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FISH WELFARE SCOPING REPORT: THE PHILIPPINES

By Ethel C. Wagas, Haven King-Nobles, and Marco Cerqueira

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We are grateful for assistance and feedback from our volunteer researchers and external reviewers who have made significant contributions to this report. Their assistance does not necessarily imply that they agree with the conclusions we draw.

Executive Summary

Aquaculture production in the Philippines has been on an upward trend since the 1980s, increasing by over 400% from 1980 to 2018. In 2017, the country was reported as having the 3rd largest aquaculture industry in Southeast Asia, and the 7th largest in the world. Aquaculture is a major contributor to the total fisheries production in the country, making up 53% of the production volume in 2017. This is projected to increase in the coming years as the country turns to this sector to supplement the declining fish catch from capture fisheries.

Despite this projected growth, there is currently very little work being done for the welfare of farmed fish in the Philippines. A 3-month scoping study was initiated by Fish Welfare Initiative to collect data on the current culture systems in the country and, from these findings, assess the welfare status of farmed fishes. Data was gathered through a series of farm interviews/visits and a review of available literature/studies relevant to Philippine aquaculture and animal welfare. Listed below are the main findings of this work:

- **Finfish culture systems**. Milkfish and tilapia are the main finfish species cultured in the country. The most common culture system used for rearing finfish are brackish water ponds, marine water cages, and freshwater cages. The sizes of farms are highly varied, ranging from small-scale producers utilizing backyard ponds to large-scale producers utilizing farms as large as 150 hectares.

- **Market information.** Finfish produced by aquaculture are largely consumed locally. Harvests from small-scale producers are usually sold in local wet markets, while bigger farms with larger production capacities sell their harvest to institutional buyers such as grocery stores and processors. Currently, there is no significant demand for high-welfare fish in the domestic market. However, there are a handful of businesses that advocate and sell higher welfare fish, but the steep prices of these products make them inaccessible to most end-consumers.

Cover photo by RDiaz

- **Welfare issues.** Data from farm visits/interviews (n=13) reveal the following welfare-related concerns: (1) a lack of water quality monitoring systems, (2) a lack of access to veterinary care, (3) the use of inhumane slaughter procedures, (4) the non-certification of farms, and (5) a lack of training opportunities for farmers. These concerns are most common among the small- to medium-scale producers that sell their produce to local wet markets. Nonetheless, the majority of the farms have expressed their willingness to collaborate with any institution to help them improve their culture system and the living conditions of their fish.

There are many opportunities for fish welfare work in the Philippines. The presence of a strong institutional support for sustainable aquaculture practices from both the government and non-governmental organizations (NGOs) can serve as a good foundation for welfare work to begin in the country. Our recommendations highlight the need for a collaborative approach for starting welfare work in the country, taking into consideration the viewpoints and concerns of multiple stakeholders in the aquaculture sector (farmers, retailers, end-consumers, government, and NGOs).

We encourage any organization or industry interested in engaging with fish welfare in the Philippines to contact us. We are available to provide consultation, training in fish welfare improvements, and access to funding.

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

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1. Farmed Fish Welfare: An Introduction

Animal welfare is an evaluative concept, changing from only connoting balanced biological functioning to also including the animal's subjective experiences. Within this context, the definition of animal welfare has progressed from the ability of animals to cope with the condition in which it lives[1] to "the quality of life as perceived by the animal itself."[2]

Animal welfare is a vital component to aquaculture. Restrictive farm environments often subject farmed animals to highly stressful situations that they normally would not experience in the wild,[3] and this can have negative effects on the animal's biological, cognitive, and psychological processes.[4] Hence, in order to give captive fish a life worth living, negative experiences should be minimized at all costs and positive experiences, as perceived by the animal, should be promoted. The Five Freedoms Model is one of the most widely used standards for defining ideal states of welfare. This model upholds the animal's freedom from (1) hunger and thirst, (2) discomfort, (3) pain and diseases, (4) fear and distress, and (5) constraints to expressing normal behavior. This framework has made it possible to systematically identify operating indicators to measure the welfare status of fish reared in captivity.[5]

Aside from the ethical considerations of rearing fishes in captivity, welfare also brings about benefits to multiple stakeholders in the aquaculture sector and society in general. In fact, animal welfare has been recognized as an important aspect for environmental sustainability, business resilience, and human health.[6]

1.1 Fish Welfare and the Environment

There is a growing number of studies documenting the effects of aquaculture practices on the environment.[7] Aquaculture-derived pollutants such as excess nutrients, metabolic wastes, and uneaten feed are known to exacerbate the problem of eutrophication, negatively affecting both pelagic and benthic communities in aquatic ecosystems.[8] Cultures with intensive production systems, on the other hand, make fish populations prone to

[1] Broom, DM. (1996). Animal welfare defined in terms of attempts to cope with the environment.
[2] Bracke, M.B.M., Spruijt, B.M., and Metz, J.H.M. (1999). Overall welfare reviewed. Part 3: Welfare assessment based on needs and supported by expert opinion.
[3] Braithwaite, V.A., and Ebbesson, L.O.E., (2014). Pain and stress responses in farmed fish.
[4] Galhardo, L and Oliviera, R.F. (2009). Physiological stress and welfare in fish.
[5] The Fish Site.(2008). The welfare of farmed fish.
[6] FAO. (2020). The State of the World Fisheries and Aquaculture 2020. Sustainability in Action.
[7] Schwitzguebel, J.P. et al. (2007). Environmental impacts of aquaculture and countermeasures to aquaculture pollution in China.
[8] White, P. (2017). Aquaculture Pollution: An overview of issues with a focus on China, Vietnam and the Philippines.

disease outbreaks, which can potentially spread to wild populations across vast geographic regions.[9]

The environmental threats brought about by aquaculture pollution are best controlled locally, by improving culture practices[10] and upholding the living conditions of fishes. Water quality has direct and significant effects on fish health and living conditions and is a top priority in higher welfare farms. With better water quality and stock management practices, the input of pollutants into the water is significantly reduced, giving way to cleaner water systems and lessening their effect on the environment.

1.2 Fish Welfare and Business Resilience

Improving the welfare of farmed fish can directly lead to more cost-effective production systems and improved quality of harvest.[11] Fish kept under good conditions are healthy, are less prone to diseases, exhibit better growth, have more efficient food-to-body-weight conversion, and have better survival rates, which ultimately improves production profitability.

In the global market, there is now a growing demand for higher-welfare products as consumers become more conscious about the sustainability and welfare issues that come with raising farmed animals.[12] Higher-welfare farms are starting to gain a competitive edge over other producers, especially in the European markets where welfare is considered a requirement.[13]

1.3 Fish Welfare and Public Health

Aquatic food supply contributes to food security when the food supply is sufficient, safe, and sustainable.[14] However, the increasing use of chemicals and noxious substances in aquaculture is starting to become a growing global concern. The presence of bioaccumulative pollutants (e.g., antibiotics, parasitical treatment, and anesthetics) in farmed fishes[15] and the emergence of antimicrobial resistant bacteria[16] are two of the biggest health concerns linked to aquaculture.

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[9] Leung, T. L. F. and Bates, A. E. (2013). More rapid and severe disease outbreaks for aquaculture at the tropics: implications for food security.
[10] Jennings, S. et al. (2016). Aquatic food security: insights into challenges and solutions from an analysis of interactions between fisheries, aquaculture, food safety, human health, fish and human welfare, economy and environment.
[11] Segner, H. et al. (2019). Welfare of fishes in aquaculture.
[12] Conte, F. et al. (2014). Consumers' attitude towards fish meat.
[13] European Food Safety Authority. (n.d.). Fish Welfare.
[14] Ibid, Jennings S.
[15] Ibid, Jennings S.
[16] FAO. (2006). Antimicrobial use in aquaculture and antimicrobial resistance.

Instead of using antibiotics and other toxic chemicals, higher-welfare farms take on a more preventive approach to controlling disease in the form of disease prophylaxis. Prophylactic measures include fish vaccination, the proper monitoring of water quality, and the use of appropriate procedures for the isolation of infected individuals to prevent further outbreaks.

1.4 Current State of Fish Welfare in the Philippines

In the Philippines, aquaculture is a relevant sector in seafood production, but as with most Asian countries, the existing legislation that sets the standards for good aquaculture practices does not explicitly consider the welfare of farmed fishes. As a result, the true status of farmed fish welfare in thousands of farms across the country is unknown, unmonitored, and not prioritized.

To Fish Welfare Initiative, one of the main obstacles to upholding the welfare of farmed fish in countries like the Philippines is the lack of information on the actual status of fish welfare in the region. The wide range of culture-systems practiced in the country require production-specific welfare interventions that must be carefully assessed. Fish Welfare Initiative believes that by studying the long-accepted cultural practices within these countries' perspectives and realities, we can create interventions that not only uphold the welfare of farmed fishes but are acceptable and fair to farm operators of all production-scales.

This scoping research in the Philippines is part of a larger body of work that seeks to better understand the state of fish welfare in countries in the Global South and to determine the degree to which farmers are integrating this concept into their production systems.

