

## V. PHILIPPINE SHELLS USED IN THE MANUFACTURE OF PEARL BUTTONS.

In addition to the pearl-oyster shells, which are exported from the Philippines in large quantities,<sup>12</sup> there are three varieties of shells found in these Islands and used in the manufacture of pearl buttons. These

are the great top shell (*Trochus niloticus* Linn.), the green snail (*Turbo marmoratus* Linn.), and the chambered nautilus (*Nautilus pompilius* Linn.).

### THE GREAT TOP SHELL.

The great top shell (*Trochus niloticus* Linn.) (Plate XI, figs. 1 to 4) known locally as the lock, conic shell, trochus, *susong-dalaga*, or *samong*, is a large, conical, top-shaped shell, found in abundance in many islands of the Philippine Archipelago. Aside from the true pearl oyster, this shell is the one in greatest demand for manufacturing buttons. As a matter of fact, owing to its cheapness, it is frequently made into buttons in preference to employing the pearl oyster. The great top shell when mature is from 10 to 15 centimeters in diameter and a trifle less in height; it has many close whorls, the largest of which flares decidedly. The shell is marked with radiating or zigzag bands of red, violet, or brown; the aperture is oblique and has a spiral operculum. An adult shell 10 centimeters in diameter weights 330 grams.

The great top shell is usually found at low tide near the outer edge of coral reefs or under large rocks, and while small quantities may be encountered on almost any coral reef in the Archipelago, they are especially abundant in the vicinity of Sitanki, along the coast of Pangasinan, and Ambos Camarines, Luzon, and on the northern coast of Palawan, the eastern coast of Samar, and in the vicinity of Masbate. There are also numerous places on the coasts of Mindoro where they are abundant. I noticed a number of these shells washed up on the beach on the eastern side of the Gulf of Davao.

The soft portion of the great top shell is regarded by the Filipinos as a very fine article of food and, as a matter of fact, this species of mollusk is more sought after for its meat than for its shell. One proof of this is in the numerous piles of empty shells to be found on the beach in localities near the ocean. It is usually noticed that they have been placed on the fire, in order to cook the animal, after which it is easily removed from the shell. Of course, shells treated in this manner are spoiled so far as their commercial value is concerned. The proper way to remove the animal is to place the shell in hot water, as the shell is in no wise injured by this treatment.

So far as my experience shows, the great top shell is always more or less solitary and while five or six are frequently found under one large stone they never occur in beds or in great numbers over a given limited area.

The average annual export of this shell from the Philippines during the past four years has been about 350,000 kilograms valued at about 60,000 pesos. The price fluctuates greatly. For a considerable period the standard price was 7.50 pesos per picul for middle grade shells. The Manila

button factory, in 1910, was paying from 10 to 22 centavos per kilogram, depending on the grade. A small quantity of shell sent to the United States was sold for about 22 centavos per kilogram (5 cents gold per pound). Japanese button factories offered to buy, in large quantities, half-grown shells for 28 pesos per picul of 137.5 pounds. During May the price for great top shell in Zamboanga was 18 pesos per picul. During the past few weeks the price has fallen to 12 pesos.

The establishment of a second button factory in Manila, together with the evident desire on the part of American button factories to secure Manila shell, no doubt, are responsible for the increase in the price. The result will certainly be greatly beneficial to the trade as it will stimulate the gathering of these shells and the native fishermen will soon learn that it is more profitable to bring them to market than to destroy them by fire in order to extract the animal for food.

The one objectionable feature which must soon be taken into consideration is the desire of the Japanese buyers to secure the young, half-grown shells. It is very evident that if the young shells are taken it will not be long before there are none left to propagate. However, this is a condition that may easily be remedied by legislation. An adequate export duty on great top shells of less than 9 centimeters (3.5 inches) should be imposed at the earliest possible date.

No careful study has been made in the Philippines of the reproduction, habits, rate of growth, food, or the possibilities of artificial cultivation of this commercially important shell.

#### THE GREEN SNAIL SHELL.

The green snail shell (*Turbo marmoratus* Linn.) (Plate XII, figs. 1 to 4) known locally as turbo, sea snail, *lalong*, or *bulolo*, is a large, heavy, turban-shaped shell, found throughout the Philippine Archipelago, and largely used in the manufacture of buttons. It is not in as great demand as the great top shell, as it is considerably harder to work, and of less desirable color, having an opalescent instead of a pure white luster.

