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Dolphin Bycatches in Tuna Fisheries: A Smokescreen Hiding the Real Issues?

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The taking of dolphins in tuna fisheries has attracted a lot of attention in both law and science. The problem assumed international significance in the wake of the two General Agreement on Tariffs and Trade (GATT) panels on imports of tunas. This article addresses the issue of incidental bycatch in fisheries generally and avers that dolphins are but one of the numerous species that are taken incidentally in commercial fisheries. It argues that the bycatch problem should be approached from a broader perspective that takes into account whole ecosystems and diverse interests in fisheries. It then posits possible ways of encouraging more selective fishing techniques that minimize overall bycatches.

Keywords dolphins, Eastern Tropical Pacific, incidental bycatches, marine environment, tunas

The association between dolphins and tunas has come under close scrutiny in the past decade at the international level. This can be explained principally by a keen interest of the United States in this issue, led by a strong environmental constituency. The tuna/dolphin problem has highlighted political and commercial conflicts in the fisheries around the world, and became an object of international diplomacy after it surfaced in the context of the General Agreement on Tariffs and Trade (GATT) dispute resolution mechanism on two occasions.¹ It must be noted, at the outset, that the internationalization of the problem stemmed mainly from a domestic concern with the protection of marine mammals that already had led the United States to take a lead in the struggle to achieve an international moratorium against the taking of whales in the International Whaling Commission²

The by-catch of dolphins in tuna fisheries must be understood against the background of the importance of fish to humankind. Fish constitute an important source of livelihood for numerous people, mostly in developing countries.³ Small-scale fishermen account for about a fourth of the world's fisheries output and for a third of all fish destined for human consumption. Fish also provide an important source of protein worldwide and account for as much as 50% of the total protein intake for hundreds of millions of people around the world.⁴ Another point to consider is the divergence of interests between commercial and subsistence fisheries. Commercial fisheries usually

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operate larger boats that can both catch more fish and go further out to sea, whereas subsistence and artisanal fisheries operate on a smaller scale, closer to the shores. There are, however, interactions between the two; they might, for instance, compete for the same fish stocks in a given area.

The other distinction between commercial and subsistence fisheries lies in their different environmental impacts. Commercial fisheries tend to use types of fishing gear that are much less selective than those used by small-scale fishermen and that occasion much higher bycatches and discards that have a significant impact on the marine environment. Moreover, all fishing activities have a direct impact on the sustainable management of fish stocks and global equilibria in marine ecosystems. For this reason, the authors are concerned mainly with commercial fisheries whose overall catching capacity has risen tremendously over past decades, owing both to improved fishing gear and an increase in the number of boats. This expansion of the industry has raised concerns both about the sustainability of many fisheries and about discards. A comprehensive study of the sustainable management of fisheries around the world calls for consideration of the interests of trade vis-à-vis those of satisfaction of basic needs.

Bycatches and Fisheries: An Overview

Major Issues

Importance of Fisheries Worldwide. Fisheries today constitute a major industry in all regions of the world. In all coastal areas, a sizable part of the population often depends in one way or another on the fishing industry, and fish constitute an important component of the usual diet.⁵ Most fish caught in coastal areas are consumed fresh in the vicinity. However, in developing countries fish provide an important share of animal protein for a majority of the population, whether they live by the sea or not.⁶

In the case of highly migratory species such as tunas,⁷ local and subsistence fisheries are not the major players in the industry because such fish often are caught at great distances from shore. Commercial boats that can operate both in exclusive economic zones (EEZs) and on the high seas beyond EEZs thus have a major stake in these fisheries. The international trade in fish and fish products is dominated by the developed countries, with developing countries gradually increasing their exports of fish to the former's markets.⁸ This increased internationalization of the fish trade has led to a need for the consideration of interests of commercial and subsistence fishermen.

Overall Incidental Bycatches. Commercial fisheries tend to use fishing gear that is relatively nonselective; therefore, their catches include numerous animals that are not of the target species and will be discarded. Overall, it is estimated that about a third of all landings are discarded and that bycatches of finfish amount to 27 million metric tons annually.⁹ Bycatches include immature fish of the target species and nontarget species, including finfish, marine mammals, seabirds, and turtles. All of these individuals usually will be discarded, even in cases where they have commercial value in other fisheries.

All commercial fisheries take bycatches to varying extents. Shrimp fisheries seem to have the highest bycatch rate overall, discarding, in the worst case, as much as 14.71 kilograms of bycatch for each kilogram of shrimp taken.¹⁰ Shrimp trawls account for 37.2% of global commercial fisheries' discards and thus represent the most wasteful segment of the industry.¹¹ On the other hand, drift nets and purse seines have been found to be relatively more efficient at minimizing bycatches.¹²

Tuna fisheries do not result in the bycatch of dolphins only. The majority of their discards are comprised of different finfish species, such as sharks, billfish, squids, rainbow runners, mahi-mahis, triggerfish, rays, and wahoos. In addition, turtles are caught in large quantities in fish trawls,¹³ marine mammals such as sea lions and seals also are entangled in nets in significant numbers, and seabird casualties can be quite high.¹⁴

Importance of Tuna Fisheries. Tuna fisheries constitute one of the most important commercial fisheries around the world, and tunas are one of the main highly migratory species caught on a large commercial scale. The main commercially valuable species of tuna are the albacore, bluefin, yellowfin, and skipjack: They are used mainly for canning and sashimi. For the most part, tuna stocks have not been overexploited, in part because of their high fecundity.¹⁵ Some scientists argue, for instance, that yellowfin catches in the Central Pacific could be doubled without jeopardizing the stability of the stock.¹⁶ However, the western Atlantic bluefin has been overharvested to the point of being severely depleted, and restrictions put in place have not succeeded in restoring the population to an optimal level.¹⁷

The Eastern Tropical Pacific (ETP) tuna fishery has been the focus of most attention because of the close association between yellowfin tunas and dolphins.¹⁸ It is noteworthy that the ETP tuna fishery is the most important fishery in this region¹⁹ and one of the most important tuna fisheries in the world, with a 25% share of tuna catches globally.²⁰ Sustainable management of the fishery therefore is of crucial importance, since closing down the fishing operations, as some environmentalists have proposed, would affect a substantial number of people whose livelihoods depend on ETP fish supplies.²¹

Ecological Impact of Fisheries

Impact on Ecosystems. All fishing activities have an impact on marine ecosystems. Interferences include the generation of marine debris, discarded or lost nets that drift at sea entangling more animals, and wastes from discards.²² Fishing, even on a small scale, disturbs natural equilibria. Though fishing is accepted as being necessary insofar as it constitutes an important part of the human diet, the sustainability of fishing activities should be taken into account in order to avoid overfishing. Overfishing of target species can render target and nontarget species more vulnerable, because the equilibrium between predators and their prey is disturbed. Bycatches cause further negative effects on the environment, such as when individuals removed from the sea are returned to the sea dead.

