# Impacts on Anglers of the Proposed Halibut Charter IFQ System

**By**

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## I. Introduction

Proposals to create ITQs in the sports charter fishery have created some concern among potentially impacted parties that the ITQ program may cause party boat charter trip prices to rise. The thinking is that trip prices may have to rise in order to pay for the extra costs associated with the market prices that ITQ permits will attain. In fact, while this is a commonly held view, it is mistaken one in that it gets the direction of causality reversed. The actual mechanism is that sports charter trip prices will determine ITQ prices rather than the other way around. This is similar to an old debate from 200 years ago about the relationship between land prices and food prices. While many believed that "corn prices were high because land rents were high", the opposite was true in that high corn prices caused land rents to be high. If ITQs are implemented in the halibut sports charter sector, the market for sports trips and the prices that are charged will be determined first, and then ITQ prices will rise to reflect any "rents" or residuals of revenues in excess of costs. Understanding how sports charter trips prices will be determined under ITQs thus requires understanding how they are determined now under current and GHL conditions.

The sports charter industry operates in a competitive market for clients and hence sports charter trip prices are established in a manner that reflects the forces of supply and demand. It is worth decomposing the manner in which supply and demand forces do come together to determine current sports charter prices. On the demand side, sports charter trips compete with other forms of recreation available to prospective clients. Among non-residents clients, there are both "walk ons" who decide to take a day charter trip as a more or less spontaneous part of a trip involving multiple recreation and other activities. In addition, many other non-residents set up charter trips as part of a planned package of activities when they plan to come to Alaska. For non-residents, the fact that the charter trip price is such a small price of the total trip cost means that the demand from these individuals will be relatively price insensitive. Adding $20 to a $125 single day charter trip price taken by a non-resident will cause some reduction in the demand for trips by individuals at the margin, but the impact will not be large. Hence the demand by non-residents is likely to be relatively price insensitive.

The total size of the market for non-resident sports charter trips depends most importantly upon the number of visitors who choose to come to Alaska to participate in outdoor activities. In this sense, Alaska trips compete with trips to other places within the U.S. such as Yosemite, Yellowstone, the Cascades and the Sierras, as well as trips to other destinations outside the U.S. such as Canada, Mexico, the Galapagos Islands, Costa Rica. The important point is that even though trips to participate in Alaska's outdoors is a special experience, at the same time there is a relatively large number of substitute activities that compete for recreationists' dollars and time. What this means is that there is some elasticity in the market for Alaskan vacation trips, and as Alaskan trip prices rise, the market demand for trips will fall and vice versa for a price drop. Similarly, as the prices of opportunities to other substitute sites changes, the market for Alaskan trips will be impacted. If the development of new ecotourism facilities in South American countries like Costa Rica increases and trip prices there fall, we would expect that at least some potential visitors to Alaska would divert some of their vacation budgets to Costa Rican trips at the expense of Alaskan trips. At the same time, as habitat losses in Pacific Coast state salmon streams reduce opportunities for citizens of Washington, Oregon and California to fish in their own backyards, some budgets will make room for substitute trips to Alaska.

In addition to the fact that Alaskan trips compete in a North American and even world market for recreational experiences, there are other fundamental driving forces affecting market demand over the long run. One of the most important is the health of the economy, reflected particularly in household income levels. When times are good, the market for recreational and vacation trips will be strong and when economic activity wanes, market demand will fall. Finally, a driving force of the strength of a recreational market like that for sports charter halibut is the fundamental demographic composition of the market, including the size of the retired population, the size of the population with fishing interests or experience, etc.

The demand for resident Alaska sports fishing trips is driven by the same fundamental forces, namely the price of trips, the money and time price of substitute activities, incomes, and preferences for fishing and other outdoor activities. A factor that distinguishes resident from non-resident trip demand is the role played by the opportunity for fishing to fulfill subsistence needs. Many Alaskans live in the state precisely because of the opportunity to combine recreational experiences with being partially self-sufficient in the provision of food needs with fish and game. For these individuals, a sports charter trip represents the opportunity to not only have a desirable recreation experience, but also to fill a freezer with halibut. But these Alaskans have other opportunities to fill their freezer with substitute foodstuffs, including game, other fish, crab, etc. Hence other opportunities to engage in subsistence activities in Alaska compete with halibut charter opportunities. As a result, we expect that the demand for trips from Alaska residents is more price sensitive than for non-residents. At the same time, trip demand is also likely to be more responsive to the chance of success. Thus when halibut are abundant and fishing is abnormally good, residents may turn out in numbers that fill the excess capacity in the charter industry.

