

Wasted Cash: The Price of Waste in the U.S. Fishing Industry



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Executive Summary

Bycatch, or the capture of non-target fish and ocean wildlife, remains one of the biggest threats to the health of ocean ecosystems, contributing to overfishing and the decline of fish populations around the world. As much as 2 billion pounds of fish are discarded by fisheries in the United States each year, hindering the recovery of depleted stocks. What is the price the industry pays for this wasteful habit? In this report, Oceana estimates that the value of discarded fish in the U.S. is at least \$1 billion annually.

In 2012, U.S. commercial fishermen landed almost 10 billion pounds of fish worth just over \$5 billion. Unfortunately, all of this value is undermined by the discarding of fish as bycatch. In 1994, the Food and Agriculture Organization concluded that “the loss of potential catch resulting from discarding around the world amounts to billions of U.S. dollars,” and the economic losses due to bycatch equal or exceed the value of landed catch in some fisheries. More recently, in 2009, the World Bank estimated that poor management and overexploitation of fishery resources costs the global economy \$50 billion every year, signaling that this is not just a problem in the U.S. Despite notable improvements in a few specific regions and fisheries, industry practices have not significantly changed to ameliorate these monumental losses.

In this report, we assess the value of discarded fish if they were sold instead of thrown overboard (though we recognize that not all discarded fish are marketable based on regulations or quality). By multiplying the best available bycatch data compiled from the National Marine Fisheries Service’s *National Bycatch Report* by the ex-vessel value listed in the National Oceanic and Atmospheric Administration’s commercial landings database for each species, we derived estimates for the value of discarded fish in each region of the U.S. Consequently, this report does not include value lost to recreational fisheries, indirect losses of diminished wages, wholesale revenue, the cost of replacing ruined gear, the opportunity costs of disentangling protected wildlife, or fluctuations in market value. Our analysis represents a conservative estimate because it does not account for observer bias and undocumented mortality, nor does it include value derived from protected species, or the future value of these discarded fish, their offspring and their roles in the ecosystem.

This analysis can inform the cost-effectiveness of different ways to reduce wasteful discarding across regions and fishing gears. In this way, the decision of whether to invest in actively managing bycatch by transitioning to new gears or implementing seasonal closed areas will not only be informed by the potential cost of a given alternative, but also the potential cost of not taking action.

While fisheries management and science are complex and continually evolving, the logic of bycatch economics is simple: waste not, want not. Several countries around the world have employed innovative management schemes and fishing techniques that use economic incentives to reduce bycatch. Fisheries managers in the U.S. should provide similar incentives for fishermen to transition to cleaner operations that will improve the resilience of fishery resources and fishing communities into the future.

Wasted Cash: The Price of Waste in the Business of Fishing

What is bycatch?

Bycatch is the capture of non-target fish and ocean wildlife, including what is brought to port and what is discarded at sea, dead or dying. Bycatch is one of the biggest threats to the oceans and has contributed to overfishing and the dramatic decline of fish populations around the world. Fishermen discard fish for three main reasons: regulations prohibit them from being kept, the fish are poor quality, or the fish have little to no market value. Commercial fisheries bring in approximately 160 billion pounds of marine catch around the world each year,¹ but unfortunately, many fisheries discard more fish than they keep. In the U.S., fishermen discard approximately 20 percent of what they catch, amounting to as much as 2 billion pounds each year during the last decade. This conservation problem must be solved to ensure healthy oceans into the future.

Valuing Natural Resources: The Cost of Bycatch

Many people feel an inherent appreciation for the bounty and beauty of the ocean, but marine resources have a measurable and significant economic value as well. Everything ranging from seafood, seaweed products, tidal energy, recreation, tourism and even the very oxygen we breathe provides tremendous value on the scale of billions of dollars. In 2012, commercial fishermen landed almost 10 billion pounds of fish worth just over \$5 billion.¹ As a whole, the U.S. seafood industry generated more than \$82 billion in sales and supported 1.2 million jobs.¹

But how are these facts and figures derived? Economists measure value in terms of direct and indirect benefits. For example, fishermen and the general public enjoy *direct* benefits from the ocean in the form of livelihoods and seafood. However, fishermen also enjoy the *indirect* benefits provided by a resilient ecosystem that supports the healthy fish stocks they will depend on for decades into the future. In both instances, bycatch detracts from these benefits (Figure 1).

