

RATE OF PROFIT RETURN WITH ITQs: FISHING FOR OPTIMALITY

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ABSTRACT

The year 1990 saw the introduction of individual transferable quota rights to the NZ rock lobster fishery. This paper presents an analysis of the evolution of profitability in five different quota management areas over the period 1990-2001. The bio-economic model of an optimal fishery provides the basis for econometric analysis. The rate of profit return in each region was regressed on the corresponding real interest rate and the marginal stock effect. Evidence is found for the existence of optimal fishery. In general the half-life value of each region's rate of profit return is trending towards its mean value. Significant individual monthly effects are also evident when we regress the rate of profit return on a time trend and monthly dummy variables.

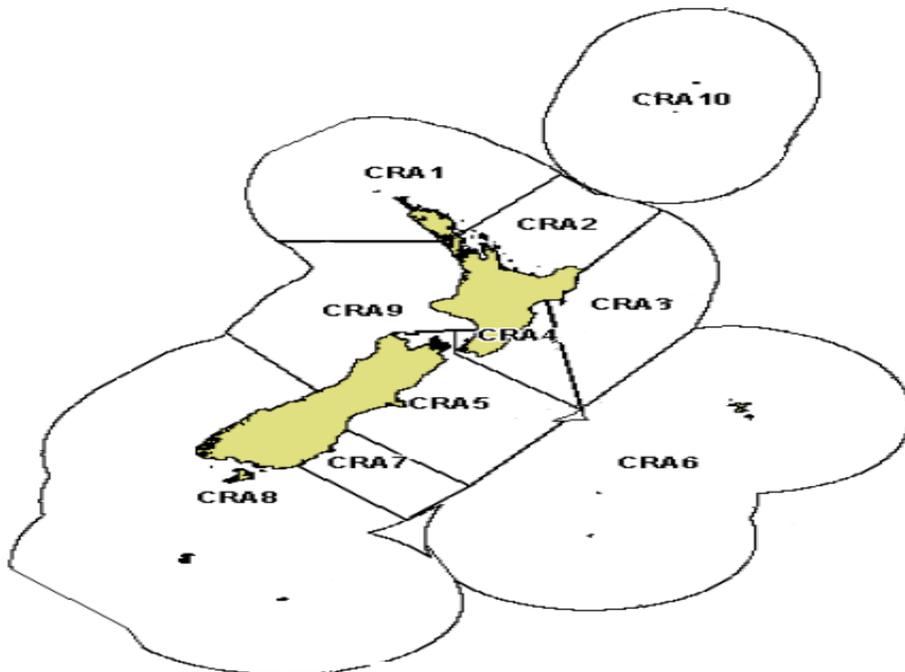
Keywords: quota prices, time series, half-life; convergence

INTRODUCTION

The New Zealand rock lobster fishery consists of two species: the red rock lobster (*Jasus edwardsii*) which accounts for most of the total landings; and the packhorse rock lobster (*Sagmariasus verreauxi*) which is relatively rarer. Development of New Zealand's rock lobster fishery over the period 1963-1983 was fueled by government structural policies designed to encourage growth. Government supplied financial incentives and a regulatory environment aimed at encouraging development. Throughout this period no explicit value attached to the permit needed to harvest lobster. Any positive implicit rents attached to the right created an incentive for firms to enter the fishery and compete for rent. As theory predicts, the number of vessels increased as did harvesting power, which eventually led to biological and economical decline.

The quota management system (QMS), based on transferable harvesting rights operating within the constraints of sustainable yield, was introduced into the rock lobster fishery on 1 April 1990. Figure 1 shows New Zealand's exclusive economic zone divided into 10 quota management areas (QMAs). Rock lobster stocks (labeled CRA) are managed on a QMA basis. Legislation directs the Minister of Fisheries to set a total allowable catch (TAC) for each QMA that moves each stock towards maximum sustainable yield. The TAC is further partitioned into a total allowable commercial catch (TACC), and allowances made for recreational harvest and Maori customary harvest. This research is based solely on CRA QMAs 1-5.

