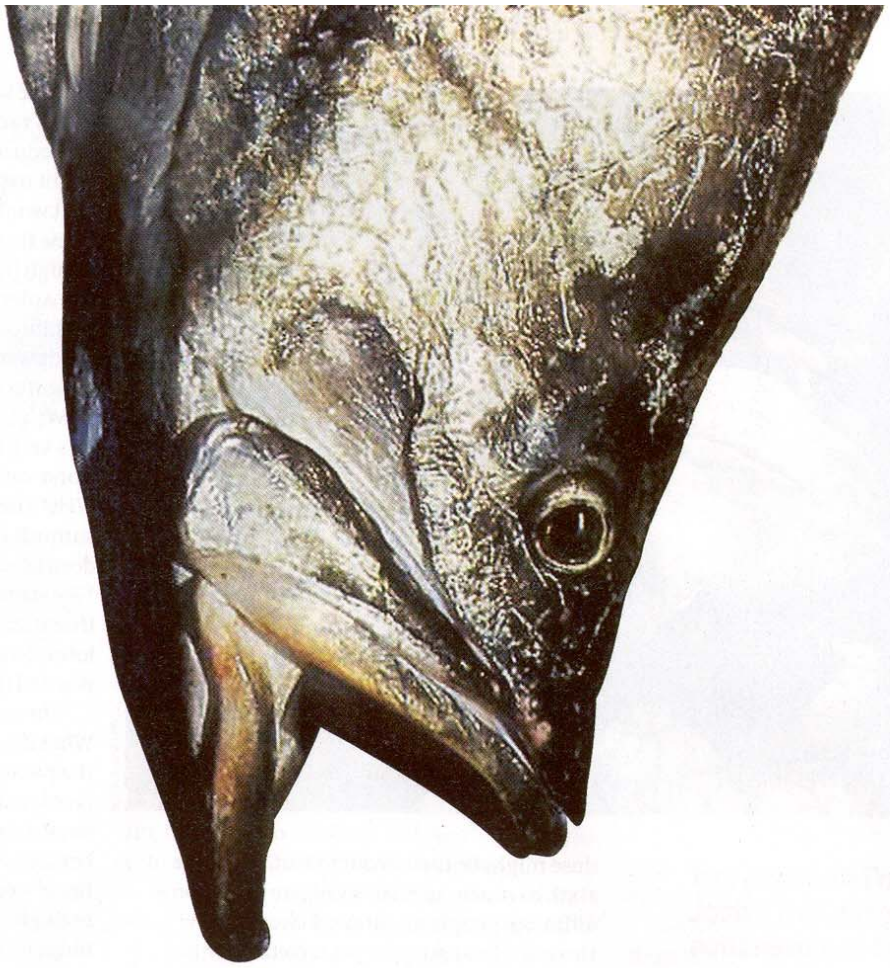


Dark secret of the lake

The fabulous diversity of Lake Victoria's cichlid fish is under siege, and not just from alien predators. Time is running out to tackle another villain that has been lurking unsuspected in the shadows, as **Sarah DeWeerdt** reports

AT FIRST, Ole Seehausen was overjoyed to find the small fish thrashing about in his net last spring. The blue-black cichlid with a saffron tail fin looked like one of the 200 species that biologists had watched go extinct over the past two decades in East Africa's Lake Victoria. It was as if *Yssichromis piceatus* had returned from the dead. But as evolutionary biologist Seehausen studied its features more closely, his joy evaporated. The little fish looked like a hybrid of two of the lake's cichlid species. It was the latest evidence that without quick action by conservationists, Lake Victoria's fantastic diversity of cichlids is doomed.

If Seehausen and his colleagues at the University of Hull, UK, are correct, conservationists fighting to save the lake's remaining 300 or so species of cichlids have been ignoring a dangerous enemy. They will need to shift their focus quickly before the surviving species fade away. And they'll have to act fast to prevent the same fate befalling the even richer diversity of native fish in Africa's other Great Lakes.

You can read the classic story of the evolution of Lake Victoria's cichlids – technically, a subgroup of the cichlid family called haplochromines – in almost any ecology textbook. Until a few decades ago, the lake was home to more than 500 cichlid species, most of which had evolved within the past 15,000 years – one of the world's most impressive examples of exuberant diversification. In that evolutionary blink of an eye, the fish expanded into every slice of habitat available in the lake. They took on a profusion of colours, forms and ways of life, including some improbably bizarre ones. Some sifted detritus from the muck at the bottom of the lake, some scraped algae from rocks, and others gulped tiny zooplankton in the lake's open waters. One particularly strange group, the paedophages, ate the eggs or larvae of other cichlids by engulfing the heads of mouth-brooding females with their thick, rubbery lips and sucking out the young.

