



Menu-driven software series (No. 2)

# ASPIC\_MANAGER (VER1.1.0) **Manual**

(April 8, 2024)

**Tom NISHIDA** (PhD) (Representative)

aco20320@par.odn.ne.jp

**Kazuharu Iwasaki** (Software Engineer)

[MENU] Menu-driven stock assessment software developing team(Japan)

<https://www.esl.co.jp/products/menu>

*[MENU] is supported by Environmental Simulation Laboratory (Japan)*

*© All copyrights and patents are reserved by [MENU]*

# Contents

Warnings (copyright)-----	03
Acronyms-----	04
1. Introduction-----	05-06
2. Requirements for PC and Remarks-----	07-10
3. Installation -----	11-17
4. Running software (6 menus) (ASPIC_Manager)-----	18
4.1 Batch job (Searching best parameters & model) -----	19-46
4.2 Creating results (*.fit) file for best parameters & model-----	47-50
4.3 Graphs (Past trends for point estimates) -----	51-56
4.4 Kobe I (Kobe plot) -----	57-68
4.5 Graphs (Past trends & future projections with uncertainties) -----	69-72
4.6 Kobe II (Strategy matrix)(management decision tool) -----	73-80
Appendix A: History of development-----	81
Appendix B: Output file (for 4.2)-----	82-86

# Warnings

© All copyrights and patents are reserved  
by [MENU] Menu-driven stock assessment software developing team

- (1) This software can be used only by those who had trainings by [MENU] (personal copy & personal use only).
- (2) Please don't give or sell copies to others.
- (3) Please don't inform the download link of this software to others.
- (4) If uses want to make reports and/or publish papers using this software, please get permission from [MENU] at [menu.soft.SEC@gmail.com](mailto:menu.soft.SEC@gmail.com)

# ACRONYMS

ASPM	Age-Structured Production Model	EST	Estimated	K	Carrying Capacity	SB <sub>MSY</sub> or SSB <sub>MSY</sub>	Spawning Biomass or Spawning Stock Biomass at MSY
ASPM	Incorporating Covariates	F	Fishing mortality	LRP	Limit Reference Point		
ASPM	Age-Structured Production Model	FIT	To estimate (ASPIC Command)	MCMC	Markov Chain Monte Carlo methods	SPSS	Statistical Package for the Social Sciences
B	Total biomass or Spawning Stock Biomass	F <sub>MSY</sub>	Fishing mortality at MSY	MSY	Maximum Sustainable Yield	SRA	Stock Reduction Analysis
BMSY	Total biomass or Spawning Stock Biomass at MSY	GPS	Global Positioning System	OBS	Observed	SS3	Stock Synthesis 3
BO	Initial Biomass	ICCAT	International Commission for the Conservation of Atlantic Tunas	PT	Pella and Tomlinson	STD	Standardized (CPUE)
BOT	Bootstrap (ASPIC Command)	IOTC	Indian Ocean Tuna Commission	QC	Quality Control	SWO	Swordfish
CI	Confidence Interval	IRF	Iteratively Reweighted Fit (ASPIC Command)	RFMO	Regional Fisheries Management Organization	TB	Total Biomass
CPUE	Catch Per Unit Effort	JABBA	Just Another Bayesian Biomass Assessment	RMS	Root Mean Square (Error)	TB <sub>MSY</sub>	Total Biomass at MSY
DOS	Disk Operation System			SA	Stock assessment	TRP	Target Reference Point
				SAS	Statistical Analysis System	Y/R	Yield per Recruit
				SB or SSB	Spawning Biomass or Spawning Stock Biomass		

# 1. Introduction

## Evolution of PM (Production Model)

Evolution	Type	Primnary author	Features				Comments
			Equilibrium Condition (EC) (death=increase) (un-reaistic)	Error type		Bayesian (better) Approach	
				Observation (data) error	Process (model) error		
old	Original PM	Shaeffer(1954), PT(1969) & Fox (1970)	YES				Classical <u>(Not recommended)</u> to use due to EC)
	ASPIC (Ver5.05)	Prager (2004)					Basic, standard & commonly used among RFMOs & fishing countries
	ASPIC (ver7.5)	Prager (2017)	NO				
new	JABBA (Just Another Bayesian Biomass Assessment)	Winker (2018)					Best but high standard (slowly expanding) <b>Recommended</b>

(Note) PT: Pella and Tomlinson

➔ This manual is for ASPIC\_Manager to implement ASPIC(ver5.05)  
JABBA\_Manager for JABBA ➔ to be completed in 2024

# 1. Introduction : ASPIC\_Manager

## Pervious ASPIC software (2023 or before)

Only one menu (batch job) was available.

→ It is now menu (1)

in the new ASPIC\_Manager.

But all other works for menu (2)~(6)

need to be done manually

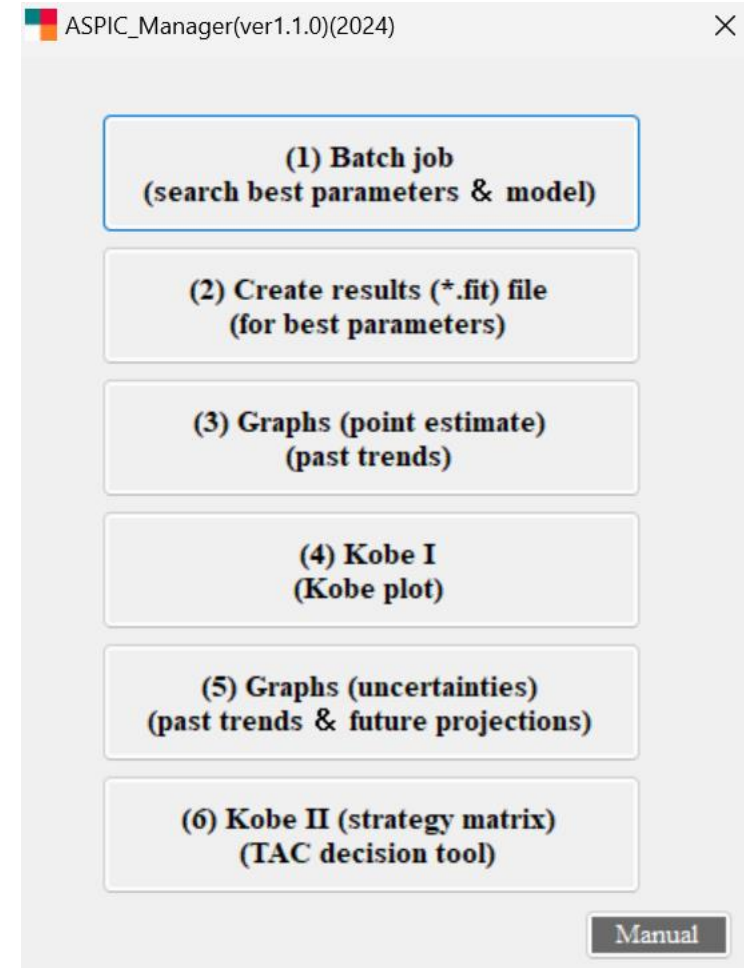


*caused many errors in the past*

## New software : ASPIC\_Manager (from 2024) (6 menus)

(ALL-in-one & Automated)

Simple & friendly operations → No mistakes/errors



But users must understand meanings of processes (this manual explains)

## 2. REQUIREMENTS FOR PC AND REMARKS (1/4)

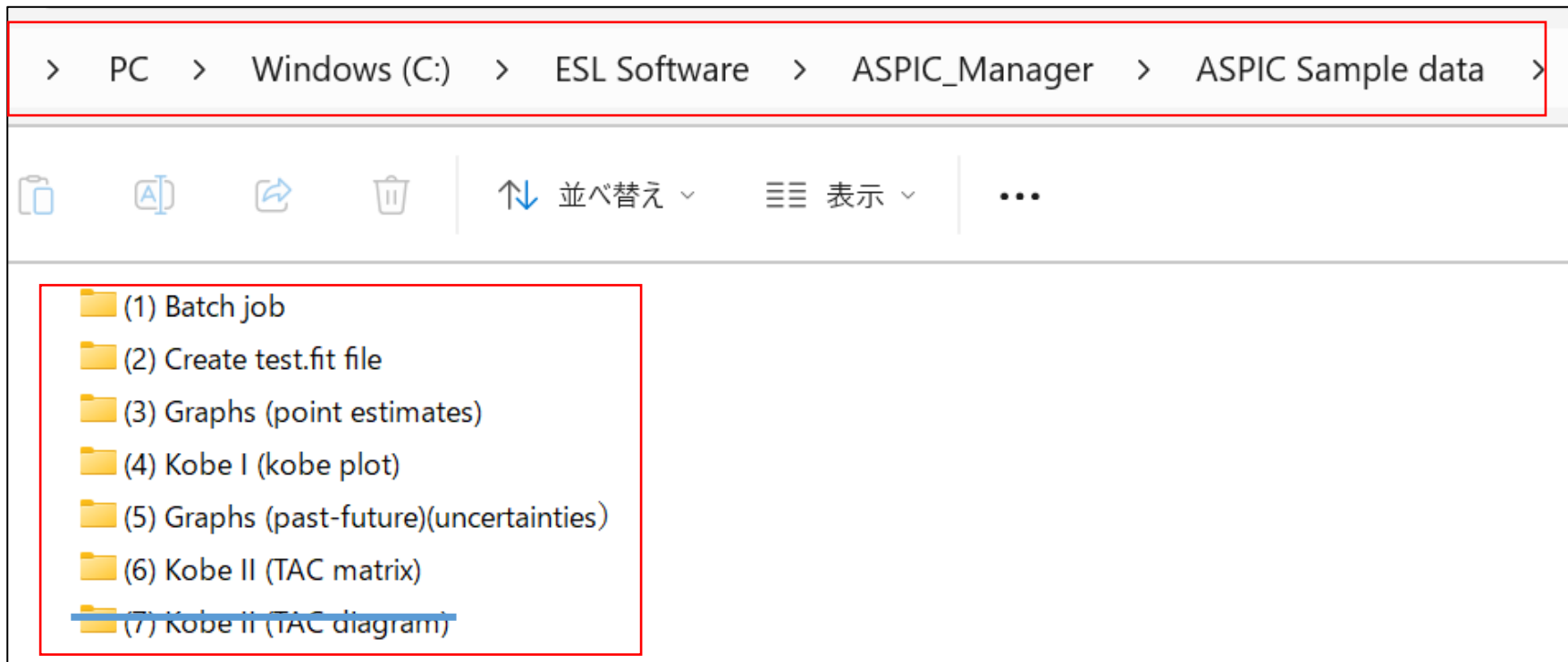
### (1) Requirements for PC

- Operation System: MS window 10 or 11 and NOT applicable for MAC (apple) PC.
- 64bit PC.
- RAM: minimum 2GB.
- Basic software (Word, Excel and Notepad)
- R programming language for window (R-4.3.1-win) needs to be installed in advance. Its size is 80MB (zipped) and 180MB (unzipped).
- To make smooth operations, users need at least 30% of empty space of the hard disk.

## 2. REQUIREMENTS FOR PC AND REMARKS (2/4)

### (2) Important remarks (sample data) (REVISED)

- This manual uses the sample data for demo.
- Users can use the sample data for practice
  - ➔ **important: Use the data available folders corresponding to the menu.**
- Location of the sample data (7 folders for 7 menus)





## 2. REQUIREMENTS FOR PC AND REMARKS (3/4)

### (2) Important remarks (*continued*)

#### **Manual**

This PowerPoint is the manual (REVISED).

Manual call button is available in menus → do not use (old version)

#### **Keep the original files** (important)

Don't use original files. Make copies & use copies as work files like wk1, wk2, etc.

#### **Operation by mouse**

This manual explains operations based on "mouse".

For "touch panel" or "key board", follow corresponding manipulations.

#### **Save**

Save files frequently.

## 2. REQUIREMENTS FOR PC AND REMARKS (4/4)

### (2) Important remarks (*continued*)

- **Engines (programs and applications) underpinning this software**
  - Microsoft Visual Studio (2019)
  - Graphics: C# and. NetFrameWork4.7.2
  - ASPIC Batch job (Grid search) menu-driven Software (Ver 1.1) (2018)
  - Kobe\_I\_II(ver.6.1.5)(2023)
  - R-4.3.1-win(2023)

### 3. Installation

## 3 application and Linking R to ASPIC\_Manager

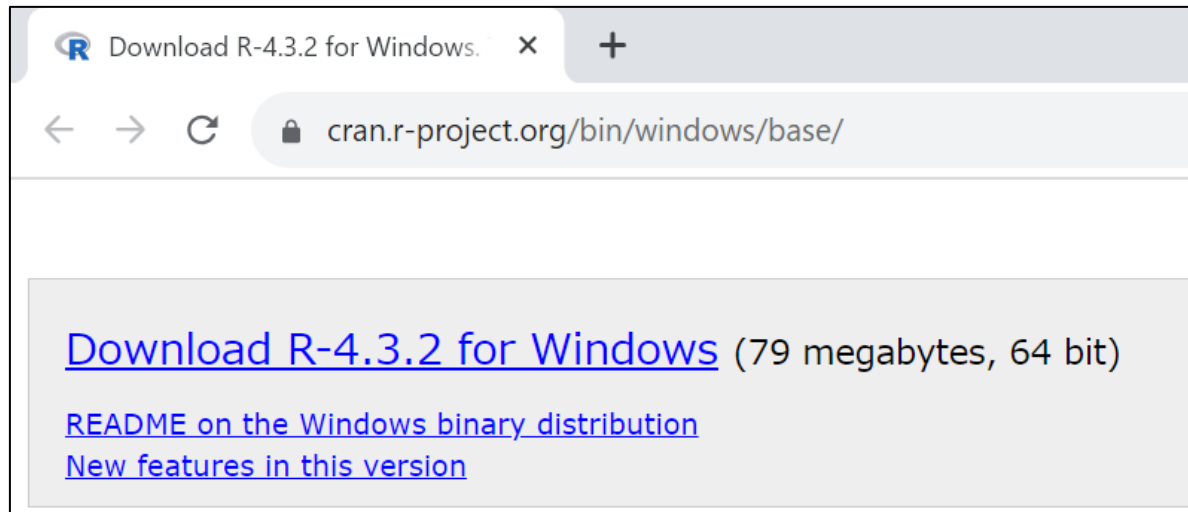
*Before installation, uninstall old versions if users have previous versions.*

Order of the installation	Name of software	Download link	Size of Zipped file (MB)	Size of unzipped (actual) files (MB)	How to install? See slide # (This manual)
1	R-4.3.1-win	<a href="https://cran.r-project.org/bin/windows/base/">https://cran.r-project.org/bin/windows/base/</a> Download R-4.3.1 for Windows	80	180	12
2	Kobe_I_II (ver6.2.0) (2024)	<i>Get links from Menu-driven stock assessment software developing team [MUNE] Menu.soft.SEC@gmail.com</i>	7.4	13	13-14
3	ASPIC_Manager (ver1.1.0) (2024)		26	100	15-16
4	Linking R to ASPIC_Manager				17

### 3. Installation : How to install “R-4.3.1-win”?

Go to <https://cran.r-project.org/bin/windows/base/>

Users will see the window below:



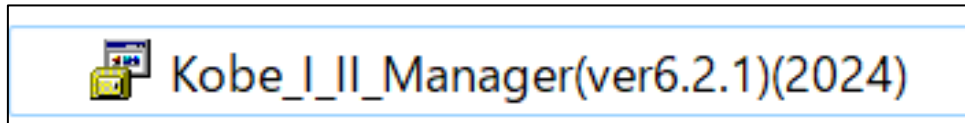
Then download from [Download R-4.3.1 for Windows](#)

### 3. Installation: Kobe I (plot) & II (management tool)

Double click the zipped installer (located folder or desktop)

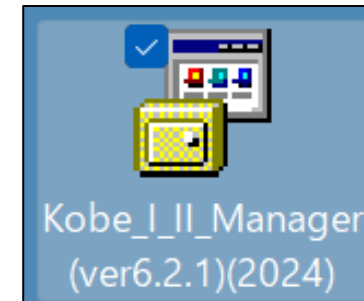
*Users can get the download link of the software  
from the [MENU] Secretariat at [menu.soft.SEC@gmail.com](mailto:menu.soft.SEC@gmail.com)*

*Installer (folder)*



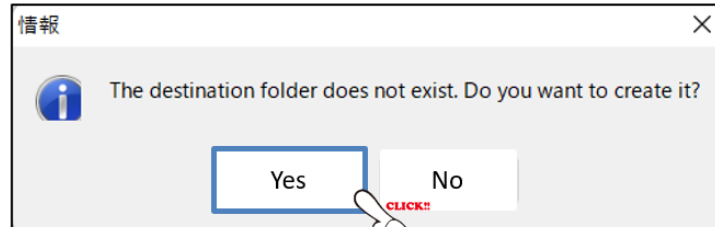
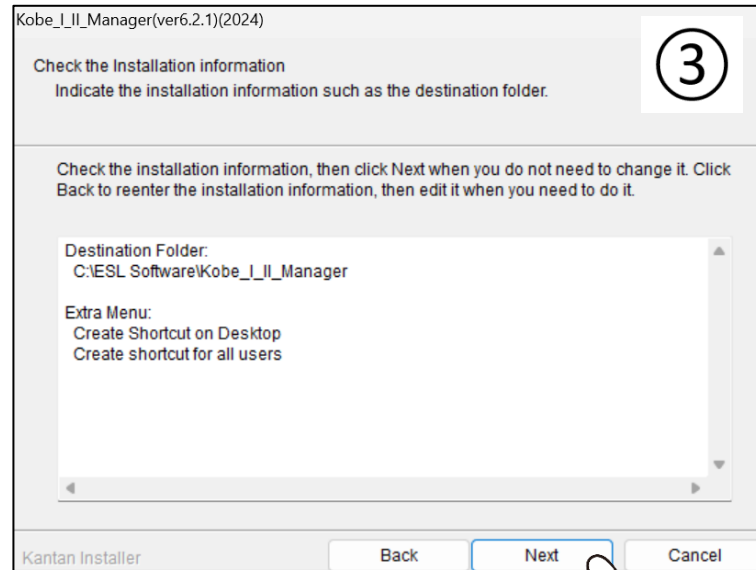
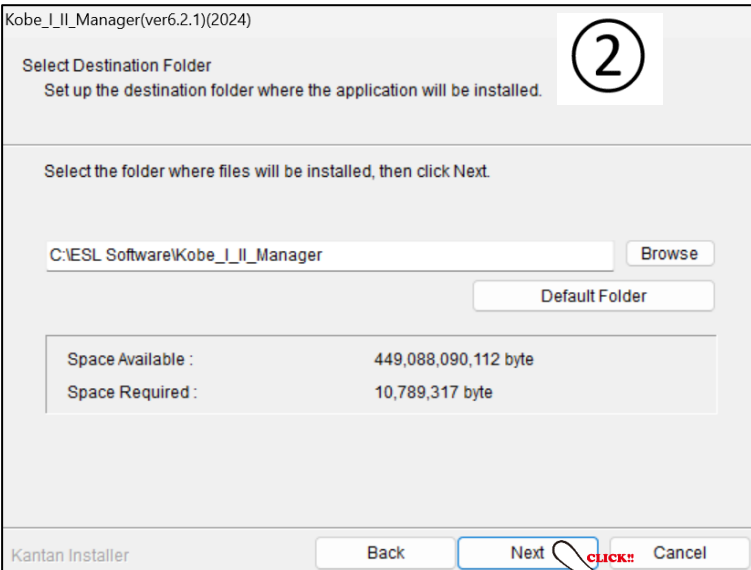
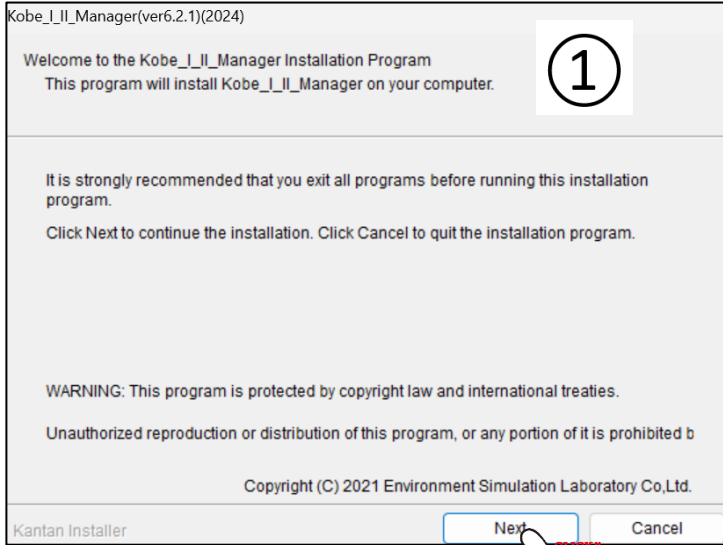
  
DOUBLECLICK

*Installer (desktop)*

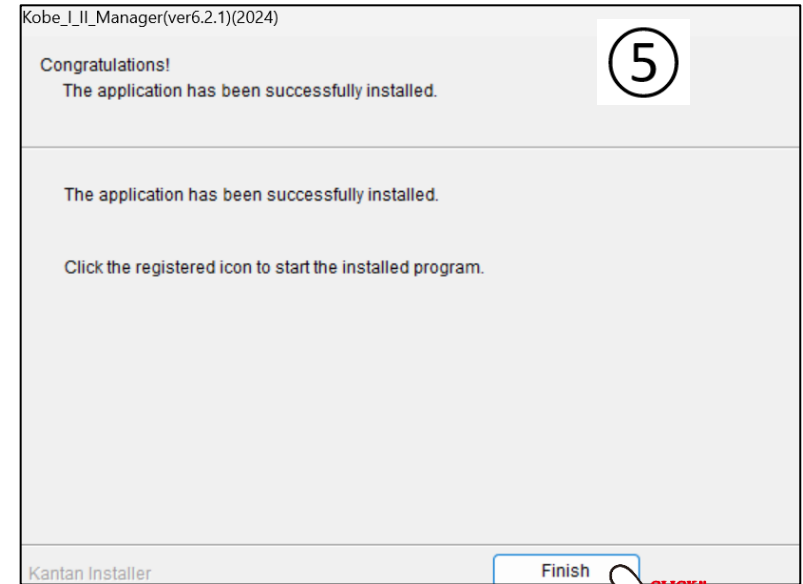
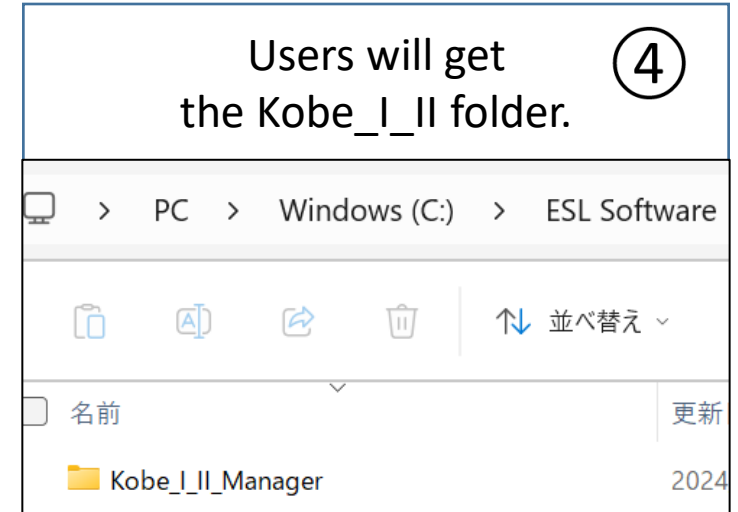


  
DOUBLECLICK

# 3. Installation: Kobe I+II Follow 5 steps



If the destination folder "ESL Software" exists, this window will not appear.

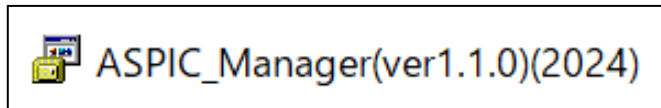


### 3. Installation: ASPIC\_Manager

Double click the zipped installer (located folder or desktop)

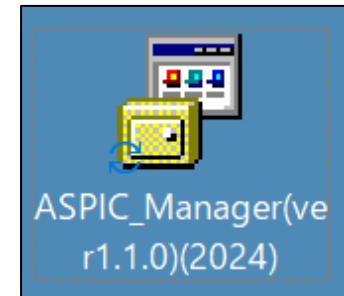
*Users can get the download link of the software  
from the [MENU] Secretariat at [menu.soft.SEC@gmail.com](mailto:menu.soft.SEC@gmail.com)*

*Installer (folder)*



  
**DOUBLECLICK**

*Installer (desktop)*

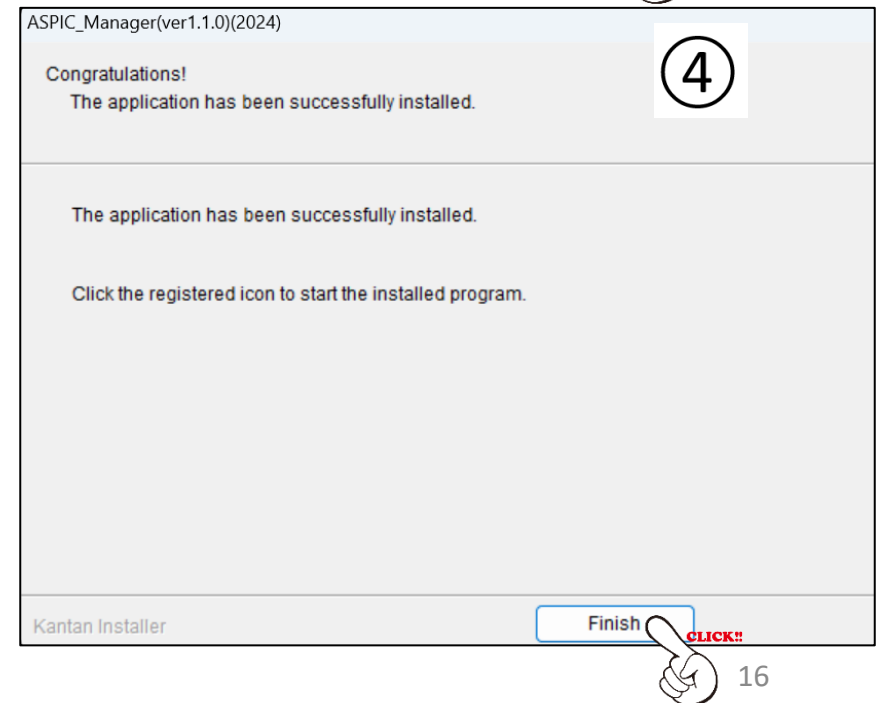
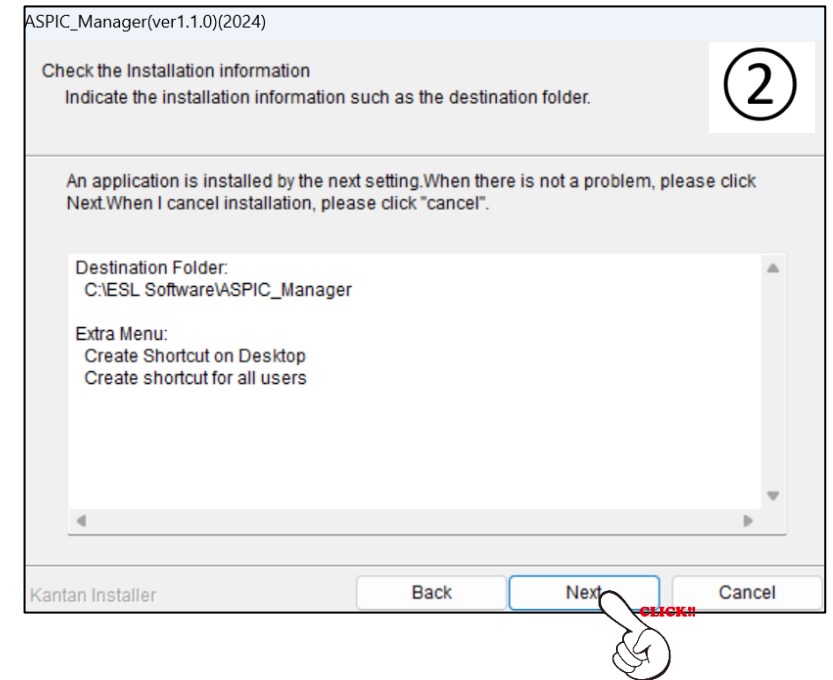
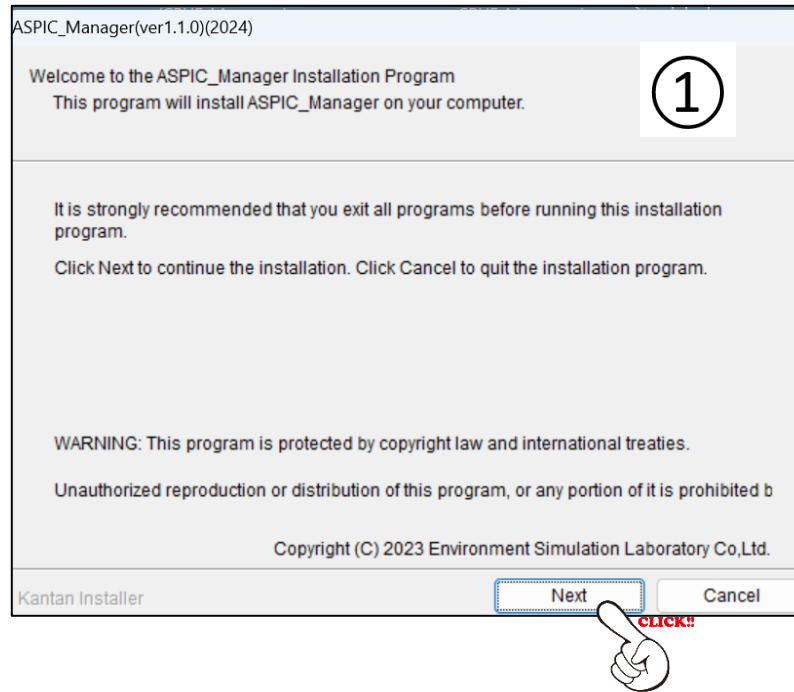


  
**DOUBLECLICK**

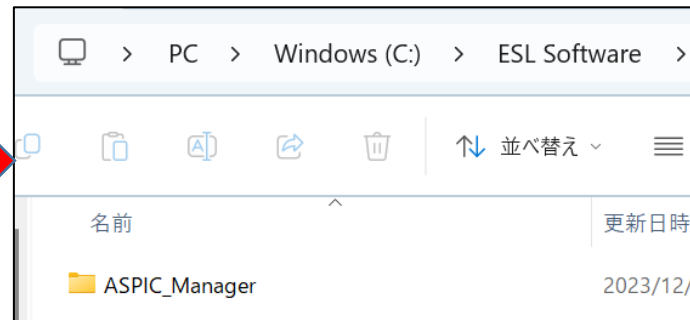
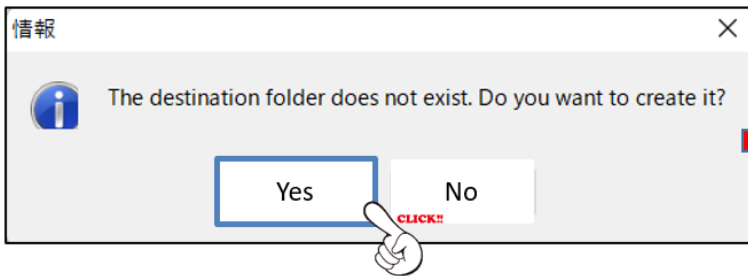
# 3. Installation

## ASPIC\_Manager

4 steps



③

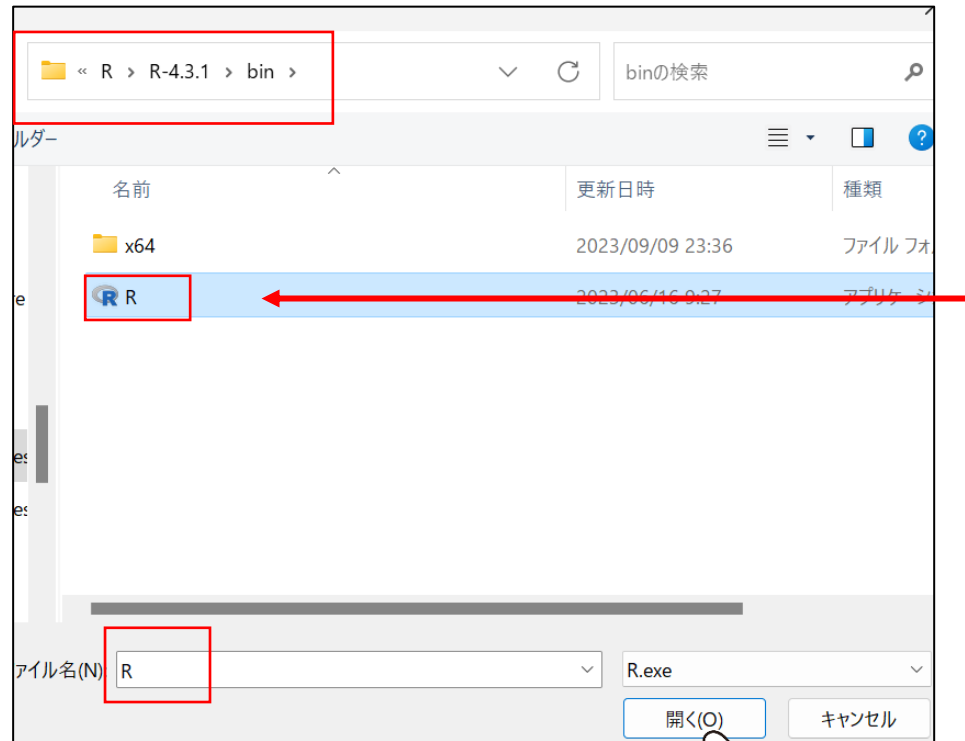
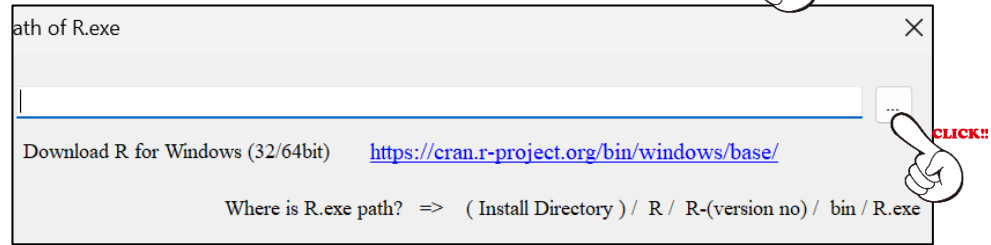
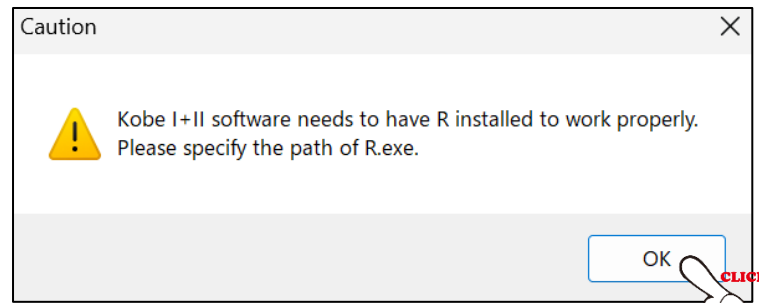
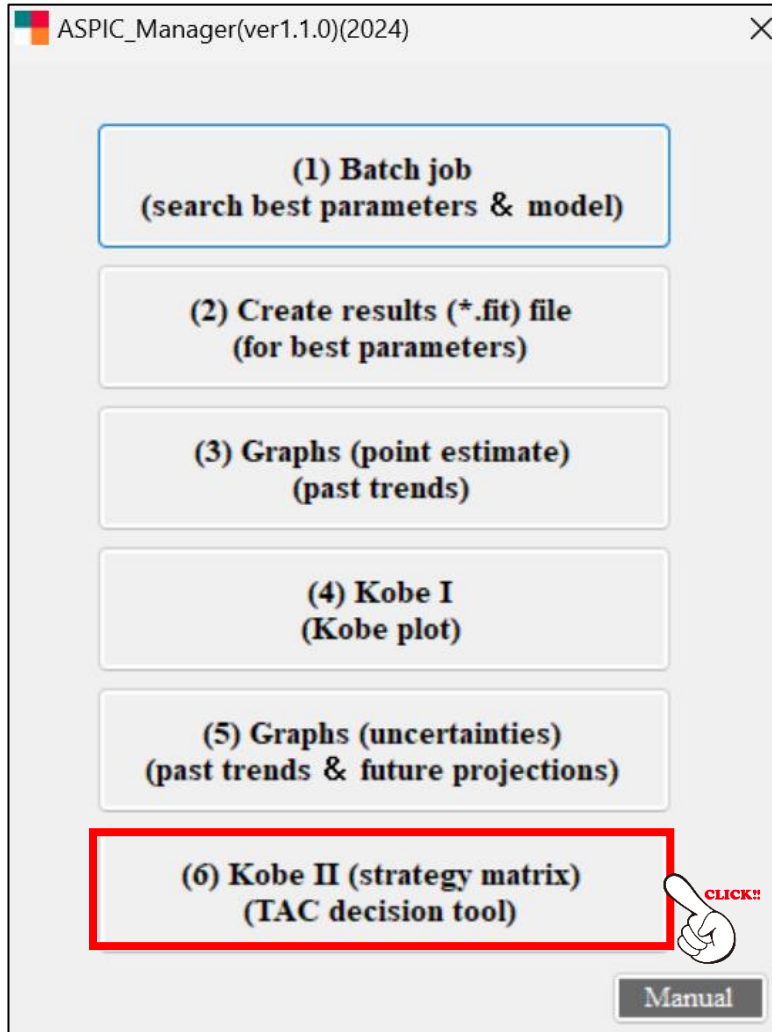


Users will get  
the ASPIC\_Manager folder



# 3. Installation

## Linking R to ASPIC\_Manager



# 4. Running software (6 menus) ASPIC\_Manager

## **4. Running ASPIC\_Manager**

### **4.1 Batch job**

## 4. Running software : 4.1 Batch job

ASPIC needs one input file (\*.inp) (program+ data) to search best parameters & model (batch job).

