Issue 23

DOLPHIN-SAFE TUNA[1]

Key Questions

- What is bycatch?
- What do consumers think "dolphin-safe" means?
- What is the exact meaning of "dolphin-safe"?
- What are the social, economic, and environmental costs and benefits of dolphin-safe fishing methods?
- Is the ecological impact of commercial fishing at acceptable levels?

One of the main problems with large-scale "harvesting" of wild marine organisms for human consumption is that most commercial fishing techniques are indiscriminate, that is, they cannot selectively capture only the target species. As a result, as much as 25% of the total global commercial catch is wasted or unused. This quantity is known as "bycatch" and refers to undersized fish, low-value, and nontarget species. These may include benthic (bottom-associated) organisms like sponges, worms, sea stars, crabs, etc., and also sharks, dolphins, whales, and sea turtles. Bycatch may die in nets or on longlines or may be returned to the water dead or dying.

Among the most harmful of all fishing activities is trawling for shrimp (see Issue 21). In addition to damaging the ocean bottom (trawling has been compared to clearcutting a forest), as much as 90% of the trawl contents may be nontarget and hence unused species, sometimes called *trash fish* by fishers, and at times including endangered sea turtles.

Question 1: Loggers sometimes refer to unwanted trees in a clearcut as "trash trees." Do you think such terminology is appropriate? Why or why not?

[1]Robert Young of Coastal Carolina University contributed to this Issue.

Although shrimp trawling is widespread (as many as 25,000 boats ply U.S. waters and the U.S. imports wild-caught shrimp from nearly 40 countries) and may cause extreme environmental damage, consumers are virtually unaware of the dimensions of its destructiveness. Contrasted with this is perhaps the best-publicized and galvanizing issue of bycatch—the capture of dolphins by tuna fishers.

In this issue we will analyze the multifaceted topic of bycatch in the tuna fishing industry and evaluate the costs and benefits of bycatch-reduction techniques.

DOLPHINS AND TUNA IN THE EASTERN TROPICAL PACIFIC

The eastern tropical Pacific Ocean (ETP), an area of approximately 8 million square miles (21,000,000 km^2), is one of the world's richest sources of commercially important tunas. The ETP fishery for yellowfin tuna (*Thunnus albacares*), in fact, has been called one of the most important fisheries in the world.[2] Yellowfin and skipjack tunas (*Katsuwonus pelamis*) are mainstays of the canned light meat tuna industry. The ETP fishery for albacore (*Thunnus alalunga*), whose flesh is the basis of the white-meat tuna industry, is small by comparison.

Two methods have been widely used to catch yellowfin and skipjack tunas in large-scale fisheries in the ETP. In *school fishing* (Figure 23-1), a technique no longer practiced in the ETP, rugged commercial fishers used stout rods to catch tunas, which frequently bit unbaited hooks during their feeding frenzy. Worldwide, according to Bumblebee Seafoods, 40% of the world's commercial tuna are caught on pole and line. A more productive method of catching yellowfin and skipjack tunas is *purse seining*. Globally, 30% of the world's commercial tuna are caught in purse seines. (Long-lining, in which hooks are set at intervals along a horizontal line stretching for miles, accounts for 30% of world commercial tuna catch, essentially albacore, which are also caught commercially by trolling).

In purse seining, a school of fish is encircled by speedboats with a net that may be 2 km (1.2 mi.) long and 200 meters (660 ft) deep. A purse line attached to the bottom of the net is then pulled in, trapping the tunas and other organisms unfortunate enough to be in the same location. Vessels from 12 nations, including the United States, purse seine in the ETP for tuna.

In the ETP, tunas frequently congregate around floating objects, such as tree trunks.[3] and also along with two kinds of dolphins, northern offshore spotted (*Stenella attenuata*) and eastern spinner (*Stenella longirostris*), a fact discovered by the U.S. tuna fleet nearly three decades ago. This relationship is thought to benefit the tunas, which can easily follow dolphins and take advantage of the latter's superior prey-finding abilities. Setting nets around dolphins typically catches the largest tunas and is thus the more desirable method.

