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Contents:

PEARL WORLD
The International Pearling Journal

Pearl culturing in the Gulf of California

MAGNIFICENT MEXICAN MABES

The invitation came to visit what is billed as "the first commercial marine pearl farm from the pearl oysters *pteria sterna* and *pinctada mazatlantica* in all of the American continent" through the good graces of Richard Fassler's longstanding friendship with Sergio Farell of *Perlas de Guaymas.*

I previously had met Sergio on Richard's own stomping grounds– Honolulu, Hawaii– during *Pearls '94,* the conference that brought together much of the global pearl industry for the first time, and then had met up with Sergio time and time again at the annual jewelry convention held in Tucson, Arizona, in late January to early February of each year.

Since Guaymas, Mexico, is so close to Phoenix, Arizona (where *Pearl World* is based)– only about 55 minutes by air– it was a invitation to be eagerly and easily accepted... providing yet another chance to chronicle and follow a pearl farming operation from its early, embryonic stages.

HISTORICAL BACKGROUND

Since unrecorded time, Man has obtained many products from the seas, mainly for food and common use artifacts. Because of their inherent beauty, the shells of the pearl oysters and the pearls that were occasionally found therein were quite highly prized.

Both the pearl and mother-of-pearl have been used by humanity since the Paleolithic period, and were often an important part of religious rituals and significance... also as part of the treasures of ancient and powerful monarchs.

Pearl oyster fisheries were a highly productive activity for many centuries, especially along the Indopacific and tropical American Pacific coasts.

Many regions were made famous for the abundance and quality of their pearls: The Gulfs of Manaar and Kutch (India), the Atolls of the Tuamotu Islands in French Polynesia, the Gulf of Sudan, the Persian Gulf, Torres' Strait (Australia), Ago Bay (Japan), and the Gulf of California (Mexico).

By the end of the 19th century, many of these famous pearl fishing areas started to manifest signs of overexploitation, such as in Japan, India, the Gulf of California and French Polynesia. Disappearance of oyster beds was also caused by oil contamination in areas such as the Red Sea and the Persian Gulf.

The solution for many of these problems came with the advent of modern pearl oyster farming and husbandry practices.

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Hawaii's hatchery blazes new trails

THE PATH OF PEARLING TO COME

We are not simply seeking to produce more black pearls in the Marshall Islands; we want to produce the best black pearls in the world. Neil Sims, the V.P. and Research Director for Black Pearls, Inc. acknowledges that this is an ambitious aspiration, bordering on the brazen. But now that he has my attention, he proceeds to lay out what his company sees as the path of pearling yet to come – 20 or 30 years off into the future.

"Pearl culture is still in its infancy, compared to other aquaculture industries. It is largely reliant on natural stocks or spat-collected animals, and the surgical procedures are based on turn-of-the-century science. The fusion of aquaculture and biotechnology is creating a blue revolution across the globe, with tremendous implications for pearl culture."

Dr. Dale Sarver, the President of Black Pearls, Inc. runs through a wish list of "what-ifs," each supported by case-histories of other aquaculture or agriculture developments, or established medical procedures.

"Selective breeding of hatchery stocks is one of the simpler

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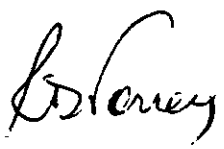
EDITORIAL

Dear Reader:

Should you wish further details on the companies or individuals covered in this issue, here's how to reach them:

Mr. Sergio Farell
Director General
ITESM Perlas de Guaymas
Bahia de Bacochi Bampo S/N
Guaymas, Sonora CP 85450
MEXICO
Ph: XXX-52-622-10136
Fax: XXX-52-622-10243
e-mail:
perlas@campus.gym.itesm.mx

Mr. Neil A. Sims
Black Pearls Inc.
P.O. Box 525
Holualoa HI 96725
USA
Ph: XXX-808-325-6516
Fax: XXX-808-325-3425
e-mail: nasims@aloha.net



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THE GULF OF CALIFORNIA

In the Gulf of California one can find two species of native pearl oysters: the Panamic Mother-of-Pearl Oyster or "Madreperla" (*Pinctada mazatlantica*) and the Western Winged Pearl Oyster or "Concha-Nácar" (*Pteria sterna*), also called "Callo de Arbol" by locals. Both species of pearl oyster inhabit the Sonora coastline as part of their natural distribution.

