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Transferable Rights of Recreational Fishery: An Application to Red Snapper Fishery in the Gulf of Mexico

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Short Summary : Transferable rights (TRs) programs are being increasingly considered in fisheries to overcome current overfishing situation. This paper will focus on developing a conceptual foundation, investigating advantages of the TRs program in fishery management, and answering critical issues to implement recreational TRs programs. Implication is to the Gulf of Mexico red snapper fishery.

JEL Classification: Q22

Key words : Transferable Rights; Individual Transferable Quota; Recreational Fishery

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I. Motivation

As is true for many fisheries worldwide, the red snapper fishery in the Gulf of Mexico has been overfished due to excess commercial and recreational effort. Recreational effort targeted toward red snapper stocks has increased substantially in recent years. In 20 years the number of charter vessels increased by 149% and charter angler trips increased by 188% (GMFMC, 1999).

As a result, recreational harvests of red snapper in the Gulf have often exceeded the total allowable catches (TAC) by a significant margin. Regulatory responses have limited the recreational fishery in ways that have diminished the quality of the recreational fishing experience (Sutinen and Johnston, 2003). For example, in 2001 a moratorium was established on recreational reef fish permits and the season has been shortened sharply in recent years. While these restrictions have reduced fishing pressure, they have not fostered an efficient allocation of recreational effort.

As an alternative way to limit fishing effort, transferable rights (TRs) programs are being increasingly considered in fisheries across the globe. TRs are usually implemented as individual transferable quotas (ITQs), also called individual fishing quotas(IFQs) in the commercial sector. However, examples of TRs in recreational fisheries are few, and the literature appears to be limited. While a number of nations have used transferable quota system for the commercial sector, including Canada, Iceland, Australia, and New Zealand, the Alaska Halibut charter Individual Fishing Quota appears to be the only recreational TRs program in the U.S.[1]

[1] Currently, a few federal ITQ/IFQ programs exist in the United States: for surf clams and ocean quohogs in Mid-Atlantic and New Englnad waters; for wreckfish along the South Atlantic coast; and for halibut and sablefish in Alaskan waters (FAO, 2001).

Should transferable permits become legal, they offer the potential to increase overall economic efficiency in both commercial and recreational fisheries by making it possible for the fishermen who value the resource the most to harvest the fish. However, before a system of TRs could be used, there are new variables that need to be considered and questions that must be answered. This study will focus on developing a conceptual foundation for the recreational TRs system because there is lacking in the literature a fully developed model of how recreational ITQs would function[2]. This study will, therefore, consider the potential to use TRs program to overcome recent difficulties of the recreational red snapper sector.

The principal objective of this paper is to study the potential use of TRs in the recreational fisheries. Economically desirable institutions and structures to implement TRs programs in recreational fisheries are investigated. In the next section we provide background on the use of TRs in fisheries, highlighting the limited experience with rights-based programs in recreational fisheries. We then provide a brief overview of the specific rules that govern recreational fishing for red snapper in the Gulf of Mexico. This is important for a new approach to regulating recreational fishing will be most easily implemented and accepted if it builds on existing institutions.[3] We then discuss the critical design issues that must be answered if TRs are to be set up for the recreational fisheries.

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[2] The basic theory behind ITQs in the commercial fisheries has been established since Clark (1980) and there is a rich literature that has been studied the theoretical and institutional characteristics of these policies.

[3] We use the word *institutions* in this paper to describe "the rules and conventions that define choice sets from which individuals, firms, households, and other decision-making units choose courses of action" (Bromley 1989, p. 39)

II. Literature review – rights based management of recreational fisheries

A. Transferable rights – background

In general, TRs have been studied in depth.[4] There is strong evidence that market-based systems can be more efficient than command and control systems, in which sources have less flexibility (see Repetto 2001). Should transferable permits become legal in the U.S., they offer the potential to increase overall economic efficiency by making it possible for fishermen, who value the resource the most, to harvest the fish.