Dolphin Bycatches. The issue of dolphin bycatches in tuna fisheries arose from the biological link between them, mainly in the ETP.²³ Dolphins and tunas are known to swim together in schools, and the frequent surfacing of dolphins for breathing helps fishermen to locate tunas. This link exists chiefly between the yellowfin tuna and Spotted, Spinner, and Common dolphins in the ETP.²⁴ Moreover, it is mostly mature yellowfins that swim with dolphins because smaller fish cannot follow the dolphins' pace. It is not well known why these species congregate, but it has been contended that they might share a common food source and that, besides the benefits of schooling, the association may provide enhanced protection against mutual predators.²⁵ On a global level, dolphins are caught in association with tunas in only about 25% of the fisheries, but this proportion increases to about 70% for yellowfins in the ETP.²⁶ The problem, however, is not limited to tuna fisheries: Dolphins account for part of the bycatch in almost all of the world's purse-seine fisheries.²⁷

Until the 1950s, tunas were caught almost exclusively with the use of the pole and line method from small boats.²⁸ This eventually led to a stagnation in tuna catches because of the intrinsic limitations of this method. The introduction of nylon nets allowed for the manufacture of much larger nets, which led to the development of purse seines. Purse seines helped fishermen to take advantage of the close relationship between tunas and dolphins, and led to the development of a technique known as "dolphin fishing," where the net is set on schools of tunas found close to the dolphins.²⁹ This resulted in increased catches of yellowfin tunas and, at first, high incidental mortality of dolphins caught in nets.

In the 1950s and 1960s, bycatches of dolphins amounted to several hundred thousand dolphins per year. Due to subsequent technological improvements and regulatory action both in the United States and internationally, mortality dropped dramatically to 3,600 in 1993. This figure went up to 4,095 in 1994 (a 14% increase from the 1993 level), owing to one disaster that raised mortality significantly.³⁰ Among organizations involved in the attempts to stem dolphin mortality, the Inter-American Tropical Tuna Commission (IATTC) and its member states played a significant role, together with the U.S. National Marine Fisheries Service (NMFS). It must be noted that the United States was once a dominant player in this industry, but its share dwindled rapidly after the end of the 1960s. It is against the background of a dwindling U.S. fleet, influenced partly by the rapid development of tuna fisheries in Latin America, that the dolphin issue began acquiring international prominence.

The Marine Mammal Protection Act (MMPA) of 1972 established a moratorium on the taking of marine mammals, subject to certain exceptions, one of which authorized the issuance of regulations and permits allowing for the taking of nondepleted marine mammals incidental to commercial fishing operations.³¹ On the basis of these regulations and general permits, the American Tunaboat Association was authorized to continue taking dolphins in the ETP tuna fishery. Subsequent reauthorizations set maximum permissible limits of marine mammal takings by U.S. tuna fishing operations. To ensure that U.S. fishermen would not then be at a comparative trade disadvantage, import restrictions were put in place against countries whose marine mammal taking limits were 1.25 times the maximum permissible limits under the MMPA.³²

Alongside dolphin fishing, other fishing methods that have been used to catch tunas with purse seines are school fishing, which relies on the sighting of tuna schools swimming sufficiently near the surface to be seen from the boats, and log fishing, which relies on the aggregating power of floating objects that attract different species of fish. The major disadvantage of dolphin fishing is the high incidental taking of dolphins. However, since only large tunas are capable of swimming as fast as dolphins, the catch will consist mainly of mature tunas. In school fishing, no dolphins are caught, but the catch consists mainly of small tunas that swim closer to the surface than the more mature ones.³³ In log fishing, the overall bycatch is significant because different species of marine living resources are attracted by logs. Therefore, of the three fishing methods, dolphin fishing occasions the fewest overall bycatches, catches the biggest tunas, and results in an overall catch rate 55% higher than other methods.³⁴ Moreover, both log and school fishing tend to catch small, sexually immature tunas that often will have to be discarded for legal or other reasons, whereas dolphin fishing catches hardly any small tunas. Thus, from an ecological point of view, dolphin fishing should not be discarded as wasteful and destructive.³⁵

In addition to purse seine fishing, commercial tuna fisheries also rely on longline fishing. This method is used especially for bigeye tunas that are sold mainly on the sashimi market. Longline fishing results in catches of large fish, but leads to lower catch

rates because it targets individual fish as opposed to schools of fish. It nevertheless is commercially valuable, because Bigeye tunas command a much higher price than other species of tunas. Even though this method is much more selective than purse seines, it is not totally devoid of bycatches.³⁶

It should also be noted that, for the most part, the dolphin species involved in these tuna fisheries are by no means endangered or threatened.³⁷ In 1992, for instance, out of more than 9 million dolphins (estimated) swimming in association with tunas, only 15,539 were killed in tuna fisheries. For all the stocks involved, the bycatch rate amounted to less than 0.15%, whereas the recruitment rate is believed to be around 2%.³⁸ On the other hand, some other marine mammal species found on the West Coast of the United States are known to be endangered and deserve closer attention.³⁹

