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## **Recreational fishing in France: Market or institutional failures ?**

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### **Abstract**

In France, freshwater recreational fishing management does not account for anglers' satisfaction in a sufficient manner. On one hand, fishing effort is too high creating congestion costs. On the other, environmental quality is low while there is a positive willingness-to-pay for improvements. These inefficiencies are explained by the conjunction of three phenomena. First, private property rights are attenuated under institutional pressure. Second, recreational fishing is managed as an open access resource over the whole territory. Finally, halieutic policies focus on the protection of environmental resources and are inefficient to maximize the social rent provided by recreational fisheries. Fishing effort regulation and environmental services provision following the beneficiary-pays principle could improve collective welfare. Social pricing could insure equity in access to the resource.

**Keywords :** open access, congestion, efficient management, environmental services, transaction costs.

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## 1. Introduction

For decades, recreational activities linked to natural resources are in expansion. On the opposite, a traditional recreational activity like freshwater recreational fishing seems to be in disaffection in France while it is a country with a large hydrographic system.

Drawing the picture of recreational fishing practices in France is a hard task since existing data are neither centralized nor up to date. The last nationwide survey on freshwater recreational fishing has been undertaken in 1991 (*CSP*, 1992). It stated an overall angling population of five million people (9% of the French population) among which three million anglers taking more than 5 fishing trips annually. These numbers are much higher than the 1.9 million license holders counted in 1990. The difference is explained by exoneration (20% of the angling population) and by those who fish in closed waters not subject to general regulations and where management is private. The 1991 national survey aimed at explaining the constant decrease of the recreational fishing population in rivers and streams, at the pace of 40,000 anglers per year that caused the financial crisis of the National Fishing Council<sup>1</sup>. In the same time, private fishing would be rising. The future of associative recreational fishing in France is put under discussion in the context of the National Water Act reform.

The loss of 1.5 million associative anglers since 1964 would be due to the socio-economic evolutions of the country (*Breton*, 1993): decrease in the working-class, drift from the land and urbanized lifestyles, competition with other forms of leisure that benefited from better promotion. Aquatic ecosystems perturbations are also evoked while one could not always make the connection with the decline in angling population. An example, concerning water quality is the diminution of industrial and households pollution as well as the disappearance of the most pristine waters (*IFEN*, 1998). Agriculture is called into question for landscape and ecosystem modifications, non-point source pollution increase, irrigated lands and disused lands affecting riverbanks maintenance and access.

After a fleeting development in the 60's, recreational fishing tourism did not succeed in stopping the decline of the angling population in rural areas. The French fishing guides federation denounces the hard competition with overseas recreational fisheries and the over-exploitation of the best national fishing site which could attract French and foreign anglers (*AFIT*, 1996). It explains the imbalance in the flows of tourist anglers between France and foreign countries. A few foreign anglers visit France. They are in search of fishing areas rigorously managed with a low density of anglers (*Lafage*, 1992). In the same time, French an-

glers practice a lot abroad. A survey shown that they were interested in specific fishing sites of quality, the most natural possible, which are not common in our country (*CRISTAL*, 1996).

Fishing sites, managed by angling associations, are suspected to be overexploited because there is no regulation of fishing effort. Yet, few data are available on that features. Following the 1991 national survey, 38% of anglers and 58% of the sub-population of "sport" anglers don't want any increase in fishing effort. Quality fishing requiring space, such as salmon angling, is particularly sensitive to crowding. Western France salmon anglers, surveyed by *Salanié* (2004), deplore the excessive crowding of some rivers. As an answer to the lack of quality fishing, the highly rated fishing sites stocked with highly demanded species like salmon and trout, are privatized reminding us what happened to hunting.

We can question why France do not derive more benefits from recreational fishing as it is the case in northern European countries. This question is interesting to address the stakes that, beyond recreational fishing, face recreational activities based on natural resources:

- improving users welfare,
- developing rural and mountainous areas,
- reconsidering multifunctional agriculture at a time where public support is contested.