## II. The Industry under the Status Quo

How would we expect the market to operate under the open access system? In this case, there is no limit on total harvest since the take comes off the top of the total halibut TAC. In Figure 1, we depict a stylized market that serves both resident and non-resident anglers. In this figure, the demand for non-residents in depicted as relatively price insensitive whereas the demand from residents (dotted line) is price sensitive. The combined demand from both markets is depicted with the heavy line, which sums the two demand curves horizontally at every price. We also depict the marginal (and average) cost curves associated with operating the charter fleet. MC* (assumed equal to AC*) represent costs that would be incurred with an efficiently operating industry with secure property rights. These are the lowest costs associated with providing recreation trips, and they presume reasonably fully utilized capacity and efficient use of variable inputs. $MC^{OA}$ represents the current open access marginal/average cost curves, presumed to be higher reflecting the relative inefficiency of open access production conditions. These might represent the additional costs associated with having excess vessels operating at minimal capacity and wasteful variable input use. The industry equilibrium occurs at a trip price $P^{OA}$ and total trip supply of $T^{OA}$. Trip prices are higher under open access conditions, and the industry attracts fewer anglers than would be the case under efficient conditions with secure rights to the resource. Importantly, residents and non-residents take fewer trips under open access at higher prices than would be the case in an efficient industry. Total angler consumer surplus from both groups is lower than it would be under efficient conditions.

Under the circumstance in which the harvest taken by the charter industry is subtracted from the total TAC prior to determining commercial allowable harvests, this open access equilibrium in the charter industry will result in a certain total harvest $H^{OA}$. What is this amount? It is simplest to presume that total harvest will be proportional to trips taken by individuals in each market, holding abundance constant. This is borne out in practice. Most non-resident anglers take home a little less than one fish per trip; residents take home a bit more than one. The total actual catch per trip generally exceeds total harvest, and the difference is mostly fish landed but voluntarily released. We can depict total harvest on the cumulative harvest graph in the bottom panel of Figure 1. The first segment represents cumulative take by non-residents (at a constant rate per trip) and the second segment represents the take by residents (at a slightly higher rate per trip). This curve is drawn under some fixed abundance conditions that determine landings and harvest per trip. The equilibrium number of trips is associated with a total harvest of $H^{OA}$.

Now, what happens when abundance rises? Then we would expect a shift in resident demand for trips, reflecting the added satisfaction generated by higher expected catch per trip. We would expect much less response to higher abundance from non-residents, and we assume to keep the graphs from getting cluttered that there is no responsiveness in Figure 2. Then the new equilibrium would occur at the same price per trip (because we are assuming that prices are driven down to the constant marginal costs) but with more trips taken. Total harvest would rise, and the increment would be taken by increases in the numbers of resident angler trips. This response is to the increased chance to fill freezers at higher catch rates associated with higher abundance.

These figures depict the "status quo" scenario in which total harvests in the recreational sector increase and decrease according to the general factors that influence the market for charter trips by residents and non-residents, in addition to the role played by abundance. In this scenario, there is no constraint on total harvests in the charter sector since sports charter allocations are subtracted from the overall TAC. As economic conditions change (incomes, prices and availability of substitute trips, demography), the demand curves may shift in and out with the size of the overall market for Alaskan sports charter trips. As abundance changes, we also would expect some changes in participation by those responsive to expected harvest, which in turn is related to abundance. In addition, total harvest is governed to some extent by industry convention with regards to catch and release fish. A recreational trip by a non-resident may involve an average of one fish per trip, even when the bag limit is two, because tourists don't particularly want to keep two fish. On the other hand, residents may wish to maximize the pounds kept per trip, up to limits determined by the bag limit. Hence their harvest rates per trip may reflect strategies involving decisions about which fish to keep as one's first fish, whether to throw back subsequent fish below certain sizes, pooling fish over several individual limits, etc. Importantly, however, in this status quo scenario the total harvest is determined as a consequence of the market for trips rather than vice versa. This changes if total recreational constraints become binding for the industry as a result of either the GHL or a quota system.

## III. The Industry Under the GHL

There are two main issues that are important in thinking about the impacts of the GHL. The first is the likelihood that the measures that are designed to be triggered will in fact become binding on the industry. The second issue is whether the promise of binding measures can induce changes in charter boat operator behavior in anticipation of those constraints. As staff analysis of GHL options suggests, the measures that are likely to be most effective in actually constraining harvest are bag limits and vessel limits. Season length restrictions might also constrain aggregate harvest, although we would expect some compensating behavior that would involve intensified activity during the remaining compressed open season. Shorter seasons would probably disproportionately affect operations catering to tourists, since the tourist market is less capable of adjusting around season length restrictions.

