

FINANCIAL TIMES

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Visual investigation

The hidden cost of your supermarket salmon

MAURITANIA

Fish sold by major retailers in Europe is harming food security in west Africa

Alexandra Heal, Lucy Rodgers, Justine Williams, Irene de la Torre Arenas, Dan Clark in London, Jack Thompson and Ely Cheikh Mohamed Vadel in Nouadhibou and St Louis JANUARY 31 2024

SENEGAL

mapbox

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Last September, the **oil tanker Key Bay** left the

dusty docks of Nouadhibou, Mauritania's bustling second city.

After 21 days at sea as well as stops in Belgium and the Netherlands . . .

... the vessel, which has been known to carry fish oil made from ground whole fish caught in Mauritania, anchored in Norway.

It docked at a fish feed factory owned by Mowi, the world's biggest salmon producer.





© Google

Mowi supplies Norwegian-farmed salmon across Europe — including to British supermarkets Tesco, Sainsbury's, Aldi and Lidl.

The Mauritanian fish oil factories are hoovering up small fish crucial to west African diets. Locals say prices of sardines are soaring, while stocks of related species sardinella are on the verge of collapse.

“If this is not addressed we’re going to have a food crisis in the next 10 years in the whole region,” says Béatrice Gorez, co-ordinator at the Brussels-based Coalition for Fair Fisheries Arrangements. “They’re on a knife edge.”

In an industrial zone of the coastal city Nouadhibou, the stench of rotting fish is stifling. Guards with fierce-looking dogs on chains are on patrol, surveying the road with suspicion while waving through rusty 1990s Mitsubishi pick-ups stuffed with fresh fish.

Factories producing fish oil — and its sister product fishmeal — have

multiplied along this coastline over the last decade, as they have in a number of north-west African countries.

But the Mauritanian government has embraced production of these obscure but important commodities with extra zeal. It awarded Nouadhibou freeport status in 2013, allowing foreign businesses, including those establishing fishmeal factories, to pay little or no tax. The government hoped the industry would create employment by processing Mauritania's resources on its own shores.



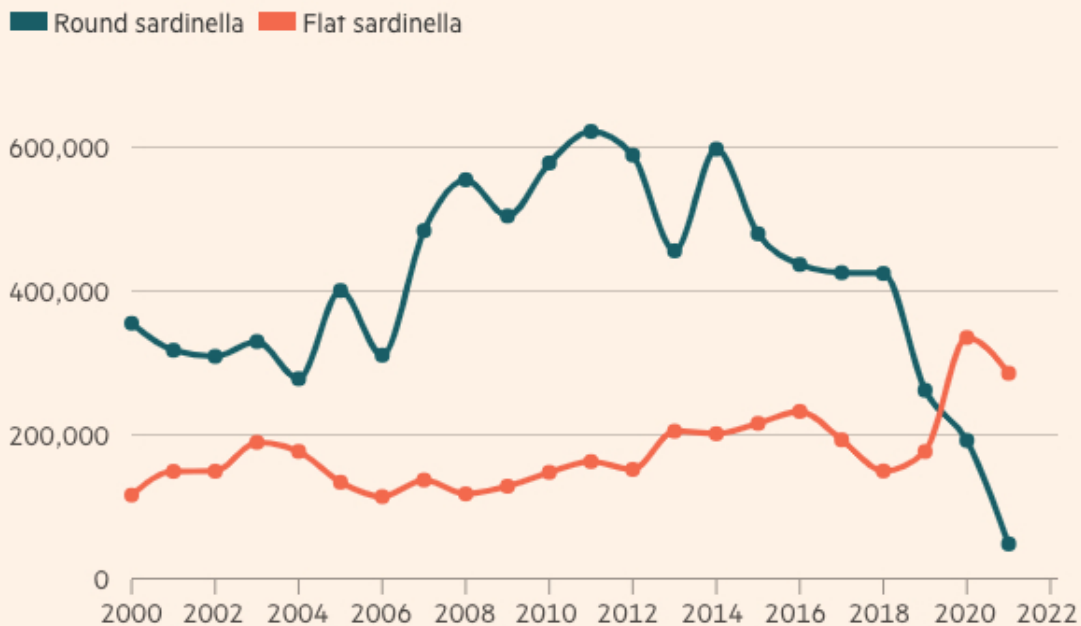
Source: Planet Labs

But experts blame the factories and the foreign vessels that supply them for a [“dizzying” fall](#) in regional catches of round sardinella — a small oily fish widely eaten in the region.

