Rapid Assessments - Risk & Fisheries

TOWARDS DEVELOPMENT OF FISHERIES MANAGEMENT PLAN

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RAPID ASSESSMENTS FOR MANAGEMENT

(1) Risk based approaches are designed to handle data poor situations –have been developed in Australia and then applied by the Marine Stewardship Council (MSC)

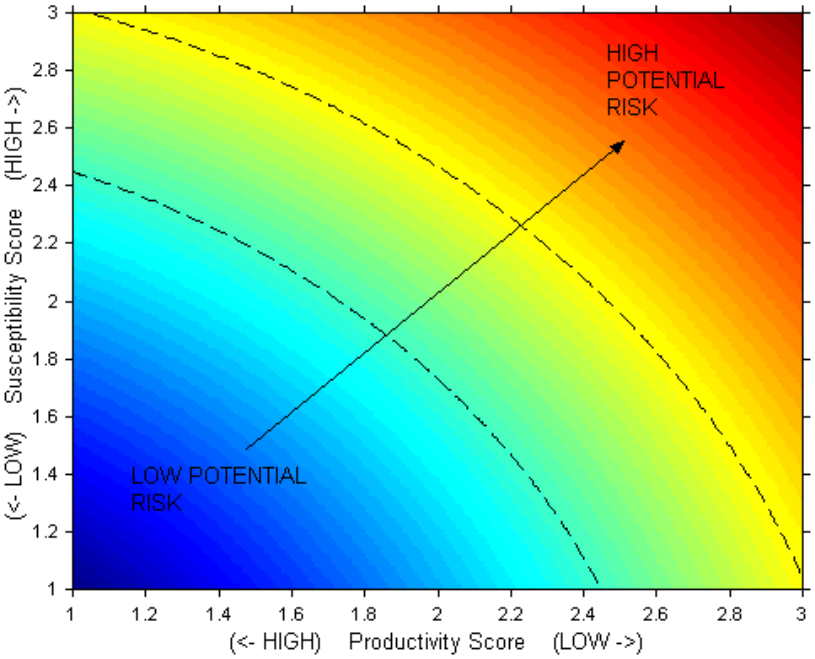
(2) Fisheries Assessment evaluate fisheries against performance standards to help focus and guide management responses. It adopted from MSC Benchmarking Standard methodology.

Combining these approaches;

- There is much value for an EAFM, i.e. An integrated approach, and helps implement the FAO Code of Conduct for Responsible Fisheries (CCRF)
- Cost Effective, Flexible and Relevant to management.

(2)

(1). RISK ASSESSMENT: PRODUCTIVITY & SUSCEPTIBILITY ANALYSIS (PSA)



Source: Hobday et al., 2007

Examines for each species:

- Seven attributes under <u>productivity</u>

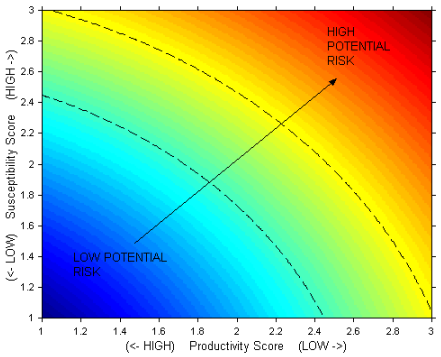
{1. age at maturity, 2. Max. Age, 3. Fecundity, 4. Max. Size, 5. Size at maturity, 6. Reproductive strategy. 7. Trophic level}

- Four attributes of the different aspects under <u>susceptibility</u> (~ q)

{1. Availability, 2. Encounterability 3. Selectivity, 4. Post capture mortality}

=> Risk level for the species

(1). RISK ASSESSMENT: PRODUCTIVITY & SUSCEPTIBILITY ANALYSIS (PSA)

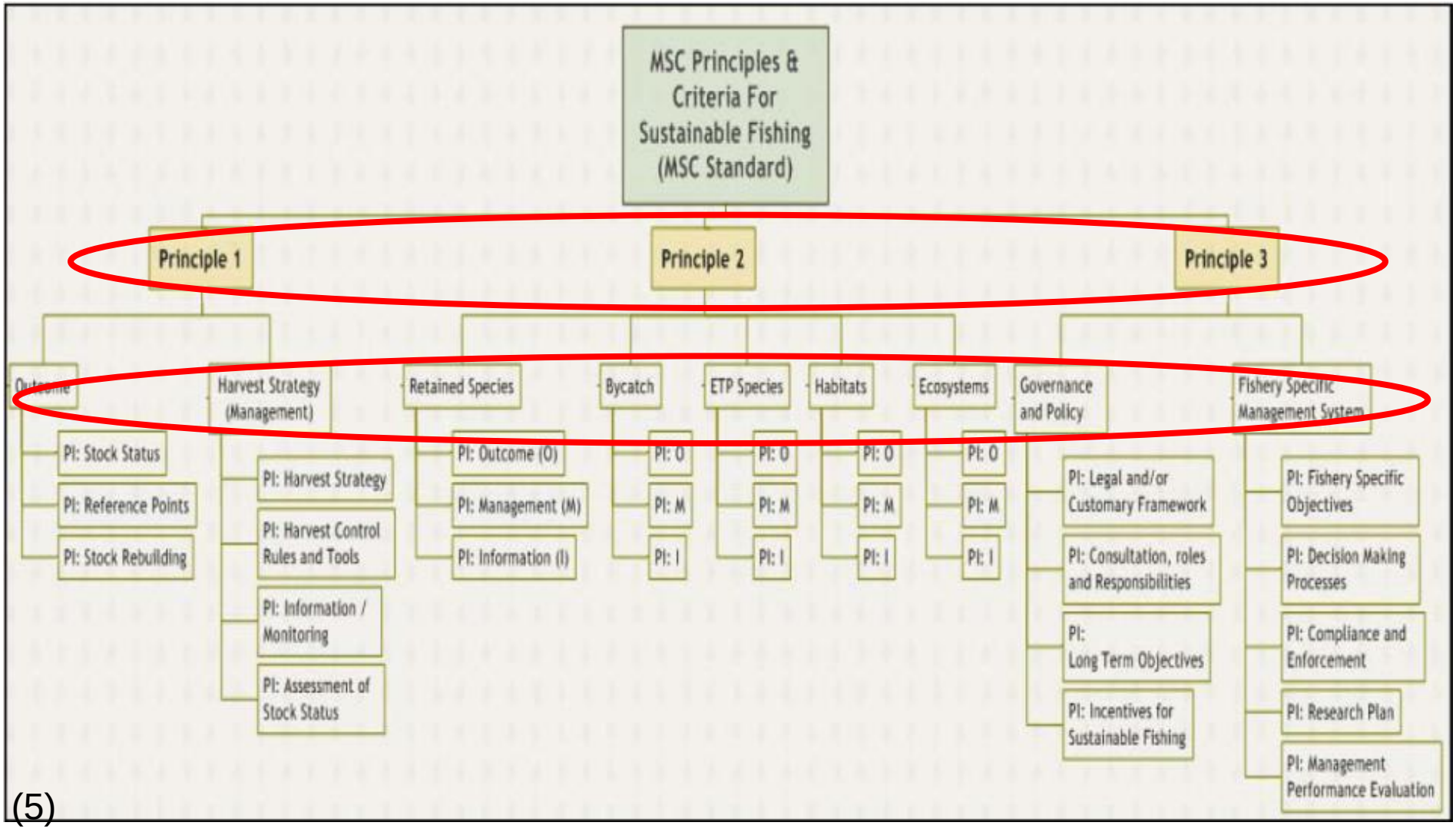


Intepretation of the results:

- The results measure the potential risk from direct impacts of fishing on the fish species in terms of potential to be stock overfished or experiencing overfishing.
- Impacts from other anthropogenic factors such as pollution, climate change, habitat lost etc. are not included.
- PSA helps managers to determine whether existing management measures and regulations were appropriate, and
- Identify appropriate effort of specific data collection for this complex multi-species fishery.

