



A survey of alternative livelihood options for Hong Kong's fishers

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Abstract

Purpose – Hong Kong's largely unregulated fisheries are in a state of biological and economic decline. The government has proposed new fisheries management regulations which will likely restrict fishing effort. Thus, the purpose of this study is to investigate: fishers' willingness and capacity to switch to alternative jobs or livelihoods; and the feasibility of the marine recreation sector to provide alternative employment options for fishers.

Design/methodology/approach – The authors conducted interviews to find out about perceptions and attitudes towards the proposed management regulations, and alternative livelihood options for fishers. They interviewed participants in the fisheries sector (mainly fishers) and the marine recreation sector. A questionnaire was also mailed or faxed to marine recreation businesses throughout Hong Kong.

Findings – It was found that up to 75 per cent of fishers interviewed were generally willing to leave the fishery if they were provided with adequate compensation, but they were not optimistic about finding suitable jobs due to their limited skills and education. About 55 per cent of marine recreation respondents said they would consider hiring fishers; however, there were unlikely to be sufficient jobs for all the potentially displaced fishers. Hence, fishers have to look outside the marine sector for alternative livelihoods.

Practical implications – The results highlight that a sizable portion of fishers are willing to depart from "their way of life" under the right conditions. This indicates that, the government can help restore Hong Kong's fisheries and fisher livelihoods by providing appropriate training and designing acceptable compensation packages for fishers.

Originality/value – The study reported in this paper is significant because it shows that fishing is no longer economically profitable for Hong Kong's fishers, a situation which can largely be attributed to the lack of fisheries management in Hong Kong, which has dissipated biological and economic productivity of the fisheries' resources.

Keywords Hong Kong, Fisheries, Stakeholder analysis

Paper type Research paper

Introduction

Fisheries worldwide are being overexploited, with global catches declining since the late 1980s (Pauly *et al.*, 2002). Over half of the world's marine fish stocks are considered

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to be either fully exploited, overexploited, or depleted (FAO, 2007). Overfishing not only has biological ramifications (Jackson *et al.*, 2001; Pauly *et al.*, 1998), but can also result in socio-economic difficulties for fishing communities (Sumaila *et al.*, 2000). Often however, increasing fisheries management in order to rebuild stocks brings upon a dilemma, as it entails initial costs. In most cases, fishing effort will have to be reduced significantly in the short-term, therefore bringing up the need to find feasible alternative livelihoods or employment for displaced fishers (Pet-Soede *et al.*, 1999; Gell and Roberts, 2003).

In many tropical developing countries, alternative income activities commonly resorted to when fishing activity becomes restricted are marine tourism jobs, mariculture projects, and terrestrial agricultural projects (Gell and Roberts, 2003). Aquaculture and post fishing activities are other popular alternative livelihood activities, while engaging in traditional activities such as handicraft production can be another option for some fisher communities. Government, non-governmental organizations (NGOs) and other institutional organisations play an integral role in making alternative livelihoods economically, socially, and environmentally sustainable. In most cases, fishers require training to acquire the necessary skills, and loans or other funding are also required for setting up the new economic venture (Cinner and Pollnac, 2004). It is important that alternative livelihood programmes are established to fit within the communities' culture, resources, and environment. Thus, an understanding of the fishing community, in terms of its diversity, adaptability, incentives, and vulnerabilities, is an essential part of the process towards sustainable fisheries management (Allison and Ellis, 2001; Pomeroy *et al.*, 2006).

It is widely accepted that consulting fishers and other stakeholders through a participatory process is the best way to begin finding solutions to fisheries problems (Pomeroy and Carlos, 1997; Neis *et al.*, 1999; Aswani and Weiant, 2004). However, it is also noted that participation itself does not always equate to management success (Bene and Neiland, 2006). A participatory approach has previously been used in Hong Kong to consult fishers about the introduction of artificial reefs as a fisheries management tool (Clarke *et al.*, 2002). This study was initiated to try and inform key stakeholders about new fisheries management legislation proposed in 2005.

The objective of this study was to use interviews and surveys to investigate the following:

- the proportion of fishers willing to move to other economic activities;
- the alternative job opportunities available and accessible to them;
- their capacity for moving to alternative jobs;
- the feasibility for operators of two marine associated recreational activities (scuba diving and recreational fishing) to provide employment for the fishing community; and
- the government's role in facilitating fishers' transition to alternative jobs.

We first describe Hong Kong's fisheries and the present state of the fishing sector. We then present the results from two sets of interviews and surveys: the first with fishers and fishing representatives, and the second with retailers or operators of marine recreation activities who could be potential employers of fishers. We then qualitatively assess the potential for fishers to find suitable alternative jobs in these marine

associated sectors, and discuss the role government should play in rehabilitating Hong Kong's fisheries and fisher livelihoods.