Program

FIT	## Run type (FIT, BOT, or IRF)
"test"	## title
LOGISTIC YLD SSE	## Modeltype, conditioning, loss fn
2	## Verbosity on screen (0-3); add 10 for SUM & PRN file
1000	## Number of bootstrap trials, <= 1000
0 20000	## 0=no MC search, 1=search, 2=repeated srch; N trials
1d-8	## Convergence crit. for simplex
3d-8 6	## Convergence crit. for restarts, N restarts
1d-4 24	## Conv. crit. for F; N steps/yr for gen. model
8d0	## Maximum F when cond. on yield
1d0	## Stat weight for B1>K as residual (usually 0 or 1)
1	## Number of fisheries (data series)
1	## Statistical weight for data series
1	## B1/K (starting guess, usually 0 to 1)
7300	## MSY (starting guess)
70000	## K (carrying capacity) (starting guess)
0.004	## q (starting guesses -- 1 per data series)
0 1 1 1	## Estimate flags (0 or 1) (B1/K, MSY, K and q)
3000 15000	## Min and max constraints -- MSY
23000 170000	## Min and max constraints -- K
39332385	## Random number seed (large integer)
35	## Number of years of data in each series
"CPUE Catch"	## Title for 1st series (<=40 chars)

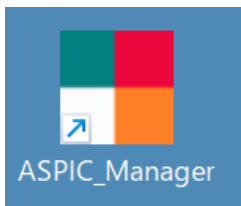
Data

CC	## Series type (CC = CPUE, catch)	
1950	-1	3646
1951	-1	2581
1952	-1	2993
1953	-1	3303
1954	-1	3034
(omitted)		
1964	380	11258
1965	240	8652
1966	229	9349
1967	278	9107
1968	220	9172
1969	197	9203
1970	219	9495
1971	-1	5266
1972	-1	4766
1973	-1	6074
1974	-1	6362
1975	350	8839
1976	309	6696
1977	337	6409
1978	445	11835
1979	316	11937
1980	252	13558
1981	231	11180
1982	283	13215
1983	222	14527
1984	213	12791

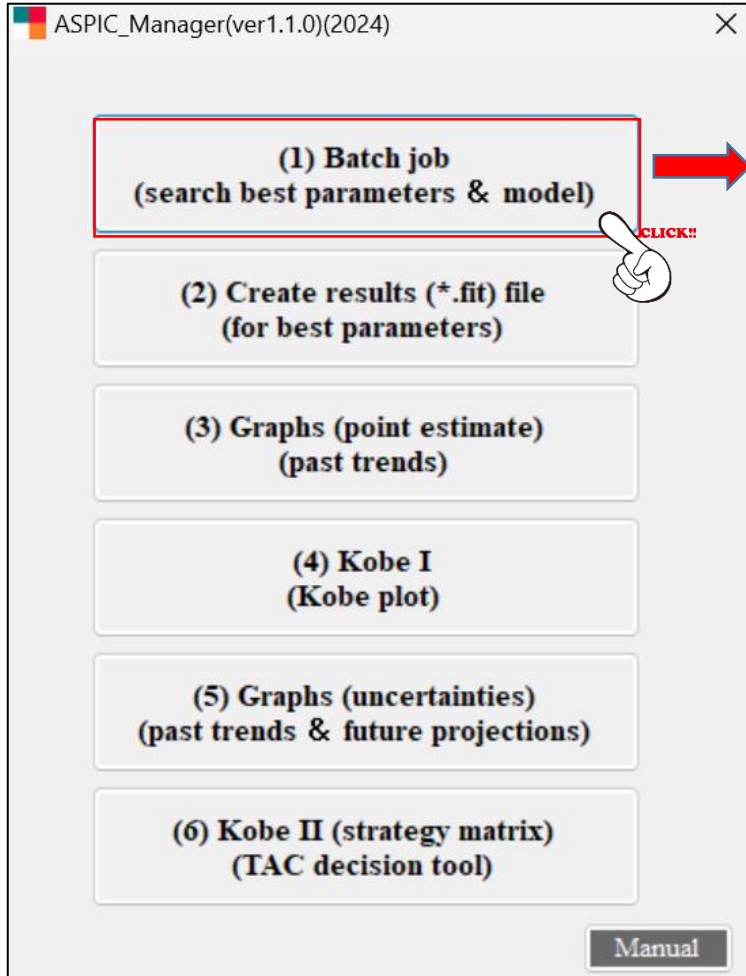
### Entry items

- **Red boxes** : Users must edits (details are explained in this Section 4.1 Batch job).
- **Black boxes**: Numbers need to be entered using specific computing rules, which are automatically conducted by this software. Thus, users don't need to enter (for details, see **Appendix B**).
- For all others: Default values/names will be used. Thus, users don't need to enter.

Data (YEAR, CPUE CATCH in tons)  
Users need to make this data set  
(see slide #28)



DOUBLECLICK ↓



## 4. Running software : 4.1 Batch job

To start, click menu (1), then entry window will appear (below).  
Users need to enter 5 items.

Create input file

	Input item	Example	Edit
①	Title name	SWO	<input type="text" value="sm"/>
②	Estimate flags (1=yes or 0=no -> fix) (B1/K, MSY, K, q)	0 1 1 1	<input type="text" value="1"/> <input type="text" value="1"/> <input type="text" value="1"/> <input type="text" value="1"/>
③	Intrinsic population growth rate (r)	0.27	<input type="text" value="3"/>
④	Data (YEAR, CPUE AND CATCH)		<input type="text"/> <input type="button" value="..."/>

OK Cancel

① is self-explanatory. ②~④ are explained in slides #21~#27.

## 4. Running software : 4.1 Batch job

② What are Estimate flags (1=yes or 0=no → fix) (B1/K, MSY, K, q) ?

4 parameters (B1/K, K, MSY & q) need to be estimated.

flag=1 (yes to estimate) or flag=0 (no estimate and fix some values)

For example,

If estimate all 4 parameters

If no estimate B1/K (fix some value)

B1/K, MSY, K, q



1	1	1	1
0	1	1	1



Normally at the beginning, all 4 parameters will be estimated.

If no convergences (all 4 parameters cannot be estimated)...

→ 1 or 2 parameters will be fixed to get convergences

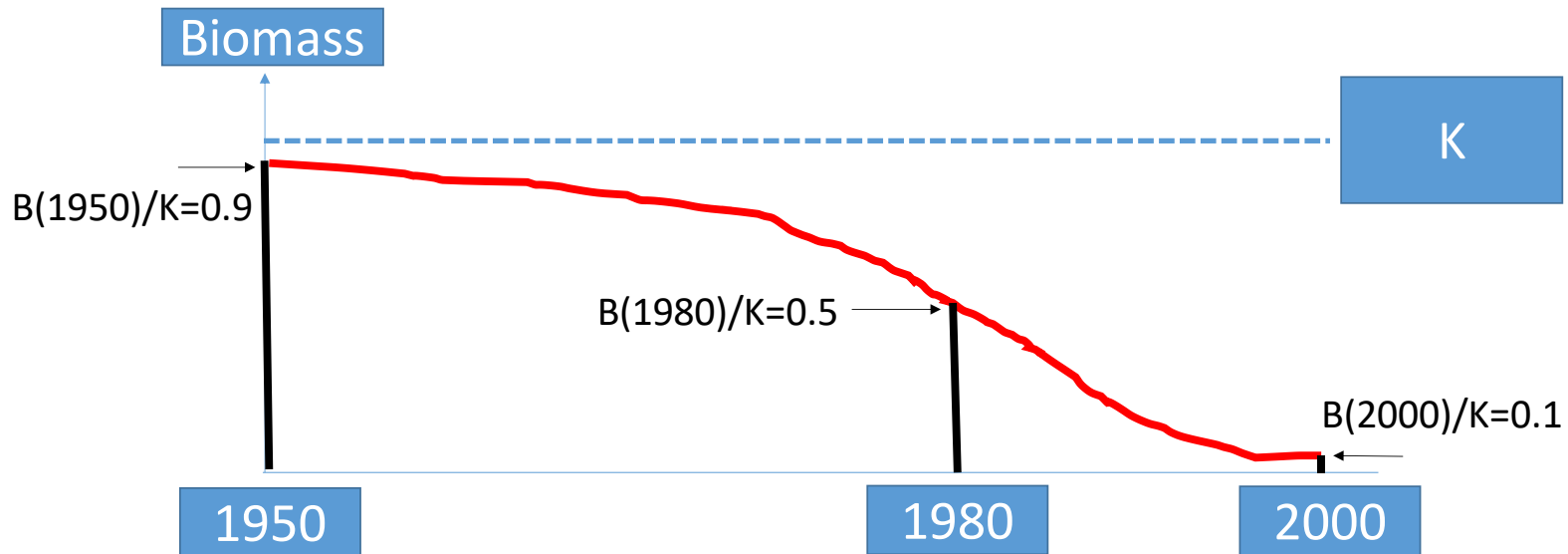
(see #37- #41 & #43 for details)

## 4. Running software : 4.1 Batch job

Relevant information on ②

What is  $B1/K$  (start guess or fixed value)(0 to 1)?

[K] Carrying Capacity (Maximum biomass)  
[B1] Biomass (1<sup>st</sup> year of stock assessment) → example: B(1980)  
[B1/K] **Depression** (% decrease from K) → example:  $B(1980)/K=0.5$  (50%)  
Range: 0~1 (0%~100%)



Users need to assign one value → Example:  $B1=B(1980)=0.5$

## 4. Running software : 4.1 Batch job

Relevant information on ②

What is  $q$  (catchability coefficient) (*efficiency of catch*).

*If gear A catches 2 times higher than gear B in the same effort,*

*$q=1.0$  (gear A) and  $q=0.5$  (gear B)*

*Gear A is 2 times efficient*

*to catch same amount of catch in the same effort than Gear B*



## 4. Running software : 4.1 Batch job

Relevant information on ②

Assigning initial seeding values for  $B1/K$ ,  $MSY$ ,  $K$  and  $q$  (Batch job)

$MSY$  &  $K$  (carrying capacity) → initial guess values & Min/Max values  
 $q$  (catchability) → initial guess value

Refer to next slide



Computing rules are applied.

This soft will automatically compute and assign.

→ Thus users don't need to enter, but they understand the background.

## 4. Running software : 4.1 Batch job

Relevant information on ②

Definition of initial seeding values for 3 parameters (MSY, K and q)

*(note) This software will automatically compute these values using definition (below) and assign to the batch job. Thus, users do not need to do this work, but need to understand the meanings.*

Parameter	Min	Start	Max
MSY	Average catch of 3 lowest annual catches	1/2 of Max catch	Maximin Catch
K	1.1 times of Max MSY	1.1 times of Min K	$4(\text{Schaefer}) * \text{Max (MSY)}/r$ (* )
q (**)		$0.2 * \text{Ave CPUE}/\text{Ave catch}$ (average in last 5 years)	

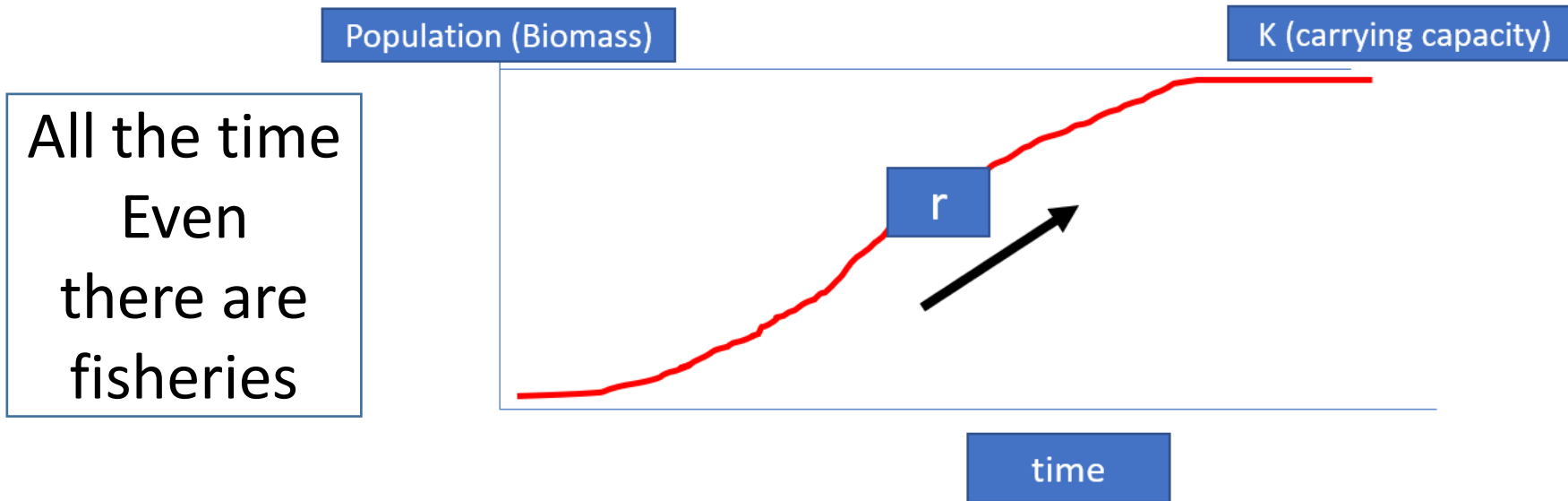
*(\*)  $K = (\text{constant for Schaefer model}) * \text{MSY}/r$ , where  $r$  is the intrinsic population growth rate (see slide #27-#28)*

## 4. Running software : 4.1 Batch job

Relevant information on ③

What is the intrinsic population growth rate ( $r$ ) ?

Speed of population increase



$r$  is different by species  
long live species  $\rightarrow$  smaller  $r$     short live species  $\rightarrow$  larger  $r$

## 4. Running software : 4.1 Batch job

intrinsic population growth rate ( $r$ )

$r$  can be found FAO FishBase and/or Literatures



**FishBase**

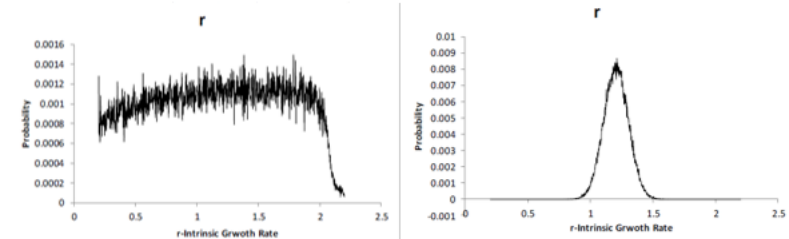
Table (below) shows examples  
Range and selection of representative  $r$   
(LOT: longtail tuna and KAW: Kawakawa)

Estimated  $r$  can be also found results of stock assessment.

Age and growth of longtail tuna (*Thunnus tonggol*) in tropical and temperate waters of the central Indo-Pacific

Shane P. Griffiths, Gary C. Fry, Fiona J. Manson, and Dong C. Lou

Griffiths, S. P., Fry, G. C., Manson, F. J., and Lou, D. C. 2010. Age and growth of longtail tuna (*Thunnus tonggol*) in tropical and temperate waters of the central Indo-Pacific. - ICES Journal of Marine Science, 67: 125-134.



Froese et al. (2017)

Area	Reference	sp	this WS (ave of Indian Ocean)	area	source	r																		
						0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1	1.1	1.2	1.3	1.4				
World wide	Fishbase																							
Indian Ocean	Zhou and Sharma (2014)	LOT	0.99	world wide	Fish base				0.32															
Indian Ocean	IOTC (2015)			Indian Ocean	Zhou and Shama (2014)										0.94									
World wide	Fishbase			Indian Ocean	IOTC(2015)											1.03								
Indian Ocean	Sharma (2013)	KAW	1.34	world wide	Fish base						0.57													
Indian Ocean	Zhou and Sharma (2014)			Indian Ocean	Shama (2013)																			1.37
				Indian Ocean	IOTC(2015)																			1.3

## 4. Running software : 4.1 Batch job

④

What is  
Data (YEAR, CPUE, CATCH)?



3 basic input data

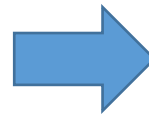


Make input file (excel)  
(e.g. test.xlsx)

Put the file in working folder

Missing CPUE value = -1

At least latest 4 consecutive  
years of CPUE data is needed,  
otherwise ASPIC will not run.



	A	B	C
1	YEAR	CPUE	CATCH
2	1950	-1	3646
3	1951	-1	2581
4	1961	-1	4381
5	1962	-1	5342
6	1963	-1	10190
7	1964	380	11258
8	1965	240	8652
9	1966	229	9349
10	1967	278	9107
11	1968	220	9172
12	1969	197	9203
13	1970	219	9495
14	1971	-1	5266
15	1972	-1	4766
16	1973	-1	6074
17	1974	-1	6362
18	1975	350	8839

Catch (tons)

# Now we will practice using Sample data (Revised)

File Explorer path: PC > Windows (C:) > ESL Software > ASPIC\_Manager

Navigation icons: Copy, Paste, Share, Delete, Sort (並べ替え), View (表示), and More options (⋮).

名前	更新日時	種類
ASPIC Sample data (revised)(Jan 23)	2024/01/23 16:39	ファイル フォルダ
ASPICBatchJob	2024/01/23 15:59	ファイル フォルダ
RiskAssessment	2024/01/16 2:03	ファイル フォルダ
sys	2024/01/23 1:47	ファイル フォルダ

# 4. Running software : 4.1 Batch job

Starting the batch job & Set up

Follow ① ~ ⑪

ASPIC\_Manager(ver1.1.0)(2024)

①

**(1) Batch job  
(search best parameters & model)**



**(2) Create results (\*.fit) file  
(for best parameters)**

**(3) Graphs (point estimate)  
(past trends)**

**(4) Kobe I  
(Kobe plot)**

**(5) Graphs (uncertainties)  
(past trends & future projections)**

**(6) Kobe II (strategy matrix)  
(TAC decision tool)**

Manual



②

Previous input information will appear.

Input item	Example	Edit
Title name	swo	scad
Estimate flags (1=yes or 0=no -> fix) (B1/K, MSY, K, q)	0 1 1 1	0 0 1 1
B1/K(start guess or fixed value)(0 to 1) (One digit only)(for example: 1, 0.9, 0.8 etc.)	0.9	0.7
Intrinsic population growth rate (r)	0.27	0.87
Data (YEAR, CPUE AND CATCH)		

OK Cancel



③

Change to the current information

Input item	Example	Edit
Title name	swo	test
Estimate flags (1=yes or 0=no -> fix) (B1/K, MSY, K, q)	0 1 1 1	1 1 1 1
B1/K(start guess or fixed value)(0 to 1) (One digit only)(for example: 1, 0.9, 0.8 etc.)	0.9	1
Intrinsic population growth rate (r)	0.27	0.35
Data (YEAR, CPUE AND CATCH)		

OK Cancel

New name

Estimate all (1<sup>st</sup> time)

For the virgin stock

Representative value

## 4. Running software 4.1 Batch job

Importing the input file (catch & effort) data

4

Create input file

Input item	Example	Edit
Title name	sw0	test
Estimate flags (1=yes or 0=no -> fix) (B1/K, MSY, K, q)	0 1 1 1	1 1 1 1
B1/K(start guess or fixed value)(0 to 1) (One digit only)(for example: 1, 0.9, 0.8 etc.)	0.9	1
Intrinsic population growth rate (r)	0.27	0.35
Data (YEAR, CPUE AND CATCH)		<input type="checkbox"/>

OK Cancel

CLICK!!

5

Select the test.xlsx file

Software¥ASPIC\_Manager¥ASPIC Sample data

ASPIC Sample dataの検索

名前	更新日時	種類
test	2023/11/13 10:23	Microsoft Excel 7...

ファイル名(N): test

\*.xlsx

開く(O) キャンセル

CLICK!!

	A	B	C
1	YEAR	CPUE	CATCH
2	1950	-1	3646
3	1951	-1	2581
4	1952	-1	2993
5	1953	-1	3303
6	1954	-1	3034
7	1955	-1	3502
8	1956	-1	3358
9	1957	-1	4578
10	1958	-1	4904
11	1959	-1	6232
12	1960	-1	3828
13	1961	-1	4381
14	1962	-1	5342
15	1963	-1	10190
16	1964	380	11258
17	1965	240	8652
18	1966	229	9349

6

Create input file

Input item	Example	Edit
Title name	sw0	test
Estimate flags (1=yes or 0=no -> fix) (B1/K, MSY, K, q)	0 1 1 1	1 1 1 1
Intrinsic population growth rate (r)	0.27	0.35
Data (YEAR, CPUE AND CATCH)		<input type="checkbox"/>

OK Cancel

C¥ESL Software¥ASPIC\_Manager¥ASPIC(Sample data)¥folder

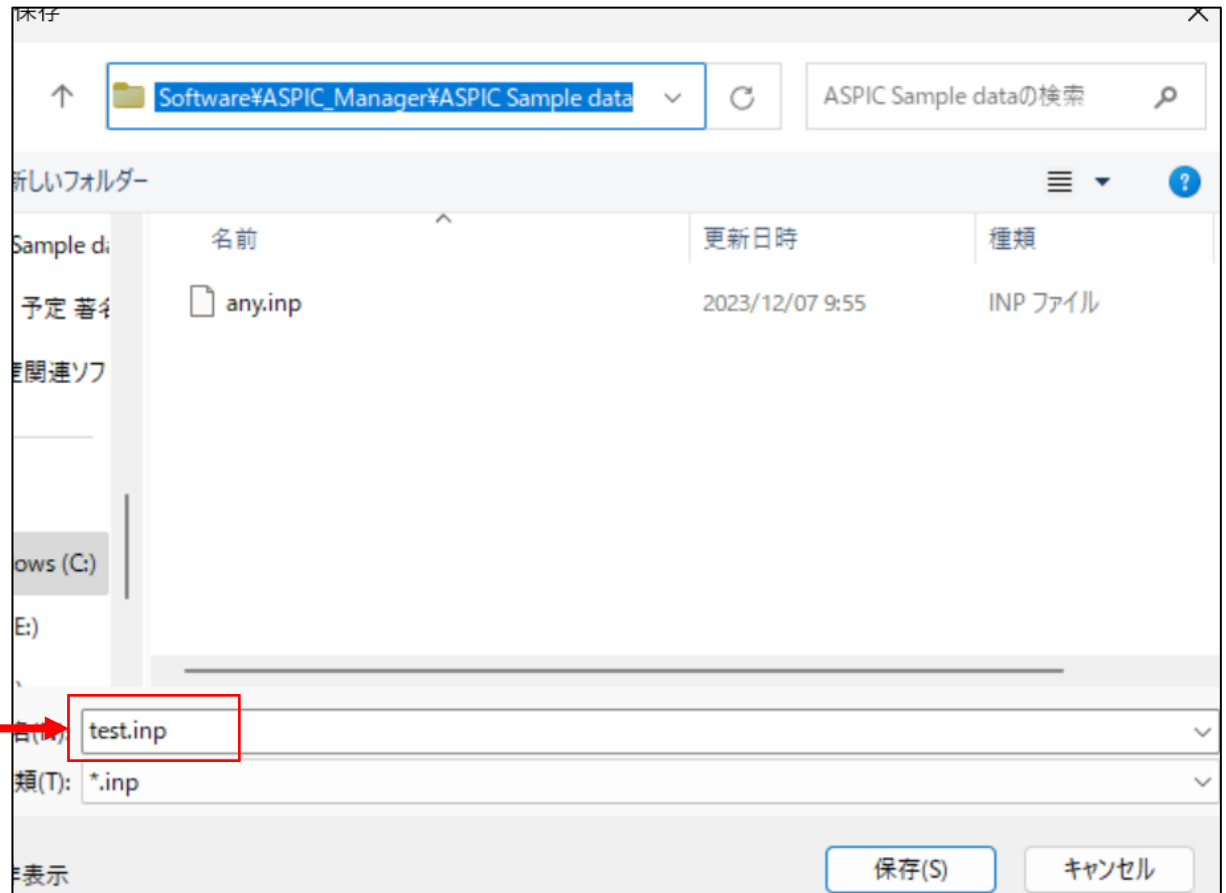
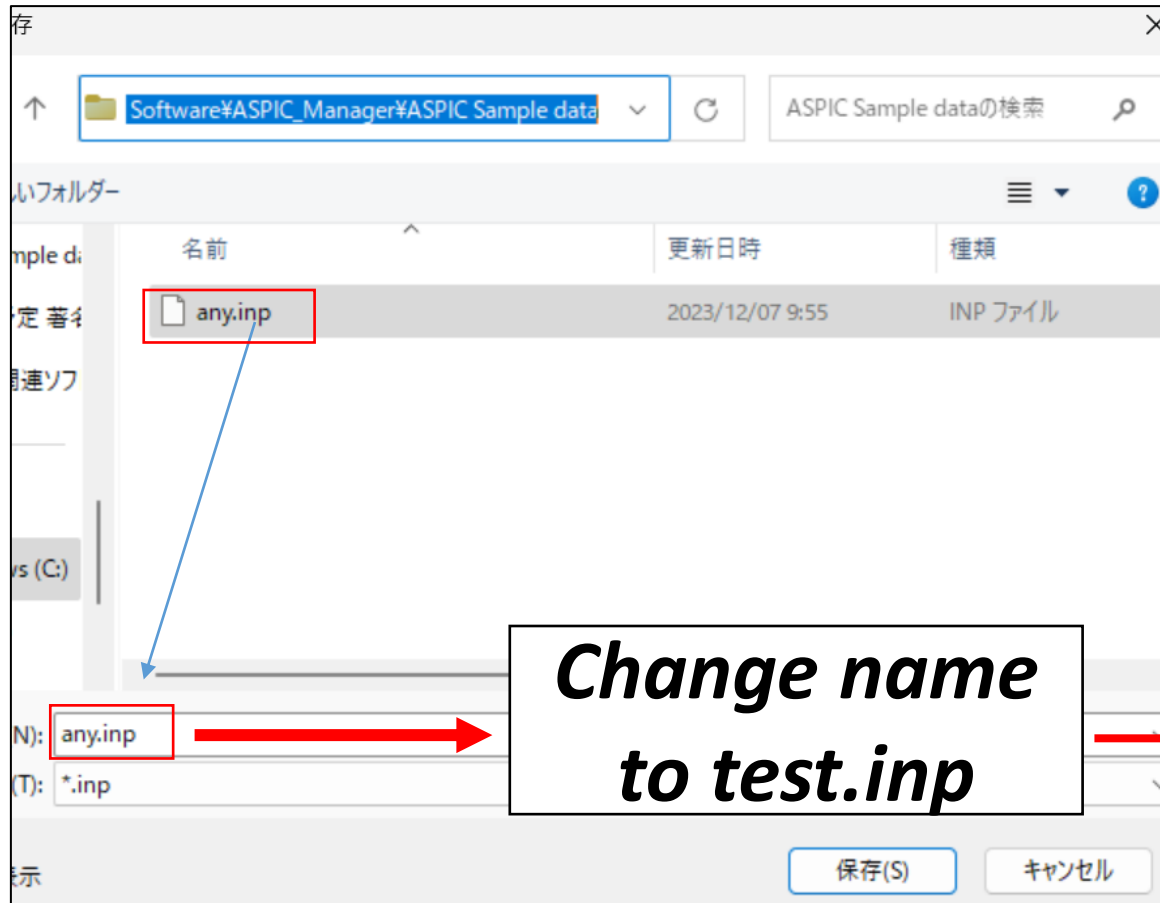
The test.xlsx file is imported from

C:¥ESL Software¥ASPIC\_Manager¥ASPIC(Sample data)¥folder



## 4. Running software: 4.1 Batch job

- 7 Creating the new input file by overwriting to the any previous input file.  
Example(below) any.inp → test.inp



## 4. Running software

### 4.1 Batch job

Setting up entries for the batch job

After creating the (new) test.inp file, the batch job window will appear.

Edit entries  
3-4 steps  
for each entry  
(B1/K, q, MSY, K)

↓  
162 combinations  
(runs)

8

ASPIC\_Manager(ver1.1.0)(2024)

Input file(\*.inp)  
C:\ESL Software\ASPIC\_Manager\ASPIC Sample data\{(1) Batch job\test.inp

Models  
 Schaefer  FOX Combination: 2

	mini(<=)	Start	max(<=)	step	Combination
B1/K	0.1	0.5	1.0	0.4	3
q	0.003	0.004	0.005	0.001	3
set up	mini(1,000tons)	Start	max(1,000tons)	step	
MSY	3	7.3	15	5	3
K	17	70	170	60	3

Do not change these min & max values unless otherwise the software requests so during the process to solve min max related problems.

total number of combinations (batch job) 162

Start

(To terminate, close the window by clicking X)

Processing time: 00h00m 00/00  
[Current no. of the batch job being processed]/[total number of the batch job]

2 models

Make 3-4 steps for each entry

# Important note

Even when values of MSY & K for mini, start & max are valid, for some cases, there will be warning messages for invalid values and no results.

This is caused by r values. In such case, try other r values, then there will be no warnings and results will be obtained.

ASPIC\_Manager(ver1.1.0)(2024)

Input file(\*.inp)  
C:\ESL Software\ASPIC\_Manager\ASPIC Sample data\{(1) Batch job\test.inp

Models  
 Schaefer  FOX Combination: 2

	mini(<=)	Start	max(<=)	step	Combination
B1/K	0.1	0.5	1.0	0.4	3
q	0.003	0.004	0.005	0.001	3

set up	mini(1,000tons)	Start	max(1,000tons)	step	
MSY	3	7.3	15	5	3
K	17	70	170	60	3

total number of combinations (batch job) 162

Start

(To terminate, close the window by clicking X)

Processing time: 00h00m 00/00  
[Current no. of the batch job being processed]/[total number of the batch job]

## 4. Running software

### 4.1 Batch job

After clicking the start button, the confirmation (check) window will appear. If OK, click OK.