(2). FISHERIES ASSESSMENT:

(MSC PRE-ASSESSMENT –ASSESSING EAF PERFORMANCE & SETTING WORKABLE GOALS)



(2). FISHERIES ASSESSMENT

The 3 MSC Principles (in response to EAF)

Principle 1 (Stock Status)	A fishery must be conducted in a manner that does not lead to over-fishing or depletion of the exploited populations and, for those populations that are depleted, the fishery must be conducted in a manner that demonstrably leads to their recovery.
Principle 2 (Ecosystem Impacts)	Fishing operations should allow for the maintenance of the structure, productivity, function and diversity of the ecosystem (including habitat and associated dependent and ecologically related species) on which the fishery depends
Principle 3 (Fisheries Management)	The fishery is subject to an effective management system that respects local, national and international laws and standards and incorporates institutional and operational frameworks that require use of the resource to be responsible and sustainable.

(2). FISHERIES ASSESSMENT

Principles 1:
A fishery must be conducted in a manner that does not lead to over-fishing or depletion of the exploited populations and, for those populations that are depleted, the fishery must be conducted in a manner that demonstrably leads to their recovery.

Performance Indicator/ Criterion	Details	Status Weak/Inter./Good
1.1 : Outcome		
1.1.1 : The Stock	-the stock allow recruitment to take place -the stock is around its target ref. point	If unknown:
1.1.2 : Reference Points	-the ref. point is can be est., allow reproductive capacity & consistence with BMSY	- do TAC, PSA, Kobe Plot, etc.
1.2 : Harvest Strategy		
1.2.1 : Harvest Strategy	-Towards achieving management objectives, (tested) & monitored.	
1.2.2 : Harvest Control –Rules & Tools	-well define & in place, is appropriate / effective in achieving levels required	
1.2.3 : Information Monitoring	-Info. on stock (structure, productivity), fleet & other are available to support 1.2.1	
1.2.4 : Assessment of Stock Status	-assessment evaluating stock status relative to ref. points (subject to peer review)	

(2). FISHERIES ASSESSMENT

Principle 2 :
Fishing operations should allow for the maintenance of the structure, productivity, function and diversity of the ecosystem (including habitat and associated dependent and ecologically related species) on which the fishery depends

Performance Indicator/ Criterion	Details	Status Weak/Inter/Good
2.1 Retained Species		
2.1.1 Stock Status	-within biological limits, allow recovery	If unknown:
2.1.2 Management Strategy	-strategy in place for managing by-catch -Information on strategy that implemented	- do TAC, PSA, Kobe Plot, etc
2.1.3 Information/ monitoring	-Information is adequate to support a partial strategy to manage main retained species.	
2.2 By-catch Species	-By-catch sp. arey likely within biological limit.	
2.3 ETP Species	-Direct effects are highly unlikely to create unacceptable impacts to ETP species.	
2.4 Habitat	-The fishery unlikely to reduce habitat structure and function	
2.5 Ecosystem (Comm., trophic impacts etc)	-fishery is unlikely to disrupt the key elements underlying ecosystem structure and function	

(2). FISHERIES ASSESSMENT

Principle 3:
The fishery is subject to an effective management system that respects local, national and international laws and standards and incorporates institutional and operational frameworks that require use of the resource to be responsible and sustainable.

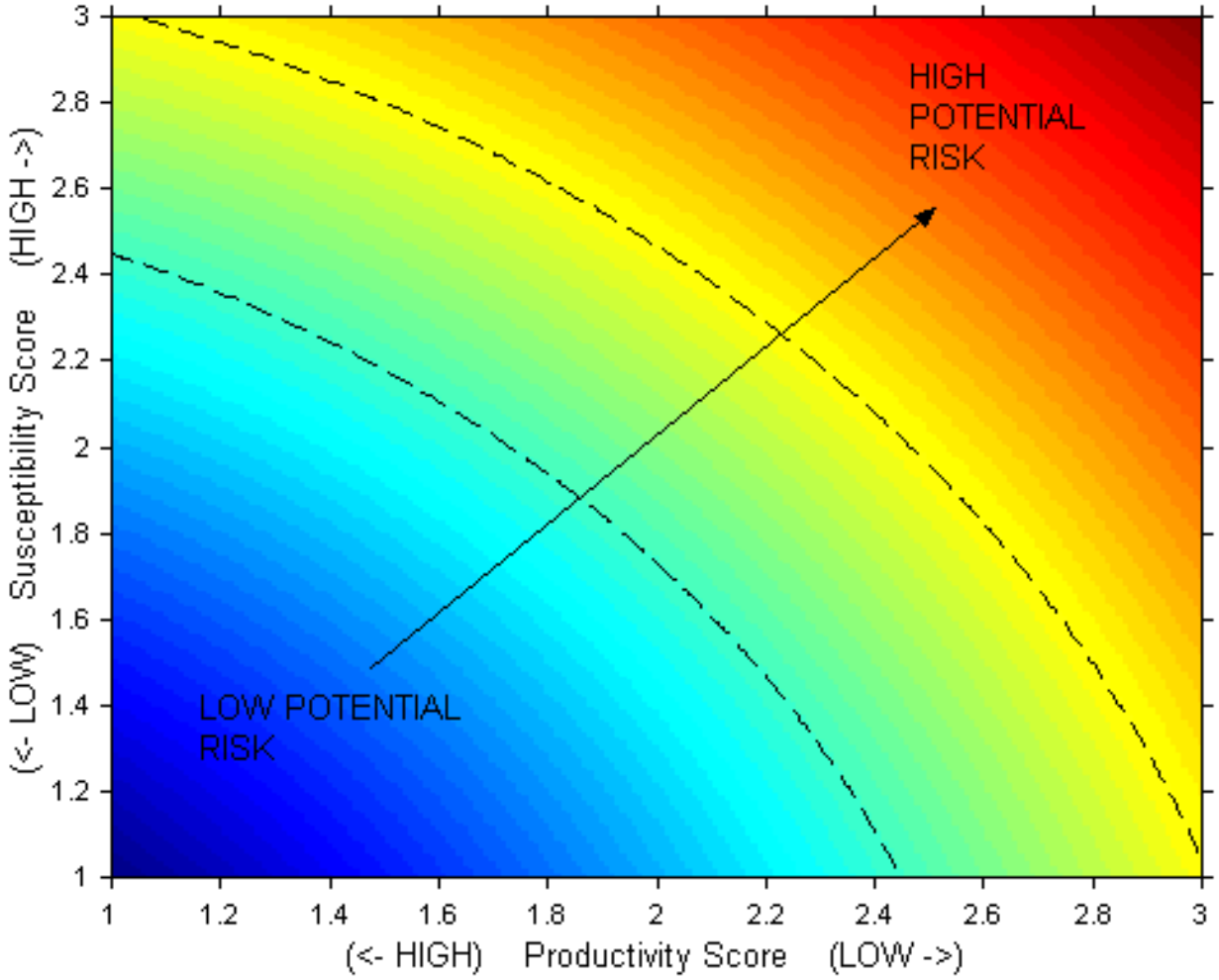
Performance Indicator/ Criterion	Details	Status Weak/Inter/Good
3.1 Governance and policy	ref. to PAFM, EAFM and PSA measures?	
3.1.1 Legal and/or customary framework	consistent with local, national & I/national laws	
3.1.2 Consultation, roles & responsibilities		
3.1.3 Long term objectives	have clear long-term obj.	
3.1.4 Incentives for sustainable fishing	system provide economic & social incentives	
3.2 Fishery-specific management system		
3.2.1 Fishery- specific objectives		
3.2.2 Decision-making processes		
3.2.3 Compliance & enforcement		
3.2.4 Research plan	Results are avail. to all?	
3.2.5 Management performance evaluation	Peer review structure?	

