2nd Workshop (WS)

May 19-23, 2025

Pla lung meeting room (Indian mackerel room!)
(good name for our WS) 7th floor
Marine Fisheries Research and Development Division, DOF, Bangkok

Stock assessments (SA)
for important species in Thailand

Welcome to the 2nd workshop

Questions & Comments
ANY time

Acknowledgments การแสดงความยอมรับ

DOF DG

Bancha Sukkaew

Supervisors

Amnuay Kongprom (Division Director)

Pavarot Noranarttragoon

Coordinator

Weerapol Thitipongtrakul

Resource Person

Supapong Pattarapongpan(SEAFDEC/TD)

ALL Participants

Short mackerel WG members

Orawan Prasertsook

Nipa Kulanujaree

Weerapol Thitipongtrakul

Demersal fish WG members

Weerapol Thitipongtrakul

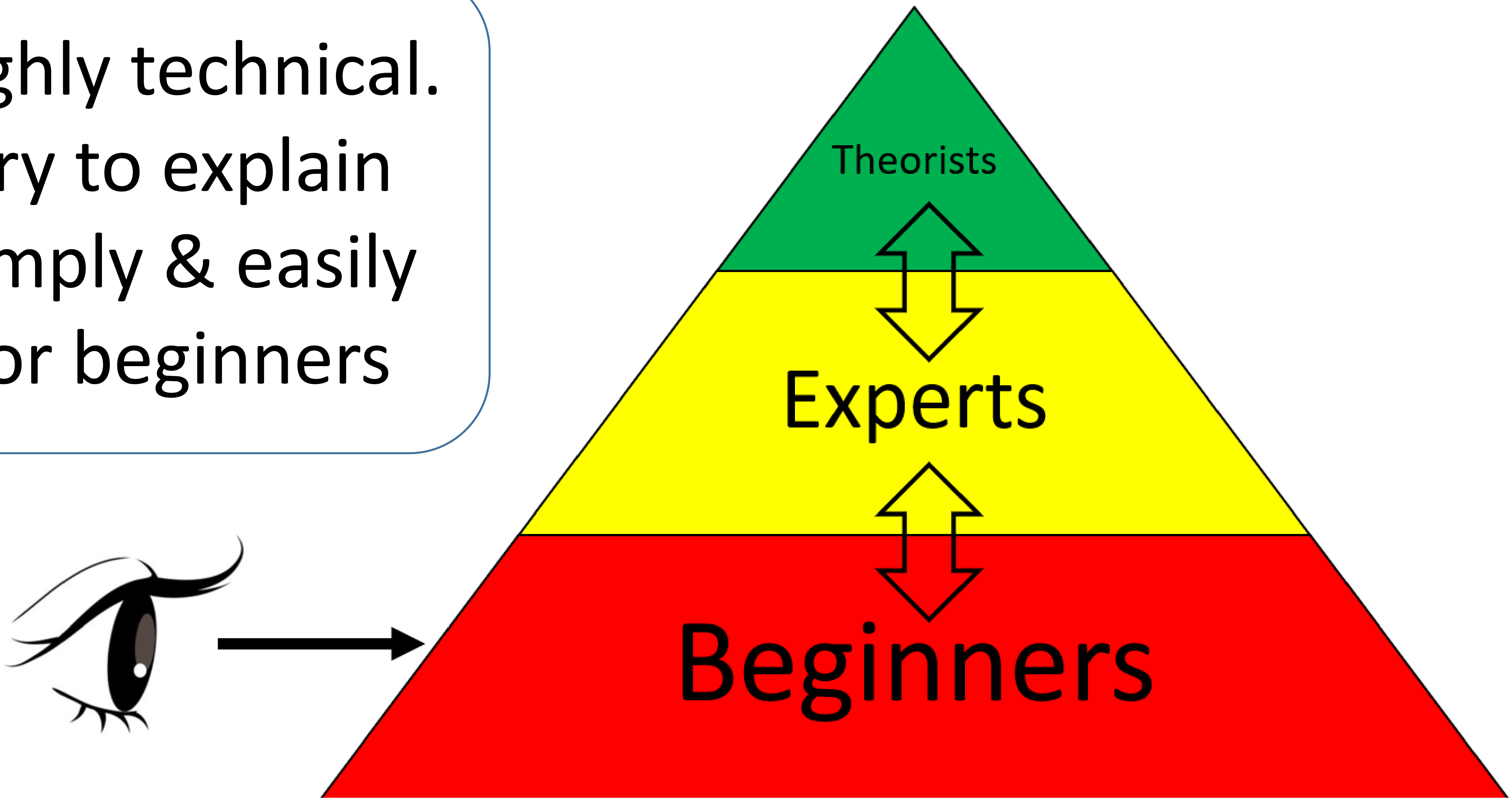
Carp WG members

Nipa Kulanujaree

Wiparat Thong-ngok

Kajitpan Jarernnate

Highly technical.
Try to explain
simply & easily
for beginners



No equations (Math)

Language (English)

But you need ➔ Basic SA knowledge

(F, r, K etc.)(see next page)

Otherwise, a bit difficult to follow

➔ Study, Ask, Learn, study.. Ask, ASK aSK

You need also Basic English Skill

ACRONYMS

AR	AutoRegressive model
ASPIC	A Stock-Production Model Incorporating Covariates
B_{MSY}	Total biomass or Spawning Stock Biomass at MSY
CI	Confidence Interval
CPUE	Catch Per Unit Effort
CV	Coefficient of Variation
DevTools	R package for web-developer tool
EC	Equilibrium Condition
F_{MSY}	Fishing mortality at MSY
GitHub	Git (file management tool) + Hub(center) (Internet hosting service)
HCR	Harvest Control Rule
JABBA	Just Another Bayesian Biomass Assessment
JABBA_Manager	Menu-driven software for JABBA
JAGS	Just Another Gibbs Sampler
MASE	Mean Absolute Scaled Error
MCMC	Markov Chain Monte Carlo methods

MSY	Maximum Sustainable Yield
OBS	Observed or Observation
PM	Production Model
POR	Portugal
PPC	Posterior Predictive Check
PPMR	Prior to Posterior Median Ratio
PPVR	Prior to Posterior Variance Ratio
psi	Depletion rate (B1/K)
R	Open-source & free programming language for statistical analyses & others
Reshape2	R package to transform data between wide and long formats.
RMSE	Root Mean Square Error
Sigma2	Process variance
SpiCT	Stochastic surplus production model in continuous time
SWO	Swordfish
TAC	Total Allowable Catch
TB	Total Biomass
TB_{MSY}	Total Biomass at MSY

Important note

To learn JABBA

(technical, lot of processes & decisions)

⇩

Take Many years

(not only by 1 WS) (Surface)

⇩

Especially practitioner (real users)

Need to work with [MENU]

Before start, 2 training materials

(1)PowerPoint (for Day 1) 11MB via email

Hope that you got it

(1)Data practice folder ~~97MB~~ 14MB via USB stick

Participants will copy during the morning tea break

Another important notice

This time, we work for Short mackerel WG & demersal WG.

↓

Thus, members of 2 WG (**Weerapol, Nipa & Puy**) → **CORE participants**

↓

What are core participants?

They need to understand (perfect) as they will actively use & publish

↓

Thus, other participants have LESS priority

(cannot wait)

↓

Please ask core persons or [MENU] off time or after WS2

ALL Installation Completed

CPUE_Manager & JABBA_Manager

Thanks for cooperation

Sorry for push

Why so push ??????

In the past training (not in Thailand), it took 3 days to solve the un-expected Installation problems after training started.

That is why we now take precautionary approach
to start on time
(like fisheries under uncertainties)

Provisional WS2 schedule (subject to change depending on situation)

AM 9-12 & PM 13-16 — 30 minutes health break (AM & PM)

May		AM	PM	Organized by	Short presentation	Presenter
19	**Mon**	Opening & Group photo (before the break) Introduction & Practice JABBA+CPUE standardization		[MENU] (Nishida) and Resource Person (Supapong) SEAFDEC/TD	*Merit & Demerit of "Bayesian approach" & "Statistical inference". In which situation, we should use one of 2 methods?*	Supapong
20	**Tue**	Demersal WG			*Change of Thai Fisheries affecting q catchability.*	Weerapol
					Recent stock assessment of Brushtooth lizardfish Saurida undosquamis by DOF (TB method and/or others (GOT)	Weerapol
21	**Wed**	Short mackerel WG			*Recent stock assessment of Short mackerel by DOF (TB method and/or others) (GOT)*	Puy or Nipa
22	**Thu**	Preparation of home work				
23	**Fri**	Preparation of home work	Submission of your home work & presentation of your home work			
			Carp WG and Sum-up session			

Day 1 Group photo before morning tea break
copy Data practice folder (USB) (96MB) during break

List of participants(13): 10 trainees (red box) (3 core)

No	prefix	name	agency	core participants	remark
1	Dr.	Pavarot Noranarttragoon	Marine Fisheries Research and Development Division		Supervisor
2	Mr.	Weerapol Thitipongtrakul	Fishery Resources Assessment Group		coordinator
3	Ms.	Nipa Kulanujaree	Fishery Resources Assessment Group		
4	Ms.	Orawan Prasertsook	Fishery Resources Assessment Group		
5	Ms.	Budsayaphon (JAM)Thongprang	Fishery Resources Assessment Group		young scientist
6	Ms.	Jutima Jangjaiboon	Samutprakarn Marine Research and Development Center		young scientist
7	Ms.	Nitwadee Rittison	Rayong Marine Research and Development Center		young scientist
8	Mr.	Amonthep Khemto	Phuket Marine Research and Development Center		young scientist
9	Mr.	Aphinan Suepsing	Ranong Marine Research and Development Center		young scientist
10	Ms.	Wiparat Thong-ngok	Freshwater Research Division		
11	Ms.	Kajitpan Jarernnate	Freshwater Research Division		
12	Dr.	Supapong Pattarapongpan	SEAFDEC-TD		Resource person
13	Dr.	Tom Nishida	[MENU] Menu-driven stock assessment software development team		Co-organizer

Some one (volunteer) Camera(wo)man
Please help to take pictures for records

(not many & only sometimes)
(small amount for important scenes)

For new comers

Introduction

[MENU]

Menu-driven stock assessment (SA) software development team
(since 2005) (21 years) (start TT?)

To provide menu-based software without programming
(like window, Excel, Word, applications, etc.)

For new comers

For those cannot use programs,
no SA experts, Biologist, student etc.

Can do CPUE standardization, SA (such as JABBA)
easily & quicky

but need many years of practice with us [MENU]

JABBA GOAL 80%??

80% satisfaction➔ Good

100% not possible

(as no perfect CPUE & catch available)

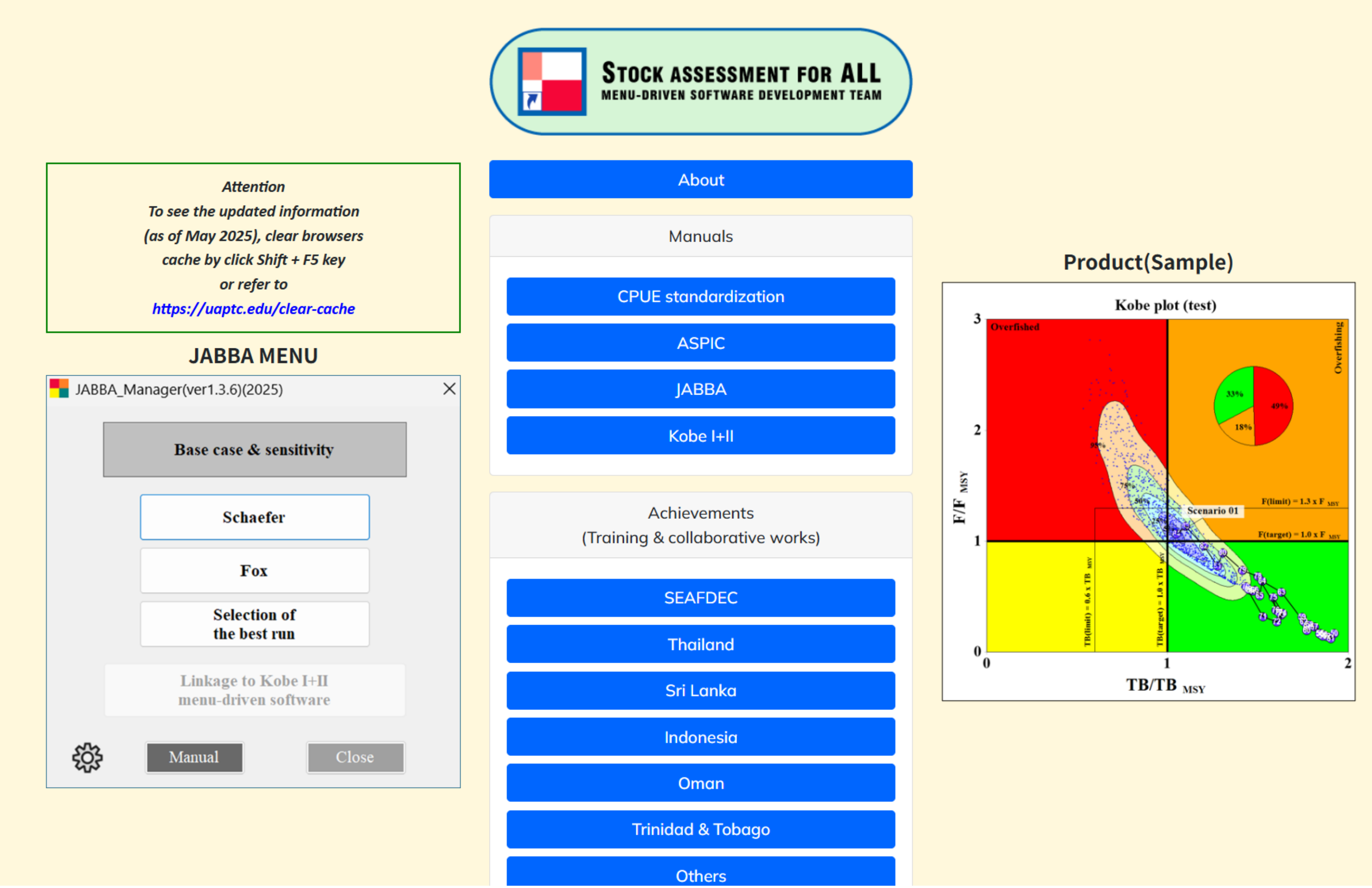
(same as our life for happiness)

We will see many examples later

What is TT?
Strat-up at
TT: Trinidad & Tobago (2005) (ASPIC)

20 years anniversary (2024) (Thailand) (last year)

Visit Our home page https://www.esl.co.jp/products/menu/



Software copyright and terms of use
4 points

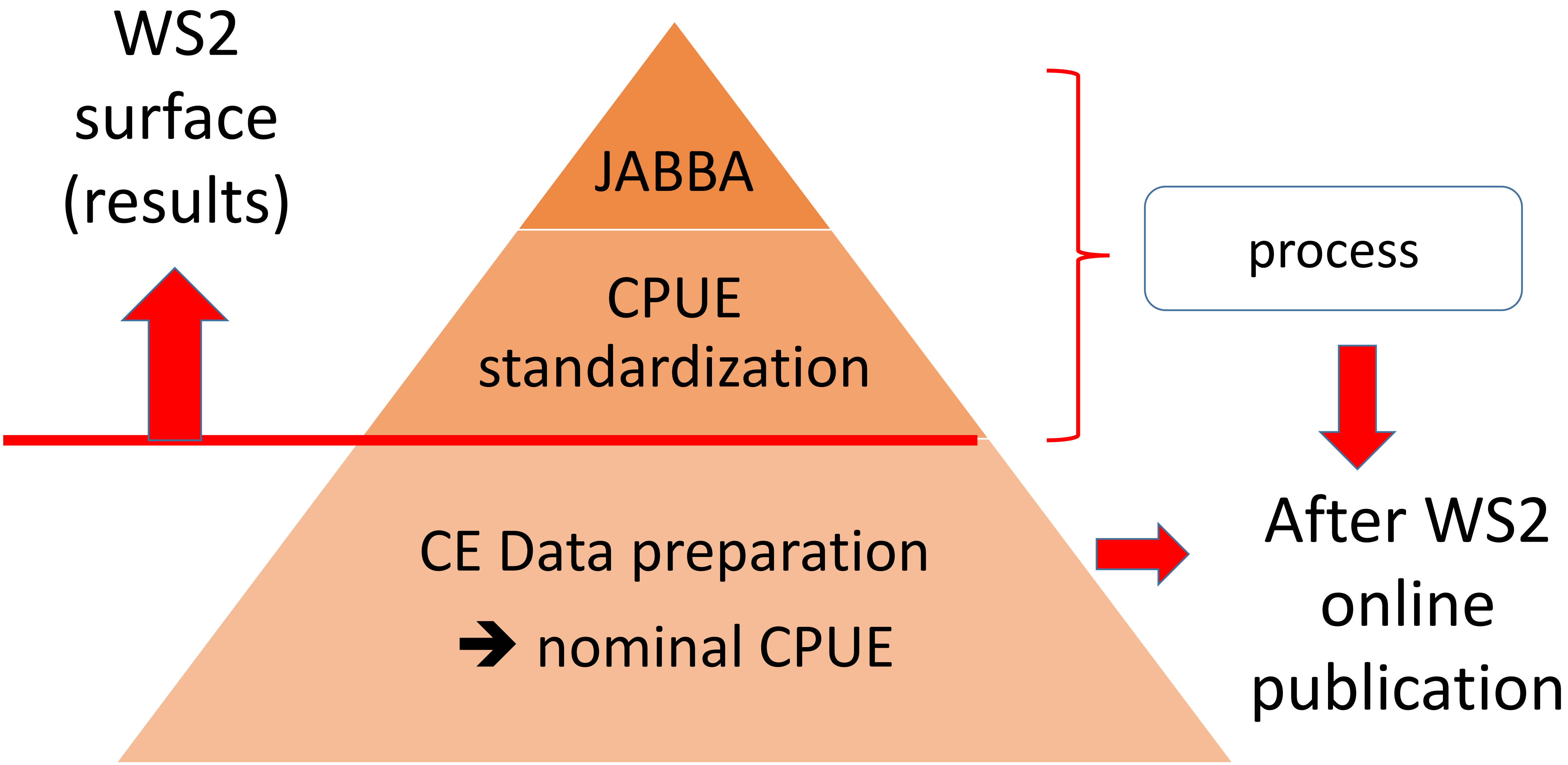
- Use yourself for your practice.
- Do not provide copy to others.
- Get our permission for official publication, reports etc.
- Users should work with [MENU] for proper usage.

Program + Plan

1. General session (today)

1.1 Introduction	PP#	
(1) JABBA (theory)	99	AM
(2) New CPUE standardization	11	AM
1.2 Demo + Practice		
(1) JABBA	35 + Practice	PM
(2) CPUE standardization	24 + Practice	PM
(3) Data process	1 + Practice	after WS2

2. WG session
   - 2.1 Demersal WG
   - 2.2 Short mackerel WG
   - 2.3 Carp WG
3. Homework (Presentation & submission)
4. Sum-up session
   - 4.1 Review, Summary & Recommendation
   - 4.2 Future plan


WS2
surface
(results)
JABBA
CPUE
standardization
CE Data preparation
➔ nominal CPUE
process
After WS2
online
publication

1.1 JABBA (Introduction)

Based on Software Manual (136pp) (10MB)

(use as reference)

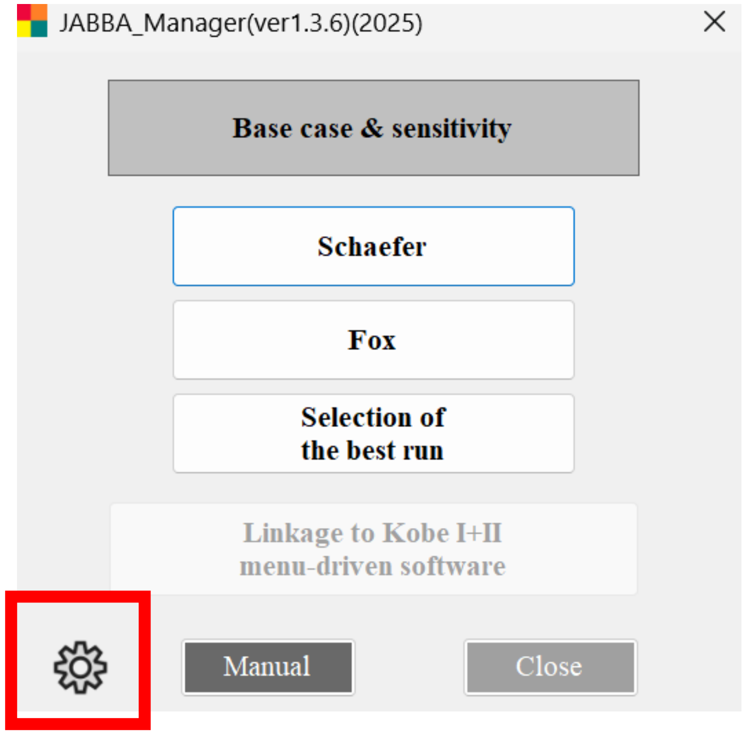
Contents

- Outline
- Installation
- Implementation
- Demo (case study)

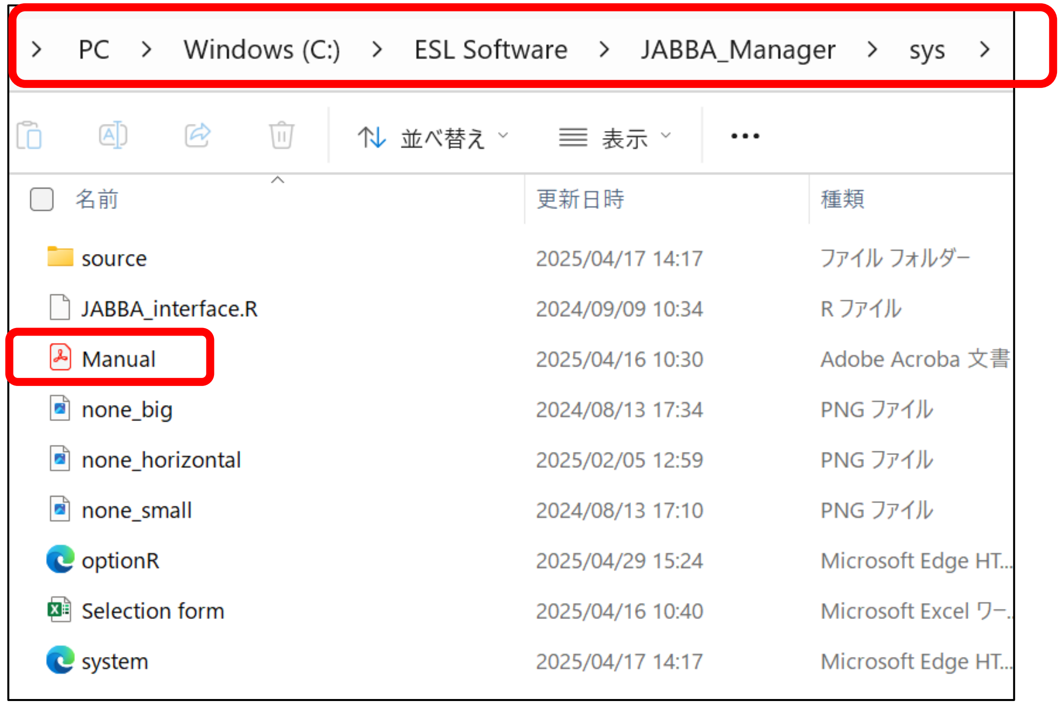
3 ways to get the software Manual

(1) Form Home page
https://www.esl.co.jp/products/menu/jabba_manager.pdf

(2) From Call button (software)



(3) From software folder



STOCK ASSESSMENT FOR ALL
MENU-DRIVEN SOFTWARE DEVELOPMENT TEAM

Menu-driven software series (No. 3)

JABBA_MANAGER (VER 1.3.6)
Manual

(May, 2025**)**

Tom Nishida (PhD) (Representative)
aco20320@par.odn.ne.jp
Kazuharu Iwasaki (Software Engineer)
[MENU]© Menu-driven stock assessment software development team(Japan)
https://www.esl.co.jp/assets/menu

Supervised by Dr Sheng-Ping Wang
Professor National Taiwan Ocean University
Peer reviewed by Dr Doug Butterworth
Professor Emeritus, University of Cape Town

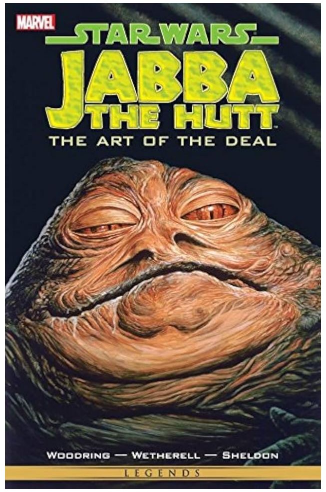
Our 4 technical advisors
(personally 30 years together)

Wang

Butterworth

+ 2 others
(Dr Yokoi & Professor CPUE=Shono)

JABBA: Just Another Bayesian Biomass Assessment
Henning Winker South Africa) (2018)
➔ sound tough & difficult



Contents lists available at ScienceDirect

Fisheries Research

ELSEVIER

journal homepage: www.elsevier.com/locate/fishres

JABBA: Just Another Bayesian Biomass Assessment

Henning Winker[a,b,*], Felipe Carvalho[c], Maia Kapur[c,d]

JABBA
What types of stock assessment?

This session ➔ highly technical
no worry
you can run JABBA

Type 3 : Data rich type with catch, CPUE & Prior

	Data type	Information	Name (main data)	Data period	Reference Point (RP) (MSY, Fmsy, TBmsy, target & limit RP)	Models & Application (examples)	Implementation (R, code, package) (examples)
TYPE 1	Qualitative	Parameters	No data			● ERA (Ecosystem Risk Assessment) ● PSA (Productivity Susceptibility Analysis)	✓ R ✓ Package
TYPE 2	Quantitative	✓ Real data ✓ Parameter valuses ✓ Priors (Bayesian approach)	Data Poor (length)	Shorter (< a few years)	Some available only for short period (snap shot SA)	● Length based models (ELEFAN, FiSAT, Y/R, S/R, LBSPR, Thompson & Bell)	✓ R ✓ Package (FAO & others)
			Data Poor (cach)	Longer (> 10 years pre-ferable)	Some avilable (relative & subject to assumptions)	● Delpetion rate assumed (CMSY & OCOM) ● Depletion rate not assumed (ORCS & SSCOM) ● Robin-hood methods	
TYPE 3			Data Rich (catch; CPUE; biological paramter values; and/or priors)		Available Realistic & objective (subject to assumptions) (most important for management)	● Surplus Production models (SPM) (ASPIC, SPiCT & JABBA) ● Age/size structured model (VPA, ASPM, SCAA, SCAS) ● Integrated models (SS, CASAL)	✓ Own codes (SS) ✓ R (JABBA) ✓ MENU driven (JABBA_Manager)

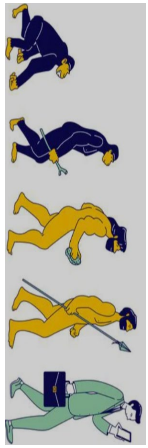
Nishida (2025)

JABBA Surplus Production Model

What kinds of Surplus Production Model Available?

Evolution!?

Evolution of SPM (Surplus Production Model) Color legend: Green (Advantage) and Yellow (data)

Evolution	Type	Author	Features: Non-equilibrium condition	Features: Bayesian approach	Error type: Observation error (CPUE)	Error type: Observation error (Catch)	Error type: Process error (Model)	Error type: Process error (F)	Time: Continuous & Seasonal pattern	Life history and Selectivity	Data	Comments
	Original SPM	Shaeffer(1954), PT(1969) & Fox (1970)										Original (not recommended)
	ASPIC (ver2~5)	Prager (2004~2013)									Annual catch & CPUE	Outdated (not recommended)
	ASPIC (ver7)	Prager (2014~)										
	SPiCT (Stochastic surplus production model in continuous time)	Pedersen & Berg (2017)	YES		YES	YES		YES	YES		Quarterly or finer-scale catch & CPUE	Space state (all-in-one SPM) (recommended)
	JABBA (Just Another Bayesian Biomass Assessment)	Winker *et al* (2018)		YES			YES				Annual catch & CPUE	
	JABBA -Select	Winker *et al* (2020)								YES	Annual catch, CPUE & length-composition	Advanced JABBA (suitable for moderate data) (recommended)

(Note) Representative SPMs are listed, while there are many other SPMs (for details, see Cousido-Roch et all, 2022)

2 important points for theoretically GOOD SPM

(1) Bayesian approach

(2) Observation & Model error

↓

Space State SPM

↓

(3 general use application)

JABBA, SPiCT & JABBA-select

What is Bayesian approach

Parameters estimation method (Probability distribution function)

(mean & SE)

Estimation
(model run)

Before estimation

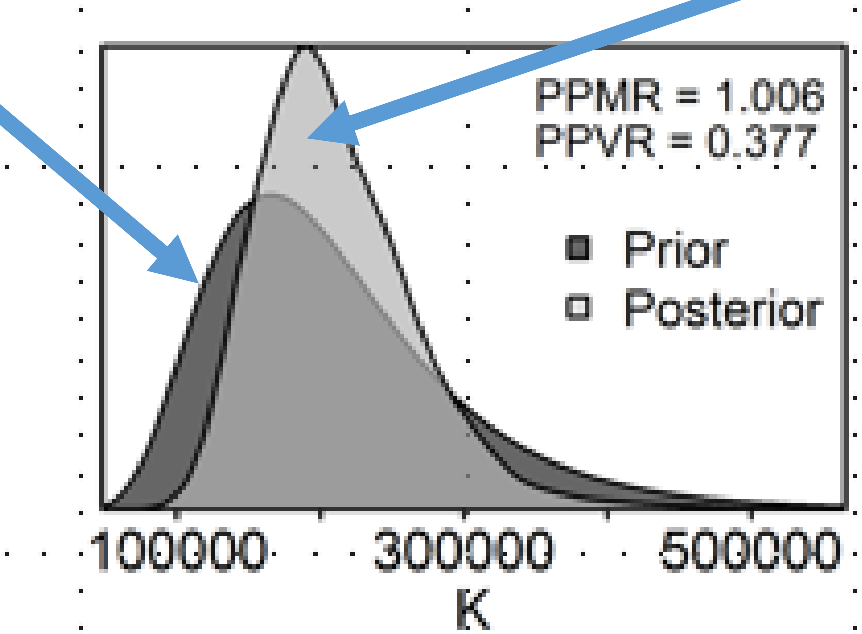
Prior

Give guess
Parameters

After estimation

Posterior

Estimated
Parameters



No real data are used !!

What is different between Bayesian (JABBA) vs. Statistical inference (ASPIC)

Method used in ASPIC

Statistical inference (least mean square)(data based)

Bayesian approach

(No data)

Based on probability distribution

(mean & SE)

(1) Merit & demerit between 2 methods

(2) In which case (Situation) we should use Bayesian approach

(all the case ? or particular case?) and also for statistical inference.

Dr Supapong Pattarapongpan(SEAFDEC/TD)

will explain

Why we call Space State (SS) SPM?

What is the SS ?

Space (parameters) & State (modelling)

Integrated Statistical modelling

Theoretically BEST SPM incorporate

[Observation] + [Model] errors

Bayesian framework

↓

Integrated Statistical SPM

↓

Space State SPM

3 Space State SPM

JABBA	: Annual based SPM (discrete)
JABBA-Select	: Annual based SPM with size data (discrete) (life history & Selectivity)
SPiCT(BEST)	: Quarterly + (continuous time) + (catch error) SPM

Why we chose JABBA?
Because we do annual based SPM (basic)

JABBA-select can be done(future if size available)
SPiCT not possible (fine scale SA & highly technical)

JABBA Outline

(1)Bayesian State-Space Surplus Production Model;

(2)Fox, Schaefer or Pella Tomlinson

(3)Runs quickly & provide

➔ key parameters, graphs, diagnostics,

Retrospective & hindcasting (projection) (ALL in one).

(1)Many world-wide users.

2 features in this software

(1) 2 models (Schaefer + Fox)

- Pella Tomlinson is not used

  as Schaefer or Fox normally used as standard.

- Schaefer or Fox (results) close to Pella Tomlinson
- Pella Tomlinson (many parameters and complex) → no need

Start 10:50 AM

- COPY DATA PRACTICE 140MB

2 features in this software

(2) **2 steps approach to estimate Parameters**

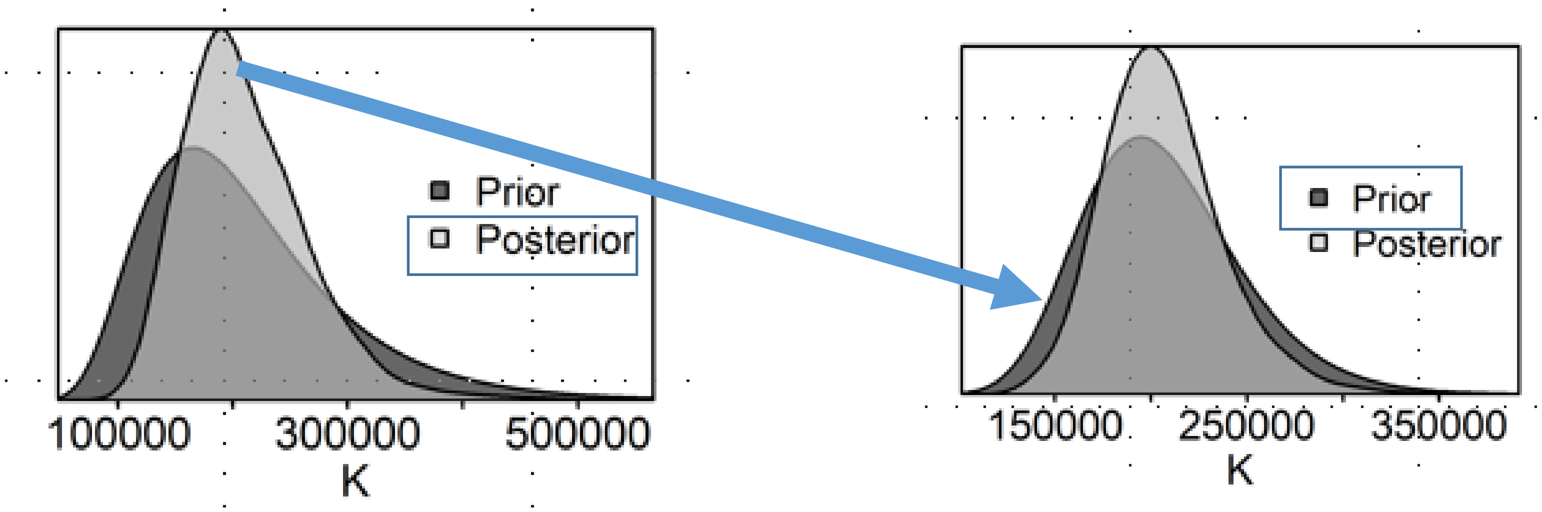
- 5 key parameters will be estimated by Bayesian approach
- The 1st estimation will be used for prior of the 2nd estimation

What dose it mean?

#	parameters	Meaning
1	r	Population growth rate
2	K	Carrying capacity
3	q	Catchability (each fleet)
4	psi	Depletion
5	sigma2	Process error

1st step

2nd step



Refinement approach

What is MCMC (Markov Chain Monte Carlo) ?