While recreational fishing is a main empirical subject for Anglo-Saxons environmental economists, we list only a few French studies (*Bonnieux / Vermersch*, 1993 ; *Desaigues et al.*, 1998 ; *Changeux et al.*, 2001). These precursory studies measure recreational benefits from angling but do not treat of management issues. Yet, there is a scientific interest in knowing why recreational fishing is not best managed while property rights are perfectly designed and regulation policies are old.

The first aim of this paper is to explain the origins of the inefficiencies affecting recreational fishing in France. The second aim is to introduce a reflection upon measures that could be implemented to reduce some of these inefficiencies. Recreational fishing is most often a non-market activity necessitating the simultaneous management of the environment, fish habitats, the resource and fishing effort. In that context, we lead our analysis using the economic theory of environmental and natural resources inside a public economics framework.

The first part of the paper summarizes the economic work done in the area of optimal management of recreational activities in general and fishing in particular. In the second part we confront this theoretical framework to the institutional organization and to the management policies in France, focusing on property rights. The last part deals with the tools and

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<sup>1</sup> Organism in charge of hydrobiological research and technical support to angling associations, financed through the annual fishing fee paid by anglers.

regulations that could improve economic efficiency of recreational fishing, conserving equity in access insured by associative management.

## 2. Economic modeling and optimal management of recreational fishing

In the field of public economics, a few paper deal with the static modeling of recreational activities. Among them, *Fisher / Krutilla* (1972) are precursors and *Sibly* (2001) produced the most recent work. In the tradition of these models, *Anderson* (1983 and 1983) formalized the recreational fishing case. While commercial fishing economics focuses on producers behavior, *Anderson's* initial model (1983) relies on the specification of the trip demand function to a fishing site resulting from the sum of individuals' demand functions. To account for externalities among anglers, *Anderson* introduces<sup>2</sup> the notion of constant externality demand curves ( $KK_i$  curves in figure 1). As long as total effort ( $D_i$ ) increases, anglers are found on inferior  $KK_i$  curves showing their willingness-to-pay decrease with the externality. Observed points are the ones where total fishing effort meets the corresponding  $KK_i$  curve. They describe the CC "observed" demand curve. The inverse demand function associated with any  $KK_i$  curve can be written :

$$P_i = P(D, X(D_i))$$

where  $D$  is the total number of fishing trips and  $X$  represents the quality of fishing experience, itself a function of  $D_i$  that is hold constant along each  $KK_i$  curve. We have :

$$\frac{\partial P}{\partial D} = P_1 < 0 \text{ et } \frac{\partial P}{\partial D_i} = P_2 X_1 \text{ which sign depends on } X_1 \text{ because } P_2 \text{ is positive.}$$

Fishing quality is a function of parameters depending on total fishing effort like catch rate, average size of catch and crowding. Generally,  $X_2$  is negative which corresponds to stock or congestion externalities that cannot be distinguished.

In open access, the total fishing effort settles at the level where the marginal willingness-to-pay for the last day fished is null (Figure 1), that is :

$$P(\bar{D}, X(\bar{D})) = 0$$

The optimal effort is the one that maximizes anglers' surplus :

$$\max_{D_1} \int_0^{D_1} P[D, X(D_i)] . dD$$

It verifies :

$$P(D^*, X(D^*)) = - \int_0^{D^*} [P_2(D, X(D))X_1] . dD$$

Then, effort must be brought to the level where willingness-to-pay for the last day fished equals the loss of welfare imposed to all anglers resulting from this marginal increase in effort. Because this externality is negative, optimal effort is lower than open access effort.