(2). FISHERIES ASSESSMENT

The out-comes: Summary scores of the 3 principles

Indian Mackerel																																
Unit of Assessment		Principle 1: Stock status							Principle 2: Ecosystem impacts														Principle 3: Governance & Management									
		Outcome			*Harvest strategy*				*Retained*			*Bycatch*			*ETP*			*Habitat*			*Ecosystem*			*Governance & Policy*				*Fishery specific man.*				
Spp	Gear	1.1.1. Stock status	1.1.2. Reference points	1.1.3. Stock rebuilding if necessary	1.2.1. Performance of Harvest Strategy	1.2.2. Harvest control rules and tools	1.2.3. Information and monitoring	1.2.4. Assessment	2.1.1. Retained status	2.1.2. Retained management	2.1.3. Retained info / monitoring	2.2.1. Discards status	2.2.2. Discards management	2.2.3. Discards info / monitoring	2.3.1. ETP status	2.3.2. ETP management	2.3.3. ETP info / monitoring	2.4.1. Habitat status	2.4.2. Habitat management	2.4.3. Habitat: info / monitoring	2.5.1. Ecosystem status	2.5.2. Ecosystem strategy	2.5.3. Ecosystem info / monitoring	3.1.1. Legal customary framework	3.1.2. Consultation, roles & responsibilities	3.1.3. Long-term objectives	3.1.4. Incentives for sustainable fishing	3.2.1. Fishery-specific objectives	3.2.2. Decision-making processes	3.2.3. Compliance & enforcement	3.2.4. Research plan	3.2.5. Management performance evaluation
I. mackerel	Purse seine	0	0	n/a	0	0	1	0	1	0	2	2	2	1	0	1	1	2	2	2	1	1	1	2	2	2	1	0	0	1	0	1
I. mackerel	Btm otter trawl	0	0	n/a	0	0	1	0	0	0	2	2	2	1	0	1	2	0	1	2	0	0	1	2	2	2	1	0	0	1	0	1
I. mackerel	Gill nets	0	0	n/a	0	0	1	0	0	0	2	2	2	1	0	1	1	2	2	1	1	1	1	2	2	2	1	0	0	1	0	1

(1). RISK ASSESSMENT: PRODUCTIVITY & SUSCEPTIBILITY ANALYSIS (PSA)



(1). RISK ASSESSMENT: PRODUCTIVITY & SUSCEPTIBILITY ANALYSIS (PSA)

Two case studies on Small Pelagic

A). Indian Mackerel – multi gears

- (BOBLME project report)

B). Purse-seine Fishery – multi species

- (West Coast Peninsular Malaysia, FAO W/shop)

PELAGIC FISHES:
PERCENTAGE CONTRIBUTION OF LANDINGS BY GEAR TYPE

Case study (B)

Fishery on the West Coast of Peninsular Malaysia: Percentage contribution by gear, >10% is co

ISSCAAP Code	Family Name	Scientific Name	Valid Common Name	Contribution (%)		
				Trawler	P-seiner	Drift/Gill
24	CLUPEIDAE	*Pellona ditchela*	Indian pellona	31	**51**	18
		Ilisha elongata	Elongate ilisha	22	**44**	34
	SIGANIDAE	*Siganus argenteus*	Streamlined spinefoot	43	**8***	3*
	LEIOGNATHIDAE	*Leiognathus splendens*	Splendid ponyfish	23	**12**	64
		Leiognathus bindus	Ornate ponyfish	23	**12**	64
		Secutor rucornis	Deep pugnose ponyfish	23	**12**	64
		Gazza minuta	Toothpony	23	**12**	64
34	CARANGIDAE	*Parastromateus niger*	Black pomfret	74	**2***	22
		Alepes djedaba	Shrimp scad	33	**62**	4*
		Alepes melanoptera	Blackfin scad	33	**62**	4*
		Atropus atropos	Cleftbelly trevally	33	**62**	4*
		Atule mate	Yellowtail scad	18	**80**	2*
		Decapterus macrosoma	Shortfin scad	3*	**97**	
		Decapterus maruadsi	Japanese scad	3*	**97**	
		Megalaspis cordyla	Torpedo scad	43	**52**	6*
		Gnathanodon speciosus	Golden trevally	16	**84**	
		Selar boops	Oxeye scad	37	**63**	
		Selar crumenophthalmus	Bigeye scad	37	**63**	
		Selaroides leptolepis	Yellowstripe scad	82	**18**	
	SPHYRAENIDAE	*Sphyraena jello*	Pickhandle barracuda	85	**1***	5*
35	CLUPEIDAE	*Sardinella gibbosa*	Goldstripe sardinella	50	**46**	
		Sardinella fimbriata	Fringescale sardinella	50	**46**	
		Dussumieria acuta	Rainbow sardine	15	**85**	
		Dussumieria elopsoides	Slender rainbow sardine	15	**85**	
		Escualosa thoracata	White sardine	17	**81**	2*
	ENGRAULIDAE	*Coilia dussumieri*	Goldspotted grenadier anch	3*	**4**	
		Stolephorus indicus	Indian anchovy	3*	**4**	
		Stolephorus commersonii	Commerson's anchovy	3*	**4**	
36	SCOMBRIDAE	*Thunnus tonggol*	Longtail tuna	8*	**91**	1*
		Euthynnus affinis	Eastern little tuna	1*	**99**	
		Scomberomorus commerson	Narrowbarred spanish mack	34	**5**	60
		Scomberomorus guttatus	Indo-pacific king mackeral	34	**5**	60
		Rastrelliger kanagurta	Indian mackerel	32	**66**	2*
		Rastrelliger brachysoma	Short mackerel	18	**43**	39
	TRICHIURIDAE	*Trichiurus lepturus*	Largehead hairtail	80	**17**	1*

Case study (A)

TABLE 1: PRODUCTIVITY ATTRIBUTES AND SCORES

Productivity attributes	Low productivity (high risk) Score : 3	Med productivity (medium risk) Score : 2	High productivity (low risk) Score : 1
1. Avg. age at maturity	>15 years	5 - 15 years	<5 years
2. Avg. max. age	>25 years	10 - 25 years	<10 years
3. Fecundity	<100 eggs /year	100 - 20,000 eggs/yr	>20,000 eggs/year
4. Avg. max. size	>300 cm	100 - 300 cm	<100 cm
5. Avg. size at maturity	>200 cm	40 - 200 cm	<40 cm
6. Reproductive strategy	Live bearer	Demersal egg layer	Broadcast spawner
7. Trophic level	>3.25	2.75 - 3.25	<2.75