Pearl oyster fisheries in the area reach back as far as 800 to 1400 AD. Fishing was done by many native tribes of Baja California Sur, and the Seri Indian Nation (or *Kum Kaak* as they call themselves) of the State of Sonora. This ancient fishery was done out of hunger... a fortunate byproduct being the shells and pearls.

Recent excavations done inside the Templo Mayor (Main Temple) of the Mexican or Aztec civilization have shown the high appreciation that this culture possessed for the mother-of-pearl shells of the Pacific waters, which they utilized as a whole or as pectorals to make zoomorphic figurines used in various religious rituals.

Later, as America began to be explored by hordes of Spanish conquerors, word came of the fabulous pearl beds to be found in the recently discovered Sea of Cortez (now the Gulf of California).

The first to return with news of this discovery were mutineers who had taken over the exploration vessel "La Concepción" which Hernán Cortez had dispatched towards the end of 1533. Fortún Jiménez was the unlucky captain of this vessel... as he and twenty of his men were killed by hostile Indians at a tranquil bay known first as Santa Cruz, and later as La Paz.

The survivors told stories of the many pearl adornments that these Indians wore, and so ignited the desire of many to possess these pearls. Many Spaniards came back with ships and slaves– mostly Yaqui Indians from Sonora considered to be by far the best divers– to fish the rich pearl beds. Many of these expeditions ended in tragedy, while others returned home with glory and pearls.

By the end of the 16th century, Dutch and English merchants began trading with the Indians for pearls. This sequence of events led to the colonization of the arid and desolate peninsula of Baja California Sur.

A Frenchman, Gastón Vivès, managed to start up a successful mother-of-pearl oyster culturing operation on the island of Espíritu Santo at the turn of the present century, making it the first commercial natural pearl farm in the world. But this venture came to an abrupt halt during the Mexican Revolution when the Constitutionalist General Miguel Cornejo took the city of La Paz in 1914, and the unhappy populace sacked the installation, totally destroying the company's records. Vivès barely escaped death at the hands of a lynch mob.

On the other side of the coast of the Gulf of California, in the State of Sonora, Colons from the nearby town of Pitic (now Hermosillo) traded with the Seri Indians for pearls and coral taken from around the magnificent Isla

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PEARL WORLD
The International Pearling Journal

K. Obuchi • President

R. Torrey • Editor

P. Grella • Production Supervisor

P. Brutcher • Production Manager

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approaches. Imagine being able to produce an oyster out of the hatchery that reaches seedable size within eighteen months, or even sooner. The shell could be more deeply-cupped than the oysters found in the wild, with a larger pearl sac, and have better color. It might be better resistant to known pathogens, and have been bred to better withstand the stresses of farming.

"Anyone familiar with pearl oysters knows how much variability there is in these economically important traits in any population. This is typical for invertebrates, especially bivalves, which are renowned for their high level of genetic variability. Such a broad range of traits presents a good potential for rapid stock improvement through a selective breeding program.

"Hatchery-rearing also offers other opportunities for simple improvements in oysters and techniques, and better yields. The donor oyster might be reared from the same parents... even from the same spawn. This may increase the likelihood that the sibling tissue grafts would take, thereby reducing rejection rates. Triploidy could produce faster growth, as in edible oysters. Polyploidy also has profound effect on the reproductive organs and could result in more consistent gonad size, eliminating the need for conditioning before seeding.

"The more advanced biotech processes offer even more potential. The nacre-producing mantle graft could come from a tissue culture suspension, allowing all of the pearls to be of the same desired color, with few tissue graft deformities. The traits of best luster and orient could also be specially selected for. Hormonal controls could increase the rate of nacre deposition or the thickness of the nacre layers, giving a superb luster over the crucial 'finishing-off' period of pearl incubation."

Sarver continues, "It is hard to even imagine the implications of gene splicing. The results in the salmon industry have been spectacular, and they are only beginning to be applied on a commercial scale. These technologies are already proven and it's just a matter of time before they are adapted to pearl oysters. We are starting to apply them now."

More than just pipe-dreams or pontificating, the partners in this small start-up company are already taking the first steps toward these goals. The Black Pearls, Inc. hatchery, based in Kona, on the Big Island of Hawaii, has been providing spat to a farm in the Marshall Islands now for over two years. They are now working on their F2 generation and selecting for faster growth and improved color. The first hatchery-produced oysters were seeded in February this year, with another cohort on the lines ready for seeding next year. BPI has set up a Marshall Islands subsidiary, Black Pearls of Micronesia, Inc., to run this farm, and is now looking for capital to expand the operations there.

