

# Skate-ing to Extinction?

## Some long-lived fish are facing accidental annihilation

By JANET RALOFF

Trawlers, which efficiently scour the ocean floor for groundfish, unintentionally haul in plenty of untargeted fish, including large, slow-to-reproduce skates.

William Raschi, Bucknell Univ.

For millions of years, a voracious predator has gracefully patrolled North Atlantic waters. Sinuous undulations propel its disklike body in glides and swoops along the seafloor. Fitted with many rows of teeth, its jaws can make quick work of shrimp, worms, squid, even lobsters. It also dines on herring, menhaden, or any other fish unlucky enough to catch its fancy.

These large skates, sometimes called rays, are essentially flattened sharks with wings. Though edible—some describe them as tasting like scallops—skates have never been deliberately targeted by U.S. fishers. Having no serious predators, they existed undisturbed at the top of the marine food chain until the 20th century.

During the past few decades, fishing fleets have intensified their efforts, depleting groundfish stocks throughout the world's coastal waters. Commercial operations have increasingly invested in large, efficient trawls and dredges. Although this gear is deployed to bring in cod, haddock, pollack, shrimp, or flounder, it scoops up everything in its path as it plows the ocean floor (SN: 10/26/96, p. 268).

Among the unintended victims of trawling have been skates, especially the spectacularly large barndoor skate, *Raja laevis*, in the Atlantic off North America. This skate and others also have been unintentionally snagged by baited longlines. Commercial fishing has, in fact, devastated the barndoor skate, scientists recently reported.

Nearly a century ago, fishing boats ply-

ing Georges Bank off Massachusetts could bring in up to 600 skates per day, according to a 1953 U.S. Fish and Wildlife Service bulletin. As late as 1951, one ship reported a cruise during which it landed 146 skates per haul, a quantity that the bulletin reported "works out to about 9 to 10 skates per acre."



Barndoor skate photographed in the 1970s.

Today, barndoor skates are rarely caught. In some of the areas where trawlers used to routinely haul in 6 to 30 barndoor skates per tow of the net, not a single barndoor is showing up—despite increased rates of trawling with ever more efficient gear.

Conservationists now worry that the unintentional catch of skates on both sides of the North Atlantic has endangered the barndoor skates and several other species. Today, no regulations limit

fishing's impact on these animals, but that could change soon.

In March, two organizations independently petitioned the National Marine Fisheries Service (NMFS) to designate the barndoor skate as an endangered species. By June, officials must determine whether sufficient data exist to warrant extending federal protection to this little-understood and largely ignored animal.

Even if this skate isn't judged to face imminent extinction, it may still be considered an overfished resource. One of the recent petitions asked NMFS to evaluate this possibility. A positive finding would automatically trigger at least some protection—a move that could bring an uproar from commercial fishing fleets.

The barndoor skate's precarious status only came to light when a pair of Canadian biologists published data in the July 31, 1998 *SCIENCE* showing a precipitous decline in landings of the species. If this decline isn't arrested, "the barndoor skate could become the first well-documented example of extinction in a marine fish," argued Jill M. Casey of Memorial University of Newfoundland in St. John's and Ransom A. Myers of Dalhousie University in Halifax, Nova Scotia.

New data of a similarly worrisome trend affecting large eastern North Atlantic skates such as the common skate, *Dipturus batis*, were presented at a Marine Conservation Biology Institute symposium in Boston 6 weeks ago by researchers from the Univer-

sity of East Anglia in Norwich, England.

Though the overall tonnage of all skates accidentally caught off Britain, Ireland, and the Netherlands has remained fairly constant in recent years, the species-by-species profile of trawlers' by-catch has been changing. John D. Reynolds and Nicholas K. Dulvy shared this data with the Boston symposium.

Increasingly, common skates and other large species have been disappearing, and small skates have been taking their place. This probably explains, Reynolds notes, why populations of the smallest species, such as the starry rays (*Raja radiata*), seem to have mushroomed.

A pattern that's emerging throughout the North Atlantic, he reported in Boston, is that in terms of marine survival, "big is bad—which is obviously relevant to the barndoor."

**H**istorical accounts recall trawlers that hauled in barndoor skates measuring up to 6 feet long and weighing several dozen pounds.