Hong Kong's fisheries

Fishing has a long tradition in Hong Kong, where communities of floating fishing villages developed their own distinct culture and customs (Ward, 1959). After a setback during World War II, Hong Kong's fishing industry rapidly expanded, funded mostly by low-interest loans from the government (Pitcher *et al.*, 1998; Cheung and Sadovy, 2004). Presently, Hong Kong's fisheries are mainly concentrated in the waters of the adjacent continental shelf in the South and East China seas. In 2005, Hong Kong's fishing industry comprised of approximately 4,150 fishing vessels, and its 9,200 fishers (The Agriculture, Fisheries, and Conservation Department, AFCD, 2007) made up less than 1 per cent of Hong Kong's population of approximately 6.8 million (Hong Kong Census and Statistics Department, 2007).

In 2001/2002, fishing fleets landed approximately 29,000 tonnes of fish from Hong Kong waters, i.e. the waters administrated by the Hong Kong Special Administrative Region (total area = 1,680 km²), contributing HK\$ 552 million (US\$ 70.8 million) in landed value (AFCD Port Survey 2001/2002, unpublished data). Fisheries do not play an important role in Hong Kong's economy, contributing less than 1 per cent to GDP when combined with agriculture (Hong Kong Census and Statistics Department, 2007). Nevertheless, fishing is disproportionately significant to Hong Kong's fishing communities, who rely on it for their livelihood and income.

The main fishing gears used include bottom and mid-water trawls (pair, stern, shrimp, pelagic or hang trawls), gillnet, purse seine, long line, hand line and cage traps. Approximately, 32 per cent of fisheries production from Hong Kong waters comes from the trawling sector AFCD Port Survey 2001/2002, unpublished data. The small-scale fishing sector (referred to as the P4/7 sector due to its boat registration code) accounts for around 43 per cent of fisheries production, and consists of fishers using a wide variety of fishing gears, for example, long lines, nets, traps and hand lines. Fishers in the P4/7 sector use small glass-reinforced boats with outboard engines. They target higher value species such as grouper, snapper, rabbitfish and crabs, which are caught using traps and gillnets, and lower value small pelagic fishes (fry and juveniles) using seine and dip nets. Larger vessels (medium size purse seines, hang trawlers, and shrimp trawls) target small pelagic species, invertebrates and demersal fishes.

Over the past decade, following intensive exploitation and severe depletion of fishery resources, catches in local Hong Kong waters have declined by over 50 per cent (Pitcher *et al.*, 1998; Cheung and Sadovy, 2004). Commercially important near shore demersal species have declined, while those species remaining are of reduced size (Pitcher *et al.*, 2000). For example, once important and abundant species, such as most sharks, some groupers and Chinese bahaba (*Bahaba taiipingensis*), are either rarely seen in markets, or have disappeared from commercial catches altogether (Sadovy and Cornish, 2000; Sadovy and Cheung, 2003; Cheung and Sadovy, 2004). The effects of overexploitation have been exacerbated by pollution from industry, agricultural and domestic sources, extensive coastal development, and land reclamations which have degraded water quality and led to the loss of spawning and nursery grounds for fish species. Hong Kong's situation mirrors regional trends in Southeast Asia, where steep declines in demersal fisheries resources have been attributed to overfishing, and further exacerbated by environmental degradation (Stobutzki *et al.*, 2006).

Despite the depletion of fisheries resources, fishing effort in Hong Kong has largely been unregulated and unmanaged to date, except in existing marine protected areas (which makes up less than 2 per cent of Hong Kong waters) and large vessel fairways. There are currently four marine parks (MPs) in Hong Kong (Tung Ping Chau, Yan Chau Tong, Hoi Ha Wan, Sha Chau-Lung Kwu Chau), and one small Marine Reserve at Cape d'Aguiar. Commercial fishing is prohibited in MPs except for hundreds of licensed small-scale fishers who have traditionally fished in those areas, while recreational fishing is not allowed except in Tung Ping Chau Marine Park. AFCD – the government department responsible for managing Hong Kong's fisheries – is reluctant to implement management initiatives, such as reducing fishing effort, which will be unpopular with the public (Cheung and Sadovy, 2004). As a result, only relatively non-controversial projects with uncertain fisheries benefits, such as restocking and artificial reefs, have been implemented (Cheung and Sadovy, 2004). In addition, there is limited monitoring of fishery catches from Hong Kong waters, as well as failure to establish successful collaboration with mainland China for joint management of South China Sea fisheries (Cheung and Sadovy, 2004).

In 2004, the AFCD developed a framework for regulating fishing activities in Hong Kong. This fisheries management plan includes measures such as a fishing license system for all fishing vessels, the establishment of fisheries protection areas (FPAs) (Figure 1), and the implementation of a closed fishing season. FPAs are intended to

