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A Section

Jellyfish 'Blooms' Could Be Sign of Ailing Seas; Glut in Some Locations Harms Other Marine Life, Scientists Warn

Cheryl Lyn Dybas

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Once a month, on the darkest nights near the new moon, otherworldly beings emerge from Pacific Ocean depths and drift onto the beaches of Hawaii. Hundreds, sometimes thousands, of these quivering masses of jelly float in with the night tide. Near shore, time grows short to complete their mission: to reproduce, leaving behind miniature versions of themselves fastened with a glue-like substance to reefs and rocks in the shallows.

Box jellyfish, the invaders are called. "They come in each month here in Hawaii with unbelievably precise timing," said marine scientist Jerry Crow of Honolulu's Waikiki Aquarium, "and they're in a frenzy to reach their shoreward destination. Most jellies just float along, but box jellyfish actually swim. Like the rabbit in 'Alice in Wonderland,' they seem to be saying, 'I'm late, I'm late.' "

Crow and colleagues from around the world are studying Hawaii's box jellies. "Over the past few decades, more and more box jellies are in the waters around Hawaii," he said. "The question is, where are all these jellies coming from, and why now?"

Populations of jellyfish are exploding in seas and oceans around the world, scientists say, raising concerns about the health of marine ecosystems. Off the coast of France, aggregations of jellyfish have sunk 500-pound fishing nets. In Japan, jellies have clogged the water intakes of nuclear power plants. In the Gulf of Mexico, jellyfish are competing with humans for the larvae of commercially important species such as shrimp. One gulf shrimp boat captain said that in some places, the jellies are so thick "you can almost walk across the water on them."

In recent decades, humans' "expanding influence on the oceans has begun to cause changes, and 'blooms' of jellyfish may be occurring in response to these impacts," said Claudia Mills of the University of Washington in Seattle. As parts of the ocean are increasingly disturbed and overfished, jellyfish may be taking the place of fish in the food web of the seas. "Jellyfish feed on the same kinds of prey as adult and young fishes," said Marsh Youngbluth, a jellyfish researcher at the Harbor Branch Oceanographic Institution in Fort Pierce, Fla., "so if fish are removed from the equation, jellyfish are likely to move in."

If overfishing continues in the North Atlantic and elsewhere, fishing boats could soon be chasing jellyfish instead of fish, said fisheries scientist Daniel Pauly of the University of British Columbia.

But overfishing isn't the only possible explanation for rapidly expanding jellyfish populations, said scientist Monty Graham of the Dauphin Island Sea Lab in Alabama. "Ecosystems in which there are high levels of nutrients as a result of agricultural run-off, for example, provide nourishment for the small organisms on which jellyfish feed. In waters where there is eutrophication [over-fertilization], low oxygen levels often result, favoring jellyfish as they thrive in less oxygen-rich water than fish can tolerate. The fact that jellyfish are increasing is a symptom of something happening in the ecosystem."

Graham cited the northern Gulf of Mexico, in which all species of jellyfish are rapidly increasing. Moon jellyfish, for example, are being found in dense concentrations in offshore areas that overlap prime fishing grounds, such as those for red snapper. "Moon jellies have formed a kind of gelatinous net that stretches from end to end across the gulf," said Graham. "How much impact they will have on red snapper and other fisheries is a big concern."

Graham has begun a program called Dock Watch, in which volunteers along the coasts of Alabama and Mississippi report observations of jellyfish species and numbers. "The only way we're going to figure this out," said Graham, "is by having enough eyes out there to see where 'swarms' of jellyfish are, when. Then we can begin to pinpoint why there are so many of them."

In the Adriatic Sea, a "bloom" of a jellyfish called *Pelagia* nearly shut down the ecosystem. "Huge quantities of jellyfish clogged all nets in almost no time," said scientist Ferdinando Boero of the University of Lecce in Italy. The *Pelagia* population has returned to normal, but the main cause, said Boero, "could result in another such bloom at any time. Industrial, agricultural, and urban activities lead to enormous nutrient overloads discharged into the Adriatic Sea by the Po River."

Long-term changes in jellyfish abundance may be a response to the effects of intense fishing, nutrient enrichment along coasts or other factors. Warming ocean waters as a result of global climate change, and introductions of species into areas in which they are not native, may also play a part.

Whatever the forces behind jellyfish blooms, some jellyfish population explosions rival the plot of a B-grade science fiction movie. For instance, consider the comb jelly, or sea walnut: After some were transported in a ship's ballast water from the east coast of North America to the Black Sea, the species took over not only the sea's waters, but the region's economy as well.

The comb jelly virtually emptied the Black Sea of the small drifting animals on which fish depend for food. Then it ate the fishes' floating eggs and larvae. Thousands of fishers folded their nets as the mass of the comb jellies rose to exceed the world's annual fish landings. However, the sea walnut's days as king of the Black Sea may be numbered: Another North American comb jelly, the oval comb jelly, also has hitched a shipboard ride into the Black Sea's waters. The oval comb jelly's prey? Sea walnuts.

Not everywhere, though, are jellyfish populations reigning over the seas. In some areas, they've been the victims of the same conditions that led to blooms in other regions.

In Palau, home to Micronesia's Jellyfish Lake, the El Niño climate event of 1998 significantly warmed the lake, wiping out the rare golden jellyfish that live there, said marine biologist Mike Dawson of the University of California at Los Angeles. Golden jellyfish have evolved over millennia to live in a lake permanently cut off from the sea.

"The situation was seemingly hopeless," said Dick Dewey, a scientist at Portland State University in Oregon. "Palau's reputation as one of the 'seven biological wonders of the world' had been based on this magnificent lake and its jellyfish."

When climate and weather patterns returned to normal, the lake's water temperatures dropped to a more usual 86 degrees from the 95-plus they had hit during El Niño. "Amazingly," said Dewey, "golden jellyfish larvae attached to the floor of the lake survived."

As the waters cooled, tiny golden jellies by the thousands emerged from the muddy bottom. Eventually, more than 1 million golden jellies came back in Jellyfish Lake.

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