Moving fisheries from data poor to data sufficient: evaluating the costs of management versus the benefits of management

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Data-poor to data-sufficient: evaluation

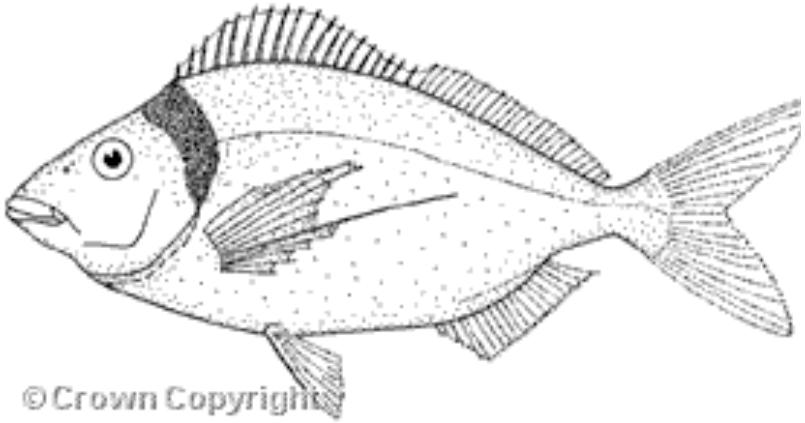
- Amount of data is more a function of management than of the fishery
- Too little data = do not fully realise management objectives
- Too much data = high management costs = do not fully realise management objectives
- Evaluate alternative types and intensities of monitoring
- After evaluation move to data-sufficient by:
  - Collecting more data
  - Collecting less data
  - Collecting different data
  - Not doing anything (i.e. we are already collecting the right amount of data)

An evaluation approach for monitoring

- Monitoring is an attribute of a management procedure and can be altered and evaluated like its other attributes
- So the MPE (aka MSE) framework provides a basis for evaluating alternative forms of monitoring
- Illustrate a method for combining performance measures from MPE including the cost of monitoring
- Aim to show that even for data-poor stocks it is possible to take a formal approach to data-collection strategies

Example fishery

- An illustrative "data-poor" example from NZ
- Tarakihi (*Nemadactylus macropterus*) Area 3
- Trawl fishery ~1000t / year
- No quantative assessment
- Commercial CPUE
- Few fishery independent surveys
- Growth from tagging studies
- "Best guess" operating model

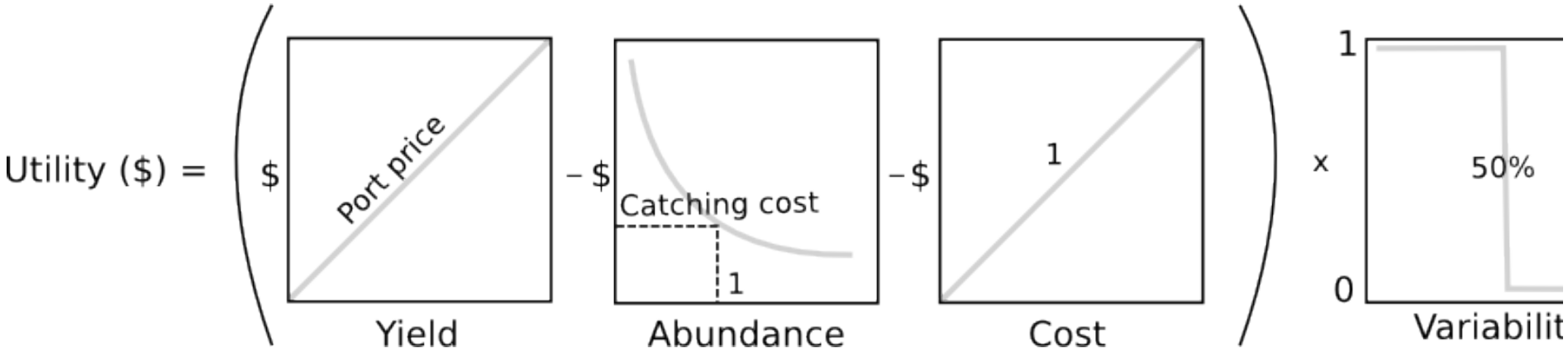


Example performances measures

- Maximize yield to maximize fishing revenue
- Maximize abundance to minimize fishing costs
- Minimize variability in TAC to provide stability to industry
- Minimize management costs
- Maximize sustainability

