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A Twisted Trajectory

The fish-processing industry's path of using fishmeal to grow shrimp amounts to exporting the precious nutrition that India's children badly need

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In the early morning of 25 September 2019, on the shores of Cuddalore in Tamil Nadu, India, the humble sardine commenced its journey. The journey of its afterlife, that is.

A group of women waited together, empty baskets in hand, chatting while waiting for the boats to arrive. Their expectations do not remain unanswered. Boats bulging with little shiny sardines return from calm seas. Boats carrying sardines, along with their histories of struggle. Big trawlers, small trawlers, ring seines, fibreglass boats: everyone has been scooping up schools of sardine today.

The women are eagerly waiting for a good auction, hoping to take some

hungry stomachs at all? Will they get transformed into sumptuous curry? As onlookers, our glances are brimming with questions.

Small sardines, juvenile sardines, flapping sardines, damaged sardines, bulk-landed sardines. Three out of four sardines landed in Cuddalore make their way on to the trucks. Trucks that provide a safe haven for unruly schools of fish arriving in unpredictable quantities.

We turn our eyes back to the waiting women, with mixed feelings. Some of them display a bit of relief for being able to procure some sardines. Other faces are about to erupt in frustration as their expectations are crumbling in front of them. They never wanted too much, yet their baskets are almost empty. They didn't get a chance at the auction! Who said competition is fair? They waited in vain. No need to ask why the sardines ended up in the trucks beyond their reach, though. They know why.

The plants are growing increasingly hungry. Their ever-growing bellies need to be sated. They push trawlers into the seas; sponsor madness through credit...

Bulging trucks

Hundreds of miles to the west, packed in line, the trucks move through the gates of a plant in Udupi, a coastal town in Karnataka. Trucks from harbours near and far away, piled with fish, their bulging intestines squeezed out of overflowing baskets.

We land upon one such fishmeal plant, established in 1989, one of the earliest in India. It arrived on the coast as a saviour in 1989, to accommodate the overproducing modernized fleets, to convert bumper catches into fish oil and fishmeal. Bumper catches that couldn't be stored, iced or eaten. The fishmeal plants arrived as a welcome rescue, and converted supposedly worthless bycatch into 'real' value. Yet, as time passed, dozens of fishmeal plants were built along the Karnataka

sardines to their loyal customers and earn a livelihood. Their customers are waiting to make a sumptuous fish curry of the sardines, keeping a little aside to be fried. Tasty curries, destined to nourish families with the nutritious wealth of the humble sardine. But today is not a day for sardine curry.

Big boxes of sardines are swiftly unloaded from boats to the shore on the heads of careworn labourers, who blithely pass the baskets along and straight into waiting trucks. The number plates reveal the trucks' origin and destiny. Securely filled metal bellies thronged with tonnes of tiny humble sardines, ready to traverse the highways to Karnataka. We wonder whose stomach would require so much sardine! Will they satisfy any

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Inside a fishmeal plant in Mangalore, Karnataka. What looked like a humble enterprise in the beginning began to stare gluttonously at the sea, desiring any fish that could be caught. The humble sardine is the prized prey for its oil and high protein.

coastline, their hungry cravings to be satisfied by the ocean's wealth. They began to pollute the water, the coastline and the air.

The trucks release their sardine-filled bellies onto piles of unidentifiable oceanic biomass. Fish treated without care; fish treated worse than waste. Waiting to be released to machines that devour sardines, smashed, trashed, squeezed and meshed. The humble sardine is transferred to oil and powder. Meal, yet not a human meal.

The plants are growing increasingly hungry. Their ever-growing bellies need to be sated. They push trawlers into the seas; sponsor madness through credit; contract trawlers to ensure future supplies; and navigate the market in innumerable ways. Ever-growing boats, with ever-growing nets and engines, spread their reach like octopi. They search for whatever is there in the sea. The plants aren't so picky. Their centrifugal machines gratefully grind any fish into oil and meal.

What looked like a humble enterprise in the beginning began to stare gluttonously at the sea, desiring any fish that could be caught. The

humble sardine is the prized prey for its oil and high protein. From Cuddalore to Kanyakumari, from Malvan to Mangalore, the sardine keeps finding its way to the fish-devouring machines.

This is where the humble sardine begins its journey. We continue to follow the sardine. Some sardines find their way to overseas fish farms. Yet we follow the larger share and, bypassing the shrimp feed plants, we reach the mouth of the Godavari in Andhra Pradesh. The coast here is buzzing with enterprising enthusiasm that has already transferred rice fields into 100,000 ha of high-yield shrimp ponds. The whiteleg shrimp (*Litopenaeus vannamei*) descended from nowhere to become Andhra's new white-pink gold. And its growth knows no limits.