> The fusion of aquaculture and biotechnology is creating a global, blue revolution.

Beyond Majuro, Black Pearls, Inc. is also applying for ocean leases for pearl farms in the Hawaiian Islands. This work has both environmental and commercial benefits, with a working farm being the most practical means of re-establishing the imperilled native Hawaiian variety of *Pinctada margaritifera*.

"This subspecies is no longer tottering on the brink of extinction ... it has begun to slide down the slope" said Sims. "A concerted program of stock re-establishment is needed to preserve this endemic variety."

The company's research has shown that a series of reproductive reserves maintained at several sites throughout the islands would be the most effective means of re-establishing this oyster on the reefs of Hawaii. BPI's logic is simple: the best kind of reproductive reserve, they claim, is a commercial pearl farm. Oysters on farms start spawning as males at one year old, and some turn female as early as year 2. Being well tended on a farm, they are in top condition, and the close proximity of the oysters to each other ensures maximum fertilization rates. BPI has formally proposed a public-private partnership to provide for such a farm, and to achieve both goals together.

"We have found strong support for this innovative concept," says Dr. Sarver. "The State Aquaculture Development Program is actually an active partner with us in blazing the bureaucratic trails. Their support– and the ongoing support of the National Marine Fisheries Service through their S-K grant program– has been invaluable."

BPI has continued to make good use of federal research and development programs, with support for various components of their work from the National Marine Fisheries Service, the U. S. National Science Foundation, and the U. S. Department of Agriculture. The Marshall Islands Ministry of Marine Resources (MIMRA) has also offered guidance, assistance and in-kind contributions for the development of the farm in Majuro. More recently, the U. S. Sea Grant and Land Grant programs have recognized the broader development potential for this industry, and have supported extension and expansion activities. BPI sees this ongoing research support as a distinct competitive advantage.

"Our links with the biotech industry, and our access to the competitive R & D funding available enables us to move new products and processes readily from concept, to the laboratory, to the

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de Tiburón (Sharks' Island).

Later, in the early-to-mid 1900s, one last huge fishing effort was attempted, employing Seri Indians as divers to exploit the rich pearl beds of mother-of-pearl oysters and western winged pearl oysters which proliferated near Isla de Tiburón's Punta Perla (Pearl Point), and among other beds on the Sonoran coastline.

This practice continued, unabated, until both species became overexploited. Thus, for more than four centuries, natural pearls were one of the main products coming from the Gulf of California. The only thing that could be done to rejuvenate wildstock, and to recover and enhance such a precious resource, was governmental intervention.

Since the 1940s, a federal fishing ban has been established to stop the excessive fishing done on the few remaining pearl beds in the Gulf of California. Further laws discouraged investment in many fields of aquaculture development.

MODERN DAY PRACTICES

Recently, as part of the new initiatives to promote investment in the area of marine aquaculture, the Mexican government established "species leases " of up to 50 years' duration for the rational use in aquaculture of many marine species.... including both species of pearl oysters (*Pteria sterna* and *Pinctada mazatlanica*).

Since the numbers of adult oysters still remains quite small due to illegal fishing, the future of Mexico's pearl culture programs will be closely linked and highly dependent on small scale and ecologically sound mariculture operations that involve spat collection or laboratory seed production, nursery and grow-out management.

Nowadays, Mexican pearl culture operations employ a wide array of the common mariculture techniques used with success throughout the pearl producing countries of the Indopacific region... the most successful methods being those introduced by the Japanese for the culture of scallops (*Pectinids*) and, of course, pearl oysters... such as the use of lantern, pearl and pocket nets.

The first step in a typical pearl farm is to set up the farm itself. The mariculture operation takes place inside tranquil, protected bays with rocky shorelines which are blessed with nutrient-rich sea currents. The farm consists of many series of long-lines, lines that keep elements afloat on the surface for easy access from small boats. These long-lines are used to "hang" the culture equipment and their valuable cargo, the oysters themselves.

Once the farm is operational, it needs a good supply of healthy young oysters, called "spat." This can be accomplished either by stocking up from nearby oyster hatcheries, which is expensive, or by collecting wild spat.