If not OK, click cancel and revise entries.

9

The screenshot displays the ASPIC\_Manager (ver1.1.0)(2024) interface. The 'Input file(\*.inp)' field is set to 'C:\ESL Software\ASPIC\_Manager\ASPIC Sample data\{(1) Batch job\test.inp'. Under 'Models', 'Schaefer' and 'FOX' are checked, with 'Combination' set to 2. A table shows parameters for 'B1/K' and 'q' with their respective ranges and steps. Another table shows 'set up' parameters for 'MSY' and 'K'. The 'total number of combinations (batch job)' is 162. A 'Start' button is highlighted with a red 'CLICK!!' label and a hand icon. A 'Check' dialog box is open, asking 'Batch job is 162 times. Start the batch job?' with 'OK' and 'キャンセル' (Cancel) buttons. The 'OK' button is also highlighted with a red 'CLICK!!' label and a hand icon. The bottom of the window shows 'Processing time: 00h00m' and a progress indicator '00/00'.

ASPIC\_Manager(ver1.1.0)(2024)

Input file(\*.inp)  
C:\ESL Software\ASPIC\_Manager\ASPIC Sample data\{(1) Batch job\test.inp

Models  
 Schaefer  FOX Combination: 2

	mini(<=)	Start	max(<=)	step	Combination
B1/K	0.1	0.5	1.0	0.4	3
q	0.003	0.004	0.005	0.001	3

set up	mini(1,000tons)	Start	max(1,000tons)	step
MSY	3	7.3	15	
K	17	70	170	

total number of combinations (batch job) 162

Start

(To terminate, close the window by clicking X)

Check

Batch job is 162 times. Start the batch job?

OK キャンセル

Processing time: 00h00m 00/00

[Current no. of the batch job being processed]/[total number of the batch job]

# 4. Running software: 4.1 Batch job

10 Snapshot of the processing during the batch job (35<sup>th</sup> run)

11 Batch job done message  
Click OK

The screenshot shows the ASPIC\_Manager interface with the following details:

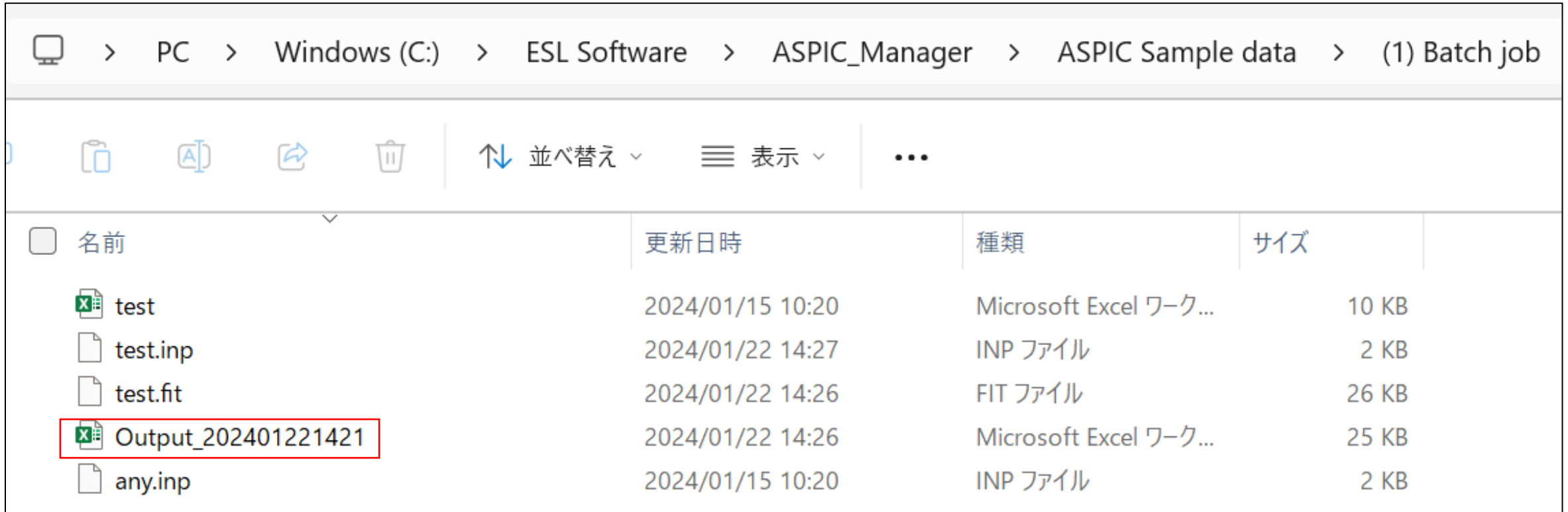
- Input file:** C:\ESL Software\ASPIC\_Manager\ASPIC Sample data\1) Batch job\test.inp
- Models:** Schaefer and FOX are selected with a combination of 2.
- Parameters:** B1/K (0.1, 0.5, 1.0), q (0.003, 0.004, 0.005, 0.001), MSY (3, 7.3, 15), and K (17, 70, 170) are set with a step of 5 and a combination of 3.
- Progress:** Processing time is 0h0m, and the current run is 35/162.
- Output:** The console shows ASPIC Version 5.10 output, including a fatal error: "FATAL: K bounds do not include starting guess."

The screenshot shows the ASPIC\_Manager interface with the following details:

- Progress:** Processing time is 0h3m, and the batch job is 162/162 completed.
- Output:** The console shows ASPIC Version 5.10 output, including a note: "NOTE: ASPIC ended normally. The output file is test.fit".
- Dialog Box:** A "Done" dialog box is displayed with the message "Batch processing completed." and an "OK" button. A hand icon points to the "OK" button.

## 4. Running software: 4.1 Batch job

Results of all runs will be stored in the excel file with time stamp.



名前	更新日時	種類	サイズ
test	2024/01/15 10:20	Microsoft Excel ワーク...	10 KB
test.inp	2024/01/22 14:27	INP ファイル	2 KB
test.fit	2024/01/22 14:26	FIT ファイル	26 KB
Output_202401221421	2024/01/22 14:26	Microsoft Excel ワーク...	25 KB
any.inp	2024/01/15 10:20	INP ファイル	2 KB

# 4. Running software: 4.1 Batch job Results

Results (Excel file) (2 sheets) → “Converged” & “Not converged/Errors”

Users will use the “Converged” sheet to select the best parameters (see next slide).

If no results in “Converged sheet”, users need to fix one parameter & re-run the batch job (see #38-#40 for details)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y
1	Time	0h2m	No of jobs	162	Average	0.0180	Min/job	1.08	Sec/job																
2	Parameters	Model	B1/K	q	MSY	K																			
3	Range (step)	Fox and Schaefer	0.8-1 by 0.1	0.003-0.005 by 0.001-3	3-15 by 5	23-170 by 60																			
4	Flag (0: fixed / 1: estimate)		1	1	1	1																			
5	Weight unit (1,000 tons)																								
7	Combination										Results														
9	No	B1/K	MSY (min)	MSY (start)	MSY (max)	K(min)	K(start)	K(max)	q	R2	RMS	r [Est]	Model	B1/K [Est]	MSY [Est]	K [Est]	q [Est]	Current catch	TBmsy [Est]	TB [Est]	Fmsy [Est]	B/Bmsy [Est]	F/Fmsy [Est]	note	
10	13	0.8	3	8	15	23	83	170	0.003	0.524	0.175	0.3435	Schaefer	0.113	9.533	111	0.0066	12.79	55.52	31.7	0.172	0.472	2.58	ASPIC ended normally.	
11	14	0.8	3	8	15	23	83	170	0.004	0.524	0.175	0.3435	Schaefer	0.113	9.533	111	0.0066	12.79	55.52	31.7	0.172	0.472	2.58	ASPIC ended normally.	
12	15	0.8	3	8	15	23	83	170	0.005	0.524	0.175	0.3432	Schaefer	0.113	9.533	111.1	0.0066	12.79	55.53	31.7	0.172	0.472	2.58	ASPIC ended normally.	
13	16	0.8	3	8	15	23	140	170	0.003	0.524	0.175	0.3433	Schaefer	0.113	9.534	111.1	0.0066	12.79	55.53	31.7	0.172	0.472	2.58	ASPIC ended normally.	
14	17	0.8	3	8	15	23	140	170	0.004	0.524	0.175	0.3433	Schaefer	0.113	9.534	111.1	0.0066	12.79	55.53	31.7	0.172	0.472	2.58	ASPIC ended normally.	
15	18	0.8	3	8	15	23	140	170	0.005	0.524	0.175	0.3433	Schaefer	0.113	9.534	111.1	0.0066	12.79	55.53	31.7	0.172	0.472	2.58	ASPIC ended normally.	
16	22	0.8	3	13	15	23	83	170	0.003	0.524	0.175	0.3436	Schaefer	0.113	9.534	111	0.0066	12.79	55.52	31.7	0.172	0.472	2.58	ASPIC ended normally.	
17	23	0.8	3	13	15	23	83	170	0.004	0.524	0.175	0.3433	Schaefer	0.113	9.534	111.1	0.0066	12.79	55.53	31.7	0.172	0.472	2.58	ASPIC ended normally.	
18	24	0.8	3	13	15	23	83	170	0.005	0.524	0.175	0.3436	Schaefer	0.113	9.534	111	0.0066	12.79	55.52	31.7	0.172	0.472	2.58	ASPIC ended normally.	
19	25	0.8	3	13	15	23	140	170	0.003	0.524	0.175	0.3436	Schaefer	0.113	9.534	111	0.0066	12.79	55.52	31.7	0.172	0.472	2.58	ASPIC ended normally.	
20	26	0.8	3	13	15	23	140	170	0.004	0.524	0.175	0.3435	Schaefer	0.113	9.533	111	0.0066	12.79	55.52	31.7	0.172	0.473	2.58	ASPIC ended normally.	
21	27	0.8	3	13	15	23	140	170	0.005	0.524	0.175	0.3436	Schaefer	0.113	9.534	111	0.0066	12.79	55.52	31.7	0.172	0.472	2.58	ASPIC ended normally.	
22	40	0.9	3	8	15	23	83	170	0.003	0.524	0.175	0.3433	Schaefer	0.113	9.534	111.1	0.0066	12.79	55.53	31.7	0.172	0.472	2.58	ASPIC ended normally.	
23	41	0.9	3	8	15	23	83	170	0.004	0.524	0.175	0.3433	Schaefer	0.113	9.534	111.1	0.0066	12.79	55.53	31.7	0.172	0.472	2.58	ASPIC ended normally.	
24	42	0.9	3	8	15	23	83	170	0.005	0.524	0.175	0.3435	Schaefer	0.113	9.533	111	0.0066	12.79	55.51	31.69	0.172	0.473	2.58	ASPIC ended normally.	
25	43	0.9	3	8	15	23	140	170	0.003	0.524	0.175	0.3433	Schaefer	0.113	9.534	111.1	0.0066	12.79	55.53	31.7	0.172	0.472	2.58	ASPIC ended normally.	
26	44	0.9	3	8	15	23	140	170	0.004	0.524	0.175	0.3435	Schaefer	0.113	9.533	111	0.0066	12.79	55.52	31.7	0.172	0.472	2.58	ASPIC ended normally.	
27	45	0.9	3	8	15	23	140	170	0.005	0.524	0.175	0.3432	Schaefer	0.113	9.533	111.1	0.0066	12.79	55.53	31.7	0.172	0.472	2.58	ASPIC ended normally.	
28	49	0.9	3	13	15	23	83	170	0.003	0.524	0.175	0.3433	Schaefer	0.113	9.534	111.1	0.0066	12.79	55.53	31.7	0.172	0.472	2.58	ASPIC ended normally.	
29	50	0.9	3	13	15	23	83	170	0.004	0.524	0.175	0.3433	Schaefer	0.113	9.534	111.1	0.0066	12.79	55.53	31.7	0.172	0.472	2.58	ASPIC ended normally.	
30	51	0.9	3	13	15	23	83	170	0.005	0.524	0.175	0.3435	Schaefer	0.113	9.533	111	0.0066	12.79	55.52	31.7	0.172	0.473	2.58	ASPIC ended normally.	
31	52	0.9	3	13	15	23	140	170	0.003	0.524	0.175	0.3433	Schaefer	0.113	9.534	111.1	0.0066	12.79	55.53	31.7	0.172	0.472	2.58	ASPIC ended normally.	
32	53	0.9	3	13	15	23	140	170	0.004	0.524	0.175	0.3433	Schaefer	0.113	9.534	111.1	0.0066	12.79	55.53	31.7	0.172	0.472	2.58	ASPIC ended normally.	
33	54	0.9	3	13	15	23	140	170	0.005	0.524	0.175	0.3436	Schaefer	0.113	9.534	111	0.0066	12.79	55.52	31.69	0.172	0.472	2.58	ASPIC ended normally.	
34	67	1	3	8	15	23	83	170	0.003	0.524	0.175	0.3435	Schaefer	0.113	9.533	111	0.0066	12.79	55.52	31.7	0.172	0.472	2.58	ASPIC ended normally.	
35	68	1	3	8	15	23	83	170	0.004	0.524	0.175	0.3433	Schaefer	0.113	9.534	111.1	0.0066	12.79	55.53	31.7	0.172	0.472	2.58	ASPIC ended normally.	
36	69	1	3	8	15	23	83	170	0.005	0.524	0.175	0.3435	Schaefer	0.113	9.533	111	0.0066	12.79	55.51	31.69	0.172	0.473	2.58	ASPIC ended normally.	
37	70	1	3	8	15	23	140	170	0.003	0.524	0.175	0.3433	Schaefer	0.113	9.534	111.1	0.0066	12.79	55.53	31.7	0.172	0.472	2.58	ASPIC ended normally.	

Run time information

Information for the batch job

See the next slide, how to decide the best parameters using results.

Converged Not converged or Errors

## 4. Running software: 4.1 Batch job

*How to decide the best parameters using results*

Step 1: Sort R2: descending & RMS: ascending order.

R2: Correlation coefficient and RMS: Root Mean Square Error

→ R2: Higher and RMS: lower better

R2	RMS
0.524	0.175
0.456	0.222
0.347	0.345
0.223	0.678

Step 2 Check B1/K if OK.

For this case, B1/K=0.113 is too low as it is the virgin stock (should be close to 1).

Best answer →

Results													
R2	RMS	r [Est]	Model	B1/K [Est]	MSY [Est]	K [Est]	q [Est]	Current catch	TBmsy [Est]	TB [Est]	Fmsy [Est]	B/Bmsy [Est]	F/Fmsy [Est]
0.524	0.175	0.3435	Schaefer	0.113	9.533	111	0.0066	12.79	55.52	31.7	0.172	0.472	2.58
0.524	0.175	0.3436	Schaefer	0.113	9.534	111	0.0066	12.79	55.52	31.69	0.172	0.472	2.58
0.524	0.175	0.3433	Schaefer	0.113	9.534	111.1	0.0066	12.79	55.53	31.69	0.172	0.472	2.58
0.524	0.175	0.3433	Schaefer	0.113	9.534	111.1	0.0066	12.79	55.53	31.7	0.172	0.472	2.58

We cannot accept this result. As next step, we will fix B1/K=1 & do batch job again



## 4. Running software: 4.1 Batch job

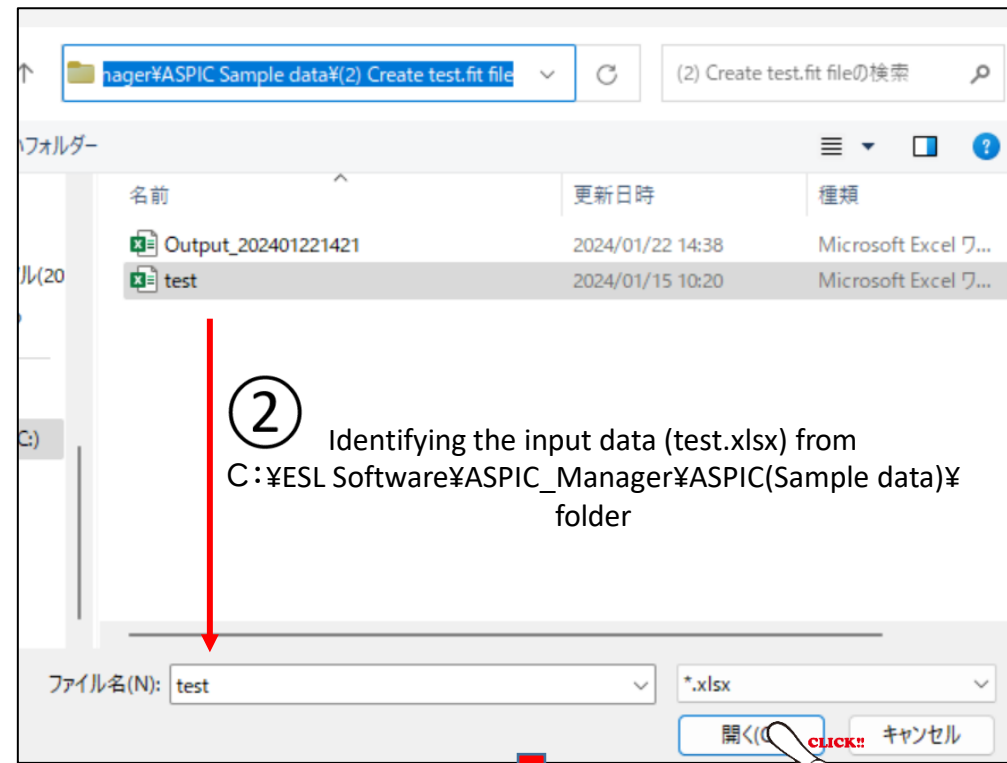
Fix  $B1/K = 1$  because of the virgin stock  
( $B1 \approx K$ )

then, re-run the batch job (same process)

①

Input item	Example	Edit
Title name	SWO	test
Estimate flags (1=yes or 0=no -> fix) (B1/K, MSY, K, q)	0 1 1 1	0 1 1 1
Intrinsic population growth rate (r)	0.27	0.35
Data (YEAR, CPUE AND CATCH)		...

Click to Import  
the input data



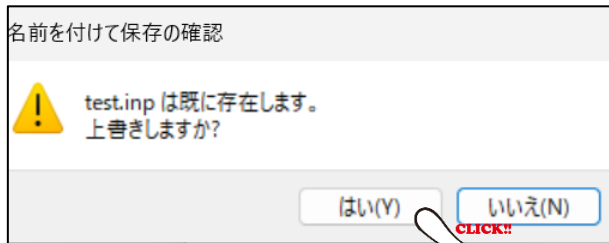
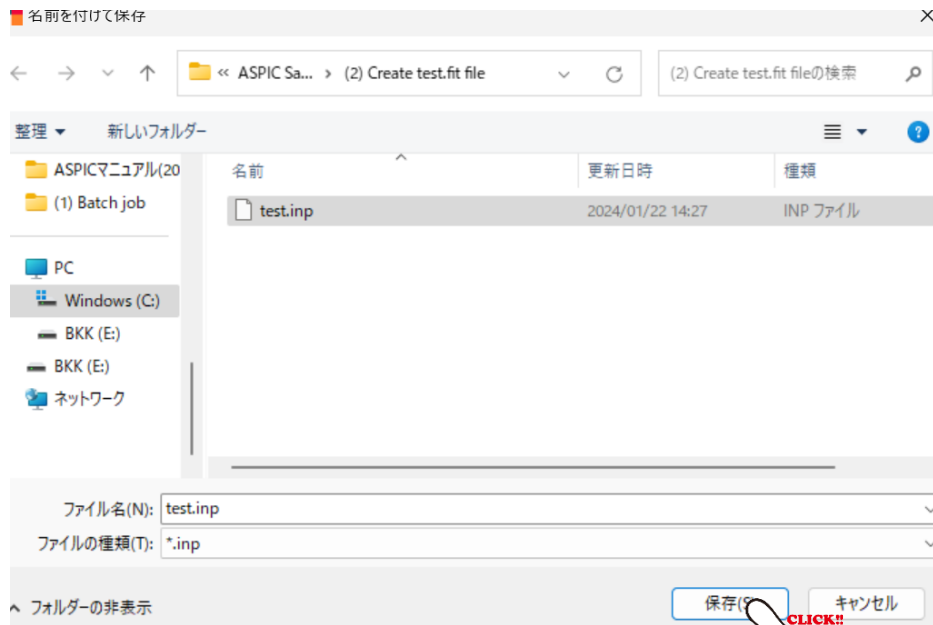
Input item	Example	Edit
Title name	SWO	test
Estimate flags (1=yes or 0=no -> fix) (B1/K, MSY, K, q)	0 1 1 1	0 1 1 1
Intrinsic population growth rate (r)	0.27	0.35
Data (YEAR, CPUE AND CATCH)		C:\ESL Software\ASPIC_Manager\ASPIC... ..

③ The test.xlsx file is now imported

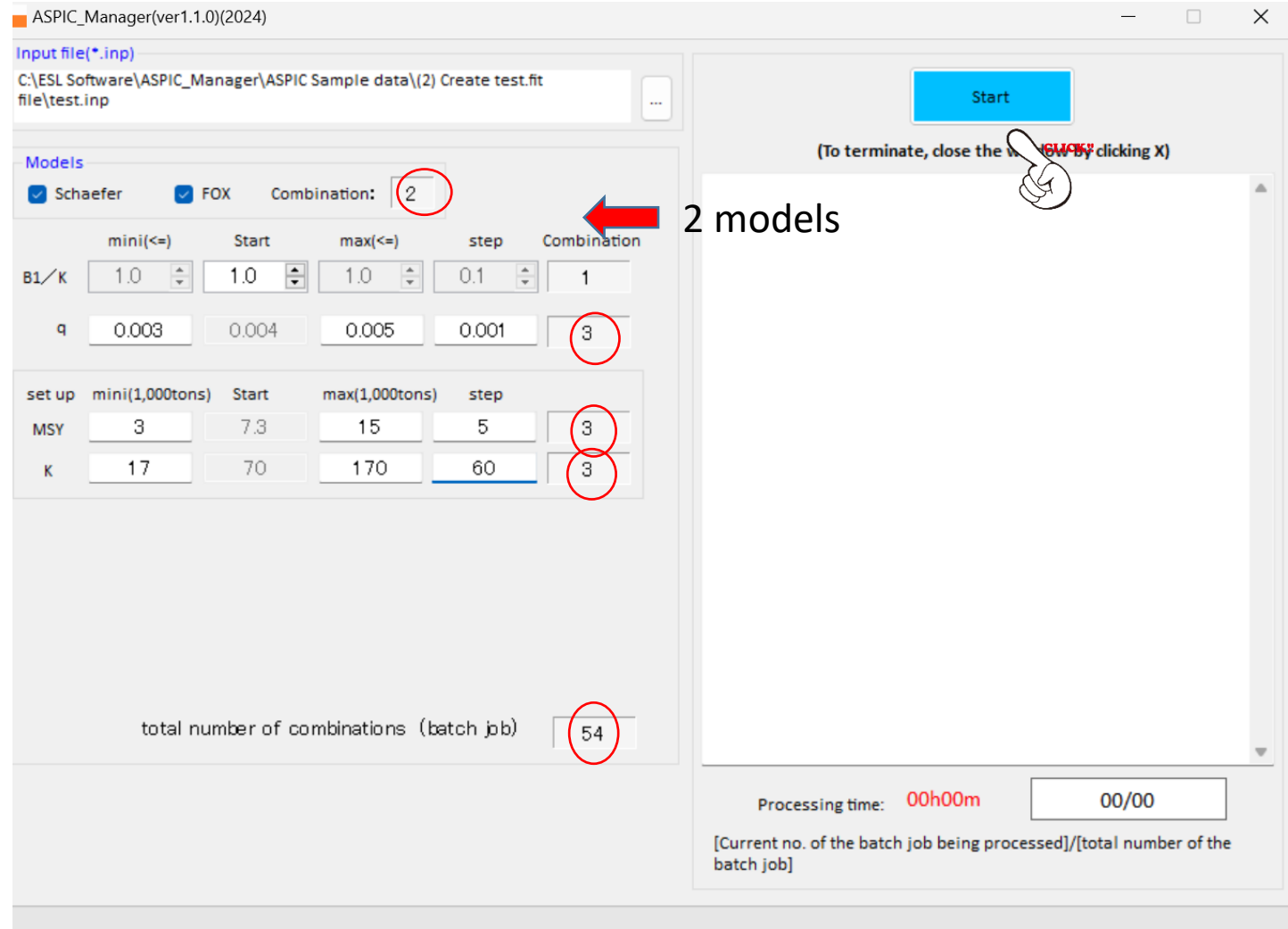
## 4. Running software: 4.1 Batch job

Fix  $B1/K = 1$  because of the virgin stock ( $B1 \approx K$ ), then re-run the batch job

- ④ Save the same input file name as before (test.inp) by overwriting



- ⑤ Edit the parameters as before except  $B1/K = 1$  (fixed), so need to enter values.



## 4. Running software

### 4.1 Batch job

Re-running  
the batch job  
by fixing B1/K=1

because  
the initial run did not  
produce plausible  
results  
and  
the virgin stock is  
assumed (B1/K).

ASPIC\_Manager(ver1.1.0)(2024)

Input file(\*.inp)  
C:\ESL Software\ASPIC\_Manager\ASPIC Sample data\{(2) Create test file\test.inp

Models  
 Schaefer  FOX Combination: 2

	mini(<=)	Start	max(<=)	step	Combination
B1/K	1.0	1.0	1.0	0.1	1
q	0.003	0.004	0.005	0.001	3

set up	mini(1,000tons)	Start	max(1,000tons)	step	
MSY	3	7.3	15	5	3
K	17	70	170	60	3

total number of combinations (batch job) 54

Start

(To terminate, close the window by clicking X)

```
R:1 It: 144 B1/K:1.0000 K:7.05E+04 MSY:1.12E+04 SSE:6.1244253E-01
R:2 It: 154 B1/K:1.0000 K:7.05E+04 MSY:1.12E+04 SSE:6.1244253E-01
R:3 It: 145 B1/K:1.0000 K:7.05E+04 MSY:1.12E+04 SSE:6.1244253E-01
R:4 It: 140 B1/K:1.0000 K:7.05E+04 MSY:1.12E+04 SSE:6.1244254E-01
R:5 It: 150 B1/K:1.0000 K:7.05E+04 MSY:1.12E+04 SSE:6.1244253E-01
```

Elapsed CPU ticks: 7  
Elapsed time: 0 hours, 0 minutes, 0 seconds.

NOTE: ASPIC ended normally. The output file is test.fit

----- ASPIC Version 5.10 -----

NOTE: Reading input file test.inp  
TITLE: test

```
R:0 It: 523 B1/K:1.0000 K:7.05E+04 MSY:1.12E+04 SSE:6.1244253E-01
R:1 It: 144 B1/K:1.0000 K:7.05E+04 MSY:1.12E+04 SSE:6.1244253E-01
R:2 It: 151 B1/K:1.0000 K:7.05E+04 MSY:1.12E+04 SSE:6.1244253E-01
R:3 It: 143 B1/K:1.0000 K:7.05E+04 MSY:1.12E+04 SSE:6.1244253E-01
R:4 It: 154 B1/K:1.0000 K:7.05E+04 MSY:1.12E+04 SSE:6.1244253E-01
R:5 It: 154 B1/K:1.0000 K:7.05E+04 MSY:1.12E+04 SSE:6.1244253E-01
```

Elapsed CPU ticks: 27  
Elapsed time: 0 hours, 0 minutes, 0 seconds.

NOTE: ASPIC ended normally. The output file is test.fit

Processing time: 0h0m 33/54

[Current no. of the batch job being processed]/[total number of the batch job]

## 4. Running software: 4.1 Batch job

Results													
R2	RMS	r [Est]	Model	B1/K [Fix]	MSY [Est]	K [Est]	q [Est]	Current catch	TBmsy [Est]	TB [Est]	Fmsy [Est]	B/Bmsy [Est]	F/Fmsy [Est]
0.295	0.209	0.6334	Schaefer	1.000	11.16	70.48	0.0054	12.79	35.24	38.74	0.317	1.05	1.07
0.294	0.209	0.6334	Schaefer	1.000	11.16	70.48	0.0054	12.79	35.24	38.74	0.317	1.05	1.07

Run with the highest R2 & the Lowest RMS  
was selected as the best answer

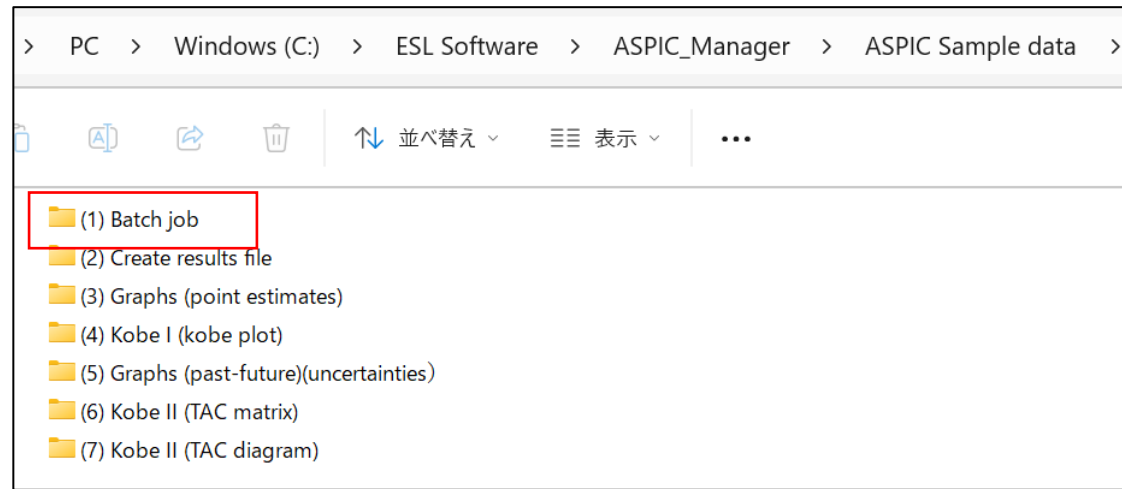
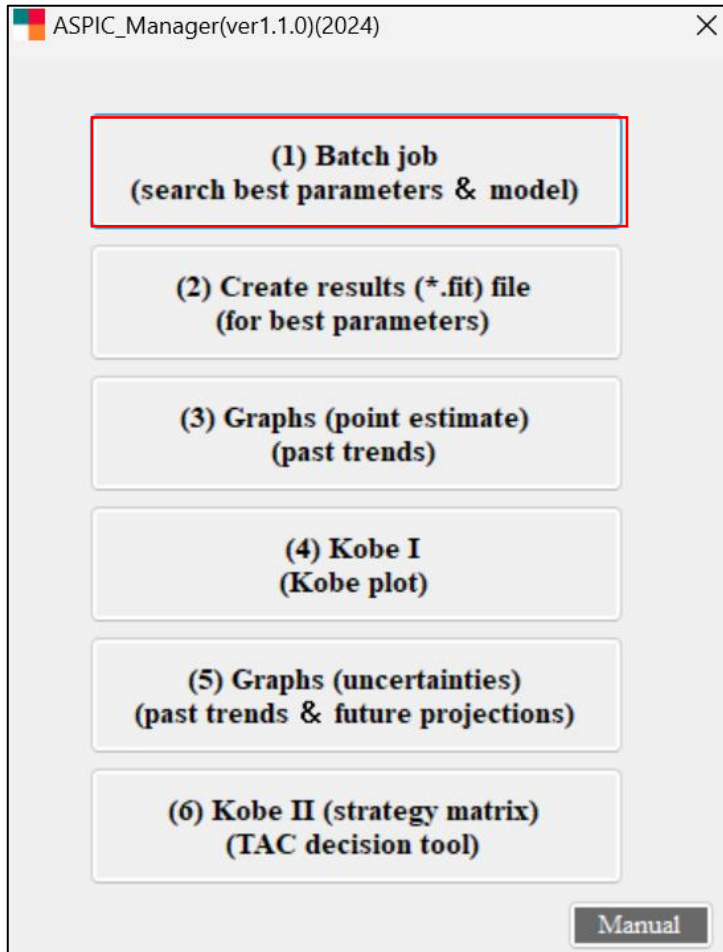
Estimated  $r=0.63$  different from  $r=0.35$

## 4. Running software:

### 4.1 Batch job

ASPIC Sample data

List of INPUT & OUTPUT files for menu (1) Batch job



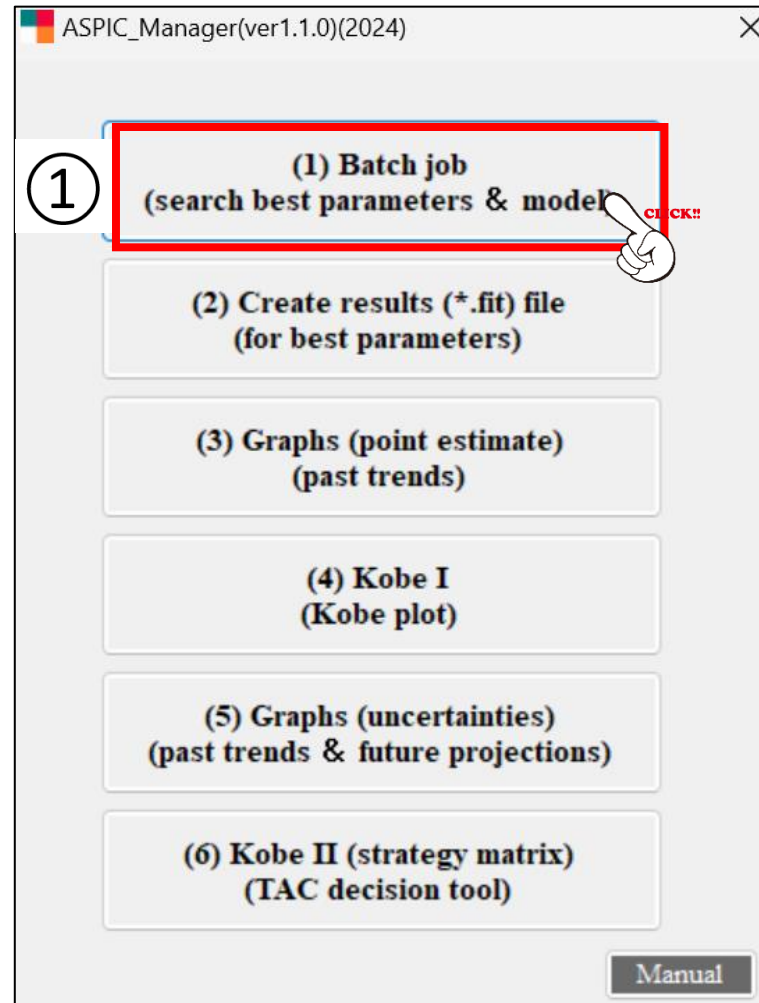
名前	更新日時	種類	サイズ
test.inp	Input file (1 <sup>st</sup> and 2 <sup>nd</sup> batch job)	INP ファイル	2 KB
Output_202401221445	Result of the 1 <sup>st</sup> batch job	Microsoft Excel ワーク...	17 KB
test.fit	Output file (1 <sup>st</sup> & 2 <sup>nd</sup> batch job)	FIT ファイル	26 KB
Output_202401221421	Result of the 2 <sup>nd</sup> batch job	Microsoft Excel ワーク...	25 KB
any.inp	Previous input file	INP ファイル	2 KB
test	Input (CPUE & CATCH) data	Microsoft Excel ワーク...	10 KB

