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Buybacks in Fisheries

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Abstract

Buybacks of fishing vessels, licenses or access and other use rights, and gear can be key management tools to address overcapacity, overexploitation of fish stocks, and distributional issues. Buybacks can also contribute to a transition from an open-access fishery to a more rationalized one. As a strategic policy tool, buybacks can help restructure relations among participants in a fishery, creating positive incentives that reinforce conservation and management objectives. Buybacks, by reducing vessel numbers, increasing profitability, strengthening positive incentives, improving attitudes, and lowering exploitation pressures on fish stocks, can also help in the establishment of self-enforcing voluntary agreements among industry participants. Selectively targeted buybacks can also help conserve ecological public goods, such as the incidental bycatch of species other than tunas when sets are made on dolphins or floating objects.

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1. Introduction¹

Buybacks of fishing vessels, licenses or access and other rights, and gear can be key management tools to address overcapacity, overexploitation of fish stocks, and distributional issues.² Buybacks can also contribute to a transition from an open-access fishery to a more rationalized one. As a strategic policy tool, buybacks can help restructure relations among participants in a fishery, creating positive incentives that reinforce conservation and management objectives.³ Buybacks, by reducing vessel numbers, increasing profitability, strengthening positive incentives, improving attitudes, and lowering exploitation pressures on fish stocks, can also help in the establishment of self-enforcing voluntary agreements among industry participants. Selectively targeted buybacks can also help conserve ecological public goods, such as the incidental bycatch of species other than tunas when sets are made on dolphins or floating objects.

Buyback programs for vessels and licenses have been widely applied in Europe, North America, Australia, and Northeast and Southeast Asia. In Australia, they have been applied to the northern shrimp, Northern Territory barramundi, South East trawl, Western Australia rock lobster, and Victoria Port Phillip bay scallop fisheries. In Northeast Asia, they have been applied to the Japanese high seas longline fishery and to the Taiwanese offshore longline and drift net fisheries. In Southeast Asia, Malaysia bought back vessels in the west coast Peninsular demersal (finfish and prawn), pelagic, and traditional inshore fisheries. In Canada, buybacks have been applied to the British Columbia Pacific salmon, Atlantic inshore lobster, and Atlantic groundfish fisheries. In Mexico, buybacks have been applied to the Gulf of California shrimp trawl fishery. In the United States, buybacks have been applied to the New England groundfish trawl, Pacific Northwest

¹ This paper draws heavily from the papers in Curtis and Squires (forthcoming), and especially Groves and Squires (forthcoming) and Hannesson (forthcoming). The paper also draws from Barrett *et al.* (2004), FAO (1998, 2000), GAO (1999, 2000), Holland *et al.* (1996), Joseph and Greenough (1978), Joseph (2003, 2005), Joseph *et al.* (2006), Weninger and McConnell 2000, and World Bank (2004).

² Hannesson (2005) defines use rights to fish, either as rights to catch a certain quantity of fish (as a share in the total allowable catch, for example) or as rights to own and to operate a fishing boat for some specific purpose, depending on what method is found most appropriate for regulating the fish stock. To illustrate, Individual Transferable Quotas (ITQs) are a use right held by individual firms, but ownership – the property right – is retained by the state. This definition would encompass access rights, but a distinction is made in this paper between the general right to access a fishery and all of its potential species and use rights to harvest a specific quantity and/or specific group of species. Baland and Platteau (1996) provide further discussion on use and property rights.

³ Economic incentives can be either positive – “carrots” – or negative – “sticks” (Barrett 2003). Positive incentives are created, for example, through enhanced property rights, where profitability increases, or vessel buyback programs, where profits can increase for remaining vessels and payments are received for selling a vessel when exiting the fishery. Negative incentives, such as the trade sanctions or loss of market access enacted by the North Pacific Fur Seal Treaty or Japan for the OPTR, are more disruptive and difficult to implement, although in many instances, necessary. Credibility is more likely to come from stiff punishments, but such punishments can hurt cooperating fishers or countries as well, and hence be more difficult to achieve credibility or to implement.

salmon troll (licenses), Pacific coast groundfish, Texas bay and bait shrimp (licenses), Bering Sea groundfish, Alaska snow crab, and Gulf of Mexico longline fisheries. The European Union Multi-Annual Guidance Reduction Program has applied buybacks in Denmark, Italy, France, the Netherlands, Spain, Sweden, and the United Kingdom. In Norway, buybacks have been implemented for purse seine and trawl fisheries and traditional fisheries with smaller vessels, including nets, longlines, or hand lines. Gear buybacks are less frequently employed than license and vessel buybacks. The 1994 Florida Net Ban on entangling nets (gillnets and trammel nets) is one of the few documented cases.

2. Buybacks to Address Overcapacity and Overfishing

The problem of overcapacity in tuna fisheries has become a serious issue. The World Tuna Purse Seine Owners Association (WTPO) called for a moratorium on the construction of tuna purse seine vessels. The Organization for the Promotion of Responsible Tuna Fisheries (OPRT) has moved to reduce the number of large-scale longline vessels by twenty percent. Reid *et al.* (2005) showed that there is more fishing capacity available in purse seine tuna fisheries than is necessary for current harvest levels. They further demonstrated that additional fishing capacity in these fisheries could threaten the tuna stocks with overexploitation.

Joseph *et al.* (2006) observe that most of the tuna currently harvested on a world basis is taken by distant-water fishing nations, with a majority caught within the EEZs. In the Atlantic and Indian Oceans and the EPO, nearly half of the catch is taken inside the EEZs, and in the WCPO, more than 70 per cent of the catch is taken inside the EEZs. Many of the coastal states do not have tuna fleets, or only small ones, but nonetheless would like to develop their fishing capacity. Programs to limit and even reduce fishing capacity, such as buybacks, will have to directly address the desires and rights of these coastal states to develop their fishing capacity, while also addressing the current level of fishing capacity.

Vessel, license or access rights, or gear buybacks are one of the key policy instruments to address excess fishing capacity, overexploitation of fish stocks, and distributional issues, and are one of the few alternatives to a property rights approach to address these issues. By directly reducing fishing capacity through removing vessels and licenses and relieving pressures on resource stocks, vessel profits and resource rents can potentially rebound, fish stocks recover, and income and wealth distribution change through redistribution of access and compensation and transfer payments. The objectives of most buyback programs often include a mixture of all goals, and simultaneous pursuit of these objectives is possible and not necessarily contradictory. Buyback programs often arise in response to a crisis, implicitly acknowledging that long-term profitability and resource conservation objectives may not be met without drastic action by the time these programs are introduced.

Buybacks can directly bring fishing capacity closer into balance with the ability of stocks of tunas to sustain target levels of catch and to generate sustainable rents in the fishery.

One of the more common intentions of vessel buyback programs centers on conserving, or more typically, rebuilding overexploited fish stocks. Nursery grounds may also be protected through buybacks. All of the European Union's Multi-Annual Guidance Programmes (MAGPs) included rebuilding overexploited fish stocks as one of intentions of the programs, as did the buyback for the Taiwan offshore fishery. In contrast, the Australian South East trawl fishery buyback's goal did not include protection of overexploited resource stocks, because the fishery was already managed by Individual Transferable Quotas (ITQs) and the corresponding Total Allowable Catches (TACs) were not fully fished.

A successful buyback can raise profits received by owners of vessels and licenses and economic rent to the fishery in the short run. Fewer vessels mean that rent is shared among these fewer vessels. Lower fishing capacity can lead to higher catch rates for the remaining vessels, possibly allow gains in economies of scale and scope for the remaining vessels, and reduce overall industry costs (especially capital) and vessel costs.⁴ Rents to crewmembers are also shared among fewer vessels. To the extent that the volume or timing of landings is not substantially altered, fish processors are likely to be unaffected in the short run.

Buybacks fisheries do not, by themselves, necessarily sustain profits to vessels and rents to the fisheries over the long run. Long-run rent gains depend on the ability to limit replacing or even expanding fishing capital. Economic welfare can fall with additional investment in the post-buyback fishery if the use or property right conditions underlying the "Tragedy of the Commons" are not ameliorated, so that further investments are redundant from the perspective of society.⁵ In the absence of property rights or taxes, increased resource rent can reinforce the very investment incentives that lead to the initial overcapacity.

Buybacks in trans-national fisheries exploiting highly migratory species face the additional complexity of jurisdictional issues, different flag states, national sovereignty, coastal and distant-water nations, highly migratory and trans-national fish, vessel mobility across EEZs and the high seas, and the different methods of fishing (dolphin, schools, floating objects), some with incidental takes. Unilateral buybacks of vessels by individual flag states may achieve little or no conservation, because vessels from other

⁴ Economies of scale are reductions in unit harvesting costs when costs, especially fixed costs, are spread out among higher levels of output or catch. Economies of scope are cost savings from joint production of multiple outputs or species.

