Fishing for revenue: how leasing quota can be hazardous to your health

John Tisdell

With Timothy Emery, Klaas Hartmann, Bridget Green, Caleb Gardner

University of Tasmania

Outline

- Introduction
- ITQs – benefits and limitations
- Case study
- Results and conclusions

Introduction

- Successful fisheries management requires an understanding of fisher decision-making to ensure the desired behavioural response to institutional or regulatory change (Smith and Wilen, 2005; Hilborn, 2007; Fulton et al., 2011).
- In many cases, the institution of management measures and policies have altered the incentives and consequent behaviour of fishers in ways unanticipated by their designers (Fulton et al., 2011).

ITQs

Individual transferable quota (ITQ) management has been considered an improvement on traditional input control management because it aims to align fisher incentives and thus behaviour with desired fishery outcomes (Grafton, 1996; Grafton et al., 2006).

By providing individual fishers with the ability to trade quota creates incentives for:

(i) quota owners to maximize their profits by both harvesting their fixed quota units (or catch) at minimum cost and modifying their fishing behaviour to increase revenue

(ii) Inefficient owners to sell their quota units to more efficient owners and leave the fishery

(i) Creates a stewardship incentive (National Research Council 1999).

Those that fish and those that own quota

These theoretical advantages of ITQ management implicitly assume that fishing is undertaken by those who own the majority of their quota units (i.e. quota owners).

In many ITQ fisheries, there is an increasing disconnect between those that own the quota and those that actually fish the quota, with many quota owners preferring to lease out their quota to gain income from their quota asset (Connor and Alden, 2001; Pinkerton and Edwards, 2009).

Examples

- Around 60% of the quota in the mid-Atlantic (US) surf clam (Spisula solidissima, Mactridae) and ocean quahog (Artica islandica, Arcticidae) fishery was leased out by quota owners instead of directly fished ten years after the introduction of ITQs (Brandt 2005).

- In the British Columbia halibut (Hippoglossus stenolepis, Pleuronectidae) fishery in 2006 79% of the quota was leased out by quota owners and half of the vessels operating relied on leased quota for the majority of their catch (Pinkerton and Edwards 2009).

- Similarly, after ten years of ITQ management in the Tasmanian southern rock lobster (Jasus edwardsii, Palinuridae) fishery, 37% of the quota was leased out by quota owners, with the number of lease-dependent fishers (fishers who only lease quota) growing over the same period (van Putten and Gardner 2010).

Incentives and returns to lease quota owners

- Lease quota fishers are not guided by the same incentive structure generated by ITQ management that theoretically regulates the behaviour of quota owners (Bradshaw 2004; Gibbs 2009).

- This is because their revenue is not constrained by the quota they own— they are able to obtain effectively unlimited additional quota through the lease market.

- Further, their profitability is based on the margin between the quota lease price and market price, and they do not receive any benefit from improvement in the resource rent (which flows to quota owners).

- Having to pay to lease quota units can create greater incentives for lease quota fishers to respond more to short-term changes in expected revenues than quota owners.

The risk of fishing

- The fishing incentives and behaviour of quota owners and lease quota fishers is particularly important when considering regulatory changes that have ramifications for the operational health and safety of fishers (Smith and Wilen 2005).

- Fishing is a dangerous occupation
  - high rates of fatalities and injuries due to the nature of the working conditions and unpredictability of the environment (Mayhew 2003; Windle et al. 2008; Roberts 2010; Brooks 2011).

- Most empirical evidence on the risk behaviour of fishers suggests that
  - they are generally risk averse (Sutinen 1979; Mistiaen and Strand 2000; Nguyen and Leung 2009),
  - particularly to physical risk caused by weather (Smith and Wilen 2005; Kahui and Alexander 2008).

- Risk aversion may vary, however, depending on the interactions of factors such as:

  - the current management system
  - expected revenue
  - skipper experience
  - vessel size and
  - financial security (Brooks, 2007).

