Welcome to SEAFDEC TD

Where is 7/11?

Welcome aboard

PRACTICAL WORKSHOP ON STOCK ASSESSMENTS OF INDO-PACIFIC KING MACKEREL AND NARROW-BARRED SPANISH MACKEREL IN THE SOUTHEAST ASIAN WATERS

Captain
Tom Nishida

Acknowledgements (1)

SEAFDEC SECRETARIAT (Bangkok, Thailand)

Kom Silapajarn	Secretary General
Akito Sato	Deputy Secretary General
Somboon Siriraksophon	(ex) Policy and Program Coordinator
Magnus Torell	(ex) Senior Advisor
Suwanee Sayan	Policy and Program Officer II
Supapong Pattarapongpan	Stock assessment expert

SEAFDEC/MFRDMD (Kuala Terengganu, Malaysia)

Raja Bidinbin Raja Hassan	Chief
Kenji Taki	Deputy Chief

FUNDING AGENCY

Government of Sweden through the SEAFDEC-Sweden Project entitled "**Fisheries and Habitat Management, Climate Change and Social Well-being in Southeast Asia**".

Acknowledgements (2) data coordinators

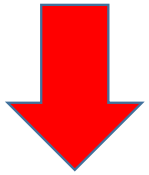
Country	Coordinators	Agency
Brunei	Muhammad Adam Ramlee	Department of Fisheries
Cambodia	Mr. Suy Serywath	Fisheries Research and Development Institute, Fisheries Administration (FiA)
	Mr. Kao Monirith	
Indonesia	Dr Khairul Amri	Research Institute for Marine Fisheries
	Mr Thomas Hidayat	
Malaysia	Mr Sallehudin Jamon	Department of Fisheries
Myanmar	Dr Htun Thein	Marine Resources Survey & Research Unit, Department of Fisheries
	Mr Nay Myo Aye	
Philippines	Ms Grace Lopetz	Bureau of Fisheries and Aquatic Resources (BFAR)
	Mr Val	
Thailand	Ms. Suwantana Tossapornpitakkul	Marine Fisheries Technology Research and Development Institute, Department of Fisheries
	Ms. Praulai Nootmorn	
Viet Nam	Mr Nguyen Viet Nghia	Research Institute for Marine Fisheries
	Mr Pham Hung	
	Mr Hao	

Congratulations

- 13 boys are rescued !

- But > 250 killed in Japan by floods…

We make a short meeting report



Rapporteurs
Secretariat, who (OK?)

Contents

1. Introduction
2. National Report
3. Biology and Ecology (Dr Taki)
4. Stock structure
5. Data (Catch and CPUE)
6. CPUE standardization
7. Stock assessment (ASPIC) (r: Supapong)
8. Kobe plot
9. Risk assessment
10. Discussion and recommendations
11. Future

Introduction

Introduction
(Backgrounds, Objectives and Workplan)

Background (1) 6 years (2013-2018)

45th SEAFDEC Council Meeting (2013)

the proposal endorsed for the development of

Regional Plan of Action for Sustainable Neritic Tuna Fisheries (RPOA-Neritic Tuna)

Consultative Meeting organized (Oct 2013, Songkhla Province, Thailand)

RPOA-Neritic Tuna finalized (Jun 2014, Krabi province, Thailand)

47th SEAFDEC Council Meeting (Apr 2015)

・RPOA-Neritic Tuna endorsed

SWG (Scientific Working Group) stock assessment of neritic tunas (ASEAN region) established

・TOR for SWG-Neritic Tunas endorsed

Background (2) 6 years (2013-2018)

1st Meeting of SWG-Neritic Tunas (Nov 2014, Shah Alam, Malaysia)

Agreed to 7 species, and to focus on two (2) neritic tuna species **(KAW+LOT)+(2) Seerfish (Spanish + King)**

2nd Meeting of SWG-Neritic Tunas (Jun 2015, Hai Phong, Viet Nam)

Agreed to A Stock-Production Model Incorporating Covariates (ASPIC)

3rd Meeting of SWG-Neritic Tunas (Jun 2016, Pattaya, Thailand)

ASPIC Results and recommendations ➔ published

4th Meeting of SWG-Neritic Tunas (Nov 2017, KL, Malaysia)

Agreed to conduct the workshop for data QC + seerfish stock assessment

"Practical Workshop on Stock Assessment of Indo-Pacific king Mackerel and Narrow-barred Spanish Mackerel in the Southeast Asian Waters"

16-20 June 2018 at SEAFDEC/TD in Samut Prakan, Thailand

7 species

(1) Longtail tuna

(2) Kawakawa

(3) Narrow-barred Spanish mackerel

(4) Indo-Pacific king mackerel

****

(5) Bullet tuna

(6) Frigate

(7) Bonito


NHÀ E
SEAFDEC
SWEDEN
2nd Meeting of the Scientific Working Group on
NERITIC TUNAS STOCK ASSESSMENT
IN THE SOUTHEAST ASIAN WATERS
15-17 June 2015, RIMF, Hai Phong, Viet Nam

4TH MEETING OF SCIENTIFIC WORKING GROUP ON NERITIC TUNAS STOCK ASSESSMENT AND ADVANCE TRAINING COURSE ON RISK ASSESSMENTS OF LONGTAIL TUNA AND KAWAKAWA IN THE SOUTHEAST ASIAN WATERS

7–9 NOVEMBER 2017

KUALA LUMPUR, MALAYSIA

Publication

NERITIC TUNA STOCK AND RISK ASSESSMENT
PART I

STOCK ASSESSMENT OF KAWAKAWA (*Euthynnusaffinis*) AND LONGTAIL TUNA (*Thunnustonggol*) RESOURCES IN THE SOUTHEAST ASIAN WATERS[1]

Tsutomu **NISHIDA**
National Research Institute of Far Seas Fisheries, Shimizu, Shizuoka, Japan
aco20320@par.odn.ne.jp
Corresponding Author

Co-authors

MUHAMMAD ADAM bin Ramlee (Brunei Darussalam)
THOMAS Hidayat (Indonesia)
SALLEHUDIN bin Jamon (Malaysia)
SHERYLL Mesa (Philippines)
PHAM QUOC Huy (Viet Nam)
CHALIT Sa-Nga-Ngam (Thailand)
PRAULAI Nootmorn (Thailand)
THANITHA Darbanandana (Kasetsart University)
MOHAMMAD FAISAL bin Md Saleh (SEAFDEC/MFRDMD)
SUPAPONG Pattarapongpan (SEAFDEC/TD)

February 2017

NERITIC TUNA STOCK AND RISK ASSESSMENT
Part II

RISK ASSESSMENT OF KAWAKAWA (*Euthynnus affinis*) AND LONGTAIL TUNA (*Thunnus tonggol*) RESOURCES IN THE SOUTHEAST ASIAN WATERS

Supported by

SEC/SP/161			February 2017

SOUTHEAST ASIAN FISHERIES DEVELOPMENT CENTER

THIS PAPER WAS ENDORSED BY THE 25TH MEETING OF ASEAN SECTORAL WORKING GROUP ON FISHERIES IN MAY 2017

Objectives (1)

- Stock assessments, stock status and management (soft) advices (🡐 no binding!).

- Narrow-barred Spanish mackerel and Indo-Pacific king mackerel in SE Asian waters, i.e., (Bangladesh), Brunei, Cambodia, Indonesia Malaysia, Myanmar, Philippines, Thailand and Viet Nam

Objectives (2)

- Not only for training (Capacity Building) and but also for workshop(discussion)
- Subject covered : Data, CPUE, ASPIC, Kobe Plot and Risk assessments
- Practices : **Paper writing** and **presentation** of stock assessment (assignments)
- Recommendations (to improve and solve problems)

  ➔ (for examples, data collections, we will list at the end)

Resource person Dr Tom Nishida

+ 2 Assistants

Dr Kenji Taki Resource person

SEAFDEC: Marine Fishery Research Development and Management Department (MFRDMD),

Mr Supapong Pattarapongpan: Fish Stock Assessment Researcher
Research and Development Division (R&DD)Training Department

Self introductions (all participants)

Self introduction
Marine GIS, (tuna + Demersal) Stock assessments (IOTC, NAFO, SEAFO and SIOFA)

Education

Hokkaido University **(Hakodate)** (BS)

University of Washington (Seattle, USA) (MS)

Tokyo University (PhD)

Works

FAO fisheries (BOBP+IPTP) (Sri Lanka)

National Research Institute of Far Seas Fisheries (NRIFSF)

Self- Introduction Instructors and participants

	Example
• Name and Country	Tom Nishida, Japan
• Post	tuna scientist, Resource Person..
• Agency	National Research Institute of Far Seas Fisheries
• Your work ?	Tuna stock assessments
• Others (any..)	I want to work with you! I love SEAFDEC/TD

Work plan (tentative)
(instructors: Nishida + Taki+ Supapong)

- July 16 (Mon) Openings, Introduction, national reports, Biology▪Ecology (Dr Taki) +stock structure + Data (Catch▪CPUE)+STD_CPUE stock assessments (Nishida) +“r” (Mr Supapong)…
- July 17 (Tue) Work together (Nishida + participants) demo session **Spanish (PO): CPUE+ASPIC+KOBE PLOT+RISK ASSESS**
- July 18-19 (Wed + Thu) Assignments to participants (assisted by instructors) Spanish (IO) + King (PO) + King (IO) prepare Papers and PowerPoint
- July 20 (Fri) Submission papers and presentations (morning)

4 groups (draft) 8 CORE participants need to submit a paper and present using PowerPoint

Group	Spanish (PO)	Spanish (IO)	King (PO)	King (IO)
	SP	SI	KP	KI
Supervisor	Nishida and Taki	Supapong	Taki	Nishida
Participants (CORE)	Kong (Cambodia)	Thitipon (Thailand)	Faisal (MFRDMD)	Sallehudin (Malaysia)
	KO KO (Myanmar)	one student ?	Son (Viet Nam)	Osman (MFRDMD)

Observer/Secretariat		
Suwanee (TD)	Sukchai (TD)	Sirporn (TD)
Observer (students)		
Sireemas	Phisit	Gittinan

Paper + PowerPoint presentations
Stock and Risk assessment (SP, SI, KP or KI)

1. Introduction
2. Data : Catch and CPUE
3. Stock assessment (ASPIC): Methods, results and discussion
4. Risk assessment: Methods, results and discussion
5. Recommendations

    Data, methods, management advices

    and any other issues for improvements

Use Tables, Figs etc. Deadline July 20 (Fri) 9 AM

July 20 (Fri) morning (When the prayer start?)
Presentations (15 minutes) + QA (5 minutes)

Time	9-9:20	9:20-9:40	9:40-10	10-10:20	10:20-10:50	11:20-12:10	12:10-12:30
Supervisor	Nishida and Taki	Supapong	Taki	Nishida			
Group	Spanish (PO)	Spanish (IO)	King (PO)	King (IO)	tea break	Wrap up and recommendations (rapporteurs : Secretariat)	closings
Participants (presenters)	Kong (Cambodia)	Thitipon (Thailand)	Faisal (MFRDMD)	Sallehudin (Malaysia)			
	KO KO (Myanmar)	one student ?	Son (Viet Nam)	Osman (MFRDMD)			

Daily plan 9AM-5PM (breakfast & lunch provided) Dinner ? after hours ➔ do your home works

- 09:00-10:30 morning session (1)
- 10:30-11:00 morning tea break
- 11:00-12:30 morning session (2)

- 12:30-13:30 lunch

- 13:30-15:00 afternoon session (1)
- 15:00-15:30 afternoon tea break
- 15:30-17:00 afternoon session (2)

Later we make one paper as in the past
(all participants + 3 instructors)

To be published from SEAFDEC

(technical paper)

If time allowed

- We will practice Data (catch and CPUE) QC (massage)
- For this time➔ 60% of time needed
- To save time➔ selected CPUE will be provided
- Work on your data

Important notice: Work on your own data

It will be very important to work your own data.

For CPUE standardization, ASPIC, Kobe plot and Risk assessments.

Hope that you brought, so that..

We will work your data together if time allowed.

Pre-Requirements for PC + software

Pre-Requirements for PC + software

- **[PC and basic software]**
- Operation System: MS window 7or newer version that must include Word, Excel and PowerPoint.
- **No MAC (apple) PC** are allowed as our software cannot be used.
- Participants should be able to use MS-Excel (basic functions, sum, averages, pivot table and others), MS-Word (basic functions for report writing) and MS-PowerPoint (basic functions for presentations).
- RAM: minimum 2GB.
- Both 32bit/64bit are OK.

Pre-install 4 Software (1)

- If you don't have "R" in your PC, please **pre-install "R" language (version 3.1.1)** from the internet, which needs for software.

- If you don't have ".NET Framework4" in your PC, please pre-install **".NET Framework4"** from the internet, which needs for software.

- If you have Kobe plot, CPUE standardization, ASPIC and/or Risk assessment software in your PC, **please un-install.**

Pre-install 4 Software (2)

After you finish above 3 requirements, please **pre-install 4 software** from the links below. Please read manuals carefully.

- CPUE standardization http://ocean-info.ddo.jp/kobeaspm/glm/cpueglm_setup.exe
- ASPIC (version 5.05) [original program] + [batch job]
  http://ocean-info.ddo.jp/kobeaspm/aspic/aspic_setup.exe
- Kobe plot http://ocean-info.ddo.jp/kobeaspm/kobeplot/KobePlot.zip
- Risk assessment http://ocean-info.ddo.jp/kobeaspm/riskassessment/Setup_RiskAssessment.zip

Warnings Warnings Warnings Warnings

Indonesian or Malaysian language based window (PC)

Excel data may not work !

based on our past experiences

In such case, create the same excel data by your own PC

(based on the investigation by Dr Taki)

Excel functions: very important you need to learn

- Data process
- Sum + Average
- Graphs
- Tables (Pivot table)
- Data massage

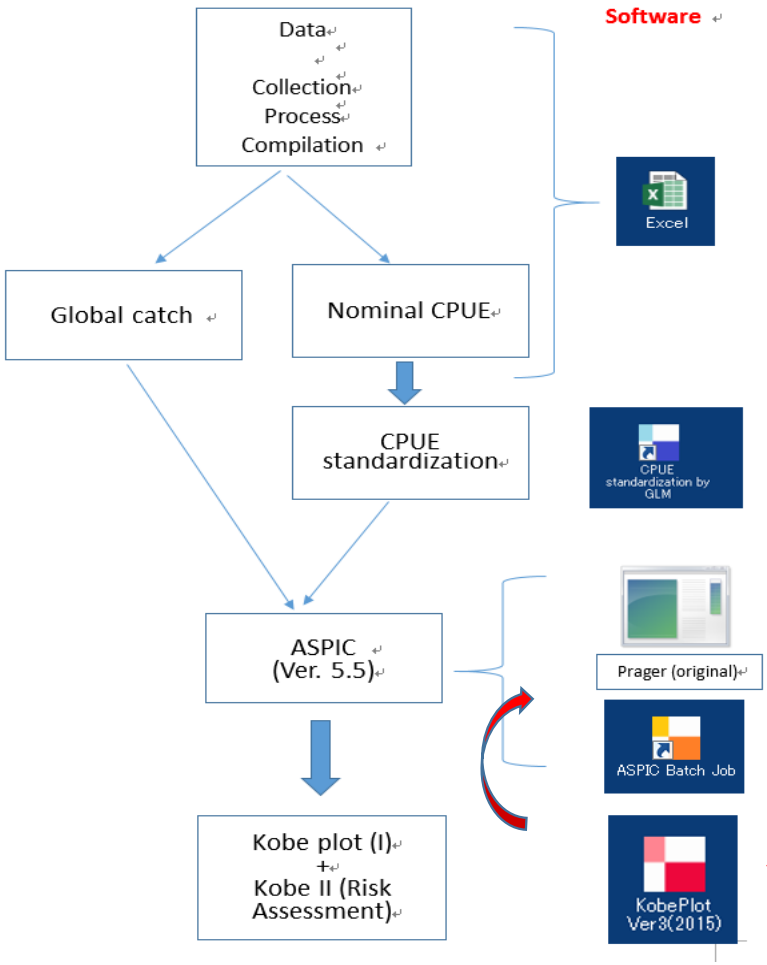
Data process :important rule

- **Keep Original file : don’t use the ORG file**
- Make a WK copy then work
- SP ➔ SP1
- You may need to save SP1 SP2…
- Because you need to go back
- if you don’ keep and if you lost

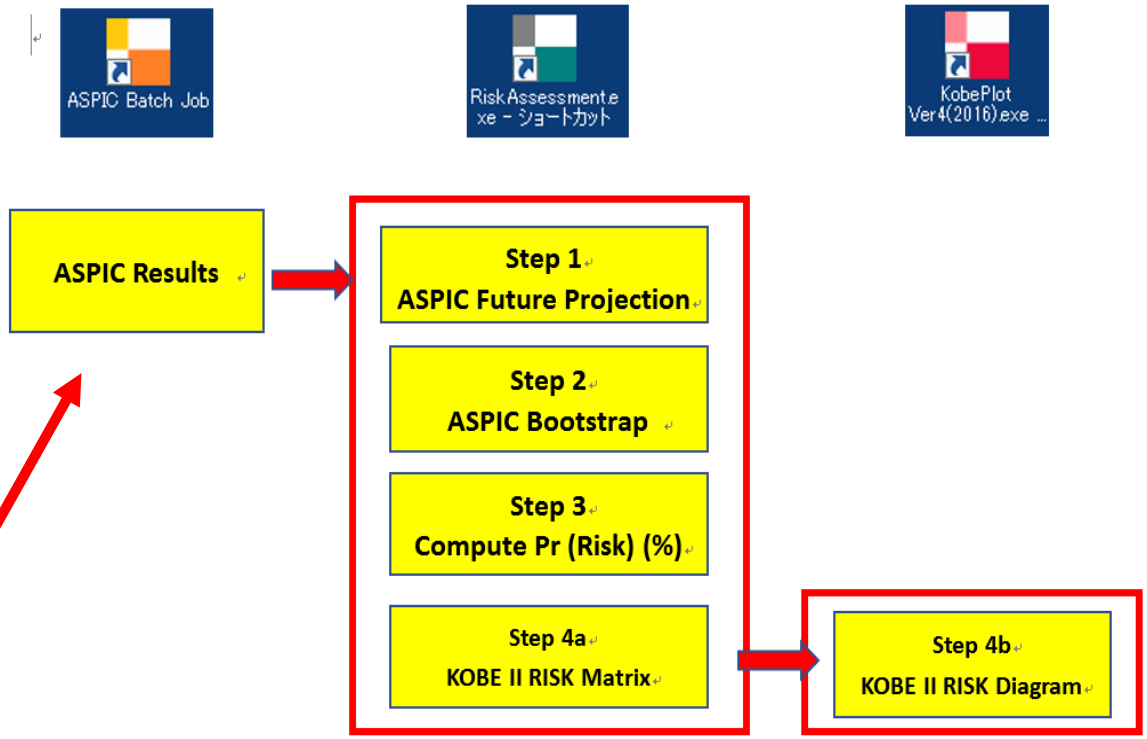
  ➔ then you need to make same files (repeat) again

  ➔ waist time and create errors

Part 1 :Stock assessments



Part II: Risk assessments



時間があれば図を入れたものも紹介

Request to participants manuals, soft and any others

- If you find errors or need improvements let us know

- We will improve next version

List of Documents

Information Papers (INF)

INF01 List of Documents

INF02 Information Note & Pre-Requirements to participants for PC and software

INF03 Provisional Prospectus

INF04 Provisional Timetable and Agenda

INF05 List of Participants

National Report (NR)

NR01 Indonesia national reports on activities on stock assessments of yellowfin tuna, bigeye tuna and skipjack tuna in Sulu and Sulawesi Seas.

NR02 Malaysia national reports on activities on stock assessments of yellowfin tuna, bigeye tuna and skipjack tuna in Sulu and Sulawesi Seas.

NR03 Philippines national reports on activities on stock assessments of yellowfin tuna, bigeye tuna and skipjack tuna in Sulu and Sulawesi Seas.

Documents (Suwenee)

- Information
- National reports
- Refences

Working Papers (WP)

WP01 Intrinsic Increase Rate of Tuna Population Growth (yellowfin tuna, bigeye tuna and skipjack tuna) *by Supapong Pattarapongpan and Tom Nishida*

WP02 Kobe Plot I and II software manual (Ver.3, 2014) (Revised Jan., 15, 2015) (PowerPoint) *by Tom Nishida*

WP03 SSS Workshop (Feb 2018) (PowerPoint) *by Tom Nishida*

WP04 CPUE standardization (outline) (2018) (PowerPoint) *by Tom Nishida*

WP05 ASPIC outline (2018) (PowerPoint) *by Tom Nishida*

WP06 ASPIC practice (2018) (PowerPoint) *by Tom Nishida*

WP07 Kobe plot (outline) (2018) (PowerPoint) *by Tom Nishida*

WP08 ISC seminar visualization (2018) (PowerPoint) *by Tom Nishida*

WP09 Kobe Plot (outline) (2018) (PowerPoint) *by Tom Nishida*

Reference (REF)

REF01 CPUE Standardization by GLM (Menu-driven software) Manual (Ver. 1.2) (2018)

REF02 ASPIC (ver. 5.05) Batch (Grid search) Job Software (Menu-driven software) (Ver. 1.1) Manual

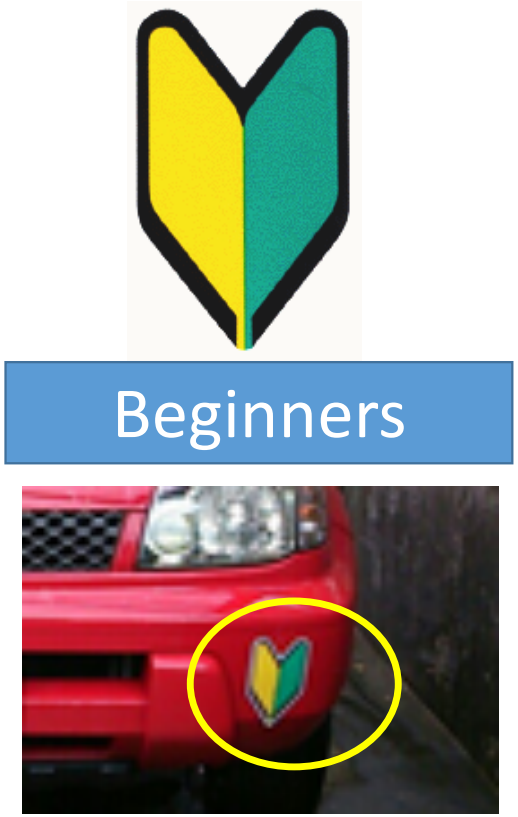
REF03 Kobe I (Kobe plot) + Kobe II (risk assessment) software (New version 3, 2014) User's manual

REF04 Stock assessments of yellowfin tuna (*Thunnus albacares*), bigeye tuna (*Thunnus obesus*) and skipjack tuna (*Katsuwonus pelamis*) in Sulu and Sulawesi Seas by ASPIC* **A Stock Production Model Incorporating Covariates*

REF05 User's Manual for ASPIC: A Stock-Production Model Incorporating Covariates (ver. 5) And Auxiliary Programs

Remarks

Presentations for the beginners



Special Marks on car (Japan)

Official Language ENGLISH

- Any accent of ENGLISH is OK
  (Malay, Indonesia, Chinese,
  Japanese, Philippines……)

- No native English speakers
  except Philippines

For ALL

Speak
ENGLISH
SLOWLY &
CLEARLY

Internet

[Free Wi-Fi]

Get ID and PW

SEAFDEC

Please raise your hands
ANYTIME
if you have questions
and/or comments
(informal session)
FEEDBACK(2 ways)

Warnings species names

- Narrow-barred **Spanish** mackerel (*Scomberomorus commerson*)

  Thailand➔ King mackerel

  Brunei ➔ Narrow barred Spanish

- Indo-Pacific **King** mackerel (*Scomberomorus guttatus)*

  Thailand ➔Pla Insee Ju (in Thai language)

  Brunei ➔ Spanish mackerel

WARNINGS

- You can not learn everything for this time
- Take time (5 years) need more practice work together with experts
- But good news is to use software so you can learn less time
- Need philosophy (intuition) for data and ASPIC
- Need practice using various data

Let’s make fruitful, productive, constructive and friendly

Training
+
Workshop

Contents

1. Introduction
2. National Report
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National Report

National Report *:Indo-Pacific king mackerel and narrow-barred Spanish mackerel*

- Participants are requested to submit their National Report.

- One National Report is requested per each participating member county (Brunei, Cambodia, Indonesia, Malaysia, Myanmar, Philippines, Thailand and Viet Nam).

- Both document and Presentation (PowerPoint) are requested to submit by July 11(Wednesday) and July 15 (Sunday), 2018 respectively to Secretariat (Ms. Suwanee Sayan, suwanee@seafdec.org).

1. **Introduction**

2. **Description of Fisheries**

   Describe fisheries including boat type, gear type, fishing grounds (with map), fishing seasons and any other relevant matters.

3. **Relevant statistics**

   Describe available historical statistics (catch, CPUE, size etc.)

4. **Parameters for stock assessments**

   Describe available parameters and/or equations for stock assessment (LW relations, growth equations r, M, etc.)

5. **Stock assessments in the past**

   Describe briefly any stock assessment conducted in the past.

6. **Management measures**

   Describe any management measures in place

7. **Problems**

   Describe any problems facing on above issues

8. **Summary**

Contents

1. Introduction
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Biology and Ecology (Dr Taki)

Contents

1. Introduction
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Stock structure

3. Stock structure

To conduct stock assessments

knowledge of the stock structure is essential.

because stock assessments

need to be implemented by stock

to manage the particular stock

3. Stock structure

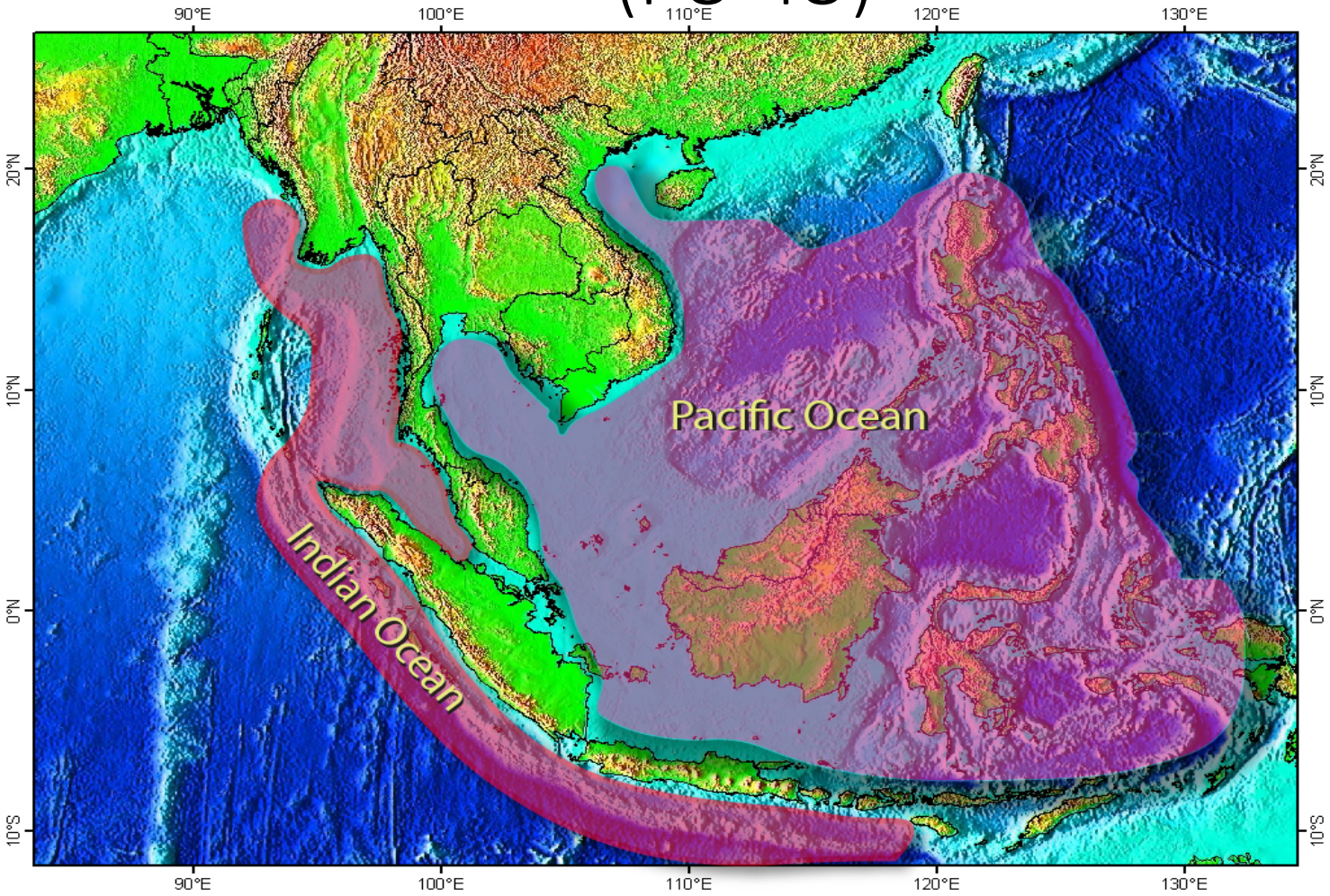
If we don’t know the stock structure
and conduct stock assessments

results are not meaningful

as we don’t know which particular stock
can be managed by the results

uncertainties

2 stock hypothesis (Pacific and Indian Ocean) (PO+IO)



Pacific and Indian stocks covered by country		
	(a) Pacific (F71)	(b) Indian (F57)
(1) Brunei		
(2) Cambodia		
(3) Indonesia (2 stocks)		(Malacca+Indian O)
(4) Malaysia (2 stocks)		(Malacca)
(5) Myanmar		(Bay of Bengal and Andaman)
(6) Philippines		
(7) Thailand (2 stocks)		(Andaman)
(8) Viet Nam		
(9) Bangladesh		(Bay of Bengal)

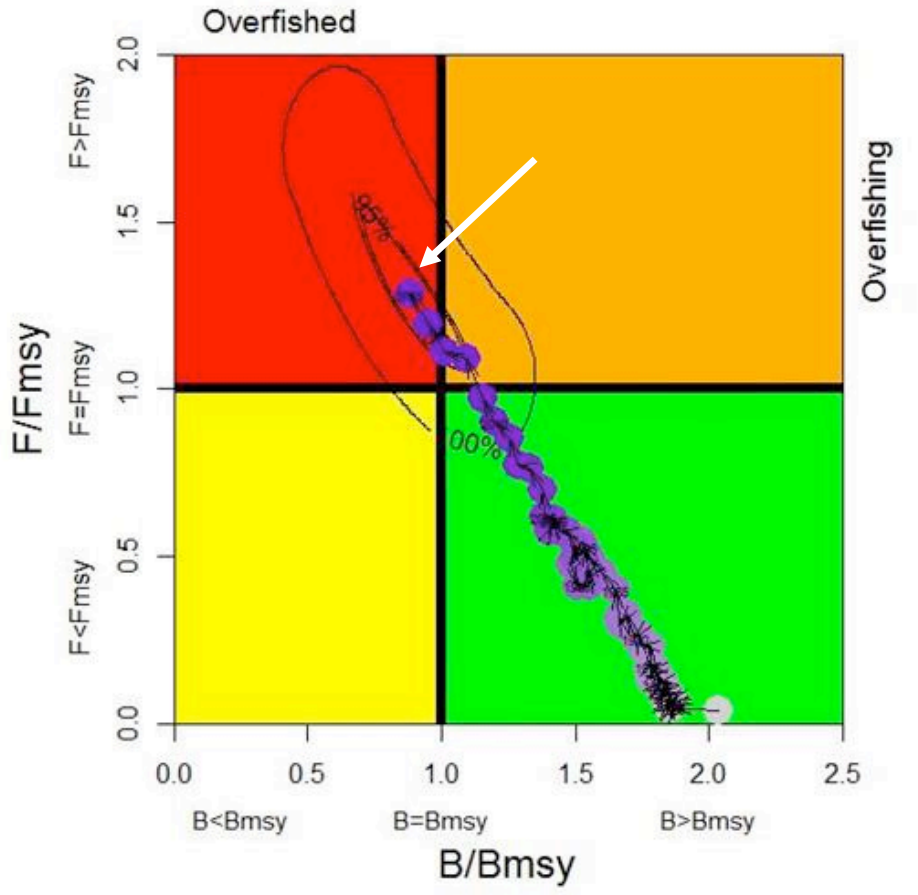
We will do 4 stock assessment

- SP ➔ demo work together
- SI
- KP
- KI

IO stock ➔ you can compare to the IOTC results (While IO)

IOTC

Spanish (2015)
SRA (Catch only)



King (2015)

UNKNOWN

4 groups (draft) 8 CORE participants need to submit a paper and present using PowerPoint

Group	Spanish (PO)	Spanish (IO)	King (PO)	King (IO)
	SP	SI	KP	KI
Supervisor	Nishida and Taki	Supapong	Taki	Nishida
Participants (CORE)	Kong (Cambodia)	Thitipon (Thailand)	Faisal (MFRDMD)	Sallehudin (Malaysia)
	KO KO (Myanmar)	one student ?	Son (Viet Nam)	Osman (MFRDMD)

Observer/Secretariat		
Suwanee (TD)	Sukchai (TD)	Sirporn (TD)
Observer (students)		
Sireemas	Phisit	Gittinan

July 20 (Fri) morning (When the prayer start?)
Presentations (15 minutes) + QA (5 minutes)

Time	9-9:20	9:20-9:40	9:40-10	10-10:20	10:20-10:50	11:20-12:10	12:10-12:30
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DATA

For stock assessment (ASPIC)
to be explained later why we use ASPIC

INPUT: global Catch and CPUE

We need to collect historical data

Search history from member countries + FAO + IOTC (January – July, 2018) (7 months)

No	Country	stock			Coordinators	Post	Agency	e-mail		以前	3月25日	4月18日	5月上旬	6月上旬		
1	Brunei	1	ブルネイ	1	Ms Noorizan Karim	Head	Department of Fisheries	noor6263@gmail.com	;	1回受取り終了	返事ありI'll send the updates on Spanish and King mackerels data to you hopefully by next week ADAM		5/26 追加データ再チェック	6/1 催促 2017 データを6月末までに送付 終了		
				2	Mr Matzaini Juna	Head		matzaini.juna@fisheries.gov.bn								
				3	Muhammad Adam Ramlee	Fisheries Assistant		adam.ramlee@fisheries.gov.bn								
				4				muhd.adam1804@gmail.com	;							
2	Cambodia	1	カンボジア	5	Mr. Suy Serywath	Director	Fisheries Research and Development Institute, Fisheries Administration (FiA)	serywath@gmail.com	;		返事ありCambodia did not have the production by species, it is for your information. Serywath	カンボジアにはさわら統計なし	終了			
				6	Mr. Kao Monirith	Deputy Director		kaomonirith@yahoo.com	;							
3	Indonesia	2	インドネシア	7	Dr Khairul Amri	Chief scientist	Research Institute for Marine Fisheries	Kh_amri@yahoo.com	;	1回受取り終了	返事なし		5/26 追加データ再チェック	以前のがすべて終了		
				8	Mr Thomas Hidayat	Researcher		hidayatthomas245@gmail.com	;							
4	Malaysia	2	マレーシア	9	Mr Samsudin Bin Basir	Chief scientist	Department of Fisheries	s_basir@yahoo.com	;		返事なし	返事なし	5月4日受取 終了			
				10	Mr Sallehudin Jamon	Scientist		dinjamon@rocketmail.com	;							
				11				sallehudin_jamon@dof.gov.my	;							
5	Myanmar	1	ミャンマー	12	Dr Htun Thein	Assistant Director	Marine Resources Survey & Research Unit, Department of Fisheries	htunthein.akyab@gmail.com	;		返事ありWe will send you soon the some existing data.Htun Thein Htun Thein		5/26 催促	6/1 催促	6・4催促	6・19催促 2回催促
				13	Mr Nay Myo Aye	Assistant Fisheries Officer		nvnghia@rimf.org.vn	;							
6	Philippines	1	フィリピン	14	Mr Noel Barut	Director	Bureau of Fisheries and Aquatic Resources (BFAR)	noel_c_barut@yahoo.com	;		返事なし	返事あり	5月11日までに送付 5/14 ＋26催促	5/31 受け取り一部まだ	6/19 最後通知	
				15	Ms Grace Lopetz	Aquaculturist II		gmvlopez@yahoo.com	;							
7	Thailand	2	タイ	16	Ms. Suwantana Tossapornpitakkul	Fishery Biologist	Marine Fisheries Technology Research and Development Institute, Department of Fisheries	tsuwantana@yahoo.com	;		返事なし	返事あり5月中に送付	5/26 催促	5/31 受け取り		
				17	Ms. Praulai Nootmorn	Senior Expert in Marine Fisheries		nootmorn@yahoo.com	;							
8	Viet Nam	1	ベトナム	18	Mr Nguyen Viet Nghia	Deputy Director	Research Institute for Marine Fisheries	nvnghia@rimf.org.vn	;		返事なし	返事ありHung担当者でないので 担当者を紹介リクエスト	5/14+26 担当問い合わせ 返事あり	5/26 新担当者HA さんへ問い合わせ 6/1 催促	6・4催促	6・19 OK
				19	Mr Pham Hung	Officer	Research Institute for Marine Fisheries	hungfam83@gmail.com	;							

thanks for data coordinators

Many feedbacks

Catch

Catch construction

- Sources

catch data

FAO+IOTC long time series (consistency)

(official data)

+

Data from member countries

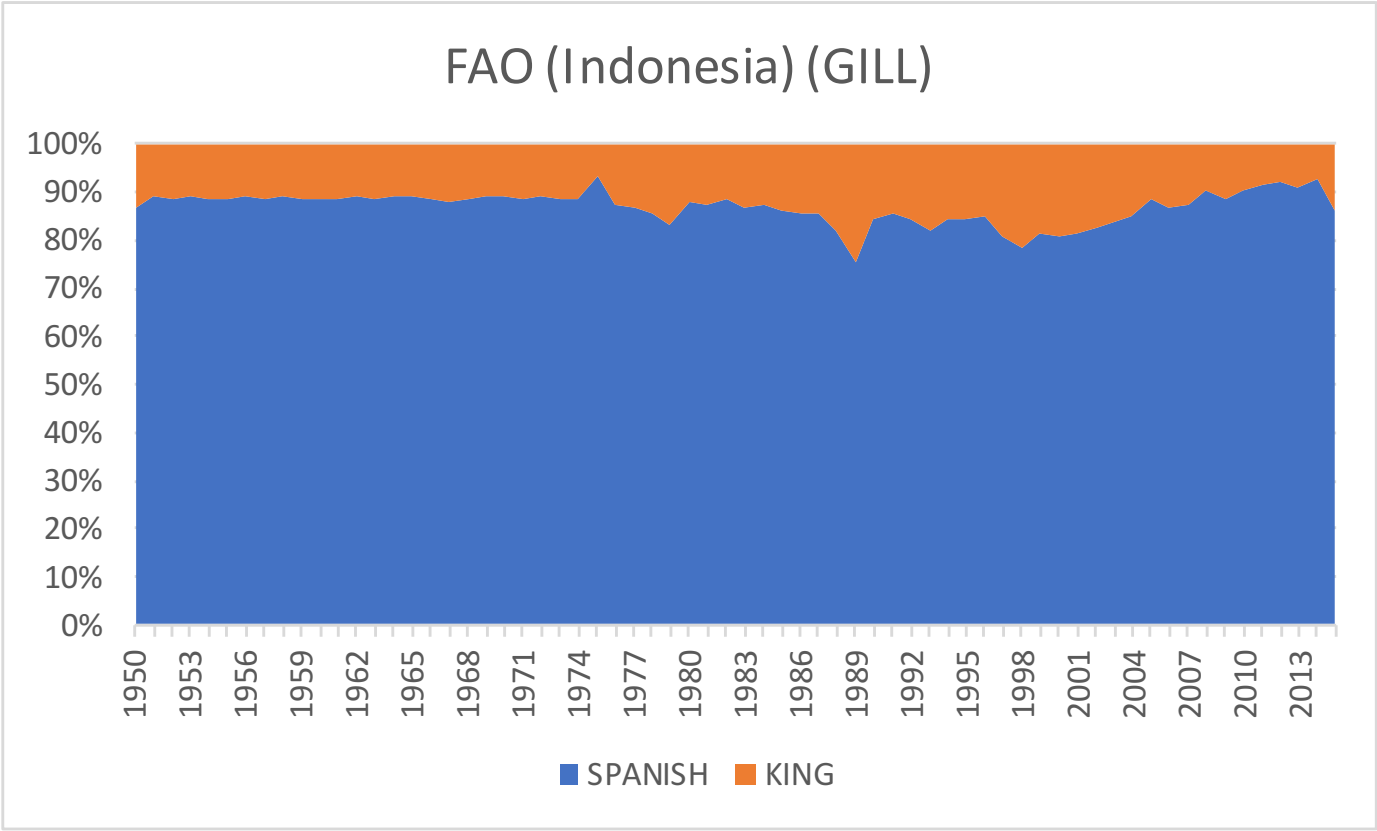
Results

SPANISH : Pacific and Indian stocks covered by country, IOTC(1950-2016) and FAO (1950-2016)		
	(a) Pacific (F71)	(b) Indian (F57)
(1) Brunei	Brunei (2001-2017)	
(2) Cambodia	(no data)	
(3) Indonesia (2 stocks)	Indonesia(2005-2016)+FAO	Indonesia (2005-2016)＋IOTC+FAO
(4) Malaysia (2 stocks)	Malaysia (1990-2017)	Malaysia (1990-2017)+IOTC
(5) Myanmar		IOTC
(6) Philippines	Philippines(1999-2017)+FAO	
(7) Thailand (2 stocks)	Thailand (2000-2016)	Thailand (2000-2016)+IOTC
(8) Viet Nam	Viet Nam (2014-2015)	
(9) Bangladesh		IOTC

