The 2nd Annual Review Workshop

FIP for the Orkney brown crab fishery

26 Feb 2015

M&S
EST. 1884

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Overall summary of Brown Crab FIP

- Pre-assessment identified three critical issues:
  - lack of biological reference points
  - lack of pre-agreed harvest control rule to reduce exploitation rate in response to stock decline
  - lack of effort data
- The FIP is addressing these short-comings by:
  - collecting VMS and logbook data on fishing effort and catch rates
  - developing a sound basis for stock assessment, generating candidate biological reference points
  - providing data and fishery metrics on which any harvest control rules can be based

BMT applied to Orkney Brown Crab

Principle	Component	PI	Performance Indicator	Actual Year 1	Expected Year 2	Expected Year 3	Expected Year 4	Expected Year 5	Actual Year 2	Status	Actual Year 3	Status	Ac Ye
1	Outcome	1.1.1	Stock status	60-79	60-79	60-79	60-79	≥80	60-79	On Target	60-79	On Target	---
		1.1.2	Reference points	≥80	≥80	≥80	≥80	≥80	≥80	On Target	≥80	On Target	---
		1.1.3	Stock rebuilding	---	---	---	---	---	---		---		---
	Management	1.2.1	Harvest Strategy	<60	<60	<60	60-79	60-79	<60	On Target	<60	On Target	---
		1.2.2	Harvest control rules and tools	<60	<60	<60	60-79	60-79	<60	On Target	<60	On Target	---
		1.2.3	Information and monitoring	<60	60-79	≥80	≥80	≥80	60-79	On Target	≥80	On Target	---
		1.2.4	Assessment of stock status	≥80	≥80	≥80	≥80	≥80	≥80	On Target	≥80	On Target	---
2	Retained species	2.1.1	Outcome	60-79	60-79	60-79	60-79	≥80	60-79	On Target	60-79	On Target	---
		2.1.2	Management	≥80	≥80	≥80	≥80	≥80	≥80	On Target	≥80	On Target	---
		2.1.3	Information	≥80	≥80	≥80	≥80	≥80	≥80	On Target	≥80	On Target	---
	Bycatch species	2.2.1	Outcome	≥80	≥80	≥80	≥80	≥80	≥80	On Target	≥80	On Target	---
		2.2.2	Management	≥80	≥80	≥80	≥80	≥80	≥80	On Target	≥80	On Target	---
		2.2.3	Information	≥80	≥80	≥80	≥80	≥80	≥80	On Target	≥80	On Target	---
	ETP species	2.3.1	Outcome	≥80	≥80	≥80	≥80	≥80	≥80	On Target	≥80	On Target	---
		2.3.2	Management	≥80	≥80	≥80	≥80	≥80	≥80	On Target	≥80	On Target	---
		2.3.3	Information	≥80	≥80	≥80	≥80	≥80	≥80	On Target	≥80	On Target	---
	Habitats	2.4.1	Outcome	≥80	≥80	≥80	≥80	≥80	≥80	On Target	≥80	On Target	---
		2.4.2	Management	≥80	≥80	≥80	≥80	≥80	≥80	On Target	≥80	On Target	---
		2.4.3	Information	≥80	≥80	≥80	≥80	≥80	≥80	On Target	≥80	On Target	---
	Ecosystem	2.5.1	Outcome	≥80	≥80	≥80	≥80	≥80	≥80	On Target	≥80	On Target	---
		2.5.2	Management	≥80	≥80	≥80	≥80	≥80	≥80	On Target	≥80	On Target	---
		2.5.3	Information	60-79	60-79	≥80	≥80	≥80	60-79	On Target	60-79	Behind	---
3	Governance and Policy	3.1.1	Legal and customary framework	<60	<60	<60	60-79	60-79	<60	On Target	<60	On Target	---
		3.1.2	Consultation, roles and responsibilities	≥80	≥80	≥80	≥80	≥80	≥80	On Target	≥80	On Target	---
		3.1.3	Long term objectives	60-79	60-79	60-79	≥80	≥80	60-79	On Target	60-79	On Target	---
		3.1.4	Incentives for sustainable fishing	≥80	≥80	≥80	≥80	≥80	≥80	On Target	≥80	On Target	---
	Fishery specific management system	3.2.1	Fishery specific objectives	60-79	60-79	60-79	≥80	≥80	60-79	On Target	60-79	On Target	---
		3.2.2	Decision making processes	60-79	60-79	60-79	≥80	≥80	60-79	On Target	60-79	On Target	---
		3.2.3	Compliance and enforcement	≥80	≥80	≥80	≥80	≥80	≥80	On Target	≥80	On Target	---
		3.2.4	Research plan	≥80	≥80	≥80	≥80	≥80	≥80	On Target	≥80	On Target	---
		3.2.5	Management performance evaluation	≥80	≥80	≥80	≥80	≥80	≥80	On Target	≥80	On Target	---
	Total number of PIs less than 60			4	3	3	0	0	3		3		
	Total number of PIs 60-79			6	7	5	5	3	7		6		
	Total number of PIs equal to or greater than 80			20	20	22	25	27	20		21		
	Overall BMT Index			**0.77**	**0.78**	**0.82**	**0.92**	**0.95**	**0.78**		**0.80**		

BMT Summary Table

Last update: Actual Year 1

Scoring Level	Overall Number of PIs	Principle 1 Number of PIs	Principle 2 Number of PIs	Principle 3 Number of PIs
≥80	20	2	13	5
60-79	6	1	2	3
<60	4	3	0	1
BMT Index	**0.77**	**0.42**	**0.93**	**0.72**

2013

BMT Summary Table

Last update: Actual Year 2

Scoring Level	Overall Number of PIs	Principle 1 Number of PIs	Principle 2 Number of PIs	Principle 3 Number of PIs
≥80	20	2	13	5
60-79	7	2	2	3
<60	3	2	0	1
BMT Index	**0.78**	**0.50**	**0.93**	**0.72**

