

Ghost Fish: After 420 Million Years in the Deeps, Modern Gillnets from Shark Fin Trade Drag Coelacanths into the Light

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Demand for shark fins and oil has led fishers in southwestern Madagascar to set gill-nets in deeper waters. They are finding — and possibly harming — previously-unknown populations of these West Indian Ocean coelacanths.

The landing of the first living coelacanth off the coast of South Africa made world headlines in 1938. Marine scientists were agog. A truly remarkable “four-legged, living fossil fish” had seemingly returned from the dead.

In the ensuing decades, more of these rare and unusual fish were caught off the coastlines of South Africa, Tanzania, and the Comoros Islands; a different coelacanth species turned up in Indonesian waters.

Living coelacanths are found in undersea canyons at depths between 100 and 500 metres. They belong to an ancient group of fishes whose origins can be traced back 420 million years. They have eight fins, large eyes and a small mouth, and a unique pattern of white spots allowing each fish to be individually identified. They weigh up to 90 kilogrammes and give birth to live young after a gestation period of 36 months.

The Western Indian Ocean species, [Latimeria chalumnae](#), is classified as Critically Endangered by the IUCN, while a similar species found in the seas around Indonesia (*L. menadoensis*) is classified as Vulnerable.

Old fish caught by new fishery

Beginning in the 1980s, a new commercial market in China for shark fins and oil prompted fishers off the southwest coast of Madagascar to set large-mesh gill-nets known as *jarifa* in deeper waters: a startling number of coelacanths have been landed as by-catch. A [new study in the SA Journal of Science](#) reviews the data for specimens and puts forward an important hypothesis.

Lead author Andrew Cooke said that while a handful of captures had been reported at the local level in Madagascar, the international scientific literature did not reflect the number caught there.

“When we looked into this further, we were astounded [by the numbers caught]... even though there has been no proactive process in Madagascar to monitor or conserve coelacanths,” says Cooke, who is based at the Antananarivo-based marine resources consultancy [Resolve sarl](#), adding that that well over 100 coelacanths may have been caught off the island in recent decades.

For example, one local fisherman (a Mr Tinard) told Minosoa Ravoloharinjara, one of Cooke’s co-authors, that he caught “dozens of coelacanths in a single week” during 2010, while fisherman Tine Hoe Julien was reported to have caught seven coelacanths off Nosy Ve, Sarodrano, and Andanora between May 2010 and July 2011.

Following the field survey, which was funded by Resolve, the paper’s other co-author, Michael Bruton, formally reported several additional captures to the list maintained by the Coelacanth Conservation Committee. The updated list now records [34 catches off Madagascar](#), including several specimens held privately or in museums. A further 40-50 anecdotal reports were left out.

While sharks have been targeted in the Indian Ocean for more than a century, the rapid growth of the Chinese economy during the 1980s had led to an “explosion” of incidental coelacanth captures in Madagascar and other countries in the western part of the Indian Ocean.

A few dozen captures may not immediately seem significant, but the Western Indian Ocean coelacanth’s is listed as critically endangered. Its population size is still unknown and the increasing frequency of catches is alarming — especially as the true catch rate by jarifa nets could be higher than current official records.

“The jarifa gillnets used to catch sharks are a relatively new and more deadly innovation as they are large and can be set in deep water,” say the researchers, noting that large-mesh nets (15cm or 24cm) are often baited with small fish.

“The introduction of market forces from abroad has often resulted in much greater pressure being placed on a natural resource that was once exploited sustainably for local use, and this appears to be the case in Madagascar. There is little doubt that large mesh jarifa gillnets are now the biggest threat to the survival of coelacanths in Madagascar,” they suggest.



Scientists are concerned that jarifa gill-nets, used to catch sharks, have become a significant threat to coelacanths in parts of Madagascar. Image by Minosoa Ravoloharinjara

This is because the nets are set in deep water, generally between 100 m and 300 m, within the preferred habitat range of coelacanths, and, unlike trawl nets, can be deployed in the rugged, rocky environments which coelacanths prefer.

As a result, it is difficult for coelacanths to detect the static nets. Because they also hunt at night and have poor eyesight, their main sense organ (electro-reception) may not be triggered by the thin strands of a gillnet.

A significant number of coelacanths have also turned up in jarifa gillnets off Tanga in Tanzania, where 19 were caught in a six-month period between 2004 and 2005, including six captures in a single night.

