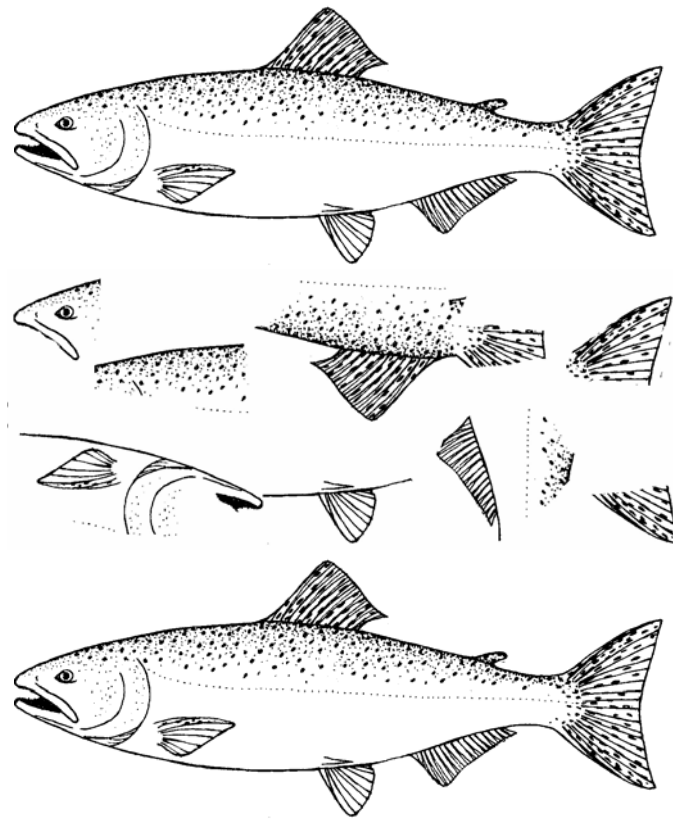


# FISHERY REGULATION ASSESSMENT MODEL (FRAM)

## Programmers Guide



MODEL EVALUATION WORKGROUP  
**Pacific Fishery Management Council**  
**7700 NE Ambassador Place, Suite 101**  
**Portland, OR 97220-1384**  
**(503) 820-2280**  
[www.pcouncil.org](http://www.pcouncil.org)

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# ACKNOWLEDGMENTS

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## MODEL EVALUATION WORKGROUP

**MR. ANDY RANKIS, CHAIR**

Northwest Indian Fisheries Commission, Olympia, Washington

**MR. LARRIE LAVOY, VICE CHAIR**

Washington Department of Fish and Wildlife, Olympia, Washington

**MR. ETHAN CLEMMONS**

Oregon Department of Fish and Wildlife, Newport, Oregon

**MR. ROBERT CONRAD**

Northwest Indian Fisheries Commission, Olympia, Washington

**MR. ALLEN GROVER**

California Department of Fish and Game, Santa Rosa, California

**MR. JIM PACKER**

Washington Department of Fish and Wildlife, Olympia, Washington

**MR. RISHI SHARMA**

Columbia River Intertribal Fish Commission, Portland, Oregon

**MR. DELL SIMMONS**

National Marine Fisheries Service, Lacey, Washington

**MR. HENRY YUEN**

U.S. Fish and Wildlife Service, Vancouver, Washington

## PACIFIC FISHERY MANAGEMENT COUNCIL STAFF

**MR. CHUCK TRACY**

**MS. RENEE DORVAL**

**MS. CARRIE COMPTON**

**MS. KIM MERYDITH**

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## Table of Contents

	<u>Page</u>
Table of Contents .....	i
List of Figures .....	i
1. Introduction .....	1
2. Form Design and Interaction .....	2
2.1 FRAM_MainMenu.Frm .....	2
2.2 FRAM_InputMenu.Frm .....	4
2.3 FRAM_Run.Frm .....	6
2.4 FRAM_DriverMenu.Frm .....	7
3. FRAM Visual basic Modules .....	11
3.1 FramCalcs.Bas .....	11
3.2 ReadCMDFile.Bas .....	23
3.3 ReadOutFile.Bas .....	24
3.4 DriverFile.Bas .....	25
3.5 SaveCmdFile.BAS .....	29
3.6 Reports.Bas .....	30
4. VARIABLE DESCRIPTIONS .....	40
4.1 Base Period PUBLIC Variables .....	40
4.2 Command File PUBLIC Variables .....	40
4.3 FramCalcs PUBLIC Variables .....	41
4.4 Report and TAMM Variable Names .....	42

## List of Figures

	<u>Page</u>
Figure 1. FRAM MainMenu form display .....	2
Figure 2. FRAM MainMenu form interaction pathways .....	3
Figure 3. FRAM InputMenu form display .....	4
Figure 4. FRAM_InputMenu form interaction pathways .....	5
Figure 5. FRAM_Run form display .....	6
Figure 6. FRAM_DriverMenu form display .....	7
Figure 7. FRAM_Outfile form display .....	8
Figure 8. FRAM_BackwardsRun form display (Coho only) .....	9
Figure 9. FRAM interaction pathways for other MainMenu options .....	10

# 1. INTRODUCTION

The Fishery Regulation Assessment Model (FRAM) was developed to estimate fishery related impacts to Chinook and coho stocks in fisheries managed by the Pacific Fishery Management Council (PFMC), the Washington State Department of Fish and Wildlife (WDFW), and the Treaty Tribes of Washington State. The FRAM program uses coded-wire-tag (CWT) release and recovery information averaged over several years to estimate a base period state of exploitation rates by stock, fishery, and time period. In the preseason regulation setting process scalars for stock abundance and fishery size are inputted into FRAM to simulate expected fishery impacts for each model stock. The FRAM output is then used to assess compliance with stock based conservation goals and allocation needs between fishery user groups.

The FRAM program replaced two earlier versions of regulation assessment tools. The Coho Assessment Model (CAM) was a spreadsheet based application used for many years (1986-1993) in the PFMC and “North of Falcon” (NOF) (WDFW and Treaty Tribes) regulation assessment processes. A Chinook model was developed using MS Quick Basic 4.5 but was not used much because fishery restrictions for coho conservation concerns were always greater than restrictions that were necessary for Chinook. Both of these models used the same basic catch algorithms and base period development as FRAM. They also used the same CWT recovery years (1979-1981) for their respective base periods.

The Chinook model was used as the basis for FRAM development using the MS Visual Basic 5.1 program. The CAM spreadsheet was prone to errors, very difficult to document, and was extremely difficult to add additional stocks or fisheries. The Chinook model was easier to use but had limited report capabilities and lacked some critical functions. The FRAM Visual Basic program made the application into a more modern compiled program that could be easily distributed and took advantage of the MS Window operating system environment.

This document is organized in a manner similar to a Visual Basic application. That is the forms (user interface screens) and modules (computer language code) are the main focus of the document. The FRAM program has 31 forms and 6 modules. Each of the forms has associated subroutines (object oriented approach) and each of the modules contain multiple subroutines. The modules are typically called by several of the forms and are organized by function such as catch estimation or file input.

The first part of this document shows how the forms are organized in relation to each other. This is essentially a roadmap of the user interface. The second part is a listing of pseudo-code (short descriptive phases) that shows the program design. The third part is a listing of program variables and a description of their use.

A complete set of code for the FRAM forms and program design is available from the Council upon request or may be downloaded from the Council web site at:  
<http://www.pcouncil.org/salmon/salother.html>

## 2. FORM DESIGN AND INTERACTION

### 2.1 FRAM\_MainMenu.Frm

The FRAM\_MainMenu form is the controlling mechanism of the application. It is used to direct the program into each of the major functions. Figure 1 shows the form display and Figure 2 shows the form interaction pathways.

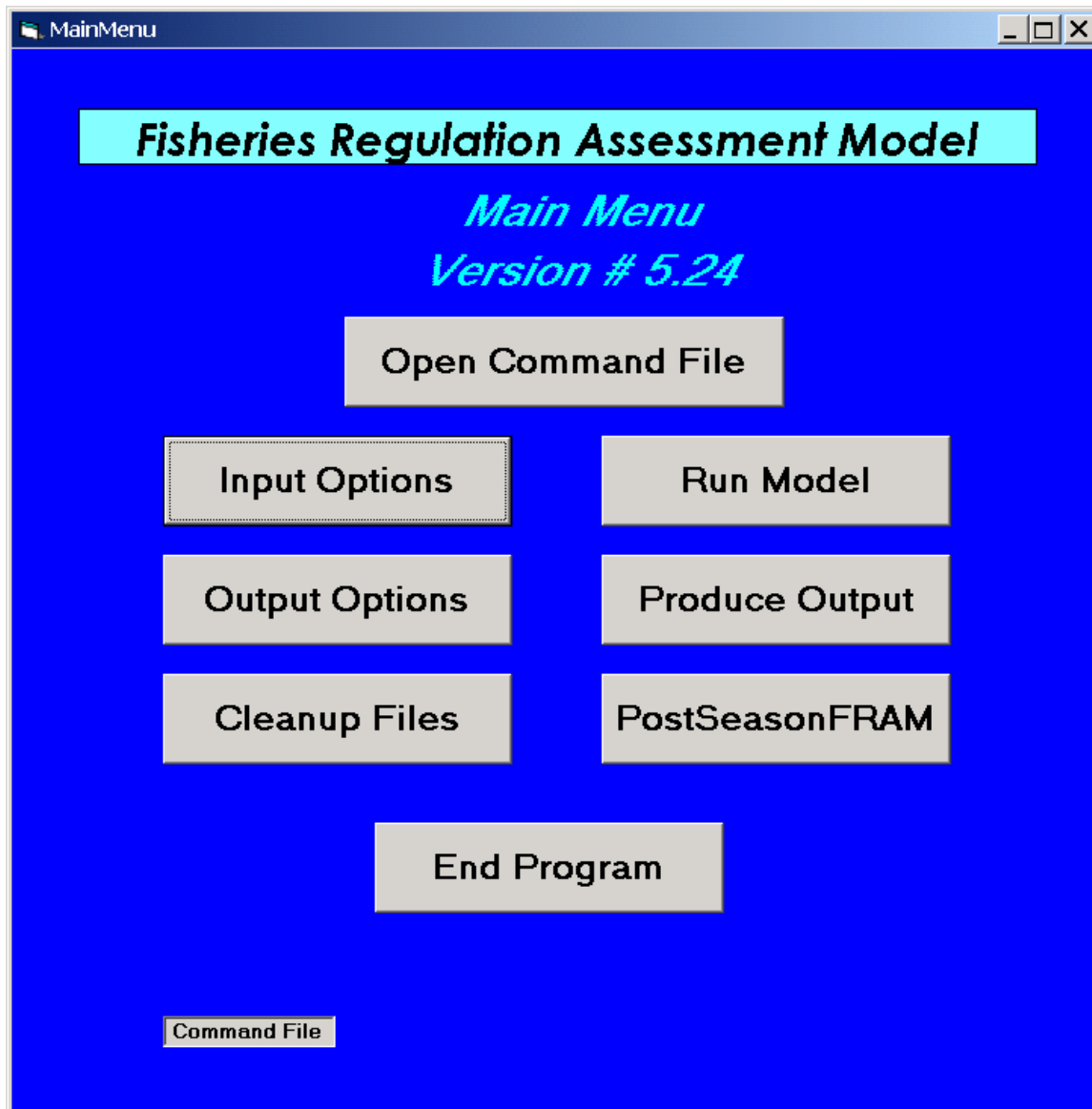


Figure 1. FRAM MainMenu form display.

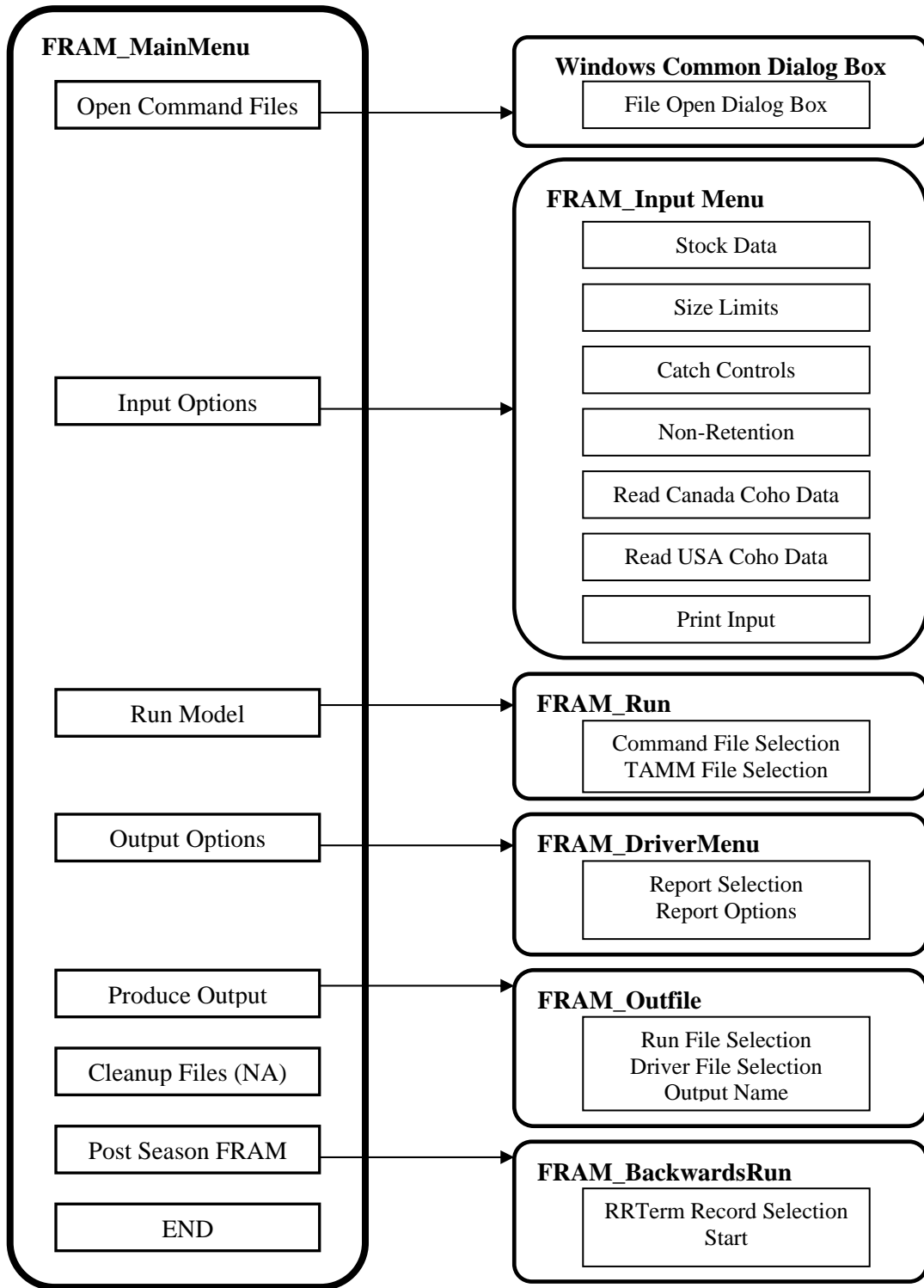


Figure 2. FRAM MainMenu form interaction pathways.