## 4. Running software: 4.1 Batch job Summary

- Data QC → check catch & CPUE
- Batch job is the most fundamental part of ASPIC (80%).
- Need to estimate the best solution for 4 parameters & Model, i.e.,  
→ 4 parameters(B1/K, MSY, M & q) and Model (Schaefer or Fox)
- In the 1<sup>st</sup> trail, estimate all 4 parameters (1111) and Model.
- To select the best run, choose the run with **highest R2 and lowest RMS.**  
(Check B1/K. If not realistic, fix B1/K=1 (if the virgin stock). Do the same)
- If no answers (convergences), check data.
- If data OK, fix 1 parameter (e.g., 0111).
- If still no answer, fix 2 (e.g., 0101).
- If still no → not possible to do ASPIC (one of answers/results)

## 4. Running software:

### 4.2 Creating results (\*.fit) file for best parameters & model



## 4. Running software: 4.2 Creating results (\*.fit) file for best parameters & model

Using the best parameters & model selected in (1) Batch job, full numerical output (results) (\*.fit file) will be obtained. The \*.fit file will be used for further analyses in Menu (3)~(7)

Previous information

Create result (\*.fit) file

\*.inp file

Input (final)	Example	Edit
model	Schaefer or Fox	<input type="radio"/> Schaefer <input type="radio"/> Fox
B1/K	0.96	0.553
MSY (1,000 tons)	12	0.09673
K (1,000 tons)	123	0.2389
q	0.00456	0.00017

**Note: Normally the process completes instantaneously.  
But when DOS prompt window appears, it will take 5-10 minutes.  
In such case, do not click any buttons until completed.**

OK CLICK!! Cancel

Change to the new information

R2	RMS	r	Model	B1/K	MSY	K	q
0.295	0.209	0.6334	Schaefer	1.000	11.16	70.48	0.0054

Create result (\*.fit) file

\*.inp file

Input (final)	Example	Edit
model	Schaefer or Fox	<input checked="" type="radio"/> Schaefer <input type="radio"/> Fox
B1/K	0.96	1
MSY (1,000 tons)	12	11.16
K (1,000 tons)	123	70.48
q	0.00456	0.0054

**Note: Normally the process completes instantaneously.  
But when DOS prompt window appears, it will take 5-10 minutes.  
In such case, do not click any buttons until completed.**

OK CLICK!! Cancel

4



## 4. Running software 4.2 Creating results (\*.fit) file for best parameters & model

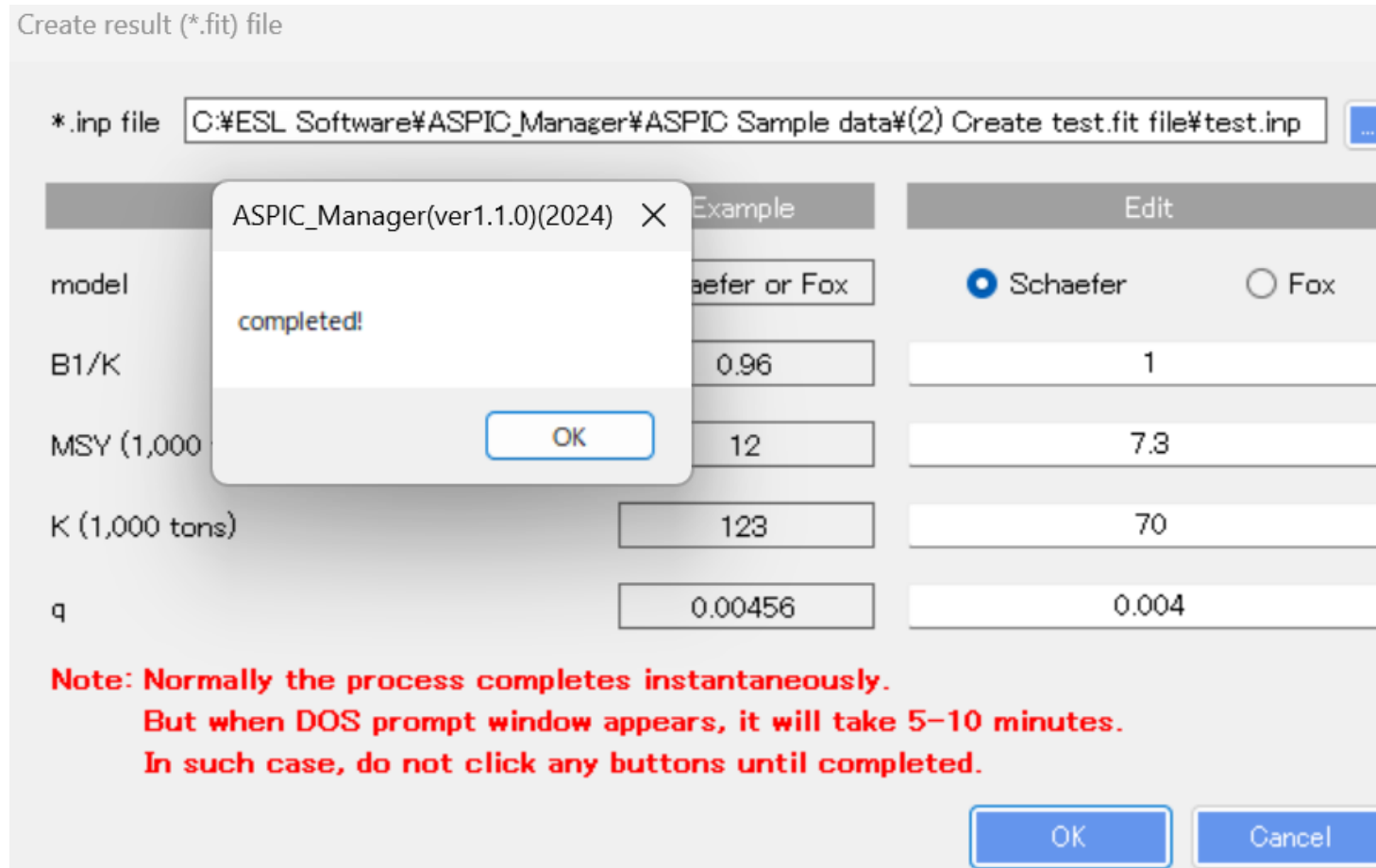
Create result (\*.fit) file

\*.inp file

	Example	Edit
model	Schaefer or Fox	<input checked="" type="radio"/> Schaefer <input type="radio"/> Fox
B1/K	0.96	1
MSY (1,000	12	7.3
K (1,000 tons)	123	70
q	0.00456	0.004

**Note: Normally the process completes instantaneously.  
But when DOS prompt window appears, it will take 5-10 minutes.  
In such case, do not click any buttons until completed.**

OK Cancel

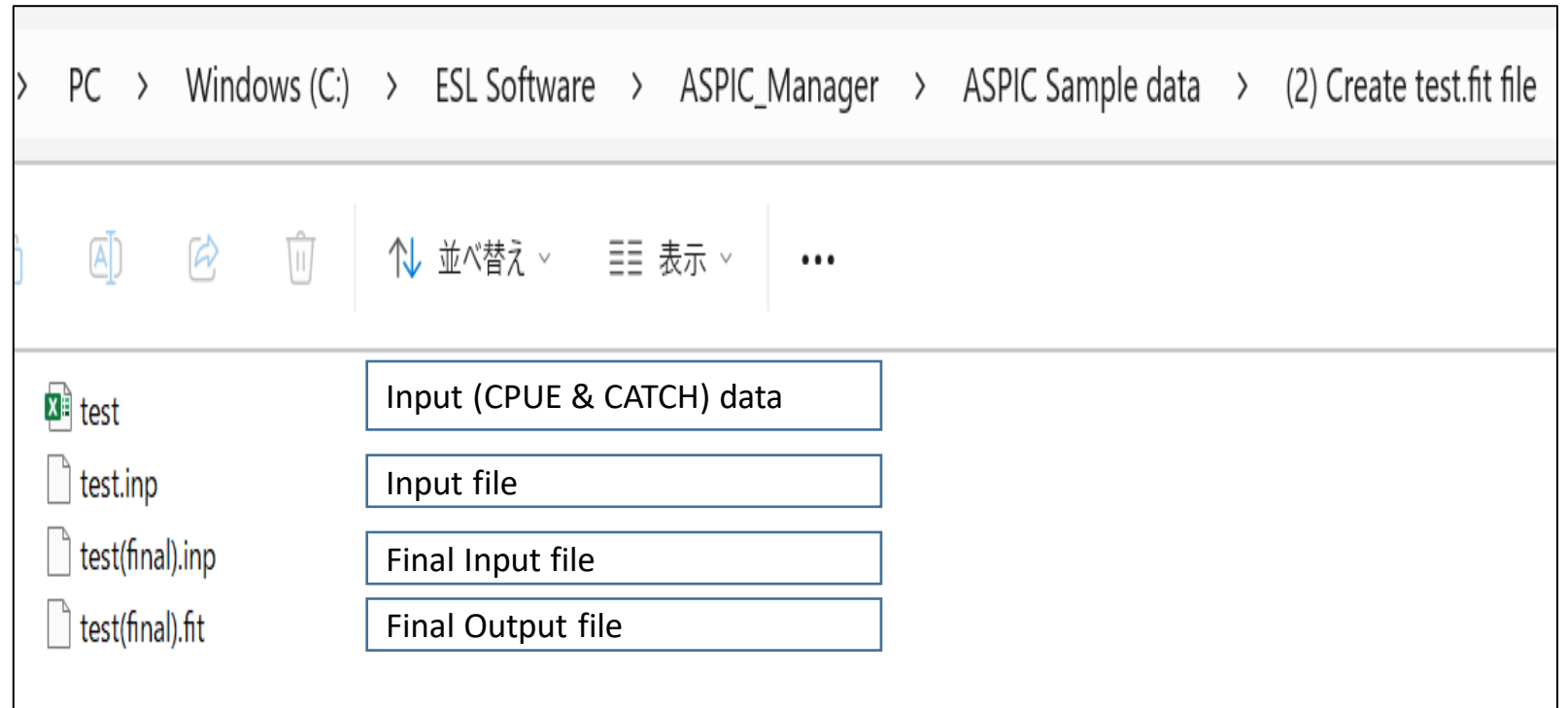
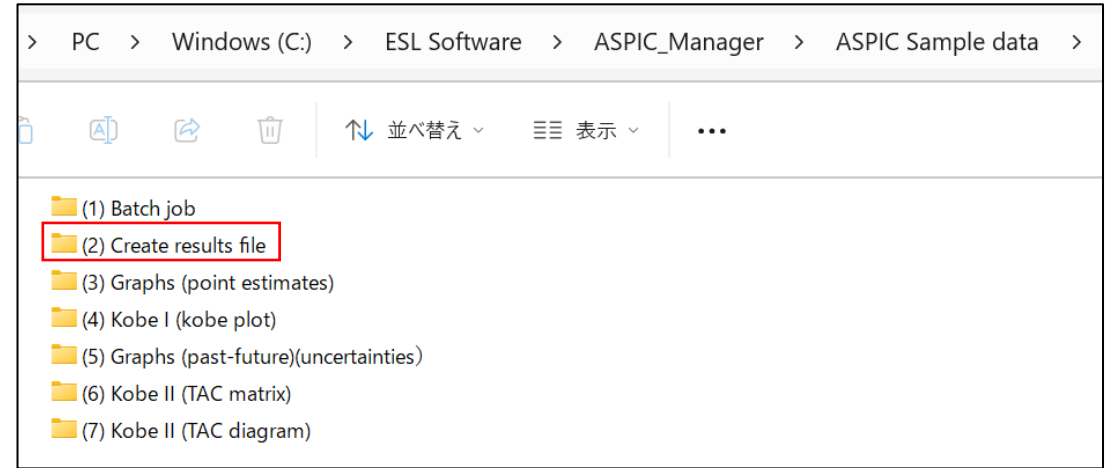
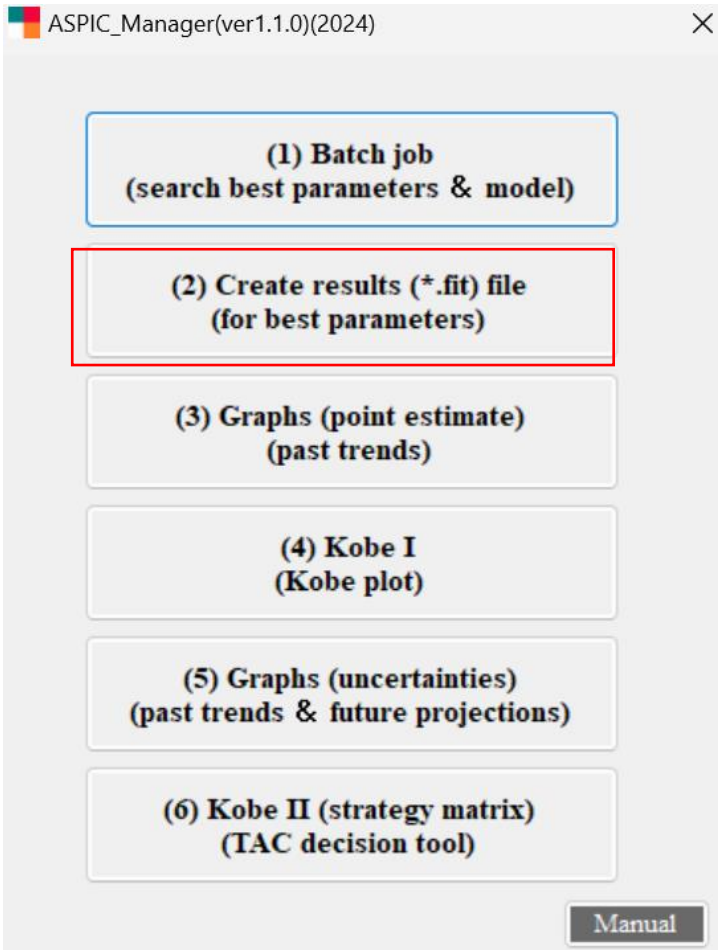


## 4. Running software

### 4.2 Creating results (\*.fit) file for best parameters & model

ASPIC Sample data

List of INPUT & OUTPUT files for menu (2) Create test.fit file

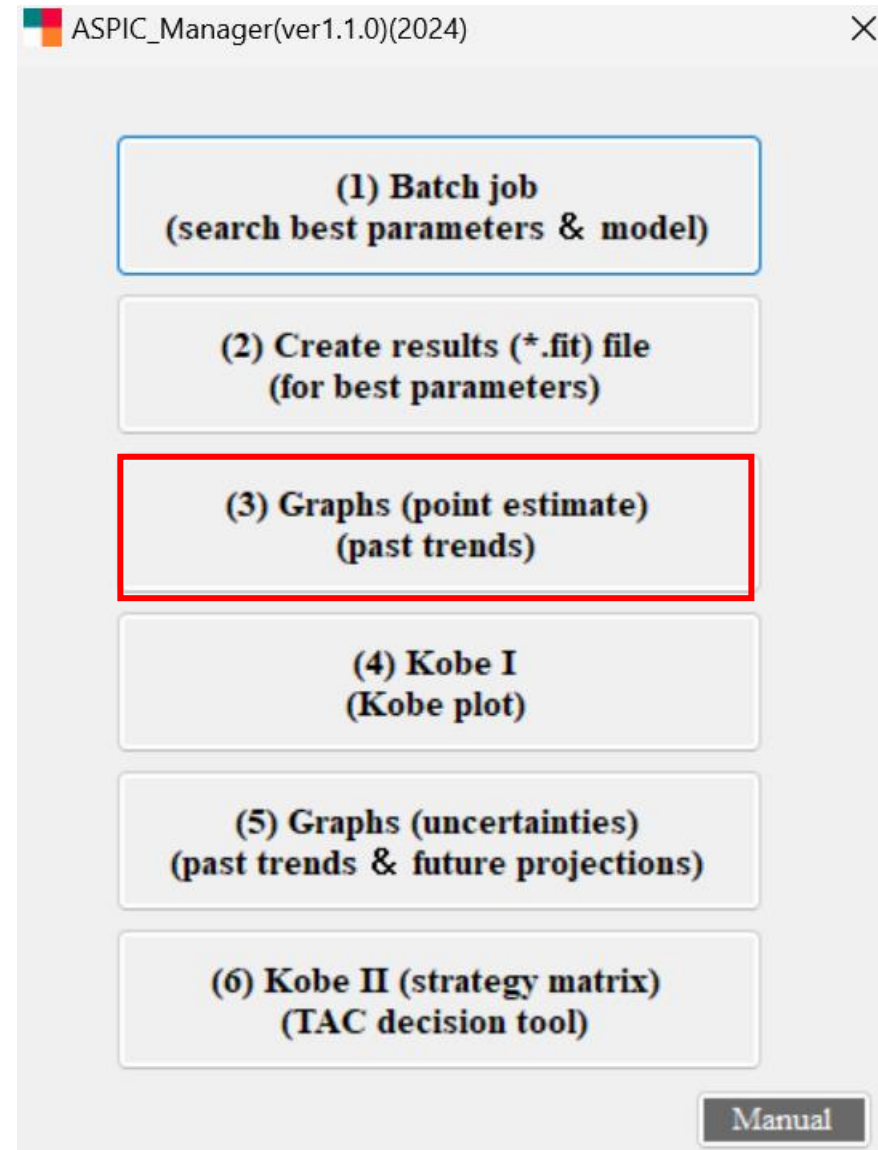


## 4. Running software

### 4.3 Graphs

(Past trends for point estimates)

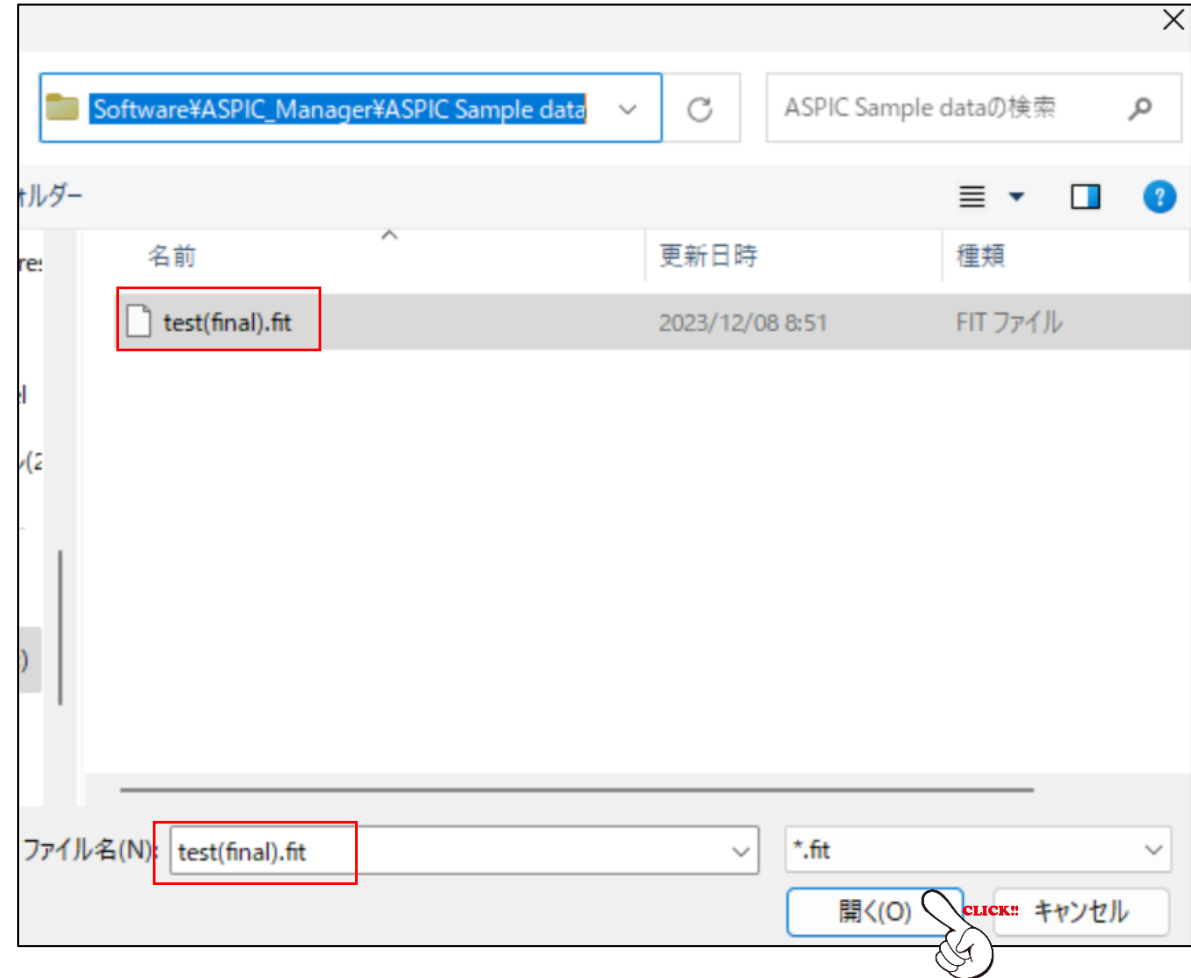
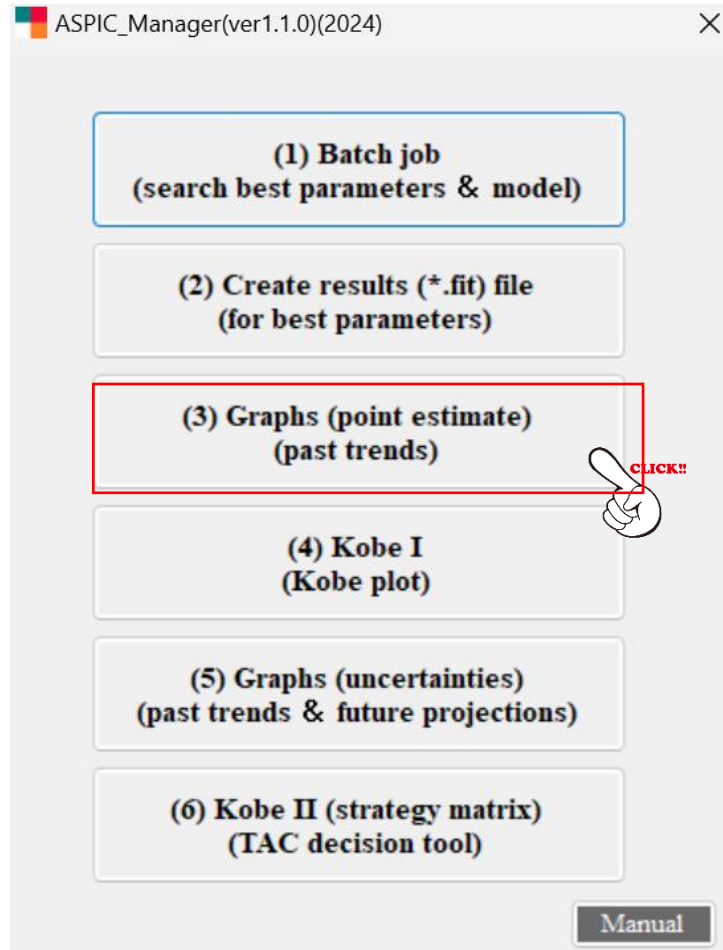
(6 graphs)




## 4. Running software

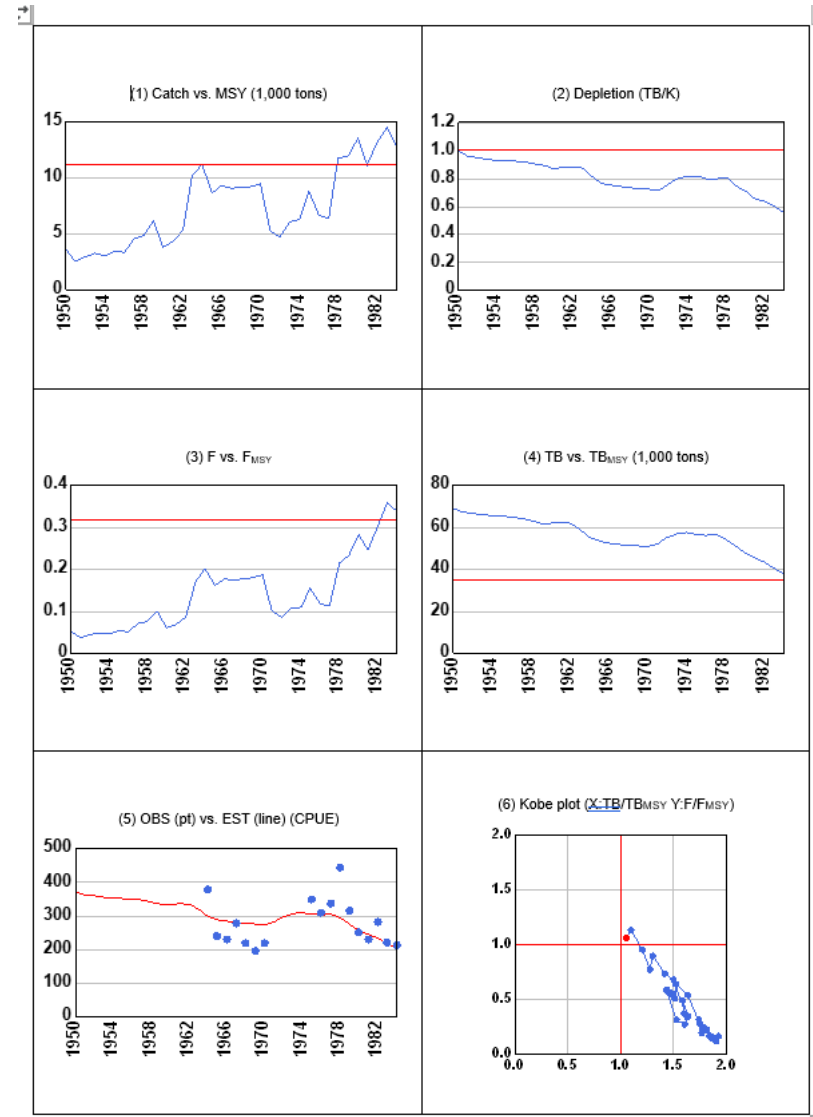
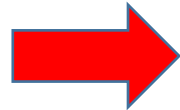
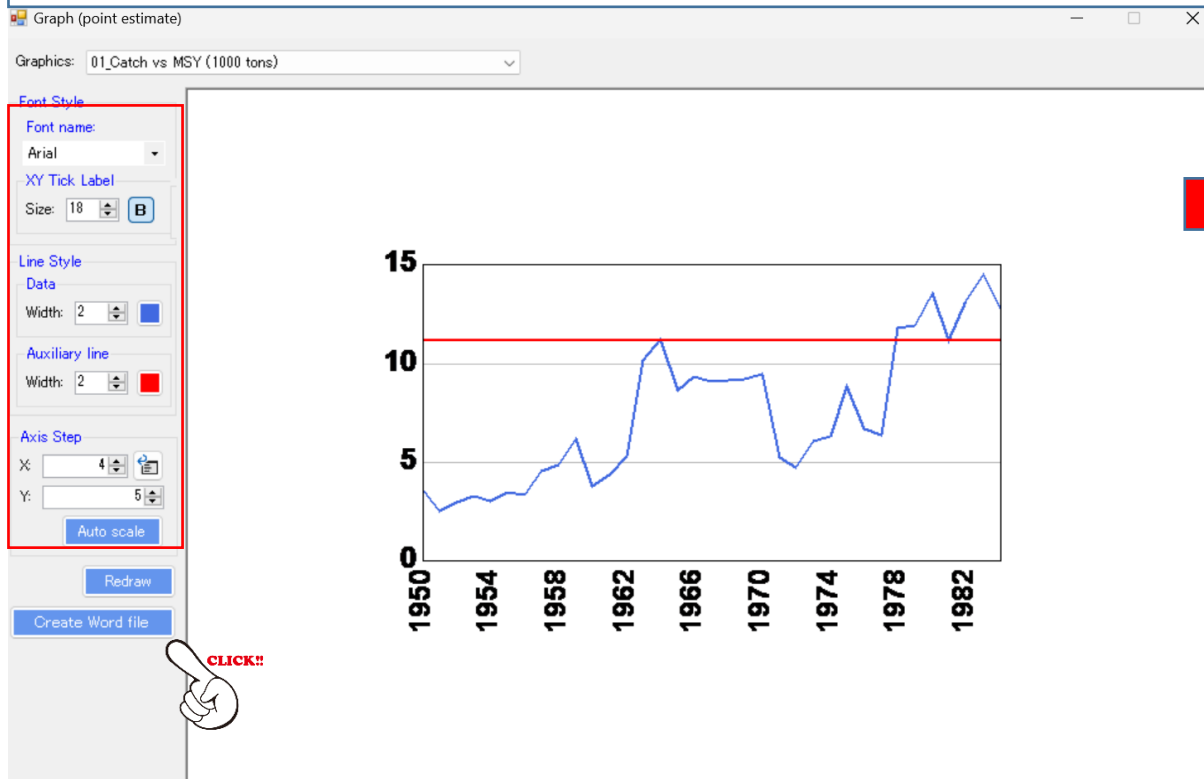
### 4.3 Graphs (Past trends for point estimates) (6 graphs)

Open \*(final).fit file → test(final).fit (our example)



# 4. Running software: 4.3 Graphs (Past trends for point estimates) (6 graphs)


After clicking “Open” (previous slide), the 1<sup>st</sup> graph (catch vs. MSY) appears (below). Users can edit 6 graphs one by one using graph settings functions (red box) available on left except X-axis batch settings for 5 graphs (for details, see next slide). After completing editions, click “Create word file” bottom. Then all 6 graphs will be made and saved in the word file with time stamp →  Graphs (point estimate)\_20231117162058





**4. Running software:**  
**4.3 Graphs**  
**(Past trends for point estimates) (6 graphs)**

What is the batch setting of X-axis ?

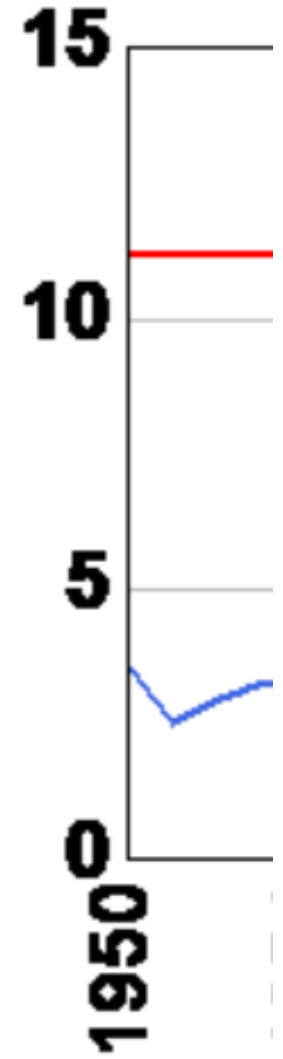
XY Tick Label  
Size: 18 **B**

Line Style  
Data  
Width: 2 

Auxiliary line  
Width: 2 

Axis Step  
X: 4   
Y: 5 **Batch setting of X-axis**

Auto scale  
Redraw  
Create Word file



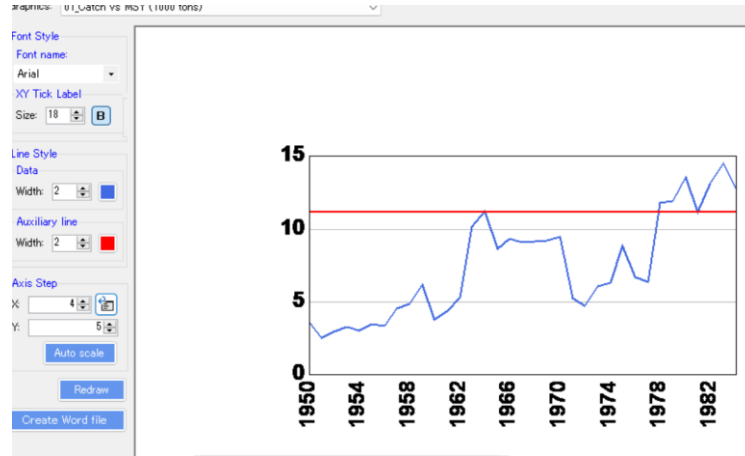
# 4. Running software

## 4.3 Graphs (Past trends for point estimates) (6 graphs)

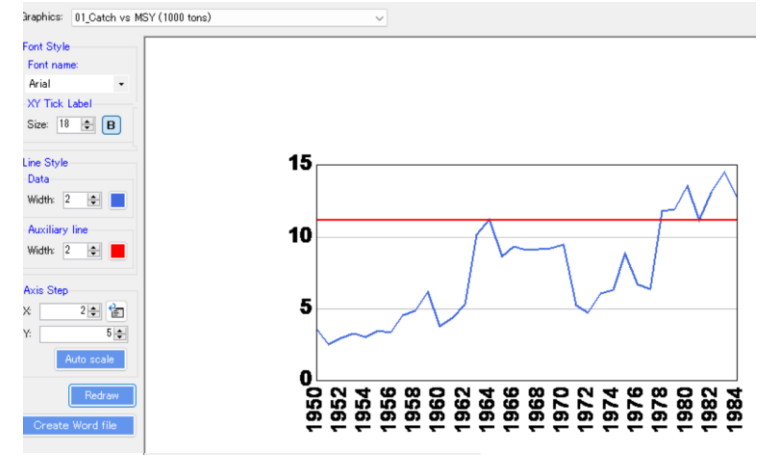
What is X-axis batch setting?

