FOREST RESOURCES

PANAMA PACIFIC INTERNATIONAL EXPOSITION
SAN FRANCISCO CALIFORNIA
FOREST RESOURCES OF THE PHILIPPINES

TIMBER

Area.—The virgin forests of the Philippine Islands cover approximately 40,000 square miles, about equal to the area of the State of Kentucky. This is about one-third of the total area of the Archipelago. In addition there are estimated to be about 20,000 square miles of second-growth forest which will yield large quantities of firewood and some small-sized timber. Taken together, the virgin and second-growth forests of the Philippines cover an area about equal to that of the State of New Mexico.

Ownership.—More than 90 per cent of the timber belongs to the Philippine Government and is under the administrative control of the Bureau of Forestry. Less than 1 per cent of the timber is held under sure title of private ownership.

Composition.—About 70 per cent of all Philippine timber belongs to the dipterocarp family, which is generally found in stands which are almost pure from the lumberman’s point of view. The largest individuals of this family reach 200 feet in height and some specimens have a diameter of 1 foot. This family is by far the most important, as it furnishes the main bulk of the timber cut in the Philippines. About a dozen botanically distinct species furnish probably 80 per cent of the entire cut. From the standpoint of the lumberman, however, this number can be reduced to three groups, namely, the lauan, apitong, and yacal.

Yacals.—This group comprises trees locally known as yacal, narig, mangachapuy, and dalingdingan. The timbers are hard and durable and are more plentiful than the other very durable commercial woods of the Islands.

Apitongs.—The apitong group comprises timbers known as apitong, panao, hagachac, and guijo. The first three are marketed under the name of apitong. Guijo is generally considered somewhat superior. Well-seasoned timbers of this group weigh between 40 and 50 pounds per cubic foot.

Lauans.—It is in this group that the main wealth of the Philippine forests lies. It comprises timbers locally known as white lauan, red lauan, almon, balachacan, bagtican, ma-yapis, tiaong, and tanguile. For the sake of simplicity, they may be divided into two classes, namely, the white and red lauans. Export grades of the red lauans are used in Europe and America as substitutes for mahogany, and are frequently
sold as such. While not so hard and durable as mahogany, lanun has a beautiful grain and permits of a very fine polish.

The main bulk of the forests produces timbers of comparatively few kinds and in some instances approaches pure stands of one or two grades. It is estimated on an average that 70 to 80 per cent of all the dipterocarp forests will yield timbers that belong to the groups described above.

Leguminosae.—Next in importance to the dipterocarp family are the leguminosae, or locust family, to which a number of the commercially important cabinet woods of the Philippines belong. Among the principal representatives of this family are narra, tindalo, ipil, supas, acle, and banuyo. No finer hardwoods are found anywhere in the world.

Stand.—The average stand in the virgin forests of the Philippines may be roughly estimated to run 6,000 board feet per acre and over. On some of the tracts now being worked under long-term license agreements (or concessions as they are popularly called) the stands run between 15,000 and 35,000 board feet per acre. Stands of 35,000 to 60,000 board feet per acre are not infrequent, principally at elevations between 800 and 1,200 above sea level.

Obtaining a tract of timber.—The public forests of the Philippines are not sold, but are developed under a lease system. Small operators usually work under ordinary yearly licenses for definite small areas. Exclusive licenses, or concessions as they are popularly called, are generally in the form of a twenty-year exclusive license to cut and extract timber and other forest products from a specified tract. The land itself is in no way affected by such a lease, merely the timber and minor forest products are included.

When a lumberman seriously considers an investment in the Philippines he himself or an experienced representative should state to the Director of Forestry approximately the extent of the investment he contemplates. He will then be given information about several tracts which promise to answer his needs, and arrangements can be made for an experienced forester to accompany him over the tracts in question so that he can size up conditions for himself. All maps, estimates, and other detailed information which may have been collected on the tract will, of course, be placed at his disposal, and he can count upon the heartfelt government cooperation and assistance in making a success of his enterprise. It should be understood, however, that in no case does the Director of Forestry guarantee the correctness of the estimates or other data which he furnishes. These are given to the applicant for what they are worth, and in every case he is advised to take such steps as may be necessary to satisfy himself as to whether or not they are correct. If the lumberman then decides to apply for the concession, he makes a formal application in writing to the Director of Forestry for an exclusive twenty-year privilege for the tract he has selected. His application is then forwarded by the Director of Forestry with recommendations to the Secretary of the Interior. He may then approve the issuance of an exclusive license, if he decides that such a course is in the public interest. For an area of more than 1,000 hectares (approximately 2,500 acres) proposals for bids to secure the desired privilege are published in the Official Gazette and other papers. At least six weeks intervene between the appearance of the first advertisement and the opening of the bids, but in order to give interested parties in the Philippines ample time to correspond with their principals in Europe or America this period is usually extended to about four months. The advertisement states the amount of capital which must be invested within a given time, the minimum cut during the several succeeding years, together with certain requirements regarding logging and milling equipment, etc.

Formal bids are finally submitted and the license will be granted to the bidder who gives the best assurances of developing the tract most thoroughly and promptly. The right to reject any and all bids is expressly reserved. The areas thus granted as concessions are generally of sufficient extent to permit operations for a considerably longer time than the period for which they are granted, and thus the logger and millman in making his investment may expect to operate not merely for twenty years, the limit expressed in his license agreement, but almost for an indefinite period. In fixing the annual production there is taken into consideration so far as possible the amount of overmature timber on the stand and the amount of annual increment, with the object of rendering the investment a permanent one instead of merely permitting the operator to strip and abandon the area he holds. In preparing regulations under which the operator is required to work, first care is given to the future condition of the area in order that the land after logging may be potentially as valuable as before, and no consideration of immediate profit is allowed to interfere. Nevertheless, the logger in the Philippines will find that in comparison with similar conditions elsewhere he will have few restrictions to contend with, and in practically no case are there such as seriously to increase the cost of his operations. It is to permit such permanent use of the land that concessions are granted over such large areas, often consisting of
100 square miles or more. The Philippine Government sells its timber cheap—at half and less than half the stumpage prices asked for similar woods in neighboring tropical countries. It costs nothing to secure a concession—evidence of good faith is all that is required. It may be mentioned that the stumpage is collected as the timber is cut.

Sawmills.—At present there are about 70 sawmills of all sizes and descriptions operating in the Islands, about 12 of which can be compared to the average modern sawmills in the United States. The largest sawmills are located on timber concessions, while the others are operated under short-term licenses. The total cut of the mills of the Philippine Islands is about 65 to 70 million board feet per year.

A company properly equipped and managed and operating in a suitable tract should be able to deliver many kinds of native lumber in Manila at a cost of about half the prevailing market prices. The commercial forests are found either along the coasts where the timber can be skidded directly to the bench and loaded in suitable harbors, along navigable and floatable rivers where it is skidded directly to the water and floated or rafted down stream, or at a short distance inland where short logging railroads are advisable or necessary. For such timber as is close to the beach or large rivers, logging is easy and cheap, requiring but little capital. In these forests there are already a large number of operators, most of whom cut only small quantities of timber. The shipping of timber to the market from isolated sawmills in the Philippines involves considerable difficulty and expense and the lumberman who does not own his own interisland transportation is decidedly handicapped. Few interisland steamers are adapted for carrying lumber and freight rates are high and sometimes prohibitive. A company operating on a large scale should therefore provide its own means of transportation to the Philippine markets or else make provision for loading export stock direct to ocean-going vessels at the mill. With such privately owned interisland transportation the lumber ought to be carried to Manila for from $3.50 to $4.50 United States currency per 1,000 board feet, or even less. Freight rates from Manila to the Pacific coast vary from $7 to $8 United States currency per ton (logs), or from $10 to $14 per 1,000 board feet. There are no export duties on timber or manufactured products. Sawmill and logging machinery from the United States can enter duty free, and timber and logs are admitted to the United States without customs charges. Any mill with a capacity of 1,000,000 feet or more per month of export material is in a position to ship directly to the United States and other countries, thus saving the cost of transportation to Manila and reshipment.