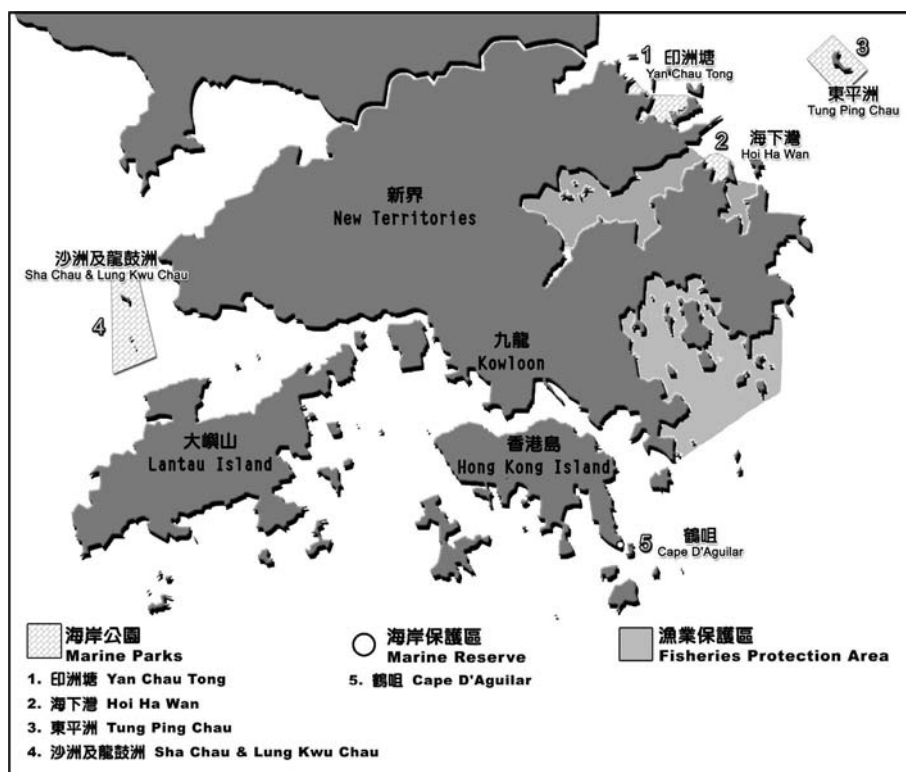


Figure 1.
Map showing the existing
MPs and reserve, and the
proposed FPAs in
Hong Kong

protect important spawning and nursery grounds. Trawling at the two proposed FPAs (Tolo Harbour and Port Shelter) will be prohibited, and commercial fishing will only be allowed with a permit. At the same time, WWF Hong Kong has been advocating for stricter measures than those proposed by the AFCD, which they perceive as being insufficient for ensuring the long-term sustainability of the marine ecosystem. Consequently, the WWF has developed its “Save Our Seas” (SOS) campaign, which aims to protect Hong Kong’s marine biodiversity, restore fisheries, and create new jobs. The campaign proposes to establish no-take zones in all existing MPs as well as in the proposed FPAs at Port Shelter, Tolo Harbour, and Long Harbour.

Hong Kong fishers are facing tough economic conditions as profit margins have decreased due to falling fish prices and increasing operating costs, especially fuel (Sumaila *et al.*, 2007). Small-scale fishers use gasoline for their outboard motors, while trawl and purse seine vessels use diesel. The current high-fuel prices have forced some of the mid-size and larger vessels to reduce their fishing activities, while some have stopped fishing altogether. Others have switched to more fuel-efficient sectors, such as the P4/7 sector.

Alternative income and jobs for fishers

Some local fishers (largely from the P4/7 and purse seine sector) obtain supplementary income from mariculture, driving transport or leisure boats, or operating mariculture raft fishing (a form of recreational fishing). Mariculture was a viable activity for many fishing families in the P4/7 sector from the 1980s until the late 1990s. However, in recent years, the mariculture industry has declined due to a combination of factors such as red tide outbreaks, high-fish fry mortality, disease, and pollution (Chan, 2005). As such, it is no longer viewed as a viable source of income for fishers (Sumaila *et al.*, 2007). The AFCD has developed several programmes to help fishers switch to other fishing or economic activities. These include low-interest loans, training on offshore fishing and aquaculture (co-funded with the Hong Kong Fish Marketing Organisation), and provision of technical support and training (e.g. boat construction and maintenance). The AFCD is also investigating the feasibility of buy-back or *exgratia* payments to deal with affected fishers.

Methodology

Study sites

Our study covered all fishing communities which were likely to be impacted by the proposed fishing regulations and potential designation of the FPAs and no-take zones in Hong Kong. These included villages adjacent to, or close to, the proposed FPAs (Port Shelter, Tolo Harbour and Channel, and Long Harbour (Figure 1), and all four existing MPs. Furthermore, we interviewed and sent out questionnaires to operators of dive and recreational fishing shops (referred to as alternative livelihood operators from now on) throughout Hong Kong.

Interviews

Interviews were semi-structured so that interviewees had a wide scope in answering questions, thus allowing any topics of interest to be elaborated upon. Interview questions were, however, prepared in advance to serve as a guideline in covering important topics. Not every respondent answered all the prepared questions. As such, the

number of responses differs for each question, and this is indicated in brackets when reported in the results section. Fishers were told that the purpose of the study was to find out about their livelihood and perceptions about proposed fisheries policies. Alternative livelihood operators were informed that the interview covered questions about providing alternative fisher livelihoods as well as fisheries management policies.