Plummeting stocks led the industry to target other fish, including flat sardinella, a species also [showing signs](#) of overexploitation. Corruption and rule-breaking, suggested in interviews with the Financial Times, have made things worse. Scientists fear sardines — the factories' latest target — could be next.

Catches of round sardinella in west Africa declined steeply from 2018

Regional catch in tonnes



Source: [Braham et al, Fisheries Research 2024](#)

What happens in Mauritania has ramifications across the west African region, where food insecurity has hit a 10-year high and poor wages and prospects force thousands to leave each year. The fish targeted are migratory, meaning catches in Mauritanian waters impact stocks, diets and livelihoods across neighbouring nations, such as Senegal and Gambia.

According to FT interviews with 37 locals, far fewer of these fish are available at markets in Mauritania and Senegal, and prices are rising.

A [report](#) commissioned by the industry found the price of sardinella in Mauritania had risen from 0.25 to 1.5 euros per kilogramme in recent years, while a fishmonger in Nouadhibou says the price they pay for sardines has gone from 0.41 to 8 euros per two kilogrammes.

Another fishmonger, Khadouj Mohemed, accuses the Nouadhibou

factories of “swallowing” the country’s stocks. “Fish is my daily food and is for everyone here, but where is the fish now?” she asks.

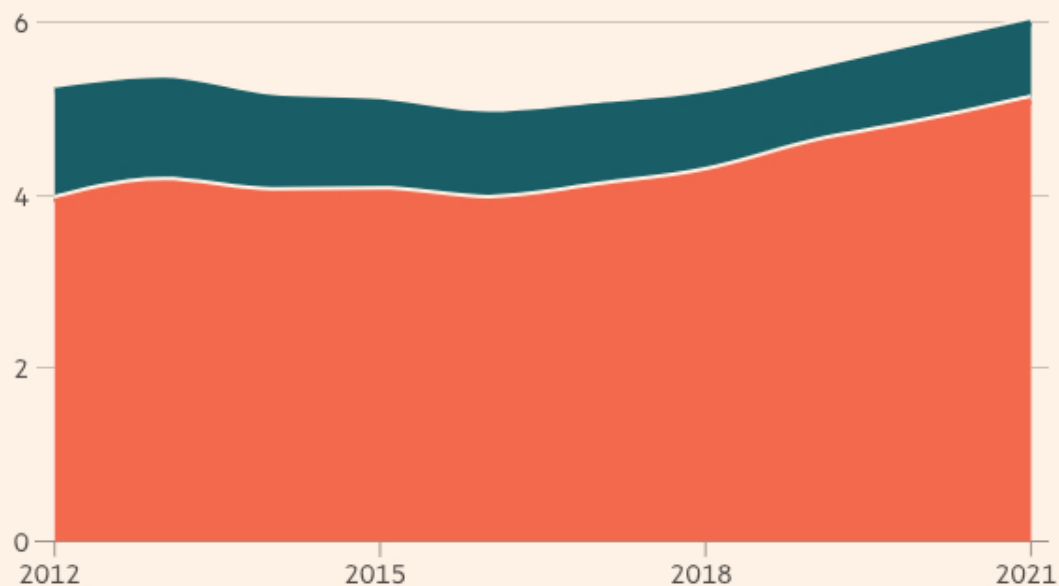
Colossal demand

The fish farming industry consumes enormous amounts of whole, wild fish. Globally, more than [16mn tonnes](#) of whole fish — a fifth of all wild fish caught — was ground into meal or oil in 2020. More than three-quarters of this is fed to farmed seafood.

Fish farming has used more fishmeal and oil over the past few years

Tonnes, mn

■ Aquaculture ■ Other



Source: IFFO

Norway alone required 2mn tonnes of whole fish to produce 1.5mn tonnes of salmon in 2020, according to [a report](#) released on Wednesday by campaign group Feedback. The Norwegian industry, which is the UK’s biggest salmon supplier with 44 per cent of the market, is planning to triple output by 2050.

