

THE PEARL OYSTER IN FRENCH POLYNESIA: THE REVIVAL OF AN HISTORIC RESOURCE

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INTRODUCTION

For nearly two centuries export statistics have shown mother of pearl to be one of French Polynesia's major sources of wealth. Until about 1950 the exports of rough mother of pearl competed for second place with copra and vanilla, just behind phosphates, in the territory's overseas trade. In the most productive years exports exceeded a thousand tons, but fell drastically between 1975 and 1980 to less than ten tons. This fall-off in trade provides evidence of the extent to which stocks have been depleted due to poorly controlled fishing. From about 1970 it seemed that traditional Polynesian collecting by means of skin-diving was doomed as a result of the critical state of the oyster beds. However, at this time came the advent of pearl farming, providing new prospects for exploiting the resource. Since then there has been an expansion in farming and black pearl has become the territory's most important export.

The main constraint on pearl farming development has been the supply of healthy oysters for grafting. Experiments to breed oysters and to raise spat were unsuccessful, and because of this the whole industry has had to be based on stocks obtained from their natural habitat (wild stocks).

The farmers' needs can be supplied in two ways: by 'skin-diving' and 'spat collecting'. Skin diving is a traditional activity in which adult oysters are taken from their natural beds, whereas 'spat collecting' provides young animals which have to be farmed for three years before grafting.

The high risk of continued exploitation pressure on already exhausted stocks requires a strict policy to ensure the protection and the restoration of the oyster beds. The formulation and implementation of new regulations must be supported by an enhanced research effort to assess the remaining oyster populations around the productive islands. In addition, research is needed on the biology and population dynamics of the species. Research in these fields was initiated a few years ago by EVAAM and ORSTOM.

HISTORICAL EXPLOITATION OF THE RESOURCE

The first evidence for pearl fishing is provided by the cargo manifest of the schooner "Margaret" in the Gambier islands in 1802. Since the late nineteenth century the customs service has provided statistics on the quantities of mother of pearl leaving the territory.

These are of value in studying fishing trends in the past (Figure 1). Several periods can be seen on this graph:

- Until 1916 production was stable at around 300 to 650 tons per year.
- From 1917 to 1930 production fluctuated but it reached particularly high levels in 1919 (1200 tons) and 1924 (1350 tons).
- Between 1931 and 1940, production was generally low but recovered towards the end of the period, mainly due to the fall in Australian production which had been the most important in the world.
- Until around 1960 exports varied between 500 and 800 tons per year but over the last twenty years there has been a continuous decrease, particularly well marked from 1965, reflecting the decline in natural stocks which are no longer able to sustain the fishery.

A total of 45,000 tons of mother of pearl was exported between 1889 and 1980 and probably twice that amount in the periods before customs records were kept.

As far as we can know from historical narratives, the Polynesian lagoons were prodigiously rich before and even at the beginning of the exploitation. Even around 1920, non-divers could collect in very shallow water of the Hikueru lagoon as much 100 kg of mother of pearl per person per day. But this littoral material was of poor value and the fishermen very soon resorted to diving to seek for the best mother of pearl. Everybody knows that the Polynesians excel at skin-diving and they were able to exploit beds to a depth of 30 metres. Consequently, by 1950, in the same Hikueru lagoon, the best skin-divers could collect no more than 10 to 15 kg of mother of pearl per day.

The divers' main purpose was to collect the mother of pearl; the oysters were rapidly killed and the valves washed before drying. The real pearls that could be found during the cleaning process were a by-product of fishing. The little small stunted pearls, called puppy seeds or keshi by the Japanese, could be found in some of the opened oysters, but flawless black pearls, called '*Poe Rava*' in Polynesia, remained very rare, and only a few specimens were recovered each season. Such perfect black pearls obtained very high prices.

THE GROWTH IN PERLICULTURE

As a result of the success of pearl farming in Japan, Dr. Domard (from the fisheries office) initiated an experiment in grafting in 1963. This test occurred in Bora-Bora and was carried out with the assistance of Japanese technicians. The encouraging results obtained gave rise to several projects among which the Manihi farm was the first to be fully realised in 1972. During last fifteen years, the farms have spread out in the Tuamotu-Gambier archipelago and two types of factories have been established: private ones and cooperatives assisted by the fisheries office. The increase in the number of farms has been remarkable: from eight private factories and eight cooperatives in 1981 to 24 private and 91 cooperatives in 1986. Private farms account for most of the pearl production; the proportion they produce cannot be accurately determined but is thought to be about 80%.

