

# Buybacks in fisheries

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### ABSTRACT

Buybacks of fishing vessels, of licences or access and other use rights and of 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 environmental public goods, such as the incidental bycatches of small tunas and species other than tunas when sets are made on fish associated with dolphins or with floating objects.

### 1. INTRODUCTION<sup>1</sup>

Buybacks of fishing vessels, of licences or access and other rights and of gear can be key management tools to address overcapacity, overexploitation of fish stocks and distributional issues.<sup>2</sup> Buybacks can also contribute to a transition from an open-

<sup>1</sup> This paper draws heavily from the papers in Curtis and Squires (in press), especially those of Groves and Squires (in press) and Hannesson (in press). It also draws from those of Joseph and Greenough (1978), Holland *et al.* (1999), FAO (1998, 2000), GAO (1999, 2000), Weninger and McConnell (2000), Joseph (2003, 2005), Joseph *et al.* (2007), Barrett *et al.* (2004) and World Bank (2004).

<sup>2</sup> 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.

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.<sup>3</sup> 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 environmental public goods, such as the incidental bycatches of small tunas and of species other than tunas when sets are made on fish associated with dolphins or with floating objects.

Buyback programmes for vessels and licences 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 salmon troll (licences), Pacific coast groundfish, Texas bay and bait shrimp (licences), 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 licence 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 20 percent. Reid *et al.* (2005) showed that there is more fishing capacity available in tuna purse-seine 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.* (2007) 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 Exclusive Economic Zones (EEZs) of the states adjacent to the resources. In the Atlantic and Indian Oceans and the eastern Pacific Ocean (EPO), nearly half of the catch is taken inside the EEZs, and in the western and central Pacific Ocean (WCPO), more than 70

<sup>3</sup> 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 the 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 Organization for Promotion of Responsible Tuna Fisheries, 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.

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 capacities. Programmes 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, licence 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 licences and relieving pressures on resource stocks, vessel profits and resource rents can potentially rebound, fish stocks can recover and income and wealth distribution can change through redistribution of access and compensation and transfer payments. The objectives of most buyback programmes often include a mixture of all goals, and simultaneous pursuit of these objectives is possible, and not necessarily contradictory. Buyback programmes 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 programmes 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 programmes 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 (EU MAGPs) included rebuilding overexploited fish stocks as one of intentions of the programmes, as did the buyback for the Taiwanese 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 utilized.

A successful buyback can raise profits received by owners of vessels and licences and economic rent to the fishery in the short run. Fewer vessels means that rent is shared among these fewer vessels. Lesser fishing capacity can lead to greater 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.<sup>4</sup> Rents to crew members 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 in 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" (Harden 1968) are not ameliorated, so that further investments are redundant from the perspective of society.<sup>5</sup> In the absence of

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

<sup>5</sup> 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) observed 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) suggested 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.

property rights or taxes, increased resource rent can reinforce the very investment incentives that lead to the initial overcapacity.

Buybacks in transnational 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 transnational fish, vessel mobility across EEZs and the high seas and the different methods of fishing (fishing on tunas associated with dolphins, associated with floating objects or in free-swimming schools), some with incidental takes. Unilateral buybacks of vessels by individual flag states may achieve little or no conservation, because vessels from other 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 buyback programme for the Italian drift gillnet fishery for swordfish (Spagnolo and Sabatella in press). Buybacks in multinational transboundary fisheries instead require a cooperative, multilateral approach, such as the buyback of high-seas tuna longline vessels conducted by Japan and OPRT.

### 3. BUYBACKS AS A TRANSITIONAL STRATEGY

Buybacks may form part of a transitional strategy to a more rationalized fishery—one that is more closely integrated into the rest of the economy. As long as management is based on input controls or total allowable catches (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 transnational 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 helped lay the foundation for a planned programme of ITQs. 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, thereby allowing 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, Gooday and Elliston, 2004). Buybacks can help speed the transition under these circumstances, as in the Australian northern prawn fishery.

### 4. FEATURES OF BUYBACK PROGRAMMES

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

#### 4.1. Critical preconditions

There are several critical preconditions for a buyback of licences or vessels. One of the first steps starts with proper registration of licences and vessels to create a well-defined group of eligible owners and to provide well-defined boundaries to the fishery and the programme. 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 (gross registered tonnage (GRT), gross tonnage (GT), length, fish-carrying capacity) and/or engine power (horsepower or kilowatts), 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 programmes, and there were disparate units of fishing capacity (vessel tonnage and kilowatts), 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 programme in the Taiwanese offshore fishery over 1991-1995 purchased only vessels more than 12 years old (Sun in press).

