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Held in connection with

The GREAT INTERNATIONAL FISHERIES EXHIBITION

THE FISHERIES OF THE BAHAMAS

BY

A. J. ADDERLEY

COMMISSIONER FOR THE BAHAMAS TO TH
FISHERIES EXHIBITION

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LONDON, 1883

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By A. J. ADDERLEY

COMMISSIONER FOR THE BAHAMAS
TO THE INTERNATIONAL FISHERIES EXHIBITION

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THE

FISHERIES OF THE BAHAMAS.

HER MAJESTY'S possessions, the Bahama Islands, extend from the northern coast of St. Domingo to the eastern coast of Florida, United States, a distance of nearly 600 miles. In all there are 29 islands, 661 cays, and 2,387 rocks. The area is 4,424 square miles.

The population by the census of 1881 was 44,000. Of this number about 10,000 are whites, the remainder descendants of emancipated Africans. The population per square mile is about 10.

The principal islands are New Providence, on which is the capital Nassau, Grand Bahama, Eleuthera, Andros, Abaco, Long Island, San Salvador, Rum Cay, Inagua, Crooked Island, and Berry Island. The formation of the islands is of calcareous rocks, of coral and shell, hardened into limestone, and much honeycombed. There are no traces of primitive or volcanic rock. The shores generally rise gradually to a hill range in the principal islands, perhaps to a height of 250 ft. With the exception of the island of Andros, no freshwater rivers exist. The supply of water is from wells and from rain-water tanks.

The woods are the mahogany, lignum vitæ, iron, mastic, ebony (green and black), braziletto, logwood, satin wood, and many others. A wood called horseflesh is in great

repute for ship's timbers, being hard and practically everlasting. In former times the wooden walls of old England were partly formed by timbers cut from Andros. The fruits are oranges, lemons, limes, pineapples, bananas, plantains, melons, yams, potatoes, tomatoes, sugar cane, ginger, cocoanut, and many others. There is a large export of pineapples, oranges, and tomatoes. Tobacco and cotton grow readily, but labour and perseverance has so far been wanting to develop these important products. The castor-oil plant grows wild, and the cascarilla and canella alba barks are exported to a considerable extent.

Animal life is restricted to the wild cat, raccoon, and guano; whilst a dog that did not bark is said to have existed among the aborigines.

Of birds, flamingoes, wild ducks, pigeons, are plentiful. There are also parrots, geese, humming birds, cranes, snipe, &c.

Of fish the varieties are innumerable. Some of them by their local names are as follows: Grouper, Red Snapper, Market-fish, Barracouta, Hound-fish, Porgy, Goggle eye, Jack, Mutton-fish, Shark, Stingray, Mullet, Cray-fish, Sword-fish, Bone-fish, Hog-fish, Turtle, Angel-fish, June or Jew-fish, Dolphin, King-fish, Grunts, &c.

The fishing-boats, numbering 100, and employing 500 men, are usually of the sloop rig, with a leg-of-mutton sail, and a well for keeping the fish alive. The sponging and wrecking vessels, numbering 500, are of schooner rig, fine models, and fast sailers. They are built by the islanders, the timbers being of native hardwood (horse-flesh), the planking of yellow pine, from North Carolina, and vary in tonnage from 15 to 60 tons.

Fish are caught with fish-pots, hand-lines, and nets, the nets being taken out some distance from the land, and

hauled slowly in to the shore, when a great variety, many of brilliant and variegated colours, is usually secured. It forms an important article of food, but none are exported, with the exception of turtle (*Chelonia Mydas*) and the hawksbill (*Chelonia imbricata*), yielding the tortoiseshell of commerce.

The bait used in line-fishing is usually the conch. The fish are drummed up by striking two shells of the conch together, and are ground-baited as in English rivers. During the boisterous north-west winds, prevailing between November and February, they are difficult to catch, and are brought alive in the wells of the boats, and thus sold in the market-place.

The estimated value of fish used in home consumption is £18,000 per annum, and of turtle exported, £600 per annum.

King, queen, and common conch-shells are exported in large quantities, being used for cameos, and in the latter is found the beautiful pale pink pearl now becoming so valued. The value of shells exported is £1,200 per annum, and of pearls £3,000 per annum.

Ambergris is also found on these shores, and sea-cucumber (trepang). The value of ambergris exported is £1,000 per annum.

Corals and small shells, which are very beautiful, are largely collected, and find a ready sale among the American visitors, and in England.

The value of the sponge exports for 1883 is estimated at £60,000. In 1882 it was £59,033. The sponge trade gives employment to several thousands of persons and some hundreds of vessels, the sponges being divided into coarse and fine. The principal varieties, in the order of their value, are known as sheep-wool, white reef, abaco

velvet, dark reef, boat, hardhead, grass, yellow, and glove; and of some of these varieties there are several grades, designated by numbers, all being used for mechanical, surgical, and bathing purposes. Bahama and Florida sponges are about equal in texture and value, but both are inferior to those of the Mediterranean. The vessels employed in sponging are small, with crews of from six to twelve men. About six weeks' provisions are taken on board, and they then coast along the banks and reefs, where the water is shallow and generally so clear that the sponges are readily seen, and are brought to the surface by hooked poles, or sometimes by diving. When first brought up they are covered with a soft gelatinous substance as black as tar, and full of organic life, the sponge as we know being only the skeleton of the organism. The day's catch is spread out on the deck so as to kill the mass of animal life, which in dying emits a most unpleasant smell. Then the spongers go ashore and build a pen or "crawl" of stakes close to the water's edge, so that the action of the tide may wash away the black covering, in which it is aided by pounding the sponges with sticks. When this operation is completed, the sponges are strung upon small palmetto strips, three or four to a strip, which is called "a bead," when they are taken to Nassau to be sold in the sponge-market under certain conditions and regulations, nobody being allowed to sell his cargo otherwise than through this sponge exchange. On the conclusion of the sale the sponges are taken to the packing-yard, where they are sorted, clipped, soaked in tubs of lime-water, and spread out to dry in the sun. They are then pressed by machinery into bales, containing 100 lbs., and in this state are shipped to England or the United States, which of late years is almost the largest customer for Bahama sponges. The

export has been gradually increasing, for whereas in 1874 it only represented £16,000, in 1881 it amounted to £31,000, and the year before to £35,000. A new sponge-field was discovered last year at the Island of Eleuthera, 60 miles from Nassau, extending over an area of many miles, and yielding the sheep-wool, the most valuable quality. Notwithstanding this fact, there have been two drawbacks to working this field, one being, though the sponges are of a very large size, they are exceedingly tender in the inner portions, and will not cut to advantage; the other, that at certain times of the year myriads of small fish, known as "sailors," arrive at the field and stir up the muddy bottom to such an extent that not a single sponge can be seen.

The sheep-wool sponge brings quite as high a price in markets as the Turkish variety of same. The success which is said to have been attained in the artificial propagation of the sponge by Professor Oscar Schmidt, of the University of Gratz, may lead to great development of this industry in the Bahamas. To the late Sir John Lees, father of the present popular Governor, the people owe a debt of gratitude for the discovery of the sponge.

Salt is made in large quantities by solar evaporation, and is much esteemed in America for packing purposes for pork and beef.

In consequence of the number of islands, harbours are easily made during heavy weather, and sad cases of distress are of rare occurrence.

Several friendly societies exist for mutual aid in time of sickness.

Mr. R. Davey, in his agreeable account of a visit paid to the Bahamas in 1878, thus describes his first impression of Nassau:—

"Nassau, the capital of New Providence, is considered a rival to Nice as a sanitarium and winter resort. In many ways it is indeed a superior residence, for the climate is milder and much more equable. During my winter stay, the thermometer never rose above 81° or descended below 70°. There was scarcely a breath of wind, and rain fell abundantly in the night, but never in the day-time.

"It is now decided by the leading medical authorities in America, that in no part of the known world is there another climate so beneficial to persons suffering from nervous diseases. Rest of brain and muscle, body and mind, becomes almost inevitable in the delicious balmy atmosphere of Nassau. You insensibly give way to the prevailing *dolce far niente* of the place, and there is absolutely no great excitement, social, political, or artistic, to stimulate you. There is society, plenty of it, for the hotels are often crowded to excess by persons of wealth and fashion, but after eleven o'clock all have retired to rest, and the whirl of balls and other like dissipation, is, although by no means unknown in the fair 'Isle of June,' as the natives love to call their charming island, of a less exciting kind than in most other fashionable resorts.

"It was early on a bright winter morning that our good steamer *San Jacinto* passed into the harbour of the capital of New Providence. As I leaned over the deck and looked down into the waters upon which I was sailing, I could scarcely believe my sight. It seemed impossible that water deep enough to bear our vessel should be so marvellously clear. We appeared to be passing over a sheet of pale sea-green crystal. Not a pebble, bit of sponge, shell, fish, crab, or coral, but was distinctly visible as if only a few feet under the surface. It was like floating upon ether, for the sparkle of the sunlight alone persuaded it was water. No, there was something else, for as we neared the wharf, a score or so of dusky forms splashed into the briny mirror, broke up its rippleless surface, sent into the air a spray of diamonds, and then dived far down into its pellucid depths in quest of coppers liberally thrown them by the amused passengers. 'Please, boss, give us a small dive,' is the entreaty which greets you from a dozen little

black urchins, who, on the least encouragement, jerk off their coats and shirts and plunge into the sea. Sometimes they catch the coin before it touches the bottom ; at others, however, the diver remains quite a time searching for it, looking, as seen from above, with his wriggling legs and arms, for all the world like a huge black spider."