2. A Background on Philippine Aquaculture

2.1 History

The Philippines is an archipelagic country in Southeast Asia with over 7,641 islands scattered across 300,000 kilometers of territory (Fig. 1). The country is geographically divided into three main regions - Luzon to the north, Visayas in the middle, and Mindanao to the south, each with highly diverse local cultures and languages. As it is surrounded by large bodies of water, the Philippines holds a population that is heavily reliant on its aquatic resources for food. The practice of rearing aquatic organisms also has a long-standing history in the region.

Figure 1. *Map of the Philippines showing the 3 main regions (Luzon: orange, Visayas: yellow, Mindanao: green) Image source: PhilNews.ph.*

The first record showing evidence of fish farming in the Philippines was a publication by Herre and Mendoza in 1929. The manuscript depicted the arrival of the Spanish conquistador Ferdinand Magellan to the shores of Cebu, along with descriptions of fish ponds with no mention of the organism being cultured.[17] The first finfish species cultured in the Philippines was the milkfish, *Chanos chanos*. Wild fish fry were reportedly caught along the coastlines and grown in brackish water ponds as far back as 4 centuries ago.[18] The very first exotic farmed fish species introduced into the country, on the other hand, was the common carp, *Cyprinus carpio*, brought from Hong Kong in 1915 and reared in freshwater ponds in Cotabato.[19] In the 1900s, several other species were introduced into the practice of fish culture, such as giant gourami from Thailand (1927), a number of plasalid species (1930s), and carp species (1960s).

The introduction of the first tilapia species, *Oreochromis mossambicus,* from Thailand, was a significant point in Philippine aquaculture. The ease in rearing *O. mossambicus* led to the boom and popularity of shallow backyard ponds throughout the country. However, the

[17] Yap, W. (1999). Rural Aquaculture in the Philippines.
[18] Bagarinao, T. (1998). Historical and current trends in Milkfish farming in the Philippines. Tropical Mariculture.
[19] Villaluz, D. (1953). Fish Farming in the Philippines.

combination of shallow enclosures and fast reproductive rate eventually led to its stunted growth and low market value. It was not until the introduction of the Nile tilapia, *O. niloticus,* in the 1970s that a significant transition from backyard systems to bigger, seasonal operations were made.[20] The introduction of this species marked the beginning of more extensive research on culture techniques such as sexing through hormonal experiments[21] and genetic manipulation (see Genetic Improvement of Farmed Tilapia Project) to improve production.[22]

Despite the many fish species introduced into the country's aquaculture sector, the development of rearing techniques and targeted research has not been equivalent across all species. This inconsistency has resulted in a handful of species groups being cultured with more success in terms of some production indicators (e.g., growth performance and stress resilience), and at larger scales than others.

2.2 Aquaculture Trends in the Philippines

The aquaculture trends in the Philippines have changed over the years. Production has significantly increased from 199,911 tonnes in 1980 to 826,059 tonnes in 2018.[23] In 2017, the Philippines was named as the 3rd largest aquaculture industry in Southeast Asia, and the 7th in the world. This increasing trend is largely attributed to advances in the culture techniques and technologies of a handful of species groups.

Since welfare interventions must generally be species- and production-specific, basic information on common production systems and the species being cultured is crucial to starting welfare work. In this section, we discuss the Philippines' current aquaculture trends to understand the present state of farmed fish welfare in the country.

2.2.1 Culture Systems

Fishes are reared in a variety of ecosystems - from freshwater or marine water to brackish water environments. The predominant culture ecosystems for most farms in the Philippines are in brackish water and freshwater environments, with production totalling to 329,636 metric tonnes and 322,598 metric tonnes, respectively, as of 2018 (Fig. 2). Among the three ecosystem types, freshwater has the most varied culture systems, with ponds, cages, and pens. Production can also be highly varied, from extensive backyard or earthen ponds yielding only 500 kg/ha to highly intensive marine cages that can produce as much as 50,000 kg in an area as small as 300 sqm.[24]

[20] Aypa, S. (1995). Aquaculture in the Philippines.
[21] Guerrero III, R. (1994) Tilapia farming in the Philippines: A success story.
[22] Gupta, M.V. and Acosta, B.O. (2004). From drawing board to dining table: The success story of the GIFT Project.
[23] FAO. (2018). Fishery and Aquaculture Country Profile: Republic of Philippines.
[24] Yap, Wilfredo. (1999). Rural Aquaculture in the Philippines.

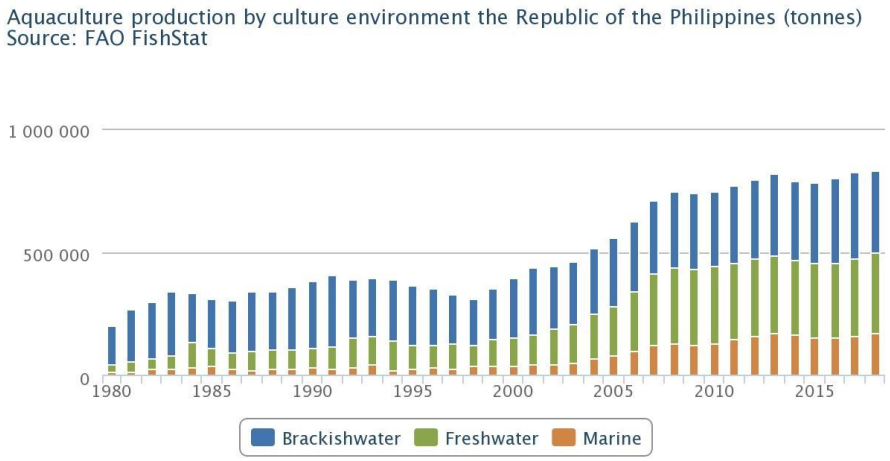

Figure 2. *Aquaculture production by culture environment in tonnes. Source: FAO (2020).*

The most common culture system for finfish are the brackish water ponds where most milkfish production occurs.[25] Finfish reared in brackish water fish ponds have the highest contribution in terms of value (Philippine Peso) to the total aquaculture production in the country in 2018 (~ 54%) (Fig. 3).[26] This was followed by marine fish cages and freshwater fish ponds, which contributed 12% and 11% of the total production, respectively. Other culture systems include freshwater fish cages, freshwater fish pens, marine fish pens, and others.

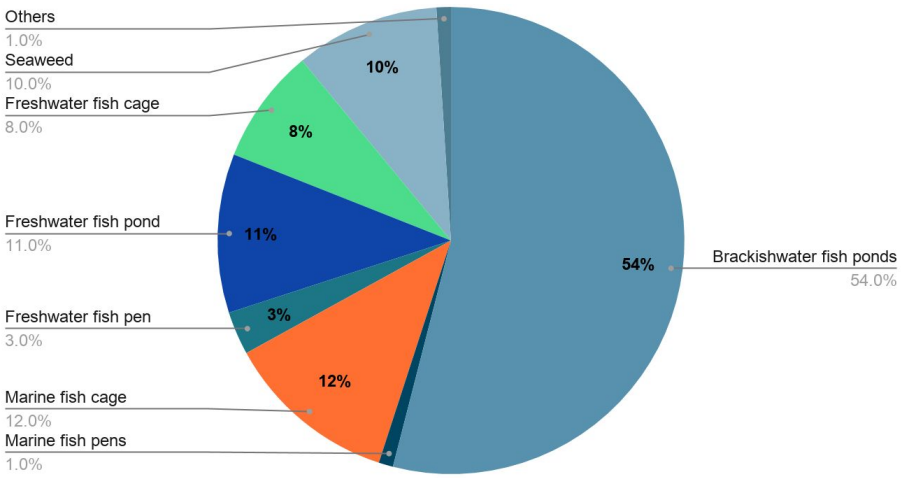

Figure 3. *Percent contribution (in value) of different culture systems in 2018. Source: Philippine Statistics Authority (2018).*

[25] FAO. (2020). National Aquaculture Sector Overview: Philippines.
[26] Philippine Statistics Authority. (2018). Fisheries Statistics of the Philippines: 2016-2018, Vol. 27.

The majority of the brackish water fish ponds are constructed in mangrove forests, which are usually operated through government leases known as Fishpond Lease Agreements (FLA). This is a controversial issue, as mangrove deforestation in the country has been largely attributed to the rapid conversion of mangrove forests to ponds during the 1970s.[27] In 1982, a Presidential Proclamation was made to stop any further cutting of mangrove trees, and a re-classification and re-zonation of forestlands was done to prevent further destruction of mangrove resources.[28] Currently operating FLAs are now only found in selected zones declared as public domain by the Department of Environment and Natural Resources.[29] Mangrove forests within protected zones (an estimated area of 49,363 ha, or 19% of the country's total mangrove cover[30]) are guarded from these activities.

2.2.2 Commonly Farmed Fish Species

A report from the Philippne Statistics Authority identified milkfish, tilapia, carp, groupers, and siganids as the top 5 finfish species produced in the aquaculture sector. In 2018, the production of these species totalled 672,561 metric tons, which comprised ~29% of the total aquaculture volume for that year (Fig. 4).[31] Other finfish species such as groupers, catfishes, and Pangasius make up 1% of the total production. Finfish production is only surpassed by seaweed production (~64%). Decapods and other invertebrates, on the other hand, contribute 8% of the total volume.