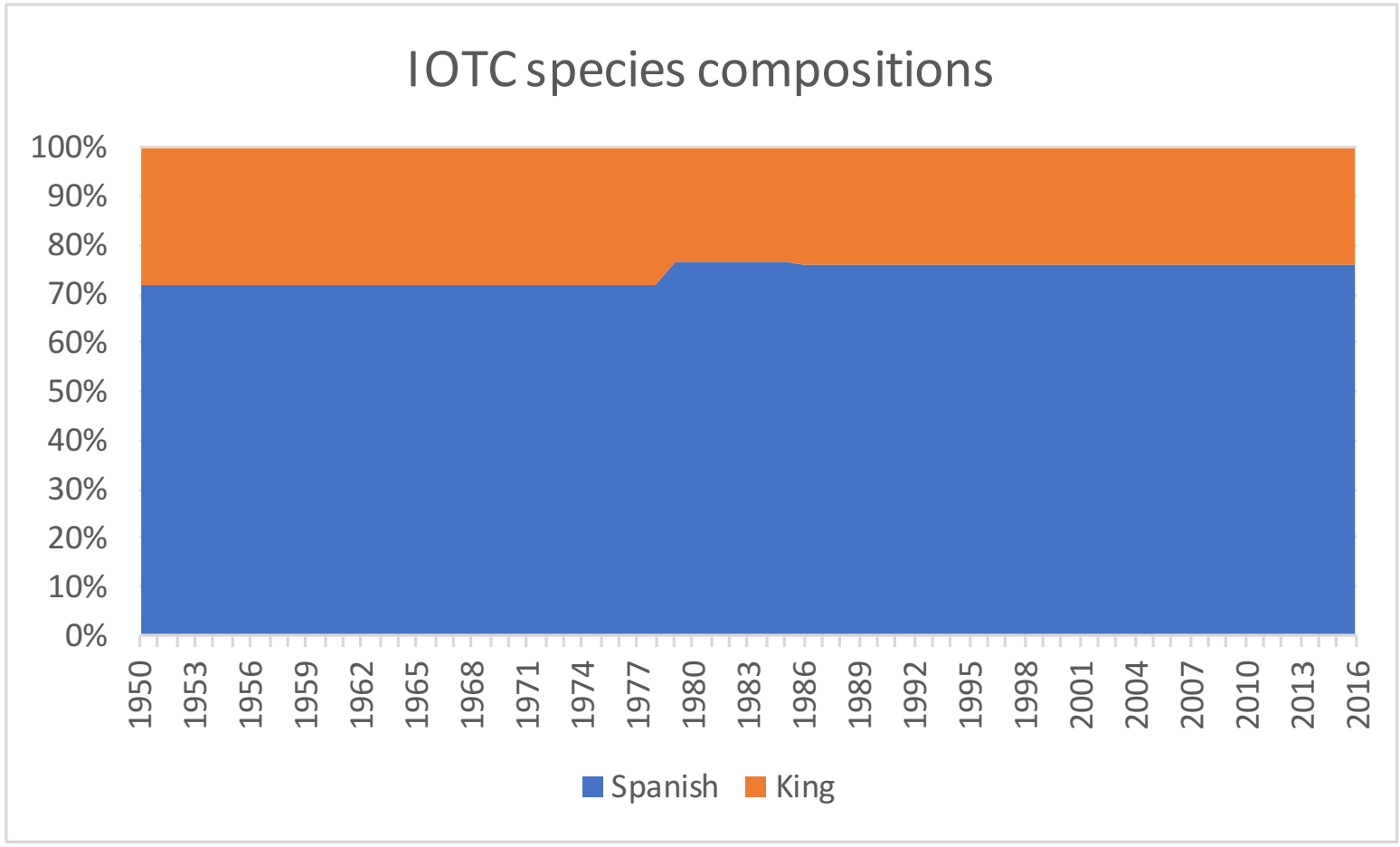
KING : Pacific and Indian stocks covered by country, IOTC (1950-2016)and FAO (1950-2015)		
	(a) Pacific (F71)	(b) Indian (F57)
(1) Brunei	Brunei (2001-2017)	
(2) Cambodia	(no data)	
(3) Indonesia (2 stocks)	Indonesia(2005-2016)+FAO	Indonesia(2005-2016)+IOTC+FAO
(4) Malaysia (2 stocks)	Malaysia (1990-2017)	IOTC
(5) Myanmar		IOTC
(6) Philippines	(no data)	
(7) Thailand (2 stocks)	(no data)	IOTC
(8) Viet Nam	Viet Nam (2014-2015)	
(9) Bangladesh		IOTC

Malaysia GILL (Pacific) (1990-2016) species aggregated uncertainties

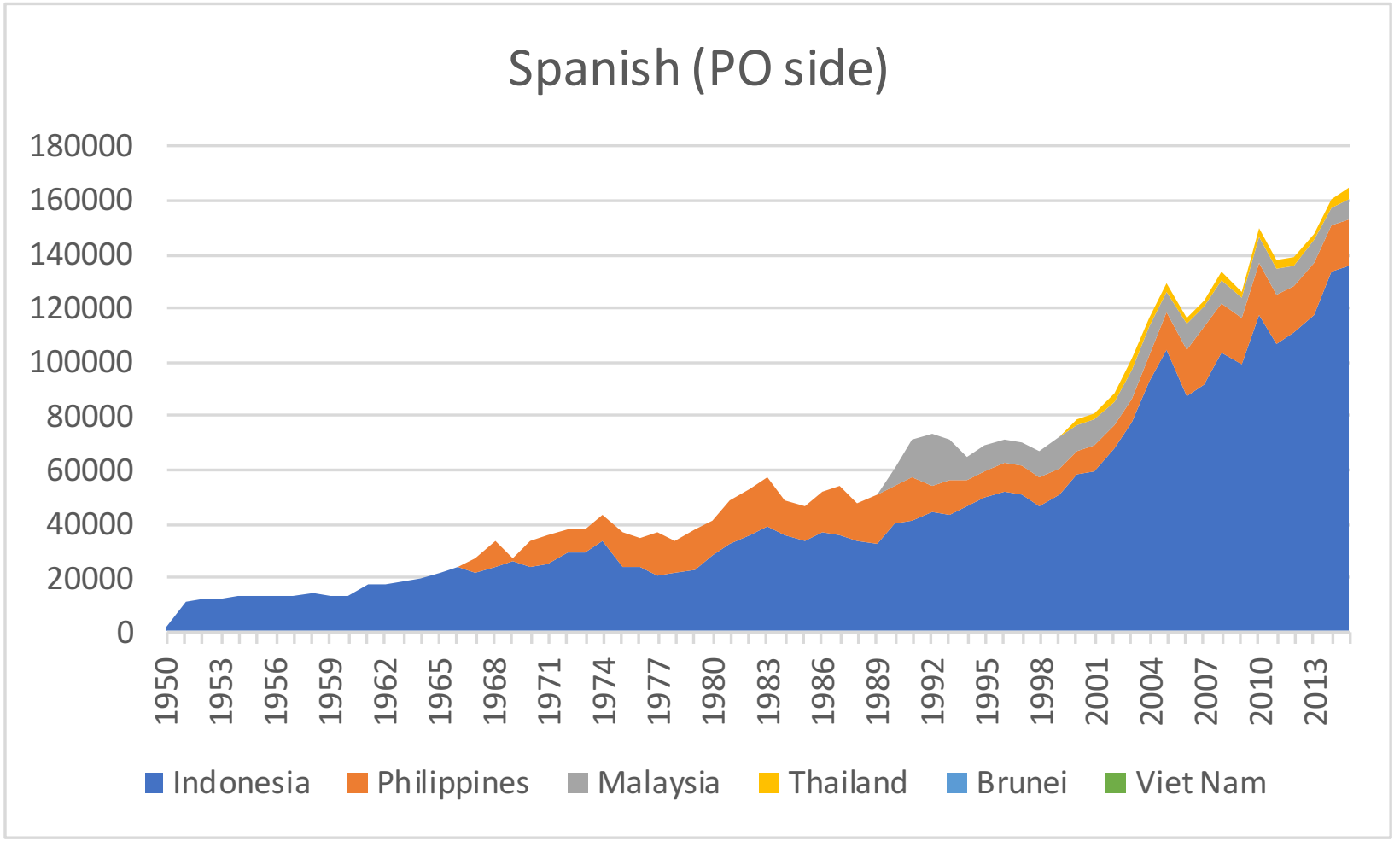
Apply FAO Indonesia (GILL) species compositions



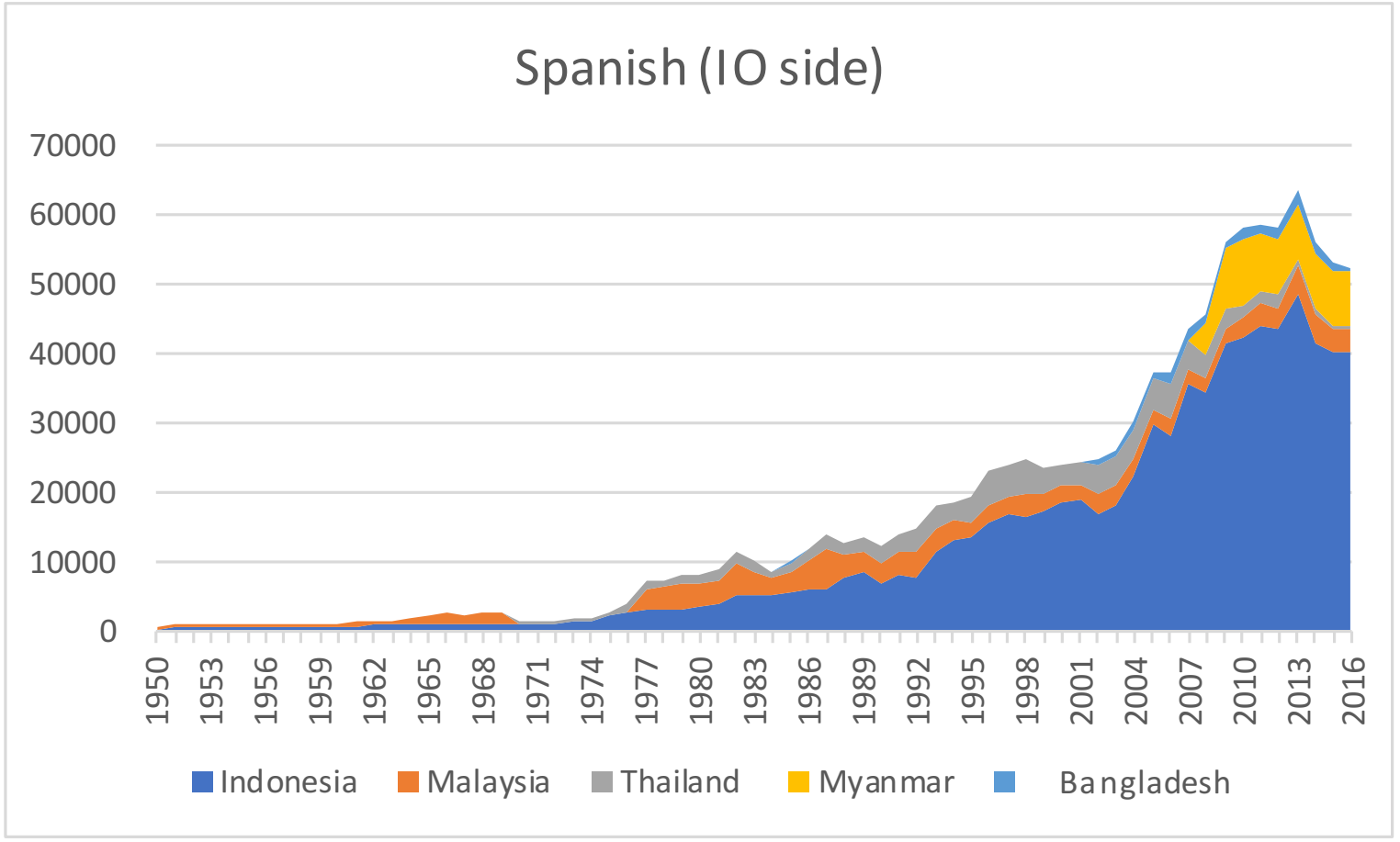
IOTC species compositions (all gears)

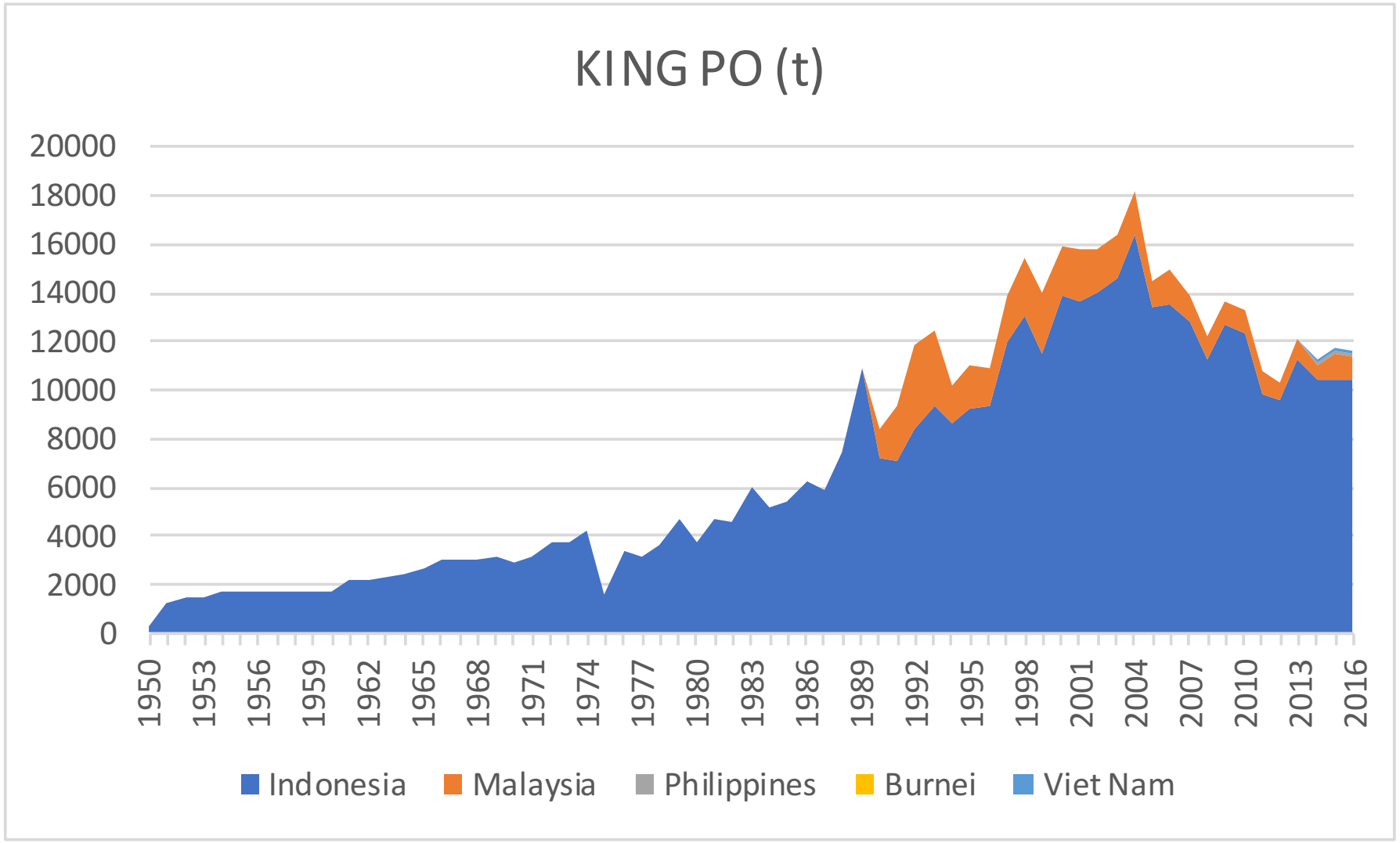


Spanish Catch PO side
FAO(Indonesia) + reports(members) (1950-2015)

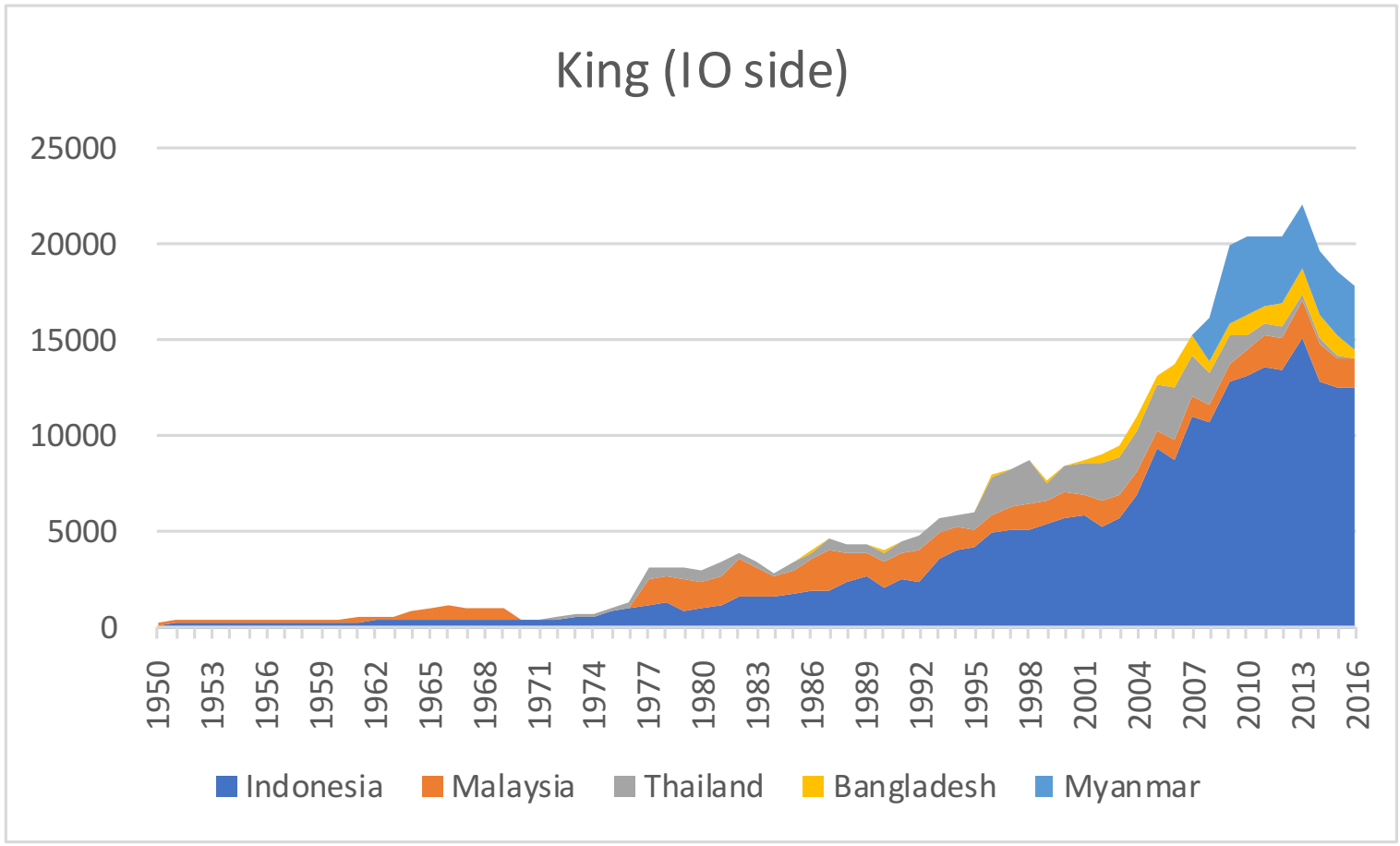


Spanish Catch IO side : IOTC database (1950-2016)

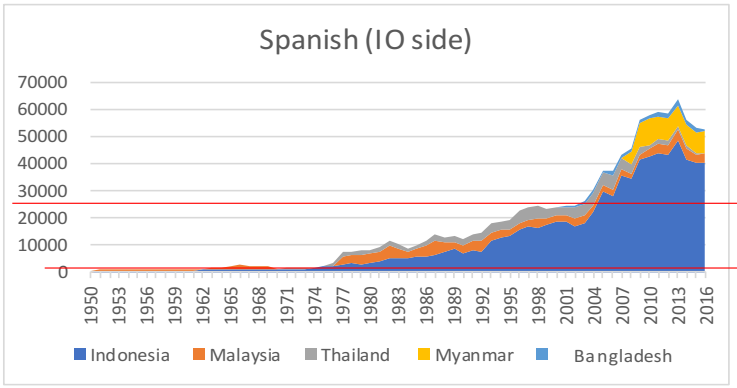


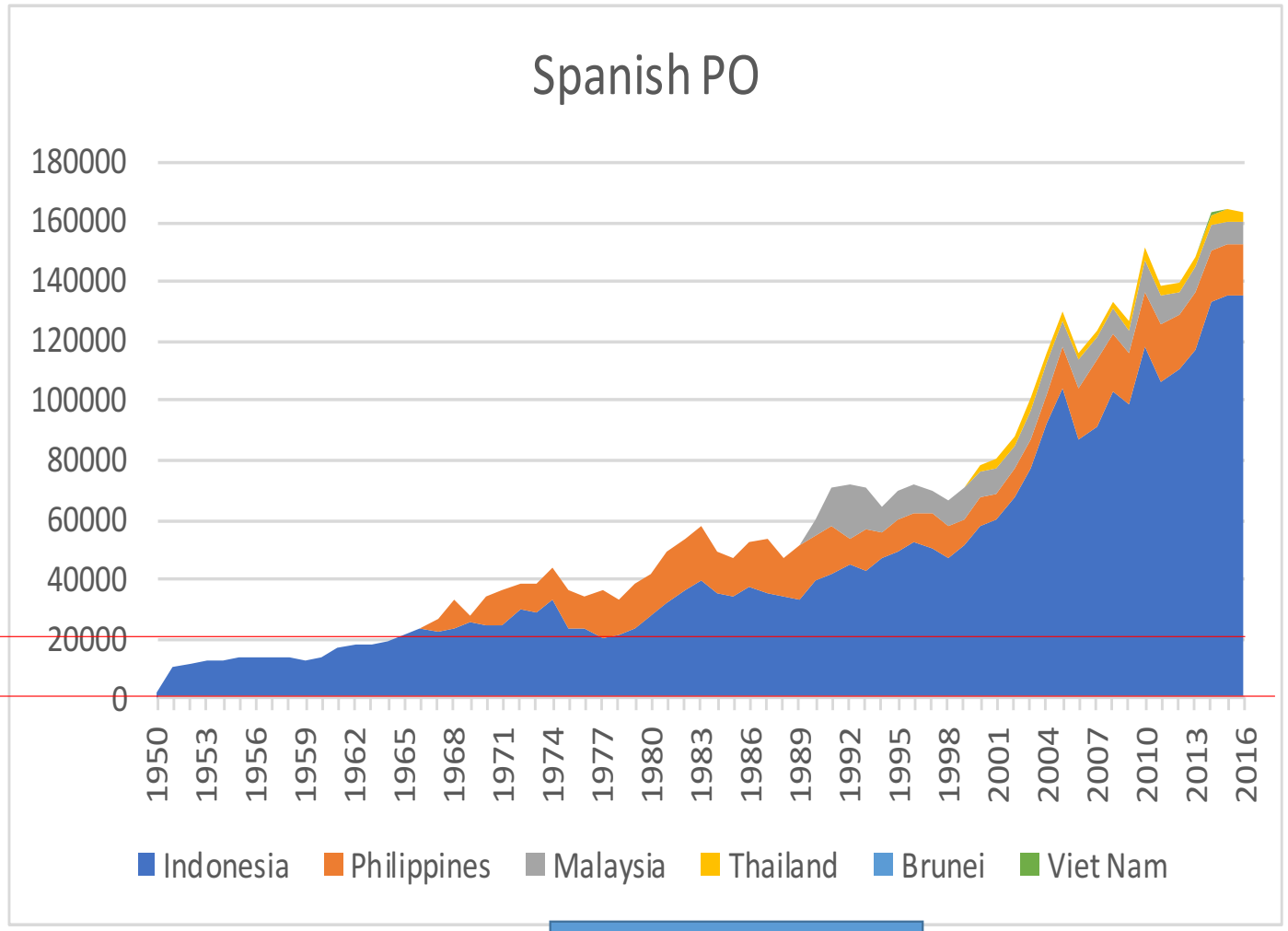

KING PO (t)
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
1950
1953
1956
1959
1962
1965
1968
1971
1974
1977
1980
1983
1986
1989
1992
1995
1998
2001
2004
2007
2010
2013
2016
Indonesia
Malaysia
Philippines
Burnei
Viet Nam

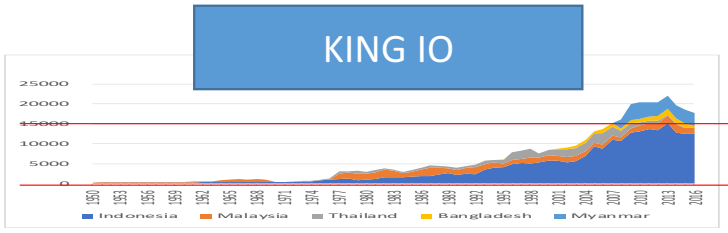
King Catch IO side : IOTC database (1950-2016)



Comparisons
Red line 20,000 t







ALL Catch trends
➔ plausible
(smooth, realistic and natural)

no sudden jumps or drops

good signs for stock assessment

Why do we need CPUE?

Basic metrics for stock assessments

If we don’t have CPUE,
we can not use major stock assessment models

We will explain this later..

CPUE

(data compilation, collection, process and massage)

What is different

between data compilation vs. collection

- Nominal CPUE

CPUE

CPUE

Beginning almost NO CPUE
(from experiences in KAW+LOT)

BUT there are many nominal CPUE **(BIG surprise)**
Brunei , Malaysia, Thailand and Philippines

But all are aggregated (no fine scale data)
No CPUE standardization possible

Regret No Indonesian CPUE ← large catch
(we need) (recommendation)

Notes on nominal CPUE

- Brunei, Thailand, Malaysia and Philippines (annual base)
- Philippines: some fine scale only for 5 years
- Malaysia : monthly (2008-2016) not for ALL (1994-2016)

- Not possible CPUE standardization

- We use nominal CPUE➔ uncertainties

To select feasible CPUE : 3 weeks

- Data massage ➔ if time allowed, we will practice…
- SEAFDEC plan this training in the future (with SSS?)

QC (data massage)

Criteria (massage) to select plausible CPUE (1)

- 10 years or more ➔ if no long ones (combine 2 CPUE)
- Do not delete ➔Try to use all data ➔ delete only outliers
- No big jumps nor drops
- high negative correlations between catch vs CPUE
- Make sure CPUE are not species aggregated

  ➔ if so, try to separate using species compositions
- If we have aggregated nominal CPUE (not possible STD_CPUE), we will use even nominal CPUE if it is plausible.

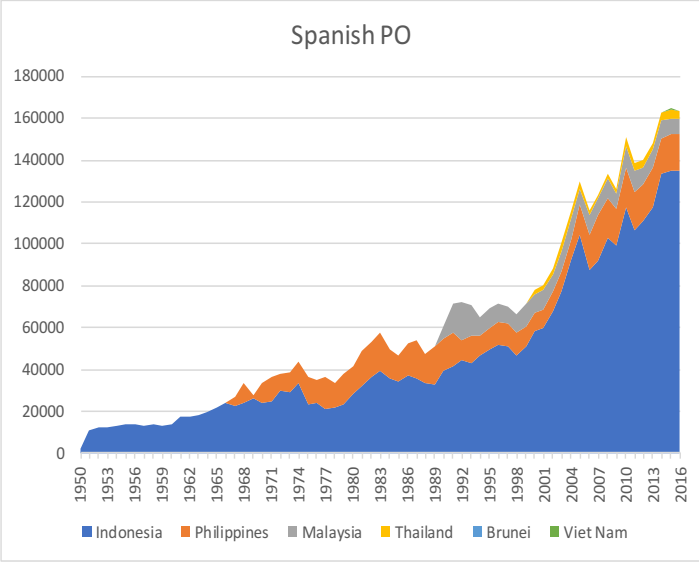
Criteria (massage) to select plausible CPUE (2)

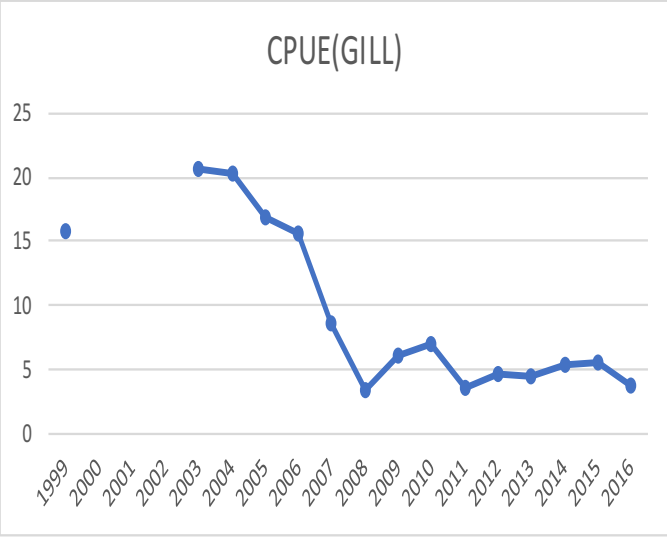
- If trends of CPUE by different fleet, gear and area are similar
  => Good as independent CPUE show consistent trends ➔ plausible
- Check sample size ➔ we may need to aggregate to area, Q etc..
- Select 1 or 2 best ones : personal preference (Philosophy)
- 2 or more➔ average or separate
- If we use 2 or more ➔ difficult to get parameters (no convergence)

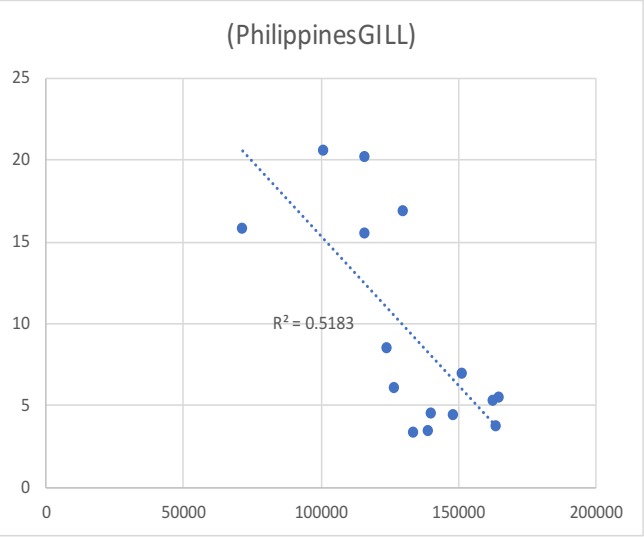
Results

Spanish (Pacific)

Country	gear	Area	CORR	nominal CPUE	19xx	20xx																to be used in SA?	Reason
				unit	99	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16		
Malaysia	GILL	Labuan	38%	t/net																		No	
Philippines	drift-GILL	ALL	52%	kg/day /boat																		YES	long (15 yrs)and high CORR
Thailand (Gulf of Thailand)	drift-GILL	All	21%	t/day																		NO	
	PS	2	23%																			NO	

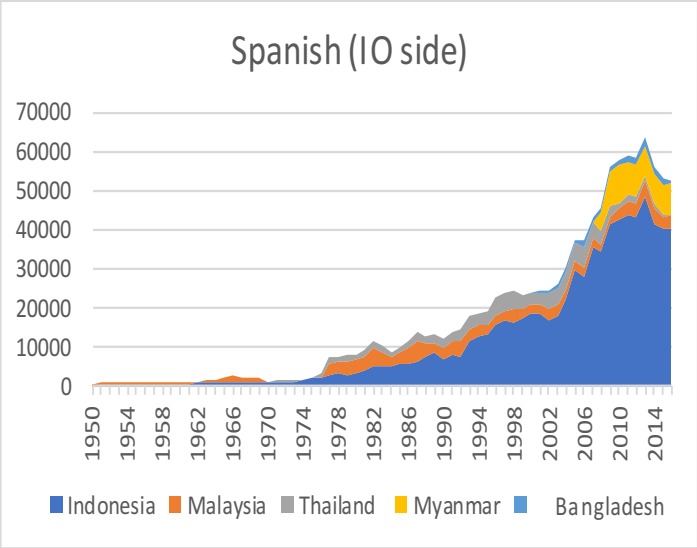


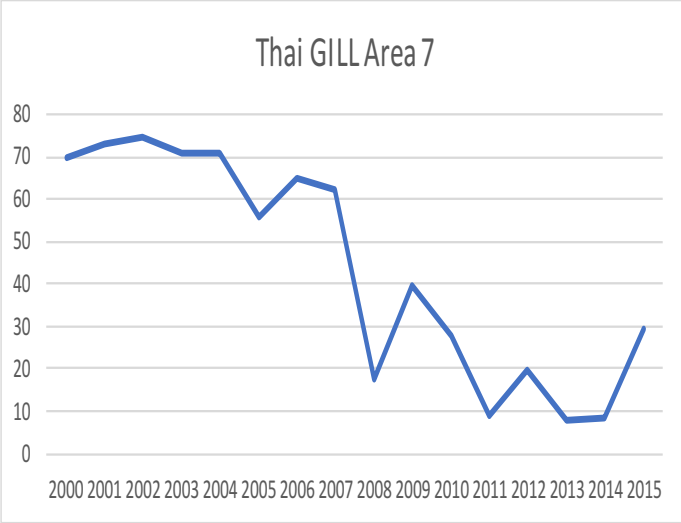


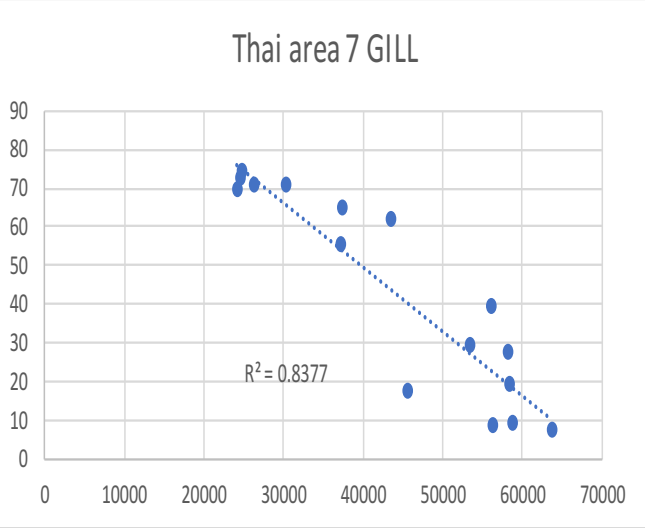


Spanish (Indian)

Country	gear	Area	CORR	nominal CPUE	20xx																to be used in SA?	reason
				unit	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16		
Malaysia	drift-GILL	West	14%	t/day																	NO	
Thailand (Andaman Sea)	KING-GILL	Andaman area 7	84%	t/day																	YES	long time series (16 yrs) and highCORR
	PS	Andaman area 7	54%																		NO	

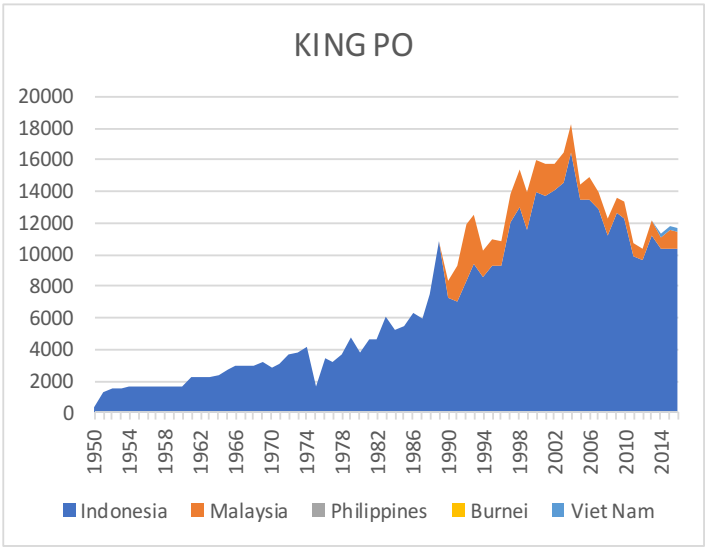


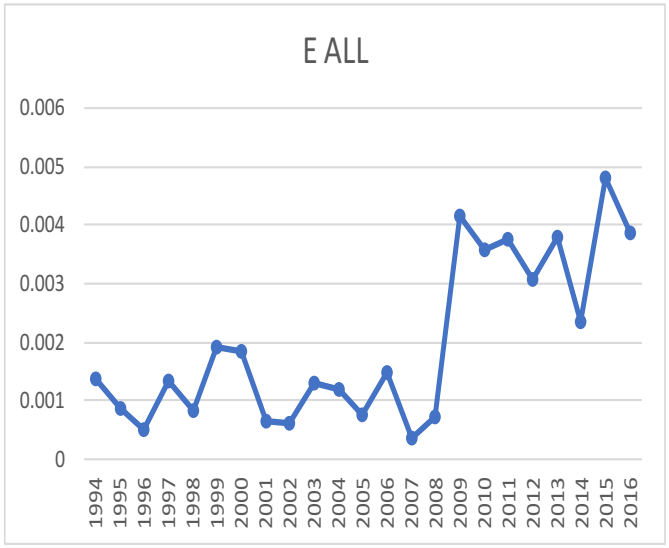


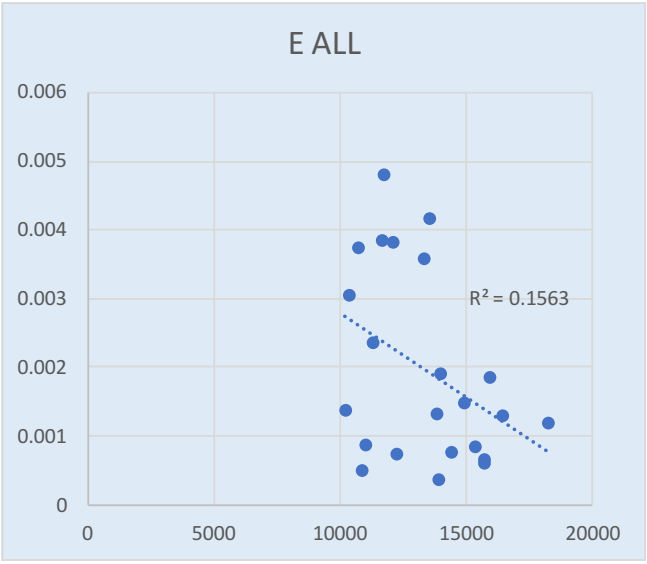


King (Pacific)

Country	gear	Area	CORR	nominal CPUE	19xx			20xx															to be used in SA?	Reasom
				unit	97	98	99	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16		
Malaysia	drift-GILL	East	16%	t/day																				YES	LONG (20 yrs)
Philippines	GILL	All	6%	kg/day /boat																				NO	

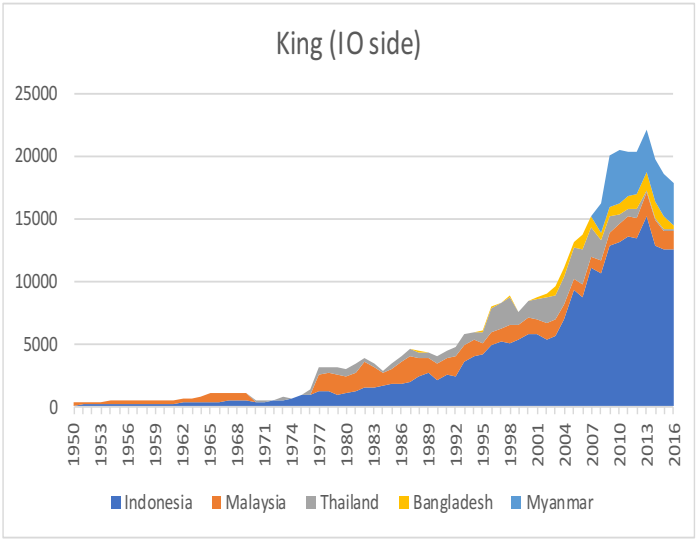


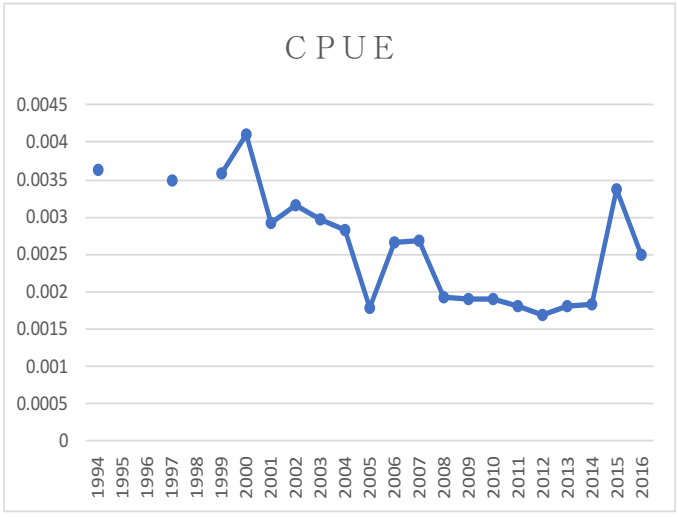


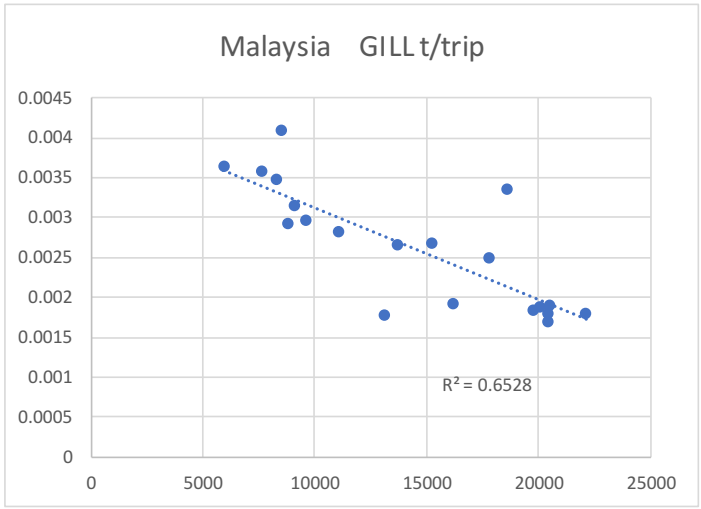


King (Indian)

Country	gear	Area	CORR	nominal CPUE	19xx						20xx																to be used in SA?
				unit	94	95	96	97	98	99	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
Malaysia	GILL	West	65%	t/net																							long time (20 yrs) and best CORR







Contents

1. Introduction
2. National Report
3. Biology and Ecology (Dr Taki)
4. Stock structure
5. Data (Catch and CPUE)
6. CPUE standardization
7. Stock assessment (ASPIC) (r: Supapong)
8. Kobe plot
9. Risk assessment
10. Discussion and recommendations
11. Future

6. CPUE standardization

CPUE (lecture)

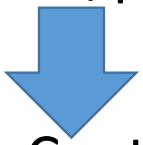
Errors (biases) in nominal CPUE

Nominal CPUE : various types of errors

miss-identification of species

biases in sampling ➔ CPUE standardization

data entries/processing….



