UNDER SEA WITH HELMET AND CAMERA

A. FELIX DU PONT

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UNDER SEA PHOTOGRAPHER

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Experiences of an Amateur

By

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With Illustrations from Photographs taken by the Author

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To my daughters, Lydia Chichester du Pont and Alice du Pont Mills, who first showed me the bottom of the sea.

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INTRODUCTION

A new and fascinating pursuit has developed in recent years which lovers of nature, especially aquatic life, are only beginning to appreciate. This is amateur submarine diving. Some interesting motion pictures and books devoted to submarine research or adventure have appeared during the past decade, but the equipment, technique and danger described as seemingly necessary to this pursuit must have discouraged the majority of people who have a desire to feel the thrill of wandering on the sea bottom. It appears that the authors of these books have recounted their activities and accomplishments primarily for the edification and entertainment of people who enjoy descriptions of unusual and dangerous experiences. The matter of encouraging others to enjoy a similar pursuit was not part of their purpose. The writer, since boyhood, has had a deep interest in this subject. He has pursued his investigations in an amateurish manner but with thrilling results. A narrative of these experiences, with a description of the equipment and technique employed, would seem to have a place in undersea literature, hence this book. The most interesting subjects represented by the illustrations are reproduced from sixteen-millimetre motion pictures; the result is necessarily poor, although the pictures when projected in motion are satisfactory. Furthermore, when the photographs were being taken, there was no thought that they would be published in a book. The considerate reader will perhaps bear these points in mind when criticizing the illustrations.

The opportunity to begin submarine diving came to this author through a fortunate and unlooked for circumstance. Books that had been published describing undersea photography had escaped his attention, but

he had heard enough about the subject to know that he was not a pioneer in the field, though he may be among the first of the amateurs. Here let it be recorded, therefore, that the man who made the first photographs of fishes in their natural habitat did so in the year 1913, and his name is J. E. Williamson. He it was who conceived and designed the wonderful apparatus which he called the photosphere.*

My expeditions under the sea, at least the only ones meriting description, were made in the Bahamas; the out islands as those are called that lie nearest Nassau. Cruising in these waters is so full of interest and new sensations that my activities were not confined to submarine photography. Companions were with me for whose enjoyment I felt responsible; consequently we spent much time in going from place to place, fishing, bathing, and walking on strange and beautiful beaches. I have, therefore, described these cruises in narrative, bringing in each diving expedition as it occurred.

* *20 Years Under the Sea.* Williamson (Hale, Castleman and Flint).

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UNDER SEA

CHAPTER I

CHILDHOOD EXPERIENCE

WHEN I was fourteen years old, and for some years thereafter, my playmates and I passed the long summer vacations entirely free to follow whatever diversions we could originate. We lived in the country. Automobiles, movies, radios had not been invented. Not more than two families that we knew owned graphophones. The invention of pneumatic tires had made bicycling a pleasure. The fact is not generally known that in those days a bicycle was not a salable article if it weighed more than twenty-two pounds. If this statement does not seem important the reader should ascertain the weight of the bicycle now being used by the average boy of sixteen years or over. We made journeys on bicycles of eighty to ninety miles in a day. Lengthy arguments were entered into regarding the weight of various makes of bicycles, the tread, gear and tires. Reduction of weight was more important than anything else. A boy owning a bicycle encumbered with mud-guards was a "sissy." Bicycles were equipped with tool-cases. We would carry our tools in our pockets and discard the case to get rid of its weight. Today, a boy on an average bicycle is as badly handicapped as one of us would have been if he had been carrying a knapsack weighing twenty pounds.

The business of some of our fathers was manufacturing. We lived near mills that inspired interest in mechanics and chemistry. Our amusements were, therefore, wholesome and constructive. We built boats and waterwheels, made gunpowder and fired it in cannons of our own construction. For sport we took the bicycle rides, played tennis, went canoeing and

swimming. Some of our summers were spent on the New Jersey coast. We formed, with some boys we met there, a sort of "club," at least it had sufficient organization for us to procure uniform caps (or perhaps our mothers did this for us). The chief accomplishment of the club was making a collection of specimens of life along the shore of a small inlet from the sea. We dried our small fishes and preserved more bulky ones in alcohol. The conditions at this inlet must have been unusual, for we obtained many sea horses, pipe fish and star fish. All other kinds of fish died very soon after being placed in bowls or buckets, but these lived for a long time. We luckily obtained the sea horses at spawning time and witnessed the young emerging from the pocket in which the parent carries them. They were so small that I mounted some on microscope slides. This pastime gave to me a lasting interest in life beneath the surface of the sea, fresh water ponds and streams.

At home, swimming took precedence over all other summer amusements. Our "swimming hole" was in the Brandywine Creek among the gunpowder mills which lined its banks for two miles. At the place we had chosen, a sycamore tree, its roots undermined by the stream, had started to fall into the water but had apparently changed its mind just before it was too late. It leaned over the stream at an angle which made walking on its trunk an easy matter. We built a platform for diving where the height above the water was about ten feet and made a rope-ladder to get back to the platform. Sometimes the "girl-friends" were allowed to go with us. Diving, swimming under water, collecting stones from the bottom became matters of great interest and competition. One of the boys made a pair of glasses to aid his vision when beneath the surface. Then we became interested in devising a means for breathing and so initiated ourselves into the elementary problems of submarine diving. The first and most obvious experiment was to place a short section of garden hose in the mouth, then submerge, and breathe in and out through the hose. We found that when

SOMETIMES THE GIRL-FRIENDS WERE ALLOWED TO GO WITH US

the head was submerged but one foot beneath the surface the lungs seemed to collapse, air was expelled through the hose, and inhalation was a feat of utmost muscular exertion. Then too, even if this feat of breathing could be accomplished, the hose would always contain used air. Only a few feet of hose would contain all of the air exhaled, so that no fresh air would be admitted. We tried holding the hose in one side of the mouth, inhaling only through it and exhaling from the other side, using the tongue as a check-valve. This was too complicated, and after gulping water a few times we abandoned the experiment.

A few rough figures will show why air at atmospheric pressure cannot be drawn from the surface by a person under water. A cubic foot of water weighs sixty-two pounds. An area one foot wide encircling a man's chest contains approximately three square feet. If he is submerged one foot, he is subjected to a pressure 3 x 62 pounds, or 186 pounds distributed around his chest, not to mention an equal or greater pressure around his abdomen, forcing all of the organs in that region upwards against the lungs. If our friend descends into the water to a depth of thirty feet, which gives no discomfort to a properly equipped amateur diver, the pressure around the chest is increased to 3 x 30 x 62 pounds, or 5580 pounds, and the abdominal pressure in like proportion.

We boys were familiar with the elements of physics and knew something from hearsay and books about submarine diving as used for construction and salvage; consequently, our next experiment was to make a contraption whereby air at the same pressure as that of the water could be inhaled and exhaled. A large iron bucket was procured and inverted, and sufficient scrap iron was tied to the bale to sink it in spite of the air imprisoned within. A short rubber tube was equipped with a float at one end so that it would hold that end above the surface of the water. We took our apparatus to the swimming hole and let the bucket down into the water. Then I, with the rubber tube in my mouth, let the other end float

on the surface of the water inside the bucket. While I held the bucket alongside my head, my companions on the platform in the tree lowered it slowly and I went with it until my feet rested on the bottom. Air from the bucket was drawn into the lungs and passed back into the bucket. This air was at the same pressure as the water and there was no difficulty in breathing, except that the air became foul after a very few breaths. Our next improvement was to use two buckets, shift the tube from one to the other, send a signal for the used bucket to be hoisted up, filled with fresh air, and sent down again. This was rather complicated, the water was seldom clear enough to see through at all, it was not as much fun as we had anticipated; consequently, the diversion came to an end. Had we lived where there was clear, still, salt water we surely would have evolved a real diving apparatus.

CHAPTER II

FIRST VISIT TO THE BAHAMAS

In the spring of 1935 (only forty years after the experiments described in the last chapter) my two daughters, Lydia and Alice, were spending some weeks in Nassau. They decided to give their father a new kind of vacation and sent word that they had chartered a boat and we would cruise among the out-islands. This was a command in obedience to which I made my first visit to the Bahamas.

On my arrival, we proceeded at once to our boat which was lying at a dock at the market-place. It was native-built, about thirty feet overall and eight feet beam. Sloop-rigged, it had a fair amount of sail and was equipped with a twenty horsepower motor. The main cabin had the usual accommodations in a small boat, consisting of two lower and two upper berths, a gas stove and toilet. It was of shallow draft with centerboard which occupied valuable space and caused considerable inconvenience. A hatch on the fore-deck gave access to space below sufficient for two bunks which were used by the Captain and his assistant. A small cockpit aft and a dinghy which was towed, completed the main characteristics of this little vessel, which we found admirably suited to the purposes for which it was used. It had been given the attractive name of *Spindrift*. The two men who navigated and provided for us were experienced natives and seemed capable and anxious to please. Indeed we found them so.

I had arrived in the forenoon and we were anxious to start on our cruise at once. All that was needed was an extra supply of fuel which our Captain had not taken on because he had not understood that we intended to stay

away from Nassau during the entire time for which the boat was chartered. Here we were disappointed. The town was giving a formal welcome to the Duke and Duchess of Kent; a holiday had been declared, and a British Colonial holiday is taken very seriously. Every commercial building is is closed and barred, including shops, even drugstores and filling stations. If your car runs out of gas, you leave it on the street until the next day. There is nothing to be done unless some kind motorist pushes you home. So we embarked after lunch and sailed to Paradise Beach to have a swim. In the evening we enjoyed the wandering minstrels on the street, negroes, who in groups of three or four, sang with guitar accompaniment. I heard for the first time songs which became familiar on subsequent visits. The most popular one—*Mama don't want no rice, no peas, no coconut oil*—has a lilt to it that is catching and I found myself whistling or humming it for days.

The type of songs, however, is quite different from those that we are accustomed to hearing sung by the colored people in the United States. They are evidently composed for the amusement of tourists who land in Nassau from the cruise boats and stay for a few hours. None of these songs has a religious theme. On each subsequent visit, I noticed that the charm of these street singers decreased. A progressive degeneration was apparent in the quality of the songs. They are ribald and sometimes even express obscene sentiments, which are not natural to the negro, and suggest inspiration from the white man. The matter is giving concern to those who are responsible for law and order in their attractive little town.

Next morning we got under way with plenty of fuel and other supplies. Not until then did we consult with the Captain regarding our destination. The character of the various out-islands was unknown to all of us. After hearing about the beauty of Eleuthera, we laid our course N.E. x E. after we had cleared Nassau light on the Western end of Hog Island. We had been on this course for about half an hour when Lydia spoke of a

CLOUD EFFECTS IN THE BAHAMAS

MISSIONARY BOAT AND ANDROS NATIVES

nesting place of flamingoes which she had heard was situated on Andros. We discussed Andros with our Captain and changed our course to W. x S. After passing Clifton Point, we bore S.W. for twenty miles. This course crosses Tongue of the Ocean, an area about thirty miles wide and extending southeastward for a distance of 120 miles. The soundings marked on the chart are surprising: 800, 939, 1000, 1409, 1600 fathoms; and the area is surrounded by shoals and reefs which drop off abruptly to these great depths. What a strange appearance it would present if the water was drained off!