Fishing sector. Fisher interviews were conducted in Cantonese from 9 to 20 July 2006. A total of 35 fishers and three fishing association representatives, covering both commercial and small-scale fishers from all major Hong Kong home ports, were interviewed. Interviewees included fishers, fishing cooperative leaders and fisheries managers. We contacted the interviewees through local fishers associations and cooperatives, the AFCD, and by visiting coastal villages. We also employed a “snowball” sampling approach, asking interviewees to introduce other potential respondents. Fisher interviews covered economics (fishing costs and income), perceptions and attitude towards other types of potential employment, fishers’ criteria for feasible alternative livelihoods, and whether fishers would be willing to move away from fishing to other activities (Sumaila *et al.*, 2007 for questionnaire).

Alternative livelihood sector. There are 137 recreational fishing and 107 diving shops in Hong Kong, respectively. We surveyed a total of 54 of these alternative livelihood operators, either through interviews or by having them complete questionnaires. We conducted 20 face-to-face interviews from 9 to 20 July 2006; eight of these were with dive shop operators and 12 with recreational fishing store operators. In addition, approximately 100 questionnaires (Sumaila *et al.*, 2007) were mailed or faxed to dive and fishing tackle shops throughout Hong Kong, of which 34 were completed and returned. Among these were four respondents who classified themselves to be in the “ecotourism” sector.

Interviews involving operators of alternative livelihood activities included questions on:

- willingness to hire and train fishers;
- workers’ income; and
- potential growth of the industry.

One section of the questionnaire involved scenarios to investigate the likely impact implementing different spatial fisheries regulations would have on alternative livelihood businesses. Respondents were asked to estimate the anticipated change in customers one, three, five, and ten years after the establishment of no-take MPs and FPAs. For each year, respondents were given a choice of 4 possible increase or decrease in the number of customers (<5, 5-10, 10-20, > 20 per cent) We assumed that any percentage increase in customers directly translated to a proportional increase in business income that became available for additional activities, such as hiring new staff. Therefore, the increase in customers was used to predict the number of jobs available for fishers from recreational fishing, diving and marine-related tourism businesses.

Results

Fisher interviews

Biological and economic state of fisheries. All fishers stated that their current catches were lower than in the past. Fishers most frequently mentioned that catches had declined since 20-30 years ago (38 per cent of responses, $n = 13$), followed by 10-20 and less than ten years (both 31 per cent). The median perceived magnitude was a

four-fold decrease; a 50-fold decrease was the largest mentioned. Around 40 per cent ($n = 28$) of fishers blamed decreased catches on coastal development projects and land reclamation, and 36 per cent on the use of destructive fishing methods by Chinese fishing vessels. This included the use of dynamite and “electric nets” – trawl nets that use high-voltage electric current to increase the catchability of target species, but which also kill large amounts of non-target organisms around the path of the trawl nets.

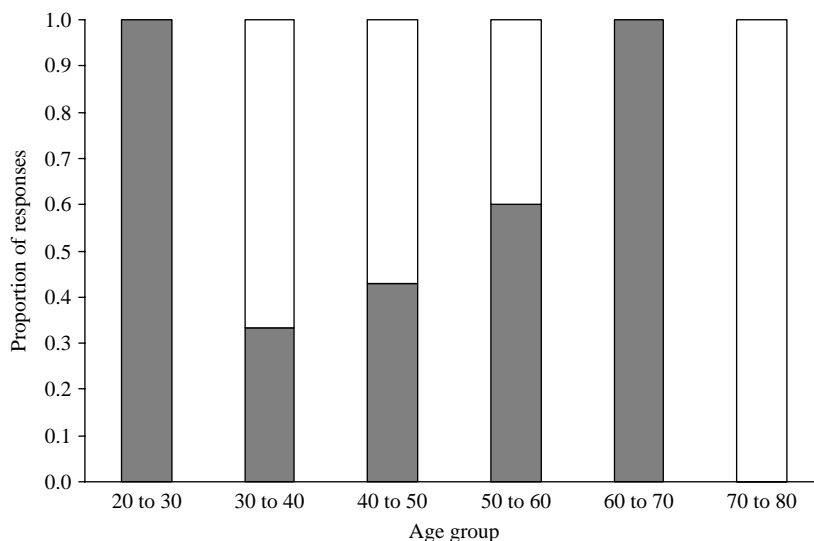
Daily fishing revenue was highly variable, reflecting the variability in catches. Small-scale fishers using gillnets or trammel nets reported daily revenues ranging from HK\$ 100 to 1,000 per day (or approximately HK\$ 2,000-20,000 per month[1], based on an average of 20 fishing days a month). The monthly revenue of mid-size and large vessels ranged from HK\$ 13,000 to 110, 000 per month. Profitability estimates by Sumaila *et al.* (2007) and the (AFCD unpublished data, 2004) indicated that the trawl sector had lower profitability compared to the P4/7 and purse seine sectors, while the traditional gillnet sector had negative profitability.