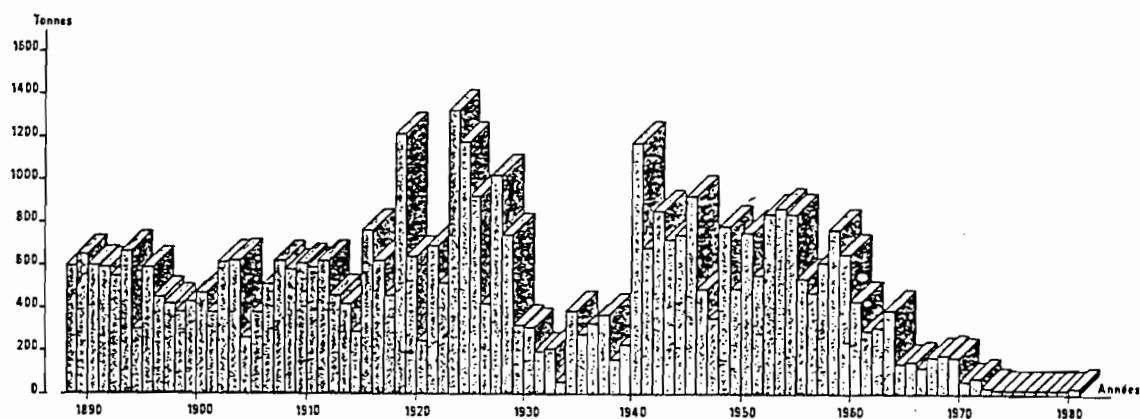


Figure 1: Rough mother of pearl exports, (from Customs data)

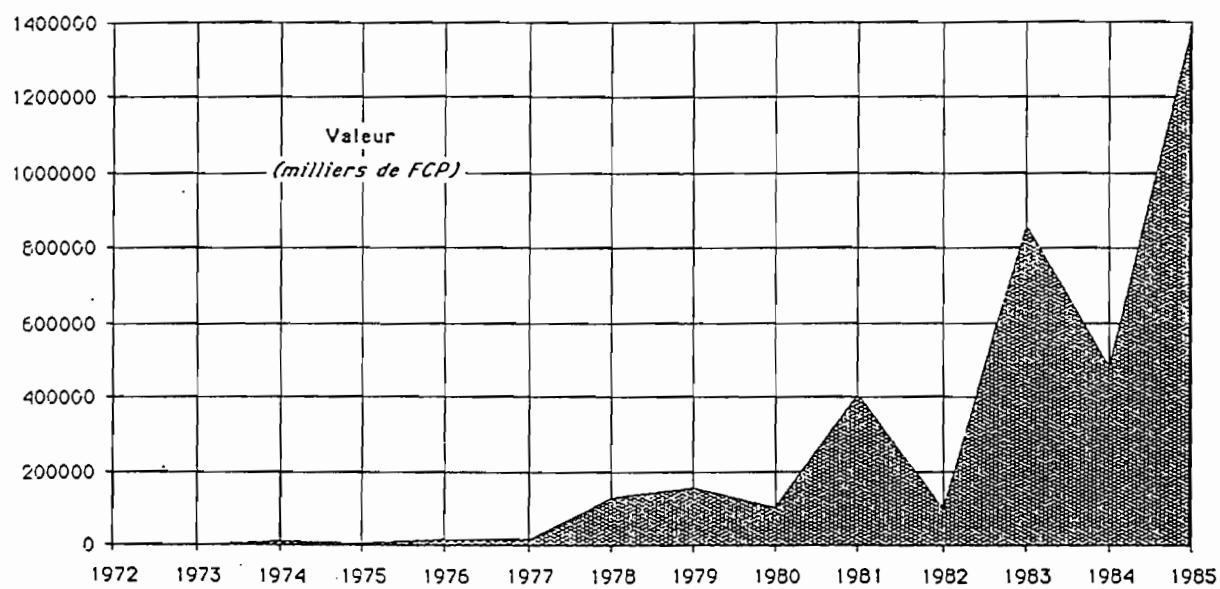


Figure 2: The monetary value of black pearl exports

Pearl production (Figure 2) became important in 1978 when production exceeded 40 kgs and was valued at 122 million Pacific francs. Production increased, and more than 160 kg were produced in 1983 for a value of more than 800 million francs. Thus, for the first time, black pearl became the territory's most valuable export

DIRECT EXPLOITATION OF STOCKS: SKIN DIVING

Skin-diving remains today a way of supplying farms, but the operating scale cannot be compared with what was occurring some decades ago. The scale and manner of operations has changed: the opening of the diving season does not lead to a population migration of several hundred people, along with schools, stores and even a post office, as happened during the 1950s. Traditional diving from sailing canoes with a stone held between the feet has completely ceased and snorkel divers now operate from speed boats powered by outboard engines. The regulations forbid scuba diving other than in exceptional conditions where the oyster beds are at great depths.