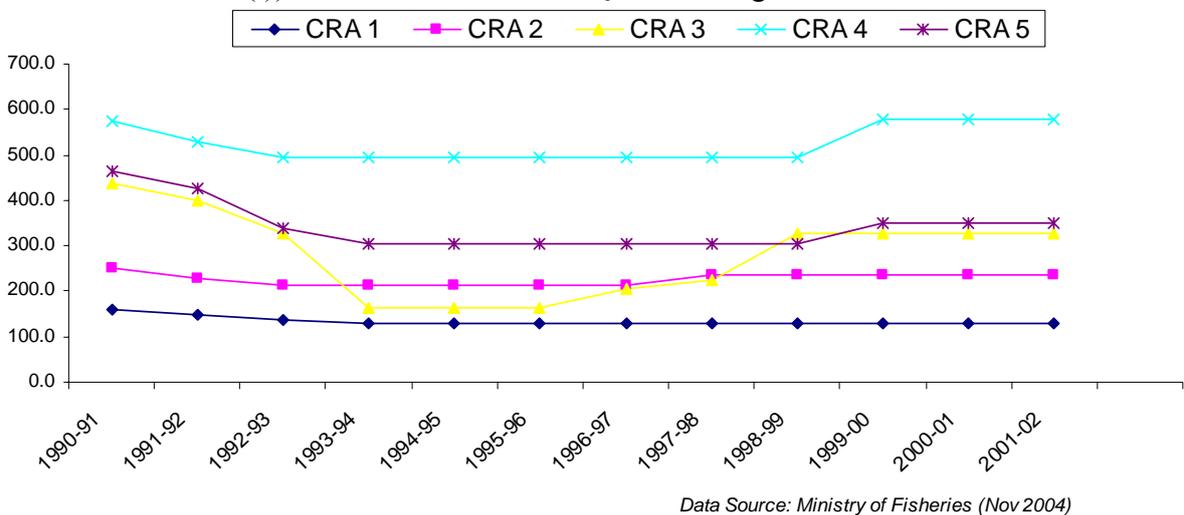
Acknowledgements: we appreciate the assistance supplied by Donggyu Sul, Ryan Greenaway-McGrevy, and Alan Rogers.



Source: Ministry of Fisheries (2004)

Figure 1: Rock lobster quota management areas

Whenever an adjustment is made to the TAC the TACCs and allowances for non-commercial harvest are re-assessed accordingly. The following Figure 2 illustrates the changes in TACCs (measured in tonnes (t)) for each of the 5 CRA QMAs through 2002.



Data Source: Ministry of Fisheries (Nov 2004)

Figure 2: TACC (t) for *Jasus edwardsii* in CRA QMAs 1-5

Under the reformed structure, a quota right has economic value that is co-determined by harvesting costs, the market price of fish, and management decisions. This mechanism not only reduces individual incentives to “race for fish”, it also avoids the potential inefficiency and inequities associated with fixed quota holding by allowing catching rights gravitate to their most highly valued commercial use. Initially ITQ rights were issued in perpetuity and specified in terms of weight, transferability, divisibility as well as transformability (Sharp,

2004). In 1992 ITQ rights were redefined as “share rights” where individual owned a percentage share of the annual TACC set by the Ministry. Duration, divisibility and transferability were not changed.

New Zealand is among several other countries in the world including Canada, Australia and Iceland that have implemented ITQ rights based fishery management system. The performance of ITQ system has been monitored constantly to determine whether it has led to changes in a reduction in fishing effort or an improvement in profitability. Before the introduction of QMS, the fishery was regulated by input controls, including minimum legal size restrictions, a prohibition on the taking of berried females and soft-shelled lobsters, and some local area closures. Most of the input controls have been preserved in the fishery but the limited entry provisions were replaced by allocation of ITQ to the previous licence holders based on catch history (Sullivan, 2004).

Improvement in the vulnerable biomass, which can be loosely referred to as the total size of fish stock, contributes to one of the significant sources in economic growth (Sharp and Jeffs, 2004). The intuition here is simple because a larger biomass level over time *ceteris paribus* reduces the fishing cost associated with one unit of catching, in other words, it leads to an enhancement in the catch per unit effort (CPUE) that is measured in terms of kilograms per pot lift. More recent trends in the vulnerable biomass show evidence of slight bounce back since the ITQ system was introduced (see Figure 3 below). This paper examines the trend in profitability and uses quota market data to see if the rate of return in the fishery tracks the opportunity cost of capital in the economy.