- Keeping illustration simple - likely to be more performance measures, representing other stakeholder interests

Utility function

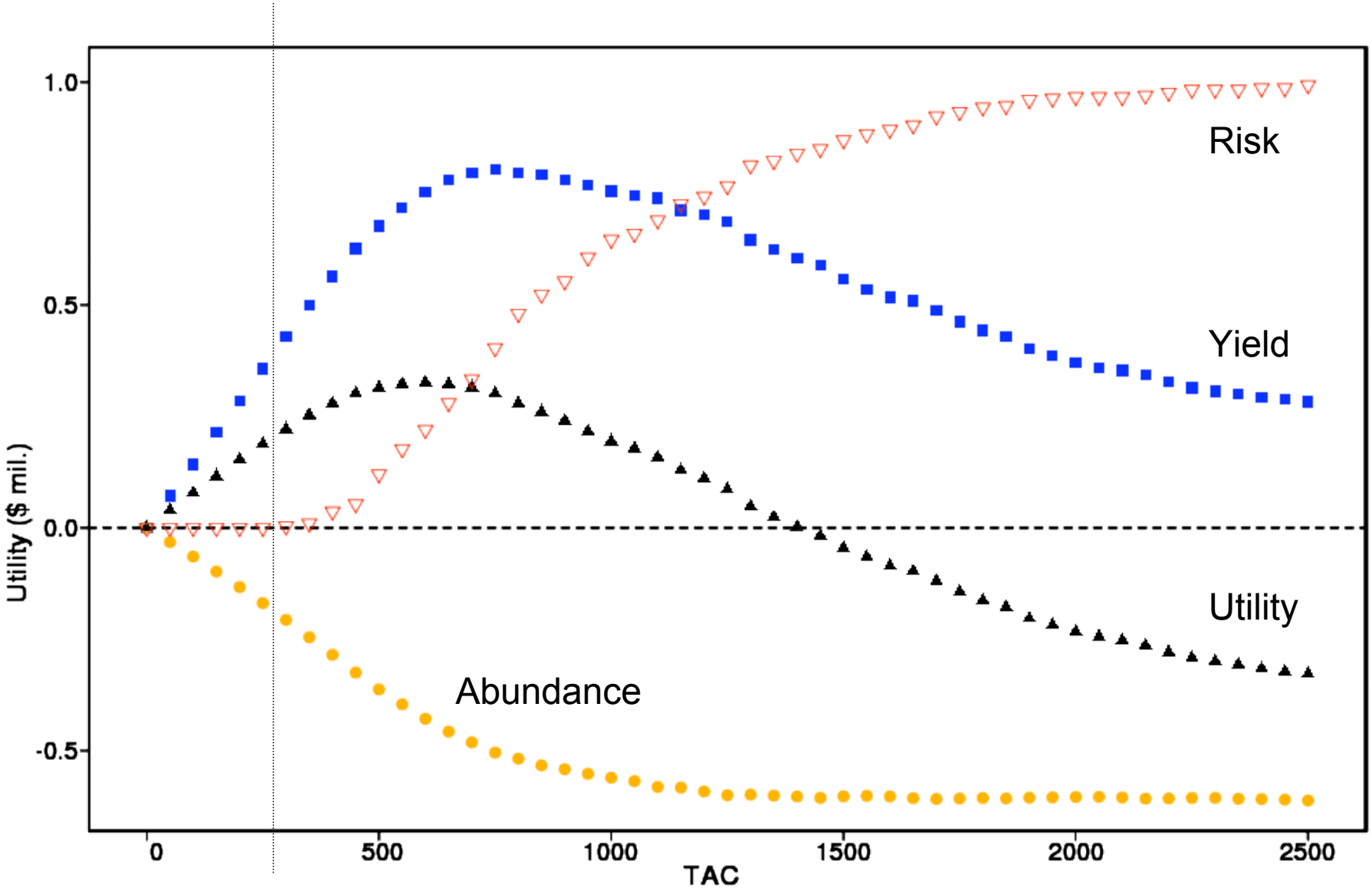


- Transform performance measures to dollars using readily available data – port price and trading price of quota.
- For less easily monetorized performance measures – use a threshold (1 or 0) part-utility function (could use other function)