As with any market, a TRs market will function properly if the property rights are "complete." Hanley, Shogren, and White (1997) elaborate:

> "markets will be complete when traders can costlessly create a well-defined property rights system such that a market will exist to cover any exchange necessary. This well-defined property rights system represents a set of entitlements that define the owner's privileges and obligations … (p. 24).

More specifically, they state that the use of a resource will be efficient if the rights are comprehensively assigned, exclusive, transferable, and secure. Because TRs markets are purposefully created by government, it is particularly important that these characteristics be taken into account in their creation.

Scott (1989) discusses three ways in which ITQs can be an improvement over existing regulations. The first of these is the advantage relative to the regulation of gear types. When a quota is used, administrators need not concern themselves with gear, net

[4] In fisheries, the theory is spelled out by, e.g., Clark (1990) and Anderson (1995).

type and so on but instead focus on the issue of concern, the long-run management of the stock. Second, a quota system removes the incentive for a "race to the fish." "Far from being a racetrack under close official supervision, [with quotas] a fishery may take on the appearance of a common rangeland, with the owners replacing fishery wardens in checking on each other" (Scott 1989, p. 28). Third, a quota system can be preferred in the management of mixed stocks.

Scott also points out that a quota system is not a substitute for regulation, but instead requires reinforcement from government and substantial oversight. He concludes "there is no doubt that if the individual quotas exist, their owners can at some cost contract with each other to coordinate them, to perform what are now regarded as government functions (p. 29)."

A number of nations use transferable quota system including Iceland, New Zealand, and Australia (FAO, 2001). Haddad (1997) provides examples of New Zealand and Iceland in terms of program design and implementation. The New Zealand case is representative. ITQs were created in 1993 to overcome economic and biological problems. According to Haddad (1997), officially, the ITQ system "allocates to individuals the transferable or tradable right to harvest a specific quantity of the fish stock production." In 1986, ITQs were first applied to stressed species found close to shore.

Haddad also reported that in creating ITQs, the New Zealand government's goals were to introduce tradable property rights, reduce the level of regulatory intervention, and allow revenue through resource rental fees. With ITQ rights, fishermen can spread fishing effort out over the entire year, be more selective in bypassing juvenile schools in favor of higher-valued mature schools, and can purchase or lease additional quota to expand

catch. These measures would protect the fishery while at the same time improving the economics of the fishing industry.

B. Transferable rights in recreational fisheries

In case of recreational fisheries as well as commercial fisheries, National Research Council (1999) reports that attention should be given to the implications of recreational participation in the fishery, and to consider the potential application of the ITQ to recreational fisheries. Sutinen et al. (2002) discuss some examples of rights-based management's applied to recreational sectors, the most important of which is the Alaskan halibut fishery.

The examples of TRs in recreational fisheries are few and the literature appears to be limited to only two reports: Sutinen, Johnston, and Shaw (2002); and Sutinen and Johnston (2003). Recreational fisheries are commonly managed with target TACs that are achieved indirectly using a combination of bag limits, size limits, and seasonal closures. There are two allocation methods to allocate TACs. One is that commercial sector may be subject to a hard TAC, in which the commercial fishery is closed when the quota is met, while no hard cap on catch restricts the recreational sector. The other is that the TAC is divided between the two sectors such that the commercial sector and recreational sector each receives a percentage of the TAC (Sutinen et al., 2002).

C. The Alaska Halibut Fishery

Sutinen et al. (2002) study in detail the program proposed for the Alaska halibut fishing since it is "the sole U.S. template for the design of joint commercial-recreational rights-based management" (p.9). In the response of success of IFQ management in the

commercial sector, the North Pacific Fishery Management Council (NPFMC) approved an IFQ program for the halibut charter fleet in Southeast and South-central Alaska on April 14, 2001. As of May 2005 the program has not been yet implemented because there are some practical issues to be solved. The IFQ program is expected to replace the Guideline Harvest Level (GHL) program proposed by the NPFMC in February 2000 (NPFMC, 2001a).

