FISH WELFARE INITIATIVE

FISH WELFARE SCOPING REPORT: INDIA

By Marco Cerqueira, Haven King-Nobles, Jennifer-Justine Kirsch, and Koushik Raghavan





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We welcome comments, questions, and feedback from all interested parties. To do that, please <u>contact us</u>. *We will occasionally update this report as we learn new information.*

We are grateful to Karthik Pulugurtha and Sirjana Nijjar for providing valuable feedback.

Executive Summary

Aquaculture is the fastest growing food production sector in the world,¹ with roughly 73 to 180 billion farmed fish alive at any given point.² Nevertheless, little concern has thus far been given to their welfare. Fish are often kept under poor environmental conditions and in high densities, fed for fast growth, and slaughtered via inhumane methods. These welfare issues are now becoming exacerbated and entrenched as production increases and intensifies. However, an increasing number of both academic and advocacy organizations, including Fish Welfare Initiative, are now recognizing that welfare is a guiding principle for responsible aquaculture.

This report discusses the welfare of farmed fish in India, a country with an estimated 3 to 14 billion finfish alive in aquaculture, the second largest quantity of cultured finfish per country in the world.³ To better understand Indian aquaculture, we first reviewed FAO data, industry data, and other studies relevant to fish welfare. Secondly, we visited and surveyed 17 farms in India in March and July of 2020. Our main findings are the following:

- In India, farmed finfish are largely consumed domestically: only 26% of aquaculture exports are finfish.⁴ Domestically consumed fish are often sold in informal markets with little to no government regulations.⁵ Although there is increasing centralization of the seafood market, top-down changes still appear challenging.
- The primary aquaculture systems in India are extensive and semi-intensive freshwater ponds. In 2018, 86% of fish producers operated freshwater systems.⁶ More intensive farming systems, such as Recirculatory Aquaculture Systems (RAS)

¹ Van Duren, L. (2020). <u>Environmental impact of fast growing aquaculture sector</u>.

² Fishcount. (2019). <u>Numbers of farmed fish slaughtered each year</u>.

³ Fishcount. (2017) <u>Estimated numbers of individuals in aquaculture production (FAO) of fish species</u> (2017).

⁴ ET Bureau. (2018). <u>Indian seafood export touches new high at \$7.08 billion</u>.

⁵ Department of Fisheries. (2018). <u>Handbook on Fisheries Statistics</u>.

⁶ FAO. (2014). <u>National Aquaculture Sector Overview India</u>.

and raceways, are becoming increasingly popular.⁷ In 2018, Indian Major Carp accounted for 73% of finfish production, and catfish for 10%.⁸

- The proportion of certified aquaculture facilities in India is still very low, although the Global Aquaculture Alliance Best Aquaculture Practices (BAP), the Aquaculture Stewardship Council (ASC), and Friend of the Sea (FoS) certification schemes are all either already active in India or have indicated interest in being so. The vast majority of facilities certified by BAP and ASC farm or process shrimp.
- In our field visits and farm surveys (n=17), the production issues reported by the largest number of farmers were water quality, diseases and infections, and lack of qualified veterinary care or appropriate medicines. The majority of farmers surveyed expressed an interest in future NGO collaboration. Pre-slaughter stunning was absent in every facility we visited.

We conclude with a list of recommendations for future fish welfare work in India. Specifically, we recommend that organizations demonstrate the connection between fish welfare and other issues and include a focus on enforcement, amongst other recommendations. For specific welfare guidelines and on-the-farm recommendations for Indian Major Carp, see our upcoming Fish Welfare Improvements in Aquaculture report.

We encourage any organization or industry interested in engaging with fish welfare in India to <u>contact us</u>. We are available to provide consultation, training in fish welfare improvements, and access to funding.

Lastly, we would like to thank the numerous people in India who made this report possible.

⁷ Ghosh, S. & Mandal, B. (2020). <u>Concept of indigenous recirculatory aquaculture system executed in</u> <u>West Bengal, India and other places</u>.

⁸ FAO. (2020). <u>Fishstatl</u> (numbers from 2018).

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1. Background

1.1 About Fish Welfare

Researchers first demonstrated that fish are capable of feeling pain in 2003.⁹ Since then, the scientific community frequently highlights their remarkable perceptual, social, and emotional capabilities.¹⁰ However, despite this increasing knowledge, little progress has been made to safeguard fish welfare. Today, fishes' well-being is not legally protected, and stakeholders frequently dismiss fish welfare as a non-essential part of their farming operations. In reality, fish welfare impacts farmers' well-being, public health, and environmental sustainability, while at the same time improving the lives of fish. Higher welfare can enhance feeding efficiency,¹¹ decrease the need for antimicrobials,¹² and, ultimately, lower mortality rates.¹³ By giving fish what they need (e.g., access to proper feeding and nutrition, water quality, and health conditions, as well as the possibility to exhibit their natural behavior), producers can ensure a safer, more sustainable, and more ethical product.

Drawing on research, farm visits, and surveys, this report analyzes challenges to and opportunities for welfare in fish farming in the country that produces the second largest quantity of farmed fish in the world: India.

1.2 About India

India is a peninsular South Asian country and home to the world's second largest population, with 1.35 billion people. India is one of the most diverse countries in the world, with 6 major religions, 22 recognized languages, and thousands of small ethnic groups. The country is divided into 28 states and 8 union territories (Fig. 1).¹⁴ India is a primarily federal country where the power to legislate largely rests with the union and state governments. However, there are specific areas where only the central government may pass legislation, others where it is reserved for the states, and still others where the states may legislate but may be overridden by central laws.

⁹ Sneddon, L. U. (2003). <u>The evidence for pain in fish</u>.

¹⁰ For examples, see Brown, C. (2015). <u>Fish Intelligence, Sentience, and Ethics</u> and Cerqueira, M. et al. (2020). <u>Cognitive appraisal in fish</u>.

¹¹ Miller, D. & Semmens, K. (2002). <u>Waste Management in Aquaculture</u>.

¹² Barker, G. (2000). <u>Novel methods to reduce disease in aquaculture</u>. (proceedings page 66)

¹³ EFSA Journal. (2009). <u>Scientific Opinion of the Panel on Biological Hazards on a request from The</u> <u>European Commission on Food Safety considerations concerning the species-specific welfare</u> <u>aspects of the main systems of stunning and killing of farmed fish</u>.

¹⁴ While this may have implications for legislative strategies, we will refer to both states and union territories as "states" throughout this report.



Figure 1: Indian states, union territories, and their respective capitals. Source: <u>GKmojo</u>.

Post-independence, thriving agriculture and meat sectors have brought economic prosperity to many Indians. Nevertheless, India remains the country with the second largest number of people living below the World Bank's poverty line of US\$1.90. Since the economic liberalization in 1991, the country has moved towards a free market system that has given a significant boost to the economy.¹⁵

We have found India to be a promising country for fish welfare improvements because of its high production volume, prevalent welfare challenges, farmers' openness to improving welfare, and the presence of animal advocacy organizations. In the following, we elaborate further on these characteristics.

1.3 Structure of the Indian Aquaculture Industry

India is the second largest producer of both fish more broadly (finfish, molluscs, and crustaceans) and finfish specifically. In 2018, Indian farmers produced 6.36 million tonnes of finfish (Fig. 2).¹⁶ This represents an average annual growth rate of over 5% per year since 1950. Although average fish consumption in India is low (only contributing 2% of total animal protein consumed), it varies greatly between states. States in the South and

¹⁵ See the respective document of the World Bank <u>here</u>.

¹⁶ FAO. (2020). <u>The State of World Fisheries and Aquaculture</u>.

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Northeast of India have the highest per-capita consumption, while North Indian states have the lowest. For example, the monthly average fish and prawn consumption in Kerala (South India) is 3.31 kg/per capita, and in Haryana (North India), 0.01 kg/per capita.¹⁷



Figure 2: Finfish production in India from 1950 until 2018. Source: FishStatJ, 2020.