Sustainability

- In addition to utility require a measure of sustainability becaus management procedure with maximum expected utility can involve significant risk.
- Use a risk of stock extinction as measure of sustainability – arbitrarily chose 5% of B0 as extinction point.
- Require a probability of less than 0.1% of ever going below tha point

No monitoring: constant TAC

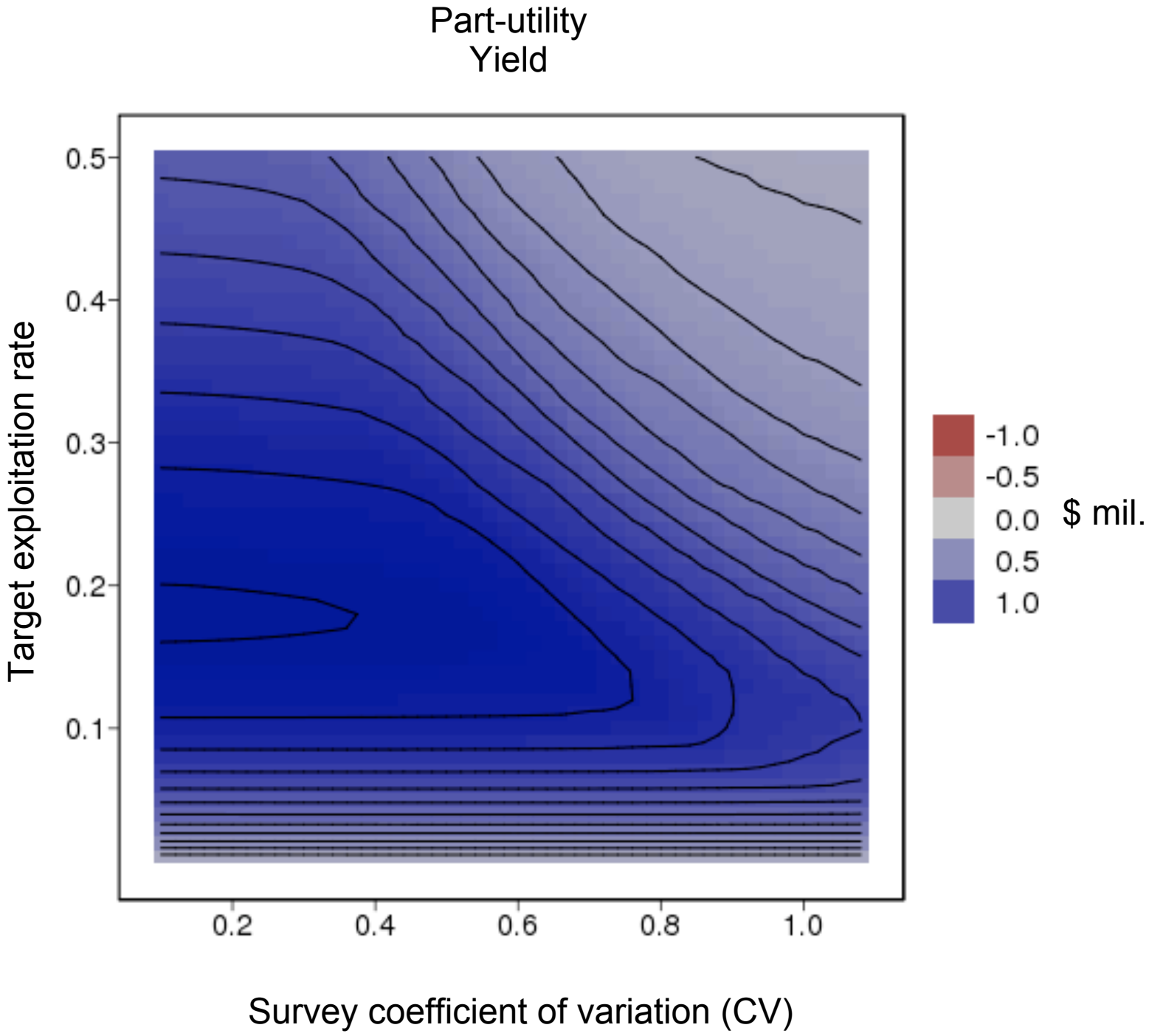


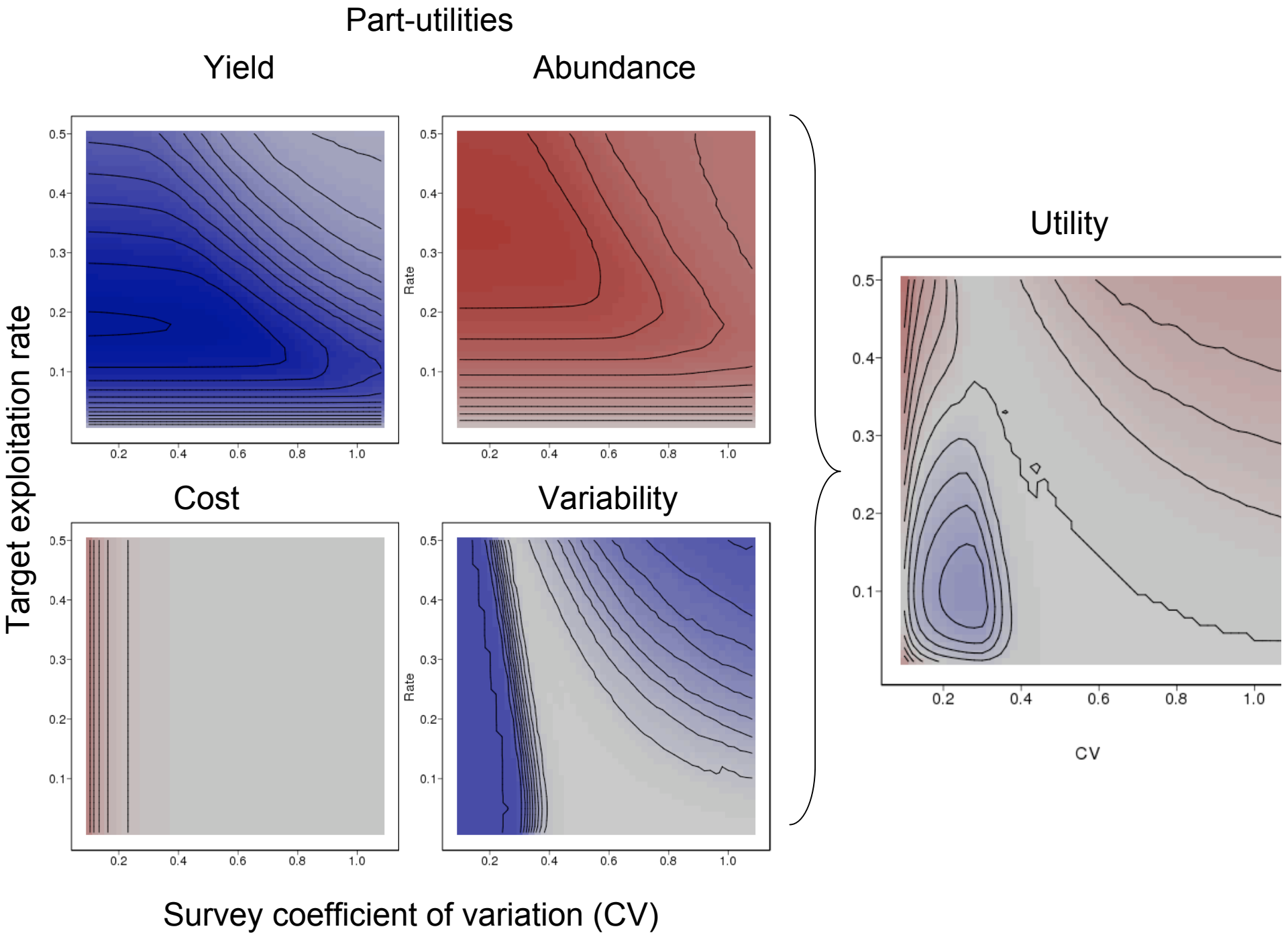
Fixed monitoring

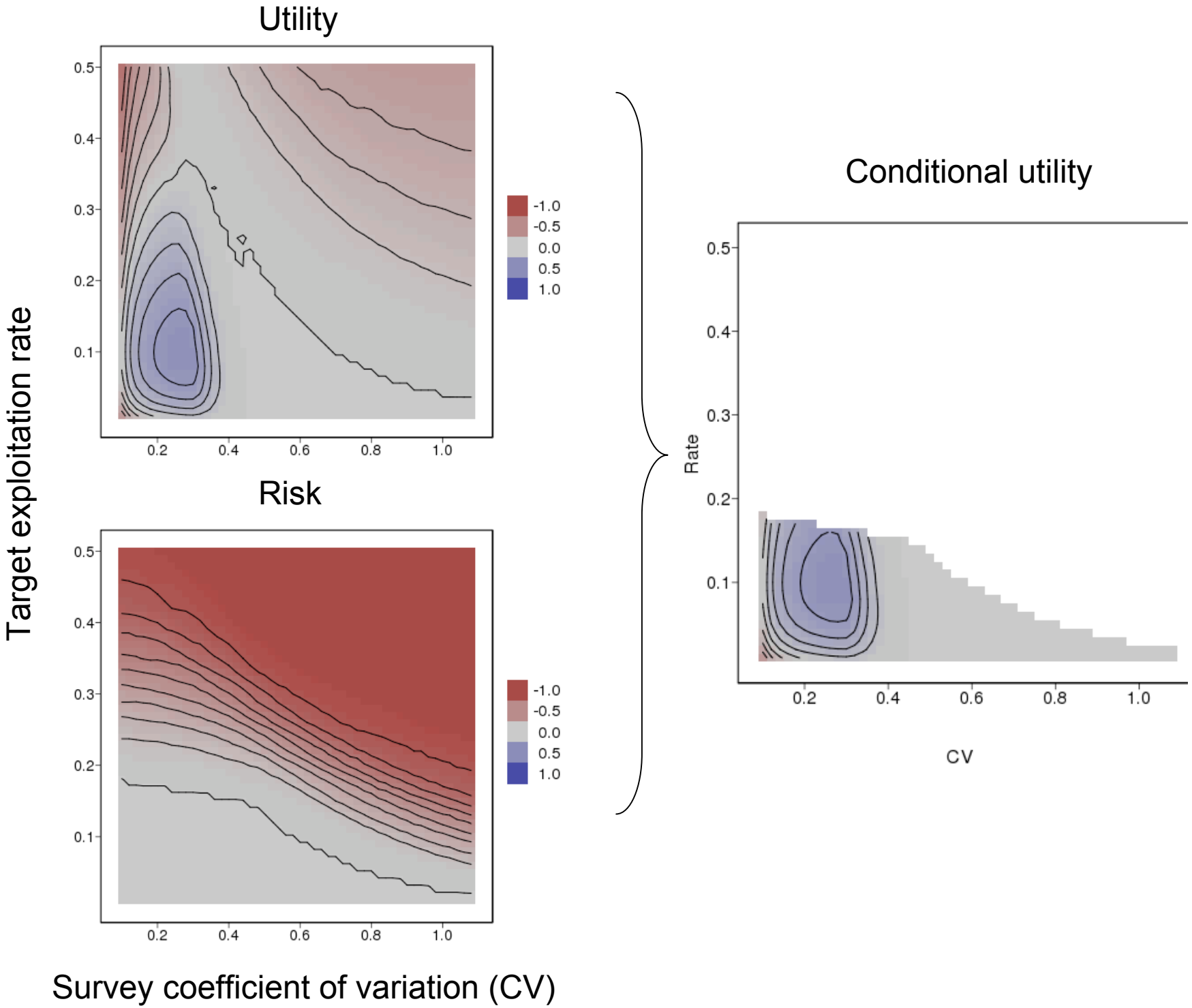
- Survey every year with a target *CV*
- *TAC* based on biomass estimate, *B* and exploitation rate, *E*

$$TAC = B * E$$

- Simplistic example of a management procedure with monitorin attribute, *CV*, with alternative cost implications but that can be evaluated
- Costs of surveys with different CVs is based on sample size and CV obtained in 2007 survey.