The NPFMC report summarizes major features of the approved charter IFQ program as follows (2001a): the program does not change the 2-fish daily bag limit or the 2-day possession limit for charter anglers. The charter quotas are issued to charter owners, or to people who leased a vessel from an owner and who carried clients in 1998 or 1999 and 2000. The Charter IFQ is allocated 125% of the average 1995-99 charter harvests, but these allocations may grow over time. The charter IFQ would be integrated into the existing commercial IFQ program and would be equal to about 13% of the combined commercial and charter quota in Southeast Alaska and about 14% of the combined commercial and charter quota in South-Central Alaska (NPFMC, 2001a).

More issues to implement charter IFQ program are included in the summary of NPFMC (2001a):

- The proposed unit of recreational IFQs is the number of fish, in keeping with current regulations.
- Charter quota shares may not be sold to the commercial sector but commercial shares which are issued in pounds, may be transferred to the charter sector, translating pounds to fish based on average weight.

- The program does not affect non-charter recreational anglers. There would be a delay of one year between the issuance of quota shares and fishing under the IFQ program.

There were concerns with the implementation of the charter IFQ program. One was that IFQs may increase charter fishing prices and the other was enforcement of the charter IFQs because traditional methods used to enforce commercial IFQs might not be directly applicable to the recreational sector (Sutinen et al., 2002).

Practical issues that must be addressed in any transferable rights program are evident in the minutes of the NPFMC's committees (NPFMC 2001b and NPFMC 2003a). For example, in 2001, enforcement issues such as prior notice of landings (PNOL), offload window, vessel clearance requirement, and shipment report were reviewed and considered (NPFMC, 2001a).

The NPFMC submitted the analysis of the charter IFQ program to NMFS in May, 2003. The following approval process is anticipated: Secretary of Commerce adoption in 2004; program development by NMFS in 2005 including calculation, distribution, and appeals; and one year delay between the issuance of quota and fishing to examine the geographic distribution of quota in 2006. It is anticipated, therefore, that the Alaska halibut charter IFQs may be in effect in 2007 (NPFMC, 2003b).

The Alaska halibut charter IFQ program is an example of a recreational fishery because it is the first attempt of TRs in recreational fisheries. As IFQ programs are developed in other regions, this program will provide valuable lessons about issues of initial allocation, unit of rights, and transferability between sectors.

III. Existing institutional structure

Before a TRs program for the Gulf of Mexico red snapper fishery can be considered, it is important to first be aware of the existing institutional structure.

A. Red-Snapper Recreational fishing in the Gulf of Mexico

Red snapper recreational fishing regulations are based on the Reef Fish fishery Management Plan (RFFMP) which was developed by the Gulf of Mexico Fishery Management Council (Council) in 1984. It was revised by 21 regulatory amendments to overcome overfishing situation and to pursue sustainable fisheries in the Gulf of Mexico.

Until now, the main control tool for red snapper fisheries was total allowable catch (TAC). GMFMC (2000) defines the TAC as "a level of fishing intended to obtain optimum yield (OY) and to prevent overfishing, or to follow a recovery plan when a stock is overfished. Annual changes to TAC or measures to attain TAC are implemented through a regulatory amendment." The Council sets a level of TAC from within the acceptable biological catch (ABC) range which is intended to stop overfishing or keep sustainability of fisheries.

Table 1 presents changes in the regulations that govern red snapper fishing in the Gulf of Mexico from 1991 to 2003. The official TAC of the recreational sector was 1.96 million lbs in 1990 and increased to 4.47 million lbs in 1996. However, the TAC was not enforced until 1997 and has remained constant at 4.47 million lbs since that year (Hood and Steele, 2004). Recreational harvests of red snapper are estimated to have often exceeded the TAC by significant margins, while commercial sector correspond with the TAC (Sutinen and Johnston, 2003). The average of the difference between the

recreational quota and harvest from 1991 to 2003 is 0.6 million lbs. The average of 0.6 million lbs consists of over 13.5% of total recreational allocation in 2003.

There are three fishing regulations that are used in the red snapper recreational fishing: 1) size limits, 2) bag limits, and 3) season closures. These fishing regulations are most commonly used in recreational fisheries. A bag limit as a mandatory restriction that places an upper limit on the number of fish that an angler can retain during a fishing trip. A size limit is a regulation such that a an angler can retain a fish only of it exceeds a minimum size.