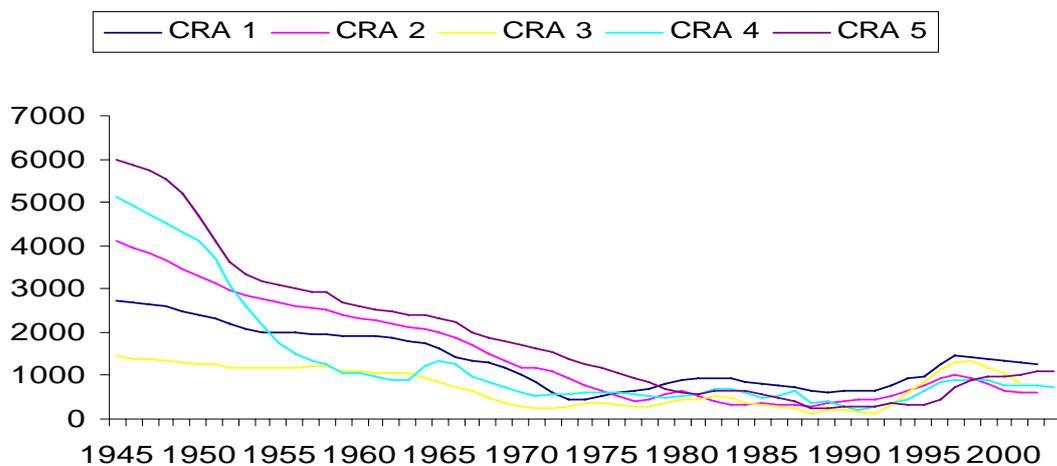


Figure 3: Estimated vulnerable biomass for *Jasus edwardsii* in CRA QMAs 1-5 (Data source: Sharp and Jeffs, 2004).

THE ECONOMIC MODEL

Consider a fishery with single species fishery, namely, rock lobster in a discrete time format. Denote the fish stock or biomass level at time t as $B(t)$. According to Hartwick and Olewiler (1986), the equilibrium condition of a sustainable fishery is to satisfy that the change in the fish stock, $F[B(t)]$, must exactly equals to the harvest, $H(t)$, over the same time interval. The biological mechanism from one period to the next can be written as

$$B(t+1) = B(t) + F[B(t)] - H(t) \quad (2.1)$$

Equation (2.1) can be re-arranged in terms of $H(t)$ as

$$H(t) = F[B(t)] - [B(t+1) - B(t)] \quad (2.2)$$

Equation (2.2) can be interpreted as the amount of harvest at equilibrium equals to the difference of the instantaneous growth in fish population at time t and the actual change in the fish stock from one period to the next.

Hartwick and Olewiler (1986) define $U[H(t)]$ as the total benefit derived from harvest and $C[H(t), B(t)]$ as the cost function of harvesting fish which depends on the amount harvested as well as the fish stock. Within a given time interval, the net benefit for harvest is $U[H(t)] - C[H(t), B(t)]$. Taking into account of the positive discount rate (r), the optimal fishery equilibrium is determined by maximizing the sequence of net benefit (Π) subject to the state equation (2.2). That is,

$$\begin{aligned} \text{Arg Max } \{ \Pi = & U[H(0)] - C[H(0), B(0)] + (1/1+r)\{U[H(1)] - C[H(1), B(1)]\} + \dots + \\ & (1/1+r)^n \{U[H(n)] - C[H(n), B(n)]\} + \dots \} \quad (2.3) \\ \text{Subject to } & H(t) = F[B(t)] - [B(t+1) - B(t)] \\ \text{For } & t = 1, \dots, n \end{aligned}$$

The Hamiltonian function is solved by substituting equation (2.2) into equation (2.3), differentiating with respect to $B(t)$, and setting each derivative equal to zero. To simplify the expression, let $V(t)$ equal to $[U'(t) - C'(t)]$, and the following equation represents the equilibrium condition within the fisheries that maximizes the economic value of harvesting under the resource constraint for any two periods, t and $t+1$:

$$\frac{V(t+1) - V(t)}{V(t)} + \frac{V(t+1)F[B(t)]}{V(t)} + \frac{C_B[H(t), B(t)]}{V(t)} = r \quad (2.4)$$