QC (Quality Control) (massage)

to select realistic and accurate CPUE

Why we need CPUE standardization

- Later if time allowed

Practice CPUE standardization

- Later (next time)

OUR CASE
Simple GLM : 3 covariates (factors)
Year, season (Mo/Q) and area effect
no interaction

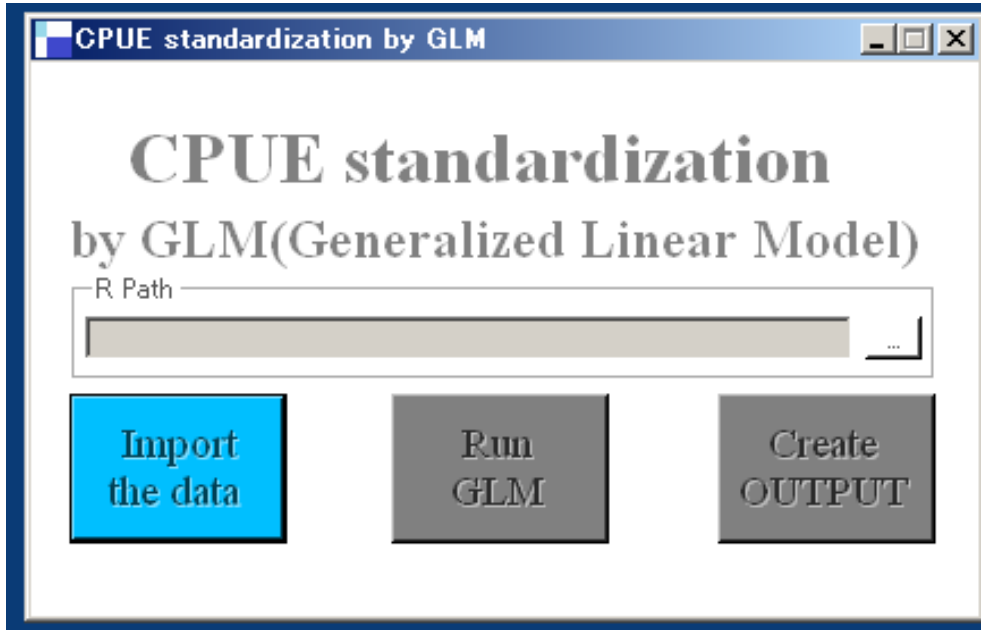
- Log (CPUE+ C)=mean+[YR]+[Q]+[area] +[error] (full model)
- Log (CPUE+ C)=mean+[YR]+[Q] +[error]
- Log (CPUE+ C)=mean+[YR]+[area] +[error]
- Log (CPUE+ C)=mean+[YR] +[error]

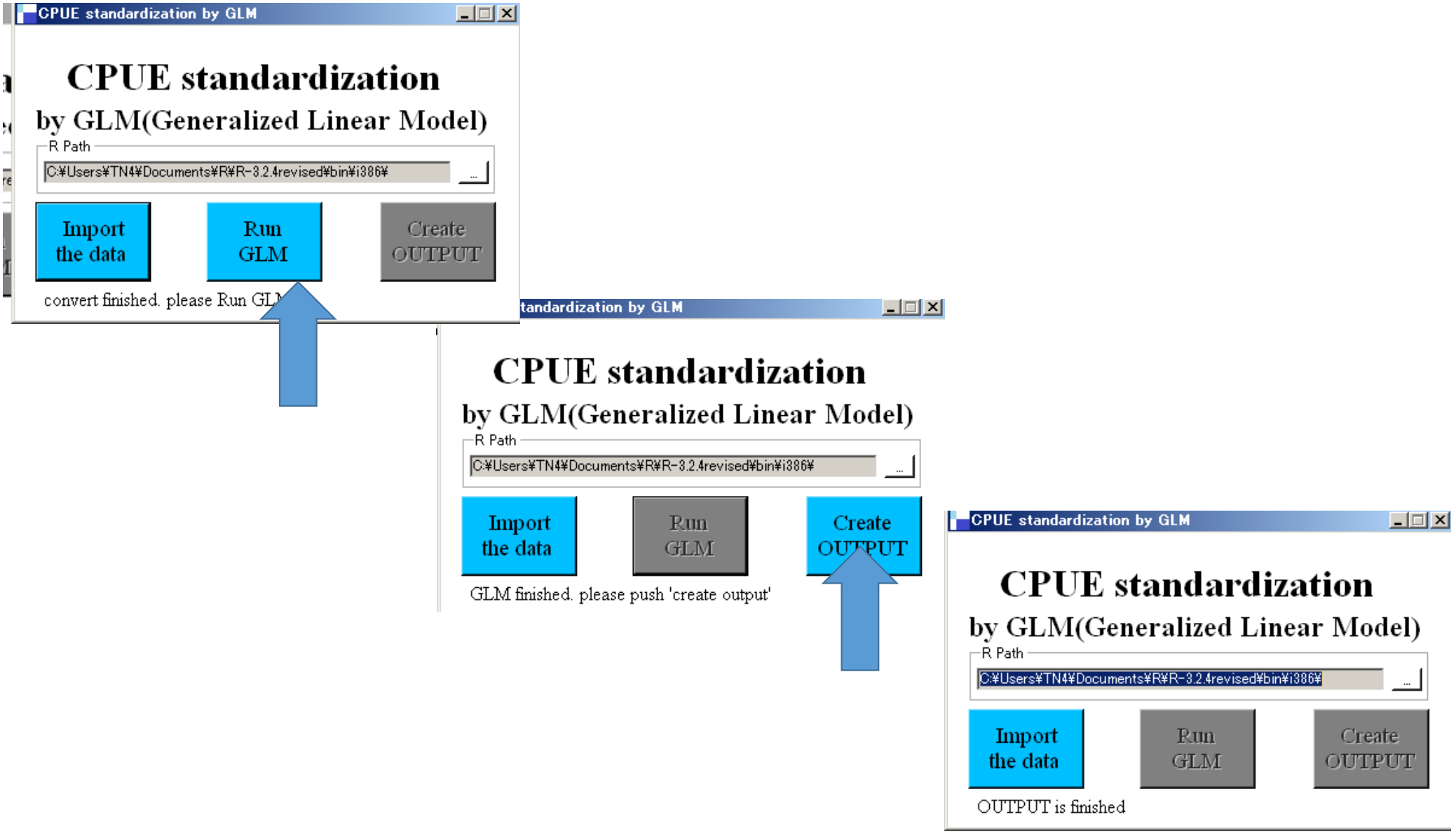
partial model

C: constant 10% of average nominal CPUE

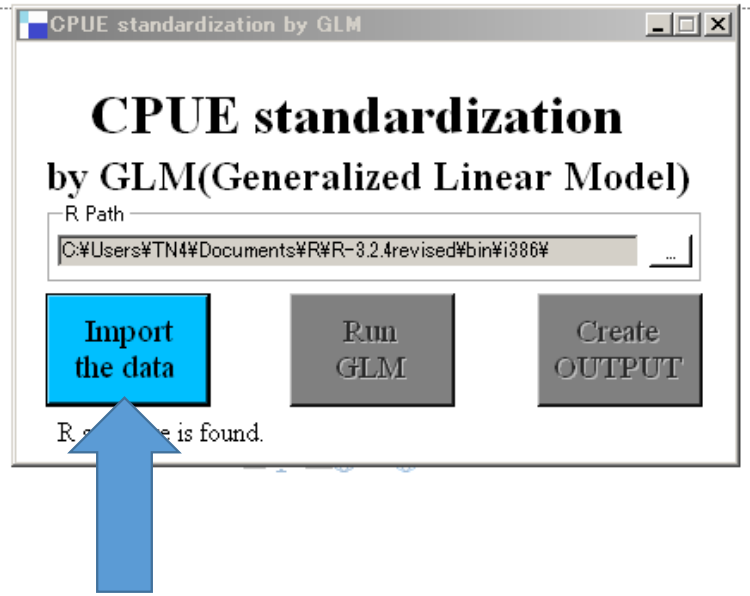
CPUE standardization 

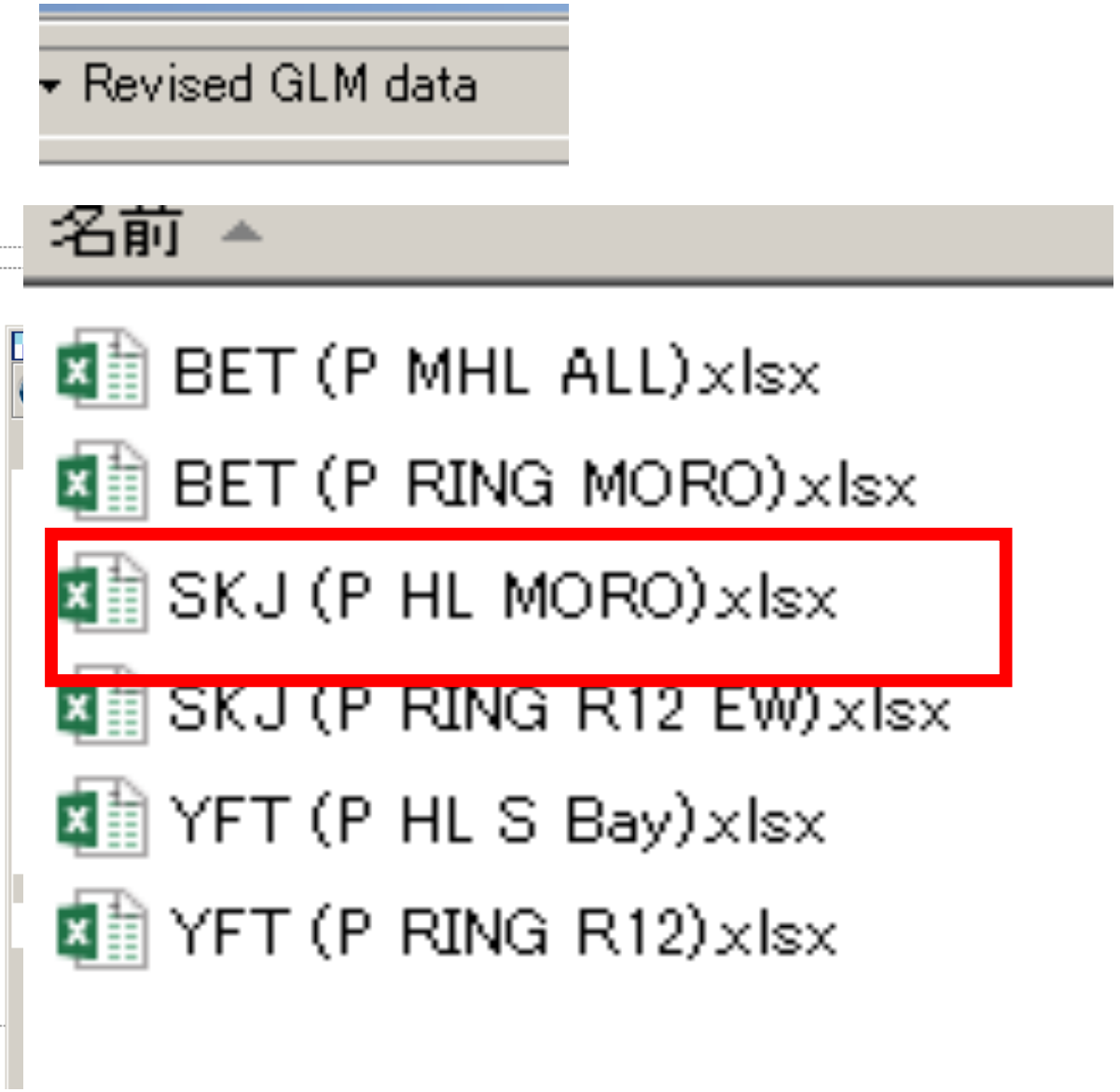
double clicks



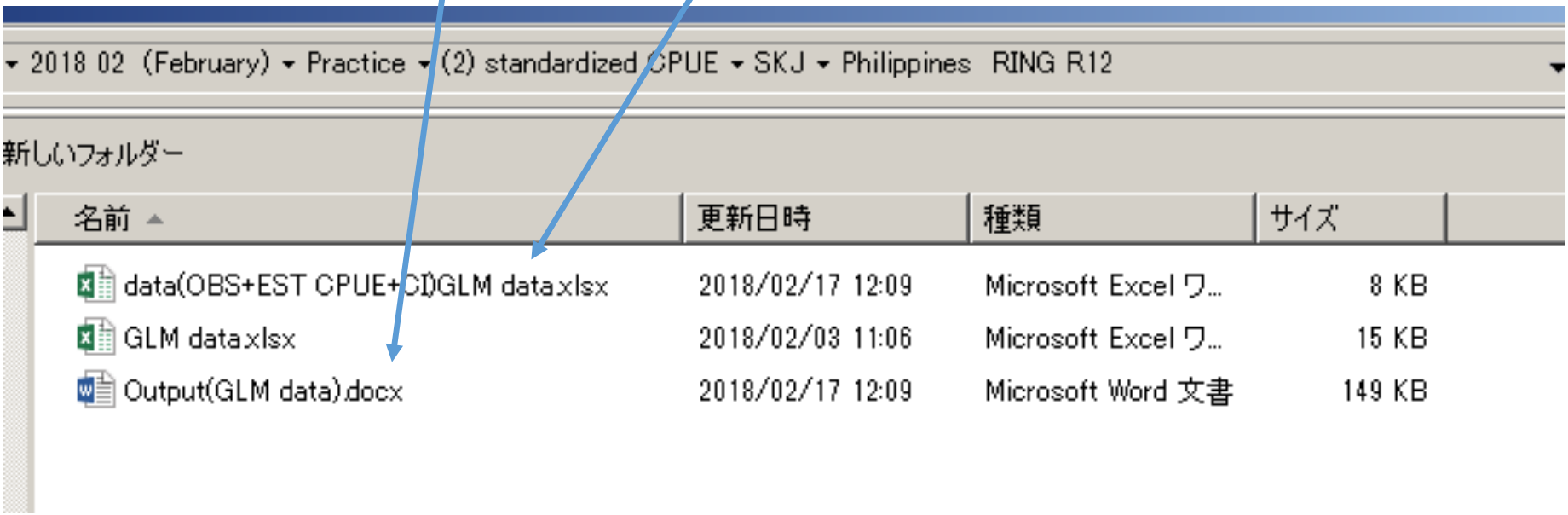

CPUE standardization by GLM
CPUE standardization
by GLM(Generalized Linear Model)
R Path
C:¥Users¥TN4¥Documents¥R¥R-3.2.4revised¥bin¥i386¥
Import the data
Run GLM
Create OUTPUT
convert finished. please Run GL
tandardization by GLM
CPUE standardization
by GLM(Generalized Linear Model)
R Path
C:¥Users¥TN4¥Documents¥R¥R-3.2.4revised¥bin¥i386¥
Import the data
Run GLM
Create OUTPUT
GLM finished. please push 'create output'
CPUE standardization by GLM
CPUE standardization
by GLM(Generalized Linear Model)
R Path
C:¥Users¥TN4¥Documents¥R¥R-3.2.4revised¥bin¥i386¥
Import the data
Run GLM
Create OUTPUT
OUTPUT is finished

Select data


CPUE standardization by GLM
CPUE standardization
by GLM(Generalized Linear Model)
R Path
C:¥Users¥TN4¥Documents¥R¥R-3.2.4revised¥bin¥i386¥
Import the data
Run GLM
Create OUTPUT
is found.


Revised GLM data
名前
BET (P MHL ALL).xlsx
BET (P RING MORO).xlsx
SKJ (P HL MORO).xlsx
SKJ (P RING R12 EW).xlsx
YFT (P HL S Bay).xlsx
YFT (P RING R12).xlsx

Output(report)　　data



Word file: 4 types of output

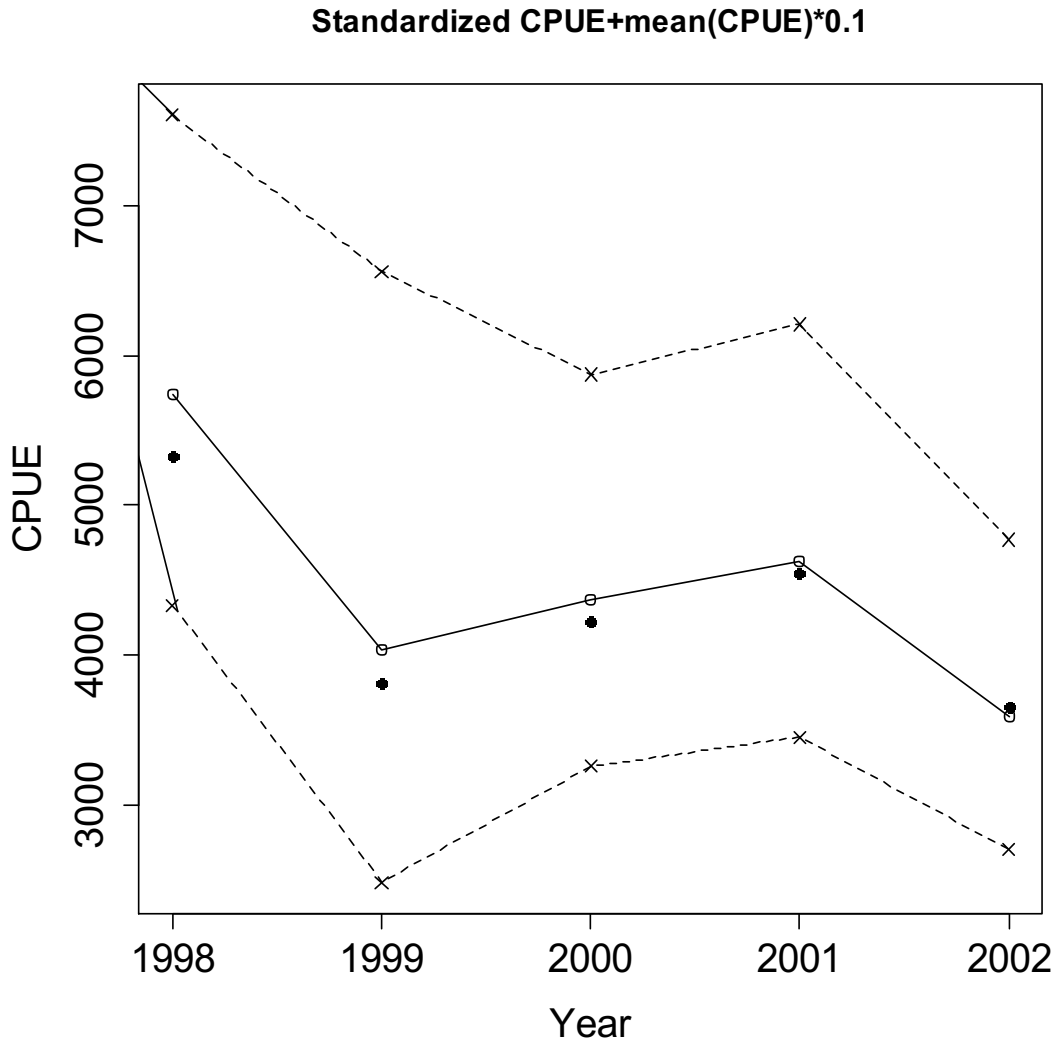
ANOVA (Analysis Of Variance) Table					
Adjusted R2 = 0.0978					
Factors	DF (Degrees of Freedom)	Type III SS (Sum of Squares)	MSE (Mean Squared Error)	F value	Pr(>F)
YR	4	4.48	1.12	2.34	0.06
Q	3	8.44	2.81	5.88	0.00
area	1	0.45	0.45	0.95	0.33
Residuals	176	84.23	0.48		

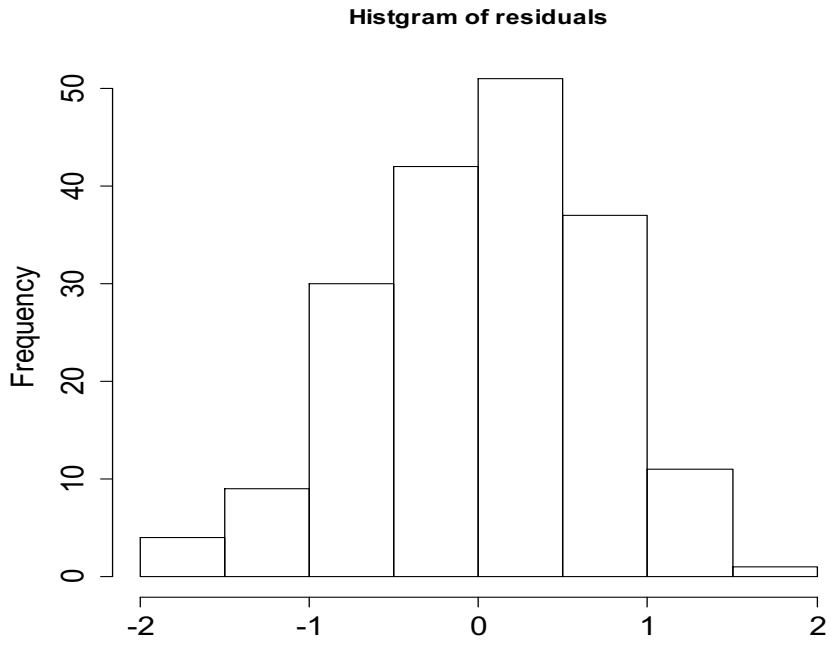
Pr of year affecting nominal CPUE NOT significantly

Explanatory note: ANOVA

ANOVA is an analysis tool used in statistics that splits the aggregate variability found inside a data set into two parts: systematic factors (such as YR: year, Q: quarter and area effect in our case) and random factors (residuals or unknown errors besides systematic factors).

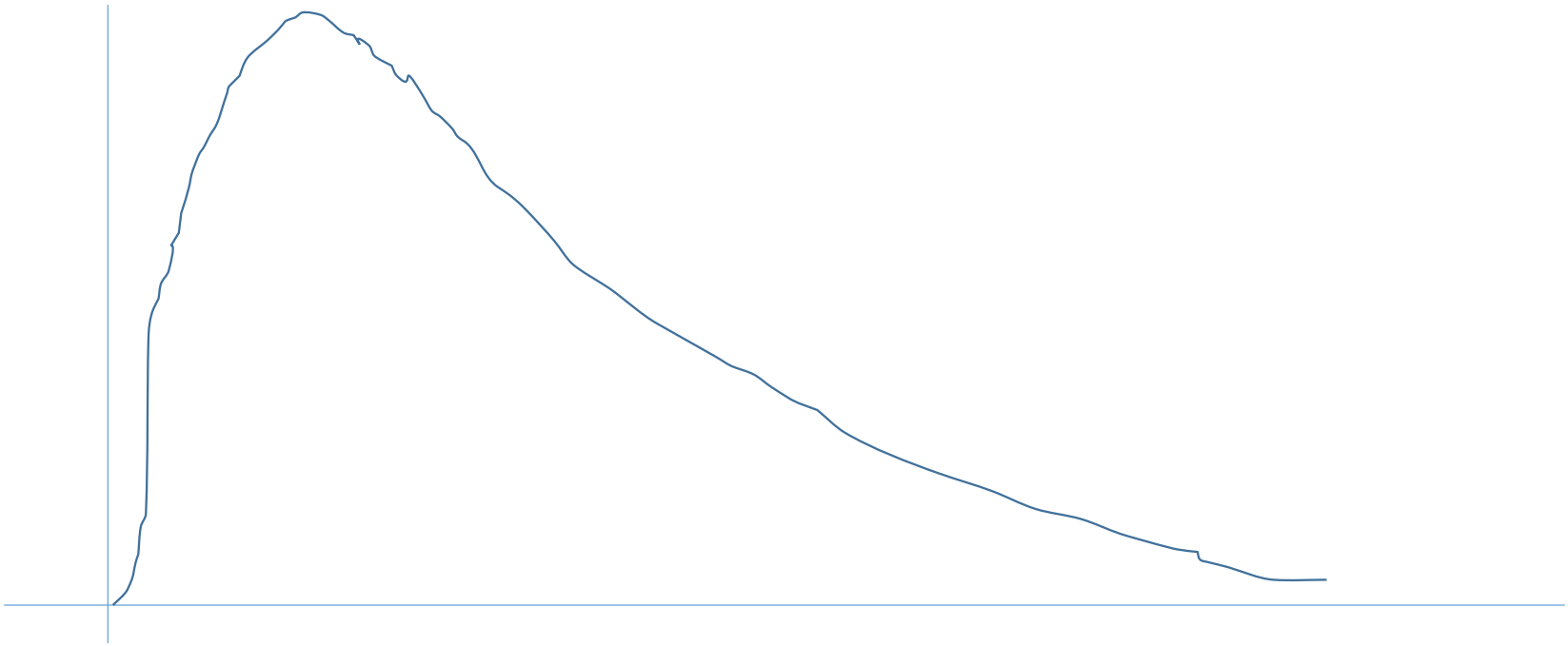
The systematic factors have a statistical influence on the given data set (nominal CPUE in our case), but the random factors do not. Analysts use the analysis of the variance test to determine if the resultant independent variables (such as YR, Q and area) statistically affect the dependent variable (nominal CPUE in our case).


Standardized CPUE+mean(CPUE)*0.1
CPUE
3000
4000
5000
6000
7000
1998
1999
2000
2001
2002
Year



Explanatory note

The Histogram of the Residual can be used to check whether the variance is normally distributed. A symmetric bell-shaped histogram which is evenly distributed around zero indicates that the normality assumption is likely to be true. If the histogram indicates that random error is not normally distributed, it suggests that the model's underlying assumptions may have been violated.

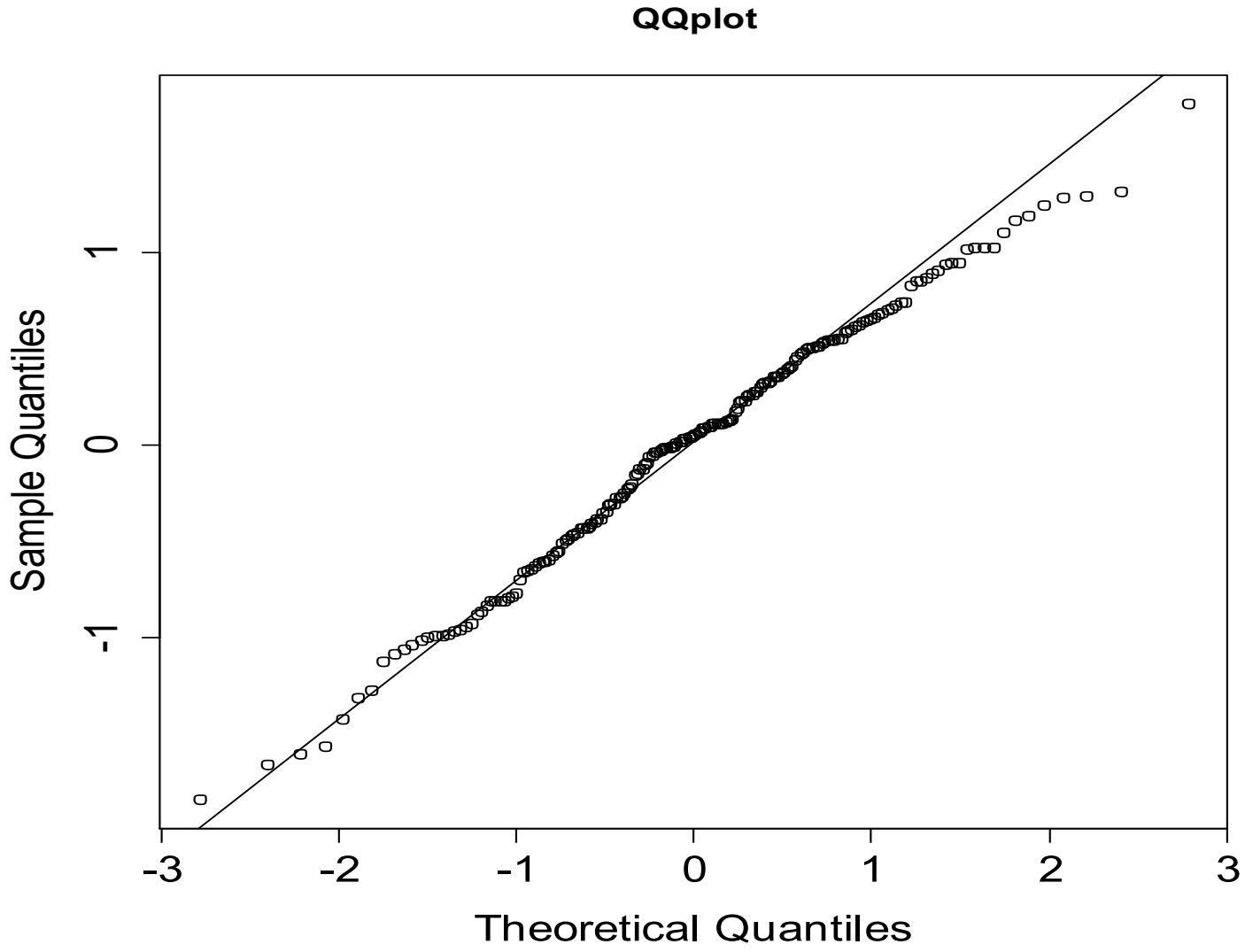


Explanatory note

The Q-Q plot, or quantile-quantile plot, is a graphical tool to help us assess if a set of data plausibly came from some theoretical distribution such as a Normal or exponential. For example, if we run a statistical analysis that assumes our dependent variable is Normally distributed, we can use a Normal Q-Q plot to check that assumption.

It's just a visual check, not an air-tight proof, so it is somewhat subjective. But it allows us to see at-a-glance if our assumption is plausible, and if not, how the assumption is violated and what data points contribute to the violation.

A Q-Q plot is a scatterplot created by plotting two sets of quantiles against one another. If both sets of quantiles came from the same distribution, we should see the points forming a line that's roughly straight.


QQplot
Sample Quantiles
Theoretical Quantiles
-3
-2
-1
0
1
2
3
-1
0
1

How GLM is conducted by R?

```
#First, please set the working directory. This is the place of the file.
setwd("C:/")

#!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!#
#Loading data. Note that the order of column should be set as the same of the sample proram.
#In other words, prepare these column by this order, "Year", "season", "area" and "CPUE", although
#the name of the column is not the matter.
#!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!#

Data <- read.delim("GOT KAW.txt", header=T)
colnames(Data) <- c("YR", "Q", "area", "CPUE")

#Model fitting by linear model
#Here, we added the mean value of CPUE by 0.1 (i.e., mean(CPUE)*0.1) because there were a lot of zero values.
res <- lm(log(Data$CPUE+mean(Data$CPUE*0.1)) ~ as.factor(Data$YR) + as.factor(Data$Q) +
as.factor(Data$area))
summary(res)

###Calculating estimated CPUE+mean(CPUE)*0.1 and its 95% confidential interval###
Data$Estimated_CPUE    <- exp(predict(res)+sd(summary(res)$residuals)^2/2)
Data$Estimated_CPUE975 <- exp(predict(res)+predict(res, se.fit=T)$se*1.96+sd(summary(res)$residuals)^2/2)
Data$Estimated_CPUE025 <- exp(predict(res)-predict(res, se.fit=T)$se*1.96+sd(summary(res)$residuals)^2/2)
```

How GLM is conducted by R?

```
#If you want, you can check the estimated log(CPUE+mean(CPUE)*0.1) and its 95% confidential intervals
#plot(log(Data[, 4]+mean(Data[, 4])*0.1))
#points(predict(res), type="l")
#points(predict(res)+predict(res, se.fit=T)$se*1.96, type="l", lty=2)
#points(predict(res)-predict(res, se.fit=T)$se*1.96, type="l", lty=2)

#If you want, you can check the estimated CPUE+mean(CPUE)*0.1 and its 95% confidential intervals
#plot(Data[, 4]+mean(Data[, 4])*0.1, ylab="CPUE", cex.lab=1.5, cex.axis=1.5, pch=16)
#points(Data$Estimated_CPUE, type="l", lwd=1.2)
#points(Data$Estimated_CPUE025, type="l", lty=2, lwd=1.2)
#points(Data$Estimated_CPUE975, type="l", lty=2, lwd=1.2)

#Now, we estimated CPUE+mean(CPUE)*0.1 by year, area and season. However, we only need the CPUE by year.
#Therefore, the estimated CPUE was aggregated to yearly CPUE
Obs_CPUE <- aggregate(Data$CPUE+mean(Data$CPUE)*0.1~ Data$YR, FUN=mean, na.rm=T)
Est_CPUE <- aggregate(Data$Estimated_CPUE~ Data$YR, FUN=mean, na.rm=T)
Est_CPUE025 <- aggregate(Data$Estimated_CPUE025~ Data$YR, FUN=mean, na.rm=T)
Est_CPUE975 <- aggregate(Data$Estimated_CPUE975~ Data$YR, FUN=mean, na.rm=T)

#Estimated yearly CPUE+mean(CPUE)*0.1 and its 95% confidential interval.
#Bold line is estimated yearly CPUE+mean(CPUE)*0.1 and black points are observed yearly CPUE+mean(CPUE)*0.1.
#Break lines show the 95% confidential interval.
setwd("C:/") #the place of output file
pdf("Outputs GOT KAW.pdf") #output as PDF file
plot(Obs_CPUE[, 1], Obs_CPUE[, 2], ylim=c(min(Obs_CPUE, Est_CPUE025[, 2]), max(Obs_CPUE[, 2], Est_CPUE975[, 2])),
     xlab="Year", ylab="CPUE", cex.lab=1.5, cex.axis=1.5, pch=16, main="Standardized CPUE+mean(CPUE)*0.1")
points(Est_CPUE[, 1], Est_CPUE[, 2], type="l", lwd=1.5)
points(Est_CPUE025[, 1], Est_CPUE025[, 2], type="l", lty=2, lwd=1.5)
points(Est_CPUE975[, 1], Est_CPUE975[, 2], type="l", lty=2, lwd=1.5)
```

```
#Histgram of residuals (diferrences between estimated and observed CPUE+mean(CPUE)*0.1)
hist(resid(res), cex.lab=1.5, cex.axis=1.5,main="Histgram of residuals")

#QQplot
qqnorm(resid(res),    cex.lab=1.5, cex.axis=1.5, main="QQplot")
qqline(resid(res))
dev.off()

#Anova table
resanova <- anova(res, test="F")

#R2
r2 <- summary(res)$adj.r.squared

M <- matrix(NA, nrow=nrow(resanova), ncol=(ncol(resanova)+1))
M[, 1] <- round(resanova[, 1], 4)
M[, 2] <- round(resanova[, 2], 4)
M[, 3] <- round(resanova[, 3], 4)
M[, 4] <- round(resanova[, 4], 4)
M[, 5] <- round(resanova[, 5], 4)
M[nrow(M), 6] <- round(r2, 4)
rownames(M) <- rownames(resanova)
colnames(M) <- c(colnames(resanova), "Adjusted R2")

#Anova table and adjusted R2 are output as CSV file
write.csv(M, "ANOVA and r2 GOT KAW.csv")

#The standardized and nominal CPUE
M2 <- matrix(NA, nrow=nrow(Obs_CPUE), ncol=4)
rownames(M2) <- Obs_CPUE[, 1]
M2[, 1] <- Obs_CPUE[, 2]
M2[, 2] <- Est_CPUE[, 2]
M2[, 3] <- Est_CPUE025[, 2]
M2[, 4] <- Est_CPUE975[, 2]
colnames(M2) <- c("Observed CPUE+0.1*mean(CPUE)", "Estimated CPUE+0.1*mean(CPUE)", "2.5%", "97.5%")
write.csv(M2, "Standardized CPUE0.1mean(CPUE) GOT KAW.csv")
```

Contents

1. Introduction
2. National Report
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11. Future

Stock assessment (lecture)

Why we need stock assessments?

To understand **the status of the stock**

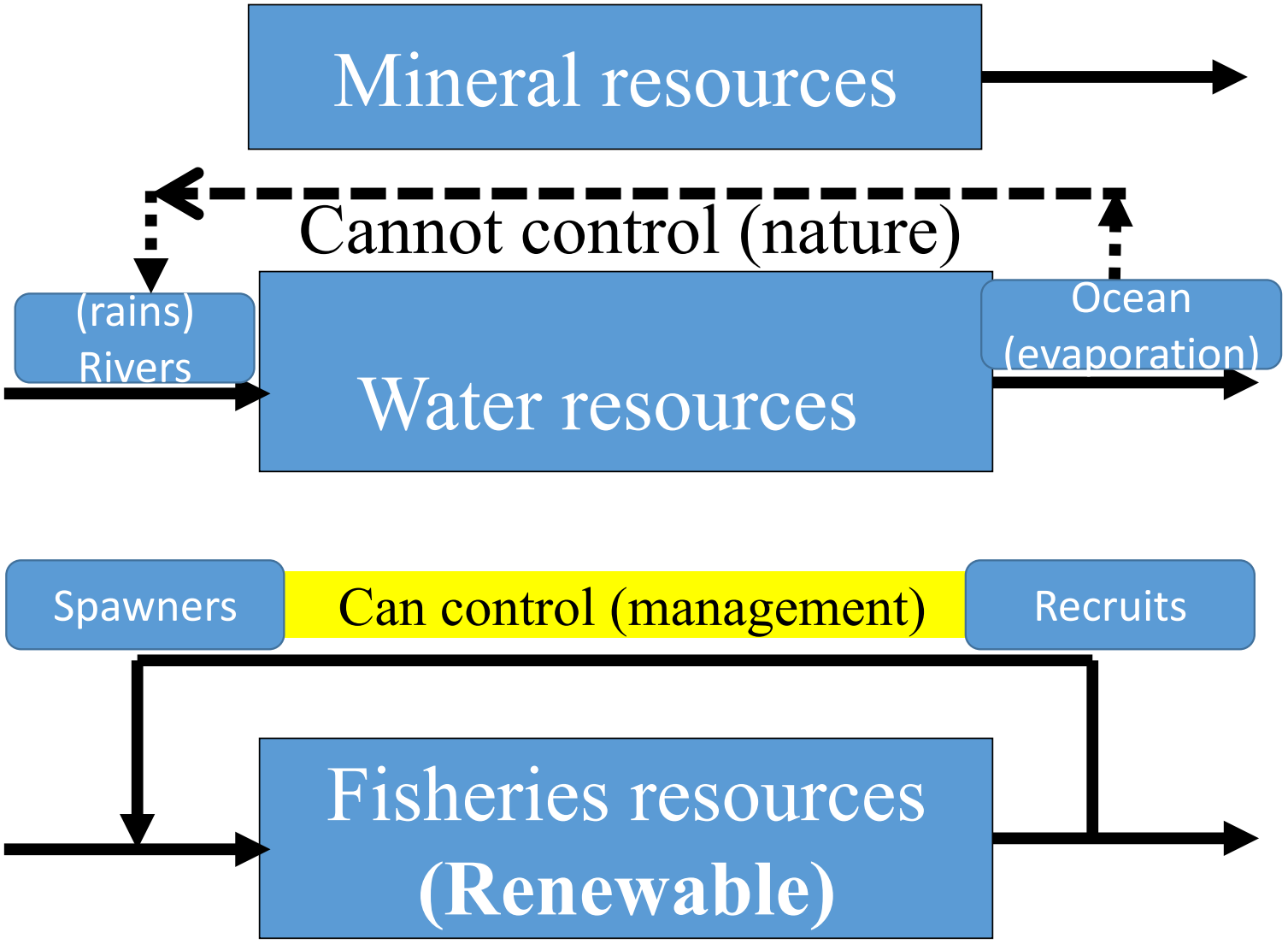
in order to manage the fisheries resources safely

for sustainable utilization

Fisheries resources is renewable

We need manage well

What is renewable ?


Mineral resources
Cannot control (nature)
(rains)
Rivers
Water resources
Ocean
(evaporation)
Spawners
Can control (management)
Recruits
Fisheries resources
(Renewable)

There are no beautiful answers for stock assessments

Never happened 1+1=2

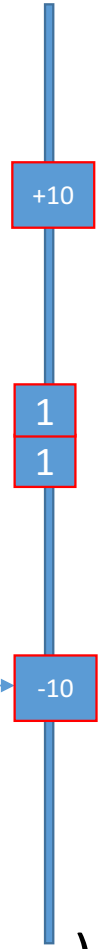
Normally 1+1 = -10 to +10

As each 1 have uncertainties from -5 to +5

Then answer will be one of -10 to +10

This is the real situation

Uncertainties ← data (catch, cpue…) and models (FOX, r….)



So it is miracle to make successful SA

RFMO no body satisfy results

It will take 10 years to get a little better results

Thus all need to work together to get better results

You can not do it yourself (5 years)

Better work together until you get philosophy and experiences
(many exercise and experiences)

Difficult to work by e-mail
➔take 10 times more and less understandings

Example : small pelagic project (Taki san and Supapong)
For your other application➔ better work with experts

How to use SA results

Use as references for 8 member countries

Stock status is not good

Precautionary advice ➔ Managers may advise to reduce effort

SEAFDEC can not suggest anything (not RFMO)

But can **provides our results**

(Objectives)

Stock assessment (SA) models

Consideration (selection) of stock assessments for SSS

How many SA methods ? Many methods (about 10 types and more than 50 approaches)

Method	Data Requirements		Reference Points	Management Advice	Pros	Cons
	Biology	Fishery				
PSA	Qualitative	Qualitative	No	Qualitative	Easy to use if LH parameters available	Difficult to relate to current abundances and fishing mortality.
Demographic Models/Elasticity Analysis	Age & growth, Fecundity, Natural Mortality	Several fishery characteristics	No	Mostly qualitative (change of gear) and F	Easy to use if LH Parameters available. Can provide guidance on gear usage/ selectivity	Must assume that LH parameters are correct, but uncertainties can be introduced. Difficult to relate to current abundances and fishing mortality.
Catch free LH Based	M, growth curve parameters, and Age at full Maturity or Max Age	Selectivity	Yes (F_{MSY})	F_{MSY}	Easy to get LH parameters if available. Zhou et. al (2011) provides equations that are relevant to species. Could run a meta-analysis and run as well using a Bayesian Hierarchical Model Approach. Provides a Target F.	Guidelines provided for Fishing Mortality but no specifics on current status. No idea what current Biomass and F are. However some guidelines could be provided based on theoretical carrying capacity, current depletion levels, and whether current take are meeting or exceeding targets.
Catch free CPUE Based	M, growth curve parameters, and Age at full Maturity or Max Age & recruitment	Selectivity and CPUE Series	Yes (F_{MSY} & B_{MSY})	F_{MSY} & B_{MSY}	Easy to parameterize with LH data. Estimate recruitment, F and selectivity to tune to the CPUE series. Provides target F, Yield levels and where we are with regards to these rates. Provides target B as well and where we are	LH based assumptions could be misleading. CPUE series may not be representative of abundance series if from a limited fleet and area. Catch at size should be estimated from the viewpoint of the operational patterns
Catch Based SRA	r & K	Catch series	Yes (F_{MSY} & B_{MSY})	F_{MSY} & B_{MSY}	Set of data that currently exist (but may not be too good). Tried and tested approach in ICES, Walters, etc. Easy to run, provides Yield targets and FMSY & BMSY	Uncertainty in catch series can give misleading results. Based on assumptions of depletion range in current years that may give misleading results. May not be very accurate in terms of FMSY and BMSY
Surplus Production (Bayesian or Otherwise)	r & K	Catch series & CPUE series	Yes (F_{MSY} & B_{MSY})	F_{MSY} & B_{MSY}	Traditional approaches. Used extensively in literature. Provides yield targets and FMSY and BMSY	Length of time-series and uncertainty in catch series and CPUE series can bias results. Models may have problems converging to a solution if there is no contrasting information.
Integrated assessments	Recruitment, M by age, growth parameters, maturation schedule, fecundity, recruitment	Catch series, Length based samples, CPUE data (and or have tagging data), fishery selectivity	Yes (F_{MSY} & B_{MSY})	F_{MSY} & B_{MSY}	Most robust approach. Incorporates all information in a dynamic model. Provides most representative yield targets and FMSY and BMSY	Highly data dependent. Models can have problems converging. Learning curve steep.

