	1%	0%
1994	1%	0%
1995	3%	0%
1996	5%	0%
1997	5%	0%
1998	1%	0%
1999	1%	0%
2000	1%	0%
2001	1%	0%
2002	1%	0%
2003	1%	0%
2004	2%	0%
2005	3%	0%
2006	3%	0%
2007	2%	0%
2008	3%	0%
2009	2%	0%
2010	4%	0%
2011	4%	0%
2012	1%	0%
2013	3%	0%
2014	11%	0%
2015	2%	0%
2016	1%	0%

U.S. STOCKS

There are fourteen U.S. stocks for which ISBM postseason indices are currently calculated: GRN_SPS, Nooksack_NSF_NKS, STL, Grays_QUE, Hoh_QUE, Queets_QUE, Quillayute_QUE, Deschutes_URB, LRW, SUM, URB, Nehalem_SRH, Siletz_SRH, and Siuslaw_SRH. Seven of these U.S. stocks use an external harvest rate. Those external harvest rates used as additional input to the revised ISBM program are as follows in the below tables.

Table C5.–External harvest rates for Grays_QUE

	Fishery		
Year	WA Coast Net	US Term Net	US Term Sport
1979	44%	0%	0%
1980	44%	0%	0%
1981	50%	0%	0%
1982	37%	0%	0%
1983	59%	0%	0%
1984	38%	0%	0%
1985	8%	0%	0%
1986	36%	0%	0%
1987	39%	0%	0%
1988	27%	0%	0%
1989	52%	0%	0%
1990	55%	0%	0%
1991	54%	0%	0%
1992	42%	0%	0%
1993	55%	0%	0%
1994	47%	0%	0%
1995	54%	0%	0%
1996	35%	0%	0%
1997	38%	0%	0%
1998	34%	0%	0%
1999	15%	0%	0%
2000	37%	0%	0%
2001	50%	0%	0%
2002	24%	0%	0%
2003	10%	0%	0%
2004	23%	0%	0%
2005	12%	0%	0%
2006	22%	0%	0%
2007	26%	0%	0%
2008	14%	0%	0%
2009	31%	0%	0%
2010	27%	0%	0%
2011	33%	0%	0%
2012	41%	0%	0%
2013	33%	0%	0%
2014	32%	0%	0%
2015	38%	0%	0%
2016			

Table C6.–External harvest rates for Hoh_QUE

	Fishery		
Year	WA Coast Net	US Term Net	US Term Sport
1979	23%	0%	0%
1980	21%	0%	0%
1981	23%	0%	0%
1982	22%	0%	0%
1983	24%	0%	0%
1984	27%	0%	0%
1985	37%	0%	0%
1986	17%	0%	0%
1987	35%	0%	0%
1988	40%	0%	0%
1989	41%	0%	0%
1990	33%	0%	0%
1991	46%	0%	0%
1992	22%	0%	0%
1993	23%	0%	0%
1994	8%	0%	0%
1995	24%	0%	0%
1996	26%	0%	0%
1997	42%	0%	0%
1998	21%	0%	0%
1999	35%	0%	0%
2000	34%	0%	0%
2001	38%	0%	0%
2002	23%	0%	0%
2003	30%	0%	0%
2004	27%	0%	0%
2005	21%	0%	0%
2006	34%	0%	0%
2007	36%	0%	0%
2008	23%	0%	0%
2009	24%	0%	0%
2010	19%	0%	0%
2011	40%	0%	0%
2012	36%	0%	0%
2013	60%	0%	0%
2014	27%	0%	0%
2015	29%	0%	0%
2016			

Table C7.–External harvest rates for Quillayute_QUE

	Fishery		
Year	WA Coast Net	US Term Net	US Term Sport
1979	41%	0%	0%
1980	12%	0%	0%
1981	16%	0%	0%
1982	26%	0%	0%
1983	45%	0%	0%
1984	13%	0%	0%
1985	27%	0%	0%
1986	25%	0%	0%
1987	39%	0%	0%
1988	31%	0%	0%
1989	42%	0%	0%
1990	19%	0%	0%
1991	18%	0%	0%
1992	18%	0%	0%
1993	8%	0%	0%
1994	13%	0%	0%
1995	18%	0%	0%
1996	21%	0%	0%
1997	11%	0%	0%
1998	15%	0%	0%
1999	30%	0%	0%
2000	22%	0%	0%
2001	32%	0%	0%
2002	36%	0%	0%
2003	22%	0%	0%
2004	38%	0%	0%
2005	23%	0%	0%
2006	26%	0%	0%
2007	26%	0%	0%
2008	31%	0%	0%
2009	47%	0%	0%
2010	34%	0%	0%
2011	41%	0%	0%
2012	47%	0%	0%
2013	43%	0%	0%
2014	62%	0%	0%
2015	49%	0%	0%
2016			

Table C8.–External harvest rates for Deschutes_URB

	Fishery	
Year	US Term Net	US Term Sport
1979	34%	16%
1980	12%	29%
1981	13%	21%
1982	10%	24%
1983	15%	19%
1984	30%	21%
1985	29%	11%
1986	33%	12%
1987	34%	15%
1988	35%	17%
1989	30%	19%
1990	29%	20%
1991	23%	7%
1992	14%	6%
1993	14%	5%
1994	7%	4%
1995	5%	5%
1996	8%	7%
1997	8%	7%
1998	7%	8%
1999	6%	13%
2000	11%	13%
2001	7%	8%
2002	8%	15%
2003	8%	12%
2004	10%	15%
2005	9%	15%
2006	10%	11%
2007	8%	15%
2008	11%	15%
2009	15%	15%
2010	11%	14%
2011	15%	14%
2012	13%	17%
2013	13%	17%
2014	15%	14%
2015	11%	15%
2016		

Table C9.–External harvest rates for Nehalem_SRH

	Fishery
Year	US Term Sport
1979	5%
1980	9%
1981	4%
1982	7%
1983	6%
1984	6%
1985	4%
1986	10%
1987	13%
1988	13%
1989	11%
1990	17%
1991	21%
1992	19%
1993	34%
1994	23%
1995	30%
1996	27%
1997	19%
1998	19%
1999	16%
2000	14%
2001	26%
2002	19%
2003	16%
2004	26%
2005	12%
2006	21%
2007	16%
2008	15%
2009	0%
2010	16%
2011	12%
2012	10%
2013	19%
2014	29%
2015	34%
2016	

Table C10.–External harvest rates for Siletz_SRH

	Fishery
Year	US Term Sport
1979	8%
1980	9%
1981	15%
1982	10%
1983	12%
1984	10%
1985	6%
1986	7%
1987	11%
1988	7%
1989	12%
1990	10%
1991	11%
1992	11%
1993	21%
1994	8%
1995	23%
1996	13%
1997	19%
1998	11%
1999	22%
2000	16%
2001	12%
2002	12%
2003	18%
2004	50%
2005	15%
2006	15%
2007	18%
2008	13%
2009	10%
2010	3%
2011	18%
2012	8%
2013	23%
2014	17%
2015	34%
2016	

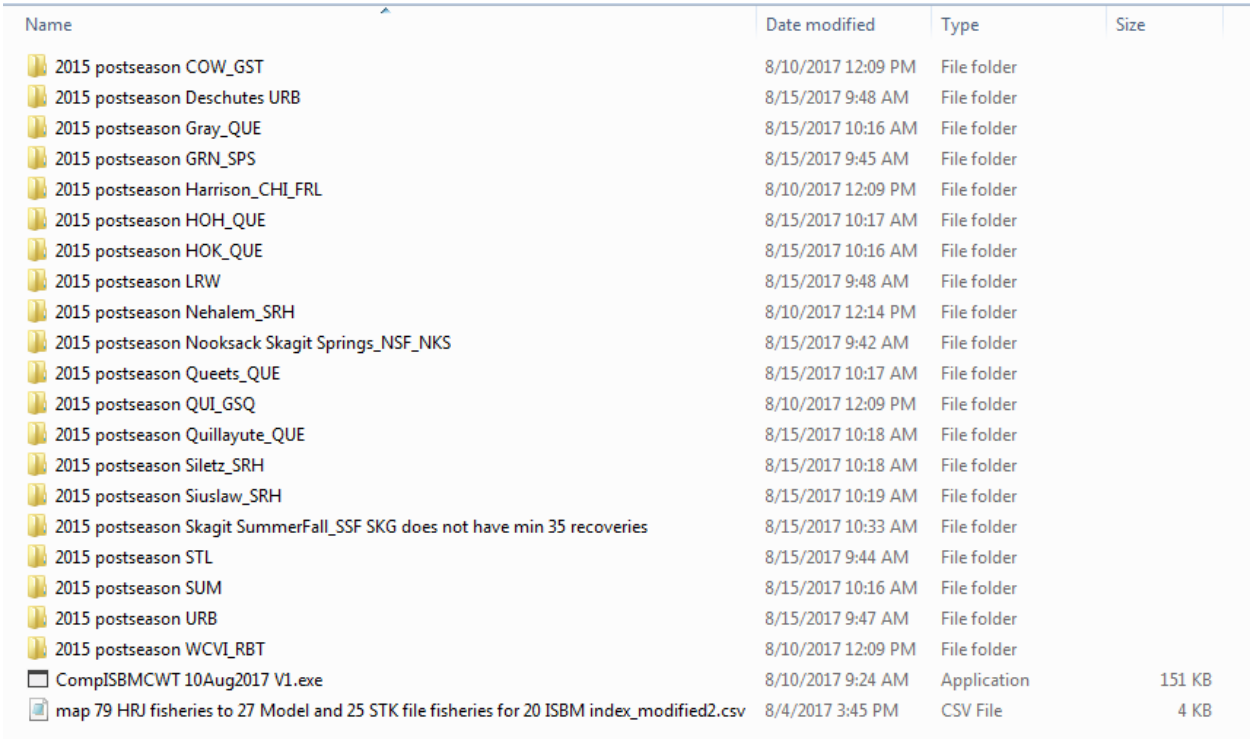
Table C11.–External harvest rates for Siuslaw_SRH