⁵ Continued technical change can increase rent in the short run, but countervailing pressures can be created that lower rents over longer time periods to the extent that resource stocks are adversely impacted (Squires 1992). Campbell (1989) observes that the net benefits of a buyback vary positively with the share of the restricted input(s) as a proportion of total costs and inversely with the ability to substitute between restricted and unrestricted inputs. Clark, Munro, and Sumaila (2005) suggest that to the extent buybacks come to be anticipated by fishers, fishers will be motivated to acquire vessels, even if the prospects of making a normal return on their investments are low. As a result, to the extent that fishers anticipate future benefits, there can be greater overcapacity than would otherwise occur.

countries may continue to exploit the same resource stocks, i.e. they may free-ride on the efforts of participating parties. This issue, for example, limited any resource stock improvements from the Italian swordfish drift gillnet fishery buyback program (Spagnolo and Sabatella forthcoming). Buybacks in multinational trans-boundary fisheries instead require a cooperative, multilateral approach, such as the buyback of high seas tuna longline vessels conducted by Japan and the Organization for the Promotion of Responsible Tuna Fishing (OPRT).

3. Buybacks as a Transitional Strategy

Buybacks may form part of a transitional strategy to a more rationalized fishery, one which is more closely integrated into the rest of the economy. As long as management is based on input controls or TACs and without strengthened property rights, buybacks may not be the long-term answer, since vessels can expand fishing capacity by increasing investments and use of uncontrolled inputs (Wilén 1979, 1988, Townsend 1992) and technical progress (Squires 1992). Moreover, when fisheries are mired in debt and an absence of vessel profits and resource rent, cooperation is difficult to achieve among fishers. Under adverse conditions, individual discount rates can be exceptionally high as vessel owners scramble to cover vessel mortgage payments and even cover operating costs excluding maintenance. As a transitional strategy however, buybacks can help counter these adverse forces, and in trans-national fisheries harvesting highly migratory species, multilateral buybacks may have a unique role to play due to limits in international law and property rights.

After a successful buyback, when a fishery resumes profitability, increased cooperation can follow. The smaller number of fishers also contributes to increased cooperation, and the remaining fishers tend to be those most committed to the long-term economic viability of the fishery. An industry initiated and financed buyback of vessels in the Pacific coast groundfish trawl fishery of the United States improved attitudes and incentives and help lay the foundation for a planned program of individual transferable quotas. Buybacks of vessels in the Australian South East Trawl Fishery were intended to reduce the perceived overcapacity in the fishery and settle some distributional issues, and thereby allow a quicker transition to optimal catch levels (TACs were not binding for the ITQ-managed species).

Autonomous adjustment following a management change may be relatively slow. A key factor influencing the rate of change is the alternative uses for retired capital. If there is not another fishery in which a vessel can be used it may be rational for an operator to delay exiting the fishery until the vessel is at or near the end of its economic life (Newby *et al.* 2004). Buybacks can help speed the transition under these circumstances, such as in the Australian northern prawn fishery.

4. Features of Buyback Programs

This section examines some of the most important features of buyback programs based on the global experience. Papers in Curtis and Squires (forthcoming) more extensively discuss these and additional components of buyback programs.

4.1. Critical Preconditions

There are several critical preconditions for a buyback of licenses or vessels. One of the first steps starts with proper registration of license and vessels to create a well-defined group of eligible owners and to provide well-defined boundaries to the fishery and program. Because of the prevalence of eligibility requirements and different buyback pricing formulae, the registration typically includes some combination of measures of the heterogeneous capital stock, such as vessel size (GRT, GT, length, well capacity) and/or engine power (horsepower or kW), plus catch history, revenue, home port, gear type, methods of fishing, vessel age, crew size, area fished, and so forth. The EU register of fishing vessels was not yet established prior to the first two EU MAGP programs, and there were disparate units of fishing capacity (vessel tonnage and kW), which hindered monitoring. In some instances, a time series of some of these measures, such as catch history, is required for each vessel, such as when a window of multiple years is used to establish eligibility. For example, the vessel buyback program in the Taiwan offshore fishery over 1991-1995 purchased only vessels older than 12 years (Sun forthcoming).

A second critical precondition of buybacks is *in situ* measures to prevent new boats from entering the fishery in place of the ones that have been removed. Without a pre-existing program of limited entry, ITQs, or some form of common or private property or use rights that strengthen the exclusive use characteristic of property rights, funds from purchased vessels or licenses can be used to purchase an upgraded or new vessel for the fishery or new participants may enter the fishery as it becomes profitable. In the Italian Adriatic trawl buyback, the Italian government introduced a moratorium on new licenses and a limit on construction of new vessels, whereby building a new trawler was only allowed if a larger vessel, not less than 120% of the new one, was scrapped. The latter reduced the average GRT per vessel, but had less effect on kW per vessel, since the regulation was limited only to GRT and not kW.

A related issue is funds received from the buyback used to finance further investment in existing vessels held by the same owner, or to reenter the fishery by selling a vessel or license and using the proceeds to purchase an existing vessel or license. If there are permit holders which not actively fishing but eligible to enter the fishery, one of these permits could be purchased for far less than the funds received to exit the fishery and fishing effort potentially expand. Public funding of buybacks can exacerbate this problem of fishing capacity expansions through investment and technical progress for the remaining vessels, since additional funds from outside of the sector are now potentially available for owners of exiting vessels, permits, or gear. The New England groundfish buyback program was adversely affected by sellers reentering the fishery by purchasing previously inactive licenses.

4.2. Who Pays for Buybacks?

Buyback schemes have largely been funded by central governments. The World Bank (2004) observes that public funding may be appropriate initially in terms of correcting past policy errors and that buyback schemes are effectively government subsidies for the improved performance of the fishing industry. The European Union has largely funded the MAGP, although various EU Member States have financed portions of the buybacks. For example, EU funding in France was supplemented by the French government and local communities (region and department). Public funding of the Australian South East trawl buyback, for example, was deemed necessary to help redress problems with the initial ITQ allocation and the need to encourage and stimulate ITQ trades through a more rapid period of structural adjustment. General public revenue funded the British Columbia salmon buyback program, although revenues from vessel sales helped raise funds.

Mixtures of funding have been used. Commercial and recreational fishing interests may finance all or part of the buyback, usually in conjunction with public funds. Financing includes government grants, annual payments from license fees, and commercial or government loans. Industry financed eighty percent of the Australian northern prawn buyback program through commercial loans serviced by levies on remaining fishers (World Bank 2004). The U.S. Pacific coast trawl vessel buyback program was funded by a federal government loan that is to be paid back by fees on the landings of the remaining vessels. The Australian Northern Territories barramundi fishery buyback was financed by commercial loans against expectations of future license revenues (World Bank 2004). In the early 1980s, fishing vessels remaining in the Japanese long-line tuna fleet paid compensation to the 169 vessels withdrawn (Kuronuma 1997). Eighty percent of the compensation was from government loans to the remaining vessel owners and the remaining twenty percent was paid private funds. In the Texas bay and bait buyback program, the cost is partially borne by the shrimp fishery through a surcharge on license, part by society through public funds (including federal), and by the recreational fishery through the increased fee for the salt water fishing stamp.

A commercial fishery-financed buyback finances the program from the proceeds that are expected to arise following the expected recovery. Such a buyback can be initially funded by a public loan, which is paid back by the commercial fishery based on landings fees. In this case, the public bears a substantial portion of the risk of the loan. NGOs can finance through purchases of licenses or vessels. The World Bank, Asian Development Bank, Inter-American Development Bank, and other such institutions may have an important role providing initial funding for industry-financed buybacks in trans-national fisheries.

When a buyback is financed by commercial or recreational fishers, the buyback's debt obligation then becomes collective rather than individual. Collective borrowing rather than by individuals also spreads the risk among remaining fishers.

Responsibility for payment can, in principle, be assessed by evaluating the recipients of the buyback benefits and their relative share of benefits. On this basis, the commercial fishery would pay that portion of the cost that is proportional to the share of economic

rent in total economic value. Recreational anglers would fund that portion of the cost that is proportional to the share of indirect use values in total economic value. If significant external benefits accrue to society outside of the commercial and recreational user groups, society and NGOs would fund that portion of total program cost that is proportional to the share of existence value in total economic value.

Another principle that could contribute to payment design is to design the program to signal the proper incentives. In principle, those user groups remaining in the fishery would have the self-interest to behave in the socially optimal manner, i.e. the objectives that have been set for the buyback program. When user groups fund all or part of the buyback program, confronting these user groups with the full costs and benefits of their actions helps to insure that private incentives align with social objectives. The owners of exiting vessels or permits can in principle behave in a socially optimal manner, and thereby do not delay or obstruct the program.

4.3. Purchase Vessels or Licenses (Permits)?

Should the buyback program purchase the vessel, license, or both? Purchasing only the license tends to be cheaper than purchasing the vessel, which in turn is generally cheaper than purchasing both the vessel and license. License prices may be set at the market rate (although expectation of increased revenues after capacity reduction may cause license prices to rise sharply) or at the value required to encourage the chosen proportion of fishermen to surrender their licenses (Read and Buck 1997).