IOTC (2015)

categories of SA

Type No.	Type	Major Information	Data period	Reference point (MSY, Fmsy, SSBmsy etc)	Models
1	Demography	Parameters			Leslie matrix PSA
2	Normal (quantitative) stock assessments	Real data	Short term (Snap shot)	Partially available, but only for the short term (subjective)	● ELEFAN ● Fi STAT
3			Long term historical fisheries data (10 years or longer)	Available (more objective due to a longer term data)	**(1) SRA (Catch only method)** **(2) Production model (ASPIC etc)** **(3) Age (size) structured models (VPA, SCAA, ASPM etc)** **(4) Integrated models (SS3, MULTIFAN-CL etc)**

We need SA methods with ALL reference points ➔ type 3

Type No.	Type	Major Information	Data period	Reference point (MSY, Fmsy, SSBmsy etc)	Models
1	Demography	Parameters			Leslie matrix PSA
2	Normal (quantitative) stock	Real data	Short term (Snap shot)	Partially available, but only for the short term (subjective)	● ELEFAN ● Fi STAT
3	assessments		Long term historical fisheries data (10 years or longer)	Available (more objective due to a longer term data)	**(1) SRA (Catch only method)** **(2) Production model (ASPIC etc)** **(3) Age (size) structured models (VPA, SCAA, ASPM etc)** **(4) Integrated models (SS3, MULTIFAN-CL etc)**

We need various **reference points** such as MSY, Fmsy and SSBmsy

Why ?

For management criteria

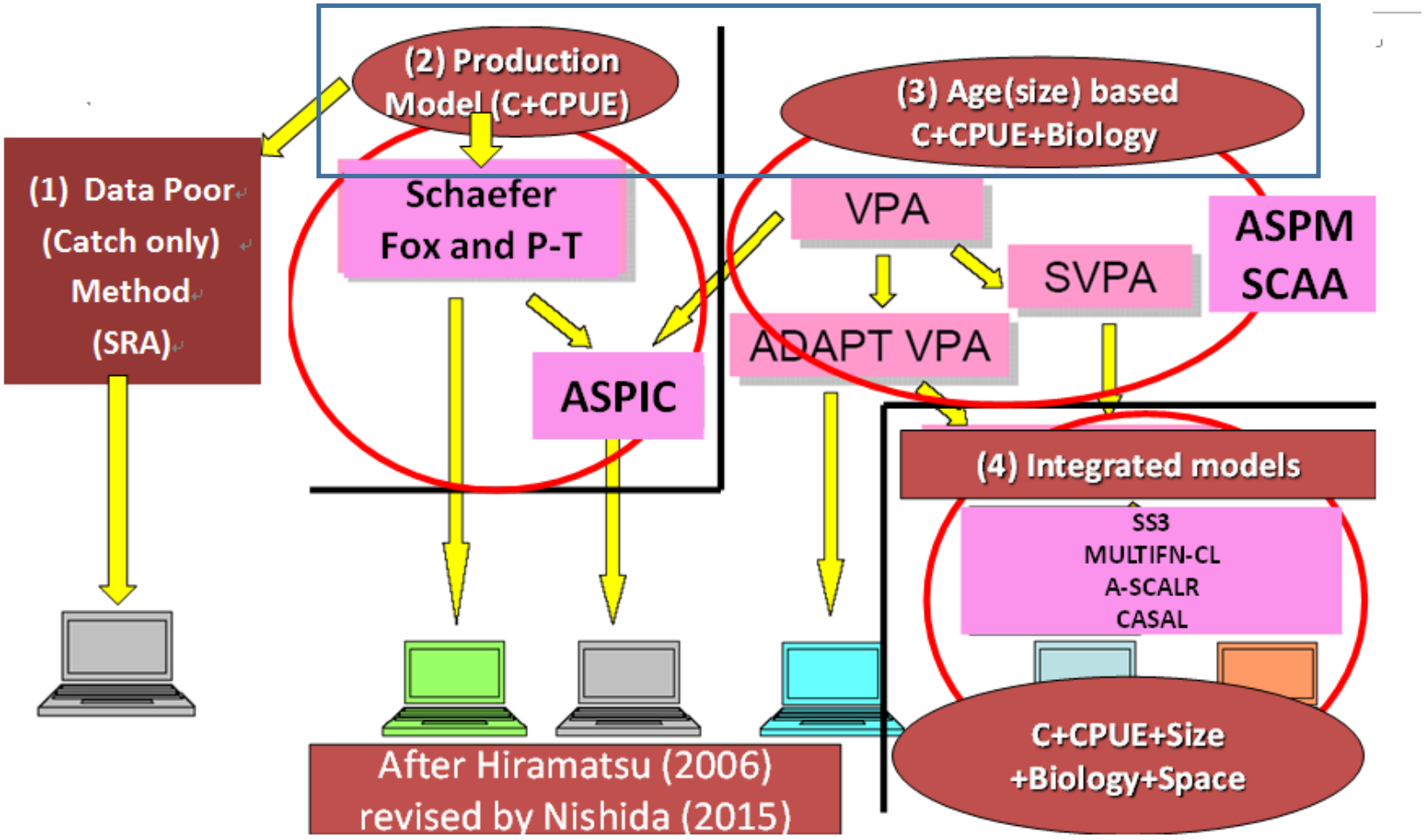
F is too high, Biomass is safe etc…

Only type No 3 type can provide various reference points

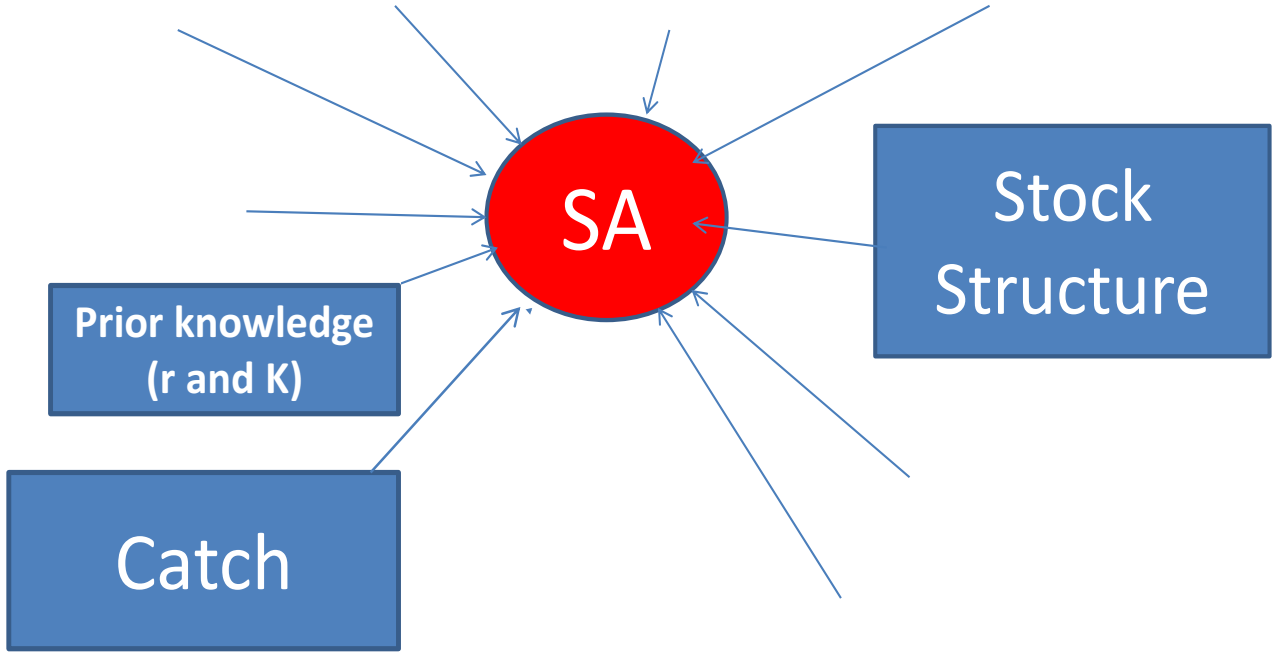
Summary (type 3)

Models		Example	Data and parameters required							
			Stock structure	Global catch	Abundance indices (CPUE or fisheries in depend indices such as acoustic/areal survey data)	size/age	M (natural mortlity)	LW relation + growth eq	Maturity + fecundity	Space and movement
Data limit approach		SRA (catch only)								
Production model		ASPIC								
		BSP-SS								
Age/size structure model	(without abundance indices)	VPA								
	(with abundance indices)	ADAPT—VPA								
	Integrated model (I)	SCAA and SAM								
	Integrated model (II)	CASAL and SS3								(option)

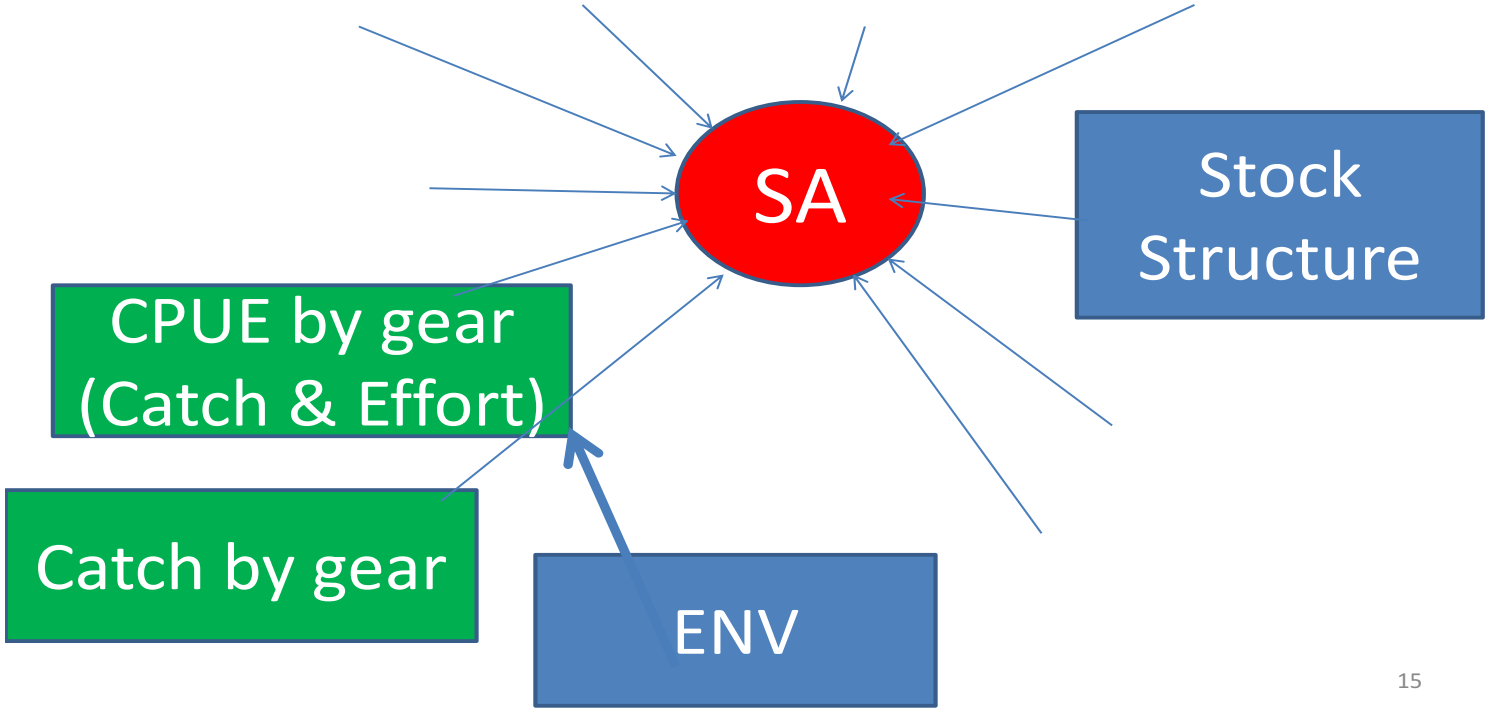
Standard (Traditional) SA models



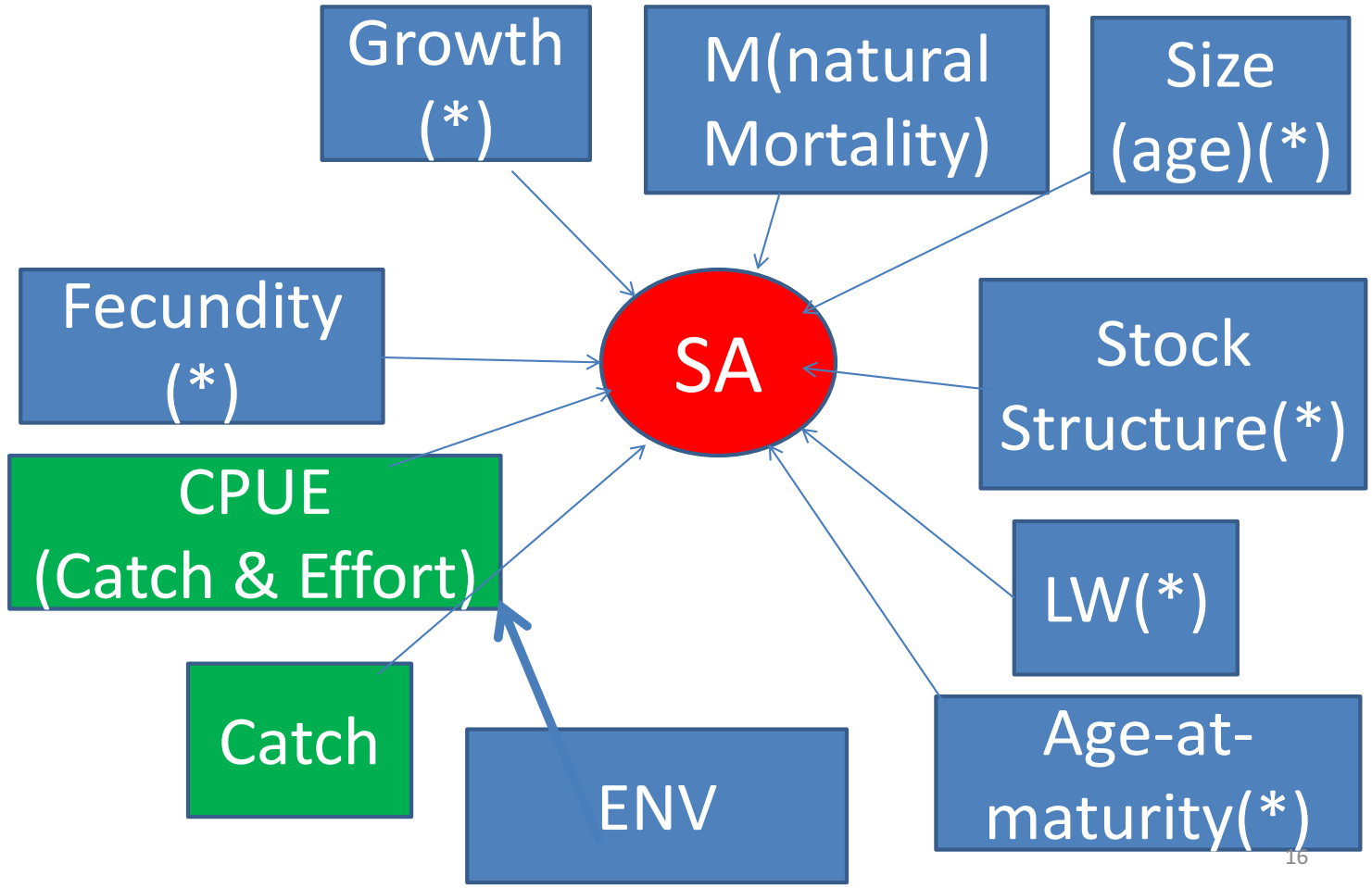
(1) What do we need for data poor stock assessment (catch only) model
SRA: Stock Reduction Analyses



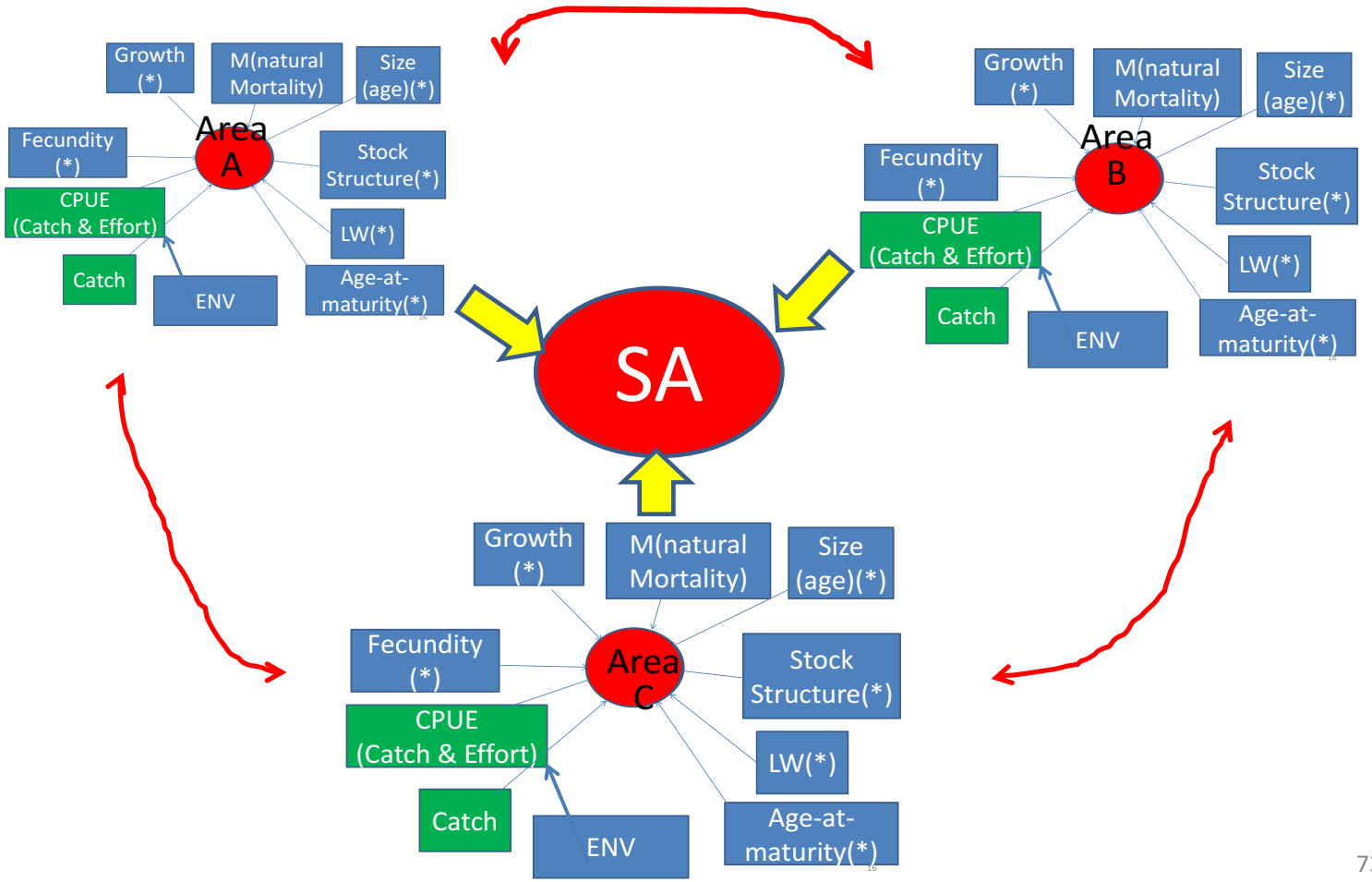
(2) What do we need for Production models (PM)



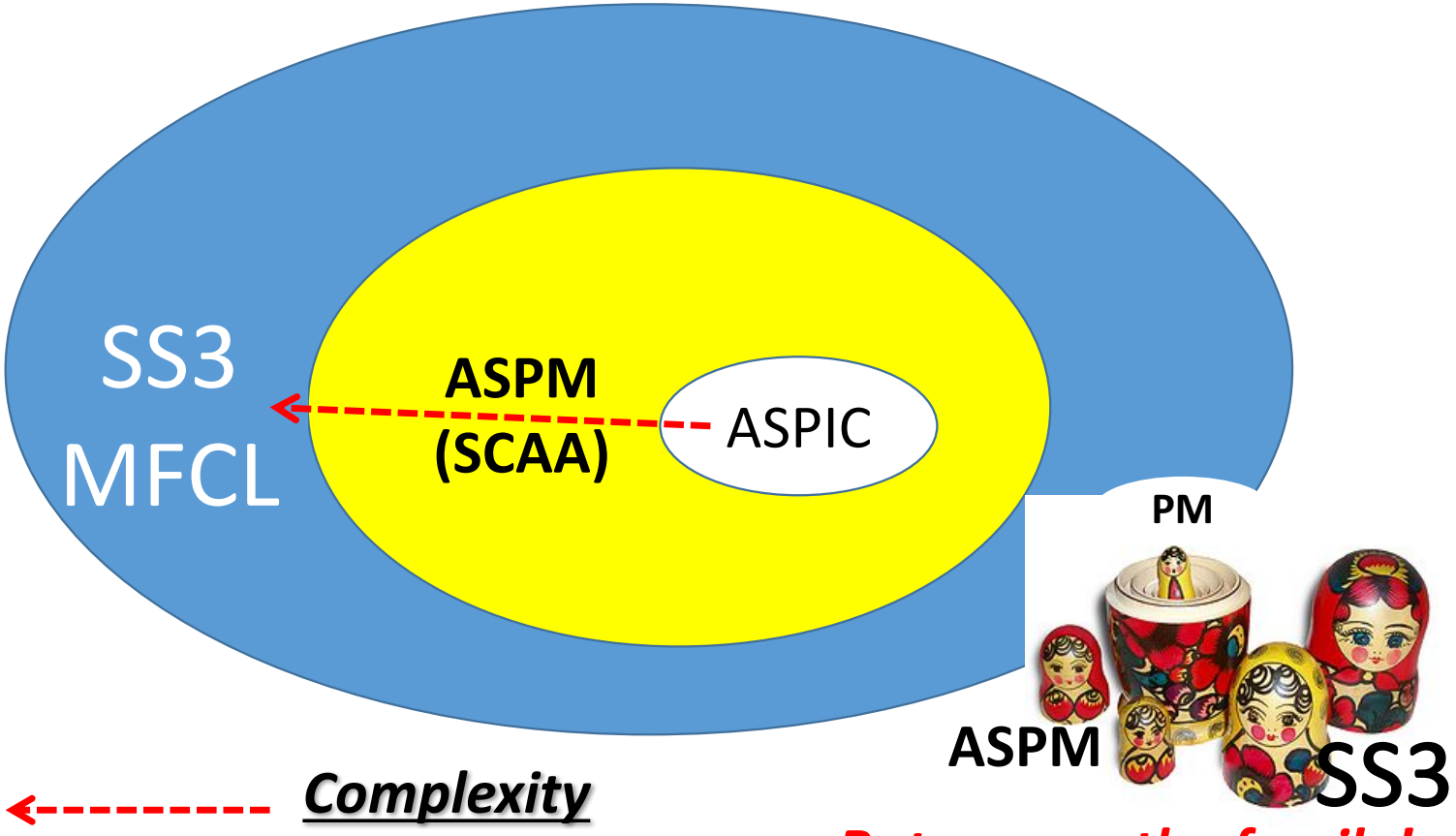
(3) What do we need for Age based stock assessment (*) Biological information



(4) What do we need for the integrated models
Special info. in addition to info. in (3) age based model



ASPM(SCAA) : Intermediate assessment model
not too simple(ASPIC)
not too complicated(MFCL, SS3,)



Well we understand stock assessment models
But, what type of stock assessments do we use for seerfish?

As 1st step we try PM (Production models)

We have catch and CPUE

If we are succeed we can attempt (3) Age specify stock assessments using biological data

But never try (4) integrated models

We attempt PM (simple model) first

Even the simple model ➔ not easy

There are many types of PM

See next page

Table 3 Evolution of surplus production models

Evolutions	Specification →	No Bayesian framework				Bayesian framework
		Equilibrium conditions		Consideration of Errors		
	Type of SPM (*)	Yes	No (plausible)	Observation errors	Process errors	
Old	(1) Original SPM					
	(2) ASPIC (example)					
	(3) Bayesian SPM					
New	(4) BSP-SS					

(*) SPM normally considers Schaeffer, Fox or Pell Tomlinson models

What type of PM (Production models) do we use for seerfish ?

ABSOLUTENLY **not equilibrium PM u**sing original Schaefer, Fox and Pella-Tomlinson models

Why

Removal (natural death + death by fisheries)

= Production (recruitment + growth)

Not realistic ➔ biases

We use (2) ASPIC : more realistic (non equilibrium) and software available

(1) Original PM➔ Bias

(3) Bayesian Surplus Production model (BSP)

(4) Bayesian State-Space Surplus Production model (BSP-SS)

Complicated for computation

Why not use
SRA (data poor method) with catch only

Too risky…

Fmsy and TBmsy : relative (not absolute)

Uncertainty in catch series can give misleading results. Based on assumptions of depletion range in current years that may give misleading results. May not be very accurate in terms of FMSY and BMSY

If we have CPUE➔ better use PM

How do we use stock assessments results for managements

Simple example

Catch (BET, Indian Ocean) in 2016

should not exceed

the MSY level (99,000 tons)

We need the reference point (MSY, Fmsy..)

by stock assessments for sustainable utilization

Problems in Stock assessments

Not like fine scale (**exact**) sciences

Unlike physics, chemistry, engineering type

But more **fuzzy** sciences

Large Uncertainties (data + model)

Uncertain results(MSY, Fmsy..)

Precautionary approach

MSY=30,000 tons (95%CI: 10,000-40,000 tons)

We may choose **20,000 ton (2016 TAC)**

That is another reason to use reference points with Kobe plot

- Target Reference Point
- Limit Reference Point

What are RP: Fmsy, SSBmsy, TBmsy…

Basic but very important

Basic terminology

(population size)

SSB: Spawning Stock Biomass

TB: Total Biomass

(fishing pressure)

F: Fishing mortality

Summary

Models		Example	Data and parameters required							
			Stock structure	Global catch	Abundance indices (CPUE or fisheries in depend indices such as acoustic/areal survey data)	size/age	M (natural mortlity)	LW relation + growth eq	Maturity + fecundity	Space and movement
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ASPIC

A Stock Production Model Incorporating Covariates

Outline

Evolution (19 years)
(world most popular SA tool)
（Mike Prager, NMFS/NOAA, USA)

- Ver 3.82 (2000) Schaeffer (logistic model）
- Ver 4 (2003?) Test version (no release)
- Ver 5.05 (2004) 3 models (S+FOX+PT)
- Ver 5.16 (2006?) GUI (interactive)
- Ver 7 (2015) 4 estimators and new Par.
- Ver 7.07 (2016) Ver 7 revised

➔ **NMFS tool box**

ASPIC

INPUT : Catch (global) and CPUE by gear

CPUE (1 or more OK)

OUTPUT

MSY, F, r (intrinsic Pop growth rate),

K (Carrying capacity) and q (catchability)

Population size

(NO S-R relation ← critical points)

ASPIC (Theory)

Let the logistic population growth model be $dB/dt=r(1-B/K)B$ ------ (5)

If there is catch, equation (5) will be $dB/dt=r(1-B/K)B - C$ ------- (6)

Logistic model change POP ‡ CATCH ➔ non−equliriburium

When dB/dt=0 it is the equilibrium PM, which produces large biases (Polacheck et al, 1993). Hence we use the non-equilibrium PM, i.e., the situation when dB/dt‡0. Assuming biomass is roughly proportional to standardized CPUE, then we have B= (1/α) CPUE which is substituted in equation (6)

$dB/dt=r(1-CPUE/qK)(CPUE/q) - C$ (7)

CPUE ∝ Abundance

where

CPUE = *standardized CPUE or abundance index (no unit)*
q = *catchability*
B = *biomass (tonnes)*
C = *catch (tonnes)*
r = *intrinsic growth rate of the population*
K = *carrying capacity*

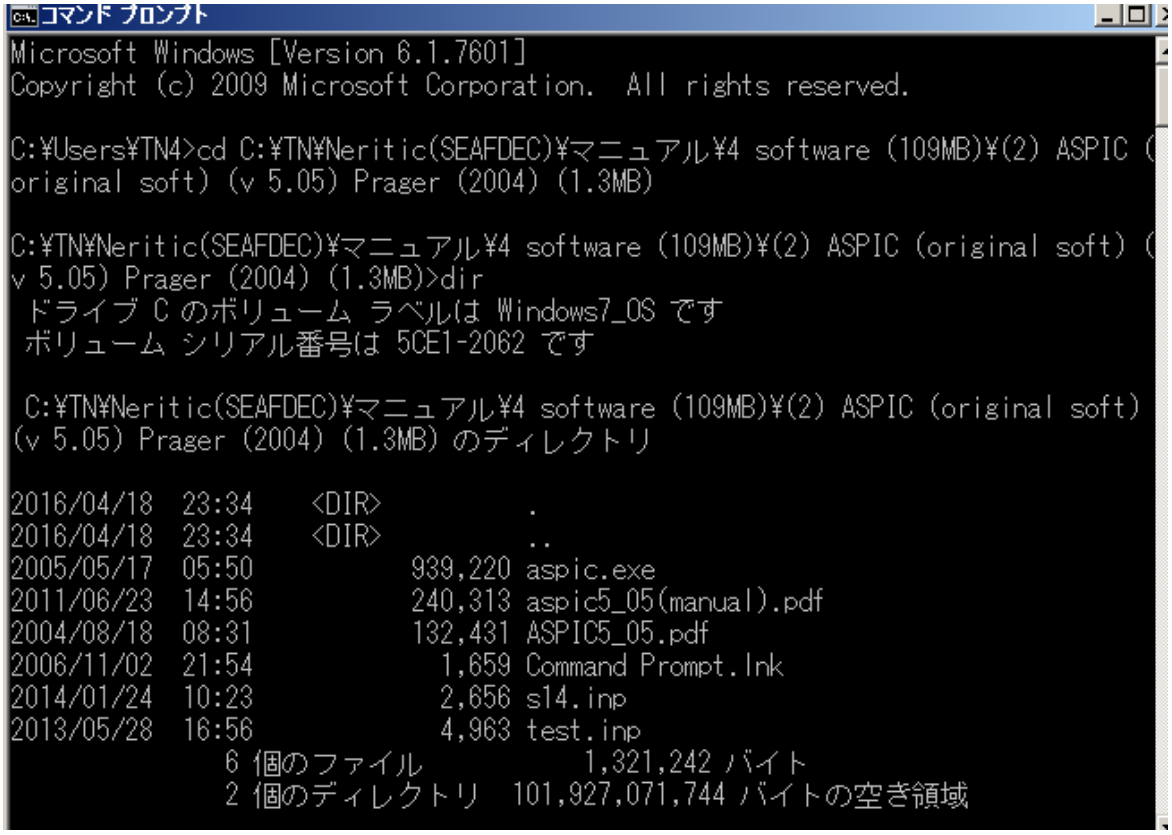
Non linear
Least square method
➔ Estimate parameters

Parameters estimation (for 3 models)

normally 2 models (Logistic or Fox)

- B1/K
- K
- MSY
- q

Only Single run by ASPIC original tool



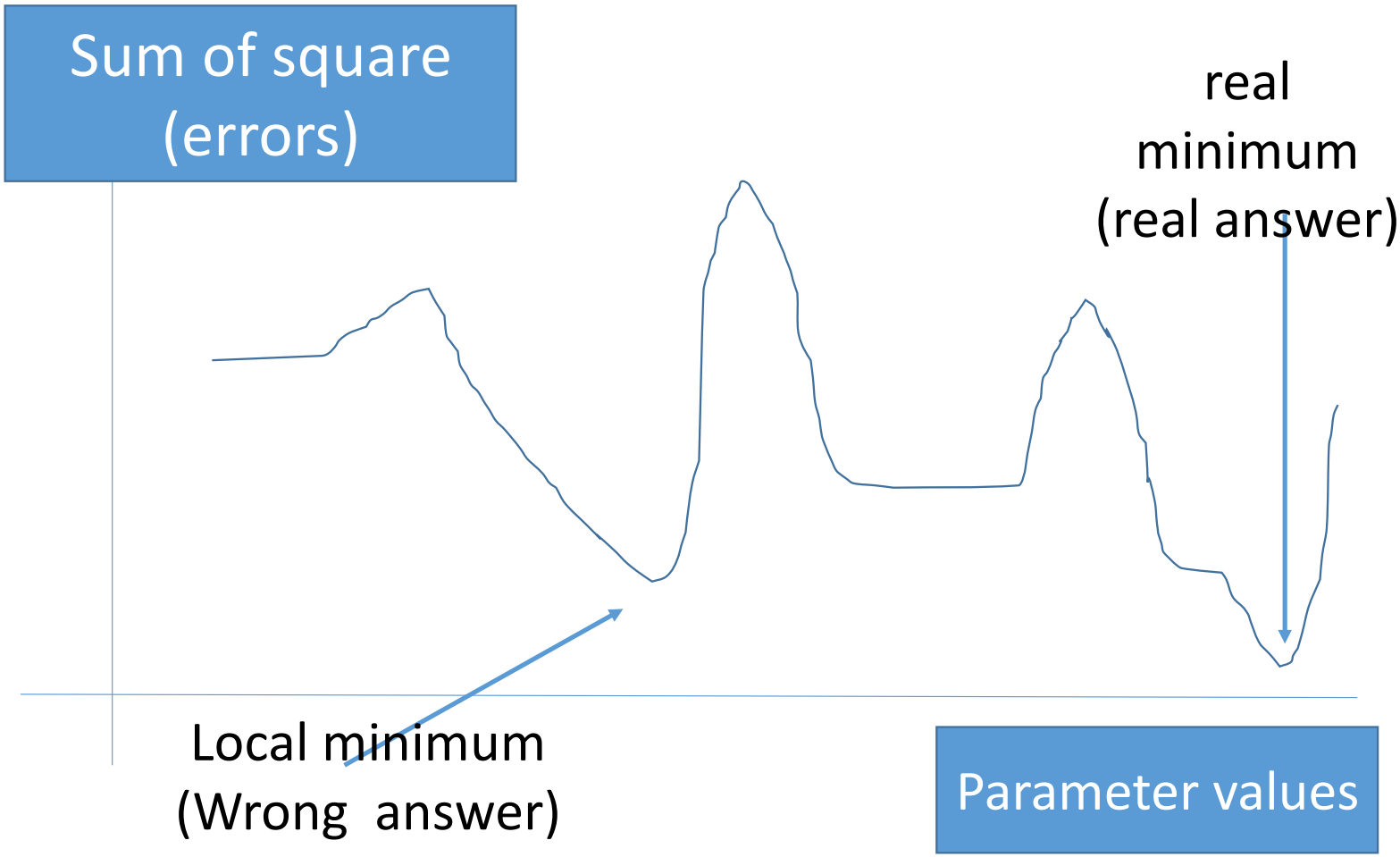
If you have 3 combination and 2 models

- 3^4 =81
- Then 2 models
- Total 162 combinations
- Too much
- ➔ normally we guess and use plausible
- ➔ by hand repeat until we get conversions

But danger is local minimum

- False conversions

What is the local minimum?



Original program

One run only at one time

You need to repeat until you find the optimum

Parameters. **You may find the parameters at local minimum (Wrong answer)**

Grid search

This repeats runs for many combination of parameters at one time

Thus most optimum parameters can be found

(**correct answer**)

What are the relation between 2 software ?

ASPIC original software (Prager, 2004)

This is the basic ASPIC program

=> We will input initial seeding values

ASPIC grid (parameter) search (menu driven software)

The original program can run only one set of parameters at once.

This soft will search optimum parameters by grid search

using all combination of parameters

How to find seeding values B1/K, K, MSY and q

- Initial guess parameter values

- We will discuss later

ASPIC: How do we get conversion ?

- 4 parameters (B1/K, MSY, K, q1)+ 2 models (Schaefer + Fox)
- **If data and ASPIC well match ➔ very quickly converged**

  ➔ lucky case ☺ you can finish
- If not, take a long time (2 weeks..) very furustrated

  ➔ implausible values or never converged

If you can not get in 4-5 trials or one day trials then move next massage

ASPIC: How do overcome difficulty ? (again, massage !!)

(1) If CPUE series are a short, difficult to converge

➔ use a longer CPUE (even nominal CPUE is OK)

(2)check Catch and CPUE again graphically

➔ remove strange points

(jumps, outliers, zigzag etc.)

➔ removal of one point ➔ can solve a problem

ASPIC: How do overcome difficulty ? (again, massage !!)

(3) Fix 1 or 2 parameters

➔ Fix K (run a few plausible values) select the best case
rough K=4*MSY/r if r=1 then K=4*MSY

➔ or Fix B1/K (between 0-1) our case 0.5

➔ if still no conversion➔ fix both K and B1/K (several scenarios)

If you FIX, then ASPIC results are subject these values

We need to explain this well to managers

There are many steps to run ASPIC

- We will repeat a few times so that we can run ASPIC

- As explained, it take one year to get used to the program.. As for a few times of practice, it still difficult to learn.

r is also important
to evaluate result

Special lecture on r by Supapong

ASPIC Practice

It took 3 weeks to do (preliminary) stock assessment

It is not easy task

Philosophical matter and very technical

(to handle data and fit to ASPIC)

Very complicated ➔ 5 years to learn (for this case)

If data are simple (one accurate catch and one GOOD CPUE)

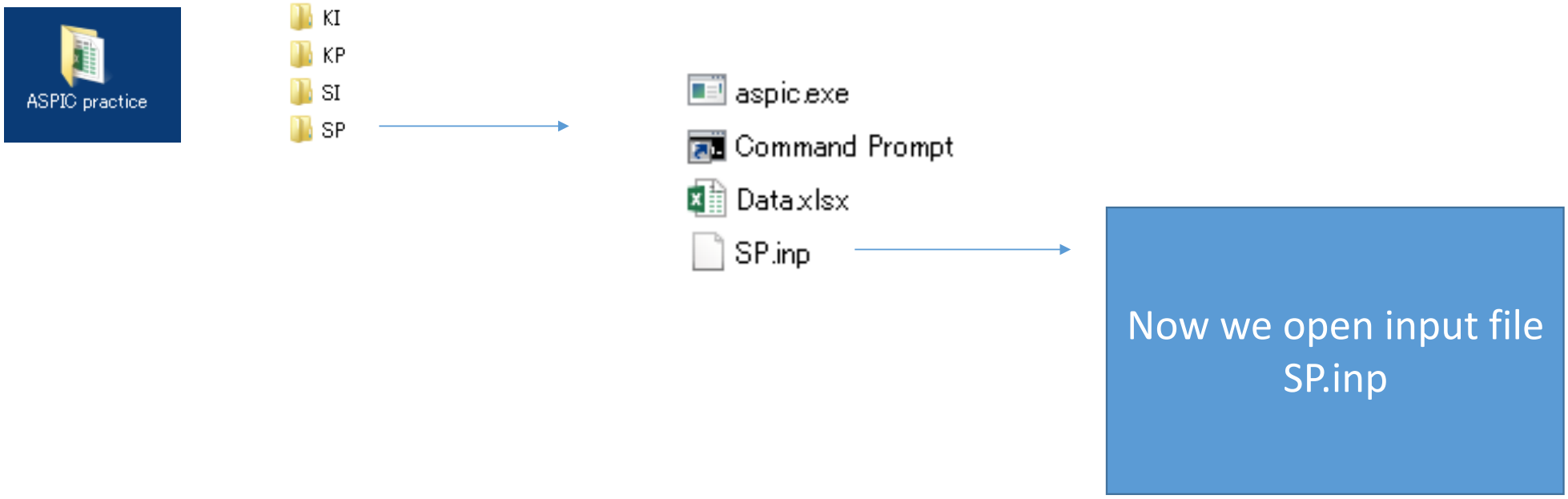
(perfect situation)

➔ you can do by yourself **(but normally NOT)**

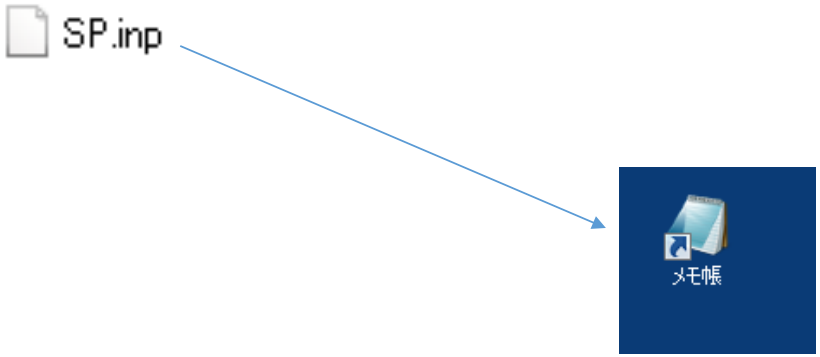
Demo: ASPIC Spanish Pacific Ocean

- We work together Step by step
- A bit complicated as a first time
- If you practice 2 times, you will be OK (a bit)

You have ASPIC practice holder
then you have 4 sub holder (stock assessment)
in each sub-folder, there are 4 items (see below)



How to open ? Use Memo pad



Drag SP.inp to memo pad

Then you see inside and you can edit.

