

Fishpen and fishcage culture in Laguna de Bay: its importance and problems

Danilo C. Israel

Laguna de Bay or Laguna Lake has a water area of 90,000 hectares representing about 45 percent of the total area of all lakes in the Philippines. This relatively large size and close proximity of the lake to Metro Manila make it an important resource for the practice of various economic activities including aquaculture.

From its humble beginnings in the early 1970s, fishpen and fishcage culture, which is the main form of aquaculture practiced in Laguna de Bay, has grown with increasing intensity and is now widely practiced. From 2001 to 2006, in particular, the number of fishpen operators and total area of fishpens in the lake had generally increased (Table 1). For fishcages, although its total area had

decreased, the number of fishcage operators had generally increased.

The proliferation of fishpen and fishcage culture in Laguna de Bay, meanwhile, caused certain social and environmental problems that negatively impact not only on aquaculture itself but also on other sectors in the lake. Because of this, there have been suggestions and ongoing efforts to discontinue fishpen and fishcage culture in the lake (e.g., Adraneda and Macairan 2008, The Daily Tribune 2008).

To help provide an analysis of the situation so that decisionmakers and other stakeholders

PIDS Policy Notes are observations/analyses written by PIDS researchers on certain policy issues. The treatise is holistic in approach and aims to provide useful inputs for decisionmaking.

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may be able to make informed decisions and opinions related to the activity, this *Policy Notes* looks into the importance of fishpen and fishcage culture in Laguna de Bay to the surrounding lake communities and the country. It likewise reviews the social and environ-

mental problems caused by fishpen and fishcage culture and provides some general recommendations for addressing them.

In essence, this *Notes* points out the importance of fishpen and fishcage culture in

Laguna de Bay and calls for all concerned to properly address and manage the ensuing social and environmental problems it causes in order for the practice to be continued in the coming years.

Production in fishpens and fishcages

The main economic contribution of fishpen and fishcage culture in

Laguna de Bay is the fish that it produces. In the past, the fish species cultured in fishpens and fishcages were mostly milkfish and tilapia but in recent years, carp, mainly bighead carp, has also been raised. Catfish, on the other hand, has been cultured only recently. In 2006, in terms of volume, total production from fishpens and fishcages was 48,187 metric tons (Table 2). Milkfish was the main specie produced, followed closely by tilapia and carp. From 2001 to 2006, total volume of production had grown at an annual average rate of 10.65 percent. Carp had been the fastest growing fish cultured in fishpens and fishcages followed by milkfish and tilapia. In

Table 1. Number of registered fishpen and fishcage operators and area of fishpens and fishcages in Laguna de Bay, 2000–2006

Year	Fishpen		Fishcage		Total	
	Number of Operators	Area (hectares)	Number of Operators	Area (hectares)	Number of Operators	Area (hectares)
2000	299	8,180	871	4,556	1,170	12,736
2001	230	7,051	1,018	1,050	1,248	8,101
2002	232	6,870	1,370	770	1,602	7,640
2003	363	10,064	1,546	854	1,909	10,918
2004	362	10,393	1,758	986	2,120	11,379
2005	365	10,174	1,808	1,111	2,173	11,285
2006	455	12,117	1,599	998	2,054	13,115
Average Annual Growth Rate (%)	9.91	8.40	11.55	-12.46	10.38	3.41

Source: Laguna Lake Development Authority (LLDA)

Table 2. Volume of production in fishpens and fishcages of Laguna de Bay by species, 1996–2006 (metric tons)

Year	Milkfish	Tilapia	Carp	Catfish	All
1996	10,779	6,990	1,295	0	19,064
1997	14,151	8,061	1,570	0	23,782
1998	13,729	7,480	4,440	0	25,649
1999	15,973	7,979	10,136	0	34,088
2000	13,515	10,632	10,284	0	34,431
2001	2,835	8,121	19,271	0	30,227
2002	8,274	8,733	17,933	0	34,940
2003	16,015	12,019	8,629	0	36,663
2004	20,766	13,543	13,337	0	47,646
2005	18,971	15,915	16,757	2	51,645
2006	16,997	15,716	15,470	4	48,187
Average Annual Growth Rate (%)	24.63	9.85	43.49	-	10.65

Source: Bureau of Agricultural Statistics (BAS)

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terms of value, total production from fishpens and fishcages was about P1.8 billion in 2006 (Table 3). Tilapia was the main specie, followed closely by milkfish with carp a distant third. From 2001 to 2006, total value of production had grown at an annual average rate of 9.26 percent. As in volume, carp had been the fastest growing in value terms, followed by milkfish and tilapia.