Consider first the implementation of more restrictive bag limits. In principle it would be possible to reduce total charter sector harvest by reducing bag limits from two to one fish per person per trip. In practice, however, it will be hard to actually fine tune to the degree that is needed to squeeze aggregate harvest. The first problem is with the discreteness of bag limits, i.e. the fact that they must be implemented in integer units such as one or two fish per person per day. The discreteness of bag limits reduces their flexibility and ability to smoothly reduce harvest. For example, current practice involves an actual bag average of about one fish per non-resident angler and about 1 ½ per resident angler. Thus on first glance, a one fish bag limit will not affect non-resident angling significantly but will bite for residents. As discussed above, residents are more interested in actual harvests and hence a reduced bag limit is likely to result in a reduction in trips by residents. Predicting how much reduction in harvest will take place as result of a bag limit reduction is thus likely to be a difficult task, since analysts will have to predict resident demand reductions. A second issue is related to the fact that a one fish bag limit reduces the charter boat ability to spread a bag limit across all customers. It is rarely the case that each client hooks and lands a fish and hence it is always possible to share fish across all clients without exceeding the vessel bag limit. With two fish limits per person there is considerable flexibility to do this; with one fish bag limits it will be much more difficult, probably reducing trip demand by both residents and non-residents.

An issue with GHL policies is whether the anticipation of the triggering of GHL policies can alter behavior in such a manner that they are not actually triggered. In many ways, it would be ideal if charter operators could induce clients to voluntarily reduce their take of fish, without necessarily reducing the actual catch rate. Thus in periods of relative scarcity of halibut, emphasis would be shifted to the sport of hooking, landing, and releasing fish rather than harvesting them. This might be done by charter operators announcing that trips would henceforth be one fish per person trips (for the remainder of the season in which the aggregate harvest constraint threatens to bind). If charter operators can successfully achieve voluntary one fish per person per trip behavior, then the GHL trigger might be avoided. We would expect some change in strategic behavior among fishermen as a result, however. With a one fish limit, there would be more of an incentive to release small fish caught initially in hopes of landing larger fish. This might offset the intent of the harvest reduction somewhat, both by raising the average size of landed fish and by increasing hook mortality.

In the final analysis, the problem with relying on voluntary changes in behavior is that there must be some mechanism to enforce behavior among participants who collectively stand to gain from cutbacks, but who individually stand to gain from deviating from the collective policy. We might anticipate that charter operators would self enforce, by watching each other and disenfranchising those who fail to follow the voluntary one fish policy. Unfortunately, it is equally likely that charter operators would either choose to look the other way or to actually hide fish caught in excess of the informal one fish rule. This later possibility is something that managers should truly worry about, since the data base would then be distorted in unknown ways. It may seem a paradox, but it is certainly possible that attempts to induce voluntary cutbacks in landings might only actually produce a reduction in reported (and not actual) landings.

Figure 3 show some possible impacts of either regulated or effective voluntary bag limit reductions. We assume first that there is a need to cut back total harvest to $H_2$ from $H^{OA}$ via bag limit reductions. We depict this as mostly affecting the resident market. First, there would be some impact on the harvest rate per resident trip, shown by the twist in the harvest rate function downward, shown in the lower panel. This shows that each resident trip yields a smaller harvest rate after regulated or voluntary reductions in harvest are implemented. If trip demand remained at $T_{0A}$ , the aggregate harvest would fall to $H_1$, which is a fraction of the desired reduction. But with lower bag limits, the demand for resident trips would actually fall somewhat, shown by the leftward shift in the (dotted) resident demand curve and in the combined (heavy dark) market demand curve. The combined reduction in take per trip and reduced resident demand would achieve the desired reduction in aggregate harvest to $H_2$, at a cost of reducing both the quality and quantity of resident angler trips.

## IV. The Industry with ITQs

What impact would a transferable quota program have on the charter halibut industry and how would it affect anglers in the charter market? The most important effect of ITQs would be that they would change fundamental incentives faced by charter operators. In particular, with a guaranteed quota, charter boat operators will shift some of their attention toward trying to maximize the values derived per pound of quota held.

In Figure 4 we show the "first round" impact of ITQs on the charter halibut system. In this figure, we assume that the charter industry is granted a supply of quota $H^{OA}$ equal to the amount that was previously caught under the open access status quo setting. This is shown by the horizontal total harvest curve in the lower panel at an ITQ level equal to $H^{OA}$. The initial impact of an ITQ system will be to induce charter operators to rearrange inputs, management, and other practices in order to reduce the costs of trips. This is reflected in the marginal costs of operation falling to the efficient level MC* from $MC_{OA}$. The kinds of changes likely to be induced by ITQs are many, including less time spent searching, more trips scheduled at full capacity, rationalization over the season so that more trips are taken during high yield periods, etc.