Set up ASPIC Program

change items in rex box

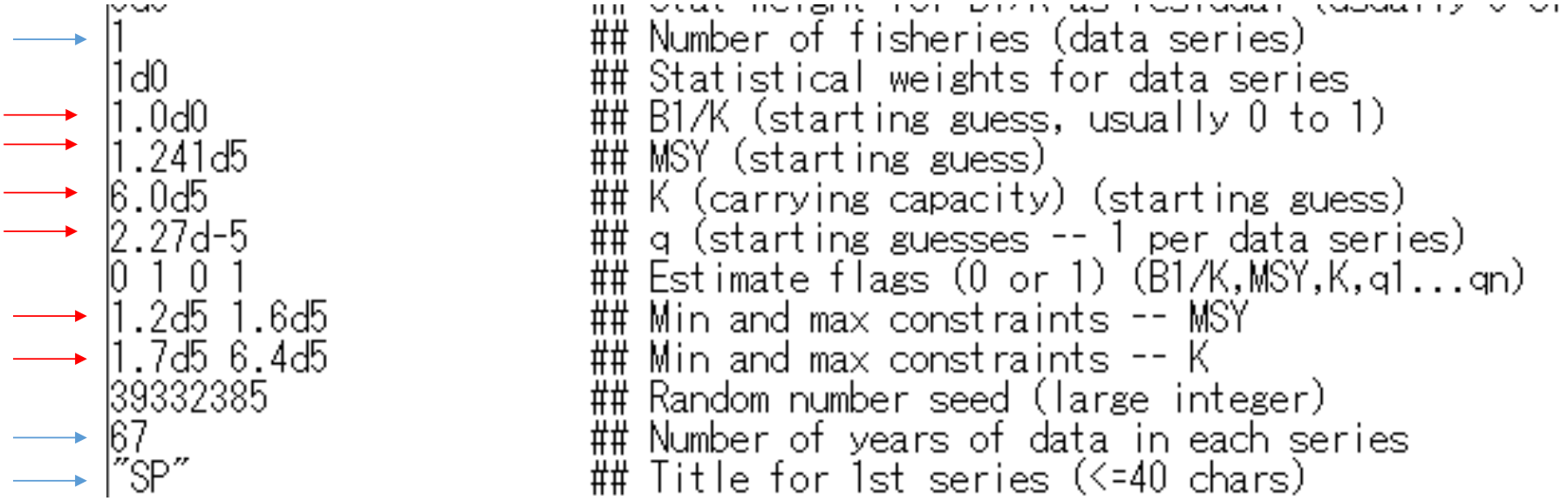
no space
S P➔ NG
SP➔ OK

```
FIT
"SP"
LOGISTIC YLD SSE
2
1000
0 20000
1d-8
3d-8     6
1d-4     24
8d0
0d0
1
1d0
1.0d0
1.241d5
6.0d5
2.27d-5
0 1 0 1
1.2d5 1.6d5
1.7d5 6.4d5
39332385
67
"SP"
CC
1978     -1       33462
1979     -1       38147
1980     -1       41695
```

```
## Run type (FIT, BOT, or IRF)
## title
     ## See notes at end of this file
## Verbosity on screen (0-3); add 10 for SUM & PRN file
 ## Number of bootstrap trials, <= 1000
## 0=no MC search, 1=search, 2=repeated srch; N trials
## Convergence crit. for simplex
## Convergence crit. for restarts, N restarts
## Conv. crit. for F; N steps/yr for gen. model
## Maximum F when cond. on yield
## Stat weight for B1>K as residual (usually 0 or 1)
## Number of fisheries (data series)
## Statistical weights for data series
## B1/K (starting guess, usually 0 to 1)
## MSY (starting guess)
## K (carrying capacity) (starting guess)
## q (starting guesses -- 1 per data series)
## Estimate flags (0 or 1) (B1/K,MSY,K,q1...qn)
## Min and max constraints -- MSY
## Min and max constraints -- K
## Random number seed (large integer)
## Number of years of data in each series
## Title for 1st series (<=40 chars)
## Series type (CC = CPUE, catch)
```

```
FIT                          ## Run type (FIT, BOT, or IRF)
"SP"                         ## title
LOGISTIC YLD SSE                  ## See notes at end of this file
```

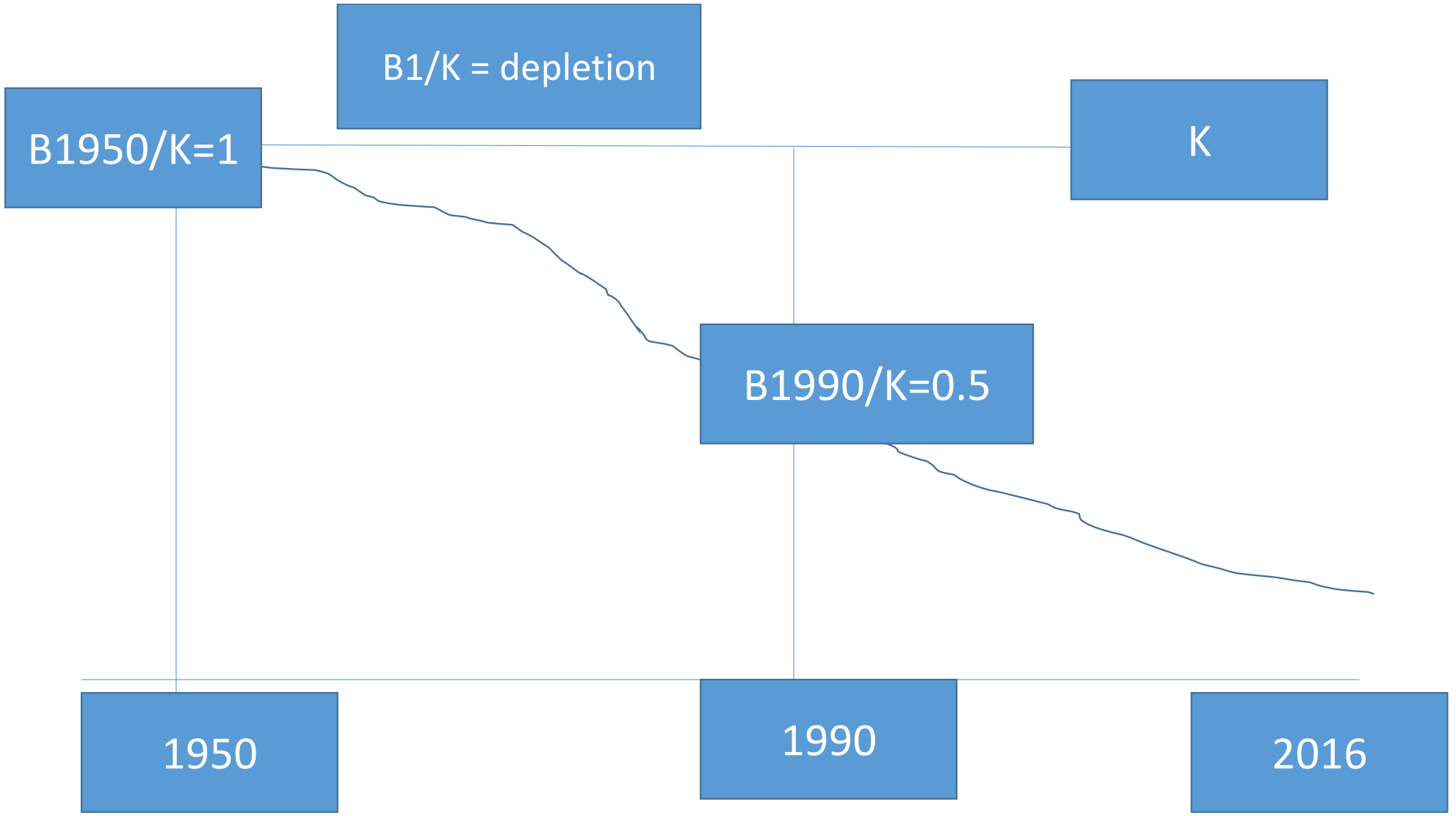
- FIT to estimate parameters
- BOT bootstrap to estimate uncertainties
- SP title Spanish Pacific
- LOGISTIC type of production model FOX or Logistic (Schaefer)
  (no change as batch job can select 2 models)



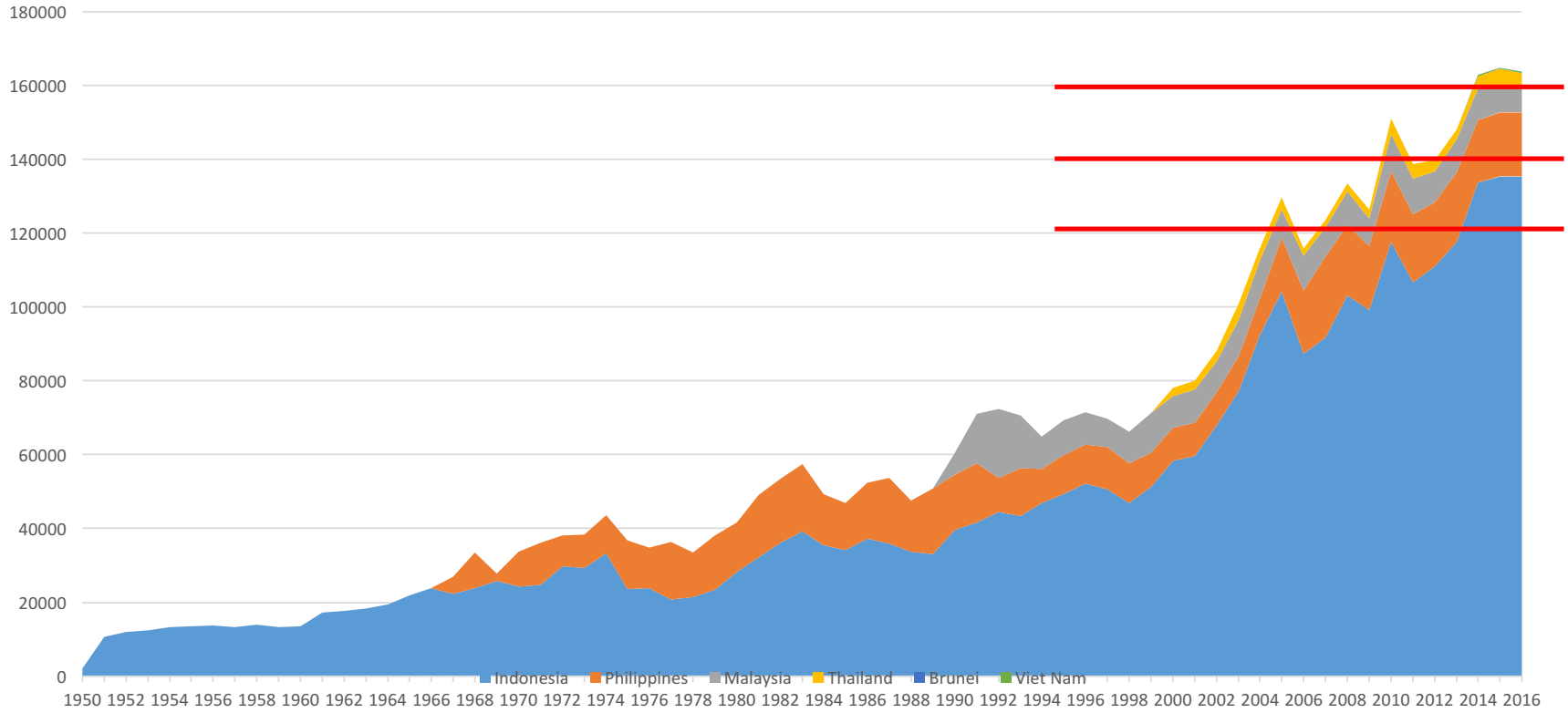
- Need initial guess (seeding values) →

Notation of values

• 0.001	1.0d-3	1,000	1.0d3
• 0.0001	1.0d-4	10,000	1.0d4


B1/K = depletion
B1950/K=1
K
B1990/K=0.5
1950
1990
2016

How to guess MSY point 140,000
NINI▪NAX @±20% (rough)
MINI:120,000Spanish PO MAX:160,000

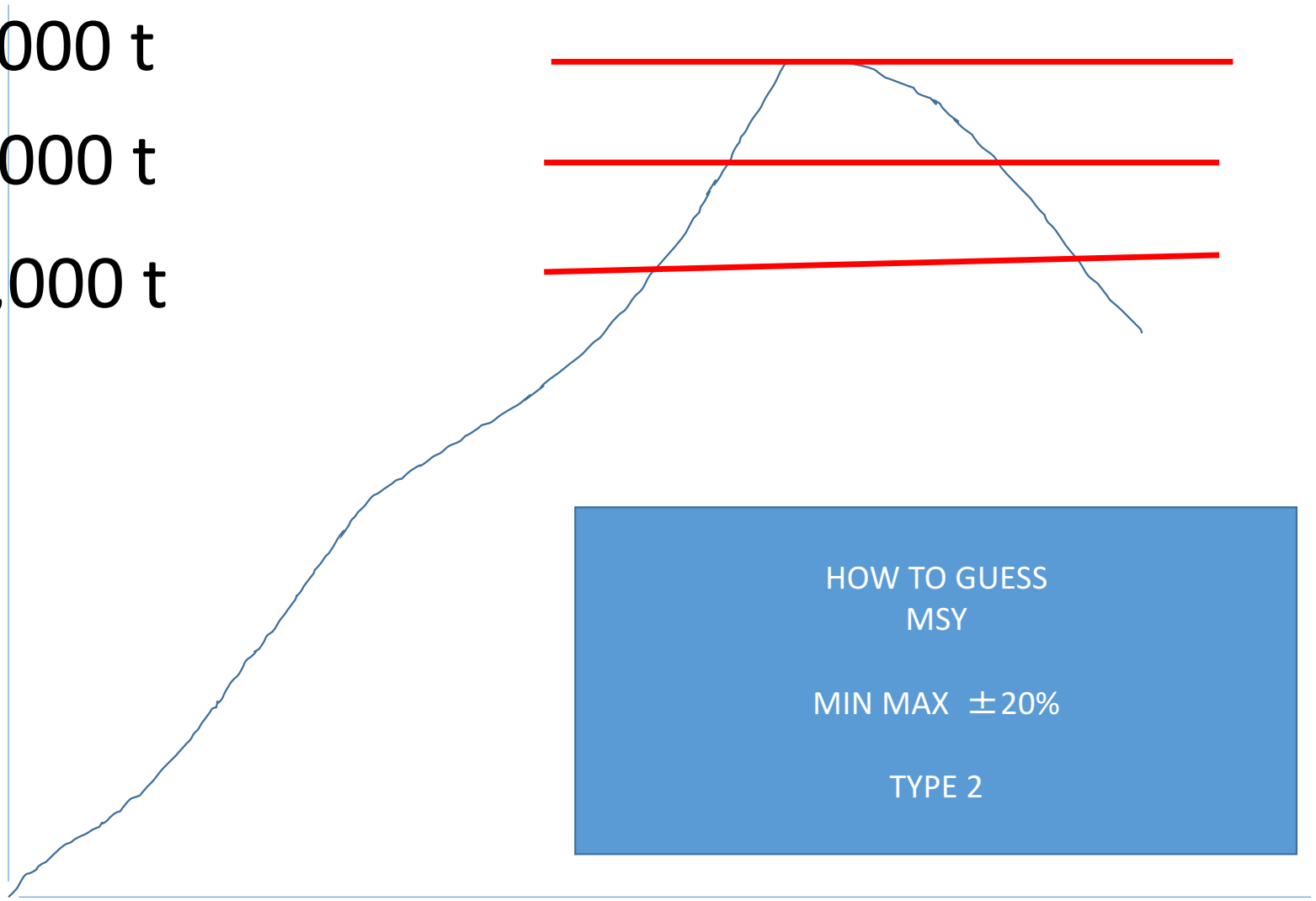


Catch different type

160,000 t

140,000 t

120,000 t



HOW TO GUESS
MSY

MIN MAX ±20%

TYPE 2

How to guess K (carrying capacity) (Schaefer)

$$K = {}^{4MSY}/_{r}$$

Mini =little above MAX MSY why ? ➔ next page
Point =4*140,000/1 =560,000
MAX =4*160,000/1 =640,000

Tuna Species	r – value	Reference	Remarks
S. guttatus	1.0 – 1.5	IOTC (2016)	Indian Ocean
S. commerson	0.31	Mackie *et. al.* (2003)	Western Australia
	0.6 – 1.5	IOTC (2015)	Indian Ocean
	1.0 – 1.5	IOTC (2016)	Indian Ocean

Concept to guess

MSY and K

point, MINI and MAX

MSY	ton	K	
	640,000	MAX	wide serach range
	620,000		
	600,000		
	580,000		
	560,000	Point	
	540,000		
	520,000		
	500,000		
	480,000		
	460,000		
	440,000		
	420,000		
	400,000		
	380,000		
	360,000		
	340,000		
	320,000		
	300,000		
	280,000		
	260,000		
	240,000		
	220,000		
	200,000		
	180,000		
	170,000	MINI	little above MSY
MAX	160,000		
Point	140,000		
MIN	120,000		

How to guess q

- F=q*E q=F/E q=F/(C/CPUE)

  F: fishing mortality and E: fishing effort

- If F=0.3 q=0.3/(Ave C)/(Ave CPUE)

q =0.3/(136,798/8.97)

=1.97d-5

Later you will practice this

1999	15.80	71245
2000	-1	78009
2001	-1	80147
2002	-1	88193
2003	20.64	100886
2004	20.23	115879
2005	16.87	129817
2006	15.58	115800
2007	8.58	123678
2008	3.34	133572
2009	6.12	126368
2010	7.00	151059
2011	3.48	138706
2012	4.56	139837
2013	4.46	148191
2014	5.33	162815
2015	5.55	164842
2016	3.79	163713
	Ave CPUE 8.97	Ave CATCH 136,798

What is this ??

```
0 1 1 1          ## Estimate flags (0 or 1) (B1/K,MSY,K,q1...qn)
```

- 0 no estimation (use Fixed value)
- 1 to be estimated

- 0 B1/K =1 our case as 1950 is the virgin stock =K
- 1 MSY we will estimate
- 1 K Carrying Capacity : we will also estimate
- 1 q : catch ability (efficiency to catch fish)

Now you need to edit these parameters and you should have as below…

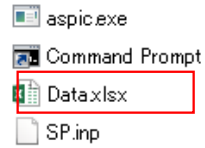
```
FIT                     ## Run type (FIT, BOT, or IRF)
"SP"                    ## title
LOGISTIC YLD SSE        ## See notes at end of this file
2                       ## Verbosity on screen (0-3); add 10 for SUM & PRN file
1000                    ## Number of bootstrap trials, <= 1000
0 20000                 ## 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
0d0                     ## Stat weight for B1>K as residual (usually 0 or 1)
1                       ## Number of fisheries (data series)
1d0                     ## Statistical weights for data series
1.0d0                   ## B1/K (starting guess, usually 0 to 1)
1.2d5                 ## MSY (starting guess)
6.0d5                   ## K (carrying capacity) (starting guess)
1.97d-5                 ## q (starting guesses -- 1 per data series)
0 1 0 1                 ## Estimate flags (0 or 1) (B1/K,MSY,K,q1...qn)
1.4d5 1.6d5             ## Min and max constraints -- MSY
1.7d5 6.4d5             ## Min and max constraints -- K
39332385                ## Random number seed (large integer)
67                      ## Number of years of data in each series
"SP"                    ## Title for 1st series (<=40 chars)
CC                      ## Series type (CC = CPUE, catch)
```

But you have one more work for SP.inp, you need to enter the data.. You have data as below.

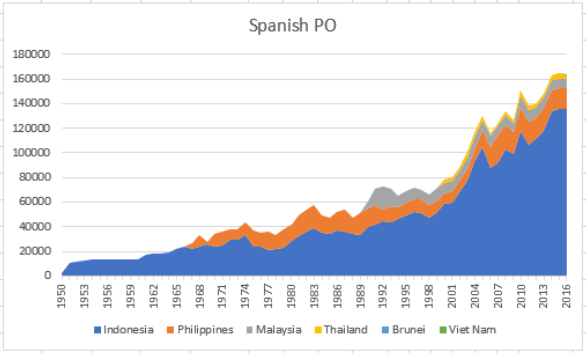
1st you delete all the data

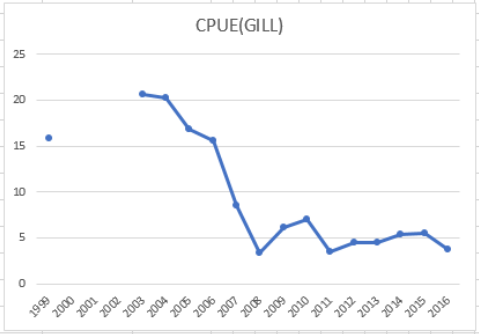
978	-1	33462
979	-1	38147
980	-1	41695
981	-1	49149
982	-1	53522
983	-1	57474
984	-1	49291
985	-1	46970
986	-1	52358
987	-1	53683
988	-1	47628
989	-1	50980
990	-1	60583
991	-1	71185
992	-1	72296
993	-1	70738
994	-1	64840
995	-1	69309
996	-1	71582
997	-1	69741
998	-1	66215
999	15.80	71245
2000	-1	78009
2001	-1	80147
2002	-1	88193
2003	20.64	100886
2004	20.23	115879
2005	16.87	129817
2006	15.58	115800
2007	8.58	123678
2008	3.34	133572
2009	6.12	126368
2010	7.00	151059
2011	3.48	138706
2012	4.56	139837
2013	4.46	148191
2014	5.33	162815
2015	5.55	164842
2016	3.79	163713

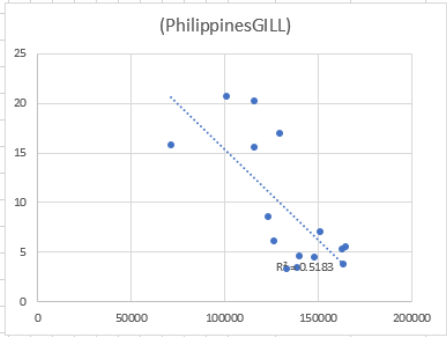
Then enter the real data.. How to do? Open data.xlsx then we just copy the data and paste to memo pad



Country	gear	Area	CORR	nominal CPUE unit	GLM covariates YR	area	MO	Boat	19xx 83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	20xx 0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	to be used in SA?	Reason
Malaysia	GILL	Labuan	38%	t/net																																							
Philippines	drift-GILL	ALL	52%	kg/day /boat	NO GLM																																						YES	long and high CORR
Thailand (Gulf of Thailand)	drift-GILL	All	21%	t/day																																							NO	
	PS	2	23%																																								NO	







	CPUE	Catch
1950	-1	2000
1951	-1	10700
1952	-1	12000
1953	-1	12400
1954	-1	13200
1955	-1	13600
1956	-1	13800
1957	-1	13400
1958	-1	13900
1959	-1	13200
1960	-1	13500
1961	-1	17200
1962	-1	17800
1963	-1	18400
1964	-1	19500
1965	-1	21900
1966	-1	23800
1967	-1	26900
1968	-1	33600
1969	-1	27800
1970	-1	33800
1971	-1	36200

SP.inp - メモ帳

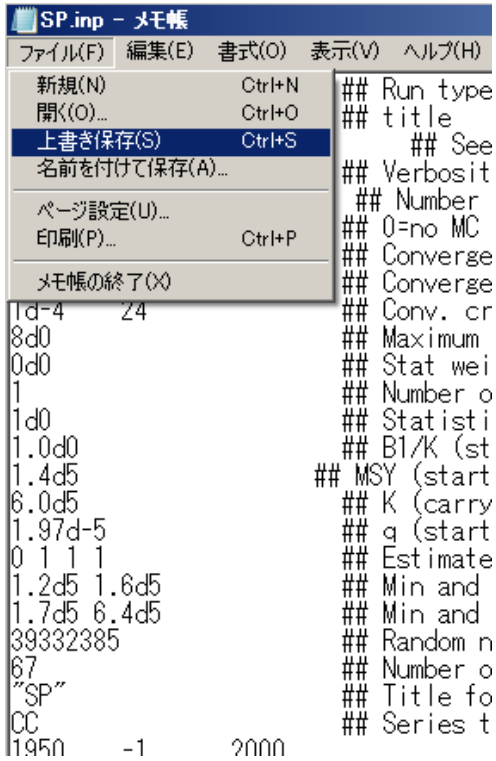
ファイル(F) 編集(E) 書式(O) 表示(V) ヘルプ(H)

```
FIT                     ## Run type (FIT, BOT, or IRF)
"SP"                    ## title
LOGISTIC YLD SSE            ## See notes at end of this file
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
0d0                     ## Stat weight for B1>K as residual (usually 0 or 1)
1                       ## Number of fisheries (data series)
1d0                     ## Statistical weights for data series
1.0d0                   ## B1/K (starting guess, usually 0 to 1)
1.4d5                 ## MSY (starting guess)
6.0d5                   ## K (carrying capacity) (starting guess)
1.97d-5                 ## q (starting guesses -- 1 per data series)
0 1 1 1                 ## Estimate flags (0 or 1) (B1/K,MSY,K,q1...qn)
1.2d5 1.6d5             ## Min and max constraints -- MSY
1.7d5 6.4d5             ## Min and max constraints -- K
39332385                ## Random number seed (large integer)
67                      ## Number of years of data in each series
"SP"                    ## Title for 1st series (<=40 chars)
CC                      ## Series type (CC = CPUE, catch)
1950    -1      2000
1951    -1      10700
1952    -1      12000
1953    -1      12400
1954    -1      13200
```

you should have this

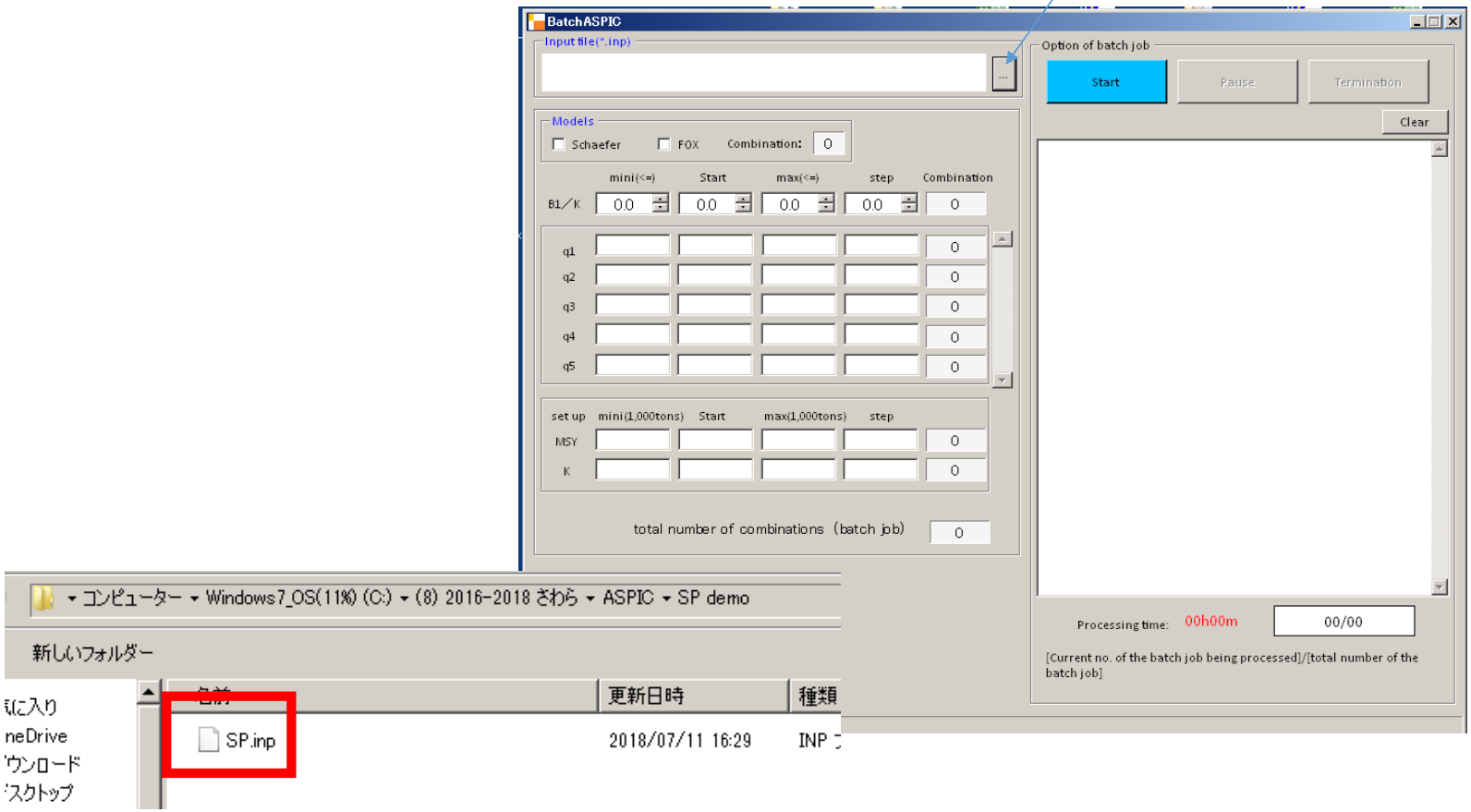
```
1996    -1      71582
1997    -1      69741
1998    -1      66215
1999    15.80   71245
2000    -1      78009
2001    -1      80147
2002    -1      88193
2003    20.64   100886
2004    20.23   115879
2005    16.87   129817
2006    15.58   115800
2007    8.58    123678
2008    3.34    133572
2009    6.12    126368
2010    7.00    151059
2011    3.48    138706
2012    4.56    139837
2013    4.46    148191
2014    5.33    162815
2015    5.55    164842
2016    3.79    163713
```

Don’t forget to save … just over-write

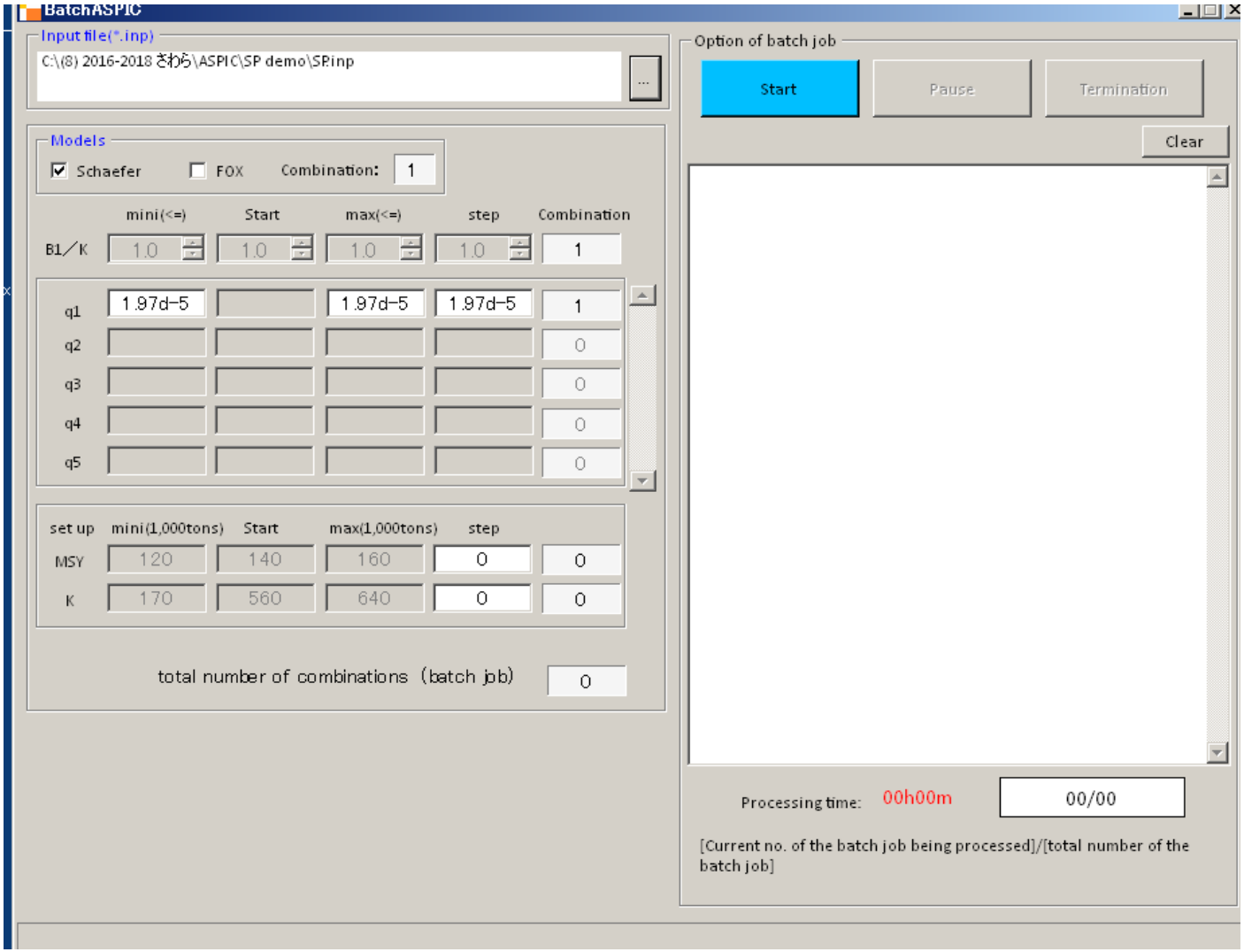


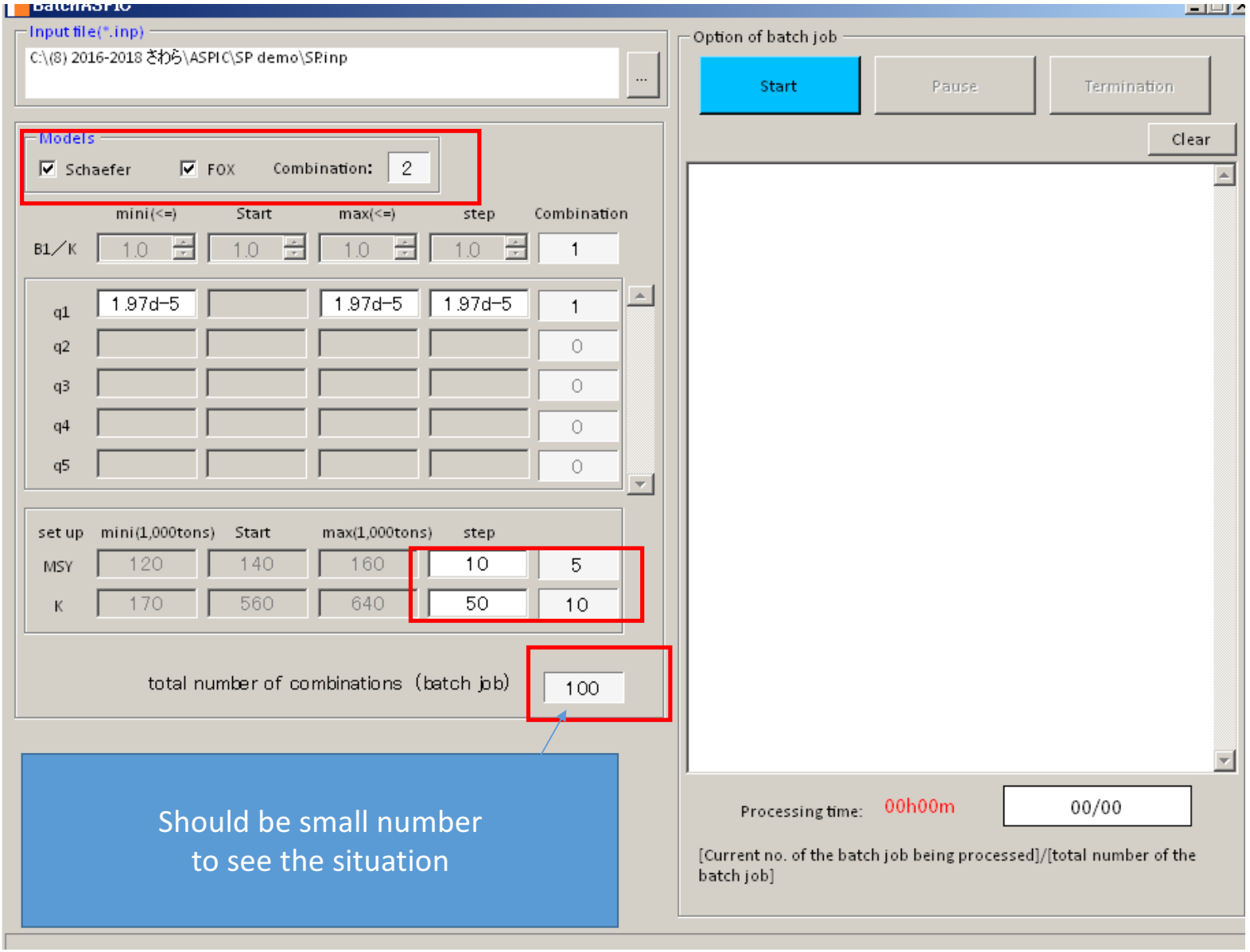
Now we run 1st ASPIC using Batch job

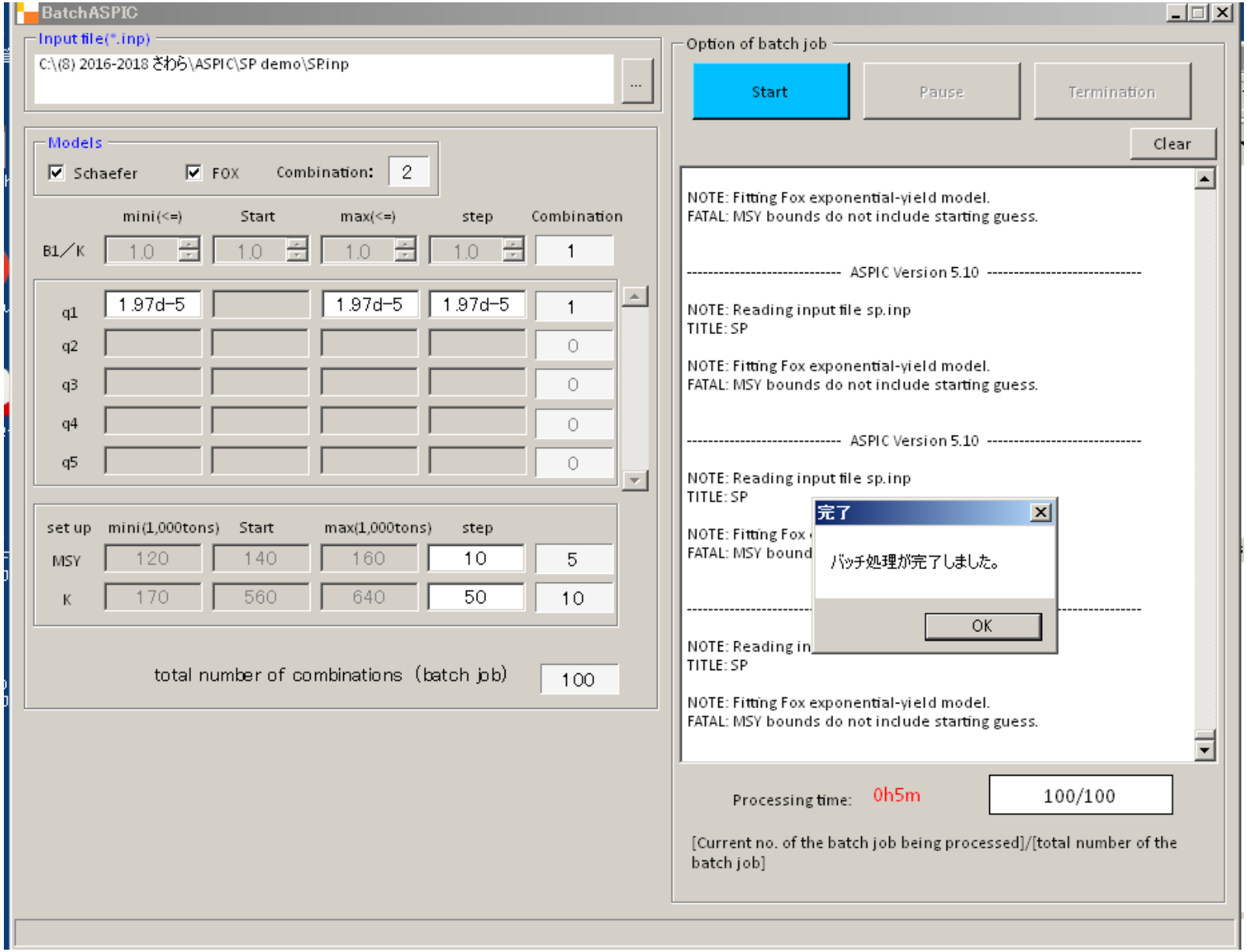
1. Double click  then read SP.inp



Then set up ranges




Input file(*.inp)
C:\(8) 2016-2018 さわら\ASPIC\SP demo\SP.inp
Models
Schaefer
FOX
Combination: 2
mini(<=) Start max(<=) step Combination
B1／K 1.0 1.0 1.0 1.0 1
q1 1.97d-5 1.97d-5 1.97d-5 1
q2 0
q3 0
q4 0
q5 0
set up mini(1,000tons) Start max(1,000tons) step
MSY 120 140 160 10 5
K 170 560 640 50 10
total number of combinations (batch job) 100
Should be small number to see the situation
Option of batch job
Start
Pause
Termination
Clear
Processing time: 00h00m
00/00
[Current no. of the batch job being processed]/[total number of the batch job]


BatchASPIC
Input file(*.inp)
C:\(8) 2016-2018 さわら\ASPIC\SP demo\SP.inp
...
Models
Schaefer
FOX
Combination: 2
mini(<=) Start max(<=) step Combination
B1／K 1.0 1.0 1.0 1.0 1
q1 1.97d-5 1.97d-5 1.97d-5 1
q2 0
q3 0
q4 0
q5 0
set up mini(1,000tons) Start max(1,000tons) step
MSY 120 140 160 10 5
K 170 560 640 50 10
total number of combinations (batch job) 100
Option of batch job
Start
Pause
Termination
Clear
NOTE: Fitting Fox exponential-yield model.
FATAL: MSY bounds do not include starting guess.
---------- ASPIC Version 5.10 ----------
NOTE: Reading input file sp.inp
TITLE: SP
NOTE: Fitting Fox exponential-yield model.
FATAL: MSY bounds do not include starting guess.
---------- ASPIC Version 5.10 ----------
NOTE: Reading input file sp.inp
TITLE: SP
NOTE: Fitting Fox
FATAL: MSY bound
NOTE: Reading in
TITLE: SP
NOTE: Fitting Fox exponential-yield model.
FATAL: MSY bounds do not include starting guess.
完了
バッチ処理が完了しました。
OK
Processing time: 0h5m
100/100
[Current no. of the batch job being processed]/[total number of the batch job]

Results

aspic.exe	2005/05/17 5:50	アプリケーション	918 KB
Command Prompt	2006/11/02 21:54	ショートカット	2 KB
Output_201807120049xlsx	2018/07/12 0:54	Microsoft Excel ワ...	17 KB
SP.fit	2018/07/12 0:54	FIT ファイル	35 KB
SP.inp	2018/07/11 16:29	INP ファイル	3 KB

Time	0h5m	No of jobs	100	Average	0.0559	Min/job	Sec/job	3.36												
Paramete	Model	B1/K	q(SP)	MSY	K															
Range (ste	Fox and Lo	1	1.97d-5-1.	120-160 by	170-640 by 50															
Flag (0: fixed / 1: est		0	1	1	1															
No	Model	B1/K	q	MSY(start	MSY(min)	MSY(max)	K(start)	K(min)	K(max)	B1/K[Est]	R2	q(SP)[Est]	RMS	r	K[Est]	MSY	Bmsy	Fmsy	B/Bmsy	F/Fmsy	TB	note
1	logistic	1	2.0d-5	120	120	160	170	170	640	1	-0.456	0.000467	295.2	1.367982	407.9	139.5	150	0.9294	0	8.608	0	FATAL: K bounds do not include starting guess.
2	logistic	1	2.0d-5	120	120	160	170	220	640	1	-0.456	0.000467	295.2	1.367982	407.9	139.5	150	0.9294	0	8.608	0	FATAL: MSY bounds do not include starting guess.
3	logistic	1	2.0d-5	120	120	160	170	270	640	1	-0.456	0.000467	295.2	1.367982	407.9	139.5	150	0.9294	0	8.608	0	FATAL: MSY bounds do not include starting guess.
4	logistic	1	2.0d-5	120	120	160	170	320	640	1	-0.456	0.000467	295.2	1.367982	407.9	139.5	150	0.9294	0	8.608	0	FATAL: MSY bounds do not include starting guess.
5	logistic	1	2.0d-5	120	120	160	170	370	640	1	-0.456	0.000467	295.2	1.367982	407.9	139.5	150	0.9294	0	8.608	0	FATAL: MSY bounds do not include starting guess.
6	logistic	1	2.0d-5	120	120	160	170	420	640	1	-0.456	0.000467	295.2	1.367982	407.9	139.5	150	0.9294	0	8.608	0	FATAL: MSY bounds do not include starting guess.
7	logistic	1	2.0d-5	120	120	160	170	470	640	1	-0.456	0.000467	295.2	1.367982	407.9	139.5	150	0.9294	0	8.608	0	FATAL: MSY bounds do not include starting guess.
8	logistic	1	2.0d-5	120	120	160	170	520	640	1	-0.456	0.000467	295.2	1.367982	407.9	139.5	150	0.9294	0	8.608	0	FATAL: MSY bounds do not include starting guess.
9	logistic	1	2.0d-5	120	120	160	170	570	640	1	-0.456	0.000467	295.2	1.367982	407.9	139.5	150	0.9294	0	8.608	0	FATAL: MSY bounds do not include starting guess.
10	logistic	1	2.0d-5	120	120	160	170	620	640	1	-0.456	0.000467	295.2	1.367982	407.9	139.5	150	0.9294	0	8.608	0	FATAL: MSY bounds do not include starting guess.
11	logistic	1	2.0d-5	120	130	160	170	170	640	1	-0.456	0.000467	295.2	1.367982	407.9	139.5	150	0.9294	0	8.608	0	FATAL: K bounds do not include starting guess.
12	logistic	1	2.0d-5	120	130	160	170	220	640	1	0.359	2.14E-05	0.5448	0.763125	640	122.1	320	0.3816	0.3627	2.859	19.7	WARNING: At least one parameter estimate is at or near a constraint.
13	logistic	1	2.0d-5	120	130	160	170	270	640	1	0.359	2.14E-05	0.5448	0.763125	640	122.1	320	0.3816	0.3626	2.86	19.7	WARNING: At least one parameter estimate is at or near a constraint.
14	logistic	1	2.0d-5	120	130	160	170	320	640	1	0.359	2.14E-05	0.5448	0.763125	640	122.1	320	0.3816	0.3627	2.859	19.7	WARNING: At least one parameter estimate is at or near a constraint.
15	logistic	1	2.0d-5	120	130	160	170	370	640	1	0.359	2.14E-05	0.5448	0.763125	640	122.1	320	0.3816	0.3626	2.86	19.7	WARNING: At least one parameter estimate is at or near a constraint.
16	logistic	1	2.0d-5	120	130	160	170	420	640	1	0.359	2.14E-05	0.5448	0.763125	640	122.1	320	0.3816	0.3627	2.86	19.7	WARNING: At least one parameter estimate is at or near a constraint.
17	logistic	1	2.0d-5	120	130	160	170	470	640	1	0.359	2.14E-05	0.5448	0.763125	640	122.1	320	0.3816	0.3626	2.86	19.7	WARNING: At least one parameter estimate is at or near a constraint.

