

Research Article

Pomfret or Pompano? Aquaculture as a solution to the Tragedy of the Commons in Hong Kong

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Abstract

Total weight of fish captured and traded through the Fish Marketing Organization in Hong Kong from 1947 to 2019 showed a decreasing trend from mid-1970's onwards. Fish landing in 2019 was only half that in 1977 as a result of overfishing, a tragedy of the commons. Daily wholesale and retail prices of *Pampus chinensis* (Chinese pomfret) and *Pampus argenteus* (silver or white pomfret) surveyed for one year indicated high volatility while those for *Trachinotus blochii* (pompano) remained stable. Price movements reflected the unreliable supply from wild harvest of the pomfrets and the steady supply of pompano from fish farming. Greater consumption of the farmed pompano would reduce the fishing pressure on the over-exploited pomfrets and would give their stressed wild populations time to recover. Consuming pompano which is around one-sixth the price of Chinese pomfret and around one-third the price of silver pomfret would also be economically advantageous for the consumer. Sustainable aquaculture, in this particular case, the farming of pompano, is put forward as a solution to the tragedy of the commons of the pomfrets.

Keywords: Aquaculture; Hong Kong; Overfishing; Pomfret; Pompano

Introduction

The world population in 2022 is around 7.9 billion [1] and is projected to increase to 8.6 billion in 2030 and 9.8 billion in 2050 [2]. In tandem with the growing population, per capita food consumption has been rising in the last few decades. More specifically, world per

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capita apparent fish consumption has been increasing steadily, from 9.0 kg in 1961 to 20.3 kg in 2017. In the period 1961 to 2017, the average annual growth rate of total food fish consumption outpaced that of all other animal proteins, 3.1 percent per year against 2.1 percent per year [3].

This large demand for fish food poses a heavy strain on fishery resources. Based on FAO's long-term monitoring of assessed marine fish stocks, the state of marine fishery resources has continued to decline. In 2017, as much as 34.2 percent of the fish stocks of the world's marine fisheries were classified as overfished. Overfishing results when stock abundance is fished to a level lower than that which can produce the maximum sustainable yield. The percentage of fish stocks that are within biologically sustainable levels has been decreasing, from 90% in 1974 to 65.8% in 2017. In contrast, the fraction of stocks fished at biologically unsustainable levels has been increasing, from 10% in 1974 to 34.2% in 2017. Overfishing negatively impacts biodiversity and ecosystem functioning and reduces fish production which in turn leads to negative social and economic consequences.

Overfishing is an example of the tragedy of the commons expounded by [4]. The tragedy of the commons is the ultimate destruction of a limited resource shared among multiple individuals because these individuals use the common resource for their own self-interest without considering its future sustainability. But is the tragedy inevitable? Three solutions have been proposed: 1) personal action, 2) internal governance and 3) external governance.

With regard to personal action [4] gives three reasons why it is difficult and highly unlikely that individuals will forego their self-interest in favor of the common good. [5], however, argues that human nature not only harbors self-interest but also altruism. She demonstrated this by using the Public Goods Game and translated this into fisheries management settings. Altruism, however, may not be feasible in many real situations.

Internal governance refers to social pressure, when a group of fishermen or a community talks together and come to a common agreement about what sustainable use is and they self-police. Internal social regulations can be a powerful way to prevent overuse of resources, especially when there are strong group norms about not flouting the will of the other people in the group [6]. Internal governance was successful in averting a tragedy of the commons in a mixed fishery industry in south Devon, U.K. Conflict between the demersal fish trawlers and the crab pot fishers was resolved through dialogue and voluntary agreement between the parties resulted in the partitioning of the fishing ground, thus conserving the resource and maintaining the livelihood of both groups [7]. Similar positive results were obtained for the lobster industry in Maine, U.S.A. and the trawl fishery in the New York Bight region [8, 9].