TABLE 2: SUSCEPTIBILITY ATTRIBUTES AND SCORES

Susceptibility attribute	Low susceptibility (low risk), Score 1	Medium susceptibility (medium risk), 2	High susceptibility (high risk), score 3
1. Availability – overlap of species range with fishery	<10% overlap	10-30% overlap	>30% overlap
2.Encounterability – Habitat and depth check	Low overlap with fishing gear	Medium overlap with fishing gear	High overlap with fishing gear
3. Selectivity (varies per gear type)	< mesh size, or >5m in length	1-2 times mesh size, or 4-5m in length	>2 times mesh size or up to 4m in length
4. Post capture mortality	Evidence of post capture release and survival	Released alive	Retained spp. or majority dead when released

(1). RISK ASSESSMENT: PRODUCTIVITY & SUSCEPTIBILITY ANALYSIS (PSA)

A). Indian Mackerel

(Andaman Sea: *Indonesia, Malaysia, Myanmar & Thailand*)

PSA: INDIAN MACKEREL, BOBLME

Indian mackerel (target species) - key productivity

Attribute	Indian mackerel	Risk level
1. Av. age at maturity	6 months – 1 year	Low (1)
2. Av. maximum age	4 years	Low (1)
3. Fecundity	22,000-94,000	Low (1)
4. Av. maximum size	35 cm	Low (1)
5. Av. size at maturity	18 - 19 cm	Low (1)
6. Reproductive strategy	Broadcast spawner	Low (1)
7. Trophic level	3.19	Medium (2)

		ductivity m risk) e : 2	High productivity (low risk) Score : 1
		ars	<5 years
		ears	<10 years
		000	>20,000 eggs/year
4. Avg. max. size	>300 cm	100 - 300 cm	<100 cm
5. Avg. size at maturity	>200 cm	40 - 200 cm	<40 cm
6.Reproducti vestrategy	Live bearer	Demersal egg layer	Broadcast spawner
7. Trophic level	>3.25	2.75 - 3.25	<2.75

Source: FishBase

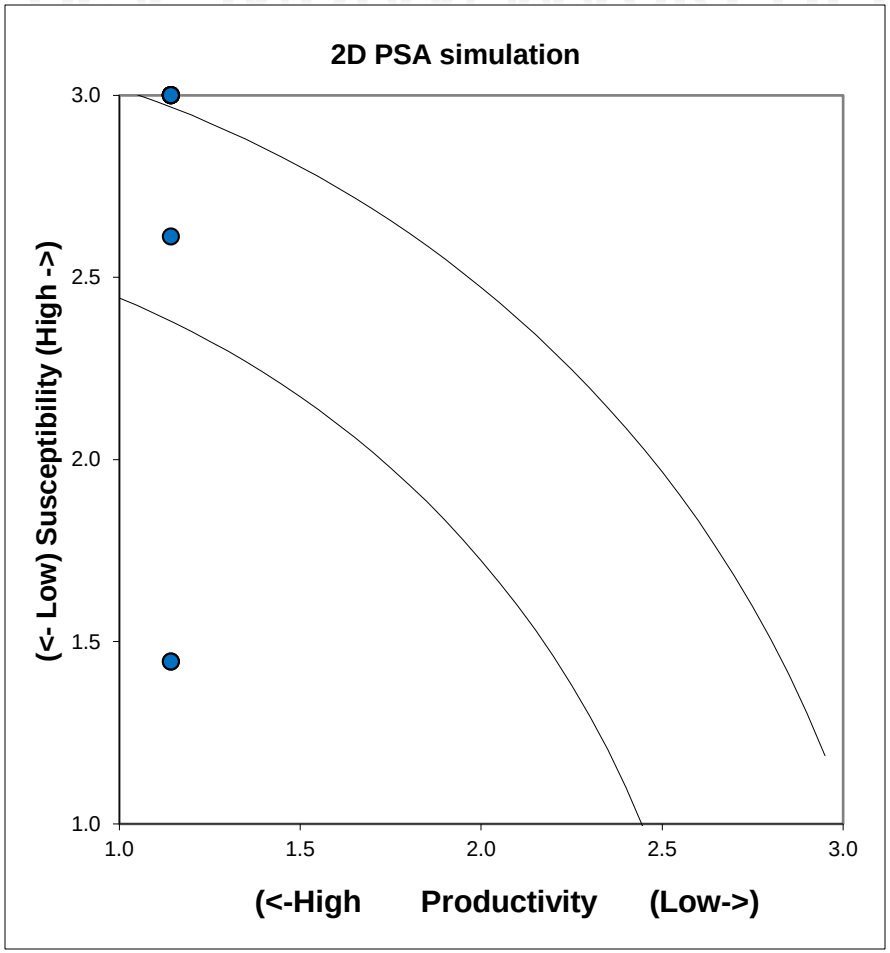
PSA: INDIAN MACKEREL (TARGET SP.), BOBLME

	ATTRIBUTE SCORE	RISK
	1	LOW
	2	MED
	3	HIGH

	RISK	Overall Risk (2D)	
	HIGH	>3.18	3.18
	MED	>2.64	2.64
	LOW	>1.41	

		PRODUCTIVITY									SUSCEPTIBILITY						OVERALL RISK VALUE		
Country	Fishing Gear	Average age at maturity	Average max age	Fecundity	Average Max size	Average size at maturity	Reproductive strategy	Trophic level	Total Productivity		Availability	Encounterability	Selectivity	Post-capture Mortality	Total Susceptibility		PSA Score	Risk category	MSC score
Indonesia	Purse seine	1	1	1	1	1	1	2	1.14		3	3	3	3	3.00		3.21	High	60-80
	Bottom Otter trawl	1	1	1	1	1	1	2	1.14		3	3	3	3	3.00		3.21	High	<60
	Gill Nets	1	1	1	1	1	1	2	1.14		1	2	3	3	1.44		1.84	Low	<60
Malaysia	Purse seine	1	1	1	1	1	1	2	1.14		3	3	3	3	3.00		3.21	High	60-80
	Bottom Otter trawl	1	1	1	1	1	1	2	1.14		3	3	3	3	3.00		3.21	High	60-80
	Gill Nets	1	1	1	1	1	1	2	1.14		1	2	3	3	1.44		1.84	Low	<60
Thailand	Purse seine	1	1	1	1	1	1	2	1.14		3	3	3	3	3.00		3.21	High	>80
	Bottom Otter trawl	1	1	1	1	1	1	2	1.14		3	3	3	3	3.00		3.21	High	80
Myanmar	Purse seine	1	1	1	1	1	1	2	1.14		3	3	3	3	3.00		3.21	High	<60
	Bottom Otter trawl	1	1	1	1	1	1	2	1.14		3	3	3	3	3.00		3.21	High	<60
		1	1	1	1	1	1	2	1.143	#	2.5	2.8	3	3	2.61		2.85	Med	

PSA: INDIAN MACKEREL (TARGET SP.), BOBLME



The PSA Plot for Indian mackerel caught by three types of gear in the Andaman Sea