Recent regulatory amendments show a pattern of smaller bag limits and increasing minimum size in the recreational sector. The RFFMP in 1984 established a minimum size limit of 13 inches total length (TL) for red snapper with the exceptions that for hire boats were exempted until 1987 and each angler could keep 5 undersize fish (GMFMC, 2000). By 2003 the Council had set the recreational red snapper bag limit at 4 fish and set the recreational red snapper minimum size limit at 16 inches TL.

The recreational red snapper fisheries reveal a pattern in which open days have decreased over time. The first closure of the fishery took place in 1997 when the season was ended in late November. From 1990 to 1996, Gulf of Mexico red snapper fishery open days were 365 but decreased to 330 days in 1997 and only 194 days in 2003 (Hood and Steele, 2004). The decreasing season length is the most important trend in recreational red snapper management.

B. Fishing regulations and rules in the Gulf States

Table 2 presents a summary of the regulations that govern red snapper fishing in the Gulf of Mexico in 2003. It is notable that the fishery is already under relatively tight

restrictions in terms of the size and bag limits, and season closures. The introduction of a TRs program in the fishery would amount to a requirement that anglers possess an additional authorization in order to fish for red snapper.

In all states in the Gulf, anglers are currently required to hold a license, but it appears that only in Texas is an additional red snapper stamp required, and that stamp is valid for the entire red-snapper season. Hence, the introduction of a requirement that anglers purchase a right to fish on a given day, would be rather new. However, short-term rights are not unfamiliar in management of hunting and fishing. Three- and five-day non-resident hunting and fishing rights are routinely issued in many states, often at rather substantial fees.[5] Although residents may balk at the loss of their entitlement to fish whenever they choose, the implementation of such a program would not be entirely new and enforcement could be handled in the same fashion that license requirements are currently enforced.

IV. Critical questions that must be answered in the design of a transferable rights program in red snapper recreational fishery.

In designing a TRs program for a recreational fishery, a number of issues must be considered. In this section we give a brief introduction to these issues. The basic system that we envision is one in which TRs must be held by any angler fishing for red snapper in the Gulf of Mexico. The questions revolve around the form that the rights would take, and how trading will proceed. These questions are interrelated, but all must be addressed if a program is to be established.

[5] For example, Arkansas charges $100 for a Nonresident 3-Day All Game Hunting License (http://www.arkansasstripers.com/arkansas-hunting-fishing-license.htm).

A. Who should hold rights?

The first question that must be determined is what organizational units might hold rights. Traditionally in TRs programs, rights have been primarily held by individuals, e.g., individual polluters or individual commercial fishermen. Dales (1968) called the ownership scheme where the right is assigned to each individual "full ownership".

However, it is noteworthy that Sutinen and Johnston (2003) argue that because of difficulty of initial quota allocation and enforcement, angling rights for the market based system should be assigned to Angling Management Organizations (AMOs) unlike traditional IFQ management in which rights belongs to individuals. Angling Management Organizations, consisting of groups of anglers, would be allocated the rights, and they would then determine how those rights would be distributed to individual anglers. Dales refers to the ownership scheme of allowing AMOs or common property institutions (see Holland and Ginter, 2001) to hold the rights as "status-tenure or fixed tenure ownership".

Alternatively, rights might be allocated to local or regional governments and then distributed in a similar fashion. Accordingly, there are 4 alternatives that might be chosen, each with its respective advantages and disadvantages.

Alternative 1: Individual anglers

Alternative 2: For-hire recreational sector only

Alternative 3: Angling Management Organizations

Alternative 4: Local or regional government authorities

B. How should transferable Rights be measured?

The next question that must be answered is the units of measurement in which the rights will be denominated. Dales (1968) argued that the divisibility of the right to which

it is applied creates certain characteristics of a right ownership. For example, small right can allow a larger number of individuals to own the rights. He introduced an “asset-unit” as a term to explain the divisibility of the asset, and defined it as the smallest physical amount of the asset to which it is practicable to apply property rights. In the recreational fishery TRs program, it may be difficult to determine an asset-unit because of biological characteristics, i.e., fishing mortality when fish are released, and individuals’ different fishing preferences. However, three alternatives seem to be apparent:

Alternative 1: Set the unit of transferable rights in fish.