Normally Y axis are different scales, thus optimum steps need to be adjusted one by one.

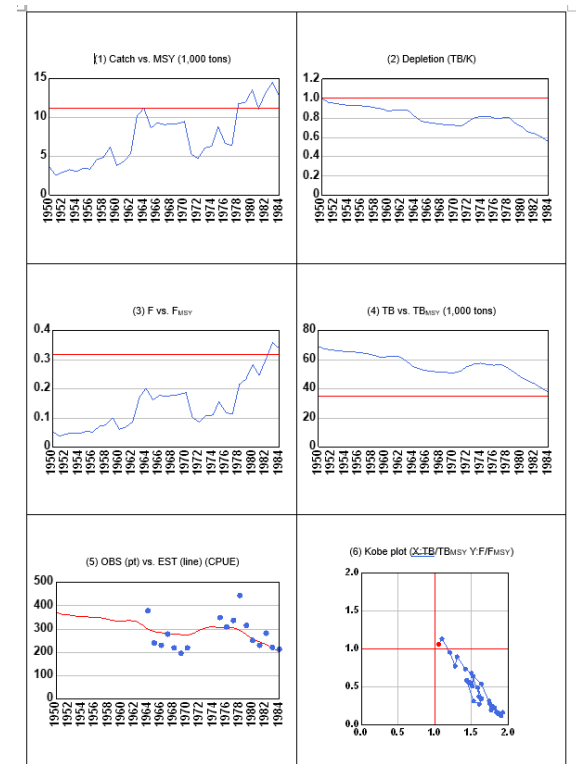
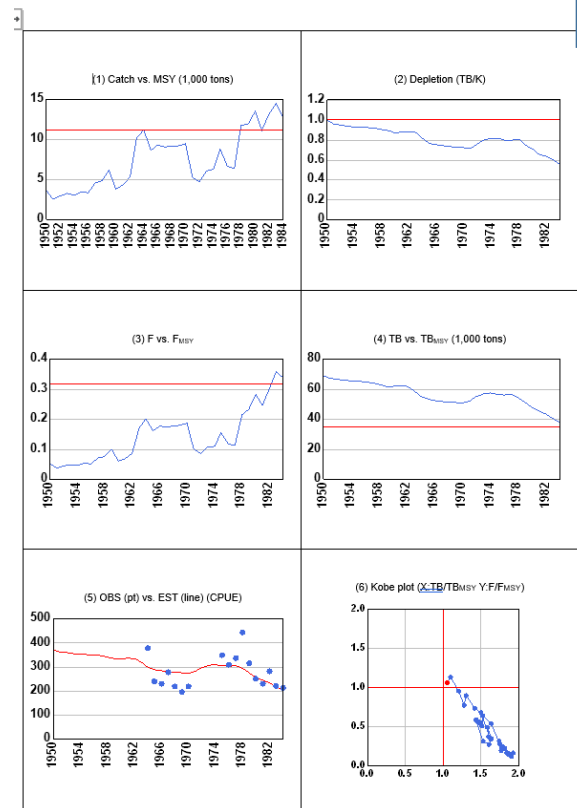
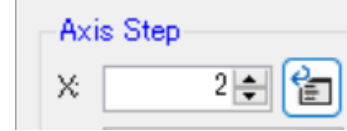
However, X axis is common all for years except the last Kobe plot. Thus this x-axis batch setting can change steps for 5 graphs automatically.



example



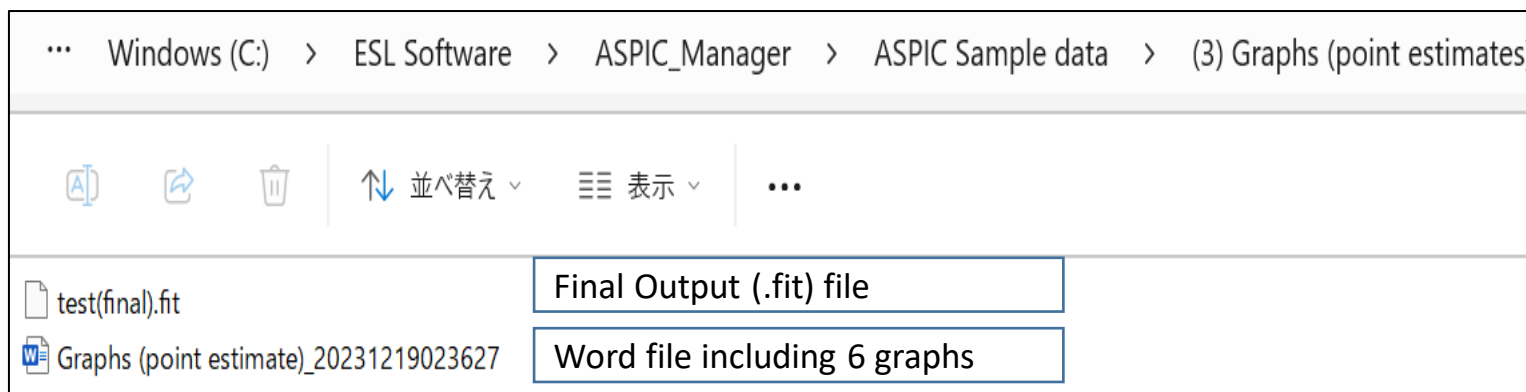
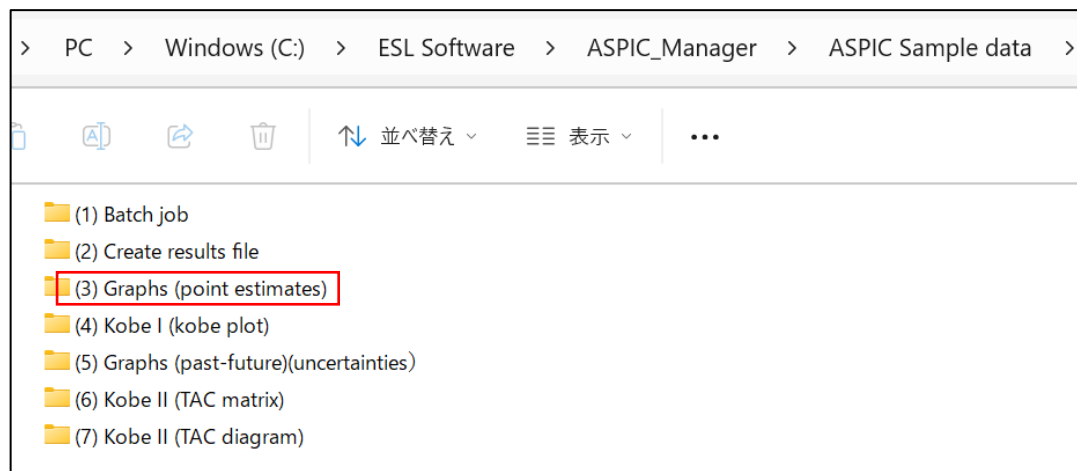
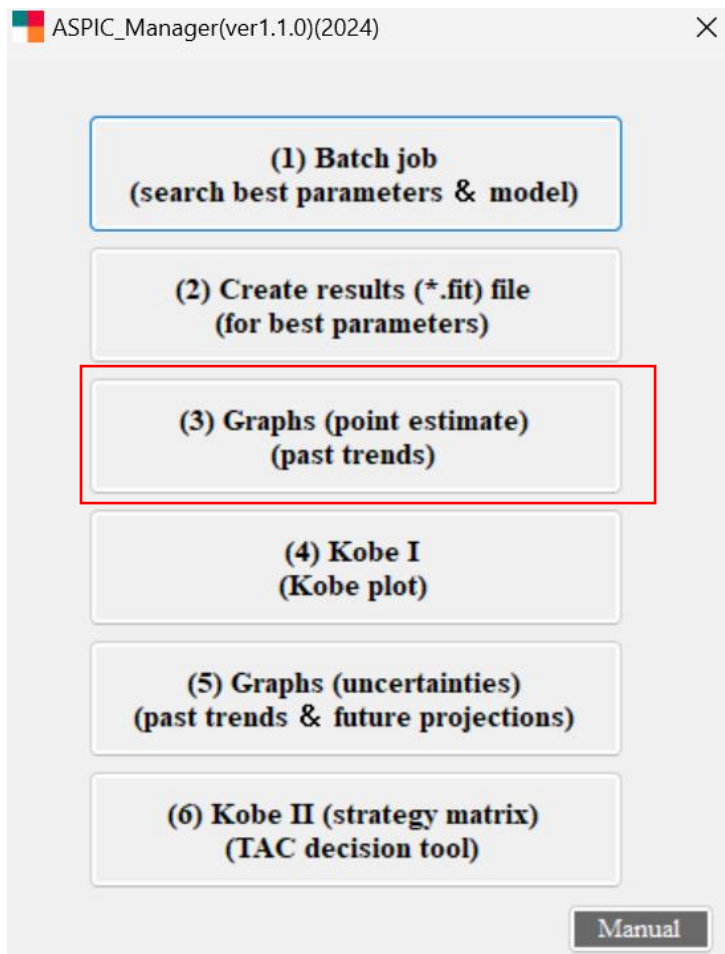
Change the step from 4 to 2 for 5 graphs at once.



# 4. Running software

## 4.3 Graphs (Past trends for point estimates) (6 graphs)

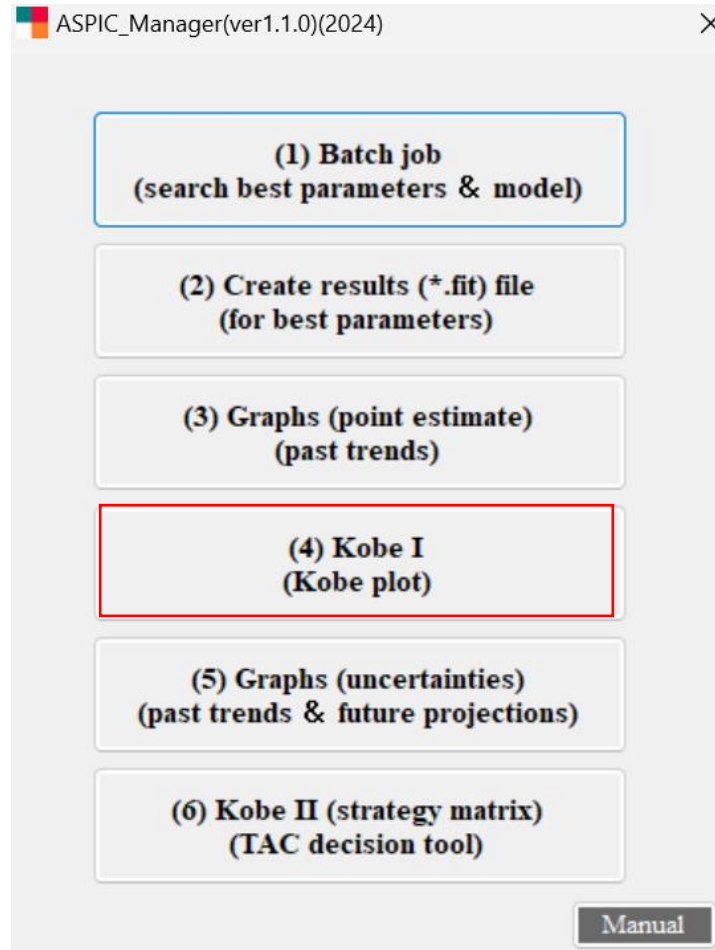
ASPIC Sample data List of INPUT & OUTPUT files for menu (3) Graphs (point estimate)





## 4. Running software: 4.4 Kobe I (Kobe plot)

Produce Kobe plot with uncertainties (confidence surface)



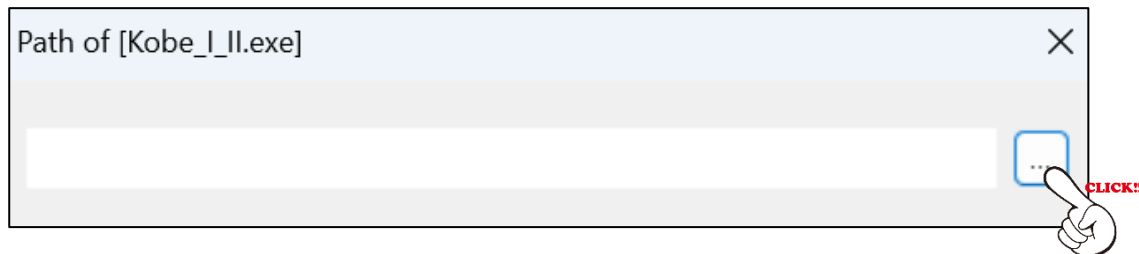
## 4. Running software: 4.4 Kobe I (Kobe plot) Locate Kobe\_I\_II.exe file

**IMPORTANT** → *This will be done only when users use this menu at the first time*

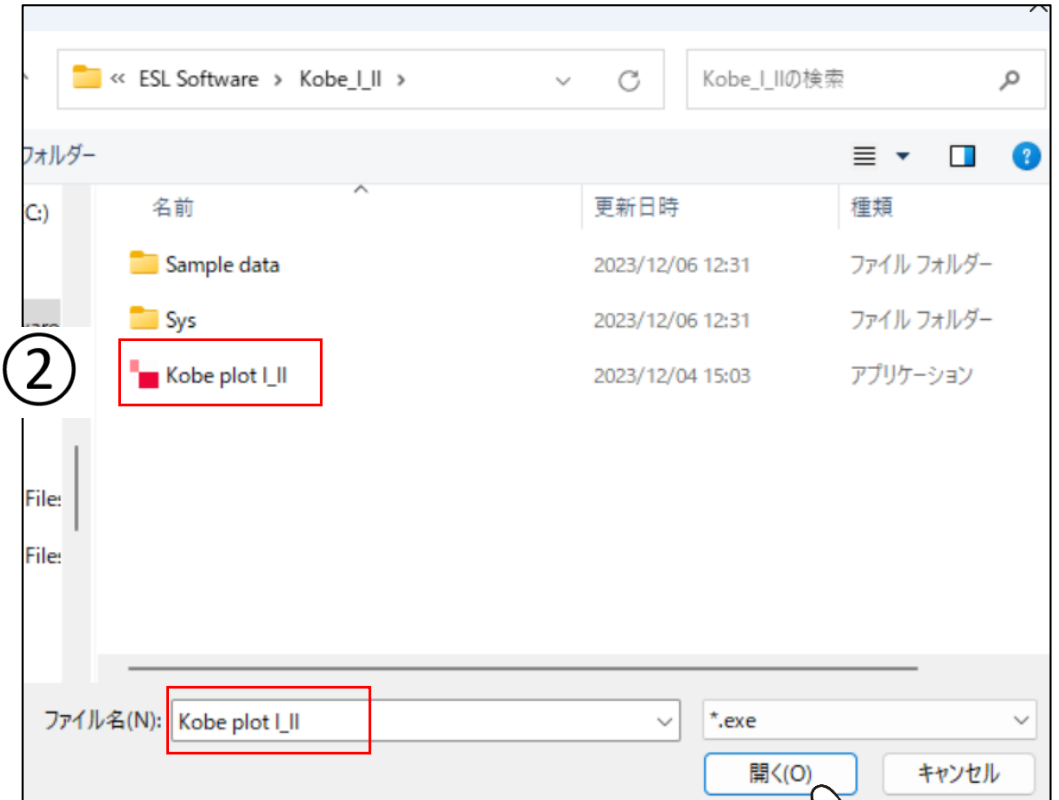
After clicking the menu,

- ① Users will see the 1<sup>st</sup> window requesting to locate Path of [Kobe\_I\_II.exe] then Click.
- ② Identify the file
- ③ Confirm window will appear. & close window

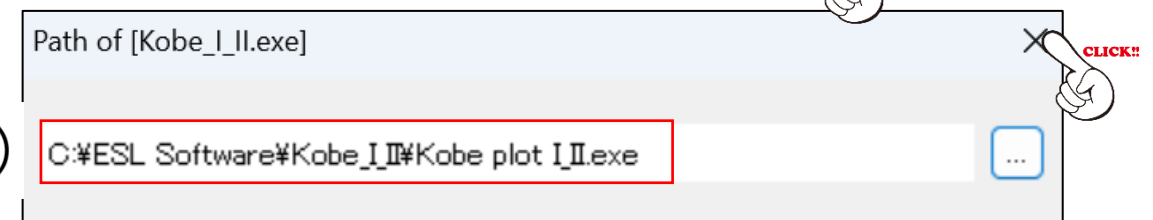
①



②



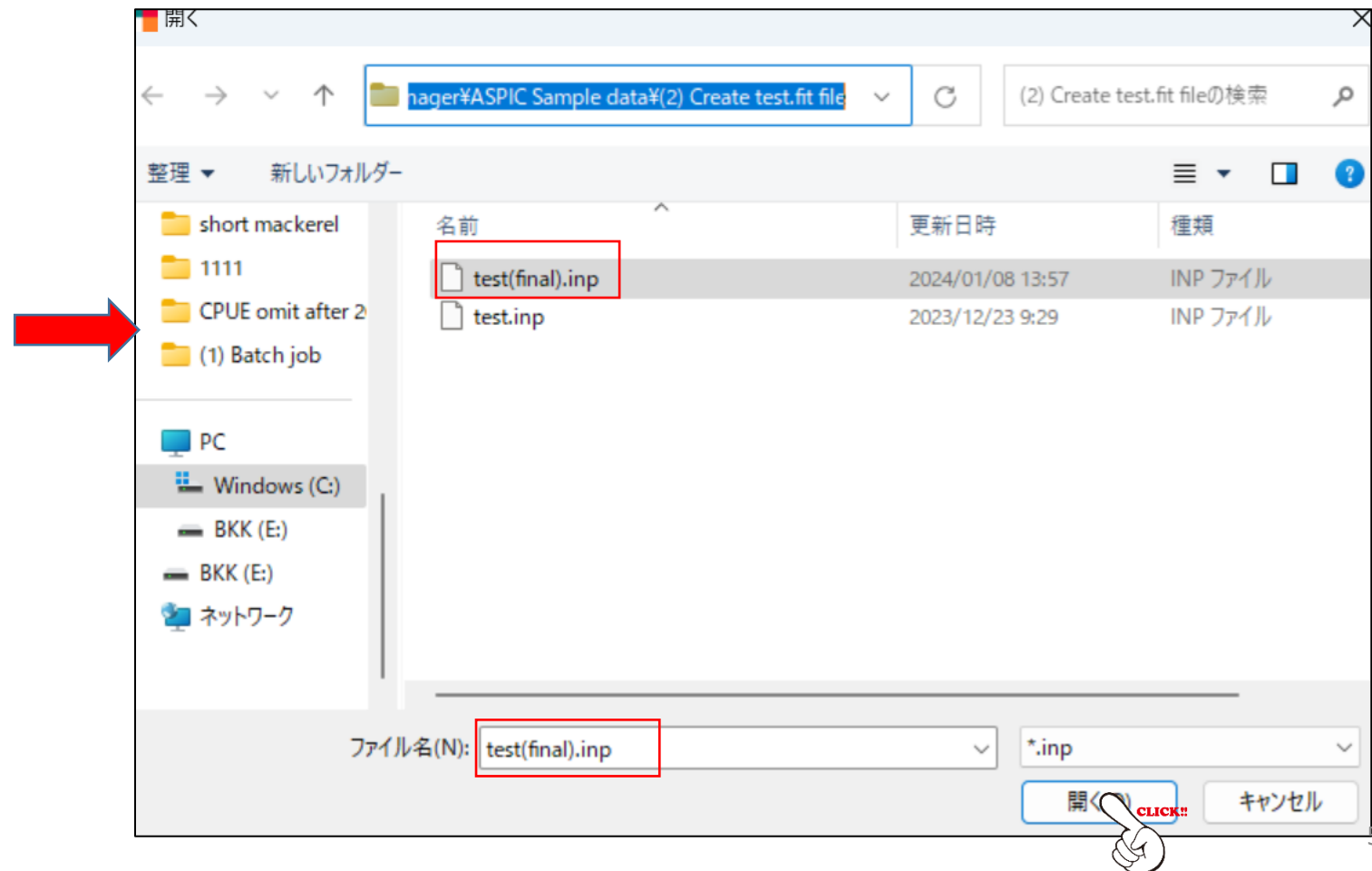
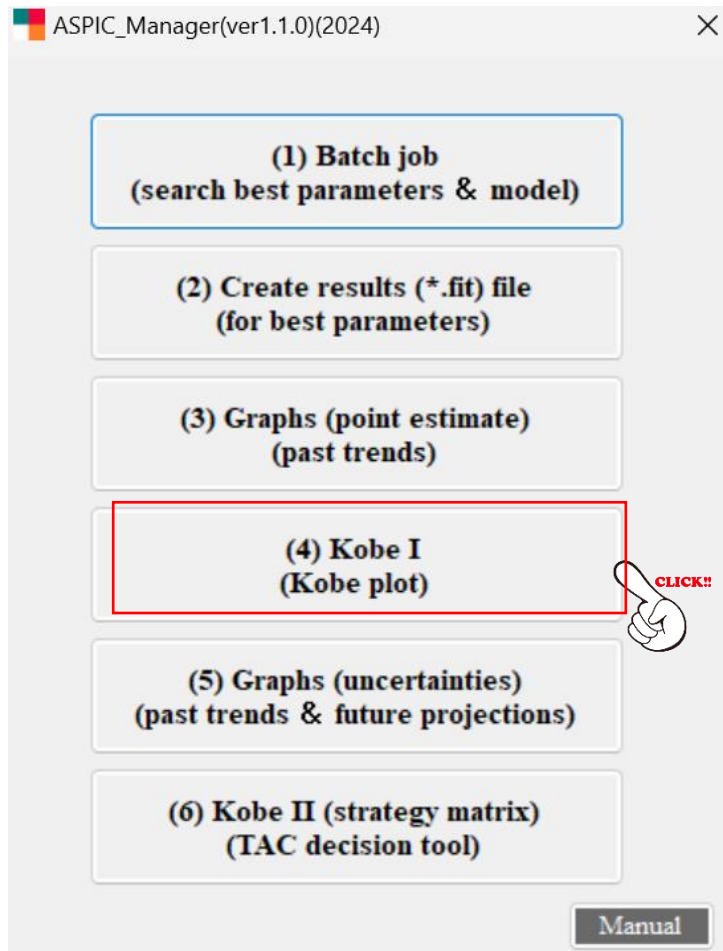
③



## 4. Running software: 4.4 Kobe I (Kobe plot)

Produce Kobe plot with uncertainties (confidence surface) using \*(final).inp

Import the test(final).inp file (example) to conduct bootstrap (1,000 times) to estimate uncertainties in the final stock assessment year (take some time). Bootstrap is one of methods to estimate uncertainties by re-sampling the data used.



## 4. Running software: 4.4 Kobe I (Kobe plot)

If users see the following Note,  
please change K values to make Kobe plot.

Note: K for initial value is too high or too low. Expand Min K and/or Max K values in the batch job window and try again.

## 4. Running software

### 4.4 Kobe I (Kobe plot)

Snapshot  
during processing  
the bootstrap  
by the DOS prompt

For this example,  
it will take 15-30 minutes  
(some case 2-5 hours)  
depending on data set &  
PC performance.

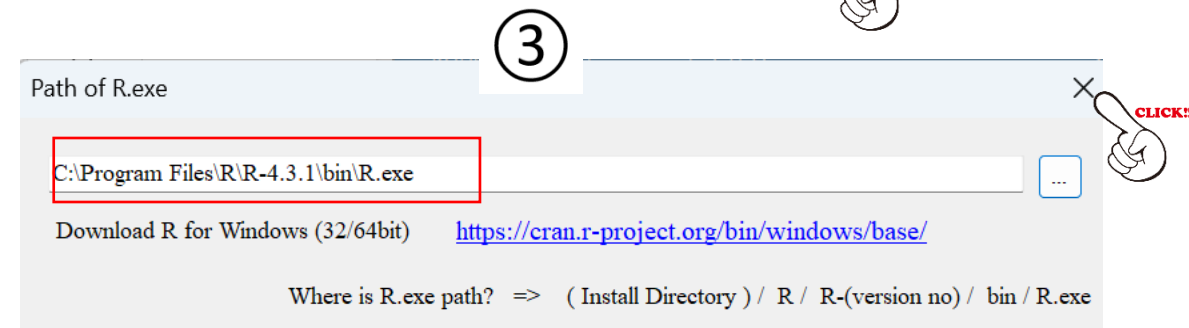
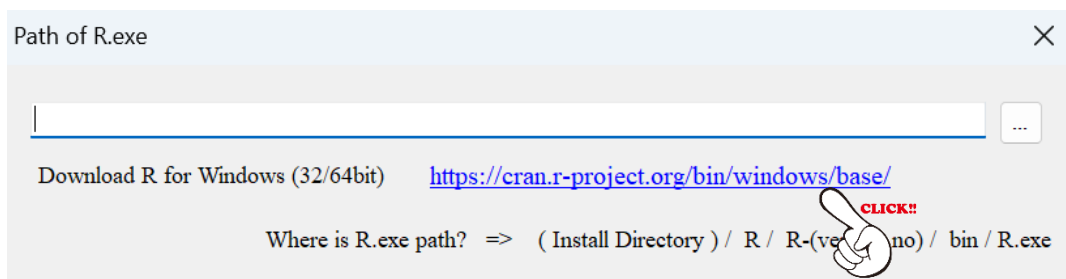
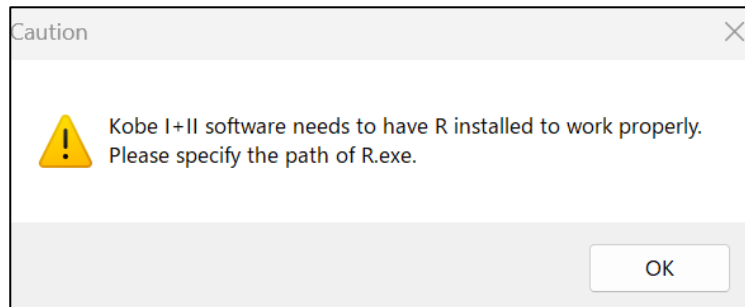
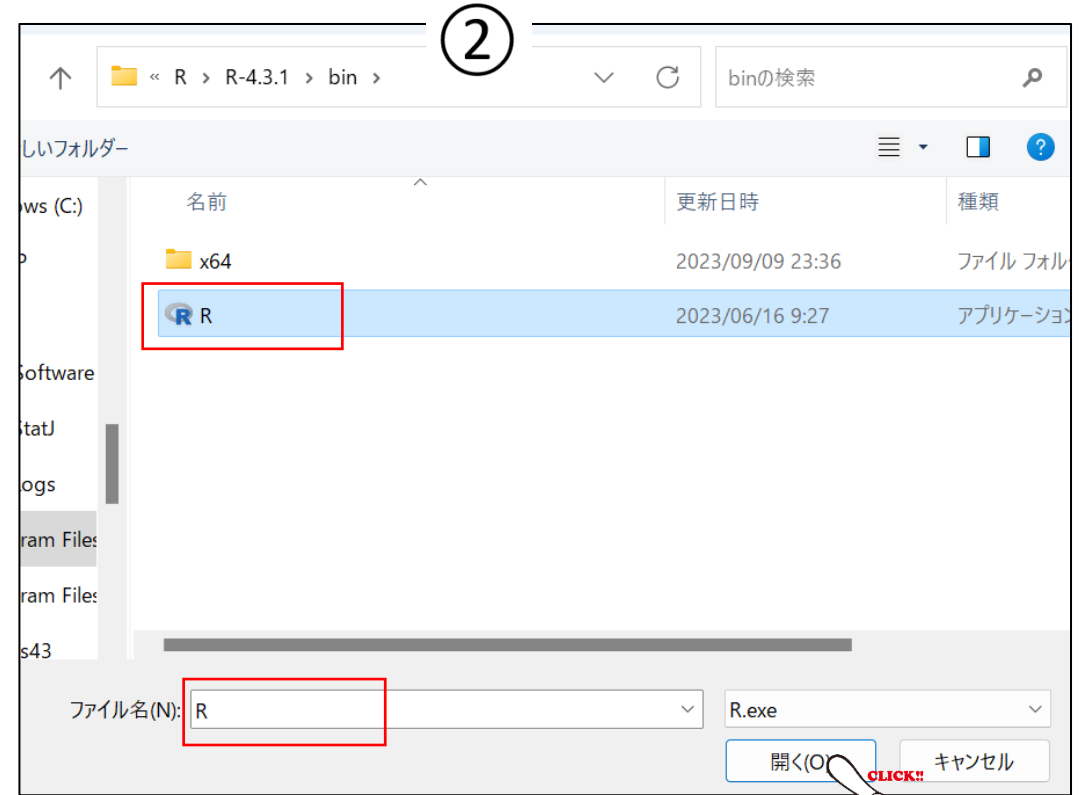
```
C:\ESL Software\ASPIC_Manual >
Tr: 425 Cn: 6 B1/K: 1.000 K:1.404E+05 MSY:7.920E+03 SSE:3.15192736E-01
Tr: 426 Cn: 6 B1/K: 1.000 K:8.835E+04 MSY:9.929E+03 SSE:1.27911475E+00
NOTE: K estimate too small. Pending trial will be replaced.
Tr: 427 Cn: 6 B1/K: 1.000 K:6.942E+04 MSY:1.383E+04 SSE:8.32698968E-01
NOTE: K estimate too small. Pending trial will be replaced.
Tr: 428 Cn: 6 B1/K: 1.000 K:5.929E+04 MSY:1.310E+04 SSE:4.09525229E-01
Tr: 429 Cn: 6 B1/K: 1.000 K:4.199E+04 MSY:1.295E+04 SSE:6.99638790E-01
NOTE: K estimate too small. Pending trial will be replaced.
Tr: 430 Cn: 6 B1/K: 1.000 K:7.274E+04 MSY:9.228E+03 SSE:8.98062412E-01
NOTE: K estimate too small. Pending trial will be replaced.
Tr: 431 Cn: 6 B1/K: 1.000 K:4.660E+04 MSY:1.247E+04 SSE:9.72638974E-01
NOTE: MSY estimate too large. Pending trial will be replaced.
Tr: 432 Cn: 6 B1/K: 1.000 K:8.370E+04 MSY:1.139E+04 SSE:6.20688221E-01
Tr: 433 Cn: 6 B1/K: 1.000 K:7.328E+04 MSY:1.128E+04 SSE:6.11899171E-01
Tr: 434 Cn: 6 B1/K: 1.000 K:4.544E+04 MSY:1.081E+04 SSE:5.03696928E-01
Tr: 435 Cn: 6 B1/K: 1.000 K:1.333E+05 MSY:1.127E+04 SSE:3.59222518E-01
Tr: 436 Cn: 6 B1/K: 1.000 K:6.200E+04 MSY:1.263E+04 SSE:6.96547959E-01
NOTE: K estimate too large. Pending trial will be replaced.
Tr: 437 Cn: 6 B1/K: 1.000 K:5.776E+04 MSY:1.111E+04 SSE:5.32745343E-01
NOTE: K estimate too large. Pending trial will be replaced.
Tr: 438 Cn: 6 B1/K: 1.000 K:6.691E+04 MSY:1.151E+04 SSE:4.16226400E-01
Tr: 439 Cn: 6 B1/K: 1.000 K:8.052E+04 MSY:1.016E+04 SSE:6.06107959E-01
NOTE: MSY estimate too large. Pending trial will be replaced.
NOTE: K estimate too small. Pending trial will be replaced.
NOTE: K estimate too small. Pending trial will be replaced.
Tr: 440 Cn: 6 B1/K: 1.000 K:9.742E+04 MSY:1.056E+04 SSE:5.50004978E-01
Tr: 441 Cn: 6 B1/K: 1.000 K:1.523E+05 MSY:1.355E+04 SSE:4.26343001E-01
NOTE: MSY estimate too large. Pending trial will be replaced.
NOTE: K estimate too small. Pending trial will be replaced.
Tr: 442 Cn: 6 B1/K: 1.000 K:6.087E+04 MSY:1.199E+04 SSE:7.93617604E-01
```

## 4. Running software: 4.4 Kobe I (Kobe plot) Locate R path

**IMPORTANT** → This will be done only when users use this menu at the first time

After the bootstrap is completed,

- ① users will see 2 windows requesting to locate the R path.
- ② Identify and import the R.exe file
- ③ Confirm window will appear. & close window



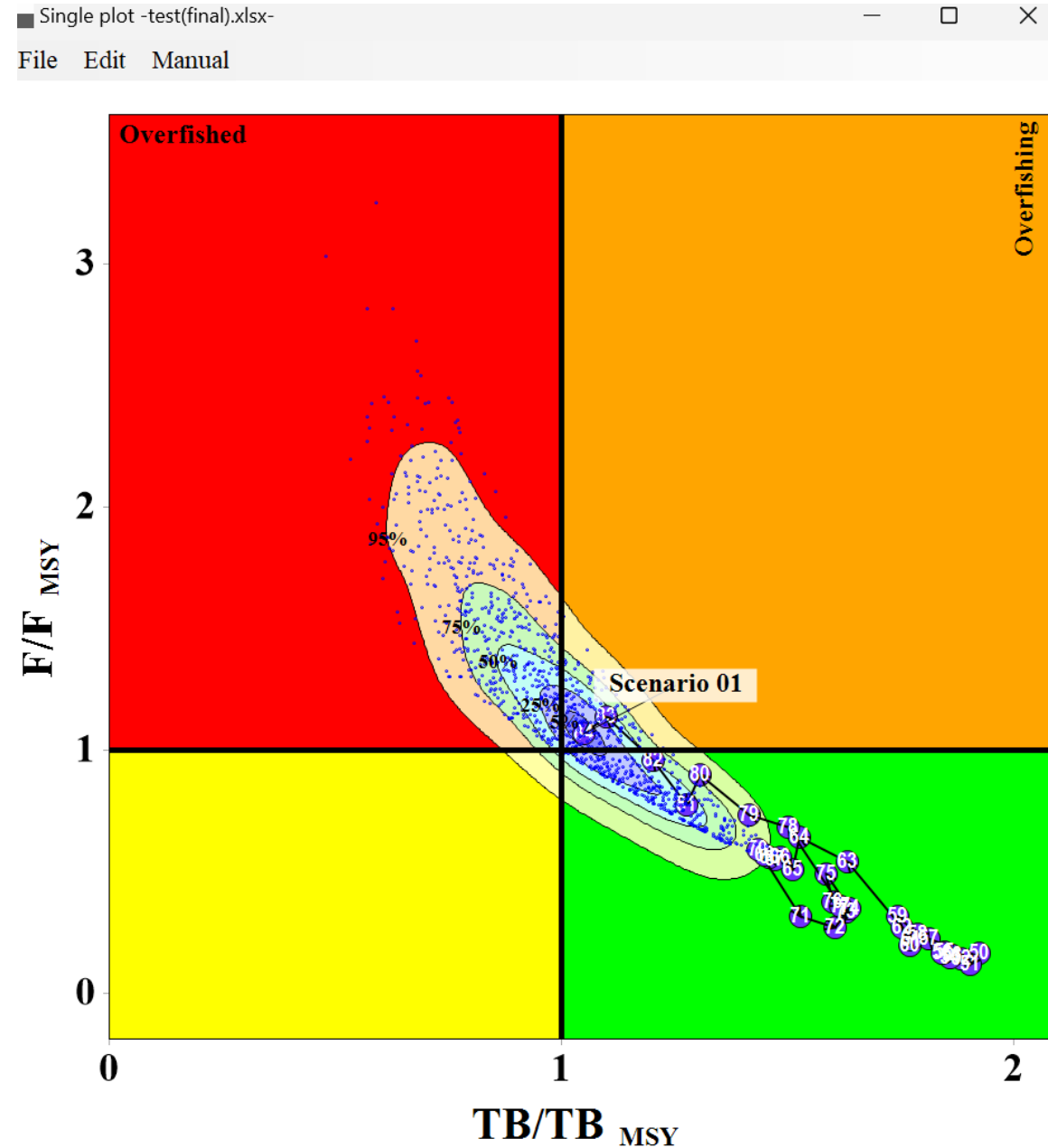
# 4. Running software

## 4.4 Kobe I (Kobe plot)

After the bootstrap is completed, the default Kobe plot appears.