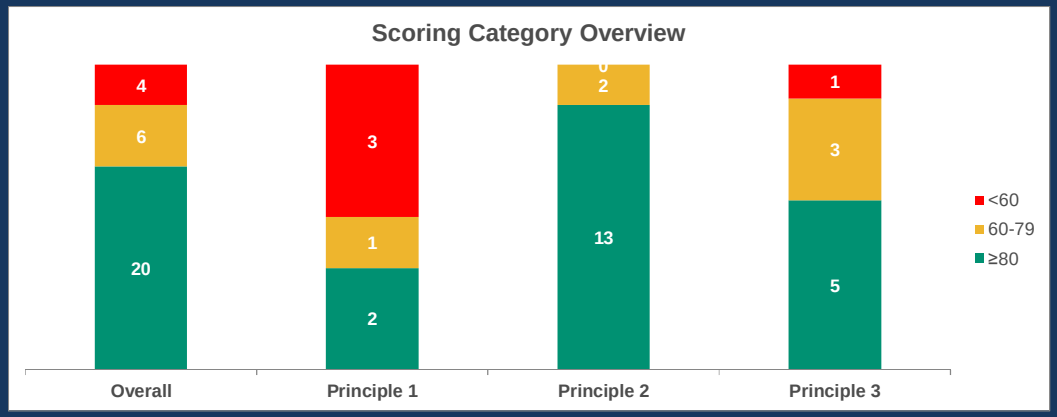
2014

BMT Summary Table

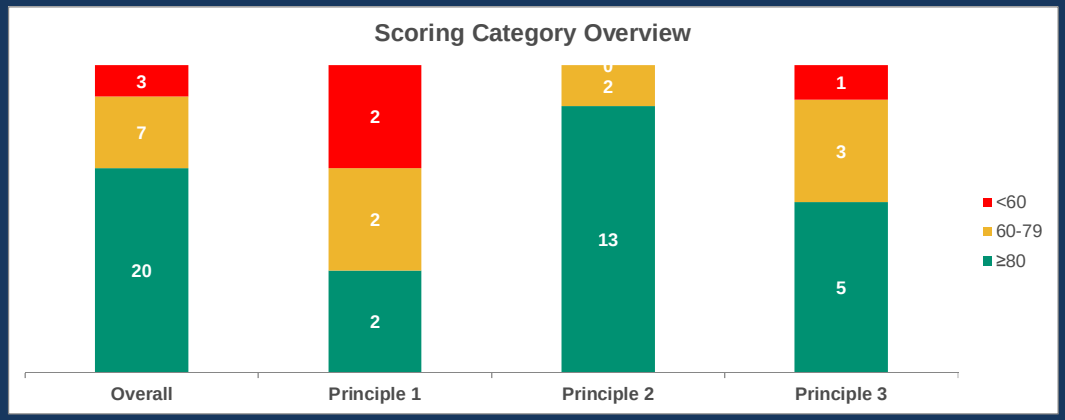
Last update: Actual Year 3

Scoring Level	Overall Number of PIs	Principle 1 Number of PIs	Principle 2 Number of PIs	Principle 3 Number of PIs
≥80	21	3	13	5
60-79	6	1	2	3
<60	3	2	0	1
BMT Index	**0.80**	**0.58**	**0.93**	**0.72**

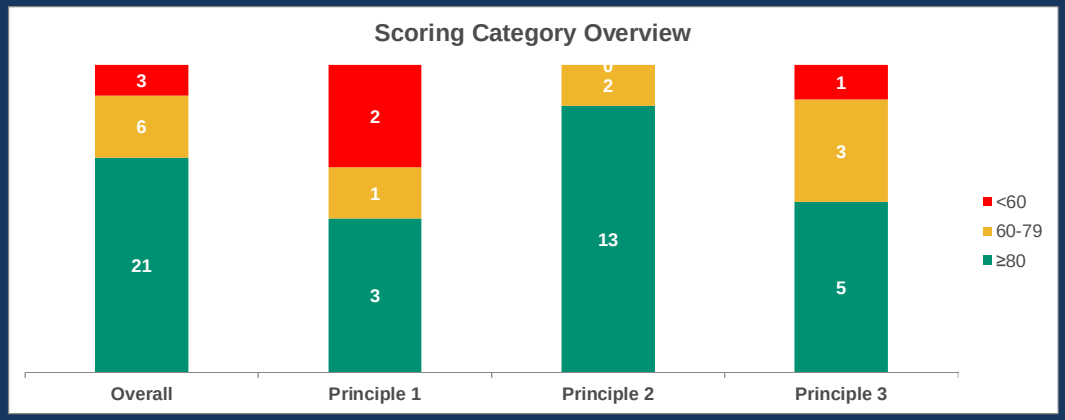
2015



2013

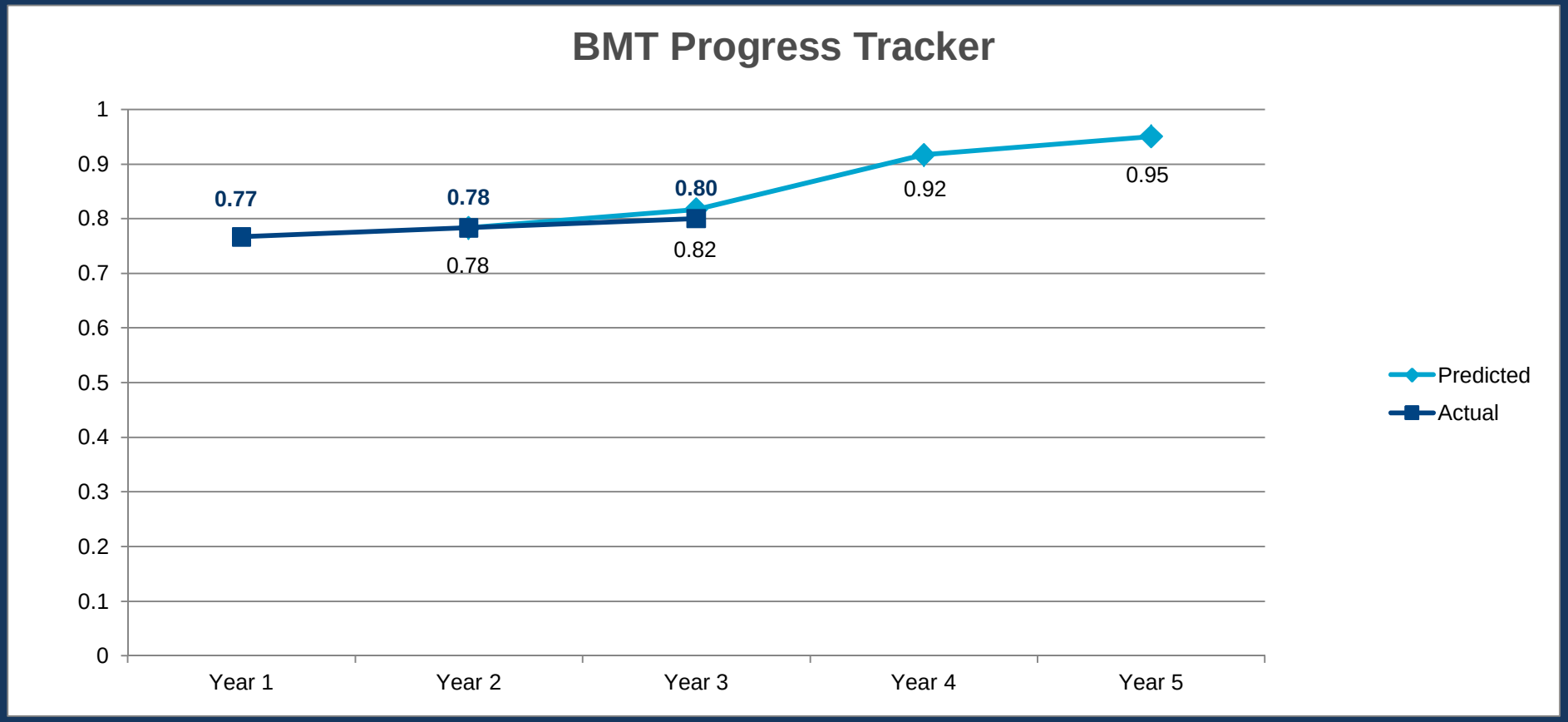


2014



2015

BMT applied to Orkney Brown Crab



Progress Year 1 (baseline) to Year 2:

Principle	Component	PI	Performance Indicator	Actual Year 1	Expected Year 2	Actual Year 2
1	Outcome	1.1.1	Stock status	60-79	60-79	60-79
		1.1.2	Reference points	≥80	≥80	≥80
		1.1.3	Stock rebuilding	---	---	---
	Management	1.2.1	Harvest Strategy	<60	<60	<60
		1.2.2	Harvest control rules and tools	<60	<60	<60
		1.2.3	Information and monitoring	<60	60-79	60-79
		1.2.4	Assessment of stock status	≥80	≥80	≥80
2	Retained species	2.1.1	Outcome	60-79	60-79	60-79
		2.1.2	Management	≥80	≥80	≥80
		2.1.3	Information	≥80	≥80	≥80
	Bycatch species	2.2.1	Outcome	≥80	≥80	≥80
		2.2.2	Management	≥80	≥80	≥80
		2.2.3	Information	≥80	≥80	≥80
	ETP species	2.3.1	Outcome	≥80	≥80	≥80
		2.3.2	Management	≥80	≥80	≥80
		2.3.3	Information	≥80	≥80	≥80
	Habitats	2.4.1	Outcome	≥80	≥80	≥80
		2.4.2	Management	≥80	≥80	≥80
		2.4.3	Information	≥80	≥80	≥80
	Ecosystem	2.5.1	Outcome	≥80	≥80	≥80
		2.5.2	Management	≥80	≥80	≥80
		2.5.3	Information	60-79	60-79	60-79
3	Governance and Policy	3.1.1	Legal and customary framework	<60	<60	<60
		3.1.2	Consultation, roles and responsibilities	≥80	≥80	≥80
		3.1.3	Long term objectives	60-79	60-79	60-79
		3.1.4	Incentives for sustainable fishing	≥80	≥80	≥80
	Fishery specific management system	3.2.1	Fishery specific objectives	60-79	60-79	60-79
		3.2.2	Decision making processes	60-79	60-79	60-79
		3.2.3	Compliance and enforcement	≥80	≥80	≥80
		3.2.4	Research plan	≥80	≥80	≥80
		3.2.5	Management performance evaluation	≥80	≥80	≥80

Progress Year 2 to Year 3 (current):

Principle	Component	PI	Performance Indicator	Actual Year 2	Expected Year 3	Actual Year 3	
1	Outcome	1.1.1	Stock status	60-79	60-79	60-79	
		1.1.2	Reference points	≥80	≥80	≥80	
		1.1.3	Stock rebuilding	---	---	---	
	Management	1.2.1	Harvest Strategy	<60	<60	<60	
		1.2.2	Harvest control rules and tools	<60	<60	<60	
		1.2.3	Information and monitoring	60-79	≥80	≥80	←
		1.2.4	Assessment of stock status	≥80	≥80	≥80	
2	Retained species	2.1.1	Outcome	60-79	60-79	60-79	
		2.1.2	Management	≥80	≥80	≥80	
		2.1.3	Information	≥80	≥80	≥80	
	Bycatch species	2.2.1	Outcome	≥80	≥80	≥80	
		2.2.2	Management	≥80	≥80	≥80	
		2.2.3	Information	≥80	≥80	≥80	
	ETP species	2.3.1	Outcome	≥80	≥80	≥80	
		2.3.2	Management	≥80	≥80	≥80	
		2.3.3	Information	≥80	≥80	≥80	
	Habitats	2.4.1	Outcome	≥80	≥80	≥80	
		2.4.2	Management	≥80	≥80	≥80	
		2.4.3	Information	≥80	≥80	≥80	
	Ecosystem	2.5.1	Outcome	≥80	≥80	≥80	
		2.5.2	Management	≥80	≥80	≥80	
		2.5.3	Information	60-79	≥80	60-79	←
3	Governance and Policy	3.1.1	Legal and customary framework	<60	<60	<60	
		3.1.2	Consultation, roles and responsibilities	≥80	≥80	≥80	
		3.1.3	Long term objectives	60-79	60-79	60-79	
		3.1.4	Incentives for sustainable fishing	≥80	≥80	≥80	
	Fishery specific management system	3.2.1	Fishery specific objectives	60-79	60-79	60-79	
		3.2.2	Decision making processes	60-79	60-79	60-79	
		3.2.3	Compliance and enforcement	≥80	≥80	≥80	
		3.2.4	Research plan	≥80	≥80	≥80	
		3.2.5	Management performance evaluation	≥80	≥80	≥80	

Expected progress Year 3 to Year 4:

Principle	Component	PI	Performance Indicator	Actual Year 3	Expected Year 4
1	Outcome	1.1.1	Stock status	60-79	60-79
		1.1.2	Reference points	≥80	≥80
		1.1.3	Stock rebuilding	---	---
	Management	1.2.1	Harvest Strategy	<60	60-79
		1.2.2	Harvest control rules and tools	<60	60-79
		1.2.3	Information and monitoring	≥80	≥80
		1.2.4	Assessment of stock status	≥80	≥80
2	Retained species	2.1.1	Outcome	60-79	60-79
		2.1.2	Management	≥80	≥80
		2.1.3	Information	≥80	≥80
	Bycatch species	2.2.1	Outcome	≥80	≥80
		2.2.2	Management	≥80	≥80
		2.2.3	Information	≥80	≥80
	ETP species	2.3.1	Outcome	≥80	≥80
		2.3.2	Management	≥80	≥80
		2.3.3	Information	≥80	≥80
	Habitats	2.4.1	Outcome	≥80	≥80
		2.4.2	Management	≥80	≥80
		2.4.3	Information	≥80	≥80
	Ecosystem	2.5.1	Outcome	≥80	≥80
		2.5.2	Management	≥80	≥80
		2.5.3	Information	60-79	≥80
3	Governance and Policy	3.1.1	Legal and customary framework	<60	60-79
		3.1.2	Consultation, roles and responsibilities	≥80	≥80
		3.1.3	Long term objectives	60-79	≥80
		3.1.4	Incentives for sustainable fishing	≥80	≥80
	Fishery specific management system	3.2.1	Fishery specific objectives	60-79	≥80
		3.2.2	Decision making processes	60-79	≥80
		3.2.3	Compliance and enforcement	≥80	≥80
		3.2.4	Research plan	≥80	≥80
		3.2.5	Management performance evaluation	≥80	≥80

Progress measured by BMT

- Baseline to Year 2
  - PI 1.2.3 Information and Monitoring moved from fail (<60) to conditional pass (60-79) as data on LPUE and CPUE are collected
- Year 2 to Year 3 (current)
  - PI 1.2.3 Information and Monitoring moved from conditional (60-79) to unconditional pass (80+) as LPUE and CPUE data accrue giving a fuller picture of overall fishing effort
  - PI 2.5.3 Ecosystem Information expected to be moved from conditional (60-79) to unconditional pass (80+) after data analysis and ecosystem modeling undertaken to understand ecological consequences of removal of target species – analysis not completed