In a second time, Anderson links fishing quality to environmental improvements (M), affecting fish stocks and provided at the cost  $\Phi(M)$ . Besides the preceding condition, the optimum is then characterized by :

$$\int_0^{D_1} [P_2(D, X(D_i, M))X_2] . dD = \Phi_1$$

We recognize here the classical condition for the optimal provision of public goods that is not spontaneously reached in the presence of externalities (no incentives to provide the public good). To sum up, D and M have to be increased to the point where marginal willingness-to-pay equals the marginal cost of the additional effort unit (i.e. a trip).

### 3. Management failures in French recreational fisheries

The actual organization of associative angling in France relies on the Acts of 1941 and 1984 (Breton, 1993). Since 1941, anglers have the obligation to belong to an authorized angling association for the protection of the aquatic environment (AAPPMA in French) and to pay the annual fishing fee that serve to insure surveillance and development of the national fishing patrimony. The 1994 Act keeps this associative framework and in particular the obligation of membership in an AAPPMA. It enforces the responsibilities and means of the AAPPMA concerning the protection of aquatic environment and fish stocks. It also aims at democratizing recreational fishing and simplifying angling regulations. Some authors talked about the

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<sup>2</sup> Fisher / Krutilla were the first to use this notion.

"associative dilemma" in relation to these possibly contradictory requirements (*Auxière / Jantzen*, 1992).

Angling associations usually rent or possess fishing rights and manage the corresponding fishing lots that are accessible to all. They have the obligation to belong to a county federation coordinating their actions in term of aquatic environmental maintenance through cooperation with attorneys and local governments. County federations can voluntarily take part in the national federation for fishing in France (*UNPF* in French). The *UNPF* is, along with the *National Fishing Council* (*CSP* in French), the interlocutor of the government for the implementation of legislation and regulations concerning protection of the aquatic environment and fishing practices. The *UNPF* acts for the harmonization of fishing conditions over the whole territory (see *infra*). The 1984 Act has been initiated by the *UNPF* which participates actively in the reflection concerning recreational fishing that occurs in the context of the National Water Act reform (*UNPF*, 2003).

In this context, the fishing fee would disappear and be replaced by a tax over the use of the resource that would be collected by the *Water Agencies*. The *National Fishing Council* would be dissolved and its agents would join the government's decentralized environmental services. The law would confirm the obligation of membership to an AAPPMA and would create a national federation with membership obligation for county federations. Moreover, the national federation would be entitled to evening out a special fund called "*the national compensation fund*" supplied through a "*national tax for the aquatic environment*" paid by anglers.

Fishing rights belong to the French government on public waters<sup>3</sup> and to riverside landowners elsewhere ; on rivers called "*private waters*". Fishing rights are a right to use the resource that came in compensation of river maintenance obligations. However, this fishing right cannot be fully exercised because of several legislative and regulatory measures. First, it is the obligation to pay the annual fishing fee and to be a member of an angling association, regularly reaffirmed in the law. This obligation applies even to fishing right owners or to their clients whether they want to use their rights for himself or commercially. Then, it is the 1984 law that requires from landowners to share their right with angling associations to get public support to maintenance<sup>4</sup>. In this context, the decree of April the 17<sup>th</sup> of 2000 sets a typical model of convention relative to the free disposal of fishing rights from landowners to angling

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<sup>3</sup> Boatable rivers.

<sup>4</sup> Article L. 235-5 of the Rural Code.

associations. These dispositions give incentives to landowners to renounce to their property rights for free to the AAPPMA<sup>5</sup>.

Angling associations deliver annual fishing cards which lump sum price contains, as well as the national fishing tax and the facultative additional tax for migratory species, the membership fee to the AAPPMA and to the county federation. The total amount of the fishing license in France is modest<sup>6</sup> in regard of the prices practiced elsewhere and data on willingness-to-pay for recreational fishing (*Walsh et al.*, 1992 ; *Amigues et al.*, 1995 ; *Sturtevant et al.*, 1998 ; *Markowski et al.*, 2000 ; *Rosenberger / Loomis*, 2001). Reciprocity agreements exist between AAPPMA and county federations. They allow an angler, member of an angling association, to access the reciprocitarian territory for an additional fee of 15 €. Under the impulsion of the UNPF, the *Entente Halieutique du Grand Ouest*<sup>7</sup> and the *Club Halieutique Interdépartemental*<sup>8</sup> engaged a reciprocity agreement opening the two thirds of the national territory. Some angling associations, mostly well endowed in highly rated rivers, refused to sign these agreements (*Elorn*, 2003).