In addition to fishing income, some small-scale fishers also had supplemental income from mariculture, part time work transporting passengers by boat, or from running recreational fishing operations from their mariculture rafts. For instance, mariculture and raft recreational fishing businesses can generate an additional HK\$ 20,000-30,000 per month, while fishers can earn an extra HK\$ 300-800 a day during the weekends (i.e. approximately HK\$ 2,400-6,400 a month) transporting passengers or taking recreational fishers out for fishing trips.

About 50 per cent ($n = 24$) of interviewed fishers said that they could make a living now, 29 per cent said they could not, and 21 per cent were just barely making ends meet. The majority (58 per cent) of respondents who could barely or were not able to make a living were trawl fishers, reflecting their relatively low profitability compared to the P4/7 or purse seine sectors (Sumaila *et al.*, 2007). Many fishers stated that they were just making enough to cover expenses, and were living a day-to-day existence. Many remained in the fishery solely in the hope that fuel prices would drop in the future. According to them fishing would be profitable if fuel prices were between HK\$ 400 and 500 a barrel for diesel, almost half of the current fuel price in Hong Kong.

Willingness to switch jobs. About 54 per cent ($n = 24$) of interviewed fishers said they were willing to switch jobs, with the remainder saying that they would not consider it. Of those who were willing to switch jobs, concern about not being able to secure a job due to their poor education level was high. We investigated whether there was a connection between fishers being able to make a living and their willingness to switch jobs. Among the fishers who could make a living ($n = 15$), eight (53 per cent) were willing to switch jobs. Of those fishers ($n = 5$) not able to make a living from fishing, three (60 per cent) were willing to switch jobs. Thus, it appears that the proportion of fishers willing to switch jobs or livelihood was similar across both groups, regardless of the fishers’ economic situation.

The majority of fishers were between the ages of 40 and 60. A breakdown of each age group was as follows: the youngest fishers, aged 20-30, made up 4 per cent of respondents; age 30-40, 13 per cent; age 40-50, 29 per cent; age 50-60, 42 per cent; age 60-70, 8 per cent; and age 70-80, 4 per cent. For the 40-50 year old group, the majority (57 per cent, $n = 7$) were not willing to switch jobs. In contrast, 60 per cent of fishers aged 50-60 ($n = 10$) were willing to switch jobs (Figure 2). With the exception of the youngest (all willing) and oldest (none willing) age group, there was no discernable correlation between age and willingness to leave fishing ($\chi^2 = 0.48$, $df = 5$, $p > 0.05$).



Notes: Grey bars indicate 'Yes' and white bars indicate 'No'

Figure 2.
Willingness to switch to a
land-based job by fisher
age group

When choosing a secondary job, fishers preferred marine associated activities that involved skills that they had (e.g. boating and fishing). Alternatively, they might work in low wage, non-marine related sectors such as the construction industry. Fishers repeatedly expressed that it was not feasible for the current alternative marine employment options (passenger/leisure boat operator, recreational raft fishing, mariculture, deep sea tuna fishing) to provide the number of jobs necessary to absorb all the fishers if they were to leave the fishery en masse. The fishers believed that the number of boat operator jobs, whether for recreation or everyday transport, is limited. They also pointed out that since recreational fishing is a leisure activity, demand for such activity, and hence boat operators, will fluctuate according to the state of the economy. Legal and administrative barriers such as the issuance of boat licenses and regulations regarding boat modifications (from fishing to other purposes) were further obstacles for current fishers considering these alternative options. Overall, fishers were pessimistic about their ability to find suitable alternative jobs.

Buy-back and compensation. Fishers were open to the idea of a government vessel buy-back scheme. About 35 per cent ($n = 20$) were willing to participate in such a scheme, while another 40 per cent were willing to participate if they were reasonably compensated for their vessel, and 10 per cent of fishers would not consider a buy-back scheme at all. It should be noted that, those who would not consider a buy-back appeared to be doing relatively well financially, as these fishers said that they were able to make a living from fishing, whereas others said they could not. Another 15 per cent thought that it was not possible for the government to implement such a scheme. Fishers were asked about the level of alternative income they would require before they would be willing to permanently (i.e. until retirement) switch to a shore-based job. Responses varied between HK\$ 7,000 and 11,000 per month.

Protected areas. Fishers were asked about three forms of potential protected areas:

- (1) no-trawl FPAs;
- (2) no-take MPs[2]; and
- (3) no-take FPAs.

The proposal for a no-trawl FPA received a lot of support from the P4/7 fishers; 72 per cent ($n = 11$) of respondents (all small-scale gear from Sai Kung and Tai Po) were in agreement with the proposed no-trawl FPA. Only one group, the Hong Kong Fisheries Alliance totally refused to accept it because its members mainly comprised of trawl fishers who would be adversely affected by the new policy. In contrast, another trawl association from Tai-Po was more open to the proposal, and said that they were willing to accept the trawl ban if they received compensation for doing so. However, a no-take FPA was less popular, with six out of nine (67 per cent) of respondents not supporting the proposal. None of the respondents agreed with the establishment of a no-take MPs (Table I). In general, fishers did not think that protected areas provided any sort of benefits; 63 per cent ($n = 19$) thought that marine reserves had no effect or were no use, i.e. they did not think that protected areas had increased fish abundance or fish catch. It is interesting to note that those who thought that MPs did provide benefits were all P4/7 fishers.