International Legal Framework Governing Bycatches in Tuna Fisheries

International law has not paid a great deal of attention to bycatch issues apart from a few specific instances, such as the tuna/dolphin association and, more recently, large-scale drift nets. Overall, when bycatch issues have been considered, the approach usually has been on a species-by-species basis without considering whole ecosystem sustainability. The 1982 UN Convention on the Law of the Sea (LOS) does consider "dependent" and "associated" species; it is unclear what these terms encapsulate, but it is not likely that they were intended to cover all bycatches.⁴⁰ At the institutional level, most fisheries' organizations have been concerned mainly with the allocation of catch quotas. Moreover, these organizations often have been set up to oversee the management of target species without taking into account other factors, such as the balance within the ecosystem and the impact of discards in particular.⁴¹

Dolphin bycatches have been addressed principally in the La Jolla Agreement of 1992, signed by the members of the IATTC, which calls for a progressive reduction of mortality to zero in ETP tuna fisheries.⁴² It also calls for the maintenance of optimal utilization and conservation of the tuna resource, 100% observer coverage, research programs to improve and modify existing fishing gear and techniques, and training to improve operator performance throughout the fleet. However, the La Jolla Agreement, which is voluntary and nonbinding, focuses exclusively on dolphin protection and does not even mention other issues related to bycatches. Latin American countries have threatened to withdraw from the agreement because of restrictions they face in marketing their tuna in the United States, despite the significant decline in dolphin mortality. The San José Declaration of July 1995, which was signed by a number of Latin American countries, recognizes that the incidental taking of marine mammals is only one of the bycatch issues to consider and that fishing techniques must be chosen according to their overall impact on the ecosystem.⁴³ It accordingly provides that "setting on dolphins is the most effective method of protecting the biodiversity and the marine ecosystems of the eastern Pacific Ocean."⁴⁴

The Panama Declaration that was signed in October 1995 by many states with fishing interests in the ETP, including the United States, seeks to build on the achievements of the La Jolla Agreement and to avert the potential defections of dissatisfied Latin American states. Though its main concern is to stabilize dolphin mortality, it also addresses the issue of the minimization of bycatch of nontarget species.⁴⁵

The IATTC is the principal international monitoring organization for the management of tuna fisheries in the eastern Pacific Ocean.⁴⁶ When the United States raised concerns about the high mortality of dolphins, the IATTC was charged with the respon-

sibility of monitoring the incidental mortality of dolphin stocks and introducing measures to reduce the level to a minimum.⁴⁷

At the global level, it is noteworthy that the 1992 "Earth Summit's" Agenda 21 recognizes the need to promote the development and use of selective fishing gear and practices that minimize wastes in the catch and bycatches of nontarget species both in the high seas and in areas under national jurisdiction.⁴⁸ The new 1995 agreement on the implementation of the LOSC provisions relating to the management and conservation of straddling and highly migratory fish stocks has taken a step toward recognizing the need to minimize bycatches of fish and nonfish species and associated discards.⁴⁹ Other examples include the Convention on the Conservation of Antarctic Marine Living Resources, which provides for the consideration of the likely effects of proposed harvest levels of the target species on nontarget species and on the marine ecosystem as a whole.⁵⁰ The 1995 Food and Agriculture Organization of the United Nations (FAO) Code of Conduct for Responsible Fisheries also points to the need to ingrain the concept of responsible fishing through the design of fishing gear and practices that ensure sustainability and promote the use of selective gear and minimization of bycatch of nontarget species.⁵¹ The problem of large-scale drift nets also has been considered in some detail in the international arena, although the main legal output of this has been a series of UN General Assembly resolutions.⁵² It is noteworthy that, here again, the international community has not concentrated on the crux of the matter. If the problem of bycatches has indeed been addressed in this context, it must be remembered that drift nets are among the least damaging gear in terms of overall bycatches and that this sudden international concern has been driven mainly by political and commercial motives, not by the genuine desire to tackle the overall bycatch problem.⁵³

Why a Smokescreen?

Environmental Perceptions of Marine Mammals Versus Ecosystems

Marine mammals, and dolphins in particular, have received a great deal of attention from environmentalists, politicians, and the general public. This interest can be explained by several factors. People usually can relate better to other mammal species than to other animals. Mammals such as dolphins also allow for a direct interaction between humans and the animals that promotes a sense of friendship, somewhat similar to feelings people can have toward cats and dogs. In addition, dolphins are held to be among the most intelligent animals on earth, together with a few species of monkeys and other marine mammals. All of these characteristics, to which must be added a charisma arising from a certain photogenic character, have made dolphins one of the favorite targets of environmental conservation groups in the developed world. Conservationists' efforts have led the American public to perceive the killing of any dolphin as fundamentally wrong. It is from this point of departure that the U.S. insistence on reducing bycatches to zero should be understood. The success of this campaign also can be explained partly by the fact that, in industrial countries in general, the link between the sea and consumers is more remote than in developing countries.⁵⁴

Overplaying Dolphin Bycatches

As noted above, even an incidental taking of a few thousand dolphins is rather insignificant biologically, since it does not threaten the viability of the stock and it is much

below their recruitment rate. In this sense, dolphin bycatches do not any longer constitute a conservation issue.⁵⁵ Furthermore, bycatches of marine mammals other than dolphins, some of which are threatened or endangered, frequently occur alongside incidental takings of other marine living creatures.⁵⁶

Once it has been acknowledged that dolphins do not warrant any special conservation measures simply because some are killed each year, the ecological value of saving one dolphin must be ascertained. Another question to be answered is whether or not such a value justifies the taking of a number of individuals of other species living in the same environment. Since the prohibition of dolphin fishing would force fishermen to concentrate on other fishing methods that would result in much higher overall incidental takings, it must be proved why and how a higher value can be put on dolphins than on other species in a given ecosystem. Current policies seem to place an infinite value on dolphins in total disregard of all other species. The emphasis on log fishing, as an alternative to dolphin fishing, illustrates this trend.

The role of dolphins in marine ecosystems is not well known, and the rationale for granting them differential treatment from other marine living species has no sound scientific basis. Since the number of catches has already reached a level at which the stability of the stock is not in question, attention should be centered on other components of the marine environment. This would foster an ecosystem approach to the preservation of marine living resources, as opposed to a species-by-species approach.

