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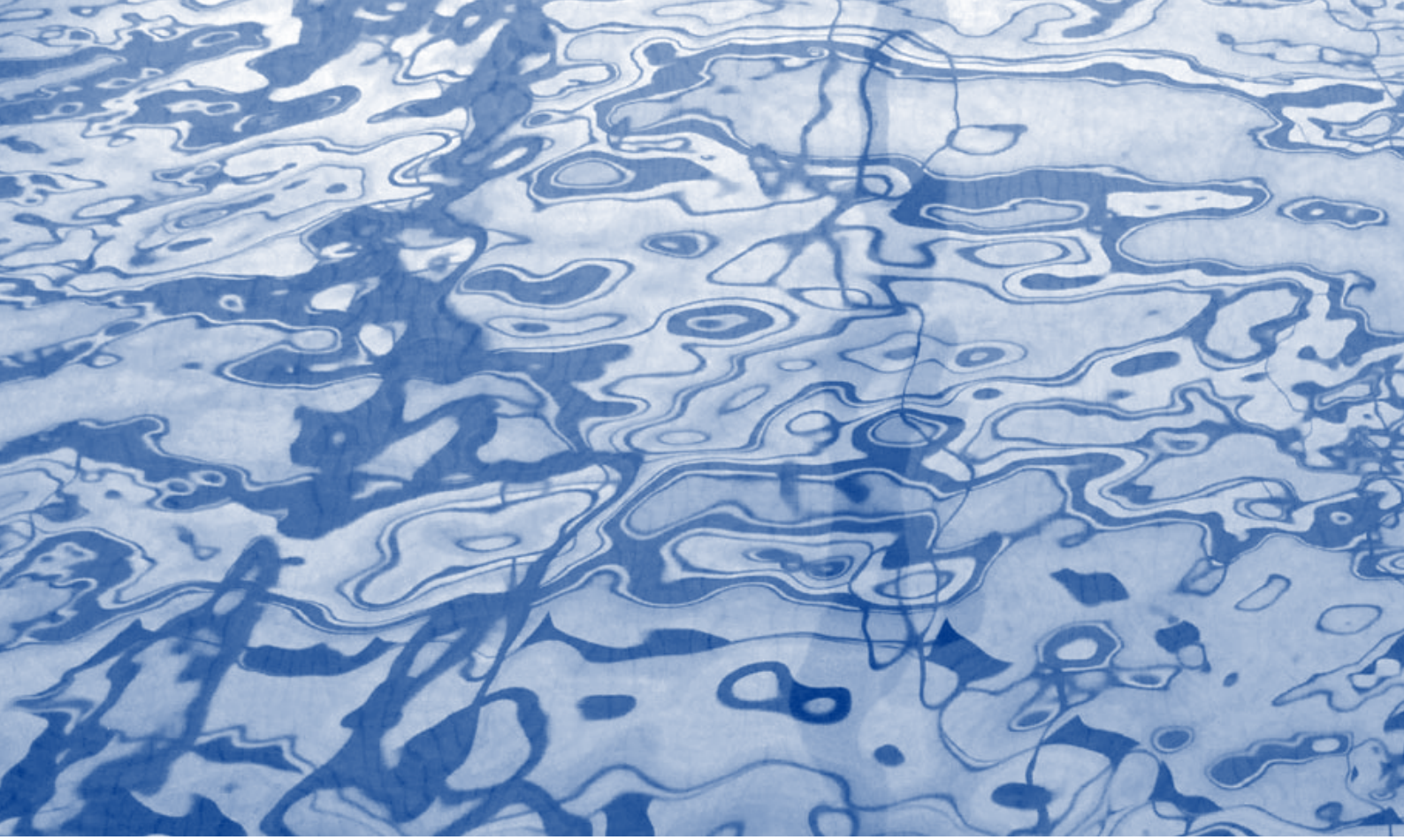