With the <u>National Fisheries Policy 2020</u>, the Indian government promotes fish farming by increasing infrastructure, investment, and exports. While this proposal is supported by foreign and international investors, local fishermen have expressed concerns about its implications for small-scale fishing.¹⁸ They fear that big companies will dominate the sector while small-scale fishing and farming communities have less access to fishing grounds and markets. Aside from potential harm to local communities, expansion plans under the National Fisheries Policy will likely intensify aquaculture production, creating further fish welfare issues.

Trade

Finfish raised in India is predominantly consumed domestically, while crustaceans are mostly exported. In 2017, India was the fourth biggest exporter of fish products (along with Vietnam, Chile, Thailand, the Netherlands, and the United States).¹⁹ The export market clearly focuses on shrimp, both in quantity and by value. Between 2017-18, frozen shrimp constituted 41% of quantity and 68% of dollar value of total aquaculture exports.²⁰ The respective numbers for frozen fish²¹ were 26% and 10%. A large portion of these exports is overseen by the <u>Seafood Exporters Association</u>, India's largest coalition of seafood exporting companies. The biggest export markets for Indian fish products (by quantity) are

¹⁷ Department of Fisheries. (2018). <u>Handbook on Fisheries Statistics</u>.

¹⁸ Vohra, S. (2020, July 21). Draft National Fisheries Policy seeks big growth but ignores fishers.

¹⁹ FAO. (2020). <u>The State of World Fisheries and Aquaculture</u>.

²⁰ ET Bureau. (2018). Indian seafood export touches new high at \$7.08 billion.

²¹ The definition of fish is not clarified but likely refers to finfish as shrimp are mentioned separately.

Japan, the U.S., and the European Union (Fig. 3).²² By value, most fish products are exported to Southeast Asian countries. In 2019, India signed a novel trade agreement with China to export Indian fishmeal and fish oil (FMFO) to China.²³ Perhaps due to this agreement, Indian aquaculture exports to China have risen from US\$590 million to \$1.39 billion between 2018 and 2019.²⁴



Figure 3: Top importers of Indian fish products by quantity (tons) from 2017-18. Source: <u>Department of Fisheries, 2018</u>, illustrated by FWI. Note: The term "fish products" does not differentiate between wild-caught and farmed fish.

However, the fact that most farmed fish in India are consumed *domestically* does not mean that most are consumed *locally*. In the case of Andhra Pradesh, the state where Fish Welfare Initiative conducted five of its farm visits, 75-80% of Indian Major Carp are consumed in Eastern or Northern India.²⁵

Value Chain

Because Indian finfish is largely consumed nationally, domestic markets are a crucial outlet for farmers' produce. Fish prices are driven by supply and demand, with little governmental control.²⁶ However, there are unions and cooperatives in most areas, usually minded by a local businessman and/or local politician, that advise and exert significant influence over producers.

²² Department of Fisheries. (2018). <u>Handbook on Fisheries Statistics</u>.

²³ India Department of Commerce. (2019). <u>Annual Report 2018-19</u>.

²⁴ Trading Economics. (2020). <u>India exports of fish, crustaceans, molluscs, aquatics invertebrates to</u> <u>China</u>.

²⁵ The New Indian Express. (2020). <u>Aquaculture farmers of Andhra Pradesh stare at heavy losses</u> <u>despite rise in production</u>.

²⁶ FAO. (2014). National Aquaculture Sector Overview - India.

In some states, farmers do not have access to wholesale markets.²⁷ For example, farmers in West Bengal frequently have to travel up to 1,200 km to sell their produce.²⁸ This lack of infrastructure for farmers to sell fish themselves necessitates the existence of resellers. Resellers give farmers access to the supply chain's upper levels by collecting the fish at farms and processing facilities and then selling them on markets (Fig. 4).²⁹ In this relationship, resellers have full control over price. Several other layers of middlemen and/or bureaucrats between the farmer and the end consumer may also be present. As a result, farmers frequently get paid far less than the fish's actual worth. The reseller model can be disrupted by retailers who buy fish from farmers and sell them at supermarkets. As in other Southeast Asian countries, supermarkets have become increasingly important in India,³⁰ reducing the need for resellers.



Figure 4: Generic supply chain in India, excluding import/export activities. Source: Information from <u>Jong,</u> <u>2017, Belton et al., 2017</u>, and <u>Anand, 2019</u>; illustrated by FWI.

Market Centralization

Selling directly to retailers is not the only way to forgo resellers. The Indian Tobacco Company (ITC) developed the <u>e-choupal</u> (or aquachoupal) concept to create vertical integration in the local seafood sector. ITC provides computer kiosks to local farmers where they can find the latest market price.³¹ This allows them to decide when and how much

 ²⁷ For this report, the term "wholesale markets" refers to unstructured markets where animals are primarily sold alive and/or unprocessed. These markets are frequently referred to as "wet markets".
 ²⁸ Belton, B. et al. (2017). Boom and bust in Andhra Pradesh.

 ²⁹ Anand, P. E. V. (2019). The fish farming industry of India.

³⁰ Reardon, T. et al. (2010). <u>Supermarket revolution in Asia and emerging development strategies to</u> <u>include small farmers</u>.

³¹ Mahalakshmi, P. et al. (2008). <u>Web kiosks in aquaculture</u>.

they want to sell. Farmers can also directly sell their products to ITC facilities, a process that eliminates the need for resellers. It is unclear how widespread this technology is, but it may drive forward farmers' autonomy and reduce their reliance on resellers and wholesale markets. At the same time, this model strengthens the market dominance of ITC and other big corporations.

Farmer Producer Organizations are another system that increases vertical integration (Fig. 4). These provide all the steps in the supply chain: harvesting, slaughter, cooling, packaging, and distribution to resellers.³² Trade clusters allow farmers to access all parts of the supply chain and make the sale of their fish easier, even in areas with little existing supply chain infrastructure. When part of a trade cluster, farmers partially own the supply chain and thus have increased control over it.³³ Finally, while small-scale farmers still dominate the fish farming landscape, Farmer Producer Organizations and aquachoupals help connect individual farmers and increasingly centralize the market.

1.4 Finfish Production and Culture Systems

Finfish make up the majority of Indian aquaculture production. The systems in which these fish are reared have been intensified since the late 1980s to answer the growing demand for cultured fish. This has led to an ever increasing number of semi-intensive and intensive farms.³⁴

Most finfish farms in India are freshwater cultures (Fig. 5). In 2018, 86% of Indian producers operated freshwater farms, 11% brackishwater, and 0.2% mariculture farms. The most common production systems for freshwater are ponds. But with the rise of semi-intensive operations, raceways, tanks, and cages are becoming increasingly popular. Some farmers are also experimenting with Recirculatory Aquaculture Systems (RASs).³⁵ Brackishwater culture is restricted to shrimp, which are usually reared in ponds.³⁶ Mariculture in India is a small sector that is currently developing the production of bivalves in sea cages.³⁷

³² Ramakrishna, R. et al. (2013). <u>Feeding and feed management of Indian major carps in Andhra</u> <u>Pradesh, India</u>.

³³ Kassam, L. et al. (2011). <u>Aquaculture farmer organizations and cluster management</u>.

³⁴ Kumar, J. Y., Reddy, S. J., & Suguna, T. (2020). <u>Disease Prevalence of Indian Major Carps in Semi</u> <u>Intensive Culture System</u>.

³⁵ Ghosh, S. & Mandal, B. (2020). <u>Concept of indigenous recirculatory aquaculture system executed in</u> <u>West Bengal, India and other places</u>.

³⁶ FAO. (2014). <u>National Aquaculture Sector Overview India</u>.



Fig. 5: Aquaculture production (in tonnes) by culture system from 1980 to 2019. Source: NASO, 2014.

In addition to commercial farming, India has a long history of traditional, extensive systems: rice-cum-fish and sewage-fed cultures. Rice-cum-fish culture is practiced in rice paddy fields in lowland India. Farmers create trenches around rice cultivation where fish are kept without external feed input. Rice-cum-fish culture originated in Northeast India and is now also present in Kerala and Tamil Nadu in Southern India.³⁸ For more information on sewage-fed systems, see <u>2.5. Sewage Farms</u> below.

