Nile Delta fishery grows dramatically thanks to run-off of sewage, fertilizers

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(PhysOrg.com) -- While many of the world's fisheries are in serious decline, the coastal Mediterranean fishery off the Nile Delta has expanded dramatically since the 1980s.

The surprising cause of this expansion, which followed a collapse of the fishery after completion of the Aswan High Dam in 1965, is run-off of fertilizers and sewage discharges in the region, according to a researcher at the University of Rhode Island Graduate School of Oceanography.

Autumn Oczkowski, a URI doctoral student, used stable isotopes of nitrogen to demonstrate that 60 to 100 percent of the current fishery production is supported by nutrients from fertilizer and sewage. Her research will be reported in the Jan. 21 online edition of the *Proceedings of the National Academy of Sciences*.

"This is really a story about how people unintentionally impact ecosystems," Oczkowski said.

Historically, the Nile would flood the delta every fall, irrigate nearby agricultural land, and flow out to the Mediterranean, carrying with it nutrients to support a large and productive fishery. Construction of the dam stopped the flooding, and the fishery collapsed.

"That's when fertilizer consumption in the country skyrocketed," said Oczkowski. "The Egyptians were fertilizing the land, and then fertilizing the sea with the run-off. It also corresponded with a population boom

and the expansion of the public water and sewer systems."

As a result, landings of fish in coastal and offshore waters are more than three times pre-dam levels. While increased fishing effort in recent years may have played some role in the recovery, Oczkowski's findings indicate that anthropogenic nutrient sources have now more than replaced the fertility carried by the historical flooding.

Oczkowski and colleagues from URI, the U.S. Environmental Protection Agency, and the University of Alexandria collected more than 600 fish in 2006 and 2007 from four regions that received run-off from the delta and two areas not affected by the Nile drainage. Stable isotopes of nitrogen in each fish were measured and compared.

She found that the isotope signatures in the fish reflected two distinct sources of nitrogen: anthropogenic nitrogen from fertilizers and sewage in the fish caught in coastal and offshore areas of the delta, and nitrogen values consistent with the middle of the Mediterranean in fish caught in waters that were not affected by the delta drainage.

These results have raised questions among many scientists about the value of anthropogenic sources of nutrients to ecosystems.

"We're programmed in the West to think of nutrient enrichment of coastal systems as bad," Oczkowski said. "Here in Rhode Island we've spent hundreds of millions of dollars to upgrade sewage plants to reduce nutrient loading into Narragansett Bay. And it's a major issue in the Chesapeake Bay and in the Gulf of Mexico, where run-off of fertilizers from the country's breadbasket into the Mississippi River has caused a dead zone in the Gulf.

"But the Egyptians don't think it's a bad thing. For them, it's producing tons of fish and feeding millions of hungry people. It's forcing us to

reconsider whether we can say that nutrient inputs are always a bad thing."

Provided by University of Rhode Island