The first term in equation (2.4) indicates the percentage capital gain (or loss) - the change in net profits received from the fishery - from period t to $t+1$. For the owner with private quota rights, $V(t)$ is the *rent* per unit of harvest at period t . The second term is the value of one additional unit of biomass (or stock) utilized by the fishery, the term $F'[B(t)]$ shows the physical growth in the fish stock in period t . The third term captures the stock externality. It is obvious that the cost of harvesting is positively correlated with harvest but negatively correlated with the entire biomass level available. The optimality condition described by equation (2.4) is stated as: "... along a potentially optimal path, a rate of harvest must be chosen such that the sum of the capital gain plus the marginal stock effect minus the stock externality must be set equal to the interest rate" (p.271). (Hartwick and Olewiler, 1986).

THE DATA

Four data sets were collected: monthly recorded annual lease prices per tonne of rock lobster quota (LP_{it}), asset prices per tonne of quota (AP_{it}) as well as the 90-day bank bill rates (X_t) covering the period starting from April 1990 to August 2001. Quota leases convey a right to harvest a given quantity of rock lobster in any one season. Lease prices are used as a measure of annual profit. Asset price, on the other hand, is the value of a right to harvest a share of the TACC in the perpetuity. At the time of sale, asset price is a measure of the present value of future profit per tonne. Prices from the five QMAs are used. Quota trades are reported to the Ministry of Fisheries at the time of sale. Table 1 provides a summary of trading activity in each rock lobster QMA, including the mean values in a particular month for each category with the standard deviation in parentheses. Data ranges start from Apr 1990 to Sep 2001 for most QMAs.

Table 1: Summary of trading activity

	CRA 1	CRA 2	CRA 3	CRA 4	CRA 5
Monthly trades	0.91	2.16	2.04	2.64	2.00
(number)	(1.32)	(2.73)	(3.39)	(2.88)	(2.12)
Monthly trades	1.40	3.08	5.53	7.94	4.15
(tonnes)	(3.06)	(4.62)	(11.09)	(11.94)	(5.59)
Total trade	110,998.20	365,145.16	679,280.49	887,999.44	294,156.48
(NZ \$)	(202,516.11)	(568,675.94)	(3,028,102.77)	(1,635,086.37)	(448,795.29)

The above data indicate that trading activity, both in tonnage and monetary terms, is highest in CRA 4. By contrast, CRA 1 records the lowest level of activity. In some months, particularly April and November, when fishing activity is high a large number of trades occur; in other months, the number of data recorded may be much less or even none. The linear interpolation method was employed to address this issue by taking the average of the month with multiple data or filling any gaps by adding up the averaged increment value. During the same time period, the estimates of vulnerable biomass (B_{it}), which is a measure of the fish stock that can be potentially harvested, for rock lobster were obtained from recent stock assessments (Sharp and Jeffs, 2004).

Lease price provides us with a measure of the annual expected profit, assuming of course that quota owners exercise their right in the pursuit of profit. The ratio LP_{it} / AP_{it} is used as a measure of the rate of profit return and this ratio is denoted as Y_{it} . Because the lease price of quota rights is also influenced by the expected cost of fishing, it is therefore reasonable to assume that Y_{it} captures the effect of stock externality on cost as well since we can not directly observe the cost function in the rock lobster industry. Vulnerable biomass (B_{it}) interacts with Y_{it} as shown in equation (2.4).

Since the biomass data are available as annual time series, prior to estimating the additional value of biomass (W_{it}) which is the second term in the LHS of equation (2.4), we annualize the lease price and estimate the calculate the additional value of the biomass according to: $W(t) = \frac{LP(t+1)}{LP(t)} * \frac{B(t+1) - B(t)}{B(t)}$. Only 11 observations were obtained in each of the five regions.

Other data Y_{it} , X_t are annualized separately by simply taking the annual average of each as well to maintain a consistency with the rest of the analysis. Summary statistics are provided in the Appendix, Table A1.

