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Economic Value and Aquaculture's Role in
Sustaining It**

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RECREATIONAL FISHING: ITS EXPANSION, ITS ECONOMIC VALUE AND AQUACULTURE'S ROLE IN SUSTAINING IT

Abstract

Economic growth usually leads to a substantial increase in the demand for recreational fishing, and China is likely to follow this trend. Factors influencing this expansion in demand are identified. Recreational fishing is of major economic importance in higher income countries and indicators of its economic significance are given. Growing demand for recreational fishing results in intensified involvement of recreational fishers in conflicts about resource use. With increasing demand for recreational fishing, recreational fishers face growing competition with one another for limited fish stocks and with commercial fishers. Their concerns for environmental threats to fish stocks also intensify. Furthermore, some strategies of recreational fishers are increasingly criticised by conservationists. Governments, therefore, are put under pressure to adopt policies to address these conflicts. Some of the policy measures adopted to help sustain the fisheries and reduce conflict are outlined. These include limits on the catch and exclusive zones for recreational fishing. However, wild stocks of fish are likely to remain under mounting harvesting and other pressures. Therefore, we need to consider the role that aquaculture can play in overcoming these problems. The possible ways in which aquaculture can do this are outlined and discussed.

RECREATIONAL FISHING: ITS EXPANSION, ITS ECONOMIC VALUE AND AQUACULTURE'S ROLE IN SUSTAINING IT

1. Introduction

Countries that experience sustained economic growth and rising levels of income, such as China has, typically show substantial growth in demand for leisure and recreational activities, and in demand for the resources and goods needed to satisfy these demands. With rising standards of living, the bulk of the population is able to expand its involvement in recreational activities, such as fishing. Growth in mass outdoor recreation occurs. Outdoor recreation is no longer confined to a rich privileged class, sometimes identified in the past as the leisure class (Veblen, 1934, Ch.3) or as the bourgeoisie by Marxians (Vickerman, 1975, p.5).

Large increases in demand for participation in recreational activities, such as recreational fishing, as economic growth occurs come about not merely because incomes per head rise. Usually hours of work also fall and the amount of holidays available annually increase with economic development, thereby, increasing available leisure-time. Furthermore, the general level of education of the population usually increases as well and this can have positive effects on the demand for some recreational activities, such as angling.

Cross-sectional evidence from the United States about the involvement of Americans in recreational fishing supports these observations. The United States is the only nation to collect substantial data on the involvement of its residents in recreational fishing and their expenditure on it over a considerable period of time (nearly 50 years). Let us consider the implications of this data. Using this data, and also considering some European data, trends in participation in recreational fishing and factors influencing such participation will be outlined. Then attention is given to the economic importance and economic value of recreational fishing.

While growing demand for recreational fishing is likely to be welcomed by industries that benefit from this expansion, wild fishery stocks are limited. Consequently, social conflicts emerge and magnify as demands to use these stocks grow. Governments are increasingly called on to devise policies to ease these conflicts. In the circumstances, there is an increased

potential for aquaculture to supplement wild fish stocks and help sustain recreational fishing. Ways in which it can do this are highlighted.

2. Participation in Recreational Fishing

National surveys by the US Fish and Wildlife Service reveal that the number of anglers in the US increased by nearly twice the rise in its population in the period 1955 to 2001 (Fish and Wildlife Service and US Census Bureau, no date, p.6). Hence, in this period the participation rate of Americans in recreational fishing almost doubled. In the same period the US experienced considerable economic growth. During 2001, 16 per cent of US residents engaged in recreational fishing whereas in 1955 their participation rate was only around 9 per cent.

American males are much more likely to participate in angling than females. The participation rate for males in 2001 was 25 per cent and only 8 per cent for females. The participation rate is also associated with race. Blacks and Asians showed lower participation rates (7 per cent and 5 per cent respectively) than whites (18 per cent) and others (17 per cent). Consequently, whites in the US accounted for 92.5 per cent of all anglers. However, Hispanics had a relatively low participation rate. Therefore, in the United States, recreational fishing is largely dominated by white males of non-Hispanic origin.

