

Overfished Amazon fish disperse seeds long distances

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Colossoma macropomum with recently implanted radio tag.

(PhysOrg.com) -- The gamitana fish, a close relative of the flesh-eating piranha, mostly eats fruit and can carry seeds down the Amazon River as far as 3 miles (5 kilometers), reports a new Cornell study, making it one of the longest seed dispersals ever reported. The researchers report that these fish (*Colossoma macropomum*, known as gamitana in Peru, and tambaqui in Brazil) may play an important role in the structure of the Amazon forest as fruit seeds remain viable in their gut for many days and are widely spread.

But these [fish](#), one of the most important commercial fish in tropical South America, are heavily overfished, with populations decimated by 90 percent in some areas over the last several decades. That has greatly reduced the number of larger fish that can spread [seeds](#) the farthest.

"Overharvesting may be disrupting an ancient co-evolutionary relationship between *Colossoma* and Amazonian plants," said Alexander Flecker, professor of ecology and evolutionary biology and co-author of the paper recently published online in the [Proceedings of the Royal Society B](#).

"These fish can move seeds very far distances," said Jill Anderson, Ph.D. '09, a postdoctoral researcher at Duke University and the paper's lead author. "This long-distance [seed dispersal](#) by fish can connect plant communities through gene flow and is potentially important for the [genetic diversity](#) of [plant populations](#)," she added.

In the lab, the researchers timed how long it took *Colossoma* to pass seeds through their gut; in the wild in Peru, they tagged and radio-tracked how far the fish traveled over time.

They found that these fish typically dispersed seeds up to one-third of a mile (0.5 km), while about 5 percent of the fish were predicted to disperse seeds between 1 mile (1.7 km) and 1.3 miles (2.1 km) with a maximum dispersal distance of 3.4 miles (5.4 km), farther than dispersals by almost all other frugivores reported. These maximum dispersal rates are similar to African hornbills and Asian elephants, which travel farther, but do not retain seeds as long as the fish, which can take up to a week to digest them.

The researchers also found nearly 700,000 intact seeds from 22 tree and woody-stemmed vine species -- representing up to 21 percent of the floral species that fruit during the flood season in the field site in Peru -- in the digestive contents of 230 *Colossoma* fish. The co-evolutionary relationship between these fish and plants is tied to the seasonal rains, which can flood areas for up to eight or nine months, with water 16 to 19 feet deep for about five of those months. The researchers found that during the rainy season, the fish spend 90 percent of their time in these

flooded habitats, as they are drawn to fruit that falls into the water during flood season.

Next, the researchers plan to explore the implications of fish overharvesting and seed dispersal for the Amazon plants, as well as the relative roles of fish versus bats, birds and monkeys in spreading seeds.

Provided by Cornell University

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