There are no available time-series data on total fisheries production in Laguna de Bay in recent years that cover both aquaculture and capture fisheries. The Laguna Lake Development Authority (LLDA 2005), however, reported that the catch from capture fisheries in the lake had been falling over time and registered 38,000 metric tons in 1996. Assuming that this production figure remained the same in 2006, then the total fisheries output in the lake was 86,187 metric tons in that year with the production of 48,187 metric tons from fishpens and fishcages. Fishpen and fishcage culture therefore contributed around 56 percent to total fisheries output in Laguna de Bay. This is higher than the production from capture fisheries.

At the national level, fishpen and fishcage production in Laguna de Bay also has a significant contribution. In 2006 specifically, the aquaculture production of 48,187 metric tons in the lake amounted to 2.3 percent of total aquaculture production and 1.1 percent of total fisheries production in the Philippines. These percentage contributions were attained even with a small area of 13,115

Table 3. Value of production in fishpens and fishcages of Laguna de Bay by species, 1996–2006 (thousand pesos)

Year	Milkfish	Tilapia	Carp	Catfish	All
1996	618,745	305,683	33,308	0	957,736
1997	696,389	342,968	24,490	0	1,063,847
1998	676,000	340,825	92,356	0	1,109,181
1999	814,269	377,916	212,450	0	1,404,635
2000	732,608	573,396	260,840	0	1,566,844
2001	123,607	416,582	389,366	0	929,555
2002	305,752	437,538	232,246	0	975,536
2003	674,235	535,983	179,885	0	1,390,103
2004	953,007	654,359	323,061	0	1,930,427
2005	905,638	737,104	334,486	41	1,977,269
2006	729,764	739,472	329,304	221	1,798,761
Average Annual Growth Rate (%)	22.17	10.94	47.14	-	9.26

Source: BAS

hectares used for fishpen and fishcage culture in that year.

Other economic contributions

In addition to fish production, fishpen and fishcage culture in Laguna de Bay contributes to income generation. In 2006, the direct gross income of fishpen and fishcage operators was estimated at P1.8 billion (Table 3). Moreover, fishpen and fishcage culture indirectly resulted in the generation of incomes among the other participants of the aquaculture industry which include the sellers of fry and fingerlings, feeds, nets, bamboos, and other fishpen and fishcage inputs, and the *consignacions*,¹ wholesalers, retailers, and other participants in the fish and fish products market.

¹ *Consignacions* are fish brokers who assist the fishpen and fishcage operators and other fish producers for a fee in selling their fish to wholesalers, retailers, and other buyers.



A panoramic view of fishpens in Laguna de Bay taken in a coastal area in Cardona, Rizal.

There are no available data that can be used to directly measure employment in fishpens and fishcages in Laguna de Bay. Using extrapolation, though, it is estimated that fishpen and fishcage culture in the lake employed 5,152 people in 2006. In addition, the activity indirectly contributed to the employment of many more people in its input and product markets who were, in one way or another, dependent on aquaculture in the lake for employment and livelihood.

Fishpen and fishcage culture in Laguna de Bay further contributes to public revenue generation. The revenues include the bid price, annual registration fees, and other fees that the fishpen and fishcage operators pay for the right to operate. In addition, fishpen and fishcage culture contributes to the

generation of national and local taxes from the economic activities of fishpen and fishcage operators, sellers of production inputs, sellers of fish and fish products, and other industry participants.

Social importance

Aside from its economic significance, fishpen and fishcage culture in Laguna de Bay has social implications. Firstly, the milkfish, tilapia, carp, and catfish produced in fishpens and fishcages in the lake are not cash crops but relative low-value species. They are therefore mainly consumed by the lower economic brackets of society which

comprise the great majority of the population.

Secondly, depending on individual species, about 70 to 95 percent of the fish produced in fishpens and fishcages in Laguna de Bay are sold in Rizal, Laguna, and Metro Manila. Most of the fish produced in the lake are therefore sold in the metropolitan area where a highly significant segment of the urban and relatively politically sensitive population of the country resides.