The island of Andros is the largest of the Bahama group. Its length is 104 miles; its greatest breadth forty miles, the same size as my native State of Delaware. It is divided near its middle by three waterways known as North Bight, Middle Bight, and South Bight. A line of coral reefs guards the entire length of the Eastern shore, which is high land. The Western shore is marshy, and shallow water extends far out to sea. Vessels cannot approach this shore. The population of the island is 6900 and they all live on the Eastern shore. There are no roads. The inhabitants communicate with one another and with Nassau by boat. Because of the coral reefs, a sharp lookout has to be maintained in approaching any part of the Western shore. We found that the shallow draft of *Spindrift* was an advantage in crossing these reefs, for most of the "coral heads" plainly visible in these crystal-clear waters were below our depth. It was impossible for me to judge whether these obstacles were deep down or dangerously near the surface, but our experienced navigators ran boldly over some dangerous looking heads and skirted others. This clear water is a fascinating characteristic of the Bahamas. Its constant and beautiful changes caused by wind, sun, and cloud can be fully appreciated only by those who cruise among the islands in small boats. Unbelievable shades of blue, green and copper combine with clouds, white beaches, and tropical vegetation with effects that neither pen nor brush can describe. Inside the reefs we bore southward

and did some trolling. I had done little southern fishing and always expected each catch to be something new. A Mutton fish and a Jew fish rewarded our first efforts, so I was not disappointed.

We anchored in the late afternoon off Coakley Town. The shore did not look inviting for bathing so we enjoyed a swim by diving overboard. Nearby, also at anchor, was a fine schooner. She looked like a yacht but, though well kept, showed by absence of cushions, awnings and other luxuries that she went forth on serious occasions and not at the whim of the owner. We wondered why such an important looking vessel was anchored off the tiny village.

Our arrival had been seen by the villagers, and presently we saw some small boats putting off. They were the most dilapidated looking craft I ever saw. The one which first approached us contained three negroes, a man and two women. The sail was made of scraps of material sewed together, grain sacks and burlap. One of the women was steering, the other bailing steadily to keep afloat, and the man was standing before the mast holding a live chicken. He said, "Captain, yo' don't want no chicken, no eggs?". There were offerings from other boats, mostly specimens of coral or shells. The question was always put in the negative. This is an odd example of a characteristic of the African that I have often noticed. He avoids disagreeing or being disagreed with.

We went ashore while the meal was being prepared, finding this convenient for our crew. A group of children was awaiting us and followed, exhibiting much curiosity. No doubt a visit of white persons to their village is an event. About a dozen houses were visible. There were more, we observed later, concealed in the bush. We made our way towards a church, crudely constructed, not unlike the negro meeting houses one finds through the South Atlantic States. I went inside and was followed by one of the children, a girl older than the rest. The interior was a surprise. Its appearance of order and cleanliness and its decorations, though rather

pitiful in quality, gave unmistakable evidence that here was an humble representative of the historic Church whose people were properly trained, and proud of their heritage. I said, "Is this the Roman Catholic Church?" The young girl, with a slight inclination toward the altar, said, "No, sir, this is the Church of England. The Roman Catholic Church is on the other side of the village." "Does your minister live here?" "No, sir, the priest lives in Nassau and comes here once a month, but we have a Catechist who lives here. He teaches school and reads the services when the priest is not here." "Does the Bishop ever visit you?" "Oh, yes, sir, he comes once a year for confirmation." "Does the Roman Catholic Priest come often?" " 'Bout same as ours. He got a mighty fine boat; she lay out there by yours. They have a Catechist too." This girl was as merry and noisy as the rest of the children until she entered the church, whereupon she assumed a quiet dignity. She exhibited training and education which though it did not entirely rid her of the negro dialect, renewed my respect for British institutions and for the Missionary organization of the Church of England.

An Anglican priest at Nassau gave me the following additional information. One priest is required at times to visit all the churches on Andros, Bimini, and the Berry Islands, thirteen in all, and each separated from the other by water. Fr. Brooks at present has that duty and a sailing boat, *New Dorothy*, is at his disposal. More often the care of these churches is divided between two priests. Rectories have been provided at the principal settlements, and at most of the others there are small cabins for the use of these ministers. The churches are supported by the people themselves and by subscriptions collected by "The Nassau Association" of England and Canada.

The Anglican and the Roman churches apparently do a good job on the Islands. Speaking only of the negro element (there are white people on some of the islands), other Christian sects exist, but I think that none of these has an energetic supervision by white people.

We proceeded to the inland extremity of the village. The children continued with us and struck up a sort of marching song. My daughters sensed a chance for additional entertainment and asked them if they liked to dance. They said something about a "fire dance," indicating that they made quite a ceremonial of dancing. Lydia asked them if they would dance for us should we come ashore again after supper. The older girl spoke up immediately, "No, Miss, we couldn't dance for you 'cause this is Lent." Later I was sorry that we missed this fire dance because I learned that it has a most interesting character. The negroes on Andros have lived there for many generations and have had little contact with the outside world. It has been concluded by travelers studying the island from an ethnological standpoint that this dance is undoubtedly a relic of their African forebears.

We proceeded up a short flight of steps to some higher ground and found a small area where some of the soil was cultivated. It was pathetic. Some corn was scattered about, no attempt having been made to plant in rows. Some vegetables appeared here and there, but all that we could see would hardly feed one family. The soil, what there was of it, looked fertile but very shallow and the coral-rock formation of the island protruded through it in many places. Beyond this cultivated area, we came upon an impenetrable thicket and could go no farther. There were no trees over twelve feet high, and very few of those. I believe that the greater portion of the island is covered with this growth, although the Southern end of it contains some timber. Exploration of the island by aerial photography might be interesting. Large plantations on the island have been referred to by early writers.

When we returned to the stairway, we had an encounter which left an unpleasant impression. A white man was waiting there with the evident intention of entering into conversation with us, so we stopped. His manner and speech showed unmistakable signs of culture. He said that he had

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THE ANDROS MAIL

lived in the village for twenty years. He gave us interesting information about the island and questioned us about our visit. He told us that he had had a fine house but that it was destroyed by a hurricane a few years ago. He had built a sort of shanty on the foundations of the original house, and pointed to where it stood about fifty yards away. When we left him, he walked toward his home and his family came out to greet him, all black as coal.

After this experience, we returned to the waterfront and rowed out to our anchorage. A good meal had been prepared for us, including some of the fish we had caught during the day. We discussed our experiences and our plans for next day; then Alice produced her portable graphophone. The moon was nearly full, the air balmy. The charm of the islands was working on me swiftly. It seemed unbelievable that only four days ago I had been working at a desk.

Next morning we got under way after breakfast in search of a suitable "sea garden." Lydia had procured a diving apparatus, the use of which she had planned to make the outstanding attraction of the cruise. During her stay in Nassau that winter and the previous one she had made some friends who used diving helmets, and had made several descents. Now she owned her personal equipment and was proud of being the one to give me my first experience. We arrived at a point on the outside of the coral reefs. Our Captain, letting our little yacht drift for a while, took the dinghy and searched the coral formations with a water glass. He soon selected a suitable place, returned to *Spindrift*, moved her over to the place he had chosen, and cast anchor.

Our diving equipment was made ready. This consisted of a helmet, a hand-operated air pump, and about fifty feet of rubber hose. The helmet was of copper and went over the head, resting on the shoulders. It contained two windows of flat glass, separated by a small frame located exactly in front. A line tied to a piece of scrap iron was now dropped over

side and secured to a cleat. Following directions, I swung myself overboard and grasped the line, supporting myself chin-deep in the water. The pump was set in motion and the helmet lowered over my head. Letting myself down about two feet, I stopped for a short time. The air was admitted through a nipple in the side of the helmet and escaped at the bottom, around the shoulders. I let myself down slowly now. The increasing pressure made itself felt by stoppage in the ears. The discomfort was cured by yawning.

When my feet were on the bottom I looked around me. This first experience was thrilling. Objects which I had looked down upon perpendicularly from the surface now stretched before me as on land, but what a marvelous difference! A shimmering light of a pale blue tinge pervaded all. Every object that met the eye was unfamiliar but beautiful. At first I noticed only the larger objects, coral heads, huge sponges, red and yellow sea fans. Then I began to discern the fishes. They were small but seemed to be of infinite variety, and their coloring was superb. They swam in and out through grasses and arches of coral, appearing and disappearing. I moved from place to place in order to get a better view of any grouping that attracted me. The shimmering light was caused by the sun's rays being deflected by the ripples on the surface. I turned back reluctantly to my point of descent, and ascended hand over hand quite slowly, as directed.

I thought over this experience, and wondered why I had not observed details more closely. In later descents the same failing has been noted. It probably is caused by unfamiliarity with the surroundings, nervousness about the air supply, and fear of unconsciously coming in contact with some harmful animal or plant. Lydia took her turn, but Alice could not be induced to try it. Some people have an attack of claustrophobia when the helmet is placed over their heads. These should never try diving; they will get nothing out of it themselves and add nothing to the enjoyment

of their companions.

We stowed our equipment, weighed anchor, and proceeded southward inside the reefs.

In the afternoon we stopped at some point off Big Wood Cay where there is a natural curiosity that is worth visiting. A well, uncovered at low tide, is situated off shore about one hundred yards. It is about ten feet in diameter and a large volume of salt water flows from it when the tide is receding. A short distance inland there is a pond which is said to be connected by a subterranean tunnel with the well. We visited this pond and looked down upon a school of Angel fish. Although the water was not very clear, we procured the diving apparatus and explored the pond, hoping to find this outlet. But we were not successful, and returning to the well, explored its interior. I was letting myself down by a rope, touching the wall with my toes and feeling for a foothold. Presently I felt a ledge of rock and was able to turn around and sit on it. The depth was about fifteen feet. A multitude of small fish of many varieties were swimming about. Their bright colors against the dark rock gave a beautiful effect. The wall was more rugged at this depth but as we had not sounded the well beforehand, I went no deeper. It appealed to me as an interesting and adventurous place for exploration. The rocks were over-hanging and forbidding. Artificial light would be required to explore to any extent. I resolved to visit this place again if possible.

When we had finished this exploration our Captain took us to a place where Bone fish can be caught. Bone fish come in over broad flats which are bare at low water. Small shell fish come to the surface of the ground when the tide goes out. When it comes in, the Bone fish come with it to feed on these shell fish which have not yet gone far enough into the ground to protect themselves. The time and place to catch Bone fish, therefore, is on the young flood tide coming over flats on which there are plenty of shell fish. We were not well equipped; one heavy rod and two hand lines.

Alice caught one small Bone fish. Soon we were overtaken by darkness and abandoned our efforts.