Many vessels hold licenses for more than one fishery. If the program buys back only the license, the vessel remains free to fish elsewhere, and in doing so, shifts fishing capacity to another fishery. If the program buys back the vessel but not the license, the license, if allowed to be transferable to another vessel, can be used with another vessel in the fishery. In this instance, pressures on the fish stocks and economic rents may not be abated, and may even increase if the license is used with a vessel that is even more productive than the vessel that was removed.

Purchasing only the license frequently removes vessels from the fishery that are inactive or with low levels of fishing, but which could potentially increase their fishing as the profitability of the fishery improves. This was the primary purpose of the New England groundfish buyback for permits. Although the average vessel age in the New England groundfish permit buyout was nearly the same as in the subsequent vessel buyout, the average length, gross tons, and vessel horsepower were all much smaller. Inactive or low activity vessels may have their primary focus of fishing in other fisheries, and be holding licenses more as options to fish, and the license price may fundamentally reflect option value. Purchasing the lowest priced licenses tends to remove the least active vessels, such as vessels fishing part time or in multiple fisheries, or which are the most marginal in some other sense.

Purchasing inactive licenses affects the longer-term effectiveness of the buyback. The long-term effectiveness of buyback program can depend upon whether previously

inactive vessels or buyback beneficiaries return to the fishery (GAO 1997). For example, the New England groundfish program purchased 79 vessels, but 62 previously inactive vessels began catching groundfish and several participants in the program used the buyback funds to buy new vessels and return to the fishery.

The license can be attached and locked to the vessel, so that a separate market for licenses does not emerge. The buyback would make no distinction between the vessel and license, and the buyback price would include the values of two assets. Fishing capacity would not be allowed to shift to another fishery. If a bought-out vessel also held licenses for other fisheries, and these licenses were also attached to the vessel, the buyback price could include the license values from the other fisheries and reflect the expected profitability of the other fisheries.

Multiple licenses for the same fishery may be held with the vessel – are “stacked.” When licenses are attenuated by limits to capacity, stacking then allows a larger vessel or catch. The buyback price can be expected to increase with stacking.

Economic rents from a fishery are capitalized into all capital assets, which in the fishery without some form of private or common property right for area or catch, are the vessel and license. Rising economic rents following a vessel buyback program would consequently lead to rising values of the vessel and license. Purchasing only the vessel leaves the license as the recipient of any gains in economic rent, reflected by a gain in license value. Purchasing only the license leaves the vessel as the recipient of any gains in economic rent, reflected by a gain in vessel value.

Other considerations arise when deciding whether to buy back vessels or licenses. There is a trade-off with affordability, since it is less expensive to buy permits. Another factor is whether or not strong spillover affects onto other fisheries. Also, if the permit is removed from the vessel through the buyback, can the vessel still participate in other fisheries? Part of the answer relates to the scope of the program.

4.4. Voluntary versus Mandatory Participation

Virtually all license and vessel buyback programs have been designed on the basis of voluntary participation. One of the few buyback programs with mandatory participation was the Northern Australian prawn fishery, which was extensively discussed by Holland *et al.* (1999). In this fishery, fractional licensing (Townsend and Pooley 1995, Cunningham and Gréboval 2001, Joseph 2005) was used, in which vessels were required to purchase thirty percent of their vessel units from other vessels to remain in the fishery. The Japanese longline buyback made provisions for mandatory participation should a sufficient number of voluntary participants fail to materialize, but this provision was never required (Kuronuma 1997).

4.5. Conditions on Reuse of Vessel, Gear, or License

Buyback programs may place conditions on the reuse of the purchased vessel, gear, or license. One of the most important conditions for vessel buybacks is whether or not the purchased vessel is required to be scrapped or not. If a purchased vessel is not scrapped or sold quickly, then the government incurs maintenance costs as well as losses from vessels both sinking and depreciating in value. Vessels which are not scrapped (and not committed to a non-fishery use) may be used in another fishery, which itself may face overcapacity and overfishing, thereby simply transferring the problems from one fishery to another while providing windfall gains to those vessel owners whose vessel was purchased and subsequently transferred. Even if a vessel is not transferred, funds from the buyout might be used to purchase vessel in other fisheries.

In the New England groundfish vessel buyback program, the vessel owner was required to show that the vessel was being scrapped, sunk, or committed to some non-fishing use. Most vessels were either scrapped or sunk, with others transferred to non-fishery use. Vessel owners were required to surrender all federal fishing permits and to pay any costs associated with scrapping or transferring the vessel. Nonetheless, several program participants used the buyback funds to purchase new vessels and return to the fishery. In MAGP I, such as in Denmark, France, and Italy, purchased vessels were to be scrapped, transferred to other non-fishing uses, or transferred outside of EU waters.

Some buyback programs allow construction of new vessels if the previous vessel is scrapped. There may also be a requirement that the scrapped vessel be no larger in terms of GRT or length or some similar measure of vessel size than the newly constructed vessel and may even require removing a greater amount of tonnage or engine power than the newly constructed vessel in an attempt to limit the growth in fishing capacity. The Italian government introduced a moratorium on new licenses and a limit on construction of new vessels, whereby building a new trawler was only allowed if a larger vessel, not less than 120% of the new one, was scrapped. During the first two MAGP programs, no controls were in place to prevent the replacement of decommissioned vessels by newly constructed vessels of the same capacity.

Some buyback programs restrict the use of the vessel or license in another fishery in that country. The Norwegian buyback program stripped the scrapped or transferred vessels of their fishing concessions; i.e., their rights to participate in specific fisheries such as purse seining for capelin, trawling for cod or shrimp, etc. Concomitant with these concessions is usually a right to a certain portion of the total quota for one or more fish stocks and so, by nullifying the concession, the quotas of the remaining vessels and their profitability can be raised.

Under the conditions of some buyback programs, vessels can convert to another activity or gear. Under the Italian buyback program for swordfish driftnet fishing, operators chose between the re-conversion or permanent withdrawal from any fishing activities. Vessel owners were entitled to receive a retirement allowance if they permanently exited from any fishing activities or a re-conversion allowance if they continued fishing by shifting to other gear. The Spadare Plan allowances received by vessel owners were related to vessel tonnage (GRT) and the year of participation in the plan, where the premium decreased if

there was late participation. The 129 retirement allowances were higher than the 634 re-conversion ones. Fishers permanently withdrawing from any fisheries and applying for a retirement allowance were required to return both their fishing licenses and nets. Those who opted for transfer to another fishery were required to return their nets and driftnet license. If the converters did not have another extant license, they were entitled to apply for a purse-seine license or a new license for small-scale fishing gear. Crewmembers involved in the plan were entitled to receive a retirement allowance if they agreed to forgo any fisheries activities or a re-conversion allowance if they shifted to other fishing activities involving gear other than driftnets or to other economic sectors.

Some buyback programs allow the vessel to be exported to another country. The EU MAGP programs are an example, although vessels under 25 GRT cannot be exported to non-EU countries. The Norwegian buyback programs allowed the sale of vessels out of the country. If purchased vessels are sold abroad, then there may be simply an export of the overfishing and overcapacity problems if the vessel is used in a fishery with the same problems.

Vessels might be sold to help finance the buyback program, as in the British Columbia salmon troll buyback. Revenues from vessel sales helped raise funds, but many vessels could not be quickly sold, and the government incurred maintenance costs as losses from vessels both sinking and depreciating in value. The question remains as to the alternative use of the vessels that were sold.

A program that does not require scrapping may have an impact on the price of the vessel that is to be bought out and the prices of second-hand vessels may fall. A buyback program that purchase only the license does not have to explicitly deal with a bought-back vessel; instead, the decision is retained by the vessel owner, as was the case in the New England license buyback program.

4.6. Conditions on Reinvestment

Conditions might be placed on reinvestment of funds received by vessel or permit owners, with an eye on limiting expansions in the capital stock and adoption of new technology that is either embodied in the capital stock or is disembodied, such as new ways of fishing. In the Australian South East trawl fishery, the purchase of latent licenses, although partially limiting future increases in fishing effort, appears to have facilitated additional investment in the fishery, since public funds obtained from the sale of latent licenses were evidently invested by operators in the capacity of active vessels. In the New England groundfish buyback, while 79 boats were sold to the government, 62 previously inactive vessels began catching groundfish since the project began, and several participants in the program used the buyback funds to buy new vessels and return to the fishery (GAO). The British Columbia salmon troll buyback required that vessel owners replacing an existing vessel with a larger one were required to purchase another licensed vessel such that the gross tonnage of the two existing vessels was greater than or equal to the replacement vessel.

4.7. Buyback Price Formation Process

An important program design issue is the price formation process for the vessels, licenses, fishing rights, or gear to be purchased. There are many different ways to design this process, but in all instances a cost-effective process more efficiently removes fishing capacity. Some of the key issues include the program seeking bids or making offers, single price or reverse auctions, single or multiple rounds of bidding, sealed or open bidding, irrevocable bids, whether bids are responsive or non-responsive to the criteria and conditions established, the length of the bidding process and buyback program, and how much bids must be beaten by. The program designers have to decide which approach mobilizes support for the program, is more cost-effective, and fits the budget.