A second critical precondition of buybacks is *in situ* measures to prevent new vessels from entering the fishery in place of the ones that have been removed. Without a pre-existing programme 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 licences 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 licences and a limit on construction of new vessels, whereby building a new trawler was allowed only if a larger vessel, not less than 120 percent of the new one, was scrapped. The latter reduced the average GRT per vessel, but had less effect on kilowatts per vessel, since the regulation was limited to GRT and not kilowatts.

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 licence and using the proceeds to purchase an existing vessel or licence. If there are permit holders that are 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 could 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 programme was adversely affected by sellers reentering the fishery by purchasing previously inactive licences.

#### 4.2. Who pays for buybacks?

Buyback schemes have been funded largely 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 MAGP has been largely funded by the EU, although various member states of the EU have financed portions of the buybacks. For example, EU funding in France was supplemented by the French government and local communities (regions and departments). 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 programme, 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 licence fees and commercial or government loans. Industry financed 80 percent of the Australian northern prawn buyback programme through commercial loans serviced by levies on remaining fishers (World Bank 2004). The United States Pacific coast trawl vessel buyback programme 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 licence revenues (World Bank 2004). During the early 1980s, fishing vessels remaining in the Japanese longline tuna fleet paid compensation to the owners of the 169 vessels withdrawn (Kuronuma 1997). Eighty percent of the compensation was from government loans to the remaining vessel owners, and the other 20 percent was paid by private funds. In the Texas bay and bait shrimp buyback programme, the cost is borne partially by the shrimp fishery through a surcharge on licences, partially by society through public funds (including federal funds) and partially by the recreational fishery through the increased fee for the salt water fishing stamp.

A commercial fishery-financed buyback finances the programme from the proceeds that are expected to arise following the expected recovery. Such a buyback can be funded initially 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. Non-governmental organizations (NGOs) can finance these programmes through purchases of licences or vessels. The World Bank, Asian Development Bank, Inter-American Development Bank and other such organizations may have an important role providing initial funding for industry-financed buybacks in transnational 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 borrowing by individuals, also spreads the risk among the remaining fishers.

Responsibility for payment can, in principle, be assessed by evaluating the recipients of the buyback benefits and their relative shares of the 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 programme cost that is proportional to the share of existence value in the total economic value.

Another principle that could contribute to payment design is to design the programme 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 programme. When user groups fund all or part of the buyback programme, confronting these user groups with the full costs and benefits of their actions helps to ensure that private incentives are aligned 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 programme.

#### 4.3. Purchase of vessels or licences (permits)?

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

Many vessels hold licences for more than one fishery. If the programme buys back only the licence, the vessel remains free to fish elsewhere, and, in doing so, shifts fishing capacity to another fishery. If the programme buys back the vessel, but not the licence, the licence, if 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 licence is used with a vessel that is more productive than the vessel that was removed.

Purchasing only the licence frequently removes vessels from the fishery that are inactive or that fish infrequently, but which could potentially increase the amount that they fish if the profitability of the fishery increases. 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 tonnage and horsepower were all much less. Inactive or low-activity vessels may have their primary focus on fishing in other fisheries, and be holding licences more as options to fish, and the licence price may fundamentally reflect option value. Purchasing the lowest-priced licences 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 licences affects the long-term effectiveness of the buyback. The long-term effectiveness of a buyback programme can depend upon whether previously inactive vessels or buyback beneficiaries return to the fishery (GAO 1999). For example, the New England groundfish programme purchased 79 vessels, but 62 previously-inactive vessels began catching groundfish, and several participants in the programme used the buyback funds to buy new vessels and return to the fishery.

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

Multiple licences for the same fishery may be held by a single vessel, in which case it would be said that they are “stacked”. When licences are attenuated by limits to capacity, stacking them allows a larger vessel or a greater 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 licence. Rising economic rents following a vessel buyback programme would consequently lead to rising values of the vessel and licence. Purchasing only the vessel leaves the licence as the recipient of any gains in economic rent, reflected by a gain in licence value. Purchasing only the licence 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 licences. There is a trade-off with affordability, since it is less expensive to buy permits. Another factor is whether there is strong spillover 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 programme.