ESTIMATION AND RESULTS

The aim of this paper is see if the time series of CRA quota prices in 5 QMAs provides any evidence of economic optimality. We use two approaches in an attempt to find evidence of that suggests the evolution of an optimal fishery.

- a) Because biomass estimates are annual, the first regression uses a relatively small data set and tests the hypothesis that there is no connection between rate of profit and the cost of capital. This regression also enables us to estimate the half-live for each fishery.

- b) The full data set, using monthly observations, is used to test for the existence of a time trend while controlling for seasonal monthly effects.

The null hypothesis is that the data reveal the NZ rock lobster industry has been trending to the optimal path (equation (2.4)), as suggested by Hartwick and Olewiler (1986), since the ITQ reform in year 1990.

$$\text{Regression 1: } y_{it} = \alpha_i + \beta_i x_t + \gamma_i W_{it} + e_{it}$$

$$e_{it} = \rho_i e_{it-1} + u_{it}$$

We test the following:

$$H_0: \beta > 0; \gamma < 0.$$

H_A : otherwise.

Regression 1 is a simple OLS that regresses the rate of profit return (Y_{it}) on the real interest rate (X_t) and the value of one additional unit of biomass (W_{it}) with its residual following an AR(1) process. Starting from the underlying economic theory in the case of economic optimality within the rock lobster industry, i.e., when the null hypothesis is true, we expect the values of β to be significantly positive and the values of γ to be significantly negative. Intuitively, we can consider the rate of profit return in rock lobster harvesting has a positive relationship with the rate of capital market return plus a risk factor which negatively correlates with the biomass level, larger fish stock lowers the risk of harvest that in turn reduces the magnitude of risk premium between the two investment alternatives.

The value of ρ enables us to calculate the half-life for each region by adopting the half-life formula- $H(\rho) = \frac{\ln(0.5)}{\ln(\rho)}$. Half-life measures the speed of convergence to the mean value of rate of profit return, i.e., $E(Y_{it})$ it is the time required for any deviation from $E(Y_{it})$ to dissipate by one half (Choi, *et al.*, 2004). The value of $E(Y_{it})$ in question is influenced by both X_t and W_{it} . In the case of the AR(1) process, this measure allows a comparison among regions in terms of the speed of convergence to the expected rate of profit return. The estimated coefficients of X_t and W_{it} along with half-life values obtained are listed in Table 2. A one-sided t-test with 5% significance level was carried out to check the sign and significance of β and γ .

Table 2: Regression 1 Results

	$\hat{\beta}_i$	t-stat	p-value (one-sided)	$\hat{\gamma}_i$	t-stat	p-value (one-sided)	$\hat{\rho}_i$	$H(\hat{\rho}_i)$
CRA 1	0.9904	0.7711	0.2314	-4.1652	-1.3127	0.1129	-0.1268	N/A
CRA 2	0.0045	0.0093	0.4964	0.4669	3.6821	0.0031	0.4351	0.8330
CRA 3	-0.0308	-0.0618	0.4760	1.9631	2.2006	0.0277	0.5885	1.3074
CRA 4	1.1997	2.2070	0.0292	-5.8755	-1.9624	0.0427	0.3442	0.6499
CRA 5	0.5960	0.7152	0.2474	-2.3151	-0.5556	0.2969	0.2465	0.4949

Table 2 can be summarized as:

- a) The signs hypothesized $\beta > 0$ and $\gamma < 0$ were evident in CRA 1, CRA 4, and CRA 5; the coefficients were significant for CRA 4.
- b) We reject the null hypothesis $\gamma < 0$ for CRA 2 and CRA 3.
- c) We reject the null hypothesis $\beta > 0$ for CRA 3.

We find evidence in support of the Hartwick-Olewiler optimality condition in CRA 4.

Granger causality tests were run on the entire data for each QMA and are reported in Table 3. Although the causality test is somewhat ambiguous for CRA 4, some consistency is evident in the data to support a conclusion that CRA 4 and CRA 5 are trending toward the Hartwick-Olewiler optimality condition.