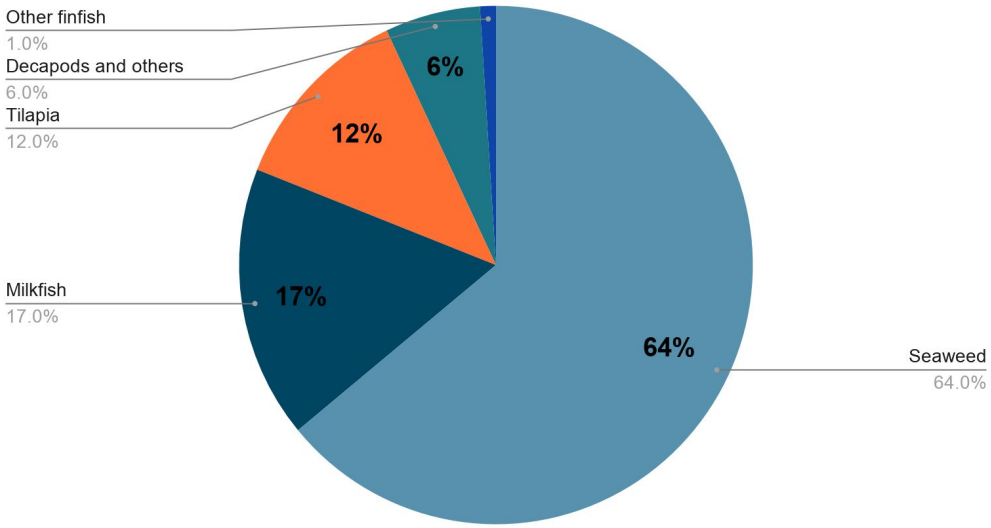

Figure 4. *Percentage volume of aquaculture production (metric tons) in 2018, classified according to species/groups reared. Source: Philippine Statistics Authority (2018).*

[27] Primavera, J. (1995). Mangroves and brackish water ponds in the Philippines.
[28] Dieta, R., and Arboleda, F. (2004). The use of mangroves for aquaculture: Philippines.
[29] Bureau of Fisheries and Aquatic Resources. (2000). Fisheries Administrative Order No. 197 Series of 2000.
[30] Garcia, K., Dixon G., and Pastor M. (2013). Philippines' Mangrove Ecosystem: Status, Threats, and Conservation.
[31] Philippine Statistics Authority. (2018). Fisheries Statistics of the Philippines: 2016-2018, Vol. 27.

Milkfish and tilapia have the most developed culture techniques among finfish species, as they are the focus of many research efforts. Not surprisingly, they are also cultured at significantly higher volumes than the others, and thus will be given special focus in this report (Fig. 5).

Work on milkfish breeding has been done since the 1970s and began with broodstock rearing, larval rearing, and fry production.[32] In 1980, the National Bangus Breeding Program was created with the aim to improve broodstock production in all 12 regions of the country. The Genetic Improvement of Farmed Tilapia project (GIFT), on the other hand, was a tilapia-targeted project that began in the 1980s, initiated by the WorldFish Center. Through this effort, partner institutions were able to successfully develop an improved tilapia strain made specifically for Philippine conditions.[33]

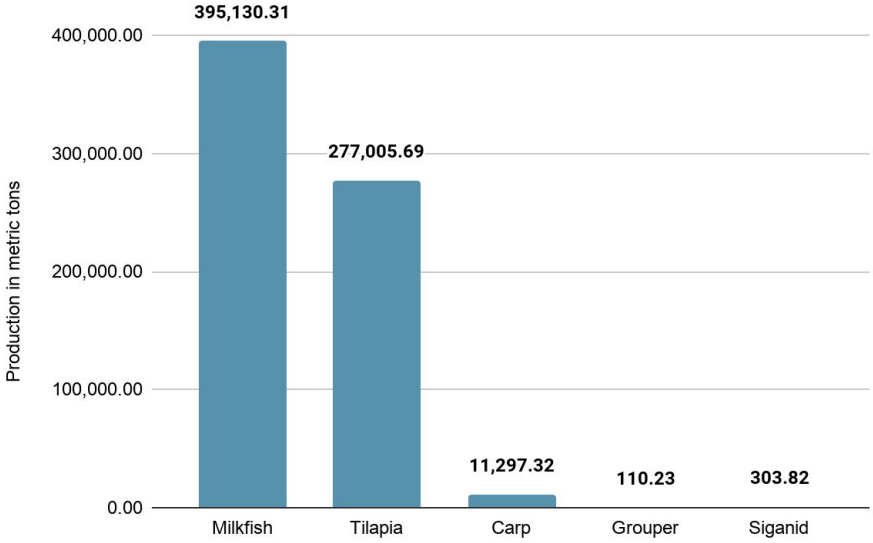

Figure 5. *Farmed fish species with the highest production (in metric tons) in 2018. Source: Philippine Statistics Authority (2018).*

Standard metrics of reporting aquaculture yield in the country are commonly by volume (metric tons) or by value (Philippine Peso), and the number of individuals that are actually harvested is rarely reported. Data published by Fishcount in 2017, however, recorded a total of 1,158 to 2,719 million individuals reared in fish farms in the country in that year. Out of the 14 farmed fish species on record, only 5 had data on estimated individual numbers (Table 1).

[32] Yap, W., Villaluz, A., Soriano, M.G., and Santos, M.N. (2007). Milkfish production and processing technologies in the Philippines.
[33] Gupta, M.V. and Acosta, B.O. (2004). From drawing board to dining table: The success story of the GIFT Project.

Table 1. *Farmed fish species reared in 2017, recorded as the number of individuals. Source: Fishcount (2017).*

Fish Species	Estimated number of individuals farmed (millions)
Milkfish	822 - 1,644
Nile tilapia	208 - 666
Tilapias nei	126 - 405
Striped snakehead	1 - 3
Giant gourami	< 1

2.2.2.1 Milkfish (*Chanos chanos*)

Chanos chanos, commonly known as milkfish and locally known as *Bangus,* is the most cultured finfish species in the country (Fig. 6). It is the species of choice for many farmers primarily for its efficient feed-to-body-weight conversion. The culture systems for Milkfish are mostly found in brackish water environments, where more than 50% of total Milkfish production originates. Demand for milkfish varies in different regions. Areas with a production surplus usually sell their produce to regions where the demand is higher.[34]

The volume of milkfish production has been fluctuating over the years. From 2017 to 2018, production was reported to have decreased from 411,103.47 metric tons to 395,130.31 metric tons,[35] which was largely attributed to a shortage in the supply of milkfish fry. A similar case was documented during the late 1980s to mid 1990s, when production dropped from 225,026 tons to 150,151 tons from 1981 to 1996. This drop was caused by illegal exportation and a declining supply of fry from the wild. To remedy this, the enforcement against illegal fry exportation was strengthened, along with the intensification of hatchery-bred fry production and importation of fry from neighboring countries like Taiwan.[36]

The present rate of culture intensification has made fry shortage a recurring problem. In 2019, hatchery-bred and wild-caught fry (with an estimated number of 860.75 million and 19.5 million individuals, respectively) only supplied 24% of the demand from grow-out farms. To compensate for this large deficit, the industry turned to importation, and an estimated 2.810 billion Milkfish fry were sourced from other countries.[37] On top of that,

[34] Department of Agriculture. (2008). Fisheries Commodity Roadmap: Milkfish. 2008.
[35] Philippine Statistics Authority. (2018). Fisheries Statistics of the Philippines: 2016-2018, Vol. 27
[36] Ahmed, M. et al. (2001). Bangus fry resource assessment in the Philippines.
[37] Philippine Information Agency. (2019). DA-BFAR's satellite hatcheries to boost country's Milkfish industry.

increasing water temperature is known to be detrimental to the survival of *Bangus* fry, making Milkfish one of the most vulnerable aquaculture species to global warming.[38] This is expected to exacerbate the shortage of milkfish supply in the industry.