Incentives for property rights attenuation and the associative policy for unregulated access at a modest price, transformed private well-defined property rights into a common resource with limited exclusion possibilities. Reciprocity agreements undertaken at a very large scale involve that angling associations themselves renounce to the rights they bought out from riverside landowners. This situation generalizes open access. The resulting externalities do not allow to reach the optimums described in the first part of the paper. Riverside landowners are not incited to provide environmental services because there is no market for them anymore. A typical example is the abandon by farmer of the valleys lower parts and of riverbanks with consequences for ecosystems and access to the rivers. In the same way, angling associations are not incited to take measures to improve and manage aquatic ecosystems because they can't get benefits from these measures (*Elorn*, 2003). This constitute a main contradiction in the 1984 Act. Hydrobiologists contest stock externalities because of the low efficiency of line and rod fishing to catch fish<sup>9</sup>. However, congestion externalities can equally lead to the tragedy of the commons. Unlike in *Hardin's* example (1968), this is not the stock or the commercial rent that are affected but the quality of angling and collective anglers' welfare.

The government and angling organizations enforced regulations to limit the consequences of open access on aquatic resources for years. They concern closures during spawn-

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<sup>5</sup> Exceptions are found near Paris and in Normandy.

<sup>6</sup> Less than 80 €.

<sup>7</sup> Reciprotarian club of western France.

<sup>8</sup> Reciprotarian club of the South of France.

<sup>9</sup> Except for endangered species showing high catchability from line and rod fishing like atlantic salmon.



ing periods, minimum legal sizes, daily catch limits and gear and bait restrictions. Some authors questioned the interest of some of these measures because there is generally no over-fishing by anglers. Salmon angling is subject to specific regulations : daily closures in some counties, total catch limits per river and season leading to fishery closure when the Total Allowable Catch (TAC) for the river is reached. To maintain fish populations, angling associations also resort to stocking using farmed fish. But, hydrobiologists that favor the improvement of ecosystems quality, and specially of fish habitats, contest this measure (Cox, 1997).

All these measures are inspired by the biological approach of resource conservation. They do not account for anglers behavior, probably because recreational fishing is managed by hydrobiologists<sup>10</sup>. But, whatever would be the biological efficiency of these measures, they are insufficient from the welfare point of view because they aim at the consequences of open access rather than limiting fishing effort. Thus, Cox / Walters (2002) have shown that in open access measures to improve stocks have limited effect on the quality of fishing in terms of catch rate. This is due to the increase in effort along with the increase in stock. Economic theory (the tragedy of the commons and marginal willingness-to-pay nullification) explains well these observations made by hydrobiologists.

To not account for anglers satisfaction can lead to pervert effects. In the case of salmon, if the use of TACs cannot be contested, the possibly induced fishery closures (or delayed opening day) can greatly lower welfare. It could be partially overcome by a better management of fishing effort over time. In the same way, daily closures can lead to effort transfer on opened days and consequently in a decrease of welfare due to the resulting additional crowding. It is a welfare loss considering total effort constant. However, these radical measures have the advantage of reducing the transaction costs associated to fishing effort control<sup>11</sup>.

#### **4. Considerations to reach the economic optimum**

How to account for external effects to improve anglers welfare ? We can try to answer this question in the coasian framework of transaction costs (Coase, 1960). Indeed, anglers get satisfaction from consuming a bundle of goods showing more or less public characteristics and differing in the transaction costs associated to their provision. These costs arbitrate between the public or private provision of these goods.