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Abstract

The Great Barrier Reef Marine Park Authority (GBRMPA) introduced a controversial Representative Areas Program (RAP) for the Great Barrier Reef Marine Park (GBRMP) on 1 July 2004; closing one third of the GBRMP to commercial fishing. The RAP resulted in a significant reallocation of resources, industry angst, business failure and personal trauma and grief. The role of Queensland seafood industry representatives was a key factor in establishing effective and fair adjustment policy, administrative procedures and funding for both the commercial fishing fleet and fishing related businesses. Without this input, it is questionable whether anything other than minimal assistance would have occurred. This case study is about the socio-economic impacts resulting from the implementation of the RAP not the processes undertaken by the GBRMPA in determining appropriate closures for biodiversity purposes, even though the two are inter-related. The former was virtually ignored by GBRMPA in determining the latter. Moreover, the two main fisheries within the GBRMP, the otter trawl fishery and reef line fishery, had already been significantly restructured, and deemed sustainable, before the implementation of the RAP. The resource reallocation outcomes and their associated socio-economic impacts of the RAP on commercial fishing and fishing related businesses and how these are measured under an adjustment scheme are presented. The findings are based on personal interactions with hundreds of fishers and businesses directly affected by the RAP. There are two important resource allocation lessons for any jurisdiction considering the implementation of marine protected areas (MPAs): 1) the socio-economic impacts of MPAs; and 2) the need for an integrated approach.

Background and context

The Great Barrier Reef Marine Park Authority (GBRMPA) introduced a controversial Representative Areas Program (RAP) for the Great Barrier Reef Marine Park (GBRMP) on 1 July 2004, closing one third of the GBRMP to commercial fishing: an increase of closures from 4% to 33%. The RAP resulted in significant industry angst, business losses and failure and personal trauma and grief (QSIA 2003a) and (McPhee and Hundloe 2006). As a consultant to the structural adjustment program, the author witnessed firsthand the social and economic impacts imposed on the seafood industry and related fishing businesses and the complexities of adjustment programs, which in many instances exacerbated the impacts of the RAP.

The consequences of the RAP process are: 1) rezoning plan stemming from RAP, 2) displaced effort from the closed areas and reallocation of fisheries resources, 3) the resulting socio-economic impacts on the seafood industry and fishing related land based businesses, and 4) structural adjustment assistance to help offset those impacts. The focus of this paper is on 2) and 3).

The rezoning of the GBRMP was the result of the Australian Government's Oceans Policy that provided the basis for establishing a National Representative System of Marine Protected Areas (NRSMPA) as a means of developing a national reserve system, based on best available scientific information and designed to meet Australia's obligations under the Convention on Biological Diversity (ANZECC 1998). Marine Protected Areas (MPAs) are defined by (IUCN Resolution GA 17:38, 1994) as 'An area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means.' The details of the why, what and how of NRSMPA are found in (WCPA 1999) and (DEH 2002), specifically for Queensland refer to Dinesen (2006) and of the importance and limitations of MPAs as fisheries management tools detailed in Ward *et al.* (2001) and Ward (2005).

The RAP process of rezoning the GBRMP reallocated marine resources away from generating a private benefit (fishing, recreation and tourism) to the broader benefits of the public good of biodiversity conservation by controlling the extraction of marine resources. However, the Australian Government's, Marine Protected Areas and Displaced Fishing Policy (DEH 2004a) states that socio-economic hardships may arise from biodiversity conservation decisions and that assistance maybe needed for affected parties.

The role of Queensland seafood industry representatives was a key factor in establishing effective and fair adjustment policy, administrative procedures and funding for both the commercial fishing fleet and fishing related businesses. Without this input, it is questionable whether anything other than minimal assistance would have occurred as the following examples indicate.
The Queensland Seafood Industry Association argued that turning private benefits from fishing to that of the public good of biodiversity has been hard to swallow, should not be borne totally by the seafood industry and was neither fully researched nor fully explained to the Queensland seafood industry (QSIA 2003b). QSIA therefore lodged a comprehensive submission, after extensive port meetings with fishers, to the Australian Government detailing the problems and actions required under the proposed rezoning of the GBRMP under RAP (QSIA 2003c).