Next morning, after a swim and breakfast, we turned Northward, having learned to our disappointment that it would take two more days to go to the nesting place of the flamingoes, which is near the Southern extremity of the island and several miles inland. Our destination was Mastic Cay, a good anchorage and a point well situated for taking off next morning on the run to Nassau. The distance was not great; we took plenty of time fishing and spearing crawfish when we found likely places. The latter is good fun, by the way, and requires practice and natural agility. According to conditions, it is done from a small boat or walking in water about waist deep. The hunter is provided with a water glass and a grains or spear with two or three barbed points. The crawfish, which are larger than the average lobsters found in Northern waters, differ essentially from those in the absence of claws. They are not quite as tender as lobsters but make very good eating. They can be seen by searching the bottom and the sides of coral formations with the glass. A sharp eye is required, for usually only the "whiskers" are seen protruding from some refuge into which the crawfish can retire backwards with great speed. The spear must be brought as close to him as possible without scaring him and this must be done with a steady, slow motion, bearing in mind that the arm must have enough remaining forward motion to accomplish the final thrust. This, of course, must be made with the utmost speed and accuracy. Often a piece of overhanging coral will shield the crawfish from the fatal thrust. His disappearance is permanent and the forked spear is bent so that it has to be straightened before the hunting can be continued. Moreover, the eye must be trained to allow for refraction. A thrust does not come near the quarry until one has learned to make this allowance. We were not very successful with our attempts at this sport, and realizing that the contemplated

crawfish picnic which we were looking forward to was likely to be a disappointment if we did not change our tactics, we turned the quest over to our crew, who procured a bucketful in a surprisingly short time.

Before sundown, we arrived at Mastic Cay and anchored off a sandy beach, a delightful place for bathing and walking on the shore. We brought cooking utensils from the yacht, cut firewood, and our crew prepared for us a meal of conch chowder, broiled crawfish, bacon, bread, coffee, and young coconuts. I consider conchs a real delicacy. They can be eaten raw or cooked in various ways, but they do not appear on the hotel menus in Nassau. Young coconuts were a new experience to me. The meat is of a jelly-like consistency, entirely different from that of the matured ones shipped North. They are very palatable. As we ate, a schooner was sighted, coming towards us. It made a beautiful picture in the sunset. When it came near enough to observe in detail, the lack of recent paint and the discolored sails covered with patchwork indicated a lowly place in maritime society. Yet it had a stately bearing which gave it a look of importance. Sailing vessels, like people, have character which can be recognized by the discerning eye in spite of their clothing. We were told that this vessel was the Andros mail. In Nassau, I procured a photograph of her from Mr. Armbrister to whom I am indebted for the accompanying illustration.

When our unusual and enjoyable repast was finished "All was well with the world." We stretched ourselves on the sand. The mate spun yarns to us about experiences with Mr. J. E. Williamson, by whom he had been employed in the making of undersea moving picture plays. The full moon rose over the cays with that tropical brilliance which works a magic spell on all persons having a spark of sentiment, be they saints or sinners. Alice started her portable graphophone, and the record *Blue Moon* was metamorphosed from the silly night club number that it is to a soul lifting and glorious composition. Now, after five years, when I hear that song pre-

cious memories are stirred within me.

Next morning we had an uneventful run to Nassau, and this altogether delightful experience was ended. I resolved to make another cruise during the next year for the particular purpose of having more diving experiences and, if possible, to make photographs of the sea gardens.

CHAPTER III

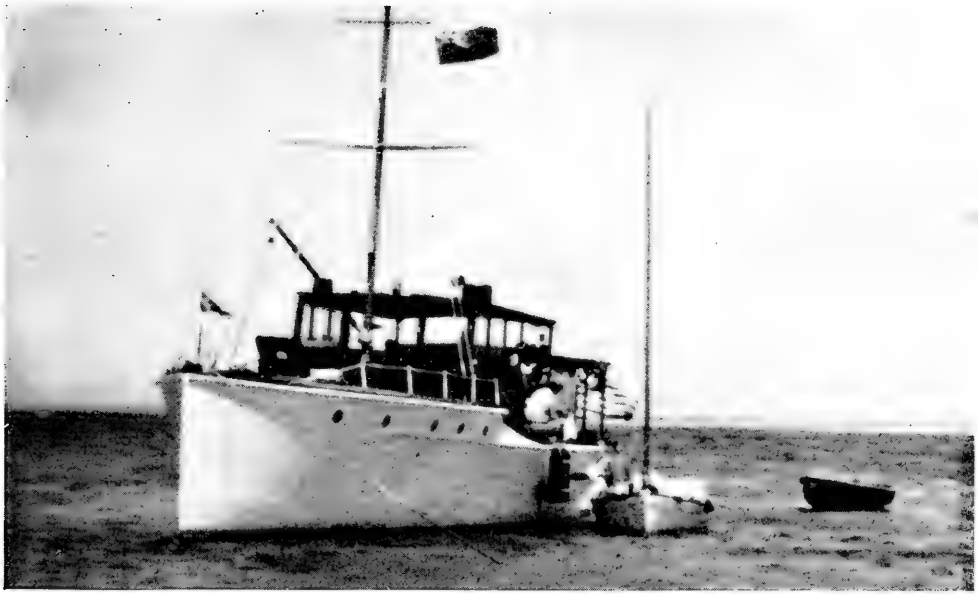
ANDROS

WHEN the spring of 1936 arrived I had sent a small cruising power yacht, *Aquila,* to Florida through the Inland Waterway. This boat, in charge of Captain Malcolm Billsborough, was built according to my general ideas, and had been used during the past five years only for summer cruising and sword fishing in Northern waters. From Miami, she proceeded to Nassau where she awaited my arrival. This little yacht was fairly well adapted to island cruising, although on account of her light construction hardly safe to take across the Gulf Stream. She is forty-nine feet overall, eleven feet six inches beam, and three feet six inches draft. In addition to the usual four berths in the main cabin, there is a small cabin forward with two berths. Aft of the main cabin is a galley. A watertight bulkhead separates the above described part of the ship from the engine room, which also serves as crew's quarters. I had some ideas of speed when this little cruiser was built under my instructions, and powered her with a medium speed gasoline motor rated at 180 horsepower. The motor never seemed to yield the power claimed for it and as regards speed, the little yacht was a disappointment. Her fuel consumption was very great.

However, Captain Billsborough can make up for many deficiencies in a yacht if he is willing to take her. A born seaman, steady and reliable, he had in his younger days a desire to broaden his knowledge by shipping on many different kinds of craft. His first experience, as a boy, was with the New Jersey oyster fleets in Delaware Bay, and on some sailing yachts. After 1902, he became second mate of a steam driven lumber barge, and

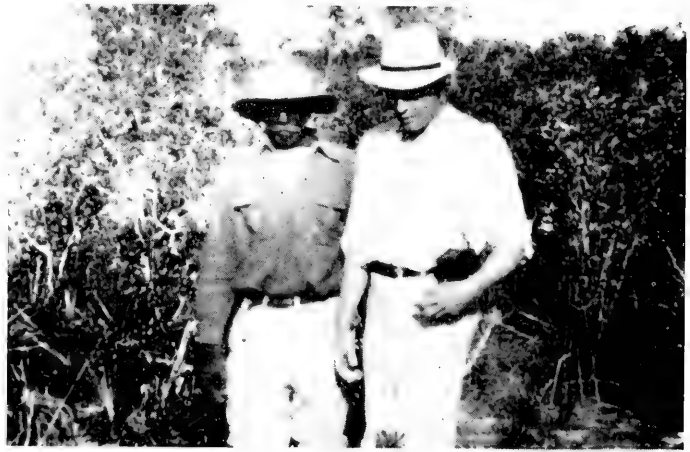
from that time his record of service shows that he was second mate, first mate, and Master, consecutively, of several fisheries boats working out of New Jersey ports. He was employed by my brothers and me for the season of 1908 on a jointly owned motor yacht of seventy-five feet length and fourteen feet beam. We were very proud of this boat, for she was among the first of the motor yachts to be turned out under the radical changes in design that naval architects had begun to apply to that type of vessel. Our new Captain was just as proud of the boat as we were but did not let us know it. Captain Billsborough, a young man of thirty-two years, won our respect at once because of his knowledge and self-confidence, along with his courteous and unassuming manner. After the season was over, he became first mate on U.S. Lightship *Five Fathom Bank*, which post he held for three years. T. Coleman du Pont, knowing the Captain's ability, gave him the position of Master on his steam yacht *Tech*, a position he held until the end of December, 1930, including leave during the first World War to take the position of third mate on an oil tanker carrying fuel overseas to the Allies. He had eighteen pleasant years with a delightful family who were interested in water fowl shooting, and racing speed boats. He came back to me after twenty-four years and here we find him, Master of a frail "summer" cruiser which had no right to be on the opposite side of the Gulf Stream from that on which she was built.

Aquila served me well in my second cruise among the Islands. I had a party of five. We left Nassau early in April with Captain Billsborough, a cook, and a native guide. I resolved not to disappoint Lydia, therefore made our first objective the flamingo nesting-place on Andros. We passed out of Nassau Harbor eastward, rounded East Point, and headed for South Bight, Andros, S.W. x S.¾S, a distance of fifty-two miles. The run took about five hours; we did a little trolling, and even at cruising speed caught several small Spanish Mackerel. At South Bight there is a settlement named Golding Cay. An official known as the Commissioner lives here. We



YACHT *Aquila*

CAPTAIN BILLSBOROUGH



FLAMINGO NESTS

FIRST PHOTOGRAPHS

(*Enlarged from 16 m.m. motion picture.*)

visited him and he kindly furnished a guide to go with us to Grassy Creek. This guide was an elderly negro with a pleasing manner. We proceeded southward along the coast for about twenty-three miles, arriving at last off Grassy Creek. We were fortunate in having a boat of light draft, for the water between the reefs and the shore at this part of the Island is very shallow. Our arrival at this anchorage was after sundown, too late for any excursions on land. We amused ourselves watching and talking with the natives who came out to sell us some of their wares, chiefly coral and shells. The new moon and perfect weather, which seldom fails in April, added greatly to our enjoyment and to the comfort of all hands, for *Aquila* had no regular accommodations for the two extra men.

Next morning Lydia and I went ashore with our local guide to see the flamingoes. We set out through a tiny settlement, and thence across trackless country. At times we were crossing stretches of bare ground, coral rather, which is the foundation of all of these islands. This is dark gray in color and while smooth in some places, in others is so rough that it is difficult to walk upon, even when wearing rubber-soled shoes. It looks like lava and I have not been able to obtain a satisfactory explanation of its shape and quality. My own observation brings me to the conclusion that sand from coral has arisen above the water (though I don't know why it should) and has been baked into a hard mass by the action of the sun, then the rain has gradually disintegrated portions which for some reason were softer than others. This leaves a surface of sharp ridges and points similar to nothing I have ever seen. Any extended walking on this material would soon tear up the soles of rubber shoes. It can be broken with a hammer, exposing coral sand within the hard exterior. We were amazed to see our guide walk with bare feet over this formation and apparently without even picking his steps.

We passed through beautiful tropical growths and eventually arrived at the shore of a lake, the breadth of which was a half mile. Hitching our

cameras and lunch boxes high on our bodies we waded across this lake, which had a hard sandy bottom and was not over three feet deep. This obstacle only added to our enjoyment of an unusual journey on foot. Our walk was perhaps four miles when we arrived at the flamingo nests. We were disappointed to find that the birds were not there. Our guide said we were too early. He expected them but could not predict their arrival more closely than a week and this was one of their late years. However, the last year's nests were interesting to see—hundreds of them. They are built of sand, cylindrical, and rising about one foot from the ground. But one egg is laid by each bird on the flat top of the cylinder. The mother squats on the egg with her feet on the ground. After taking some photographs and eating lunch we returned to the shore, having enjoyed a most delightful expedition.