If succeeded, we should have some number with NOTE: ASPIC ended normally

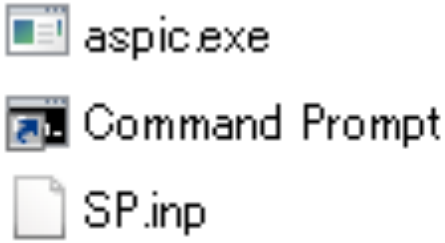
0	NOTE: ASPIC ended normally. The output file is sp.fit
0	NOTE: ASPIC ended normally. The output file is sp.fit
0	FATAL: K bounds do not include starting guess.
0	NOTE: ASPIC ended normally. The output file is sp.fit
0	NOTE: ASPIC ended normally. The output file is sp.fit
0	NOTE: ASPIC ended normally. The output file is sp.fit
0	NOTE: ASPIC ended normally. The output file is sp.fit
0	NOTE: ASPIC ended normally. The output file is sp.fit
0	NOTE: ASPIC ended normally. The output file is sp.fit

In our 1st run, we could not get any answers

- In such case, even we try other runs, we will not get answers
- To solve this problem
- We will fix K values using plausible number
- K=560,000 (point) we will attempt some number around this values 300,000, 400,000, 500,000 and 600,000 tons and evaluate

You make 4 folders (scenarios) (options)

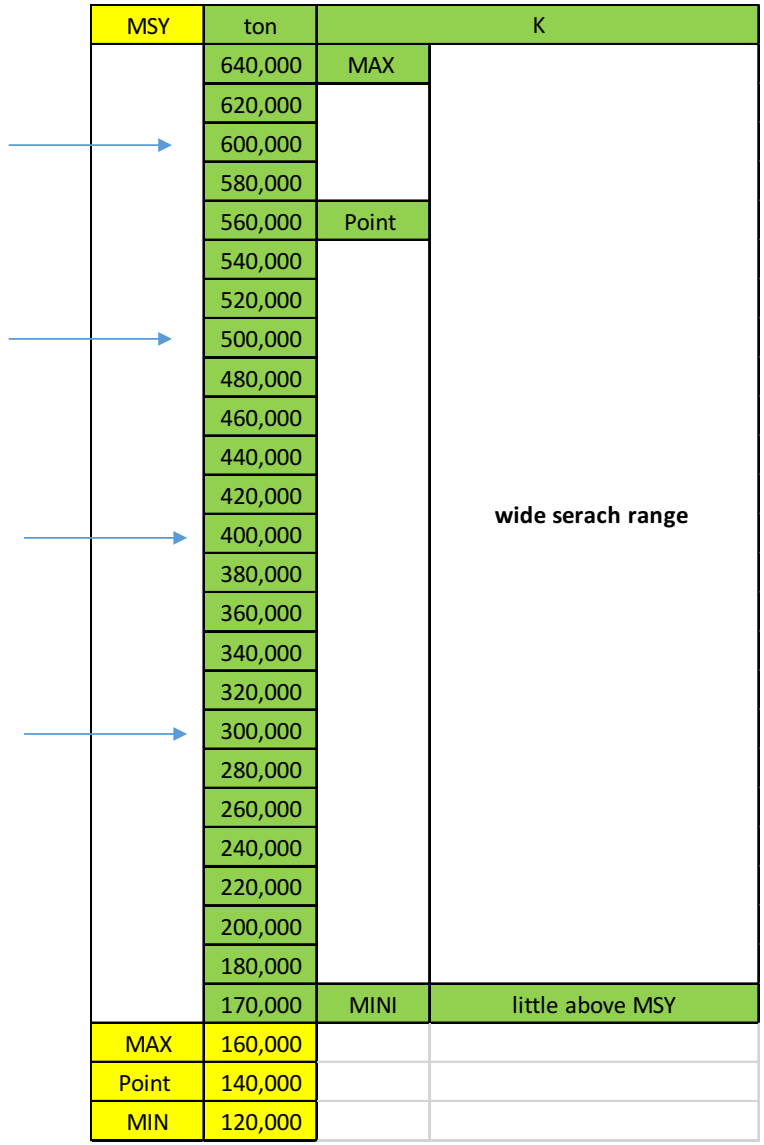
In each folder , you should have



Concept to guess

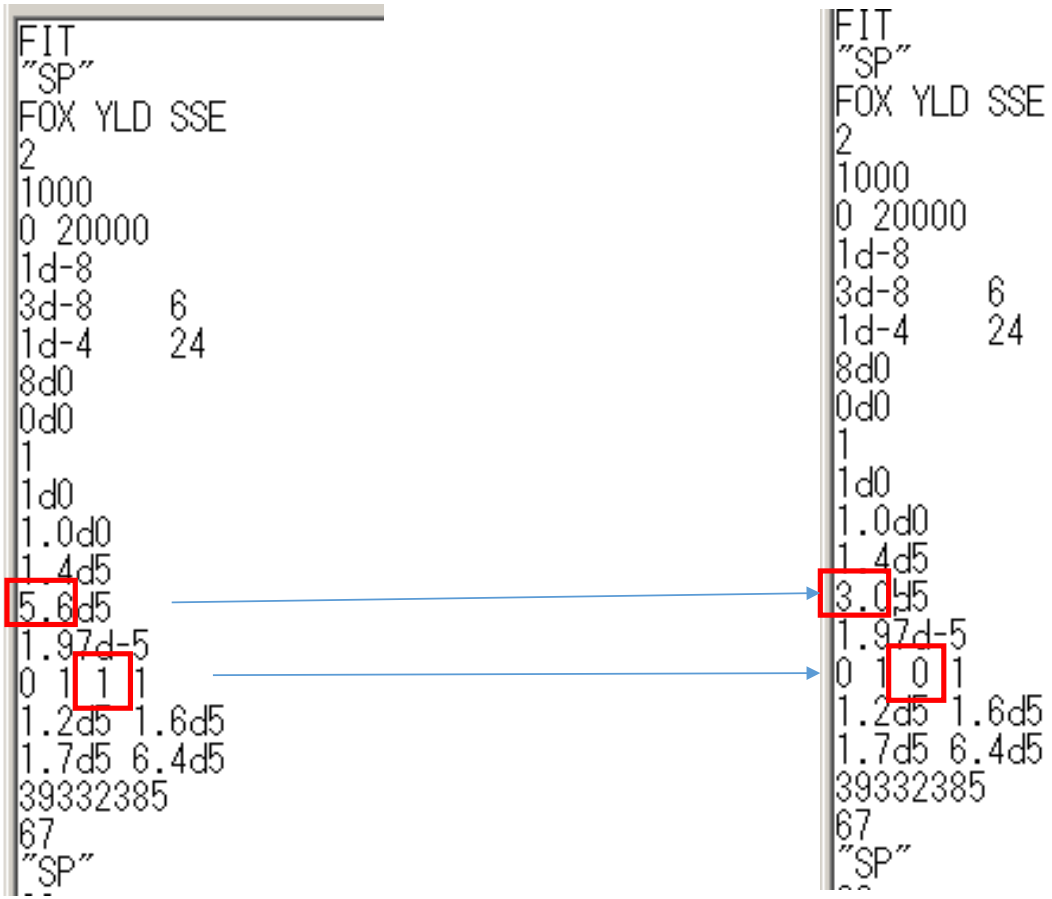
MSY and K

point, MINI and MAX

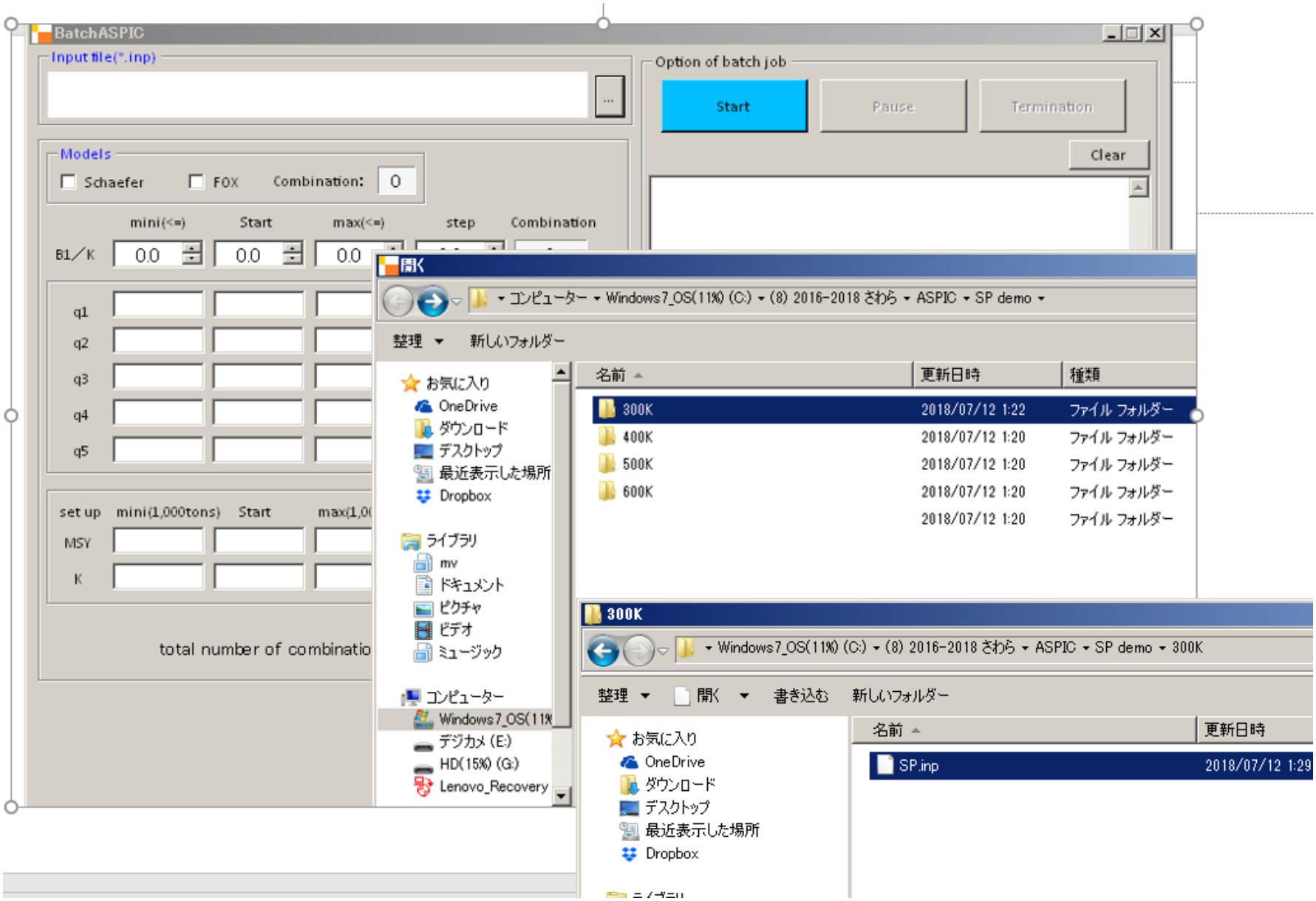


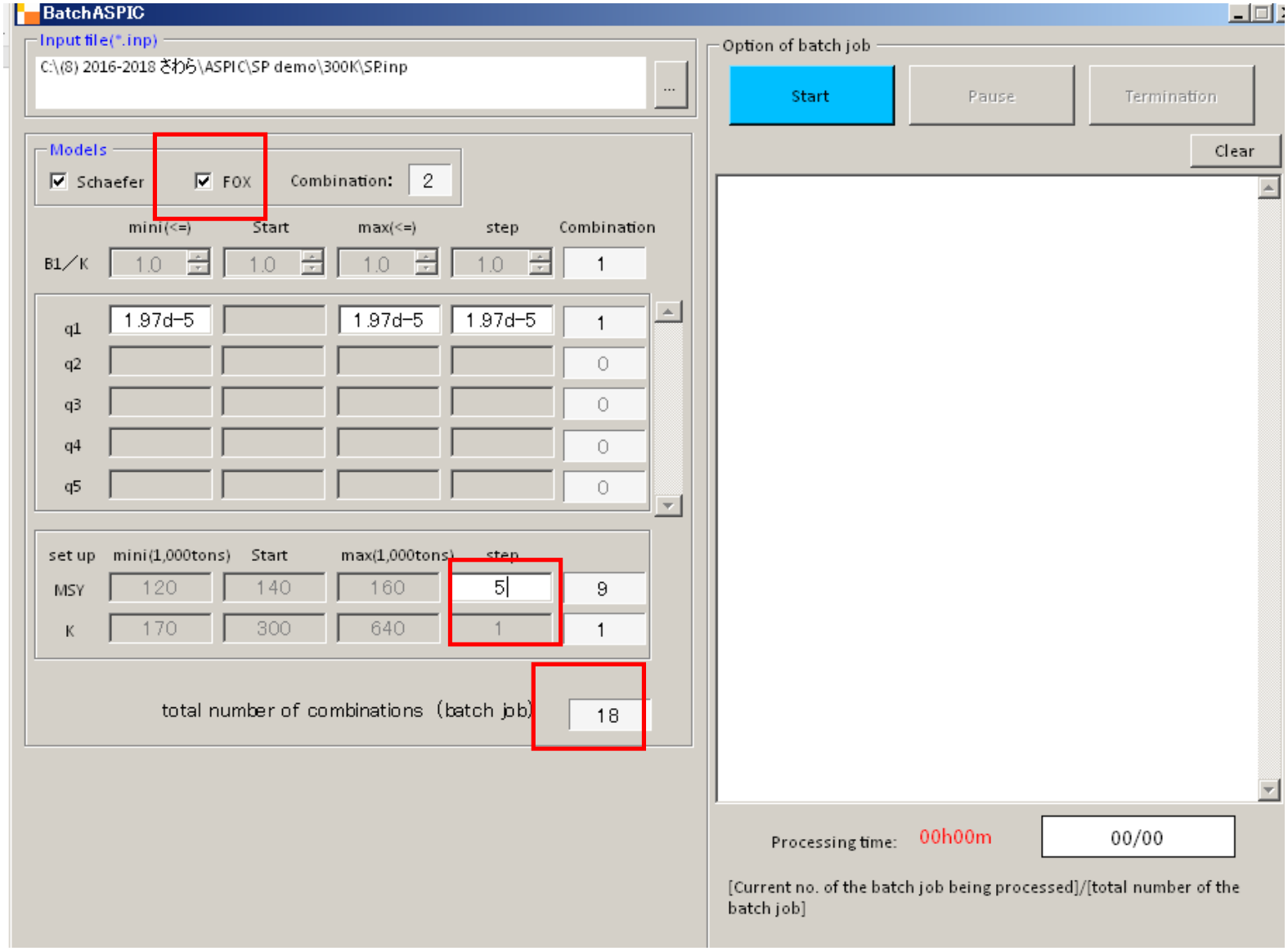
MSY	ton	K	
	640,000	MAX	
	620,000		
	600,000		
	580,000		
	560,000	Point	
	540,000		
	520,000		
	500,000		
	480,000		
	460,000		
	440,000		
	420,000		wide serach range
	400,000		
	380,000		
	360,000		
	340,000		
	320,000		
	300,000		
	280,000		
	260,000		
	240,000		
	220,000		
	200,000		
	180,000		
	170,000	MINI	little above MSY
MAX	160,000		
Point	140,000		
MIN	120,000		

Then you change 2 parameters SP.inp

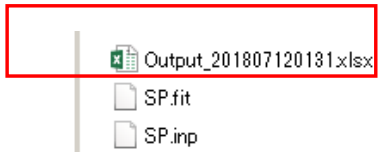


Then try again




BatchASPIC
Input file(*.inp)
C:\(8) 2016-2018 さわら\ASPIC\SP demo\300K\SP.inp
Models
Schaefer
FOX
Combination: 2
mini(<=) Start max(<=) step Combination
B1／K 1.0 1.0 1.0 1.0 1
q1 1.97d-5 1.97d-5 1.97d-5 1
q2 0
q3 0
q4 0
q5 0
set up mini(1,000tons) Start max(1,000tons) step
MSY 120 140 160 5 9
K 170 300 640 1 1
total number of combinations (batch job) 18
Option of batch job
Start
Pause
Termination
Clear
Processing time: 00h00m
00/00
[Current no. of the batch job being processed]/[total number of the batch job]

Result

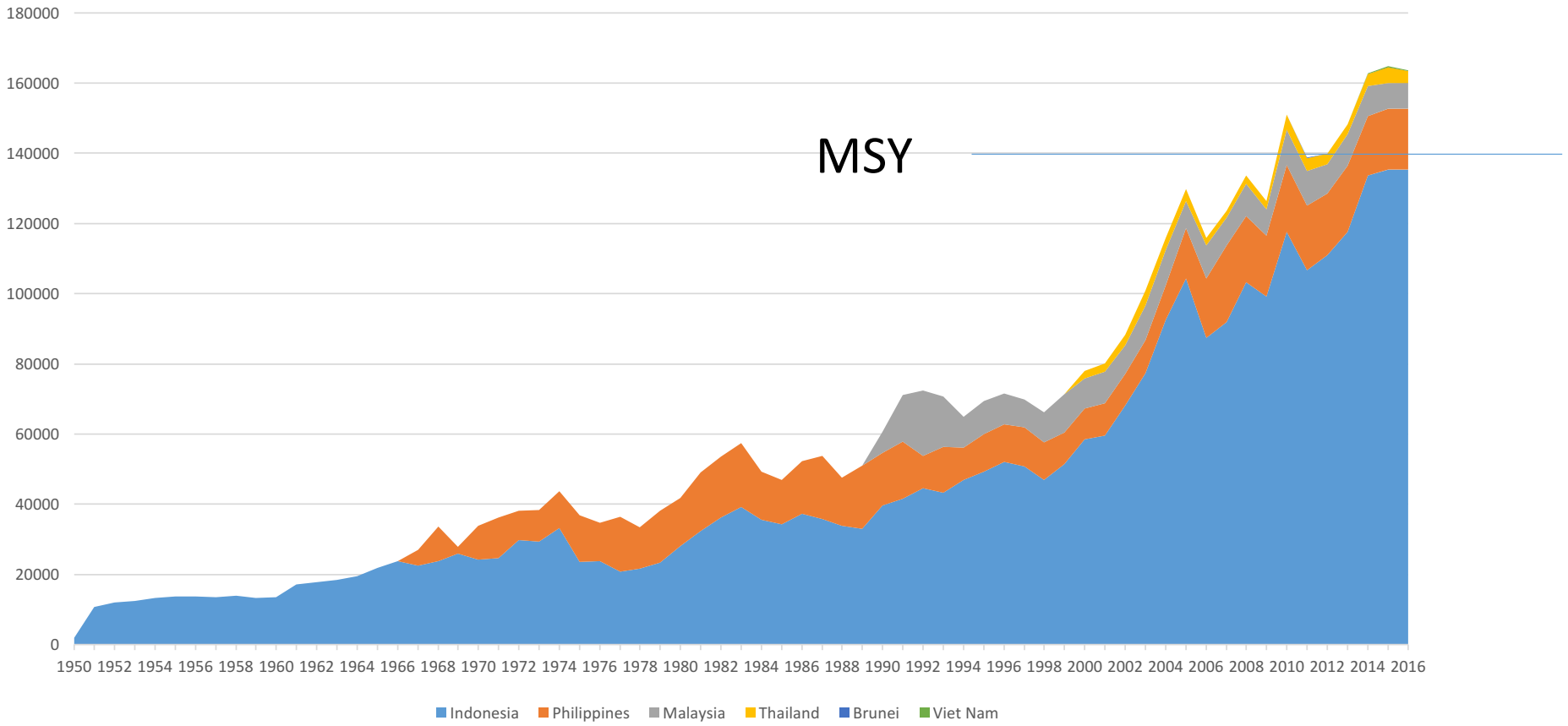


- Seems OK but MSY < TB never happen

	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	Z	AA
1	Time	0h0m	No of jobs	18	Average	0.0133	Min/job	Sec/job	0.8																		
2	Paramete	Model	B1/K	q(SP)	MSY	K																					
3	Range (ste	Fox and Lo	1	1.97d-5-1.	120-160 by	300																					
4	Flag (0: fixed / 1: est		0	1	1	0																					
5																											
6	No	Model	B1/K	q	MSY(start	MSY(min)	MSY(max)	K(start)	K(min)	K(max)	B1/K[Est]	R2	q(SP)[Est]	RMS	r	K[Est]	MSY	Bmsy	Fmsy	B/Bmsy	F/Fmsy	TB	note				
7	1	logistic	1	2.0d-5	120	120	160	170	300	640													FATAL: MSY bounds do not include starting guess.				
8	2	logistic	1	2.0d-5	120	130	160	170	300	640	1	0.267	4.19E-05	0.5534	1.877333	300	140.8	150	0.9387	0.4004	2.134	113.5	NOTE: ASPIC ended normally. The output file is sp.fit				
9	3	logistic	1	2.0d-5	120	130	160	170	300	640	1	0.267	4.19E-05	0.5534	1.877333	300	140.8	150	0.9387	0.4004	2.134	113.5	NOTE: ASPIC ended normally. The output file is sp.fit				
10	4	logistic	1	2.0d-5	120	140	160	170	300	640	1	0.267	4.19E-05	0.5534	1.877333	300	140.8	150	0.9387	0.4004	2.134	113.5	NOTE: ASPIC ended normally. The output file is sp.fit				
11	5	logistic	1	2.0d-5	120	140	160	170	300	640	1	0.267	4.19E-05	0.5534	1.877333	300	140.8	150	0.9387	0.4004	2.134	113.5	NOTE: ASPIC ended normally. The output file is sp.fit				
12	6	logistic	1	2.0d-5	120	150	160	170	300	640	1	0.267	4.19E-05	0.5534	1.877333	300	140.8	150	0.9387	0.4004	2.134	113.5	NOTE: ASPIC ended normally. The output file is sp.fit				
13	7	logistic	1	2.0d-5	120	150	160	170	300	640	1	0.267	4.19E-05	0.5534	1.877333	300	140.8	150	0.9387	0.4004	2.134	113.5	NOTE: ASPIC ended normally. The output file is sp.fit				
14	8	logistic	1	2.0d-5	120	160	160	170	300	640	1	0.267	4.19E-05	0.5534	1.877333	300	140.8	150	0.9387	0.4004	2.134	113.5	FATAL: MSY bounds do not include starting guess.				
15	9	logistic	1	2.0d-5	120	160	160	170	300	640	1	0.267	4.19E-05	0.5534	1.877333	300	140.8	150	0.9387	0.4004	2.134	113.5	FATAL: MSY bounds do not include starting guess.				
16	10	fox	1	2.0d-5	120	120	160	170	300	640	1	0.267	4.19E-05	0.5534	1.27578	300	140.8	150	0.9387	0.4004	2.134	113.5	FATAL: MSY bounds do not include starting guess.				
17	11	fox	1	2.0d-5	120	130	160	170	300	640	1	0.349	4.92E-05	0.5241	1.293902	300	142.8	110.4	1.294	0.5057	1.865	89.4	NOTE: ASPIC ended normally. The output file is sp.fit				
18	12	fox	1	2.0d-5	120	130	160	170	300	640	1	0.349	4.92E-05	0.5241	1.293902	300	142.8	110.4	1.294	0.5057	1.865	89.4	NOTE: ASPIC ended normally. The output file is sp.fit				
19	13	fox	1	2.0d-5	120	140	160	170	300	640	1	0.349	4.92E-05	0.5241	1.293902	300	142.8	110.4	1.294	0.5057	1.865	89.4	NOTE: ASPIC ended normally. The output file is sp.fit				
20	14	fox	1	2.0d-5	120	140	160	170	300	640	1	0.349	4.92E-05	0.5241	1.293902	300	142.8	110.4	1.294	0.5057	1.865	89.4	NOTE: ASPIC ended normally. The output file is sp.fit				
21	15	fox	1	2.0d-5	120	150	160	170	300	640	1	0.349	4.92E-05	0.5241	1.293902	300	142.8	110.4	1.294	0.5057	1.865	89.4	NOTE: ASPIC ended normally. The output file is sp.fit				
22	16	fox	1	2.0d-5	120	150	160	170	300	640	1	0.349	4.92E-05	0.5241	1.293902	300	142.8	110.4	1.294	0.5057	1.865	89.4	NOTE: ASPIC ended normally. The output file is sp.fit				
23	17	fox	1	2.0d-5	120	160	160	170	300	640	1	0.349	4.92E-05	0.5241	1.293902	300	142.8	110.4	1.294	0.5057	1.865	89.4	FATAL: MSY bounds do not include starting guess.				
24	18	fox	1	2.0d-5	120	160	160	170	300	640	1	0.349	4.92E-05	0.5241	1.293902	300	142.8	110.4	1.294	0.5057	1.865	89.4	FATAL: MSY bounds do not include starting guess.				

Spanish PO

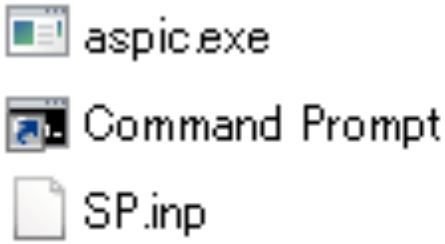
TB should higher than MSY



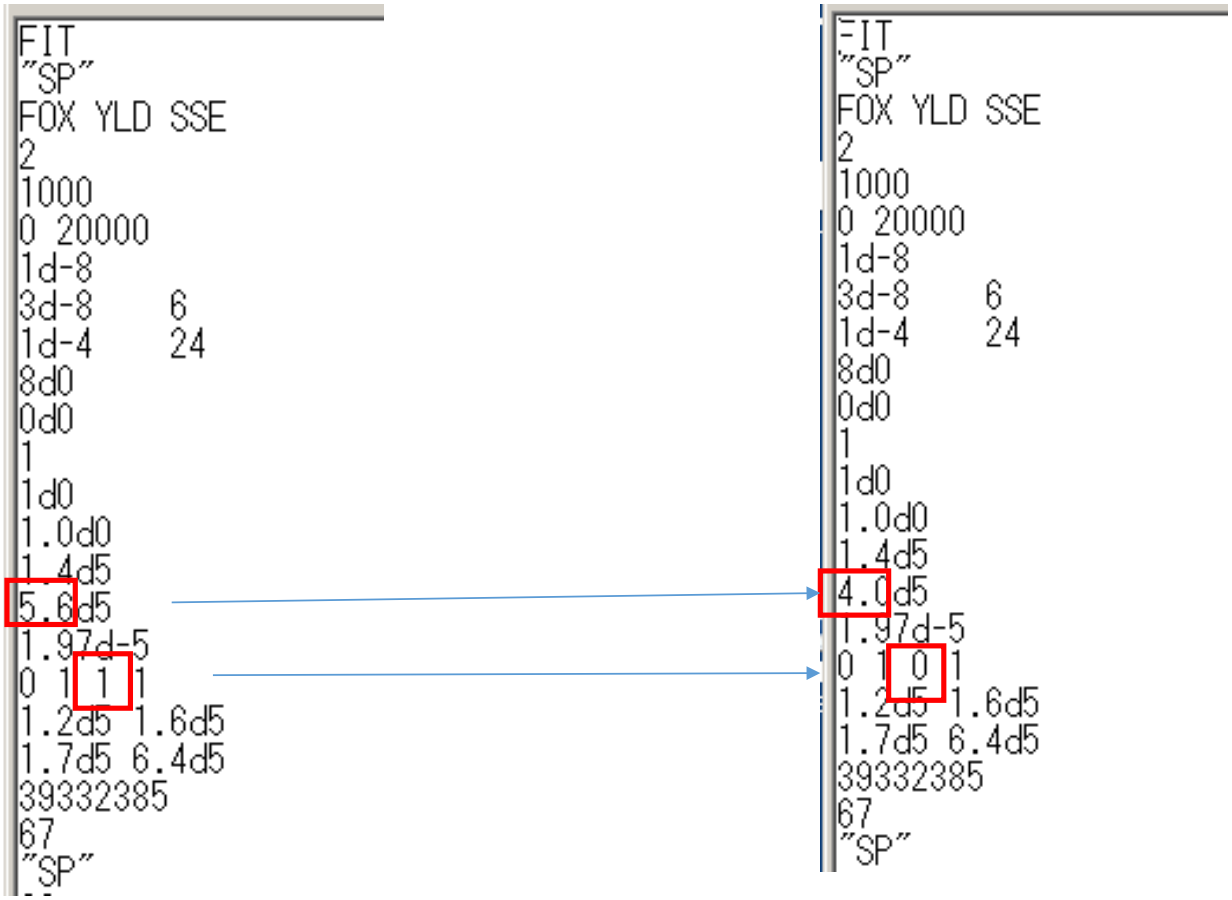
Now try 400K in the same way..

You make 4 folders (scenarios) (options)

In each folder , you should have



Then you change 2 parameters SP.inp



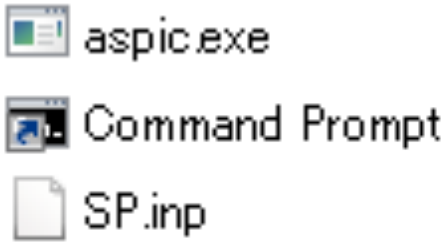
STILL MSY > TB or both are too close NO GOOD

	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	Z	AA
	Time	0h0m	No of jobs	18	Average	0.0177	Min/job	Sec/job	1.06																		
	Paramete	Model	B1/K	q(SP)	MSY	K																					
	Range (ste	Fox and Lo	1	1.97d-5-1.	120-160 by	400																					
	Flag (0: fixed / 1: est		0	1	1	0																					
	No	Model	B1/K	q	MSY(start	MSY(min)	MSY(max)	K(start)	K(min)	K(max)	B1/K[Est]	R2	q(SP)[Est]	RMS	r	K[Est]	MSY	Bmsy	Fmsy	B/Bmsy	F/Fmsy	TB	note				
	1	logistic	1	2.0d-5	120	120	160	170	400	640													FATAL: MSY bounds do not include starting guess.				
	2	logistic	1	2.0d-5	120	130	160	170	400	640	1	0.304	3.25E-05	0.5412	1.346	400	134.6	200	0.673	0.3773	2.388	138.1	NOTE: ASPIC ended normally. The output file is sp.fi				
	3	logistic	1	2.0d-5	120	130	160	170	400	640	1	0.304	3.25E-05	0.5412	1.346	400	134.6	200	0.673	0.3773	2.388	138.1	NOTE: ASPIC ended normally. The output file is sp.fi				
0	4	logistic	1	2.0d-5	120	140	160	170	400	640	1	0.304	3.25E-05	0.5412	1.346	400	134.6	200	0.673	0.3773	2.388	138	NOTE: ASPIC ended normally. The output file is sp.fi				
1	5	logistic	1	2.0d-5	120	140	160	170	400	640	1	0.304	3.25E-05	0.5412	1.346	400	134.6	200	0.673	0.3773	2.388	138	NOTE: ASPIC ended normally. The output file is sp.fi				
2	6	logistic	1	2.0d-5	120	150	160	170	400	640	1	0.304	3.25E-05	0.5412	1.346	400	134.6	200	0.673	0.3774	2.388	138.1	NOTE: ASPIC ended normally. The output file is sp.fi				
3	7	logistic	1	2.0d-5	120	150	160	170	400	640	1	0.304	3.25E-05	0.5412	1.346	400	134.6	200	0.673	0.3774	2.388	138.1	NOTE: ASPIC ended normally. The output file is sp.fi				
4	8	logistic	1	2.0d-5	120	160	160	170	400	640	1	0.304	3.25E-05	0.5412	1.346	400	134.6	200	0.673	0.3774	2.388	138.1	FATAL: MSY bounds do not include starting guess.				
5	9	logistic	1	2.0d-5	120	160	160	170	400	640	1	0.304	3.25E-05	0.5412	1.346	400	134.6	200	0.673	0.3774	2.388	138.1	FATAL: MSY bounds do not include starting guess.				
6	10	fox	1	2.0d-5	120	120	160	170	400	640	1	0.304	3.25E-05	0.5412	0.914702	400	134.6	200	0.673	0.3774	2.388	138.1	FATAL: MSY bounds do not include starting guess.				
7	11	fox	1	2.0d-5	120	130	160	170	400	640	1	0.383	3.8E-05	0.5129	0.931691	400	137.1	147.2	0.9314	0.4761	2.047	111	NOTE: ASPIC ended normally. The output file is sp.fi				
8	12	fox	1	2.0d-5	120	130	160	170	400	640	1	0.383	3.8E-05	0.5129	0.931691	400	137.1	147.2	0.9314	0.4761	2.047	111	NOTE: ASPIC ended normally. The output file is sp.fi				
9	13	fox	1	2.0d-5	120	140	160	170	400	640	1	0.383	3.8E-05	0.5129	0.931691	400	137.1	147.2	0.9314	0.476	2.047	111	NOTE: ASPIC ended normally. The output file is sp.fi				
0	14	fox	1	2.0d-5	120	140	160	170	400	640	1	0.383	3.8E-05	0.5129	0.931691	400	137.1	147.2	0.9314	0.476	2.047	111	NOTE: ASPIC ended normally. The output file is sp.fi				
1	15	fox	1	2.0d-5	120	150	160	170	400	640	1	0.383	3.8E-05	0.5129	0.931691	400	137.1	147.2	0.9314	0.476	2.047	111	NOTE: ASPIC ended normally. The output file is sp.fi				
2	16	fox	1	2.0d-5	120	150	160	170	400	640	1	0.383	3.8E-05	0.5129	0.931691	400	137.1	147.2	0.9314	0.476	2.047	111	NOTE: ASPIC ended normally. The output file is sp.fi				
3	17	fox	1	2.0d-5	120	160	160	170	400	640	1	0.383	3.8E-05	0.5129	0.931691	400	137.1	147.2	0.9314	0.476	2.047	111	FATAL: MSY bounds do not include starting guess.				
4	18	fox	1	2.0d-5	120	160	160	170	400	640	1	0.383	3.8E-05	0.5129	0.931691	400	137.1	147.2	0.9314	0.476	2.047	111	FATAL: MSY bounds do not include starting guess.				
5																											

NOW TRY K=500

You make 4 folders (scenarios) (options)

In each folder , you should have



Now seems to be OK how to select the best one
I will show step by step using this excel sheet
(Taki san and Supapong will help you)

Time	0h0m	No of jobs	28	Average	0.0292	Min/job	Sec/job	1.75																				
Paramete	Model	B1/K	q(SP)	MSY	K																							
Range (ste	Fox and Lo	1	1.97d-5-1.	120-160 by	500																							
Flag (0: fixed / 1: est		0	1	1	0																							
No	Model	B1/K	q	MSY(start	MSY(min)	MSY(max)	K(start)	K(min)	K(max)	B1/K[Est]	R2	q(SP)[Est]	RMS	r	K[Est]	MSY	Bmsy	Fmsy	B/Bmsy	F/Fmsy	TB	note						
1	logistic	1	2.0d-5	120	120	160	170	500	640													FATAL: MSY bounds do not include starting guess.						
2	logistic	1	2.0d-5	120	120	160	170	500	640													FATAL: MSY bounds do not include starting guess.						
3	logistic	1	2.0d-5	120	130	160	170	500	640	1	0.331	2.67E-05	0.5323	1.0336	500	129.2	250	0.5167	0.3699	2.589	161.5	NOTE: ASPIC ended normally. The output file is sp.fit						
4	logistic	1	2.0d-5	120	130	160	170	500	640	1	0.331	2.67E-05	0.5323	1.0336	500	129.2	250	0.5167	0.3699	2.589	161.5	NOTE: ASPIC ended normally. The output file is sp.fit						
5	logistic	1	2.0d-5	120	130	160	170	500	640	1	0.331	2.67E-05	0.5323	1.0336	500	129.2	250	0.5167	0.3699	2.589	161.5	NOTE: ASPIC ended normally. The output file is sp.fit						
6	logistic	1	2.0d-5	120	140	160	170	500	640	1	0.331	2.67E-05	0.5323	1.0336	500	129.2	250	0.5167	0.3699	2.589	161.5	NOTE: ASPIC ended normally. The output file is sp.fit						
7	logistic	1	2.0d-5	120	140	160	170	500	640	1	0.331	2.67E-05	0.5323	1.0336	500	129.2	250	0.5167	0.3699	2.589	161.5	NOTE: ASPIC ended normally. The output file is sp.fit						
8	logistic	1	2.0d-5	120	140	160	170	500	640	1	0.331	2.67E-05	0.5323	1.0336	500	129.2	250	0.5167	0.3699	2.589	161.5	NOTE: ASPIC ended normally. The output file is sp.fit						
9	logistic	1	2.0d-5	120	140	160	170	500	640	1	0.331	2.67E-05	0.5323	1.0336	500	129.2	250	0.5167	0.3699	2.589	161.5	NOTE: ASPIC ended normally. The output file is sp.fit						
10	logistic	1	2.0d-5	120	150	160	170	500	640	1	0.331	2.67E-05	0.5323	1.0336	500	129.2	250	0.5167	0.3699	2.589	161.5	NOTE: ASPIC ended normally. The output file is sp.fit						
11	logistic	1	2.0d-5	120	150	160	170	500	640	1	0.331	2.67E-05	0.5323	1.0336	500	129.2	250	0.5167	0.3699	2.589	161.5	NOTE: ASPIC ended normally. The output file is sp.fit						
12	logistic	1	2.0d-5	120	150	160	170	500	640	1	0.331	2.67E-05	0.5323	1.0336	500	129.2	250	0.5167	0.3699	2.589	161.5	NOTE: ASPIC ended normally. The output file is sp.fit						
13	logistic	1	2.0d-5	120	160	160	170	500	640	1	0.331	2.67E-05	0.5323	1.0336	500	129.2	250	0.5167	0.3699	2.589	161.5	FATAL: MSY bounds do not include starting guess.						
14	logistic	1	2.0d-5	120	160	160	170	500	640	1	0.331	2.67E-05	0.5323	1.0336	500	129.2	250	0.5167	0.3699	2.589	161.5	FATAL: MSY bounds do not include starting guess.						
15	fox	1	2.0d-5	120	120	160	170	500	640	1	0.331	2.67E-05	0.5323	0.702404	500	129.2	250	0.5167	0.3699	2.589	161.5	FATAL: MSY bounds do not include starting guess.						
16	fox	1	2.0d-5	120	120	160	170	500	640	1	0.331	2.67E-05	0.5323	0.702404	500	129.2	250	0.5167	0.3699	2.589	161.5	FATAL: MSY bounds do not include starting guess.						
17	fox	1	2.0d-5	120	130	160	170	500	640	1	0.405	3.1E-05	0.5054	0.717083	500	131.9	183.9	0.7173	0.4629	2.193	131.9	NOTE: ASPIC ended normally. The output file is sp.fit						
18	fox	1	2.0d-5	120	130	160	170	500	640	1	0.405	3.1E-05	0.5054	0.717083	500	131.9	183.9	0.7173	0.4629	2.193	131.9	NOTE: ASPIC ended normally. The output file is sp.fit						
19	fox	1	2.0d-5	120	130	160	170	500	640	1	0.405	3.1E-05	0.5054	0.717083	500	131.9	183.9	0.7173	0.4629	2.193	131.9	NOTE: ASPIC ended normally. The output file is sp.fit						
20	fox	1	2.0d-5	120	140	160	170	500	640	1	0.405	3.1E-05	0.5054	0.717083	500	131.9	183.9	0.7173	0.4629	2.193	131.9	NOTE: ASPIC ended normally. The output file is sp.fit						
21	fox	1	2.0d-5	120	140	160	170	500	640	1	0.405	3.1E-05	0.5054	0.717083	500	131.9	183.9	0.7173	0.4629	2.193	131.9	NOTE: ASPIC ended normally. The output file is sp.fit						
22	fox	1	2.0d-5	120	140	160	170	500	640	1	0.405	3.1E-05	0.5054	0.717083	500	131.9	183.9	0.7173	0.4629	2.193	131.9	NOTE: ASPIC ended normally. The output file is sp.fit						
23	fox	1	2.0d-5	120	140	160	170	500	640	1	0.405	3.1E-05	0.5054	0.717083	500	131.9	183.9	0.7173	0.4629	2.193	131.9	NOTE: ASPIC ended normally. The output file is sp.fit						
24	fox	1	2.0d-5	120	150	160	170	500	640	1	0.405	3.1E-05	0.5054	0.717083	500	131.9	183.9	0.7173	0.4629	2.193	131.9	NOTE: ASPIC ended normally. The output file is sp.fit						
25	fox	1	2.0d-5	120	150	160	170	500	640	1	0.405	3.1E-05	0.5054	0.717083	500	131.9	183.9	0.7173	0.4629	2.193	131.9	NOTE: ASPIC ended normally. The output file is sp.fit						
26	fox	1	2.0d-5	120	150	160	170	500	640	1	0.405	3.1E-05	0.5054	0.717083	500	131.9	183.9	0.7173	0.4629	2.193	131.9	NOTE: ASPIC ended normally. The output file is sp.fit						
27	fox	1	2.0d-5	120	160	160	170	500	640	1	0.405	3.1E-05	0.5054	0.717083	500	131.9	183.9	0.7173	0.4629	2.193	131.9	FATAL: MSY bounds do not include starting guess.						
28	fox	1	2.0d-5	120	160	160	170	500	640	1	0.405	3.1E-05	0.5054	0.717083	500	131.9	183.9	0.7173	0.4629	2.193	131.9	FATAL: MSY bounds do not include starting guess.						