	Fishery
Year	US Term Sport
1979	14%
1980	7%
1981	10%
1982	11%
1983	26%
1984	19%
1985	6%
1986	6%
1987	19%
1988	11%
1989	16%
1990	13%
1991	15%
1992	11%
1993	50%
1994	15%
1995	26%
1996	25%
1997	29%
1998	38%
1999	19%
2000	37%
2001	21%
2002	23%
2003	20%
2004	20%
2005	12%
2006	20%
2007	44%
2008	24%
2009	24%
2010	22%
2011	29%
2012	20%
2013	33%
2014	25%
2015	40%
2016	

APPENDIX D. USER GUIDE FOR THE POSTSEASON ISBM PROGRAM

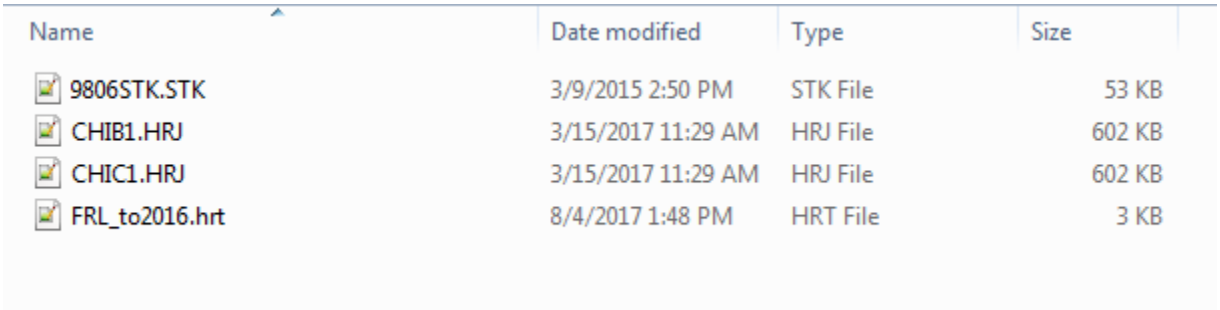
INPUT FILES

Although not strictly necessary, use of a file organizational system is highly recommended when using the postseason ISBM Program. For example, create a separate folder for each stock in the postseason ISBM analysis, as well as save a version of the program (CompISBMCWT 10Aug2017 V1.exe) and the mapping file (map 79 HRJ fisheries to 27 Model and 25 STK file fisheries for 20 ISBM index_modified2.csv) in the outermost directory.



Name	Date modified	Type	Size
2015 postseason COW_GST	8/10/2017 12:09 PM	File folder	
2015 postseason Deschutes URB	8/15/2017 9:48 AM	File folder	
2015 postseason Gray_QUE	8/15/2017 10:16 AM	File folder	
2015 postseason GRN_SPS	8/15/2017 9:45 AM	File folder	
2015 postseason Harrison_CHI_FRL	8/10/2017 12:09 PM	File folder	
2015 postseason HOH_QUE	8/15/2017 10:17 AM	File folder	
2015 postseason HOK_QUE	8/15/2017 10:16 AM	File folder	
2015 postseason LRW	8/15/2017 9:48 AM	File folder	
2015 postseason Nehalem_SRH	8/10/2017 12:14 PM	File folder	
2015 postseason Nooksack Skagit Springs_NSF_NKS	8/15/2017 9:42 AM	File folder	
2015 postseason Queets_QUE	8/15/2017 10:17 AM	File folder	
2015 postseason QUI_GSQ	8/10/2017 12:09 PM	File folder	
2015 postseason Quillayute_QUE	8/15/2017 10:18 AM	File folder	
2015 postseason Siletz_SRH	8/15/2017 10:18 AM	File folder	
2015 postseason Siuslaw_SRH	8/15/2017 10:19 AM	File folder	
2015 postseason Skagit SummerFall_SSF SKG does not have min 35 recoveries	8/15/2017 10:33 AM	File folder	
2015 postseason STL	8/15/2017 9:44 AM	File folder	
2015 postseason SUM	8/15/2017 10:16 AM	File folder	
2015 postseason URB	8/15/2017 9:47 AM	File folder	
2015 postseason WCVI_RBT	8/10/2017 12:09 PM	File folder	
CompISBMCWT 10Aug2017 V1.exe	8/10/2017 9:24 AM	Application	151 KB
map 79 HRJ fisheries to 27 Model and 25 STK file fisheries for 20 ISBM index_modified2.csv	8/4/2017 3:45 PM	CSV File	4 KB

Within each stock's directory, it is advisable to save copies of the HRJ (CHIB1.HRJ and CHIC1.HRJ), HRT (FRL_to2016.hrt), and base period exploitation rate files (9806STK.STK).



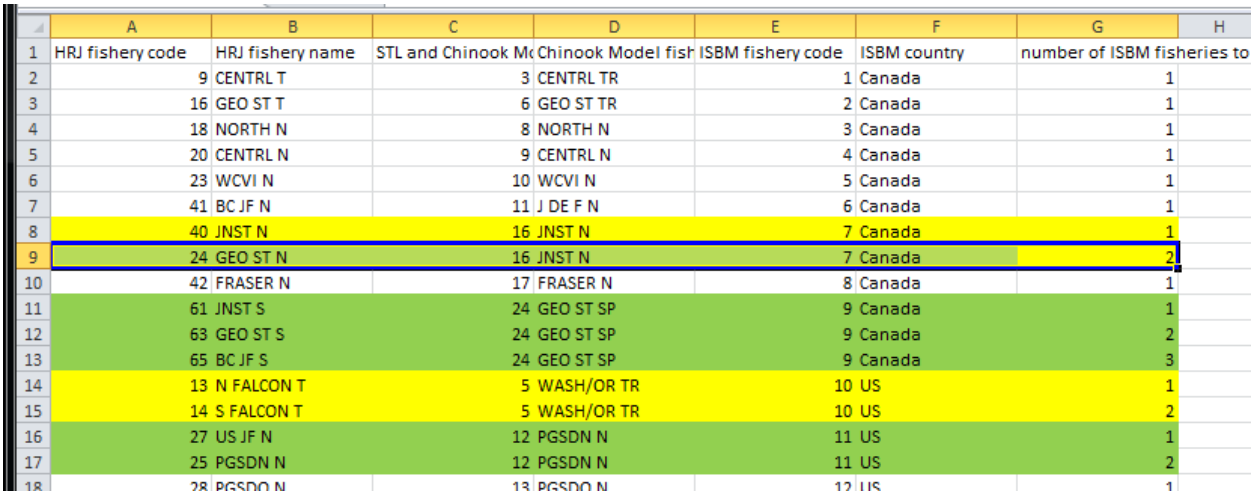
Name	Date modified	Type	Size
9806STK.STK	3/9/2015 2:50 PM	STK File	53 KB
CHIB1.HRJ	3/15/2017 11:29 AM	HRJ File	602 KB
CHIC1.HRJ	3/15/2017 11:29 AM	HRJ File	602 KB
FRL_to2016.hrt	8/4/2017 1:48 PM	HRT File	3 KB

HRJ Files

The HRJ files are output from CoShak12.

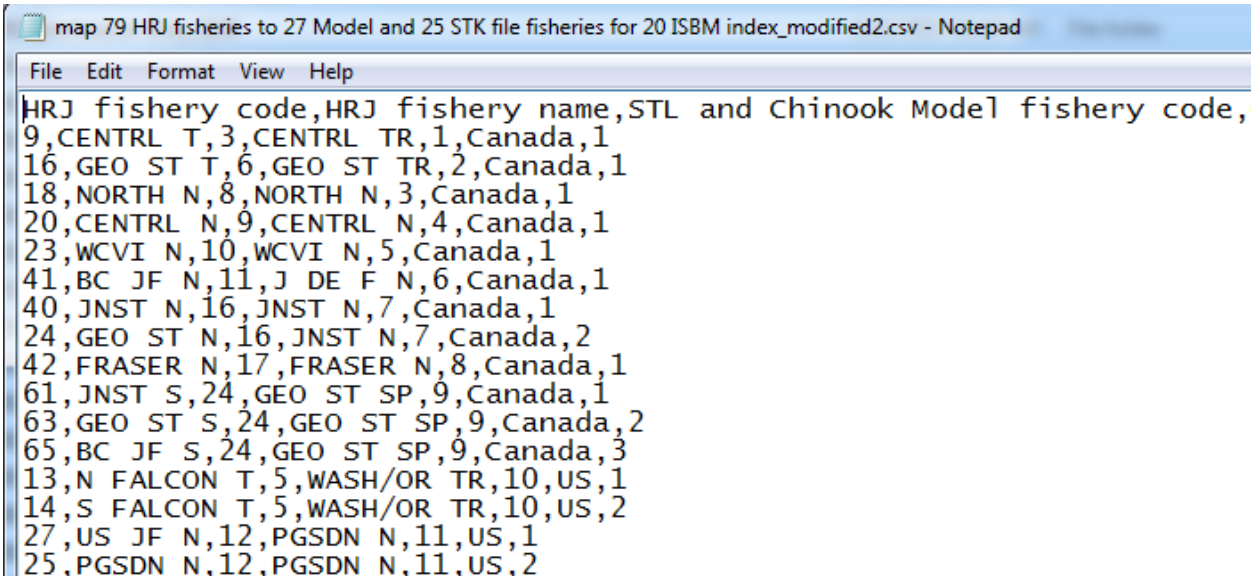
Mapping File

The mapping file is used to link ERA fishery number (i.e., HRJ fishery), Chinook Model fishery number, and ISBM fishery number. Note that all fisheries should have ERA and Chinook Model entries, but may not need an ISBM fishery number. Lack of an ISBM fishery number means that a fishery will not be included in the ISBM index. To modify the mapping file, the user must supply the ERA and Chinook Model fishery, and if the fishery is to be used in the ISBM index, also provide a ISBM fishery number, country, and appropriately fill in the number of fisheries that are to be combined.