Table 3: Pair wise Granger Causality Tests

	N	y_{2t} does not GC x_{2t}	x_{2t} does not GC y_{2t}
CRA 1	129	0.3978 (can't reject)	0.9304 (can't reject)
CRA 2	134	0.8606 (can't reject)	2.8772** (reject)
CRA 3	131	0.0204 (can't reject)	0.1870 (can't reject)
CRA 4	134	3.4437** (reject)	5.8276*** (reject)
CRA 5	134	0.5102 (can't reject)	3.0038** (reject)

Note: variable lagged by 2

The half-life estimated for CRA 4 and CRA 5 are 0.6499 and 0.04949 respectively. Based on the estimated half-life $H(\rho)$ the rate of profit return in most regions is converging to its expected value following any shock - only CRA 1 did not give positive values of half-life. The ranking in the two sets of $H(\rho_i)$ vary dramatically, for instance, the half-life value for CRA 5 is the lowest, bearing in mind that the non-linear feature in $H(\rho_i)$ implies any small variation in ρ values will inevitably lead to a significantly disproportional change in $H(\rho_i)$.

Table 4: Estimated CPUE (kg/potlift) for each CRA QMA for the nine most recent fishing years. (Data source: Ministry of Fisheries)

Fishing Year	CRA 1	CRA 2	CRA 3	CRA 4	CRA 5
1995-96	0.94	0.69	1.30	0.86	0.49
1996-97	0.94	0.83	1.76	1.03	0.56
1997-98	0.88	0.85	2.18	1.24	0.78
1998-99	1.04	0.91	1.63	1.31	0.89
1999-20	1.09	0.71	1.56	1.27	1.00
2000-01	1.17	0.71	1.19	1.26	1.16
2001-02	1.30	0.56	0.95	1.06	1.27
2002-03	1.20	0.44	0.73	1.09	1.26
2003-04	1.22	0.43	0.63	1.14	1.39

An independent view of time trend is provided by Table 4 which shows the estimated catch per unit effort measured in kilograms per pot lift for CRA 1 to CRA 5 from fishing year 1995 to 2003. From 1995 on the CPUE of CRA 1, CRA 4, and CRA 5 has increased. In contrast, the CPUE for CRA 2 and CRA 3 has decreased relative to 1995. These trends are in general support of the earlier regression results.

Turning to the time trend, and within season effects, we estimated regression 2:

$$\text{Regression 2: } y_{it} = \alpha_i T_i + \beta_i \text{Dum}_i + u_{it}$$

Where T_i is the time trend that starts from zero till the end of observations; and $\text{Dum}_i = (0 \ 1 \ 2 \ 3 \ 4 \ 5 \ 6 \ 7 \ 8 \ 9 \ 10 \ 11)'$

Regression 2 enables us to explore any time trend or seasonal patterns in the period of interest for which the data are available from year 1990 to 2001 across 5 different CRA QMAs. The monthly dummy variable (Dum) is a twelve by one vector which assigns an integer number from zero to eleven to each month starting from April to March, i.e., April equals zero... March equals eleven.

The econometric results at 5% significance level are shown in Table 5 below, with the signs of each coefficient shown in brackets. The first null hypothesis, that there is no significant time trend over the period 1990-2001, was rejected for all five QMAs. All the time trend coefficients are of negative indicates a decline in the rate of profit in the last decade across all five QMAs.

Table 5: Econometric results

QMA	1. $H_0: \alpha_i = 0$	2. $H_0 : \beta_i = 0$	3. (Wald Test) $H_0: \beta_{i0} = \beta_{i4}$
CRA1	Reject H_0 (-ve)	Reject H_0 (+ve)	Cannot reject H_0
CRA2	Reject H_0 (-ve)	Reject H_0 (+ve)	Reject H_0
CRA3	Reject H_0 (-ve)	Reject H_0 (+ve)	Reject H_0
CRA4	Reject H_0 (-ve)	Reject H_0 (+ve)	Reject H_0
CRA5	Reject H_0 (-ve)	Reject H_0 (+ve)	Cannot reject H_0

Each monthly dummy coefficient β_i indicates the average rate of profit return for that particular month. Once again the second null hypothesis, of there being no within-season differences in the rate of profit, was rejected in all five QMAs. Furthermore, positive average monthly returns were reflected through the positive signs in monthly dummy coefficients. Figure 3 below was plotted after obtaining the seasonal dummy coefficients β_i in each of the five QMAs. From this graph we can observe that most QMAs experienced both highs and lows in terms of profit return in an average fishing year. This phenomenon is more marked in regions CRA 2, 3 and 5.

