

NOBLE SCALLOP - *Mimachlamys nobilis*

The noble scallop *Mimachlamys nobilis* is a warm water species, sometimes also referred to as *Chlamys nobilis* in certain literatures. *M. nobilis* is primarily distributed in South China Sea, East China Sea, Eastern Japan and as far south as Indonesia, and is most abundant in Daya Bay from Guangdong Province (Guo & Luo, 2016).

According to FAO data, China dominates the scallop nei production globally (note the term 'nei' is used for scallops without sufficient information on species identification), and China produced 1,828,107 tonnes of scallop nei in 2019 (Table 1). Despite the large number, *M. nobilis* makes up only 3% of the total production in China, which is roughly 50,000 tonnes per year (Guo & Luo, 2016). Culturing of *M. nobilis* is also reported in Vietnam and Korea, but the production scale is minimal compared to that of China (Thu, 1999; Won et al., 2008).

Despite not being recorded by FAO, Japan is also home to a large-scale scallop industry, and produced 499,674 metric tonnes of Japanese scallop (*Patinopecten yessoensis*) in 2012 (Kosaka, 2016). Although the hanging culture for *M. nobilis* is industrialized in Japan, the production is not extensive and kept small as a subsidiary job for local fishermen (Kosaka, 2016).

Table 1. Scallop nei global aquaculture production from 2009 to 2019

Species		Scallops nei [Pectinidae]										
Measure		Tonne										
Year		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Country	Unit											
Canada	Tonnes	388	697	300	215	116	104	31	38	75	94	13
Norway	Tonnes	..	..	..	..	..	..	..	..	..	..	..
United States	Tonnes	0	0	0	0	0	0	..	..	..	..	..
Non-OECD Economies	Brazil Tonnes	..	..	..	..	..	..	..	..	..	..	..
	China (People's Republic of) Tonnes	(£) 1 262 031	(£) 1 365 896	(£) 1 244 983	(£) 1 360 689	(£) 1 539 226	(£) 1 576 378	(£) 1 710 080	1 849 887	2 007 529	1 917 850	1 828 107

China began large-scale *M. nobilis* aquaculture in the 1980s, with extensive farming (2,400 hectares) being carried out along the Southern coast (Tan et al., 2020). Yet heavy mortalities of *M. nobilis* stock had been reported to occur recurrently and caused enormous economic losses (Ye et al., 2021). The exact cause for the mortalities was not determined.

China has also developed scallop hatcheries techniques since the 1970s (Guo & Luo, 2016). Currently the *M. nobilis* hatcheries can be found in multiple provinces, including Shandong, Guangdong and Fujian (Huang et al., 2011; Waterberg et al., 2018).

The scallop seedlings are normally cultivated in the sea with suspended techniques, usually the long line system or rafts. The juveniles would be cultured in a higher density, while in the final grow-out phase the scallops would be cultured in a lower density until reaching commercial size (Shumway, 2021).

Hong Kong

Noble scallop *M. nobilis* culture is a relatively new industry in Hong Kong. Wartenberg et al. (2018) explored the feasibility of culturing *M. nobilis* in existing fish farms and concluded that this industry is technically and economically feasible to operate in Hong Kong for both small and large-scale fish farms. The common practice for culturing *M. nobilis* is to put the seeds in lantern nets with multiple layers spread between one metre and three metres underwater (Figure 1), where there is an adequate supply of food close to the water surface, and to avoid the hypoxia zone that is more likely to occur in bottom waters during summer (Wartenberg et al., 2018; Law Kwong Choi, pers comms, February 15, 2022; Yin et al, 2011). The scallops can be harvested after being cultured for around one year.