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<sup>10</sup> Concerning the measure to take to develop angling tourism, Tendron underlines : "They aim at supporting the fact that general regulations and legislation is not undertaken only for biological imperatives" (Tendron, 1996).

<sup>11</sup> Overcrowding resulting from the concentration of anglers over time can be considered as a low cost mean to regulate fishing pressure on the resource.

First, collective goods showing common pool resources or public characteristics have to be provided on a public basis because the associated transaction costs are high, in particular those associated with exclusion. It concerns halieutic resources such as migratory species (salmon), water resources, and physical catchments characteristics affecting water cycle, etc. Appropriate management of these goods rely upon policies to conserve and to share halieutic resources as well as water policy and agri-environmental measures. It is not the purpose of this paper to examine these specific public policies. This is why the following analysis will focus on associative policies concerning recreational fishing institutions.

Two types of measures enter the intervention sphere of angling institutions. On one hand, it is about local collective goods, particularly those linked to fish stocks : fish circulation, spawning areas, ecosystems maintenance, stocks improvements. For the reasons evoked above, these goods require public management that would be usefully insured by angling associations and their federations, as it is the case at present : dams and obstacles removal, fishing reserves creation, spawning areas development, juveniles production units. Public support can be beneficial in respect to the passive use values associated to biodiversity and fish stocks.

On the other hand, we face private goods managed like common pool resources as a result of property renunciations from landowners in favor of angling associations :fishing rights, riverbanks access and the corresponding local goods and services (especially the environmental ones). These goods could be privatized because property rights are correctly defined and exclusion and transaction costs are probably low because private recreational fishing in ponds and lakes is developing. Despite institutional difficulties, the privatization of fishing courses in river is also developing in areas where common goods are of good quality (water and fish stocks). While it is an efficient way to manage the environment and the resources<sup>12</sup>, privatization is not desirable for distribution issues linked to equity in access. For the next years, the associative challenge is to improve the economical efficiency of management while maintaining nondiscriminatory access. To limit privatization and provide local goods and services<sup>13</sup>, angling associations have to be encouraged to take position on the fishing rights market through leases and local services negotiation with riverside landowners or riparian parcels buy out. Riverside landowners, mostly farmers, are able to provide low cost environmental services due to economies of scale. This market internalization is subject to an

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<sup>12</sup> Only under the hypothesis of a utilitarian social welfare function and a constant marginal utility of income (optimal distribution of revenues).

<sup>13</sup> Today, everything relies on public policies such as agri-environmental measures which efficiency is constested in comparison of their high command and control costs. Some of these measures could be managed by angling associations to insure the transition with the beneficiairy-pays principle.

increase in fishing fees. While still underdeveloped and limited to highly rated rivers, some AAPPMAs are introducing the concept (e.g. some AAPPMA in the Manche county introduced an additional salmon fee to fund parcels leasing; the *Elorn* AAPPMA (Finistère county) is involved in riparian parcels buy outs). It would be useful to use the funds from fishing licenses for local negotiation which do not seem to be the case in the context of the National Water Act reform that reinforces centralization.

The other problem facing fishing organizations is to efficiently and equitably regulate fishing effort without using radical tools consisting in reducing the fishing period. For decades, Anglo-Saxons economists have been looking to rationing recreational activities subject to congestion costs using classical economic tools such as fees and quotas. *Cullen* (1985) compared entrance fees and fishing day quotas to lotteries and queuing in an analysis considering equity, efficiency and administrative costs. A traditional result, also evoked by *Rosenthal et al.* (1984) and formalized by *Sibly* (2001) is that fees are more efficient than any other rationing device because they allocate trips to the ones that put the highest value on them. On the opposite, global or individual quotas allow for the exclusion of users having the greatest willingness-to-pay for trips by those having lower one. It leads to a lower collective welfare. Figure 2, representing the reaction of two types of anglers to an entrance fee, illustrates that result. For the same decrease in effort, individual quotas lower total surplus by the area  $c+g-e$  with respect to an entrance fee at price  $p$ . Moreover, prices differentiation respect to congestion induces effort redistribution over the fishing sites in an optimal way. Finally, applying the beneficiary-pays principle results in less fiscal pressure over nonusers and validate recreational values allowing for arbitrage with other functions of natural resources.