The green snail is the largest of the turbo family, sometimes reaching a diameter of 20 centimeters. The usual size is about 16 centimeters; the whorls are few, more or less knobbed; the body whorl is the largest; the aperture is nearly round.

The color of the shell is a rich green, mottled or spotted with brown and white. The very old shells lose much of the brown color, and show continuous bands of white following the whorls. When the rough outer layer is removed they are of a beautiful, opaline mother-of-pearl color inside and out.

In addition to being made into buttons they are also a favorite shell for cabinets, spoons, and drinking horns. The royal family of Scandinavia from time immemorial have had these shells studded with gems, mounted with silver, and formed into royal drinking cups.

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is a subject of sufficient interest to warrant giving the following suggestions:

*Location of factory.*—Manila, Cebu, Iloilo, or Zamboanga would be a good place for the establishment of a button factory. The cost of renting a suitable building for a factory in either of these places would not exceed 50 dollars per month. A building would cost somewhat more than a similar structure in the country or coastwise districts in the eastern United States.

*Labor.*—The laborers would be Filipinos. They are found quite satisfactory by the Manila button factory, the pay in this factory being from 5 to 10 pesos per month, ten-hour days.

*Power.*—Steam or gasoline power would probably be found most satisfactory, although in all the places mentioned, except Zamboanga, electric power could be obtained. Wood as fuel is quite out of the question; coal costs from 10 to 14 pesos per ton in Manila. At Zamboanga water-power might be secured. Gasoline in Manila sells at from 4.50 to 5.00 pesos per 10 gallons; petroleum costs 1.40 pesos per tin of 5 gallons.

*Taxation.*—A manufacturer's license, costing 2.40 pesos, is required, and the internal revenue tax is one-third of 1 per cent of the gross receipts, payable quarterly.

*Amount of shell available.*—The amount of shell available for button making is about 450,000 kilograms of great top and green snail shell and 300,000 kilograms of pearl shell, making a total of about 750,000 kilograms (1,675,000 pounds) of shell per year.

*Bleaching shell for button making.*—A large portion of the button trade is with the Chinese and they require a very white button, consequently a bleach of some sort is necessary. The following method, given by Robert R. Williams of the laboratory of organic chemistry, Bureau of Science, is effective and cheap.

“Many processes are in existence for the bleaching of ivory, horn, and shell for ornamental or other purposes. When chemicals are used those having a solvent or oxidizing action on the organic matters in the horn or shell are chosen. Nowadays the most commonly used agent is hydrogen peroxide which may be had very reasonably in Europe and America. It is not feasible to use it at a distance from the factories making this chemical because of the deterioration in transit. Therefore it is more practicable to use a metallic peroxide and generate the hydrogen peroxide when needed. Barium or sodium peroxide may best be used, preferably the latter. The following process has been tested on shell buttons and found satisfactory. The buttons are first immersed in fuming sulphuric acid for ten to fifteen minutes. The acid is then drained off and may be used repeatedly if kept in well stoppered bottles. The buttons are then rinsed three times with water and covered with a 5 per cent solution of oxalic acid. Ordinarily 1 liter of buttons will require 1 liter of solution, though more is necessary for large or dark-colored buttons than for small or light ones. The oxalic acid solution should be kept ice cold if possible or at least below 20° C. Commercial sodium peroxide is now added in small quantities with constant stirring till the solution is alkaline to litmus paper. About 40 to 45 grams will be required per liter according to the purity of the chemicals. A very little of the 5 per cent oxalic acid solution is now added till, after stirring, the solution reacts acid to litmus. It is important that the solution be acid, but a large excess of acid is to be avoided.

“The buttons are allowed to lie in this solution for 24 to 72 hours according to their size and color. Bleaching proceeds better and more rapidly if the buttons are exposed to direct sunlight while lying in the liquor. This can be done in colorless glass jars which, if possible, should be tightly stoppered.

“The buttons after removal from the bleach liquor may be washed with water containing a little hydrochloric acid. This removes the encrustation from the outside and brings out the luster. After washing again with water they are ready for the further processes of manufacture.

“It will be found that buttons can be bleached effectively by this means and that the strength of the shell is increased by the deposition of calcium oxalate in the interior.”