Figure 6. *Milkfish (Chanos chanos) sold in a wet market. Source: personal photo.*

Figure 7. *Tilapia (Genus Oreochromis) sold in a wet market. Source: personal photo.*

2.2.2.2 Tilapia (Genus Oreochromis)

Tilapia is the second most important finfish species in the sector (Fig. 7). Unlike Milkfish, which has experienced fluctuations in volume, production for this finfish species has been slowly increasing from 259,045.56 metric tons in 2016 to 277,005.69 metric tons in 2018.[39]

There are no native tilapia populations in the Philippines. The Nile Tilapia (*Oreochromis niloticus*), which was introduced into the country in 1972, is currently the main species being cultured for its ease in growing in a variety of culture systems - from backyard ponds to commercial scale ponds and cages.[40]

In the 1980s, a decline in the production of Tilapia was reported due to inbreeding and deterioration of genetic quality. This led to the creation of selective breeding and genetic improvement programs to improve current Tilapia strains.[41] However, cross-breeding is still

[38] Cruz, R.A.L., Kumar, V., Ragaza, J.A. (2019). Some current trends and challenges in Philippine Aquaculture, with an emphasis on synergies with biodiversity initiatives.
[39] Philippine Statistics Authority. (2018). Fisheries Statistics of the Philippines: 2016-2018, Vol. 27.
[40] ADB. (2004). Case Study 4: Overview of freshwater aquaculture of Tilapia in the Philippines.
[41] Ordoñez, J.F., Santos, M.D., and Tayamen, M.M. (2014). Tilapia Genetic R&D in the Philippines.

a common practice in the industry. Private hatcheries often create their own "improved" breeds that produce less than ideal strains in the market.[42]

In an effort to regulate such activities and prevent another decline in production, the government created an accreditation system among private hatcheries to promote the production of good quality stocks, particularly the GET-EXCEL strain.[43] Private hatcheries are evaluated by the Bureau of Fisheries and Aquatic Resources based on their exclusivity (no other strains are to be distributed by the hatchery), technical capacity to operate the facility, willingness to adapt to new technologies, and willingness to collaborate for research and development work before receiving their certification. The issuance of a certificate provides assurance to farmers that they are buying high quality fingerlings and qualifies them to multiply this strain under government monitoring.[44]

2.3 Value Chain of Cultured Finfish in the Philippines

A large proportion of cultured finfish produced in the country are consumed domestically, and only a small amount is sold in the international market. Cultured finfish products are considered to be minor produce, and fall under the "other commodities" category in a report on the top exported aquaculture products in the country by the Bureau of Fisheries and Aquatic Resources.[45]

The key players in the cultured finfish market chain are (1) the hatchery and nursery operators, (2) the fish producers, (3) the traders (wholesalers, consignaciones[46], viajeros[47], and retailers), and (4) the processors. The end products are either sold to the small-scale retailer or the institutional buyers, which include supermarkets, food chains, specialty shops, and restaurants (Fig. 8).

The fish usually goes through several marketing levels (wholesalers, consignaciones, viajeros, and retailers) before arriving at the consumer's table. Small-scale retailers sell the produce in local wet markets for the household-level/end users, while institutional buyers cater to larger businesses such as supermarkets, specialty shops, or restaurants. The household-level buyers that acquire the fish from local fish markets or fish stalls buy them whole and live/frozen. Institutional buyers, on the other hand, sell more varied product types, which can range from whole live fish, fillets, frozen fish, or cooked fish.

[42] Guerrero III, R. (1994). Tilapia farming in the Philippines: A success story.
[43] The GET-EXCEL Tilapia strain is a product of the GIFT Project and is a synthetic Tilapia from the African and Asian strain selected for its improved growth and survival rates compared to the commercially available *O. niloticus*.
[44] Tayamen, M. (2001). Nationwide Dissemination of GET EXCEL Tilapia in the Philippines.
[45] Bureau of Fisheries and Aquatic Resources. (2018). Philippine Fisheries Profile: 2018.
[46] Sellers who use the consignment system of selling.
[47] Wholesalers who transport fish in bulk to major market destinations.

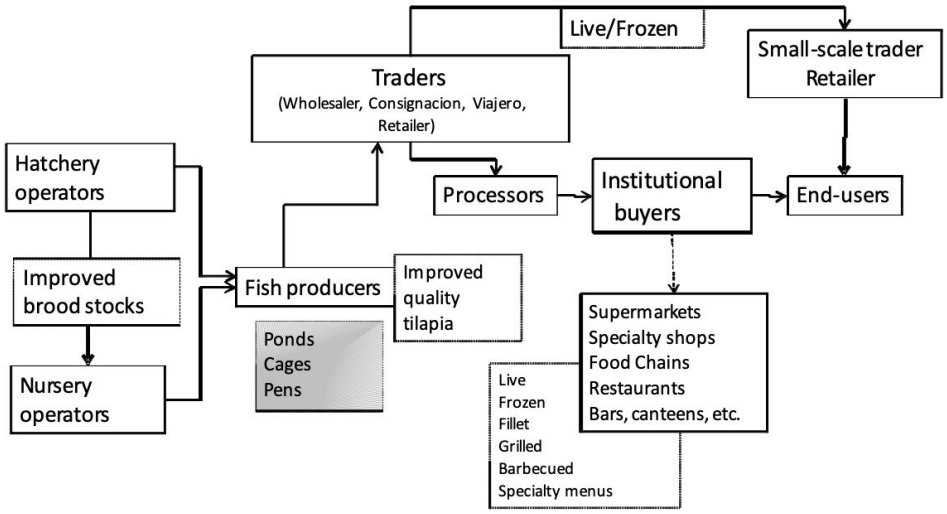

Figure 8. *Value chain of the tilapia market showing the major players and their activities. Source: Bolivar and Borski (2011).*

For some farms, the multiple levels of marketing often have negative repercussions on the farmer. Farm prices are sometimes low, but products can double in value as they reach the consumer's table.[48] However, farms that sell their harvest directly to consolidators fare better, as they are assured of sales at a pre-agreed price. In some parts of the country, it is also common practice for the trader/consolidator to pay for the harvesting activities. In return, farms sell their products exclusively to the financier.[49]

In terms of trade, the export market for cultured finfish is dominated by a very few large companies that cater to markets in the USA and Europe.[50] The same is true for tilapia, where insignificant amounts are exported.[51] Exported products are usually quick-frozen, dried, canned, smoked or marinated.[52] For a selection of the major companies involved in the farming and/or processing of milkfish and tilapia, please refer to the Annex.

2.4 Support Systems

2.4.1 Legal Support System

Republic Act 8485, also known as the Animal Welfare Act of 1998 (now amended to Republic Act 10631), was created to protect and promote the welfare of all terrestrial,

[48] Department of Agriculture. (2008). Fisheries Commodity Roadmap: Milkfish. 2008.
[49] Jamandre W.E. et al. (2011). Improving supply chain opportunities for Tilapia in the Philippines.
[50] Yap, W., Villaluz, A., Soriano, M.G., and Santos, M.N. (2007). Milkfish production and processing technologies in the Philippines.
[51] Bureau of Fisheries and Aquatic Resources. (2006). Fisheries Commodity Map: Tilapia.
[52] FAO. (2020). Cultured aquatic species information program: *Chanos chanos.*

aquatic, and marine animals in the Philippines through the supervision and regulation of all establishments used for breeding, rearing, maintaining, and treating animals. This legislation creates a framework where these establishments can be monitored through a certification system that will be evaluated by the Bureau of Animal Husbandry.

The Fisheries Code of the Philippines, also known as Republic Act 8550, was also enacted in 1998 (later amended into Republic Act 10654 in 2015), giving legal grounds for the development, management, use, and conservation of aquatic resources. The Aquaculture Code of Practice was created under this act, which sets standards for environmentally sound farm designs for sustainable aquaculture operations. The code established regulations for water quality, feed management, waste-water management, fish movement, disease control, and the use of drugs in aquaculture. Although this legislation was created for the purpose of sustainable long-term aquaculture production, these practices closely align with principles that are followed in high-welfare farms.

Internationally, the Philippines is a member of the World Organization for Animal Health (OIE), which is one of the leading animal welfare organizations in the world. The OIE has published its Aquatic Animal Health Code, the aim of which is to provide guidelines for the rearing of farmed animals all around the globe. However, given that welfare interventions are highly species- and production-specific, the guidelines set by the OIE are often vague. It is also hard to determine if they are followed by fish farms around the country, and if the adherence to such regulations is properly monitored by the government.

2.4.2 Support From Non-Government Institutions

The Philippines is a member of the Southeast Asian Fisheries Development Center (SEAFDEC). The organization is mandated to conduct research, develop technologies and disseminate information, and train people in the aquaculture sector throughout Southeast Asia. Despite the SEAFDEC offering training courses on various culture systems, aquaculture nutrition, grow-out and hatchery operations, fish health diagnostics, and many other aspects of aquaculture, welfare is yet not contemplated in their portfolio. Regardless, this training has significant implications for welfare work in the country, as farmer knowledge and training is seen as one of the primary factors critical to upholding fish welfare.[53]

2.4.3 Certification Schemes in the Aquaculture Industry

2.4.3.1 Government Certification

Under the Animal Welfare Act of 1998 (RA 10631), all establishments that rear, breed, treat, or maintain both terrestrial and aquatic animals are required to apply for a certificate of registration under the Bureau of Animal Industry. This is a prerequisite for business

[53] Segner, H., et al. (2019). Welfare of fishes in aquaculture.

operation. However, there are no guidelines set by RA 10631 specifically for the rearing of aquatic organisms in an aquaculture setting.

Apart from RA 10631, farms are also required to get certification from the Bureau of Fisheries and Aquatic Resources under Republic Act 10654. This law requires all farms to follow the Code of Practice for Aquaculture, which covers guidelines for overall farm operations. As this legislation was designed specifically for fish farms, it sets specific guidelines on proper water management, the use and discharge of chemicals, stock selection and stocking practices, and feed use and management.