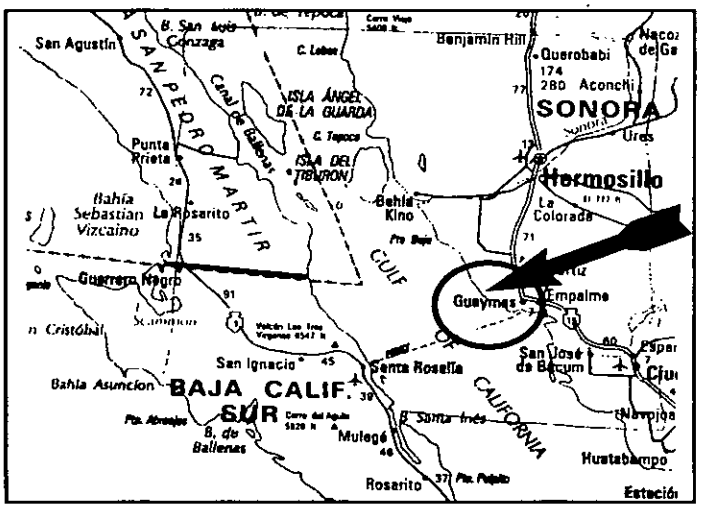
Wild spat is by far the best in quality, showing better growth and survival, and is cheaper (although it is a labor intensive operation). Spat is collected by immersing a line full of "onion bags," filled with pieces of discarded fishing nets, for six to eight weeks.

These spat collectors are put inside areas known for their productivity, but only at certain times of the year, known as "settling peaks." To ensure enough healthy little oysters, thousands of spat collectors have to be put at sea at a time. When the time comes, the spat collectors are taken back to the farm and each bag must be meticulously searched for the little oysters (some as small as 1 mm)... each bag giving up numbers varying from one oyster to around 200... with Lady Luck as the sole judge of success.

Once the spat have been obtained from the bags, they are introduced into pearl nets (mesh structures that resemble little pyramids)– fine mesh if the spat are small, or larger mesh if they are of bigger size– which are left to grow for five to six months.

After six months the oysters have attained the size of juveniles, about 3.5 to 4.5 cm, and are then transferred to lantern nets (so called because they resemble old-style Japanese lanterns) where they will remain until they attain a size around 7 cm... a good size to begin the implant operation. In this respect the mother-of-pearl and the western winged oysters differ, since the latter attains this size in little less than a year while the former takes two whole years.

Healthy oysters of the proper age and size are



Source: Rand McNally

cleaned of their external epibionts (organisms that settle on the outside shell of the oyster) and parasites and, when readied, they are taken to a nearby laboratory to receive their pearl implants.

Once in the lab, the oysters are immersed in a solution composed of sea water and a narcotizing agent. This procedure induces the oysters to open up their valves, permitting a safer implanting procedure, as forcing open the valves of an oyster can cause injury or even death to the animal.

Once open, two surgical procedures can take place: round pearl or mabé implantation.

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Round pearl surgery is by far the most difficult operation of all, and its scientific basis was discovered back at the beginning of the present century. The procedure begins with a donor oyster of the same species being sacrificed for its mantle (a skin-like organ capable of producing nacre, the pearly coating of the inside shell of a pearl oyster). This mantle is sliced thinly and then cut into many small pieces or "grafts."

Meanwhile, a mother oyster has been carefully opened, and a cut has been made near its foot. A small spherical nucleus (made from a very special pearly shell) is gently introduced through this small cut and into the gonadal tissue of the recipient oyster.

Now, the graft is inserted and placed on top of the nucleus, and the animal is closed and then placed back inside one of its cages and thence into the sea. The operation is quite difficult (the open gap of the valves is as small as 2 cm) and is done with highly specialized surgical equipment. Mortalities are high and can soar to 60% among the operated-on individuals.

Implanting mabés (also called half-pearls or blister pearls) is easier to do. Its procedure is as follows: an oyster is opened and the mantle and gills are carefully pushed back to expose the inner shell. A hemispherical plastic nucleus is then attached to the shell, and the animal is taken back to the sea. This procedure takes some time to do, but it is much easier and has a survival rate of almost a 100%.

Back at the farm and in the sea, the oysters tend to their wounds, sometimes healing completely, some dying and a few others surviving but rejecting the implanted object, either round or half-round. Depending on the kind of implant, the oysters are harvested in a year or two: normally one year for mabé pearls and two years for round pearls.

The pearls derived from these two species of pearl oyster are unique, and have been highly appraised by experts in this field.

Pearls from the western winged pearl oyster (*Pteria sterna*) have many colors ranging from gray, golden, pinkish-green, obsidian black and an unusual rainbow colored purple-lavender. Pearls from the panamic mother-of-pearl oyster (*Pinctada mazatlanica*) have colors that range from opal white, golden, steel gray and a deep dark green with peacock tinges, very similar to Tahitian blacks.