Recently, a new system called ranching has emerged. Ranching connects aquaculture and fisheries to create a form of restocking. Fish are reared in captivity and then released into the wild, where they grow until they are caught again for consumption.³⁹

1.5 Scale and Species

Indian aquaculture primarily consists of two main species groups: carp and catfish. In 2018, carp production amounted to 4,641,700 tonnes, and catfish production to 637,000 tonnes. ⁴⁰ This equates to 73% of total finfish production in 2018 for carp, and 10% for catfish. The most commonly farmed species are catla, rohu, striped catfishes (species group), and Silver carp (Fig. 6).

³⁸ Das, D. N. (2002). <u>Fish farming in rice environments of North Eastern India</u>. And Rai, S. C. (2005).
 <u>Apatani paddy-cum-fish cultivation: An indigenous hill farming system of North East India</u>.
 ³⁹ Kitto, M. R. & Rajan, M. (2013). <u>The science of sea ranching</u>. And n.d. (2019, November 25). <u>Sea</u>

ranching to boost fish resources off T.N. coast. ⁴⁰ FAO. (2020). Fishstatl (numbers from 2018).



Figure 6: The most farmed species in India (tonnes). Source: FAO, 2018.

Carp (cyprinids)

Carp are freshwater species commonly farmed in earthen or artificial ponds.⁴¹ Most carp production is extensive or semi-intensive, with minimal feed and fertilizer input. Polyculture, where several species of carp are cultivated in the same system, is the most prevalent freshwater aquaculture system. Polyculture usually involves the three Indian Major Carp: catla (*Catla catla*), rohu (*Labeo rohita*), and mrigal carp (*Cirrhinus cirrhosus*). Exotic carp species such as silver (*Hypophthalmichthys molitrix*), grass (*Ctenopharyngodon idella*), and common carp (*Cyprinus carpio*) are also occasionally farmed together.

Catfish (siluriformes)

India has 142 species of catfish. Striped catfish (iridescent shark, *Pangasius hypophthalmus*) and torpedo-shaped catfish (*Clarias spp.*) are the most commonly farmed species and groups (Fig. 6). Due to consumers' preference for catfish and plummeting wild populations, the Indian government strongly supports the expansion of catfish farming.⁴² Catfish are usually raised in monoculture ponds, but sometimes they are farmed in polyculture with perch. Most catfishes are air-breathing species that can survive low oxygen levels.⁴³

A Note on Species Prioritization

In Fish Welfare Initiative's previous research, we found catla and rohu to be particularly promising species for welfare improvements.⁴⁴ In 2018, these two species made up 61% of India's total farmed finfish, and Indian production of catla and rohu accounted for 8% and 7% of the total finfish produced in Asia and the entire world, respectively.⁴⁵ From the species we assessed, catla was the most sensitive to negative stimuli and environmental changes compared with the other Indian Major Carp. Thus, their welfare may easily be

 ⁴¹ Rahman, M. (2015). <u>The role of common carp (*Cyprinus carpio*) in aquaculture production systems</u>.
 ⁴² FAO. (2014). <u>National Aquaculture Sector Overview India</u>.

⁴³ Haniffa, M. A. (2009). Native catfish culture.

 ⁴⁴ Billington, T. & Cerqueira, M. (2020). <u>Prioritizing Fish Species for Effective Welfare Improvements</u>.
 ⁴⁵ FAO. (2020). <u>FishStat</u>J.

compromised. As 91% of catla is produced in India,⁴⁶ we expect there to be many opportunities for welfare interventions. While rohu appears to be somewhat more resilient, the literature suggests that infections and diseases frequently occur.⁴⁷ Overall, little research has explored the sensitivity of Indian Major Carp, despite their dominance in Indian aquaculture.

1.6 Legislative Protection and Certification Schemes

Welfare Regulation in India

Nationally, neither the <u>Slaughter House Rules</u> 2001, nor the <u>Prevention of Cruelty to</u> <u>Animals Act</u> 1960 mention fish, and instead focus on domestic animals. This, paired with the acts' minimal requirements, allows for the exploitation of fish and their welfare is not legally protected. In June 2017, the government drafted a rule for fishes in aquariums to be included in the Prevention of Cruelty to Animals Act.⁴⁸ However, this rule was withdrawn in November for unknown reasons and is yet to be re-addressed.⁴⁹

Internationally, India is part of the World Organization for Animal Health (OIE) and the Association of Southeast Asian Nations (ASEAN). The OIE Aquatic Animal Health Code, provides best practices for the farming of aquatic animals. These standards are not mandatory, not species-specific, and often vague. For example, the code does not ban asphyxiation in ice slurries, a slaughter method that is criticized for causing prolonged suffering.⁵⁰ Despite the fact that they recommend humane slaughter, the OIE allows slaughter without stunning. The ASEAN has guidelines for Good Aquaculture Practices (ASEAN GAQP for Food Fish) which include the Aquatic Animal Health Code. The ASEAN guidelines are also left vague (e.g., minimize physical damage) and aim at assuring food safety and production efficiency rather than preserving welfare.

Given these, the welfare of fish is not sufficiently safeguarded on a national level by either the government or international institutions such as the ASEAN and OIE. There may be state-wide regulations, but we did not identify any during our visits and research. It is unclear how effective laws safeguarding fish welfare would be given poor enforcement mechanisms.⁵¹

⁴⁶ Open Philanthropy Project. (2016). <u>Finfish numbers</u>. (accessed September 30, 2020).

⁴⁷ Abraham, T. J., Sil, S. K., & Nagesh, T. S. (2020). <u>Association of Risk Factors and Management Issues</u> on the Occurrence of Diseases in Carp Aquaculture in West Bengal, India.

⁴⁸ Das, S. (2017, June 19). <u>Aquarium fish in troubled waters</u>.

⁴⁹ Press Trust of India. (2017, December 2). <u>Centre withdraws rules to regulate fish, aquarium</u> <u>markets</u>.

⁵⁰ Guiffrida, A. et al. (2007). <u>Influence of Slaughtering Method on Some Aspects of Quality of Gilthead</u> <u>Seabream and Smoked Rainbow Trout</u>.

⁵¹ For instance, the fine for failing to comply with the 1960 Prevention of Cruelty to Animals Act is generally ₹50. This outdated fine is the equivalent of less than \$1 USD.

Welfare Certification

Private, international certification schemes address the lack of national legislation and offer an independent manner of certifying that a facility holds up to higher biosecurity and sustainability standards, among others. Historically, fish welfare has largely been disregarded in certification schemes. However, some certifiers have recently begun developing welfare standards.⁵²

The most used certification schemes in India include Global Aquaculture Alliance's Best Aquaculture Practices (GAA BAP), and the Aquaculture Stewardship Council (ASC). Roughly 15% of the total number of GAA BAP-certified facilities worldwide are Indian. GAA BAP certifies 484 processing plants, farms, hatcheries, and feed mills, mainly for shrimp. ASC certifies 38 shrimp facilities, but none yet for finfish. Hence, the number of certified farms is still insignificant in India, particularly for finfish. FWI sees great potential in helping schemes include more welfare standards, and then promoting these standards across Indian farms.

We are also aware that the Friend of the Sea (FoS) scheme, which has previously collaborated with FairFish International to develop welfare standards for species in Europe, is planning to develop standards for Indian species in 2021.⁵³

2. Field Visits

2.1 Methodology

We collaborated with the Federation of Indian Animal Protection Organizations (FIAPO) to visit about 30 aquaculture sites spanning the states of Andhra Pradesh, West Bengal, and Bihar. These states were selected due to their production numbers and national significance for aquaculture, as well as due to logistical reasons related to the onset of COVID-19. The visits were informal, and primarily consisted of observing the farm and speaking with the owner (see Fig. 7 for visit locations).

Additionally, we visited a number of hatcheries and wholesale (wet) markets to better understand the fishes' conditions throughout the entire supply chain.

⁵² For example, see the Aquaculture Stewardship Council's <u>Fish Welfare Project</u>.