In 2012, the Philippine National Standard for Organic Aquaculture certification scheme was created. Although the overall aim of this certification scheme was to establish guidelines for the operation of organic aquaculture in different aquatic environments, it also covers a component specifically on animal welfare following the guidelines set by OIE.[54] This section covers guidelines on the proper use of veterinary drugs, natural methods for pest control, water quality monitoring, and harvest.

It is noteworthy to mention that although the following certification programs have not been explicitly designed for fish welfare, it has incentivized some farms to follow proper culture practices that are close to those done in high-welfare farms (e.g., proper water quality management, the use of adequate stocking densities, the correct use of chemicals, etc.). Nonetheless, the true state of fish welfare in farms still remains unknown and unmonitored due to the lack of welfare-focused certification programs.

2.4.3.2 Non-Government Certification System

The Aquaculture Stewardship Council Farm Certification (ASC) is the only non-government certification scheme available to aquaculture farms in the Philippines. However, this certification covers only tilapia, Pangasius, and other tropical marine fish species (e.g., groupers, snappers, pompano, barramundi, salmon, seabass, and croaker) and does not include Milkfish.[55] Nonetheless, ASC's Tropical Marine Finfish Standards give clear guidelines for ecologically sound farm construction, protection of the genetic health of wild populations, feed management (the use of traceable feed sources), wastewater management, disease control, and the practice of social equity for farmers. Currently, there are only 2 businesses (in processing and retail) that are ASC certified in the country.[56]

ASC is currently developing guidelines to identify indicators to assess and promote welfare among fish farms through their Fish Welfare Project, which will be aligned into their ASC Farm Standards. ASC certification in the Philippines is done through a third-party

[54] Bureau of FIsheries and Aquatic Resources. (2016). Organic Aquaculture.
[55] See Aquaculture Stewardship Farm Certification website for details on the 17 species covered by the certification.
[56] See ASC website for the latest Philippine accredited establishments.

contractor that gives independent inspection, verification, and technical support to farms applying for certification.

Overall, private certification schemes are important as they give farms better access to bigger markets and more competitive prices. However, this process is often lengthy, expensive, and hard to achieve,[57] especially for small- to medium-scale farms that cannot afford the added cost.

3. Field Visits

3.1 Methodology

A series of farm visits/interviews were conducted in grow-out farms, hatchery facilities, and wet markets in various parts of the country. Data was collected using a standardized set of questionnaires (refer to the Annex) to achieve the following objectives:

1. Identify the different farm systems currently operating in the country.
2. Assess the state of fish welfare among the interviewed/visited farms.
3. Gauge farm owners' openness to working with organizations focusing on the improvement of fish and farm welfare in the future.

Due to COVID-related restrictions, data gathering was not strictly limited to face-to-face farm visits. Data was also collected through phone interviews with actual farm owners to supplement the limited data from face-to-face visits. Photo-documentation was also conducted, under the farm owner's consent and approval. For phone interviews, farmers were asked to send in pictures of their farm if available. Wet markets were also visited to look at the welfare status of fishes in this part of the market chain.

3.2 Survey Findings

3.2.1 Site Description: Grow-out and Nursery Farms

A total of 13 fish farms were interviewed for this study (Fig. 9 and 10; Table 1). Eight farms are located in the Visayas, four farms in Mindanao, and 1 farm in Luzon. Ten of these farms are grow-out farms, while the remaining 3 are nursery facilities.

[57] FAO. (2020). The State of WOrld Fisheries and Aquaculture (2020).

Table 2. *List of farms interviewed and/or visited.*

Region	Area	Culture System	Species reared
Visayas (8 farms)	Carmen, Cebu	Extensive	Milkfish and tilapia
	Ronda, Cebu	Semi-intensive	Milkfish
	Maltibog, Southern Leyte	Extensive	Tilapia
	Ayungon, Negros Oriental	Semi-Intensive	Milkfish
Mindanao (4 farms)	Cagayan de Oro	Semi-intensive	Milkfish fingerlings
	Davao del Sur	Intensive	Milkfish grow-out/fingerlings
Luzon (1 farm)	Laguna de Bay	Intensive	Milkfish and carp

Figure 9. *Map showing the location of the different farms (in red) interviewed in the Philippines.*

***Figure 10**. Photo-documentation showing different culture systems: (1) marine cages (left). Source: farm owner; and (2) earthen ponds (right). Source: personal photo.*

3.2.2 Site Description: Hatchery Facility

A single tilapia hatchery facility was visited in Carmen, Cebu. The facility is operated by a state university, and fingerlings that are produced by the hatchery are used to stock their own grow-out ponds or are sold to neighboring fish ponds within the town. By visual observation, the facility is well-kept, with an adequate supply of freshwater and tanks of various sizes to serve as suitable incubation systems (Fig. 11).[58]

***Figure 11.** Cement tanks in a tilapia hatchery facility in Carmen, Cebu. Source: personal photo.*

[58] FAO. (1990). Hatchery rearing of Tilapia eggs and fry.

3.2.3 Site Description: Wet Markets

Wet markets were visited in the Visayas and Luzon regions (Fig. 12). All of the farms interviewed for this study sell their harvest to neighboring wet markets. Fishes are delivered inside ice boxes or insulated containers, and are usually dead when they arrive. There are occasionally some individuals that make it to the market alive, and these are usually preferred by buyers for freshness.

Figure 12. *Wet market in Metro Manila selling both wild caught and cultured fish. Source: personal photo.*

3.2.4 Welfare-related issues

Table 3 summarizes the answers to the questionnaire used during the interview. Each item targets specific welfare-related issues, and will be discussed in greater detail in the sections below:

Table 3. *Answers from the questionnaire used in the survey, arranged according to welfare-related issues.*

Question Item	Findings
Is there a water quality monitoring system?	One farm (1/13) monitors the quality of their pond waters on a weekly basis. The rest (12/13) of the respondents do not have the proper equipment to do so.
Is there a problem with diseases or parasite infestation?	One farm (1/13) reported an issue with parasites, which was observed in the form of lesions.

Are fishes vaccinated?	All (13/13) respondents do not vaccinate their fish.
Do farms have access to veterinary care?	One farm (1/13) has access to proper veterinary care.
Do farmers have access to related training?	One farm (1/13) has participated in aquaculture-related training.
What is the mortality rate?	All of the grow-out farms (10/10) report a mortality rate of 30% or less. All three nursery farms (3/3) report a mortality of 40% or less.
What is their feeding practice?	Nine (9/13) of the ponds used purely artificial feed. Two (2/13) used a combination of natural (periphyton) and artificial feeds while two (2/13) used purely natural feed.
Are the farms certified?	Nine (9/13) of the farms have not been certified by the government or by any certification scheme. Four farms are certified by the Bureau of Fisheries and Aquatic Resources.
Have farms collaborated with a research institution/academia?	Only one (1/13) farm in Carmen, Cebu has received direct assistance from a research institution.
Have farms received assistance from the government?	Four (4/13) of the respondents have received government assistance in the form of fish fingerlings to restock their ponds.
Are farms willing to collaborate with NGO working on fish and farm welfare?	All (13/13) of the respondents have expressed their openness to collaborate with any group working on fish and farm welfare.

3.2.4.1 Water quality

Twelve of the thirteen farms reported no problems with water quality, and there were no obvious signs of solid waste problems observed. One farm reported a problem with dissolved oxygen in the water and is therefore monitoring DO levels once a week. Ponds that are found near coastlines (in Ayungon, Carmen, and Cagayan de Oro) source their water from the sea (tide-driven), while those that are found inland (Malitbog) get their water from deep wells with the use of electric water pumps (Fig. 13). One farm is located within a eutrophic freshwater lake (Laguna de Bay) in the region of Luzon.

Figure 13. *Water sources of the ponds are from coastal areas and deep wells. Source: personal photo.*

The absence of water quality monitoring has also been reported in many fish farms in Luzon.[59] Fig. 14 shows data from a study on several fish farms in Manila Bay, which borders the coastline of 5 large provinces in the Luzon region. A large percentage of the farm respondents in the study report the non-monitoring of water quality. In Cavite, where most of the farms do monitor selected water quality parameters, 25% of farms rely on the government for free water quality monitoring services, which are usually done only at random and, therefore, very irregularly. For most of these ponds (as with the interviewed farms), water quality can only be maintained by frequent water exchanges from natural sources. This can, however, pose a problem if these sources (coastal area, rivers, and deep wells) are contaminated and not properly monitored.

[59] Bayate D.D.E., Cambia F.B., and Montojo, U.M. (2016). Pollution in Manila Bay Aquaculture Farms: Status, Impact, and Remedial Options.