Parameter estimation method by re-sampling of the data

(e.g. 1 million times of repetitions)

→ To estimate Median & SE

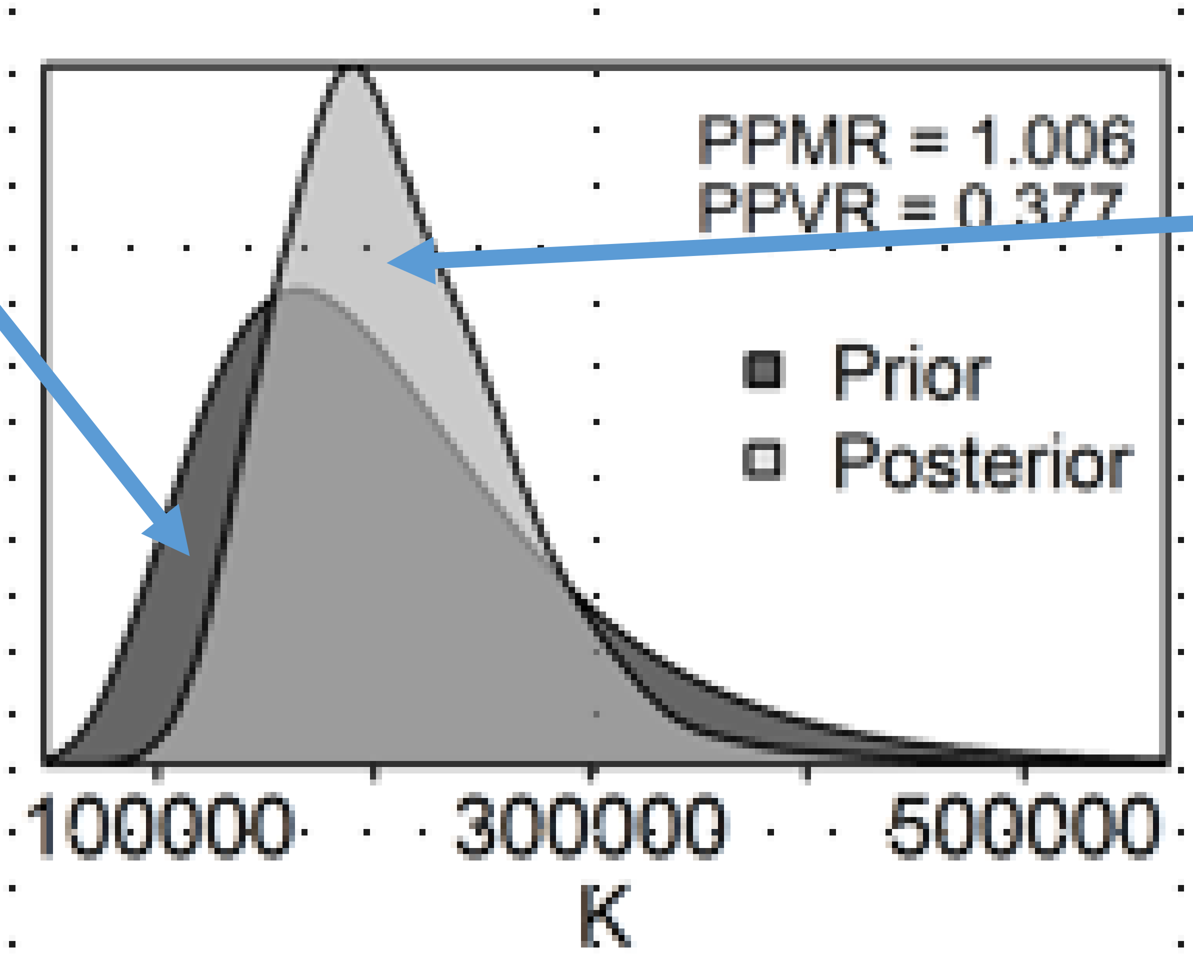
→ Bayesian approach

Estimation procedure by the Bayesian approach by MCMC

Prior parameters provided

JABBA Run by MCMC

Posterior parameters estimated by MCMC

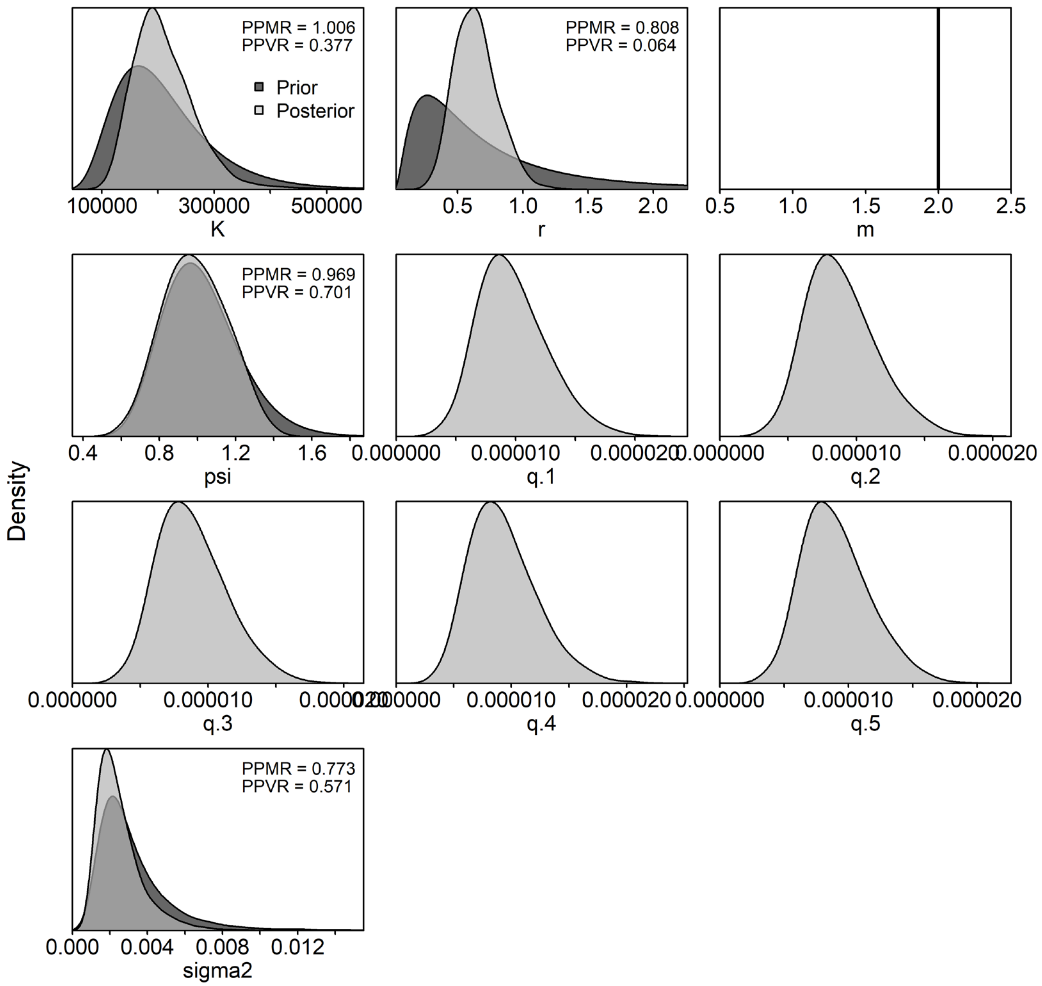


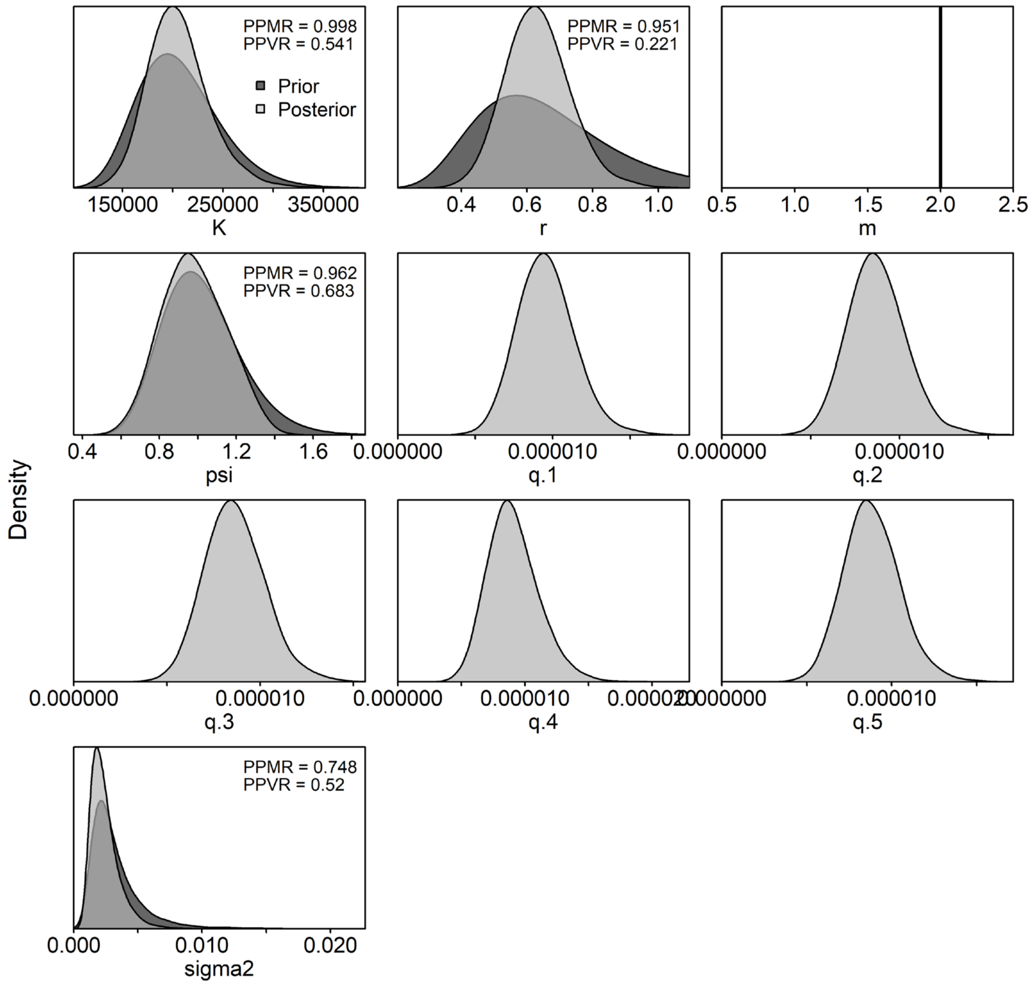
5 parameters will be estimated by 2 steps.
r, K, q use different function, while psi & signma2 same

#	parameters	Meaning	Model	
			1st step	2nd step
1	r	Population growth rate	constant	log normal
2	K	Carrying capacity		
3	q	Catchability (each fleet)		
4	psi	Depletion	log normal	
5	sigma2	Process error	inverse gamma (4, 0.01)	

1st step (constant)

2nd step (log normal)





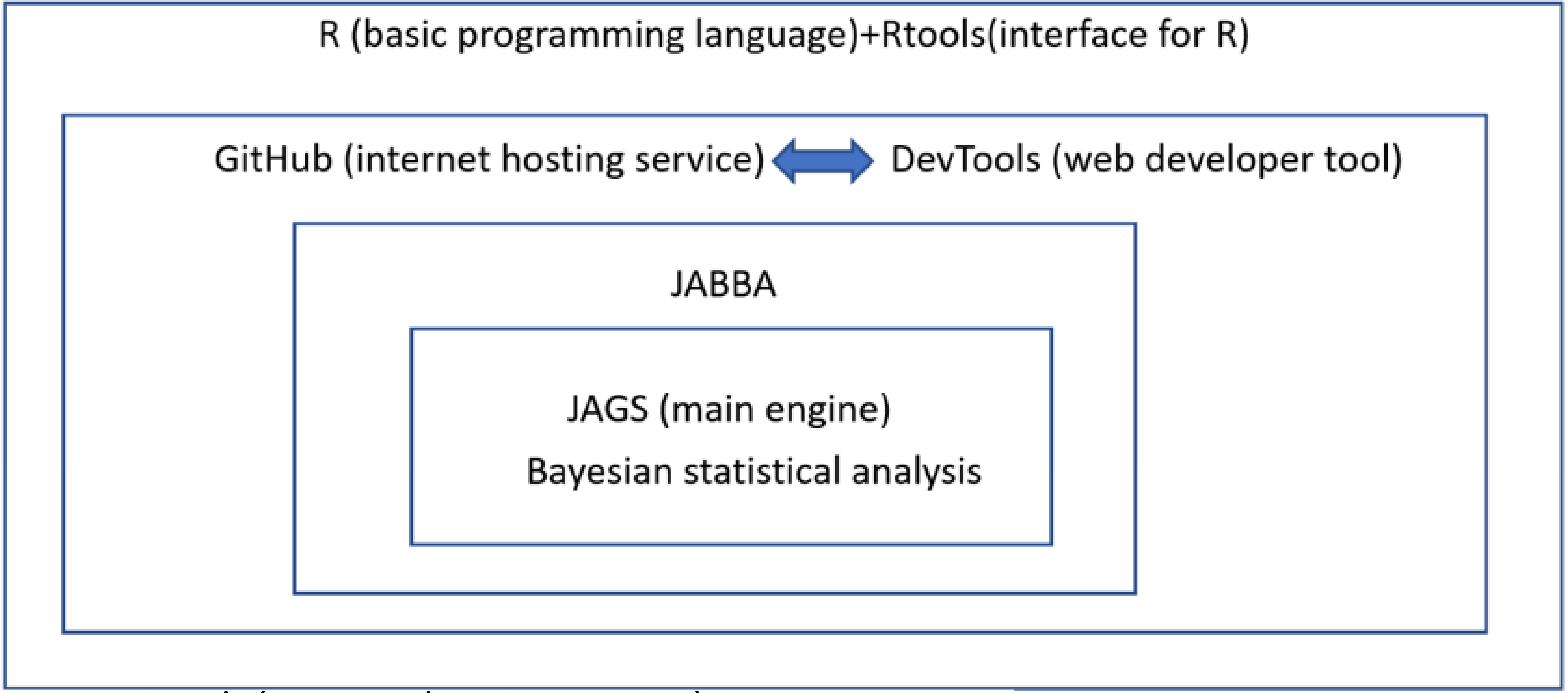
5 fleets (5q) model

Anyway, you don't touch these technical matters
➔ software covers

But, at lease,

you need to know the concept & outlies

Schematic diagram of JABBA components and their relations



Note: GitHub (Internet hosting service)
JAGS (Just Another Gibbs Sampler)

1.1 JABBA (Introduction)

Contents

- Outline
- Installation (completed)
- Implementation
- Case studies

1.1 JABBA (Introduction)

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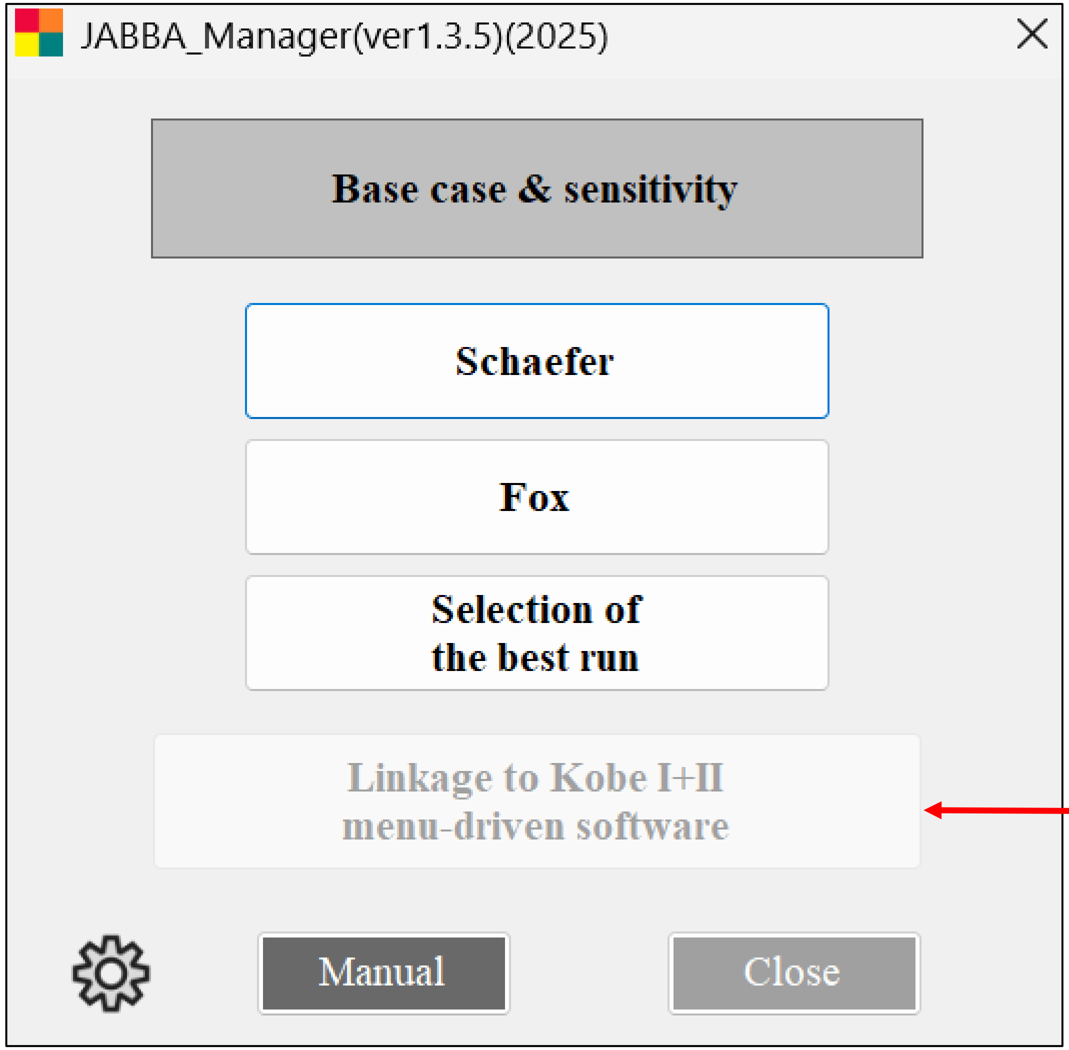
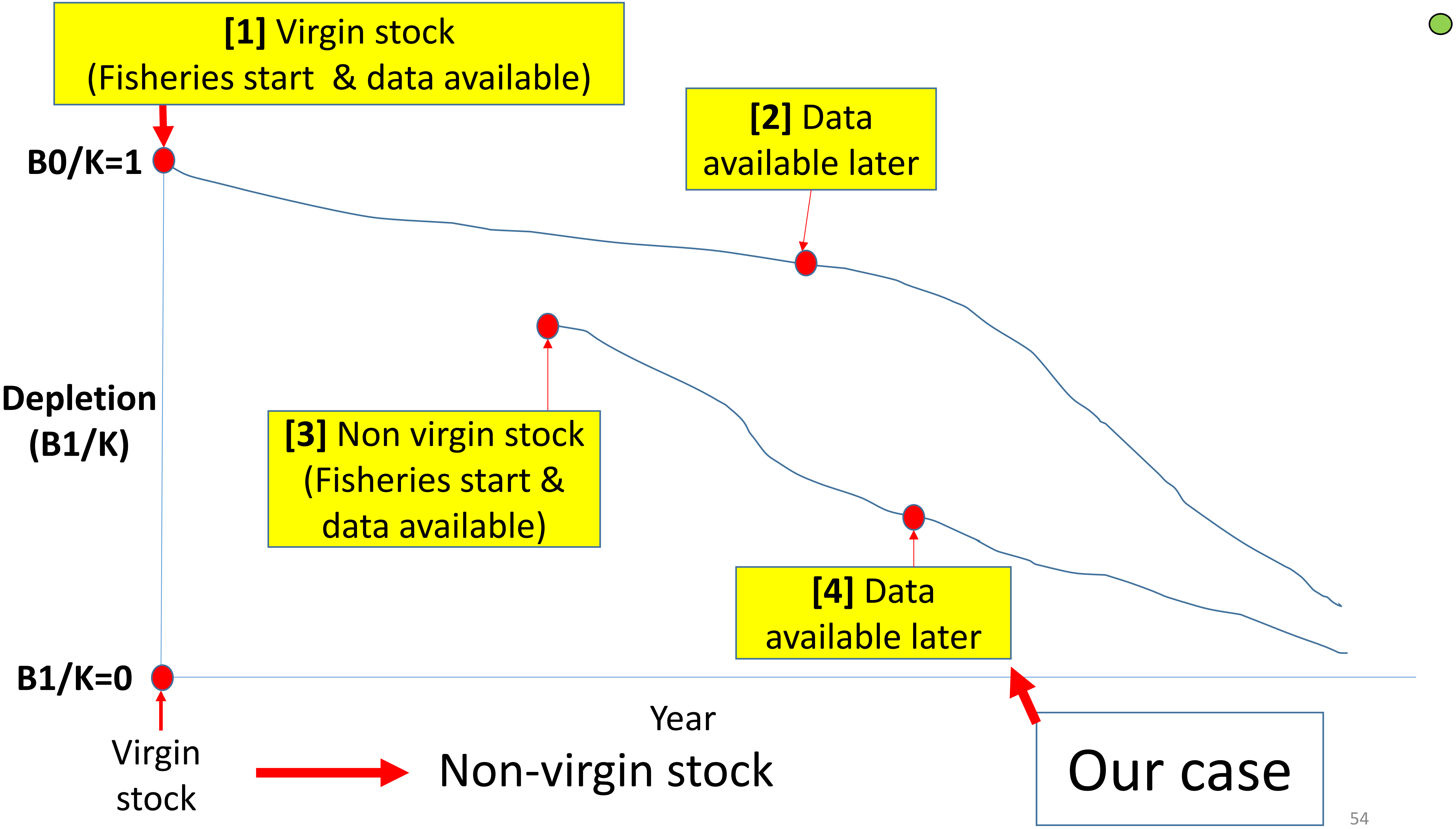
JABBA menus



To be completed by 2026.

4 cases to implement

What & why are 4 cases?


[1] Virgin stock
(Fisheries start & data available)
[2] Data
available later
B0/K=1
Depletion
(B1/K)
[3] Non virgin stock
(Fisheries start &
data available)
[4] Data
available later
B1/K=0
Year
Virgin
stock
Non-virgin stock
Our case

Implementation

Case [1] ➔ direct (normal) approach

Case [2]~[4] ➔ Scenario approach

Case [2]~[4]
Why scenario approach ? Why not normal approach?
Butterworth, Wang, Nishida & references

To use direct (normal) estimation approach : Case [1]

➔ Virgin stock & data available

(Need long, stable & reliable data)

➔ Tuna & BILL fish data (RFMO) 1950~ OK

RFMO Regional Fisheries Management Organization

Why scenario approach ? Why not direct approach?
Butterworth, Wang, Nishida & references

- If fisheries start after virgin stock ➔ B1/K cannot be estimated
- If normal approach is used for [2]~[4]

  ➔ Seeded B1/K itself is estimated (NG)

  Normally different estimated values

⇩

Need Scenario (robust & certain) approach

Initial Seeding values (B1/K) Depletion	Estimated B1/K (almost same) NG	
	Schaefer	Fox
0.2	0.21	0.20
0.4	0.39	0.39
0.6	0.59	0.58
0.8	0.80	0.82

How to implement cases [2]~[4]?

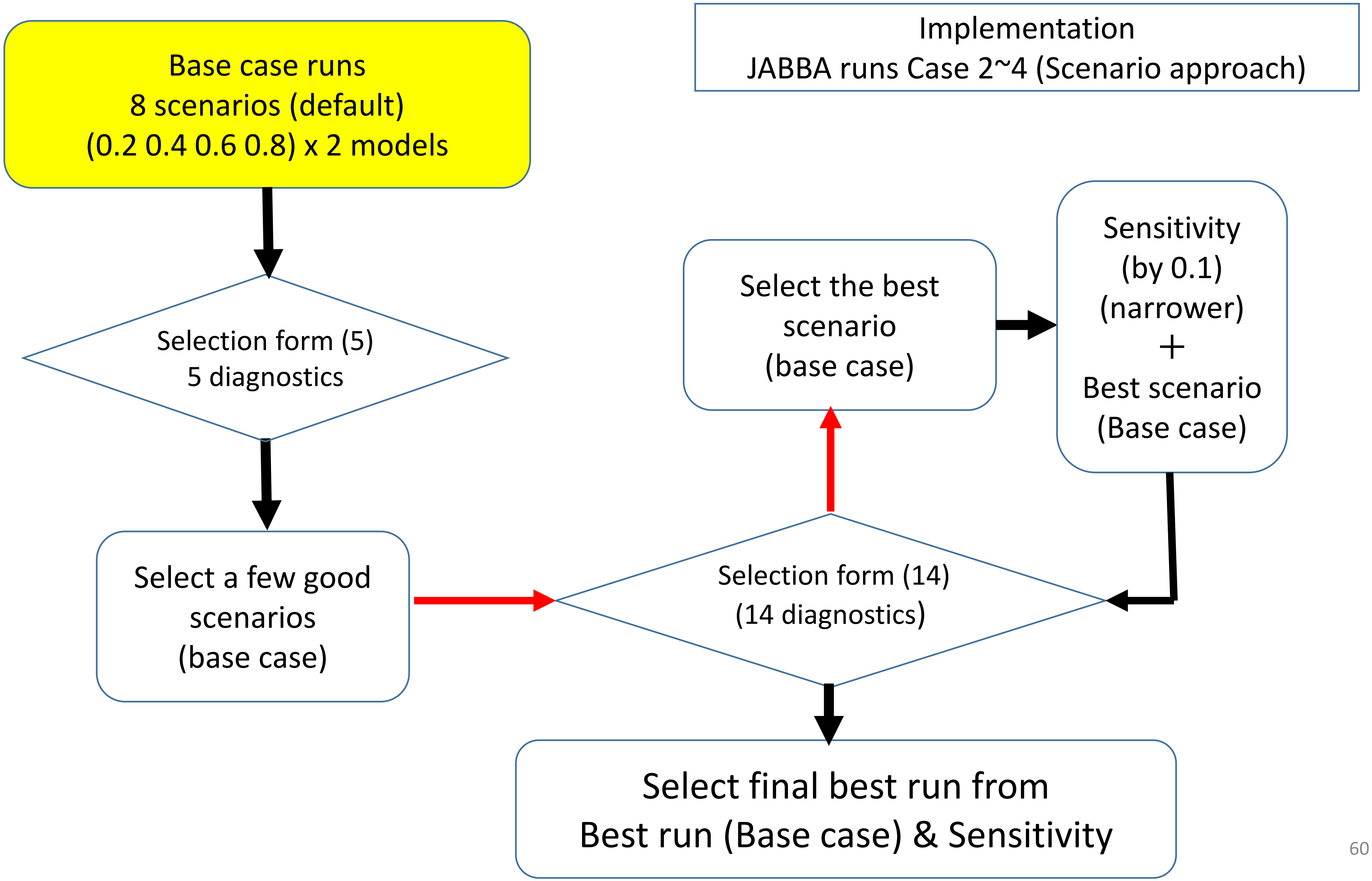
Our case is mainly [4]

Set up scenarios for depletion (B0/K)
Model Schaefer & Fox

Default (no pre-knowledge of B0/K)

➔ Default 4 B0/K (0.2 0.4 0.6 0.8) (to search wider range)

➔ **Then 8 scenarios 4B0/K (depletion) x 2 models**


Implementation
JABBA runs Case 2~4 (Scenario approach)
Base case runs
8 scenarios (default)
(0.2 0.4 0.6 0.8) x 2 models
Selection form (5)
5 diagnostics
Select a few good scenarios (base case)
Selection form (14)
(14 diagnostics)
Select the best scenario (base case)
Sensitivity (by 0.1) (narrower)
+
Best scenario (Base case)
Select final best run from
Best run (Base case) & Sensitivity

Implementation (Base case) Selection form (5)(MAX case)

Don't worry normally much simpler

Strategy to search good CPUE for JABBA (4 fleet) (Max 8 scenarios) (sample) (base case)

	Strategy		1st							2nd								3rd							
			Individual CPUE							Average CPUE								hybrid (individual and/or ave) CPUE							
	series #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
	Scenario	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
	B0/K (depletion)	0.2	0.2	0.4	0.4	0.6	0.6	0.8	0.8	0.2	0.2	0.4	0.4	0.6	0.6	0.8	0.8	0.2	0.2	0.4	0.4	0.6	0.6	0.8	0.8
	Model	s	f	s	f	s	f	s	f	s	f	s	f	s	f	s	f	s	f	s	f	s	f	s	f
	run ID	IN1-s0.2	IN2-f0.2	IN3-s0.4	IN4-f0.4	IN5-s0.6	IN6-f0.6	IN7-s0.8	IN8-f0.8	AV1-s0.2	AV2-f0.2	AV3-s0.4	AV4-f0.4	AV5-s0.6	AV6-f0.6	AV7-s0.8	AV8-f0.8	HY1-s0.2	HY2-f0.2	HY3-s0.4	HY4-f0.4	HY5-s0.6	HY6-f0.6	HY7-s0.8	HY8-f0.8
fleet	f1(CPUE1)		Individual CPUE							Average CPUE								Individual CPUE							
	f4(CPUE4)		Individual CPUE															(not used)							
	f3(CPUE3)		Individual CPUE							Average CPUE								Average CPUE							
	f4(CPUE4)		Individual CPUE																						
5 diagnostics	(1) Kobe plot	ok	ok	ok	ok	ok	ng	ng	ng	ok	ok	ok	ok	ok	ok	ng	ok	ok	ok	ok	ok	ng	ng	ng	ok
	(2) CPUE	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok
	(3) Retro	na	ng	ok	ng	ng	na	na	na	ng	na	ng	ok	ng	ng	na	na	ng	ok	ng	ok	na	na	na	ok
	(4) Convergence	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ng	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok
	(5) Retro&Hind Table	na	ok	ng	ok	na	na	na	na	na	na	ok	ok	ok	na	na	na	ok	ng	ok	ok	na	na	na	ok
	Results	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ok	ng	ng	ng	ok
	Note																								

What is Strategy ?
Why we need ?

Case (2~4)➔ Scenario approaches
3 strategies to change <u>CPUE</u> to find good results

1st Strategy	Use all CPUE individually (If NG, go to 2nd)
2nd Strategy	Use average CPUE (If NG, go to 3rd)
3rd Strategy	Use combination of individual CPUE and/or Ave CPUE (hybrid approach) (if NG, finish runs as no good results)

Some times we can finish only 1st Strategy

Scenario # ➔ within scenario, Series # ➔ whole run

Strategy	1st								2nd								3rd							
	Individual CPUE								Average CPUE								hybrid (individual and/or ave) CPUE							
series #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Scenario	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8

But life is no so easy

Often you need to do additional run after the initial run

For example,

After the 1st run completed (red box)

You might need to try another run such by deleting one CPUE

Because it might give better results➔ finish quickly..

Then you need to change scenario 1a 1b…

Run ID important to manage runs ➔you can make name

	Strategy	1st						2nd				
		Individual CPUE						Average CPUE				
	series #	3	4	5	6	7	8	9	10	11	12	13
	Scenario	3	4	5	6	7	8	1	2	3	4	5
	B0/K (depletion)	0.4	0.4	0.6	0.6	0.8	0.8	0.2	0.2	0.4	0.4	0.6
	Model	s	f	s	f	s	f	s	f	s	f	s
	run ID	IN3-s0.4	IN4-f0.4	IN5-s0.6	IN6-f0.6	IN7-s0.8	IN8-f0.8	AV1-s0.2	AV2-f0.2	AV3-s0.4	AV4-f0.4	AV5-s0.6
fleet	f1(CPUE1)	Individual CPUE						Average CPUE				
	f4(CPUE4)	Individual CPUE										
	f3(CPUE3)	Individual CPUE						Average CPUE				
	f4(CPUE4)	Individual CPUE										
5 diagnostics	(1) Kobe plot	ok	ok	ok	ng	ng	ng	ok	ok	ok	ok	ok
	(2) CPUE	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok
	(3) Retro	ok	ng	ng	na	na	na	ng	na	ng	ok	ng
	(4) Convergence	ok	ok	ok	ok	ok	ok	ok	ok	ok	ng	ok
	(5) Retro&Hind Table	ng	ok	na	na	na	na	na	na	ok	ok	ok
	Results	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng

For example, why AV1-s0.2?

AV ➔ 2nd Strategy (Average), 1 ➔ scenario 1, s0.2➔ Schaefer(Depletion 0.2)

If you like species code (SM)➔ SM-AV1-s0.2

OK, let's try scenario 1 using 5 diagnostics (inspection items)

	Strategy	
	series #	1
	Scenario	1
	B0/K (depletion)	0.2
	Model	s
	run ID	IN1-s0.2
fleet	f1(CPUE1)	
	f4(CPUE4)	
	f3(CPUE3)	
	f4(CPUE4)	
5 diagnostics	(1) Kobe plot	
	(2) CPUE	
	(3) Retro	
	(4) Convergence	
	(5) Retro&Hind Table	
	Results	

What are 5 diagnostics?

การวินิจฉัย

In page 3-4
(each Report)

1st page

Report_SM-IN1-06s (Schaefer)

Sample

Contents

Note: Sometimes there are blank figures and/or tables due to space limitations. In such a case, please copy and paste from the original output files located one before this Report folder). If there are no outputs, please leave it empty.

5 key diagnosis ➔ Page 3

SM-IN1-06s(Schaefer)

Visual inspection

(1) Kobe plot

(2) CPUE (Autocorrelation) (green)

(3) Retrospective pattern (B & F)

Numerical inspection

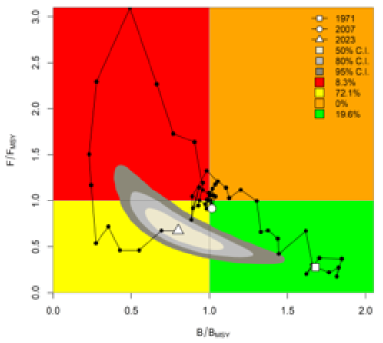
(4) Convergence

(5) Retro & Hind cast Table

Summary of results & diagnoses (1/2) (Key diagnoses)

(1) KOBE PLOT

(#18) (page 18) Kobe plot



CONVERGENCE

(#20) (p.5) Convergence (MCMC) (> 0.05) (higher better)

Yellow markers (not converged)

(4)

	Geweke.p	Heidel.p
K	0.44	0.67
r	0.33	0.59

RETROSPECTIVE ANALYSES

(5) Retro Table

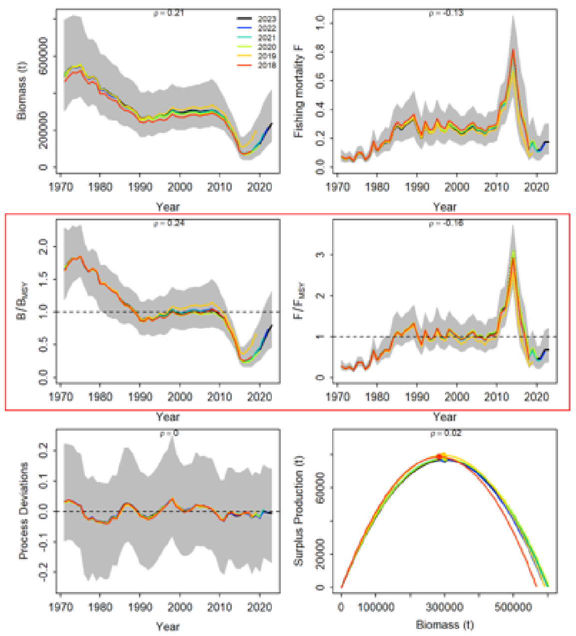
(#42) (p.12) Retrospective analyses for 2 most important parameters (B & F) Mohan ρ (-0.15 < ρ < 0.2) ➔ Converged (value closer to 0.025 is better)

Yellow marker (not converged)

Mohan ρ	B	F
2023	0.04	-0.04
2022	0.09	-0.10
2021	-0.04	0.05
2020	0.86	-0.47
2019	0.12	-0.10
Average	0.21	-0.13

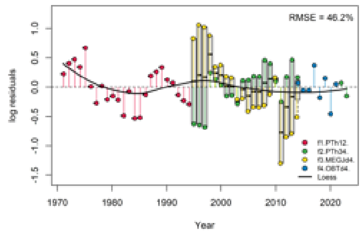
(#40) (p.14) Retrospective patterns

(3)



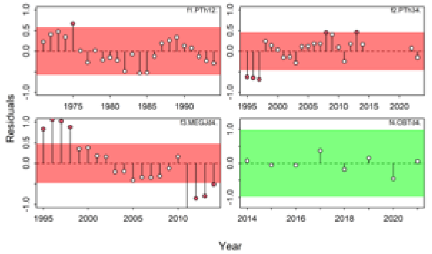
CPUE FITNESS

(#10) (page 8) CPUE fitness (1) (lower RMSE better)



(#13) (page 7) CPUE fitness (2)
Red band: No randomness
Red points: outliers

(2)



5 key diagnosis ➔ Page 4

SM-IN1-06s(Schaefer)

Visual inspection
(1) Kobe plot
(2) CPUE (Autocorrelation) (green)
(3) Retrospective pattern (B & F)

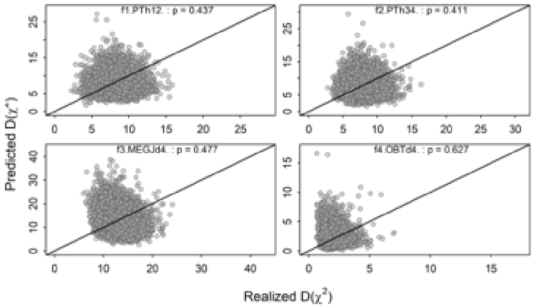
Numerical inspection
(4) Convergence
(5) Retro & Hind cast Table

Summary of results & diagnoses (2/2)

MODEL FITS

(#12) (page 11)
Posterior Predictive Check (PPC).
p should be
0.2<p<0.8
and closer to 0.5
is better fit.
(Users: compute Ave. & write below)

Ave. p=___



ESTIMATED PARAMETER VALUES

(#21)
(page 16)

Parameter	Meaning	Mean	Lower (95%)	Upper (95%)
K	Carrying capacity (t)	599,683	438,164	815,569
r	Pop. growth rate	0.51	0.37	0.73
B0/K	Depletion (EST)	0.81	0.58	1.09
sigma.proc	Estimable process VAR	0.06	0.04	0.14
m	Shape parameter	2	2	2
Fmsy	F at MSY	0.26	0.18	0.36
TBmsy	TB at MSY (t)	299,841	219,082	407,784
MSY	MSY (t)	76,999	68,584	85,725
Catch(2023)	Current catch	41,219		
bmsyk	Limit Ref. Point (TB/TBmsy)	0.50	0.50	0.50
TB(1971)/ K	Depletion (OBS)(start)	0.84	0.60	1.14
TB(2023)/ K	Depletion (OBS)(last)	0.40	0.23	0.66
TB/TBmsy	TB ratio	0.80	0.47	1.32
F/Fmsy	F ratio	0.67	0.38	1.21

HINDCAST ANALYSES

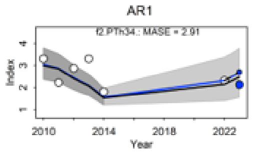
(#41) (page 15) Hindcast
(predictive skill)
If predicted color points > 95% CI
➔NG for prediction

(#43) (page 14)
MASE
(Predictive skill)
(< 1)
(smaller better)

Yellow markers (> 1)
Not acceptable

Index	MASE
f1.PTh12.	NA
f2.PTh34.	2.91
f3.MEGJd4.	NA
f4.OBTd4.	NA
Average	NA

(5) Hind Table



How to use 5 diagnostics?