#### 4.4. Voluntary versus mandatory participation

Virtually all licence and vessel buyback programmes have been designed on the basis of voluntary participation. One of the few buyback programmes with mandatory participation was that for the Northern Australian prawn fishery, which was discussed extensively by Holland, Gudmudsson and Gates (1999). In this fishery, fractional

licensing (Townsend and Pooley 1995, Cunningham and Gréboval 2001, Joseph 2005), in which vessels were required to purchase 30 percent of their vessel units from other vessels to remain in the fishery, was used. The Japanese longline buyback programme made provisions for mandatory participation should a sufficient number of voluntary participants fail to materialize, but this provision was not required (Kuronuma 1997).

#### 4.5. Conditions on reuse of vessels, gear or licences

Buyback programmes may place conditions on the reuse of the purchased vessel, gear or licence. One of the most important conditions for vessel buybacks is whether it is required that the purchased vessel be scrapped. If a purchased vessel is not scrapped or sold quickly, then the government incurs maintenance costs, losses due to depreciation in value and possible losses due to sinking, burning or running aground. Vessels that are not scrapped or 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 vessel owners whose vessels were purchased and subsequently transferred. Even if a vessel is not transferred, funds from the buyout might be used to purchase a vessel to be used in another fishery.

In the New England groundfish vessel buyback programme, the vessel owner was required to show that the vessel was being scrapped, had sunk or had been 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 programme participants used the buyback funds to purchase new vessels and return to the fishery. In MAGP I, as in Denmark, France and Italy, the purchased vessels were to be scrapped, transferred to non-fishing uses or transferred outside of EU waters.

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

Some buyback programmes restrict the use of the vessel or licence in another fishery in that country. The Norwegian buyback programme 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 increased.

Under the conditions of some buyback programmes, vessels can convert to another activity or gear. Under the Italian buyback programme for driftnet fishing for swordfish, 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 GRT and the year of participation in the plan, for which the premium decreased if there was late participation. The 129 retirement allowances were greater 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 licences and nets. Those who opted for transfer to another fishery were required to return their nets and driftnet licences. If the converters did not have other extant licences, they were entitled to apply for purse-seine licences or new licences for small-scale fishing gear. Crew members involved in the plan were entitled to receive retirement allowances if they agreed to forgo any fisheries activities or re-conversion allowances if they shifted to other fishing activities involving gear other than driftnets or to other economic sectors.

Some buyback programmes allow the vessel to be exported to another country. The EU MAGP programmes are an example, although vessels under 25 GRT cannot be exported to non-EU countries. The Norwegian buyback programmes 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 programme, 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 and losses due to vessels depreciating in value or sinking. The question as to the alternative use of the vessels that were sold remains.

A programme 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 programme that purchases only the licence does not have to deal explicitly with a bought-back vessel; instead, the decision is retained by the vessel owner, as was the case in the New England licence buyback programme.

#### 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 licences, 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 licences were evidently invested by operators in the capacity of active vessels. In the New England groundfish buyback programme, while 79 boats were sold to the government, 62 previously inactive vessels began catching groundfish after the project began, and several participants in the programme used the buyback funds to buy new vessels and return to the fishery (GAO 1999). The British Columbia salmon troll buyback programme required that a vessel owner replacing an existing vessel with a larger one was required to purchase another licensed vessel of such size that the gross tonnage of the two existing vessels was greater than or equal to that of the replacement vessel.

#### 4.7. Buyback price formation process

An important programme design issue is the price formation process for the vessels, licences, 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 programme 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 programme and how much bids must be beaten by. The programme designers have to decide which approach mobilizes support for the programme, 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 the least cost, such as different metrics as discussed below. Second, the buyback programme may establish an offer price, which vessel, licence, 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 single buyer receives bids from several would-be sellers and chooses the lowest bid, whereas in a standard auction a single seller receives bids from several would-be buyers and chooses the highest bid. Bids are usually sealed. The buyback programme may calculate and offer single-round prices, which asset owners are free to accept or reject. The programme'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 by which the total capacity 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 length, GT, GRT, fish-carrying capacity, revenue or fishing capacity militates against this problem. If licences are for a given category, then the licences 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.<sup>6</sup>