In some cases, internal governance work with external governance to avoid the tragedy of the commons. [10]'s study indicated that both government controls and informal, community-level controls led to successful resource management outcomes for sea-urchin populations

in St. Lucia, West Indies. Similarly, a commons problem in small-scale shrimp aquaculture in northwestern Sri Lanka was successfully solved by a joint regime of individual shrimp farmers, community associations and government [11].

Thirty years after Hardin's "The Tragedy of the Commons", [12] noted that apart from self-organization and social norms, external governance is needed to solve common pool resource problems. External authorities or government can help devise, monitor and enforce rules that limit who can use a common resource and specify how much and when that use will be allowed. They can also establish sanctions for non-compliance of the rules.

This research paper presents an overview of the status of Hong Kong fisheries over a period of 72 years. Particular focus is given to three fish species: *Trachinotus blochii* commonly known as snubnose pompano, *Pampus chinensis*, also known as Chinese pomfret and *Pampus argenteus* or white or silver pomfret. Trends in the daily average wholesale prices and the retail prices of these three fish over a period of one year are presented. Their economics in terms of supply and demand and the significance of aquaculture in solving the tragedy of the commons are discussed. The role of cultured fish like pompano in promoting the sustainability of wild fisheries is also considered.

Materials and Methods

This study focuses on three fish species: *Trachinotus blochii* (snubnose pompano), *Pampus chinensis* (Chinese pomfret) and *Pampus argenteus* (white or silver pomfret) (Figure 1). These three fish are commonly sold in Hong Kong wet markets and often appear on restaurant menus.

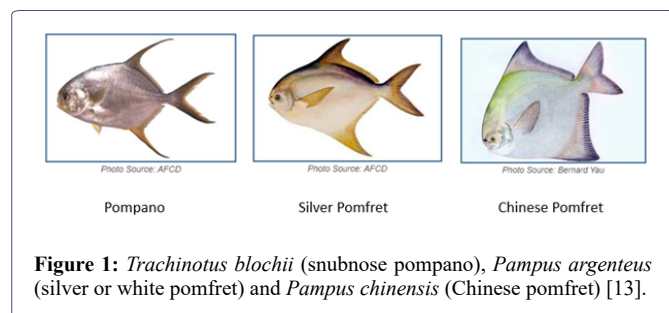


Figure 1: *Trachinotus blochii* (snubnose pompano), *Pampus argenteus* (silver or white pomfret) and *Pampus chinensis* (Chinese pomfret) [13].

Trachinotus blochii, commonly known as snubnose pompano, or silver pompano is a high-value fish having good taste, few spines and high levels of Omega 3 fatty acids such as EPA and DHA in their meat. Its shape, coloration and meat quality are comparable with that of the silver pomfret and thus, it is much sought after in the international market. It is an ideal species for aquaculture due to its fast growth, good meat quality and high market demand [14-16].

Pampus chinensis (Chinese pomfret) is called 鷹鯧 in Chinese or Eagle Chong while *Pampus argenteus* (white or silver pomfret) is called 白鯧 in Chinese or Swallow Chong. Their names in Chinese are descriptive of their fins. They are species of butterflyfish belonging to the Family Stromateidae. Pomfret muscle is a source of high-quality protein with a well-balanced composition of essential amino acids [17]. Because of their tender meat and high nutritional content, pomfrets are elite marine fish food with great market demand worldwide [18-20].

Data on the total weight (tons) of fish captured and traded through the Fish Marketing Organization (FMO) in Hong Kong from 1947 to 2019 were obtained from the FMO Annual Reports [21]. These are presented in Figure 2.