Doctrinal Neglect of Other Issues

Commentators usually have focused on issues relating to the exploitation of different marine living resources without considering potential side effects. Optimizing exploitation has proved to be an overriding concern in fisheries management. The few issues that have gained prominence in the international arena have included high profile and charismatic marine mammals, turtles, and birds.⁵⁷ The fact that fisheries pose a threat to the sustainability of the fish resources themselves and other less visible species has been largely ignored until recently. In the case of tuna fisheries, the two GATT panel decisions have had an important impact on the way discussions of bycatch issues have evolved.

Issues at Stake

Bycatches represent a serious problem in fisheries management worldwide. The most effective way to minimize bycatches generally would be to halt or reduce commercial fishing operations. However, since fish constitutes a significant source of protein for humankind, an important alternate first step would be to concentrate on diminishing global bycatches.

Bycatches in General

In most cases, bycatches are not put to any use. Bycatches can be made up of species that would constitute the target species of other fisheries but are not kept for a variety of reasons, thus producing a waste of potential commercial landings. Immature or too small individuals of the target species also will often be caught. Fish that are legally too small will be discarded whereas immature ones sometimes may be kept, but their taking affects the recruitment rate of the stock. In addition, marine mammals, birds, turtles, and other individuals incidentally caught will be discarded. The few studies that have been

made on the viability of discards tend to show that a large proportion will not survive due to exhaustion or injuries.⁵⁸

Sustainable Fisheries

A second major concern should be the sustainability of fisheries, and the case of tuna fisheries is illustrative of this problem. The attention on bycatches of dolphins masks other underlying concerns. At present, tuna stocks in general have not been over-exploited, but a number of specific stocks are at or near optimal utilization.⁵⁹ Therefore, it is possible that overexploitation will become an issue in the future, since an increase in consumption is forecast. This calls for the adoption of a precautionary approach to the exploitation of tuna resources, and it is thus imperative that the management of tuna stocks be given priority, especially because the tuna fishery is a major commercial fishery worldwide.⁶⁰ Sustainability also involves a shift from maximization of yields to a focus on high productivity within the stocks. Moreover, sustainability of fisheries cannot be equated with what scientists say is the maximum possible level of takings, because there are many interactions between target and nontarget species that are not yet known or fully understood.⁶¹ Another concern in tuna fisheries is that the shift from dolphin fishing to log or school fishing has implications for the renewal of stocks.

Importance of Fisheries for Developing Countries

As mentioned above, in the developing world in general, fish constitute an important element of the human diet. In coastal areas fish can be the major source of animal protein available, and fishing activities can also represent an important economic activity for millions of people. It should be noted that many more people in developing countries than those in industrialized countries are directly or indirectly dependent on the artisanal fishing industry.⁶² In addition to subsistence fishing, some developing countries also have commercial fishing industries that constitute a supplementary source of export revenue.⁶³

The expansion of fisheries worldwide has led to the overlap between large- and small-scale fisheries and competition between the two for the same resources using different fishing gear. In many instances, the influence of commercial fisheries conducted far from the coast is only indirectly felt through their impact on the ecosystems, but in other cases commercial fisheries effectively harvest the same stock as subsistence fishermen.⁶⁴

Most bycatches are occasioned by commercial fisheries, both within the EEZ and on the high seas. Subsistence fishing is less destructive of the marine environment, since the types of fishing gear employed are much more selective. Thus, one way to reduce bycatches without compromising human dietary needs would be to discourage capital intensive operations. Even though subsistence fishing is less economically efficient, it meets both the needs of people who depend directly on this activity and those of ecosystem sustainability. It is the authors' view that the satisfaction of basic needs should precede commercial interests.⁶⁵

Changing Commercial Interests in Eastern Tropical Pacific Tuna Fisheries

Over the past two decades, one of the most significant developments in ETP tuna fisheries has been the declining presence of U.S. purse seiners. The size of the U.S.

fleet went down from an all time high of 90% of the total capacity of the international tuna fleet in the ETP in 1960, to 35% by 1984, and a meager 8% in 1995.⁶⁶ This reduction can be explained by the increasing difficulty in accessing the coastal fisheries of Latin American countries and the more stringent regulatory framework put in place under the MMPA.⁶⁷ The MMPA's provisions on the issuance of permits for the taking of dolphins made dolphin fishing more expensive and, ultimately, less economically competitive.

It is noteworthy that the increased attention given to the dolphin bycatch problem has coincided with the declining interest of U.S. fishermen in this industry and the concomitant increase in participation by Latin American countries.⁶⁸ The prominence of the dolphin bycatch issue also can be explained by the status of the United States as a major consumer of tuna, alongside Japan and the European Union (EU) countries. This is part of the reason why the United States was able to pressure Mexico and other tuna exporting countries to accept dolphin-safe fishing techniques through, inter alia, the institution of trade embargoes.⁶⁹ There currently are proposals in the United States Congress aimed at changing the present regime.⁷⁰ One of these bills seeks to implement the provisions of the Panama Declaration and to redefine the notion of dolphin-safe tuna by encouraging the use of fishing methods that minimize overall bycatches.⁷¹

The tuna/dolphin issue warrants close scrutiny when developments with respect to the prohibition of large-scale drift net fishing are considered. The moratorium agreed upon in the General Assembly seems to have been driven mainly by commercial interests of U.S. fisheries and the environmental lobby, instead of by sound scientific evidence.⁷² It is only because the United States took a lead on this issue, even backing its commitment with the threat of trade sanctions, that a consensus could be achieved.⁷³ As noted above, drift nets are among the most selective fishing gear employed in commercial fisheries. It thus appears that moves toward dolphin conservation have been driven chiefly by the environmental constituency, and possibly by commercial interests in the United States.⁷⁴

Potential Legal Solutions to the Bycatch Problem

This section will present a few of the available solutions that either have achieved a degree of prominence in international discourse or seem to the authors to be particularly relevant to dealing with the real issues facing fisheries and, particularly, small-subsistence fishermen throughout the world.