There are several different price formation processes. Consider first reverse auctions, in which operators submit confidential bids to the scheme, the lowest bid wins, and that operator is paid that lowest bid. Additional information may be required to help discriminate between the bids and achieve the greatest impact for least cost, such as different metrics as discussed below. Second, the buyback program may establish an offer price, which vessel, license, or gear owners are free to accept or reject. Third, in sealed bid auctions, the bidder with the highest sealed bid wins and pays that bid. Vickrey auctions have a second price, sealed bid format. The bidder making the highest bid wins and pays the next highest bid.

A reverse auction is the most widely used process to form prices. This process is called a reverse auction because a standard auction features a single seller receiving bids from would-be buyers. Bids are usually sealed. The buyback program may calculate and offer single-round prices, which asset owners are free to accept or reject. The program's offered buyback price may not equilibrate supply and demand, and the number of applicants can exceed or fall short of the funds available.

Price and distribution can be affected by eligibility requirements, bid ranking systems, and direct allocation of funds among groups. The scoring or ranking of bids affects who stays and who exits, i.e. the composition of the remaining fleet, and the amount of capacity that is reduced. A problem with most bid systems involving the sale of a vessel is that everyone offers a different product – there is not a homogeneous metric. However, the use of units of meters, tonnage, well capacity, revenue, or fishing capacity militates this problem. If licenses are for a given category, then the licenses are closer in equivalence than simply vessels, and hence easier to judge and require less information.

Buybacks can occur all in one round – the “Big Bang” option – or in multiple rounds. There are advantages and disadvantages to multiple and single round buybacks, and in practice, the availability and timing of funding often determines which approach is adopted.⁶

5. Vessel Buybacks in Transnational Fisheries⁶

5.1. Introduction

Overcapacity and overfishing in transnational resources spring from the customary right of any state to fish on the high seas. International law, specifically Article 116 of the Law of the SEA, qualified by articles 117, 118, and 119, allows free entry to fish on the high seas. Article 64 of the Law of the Sea mandates international cooperation among nations to manage and conserve tunas, defined as highly migratory species, but the effects from the absence of well-defined and fully structured property rights, national sovereignty, and jurisdictional issues override Article 64, so that the dominant strategy for vessels and flag states largely remains non-cooperation with regards to fishing capacity. Incentives thus remain to enter the fishery, steadily expand vessel size, and adopt technological advances in the race to fish. Regulation by TACs and the seasonal closures in the absence of the incentives from well-structured property rights can reinforce this race to fish. Prior to the implementation of ITQs in the U.S. and Canadian Pacific halibut fisheries, a steadily shortening season and expanding fishing capacity left a remarkably short fishing season in the end.

The main institutions are the regional fishery management agreements and their commissions. The primary legal instruments are the Law of the Sea, United Nations Implementing Agreement, and the FAO Code of Conduct for Responsible Fisheries. Some regional fishery management organizations allow for trade sanctions among member parties. Sovereignty and failure of custom require transnational externalities be resolved through international cooperation (Barrett 2003, in press).

Unilateral buybacks in fisheries exploiting trans-national resources simply remove fishing capacity from one country, thereby reduce pressures on profits and resource stocks, which in turn allows free-riding through growth in another country's fishing capacity. The Italian buyback of fishing capacity in the drift gillnet fishery for swordfish simply allowed expansions of fishing capacity by other nations fishing swordfish in the Mediterranean (Spagnolo and Sabatella forthcoming).

The OPRT buyback of high seas tuna longline vessels in the Pacific is a second example of a successful buyback in a trans-national fishery. Nonetheless, there was some free-riding through expansion of longline vessels by non-cooperating parties in this fishery, which in turn mitigated against some of the gains from the largely unilateral buyback.⁷ A

⁶ This section largely draws from Barrett (2003, in press), Curtis and Squires (in press), Joseph and Greenough (1978), Joseph (2003, 2005), Barrett *et al.* (2004), Joseph *et al.* (2006), Groves and Squires (forthcoming), Hannesson (forthcoming).

⁷ Joseph *et al.* (2006) observes Japan has targeted 130 vessels for removal from its fleet, and Taiwan has agreed to limit its fleet to 600 vessels. Taiwan will require that Taiwanese-owned vessels under flags of convenience be transferred to its registry. Some of the recalled vessels will be bought back and scrapped along with the 130 Japanese vessels. Moreover, funds were loaned to the industry groups by the Japanese government on a 20-year payback schedule. This buyback was partly in response to the reduction of fishing areas when national waters were extended into what had been international fishing grounds (Holland *et al.*).

key factor contributing to potential success is that Japan is the primary market for sashimi-grade fish, and if that market were denied to a longline vessel, that vessel would face difficulty in turning a profit (Joseph *et al.* 2006). A very similar trade restriction, built on a near-monopoly for processing, was one of the key factors contributing to the success of the North Pacific Fur Seal Treaty (Barrett 2003).⁸ This treaty deterred entry into the high seas pelagic sealing industry, effectively transforming open access into common property, improved on unilateralism, and made every party better off by creating an aggregate gain and distributing this gain such that all countries would prefer the agreement succeed.

Gains to international cooperation through gains from participation and compliance and deterring entry and expansion by non-parties are perhaps the biggest challenges to a buyback on shared resource stocks such as tunas. Gains to multilateral cooperation from reducing fishing capacity due to a buyback come from saving on losses due to overcapacity and excessive exploitation of common resources, i.e. from lowering the losses due to the “Tragedy of the Commons.”

Success requires that a buyback ensures that every party is better off with the program than without it, but to succeed the program also needs to ensure that each party would lose by not participating. That is, free-riding through non-participation must be addressed by some credible means, such as a credible trade restriction, as noted above. In addition to a negative incentive, a positive incentive for participation comes to the remaining vessels through the aggregate gain from participating, in the form of increased profits, and to sellers of vessels and/or rights through compensation in the form of the buyback payment.

5.2. National Sovereignty: Individual Vessels or Flag States?

National sovereignty complicates buybacks in transnational fisheries. Buybacks and the critical preconditions of limited access and vessel registry can be defined either in terms of the individual vessel or the flag state. That is, what is the basic unit in the program, flag states or vessels and their associated measures of fishing capacity (potential output, GRT, well capacity, length, etc.)? Can vessels and their associated measure of capacity freely transfer among flag states, or are vessels and their associated capacity directly tied to the flag state? IATTC developed their Regional Vessel Registry incorporating the concept of transferability, but there has been reluctance on the part of some states to

⁸ Virtually all processing of Pacific fur seal skins was in London, giving a credible threat to restrict trade (Barrett 2003). Article III of the North Pacific Fur Seal Treaty banned imports of non-authenticated sealskins (the skins of seals killed by non-parties to the treaty). The trade restriction deterred entry by non-parties into the pelagic sealing industry because the entire pelagic harvest of sealskins was processed and sold in London. The treaty went a step farther. “Implicit in the original treaty is also a kind of “Grim” strategy calling for complete dissolution of the agreement and, by implication, a reversion to the disastrous open access outcome, should any of the parties withdraw at a later date.” (Barrett p. 36, 2003) The treaty also allowed signatory countries to seize a violating ship from another signatory country and deliver to the violating ship’s authorities, who were bound by their own domestic laws to tackle the issue.

recognize this provision of the program. Strictly on the grounds of economic efficiency, a limited access and vessel buyback program defined solely in terms of vessels rather than flag states can be expected to lead to greater economic rents and overall healthier profits in the fishery, since there can be greater gains from trade (arbitrage efficiency) as capacity and the right to fish shift to lower-cost vessels.

5.3. Coastal and Distant-Water States

An additional issue that arises is the distribution of vessels and fishing capacity among coastal and distant-water states, and more generally, the unique nature of the required multilateral cooperation to manage fishing capacity when there is asymmetry among states. This issue is not unique to fisheries. Major international environmental agreements, such as the Montreal and Kyoto Protocols, addressed similar asymmetries between developed and developing nations with global atmospheric public goods. Coastal states control entry into their EEZs and special privileges are enshrined in international law.⁹ Potentially viable limited entry and buybacks have to allow for the expansion of vessels and fishing capacity by coastal states, a measure allowed by the IATTC, for example, in its Regional Vessel Register and capacity limitation. This provision represents side payments and strategic choice in response to the asymmetries between coastal states and distant-water fishing nations.¹⁰ This provision also reflects an implicit agreement about use and property rights, beginning a transformation from open access to common property.¹¹ This provision ensures that the countries, which might otherwise lose by participating, instead gain. Side payments help insure that each country would lose by not participating, given that the others have agreed to participate. Side payments are thus a strategic choice and can redefine the cooperation problem, making participation in the interests of developing countries.