Such catches are now extremely rare. In 26 years of research trawls by NMFS biologists, no 6-footer and only one 5-footer has been captured. It was in 1963, and even this animal appeared to be a juvenile, notes Kathy Sosebee, a NMFS fish analyst in Woods Hole, Mass.

This February, NMFS researchers again ran a trawl net along the seafloor off the northeastern U.S. coast. Each 30-minute run retrieved about 700 pounds of fish. They typically included 160 skates, of which more than 140 were little skates (*Raja erinacea*) and only one was a barndoor. The average barndoor that they collected spanned just 20 inches, tip to tail, and weighed a mere 2 pounds. All the 91 barndoors caught during the project appeared to be juveniles.

On the Grand Banks off Newfoundland, the northern limit of the barndoor skate's range, the fish has proved even rarer. Research surveys have not reported catching one in about 25 years, says Myers.

Indeed, he notes, though they once inhabited coastal environments to depths of a few hundred feet, the only barndoor skates now known to remain off Newfoundland are at depths of more than a half mile. Members of the Canadian Department of Fisheries and Oceans accidentally discovered the skates while prospecting for new exploitable fisheries.

Even these depths are now being plied by commercial trawlers. This is unfortunate, Myers adds, because it may shelter one of the few remaining reservoirs of the beleaguered barndoor.

**T**o compensate for heavy predation, most bony fish mature early and produce huge numbers of young. A female striped bass, for instance, can lay

1 million eggs annually. Some of this year's fry will be ready to take their mother's place in the breeding stock within 6 to 8 years.

Not so for cartilaginous fish like sharks and skates. Developing in the absence of aggressive predators, they evolved a different strategy. Not only do they grow slowly but they mature relatively late and produce few young—typically a mere 2 to 20 annually.

The larger these species are, the more slowly they develop. Inhabiting cold waters, as barndoor skates do, further retards their growth. Indeed, throughout most of their range, female barndoor skates probably bide some 10 to 15 years before producing their first egg. Each female must therefore evade capture by the groundfish fleets for close to 2 decades before it can play a significant role in rebuilding a depleted stock.

That's a tall order for fish living in regions where 80 percent of the ocean floor may be trawled at least annually.

Further compromising the barndoor skate's prospects is the size of the case that houses each egg. Each rectangular case is large enough to be subject to fishing's ravages.

"If you're going to harvest these species—even as by-catch, as with the barndoor skate—you'll have to do it at a low level from the get go. Otherwise, you'll risk a collapse [of its population] within a relatively rapid period, perhaps 10 years," says John A. Musick of the Virginia Institute of Marine Science in Gloucester Point. That's worrisome because with this unusual reproductive history, "their ability to recover from overfishing is very limited," notes the biologist who specializes in cartilaginous fish.

Musick says that sharks face the same threat from overfishing. He's described an instance where the sand tiger shark became rare locally because it has a lower reproductive rate than other sharks, like the sandbar shark, that are abundant and still drive a fishery. In fact, he adds, "there are precious few places in the world where there is any shark management."

**I**ronically, until very recently, "a lot of fisheries biologists didn't believe you could drive marine species extinct," Musick notes. Because these fish aren't



The barndoor skate jackets each egg in its own protective leathery case, about 5 inches long and 3 inches wide. Throughout the 18 to 24 months that the sack incubates on the ocean floor, it's vulnerable to being scooped up or mashed by trawls. Hatching offers no respite from danger. The 7-inch-long young emerge already big enough to be snared by bottom-trawling nets.

penned in and most spawn hundreds or thousands of eggs at a time, the scientists had argued that even heavily overfished populations should rebound once they were offered a little protection.

Moreover, these biologists had asserted that before a species could be fished to extinction, its stocks would become too uneconomical to harvest—thereby providing a natural check against overexploitation.

The "fallacy" in such arguments, Musick says, is that in mixed-species communities, fishing may remain economically productive if slowly reproducing species are replaced by high numbers of more quickly reproducing fish. Moreover, if some of the overfished species were never commercially targeted, their depletion would have no effect on the economics.

"That's what happened with the barndoor skate," Musick says. Even as the North Atlantic cod fishery was declining, there were enough of the abundantly spawning fish to fill nets long after the region's barndoor skates were all but locally exterminated.