Alternative 2: Set the unit of transferable rights in fishing days.

Alternative 3: Set the unit of transferable rights in pounds of caught fish.

Under alternative 1, a single right would grant its holder a right to harvest one fish (presumably of legal size). If anglers who purchase such rights rush to go fishing in the certain season (e.g. summer), biological problems could arise and fishing mortality would be reduced. As with bag limits, a right denominated in fish creates a moral hazard problem. If a recreational angler buys such a rights permit, he or she has an incentive to discard caught fish (that may not survive), so that the right is essentially used several times. Control and enforcement to avoid such behavior would be difficult. However, Sutinen, et al. (2002) point out that the rights granted to the recreational fishery in the Alaskan Halibut program are denominated in fish to be as consistent as possible with existing regulations.

Under alternative 2, rights would be stated in terms of a number of days for fishing. If stated as a number of days, bag limits would probably be used to control total catches per day. Relative to the other alternatives, a day-based right is more easily

monitored and enforced, but introduces more uncertainty in the biological impact that results.

Under alternative 3, rights would be stated in terms of a number of pounds of red snapper. If stated as pounds, the total amounts of rights permits should be set to be equal to the official TAC of the year. The advantage of this approach is that it would be most directly comparable with the TAC and would reduce the incentive to discard undersize fish since these would use up less of the angler's right. Still, because most anglers will purchase relatively few permits and the stochastic nature of fishing exists, the limit on pounds might cause anglers to discard fish in order to come close to using their complete right. The advantage to this alternative is that it would be easier to ensure that harvested red snapper does not exceed the TAC.

In separate research, we theoretically investigate which measurement unit of TRs would be preferred using a theoretical model for a representative angler's utility maximization problem following Woodward and Griffin (2003). The results are preliminary, but indicate that the right denominated by fish provides anglers with more fishing days and time spending fishing, and the right denominated by days gives them more fish landed.

C. How should temporal and spatial elements of TRs be handled?

Decisions must be made about a number of important restrictions that might be placed on the purchased rights. First, there is the spatial dimension: would permits be valid in all Gulf states, or would the TAC be allocated across the states or even smaller regions? Based on the simplest conception of economic efficiency, economists would typically argue for no spatial limitation so that rights could go to those areas where the

permits are most valuable. However, there may be equity considerations and if, for example, the vast majority of the permits were purchased for use in a single state, this could adversely affect the remaining states. Hence, political forces may push for a fixed allocation across states. Furthermore, as pointed out by Sutinen and Johnston (2003) if rights became highly concentrated, this could lead to localized stock depletion.

Second there is the temporal dimension. Here there are two issues that must be resolved. First, how long a permit would be valid – e.g., would unused permits expire at the end of the year? There is strong evidence that such expirations would be counterproductive (Hahn and Hester, 1989) as they would encourage use at the end of the year when slight delay would actually be preferred for both by the anglers and in terms of the biological health of the fishery. The second issue is how to control how long a permit would be valid for use. Here, the answer is that regardless of the units of the right, that right should have a limited life, probably a single day. Thus, since enforcement is difficult, there must be a mechanism by which a right becomes invalid after its use, even if the angler did not encounter a fisheries official at the end of the day.

D. How should transferable rights be allocated initially?

Oncethe form that TRs would take has been established, it must then be determined how these will be allocated and transacted. When TRs are used in pollution markets, it is common for right to be allocated to sources based on historical emissions. Although we consider this possibility, it may not be a practical alternative in the case of a recreational fishery.

Alternative 1: Grandfathering base on historical use.

Alternative 2: Auction

Alternative 3: Federal Sale (retail at fixed price)

Alternative 4: Lottery

Under alternative 1, TRs can be initially allocated by historical catch records of all eligible applicants who owned or operated a vessel. In addition, individual anglers who keep fishing licenses and stamps for red snapper fisheries for a certain period can join the initial allocation of the TRs. Because of the large number of anglers and the lack of records, this system may not be practical. Because of the difficulty in establishing grandfathered rights, Sutinen and Johnston (2003) argue that rights should instead be grandfathered to regional AMOs.