When, on October 17, 1492, Christopher Columbus landed on the shores of "Guanahai," and named the present island of New Providence San Salvador, he was so enchanted with its beauty that he wrote a letter to the Spanish sovereigns, in which he expressed his delight and enthusiasm. "The loveliness," says he, "of this island is like unto that of the Campana de Cordoba. The trees are all covered with ever-verdant foliage, and perpetually laden with either flowers or fruit. The plants in the ground are full of blossoms. The breezes are like those of April in Castille. The nightingales (mocking-birds?) sing more sweetly than I can describe. It seems to me that I could never quit so enchanting a spot, as if a thousand tongues would fail to describe it, as if my hands, spell-bound, would never be able to write concerning it." Due allowance being made for the nervous enthusiasm of an explorer inebriated with the treasure he has found, it must still be confessed that his words, all-glowing as they are, scarcely exaggerate the charms of the peaceful scenery which so inflamed his poetic ardour, for the Bahamas are islands like unto the one chosen by Shakespeare for the scene of the 'Tempest' :—

"Full of infinite delight."

Surgeon-Major Bacot, in his interesting work 'The Bahamas,' published in 1869 by Messrs. Longman and Co., gives a great deal of curious information concerning the

by no means unromantic history of the islands. He speaks with horror of the cruelties inflicted upon the wretched aborigines by the Spaniards, and of the enormous oppression which they endured, an oppression so excessive that it met with the stern condemnation of the human and illustrious Dominican Los Casas.

The transfer of the islands from Spain to England, at the cost of many a bloody episode, forms a lengthy and exciting period in colonial history, one, however, far too pregnant with startling events to be dwelt upon in these pages. The piratical history of the islands is also of deep and picturesque interest, but, although it abounds in romantic incidents, I must perforce pass it by and merely allude to it by saying that the novelist and the lover of exciting narratives will find in the pages of 'The Memoirs of Peter Henry Bruce,' of 'Daniel McKinnen's Tour of the West Indies,' and of 'Montgomery Martin,' enough material for more than one exciting story of old colonial life.

The object, however, of this Pamphlet is not historical, but essentially practical, and, moreover, devoted principally to the fisheries and fishing industries of a colony, which by reason of its superb climate and its proximity to the United States, is of very great value to the Crown, and the inhabitants of which are essentially loyal and earnest in their endeavours to progress with the rest of the world in intellectual and commercial prosperity.

The island of New Providence is about twenty miles long by seven in breadth, and is the most important, though by no means the biggest, of the Bahama group. The history of the island since its discovery by Columbus, down through the buccaneer period, is only interesting to its inhabitants and government. I may observe that,

however unpleasant may be its memories of the old pirate days, it is a remarkably respectable place, not even a murder having thrown a shadow on its nearly untarnished reputation during the past fifteen years. It would be difficult to imagine a quieter spot. On Sundays especially, is it quiet, when not only are the shops all closed, but the majority of the house-shutters also, and the tranquil air is laden with church music of the most orthodoxly sober description.

The first place you drive to on landing is *the* hotel—the "Royal Victoria." This homelike and admirably organised house can accommodate at least 300 persons. The rooms are very clean and pleasant, and the board abundant and varied. The charge per day is only $3 (12*s.*), everything included, except, of course, wine and spirits. The "Royal Victoria" stands in a beautiful tropical garden, and, as it is a picturesque building, produces a most favourable effect, especially upon those who have just landed from New York, which, perhaps, they left only four days previous, in the midst of a snow-storm.

"The first impression," continues Mr. Davey, "produced upon our arrival in Nassau, from Cuba, was rather singular, and concerned the marked difference of the influence of the Spanish and the Anglo-Saxon races upon the African. Cuba is a Spanish colony, and unhappily (although the cursed institution is slowly dying out) still a slave country, with a large coloured population; New Providence has a population of 15,000 free negroes to only 4,000 whites. Personal observation only can give any idea of the filthiness of the dwellings of the lower classes of Cubans, and especially of those belonging to the blacks. The coloured folks of Nassau are cleanly and tidy to a great degree. Most of the Cuban towns are more or less squalid. The city of Nassau is, if anything, too prim, and its inhabitants are models of order in their dress and habits. I saw at a glance that the coloured people here have

been disciplined and trained by a race which is certainly as superior to the Spanish in all that concerns common-placedness and common sense, as it is inferior in its natural artistic instincts. I never saw anything, no not even in the Bethnal Green district of London, to surpass the interiors of the Cuban cottages in unutterable disorder and general abomination. But as you pass along the roads at Nassau, and glance in at the windows of the negroes' cottages you will almost invariably perceive interiors worthy of the brush of a Teniers or of a Sir David Wilkie, a floor on which you could eat your dinner, neatly papered walls, with framed chromos symmetrically arranged upon them, spotless curtains, shining brass lamps and cooking utensils, and a bed covered with a counterpane as white as drifted snow. If you peep in at meal times, you will note a clean cloth, covered with orderly-arranged plates and dishes. I am speaking of the dwellings of negroes, of those self-same coloured people, who in the same climate, only a day and a half's journey away in Cuba, under another race and civilization, dwell in a condition too nasty to be described here."

I cannot forbear here introducing an exceptionally vivid description by Mr. Davey of the town of Nassau and of its population, which I shall also supplement with this popular writer's remarkable word-picture of the "sea garden," which has been so frequently quoted on account of its graphic picturesqueness.

"As you drive," I said, "through Grant's Town, the negro quarter, you see so much to gladden you that it must do more real good to an invalid than many a cunningly-prepared draught. Charmingly picturesque wooden huts, thatched with palmetto, and as neat as you please, overshadowed by cocoa-nut trees, and exquisite flowering creepers border either side of the road, and on their thresholds are laughing groups of women and children of every shade of black, mahogany, and 'yullah.' Then, when the shades of evening grow long and deep in the thickets of the banyan-trees, coloured Pyramus courts coloured Thisbe over the wall which separates their gardens, and the roads are literally swarming

with little darkies, romping, laughing, and chasing each other round and about, whilst neatly-dressed women, standing at their doors, or leaning out of their open windows, watch the return of their 'men,' as they boldly call their husbands. The air is still, and laden with the penetrating perfume of the Cape jasmine, the white blossoms of which gleam like stars amidst the dark foliage, and of the crimson and pink oleander which flowers here to great perfection. No pen can describe or give even a faint idea of the delicious peacefulness of the scene, of the cheerful sounds of greeting, of the merry clatter of the negroes, the tuning of banjoes, and above all, of the beautiful sunset-lit clouds above, which shed a rosy tint abroad, and mark in bold relief the tall stems of the waving palms, and of the strange-named but useful trees, whose bizarre foliage so attracts attention, and between whose gnarled boughs you catch glimpses of the high-roofed houses of the city, of the cathedral spire, and of a sea as blue as a turquoise, now shivering in the gentlest of breezes.

"The town of Nassau itself is not particularly interesting, inasmuch that, with the sole exception of the cathedral, it cannot boast of a single monument of any artistic importance. The houses are mostly built of stone faced with wood, and possessed of high-slated roofs and wide verandahs, which surround each story and afford cool shade during the sunny hours of the day. The public buildings are clean and unpretentious, and evidently modelled after those of some English village in which the sturdy and inelegant Georgian architecture predominates. There are few traces anywhere of the influence of the higher art, although the cathedral itself is an exceedingly handsome Gothic building, wherein the services of the Church of England are most admirably conducted.

"The gardens are trim and pretty, but, notwithstanding their profusion of tropical plants, lack the luxuriant charm which makes the ill-kept garden of Havana so romantic and picturesque. Very few of the private houses are of superior size, and even the Governor's palace is a modest-looking dwelling, situated on the highest of the surrounding hills, and commanding a fine view of the town and harbour.

"The chief monument of Nassau is not one built by hand, but a silk cotton tree, planted some two hundred years ago by John Miller, Esq., opposite where now stands the 'public buildings.' It is a stupendous tree of Titanic proportions. The roots, unable to find their way down through the rocky soil, swell up like great buttresses, radiating round the trunk some fifteen yards, and rising from the ground six and eight feet, making a part of the actual bulk of the tree, and giving the huge plant the appearance of a web-footed monster, standing in solemn reverie. Among these gnarled and weird roots are ravines, in whose dark hollows a legion of elves could dwell and hold their revels. High above this root-works spreads a canopy of leaves of the most exquisite, tender green. Singular to say, the gigantic plant flattens its branches at the top, nearly squared off in correspondence with the flatness its roots are obliged to assume owing to the paucity of earth. Had Shakespeare seen this august tree, which travellers from California declare to be even more imposing than any of the Mammoth trees, he would have immortalized it in a few grand lines. Or, perhaps, made it the background of some quaint fairy scene, or the home of another Herne the Hunter, Oberon and Titania, Ariel or Puck. There are several other fine silk-cotton-trees on the island, and in Cuba this tree grows to perfection; but *the* tree I have first attempted to describe is universally acknowledged to be the finest known. I was much surprised to notice the rapidity with which this plant puts forth its leaves. On my arrival, I saw one of the trees in the grounds of the hotel, which seemed to be dead. The rest were in leaf, but this one was quite barren. In three days it was lost to sight, hidden in its own new foliage, put on in at most two nights. The silk-cotton-tree is so called because it bears a pod full of flossy silk, which is used for filling pillows instead of down, but they say the fibre is too short to be woven.

"Nassau and its neighbourhood is really not unlike an open-air museum of botanical and marine curiosities. As you drive or walk through the woods and lanes your attention is constantly attracted to some tree or shrub peculiar for its curious shape, leaves and flowers. If you ask its name you will be told that it is

either the gum-arabic-tree, the guava, the banyan, or the ipicac, or the pimento, or the spice, the cinnamon, the pepper, the caper, the castor-oil, or in short any one of half the plants which stock our drug or grocery shops. One day I noticed an onion-like looking plant, with somewhat curious leaves, and asked its name. It turned out to be my old acquaintance 'squills,' of syrup fame.