“Three-quarters of this fish, most of which is sourced from countries in the global south, could be eaten directly instead,” says Natasha Hurley, campaigns director at Feedback, adding that turning Mauritanian fish into feed “represents a transfer of valuable micronutrients away from regions already suffering acute food insecurity”.

The report suggests half a million tonnes of west African fish, enough to feed 33mn people, are being turned into meal and oil every year.

Academics and campaigners suggest similar factories are also affecting food availability in [India](#), [Vietnam](#), [Kenya](#) and elsewhere.



Artisanal fishing boats and vessels serving fish feed factories are seen through a car window in Nouadhibou, Mauritania. Old trucks, laden with fish and equipment, cross paths in the busy port © Guy Peterson for the FT

All of Mauritania’s fishmeal and oil is exported, largely to feed farmed fish. While 70 per cent of the country’s meal heads to China, 90 per cent of its fish oil ends up in Europe, where it is fed to salmon sold across the continent.

Salmon farmed in Norway by companies sourcing Mauritanian fish oil is available in several of the UK’s biggest grocers. The FT identified

available in several of the UK's biggest grocers. The FT Research Norwegian-farmed salmon stamped with factory codes for producer Mowi in Tesco, Lidl and Aldi. Feedback, the NGO, identified the same in Sainsbury's.

UK supermarket salmon supplied by a company using oil made from Mauritanian whole fish

Mowi company's Norwegian salmon on British shelves



FT Research

While Mowi says it no longer uses sardinella from Mauritania, the company has confirmed it sources Mauritanian sardines. Cargill, another big aquafeed producer feeding Norwegian salmon sold in UK branches of Lidl, confirmed the same. Mauritanian flat sardinella is still used by Danish feed maker BioMar, with the company's produce fed to Norwegian salmon sold in Asda, the FT found.

Both Mowi and Cargill sourced Mauritanian fish oil made from sardinella as recently as 2018 and 2019. Skretting, another leading feed producer and part of Lidl's UK supply chain, was still sourcing sardinella from Mauritania in 2022.

It is hard to ascertain how much of Norway's salmon is fed on Mauritanian fish oil because, while Mowi, BioMar, Skretting and Cargill

say they have only used small amounts, between them these companies supply almost 100 per cent of the industry's feed, according to Feedback. The Scottish salmon industry, which supplies 43 per cent of salmon sold in the UK, according to analysts Kontali, says it does not use ingredients from west Africa in its feed.

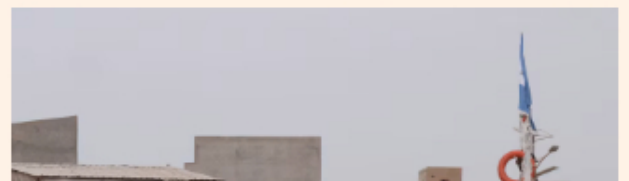
Mowi, BioMar, Skretting, Cargill and Asda say their Mauritanian ingredients are from one of two factories recognised as working to improve the fishery by the industry's certification body, MarinTrust. All four feed companies say they are committed to sourcing sustainable feed ingredients. Mowi adds it would be "in best case misleading" to link its sourcing to declining fish stocks.

Sainsbury's and Aldi say they expect all suppliers to maintain high sustainability standards, Lidl declined to comment and Tesco did not respond. Sea Tank Chartering, the company operating the tanker Key Bay, says it has "no comment on specific assignments [we] carry out for various customers".

Fish stock decline

While the Mauritanian authorities hoped their backing of the fishmeal industry would boost employment, in reality it has created few jobs while undermining the food security of some of the region's poorest groups.

Together the factories employ 2,000 people, mainly foreigners, according to an [industry-commissioned report](#), despite churning up huge amounts of fish. In 2020, they treated more than [800,000 tonnes](#) of small pelagics — species that live in schools in open water — up from 50,000 tonnes less than a decade earlier. Exports have risen over 10-fold since 2009.