⁵³ Any party interested in contacting Friend of the Sea may contact <u>Amod Ashok Salgaonkar</u> for additional information.

2.2 Survey Findings

Fish Welfare

We successfully completed surveys for 17 of these farms (Table 1). We were unable to survey every farm we visited because the owners were sometimes unavailable

State	Number of Surveys Completed
Andhra Pradesh	5
Bihar	6
West Bengal	6



Table 1: Locations of Farm Visits.

Figure 7: Map of Farm Visits.

Given the small sample size of surveys (17), our findings here should not be viewed as representative and we cannot draw any firm conclusions from them. Communication and language barriers further reduced our findings' validity,⁵⁴ but we believe that the majority of the information is still useful.

For the 17 surveys we collected, our findings are as follows (Table 2).⁵⁵ See the appendix for the list of survey questions.

Number	Торіс	Survey Findings
1	Farming/Production Issues ⁵⁶	5/17 farmers mentioned water quality, and 6/17 mentioned either disease, infections, or lack of qualified veterinary care and medicines as significant issues. Other issues mentioned more than once include lice, feed management, stocking densities, and predator control (Fig. 8).

⁵⁴ Many different languages are spoken throughout India, and a total of 22 are recognized by the Constitution. This meant that even though we traveled with an Indian national, he sometimes required a translator as well. Lower levels of rural education and literacy further complicated communication.

⁵⁵ Note that due to communication and time constraints, we were not always able to ask each farmer every question. <u>Contact us</u> to access our anonymized survey data.

⁵⁶ Note that we specifically asked about production, not welfare. This was because we were unsure whether the translation of "welfare" would accurately capture our understanding of it.

2	Certification	None of the farms we visited were certified (Fig. 9).
3	Farmer Training	13/16 farmers noted that their employees had <i>not</i> been trained nor demonstrated proficiency in the farming routines. However, the amount of training needed varies significantly with the type of production system and responsibilities of the staff.
4	Use of Production-enhancing Technology	Two of the farms were using water quality sensors.
5	R&D Collaboration	One farm had collaborated with an R&D facility (in this case, they collaborated with a feed company).
6	Government Assistance	One of the farms mentioned receiving an electricity bill reduction, and another mentioned receiving a 25% subsidy. Additionally, we spoke with several farmers who were renting their ponds from the government.
7	Sales	All of the farmers either sold to intermediary resellers or directly to local markets. The resellers often seemed to sell the fish to other states in India, although there were no exports that we were aware of. The farmers themselves are usually removed from the sales process and typically do not know where the fish are sold.
8	Frequency of Water Quality Checks	4/16 respondents said they never check water quality, and 4/16 more say they only check it when a problem is observed. The remaining 8 check water quality several times annually or more frequently.
9	Do fish feel pain?	In response to whether fish feel pain, 6/12 of the respondents thought they did, while the other half said no, were unsure, or gave some other response.
10	Common Diseases and Parasites	9/16 of the respondents noted that red spot disease was common amongst farmed fish in the region, and another 9/16 noted the same for lice infections.
11	Antibiotic Use	6/13 of the respondents reported using antibiotics on their fish.
12	Wastewater Runoff	Most wastewater does not seem to be filtered, and

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		flows directly into local rivers, creeks, or drainage.
13	Interest in collaborating with an NGO	10/15 of the farmers mentioned that they would be interested in collaborating with an NGO to improve health issues (Fig. 9).
14	Mortality Rates	The self-reported mortality rates we collected varied from 6% to 50%, with most in the 10-20% range.

Table 2: Farm survey findings.



Most Reported Production Issues

Figure 8: Most commonly reported production issues (out of 17 survey results).

09% Percent of farms surveyed that were certified

Percent of farms surveyed that were interested in collaborating with an NGO to improve health issues

75%

Figure 9: Percent farms certified and percent interested in collaboration with an NGO.

Farmer Well-Being

While the primary focus of our work is fish welfare, we believe it is critical to identify and act upon opportunities to improve the lives of humans as well. This is especially true in

India, where 70% of rural households still depend on agriculture for their livelihoods.⁵⁷ Another 70% of India's poor are found in rural areas.⁵⁸ This was consistent with our observations, particularly in Bihar (one of the poorest states in India, with 1 in 3 people living below the poverty line).⁵⁹

When we spoke with farmers, we attempted to gain a holistic view of both the condition of their fish as well as of their own lives. In addition to the normal impacts of rural poverty, such as low prices for their goods, several farmers mentioned significant economic losses due to the COVID-19 pandemic.⁶⁰ These losses were in part caused by a lack of sales and available laborers (particularly migrant laborers).

Fishes' health and welfare issues themselves also jeopardize farm viability, indicating an intersection for work to empower the farmers while improving the lives of their fish. For instance, several farmers in West Bengal mentioned the lack of qualified veterinary care as being a serious issue, and faced regular disease or infection outbreaks that they, and sometimes their local veterinarian, did not know how to treat.

2.3 Hatcheries

In India (as in many other places), fish are often bred in separate hatchery facilities, from which the eggs or fry are transported to the farms. We visited several hatcheries and one distribution center to observe this. Our understanding is that hatcheries are often located in hubs, such that one city provides the eggs and fry for much of a region and across the country. Fry may face very high mortality rates in hatcheries,⁶¹ and stripping, the process of removing eggs and milt from fish, is also stressful.⁶²

2.4 Pond Farms

The most prominent aquaculture systems in India are pond farms (Fig. 10), which are where we conducted the majority of our visits. The pond farms we visited were generally small to medium scale semi-intensive polyculture systems, usually with some combination of the Indian Major Carps (catla, rohu, and mrigal). We also observed the culture of other species, including various types of catfish, and many species with local names, of whose equivalents we are unsure.

⁵⁷ FAO. (2020). <u>India at a glance</u>.

⁵⁸ The World Bank. (2012). India: Issues and Priorities for Agriculture.

⁵⁹ Reserve Bank of India. (2015). <u>Number and Percentage of Population Below Poverty Line</u>.

⁶⁰ Srikanth, S. G. (2020, July 27). <u>Aquaculture farmers of Andhra Pradesh stare at heavy losses despite</u> rise in production.

⁶¹ Tørud, B. et al. (2019). <u>Animal welfare in fish hatcheries</u>.

⁶² Stone, D. A. J. (2008). Evaluation of the effects of repeated fecal collection by manual stripping on the plasma cortisol levels, TNF-α gene expression, and digestibility and availability of nutrients from hydrolyzed poultry and egg meal by rainbow trout, Oncorhynchus mykiss (Walbaum).

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Figure 10: Left: A typical pond farm in Andhra Pradesh. Right: A typical pond farm in Bihar, a state with fewer economic resources and investments in aquaculture than Andhra Pradesh. Source: FIAPO, personal photo.

The pond farms we surveyed contained between 400 and 140,000 fish, as reported by the farmers. Most farms in India skew towards the smaller end of that spectrum, with several thousand or tens of thousands of fish. As the farmers described them, they were relatively "low maintenance" and the fish were "hardy": the laborers would feed the fish daily, and few other inputs were required.

However, despite (and often because of) the "low maintenance" nature of these fish, we observed several areas of compromised welfare. The following are our observations of the most important components of welfare in pond farms:

Water Quality

Water quality is amongst the most important aspects for good fish welfare.⁶³ Concerningly, we regularly observed the following conditions, suggesting degraded water quality:

- Frequent issues with disease and infection.⁶⁴
- Stagnant water, often with no inflow or outflow. Pond water, especially during summer, tends to stratify, and only a few of the fish farms we visited had aerators. Stagnant water means that the fish are more vulnerable to temperature-induced drops in dissolved oxygen, as well as other issues with turbidity and pH related to the decomposition of organic matter. Higher temperatures also increase the likelihood of algae blooms and, thus, decreased oxygen levels for the fish.⁶⁵
- Infrequent water quality testing: in most of the Andhra Pradesh farms, water quality seemed to be tested about monthly. In many of the farms we visited in other states, it was almost never checked unless mortality rates rose dramatically.