	A	B	C	D	E	F	G	H
1	HRJ fishery code	HRJ fishery name	STL and Chinook Mc	Chinook Model fish	ISBM fishery code	ISBM country	number of ISBM fisheries to	
2	9	CENTRL T	3	CENTRL TR	1	Canada	1	
3	16	GEO ST T	6	GEO ST TR	2	Canada	1	
4	18	NORTH N	8	NORTH N	3	Canada	1	
5	20	CENTRL N	9	CENTRL N	4	Canada	1	
6	23	WCVI N	10	WCVI N	5	Canada	1	
7	41	BC JF N	11	J DE F N	6	Canada	1	
8	40	JNST N	16	JNST N	7	Canada	1	
9	24	GEO ST N	16	JNST N	7	Canada	2	
10	42	FRASER N	17	FRASER N	8	Canada	1	
11	61	JNST S	24	GEO ST SP	9	Canada	1	
12	63	GEO ST S	24	GEO ST SP	9	Canada	2	
13	65	BC JF S	24	GEO ST SP	9	Canada	3	
14	13	N FALCON T	5	WASH/OR TR	10	US	1	
15	14	S FALCON T	5	WASH/OR TR	10	US	2	
16	27	US JF N	12	PGSDN N	11	US	1	
17	25	PGSDN N	12	PGSDN N	11	US	2	
18	28	PGSDO N	13	PGSDO N	12	US	1	

The mapping file is read in by the program as a CSV format; however, it's recommended to use the excel version of this file to modify and prevent mistakes.



map 79 HRJ fisheries to 27 Model and 25 STK file fisheries for 20 ISBM index_modified2.csv - Notepad

File Edit Format View Help

```
HRJ fishery code,HRJ fishery name,STL and Chinook Model fishery code,
9,CENTRL T,3,CENTRL TR,1,Canada,1
16,GEO ST T,6,GEO ST TR,2,Canada,1
18,NORTH N,8,NORTH N,3,Canada,1
20,CENTRL N,9,CENTRL N,4,Canada,1
23,WCVI N,10,WCVI N,5,Canada,1
41,BC JF N,11,J DE F N,6,Canada,1
40,JNST N,16,JNST N,7,Canada,1
24,GEO ST N,16,JNST N,7,Canada,2
42,FRASER N,17,FRASER N,8,Canada,1
61,JNST S,24,GEO ST SP,9,Canada,1
63,GEO ST S,24,GEO ST SP,9,Canada,2
65,BC JF S,24,GEO ST SP,9,Canada,3
13,N FALCON T,5,WASH/OR TR,10,US,1
14,S FALCON T,5,WASH/OR TR,10,US,2
27,US JF N,12,PGSDN N,11,US,1
25,PGSDN N,12,PGSDN N,11,US,2
```

External Harvest Rate File (optional)

The external harvest rate (HRT) file is used to externally specify the harvest rate for a fishery. In the example below:

```
3
0,19,20
2
19
20
81
116
     1981, 1982, 1983, 1984, 1985 ,1986, 19
19, 0.045,0.045,0.045,0.045,0.031,0.079,0.0
19, 0.045,0.045,0.045,0.045,0.031,0.079,0.0
19, 0.045,0.045,0.045,0.045,0.031,0.079,0.0
19, 0.045,0.045,0.045,0.045,0.031,0.079,0.0
20, 0.000,0.000,0.000,0.000,0.000,0.000,0.0
20, 0.000,0.000,0.000,0.000,0.000,0.000,0.0
20, 0.000,0.000,0.000,0.000,0.000,0.000,0.0
20, 0.000,0.000,0.000,0.000,0.000,0.000,0.0
```

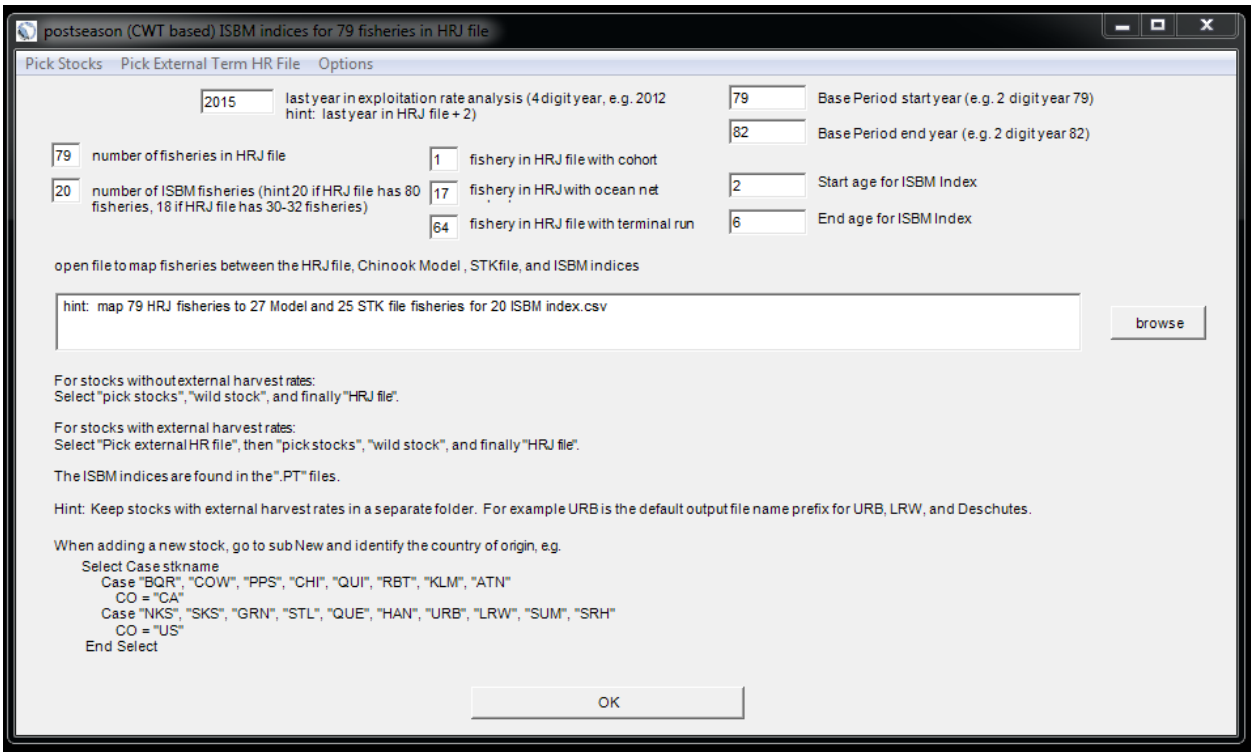
- row 1 has the number of *ISBM fisheries* to adjust plus 1 (escapement)
- row 2 has the *ISBM fishery numbers* to adjust (including escapement, which is 0)
- row 3 has the number of *ISBM fisheries* to adjust (NOTE: this time without escapement)
- rows 4-5, and possibly more, has each *ISBM fishery* number
- rows 6-7 has the start and end year of the harvest rate data
- row 8 has the start through end year of the harvest rate data
- rows 9-16, and possibly more, has the *ISBM fishery number* followed by the annual harvest rate data. There are four rows by age 2-5 for each fishery because this data is age-specific.

External harvest rate files not in this exact format will result in erroneous calculations.

Base Period Exploitation Rate File (optional)

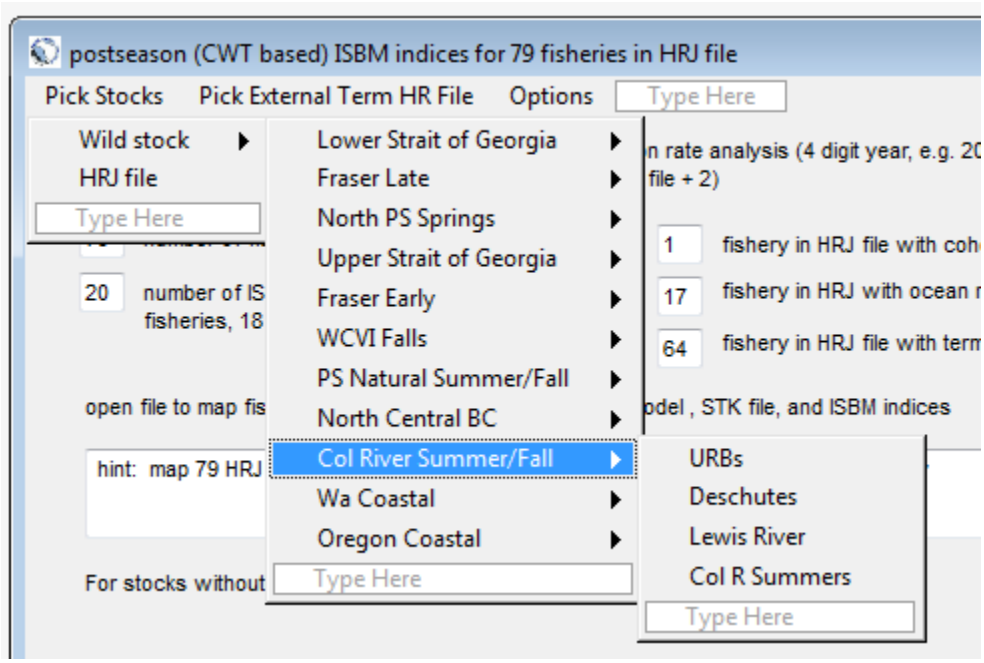
The base period exploitation rate file (.stk) is an input to the Chinook Model, and is generated by the base period calibration program.