Unfortunately, all of this added value derived from fishery resources is undermined by ineffective management of bycatch, which is a chronic problem in the U.S. and around the world. In 1994, the Food and Agriculture Organization conducted a global assessment of fisheries bycatch and concluded that “the loss of potential catch resulting from discarding or discard regulations amounts to billions of U.S. dollars, and in many fisheries the losses due to discard mortalities are noted to equal or exceed landed catches.”² More recently in 2009, the World Bank faulted poor management and overexploitation of fishery resources as costing the global economy \$50 billion every year, and likely \$2 trillion over the last three decades.³ Clearly the situation is not improving.

In this report, we assess the value of discarded fish were they to be sold instead of discarded. Consequently, this report does not include indirect losses of diminished wages, opportunity costs of disentangling protected species or changes in market value. While not a comprehensive economic analysis, this review provides a baseline with which to evaluate the cost effectiveness of potential ways to reduce wasteful discarding across regions and fishing gears. In this way, the decision of whether to invest in transitioning to new gears or implementing seasonal closed areas will not only be informed by the potential cost of a given alternative, but also the possible cost of perpetuating inaction.

The bottom line: bycatch costs fishermen and the marine environment in more ways than one.

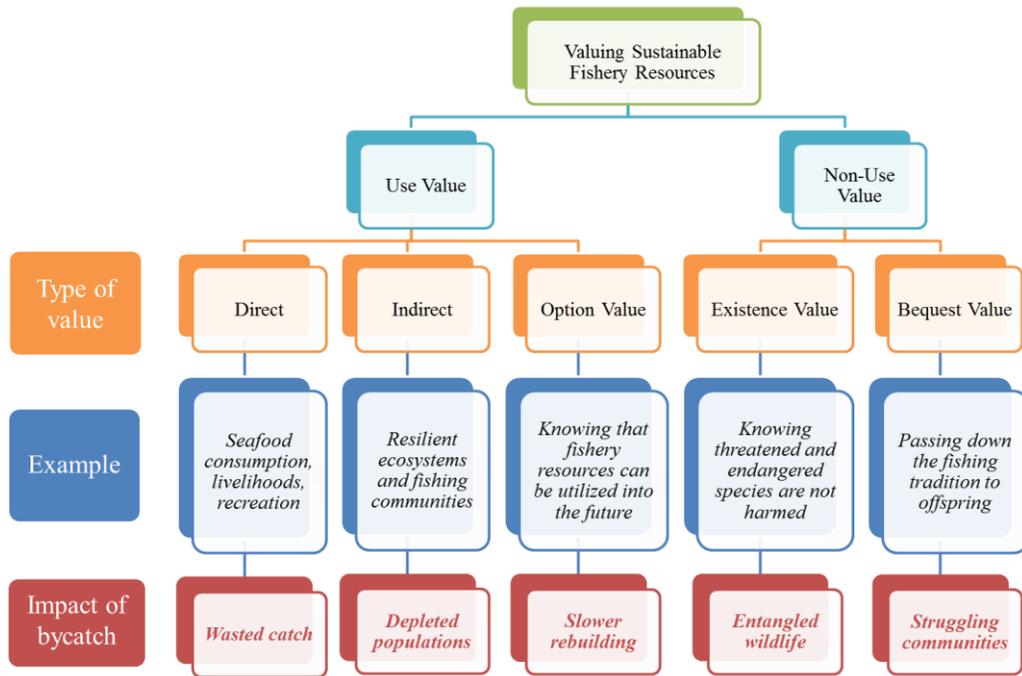


Figure 1: Examples of direct and indirect benefits derived from fishery resources and several ways that bycatch detracts from those values.

(Mis)Managing Bycatch under the MSA

Requirements of the Law

Federal fisheries managers are responsible for implementing the Magnuson-Stevens Act (MSA) by establishing annual catch limits and using the best available science to assess the status of fishery resources and reducing wasteful fishing practices. Additionally, fisheries managers must ensure that fishermen comply with existing regulations to protect marine wildlife and seabirds from harm. These laws require that conservation and management measures minimize bycatch. Different fisheries around the country tackle the bycatch problem in various ways, such as using cleaner gears, implementing bycatch limits, or closing areas in certain times of the year. It is generally acknowledged that a combination of these solutions can effectively reduce bycatch and even improve the efficiency of a fisherman's operation. Unfortunately, these proven measures have only been implemented in a handful of fisheries around the country.