Visual inspection

(1) Kobe plot

(2) CPUE (Autocorrelation) (green)

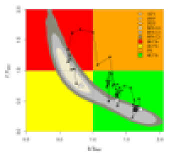
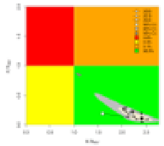
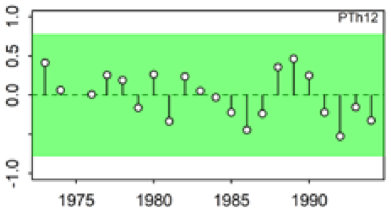
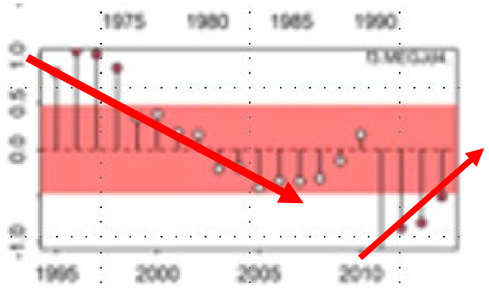
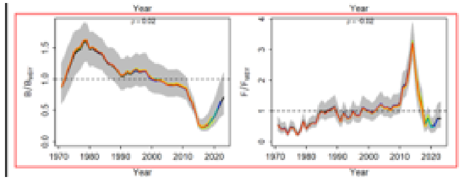
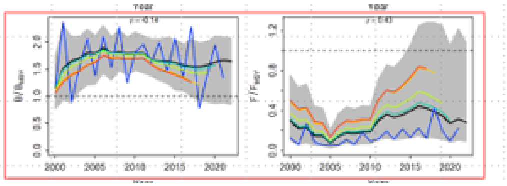
(3) Retrospective pattern (B & F)

Numerical inspection

(4) Convergence

(5) Retro & Hind cast Table

5 Quick diagnostics (refer to Report or Manual for details)

Type	Contents	Criteria	Judgment: OK	Judgment: NG
Kobe plot	Stock status	Should reflect the plausible stock status		Too optimistic 
Time series residual CPUE		No autocorrelation, i.e., time series patterns of CPUE should be random and no patterns.		
		Outliers	OK	One outlier Remove then may become green
Retrospective analyses	Justification of JABBA runs	Retrospective patterns should be similar (especially for B/Bmsy & F/Fmsy)		
Convergence	All parameters are properly estimated.	Non-significant in Geweke p & Welch p tests	NG for yellow markers	

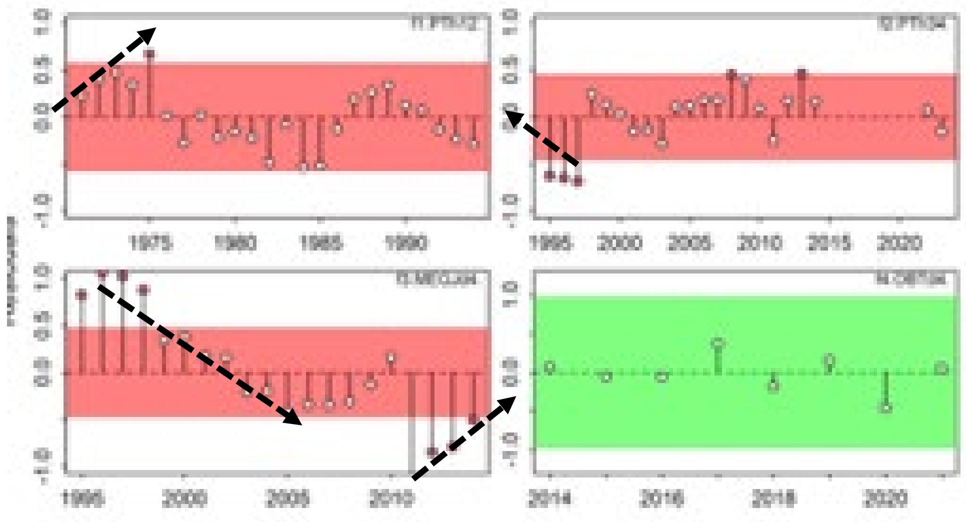
	Geweke.p	Heidel.p
K	0.04	0.22
r	0.97	0.56

Autocorrelation (1/2)

- In the time series CPUE data, if there are no randomness in their residuals, it is the autocorrelation problem

  ➔ Cannot use CPUE

- To mitigate this problem, points with particular patterns (not random) and/or (large) outliers in the residual plots need to be removed.



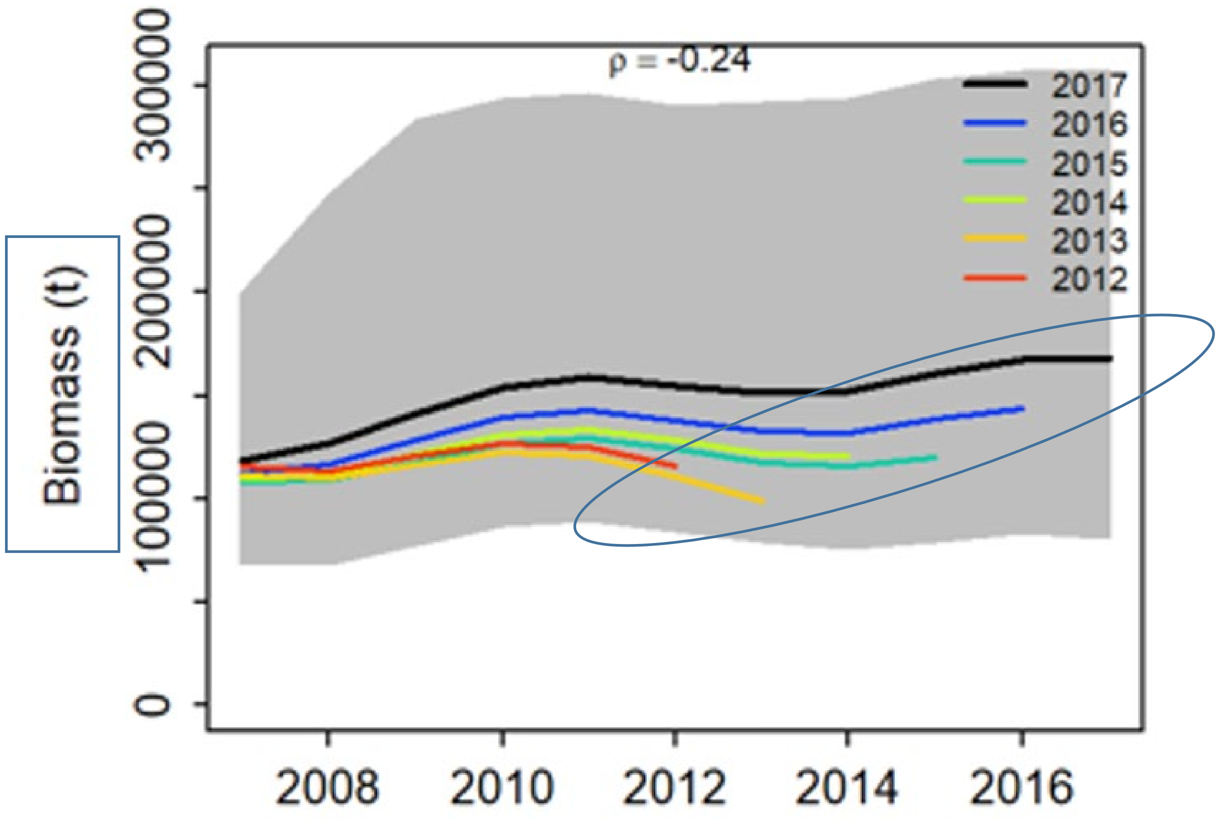
Autocorrelation (2/2)

- Re-run JABBA, then the autocorrelation problem sometime may be solved.

- If still red color, such CPUE data sets should be removed. See red box page 63

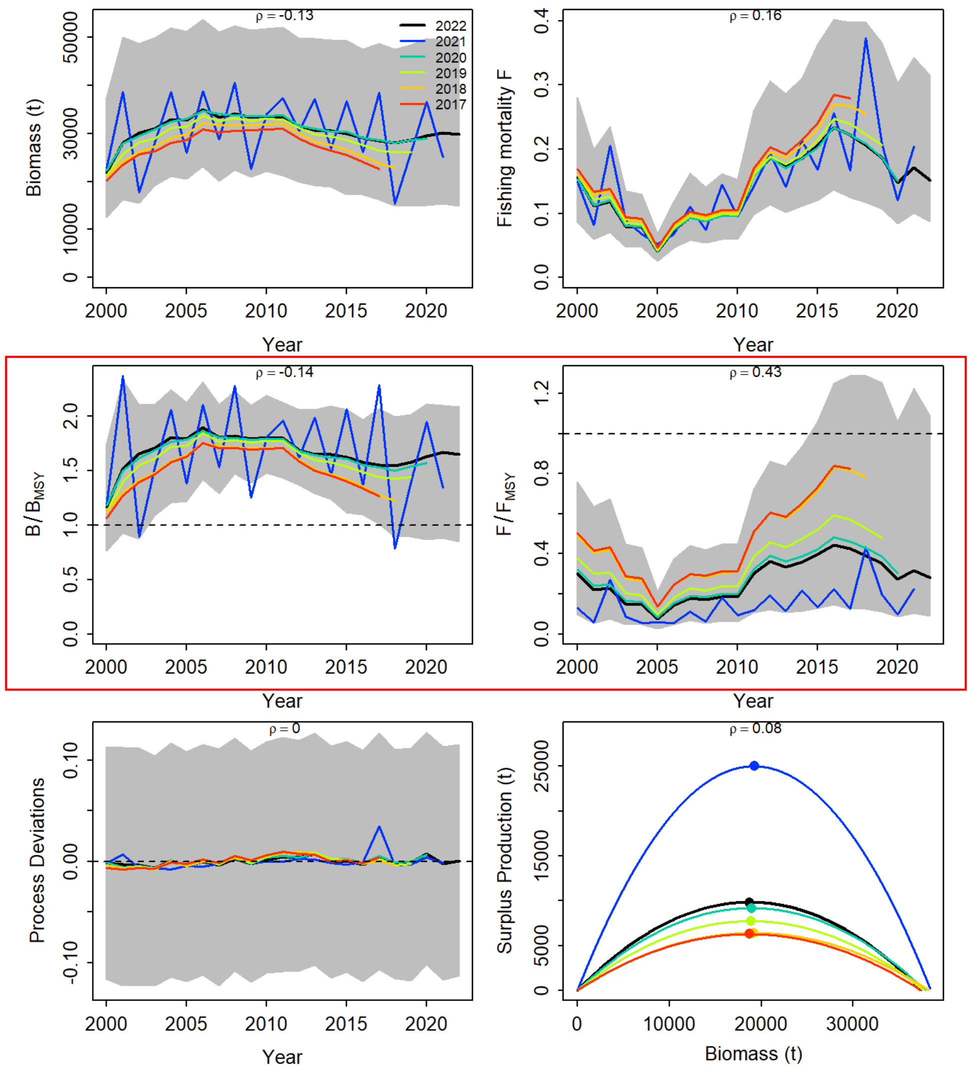
Retrospective (past) analyses: to evaluate results OK? Visual inspection (all parameters)

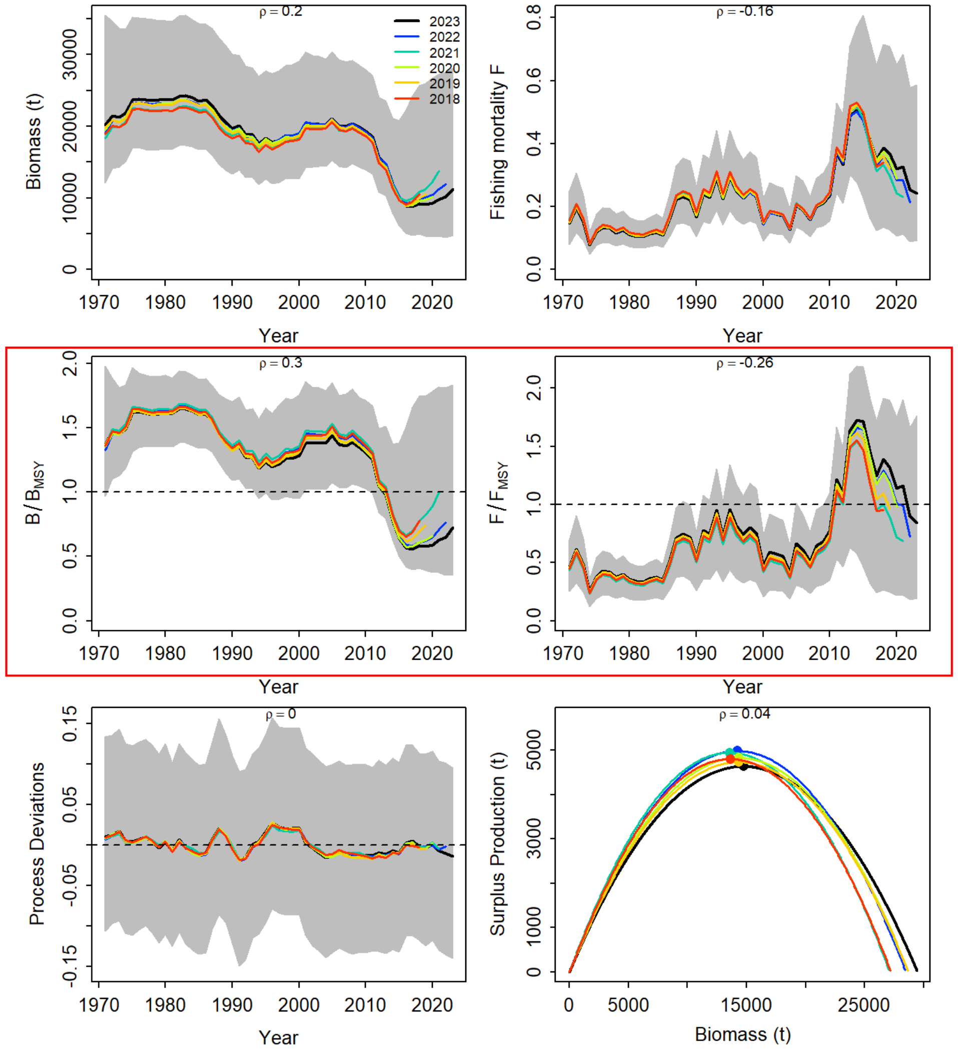
Change JABBA start year
2012~2017 (6)
Run 6 JABBA
⬇
If all results
(retro patterns)
Similar
⬇
Results (robust)
OK



This case ➔ not so good (similar) and not too bad (close)

BAD & GOOD Retro Patterns





Not so Good but OK (80% ism)

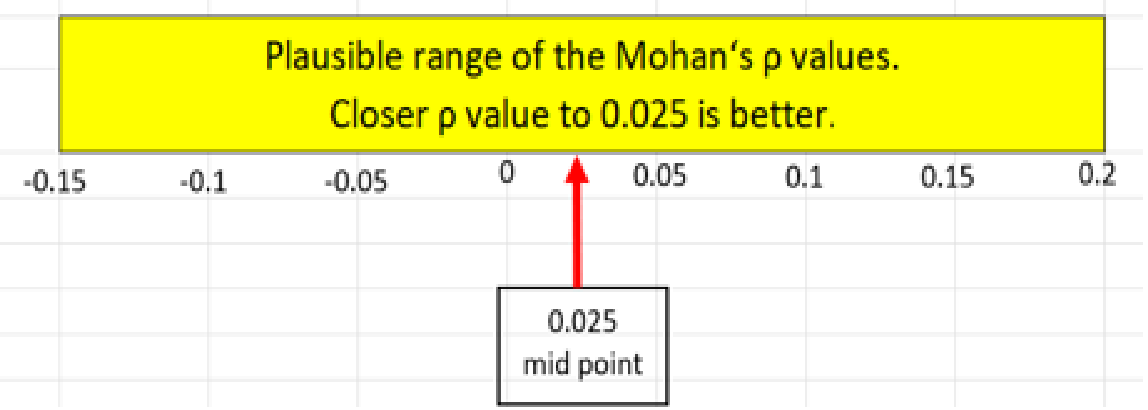
	B	F	Bmsy	Fmsy	procB	MSY	Average
2023	0.17	-0.16	0.18	-0.19	0.01	0.04	0.01
2022	0.41	-0.29	0.59	-0.41	0.00	0.06	0.06
2021	0.10	-0.09	0.12	-0.14	0.00	0.03	0.00
2020	0.16	-0.13	0.29	-0.27	0.00	0.03	0.01
2019	0.15	-0.12	0.34	-0.31	0.00	0.05	0.02
Average	0.20	-0.16	0.30	-0.26	0.00	0.04	0.02

Mohan ρ: $-0.15 < \rho < 0.2$ ➔ converged. If not converged, they are indicated by yellow markers.

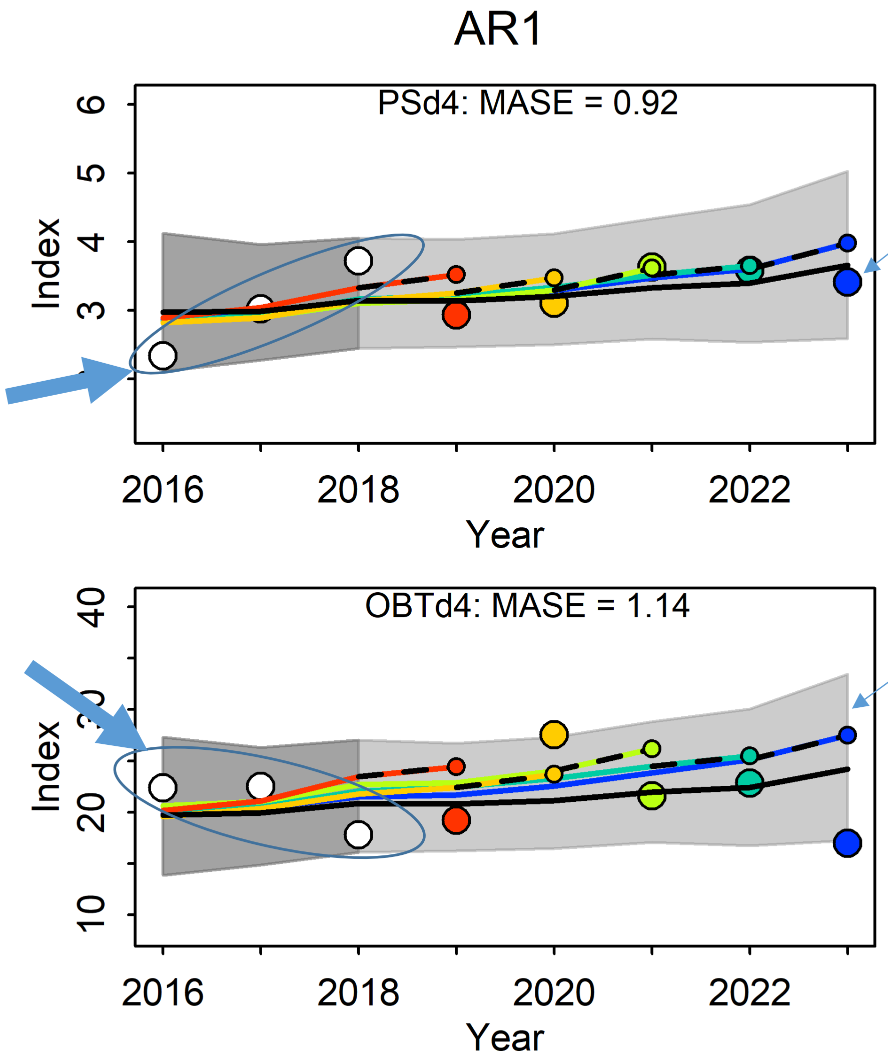
Numerical inspection

⇩

ρ value close to 0.025 better.



Hindcast analyses: Other way **(future)** of retrospective analyses
To evaluate future projection (Power)



While circles (observed) Before projection

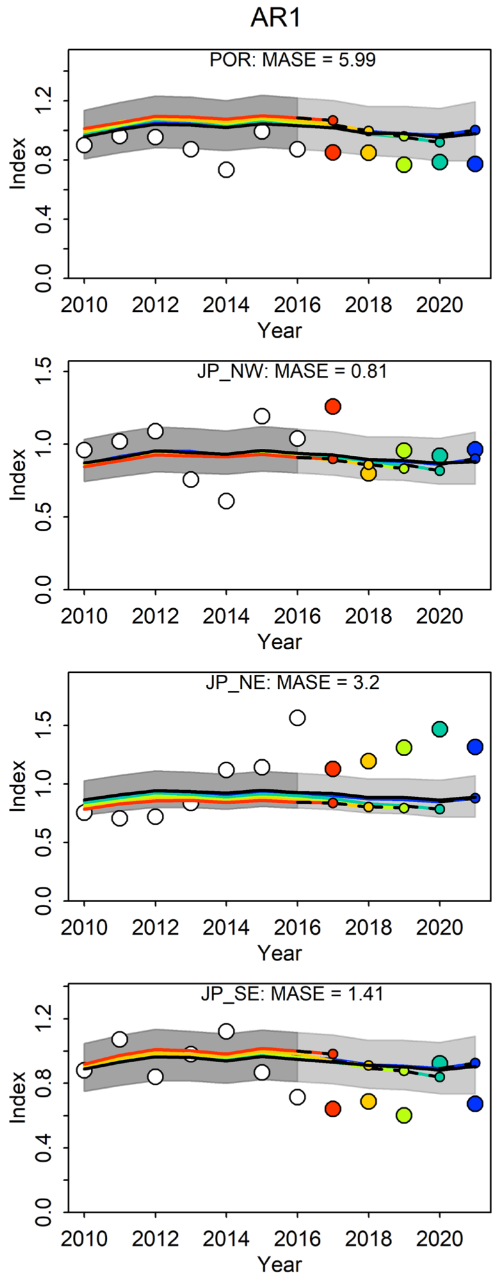
Large color (Observed) projection

small color points (predicted) projection

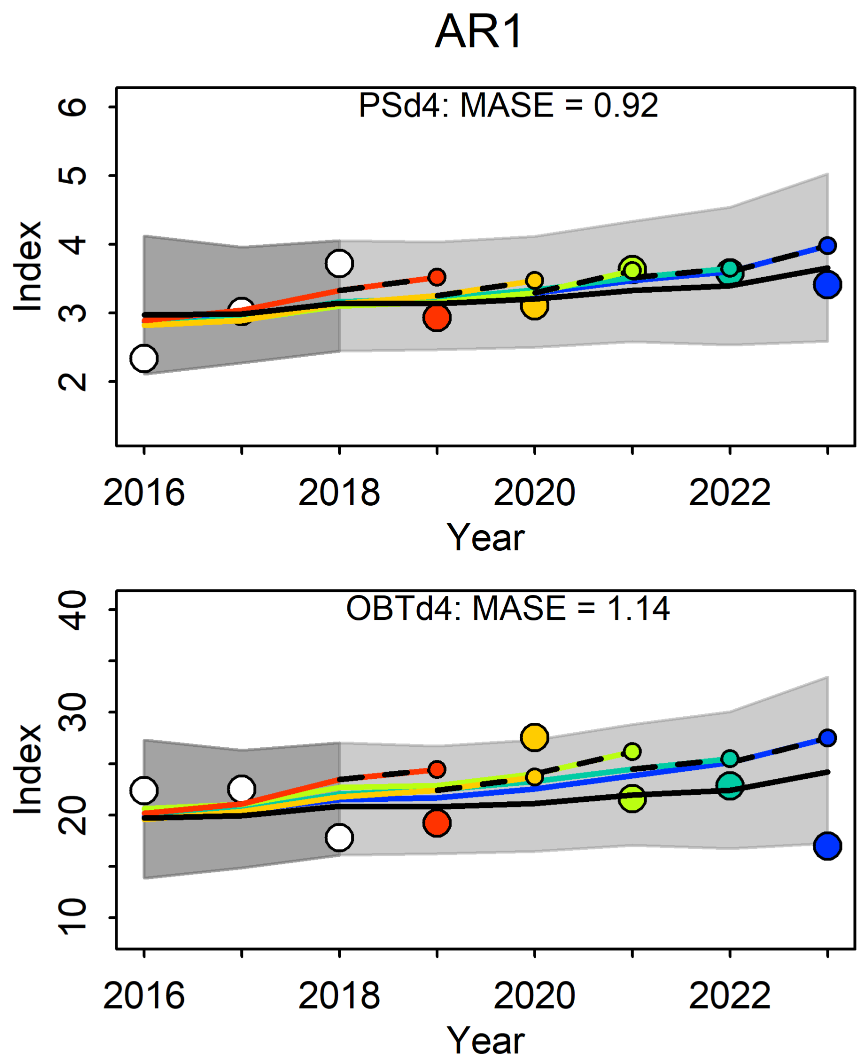
Example

BAD & GOOD

Hindcast plots



BAD



GOOD

Numerical inspection (MASE)

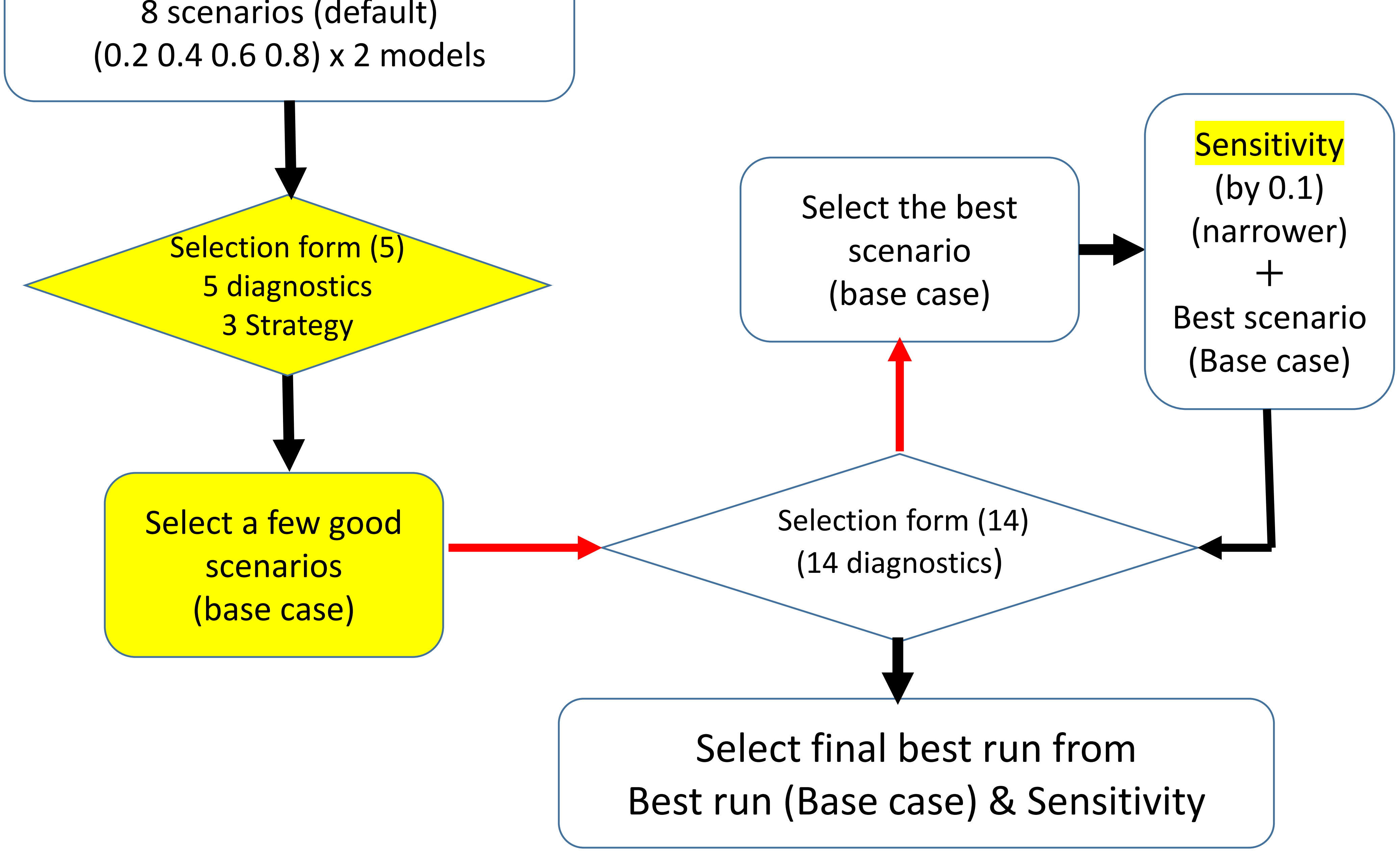
Index	MASE
PTh12	NA
PSd23	NA
PSd4	0.92
OBTd4	1.14
Average	1.07

Need at least 5 years CPUE

If MASE (Mean Absolute Scaled Error) < 1 ➔ better prediction ability

MASE ≥ 1 (yellow markers) ➔ Poor prediction power
(Larger MASE values, less prediction power)

Implementation
JABBA runs Case 2~4 (Scenario approach)



Only one best runs is found (0.4s) at the 3rd Strategy (hybrid) (long process)

Strategy to search good CPUE for JABBA (4 fleet) (Max 8 scenarios) (sample) (base case)																									
	Strategy	1st								2nd								3rd							
		Individual CPUE								Average CPUE								hybrid (individual and/or ave) CPUE							
	series #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
	Scenario	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
	B0/K (depletion)	0.2	0.2	0.4	0.4	0.6	0.6	0.8	0.8	0.2	0.2	0.4	0.4	0.6	0.6	0.8	0.8	0.2	0.2	0.4	0.4	0.6	0.6	0.8	0.8
	Model	s	f	s	f	s	f	s	f	s	f	s	f	s	f	s	f	s	f	s	f	s	f	s	f
	run ID	IN1-s0.2	IN2-f0.2	IN3-s0.4	IN4-f0.4	IN5-s0.6	IN6-f0.6	IN7-s0.8	IN8-f0.8	AV1-s0.2	AV2-f0.2	AV3-s0.4	AV4-f0.4	AV5-s0.6	AV6-f0.6	AV7-s0.8	AV8-f0.8	HY1-s0.2	HY2-f0.2	HY3-s0.4	HY4-f0.4	HY5-s0.6	HY6-f0.6	HY7-s0.8	HY8-f0.8
fleet	f1(CPUE1)	Individual CPUE								Average CPUE								Individual CPUE							
	f4(CPUE4)	Individual CPUE																(not used)							
	f3(CPUE3)	Individual CPUE								Average CPUE								Average CPUE							
	f4(CPUE4)	Individual CPUE																							
5 diagnostics	(1) Kobe plot	ok	ok	ok	ok	ok	ng	ng	ng	ok	ok	ok	ok	ok	ok	ng	ok	ok	ok	ok	ng	ng	ng	ng	ok
	(2) CPUE	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok
	(3) Retro	ng	ng	ok	ng	ng	na	na	na	ng	na	ng	ok	ng	ng	na	na	ng	ok	ok	ok	na	na	na	ok
	(4) Convergence	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ng	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ng
	(5) Retro&Hind Table	ok	ok	ng	ok	na	na	na	na	na	na	ok	ok	ok	na	na	na	ok	ng	ok	ok	na	na	na	ok
	Results	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ok	ng	ng	ng	ng	ng

When we stop JABBA run (base case)?