Labor conditions.—The Filipino has a natural aptitude for running machinery and is easily taught. Given a good, experienced foreman it is surprising how well a Filipino crew can handle a sawmill. They work for small wages—from $0.25 to $0.75 United States currency per day for unskilled labor—and if they are accorded fair treatment they make steady and permanent workmen. In the thinly settled forest regions it is necessary to bring in labor from the more thickly settled provinces. To the lumberman the labor problem in the Philippines is not a difficult one. He will find that he has escaped many of the vexations labor difficulties of the United States to meet comparatively few in the Philippine Islands. Patience and fair dealing will secure most excellent results.

Markets.—Approximately 80 to 100 million board feet of lumber are used each year in the Philippine Islands. Of this, strange to say, a considerable amount is imported, although the amount of such imported lumber is steadily being lessened as the capacity of the Philippine mills increase. China, Japan, and Australia use yearly more than 200 million board feet of American lumber, a large part of which could be furnished by lumber companies in the Philippines if there were a sufficient number properly capitalized and equipped. A market for Philippine lumber has already been secured in the United States and to a lesser extent in Europe. As already stated, many Philippine timbers are unexcelled for interior finish, cabinetwork, and other special uses for which imported woods are coming to be more and more demanded in the United States and Europe as the local supplies of hardwoods diminish.

MINOR FOREST PRODUCTS

This term includes all products of the forest except timber or lumber. Many of the minor forest products of the Philippines are at present almost unknown in the world's markets and are largely confined to local use. They are developed under a system of licenses issued by the Bureau of Forestry very much as in the case of timber. Forest charges amount to 10 per cent of the local market value. Among the minor forest products which are more or less generally used throughout the Islands and which have export possibilities are the following:

Nipa products.—Nipa is a palm that grows on the tidal flats along the seacoast. Nipa areas, or nipales as they are called locally, vary in extent up to about 20,000 acres; although there is one area which is estimated to embrace about 45,000 acres, only one-third of which, however, is
being utilized at present. Nipa sap has the important distinction of being the cheapest raw material known in the world for making sugar and alcohol. After extraction from the flower stalk this sap is known as "tuba" and contains about 15 per cent of sugar when fresh. Investigations made by the Philippine Bureau of Science bear the definite conclusions that nipa sugar is equal to cane sugar and can be extracted cheaper, as no crushing machinery is necessary; also that a hectare (2.47 acres) of nipa will produce 10,428 kilos (22,942 pounds) of sugar which, valued at $0.05 United States currency a kilo (2.2 pounds), would yield an annual income of more than $800 United States currency.

The yield of alcohol varies, depending on the grade of the product. It has been found that a hectare of nipa (about 2,000 plants) will average 36,000 liters (21,500 gallons) of sap per year; and that from 16 liters (4 gallons) to 30 liters (7.9 gallons) of sap are required to produce 1 liter of alcohol.

Nipa alcohol was awarded the first prize for purity at the Paris Exposition.

The use of alcohol of 186 proof, mixed with 10 per cent gasoline, has been shown to be of equal effectiveness with pure gasoline in a year's continuous trial in six automobiles in Manila. Manila imports about $200,000 worth of gasoline each year which could apparently be supplanted by alcohol.

On account of the opportunity for their utilization on a commercial scale, the products of the nipa palm must therefore be ranked among the most important minor forest products of the Philippines. All nipa growing on public land is under the supervision of the Bureau of Forestry; and up to the present time no forest charges on its products have been assessed.

Rattan.—Rattan is the product of the many species of climbing palms found in the tropical regions of the Old World. There is a large range of sizes, making the product adaptable to many uses. The thickness varies from one-quarter of an inch to 2 inches, and a length of 200 feet is not unusual. The larger sizes are used for canes and furniture, while the smaller ones are split to secure the outer part for caning chairs and the inner part or "core" for wicker furniture. The very small sizes are used in making baskets and other similar work. [There are probably no finer rattans in the world than those which grow in the Philippine Islands.]

This is an industry as yet but little developed, as with a limited exportation, the local consumption is only about 61 million pounds per annum. During the fiscal year ended June 30, 1914, unmanufactured rattan to the value of $4,210.56 United States currency was exported, of which the exports to the United States made up only $397. The importation of rattan into the Philippines for furniture manufacture is nearly four times greater. Locally the chief uses are for tying bales of hemp, tobacco, and other agricultural products. Especially since the European war has interfered with the Singapore market for rattan, the world's demand is directed more and more to the Philippines, and there is an exceptional opportunity for developing an extensive business in the Islands.

Manila copal or almaciga.—This gum, or resin, is obtained from a tree of the pine family known as Agathis alba and is commonly known in the Philippines as almaciga. The dried gum is very similar in appearance to amber and varies in color from light yellow to almost black. Its principal use is for the well-known copal varnish used in high-grade work such as on coaches and automobiles. The best quality is at present obtained from accumulated deposits at the bases of trees. Large lumps of almaciga, often weighing 100 pounds, can be found after all traces of the tree have disappeared. Locally it is graded according to purity into three or more classes. Although there is no organized or well-developed business in Manila copal, the Philippine Islands exported a quantity valued at $54,564 United States currency in 1913. The world's requirements for this product are still far from being met. This shortage could largely be reduced by the development of large forest tracts in the Philippine which produce Manila copal, or almaciga.

Other resins, gums, and oils.—Many trees in the Philippine Islands yield resins and oils of high potential commercial importance, but up to the present time their use has been largely restricted within local limits. One gum in particular, known as Manila elemi, promises possibilities of high development. This is derived from a tree known botanically as Canarium luzonicum, and popularly as pili. In 1913, 281,729 pounds of this gum were exported.

Yacal yields a resin which, while considered inferior to almaciga, is often mixed with it when sold by the collectors at the trading stations. Shipments of yacal resin to Europe are not infrequent.

The lauans could also be tapped for resin, as all species of the family are more or less resinous.

Various species of apitong yield an oil, or more properly a semifluid resin, known as balao or panao.

Two species of Philippine pines, which are very similar to the yellow pines of the United States, have been tapped for
resin. They are found to be rich in turpentine, but at present it is not known whether they would justify exploitation on more than a very limited scale.

A true wood oil is derived from a tree of the Leguminosae (or locust family) known as supu or manapo, which is largely used by shipbuilders.

Lumbang oil is the product of the nuts of two species of Aleurites. These are closely allied to the trees from which the Chinese wood oil (candlenut or tung oil) is derived. This oil is highly valued by varnish manufacturers because of its transparency and quick-drying and noncracking qualities.

Tan barks.—The supply of hemlock and oak bark for tanning in the United States is no longer sufficient, and for many years there has been an increased importation of tanning materials from tropical countries, amounting now to about $6,500,000 per year. This consists chiefly of quebracho wood from South America, myrobalan nuts from India, mangrove bark from East Africa, gambier extract from Singapore, and bate, a chemical mixture, from Europe.