## 2.2 FRAM\_InputMenu.Frm

The FRAM\_InputMenu form is used to direct the program to the user input functions necessary to run the program in preseason mode. Figure 3 shows the form display and Figure 4 shows the form interaction pathways.

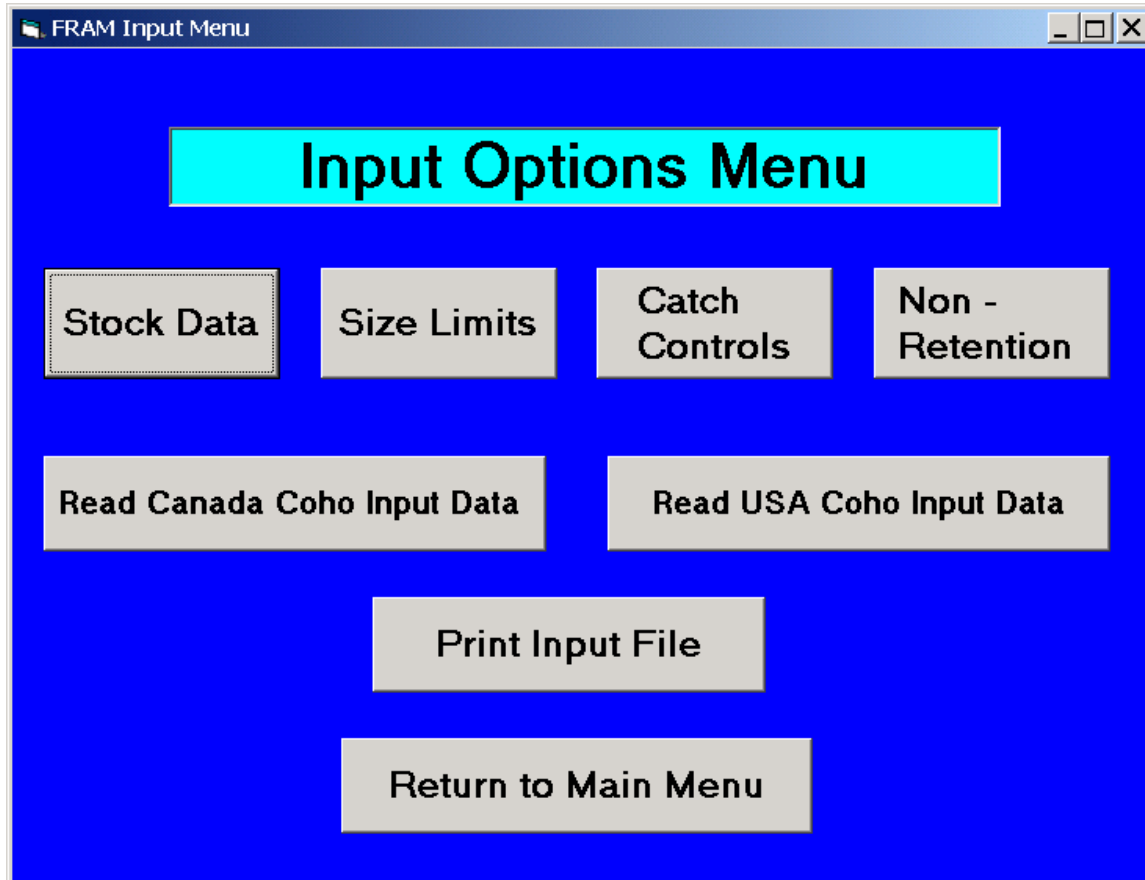


Figure 3. FRAM InputMenu form display.

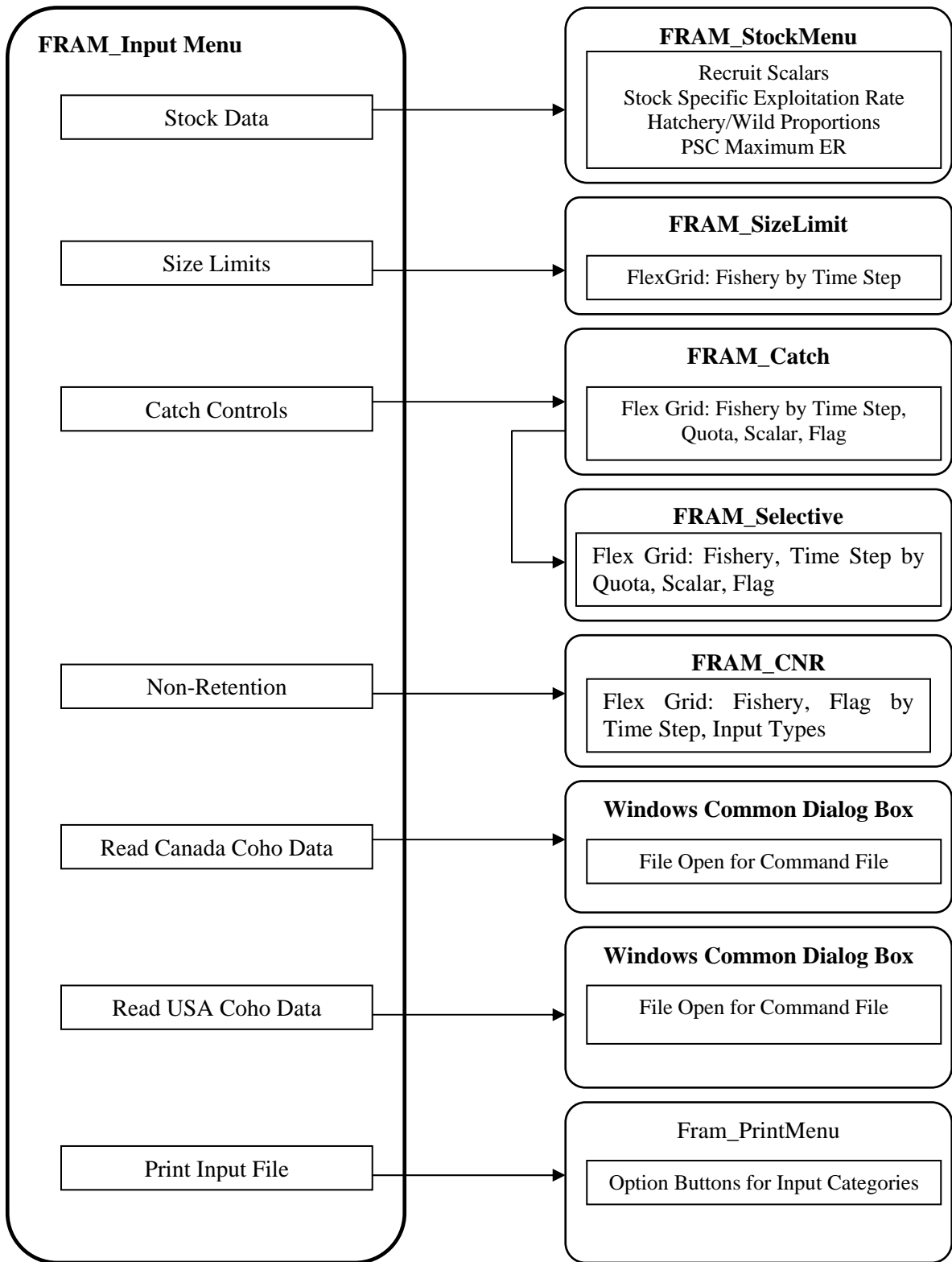


Figure 4. FRAM\_InputMenu form interaction pathways.

### 2.3 FRAM\_Run.Frm

The FRAM\_Run form prompts the user for the input files necessary to do a model run including the associated TAMM spreadsheet. Figure 5 shows the form display and Figure X shows the form interaction pathways.

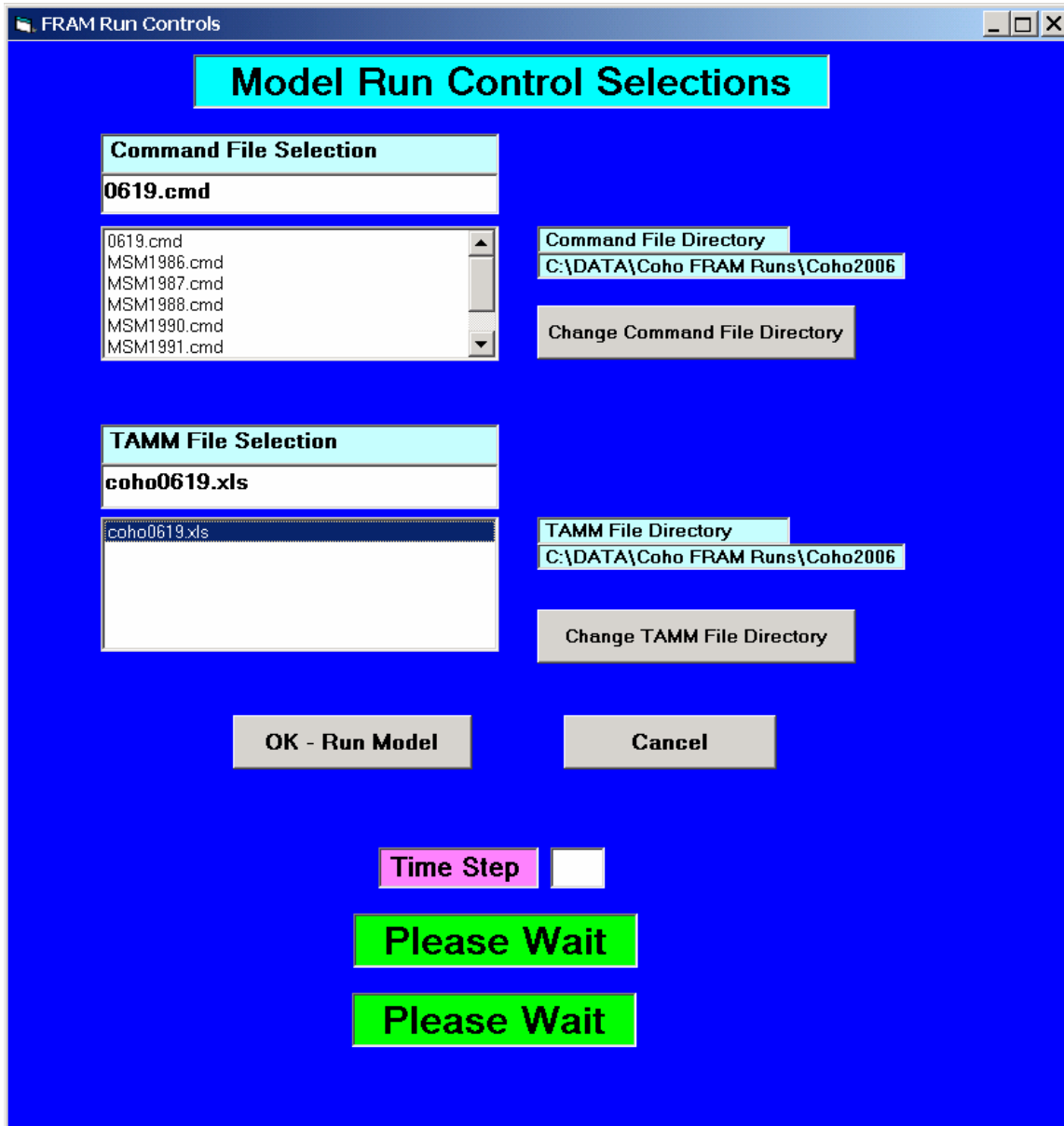


Figure 5. FRAM\_Run form display.

## 2.4 FRAM\_DriverMenu.Frm

Output Driver File Options

- Fishery Summary**
- Terminal Run Sizes**
- Stock Catch by Fishery**
- Exploitation Rate Comparison**
- Mortality by Stock and Age**
- Fishery Scale Factors**
- Stock Summary**
- Population Statistics**
- Exploitation Rate Distribution**
- Total Exploitation Rate**
- Coho Summary (CAM Style)**
- Coho Escapement (CAM Style)**
- Coho Coastal (CAM Style)**
- Selective Fishery Impacts**
- PSC Coho Exploitation Rates**
- Stock Expl. Rate and Distribution**
- Fishery Stock Composition**

Check the Reports to Include in this Output Driver File

You must Supply Options for some Reports

OK - Save Driver File

Cancel - Return to MainMenu

Figure 6. FRAM\_DriverMenu form display.



Figure 7. FRAM\_Outfile form display.