The concept of displaced effort and the resulting socio-economic impacts of RAP were also hotly debated by QSIA which advocated: mitigating short term losses and increasing long term resilience of fishing businesses, socio-economic and environmental impacts of displaced fishing effort, employment loss, social and family impacts, the inequities of the 'yellow' conservation zones; and most importantly the sharing of the burden of private losses for the public good benefits of biodiversity conservation (QSIA 2004) and (QSIA 2002).

As a result of QSIA intense lobbying, a GBRMP Structural Adjustment Package (GBRMPSAP) was refined to assist fishermen, fishery related businesses, employees and communities impacted by the rezoning of the GBRMP.

The GBRMPSAP consists of seven components: Business Exit Assistance (Licence Buyout); Full Business Restructuring Assistance (FBRA); Simplified Business Restructuring Assistance (SBRA); Fishery Related Business Exit Assistance (FRBEA); Employee Assistance Business Advice Assistance; and Social and Community Assistance (DEH 2004b). The GBRMPSAP is the most comprehensive sustainability and socio-economic adjustment strategy implemented in Australia and set the benchmark for the current Australian Government's $220M package to restructure Australia's over-fished Commonwealth fisheries managed by the Australian Fisheries Management Authority (DAFF 2006).

Resource reallocation and displaced effort

The first component of the GBRMPSAP to be implemented was the fishing licence buyout. The buyout was a key element in delivering the Package's objective of 'managing in the most cost effective manner any displaced fishing effort that has unsustainable ecological or economic impact' (DEH 2004b).

The guidelines for the Business Exit (Licence Buyout) Assistance required a minimum effort reduction target to be established for each licensed fishery operating in the GBRMP. The effort reduction target was required to reflect the level of fishing sought to be removed in order to avoid unsustainable ecological impacts on the fishery or economic impacts on the fishers who remained in the industry after the buyout. This was a QSIA requirement that there be no net gain of fishing effort in the remaining open areas (QSIA 2003c). The displaced fishing effort targets are therefore the macro economic impact and an aggregate measure of the resource reallocation of the RAP. The actual buy-out outcomes were similar to these targets and will be reviewed in 2006 to determine whether the displaced effort was appropriate for the rezoning that took place under RAP.

The targets were expressed in terms of either gross value of production (GVP) or effort units or quota and generally were based on the measured impact (%) of the rezoning on each fishery within the GBRMP during the assessment period and were based on official logbook data (Table 1). The assessment period varied for each fishery depending on the date of the investment warning. The Queensland Department of Primary Industries and Fisheries (DPI&F) provided all licensed commercial fishers with an estimate of the GVP of their fishing operations based on standard beach prices. This same data was used to determine the overall impact of the rezoning on fishermen.

Table 1. Measurement of displaced fishing effort based on buy-back data.

Fishery (Symbol)	Measurement unit	Proportion of fishery
Inshore net (N1, N2)	$ 7.451M	14.5%
Mud and blue swimmer crab (C1)	$ 4.032M	14.2%
Otter trawl (T1, T2)	136,400 effort units	6.2%
Coral reef finfish (RQ)	306,000 kg quota	10%
Spanish mackerel (SM)	62,000 kg quota	10%
Spanner crab (C2, C3)	nil	nil
Reef only fishing (L1, L3)	$ 1.8M	10%

The gross annual impact effects of the RAP have varied from $0.5M-2.4M (Hand 2003), $10M (BRS 2003) and $23M (Hundloe 2003), in the end the Australian Government started with $10.2M and from media releases, the current payments have exceeded $50M ($32M relates to the licence buyout) and could be as much as $100M. The GBRMPA by comparison suggested that there were no significant economic effects (McPhee 2006).