In the morning we headed North to Middle Bight and found an anchorage outside the reefs where the bottom looked satisfactory for my first attempt at submarine photography. I had prepared for this by having made a case of sheet brass put together by solder. It is designed to fit my camera snugly and is equipped with a window covered with plain glass situated so that the exposure can be made through it. A detailed description of the camera-case and its use is given in the second part of this book.

All was ready, now, for my first descent with the camera. Although the sun was shining brightly, I opened the diaphragm wide. I had no data to go on, and thought perhaps the sun's rays filtering through the water might not act on sensitized film as quickly as in the air. I decided that the error of overexposure was sure to bring some visible results, whereas underexposure might produce nothing. This first attempt excited me so much that I photographed the first sea grasses which I saw with a few small fish among them. It has occurred to me since, that a fairly satisfactory method of determining the exposure to be used under water would be to point an

exposure meter diagonally downward from the surface through a water glass.

On the second descent, I felt more calm and looked about me for interesting objects. The yacht had been moved over to where the depth was thirty feet. This was a new experience. The pump had to be worked much faster. I had to clear the pressure from my ears several times on the way down, and felt very lonely and insecure. But by a coral head about twenty feet distant a Grouper of considerable size (four or five pounds) was suspended, motionless. He allowed me to approach within focal distance and my precious thirty feet of film was used on this subject alone. As I turned back I happened to look upward, and in front of me, six feet above my head was a Barracuda, also motionless. I walked beneath this sinister form thinking, "I don't bother you, don't you bother me."

After this excursion was finished Lydia made a descent, her first in thirty feet of water. She fared well and enjoyed it, but not for long. She also saw the Barracuda. I have not since that experience descended to so great a depth. It produces a feeling of awe. I seemed to be walking through a forbidden land, feeling very helpless, and far from my native element. The surroundings appeared sinister, and I imagined that lurking foes were watching me from their hiding places.

After lunch we went ashore, carrying the diving equipment in the dinghy. We located the well which we had visited on our previous cruise, and I decided to explore it to the bottom. This well is smooth and cylindrical for about ten feet of its depth; then it becomes irregular and much larger. Overhanging rocks cast deep shadows and the place has a forbidding appearance. Reaching the bottom at twenty feet, I found a tunnel which evidently connects with the inland lake. Poised in this tunnel there was a large fish, probably a Jew fish. He must have found it a convenient place for feeding. All of the small fish coming out of the lake had to pass

close by him.

Lydia and I had been enjoying these experiences so greatly that we had to force ourselves to think about the other members of our party who were not entering into the scientific part of our cruise and were becoming somewhat bored; so we decided to return to Nassau for a couple of days before going in another direction. We had dismissed our Andros guide with reluctance. He was a fine type of old negro, courteous and willing, with a fund of information. On one occasion Lydia asked him if he wanted to go down in the diving helmet. He said, "No, Ma'am! I don't go down among dem! Dat's deir home!"

We made a start at daybreak next morning and arrived in Nassau before noon. *Aquila* was refuelled and reprovisioned, while our party enjoyed for two days the recreational features that the little town has to offer.

CHAPTER IV

EXUMA

My two cruises out of Nassau had been Westward to Andros. Exuma lies Eastward and I contemplated with great interest this new experience. Even the appearance of this land on the chart is fascinating. It is extremely narrow, in most places only a few hundred yards wide, but its length is ninety-five miles. It is composed of more than one hundred islands, all of them small and some of them tiny. The approaches to the leeward or Western side are shallow and rocky, but with inviting harbors, suitable, however, only for small craft. Our course was set from Porgee light, Nassau, S.E. to Highborne Cay—thirty-one miles. Leaving Nassau at noon, we sighted land before three o'clock. The crossing was most pleasing. *Aquila* was headed into a slight chop, not heavy enough to wet the deck, and the sunlight danced on wavelets which splashed on either side of the hull with a sound that to me is more delightful than anything I know, except fine music. Highborne Cay was easily distinguishable by its height and its proximity to Lowborne Cay, the two standing out prominently from the shoreline which extended as far as the eye could reach. As we drew near the reef, coral heads began to show, and our guide had to direct Capt. Billsborough with great care. Presently we found ourselves entering the most beautiful little cove I had ever seen. Ahead of us was a broad beach of white sand, behind which the land was so low that we could see water beyond it, and another small island; beyond this the open sea. At the Northern end of the beach the land arose out of green shrubbery to a height of perhaps thirty feet. As we looked at the crest we were astonished and thrilled

to see great clouds of spray rising high above it. No time was lost in going ashore to enjoy this wonderful spot. Our first thought was to go to the top of the ridge and look at the sea on the other side. Climbing upon the same rough formation encountered at Andros, we looked down upon great waves dashing against a precipitous shore and rising in spray which drenched us time and again. Behind us, on looking back from this turmoil appeared the peaceful blue water of the cove where *Aquila* rode at anchor without the slightest motion. Truly the contrast was wonderful! Descending to the beach we found a variety of delicate shells, among which were the nautilus and a kind of large sea-urchin. This beach was a fine place to bathe from, the hard clean sand extending far out with a very even and gradual increase in depth. After enjoying a swim, we returned to *Aquila* for the evening meal. We went ashore again in the evening, some of us hunting for crawfish along the rough shore at the end of the beach.

The full moon produced an effect more wonderful than any I had ever seen. The cove was so sheltered by the high land from whatever breeze was stirring that there was not a ripple on its surface. The water was so clear that the eye could not distinguish where air and water met. Both the yacht and the dinghy being rowed along the shore seemed suspended in air. The solitude added to the marvelous attraction of this place.

The forenoon of the first day was devoted to photography on shore, shell collecting, and bathing. In the afternoon, before the turn of the tide, a place was selected for submarine diving and we found the most beautiful sea gardens we had yet visited. These gardens were profuse in sea-fans of two colors—red and yellow. I found on subsequent trips that the yellow fan is much rarer than the red. The contrast, too, in color of sponge, grasses, coral and sand was richer than at the places we visited at Andros. The photographs, due to inexperience, were not so good as others made on subsequent cruises. I had not yet learned what diaphragm to use under water. Now, I find that a one point larger opening than used on land under the

same light conditions for ordinary film and two points for color film is satisfactory. One of the difficulties which should be remembered is that with motion pictures the result of mistakes cannot be seen until the films have been processed, which is likely to be some two or three weeks after returning home.

An example of unpleasant results from submerging too quickly was demonstrated by my nephew Edmond, a member of the party, on his first experience. After his helmet was under water he let the line slide through his hands and reached bottom, twenty feet below, in about six seconds, instead of letting himself down slowly. The sudden pressure on the ears affected the passages so that they could not be opened by yawning; he experienced sharp pains while on the bottom, and for that reason returned to the surface almost immediately, and suffered a severe headache during the remainder of the day.

The return trip to Nassau, after another beautiful moonlight night at our anchorage, was made next day.

The four members of my party stayed in Nassau a few days longer and Capt. Billsborough, our cook, and I made the crossing to Miami in *Aquila*. This trip deserves mention for the benefit of adventurous amateur yachtsmen. We started at noon, intending to anchor at Gun Key, get a few hours' sleep, then leave for Miami at two in the morning, in order to arrive at about nine. We carried out this plan to the point of departing from Gun Key. When we attempted to start the motor, ignition trouble developed, the location and correction of which consumed four hours, and we were not under way until six. A brisk Northeast breeze had been blowing all night, and when we emerged into the Gulf Stream we found ourselves subjected to a much heavier sea than I had ever expected to negotiate with *Aquila*. The waves were very high, some of them were breaking at the crest. They were coming upon our starboard beam, and great care and watchfulness had to be observed to head into these seas when they looked

dangerous. A feeling of mistrust in our ignition system caused us serious apprehension, for *Aquila* had no sails, nor did we have any material with which to construct a sea-anchor. Had the engine failed we would have been in a dangerous predicament. We were really lucky in having had to make repairs at Gun Key, for the delay caused us to enter the Gulf Stream by daylight. Had it been dark, we could not have seen which were the dangerous waves and we would not have been able to take them head on. However, all went well and we made port without mishap. The shallow draft and light construction of *Aquila* caused her to ride the waves like a cork, and for that reason the seas did not break over her. We passed a freight-steamer bound North and by comparison had a fine demonstration of what we were passing through. She was taking clear water over her bows which was pouring off her sides as far aft as her mid-ship section.

This experience taught us that I had outgrown *Aquila* and would require a more seaworthy yacht if I intended to continue to go off-shore.

A few weeks after my return home the films were returned from Rochester. The results were encouraging. The focus was good but they were for the most part over-exposed. A short piece of color film showed promise but the subjects could have been better chosen. I resolved to take the same kind of vacation during the following year and determined to add to my equipment, if possible, a camera and case for still pictures.

CHAPTER V

AN UNSUCCESSFUL EFFORT

In the autumn of 1936, Capt. Billsborough called my attention to an offer of the motor-sailer *Buckaroo* for sale. We proceeded at once to Boston, looked her over, and had a trial trip, using both sail and motor-power alternately. She seemed to suit my purposes admirably except for accommodations below, which were possible to improve. Her dimensions were: length overall, fifty-two feet, beam fourteen feet, draft five feet. She carried six tons of ballast. The height of her mast was fifty-six feet from waterline. She was equipped for swordfishing with harpoon, a sport which I prefer to any I have experienced. We brought this boat to Wilmington and our satisfaction with her qualities increased as we sailed her down the coast. She was of heavy construction and very seaworthy. We made radical changes below decks. Capt. Billsborough and I had a most interesting problem in reconstruction of the accommodations. The sleeping arrangements were changed so that the owner's party could be six instead of five, a better appointed galley was built, occupying half the space of the former one, and a little coal stove was installed which heats the whole boat and dries it out. This has proved a great additional comfort, for *Buckaroo* has often been used in cold weather. The crew's quarters were greatly improved, and much waste space was found for storage. Last but not least, a place was found for a neat little bar which is my pride.

When these changes were completed, we proceeded to Miami by a series of short cruises, both off-shore and through the inland waterway. At Miami, we decided to increase the sail area, and changed her from sloop to ketch rig by stepping a mizzen-mast in her, the height of which

was thirty-five feet from waterline. We were pleased with her appearance and performance after this transformation.

When spring came (1937), we took *Buckaroo* to Nassau. My son Richard, his wife, and her sister made this party but they had not "signed on" for the contemplated cruise to the out-islands. In addition to the motion picture equipment, a little French camera to take still pictures had been borrowed. A case for submarine work was made for it. Much difficulty in the design of a case is avoided if the camera used is made, as this one was, to control the motions of exposure and changing film in one.