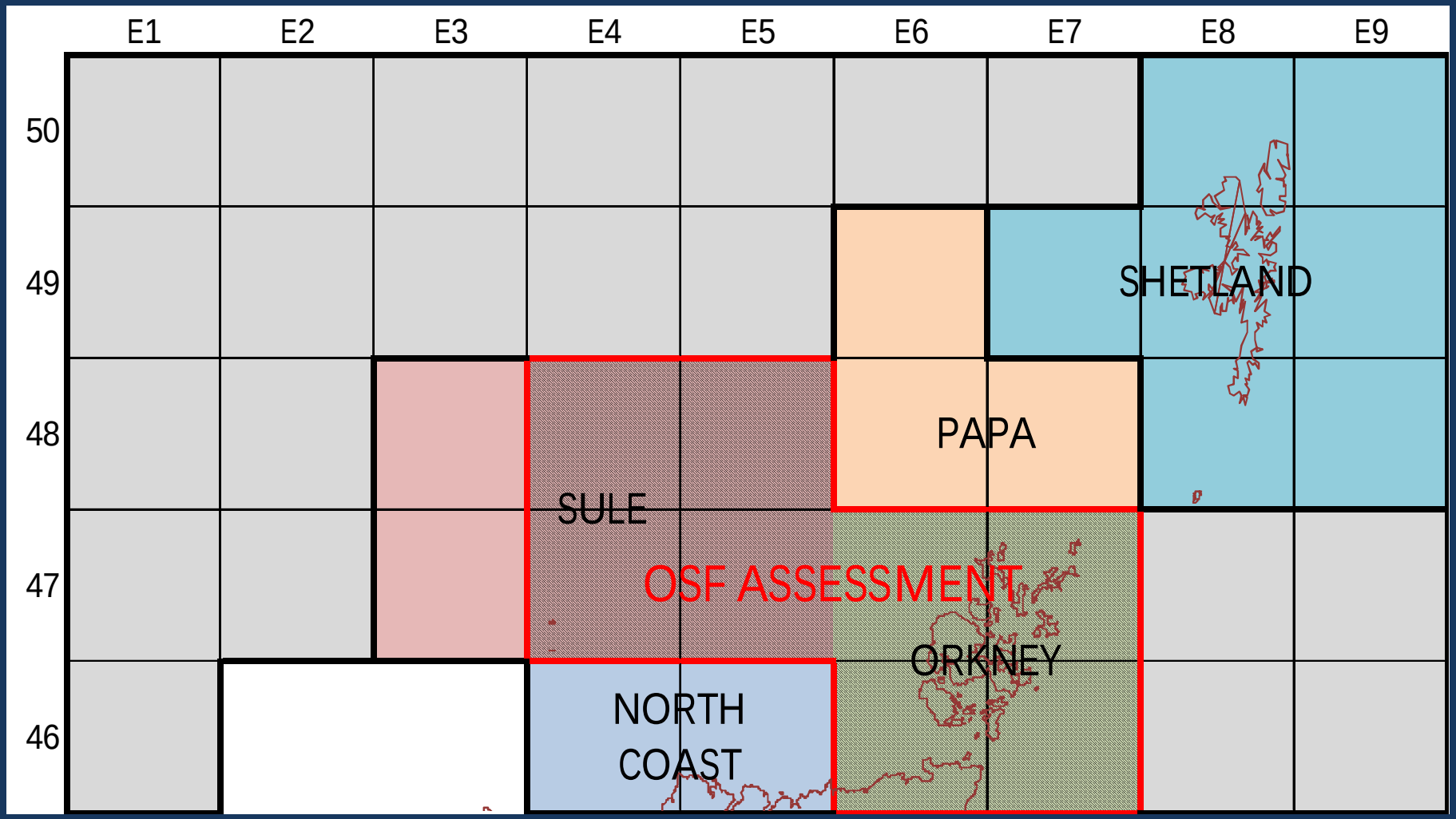
Progress *projected* by BMT

- Year 3 (current) to Year 4
  - PIs 1.2.1 & 1.2.2 Harvest Strategy & Harvest Control Rules moved from fail (<60) to conditional pass (60-79) as management framework is defined based on stock assessment
  - PI 3.1.1 Legal Framework moved from fail (<60) to conditional pass (60-79) as management conditions needed to meet Principles 1 and 2 are implemented
  - PIs 3.1.3 & 3.2.3 Objectives moved from conditional (60-79) to unconditional pass (80+) as short- and long-term objectives are explicitly defined and codified within the management system
  - PI 3.2.2 Decision making processes moved from conditional (60-79) to unconditional pass (80+) with full and explicit assimilation of a risk-based approach to management based on monitoring data and application of a harvest strategy

BMT indicates main tasks for year ahead:

- Explicitly define short- and long-term objectives for the fishery
- Select biological reference points and set values
- Decide on rules about management actions to be taken in response to stock status in relation to biological reference points – Harvest Control Rules
- Define a Harvest Strategy (the combination of monitoring, stock assessment, harvest control rules and management actions)
- Stock assessment will provide the context for these
- Powers to implement management actions are necessary for these tasks to be achieved