When a few good runs (5 diagnostics) found

You may find a few good one

in the 1st Strategy, 2nd or 3rd

If you cannot find 1st

➔move to the 2nd and 3rd

Our case 2 good runs in the 3rd Strategy

Example: In the 2nd Strategy, we stop as 3 good result found

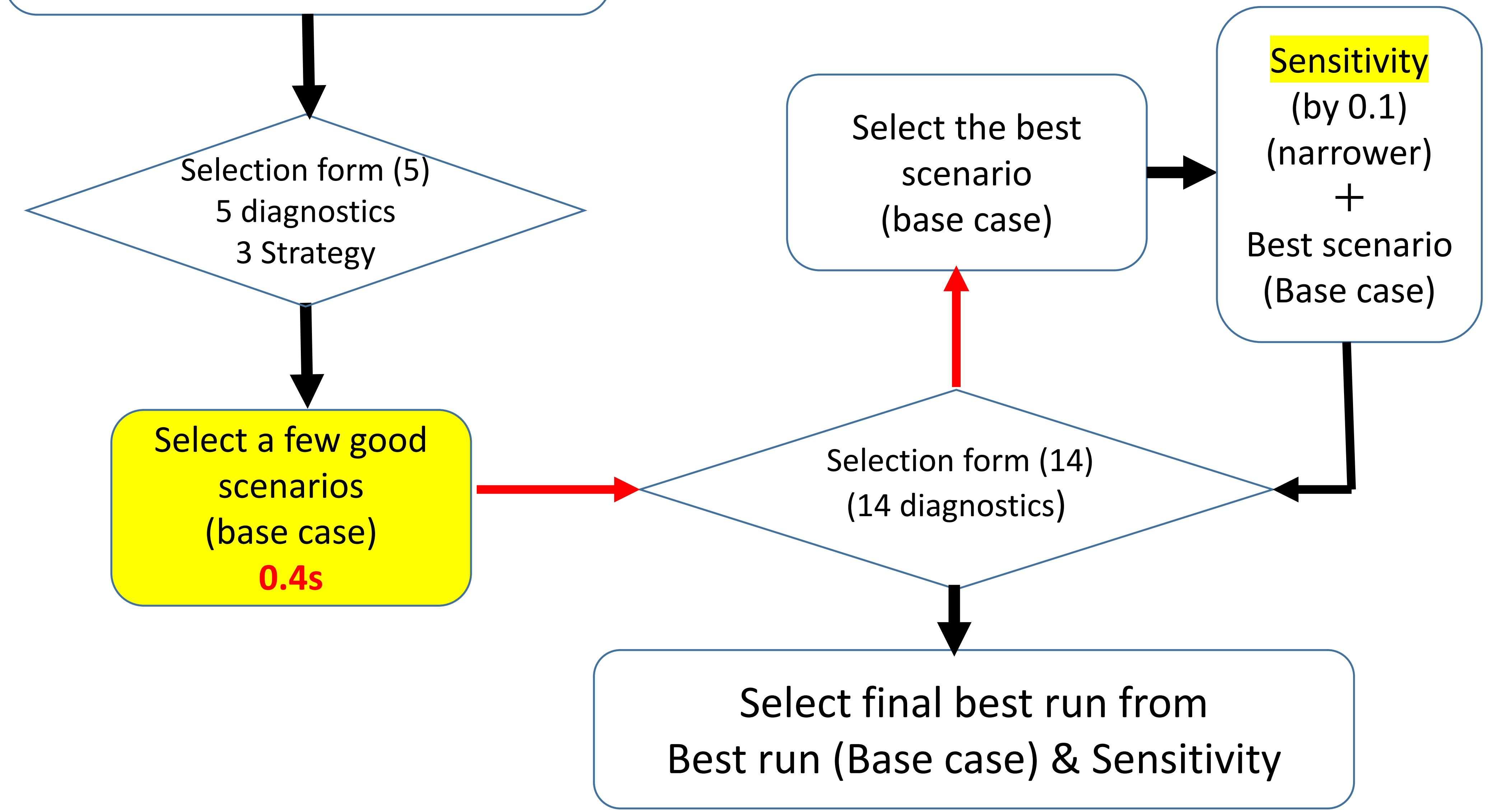
Strategy to search good CPUE for JABBA (4 fleet) (Max 8 scenarios) (sample)

	Strategy	1st								2nd								3rd							
		Individual CPUE								Average CPUE								hybrid (individual and/or ave) CPUE							
	series #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
	Scenario	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
	B0/K (depletion)	0.2	0.2	0.4	0.4	0.6	0.6	0.8	0.8	0.2	0.2	0.4	0.4	0.6	0.6	0.8	0.8	0.2	0.2	0.4	0.4	0.6	0.6	0.8	0.8
	Model	s	f	s	f	s	f	s	f	s	f	s	f	s	f	s	f	s	f	s	f	s	f	s	f
fleet	f1(CPUE1)	Individual CPUE								Average CPUE								Individual CPUE							
	f4(CPUE4)	Individual CPUE																(not used)							
	f3(CPUE3)	Individual CPUE								Average CPUE								Average CPUE							
	f4(CPUE4)	Individual CPUE																							
5 diagnostics	(1) Kobe plot																								
	(2) CPUE																								
	(3) Retro																								
	(4) Convergence																								
	(5) Retro&Hind																								
	Table																								
	Results																								
	Note																								

No good runs
➔ go to the 2nd Strategy

We stop here

Implementation
JABBA runs Case 2~4 (Scenario approach)



<u>Only one best runs</u> is found (0.4s) at the 3rd Strategy (hybrid) (long process)

Strategy to search good CPUE for JABBA (4 fleet) (Max 8 scenarios) (sample) (base case)

	Strategy	1st								2nd								3rd							
		Individual CPUE								Average CPUE								hybrid (individual and/or ave) CPUE							
	series #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
	Scenario	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
	B0/K (depletion)	0.2	0.2	0.4	0.4	0.6	0.6	0.8	0.8	0.2	0.2	0.4	0.4	0.6	0.6	0.8	0.8	0.2	0.2	0.4	0.4	0.6	0.6	0.8	0.8
	Model	s	f	s	f	s	f	s	f	s	f	s	f	s	f	s	f	s	f	s	f	s	f	s	f
	run ID	IN1-s0.2	IN2-f0.2	IN3-s0.4	IN4-f0.4	IN5-s0.6	IN6-f0.6	IN7-s0.8	IN8-f0.8	AV1-s0.2	AV2-f0.2	AV3-s0.4	AV4-f0.4	AV5-s0.6	AV6-f0.6	AV7-s0.8	AV8-f0.8	HY1-s0.2	HY2-f0.2	HY3-s0.4	HY4-f0.4	HY5-s0.6	HY6-f0.6	HY7-s0.8	HY8-f0.8
fleet	f1(CPUE1)	Individual CPUE								Average CPUE								Individual CPUE							
	f4(CPUE4)	Individual CPUE																(not used)							
	f3(CPUE3)	Individual CPUE								Average CPUE								Average CPUE							
	f4(CPUE4)	Individual CPUE																							
5 diagnostics	(1) Kobe plot	ok	ok	ok	ok	ok	ng	ng	ng	ok	ok	ok	ok	ok	ok	ng	ok	ok	ok	ok	ng	ng	ng	ng	ok
	(2) CPUE	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok
	(3) Retro	ng	ng	ok	ng	ng	na	na	na	ng	na	ng	ok	ng	ng	na	na	ng	ok	ok	ok	na	na	na	ok
	(4) Convergence	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ng	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ng
	(5) Retro&Hind Table	ok	ok	ng	ok	na	na	na	na	na	na	ok	ok	ok	na	na	na	ok	ng	ok	ok	na	na	na	ok
	Results	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ok	ng	ng	ng	ng	ng

What is the next process
after you get one good run (BASE CASE)➔ sensitivity

What is sensitivity?

We know the results (base case)

But we check Depletion wider level by 0.2

We need to check result finer level by 0.1

0.1, 0.3, 0.5, 0.7

To inspect if we can find better results

➔ Sensitivity (analyses)

For our case

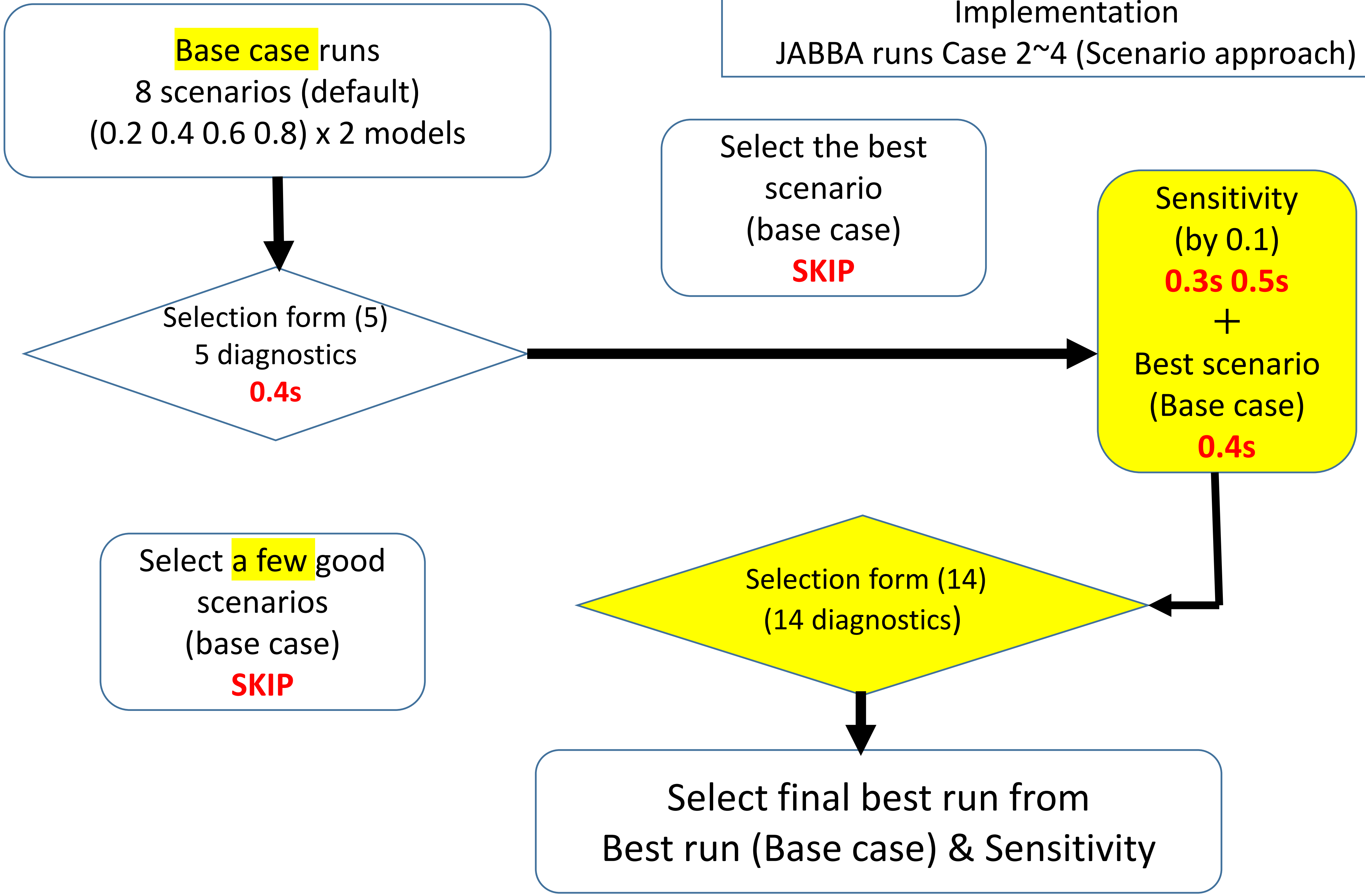
0.4s the best run (base case)

Then we will inspect by 0.1

Before & after 0.4s

0.3s & 0.5s as sensitivity

Implementation
JABBA runs Case 2~4 (Scenario approach)

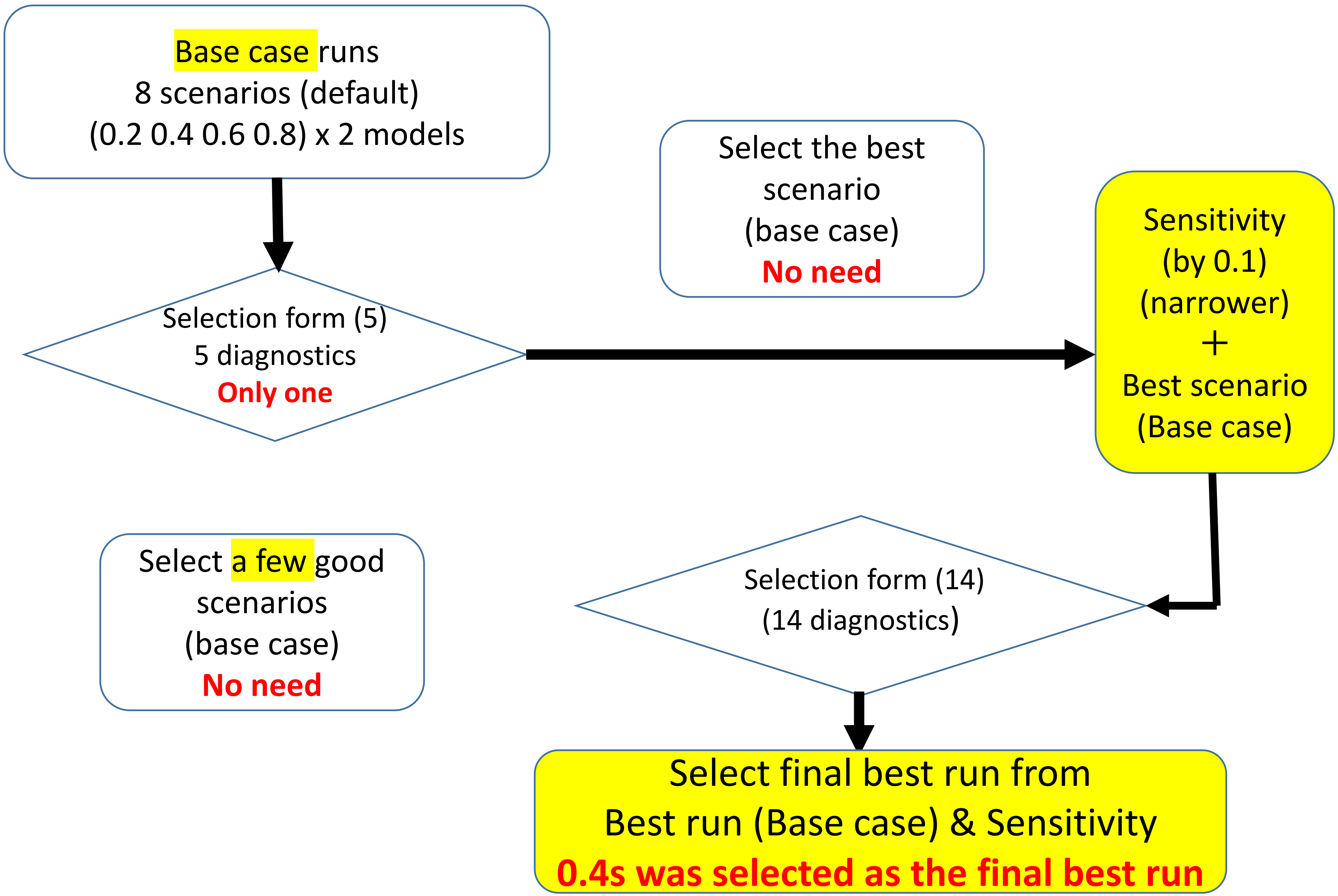


0.4s (best base case)➔ Selection form (14)➔ sensitivity 0.3s & 0.5s with 0.4s

Selection of the best scenario run using 14 diagnostics
(Use "Summary of results & diagnostics", page 3~4, Report) Example : Indian Mackerel (IM) (for details, see Manual)

Please see Manual for details on diagnostics.	Evaluation	1. Convergence (MCMC)				2. Model Fit					3. Retrospective analyses		4. Hindcast analyses		
		Heidelberger & Welch p test				2.1 CPUE residuals		2.2 RMSE	2.3 Posterior Predictive Check (PPC)						
	Methods	Geweke.p (larger value better)		Heidel.p (larger value better)		95% CI band		RMSE	Average p values (compute yourself)	Visual inspection	Mohan's ρ (-0.15~2.0)	Visual inspection	MASE (# of yellow: non significant=no predicted skill) (for B & F)	MASE (Average value)	Visual inspection
	Criteria	K	r	K	r	Red band Auto-correlation? No is better	total # of outliers less # is better	Less % better fit	Use the 5th sheet to compute. Closer to 0.5 is better	Ball shapes located in center are better	# of yellow markers (B & F ratio) less better	All trends should be similar patterns.	Less # better	should be < 1 & smaller better	# OBS points beyond the 95% CI band
	Output # (page#)	# 20 (p.3)				# 13 (p.3)		# 10 (p.3)	# 12 (p.4)		# 42 (p.3)	# 40 (p.3)	# 43 (p.4)		# 41 (p.4)
	diagnostics #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	Refer to sheet # how to do								(4)		(5)		(6)		
Users can adjust # of scenarios to compare	Scenario #8 0.3 (Schaefer AVE)	0.94	0.16	0.44	0.58	NO	0	90.9%	0.467	NA	NA	NG	NA	NA	NA
	Scenario #8 0.4 (Schaefer AVE)	0.25	0.52	0.78	0.44	NO	0	93.2%	0.459	better	2	OK	0	0.56	1
	Scenario #8 0.5 (Schaefer AVE)	0.16	0.14	0.08	0.72	NO	0	95.7%	0.479	better	NA	NA	NA	NA	NA
	Best scenario?	#0.3	#0.4	#0.4	#0.5	same	same	#0.3	#0.5	#0.4 & #0.5	#0.4	#0.4	#0.4	#0.4	#0.4
Comments & decision	(1)	8 for #0.4, 1 for #3, 2 for #0.5 and 2 for same. Thus #0.4 is the best.													
	(2)	In addition, no retrospective analyses nor hindcasting are available for #0.3 and #0.5.													
	(3)	Thus #0.4 is selected as the best scenario.													

We will practice later


Base case runs
8 scenarios (default)
(0.2 0.4 0.6 0.8) x 2 models
Select the best
scenario
(base case)
No need
Selection form (5)
5 diagnostics
Only one
Sensitivity
(by 0.1)
(narrower)
+
Best scenario
(Base case)
Select a few good
scenarios
(base case)
No need
Selection form (14)
(14 diagnostics)
Select final best run from
Best run (Base case) & Sensitivity
0.4s was selected as the final best run

Any questions & Comments so far to here?

มีคำถามหรือความคิดเห็นใดๆ จนถึงตอนนี้บ้างไหม?

Later JABBA practice
Selection form (5) & (14)

Now we go to CPUE standardization
see next

Program

1. General session
    - 1.1 Introduction
        - (1) JABBA
        - (2) New CPUE standardization

Tea break ➔ group photo and copy practice folder

    - 1.2 Demo + Practice
        - (1) JABBA
        - (2) CPUE standardization
        - (3) Data process
2. WG session
    - 2.1 Demersal WG
    - 2.2 Short mackerel WG
    - 2.3 Carp WG
3. Homework (Presentation & submission)
4. Sum-up session
    - 4.1 Review, Summary & Recommendation
    - 4.2 Future plan

What is new?

Before only 3 Covariates → year, season and area

New → 7 Covariates → 4 more

For example, mesh size, # of gillnet,

ENV (depth, SST, chlorophyl concentration, etc.)

Categorical data (Boat class), gear materials, size etc.

More practical & useful

7 Covariates (before 3)

3 core | **4 addition** (1 categorical + 3 continuous) | **Nominal CPUE**

	A	B	C	D	E	F	G	H
1	**Independent variable (7 Covariates)**							**Dependent (Response) variable**
2	Core			Optional				Core
3	1	2	3	4	5	6	7	8
4	Integer	Categorical data			Continuous data			
5	Example							
6	Year (1950~2022)	Season (Month & Quarter)	Fishing area (A~D)	Boat class (S, M, L)	Mesh size (inch)	chlorophyl concentration (Chl)	Depth (m)	Nominal CPUE (Kg/set)
7–9	Data							

Why

- Normally 3 enough (developing countries)
- But recently Sri Lanka

➔ depth, mesh size, chlorophyl concentration (Chl)

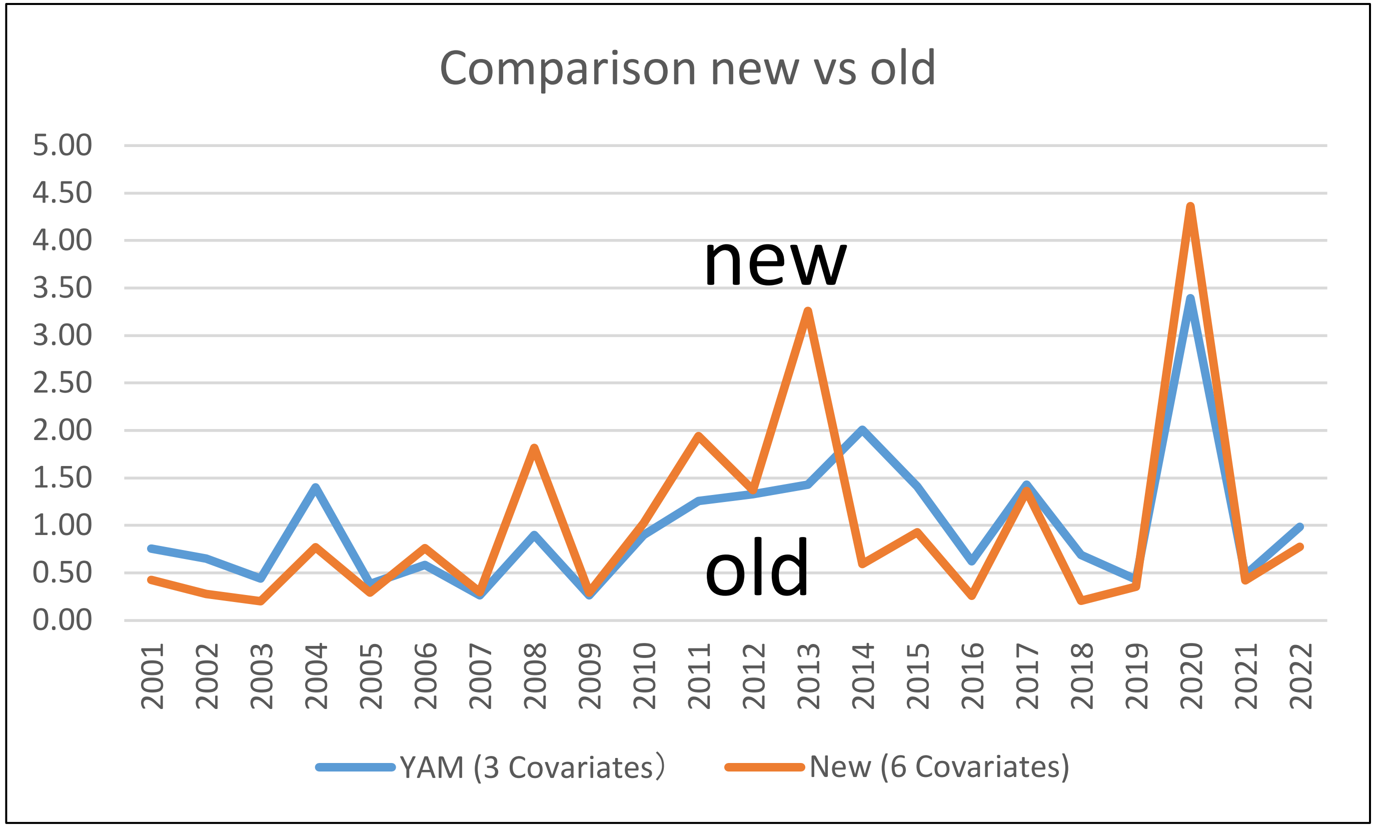
Thailand

➔Demersal survey (Thai) used 2 extra Covariate

depth & boat type (steel & wood)

➔ Useful to get more accurate abundance index

Comparisons
between **old model(YQM)** vs **new model (7 Covariate)**



Example

	A	B	C	D	E	F	G	H
1	Independent variable							Dependent variable
2	Core data			Optional				Core data
3	Integer	Categorical data		categorical data	Continuous data			
4	1	2	3	4	5	6	7	8
5	Year	Season (Quarter)	Area	Boat class (S, M, L)	Mesh_Size (inch)	Chl (ml/L)	depth (m)	CPUE (kg/set)
6	2016	1	Negombo	S	0.8	1.22	91	1.5385
7	2017	2	Negombo	M	1.1	0.42	.	1.0702
8	2017	4	Matara	M	2.1	0.21	9	0.6509
9	2017	3	Matara	.	0.8	0.11	34	0.9467
10	2003	1	Negombo	L	1.9	0.42	32	0.6509
11	2001	1	Negombo	L	.	.	7	0.9341
12	2003	1	Negombo	S	2	0.98	22	1.3122
13	2005	2	Kalutara	S	.	1.11	18	.
14	2006	4	Kalutara	M	2.1	0.23	22	.

Nominal CPUE data set (INPUT)(example)

	6 Covariates					CPUE (response var)
	A	B	C	D	E	F	G

	A	B	C	D	E	F	G
1	Year	Season	District	mesh_size	Chl	depth	CPUE
2	2011	SW	Chilaw	1.75	1.36	8	10
3	2001	SW	Negombo	2.5	0.9	20	8.73
4	2001	SW	Negombo	2.25	0.9	18	5.417
5	2011	SW	Chilaw	1.75	1.36	8	5.333
6	2008	SW	Chilaw	1.75	1.58	9	5
7	2013	IM2	Chilaw	3.25	1.12	10	5
8	2022	SW	Kalutara	2.5	3.15	13	5
	Integer	Categorical		Continuous			

Nominal CPUE data

1 response (dependent) variable CPUE kg/(hr*net)

6 Covariates

(1) Year : 2001~2022 (23 years)

(2) Season by monsoon (more meaningful than simple Q1~Q4)

SL

1st Inter monsoon	3-4
SW	5-9
2nd inter monsoon	10-11
NE	12-2

Thai

Jan-Feb & Nov ~ Dec	NE (NE monsoon)
Mar ~ April	IM (Inter Monsoon)
May ~Oct	SW (SW monsoon)

(3) Area 3 landing sites (Chilaw, Negombo, Kalutara)

(4) Mesh_size

(5) Chl chlorophyl concentration (Chl)

(6) Depth

2 GLM model for CPUE standardization (same as before)

0 catch rate (%)	Model	Short name
0% ～ 30%	Log normal GLM	Log normal model
30% ～	Zero (0) inflated Delta 2 steps log normal GLM	Delta model

Formula of 2 models [A] & [C]

[A] Log normal GLM

log (CPUE + Constant) =Intercept + Year + Season + Area + Season*Area

Categorical data + Other covariates (Max 3) + Error ~ $N(0, \sigma^2)$

*See next page about Constant (0.1*average of nominal CPUE)*

[C] Delta 2 steps log normal model

1st step (delta model using logit model)

E [log{q/(1-q)}] =intercept + Year + Season + Area + Season*Area

Categorical data + Other covariates (Max) ,where q(ratio of zero-CPUE)~Binominal (θ)

2^{nd} step (log normal model for non 0 CPUE)

log(CPUE)=Intercept + Year + Season + Area + Season*Area

Categorical data + Other covariates (Max 3) + Error ~ $N(0, \sigma^2)$

Program

1. General session
    - 1.1 Introduction
        - (1) JABBA
        - (2) New CPUE standardization
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    - 4.2 Future plan

Let’s work a simple case study together

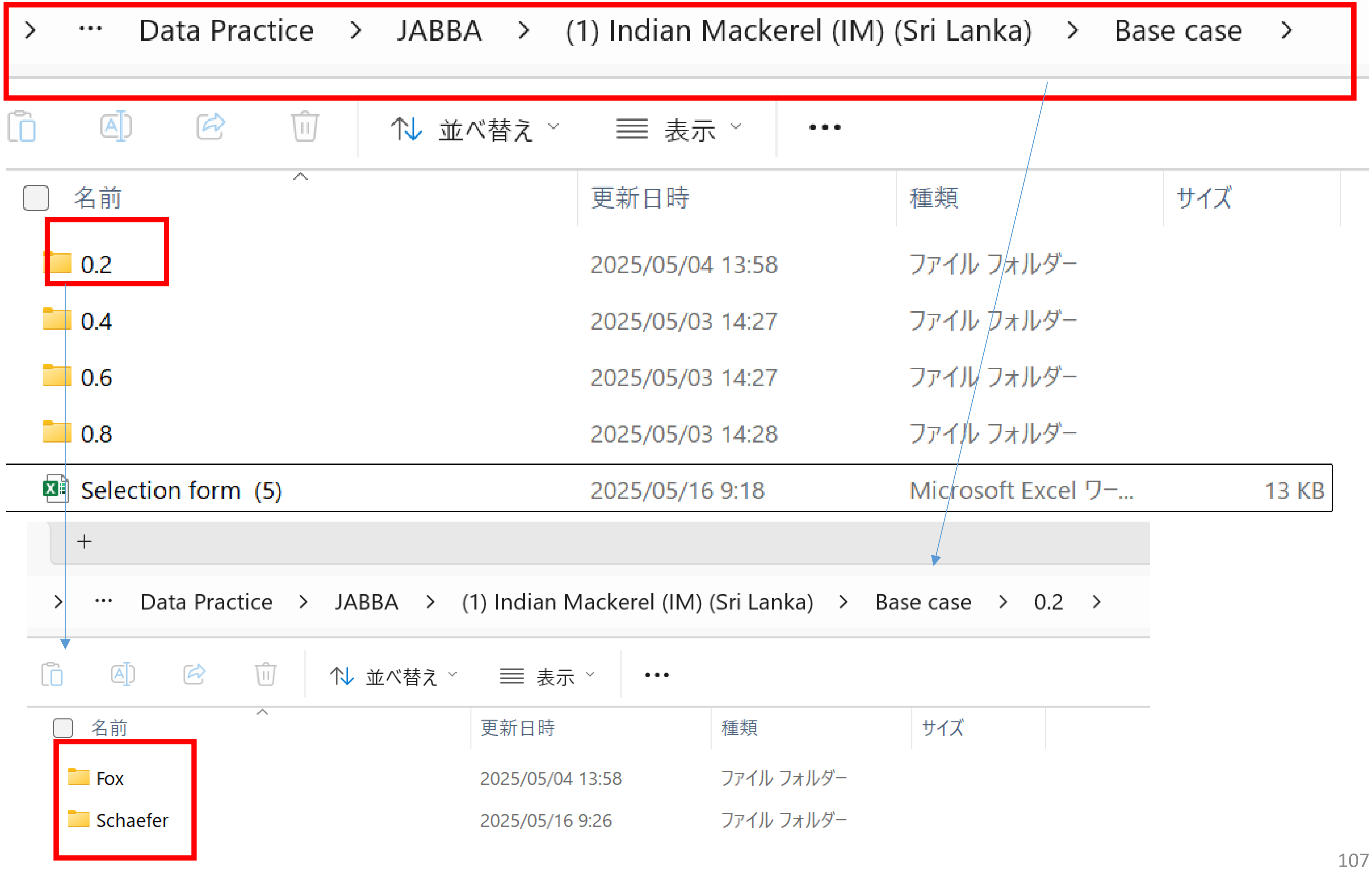
Indian Mackerel (Sri Lanka)

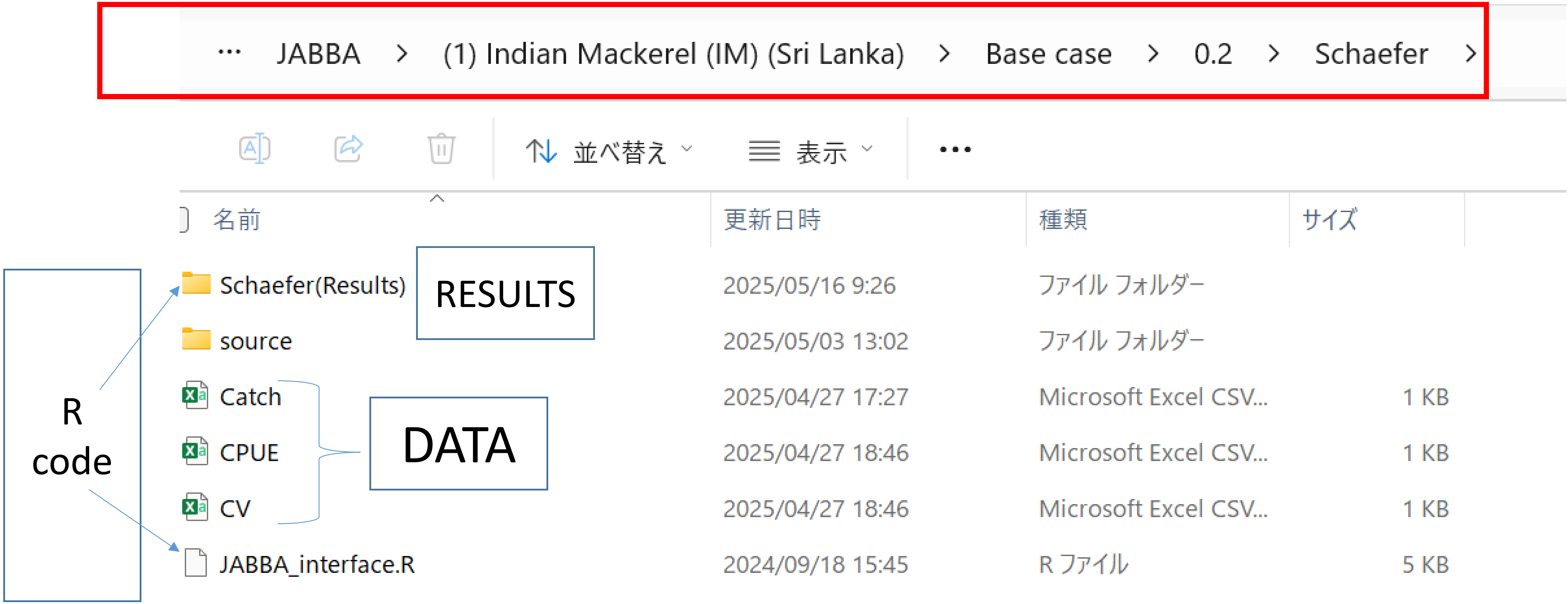
One CPUE

DEMO & Practice

To run JABBA

we need folder & files


> ··· Data Practice > JABBA > (1) Indian Mackerel (IM) (Sri Lanka) > Base case >
並べ替え
表示
名前
更新日時
種類
サイズ
0.2 2025/05/04 13:58 ファイル フォルダー
0.4 2025/05/03 14:27 ファイル フォルダー
0.6 2025/05/03 14:27 ファイル フォルダー
0.8 2025/05/03 14:28 ファイル フォルダー
Selection form (5) 2025/05/16 9:18 Microsoft Excel ワー... 13 KB
> ··· Data Practice > JABBA > (1) Indian Mackerel (IM) (Sri Lanka) > Base case > 0.2 >
並べ替え
表示
名前
更新日時
種類
サイズ
Fox 2025/05/04 13:58 ファイル フォルダー
Schaefer 2025/05/16 9:26 ファイル フォルダー


··· JABBA > (1) Indian Mackerel (IM) (Sri Lanka) > Base case > 0.2 > Schaefer >
並べ替え
表示
名前
更新日時
種類
サイズ
Schaefer(Results) 2025/05/16 9:26 ファイル フォルダー
source 2025/05/03 13:02 ファイル フォルダー
Catch 2025/04/27 17:27 Microsoft Excel CSV... 1 KB
CPUE 2025/04/27 18:46 Microsoft Excel CSV... 1 KB
CV 2025/04/27 18:46 Microsoft Excel CSV... 1 KB
JABBA_interface.R 2024/09/18 15:45 R ファイル 5 KB
RESULTS
DATA
R
code

data

Catch

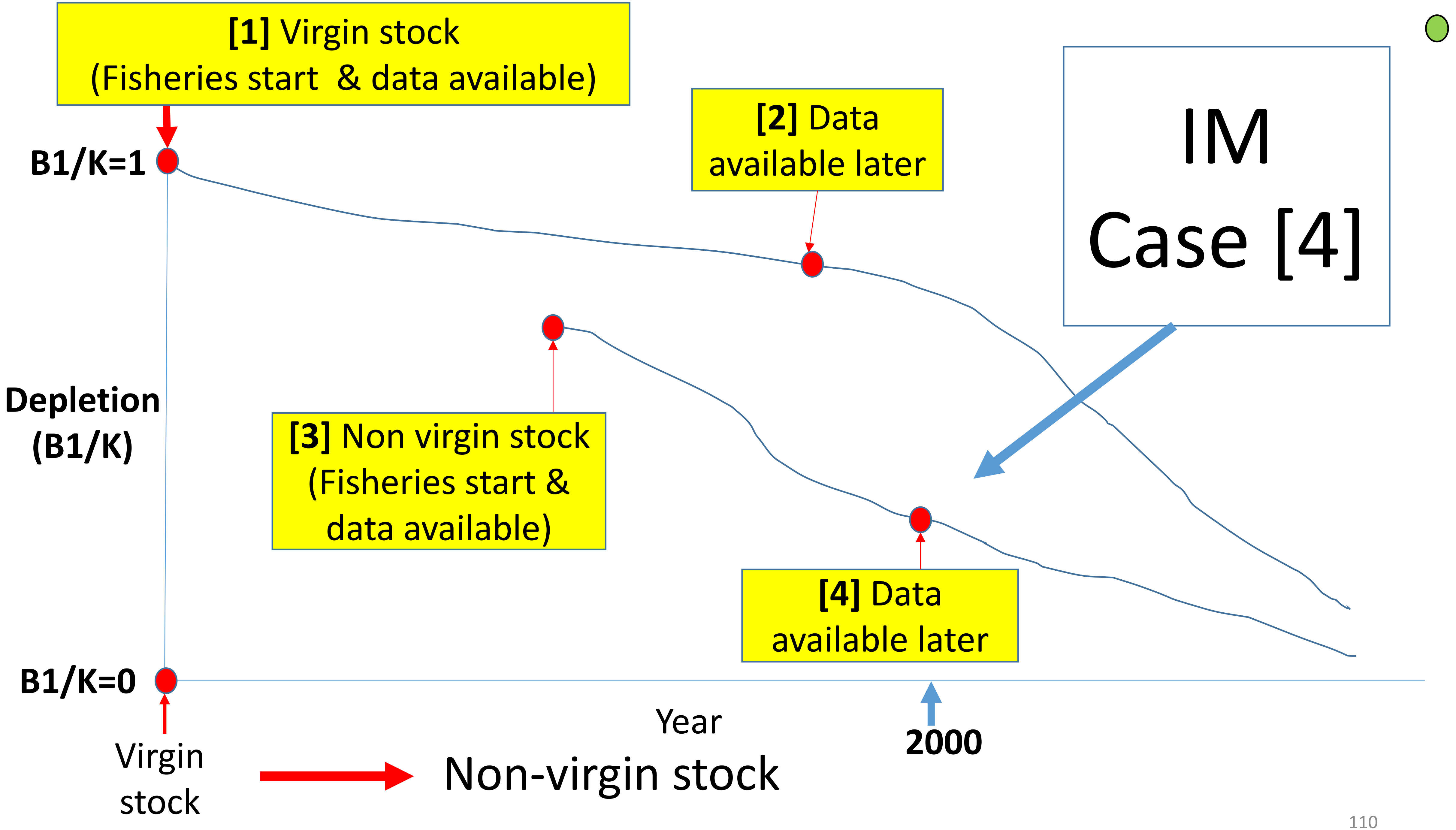
	A	B
1	Year	Catch
2	2000	3404
3	2001	3123
4	2002	3554
5	2003	2482
6	2004	2585
7	2005	1344
8	2006	2609
9	2007	3149
10	2008	2998
11	2009	3243
12	2010	3254
13	2011	5327
14	2012	5929
15	2013	5286
16	2014	5694
17	2015	6145
18	2016	6817
19	2017	6317
20	2018	5809
21	2019	5375
22	2020	4361
23	2021	5140
24	2022	4522

Standardized CPUE

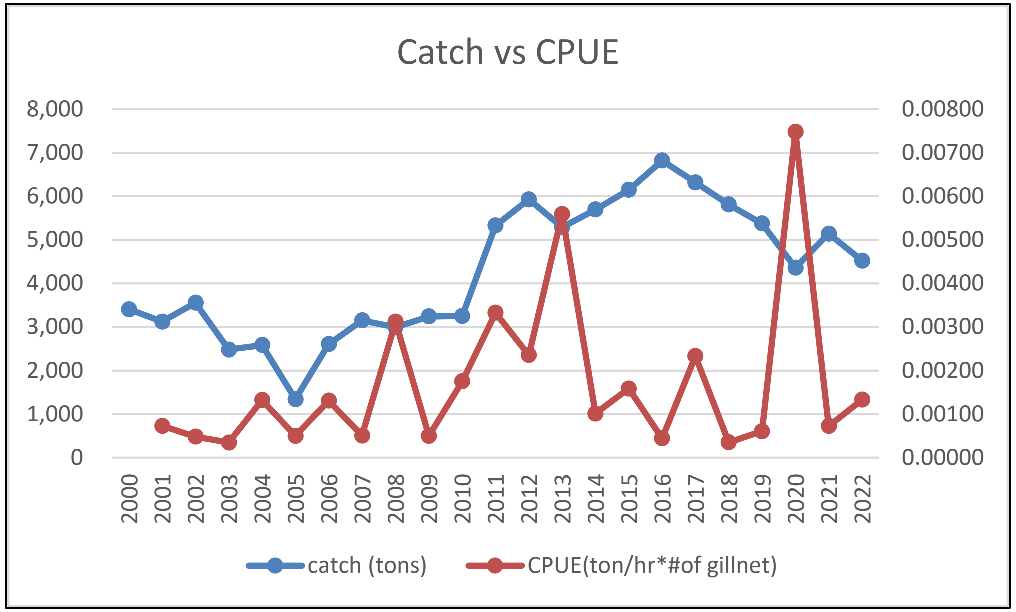
	A	B
1	year	f1
2	2000	
3	2001	0.42
4	2002	0.28
5	2003	0.2
6	2004	0.77
7	2005	0.29
8	2006	0.76
9	2007	0.3
10	2008	1.82
11	2009	0.29
12	2010	1.02
13	2011	1.94
14	2012	1.37
15	2013	3.26
16	2014	0.59
17	2015	0.93
18	2016	0.26
19	2017	1.36
20	2018	0.21
21	2019	0.36
22	2020	4.36
23	2021	0.42
24	2022	0.78

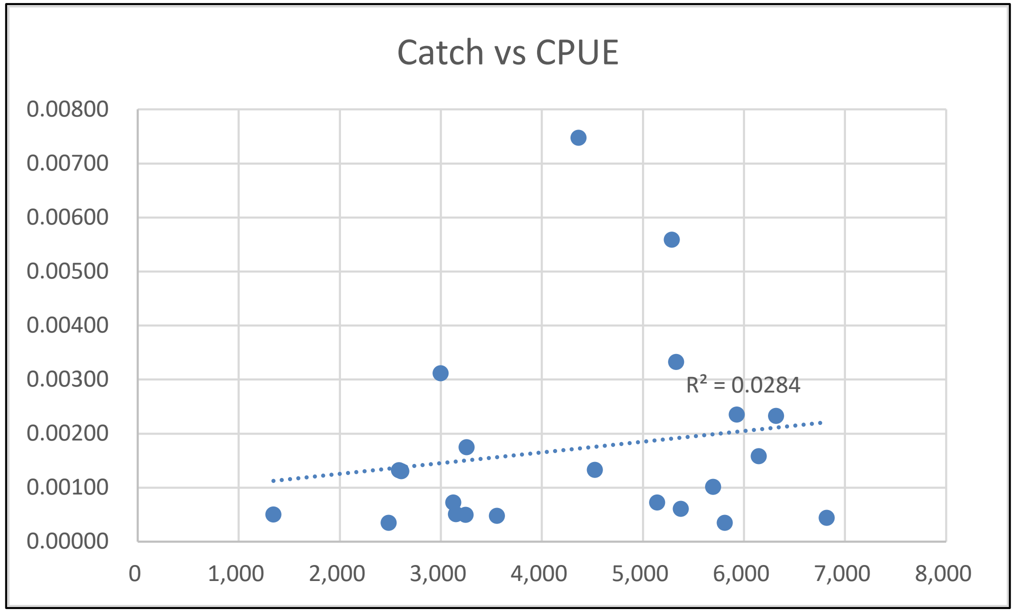
CV

	A	B
1	year	f1
2	2000	
3	2001	0.2
4	2002	0.2
5	2003	0.2
6	2004	0.2
7	2005	0.2
8	2006	0.2
9	2007	0.2
10	2008	0.2
11	2009	0.2
12	2010	0.2
13	2011	0.2
14	2012	0.2
15	2013	0.2
16	2014	0.2
17	2015	0.2
18	2016	0.2
19	2017	0.2
20	2018	0.2
21	2019	0.2
22	2020	0.2
23	2021	0.2
24	2022	0.2


[1] Virgin stock
(Fisheries start & data available)
[2] Data available later
IM
Case [4]
B1/K=1
Depletion (B1/K)
[3] Non virgin stock (Fisheries start & data available)
[4] Data available later
B1/K=0
Year
2000
Virgin stock
Non-virgin stock

IM data (catch and standardized CPUE)





Catch gradually increasing
CPUE up & down
Stable

Positive r2 NG but 3% OK
But this is the only CPUE, we will use.