"The crowning glory of Nassau is her unrivalled bay, with its enchantingly crystal clear water. Many a pleasant day have I passed sailing round the pretty shores of this pleasant island. We usually had for 'captain' a certain remarkable darkie, by name 'Captain' Sampson Stump, one of those sable worthies you read about, full of devilry, and withal shrewd and witty, and a capital sailor. The Cap'en is reputed wealthy, for he is a great favourite with the visitors, and on Sundays he is considered by the inhabitants of Grant Town the greatest 'dissentin' minister' in the island. Amongst the natural wonders the Cap'en took us to see was the 'sea garden.' I wish Victor Hugo could behold it, for then he could paint in his vivid language a pendant to his sea monster, the devil-fish of the 'Toilers of the Sea'; but this time he would show us the beautiful instead of the hideous—the paradise of the sea, and not its hell. They give you a box with a glass bottom to it to look through, which you put over the side of the boat and dip beneath the surface of the waves. Lo! you behold the garden of the sea-nymphs, the home of Aphrodite. Beneath you, seen through the pale, pellucid waters of this vast aquarium, is a lovely garden, full of every imaginable delicate-tinted sea-flora. Some are pale pink, others are of light yellow, and some brown as leaves in autumn, surrounding the vivid purple and scarlet sea anemones, which cling to the summits of beds of pearly coral. Here purple sea-fans wave gently to and fro. Here are groves of wonderful sponges, and here beds of marine flowers of all kinds and shapes. Fish as brilliant as humming-birds—red, blue, and metallic green and orange—peep in and out knowingly of the branches of this strange submarine vegetation, which is crossed and re-crossed in all directions by pathways of the soft and silver gravel. Nothing more fascinating, more fairylike, can be well imagined. We expect at any moment to see Venus or

one of her nymphs rise to the surface from this abode of cool delights; but more frequently the clear aquamarine-coloured waters part and close, bubbling over the dusky form of a sturdy negro diver in search of pink conch-shells or stag's-horn corals for some *belle* from England or the States, whose pretty exclamations of surprise and delight, 'Oh, see!' and 'Oh, my!' sound cheerily enough on the summer air.

"Involuntarily the world-renowned description of the bottom of the sea was brought to my mind:—

> "Methought I saw . . .
> Wedges of gold, great anchors, heaps of pearl,
> Inestimable stones, unvalu'd jewels,
> All scatter'd in the bottom of the sea.
> Some lay in dead men's skulls; and, in those holes
> Where eyes did once inhabit, there were crept
> (As 'twere in scorn of eyes) reflecting gems,
> That woo'd the slimy bottom of the deep,
> And mock'd the dead bones that lay scatter'd by."
>
> *Clarence's Dream, Richard III.*

A very extraordinary fact about the vegetation in the Bahamas is, that it grows with its roots almost entirely exposed. The island is of coral formation, and only very lightly coated with earth, but such is the abundance of the dews and the fertilizing quality of the atmosphere, that it suffices for a plant to have but one or two feelers caught in the pores of the coraline rock, as it is called, for it to grow and flourish. I have seen big trees with all their roots, save one, above ground. Some trees I have noticed growing on the garden wall, horseback fashion, with one half of their roots on one side and the rest on the other. I am assured that there is so much decayed animal matter in the coraline that it is one of the richest of soils; and the cause of the fertility of the island is doubtless the heavy dews which fall immediately after sunset. A number of "air-plants" grow in the woods, and of

course derive their nourishment entirely from the abundant dews. These curious plants are, for the most part, a species of wild pine, and although found suspended to the branches of trees, and apparently existing without any other nourishment than air, they are really fed, as I have said, by the heavy moistures of the night. One of the most remarkable of them is the green snake, which looks exactly like a long serpent made of coloured india-rubber. It lays on the branches of the trees, but requires no earth, and subsists on dew. The common life-plant of the tropics grows everywhere, and, together with the air-plants, affords much curiosity to visitors from Europe and America. If you take one of its thick, waxy, oak leaf-shaped leaves and hang it on a nail, it will live for months and shoot forth new leaves without needing either water or earth.

The maladies of all others which Nassau benefits most are those of the lungs and nervous system, and this I am assured is now the opinion of the leading medical men in New York. For the advantage of such of my readers who might perhaps wish to visit this charming resort, I quote the following valuable remarks from the New York 'Medical Record,' February, 1877 :—

"The drinking water of Nassau is of two kinds—that from reservoirs, being stored rain-water collected from the roofs of houses; and that from wells. The former only is generally used by the well-to-do white population, exclusively so at the hotel, and is an unusually good potable water.

* * * * * * *

"The surface drainage of the city is excellent. Water soon disappears, either through the gutters cut in the stone—which, by the way, are very good—at the roadside, or by percolation. It would hardly be possible to find a stagnant pool of any kind. The

streets are very neat, and as both the narrow side-walks and the carriage-ways are cut on the native rock, and are equally hard and clean, it is more customary to walk on the latter than the former. All the roads throughout the island are of the same character, constructed by the government, and kept in repair by convict labour. There is no dust.

"The mean temperature during the winter months is somewhat higher than at other health resorts, as is shown by the following comparisons:

Place.	Nov.	Dec.	Jan.	Feb.	March.	April.
Nassau, N.P. . . .	76·8	73·6	73·6	73·7	75·4	76·1
Savannah, Ga. . . .	58·6	51·5	52·2	54·5	60·4	67·7
Jacksonville, Fla. . .	64·1	54·2	56·4	56·1	64·2	67·8
St. Augustine, Fla. . .	64·1	57·2	57·0	59·9	63·3	68·8
Pilatka, Fla.	61·5	56·0	57·2	58·3	64·1	71·2
San Diego, Cal. . . .	56·9	51·7	51·9	53·3	56·0	61·2

"But the average mean temperature of a month may be quite deceptive. It is the diurnal and from day to day fluctuations which are of the greatest importance and have the most influence upon the health of invalids. In this particular Nassau has an advantage over any locality on the Atlantic side of the continent.

"No other place we know of so well fulfils the requirements of a winter sanitarium in this respect as Nassau.

* * * * * * *

"The Royal Victoria Hotel is perhaps superior to any in the south in its hygienic appointments, and is equalled by few anywhere. Its table is supplied with excellent food, well prepared.

"To briefly recapitulate: From November to April, Nassau has a warm and remarkably equable climate.

"It has a moderate degree of humidity.

"Its surface is well covered with vegetation.

"Its drainage, chiefly by subsidence into the rock, is good.

"Its stored drinking water is ample in supply, and healthful.
"It is quite free from malarious and other endemic diseases."

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The fisherman's calling is ever an anxious and an arduous one, and in the Bahamas, the maritime population is subjected to great physical exertion, and prolonged absence from home. I am given to understand, the vessels in which they ship are poorly fitted and overmanned; if this is the case, legislation should remedy the evil. Life-preserving apparatus should be made an absolute necessity in an outfit, and heavy penalty incurred through any default.

The marine products of the Bahamas are undoubtedly susceptible of very important expansion, and I make the following practical suggestions to that end :—

On the subject of the Sponge Fisheries, I have fortified my opinion by the important Paper herewith attached, written by Mr. Savile Kent, F.L.S., F.Z.S., an authority on this special subject. I am of opinion that a close season for sponges would not be practical or beneficial, the most favourable, if not exclusive season for their collection being the summer months, which is likewise the time during which they usually reproduce their species.

On the other hand, a very great advantage would be derived from the periodical isolation and protection of suitable areas upon the sponge grounds, to enable them to recover from the effects of over-fishing; or to form as it were a nursery from whence the sponge germs would be freely distributed throughout the surrounding districts.

I suggest experiments with the object of introducing into your waters the fine concave, or cup-like form of sponge (*Spongia officinalis*) of the East, provided it is not already

there, as suspected by Mr. Kent in his Paper. The prohibition of the dredger in shallow waters should be continued.

I am of opinion that vessels of from 40 to 50 tons burden, with diving apparatus for men, to enable the careful collecting of the sponges, are best for this class of fisheries. By using the diving dresses, fishermen would only disturb those sponges which are matured, and the present primitive mode of hooking, so injurious to health, would cease. The expense of the dresses would be soon defrayed by the more expeditious collecting, the saving of labour, and also by the more presentable and merchantable state of the article when brought to market, in addition by searching in the same depth of water, as in the Mediterranean, instead of in the shallow waters as is the custom, finer qualities of sponges would undoubtedly be found.

I would also advise a close season for the Queen and Pink Conch; but I fear it is not practicable. I am under the impression that this fish is not so plentiful as it used to be, and that its protection is desirable. I think these two varieties of mollusks may be made a source of considerable revenue. The shells are, I believe, found only in the Bahamas, and a limit being placed on their export, as has been found necessary to do with corals in Japan, would lead to a considerable increase in their value. Combination among the exporters would have the same result. They are used to an immense and increasing extent in Italy; and in the case of the pink shell, sold in this country at a shilling a-piece, I am quite sure from the offers I have had for those in the Exhibition, that twenty times that amount would be readily paid, if the price were firmly maintained, as the profit when converted into cameos and other *objets d'art* is enormous.

I shall refer again to this matter in another part of my Paper.

On the subject of fish-curing, I think that if the goggle-eyes were cured by the same process, and with equal care as the herring in this country, and the jack, as the mackerel in Newfoundland, a market would be found not only in Europe, but also in the Catholic parts of Southern America.

Such a harvest of the sea should not go ungarnered, and the Red Snapper and Grouper should be exported in tins. There is already a demand for these two fishes in America. The United States alone, after its own consumption, exports of fish in tins six hundred thousand pounds (£600,000) in value annually.

Among waste products I suggest the skins and bones of fishes being utilized for the manufacture of glue and isinglass in the colony itself. On this subject, Professor G. Browne Goode says in his Paper on the fisheries industries of the United States :

"The utilization of secondary products of certain fisheries by adding in an appreciable degree to the profits of each person engaged, has proved an important impetus. Mr. Earll has demonstrated that the secondary products in the cod fisheries amount to more than 14½ per cent. of the value of the fish as taken from the water, raising the receipts of several important ports by about one hundred thousand dollars (100,000) each."