Administrative decisions will be inevitably related to allocation process. The advantage of allocation by administrative decision is that the regulatory authority can maintain a very tight control and enforcement over individual transferable quotas including interests of the wider community. On the other hand, it would be inefficient since it is highly likely that a regulatory authority would have sufficient detail of the demand structure for quotas of it to optimize the quota price no matter how much fishermen value the price of rights (Morgan, 1995).

An aspect of grandfathering that should not be ignored is that the process of determining who will receive rights creates an incentive for historical users of a resource to reveal their use (Montero, Sanchez and Katz, 2002). This not only determines who will receive the right, but can help establish a system for monitoring future use.

Under alternative 2, the transferable rights permits can be initially distributed to the public through an auction. The auction participants could be retail shops, which

would then be allowed to trade the rights to angler organizations, recreational vessel owners and individual anglers.

Auctions are frequently been used to transfer assets from public to private hands, as in timber rights and off-shore oil leases, and when the seller is unsure about the values that bidders are willing to pay. They also have the advantage of transparency, which is important in such transactions. The uncertainty regarding values facing both sellers and buyers is an important feature of auctions (Krishna, 2002). Economic efficiency of the auction in the initial allocation of fisheries TRs might, however, depend on the detailed mechanism of the auction.

Morgan (1995) argued that the method of initially allocating fisheries quotas will eventually move to auctions because quota allocation by administrative decision is economically inefficient. He said that auctions offer two significant advantages over other alternatives of resource allocation. First, the process is economically efficient due to readily identified market demand and appropriate price for quotas. Second, the process identifies those potential users of the resource with the highest use – values for the fishery in question.

Using auctions to allocate initial fisheries transferable rights might be better than using other alternatives because it identifies potential fishermen with the highest use value of the fisheries and maximizes revenues in an economically efficient way. Consequently, we affirm more attention should be paid to designing fisheries rights auction system.

The third option would be to sell the licenses at a fixed price. For example, in the red snapper case, rights might be held throughout the year by the GMFMC or National

Marine Fisheries service (NMFS) and sold directly to the public. A disadvantage of this approach is that the fixed price could create opportunities for rent-seeking behavior if the price chosen by the agency is too low. If at the set price demand exceeds supply, then it is likely that a secondary market would arise, creating opportunities for profiteering by those able to figure out the system and purchase their permits early. If a fixed-price approach is taken, governments may feel compelled to regulate transfers in a manner that diminishes the potential for the market to efficiently allocate the permits.

Finally, a lottery can be used for the initial allocation of TRs. This approach is followed in many recreational systems in which the supply of available use rights is less than the demand. In cases like the Gulf of Mexico's red snapper fishery, the presence of charter and "party" boats, which are commercial suppliers of recreational opportuinites, might need to be handled separately. Alternatively, TRs might be distributed to all registered anglers by a drawing of lots and then only the winners would have demand for the commercial services provided. As with the fixed price system above, the potential for a secondary market in TRs allocated by lottery is significant.

E. How trade will take place?

Once the initial allocation of rights is made, it is necessary to evaluate how the rights will be transferred between those who hold the rights and those who want to go fishing.

Alternative 1: Trades take place in retail markets

Alternative 2: All sales made by government

Transferability of rights requires the development of a market. Under alternative 1, retail shops would be able to sell or buy rights. These could be sporting goods stores,

bait and tackle shops, grocery stores, etc.; or transactions might take place between private parties. Most current shops where fishing licenses are sold would be a potential outlet for the sale of transferable rights.

Under alternative 2, the rights would be sold only by government agencies. This would have the advantage of transparency and avoid the impression that private parties are profiting from a public resource. But because governments are not able to easily balance supply and demand in the market place, it is almost certain that supply and demand would not be in equilibrium at the government set price. If the price is set too low, then demand would exceed supply and inefficient rationing would result.