*Cox and Walters* (2002) notice that opposition to fishing effort limitations generally comes from local anglers having easy access to the rivers. Figure 2 shows that quotas, but not prices, are more penalizing for anglers making more trips, which is usually the case for local anglers. Fees are also found inequitable by this population of rural anglers, having lower revenues than by urban anglers. However, the differences in fishing effort for open access are not more equitable if we consider the negotiation of fishing rights and services. At present, wealthy anglers can fish the best quality fishing courses by going abroad or paying for private sites. It constitute an undesirable wild regulation way. Social pricing, or at least the differentiation between local and nonresident anglers, could bring solution to equity problems.

## 5. Conclusion

In France, recreational fishing management does not account sufficiently for anglers satisfaction. On one hand, fishing effort is too high which involves congestion costs. On the other, environmental quality is insufficient while there is a positive willingness-to-pay for improvements. These inefficiencies are explained by the conjunction of three phenomena :

1. the institutional attenuation of private property rights and their transfer to angling associations,
2. the open access policy enforced by angling associations and generalized over the whole territory,
3. the inefficiency of halieutic policies that favor biological aspects of resource conservation rather than collective welfare.

To survive, which is sociably desirable, associative angling has first to recognize fishing rights through the negotiation of environmental services with riverside landowners, then to enforce management tools that insure equity and efficiency in fishing effort regulation. The enforcement of the beneficiary-pays principle would cope simultaneously with fishing rights acquisition and individual fishing effort management, allocating it to those who value them the more.

These hypothesis have to be tested on empirical data. It is first about measuring recreational demand functions to infer congestion costs and willingness-to-pay for environmental services in the French case. Then, it is about quantifying control and transaction costs associated to the different management options as well as the environmental services production costs. The measure of recreational fishing demand should bring elements to answer these issues. Contingent valuation methods and even more the travel cost method should be undertaken using individual surveys on anglers behavior. Classical multi-site models (continuous or count-data models) and particularly discrete-choice models (the probability of making a trip to a fishing site) would explain the link between fishing trips and site characteristics. Specific efforts should be made to integrate congestion issues that are important for the good comprehension of recreational fishing problematic. To our knowledge, *Lin et al.* (1996), *Kerkvliet / Nowell* (2000) and *Schuhmann / Schwabe* (2004) are the only studies providing measures of congestion externalities for recreational fisheries. *Kerkvliet / Nowell* and *Schuhmann / Schwabe* results show clearly the negative impact of crowding on anglers welfare. Furthermore, these models would give elements to identify fishing effort optimums and to evaluate halieutic policies such as fishing closures, pricing and quotas or catch limitations.

In the same way, it would be useful to compare recreational fishing management in France and in other countries. Management systems can widely differ from a country to an-

other. In northern European countries like Great-Britain, Ireland and Norway, most fishing sites are private and fishing effort is regulated with sometimes the obligation of being accompanied by a guide. In Spain, several types of management coexist. For example, highly rated fishing sites, the "*cotos*", are managed through lotteries which insure limited fishing effort and equity in access. In addition there are open access fisheries like in France. In Canada or in the United States, management can differ from one fishing site to another. However, most fishing sites are in open access. Some North-American authors (*Bergen, 2000 ; Minard, 2000 and Radomski et al., 2001*) underline the risks surrounding such a management evoking the possible privatization of the best fishing sites.

Finally, the framework developed in this paper could be applied to other leisure activities. It is especially the case for hunting in France which organization is very similar to the fishing one. Hiking and water or mountain activities would deserve particular treatment because they rely on public goods.