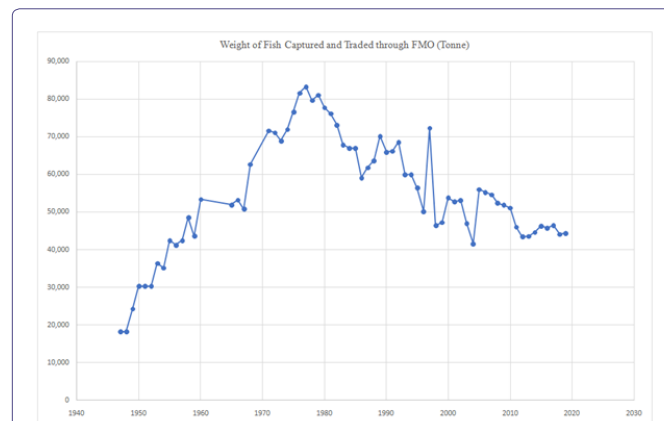


Figure 2: Total weight (tons) of fish captured and traded through the Fish Marketing Organization in Hong Kong from 1947 to 2019 [21].

Daily average wholesale prices of pompano, Chinese pomfret and white pomfret were obtained from FMO for the period from 3 September 2020 to 2 September 2021 [22]. These are shown in Figure 3. FMO uses *Stromateoides sinensis* and *Stromateoides argenteus* as the scientific names for Chinese pomfret and white pomfret respectively. These are synonyms of *Pampus chinensis* and *Pampus argenteus*, respectively. FMO wholesale prices of pompano are for live marine products while those for Chinese pomfret and white pomfret are for fresh (chilled) marine fish.

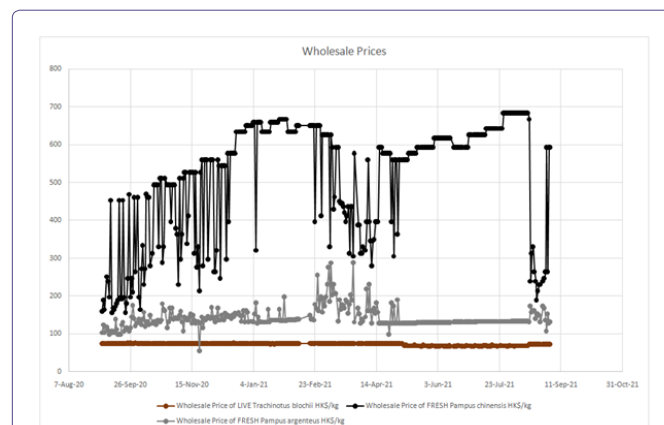
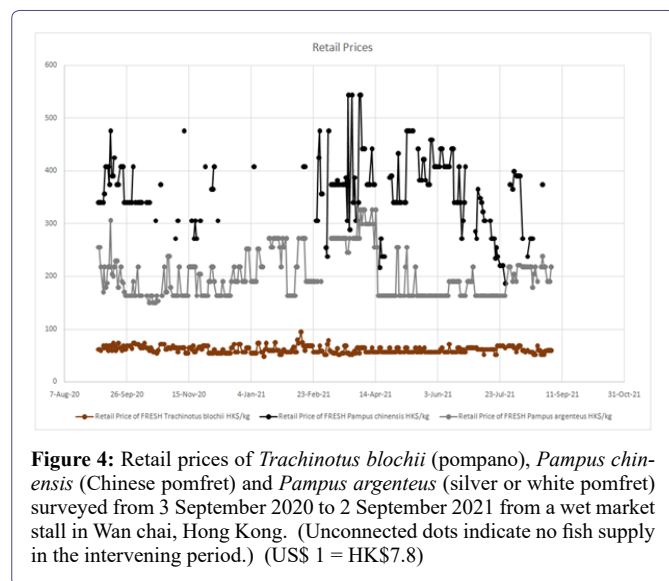


Figure 3: Wholesale prices of *Trachinotus blochii* (pompano), *Pampus chinensis* (Chinese pomfret) and *Pampus argenteus* (silver or white pomfret) surveyed for the period 3 September 2020 to 2 September 2021 [22]. (US\$ 1 = HK\$7.8)

Retail prices of pompano, Chinese pomfret and white pomfret were surveyed daily for one year, from 3 September 2020 to 2 September 2021, at a fish stall in the wet market in Wan chai, Hong Kong. Only medium-sized fish were surveyed. The retail prices can be seen in Figure 4.