Each year, several lagoons are open to fishing. Since 1969 quotas have been assigned on the basis of advice from a commission composed of administration officers and professionals. But the control of quotas is not very strict and the actual yield is very often much higher than authorized. Continued diving has depleted the resource, leading to lower biomass and reduced the reproduction rate so that spat collecting may also be affected.

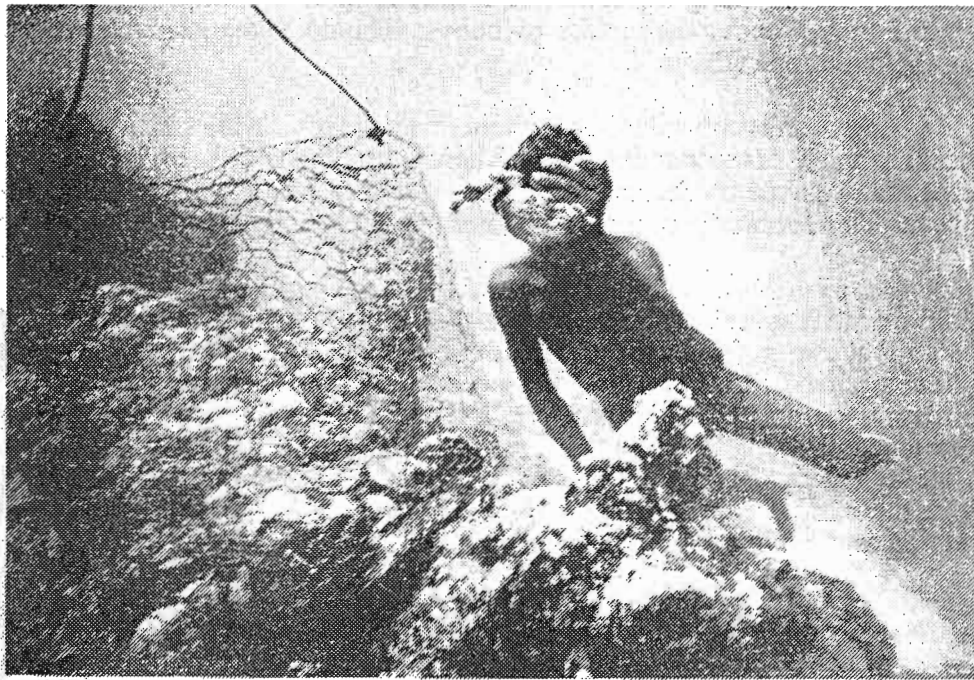
Moreover, the oysters caught suffer stress because of their removal from the substrate and they must be acclimatised to the farm environment for several months during which the mortality may be high. Furthermore, the success rate of grafting, and especially the quality of the pearls obtained, is lower than that from raised spat.

Diving cannot therefore be considered as the best way to supply the farms but it is still necessary and adult oysters from the natural environment still provide more than 60% of pearl farms' needs. For the last few years the quota has decreased gradually, reflecting government intention to stop diving in the near future and to promote spat collecting.