Multilateral Trade Measures

Trade measures have come into sharp focus in the United States because of the tuna/dolphin controversy and the embargoes imposed at the start of this decade to force exporting countries to stop killing dolphins in their purse seine sets. Whatever the findings of the GATT panels, this kind of unilateral trade sanction does not seem appropriate for resolving the problem of bycatch in general. The United States committed itself in the dolphin controversy because of a lasting interest in the protection of marine mammals and a strong environmental lobby. However, it is by no means certain whether the United States would act with the same determination to save, say, squids or any other nonvisible species from extinction. Furthermore, unilateral trade sanctions are effective only if the threat can be backed by political and economic leadership, and thus can be used by only a handful of powerful countries. In this case, the large U.S. market for tuna and tuna products made trade an effective tool for enhancing dolphin-safe fishing

in the ETP.⁷⁵ In situations where the United States is not taking a lead on environmental issues, unilateral trade measures would be of no use in seeking to achieve the stated goals.

Multilateral trade measures, on the other hand, have the potential to foster reductions in bycatches. Trade embargoes can, for instance, provide the necessary incentives to adopt more selective fishing gear, such as mesh sizes that would let the small fish escape from the nets, and less harmful fishing techniques, such as improved backdown procedures. A ban on imports should extend to both tuna and tuna products in cases where fishing has adverse impacts on nontarget species, and could also include imports from intermediary nations trading with the nation under embargo. Trade measures also could aim at engendering more trade in dolphin-safe fishing techniques through black and white lists identifying unsafe and safe technologies and techniques, respectively, with a view toward influencing the behavior of fishermen.

Financial Mechanisms

A Biodiversity Fund. Minimization of bycatches in fisheries represents one of a host of issues pertaining to the conservation of marine biodiversity. It is, however, a significant problem among the different human-induced impacts on the marine environment. Since the problem of bycatches extends beyond national boundaries and to all fisheries even on the high seas, global cooperation is required if improvements are to be achieved. Since it is uncertain whether any single nation would have either the economic capacity or political will to undertake the research necessary to better understand the biological link between tunas and dolphins, or to finance studies for improving fishing techniques, international measures should be agreed on. Financial measures may represent the best way to ensure that the necessary bycatch reductions are carried out. The establishment of a biodiversity fund thus might constitute a useful step toward the progressive reduction of bycatches.⁷⁶ Funds could, for instance, be drawn from a charge on tuna landings or on the exploitation of deep seabed minerals.⁷⁷ In the former case, even an insignificant charge on the value of tuna landings would raise substantial financial resources.⁷⁸ In the latter case, all commercial exploitation would have to be channeled through the competent international organization, which could facilitate the collection of a charge.

A Compensation Fund. At the level of the implementation of measures that might be agreed on to reduce bycatches, the different needs and situations of nascent commercial fisheries in developing countries must be taken into account. Thus, measures should be devised to ensure that these segments of the industry are not penalized by the high cost of adopting new practices and technologies that do not increase the yields but serve only to protect and preserve the environment.

A compensation fund would constitute an incentive to attract the necessary universal acceptance of a regime dealing with a commons problem. The internationalization of this problem is accentuated by the fact that a growing proportion of catches from the EEZs of developing countries is consumed in the North. Another reason for a compensation fund includes the vulnerability and dependence of some developing countries on the exploitation of marine living resources, whereas the tuna industry, for instance, represents a tiny share of U.S. overall production. As already recognized in a number of cases, the burden of new conservation measures should not fall on developing countries.⁷⁹

Ecolabeling

Ecolabeling involves availing information to consumers to enable them to make informed choices, thus promoting environmentally friendly behavior. Here such facts would concern fishing methods, and a blacklisting and whitelisting process would complement the attainment of full information in this regard.⁸⁰ Recognized labels should be officially awarded following an objective assessment procedure, and criteria used for this process should not be flawed by giving some parties advantages over others. This underscores the need for a multilateral arrangement to avoid unilateral fixing of standards that would be easier to meet for nationals of the country fixing them, to regulate the use of “bycatch-safe” labels on cans of tuna not caught in association with dolphins, and to map out guidelines for certification of tuna as bycatch safe.⁸¹ The award of an ecolabel involves a judgment on the overall quality of the product at stake, but does not provide tools to distinguish criteria to define, for instance, dolphin-safe tuna. Moreover, green labels are always positive in the sense that they are used, not to warn of particular problems associated with a product, but only to show one of its environmental qualities.⁸² In the case of bycatch safe labels, a decision should be made on the environmental issues to be accorded priority in identifying criteria for issuing such labels.⁸³

Other Regulatory Avenues

Granted that minimization of bycatches can be achieved through improved fishing techniques and technologies, use of such techniques and technologies can be encouraged through legal instruments banning older technologies that occasion high bycatches. This avenue has been used with respect to drift nets.⁸⁴ Such an approach must be based on sound scientific information to ensure that the techniques banned are not replaced by more harmful ones.

At another level, it has been ascertained that bycatches contain fish that constitute the target species of other fisheries.⁸⁵ These fish usually are discarded, reducing potential yields of those other fisheries. For example, when purse seiners fish on logs for tunas, they end up catching Mahi-mahis that are discarded and thereby wasted, denying coastal Mahi-mahi fisheries potential landings of their target species.

Conclusion

The problem of bycatch exists in all fisheries. Much attention has been devoted to dolphin bycatches in tuna fisheries. Without trivializing the taking of dolphins, the authors dare say that bycatches present a major problem for the sustainable management and conservation of marine living resources—a problem whose magnitude is masked by focusing on particular species. Emphasizing the size of species, their charisma, or their behavior does not capture the importance of interactions among all species and may obscure the role of less visible species.

Issues that must be addressed in resolving the bycatch problem include the sustainability of fisheries and bycatches other than those of marine mammals, seabirds, and turtles. Other issues of relevance are the importance of fisheries in general, especially for developing countries, and the commercial interests at stake. Another matter for consideration is the effect of measures taken to reduce discards in commercial fisheries on subsistence fishermen.