We encountered the first inclement weather thus far experienced in the Bahamas, and I had to confine myself to some work in the lee of Rose Island, which is part of Nassau. The still camera had been procured and a case constructed in such a hurry that I had no chance to try it out before leaving home. Good subjects for photography were found and the film was used up, but I had no confidence in the results of my efforts. A small amount of motion picture film was exposed until the driving-belt in the camera broke and a new one could not be procured. After a few days, I returned to Florida, leaving *Buckaroo* for Richard to use, and went home greatly disappointed, a year having been wasted as far as photography was concerned. This loss was particularly impressed upon me when I found that the still pictures showed nothing. The above details may not be interesting but they are given to show how easily an expedition of this kind may result in failure by not testing equipment nor carrying spare parts.

An incident occurred one evening in Nassau that left me with a bright recollection of the trip, however. I had an English Austin car, open touring model, "vintage" of 1929 which I had given to Richard. He received it from the boat on Thursday, but the next day being Good Friday, he found it impossible to obtain a license for it. With some difficulty, he located one of the officials who had authority over the granting of licenses. This gentleman informed Richard that the bureau would not be open un-

MOTOR-SAILER *Buckaroo*

til the following Monday. He gave Richard verbal permission, however, to operate the car until that time without a license. On Friday evening a party of four, Richard, his wife, his sister-in-law and I drove into the town and parked near the Prince George hotel where we dined. When we came out, one of those colored policemen, whose splendid uniforms have made Nassau famous, was standing guard over the car. He addressed us: "Excuse me, but could yo' tell me who is de owner of dis car?" Richard stepped forward and admitted ownership. The policeman said, "Well, I want to show you dat you is breaking de law in two ways. Come heah," and leading Richard to the front of the Austin, he said "Dis car is pahked beyond de pahkin' line. Look heah," and pointing a flashlight on the pavement, "Heah is de pahkin' line." The flashlight was so nearly gone that it failed to make a light on the pavement. "I knows de pahkin' line is hahd to see but heah it is, and yo' front wheels is beyond it; and now look heah—I look at de front of de car an' I find no numbah. An' look heah, I look at de rear of de car an' I find no numbah."

Richard said, "Well, I can push it back of the line," and did so. Then—"I went to the Government House to get a license but the office was closed. However, I found Mr. Morley and he gave me permission to drive the car without number plates until Monday."

"Well, den," said the policeman, "if de Government has given yo' permission, I shall withdraw de complaint. Goodnight, sah."

After my departure and while Richard and his friends were enjoying *Buckaroo,* he had two experiences that are instructive. He was on the bottom near an old wreck which was in such a state of disintegration that most of it consisted of steel plates, angle iron and I-beams lying on the bottom. Fish of many varieties assemble around objects of this kind, and he was hunting with a "harpoon gun" that he had devised. This consists of a miniature harpoon placed in a brass tube with a flat length of rubber at the rear end which is stretched like a small boy's "bean shooter" to

project the harpoon. He had some success with it.

As he was about to step on a steel plate, he noticed something peculiar projecting from underneath it. It was a head, and seen directly in front, he said it made him think of a poodle. He went back to the yacht and prepared a fish-hook and bait in a hurry, tying the line directly to the hook. From the dinghy, with the water glass he could see the object, and let the bait down in front of it. The creature emerged from beneath the steel plate and was hooked. Richard pulled it part way out of water but it twisted itself around the line, which it finally bit through and escaped. All hands had a good view of the fish, a green Moray, which they estimated to be at least six feet long. These denizens of the deep are shaped like an eel, their color is green, and they have large jaws full of several rows of irregular and sharp teeth. They are said to be venomous, but I have not as yet found an authoritative statement that the bite is fatal.

Before hearing of this adventure, it was my custom to dive clothed only in bathing trunks and sneakers. Now I use long trousers and shirt. It would not be a foolish precaution to cover the body with heavy material such as canvas, and to have the trousers tied to the shoes so that the ankles would be effectively protected.

Richard's other experience was one that demonstrates the importance of bearing in mind the physical laws under which the diver works. The helmet is the only equipment he carries. The weights which keep him on the bottom are attached to the helmet. If the diver wants to rise quickly to the surface he can throw the helmet off his head, whereupon he is as free as any swimmer. Richard was on the bottom, thirty feet down. He decided he would try, as a matter of experience, coming up without the helmet. Instinctively he took a deep breath just as any ordinary swimmer would do before diving or swimming under water. But he was forgetful of the fact that the air he had in his lungs was under pressure of thirteen pounds to the square inch. As he rose to the surface the pressure of the

water decreased and the volume of air in his lungs increased proportionately. It caused severe pain which did not abate for several hours. He should, of course, have allowed air to escape from his mouth in small quantities as he ascended. Among the professional deep-sea divers terrible accidents have happened through lack of control of pressure caused by breakage of machinery, hose, joints, etc. It is a dangerous business (professional diving) and cannot be expected to be pursued without accident. Richard's little incident, however, shows that the diving helmet, even at moderate depths, is no plaything, and its use should be carefully guarded by constant thought and by provision for every safety precaution. We have learned since this incident that it is unwise to take the helmet off under any circumstances while on the bottom.

My disappointment over the results of the photographic work was in a measure balanced by a most enjoyable cruise home. After *Buckaroo* had returned to Miami, I collected some kindred spirits, and four of us, in addition to the yacht's regular crew, made a "non-stop" run to New Castle, Delaware. A large portion of the total distance was made under sail only and the time spent on the cruise was six days.

Under favorable sailing conditions the motor was not used. *Buckaroo's* sailing performance was surprisingly satisfactory. She made six knots at times. We found an interesting sport, while in the Gulf Stream, was practising marksmanship on flying fish. When they emerge from the water the flight is steady as a clay pigeon. When the shooter scores a miss, the extent of his error can be seen on the water. Some may condemn this sport as useless slaughter. I am not partial to the destruction of animal life for no purpose; however, in this case my conscience is lulled by the knowledge that the destiny of the flying fish is to become food for larger fish. By shooting them we merely hasten their destiny. They are extremely palatable, too, and I wished we could have devised some means of retrieving them.

CHAPTER VI

CRUISE OF 1938

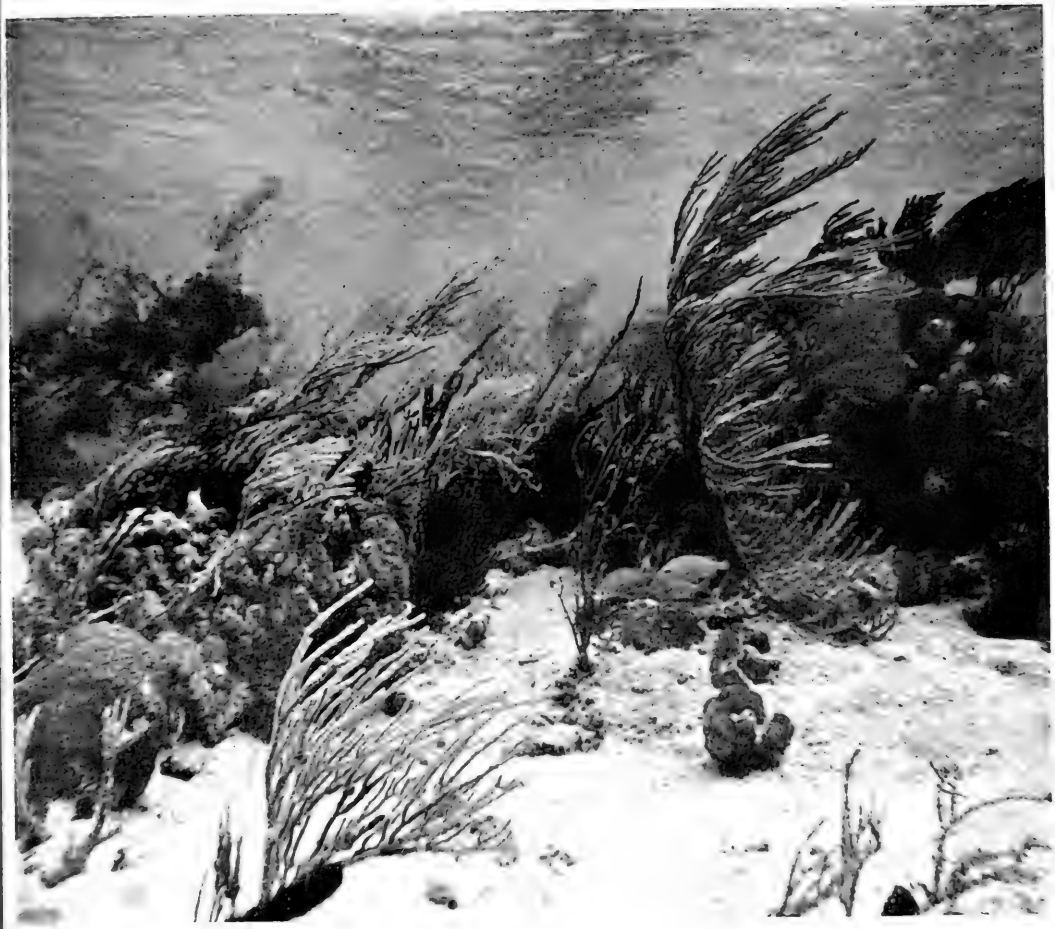
THE spring of 1938 found me again at Nassau with guests who were interested in whatever might be forthcoming, to whom the Bahamas were new, and cruising in a small boat a great pleasure, notwithstanding lack of comfort.

We made a party of four: my wife (Ann), Mr. and Mrs. Arthur F. Shettle (Emily and Arthur), and myself. This time a new, modern still camera with a well designed case of cast bronze had been procured. The old reliable case for the motion picture camera was still on the job.

Instead of doing something new we sailed directly for Highborne Cay, Exuma, for two reasons. It is the most attractive and astonishing place to new-comers in the Bahamas that I have as yet visited, and experience had assured me of finding colorful and interesting subjects for under-water and surface photography.

For three days we lay there enjoying the bathing, bottom-fishing, weather and moonlight, and solitude—as well as the photographic work. The locations we had chosen for diving were subject to strong currents and it was necessary to select a time shortly before slack water for our diving. The tide would always be running fairly fast before I finished. In some cases this gave to my still-pictures an additional interest, for they show the vegetation bending as shrubbery does on land in a high wind. Emily had her first experience under a diving helmet, which she enjoyed immensely.