Case Study: Tasmanian Rock Lobster Fishery

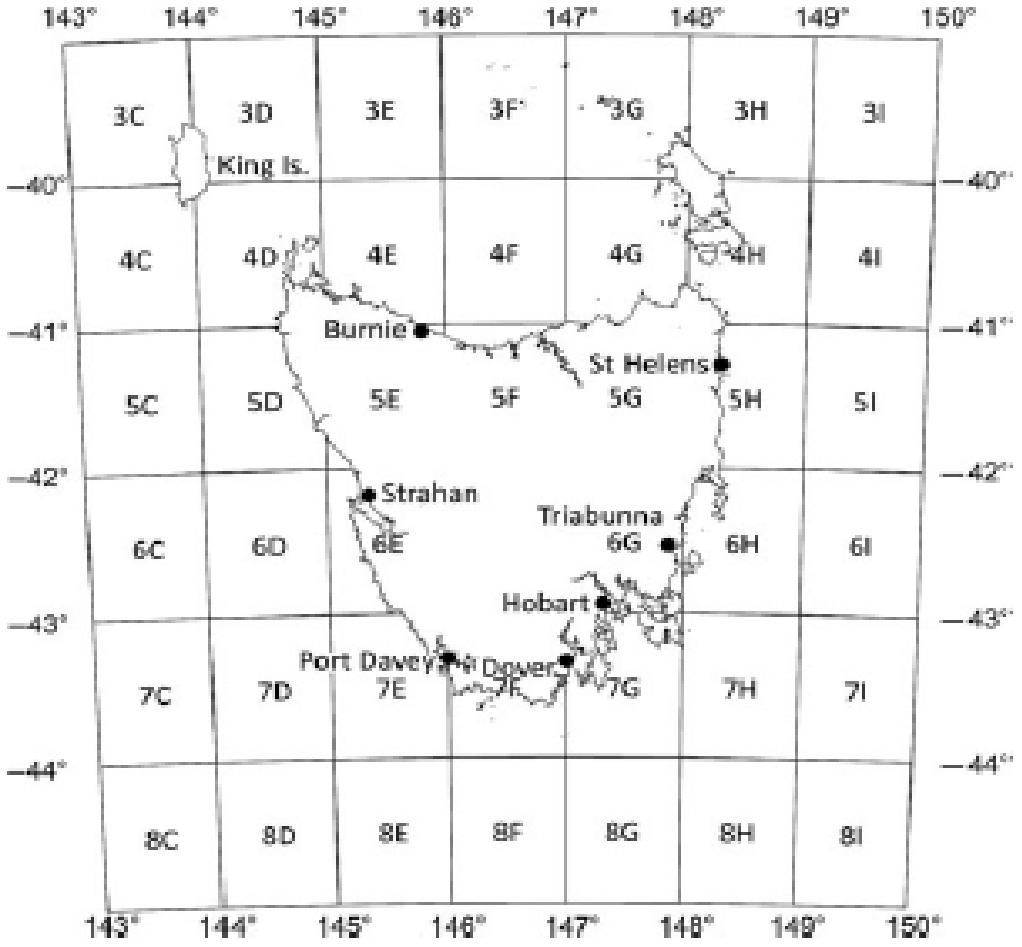

Figure 2. Map of the Tasmanian southern rock lobster fishery, Australia, with one degree squares (e.g. 3C) used for compulsory logging of the location of daily effort.

- King Island
  - Blocks (3C, 3D, 4C and 4D)
- Southwest coast
  - (blocks 5D, 6E, 7E and 7F)
- East coast and Hobart
  - (blocks 5H, 6H, 6G and 7G)

Table 1. Discrete daily choice model comparing the decision to fish among significant explanatory variables.