Thus, what the international community must urgently address is not whether the

two tuna/dolphin GATT panels delivered decisions that were antienvironmental, but instead whether discards are acceptable at all. Among other things, this calls for a balancing of the interests of commercial and subsistence fishing, taking into account the satisfaction of basic needs in the overall assessment of benefits derived from fishing.

Notes

1. Both cases involved the imposition of trade restrictions on environmental grounds and the compatibility of such measures with the provisions of the General Agreement on Tariffs and Trade (GATT). See General Agreement on Tariffs and Trade: Dispute Settlement Panel Report on United States Restrictions on Imports of Tuna, June 1994, reprinted in 33 I.L.M. 839 (1994), and General Agreement on Tariffs and Trade: Dispute Settlement Panel Report on United States Restrictions on Imports of Tuna, Aug. 16, 1991, reprinted in 30 I.L.M. 1594 (1991).

2. See, e.g., David D. Caron, "The International Whaling Commission and the North Atlantic Marine Mammal Commission: The Institutional Risks of Coercion in Consensual Structures," 89 *Am. J. Int'l L.* 154, 157 (1995), and Pat W. Birnie, "International Legal Issues in the Management and Protection of the Whale: A Review of Four Decades of Experience," 29 *Nat. Resources J.* 903, 924-927 (1989).

3. Bruce T. Wilkins and Herbert Acquay, "Industrialized Fishery Policy Implications for Developing Countries' Structural Adjustment Programs," in *Public Policy Issues in Wildlife Management* 166ff. (William R. Mangun ed., 1991).

4. See, e.g., Simon Fairlie et al., "The Politics of Overfishing," 25 *Ecologist* Nos. 2-3, at 46, 49 (1995).

5. Asian countries are both major players in the fish trade as well as in the consumption of fish, from which they derive a relatively high proportion of their animal protein. James R. Coull, *World Fisheries Resources* 234, 239 (1993).

6. In the United States, the protein intake from fish amounts to only 3% of the total consumption of animal protein; for 60% of the remaining world population, it amounts to 40%. See Dayton L. Alverson et al., *A Global Assessment of Fisheries Bycatch and Discards* 73 (FAO Fisheries Technical Paper 339, 1994).

7. See United Nations Convention on the Law of the Sea, opened for signature Dec. 10, 1982, art. 64 and Annex I, 21 I.L.M. 1261, 1282, 1329 (1982) [hereinafter LOSC]. See also Food and Agriculture Organization of the United Nations (FAO Fisheries Technical Paper 335, 1993), *Review of the State of World Marine Fishery Resources* 70 [hereinafter FAO 335], noting that some species that are less commercially valuable live close to the continental shelf area or around islands.

8. Coull, *supra* note 5, at 228.

9. This figure does not include either recreational fishing or marine mammals. See Alverson et al., *supra* note 6, at 184.

10. *Id.* at 27.

11. *Id.* at 47.

12. William T. Burke et al., "United Nations Resolutions on Driftnet Fishing: An Unsustainable Precedent for High Seas and Coastal Fisheries Management," 25 *Ocean Dev. & Int'l L.* 127, 132 (1994).

13. See, e.g., Suzanne Iudicello and Margaret Lytle, "Marine Biodiversity and International Law: Instruments and Institutions That Can Be Used to Conserve Marine Biological Diversity Internationally," 8 *Tul. Envtl. L.J.* 123, 128 (1994).

14. See generally Nigel Brothers, "Albatross Mortality and Associated Bait Loss in the Japanese Longline Fishery in the Southern Ocean," 55 *Biological Conservation* 255 (1991).

15. Global tuna catches have grown dramatically in the past two decades, more than doubling from their early 1970s level to 4.2 million tons in 1990. See FAO 335, *supra* note 7, at 71.

16. *Id.* at 72.

17. Food and Agriculture Organization of the United Nations (FAO Fisheries Technical Paper 337, 1994), *World Review of Highly Migratory Species and Straddling Stocks* 35 [hereinafter FAO 337], notes that the bluefin's status has even been discussed in the context of the Convention on International Trade in Endangered Species of Wild Fauna and Flora of 1973.
18. The Eastern Tropical Pacific covers around 5 million square miles from southern California to northern Chile, and to the west up to Hawaii.
19. Simon P. Northridge, *World Review of Interactions Between Marine Mammals and Fisheries* 140 (FAO Fisheries Technical Paper 251, 1984).
20. See Committee on Reducing Porpoise Mortality from Tuna Fishing, National Research Council, *Dolphins and the Tuna Industry* 1 (1992). Moreover, the Pacific Ocean yields 71% of skipjack, 66% of yellowfin, 53% of bigeye, and 53% of albacore. See FAO 337, *supra* note 17, at 24.
21. Betsy Carpenter, "What Price Dolphin?" *US News & World Rep.*, June 13, 1994, at 71, 71.
22. See generally Eric J. Fjelstad, "The Ghosts of Fishing Nets Past: A Proposal for Regulating Derelict Synthetic Fishing Nets," 63 *Wash. L. Rev.* 677 (1988).
23. However, dolphins have been found in association with tunas in other areas of the world, only in much lower concentrations. See Committee on Reducing Porpoise Mortality from Tuna Fishing, National Research Council, *supra* note 20, at 14.
24. Of these, the most heavily affected by tuna fisheries are the spotted dolphins. See Northridge, *supra* note 19, at 137.
25. 2 Food and Agriculture Organization of the United Nations (Richard S. Shomura et al. eds., FAO Fisheries Technical Paper 336/2, 1994), *Interactions of Pacific Tuna Fisheries* 74.
26. James Joseph, "The Tuna-Dolphin Controversy in the Eastern Pacific Ocean: Biological, Economic, and Political Impacts," 25 *Ocean Dev. & Int'l L.* 1, 8 (1994).
27. See Alverson et al., *supra* note 6, at 35.
28. See, e.g., Martin A. Hall, *An Ecological View of the Tuna-Dolphin Problem* 1 (1993) (unpublished manuscript, on file with the authors).
29. *Id.* at 7.
30. Martin A. Hall and C. Lennert, *Estimates of Incidental Mortality of Dolphins in the Eastern Tropical Pacific Ocean Tuna Fishery in 1994*, at 3 (1995) (mimeographed manuscript, on file with the authors).
31. *Marine Mammal Protection Act of 1972 (MMPA)*, 16 U.S.C. §§ 1361–1407 (1988 & Supp. II 1990).
32. 16 U.S.C.A. § 1371 (B)(II).
33. These include juvenile yellowfin tuna as well as skipjack and bigeye tuna of the same size in the Western and Central Pacific. See Alverson et al., *supra* note 6.
34. Joseph, *supra* note 26, at 20.
35. Thus, it has been stated that "from the ecological viewpoint, the gains made with the decline in dolphin mortality have been offset by a substantial increase in the discards of young tuna and other pelagic fish species." Alverson et al., *supra* note 6, at 35.
36. Mike Hagler, "Deforestation of the Deep—Fishing and the State of the Oceans," 25 *Ecologist* Nos. 2–3, at 74, 77 (1995), notes that numerous albatrosses are taken in the Japanese longline tuna fishery. See also Simon Barnes, "Justified and Ancient," *Guardian* (London), Mar. 23, 1996, Weekend Sec., at 34.
37. The eastern spinner dolphin constitutes an exception. The U.S. National Marine Fisheries Service (NMFS) has recognized that its stock level is at about a third of what it was in the 1960s. It has been designated as depleted despite the fact that its population has remained stable over the past two decades. See *Taking and Importing of Marine Mammals; Listing of the North-eastern Offshore Spotted Dolphin as Dolphin*, 58 Fed. Reg. 58, 285 (1993).
38. Hall, *supra* note 28, at 6.
39. See Joseph, *supra* note 26, at 25.
40. See LOSC, *supra* note 7, art. 61(4), and William T. Burke, *The New International Law of Fisheries—UNCLOS 1982 and Beyond* 200 (1994).