Results

Figure 2 presents the total weight (tons) of all fish captured and traded through the Fish Marketing Organization in Hong Kong for



the period from 1947 to 2019. There was an increasing trend in the number of fish captured and traded from 1947 until the mid-1970's. After that, fish landing was erratic but decreased steadily from 83,283 tons in 1977 to 44,363 tons in 2019.

Figure 3 shows the average wholesale prices of pompano, Chinese pomfret and white pomfret. Wholesale prices of pompano were relatively constant, fluctuating slightly between HK\$67 - HK\$76/kg over the period of study.

Wholesale prices of white pomfret reflect minor variations with a slight increasing trend in the first half of the survey year. Prices varied between HK\$55 - HK\$289/kg over the survey year. From May 2021 to August 2021, wholesale prices of white pomfret remained relatively steady at HK\$ 128 - HK\$134/kg.

In contrast, wholesale prices of Chinese pomfret indicate high volatility but an overall increasing trend is still readily observable. Peaks in the Chinese pomfret graph ranged from HK\$454 - HK\$685/kg while troughs ranged from HK\$157 - HK\$330/kg.

Looking at the average wholesale prices over the whole year, pompano was the cheapest, with a yearly mean of HK\$72/kg and Chinese pomfret was the most expensive, with a yearly mean of HK\$513/kg. White pomfret's wholesale price was intermediate, with a yearly mean of HK\$142/kg.

Figure 4 presents the retail prices of pompano, Chinese pomfret and white pomfret. Retail prices of pompano showed minimal variation and varied from HK\$48 - HK\$95/kg.

In contrast, retail prices of Chinese pomfret and white pomfret reflect greater price volatility, more marked for Chinese pomfret. Retail prices for Chinese pomfret fluctuated between HK\$187 - HK\$544/kg while those for white pomfret ranged from HK\$150 - HK\$326/kg.

It is notable that the supply of Chinese pomfret in the retail market was highly irregular. In September 2020, there were 3 days when there was no supply of Chinese pomfret in the retail market. These no supply days increased to 15 and 17 days in the next two months and to 23 and 25 days in December 2020 and January 2021. Starting in February 2021, Chinese pomfret started returning to the retail market although there continued to be periods of no supply at intermittent intervals until the end of the survey year.

Similar to Chinese pomfret, white pomfret also had days of no supply in the retail market. However, these were only 18 days in total over the whole survey year. In contrast to Chinese pomfret and white pomfret, pompano was consistently available in the retail market throughout the year.

Looking at the retail prices over the whole year, pompano was the cheapest, with a yearly mean of HK\$61/kg and Chinese pomfret was the most expensive, with a yearly mean of HK\$363/kg. White pomfret's retail price was intermediate, with a yearly mean of HK\$201/kg.

Average wholesale prices of pompano and Chinese pomfret were higher than their respective retail prices but the converse was true for the white pomfret. Considering both wholesale and retail prices, Chinese pomfret was around 6 - 7 times more expensive than pompano while white pomfret was around 2 - 3 times more expensive than pompano.

Table 1 shows the wholesale and retail price differentials for cultured fish price as a percentage of wild-caught fish price. Both wholesale and retail price differentials fluctuated over the year but no clear trend may be observed. Variations in the wholesale price differentials did not show the same pattern as variations in the retail price differentials. For pompano price as a percentage of Chinese pomfret price, the yearly mean wholesale and retail price differentials were similar (16.4% and 17.3% respectively) but for pompano price as a percentage of silver pomfret price, the yearly mean of the wholesale price differential was nearly double that of the retail price differential (52.2% and 31.3% respectively). Looking at the ranges of the price differentials, wholesale and retail price differentials for pompano price as a percentage of Chinese pomfret price were lower than those for pompano price as a percentage of silver pomfret price. Yearly mean coefficients of variation for wholesale and retail pompano price/silver pomfret price were low (11.4% and 14.0% respectively) as was that for pompano/ Chinese pomfret retail price (16.1%). These low values for the coefficient of variation indicate little variability about the mean price differentials. In contrast, the yearly mean coefficient of variation for wholesale pompano price/ Chinese pomfret price was greater than that for the corresponding retail price (24.9% vs. 16.1%), indicating greater dispersion around the mean price differentials.