Workers sit on top of goods in the back of an old pick-up truck on one of Nouadhibou's dusty roads. Fish is unloaded from boats while a pump churns dirty factory water back out to sea © Guy Peterson for the FT

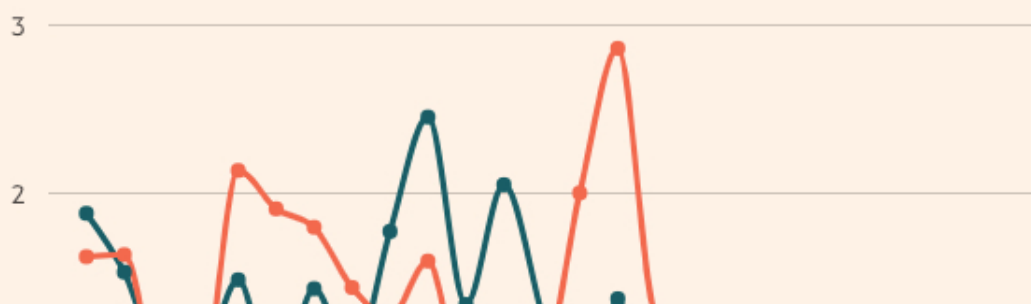
Many of the country's 29 processing plants are run by Turkish and Chinese owners. Luxury villas and smart restaurants serving these expatriates have appeared in secluded neighbourhoods of the overwhelmingly poor city of Nouadhibou.

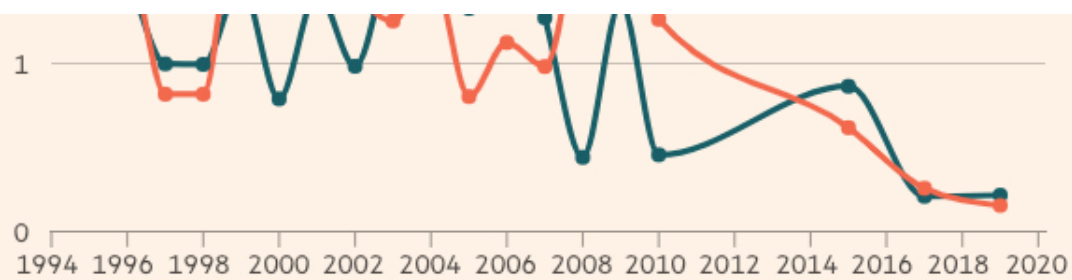
The impact on fisheries has been devastating. Annual north-west African stocks of round sardinella [plummeted](#) from between 800,000 and 2.8mn tonnes before 2010 to just 160,000 in 2019. Since 2021, catches [have fallen](#) to below a tenth of their 2011 peak.

Research ships have recorded a significant drop in regional sardinella numbers

Estimated regional biomass of sardinella via acoustic surveys in tonnes, mn

■ Flat sardinella ■ Round sardinella



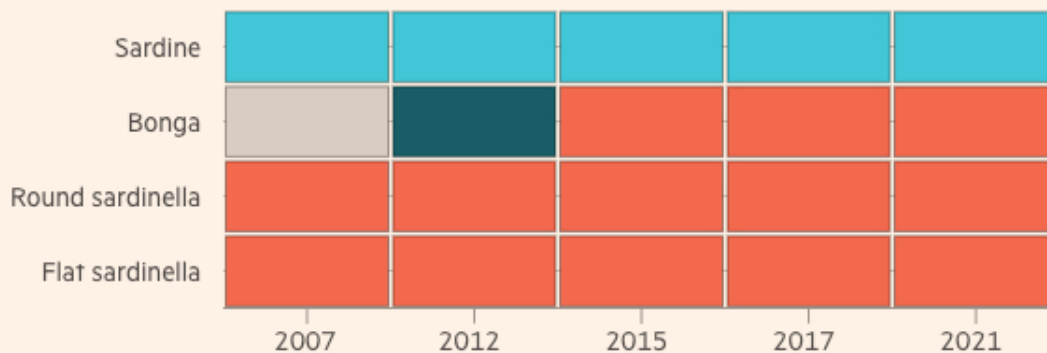


Source: [Braham et al, Fisheries Research 2024](#)

Multiple species used by the factories are considered over-exploited across the region. Several locals, including the Mauritanian fishing union head, Hademine Sidi Mahamed, say it is hard to watch their resources exported to feed foreign animals “while we are suffering with poverty”.

Species used by fishmeal and oil factories are considered overexploited

Status in west Africa: ■ Under-exploited ■ Fully exploited ■ Over-exploited ■ No data



Source: Partner Africa

Local and foreign boats have long fished the region’s pelagics for human consumption, and climate change is also impacting stocks, but local scientists and economists link the current sardinella crisis to unlimited demand from the region’s new fishmeal industry.