Reducing Bycatch is Cost Effective

The MSA requires that bycatch is reduced to the "maximum extent practicable," which allows for flexibility in actually addressing the problem. Fisheries managers and the fishing industry often focus on the initial investment of reducing bycatch as a burden instead of looking to the benefits of reducing waste to improve long-term revenues. However, the upfront costs of implementing new gears or measures to reduce bycatch can easily be outweighed by the long-term or immediate benefits of a more efficient operation and healthier fish populations. The economic benefits of working to reduce bycatch include avoiding premature fishery closures, improving the efficiency of fishing operations, or even avoiding high costs of replacing ruined gear. It is important to use an economic approach to ascertain the most cost effective and efficient investments in more selective gear or other management measures intended to incentivize fishermen to avoid bycatch.

Investment and Cost Recovery for Better Bycatch Data

The MSA also requires that bycatch is documented using consistent protocols to ensure accurate reporting across fisheries, gear types and regions. Unfortunately, few fisheries, if any, have adequate bycatch reporting, and only two regions in the country have adopted formal reporting protocols to date. Accurate and precise bycatch data are critical to ensuring stocks are not overfished, fishermen do not unintentionally exceed annual quotas, and that the industry adheres to sound management measures. Without accurate estimates of how much fishermen are catching and discarding, the National Marine Fisheries Service (NMFS) has no way of understanding the long and short-term economics of a fishery and therefore has a diminished ability to implement cost-effective management measures.

Methods: The Value of Discarded Fish

In 2014, NMFS updated the First Edition *National Bycatch Report*, which estimates bycatch in 79 fisheries throughout six regions of the U.S. based on 2010 catch data. This NMFS publication served as the primary source for the bycatch data in this report.

Assessing Value

To assess regional and species-specific patterns in the value of discarded catch in U.S. fisheries, we compiled bycatch data from the NMFS' *National Bycatch Report*⁴ for each stock across six regions of the U.S. Because some regional fisheries report bycatch according to the number of fish that were discarded rather than the poundage, we used a simple approach to convert the number of discarded fish into poundage for those select fisheries or species, thus deriving a more comprehensive estimate of bycatch.¹ We then multiplied the poundage of discarded fish by the 2012 ex-vessel price per pound for each species according to the NOAA commercial fisheries landings database. The value of each discarded species was aggregated within each region and then summed for a nationwide estimate of the value discarded from all reported fisheries, summarized in equation 1. The total value derived within each region was then divided by the total pounds of bycatch for an average regional price per pound of discarded fish. This approach is far more accurate than previous studies that have used average regional ex-vessel landings prices, as that presumes that the composition of landed and discarded fish is the same.

$$\text{Equation 1. Discards}_{\text{lbs}} * \$/\text{lb} \rightarrow \text{Value}_{\text{species 1}} + \text{Value}_{\text{species 2...}} \rightarrow \text{Value}_{\text{total reported}}$$

Scaling Up: Total Nationwide Estimate

The 2014 NMFS' *National Bycatch Report* only included fisheries responsible for 58 percent of nationwide landings. Using only these figures therefore significantly underestimates the value of discarded fish. For a more comprehensive estimate, we developed a range of bycatch volume and value for the remaining 42 percent of unreported fisheries. This required making assumptions about the behavior of unreported fisheries in a two-step process: first, scaling up the pounds of bycatch, and second, applying the appropriate monetary value to that bycatch.

At the low end of the range, we assumed that unreported fisheries were responsible for a negligible amount of bycatch and therefore resulted in the same baseline value derived from the formula above (equation 1). For a mid-range estimate of total U.S. bycatch poundage, we assumed that unreported fisheries discard fish at half the average rate of other fisheries in the region. At the high end of the range, we assumed that unreported fisheries discarded fish at the same average rate as other fisheries in each region.

¹ Discarded fish were presumed to weigh 5% and 10% of maximum reported weights (according to FishBase) for large pelagic (max. weight > 75lbs) and smaller (max weight < 75lbs) fish, respectively.