Discussion

The present study sheds some light on three important global phenomena. First, the depletion of ocean fishery resources. Second, aquaculture as a rising industry and third, the international quest for sustainability. The discussion below demonstrates that the first phenomenon is a form of the tragedy of the commons, the second a solution to that tragedy and the third has an aquacultural dimension.

Depleting Fish Stocks

Hong Kong's big appetite for seafood is well-known. No Chinese meal or banquet is complete without seafood, especially on important Chinese festivals like the Spring Festival (Lunar New Year) or the Winter Solstice Festival. Although Hong Kong only has 7.6 million residents in a 1,106 sq. km. territory [23], it has the second highest per capita consumption of seafood in Asia and is the eighth largest seafood consumer in the world [24]. Hong Kong's per capita consumption of seafood is 71.6 kg which is about 4.1 times higher than the global average (18.9 kg) and double that of mainland China [25-27].

	Pompano price / Chinese pomfret price				Pompano price / silver pomfret price			
	Wholesale Prices		Retail Prices		Wholesale Prices		Retail Prices	
	Mean %	CV %	Mean %	CV %	Mean %	CV %	Mean %	CV %
2020								
Sept	34.4	30.1	17.4	10.5	65.2	12.8	32.7	18.6
Oct	20.4	38.4	19.3	6.2	53.8	10.9	37.4	12.7
Nov	18.5	33.1	19.5	16.1	56.6	27.6	35.4	14.9
Dec	15.0	37.0	15.6	9.1	50.7	7.0	31.1	9.0
2021								
Jan	11.7	18.4	*	*	53.2	9.4	25.0	12.3
Feb	12.2	17.2	15.9	13.8	49.3	14.8	32.0	16.6
Mar	15.9	23.4	16.3	23.4	39.9	19.0	21.4	13.0
Apr	17.2	27.0	17.0	27.8	51.9	17.3	27.8	29.5
May	12.1	13.9	14.6	14.9	52.7	6.1	33.5	11.1
Jun	11.1	2.6	15.4	15.3	51.5	1.2	34.1	7.4
Jul	10.5	3.4	22.4	23.1	51.1	1.3	36.6	10.4
Aug	18.0	54.5	18.7	16.8	50.1	9.6	28.4	12.8
Yearly Mean	16.4	24.9	17.3	16.1	52.2	11.4	31.3	14.0
Range	9.8 - 47.1		9.4 - 34.5		25.6 - 134.5		17.2 - 44.8	

Table 1: Mean, Coefficient of Variation (CV) and Range of wholesale and retail price differentials for pompano price as a percentage of Chinese pomfret price and pompano price as a percentage of silver pomfret price.

* Only one data point for this month

In view of this great local demand for seafood, it is no wonder that Hong Kong fisheries are over-exploited. Figure 2 shows that the total weight of fish captured and traded at the Fish Marketing Organization increased from 1947 to the mid-1970's reflecting the response of fishing effort and trade to the growing population and the greater demand for fish. In addition, since the 1950's, the government has introduced new technology, encouraging mechanization of the fishing vessels, thus increasing fish catch [28]. However, fish landing declined dramatically from 1977 to 2019, with the total weight of fish captured and traded in 2019 being approximately half of that in 1977. Many species of groupers, the yellow croaker, the giant croaker and a variety of reef fishes that used to be abundant have disappeared from commercial fishery catches [28]. While coastal development such as reclamation, dredging, dumping, industrial and domestic effluent play a part in threatening marine resources [29], the main reason for the decline is intensive and largely unregulated fishing [28]. Clearly, fishery resources in Hong Kong are getting depleted and capture fishery is under severe pressure to supply enough fish for consumption for the growing population.