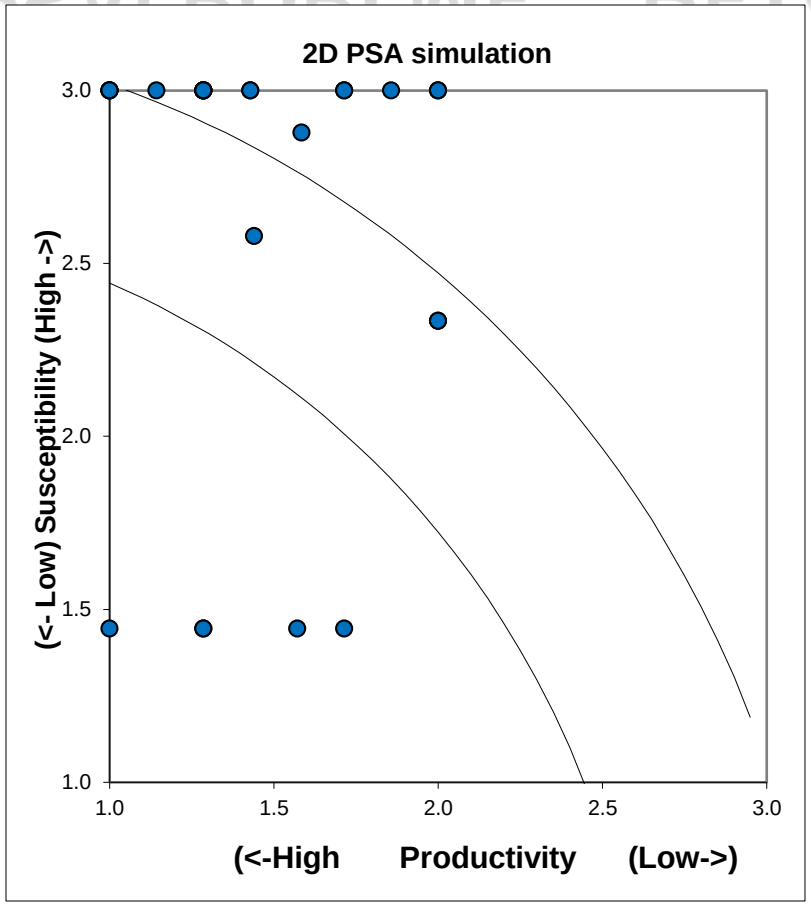
PSA Plot for **Indian mackerel**
Total risk = 2.85 (medium to high risk)
Low risk: Gill nets
High risk: Trawl

Note:
High risk = >3.18 score
Medium risk = >2.64 score
Low risk = >1.41

PSA: RETAINED SPECIES, BOBLME

		PRODUCTIVITY								SUSCEPTIBILITY					O/ALL RISK VALUES	
Gear	Fish name	Average age at maturity	Average max age	Fecundity	Average Max size	Average size at maturity	Reproductive strategy	Trophic level	Total Productivity	Availability	Encounterability	Selectivity	Post-capture Mortality	Total Susceptibility	PSA Score	Risk category
Purse seine	Indo-pacific mackerel	1	1	1	1	1	1	1	1.00	3	3	3	3	3.00	3.16	Med
	Skipjack tuna	2	2	2	2	2	1	3	2.00	2	3	3	3	2.33	3.07	Med
	Longtail tuna	2	2	2	2	2	1	3	2.00	3	3	3	3	3.00	3.61	High
	Frigate tuna	1	1	2	1	1	1	3	1.43	3	3	3	3	3.00	3.32	High
	Bigeye tuna	2	2	2	2	2	1	3	2.00	2	3	3	3	2.33	3.07	Med
	Eastern little tuna	2	2	2	2	2	1	3	2.00	3	3	3	3	3.00	3.61	High
	Yellowfin tuna	2	1	2	2	2	1	3	1.86	3	3	3	3	3.00	3.53	High
	Round scad	1	1	1	1	1	1	3	1.29	3	3	3	3	3.00	3.26	High
	Hardtail scad	1	1	1	1	1	1	3	1.29	3	3	3	3	3.00	3.26	High
	Anchovy	1	1	1	1	1	1	3	1.29	3	3	3	3	3.00	3.26	High
Bottol Otter trawl	Round scad	1	1	1	1	1	1	3	1.29	3	3	3	3	3.00	3.26	High
	Hardtail scad	1	1	1	1	1	1	3	1.29	3	3	3	3	3.00	3.26	High
	Penaeid shrimp (*P. monodon*)	1	1	1	1	1	1	1	1.00	3	3	3	3	3.00	3.16	Med
	P. shrimp (*P. semisulcatus*)	1	1	1	1	1	1	1	1.00	3	3	3	3	3.00	3.16	Med
	Indo-pacific mackerel	1	1	1	1	1	1	1	1.00	3	3	3	3	3.00	3.16	Med
	Squid	1	1	1	1	1	2	3	1.43	3	3	3	3	3.00	3.32	High
	Pomphret	1	1	1	1	1	1	2	1.14	3	3	3	3	3.00	3.21	High
	Snapper	1	3	1	1	2	1	3	1.71	3	3	3	3	3.00	3.46	High
	Grouper	2	2	1	1	2	1	3	1.71	3	3	3	3	3.00	3.46	High
	Small carangids	1	1	1	1	1	1	3	1.29	3	3	3	3	3.00	3.26	High
Gill net	Indo-pacific mackerel	1	1	1	1	1	1	1	1.00	1	2	3	3	1.44	1.76	Low
	Seerfish	2	1	1	2	2	1	3	1.71	1	2	3	3	1.44	2.24	Low
	Indo-Pasific king mackerel	1	2	1	1	2	1	3	1.57	1	2	3	3	1.44	2.13	Low
	Small carangids	1	1	1	1	1	1	3	1.29	1	2	3	3	1.44	1.93	Low
	Sardine species	1	1	1	1	1	1	3	1.29	1	2	3	3	1.44	1.93	Low
		1.45	1.4	1.5	1.5	1.5	1	2.8	1.584	#	2.8	3	3	3	2.88	3.29	High

PSA: BOBLME – RETAINED SPECIES



The PSA Plot for retained species caught by three types of gear in the Andaman Sea

PSA Plot for **retained species**
Total risk = 3.29 (high risk)
Low risk: Gill nets
High risk: Trawl & Purse seine

Note:
High risk = >3.18 score
Medium risk = >2.64 score
Low risk = >1.41

(1). RISK ASSESSMENT: PRODUCTIVITY & SUSCEPTIBILITY ANALYSIS (PSA)