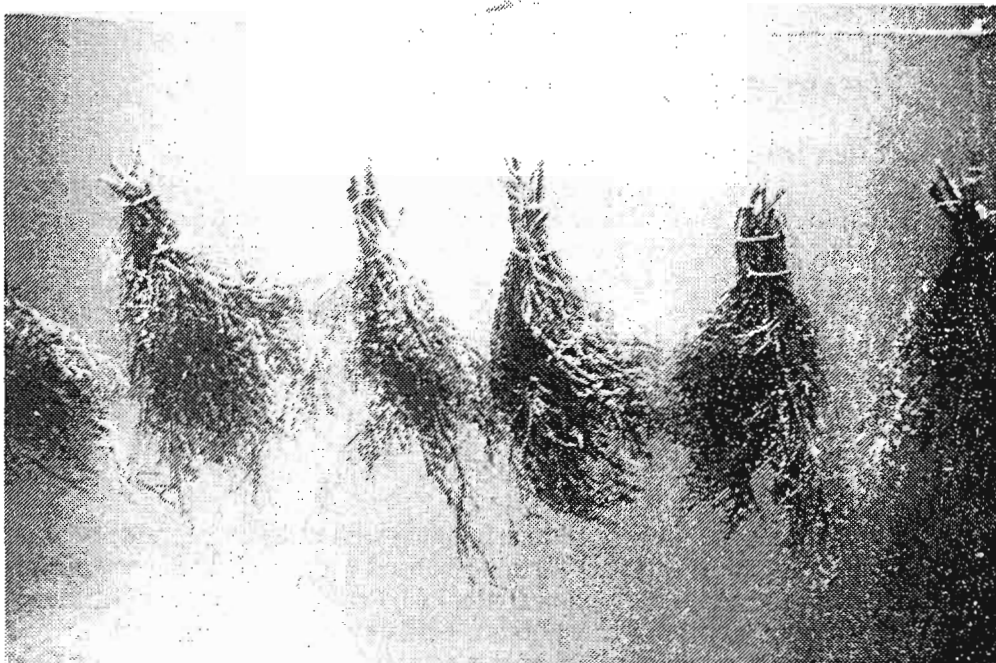
INDIRECT EXPLOITATION: SPAT COLLECTING

As far back as the end of the nineteenth century, some people have thought it could be profitable to raise the oysters from the spat in the lagoons. Techniques using bundles of branches proved to be practical but not competitive with other forms of exploitation. About 1950, the situation became more crucial and Ranson (1952) took up the collecting idea, but again as the trade was still based largely on mother of pearl, no proper experiments were done. With the development of pearl culturing the fisheries office started an ambitious program of spat production in 1976. The methods used have been greatly improved and are presently effective in lagoons where the natural oyster populations are abundant and where the lagoon morphology allows the larvae to grow during their three weeks of planktonic life. The closed lagoon of Takapoto was the first supplier of spat and production is now spreading throughout the archipelago.

Collecting is largely done using a bundle of branches cut from "Miki-Miki" (*Pemphis acidula*). Yields are good, occasionally reaching more than 200 young oysters per bundle. Other materials can be successfully used, for example coconut tree fibre or plastic film.



A skin diver loading his basket with oysters.



Spat collectors made from miki miki bundles.

The collectors are moored along a master line from 200 to 300 metres long and they are maintained 3 to 5 metres under the surface by buoys. The collectors are tied every 30 to 50 cms along the main rope (Photo 2).

The collected young oysters are sold during their first year of life at a price of 300 to 400 Pacific francs each. This production system tends to be dissociated from the pearl working and is mainly done by family units which may produce 30,000 to 50,000 young oysters per year. This form of production however can only supply about 40% of current demand.

When cultured under favourable ecological conditions in farms, the growth of oysters is homogenous so that the grafting can be done on a well sorted stock. Accustomed since their youth to being handled for cleaning or placed on submarine structures, they suffer a minimum stress when grafted. The thickness and the quality of the mother of pearl deposit on the nucleus are better than that obtained from oysters collected by diving and the spat collecting method appears to be the best for supplying the farms. The adult populations in the natural environment, no longer being collected, may recover a high reproduction rate as the biomass increases.

THE ISOLATION FACTOR ON LAGOON OYSTER POPULATIONS

The natural beds generally occur in more or less closed lagoons which are geographically isolated from each other. The duration of the larvae's planktonic life theoretically allows exchange between populations around islands which are close to each other, but such exchange is never abundant and never regular. In these conditions, separate lagoon populations breed without external interaction and they have developed their own genetic characteristics, as shown by Blanc (1983). The exhaustion of natural populations leads to the dying out and loss of important genetic characteristics.

PEARL FARMING: A DISTURBANCE FACTOR

The pearl farms often have great difficulties in obtaining stock from the island where they are located and they have to buy the oysters from the few producing islands in the region. These transfers lead to a mixing of populations that were up to now separated. The consequent cross-breeding is a potential threat to the integrity of the natural populations and may cause some unforeseeable effects, eventually prejudicial to pearl farming. One example of such effects is disease propagation which causes high mortalities in some lagoons. As a result the administration was lead to forbid oysters being transferred from affected islands such as Gambier and Hikueru.

CONCLUSION

Most of the pearl oyster natural stocks are nearly exhausted after two centuries of intense exploitation. The development of pearl farming caused a demand for live animals that could only be met from the remaining natural stocks by diving or by spat collecting. At present these two ways of exploitation co-exist, neither one or the other being able to ensure by itself the economic functioning of the established farms. By intensifying the spat collecting it is hoped that this method will eventually supply all needs so that the diving will completely stop.

Nevertheless, as the natural oysters and spat are produced by only a few islands, there is a risk of genetic manipulation with possible dangerous results. Moreover, these transfers promote the spreading of pathogenic vectors able to generate high mortalities in the farms.

With regard to pearl farming development, two different situations may be considered. In the first case, of farms which are settled in a lagoon where there are no natural oyster beds, then oysters from other localities may be introduced without problems. But the lack of indigenous oysters means that farming in such situations may be uneconomic

In the second, the farms are established in a lagoon where the natural stock is still appreciable and where foreign inputs may disturb the whole population. Thus it seems advisable to rely on local supply from spat collecting for these farms.

Our important study has been concerned with analysing the different factors involved in pearl production and providing answers to the problems. It is hoped that it will provide the basis for a policy for the conservation of a resource which is of particular value to the tropical islands of French Polynesia.

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