41. Burke, *supra* note 40, at 172.
42. Agreement for the Reduction of Dolphin Mortality in the Eastern Pacific Ocean (EPO), June 1992, 33 I.L.M. 936 (1994).
43. San José Declaration, July 14, 1995 (available from Conservation Biology Discussion Group, Message ID 41cr31\$un@newsbf02.news.aol.com).
44. *Id.* para. 3.
45. See Declaration of Panama, Oct. 4, 1995, para. 4 (available on the World Wide Web, <http://www.greenpeace.org/~usa/campaigns/biodiversity/panama.html>).
46. The Inter-American Tropical Tuna Commission (IATTC) was established in 1949 to study tuna resources in the Eastern Tropical Pacific (ETP) and make recommendations for the management and conservation of those resources. See Convention for the Establishment of an Inter-American Tropical Tuna Commission, U.S.-Costa Rica, May 31, 1949, 80 U.N.T.S. 4 (1951).
47. This was in 1976, and the concern was to maintain a high level of tuna production while ensuring the maintenance of dolphin stocks at or above levels that assure their survival in perpetuity. An observer program was put in place to gather the requisite information. See *Annual Report of the Inter-American Tropical Tuna Commission 1994*, at 47 (1995).
48. See paras. 17.46 and 17.75 of Agenda 21 (*Report of the United Nations Conference on Environment and Development, United Nations, Rio de Janeiro, 3-14 June 1992*, UN Doc. A/CONF.151/26/Rev.1, vol. 1, Annex II).
49. Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, adopted Aug. 4, 1995, art. 5(f), 34 I.L.M. 1542, 1550 (1995) [hereinafter Straddling and Highly Migratory Fish Stocks Agreement].
50. Convention on the Conservation of Antarctic Marine Living Resources, May 20, 1980, 19 I.L.M. 837 (1980).
51. See, e.g., Code of Conduct for Responsible Fisheries, arts. 8(4) and 8(5), in *Report of the Conference of FAO, 28th Sess., Rome, 20-31 Oct. 1995*, Doc. C 95/REP, Annex I.
52. See United Nations: General Assembly Resolution on Large-Scale Pelagic Driftnet Fishing and Its Impact on the Living Marine Resources of the World's Oceans and Seas (G.A. Res. 46/215), Dec. 20, 1991, reprinted in 31 I.L.M. 241 (1992); United Nations: General Assembly Resolution on Large-Scale Pelagic Driftnet Fishing and Its Impact on Living Marine Resources of the World's Oceans and Seas (G.A. Res. 44/225), Dec. 22, 1989, reprinted in 29 I.L.M. 1555 (1990); and United Nations: General Assembly Resolution on Large-Scale Pelagic Driftnet Fishing and Its Impact on Living Marine Resources of the World's Oceans and Seas (G.A. Res. 45/197), Dec. 21, 1990, UN GAOR, 45th Sess., Supp. No. 49, at 123, UN Doc. A/45/49 (1990).
53. Burke et al., *supra* note 12, at 167.
54. See Alverson et al., *supra* note 6, at 75.
55. It may well be that dolphin conservation was never really the big issue that it has turned out to be when one considers that the exact data for the late 1950s through the 1960s cannot be given with accuracy because there was no comprehensive observer program in place. The data presented for those years were based on 9 out of 4,250 fishing trips. The mortality rates went down dramatically from 1972 to 1976 when a program was put in place. By 1994, most countries involved in the ETP tuna fisheries had, in conjunction with the IATTC, achieved 100% observer coverage. See Hall and Lennert, *supra* note 30, at 1.
56. See, e.g., Simon P. Northridge, *Driftnet Fisheries and Their Impacts on Non-Target Species: A Worldwide Review* 90-96 (FAO Fisheries Technical Paper 320, 1991).
57. Kerry L. Holland, "Exploitation on Porpoise: The Use of Purse Seine Nets by Commercial Tuna Fishermen in the Eastern Tropical Pacific Ocean," 17 *Syracuse J. Int'l L. & Com.* 267 (1991), and Laura L. Lones, "The Marine Mammal Protection Act and International Protection of Cetaceans: A Unilateral Attempt to Effectuate Transnational Conservation," 22 *Vand. J. Transnat'l L.* 997 (1989).
58. See Alverson et al., *supra* note 6.
59. See, e.g., FAO 337, *supra* note 17, at 28-34.