BREEDING CYCLES

The pearl oysters *Pinctada mazatlanica* and *Pteria sterna*, have been an attractive resource for centuries in the Gulf of California, but natural beds were depleted to a point where populations became endangered and a fishing ban was imposed. Any further use of this resource will be linked to aquaculture operations, and for this purpose, it is relevant to know the breeding cycles.

Wild pearl oysters of both species from different locations, and cultured organisms from the existing long line system, were sampled monthly for a one year period. Gonad histology and condition index were used to find the seasonal cycle of gonad activity. For the *Pinctada mazatlanica*, gonad width was also measured.

Pteria sterna presents its breeding season from October to April... with two peaks. In culture, peaks are in November and April; in the wild, the first peak lasts from October to December and the second is in April.

The breeding season is of greater intensity and duration in the wild than in suspended culture. During the summer, gametogenesis is suspended and regression may be complete. The effects of summer are more pronounced in culture conditions than in the wild. The breeding cycle is asynchronous.

The sex ratio (female to male) is 0.45 : 1 in culturing and 1.4 : 1 in the wild. *Pteria sterna* is a hermaphrodite and its primary gonad maturity may be either as male or female. Bisexual organisms were found only in culture (4.17%) and this was considered to be transitional. First maturity may begin at 8mm.

Pinctada mazatlanica presents its breeding season in summer– from June to September, with maturity peaks in June (main) and August (secondary). Regression is never complete and the gonad of a mature organism does not pass through an indeterminate sexual phase. In winter, organisms– being in practically any stage of gonad maturity– may enter a dormant stage. In the months when temperatures dropped, gametogenesis was absent. Its breeding cycle is asynchronous.

Pinctada mazatlanica is a protandric hermaphrodite whose first maturity is presented in a range of sizes up to 100 mm in height. Bisexuality was present in 1.4% of the sample and was considered to be transitional. The sex ratio (F:M) was 2.6 : 1... very different from the sex ratio of other pearl oysters.

Of the three methods used, the histological procedures provided more information about reproduction and sexuality of these species; condition index marks

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maturity peaks when all samples come from the same location; and gonad width clearly indicates maturity peaks even for organisms that come from different locations within one area... besides being more objective, quicker, easier and less expensive than histological procedures.

HANGING CULTURE

The object of this study was to describe the growth and associated mortality of a suspended culture, nursery and grow-out, of the two native species of pearl oysters, *Pinctada mazatlanica* and *Pteria sterna*, inside Bacochibampo Bay, at different stocking densities.

Studies on the Panamic Mother-of-pearl Oyster (*Pinctada mazatlanica*) began in August 1993 (N=10) and August 1994 (N=680). Spat was raised inside pearl nets for 6 months, being transferred to pocket or lantern nets for final grow-out. Stocking densities were the following: 30, 70, 125, and 200 org• m^{-2} in grow-out.

With the Western Winged Pearl Oyster, *Pteria sterna*, experiments began with November 1993's spat collection (N=3000), using the following stocking densities both for nursery and grow-out: 150, 400, 650 and 1000 org• m^{-2}. Later, an additional group was raised, being collected in May 1994, at 150 org• m^{-2}.

Mortality and growth measurements (n=40 organisms) for each experimental batch was done monthly. The monthly average water temperature was obtained by measuring temperatures daily by means of a Taylor Thermometer (°C). The hanging culture of every experimental batch was finalized by July 1995, although mortality records were extended one more month (August, 1995) for the remaining batches of *P. sterna*.

P. sterna had statistically significant differences in growth (ANOVA) at the end of nursery stage, in the batch with the smallest stocking density (P=0.000) which had a slower growth (SGR=0.147 mm/day) if compared with the other batches (SGR=0.160-0.170 mm/day). Afterwards, during grow-out, the two experimental batches with highest stocking densities had to be eliminated due to inherent problems. The batch with the smaller density reported a higher growth rate (SGR=0.131 mm/day). Von Bertalanffy's growth function (VBGF) was obtained, with the following values: L_∞=138 mm, K=0.049864, t_o=-1.052353 and ø'=2.97795.

With *Pinctada mazatlanica*, no significant differences were found (ANOVA P=0.603) during nursery (SGR=0.10-0.16), although significant differences were found at the end of the grow-out period, both amongst lantern net experiments (P=0.033; SGR=0.125-1.149), and between lantern and pocket nets (Levene's P=0.028; SGR=0.125-0.137). Experimental batch #1, grown inside a pocket net (50 org•m^{-2}) registered the best growth, and its VBGF values were the following: L_∞=180 mm; K=0.0302; t_o=-2.4228 and ø'2.991.