The second step was then to appropriately scale up the economic value of this nationwide bycatch estimate. Continuing with the range approach, two estimates were derived by assuming the value (\$/lb) of unreported discarded fish is either half of or equal to the regional average of reported discards. These additional values were then added to the baseline low-end value derived from the formula above (equation 1) for mid-range and high end estimates. These calculations were carried out for each of the six regions and then summed for a nationwide estimate.

Caveats

We made the following assumptions in deriving our estimate. First, we did not distinguish between the different reasons that fish are discarded because selecting multipliers to account for those differences would have been arbitrary and unrepresentative. Reasons for discarding fish vary considerably across gear types and regions and are sometimes inaccurately reported, and we therefore believed that those details would be more appropriately assessed in fishery or gear-specific analyses. Our analysis also does not include the cost (direct or indirect) of retaining bycatch species onboard until the point of sale, which varies considerably depending on vessel size and the amount and value of target and non-target species caught within the fishery.

Second, and similarly, our analysis does not include a multiplier to account for the mortality rate of each species once discarded.² Not all individuals die after being thrown back overboard, but the rate varies considerably across species and gear types. Again, accounting for this would be most appropriate in a fishery or species-specific study. We are confident that the amount that this oversimplification might overestimate the value of discarded bycatch would be offset by unseen or unobserved mortality. Third, we did not take into account different prices for smaller or lower quality fish, or the market dynamics of changing supply and demand over time.

Despite these caveats, our analysis still represents a conservative estimate. It does not include the future value of discarded fish, their unrealized offspring, their functional roles in the ecosystem, or the larger losses in total sales and jobs for the seafood industry and overall economy.

Results: \$1 Billion in Discarded Fish

Throughout the last decade, U.S. fishermen have discarded approximately 20 percent of their catch every year, amounting to as much as 2 billion pounds each year. The amount of money these discarded fish represent is staggering. According to our analysis as described above and based on the most recent bycatch data, fish discarded in the U.S. could be worth \$0.5 - \$2.6 billion dollars every year, with a mid-range value of at least \$1 billion dollars. This estimate is consistent with a recently published journal article in *Marine Policy*, which estimated that 2002 bycatch levels were leading to half a billion dollars in lost revenue, more than \$4 billion in economic benefits, and more than 60,000 unrealized jobs every year due to non-selective gear and discarding.⁵

² This analytical shortcoming is most relevant for discarded shellfish, such as Atlantic sea scallops, where discard mortality has been estimated at 20 percent but may be much higher in certain regions and seasons of the year.

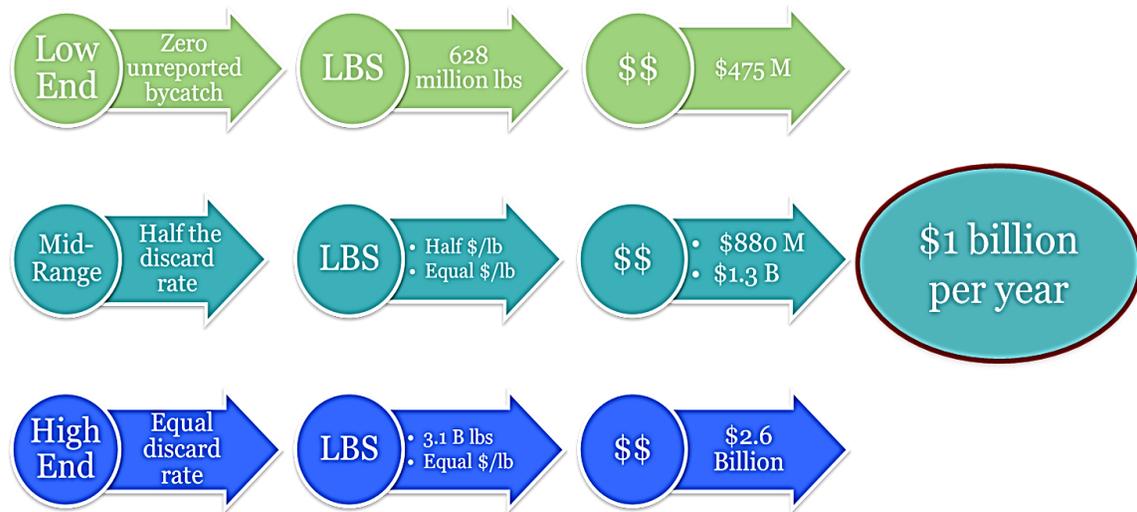


Figure 2: Visual display of assumptions and values used to derive an estimated range of the value of discarded fish.