[30] reported that the live reef food fish trade in Hong Kong was in difficulties because the supply of wild-caught, market-sized fish was dwindling. According to [34], up till the 1980s, live reef fish consumed in Hong Kong were caught in local waters and in the northern part of the South China Sea. However, as stocks have been getting overfished and the demand for the desired fish species has continued unabated, Hong Kong has resorted to importing fish from countries such as the Philippines, Indonesia, the Maldives, Australia and the western Pacific [30-32]. So much so that now, Hong Kong has become the major importer of live reef fish for food in Southeast Asia and globally [25, 31, 33].

As observed in the present study, wholesale prices of Chinese pomfret showed an increasing trend up to as much as HK\$685/kg (Figure 3). As the wholesale prices are dictated not only by the size of the fish but by the economics of supply and demand, this high price suggests reduced supply in the face of constant high demand. The low supply would be consistent with the overfished state of Hong Kong fisheries, as discussed above. As a result, in the market stall surveyed in this study, there was often no supply of Chinese pomfret, especially in the first half of the survey year (Figure 4). Starting in February 2021, the retail market started to have Chinese pomfret again available for sale. The supply of Chinese pomfret came not from locally caught fish but were fish imported from China.

Aware of the deteriorating state of the local fisheries, the Government of the Hong Kong SAR, through the Agriculture, Fisheries and Conservation Department (AFCD), has been implementing a series of fisheries management measures for the conservation of marine resources and the promotion of sustainable development of the fishing industry. To curb overfishing and to avert the tragedy of the commons, the government has set up a registration system for local fishing vessels, limited the entry of new fishing vessels, maintained an appropriate level of fishing effort, restricted fishing with non-fishing vessels and prohibited fishing with non-local fishing vessels. In addition, the government has prohibited destructive fishing practices such as the use of explosive, toxic substances, electricity, dredging and suctioning devices. It has imposed a statutory ban on trawling in Hong Kong waters so that damaged seabed and depleted marine resources can rehabilitate as soon as possible. It has also implemented an artificial reef project to enhance fisheries resources and promote biodiversity in Hong Kong's marine environment [34].

Together with these fisheries management measures, the government of the Hong Kong SAR has also been promoting aquaculture

since the late 1960's [35, 36]. Aquaculture in Hong Kong includes marine fish culture, pond fish culture and oyster culture. Common fish species under culture include green grouper, brown-spotted grouper, giant grouper, Russell's snapper, mangrove snapper, gold-lined seabream and star snapper. In 2020, aquaculture production was 3,322 tons valued at \$127 million, which was 3 percent in weight and 4 percent in value of the total fisheries production [37].

Pompano is one of the fish species under culture in Hong Kong. Farming of pompano ensures a steady supply of the fish which explains the remarkable stability of its wholesale and retail prices (Figures 3 and 4). In contrast, Chinese pomfret and silver pomfret are wild-caught. Due to overfishing, stocks of these fish have been declining and fish catch is irregular. The unreliable supply of Chinese pomfret and silver pomfret explains why their wholesale and retail prices show high volatility (Figures 3 and 4). In the case of silver pomfret, their wholesale prices stabilized at HK\$128 - HK\$134/kg in May 2021 to August 2021. The reason for this was the import of cultured silver pomfret from China and the annual fish moratorium in the South China Sea.