We will use Selection form (5)

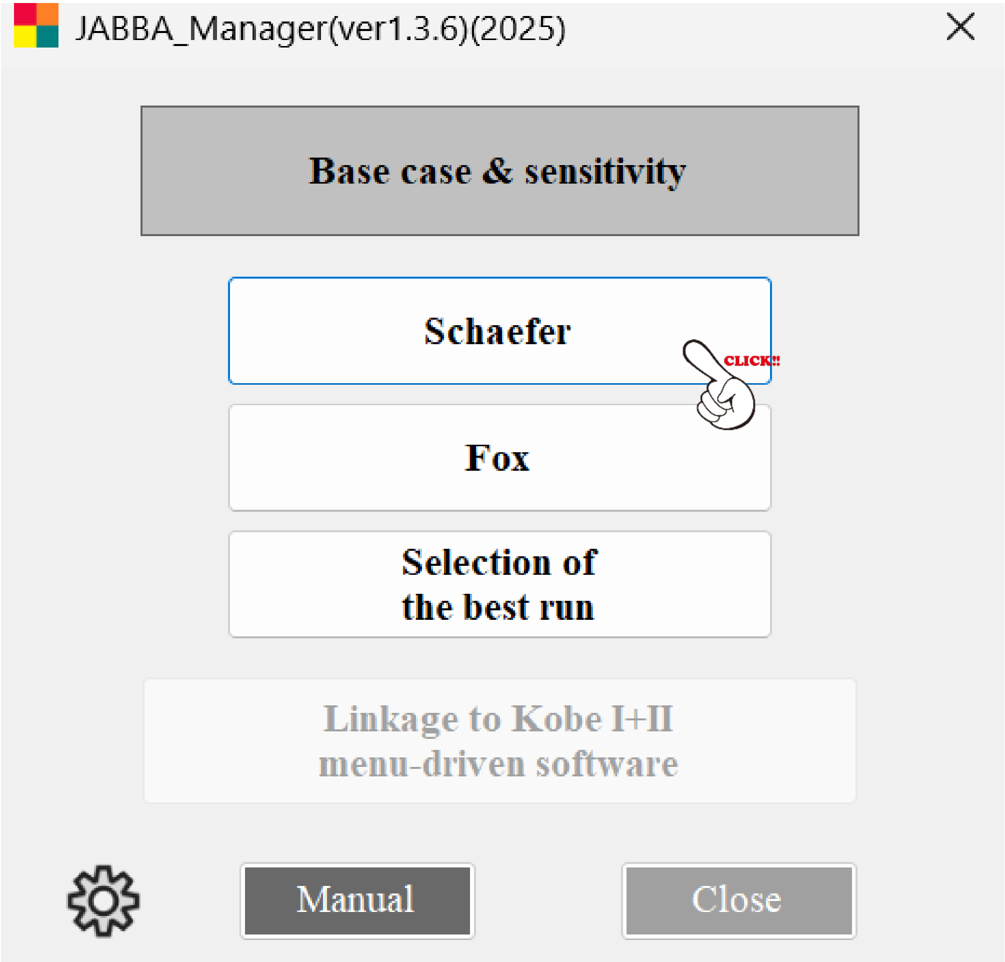
Base case set up for evaluation
(Available in your data practice folder)

Strategy to search good CPUE for JABBA (1 fleet) (Max 8 scenarios) (sample)									
	Strategy	1st							
		Individual CPUE							
	series #	1	2	3	4	5	6	7	8
	Scenario	1	2	3	4	5	6	7	8
	B0/K (depletion)	0.2	0.2	0.4	0.4	0.6	0.6	0.8	0.8
	Model	s	f	s	f	s	f	s	f
	Run ID	IN1-0.2s	IN2-0.2f	IN3-0.4s	IN4-0.4s	IN5-.6s	IN6-0.6f	IN7-0.8s	IN8-0.8f
fleet	f1(CPUE1)	INdividual CPUE							
5 diagnostics	(1) Kobe plot								
	(2) CPUE								
	(3) Retro								
	(4) Convergence								
	(5) Retro&Hind Table								
	Results								
	Note								

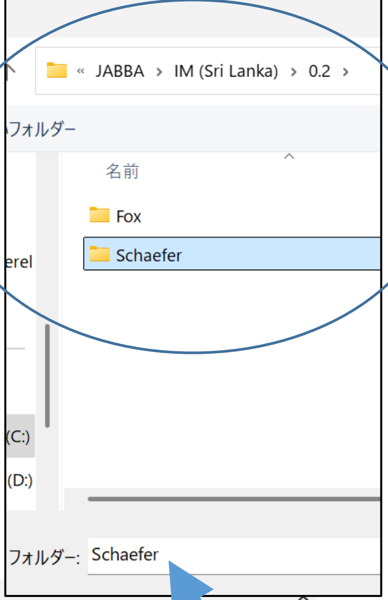
Now Practice

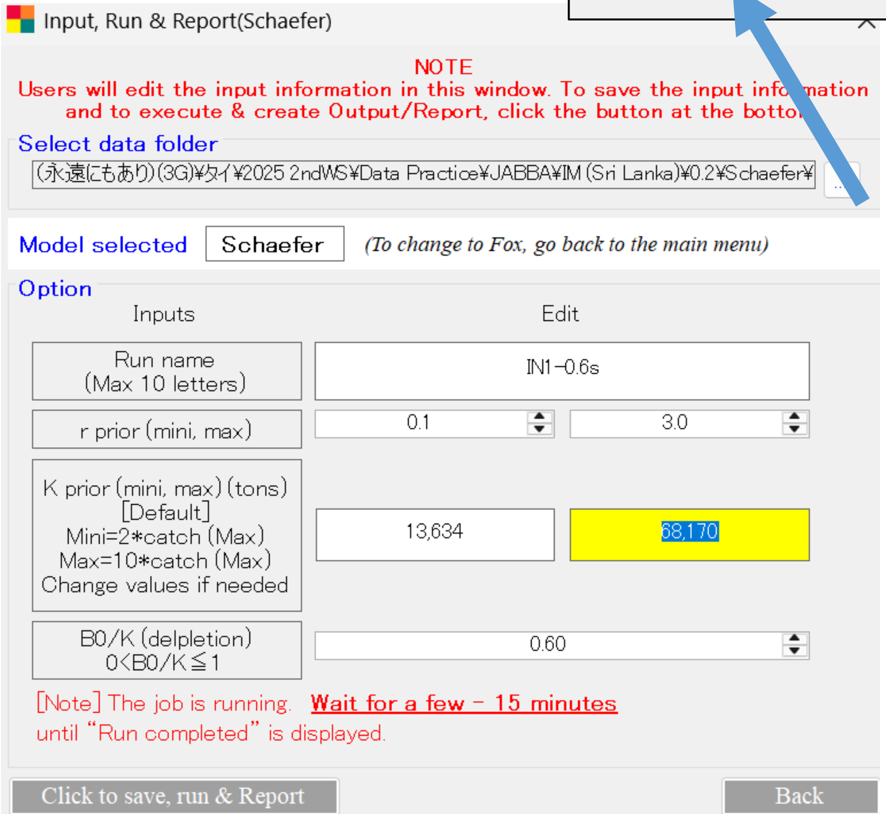
Let’s start from 0.2s （Schaefer）

DOUBLECLICK

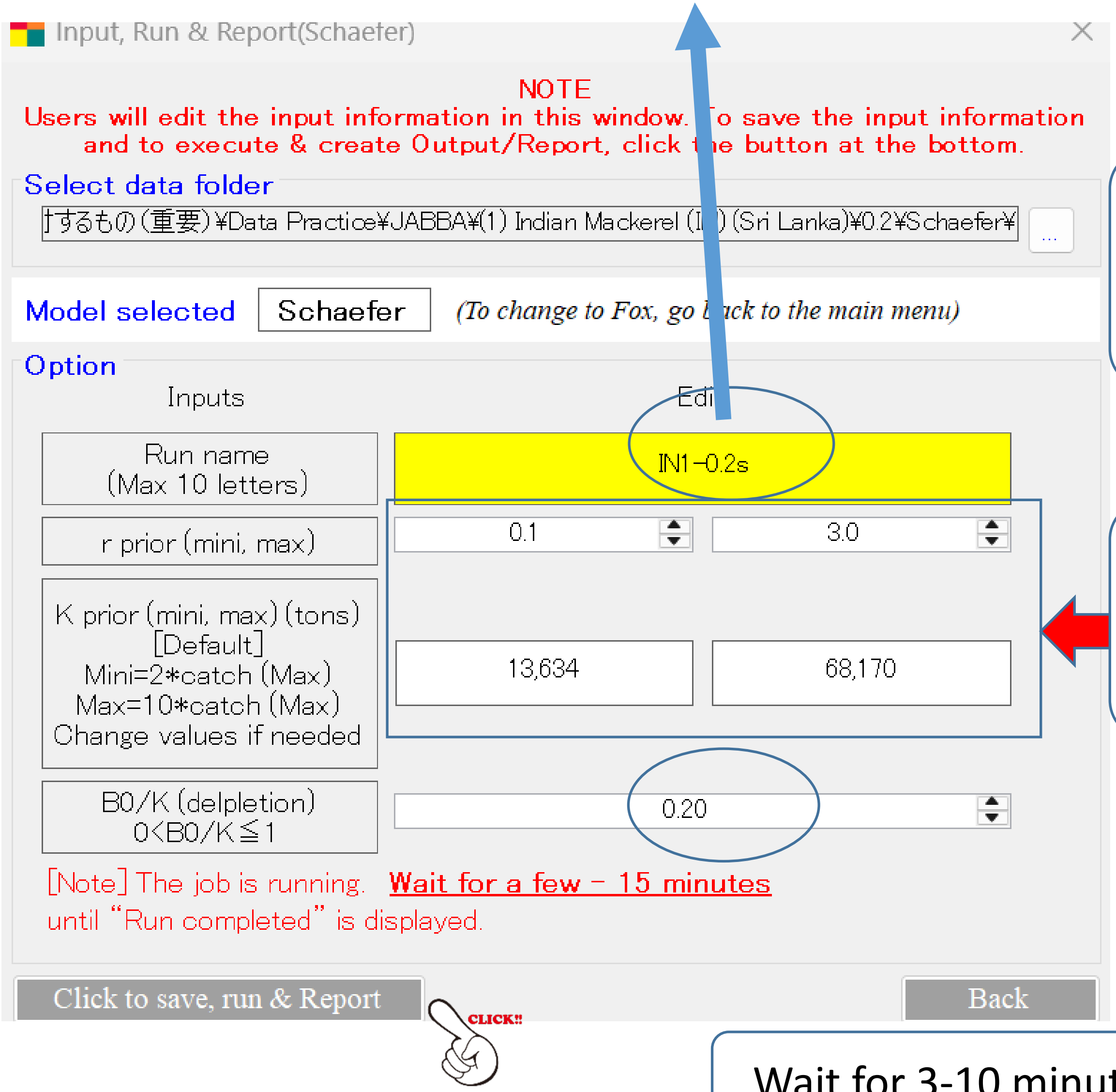


Import data





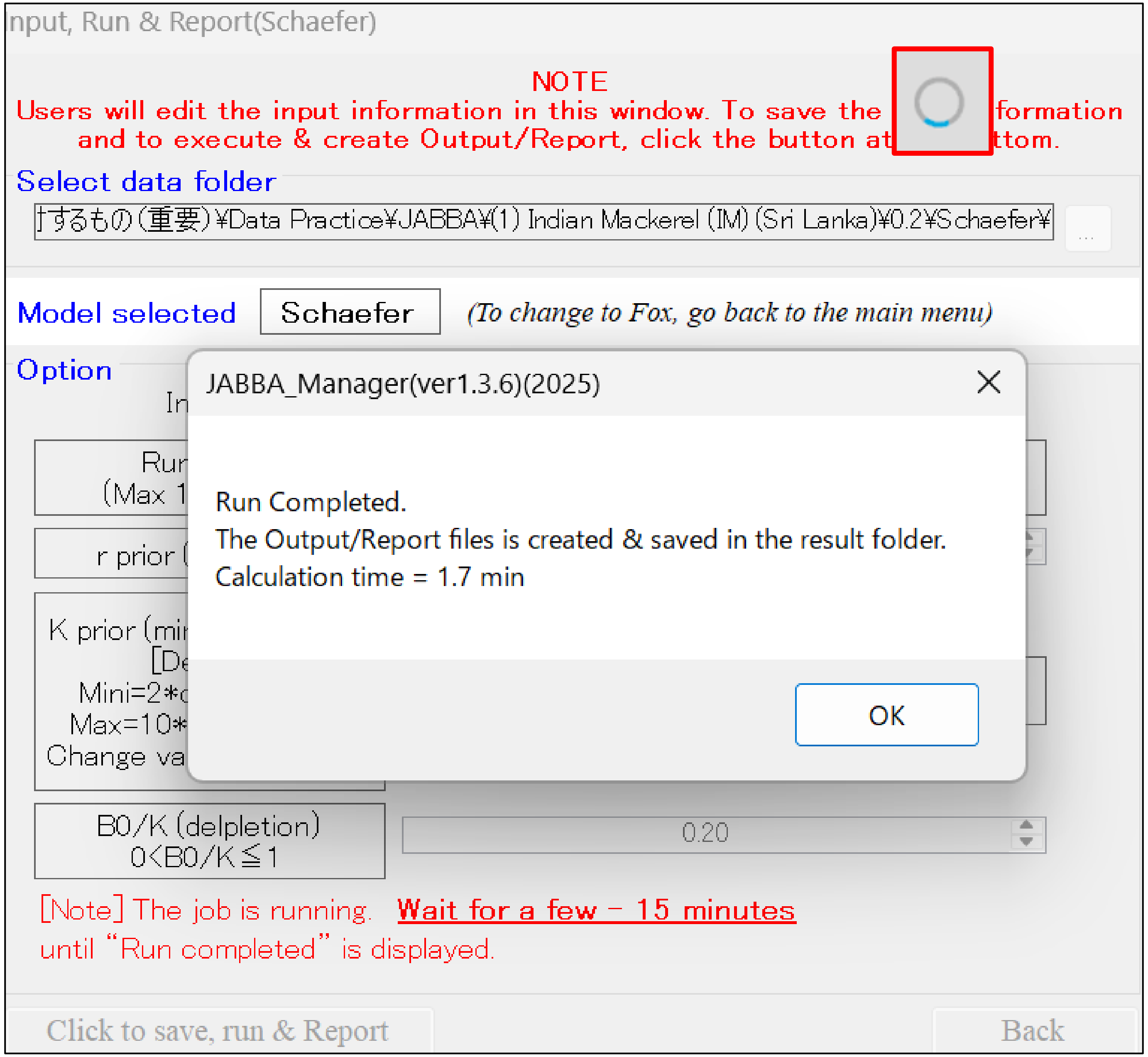
Run name (important as this will be ID)
IN1-0.2s (depletion level 0.2 Schaefer)
IN1 (INdividual scenario 1)



ONLY 2 changes

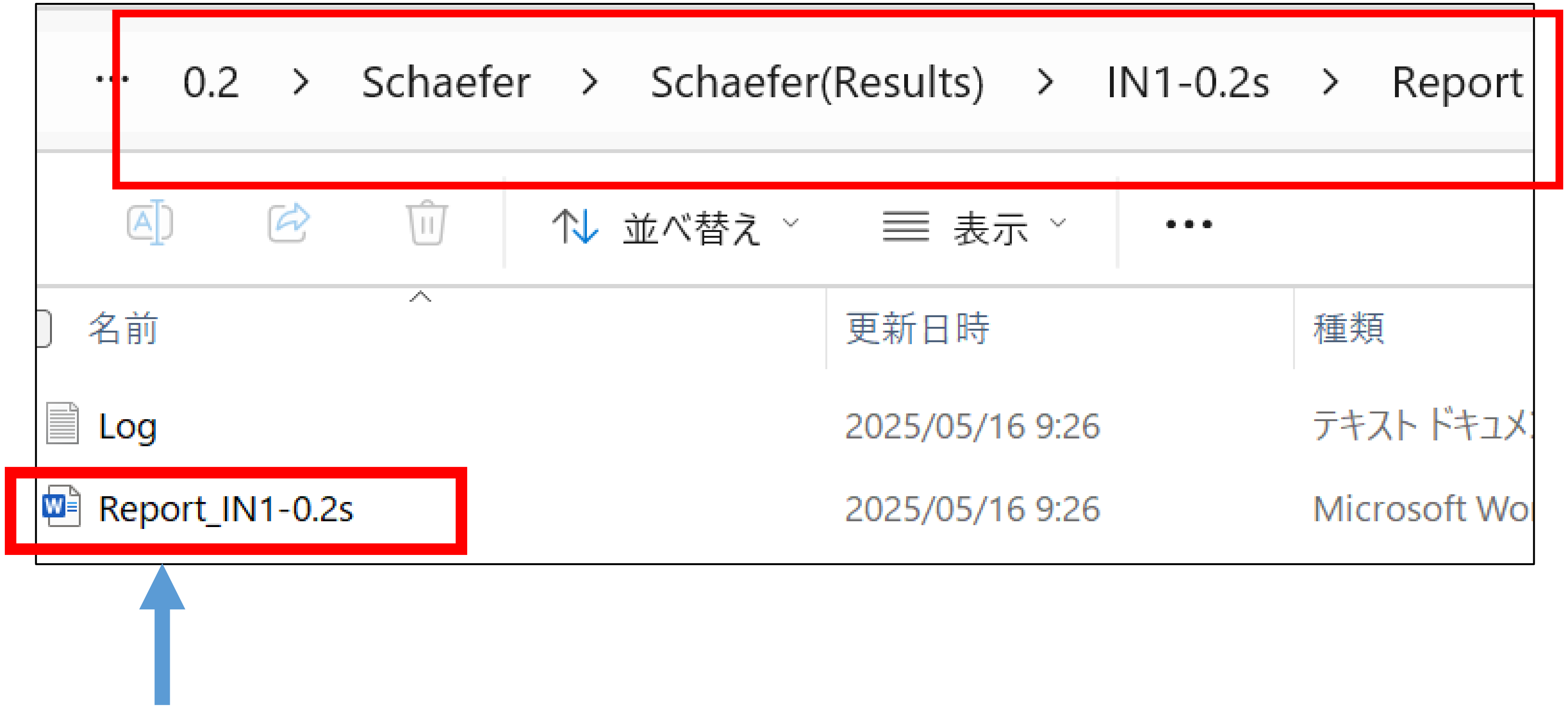
Default OK

Wait for 3-10 minutes


nput, Run & Report(Schaefer)
NOTE
Users will edit the input information in this window. To save the formation
and to execute & create Output/Report, click the button at ttom.
Select data folder
するもの(重要)¥Data Practice¥JABBA¥(1) Indian Mackerel (IM) (Sri Lanka)¥0.2¥Schaefer¥
Model selected
Schaefer
(To change to Fox, go back to the main menu)
Option
JABBA_Manager(ver1.3.6)(2025)
Run Completed.
The Output/Report files is created & saved in the result folder.
Calculation time = 1.7 min
OK
B0/K (delpletion)
0<B0/K≦1
0.20
[Note] The job is running. Wait for a few - 15 minutes
until "Run completed" is displayed.
Click to save, run & Report
Back

Check results

Find your report (deep)



Run name important

IN1-0.2s(Schaefer)

Report_IN1-0.2s (Schaefer)

Contents

Front page

You need to see Page 3-4 (5 diagnostics to evaluate results)

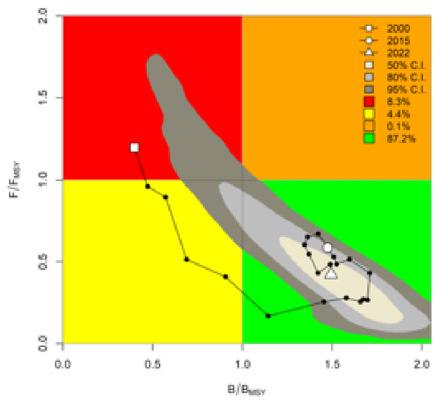
Note: Sometimes there are blank figures and/or tables due to space limitations. In such a case, please copy and paste from the original output files located one before this Report folder). If there are no outputs, please leave it empty.

Page 3

Summary of results & diagnoses (1/2) (Key diagnoses)

KOBE PLOT

(#18) (page 18) Kobe plot



CONVERGENCE

(#20) (p.5) Convergence (MCMC)
(> 0.05) (higher better)
Yellow markers
(not converged)

	Geweke.p	Heidel.p
K	0.97	0.33
r	0.87	0.23

RETROSPECTIVE ANALYSES

(#42) (p.12) Retrospective analyses
for 2 most important parameters (B & F)
Mohan ρ (-0.15 < ρ < 0.2) ➔ Converged
(value closer to 0.025 is better)
Yellow marker (not converged)

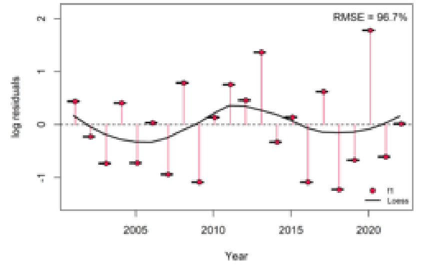
(Not available)

(#40) (p.14) Retrospective patterns

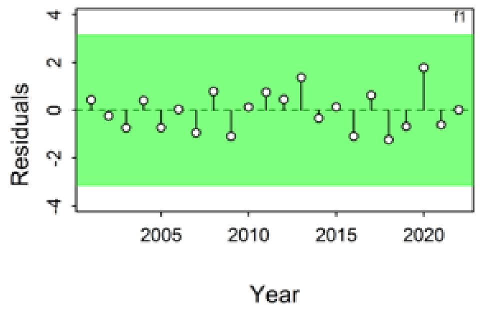
(Not available)

CPUE FITNESS

(#10) (page 8) CPUE fitness (1)
(lower RMSE better)



(#13) (page 7) CPUE fitness (2)
Red band: No randomness
Red points: outliers



Page 4

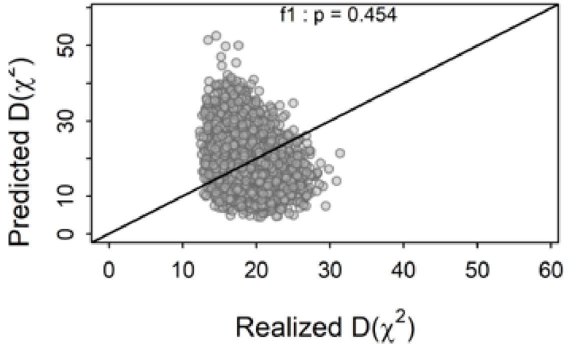
IN1-0.2s(Schaefer)

Summary of results & diagnoses (2/2)

Model fits

(#12) (page 11)
Posterior Predictive Check (PPC).
p should be 0.2<p<0.8
and closer to 0.5 is better fit.
(Users: compute Ave. & write below)

Ave. p=___



Estimated parameter values

(#21)
(page 16)

Parameter	Meaning	Mean	Lower (95%)	Upper (95%)
K	Carrying capacity (t)	34,874	24,311	50,668
r	Pop. growth rate	0.83	0.49	2.31
B0/K	Depletion (EST)	0.20	0.14	0.29
sigma.proc	Estimable process VAR	0.05	0.03	0.09
m	Shape parameter	2	2	2
Fmsy	F at MSY	0.42	0.25	1.16
TBmsy	TB at MSY (t)	17,437	12,155	25,334
MSY	MSY (t)	7,119	4,888	20,394
Catch(2022)	Current catch	4,522		
bmsyk	Limit Ref. Point (TB/TBmsy)	0.50	0.50	0.50
TB(2000)/ K	Depletion (OBS)(start)	0.20	0.14	0.29
TB(2022)/ K	Depletion (OBS)(last)	0.75	0.27	0.98
TB/TBmsy	TB ratio	1.49	0.55	1.96
F/Fmsy	F ratio	0.42	0.12	1.63

Hindcast analyses

(#41) (page 15) Hindcast
(predictive skill)
If predicted color points > 95% CI
➔NG for prediction

(Not available)

(#43) (page 14)
MASE
(Predictive skill)
(< 1)
(smaller better)

Yellow markers (> 1)
Not acceptable

(Not available)

Evaluate yourself. Below is correct answer

Strategy to search good CPUE for JABBA (1 fleet) (Max 8 scenarios) (sample)									
	Strategy	1st							
		Individual CPUE							
	series #	1	2	3	4	5	6	7	8
	Scenario	1	2	3	4	5	6	7	8
	B0/K (depletion)	0.2	0.2	0.4	0.4	0.6	0.6	0.8	0.8
	Model	s	f	s	f	s	f	s	f
fleet	f1(CPUE1)	INdividual CPUE							
5 diagnostics	(1) Kobe plot	ok							
	(2) CPUE	ok							
	(3) Retro	na							
	(4) Convergence	ok							
	(5) Retro&Hind Table	na							
	Results	ng							
	Note								

na : not available and ng :no good

If OK, Let's practice all others

Strategy to search good CPUE for JABBA (1 fleet) (Max 8 scenarios) (sample)									
	Strategy	1st							
		Individual CPUE							
	series #	1	2	3	4	5	6	7	8
	Scenario	1	2	3	4	5	6	7	8
	B0/K (depletion)	0.2	0.2	0.4	0.4	0.6	0.6	0.8	0.8
	Model	s	f	s	f	s	f	s	f
fleet	f1(CPUE1)	INdividual CPUE							
5 diagnostics	(1) Kobe plot	ok							
	(2) CPUE	ok							
	(3) Retro	na							
	(4) Convergence	ok							
	(5) Retro&Hind Table	na							
	Results	ng							
	Note								

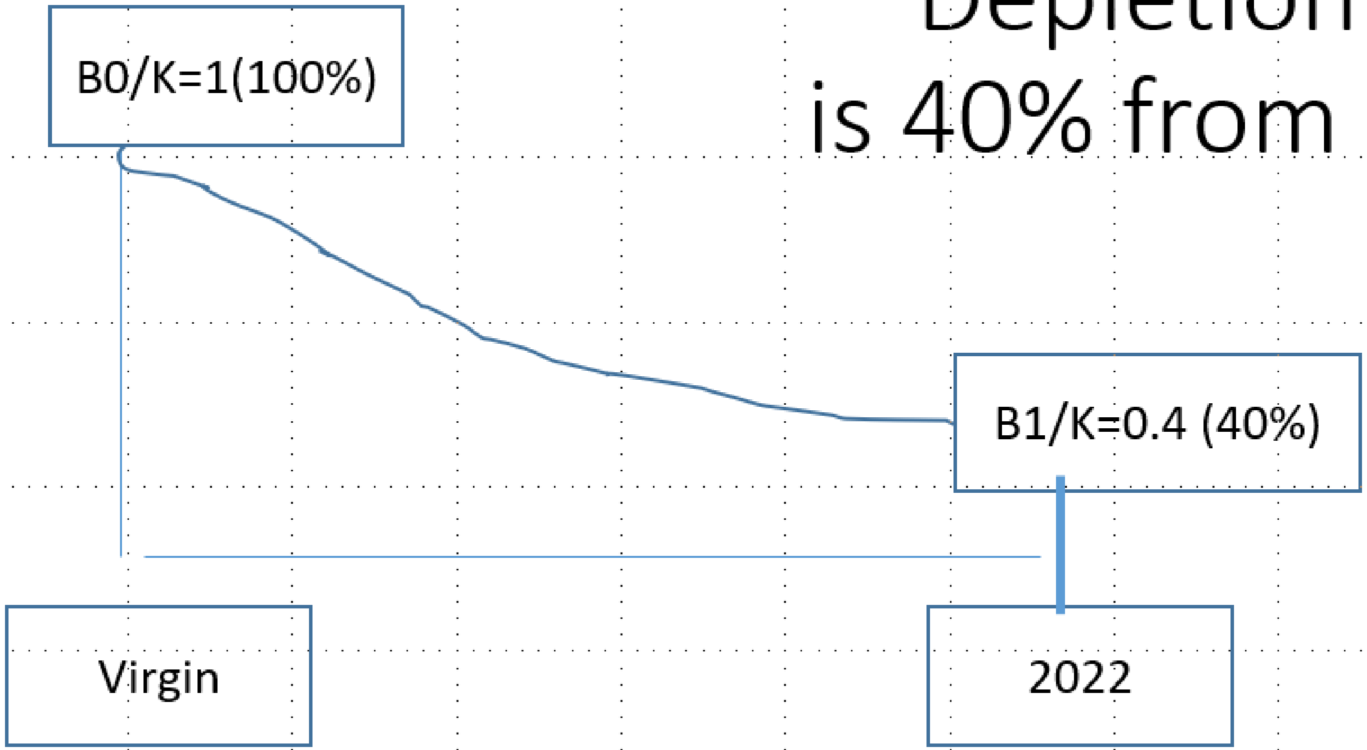
You are now working

Results of the base case➔ 0.4s good all OK for 5 diagnostics

	series #	1	2	3	4	5	6	7	8
Basic Information	Scenario	1							
	B0/K	0.2		0.4		0.6		0.8	
	Model	s	f	s	f	s	f	s	f
	f1(CPUE1)	1 fleet (individual)							
5 diagnostics	(1) Kobe plot	ok	ok	ok	ok	ok	ng	ng	ng
	(2) CPUE	ok	ok	ok	ok	ok	ok	ok	ok
	(3) Retro	na	ng	ok	ng	ng	na	na	na
	(4) Convergence	ok	ok	ok	ok	ok	ok	ok	ok
	(5) Retro&Hind Table	na	ok	ok	ok	na	na	na	na
	Results	ng	ng	ok	ng	ng	ng	ng	ng

0.4s best run (base case)

Depletion level (2022)
is 40% from virgin stock (K)



0.4s is good.   So, what is the next ?