Regional Losses - How Many Millions are Being Discarded Near You?

South Atlantic & Gulf of Mexico

Fisheries in the southeast region threw away fish worth at least half of a billion dollars in 2010, including \$45 million in seatrout, \$27 million in red snapper, \$25 million in Atlantic croaker, \$4.2 million in king mackerel, \$3.4 million in bluefin tuna and \$1.3 million in swordfish. The average price per pound of wasted fish in this region was \$1.20, the highest in the U.S.

- The southeast shrimp trawl fishery, which is responsible for some of the highest rates of bycatch in the country, may discard fish worth more than \$100 million every year.
- The highly migratory species longline fishery discards hundreds of thousands of pounds of the same tuna, sharks and swordfish that it intends to catch, potentially worth more than \$4 million each year, not including the value they hold for recreational fishermen. Using selective gear or fishing in times and places to avoid bycatch would allow fishermen to earn this value and more into the future if fish were not discarded dead.
- Snapper-grouper longline fishermen discarded approximately 15,000 individual red snapper fish in 2010, likely worth more than \$250,000, proving that even seemingly small amounts of bycatch can be very wasteful. The fishery also discarded almost \$3 million in red grouper in just one year.
- In 2014, NMFS estimated that more than 50,000 sea turtles are caught and killed in southeast shrimp trawls--an example of a significant cost of bycatch not included in this report.

New England & Mid-Atlantic

Indiscriminate trawl fishing in New England and the Mid-Atlantic region lead to the capture of large amounts of marketable non-target fish. Every year, fish worth millions of dollars are thrown overboard, including more than \$20 million in sea scallops, \$13.5 million in flounders, \$7 million in monkfish and \$4 million in hake. Discarded fish in this region are worth an average of 50 cents per pound.

- Discarded fish in the New England bottom trawl fishery amounted to \$20 million in 2010, equivalent to almost 20 percent of the overall value of the fishery.
- Discarded fish in the Mid-Atlantic bottom trawl fishery were worth more than \$4.5 million, with almost \$1 million in summer flounder alone.
- Although cod landings were valued at \$28 million in 2010, regional fishermen might discard as much as \$3 million of this overfished species every year.
- Two types of flounder (yellowtail and summer) discarded in regional trawl and dredge fisheries would have been worth \$8.5 million combined, which amounts to approximately 30 percent of the value fishermen earned in revenue for these species.

Alaska & the Pacific Coast

Alaska produces the highest earnings in the country for seafood products, bringing in fish worth \$1.7 billion alone in 2012. However, valuable fish thrown away include Pacific halibut, snow and red king crabs, Pacific cod and sablefish, when they are caught by fishermen who don't have quotas for those species. Along the coast of California, Oregon and Washington, valuable fish that are commonly discarded include spiny lobster, rockfish, California halibut, sea bass and sharks. The average price per pound of discarded fish in 2010 was 63 cents.

- In 2010, approximately \$53 million worth of Pacific halibut was discarded in Alaskan fisheries, equivalent to 25 percent of the landed value.
- Flatfish trawlers in the Gulf of Alaska discarded fish worth more than \$17 million in 2010, including almost \$1.3 million in cod and more than \$12 million in Pacific halibut.
- The California drift gillnet fishery discarded half a million dollars' worth of bluefin tuna in 2010.
- California gillnet fisheries also capture and kill a large number of sea turtles, dolphins, whales and baby great white sharks every year.

Popular Dinner Plate Discards

The value of discarded fish depends both on the volume that is discarded and the market price of a specific species. Many species are discarded in large amounts, but even smaller volumes of wasted highly valuable species can represent significant loss. Some examples of discarded valuable species include Pacific halibut (\$58 million), seatrout (\$45 million), Atlantic sea scallop (\$32 million), red snapper (\$27 million), and summer flounder (\$7.2 million) (Table 1).