Interviews and surveys of alternative livelihood operators

Employment of fishers. Dive and recreational shop operators were generally receptive to hiring fishers as new employees, with 55 per cent ($n = 53$) of respondents saying that they would consider hiring a fisher. The most frequent reason given for not hiring was that fishers did not have the required skills or experience, for example, sales skills. Fishers' age, attitude, suitability for business and lack of interest in the job were other reasons cited for not hiring fishers. Of those willing to hire a fisher, 73 per cent said that they would provide training for the fisher. The most frequently mentioned training periods were one week (38 per cent of responses, $n = 21$), followed by one week to one month (29 per cent of respondents). Fishers were most likely to be hired as boat operators (51 per cent of responses), followed by recreational fishing guides (24 per cent of responses). Other positions included cleaning crew, sailor, dive master and salesperson. Table II provides the breakdown of respondents' salary ranges for the positions of boat operator and fishing guide.

Table I.
Percentage of responses in agreement with proposed management policies

Response	FPA (no-trawl)	FPA (no-take)	Marine park (no-take)
Yes	73	11	0
No	9	67	100
Yes if compensated	18	22	0

Table II.
Breakdown (per cent) of respondents' monthly salary range (HK\$) for marine associated jobs

Job	Salary range (HK\$)			
	<5,000	5,000-10,000	10,000-15,000	>12,000
Boat operator ($n = 24$)	17	58	21	4
Fishing guide ($n = 18$)	22	56	22	0

Anticipated change in customers. Respondents were asked how they thought a no-take MP would affect their customer numbers one, three, five, and ten years after its establishment. After one year, the largest proportion (31 per cent, $n = 36$) of respondents thought that there would be no change to their business, while 28 per cent thought that their customers would increase. The percentage of respondents anticipating an increase in customers increased the longer the no-take MP was in effect, with 63 per cent of all respondents expecting an increase in customers in ten years time (Table III). Dive operators were more optimistic about customers increasing in the short-term, as 37 per cent of them ($n = 19$) expected customers to increase, while only 15 per cent of recreational fishing operators ($n = 13$) expected likewise (Table III). In the long-term (ten years), up to 72 per cent of dive, and 100 per cent of ecotourist operators expected an increase in customers, whereas only 30 per cent of recreational fishing operators gave the same response.

There are two proposals regarding FPAs: the government fisheries management plan proposes to ban only trawling within FPAs, while the WWF “SOS” campaign proposes that the FPAs are designated as no-take areas. There was a lot of support for banning all fishing activity (i.e. no-take) in the FPAs: 72 per cent either agreed or strongly agreed with the no-take FPA, while 28 per cent ($n = 47$) of respondents either completely or partially disagreed with the idea (the majority of these respondents were from the recreational fishing industry, who thought that no-take FPAs would reduce their customers). Lastly, 4 per cent of respondents had no opinion about no-take FPAs.

All four marine-related tourism operators supported a no-take FPA. Dive shops were a lot more supportive of no-take FPAs, with 88 per cent ($n = 25$) of dive shops agreeing, whereas only 33 per cent ($n = 18$) of recreational fishing shops expressed support. In the event of no-take FPAs being established, the majority (62 per cent, $n = 42$) of respondents did not expect to hire any extra employees, while 36 per cent expected to hire extra help. Dive operators were more open to hiring new employees, with twice as many respondents (48 per cent) expecting to hire new employees compared to recreational fishing operators (23 per cent). Overall, respondents were positive about the proposed trawl bans in FPAs, with the majority expecting their customers to increase after establishment of the FPAs. When asked about the potential change in customers one, three, five, and ten years after establishment of the FPAs, 44, 78, 75, and 79 per cent of all respondents, respectively, thought that customers would increase (Table IV). Dive operators were the most optimistic about FPAs, with none of them expecting a decrease in customers (Table IV).

Opinions on growth of dive and recreational fishing industry. Dive shop operators stated that the most important factor for divers is good visibility, followed by the

	1 year ($n = 36$)				3 years ($n = 38$)				5 years ($n = 34$)				10 years ($n = 32$)			
	All	Dv	RF	Ec	All	Dv	RF	Ec	All	Dv	RF	Ec	All	Dv	RF	Ec
Increase	28	37	15	25	61	64	46	75	62	74	27	100	63	72	30	100
Decrease	14	5	31	0	11	9	15	0	12	5	27	0	13	6	30	0
No change	30	32	31	25	5	0	15	25	6	0	19	0	3	0	10	0
Do not know	28	26	23	50	24	27	24	0	20	21	27	0	21	22	30	0

Notes: Results are grouped by all (ALL), dive (Dv), recreational fishing (RF) and ecotourist (Ec) respondents

Table III.
Percentage of responses to anticipated change in customers 1, 3, 5, and 10 years after no-take MP's are established

diversity and abundance of fish. As such, the Hong Kong diving industry is hampered by a lack of special marine life attractions. As well, water clarity is poor, as visibility is often less than 5 metre, although visibility of up to 20 metre is occasionally possible during the winter. The number of divers in Hong Kong has steadily increased over time. However, these divers do not generate much business for local dive shops with regards to expenditure on diving equipment or local diving trips. Increasingly, local divers tend to rent instead of invest in buying their own equipment. As well, divers tend only to learn to dive in Hong Kong, and then spend money diving in other parts of Southeast Asia. Some dive companies do benefit, as part of their businesses involve arranging overseas diving packages. Nevertheless, dive shop operators, on the whole, were of the opinion that there is not much opportunity for expansion of Hong Kong's diving industry.

