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Measuring, Interpreting and Monitoring Economic Productivity in the South Australian Spencer Gulf and West Coast Prawn Fisheries
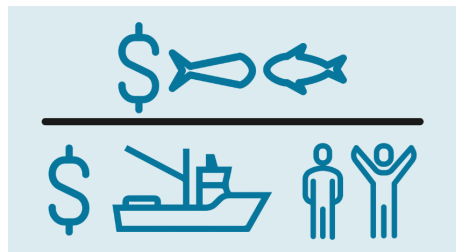
Stephanie McWhinnie, Sean Pascoe, Peggy Schrobback and Eriko Hoshino

NZARES September 2022

MOTIVATION

- Fishers and fishing vessels are not homogeneous
- Differences in ability to catch fish can be assessed using productivity analysis
- Economic objectives often stated but data is limited
- How economic performance relates to other metrics matters

This Study

Empirically examines efficiency and economic performance in South Australia's Spencer Gulf and West Coast Prawn fisheries


- Uses a unique vessel-level dataset
- Calculates quantity and value-based measures of efficiency and capacity
- Compares to economic metrics of performance
- One of three case studies within a larger project

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DATA ENVELOPMENT ANALYSIS

Data Envelopment Analysis (DEA) to compare harvesting performance to best-in-fleet

- Technical efficiency relates catch to amount of inputs: score < 1 means a vessel is inefficient
- Capacity utilisation relates output to its potential: score <1 means could catch more if input use wasn't restricted
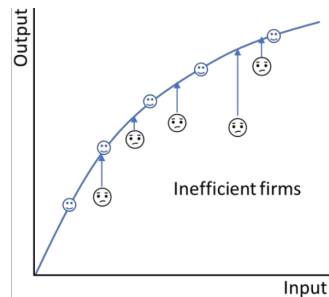
Regression analysis to estimate correlation with economic performance metrics

- Full equity profits, boat cash profits, gross margins

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SA Spencer Gulf & West Coast Prawn Fisheries
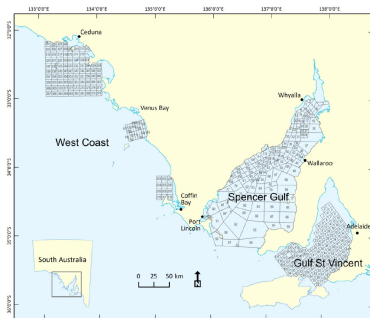
- Single-species fishery for Western King Prawn
- Average annual catch 2,000 tonnes worth $40 million
- Management goals:
  - Ecological sustainability
  - Minimal ecosystem impacts
  - Optimal utilisation & equitable distribution
  - Participative management
- Input-controlled fishery with real-time effort decisions made by Committee-at-Sea

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SA Prawn Data

- Confidential, voluntary survey of quantity and value from BDO EconSearch
- 51 license-level observations 2012/13, 2014/15, 2018/19
- Inputs:
  - Labour FTE & labour costs
  - Nights fished & boat variable costs
  - Vessel length (m) & fixed costs
- Outputs:
  - Western King prawn tonnes & revenue
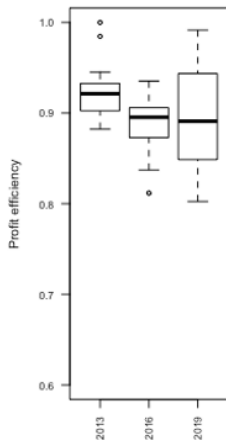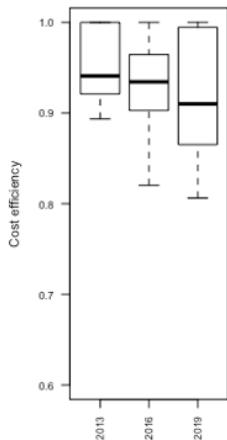 - Other catch tonnes & revenue
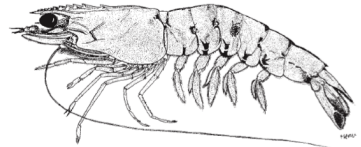
QUANTITY-BASED EFFICIENCY & CAPACITY
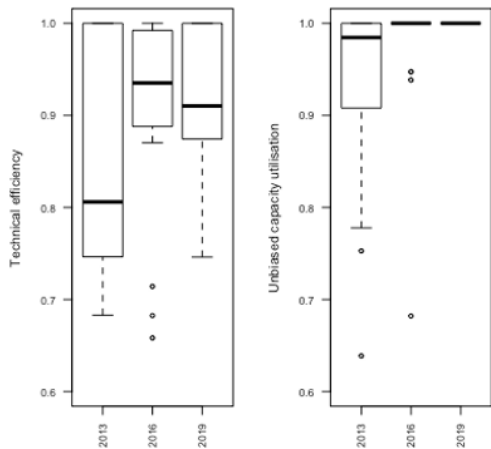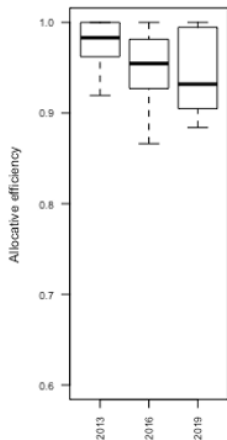