Species	Wasted Value (millions)
Pacific Halibut	\$58.7
Seatrout	\$45.5
Atlantic Sea Scallop	\$32.7
Red Snapper	\$27.2
Summer Flounder	\$7.2
Atlantic & Pacific Cod	\$6.7
Red Grouper	\$6.7
Tanner Crab	\$4.6
King Mackerel	\$4.3
Sole	\$3.9
Bluefin Tuna	\$3.4
Chinook Salmon	\$1.4
Swordfish	\$1.3
Yellowtail Flounder	\$1.3

Results Summary

Whether the value of discarded fish amounts to \$1 billion or \$10 billion, the economic impact is considerable. The important question then becomes: How can fishermen maximize their gain while simultaneously minimizing economic and ecological waste? For every fishing fleet, vessel, gear type and target species, the answer will be different. Economic analyses provide critical information to consider when making management decisions, as the long and short-term financial and ecological trade-offs can be more accurately measured.

Implementing Solutions: Examples From Around the World

Discarding billions of pounds of fish is not economically or ecologically sensible, and it is important to explore innovative solutions to combat the problem around the world. In the U.S., significant progress has been made toward reducing bycatch by improving the selectivity of gear or shifting when and where fishing occurs. However, it is critical to establish bycatch limits, standardize reporting protocols and devise better ways of communicating bycatch hotspots. Internationally, many efforts to minimize and control bycatch have utilized economic approaches such as taxes, quota buying, insurance and other market-based ideas. No single approach described below can work in all situations, but combining existing management measures with emerging ways of aligning economic incentives will be critical to improving fisheries management in the U.S.

Bycatch Quotas

Bycatch quotas are one of the most effective ways of reducing discarding and entanglement of protected species because they function as a limit that, once exceeded, triggers further restrictions to limit waste and harm. Bycatch quotas can be set at fleet level, requiring coordination and cooperation among fishermen, or at the individual vessel level, perhaps allowing fishermen to buy and sell non-target species quota amongst themselves to maximize fishing opportunity while minimizing bycatch.

Bycatch Taxes

An alternative financial incentive for reducing bycatch is to charge fishermen a fee for landing unintended or non-target fish, often referred to as a “bycatch tax.” In this situation, fishermen are charged a price per pound for all bycatch that is brought back to port and would otherwise have been discarded. This system requires that all fishing vessels are monitored to prevent cheating. Collected fees are secured in a fund that can be reapplied to pay for observer coverage or other monitoring expenses. It is then possible to adjust the specific fee according to the vulnerability of the bycatch species. One of the primary benefits of a tax system is that nothing (or very little) is actually discarded, leading to a much better understanding of overall fishing mortality. A bycatch tax must be carefully monitored and dynamically managed, as the tax rate must be set to ensure against the incentive to cheat or discard the catch. Implementing such a system could require legislative changes to the MSA.

While a bycatch tax may initially be costly and require full observer coverage, it has proven effective in several regions of the world and is a mitigation measure worth considering. Bycatch taxes have even been simulated for marine mammals, turtles and seabirds, with some results as successful as a 75 percent reduction in bycatch.⁶ Several nations have successfully incorporated bycatch taxes within their fisheries management structure to minimize bycatch and discarding. For example, Namibia taxes non-target catch in trawling vessels, while also requiring 100 percent observer coverage.⁷ The specific bycatch fee is designed to be higher than the price of purchasing additional quota and therefore incentivize bycatch avoidance.

Deemed value

Other nations have bycatch management systems that modify the concept of a bycatch tax. New Zealand uses what is called a “deemed value” system, which assigns a landings fee at a specific proportion of the ex-vessel price depending on how much the quota has been exceeded for any given species. This ensures that it is not economically beneficial to continue targeting any individual species once the quota has been reached, but provides incentives to continue landing all catch even once those quotas have been reached.⁸ This scheme effectively minimizes regulatory discards, which were estimated to be approximately one-third of all bycatch. New Zealand has also incorporated non-target bycatch species into the quota system as a way of actively managing fish that have historically had low market value and therefore high discard rates. Similarly, Icelandic fishermen must auction landed fish that exceed 5 percent of the annual quota, with the majority of the proceeds going back to the government for resource management projects.⁹