Users can edit using 2 graph setting functions to make the final plot (see next 2 slides).

*For details on graph setting functions, refer to the Kobe I+II manual.*



## 4. Running software: 4.4 Kobe I (Kobe plot)

2 graph setting functions (for details, refer to Kobe I+II manual)

Graph Settings

Points and lines Trajectory, confidence surface and phase

Select Years to Display

1st Year: 1950 35 Years

<input checked="" type="checkbox"/> 1950	<input checked="" type="checkbox"/> 1954	<input checked="" type="checkbox"/> 1958	<input checked="" type="checkbox"/> 1962	<input checked="" type="checkbox"/> 1966
<input checked="" type="checkbox"/> 1951	<input checked="" type="checkbox"/> 1955	<input checked="" type="checkbox"/> 1959	<input checked="" type="checkbox"/> 1963	<input checked="" type="checkbox"/> 1967
<input checked="" type="checkbox"/> 1952	<input checked="" type="checkbox"/> 1956	<input checked="" type="checkbox"/> 1960	<input checked="" type="checkbox"/> 1964	<input checked="" type="checkbox"/> 1968
<input checked="" type="checkbox"/> 1953	<input checked="" type="checkbox"/> 1957	<input checked="" type="checkbox"/> 1961	<input checked="" type="checkbox"/> 1965	<input checked="" type="checkbox"/> 1969

All Years

Axis

	Title	Min.	Max.	Increment
X:	TB/TBmsy	0	3	1
Y:	F/Fmsy	0	2	1

Font Size: 20 **B** [Color]

Reset

Change titles of XY axis to other names

X:   Y:

Mark

Mark Size: 10 Mark Color: [Color]

Font Size: 10 **B** [Color]

Title

Kobe plot (test)

Font Size: 18 **B** [Color]

Limit Reference Point

Limit Reference Legend

X(%): 0.6  X: TB(limit) = 0.6 x TBmsy

Y(%): 1.3  Y: F(limit) = 1.3 x Fmsy

Color: [Color] Width: 1 Style: Solid

Font Size: 10 **B** [Color]

Target Reference Point

Limit Reference Legend

X(%): 1.0  X: TB(target) = 1.0 x TBmsy

Y(%): 1.0  Y: F(target) = 1.0 x Fmsy

Color: [Color] Width: 1 Style: Solid

Font Size: 10 **B** [Color]

OK Cancel

Graph Settings

Points and lines Trajectory, confidence surface and phase

Trajectory Line

Color: [Color] Width: 2 Style: Arrow

Show Plot Points [Color] Style: Circle

Stock status points: front

Show Confidence Surface

Show Contour Labels

<input checked="" type="checkbox"/> 5%	[Color]	<input checked="" type="checkbox"/> 75%	[Color]
<input checked="" type="checkbox"/> 25%	[Color]	<input checked="" type="checkbox"/> 95%	[Color]
<input checked="" type="checkbox"/> 50%	[Color]		

Font Size: 9 **B** [Color]

Phase color: [Color] [Color] [Color] [Color]

Line width of XY axis

Color: [Color] Width: 5 Style: Solid

Phase name Label

<input checked="" type="checkbox"/> Overfished	Horizontal
<input checked="" type="checkbox"/> Overfishing	Vertical
<input type="checkbox"/> Recovering	Horizontal
<input type="checkbox"/> Safe zone	Horizontal

Font Size: 12 **B** [Color]

Show PieChart(% Composition of 4 phases)

Font Size: 10 **B** [Color]

Align confidence surface

X: 0.08 Y: -0.08

Default font name: Times New Roman [Apply for all]

Subscript MSY position alignment

Axis Label:	X: 0	Y: 0
LRP Name:	X: 0	Y: 0
TRP Name:	X: 0	Y: 0

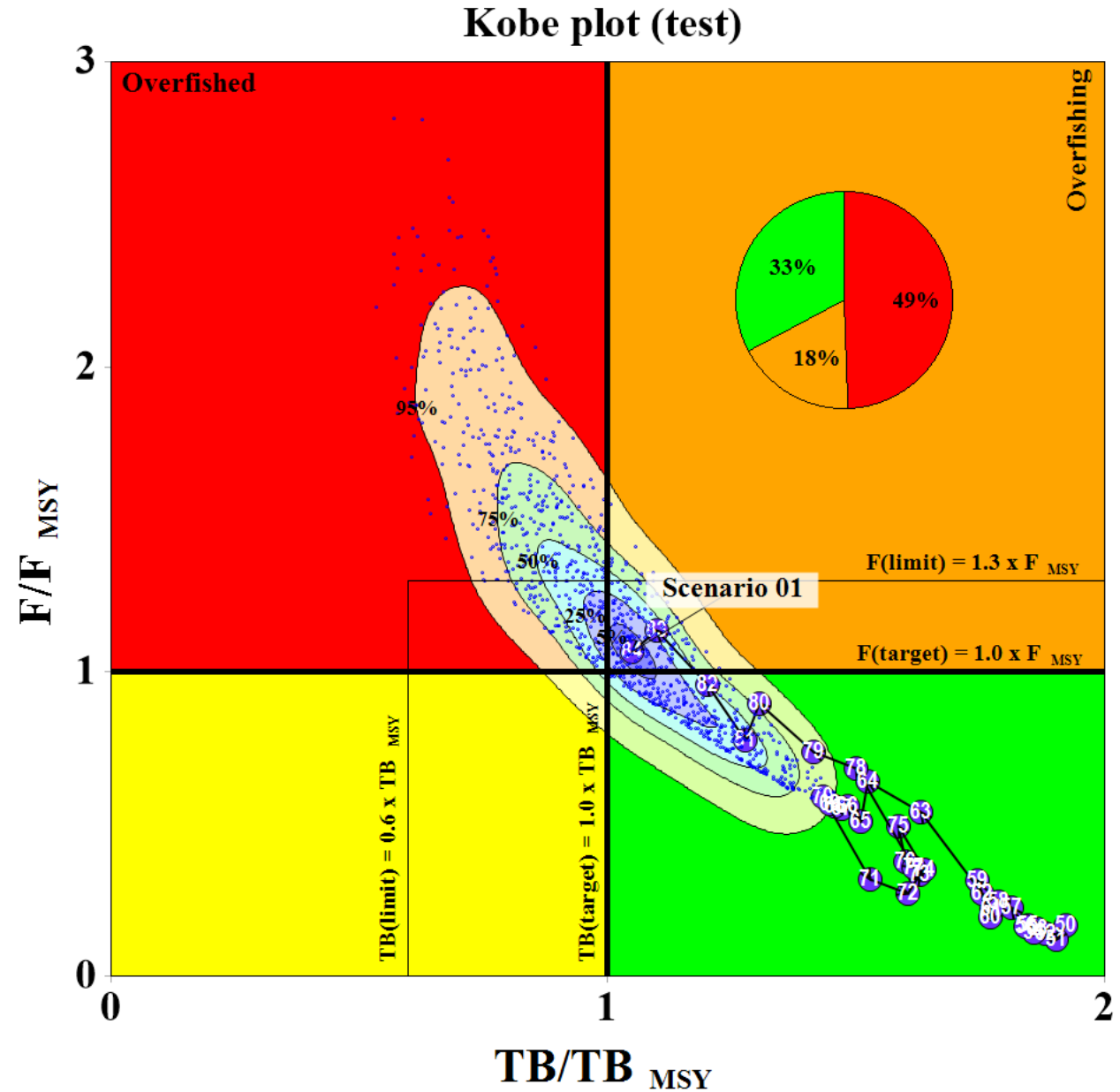
OK Cancel



4. Running software  
4.4 Kobe I (Kobe plot)

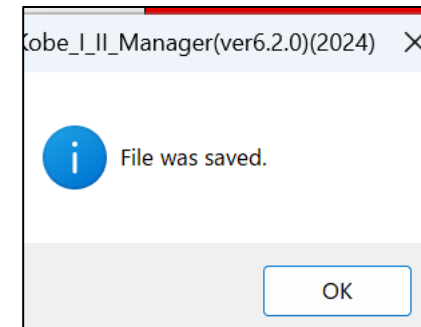
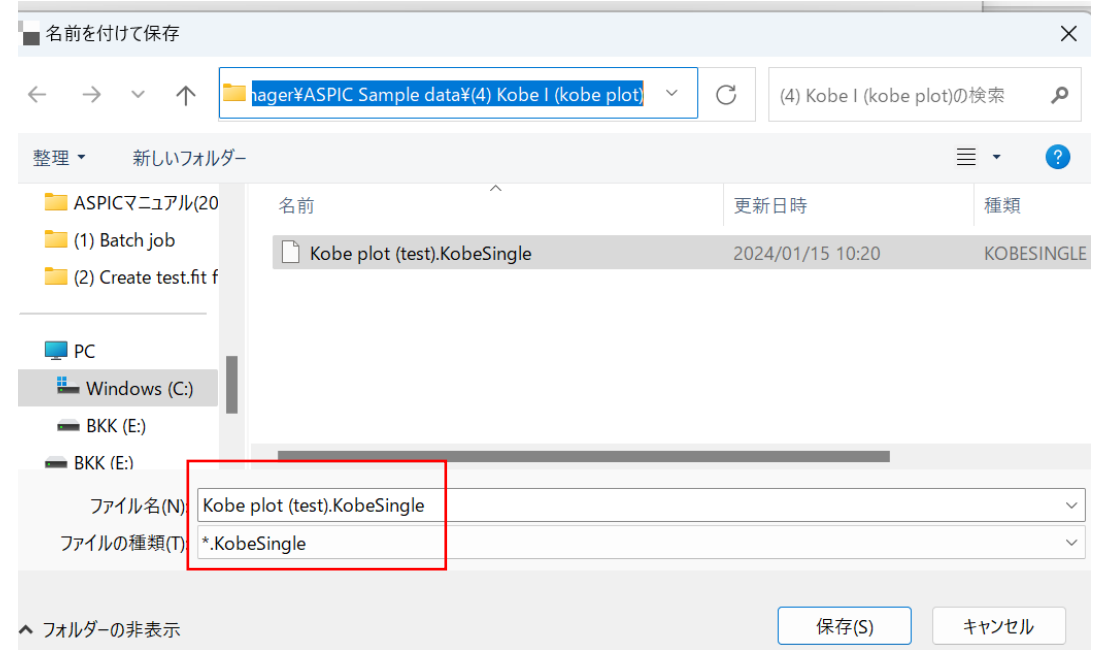
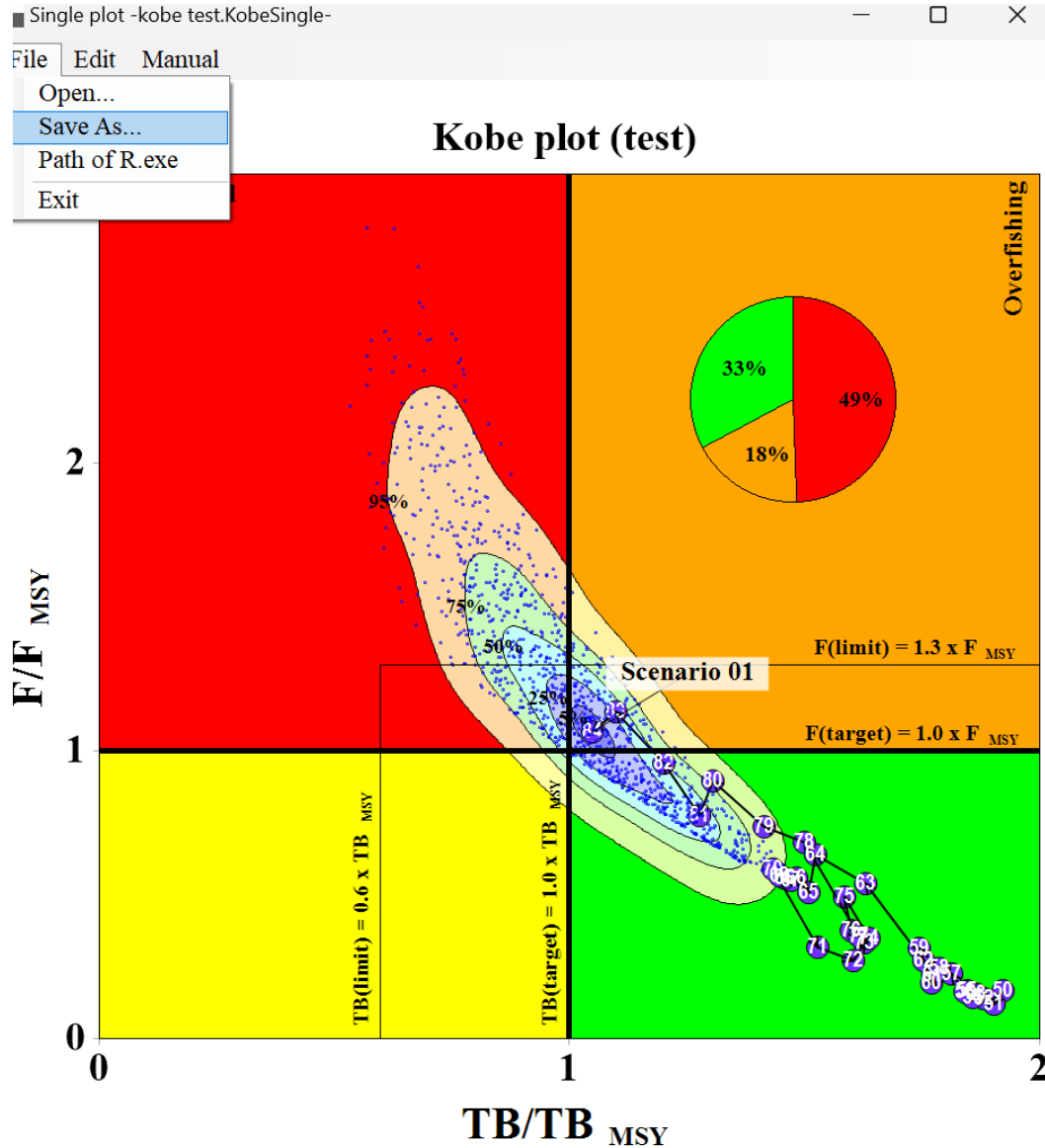
Final Kobe plot  
(edited)

How to save ?  
See next 2 slides



## 4. Running software: 4.4 Kobe I (Kobe plot)

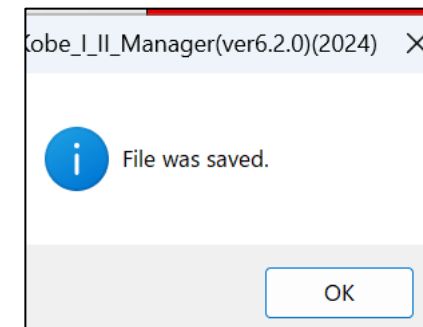
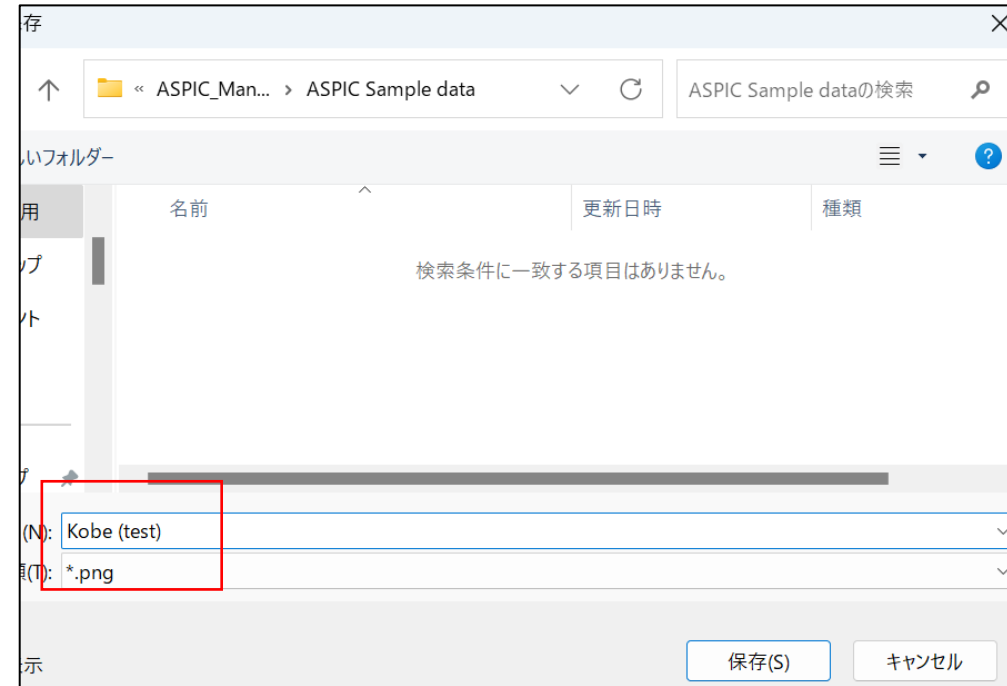
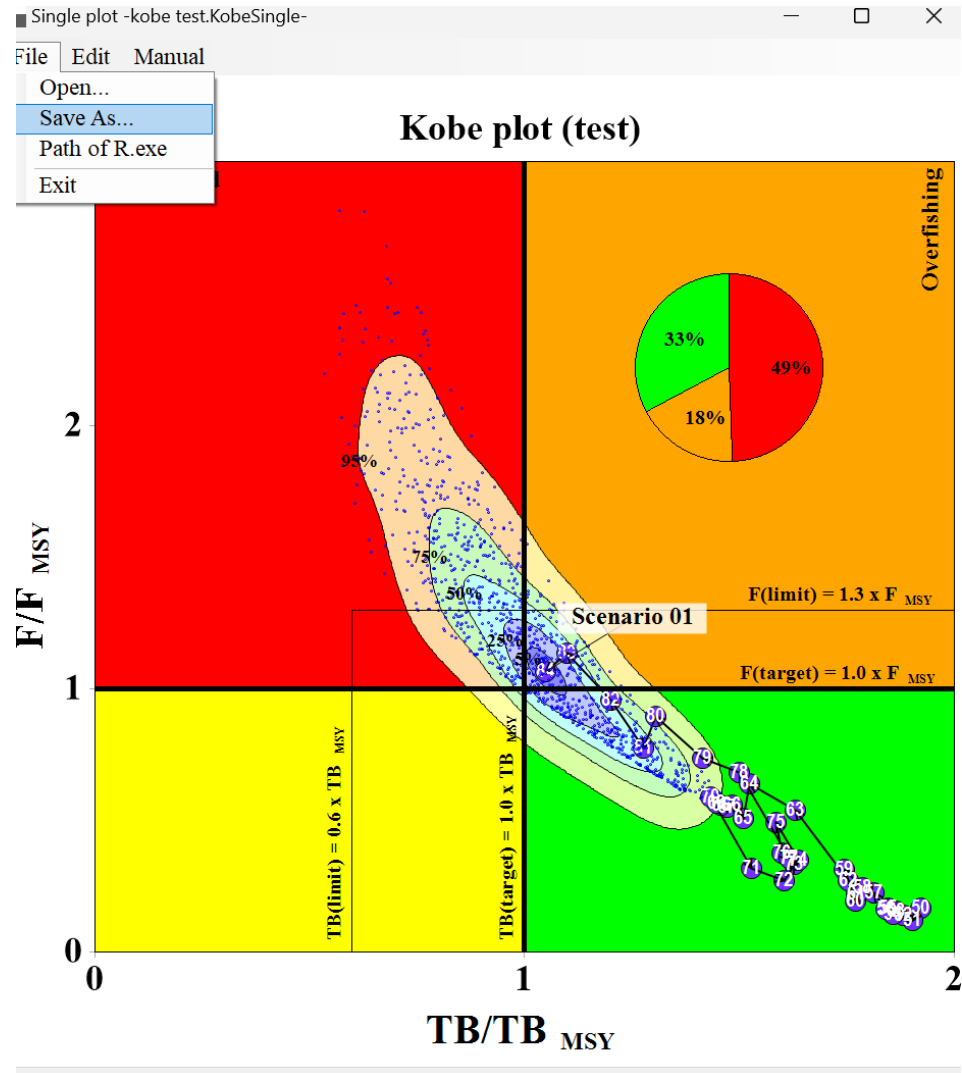
### ① Save to reproduce the last plot



## 4. Running software: 4.4 Kobe I (Kobe plot)

② Save the image for your report

→ 3 types(bmp, png or emf) → \*.png is recommended.

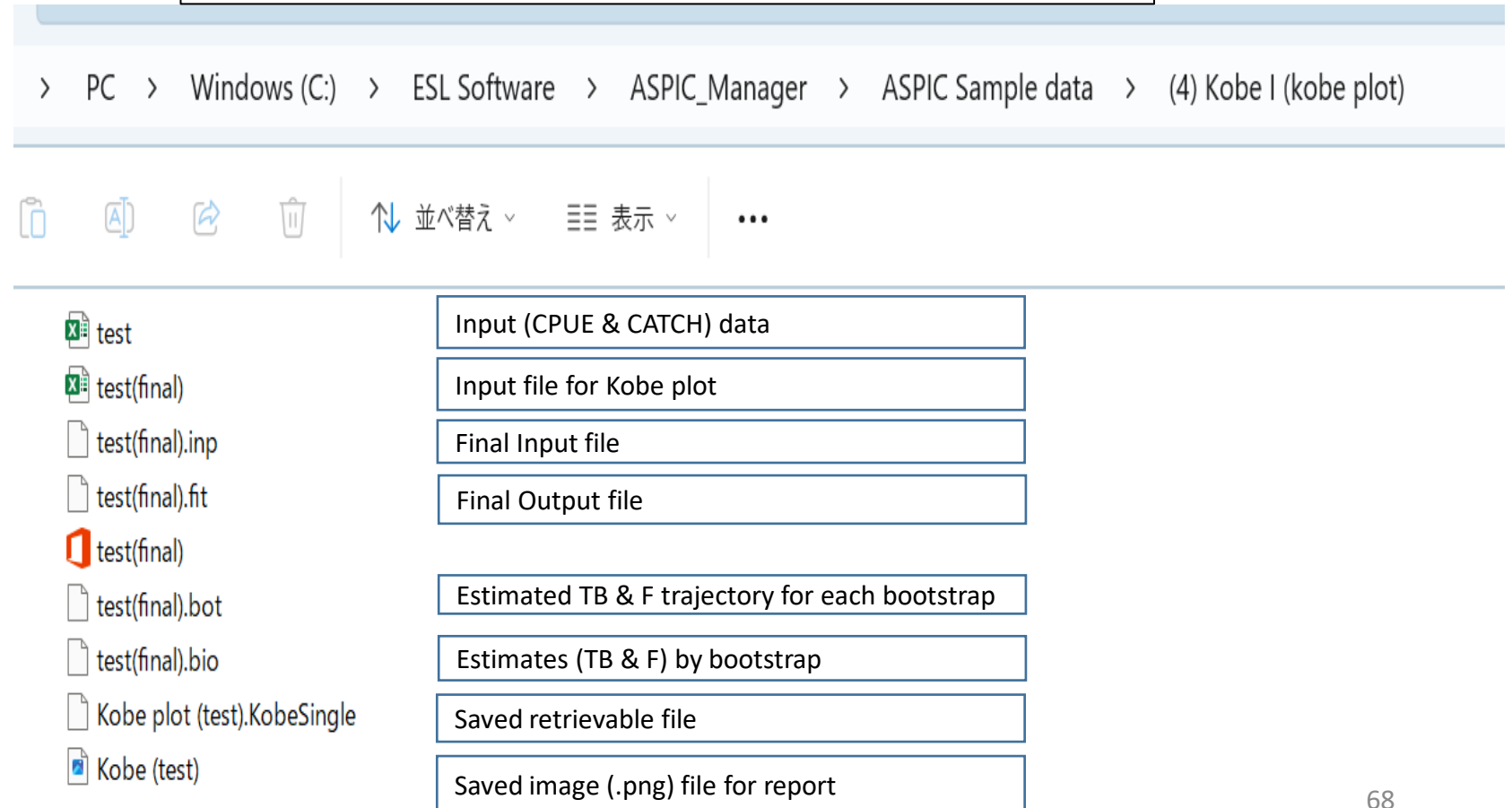
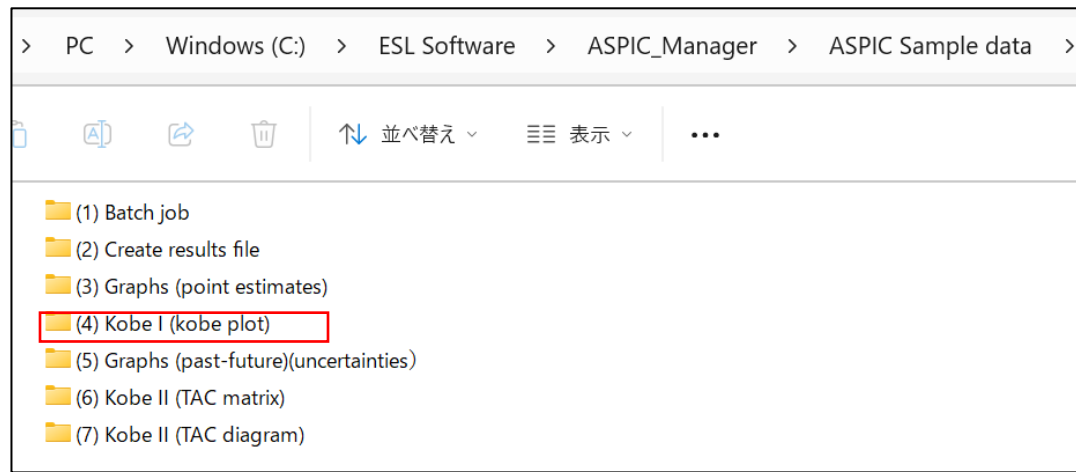
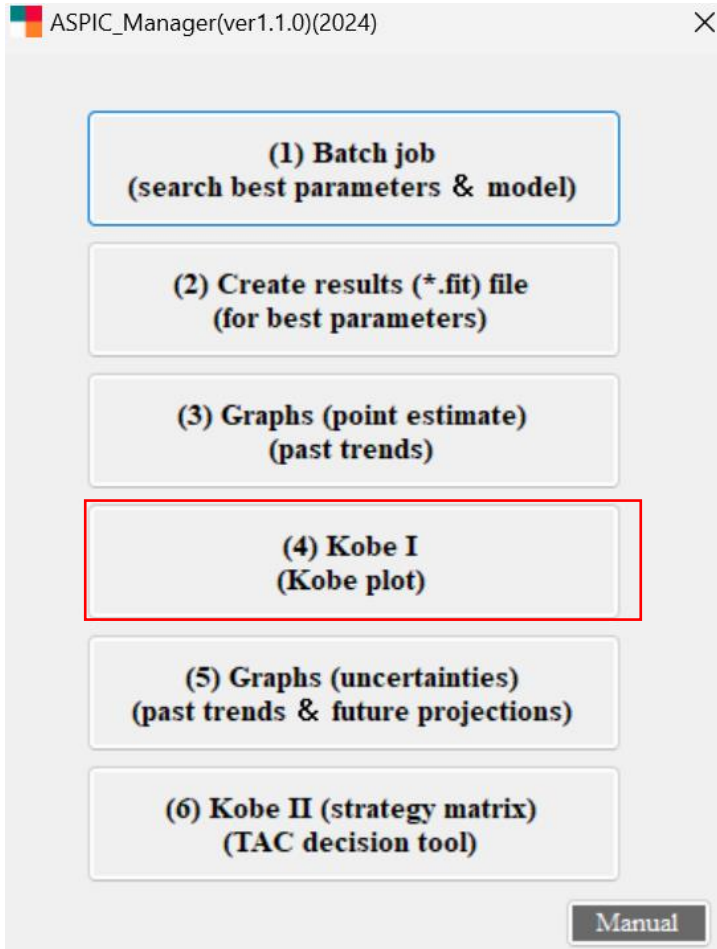


## 4. Running software: 4.4 Kobe I (Kobe plot)

ASPIC Sample data

List of INPUT & OUTPUT files for menu (4)

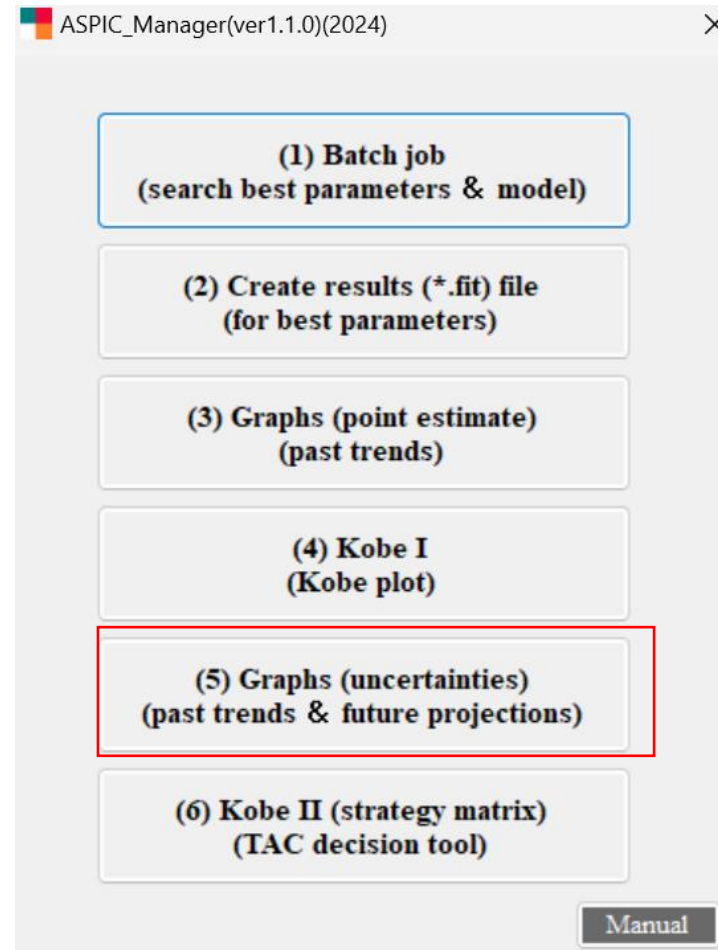
Kobe I (Kobe plot)