⁶³ Cooke, M. (2016). <u>Animal Welfare in Farmed Fish</u>.

⁶⁴ For example changes in temperature are critical drivers of disease outbreaks on farms in West Bengal (<u>Abraham et al., 2020</u>).

⁶⁵ Boyd, C. E. (2018). <u>Dissolved oxygen dynamics</u>.

 Occasional garbage and animal or human feces in or adjacent to the pond (Fig. 11). These contribute to nutrient build-up, a process that depletes the water of its dissolved oxygen. Researchers in West Bengal have also found that sewage water is a putative factor for disease outbreaks.⁶⁶

Water samples taken by FIAPO in the state of Tamil Nadu showed concerningly high levels of ammonia and suboptimal levels of dissolved oxygen for the species being raised. Further water samples were collected by the FIAPO representative on our visits. These will be discussed in an upcoming FIAPO report.



Figure 11: The polluted edge of a fish farm in Bihar. Source: personal photo.

Feed Management

On the pond farms we visited, fish were generally fed daily via manual distribution. While most farmers purchased their feed pre-formulated, some made their own feed. It can be risky for farmers to produce their own feed, as homemade variants often lack proper nutrition, promote poorer feed conversion ratios, and may be unsuitable for various life stages and fish species.⁶⁷ Poor nutritional feeding can also cause immunosuppression, deformities, and low growth performance. Excessive feeding results in the deterioration of the water quality, which impacts the health and welfare of the fish.

⁶⁶ Abraham, T. J., Sil, S. K., & Nagesh, T. S. (2020). <u>Association of Risk Factors and Management Issues</u> on the Occurrence of Diseases in Carp Aquaculture in West Bengal, India.

⁶⁷ Noble, C. et al. (2007). <u>The impact of environmental variables on the feeding rhythms and daily</u> <u>feed intake of cage-held 1+ Atlantic salmon parr (Salmo salar L.)</u>.

Two of the farms we surveyed in the state of Bihar noted that they occasionally faced issues with feed rotting in the water and killing the fish. This is likely due to either overfeeding, improper feed administration, or excess stress causing loss of appetite.

Stocking Densities

At most the farms surveyed, stocking densities were within a reasonable range: between 4000 to 7000 fish/ha, which is usual for polyculture production in India.⁶⁸ Little information about optimal stocking densities for performance or welfare is available for these species, but in Andhra Pradesh, these densities alongside with proper pelleted feeds have proved to secure higher growth rates.⁶⁹ However, higher growth rates are not necessarily indicative of high welfare.⁷⁰

We believe that these densities may be employed by farmers, in part, to lower disease risk. This is supported by the health issues found on some of the surveyed farms (see below). In fact, the fish on the two farms with the highest stocking densities (~10,000 and 16,000 fishes/ha) we visited were also suffering from health issues, despite the farms' more frequent water quality checks and use of pre-formulated feeds. This may indicate that the stocking density had already surpassed the carrying capacity of these farms.

Parasites and Disease

The farmers we spoke with consistently noted that disease affected their fish. Two of the farms we visited had fish that were visibly diseased (Fig. 12), in this case with Epizootic Ulcerative Syndrome (EUS), also known as <u>red spot disease</u> (although, as we often could not see the fish, we expect that the true number of farms we visited with diseased fish is higher).⁷¹ These two farms were within a few hundred meters of each other, which likely enabled the disease to spread between them. Of the 17 farms we surveyed, 9 of them specifically mentioned facing issues with red spot disease.

The findings from our field visits are supported by recent literature: Diseases are one of the major problems in freshwater aquaculture, and during some months, carp pond cultures in Andhra Pradesh experience disease rates of up to 100% and parasite rates of up to 75%.⁷²

The farmers did not have any solution for red spot disease, but still planned to sell the fish at market (at a discounted rate). Directly, the fungic agent that causes this disease does not pose any human health implications (known so far) and infected fish are safe to eat if

⁶⁸ Ramakrishna, R., Shipton, T. A., & Hasan, M. R. (2013). <u>Feeding and feed management of Indian</u> <u>major carps in Andhra Pradesh, India</u>.

⁶⁹ Ibid.

⁷⁰ Saraiva, J. L. et al. (2019). <u>A Global Assessment of Welfare in Farmed Fishes: The FishEthoBase</u>.

⁷¹ For more on diseases in Indian Major Carps, see <u>Pattanayak et al., 2018</u>

⁷² Kumar, J. Y., Reddy, S. J., & Suguna, T. (2020). <u>Disease Prevalence of Indian Major Carps in Semi</u> <u>Intensive Culture System</u>.

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well-cooked.⁷³ However, severely ulcerated fish (as red spot disease can lead to) should not be eaten as advised by the New South Wales Food Authority, as they can harbor secondary pathogens with direct human health implications.⁷⁴



Figure 12: Pomfret fish (Piaractus brachypomus) afflicted with red spot disease in Andhra Pradesh. Source: personal photo.

Another nine farms also mentioned problems with fish lice (argulus), which are small aquatic parasites that latch onto the fish. Fish lice are more commonly discussed in the salmon industry, where they are perhaps the industry's greatest problem.⁷⁵ However, fish lice also greatly impact Indian Major Carps, with a study in neighboring Bangladesh finding infestations in a third of the fish from the farms sampled.⁷⁶

Transportation and Slaughter

Although they only last for a short time, transportation and slaughter are likely the most stressful hours of the fishes' lives. Both procedures require prior starvation, physical handling, crowding, and netting (or pumping), all of which may be highly stressful. Bruising, crushing, puncture, and abrasion injuries from contact with other fish or the net often occur, impacting both the welfare and the quality of the sold fish. Additionally, sometimes not all of the crowded fish are harvested, and the potentially injured fish are released again. These individuals are potentially weaker physiologically and limited behaviorally,

 ⁷³ FAO. (2009). <u>What you need to know about epizootic ulcerative syndrome (EUS)</u>.
 ⁷⁴ Ibid.

 ⁷⁵ Whittle, P. (2017, September 19). <u>Plagues of Parasitic Sea Lice Depleting World's Salmon Stocks</u>.
 ⁷⁶ Das, D. R., Majumder, S., & Chandra, K. J. (2016). <u>Argulus of Indian Major Carps in Selected Fish</u> <u>Farms Of Mymensingh</u>.

making them more vulnerable to infections if the farming system's environmental conditions worsen.⁷⁷

Most of the farms we visited sold their fish live to resellers, who capture the fish in nets and dump them on land (Fig. 13 and Fig. 14), place them in crates with ice, and drive them to wholesale markets, sometimes as far as a multi-day day trip. Many fish were also sold locally, often transported on the backs of bicycles (Fig. 15). No farmer we spoke with mentioned using stunning or "humane" slaughter procedures. Such prolonged slaughter leads to increased toxins in the body of the animal, diminishing the quality of the meat.



Figure 13: The capture process. Carps are captured and netted on the day of the harvest (Andhra Pradesh). Source: <u>HSI/India</u>.

⁷⁷ Yin, Z., Lam, T.J., & Sin, Y.M. (1995). <u>The effects of crowding stress on the non-specific</u> <u>immuneresponse in fancy carp (Cyprinus carpio L.)</u>.



Figure 14: Carps are dumped without water to later be placed into crates and brought via truck or bicycle to market (Andhra Pradesh). Source: HSI/India.



Figure 15: A man in Kolkata brings newly caught fish to a local wholesale market. Source: personal photo.

2.5 Sewage Farms

Another farming system in India has gained attention, both for its possible sustainability benefits as well as for its novelty: the farming of fish reared off untreated human sewage.⁷⁸ We visited several sewage farms in West Bengal (Kolkata) and Bihar to better understand this system. From the farmers and taxi drivers we spoke with, in addition to the fact that the locals were bathing in the water, there generally seemed to be an attitude of little concern that the fish they sold and ate were fed with human sewage.