Cross-sectional data also reveal that this participation rate rises with household income and only declines marginally once household income reaches US\$100,000 or more per year. The positive response in the participation rate to rising income seems to occur first at an increasing rate then at a declining rate. This suggests that China is likely to experience an upsurge in demand for recreational fishing as Chinese incomes on average reach moderate levels by the standards of higher income countries in this century.

Data for 2001 of the US Fish and Wildlife Service also reveal a positive association between levels of education and participation in recreational fishing. Participation rates are lowest for those who have 11 years or less of education and are much higher for those with a greater level of education.

Another interesting feature of US statistics is that participation rates in recreational fishing are lower in larger urban conglomerations than in less urbanised areas. For example, in

metropolitan statistical areas of 1 million or more persons, participation rates are 12 per cent. They rise to 17 per cent in medium statistical areas (populations of from a quarter to 1 million), to 22 per cent in smaller metropolitan statistical areas, and to 24 per cent outside such areas. This suggests that, other things equal, greater urbanisation tends to reduce participation in recreational fishing. Since rising urbanisation usually accompanies economic growth (as it has done in China), this effect tends to work in the opposite direction to others that increase participation in recreational fishing with economic growth. Nevertheless, participation in recreational fishing obtains an overall boost as a result of economic growth and is still relatively high, even in large US urban areas.

There may be several reasons for lower fishing participation rates in large metropolitan areas than elsewhere. These might include (1) higher travel costs of residents in accessing suitable fishing areas; (2) over fishing in localities near such areas due to the large number of fishers and consequently low probabilities of catching fish; (3) low fish densities due to environmental changes in the vicinity of such areas; and (4) worries of residents about the consequences for the quality of local fish because of pollution from industries located in such areas. It is also possible that residents of larger urban areas have more competing recreational opportunities than those in small urban areas.

In any case, although participation rates in angling in the US were much higher in 2001 than in 1955, they have fallen somewhat since the beginning of the 1990s. Surveys of numbers of Americans involved in recreational fishing reveal a slight falling tendency during the 1990s (Fish and Wildlife Service and US Census Bureau, no date). The reasons for this are unclear, but contributing factors could be growing urbanisation in the US and the type of factors just mentioned, such as over fishing in such areas. The real level of US expenditure on recreational fishing, however, continued to rise until the mid-1990s but displayed signs of a small decline by 2001.

The estimated participation rate in recreational fishing in Europe as a whole is not nearly as high in the US. It is estimated to be around 5 per cent (Steffen and Winkel, 2002, p.131). This may be because there are significant institutional barriers to engaging in recreational fishing in some countries, for example training and certification requirements in Germany. Nevertheless participation rates vary greatly between countries. In Germany, the

participation rate is 1.7-2.4 per cent (Steffen and Winkel, 2002, p.131) and in Britain, it appears to be around 3.5 per cent (Lyons et al, 2002).

Participation rates in recreational fishing are very high in most Nordic countries. They are estimated to be 12.5 per cent in Denmark, 31.5 per cent in Iceland, 35 per cent in Sweden, 40 per cent in Finland, and 50 per cent in Norway (Toivonen, 2002). Except for Denmark, these participation rates are much higher than in the USA.

There are estimated to be over 21 million recreational anglers in Europe and together they spend several billions per year on their hobby (Cowx, 1999). Annual expenditure in Europe as a whole is less than in the United States and probably amounts to about a third of annual expenditure in the US.

Recreational fishing is also popular in Canada where participation rates are high. In 1996, recreational fishers in Canada were estimated to have spent the equivalent of \$US5.1 billion on items associated with recreational fishing. Recreational fishing is probably of even greater comparative importance in Australia and New Zealand than in the US.¹

Worldwide recreational fishing results in significant levels of expenditure and employment. Economists at the American Sportfishing Association estimated that expenditure on recreational fishing in the US generated 1.2 million jobs in 1996 or the equivalent of slightly more than 1 per cent of America's civilian labour force (Department of Fish and Game, California, no date). While employment generation in other high income countries as a result of expenditure on recreational fishing may not be comparatively as high as in the US it is nevertheless substantial.