When tuna seiners enter an area, they can spot aggregations of tunas and dolphins fairly easily, especially by helicopter, because dolphins are noisy and disturb the sea surface and thus are easily located. The netting process, which can take two to three hours, does not discriminate between the tunas and the dolphins, which stay together throughout the process. A number of dolphins can die during the process due directly to entanglement and drowning (Figure 23-2), and more may die later due to the delayed effects of severe trauma. It is estimated that the purse-seine fishery for tuna killed more then 1.3 million eastern spotted dolphins in the ETP between 1959 and 1990. As many as 5 million dolphins were killed during the first 14 years of purse seining in the ETP.[4]

---

[2]Joseph, J. 1994. The tuna-dolphin controversy in the Eastern Pacific Ocean: biological, economic, and political impacts. *Ocean Development and International Law 25*: 1–30.

[3]Surprisingly, enough such objects enter the ocean to be worthwhile to commercial fishers.

[4]Joseph, J. Op. cit.

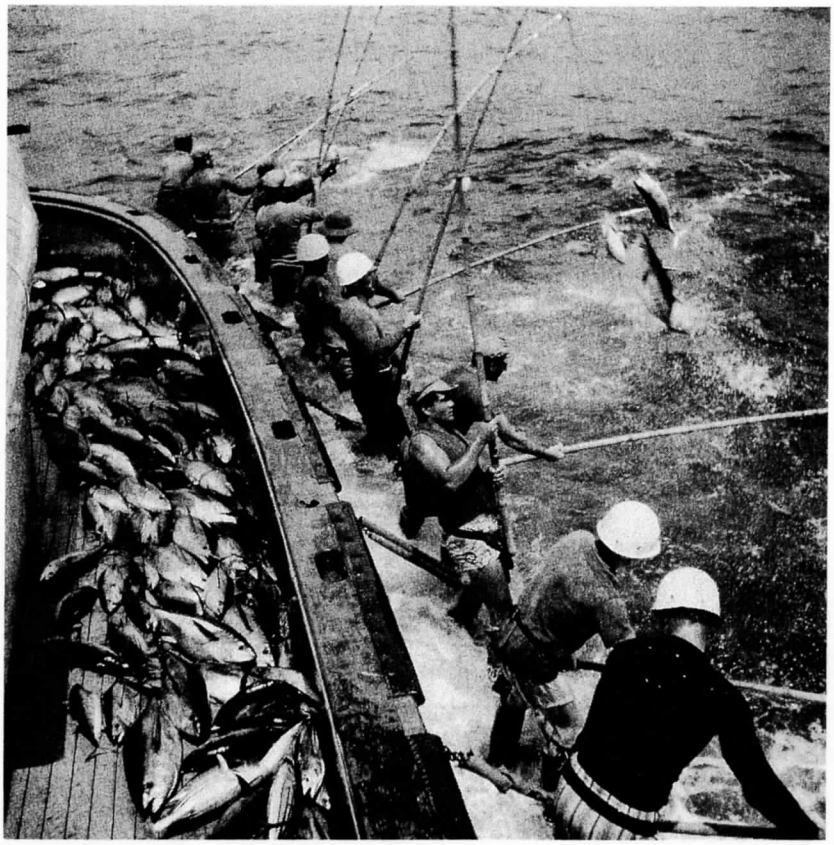

FIGURE 23-1 Commercial fishers for the New England Canning Company catch tuna in the 1960s. (©Charles E. Rotkin/CORBIS)

POLICIES TO CURB DOLPHIN MORTALITY

There have been several legislative and international attempts to curb the killing of dolphins during tuna seining. The first of these was an agreement reached with the Inter-American Tropical Tuna Commission (IATTC) in 1976 (but not funded until 1979). This program sought to (1) determine dolphin mortality, (2) reduce it such that dolphin populations were not threatened and accidental killing was avoided, and (3) maintain a high level of tuna production.[5] The chief result of this effort was the placement of observers on one-third of all vessels fishing in the ETP. As a result, the first reliable estimates of dolphin mortality were made.

A further set of treaties and regulations resulted in 100% observer coverage of ETP tuna seiners and established international limits of fewer than 5000 dolphins killed by 1999. Moreover, criteria were instituted for labeling canned tuna as "dolphin-safe." As we will see, the success of the "dolphin-safe" labeling program as a deterrent to killing dolphins is unsettled. However, as a marketing tool it is unequivocal: People buy the product. For 1996, domestic canned tuna sales approached $1 billion.

There is no question that dolphin mortality has decreased in the ETP as a result of conservation measures. But the issue remains controversial and repercussions have been felt ecologically, economically, socially, and politically, as you will see below.

---

[5]Summary minutes of the 33rd meeting of the Inter-American Tropical Tuna Commission, Managua, Nicaragua, October 11–14, 1976. IATTC, La Jolla, CA., 9.