There are a reported half a million recreational fishers in total in Hong Kong, with this number expected to grow by 30 per cent in the next ten years (AFCD unpublished data, 2004). However, fish tackle shop owners indicated that the number of active recreational fishers is considerably smaller, and the number of core recreational fishers remains stable, with no considerable increases expected. As such, recreational fishing shop owners did not think that the industry would expand much in the future due to a limited customer base. Moreover, recreational fishing is a leisure activity which is affected by the state of the economy. Owners also indicated that many Hong Kong recreational fishers have taken advantage of cheap fishing tour packages to China, and gone there to fish instead. Overall, fishing tackle shops are not very profitable, and some shop owners were in the business primarily because fishing was their hobby, and not due to profit motivation.

Opinions of fisheries officials on alternative livelihoods

The AFCD officials interviewed were not optimistic about the success of alternative livelihood options currently pursued by the government (e.g. offshore fishing, aquaculture, ecotourism). According to them, those fishers who had the ability to fish offshore would already have done so, so prospects for those wanting to join the fishery were not good. As well, they did not foresee a surge in demand for the recreational fishing industry. A transition of small-scale fishers to transporting recreational fishers would also be hampered by the high cost (several hundred thousand HK \$) required for converting fishing vessels to passenger boats due to strict requirements imposed by the marine department. Currently, the government does not have plans to subsidize the cost of converting fishing boats. The government was also unwilling to provide further fishing fuel subsidies to mitigate the cost of rising fuel prices.

Table IV.
Percentage of responses to anticipated change in customers one, three, five, and ten years after FPA establishment

	1 year (<i>n</i> = 32)				3 years (<i>n</i> = 36)				5 years (<i>n</i> = 28)				10 years (<i>n</i> = 24)			
	All	Dv	RF	Ec	All	Dv	RF	Ec	All	Dv	RF	Ec	All	Dv	RF	Ec
Increase	44	60	25	25	78	94	57	75	75	94	25	100	79	93	20	100
Decrease	6	0	20	0	6	0	14	0	11	0	38	0	13	0	60	0
No change	31	27	25	25	8	0	14	25	4	0	12	0	4	0	20	0
Do not know	19	13	50	50	8	6	14	0	10	6	25	0	4	7	0	0

Notes: Results are grouped by all (ALL), dive (Dv), recreational fishing (RF) and ecotourist (Ec) respondents

Discussion and concluding remarks

Fishing is no longer economically profitable for fishers, as half of interviewed fishers were unable or barely able to make a living. This can largely be attributed to the lack of fisheries management in Hong Kong, which has dissipated biological and economic productivity of the fisheries resources. As such, the low profitability of the fisheries may be the main reason why the majority of interviewed fishers (75 per cent) were willing to participate in a buyback or compensation programme. An essential component of restoring depleted fisheries resources and rehabilitating coastal livelihoods is an understanding of coastal communities and their livelihood strategies and vulnerabilities (Allison and Ellis, 2001; Pomeroy *et al.*, 2006). An important finding of this study is that it highlights that the fishing community itself is not homogenous, and this variation should be carefully considered so that livelihood strategies that are tailored for the needs of all fishing sectors can be developed.

In particular, it appears that Hong Kong's small-scale fishers have more diversified livelihoods. In the past, these fishers have shown their ability to adapt to peripheral economic activities by adopting mariculture (Lai and Yu, 1995) and engaging in part time work such as operating passenger boats and recreational raft fishing. It is likely that these small-scale fishers' ability to diversify to non-capture fishing activities have cushioned them somewhat from the fisheries decline. Indeed, the majority of interviewed fishers who were unable or barely able to make a living were trawl fishers, as they, in general, do not engage in non-fishing activities.

Providing compensation to fishers is a strategy that the Hong Kong government has used in the past (e.g. *ex gratia* payments in the mid 1990s for the establishment of the Cape d'Aguilar Marine Reserve). Sumaila *et al.* (2007) estimated that a vessel buy-back scheme would cost less than 0.3 per cent of the annual government budget; thus buy-backs are a financially as well as socially feasible option for reducing fishing capacity. It is particularly suitable for the low-performing trawling sector, where fishers are more financially tied down due to the large capital investment in their vessels. However, although vessel buy-back programmes have been used extensively as a means of reducing overcapacity and restoring profitability in other fisheries, they have not always achieved their objectives (Holland *et al.*, 1999). Thus, considerable effort will have to be put into designing an appropriate buy-back programme, with particular attention being paid to restricting the entry of new fishers and increases in effective fishing effort (Holland *et al.*, 1999; Clark *et al.*, 2005). To this end, the government is adopting an appropriate policy in not providing additional fuel subsidies to mitigate rising fuel prices. In addition, they should implement the fishing license scheme proposed in the fisheries management plan as soon as possible so that the number of vessels fishing in Hong Kong waters can be controlled, and vessels bought out will not be replaced by others.