Revising the big picture

Based on this updated list of captures, and the extent of suitable habitat for these cave-dwelling fish off Madagascar, Cooke and Bruton hypothesize that Madagascar is likely to the “epicentre” of coelacanth distribution in the Western Indian Ocean and progenitor of a younger [Comoros coelacanth population](#).

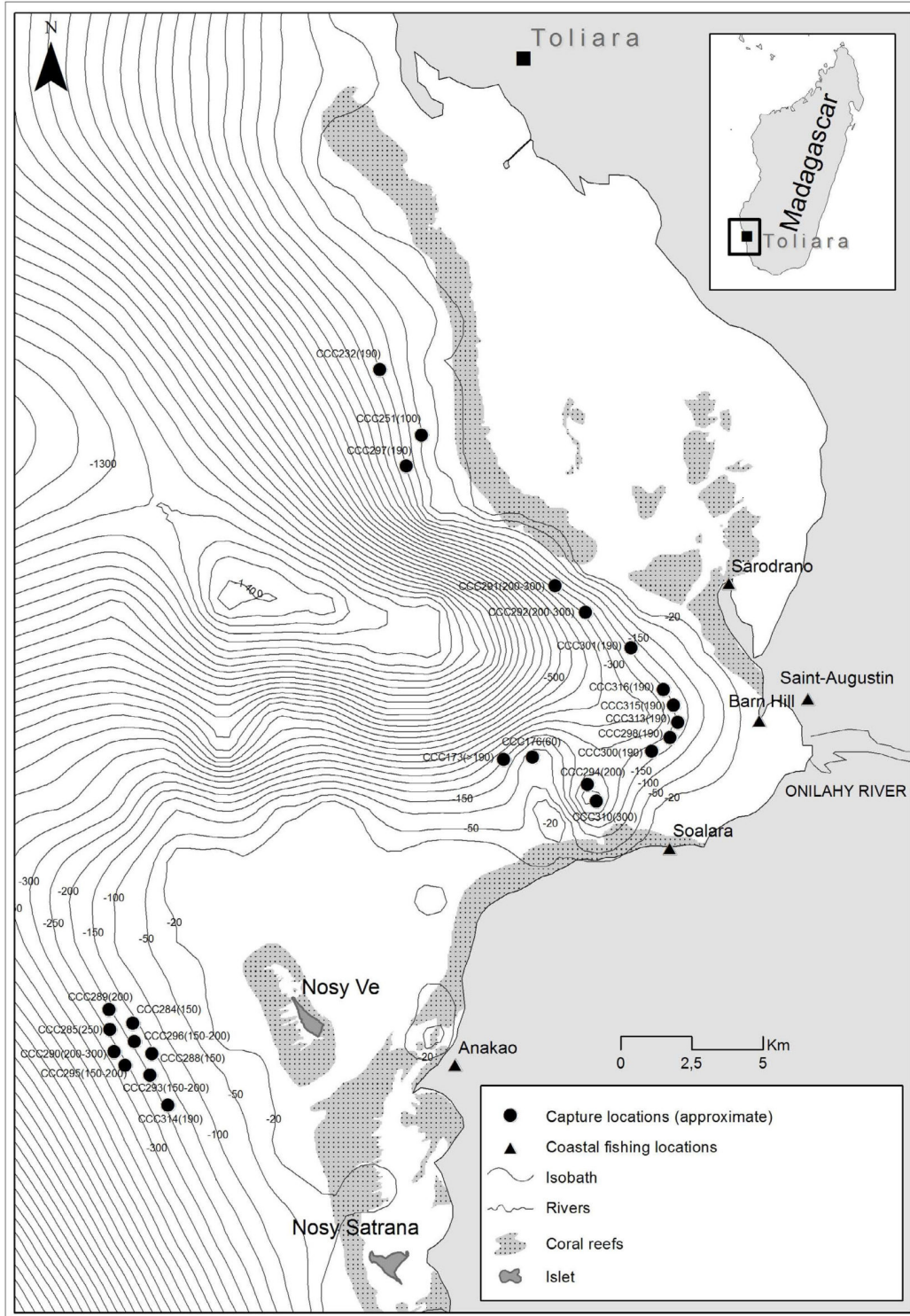


Figure 5: Map of St Augustin Bay, southwestern Madagascar showing the locations of the cluster of coelacanths caught from 1987 to 2019 near the Onilahy canyon.