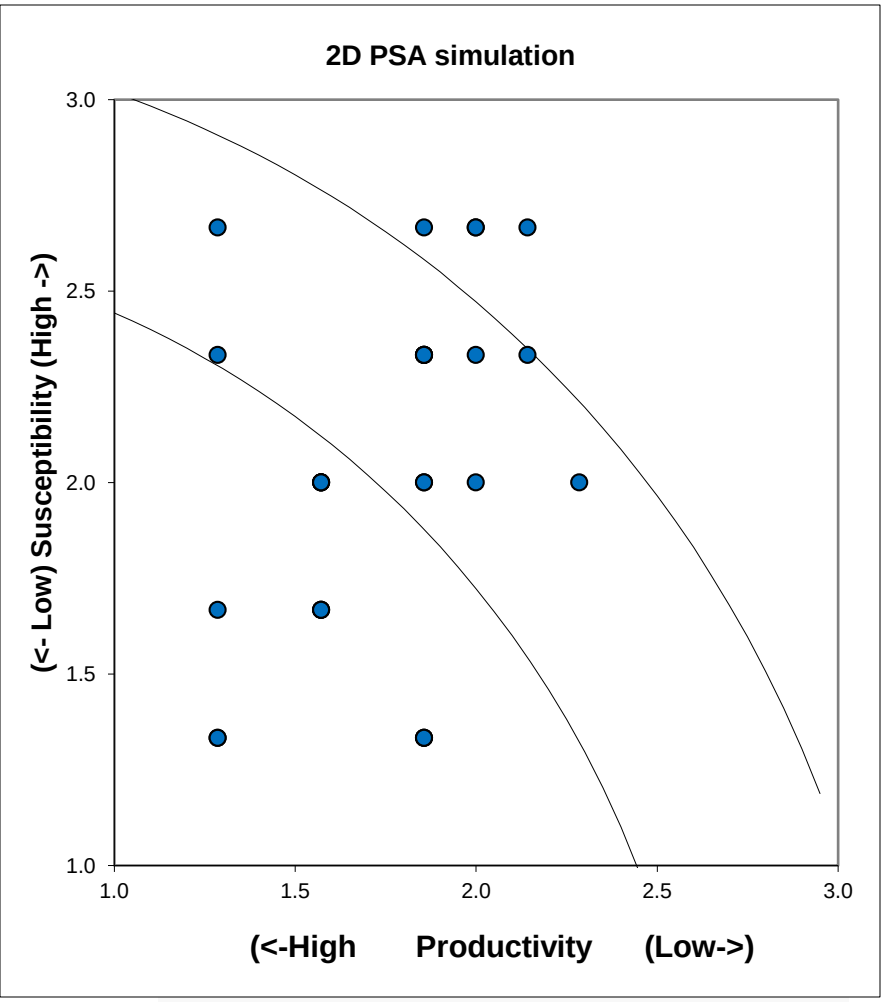
B). Purse-seine Fishery

- A case study in the west coast of Peninsular Malaysia

PSA: PURSE-SEINE FISHERIES

	PRODUCTIVITY ATTRIBUTES								SUSCEPTIBILITY ATTRIBUTES					OVERALL RISK VALUES	
LOCAL NAME	age_mat	age_max	fecundity	Size_max_rank	Size_mat_rank	Cal_repro_rank	Trophic	Productivity score	Availability	Encounterability	Selectivity	Post-capture Mortality	Susceptibility	2D Overall risk value (P&S) (multiplicative)	2D P&S Overall risk category (multiplicative)
Indian pellona	3	1	3	1	1	1	3	1.86	2	3	2	3	2.33	2.982	Med
Elongate ilisha	3	1	3	2	1	1	3	2.00	2	3	2	3	2.33	3.073	Med
Splendid ponyfish	1	1	2	1	1	1	2	1.29	1	1	2	3	1.33	1.852	Low
Ornate ponyfish	1	1	3	1	1	1	1	1.29	1	1	2	3	1.33	1.852	Low
Deep pugnose ponyfish	3	1	3	1	1	1	3	1.86	1	1	2	3	1.33	2.286	Low
Toothpony	3	1	3	1	1	1	3	1.86	1	1	2	3	1.33	2.286	Low
Shrimp scad	3	1	3	1	1	1	3	1.86	1	1	2	3	1.33	2.286	Low
Blackfin scad	3	1	3	1	1	1	3	1.86	1	3	2	3	2.00	2.729	Med
Cleftbelly trevally	3	1	3	1	1	1	3	1.86	1	3	2	3	2.00	2.729	Med
Yellowtail scad	3	1	1	1	1	1	3	1.57	1	1	3	3	1.67	2.291	Low
Shortfin scad	3	1	1	1	1	1	3	1.57	2	1	3	3	2.00	2.543	Low
Japanese scad	3	1	1	1	1	1	3	1.57	1	1	3	3	1.67	2.291	Low
Torpedo scad	3	1	3	2	1	1	3	2.00	2	1	3	3	2.00	2.828	Med
Golden trevally	3	1	3	2	3	1	3	2.29	2	1	3	3	2.00	3.037	Med
Oxeye scad	1	1	3	1	1	1	3	1.57	2	1	3	3	2.00	2.543	Low
Bigeye scad	3	1	1	1	1	1	3	1.57	1	1	3	3	1.67	2.291	Low
Yellowstripe scad	3	1	1	1	1	1	3	1.57	2	1	3	3	2.00	2.543	Low
Goldstripe sardinella	1	1	1	1	1	1	3	1.29	1	1	3	3	1.67	2.105	Low
Fringescale sardinella	3	1	3	3	1	1	1	1.86	1	3	3	3	2.33	2.982	Med
Rainbow sardine	3	1	3	1	1	1	3	1.86	1	3	3	3	2.33	2.982	Med
Slender rainbow sardine	3	1	3	1	1	1	3	1.86	1	3	3	3	2.33	2.982	Med
White sardine	3	1	3	1	1	1	3	1.86	1	3	3	3	2.33	2.982	Med
Goldspotted grenadier anchovy	1	1	3	1	1	1	3	1.57	1	3	2	3	2.00	2.543	Low
Longtail tuna	2	3	1	2	2	1	3	2.00	2	3	3	3	2.67	**3.333**	**High**
Eastern little tuna	2	3	1	2	2	1	3	2.00	2	3	3	3	2.67	**3.333**	**High**
Narrowbarred spanish mackerel	2	2	1	3	3	1	3	2.14	2	3	3	3	2.67	3.421	High
Indo-pacific king mackeral	2	2	1	2	2	1	3	1.86	2	3	3	3	2.67	3.250	High
Indian mackerel	1	1	2	1	1	1	2	1.29	2	3	3	3	2.67	2.960	Med
Short mackerel	3	1	1	1	1	1	1	1.29	2	3	2	3	2.33	2.664	Med
Largehead hairtail	2	1	3	3	2	1	3	2.14	2	2	3	3	2.33	3.168	Med
	2.43	1.2	2.2	1.4	1.3	1	2.7	1.75	1.5	2	2.6	2	2.03	2.68	Med

PSA: PURSE-SEINE FISHERIES



The PSA Plot for Purse seine Fishery for 30 species caught on the west coast of Peninsular Malaysia

PSA Plot for **Purse-seine Fishery** for 30 spp.
Total risk = 2.68 (medium risk)
High risk species group (14%): small tuna & tuna like-species.