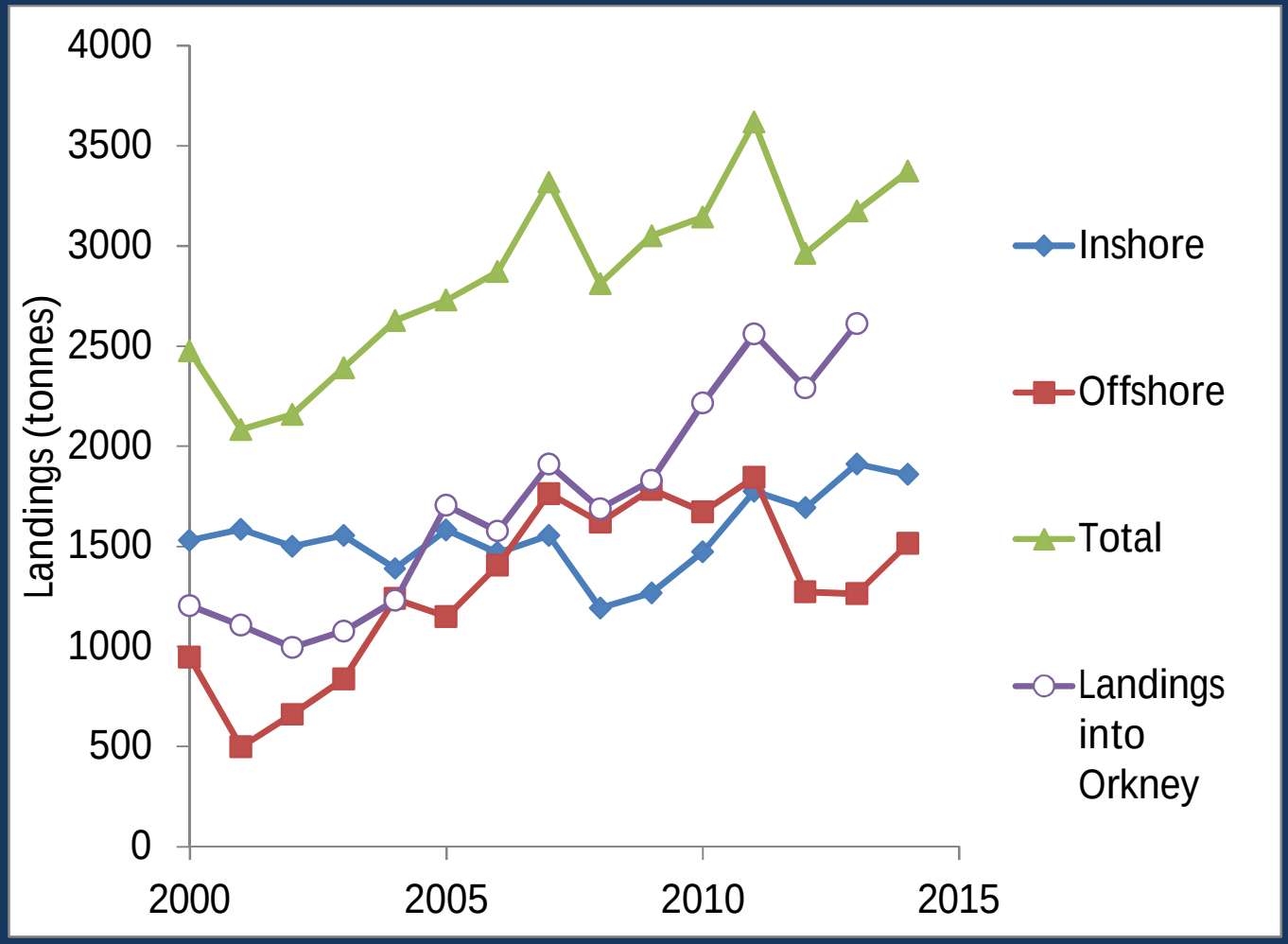
Orkney Brown crab stock assessment



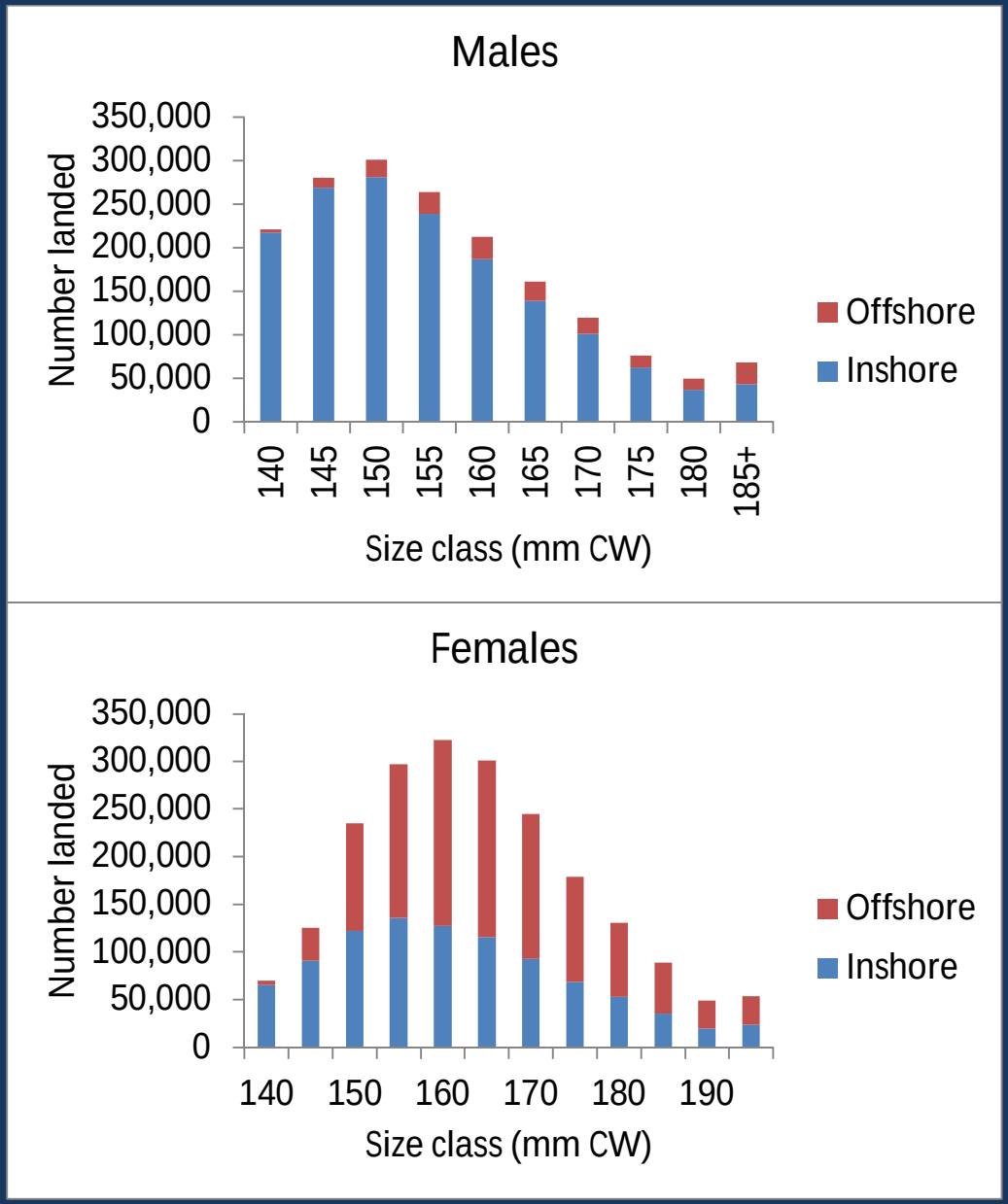
Orkney Brown crab stock assessment

	No. Crabs Measured	No. Samples Taken	% of Landings Measured	% of Landings Represented
2010	10,701	74	0.21	3.1
2011	12,874	69	0.24	3.1
2012*	9,603	20	0.22	2.9
2013	45,400	156	0.88	4.9
2014	29,042	159	0.54	4.9