Part-utility
Yield
Target exploitation rate
0.5
0.4
0.3
0.2
0.1
0.2
0.4
0.6
0.8
1.0
Survey coefficient of variation (CV)
-1.0
-0.5
0.0
0.5
1.0
$ mil.


Part-utilities
Yield
Abundance
Cost
Variability
Utility
Target exploitation rate
Survey coefficient of variation (CV)
Rate
CV
0.1
0.2
0.3
0.4
0.5
0.2
0.4
0.6
0.8
1.0


Utility
Risk
Conditional utility
Target exploitation rate
Survey coefficient of variation (CV)
Rate
CV
0.5
0.4
0.3
0.2
0.1
0.2
0.4
0.6
0.8
1.0
-1.0
-0.5
0.0
0.5
1.0

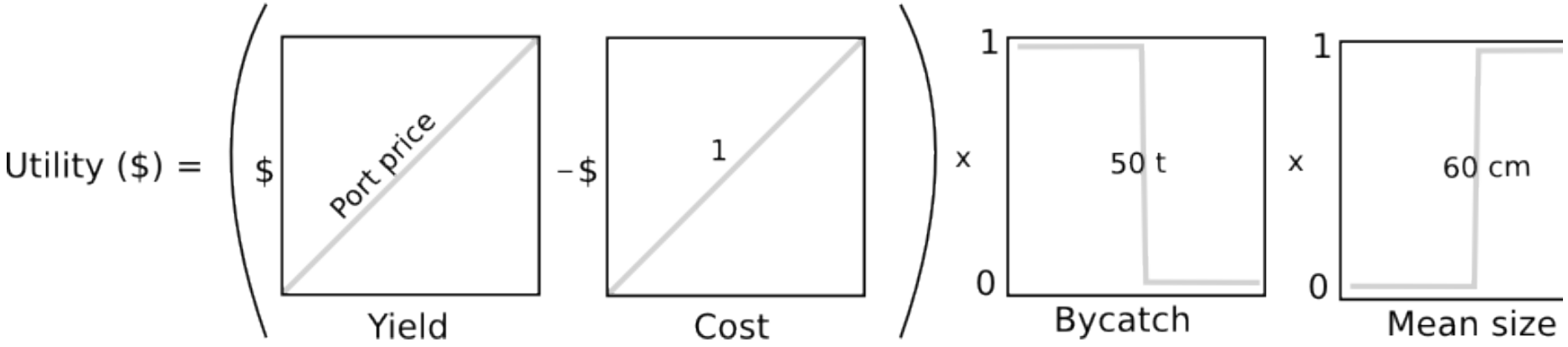
		Performance measures (mean)				Part-utilities (mean)					
Procedure type	Attributes	Yield (t)	Abundance (relative)	Variability (%)	Cost ($ mil.)	Yield ($ mil.)	Abundance ($ mil.)	Variability (prob<=50%)	Cost ($ mil.)	Utility	Risk
No monitoring	TAC=250t	250	1.48	0	0.00	0.36	0.17	1.00	0.00	0.19	0.00
Fixed monitoring	*CV*=0.28 *E*=0.1	890	0.90	40	0.07	1.27	0.72	0.98	0.07	0.47	0.00
Adaptive monitoring	*CV*=0.46 *E*=0.11 *T*=0.556	880	0.90	32	0.02	1.26	0.72	1.00	0.02	0.52	0.00

Collecting data allows far high yield for given level of risk

Making monitoring adaptive can reduce co for similar performance

Summary

- Simple illustration of an approach only but could be extended t more sophisticated MPs and utility functions
- Utility function can incorporate other performance measures ir other ways



- Utility function may be rough but provides guidance to how much should be spent on data collection.
- Better to be roughly right than do nothing at all.

Thanks