The Philippine Islands possess approximately 1,500 square miles of mangrove swamps, some of which are sufficiently extensive to warrant the erection of factories for the extraction of cutch, as the tanning material from the mangrove bark is called. A very important cutch industry has existed for years in the neighboring island of Borneo, and there is no reason why it should not be duplicated in the Philippines, especially in view of the fact that all Philippine products enter the United States free of duty.

Dyewoods and barks.—While a number of the woods, barks, and leaves of the trees and shrubs of the Philippines can be used for dyes, only one, sibucao (Caesalpinia sappan), is so used to any large extent. During the year 1913, 3,684,074 pounds of dyewoods, mostly sibucao, passed through official channels.

Nigi or tabigi (Xylocarpus obvatus) is a tree which is found in abundance in the mangrove swamps and the bark of which is used extensively for dyeing. There is no export trade in this bark, but it is used locally for dyeing sails, ropes, fishnets, cloth, etc.

Gutta percha and rubber.—Mindanao and other southern islands of the Philippine Archipelago furnish gutta percha of good grade and some rubber. The trees grow in the dense tropical forest and steps have been taken by the Bureau of Forestry to conserve them for a permanent yield. In 1913, although there was no organized collection of these products, 38,761 pounds, valued at $40,932 United States currency, were exported from the Philippines.

Paper pulp.—The various kinds of bamboo found in the Philippine Islands are probably put to more uses than any other single product. The domestic and industrial uses of bamboo are too numerous to mention. It has been found that one kind of bamboo in particular, namely caña-boho, is an excellent material for paper pulp, the cost of production being lower than that of wood pulp, while the quality is excellent. Surveys made by the Bureau of Forestry show that there is a sufficient amount of caña-boho in several localities to supply a pulp mill constantly with raw material. This is a matter which justifies very serious consideration on the part of paper manufacturers in the United States and Europe.

Fiber plants.—The number of fiber plants through the fields and forests of the Philippines is large. Many industries using such products may be developed in the Islands. The stems, petioles, midribs, leaves, air roots, and fibers from the stems and leaves are utilized for making baskets, hats, mats, ropes, textiles, etc. Among the plants used for this purpose are ferns, pandans, grasses, bamboo, sedges, palms, rattans, vines, and various other plants. The ferns are largely used for basket making; the pandans for mats, hats, and baskets, the bamboo and rattans for baskets and hats; and various palms for baskets, hats, and ropes. Sedges are made into baskets, mats, and ropes. Textiles are made from the fibers of pineapple leaves and from hemp. A fiber from a plant known as salago is exported to Japan where it is used in the manufacture of the best grade of bank notes.

All of the plants above mentioned have many other uses.

Soap barks.—There are many trees and vines in the Philippine Islands the bark of which has soaplike properties. The bark most commonly used for this purpose is that of the vine gogo (Entada scandens). This vine is abundant in all the forests of the Philippines. It is easily prepared by macerating and drying. Its most general use is for shampooing hair. Other soapy barks are available, but are less desired than gogo, of which about 2,000,000 pounds are collected annually.

Pili nuts.—These grow on the large forest tree known as pili (Canarium luzonicum) which is common in southern Luzon and neighboring islands. It is the general opinion of all who have tasted it that this nut deserves a place among the world’s best table delicacies. Very little has been done in attempting to export the nut commercially or to improve the grade, although it is a prime favorite on Manila tables. Very few trees have been planted. The nut is used largely for confectionery by the Filipinos; and by
visitors to the Philippines is generally considered superior to almonds. There is, however, some exportation for foreign use. During 1913, 635,921 pounds of nuts, valued at $22,269, were exported to the United States.

There are many fruits, spices, and other nuts used locally as food, but none of them have become as well known or as popular as pili nuts.

Wax.—The outlying districts in the Philippines furnish honey and beeswax in large quantities for sale in the neighboring towns. The supply is rather irregular, and the wax is principally used locally for making candles. Besides this local consumption, 60,931 pounds of beeswax, valued at $14,408, were exported to the United States in 1912.

Medicinal plants.—The number of plants used for medicinal purposes in the Philippines is very large. A few are recognized as sources of standard medicines, but the number having commercial value is decidedly small. From one, the St. Ignatius bean (Strychnos ignatii), the strychnine of commerce is extracted. Some of the other plants having medicinal properties are dita, datura, sibuco, macabuhay, bonduc, pili, and Aleurites sp.

Horticultural possibilities of wild plants.—One of the largest fields for investigative work in the Philippines is presented by the possibilities of developing, improving and utilizing plants now growing wild in the forests. Experiments with many of these plants have already been made and the results have shown that very beautiful flowers and shrubs for decorative purposes and fruits of very fine flavor can be obtained. There are undoubtedly many other plants and trees which will show satisfactory results. Some of the fruits of forest trees that are regarded with favor are santol, mabolo, duhat, wild mango, catmon, alupag, and the Philippine species of Chinese nut or lichee.

More detailed information available.—The scope of a paper of this kind necessarily prevents more than a mention of the possibilities partially developed or latent in the forests of the Philippines. More detailed information will gladly be furnished by the representatives of the Bureau of Forestry in the Exposition Grounds, or else by application to the Director of Forestry, Manila.
THE PHILIPPINE ISLANDS

PUBLIC HEALTH

PANAMA PACIFIC INTERNATIONAL EXPOSITION
SAN FRANCISCO CALIFORNIA
Sanitary Achievements in the Philippine Islands, 1898-1915

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The United States of America may well be proud of the results attained along the lines of sanitation and hygiene by her sanitarians in the Philippines during the past sixteen years, especially when it is known that these have been achieved with the expenditure of about 10 cents per capita per annum.

There is no doubt but that, from a sanitary standpoint, the Philippines today are far in advance of most other Oriental countries and in fact of many states in the home country.

It is impossible in a publication of this size to do more than touch upon a few of the more important lines of work and the results obtained.

ORGANIZATION.

When, on August 13, 1898, the United States assumed control of the Philippine Islands, the former city authorities were asked to turn over the sanitary service and records of vital statistics, but it was found that beyond an appropriation of $1,500.00 for municipal physicians and medicines for the poor and $2,000.00 for a municipal laboratory in Manila, no such service existed, nor had any compilation of vital statistics been made. It became necessary, therefore, to establish a health organization that would meet the needs of the situation.

To this end Brigadier-General Hughes, U. S. A., on September 29, 1898, issued an order which created a Board of Health for the City of Manila and the provisions of which the city was divided into ten sanitary districts and a native physician placed in charge of each, whose duties included the medical care of indigents, the reporting of insanitary conditions and dangerous communicable diseases, the investigation of causes of death, and the furnishing of certificates of death in all cases where death occurred without medical attention.

In addition to the ordinary functions of a Board of Health, the Board exercised general supervision over charitable institutions, prisons, and a hospital for venereal diseases, and directly supervised the vaccine plant, municipal laboratories (which the Board organized), free dispensary, and hospitals for leprosy, smallpox and plague.

Eight municipal midwives were employed, but it was a difficult matter to induce the people to avail themselves of

*A portion of the data and certain statements were taken from the annual reports of the Bureau of Health for the Philippine Islands.
their services. A plan is now under way to operate a Training School for midwives in connection with the Nurses' Training School at the Philippine General Hospital. By this means it is hoped to supply the Islands with about 200 trained women per year.

Previous to this time the registration of vital statistics was in charge of the parochial priests. The Board at once undertook the work of securing and compiling vital statistics, and required the registration of physicians, pharmacists and dentists. Comprehensive laws have since been passed which created examining boards for the professions named, and registration is granted after passing examinations that compare favorably with those held in the United States.