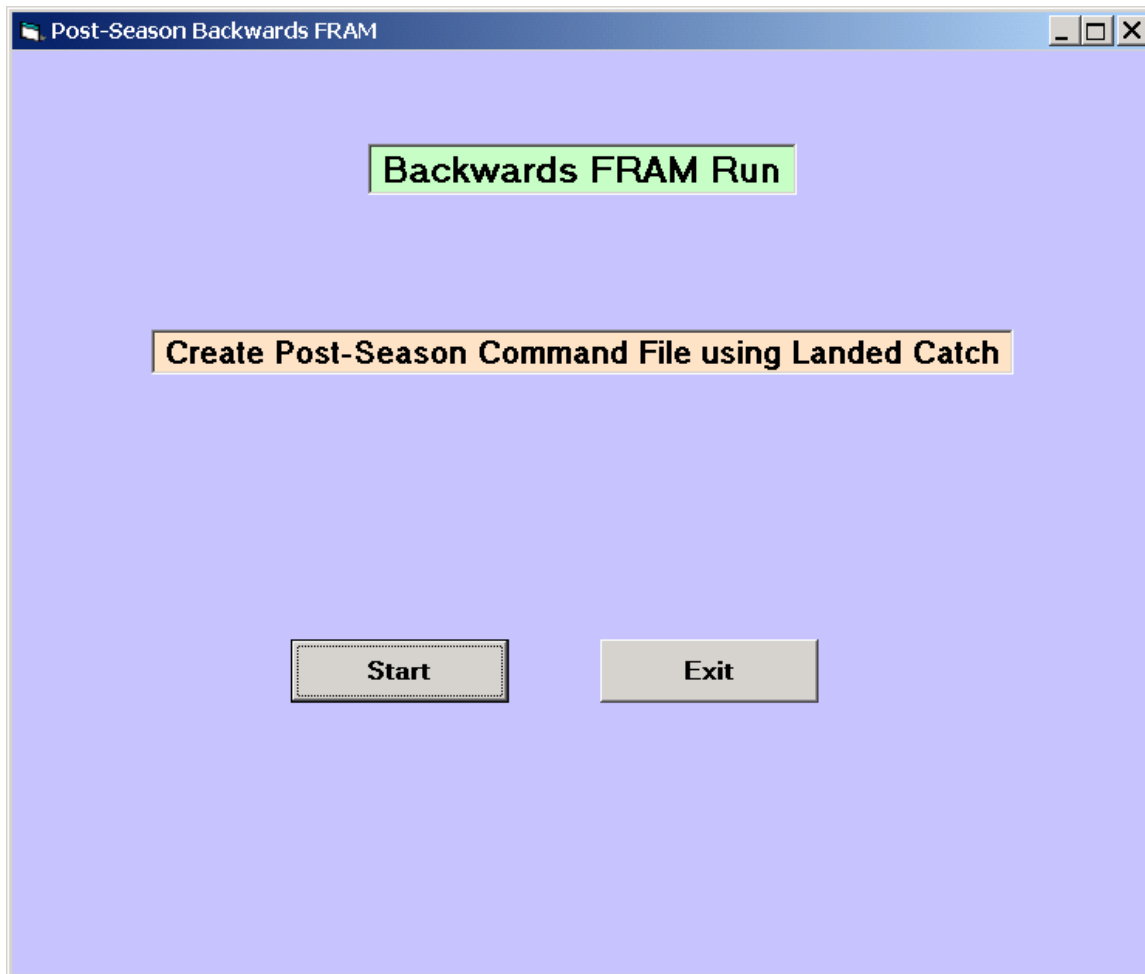


Figure 8. FRAM\_BackwardsRun form display (Coho only).

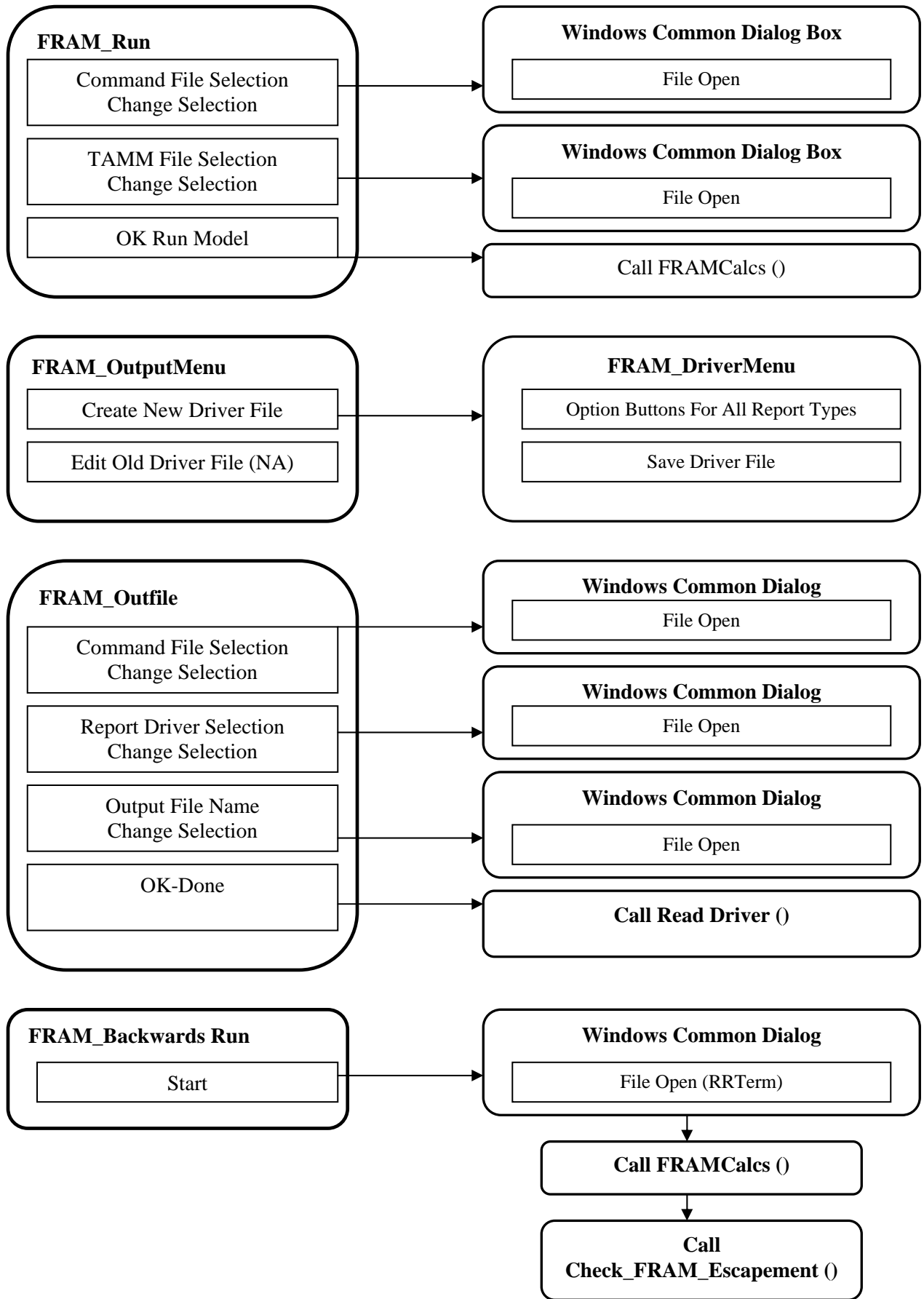


Figure 9. FRAM interaction pathways for other MainMenu options.

## 3. FRAM VISUAL BASIC MODULES

### 3.1 *FramCalcs.Bas*

**Description:** Visual Basic 6 Module containing subroutines to calculate fishery related mortalities.

**Module Subroutine List:**

Sub RunCalcs()  
Sub DetectExcel()  
Sub CompCatch(TermStat%)  
Sub CompCNR(Fish%, TermStat%, EncRate, PropSubPop())  
Sub CompCohoCNR(Fish%, TermStat%)  
Sub CompCohoShakers(Fish%)  
Sub CompEscape()  
Sub CompLegProp(Stk%, Age%, Fish%, TermStat%, SubLegalProp!, LegalProp!)  
Sub CompOthMort(Fish%)  
Sub CompPropCatch(Fish%, TermStat%, PropLegCatch(), PropSubPop())  
Sub CompShakers(Fish%, TermStat%, EncRate!, PropSubPop())  
Sub IncMort(TermStat%)  
Sub Mature()  
Sub NatMort()  
Sub SaveDat()  
Sub ScaleCohort()  
Sub TAMMComp(Iter%)  
Sub TAMMInit()  
Sub TAMMProc()  
Sub TAMMSaveDat()  
Sub TAMMTran()  
Sub TCHNComp(Iter%)  
Sub TCHNSFCComp(Iter%)  
Sub CHKSPRCH(TStep%, Fish1, Fish2, Fish3, Stk%)  
Sub CHKSPRCHSF(TStep%, Fish1, Fish2, Fish3, Stk%)  
Sub TCHNInit()  
Sub TCHNProc()  
Sub TCHNTran()  
Sub TCHNSFTran()  
Sub TCHNSaveDat()  
Sub TNewProc4()  
Sub TNewProc5()

**Sub RunCalcs ()**

\*\*\*\*\*

**Description:** Model Run Subroutine

**Called by:** MainMenu

- Set NEWCOHO TAMM variables
- Set COHO TAMM variables
- Set CHINOOK TAMM variables
- Open Binary Files for Data Storage and Retrieval
- Scale Cohort [Call ScaleCohort()]
- Time Step Loop
  - Natural Mortality [Call NatMort()]
  - Pre-Terminal Catch [Call CompCatch(PTerm)]
  - Maturation [Call Mature()]

- Terminal Catch [Call CompCatch(Term)]
- Incidental Mortality [Call IncMort()]
- Escapement [Call CompEscape()]
- Save Data [Call SaveDat()]
- Check for Negative Escapements
- TAMM Procedures
- Re-read Command File [Call ReadCmd()]
- Backwards FRAM (for NEWCOHO)

**Sub CompCatch (TermStat%)**

\*\*\*\*\*

**Description:** Compute Catch in Model Run.

**Called by:** RunCalcs()

- Fishery, Stock, Age Loop
  - Initialize Summary Arrays (TotCatch, etc.)
  - Initialize Arrays (catch, shakers, etc.)
  - Compute Legal Proportions [Call CompLegProp()]
  - Compute Catch for Scalar Fishery
  - Special Case Tulalip Bay
  - Catch by Stock, Age, Fishery, Time Step
  - Sum Encounters
  - Compute Catch for Selective Fishery
  - Compute Legal Shakers
  - Compute Catch for Quota Fishery (1<sup>st</sup> Pass)
  - Catch by Stock, Age, Fishery, Time Step
  - Compute Catch for Selective Fishery
- Fishery Loop (Quota Fishery, 2<sup>nd</sup> Pass)
  - Compute Fishery Scalar
    - Scalar = Quota/TotCatch \* ModelPct
  - Re-compute Catch & Encounters Using New Fishery Scalar
  - Ceiling Fishery
    - Encounter Ceiling Criteria (Quota/Scalar)
    - Re-compute Catch & Encounters (if necessary)
- Print NEWCOHO Time 5 Catch
  - Compute COHO Catches for South Puget Sound Net Fisheries
  - Set COHO TAMM Variables (catch)
  - Set CHINOOK TAMM Variables (catch)
    - Total Catch by Time Step
    - Nooksack AEQ Catches for Sharing Formula
    - Nooksack Spring TAMM Variables
    - White River Spring TAMM Variables

**Sub CompCNR (Fish%, TermStat%, EncRate, PropSubPop())**

\*\*\*\*\*

**Description:** Compute CHINOOK NonRetention Mortalities.

**Called by:** RunCalcs()

- Select Method (CNRFlag%)
  - Case 0 - Fishery Scale Factor
    - Legal Sized Mortality
      - CNR = Catch \* [(1-Scalar)/Scalar] \* ShakerMortRate
    - Sub-Legal Sized Mortality
      - CNR = TotalCatch\*EncounterRate\*[(1-Scalar)/Scalar]\*ShakerMortRate
  - Case 1 - Ratio of CNR Days to Normal Days



- $SD = CV * Mean$
  - $KTime = (Age - 1) * 12 + PntTime(TStep\%)$
- Check Mean against Size Limit
  - If  $< 3 * SD$  LegalProp = 1
  - If  $> 3 * SD$  LegalProp = 0
- LegalProp = 1 – NormalDist(Mean, SD)
- SubLegalProp = (1 - LegalProp) \* EncRateAdj(Age%, Fish%, Tstep%)

### Sub CompOthMort (Fish%)

\*\*\*\*\*

**Description:** Computes “other” incidental fishery mortality (i.e. dropoff, dropout)

**Called by:** SubIncMort()

$$\text{Dropoff} = \text{Catch} * \text{OtherMort}(\text{Fish}\%)$$

### Sub CompPropCatch (Fish%, TermStat%, PropLegCatch(), PropSubPop())

\*\*\*\*\*

**Description:** Computes proportion of legal and sublegal populations for stocks that contribute to a fishery.

**Called by:** Various subroutines

- Stock, Age Loop
  - Compute Legal Sized Proportion [Call CompLegProp()]
  - Sum TempCatch (Cohort \* ER \* LegalProp)
- Stock, Age Loop
  - Compute Stock Proportions of Legal Sized Catch
  - $\text{PropLegCatch} = \text{PropLegCatch} / \text{TempCatch}(\text{total})$
- Stock, Age Loop
  - Compute Sublegal Sized Proportion [Call CompLegProp()]
  - Sum Sublegal Population (Cohort \* SublegalProp)
  - Compute Nonretention Shakers  
(SublegalProp \* SublegalEncounterRate \* StockER \* SublegalHookingMortalityRate)
  - Sum Total CNR Shakers
- Stock, Age Loop
  - Compute Proportion CNR Shakers of Total CNR Shakers

### Sub CompShakers (Fish%, TermStat%, EncRate!, PropSubPop())

\*\*\*\*\*

**Description:** Computes shaker mortality for CHINOOK.

**Called by:** IncMort()

- If Fishery Catch = 0 Exit Sub
- Stock, Age Loop
  - Compute Legal Sized Proportion [Call CompLegProp()]
  - Sum Total Legal Population (of contributing shakers)
  - Exclude Non-recruited Stocks (yealings, age 2, time 1)
  - Sum Total Sublegal Population
  - $\text{Shakers} = \text{SubLegalPop} * \text{FisheryScalar} * \text{SublegalEncounterRate} * \text{ShakerMortRate} * \text{StockHRScalar}$
- Compute Encounter Rate (SublegalPop/LegalPop)

### Sub IncMort(TermStat%)

\*\*\*\*\*

**Description:** Calls shaker, CNR, and IncMort subroutines in model run main loop.

**Called by:** RunCalcs()

- Fishery Loop
  - Compute Shaker Mortalities
    - If Coho [Call CompCohoShakers]
    - If CHINOOK [Call CompShakers]
  - Compute DropOff/DropOut [Call CompOthMort(Fish%)]
  - Compute CNR Mortalities
    - If Coho [Call CompCohoCNR(Fish%)]
    - If CHINOOK [Call CompCNR(Fish%)]
- Sum Nooksack Fall CHINOOK Fishery Related Mortalities for Sharing Formula