⁹ Joseph et al. (2006, p. 10) state, “Articles 56 and 61 of the Law of the Sea recognize the rights of coastal states to control access to the waters under their jurisdictions, and therefore to decide who can fish for tunas in those waters, with the caveat (Article 62) that, if the resource is not fully utilized, access to fish must be provided to the vessels of other states.”

¹⁰ Side payments have both distributive and strategic functions in conditions of asymmetry in international environmental agreements (Barrett in press). Side payments help increase participation and make agreements fair. Side payments, by which gainers of a policy can compensate those who bear the burdens, help insure that nations that would otherwise lose by participating instead gain. Side payments redistribute the additional gain from cooperation and help guarantee that all parties are at least as well off as before cooperation.

¹¹ Open access is a form of property right, but in which no individual, group, or state has exclusive use, so that entry to the resource is open. Common property is a form of property right in which exclusive use of the resource is vested in a well-defined group, i.e. is commonly held. In this case, the group is the signatories and cooperating parties in the IATTC. The common “ownership” is due more to custom than binding international law, so that exclusive use is through the IATTC, and exclusive use by this group does not provide for full deterrence of entry (and where any trade measures, acting as a credible threat, apply only to group members and not to non-members). Baland and Platteau (1996) provide considerable discussion on this general topic, and they make clear that common property or use rights with effective management can lead to economically efficient outcomes equal to individual property or use rights, such as ITQs.

Several forms of side payments are possible, including provision for room to grow for coastal states, decommissioning greater capacity of distant-water fishing fleets, and assessing distant-water fishing fleets at a higher rate than coastal fleets in industry-financed buyback programs. As with the Montreal and Kyoto Protocols, side payments can be made for technology transfer or multilateral funds to finance continued growth by, in this case, coastal states. Limited allocation of unused capacity to coastal states creates a reserve held by these states and is a form of side payment; just such an approach was adopted by the IATTC with vessel capacity (Joseph *et al.* 2006). New entrants can purchase or lease this capacity with the proceeds accruing to the coastal states. Alternatively, a limited percentage of license or capacity units, with limited duration of the right, could expire on a periodic basis, requiring repurchase for continued use or purchase by new entrants. Similar features appear in Chile's ITQ program, where this use right has a staggered and limited duration. New entrants might also be required to purchase additional units of capacity and retire some portion of the excess. Similar restrictions might apply to reinvestment, such as "stretching" of an existing vessel. Fractional licensing is another possibility, and an alternative to vessel buybacks. Vessels are allocated only some fraction (not the entire amount) of the access right required for the fishery and must purchase the remaining amount from other, existing vessels (Townsend and Pooley 1995, Cunningham and Gréboval 2001, Joseph 2005).

Reflagging can complicate the definition of a coastal and distant-water state. That is, coastal states with unused capacity, or perhaps more accurately the right of access measured in units of capacity (vessel size), allowed by a regional fishery management organization can invite vessels from distant-water fishing nations to fish under coastal state flags.

IUU (illegal, unregulated, and unreported) fishing can also undermine the effectiveness of any buyback program established under the auspices of regional fishery management organizations. Multilateral buybacks, and capacity reduction measures in general, by member and complying nations and parties, can be undermined by IUU fishing, since cooperating parties may be deterred when non-cooperative nations reap the external benefits flowing from the sacrifices of cooperating parties, i.e. there is free-riding, and the trans-national externality remains.

5.4. Limited Access: A Critical Precondition for Buybacks

The ability to legally deter free entry into the fishery by new vessels under existing international law is a critical precondition for a buyback. Evolving customary law may be reshaping conditions to deter free entry through the formation of regional vessel registries in the IATTC, IOTC, ICCAT, and CCSBT.¹² Joseph *et al.* (2006, p. 26) observe that,

¹² Among the 16 coastal states comprising the Forum Fisheries Agency, the 1992 Palau Arrangement for the western and central Pacific purse-seine fishery by 8 members has the objective of limiting the level of purse-seine fishing in the region. The Palau Arrangement limits 205 purse-seine vessels that will be licensed by the parties for fishing in their waters. The majority of the catch of tunas from the area is taken in the waters of these 8 members.

“...ICCAT and IOTC maintain “positive lists” of vessels that are authorized to fish in the waters under their responsibility; vessels not on those lists would not be authorized to fish in the Atlantic or Indian Oceans. However, the lists do not limit the numbers of vessels that can be on them. New vessels can be entered on the lists if they meet the qualifications prescribed by the regional tuna bodies.”

The IATTC register goes a step further with a moratorium in fleet growth through numbers and sizes of vessels, where expansions by coastal states are allowed in the IATTC program. The IATTC register has begun the transformation of open access on the high seas into nascent common property but through custom rather than formal international law. The IATTC register allows transfers of existing vessels to another party, which provides opportunities to states desiring to acquire fleets, but the capacity quotas remain vessel-specific (new quotas are only allocated when vessels are retired).¹³ Such a register essentially places a moratorium on fleet growth in vessel numbers and size. Beginning in 2003, the IATTC went farther still, instituting temporary closures and prohibiting “landings, transshipments and commercial transactions in tuna or tuna products that have been positively identified as originating from fishing activities that contravene this resolution...” The new resolution instructs parties and cooperating non-parties to comply with the agreement, but there is no mention of any penalties to be paid. Most importantly, perhaps, there is no mention of whether and how the rules are to be enforced as regards non-cooperating parties.

In effect, implicit recognition is growing that treaties are weak instruments for limiting trans-national fishing, and recognition is growing that extending and strengthening rights of access through a form of limited entry is critical. Use rights in the form of rights of access and magnitudes of fishing capacity are emerging. (As discussed below, Dolphin Mortality Limits are another form of use right that also developed in the EPO.) Relations among participants are restructured in the process. These programs represent necessary *de facto* if not *de jure* attenuation of national sovereignty within EEZs and especially on the high seas, beginning a transformation from open access to nascent common property,

¹³ Joseph (2005, p. 13) observes, “The RVR provides a mechanism for fixing the fleet of purse-seine vessels operating in the EPO at its current size, with an allowance for minimal expansion to fulfill the needs of several coastal states. An important feature of the arrangement is the provision for allowing vessels to transfer among the participants. Once a vessel is listed on the RVR it is authorized to fish in the convention waters. If a vessel is removed from the RVR by its flag state it can no longer fish in the area. As long as a vessel is on the RVR it can move from flag to flag. When a vessel transfers from the flag of one participant to that of another it stays on the RVR and its capacity “quota” is transferred with the vessel. Similarly, if a vessel on the RVR is replaced, or its well capacity is increased, a vessel of equivalent size, or an amount of capacity equivalent to the increase in size, must be removed from the RVR. In a manner of speaking, the RVR creates a market for trading capacity. A vessel owner or a nation desirous of increasing its capacity can offer to purchase vessels listed on the RVR. When purchased, the vessel, which would remain on the RVR, along with its capacity quota, would go to the purchaser. Once the RVR was established through political negotiation, theoretically, any changes would result from market forces.”

i.e. a transformation from free entry to the resource to exclusive use of the resource by a well-defined group and a form of rights-based management.¹⁴

Qualification for eligibility in a regional vessel registry is another issue. Joseph (2005) observes that to qualify to be entered on the register a vessel would have to be considered to be actively fishing, and this term requires definition. To remain on the register, a vessel would have to continue to be active, according to the same or a similar definition. Establishing such a requirement would prevent vessels that had not been fishing from adding more capacity and would prevent a flood of vessels entering a region as soon as the intention to limit capacity became public knowledge.

The growth of market mechanisms, whereby new entrants and existing fishers purchase the right to fish – licenses and capacity units – from existing participants, can provide a decentralized mechanism to facilitate new entry or expansion by current participants. Such market mechanisms are most efficient when licenses and capacity units are not tied to flags. If this feature of transferability was not retained, the effectiveness of the system would weaken and there would be less economic efficiency than would otherwise be realized. The result would be a limit on fleet size that was fixed among nations and could be not changed without difficult and time-consuming negotiations. Compliance can make a key contribution in this case, with ICAAT, IATTC, and CCSBT allowing for trade restrictions, but only among member countries. The IOTC requested nations participating in the Record of Authorized Vessels of greater than 24 meters in overall length to close ports to and prohibit imports from vessels involved in IUU fishing and not grant the use of their flag to vessels that had been involved in IUU fishing unless the ownership of the vessel had changed (Joseph *et al.* 2006).

5.5. Financing the Buyback

Buybacks within regional vessel registries that limit entry can be financed, in part, by industry participants, perhaps seeded by an initial low-interest loan by a development bank or consortium of governments. In fact, the World Bank observes that in view of the high level of funding required, and the policy nature of those schemes, the World Bank and other major international financial institutions could support buyback of surplus vessels through broad sector instruments, such as Sector-Wide Approach programs (SWAPs) or Poverty Reduction Support Credits (PRSCs) or perhaps even the Global Environmental Facility (GEF) (World Bank 2004).