High risk = >3.18 score
Medium risk = >2.64 score
Low risk = >1.41

(2). FISHERIES ASSESSMENT

Indian Mackerel																																		
Unit of Assessment		Principle 1: Stock status							Principle 2: Ecosystem impacts														Principle 3: Governance & Management											
		Outcome			*Harvest strategy*				*Retained*			*Bycatch*			*ETP*			*Habitat*			*Ecosystem*			*Governance & Policy*				*Fishery specific man.*				
Spp	Gear	1.1.1. Stock status	1.1.2. Reference points	1.1.3. Stock rebuilding if necessary	1.2.1. Performance of Harvest Strategy	1.2.2. Harvest control rules and tools	1.2.3. Information and monitoring	1.2.4. Assessment	2.1.1. Retained status	2.1.2. Retained management	2.1.3. Retained info / monitoring	2.2.1. Discards status	2.2.2. Discards management	2.2.3. Discards info / monitoring	2.3.1. ETP status	2.3.2. ETP management	2.3.3. ETP info / monitoring	2.4.1. Habitat status	2.4.2. Habitat management	2.4.3. Habitat: info / monitoring	2.5.1. Ecosystem status	2.5.2. Ecosystem strategy	2.5.3. Ecosystem info / monitoring	3.1.1. Legal customary framework	3.1.2. Consultation, roles & responsibilities	3.1.3. Long-term objectives	3.1.4. Incentives for sustainable fishing	3.2.1. Fishery-specific objectives	3.2.2. Decision-making processes	3.2.3. Compliance & enforcement	3.2.4. Research plan	3.2.5. Management performance evaluation
I. mackerel	Purse seine	0	0	n/a	0	0	1	0	1	0	2	2	2	1	0	1	1	2	2	2	1	1	1	2	2	2	1	0	0	1	0	1
I. mackerel	Btm otter trawl	0	0	n/a	0	0	1	0	0	0	2	2	2	1	0	1	2	0	1	2	0	0	1	2	2	2	1	0	0	1	0	1
I. mackerel	Gill nets	0	0	n/a	0	0	1	0	0	0	2	2	2	1	0	1	1	2	2	1	1	1	1	2	2	2	1	0	0	1	0	1

(2). FISHERIES ASSESSMENT

Two Case studies on Small Pelagic:

A). Indian Mackerel – multi gears

- (BOBLME project report)

B). Purse-seine Fishery – multi species

- (West Coast Peninsular Malaysia)

(2). FISHERIES ASSESSMENT

A). Indian Mackerel – multi gears

- (BOBLME project report)

A). Indian Mackerel – multi gears, BOBLME project report

Principle 1: Stock Status

PI	Title	Weak	Intermediate	Good	Reference
Outcome					
1.1.1	Target spp status	✓			DoFM statistics, 2008 Hassan et al, 2006 in Ahmed, 2009
Explanatory Statement		Researchers believe CPUE is increasing and the status of the Indian Mackerel resource is therefore deemed to be good and not a priority for management. However, population parameters derived from a scientific survey conducted in 2006 showed high exploitation levels for West Coast stocks. The survey also estimated that the west coast peninsula of Malaysia, an area totaling nearly 28,000km^2, supported a pelagic resource of 210,000t (Hassan et al, 2006). This estimate is 23.8% lower than that estimated in the previous survey conducted in 1998.			
1.1.2	Reference points	✓			DoFM questionnaire response
Explanatory Statement		Several RK population parameters are presented, but no reference points are set. A total pelagic biomass was estimated at 210,000t, suggesting west coast landings (140,000 t) of RK & mainly RB would give a high F value.			
1.1.3	Stock rebuilding	✓			FRI, DoFM interview
Explanatory Statement		No stock rebuilding strategy			

1.1 STOCK STATUS - MALAYSIA

1.1.1 Purse seine, Trawl and Gillnets

Gear	Catch
Purse seine M/s:25mm	i). Target: s/pelagic Bycatch: N/tuna ii). Target N/tuna Bycatch: s/pelagic
B/O trawl, M/s:25mm	Target: shrimp, Del. Bycatch: s/pelagic
Set Gill net, M/s:25mm , >	Target: Dem. Fish Bycatch: small pelagic

(2). FISHERIES ASSESSMENT

A). Indian Mackerel – multi gears, BOBLME project report

Principle 1: Stock Status

Source: Poseidon. ID = Indonesia, TH = Thailand, MY = Malaysia, MM = Myanmar,

Principle 1		Principle 1: Stock status							
			Outcome			Harvest strategy			
			1.1.1	1.1.2	1.1.3	1.2.1	1.2.2	1.2.3	1.2.4
	Country	UoA	Stock status	Reference points	Stock rebuilding if necessary	Performance of Harvest Strategy	Harvest control rules and tools	Information and monitoring	Assessment
	ID	Indian mackerel	0	0	*	0	0	1	0
	TH	Indian mackerel	0	0	*	0	0	1	1
	MY	Indian mackerel	0	0	*	0	0	1	1
	MM	Indian mackerel	0	0	*	0	0	1	0

Ranking:

Good 2 Intermediate 1 Weak 0 Not applicable *

- There is evidence for the status of this species is over-fished throughout much of the region.
- PSA suggests that the stock is particularly vulnerable to purse seines and bottom otter trawlers,
- There are no reference points used in management and as a result, harvest rules and controls are weak.

A). Indian Mackerel – **Principle 2: Ecosystem Impact**

Source: Poseidon. ID = Indonesia, TH = Thailand, MY = Malaysia, MM = Myanmar,

Malaysia: Purse seine

PI	Title	Weak	Intermediate	Good	Reference
Other retained species					
2.1.1	Retained spp Status		✓		DoFM, IOTC.
Explanatory Statement		The main retained species are known, as RK is primarily capturec offshore, the interaction with coastal fisheries including demersa fisheries is less than for example RB. Tuna may be captured wher targeting shoals of small pelagic (making up 7% of seine catch).			

Malaysia: Trawl fishery

Retained species					
2.1.1	Retained spp Status	✓			DoFM, IOTC.
Explanatory Statement		The main retained species are known but their status is not. See **Erro Reference source not found.** for risk assessment of other retained species. A RK is primarily captured offshore, the interaction with coastal fisheries includin demersal fisheries is less than for example in the RB fishery. However status c many offshore resources is thought to be depleted.			

Malaysia: Gillnet

Other Retained species					
2.1.1	Retained spp Status	✓			DoFM, IOTC.
Explanatory Statement		The main retained species are known (mainly demersal), but status is either not assessed or known to be depleted. A small proportion of RK (1% of total landings) is captured by the traditional inshore fishery using gillnet.			

Assessment must be done by gear type for each country.

A). Indian Mackerel – **Principle 2: Ecosystem Impact**

Source: Poseidon. ID = Indonesia, TH = Thailand, MY = Malaysia, MM = Myanmar,

Principle 2: Ecosystem Impacts																
		Retained			*Discards*			*ETP*			*Habitat*			*Ecosystem*		
		2.1.1.	2.1.2.	2.1.3.	2.2.1	2.2.2	2.2.3	2.3.1.	2.3.2.	2.3.3.	2.4.1.	2.4.2.	2.4.3.	2.5.1.	2.5.2.	2.5.3.
Country	Fishing Gear	Retained status	Retained management	Retained monitoring	Discards status	Discards management	Discards monitoring	ETP status	ETP management	ETP monitoring	Habitat status	Habitat management	Habitat monitoring	Ecosystem status	Ecosystem strategy	Eco. monitoring
ID	Purse seine	1	0	1	2	2	1	1	0	1	2	2	1	1	1	1
ID	B/Otter Trawl	0	0	1	2	2	1	1	0	1	0	1	1	0	0	1
ID	Gill nets	0	0	0	2	2	1	0	0	1	2	1	1	1	1	1
TH	Purse seine	1	1	2	2	2	1	1	1	1	2	2	1	1	1	1
TH	B/Otter Trawl	0	0	2	2	2	1	0	1	1	0	1	1	0	0	1
MY	Purse seine	1	0	2	2	2	1	0	1	1	2	2	2	1	1	1
MY	B/Otter Trawl	0	0	2	2	2	1	0	1	2	0	1	2	0	0	1
MY	Gill nets	0	0	2	2	2	1	0	1	1	2	1	1	1	1	1
MM	Purse seine	1	1	0	2	2	1	1	1	1	2	2	1	1	1	0
MM	B/Otter Trawl	0	1	1	2	2	1	0	1	1	0	1	1	0	0	0