USING THE PROGRAM

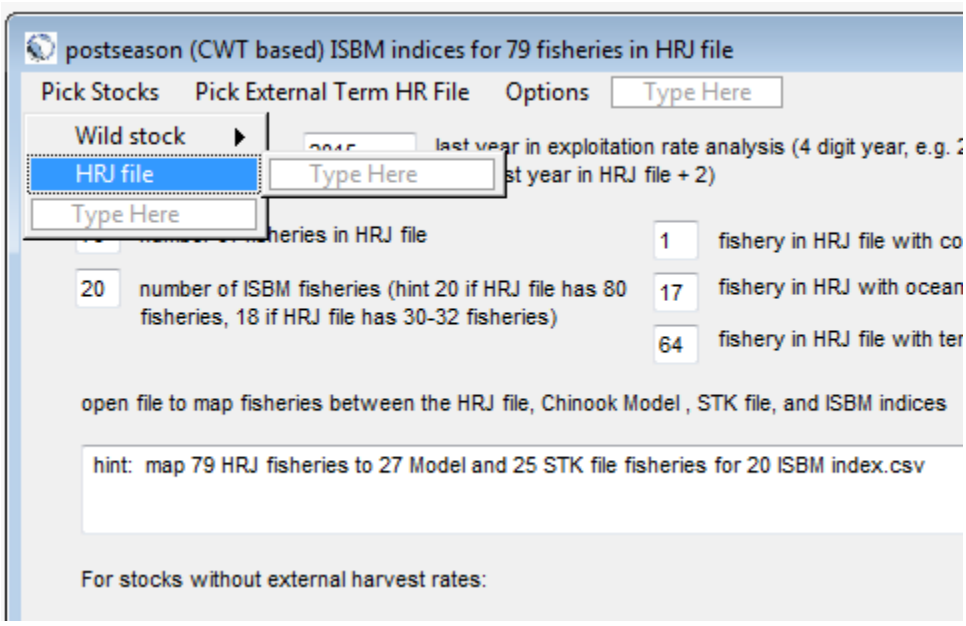


The following steps describe how to operate the postseason ISBM program. Begin by making sure that you have all inputs. After opening the program (see above figure), the user needs to:

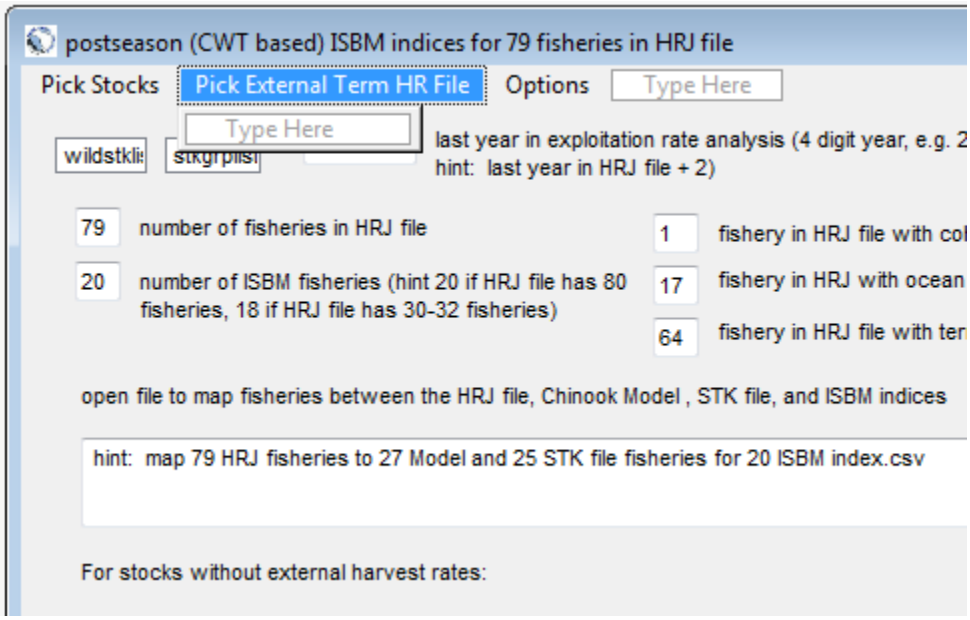
1. Select a wild stock



2. Select HRJ file, which will prompt the user to find the file on their hard drive

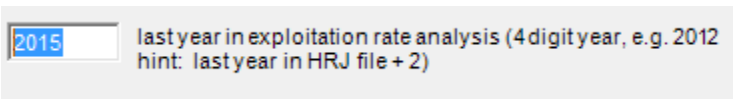


3. Select an external terminal HRT file (optional), which will prompt the user to find the file on their hard drive

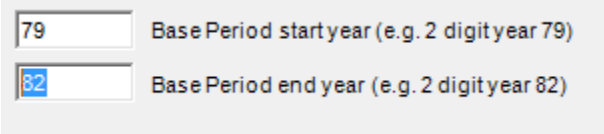


4. Select fishery mapping file, which will prompt the user to find the file on their hard drive

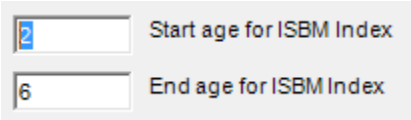
5. Enter last year in exploitation rate analysis



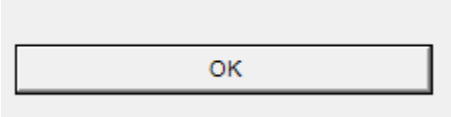
6. Enter base period start and end year



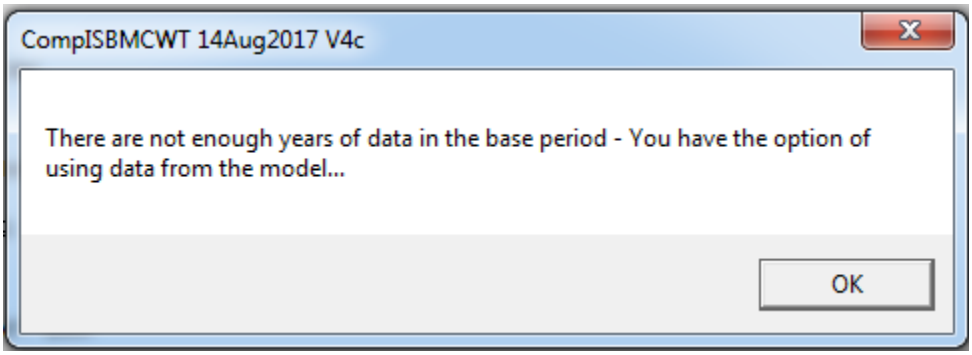
7. Enter start and end age



8. Select OK



9. Select base period exploitation rate file if prompted

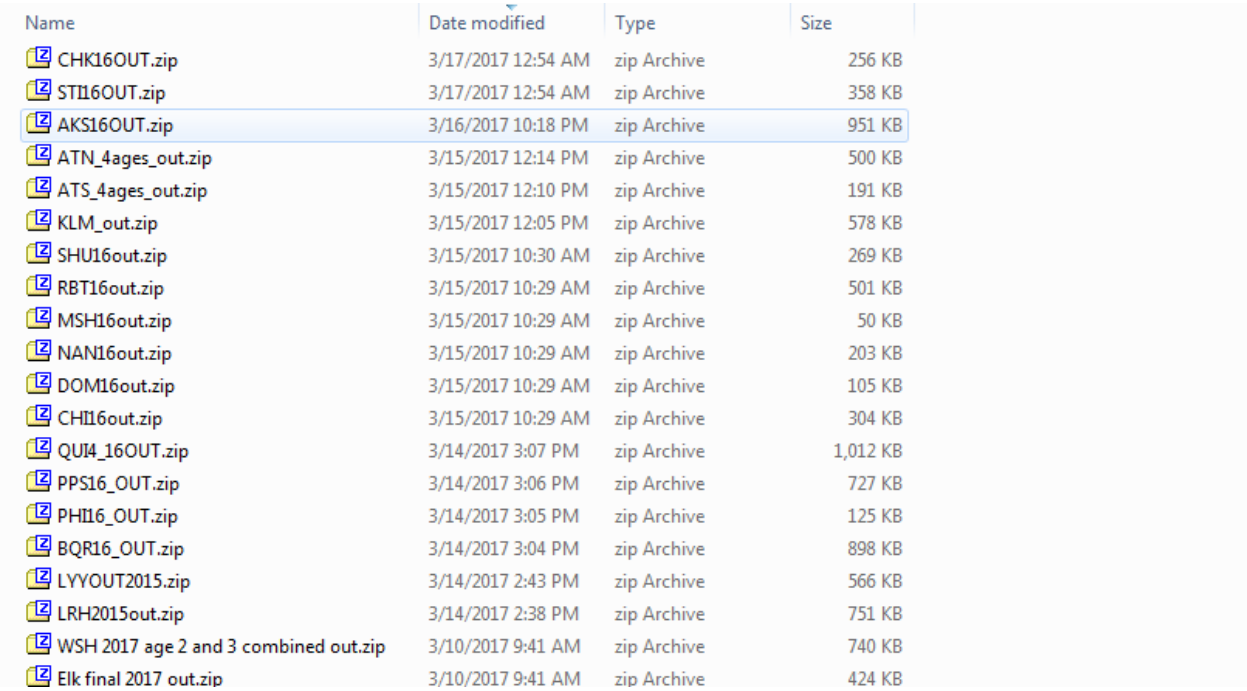


   a. Enter 3 letter acronym of the Model Stock (must use all caps)