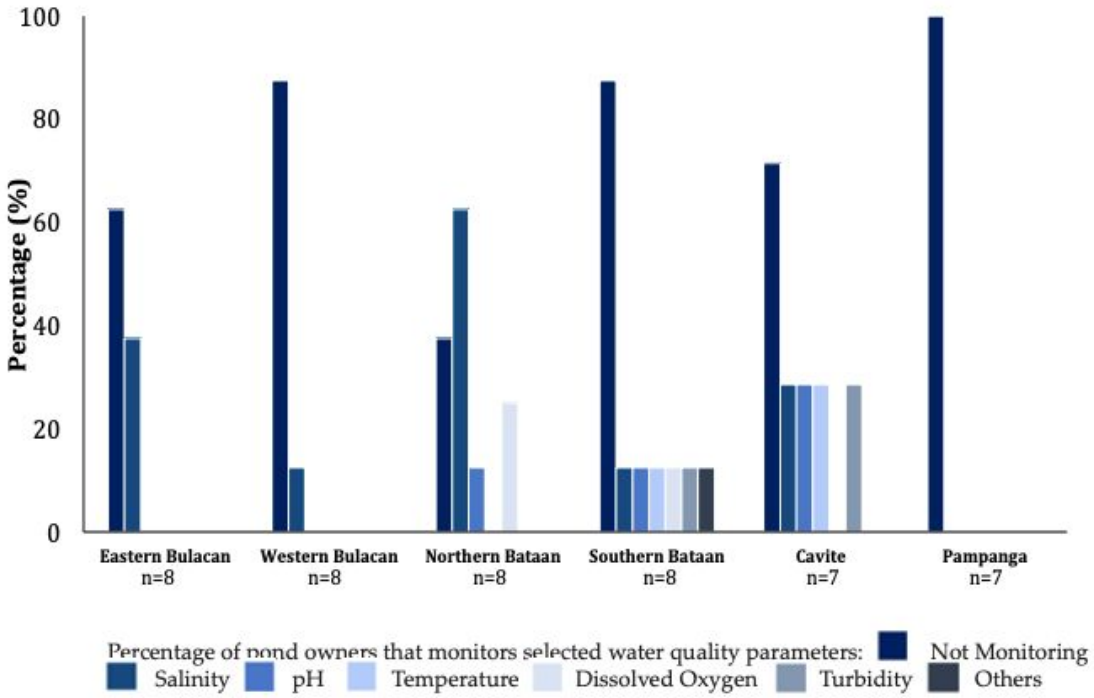

Figure 14. *Graph showing the percentage of farms in Manila Bay that water quality parameters. Source: Bayate et al. (2016).*

Water quality is an important factor in maintaining the quality of the culture environment.[60] Water is not only a source of oxygen, but also plays a vital role in the disposal of wastes (such as nitrogen and ammonia) and excess food.[61] Without proper monitoring, there is no way of knowing if water quality is deteriorating, which can lead to stress, a variety of health problems, increased susceptibility to diseases, and even mortality.[62] Overall, the lack of environmental-based inputs might arguably prevent us from evaluating the real welfare status of the individuals in these farms.

3.2.4.2 Issues with Parasites/Diseases and Access to Veterinary Care

Twelve out of the thirteen farms that were interviewed in this study reported no problems with diseases or infections. However, farmers also openly expressed that if diseases were present, they would not be able to properly assess and diagnose such cases because veterinary care is not accessible or is not a common practice. The only farmer who noted a form of infection worked on the fish cage farm in Ronda, Cebu, where the respondent reported occasional lesions. As per the farmer's observation, the lesions usually appear during the southwest monsoon season, when there is less water movement in the area.

[60] Summerfelt, R.C. (1998). Water quality considerations for aquaculture.
[61] Compassion in World farming. (n.d.). Improving the welfare of farmed rainbow trout.
[62] MacIntyre, C. (2008). Water Quality and Welfare Assessment on United Kingdom Trout Farms.

When such cases appear, veterinary care is never sought. Instead, the farmer changes the cage nettings, which are often heavily fouled with algae and other invertebrates.

3.2.4.3 Use of Antimicrobials and Other Chemicals

The farms interviewed in this study do not vaccinate their fish or use antimicrobials. It is unclear whether this is due to a lack of access to vaccinations or no need for them. Generally, vaccination should only be the last measure taken when all else fails because vaccinating fish comes with its own set of risks (e.g., stress caused by improper handling and post-vaccination mortality).[63] Good husbandry practices and health and welfare monitoring should be in place to decrease disease spread and thus reduce the need for vaccination. When vaccination is necessary, licensed veterinarians must be consulted. However, veterinarians are a resource that appears to be scarce for the farms interviewed in this study.[64]

Antibiotic use is not common among the fish farms interviewed in this study. However, previous studies have reported the use of antibiotics in some intensive farms in the country. Antibiotic use is more common in intensive culture systems where large fish populations are supported.[65] The most commonly used antibiotics in farms in the Philippines are oxytetracyclines, nifurpirinol, chloramphenicol, and sulfamonomethoxine.[66] Many of these substances are labeled as carcinogens that are not approved for use in food-producing organisms by the United States and the EU.[67]

The indiscriminate use of antibiotics is a major concern for fish welfare, as evidence has shown that it can decrease an animal's immune system, bring about more virulent disease strains, and lead to new infections among fish that are more difficult to treat, usually requiring far more expensive and more toxic drugs.[68] There are also human-associated health risks when such antibiotic resistant strains are transferred to humans during handling and contact with contaminated waste waters.[69] The use of preventive measures such as probiotics, non-specific immunostimulants, and the improvement of husbandry systems are some of the recommended alternatives to the use of antibiotics.[70]

3.2.4.4 Feed Management

Nine out of the thirteen farms interviewed in this study use purely artificial feeds for the entire cropping cycle. On average, a single cropping cycle runs for a period of 4 months.[71]

[63] Midtlyng, P.J. (1997). Vaccinated fish welfare: protection versus side-effects.
[64] Per our survey, only one farm reported having access to veterinary care.
[65] The Fish Site. (2014). Antibiotics in aquaculture: Are they needed?
[66] Cruz-Lacierda, E.R. (2000). The Use of Chemicals in Aquaculture in the Philippines.
[67] See Bureau of Agriculture website for further reading.
[68] Preena, P.G. et al. (2020). Antimicrobial Resistance in Aquaculture: A Crisis for Concern.
[69] Serrano, Pilar Hernandez. (2005). Responsible use of antibiotics in aquaculture.
[70] Karunasagar, I. (2017). Alternatives to antimicrobials for disease management.
[71] FAO. (2020). Milkfish Production Culture Systems.

After harvest, fishes are sorted according to size (which usually ranges from 300-500 grams), and sold in local markets. Feed is applied through broadcast feeding, and the amounts introduced into the ponds/cages are just estimated (*ad libitum*).

Two farms use a mixture of artificial feeds and natural feeds locally known as *lab-lab*. *Lab-lab* (technically termed periphyton) is a mixture of microflora and microfauna attached to the bottom of the pond or floating in the surface of the water[72] (Fig. 15). They are naturally grown in ponds using organic fertilizers such as green manure, copra slime, or pressmud. Periphyton is rich in protein, as are most natural feed types, and is also commonly used as fish feed in other countries such as Indonesia and Taiwan.[73]

The transition from natural to artificial feed is made when there are no longer any periphyton observed. In addition to being a food source, they have also been known to make pond systems more nutrient efficient, as the periphyton community can immediately process organic material trapped within its mass. It is believed that ponds with periphyton substrates are capable of supporting more fish than similar ponds without it. As shown by research, periphyton-based aquaculture production can effectively help increase yield. Some studies found that it can increase production by as much as 80% in monoculture systems[74] and by up to 51% in polyculture systems.[75] Artificial feeds account for a major part of the overhead costs in farms, and the use of natural food sources can help improve profitability.

Figure 15. *A pond in Cagayan de Oro containing periphyton (lab-lab) which is used as primary feed for Milkfish. Source: personal photo.*

[72] Fortes, N.R. and Pinosa, L.A.G. (2007). Composition of phyto-benthos in "lab-lab", a periphyton-based extensive aquaculture technology for Milkfish in brackish water ponds during dry and wet seasons.
[73] Van Dam, A. et al. (2002). The potential of fish production based on periphyton.
[74] Azim, M.E. (2001). The potential of periphyton-based aquaculture production systems.
[75] Jha S. et al. (2018). Production of Periphyton to Enhance Yield in Polyculture Ponds with Carps and Small Indigenous Species.

Feed management is an important part of semi-intensive to intensive productions, and a crucial aspect for farmed fish welfare. First and foremost, it is important that farmed fish be fed with nutritionally balanced feed to meet their metabolic requirements, as this has direct implications for fish health and growth.

As of 2014, there are currently 96 commercial and non-commercial feed manufacturers registered in the Philippines (a few of these companies supply feeds to some of the farms interviewed by the researchers). A study by the Food and Agriculture Organization of the United Nations reported that 57% of these manufacturers employ in-house nutritionists to develop their feed formulations and 29% rely on foreign consultants, while the remaining 14% rely on foreign business partners to provide the proper formulation.[76] In spite of this, a common issue identified in the Philippines is that most formulations follow only the minimum required standards in order to reduce the cost of feed. This, in turn, reduces the feed's nutritional value.[77]

Alongside the provision of a nutritionally balanced diet, proper feeding management is an equally important aspect of fish welfare to consider. Inadequate feeding practices can cause behavior that can be detrimental to fish welfare. Overfeeding, for example, can lead to feed loss and problems with water quality. Underfeeding, on the other hand, can lead to competition within the fish community and result in injury and starvation among less competitive individuals.[78] Most of the farms interviewed in this study feed *ad libitum*. However, this is not an ideal practice when using supplementary feeds[79] as it can lead to large fluctuations in feed intake, which can cause over-feeding or under-feeding.