Dried Green Turtle and other preparations of Turtle from Jamaica which I introduced to the notice of a number of experienced gentlemen at a special luncheon which I gave for the purpose, were pronounced so excellent that it was even asserted that these preparations were far better and richer flavoured than any to be procured in England, made from fish brought alive to this country. As the same Turtle is to be obtained in the neighbouring waters, there

is no reason why its preparation in various ways should not be added to the other industries of the Bahamas.

The *Bêche de mer* from these islands is, I am given to understand, well prepared, and of the kind most esteemed by the Chinese. I think arrangements might be made with American railway companies for a through rate of freight to San Francisco, with a view to leaving a fair margin of profit to the shippers. The Chinese there would make a market, and perhaps among Europeans it might become popular, for many in travelling in the East have learned to esteem it.

During the course of the Exhibition, the Nassau shell-work ornaments might have been sold in immense quantities. They are superior in workmanship and beauty of design to anything made elsewhere, and a depôt at the West End of London would certainly pay well. Her Royal Highness the Princess of Wales did the colony a distinguished honour by accepting a shell basket, sent on by the Government, and personally expressed to me in kindly words her great admiration of it.

Tortoise-shell ornaments will sell readily, but if they cannot be produced at a lower price than those sent on, say about one-third, the sale must be limited to the colony. No doubt this can be remedied by using better tools. The establishment of a local school of art would greatly facilitate this, and moreover introduce the art of inlaying the shell with silver and gold, as is so satisfactorily done at Naples.

The great success which has attended the creation of Art Schools in France, Italy, Bavaria, and Saxony, has been such as to deserve the attention of all thinking people. It is certain that the South Kensington Museum and School of Art has been of vast benefit to England, and

indirectly also, by contributing to the improvement of artistic taste in America and the Colonies. But the time has come when local schools of art especially created for the immediate development of their natural products, ought to be established not only in England itself, but in the principal cities of our dependencies. Hitherto Rome and Naples have almost entirely monopolised the trade in certain artistic products, the raw material for which is obtained only from the Bahamas.

It is true that years may elapse before they can produce at Nassau cameos and ornaments equal to the magnificent works of art which have proved so attractive, especially to ladies in the Italian Court at the Fisheries; but surely, if there were a well directed school of art, even on a small scale, in the capital, in the course of a little time improvements would be manifested in the designs and in the execution of the articles of personal adornment which enter into the commerce of the colony.

The art of carving cameos, inlaying with metals and tortoise-shell, so as to make articles of elegant furniture—the fabrication of what are called marine jewels and mosaics—and even the manufacture, with the beautiful coloured natural woods, of that exquisite kind of wood mosaic, called in France "marqueterie," are arts by no means difficult to acquire when once proper models, and above all skilful teachers and directors, are procured.

It would be well that attention be drawn to the propriety of the establishment, at first on a small scale, of an art school and museum, where under the tuition of one or two competent persons, English and Italian—the best artists for the purpose—a number of intelligent persons, be taught all that is necessary to enable them, in a short time, to produce workmanship worthy of competing with much

of that which finds such ready sale when imported to America from Italy.

Even among the wealthy winter residents there would soon be found a good market for these objects, and I do not fear to predict that in a few years they would enter largely into the exports of an increasing commerce.

It would be necessary at first, perhaps, to expend a little capital, but in a year or so this will be easily repaid. A director and two competent teachers is all the staff needed at first, and be it observed that the best school of art for working men at Munich, began on no more extensive scale. In a short time the school, I am sure, will become self-supporting, and not only a benefit, but a subject of intelligent pride to the islanders, a means perhaps of developing artistic genius of a high order, and also of procuring a respectable and intellectual livelihood to many persons who otherwise might be useless, for the artistic temperament is one which, if not properly utilized, is very apt to rapidly degenerate. I believe I am right in saying that many who have visited Nassau have been much struck by the evident presence of this temperament among the coloured population, and there are many now in New Providence able to speak with authority on this point.

The pink pearls from the *Strombus Gigas* have attracted much attention and admiration, and so prominent an exhibition of them has already resulted in increased demand and enhanced prices.

Many of my fellow colonists will recollect the imprisonment of a Frenchman, Mortimer by name, for selling what were called imitation pearls. He had discovered the secret of the origin of the pearl, and by a clever contrivance aiding the Strombus in developing its treasure. I do not know the grounds on which he was imprisoned, but

why not experiment with the object of largely increasing the quantity?

With success the price of the pearl would fall, but the quantity would bring much more important financial results, and thus an export would be created, limited to Bahamas waters, more beautiful than coral, requiring no polishing, and in colour putting in the shade the most expensive and valuable of the Oriental corals.

I cannot forbear being of opinion that the fisheries ought to undergo thorough scientific investigation, and that it would be well to appoint a Commissioner of Fisheries of approved scientific and practical knowledge of marine products, &c., and as to results, I can do no better than refer again to Professor G. Browne Goode's excellent Paper, page 45. He says:—

"On the 9th of February, 1871, Congress passed a joint resolution which authorised the appointment of a Commissioner of Fish and Fisheries. The duties of the Commissioner were thus defined: 'To prosecute investigations on the subject (of the diminution of valuable fishes) with the view of ascertaining whether any and what diminution in the number of the food-fishes of the coast and the lakes of the United States has taken place; and, if so, to what causes the same is due; and also whether any and what protection, prohibitory or precautionary measures should be adopted in the premises, and report upon the same to Congress.'

"The resolution establishing the office of Commissioner of Fisheries required that the person to be appointed should be a civil officer of the Government, of proved scientific and practical acquaintance with the fishes of the coast, to serve without additional salary. The choice was thus practically limited to a single man, for whom in fact the office had been created. Professor Spencer F. Baird was appointed and entered at once upon his duties. Being himself an eminent man of science, for forty years in the front rank of biological investigation, the author of several

hundred scientific memoirs, no one could realise more thoroughly the importance of a scientific foundation for the proposed work.

"Pure and applied science have laboured together always in the service of the Fish Commission, their representatives working side by side in the same laboratories; indeed much of the best work, both in the investigation of the fisheries and in the artificial culture of fishes, has been performed by men eminent as zoologists.

"The work of the Commission is naturally divided into three sections:—

"1. The systematic investigation of the waters of the United States and the biological and physical problems which they present. The scientific studies of the Commission are based upon a liberal and philosophical interpretation of the law. In making his original plans the Commissioner insisted that to study only the food-fishes would be of little importance, and that useful conclusions must needs rest upon a broad foundation of investigations purely scientific in character. The life history of species of economic value should be understood from beginning to end, but no less requisite is it to know the histories of the animals and plants upon which they feed or upon which their food is nourished; the histories of their enemies and friends, and the friends and foes of their enemies and friends, as well as the currents, temperatures, and other physical phenomena of the waters in relation to migration, reproduction and growth. A necessary accompaniment to this division is the amassing of material for research to be stored in the National and other museums for future use.

"2. The investigation of the methods of fisheries, past and present, and the statistics of production and commerce of fishery products. Man being one of the chief destroyers of fish, his influence upon their abundance must be studied. Fishery methods and apparatus must be examined and compared with other lands, that the use of those which threaten the destruction of useful fishes may be discouraged, and that those which are inefficient may be replaced by others more serviceable. Statistics of industry and trade must be secured for the use of Congress in making treaties or imposing tariffs, to show to producers the best markets, and to consumers where and with what their needs may be supplied.

"3. The introduction and multiplication of useful food-fishes throughout the country, especially in waters under the jurisdiction of the general government, or those common to several states, none of which might feel willing to make expenditures for the benefit of the others. This work, which was not contemplated when the Commission was established, was first undertaken at the instance of the American Fish Cultural Association, whose representatives induced Congress to make a special appropriation for the purpose. This appropriation has since been renewed every year on an increasingly bountiful scale, and the propagation of fish is at present by far the most extensive branch of the work of the Commission, both in respect to number of men employed and quantity of money expended."

In arranging the corals collected by Mr. Saunders, the similarity of most of them to those of the Mediterranean attracted my attention, and it occurred to me that the red and pink corals, if searched for, might possibly be discovered. I have mentioned the matter since to several eminent men, competent to form a judgment, and all favour it. I will here only quote what Professor Günther, of the Natural History Museum at South Kensington, said to me :—"You are quite right; I think you will find the red corals in the Bahamas. My experience is that whenever a marine product is found in the Mediterranean, it is invariably followed by a similar find in the Japanese and Bahamas waters." Coral has lately been found in Japan, and I say search for it in the Bahamas.

> "Where the coral worms in countless nations
> Build rocks up from the seas' foundations."

I strongly recommend that your fishermen should be encouraged to search. The dredger used is most simple in construction, and easily made.

As a minimum result to the search for corals, science might benefit as thus described :—

" A most remarkable series of contributions have been received from the fishermen of Cape Ann. When the Fish Commission had their head-quarters in Gloucester, in 1878, a general interest in the zoological work sprang up among the crews of the fishing vessels, and since that time they have been vying with each other in efforts to find new animals. Their activity has been stimulated by the publication of lists of their donations in the local papers; and the number of separate lots of specimens received, at the present time, exceeds eight hundred. Many of these lots are large, consisting of collecting tanks, full of alcoholic specimens. At least thirty fishing vessels were carrying collecting tanks on every trip, until it became necessary to recall them because no more specimens were required, and many of the fishermen, with characteristic superstition, had the idea that it ensured good luck to have a tank on board, and would not go to sea without one. The number of specimens acquired in this manner is at least fifty or sixty thousand, most of them belonging to species hitherto unattainable.

" Each halibut vessel sets, once or twice daily, lines from ten to fourteen miles in length, with hooks upon them fifteen feet apart, in water 1,200 to 1,800 feet in depth, and the quantity of living forms brought up in this manner, and which had never hitherto been saved, is very astonishing. Over thirty species of fishes have thus been added to the forms of North America, and Professor VERRILL informs me that the number of new and extra limital forms thus placed upon the list of invertebrates cannot be less than fifty."