The more prevalent diseases encountered at this time were smallpox, leprosy, malaria, dysentery and diarrhoea.

LEPROSY.

Leprosy was found to be widely distributed, the Franciscan priests estimating the total number of lepers in the Islands at 30,000. This estimate was entirely too high, as it is probable that less than 10,000 cases existed in 1898.

The necessity for the segregation of lepers was recognized and efforts made to inaugurate and carry the plan to a successful issue, but many obstacles were encountered, and beyond the isolation of a limited number of cases at San Lazaro Hospital in Manila and two similar institutions in the provinces, nothing definite was accomplished until May 1906, when the present colony at Cutium was opened. To date more than 1,500 lepers have been segregated and Cutium and the present number of colonists exceeds 3,400, the majority of whom are quite well satisfied with their lot. It is believed that hereafter the number of cases encountered outside the colony will gradually diminish.

MALARIA.

Malaria among the soldiers stationed at several points outside of Manila at once became a troublesome problem, but by forcing them to sleep under mosquito nets, and by the liberal use of quinine the disease became less and less prevalent. Gratifying results have since been obtained by the filling of stagnant pools or, if this could not be accomplished, by the use of crude oil and other sanitary measures. Within the past year quinine has been placed on sale with the municipal treasurers of the provincial towns, and this very useful drug may now be secured at a nominal rate. Formerly as high as 10 cents per 5 grain tablet has been charged in some of the more remote towns.

BUBONIC PLAGUE.

Bubonic plague appeared in Manila on December 29, 1899, and was almost continuously present to some extent until April 1906, after which no further cases occurred until June 19, 1912, when a fatal case occurred. During the remainder of the year 49 cases were reported, the year 1913 produced a total of 20 cases, and during the first nine months of 1914 there were 26 cases, at the end of which time it was believed to be eradicated. The city of Manila has passed an ordinance prohibiting the erection of buildings with hollow walls or ceilings, and this will do much toward the elimination of the rat and consequently of the plague carrying flea.

BERIBERI.

Beriberi formerly caused hundreds of deaths annually in Government institutions. After extended research it was found that the use of polished rice as the main article of diet bore a direct relationship to the incidence of the disease. The Governor-General on May 4, 1910, issued an executive order prohibiting the use of polished rice in Government institutions, and the effect of the substitution of unpolished for polished rice was very soon apparent.

During the year 1912 a total of 244 deaths from beriberi were registered at the Cutium Lepor Colony. For the two years ended June 30, 1914, during which time unpolished rice was furnished, a total of 3 deaths from this disease occurred. At Bilibid Prison similar results were obtained. It is probable that the few deaths registered were in the advanced stage of the disease at the time of admission to these institutions.

ASIATIC CHOLERA.

Cholera has caused so many as 100,000 deaths in one year in the Philippines. The prompt and efficient isolation of cases and carriers, and thorough disinfection of all fomites and of the house and the adjoining ground where infected material was thrown and the proper disposal of faeces and vomited matter have made it possible to hold the disease in check with a reasonable degree of certainty. Hundreds now die of the disease where formerly thousands died.

HOSPITALS.

Outside of Manila a few hospitals were found, the majority of which were constructed of bamboo and nipa palm leaves and were entirely devoid of sanitary accommodations.

At the present time there are three modern Government hospitals in the provinces, the materials and equipment for two of which had to be transported by hand to an elevation of about 3,000 feet over narrow mountain trails. Four smaller and less modernly equipped hospitals are also maintained by the Government in provincial towns, while others are under consideration. A number of mission and private hospitals are to be found in the provinces.

In Manila the hospital facilities were found to be extremely inadequate. During March, 1901, a "Women's Hospital" was opened, and on August 5, 1901, the Philippine Commission passed a law making it incumbent upon the Government to render medical assistance to its employees. To meet this requirement the Civil Hospital was opened during October of the same year. This institution, in connection with the San Lazaro Hospital for the care of dangerous communicable diseases, met the needs of the Government for a time, but it soon became apparent that additional hospital facilities were a necessity. Finally, on September 1, 1910, after a period of
nearly ten years of effort and planning, the Philippine General Hospital opened its doors to the public. This institution has a capacity of about 375 beds and is so planned that it may, by the pavilion system, be increased to a 1500 bed hospital. It is believed to be the best and most modern hospital in the Orient.

San Lazaro Hospital, already referred to, is utilized for the care of all classes of dangerous communicable diseases and the insane. Plans are now under way to build a modern insane asylum just outside of Manila.

In addition to the Government institutions, there are five other fair-sized and several smaller hospitals in Manila, some of which the Government assists in maintaining.

WATER AND SEWER SYSTEMS.

Water and sewer systems were practically unknown and no attempt was made properly to dispose of human or other wastes. A large part of such wastes, even in Manila, were thrown into the streets and hogs and chickens acted as scavengers.

At the time of American occupation of the Islands, Manila derived its water supply from the Marigua River, the Pasig River, and from wells and cisterns. The main supply came from the first-named river, which has its source in the mountains some ten or twelve miles from Manila. After flowing through three towns, which used the river as a common dumping ground and for bathing and washing purposes, the water was pumped into two subterranean reservoirs, hewn out of a soft white rock, which were ventilated by means of numerous cupolas. One reservoir had a capacity of 6,300,000 gallons, and the other 8,200,000 gallons. The city was supplied by gravity but, on account of the low elevation and small mains used, in some sections the pressure was practically nil.

Examination of the water showed it to be at all times dangerous for domestic use, and at one time it showed as many as 613,703 bacteria per cubic centimeter.
The total connections to the system on August 31, 1902, numbered 3,325, of which only 1,325 were private connections. The population of the city at this time was about 229,000, hence a very small percentage of the people were availing themselves of the doubtful benefits of the system.

In view of the fact that the capacity of the deposito amounted to only a two days' supply of water for the city and of the vitally important fact that the water was a constant menace to the public health, it was realized that a quiet and more adequate supply was an imperative necessity.

This was finally secured on November 12, 1908, when the present supply was made available. The watershed of the Mariguina River was cleared of its 10,000 inhabitants and a dam constructed across a gorge at the outlet, thus providing a natural reservoir with a capacity of 20,000,000 gallons. The pipe line to the city is capable of supplying 22,500,000 gallons daily, and in an emergency the old reservoirs can be utilized to supply an additional 12,000,000 gallons. A total of 7,227 private connections have been made and 258 street hydrants are available for those who cannot afford to pay for the necessary connection.

The pressure of the new system is 40 to 55 pounds to the square inch, the reservoir being 140 feet above the datum level of the city. The pipe line is 42 inches in diameter and 103/4 miles long. The total cost was about $2,000,000.00.

In the provinces the water supply was secured largely from rivers and shallow surface wells, oftentimes without walls and the opening flush with the ground level. It is not surprising, therefore, that the death rate was often as high as 50 per thousand per annum. Efforts were made, with more or less success, to improve the water supply by encouraging the people to use only the better class of wells and to discontinue the use of river water. No satisfactory results were obtained, however, until the drilling of artesian wells was begun in 1905. Rapid strides have been made along this line, and at the present time more than 1000 of these wells are in operation. Their use has resulted in a marked diminution in the number of cases of intestinal parasites and other intestinal disorders.

The average death rate for the provinces during the year 1913 was 21.53 per 1000 inhabitants, and the artesian wells may safely be accredited with a fair percentage of this highly gratifying reduction in the provincial mortality rate.