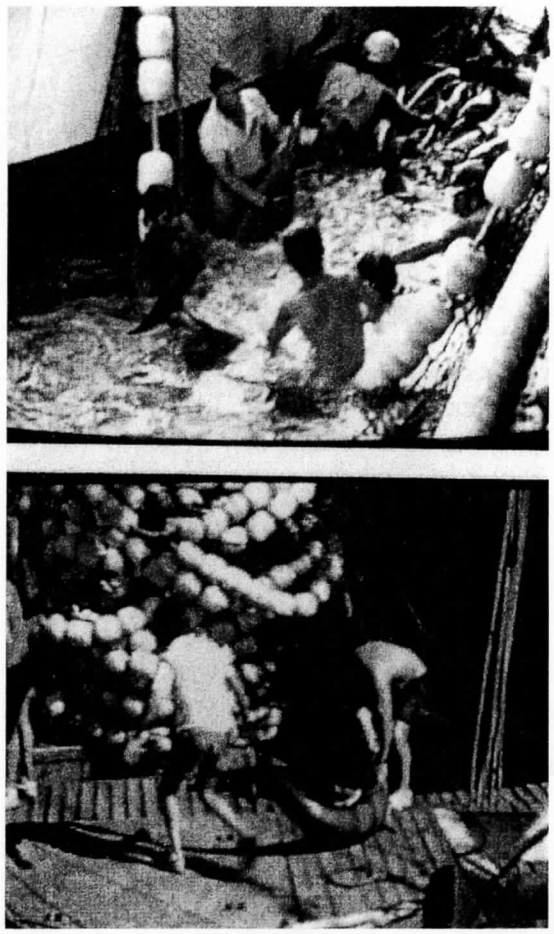

FIGURE 23-2 These photos of dead dolphins being hauled on board the Panamanian tuna boat "Maria Luisa" were from a video taken by a marine biologist who went undercover for five months on the boat to document the dolphin killings. The video from which these images were taken was broadcast on U.S. television and resulted in a huge public outcry. (AP LaserPhoto)

THE ISSUES

- **What does "dolphin-safe" really mean?**

The Dolphin Protection Consumer Information Act (DPCIA) of 1990 established minimum criteria for tuna labeled "dolphin-safe" (Figure 23-3) in the United States. Essentially, for tuna caught from any vessel to be labeled "dolphin-safe" meant that intentional encirclement of dolphins did not occur.

A problem with this was that only about 20% of commercial tuna were caught in the ETP. There, enforcement of "dolphin-safe" capture techniques was fairly tight. However, the remaining purse-seined tuna catch was not subjected to the same stringent standards. In some cases, tuna were allowed to be designated "dolphin-safe" if the ship's skipper declared it so. Furthermore, the absence of safeguards meant that real dolphin-safe tuna, ersatz dolphin-safe tuna, and non-dolphin-safe tuna could all be found on a grocery store shelf, labeled "dolphin-safe." This also placed U.S. and other ETP purse seiners under what many considered an undue burden and hindered their ability to compete fairly.

In April 1999, then-Commerce Secretary William Daley announced that "dolphin-safe" could be used to designate any tuna harvested in the ETP if no dolphins were killed or seriously injured, even if encirclement of dolphins occurred.

FIGURE 23-3 Can of tuna labeled "Dolphin-Safe." (Louis Abel/What are **YOU** looking at Photography)

This decision was denounced by a number of nonprofit organizations. Major U.S. tuna companies announced that they would continue to honor nonencirclement policies.

On April 11, 2000, Judge Thelton Henderson of the Ninth Circuit Court of Appeals, in the case *Brower v. Daley* brought by a coalition of environmental groups and individuals, ruled that the Secretary's actions were illegal.

Judge Henderson wrote:

> (The Court) concludes . . . the Secretary acted contrary to the law and abused his discretion when he triggered a change in the dolphin safe label standard on the ground that he lacked sufficient evidence of significant adverse impacts. . . . Indeed it would flout the statutory scheme to permit the Secretary to fail to conduct mandated research, and then invoke a lack of evidence as a justification for removing a form of protection for a depleted species, particularly given that the evidence presently available to the Secretary is all suggestive of a significant adverse impact.