### Sub Mature()

\*\*\*\*\*

**Description:** Computes mature and immature components of each cohort for each time step.

**Called by:** RunCalcs() after preterminal catch calculations.

- Stock, Age, Fishery Loop
  - Subtract Preterminal Mortalities from Each Cohort
  - Check for Negative Cohort Size
- Stock, Age Loop
  - Compute Mature Cohort (Preterm Cohort \* Maturation Rate)

### Sub NatMort()

\*\*\*\*\*

**Description:** Subtracts natural mortality from each cohort at beginning of each time step loop

**Called by:** RunCalcs().

- Stock, Age Loop
  - Save NEWCOHO Cohort at Time Step 4 for Terminal Calculations
  - Save Preterm Cohort
  - Compute Cohort Size (Cohort \* Survival Rate)
  - Save Working Preterminal Cohort Size

### Sub SaveDat()

\*\*\*\*\*

**Description:** Save data to binary files.

**Called by:** RunCalcs() after each time step.

- Save Stock Mortality Data
  - Fish Stock, Age Loop
    - Compute Record Number (NumPerStep% Calculation)
    - Assign Elements of StkMortRec Type Variable
    - "Put" into MRT File
- Save Cohort Data
  - Stock, Age, TermStat Loop
    - Compute Record Number (NumPerStep% Calculation)
    - Assign Elements of CohortRec Type Variable
    - "Put" into COH File
- Save Escapement Data
  - Stock, Age Loop
    - Compute Record Number
    - Assign Elements of EscapeRec

- “Put” into ESC File
- Save Fishery Mortality Data
  - Fishery Loop
    - Compute Record Number
    - Assign Elements of FishMortRec
    - “Put” into FIS File

### Sub ScaleCohort()

\*\*\*\*\*

**Description:** Computes initial cohort abundance at beginning of each run.

**Called by:** RunCalcs() at beginning of each model run.

- If BackWards-FRAM NEWCOHO Run Reset to Base Period Size
  - Stock, Age Loop
    - Compute Cohort Size (Cohort \* StockScalar)
    - Save CHINOOK Age 2, Time 1 Cohort for Time 4 Calculations
  - OPI Adjustment for COHO
    - Stock Specific Adjustments for old “CAM” Style Processing (not currently used)

### Sub TAMMComp(Iter%)

\*\*\*\*\*

**Description:** Iterative solution for Puget Sound net COHO fisheries (CAM-not currently used).

**Called by:** TAMMProc()

- Assign Preterminal Fishery Numbers
- Compute South Puget Sound Treaty/Non-treaty Shares using Preterminal Impacts
- Compute Nooksack/Samish 50/50 Sharing
- Compute South Puget Sound Estimates by Month
- Compute TAMM Estimates by Month (using TAMM inputs)
- Compare TAMM/FRAM Estimates by Month
- Compute Fishery/Time Step Scalars for Next Iteration

### Sub TAMMInit()

\*\*\*\*\*

**Description:** Initialize variables for TAMM iterations (CAM-not currently used).

**Called by:** TAMMProc()

- Print Debug Message
- Rescale Fishery Scalars using TAMM Scalars

### Sub TAMMProc()

\*\*\*\*\*

**Description:** Main COHO TAMM processing (CAM-not currently used).

**Called by:** RunCalcs() after time step loop.

- Iteration Loop (1 to 10)
  - Compute TAMM Variables [Call TAMMComp()]
  - Time Step Loop
    - Initialize Fishery Scalar [Call TAMMInit()]
    - Compute Terminal Catch [Call CompCatch(Term%)]
  - Compute Escapement [Call CompEscape()]
  - Save TAMM Data [Call TAMMSaveDat()]

### Sub TAMMSaveDat()

\*\*\*\*\*

**Description:** Save terminal catch data (CAM-not currently used).

**Called by:** TAMMProc()

- Save Stock Mortality Data
- Put Cohort into Next Time Step
- Save Escapement Data
- Save Fishery Mortality Data

### Sub TAMMTran()

\*\*\*\*\*

**Description:** Create transfer file for old “CAM” style processing (not currently used).

**Called by:** TAMMProc() after iteration solution criteria met.

- Open “Landed Catch” and “Total Mortality” Files
- Sum Total Escapements for Puget Sound, Washington Coast Stocks
- Compute Hatchery/Wild (Marked/Unmarked) for Combined Stocks
- Print Version Number
- Print Total Terminal Run and Escapements
- Print Total Fishery Catches (Marked & Unmarked)
- Print Stock Catch by Fishery

### Sub TCHNComp(Iter%)

\*\*\*\*\*

**Description:** Compute CHINOOK TAMM variables for Puget Sound net.

**Called by:** TCHNProc()

- Assign Terminal Fishery Numbers
- Assign Stock Aggregate Numbers
- Compute Total Terminal Runs
  - Sum TAMM Catch and TAMM Escapements
- Add Freshwater Sport and Subtract Marine Sport Adjustment
- Compute Nooksack/Samish Shares
  - Sum Preterminal Mortalities by Treaty/Non-Treaty
  - Compute Expected Escapement
  - Add/Subtract Equitable Adjustment
- Compute Puget Sound Spring CHINOOK Impacts in Fall CHINOOK Fisheries
- Compute TAMM Estimated Catch Using TAMM HR Inputs
- Compare TAMM/FRAM Catches
- Compute TAMM Fishery Scalars

### Sub TCHNSFCComp(Iter%)

\*\*\*\*\*

**Description:** Compute CHINOOK TAMM variables for selective fishery version of base period

**Called by:** TCHNProc()

- Assign Terminal Fishery Numbers
- Assign Stock Aggregate Numbers
- Compute Total Terminal Runs
  - Sum TAMM Catch and TAMM Escapements
- Add Freshwater Sport and Subtract Marine Sport Adjustment

- Compute Nooksack/Samish Shares
  - Sum Preterminal Mortalities by Treaty/Non-Treaty
  - Compute Expected Escapement
  - Add/Subtract Equitable Adjustment
- Special Case Tulalip Bay HR = .99 – Catch All Mature Fish without Escapement
  - Subtract FRAMM Catch Estimate for Tulalip Stock
  - Recompute Tulalip Stock Catches Using Remaining FRAM Escapement
  - Recompute TAMM Catch and Stock Impacts
- Compare TAMM/FRAM Catches
- Compute TAMM Fishery Scalars
  - Check Spring CHINOOK Impacts [Call CHKSPRCHSF()]
  - Compute Time Step 3 Scalars (TAMM Scalar = TAMMEst/FRAMCatch)
  - Compute Time Step 2 Scalars for Spring CHINOOK Impacts (Nooksack, Skagit, 13A-WhiteRiver)
  - Print Debug Messages (TAMM catch, FRAM catch, TAMM scalars)

**Sub CHKSPRCH(TStep, Fish1, Fish2, Fish3, Stk%)**

\*\*\*\*\*

**Description:** Check Spring CHINOOK Impacts (old version)  
**Called by:** TCHNProc()

- Compute Stock Specific HR Scalars for Puget Sound Spring Stocks
  - SHRS = TAMMCatch(Stk%, Age%)/FRAM Catch(Stk%, Age%, Fish%)

**Sub CHKSPRCHSF(TStep, Fish1, Fish2, Fish3, Stk%)**

\*\*\*\*\*

**Description:** Check Spring CHINOOK impacts (current SF version)  
**Called by:** TCHNProc()

- Compute Stock Specific HR Scalars for Puget Sound Spring Stocks
  - SHRS = TAMMCatch(Stk%, Age%)/FRAM Catch(Stk%, Age%, Fish%)  
 Note: Stocks include Marked and UnMarked components

**Sub TCHNInit()**

\*\*\*\*\*

**Description:** Initialize CHINOOK TAMM Variables  
**Called by:** TCHNProc()

- Print Debug Values (Fishery Scalar, Flag, TAMM Scalar)
- Compute New Fishery Scalar (Fishery Scalar \* TAMM Scalar)

**Sub TCHNProc()**

\*\*\*\*\*

**Description:** Main CHINOOK TAMM processing.  
**Called by:** RunCalcs() after normal FRAM run.

- Iteration Loop(1 to 15)
  - If Old Version [Call TCHNComp()]
  - If SF Version [Call TCHNSFComp()]
  - If Converged [Call TCHNSaveDat]
- Exit Loop
  - Time Step Loop (2 to 3 - Terminal Fishery Steps)

- Initialize Variable [Call TCHNInit]
- Compute Catch [Call CompCatch(Term%)]
- Compute Incidental Mortality [Call CompOthMort]
- Compute Escapement [Call CompEscape]
- Save TAMM Data [Call TCHNSaveDat]
- End Iteration Loop
- If Not Converged Exit Sub
- Else If Old Version [Call TCHNTran]
- If SF Version [Call TCHNSFTran]

### Sub TCHNTran()

\*\*\*\*\*

**Description:** TAMM transfer files for CHINOOK (old version)

**Called by:** TCHNProc()

- Compute Terminal Runs
  - Sum Age 2 Escapements
  - Sum Age 3-5 Escapements
  - Compute South Puget Sound Yearling Slits
  - Compute Upper and Deep SPS Fall Fingerling Slits
  - Add FW Net and Sport Catches
    - Compute SPS Yearling Splits
    - Compute Upper and Deep SPS FF Splits
  - Compute Terminal Area Abundances (TAA)
    - Add Age 3 Terminal Run
    - Compute Nooksack/Samish TAA
      - Add Bellingham Bay (Area 7B Net) All Ages
    - Compute Nooksack Spring Time Step 2
    - Compute Skagit TAA
      - Add Skagit Bay Net (Area 8 Net) All Ages
    - Compute Stillaguamish/Snohomish TAA
      - Add 8A Net All Ages
      - Add Tulalip Bay Net (Area 8D Net) All Ages
    - Compute South Sound TAA
      - Add 10/11, 13 Net All Ages
      - Split 10/11 Catch (special version for TAMM)
      - Compute SPS Yearling, FF Splits
    - Reapportion Non-SPS Impacts for SS Stocks
      - Compute Proportions for FRAM stocks
      - Compute SPS Yearlings, FF Splits
    - Compute 10/11 Net Catch Splits for Upper and Deep SPS FF
    - Hood Canal TAA
      - Add HC Net (12/12B/12C,D Net) All Ages
    - Subtract TAMM FW Sport and Marine Sport Adjustments by Stock from TAA Sums
- Print Output Files
  - Print Version Number and CMD File\$ to CKTX File
  - Print Terminal and Extreme Terminal Run Sizes (18 Puget Sound stocks) to CKTX
  - Print Total Fishery Mortality to CKTX File
    - Combine Georgia Strait Sport North and South
    - Combine Puget Sound and Area 10 and 11 Sport
  - Print Stock Catch and Mortality by Fishery
    - Stock Catch to CKTL File
    - Stock Total mortality to CKTT File

## Sub TCHNSFTran()

\*\*\*\*\*

**Description:** TAMM transfer files for CHINOOK (current selective fishery version)

**Called by:** TCHNProc()

Note: Stock include Marked and UnMarked components.

- Compute Terminal Runs
  - Sum Age 2 Escapements
  - Sum Age 3-5 Escapements
  - Compute South Puget Sound Yearling Slits
  - Compute Upper and Deep SPS Fall Fingerling Slits
  - Add FW Net and Sport Catches
    - Compute SPS Yearling Splits
    - Compute Upper and Deep SPS FF Splits
  - Compute Terminal Area Abundances (TAA)
    - Add Age 3 Terminal Run
    - Compute Nooksack/Samish TAA
      - Add Bellingham Bay (Area 7B Net) All Ages
    - Compute Nooksack Spring Time Step 2
    - Compute Skagit TAA
      - Add Skagit Bay Net (Area 8 Net) All Ages
    - Compute Stillaguamish/Snohomish TAA
      - Add 8A Net All Ages
      - Add Tulalip Bay Net (Area 8D Net) All Ages
    - Compute South Sound TAA
      - Add 10/11, 13 Net All Ages
      - Split 10/11 Catch (special version for TAMM)
      - Compute SPS Yearling, FF Splits
    - Reapportion Non-SPS Impacts for SS Stocks
      - Compute Proportions for FRAM stocks
      - Compute SPS Yearlings, FF Splits
    - Compute 10/11 Net Catch Splits for Upper and Deep SPS FF
    - Hood Canal TAA
      - Add HC Net (12/12B/12C,D Net) All Ages
    - Subtract TAMM FW Sport and Marine Sport Adjustments by Stock from TAA Sums
- Print Output Files
  - Print Version Number and CMD File\$ to CKTX File
  - Print Terminal and Extreme Terminal Run Sizes (18 Puget Sound stocks) to CKTX
  - Print Total Fishery Mortality to CKTX File
    - Combine Georgia Strait Sport North and South
    - Combine Puget Sound and Area 10 and 11 Sport
  - Print Stock Catch and Mortality by Fishery
    - Stock Catch to CKTL File
    - Stock Total mortality to CKTT File

## Sub TCHNSaveDat()

\*\*\*\*\*

**Description:** Save data to binary files for CHINOOK TAMM runs.

**Called by:** TCHNProc()

- Save Stock Mortality Data
  - Fishery, Stock, Age Loop (terminal fisheries only)
    - Compute Record Number Using NumPerStep%

- Assign Elements of StkMortRec Type Variable
    - “Put” Record in MRT File
- Save Escapement Data
  - Stock, Age Loop
    - Compute Record Number Using NumPerStep%
    - Assign Elements of EscapeRec Type Variable
    - “Put” Record in ESC File
- Save Fishery Mortality Data
  - Fishery Loop
    - Compute Record Number Using NumPerStep%
    - Assign Elements of FishMortRec Type Variable
    - “Put” Record in Fish File
- Assign Cohort Size to Next Time Step
  - If Age 2 Time Step 4 use Original Age 2 Time Step 1