But then – so the story goes – a sinister newcomer began to destroy all that diversity. The Nile perch, one of several species introduced to Lake Victoria in the 1950s and 1960s to compensate for the overfishing of native food fish, can grow to 2 metres in length and weigh 100 kilograms – and it eats cichlids. After the perch had lain low for a couple of decades, its population exploded during the 1970s and early 1980s. Over the same period, cichlid populations plummeted. In less than a decade, at least 40 per cent of the lake's known cichlid species had disappeared altogether.

It was one of the largest and most rapid episodes of vertebrate mass extinction ever witnessed. The story of conservation tragedy that has been told and retold ever since is so simple as to be almost allegorical: the bright, delicate beauty of nature done in by the huge, gape-mouthed monster of human meddling.

But recently, this tidy story has grown messier. By the early 1990s, fisheries biologists were discovering the first signs that overfishing had begun to knock back Nile perch populations in Lake Victoria. Over the past decade, the total perch catch has declined, the average size of perch caught has decreased, and fishers are catching more and more immature fish – all classic signs of overfishing.

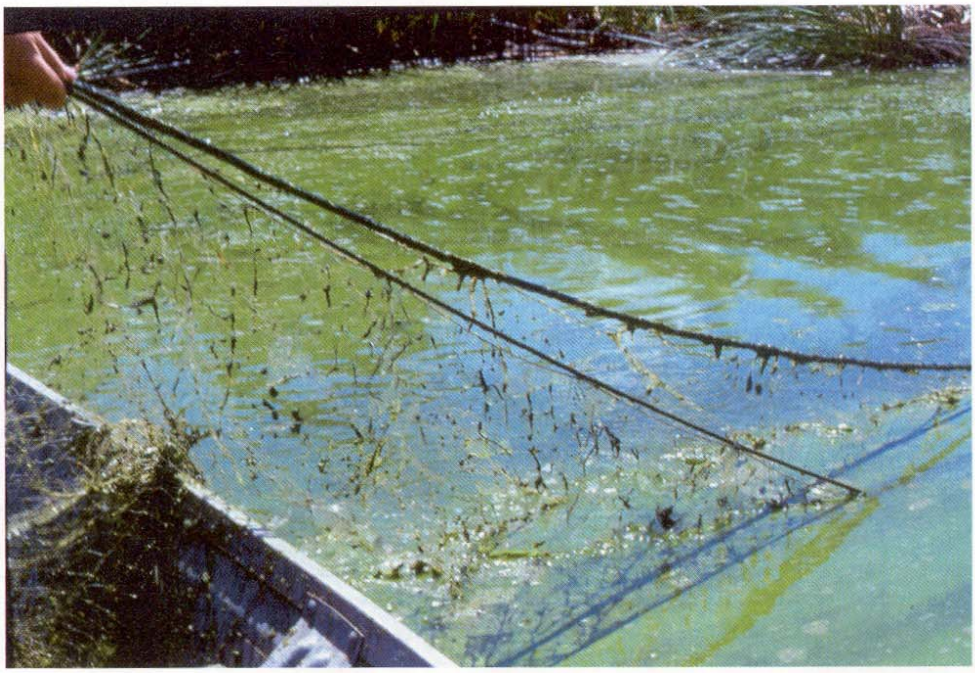
According to the standard story, this should have reduced predation pressure and allowed what was left of the lake's bright little cichlids to bounce back. And it has – but with a twist. Some species that had become very rare have indeed rebounded, and a few thought to be extinct have been rediscovered. But more often, what comes back is not the original cichlid species but intermediate, presumably hybrid forms.

At the same time, scientists were learning surprising things about a seemingly unrelated subject, a form of water pollution known as eutrophication. This is essentially over-nourishment, most often as a result of an influx of nutrients from deforestation, farming, urban sewage and other human activities. The excess nutrients trigger massive blooms of algae and phytoplankton, and the water turns a murky, unappealing greenish-brown.

In Lake Victoria, the worst signs of eutrophication appeared about the same time as the Nile perch upsurge, in the early 1980s. Among these signs were blooms so large that some of the algal species could even be identified by an observer standing on the shore. At first, scientists assumed Lake Victoria had become eutrophic gradually, as deforestation of the lake basin, conversion of natural vegetation to intensive agriculture, and population growth increased through the 20th century.

But in the early 1990s, when limnologist Robert Hecky of the University of Waterloo in Ontario, Canada, and his colleagues analysed a core of sediment from the bottom of the lake, they came to a different conclusion. Although nutrient levels in the lake did indeed begin to increase early in the century, the explosive growth of algae and other ▶

The serious problem of nutrient pollution is only just being recognised as a threat to cichlid diversity in Lake Victoria



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