3.2.4.5 Stocking Density

The farms interviewed in this study can be categorized as having extensive (~1,000 individuals/ha) to intensive (> 30,000 individuals/ha) production, following the FAO classification for Milkfish production culture systems. It is noteworthy to mention that the FAO stocking density classification is different from the classification set by the country's Code for Good Aquaculture Practices (GAqP). Under the FAO classification, ponds with >20,000 individuals/hectare are classified as intensive culture systems. Under the GAqP, however, intensive systems should hold a density of 10,001-20,000 individuals/ha for earthen ponds, and 10-20 individuals/cubic meters for fish cages.[80] The appropriate classification of culture systems is crucial, as larger populations require additional measures (e.g., aeration, pumping, and supplemental feeding) to support their large biomass and high production levels.

[76] White P.G. et al. (2018). Better Management Practices for Feed Production and Management of Nile Tilapia and Milkfish in the Philippines.
[77] Ibid.
[78] Attia, J. et al. (2011). Demand Feeding and Welfare in Farmed Fish.
[79] FAO. (1992). Aquafeeds in Asia: Regional Overview.
[80] Bureau of Agriculture and Fisheries Standards. (2017). Code of Good Aquaculture Practices for Milkfish and Tilapia.

The farms with intensive culture systems in this study, however, do not use any kind of technology (e.g., aerators) to help provide optimal living conditions for each individual fish. This is a major concern as water quality can easily degrade in high density ponds without life support systems, negatively affecting fish health and well-being.[81]

3.2.4.6 Fish handling: Harvest, Slaughter and Market

At the end of the cropping season, fishes are usually harvested by partially draining the pond and herding them to one area for easier collection. Then, the fishes are manually scooped via hand nets or dippers into smaller containers (Fig. 16), where they are either left to dry or are placed into ice baths as a form of slaughter. Fish are transported in insulated boxes with ice, either to traders or directly to the wet market. Fish are slaughtered through ice slurries and/or asphyxiation but there are instances where they are still transported alive to the market.

Figure 16. *The harvest process: (1) water is drained from the pond (left picture); (2) fish are scooped using hand nets or dippers into plastics or insulated boxes for delivery (right picture). Source: farmer owner.*

Farm owners usually hire additional workers from the community to help with the harvesting process. There are no particular qualifications needed for the task, hence, there could also be very little regard given to how fishes are handled and slaughtered during the entire process. Injuries are likely prevalent due to a lack of knowledge or training. Though farmers openly expressed their knowledge of the ability of the fish to feel pain, this is apparently not taken into consideration during the harvesting process. For the majority of these farmers, this traditional harvesting method is the only technique they know of.

Although asphyxiation and ice slurries are a cost-effective way of slaughter, they are not considered humane.[82] The purpose of humane stunning is to render the fish immediately unconscious and insensible to pain. Though humane slaughter methods need more species-specific research, and none has been done so far for Milkfish and Tilapia, two of the most effective systems with the potential to deliver humane slaughter to finfish are

[81]Segner, H., et al. (2019). Welfare of fishes in aquaculture.
[82] Lines J. and Spence J. (2014). Humane harvesting and slaughter of farmed fish.

electrical and percussive stunning.[83] These techniques are often unheard of in rural areas, and those who have read of such methods express their apprehensions because of the additional cost they could entail. It is also noteworthy to mention that as with any high-welfare slaughter technique, this should always be done with proper training and equipment as it carries its own risks to fish welfare when performed incorrectly.

3.2.4.7 Trainings, Certifications, and Other Support Systems

Four out of the thirteen farms were able to get certification from the Bureau of Fisheries and Aquatic Resources. The certified farms are large-scale farms that sell their produce to wholesalers or institutional buyers such as supermarkets and processors. Farms that did not apply for any kind of certification are smaller producers that supply to local wet markets, where certification schemes are not seen as very important for marketing.

Certification is an important tool for welfare. Welfare certification schemes create a way for farms to be monitored, evaluated, and incentivized for following high-welfare practices. However, it is noteworthy to mention that certification schemes are not always viable for all farms due to the added costs of meeting certification standards, unless a re-visioning of how sustainability standards work for small-scale producers is done.[84]

Twelve out of the thirteen respondents were not able to receive any form of training related to proper aquaculture practices. Although there are occasional capacity-building activities offered by government agencies, they seem to be very rare in the studied areas. Four out of the five respondents, however, were able to receive assistance from their local governments in the form of fish fry or fingerlings for the restocking of their ponds.

Farmer training is an important aspect of fish welfare. Farmers should be seen as an integral part of upholding fish welfare in the industry. Fishes spend a large part of their lives in farms, and farm operators play a key role in setting their living conditions. Staff and farm managers that are educated on welfare-related issues are better equipped to ensure the welfare status of fishes in farms.[85] However, from the interview data, farmers (especially small-scale producers) have limited access to experts who can help them improve their production systems.

3.2.4.8 Farmer Welfare and COVID-Related Concerns

At the time of this interview, there is very limited public transportation in the country, and the transport of fish fry/fingerlings is very much affected. Feed prices have significantly increased and most markets have temporarily closed to avoid large crowds, which has affected business operations for small farms.

[83] Boyland, N. and Brooke, P. (2017). Farmed Fish Welfare during Slaughter.
[84] Marschke, M and Wilkings, A. (2014). Is certification a viable option for small producer fish farmers in the global south? Insights from Vietnam.
[85] Segner, H., et al. (2019). Welfare of fishes in aquaculture.

Respondents have openly expressed how the past few months have been even more difficult due to the pandemic. Where the well-being of people is compromised, it is expected that the importance of fish welfare takes a back seat.

4. Discussion

The farms interviewed in this study ranged from small backyard ponds to large intensive culture systems that reared milkfish, *Chanos chanos* or tilapia (Genus *Oreochromis*). A wide range of culture systems were used (e.g., cement backyard ponds, earthen ponds, marine cages). Based on observation and the results of the interviews, we believe minimal effort has been exerted to monitor, assess, and improve the current state of fish welfare in these farms. Some of the major issues observed are:

1. **Absence of water quality monitoring systems on most farms**. As reported, twelve of the thirteen farms do not monitor water quality or have the proper equipment to do so. It is noteworthy to mention that the number of respondents that participated in this study is low, and might not completely reflect the general state of farms in the country. Nonetheless, the non-monitoring of water quality appears to be similar to most of the farms located in Manila Bay (Luzon) as reported by some studies.

2. **A lack or absence of staff training**. Farmer training is a key element in upholding fish welfare in farms. Without experienced and well-trained staff, poor fish welfare may remain undetected or may be detected too late, after there is already fish mortality.[86] Although mortality is considered an indicator of fish welfare, low mortality (~15% for hatchery bred fingerlings[87]) does not necessarily equate to fishes living in ideal welfare conditions, and therefore the proper indicators still need to be monitored by farm operators. Farmers set the living conditions for their farmed fishes and should be recognized as being on the front line in promoting fish welfare. Greater regard to building the capacity of these farmers would significantly contribute to improving welfare in fish farms.

3. **Limited access to veterinary care**. Turning to veterinary care is an uncommon practice in all of the farms interviewed. Although the majority of the farms report no presence of any disease or infection, there is a very high chance that they simply have no means or the knowledge to detect it if it is present.

[86] Segner, H., et al. (2019). Welfare of fishes in aquaculture.
[87] Astuti, L.P. and Warsa, A. (2020). Survival rate and growth rate of milkfish (*Chanos chanos*, Forsskal 1775) seeds in the acclimatization process at Ir. H. Djuanda Reservoir.

4. **Limited or no knowledge of humane methods of slaughter**. Fishes are slaughtered through asphyxiation and ice slurries, which are inhumane methods of slaughter. Most of the farmers (11 out of 13) are unfamiliar with humane slaughter methods such as mechanical or electric stunning.

5. **COVID-related challenges**. Transportation was limited during the 2nd and 3rd quarter of 2020 due to the pandemic, which led to significant delays in the transport of fish fry and fingerlings to farms (as reported by many grow-out farmers interviewed in this study). We were not able to document the actual situation in the nurseries/hatcheries, but there is a high probability that this has caused serious logistical problems and welfare-related concerns among fry/fingerlings that were not immediately transported to the appropriate grow-out ponds.

Currently, there is minimal demand for high-welfare products in the domestic market, where most of the Philippines' cultured finfish products are sold. Given the absence of any work on farmed fish welfare in the country, it is not surprising to find that farmers and other industry players have little understanding of the importance of fish welfare - not only for the benefit of the organisms, but for the aquaculture industry, the environment, and society as a whole.