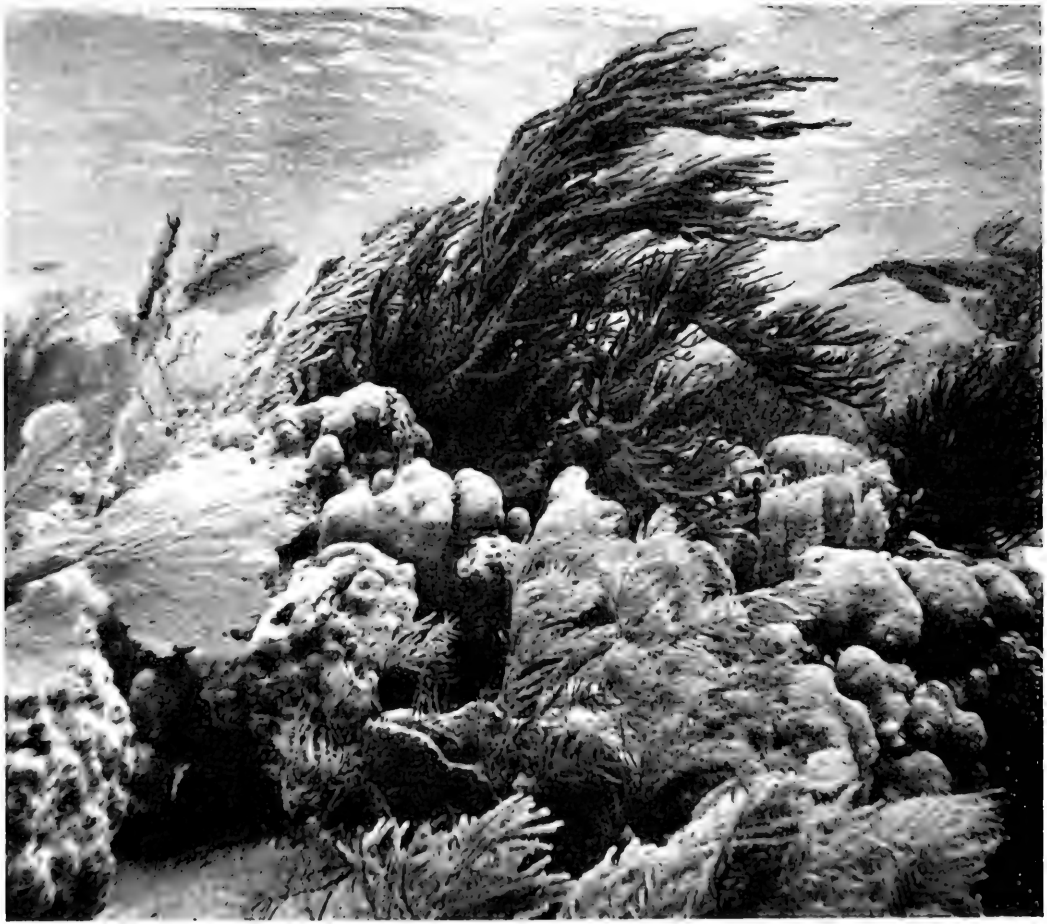
As the current increased in swiftness at this location, it became difficult



GORGONIAS AND SPONGE AT TWELVE FOOT DEPTH

GRUNTS AND SERGEANT-MAJOR FISH

AN INTERESTING GROUP OF DIVERSE OBJECTS



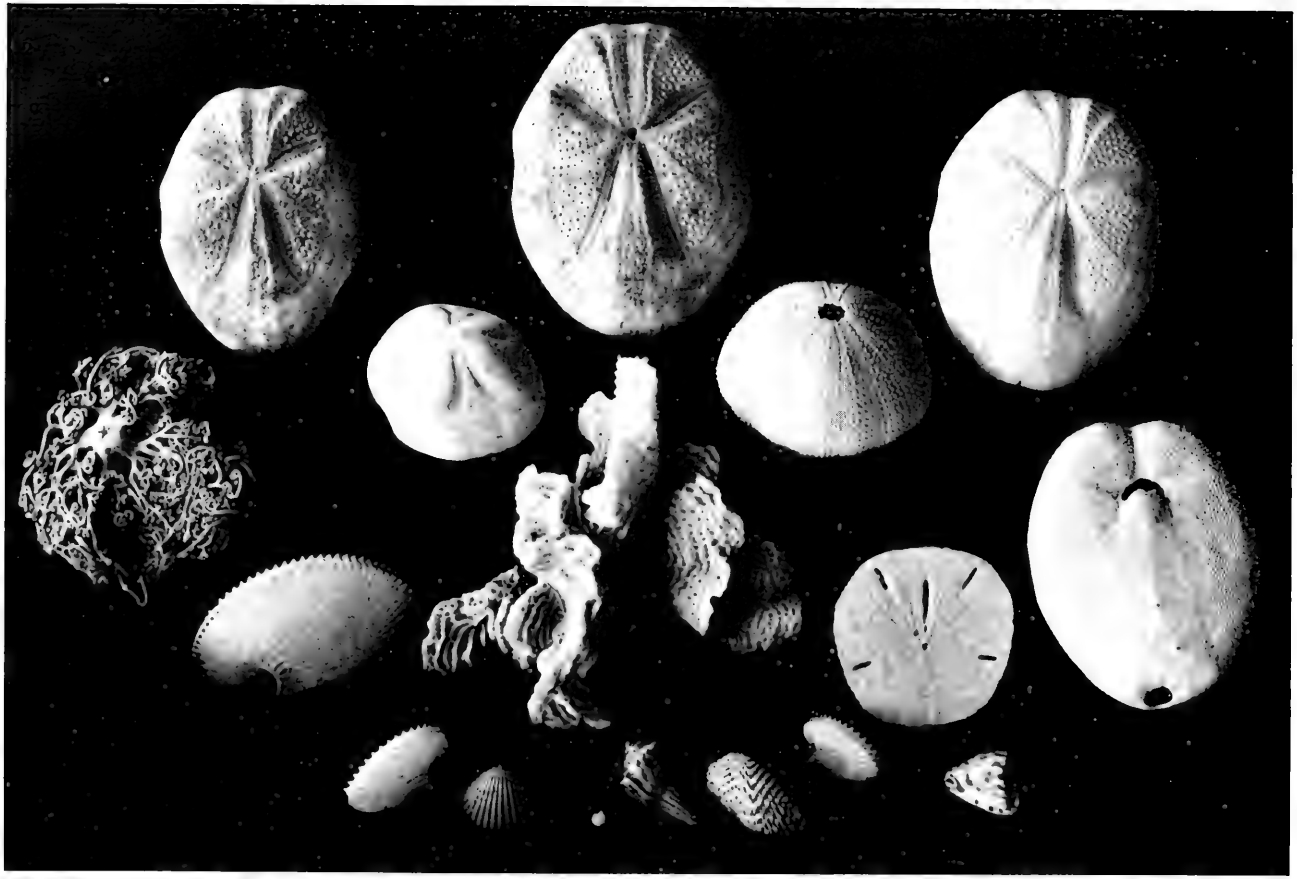
"SHRUBBERY" BENDING BEFORE THE "WIND"

YELLOW GRUNTS IN SEA-GARDENS

INTERESTING FORMATIONS AT FIFTEEN FOOT DEPTH

CORAL FORMATIONS

JOE O'NEIL SECURES SPECIMENS



SHELLS FOUND ON THE BEACH

to keep one's footing (professional divers have heavy lead soles to their shoes), and often I found it necessary to wrap my legs around a piece of coral in order to hold my position with both hands free to manipulate the camera.

I was fortunate in making color motion pictures. The sea gardens were unusually striking in their variety and the fish plentiful. The color, though not as accurately reproduced as in the atmosphere, adds enormously to the effect of the pictures.

We became increasingly interested in the wonders of marine life so lavishly strewn under the sea and along the shore. On one occasion some of us in the dinghy, looking for specimens through the water glass, came to a mound of coral, the top of which projected above the surface at low tide. Within its irregular cavities we spied a crawfish larger than had been seen by any of us, including Malone, our native guide. For hours we tried every device we could think of to get this monster out, but without success. We could not determine his size, but one leg which had been pulled off by the grains measured more than thirty-six inches.

We were all ashore, searching the beach for shells, when hearing a call, I saw Ann and Emily leaning over a pool and thrusting sticks into the water. Joining them, I found that the surface, about two-thirds of it, was covered with an unpleasant looking grayish scum. My first reaction was that this was some foul decomposition product from garbage or offal, such as might form in a cess-pool, and the first impulse was to call the investigators away. Then I remembered that we were on a desert island, and there was no possibility of such an accumulation. The substance was somewhat like parchment. It was firm enough to be pulled off the surface of the water in large pieces. There was no unpleasant odor attached to it. There did not appear to be any living things in the pool. This was a discovery for which we had no explanation, and it caused much interest and discussion.

Joe O'Neil, our cook, is an exceptionally good swimmer and diver. He could dive overboard and uproot sea fans and specimens of coral with great dexterity. Many were of unusual beauty and well worth taking home. Clinging to the roots of these specimens we often found unusual and interesting forms of life, brittle starfish and strange looking worms. The brittle starfish has truly remarkable characteristics. The variety we found was small; many were not larger than a half dollar. On being handled, they soon disintegrated. I thought at first that this was because of their exceeding brittleness, but discovered that they proceed to destroy themselves, casting off limb after limb until there is nothing left but the center. The limbs continue to move for some time after they have become separated from the center, or body.

This peculiar characteristic of various types of brittle starfish is referred to in *Animals of the Sea* by F. Martin Duncan. He quotes an account by Professor Forbes as follows:

"The first time I ever took one of these creatures I succeeded in getting it into the boat entire. Never having seen one before, and quite unconscious of its suicidal powers, I spread it out on a rowing bench, the better to admire its form and colours. In attempting to remove it for preservation, to my horror and disappointment I found only an assemblage of rejected members. My conservative endeavours were all neutralized by its destructive exertions, and it is now badly represented in my cabinet by an armless disc and a discless arm. Next time I went to dredge on the same spot, determined not to be cheated out of a specimen in such a way a second time, I brought with me a bucket of cold fresh water, to which article starfishes have a great antipathy. As I expected, a Luidia came up in the dredge —a most gorgeous specimen. As it does not generally break up before it is raised above the surface of the sea, cautiously and anxiously I sank my bucket to a level with the dredge's mouth, and proceeded in the most gentle

manner to introduce Luidia to the purer element. Whether the cold air was too much for him, or the sight of the bucket too terrific, I know not, but in a moment he proceeded to dissolve his corporation, and at every mesh of the dredge his fragments were seen escaping. In despair I grasped at the largest, and brought up the extremity of an arm with its terminating eye, the spinous eyelid of which opened and closed with something exceedingly like a wink of derision."

There are some types, too, of sea-urchins, which I had not previously seen nor heard of. We found only the shells, most of them damaged. I have looked for satisfying descriptions of these in various books but without success.

It will be noted in the illustration that the only openings in these shells are two small holes. The habits and appearance of the animal that lives in this abode has me interested and guessing. Undoubtedly, at some aquarium complete information on this subject is available. The interest taken by all hands in collecting shells, fans, and fish made me recall the days of our "club" of small boys at the New Jersey resort. What a heaven this place would be for such a group!

We departed on the morning after our three days' stay at this beautiful spot, the members of the party to whom it was new overjoyed with their experiences, and I more interested than ever and hopeful of having secured a fine collection of photographs. All of the motion pictures were taken on color film and exceeded expectations. The stills were encouraging. It is well worth while to have a still-picture outfit, for any number of copies can be made for friends. So far, it has been necessary to make these reproductions in monochrome. For undersea work, I look forward to the time, which cannot be far distant, when we will produce all of our photographs in color.