Buybacks aimed at protecting ecosystem health (ecological public goods) can, in principle, be legitimately financed by governments and international public institutions to the extent that these funds reflect the public's willingness to pay for the "existence value" of the ecosystem's health. In principle, buybacks financed by governments solely for capacity reduction without loan repayment constitutes a subsidy, but since government

¹⁴ As Baland and Platteau (1996) make clear, rights-based management not only entails use and property rights for individuals, such as ITQs, but also use and property rights held by well-defined groups, giving common use and property rights. Baland and Platteau further make clear that commonly held resources with effective management can lead to fully efficient resource exploitation.

subsidies contributed to the overcapacity problem, government subsidies may be called for, in part, to correct this problem. As the fleet was reduced toward the target size, the average catch per vessel would increase and profits rise, so that the industry can better fund the buyback. Thus the initial loan and on-going payments for buybacks could be funded by an assessment on each vessel; a landings tax would raise funds proportional to the amount of fishing. Increased profitability with success of the buyback would provide the fundamental pool of funds. Alternatively, as Joseph (2005) notes, all or part of the tax or assessment could be applied to the processed product, since the processors would reap the benefits of a well-managed fishery. Ultimately, the relative price elasticities of producers, processors, and consumers would determine the incidence of the tax among these groups. The assessments and development of a pool of buy-back funds would be region-and gear-specific.

Recreational fishers can also be expected to contribute to financing the buyback, thereby reflecting their share of the resource's exploitation. Such co-financing of a buyback occurred in the Texas shrimp fishery (Riechers, Griffin, and Woodward forthcoming).

5.6. Other Issues

In addition to limited licenses and access, still another critical precondition in trans-national fisheries may be management of capacity units, denominated in one or more measures of vessel size. The traditional response in such fisheries has been changes in vessel design and increases in other dimensions of the multi-dimensional capital stock (e.g. expanding GRT and engine power when length is limited) and accelerated adoption of technical advances (e.g. electronics or FAD fishing). Nonetheless, if limited access is the best that can be expected in the foreseeable future, limits on growth of measures of fishing capacity may be the preferred, albeit imperfect, management option. Replacement of existing vessels with new vessels might be restricted to vessels of the same size (within some tolerance) unless the license for a second vessel is purchased to provide the necessary magnitude of capacity units to support a larger replacement vessel.

The establishment of regional fishery management organizations for the highly migratory species in the different ocean basins did not fully eliminate the trans-national externality, which has implications for buyback programs. In the Pacific, the IATTC and the WCPFMC (Western Pacific Fishery Management Commission) manage highly migratory species in the eastern and western parts of the Pacific, respectively, yet uncertainty remains whether there are biologically distinct stocks of fish in the different jurisdictions. Coordination is therefore required between the two regional fishery management organizations. Buyback programs in one part of the Pacific might, in principle, only remove some of the fishing capacity creating fishing mortality on common resource stocks. More critically, vessels harvesting highly migratory species are highly mobile, and readily traverse from one part of the globe to another. Control of fishing capacity by one organization may simply create spillovers to other regions and regional fishery management organizations as vessels fish in other areas and/or reflag. The potential also exists for vessels to enter IUU fishing.

Ex-vessel markets for industries exploiting highly migratory species are global and ex-vessel markets are spatially linked by prices.¹⁵ That is, prices formed in one part of the world either follow or lead prices in another part of the world. Hence, buybacks intended to lower fishing capacity and thus supplies of highly migratory species to thereby lift ex-vessel prices and revenues have to contend with not an isolated regional market but a global market where ex-vessel prices are influenced globally.

6. Buybacks to Address Ecological Issues

The capacity issue in some tuna fisheries extends beyond more than simply the total level of fishing capacity necessary to sustainably harvest the target tuna species and insure a profitable fishery. The capacity to catch all species, both target and bycatch, is also critical. In the IATTC region, for example, some vessels set on dolphins to harvest the larger yellowfin tuna, some vessels set on unassociated schools of tunas, and some vessels set on logs and drifting aggregator devices or FADs. Dolphin sets incidentally take dolphins. Log and FAD fishing incidentally harvest small yellowfin and bigeye tunas, leading to discards, and a wide range of non-target species, including billfishes, sharks, mahi-mahi, wahoo and sea turtles (Hall 1998).

Reductions in the total level of fishing capacity through general buybacks can directly reduce catches of non-target species (as well as the targeted tunas) and thereby help strengthen ecosystem health, but the amount of reduced overall fishing capacity may be insufficient to fully address this ecological issue. Buybacks of vessels and/or use rights – the carrot approach -- can instead specifically target vessels harvesting in ways or with gear that have the most detrimental ecological impacts in sectors of the fishery facing the greatest ecological issues. Historically, economic incentives to address ecological issues, such as incidental takes of dolphins or sea turtles taken when shrimp trawling, have generally relied upon negative economic incentives – the stick approach -- through trade measures and boycotts (cf. Joseph 1994, Headley 2001).

Dolphin Mortality Limits (DMLs) are an example of an annual use right. Vessels might accept payments to not fish – their use rights are bought back -- or even leave the FAD fishery entirely – their vessel and/or use right to fish are bought back. Compensation and funding the buyback might be arranged by a collective assessment on the entire fishery, or only those actually participating, used for buyback of vessels or simply their use rights for that method of fishing. Partial funding by governments or international institutions would legitimately reflect the public's valuation for the "existence value" of ecosystem health. In this manner, buybacks of vessels and/or use rights provide positive economic incentives. Use rights, such as DMLs, also provide negative economic incentives in that failure to conserve dolphins, that is vessel mortality beyond the DML, costs the vessel forgone revenues from forgone catch by terminating fishing. DMLs (and prior to their establishment the threat of trade sanctions and consumer boycotts,) also induced changes in technology, such as the backdown procedure and the Medina panel.

¹⁵ Formally, the spatial linkages of ex-vessel markets for tunas and swordfish set the condition for pecuniary externalities

Buybacks of vessels and/or use rights might also indirectly help address ecological issues, through strengthening economic incentives and fostering cooperative self-organization to tackle the ecological issues. By improving the economic returns in the fishery, helping to dampen the race to fish, and providing a means of compensation, buybacks can help to foster cooperation among fishers to voluntarily address bycatch and ecological issues (as well as general overcapacity).¹⁶

Because protective measures can be costly, fishers may not undertake them unilaterally or voluntarily, particularly under conditions of open access. However, a growing literature in the field of environmental economics suggests that voluntary approaches to environmental protection can be effective under certain conditions even when protective measures are costly (Segerson and Wu forthcoming, Segerson and Miceli 1998, Segerson and Dawson 2001).¹⁷ Incentives for voluntary protection can exist, for example, when governments threaten to impose more costly command-and-control regulatory actions or protective measures if voluntary approaches are not successful in meeting protection targets. Threats of embargoes and trade measures can also be effective, as with the dolphin-tuna and shrimp-sea turtle issues (Joyner and Tyler 2000). These incentives can be created either at the level of an individual vessel, such as occurred when vessels reduced dolphin and sea turtle mortalities through technological and other innovations, or for a group of firms or the entire fishery, such as when the environmental performance of a subset of vessels affects all vessels in the group or industry. When there are group incentives, free-riding can arise and needs to be addressed.

The voluntary La Jolla Agreement establishing the International Dolphin Conservation Program helped conserve dolphins, and established use rights in the form of Dolphin Mortality Limits (Headley 2001).¹⁸ Self-enforcing group voluntary agreements are

¹⁶ GAO (2001, P. 6) observes, “The Bering Sea pollock buyback addressed the race to fish that had previously existed among factory trawlers by facilitating the creation of a fishing cooperative by the owners of the remaining trawlers. This cooperative was designed to eliminate the race to fish by assigning a specific amount of fish, or an allocation, to the cooperative, which divides the allocation among its members. Because of this allocation, members of the cooperative have no incentive to expand fishing capacity to catch the available fish before someone else does, as they have in another fishery. Members are able to catch their individual fish allocations at their own pace, at lower capital and operating costs, while increasing product quality. These changes resulted in higher profits and longer fishing seasons for the remaining factory trawlers.”

¹⁷ Voluntary agreements: encourage pro-active cooperative approach from industry, greater flexibility and freedom to find cost-effective solutions that are tailored to specific conditions, and the ability to meet environmental targets more quickly due to decreased negotiation and implementation lags. Voluntary agreements can be classified as either those that induce participation by providing positive incentives such as cost-sharing or other subsidies (the carrot approach) and those that induce participation by threatening a harsher outcome (such as regulations) if a voluntary agreement is not reached (the stick approach). Voluntary agreements are also widely used to reduce agricultural pollution and induce conservation (Segerson and Micelli 1998).