The highest mortality on both species of pearl oysters occurred on those experimental batches with the smallest stocking densities, so mortality was attributed to inadequate handling of the oysters.

With *Pteria sterna*, the highest mortalities coincided with the summer months (<30°C), escalating to a mortality of 54.33% when water temperatures reached 32°C for over 15 days.

In the case of *Pinctada mazatlanica*, higher mortalities were associated with cold winter months (>16°C). Batch #1 experienced the highest mortality of all (50%), while batch #4 had the least mortality (3%), both during nursery. During grow-out mortality is reduced notably, so it is deduced that the critical handling phase for this species is during its first months of culture.

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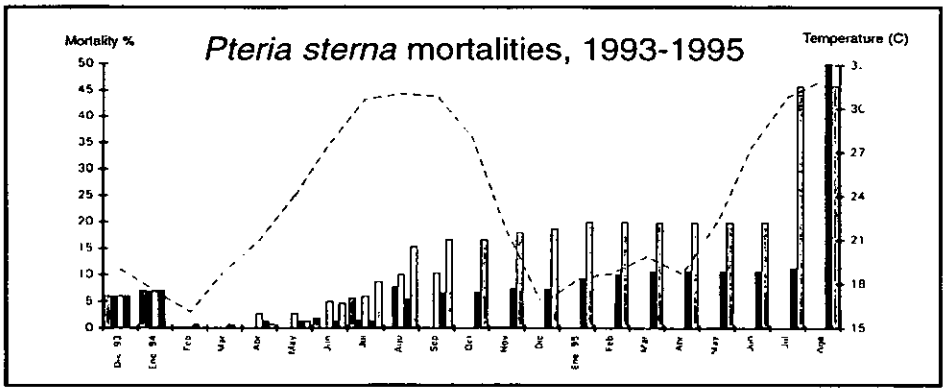

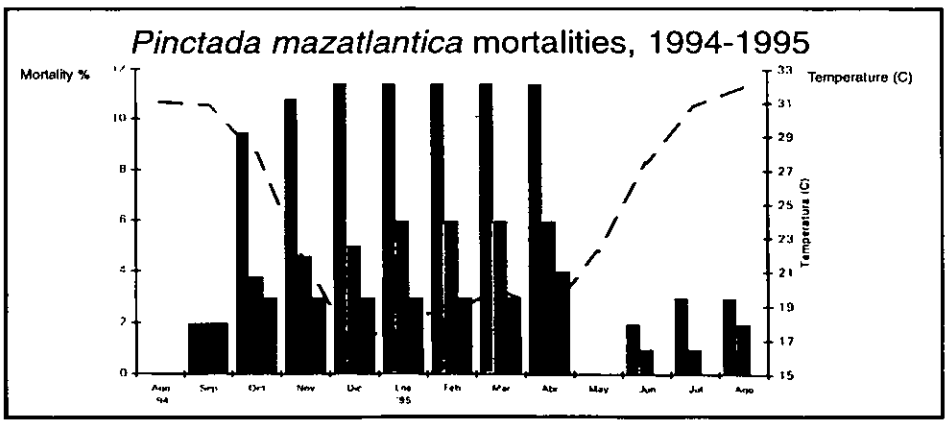

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AN UNLIKELY BEGINNING

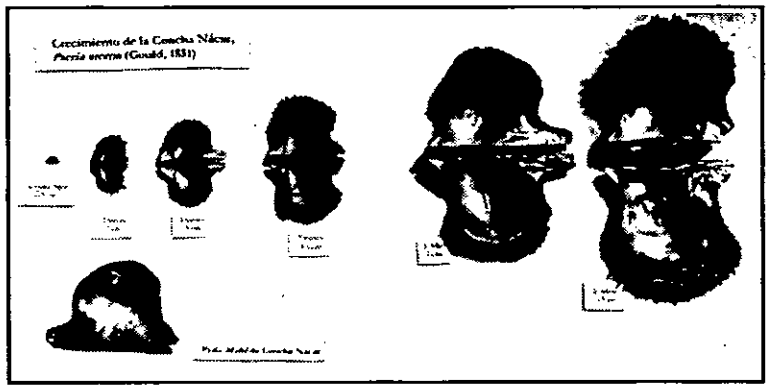
Take a Mexican university professor of mollusc culturing and three of his students looking for an aquaculture project in a field other than edible oysters and shrimp (mainstay Sonoran products) in 1991. By accident, they settled on the pearl oyster and began gathering background information on a totally new field from such sources as Fred Ward's 1985 *National Geographic* article on pearling.