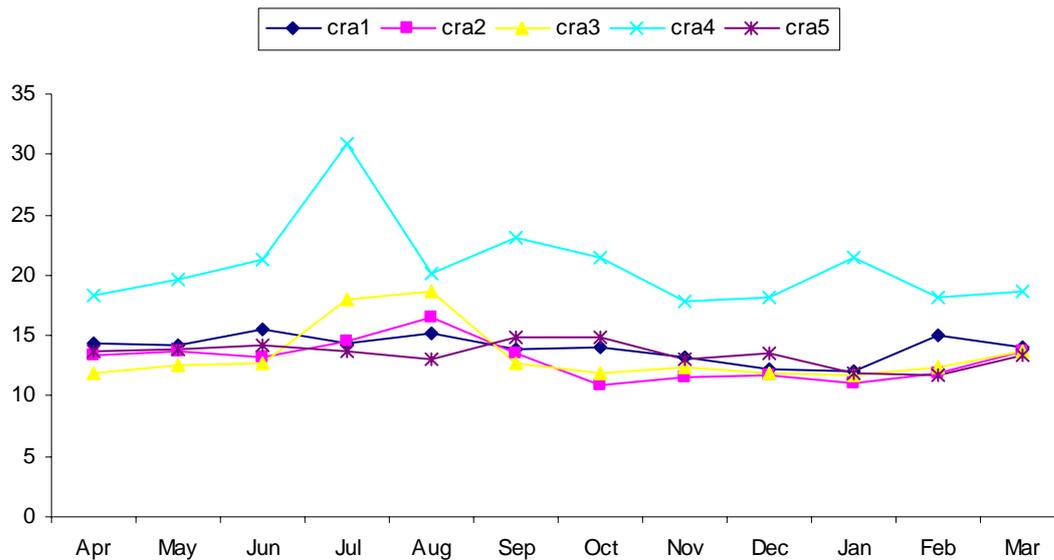


Figure 3: Average monthly profit return for CRA QMAs 1-5 1990-2001

This finding accords with Sharp and Jeffs (2004) regarding the shift in the seasonality of catch-landing over the months of June, July, August, September and October. They observed the catch in the same period accounted to 43.5% of the annual aggregated catch in 1990-1991 and this number increased to 63% in 2002-2003. They suggest that this seasonal shift may be in response to the implementation of the extended closure of the major rival spiny lobster fishery in Western Australia from 1 July to 14 November since 1978 in order to capture the higher market premium in that season for rock lobster. However, one could argue from the Table 6 below that, on a longer time period horizon the general catching activities in April is still among the highest for all the five CRA QMAs over the entire time period of interest.

Table 6: The averaged volume of trade (t) taken place in each month, 1990-2001

	CRA 1	CRA 2	CRA 3	CRA 4	CRA 5
Apr	2.73	7.81	13.73	25.93	7.98
May	1.06	3.57	8.13	9.15	7.08
Jun	2.06	4.27	6.52	10.94	5.59
Jul	2.01	3.95	6.78	7.59	4.90
Aug	1.40	1.63	3.60	6.17	3.38
Sep	0.80	1.84	3.79	3.02	3.06
Oct	1.06	3.28	4.21	7.50	2.34
Nov	2.68	1.39	9.08	8.17	3.75
Dec	0.81	2.16	2.77	2.77	3.69
Jan	0.61	0.32	0.30	1.27	2.37
Feb	0.52	1.67	3.62	1.63	2.22
Mar	1.03	4.96	3.86	9.38	4.06

In the third hypothesis tested, a restriction was imposed in regression 2 by setting the dummy coefficient for April equal to the one for August. If this Wald test restriction was in fact true, then the trading patterns in the two months were indifferent from each other. The test results

indicating this null hypothesis cannot be rejected in CRA 1 and CRA 5, therefore, in these two rock lobster QMAs I can conclude that the trading activities or profit levels at least for the month of April and August are not distinguishable at a 5% significance level. If we go back to Figure 3 and look closely, it is also observable from the graph that the profit returns data plots for April and August in CRA1 and CRA5 are scattered closely around the same horizontal line.