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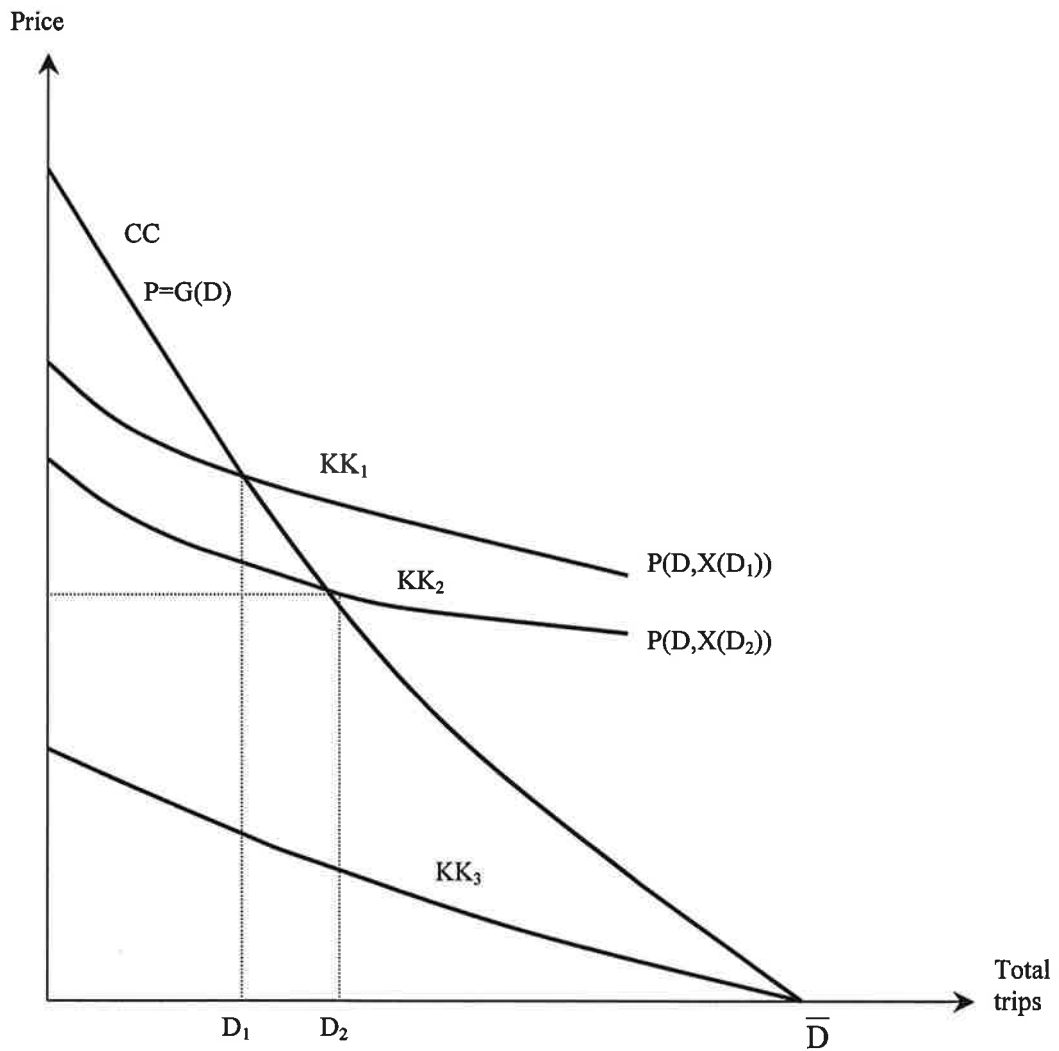
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**Fig 1: Constant externality curves and open access equilibrium.**





**Fig 2: Comparison between fishing days quotas and an entrance fee.**