Base case : Depletion rate by 0.2

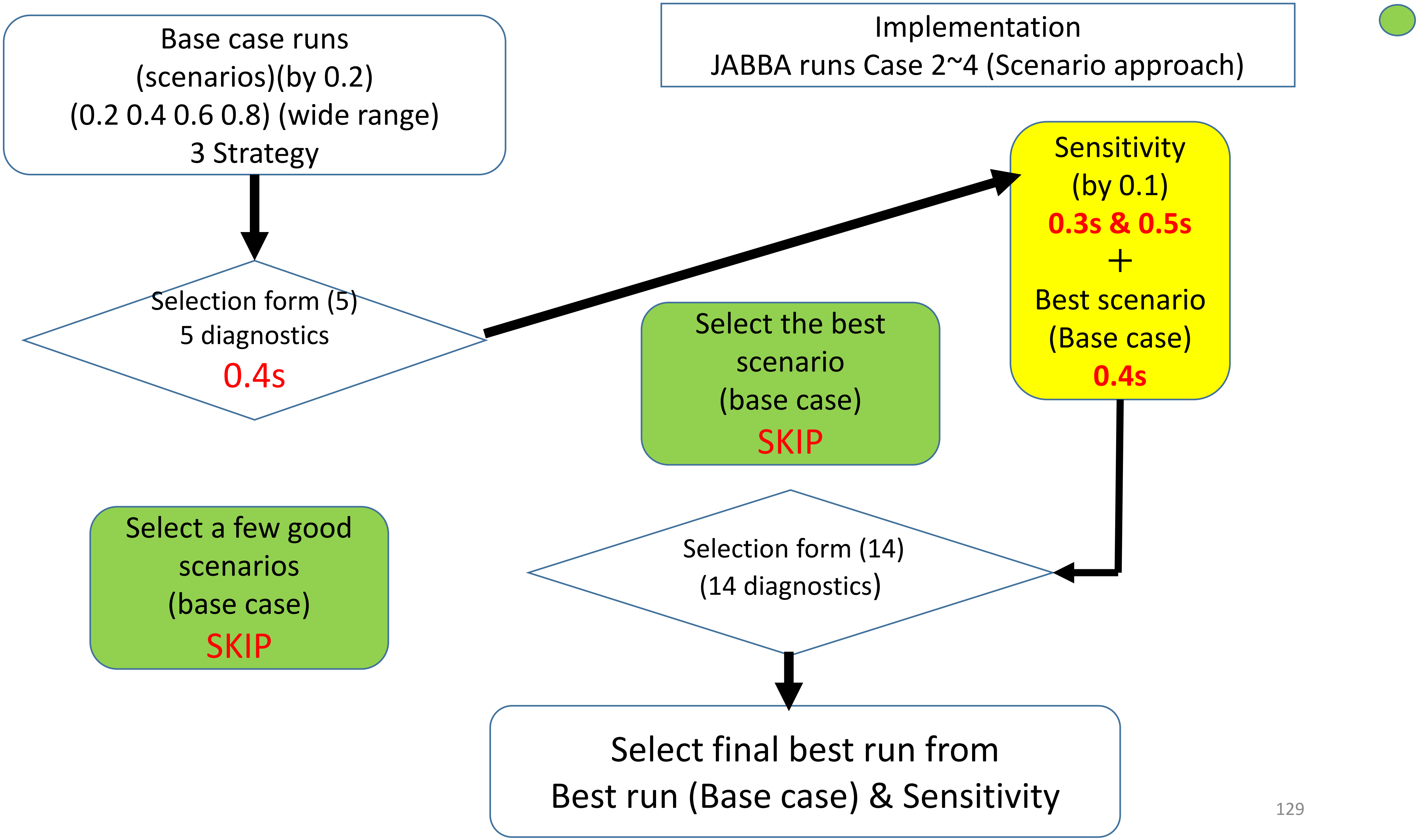
⇩

Sensitivity by 0.1

(before & after 0.1)

⇩

0.3s and 0.5s

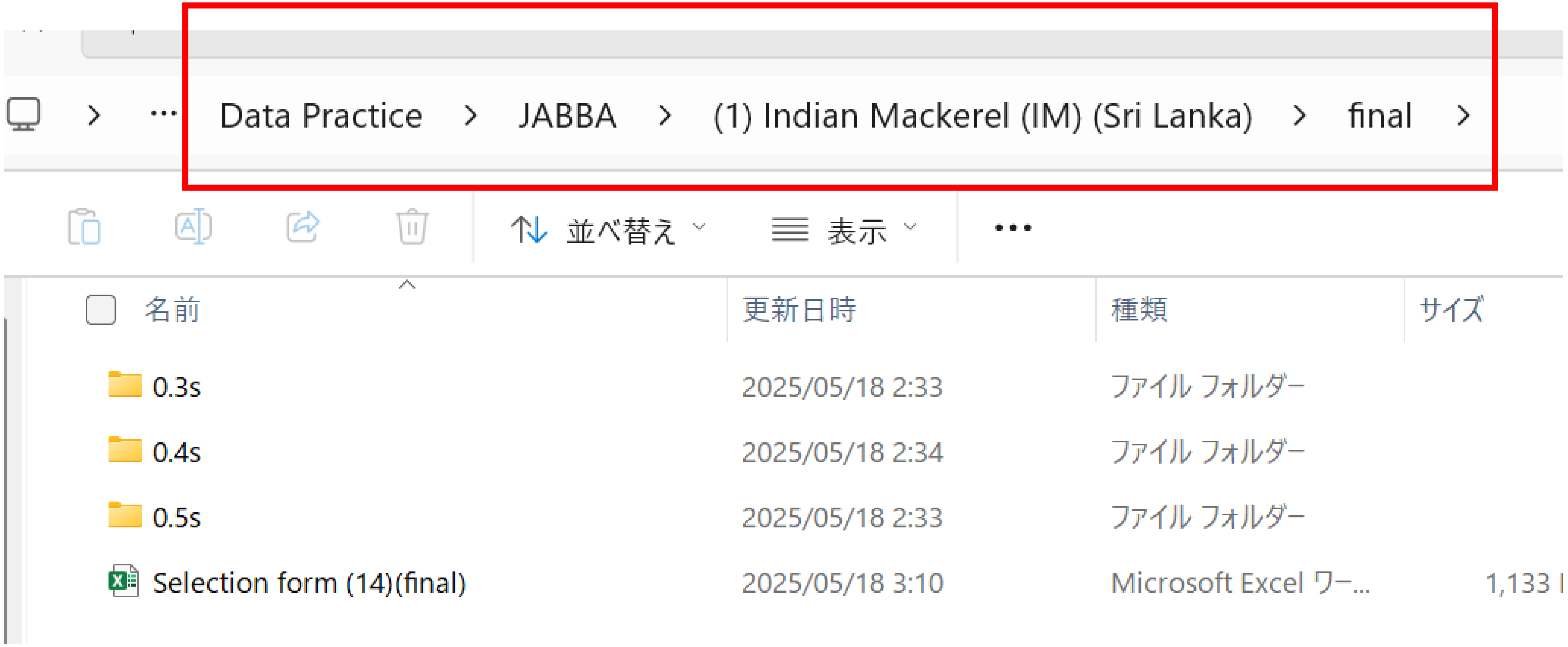

Implementation
JABBA runs Case 2~4 (Scenario approach)
Base case runs
(scenarios)(by 0.2)
(0.2 0.4 0.6 0.8) (wide range)
3 Strategy
Selection form (5)
5 diagnostics
0.4s
Sensitivity
(by 0.1)
0.3s & 0.5s
+
Best scenario
(Base case)
0.4s
Select the best
scenario
(base case)
SKIP
Select a few good
scenarios
(base case)
SKIP
Selection form (14)
(14 diagnostics)
Select final best run from
Best run (Base case) & Sensitivity

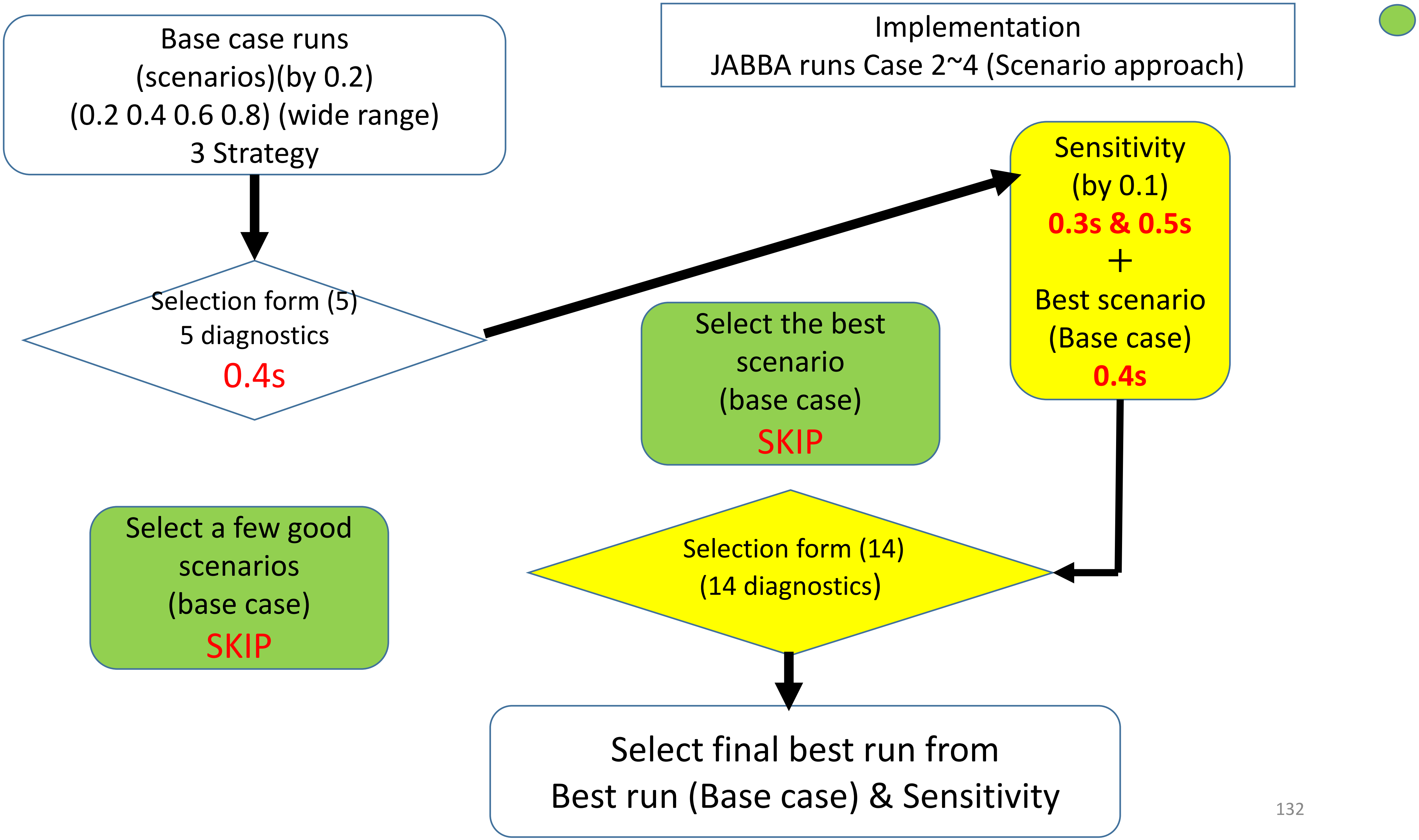
Prepare 0.3s & 0.5s folder & files (final run)

Run 0.3s & 0.5s

Get Report

0.4s (same)


Data Practice > JABBA > (1) Indian Mackerel (IM) (Sri Lanka) > final >
並べ替え
表示
名前
更新日時
種類
サイズ
0.3s
2025/05/18 2:33
ファイル フォルダー
0.4s
2025/05/18 2:34
ファイル フォルダー
0.5s
2025/05/18 2:33
ファイル フォルダー
Selection form (14)(final)
2025/05/18 3:10
Microsoft Excel ワー...
1,133


Implementation
JABBA runs Case 2~4 (Scenario approach)
Base case runs
(scenarios)(by 0.2)
(0.2 0.4 0.6 0.8) (wide range)
3 Strategy
Selection form (5)
5 diagnostics
0.4s
Sensitivity
(by 0.1)
0.3s & 0.5s
+
Best scenario
(Base case)
0.4s
Select the best
scenario
(base case)
SKIP
Select a few good
scenarios
(base case)
SKIP
Selection form (14)
(14 diagnostics)
Select final best run from
Best run (Base case) & Sensitivity

Prepare Selection form (14)

We will work together

Fill out Selection form (14)

Using hard copies

(Report page 3~4)

0.3s+0.4s+0,5s

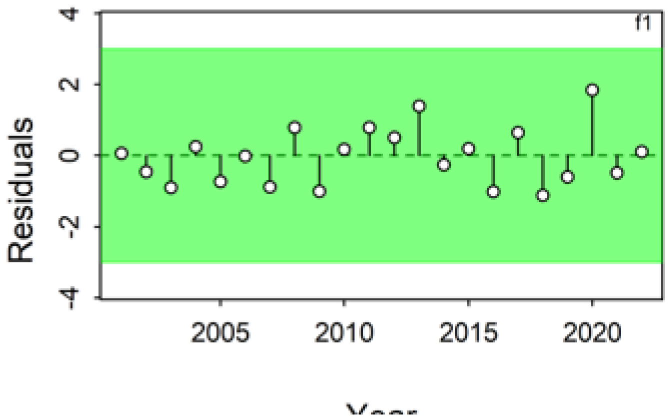
Please see Manual for details on diagnostics.	Evaluation	1. Convergence (MCMC)				2. Model Fit					3. Retrospective analyses		4. Hindcast analyses		
		Heidelberger and Welch p test				2.1 CPUE residuals		2.2 RMSE	2.3 Posterior Predictive Check (PPC)						
	Methods	Geweke.p (larger value better)		Heidel.p (larger value better)		95% CI band		RMSE	Average p values (compute yourself)	Visual inspection	Mohan's ρ (-0.15~2.0)	Visual inspection	MASE (# of yellow: non significant=NG predicted skill) (for B & F)	MASE (Average value)	Visual inspection
	Criteria	K	r	K	r	Red band Auto-correlation? No is better	total # of outliers less # is better	Less % better fit	Use the 5th sheet to compute. Closer to 0.5 is better	Ball shapes located in center are better (how many #?)	# of yellow markers (B & F ratio) less better	All trends should be similar patterns.	Less # better	should be < 1 & smaller better	# OBS points beyond the 95% CI band
	Output # (page#)	# 20 (p.3)				# 13 (p.3)		# 10 (p.3)	# 12 (p.4)		# 42 (p.3)	# 40 (p.3)	# 43 (p.4)		# 41 (p.4)
	diagnostics #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	Refer to sheet # how to do								(4)		(5)		(6)		
Sensitivity	0.3s	0.05	0.69	0.07	0.44	0	0	95.4	0.456	OK	NA	NG	NA	NA	NA
Base case	0.4s	0.84	0.18	0.17	0.33	0	0	101.3	0.438	OK	2	not so good	0	0.53	1
Sensitivity	0.5s	0.99	0.55	0.12	0.60	0	0	103.3	0.432	OK	NA	NA	NA	NA	NA
	Best scenario?	0.5s	0.3s	0.4s	0.5s	same	same	0.3s	0.3s	same	0.4s	0.4s	0.4s	0.4s	0.4s
Comments & decision	(1)	6 best for 0.4s, 4 for 0.3s, 1 for 0.5 and 3 for same. From this, 0.34s is the best/													
	(2)	Actually, 0.3s & 0.5s don't provide Retrospective & Hind cast analyses. At this point, 0.4s is the only one best run.													
	(3)	In conclusion, 0.4s is selected as the best run.													

Evaluation	1. Convergence (MCMC) Heidelberger and Welch p test			
Methods	Geweke.p (larger value better)		Heidel.p (larger value better)	
Criteria	K	r	K	r
Output # (page#)	# 20 (p.3)			
diagnostics #	1	2	3	4
Refer to sheet # how to do				
0.3s	0.05	0.69	0.07	0.44
0.4s	0.84	0.18	0.17	0.33
0.5s	0.99	0.55	0.12	0.60

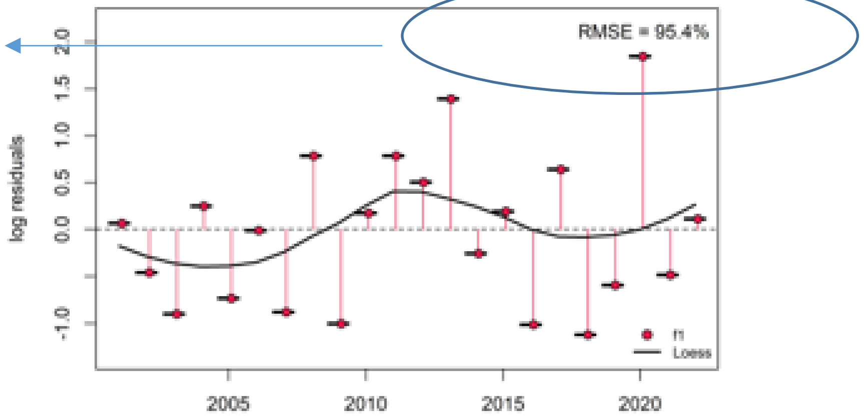
(#20) (p.5) Convergence (MCMC)
(> 0.05) (higher better)
Yellow markers
(not converged)

	Geweke.p	Heidel.p
K	0.05	0.07
r	0.69	0.44

2.1 CPUE residuals	
95% CI band	
Red band Auto-correlation? No is better	total # of outliers less # is better
# 13 (p.3)	
5	6
0	0
0	0
0	0
same	same

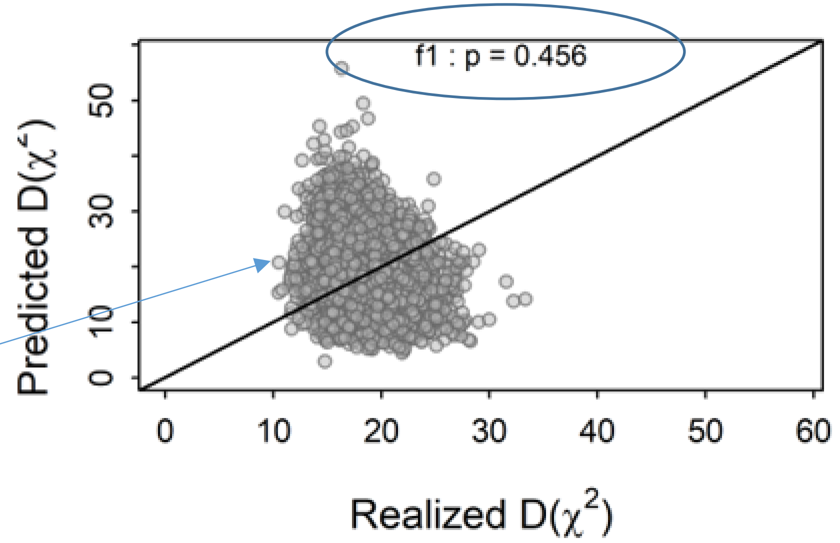


2.2 RMSE
RMSE
Less % better fit
10 (p.3)
7
95.4
101.3
103.3
0.3s



2.3 Posterior Predictive Check (PPC)	
Average p values (compute yourself)	Visual inspection
Use the 5th sheet to compute. Closer to 0.5 is better	Ball shapes located in center are better (how many #?)
# 12 (p.4)	
8	9
(4)	
0.456	OK
0.438	OK
0.432	OK

MODEL FITS
(#12) (page 11) Posterior Predictive Check (PPC). p should be 0.2<p<0.8 and closer to 0.5 is better fit. *(Users: compute Ave.*

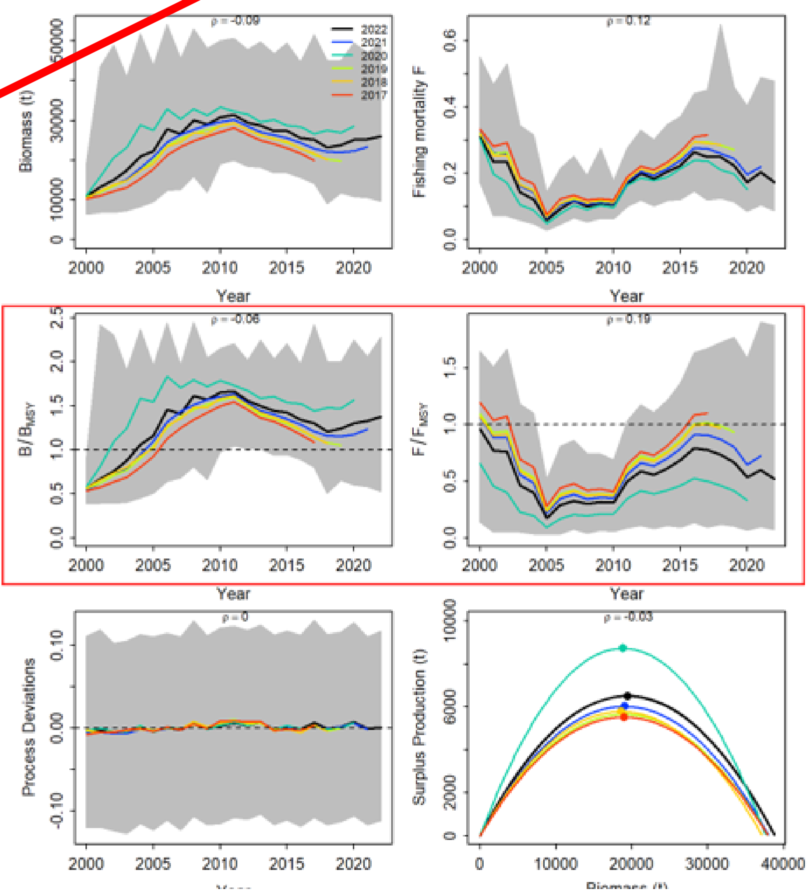


3. Retrospective analyses	
Mohan's ρ (-0.15~2.0)	Visual inspection
# of yellow markers (B & F ratio) less better	All trends should be similar patterns.
# 42 (p.3)	# 40 (p.3)
10	11
(5)	
NA	NG
2	not so good
NA	NA

(#42) (p.12) Retrospective analyses for 2 most important parameters (B & F) Mohan ρ (-0.15 < ρ < 0.2) ➔ Converged (value closer to 0.025 is better) Yellow marker (not converged)

(Not available)

(#40) (p.14) Retrospective patterns



4. Hindcast analyses		
MASE (# of yellow: non significant=NG predicted skill) (for B & F)	MASE (Average value)	Visual inspection
Less # better	should be < 1 & smaller better	# OBS points beyond the 95% CI band
# 43 (p.4)		# 41 (p.4)
12	13	14
(6)		
NA	NA	NA
0	0.53	1
NA	NA	NA

HINDCAST ANALYSES	
(#41) (page 15) Hindcast (predictive skill) If predicted color points > 95% CI ➔NG for prediction	(Not available)
(#43) (page 14) MASE (Predictive skill) (< 1) (smaller better) Yellow markers (> 1) Not acceptable (Not available)	

The best run is 0.4s

1st Strategy (Individual CPUE)

we are lucky as we could get the best run in the 1st Strategy

This is because CPUE good (green & no outliers)

NOT LIKE THIS

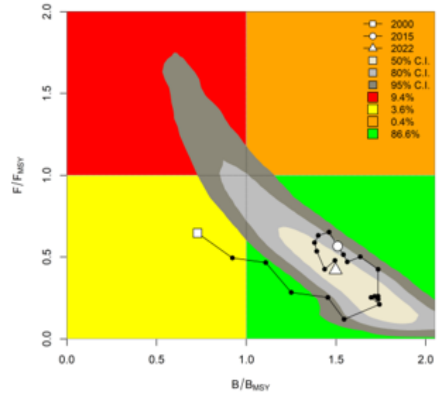
Strategy to search good CPUE for JABBA (4 fleet) (Max 8 scenarios) (sample) (base case)																									
	Strategy	1st								2nd								3rd							
		Individual CPUE								Average CPUE								hybrid (individual and/or ave) CPUE							
	series #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
	Scenario	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
	B0/K (depletion)	0.2	0.2	0.4	0.4	0.6	0.6	0.8	0.8	0.2	0.2	0.4	0.4	0.6	0.6	0.8	0.8	0.2	0.2	0.4	0.4	0.6	0.6	0.8	0.8
	Model	s	f	s	f	s	f	s	f	s	f	s	f	s	f	s	f	s	f	s	f	s	f	s	f
	run ID	IN1-s0.2	IN2-f0.2	IN3-s0.4	IN4-f0.4	IN5-s0.6	IN6-f0.6	IN7-s0.8	IN8-f0.8	AV1-s0.2	AV2-f0.2	AV3-s0.4	AV4-f0.4	AV5-s0.6	AV6-f0.6	AV7-s0.8	AV8-f0.8	HY1-s0.2	HY2-f0.2	HY3-s0.4	HY4-f0.4	HY5-s0.6	HY6-f0.6	HY7-s0.8	HY8-f0.8
fleet	f1(CPUE1)	Individual CPUE								Average CPUE								Individual CPUE							
	f4(CPUE4)	Individual CPUE																(not used)							
	f3(CPUE3)	Individual CPUE								Average CPUE								Average CPUE							
	f4(CPUE4)	Individual CPUE																							
5 diagnostics	(1) Kobe plot	ok	ok	ok	ok	ok	ng	ng	ng	ok	ok	ok	ok	ok	ok	ng	ok	ok	ok	ok	ng	ng	ng	ng	ok
	(2) CPUE	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok
	(3) Retro	ng	ng	ok	ng	ng	na	na	na	ng	na	ng	ok	ng	ng	na	na	ng	ok	ok	ok	na	na	na	ok
	(4) Convergence	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ng	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ng
	(5) Retro&Hind Table	ok	ok	ng	ok	na	na	na	na	na	na	ok	ok	ok	na	na	na	ok	ng	ok	ok	na	na	na	ok
	Results	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ok	ng	ng	ng	ng	ng

Major results

Summary of results & diagnoses (1/2) (Key diagnoses)

Kobe plot

(#18) (page 18) Kobe plot



Convergence

(#20) (p.5) Convergence (MCMC)
(> 0.05) (higher better)
Yellow markers
(not converged)

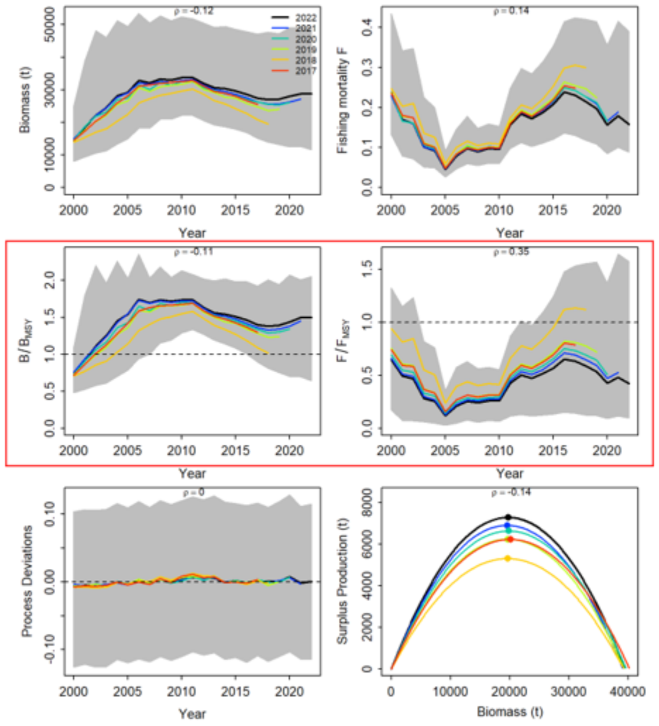
	Geweke.p	Heidel.p
K	0.84	0.17
r	0.18	0.33

Retrospective analyses

(#42) (p.12) Retrospective analyses
for 2 most important parameters (B & F)
Mohan ρ (-0.15 < ρ < 0.2) ➔ Converged
(value closer to 0.025 is better)
Yellow marker (not converged)

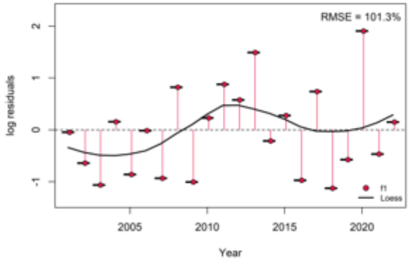
Mohan ρ	B	F
2022	-0.05	0.05
2021	-0.07	0.06
2020	-0.11	0.14
2019	-0.28	0.39
2018	-0.07	0.08
Average	-0.12	0.14

(#40) (p.14) Retrospective patterns

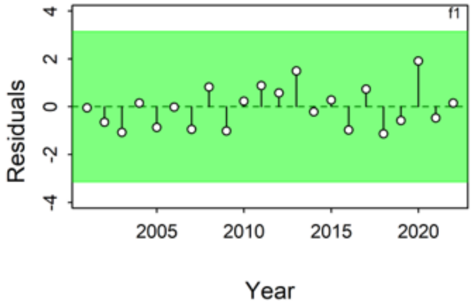


CPUE fitness

(#10) (page 8) CPUE fitness (1)
(lower RMSE better)



(#13) (page 7) CPUE fitness (2)
Red band: No randomness
Red points: outliers

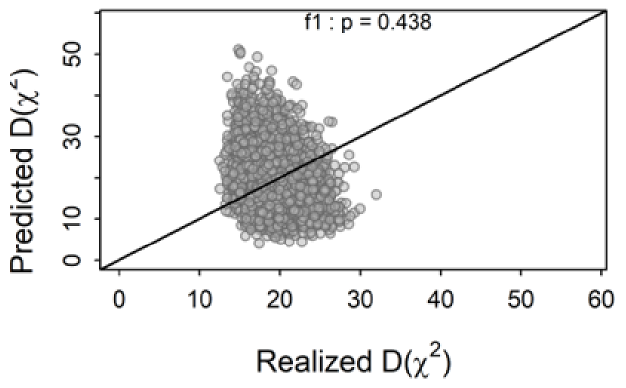


Summary of results & diagnoses (2/2)

MODEL FITS

(#12) (page 11)
Posterior Predictive Check (PPC).
p should be
0.2<p<0.8
and closer to 0.5
is better fit.
(Users: compute Ave. & write below)

Ave. p=___



Estimated Depletion=0.37

ESTIMATED PARAMETER VALUES

(#21)
(page 16)

Parameter	Meaning	Mean	Lower (95%)	Upper (95%)
K	Carrying capacity (t)	39,496	27,117	57,207
r	Pop. growth rate	0.74	0.39	2.44
B0/K	Depletion (EST)	0.37	0.25	0.55
sigma.proc	Estimable process VAR	0.05	0.03	0.10
m	Shape parameter	2	2	2
Fmsy	F at MSY	0.37	0.20	1.22
TBmsy	TB at MSY (t)	19,748	13,559	28,604
MSY	MSY (t)	7,115	4,439	24,152
Catch(2022)	Current catch	4,522		
bmsyk	Limit Ref. Point (TB/TBmsy)	0.50	0.50	0.50
TB(2000)/ K	Depletion (OBS)(start)	0.36	0.24	0.55
TB(2022)/ K	Depletion (OBS)(last)	0.75	0.32	1.02
TB/TBmsy	TB ratio	1.50	0.64	2.05
F/Fmsy	F ratio	0.42	0.10	1.57

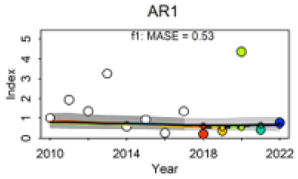
HINDCAST ANALYSES

(#41) (page 15) Hindcast
(predictive skill)
If predicted color points > 95% CI
➔NG for prediction

(#43) (page 14)
MASE
(Predictive skill)
(< 1)
(smaller better)

Yellow markers (> 1)
Not acceptable

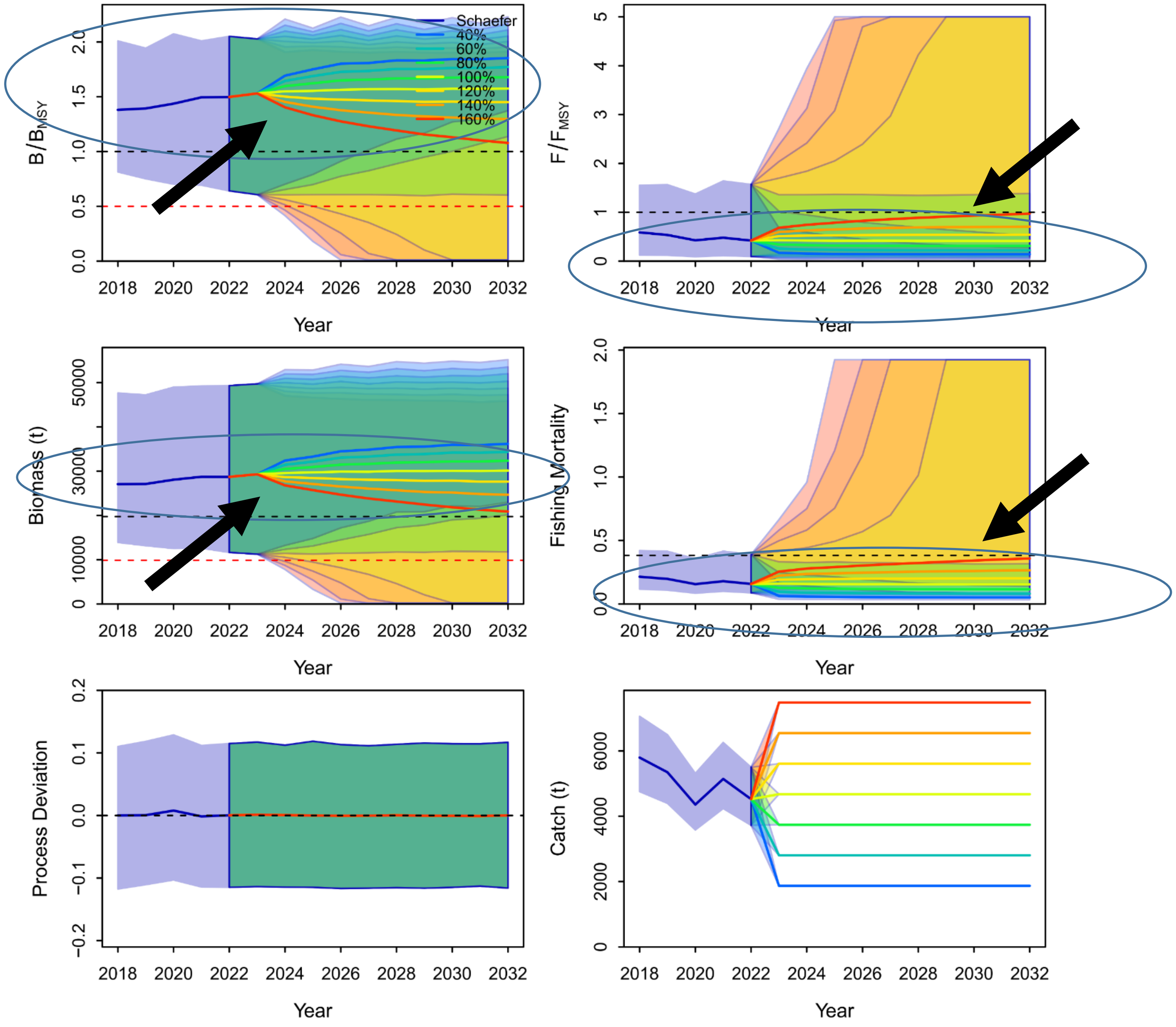
Index	MASE
f1	0.53
Average	0.53



Page 19

See blue based Trajectory (B/Bmsy=1) Normal

No need to see Red is based on B/Bmsy=0.5



If 160% (red line) (60% higher of 2022) catch is continued

TB & F still Sustainable In 10 years (2023)

Summary of results
(JABBA stock assessment for Indian Mackerel in Sri Lanka)

- Results

  ➔ ALL OK (Convergence, CPUE, retrospective analyses, Hindcast analyses, Kobe plot)

- Stock status (2022)➔ very healthy condition

  Catch 4,522 tons (63% of MSY) MSY=7,115

  TB/TBmsy=1.5 & F/Fmsy=0.42

  (Green in Kobe plot far from MSY)

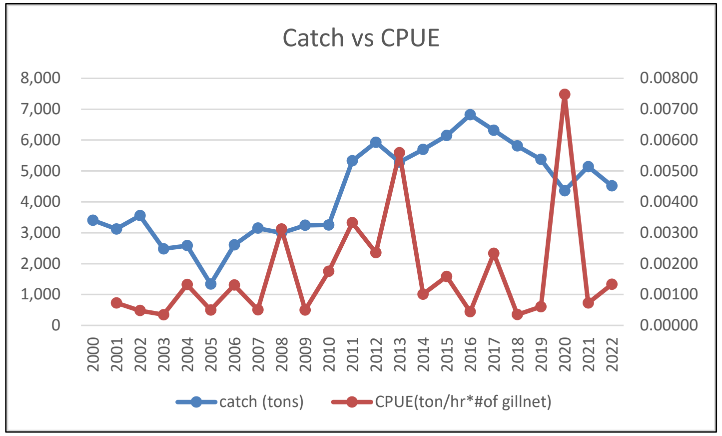
Summary of results
(JABBA stock assessment for Indian Mackerel in Sri Lanka)

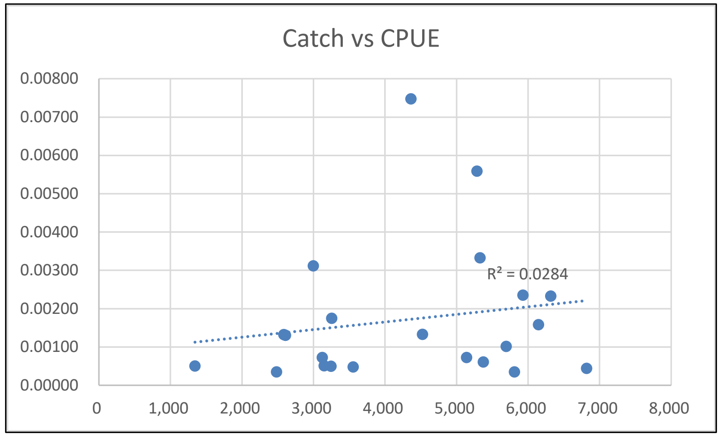
- Even 60% increase of the current catch (7,235 tons), TB & F will be sustainable in 10 years (2023).