	Statewide			King Island			Southwest Coast			East Coast		
	Coefficient	Standard Error	*p*-value	Coefficient	Standard Error	*p*-value	Coefficient	Standard Error	*p*-value	Coefficient	Standard Error	*p*-value
Intercept	1.564	0.0474	**< 0.0001***	2.1024	0.1677	**< 0.0001***	0.0566	0.1762	0.7479	1.273	0.0712	**< 0.0001***
% Quota Owned/Held	−0.1391	0.0197	**< 0.0001***	0.1585	0.1151	0.1686	0.124	0.0165	**< 0.0001***	−0.2078	0.0361	**< 0.0001***
Length	−0.0103	0.0018	**< 0.0001***	−0.0361	0.0047	**< 0.0001***	0.0122	0.0025	**< 0.0001***	−0.0206	0.0032	**< 0.0001***
Wave height 2 m	−0.362	0.0298	**< 0.0001***	−0.3492	0.1407	0.0131	−0.0965	0.1685	0.5667	−0.3599	0.0462	**< 0.0001***
Wave height 3 m	−0.6688	0.0333	**< 0.0001***	−0.8469	0.1434	**< 0.0001***	−0.4138	0.1677	0.0136*	−0.6127	0.0528	**< 0.0001***
Wave height 4 m	−1.007	0.0395	**< 0.0001***	−1.6317	0.1576	**< 0.0001***	−0.7386	0.1685	**< 0.0001***	−0.9195	0.0754	**< 0.0001***
Wave height >5 m	−1.463	0.0483	**< 0.0001***	−2.2274	0.243	**< 0.0001***	−1.2948	0.1709	**< 0.0001***	−1.316	0.0865	**< 0.0001***
Variability	−0.0454	0.0005	**< 0.0001***	−0.0637	0.0014	**< 0.0001***	−0.033	0.0006	**< 0.0001***	−0.0827	0.0016	**< 0.0001***
Revenue	0.0139	0.0005	**< 0.0001***	0.0193	0.0023	**< 0.0001***	0.0204	0.0025	**< 0.0001***	0.0194	0.0011	**< 0.0001***
% Quota Owned/Held:Wave height 2 m	0.0702	0.0184	**0.0001***	−0.0093	0.1215	0.9388				0.0458	0.0343	0.1814
% Quota Owned/Held:Wave height 3 m	0.134	0.021	**< 0.0001***	−0.0312	0.1236	0.8008				0.1276	0.0365	**0.0005***
% Quota Owned/Held:Wave height 4 m	0.1871	0.027	**< 0.0001***	0.0492	0.1337	0.7127				0.1374	0.0502	**0.006 2***
% Quota Owned/Held:Wave height >5 m	0.1659	0.0333	**< 0.0001***	0.2099	0.2469	0.3952				0.181	0.0505	**0.0003***
Wave height 2 m:Revenue	0.0026	0.0006	**< 0.0001***	0.0032	0.0024	0.1921	−0.0052	0.0025	**0.035 8***	0.0037	0.0011	**0.0008***
Wave height 3 m:Revenue	0.0023	0.0006	**0.0004***	0.005	0.0025	0.0487	−0.0057	0.0025	**0.020 4***	0.006	0.0013	**< 0.0001***
Wave height 4 m:Revenue	0.0031	0.0008	**0.0001***	0.0134	0.003	**< 0.0001***	−0.0063	0.0025	**0.010 9***	0.0127	0.0022	**< 0.0001***
Wave height >5 m:Revenue	0.0076	0.0011	**< 0.0001***	0.0176	0.0053	**0.0009***	−0.0011	0.0026	0.674	0.017	0.0026	**< 0.0001***
% Quota Owned/Held:Revenue	−0.0001	0.0002	0.7398	−0.004	0.0021	0.0636	−0.0024	0.0003	**< 0.0001***	0.001	0.0007	0.1196
% Quota Owned/Held:Length	0.0043	0.0009	**< 0.0001***							0.0056	0.0015	**0.0002***
% Quota Owned/Held:Wave height 2 m:Revenue	−0.0007	0.0003	**0.025 7***	−0.0001	0.0023	0.9633				−0.0005	0.0008	0.5435
% Quota Owned/Held:Wave height 3 m:Revenue	−0.0016	0.0004	**< 0.0001***	−0.0009	0.0024	0.7141				−0.002	0.0009	**0.023 6***
% Quota Owned/Held:Wave height 4 m:Revenue	−0.0029	0.0006	**< 0.0001***	−0.0056	0.0029	0.0515				−0.0018	0.0013	0.1891
% Quota Owned/Held:Wave height >5 m:Revenue	−0.0026	0.0008	**0.001 4***	−0.0117	0.0058	**0.043 9***				−0.0029	0.0014	**0.031 7***
Observations		371711			68252			125347			129561	
AIC		440024			70905			155019			156126	

Dependent variable: Decision to fish. Insignificant variables were removed from the model. Other significant variables not displayed: quota year, home port of vessel, month and block (area).