Initially, then, operators will make changes in operations that save the additional costs that were incurred under open access conditions by an industry competing for the halibut resource without secure rights to it. ITQ quota prices will take on positive values as a result, reflecting precisely the additional profits generated as a result of the cost saving. Quota prices will rise to a level such that the total lease value in quotas is roughly $[(P^{OA}\text{-}MC^*)*T^{OA}]$ and the price per pound is $[(P^{OA}\text{-}MC^*)*T^{OA}]$ /ITQ. Note that, as discussed in the introduction, the price of trips does not rise to "pay" for ITQ prices. Instead, the market remains driven by the fundamental forces reflected in the demand curves and the forces reflected in operating costs, and quota prices are driven up to the gap between the market-driven price of trips and the new lower cost of trips.

What happens as abundance increases? Essentially the answer depends upon what kind of adjustment is made in ITQ allocations as a result. In Figure 5 we show that an increase in abundance is reflected first in an increase in CPUE shown in the second panel. At higher CPUE per trip, demand by CPUE-responsive resident clients also shifts out. If the ITQ allocation remains fixed at the level shown in Figure 4 in the face of a demand shift, then at higher catch rates, fewer trips can be taken within the ITQ constraint. This can occur with trip prices increasing to $P_1$, so that at the higher demand level and higher catch per trip, the aggregate harvest target is held constant at $H^{OA}$=ITQ. As shown in Figure 5, the charter market will clear with fewer trips taken at higher trip prices, with each trip landing more fish per client. The proportion of trips taken by residents and non-residents is hard to predict a priori, since it depends upon both the manner in which resident demand shifts when CPUE goes up and the price elasticity of that demand. As drawn in Figure 5, total industry revenues rise, and total costs fall, leaving more rents to be embedded in quota prices. Without a change in ITQ allocation, that scenario would thus lead to higher quota prices per pound of halibut.

The implication of the above discussion is that the "first round" impacts of an ITQ system on trip prices, trips offered, harvest per trip and quota prices depend in complex ways on the market fundamentals for charter trips (and trip costs) and the relationship between ITQ allocations to the charter sector and abundance. At least on first glance, if ITQ allocation levels are held constant in the face of abundance increases, prices must rise and trips taken will fall in order to ration the increase in demand that is due to CPUE-responsive residents over the system. When abundance falls in the face of a constant ITQ allocation, in contrast, trip prices will fall, and trip numbers will increase. Most management systems tie sector allocations to the overall abundance, of course. If the Council chooses to allow the specific ITQ allocation to the charter sector "float" in response to overall abundance, we would expect a mitigation of these price effects and changes in trips taken.

The above analysis is based on what we have been calling "first round" impacts of ITQs. By "first round" we mean the impacts associated with the **cost** reductions that would be generated under the new incentive regime provided by ITQs. As it turns out, cost reductions are only part of the changes that we would expect after introducing ITQs. The other category of changes would be those associated with changes in the market side of resource rents. In particular, holding quotas not only generates incentives to reduce cost per unit quota used, but also incentives to increase revenues per unit quota held. An important feature associated with the fact that quotas attain value is thus the incentives that quota values in turn create to increase those values.

What would we expect might happen in the marketing of sports halibut charters as a result of quotas? Some insight into this question can be gained by noting first that a charter boat quota holder has an incentive to court clients who are actually inefficient in catching halibut. If all clients pay the same price for a trip, it pays the charter boat operator to try to induce clients who won't use much quota per trip to take a trip on your vessel. While the proportions of resident and non-resident clients differ in different regions of Alaska, in most ports the market serves some of both types of clients. If it were possible to charge residents and non-residents different prices, we might see some competition among charter boat owners for the lower efficiency non-resident anglers. We can conceive of situations, for example, whereby charter owners advertise in tourist magazines, or arrange tied vacation packages with subsidies to visitors to Alaska, etc. In the long run, however, it is actually difficult to discriminate between the different types of clients by charging different trip prices. However, it is possible to segment the market into different groups differing only by harvesting efficiency. The easiest way to do this is to charge different prices to each person according to their own harvesting efficiency. And the best way to do that, of course, is to charge a fixed price per trip, and an additional price per pound of fish taken home. Hence it seems likely that the ultimate way for the industry to maximize its revenues associated with quota held is to charge clients for fish taken, in addition to a trip fee covering operating costs.