Problems caused by fishpens and fishcages

Notwithstanding its importance as mentioned, fishpen and fishcage culture in Laguna de Bay has nonetheless caused various problems that negatively impact not only on itself but also

other sectors. Some of the most important are the following:

Social problems

Fishpens and fishcages in Laguna de Bay are supposed to be registered and constructed based on size specifications within aquaculture belts identified by the Laguna de Bay Fishery Zoning and Management Plan or ZOMAP (Figure 1). However, unregistered and inappropriately constructed structures exist within and outside the belts. These cause social conflicts and the unregistered ones, in particular, do not contribute to public revenue generation.

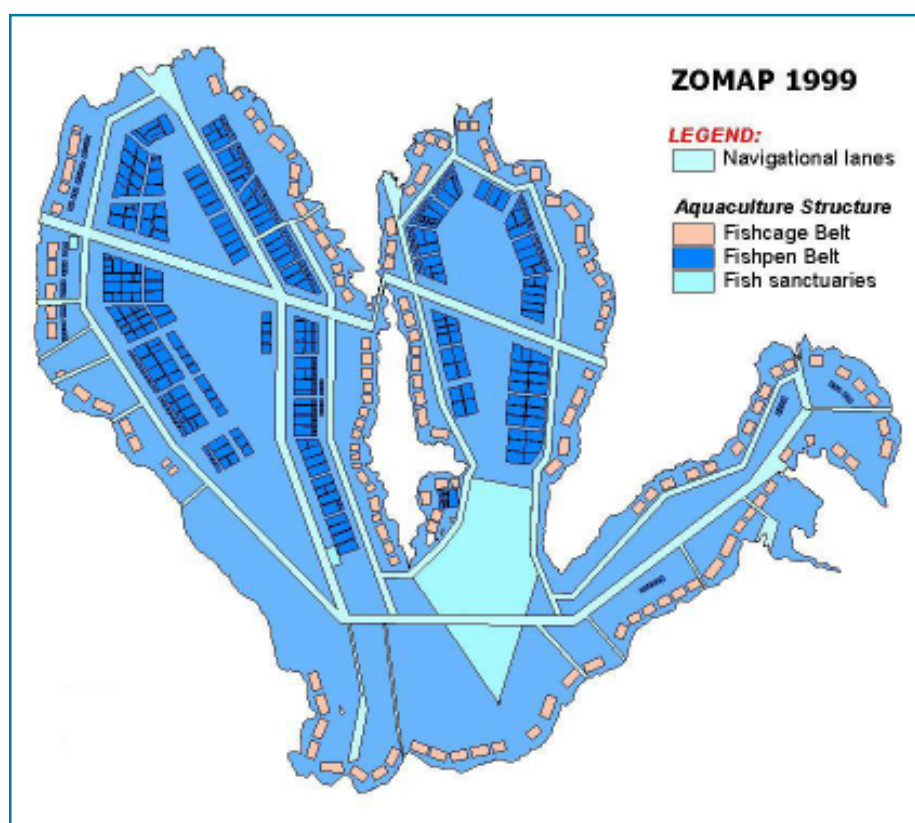
Fishpens and fishcages in Laguna de Bay have also reduced the open water areas available for municipal fishermen. This problem has likewise caused social friction, particularly between municipal fishermen and aquaculture operators, with the former being accused of intruding into the fishpen and fishcage areas and the latter of harming them.

Furthermore, fishpens and fishcages in Laguna de Bay have brought with them the problem of poaching or stealing of stocked fish. This has caused deep mistrust between fishpen and fishcage operators, on one hand, and municipal fishermen

and other perceived poachers, on the other. Incidents of suspected poachers being injured or killed by guards hired by aquaculture operators have been reported.

Fishpens and fishcages in Laguna de Bay also obstruct the navigational lanes for other lake users. Fishpens, in particular, make it more difficult and longer for other users to travel around the lake. For their part, fishcages make the lake less accessible for docking by others. Both fishpens and fishcages also make travel risky because boats could accidentally run into them.

Figure 1. Laguna de Bay fishery zoning and management plan, 1999



Source: LLDA

Finally, fishpens and fishcages are already overcrowded in some parts of Laguna de Bay. This overcrowding reduces the mobility of boats used by the fishpen and fishcage operators and other lake users and causes friction among operators themselves and between them and other users.