## 5. VESSEL BUYBACKS IN TRANSNATIONAL FISHERIES<sup>6</sup>

### 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 remains largely non-cooperation with regard to fishing capacity. Incentives thus remain to enter the fishery, increase vessel size and adopt technological advances in the race to catch fish. Regulation by TACs and the seasonal closures in the absence of the incentives from well-structured property rights can reinforce this race to catch fish. Prior to the implementation of ITQs in the fisheries of the United States and Canada for Pacific halibut, increasing fishing capacity and decreases in the length of the fishing season in response to this left a remarkably short fishing season in the end.

<sup>6</sup> This section largely draws from Joseph and Greenough (1978), Barrett (2003), Joseph (2003, 2005), Barrett *et al.* (2004), Joseph *et al.* (2007), Curtis and Squires (in press), Groves and Squires (in press) and Hannesson (in press).

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, 2005).

Unilateral buybacks in fisheries exploiting transnational resources simply remove fishing capacity from one country, and 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 for swordfish in the Mediterranean Sea (Spagnolo and Sabatella in press).

The OPRT buyback of high-seas tuna longline vessels in the Pacific Ocean is a second example of a successful buyback in a transnational fishery. Nonetheless, there was some free-riding through expansion of longline vessels by non-cooperating parties in this fishery, which, in turn, militated against some of the gains from the largely unilateral buyback.<sup>7</sup> A 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.* 2007). A 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).<sup>8</sup> 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 in such a way that all countries would prefer that the agreement succeed.

Gains to international cooperation through gains from participation and compliance, while deterring entry and expansion by non-parties, are perhaps the greatest challenges to a buyback programme 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" (Harden 1968).

A buyback programme cannot be successful unless every party is better off with the programme than without it, but to succeed the programme also must ensure that any party would lose by not participating. In other words, free-riding through non-participation must be addressed by some effective means, such as trade restrictions, 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

<sup>7</sup> Joseph *et al.* (2007) observed that Japan has targeted 130 vessels for removal from its fleet, and the Taiwan Province of China has agreed to limit its fleet to 600 vessels. The latter 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.* 1999).

<sup>8</sup> Virtually all processing of Pacific fur seal skins took place 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 2003: 36). The treaty also allowed the signatory countries to seize a violating vessel of another signatory country and deliver it to the authorities of the country in which it was registered, who were bound by their own domestic laws to tackle the issue.

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 registration can be defined either in terms of the individual vessel or the flag state. In other words, what is the basic unit in the programme, flag states or vessels, with their associated measures of fishing capacity (potential output, GRT, fish-carrying 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? The Inter-American Tropical Tuna Commission (IATTC) developed its Regional Vessel Register, incorporating the concept of transferability, but there has been reluctance on the part of some states to recognize this provision of the programme. Strictly on the grounds of economic efficiency, a limited access and vessel buyback programme defined solely in terms of vessels, rather than flag states, can be expected to lead to greater economic rents and healthier overall 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.<sup>9</sup> Potentially viable limited entry and buybacks must allow for the increases in numbers of vessels and expansion of fishing capacity by coastal states, a measure taken into account 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.<sup>10</sup> This provision also reflects an implicit agreement about use and property rights, beginning a transformation from open access to common property.<sup>11</sup> This provision ensures that the countries that might otherwise lose, instead gain, by participating. Side payments help ensure that each country would lose by not participating, given

<sup>9</sup> Joseph *et al.* (2007) 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.”

<sup>10</sup> Side payments have both distributive and strategic functions in conditions of asymmetry in international environmental agreements (Barrett 2005). 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 ensure that nations that would otherwise lose, instead gain, by participating. Side payments redistribute the additional gain from cooperation and help guarantee that all parties are at least as well off as before cooperation.

<sup>11</sup> Open access is a form of property right, but one 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 of the IATTC. The common “ownership” is due more to custom than to 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 credible threats, apply only to group members, and not to non-members). Baland and Platteau (1996) provide considerable discussion on this general topic, and they make it 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.

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.