Unfortunately, it is more difficult to depict in simple graphs the manner in which the industry might ultimately equilibrate with a combination trip price/harvest quota price system. With a flexible pricing system in which trip prices and harvest prices can be set separately, charter clients essentially face two prices. Under this system each individual will choose both the quantities of charter trips taken over the year and the quantity of fish kept simultaneously in a manner dependent upon relative prices. The market demand for trips is thus dependent on the price of quota ($P_Q$) for harvested fish in addition to trip prices ($P_T$) and other factors such as income (Y). Similarly, the demand for quota to cover harvested fish is dependent upon the price of trips in addition to the price of quota and other factors. We can write these market demands as $T^*=T(P_T,P_Q,Y)$ and $Q^*=Q(P_Q,P_T,Y)$. The characteristic of the market with a two part pricing system that distinguishes it from the status quo and GHL system is that in the quota system, the amount of halibut actually harvested per person per trip will not be simply a given quantity related to relative abundance through CPUE. Instead, the number of fish landed will be a **choice** made by each angler according to his/her preferences for landed fish, given the price of quota that is paid to cover the quota lease price. This de-couples the two panels of our graphs in Figures 1-5.

In Figure 6, we depict the equilibrium in the ITQ market after implementing two-part pricing by showing two pairs of market demand curves and the corresponding harvest "production functions" for each market group in the lower panel. In previous graphs, the lower panel harvest production functions were depicted as involuntary and only a function of relative abundance (CPUE) and skills in each market group. In the ITQ case, the slopes of the two segments of the production functions depend upon choices made by resident and non-resident anglers in the face of having to pay prices per pound for each landed fish. Figure 6 is drawn with the right solid line labeled $T(P_T,P_Q=0, Y)$ reproducing the equilibrium in Figure 4, which depicts the market before the two-part pricing scheme is adopted (hence $P_Q=0$). The left solid line in Figure 6 shows the eventual equilibrium after two part pricing is implemented. In the upper panel, the market demand curves are shifted leftward because trip demand depends upon the price of quota. The right solid line represents market trip demand curves under the assumption of a zero quota price (the conditions depicted in Figure 4) whereas the leftward shifted demand curve represents the ultimate trip demand curve with non-zero quota prices. In the lower panels, we depict the voluntary equilibrium harvest rate choices made by clients who must now pay for each fish caught. The dotted line harvest rates are drawn below the involuntary solid line curves under the assumption that both groups will choose to harvest fewer fish per trip once they have to pay for the fish.

In the full long term equilibrium, the charter industry will equilibrate in a manner in which the trip price is driven down to the level covering operating costs, or $P^*= MC^*$. As drawn in Figure 6, whether total trip demand increases in the final equilibrium depends upon the interplay between trip prices and quota prices. Higher quota prices will reduce the total market for trips (shift the demand curve leftward) but a lower trip price will compensate by inducing more trips. In the bottom panel, voluntary choices of lower harvest rates are associated with non-zero costs of landing a fish and this shifts the production functions down. As we have drawn the graphs in the two panels, total trips increase because trip demand by residents is reasonably responsive to trip price, but trip demand does not fall dramatically as quota prices attain non-zero levels. Catch rates per trip do fall also as a result of anglers being charged positive quota prices to land fish, and this allows more trips and anglers to participate in the industry.

The above analysis assumes that quotas are transferable, if not between the commercial and charter sectors, then at least within the charter sector. Without the ability to consolidate excess vessels to remove surplus capacity, some of the cost-cutting that would be passed off to clients will not take place. This mismatch of initial and final efficient capacity is likely to be particularly significant if the lead-in period between announcement and implementation allows entry of individuals hoping to gain a share of the quota. Without transferability there would still be incentives to operate in cost-efficient manners and to add value via the market. In addition, other experience has shown that entrepreneurs devise alternative methods to transfer/lease/or otherwise sell quota, even when de facto sales are not allowed.

## V. Allocating QS to Anglers or Guides?

Some have raised the issue of whether quota ought to be held by anglers (clients) rather than by charter boat operators. One can envision such a scheme in theory, but there are implementation and operating difficulties that would have to be overcome in practice. In fact, other sports activities operate in this manner, including many big game hunting activities that involve limited numbers of harvest permits. In most of these, hunters draw permits to harvest in a lottery, and guides then take the hunters out to attempt to meet their bag objective. The guide market is competitive, and each guide offers services that include tangibles related to the comfort of the experience (food, tents, clothing and equipment, transportation) as well as services relating to the harvest success. Something like this kind of scheme could be used in a charter fishery and the lessons learned in operating such a scheme could be drawn from big game hunting. One design issue is related to whether a permit should be for a fish or for pounds of fish. If permits were per fish, we would see "highgrading" and discard mortalities go up, but that could be accounted for at least in the computation of the charter sector share. If permits were for pounds of fish, there would need to some secondary market or other scheme for sweeping up odds lots and for attaining excesses to clear the market.