APPENDIX E. USER GUIDE FOR THE MORTALITY DISTRIBUTION TABLE PROGRAM

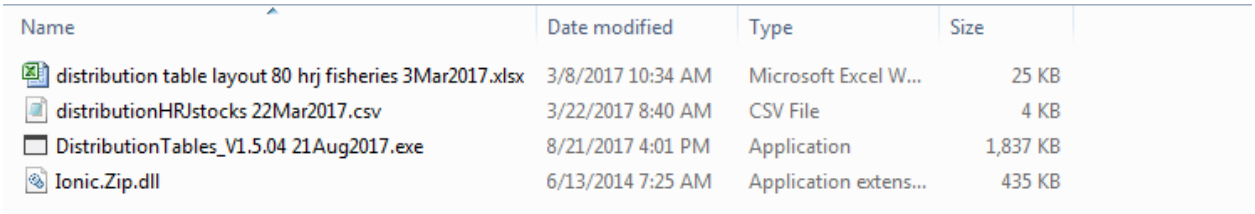
INPUT FILES

Although not strictly necessary, use of a file organizational system is highly recommended when using the Mortality Distribution Table Program. For example, have all of the ERA outputs for each stock (each in its own zip file) saved in a single folder:



Name	Date modified	Type	Size
CHK16OUT.zip	3/17/2017 12:54 AM	zip Archive	256 KB
STI16OUT.zip	3/17/2017 12:54 AM	zip Archive	358 KB
AKS16OUT.zip	3/16/2017 10:18 PM	zip Archive	951 KB
ATN_4ages_out.zip	3/15/2017 12:14 PM	zip Archive	500 KB
ATS_4ages_out.zip	3/15/2017 12:10 PM	zip Archive	191 KB
KLM_out.zip	3/15/2017 12:05 PM	zip Archive	578 KB
SHU16out.zip	3/15/2017 10:30 AM	zip Archive	269 KB
RBT16out.zip	3/15/2017 10:29 AM	zip Archive	501 KB
MSH16out.zip	3/15/2017 10:29 AM	zip Archive	50 KB
NAN16out.zip	3/15/2017 10:29 AM	zip Archive	203 KB
DOM16out.zip	3/15/2017 10:29 AM	zip Archive	105 KB
CHI16out.zip	3/15/2017 10:29 AM	zip Archive	304 KB
QUI4_16OUT.zip	3/14/2017 3:07 PM	zip Archive	1,012 KB
PPS16_OUT.zip	3/14/2017 3:06 PM	zip Archive	727 KB
PHI16_OUT.zip	3/14/2017 3:05 PM	zip Archive	125 KB
BQR16_OUT.zip	3/14/2017 3:04 PM	zip Archive	898 KB
LYYOUT2015.zip	3/14/2017 2:43 PM	zip Archive	566 KB
LRH2015out.zip	3/14/2017 2:38 PM	zip Archive	751 KB
WSH 2017 age 2 and 3 combined out.zip	3/10/2017 9:41 AM	zip Archive	740 KB
Elk final 2017 out.zip	3/10/2017 9:41 AM	zip Archive	424 KB

And in a separate folder have the Mortality Distribution Table Program (DistributionTables_V1.5.04 21Aug2017.exe), the .dll file (Ionic.Zip.dll), the stock definition file (distributionHRJstocks 22Mar2017.csv), and the fishery mapping file (distribution table layout 80 hrj fisheries 3Mar2017.xlsx).



Name	Date modified	Type	Size
distribution table layout 80 hrj fisheries 3Mar2017.xlsx	3/8/2017 10:34 AM	Microsoft Excel W...	25 KB
distributionHRJstocks 22Mar2017.csv	3/22/2017 8:40 AM	CSV File	4 KB
DistributionTables_V1.5.04 21Aug2017.exe	8/21/2017 4:01 PM	Application	1,837 KB
Ionic.Zip.dll	6/13/2014 7:25 AM	Application extens...	435 KB

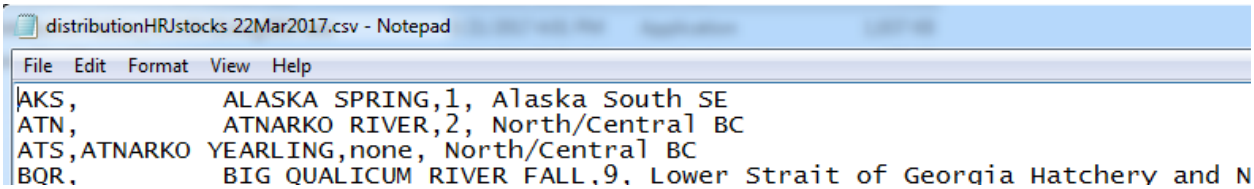
OUT Files

Although the program requires the OUT files to be all zipped in a single directory, the Mortality Distribution Table program only reads in the HRJ files. Note that all HRJ files should be from the same ERA year or the program will likely not work.

Stock Definition File

The stock definition file is used to define the stocks to be included in the Mortality Distribution

tables; however, note that the user has the option to later add more stocks. This file is read in by the program as a CSV:



where for each row:

- The first value is the 3 letter stock acronym used by the ERA
- The second value is the stock name,
- The third value is the Chinook Model stock number
- The fourth value is the Chinook Model stock name

Mapping File

The mapping file is how the CTC groups ERA fisheries in order to summarize the data in a more compact layout. This is necessary because the CTC currently has 79 ERA fisheries, and providing summary results for each fishery, stock, and year with that level of detail would not be informative or useful. There are four types of fisheries in the mapping file: AABM, ISBM, Terminal, and Escapement. Users can put any combination of the ERA fisheries under each category, but must take care to use all ERA fisheries or otherwise the program will not work. Users can also change fishery names, as well as add or subtract fisheries from the groups. For example, the current AABM fisheries are defined as:

	A	B	C	D	E	F	G
1	AABM Fishery						
2	SEAK			NBC		WCVI	
3	T	N	S	T	S	T	S
4	1 AK W/S T	17 ALASKA N	44 ALASKA S	8 NORTH T	47 NBC AABM S	10 WCVI F/W T	50 WCVI AABM S
5	2 AK JNO T					11 WCVI SPR T	
6	3 AK JNI T					12 WCVI SUM T	
7	4 AK JLO T						
8	5 AK JLI T						
9	6 AK FALL T						
10							
11							
12							

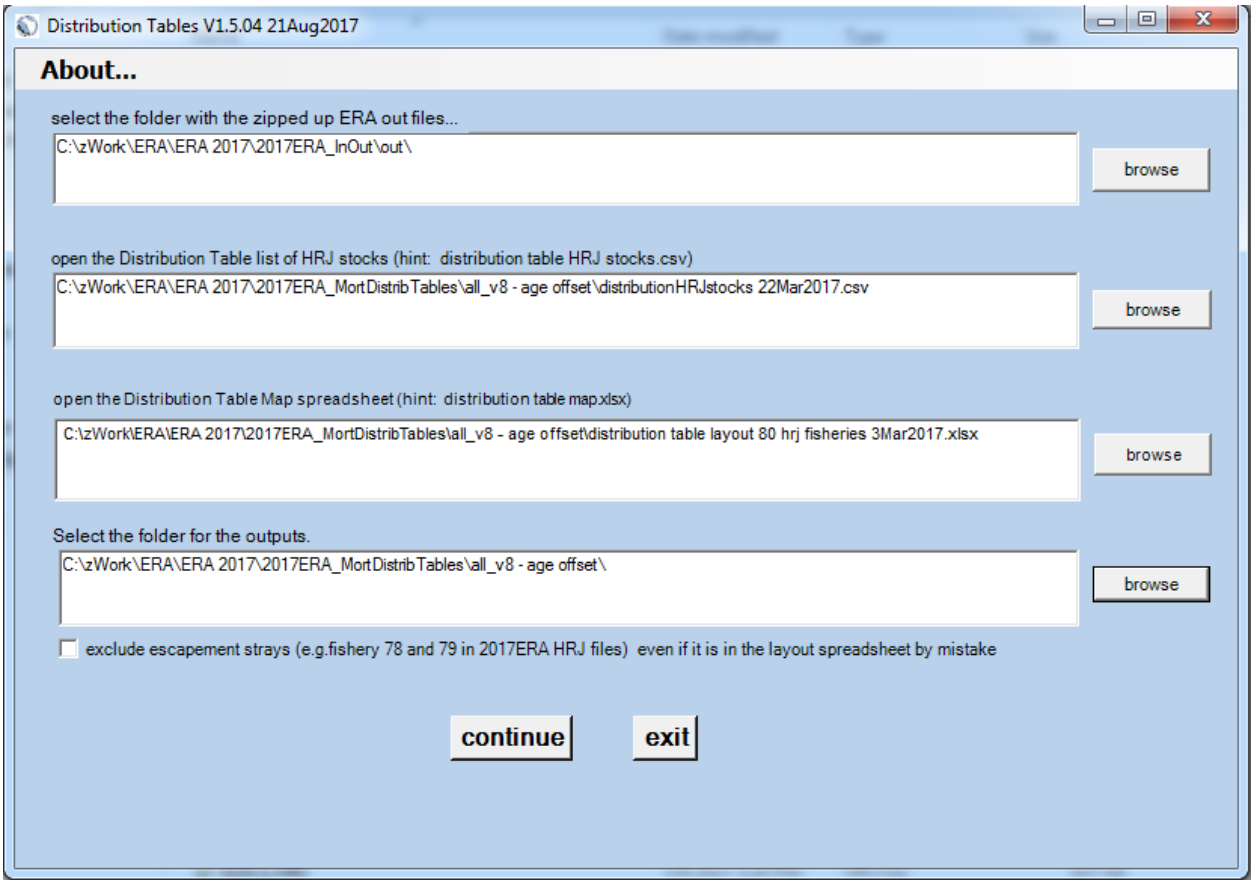
To add a new AABM fishery, first insert the number of rows corresponding to the new fishery, second merge the heading for the new fishery if there's more than one gear type (applies to row 2), third enter the names of the new fishery and gear(s), fourth create borders around the new fishery, and fifth add the ERA fisheries that comprise the new fishery:

	A	B	C	D	E	F	G	H	I
1	AABM Fishery								
2	SEAK			NBC		New Fishery		WCVI	
3	T	N	S	T	S	Spear	Bow	T	S
4	1 AK W/S T	17 ALASKA N	44 ALASKA S	8 NORTH T	47 NBC AABM S			10 WCVI F/W T	50 WCVI AABM S
5	2 AK JNO T							11 WCVI SPR T	
6	3 AK JNI T							12 WCVI SUM T	
7	4 AK JLO T								
8	5 AK JLI T								
9	6 AK FALL T								
10									
11									

The above mapping file would not work because there is no Spear or Bow AABM fishery. Note that the same procedure can be used to modify AABM, ISBM, and Terminal fisheries; however, users can not modify the number of fisheries under Escapement.

	U	V	W	X	Y	Z	AA	AB	AC	AD
	Terminal Fishery								Escapement	
	SEAK			Canada		Southern US				
	T	N	S	N	S	T	N	S	Stray	Esc
	7 TAK TERM T	32 TAK TERM N	68 TAK TERM S	34 TNORTH FN	70 TNORTH FS	15 TOR TERM T	31 TCOL R N	67 TCOL R S	78 XCA ESC STRAY	80 ESCAPEMENT
		33 TBR TERM N	69 TBR TERM S	35 TCENTRAL FN	71 TCENTRAL FS		38 TPS FN	75 TPS FS	79 XUS ESC STRAY	
				36 TGEO ST FN	72 TWCVI FS		39 TWAC FN	76 TSF TERM FS		
				37 TFRAS FN	73 TFRASER FS					
				77 TCAN TBR TE	74 TGS FS					
				22 TWCVI TERM	52 TWCVI TERM S					

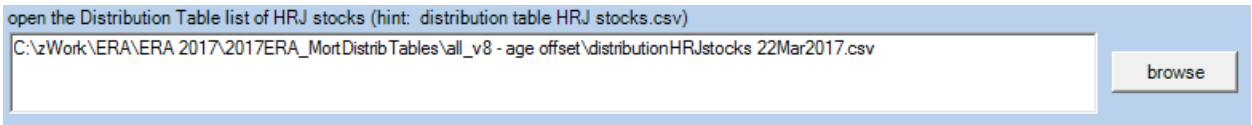
USING THE PROGRAM



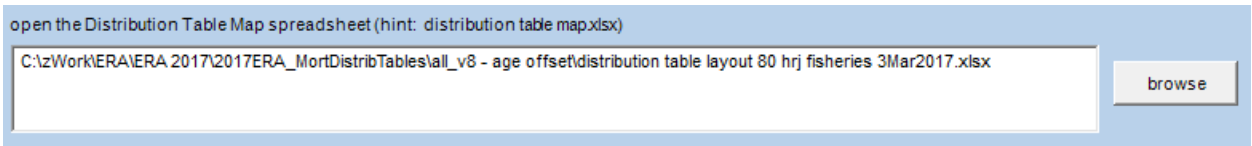
The following steps describe how to operate the Mortality Distribution Table program. Begin by making sure that you have all inputs. After opening the program (see above figure), the user needs to:

1. Select folder with the zipped ERA OUT files

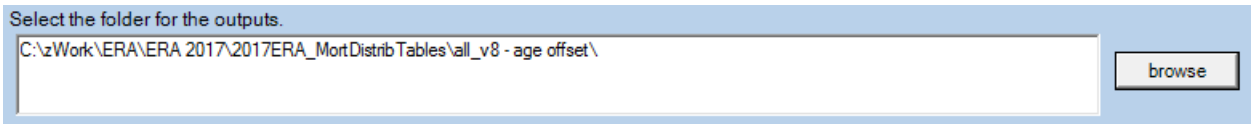
2. Select the stock definition file



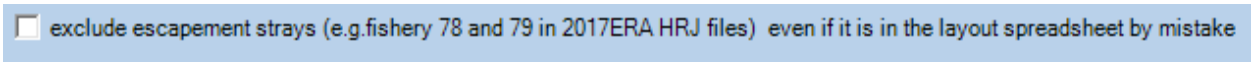
3. Select the mapping file



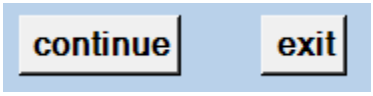
4. Select a place to save the output



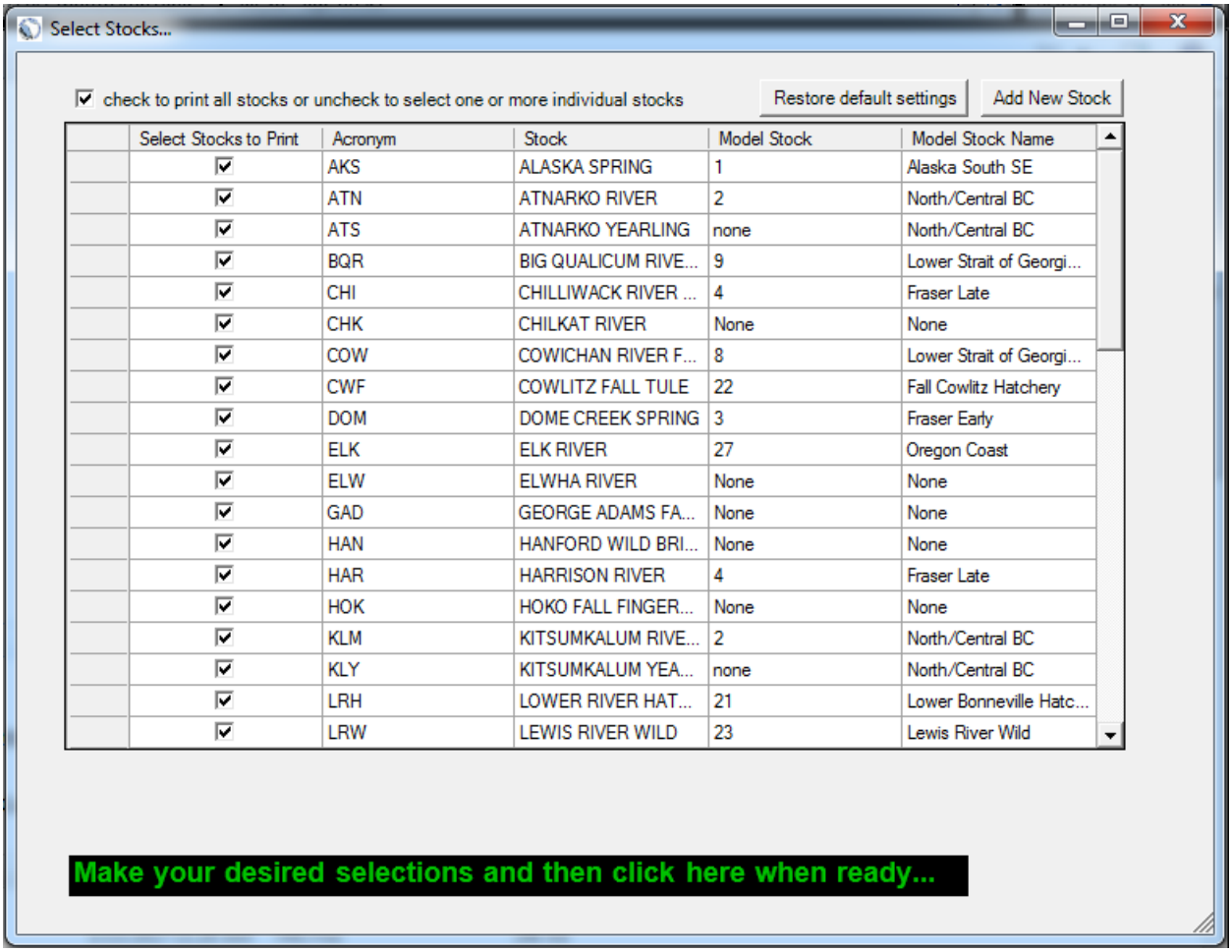
5. Choose whether or not to include escapement strays, with the default option set to include