Fairly satisfactory results have been obtained by the treatment of waters containing amoebae with calcium hypochlorite.

**SEWER SYSTEMS.**

Measures were at once adopted to minimize the dangers arising from the lack of sewer facilities, and on August 22, 1901, the Board of Health passed a resolution which provided for the establishment of a sanitary pail conservancy system for night soil. This system, together with the old insanitary septic vaults, was used until the completion of the present sanitary sewer system in Manila, which was begun during the fiscal year 1907 and completed May 25, 1909, at a cost to the Government of about $1,650,000. Fifty-two miles of sewer pipes were laid in order to give a satisfactory system to the city as a whole. This installation easily ranks with the best to be found in the Orient. The maintenance cost amounts to about $75,000 per annum.

The sewers range in diameter from 7.874 inches to 3 feet 8.9 inches, and the slopes are sufficient to warrant a velocity of not less than 25.59 inches per second when flowing one-half full. The minimum depth is 4 feet 11 inches, and the maximum depth is 17 feet 8.6 inches.
Five substations are required to give the system the flow mentioned above, and are located as follows:

Gallons per 24 hours.

Ermita, with a capacity of.......................... 5,000,000
Santa Cruz, with a capacity of........................ 12,000,000
Quiano, with a capacity of............................ 5,000,000
Malate, with a capacity of............................. 2,000,000
Paco, with a capacity of................................ 500,000

These pumps the sewage to the main pumping station, which is located on the beach in the lower part of Tondo and has a capacity of 25,000,000 gallons for twenty-four hours. The main station has a lift of approximately 28 feet 10.45 inches, and discharges into the bay, through a 3-foot 3.34 inch cast-iron force main laid 10 feet below the bed of the bay, at a point approximately 1 mile from the shore. This pipe terminates in a vertical position, which was done for the purpose of making the discharge take place above the bottom of the bay. The outlet end is encased in a huge block of cement masonry which rests upon a timber platform supported by a group of piles.

Branches or outlet pipes have been provided at intervals of 39.37 feet throughout practically the entire sewer system. The system is ventilated by omitting the vent pipe and continuing the soil pipe and vent pipe of each house connection through and above the roof. Flush tanks with suitable connections to the water system supply have been constructed at the ends of the primary lateral sewers for the purpose of keeping them clean and in a satisfactory condition. These tanks have been built to hold about 349 gallons of water each, and are provided with gates and handles for operation by hand. This feature is unique and has been introduced for the first time in Manila.

The pumping plant consists of centrifugal pumps driven by electric motors, and are supposed to be automatic. The rise and fall of the sewage in the sewer starting or stopping the pumps as occasion may require.

MOATS.

A massive stone wall as a protective measure was begun around old Manila in 1571 and completed during the eighteenth century. On the outside of and surrounding this wall was a moat which had degenerated into a swamp or morass covering 25 acres of ground. A number of private house drains emptied into it and carabao walloped in its mud and slime. Inasmuch as there was only a slight circulation of water, it was in a very filthy condition and afforded an ideal breeding place for myriads of mosquitoes.

This whole area has now been reclaimed by filling in and at present is covered with a well kept lawn and affords ideal grounds for athletic sports.

MARITIME QUARANTINE.

Sixteen years ago maritime quarantine as enforced in the Islands was ineffectual. Dangerous communicable diseases were frequently introduced without concerted efforts being made to prevent their importation.

A very efficient service was established and is maintained by the United States Public Health Service.

One of the most modern quarantine stations in the world has been constructed at Mariveles, Bataan Province, which is situated at the entrance to manila Bay, about 30 miles from Manila. A similar but smaller station is located at Cebu for the convenience of vessels which desire to enter one of the southern ports.

These stations have on numerous occasions prevented the introduction of dangerous communicable diseases into the Philippines.

DEATH RATE IN MANILA.

The death rate in Manila among the 4,412 Americans for the fiscal year 1913 was 8.42 per 1,000 and for Americans in the Government service it was 2.47 per 1,000. These figures show that even after making due allowance for the fact that the Government employees were selected only after a satisfactory physical examination, the expectancy of life for Americans is quite as good in Manila as in the United States.

GENERAL CONDITIONS.

Fifteen years ago the Philippine Islands were unenviably known from a sanitary standpoint. Today they are setting the pace along many lines for the countries most advanced in the science of sanitation.

The temperature in the lowlands ranges from about 65 to 98 degrees Fahrenheit, while in the mountains the extremes are about 25 and 50 degrees Fahrenheit.

The average Manila rainfall during the so-called dry season amounts to about 14.7 inches and during the wet season to about 14.3 inches.

It will be seen, therefore, that a low temperature, which is of great aid to the sanitarian in temperate zones, does not exist in the Philippines. Insects thrive at all seasons of the year.

Fifteen years ago there were in Manila about 31 miles of external or canal, which were in many instances extremely filthy. They have been in part filled up, and the remaining ones have been dredged out so that the water flows in and out with the tide; in some instances they have been walled up, so that instead of constituting a nuisance they now serve as useful arteries of commerce.

Formerly no provision was made for the care of the insane; they were of necessity often tied up when intractable. At present two institutions in Manila are open to this class of patients, and a project is under way to build a modern asylum just outside of Manila.

The Government operates a plant in Manila that is capable of producing 100,000 pounds of ice and 5,000 gallons of distilled water daily. These products are sold to the public at the nominal rates of 4/-1/- or £1 cent per pound for ice, and about 1 cent per quart for water delivered. The plant also provides extensive cold storage facilities.
SECTION OF THE OLD INSANITARY MOAT AROUND THE WALLED CITY OF MANILA.

Now beautiful sunken gardens.

SUNKEN GARDENS, MANILA.
Formerly an extremely insanitary moat. Now used for athletics.
Manila Hotel in background.
Shows site of Luna entrance to the Walled City and Aquarium.
not only the compilation of vital statistics and the safeguarding of the public from dangerous communicable diseases, but embrace the administration of public charities, the care of the aged, the orphans and the indigent, the administration of general and special hospitals, the hygienic and medical care of all government employees, the sanitary control of cigar and cigarette factories; it acts in a semi-missionary capacity in connection with the organization of Government units among the wild tribes, and in short comes in contact with the majority of the activities of the Archipelago.

Modern anti-tuberculosis measures have been adopted and hospitals for the care of this disease opened. At Baguio, which has an elevation of nearly 3,000 feet, uniformly good results have been obtained in the fresh air treatment of the disease.

Smallpox and Vaccination in the Philippine Islands, 1898-1914

By DR. JOHN E. SNOGDURRE.
Assistant to the Director of Health.
MANILA, P. I.

It is probable that in no other way have the results obtained by sanitarians in the Philippine Islands since American occupation been more satisfactorily or conclusively demonstrated than by vaccination for the prevention of smallpox.

Sixteen years ago the annual deaths from smallpox in the Islands were very conservatively estimated at 40,000. During the year 1913 a total of 929 deaths were reported, none of which occurred in Manila.

What is responsible for this almost unbelievable reduction in the death rate from this dread disease? The answer is that about 18,000,000 vaccinations have been performed in the Philippines during this length of time.

The military authorities began the work of vaccinating throughout the country as fast as it became opened up. The reports of the chief vaccinator under the Spanish regime show that from November 3, 1894, to October 25, 1898, when the municipality of Manila was transferred to the administration of the United States, a total of 9,136 vaccinations were performed. During the year 1899 a total of 103,931 vaccinations were performed in Manila alone, notwithstanding the fact that the authorities deemed it advisable to perform vaccinations on account of the probability of creating a lasting prejudice against this very necessary measure.