Factories in Senegal and Gambia have also contributed to the problem,

but there are now three times as many in Mauritania as both countries combined. Most production in Morocco comes from byproducts from processing small pelagics for food.

Mauritania's waters are also the region's key feeding and reproduction ground for multiple of these species, meaning catches there have a significant impact on regional stocks and food availability. Round sardinella migrate along the coastline and, although not as much is known about the movements of flat sardinella, a Mauritanian scientist confirmed the species migrated between Mauritania and Senegal.

Fish species move up and down the west African coastline



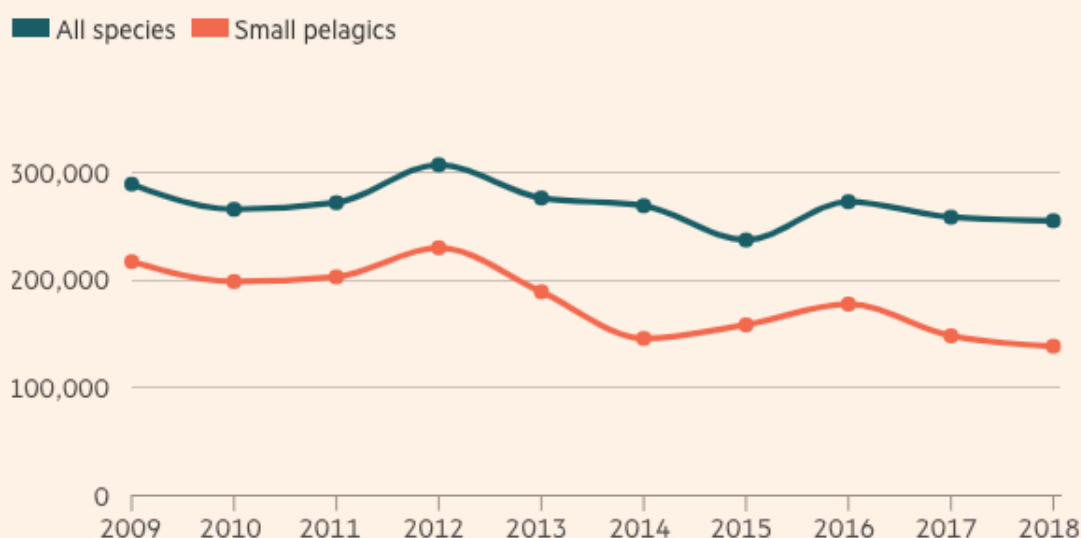
Source: Corten et al sardinella research, 2012; FT research

“The Mauritanian region serves as a food source for the entire north-west African region, particularly [both] sardinella species,” says Cheikh-Baye Braham, fisheries researcher at the government’s oceanographic institute.

Senegal has been particularly badly affected. Small pelagics have traditionally been the country's cheapest protein source, with fish making up [75 per cent](#) of animal protein consumed. But, between 2009 and 2018, the amount of small pelagics available at markets fell by two-thirds and annual consumption per person dropped by half.

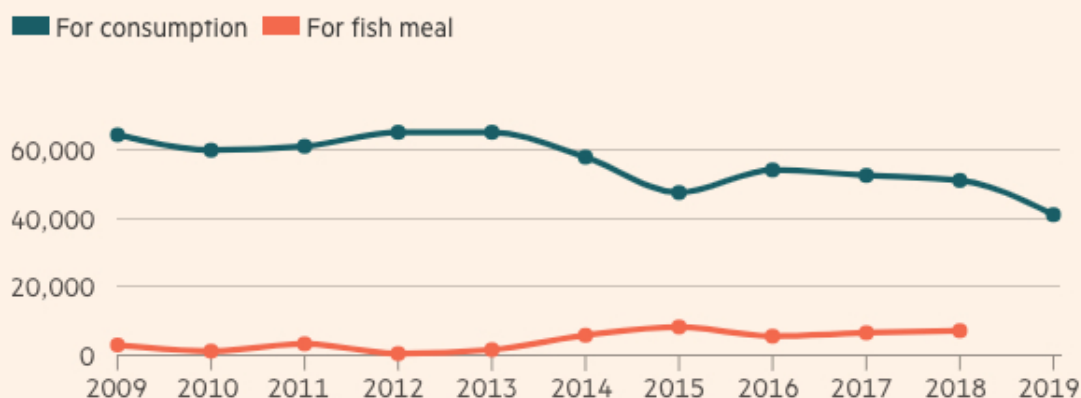
Fewer small pelagic fish are available at markets in Senegal ...