Several forms of side payments are possible, including provision for room to grow for coastal states, decommissioning part of the capacity of distant-water fishing fleets and assessing distant-water fishing fleets at a higher rate than coastal fleets in industry-financed buyback programmes. As with the Montreal and Kyoto Protocols, side payments can be made for technology transfer, or multilateral funds can be used 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 fish-carrying capacity (Joseph *et al.* 2007). New entrants can purchase or lease this capacity, with the proceeds accruing to the coastal states. Alternatively, a limited percentage of licence 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 programme, for which 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 a distant-water state. In other words, 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.

Illegal, unregulated and unreported (IUU) fishing can also undermine the effectiveness of any buyback programme 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 uncooperative nations reap the external benefits flowing from the sacrifices of cooperating parties, *i.e.* there is free-riding, and the transnational externality remains.

#### 5.4. Limited access: a critical precondition for buybacks

The ability to legally deter free entry into a 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 registers in the Commission for the Conservation of Southern Bluefin Tuna (CCSBT), the IATTC, the International Commission for the Conservation of Atlantic Tunas (ICCAT) and the Indian Ocean Tuna Commission (IOTC).<sup>12</sup> Joseph *et al.* (2007) observe that, "... 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."

<sup>12</sup> 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 establishes a limit of 205 purse-seine vessels that will be licensed by the parties for fishing in their EEZs. The majority of the catch of tunas from the area is taken in the EEZs of these eight members.



The IATTC register goes a step further with a moratorium on fleet growth through numbers and carrying capacities of vessels, where expansions by coastal states are allowed in the IATTC programme. 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 for transfers of existing vessels to other parties, which provides opportunities for states desiring to acquire fleets, but the capacity quotas remain vessel-specific (new quotas are allocated only when vessels are retired).<sup>13</sup> Such a register essentially places a moratorium on fleet growth in vessel numbers and carrying capacity. 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 penalties to be paid. Most importantly, perhaps, there is no mention of whether and how the rules are to be enforced if they are not followed by non-cooperating parties.

In effect, implicit recognition is growing that treaties are weak instruments for limiting transnational 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 programmes 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, *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.<sup>14</sup>

Qualification for eligibility in a regional vessel register 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 that 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 from entering a fishery 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—licences and capacity units—from existing participants, can provide a decentralized mechanism to facilitate new entry or expansion by current

<sup>13</sup> Joseph (2005: 292-293) observes, "The RVR [regional vessel register] 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."

<sup>14</sup> As Baland and Platteau (1996) make clear, rights-based management not only entails only 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 it clear that commonly-held resources with effective management can lead to fully efficient resource exploitation.

participants. Such market mechanisms are most efficient when licences and capacity units are not tied to flags. If this feature of transferability were not retained, the effectiveness of the system would weaken, and there would be less economic efficiency than would otherwise be the case. 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 the CCSBT, the IATTC and ICCAT allowing for trade restrictions, but only among member countries. The IOTC requested that 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 flags to vessels that had been involved in IUU fishing unless the ownership of the vessel had changed (Joseph *et al.* 2007).

### 5.5. Financing the buybacks

Buybacks within regional vessel registers 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, it and other major international financial institutions could support buybacks of surplus vessels through broad-sector instruments, such as Sector-Wide Approach programmes (SWAPs), Poverty Reduction Support Credits (PRSCs) or perhaps even the Global Environmental Facility (GEF) (World Bank 2004).

Buybacks aimed at protecting ecosystem health (environmental 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 subsidies contributed to the overcapacity problem, government subsidies may be called for, in part, to correct this problem. As the fleet was reduced towards the target size, the average catch per vessel would increase and profits would rise, so that the industry can better fund the buybacks. 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 buybacks 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 allocation of the tax among these groups. The assessments and development of a pool of buyback funds would be region- and gear-specific.

Recreational fishers could also be expected to contribute to financing the buybacks, 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 in press).

### 5.6. Other issues

In addition to limited licences and access, still another critical precondition in transnational 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.* increasing GRT and engine power when vessel length is limited) and accelerated adoption of technical advances (*e.g.* improved electronics or fishing for fish associated with fish-aggregating devices (FADs)). 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 licence 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 transnational externality, which has implications for buyback programmes. In the Pacific, the IATTC and the Western and Central Pacific Fishery Commission (WCPFC) manage the highly-migratory species in the eastern and the western and central Pacific Ocean, respectively, and yet uncertainty remains as to whether there are biologically distinct stocks of fish in the different jurisdictions. Coordination is therefore required between the two regional fishery management organizations. Buyback programmes in one part of the Pacific might, in principle, remove only some of the fishing capacity creating fishing mortality on common resource stocks. More critically, vessels harvesting highly-migratory species are highly mobile, and readily travel 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 change their flags. 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.<sup>15</sup> In other words, prices formed in one part of the world either follow or lead prices in other parts of the world. Hence, buybacks intended to lower fishing capacity, and thus catches of highly-migratory species, to increase ex-vessel prices and revenues must contend with a global market in which ex-vessel prices are influenced globally, rather than an isolated regional market.