Steam communication with New York and Florida is most important for the development of the trade. I do not think I should do wrong to designate it the most important subject in my Paper.

New Providence, as a sanitarium and winter resort for the Americans, has a magnificent future. As I write, I

picture in my mind's eye a winter—Longbranch, with its comfortable hotels, its rows of pretty cottages along the bay, its excellent drives, and its handsome club house, or casino, in short Nassau, with all the attractions which would induce the wealthy and the invalid to seek its pleasant shelter from the inclement winds of the North.

The reasons for the present only partial success are evident. A large subsidy has been paid for years to companies running ships totally unsuited to the requirements, and the depth of water in the harbour. There has been no regularity in the service. The port has been made an intermediate or secondary one; rates of freight have been excessive, with the object of reducing the volume of imports and exports, and allowing the shortest possible time at Nassau.

Invalids and others, from causes already detailed, have been landed in open boats in rough seas outside the harbour, and submitted to all kinds of risk and annoyance.

A cable to Florida is most desirable.

It is well known that many distinguished persons, political and financial, although recommended to do so by their medical advisers, have refused to visit Nassau, on account of the distance, which the non-existence of a cable has placed them at, from the great centres of social and intellectual life.

Finally, I would observe that if my suggestions were carried out on a considerable scale, the population, with increased prosperity, would soon become much larger, and perhaps the islands, under the newly advocated system of State-directed emigration, might attract to its shores some of the best and most intelligent of those persons who are forced by unkind circumstances and over population to leave their homes in this country.

A. J. ADDERLEY.

REPORT

UPON THE

SPONGES OF THE BAHAMA ISLANDS.

By W. Saville Kent, F.L.S., F.Z.S.

Visitors to the International Fisheries Exhibition cannot fail, on entering the Western Corridor, to be struck with the brilliant assemblage of the ocean's treasures that represent the fishing industries of the Bahama Islands. The highly artistic manner in which the specimens are grouped, together with the diversity and completeness of the collection exhibited, reflect the highest possible credit upon those to whom the public is indebted for the unique treat afforded by an inspection of this small but important section. Gorgonias, or flexible corals, of every hue—some forming erect fan-shaped expansions, and others gracefully drooping willowy growths—are commingled in admirable harmony with the more remarkable sponges, madrepores, or stony corals, and sea-shells—having a commercial value—that are indigenous to the coasts of this ocean paradise. In an adjoining case will be found interesting illustrations of economic uses to which certain of this raw material may be converted by the aid of art. Especially worthy of note in this connection are the superb cameos cut from the various species of helmet or conch

shells—one of these, the *Strombus gigas*, being further famous for yielding the rare and very valuable pale-pink pearl. Artificial flowers, manufactured out of various of the smaller marine shells, constitute, as in Madeira, an important article of export, and are represented by some exquisite specimens in the adjacent show cases. The edible turtle (*Chelone midas*) and the tortoiseshell-producing variety (*Caretta imbricata*) have to be included among the marine products of the Bahamas, as likewise the sea-cucumber or trepang, locally known as "Bêche de Mer." This animal, which, in life, has an elongate worm-like contour, with an anteriorly developed crown of retractile plumose tentacles, belongs to the natural order of the *Echinodermata*—including the star-fishes, sea-urchins, and crinoids, or sea-lilies. In tropical regions, where it is especially abundant, the sea-cucumber (*genus Holothuria*) is extensively used as an article of food—chiefly as a basis for soup—and constitutes an important fishery. The mode of preparing them for the market is as follows: The viscera of the animals are first removed, and they are then boiled for from ten to twenty minutes; they are next thoroughly soaked in fresh water, and then spread out on frames in the curing-houses. In these houses they are smoked and dried by means of fires lit in trenches underneath the frames during a period of four days, and by which time they are ready for market. A large barrel of sea-cucumbers, or "Bêches de Mer," thus prepared, and presenting—in the raw condition—a by no means inviting aspect, is included among the more interesting exhibits of the Bahama series.

By far the most important marine product of the Bahama Islands is, however, that of sponges, and it is to an account of this organic group in general, and of the varieties having

a commercial value indigenous to the Bahama Islands in particular, that this little pamphlet is devoted. The sponges of the world number many thousand species, which are distributed with equal abundance throughout the arctic, temperate, and tropical seas. Some inhabit the shallow water close in shore, and are left exposed to the influence of the atmosphere with every fall of the tide; others are exclusively confined to the abyssal depths of the ocean, while a small but interesting minority are denizens of our inland lakes and rivers. Out of the sum-total of known sponges, less than a dozen species, with their many local varieties, all inhabitants of the sub-tropical seas, fall under the category of economic species, and are made the subject of an important fishery. As a matter of fact, the economic value of the sponges of commerce depends entirely upon the nature and arrangement of the materials that compose their skeleton, it being only such lifeless inorganic elements that are present in the article known as sponge when brought to the market. A sponge in its living state—freshly torn from its habitat at the bottom of the sea—bears but little, if any, resemblance to our familiar "companion of the bath" or adjunct of the toilet table. The entire substance of the fine fibrous amber-coloured tissue of which it is, in its commercial form, composed, is, in such living condition, completely hidden within a glairy gelatinous matrix, having somewhat the consistence and aspect of a weak glue, with somewhat denser external pellicle. This glue-like substance represents the organic or animal element of the sponge body, its relationship to the enclosed sponge fibre being essentially identical with that which subsists between our own living tissues and the inanimate bony skeletons that is contained within them. By the process of maceration and washing, the gelatinous

flesh is entirely got rid of, and the sponge, in its well-known commercial form, is the residuum.

It is with reference to the composition of the inorganic framework left after the soft gelatinous tissues have been removed that the sponges, as an entire group, are classified by zoologists. All those in which the supporting framework or skeleton is, as in the case of the bath sponge, of a more or less flexible horn-like consistence, are relegated to the order known as the horny sponges, or *Ceratospongia.* In a second group, needle-shaped or variously modified elements known as *Spicula*, having a glass-like or silicious composition, are either added to or entirely replace the horny framework, and is consequently distinguished by the name of the silicious series or *Silicispongiæ.* In a third group, that of the *Calcispongiæ*, a spicula skeleton is likewise developed, but, as indicated by its title, is of a calcareous nature, the component spicules being composed of carbonate of lime. A fourth or relatively small group remains, in which a spicular, horny, or other skeletal framework is entirely absent, the entire sponge body consisting of the easily destructible gelatinous flesh, already referred to as constituting the living element in the ordinary sponge. For this least specialized group the title of slime sponges or *Myxospongiæ* has been proposed. The diversity of external shape presented by the adult sponge-stocks belonging to the several groups or orders above enumerated are found to be almost infinite, the same species, indeed, in a large number of instances, varying indefinitely in this respect. Among the multifarious series that exist, reference may nevertheless be made to some half-a-dozen typical growth, forms which constitute, as it were, a groundwork upon which all the other modifications are built up. Thus, in a very large series of sponges, the

typical growth-form takes the shape of a simple encrusting mass, that may be perfectly flat or raised at intervals into more or less prominent hillocks. These prominences may be yet further produced and so subdivided as to give rise to a branching tree-like structure. These several modifications are well illustrated in the common fresh-water sponge, *Spongilla fluviatilis*, that may be obtained abundantly from the river Thames, growing upon the sides of the locks and submerged tree-roots, almost everywhere above the reach of the tidal waters. A more or less solid globular form, varying in the direction of having the centre so hollowed as to constitute a thick walled cup, or further flattened out in the shape of a somewhat saucer-like expansion, represent the more common modifications of the familiar toilet sponge, *Spongia officinalis*. A simple sac-shaped or tubular contour is highly characteristic of the little white calcareous sponges (*Grantia*) and its allies, complex forms with variously branched free or anastomosing tubules, as met with in the genera *Ascandra* and *Leucosolenia*, representing the more specialized modifications of this type. Elongate tubular or so-called "fistular" forms are also abundantly met with among both the horny and silicious sponge groups, the genus *Luffaria* being an example of the former, and the so-called Venus flower-basket sponge, *Euplectella aspergillam*, of the silicious series. This last-named type, which is a native of the Japanese seas, demands somewhat more extensive notice, since it undoubtedly represents, from an artistic point of view, one of the most exquisitely beautiful productions of Nature's handiwork, and is on this account of marketable value as a household ornament. The first specimen of this sponge brought over to this country from the Philippine Islands, some thirty years ago, was sold for no less a sum

than £40, and is now on view in the British Museum. At the present day fine examples may be obtained for but little more than as many pence as the original type cost pounds. The *Euplectella*, as sold in the market, being then divested of the buff-coloured gelatinous flesh or *sarcode*, with which it was originally covered, has the form of an elongate, slightly-bent tube, of about one foot in height, which gradually widens towards its free or uppermost extremity. The walls of this tube are composed of *silicious spicules* and fibres, interwoven and amalgamated with one another in such a fashion as to resemble very delicate basket work, wrought out of clear spun glass. A certain number of the larger fibres are disposed longitudinally, and others at right angles, leaving square interstices, the areas of which are further circumscribed and rounded off by the interpolation of smaller spicules. Raised crests of fine anastomosing spicules are developed in an irregularly spiral pattern, upon the outside throughout the length of the tube, the top of which, in perfect examples, is further covered in with a perforated lid of the same silicious network. The base of attachment of this fairy-like structure is finally embraced by a delicate sheaf of long needle-like spicules, which serve to keep the organism securely anchored in the yielding mud at the bottom of the seas which it inhabits. It not unfrequently happens that several examples of a species of crab are found within the tubular cavity of the *Euplectella*, presenting to the uninitiated a problem for solution, akin to that which puzzled a certain crowned head, respecting the apple found inside the dumpling; the crab certainly could not, in its adult state, effect its entrance through the relatively minute interstices of the sponge wall, and the only logical interpretation of the phenomenon is that it passed through

in its very young or larval condition, and finding its quarters comfortable, dallied so long as to have outgrown the dimensions of the portals whereby it entered. It was originally represented by the Chinese dealers that the crab was the fabricator of its extemporised silicious cage, and a greater value being set upon those sponges which contained a crustaceous occupant, they resorted to the practice of skilfully removing the base of the sponge, introducing a crab, and fastening it up again in such a manner that the rupture made could not be detected.