Farming with sewage may have severe welfare implications for the fish: untreated sewage promotes excess bacteria growth, bacteria which respire and make the environment more

⁷⁸ Doshi, V. (2017, January 25). Kolkata: the city that eats fish reared on sewage.

vulnerable to severe fluctuations in temperature, pH, and oxygen levels.⁷⁹ One study also identified the use of sewage water as a putative factor for infectious diseases in carp.⁸⁰

Sewage-reared fish are also unhealthy for the humans who consume them: because fish are cold-blooded, bacterias and viruses (e.g., salmonella and *E. coli*) from human fecal matter accumulate in their tissue in an inert form. When consumed, these bacteria and viruses become active and can lead to health complications, such as typhoid, colon disorders, or even cholera.⁸¹ Additionally, sewage-reared fish can accumulate high levels of heavy metals like arsenic, mercury, lead, and cadmium, all of which have a major impact on public health.⁸² The farms we visited in Kolkata were immediately adjacent to a city dump, further increasing the potential for the accumulation of toxic materials in the fish (Fig. 16).



Figure 16: One of the sewage farms we visited, immediately adjacent to a city dump (the mound in the background). Source: FIAPO.

2.7 Other Aquatic Animal Welfare Information

Wild-Caught Fish

Fish Welfare Initiative's focus is not wild-caught fish, but we did have the opportunity to observe small fishing vessels land in Goa. As with most fishing, the fish generally die from asphyxiation after being captured and hauled aboard.

⁷⁹ Dauda, A. B. (2019). <u>Waste production in aquaculture</u>.

⁸⁰ Abraham, T. J., Sil, S. K., & Nagesh, T. S. (2020). <u>Association of Risk Factors and Management Issues</u> on the Occurrence of Diseases in Carp Aquaculture in West Bengal, India.

⁸¹ See <u>here</u> for an homologue case in Egypt.

⁸² Authman, M. M. N. et al. (2012). <u>Metals concentrations in Nile tilapia Oreochromis niloticus</u> (<u>Linnaeus, 1758</u>) from illegal fish farm in Al-Minufiya Province, Egypt, and their effects on some <u>tissues structures</u>.

We hope that further work is undertaken to understand and improve the welfare of wild-caught fish.

Prawn Farming

Shellfish are also not the focus nor expertise of Fish Welfare Initiative, but we had the opportunity to visit several prawn farms in Andhra Pradesh (Fig. 17). Whereas most Indian fish farms are relatively low-input, prawn farms require constant aeration and water quality monitoring. According to one farmer we spoke with, if something goes wrong in the water, all of the prawns can die in 15 minutes. The presence of a farm technician at the farms we visited generally suggests that water quality parameters are already optimized (at least for production).

Another significant element of prawn and shrimp⁸³ farming is its aftermath: these animals require brackish water (water with a greater salinity than freshwater, but less than seawater), and if the farm closes down, that land is left salty and unusable for other agricultural purposes.⁸⁴ Consequently, there have been some efforts to prevent the development of new shrimp farms on these environmental grounds.⁸⁵

Unlike with fish, most Indian prawns are exported.⁸⁶ This suggests greater viability of collaborating with importing companies in order to influence production systems.

We do not feel qualified to identify any welfare concerns in the facilities we visited, although we are excited to see more work done in this field. See <u>Crustacean Compassion</u> for ongoing work in the United Kingdom to protect decapod crustaceans.



Figure 17: A large shrimp farm in Andhra Pradesh. Source: FIAPO.

⁸³ Although they are often used interchangeably, the terms "shrimp" and "prawns" actually represent suborders with various distinct species. For instance, see <u>The Aquaculturists</u>.

⁸⁴ Islam, A. F. M. T. et al. (2011). <u>Impact of brackish water shrimp farming on agricultural land and</u> <u>surrounding environment in the southwest coastal zone of Bangladesh</u>.

⁸⁵ Govindarajan, V. (2017, May 13). <u>Shrimp farming is booming in Tamil Nadu</u>.

⁸⁶ George, E. G. J., Chinnadurai, S., & A, V. (2020, June 1). <u>India's shrimp industry adapts to COVID-19</u> <u>restrictions</u>.

2.8 Wholesale (Wet) Markets

We visited wholesale markets (often called "wet markets") in Hyderabad, New Delhi, and Kolkata. For both aquatic and terrestrial animals, no regard is paid to their welfare. Our understanding is that most fish arrive already dead at the markets, but we did observe some fish still alive. The fish that do arrive alive are later killed by exsanguination or decapitation. This often follows a prolonged period of being left out in the air. Indian Major Carp are also often descaled alive, as we observed.

The main reason that fish are brought to wholesale markets live is that there is considerable demand for live fish: Many Indians correlate live fish with "quality" and "freshness." In order to keep them alive for longer, some fish are kept in containers with shallow levels of water (Fig. 18).



Figure 18: Fish sold (barely) live at a wholesale market in Kolkata. Source: personal photo.

3. Discussion

This report aims to discuss the welfare of farmed fish in India through secondary research on the aquaculture industry, as well as report on the findings of our in-country surveys. We observed many opportunities for improvements, and believe that there is great potential for the Indian aquaculture industry to implement them.

Below, we outline several such welfare improvements and approaches for their implementation and enforcement:

3.1 Promising Welfare Improvements

There are a number of welfare improvements that can be made in Indian Major Carp pond farming systems. These include improving feeding and nutrition, improving water quality, reducing stocking densities, reducing stress involved in handling, reducing the spread and impacts of diseases and parasites, decreasing the occurrences of predation, and decreasing the stress involved in transportation and slaughter, among others. The need for each of these varies, however, from farm to farm.

After a thorough analysis, we believe that the most promising welfare improvement for Indian Major Carp is improving water quality. This is because of the large expected impact it would have on fish welfare, as well as its relative feasibility of implementation. The need for this improvement is also supported by our survey, where 5/17 farmers mentioned water quality as a significant issue, and 8/16 farmers checked the water quality only when a problem was observed, or not at all.

For more information on welfare improvements for Indian Major Carp, as well as specific implementation information, see our upcoming report Fish Welfare Improvements in Aquaculture.

3.2 Possible Approaches for Fish Welfare Work in India

India is the second most populous country in the world, and it is one of the most culturally diverse. For these reasons, and due to general uncertainty around the best ways to improve the welfare of farmed fish, we believe that a variety of approaches should be explored.⁸⁷

Given the welfare issues we observed, the following are some possibilities for improving the welfare of farmed fish in India. They have not been thoroughly researched, and should thus be explored in further detail before attempting. They are grouped by similarity (Table 3).

Institutional Outreach Approaches	Collaborative Approaches	Legal Approaches
 The following types of organizations may be useful for work to secure higher welfare commitments: Retailers Corporations Corporations with Imports/Exports 	 The following types of organizations may be useful for collaborative work: Local NGOs Farmers or Farmer Producer Organizations National Fisheries Development Board 	 The following approaches may be promising: Legislation Litigation Enforcing Bans on Farming of Certain Species

⁸⁷ Note that we have excluded approaches that primarily consist of public advocacy because Fish Welfare Initiative focuses on institutional work.

 Insurers and Bankers Hatcheries Certification Schemes 	
• Certification schemes	

Table 3: Possible approaches for fish welfare work in India.

Institutional Outreach Approaches

• Retailers

An increasing number of Indian retailers are positioning themselves as socially responsible. ⁸⁸ Such retailers are already accustomed to selling products labelled as more socially responsible (such as cage-free eggs), and may be amenable to doing so for higher welfare fish products.

However, such efforts to shift demand to higher welfare products may need to be coupled with efforts to increase available supply (as is the case with the following two sections).

• Corporations

Although most production is small to medium scale and is sold at wholesale markets, there are some major seafood corporations in India.⁸⁹ These could be approached to request that they improve welfare in their supply chain. Before undertaking this, an achievable corporate ask would need to be developed.