3. The Economic Value/Importance of Recreational Fishing

Recreational fishing results in very large levels of expenditure thereby creating considerable employment in market economies, particularly high income ones. In the US, for example, it is estimated that in 2001, recreational fishers spent \$35.6 billion dollars on items associated with recreational fishing (Fish and Wildlife Services and US Census Bureau, no date, p.9). This averaged out to \$167 per fisher in 2001, but would have varied greatly between participants.

Their main expenditures were for food and lodging (\$5.9 billion), transportation (\$3.5 billion), boating costs (\$2.6 billion), bait (\$1.1 billion), rods and reels etc. (\$1.9 billion) which were a part of fishing equipment (\$4.6 billion) and land leasing and ownership mainly for fishing purposes, (\$3.1 billion), according to the survey of the Fish and Wildlife Service and the US Census Bureau (no date, p.68). Hence, many different economic sectors obtained economic benefits from recreational fishing in the US.

Observe that while total expenditure on recreational fishing is a useful indicator of its economic importance in creating incomes and employment in a market economy, it understates the gross economic value of recreational fishing. This is because recreational fishers obtain economic benefit or satisfaction from engaging in fishing beyond their expenditure on it. This can be measured in principle by their willingness to pay more than they actually do to engage in this activity. Loomis (2000) and Bishop (1987) describe this as the net economic benefit of recreationists after allowance is made for their cost of engaging in the relevant recreational activity.² Furthermore, the gross economic value to recreational fishers of engaging in fishing exceeds the market value of their fish catch. When one is examining the competing claims of commercial and recreational fishers to utilise common fish stocks, differences in the net economic value to recreational and to commercial fishers should be an important consideration in settling their conflicting claims.

4. Recreational Fishing and Social Conflicts about Resource-Use

With global expansion in economic activity and fishing (both commercial and recreational), social conflicts about natural resource-use have become more obvious and have intensified. There is increased competition for dwindling fishery resources (Kearney, 2002). As a result governments are increasingly called on to intervene. It is worthwhile considering briefly the type of general conflicts that have arisen and the measures some governments have taken to address these conflicts.

In summary, the main social conflicts appear to be:-

- (1) Conflicts between commercial fishers and recreational fishers about the access of each group to wild fish stocks and the allowable catch by each group.
- (2) Conflicts between recreational fishers about allowable catches and methods of catch.

- (3) Concerns of all fishers about water pollution (especially from other economic activities) that adversely affect the quality and quantity of fish stocks (see Cowx, 1999, p.15).
- (4) More generally, concerns grow about any environmental changes (often associated with economic growth) that have adverse consequences for fish stocks or their quality. These would include the destruction of fish breeding grounds to make way for 'economic development', barriers to fish migration, and run-off of pollutants such as pesticides from agriculture.
- (5) Some conservationists are also increasingly concerned about the environmental damage done by some recreational fishers as well as by some forms of commercial fishing. Threats to particular fish populations due to over harvesting and some cultural practices are also of concern. For example, recreational fishing in coral reef areas may result in damage to corals, or recreational fishers may be instrumental in introducing exotic species into natural water bodies and this may result in the loss of some native species.

Evidence of growing conflict is clear from increasing government regulation of environmental or natural resource-use. Fishing regulations (for both commercial and recreational fishers in many higher income countries) include prohibition on various methods of capture and gear, licensing of fishers, limitations on the amount of catch by fishers, size limits for fish retained by fishers, seasonal closures and closed areas.

In addition, the practice has spread of reserving areas or zones exclusively for recreational fishing. In these zones, commercial fishing is not allowed. Furthermore, particular fish species may be reserved exclusively for recreational fishers or for recreational fishers with particular licences.