Among the notable species belonging to the same group of silicious sponges have to be included the curious glass-rope sponge (*Hyalonema*), originally brought from the Chinese sea, but since obtained from the deeper parts of the Atlantic. The body of the sponge, as in many other forms, is cup-shaped, but supported on a long stalk, consisting of a twisted wisp-like bundle of long silicious spicules that spread out basally in a brush-like manner, and serve like a root, to anchor the sponge in the soft slimy ooze that forms its habitat. A parasitic coral (*Palythoa*) usually encrusts the elongate stalk of this sponge, and these stalks, consisting of tiny glass-like spicules invested by the coral, were at first alone discovered and supposed to represent a complete organism, the sponge body afterwards obtained being treated by some authorities as a parasite. This error in the interpretation of *Hyalonema* received additional support from the circumstance that the Japanese divers, from whom the first examples were obtained, supplied specimens which they asserted to represent their natural growth, with the top end inserted into stones previously bored by the Pholas, and with the expanding brush-like end projecting outwards. Closely allied to the glass-rope sponge are the

two genera, *Holtenia* and *Pheronema*, whose bodies are somewhat similarly cup-shaped, but have the rope-like bundle of spicules, that in *Hyalonema* form a simple stalk, distributed singly or in small fascicles throughout the entire external surface. In *Pheronema Grayi* in particular, obtained by the writer in the year 1871, in connection with the dredging expedition of the yacht "Norma," from a depth of 600 to 800 fathoms, off the coast of Portugal, these filaments, the so-called anchoring spicules, are so thickly developed from the sponge body, and are of such extraordinary length, that the organism presents the appearance of a light blonde wig. Several specimens of this type, known to the local fishermen by the title of the Portuguese birds'-nest sponge, have been presented by the writer to, and are now on view in, the new Natural History Museum. A curious and hitherto undiscovered form belonging to the same group, the hat sponge (*Askonema Setubalense*, S.K.), obtained by the writer from the same locality, is composed chiefly of long thread-like silicious spicula, felted together in such a manner as in both shape and dimensions to closely resemble a very shabby grey flannel boating hat.

All of the several silicious sponges just described, including the *Euplectella*, or "Venus's Flower Basket," the glass-rope, birds'-nest, and hat sponges share, in common, the circumstance that the silicious spicules of which their skeletons are composed belong, more or less extensively, to what is known as the hex-radiate type, that is, are composed of six rays, and are hence as a family group distinguished by the technical title of the *Hexactinellidæ*. It is an interesting fact that the fossil sponges of the chalk formations, familiarly known as *Ventriculites*, exhibit similar structural composition, and were in like manner inhabitants

for the most part of the still, abyssal depths of the ocean. The colours of the flesh elements or so-called *sarcode* of living sponges is subject to great variation even among individuals of the same species. Thus in the ordinary sponge of commerce (*Euspongia officinalis*) it runs through various shades of brown, from yellowish grey to black, the dominant hue in one variety being rusty red. In the birds'-nest sponge (*Pheronema Grayi*), when brought up fresh from a depth of 600 to 800 fathoms, the flesh was observed by the writer to be bright orange, and this tint with shades varying from the palest lemon yellow to brilliant scarlet is characteristic of many sponges. The skeletonless Slime-sponge (*Halisarca Dujardinii*) more usually resembles in its natural habitat a little dab or dabs of red-currant jelly scattered upon the surface of the rocks or seaweeds, though at other times this carmine tint is replaced by the equally brilliant hues of sky-blue or purple. Various shades of green are common to many sponge forms; a dark tint of this colour being highly characteristic of the common fresh-water sponge (*Spongilla fluviatilis*), though in this instance it has been recently determined that the colouring agency is due to the presence of a minute parasitic vegetable. The calcareous sponges (*Calcispongiæ*), including *Grantia* and its allies, agree for the most part with one another, and differ from the other sponge tribes, in that their colour, when living, is almost pure white. This is owing to the extreme tenuity and transparency of their flesh and the refraction of the rays of light by the thickly interlacing calcareous spicules of which their skeletons are composed.

Notwithstanding the very wide differences that subsist in their external shape, in the colour, and in the composition and arrangement of the elements that form their

skeleton, it will be found that throughout the numerous orders, families and species of sponges, an essentially similar structural plan is associated with their living elements or so-called flesh. The familiar fresh-water sponge (*Spongilla fluviatilis*), already referred to as abounding in the upper reaches of the Thames, may be selected as a suitable type for illustrating the more important of these structural points. On withdrawing a living mass of this sponge from the water, it will be found that a very large portion of the vital elements, will drain away in the form of a transparent slime or mucous. If, in place of leaving it to drain, we immediately detach a fragment or place the whole mass in a glass of water, the following points and phenomena may be observed. A delicate semi-transparent, film-like structure, having much the aspect of a closely-woven cobweb, will be seen standing out from the more solid central substance of the sponge; this structure at one or more points is developed outwards in the form of a conical or cylindrical tube, and is the excurrent aperture or so-called "flue or osculum," out of which, on attentive examination, minute particles of refuse food matter may be seen issuing after the manner of smoke from a chimney-top. A yet closer inspection, with the aid of a pocket-lens or low-power of the microscope, will reveal the fact that an almost indefinite number of very minute circular openings or perforations pierce the substance of the delicate superficial film on every side, and that at these small apertures currents of water carrying the minute organic particles upon which the sponge animals feed, are more or less constantly flowing in; these are the incurrent apertures or so-called "pores." To arrive at a correct comprehension of the internal structure of the sponge, and of the motive force of the incurrent and excurrent streams

just described, it is requisite to use a yet higher magnifying power of the compound microscope, and choosing a small transparent example to focus right down into the inner substance of the living sponge. This inner substance is then found to be excavated in every direction into sub-spherical chambers, the walls of which are closely lined with minute ovate bodies or cells. Each of these cells bears at its free extremity a long whip-like appendage or "flagellum," the base of which is surrounded by a very delicate funnel-shaped extension of the cell substance, known as the collar. Minute canals place these flagellated chambers in communication with the incurrent apertures or "pores" of the sponge system, while others leading from the same chambers, freely anastomosing with one another, and thus gradually enlarging their dimensions, finally debouch upon the relatively large excurrent apertures or "oscula." It is the incessant vibratile or lashing action in one direction of the whip-like appendages, or flagella of the cells lining the internal chambers of the sponge, that produce the inflowing and outflowing currents first observed. These flagellated cells absorb and assimilate the food particles brought into the sponge system by the currents they collectively create, and constitute the essential living elements of all sponge structures.

It is interesting to find that among the lowest microscopic forms of animal life, known as the Flagellate Infusoria, organisms exist, having an equivalent structural value only of simple cells that possess, in a like manner, a whip-like flagellum and basal cellar, and are in all other respects structurally identical with these animal elements of the sponge body. Some of these flagellate infusoria or "Collared Monads," as they are more commonly designated, are solitary, while others form social colonies, which

may be aggregated on a simple or branching stem, or immersed within a mucilaginous matrix. Excepting that the social monads belonging to the last-named category project directly upon the external surface of this common mucilaginous matrix, instead of indirectly upon chambers with canal communications excavated in its substance, they are to all intents and purposes a kind of sponge, most nearly allied to that group possessing no spicular elements already referred to under the title of the slime sponges or Myxospongiæ. In addition to the flagellated cells that line the excavated chambers, other cell elements, devoid of collars or flagella, and having an irregular shape, which they are, moreover, continually changing, will be found dispersed among the mucilaginous matrix of the sponge body. In the fresh-water type, under discussion, these irregular-shaped so-called amœbiform cells, are somewhat thinly scattered throughout this matrix, but in many other types, notably the Calcareous Sponges, they are so crowded together, especially on the external surface, as to closely resemble a veritable cellular tissue, and have been consequently likened to the integumentary layer or epiderm of the higher animals. The flagellated cells with their hyaline collars that line the internal chambers of the sponge, have in a like manner been compared to the endoderm or lining tissue of the alimentary track of such animals. The motile reproductive bodies liberated from adult sponges, and that ultimately settling down, grow into a sponge-stock like the parent, have likewise been described as possessing similar external and internal cellular membranes. It may, on the other hand, be demonstrated that the non-flagellate amœbiform elements in the sponge body are merely metamorphosed phases of the flagellated cells, differing in no way from the various metamorphic

conditions assumed by the simple collared monads, at separate growth periods, and also that the reproductive bodies or so-called ciliated larvæ of the adult sponge-stock, are but ovate aggregates of similar flagellated units.* Viewed from this standpoint, a sponge body may be regarded as a colony stock of unicellular animalcules, or collared monads, including individuals in every stage of development, which throw off and live immersed within a common mucilaginous matrix, and within which matrix is built up, by a process akin to that of crystallization, the spicular or other skeleton characteristic of the specific form to which it belongs. In whichever way interpreted, either as a tissue forming metazoon allied to the corals and all higher invertebrate animals, or as a colonial protozoon, or social aggregate of many thousands of the simplest unicellular animals, the main structural points already described, remain undisturbed, and may be appreciated by the examination of any ordinary sponge, as prepared for domestic use. Taking the finer Turkey cup-sponge by way of example, all the minute perforations that traverse the external surface, represent the areas or so-called "pores," through which, during life, the food-laden currents of water were drawn into the interior substance of the sponge; the wider orifices upon the interior surface of the cup, on the other hand, represent the larger channels or "oscula," by which the same water, having all previously-contained nutritive particles extracted and laden in exchange with fœcal matters is finally discharged. In the coarser variety, distinguished by the title of the bath or

* An illustrated account of these collared monads so nearly related to the Sponge, is included in the work, "A Manual of the Infusoria," 3 vols., by W. Saville Kent, F.L.S., F.Z.S., published in the years 1881–82.

honeycomb sponge, the excurrent orifices or oscula are developed upon the convex upper surface, the incurrent apertures or pores being distributed throughout all the intermediate areas and lower surface of the organism.