Orkney Brown crab stock assessment

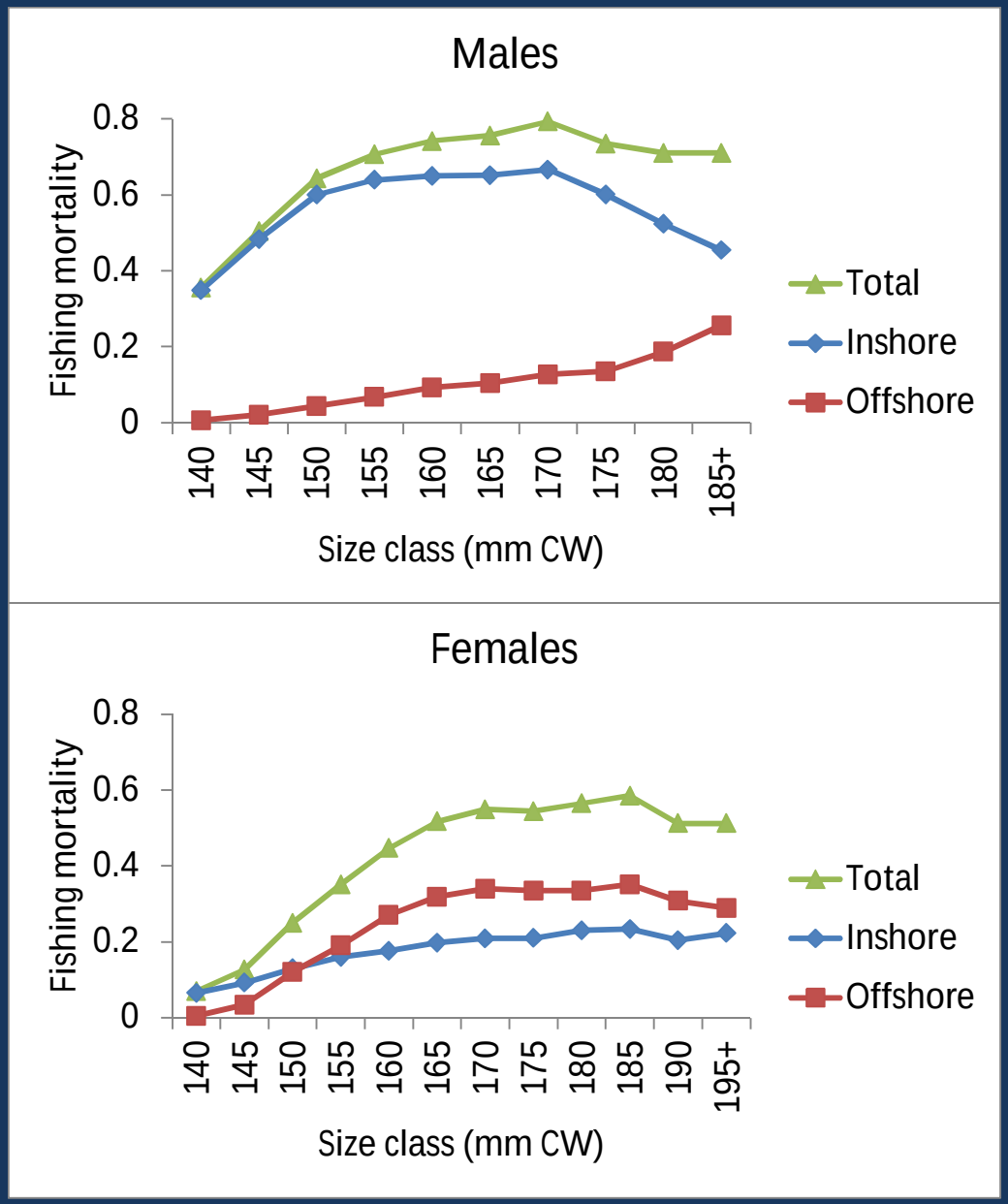


Orkney Brown crab stock assessment



Length Cohort Analysis using growth and natural mortality parameters from MSS

Orkney Brown crab stock assessment



Annual Fishing Mortality

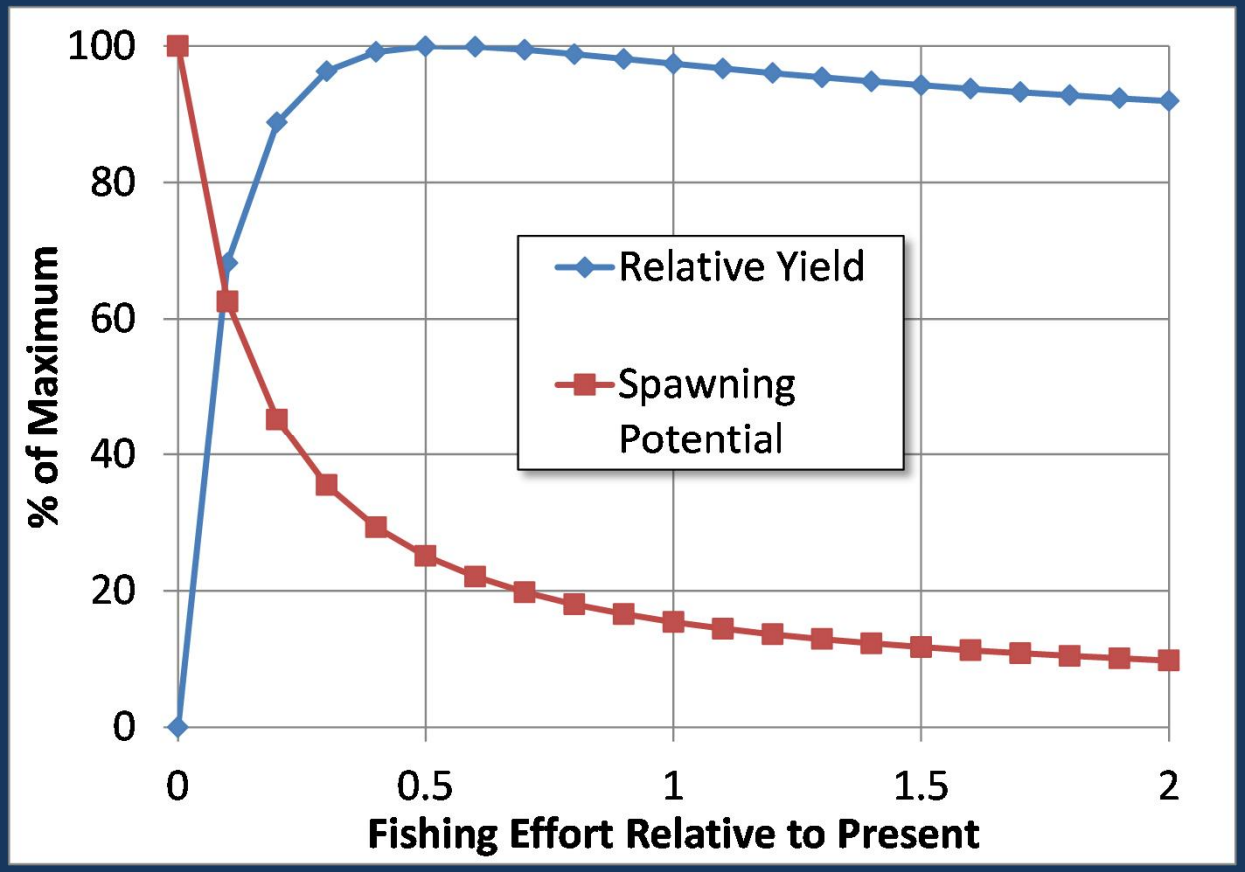
	Males	Females
Inshore	0.63	0.19
Offshore	0.094	0.28
Total	0.73	0.48

Annual Harvest Rate

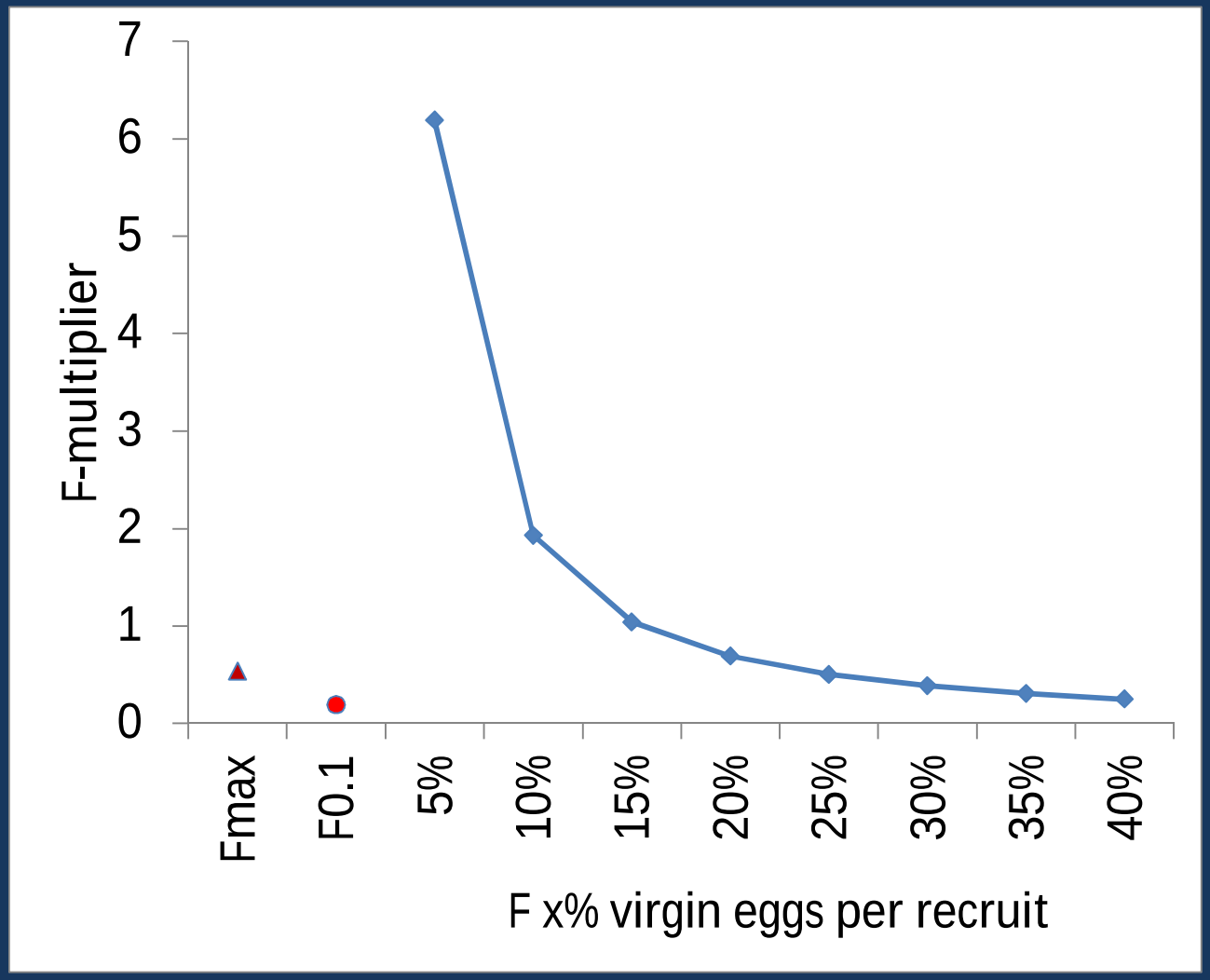
	Males	Females
Inshore	42%	15%
Offshore	8%	21%
Total	50%	36%

