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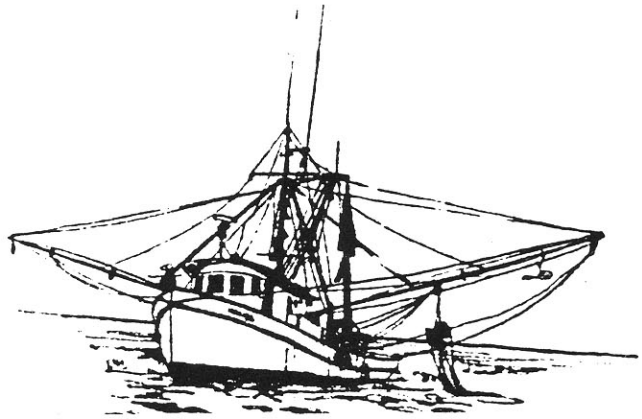

BYCATCH WHEN FISHING

by Ken Roberts and Jerald Horst

If the commercial and recreational harvest of fish and shellfish took place in a clear fish bowl, harvesters could separate target from nontarget species and take only those fish that were desired and legal. In the real world, however, the number and size of fish present cannot be observed until after the fish are caught. These nontarget, or unwanted, species taken by legal means are referred to as **bycatch**. A federal law defines bycatch as "...fish that are harvested in a fishery, but which are not sold or kept for personal use."

Bycatch is unwanted because it is of nonmarketable or illegal size or because it is not regarded as good to eat. **Economic discards** are fish that are unmarketable because they are still too small, and **regulatory discards** are those that must be returned to the water because of fishery regulations. Desirable fish discarded because they are too small to keep may grow to a larger, marketable size. Fish considered inedible by humans may serve as food for other fish that are wanted for harvest. But when they are discarded as bycatch, their potential use may be lost because many of them die in the release process.

Public awareness of the problems of bycatch has increased and lawmakers have been pressured to institute reduction policies. In 1996, Congress specified that bycatch in all fisheries be reduced and that unavoidable bycatch mortality be minimized. Awareness in Louisiana began a few years ago with the debate over gill nets, which were said to result in unintended catch and fish mortality. Another source of bycatch that has received attention is the shrimp trawl.

A two-year study of shrimp trawlers in the Gulf of Mexico from 1992 to 1994 documented finfish bycatch. Gulfwide, the ratio of finfish poundage to each pound of shrimp was 4 to 1, a decline from 10 to 1 observed in the 1970s. In Louisiana's portion of the gulf, the nearshore ratio was 3.3 pounds of finfish to 1 pound of shrimp and the offshore ratio was 6.9 to 1. Requirements for using bycatch reduction devices (BRDs) are expected to further reduce bycatch in shrimp trawls.

The specific results of the bycatch reduction policy are uncertain. In reducing bycatch in shrimp trawls, for example, three important questions must be asked. (1) What will be the effect on shrimp populations if more fish survive to eat them? (2) What will be the impact on marine species that have come to depend on discarded bycatch as food? (3) What will be the impact on finfish populations as bycatch mortality is reduced?

for their nutritional benefits and medicinal value in health food markets, other varieties are known to be poisonous to fish, animals, and humans through toxic impacts on the nervous system, skin, respiratory tract and liver. Occasional livestock losses are attributable to blue-green toxins in stock ponds, and some people may have extreme allergic reactions to toxins produced by these algae.

In marine waters, fish, manatees, sea lions, dolphins, whales, pelicans, and many other forms of wildlife are targets of other toxic algae. One widespread group is known as the dinoflagellates. Although they generally fall under the broad heading of "algae," dinoflagellates are single-celled organisms with characteristics somewhere between those of plants and animals, belonging in a group scientists call the "protists." While most are important components of aquatic food chains, a small number of the thousands of dinoflagellate species (including those responsible for red tides) are toxic to fish and many other animals.

Toxins produced within these microorganisms can become concentrated by animals that feed on them, such as shellfish and other filter-feeders. This "bioconcentration" can affect humans if contaminated shellfish are accidentally consumed. Monitoring programs and regular shellfish inspections, however, generally prevent such occurrences. Toxins can also be released directly into the environment when a dinoflagellate bloom dies back. An estimated 14 million fish were killed during a red tide outbreak in Texas in September and October 1997. Airborne toxins in sea spray can irritate the eyes and respiratory systems of humans.

Noxious dinoflagellate blooms appear to be occurring more frequently in poorly flushed bays and lagoons in many parts of the world, although some have been occurring regularly for hundreds of years. The red tide organism relies on upwelling of fertile off-shore waters to initiate a bloom, and subsequent currents and winds to push it into near-shore areas. Nutrient run-off from urban and agricultural sources can sustain a red tide outbreak in near-shore areas for an extended period until weather and current conditions can dissipate the bloom.

Another toxic dinoflagellate in the news recently is the particularly sinister *Pfiesteria* (pronounced "Fi-steer-ia") *piscicida*. Rather than producing its food through photosynthesis, *Pfiesteria* prefers to feed directly on tissues from fish and other aquatic animals. *Pfiesteria* produces two distinct toxins—one damages the nervous system of fish passing nearby, partially or completely stunning them. Another causes lesions, producing blood and sloughed tissue for the protists to feed on. Both these toxins can adversely affect people who come into contact with them.

Diatoms are another group of algae with several toxic species, indirectly killing anything from pelicans to humans that may consume shellfish containing their toxins. Of roughly 4,400 known species of marine algae, only about 50 produce toxins, but many can produce localized oxygen depletions similar to those caused by blue-green algae in freshwater habitats. Heavy blooms in coastal waters in Texas following the 1989 freeze were determined to cause a 20 percent loss of sea grass beds simply shaded because they shaded the sea bottom. Decomposition of fish and other animals killed by the freeze was suspected as the source of fertilizer for the bloom.