A). Indian Mackerel – Principle 3: Governance & Management

Source: Poseidon. ID = Indonesia, TH = Thailand, MY = Malaysia, MM = Myanmar,

Principle 3: Governance & Management										
Country	Fishing Gear	*Governance & Policy*				*Fishery specific management*				
		3.1.1.	3.1.2.	3.1.3.	3.1.4.	3.2.1.	3.2.2.	3.2.3.	3.2.4.	3.2.5.
		Legal customary framework	Consultation, roles & responsibilities	Long-term objectives	Incentives for sustainable fishing	Fishery-specific objectives	Decision-making processes	Compliance & enforcement	Research plan	Management performance evaluation
ID	PS, BOT, GN	1	2	1	0	0	0	1	1	1
TH	PS, BOT	1	2	1	0	0	1	1	1	1
MY	PS, BOT, GN	2	2	1	1	0	0	1	0	1
MM	PS, BOT	1	1	1	0	0	0	1	0	0

Good 2 Intermediate 1 Weak 0 Not applicable *

- Legal and institutional structures are mainly in place..
- Weaknesses were observed in the continued use of subsidies that serve to increase fishing effort as well as weak fisheries-specific objectives, decision-making process, research plans, MCS strategies and performance evaluation.
- Weaknesses were both specific to Indian mackerel management as well as to management of small pelagic species.

(2). FISHERIES ASSESSMENT

B). Purse seine Fishery – multi species

- (West coast of Peninsular Malaysia)

(2). FISHERIES ASSESSMENT

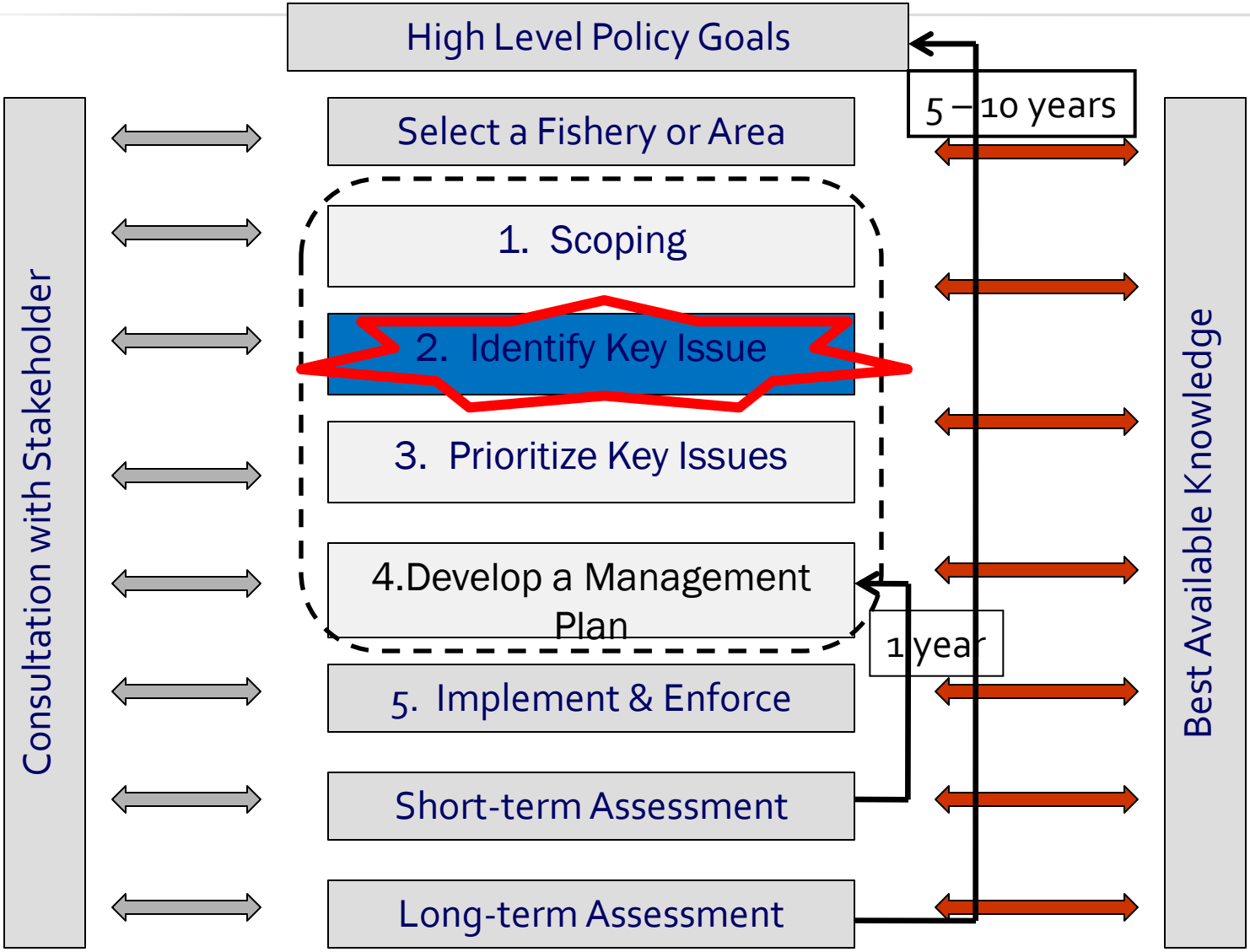
B). Purse seine fishery - Summary scores for 3 principles

Principle 1: Stock status (Small Pelagic)						
Outcome			***Harvest strategy***			
1.1.1	1.1.2	1.1.3	1.2.1	1.2.2	1.2.3	1.2.4
Stock status	Reference points	Stock rebuilding if necessary	Performance of harvest strategy	Harvest control rules and tools	Information and monitoring	Assessment
0	0	*	0	0	0	1

Principle 2: Ecosystem Impacts (Purse seine)											
Retained			***ETP***			***Habitat***			***Ecosystem***		
2.1.1.	2.1.2.	2.1.3.	2.3.1.	2.3.2.	2.3.3.	2.4.1.	2.4.2.	2.4.3.	2.5.1.	2.5.2.	2.5.3.
Retained status	Retained management	Retained info / monitoring	ETP status	ETP management	ETP info / monitoring	Habitat status	Habitat management	Habitat info / monitoring	Ecosystem status	Ecosystem strategy	Ecosystem info / monitoring
0	0	1	1	1	0	2	2	2	1	2	0

Principle 3: Governance & Management (Purse seine)								
Governance & Policy				***Fishery specific management***				
3.1.1.	3.1.2.	3.1.3.	3.1.4.	3.2.1.	3.2.2.	3.2.3.	3.2.4.	3.2.5.
Legal customary framework	Consultation, roles & responsibilities	Long-term objectives	Incentives for sustainable fishing	Fishery-specific objectives	Decision-making processes	Compliance & enforcement	Research plan	Management performance evaluation
1	2	1	1	0	0	1	0	1

HOW TO IMPLEMENT EAF



FAO Guideline: 2003. 112p

THANK YOU