An advantage to leaving quota in the hands of charter operators is that they are more likely to effective as spokespersons for resource stewardship. Again, in principle it might be possible for a representative of angler quota holders to speak on their behalf, but since there would need to be new lottery every year, the continuity that comes from permanent ownership is broken. One consistent lesson that arises out of experience in other ITQ programs in commercial fisheries is that property rights generate significant changes in attitudes toward long term stewardship. To the extent that program design can encourage these, they make the management task ultimately easier.

## VI. Impacts on Angler Utility and Welfare

A significant issue of concern among representatives of recreational anglers or clients of charter boat operators is exactly how the experience and satisfaction of the charter trip will change after ITQs are implemented. This is understandably a concern since ITQs will induce changes in the structure of the industry that are difficult to predict at this juncture. An important point is that the comparison needs to be made against the alternative system that would prevail if ITQs were not implemented. The graphs used to discuss the alternatives above give some insight into these questions. If we begin with the status quo, an important characteristic of that system is that there are over-capacity inefficiencies associated with the open access nature of the industry. In commercial fisheries this manifests itself in too many boats, with too much capacity, chasing too few fish. In a sports charter fishery it is likely that there are also too many boats, taking trips at less than full capacity, using perhaps too much effort finding and landing fish. The consequence of this for the client anglers is that the trip price must cover these inflated costs and hence trip prices are relatively high ($P^{OA}$ in Figure 1). A rationalized fishery in which these inefficiencies were removed, would actually serve more angler trips and at lower prices. The status quo thus generates a utility and welfare loss associated with open access that is paid by anglers as a group, in the form of higher trip prices and fewer trips taken.

If the charter sector total harvest is constrained by either the GHL or by an ITQ program, the constraints on harvest will also have some utility cost to anglers, relative to the circumstance in which the charter sector is allowed to expand catch at will. This can also be seen as changes in consumer surplus under the figures showing different program impacts. For example, in Figure 2 we show what might happen under an increase in abundance that shifts the trip demand function out. Several scenarios are possible. Consider first a policy that holds total harvest at $H^{OA}$ in the face of the abundance increase instead of granting a proportional TAC increase to the charter sector. Suppose this is done with restricted seasons that keep total trips constant. Then trip prices will have to rise above $P^{OA}$ , so that the increase in demand does not increase total trips taken. One can then note from the figure that there is a loss in consumer surplus associated with the fact that trip prices are driven up, offset somewhat by an increase in consumer surplus associated with the higher satisfaction per trip due to higher CPUE. Figure 3 shows what happens under an alternative policy that induces anglers to voluntarily restrict harvests. This might be done by allowing clients to only keep fish above a certain size, or to keep only a certain total poundage of fish. The important point illustrated in Figure 3 is that these "voluntary" reductions actually reduce the utility derived per trip and hence there is a consumer surplus loss associated with the leftward shift of the demand curve. With these kinds of policies, the restriction can be achieved without altering trip prices, but there is clearly a reduction in angler satisfaction, and a resulting reduction in the demand for trips, relative to the situation without the GHL controls.

With an ITQ system in place, there are two impacts on angler client welfare or satisfaction. First, there is an increase in consumer surplus associated with the reduction in trip prices to levels that cover the reduced operating costs after more efficient practices are adopted. If nothing else were changed, this price reduction would expand the charter market and there would be more angler trips taken. But there is an additional impact if the system evolves into one that charges harvesting fees to clients based on the ITQ opportunity costs. These additional harvest charges can be viewed as increases in the price of complementary inputs to the recreational experience, and they will reduce the demand for trips as a consequence. Overall, then, an ITQ system will increase client welfare by reducing trip prices, but this will be offset by welfare reductions associated with paying non-zero prices to harvest fish.

