

# China's Pearl Industry An Indicator of Ecological Stress

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作者描述中國珍珠產業，包括海水珍珠養殖業及淡水珍珠養殖業，目前所面對的各項壓力及挑戰。其中計有生態環保問題、海水污染問題、氣候問題、與其他產業的資源競爭現象、相對於其他產業的機會成本及回報對比和影響；並提及環球經濟對中國珍珠事業的衝擊，中國珍珠的品質及產量，對應於他國珍珠產品的比較。

China is the largest producer of cultured pearls in the world. But pearl farmers are now raising questions about their future as they are facing increasing ecological problems and are being excluded from industrialisation strategies. The country has a long and rich history in pearls from saltwater oysters and freshwater mussels. The region of Hepu and Behai had active marine pearl fisheries as early as the Han Dynasty (3rd century AD) (Southgate and Lucas, 2008) and reports of pearl finds in rivers and lakes date back to the 3rd millennium BC (Strack, 2006).



**Fig. 1** Chinese freshwater cultured pearls.  
*Photo: Laurent Cartier*



**Fig. 2** Grading of Akoya cultured pearls at Liu Sha pearl processing centre.  
*Photo: Laurent Cartier*

China became the largest producer of cultured pearls worldwide in the 1980s. In 2010, it produced 20 tonnes of marine cultured pearls from the Akoya oyster and a staggering 1500 tonnes of freshwater cultured pearls (Figs. 1 and 2) (Wiesauer, 2012). In comparison, Australia produced ca. 4.5 tonnes of South Sea marine cultured pearls in the same year (Anon., 2011). Chinese cultured pearls have long been associated with mass production, low value and relatively low qualities. Recent developments, however, suggest this is changing.



**Fig. 3** Xunliao pearl farm in Guangdong Province.  
*Photo: Laurent Cartier*

Marine pearl oysters are cultivated in the coastal waters of Guangxi and Guangdong (Fig. 3) whereas freshwater pearl mussels are farmed in rivers, ponds and lakes in Zhejiang, Jiangsu, Hunan and Anhui provinces (Strack, 2006). Juvenile oysters and mussels for culture are obtained through hatcheries, reducing the impact on natural populations. Whereas marine oysters can produce one or two cultured pearls at a time, freshwater mussels can produce 30-50 cultured pearls (Akamatsu et al., 2001). This also explains why freshwater cultured pearls are so much cheaper.

Although very different in their ecologies and production practices, the waters of these molluscs share common threats and opportunities. As the production of pearls continues to rise and intensify, and rapid economic development increasingly reaches these pearl producing regions, problems - largely of an environmental nature - loom.

### Pearls and paddies

The vast majority of freshwater mussels are cultivated in old rice paddies that have been excavated and flooded to become artificial lakes (usually 2-3 metres deep) for cultivation (Fig. 4). Mussels remain in these ponds for five years before they are harvested for their pearls.

The ponds are enriched with manure or animal wastes to produce as much algae (the phytoplankton food source of mussels) as possible and filter-feeding carp are added to the ponds, to improve food quality for the mussels. In their symbiotic relationship with the freshwater mussels, the carp filter phytoplankton and prevent potential eutrophication and algal blooms (Wiesauer, 2012). However, these steps can lead to nutrient impoverishment of soils and waters. In one case in 2007, pearl mussel farming was temporarily banned in Hubei province because of concerns with the levels of manure and fertilizer used in pearl production (Xinhuanet, 2007).

On the one hand, freshwater pearl farming requires clean water and is affected by pollution

from surrounding activities (e.g., farming, construction, wastewater). On the other hand, it too, if not responsibly managed, can engender ecological problems. As one pearl farmer puts it, “we need to keep a Confucian balance with nature - that is the traditional Chinese way.”