6. Select continue (or exit)



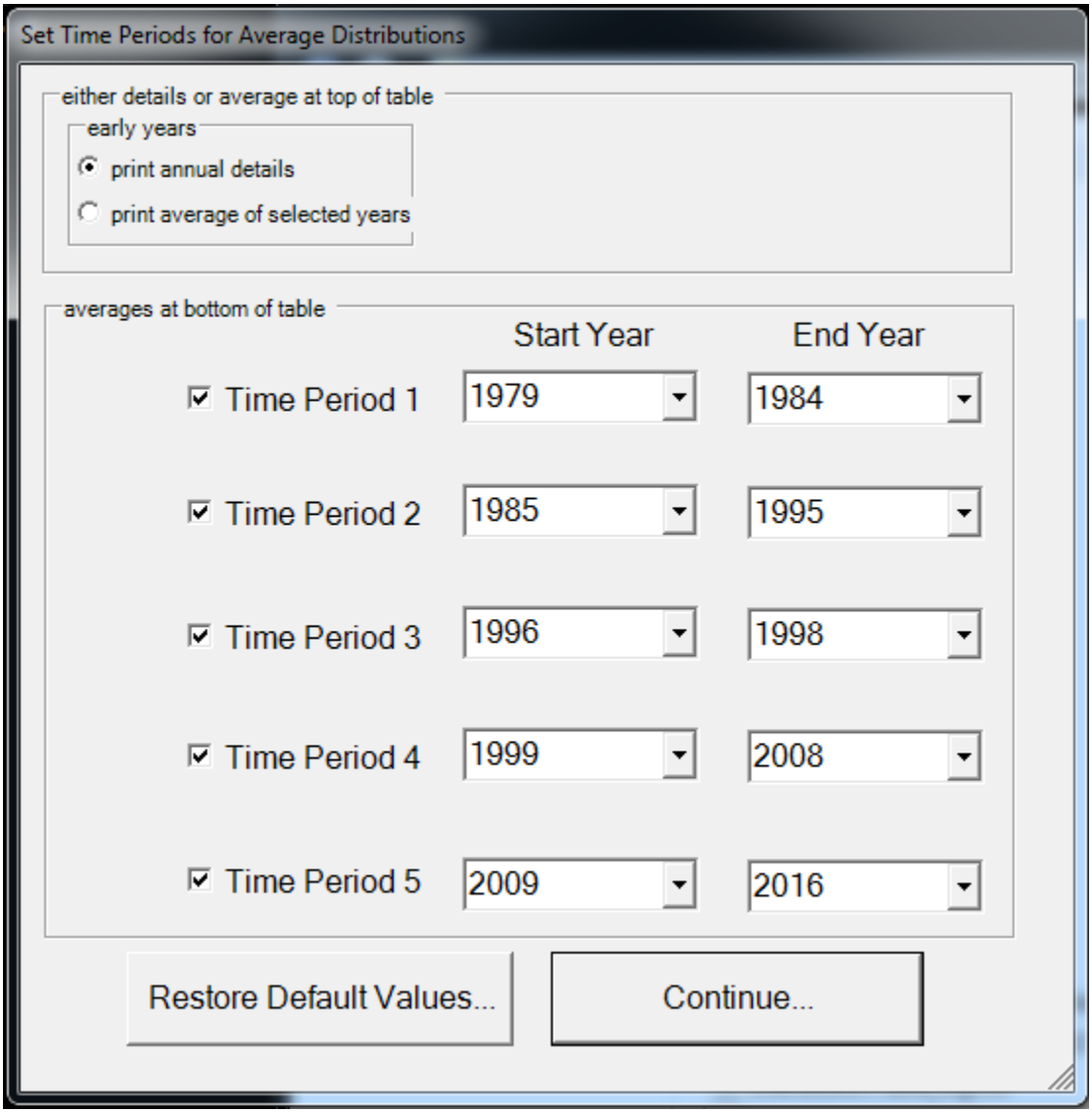
7. Select the stocks to include (individual stocks can be selected by selecting checkboxes in column “Select Stocks to Print”)



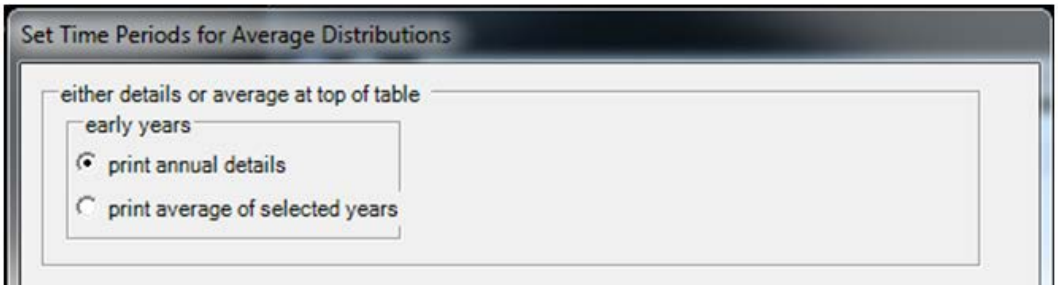
Select Stocks to Print	Acronym	Stock	Model Stock	Model Stock Name
☑	AKS	ALASKA SPRING	1	Alaska South SE
☑	ATN	ATNARKO RIVER	2	North/Central BC
☑	ATS	ATNARKO YEARLING	none	North/Central BC
☑	BQR	BIG QUALICUM RIVE...	9	Lower Strait of Georgi...
☑	CHI	CHILLIWACK RIVER ...	4	Fraser Late
☑	CHK	CHILKAT RIVER	None	None
☑	COW	COWICHAN RIVER F...	8	Lower Strait of Georgi...
☑	CWF	COWLITZ FALL TULE	22	Fall Cowlitz Hatchery
☑	DOM	DOME CREEK SPRING	3	Fraser Early
☑	ELK	ELK RIVER	27	Oregon Coast
☑	ELW	ELWHA RIVER	None	None
☑	GAD	GEORGE ADAMS FA...	None	None
☑	HAN	HANFORD WILD BRI...	None	None
☑	HAR	HARRISON RIVER	4	Fraser Late
☑	HOK	HOKO FALL FINGER...	None	None
☑	KLM	KITSUMKALUM RIVE...	2	North/Central BC
☑	KLY	KITSUMKALUM YEA...	none	North/Central BC
☑	LRH	LOWER RIVER HAT...	21	Lower Bonneville Hatc...
☑	LRW	LEWIS RIVER WILD	23	Lewis River Wild

8. After selecting stocks, press the following

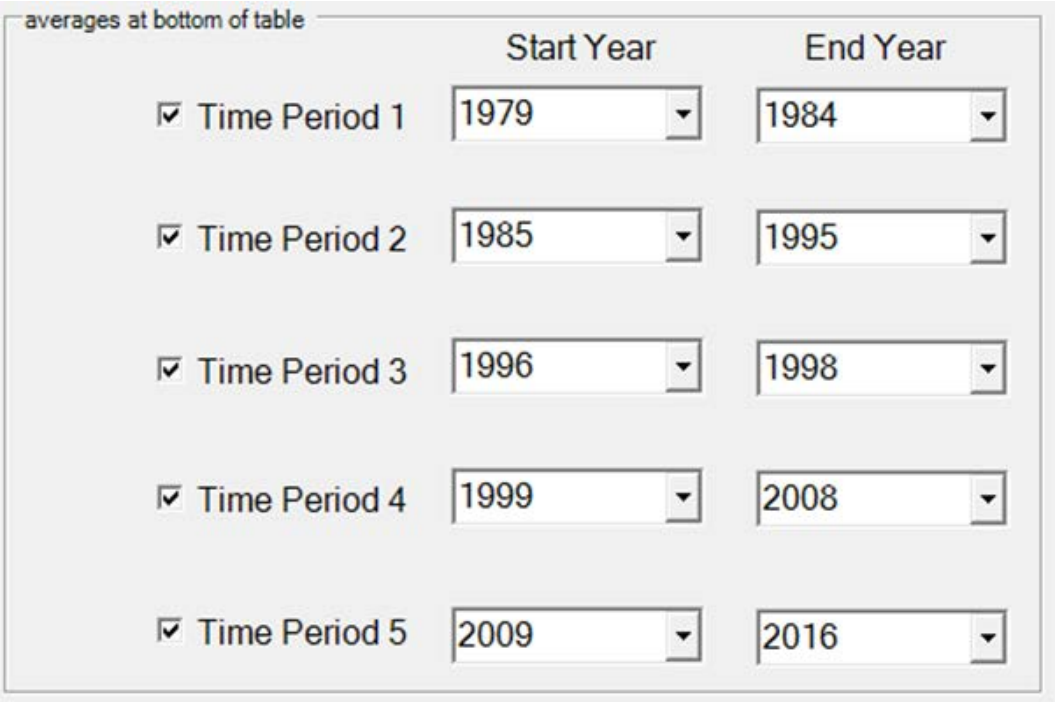
9. Select time periods details



a. Select whether or not to print annual mortality distribution values or only averages