¹⁸ DMLs are use rights allocated to nations and subsequently vessels. These use rights are not transferable, provide exclusive use by a vessel for a duration of one year, and are not divisible beyond a single dolphin. In addition, the voluntary program became binding formal international law with the Agreement on the International Dolphin Conservation Program (AIDCP), which entered into force on February, 1999.

currently employed, for example, by a group of New England longline cod fishers; these fishers contract with the regulatory body to self-manage their share of the TAC and have signed binding contracts with each other for self-enforcement. The fishing cooperatives authorized by the American Fisheries Act are another example. Similar arrangements could be made to manage incidental takes of non-target species for vessels setting on floating objects, in which contracting parties agree to reduce bycatches. Vessel owners, for example, can voluntarily enact time-area closures for sets on floating objects when bycatches are deemed highest and institute skipper training programs.¹⁹ Again, compensation for some or all reduced of the revenues might be arranged by a collective assessment on the entire fishery and/or buyback of vessels or simply their use rights for that method of fishing.²⁰ Financing can come from governments or international institutions to reflect the public's "existence value" for ecological public goods. Buybacks contribute by reducing the number of vessels and strengthening profitability in the fishery.

As a variation, a possibility adopted from the British Columbia Mifflin Plan is possible (cf. Grafton and Nelson forthcoming). The EPO fishing area could be divided into areas for the different types of tuna fishing, e.g. an area for dolphin fishing and another area for FAD fishing. A vessel license holder would then required to select one area, with the license being good for one area only. The scheme would permit license holders to purchase licenses from other holders. In so doing, the purchaser would be enabled to fish in additional areas, or with modes of fishing. This provision, popularly known as "stacking," would work as follows: The owner of a purse seine vessel, initially required to choose between one of two areas, could opt for the area with dolphin fishing, and then purchase a license from the owner of a purse seine vessel harvesting in the area with drifting FADs. The purchaser can then harvest in both areas. Capacity is reduced because the seller's purse seine vessel is removed from the fleet, with the "stacking" of the two licenses onto one vessel. Dividing the fishery into smaller areas and gear groups helps limited the number of players, thereby contributing to more cooperative behavior.

Fractional use rights to fish in an area and/or with certain types of gear are another possibility. Fishing would require purchasing additional fractional use rights. Buybacks to permanently retire some of these fractional use rights would complement.

The buyback program in the Australian northern prawn fishery helped reduce environmental damage through reduced bycatch and protection of sensitive sea grass beds (World Bank 2004). Similar terrestrial programs include the Conservation Reserve Program of the U.S. Dept. of Agriculture, Wetland Reserves, Nature Conservancy

¹⁹ For example, Hall (1998, pp. 27-28) states, "However, in the eastern Atlantic, where FADs have been used intensively, the majority of the tuna vessel owners operating there have implemented a voluntary ban on the practice in a time-area stratum (A. Fonteneau, pers. comm.), which suggests that they perceive the negative effects of the practice to be quite significant. Experiments are needed to answer this question."

²⁰ In the context of global warming and the Kyoto protocol, consideration is currently being given to payments for not harvesting, and thereby preserving, tropical rainforests in order to maintain carbon sequestration (most recent Economist magazine).

reserves, and New York City's purchase of watershed in the Catskill Mountains (Heal, 2000). While property rights are often required on land, a limited access program with spatial and/or temporal dimensions restricting use rights could serve a similar role.

7. Issues from an Industry Perspective

From an industry perspective, whatever program is put together has to make sense to participants. This is a particularly important issue if the buyback program is industry initiated and financed. Participants have to buy in and understand that a buyback program has to take place. Industry support is critical for success.

Industry support requires finding a champion, because leadership is required to bring a buyback program to fruition, particularly if the program is industry financed. Such a focal person helps to insure that the necessary steps occur throughout the process. The leadership can come from industry, government, or even NGOs. In most instances, government agency support is required, since they are typically the program administrators.

Dealing with non-supporters throughout the process is an important leadership element in any buyback program, since not everyone will buy into the buyback need and program. Some non-supporters will become deterrents. Non-supporters can come from the fishery in question or from people outside of the industry who sincerely do not want such an approach.

Flexibility is required throughout the process, since the unexpected arises. This flexibility may even require retracing steps or even starting over. Fishers and governments have to support the buyback, to realize that change has to occur, and that the process is not arbitrary.

8. What Are The Main Lessons to Be Learned From The International Experience?

The global survey of buyback programs for vessels and licenses offers a number of lessons (Curtis and Squires forthcoming). *First*, and one of the most important lessons, is that it is much easier and less expensive to prevent overcapacity and overfishing than an *ex-post* reduction.

Second, there are several critical preconditions for buyback programs to be effective. Proper registration of licenses and vessels creates a well-defined group of eligible owners and provides well-defined boundaries to the fishery and program. Limited access is another critical precondition. Without deterring entry, vessels enter the fishery as profits rebound following the capacity reduction induced by buybacks, and fishing capacity increases. The conditions for free-riding are established.

Third, buybacks can play a strategic role as a transition to longer-term conservation and management, predicated on enhanced use or property rights (whether private or common and on catches or areas, as in marine reserves). Buybacks have been applied, with the

exception of the ITQ fishery in South East Australia, to fisheries with incomplete property rights. The constraints imposed by such use or property rights mean that buyback programs can be seen as an important strategic tool, because to induce a change in behavior requires a change in incentives. That is, buybacks are introduced because of dissatisfaction over the status quo, and hence buybacks can present a real opportunity to restructure incentives so that private economic incentives of fishers more closely align with social goals of lowered capacity, fishing mortality, and environmental damages.

Buybacks accelerate this transition and restructure incentives and relations among participants through improving the economic conditions during a window of opportunity following a buyback. If buybacks sufficiently reduce the number of vessels and profits sufficiently rebound, the remaining participants are likely to be the most committed and to enjoy growing cooperation and more favorable attitudes toward more complete property rights. Industry-financed buybacks, as a collective rather than a private debt responsibility, and as an alternative to public funding, also help nudge incentives to shift behavior from non-cooperative to cooperative. Ultimately, because buybacks don't change the underlying property rights, buybacks in and of themselves don't, over the long run, address the incentives to over-invest in an open or limited access fishery, and they eventually help aggravate the problem by strengthening investment incentives through growing profits.

Buybacks viewed as a strategic opportunity have a number of different ways to induce change through the choices that are made for the design of the buyback program. These design choices are strategic choices, and thereby can be viewed as opportunities to restructure incentives and relations among those remaining in the fishery. Every substantive choice can affect incentives and thereby behavior of the remaining participants, and even the decision of who chooses to stay and who chooses to leave the fishery through participation in the buyback.

Linkages of program design features can also be a strategic choice. For example, requiring purchased vessels to also be scrapped or preventing owners of purchased vessels from using the proceeds to reinvest in the fishery affect not only the level and growth of fishing capacity, but can also affect who elects to participate, the purchase prices, and fishing capacity and profits.

Fourth, buybacks work best through co-management, i.e. cooperation between the public and private sectors and other interested parties. Strong industry participation in all phases of the programs strengthens the chances for success. Consultations and workshops with user groups help design better programs, prepare the user groups for the buyback, and critically, help build and enlist support from user groups.

Fifth, moral hazard issues may arise. The purchased vessels are frequently older and less productive than the remaining vessels. The buyback may merely accelerate the departure of vessels marginal to the fishery that would have departed in any case, but the buyback facilitates and accelerates their exit and at a higher vessel purchase price than would otherwise occur. Purchased vessels or licenses may also be among the least active, so that

buybacks may have little effect in improving economic performance and helping resource stocks to recover. By absorbing risk, buybacks may also strengthen investment incentives for the remaining vessels.

Sixth, there is often no single, best answer to many program design issues. Nonetheless, clear objectives and a clearly defined scope of the program are critical. A pilot program can also be helpful. One or more champions -- whether individuals, organizations, or public agencies -- can play an important galvanizing force.

Seventh, decisions must be made to first purchase active or inactive vessels and vessels or permits or both. Purchasing inactive vessels and/or permits has the advantage in that it is cheaper and they can allow ready expansion of fishing capacity as profits rebound and fish stocks bounce back. In most instances, vessels and their permits are purchased together rather than simply the permits, since removing the vessel eliminates capacity plus any spillover effects on other fisheries.

Eighth, beneficiaries of a buyback program can contribute to the funding of the program in all or in part. Commercial fishers can enjoy increased profits, recreational anglers can benefit from higher catch rates, and the general public and NGOs gain from non-market benefits, such as strengthened ecosystem health. The initial funding for a buyback, especially when the fishery is unprofitable, may have to be a loan from a national or state (regional or provincial) government or, in the case of trans-national fisheries, from an international organization. To some extent, public funding can be viewed as compensation for past policy errors. Public loans to user groups mean that the public bears the risk of the loan. Public outlays can be recovered through user fees, such as licenses or entrance fees to marine parks, and landings taxes, so that those enjoying the most revenue and revenue increases bear the most financial responsibility. Public funding without repayment from rent increases is ultimately a transfer payment, which can be capitalized into license or vessel values and could have a more productive use elsewhere in the economy.