• Corporations with Imports/Exports

While most Indian finfish are consumed domestically, some portion (e.g., 24% of frozen finfish) are exported.⁹⁰ A significant portion of these fish are exported to countries that currently or may in the future have demand for higher welfare products.⁹¹ Commitments could be secured by collaborating with importing corporations in higher-welfare markets, such as those of the European Union, in order to improve welfare across their supply chains. For example, many Pangasius in Vietnam are now stunned pre-slaughter due to a 2010 commitment from the European retailer Tesco.⁹²

Collaborative Approaches

• Local NGOs

The approach Fish Welfare Initiative is currently undertaking is collaborating with local NGOs to transition the farms that the NGOs support over to higher welfare farming practices. These NGOs primarily work to increase the well-being of the farmers as well as

⁸⁸ For an example of one of the growing number of outlets that market themselves as socially responsible, see <u>Sahaja Aharam Organic Stores</u>.

⁸⁹ For instance, see <u>10 Most Promising Seafood Companies – 2019</u>.

⁹⁰ Kalidoss, R. et al. (2018). <u>Growth and Performance of Indian Fish and Fishery Products Exports</u>.

⁹¹ For instance, 14% of India's finfish are exported to the European Union (See <u>Trade</u>, Fig. 4).

⁹² The Grocer. (2010, September 24). <u>Tesco reels in humane fish</u>.

the sustainability of the operation, although some are interested in animal welfare as well. For an example of such NGOs, see <u>Gramodaya Trust</u> and <u>Jaljeevika</u>. We expect our current <u>partnership</u> with Gramodaya Trust to improve the lives of several million fish.

• Farmers or Farmer Producer Organizations

As fish welfare work is novel in India (and almost everywhere else), it may be promising to begin work at a small scale before scaling up any findings, both to prove business viability as well as build the knowledge base. Furthermore, our survey provided preliminary evidence that at least some farmers generally seem to be open to collaboration with NGOs.

Some of the key welfare issues facing fish include poor water quality as well as personnel and veterinary staff that are inadequately trained. The following are several approaches that address these concerns:

- 1. Provide free or reduced cost training or workshops in welfare-friendly farming techniques to farmers. Training could be undertaken with local government or academic institutions, which would likely increase community buy-in on the project. Extensive training programs are already undertaken by Indian research institutes.⁹³
- 2. Provide free or reduced cost aeration equipment. With aerators, and given the unreliability of rural electricity, it might be useful to install ones that are powered by wind or solar energy. Doing so would also increase the overall sustainability of the project. However, care should be taken to ensure that such an approach does not increase the intensification of production (see <u>4.1 Ten Recommendations for Fish Welfare Work in India</u>).
- 3. Provide free or reduced cost water quality testing or water quality sensors.

During our visits, we met several farmers who held significant influence over their local communities. We believe that the most effective collaboration with farming communities will occur by first connecting with such parties. <u>Panchayati Raj Institutions</u>, or rural local self-governing bodies, could also be approached.

Farmer Producer Organizations (FPOs) offer another avenue to reach more farmers. In the state of Andhra Pradesh, FPOs have already begun working with NGOs and government bodies to incorporate more sustainable production practices.⁹⁴ Working with such coalitions could be promising in order to enable their members to secure better feed or equipment that could be shared (e.g., stunning equipment). Although the context is very different, such an approach has already succeeded with some farmers in Italy.⁹⁵

⁹³ Department of Fisheries. (2018). <u>Handbook on Fisheries Statistics</u>.

⁹⁴ This is our understanding from our private communication with someone who has previously worked with FPOs on the issue of poultry farming.

⁹⁵ Personal communication with Saraiva J. from Fair-Fish.

• National Fisheries Development Board

The <u>National Fisheries Development Board</u> is an autonomous organization under the Department of Fisheries with the goal of "enhancing fish production and productivity in the country and to coordinate fishery development in an integrated and holistic manner."⁹⁶ We believe that there is a strong case to be made for fish welfare as part of "holistic" fisheries development, and expect that collaboration with such an institution would significantly enable uptake and enforcement of recommended welfare improvements.

• Insurers and Bankers

Given the volatile and risky nature of aquaculture, many insurers and bankers are hesitant to insure or loan to farmers.⁹⁷ One possible approach could thus be to work with bankers and insurers to properly consider health and welfare conditions before making a loan in order to incentivize better conditions. In addition to improving fish welfare, this approach would also make financial assistance more accessible to farmers implementing higher welfare practices.

• Hatcheries

Hatcheries play a critical role in the production process. Training of proper procedures and information about proper parameters could be offered to hatcheries in order to reduce the mortality rates of fry, although we are unsure to what extent this is a problem in India,⁹⁸ and also unsure about the need for additional training in hatcheries. Additionally, hatcheries are institutions that connect with a large number of farms, so they are well-placed to disseminate information to farmers.

• Certification Schemes

Very few fish farms in India are certified. However, some certification schemes, including Friend of the Sea, are working to expand their presence in India and are interested in including a welfare component. We believe it is promising to collaborate with such schemes in order to certify higher welfare conditions, which would incentivize producers to increase welfare.

Partnering with the <u>National Programme for Organic Production</u>, which already includes certain welfare-impacting parameters such as stocking density, may also be promising.

• Providing Alternatives to Fish Farming

We are aware of many organizations that are interested in promoting plant-based alternatives to animal farming. One avenue of achieving this goal is to aid farmers in transitioning from fish farming to seaweed farming or terrestrial plant agriculture (see the

⁹⁶ National Fisheries Development Board landing page.

⁹⁷ Personal communication with producer in Bihar. Also see <u>Parappurathu et al., 2017</u>.

⁹⁸ We expect that this is difficult because it is a problem in Norway too, see <u>Tørud et al., 2019</u>.

<u>Transfarmation project</u>). However, we are currently unsure about the viability of converting fish farms in such a way, and seaweed farming primarily occurs in coastal aquaculture.⁹⁹

Legal Approaches

• Legislation

Although India already has strong animal welfare laws, more (and fish-specific) legislation could be pursued at either a national, regional, or local level. We are less certain about this approach, given that the bottleneck for animal welfare in India generally seems to be the enforcement of existing legislation.

• Litigation

Some organizations have found success using existing animal welfare legislation to challenge current practices or classifications in the courts. For instance, <u>People for Animals</u> recently secured a ruling stating that poultry farms cannot be exempted from certain pollution regulation.¹⁰⁰ Our understanding is that such rulings usually take several years or longer.

• Enforcing Bans on the Farming of Certain Species

Previously, India has banned the Thai Magur catfish from being farmed due to its status as a non-native species. We expect that work could be done to support and promote the enforcement of this ban,¹⁰¹ although further research should be conducted to understand the welfare implications of farming Thai Magur. Although farming Thai Magur was not banned for low-welfare considerations, research on possible bans for species that fare particularly poorly in aquaculture conditions could also be undertaken.¹⁰²

4. Conclusion

Our goal in this report has been to convey the various facets of fish welfare work in the hope that they will be informative to other institutions and organizations moving forward. To further facilitate this goal, we have compiled a list of recommendations for future fish welfare work in India. These have been compiled from both our own experience as well as that of our collaborators in India:

⁹⁹ Krishnan, M. & Narayanakumar, R. (2010). <u>Structure, Conduct and Performance of Value Chain in</u> <u>Seaweed farming in India</u>.

¹⁰⁰ Livemint. (2020) <u>Poultry farms cause pollution, can't be exempted from regulation: NGT.</u>

¹⁰¹ Express News Service. (2020, January 11). <u>Prohibited 'Thai Magur' farming continues unabated in</u> <u>Odisha</u>. Note that some of the farms we visited farmed what they called "Magur", but it was unclear if this was the banned species or a different variety.

¹⁰² For more information, see <u>Prioritizing Fish Species for Effective Welfare Improvements</u>.