## 6. BUYBACKS TO ADDRESS ENVIRONMENTAL 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 ensure 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 tunas associated with dolphins to harvest the larger yellowfin tuna (*Thunnus albacares*), some vessels set on free-swimming schools of tunas and some vessels set on tunas associated with flotsam and FADs. Sets on dolphins incidentally surround dolphins in the nets (although practically all of these are released unharmed). Sets on flotsam and FADs, which target skipjack tuna (*Katsuwonus pelamis*), incidentally harvest small yellowfin and bigeye (*Thunnus obesus*) tunas, leading to discards, and a wide range of non-target species, including billfishes, sharks, mahi-mahi (*Coryphaena* spp.), wahoo (*Acanthocybium solandri*) 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 improve ecosystem health, but the amount of reduced overall fishing capacity may be insufficient to fully address this environmental 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 environmental issues. Historically, economic incentives to address environmental 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. The owners of vessels might accept payments for the vessels to refrain from fishing—their

<sup>15</sup> Formally, the spatial linkages of ex-vessel markets for tunas and swordfish set the conditions for pecuniary externalities

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, and used for buybacks 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, mortality in excess of the DML, costs the vessels forgone revenues from forgone catches 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.

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

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 Miceli 1998, Segerson and Dawson 2001, Segerson and Wu in press).<sup>17</sup> 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 must be addressed.

The voluntary Agreement for the Conservation of Dolphins ("the La Jolla Agreement") of 1992, which established the International Dolphin Conservation Program, helped conserve dolphins, and established use rights in the form of Dolphin

<sup>16</sup> GAO (2001: 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."

<sup>17</sup> Voluntary agreements: encourage pro-active cooperative approaches 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 Miceli 1998).

Mortality Limits (Headley 2001).<sup>18</sup> Self-enforcing group voluntary agreements are 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 programmes.<sup>19</sup> Again, compensation for some or all of the reduced 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. Financing can come from governments or international organizations to reflect the public's "existence value" for environmental public goods. Buybacks contribute by reducing the numbers of vessels and strengthening the profitability of the fishery.

As a variation, a possibility adopted from the British Columbia Mifflin Plan is possible (*cf.* Grafton and Nelson in press). 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 and flotsam fishing. A vessel licence holder would then be required to select one area, with the licence being good for that area only. The scheme would permit licence holders to purchase licences from other holders. In so doing, the purchaser would be enabled to fish in additional areas, or with other 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 licence from the owner of a purse-seine vessel harvesting in the area with FADs and flotsam. The purchaser could then fish in both areas. Capacity is reduced because the seller's purse-seine vessel is removed from the fleet, with the "stacking" of the two licences onto one vessel. Dividing the fishery into smaller areas and gear groups helps limit 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 programme.

The buyback programme 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 programmes include the Conservation Reserve Programme of the United States Department of Agriculture, Wetland Reserves and Nature Conservancy reserves, and New York City's purchase of watersheds in the Catskill Mountains (Heal, 2000). While property rights are often required on land, a limited access programme with spatial and/or temporal dimensions restricting use rights could serve a similar role.

<sup>18</sup> DMLs are use rights allocated to nations and, subsequently, to vessels. These use rights are not transferable, provide exclusive use by a vessel for 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 in February 1999.

<sup>19</sup> For example, Hall (1998: 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."



## 7. ISSUES FROM AN INDUSTRY PERSPECTIVE

From an industry perspective, whatever programme is put together must make sense to the participants. This is a particularly important issue if the buyback programme is industry initiated and financed. The participants must buy in and understand that a buyback programme must take place.

Industry support requires finding a champion, because leadership is required to bring a buyback programme to fruition, particularly if the programme is industry-financed. Such a focal person helps to ensure 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 programme administrators.