- But max 50% increase of catch (6,800 ton) will be suggested as TAC need to consider uncertainties and precautionary approach.

If time allowed, make graphs (below)
data (catch & STD_CPUE) are available in each folder.

IM data (catch and standardized CPUE)





Catch gradually increasing
CPUE up & down
Stable

Positive r2 NG but 3% OK
But this is the only CPUE, we will use.

103

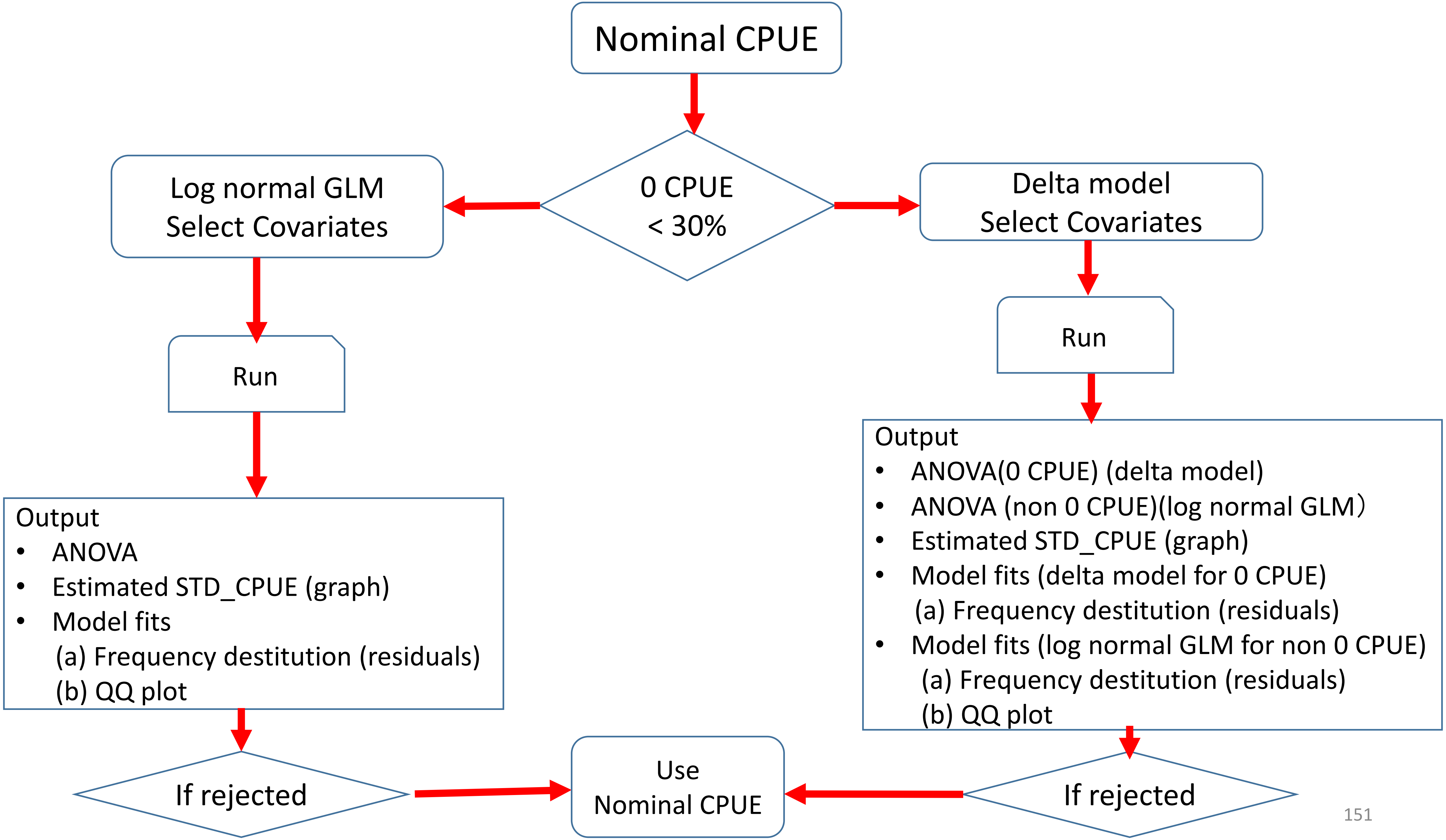
Last message on JABBA
➔ Good CPUE (important) to get good results quickly

- One Good CPUE can produce good results.
- If You have many CPUE, but if one CPUE NG, then results NG.
- Even good CPUE but with a small error will produce NG results.
- Good CPUE➔ key for good results

NG: No Good

Program

1. General session
    - 1.1 Introduction
        - (1) JABBA
        - (2) New CPUE standardization
    - 1.2 Demo + Practice
        - (1) JABBA
        - (2) CPUE standardization
        - (3) Data process
2. WG session
    - 2.1 Demersal WG
    - 2.2 Short mackerel WG
    - 2.3 Carp WG
3. Homework (Presentation & submission)
4. Sum-up session
    - 4.1 Review, Summary & Recommendation
    - 4.2 Future plan

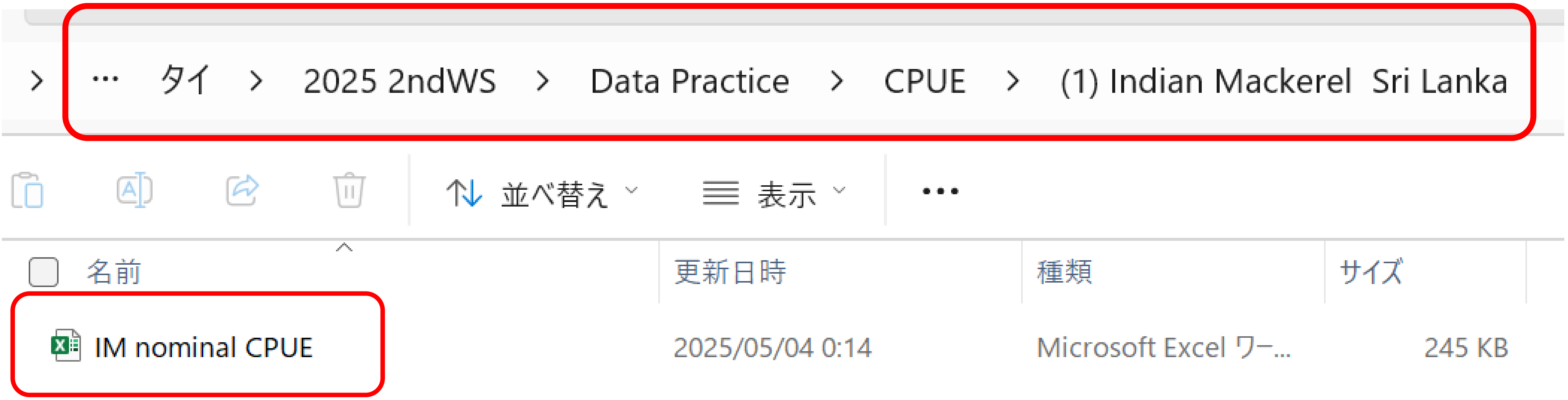

Nominal CPUE
0 CPUE
< 30%
Log normal GLM
Select Covariates
Delta model
Select Covariates
Run
Run
Output
• ANOVA
• Estimated STD_CPUE (graph)
• Model fits
(a) Frequency destitution (residuals)
(b) QQ plot
Output
• ANOVA(0 CPUE) (delta model)
• ANOVA (non 0 CPUE)(log normal GLM)
• Estimated STD_CPUE (graph)
• Model fits (delta model for 0 CPUE)
(a) Frequency destitution (residuals)
• Model fits (log normal GLM for non 0 CPUE)
(a) Frequency destitution (residuals)
(b) QQ plot
If rejected
Use
Nominal CPUE
If rejected

DEMO SL IM Sri Lanka

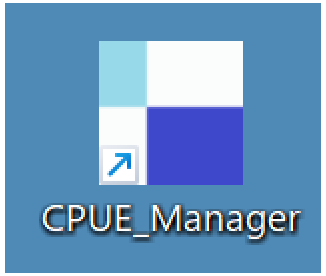
Practice Thai data

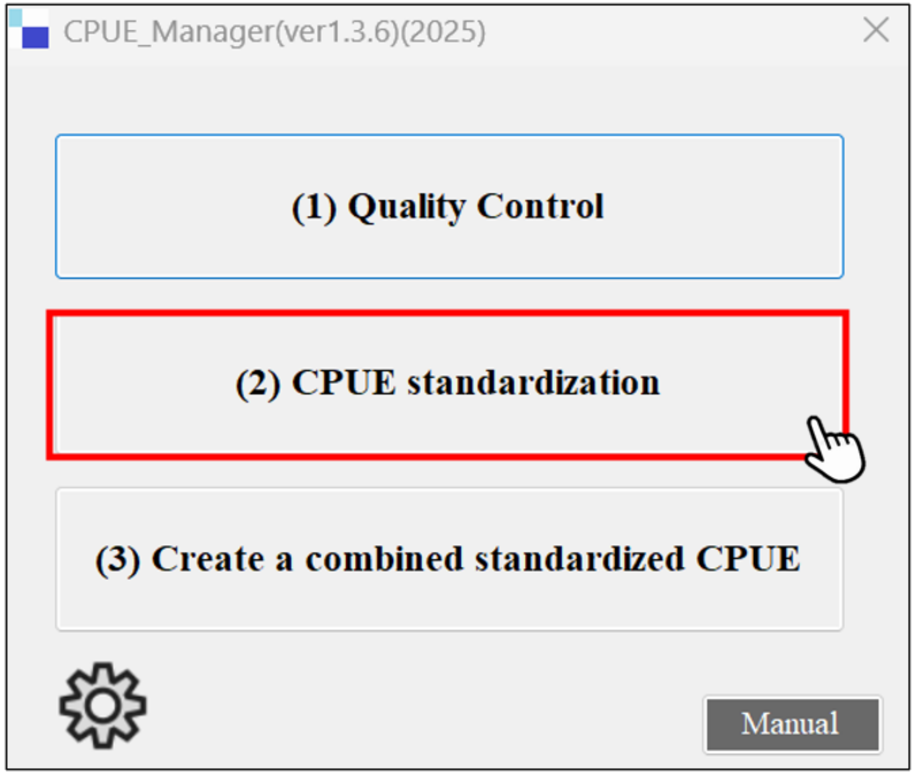
(in each WG)

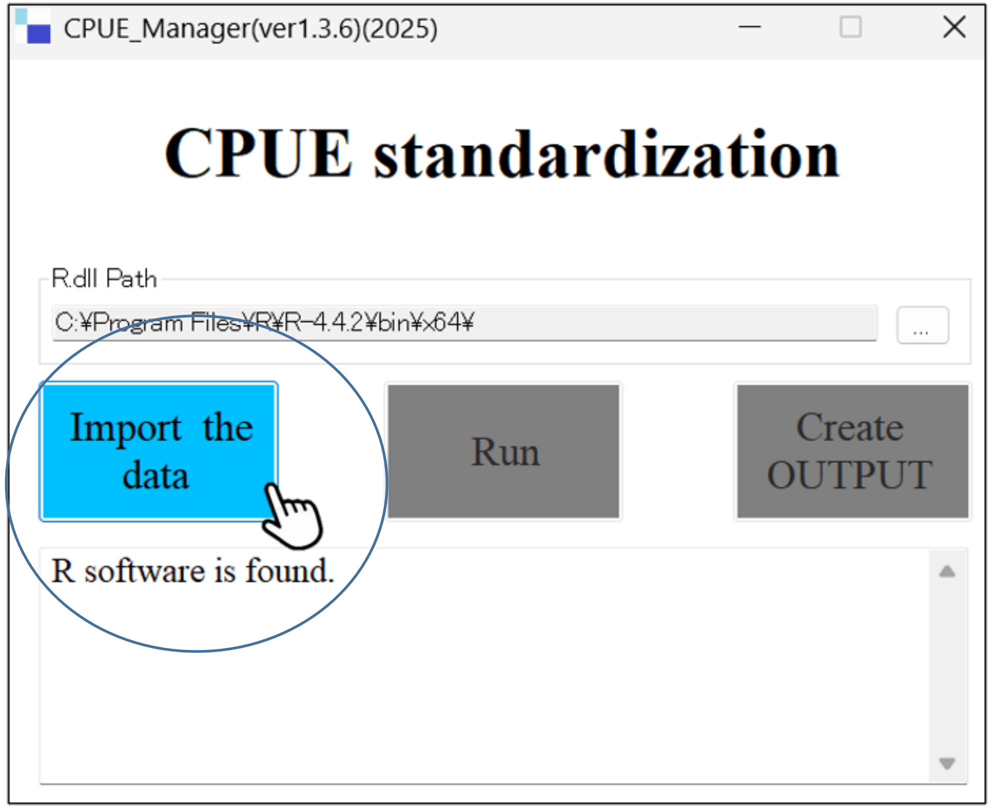
Data are available here

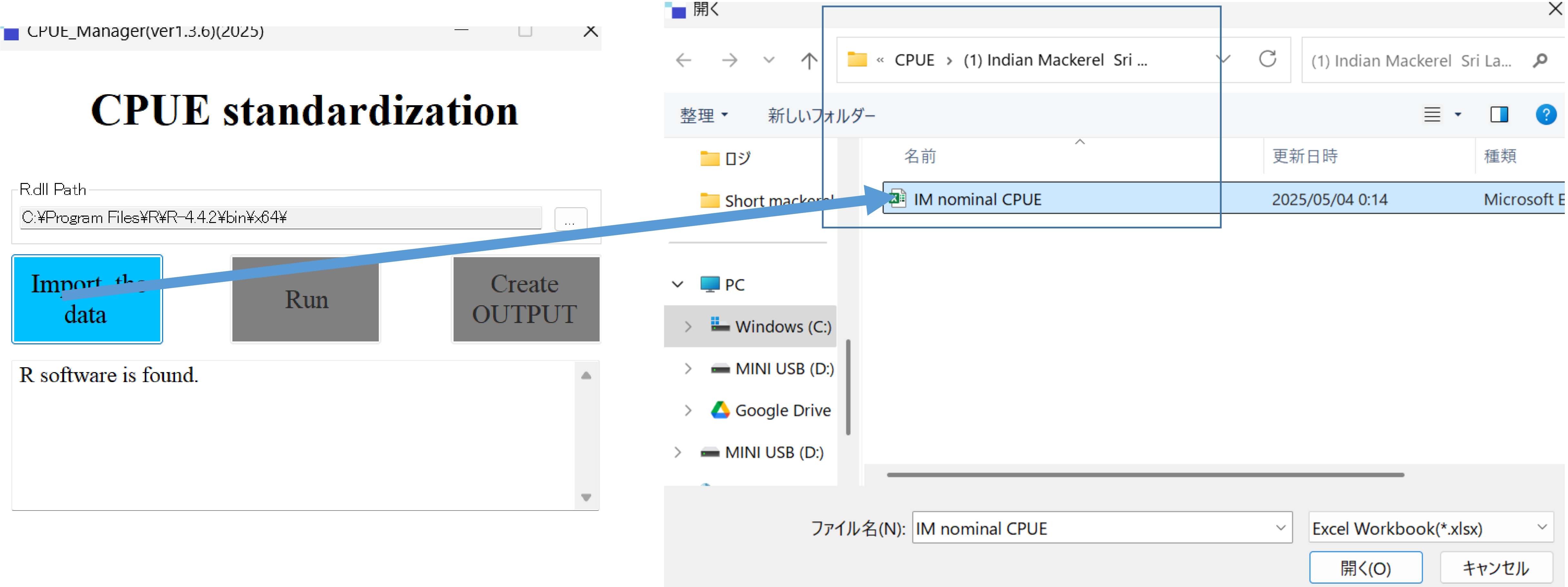


Let’s practice









CPUE_Manager(ver1.3.6)(2025)
CPUE standardization
R.dll Path
C:¥Program Files¥R¥R-4.4.2¥bin¥x64¥
Import the data
Run
Create OUTPUT
R software is found.
開く
CPUE › (1) Indian Mackerel Sri ...
(1) Indian Mackerel Sri La...
整理
新しいフォルダー
ロジ
Short mackerel
PC
Windows (C:)
MINI USB (D:)
Google Drive
MINI USB (D:)
名前
更新日時
種類
IM nominal CPUE
2025/05/04 0:14
Microsoft E
ファイル名(N):
IM nominal CPUE
Excel Workbook(*.xlsx)
開く(O)
キャンセル

Information of 0 (zero) catch, Selection of the model, and Selection of the covariates.

Sample size (n=)

Year	Sample size (n=)
2001	527
2002	374
2003	301
2004	318
2005	281
2006	583
2007	419
2008	358
2009	458
2010	404
2011	253
2012	257
2013	431
2014	75
2015	315
2016	411
2017	317
2018	224
2019	400

0 (zero) CPUE (catch) rate (red bar) = 89%

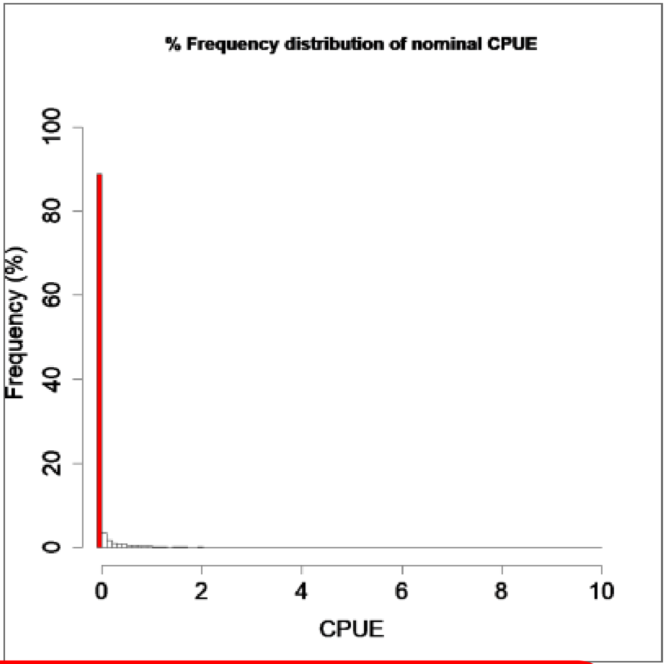
% frequency distribution of nominal CPUE

Select main (core) covariates

- [x] Year
- [x] Season
- [x] District
- [x] Season * District

Select additional covariates

- [x] mesh_size — Continuous
- [x] Chl — Continuous
- [x] depth — Continuous



Select model

- ( ) Log normal GLM: 0 (zero) CPUE (catch) rate < around 30%
- (•) Delta type 2 steps log-normal model: 0 (zero) CPUE (catch) rate > around 30%

(Note) If result of the Delta model is NG 0 CPUE rate is 30%~60%, try log normal GLM Including 0 CPUE.

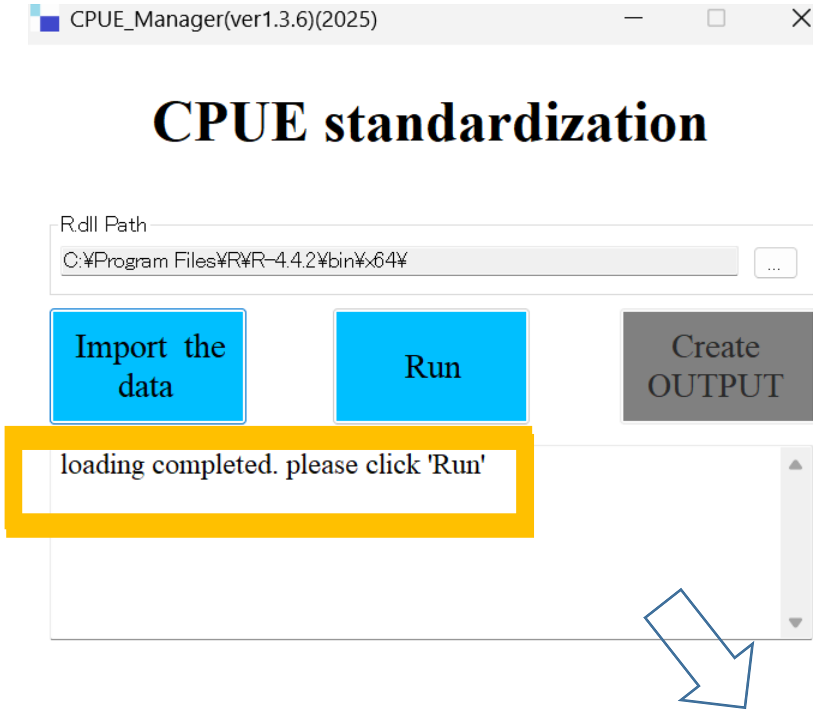
If still NG, use nominal CPUE.

OK | Cancel

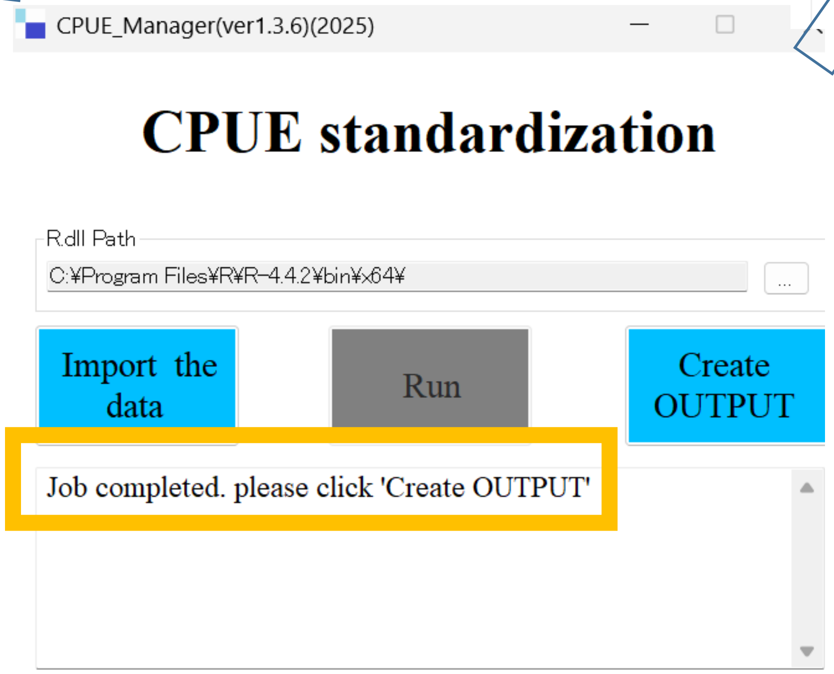
This is the delta model
your will see log normal GLM (each WG)

0 catch rate (%)	Model	Short name
0% ～ 30%	Log normal GLM	Log normal model
30% ～	Zero (0) inflated Delta 2 steps log normal GLM	Delta model

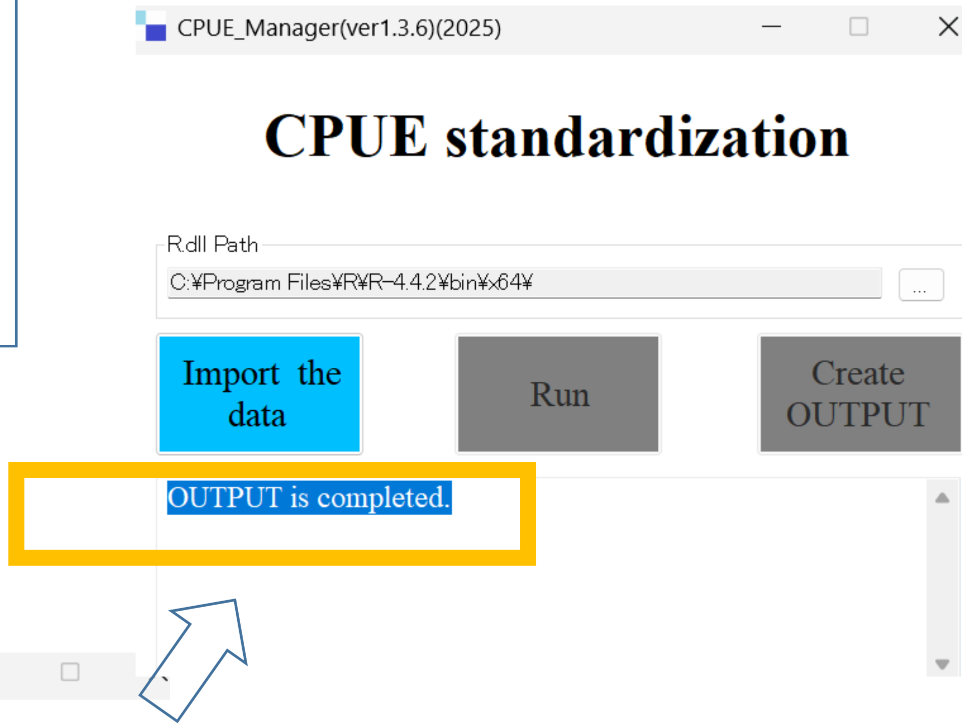
3 steps



CPUE_Manager(ver1.3.6)(2025)
CPUE standardization
R.dll Path
C:¥Program Files¥R¥R-4.4.2¥bin¥x64¥
Import the data
Run
Create OUTPUT
loading completed. please click 'Run'



CPUE_Manager(ver1.3.6)(2025)
CPUE standardization
R.dll Path
C:¥Program Files¥R¥R-4.4.2¥bin¥x64¥
Import the data
Run
Create OUTPUT
Job completed. please click 'Create OUTPUT'



CPUE_Manager(ver1.3.6)(2025)
CPUE standardization
R.dll Path
C:¥Program Files¥R¥R-4.4.2¥bin¥x64¥
Import the data
Run
Create OUTPUT
OUTPUT is completed.

To see results ➔ Go to your working folder…. 3 results files

IM nominal CPUE ➔input

Result(all)(IM nominal CPUE)(Delta) — report

Result(data)(IM nominal CPUE)(Delta) — Standardized CPUE

Result(sample size)(IM nominal CPUE)(Delta)

Let's see 2 excel files 1st data set standardized CPUE & 95%CI

Result(data)(IM nominal CPUE)(Delta) Standardized CPUE

Result(sample size)(IM nominal CPUE)(Delta)

	Observed (nominal) CPUE	Estimated (standardized) CPUE	Lower boundary of 95% CI (2.5%)	Upper boundary of 95% CI (97.5%)
2001	0.06	0.04	0.03	0.07
2002	0.03	0.04	0.02	0.07
2003	0.01	0.03	0.01	0.06
2004	0.05	0.07	0.04	0.12
2005	0.02	0.01	0.01	0.04
2006	0.05	0.06	0.04	0.10
2007	0.01	0.02	0.01	0.03
2008	0.17	0.15	0.11	0.20
2009	0.02	0.03	0.02	0.05
2010	0.04	0.06	0.04	0.08
2011	0.19	0.24	0.16	0.36
2012	0.06	0.10	0.05	0.19
2013	0.23	0.25	0.20	0.30
2014	0.09	0.08	0.04	0.16
2015	0.05	0.07	0.04	0.11
2016	0.01	0.02	0.01	0.06
2017	0.04	0.06	0.03	0.15
2018	0.02	0.02	0.01	0.04
2019	0.02	0.02	0.01	0.04
2020	0.12	0.19	0.08	0.42
2021	0.04	0.03	0.02	0.05
2022	0.16	0.20	0.15	0.26

Original scale | Scaled CPUE (Ave=1)

	Observed (nominal) CPUE	Estimated (standardized) CPUE	Lower boundary of 95% CI (2.5%)	Upper boundary of 95% CI (97.5%)
2001	0.92	0.55	0.55	0.52
2002	0.43	0.45	0.35	0.55
2003	0.20	0.34	0.26	0.42
2004	0.71	0.88	0.85	0.87
2005	0.28	0.18	0.10	0.30
2006	0.71	0.75	0.70	0.76
2007	0.18	0.24	0.22	0.24
2008	2.55	1.83	2.12	1.51
2009	0.24	0.35	0.35	0.33
2010	0.66	0.76	0.88	0.62
2011	2.81	2.95	3.08	2.69
2012	0.87	1.24	1.06	1.38
2013	3.43	3.06	3.97	2.25
2014	1.36	1.02	0.80	1.22
2015	0.72	0.82	0.77	0.82
2016	0.17	0.23	0.12	0.43
2017	0.58	0.79	0.54	1.09
2018	0.27	0.21	0.14	0.33
2019	0.26	0.23	0.19	0.27
2020	1.74	2.31	1.64	3.09
2021	0.56	0.40	0.41	0.37
2022	2.36	2.41	2.87	1.93
Average	1	1	1	1

Original scale | Scaled CPUE (Ave=1)

Let’s see 2 excel files 2nd data set sample size

Result(data)(IM nominal CPUE)(Delta) Standardized CPUE

Result(sample size)(IM nominal CPUE)(Delta)

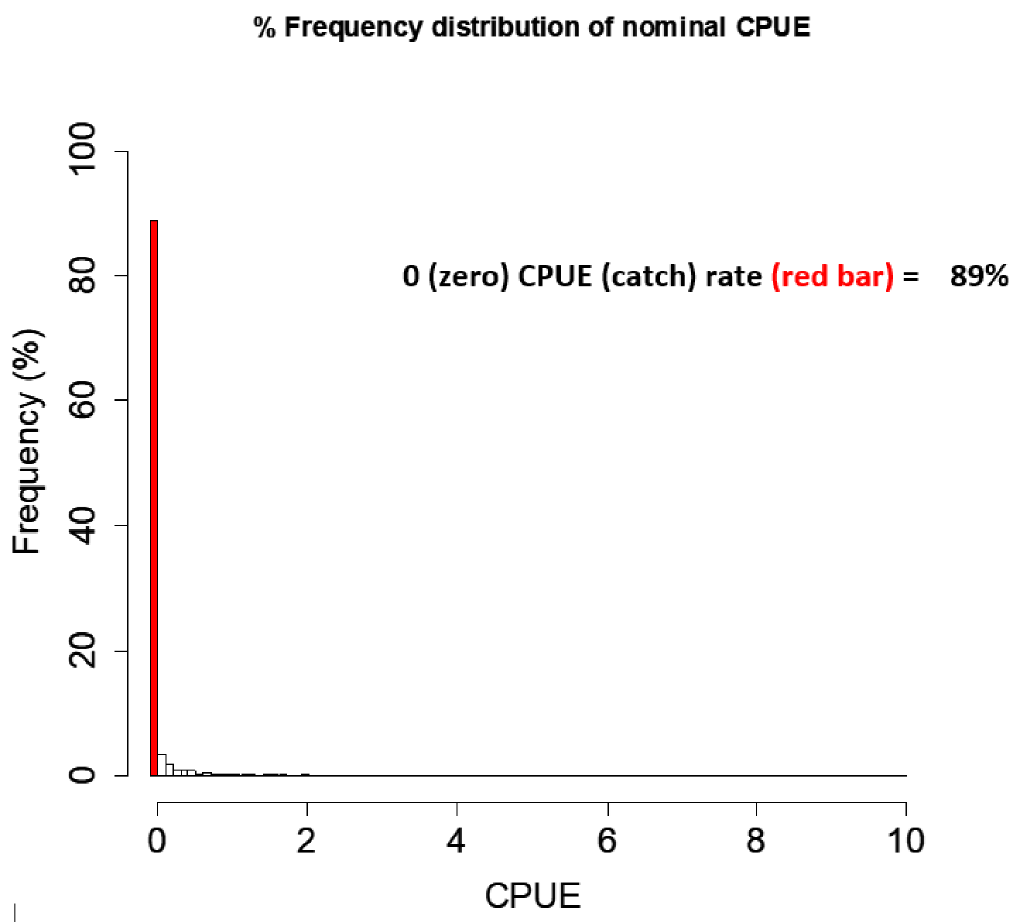
Year	Sample size (n=)
2001	527
2002	374
2003	301
2004	318
2005	281
2006	583
2007	419
2008	358
2009	458
2010	404
2011	253
2012	257
2013	431
2014	75
2015	315
2016	411
2017	317
2018	224
2019	400
2020	78
2021	385
2022	348

Year | Season | District | Season x District

Let's see

Result(all)(IM nominal CPUE)(Delta)

Delta type 2 steps log-normal GLM



All Covariates significant ➔ affecting 0 CPUE

The interaction (season*district) is not significant.
What does it mean?

ANOVA (Analysis Of Variance) table for delta model to test statistical significances on 0 (zero) CPUE (1st step)			
	Adjusted R^2 = 0.31 AIC = 3,800 BIC = 4,333		
Source	df (Degree of Freedom)	χ^2 (Chi square) (test statistic)	Probabaility ($>\chi^2$) (*)
Year	21	427.94	0.000
Season	3	→ 8.66	0.034
District	2	27.12	0.000
Season*District	6	→ 10.88	0.092
mesh_size	1	304.78	0.000
Chl	1	→ 4.19	0.041
depth	42	68.21	0.006
Intercept (mean)	1	204.93	0.000

[Note] (*) Yellow maker indicates α ＜0.05 (5%)

Low r2=31%

This model explain only 31% of variance by 7 Covariates

Other 69% are from data errors Uncertainties?

The interaction (season*district) is not significant.
What does it mean?

0 CPUE rate statistically appear same by season*District

➔ same ratios (0.89)

Season*District	Sample size(n=)		
	District		
Season	Chilaw	Kalutara	Negombo
IM1	around 0.89		
IM2			
NE			
SW			

Statistically same 0 CPUE ratios (0.89)

Intercept (mean) is significant what does it mean ?

1st step (delta model using logit model)

E [log{q/(1-q)}] =intercept + Year + Season + Season*Area + mesh + Chl + depth

,where q (zero-CPUE rate) ~Binominal (θ)

According to the famous theoretical statistician (Prof. Shono)
Significance or no significant of intercept
dose not affect the model as it affects its level(value).

Another ANOVA for non 0 CPUE model. model is significant ➔OK

ANOVA (Analysis Of Variance) Table for log normal GLM model to test statistical significances on positive (non zero) nominal CPUE (2nd step)						
Adjusted R^2 = 0.25 AIC = 2,853 BIC = 3,160						
Sources	df1	df2	Type III SS (Sum of Square)	Mean Square	F (test statistic)	Probabaility (>F) (*)
Model	63		512.59	8.14	4.98	0.000
Year	21		175.32	8.35	5.11	0.000
Season	3		18.98	6.33	3.87	0.009
District	2		13.01	6.50	3.98	0.019
*Season*District*	6		46.59	7.77	4.75	0.000
mesh_size	1		151.19	151.19	92.57	0.000
Chl	1		0.01	0.01	0.01	0.938
depth	29		107.48	3.71	2.27	0.000
Error		774	1,264.17	1.63		

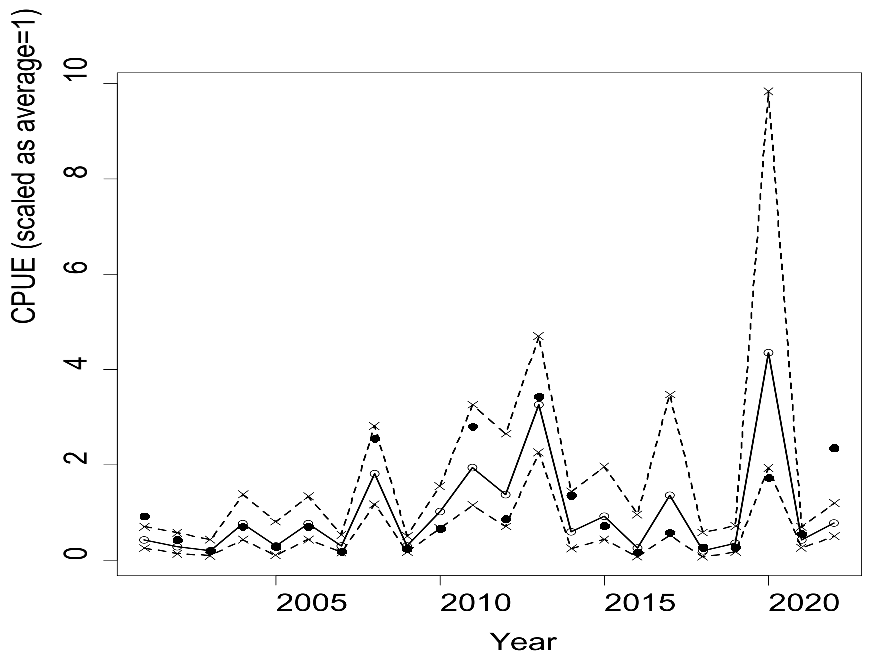
[Note] (*) Yellow maker indicates α ＜0.05 (5%)

Low r2=25%

This model explains only 25% of variance by 7 Covariates

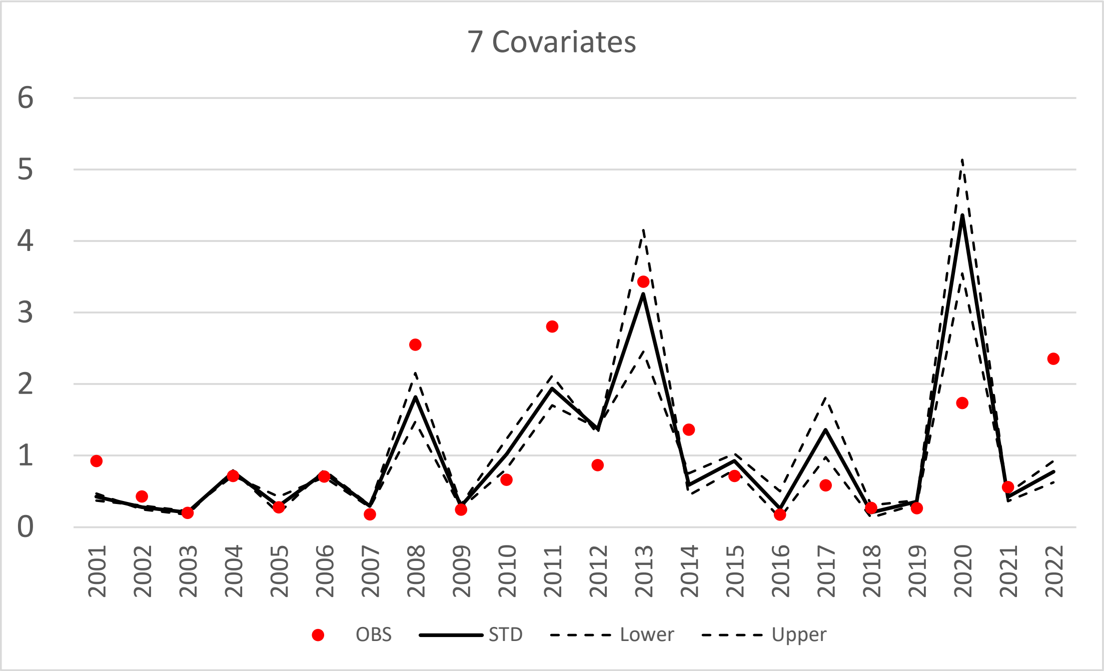
Other 75% are from other errors Uncertainties?

