

Xuwen, harvest approximately 9-10 tonnes of pearls annually; Akoya pearl production from Hainan Province is less than one tonne (A. Wang, pers. comm., 2007).

China produced 5-6 tonnes of marketable cultured marine pearls in 1993 and this stimulated Japanese investment in Chinese pearl farms and pearl factories. Pearl processing is done either in Japan or in Japanese-supported pearl factories in China. The majority of the higher quality Chinese Akoya pearls are exported to Japan. Additionally, MOP from pearl shells is used in handicrafts and as an ingredient in cosmetics, while oyster meat is sold at local markets.



Pearl farm workers clean and sort nets used for pearl oyster culture on a floating pontoon in Li'an Bay, Hainan Island, China.

India and other countries

India began Akoya pearl culture research at the Central Marine Fisheries Research Institute (CMFRI) at Tuticorin in 1972 and the first experimental round pearl production occurred in 1973. Although a number of farms have been established, particularly along the southeastern coast, commercial pearl farming has not become established on a large scale (Upare, 2001). Akoya pearls from India generally have a diameter of less than 5-6 mm (Mohamed *et al.*, 2006; Kripa *et al.*, 2007).

Halong Bay in the Gulf of Tonking in Viet Nam has been famous for its natural pearls for many centuries (Strack, 2006). Since 1990, more than twenty companies have established Akoya pearl farms in Viet Nam and production exceeded 1 000 kg in 2001.

Akoya pearl culture has also been investigated on the Atlantic coast of South America (Urban, 2000; Lodeiros *et al.*, 2002), in Australia (O'Connor *et al.*, 2003), Korea (Choi and Chang, 2003) and in the Arabian Gulf (Behzadi, Parivak and Roustaian, 1997). However, information on commercial production of cultured pearls from these regions is not yet available.



Young women clean pearl oysters and culture equipment from boats in Li'an Bay, Hainan Island, China.

Winged pearl oysters, *Pteria* spp.

The common name "winged pearl oyster" relates to the elongated hinge of *Pteria* spp. There are numerous species of *Pteria* but only two, *Pteria penguin* and *Pteria sterna*, are used for commercial scale pearl culture. *Pteria penguin* is cultured throughout Southeast Asia, in Australia and in some Pacific island nations (Beer and Southgate, 2000) and *P. sterna* is commercially cultured in the Gulf of California, Mexico (Kiefert *et al.*, 2004; Ruiz-Rubio *et al.*, 2006). *Pteria* spp. are generally used for mabé pearl (also called half pearl or blister pearl) culture and less commonly for round pearl culture. It is generally acknowledged that this is more difficult to achieve with *Pteria* spp. than



Shell of *Pteria penguin* with mabé pearls. The pearls will be drilled from the shell for processing.

Pinctada spp. as a result of morphological differences between genera. Only in recent years has successful production of round pearls from *Pteria* spp. been reported (Farell *et al.*, 1998; Yu and Wang, 2004).

Pteria penguin

Pteria penguin is the most widespread cultured winged pearl oyster. It is readily collected using spat collectors although hatchery production has been described (Beer, 1999; Yu and Wang, 2004).

In the 1950s, Japanese companies began using *P. penguin* (called “mabé gai” in Japanese) on the Ryukyu Islands for production of mabé pearls. There are currently three or four companies in Ryukyu producing approximately 200 000 pearls per annum (Hisada and Fukuhara, 1999) from hatchery produced oysters.

Pteria penguin is widely distributed along the southern coast of China where it is used for hatchery-based pearl culture (Yu and Wang, 2004). Three companies have been established at Hainan Island and Leizhou Peninsula for cultivation of mabé pearls from *P. penguin* (Yu and Wang, 2004) and round

pearls have also been produced from this species at Hainan Island.

The two major pearl farms at Phuket Island in Thailand were reported to hold 30 000 *P. penguin* for mabé production in addition to a number of smaller family farms that also produce mabé from *P. penguin* (Bussarawit, 1995). *Pteria penguin* collected as natural spat are used for production of mabé in Vava'u islands, Tonga (Finau, 2005).