The necessity for systematically vaccinating the population of the entire archipelago soon became apparent. This was made possible by Act No. 209 of the Philippine Legislature, which was passed on December 2, 1901, and made vaccination compulsory. The work was begun in 1903, and the following table shows the progress of the campaign:
<table>
<thead>
<tr>
<th>Province</th>
<th>Date of Beginning</th>
<th>Date of Completion</th>
<th>Total Vaccinations</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of Manila</td>
<td>Jan. 1908</td>
<td>Dec. 1908</td>
<td>306,168</td>
</tr>
<tr>
<td>Cagayan</td>
<td>July 1904</td>
<td>July 1905</td>
<td>121,155</td>
</tr>
<tr>
<td>Cebu</td>
<td>July 1904</td>
<td>Nov. 1906</td>
<td>262,569</td>
</tr>
<tr>
<td>Isabela</td>
<td>Dec. 1904</td>
<td>Mar. 1905</td>
<td>67,488</td>
</tr>
<tr>
<td>Rizal</td>
<td>Jan. 1905</td>
<td>Sep. 1906</td>
<td>97,598</td>
</tr>
<tr>
<td>Romblon</td>
<td>Apr. 1905</td>
<td>Apr. 1906</td>
<td>97,528</td>
</tr>
<tr>
<td>Cuitite</td>
<td>Apr. 1905</td>
<td>Apr. 1906</td>
<td>72,528</td>
</tr>
<tr>
<td>Batangas</td>
<td>Dec. 1905</td>
<td>Dec. 1906</td>
<td>237,502</td>
</tr>
<tr>
<td>Pampanga</td>
<td>Jan. 1906</td>
<td>June 1907</td>
<td>165,699</td>
</tr>
<tr>
<td>Oriental Negros</td>
<td>Mar. 1906</td>
<td>Mar. 1907</td>
<td>132,790</td>
</tr>
<tr>
<td>Ambos Camarines</td>
<td>Sep. 1906</td>
<td>Apr. 1907</td>
<td>260,481</td>
</tr>
<tr>
<td>Bohol</td>
<td>Oct. 1906</td>
<td>Jan. 1908</td>
<td>260,002</td>
</tr>
<tr>
<td>Occidental Negros</td>
<td>Oct. 1906</td>
<td>May 1909</td>
<td>95,926</td>
</tr>
<tr>
<td>Bulacan</td>
<td>Nov. 1906</td>
<td>May 1908</td>
<td>221,119</td>
</tr>
<tr>
<td>Capiz</td>
<td>Nov. 1906</td>
<td>May 1909</td>
<td>170,305</td>
</tr>
<tr>
<td>Zamboanga</td>
<td>Dec. 1906</td>
<td>Feb. 1907</td>
<td>75,368</td>
</tr>
<tr>
<td>Sorsogon</td>
<td>Jan. 1907</td>
<td>Jan. 1908</td>
<td>145,132</td>
</tr>
<tr>
<td>Taytay</td>
<td>Jan. 1907</td>
<td>Oct. 1907</td>
<td>188,132</td>
</tr>
<tr>
<td>Lepanto-Bontoc</td>
<td>Jan. 1907</td>
<td>May 1908</td>
<td>39,901</td>
</tr>
<tr>
<td>Iloilo</td>
<td>Jan. 1907</td>
<td>June 1908</td>
<td>819,236</td>
</tr>
<tr>
<td>Pangasinan</td>
<td>Mar. 1907</td>
<td>Oct. 1907</td>
<td>483,638</td>
</tr>
<tr>
<td>Nueva Ecija</td>
<td>Apr. 1907</td>
<td>June 1908</td>
<td>186,734</td>
</tr>
<tr>
<td>Tarlac</td>
<td>May 1907</td>
<td>June 1908</td>
<td>146,679</td>
</tr>
<tr>
<td>Albay</td>
<td>July 1907</td>
<td>Jan. 1908</td>
<td>254,948</td>
</tr>
<tr>
<td>Surigao</td>
<td>Jan. 1908</td>
<td>Dec. 1908</td>
<td>96,462</td>
</tr>
<tr>
<td>Misamis</td>
<td>Jan. 1908</td>
<td>Mar. 1910</td>
<td>139,900</td>
</tr>
<tr>
<td>Mountain</td>
<td>Feb. 1908</td>
<td>May 1909</td>
<td>23,130</td>
</tr>
<tr>
<td>Antique</td>
<td>June 1908</td>
<td>Mar. 1910</td>
<td>96,341</td>
</tr>
<tr>
<td>Mindoro</td>
<td>Jan. 1910</td>
<td>Apr. 1910</td>
<td>35,326</td>
</tr>
<tr>
<td>Leyte</td>
<td>May 1910</td>
<td>Apr. 1910</td>
<td>35,326</td>
</tr>
<tr>
<td>Agusan</td>
<td>June 1910</td>
<td>Feb. 1911</td>
<td>35,329</td>
</tr>
<tr>
<td>Samar</td>
<td>Oct. 1913</td>
<td>June 1914</td>
<td>104,907</td>
</tr>
</tbody>
</table>

Total systematic vaccinations: 7,032,814

In addition, non-systematic vaccinations to the number of about 11,000,000 have been made which bring the grand total up to, in round numbers, about 18,000,000.

In carrying on the work of systematic vaccination, it has been customary to employ groups of 20 to 50 native assistant sanitary inspectors, each of which was placed under the supervision of a physician or an American sanitary inspector. The towns of a province were vaccinated in geographical order, and the itinerary so arranged that a number of the vaccinators would return to a vaccinated town a week or ten days subsequently and inspect the vaccinations. Certificates were given to persons obtaining a positive result, while those showing no result were revaccinated.

*Vaccinations still continue.

The same procedure has, in part, been followed in making the non-systematic vaccinations, the exception being that towns in which an outbreak of smallpox was reported were first visited.

The law provides that all district health officers shall semi-annually cause to be vaccinated all unvaccinated persons or those not recently vaccinated, in their respective districts.

Opposition to vaccination among the natives and even among a certain percentage of Americans at the time was very marked, especially in the remote provincial towns. This antipathy has been largely overcome and the semi-annual vaccinations are taken as a matter of course.

It has so happened that now and then one of the misguided American anti-vaccinationists has managed to evade vaccination and has paid dearly for his folly.

The deaths reported throughout the islands from smallpox during the past 5 years are as follows:

- During the year 1909: 8,515 deaths.
- During the year 1910: 3,944 deaths.
- During the year 1911: 1,192 deaths.
- During the year 1912: 367 deaths.
- During the year 1913: 823 deaths.

During this period no deaths from the disease have been reported in Manila.

Were it possible to carry out the provisions of the compulsory vaccination law, it is absolutely certain that the disease would disappear from the Philippine Islands.

The virus used is manufactured by the Government laboratories in Manila and is put up in the moist form in 100 unit tubes, which, if properly conserved, is sufficient for 100 vaccinations.

The method commonly employed in performing a vaccination is as follows:

1. Cleanse the site with a pledget of cotton saturated with alcohol and allow to dry.
2. Place a small amount of virus on the spot to be scarified, using the lancet end of the vaccinating instrument after sterilization to convey the virus from the tube to the arm.
3. A five point scarifier is ordinarily used to introduce the virus. Care is used not to draw blood. The instrument is sterilized by passing it through a flame.
4. Allow the virus to dry.
5. No dressing is applied.

Despite the efforts that are often made to wash off the virus or to render it inert by the application of washes, herbs, etc., almost no ill effects are noted, which indicates that the virus furnish is of excellent quality.