During the return from Nassau to Miami fair weather prevailed and the

passage was a pleasant one. It was possible for me to take the time to repeat my previous experience of making the homeward sail by the ocean route. A friend, Dr. Lalor Burdick, joined me, making a total ship's company of five. We enjoyed pleasant sailing for the first three days; then the wind suddenly shifted to the North. The weather became threatening. We started the motor, furled sail, and rigged the storm jib to be in readiness should it be required. The wind continued to blow from the North, and by ten o'clock we were in a gale, hitting heavy seas, with Cape Hatteras lighthouse and Diamond Shoal in sight. The lightship was abeam about midnight and the wind blowing with still greater force. At four in the morning, we had not progressed more than ten miles from Hatteras and *Buckaroo* was making no headway. If we held to our course, it would be a question of which would last longer, the storm or our fuel supply. The next port was Norfolk, 115 miles to Chesapeake lightship. We decided to turn and flee for Morehead City, sixty-nine miles to the bell buoy off Cape Lookout Shoals. The turn was accomplished nicely, though with anxiety, and we hoisted our jib. I appreciated Captain Billsborough's foresight in having this sail ready for we surely needed it to keep a steady pull forward, helping to hold the ship stern-on to the waves. It would have been no fun getting that jib out of the sail locker in the forepeak under the circumstances. Our course was S.W. ¾W. but the seas were running S.S.W. When an extra heavy one approached, it was necessary to steer S.S.W. to avoid broaching. One of us had to keep looking astern, calling to the man at the wheel for the change of course. Thus, we kept gradually increasing our distance from shore. When we estimated our position to be directly off Morehead City, we turned N.W. ¼N. We experienced a terrific rolling for seven hours. After keeping the course for forty-two miles we got a radio bearing on Cape Lookout Light and took a course N.E. ¾E. The necessity of turning for the heaviest seas had taken us nearly seventy miles off-shore. The correct course would have brought us within ele

miles. We had taken this punishment for seventeen hours before we cast anchor in Lookout Bight. All effort, all motion, all sound suddenly subsided. The feeling was nearest to perfect peace that I have ever known. We sat in silence, ate sandwiches, and drank coffee. We had one thought in common. *Buckaroo* is a seaworthy little ship; beyond that the mind ceased to function. Little did we know that there had been cause for great worry. "Ignorance is bliss" as we discovered during an overhaul the following winter.

Next day, the wind still blowing a gale from the North, as reported by the Coast Guard, we decided to avail ourselves of the inland waterway to Norfolk. And here ends any matter of interest for the remainder of the cruise.

CHAPTER VII

CRUISE OF 1939

Buckaroo was ready for another cruise in the Bahamas in March. On her way to Miami, she was put in dry-dock at Fort Pierce for general overhauling. Tests for soundness of her hull revealed indications of dry-rot in the stem. A new stem had to be put in her and when the forward planking was taken off, the stem post was found to be a mere shell covering a core of rotten wood. Captain Billsborough brought a section to me. I shook hands with him after thinking of the condition *Buckaroo* was in when we were hitting those heavy seas described in the last chapter, off Hatteras, smugly proud of our seaworthy little boat. Previously, I had laughed at the care that is sometimes taken in purchasing a used boat to ascertain any indications of dry rot. This is done by drilling small holes in many places over the entire hull and examining the borings. Had *Buckaroo's* planking started from the stem in that storm, her six tons of ballast would have taken her down in a few minutes, and our boats, had we been able to launch them, would not have lived in the sea we were in. I often think of how many terrible things don't happen.

Our party cleared from Miami at 5:00 P. M. on March 30. Three enthusiastic friends accompanied me—Mr. and Mrs. Howard Callaway (Howard and Fan) of Seaford, Delaware, and Arthur Shettle. Members of the crew were the same as on the cruise of 1938. We passed Gun Key at midnight bearing towards Northwest Passage and sighted the light at 8:15 A. M., March 31. It was necessary to proceed slowly because of shoals. We reached Nassau at 4:00 P. M. where we made the best of our time

bathing, dining and calling on friends.

Next morning, we shopped and took photographs along the market dock. This to me is always a place of extreme interest. A wharf extending about two city blocks is occupied by a multitude of small boats from the out-islands. These are docked stern-to and almost touching one another for the whole extent of the wharf. Nearly all of them are sloop rig, but a few schooners are to be seen. Thirty feet is perhaps the length of these little boats. Often whole families are found living aboard, some with dogs and even a pig. They are all negroes. Their cargoes consist of dried conchs, crawfish, potatoes, sponges, firewood, and grasses to make hats with. There is a good demand for these hats on the part of people landing from cruise boats. Cooking is done on deck where they have some pieces of iron to retain a bed of sand. On this, they build a wood fire over which a pot is swung and pieces of sheet iron are adjusted to act as wind-shields. Sometimes, an iron keg with holes punched in it is used as a fire-box. Below deck, apparently there are two compartments, one for the cargo and one for the crew and passengers. I have never asked permission to make an inspection. The number of people on one tiny boat is astonishing. For example, four men, two women, an infant, and four children—and they all sleep below. At a fairly early hour, they may be seen emerging from the companionways like ants from a hole. A young negro, who came from Acklin Island, told me that the journey required about two weeks. They occasionally went in close to land; then all hands would swim or wade ashore where they spent hours lying in the sun and drying their clothing. The owners of these boats usually cannot afford to buy a compass; consequently, they navigate like the mariners of ancient times—by sun, wind, and stars.

All of my cruises were made in the months of March and April, a time when steady winds and fair weather prevail. The wind blows with little variation in direction; therefore, it can be used as a means for finding

(roughly) the points of the compass. Practically none of the boats navigated by the negroes are equipped with compass. These fair conditions do not prevail, however, throughout the year. There are at times steady rains and shifting winds, hurricanes and dead calms. The inter-island traffic continues, nevertheless. How it is done would make an interesting study.

I was enlightened on one point which was entirely new to me. This I will call "tide navigation" and it seems well worth recording. A geodetic survey of the Bahamas reveals that the islands rise from earth formations similar to what on land would be called plateaus, the islands representing peaks on these plateaus. Currents caused by the rise and fall of tides go in many directions. We, on the Atlantic Coast, are accustomed to thinking of the tide flowing Westward and ebbing Eastward. The Bahamans, however, living on their "plateaus," surrounded by water of great depth, think of the tide rising, as it does, all around their group of islands almost simultaneously, and falling in like manner. The result can be visualized by imagining a table set in a tank so arranged that water can be made to rise and fall over the top of the table. On the table are placed a number of bricks and fragments of various sizes, irregularly spaced to represent roughly the islands in the Bahama group. As the water rises, currents will flow between the bricks in many directions. These currents will reverse as the water falls. The native navigators, with generations of experience, have learned to "ride" these tidal currents when they are becalmed. They must anchor at times and wait for a favorable current. But often by their knowledge of conditions, they can take advantage both of the ebb and flow of the tide to reach their destinations. It is slow traveling at best but why should they care? They do not know that the pursuit of happiness depends upon going to two or three cocktail parties in an afternoon, then to a dinner party followed by movies and a dance at a night club.

A departure from Nassau of one of the smaller boats was one of the

AN EXAMPLE OF NATURE'S ARTISTRY

SEA FANTASY

A BANDED BUTTERFLY FISH

SPADE FISHES

SPADE FISH

most remarkable sights I ever saw. An unusually large number of men were aboard, all seated around the cockpit—in which was standing a horse! When the boat came about, the boom had to be lifted over the horse's back. They had left the dock at about five o'clock in the afternoon, and no doubt their destination was at least far enough away to require sailing all night.

On Sunday, April 2nd, we left Nassau with our course laid for North Bight, Andros. We had in tow a launch with glass in her bottom to use for finding more readily objects for photography. We arrived at 4:00 P. M. and did a little trolling as we neared land. Finally, the water became so shallow that we struck a couple of times. Just then, I hooked a dolphin and Captain Billsborough, to prevent me from losing him, kept moving until he was brought aboard. We found ourselves in a bad place with ebb tide and did not get into clear water until we had bent a propellor blade. When we found water enough to anchor in, two boats came out to us and stood by, the crews silent, as usual, holding their positions by sculling. One, containing three negroes, looked interesting and we asked them about Bone fishing. They said they would guide us for five dollars and that the proper time would be during the next afternoon. I said, "We don't need all three of you." The reply was, "Yassuh, 'cause we is a company." From that time, we called them "Andros Fisheries Limited."

Next morning, we made a search in the launch for sea gardens. The glass bottom boat was a great aid, but to our disappointment, nothing of photographic interest was found. Everything on the bottom seemed blighted with a brown deposit which must have come from decaying vegetation in the water flowing out of the Bight from the interior of the island. After lunch, "Andros Fisheries Limited" appeared, ready to take us to the Bone fishing flats. As two seemed enough to go fishing, Arthur and Howard set out in the launch with "Andros Fisheries Limited" in tow.

Fan and I visited the village at Bahrint Point. For this purpose, we used

a flat bottom sailing dinghy which I had secured to take the place of a much heavier boat, and had found to be a valuable improvement. We arrived on shore by wading the last hundred yards. Here we were immediately received by the Roman Catholic Church, in the person of a Catechist. It was necessary to visit the church and the school. In the latter building, the first floor was a school-room; there was a small school-room on the second floor, and a very small room which was the Post Office as well as the cubicle for Father Gabrael when he was staying there. With great respect and showing his admiration, the Catechist pointed to the good Father's bed and called attention to its narrowness and hardness. Then, we must climb a ladder through the roof to see the fine view from this wonderful two-story building. When we reached terra firma, we found a group of small children gathered outside, one of whom, aged about four, was crying vociferously. As we moved towards them, the weeping one fled from us as fast as she could run. Fan asked one of the older girls why the little one was so frightened. "It's because de lady have a white face an' a red mouf," she was told. It was quite likely the first time the child had seen a white woman or any white person except Father Gabrael, who is probably always heavily sunburned. We departed to the shore and there found an important-looking negro waiting for us. Our guide introduced him as "De 'piscopal Catechist." We had not time to visit his church and school, to his great disappointment. Rome had scored as usual by her eternal vigilance.

As we returned to *Buckaroo*, the sun was setting and the fishing party was in sight. They arrived with four Bone fish and fully satisfied with the catch. Fulfillment of the descriptions they had heard of this sport had not disappointed them. After ascertaining which of the crew representing "Andros Fisheries Limited" was the treasurer, we completed the terms of our contract; they hoisted sail and departed, making a beautiful picture against the glowing sunset.

We had agreed to leave Andros for a place where we knew by experience that we would not be disappointed in the photography. We weighed anchor as quickly as possible in order to pass over the rocky shoals while there was daylight. We proceeded on a course directly to Lowborne Cay. Beautiful moonlight added much to this night journey. After crossing Tongue of the Ocean, south of Nassau, we passed over an area of sandy bottom where the water seemed to be about twenty feet deep. This place was crowded with Sting-rays; their ugly black shapes could be clearly seen, by the hundreds, sliding over the bottom. I classify them among the vermin of the sea. They are as nasty to me as cockroaches or bedbugs on land.

At 2:00 A. M., Highborne Cay was in sight. It was necessary to proceed slowly, heaving the lead at frequent intervals. In another hour, we found bottom near enough to cast anchor though we were still quite distant from land. In the Bahamas, the wind changes direction only slightly during the spring months; consequently a windward shore remains a windward shore for weeks. The wind blows steadily with little change in velocity from day to day. A windward shore anchorage is, therefore, entirely safe even though there is no other land in sight.