Orkney Brown crab stock assessment

Standard Per Recruit Analyses

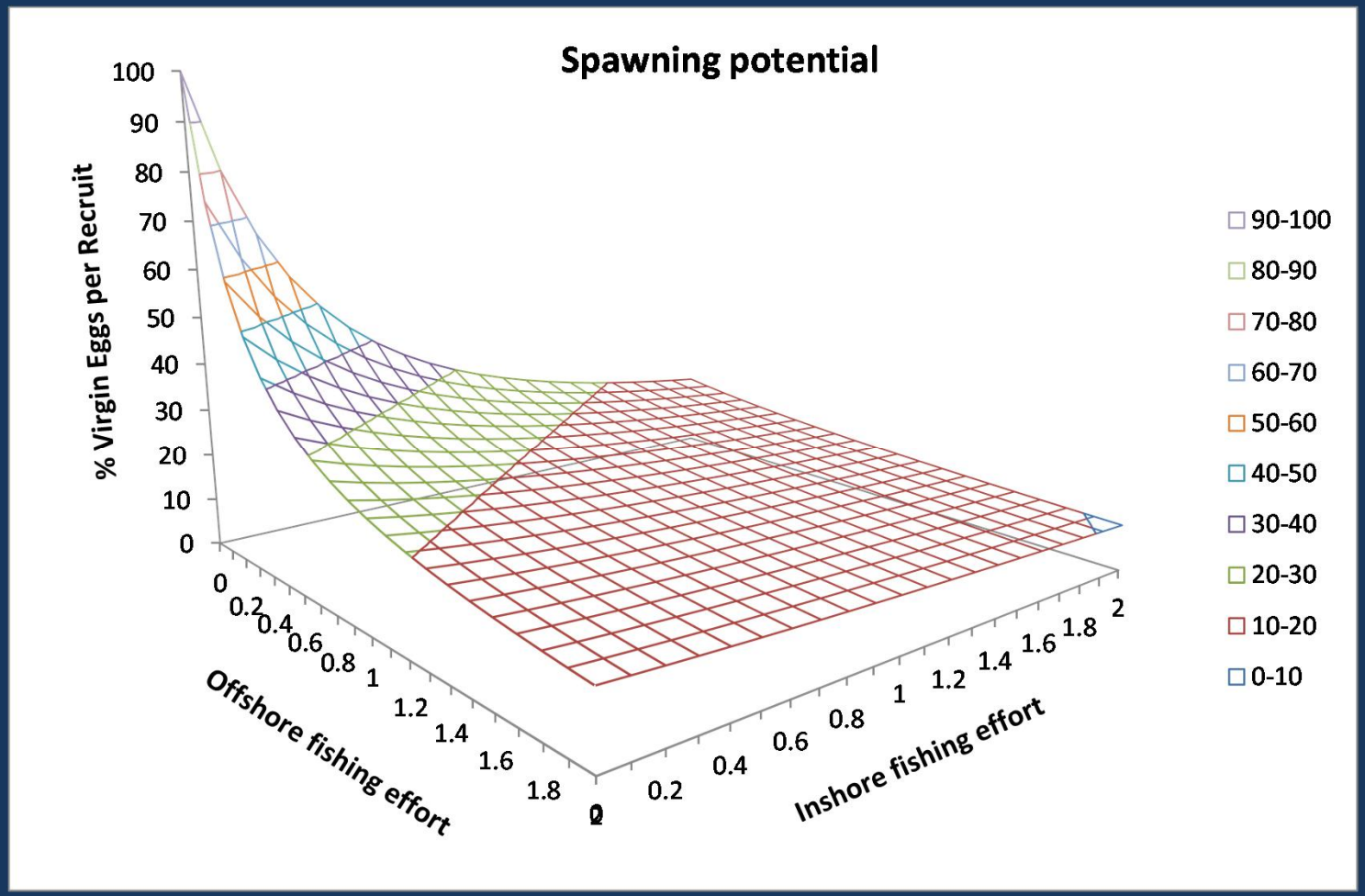


Orkney Brown crab stock assessment

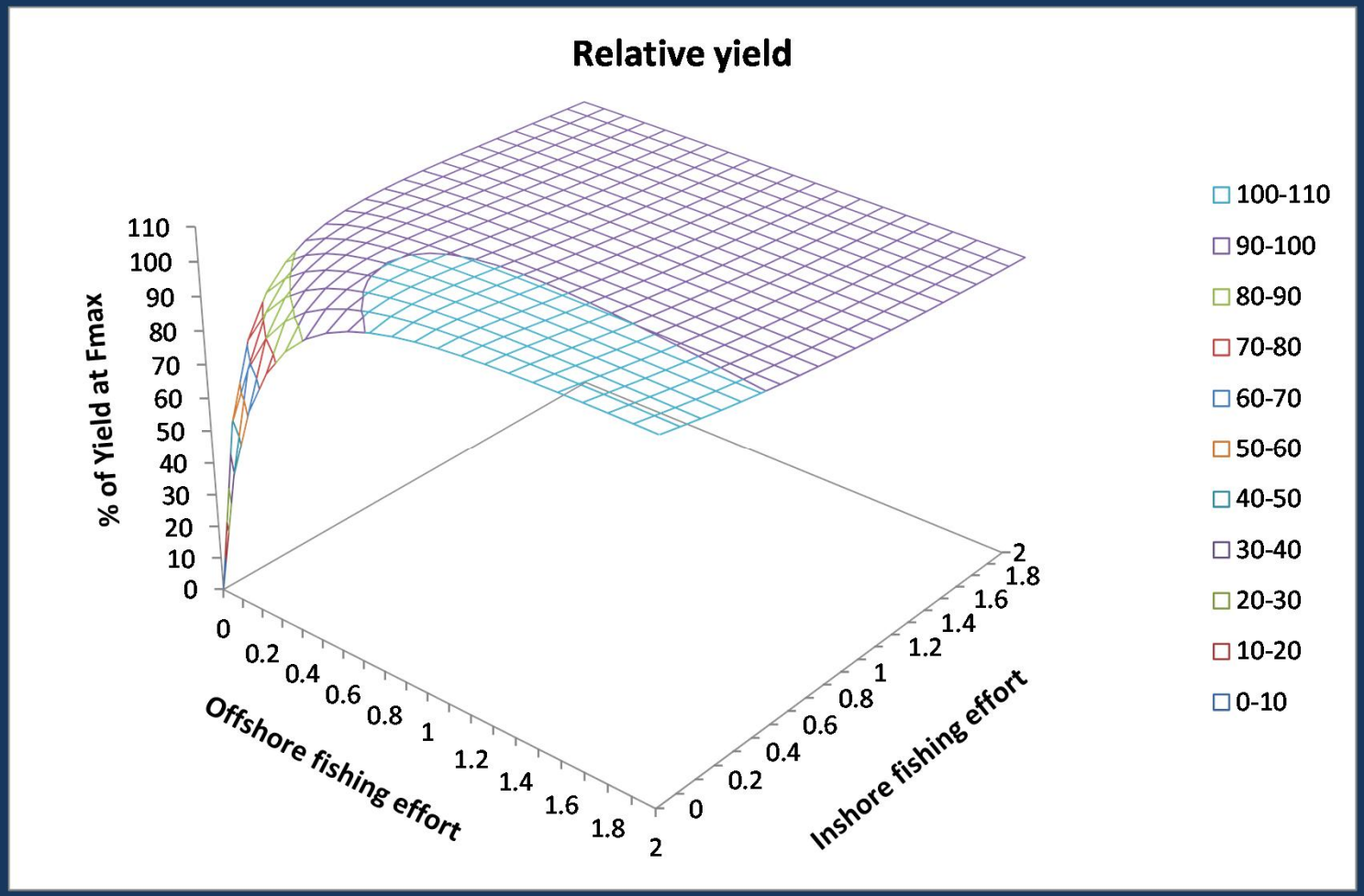


Based on standard per recruit analyses

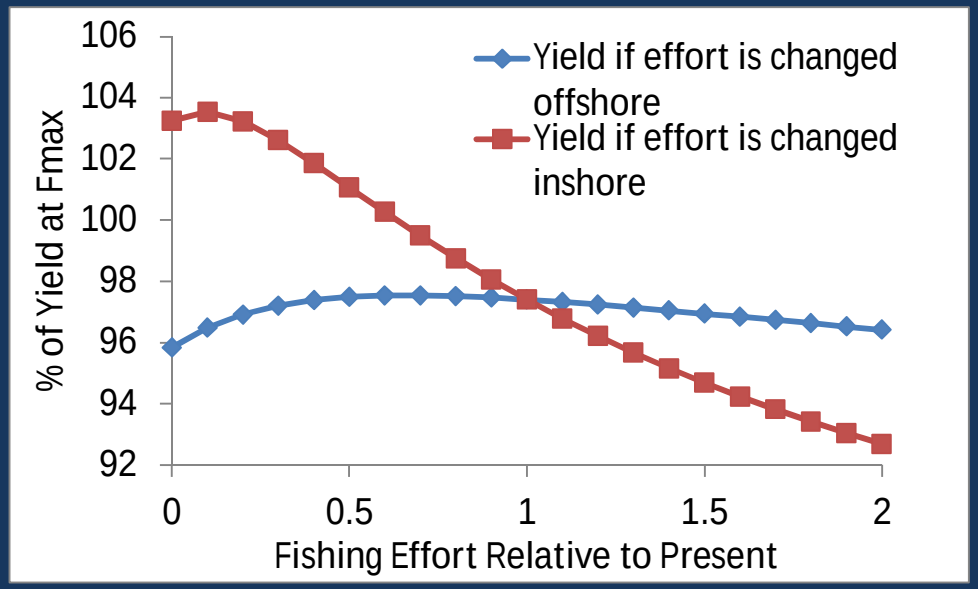
Orkney Brown crab stock assessment

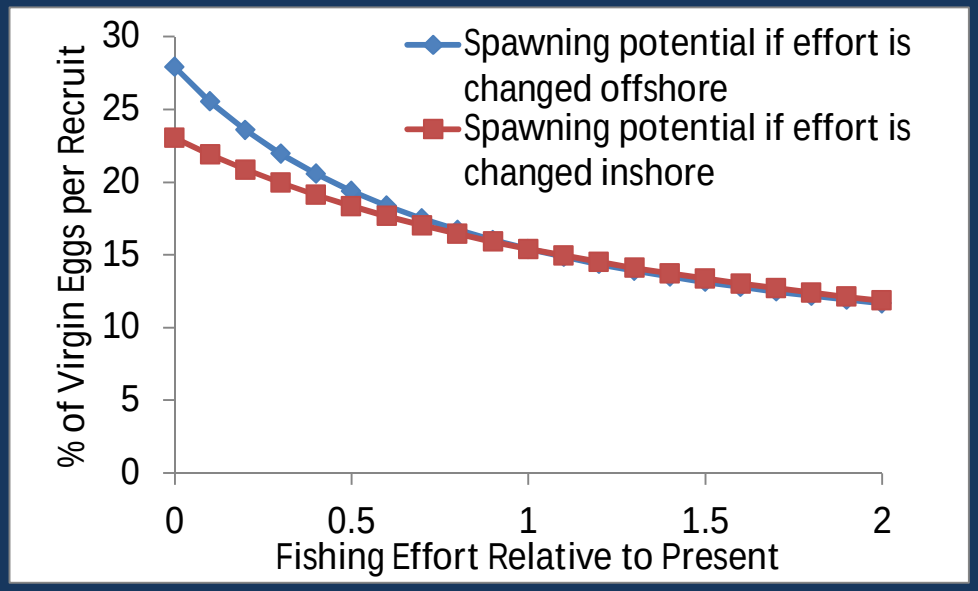


Orkney Brown crab stock assessment



Orkney Brown crab stock assessment





Effects on yield and spawning potential depend strongly differences between inshore and offshore fishery components

Orkney Brown crab stock assessment

The bottom line…

- No obvious causes for concern about sustainability of present brown crab fishery
- Careful consideration of potential controls is needed if management is to be brought in line with MSY approach
- Technical measures likely to be at least as important as effort controls
- Target reference points based on spawning potential are likely to be more meaningful than those based on yield
- Analysis of time-series data will be needed for better perspective and for definition of limit reference point

Implications for Principle 1

- PI 1.1.1 Stock Status: monitoring data and stock assessment will allow move from RBF to data-based assessment, once reference points are agreed
- PI 1.2.1 Harvest Strategy: monitoring and stock assessment are in place, but link with management actions not yet defined
- PI 1.2.2 Harvest Control Rules: possible once reference points are defined, but requires management framework for response to status

Implications for Principle 1

- PI 1.2.3 Information to support Harvest Strategy: LPUE and CPUE data available, in a position to make inferences about effort
- PI 1.2.4 Stock assessment: not required while RBF is applied, but analytical assessment is in place