Silver pomfret has been cultured in China since 2005 [38-40]. Being a farmed species, supply is regular in contrast to the supply of wild-caught fish. Thus, prices of farmed silver pomfret were stable. The annual fish moratorium further explains why imported fish from China was being sold at the fish market. This annual three and a half month fishing ban from May till mid-August aims to conserve fisheries resources and promote sustainable development of the fisheries industry. During this period, all fishing operations except mono-layer gill-netting and lining are suspended in the South China Sea [41-43].

Aquaculture as a Property Rights Solution to the Tragedy of the Commons

The institution of exclusive property rights, whether communal or private, could be a way to avoid the tragedy of the commons popularized by [4]. In the marine environment, one way of establishing property rights is through aquaculture. In the marine commons, fish come and go but marine fish culture encloses the fish in cages suspended by floating rafts to which owners can be assigned. Thus, from a legal perspective, mariculture turns a common property (fish) into private property which could provide a solution to the tragedy of the commons [36, 44, 45].

[46] uses a property rights index to contrast the strength of the property rights associated with open access fishing and intensive aquaculture. The Index is based on the transferability, exclusivity, security and durability of the property right and the index of economic freedom in the country. He provides three examples (the salmon, lobster and shrimp industries) as empirical support of how the strong property rights of aquaculture systems are closely related to their degree of control of the environment, production and marketing systems.

In Hong Kong, the enactment of the *Marine Fish Culture Ordinance* in 1980 led to the gazetting of 24 Marine Fish Culture Zones. These Marine Fish Culture Zones could be regarded as measures to establish private property rights over marine water by zoning. Statutory regulations for marine fish capture and marine fish culture differed along several dimensions of property rights including access to fisheries resources, initial allocation of rights to fisheries resources, subsequent reallocation of rights to privatized/ private fisheries

resources to retailers, direct and indirect government assistance to efforts and regulation of efforts. By designating part of an open access area into a number of private areas, owners of a given private area have the incentive to invest in fish culture activities for greater production capabilities and better sustainability. This resulted in a dramatic increase in the output of fish supplied to the area [36, 35].

The present study propounds that the problem of the dwindling wild harvest of Chinese pomfret and silver pomfret can be solved by having recourse to aquaculture. Pompano is farmed not only in Hong Kong but also in China, Taiwan, Singapore, Vietnam, Malaysia, Indonesia, Thailand, India and Florida [15, 16, 47, 48]. Farming of pompano can increase fish production in the face of growing demand for marine fish protein and limited scope for expanding wild fishery harvests. As a cultured fish, the supply of Pompano is stable. Its shape, coloration and meat quality are comparable to that of Chinese pomfret and silver pomfret. It is, therefore, a valuable alternative to wild-caught Chinese pomfret and silver pomfret. Increasing the consumption of pompano will reduce the fishing pressure on these over-exploited species and will give their stressed wild populations time to recover.

Another reason that calls for greater consumption of pompano is the price differentials of the three fish. Price differentials and percentages of pompano price over pomfret price are inversely related. The price differentials found in the present study were higher (i.e., the percentages were lower) compared to those found by [45] for 13 species of finfish surveyed from January 1988 to June 1992 and calculated as the yearly mean cultured fish price as a percentage of captured fish price. In the present study, yearly mean percentages of pompano/silver pomfret prices were 52.2 and 31.3%, for wholesale and retail prices, respectively. Yearly mean percentages of pompano/ Chinese pomfret were even lower, 16.4 and 17.3%, for wholesale and retail prices, respectively. In contrast, [45] found yearly mean percentages for the 13 species of finfish exceeded 60%. Interestingly, they even reported that for sea perch, red snapper, red pargo and gold-lined seabream, their cultured fish price as a percentage of their respective captured fish price was over 90% and even reaching 98% in two instances. Although the present data are not price differentials between cultured fish and their corresponding captured fish as in the study of [45], the results of this research do reflect the degree of difference in the prices of the fish.