Amount of fish available in tonnes



... while workers in Senegal are processing fewer for consumption

Amount of small pelagic fish processed in tonnes



Source: [Dème et al, EchoGéo 2021](#)

Twenty shoppers at a market in Saint Louis, a Senegalese fishing town, spoke of dwindling supplies and rising prices. “A case of yaboi [round sardinella] used to cost 3,000 francs [5 euros], now it costs 50,000,” says Fatou Thoiye. The high price of round sardinella is making her family poorer, she adds.

While fish is not as widely eaten in Mauritania as in Senegal, shoppers in Nouadhibou told the FT sardinella and sardines were crucial to the diets of poorer families and some ethnic groups.



Crates of sardines and weighing scales sit ready for buyers at a fish market just outside the artisanal fishing port of Nouadhibou. Customers spoke of poor availability and rising prices © Guy Peterson for the FT

Some fish feed companies have now shifted their sourcing to sardines, but academics warn this species could end up suffering the same fate as sardinella.

“If all that effort is switched to sardines we’re just going to have the same problem,” says Christina Hicks, an environmental social scientist at the University of Lancaster specialising in fisheries governance.

One marine ecologist suggests the industry is cycling through different species, one after another. Patrice Brehmer, based in Senegal for France's National Research Institute for Sustainable Development, says bonga – another fish important to west African diets – was targeted to the point of over-exploitation before sardinella.

Fisheries scientist Ad Corten, who worked in Mauritania for 20 years before recently retiring, says it is hard for boats to target sardines without inevitably catching sardinella alongside them. “By continuing to remove the few sardinellas left, you continue to prevent its recovery,” he says.

Flat and round sardinella are both now under threat

The similar-looking fish have one key distinguishing feature

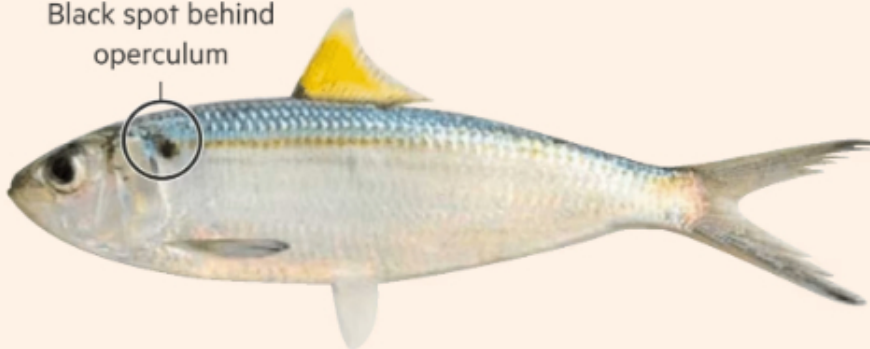
Round Sardinella

Black spot on operculum,
or gill covering



Flat Sardinella

Black spot behind
operculum



Source: Braham et al, Fisheries Research 2024

The Mauritanian government recently made moves to try to clean up the

industry and the fisheries ministry says it has made “great progress” in prioritising processing for human consumption over fish feed.

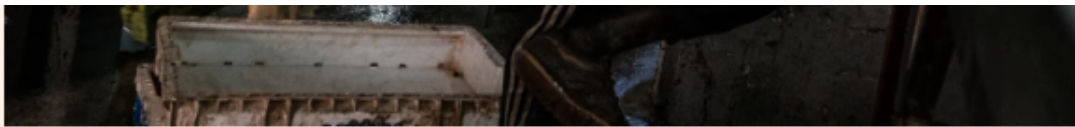
Measures include increased fines for illegal fishing and caps on the amount of fishmeal factories can produce each year. All species except sardines are now banned from the plants and 20 per cent of those must be set aside for human consumption. These measures — as well as falling catches and the pandemic — are likely behind a fall in meal and oil exports of a third between 2020 and 2022.

But interviews by the FT in Nouadhibou suggest systemic rule-breaking. Several people familiar with the matter blamed this on widespread corruption.