Though data on the barndoor skate are rather imprecise, there appears to be little question that its populations have crashed throughout almost all of its natural range, says Elliott A. Norse, president of the Marine Conservation Biology Institute in Redmond, Wash.

"We're not talking about it being down by half or even three-quarters," he says. "It looks like it's down by 99.99 percent, raising the very real possibility of extinction."

What disturbs him most is that until the report by Casey and Myers last year, this decline had gone unrecognized. "If we can unintentionally bump off large organisms like this and not

even notice," Norse contends, "something must be very wrong."

He is not alone in thinking so.

If a terrestrial species had suffered the magnitude of decline seen in barn-door populations, an army of biologists would have launched a campaign to protect it, argues Les Kaufman, a conservation biologist with the Boston University Marine Program.

The barn-door skate's population probably bottomed out during the 1970s, he says, but environmentalists didn't call for the species to be listed under the Endangered Species Act until a quarter century later.

Since NMFS is charged with managing marine fisheries, Kaufman asks, "why didn't it ensure that this didn't get to be a problem?" The delays demonstrate, he says, that when it comes to federal conservation of marine species, "the system doesn't work."

Then again, this fish "persists in our waters," counters Fred M. Serchuk, chief of NMFS' resource evaluation and assessments branch in Woods Hole, Mass. So, while its populations may total just a fraction of historical levels, "we are probably not dealing with a situation where if we don't act immediately, the resource will perish."

Because any move NMFS takes may lead to litigation by commercial fishing



The Aleutian skate being held by a fisherman in this photo is the barndoor skate's equivalent in the Bering Sea. Owing to its life history, large size, and frequent capture by ships trawling for pollack, the Aleutian skate also faces a serious risk of being unintentionally overfished.

operators, it's important to base any action on solid data and a careful weighing of the options, Serchuk says.

Such evaluations are now under way. While Kaufman is buoyed by this, he says he finds it distressing that NMFS didn't act until outside conservation advocates forced its hand with petitions this year.

The first petition was filed March 5 by Richard Max Strahan on behalf of GreenWorld in Cambridge, Mass. Strahan describes his organization's goals as developing scientific recovery plans for endangered wildlife and forcing their implementation "through litigation and other forms of persuasion."

His group successfully petitioned the federal government to list the northern spotted owl as endangered, a move that ultimately curbed logging on more than 9 million acres of western forests.

Three weeks after GreenWorld filed its petition on the barndoor skate, William R. Irvin and Sonja V. Fordham with the Center for Marine Conservation (CMC) in Washington, D.C., filed a similar petition with NMFS.

In a separate move, CMC also sent a letter to Commerce Secretary William M. Daley requesting that NMFS, an agency within the Department of Commerce, evaluate whether the barndoor skate has been overfished. Under the 1996 Fishery Conservation and Management Act, NMFS must develop a stock-rebuilding plan for any overfished species.

Indeed, the latter strategy may offer the skate its the best chance of recovery, says Serchuk. If the fish is in dire straits due to fishing, he notes, what better way to protect it than by developing new fishing limits, equipment, or rules?

Some ecologists, like Peter J. Auster, science director of the National Undersea Research Center at the University of Connecticut in Groton, also see the creation of marine reserves—where fishing is prohibited—as imperative to saving the skate. "It's the most precautionary approach we can have."

Musick, however, does not rule out the possibility of some technological help. For instance, trawls or other gear might be modified to pass up skates. Or perhaps, Myers offers, fishing fleets might be prohibited from trawling at the ocean floor in prime skate habitat.

Whatever might be done to save the barndoor skate, this fish's plight should serve as a wake-up call to all people who care about the ocean, Kaufman says. The barndoor probably is not the only slow-growing, nontargeted fish being hammered by trawls and dredges.

"It's just the one under the lamp post," he says. If a spotlight were shined elsewhere, biologists would undoubtedly discover other populations of large fish that are declining, Kaufman adds.

Does it matter if commercially unattractive or obscure species disappear? Absolutely, Kaufman maintains. If skates or their slowly reproducing brethren disappear, he argues, "it will have an effect on the other things that we do care about" for commercial reasons.

These big, flat, sharklike fish are therefore both an indicator of the environment and a potentially key player in it. Kaufman concludes, "We can ignore their fate only at our peril." □

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