The high price differentials of pompano/ silver pomfret and the even higher price differentials of pompano/ Chinese pomfret argue for more consumption of pompano. Not only would it mitigate the overexploitation of the Chinese pomfret and silver pomfret fisheries, but it would also be more economically advantageous for the consumer since the yearly mean retail price of pompano (HK\$61/kg) is almost six times cheaper than that of Chinese pomfret (HK\$363/kg) and around three times less than that of silver pomfret (HK\$201/kg).

Farming of pompano, therefore, can help solve the tragedy of the commons in Hong Kong. A similar triumph over the tragedy of the commons in Hong Kong through aquaculture was reported by [49] for the cultured Sabah Grouper over the wild-caught Leopard Coral Grouper.

Sustainability of Aquaculture

Aquaculture has been a solution to the tragedy of the commons due to overexploitation. Since 2016, aquaculture has been the main

source of fish available for human consumption worldwide, supplanting wild-caught fish. From only 4 percent in 1950, aquaculture's share has risen to 52 percent in 2018 and is expected to increase in the long term [3].

Although aquaculture can provide a solution to the tragedy of the commons due to overexploitation, it still needs to address the tragedy of the commons due to pollution [50]. There has been concern that aquaculture causes water pollution and contamination of bottom sediments. Elevated levels of organochlorine pesticides, polycyclic hydrocarbons, mercury, total organic carbon and other nutrients were detected in sediments from mariculture zones in comparison with those from non-mariculture areas. Contamination derived from uneaten fish feed (trash fish and feed pellet), fish excretion and the use of anti-fouling paints for maintaining fish cages. [51-53]. Poor water quality and red tides were also observed in marine fish culture zones [54]. Water pollution and sediment contamination not only has a negative impact on the environment but also adversely affects the health of the fish which can then, in turn, pose a risk to human health. Moreover, some aquaculture systems rely on supplies of wild-caught seed for grow-out in sea cages and make use of trash fish for feed. This exacerbates the problem of the exploitation of the ocean commons rather than mitigates it [55, 56].

The negative impact of aquaculture can be addressed through better environmental management, especially through the agency of governments which are the only entities with the authority to regulate aquaculture [57]. In Hong Kong, the government is aware of the environmental issues associated with marine fish culture and has been taking steps to address them. The Agriculture, Fisheries and Conservation Department (AFCD) has been regularly monitoring the water quality of fish culture zones and implementing a red tide monitoring and management program in order to minimize the impact of red tides and water quality deterioration on mariculture. It has been promoting an environmental management of mariculture program among fish farmers to encourage good mariculture practices in order to ensure good mariculture environment. One of these practices is fish feed management measures involving the use of dry pellet feed and balanced moist feed diet to replace trash fish. To reduce reliance on wild-caught seed, the Department has been conducting fish hatchery trials since 2008 and assisting local fish farmers in setting up local hatcheries and nurseries. In 2018, the hatchery in Ta Kwu Ling successfully produced pompano fry and workshops have been organized to transfer the hatchery technology to fish farmers. The government has also been encouraging fish farmers to join the Accredited Fish Farm Scheme [58, 37].

With regard to the sustainability of pompano, WWF reports that pompano is cultured in anchor-point floating net cage culture systems so that there is little impact on the seabed; no major regional viral and bacterial disease has been reported; chemical use is regulated and juveniles are hatchery-based. Although wild fish continues to be used as feed for this carnivorous fish, the government of the Hong Kong SAR has been promoting the use of dry pellet feed and balanced moist feed diet to replace trash fish among fish farmers. A more comprehensive strategic environmental planning would make pompano farming even more sustainable [59, 60].

Conclusion

The Hong Kong capture fishery has been overexploited and aquaculture can be a solution to the tragedy of the commons. Farming of

pompano can help satisfy the increasing demand for fish for a growing population with a huge appetite for fish while at the same time ease the fishing pressure on wild species like Chinese pomfret and silver pomfret. Continued efforts by the government to ensure the sustainability of pompano culture would aid pompano achieve its potential to be one of the fish for the future.

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