Seven industry workers describe how Turkish vessels supplying the factories leave their catch at sea for days to rot, rendering it unfit for human consumption. Two of these interviewees, classifiers who price fish, say some Turkish boats are unloading fish using tubes with blades inside to achieve the same outcome.

Four current and one former factory worker also say there is no fish sorting process, resulting in banned species, such as round sardinella and juveniles, ending up in meal and oil. “We use all types of fish,” one worker says.





Two workers sort octopus inside a busy fish processing factory in Nouadhibou's industrial zone © Guy Peterson for the FT

An industry [document](#) shows that, in 2022, the factories on average produced 3,077 tonnes of meal each from whole fish — far beyond their maximum quota of 1,044 tonnes. Only 3 per cent came from offcuts or waste fish.

In response, the Mauritanian fisheries ministry says boats have “no interest” in altering the quality of fish because the price received is directly related to the quality of the product. Vessels not returning the required 20 per cent for human consumption are punished, it says.

“There is no desire on the part of Mauritania to monopolise this [fishery] wealth, much less to impact on the food security of neighbouring and sister countries,” the ministry adds in a statement.

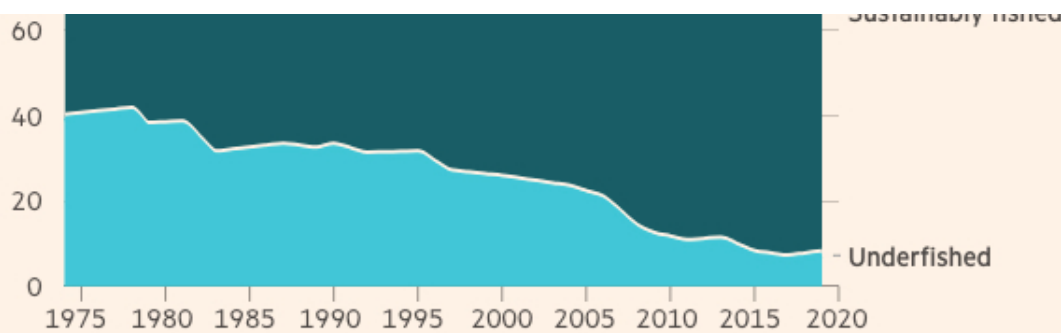
Beyond whole fish

To help protect global fish stocks and regional diets, some scientists argue salmon farms and the wider aquaculture industry should eliminate ingredients derived from whole fish altogether. They [suggest](#) consumers should eat wild fish directly or simply leave them in the sea given wider levels of overfishing, with many bigger fish and mammals relying on them for food.

A growing percentage of the world's fish are being unsustainably caught

Status of the world's marine fish stocks, %





Source: Food and Agriculture Organization

The salmon industry has taken steps to replace fishmeal in feed with soya or other crops, and says 0.93kg of whole fish are now required to produce 1kg of salmon. But it has struggled to reduce its dependency on fish oil because salmon need the omega-3 fatty acids it contains.

Brett Glencross, technical director of the global fishmeal industry body, IFFO, says that while research is continuing into replacements for fish oil, such as algal oil or genetically modified crops, “it’s a slow process”.

Happily, the proportion of meal and oil coming from fish byproducts is increasing. This has led to a fall in the amount of whole wild fish used, from 30mn tonnes in 1994 to 16mn today, according to Manuel Barange, fisheries and aquaculture director at the UN Food and Agriculture Organization.

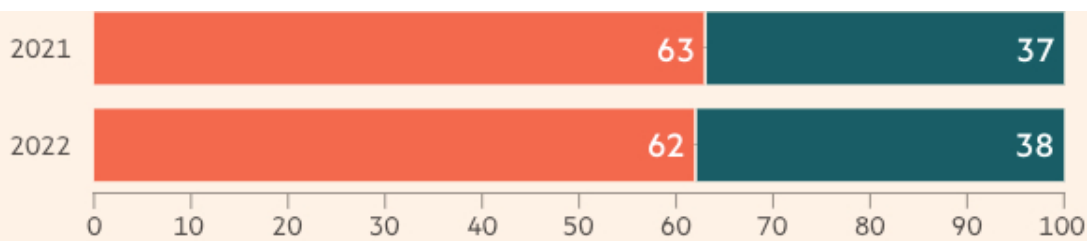
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The fishmeal and oil industry has been using less whole fish over time ...