Assurance Bonds and Insurance

Assurance bonds require that fishermen place funds into a trust, equivalent to the value of any potential damages expected from not meeting an established performance standard, such as exceeding a bycatch limit. This financial tool can be used to moderate uncertainty within fisheries operations, such as environmental or market fluctuations, declining catch or rising fuel prices.¹⁰ Requiring insurance shifts the burden of these risks away from the taxpayer and back to the fishermen, who then have a stronger incentive to adopt risk-averse alternatives under a more precautionary approach to management.^{11, 12} Assurance bonds established at the fishery level could foster collaborative bycatch avoidance but would require heightened monitoring to prevent cheating. Insurance programs are similar to assurance bonds, except that funds would only be provided if and when the performance standard was not met. These concepts remain largely theoretical to date, with ongoing efforts to carefully define “risk” and the desired outcomes of the an application to these ideas to marine fisheries.

Eco-labeling & Traceability

Consumer-driven awareness about the harmful impacts of indiscriminate fishing gears can be used to raise the value of seafood that is caught with selective gears under modernized bycatch management. Though ensuring claims of “sustainability” can be problematic, various programs are in place that have shown the added value of traceability to assure customers of the identity and origin of seafood.

Summary

Many of the alternatives described above have been successfully implemented in fisheries around the world. The usefulness of any given approach for fisheries in the U.S. would depend on the target species, gear type and regional environmental conditions, and it should be evaluated on a case-by-case basis. Adapting existing fisheries management measures to include elements of these economic frameworks could shift fishing behavior toward reducing waste in the future.

Recommendations: Using Economic Tools to Reduce Bycatch Waste

Successful businesses in the U.S. are constantly striving to increase efficiency, reduce waste, cut costs and maximize the market value of their products. Fisheries should take the same approach to reducing the wasteful practice of discarding. The many benefits of working to reduce bycatch include avoiding premature fishery closures, improving the efficiency of fishing operations, or even avoiding high costs of replacing ruined gear. Any analyses of the “practicability” of reducing bycatch should explicitly examine the cost of continued discarding.

Fisheries management in the U.S. must integrate economic tools into existing bycatch regulations. If economic incentives are not in place to reduce bycatch and discarding, the story of economic losses will still be the same in the coming decades. A commitment to reduce bycatch by 50 percent over the next decade could amount to billions in savings.

Count: Investing in Better Bycatch Data

Accurate and precise bycatch data are critical to ensuring that stocks are not overfished, fishermen do not unintentionally exceed annual quotas, and that the industry adheres to sound management measures. Without accurate estimates of how much fishermen are catching and discarding, NMFS has no way of accounting for the negative consequences of bycatch; failure of juvenile fish to mature, off-the-books fishing on heavily targeted fish, diminished stocks, opportunity costs and lost future revenues.

Cap: Reducing Bycatch Pays Dividends

Bycatch limits are essential for ensuring that vulnerable species are not overfished and that already depleted stocks can recover. In several situations, bycatch caps have prompted fishermen to come up with

innovative gear modifications and real-time open-source reporting to collectively ensure that those limits are not exceeded and they do not suffer the economic losses from premature fishery closures.

Control: Economic Incentives Changes Behavior

Management approaches that use economic tools to ensure that bycatch limits are not exceeded and that bycatch is reduced over time include incentive funding to transition to cleaner gear, bycatch taxes to discourage waste, individual bycatch quota systems to share risk, and insurance bonds to improve accountability. Like all businesses, innovation within fisheries is critical to remaining viable. Fisheries managers should utilize economic incentives where possible, and economic penalties if necessary, in order to reduce the amount of bycatch waste in our fisheries.

The Bottom Line: \$1 Billion in Wasted Cash is Too Much

Wasting billions of pounds of fish is not economically or ecologically sensible, and it is important to explore innovative and cost-effective solutions so that we can accurately **count** all catch, **cap** the amount of bycatch with science-based limits, and **control** bycatch through effective management measures that will ensure limits are not exceeded and that bycatch is reduced over time. No single approach can work in all situations, but combining existing management measures with emerging ways of aligning economic incentives will be critical to changing fishing practices and management decisions for the better, economically and ecologically.

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