Decision to fish

	Statewide		
	Coefficient	Standard Error	*p*-value
Intercept	1.564	0.0474	< 0.0001*
% Quota Owned/Held	−0.1391	0.0197	< 0.0001*
Length	−0.0103	0.0018	< 0.0001*
Wave height 2 m	−0.362	0.0298	< 0.0001*
Wave height 3 m	−0.6688	0.0333	< 0.0001*
Wave height 4 m	−1.007	0.0395	< 0.0001*
Wave height >5 m	−1.463	0.0483	< 0.0001*

King Island

	King Island		
	Coefficient	Standard Error	*p*-value
Intercept	2.1024	0.1677	**< 0.0001***
% Quota Owned/Held	0.1585	0.1151	0.1686
Length	−0.0361	0.0047	**< 0.0001***
Wave height 2 m	−0.3492	0.1407	0.0131
Wave height 3 m	−0.8469	0.1434	**< 0.0001***
Wave height 4 m	−1.6317	0.1576	**< 0.0001***
Wave height >5 m	−2.2274	0.243	**< 0.0001***
Variability	−0.0637	0.0014	**< 0.0001***

South West Coast

	Southwest Coast		
	Coefficient	Standard Error	*p*-value
Intercept	0.0566	0.1762	0.7479
% Quota Owned/Held	0.124	0.0165	**< 0.0001***
Length	0.0122	0.0025	**< 0.0001***
Wave height 2 m	−0.0965	0.1685	0.5667
Wave height 3 m	−0.4138	0.1677	0.0136*
Wave height 4 m	−0.7386	0.1685	**< 0.0001***
Wave height >5 m	−1.2948	0.1709	**< 0.0001***
Variability	−0.033	0.0006	**< 0.0001***

East Coast and Hobart

	East Coast		
	Coefficient	Standard Error	*p*-value
Intercept	1.273	0.0712	< 0.0001*
% Quota Owned/Held	−0.2078	0.0361	< 0.0001*
Length	−0.0206	0.0032	< 0.0001*
Wave height 2 m	−0.3599	0.0462	< 0.0001*
Wave height 3 m	−0.6127	0.0528	< 0.0001*
Wave height 4 m	−0.9195	0.0754	< 0.0001*
Wave height >5 m	−1.316	0.0865	< 0.0001*
Variability	−0.0827	0.0016	< 0.0001*

Revenue and wave height

	Statewide		
	Coefficient	Standard Error	*p*-value
Wave height 2 m:Revenue	0.0026	0.0006	< 0.0001*
Wave height 3 m:Revenue	0.0023	0.0006	0.0004*
Wave height 4 m:Revenue	0.0031	0.0008	0.0001*
Wave height >5 m:Revenue	0.0076	0.0011	< 0.0001*

Wave height

	Statewide		
	Coefficient	Standard Error	*p*-value
% Quota Owned/HeldxWave height 2 m	0.0702	0.0184	**0.0001***
% Quota Owned/HeldxWave height 3 m	0.134	0.021	**< 0.0001***
% Quota Owned/HeldxWave height 4 m	0.1871	0.027	**< 0.0001***
% Quota Owned/HeldxWave height >5 m	0.1659	0.0333	**< 0.0001***

Controlled for expected revenue

	Statewide		
	Coefficient	Standard Error	*p*-value
% Quota Owned/Held:Wave height 2 m:Revenue	−0.0007	0.0003	**0.025 7***
% Quota Owned/Held:Wave height 3 m:Revenue	−0.0016	0.0004	**< 0.0001***
% Quota Owned/Held:Wave height 4 m:Revenue	−0.0029	0.0006	**< 0.0001***
% Quota Owned/Held:Wave height >5 m:Revenue	−0.0026	0.0008	**0.001 4***

Boat Length

	Statewide		
	Coefficient	Standard Error	p-value
Intercept	13.1004	0.1391	< 0.0001*
No. Quota Owned	0.0379	0.0035	< 0.0001*
% Quota Owned/ Held	−0.0992	0.0252	< 0.0001*
Observations		1767	
AIC		8643	

Dependent variable: Length

Conclusions: Take home messages

- The incentive to take greater risks and engage in hazardous fishing practices in order to increase revenue is not in the interest of governments, emergency response/search and rescue authorities and/or local fishing communities.
- The rise in the fatality rate observed in the TSRL fishery occurred at the same time as significant expansion of the quota lease market.
- One possible explanation is that leasehold fishers take greater risk by fishing in adverse weather conditions in order the gain the greatest advantage they can from the quota.

Thank you