An alternative type of "dolphin safe" labeling has been devised by the nonprofit organization Earthtrust. It awards the "Flipper Seal of Approval" to companies that meet a more stringent set of criteria.[6]

- **Have dolphin populations in the ETP been threatened by incidental capture in tuna purse seines? Are they now?**

As we have seen, millions of dolphins have likely been killed in the ETP since the inception of dolphin encirclement. Today, that number has decreased significantly. However, according to Earth Island Institute:

> Federal scientists have determined that dolphin populations in the ETP are not recovering as expected, even with the dramatically lower reported kills of recent years. Harassment of dolphins by tuna fishermen and problems arising from the consequent physiological stress (some dolphin schools are chased and netted as often as three

[6]http://www.earthtrust.org/fsareq.html.

times in one day) are likely factors which cause harm to dolphin health and reproduction. Many dolphins suffer injuries in the nets and die after release, but are not counted by the on-board observer. Mothers are separated from calves, and undercounting may be occurring on board some Mexican tuna boats.[7]

To determine if a level of dolphin mortality threatens the stability of their populations, scientists must examine, among other data, the *recruitment rate* of the dolphin population. The recruitment rate is an estimate of the rate at which new individuals (i.e., recently born individuals) survive to enter the population. In this case, it provides policy makers and biologists with an estimate of the dolphin mortality that may be "acceptable," at least from the perspective of population stability. With respect to ETP dolphins, the question is whether mortalities caused by incidental catch in purse seines exceeds the recruitment rate. We will examine this issue more fully below.

- **Do alternative methods reduce dolphin bycatch?**
  Two methods of purse-seining in the ETP are most common—*dolphin sets* (in which nets are dropped around schools of dolphins) and *log sets* (encircling floating objects such as trees, under which fish congregate). Log sets reduce dolphin mortality, but they do so at the cost of much increased bycatch of other marine organisms.
- **What are the other issues?**
  Like most issues, the dolphin-tuna controversy has many dimensions. In Mexico, as many as 15,000 jobs in the tuna fishing and canning industry have been lost, and this loss has been attributed directly to the "dolphin-safe" issue.

  Also, dolphins are very intelligent animals and are revered by many.

  According to the National Marine Fisheries Service (NMFS) in 1975, 200,000 dolphins were killed as a result of purse-seining. The Inter-American Tropical Tuna Commission reports that about 100,000 dolphins were killed in 1989.

Question 2: What is the percent decrease in dolphin mortality over the 14-year period from 1975 to 1989?

Question 3: What is the average annual decrease in mortality over that period? (Use the formula $k = (1/t)\ln(N/N_o)$, demonstrated in *Using Math in Environmental Issues,* pages 15–16.)

[7]http://www.earthisland.org/news/news_immp13.html.

The estimated total population for dolphins in the ETP in 1986 was 9,576,000. Incidental kill by the purse-seine fishery was estimated at 133,174.[8]

Question 4: What percentage of the estimated dolphin population was killed by tuna seiners in 1986?

Review the section above on recruitment rate, if necessary. For dolphins in the ETP, the recruitment rate has been estimated to be about 2% of the total population.[9]

Question 5: Based on an annual recruitment rate of 2% and 1986 incidental mortality you just calculated for the ETP, do you think dolphin populations were threatened by purse seining? Show any calculations and explain you reasoning. Also, list assumptions you made in arriving at your answer.

Question 6: In light of your answer to Question 5, are efforts to reduce dolphin mortality justified from the perspective of threatening the population? Explain your reasoning.

Question 7: What do you think a typical U.S. consumer thinks upon reading the label "dolphin-safe"?

---

[8]Wade, P.R., & T. Gerrodette, 1993. Estimates of cetacean abundance and distribution in the eastern tropical Pacific. *Reports of the International Whaling Commission 43:* 477–493.

[9]Smith, T.D. 1983. Changes in the size of three dolphin (*Stenella spp*) populations in the eastern tropical Pacific. *Fishery Bulletin-United States, 81*: 1–13.

As previously stated, there are two common methods of purse-seining, **dolphin sets** and **log sets.**[10] A major difficulty with making tuna fishing dolphin-safe concerns the size of tuna captured by these two methods.

Dolphin sets typically kill 29 dolphins per 1,000 tons of tuna. Log sets kill less than one. Modal lengths and weights (the most commonly occurring values) of the tuna caught during log sets for 1994 were 47.5 cm and 2.1 kg for skipjack tuna. For dolphin sets, the distribution was bimodal (i.e., 2 values were equally common), 103 and 138 cm and 23 and 57 kg.[11]

Question 8: Identify a possible disadvantage to tunas of capturing such small fish using log sets. Explain your answer.