4.1 Ten Recommendations for Fish Welfare Work in India

- 1. **Demonstrate the connection between fish welfare and other issues.** The reality is that fish welfare work has, to our understanding, not yet been attempted in India (or most other places), and to many farmers we met with it was not something they seemed to have previously considered.¹⁰³ Therefore, we believe that fish welfare is best approached by engaging with other issues. The Indian government has already shown significant interest in engaging with health issues, which are impacted by the health and well-being of fish raised for human consumption.¹⁰⁴ For more information on the benefits of higher welfare, see our webpage <u>Why Fish Welfare</u>.
- 2. Understand the issues that humans are facing. Many consumers and farmers themselves still live in poverty, and thus extra care must be taken to protect the well-being of humans as well. Aside from being the right thing to do, interventions that properly take into account human well-being also have a greater likelihood of being supported by the government, support which will prove crucial to a successful initiative. Furthermore, strengthening coalitions of small and socially marginalised farmers in India might promote technical improvements, better management practices, collective acquisition of humane equipment, and increased knowledge-sharing.
- 3. Understand and account for production impacts (e.g., greater intensification) that may come from welfare improvements. One concerning aspect of welfare improvements like improved water quality is that they may enable producers to stock more fish in the same amount of space, thus wiping out any welfare gains that were made. Efforts must be made to ensure that welfare improvements in one area do not lead to greater costs in another. In the example of water quality, this concern could be addressed by mandating certain maximum stocking densities, and discussing the environmental and welfare implications of surpassing them.
- 4. **Collaborate with the government.** Although some progress may be made via corporate outreach, it is very difficult to achieve large-scale and long-standing change in India without the support of the government, especially given the decentralized structure of the Indian aquaculture industry. Long-term, our impression is that the most impactful changes will be those made in conjunction with the government. State governments, which deal more with the implementation and enforcement of existing policies than does the central government, will likely

¹⁰³ For instance, when we discussed implementing pre-slaughter stunning techniques, several of the producers were perplexed as to what would be the point of such techniques.

¹⁰⁴ For information on how improved welfare makes for a healthier end-product (particularly by decreasing susceptibility to microbial infections), see <u>EFSA, 2008</u> & <u>EFSA, 2009</u>.

prove to be particularly important allies.

- 5. **Include a focus on enforcement**. India has some of the most progressive animal welfare laws in the world, yet they are rarely enforced and carry low penalties for noncompliance.¹⁰⁵ Achieving policy change is hardly half the work that must be undertaken: significant resources must be available to enable compliance in accordance with existing policies, as compliance in the case of animal welfare policies is particularly difficult. Certification schemes may play an important role in enforcement and accountability, as they have traditionally done in many markets.
- 6. **Partner with universities.** Although such partnerships can take significant time, fisheries and aquaculture is a widely studied field in India, and there may be students and academics interested in engaging with welfare. Additionally, university partnerships add greater credibility and decrease the level of perceived bias in NGO work.
- 7. Engage and partner with the local animal protection movement. India has one of the most established animal protection movements in the world, with a number of organizations that already work on farmed animal welfare. We believe that collaboration with such organizations will prove invaluable in the growing field of fish welfare. For more information on the Indian animal protection movement, see <u>Animal Advocacy in India</u> by Animal Charity Evaluators.
- 8. **Engage pro-animal public support.** According to a 2018 survey, the majority of people in India would support a law requiring the humane treatment of animals used for food¹⁰⁶ (although it's possible that survey respondents did not have fish in mind when answering this question). The extent to which the public will support fish welfare campaigns should be explored further.
- 9. **Don't overrely on graphic imagery in public awareness campaigns.** As animal slaughter is common in live markets across the country, consumers are often desensitized to animal cruelty, particularly slaughter, and see it as a part of life. However, we expect that imagery showing deformities and mass fatalities in aquaculture farms may make an impact by drawing attention to the public health risks of poor fish welfare.
- 10. **Try novel approaches for improving fish welfare.** The reality is that fish welfare is still a novel idea, and given this unfortunate lack of prior precedent, there is no definitive path forward. We recommend that NGOs think creatively and learn from other farmed animal welfare campaigns when approaching fish.

¹⁰⁵ Guzikowski, M. (2019). <u>Animal Advocacy in India</u>.

¹⁰⁶ Anderson, J. (2018). <u>Attitudes towards Farmed Animals in the BRIC Countries</u>.

4.2 Closing Remarks: Future Work

We believe that there are promising opportunities to improve the welfare of fish in India. For Fish Welfare Initiative, we plan to focus our efforts on collaboration with industry and policymakers to bring water quality improvements to Indian Major Carps.¹⁰⁷ We believe that these water quality improvements must also be coupled with recommendations on maximum stocking densities, lest the welfare improvements be wiped out by increasing intensification.¹⁰⁸

We hope that our work, as well as that of the increasing number of other stakeholders of this issue, will further demonstrate that improved fish welfare is a necessary component of a society that is healthier, more sustainable, and more humane.

 ¹⁰⁷ For more information on how we reached this decision, see our <u>Prioritizing Species for Effective</u> <u>Welfare Improvements</u> and our upcoming Fish Welfare Improvements in Aquaculture report.
 ¹⁰⁸ See a broad outline of our current welfare improvements in our post <u>Our Welfare Improvements</u> <u>in India</u>.

Appendix

1. Further Reading

We found the following sources to be particularly helpful when completing this report:

- <u>Sectoral Paper on Fisheries and Aquaculture</u> (National Bank for Agriculture and Rural Development, 2018)
- India National Aquaculture Sector Overview (FAO, 2020)
- <u>Aquaculture: An investigation on trends and practices in India</u> (Federation of Animal Protection Organizations 2021)
- <u>Handbook on Fisheries Statistics 2018</u> (Indian Department of Fisheries, 2019)
- <u>Animal Advocacy in India</u> (Animal Charity Evaluators, 2019)
- <u>The fish farming industry of India</u> (Global Aquaculture Alliance, 2019)
- <u>Carp polyculture in India</u> (Global Aquaculture Alliance, 2007)
- <u>Are China and India the most promising countries for animal advocacy? A systematic</u> <u>country comparison</u> (Charity Entrepreneurship, 2019)
- <u>Detailed Results For India From Faunalytics' Study Of BRIC Countries</u> (Faunalytics, 2018)

2. List of Farmed Animal Protection Organizations in India

The following are the main organizations that work on farmed animal issues in India:

- Animal Equality
- Federation of Indian Animal Protection Organizations
- <u>The Good Food Institute</u>
- <u>Humane Society International India</u>
- Mercy for Animals
- <u>People for Animals</u>
- <u>People for the Ethical Treatment of Animals</u>
- <u>Vegan Outreach</u>

For more information on the Indian animal advocacy movement, see <u>Animal Advocacy in</u> <u>India</u> by Animal Charity Evaluators.

In addition to the organizations listed above, there are a number of environmental organizations in India whose interests may align with the welfare of farmed fish. One such example is <u>Fishing Cat Conservancy</u>, which fights mangrove deforestation in order to protect fishing cats, an endangered species. The expansion of aquaculture poses a serious threat to the fishing cat's habitat.

3. Survey Questions

The following are the questions we asked farmers as part of the farmer survey. The questions were translated to the regional languages.

- 1. How relevant are each of the following factors to increased productivity? Respondents could choose from the following: Vaccination, Humane slaughter, Parasites/Disease, Handling/Crowding, Transport, Water quality, Grading, Lack of medicines, Predator control, Water flow, Feed management, and Stocking densities.
- 2. Are your products certified (Yes?) Which certification scheme? (No?) Would you like to be certified?
- 3. Are all personnel trained and demonstrated proficiency developing the routines or other tasks (vaccination, feeding, etc)?
- 4. Are you using technology to increase efficiency of your production? Respondents could choose from the following: Grading equipment; automatic feeders; stunning equipment; sensors for pH, temperature, DO, turbidity, pollutants; camera for fish health behavior; other.
- 5. Have you worked with any R&D facility where production systems, water quality, or any other topic are investigated to refine production
- 6. Have you had any collaboration with researchers from universities or any other governmental institutions to improve your product quality / productivity / sustainability? Which institution?
- 7. Do you receive government assistance?
- 8. Who do you sell to? Do you export?
- 9. What is the frequency of water quality checks?
- 10. Do fish feel pain? Do your fish feel stressed?
- 11. What are the common diseases?
- 12. Do you use antibiotics with the fish?
- 13. Effluent discharge where does the wastewater go?
- 14. Would your farm be open to working with an NGO to help improve the health of the fish?