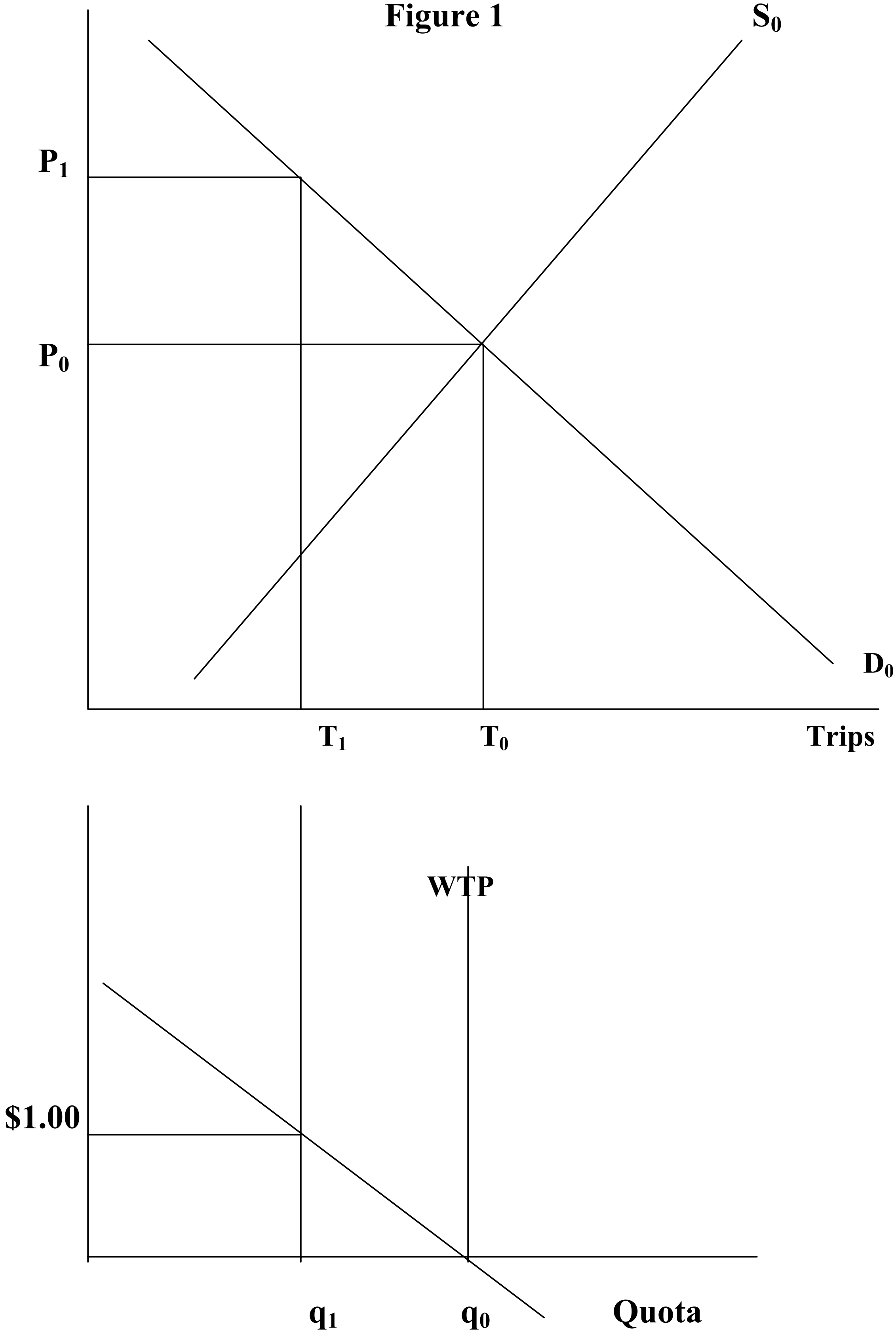


Figure 1

Price/Trip

Figure 2