Standardized CPUE



Legend

Point	(•)	: Positive (non-0-zero) nominal CPUE
Line	(o—o)	: Standardized positive (non-0-zero) CPUE (point estimate)
Dotted line	(×—×)	: 95% Confidence intervals



Report file
(Original graph)

Make better graph using excel.
Data are available

Result(data)(IM nominal CPUE)(Delta)

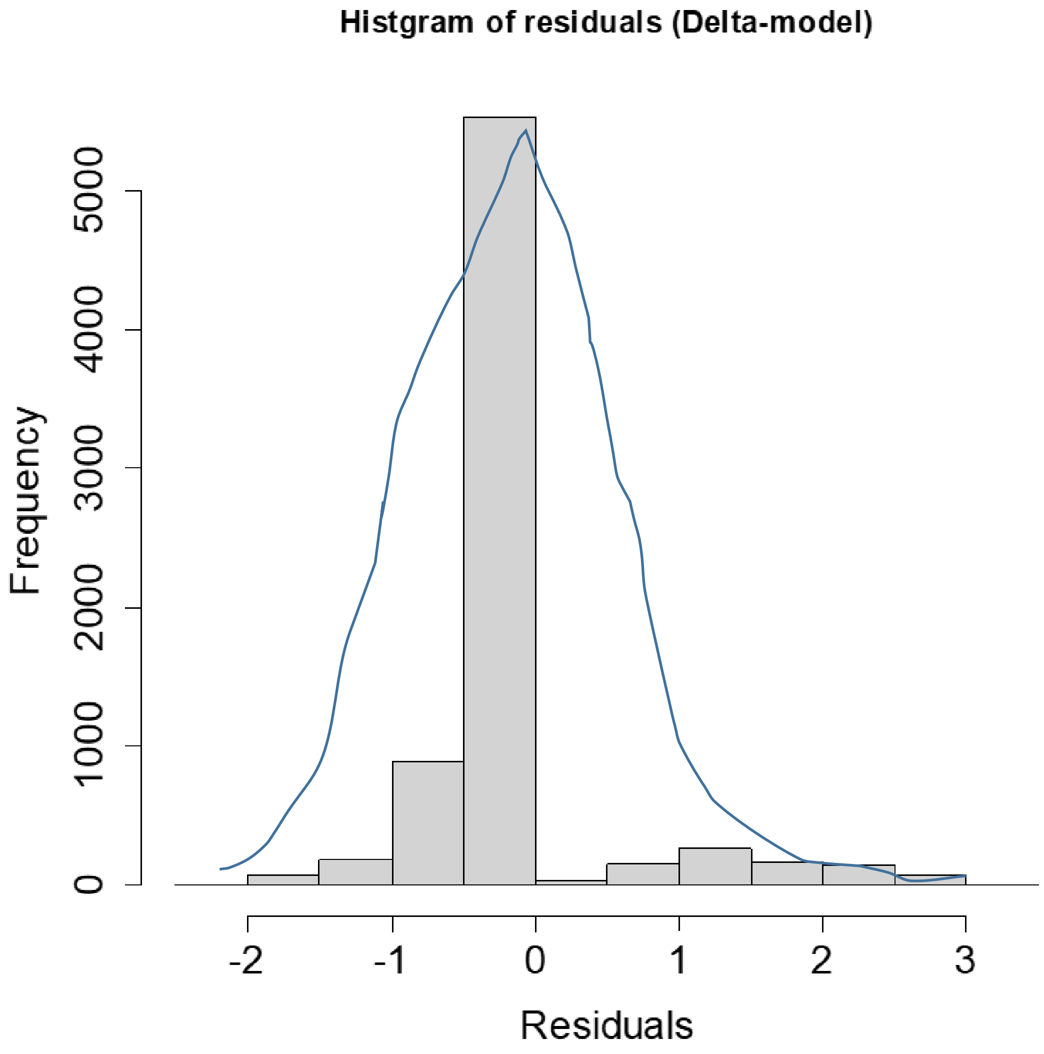
If we use nominal CPUE for JABBA results➔ Very biased➔ CPUE standardization (important)

Model evaluation
(residual analyses : fitness to the model)

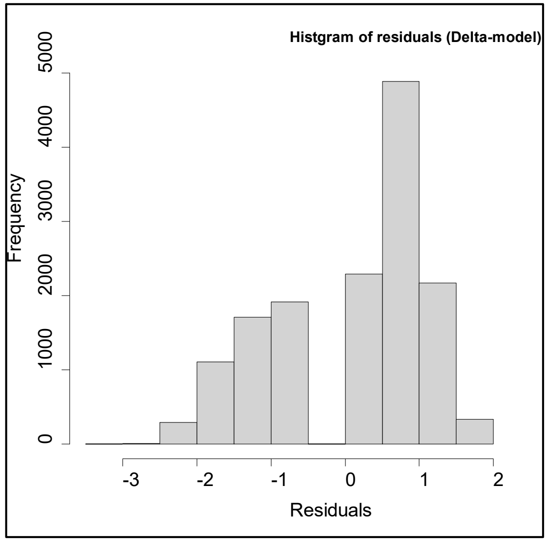
Residual 0 CPUE rate (delta model)

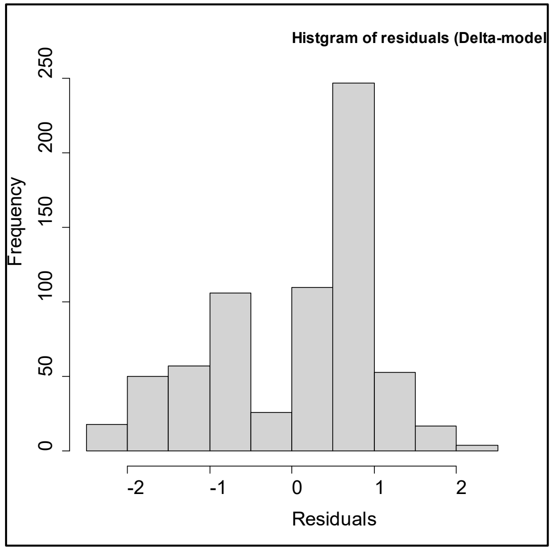
Error distribution : binominal

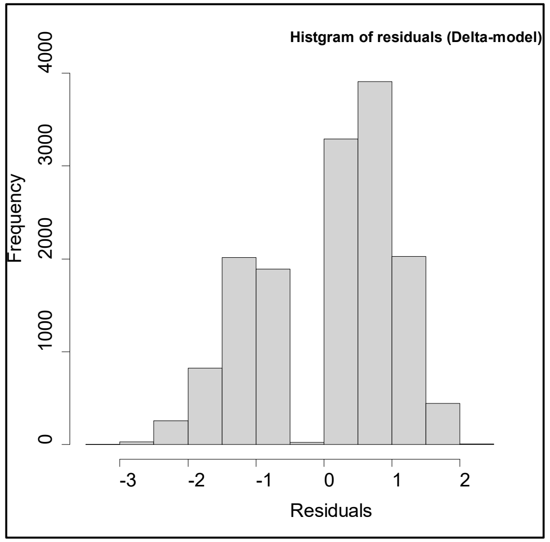
close to normal (bell) shape

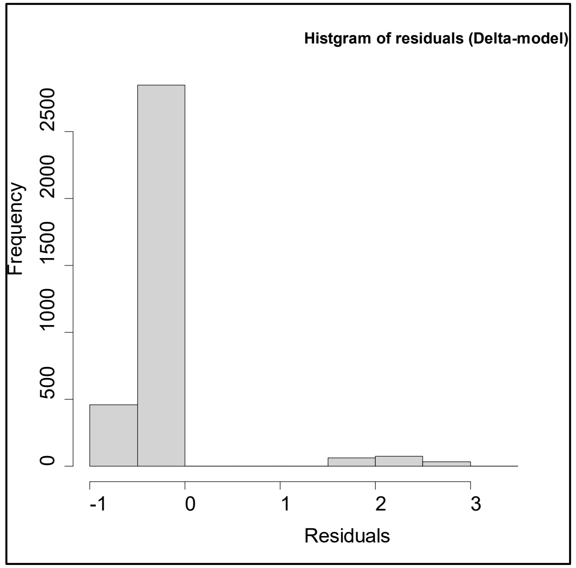


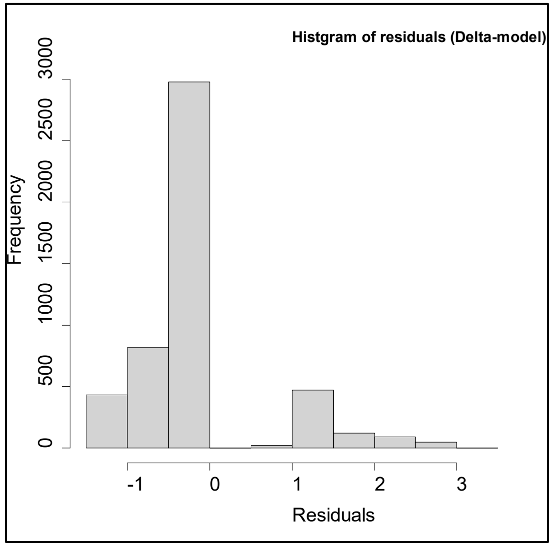
Strange patterns (binominal distribution)
(roughly bell shapes are OK)

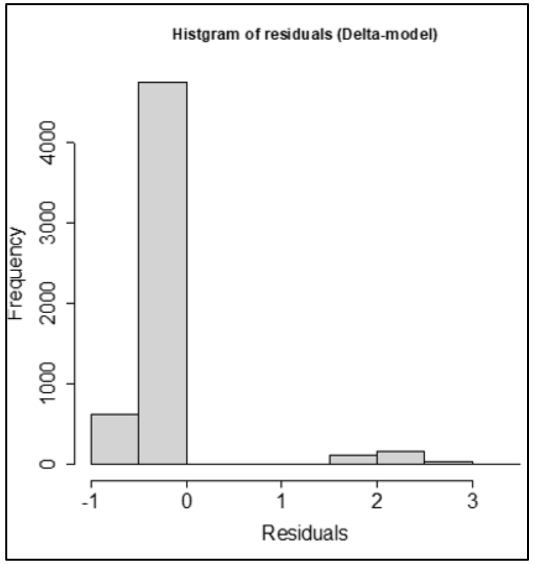










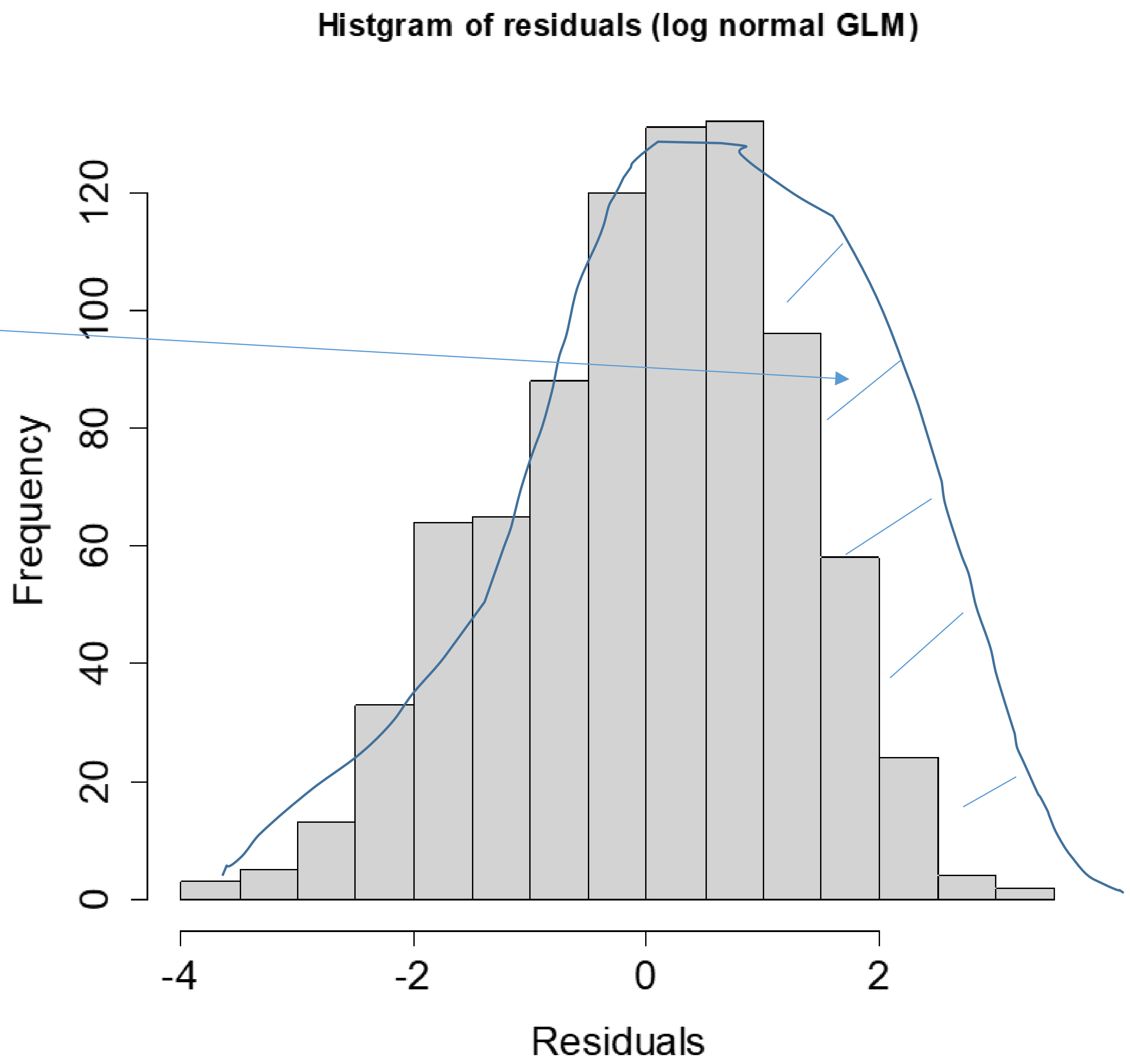


Non 0 CPUE model

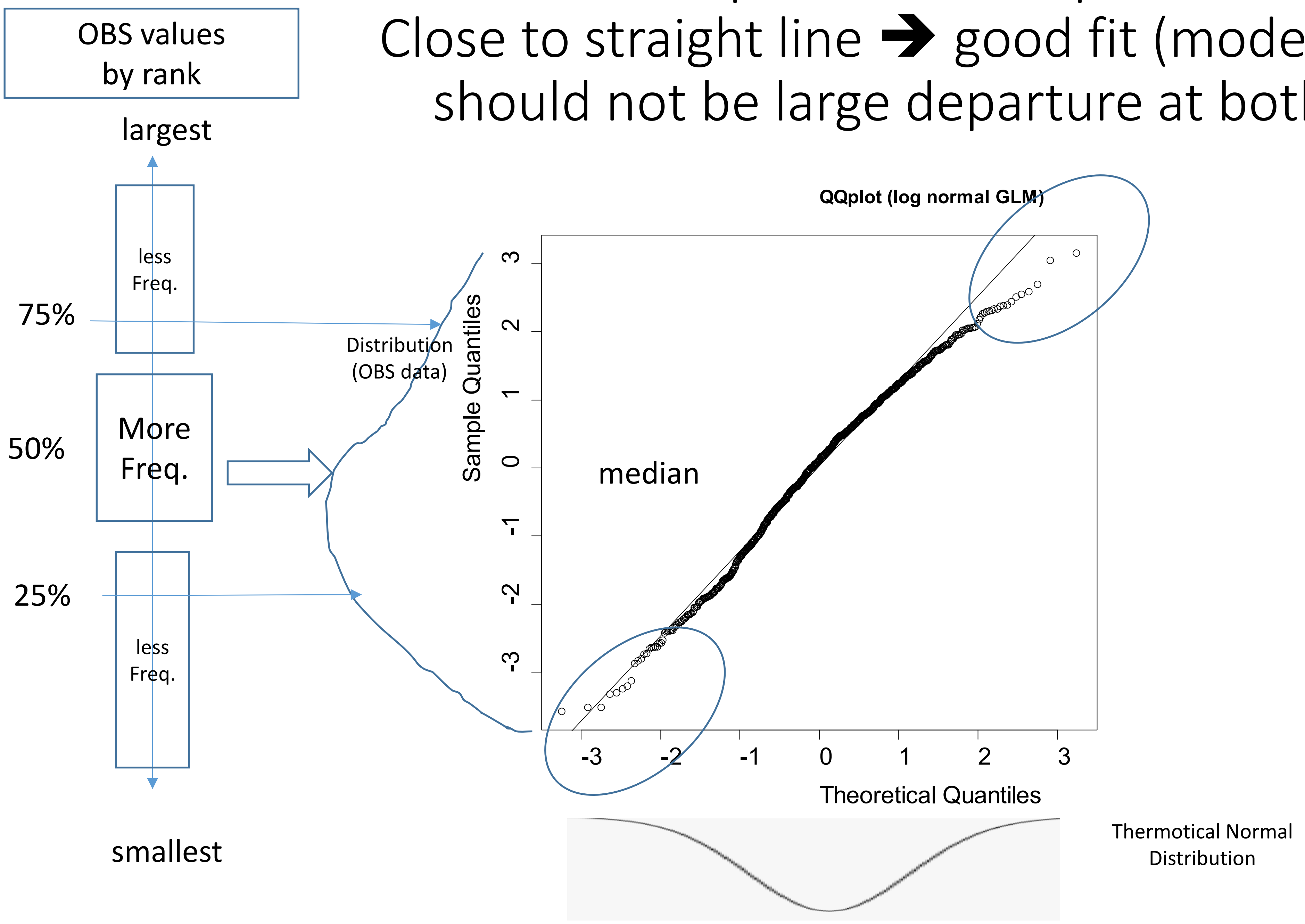
log normal ~ normal distribut

rough bell shape OK
some parts are missing

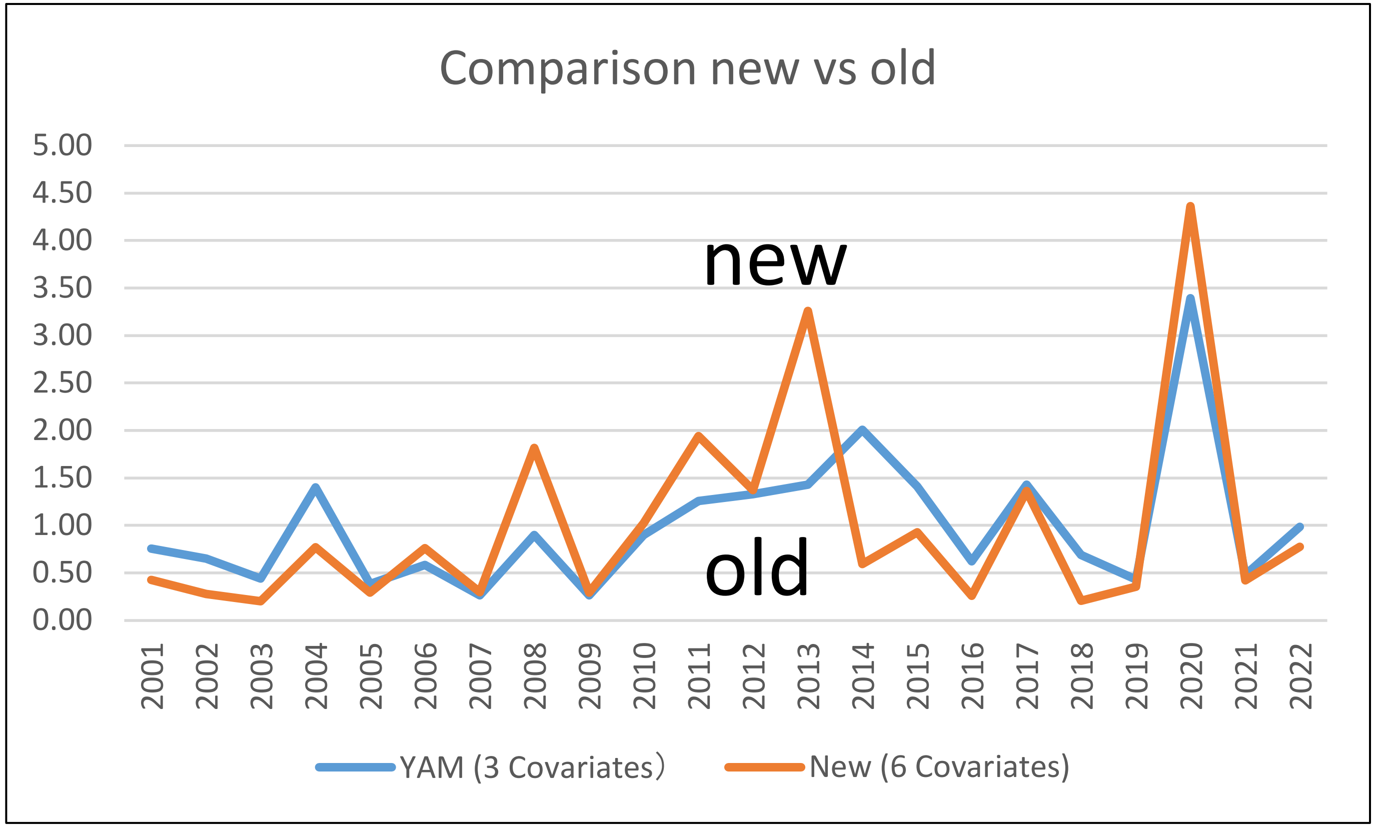
this case OK



QQ plot: Visual inspection
Close to straight line ➔ good fit (model & data) should not be large departure at both ends



Comparisons
between **old model(YQM)** vs **new model (7 Covariate)**



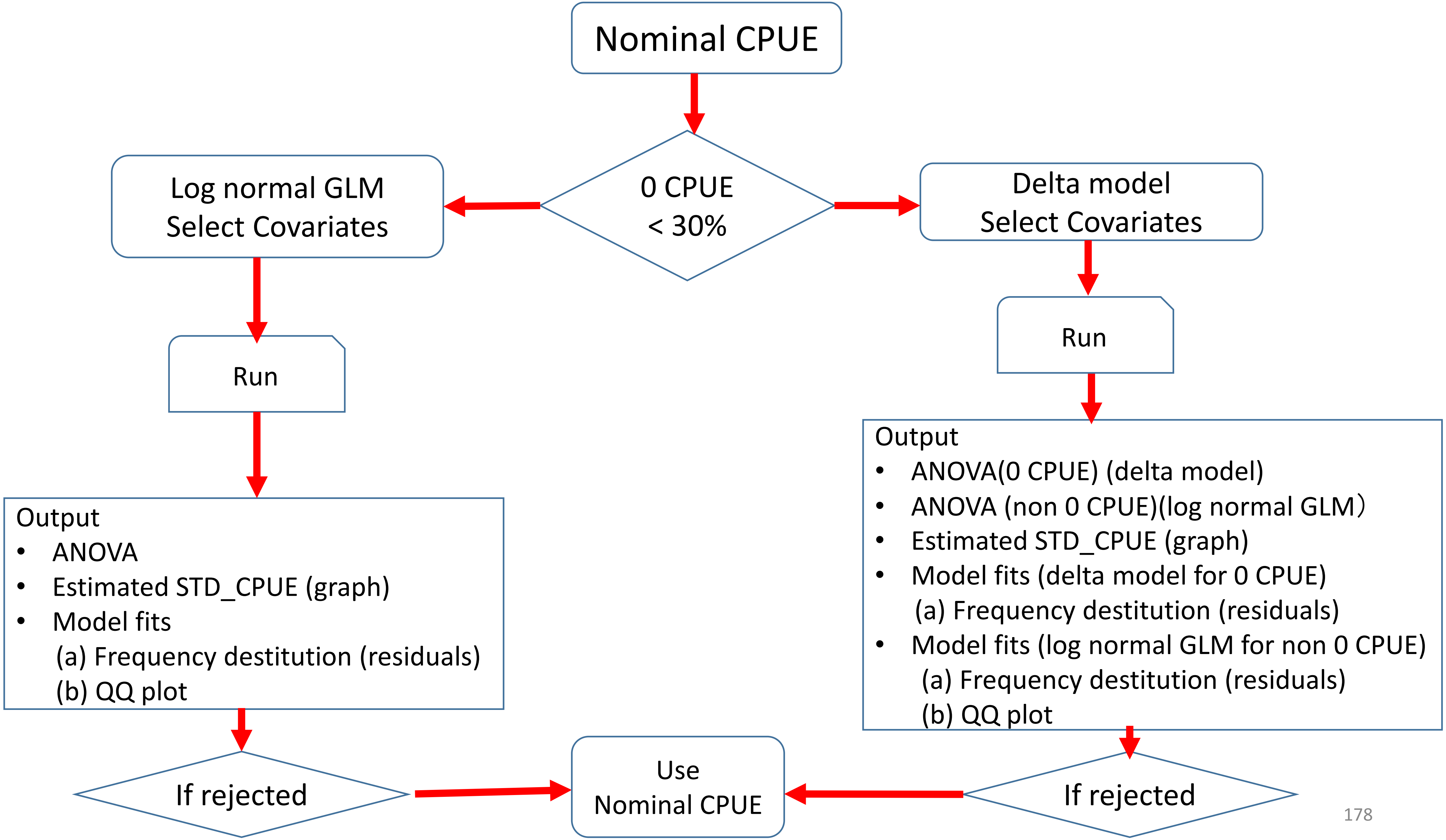
Summary

- 89% 0 CPUE → Delta model
- Zero inflated Delta 2 steps log normal GLM is OK
- 6 Covariates (year, season, district, mesh, Chl & depth) works OK
- Significant Covariates affecting nominal CPUE

  for 0 CPUE rate → Mesh size & year

  for non 0 CPUE → Mesh size (absolutely strong)

  (old) (3 Covariates) District →different


Nominal CPUE
0 CPUE
< 30%
Log normal GLM
Select Covariates
Delta model
Select Covariates
Run
Run
Output
• ANOVA
• Estimated STD_CPUE (graph)
• Model fits
(a) Frequency destitution (residuals)
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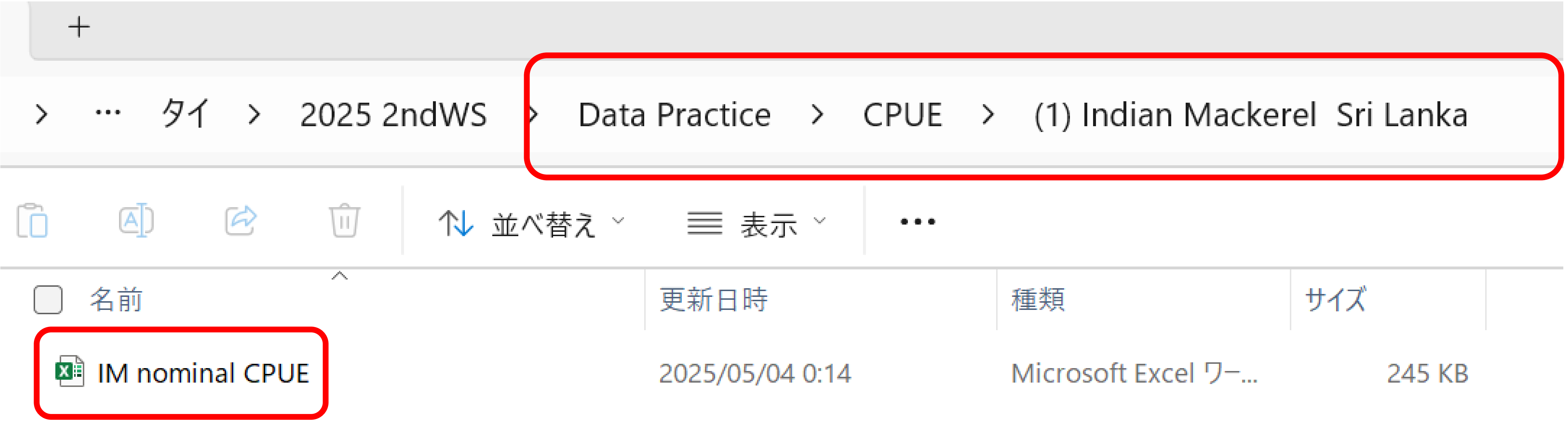
Output
• ANOVA(0 CPUE) (delta model)
• ANOVA (non 0 CPUE)(log normal GLM)
• Estimated STD_CPUE (graph)
• Model fits (delta model for 0 CPUE)
(a) Frequency destitution (residuals)
• Model fits (log normal GLM for non 0 CPUE)
(a) Frequency destitution (residuals)
(b) QQ plot
If rejected
Use
Nominal CPUE
If rejected

Practice IM (Sri Lanka) (by yourself)



Practice for Log normal GLM

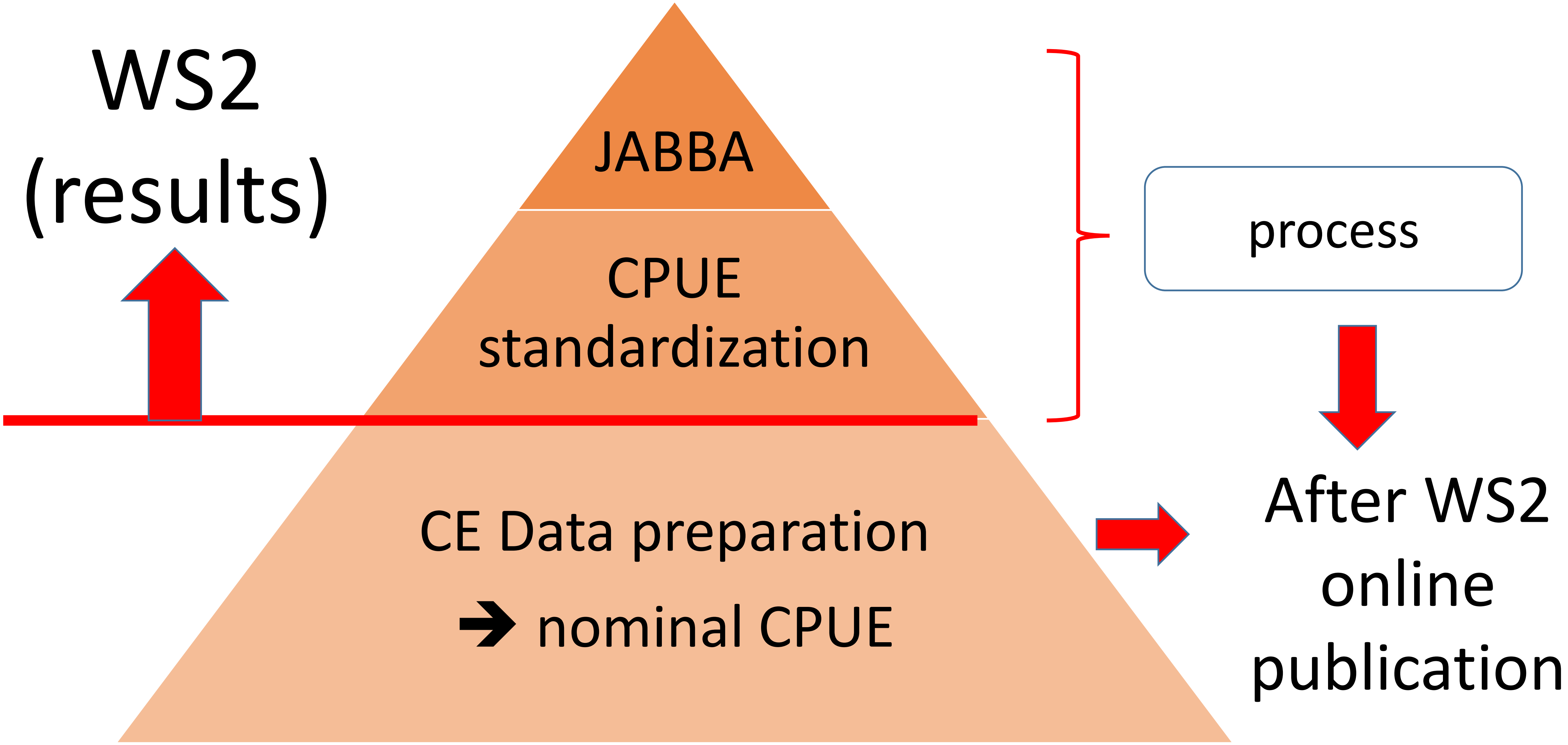
- In each WG (SM & Demersal)

Program

1. General session
   - 1.1 Introduction
     - (1) JABBA
     - (2) New CPUE standardization
   - 1.2 Demo + Practice
     - (1) JABBA
     - (2) CPUE standardization
     - (3) Data process
2. WG session
   - 2.1 Demersal WG
   - 2.2 Short mackerel WG
   - 2.3 Carp WG
3. Homework (Presentation & submission)
4. Sum-up session
   - 4.1 Review, Summary & Recommendation
   - 4.2 Future plan

(3) Demo & Practice for Data process

To be conducted later
after WS2 by online (ZOOM)


WS2
(results)
JABBA
CPUE
standardization
CE Data preparation
➔ nominal CPUE
process
After WS2
online
publication

Program

1. General session
    - 1.1 Introduction
        - (1) JABBA
        - (2) New CPUE standardization
    - 1.2 Demo + Practice
        - (1) JABBA
        - (2) CPUE standardization
        - (3) Data process
2. WG session
    - 2.1 Demersal WG
    - 2.2 Short mackerel WG
    - 2.3 Carp WG
3. Homework (Presentation & submission)
4. Sum-up session
    - 4.1 Review, Summary & Recommendation
    - 4.2 Future plan

Homework

To be explained in each WG

Program

1. General session
    - 1.1 Introduction
        - (1) JABBA
        - (2) New CPUE standardization
    - 1.2 Demo + Practice
        - (1) JABBA
        - (2) CPUE standardization
        - (3) Data process
2. WG session
    - 2.1 Demersal WG
    - 2.2 Short mackerel WG
    - 2.3 Carp WG
3. Homework (Presentation & submission)
4. Sum-up session (Day 5)
    - 4.1 Review, Summary & Recommendation
    - 4.2 Future plan

DAY 1 Summary
(need practice)

JABBA (technical & process)

If good CPUE➔ GOOD results (quick)

If CPUE NG ➔ results long time and NG

⇩

Remove big outliers before JABBA ➔ quicker (Good results)

New CPUE standardization

Additional 4 Covariates (ENV, categories…..)

⇩

Practical & useful