The complex nature of the Queensland fishery is illustrated in Table 2. Each of the fishery symbols represents authorisation to access a specific fishery, type of gear used, species and areas. For example, N1 is an inshore net fishery and the diagonal of N1 (i.e. 326) represents the number of fishers with access to that net fishery. The columns of Table 2 show the type and number of fishery symbols held by a particular licence package. For example, column T1 (trawl) licence package, of which 336 have been removed since 1998, leading to the removal of 880 other fishery symbols, including 85 C1 general crab fishers. The complexity of the Queensland fishery (Switala and Taylor-Moore 1999) and the management changes that have occurred since the implementation of management plans since 1998 complicate the measurement of displaced effort and the consequent socio-economic impacts of the closures.

Table 2. Fishery symbol matrix: Loss of fishery symbols since 1988 (source: Taylor-Moore, 2004).

Symbol Group	C1	C2&3	K	L1	L2	L3	L4 -9	N1	N2	N3 &9	T1	T2 &4	T5-9
C1	60	432	+1	60	10	61	54	249	33	15	85	1	8
C2&3		+28	2	8	3	14	+5	150	21	6	39	1	3
K			-	-	-	-	-	-			-		1
L1				138	8	139	64	303	39	16	288	1	8
L2					8		6	69	21	-	16	1	3
L3						158	55	252	35	14	296	-	9
L4-9							85	43	9	20	8		4
N1								326	38	20	128	1	38
N2									190		20		9
N3&9										14			
T1											336	5	9
T2&4												4	
T5-9													9

Changes that have occurred in the main Queensland fisheries since the implementation of RAP on 1 July 2004, have been substantial (Table 3). For example, some $40M was lost to the seafood sector: some due to management changes such as the implementation of the reef line quota system (impact of 30%), the rest due to RAP.

Table 3. Change in GVP for key Queensland fisheries 2001 to 2005.

Fishing sector	GBR		Queensland east coast	
	2001/2-03/04 3 yr mean ($M)	2004/05 ($M)	2001/2-03/04 3 yr mean ($M)	2004/05 ($M)
All prawn	64.2	54.5	90.2	79.4
Inshore N & P	20.9	17.8	45.2	39.6
Line	46.3	21.3	48.7	24.2
Net	13.4	11.4	26.2	23.3
Pot crab	7.5	6.4	19.3	16.3
Pot spanner	1.9	1.7	5.5	5.4
Trawl all species	77.9	69	110.7	105.9

Socio-economic impacts of the GBRMPRAP

The socio-economic impacts that relate to individual fishing firms, fishing related firms and individuals were catered for within the GBRMPSAP which had the objective of 'to assist fishers, fishery related businesses, employees and communities that have been adversely affected by the zoning.' (DEH 2004b). The GBRMPSAP also provided funding for counselling and support for the range of social effects witnessed by the author during fifteen months association with the scheme. These included loss of business, marriage breakdown, financial trauma, legal disputes, social and physical dislocation, reduction in school enrolments, and downturn in local businesses, mental and physical breakdown and local unemployment. Again QSIA had a significant input into the strategy that allows affected parties to apply for assistance grants (QSIA 2004). It is the methodology of the assistance process that is an effective measurement of the micro-economic impacts of the RAP based on a three budget approach (Taylor-Moore 2004b) using earnings before depreciation, interest and taxation (EBDIT).

Case study: Gladstone region

Gladstone is a key port with an estimated GVP of $14M, a diverse fishing fleet and a key area for fishing related businesses. A Gladstone based trawl business is used as an example to illustrate the practical EBDIT three step method used to determine the economic impacts of RAP.