Not surprisingly, P4/7 fishers were supportive of no-trawl FPAs, whereas both P4/7 and trawlers in general objected to no-take FPAs and no-take MPs. This highlights two issues of management and regulatory concern:

- (1) potential conflict among different fishing sectors; and
- (2) possible non-compliance by fishers.

In a related study, Sumaila *et al.* (2007) found that a policy involving a territorial-wide (i.e. all of Hong Kong waters) trawl ban and no-take MPs would provide the highest net benefits to the fisheries sector and society. Gaining support from all fishing sectors for

this policy will clearly be a challenge. Most of the fishers interviewed did not report noticeable increases in benefits from the existing MPs and reserves, suggesting that the “spillover effect” documented at some other marine reserves (McClanahan and Mangi, 2002; Russ *et al.*, 2004) has not been observed in Hong Kong’s marine ecosystems. This might have led fishers to dismiss the potential benefits from future protected areas, and this perception will likely have to be addressed through an education programme. On the positive side, it is possible that a territorial-wide ban might be accepted by some commercial trawlers, many of whom fish mostly outside Hong Kong waters (Sumaila *et al.*, 2007). In any case, the successful implementation of an ecologically and economically sound policy will require a combination of education as well as appropriate incentives designed for each fishing sector.

Overall, alternative livelihood respondents were positive about the impact the proposed no-take MPs and FPAs would have on their business, and were also open to hiring fishers. Interviewed fishers expressed a common preference for remaining in marine associated jobs, which is similar to findings in Mexico (Cinner and Pollnac, 2004) and Southeast Asia (Pollnac *et al.*, 2001). However, marine associated jobs such as mariculture are on a decline, and other business activities such as operating passenger boats or mariculture raft fishing are hampered by strict restrictions, and a limited market. Furthermore, the feasibility of the dive and recreational fishing industry being the main sources of alternative jobs for displaced fishers is not high.

Consequently, it appears that fishers have to look outside marine associated sectors as a source of alternative employment. This suggests that, the AFCD’s current alternative livelihood activities might not be the most appropriate options. In light of this, training should be given to fishers to provide them with marketable, non-fishing related skills such as in languages or in trades like carpentry and electrical work. This highlights that social and economic development, together with ecological restoration, has to be addressed in order to build resilience in fishing livelihoods (Pomeroy *et al.*, 2006). As such, the AFCD will need to cooperate with other government departments, NGOs, and the private sector to deliver these skills. Collaboration across regulatory departments is also essential for incorporating fisheries into an integrated coastal management framework to address fishers’ unanimous concern about the negative impact coastal development and pollution has had on both mariculture and capture fish stocks.

An important point for fisheries managers to bear in mind is that instead of implementing inappropriate livelihood schemes, focus should be put on building upon fishers’ existing capital and capabilities to facilitate their own efforts to get out of poverty (Allison and Ellis, 2001). This is especially applicable to the small-scale sector, which has shown the ability to adapt and diversify to other economic activities part time. Another consideration which warrants further investigation is the degree to which fishing households depend on remittance from family members for income. In some cases, family remittance amounts to a substantial source of income, and can have impacts on policy making (Allison and Ellis, 2001).

Owing to the short field period available for this study, our sample size for fishers was relatively small. However, we covered all major fishing sectors, and got consistent and similar responses from the fishers interviewed. For the alternative livelihood sector, the combined interviews and questionnaires covered about 15 per cent of total recreational fishing shops, and 25 per cent of dive shops in Hong Kong.

Mail-in questionnaires were not as informative as interviews, as they tend to miss subtleties and opinions that were expressed during interviews.

Nevertheless, this study was significant as it indicated that the majority of Hong Kong's fishers are ready to leave fishing. A buy-back scheme is a financially and socially feasible route for reducing fishing capacity; however, the alternative livelihood programmes (e.g. offshore fisheries and employment in the dive and recreational fishing industries) currently being considered by the AFCD and WWF are not likely to be plausible options. Therefore, further collaboration with fishers is necessary to develop the following aspects:

- appropriate economic compensation and/or vessel buy-back packages;
- non-marine related jobs suitable for fishers; and
- training for fishers to gain marketable skills.

Importantly, this study points for a need to further understand the livelihood strategies of each fishing sector in order that reduction in fishing pressure will occur in tandem with the development of sustainable fisher livelihoods.

Notes

1. Currency exchange rate in January 2007 was US\$ 1 = HK\$ 7.81.
2. Fishing by licensed fishers in the P4/7 sector is still currently allowed in MPs. Under the no-take MP proposal, these fishers would be excluded as well.

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