At the beginning, their project advanced slowly, due mostly to use of discarded culture equipment from other projects, plus the lack of a specific operations site. A great deal of improvising was necessitated in order to overcome the shortcomings at hand: having nothing to implant with, they rushed to a clothing store to buy buttons which they ground smooth on the backside, and then affixed to the oyster shells with dentists' glue. Is this the way to start a pearl farm?

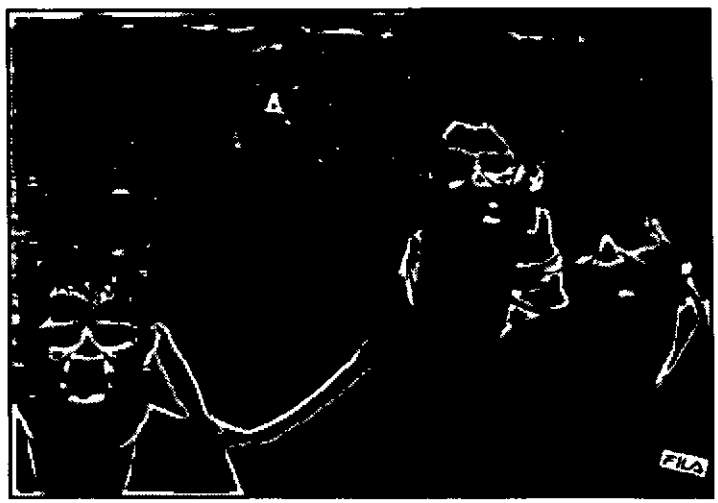
Eventually, project support started flowing... with funding coming out of ITESM, the largest and most important private university system in Latin America (it spans 27 campuses throughout all of Mexico, Campus Guaymas being the smallest and the only one specializing in Marine Sciences: Aquaculture, Conservation and Ecology Management).

In 1996, a total of 5,000 mabés and some 20 round pearls were obtained from the pilot culture which grew out of the experimental phase. This was accomplished by the work of only five people (including the four principals seen in the photo: below, left) on the farm, and two people engaged in processing the mabés.

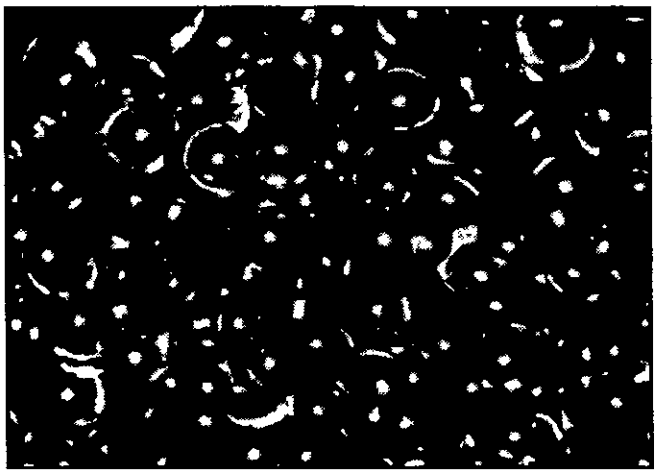
Nowadays, *Perlas de Guaymas* employs 7 local fishermen-turned-aquaculturists, some 7 other people in processing, plus the four original researchers and their indispensable assistant, to make some 30,000 mabés per year. The steady growth of this small but unique operation proves that it's perfectly OK to begin with nothing but an idea... to find an ideal environment... and to have motives that are not primarily profit for profit's sake. ❖



The growth cycle of the Conchar-Nacar, *Pteria stema* (Gould, 1851). Top, from left: spat (0.5 cm), 2 months of age (2 cm), 4 months (3 cm), 7 months (4.3 cm), 1 year (7cm), and 2 years (9.5 cm). Bottom: a fine *P de G* mabé pearl in its "Callo de Arbol" shell.



The founders of *Perlas de Guaymas* who have prevailed over long odds. From left: Manuel Nava, Enrique Arizmendi, Douglas McLaurin and General Director Sergio Farell.



Above: a closeup of some of a day's work: glittering Perlas de Guaymas mabés, after having been cut from the shell, trimmed and then filled. Colors ranged from silver to brilliant shades of blue.