The first step involved the calculation of the average EBDIT of the three years prior to 2003/04 (known as Budget A) (Table 5). EBDIT was chosen as it relates to the cash flows (total receipts less total costs) of the business, depreciation was excluded as it relates to the size of the business, interest relates to its financial structure and taxation to legal complexities, all of which distort the financial results of the business. EBDIT is easy to determine because all businesses have to submit taxation returns that relate to gross and nett profit. EBDIT is also regarded by the business world as a comparative measure of business efficiency. The mean and median EBDIT estimates of Queensland's main fisheries were first undertaken through an industry wide survey in 1999 based on 1997/98 taxation data (Taylor-Moore 2004a); the overall results are given in Table 4. In terms of EBDIT margin, the findings suggest that the key trawl and line fisheries had the worst industry performance, indicating that any significant changes to their cash flows would have serious consequences for their viability.

A three year average will account for at least some of the normal fluctuations of catch, prices and business operations. Exceptions to the three years were accepted on special grounds. In the trawl example, the EBDIT of Budget A is $62,317 with the viability of the business positive at $10,830 after allowance for depreciation and financial commitments.

Table 4. Main Queensland fisheries: Estimates of earnings before depreciation, interest and taxation (EBDIT) (1997/98).

Fishing sector	Mean ($)	Median ($)	GRI (%)	EBIT Margin (%)
Otter trawl	60,187	41,132	132	24.6
Beam trawl	43,111	32,415	189	59.5
Line	30,703	23,874	138	30.7
Net	35,438	21,427	171	43.3
General crab	32,011	17,759	197	53.4
Spanner crab	31,060	29,248	151	46.2
Diversified	35,792	24,632	175	43.9

Table 5. Estimation of the three year average EBDIT for a trawl business.

Gross fishing income	$ 287,967	
Operating expenses	$ 225,650	
EBDIT A		$ 62,317
VIABILITY OF BUSINESS		
Financial commitments (interest)	$ 33,151	
Plant replacement (depreciation)	$ 18,336	
Total		$ 51,487
SURPLUS		**$10,830**

The second step (known as Budget B) involved the estimation of the impact of the closure on the EBDIT of the business and applied to Budget A. A model has been developed by the Commonwealth Department of Environment and Heritage to estimate the joint effect of the loss of income from closures and the effects of the buy-back based on logbook data. For example, Table 6 is the model of a calculation of the RAP impact on the gross fishing income of the Gladstone based trawler.

The estimated post licence buy back impact percentage = the ratio of [(individual RAP loss + estimated GVP gain from buyback)/boat pre-RAP GVP] x 100. In this case, the ratio was -$79,866/$447,198 or -17.9%. In other words, the 17.9% estimate of the impact of the RAP on this trawl business translates to an annual gross fishing income loss of $51,546 (Table 7). The EBDIT of Budget B is therefore $27,154 after variable costs have been discounted by 10% as sunk costs (DEH 2005). The business was not viable as it could not cover financial commitments or plant replacement (i.e. an annual loss of $24,333). The overall result of the RAP on the trawl business is [EBDIT A less EBDIT B] or *ceteris paribus*, an annual loss of $35,163.

Table 6. Post licence buy back impact percentage model (source: Queensland Department of Primary Industry & Fisheries).

Grid	Fishery	Fishery PreRAP GVP	Boat mark				
			PreRAP GVP	PreRAP GVP in open waters	PreRAP GVP in closed waters (Individual's RAP loss)	Estimated GVP gain	Post licence buy back loss (-) or Gain (+)
11I17	TRAWL	359,487	3,930	3,655	275	186	-89
12I17	TRAWL	68,298	900	342	558	0	-557
12I18	TRAWL	446,403	34,212	13,001	21,211	92	-21,118
14I18	TRAWL	64,313	1,140	1,129	11	0	-10
15I17	TRAWL	11,952	2,700	0	2,700	0	-2,699
16I17	TRAWL	959,798	111,680	110,583	1,117	5,965	+4,848
17I18	TRAWL	262,844	70,470	23,980	46,510	199	-46,311
1I18	TRAWL	122,777	47,895	44,542	3,353	0	-3,352
21I17	TRAWL	79,517	34,500	30,015	4,485	273	-4,211
25H16	TRAWL	204,204	34,703	28,027	8,576	1,578	-7,098
25H17	TRAWL	21,059	20,280	20,280	0	0	0
2I17	TRAWL	25,004	210	0	210	0	-209
2I18	TRAWL	950,226	84,579	84,578	0	949	+949
Total		3,575,882	447,198	358,092	89,106	9,239	-79,866

Table 7. Estimation of impacts of RAP on EBDIT for a trawl business.