Regardless of the approach taken, it is important that the license can be transferred and used electronically. This will keep transaction costs low for purchasers and sellers of licenses as well as for the government. In addition, this would ensure that localized scarcity does not arise.

F. Will speculation be allowed?

An issue related to the two previous points is whether or not retailers will be allowed to sell permits at a profit. Fishing licenses are typically sold at a fixed price determined by the government with the seller usually receiving regulated issuance fees. Since such licenses are not scarce, this approach is reasonable. However, if a TAC is to be allocated through a market, efficiency requires that the price be allowed to vary depending on supply and demand. It is possible that this could cause public outcry if the price was particularly high. Nonetheless, with the advent of e-bay and similar online market environments, the public is increasingly comfortable with the trading of assets that previously had been unheard of. More critically, it is increasingly likely that there

will be sufficient supply and demand to give the public confidence that the rights are being traded at a "fair market price."

Speculators in markets frequently play an important role in the creation of markets. Demand for rights can be stimulated by speculators like futures and options markets. In the red snapper case, rights permits can be more flexible and transferable if speculation is allowed. The trades will more often occur in spring and summer, when recreational demand is highest and speculators might actually smooth out price variability throughout the year. On the other hand, if speculators are able to gain market power, then they might inefficiently manipulate the prices charged. Finally, speculation is likely to lead to higher prices, meaning that the resulting price of the rights permit is too high for some recreational anglers. Using price as the rationing device has its advantages, but it is clearly not equitable across all income groups. That is a feature that many might want to address.

G. Will the transfer between sectors be allowed?

Alternative 1: Transfer between commercial and recreational sectors is allowed

Alternative 2: No allowance between sectors

The transfer between commercial sector and recreational sector can be disputable. Under alternative 1, the transfer between sectors is allowed. While unconstrained transfer of the rights between sectors would provide the potential for benefits of recreational red snapper rights markets, it could also cause regional depletion and insufficient supply in each sector. Sutinen et al. (2002) provide an example of the Alaska Halibut fishery as a restriction on trading between sectors. In the Alaskan program, charter boat operators can

purchase IFQ shares from the commercial fishery, but shares originally allocated to the charter sector (recreational sector) cannot be sold to the commercial sector.

Under alternative 2, the transfer between commercial and recreational sectors is not allowed. In this case, the flexibility and transferability of markets can be weakened. The reason for such a limitation would primarily be political, protecting the rights of one resource user group over those of another group. However, there are also efficiency based reasons why such restrictions might be imposed. For example, a complete loss of rights to commercial fishermen would have secondary impacts on local processing and distribution networks. In conditions of localized unemployment, such impacts should not be ignored. Moreover, even in a fully employed economy, the transactions costs of reallocating capital and labor should be considered.

H. How should the trade of TRs be monitored?

Alternative 1: Rights could be sold and traded with agency notification

Alternative 2: Rights could be sold and traded without agency notification

Under alternative 1, all trades should be reported to a government agency such as GMFMC or NMFS. Under alternative 2, enforcement of transfer restrictions would be difficult or impossible since there would be no monitoring of the rights permit trades. The benefit of notification is that it facilitates enforcement of the overall cap and allows better monitoring of fishing. The cost is in the form of transaction costs and some loss in privacy. Transaction costs might be kept low if all trades are carried out electronically.

I. How should monitoring and enforcement be carried out?

One of the central challenges of the TRs programs is the monitoring and enforcement. Closures and gear restrictions are relatively easy to enforce. By contrast, particularly in a multiple species fishery such as the Gulf, it is difficult to ensure that all anglers fishing for red snapper have the necessary right. Sutinen and Johnston (2003) point out that the more disaggregated that rights are distributed, the more difficult monitoring becomes. In particular, they argue that the monitoring problem gives AMOs a distinct advantage since the unit needed to be monitored would be much greater.