The aquaculture industry is not unfamiliar with the concept of sustainable aquaculture, which advocates principles that are similar to the operating welfare indicators used in farmed animal welfare (e.g., the importance of good water quality, proper stocking density, and feed management). These codes of practice are, in fact, mandated by Philippine law. There were no organizations focusing on farmed fish welfare in the Philippines during the duration of this study, but the presence of these pre-existing elements may be good entrypoint for fish welfare work in the country.

5. Conclusions and Recommendations

The Philippines is a country that is currently highly dependent on its fishery resources (both wild catch and aquaculture production). Hence, proper aquaculture practices play a crucial role in safeguarding the welfare of millions of fish farmed in the country each year. Currently, the Philippines' wild catch fisheries are experiencing a significant decline in production, which is largely attributed to overfishing, pollution, and habitat destruction. Because of this decline, the government is looking to aquaculture to make up for the production lost from wild catch. This makes it all the more important to introduce the concept of farmed fish welfare into the industry.

Based on data gathered during this study, the current rearing practices and the non-monitoring of important parameters highlight the existing information gap on the true welfare state of farmed fishes, and the difficulty in assessing production-specific welfare

issues among extensive to semi-intensive farms in the country. The lack of access to technical expertise at present means that low welfare conditions could remain undetected unless proper interventions take place. Introducing this new concept into an industry as large as the aquaculture sector in the Philippines is a challenge. Therefore, we present the following recommendations on initial fish welfare work that can be done in the country:

1. **Highlight the importance and benefits of fish welfare across the entire supply chain.** Although the importance of good aquaculture practices is common knowledge in fish farms, farmed fish welfare is a relatively new concept to the aquaculture industry. Industry players and consumers have yet to understand the multi-sectoral benefits that can be brought about when welfare is prioritized.[88] Fishes thriving in good welfare conditions are less prone to diseases and exhibit better growth. As a result, the production standards and the quality of fish produced by farms are greatly improved. Furthermore, knowledge of the importance and benefits of fish welfare should not be limited to fish farm operators, but instead be accessible to everyone across the market chain. There are a few companies in the Philippines that are starting to promote sustainably caught/reared aquatic products. However, as with most products that come with certification, the prices are relatively higher and are not always accessible to the middle-class consumers.

2. **Study how the introduction of fish welfare to farm operation affects market dynamics.** Integrating operational changes to improve fish welfare can be costly. Not all farms have the capacity to make changes to their production systems for the purpose of improving fish welfare. Hence, conducting pilot studies on the integration of fish welfare practices into the culture process and studying how these operational changes can affect fish farms from a business standpoint can determine how open farms are to fish welfare. There are a few businesses operating in the country that are advocating for sustainably caught and reared aquatic products. These companies could be potential partners for market studies.

3. **Consider the possibility of different approaches to integrating fish welfare in large-scale vs. small- to medium-scale farms.** Due to COVID-related restrictions, our study was only able to target mostly small- to medium-scale farms in Visayas and Mindanao. Although this research was able to capture the state of fish welfare in these production systems, it is likely that issues commonly encountered in larger farms are somewhat different. Large-scale farms often use technology to improve production, and have better access to resources (e.g., feed) and experts to help them improve production. They also serve both local and/or international markets where certifications are more widely used. However, the high density of their production can also lead to other potential problems such as antibiotic use and

[88] Kirsch, J. (2020). Why Fish Welfare?

resistance, the rapid spread of diseases, and poor water quality. Thus, we recommend further studies on large-scale farms in the future, considering the possibility that introducing fish welfare practices across various scales of culture systems could be different.

4. **Give farmers better access to aquaculture training programs.** Training opportunities for farmers to assist in improving rearing techniques are frequently offered through the Department of Agriculture. Research and development institutions such as SEAFDEC also offer similar activities. It is necessary to link these farm operators to the proper agencies to allow them to participate in these capacity-building activities and help them improve rearing techniques as needed. This will also give them access to the necessary technical expertise and veterinary care, as this is largely lacking for all the respondents interviewed in this study.

5. **Partner with the government.** Sustainable aquaculture practices have long been promoted by the government, giving regular training and support to farm owners all over the country. Sustainable aquaculture can, therefore, be a good entrypoint for farmed fish welfare work in the Philippines. Current issues linked to aquaculture (e.g., fish kills, disease outbreaks on other organisms, and harmful algal blooms) are a direct result of low-welfare conditions (e.g., bad water and feed management, unregulated use of chemicals and antibiotics, etc.).[89] Hence, with this common objective in mind, seeking out partnerships with related government agencies, such as the Bureau of Fisheries and Aquatic Resources (BFAR), seems promising. Collaborative efforts on (1) the regular monitoring of water quality in water bodies that are highly populated by farms and (2) integrating fish welfare concepts into their existing training modules are possible entry points for collaboration.

6. **Partner with academia.** There are several universities in the country that teach aquaculture and fishery courses. As part of their community extension services, these institutions usually have partner communities where they support small-scale aquaculture farms by conducting capacity-building activities related to aquaculture. By partnering with these academic institutions, there is an opportunity to introduce the concept of farmed fish welfare into these courses and even include the appropriate protocols that promote fish welfare in training manuals.

7. **Partner with businesses and other NGOs.** As mentioned in the previous sections, there are currently no groups working on farmed fish welfare, or the welfare of farmed animals in general, in the Philippines. However, there are a number of NGOs and businesses that have long been advocating for sustainable aquaculture and the marketing of sustainably caught and reared aquatic products. Collaboration with

[89] Guerrero, R. and Fernandez, P. (2018). Aquaculture and Water Quality Management in the Philippines.

these organizations is a good opportunity to start welfare work in the country. Apart from that, fish welfare work must extend beyond fish farms, and attention should be given to the whole market chain as well. There needs to be a demand for high welfare fish in the market to encourage the incorporation of welfare practices into the farms' production systems. Connecting fish farms to business entities that promote high-welfare products may enable this transition.

6. Closing Remarks: Future Work

The Philippines holds many opportunities for fish welfare work. With the government looking into the intensification of aquaculture production to ensure food security (under its Comprehensive National Fisheries Industry Development Plan for 2006-2025), now is an opportune time to start introducing the concept and advantages of fish welfare into the industry. Collaborations and private-public partnerships are also very common and welcome in the fisheries sector. Hence, partnering with stakeholders (e.g., fish farmers and other NGOs) is not expected to be difficult. And, lastly, although the concept of fish welfare is still new in the Philippines, we believe that the past and current efforts by the government and different groups to promote sustainable aquaculture practices is a good entrypoint for welfare work in the country. The country's Code of Good Aquaculture Practices and legislative framework already has elements that translate to good welfare operations, making it a suitable foundation for animal welfare interventions to build upon.

It is our hope that this scoping work sheds the first light on the welfare status of farmed fishes in the Philippines and the significant knowledge gaps (e.g., the monitoring of important parameters, proper compliance to existing guidelines, etc.) that call for further groundwork to act as a foundation for welfare interventions. Finally, we hope that this effort has also helped identify possible entry points that animal welfare organizations can utilize for this work to begin in the Philippines.

7. Annex

7.1 Farm Survey Questions

1. What is the type of production system in the farm (e.g. ponds, cages, raceways, etc.)?
2. What fish species are reared?
3. What are the most pressing issues in the farm?
4. How has COVID-19 affected farm production?
5. Do fishes suffer from diseases, parasites or infestations? If yes, what are these and how frequently do they occur?
6. Does the farmer have issues with water quality? If yes, what parameters do they have difficulty with?

7. How frequently is water quality checked?
8. What is the average mortality rate per cropping?
9. Does the farmer believe that fish is capable of feeling pain?
10. Are fish vaccinated? If yes, how?
11. Does the farmer have access to veterinary care and medicines when needed?
12. Does the farmer have access to proper training?
13. How are the fish killed?
14. Where are the fish sold? Domestic or international market?
15. Would the farmer be willing to work with an NGO to improve farming practices and fish health?
16. Is the farm certified? If so, by which scheme?
17. What feed is given to the fish? Where does the feed come from? How frequently are fish fed?
18. What is the stocking density?
19. Is the farmer using any technology to increase production?
20. Has the farmer collaborated with any research institution or university?
21. Has the farmer received government assistance?

7.2 Aquaculture Organizations in the Philippines

A. Tambuyog Development Center (NGO)
B. Cebu Technological University (Academia)
C. University of the Philippines - Visayas (Academia)
D. Sea Traceability Inc. (Business)
E. Southeast Asia Fisheries Development Center (Research Institute)

7.3 Large-Scale Farms/Processors of Milkfish or Tilapia in the Philippines

A. GT Fishpond
B. IRMA Fishing and Trading, Inc.
C. Pediment Realty and Development Corporation
D. Approved Aquaculture
E. Jr 3 Seafoods Dealer
F. Southern Philippines Aquaculture Hydrophonics Holding Groups Inc.
G. Alson’s Aquaculture Corporation
H. Anjo Farms Inc.
I. Fisher Farms Inc.
J. Magsilum Arc MPC
K. Rdex Food International Phils., Inc.