**Sub TNewProc4()**

\*\*\*\*\*

**Description:** TAMM processing for NEWCOHO older 4 time step base period.

**Called by:** RunCalcs()

- Read Terminal Fishery Controls from “TAAETRSNUM.TXT” File
- Iteration Loop (1 to 5)
  - Terminal Run Size Loop (instructions from file read above)
    - Sum Escapement for Terminal Area Stocks
    - Sum Catch for Terminal Area Fisheries
  - Reset Terminal Fishery Scalar Variables
    - If Type 3 (TAA – Terminal Area Abundance)  
Fishery Scalar = TAA \* PctTermRun (from TAMM)
    - If Type 4 (ETRS – Extreme Terminal Run Size)  
Sum Catch Local Stock (TRS Local Catch)  
Compute Target Catch (ETRS \* PctExtremeRun from TAMM)  
Fishery Scalar = Target Catch \* (Total Catch/TRS Local Catch)
  - Compute Catch [Call CompCatch(Term%)]
  - Compute Incidental Mortality [Call IncMort(Term%)]
  - Compute Escapement [Call CompEscape]
  - Save Data [Call SaveDat]

**Sub TNewProc5()**

\*\*\*\*\*

**Description:** TAMM processing for NEWCOHO 5 time step base period. (Current Version)

**Called by:** RunCalcs()

- Read Terminal Fishery Controls from “TAAETRSNUM.TXT” File
- Iteration Loop (1 to 5)
  - Terminal Run Size Loop (instructions from file read above)
    - Sum Escapement for Terminal Area Stocks
    - Sum Catch for Terminal Area Fisheries
  - Reset Terminal Fishery Scalar Variables
    - If Type 3 (TAA – Terminal Area Abundance)  
Fishery Scalar = TAA \* PctTermRun (from TAMM)
    - If Type 4 (ETRS – Extreme Terminal Run Size)  
Sum Catch Local Stock (TRS Local Catch)  
Compute Target Catch (ETRS \* PctExtremeRun from TAMM)  
Fishery Scalar = Target Catch \* (Total Catch/TRS Local Catch)

- Compute Catch [Call CompCatch(Term%)]
- Compute Incidental Mortality [Call IncMort(Term%)]
- Compute Escapement [Call CompEscape]
- Save Data [Call SaveDat]

**Backwards FRAM Run Module (FRAM\_BackwardsRun.frm -VB Form)**

\*\*\*\*\*

- Open Output File and Print Header Information
- Iteration Loop (100 Times)
  - Print Stock Information Header
  - Call RunCalcs (Run FRAM for Current Stock Scaler Values)
  - Call Check\_FRAM\_Escapements

**Sub Check\_FRAM\_Escapements()**

\*\*\*\*\*

- Stock Loop
  - Print Stock Information (Escapement, Target, Scaler)
  - Check for Zero Values
  - Set Stock Scaler for Next Iteration
    - Reset Zero Target Stocks
    - Multiply Scaler for Stocks with Negative Escapement Times 1.1 or Average
    - Calculate Escapement Difference between Target and Model Estimate
    - Expand Escapement Difference to approximate Starting Cohort Size Difference
    - Recalculate Stock Scaler using Starting Cohort Difference
  - Print Next Scaler and Cohort Size

## 3.2 ReadCMDFile.Bas

\*\*\*\*\*

**Description:** Visual Basic 6 module to read FRAM input command file. This module contains most of the public variables declarations, type variable definitions, and ReadCmd subroutine.

### Sub ReadCMD()

\*\*\*\*\*

**Description:** Read FRAM command file variables and redimension arrays based on input parameters.

**Called by:** MainMenu

- Dimension Arrays for Old COHO Base Period (SSNetPct, Area 10 Net)
- Open CMDFile\$
- Read Title\$, Comments, Baser Period Filename, Prefix
- Open Base Period File
- Read Number of Stocks, Fisheries, Time Steps, Max Age from Base Period
- Redimension Arrays Based on Above Parameters
  - Catch, Escapement, Fish Scalars, CNR, Shakers, Dropoff, Stock Names, Fishery Names, Shaker Rates, Survival Rate, etc...
- Set old COHO TAMM Fishery Numbers
- Set Time Steps by Species, Type
- Read Base Period Data [Call ReadBase]
- Read Stock Scalars
  - Stock, Age Loop
    - Read, Scalar, Long Name, Short Name
- Read Old COHO Hatchery/Wild and OPI Parameters
- Time Step Loop
  - Fishery Loop
    - Read Minimum Size and Fishery Names
  - Fish Loop
    - Read Fishery Scalars and Selective Fishery Parameters
    - Set Old COHO TAMM Variables
    - Replace CHINOOK Fishery Variables with TAMM Inputs
      - Time Steps 2 and 4 Use Quotas Except Skagit
      - Time Step 3 Use HR Rates
  - Read CNR Parameters
  - Read Stock Specific HR Parameters (SHRS)
- End Time Step Loop
- If NEWCOHO Read PSC Max ER Values
- If NEWCOHO and Backwards FRAM Read Target Escapements

### 3.3 *ReadOutFile.Bas*

\*\*\*\*\*

**Description:** Visual Basic 6 module to read FRAM base period file.

#### **Sub ReadBase()**

\*\*\*\*\*

**Description:** Read base period parameters from input file.

**Called by:** ReadCmd() and RunCalcs()

- Redimension Base Period Public Variables
  - Cohort Sizes, Fishery, Exploitation Rates, Minimum Size, Maturation Rate, Growth Parameters, Dropoff Rates, etc.
- Set 'NEWCOHO' parameters not needed for catch calculations.
- Read AEQ (Adult Equivalent Factors)
  - Stock, Age, Time Step Loop
- Read Growth Parameters
  - Stock, Terminal Status, Age Loop
    - Read L, T0, K, CV Parameters
- Read Time Step Middle Month Parameters (for growth equations)
- Read Stock/Shaker Inclusion Parameters
- Read Base Period Cohort Sizes
  - Stock, Age Loop
- Read True-to-Model Parameters (Percent Model Stock)
- Read Dropout/Dropoff Parameters
- Time Step Loop
  - Read Natural Mortality Rates
  - Set NEWCOHO Rates not Needed for Catch Calculations
  - Read Shaker Mortality Rates (Hooking Mortality)
  - Read Encounter Rate Adjustment Parameters
  - Read Terminal Fishery Flags
  - Read Maturity Rates by Stock and Age
  - Read Exploitation Rates by Stock, Age, Fishery
  - Read COHO Shaker Rates
- End Time Step Loop
- Assign CHINOOK Time Step 4 ER, Nat Mort, and Maturity Rates

### 3.4 *DriverFile.Bas*

\*\*\*\*\*

**Description:** Visual Basic 6 module to read and write output driver files. Contains public variables used for report generation.

#### **Sub SaveDRV()**

\*\*\*\*\*

**Description:** Writes report driver file after user has selected reports and options for each report.

**Called by:** DriverMenu

- Open Driver File (DRVFile\$)
- Print Species, Number of Fisheries, Stocks, Time Steps, MaxAge
- Print Driver File Comments
- Report 1: Fishery Summary
  - Print Mortality Type, Number of Selected Fisheries
  - Fishery Loop
    - Print 1 for Selected Fisheries Else Print 0
- Report 2: Terminal Run
  - Print Number of Stock Groups
  - Stock Group Loop
    - Print Selected Stock Numbers for Each Stock Grouping
  - Fishery Group Loop
    - Print Selected Time Steps for Terminal Run
- Report 3: Stock Catch
  - Print Number of Stock Groups
  - Fishery Loop
    - Print 1 for Selected Fisheries Else Print 0
  - Stock Group Loop
    - Print Selected Stock Numbers for Each Stock Grouping
    - Print Group Name
- Report 4: Exploitation Rate Comparison
  - Print Number of Selected Fisheries, Stocks, and Ages
  - Fishery Loop
    - Print 1 for selected fisheries Else Print 0
    - Print 1 for Fisheries Selected for Summary Else Print 0
    - Print 1 for Fisheries Selected for PFMC Summary Else Print 0
  - Stock Loop
    - Print 1 for Selected Stocks Else Print 0
  - Age Loop
    - Print 1 for Selected Ages Else Print 0
  - Selected Stock, Selected Age Loop
    - Print User Defined Cohort Size
  - Selected Fishery, Selected Stock, Selected Age Loop
    - Print User Defined AEQ Catch
- Report 5: Age Specific Mortality
  - Print Number of Selected Fisheries, Stocks, and Mortality Type
  - Fishery Loop
    - Print 1 for Selected Fisheries Else Print 0
  - Stock Loop
    - Print 1 for Selected Stocks Else Print 0
- Report 6: Fishery Scale Factors

- Print Number of Selected Fisheries
  - Fishery Loop
    - Print 1 for Selected Fisheries Else Print 0
- Report 7: Stock Summary
  - Print “Y” or “N”
- Report 8: Population Statistics
  - Print “Y” or “N”
- Report 9: Exploitation Rate Distribution
  - Print Number of Fishery Groups, Stocks, and Mortality Type
  - Fishery Group Loop
    - Print Selected Fishery Numbers for Each Fishery Grouping
    - Print Fishery Group Name
  - Stock Loop
    - Print 1 for Selected Stocks Else Print 0
- Report 10: Total Exploitation Rate
  - Print Number of Fisheries, Stocks, and Mortality Type
  - Fishery Loop
    - Print 1 for Selected Fisheries Else Print 0
  - Stock Loop
    - Print 1 for Selected Stocks Else Print 0
  - Stock, Age Loop
    - Print InRiver HR
- Report 11: Coho Summary ( old “CAM” style report)
  - Print “Y” or “N”
- Report 12: Coho Escapement ( old “CAM” style report)
  - Print “Y” or “N”
- Report 13: Coho Coastal ( old “CAM” style report)
  - Print “Y” or “N”
- Report 14: Selective Fishery
  - Print “Y” or “N”
- Report 15: PSC Coho ER
  - Print “Y” or “N”
- Report 16: Stock Exploitation Rate and Distribution
  - Print Number of Stock Groups
  - Stock Group Loop
    - Print Selected Stock Numbers for Each Stock Grouping
    - Print Stock Group Name
- Report 17: Fishery Stock Composition
  - Print Number of Selected Fisheries
  - Fishery Loop
    - Print 1 for Selected Fisheries Else Print 0

**Sub SaveDriver()**

\*\*\*\*\*

**Description:** Read output file parameters and call selected report subroutines.

**Called by:** Output Report Generation Form

- Open Print File (SavFile\$)
- Open Binary Files (MRT, COH, ESC, CAT, ENC)
- Assign Time Step Names by Selected Species
- Assign COHO Report Labels
- Open Driver File (DRVFile\$)
- Read Number of Stocks, Fisheries, Time Steps, MaxAge, EncRateAdj)

- Read Diver File Comments
- Report 1: Fishery Summary
  - Redimension Report Arrays
  - Read Mortality Type, Number of Selected Fisheries
  - Read Selected Fisheries
  - Call Subroutine [Call SumRep()]
- Report 2: Terminal Run
  - Read Number of Stock Groups
  - Redimension Report Arrays
  - Stock Group Loop
    - Read Selected Stocks for Each Stock Group
    - Read Fishery Group Selections
    - Read Selected Time Steps for Terminal Runs
  - Call Subroutine [Call TrunRep()]
- Report 3: Stock Catch
  - Read Number of Stock Groups, Mortality Type
  - Redimension Report Arrays
  - Read Selected Fisheries
  - Stock Group Loop
    - Read Selected Stocks for Catch Stock Group
    - Read Stock Group Name
  - Call Subroutine [Call StkCatRep()]
- Report 4: Exploitation Rate Comparison
  - Read Number of Selected Fisheries, Stocks, and Ages
  - Redimension Report Arrays
  - Read Selected Summary Fisheries
  - Read Selected PFMC Summary Fisheries
  - Read Selected Stocks
  - Read Selected Ages
  - Redimension Selected Cohort and AEQ Catch Arrays
  - Read Selected Cohort Sizes
  - Read Selected AEQ Catch by Selected Stock and Selected Age
  - Call Subroutine [Call ExplRep]
- Report 5: Age Specific Mortality
  - Read Number of Selected Fisheries, Stocks, Mortality Type
  - Redimension Report Arrays
  - Read Selected Fisheries
  - Read Selected Stocks
  - Call Subroutine [Call MortAgeRep()]
- Report 6: Fishery Scale Factors
  - Read Number of Selected Fisheries
  - Read Selected Fisheries
  - Call Subroutine [Call ExplScaleRep()]
- Report 7: Stock Summary
  - Call Subroutine [Call StkSumRep()]
- Report 8: Population Statistics
  - Call Subroutine [Call PopStatRep()]
- Report 9: Exploitation Rate Distribution
  - Read Number of Fishery Groups, Stocks, and Mortality Type
  - Redimension Report Arrays
  - Fishery Group Loop
    - Read Selected Fisheries for Each Group
    - Read Fishery Group Name
  - Read Selected Stocks
  - Call Subroutine [Call DistRep()]

- Report 10: Total Exploitation Rate
  - Read Number of Selected Fisheries, Stocks, Mortality Type
  - Redimension Report Arrays
  - Read Selected Fisheries
  - Read Selected Stocks
  - Read InRiverHR by Selected Stock and Age
  - If Mortality Type = 4 [Call FisheryExplRep]
  - Else [Call TotExplRep]
- Report 11: Coho Summary (old “CAM” style)
  - Call Subroutine [Call CohoSumRep()]
- Report 12: Coho Escapement (old “CAM” style)
  - Call Subroutine [Call CohoTRunRep()]
- Report 13: Coastal Coho (old “CAM” style)
  - Call Subroutine [Call CoastCoho()]
- Report 14: Selective Fishery (old “CAM” style)
  - Call Subroutine [Call SelectFish()]
- Report 15: PSC Coho ER()
  - Call Subroutine [Call PSCCohoER()]
- Report 16: Stock Exploitation Rate and Distribution
  - Read Number of Stock Groups
  - Stock Group Loop
    - Read Selected Stocks for Each Stock Grouping
    - Read Stock Group Name
  - If CHINOOK [Call CHINOOKStockER()]
  - If NEWCOHO [Call NewCohoStockER()]
- Report 17: Fishery Stock Composition
  - Read Number of Selected Fisheries
  - Read Selected Fisheries
  - If CHINOOK [Call FishPctRepCHINOOK()]
  - If NEWCOHO [Call FishPctRepNewCoho()]