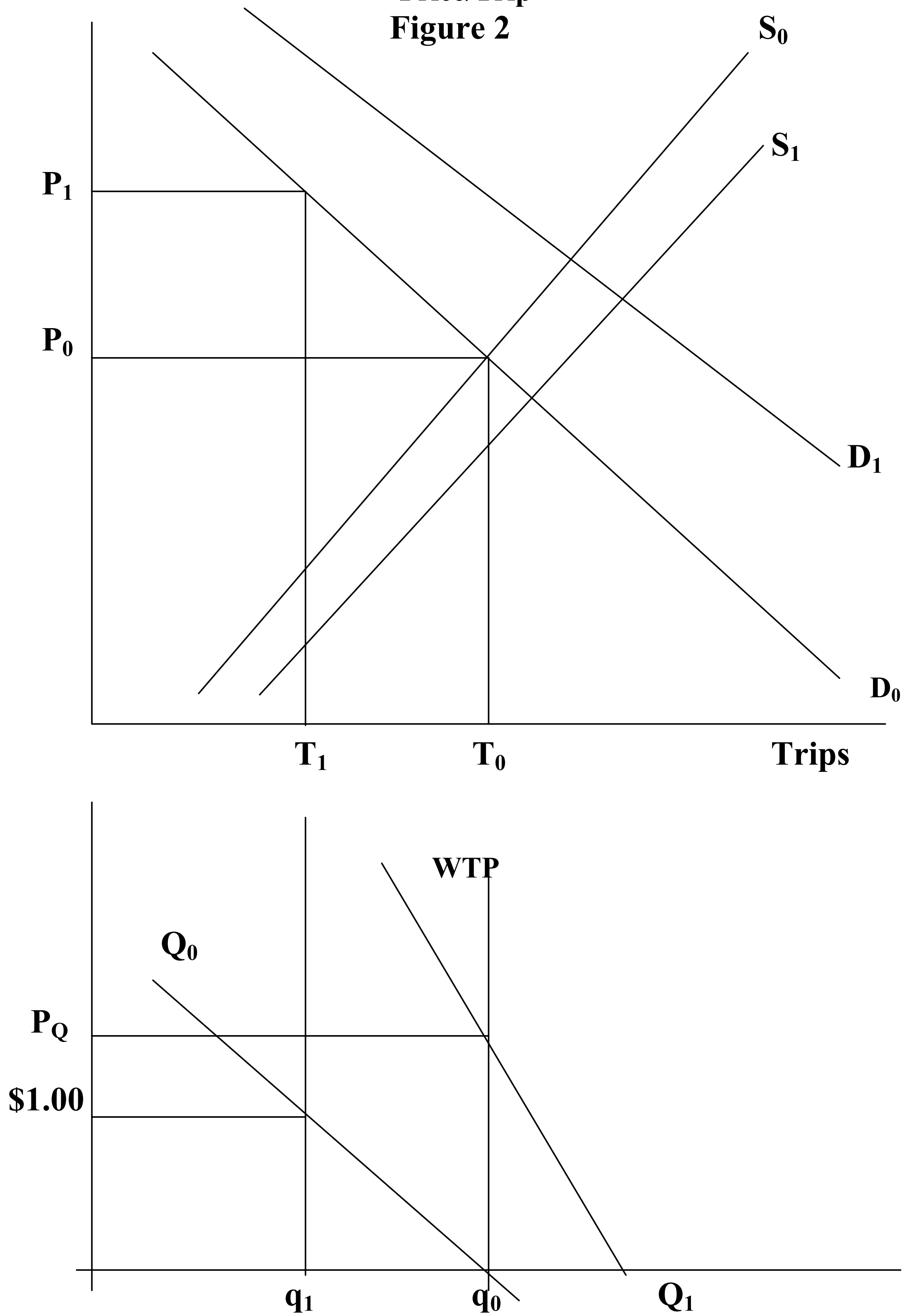

**Figure 3**

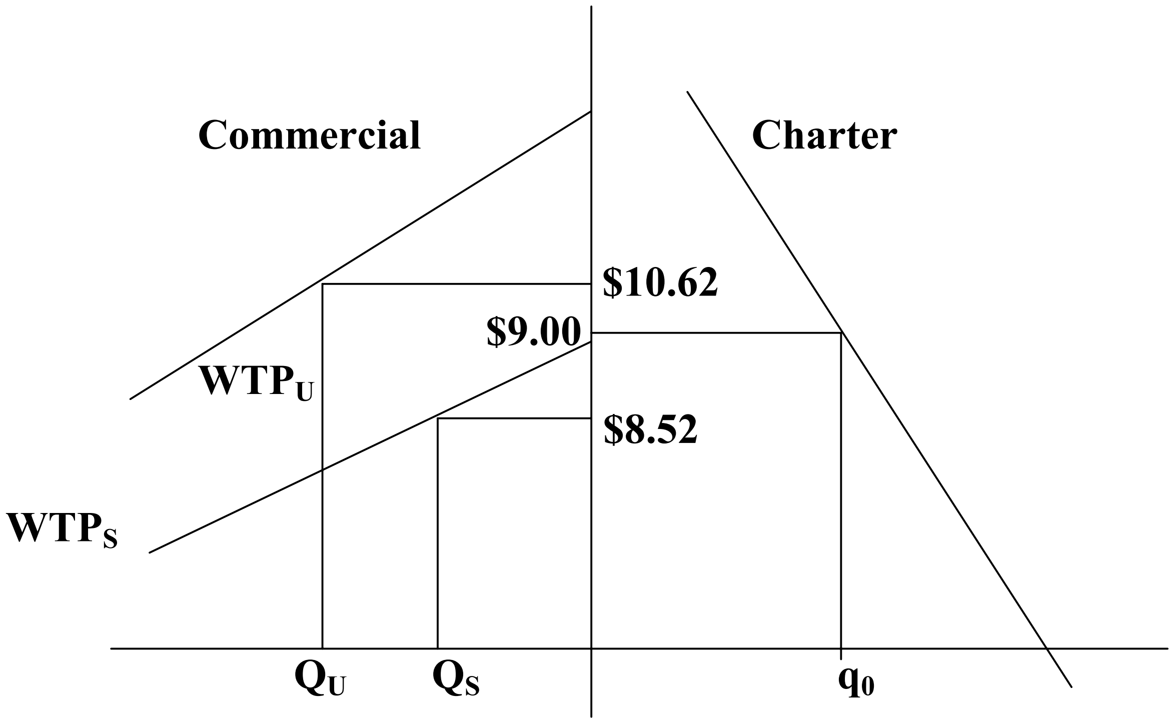

**Figure 4**