Here's a sample of how local artisans work with brilliant Mexican silver, to make exquisite mabé designs in rings, pendants, earrings or brooches.

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hatchery and the farm. As we further develop these avenues, we will be able to apply our findings directly to our Majuro operation, and to our other associate farms."

BPI is currently constructing a commercial-scale hatchery for an existing pearl farm in the Philippines, and is also involved in several other gold-lip projects in Southeast Asia. The company is also negotiating with Tahitian and American interests to expand and manage an existing farm in French Polynesia.

"All of these biotech advances hinge on controlling where your farm stock comes from," states Sims. "Hatcheries are the only way to get there." The Hawaiian company eventually sees all pearl production coming from hatchery-produced oysters.

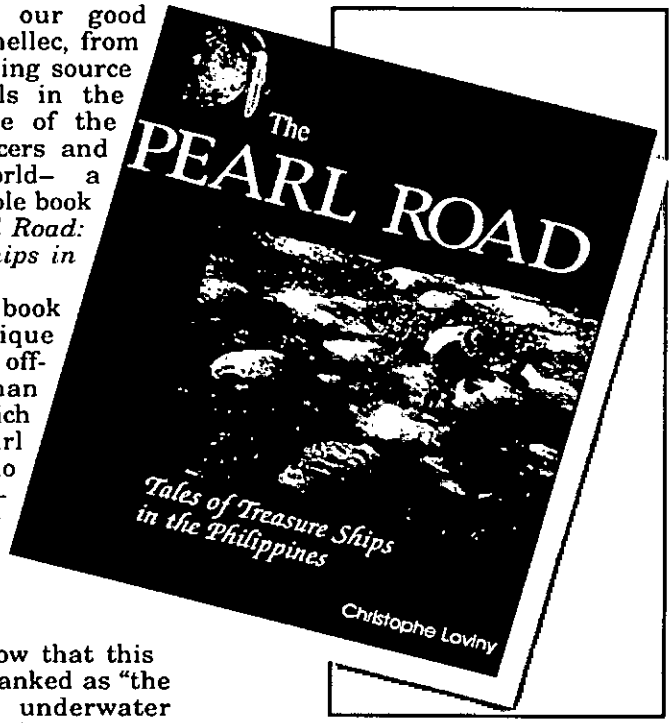
Sims draws an analogy between pearls and eggs: "Using wild oysters to produce pearls is like using wild chickens to produce eggs. The eggs are smaller and less marketable; the chickens are slow-growing, unused to handling, and susceptible to disease problems.

"The egg industry was compelled to start out that way– domesticated chickens were not simply created– but how long would a chicken farmer last today if he tossed out his commercial brooders and went back to hunting wild hens? "So where does the pearl culture industry want to be in 20 years?" he asks.

It is thinking like this which has propelled Black Pearls Inc. to the edge of fantastic potential improvements in pearl culturing... to the benefit of all. ❖

New for your library

PHILIPPINE TREASURE HUNTING



We recently received in the mail– courtesy of our good friend, Jacques Branellec, from Jewelmer– the leading source of South Sea pearls in the Philippines and one of the three largest producers and exporters in the world– a fascinating coffee table book for review: *The Pearl Road: Tales of Treasure Ships in the Philippines.*

This 184-page book tells of the unique archaeological find offshore from Pandanan Island, Palawan, which began when a pearl diver named Eduardo Gordevilla went looking for a missing pearl oyster basket and found, instead, an earthenware jar encrusted in coral.

Little did he know that this discovery would be ranked as "the most significant underwater archaeological find of Philippine pre-colonial artifacts to date," and would confirm this location as along the legendary Pearl Road of ancient maritime merchants.

Jacques Branellec, who along with his Filipino partner, Manuel Cojuangco, manages a complex of pearl farms in Southern Palawan, was immediately intrigued. And a joint recovery venture was struck with the National Museum of the Philippines in June, 1993.

As for the rest of the story, well, you'll just have to go and read the book yourself: it's an exquisitely photographed and written tale of yesterday and today... of the days gone by when merchants and adventurers sailed to these islands to trade their goods for pearls... and of the modern-day Philippine pearl industry itself.

This work won the prestigious Anvil Award of Excellence by the Public Relations Society of the Philippines for its publisher, Asiatype Inc. of Makati City, Philippines, and for its author, Mr. Christophe Loviny. Its ISBN number is 971-91719-0-1. ❖