### 3.5 SaveCmdFile.BAS

\*\*\*\*\*

**Description:** Visual Basic 6 module to save FRAM command file after changes by user.

#### Sub SaveCMD()

\*\*\*\*\*

**Description:** Writes new FRAM command file.

**Called by:** MainMenu when parameter changes detected.

- Open CMDFile\$
- Print Species, Title, Comments, Base Period Name, Prefix
- Print Stock Scalars
  - Stock, Age Loop
    - Print Stock Scalar and Stock Name for Age 2
- Print Hatchery/Wild and OPI for COHO (old “CAM” version)
- Time Step Loop
  - Print Minimum Size Limits
    - Fishery Loop  
Print Size Limit and Fishery Name
  - Print Fishery Scalars
    - Fishery Loop  
Print Quota of Fishery Scalar and Flag  
If Selective Fishery Print Selective Parameters
  - Print CNR
  - Print Stock Specific HR Adjustments
- End Time Step Loop
- If NEWCOHO print PSC Max ER Values

#### Sub PrintInp()

\*\*\*\*\*

**Description:** Prints User Selected Portions of Command File.

- Assign Coho Time Step Names
- Open Print File (PRTFile\$)
- If Selection 1 = True Print Stock Scalars
- If Selection 2 = True Print Fishery Scalars Including SF Parameters
- If Selection 3 = True Print Minimum Size Limits
- If Selection 4 = True Print Exploitation Rates
- If Selection 5 = True Print CNR Data
- If NEWCOHO Print PSC Max ER Values

## 3.6 Reports.Bas()

\*\*\*\*\*

**Description:** Visual Basic 6 module containing all the FRAM report subroutines.

### Module Subroutine List:

Sub SumRep()  
Sub TRunRep()  
Sub StkCatRep()  
Sub ExplRep()  
Sub MortAgeRep()  
Sub ExplScaleRep()  
Sub StockSumRep()  
Sub PopStatRep()  
Sub DistRep()  
Sub TotExplRep()  
Sub CohoSumRep()  
Sub CohoTRunRep()  
Sub CoastalCoho()  
Sub SelectFish()  
Sub FisheryExplRep()  
Sub PSCCohoER()  
Sub CHINOOKStockER()  
Sub NewCohoStockER()  
Sub FishPctRepNewCoho()  
Sub FishPctRepCHINOOK()

Note: All report subroutines called by Output\_Menu

### Sub SumRep()

\*\*\*\*\*

**Description:** Fishery Summary Report

- Print Header Information (Species, CMDFile\$, ReportName, DRVFile\$, Time)
- If Mortality Type = 6 (all reports)
  - Time Step Loop
    - Get Fishery Record (FSH)
    - Store Data in Report Matrix
- If COHO (old “CAM” style report – 13 time periods)
  - Printer Header Information
  - Fishery, Time Step Loop

- Get Fishery Record (FSH)
    - Print Catch, CNR, Shaker, Total Mortality Estimates
  - If Mortality Type = 6 (all reports)
    - Report Loop
      - Print Each of the Report Types
- If CHINOOK or NEWCOHO w/4 Time Steps
  - Printer Header Information
  - Fishery, Time Step Loop
    - Get Fishery Record (FSH)
    - Print Catch, CNR, Shaker, Total Mortality Estimates
  - If Mortality Type = 6 (all reports)
    - Report Loop
      - Print Each of the Report Types
- If NEWCOHO w/5 Time Steps
  - Printer Header Information
  - Fishery, Time Step Loop
    - Get Fishery Record (FSH)
    - Print Catch, CNR, Shaker, Total Mortality Estimates
  - If Mortality Type = 6 (all reports)
    - Report Loop
      - Print Each of the Report Types

### Sub TRunRep()

\*\*\*\*\*

**Description:** Terminal run summary report combining local stocks and fisheries.

- Print Header Information
- Print Escapement Header Information
- Stock Group Loop
  - Time Step, Stock, Age Loop
    - Get Escapement Record
    - Sum Estimates
  - Stock, Time Step, Age, Fishery Loop
    - Get Stock Catch Record
    - Sum Terminal Run Estimates
  - Print Escapements and Terminal Run Estimates
- Stock Group Loop
  - Print Selected Terminal Fisheries for Each Stock Group

### Sub StkCatRep()

\*\*\*\*\*

**Description:** Stock Catch Report

- Print Header Information
- If COHO of NEWCOHO
  - Print Column Header Information (time steps)
  - Fishery, Time Step, Age Loop
    - Get Catch Record (CAT)
    - Sum Catch by Time Step
    - Print Catch Summary
- If CHINOOK
  - Print Column Header Information (time steps)
  - Fishery, Time Step, Stock, Age Loop
    - Get Catch Record (CAT)

- Sum Catch by Time Step
  - Print Catch Summary
- If Mortality Type = 6 (all reports) Loop Back to Beginning Next Report

### Sub ExplRep()

\*\*\*\*\*

**Description:** Exploitation rate comparison report. Special CHINOOK report for cumulative ER comparison.

- Redimension Report Flag Arrays
- Assign Flags to Selective Fisheries
- Redimension Report Fishery, AEQ Catch, Arrays
- Stock, Age, Fishery, Time Step Loop
  - Get Catch Record (CAT)
  - Assign to AEQ Catch Array
- Compute Base Adult Equivalent Exploitation (AEQ) Rate
  - Stock, Fish, Age Loop
    - Base ER =  $AEQCatch / User\_Cohort * AEQ$
- Compute Predicted Adult Equivalent Exploitation (AEQ) Rate
  - Stock, Age Loop
    - Get Cohort Record Time Step 1 (COH)
    - Fishery Loop
      - $PredER = AEQCatch / Cohort * AEQ$
- Compute Age Specific Index
  - Stock, Fishery, Age Loop
    - Fishery Age Index =  $PredER / BaseER$
    - $BaseFish = \sum (AEQCatch / User\_Cohort * AEQ)$
    - $PredFish = \sum (AEQCatch / Cohort * AEQ)$
    - $FishIndex = PredFish / BaseFish$
- Compute Index for All Fisheries and PFMC Fisheries
  - Stock, Age, Fishery Loop
    - $BaseStk = \sum BaseER$
    - $PredStk = \sum PredER$
    - $PFMCSumBase = \sum BaseER$  for PFMC flagged fisheries
    - $PFMCSumPred = \sum PredER$  for PFMC flagged fisheries
- Print Report
  - Stock Loop
    - Print Header Information
    - Fishery, Age Loop
      - Print BaseER, PredER, Ratio
      - Sum CumERBase, CumER Pred
      - $TotalBase = \sum BaseER$
      - $TotalPred = \sum PredER$
      - Print Fish Index
      - $CumSumBase = \sum CumERBase$
      - $CumSumPred = \sum CumERPred$
      - Print CumSumPred/CumSumBase
    - Age Loop (PFMC Total)

- Print PFMC Index, Tota Base, TotalPred, Ratio
- Print Total Index

### Sub MortAgeRep()

\*\*\*\*\*

**Description:** Catch by stock, age, mortality type.

- Stock Loop
  - Print Header Information
  - Fishery, Age, Time Step Loop
    - Get Catch Record (CAT)
    - Assign Catch to Mortality Type Summary
    - Print Summary

### Sub ExplScaleRep()

\*\*\*\*\*

**Description:** Fishery Scalar Report (quota fisheries shown as scalars).

- Print Header Information
- Fishery, Time Step Loop
  - Print Fishery Name
  - Get Fishery Record (FSH)
  - Print Fishery Scalar

### Sub StockSumRep()

\*\*\*\*\*

**Description:** Stock Summary Report

- Sum Catch Over Ages and Time Steps
  - Fish, Stock, Time Step, Age Loop
    - Get Catch Record (CAT)
    - Assign Catch to Report Catch Array
- Stock Catch Summary Report
  - Print Header Information
  - Page Loop
    - Assign Stocks to Page (max 10 per page)
    - Fishery Stock Loop
      - Print Report Catch Array
  - Loop Back to Page With All Stocks Printed
- Percent Mortality Report
  - Print Header Information
  - Page Loop
    - Assign Stocks to Page (max 10 per page)
    - Fishery, Stock Loop
      - Print Ratio Stock Catch Array to Total Catch Sum

### Sub PopStatRep()

\*\*\*\*\*

**Description:** Population Statistics Report

- Redimension Arrays
- Assign Cohort Labels
- Time Step, Stock, Age Loop

- Get Cohort Record (COH)
  - Assign to PopStat Array
- Time Step, Stock, Age Loop
  - Get Escapement Record (ESC)
  - Assign to PopStat Array
- Print Report NEWCOHO
  - Print Header Information
  - Page Loop
    - Assign Stocks to Page (max 10 per page)
    - Print Page Header Information
    - Time Step, Age, Stock Loop
      - Print PopStat Array Values
- Print Report CHINOOK
  - Print Header Information
  - Page Loop
    - Assign Stocks to Page (max 2 per page)
    - Print Page Header Information
    - Time Step, Stock, Age Loop
      - Print PopStat Array Values

### Sub DistRep()

\*\*\*\*\*

**Description:** Exploitation Rate Distribution Report

- Stock Group Loop for Total Mortality
  - Fishery Group Loop
    - Age, Time Step Loop
      - If CHINOOK and Time Step = 1 Skip
      - Get Catch Record (CAT)
      - If Mortality Type = Total
        - Get Fishery Record (FSH)
        - Sum TotMort
    - Get Escapement Record (ESC)
      - Assign Escapement to TotMort
- Print Report
  - Print Header Information
  - Page Loop
    - Assign Stocks to Page (max 8 per page)
    - Print Page Header Information
    - Fish Group Loop
      - Fishery, Age, Time Step Loop
        - Get Catch Record (CAT)
          - Assign Catch to RepMort
        - If Mortality Type = Total
          - Get Fishery Record (FSH)
          - Sum MortPop (RepMort/TotMort)
      - Get Escapement Record (ESC) for Mortality Type > 3
        - Sum MortProp = Escapement/TotMort
      - Print MortProp
    - Loop Back Until All Stock Groups Printed

### Sub TotExplRep()

\*\*\*\*\*

**Description:** Total Exploitation Rate Report

- Redimension Arrays
- Stock, Fish, Age, Time Step Loop
  - Get Catch Record (CAT)
  - Assign Catch to RepMort
  - Sum TotMort
- Redimension Report Arrays
- Stock, Age Loop
  - Get Cohort Report (COH)
    - Assign Cohort\*AEQ to PredAEQCohort
    - Sum TotAEQCohort
  - $OER = TotMort/TotAEQCohort$
  - Get Terminal Cohort (COH)
    - Assign Cohort to PredTermCohort
    - $OcnEsc = PredTermCohort - TotTermMort$  (user input)
    - $TermRunRate = OcnEsc/TotAEQCohort$
    - $IRER = \sum (TermRunRate*InRiverHR)$  (user input)
  - $TotalER = (OER+IRER)$
- Print Report
  - Print Header Information
  - Stock Loop
    - Print OER, IRER, TotER

### Sub CohoSumRep()

\*\*\*\*\*

**Description:** Coho Summary Report (old “CAM” style preterminal catches).

- Assign Coho Stock Numbers
- Fishery, Time Step Loop
  - Get Fishery Record (FSH)
    - Assign Table Catch
- Sum Table Rows
- Print Report
  - Print Header Information
  - Print Table by Rows

### Sub CohoTRunRep()

\*\*\*\*\*

**Description:** Coho Escapement and Terminal Run Report (old “CAM” style).

- Assign Coho Stock Numbers
- Stock, Time Step Loop
  - Get Escapement Record (ESC)
  - Assign to StkEscpmnt
- Print Report
  - Print Header Information
  - Calculate Percent Unmarked (wild) Combined Stocks (CAM base period)
  - Stock Loop
    - Print Hatchery, Wild Escapement Using Input H/W Values

## Sub CoastalCoho()

\*\*\*\*\*

**Description:** Coastal Coho Report (old "CAM" style).

- Compute Hatchery/Wild Percents Using Input H/W Values
- Stock Loop
  - Print Header Information
  - Fishery, Time Step Loop
    - Get Catch Record (CAT)
    - Assign Catch to StkCat Array
    - Assign Catch to SideBar Array
    - Get Escapement Record (ESC)
      - Assign Escapement to SideBar Array
  - Print Stock H/W and Marked/Unmarked Values
  - Print SideBar Array

## Sub SelectFish()

\*\*\*\*\*

**Description:** Selective Fishery Report

- Fishery ,Time Step Loop
  - If Selective Print Header Information Else Loop
  - Stock Loop
    - Get Catch Record (CAT)
    - Sum Total Values
    - Print Encounter, Catch, LegalShaker, Dropoff, Shaker for Marked and Unmarked
    - Print Total Line

## Sub FisheryExplRep()

\*\*\*\*\*

**Description:** Fishery Stock Composition Report

- Redimension Report Arrays
- Stock, Fishery, Age, Time Step Loop
  - Get Catch Record (CAT)
  - Assign Catch to RepMort
  - Get Fishery Record (FSH)
    - Assign TermFlag
  - If Terminal Fishery      Total AEQMortESC = RepMort  
  Else                      Total AEQMortESC = RepMort\*AEQ
  - If Selected Fishery      SelectedAEQMort =  $\sum$  RepMort
- Time Step, Stock, Age Loop
  - Get Escapement Record (ESC)
  - Total ESC =  $\sum$  Escapement
- Print Report
  - Print Header Information
  - Stock Loop
    - StkSum =  $\sum$  SelectedAEQMort
    - Time Step Loop
      - Print Selected AEQMort/(TotalAEQMortEsc+TotalEsc)
    - Print StkSum/(TotalAEQMortEsc+TotalEsc)
    - Print TotalAEQMortESC/(TotalAEQMortEsc+TotalEsc)

## Sub PSCCohoER()

\*\*\*\*\*

**Description:** PSC Coho Maximum Exploitation Rate Report

- Assign Stock Group Numbers
- Time Step, Stock Group Loop
  - Get Escapement Record (ESC)
    - Assign to PSCER Array
- Fishery Stock Group Time Step Loop
  - Get Catch Record (CAT)
    - Assign to PSCER Array
- Print Report
  - Print Header Information
  - Stock Loop
    - $StkTotal = \sum PSCER$  (all elements)
    - Print PSCER/USCatch/StkTotal
    - Print PSCER/Canada/StkTotal
    - Print PSC-MaxER-(PSCER/US+PSCER/Canada)