With economic development and the expansion of demand for recreational fishing, the size of the area and the number of species reserved for recreational fishing is increasing. In the Netherlands for instance, all species in inland waters are reserved for recreational fishing except eel (J. Verreth, personal communication, September 2003). In Australia, the area reserved exclusively for recreational fishing is expanding in size. This is partly a result of political lobbying by organisations representing recreational fishers.³

This is supported by a recent item in *The Courier Mail*, a Brisbane-based newspaper. The article by B. O'Malley (2002) reports on an interview with Mr Turner, President of Sunfish, an association representing recreational anglers in Queensland in which Mr Turner calls for an extension of bans on commercial fishing in the inshore zone. O'Malley (2003, p.7) states "*Mr Turner said he would push for major expansion of fishing 'havens', similar to the NSW model where 30 areas covering one-third of the coast were off-limits except for recreational fishing.*"

Queensland Seafood Industry Association chief executive said the proposal was not based on sustainability, but on anglers catching more fish."

There is a changing balance in the political economy of this matter. The number of commercial fishers is falling whereas that of amateur fishers is rising. In most countries, the number of recreational fishers exceeds by a large margin the number of commercial fishers. In addition, total expenditure by recreational fishers in coastal and inland waters in many countries exceeds that of commercial fishers. So the numbers and economic balance moves in favour of recreational fishers and against commercial fishers in many higher income countries, particularly in inland and inshore waters. Hence, the observed political trend.

Whether or not exclusion policies banning commercial fishers from some areas or from harvesting some fish species are appropriate cannot be assessed here, although they can in principle be analysed by using economic principles. Despite such policies, social conflicts still remain and growing difficulties are being experienced in sustaining wild fish stocks. Therefore, the question arises of whether and how aquaculture can help reduce these conflicts.

5. Ways in which Aquaculture Can Help Sustain Recreational Fishing

Aquaculture is of growing importance as a source of fish supplies globally. Aquaculture accounted for less than 5 per cent of total global supplies of fish in 1950. By 2001, it provided around 35 per cent of total fish supplies (FAO, 2003). Considerable acceleration in the contribution of aquaculture to total fish production is apparent from the 1970s onwards.

Despite the growing importance of aquaculture as a source of fish supplies, its potential to sustain recreational fishing is not adequately appreciated. Furthermore, the various ways in

which it can do this are not well known. Therefore, it is worthwhile outlining alternative ways in which aquaculture can help meet the demands of recreational fishing and help sustain it.

Broadly the main ways in which aquaculture can help sustain recreational fishing are as follows:

- (1) Aquaculture can provide an alternative source of bait for example (live bait) to its capture from the wild.⁴
- (2) It can provide an additional (separate) stock of fish to wild stocks for recreational fishing.⁵
- (3) Aquaculture can increase supplies of fish species also targeted by the commercial fishery, thereby potentially lowering the market price of such fish and in certain cases, reducing the economic incentive of commercial fishers to harvest such species (Anderson, 1985). This displacement of commercial fishers by competition from the farmed substitute for captured fish should make more wild fish available for recreational fishers. While this is a real possibility, there can also be circumstances in which the development of aquaculture is unfavourable to wild stocks. It all depends (Tisdell, 2003).
- (4) Aquaculture can supplement wild stocks of fish by supplying fingerlings for release and for headstart programmes.⁶
- (5) Aquaculture can be used to introduce exotic species considered to be superior to local ones for recreational fishing and to sustain their populations. However, this is controversial because such introductions are likely to displace some native species of fish and bring about other environmental changes. The net result can be an irreversible reduction in global biodiversity.

The consequences of aquaculture for the sustainability of recreational fishing depend on how it is practised. Relatively self-contained pond aquaculture should have few adverse consequences on wild fish stocks. Pond aquaculture in and near large metropolitan areas should be able to provide their residents with extra recreational opportunities to catch unpolluted fish. While pond fishing may not appeal to all, it provides an opportunity for a family outing, it can be combined with other recreational facilities (such as picnic facilities, restaurants) and can increase prospects of catching fish in urban neighbourhoods.