**Fig. 4** Pearl farming activity around Changde.  
*Photo: Laurent Cartier*

In Zhuji (250 km from Shanghai), the birthplace of modern freshwater pearl mussel cultivation, many pearl farmers have either ceased pearl production (for more lucrative alternatives) or shifted production to less densely populated and less polluted waters in central China (e.g., Hunan province). In light of the rapid development of the Zhuji region, government has even begun paying pearl farmers to relocate. Zhuji remains an important pearl centre, as many former farmers have climbed up the value chain to become traders, wholesalers and jewellery manufacturers (Sun et al., 2007).

### Oceanic sensitivity

Marine pearl oysters are much more sensitive than their freshwater cousins and the farmers cultivating them are much more aware of issues such as carrying capacity and the influence of external pollution on oysters. A collapse of the ecosystem would also mean the collapse of their livelihoods, and in great contrast to other industries, this becomes apparent immediately because oysters are quick to react. Even slight ecological modifications can have important adverse effects on the oyster's ability to function and secrete mother-of-pearl.

Coastal regions of China have experienced intense economic development (Fig. 5), construction and industrialization, and it is here that pearl farms are slowly being forced out. In many cases, local governments' priorities are large-scale commercial developments.



**Fig. 5** Area around Liu Sha Pearl farm, where pearl farmers have to co-habit with other aquaculture activities.

*Photo: Laurent Cartier*

In Daba Bay (Guangdong) high heavy metal concentrations reflect strong and rapid coastal development, associated with a lack of appropriate environmental management (Chen et al., 2010). This is affecting marine organisms. In the Beibu Gulf, reports of chemical pollution and elevated antibiotics concentrations reflect intense use - e.g., construction, fish farming, farming, mining, refineries, shrimp farming - of water resources in a region that has a long pearling tradition.

A 2003 United Nations Environment Programme study in the Beibu region showed that whilst in 1974 1.25 kg pearls were produced per 10,000 shells, this was only 0.175 kg/10,000 shells in 1999 (UNEP, 2003). A primary factor of this change was worsened water conditions.

“There is not enough space and natural capital to support a thriving pearl sector and lots of industry in coastal China,” says a pearl farmer in Guangdong province. This does not bode well for the future of Chinese pearls. Marine pearl oysters are more prone to environmental change than freshwater mussels. Marine pearl farmers are already beginning to migrate

to cleaner waters in Vietnam, Philippines or Indonesia because of too much pollution in China.

### **Economic imperative**

The recent global economic crisis had a large effect on the Chinese pearl industry. The overproduction of low-quality freshwater cultured pearls coupled with low demand and spiralling prices for these pearls, has meant that many pearl farmers could no longer cover their production costs. A number of farmers have decided to quit the activity choosing to move into more lucrative economic activities (e.g., manufacturing, property development, fish aquaculture).

Consolidation of the industry is underway and with it comes the question of how pearl qualities can be improved. The quality of a pearl is defined by the techniques of the farmer and environmental parameters of the host waters.

Fundamentally, pearl farmers can improve both pearl quality and profits through cleaner production. Whereas a farmer can choose to adopt sound environmental practices, he is not the master of his destiny in terms of controlling external pollution.

Presently, pollution and competition for water resources present more risk for a pearl farmer than the longer-term effects of climate change and ocean acidification (Welladsen et al., 2010). Arguably, local problems can be better quantified and regulated than globally influenced environmental ones. Ultimately, these external sources of pollution can only be regulated and managed at a regional level but this challenges authorities to take these issues more seriously. China has many laws on the books but enforcement in remote areas is difficult and local officials remain beholden to industrial patronage.

A recent article puts forward that “China’s pearl industry is a microcosm of how the country is moving beyond low-wage jobs and imitating foreign producers” (New York Times, 2011).

However, the pressures of rapid industrialisation are evident in pearl farming areas of Hunan, Guangxi or Guangzhou. Unconstrained growth and associated consequences might well impede improvements in pearling practices, pearl profits and ultimately the future of the Chinese pearl industry (Zheng et al., 2012).