## Sub CHINOOKStockER()

\*\*\*\*\*

**Description:** CHINOOK Stock Exploitation Rate Report

- Stock Group Loop
  - Redemission Mortality Array
  - Stock, Time Step, Age Loop
    - Get Escapement Record (ESC)
    - Assign Escapement to TotStkMort, TotAEQMort Arrays
  - Fishery, Time Step Loop
    - Get Fishery Record (FSH)
    - Assign Mortality to TotFisheryMort Array
  - Stock, Fishery, Time Step, Age Loop
    - Get Catch Record (CAT)
    - Assign Catch to TotStkMort, TotAEQMort Arrays
  - $Sum\ TotStkMort = \sum TotStkMort$
  - $Sum\ TotAEQMort = \sum TotAEQMort$
  - $TotalAEQCohort = \sum TotStkMort$
  - Print Report 1 – Distribution of Impacts
    - Print Header Information
    - Fishery, Age, Time Step Loop
      - Print TotStkMort/SumTotStkMort
  - Print Report 2 – Catch per 1000 by Fishery
    - Print Header Information
    - Fishery, Time Step, Age Loop
      - Print  $TotStkMort(\sum Age)/TotFisheryMort$

## Sub NewCohoStockER()

\*\*\*\*\*

**Description:** NEWCOHO Stock Exploitation Rate Report

- Stock Group Loop
  - Redimension Mortality Arrays
  - Stock, Time Step Loop
    - Get Escapement Record (ESC)
      - Assign Escapement to InData Array
  - Fish, Time Step Loop
    - Get Fishery Record (FSH)
      - Assign to TotalMort Array
  - Stock Loop
    - Fishery, Time Step Loop
      - Get Catch Record (CAT)
        - Assign to InData Array
  - Sum TotalMort, TotalCohort, TotalFish from InData Array
  - Print Report 1 – Distribution of Impacts
    - Print Header Information
    - Fishery, Time Step Loop
      - Print InData/TotalFish
  - Print Report 2 – Total Mortality by Fishery
    - Print Header Information
    - Fishery, Time Step Loop
      - Print InData/TotalMort
  - Print Report 3 – Total Mortality Exploitation Rate Distribution
    - Print Header Information
    - Fishery, Time Step Loop
      - Print InData/TotalMort
    - Print Escapement
    - Print TotalMort
  - Print Report 4 – Total AEQ Mortality Exploitation Rate By Fishery, Time Step
    - Print Header Information
    - Fishery, Age, Time Step Loop
      - Print TotAEQMort/TotalAEQCohort
      - Print SumTimeStep/TotalAEQCohort
      - Print TotAEQMort(Escapement)
  - End Stock Group Loop (set of reports for each stock group)

### Sub FishPctRepNewCoho()

\*\*\*\*\*

**Description:** Fishery Mortality Stock Composition Reports for NEWCOHO.

- Fishery, Stock, Time Step Loop
  - Get Catch Record (CAT)
  - Assign Catch to FishData Array
- Print Report 1 – Stock/TotalMortalityReport
  - Print Header Information
  - Stock, Time Step Loop
    - Print Fish Data
- Print Report 2 – Stock Composition Report
  - Print Header Information
  - Stock, Time Step Loop
    - Print FishData/FishDataSum

### Sub FishPctRepCHINOOK()

\*\*\*\*\*

**Description:** Fishery Mortality, Stock Composition Reports for CHINOOK

- Fishery, Stock, Age, Time Step Loop
  - Get Catch Record (CAT)
  - Assign Catch to FishData Array
- Print Report 1 – Stock TotalMortalityReport
  - Print Header Information
  - Stock, Age, Time Step Loop
    - Print Fish Data
  - Age, Time Step
    - Print Fish Data ( $\sum$  TimeStep) [Model Stocks]
  - Print  $\sum$  FishData
  - Age, Time Step
    - Print FishData ( $\sum$  TimeStep)/PctModelStock [All Stock Total]
  - Print  $\sum$  FishData/PctModelStock
- Print Report 2 – Stock Total Mortality Summed by Age Report
  - Print Header Information
  - Stock, Time Step Loop
    - Temp =  $\sum$  FishData(Age)
    - Print Temp
  - Time Step, Age Loop
    - Temp =  $\sum$  FishData(Time Step, Age) [Model Stocks]
    - Print Temp
  - Time Step, Age Loop
    - Temp =  $\sum$  FishData(Time Step, Age)
    - Print Temp/PctModelStocks [All Stocks]
- Print Report 3 – Stock Composition Summed for All Ages
  - Time Step Loop
    - Get Fishery Record
    - Assign Mortality to TotFisheryMort
  - Print Header Information
  - Stock, Time Step, Age Loop
    - Temp =  $\sum$  FishData(Age)
    - Print Temp/TotalFisheryMort

## 4. VARIABLE DESCRIPTIONS

### 4.1 Base Period PUBLIC Variables

AEQ!(1 To NumStk%, 2 To MaxAge%, 1 To NumSteps%)  
Cohort!(NumStk%, 2 To MaxAge%, 0 To 4, NumSteps%)  
CohoShakerRate!(NumStk%, 2 To MaxAge%, NumFish%, NumSteps%)  
CV!(NumStk%, 2 To MaxAge%, 0 To 1)  
EncRateAdj!(2 To MaxAgeEncAdj%, NumFish%, NumSteps%)  
HR!(NumStk%, 2 To MaxAge%, NumFish%, NumSteps%)  
K!(NumStk%, 0 To 1)  
L!(NumStk%, 0 To 1)  
MatRate!(NumStk%, 2 To MaxAge%, NumSteps%)  
MaxAge%  
MinSize%(NumFish%, NumSteps%)  
NumFish%  
NumSteps%  
NumStk%  
OtherMort!(NumFish%)  
PntTime!(NumSteps%)  
ShakMortRate!(NumFish%, NumSteps%)  
SmlStockName\$(1 To NumStk%)  
Species\$  
StkCheck%(NumStk%, NumFish%)  
SubER!(NumStk%, 2 To MaxAge%, NumFish%, NumSteps%)  
SurvRate!(2 To MaxAge%, NumSteps%)  
T0!(NumStk%, 0 To 1)  
TermFlag%(NumFish%, NumSteps%)

- Adult Equivalent Values
- Cohort Sizes (Time Step 1 from Base Period)
- Coho Hooking Mortality Rate
- CV of Von Bertalanffy Estimate
- Encounter Rate Adjustment Factor for Chinook SubLegal
- Exploitation Rate
- K Value of Von Bertalanffy Formula
- L Value of Von Bertalanffy Formula
- Maturation Rate
- Maximum Age
- Minimum Size Limit
- Number of Fisheries
- Number of Time Steps
- Number of Stocks
- Dropoff or Dropout Rate
- Time Step MidPoint (month) for Von Bertalanffy Formula
- Hooking Release Mortality Rate
- Small Stock Name (abbreviated)
- Species
- Flag for Stock Inclusion in Chinook Shaker Calculations
- SubLegal Chinook Encounter Rate for Shaker Calculations
- Survival Rate (1 - Natural Mortality Rate)
- T0 Value of Von Bertalanffy Formula
- Terminal Fishery Flag

### 4.2 Command File PUBLIC Variables

BackEsc(1 To NumStk%, 1 To NumBackIterations)  
BackwardsFRAMFlag%  
Ceiling&(NumFish%, NumSteps%)  
CmdTitle\$  
CNRFish%(1 To NumFish%, 1 To NumSteps%)  
CNRFlag%(1 To NumFish%, 1 To NumSteps%)  
CNRInput!(4, 1 To NumFish%, 1 To NumSteps%)  
Comment\$(1 To NumComms%)  
InpFile\$  
NumCNR%(1 To NumSteps%)  
NumSHRS%(NumSteps%)  
OPIAdjFact!(1 To 9)  
OPIName\$(1 To 9)  
OutPreFix\$  
PSCMaxER(1 To 13)  
PSCStkName(1 To 13)

- Backwards FRAM Target Escapement
- Backwards FRAM Flag
- Quota Value when Ceiling Control selected
- Title for Command File
- NonRetention Fisheries
- NonRetention Fishery Flags
- NonRetention Values
- Command File Comments
- Base Period Filename
- Number of NonRetention Fisheries
- Number of Stock Specific ER Scale Factors
- COHO OPI Adjustment Factors (old CAM Style)
- COHO OPI Stock Names (old CAM Style)
- Binary File Prefix (4 characters)
- PSC Maximum Exploitation Rate for NEWCOHO
- PSC Stock Names

```

QuotaEff!(NumFish%, NumSteps%)
QuotaFlag%(NumFish%, NumSteps%)
SelIncRt!(1 To NumFish%, NumSteps%)
SelMrkID!(1 To NumFish%, NumSteps%)
SelRelRt!(1 To NumFish%, NumSteps%)
SelUMkID!(1 To NumFish%, NumSteps%)
StkScale!(NumStk%, 2 To MaxAge%)
StkHRScale!(NumStk%, NumFish%, NumSteps%)

```

- Fishery Scalers (Quota or Effort depending on Flag)
- Flag for QuotaEff Array
- Selective Fishery Incidental Mortality Rate
- Selective Fishery Marked Mis-ID Rate
- Selective Fishery Hooking Release Mortality Rate
- Selective Fishery UnMarked Mis-ID Rate
- Stock Scaler
- Stock Specific ER Scale Factors

### 4.3 FramCalcs() PUBLIC Variables

```

BackIter%
BackScaler(1 To NumStk%, 1 To NumBackIterations)
Catch!(NumStk%, 2 To MaxAge%, NumFish%, NumSteps%)
CmdChange%
CMDDirect$
CMDDrive$
CMDFile$
CNREncounter!(1 To NumStk%, 2 To MaxAge%)
CNRMort!(NumStk%, 2 To MaxAge%, NumFish%, NumSteps%)
CNRShakers!(1 To NumStk%, 2 To MaxAge%)
DropOff!(NumStk%, 2 To MaxAge%, NumFish%, NumSteps%)
DRVComms$(1 To NumDrvComms)
DRVDirect$
DRVDrive$
DrvError%
DRVFile$
Encounter!(NumStk%, 2 To MaxAge%, NumFish%, NumSteps%)
Escape!(NumStk%, 2 To MaxAge%, NumSteps%)
ExcelWasNotRunning
FRAM_Escapements(1 To NumStk%)
InitCohort!(NumStk%)
LegalShakers!(NumStk%, 2 To MaxAge%, NumFish%, NumSteps%)
NegEsc%(NumStk%, NumSteps%)
NumBackIterations
NumComms%
NumDrvComms%
NumSelectFish%
OPIHADJ!
OREADJ!
Style)
ORENAT!
CAM Style)
PropLegCatch(NumStk%, 2 To MaxAge%)
PropSubPop(1 To NumStk%, 2 To MaxAge%)
PRTDrive$
PRTFile$
PRTDirect$
PTerm%

```

- Backwards FRAM Iteration number
- Backwards FRAM Fishery Scaler
- Landed Catch
- Flag for Command File Changes
- Command File Directory
- Command File Drive
- Command File Filename
- NonRetention Encounters
- NonRetentino Mortalities
- NonRetention Shakers
- Dropoff Mortalities
- Driver File Comments
- Driver File Directory
- Driver File Drive
- Driver File Error Flag for Wrong Format
- Driver File Filename
- Selective Fishery Encounters
- Escapement
- Excel Flag for Opening TAMM Spreadsheet (VB)
- Backwards FRAM Array used for Convergence
- Initial Cohort Size for Time Step 1
- FramCalcs() Selective Fishery LegalSized Shakers
- Flag for Stocks with Negative Escapements
- Number of Backwards FRAM Iterations
- Number of Command File Comments
- Number of Driver File Comments
- Number of Selective Fisheries
- OPI Col. Rvr. Hatchery Adjustment Factor (old CAM Style)
  - OPI Oregon Coast HatcheryAdjustment Factor (old CAM
- OPI Oregon Coast Natural (OCN) Adjustment Factor (old
- Proportion LegalSized Catch
- Proportion SubLegal Population
- Print File Drive
- Print File Filename
- Print File Directory
- PreTerminal Variable

ReadMinSize  
 RunNum\$  
 SAVDirect\$  
 SAVDrive\$  
 SAVFile\$  
 SelFlag\$(  
 Shakers!(NumStk%, 2 To MaxAge%, NumFish%, NumSteps%)  
 TAMMdirect\$  
 TAMMdrive\$  
 TAMMFILE\$  
 Time4Cohort(1 To NumStk%)  
 VersNumb\$  
 Year\$  
 RunFile\$

- Flag for NEWCOHO Command File (skip minimum size)
- Run Number Label
- Output (Report) File Drive
- Output (Report) File Filename
- Output (Report) File Directory
- Selective Fishery Flag
- SubLegal Shakers
- TAMM File Directory
- TAMM File Drive
- TAMM File Filename
- Time Step 4 Cohort Size for NEWCOHO TAMM Calculations
- FRAM Version Number
- Year Variable for Multiple Year runs
- 

## 4.4 Report and TAMM Variable Names

ChinTime\$(1 To 4)  
 CStkLabel(NCstStk)  
 CstTtr(12)  
 Cum(1 To NumExplAge, 1 To 2)  
 CumFlag(1 To NumExplFish)  
 FA  
 FGrpName\$  
 FishData(1 To NumStk + 1, 2 To 5, 1 To NumSteps% + 1)  
 FisheryERData(NumFish%, NumSteps%)  
 FishName\$(1 To NumFish% + 1)  
 FishSelect(1 To NumFish%)  
 FishTotCat&(NumFish% + 1)  
 GrpName\$  
 HCanalFWS!  
 HW  
 InData!(1 To NumFish% + 2, 1 To NumSteps% + 1)  
 IRER(Rep1ONS), InRivHR(NumStk%, MaxAge%)  
 TotER(Rep1ONS)  
 MLCat!(1 To NumSteps%)  
 MLMrt!(1 To NumSteps%)  
 MonName  
 MortSelect\$  
 NewCmdCountry  
 NewGroup  
 NewStkFishER  
 NtFs%(29)  
 OcnEsc(Rep1ONS, MaxAge%), TermRunRate(Rep1ONS, MaxAge%)  
 OER(Rep1ONS), PredTermCohort(Rep1ONS, MaxAge%)  
 OutRep%(1 To 17)  
 Page!(1 To 28, 1 To 66)  
 TotEsc(1 To 18)  
 PCat!(1 To 5, 1 To 71)