60. See Hall, *supra* note 28, at 9.
61. See, e.g., Michael Earle, "The Precautionary Approach to Fisheries," 25 *Ecologist* Nos. 2-3, at 70, 70 (1995).
62. Burke, *supra* note 40, at 133, notes that tuna is an important resource for many island states in the Pacific. See also Robert Gillett and Foua Toloa, "The Importance of Small-Scale Tuna Fishing: A Tokelau Case Study," in *Tuna Issues and Perspectives in the Pacific Islands Region* 177 (David J. Doulman ed., 1987).
63. Donald M. Schug and Alfonso P. Galea'i, "American Samoa: The Tuna Industry and the Economy," in *Tuna Issues and Perspectives in the Pacific Islands Region*, *supra* note 62, at 191.
64. Food and Agriculture Organization of the United Nations, FAO Fisheries Technical Paper 336/1, *Interactions of Pacific Tuna Fisheries* 146 (Richard S. Shomura et al. eds., 1994).
65. See Code of Conduct for Responsible Fisheries, *supra* note 51, art. 6(18), which exhorts states to protect the rights of small-scale, subsistence, and artisanal fisheries in order to ensure that those engaging therein have income and food security.
66. See "U.S. Tuna Fisheries Update," *Tuna Newsl.* (Southwest Fisheries Science Center, National Marine Fisheries Service, La Jolla, Calif.), Feb. 1996, at 2. The United States had the largest tuna fishing fleet in the ETP until the beginning of the 1980s. See Committee on Reducing Porpoise Mortality from Tuna Fishing, National Research Council, *supra* note 20, at 30.
67. It must be recalled that most countries did not accept the former U.S. contention that tunas did not fall under domestic jurisdiction, and U.S. tunaboats thus found it difficult to access fishing resources in the 200-mile zones of Latin American countries. This proved to be detrimental to them since the association between tunas and dolphins is even stronger on the high seas. See Committee on Reducing Porpoise Mortality from Tuna Fishing, National Research Council, *supra* note 20, at 26. Latin American countries, striving to tighten their control, went even further and signed a convention aimed at limiting the access of foreign fleets to surpluses left by coastal fleets. See Agreement Creating the Eastern Pacific Tuna Fishing Organization, July 21, 1989, art. 16, reprinted in Food and Agriculture Organization of the United Nations, FAO Fisheries Circular No. 842, *Compendium of Basic Texts Concerning International Management and Development of Tuna Fisheries* 133, 145-147 (1992) (not in force).
68. The Latin American share increased from 10% in 1960 to 57% by the end of 1991. See Committee on Reducing Porpoise Mortality from Tuna Fishing, National Research Council, *supra* note 20, at 4 and Joseph, *supra* note 26, at 4.
69. MMPA, 16 U.S.C. § 1371.
70. See S. 1420, 104th Cong., 1st Sess. (1995), H.R. 2823, 104th Cong., 1st Sess. (1995), and S. 1460, 104th Cong., 1st Sess. (1995).
71. S. 1420, 104th Cong., 1st Sess. (1995) and H.R. 2823, 104th Cong., 1st Sess. (1995). See also Joel N. Shurkin, "Environmental Lobby Splits on US Tuna Bills," 379 *Nature* 288, 288 (1996).
72. Burke et al., *supra* note 12, at 167.
73. *Id.* at 176.
74. The 1990 decision by the main tuna canners in the United States not to purchase tuna caught in association with dolphins led to a further dramatic reduction in the number of U.S. purse seiners in the ETP, because the owners found it economically inefficient to use other fishing techniques to catch tuna. See Joseph, *supra* note 26, at 7.
75. Until about 1975, the U.S. market absorbed about 80% of the tuna caught in the ETP. This share had fallen to 31% by 1989. The difference has gone to Latin American and European Union (EU) countries. See Committee on Reducing Porpoise Mortality from Tuna Fishing, National Research Council, *supra* note 20, at 4.
76. See generally Christopher D. Stone, "Mending the Seas Through a Global Commons Trust Fund," in *Freedom for the Seas in the 21st Century: Ocean Governance and Environmental Harmony* 171 (Jon Van Dyke et al. eds., 1993).
77. See LOSC, *supra* note 7, Part XI, and Agreement Relating to the Implementation of Part

XI of the United Nations Convention on the Law of the Sea of 10 December 1982, July 28, 1994, Annex, sec. 7, 33 I.L.M. 1309, 1325 (1994).

78. The 1994 figures for the United States show, for instance, that tuna canners produced canned tuna for a total value of \$963 million. See "U.S. Canned Tuna Industry Highlights, First Quarter 1995," *Tuna Newsl.* (Southwest Fisheries Science Center, National Marine Fisheries Service, La Jolla, Calif.), Aug. 1995, at 2.

79. See, e.g. Straddling and Highly Migratory Fish Stocks Agreement, *supra* note 49, art. 24.

80. Information pertaining to the impact of the technology used and the fate of discards would be relevant here.

81. Bycatch-safe labels represent an attempt to overcome the shortcomings of a species-by-species approach in the conservation of the marine environment.

82. Suzanne Clabon, "Ecolabelling," 3 *Rev. Eur. Community & Int'l Env'tl. L.* No. 1, at 21 (1994).

83. In 1990 the IATTC began issuing its own certificates to purse-seine vessels that carry IATTC observers whose data verify that no dolphin has been intentionally chased or encircled during that fishing trip. See *Annual Report of the Inter-American Tropical Tuna Commission 1994*, *supra* note 47, at 49.

84. See Convention for the Prohibition of Fishing with Long Driftnets in the South Pacific, Nov. 24, 1989, 29 I.L.M. 1449 (1990).

85. See, e.g., Northridge, *supra* note 56, at 89.