Selected ones (one answer)　r　is OK
MSY < TB　OK

No	Model	B1/K	q	MSY(st	MSY(m	MSY(m	K(start)	K(min)	K(max)	B1/K[E	R2	q(SP)[E	RMS	r	K[Est]	MSY	Bmsy	Fmsy	B/Bmsy	F/Fmsy	TB	note
3	logistic	1	2.0d-5	120	130	160	170	500	640	1	0.331	2.67E-05	0.5323	1.0336	500	129.2	250	0.5167	0.3699	2.589	161.5	NOTE: ASPIC enc
4	logistic	1	2.0d-5	120	130	160	170	500	640	1	0.331	2.67E-05	0.5323	1.0336	500	129.2	250	0.5167	0.3699	2.589	161.5	NOTE: ASPIC enc
5	logistic	1	2.0d-5	120	130	160	170	500	640	1	0.331	2.67E-05	0.5323	1.0336	500	129.2	250	0.5167	0.3699	2.589	161.5	NOTE: ASPIC enc
6	logistic	1	2.0d-5	120	140	160	170	500	640	1	0.331	2.67E-05	0.5323	1.0336	500	129.2	250	0.5167	0.3699	2.589	161.5	NOTE: ASPIC enc
7	logistic	1	2.0d-5	120	140	160	170	500	640	1	0.331	2.67E-05	0.5323	1.0336	500	129.2	250	0.5167	0.3699	2.589	161.5	NOTE: ASPIC enc
8	logistic	1	2.0d-5	120	140	160	170	500	640	1	0.331	2.67E-05	0.5323	1.0336	500	129.2	250	0.5167	0.3699	2.589	161.5	NOTE: ASPIC enc
9	logistic	1	2.0d-5	120	140	160	170	500	640	1	0.331	2.67E-05	0.5323	1.0336	500	129.2	250	0.5167	0.3699	2.589	161.5	NOTE: ASPIC enc
10	logistic	1	2.0d-5	120	150	160	170	500	640	1	0.331	2.67E-05	0.5323	1.0336	500	129.2	250	0.5167	0.3699	2.589	161.5	NOTE: ASPIC enc
11	logistic	1	2.0d-5	120	150	160	170	500	640	1	0.331	2.67E-05	0.5323	1.0336	500	129.2	250	0.5167	0.3699	2.589	161.5	NOTE: ASPIC enc
12	logistic	1	2.0d-5	120	150	160	170	500	640	1	0.331	2.67E-05	0.5323	1.0336	500	129.2	250	0.5167	0.3699	2.589	161.5	NOTE: ASPIC enc

K=600　r=0.57 too small to select

Time	0h0m	No of jobs	18	Average	0.0111	Min/job	Sec/job	0.67														
Paramete	Model	B1/K	q(SP)	MSY	K																	
Range (ste	Fox and Lo	1	1.97d-5-1.	120-160 by	600																	
Flag (0: fixed / 1: est		0	1	1	0																	
No	Model	B1/K	q	MSY(st	MSY(m	MSY(m	K(start)	K(min)	K(max)	B1/K[Es	R2	q(SP)[E	RMS		K[Est]	MSY	Bmsy	Fmsy	B/Bmsy	F/Fmsy	TB	note
11	fox	1	2.0d-5	120	130	160	170	600	640	1	0.421	2.63E-05	0.5006	0.575823	600	127.1	220.7	0.5759	0.456	2.324	152.5	NOTE: ASPIC e
12	fox	1	2.0d-5	120	130	160	170	600	640	1	0.421	2.63E-05	0.5006	0.575823	600	127.1	220.7	0.5759	0.456	2.324	152.5	NOTE: ASPIC e
13	fox	1	2.0d-5	120	140	160	170	600	640	1	0.421	2.63E-05	0.5006	0.575823	600	127.1	220.7	0.5759	0.4559	2.324	152.5	NOTE: ASPIC e
14	fox	1	2.0d-5	120	140	160	170	600	640	1	0.421	2.63E-05	0.5006	0.575823	600	127.1	220.7	0.5759	0.4559	2.324	152.5	NOTE: ASPIC e
15	fox	1	2.0d-5	120	150	160	170	600	640	1	0.421	2.63E-05	0.5006	0.575823	600	127.1	220.7	0.5759	0.4559	2.325	152.5	NOTE: ASPIC e
16	fox	1	2.0d-5	120	150	160	170	600	640	1	0.421	2.63E-05	0.5006	0.575823	600	127.1	220.7	0.5759	0.4559	2.325	152.5	NOTE: ASPIC e
2	logistic	1	2.0d-5	120	130	160	170	600	640	1	0.352	2.27E-05	0.5256	0.827333	600	124.1	300	0.4136	0.3641	2.785	183.8	NOTE: ASPIC e
3	logistic	1	2.0d-5	120	130	160	170	600	640	1	0.352	2.27E-05	0.5256	0.827333	600	124.1	300	0.4136	0.3641	2.785	183.8	NOTE: ASPIC e
4	logistic	1	2.0d-5	120	140	160	170	600	640	1	0.352	2.27E-05	0.5256	0.827333	600	124.1	300	0.4136	0.3641	2.785	183.9	NOTE: ASPIC e
5	logistic	1	2.0d-5	120	140	160	170	600	640	1	0.352	2.27E-05	0.5256	0.827333	600	124.1	300	0.4136	0.3641	2.785	183.9	NOTE: ASPIC e
6	logistic	1	2.0d-5	120	150	160	170	600	640	1	0.352	2.27E-05	0.5256	0.827333	600	124.1	300	0.4136	0.3641	2.785	183.9	NOTE: ASPIC e
7	logistic	1	2.0d-5	120	150	160	170	600	640	1	0.352	2.27E-05	0.5256	0.827333	600	124.1	300	0.4136	0.3641	2.785	183.9	NOTE: ASPIC e

We have only 2 plausible answers K=500 and 600 both are almost same r=1.036 (K=500) preferable

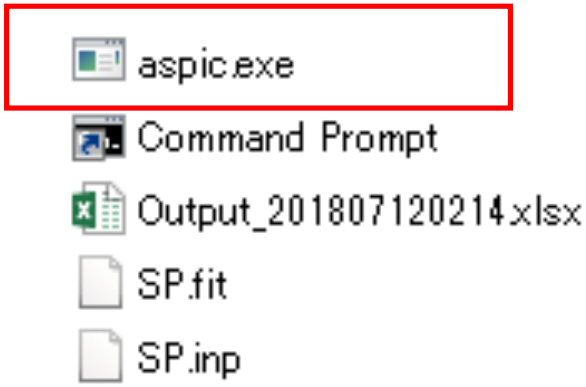
No	Model	B1/K	q	MSY(st	MSY(m	MSY(m	K(start)	K(min)	K(max)	B1/K[E	R2	q(SP)[E	RMS	r	K[Est]	MSY	Bmsy	Fmsy	B/Bmsy	F/Fmsy	TB	note
3	logistic	1	2.0d-5	120	130	160	170	500	640	1	0.331	2.67E-05	0.5323	1.0336	500	129.2	250	0.5167	0.3699	2.589	161.5	NOTE: ASPIC ende
4	logistic	1	2.0d-5	120	130	160	170	500	640	1	0.331	2.67E-05	0.5323	1.0336	500	129.2	250	0.5167	0.3699	2.589	161.5	NOTE: ASPIC ende
5	logistic	1	2.0d-5	120	130	160	170	500	640	1	0.331	2.67E-05	0.5323	1.0336	500	129.2	250	0.5167	0.3699	2.589	161.5	NOTE: ASPIC ende
6	logistic	1	2.0d-5	120	140	160	170	500	640	1	0.331	2.67E-05	0.5323	1.0336	500	129.2	250	0.5167	0.3699	2.589	161.5	NOTE: ASPIC ende
7	logistic	1	2.0d-5	120	140	160	170	500	640	1	0.331	2.67E-05	0.5323	1.0336	500	129.2	250	0.5167	0.3699	2.589	161.5	NOTE: ASPIC ende
8	logistic	1	2.0d-5	120	140	160	170	500	640	1	0.331	2.67E-05	0.5323	1.0336	500	129.2	250	0.5167	0.3699	2.589	161.5	NOTE: ASPIC ende
9	logistic	1	2.0d-5	120	140	160	170	500	640	1	0.331	2.67E-05	0.5323	1.0336	500	129.2	250	0.5167	0.3699	2.589	161.5	NOTE: ASPIC ende
10	logistic	1	2.0d-5	120	150	160	170	500	640	1	0.331	2.67E-05	0.5323	1.0336	500	129.2	250	0.5167	0.3699	2.589	161.5	NOTE: ASPIC ende
11	logistic	1	2.0d-5	120	150	160	170	500	640	1	0.331	2.67E-05	0.5323	1.0336	500	129.2	250	0.5167	0.3699	2.589	161.5	NOTE: ASPIC ende
12	logistic	1	2.0d-5	120	150	160	170	500	640	1	0.331	2.67E-05	0.5323	1.0336	500	129.2	250	0.5167	0.3699	2.589	161.5	NOTE: ASPIC ende

No	Model	B1/K	q	MSY(start	MSY(min)	MSY(max)	K(start)	K(min)	K(max)	B1/K[Est]	R2	q(SP)[Est]	RMS	r	K[Est]	MSY	Bmsy	Fmsy	B/Bmsy	F/Fmsy	TB	note
1	logistic	1	2.0d-5	120	120	160	170	600	640													FATAL: MSY bounds c
2	logistic	1	2.0d-5	120	130	160	170	600	640	1	0.352	2.27E-05	0.5256	0.827333	600	124.1	300	0.4136	0.3641	2.785	183.8	NOTE: ASPIC ended r
3	logistic	1	2.0d-5	120	130	160	170	600	640	1	0.352	2.27E-05	0.5256	0.827333	600	124.1	300	0.4136	0.3641	2.785	183.8	NOTE: ASPIC ended r
4	logistic	1	2.0d-5	120	140	160	170	600	640	1	0.352	2.27E-05	0.5256	0.827333	600	124.1	300	0.4136	0.3641	2.785	183.9	NOTE: ASPIC ended r
5	logistic	1	2.0d-5	120	140	160	170	600	640	1	0.352	2.27E-05	0.5256	0.827333	600	124.1	300	0.4136	0.3641	2.785	183.9	NOTE: ASPIC ended r
6	logistic	1	2.0d-5	120	150	160	170	600	640	1	0.352	2.27E-05	0.5256	0.827333	600	124.1	300	0.4136	0.3641	2.785	183.9	NOTE: ASPIC ended r
7	logistic	1	2.0d-5	120	150	160	170	600	640	1	0.352	2.27E-05	0.5256	0.827333	600	124.1	300	0.4136	0.3641	2.785	183.9	NOTE: ASPIC ended r
8	logistic	1	2.0d-5	120	160	160	170	600	640	1	0.352	2.27E-05	0.5256	0.827333	600	124.1	300	0.4136	0.3641	2.785	183.9	FATAL: MSY bounds c
9	logistic	1	2.0d-5	120	160	160	170	600	640	1	0.352	2.27E-05	0.5256	0.827333	600	124.1	300	0.4136	0.3641	2.785	183.9	FATAL: MSY bounds c

NEXT steps

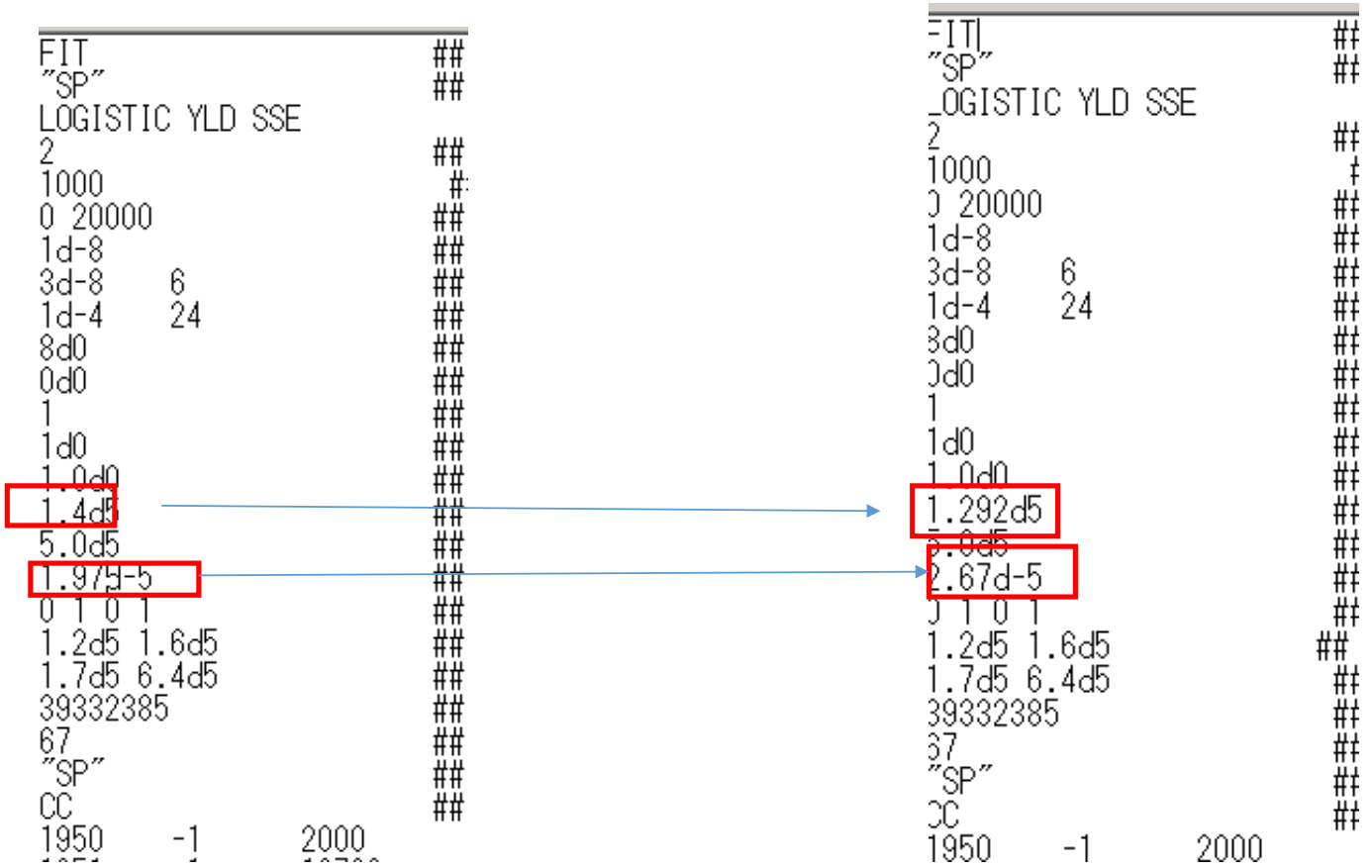
Using parameters estimated by ASPIC batch job

Run the ASPIC original program to get all detail results



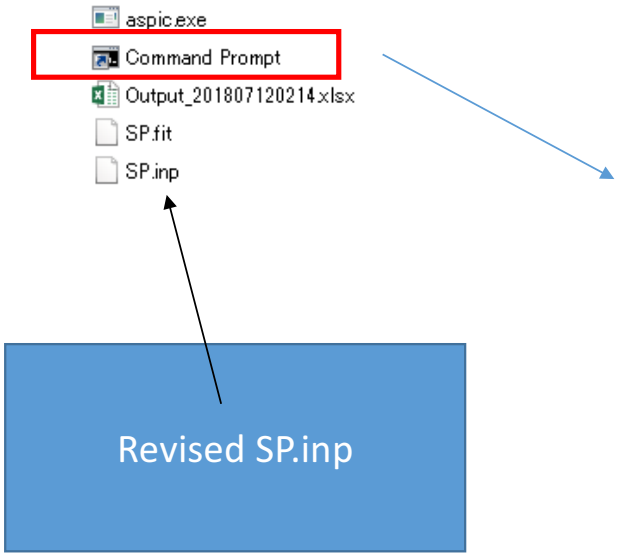
Before running we need to revise SP.inp using the final parameters

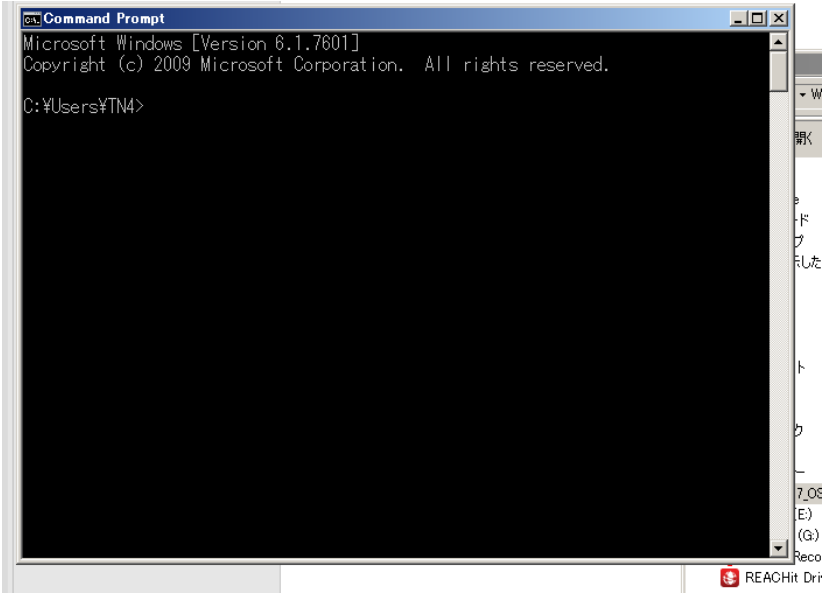
	Model	B1/K	q	MSY(start	MSY(min)	MSY(max)	K(start)	K(min)	K(max)	B1/K[Est]	R2	q(SP)[Est]	RMS	r	K[Est]	MSY
3	logistic	1	2.0d-5	120	130	160	170	500	640	1	0.331	2.67E-05	0.5323	1.0336	500	129.2
4	logistic	1	2.0d-5	120	130	160	170	500	640	1	0.331	2.67E-05	0.5323	1.0336	500	129.2
5	logistic	1	2.0d-5	120	130	160	170	500	640	1	0.331	2.67E-05	0.5323	1.0336	500	129.2

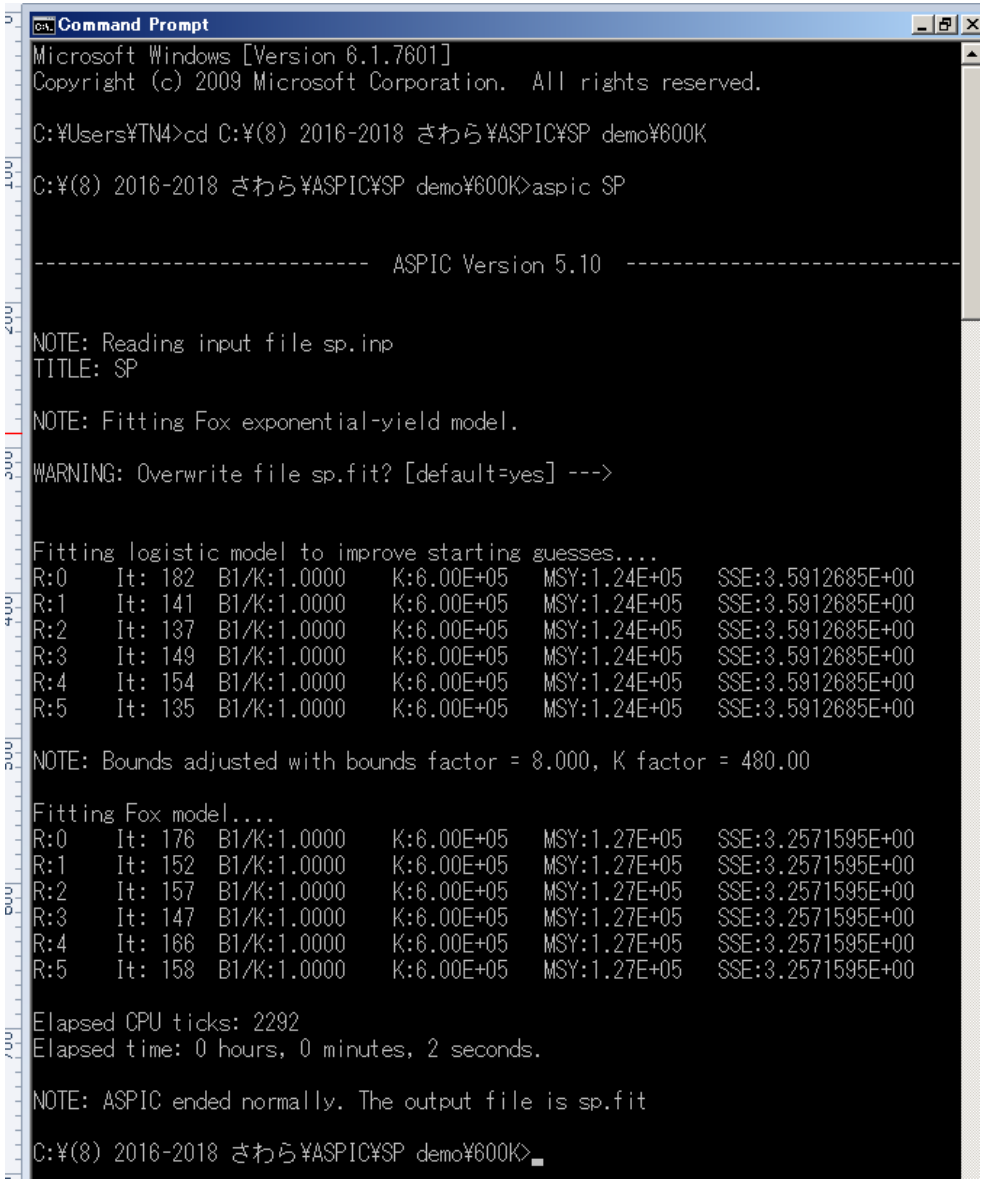


How to do? Use command Prompt

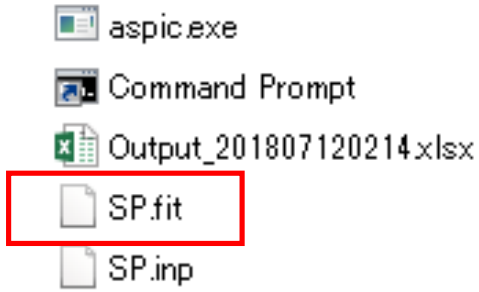
some steps needed.. We will practice






Command Prompt
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.
C:¥Users¥TN4>cd C:¥(8) 2016-2018 さわら¥ASPIC¥SP demo¥600K
C:¥(8) 2016-2018 さわら¥ASPIC¥SP demo¥600K>aspic SP
---------- ASPIC Version 5.10 ----------
NOTE: Reading input file sp.inp
TITLE: SP
NOTE: Fitting Fox exponential-yield model.
WARNING: Overwrite file sp.fit? [default=yes] --->
Fitting logistic model to improve starting guesses....
R:0 It: 182 B1/K:1.0000 K:6.00E+05 MSY:1.24E+05 SSE:3.5912685E+00
R:1 It: 141 B1/K:1.0000 K:6.00E+05 MSY:1.24E+05 SSE:3.5912685E+00
R:2 It: 137 B1/K:1.0000 K:6.00E+05 MSY:1.24E+05 SSE:3.5912685E+00
R:3 It: 149 B1/K:1.0000 K:6.00E+05 MSY:1.24E+05 SSE:3.5912685E+00
R:4 It: 154 B1/K:1.0000 K:6.00E+05 MSY:1.24E+05 SSE:3.5912685E+00
R:5 It: 135 B1/K:1.0000 K:6.00E+05 MSY:1.24E+05 SSE:3.5912685E+00
NOTE: Bounds adjusted with bounds factor = 8.000, K factor = 480.00
Fitting Fox model....
R:0 It: 176 B1/K:1.0000 K:6.00E+05 MSY:1.27E+05 SSE:3.2571595E+00
R:1 It: 152 B1/K:1.0000 K:6.00E+05 MSY:1.27E+05 SSE:3.2571595E+00
R:2 It: 157 B1/K:1.0000 K:6.00E+05 MSY:1.27E+05 SSE:3.2571595E+00
R:3 It: 147 B1/K:1.0000 K:6.00E+05 MSY:1.27E+05 SSE:3.2571595E+00
R:4 It: 166 B1/K:1.0000 K:6.00E+05 MSY:1.27E+05 SSE:3.2571595E+00
R:5 It: 158 B1/K:1.0000 K:6.00E+05 MSY:1.27E+05 SSE:3.2571595E+00
Elapsed CPU ticks: 2292
Elapsed time: 0 hours, 0 minutes, 2 seconds.
NOTE: ASPIC ended normally. The output file is sp.fit
C:¥(8) 2016-2018 さわら¥ASPIC¥SP demo¥600K>

Then you get the detail output SP.fit



GOODNESS-OF-FIT AND WEIGHTING (NON-BOOTSTRAPPED ANALYSIS)

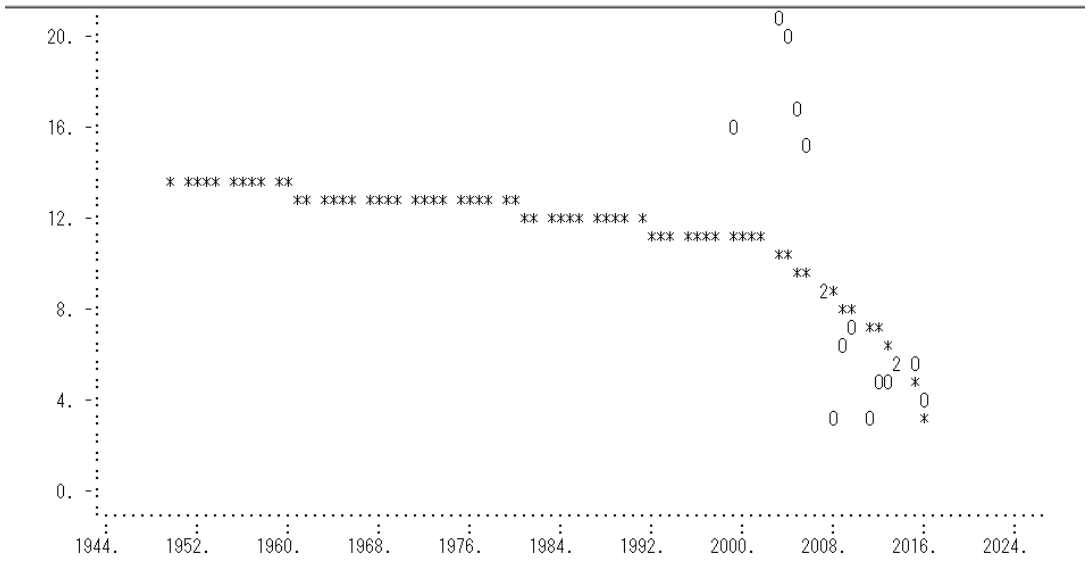
Loss component number and title		Weighted SSE	N	Weighted MSE	Current weight	Inv. var. weight	R-squared in CPUE
Loss(-1)	SSE in yield	0.000E+00					
Loss(0)	Penalty for B1 > K	0.000E+00	1	N/A	0.000E+00	N/A	
Loss(1)	SP	3.591E+00	15	2.763E-01	1.000E+00	1.000E+00	0.352
TOTAL OBJECTIVE FUNCTION, MSE, RMSE:		3.59126853E+00		2.763E-01	5.256E-01		
Estimated contrast index (ideal = 1.0):		0.8180		C* = (Bmax-Bmin)/K			
Estimated nearness index (ideal = 1.0):		1.0000		N* = 1 - |min(B-Bmsy)|/K			

MODEL PARAMETER ESTIMATES (NON-BOOTSTRAPPED)

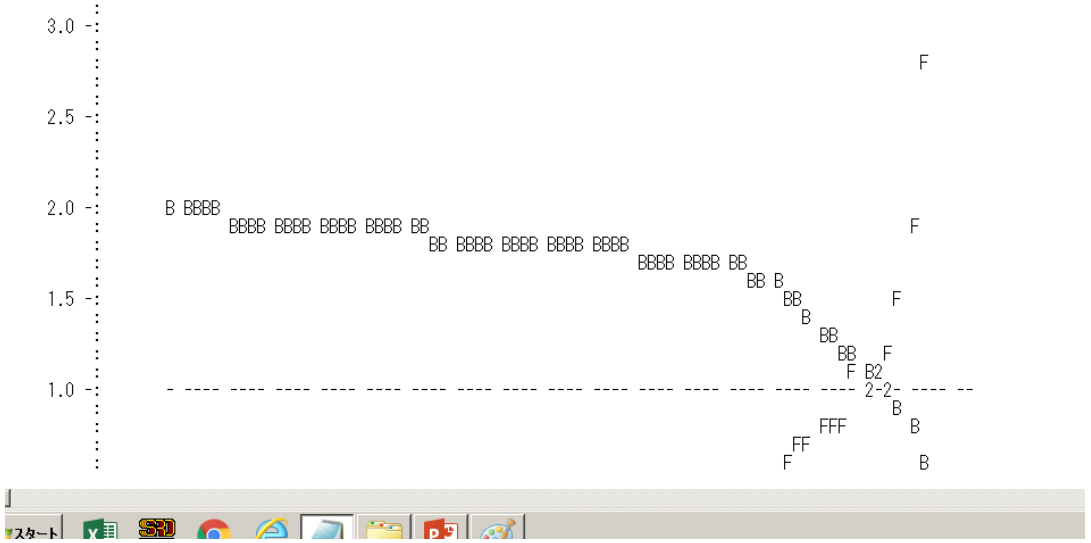
Parameter		Estimate	User/pgm guess	2nd guess	Estimated	User guess
B1/K	Starting relative biomass (in 1950)	1.000E+00	1.000E+00	7.359E-01	0	1
MSY	Maximum sustainable yield	1.241E+05	1.241E+05	1.280E+05	1	1
K	Maximum population size	6.000E+05	6.000E+05	3.091E+05	0	1
phi	Shape of production curve (Bmsy/K)	0.5000	0.5000	----	0	1
---------	Catchability Coefficients by Data Series	----------				
q(1)	SP	2.269E-05	2.270E-05	2.157E-03	1	1

MANAGEMENT and DERIVED PARAMETER ESTIMATES (NON-BOOTSTRAPPED)

Parameter		Estimate	Logistic formula	General formula
MSY	Maximum sustainable yield	1.241E+05	----	----
Bmsy	Stock biomass giving MSY	3.000E+05	K/2	K*n**(1/(1-n))
Fmsy	Fishing mortality rate at MSY	4.136E-01	MSY/Bmsy	MSY/Bmsy
n	Exponent in production function	2.0000	----	----
g	Fletcher's gamma	4.000E+00	----	[n**(n/(n-1))]/[n-1]
B./Bmsy	Ratio: B(2017)/Bmsy	3.641E-01	----	----
F./Fmsy	Ratio: F(2016)/Fmsy	2.785E+00	----	----
Fmsy/F.	Ratio: Fmsy/F(2016)	3.590E-01	----	----
Y.(Fmsy)	Approx. yield available at Fmsy in 2017	4.518E+04	MSY*B./Bmsy	MSY*B./Bmsy
	...as proportion of MSY	3.641E-01	----	----
Ye.	Equilibrium yield available in 2017	7.391E+04	4*MSY*(B/K-(B/K)**2)	g*MSY*(B/K-(B/K)**n)
	...as proportion of MSY	5.956E-01	----	----

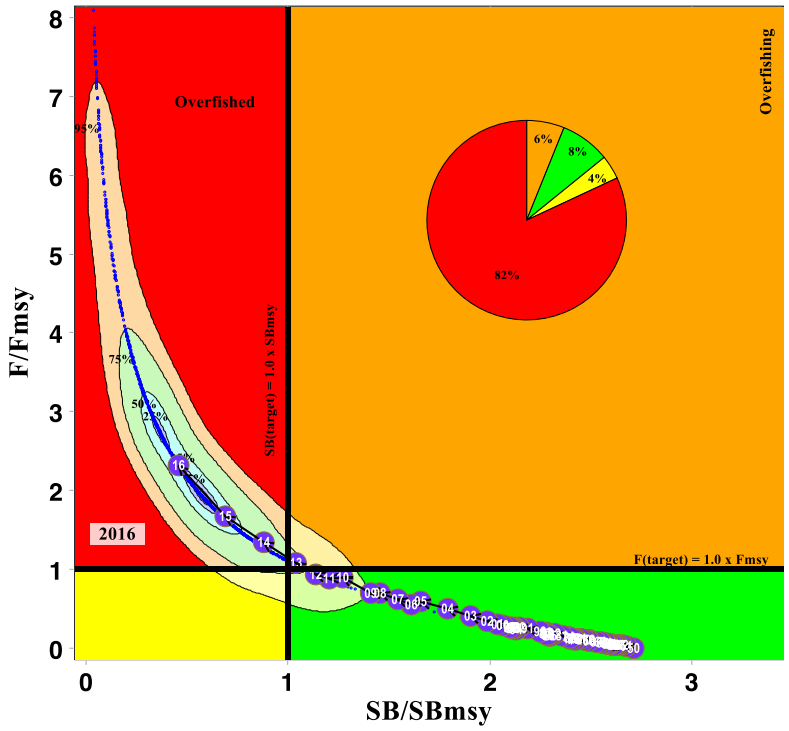


Time Plot of Estimated F/Fmsy and B/Bmsy (dashed line = 1.0)



We make some graphs later using the SP.fit

- Now we make the Kobe plot FIRST!



Contents

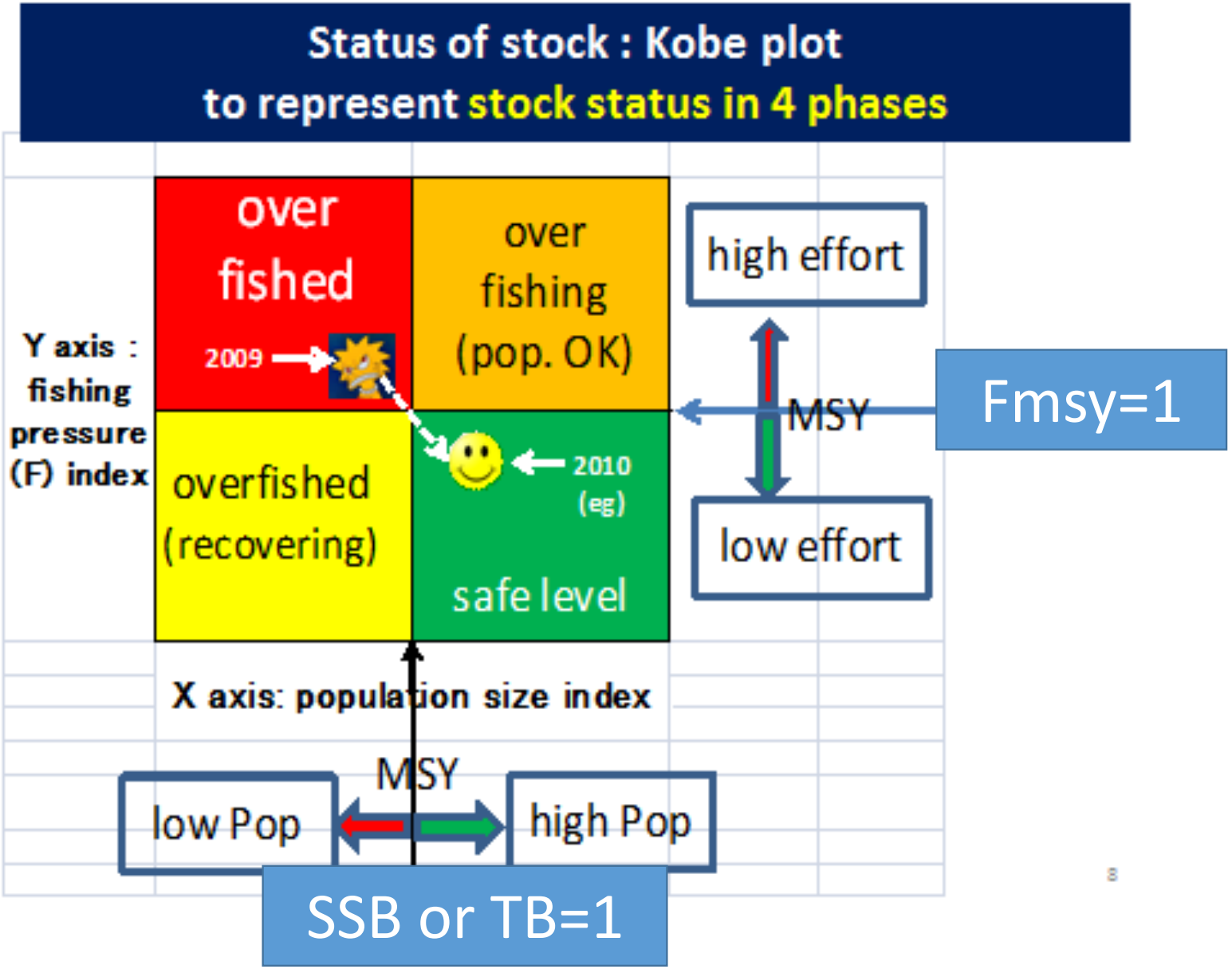
1. Introduction
2. National Report
3. Biology and Ecology (Dr Taki)
4. Stock structure
5. Data (Catch and CPUE)
6. CPUE standardization
7. Stock assessment (ASPIC) (r: Supapong)
8. Kobe plot I
9. Risk assessment Kobe II
10. Discussion and recommendations
11. Future

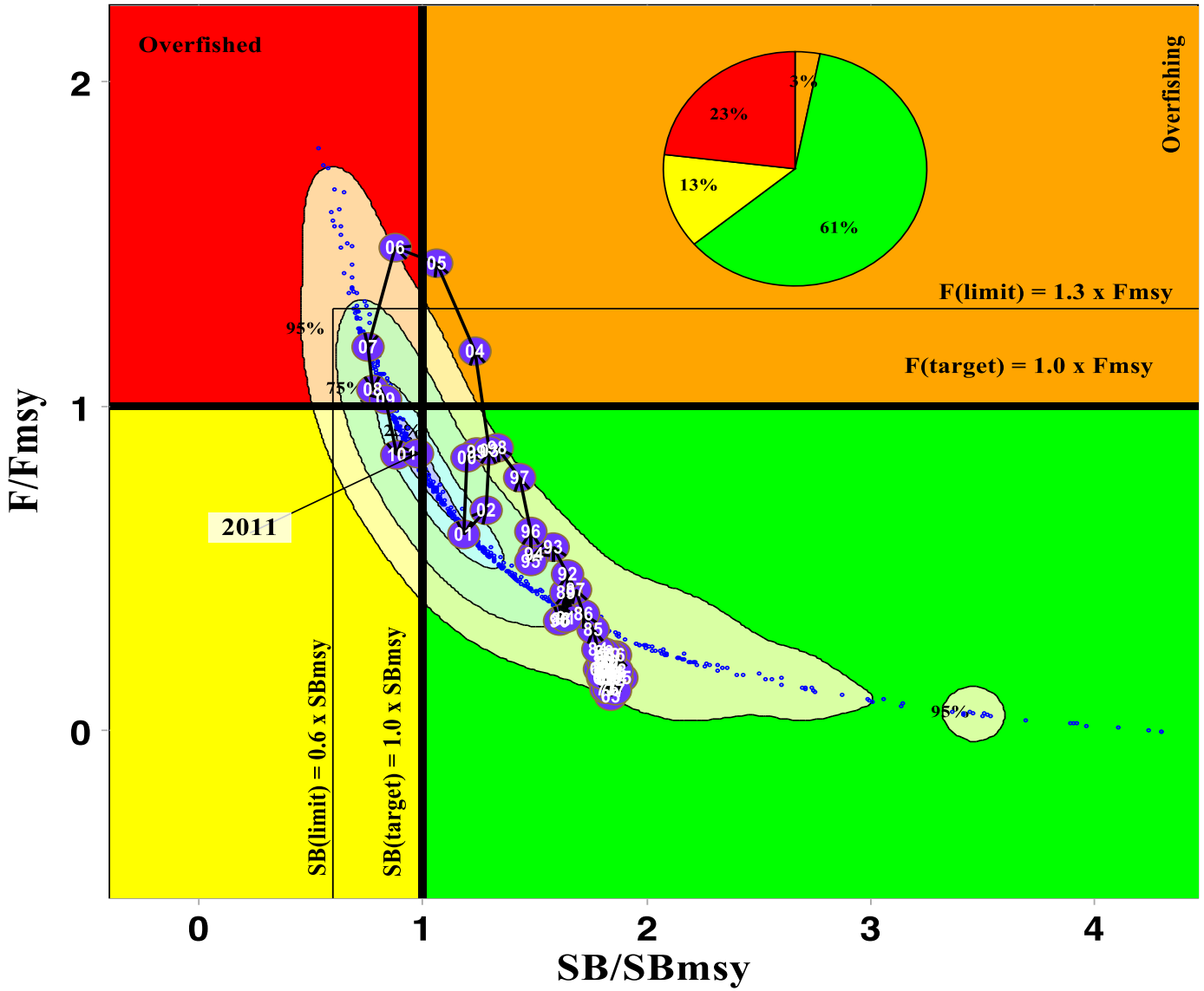
Kobe plot outline

Kobe plot : Importance on visualization

Comprehensive message (Bridge)
scientists to manager/industry

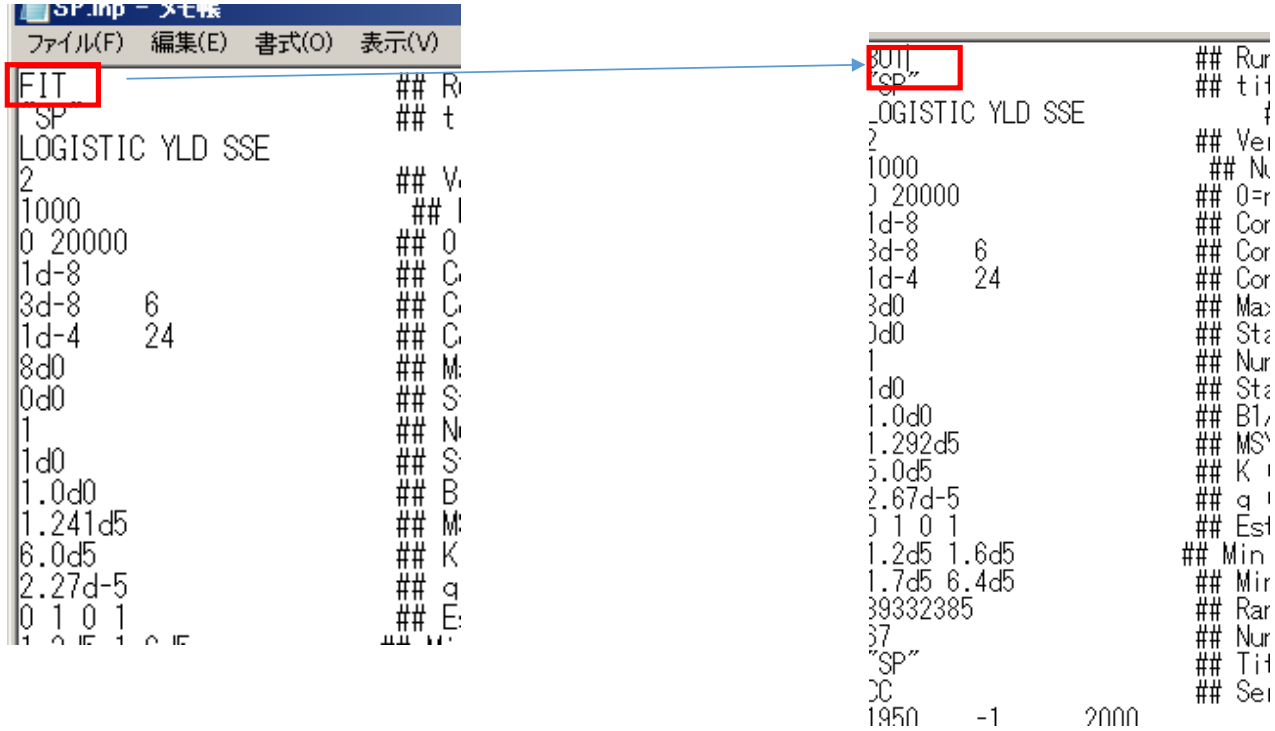
ISC Seminar (if time allowed)