A description of the special sponge species, including those indigenous to the Bahama Islands, which possess a high commercial value, with an account of their mode of collection and preparation, may now be proceeded with. To this it is proposed to add a few suggestions in the direction of yet further improving and developing this important fishery. All of the commercial sponges belong to the *Keratose* or horny-fibred sponge order, their value for economic purposes depending upon the fineness, closeness, and elastic qualities of the component fibres of their skeleton. Previous to their discovery upon the American sea-board, and notably in the vicinity of Florida and the Bahama Islands, all the sponges utilised for domestic purposes were obtained from the eastern extremity of the Mediterranean Sea, and from whence, indeed, up to the present day, all the finest qualities are still derived. Notwithstanding their tendency to vary almost indefinitely in form and texture as a consequence of their external surroundings, three distinct specific or sub-specific Mediterranean forms are usually recognised, both by the trade and scientific spongologists, and around which all the other varieties may be conveniently grouped. These three Mediterranean types, as will be presently seen, correspond structurally in a remarkable manner with a similar series that are indigenous to the seas of the Bahamas. The names of these Mediterranean types in the order of their value are, 1, the true Turkey cup-sponge (*Spongia* or *Euspongia officinalis*, Linn.); 2, the bath, horse, or honeycomb sponge (*Spongia equina*, Schm.); and 3, the hard or Zimocca sponge (*Spongia agaricina*, Schm.).

The first or most highly valued of these forms, known commercially as the finest Levant or Turkish cup-sponge, is distinguished by its usually cup-shaped contour and the exceedingly fine elastic and densely interwoven character of its component fibres. Its finest growths are obtained from the Levant and off the coasts of Syria and Tripoli. Poorer qualities of this type are gathered further westward and up the eastern shores of the Adriatic. The bath or honeycomb sponge (*S. equina*) has a more extensive range throughout the Levant, along the north coast of Africa as far as Gibraltar; it is to be recognised by its more sub-spheroidal form, the absence of distinctly radiating primary fibres, and the irregular honeycomb-like excavations of its entire substance. The third form, the Zimocca or Hard Sponge (*S. agaricina*) varies usually from a flattened saucer shaped to an elevated, irregular nodular outline with large oscular openings distributed at even distances upon its upper surface. The fibre is closely interwoven, much resembling that of the cup-shaped Levant variety; but its texture is much less elastic and is relatively hard and unyielding to the touch; it is confined almost exclusively to the eastern extremity of the Mediterranean, and occurs also in a coarser form in the northern portions of the Red Sea.

Turning now to the American series as typified by the commercial sponges of the best quality obtained from the Bahama Islands, it is found that they likewise may be grouped around three specific or sub-specific forms that correspond very closely with the three leading Mediterranean types above described. It has at the same time, however, to be observed that none of these, as so far obtained, are considered by experts to be equal in quality to their Mediterranean congeners. Mr. Alpheus Hyatt, the

American Spongologist, in his 'Revision of the North American Poriferæ,' published in the Memoirs of the Boston Society of Natural History for the year 1876, writes thus: "The coarsest varieties of the European sponges are finer, firmer, and more elastic than the finest of the corresponding American sub-species. This is directly traceable to the larger amount of foreign matter included in their primary fibres, the looser mess of the fibres as a whole, which are also comparatively coarser, and to the larger and more numerous cloacal channels of the American sponges." A type corresponding precisely with the fine cup-shaped toilet sponge of the Levant is not met with in the Bahama waters, its place being most nearly occupied by a form having the popular title of the reef or glove sponge, and technically known as *Spongia officinalis*, var. *tubulifera*. Its contour is more usually dome-shaped, though often very irregular, and it may be fistular or even dendritic. The skeleton consists of very fine closely interwoven fibres. One or more cloacal oscules open upon the top of the sponge, while the remaining general surface is perforated by numerous very regularly distributed minute porous apertures. In old specimens the fibre becomes very brittle and unfit for domestic use. It habits are eminently gregarious, and the localities it more usually affects are a hard bottom or reef in a depth of five or six feet below the surface of the water. The largest examples recorded yielded a measurement of eight inches in height and about twenty in circumference. A sponge that agrees very closely, both in form and structure, with the Mediterranean bath or honeycomb sponge is typified by the Bahaman variety known as the Sheep's-wool sponge (*Spongia equina*, var. *gossypina*). This is by far the most valuable and important sponge variety of the Bahama series, its market

value being nearly, if not quite, equal to that of the Turkish form. Like the ordinary honeycomb type, it usually exhibits a sub-spheroidal form of growth, its inner substance being honeycombed in every direction by sinuous intercommunicating channels, and the large excurrent apertures, or oscula, being distributed with comparative regularity throughout its superficies. A characteristic external feature, which readily distinguishes this sponge from its Mediterranean homotype, is supplied by the peculiar tuft-like manner in which the fibres of the external surface of the skeleton are produced in the interspaces between the oscula, and which latter structures are consequently found occupying more or less deep depressions. It is this tufted development of the superficial skeleton that imparts to the sponge that fleecy aspect from whence it derives its popular title. The habitat of the Sheep's-wool sponge is depths varying from three to as much as sixteen feet and deeper, its precise limits not having yet been ascertained. The largest and finest-fibred examples are obtained at the greatest depth, these not unfrequently measuring as much as twenty or thirty inches in diameter, with a height of eight or nine inches. It is a peculiarity, however, of these extraordinary large specimens that the centre portions of their tissue become tender and disintegrated, leaving an outer ring-shaped area of the sponge alone intact. Several remarkably fine samples of such huge ring-shaped Sheep's-wool sponges are now on view in the Bahama section of the Exhibition.

The third type, coinciding most nearly with the Zimocca variety of the Mediterranean sponges, is represented in the Bahama Seas series by what are known as the Hard-head or yellow sponges (*Spongia agaricina*, var. *corlosia dura* and *punctata*). In some respects they nearly resemble the

Sheep's-wool variety, but the texture is denser and yields only to a considerable pressure of the fingers, and they are, consequently, of much less commercial value. This variety is not found in the shallower water, being usually collected from a depth of over sixteen feet. Its habit of growth is more isolated than that of the Sheep's-wool. A height of six, with a diameter of from sixteen to twenty inches, represents the largest examples of this type that have been so far observed. Numerous coarser sponges, not suitable for toilet use, but at the same time of marketable value for outdoor purposes, are obtained in large quantities from the Bahama waters. Among these are included the so-called Velvet, Abacco-velvet, or Boat-sponge (*S. equina*, var. *meandriniformis*), differing from the Sheep's-wool in the absence of the fleece-like tufts upon its outer surface, these being replaced by protruding softened cushions of fibre which somewhat resemble the convoluted ridges of the well-known "Brain coral" (*Meandrina*). Another variety of the coarse-fibred series is the Grass-sponge (*S. equina*, var. *cerebriformis*); it in many respects resembles certain varieties of the Reef-sponge (*S. agaricina*), but may be distinguished from such varieties by the character of the general surface. This is broken up on the sides by parallel longitudinal ridges of irregular length, each of which are ornamented by longitudinal lines of tufts. These ridges are continued upon the upper surface, and give to this region a distinctly radiate pattern. The larger orifices or oscula are disposed in rows in the channels between the longitudinal ridges. A second form—which is likewise included among the so-called Grass or Glove sponges—has been figured and described by Mr. A. Hyatt under the title of *Spongia graminea*. While somewhat resembling the Glove-sponge (*S. officinalis*, var. *tubulifera*) previously described, its texture is much coarser, and its

interior substance is exceedingly open owing to the large size and central location of the efferent canals. Its general form is that of a truncated cone, fluted on the side with deep furrows, the truncated apical region being either flat or infundibuliform. The large excurrent apertures debouch upon the truncated surface, while the small apertures are situated on the sides in the interspaces between the ridges. It is a social form growing on reefs either on a smooth surface or attached to corals or to other sponges. The normal dimensions are a height of seven or eight inches with a breadth of five inches. Glove sponges of this size grow commonly at a depth of three feet only beneath the surface of the water, but examples of considerably larger dimensions occur in deeper waters.