The following experience of the writer will illustrate how trivial a matter will sometimes interfere with the success of such a campaign.

While vaccinating the province of Cebu, during which campaign over 200,000 persons were vaccinated, it was noted that...
many people were hiding and that considerable difficulty was experienced in persuading others to submit to vaccination. This experience was repeated in two or three towns. Finally, the municipal president of one of the towns explained the cause of the difficulty. The virus used at this time was put up in amber-colored glass tubes, while that previously used had been supplied in clear tubes. It appeared that a man in one of the towns had made the statement that the new virus was poison as it was not the same color as the old. The story quickly spread from town to town, and the result was that many people hid in the woods and in many instances children and babies were found in boxes, cupboards and similar hiding places.

One of the greatest difficulties encountered in carrying on the work in provincial towns is that the glycerized virus will not retain its potency for more than a week or ten days if kept on ice. In many remote municipalities more than a week is required to transport it to these towns, and as it is often carried by foot messengers, over rough mountain trails, it is impossible to transport heavy ice chests. Persistent effort has been made to secure an efficient dry virus but without any encouraging degree of success to date. Several lots of such a virus have been made at the Government laboratories, and while one lot or one tube would be satisfactory, the results obtained from the next would be negative.

The percentage of successful vaccinations with the Government virus in previously unvaccinated persons varies, but will average from 60 to 70 per cent.

The only argument necessary to explode the theories of the anti-vaccinationists is to compare the visages of the children of today with those of their parents. Very few of the former are disfigured from smallpox, while a comparatively large percentage of the latter bear the scarred faces, and often the loss of sight or other disfigurements, which formerly were so common as a sequel to smallpox in the Islands.

It will be a difficult matter to convince an unbiased judge that a measure that has reduced the number of deaths from smallpox in the Philippine Islands from over 40,000 to a few hundred per annum in the space of 16 years is not a meritorious one.

Leprosy in the Philippine Islands

By

DR. JOHN E. SNODGRASS,
Assistant to the Director of Health.

Manila, F. J.

It is stated on reliable authority that leprosy was introduced into the Philippine Islands in 1633. It appears that the Emperor of Japan sent a ship with 150 lepers on board, as a present, to be cared for by the Catholic priests. They were allowed to land and as no practical measures were taken to prevent the spread of the disease, it steadily increased until 1806 when the Cullon Leper Colony was opened.

During the Spanish regime there was a division of authority between the Church and the State, and in the matter of health measures and vital statistics, it appears that the Church assumed the major part of the responsibility.

Lepers were conducted by the Church along charitable lines, more for the purpose of aiding individual sufferers than with the view of preventing the spread of the disease.

The first leper hospital was established in Manila in 1633, on what is now Calle Concepcion, by the Franciscan order as a part of their general hospital which had been in operation since 1602. A comparatively small number of lepers were cared for in this institution until 1784, with the exception of a few years between 1832 and 1831, when they were removed to a safer place because of a threatened invasion by Chinese pirates.

In 1784, upon the expulsion of the Jesuit order from the Islands, the Spanish Government took possession of the present San Lazaro Estate and transferred it to the Franciscans, who built a leper hospital on a portion of the estate at a cost of about $31,700.00. They called the institution San Lazaro Hospital and this building with a number of additions constitutes the present Government institution, designated by the same name, for the care of dangerous communicable diseases in Manila.

The hospital was abandoned on August 12, 1898, the day before the surrender of the city to the American arms, as the priests considered it unsafe to remain outside the Walled City, and the hospital was found practically empty after the occupation took place. The lepers were gradually returned to the institution as they were apprehended.

At this time two other leper hospitals existed at Cebu, Cebu, and the Palestina Hospital at Naga (Nueva Caceres), Ambos Camarines, respectively.

The combined capacity of the three institutions was about 500.

It will be seen, therefore, that little or no effort had been made toward the segregation of the leper population.
VIEW OF A SECTION OF CULION LEPER COLONY.
November, 1911.

A SECTION OF CULION LEPER COLONY.
View from the Church. November, 1911.
The Board of Health took up the question of isolating these unfortunates, and considerable time was spent by a committee composed of the Secretary of the Interior, the Commissioner of Health and the Sanitary Engineer of the Bureau of Health in examining proposed sites for a leper colony. Finally, on January 1, 1902, Halsey Harbor on the west coast of Cullon Island was decided upon as a suitable location and it was the intention to begin the construction of a colony there at once, but an outbreak of bubonic plague in Manila required the presence of the Sanitary Engineer, which necessitated the postponement of building operations until January 1903. A great deal of difficulty was experienced in securing labor and after several months it was decided that the site did not afford a sufficient water supply for a colony of the proportions necessary and it was abandoned during the month of September 1903, in favor of the present location on the northeastern coast of the island, which was formerly the town of Cullon.

The property of the inhabitants was purchased by the Government and out of the 67 structures comprising the town those that could be utilized were retained and a sufficient number of others erected from bamboo and nipa to meet the immediate needs of the situation.

On May 28, 1906, lepers from Cebu, Cebu, to the number of 365 were landed at the colony, thus forming the nucleus of the Cullon Leper Colony, which is now widely known as the largest and one of the best institutions of its kind in the world.

The Chief of the colony had been stationed at the colony for some time prior to the arrival of the first colonists, making arrangements for their coming in order that they might be made comfortable at once. He was stationed at a point about one mile from the headquarters of the colony.

The colonists are not permitted to pass a specified point which is known as a dividing line between the colonists' and the employees' sections.

There have been three chiefs of the colony since it was opened. The Chief is the executive officer of the colony, the quarantine officer for Cullon, and ex-officio Justice of the Peace. He is not infrequently called upon to act in the latter capacity as at times there have been as many as 500 non-leprous employees upon construction work at the colony and many of them have their families with them, consequently the population of Cullon has been as high as 3,800 persons, and disputes occasionally arise.

The Chief, who according to law must be a physician, is assisted by another doctor whose duties consist of the actual medical and surgical care of the lepers.

Four Sisters of Charity of the Order of St. Paul de Chartres and one Jesuit priest were stationed at the colony to assist in caring for the lepers on their arrival. The former have been increased in number to 8, and 2 priests now minister to the spiritual needs of the colonists. The sisters assisted by both male and female leper helpers, selected because of previous experience or adaptability, do all the nursing and surgical dressings for the colony. Frequently there are more than 250 patients in the hospital at one time, and as many as 300 surgical dressings for out-patients are sometimes done during one morning.

For a number of years the lepers were permitted to elect their own president and councilmen, and ordinances passed by them were submitted to the Chief, who either approved or vetoed the measures as seemed advisable. During 1910 the only American leper at the colony was, by popular vote, elected president. This plan has been discontinued and an advisory council appointed, executive power being vested in the Chief, the Director of Health and the Secretary of the Interior.

For a number of years difficulty was experienced in apprehending lepers, as their friends would secrete them when a

GOVERNMENT CUTTER, "BASILAN"

The leper collecting steamer, at the pier, Cullon Leper Colony, collection trip was to be made. Latterly much less opposition has been encountered, and not infrequently persons having friends or relatives at the colony or those having various skin diseases resembling leprosy present themselves and ask to be taken to Cullon, the latter class stating that they are outcasts in their home towns. It has been a pleasure to be able to relieve many such cases by treatment and to give them certificates stating that they are not lepers and thus restore them to society.