Ninth, the administration of payments and the bidding process are critical issues. Should buybacks proceed on the basis of bids by vessel or permit owners or offer prices determined by the program? Capacity is usually purchased through vessel, license, or gear bids and reverse auctions and often on the basis of some metric of fishing capacity, such as dollar bid offered per GRT, HP, revenue, catch, cubic meters of well capacity, meters of length, and so forth. Bids can be in a single round or multiple rounds. Multiple rounds of buybacks increase administrative costs, but may also reduce strategic behavior in offers. Multiple rounds also allow adjusting payments to target particular groups of fishers by adjusting the criteria for bid acceptance and allowing fishers to reformulate their bids. Bids are typically sealed. Buybacks occurring over a longer time period and at times when fishery regulations are stable can facilitate making better assessments of the benefits of retiring or remaining. Irrevocable bids prevent "stink bids," in which speculators bind up a large proportion of the available funds. The program administrator can help owners form price expectations and markets to form by working to lower

transactions costs and releasing average price per unit of capacity, total available funds, etc.

Tenth, selective buybacks can help achieve social objectives other than efficiency and resource conservation goals, including recognition of aboriginal treaty rights, accommodation of new entrants, coastal states, and shifting capacity regionally, by gear type, or between commercial and recreational fishers. Buybacks provide a compensation mechanism for those players in the industry that would otherwise lose out from rebuilding fish stocks and restructuring the industry. Buybacks have a differential impact on gear types or regions, but maintaining an equitable allocation of harvests among gear types or regions helps ensure political support.

Eleventh, buybacks have largely focused on overcapacity, overfishing, raising profitability, and disaster relief, and have seldom been intended to address goals of ecosystem management. General buybacks are a blunt instrument, but to the extent they can target selective areas or times fished, gear types, or modes of fishing, buybacks can provide a tool toward restoring ecosystem health. For example, the creation of marine reserves without removing overcapacity, and especially displaced fishing capacity, simply bunches capacity up on the remaining areas; buybacks can help remove some of this overcapacity. Buybacks targeted at methods of fishing, such as sets on floating objects, can reduce bycatch.

Twelfth, buybacks for fisheries exploiting trans-national resource stocks are unlikely to be effective without a coordinated management effort among those countries contributing the bulk of the fishing capacity; unilateral rather than multilateral buybacks eventually face failure. Buybacks in transnational fisheries must also deter new entrants other than through purchase of licenses, which requires changes in, at a minimum, customary international law. Allowing capacity to transfer among individual owners, rather than restricting to flag states, allows more efficient capacity reduction. Coastal states, when resource stocks span both EEZs and high seas, are typically afforded special accommodation for growth, which can represent a side payment and strategic choice.²¹ They also reflect an implicit agreement about property rights, and ensure that the countries, which could otherwise lose by participating, instead gain. Side payments can also redefine the cooperation problem, making participating in the interests of developing countries.

Thirteenth, buyback programs usually represent only a second-best outcome. They alone are not the long-term solution to the overcapacity and overfishing problem in the open-access or even limited entry fishery, although they may be the best solution available in the foreseeable future for trans-national and other fisheries. The underlying ill-structured property rights that create incentives for over-fishing and overcapacity remain. Without a change in the underlying economic incentives that fishers face, the benefits of buybacks will be transient as investment and productivity grow over time, fueled inadvertently and in part by the buybacks themselves as outside funds expended during buybacks are

²¹ Similar issues arise with atmospheric concerns, such as greenhouse gasses and the Kyoto Protocol, and ozone-depleting chemicals and the Montreal Protocol (Barrett 2003, in press).

reinvested (unless there is a strict prohibition). Self-enforcing voluntary agreements among fishers may be an attractive option to effectively establish a form of common use rights, essentially through custom. The incentives to increase cooperation and establish such agreements can be strengthened by buybacks that restore profitability, reduce the number of participants, and leave the most committed participants.

Fourteenth, buybacks are essentially an input control that primarily addresses the capital stock and only indirectly the relationship between inputs and catches. Under command-and-control input controls, uncontrolled inputs can be substituted for controlled inputs, such as investment in additional capital in the remaining vessels, the capital stock of the remaining vessels may be more fully utilized and fishing capacity increased by fishing longer, or technology may progress, such as the addition of vessel electronics. These expansions in fishing capacity are simply responses to the market incentives and economic signals found when use and property rights are incomplete. Vessel buybacks unaccompanied by a comprehensive use or property right thus have the same shortcomings as limited entry in that the underlying ill-structured property rights generating incentives for overcapacity and over-fishing remains.

Fifteenth, the long-run success of buyback programs as a program in its own right to reduce capacity requires controlling future growth in fishing capacity through restrictions on investment and increased fishing, ideally through positive incentives. When a strengthening of the property rights structure is not feasible or appropriate, other measures can contribute. A critical component is to restrict return to the same fishery by vessels which have been bought out, by owners who have just sold an active license and purchase a remaining but inactive license, entering other fisheries with overcapacity, new entrants, new investment in remaining vessels, and increased fishing by relatively inactive vessels and licenses. Such second-best measures limit gains in economic efficiency. Scrapping of decommissioned vessels or requiring their commitment to a non-fishing use are often critical elements of a buyback program, and are almost always recommended. In some instances, a limit on fishing time may be required to keep capital and capacity utilization from aggravating the overcapacity and overfishing problem. In some cases, modernization in the form of vessel construction, and hence embodiment of new technology in a new capital stock, is only allowed with the removal of an equivalent amount of fishing capacity as measured by one or more components of the heterogeneous capital stock, such as vessel tonnage or engine power horsepower or kW. Buybacks that facilitate financing vessel replacement and modernization have greater difficulty in achieving capacity reduction.

Sixteenth, buyback programs be evaluated to identify lessons learned that might help improve future programs.²² Planning for such evaluations, including developing measures to evaluate program results, should be an important part of the design of future programs. In addition, develop performance measures for buybacks that relate to program goals and

²² This recommendation draws almost verbatim from GAO (2001, pages 5-6). Kitts and Thunberg (nd) and Kitts *et al.* (1998, 2001) are extremely useful for practical design and evaluation.

broader legislative goals, such as the need to better manage fishing capacity and sustain fish stocks.

9. Concluding Remarks

In sum, buybacks of vessels, licenses, access and other use rights, or gear have been demonstrated to be a useful policy tool in certain circumstances. Although buybacks are not a panacea, buybacks can accelerate the transition to a rationalized fishery managed on the basis of stronger use and property rights and enhanced ecosystem health when coupled with limited access, scrapping of bought-out vessels, and limits on purchases of formerly inactive licenses by owners who have just sold an active license. Co-management through design in partnership with the industry is critical.

Buybacks can be viewed as a strategic policy tool in the transition to longer-term conservation and management built on strengthened use and property rights. Following an effective buyback, buybacks can provide a window of opportunity that help transform behavior from non-cooperative to more cooperative, and replace expensive and often ineffective centralized command-and-control fishery management measures with comparatively more decentralized private incentives for fishers that more closely align with social goals. Fewer numbers of license holders, who are not driven to desperation and immediate short-term behavior by financial losses, can begin to coalesce and to act like *de facto* collective owners of the resource. Dividing the fishery up into smaller units (gears, areas, etc.) to keep the number of players limited contributes in this regard. Self-enforcing voluntary agreements among groups aimed at conservation and management purposes can play an important role and are aided by buybacks, and are increasingly expected in the future when a full property rights approach is infeasible, and in fact, form common use rights.

Left solely to themselves over a longer time period, however, buybacks by themselves do not solve the “race-to-fish” incentives of incomplete use or property rights. Unless specific steps are taken, previously inactive vessels and permits will likely be used and the gains from the buyback eroded. Moreover, continuous, on-going buybacks (facing rising vessel and license prices as expected future resource rent is capitalized in the value of the vessel and license) and automatic attrition through reductions in some specified percent of vessel capacity units with every vessel transfer would need to be a permanent feature. Such continuous structural adjustment counters the on-going increases in fishing capacity as fishers invest and substitute uncontrolled for controlled inputs (“capital stuffing”) and adopt new technology, driven by reinforcement of the incentives of open access over the longer term.

Buybacks of vessels, licenses, and access to modes of fishing may have a special role to play in trans-national fisheries as a strategic policy tool to address overcapacity and potential or actual overexploitation of resource stocks, where use and property rights and international law are not supportive of a stronger use or property right approach, but where limited access is emerging out of customary law. Buybacks can also target methods of fishing with adverse ecological impacts. Self-enforcing voluntary agreements

targeted as specific conservation and management measures, such as incidental bycatch from sets on floating objects, may make a promising contribution if entry and free-riding can be tackled in a satisfactory way. Buybacks can also help set the stage for voluntary agreements. Buybacks also provide a compensation mechanism for those players in the industry that would otherwise lose out from rebuilding fish stocks, addressing ecological issues, and restructuring the industry. Side payments providing compensation, and addressing the asymmetries between coastal states and distant-water fishing nations, are critical to achieve multilateral cooperation and participation in buybacks. Buybacks can also help restructure the industry to satisfy social and ecological objectives.

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