Some consideration may now be given to those special conditions that are indispensable to the growth of commercial sponges generally; to those that are favourable to the Bahama region in particular; and to those that would seem in connection with the last-named area to give promise, under intelligent control, of a yet more profitable development of the Bahama sponge fisheries. The conditions of depth and temperature may be cited as of the first importance in connection with geographical distribution of sponges suited for domestic use. Relatively shallow waters, varying in depth from three or four feet to thirty fathoms, represent their bathymetrical range, while a tropical or sub-tropical climate, that in winter does not yield a lower ærial temperature than from 63° to 70° Fahr. on a marine isochryme of from 55° to 60° is absolutely essential for the growth of the prime qualities. These conditions, coincident with the circumstance of their both being in the vicinity of, or embracing extensive archipelagoes, places the two areas of the Mediterranean and Bahama sponge-

grounds upon an almost equal footing. It is at the same time, as previously intimated, a generally acknowledged fact, that, compared specifically with one another, the sponges of the Bahama waters are more or less inferior in quality and value to those obtained from the Mediterranean, while the finest type of all, the Levant toilet or Turkish cup-sponge (*Spongia officinalis*), has not, so far, been found on the western shore of the Atlantic. The question has been raised by Mr. Adderley, who has the material welfare of the Bahama Islands so much at heart, "Whether it would not be possible to import and acclimatise this finest quality of the Turkish sponge in the Bahama seas?" Should this suggested scheme be found capable of practical realisation, it is needless to remark that the value of the Bahama fisheries would be enormously augmented. Before, however, incurring the considerable expense that would be necessarily involved in transporting living sponges in proper condition and in sufficient quantity for acclimatisation purposes from the Mediterranean, it would be well to ascertain whether sponges more nearly resembling the finest Turkish form do not already exist in the deeper areas of the Bahama seas. It is a well-known fact that the finest quality of Mediterranean sponges are obtained from so great a depth as from ten to thirty fathoms, and are carefully collected at such a depth by trained divers, with or without the aid of diving apparatus, or by means of drags. In the American waters up to the present time, diving operations have not been resorted to, the sponges being fished up from a depth not exceeding five fathoms with the aid of hooks and spears attached to a long pole. It may be predicted with almost an approach to certainty, that as good and probably better sponges than any that have yet been gathered, are to be obtained from the depths

corresponding with those that they inhabit in the Mediterranean, and diving or dredging operations on a small but intelligent scale might be advantageously instituted to ascertain to what extent the opinion here expressed may prove correct.

In the event of sponges of the desired quality not being forthcoming from the American seas, it is recommended that steps be taken to transport thither living examples of the best Levant varieties, and where, being once established, they would no doubt rapidly propagate. That commercial sponges can be artificially cultivated has been proved by experiments made both in the Mediterranean and American waters, the method pursued in each instance being closely identical. The idea that sponges might be propagated by means of cuttings, *i.e.*, large examples cut up into numerous fragments and artificially affixed to a new supporting basis, first originated with Professor Oscar Schmidt, and was practically carried out in the Adriatic Sea by Mr. Gregor Buccich, a telegraph supervisor, in the island of Lesina, in Dalmatia, between the years 1867 and 1872. The operations carried out were conducted by Mr. Buccich with the direct support of the Government and a number of the more prominent merchants of Trieste, a suitable station having been selected in the Bay of Socolizza, at the north-eastern point of the above-named island. The sponges selected were, in their living condition, cut carefully and rapidly into fragments, having the average dimensions of 26 square millimetres, immediately fastened to the objects upon which it was intended they should grow, and then let down to a depth of 5-6 metres. Wooden boxes previously well tarred, to prevent the attacks of the Teredo, with their sides left almost entirely open, and with holes drilled in the top and bottom, into which the sponges

were fastened by pegs made of bamboo, were found, as a propagating apparatus, to yield the most favourable results. The chief drawbacks experienced by Mr. Buccich, and which were regarded by himself and those associated with him in making these experiments as sufficiently formidable as to oblige their abandonment, arose, firstly, from the hostile attitude continually displayed by the population of the neighbourhood, who manifested a deep-rooted prejudice against what they looked upon as an undesirable innovation, and not content with constantly disturbing the growing crops with their fishing-nets, on many occasions went so far as to steal the sponges. It was in the second instance found that the sponges planted as cuttings grew so slowly, that as long a period as seven years elapsed before they arrived at a marketable size. As a general result, it was concluded that sponge cultivation, as a financial enterprise, could not be recommended to the attention of private individuals having only a small amount of capital at command; but that, if undertaken by the State, or by capitalists who could afford to wait the time indicated, planting new crops each year, and having the ground efficiently guarded, so as in the end to reap a continuous harvest, it might prove highly remunerative.

The results obtained by experiments conducted at Key West on the Florida Coast in connection with the finest American sheep's-wool sponge (*Spongia equina*, var. *gossypina*) were even more encouraging than those recorded from the Mediterranean. Separate cuttings having an original height of $2\frac{1}{2}$ inches, planted in a depth of $2\frac{1}{2}$ feet of water, grew within six months to over twice these dimensions. It was observed, furthermore, that the first four months out of the six were occupied in their recovery from the mutilation they sustained in the cutting process,

and more especially in connection with the skin-like external surface, the remaining two months only representing the period of their growth. A somewhat similar difficulty was encountered in promoting the interference with the crop by the local fishermen, hitherto permitted to fish everywhere without restriction; but the most sanguine prospects of success were reported by the firm, Messrs. McKesson and Robbins, who undertook the experiments, provided that the grant could be secured of a good tidal area of sufficient depth and dimensions and with efficient protection.

The evidence just recorded, showing the practicability of sponge culture under artificial conditions, suffices likewise to demonstrate that the acclimatisation of the finest Levant variety in the Bahama waters would be a relatively easy task. The chief difficulty to be overcome would be the safe transport of living specimens across the Atlantic. To ensure success in this direction it would be requisite in the first place to collect at some port in the Mediterranean a selected cargo of living sponges of suitable size and in the healthiest possible condition. If the director in charge of the Naples Zoological Station (Dr. Antoine Dohrn) could be prevailed upon to lend assistance in this matter, and to place certain of the tanks in the Naples Aquarium at the disposal of the Bahama authorities, the prospects of success of the experiment would be greatly augmented. The specimens selected for transport should be of small size, one or two inches in height and diameter only, and should be attached to their natural basis of support, such as small stones or shells, thus avoiding the great risk of their decaying away, which is invariably associated with examples that have been torn or cut. Tanks suitable for their transit to the Bahama seas would be the next subject

for consideration; these should be fitted with a small pumping apparatus that might be connected with the ordinary steam machinery, or might be driven independently by electricity; the end in either case to be accomplished, being the constant circulation and aëration of the water, which would be *absolutely* necessary to preserve the sponges in a healthy condition throughout the journey. It might, in addition, be found requisite during certain portions of the voyage to maintain the water, artificially, at or about the temperature of 70° Fahr., by means of steam-pipes connected with the engine boilers, conducted to the neighbourhood of the tanks.

On arriving at their destination, the sponges should be planted out in some one or more of the many sheltered lagoons that abound in the Bahama Islands in depths ranging from three to ten or twelve feet. Under such conditions they could at all times be readily inspected, and their state of health and growth be periodically registered. It would, of course, be necessary to take measures to effectually protect the selected sponge grounds from robbery or interference with by the local or other fishermen. These sponges, once established and effectively protected, would soon develop and liberate germs in such numbers as to secure the naturalization of the species throughout the adjacent waters. An important point has, however, yet to be decided before it can be predicated with certainty, that sponges equal in quality to the finest Levant variety can be successfully cultivated in the Bahama seas. This point is, whether the special conditions that obtain in these waters would favour the growth and reproduction of the imported Mediterranean sponges in their primitive *fine-fibred* condition, or, whether under the new surroundings to which they would be subjected they would manifest a

tendency to deteriorate into a coarse-fibred type? This latter possibility is suggested, and has to be taken into account in connection with the fact, that no sponges of the finest quality such as the Levant toilet sponge, have been so far obtained from seas productive of reef corals. In the area of the Red Sea, and in that of the east coast of Australia, remarkable in either case for their extensive coral reefs, sponges are relatively coarse and inferior in quality compared with those derived from the reefless Mediterranean. The same rule holds good, likewise, with respect to the existing indigenous sponge-fauna of the coral-producing Bahama and Florida seas. The solution of this important question could be arrived at only by the intelligent examination, at more or less frequent intervals, of selected individuals under cultivation throughout a period of some years' duration, special attention being directed to any alterations in the character of the fibre, as revealed with the aid of the microscope, developed upon the original framework of the sponges brought from the Mediterranean. Until a practical decision has been arrived at in this direction it would be scarcely desirable to expend a large amount of capital in the importation of living Mediterranean grown examples.

Apart from the proposed acclimatisation of European sponges in the Bahama seas, much, doubtless, could be accomplished towards the improvement and further development of the existing fisheries. That sponges of a yet finer quality than those, so far obtained from this locality are possibly to be gathered with the aid of the dredge from the deeper waters has been already suggested on a previous page. The question has recently arisen as to whether or not the existing sponge beds, if continually fished, as at present, are not likely in process of time to

become exhausted, and whether to guard against such an untoward eventuality it would not be desirable to institute a periodical close time for their protection, such period to be made coincident with their reproductive season. It is not anticipated by the writer, that so long as the sponge fisheries in the Bahama Islands are conducted upon the present primitive method, the sponges being individually transfixed with a hook or spear, that there is any likelihood of the beds being injuriously depleted; for by the method now pursued, it is only the larger sponges that are of a mercantile value that are fished up, the young individuals being overlooked or left to grow to a marketable size. Before attaining to this condition, sponges freely evolve their reproductive gemmules, so that the constant restocking of the beds is effectually provided for. If, on the other hand, the present mode of fishing should be superseded by the use of the dredge without restriction, and to such an extent that the entire area of the ground would be systematically swept clean of all sponges, great and small, the complete exhaustion of the sponge beds would doubtless be only a question of time. To provide against such an emergency, the following precautionary measures might be adopted:—The dredging operations should be restricted to a certain distance from the coast line, leaving a wide inshore margin, in which the sponges could freely propagate. Dredging operations should not be permitted over the same sponge beds for a number of years in succession, but portions of the entire area in turn should be allowed a more or less extensive resting time, during which interval a new crop of sponges might establish itself or grow to maturity. Certain favourable areas might be separated off *permanently* as stock beds or nurseries, either naturally productive of, or artificially planted with the best kinds of

sponge, and from whence germs or embryos would be constantly liberated and distributed throughout the adjacent waters.

In the writer's opinion, the precious coral of commerce (*Corallium rubrum*), and probably also the pearl oyster (*Meleagrina margaritifera*), if not *already* existing, though yet undiscovered, in the adjacent waters, might be artificially introduced and successfully cultivated in the Bahama Islands under conditions closely analogous to those here suggested with reference to Mediterranean sponges.

The subject is, at the least, well worthy the attention of those interested in the further development of the fishing industries of the Bahama seas.

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