SUMMARY AND CONCLUSIONS

In this research, we look for evidence of an optimal fishery, as developed by Hartwick and Olewiler (1986). In order to examine the time path of quota prices we used market data obtained from the Ministry of Fisheries. Datasets from five QMAs were interpolated linearly to cope with the problems caused by missing observations and multi-recorded observations. A simple OLS regression and its dynamically transformed regression were run together to see if the estimated coefficients are in accordance with the economic theory. By combining the two sets of results we find CRA 4 is the only region meets the criteria of an optimal fishery as suggested by Hartwick and Olewiler (1986). In general, the positive half-life values provided evidence of converging characteristics of the profit return ratio toward their mean value in most regions. The time trend model shows a steady decline in the rate of profit towards the cost of capital. These findings are resonant; in general, with other data collected from the fisheries viz. CPUE and stock biomass data. Needless to say, the fact that the modest number of observations involved in both regressions makes the interpretation process a bit difficult thus leaves the credibility of test results questionable. Further study could be investigate the intuition behind CRA 4's success and also possibly search for an econometric remedy to minimize the variations in the two sets of estimation of half-life values (ρ) to obtain a convincing ranking in the half-life results across all five regions.

Both datasets and econometric results revealed some seasonal patterns in trading behavior and profit rates: The month of April, as the start of the fishing year, unbeatably won the largest-trading-volume award; however, as the implication from Figure 3, for most rock lobster QMAs July and August are the months in which firms made the most profit.

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APPENDIX A

Table A1: Summary statistics of datasets, 1990-2001.

Region	Sample Size(T)	Mean			SD		
		Y _{it}	W _{it}	X _t	Y _{it}	W _{it}	X _t
CRA 1	11	14.5138	0.1922	7.1944	14.0418	0.5182	2.1027
CRA 2	12	8.9055	0.0716	7.1431	3.0924	0.1491	2.0981
CRA 3	12	10.7727	0.3051	7.2171	3.6161	0.8495	2.0668
CRA 4	12	13.2610	0.1269	7.1807	6.1607	0.2255	2.1005
CRA 5	12	8.5143	0.1744	7.2375	3.0649	0.2273	2.1242

Table A2: Reported commercial catch (t) and commercial TACC (t) by rock lobster CRA for each fishing year since the species was included in the QMS on 1 April 1990. (Data source: Ministry of Fisheries)

Fishing year	CRA 1		CRA 2		CRA 3		CRA 4		CRA 5	
	Catch	TACC								
1990-91	131.1	160.1	237.6	249.5	324.1	437.1	523.2	576.3	308.6	465.2
1991-92	128.3	146.8	229.7	229.4	268.8	397.7	530.5	529.8	287.4	426.8
1992-93	110.5	137.4	190.3	214.6	191.5	327.5	495.7	495.7	258.8	336.9
1993-94	127.4	130.5	214.9	214.6	179.5	163.7	492.0	495.7	311.0	303.2
1994-95	130.0	130.5	212.8	214.6	160.7	163.7	490.4	495.7	293.9	303.2
1995-96	126.7	130.5	212.5	214.6	156.9	163.7	487.2	495.7	297.6	303.2
1996-97	129.4	130.5	213.2	214.6	203.5	204.7	493.6	495.7	300.3	303.2
1997-98	129.3	130.5	234.4	236.1	223.4	225.0	490.4	495.7	299.6	303.2
1998-99	128.7	131.1	232.3	236.1	325.7	327.0	493.3	495.7	298.2	303.2
1999-00	125.7	131.1	235.1	236.1	326.1	327.0	576.5	577.0	349.5	350.0
2000-01	130.9	131.1	235.4	236.1	328.1	327.0	573.8	577.0	347.4	350.0
2001-02	130.6	131.1	225.0	236.1	289.9	327.0	574.1	577.0	349.1	350.0