Dealing with non-supporters throughout the process is an important leadership element in any buyback programme, since not everyone will agree with the programme. Some non-supporters will become deterrents. Non-supporters can come from the fishery in question or from people outside of the industry who are sincerely opposed to such an approach.

Flexibility is required throughout the process, since the unexpected will inevitably arise. This flexibility may require retracing steps, or even starting all over. Fishers and governments must support the buybacks and must realize that change must 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 programmes for vessels and licences offers the following lessons (Curtis and Squires in press).

*First*, and one of the most important lessons, it is much easier and less expensive to prevent overcapacity and overfishing than to initiate an *ex-post* reduction.

*Second*, there are several critical preconditions for buyback programmes to be effective. Proper registration of licences and vessels creates a well-defined group of eligible owners, and provides well-defined boundaries to the fishery and the programme. Limited access is another critical precondition. Unless entry is deterred, the conditions for free-riding will be established. Vessels will enter the fishery as profits rebound following the capacity reduction induced by buybacks, and fishing capacity will increase.

*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 on 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 programmes can be seen as an important strategic tool, because to induce a change in behavior requires a change in incentives. In other words, 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 are more closely aligned with social goals of reduced capacity, reduced fishing mortality and lessened environmental damage.

Buybacks accelerate this transition and restructure incentives and relations among participants by improving 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 to the programme and to most enjoy the growing cooperation and more favorable attitudes towards 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 uncooperative to cooperative.

Ultimately, because buybacks do not change the underlying property rights, buybacks in and of themselves do not, 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.

There are several different ways to induce change through the choices that are made for the design of a buyback programme. 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 the behavior of the remaining participants, and even the decision as to who chooses to stay in the fishery and who chooses to leave it through participation in the programme.

Linkages of programme design features can also be a strategic choice. For example, requiring that the purchased vessels be scrapped or preventing the 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 the 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 programme increases the chances for success. Consultations and workshops with user groups help design better programmes, prepare the user groups for the buyback and 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; the buyback facilitates and accelerates their exit, and at a higher purchase prices than would otherwise have been the case. The purchased vessels or licences may also have been among the least active ones, in which case the buybacks would have had little effect in improving economic performance and helping the 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 programme design issues. Nonetheless, clear objectives and a clearly-defined scope of the programme are critical. A pilot programme can also be helpful. One or more champions—individuals, organizations or public agencies—can play an important galvanizing force.

*Seventh*, decisions must be made as to whether to first purchase active or inactive vessels or permits or both. Purchasing inactive vessels and/or permits is cheaper, and 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 and any spillover effects on other fisheries.

*Eighth*, the beneficiaries of a buyback programme can contribute to the funding of the programme, all or in part. Commercial fishers can enjoy increased profits, recreational anglers can benefit from higher catch rates and the general public and NGOs can gain from non-market benefits, such as increased 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 transnational 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 licences or entrance fees to marine parks, and landings taxes, so that those enjoying the greatest revenue and revenue increases bear the greatest financial responsibility. Public funding without repayment from rent increases is ultimately a transfer payment, which can be capitalized into licence 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 programme? Capacity is usually purchased through vessel, licence or gear bids and reverse auctions, and often on the basis of some metric of fishing capacity, such as dollar bid offered per GRT, horsepower, revenue, catch, fish-carrying capacity, length, *etc.* 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 in the fishery. Irrevocable bids prevent “stink bids”, in which speculators bind up a large proportion of the available funds. The programme 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 and coastal states and shifting capacity regionally, by gear type, or between commercial and recreational fishers. Buybacks provide a compensation mechanism for those in the industry who would otherwise lose out from rebuilding fish stocks and restructuring the industry. Buybacks have different impacts on gear types or regions, but maintaining an equitable allocation of harvests among gear types or regions helps ensure political support.

*Eleventh*, buybacks have been focused largely 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 that they can target selective areas or times fished, gear types or modes of fishing, buybacks can provide a tool towards restoring ecosystem health. For example, the creation of marine reserves without removing overcapacity, and especially displaced fishing capacity, simply bunches capacity upon 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 bycatches.