However, at some point, individual behavior must be ensured because it is the angler that harvest the fish. Hence, regardless of whether the right is transferred directly to the angler, or the angler receives the right indirectly through an AMO or a local government agency, at some point individual behavior must be monitored. One thing to note is that if rights are auctioned, this would generate revenue that would be available for monitoring and the pool of money available for monitoring would be directly related to the value of the rights. If the rights are extremely scarce, then they will command a high price and the auction would generate substantial money for ensuring that the rights are secure. On the other hand, if the price of the rights is low, then little revenue would be available but the incentive to fish without a license would also be low.

V. Concluding Remarks

In contrast to commercial fisheries which have been the center of ITQ studies, little attention has been paid to the implementation of TRs in the recreational fishery. This paper provide the background necessary to begin exploring in more detail the issues of how a TRs program might be implementedin the red-snapper recreational fishery. In the

paper we have briefly summarized the issues at stake and present the advantages and disadvantages of alternative solutions. These practical issues for ITQ programs in the recreational sector were studied based on the literature and case studiesof successfully implemented TRs programs, particularly in other areas (e.g., pollution credit markets and commercial ITQ systems).

Although the use of TRs in recreational fisheries is a new idea, we believe that it is an idea that has a great deal of merit and the institutional barriers are not insurmountable. Related research is taking this idea one step further, studying the potential for such a program using the empirically based General Bioeconomic Fisheries Simulation Model (GBFSM).

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Table 1 : Changes in recreational red snapper regulations

Year	Size Limit (Inches TL)	Daily Bag Limit (Number of Fish)	Season Length (days)	Recreational Allocation/Quota (MP)	Recreational Harvest (MP)
1991	13	7	365	1.96	1.94
1992	13	7	365	1.96	3.03
1993	13	7	365	2.94	5.29
1994	14	7	365	2.94	4.26
1995	15	5	365	2.94	3.25
1996	15	5	365	4.47	3.57
1997	15	5	330	4.47	5.41
1998	15	4	272	4.47	5.76
1999	15	4	240	4.47	5.51
2000	16	4	194	4.47	3.92
2001	16	4	194	4.47	4.52
2002	16	4	194	4.47	5.32
2003	16	4	194	4.47	4.58

Source: History of red snapper management in federal waters of the U.S. Gulf of Mexico -1984-2004: 2004 Red Snapper SEDAR, NOAA Fisheries, SEDAR7-DW-40 (Hood and Steele, 2004)

Table 2: Recreational Saltwater Fishing Regulations 2003

	LICENSE	STAMP	SIZE LIMIT	BAG LIMIT	SEASON [g)]
FEDERAL [a)]	State License Required		16 in. TL	4 / person	April 21-October 31
TEXAS [b)]	annual: 1yr (R & NR) trip: 3day,14day(R) & 5day(NR) lifetime-n/a	Saltwater Fishing Stamp Endorsement Required	15 in. TL	4 / person	"
FLORIDA [c)]	annual: 1yr (R & NR) & 5yr (R) trip-3day, 7day (NR) lifetime: (R only)		20 in. TL(Atlantic) 16 in. TL (Gulf)	2 / person (Atlantic) 4 / person (Gulf)	"
MISSISSIPPI [d)]	annual: 1yr (R & NR) trip-3day (NR) lifetime-n/a		16 in. TL	4 / person	"
LOUISIANA [e)]	annual- 1yr (R & NR) trip: 1day,4day (NR) lifetime: (R only)		16 in. TL	4 / person	"
ALABAMA [f)]	annual-1yr (R & NR) trip-7day (R & NR) lifetime-n/a		16 in. TL	4 / person	"

Sources :
a. Gulf of Mexico Fishery Management Council(http://www.gulfcouncil.org)
b. Texas parks and wildlife Department(http://www.tpwd.state.tx.us)
c. Florida Fish and Wildlife Conservation Commission (http://myfwc.com)
d. Mississippi Department of Marine Resources (http://www.dmr.state.ms.us)
e. Louisiana Department of Wildlife and Fisheries (http://www.wlf.state.la.us)
f. Alabama Department of Conservation and Natural Resources -Marine Resources Div. (http://www.dcnr.state.al.us/MR)
g. Vary annually
Note :
R - Resident, NR - Non-Resident, and TL - Total Length