Furthermore, fish can be cultured to a certain stage elsewhere (in order to reduce costs) before they are brought to recreational ponds located within areas in easy reach by metropolitan residents.

While fish cultured in pens and open cages can also be used directly for recreational fishing, these methods of aquaculture may have adverse environmental effects on wild stocks and can interfere with the activities of recreational fishers targeting wild species. Adverse environmental consequences from such culture may be more frequent than from pond culture.

There should also be scope for co-operatives and companies to develop aquaculture for recreational fishing in relatively large self-contained water bodies, if they can jointly agree to it or have appropriate property rights. Husbandry can be used to increase the economic value of such water bodies for recreational fishing.

6. Concluding Comments

Globally, we can expect the demand for recreational fishing to increase as world economic growth proceeds. Although economic growth will differ between nations, Asian countries, such as China are expected to improve their standards of living significantly in this century. The resulting increased global demand to use wild fish stocks for recreational fishing is, however, subject to severe natural resource constraints. There is considerable competition for wild fish stocks from commercial fishers and widespread over fishing of such stocks. Furthermore, in some areas environmental deterioration has reduced the level and quality of wild fish stocks. Although governments have introduced policy measures in an attempt to reconcile competing demands on the natural/environmental resources involved, serious problems continue to exist. Demands to use wild fishing stocks have outstripped the capacity of these stocks to satisfy these demands.

Aquaculture can add to fishing stocks and help ease the social conflicts about fishing. It can help sustain levels of recreational fishing both directly and indirectly although, it cannot overcome all the supply-side constraints. Nevertheless, its potential to support recreational fishing has as yet been barely utilised. That is not to say that all types of aquaculture are beneficial to recreational fishing nor that all types of recreational fishing and all recreational fishers can benefit from aquaculture. Because, for example, the demand for recreational fishing is quite segmented (for instance, those enjoying big game fishing may not be very

keen on more passive types of fishing) and because fishing for many is a total experience involving attributes other than just fish (such as wilderness, or involvement in adventure, if fishing at sea) aquaculture cannot replicate all of these qualities. Nevertheless, the demand from several segments of the recreational fishing community can be effectively met by aquaculture. It can replicate some of the environmental attributes wanted by some fishers, and provide added environmental attractions to those available in the wild. Thus, there is, much merit in encouraging environmentally beneficial forms of aquaculture. Recreational fishing can gain substantially from this.

Notes

- ¹ According to state government reports in Australia, participation rates in recreational fishing in Western Australia were 30 per cent in 1996, and in the Northern Territory 35 per cent in 1995. Therefore, Australian participation rates in recreational fishing might exceed those in North America.
- ² It is the net consumers' surplus of recreational fishers.
- ³ Political lobbying by recreational fishers probably intensifies when they are required to pay state licence fees. Recreational anglers are then likely to demand more value for money from the government. Their demands may include greater exclusive access to wild fish stocks and demands for the government to support fish stock supplementation and restocking.
- ⁴ A recent development in this regard has been the successful aquaculture of marine worms in New South Wales by Aquabait Pty Limited. This is an important development because taking increasing quantities from the wild is not sustainable. For information see <http://www.aquabait.com.au/worms.htm>, and <http://www.abc.net.au/catalyst/stories/s958739.htm>.
- ⁵ An example is Glassy's Fishing World located in the Gold Coast region of Queensland. It relies on 12 large ponds stocked with mostly Australian native fish, and caters for Fly Fishing and Bobby Fishing. Fish are caught and released by visitors and a variety of different packages are available ranging from use of the grounds solely for picnicking to overnight stays in cabins. Further details: <http://www.glassysfishingworld.com.au/>
- ⁶ In Queensland, the Queensland Fisheries Service of the Queensland Government uses a freshwater licence scheme [The Stock Impoundment Permit Scheme (SIP)] to provide funds to fishing groups to purchase fingerlings to stock 29 dams (Queensland Fisheries Service, 2003).

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