Although the total output volume of *M. nobilis* in Hong Kong is yet to be known, one farmer purchased 300,000 seeds to culture, demonstrating that there are resources and manpower to handle a large number of seedlings to supply local/foreign markets (Law Kwong Choi, pers comms, February 15, 2022). Certain farms that culture *M. nobilis* are also under a review process of certification from a third-party organic organisation - Hong Kong Organic Resource Centre Certification Ltd (HKORC), which is accredited by the International Federation of Organic Agriculture Movements (IFOAM). The farm (s) will be assessed by HKORC for its aquaculture practises to see if it meets the criteria of an organic aquaculture production system. The risk assessment below refers to farms that are undergoing the review process for HKORC certification as well as other farms.

Figure 1. *M. nobilis* being cultured in a lantern net in Hong Kong



Risk Assessment

- Farm sitting: low risk
 - Farm locations are historic and there is minimal new development.
 - *M. nobilis* is cultured in existing floating fish farms in Tolo Channel and Sai Kung area. Most of these fish farms are not being operated for fish aquaculture anymore, or are just maintaining a low quantity of fish stock.

- Nutrient pollution: low risk
 - Operations do not cause nutrients to be released into the environment.
 - Scallops are known as filter feeders which lead to a net removal of nutrients from the water column, thus there is minimal nutrient pollution to the surrounding marine environment.
 - As the farms are part of the Hong Kong Government's Accredited Fish Farm Scheme (AFFS), the farmers are able to assess the live water quality monitoring data close to their fish farm area, a system installed by AFCD, which includes temperature, salinity and dissolved oxygen value in different water depths.
 - A small degree of pollution could be induced when removing the biofouling organisms from the scallop shells and leftovers are discarded back into the nearby area, which is done every two weeks to two months, depending on farmer practices and seasons.
 - Certain local fish farmers are exploring the polyculture technique by culturing the scallop with *Sparus aurata*, a commercial bream species that could consume the fouling organisms growing on the surface of lantern nets with scallops inside, which has found to be effective and has reduced the amount of fish feed required at the same time (Law Gwong Choi, pers comms, February 15, 2022).

- Feed source: low risk
 - The farm does not use feed in its operations.
 - Scallops are known as filter feeders, therefore the culturing of *M. nobilis* does not require any extra feeds.

- Disease, medicine and chemicals: low risk
 - Currently there are no reports on any use of chemicals or medicines involved in the *M. nobilis* culture practices in Hong Kong.
 - Most *M. nobilis* farms in Hong Kong are part of the Accredited Fish Farm Scheme (AFFS) initiated by the government, which provides disease prevention and treatment guidelines.

- Introduction / genetics: low risk
 - The farm operation does not pose a risk to native species/ populations, as the species is already native to the country AND farmed species genetics are unlikely to establish in the wild.
 - *M. nobilis* is native to the region around Hong Kong.

- All Hong Kong *M. nobilis* seeds were purchased from Southern China at a very low cost (around 5 cents per individual), where there are mature breeding and nursery programmes, and also related expertise (Law Gwong Choi, pers comms, February 15, 2022).
- No evidence of genetic contamination from cultured to wild populations so far (Ma et al., 2021).

- Wild seed: low risk
 - The operation does not rely on the collection of wild seed. i.e., the seed comes from second generation broodstock in closed loop hatchery production.
 - Ma et al. (2021) found evidence that the seeds from China were produced by mixing broodstocks from different culture zones, and also strong differentiation of genetic structure between wild and culture populations, suggesting the seedling production in China is self-sufficient.

- Welfare: low risk
 - The operation demonstrates good animal husbandry appropriate to the cultivated species.
 - As the farms are part of AFFS, the farmers are able to assess the live water quality monitoring data close to their fish farm area, a system installed by AFCD, which includes temperature, salinity and dissolved oxygen value in different water depths. Mass mortality events could be avoided, or minimized by monitoring these water parameters.
 - High mortality has occurred in the rainy season where heavy rainfall has dropped the salinity over a prolonged period. Certain local fish farmers move the scallop to water tanks on the fish farm during heavy rain periods to minimize mortality (Law Gwong Choi, pers comms, February 15, 2022).

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