*Twelfth*, buybacks for fisheries exploiting transnational resource stocks are unlikely to be effective without a coordinated management effort among the countries contributing the bulk of the fishing capacity; unilateral buybacks, in contrast to multilateral buybacks, eventually face failure. Buybacks in transnational fisheries must also deter new entrants other than through purchase of licences, which requires changes in, at a minimum, customary international law. Allowing capacity to transfer among individual owners, rather than restricting them to flag states, allows more efficient capacity reduction. Coastal states, when resource stocks span both EEZs and the high seas, are typically afforded special accommodation for growth, which can represent a side payment and strategic choice.<sup>20</sup> 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 programmes usually represent only a second-best outcome. They alone are not the long-term solution to the overcapacity and overfishing problem in an open-access, or even a limited-entry, fishery, although they may be the best solution available in the foreseeable future for transnational and other fisheries. The

<sup>20</sup> Similar issues arise with atmospheric concerns, such as greenhouse gasses and the Kyoto Protocol, and ozone-depleting chemicals and the Montreal Protocol (Barrett 2003, 2005).

underlying ill-structured property rights that create incentives for overfishing 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 reinvested (unless there is a strict prohibition against that). 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 addresses primarily 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, in which case the capital stock of the remaining vessels may be more fully utilized and fishing capacity increased by fishing longer or technology, such as the addition of vessel electronics, may progress. 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 remain.

*Fifteenth*, the long-run success of buyback programmes as a programme 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 that have been bought out, by owners who have just sold an active licence and purchase a remaining, but inactive licence, entering other fisheries with overcapacity, new entrants, new investment in remaining vessels and increased fishing by relatively inactive vessels and licences. 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 programme, 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 allowed only 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 kilowatts). Buybacks that facilitate financing vessel replacement and modernization have greater difficulty in achieving capacity reduction.

*Sixteenth*, buyback programmes be evaluated to identify lessons learned that might help improve future programmes.<sup>21</sup> Planning for such evaluations, including developing measures to evaluate programme results, should be an important part of the design of future programmes. In addition, performance measures for buybacks that relate to programme goals and broader legislative goals, such as the need to better manage fishing capacity and sustain fish stocks, should be developed.

<sup>21</sup> This recommendation draws almost verbatim from GAO (2001: 5-6). The papers of Kitts and Thunberg (no date) and Kitts, Thunberg and Robertson (1998, 2000) are extremely useful for practical design and evaluation.

## 9. CONCLUDING REMARKS

*In sum*, buybacks of vessels, licences, 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, they 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 licences by owners who have just sold active licences. 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, they can provide a window of opportunity that helps transform behavior from uncooperative to more cooperative, and replace expensive and often ineffective centralized command-and-control fishery management measures with more decentralized private incentives for fishers that are more closely aligned with social goals. Lesser numbers of licence 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 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. These are expected to increase in the future, when a full property-rights approach is infeasible, and, in fact, to form common-use rights.

Left solely to themselves over a longer time period, however, buybacks by themselves do not solve the “race-to-catch-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 buybacks eroded. Moreover, continuous, on-going buybacks (facing rising vessel and licence prices as expected future resource rent is capitalized in the value of the vessel and licence) 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, licences, and access to modes of fishing may have a special role to play in transnational fisheries as a strategic policy tool to address overcapacity and potential or actual overexploitation of resource stocks, for which use and property rights and international law are not supportive of a stronger use- or property-right approach, but for which 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 players in the industry that would otherwise lose out from rebuilding fish stocks, addressing environmental 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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## Methodological Workshop on the Management of Tuna Fishing Capacity

Stock status, data envelopment analysis,  
industry surveys and management options

8–12 May 2006

La Jolla, California, United States of America

These Proceedings include the report and papers presented at the Methodological Workshop on the Management of Tuna Fishing Capacity – Stock status, data envelopment analysis, industry surveys and management options, which was hosted by the Inter-American Tropical Tuna Commission in La Jolla, California, United States of America, from 8 to 12 May 2006. It also contains a statement prepared by the participants and presented at the Meeting of Tuna Regional Fisheries Management Organizations held in Kobe, Japan, in January 2007.

The purpose of the workshop, organized in collaboration with tuna agencies and programmes, was to develop quantitative methods to determine the desired magnitude of or desired change to fishing capacity on the basis of the status of stocks. The outcome of the workshop is relevant for the work of these organizations and their member countries, providing technical assistance in managing tuna fishing capacity.

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