- Technical efficiency scores are high
    - Relatively homogeneous fleet by quantity
- Technical efficiency scores lowest in 2012/13
- Capacity utilisation is high
    - Input restrictions make it difficult to identify maximum capacity

VALUE-BASED EFFICIENCY

- Allocative, cost and profit efficiency also high
- But mean is falling and interquartile range is expanding

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SA Prawn DEA Correlations

	Full equity profits	Boat cash profits	Gross margins
log(TE)	1.343	1.425	1.231**
	(0.771)	(0.958)	(0.428)
log(UCU)	4.009***	2.815	1.803**
	(1.021)	(1.594)	(0.588)
Intercept	12.237***	12.079***	12.937***
	(0.156)	(0.194)	(0.078)
Adj. R^2	0.238	0.053	0.195

–Pooled cross section   – 51 observations

- Some positive relationships between quantity and economic outcomes
- But low overall explanatory power
- Why a disconnect?

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ECONOMIC PERFORMANCE
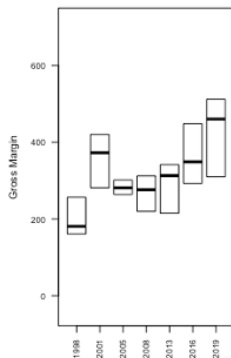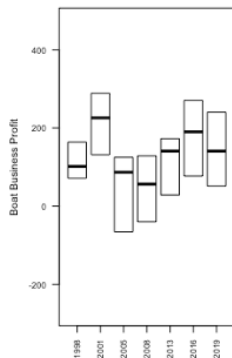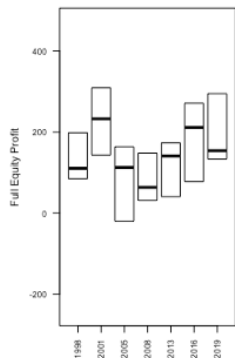
- Large variation in all measures of economic performance
- Prices, costs and on-shore inputs matters for profit

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Concluding Remarks - SA Prawn

- Technical efficiency and capacity utilisation are relatively high amongst Spencer Gulf and West Coast Prawn fishers

- Input restrictions and cooperative management has led to similar quantitative measures, but economic outcomes have greater variation

- Only price-based levers are available so quantity-based metrics less likely to be suitable indicators for economic performance in this fishery

- Lower variation in quantities than in values has potential implications for longer-term management pressures

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Concluding Remarks - Whole Project

- Demonstrated the use of productivity measurement and analysis as a performance indicator in three Australian fisheries:
    - Commonwealth Northern Prawn; SA Prawn; Queensland Spanner Crab
- Addressed different questions with a common backbone of TE & CU from DEA
- Data-rich and data-poor need more nuanced interpretation
- Appropriate data collection needs to correspond to the question and consider:
    - Objectives of the fishery
    - Management scenario
    - Potential future questions
    - Retention of and access to data

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NGAITALYA AND THANK YOU

- The project team acknowledges the Indigenous people who are the traditional owners of country and recognises their continuing connection to lands, waters and culture. This work was conducted in the lands of the Kaurna, Turrbal, Yuggera, Muwinina and Ngunnawal peoples.

- The data sets used in this project were accessed from the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES), BDO EconSearch and Queensland Department of Agriculture and Fisheries and we are grateful for the fishers who provided the original data.

www.frdc.com.au/project/2019-026