## 4. Running software

### 4.5 Graphs (Past trends & future projections with uncertainties)

Trends of 6 key parameters with uncertainties estimated by bootstrap

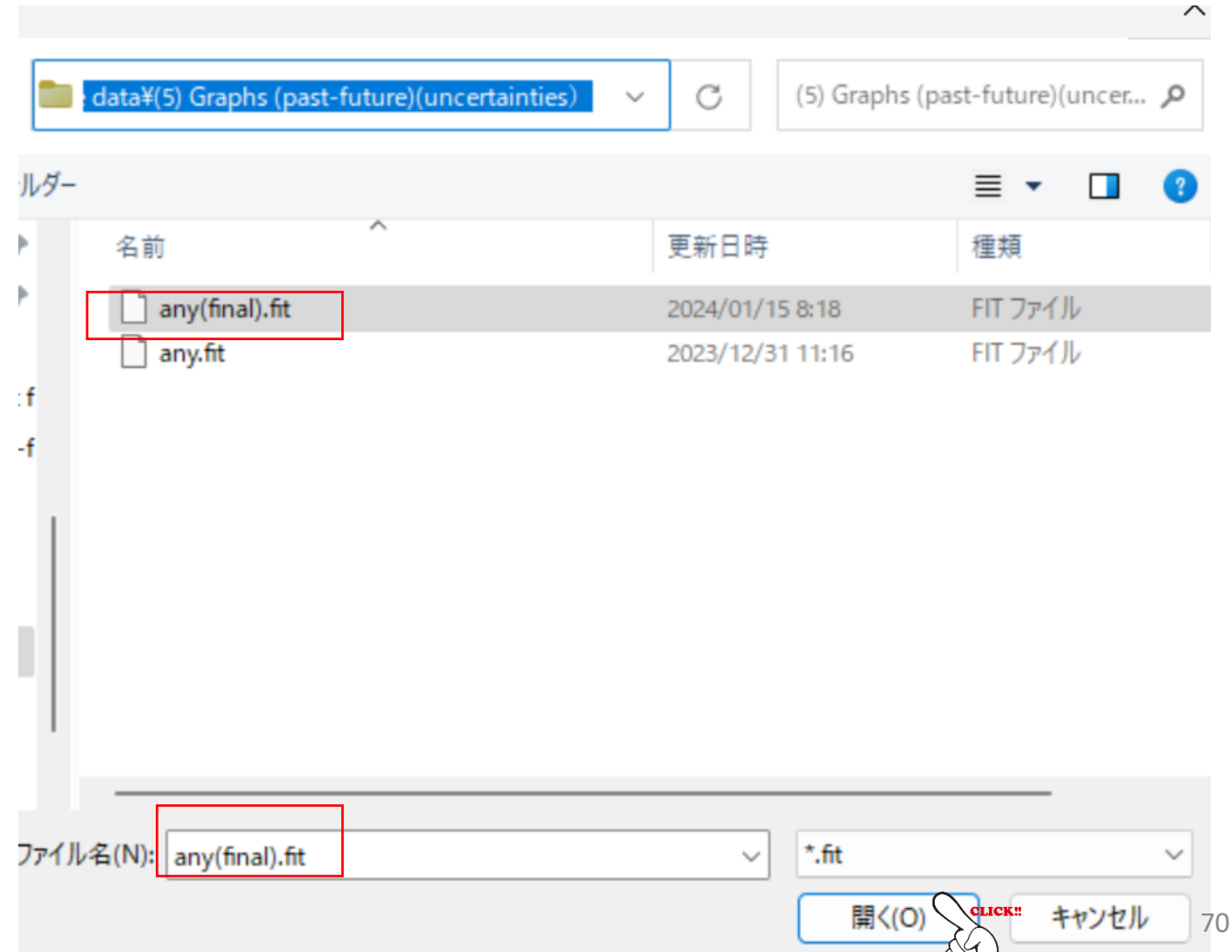
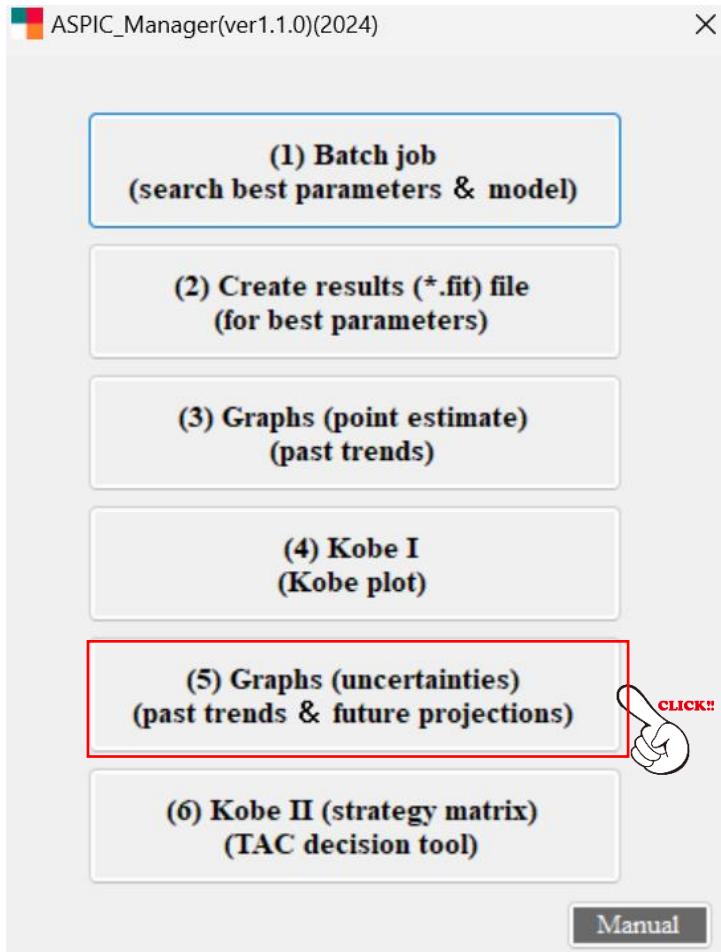


## 4. Running software

### 4.5 Graphs (Past trends & future projections with uncertainties)

Trends of 6 key parameters with uncertainties estimated by bootstrap (using other sample data)


Import the \*(final).fit file  
Test(final).fit (our example)

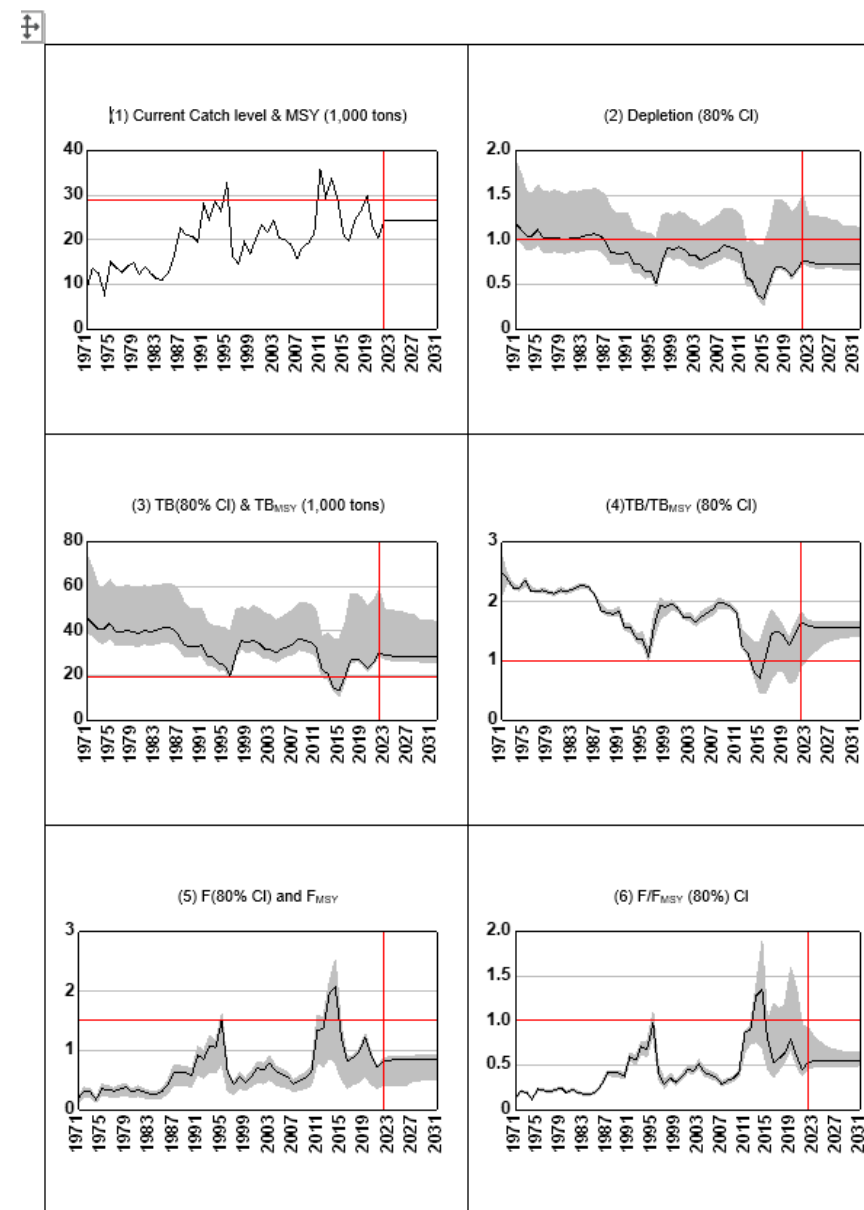
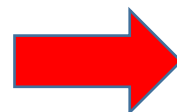
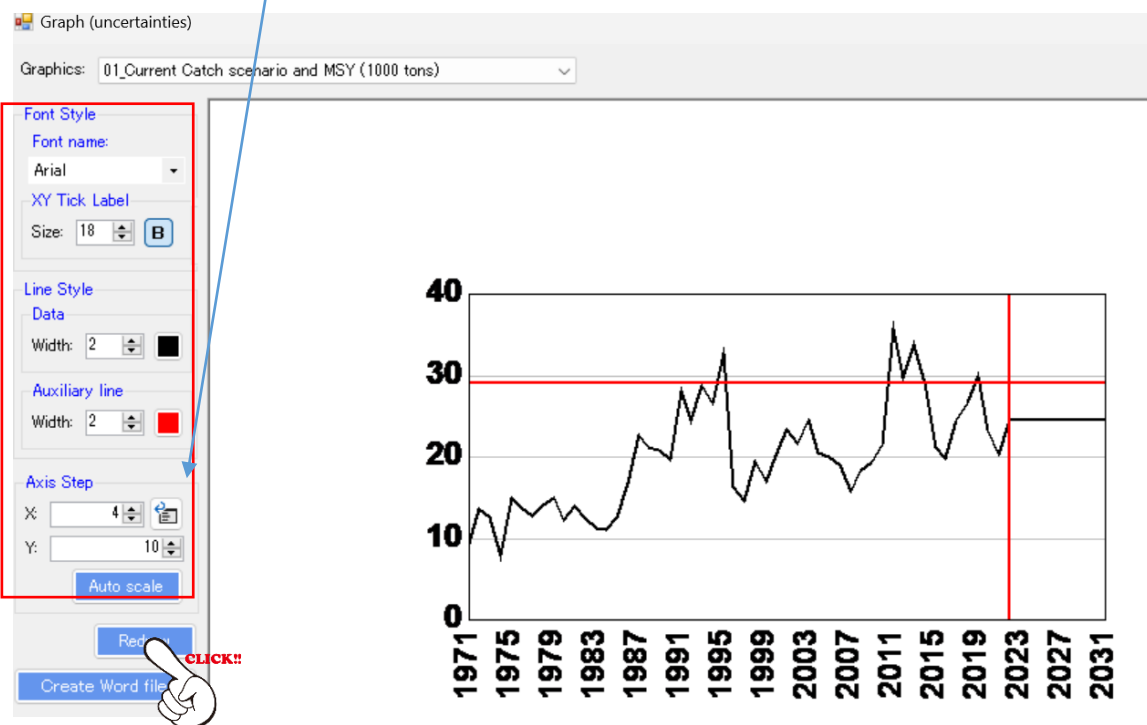


## 4. Running software

### 4.5 Graphs (Past trends & future projections with uncertainties)

After clicking “Open” (previous slide), users will see DOS process for bootstrapping for a short time. Then, the 1<sup>st</sup> graph (catch vs. MSY) appears (below). Users can edit 6 graphs using graph settings functions available on left (red box) except x-axis batch setting (for details, see slide # 51). After completing editions, click “Create word file” bottom. Then all 6 graphs will be made and saved in the word file with time stamp →

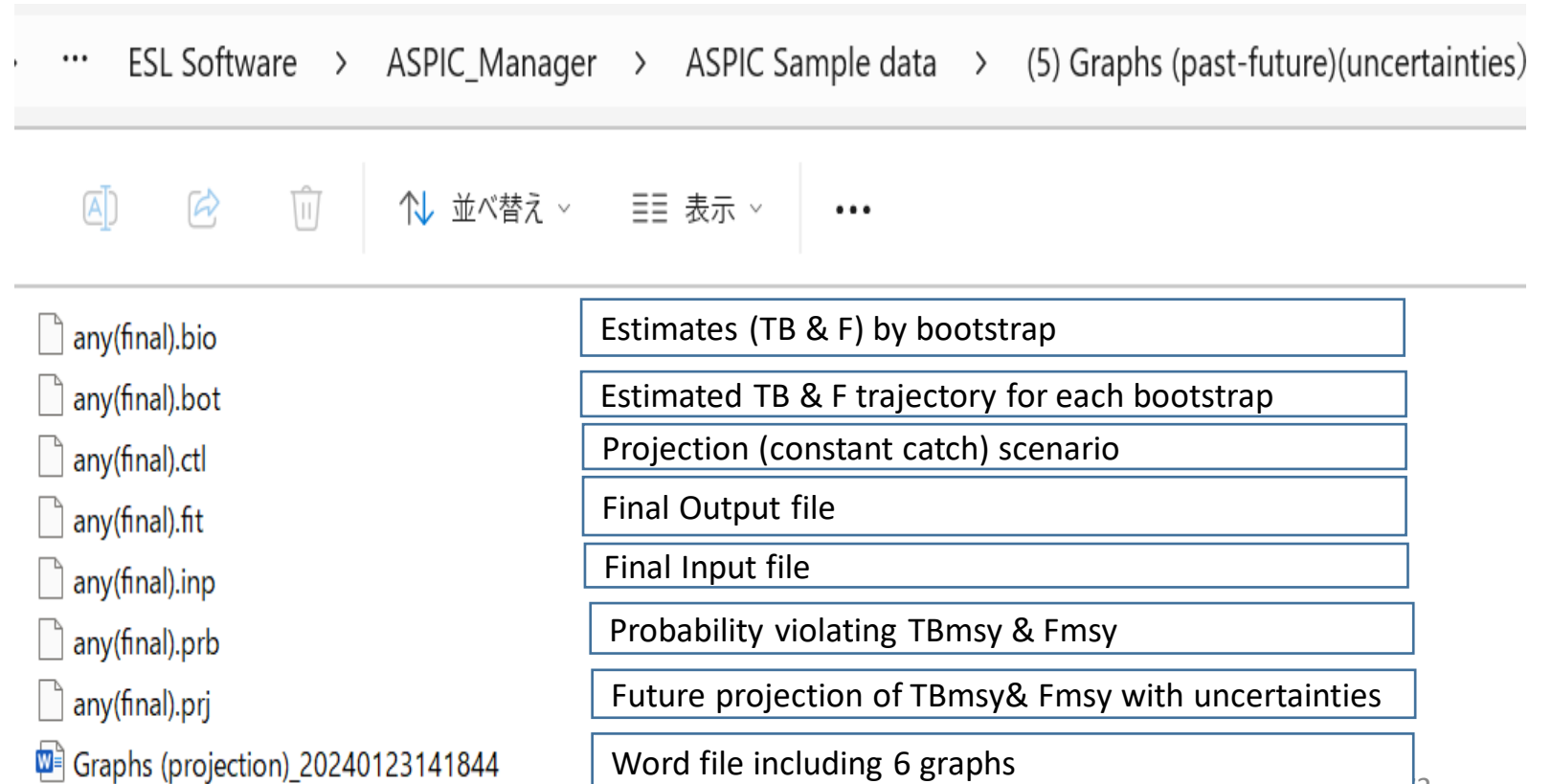
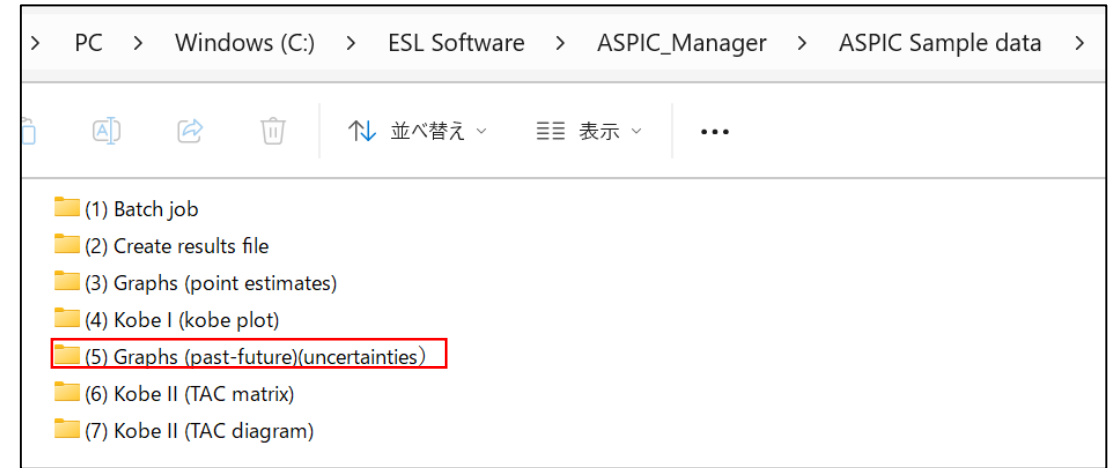
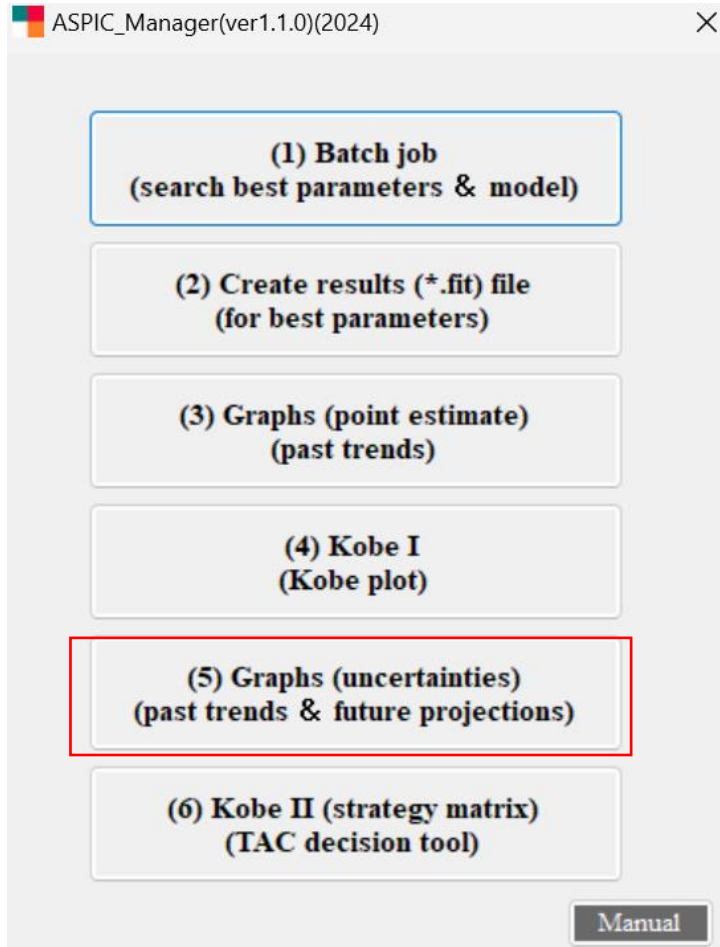
 Graphs (projection)\_20231130125624



## 4. Running software

### 4.5 Graphs (Past trends & future projections with uncertainties)

ASPIC Sample data: List of INPUT & OUTPUT files

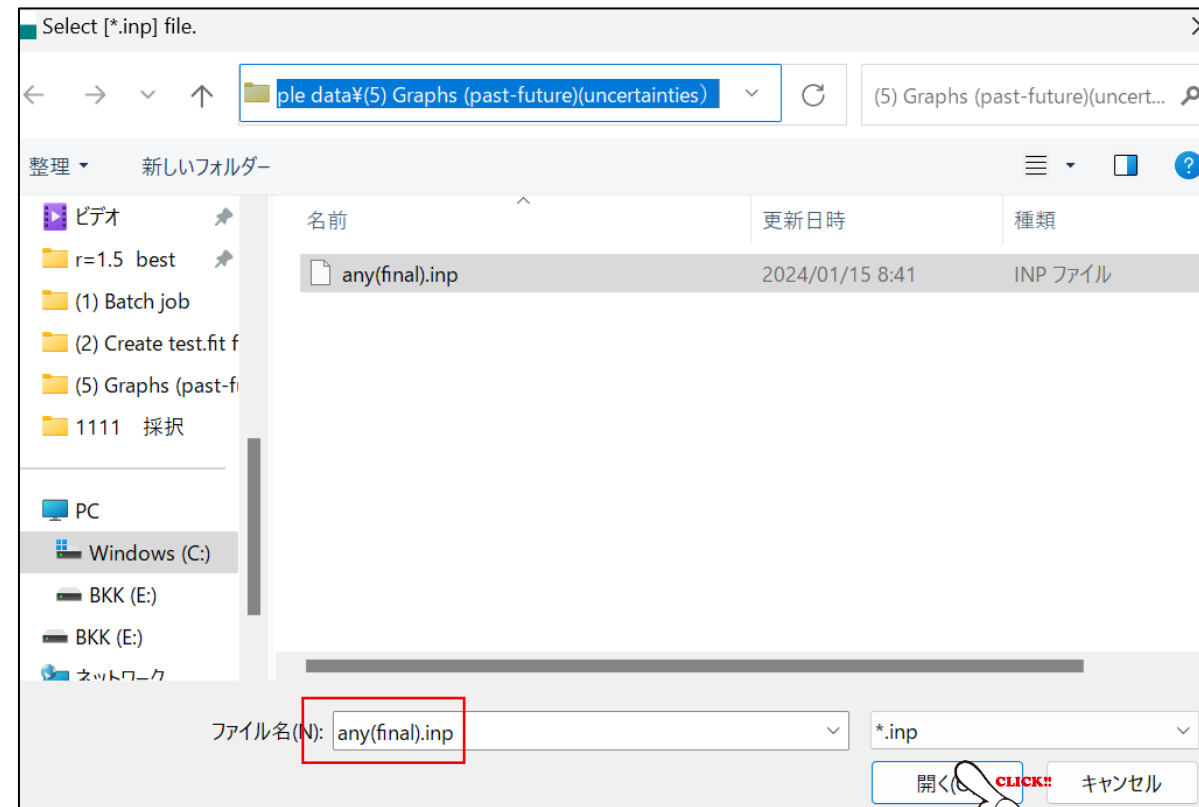
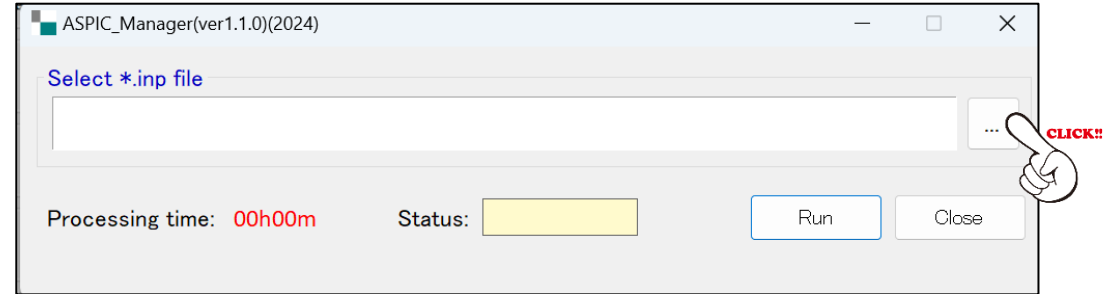
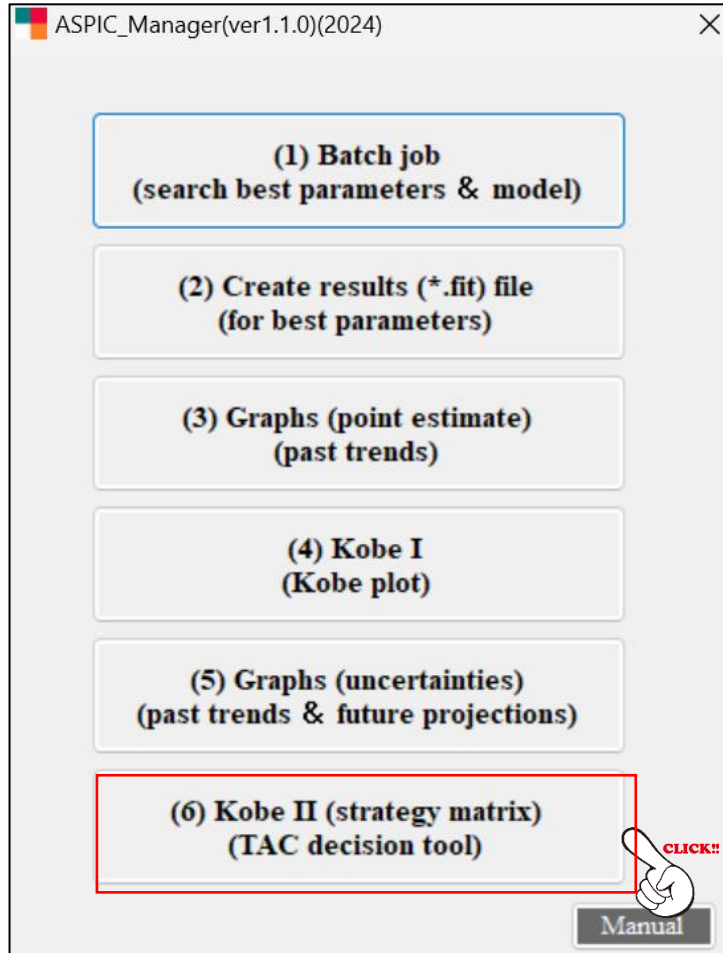




## 4. Running software : 4.6 Kobe II (Strategy matrix)(TAC decision tool by risk assessment)

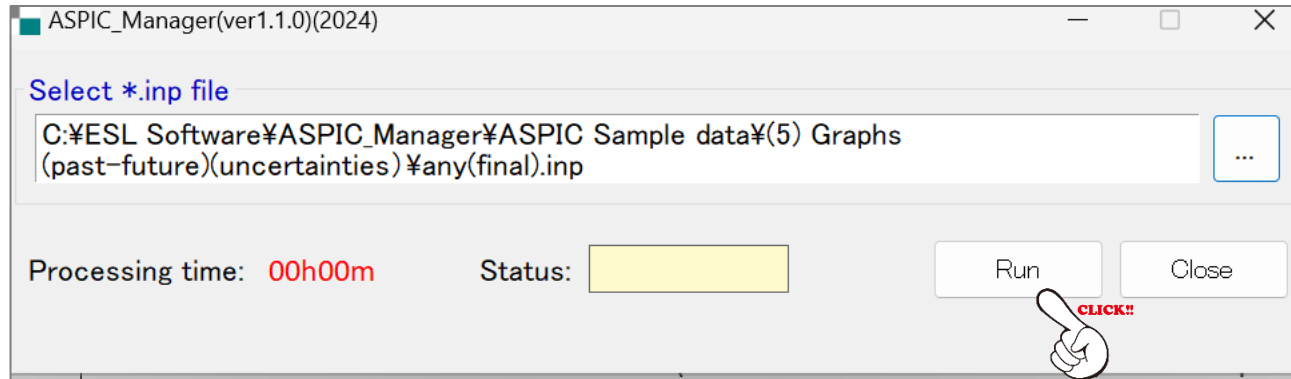
Probability violating  $TBmsy$  &  $Fmsy$  in 3 & 10 years if current catch level continues based on 1,000 bootstrapping

Import the test(final).inp (example)

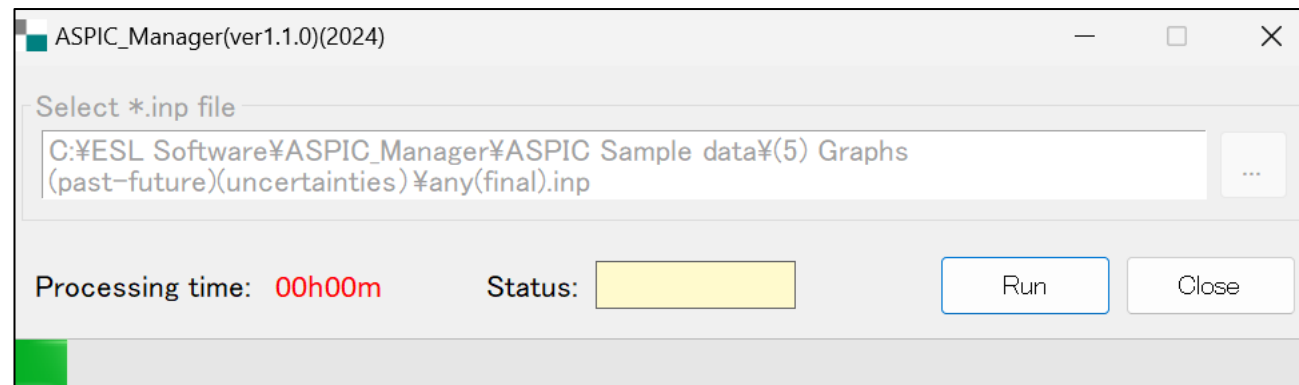


## 4. Running software: 4.6 Kobe II (Strategy matrix)

After importing the conformation window will appear (below)



It will take 10-30 minutes (sometimes a few hours) to complete depending on the data set and PC



# 4. Running software

## 4.6 Kobe II

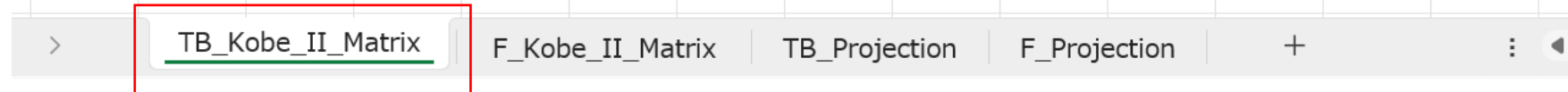
### (Strategy matrix)

Then, one excel sheet (TB\_F\_KOBEII.xlsx) containing 4 sheets is created. (for the next 10 years )

1<sup>st</sup> Sheet :  
TB\_Kobe\_II\_Matrix

Risk probability (%) violating TB(MSY) level by catch level												
		Color legend										
Risk levels		Low risk	Medium low risk	Medium high risk	High risk							
Probably		0 - 25%	25 - 50%	50 - 75%	75 - 100%							
	%	Catch (tons)	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
% Increased from the current catch level	200%	40,533	36%	41%	85%	97%	100%	100%	100%	100%	100%	100%
	150%	33,778	36%	41%	79%	94%	99%	100%	100%	100%	100%	100%
	100%	27,022	36%	41%	71%	87%	95%	98%	99%	100%	100%	100%
	80%	24,320	36%	41%	66%	83%	91%	96%	98%	99%	100%	100%
	60%	21,618	36%	41%	61%	77%	87%	93%	96%	98%	99%	99%
	40%	18,915	36%	41%	57%	70%	80%	87%	91%	94%	95%	97%
	30%	17,564	36%	41%	54%	67%	75%	82%	87%	91%	93%	95%
	20%	16,213	36%	41%	52%	61%	70%	77%	81%	86%	89%	90%
10%	14,862	36%	41%	49%	56%	63%	69%	75%	79%	82%	84%	
* Current catch	0%	13,511	36%	41%	47%	51%	56%	60%	64%	68%	71%	74%
% decreased from the current catch level	-5.60%	**12,760	36%	41%	45%	47%	50%	54%	57%	59%	62%	64%
	-10%	12,160	36%	41%	43%	45%	47%	50%	52%	53%	56%	58%
	-20%	10,809	36%	41%	40%	39%	37%	37%	37%	37%	37%	38%
	-30%	9,458	36%	41%	35%	31%	29%	27%	24%	23%	22%	21%
	-40%	8,107	36%	41%	32%	26%	19%	16%	14%	13%	12%	11%
	-60%	5,404	36%	41%	26%	13%	8%	6%	6%	6%	6%	6%
	-80%	2,702	36%	41%	19%	6%	3%	3%	3%	3%	3%	3%
-100%	0	36%	41%	12%	2%	1%	1%	1%	1%	1%	1%	

(Note) \* Average catch for 3 last assessments years \*\* MSY level



# 4. Running software

## 4.6 Kobe II

### (Strategy matrix)

Then, one excel sheet (TB\_F\_KOBEII.xlsx) containing 4 sheets is created. (for the next 10 years )

2<sup>nd</sup> Sheet :  
F\_Kobe\_II\_Matrix

Risk probability (%) violating TB(MSY) level by catch level												
		Color legend										
Risk levels	Probably	Low risk	Medium low risk	Medium high risk	High risk							
		0 - 25%	25 - 50%	50 - 75%	75 - 100%							
	%	Catch (tons)	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
% Increased from the current catch level	200%	40,533	42%	99%	100%	100%	100%	100%	100%	100%	100%	100%
	150%	33,778	42%	96%	99%	100%	100%	100%	100%	100%	100%	100%
	100%	27,022	42%	89%	96%	99%	100%	100%	100%	100%	100%	100%
	80%	24,320	42%	85%	93%	97%	99%	100%	100%	100%	100%	100%
	60%	21,618	42%	79%	88%	93%	96%	98%	99%	100%	100%	100%
	40%	18,915	42%	71%	80%	87%	91%	94%	96%	97%	98%	99%
	30%	17,564	42%	65%	75%	82%	87%	91%	93%	95%	96%	97%
	20%	16,213	42%	60%	69%	76%	81%	86%	89%	91%	92%	93%
* Current catch	0%	13,511	42%	48%	51%	56%	61%	64%	68%	72%	75%	77%
% decreased from the current catch level	-5.6%	**12,760	42%	42%	45%	48%	51%	54%	57%	60%	62%	64%
	-10%	12,160	42%	39%	41%	43%	45%	48%	50%	52%	54%	55%
	-20%	10,809	42%	30%	28%	28%	27%	26%	27%	27%	27%	27%
	-30%	9,458	42%	21%	15%	11%	9%	8%	8%	8%	8%	9%
	-40%	8,107	42%	10%	4%	2%	1%	1%	1%	1%	1%	1%
	-60%	5,404	42%	1%	0%	0%	0%	0%	0%	0%	0%	0%
	-80%	2,702	42%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	-100%	0	42%	0%	0%	0%	0%	0%	0%	0%	0%	0%