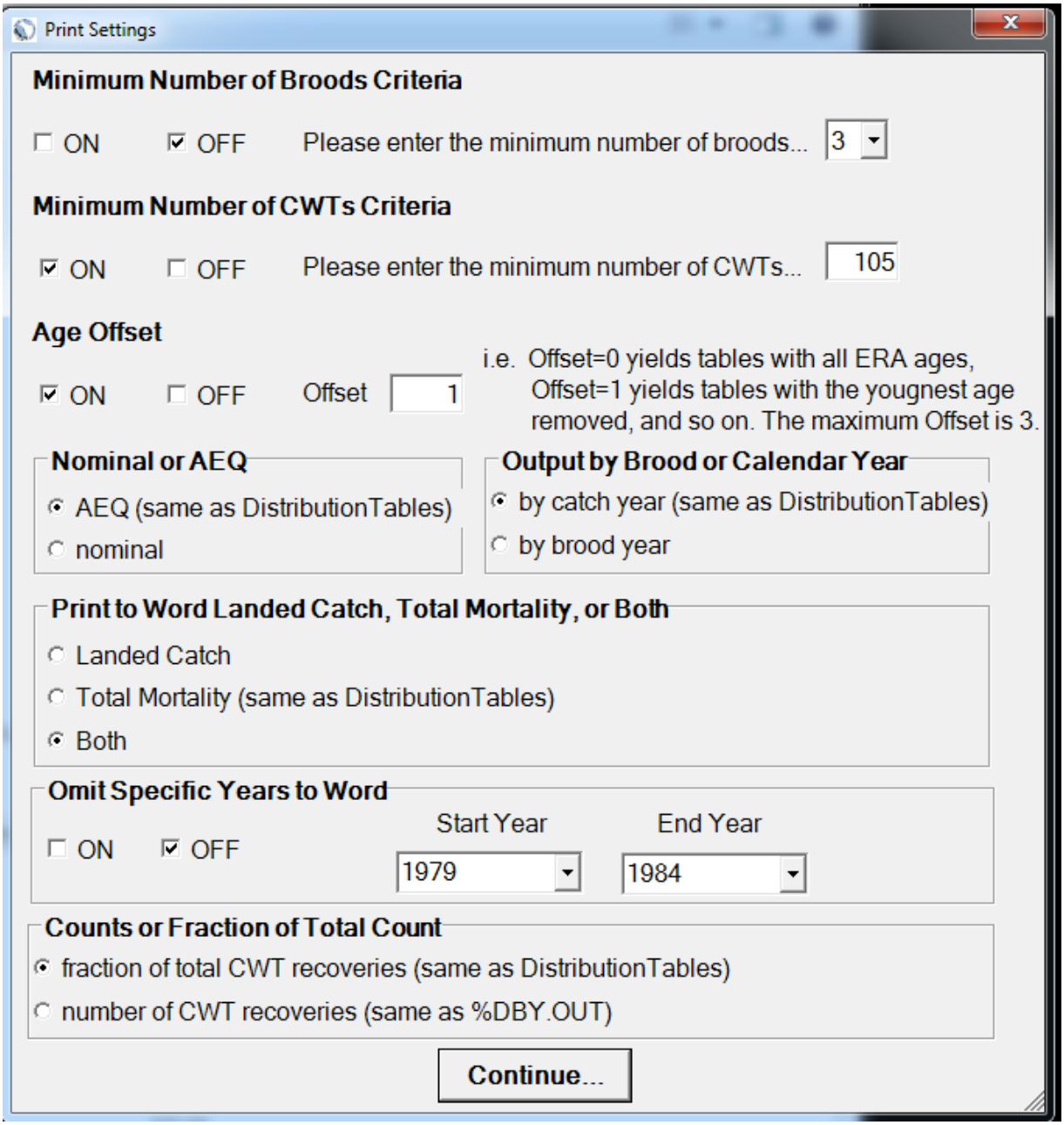


b. Select how many averages (up to 5) to include and define the range of annual years to be used to compute the average

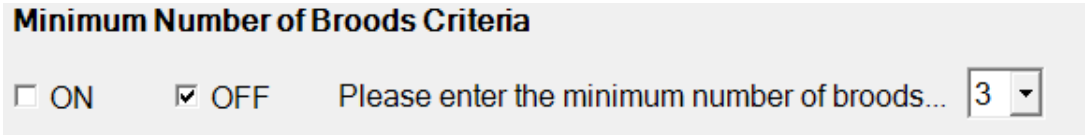


c. Select Continue

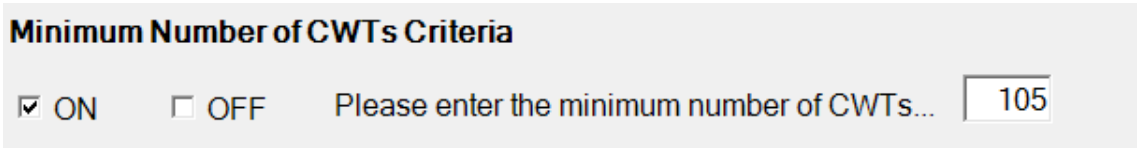
10. Select print settings.



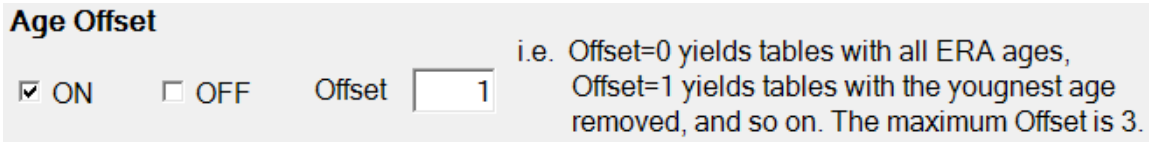
a. Minimum number of broods criteria. Note the CTC recommends to use "ON" and a minimum number of broods of 3



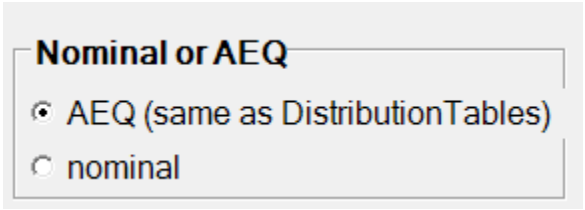
b. Minimum number of CWTs criteria. Note the CTC recommends to use "ON" and a minimum number of CWTs of 105



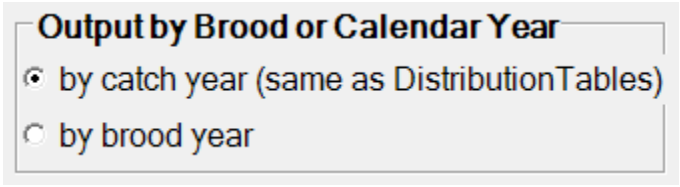
c. Age offset. Note the CTC default is "OFF". User should turn off the minimum number of broods criterion when using the age offset function to avoid conflicts between these two instructions.



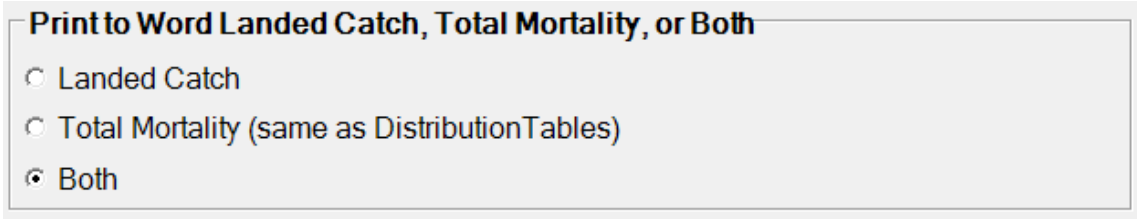
d. Nominal or AEQ. Note the CTC default is "AEQ"



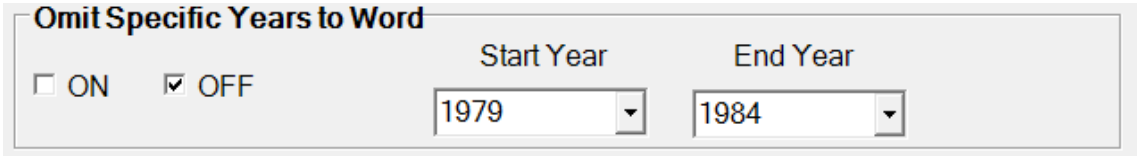
e. Output by brood or calendar year. Note the CTC default is "by catch year"



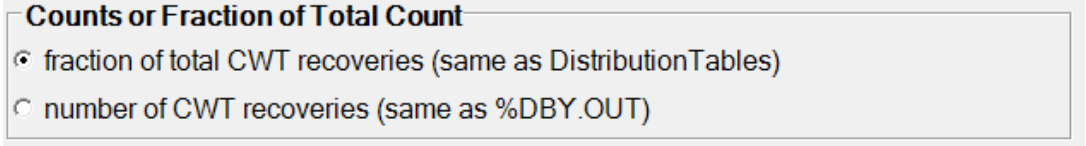
f. Print to word landed catch, total mortality, or both. Note the CTC default is "Total Mortality"



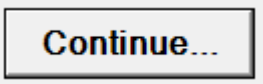
g. Omit specific years to word. Note the CTC default is "ON"



h. Counts or fraction of total count. Note the CTC default is "fraction of total CWT recoveries"



i. Select Continue



11. Choose a file name to save the results as. Note that depending on your computer's speed, it might take a while for this prompt