Pearl farming is characterised by two trends, which are also central to the development trajectory of modern China. Firstly, that quality and profits (of pearls) can only rise through cleaner production and innovation. Secondly, that short-term pollution is bound to have serious long-term consequences. Because pearl molluscs are good environmental indicators, these dynamics are becoming much more visible and evident today (Li et al., 2012). The sector is not only a microcosm of China's socio-economic rise but also emblematic of many environmental issues surrounding coastal and inland development.

The country is set to become the largest jewellery market in the world by 2015 (Reuters, 2012). The hope is not only that its millennial pearling tradition can continue to innovate and prosper, but also that its pearls can provide an impetus for raising environmental awareness in China.

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#### **References**

- Akamatsu, S., Zansheng, L. T., Moses, T. M., Scarratt, K., 2001. The current status of Chinese freshwater cultured pearls. *Gems & Gemology*, 37, 2, 96-113.
- Anon., 2011. SPC Pearl Oyster Information Bulletin, 19, 11-12.
- Chen, T. R., Yu, K. F., Li, S., Price, G. J., Shi, Q., Wei, G. J., 2010. Heavy metal pollution recorded in Porites corals from Daya Bay, northern South China Sea. *Marine environmental research*, 70(3), 318-326.
- Li, F., Liu, Y., Chen, G., She, Z., Wu, K., 2012. Petroleum Hydrocarbon Content in Oyster and Purifying Effect of Mangrove in Mangrove Plantation-Aquaculture Coupling Systems. *Chinese Journal of Applied & Environmental Biology*, 18, 3, 432-437.
- New York Times, 2011. Pearls, Finer but Still Cheap, Flow From China- 01.08.2011. Accessed 15.05.2013 [http://www.nytimes.com/2011/08/02/business/global/chinas-high-quality-pearls-enter-the-mass-market.html?\\_r=1&pagewanted=all](http://www.nytimes.com/2011/08/02/business/global/chinas-high-quality-pearls-enter-the-mass-market.html?_r=1&pagewanted=all)
- Reuters, 2012. Jeweler Chow Tai Fook profit jumps on Chinese demand. Accessed 15.05.2013. <http://www.reuters.com/article/2012/06/26/us-chowtaifook-earnings-idUSBRE85P0H820120626>
- Southgate P.C., Lucas J.S., 2008. *The Pearl Oyster*. Elsevier, Oxford, 574pp.
- Strack E., 2006. *Pearls*. Stuttgart: Rühle-Diebener-Verlag, Stuttgart, 707pp.
- Sun, T.T., Brown G., Liping, L., 2007. Freshwater cultured pearl from China. Poster presented at 1st International Pearl Convention, Dubai (UAE) 18-22 Nov. 2007.
- UNEP, 2003. Final Report of Review of China National Mangrove Economic Values. Report by UNEP/GEF Regional Working Group on Mangroves. United Nations Environment Programme (UNEP) publication, Bangkok, Thailand, 14pp.
- Welladsen H.M., Southgate P.C., Heimann K., 2010. The effects of exposure to near-future levels of ocean acidification on shell characteristics of *Pinctada fucata* (Bivalvia: Pteriidae). *Molluscan Research*, 30, 3, 125-130.
- Xinhuanet, 2007. Central China bans pearl farming to restore water quality. Accessed 15.05.2013 [http://news.xinhuanet.com/english/2007-08/11/content\\_6515102.htm](http://news.xinhuanet.com/english/2007-08/11/content_6515102.htm)
- Wiesauer G., 2012. Chinas Süßwasser-Zuchtperlen. *Gemmo News-Österreichische Gemmologische Gesellschaft* 09/2012, 33, pp. 4-14.
- Zheng, Q., Zhang, R., Wang, Y., Pan, X., Tang, J., Zhang, G., 2012. Occurrence and distribution of antibiotics in the Beibu Gulf, China: Impacts of river discharge and aquaculture activities. *Marine Environmental Research*, 78, 26-33.