- FishPctRepChinook() Time Step Labels
- CoastCoho() Stock Labels
- CoastCoho() Total Terminal Run
- ExplRep() Cumulative Run
- ExplRep() Flag for Cumulative Fisheries
- CohoSumRep() Fishery Area Array
- DistRep() Fishery Group Name
- FishPctRepCoho(), FishPctRepChinook() Catch Data
- Flag for existence of ER data in Fishery
- Report Fishery Names
- Flag for Selected Fisheries in Reports
- StkSumRep() Fishery Total Catch
- Stock Group Name for Reports
- COHO TAMM Hood Canal Freshwater Catch (CAM)
- COHO TAMM Hatchery/Wild Pcts (CAM)
- NewCohoStockER(), ChinookStockER() Catch Matrix
- TotExplRep() InRiver ER (User Entered)
- TotExplRep() Total ER (IRER + OER)
- TAMM Marked Landed Catch
- TAMM Marked Total Mortality
- COHO Month Name (CAM)
- DriverFile Mortality Type Selection
- NEWCOHO Combine CMD Files Flag
- DriverFile NewGroup Flag
- Number of User Entered SHRS Rates
- TAMM Nooksack PreTerminal Fishery List
- TotExplRep() Ocean (Model) Escapement
- TotExplRep() Ocean ER
- Flag for DriverFile Selected Reports
- TAMM Chinook Mortality Matrix
- TAMM Chinook Escapement
- TAMM Chinook Landed Catch

PFMCFlag(1 To NumExplFish)	- ExplRep() Flag for PFMC Cumulative Fisheries
PointExplAge(1 To 4)	- ExplRep() Flag for Selected Ages
PointExplFish(1 To NumExplFish)	- ExplRep() Flag for Selected Fisheries
PointExplStk(1 To NumExplStk)	- ExplRep() Flag for Selected Stocks
FishAgeIndex(1 To NumExplStk, NumExplAge, NumExplFish)	- ExplRep() Ratio Predicted/Base ER's
FishIndex(1 To NumExplStk, 1 To NumExplFish)	- ExplRep() Base Stock/Fishery ER
PredCohort(1 To NumExplStk, 1 To NumExplAge)	- ExplRep() Predicted Stock/Fishery ER
TotIndex(1 To NumExplStk)	- ExplRep() Ratio Predicted/Base Stock ER
BaseExpl(1 To NumExplStk, 1 To NumExplAge, 1 To NumExplFish)	- ExplRep() Base Stock/Age/Fishery ER
PredExpl(1 To NumExplStk, 1 To NumExplAge, 1 To NumExplFish)	- ExplRep() Predicted Stock/Age/Fishery ER
PopStat!(MaxAge% - 1, NumStk%, NumSteps% * 2 + 1, 2)	- PopStatRep() Cohort Matrix
PR_Short_Name(0 To 29)	- BackFRAM() Production Region Names
PredAEQCohort(Rep10NS, MaxAge%), TotAEQCohort(Rep10NS)	- ExplRep() Predicted Adult Equivalent Cohort
PredCohort(1 To NumExplStk, 1 To NumExplAge)	- ExplRep() Predicted Cohort Size
PropCatch!(1 To NumStk%)	- CompCohoCNR Proportion of Catch by Stock
PRStocks(0 To 29)	- BackFRAM() Production Region Numbers
SSNetStk%(1 To 34)	- COHO TAMM South Sound Net Pcts (CAM)
Rep1Fish(1 To NumFish%)	- SumRep() DriverFile Fishery Selections
Rep1Mort	- SumRep() DriverFile Mortality Type Selection
Rep1NF	- SumRep() DriverFile Number of Fishery Selections
Rep2Fish(1 To 256, 0 To NumFish%)	- TRunRep() DriverFile Terminal Fishery Selections
Rep2Fish(1 To NumFish%)	- TRunRep() DriverFile Fishery Selections
Rep2Flag(1 To Rep2NSG)	- TRunRep() DriverFile Flag for Stock Group/Fishery
Rep2GName\$(1 To Rep2NSG)	- TRunRep() DriverFile Stock Group Name
Rep2NF	- TRunRep() DriverFile Number of Selected Fisheries
Rep2NSG	- TRunRep() DriverFile Number of Stock Groups
Rep2Stock(1 To 256, 0 To NumStk%)	- TRunRep() DriverFile Stock Selections by Group
Rep2Time(1 To Rep2NSG, 1 To 2)	- TRunRep() DriverFile Terminal TimeStep Selections
Rep3Fish(1 To NumFish%)	- StkCatRep() DriverFile Fishery Selections
Rep3GName\$(1 To Rep3NSG)	- StkCatRep() DriverFile Stock Group Names
Rep3Mort	- StkCatRep() DriverFile Mortality Type Selection
Rep3NF	- StkCatRep() DriverFile Number of Fisheries Selected
Rep3NSG	- StkCatRep() DriverFile Number of Stock Groups
Rep3Stock(1 To Rep3NSG, 0 To NumStk%)	- StkCatRep() DriverFile Stock Selections by Group
Rep4AEQCat(1 To Rep4NS, 1 To NumAge, 1 To Rep4NF)	- ExplRep() Adult Equivalent Catch
Rep4Age(2 To MaxAge%)	- ExplRep() DriverFile Age Selections
Rep4Cohort(1 To Rep4NS, 1 To Rep4NA)	- ExplRep() DriverFile User Cohort Sizes
Rep4CumFlag(1 To NumFish%)	- ExplRep() DriverFile Cumulative Fishery Selections
Rep4Fish(1 To NumFish%)	- ExplRep() DriverFile Fishery Selections
Rep4FishType	- ExplRep() DriverFile Mortality Selection
Rep4NA	- ExplRep() DriverFile Number of Age Selections
Rep4NF	- ExplRep() DriverFile Number of Stock Selections
Rep4NS	- ExplRep() DriverFile Number of Fishery Selections
Rep4PFMCFlag(1 To NumFish%)	- ExplRep() DriverFile PFMC Selection
Rep4Stock(1 To NumStk%)	- ExplRep() DriverFile Stock Selections
Rep5Fish(1 To NumFish%)	- MortAgeRep() DriverFile Fishery Selections
Rep5Mort	- MortAgeRep() DriverFile Mortality Type Selection
Rep5NF	- MortAgeRep() DriverFile Number of Fisheries Selected
Rep5NS	- MortAgeRep() DriverFile Number of Stocks Selected
Rep5Stock(1 To NumStk%)	- MortAgeRep() DriverFile Stock Selections

```

Rep6Fish(1 To NumFish%)
Rep6NF
Rep9Fish(1 To Rep9NFG, 0 To NumFish%)
Rep9GName$(1 To Rep9NFG)
Rep9Mort
Rep9NF
Rep9NFG
Rep9NS
Rep9Stock(1 To NumStk%)
Rep10Fish(1 To NumFish%)
Rep10InRiverHR(1 To Rep10NS, 2 To MaxAge%)
Rep10Mort
Rep10NF
Rep10NS
Rep10Stock(1 To NumStk%)
Rep13Mort
Rep16GName$(1 To NumStk%)
Rep16NSG
Rep16Stock(1 To 256, 0 To NumStk%)
Rep17Fish(1 To NumFish%)
Rep17NF
Fisheries
RepMatrix!(Rep1NF, NumSteps% + 2, 5)
RepOpt$
RepTMort(1 To Rep10NS)
TotTermMort(1 To Rep10NS, 2 To MaxAge%)
RepTMort(1 To Rep9NS)
RepType%
SelectedAEQMort(1 To NumStk%, 2 To NumSteps%) As Double
SideBar!(6, 19, 3, 2), SideLabel$(19)
SpecFish(1 To NumFish%, 1 To NumSteps%, 1 To 3)
StartStk(1 To 7)
StopStk(1 To 9)
StepName$(13)
Stk10Cat!(1 To 34, 1 To 2)
Stk10Num%(1 To 28)
Stk10Prop!(1 To 28, 1 To 2)
StkCatch(1 To NumFish%, 1 To NumSteps%)
StkEscpmnt(NSumStk * 2)
StkLabel
StkLp
StkPos
StkSelect(1 To NumStk%)
StkSum
StkTotal
StkTotCat&(NumStk%, NumFish% + 1)
StkVal%
SumFish(NumFish%)
SumTotAEQMort!
SumTotStkMort!

```

```

- ExplScaleRep() DriverFile Fishery Selections
- ExplScaleRep() Number of Fisheries Selected
- DistRep() DriverFile Fishery Group Selections
- DistRep() DriverFile Fishery Group Names
- DistRep() DriverFile Mortality Type Selection
- DistRep() DriverFile Number of Selected Fisheries
- DistRep() DriverFile Number of Fishery Groups
- DistRep() DriverFile Number of Selected Stocks
- DistRep() DriverFile Stock Selections
- TotExplRep() DriverFile Fishery Selections
- TotExplRep() DriverFile InRiver ER (User Entry)
- TotExplRep() DriverFile Mortality Type Selection
- TotExplRep() DriverFile Number of Fisheries Selected
- TotExplRep() DriverFile Number of Stocks Selected
- TotExplRep() DriverFile Stock Selections
- CoastCoho() DriverFile Mortality Type Selection
- NewCohoStockER() DriverFile Stock Group Names
- NewCohoStockER() DriverFile Number of Stock Groups
- NewCohoStockER() DriverFile Stock Group Selections
- FishPctRepNewCoho() DriverFile Fishery Selections
  - FishPctRepNewCoho() DriverFile Number of Selected
- SumRep() Mortality Matrix
- DriverFile Report Option (Y/N)
- TotExplRep() Stock Total Mortality
- TotExplRep() Total Terminal Mortality
- DistRep() Total Mortality
- DriverFile Mortality Type Selection
- FisheryExplRep() Total AEQ Mortality
- CoastCoho() Landed Catch Table
- SelectFish() Flag for Selective Fisheries
- TAMM Stock List
- TAMM Stock List
- COHO TimeStep Names (CAM)
- COHO PS Area 10 Stock Catch (CAM)
- COHO PS Area 10 Stock Numbers (CAM)
- COHO PS Area 10 Stock Catch Proportions (CAM)
- BackFRAM() Stock Catch
- CohoTRunRep() Stock Escapement (CAM)
- CohoTRunRep() Stock Labels (CAM)
- CHKSPRCHSF() Loop Variable
- Variable for Position in Stock Selection Arrays
- DriverMenu() Stock Selection Array
- FisheryExplRep() Stock Selections
- FisheryExplRep() Stock Total Mortality
- StkSumRep() Stock Total Catch
- TCHNSFTran() Model Stock Number
- CoastCoho() Fishery Landed Catch
- ChinookStockER() Total AEQ Mortality
- ChinookStockER() Stock/TimeStep Total Mortality

```

Table(1 To 10, 1 To 33)	- CohoSumRep() Landed Catch Matrix
TableName	- CohoSumRep() Table Names
Temp1	- Temporary Sum for Total Mortality
Temp14	- Temporary Sum for Chinook TimeStep 1-4
TempCom(1 To 20) As String	- SaveCMD() Temporary Save Comments
TempScaler	- ExplScaleRep() Fish Scaler Storage
TermAbun!(1 To 14)	- TCHNSFTran() Terminal Abundance
TermTime1	- TRunRep() DriverMenu() Terminal TimeStep Start
TermTime2	- TRunRep() DriverMenu() Terminal TimeStep End
TimeLabel\$(1 To NumSteps% + 1)	- DriverFile TimeStep Labels
TimeName\$(1 To 13)	- COHO TimeStep Labels (CAM)
TotAEQMort!(1 To NumFish% + 2, 2 To MaxAge%, NumSteps% + 2)	- ChinookStockER() Total AEQ Mortality
TotalAEQCohort!	- ChinookStockER() Total AEQ Cohort
TotalAEQMortEsc(1 To NumStk%) As Double	- FisheryExplRep() Stock Escapement for AEQ
TotalBase(1 To NumExplAge)	- ExplRep() Total Base Age ER
TotalEsc(1 To NumStk%) As Double	- FisheryExplRep() Escapement
TotalMort!(1 To NumFish% + 2, 1 To NumSteps% + 1)	- FisheryExplRep() Total Mortality
TotalPred(1 To NumExplAge)	- ExplRep() Total Predicted Age ER
TotCkEsc!(1 To 6, 1 To 22)	- TCHNSFTran() Chinook Escapement
TotFisheryMort!(1 To NumFish% + 2, 1 To NumSteps% + 1)	- ChinookStockER() Fishery Total Mortality
TotIndex(1 To NumExplStk)	- ExplRep() Stock Index
TotMCat	- SelectFish() Total Marked Catch
TotMEnc	- SelectFish() Total Marked Encounters
TotMNon	- SelectFish() Total Marked DropOff
TotMShk	- SelectFish() Total Marked Legal Shakers
TotMSub	- SelectFish() Total Marked SubLegal Shakers
TotStat!(MaxAge% - 1, PTerm% To Term%)	- PopStatRep() Total Cohort size
TotStkMort!(1 To NumFish% + 2, 2 To MaxAge%, NumSteps% +2)	- ChinookStockER() Sum Stock Total Mortality
TRFish(1 To 6)	- COHO Treaty Fisheries (CAM)
TrFs%(8)	- COHO Treaty Fishery Index (CAM)
TRS(1 To 55)	- TNewProc5() Terminal Run Size
TrsFish(1 To 55, 0 To 30)	- TNewProc5() Terminal Run Size Fishery List
TRSName(1 To 55)	- TNewProc5() Terminal Run Size Names
TrsStk(1 To 55, 0 To 50)	- TNewProc5() Terminal Run Size Stock List
TRSType(1 To 55)	- TNewProc5() Terminal Run Size Mortality Type
TS(1 To 22, 1 To 8)	- CohoSumRep() Stock Index (CAM)
TS1	- CohoSumRep() Stock Selection (CAM)
TS2	- CohoSumRep() Stock Selection (CAM)
U(1 To NumExplStk, 1 To NumExplAge, 1 To NumExplFish)	- ExplRep() Predicted ER
ULCat!(1 To NumSteps%)	- COHO TAMM UnMarked Landed Catch Sum
ULMrt!(1 To NumSteps%)	- COHO TAMM UnMarked Total Mortality Sum