Gross fishing income	$ 244,247	17.9% LOSS
Operating expenses	$ 217,093	7.9% LOSS
EBDIT B		**$ 27,154**
VIABILITY OF BUSINESS		
Financial commitments	$ 33,151	
Plant replacement	$ 18,336	
Total		$ 51,487
LOSS		**-$24,333**

The third step is Budget C which is an estimate of how the financial position of the firm can be re-established with a grant under GBRMPSAP. For example, make up the EBDIT loss of $24,333 each year for the trawler example, in the short to medium future through a grant for various options such as debt reduction, buying more quota (line fishery) or effort units (trawl fishery), value adding or modifications to fishing operations. This aspect is not discussed in this paper.

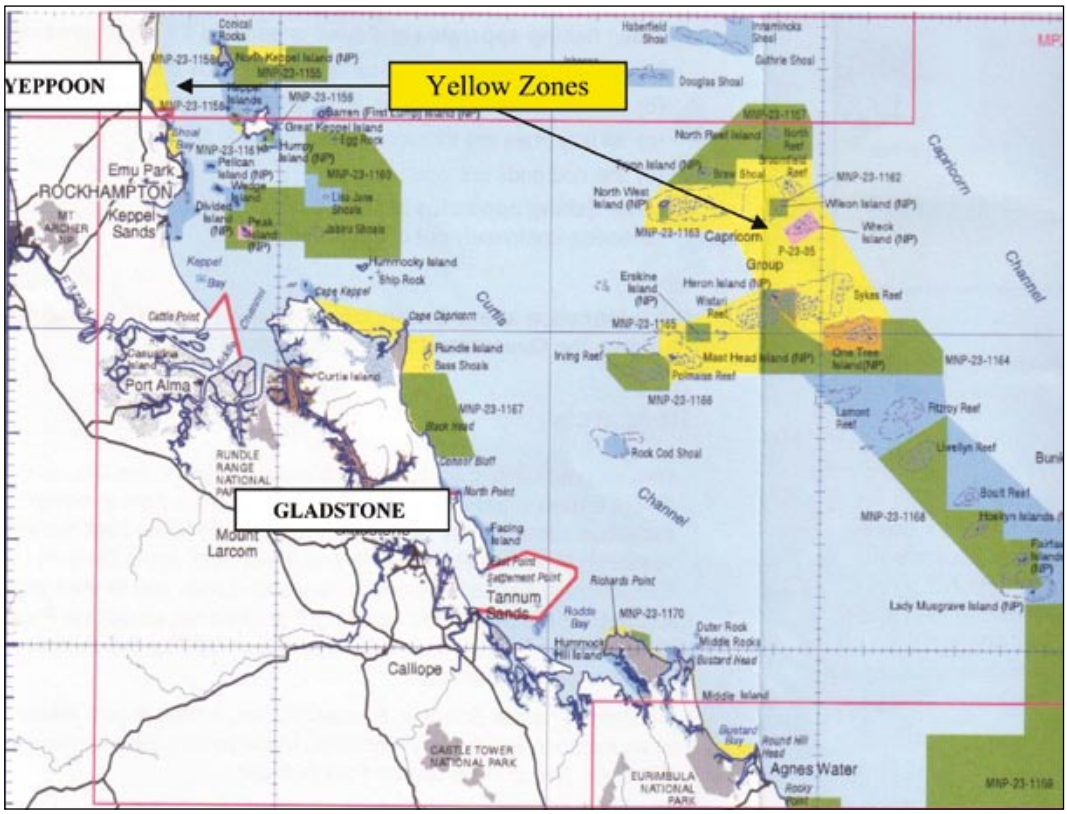
Modification of estimates of impacts

However, there are many issues that need to be considered in determining both Budget A and/or Budget B. For example, the effects of Queensland fisheries management plans that introduced reef line fishery quotas on the same day as the RAP was introduced (1 July 2004), limitations of logbook data as only one site can be entered daily, assumptions of fishing practices for the inshore net fishery which limits length and placement of nets, lack of appropriate data for land-based firms, fisheries where no buy-back occurred such as the harvest fisheries (marine aquarium, beche-de-mer, trochus and tropical rock lobster), and of critical significance was the fact that details of Licence Packages surrendered under the buy-back scheme were not made available to land based seafood businesses due to a confidentiality policy. Two examples of how these problems can be accounted for are now explained.

Fishing business operating within a conservation (yellow) zone

One of the most contentious issues was the widespread use of conservation zones (yellow zones) throughout the GBRMP region. QSIA (2003c) argues that the yellow zones are inconsistent with RAP and NRSMPA, cannot be justified on the grounds of biodiversity protection and are more consistent with fishery management planning objectives and hence the application of the Queensland DPI&F Fisheries Resource Allocation Policy (Anderson and Dekker 2006). The range of yellow zones within the Gladstone region of the GBRMP is illustrated in Figure 1.

Figure 1. Zoning within Gladstone Section of the Great Barrier Reef Marine Park.



A net fisher's model was modified because he fished within the yellow zone located near Yeppoon, as shown in Figure 1. The licence package used by the net fisher only allows set nets within the inter-tidal zone but the post licence buy back impact percentage model allocated him benefits from the buy-out that he could not legally achieve. The post licence buy-back impact percentage was therefore changed from +2% to -35% after this adjustment was made to the model which made unknown implicit assumptions about fishing behaviour of affected fishers. Therefore Budget B for the net fisher showed a greater impact than was otherwise predicted by the model.