A map of St Augustin Bay, southwestern Madagascar, showing the locations of the cluster of coelacanths caught between 1987 and 2019 near the Onilahy canyon. Map by A. Cooke et al.

Bruton, a South Africa-based coelacanth expert and former director of the JLB Smith Institute of Ichthyology, also believes coelacanths may occur around the entire coastline of Madagascar and that this massive island “is likely to harbour the largest populations of coelacanths in the Western Ocean”.

Tony Ribbink, former head of the [African Coelacanth Ecosystem Programme](#)(ACEP) and

current chief executive officer of the [Sustainable Seas Trust](#), says this hypothesis needs more research.

“It would be extremely valuable if they also considered a competing hypothesis that the large number of canyons, many of which are very big, deep and extensive, running along the northern Mozambique coast from where the Sofala Banks end northwards to the southern part of Tanzania (just south of Mtwara) offer the most extensive area of suitable habitat for coelacanths,” he told Mongabay.

“This unexplored continental area may well be the epicentre of coelacanth distribution. This area has not been studied, however and, until it is eliminated as a plausible competing hypothesis, the work of the authors will remain hypothetical.”

It would be positive news for the species if coelacanth range and population prove to be larger than had been thought, but Cooke and Bruton are worried about continued pressure of incidental capture by artisanal fishers.

Cooke and his colleagues say an additional but less significant threat is posed by the high scientific interest in the fish “which inevitably commands a price, even in the absence of a true market”.

For example, the presence of the IHSM marine research institute in the town of Toliara, had increased fishers’ awareness of the coelacanth’s significance and value. A separate report published last year reported payments of 150 000–400 000 ariary (40–110 dollars) for coelacanth specimens caught in the Toliara region.

There are also some indications that illegal trafficking of coelacanths may be taking place in Madagascar, such as the discovery of an undeclared coelacanth being hidden on board the factory ship, El Amine, on 20 September 2008.

A month later, the newspaper *Les Nouvelles* reported that over 300 kg of coelacanths had been captured by El Amine’s jarifa nets. Local fish biologist, Faratiana Ratsifandrihamanana, also reported that she had seen a cartful of dead coelacanths in the yard of the IHSM in April 2012. The four adults and about 5-7 juveniles had been caught by fishers from St Augustin who said they had been deliberately targeted as they could sell them to *vazaha* (foreigners) at 100 000 ariary per fish. However, staff at IHSM had refused to buy the fish and they were taken away.



A local fisherman from the St Augustin area, photographed in May 2010 with a massive coelacanth that he brought to a fisheries research centre by rickshaw. Image by Thierry Cordenos.

Other researchers remain sceptical that jarifa nets are having a significant impact on coelacanths. Paubert Tsimanaoraty Mahatante, a marine researcher with the Madagascar government's Institute of Fisheries and Marine Science (IHSM) said he does not believe that fishermen are deliberately targeting coelacanths for sale.

"Some fishermen from St Augustin used to bring them directly to the institute and ask for high prices. At the beginning we bought them at a high price but now we have about five or seven specimens and we don't want to buy any more as that would incentivise fishermen."

He expressed concern that some hotels in southern Madagascar were buying and displaying preserved coelacanth specimens to attract tourists.

Mahatante said he doubted that the gill nets deployed in southern Madagascar go beyond 100m in depth, but if they were deployed deeper than this "it could be a big problem".

"Catching a coelacanth is totally uncommon and people are in some ways even afraid to catch something that is so uncommon. So I don't think that coelacanths are being targeted deliberately."

Cooke and Bruton remain concerned, nevertheless, stating that the coelacanth by-catch fishery is significant as this vulnerable species is unlikely to survive high exploitation due to

its rarity, large size, high trophic level in the food pyramid, low dispersal rates, few offspring and high longevity.

They are calling for intensified research into Madagascar's coelacanths, along with new conservation measures that are sensitive to the needs of local fishing communities.

Cooke says it would not be practical to ban jarifa nets outright as this would lead to considerable hardship and anger, but hopes the authorities can begin to negotiate management solutions – especially in places such as the Onilahy River mouth, where the largest known concentrations of coelacanth have been reported.

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Sources

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Featured image: *Coelacanths in a cave off Grand Comore. Image by Hans Fricke.*

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