Vannamei is hungry too: hundreds of thousands of tonnes of shrimp do not grow on air or murky waters. They need the powdered little fish. We sit down and calculate. Growing 680,000 tonnes of shrimp requires almost 1 MT of shrimp feed, including 220,000 tonnes of fishmeal. Producing such amounts of fishmeal requires over 1 MT of marine fish. Sufficient to lay a dense

fish tapestry over New Delhi. A third of India's annual marine fish catches are required to feed the hungry shrimp.

By now transformed into frozen shrimp, the sardine is destined to leave the country. Masses of shrimp are exported to feed foreign elites. Americans, Europeans and Japanese all love Indian shrimp. This route doesn't nourish the needy or hungry children. Empty stomachs cannot afford shrimp. But these exported shrimp certainly make a lot of dollars. *Vannamei* is championing the art of transforming our humble sardine from Cuddalore into dollars. It powerfully adds dollar value in the chain, destroying other values along the way.



Why, we wonder, do we allow over 1 mn kilos of little fish to fill the shrimp's stomach? Foreign exchange and employment are worthwhile, for sure. Yet, had the sardines been sold in Cuddalore or Mayurbhanj, Nalgonda or Srikakulam, they would have been sufficient to nourish 35 mn children. Sufficient to nourish a nutrient-deficient nation. A nation headlining the global ranks of malnutrition; headlining the global ranks of child stunting; leading the global ranks of child wasting.

It's a choice between feeding the shrimp for export dollars or nourishing the nation.

Leading the global ranks of shrimp exports, then, isn't so innocent anymore.

A few hundred kms north of the Godavari delta, a ray of hope emerges when we reach Cuttack in Odisha. It is 17 October 2019. Here, the possibility of an alternative journey fires our imagination. Along with WorldFish, the Odisha government is seeking to put small fish to a better use.

The idea is straightforward: supply fish-based nutrients to those who most need the nutrition. Nourishing children, pregnant and lactating mothers, provided they welcome fish in their diet. The work builds on the

existing infrastructure of the mid-day meal and the Integrated Child Development Services (ICDS) scheme. It draws the connection between prolific malnutrition and the nutritious wealth of small fish. The movement from fishmeal to mid-day meal is a salutary re-orientation in purpose that sits much better with the soul.

This repurposing of little fish to local schools is not as simple as it sounds. On a different day, about 80 km from Cuttack, we visit a shelter home called Nilachal Seva Pratishtan (NSP) in a place called Kanas. It hosts hundreds of orphans, visually and physically challenged children, homeless elders and helpless widows. If so much vulnerability and suffering doesn't melt you, nothing else will.

It is the day of the week when small fish is served in the mid-day meal, an experiment initiated just a few months ago. We are curious: how do they cook the fish, how is the response from the cooks, children and others when they eat the fish; what are the challenges? *Mola* fish (or *Mahurali* in Odia) is fried in an open kitchen and added to the curry prepared with a strong mustard flavour. The ecosystem of NSP is like a family despite the people being far from blood relations; the children, elders and the physically challenged are cared for by able women and men. There is a glow on their faces when the crunchy fried fish touches their lips. The rice filling the hungry stomach, the fish appealing to the taste buds. The sardines missing in the plates in Cuddalore are replaced with the joy of Mahurali in the plates at last. Of course, *mola* isn't sardine. Yet it could well be to Odisha what the sardine is to Telangana or other regions. (Here, sardine covers a broader range of small pelagics, including oil sardine, lesser sardine, Indian scad and small-sized mackerel.)

More challenges

Yet the challenges come when the numbers grow. How to scale up this approach? There are 6 mn school going children in Odisha. There is an equal number of children in the pre-school group. Great numbers of lactating and pregnant mothers would

Fishmeal production and exports

At the time of writing, in between 45 and 60 fishmeal plants were functioning across India, about half of them in the state of Karnataka. The maximum capacity of these factories is 100-800 tonnes raw fish processed per day. Since the 1970s, the capacity of these plants and exports increased approximately by a factor 100. India's total cultured shrimp production was estimated at 680,000 tonnes for 2018, according to FAO data.

The feed conversion ratio (FCR) of whiteleg shrimp is 1.2-1.6 kg feed input per kg shrimp output. Only 6 per cent of these feed requirements are imported, and 17-27 per cent of this feed consists of fishmeal. To produce 1 kg of fishmeal requires 4-5 kg of fresh fish. We have used the averages of these ranges, verifying the data with local industry. India is also a net exporter of fishmeal (about 25 per cent of the total production is exported, whereas imports are minimal), making total fishmeal production larger than required for shrimp production alone.