Status of stock : Kobe plot
to represent stock status in 4 phases
over fished
over fishing (pop. OK)
overfished (recovering)
safe level
2009
2010 (eg)
Y axis : fishing pressure (F) index
X axis: population size index
high effort
low effort
MSY
Fmsy=1
MSY
low Pop
high Pop
SSB or TB=1


Overfished
Overfishing
F(limit) = 1.3 x Fmsy
F(target) = 1.0 x Fmsy
SB(limit) = 0.6 x SBmsy
SB(target) = 1.0 x SBmsy
F/Fmsy
SB/SBmsy
2011
95%
75%
95%
3%
23%
13%
61%
0
1
2
3
4

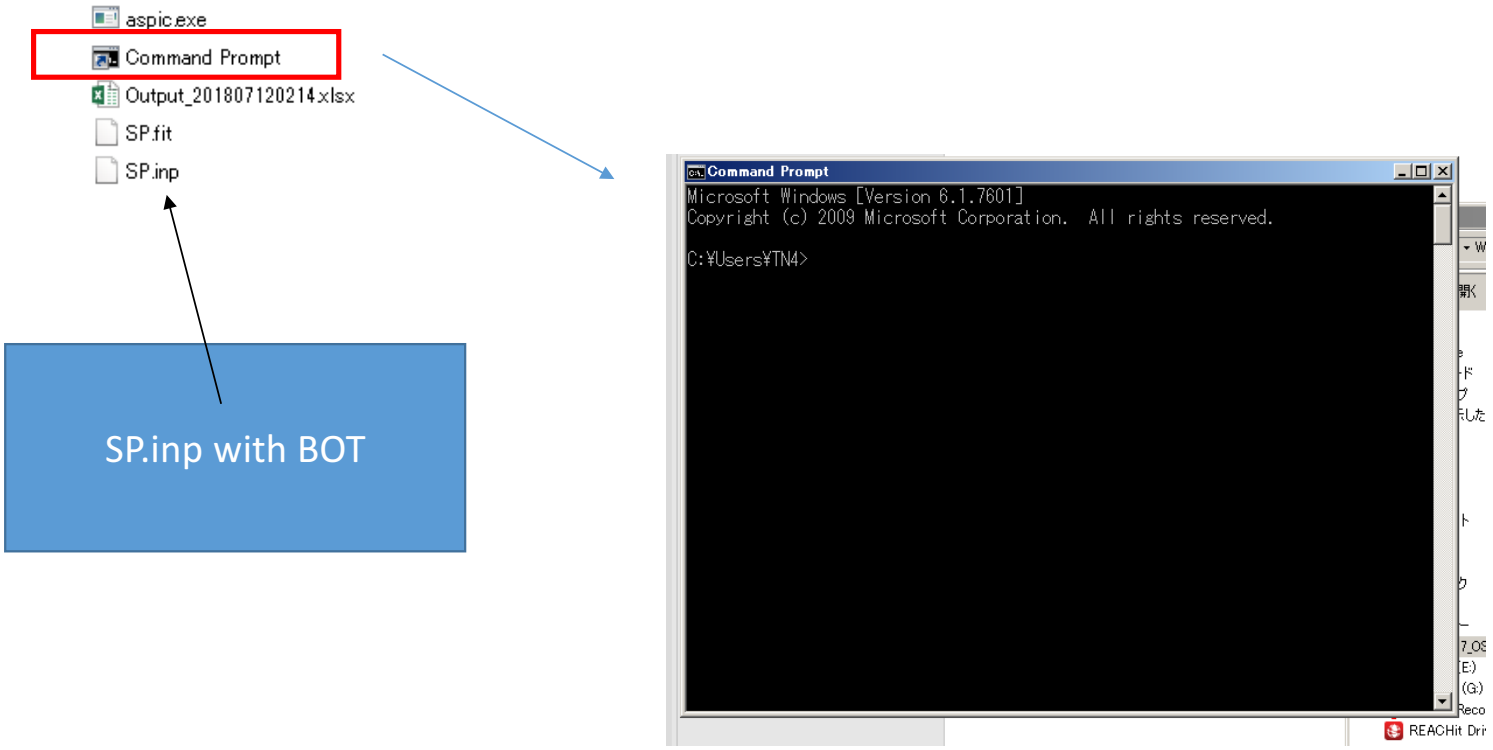
Back to our SP Kobe plot

To get uncertainties (banana) we need to do bootstrap need to change SP.inp



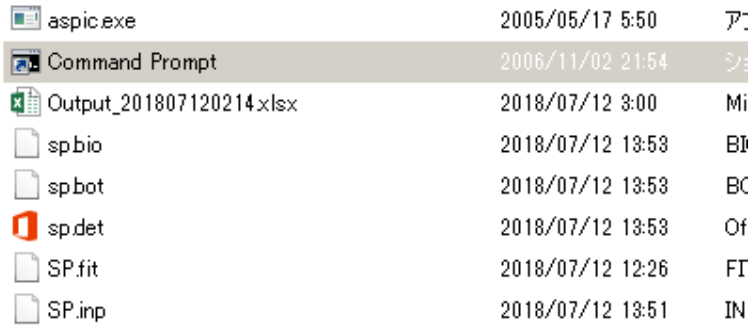
How to do? Use command Prompt

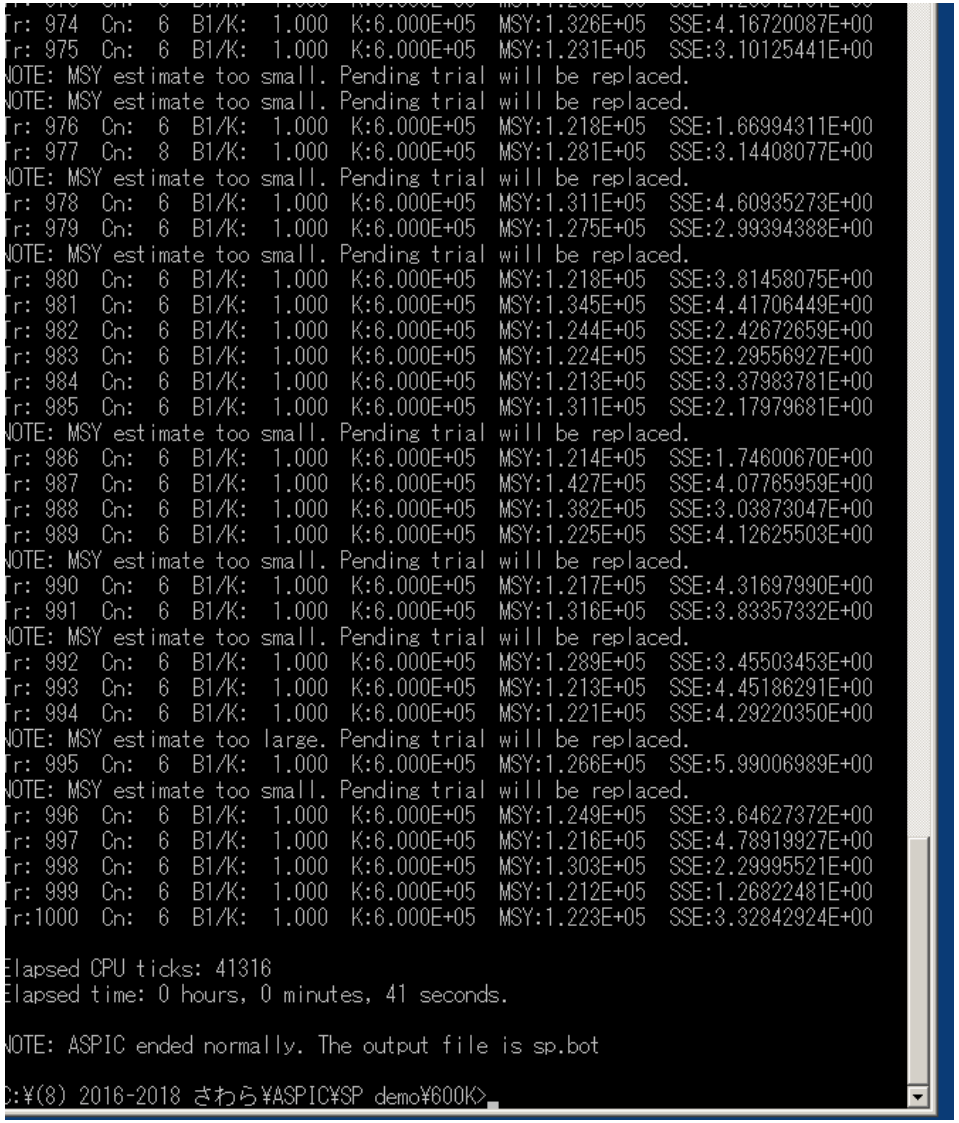
some steps needed.. We will practice



1000 bootstraps

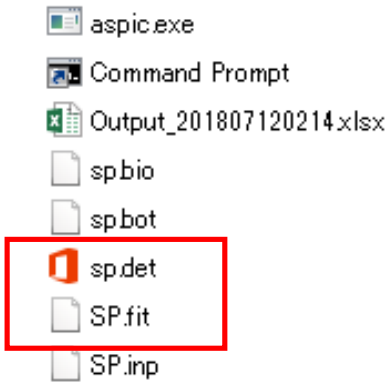
- 1-2 minutes
- Many results





How make the Kobe plot ?

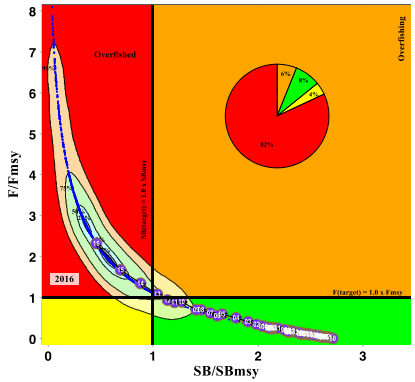
- A bit complicated. you need two files



You need to transfer some of data to one excel file

- aspic.exe
- Command Prompt
- Output_201807120214.xlsx
- sp.bio
- sp.bot
- sp.det
- SP.fit
- SP.inp

(1) Stock status (1950-2016)
67 points

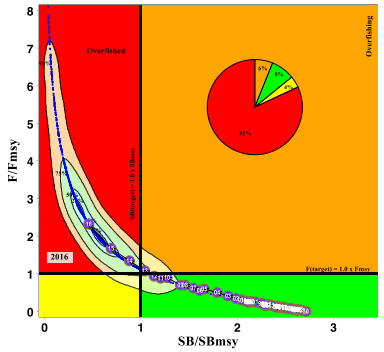


TRAJECTORY (NON-BOOTSTRAPPED)

Obs	or ID	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	0.004	5.000E+05	4.993E+05	2.000E+03	2.000E+03	7.525E+02	7.753E-03	2.000E+00
2	1951	0.022	4.988E+05	4.953E+05	1.070E+04	1.070E+04	4.802E+03	4.181E-02	1.995E+00
3	1952	0.024	4.929E+05	4.911E+05	1.200E+04	1.200E+04	9.018E+03	4.729E-02	1.971E+00
4	1953	0.025	4.899E+05	4.891E+05	1.240E+04	1.240E+04	1.104E+04	4.907E-02	1.959E+00
5	1954	0.027	4.885E+05	4.879E+05	1.320E+04	1.320E+04	1.218E+04	5.236E-02	1.954E+00
6	1955	0.028	4.875E+05	4.871E+05	1.360E+04	1.360E+04	1.296E+04	5.403E-02	1.950E+00
7	1956	0.028	4.869E+05	4.866E+05	1.380E+04	1.380E+04	1.343E+04	5.488E-02	1.947E+00
8	1957	0.028	4.865E+05	4.866E+05	1.340E+04	1.340E+04	1.352E+04	5.330E-02	1.946E+00
9	1958	0.029	4.866E+05	4.864E+05	1.390E+04	1.390E+04	1.363E+04	5.530E-02	1.946E+00
10	1959	0.027	4.863E+05	4.865E+05	1.320E+04	1.320E+04	1.354E+04	5.251E-02	1.945E+00
11	1960	0.028	4.867E+05	4.866E+05	1.350E+04	1.350E+04	1.344E+04	5.369E-02	1.947E+00
12	1961	0.035	4.866E+05	4.852E+05	1.720E+04	1.720E+04	1.482E+04	6.860E-02	1.946E+00
13	1962	0.037	4.842E+05	4.835E+05	1.780E+04	1.780E+04	1.651E+04	7.125E-02	1.937E+00
14	1963	0.038	4.829E+05	4.824E+05	1.840E+04	1.840E+04	1.752E+04	7.381E-02	1.932E+00
15	1964	0.041	4.821E+05	4.815E+05	1.950E+04	1.950E+04	1.846E+04	7.839E-02	1.928E+00
16	1965	0.046	4.810E+05	4.799E+05	2.190E+04	2.190E+04	1.995E+04	8.832E-02	1.924E+00
17	1966	0.050	4.791E+05	4.779E+05	2.380E+04	2.380E+04	2.181E+04	9.638E-02	1.916E+00
18	1967	0.057	4.771E+05	4.755E+05	2.690E+04	2.690E+04	2.411E+04	1.095E-01	1.908E+00
19	1968	0.071	4.743E+05	4.711E+05	3.360E+04	3.360E+04	2.812E+04	1.380E-01	1.897E+00
20	1969	0.059	4.688E+05	4.697E+05	2.780E+04	2.780E+04	2.938E+04	1.145E-01	1.875E+00

- aspic.exe
- Command Prompt
- Output_201807120214.xlsx
- sp.bio
- sp.bot
- sp.det
- SP.fit
- SP.inp

1000 bootstrap (B/Bmsy and F/Fmsy) banana



	msy	bmsy	brel	frel	bl.k	k	
	4091641E+05	3.00000000E+05	3.64082547E-01	2.78514380E+00	.00000000E+00	6.00000000E+05	2
2	3.38821732E+00	1.37097459E+05	3.00000000E+05	8.63837566E-01	1.31747449E+00	.00000000E+00	6.00000000E+05	1.67643353E-05
3	1.59890134E+00	1.46684857E+05	3.00000000E+05	1.04060635E+00	1.04566110E+00	.00000000E+00	6.00000000E+05	1.69428521E-05
4	3.97726753E+00	1.34220876E+05	3.00000000E+05	7.91153235E-01	1.44941565E+00	.00000000E+00	6.00000000E+05	2.09333295E-05
5	3.71048628E+00	1.23606129E+05	3.00000000E+05	3.30288574E-01	2.97635700E+00	.00000000E+00	6.00000000E+05	2.11575468E-05
6	4.41305911E+00	1.25259494E+05	3.00000000E+05	4.37019502E-01	2.44083152E+00	.00000000E+00	6.00000000E+05	2.23578453E-05
7	1.87636222E+00	1.31864401E+05	3.00000000E+05	7.20735751E-01	1.59286861E+00	.00000000E+00	6.00000000E+05	1.79998427E-05
8	2.95112788E+00	1.26398299E+05	3.00000000E+05	4.99154836E-01	2.20186993E+00	.00000000E+00	6.00000000E+05	2.57880781E-05
9	2.13827731E+00	1.29609975E+05	3.00000000E+05	6.41527652E-01	1.77802750E+00	.00000000E+00	6.00000000E+05	2.52549165E-05
10	2.58296104E+00	1.33297747E+05	3.00000000E+05	7.64981101E-01	1.50077961E+00	.00000000E+00	6.00000000E+05	1.95637649E-05
11	4.10188446E+00	1.22186385E+05	3.00000000E+05	2.15027712E-01	3.87362124E+00	.00000000E+00	6.00000000E+05	1.79937927E-05
12	3.17946437E+00	1.22918862E+05	3.00000000E+05	2.78132131E-01	3.32520131E+00	.00000000E+00	6.00000000E+05	1.73976054E-05
13	2.64752234E+00	1.23722929E+05	3.00000000E+05	3.38647308E-01	2.92668939E+00	.00000000E+00	6.00000000E+05	1.86737903E-05
14	2.40471153E+00	1.39232504E+05	3.00000000E+05	9.10630760E-01	1.23961044E+00	.00000000E+00	6.00000000E+05	1.88359495E-05
15	4.74176543E+00	1.32310734E+05	3.00000000E+05	7.35021915E-01	1.56238889E+00	.00000000E+00	6.00000000E+05	2.07467306E-05
16	3.51446982E+00	1.33373642E+05	3.00000000E+05	7.67036710E-01	1.49660595E+00	.00000000E+00	6.00000000E+05	1.69648387E-05
17	5.68772802E+00	1.26646349E+05	3.00000000E+05	5.11715365E-01	2.15829821E+00	.00000000E+00	6.00000000E+05	1.83976269E-05
18	4.86355230E+00	1.23139587E+05	3.00000000E+05	2.95671020E-01	3.19937734E+00	.00000000E+00	6.00000000E+05	2.34346694E-05
19	3.54163499E+00	1.25177594E+05	3.00000000E+05	4.32211090E-01	2.46124106E+00	.00000000E+00	6.00000000E+05	2.48561801E-05
20	4.22390850E+00	1.30704203E+05	3.00000000E+05	6.81703407E-01	1.68056577E+00	.00000000E+00	6.00000000E+05	1.82813902E-05
21	2.52348525E+00	1.22956917E+05	3.00000000E+05	2.81224858E-01	3.30248628E+00	.00000000E+00	6.00000000E+05	2.64551716E-05
22	2.77409580E+00	1.23788815E+05	3.00000000E+05	3.43211810E-01	2.90030481E+00	.00000000E+00	6.00000000E+05	2.42245936E-05
23	3.50633603E+00	1.22623388E+05	3.00000000E+05	2.53789658E-01	3.51721504E+00	.00000000E+00	6.00000000E+05	2.84707532E-05
24	7.88680071E+00	1.35951290E+05	3.00000000E+05	8.36241128E-01	1.36582416E+00	.00000000E+00	6.00000000E+05	1.84501204E-05
25	4.39241579E+00	1.25679654E+05	3.00000000E+05	4.60856957E-01	2.34413987E+00	.00000000E+00	6.00000000E+05	2.11399096E-05
26	4.42806298E+00	1.22066580E+05	3.00000000E+05	2.03796599E-01	3.99175254E+00	.00000000E+00	6.00000000E+05	2.38715640E-05
27	2.92318468E+00	1.22279170E+05	3.00000000E+05	2.23648893E-01	3.78801663E+00	.00000000E+00	6.00000000E+05	2.68948747E-05
28	5.02634023E+00	1.24887028E+05	3.00000000E+05	4.14803047E-01	2.53740289E+00	.00000000E+00	6.00000000E+05	2.04397160E-05
29	1.51970755E+00	1.21302446E+05	3.00000000E+05	1.21145325E-01	5.18616582E+00	.00000000E+00	6.00000000E+05	2.50148901E-05

Now we need to combine the excel file for Kobe plot software

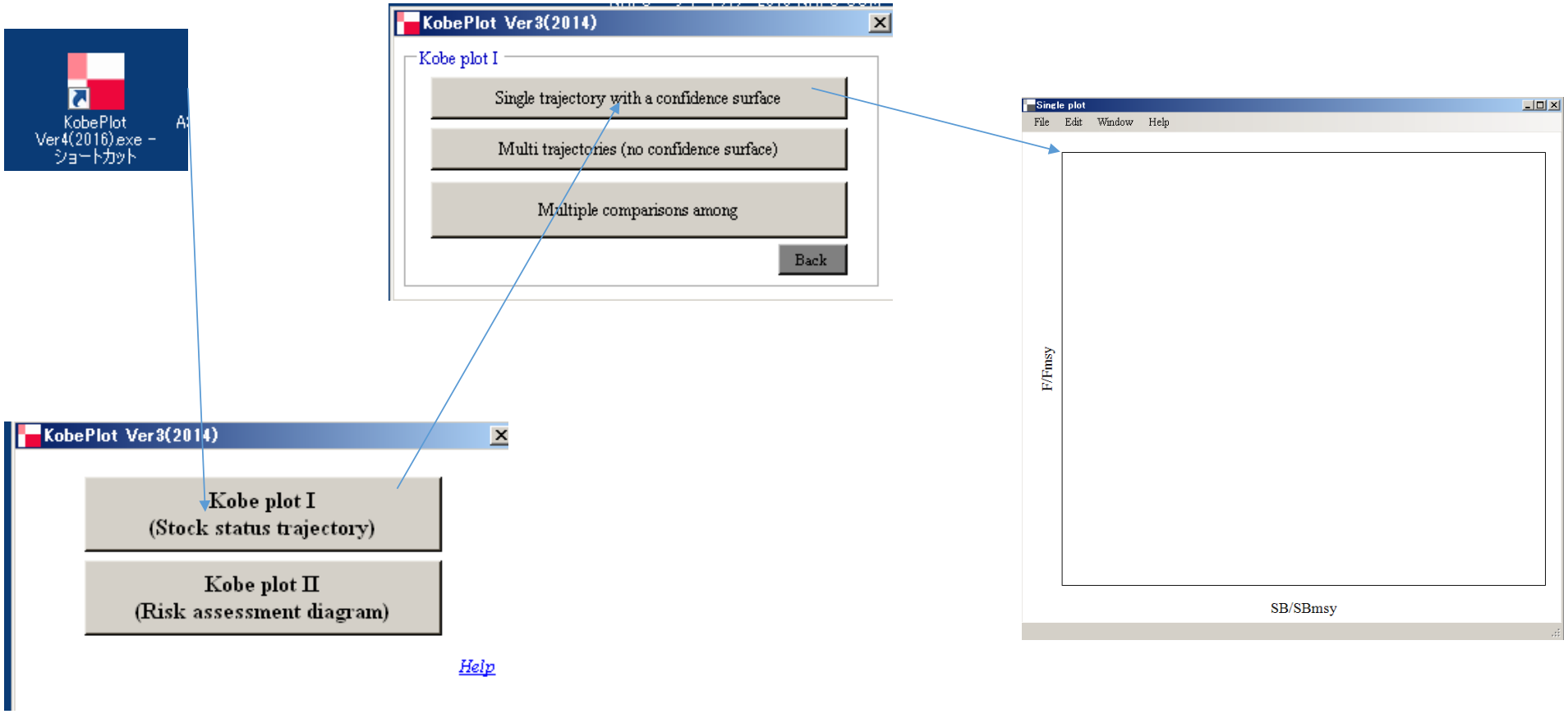
we will practice step by step using real data (a bit complicated)

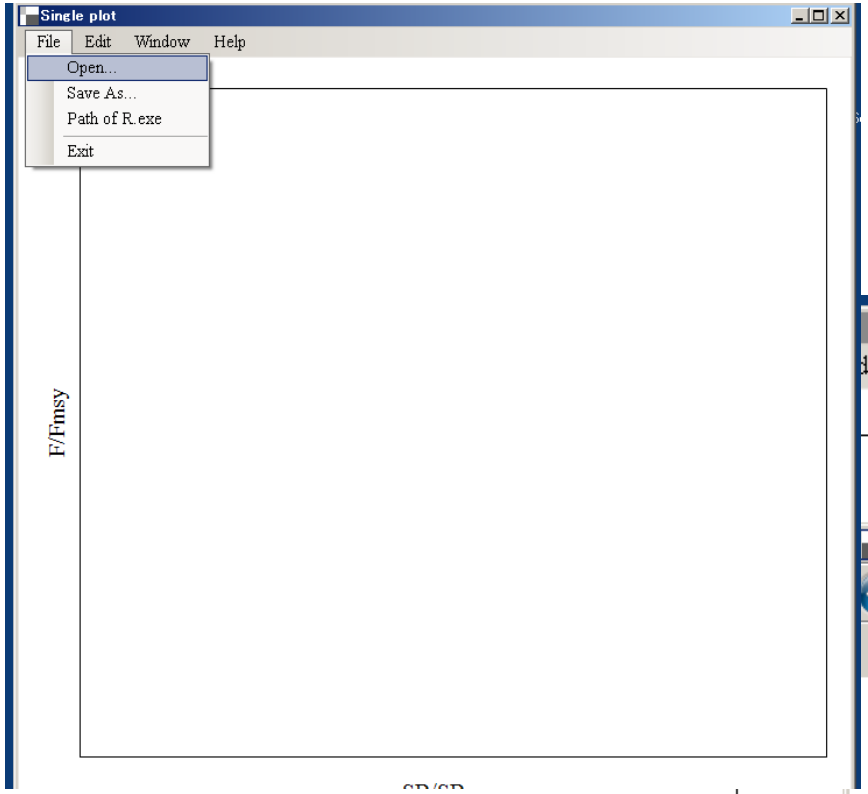
then finally we make this excel data

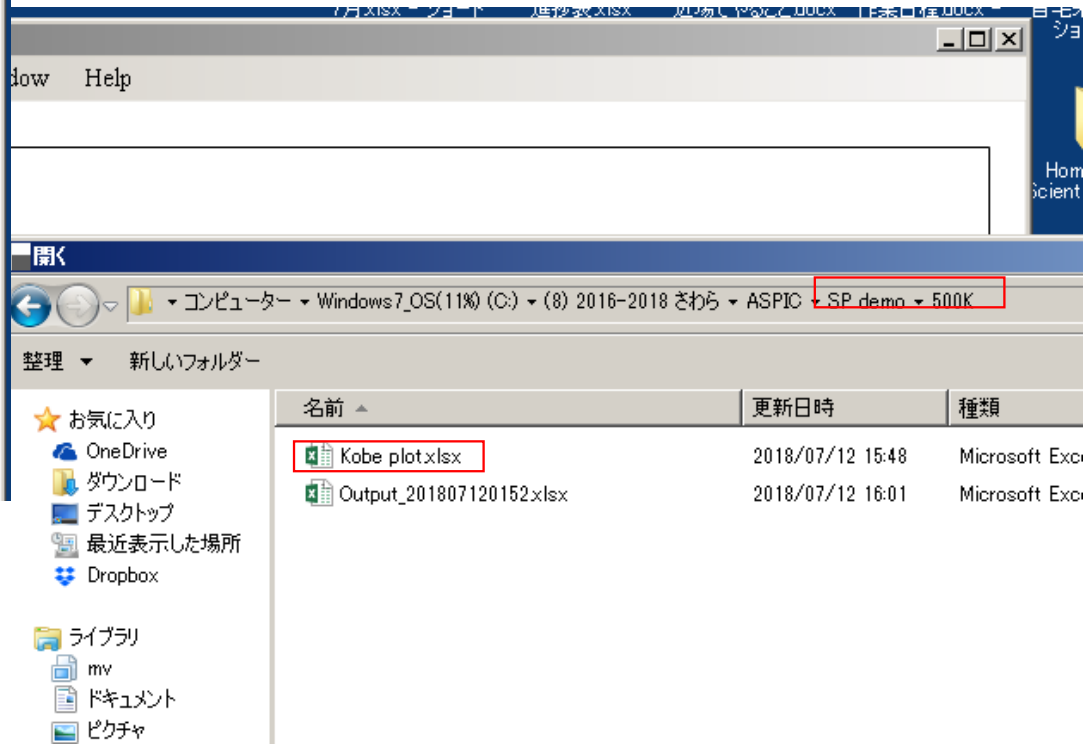
	A	B	C	D	E	F
1	yr	B/Bmsy	F/Fmsy	brel	frel	
2	1950	2.00E+00	7.75E-03	3.70E-01	2.59E+00	
3	1951	1.97E+00	4.18E-02	9.16E-01	1.20E+00	
4	1952	1.96E+00	4.73E-02	1.13E+00	9.17E-01	
5	1953	1.95E+00	4.91E-02	8.75E-01	1.27E+00	
6	1954	1.95E+00	5.24E-02	3.19E-01	2.84E+00	
7	1955	1.95E+00	5.40E-02	4.40E-01	2.30E+00	
8	1956	1.95E+00	5.49E-02	7.70E-01	1.45E+00	
9	1957	1.95E+00	5.33E-02	9.54E-02	5.15E+00	
10	1958	1.95E+00	5.53E-02	5.39E-01	1.97E+00	
11	1959	1.95E+00	5.25E-02	6.89E-01	1.60E+00	

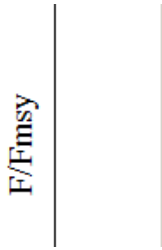
990				2.00E-01	3.04E+00
991				2.44E-01	3.33E+00
992				8.60E-01	1.29E+00
993				5.53E-01	1.94E+00
994				4.73E-01	2.18E+00
995				1.79E-01	3.91E+00
996				3.32E-01	2.78E+00
997				6.66E-02	5.88E+00
998				4.14E-01	2.40E+00
999				7.22E-01	1.54E+00
1000				2.14E-01	3.57E+00
1001				6.73E-01	1.64E+00

Now how to use Kobe plot software?

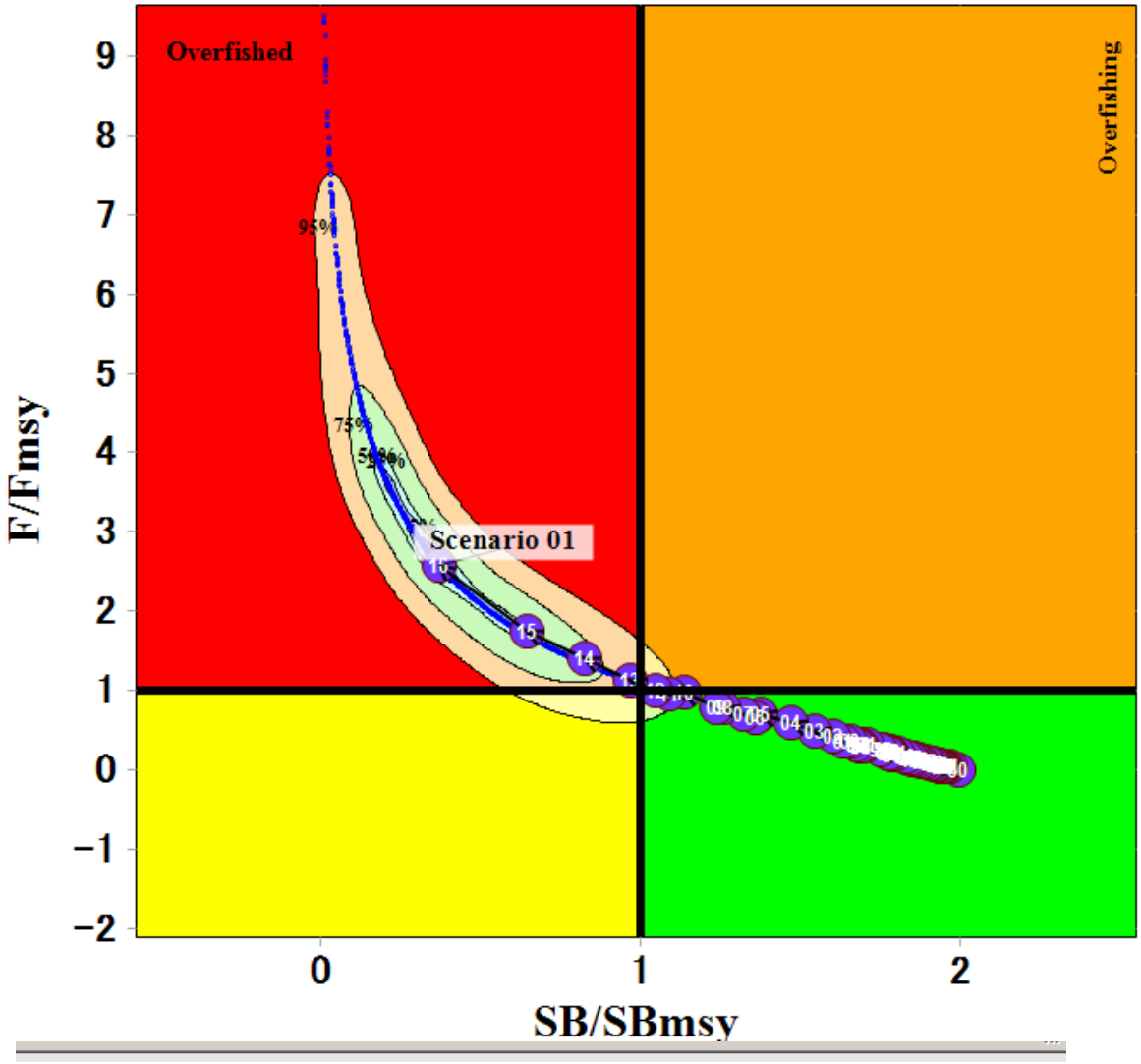



Single plot
File
Edit
Window
Help
Open...
Save As...
Path of R.exe
Exit
F/Fmsy


dow
Help
開く
コンピューター
Windows7_OS(11%) (C:)
(8) 2016-2018 さわら
ASPIC
SP demo
500K
整理
新しいフォルダー
お気に入り
OneDrive
ダウンロード
デスクトップ
最近表示した場所
Dropbox
ライブラリ
mv
ドキュメント
ピクチャ
名前
更新日時
種類
Kobe plot.xlsx
2018/07/12 15:48
Output_201807120152.xlsx
2018/07/12 16:01


F/Fmsy

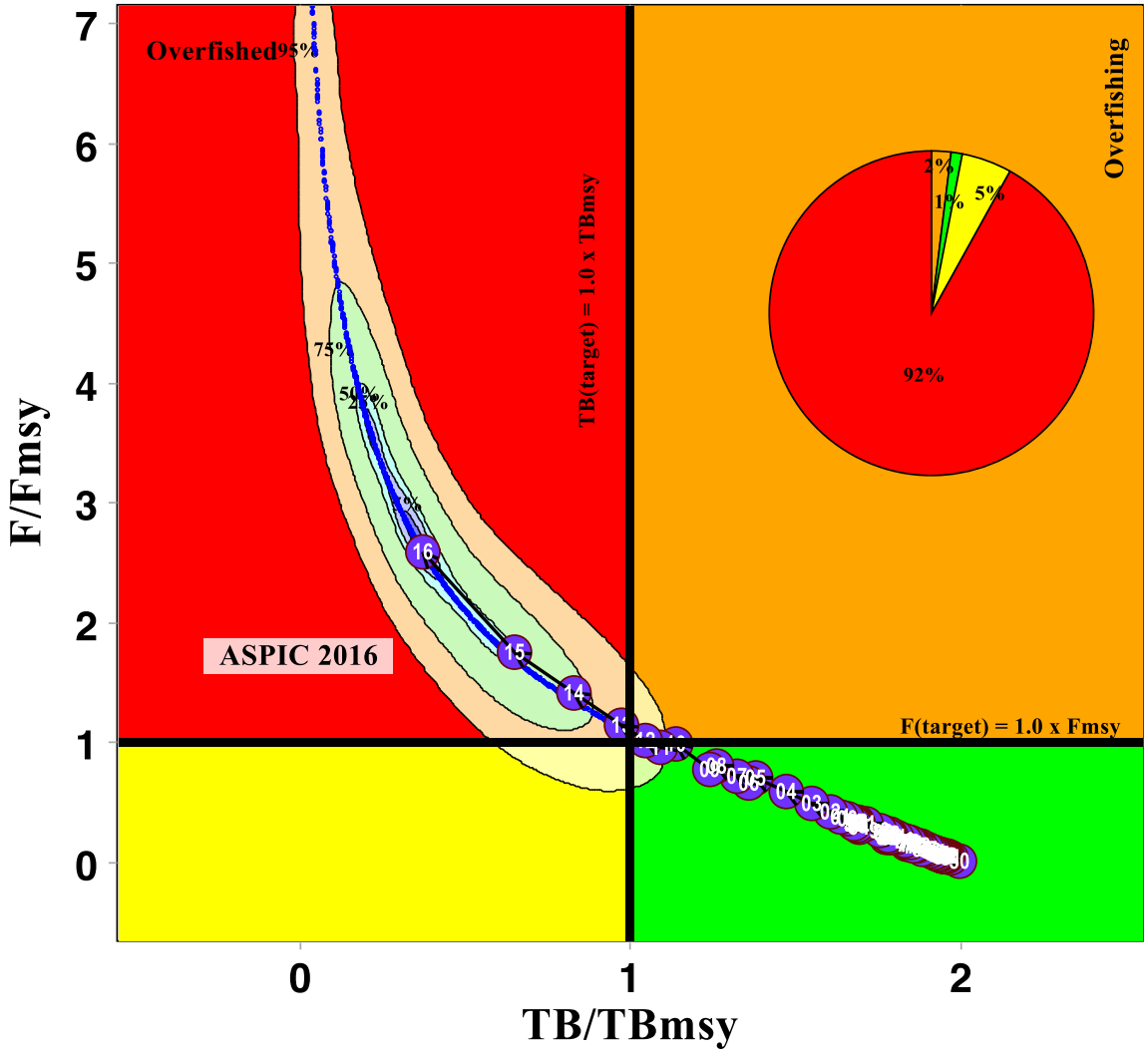
Default


Overfished
Overfishing
Scenario 01
95%
75%
F/Fmsy
SB/SBmsy
9
8
7
6
5
4
3
2
1
0
−1
−2
0
1
2

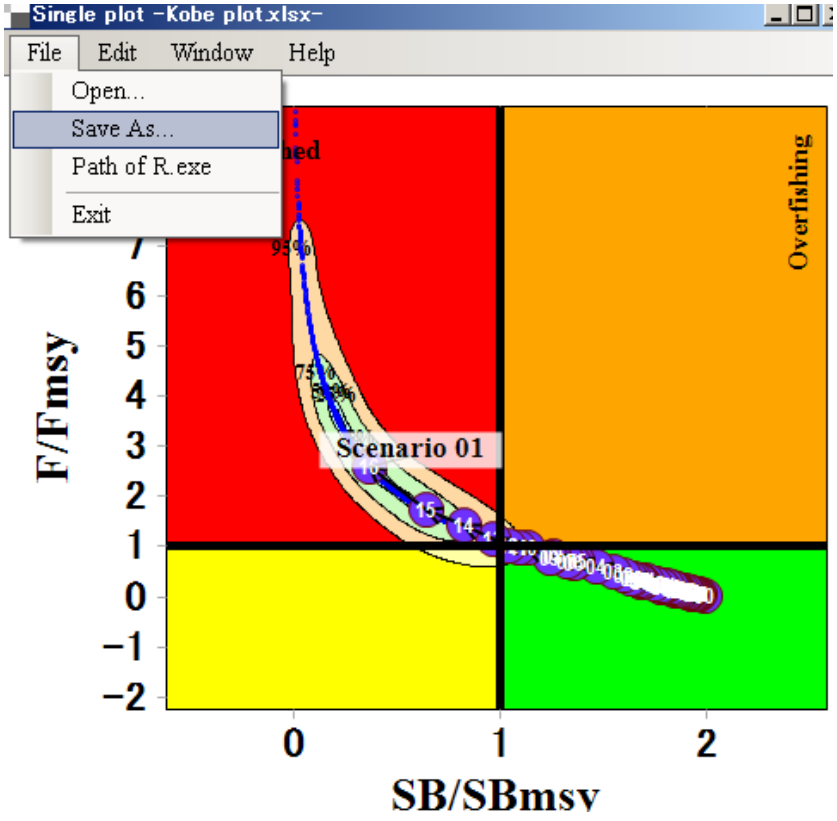
Then we edit to make final plot

we practice this process

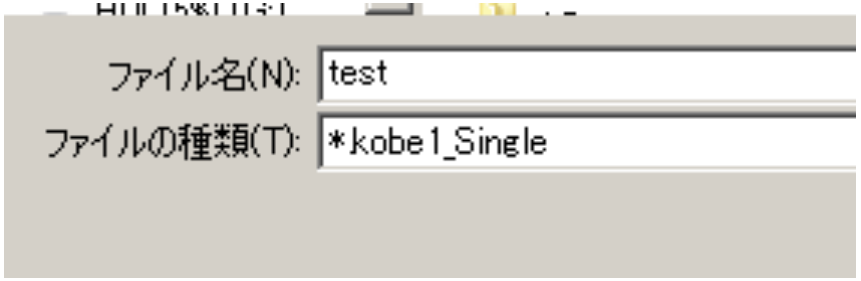
step by step



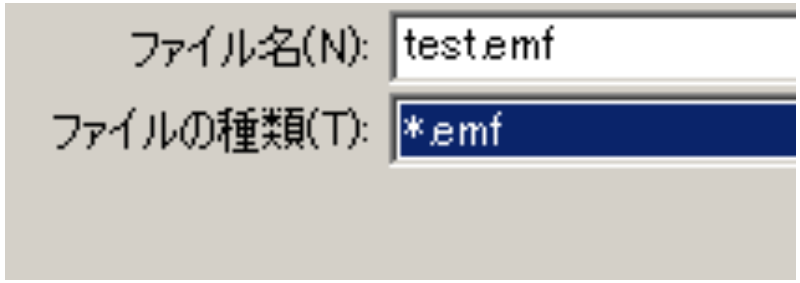
How to save etc.



To save all➔ You can retrieve the same picture !



To save image ➔ You can use in your report



Contents

1. Introduction
2. National Report
3. Biology and Ecology (Dr Taki)
4. Stock structure
5. Data (Catch and CPUE)
6. CPUE standardization
7. Stock assessment (ASPIC) (r: Supapong)
8. Kobe plot I
9. Risk assessment (Kobe II)
10. Discussion and recommendations
11. Future