In addition to capturing immature fish (i.e., fish not yet reaching reproductive age) log sets also create another problem—bycatch. In this case, during log sets bycatch can include mahi mahi, sharks, wahoo, rainbow runners, other small fish, billfish, yellowtail, other large fish, triggerfish, and sea turtles.

For each 10,000 dolphin sets, 5340 dolphins were captured, along with 1.56 million small tunas, 11,046 sharks, 98 sea turtles, and 3641 "other small fish." The respective numbers for 10,000 log sets are 36 dolphins, 103.2 million small tunas, 140,185 sharks, 456 sea turtles, and 264,886 other small fish (Hall, unpublished data).

Question 9: For each type of bycatch above, calculate the ratio of organisms caught during log sets to those captured during dolphin sets (e.g., 36:5340 dolphins) and complete the table below.

	Log Set	Dolphin Set	Ratio
Dolphins	36	5340	1:148.3
Tunas (Small)			
Sharks			
Sea Turtles			
Other			

[10]Surprisingly, enough floating objects enter the ocean to be worthwhile to commercial fishers.

[11]Hall, M.A. An Ecological View of the Tuna-Dolphin Problem. Unpublished manuscript.

Question 10: For each type of bycatch, in both dolphin and log sets, calculate how many small tunas, etc. were captured for each dolphin, etc. Fill in the table below.

	Log Set	Dolphin Set
Tuna per dolphin	2.87×10^6	292
Sharks per dolphin		
Sea turtles per dolphin		
Other per dolphin		
Tuna per shark		
Tuna per turtle		

Question 11: Use the information in the tables you just constructed and your knowledge of marine life and ecosystems to answer this question: Which method—log or dolphin sets—do you think is more ecologically sound? Explain your answer.

Question 12: Recall from p. 250 the dolphin-tuna controversy in Mexico. In 1991, an embargo was placed on Mexican tuna as a result of Mexico's tuna fleet's killing too many dolphins. Do you think an embargo was justified in light of the number of jobs lost in a relatively poor country? Do you think regulations should be relaxed? Explain your reasoning.

Question 13: Even when purse seining is employed, dolphin mortality can be reduced. One method involves using finer mesh nets, which prevents dolphins from getting their snouts caught. A second, called "backing down" involves having the boat reverse after the net is set. This drops part of the net below the water line, where dolphins are herded and chased into the open sea. Fishers risk their lives by entering the water to save the dolphins. These methods have reduced dolphin mortality from 15 per set in 1986 to 3.1 in 1991 and even fewer today. Should the definition of "dolphin-safe" be expanded to include methods of dolphin sets that reduce dolphin mortality? Discuss, and justify your answer.

Question 14: Dolphins are relatively intelligent animals. What role does this play in your assessment of the issue? How do you weigh killing intelligent animals versus endangering stocks of sea turtles or sharks?

FOR FURTHER STUDY

■ **Turtle-Safe Shrimp**

The Associated Press reported:

> In early 2000, "about 280 dead sea turtles, mostly threatened loggerheads, washed up on ocean beaches on Ocracoke and Hatteras islands. Gear from large-mesh gill nets was found on four turtle bodies.
>
> The turtles were killed in greater numbers in a week's time than the average on all state beaches in a year."[12]
>
> This particular kill was attributed to commercial monkfish fishers operating in North Carolina's waters in March and April, 2000. Sea turtle kills due to commercial shrimping are even more common. In the early 1990s, according to conservationists, shrimp trawlers in Texas killed more than 11,000 sea turtles annually.[13]

Question 1: Go to http://www.enn.com/enn-news-archive/2000/04/04292000/shrimpregs_12477.asp and read the article and access linked websites. What actions have been taken and are proposed to protect endangered sea turtles? Are these sufficient to protect endangered species from extinction?

Question 2: Go to http://www.enn.com/enn-news-archive/1998/10/101398/wtoturtles.asp and http://www.sierraclub.org/trade/environment/turtles2.asp and read the article and letter. Do you think the World Trade Organization should have the right to overrule the environmental laws and regulations of the United States and other countries? Explain your reasoning.

---

[12]*Myrtle Beach Sun News,* 5/26/00.

[13]http://www.enn.com/enn-news-archive/2000/04/04292000/shrimpregs_12477.asp).