PASSAGE FOUR

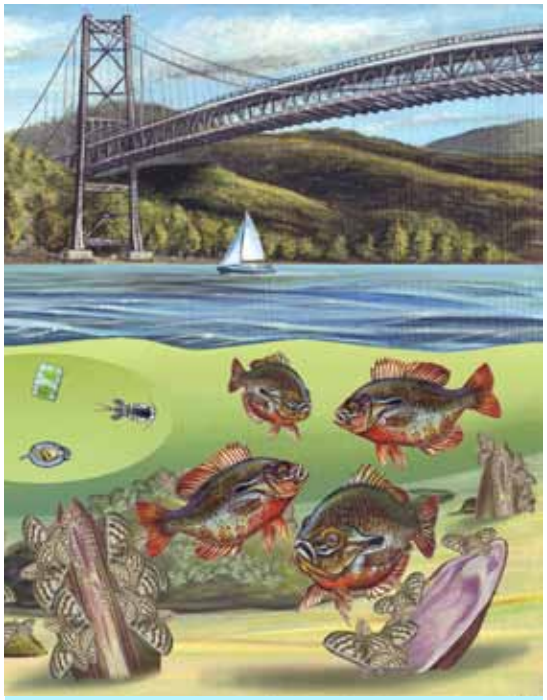
Long-Term Monitoring of the Hudson River

A puzzling reversal

In 2005, 14 years after the first sighting of zebra mussels in the Hudson River, Cary Institute scientists noticed an unexpected change in the river: zooplankton had returned to the same levels as before the invasion. Why weren't the zebra mussels eating as much zooplankton?

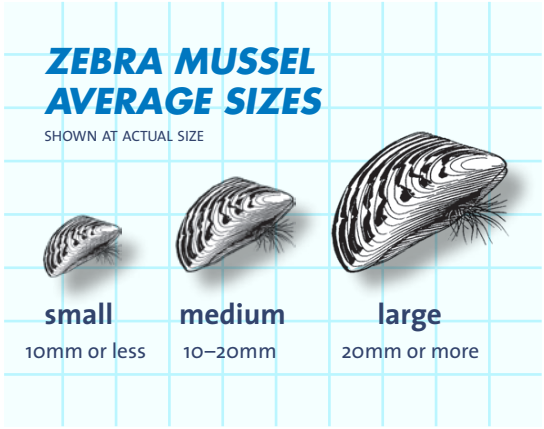
Then the scientists observed a change in the zebra mussels they were collecting from the river. Zebra mussels are grouped into three sizes: small (less than 10 mm), medium (10–20 mm), and large (more than 20 mm). While there were still many zebra mussels in the Hudson River, they were on average much smaller. Populations of the largest — or oldest mussels — were in decline. Zebra mussels can live six or seven years, but now it seemed that most were dying after only one or two years. Adult zebra mussels had less than one percent chance of surviving a given year. The impact of the zebra mussel invasion was changing.

If there were fewer large zebra mussels, it made sense that there was more zooplankton. That's because large zebra mussels



WHAT HAPPENS NEXT?

What's the future of the Hudson River ecosystem now that zebra mussels have arrived? Only time and observation will tell.



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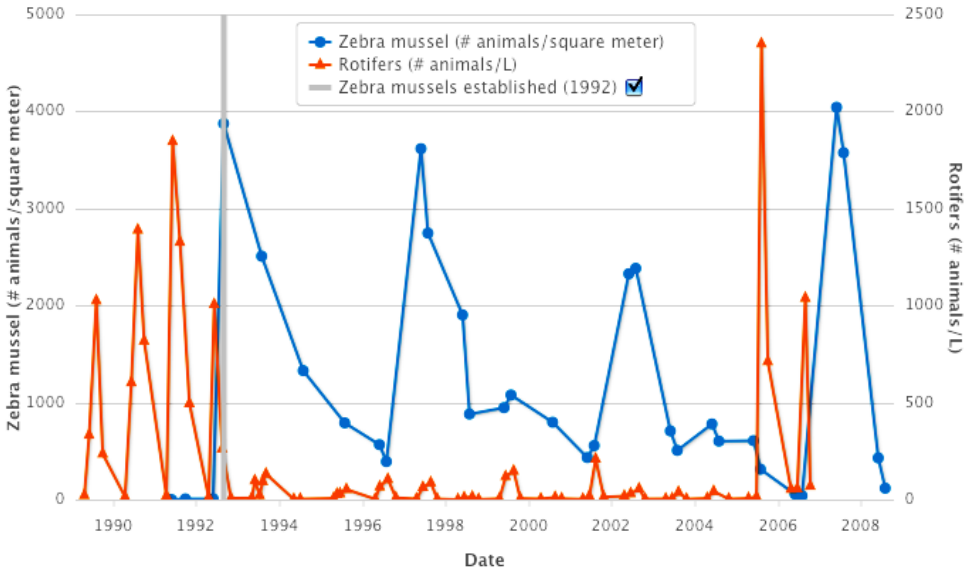
CONTINUED: LONG-TERM MONITORING OF THE HUDSON RIVER

feed on bigger food particles like zooplankton. Smaller zebra mussels can eat only smaller particles like phytoplankton and bacteria.

These new effects rippled through the food web. As zooplankton rebounded, so did native mussels and clams. Scientists anticipate some fish species will rebound too as their food supply increases. Scientists don't know exactly what caused the decline in large zebra mussels, but they do know blue crabs were eating some of them.



ANALYZE THIS

This graph shows the relationship between rotifers (or zooplankton, shown with an orange line and triangles) and the zebra mussels (shown with a blue line and circles) in the Hudson River over 20 years. Look at what happens in the last five years: what do you think is happening to the ecosystem?

More time, more data, more answers... and more questions

By monitoring several aspects of the Hudson River over many years, Cary Institute scientists are beginning to answer their original question: How might a zebra mussel invasion affect the Hudson River ecosystem? Early on during the invasion, zebra mussels survived, thrived, and had a huge impact on the ecosystem's food web — just as scientists had predicted.

Blue crabs are a bottom-dwelling predator and a chief consumer of bivalves and other crustaceans, including zebra mussels.

EXPLORE MORE AT
amnh.org/education/hudsonriver

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Almost 20 years later, the number of zebra mussels has greatly declined. And parts of the ecosystem, such as the number of zooplankton, native mussels, and clams, have started to increase. But is this the end of the story? Or have we just seen the first two stages of an invasion that might have three or four stages, or more?

As their data grows, the scientists are able to track changes in the river — whether from pollution, weather, sea level rise, invasive species, or human activity – and to pose new questions. This broad approach also puts Cary scientists in a unique position to investigate future changes to the Hudson River ecosystem.

STOP AND THINK

1. **Scientists study the natural world through scientific inquiry. This involves:**

   - **Asking questions**
   - **Developing and using models**
   - **Planning and carrying out investigations**
   - **Analyzing and interpreting data**
   - **Using mathematics and computer technology**
   - **Constructing explanations**
   - **Engaging in argument from evidence**
   - **Obtaining, evaluating, and communicating information**

How is the investigation of the Hudson River ecosystem an example of scientific inquiry?

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