Land Based Fishing Related Businesses

The forward and backward linkages of the seafood industry were accounted for under GBRMPSAP but estimating the impacts proved extremely difficult for the firms involved. Two groups of land-based firms were affected by the RAP: services firms such as marine electronics, transport and storage, mechanics and boat builders (backward linkage) and seafood sellers such as processors, wholesalers and retailers (forward linkage). The same budget approach was used for these firms but determining the impact percentage for these firms for estimating Budget B required detailed data on the fishers that

were either bought out, left the fishery or simply reduced their transactions with these firms that was not readily available unless fishers were prepared to provide their confidential data.

One of the serious weaknesses of the GBRMPSAP was the inability of the Australian Government to release details of boat marks of licence packages surrendered under the buy-back scheme to affected businesses. These land-based firms also found that fishers were reluctant to provide any details of why they have changed their business dealings – a serious problem for these firms as the Department of Environment and Heritage were too strict in their interpretation of the estimated impacts of this loss in the assessment of applications for grants under GBRMPSAP.

Conclusion

The rezoning process followed by the GBRMPA included community consultation and meetings with industry totally underestimated the full effects of the rezoning. The paper shows that the socio-economic impacts of the implementation of MPAs such as the GBRMPRAP can be measured through a financial model using EBDIT based budgets. However, the limitations of the financial model is the estimation of the impacts related to changes in the behaviour of the fishing fleet and the flow-on effects throughout the economy associated with the introduction of an MPA for biodiversity conservation purposes.

The problems that were obvious with the GBRMPRAP processes highlights the need for an integrated package that contains clear policy objectives and planning strategies, consultation and participatory processes, defined outcomes and established administrative processes required to carry out fair and effective adjustment or compensation. Assessment of the potential economic and social impacts (including flow-on effects) of modifying the fishing industry's access to fisheries resources must be undertaken and considered during the planning process of MPAs (ASIC 2000).

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