Using these figures, fishmeal production is estimated at 280,000 tonnes per year in 2018, requiring approximately 1.25 MT of raw fish. And this is accounting for only industrial fishmeal production from 'wet fish'. It excludes the fish that is sun-dried on the beaches and subsequently sold to poultry feed manufacturers, which can also be referred to as fishmeal.

Shrimp exports

The total export value of shrimp was US\$ 4.8 bn in 2017. India is the number one shrimp exporter in the world, both in terms of volume and value. It ranks fourth in terms of total seafood exports. A central minister announced in February 2020 that India was keen to become the top global seafood exporter. Up to 60 per cent of India's shrimp exports are destined for the US, Europe and Japan. *Litopenaeus vannamei* of Indian origin sold for € 26.90 (US\$ 31.5) per kg in a mainstream Dutch supermarket in June 2020, which positions shrimp in the upper price range of fish and meat products in these supermarkets.

Food and nutrition security

In absolute terms, India has the highest number of stunted, wasted children in the world, both key indicators of malnutrition. In relative terms, corrected for population size, India ranked 102 out of 117 countries measured, according to the Global Nutrition Report 2018. Iron and zinc inadequacy is high in India. The total content of iron and zinc in fish entering the fishmeal plants equals the recommended intake of these nutrients for 35 mn children. From a food and nutrition security perspective, the significance of eating 'small' fish, as compared to larger fish like carp or tilapia, stems mostly from the fact that small fish tends to be eaten whole, including bones and heads, which is where significant parts of the nutrients are located. World Fish recommends 75 gm of fish powder or dry fish per child per week.



also be in need of nourishment. Even a crude calculation of 10 mn individuals needing 100 gm equivalent of fresh fish for 50 weeks would mean 50,000 tonnes of fish for Odisha alone. And to nourish the entire non-vegetarian population of the country, we need far more than this.

Yet it requires less than a miracle; it doesn't require a production boom; it doesn't require a high-tech innovation. The sardine and other varieties of small fish are quite plentiful. Only their course needs to change, a reimagination of the sardine's journey and some bold, co-ordinated action. It needs to return the sardine to those baskets of waiting women. To find frugal technologies for

drying, packing and distribution. This will allow the sardine to find their place on the plates of school children across the nation.

Looming disaster

Our journey traced the fate of the humble sardine. The anguish of the Cuddalore fisherwomen and their near-empty baskets! The gloom of the factory in Udupi where the sardines were crushed into meal for shrimp and salmon! The looming disaster in Andhra with its shrimp culture that exports the sardine hidden in its flesh while degrading the surrounding soil and waters. There was hope still. At NSP, the plates carrying fish and the

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Fish vendors waiting for the sardine catch to be unloaded at Cuddalore, Tamil Nadu. Big boxes of sardines are swiftly unloaded from boats to the shore on the heads of careworn labourers, who blithely pass the baskets along and straight into waiting trucks.

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happy faces of children savouring the food despite the adversity that brought them to this place provided a glimmer. We left the place with some wishful thoughts. How can the sardine go to these plates and nourish the children, instead of disappearing in the export markets? Isn't this just plain sense?

This isn't to say that a good diet is merely a matter of compiling a cocktail of adequate nutrients. Human diets reflect historical and cultural preferences. People should be able to choose a diet fitting their taste and preferences. Yet diets and preferences are also subject to change. Who will argue against adding some fish to carefully devised school meals?

In a page from history, way back in 1978, when the fishmeal plants were only infants, John Kurien noted prophetically: When the option is between fishmeal for earning foreign exchange and protein for the masses, the choice is obvious. He was referring to the obvious choice in front of the powers that be. Four decades later we realize the choice isn't obvious, the path is tangled. It's a choice between feeding the shrimp for export

dollars or nourishing the nation. The twisted trajectory must be unknotted and straightened. We need to abandon this madness and rebuild the sardine's road. A road that leads to the plates of the needy children, to nourish them now and forever. 3

For more

<http://changingmarkets.org/wp-content/uploads/2019/10/CM-WEB-FINAL-FISHING-FOR-CATASTROPHE-2019.pdf>

Fish meal and fish oil industries pose threat to the fishing sector in India

https://www.researchgate.net/publication/267381587_Production_and_marketing_of_fish_meal_in_India_-_a_study

Production and marketing of fish meal in India: A study

<http://eprints.cmfri.org.in/9607/1/3.pdf>

Economic analysis of fishmeal plants in Uttara Kannada district, Karnataka