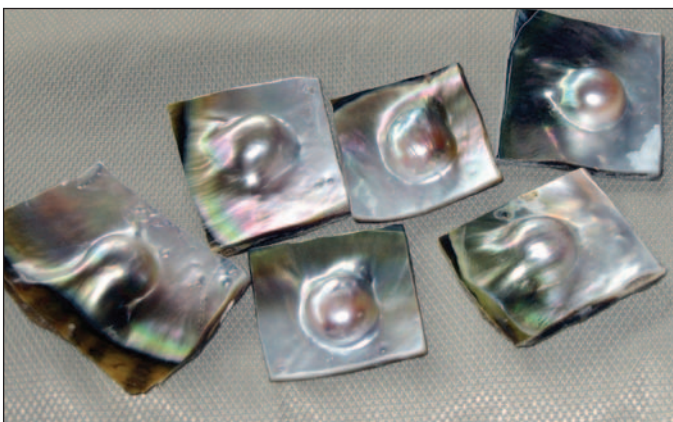
Pteria sterna

There has been regular production of pearls, both mabé and round pearls, from *P. sterna* in Mexico since 1993. Development of a seeding technique for round pearl production from *P. sterna* was a breakthrough for the cultured pearl industry in Mexico (Nava *et al.*, 2000) and research has also been carried out to determine factors that influence the quality of mabé pearls from this species (Ruiz-Rubio *et al.*, 2006). The mabé are in the range of 12-15 mm and round pearls are generally sized between 6.5-8.5 mm, but may reach up to 14 mm. Current production is approximately 4 000 round pearls and 8 000 mabé annually.

Natural spatfall of *P. sterna* can supply the oysters currently required by commercial pearl farms in Mexico. However, hatchery production of this species has been described (McAnally-Salas and Valenzuela-Espinoza, 1990; Araya-Nuñez, Ganning and Bueckle-Ramirez, 1995) as well as factors influencing nursery culture (e.g. Monteforte and Garcia-Gasca, 1994).

Other *Pteria* species

Pteria colymbus has recently been the subject of research in Venezuela and Colombia (Marquez *et al.*, 2000;



Mabé pearls produced from *Pinctada magraritifera* in Tanzania, east Africa.

Lodeiros *et al.*, 1999), where it could be used to produce cultured round pearls of a size similar to Akoya.

Summary

The global cultured pearl industry is diverse in its methods, technological levels and products. In French Polynesia, oysters can be easily collected using spat collectors. This provided the opportunity for pearl culture to expand through the establishment of small-scale or family-based farms. An individual, or family, can enter the industry at a number of levels. They may simply collect spat for sale to a larger pearl farm, grow pearl oysters for their MOP, or produce mabé or round pearls.

Furthermore, the pearl industry provides opportunity for the involvement of women and provides the raw materials for local handicraft manufacture, which may include lower grade pearls or pearl shell. In general, the pearling industry provides significant socio-economic benefits for coastal communities where it occurs (Tisdell and Poirine, 2000).

In contrast to family-based ventures, the dominant companies within the industry are large, wealthy and highly mechanized, and many have active research programmes. Hatchery cultivation of pearl oysters offers opportunity for selective breeding and stock enhancement, yet this area of research has been slowly embraced by the pearling industry compared to other aquaculture industries. Indeed, the two largest cultured pearl industries, in Australia and French Polynesia, are based on oysters collected from the wild. Furthermore, we still have limited understanding of the respective influences of genetics and environment on pearl quality. The next step in the evolution of the cultured pearl industry will probably be based on development of appropriate selective breeding programmes and improved knowledge of the factors influencing pearl quality.

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Handicrafts made from lower grade pearls and pearl shell offer opportunities for income generation in coastal and island communities. The photograph shows participants in a pearl handicraft training workshop held in Kiribati, central Pacific.

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