% used

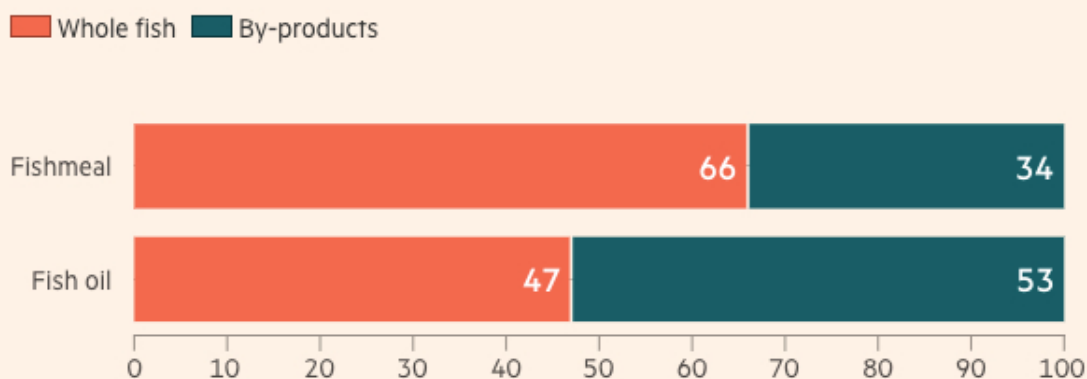
Whole fish By-products





... but fishmeal production still uses a large proportion of whole fish

% used in 2022



Source: IFFO

Meanwhile, some local companies are working with the Mauritanian government to improve the industry, aiming to achieve better stock data collection, law enforcement and co-operation with neighbouring countries.

Libby Woodhatch, executive chair of the certification body MarinTrust, says fishmeal factories should continue operating in Mauritania using byproducts and fish “not considered suitable by the food industry”. She argues salmon will continue to require ingredients derived from unwanted fish — such as the Peruvian anchoveta, which counts for most global fishmeal and oil production — at certain life stages because they are carnivorous.

But David Willer, sustainable seafoods researcher at the University of Cambridge, suggests efforts should instead be made to build markets for such under-appreciated fish. Eating the species currently turned into

meal and oil, which live near the bottom of the food chain, would be more beneficial than consuming salmon, he argues, because 90 per cent of energy is lost at each stage in the food cycle.

While he would consider salmon better than many meats if it could “come off its rather ridiculous dependence on fishmeal and oil”, consumers should prioritise other seafoods, he says. “Mussels, clams, sardines, small fish . . . It’s about trying to create products that make those species appealing.”

Additional reporting by Susannah Savage.

Shipping AIS data from Spire Global and MarineTraffic. Global Fishing Watch data and analysis contributed to this report.

Other experts consulted: Hamady Diop, freelance fisheries economist; Elimane Kane, fisheries economist, Mauritanian Institute of Oceanographic and Fisheries Research; Dave Martin, programme director, Sustainable Fisheries Partnership; Kevin Fitzsimmons, environmental scientist, the University of Arizona; Mansour Brahim Boidaha, president, Zakia; Mika Diop, marine biologist, Subregional Fisheries Commission.



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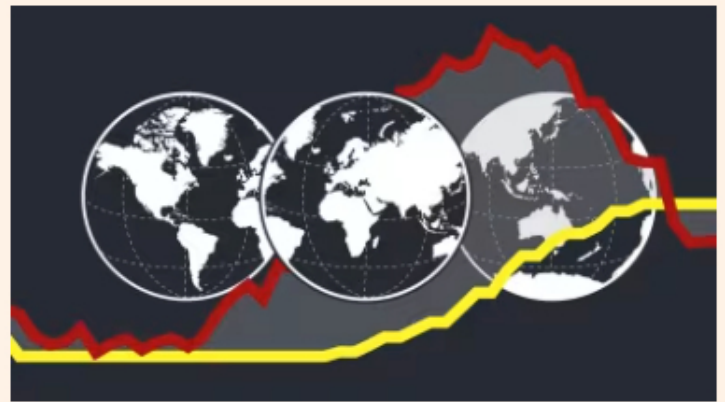
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