Lepers collecting trips are made about twice yearly. About three weeks before a trip is to be made the District Health Officers are notified to segregate all the lepers in their districts at a convenient port.—nearly all of the provinces having a seaport. A steamer of about 100 tons capacity is ordinarily
used to collect the lepers. A bacteriologist from the Government laboratories accompanies each expedition and examines all suspects. No case is taken unless positive microscopically, with the exception of a few of the clinically positive ones having the anaesthetic form of the disease, it being a difficult matter to demonstrate the bacillus in the purely anaesthetic type without resorting to a nerve section. Cases clinically positive and microscopically negative are examined on the occasion of a subsequent collection and are usually found to be positive.

At the colony a leper police force numbering 15 to 18 is maintained to preserve peace in the colony. They are of great aid to the Chief and render comparatively easy what would otherwise be a difficult situation to meet. When on duty they wear a regulation uniform of khaki, except that on special occasions white is worn. The Government pays them a small salary for their services.

Paid leper sanitary inspectors are of great aid in maintaining the colony in a sanitary condition. A non-leprous native sanitary inspector of the Bureau of Health is in charge of the force under the direction of the Chief of the Colony.

A brass band of about 16 pieces greets newcomers to the colony and gives concerts on special occasions. A string orchestra possessing considerable merit furnishes the necessary music for dances, receptions, etc.

An attractive concrete theatre has been constructed, where the colonists enjoy moving pictures, phonograph concerts, dances and receptions. This building has no walls and is in effect an open air theatre. In case of a driving rain, another nearby hall furnishes a suitable substitute.

Athletic meets are occasionally held and a great deal of interest is manifested in baseball. That they possess the true American baseball spirit was demonstrated at one of the games when both teams attacked the umpire with ball bats.

Many of the lepers spend a large part of their time in fishing from rafts made of 6 or 8 pieces of bamboo, 3 or 4 inches in diameter, lashed together. It is not solely a pastime; for the Government pays them at the rate of nearly $4 cents per pound for as many fish as they can catch. A catch of 25 pounds or more in a day for one man is not infrequent.

The Government pays a weekly gratuity of 10 cents to the colonists in addition to providing them with quarters, if they are unable to procure bamboo and nipa to build their own, part of the necessary clothing, and subsistence. The gratuity is paid with a special aluminum colonial currency which is worth face value in the colony. All money, mail or other effects from the colony are disinfected before leaving Cullow.

All leper employees on permanent detail are paid a small monthly salary, and a variety of ways of earning money permits the colonists to accumulate considerable sums.

Since 1906, lepers have been transferred to Cullow as follows (readmissions not included):

<table>
<thead>
<tr>
<th>Year</th>
<th>First quarter</th>
<th>Second quarter</th>
<th>Third quarter</th>
<th>Fourth quarter</th>
</tr>
</thead>
<tbody>
<tr>
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<td>365</td>
<td>132</td>
<td>132</td>
<td>365</td>
</tr>
<tr>
<td>1907</td>
<td>1</td>
<td>310</td>
<td>271</td>
<td>158</td>
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<tr>
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<td>1,025</td>
<td>150</td>
<td>257</td>
<td>171</td>
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<td>1910</td>
<td>132</td>
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<td>399</td>
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<tr>
<td>1911</td>
<td>173</td>
<td>266</td>
<td>0</td>
<td>448</td>
</tr>
<tr>
<td>1912</td>
<td>131</td>
<td>276</td>
<td>261</td>
<td>287</td>
</tr>
<tr>
<td>1913</td>
<td>250</td>
<td>254</td>
<td>204</td>
<td>78</td>
</tr>
<tr>
<td>1914</td>
<td>319</td>
<td>269</td>
<td>140</td>
<td>8,386</td>
</tr>
</tbody>
</table>
The largest number occurred at the age of 21, when 139 were registered; at the age of 24 there were 102 cases. From this age the number declines comparatively rapidly.

It will be seen, therefore, that the disease occurs more frequently during early manhood and womanhood.

The proportion of males to females at the colony is usually about 2 to 1.

No definite conclusions have been reached with regard to the method of transmission of the bacillus from one person to another. It would seem, however, that in the absence of an actual wound infection, long continued close association with a case is necessary to induce infection. That the disease is not highly infectious is evidenced by the fact that a large percentage of the population of the Islands have not contracted it when so many widely distributed centers of infection have existed for years.

TREATMENT.

The policy of the Bureau of Health has been to give all bona fide new remedies recommended for the cure of this disease a thorough trial. Very few of them have given encouraging results.

A series of cases for a time appeared to show marked improvement under treatment with the X-Ray, but after the treatment was discontinued they relapsed.

Chaulmoogra oil has given the most promising results. For a time it was exhibited in the form of the crude oil and given by mouth, injection, or inunction, with more or less satisfactory results. During the past few years chaulmoogra oil with camphorated oil and rosin have given really encouraging results, though these results do not indicate that this combination is in any sense a specific for the treatment of leprosy. The following extract from the annual report of the Bureau of Health for 1913 indicates the method of administering the prescription referred to and the results obtained in two cases:

"On June 21 there were released from San Lazaro Hospital two persons who were formerly afflicted with leprosy and have now been pronounced free from the disease."

"C. A., male, Filipino, age 27, admitted to the San Lazaro Lepers Hospital May 29, 1909. On admission the case presented thickened reddish spots on the nose and thickening and discoloration of the lobe of the right ear. Smears made from the lesions were positive for leprosy bacilli. Beginning August 1909, he received vaccine treatment at intervals for one year, but apparently there was no change in his condition during this period. From September 1910, to November 1910, he took crude chaulmoogra oil by mouth, beginning with daily 15-drop doses and by November reaching 60 drops per day. The oil was given three times daily in divided doses. Beginning in November he received hypodermic injections of the following prescription of Doctor Mercado, house physician at San Lazaro Hospital:

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TUBERCULAR LEPROSY.

Showing improvement under treatment with chaunmogna oil, resorcin, and camphorated oil.

Photographed February 21, 1912, August 19, 1912, and October 28, 1912.

A WELL-DEFINED CASE OF TUBERCULAR OR NODULAR LEPROSY

TUBERCULAR LEPROSY.

Showing early nodular lesions.

A MIXED CASE OF LEPROSY.

Note clubbed end of right thumb and ulcers on fingers. Face presents lesions of the tubercular type.
made at frequent intervals, but always with negative results. On June 11, 1913, the date of her discharge, all macules had disappeared, but there was still some suffusion of the countenance.

"It is not known whether the vaccine treatment had any influence in these cures. It may be said, however, that there are a number of other cases at San Lazaro Leper Hospital, and at the Culion Leper Colony that have been negative for nearly two years, which presented more marked lesions than those already discharged, and yet they received only chaulmoogra oil, no vaccine being employed.

"Apparent cures have been reported from time to time in the past from San Lazaro Hospital, but unfortunately all of them relapsed or died from some intercurrent disease soon after a period of one year. The cases now reported have been negative for a period of two years and there seems to be ground for hope that the results may be more permanent."

A distinct advance toward the ultimate discovery of a serum for leprosy was made during 1909 by Mr. Moses T. Clegg, at that time employed in the Government laboratories, in the cultivation of the leper bacillus on an artificial media.

There is an urgent need for the services of a commission for the study of leprosy in the Philippines. The field is large and the facilities for research work at Culion are probably unexcelled. It is believed that such a body would, within a comparatively short time, be able to impart definite knowledge as to the method of transmission, which would be of great practical value, and possibly evolve a definite cure for this most distressing malady which makes its victims outcasts from society and condemns them to a life of isolation with scant hope of ultimate recovery.