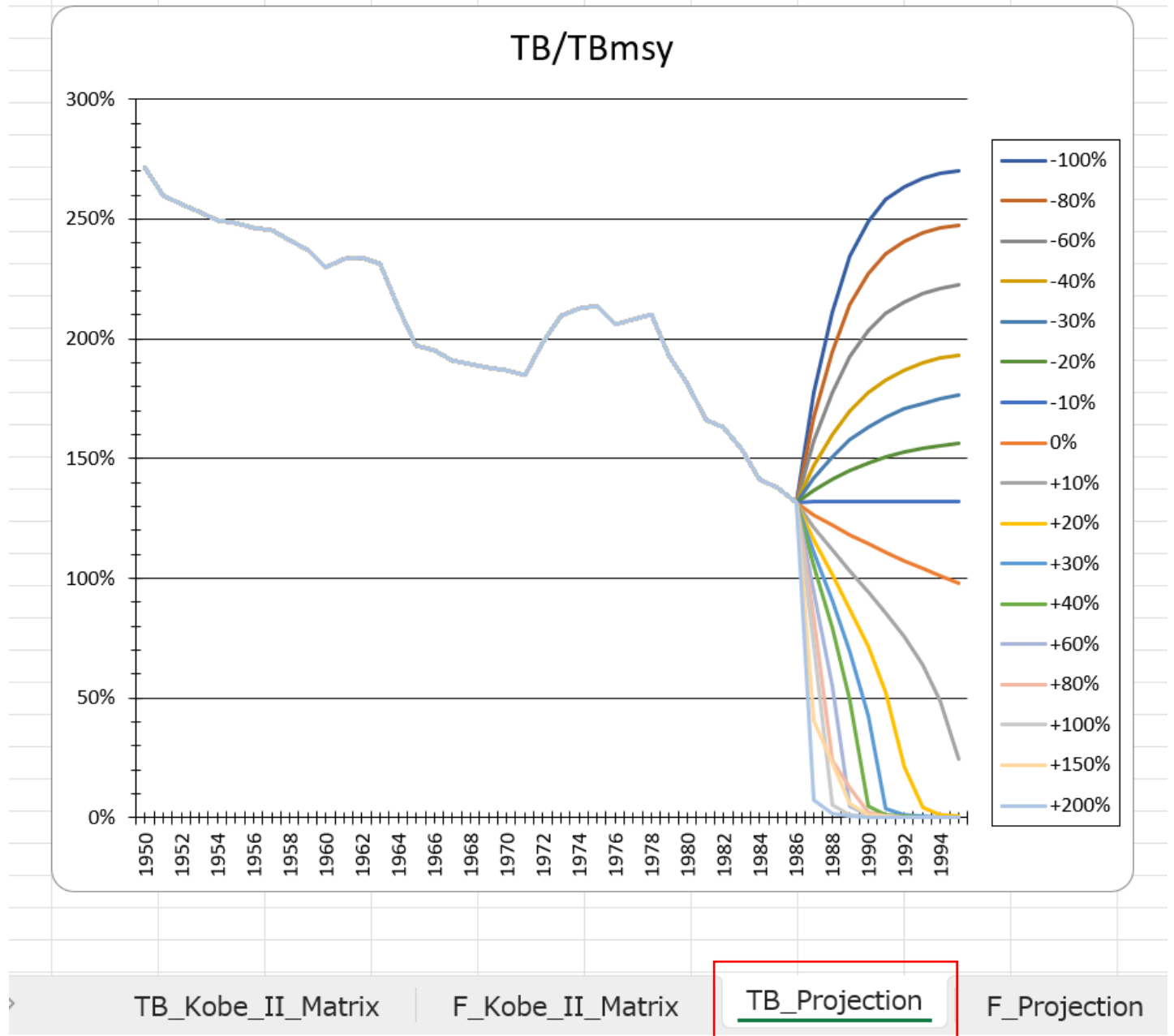
(Note) \* Average catch for 3 last assessments years \*\* MSY level

>	TB_Kobe_II_Matrix	<b>F_Kobe_II_Matrix</b>	TB_Projection	F_Projection	+	:
---	-------------------	-------------------------	---------------	--------------	---	---

## 4. Running software 4.6 Kobe II (Strategy matrix)

Then, one excel sheet  
(TB\_F\_KOBEII.xlsx)  
containing  
4 sheets is created.  
(for the next 10 years )

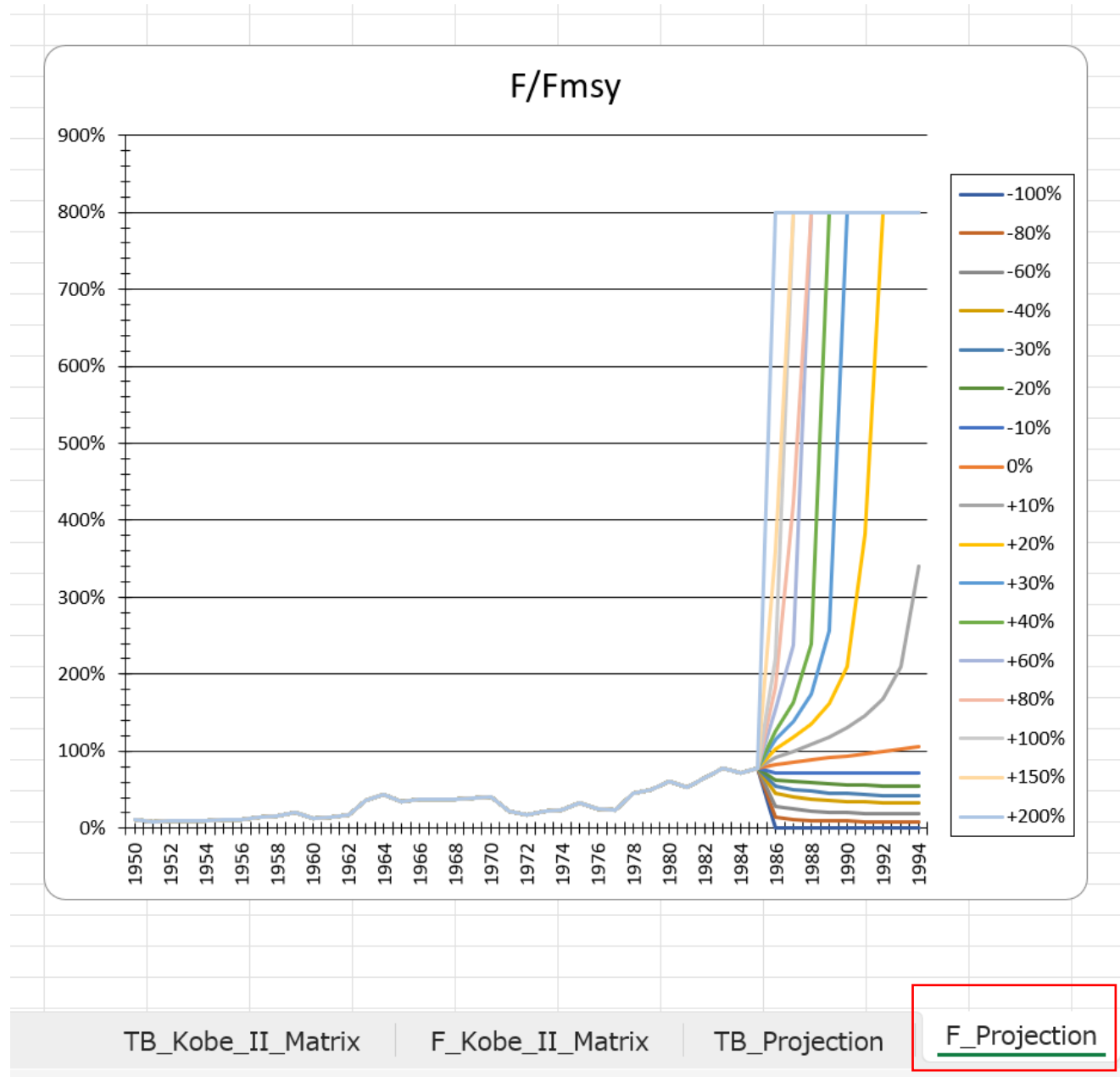
3<sup>rd</sup> Sheet :  
TB\_Projection



## 4. Running software 4.6 Kobe II (Strategy matrix)

Then, one excel sheet  
(TB\_F\_KOBEII.xlsx)  
containing  
4 sheets is created.  
(for the next 10 years )

4th sheet :  
F\_Projection



TB\_Kobe\_II\_Matrix

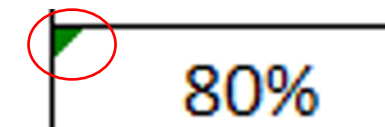
F\_Kobe\_II\_Matrix

TB\_Projection

F\_Projection

## Note:

Some users might have green triangles in the upper left corner of the cell  
There are a few methods to clear. Please refer to the Excel manual.

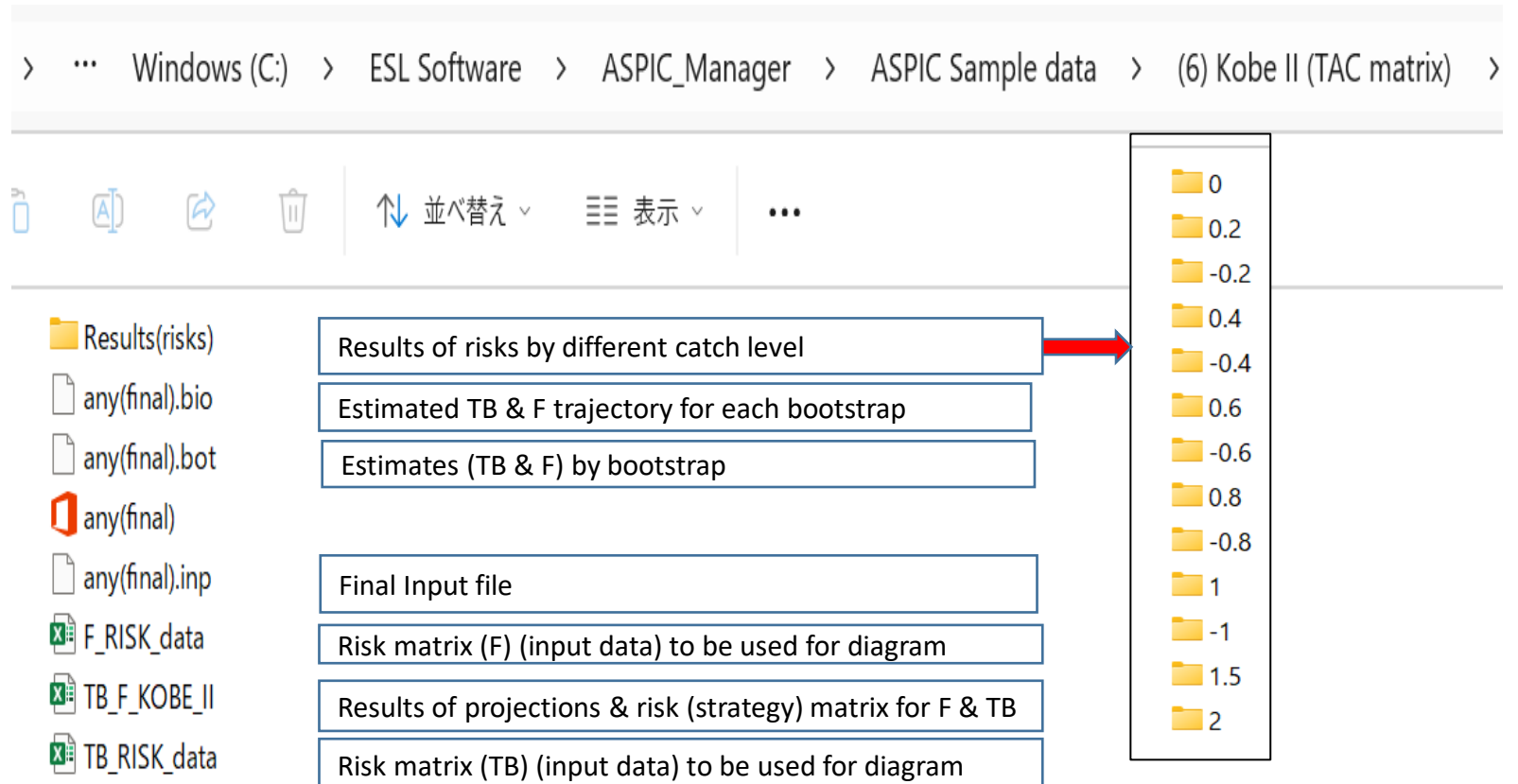
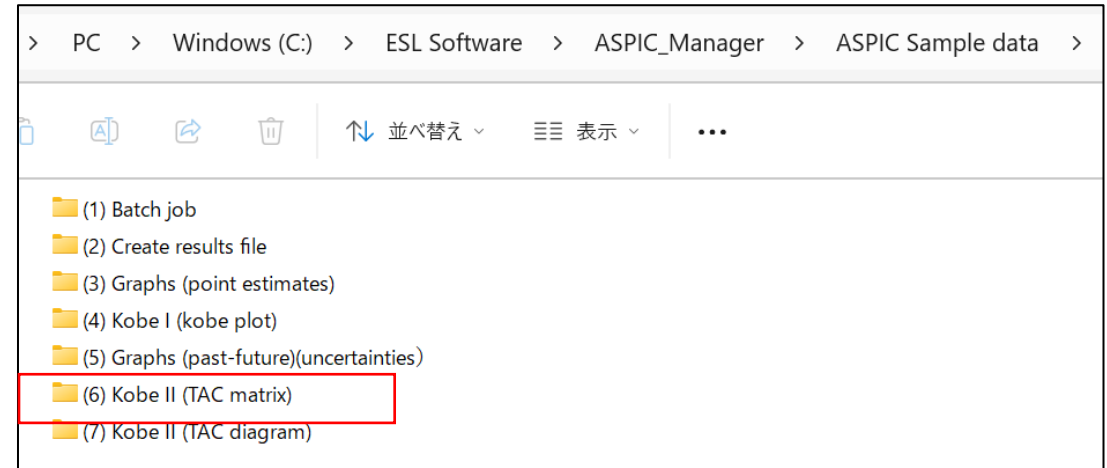
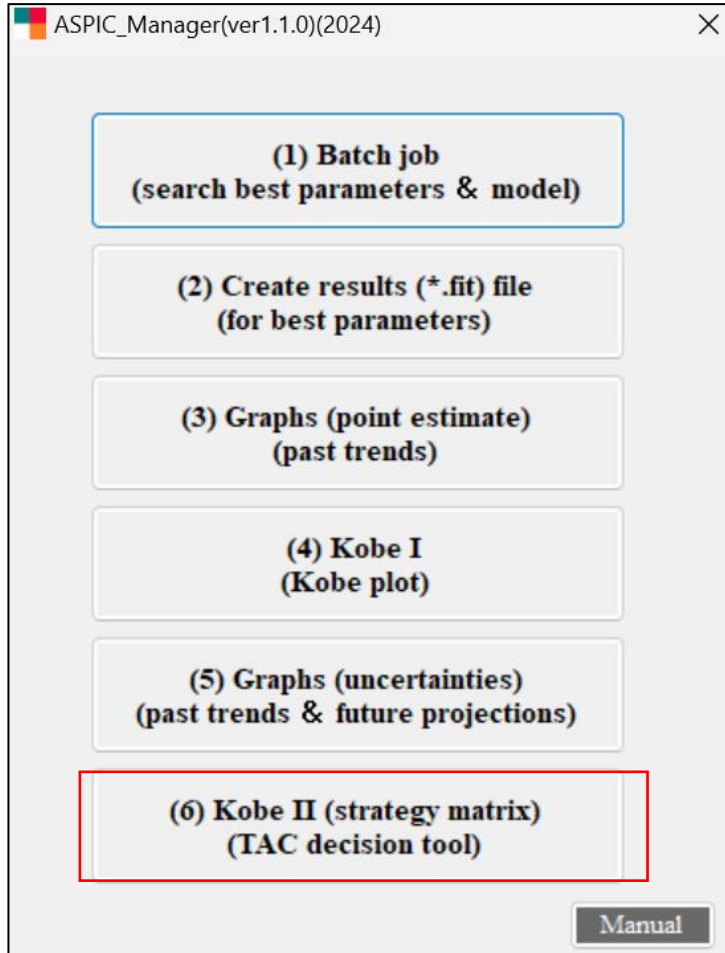


Risk probability (%) violating TB(MSY) level by catch level												
		Color legend										
Risk levels		Low risk	Medium low risk	Medium high risk	High risk							
Probably		0 - 25%	25 - 50%	50 - 75%	75 - 100%							
	%	Catch (tons)	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
% Increased from the current catch level	200%	40,533	36%	41%	85%	97%	100%	100%	100%	100%	100%	100%
	150%	33,778	36%	41%	79%	94%	99%	100%	100%	100%	100%	100%
	100%	27,022	36%	41%	71%	87%	95%	98%	99%	100%	100%	100%
	80%	24,320	36%	41%	66%	83%	91%	96%	98%	99%	100%	100%
	60%	21,618	36%	41%	61%	77%	87%	93%	96%	98%	99%	99%
	40%	18,915	36%	41%	57%	70%	80%	87%	91%	94%	95%	97%
	30%	17,564	36%	41%	54%	67%	75%	82%	87%	91%	93%	95%
	20%	16,213	36%	41%	52%	61%	70%	77%	81%	86%	89%	90%
10%	14,862	36%	41%	49%	56%	63%	69%	75%	79%	82%	84%	
* Current catch	0%	13,511	36%	41%	47%	51%	56%	60%	64%	68%	71%	74%
% decreased from the current catch level	-5.6%	**12,760	36%	41%	45%	47%	50%	54%	57%	59%	62%	64%
	-10%	12,160	36%	41%	43%	45%	47%	50%	52%	53%	56%	58%
	-20%	10,809	36%	41%	40%	39%	37%	37%	37%	37%	37%	38%
	-30%	9,458	36%	41%	35%	31%	29%	27%	24%	23%	22%	21%
	-40%	8,107	36%	41%	32%	26%	19%	16%	14%	13%	12%	11%
	-60%	5,404	36%	41%	26%	13%	8%	6%	6%	6%	6%	6%
	-80%	2,702	36%	41%	19%	6%	3%	3%	3%	3%	3%	3%
-100%	0	36%	41%	12%	2%	1%	1%	1%	1%	1%	1%	

(Note) \* Average catch for 3 last assessments years \*\* MSY level

## 4. Running software: 4.6 Kobe II (Strategy matrix)

ASPIC Sample data :List of INPUT & OUTPUT files





# Appendix A: History of development

## ASPIC Batch job (Grid search) menu-driven software (single menu)

➔ *Equivalent to Menu (1) in ASPIC\_Manager*

Ver 1.1	February 13	2018
Ver 1.1 (REV)	February 18	2018
Ver 2.0	August 6	2018

## ASPIC\_Manager (all-in-one)

Ver 1.0.0	August	2023	6 menus (original)
Ver 1.0.7	September	2023	6 menus (Batch job improved)
Ver 1.1.0	April	2024	6 menus (Risk matrix improved)

## Appendix B

# Results of the batch job : test(final).fit

(next 4 slides)

Users will not use results as ASPIC\_Manager software uses results in this file.

Majority of results are self-explanatory.

If users have difficulties to understand meanings of some of results,  
refer to the original ASPIC manual (Prager, 2004) or  
contact [MENU] Menu-driven stock assessment software developing team.

test

ASPIC -- A Surplus-Production Model Including Covariates (Ver. 5.10)

Author: Michael H. Prager; NOAA Center for Coastal Fisheries and Habitat Research  
101 Pivers Island Road; Beaufort, North Carolina 28516 USA  
Mike.Prager@noaa.gov

FIT program mode  
FOX model mode  
YLD conditioning  
SSE optimization

Reference: Prager, M. H. 1994. A suite of extensions to a nonequilibrium  
surplus-production model. Fishery Bulletin 92: 374-389.

ASPIC User's Manual is available  
gratis from the author.

CONTROL PARAMETERS (FROM INPUT FILE)

Input file: test(final).inp

-----  
Operation of ASPIC: Fit Fox exponential-yield model by direct optimization.

Number of years analyzed:	35	Number of bootstrap trials:	0
Number of data series:	1	Bounds on MSY (min, max):	3.000E+03 1.500E+04
Objective function:	Least squares	Bounds on K (min, max):	2.300E+04 1.700E+05
Relative conv. criterion (simplex):	1.000E-08	Monte Carlo search mode, trials:	0 20000
Relative conv. criterion (restart):	3.000E-08	Random number seed:	39332385
Relative conv. criterion (effort):	1.000E-04	Identical convergences required in fitting:	6
Maximum F allowed in fitting:	8.000	Number of steps for numerical integration	24
Bounds factor for generalized fit:	8.000	Bounds on phi (%):	37 37

COMPARISON OF LOGISTIC AND FOX MODELS

Model	Code	Exponent	Bmsy/K	B1/K	MSY	K	q1	Objective fn.
L	0	2.00	0.500	1.000E+00	1.116E+04	7.048E+04	5.391E-03	6.12443E-01
F	0	1.00	0.368	1.000E+00	1.276E+04	6.562E+04	6.107E-03	6.04592E-01

NOTE: Following report describes Fox model w/ adjusted bounds: MSY(1.40E+03, 8.93E+04), K(1.47E+02, 3.38E+07)

PROGRAM STATUS INFORMATION (NON-BOOTSTRAPPED ANALYSIS)

error code 0

-----  
Normal convergence

Number of restarts required for convergence: 5

GOODNESS-OF-FIT AND WEIGHTING (NON-BOOTSTRAPPED ANALYSIS)						
-----						
Loss component number and title	Weighted SSE	N	Weighted MSE	Current weight	Inv. var. weight	R-squared in CPUE
Loss(-1) SSE in yield	0.000E+00					
Loss(0) Penalty for B1 > K	0.000E+00	1	N/A	1.000E+00	N/A	
Loss(1) CPUE Catch	6.046E-01	17	4.031E-02	1.000E+00	1.000E+00	0.306
.....						
TOTAL OBJECTIVE FUNCTION, MSE, RMSE:	6.04591901E-01		4.319E-02	2.078E-01		
Estimated contrast index (ideal = 1.0):	0.4938		C* = (Bmax-Bmin)/K			
Estimated nearness index (ideal = 1.0):	0.8617		N* = 1 -  min(B-Bmsy) /K			
MODEL PARAMETER ESTIMATES (NON-BOOTSTRAPPED)						
-----						
Parameter	Estimate	User/pgm guess	2nd guess	Estimated	User guess	
B1/K Starting relative biomass (in 1950)	1.000E+00	1.000E+00	7.978E-01	0	1	
MSY Maximum sustainable yield	1.276E+04	1.160E+04	6.352E+03	1	1	
K Maximum population size	6.562E+04	7.040E+04	3.811E+04	1	1	
phi Shape of production curve (Bmsy/K)	0.3679	0.3679	----	0	1	
----- Catchability Coefficients by Data Series -----						
q(1) CPUE Catch	6.107E-03	5.400E-03	4.750E-01	1	1	
MANAGEMENT and DERIVED PARAMETER ESTIMATES (NON-BOOTSTRAPPED)						
-----						
Parameter	Estimate	Logistic formula	General formula			
MSY Maximum sustainable yield	1.276E+04	----	----			
Bmsy Stock biomass giving MSY	2.414E+04	K/2	K*n**(1/(1-n))			
Fmsy Fishing mortality rate at MSY	5.287E-01	MSY/Bmsy	MSY/Bmsy			
n Exponent in production function	1.0001	----	----			
g Fletcher's gamma	2.718E+04	----	[n**(n/(n-1))]/[n-1]			
B./Bmsy Ratio: B(1985)/Bmsy	1.376E+00	----	----			
F./Fmsy Ratio: F(1984)/Fmsy	7.194E-01	----	----			
Fmsy/F. Ratio: Fmsy/F(1984)	1.390E+00	----	----			
Y.(Fmsy) Approx. yield available at Fmsy in 1985	1.756E+04	MSY*B./Bmsy	MSY*B./Bmsy			
...as proportion of MSY	1.376E+00	----	----			
Ye. Equilibrium yield available in 1985	1.196E+04	4*MSY*(B/K-(B/K)**2)	g*MSY*(B/K-(B/K)**n)			
...as proportion of MSY	9.368E-01	----	----			
----- Fishing effort rate at MSY in units of each CE or CC series -----						
fmsy(1) CPUE Catch	8.657E+01	Fmsy/q( 1)	Fmsy/q( 1)			

## ESTIMATED POPULATION TRAJECTORY (NON-BOOTSTRAPPED)

Obs	Year or ID	Estimated total F mort	Estimated starting biomass	Estimated average biomass	Observed total yield	Model total yield	Estimated surplus production	Ratio of F mort to Fmsy	Ratio of biomass to Bmsy
1	1950	0.057	6.562E+04	6.405E+04	3.646E+03	3.646E+03	7.852E+02	1.077E-01	2.718E+00
2	1951	0.041	6.276E+04	6.229E+04	2.581E+03	2.581E+03	1.709E+03	7.838E-02	2.600E+00
3	1952	0.049	6.189E+04	6.142E+04	2.993E+03	2.993E+03	2.138E+03	9.217E-02	2.564E+00
4	1953	0.054	6.103E+04	6.062E+04	3.303E+03	3.303E+03	2.535E+03	1.031E-01	2.528E+00
5	1954	0.050	6.027E+04	6.013E+04	3.034E+03	3.034E+03	2.778E+03	9.545E-02	2.496E+00
6	1955	0.059	6.001E+04	5.972E+04	3.502E+03	3.502E+03	2.970E+03	1.109E-01	2.486E+00
7	1956	0.057	5.948E+04	5.936E+04	3.358E+03	3.358E+03	3.144E+03	1.070E-01	2.464E+00
8	1957	0.078	5.926E+04	5.866E+04	4.578E+03	4.578E+03	3.468E+03	1.476E-01	2.455E+00
9	1958	0.085	5.815E+04	5.763E+04	4.904E+03	4.904E+03	3.946E+03	1.610E-01	2.409E+00
10	1959	0.111	5.720E+04	5.628E+04	6.232E+03	6.232E+03	4.553E+03	2.095E-01	2.369E+00
11	1960	0.068	5.552E+04	5.599E+04	3.828E+03	3.828E+03	4.705E+03	1.293E-01	2.300E+00
12	1961	0.078	5.639E+04	5.645E+04	4.381E+03	4.381E+03	4.492E+03	1.468E-01	2.336E+00
13	1962	0.095	5.651E+04	5.612E+04	5.342E+03	5.342E+03	4.634E+03	1.801E-01	2.341E+00
14	1963	0.191	5.580E+04	5.337E+04	1.019E+04	1.019E+04	5.784E+03	3.612E-01	2.311E+00
15	1964	0.228	5.139E+04	4.928E+04	1.126E+04	1.126E+04	7.424E+03	4.321E-01	2.129E+00
16	1965	0.183	4.756E+04	4.730E+04	8.652E+03	8.653E+03	8.182E+03	3.460E-01	1.970E+00
17	1966	0.201	4.709E+04	4.659E+04	9.349E+03	9.349E+03	8.431E+03	3.796E-01	1.951E+00
18	1967	0.198	4.617E+04	4.593E+04	9.107E+03	9.108E+03	8.661E+03	3.751E-01	1.913E+00
19	1968	0.201	4.572E+04	4.552E+04	9.172E+03	9.172E+03	8.799E+03	3.811E-01	1.894E+00
20	1969	0.204	4.535E+04	4.519E+04	9.203E+03	9.203E+03	8.909E+03	3.852E-01	1.879E+00
21	1970	0.212	4.506E+04	4.481E+04	9.495E+03	9.495E+03	9.035E+03	4.009E-01	1.866E+00
22	1971	0.114	4.460E+04	4.636E+04	5.266E+03	5.266E+03	8.535E+03	2.149E-01	1.847E+00
23	1972	0.097	4.787E+04	4.932E+04	4.766E+03	4.766E+03	7.463E+03	1.828E-01	1.983E+00
24	1973	0.119	5.056E+04	5.097E+04	6.074E+03	6.074E+03	6.816E+03	2.254E-01	2.095E+00
25	1974	0.124	5.131E+04	5.145E+04	6.362E+03	6.362E+03	6.621E+03	2.339E-01	2.125E+00
26	1975	0.175	5.156E+04	5.054E+04	8.839E+03	8.839E+03	6.962E+03	3.308E-01	2.136E+00
27	1976	0.134	4.969E+04	4.996E+04	6.696E+03	6.696E+03	7.205E+03	2.535E-01	2.058E+00
28	1977	0.127	5.020E+04	5.051E+04	6.409E+03	6.409E+03	6.993E+03	2.400E-01	2.079E+00
29	1978	0.244	5.078E+04	4.851E+04	1.184E+04	1.183E+04	7.711E+03	4.615E-01	2.103E+00
30	1979	0.265	4.666E+04	4.501E+04	1.194E+04	1.194E+04	8.946E+03	5.016E-01	1.933E+00
31	1980	0.325	4.366E+04	4.169E+04	1.356E+04	1.356E+04	9.970E+03	6.152E-01	1.809E+00
32	1981	0.281	4.008E+04	3.973E+04	1.118E+04	1.118E+04	1.054E+04	5.324E-01	1.660E+00
33	1982	0.346	3.943E+04	3.817E+04	1.322E+04	1.321E+04	1.092E+04	6.548E-01	1.633E+00
34	1983	0.409	3.714E+04	3.548E+04	1.453E+04	1.453E+04	1.152E+04	7.744E-01	1.538E+00
35	1984	0.380	3.413E+04	3.363E+04	1.279E+04	1.279E+04	1.188E+04	7.194E-01	1.414E+00
36	1985		3.322E+04						1.376E+00

## RESULTS FOR DATA SERIES # 1 (NON-BOOTSTRAPPED)

CPUE Catch

Data type CC: CPUE-catch series

Series weight: 1.000

Obs	Year	Observed CPUE	Estimated CPUE	Estim F	Observed yield	Model yield	Resid in log scale
1	1950	*	3.912E+02	0.0569	3.646E+03	3.646E+03	0.00000
2	1951	*	3.804E+02	0.0414	2.581E+03	2.581E+03	0.00000
3	1952	*	3.751E+02	0.0487	2.993E+03	2.993E+03	0.00000
4	1953	*	3.702E+02	0.0545	3.303E+03	3.303E+03	0.00000
5	1954	*	3.672E+02	0.0505	3.034E+03	3.034E+03	0.00000
6	1955	*	3.647E+02	0.0586	3.502E+03	3.502E+03	0.00000
7	1956	*	3.625E+02	0.0566	3.358E+03	3.358E+03	0.00000
8	1957	*	3.582E+02	0.0780	4.578E+03	4.578E+03	0.00000
9	1958	*	3.520E+02	0.0851	4.904E+03	4.904E+03	0.00000
10	1959	*	3.437E+02	0.1107	6.232E+03	6.232E+03	0.00000
11	1960	*	3.419E+02	0.0684	3.828E+03	3.828E+03	0.00000
12	1961	*	3.448E+02	0.0776	4.381E+03	4.381E+03	0.00000
13	1962	*	3.427E+02	0.0952	5.342E+03	5.342E+03	0.00000
14	1963	*	3.259E+02	0.1909	1.019E+04	1.019E+04	0.00000
15	1964	3.800E+02	3.010E+02	0.2284	1.126E+04	1.126E+04	-0.23319
16	1965	2.400E+02	2.888E+02	0.1829	8.652E+03	8.652E+03	0.18525
17	1966	2.290E+02	2.845E+02	0.2007	9.349E+03	9.349E+03	0.21701
18	1967	2.780E+02	2.805E+02	0.1983	9.107E+03	9.107E+03	0.00879
19	1968	2.200E+02	2.780E+02	0.2015	9.172E+03	9.172E+03	0.23395
20	1969	1.970E+02	2.760E+02	0.2037	9.203E+03	9.203E+03	0.33709
21	1970	2.190E+02	2.736E+02	0.2119	9.495E+03	9.495E+03	0.22269
22	1971	*	2.831E+02	0.1136	5.266E+03	5.266E+03	0.00000
23	1972	*	3.012E+02	0.0966	4.766E+03	4.766E+03	0.00000
24	1973	*	3.112E+02	0.1192	6.074E+03	6.074E+03	0.00000
25	1974	*	3.142E+02	0.1237	6.362E+03	6.362E+03	0.00000
26	1975	3.500E+02	3.086E+02	0.1749	8.839E+03	8.839E+03	-0.12575
27	1976	3.090E+02	3.051E+02	0.1340	6.696E+03	6.696E+03	-0.01257
28	1977	3.370E+02	3.085E+02	0.1269	6.409E+03	6.409E+03	-0.08840
29	1978	4.450E+02	2.962E+02	0.2440	1.184E+04	1.184E+04	-0.40692
30	1979	3.160E+02	2.749E+02	0.2652	1.194E+04	1.194E+04	-0.13938
31	1980	2.520E+02	2.546E+02	0.3252	1.356E+04	1.356E+04	0.01016
32	1981	2.310E+02	2.426E+02	0.2814	1.118E+04	1.118E+04	0.04894
33	1982	2.830E+02	2.331E+02	0.3462	1.322E+04	1.322E+04	-0.19383
34	1983	2.220E+02	2.167E+02	0.4094	1.453E+04	1.453E+04	-0.02420
35	1984	2.130E+02	2.054E+02	0.3803	1.279E+04	1.279E+04	-0.03638

\* Asterisk indicates missing value(s).

# Stock assessments for ALL



**STOCK ASSESSMENT  
SOFTWARE DEVELOPING TEAM**



**STOCK ASSESSMENT FOR ALL**  
**MENU-DRIVEN SOFTWARE DEVELOPMENT TEAM**