Environmental problems

Some fishpen and fishcage operations in Laguna de Bay overfeed their stock. The intensive use of feeds can cause eutropication or the increase of phosphate and nitrogen in the water that leads to algal bloom. Algal bloom in turn may cause cultured fish and those in nearby open waters to die of asphyxiation due to oxygen depletion. Moreover, the fish that survive may have a tainted flesh and mud-like taste.

It should be noted, though, that while overfeeding is indeed being done in some fishpens and fishcages in Laguna de Bay, there is reason to believe that it is not as widely practiced as feared. This is because a majority of fishpen and fishcage operators still use the extensive method of culture that depends only on natural food found in the lake for feeding their stock.

Fishpens and fishcages also contribute to the problem of siltation and sedimentation in Laguna de Bay. In particular, poor water circulation in overcrowded fishpen and fishcage areas hastens the accumulation of silts and sediments. Furthermore, decaying bamboos, anahaw poles, and other materials used in fishpen and fishcage construction exacerbate the problem of siltation and sedimentation as well as pose risk to lake travel.

Most of the fish cultured in Laguna de Bay are sold and consumed in the Rizal, Laguna, and Metro Manila areas.



Still, even as fishpens and fishcages certainly contribute to reduced water quality, siltation and sedimentation, and overall environmental degradation in Laguna de Bay, they are not considered a major cause. Bacallan (1997), for one, explained that of the pollution in the lake, 40 percent came from agricultural sources, 30 percent was caused by industrial sources, and 30 percent came from domestic sources. Centeno (1987) further identified the various sources of pollution in the lake, including industrial effluents, sanitary wastes, effluents from agribusiness, run-off from agricul-

ture, and inflows from the Pasig River.

Conclusions and recommendations

As shown in the preceding discussions, fishpen and fishcage culture in Laguna de Bay has important economic and social contributions as well as brings about certain social and environmental problems. Among other factors, therefore, these should be considered in deciding whether or not the activity will be continued.



Fishermen in Laguna de Bay have complained that fishpens and fishcages have reduced their fishing areas and made navigation difficult.

In the absence of a detailed analysis of the full costs and benefits derived from fishpen and fishcage culture, it is prudent even at this point that the problems that it causes are already seriously tackled. The following general recommendations are hereby offered to address the social and environmental problems in Laguna de Bay:

- Illegal structures should be immediately dismantled. The total area of 10,000 hectares allotted for fishpens, in particular, has already been exceeded since 2003. Dismantling will help lessen overcrowding, improve navigation and reduce social conflicts in the lake.
- At the same time, the optimal area allotted for fishpen and fishcage culture in the

lake should be determined once and for all since some sectors argue that the present allotment of 15,000 hectares is too large. There are also concerns that the allotment has gone beyond the 10 percent area of lakes and rivers for aquaculture development as specified in the Philippine Fisheries Code of 1998. The determination of the optimal area should involve all stakeholders in order to ensure that a scientifically, socially, and politically valid result will be obtained.

- The national and local governments should develop alternative livelihood programs for the municipal fishermen in Laguna de Bay. Among others, uplifting their economic plight will lessen the conflict between them and the fishpen and fishcage operators.

Research agencies should fund and conduct more research on environmental problems in Laguna de Bay. More emphasis on environmental problems will serve the interests of the numerous stakeholders who depend on an environmentally sustainable lake for their livelihood and needs.

- Research agencies should fund and conduct more research on environmental problems in Laguna de Bay. More emphasis on environmental problems will serve the interests of the numerous stakeholders who depend on an environmentally sustainable lake for their livelihood and needs.
- A clean-up of the waters of Laguna de Bay of decaying bamboos, anahaw poles, and other materials should immediately be done. This activity may be conducted by the operators within and around their fishpens and fishcages while the government can undertake clean-up operations in the open areas.

For further information, please contact

The Research Information Staff
 Philippine Institute for Development Studies
 NEDA sa Makati Building, 106 Amorsolo Street, Legaspi Village, 1229 Makati City
 Telephone Nos: (63-2) 894-2584 and 893-5705
 Fax Nos: (63-2) 893-9589 and 816-1091
 E-mail: disrael@pids.gov.ph; jliguton@pids.gov.ph

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- Finally, the government can achieve much by strengthening its relevant institutions' monitoring and enforcement in Laguna de Bay. Past failure in this respect has been blamed for the proliferation of illegal fishpens and fishcages, poaching, overfeeding, and other social and environmental problems in the lake. 📄

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