We slept late next morning, then worked our way in to our old anchorage, my third visit to this beautiful spot. At nine o'clock, we put all of our diving and photographic equipment in the launch. Malone steered to Saddle Cay, a new place to us. The gardens looked beautiful in ten feet of water. Fan and Howard had their first experiences under the helmet, and I made some satisfactory exposures with both motion and still cameras, at about twelve and fifteen foot depths.

We moved to another place, about twenty feet deep, chose our position carefully and more motion pictures were made. On the first descent, I had found a coral head which made an excellent background with several varieties of fish near it. After coming back on board to re-wind

the camera and take a short rest, another descent was made. The coral head had a totally different appearance which for a moment puzzled me. The cause of this was a huge (by comparison with the others) fish at rest, close to the coral head and almost obscuring it. Its shape was like an Angel fish but its marking and color can best be described by stating that it was similar to a zebra. When a few feet of film had been exposed, its mate came along and I manoeuvered into position to get them both. I had trouble with one of them because he (or she) became curious and coming to the window of my helmet would not go away for some time. The front sight had broken off my camera case but I thought experience would enable me to point correctly. I kept photographing these fish until the motor had run down, and came back on board exulting over the most interesting picture taken yet. But alas! my aim had been incorrect—only a few feet show these fish, and at that, they are not well placed as to position. The larger of the fish must have been about thirty-four inches in length and twenty-one inches from belly to back. Upon inquiry at Marine Gardens, Florida, the fish was identified as a spade fish.

In spite of my disappointment, this adventure is regarded as the most interesting of any that I have had so far. The various species of fish, while numerous, were becoming familiar and nothing new was expected, especially on a second dive in the same place. To come suddenly upon a magnificent sight that eclipsed all else was a thrill which seemed to me beyond comparison. Perhaps this might approach it: A man is on an African hunt with camera and gun. He is near the end of his allotted time and has had indifferent luck. He walks back to his camp from a blind where he has been hoping to see some unusual specimens. Returning to the blind after a short absence, he sees in front of him a herd of giraffe in good photographing position—animals that he had never seen except in a zoo, and had not expected to meet on this expedition.

We returned to *Buckaroo* for luncheon, then decided to try some photography in very shallow water; also, to search the bottom for specimens. Some still pictures in color were made and they were quite encouraging, but the colors did not seem to compare favorably with those of the motion pictures. This photography was done in water less than six feet deep; it was necessary to move in a squatting position in order to prevent the helmet from rising above the surface.

Specimen collecting brought forth a Basket Starfish which was unfamiliar to us until it was identified in a Natural History. The limbs of this animal branch out like a shrub and multiply one hundred fold. It lies on the bottom, branches waving in the tide. Unwary tiny fishes are attracted within these branches but they never come out. We found this specimen on a large piece of coral imbedded in the bottom. We had pulled the mass up because it was attached to a sea-fan. At first, we thought the Starfish was an unusual piece of vegetation, then we saw that it was in motion throughout every branch and twig. It became our most valued specimen because it is rare, and because we were successful in preserving it by careful sun-drying.

Our day ended with preparations for a picnic. This seemed to have become an annual observance. The moonlight was beautiful, a mandolin and guitar, and the presence of a Nassau negro, who was in charge of the launch, improved the vocal efforts of all hands. The ceremony ended with a parade to the ship's boats, the marching song—*Mama don't want no corn, no rice, no coconut oil.*

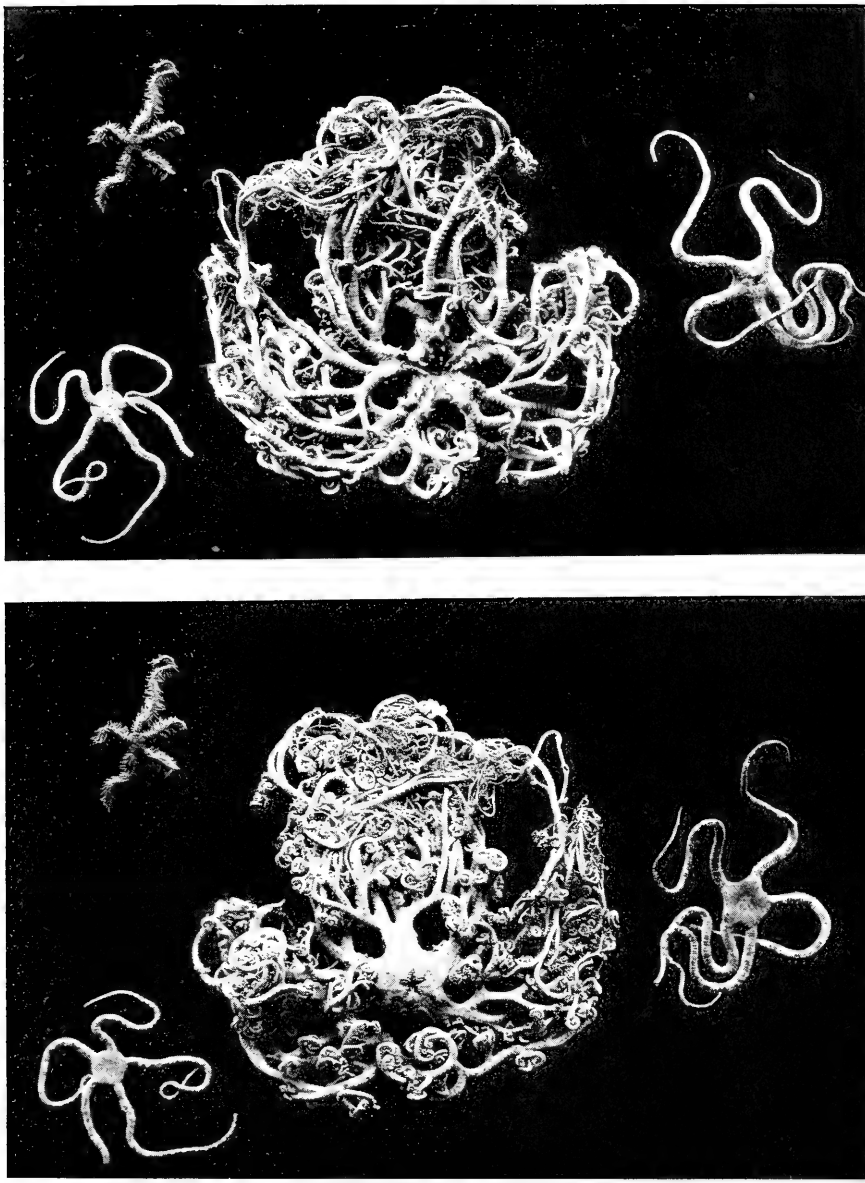
I had not understood until after this third visit to our beautiful harbor that we had not come upon it by chance. True, our guide, Herbert Malone, had brought us to it, but the rather devious route taken after we had come near to Highborne Cay had caused me to think that he was guiding us at random, with the intention of choosing by appearances above and below water, and by soundings, a suitable anchorage from

which to operate. Not at all. Highborne Cay is the location at which the dramatization of Jules Verne's novel *The Mysterious Island* was photographed under the direction of Mr. J. E. Williamson. Fifty persons were engaged in this work. The hardships and dangers that they incurred, including subjection to a hurricane, have made it a historic spot, and the story is a most interesting one. Few of us are familiar with that picture for, as Mr. Williamson tells us, the film when sent to Hollywood met another "hurricane" in the industry: the birth of the motion picture with voice, popularly known as "the talkies." *

On the following morning, we started on our way to Nassau, but made some manoeuvers first to photograph *Buckaroo* under full sail. Having the launch with us from which to photograph was helpful. Arrived at Nassau, we shopped some more, had a swim, then put on the clothing of civilized people and enjoyed the pleasing and restful hospitality of the Hotel Victoria at dinner.

We departed, bound for Miami at ten o'clock on April 7th, and cast anchor in Cat Cay harbor in the afternoon. After a swim, a message was brought to the yacht inviting us ashore to the Club. Here we were pleasantly entertained at the most carefully arranged fishing club I had ever seen. The fishing is confined to trolling for big fish in the Gulf Stream. The management makes every known effort, scientifically and intuitively to provide information beforehand regarding the chances of having a good fishing day. Interesting scores regarding the catches of each club member are put on the bulletin board in the main social room daily and the names of members who break the record in weight of single fish are engraved on a plaque placed permanently on the wall. The best trolling begins in the afternoon and lasts until dark. The club members, being fishermen, are not interested in any other form of outdoor sport; consequently, there is practically no provision for such. But indoors

* *20 Years Under the Sea.* Williamson (Hale, Cushman and Flint).



BASKET STARFISH AND OTHER SPECIES

CRUISE OF 1939, SHIP'S COMPANY

everything has been provided for a painless existence. We found memorable proof of this when we arose to go to dinner. Our kind hosts had succeeded in making us forget the number of Planters Punches with which they had plied us.

A really fine development has been effected at Cat Cay and in a very short time. The grounds are well laid out and a large number of cottages have been built. The architecture, both as to building and landscape, has been done with excellent taste. We left this delightful place at about ten o'clock in the morning and arrived at Miami with no other incident than a rough crossing, including a brief but violent squall.

The 1939 cruise was ended to the regret of all hands for we had enjoyed ourselves greatly. Surely no vacation, for those who love the sea, can excel an independent voyage among beautiful islands, with a constructive and educational object, above all when by good fortune the entire ship's company shares the purpose of the undertaking with enthusiasm, good will, and co-operation.

On my part there were feelings of foreboding and sadness upon leaving Nassau. A tie had been broken by the decision of Richard and his wife to dispose of their beautiful little house, which is situated on a coral rock, west of the town. When they purchased this house, the charm of the islands had entered into them so deeply that they were willing to detach themselves from home ties for such periods of time as would be necessary to enjoy the life ashore and cruising. Life is seldom like that, however, especially for young people who have families to raise, a serious purpose, also relatives and intimate friends at home. Their knowledge of the people and the islands had helped me greatly, and discussions of our separate experiences were a source of continual interest. These discussions have formed a picture in my mind of a side of negro life to which a separate chapter is devoted. I left Nassau, therefore, with a feeling that I might never return.

CHAPTER VIII

SUPERSTITION

We in the United States are accustomed to the superstitions of the negroes who live with us. In all parts of our country, they are the servants of the white man and have almost daily contact with him. Their habits and superstitions, handed down by their native African forebears still exist but are suppressed by this contact for they are ridiculed, and have become subjects for an endless number of amusing stories.

In the Bahamas the situation is different. Negroes have fallen heir to the industries for the working of which they were imported by white masters after the original inhabitants, the Lucayans, had been transported to Cuba by the Spaniards. These industries became practically unprofitable and the white men abandoned them. Consequently, on some of the islands, there are no white men and the negroes live their own lives almost free from interference. Their superstitions are real to them, and undoubtedly they practice voodoo ceremonies.

I have mentioned the sophistication of the negroes who wander on the streets of Nassau and the absence of the religious theme in their songs. And yet even here the spirituals are not entirely extinct. On one occasion when I stayed overnight at Richard's house, which is situated outside the town, some laborers—two men and a woman—were clearing land on a property across the road. They were singing as they worked. The words were not distinguishable, but the slow time and the plaintive melody were unmistakable. They were praying through song to their God, the Christian God now, but I can imagine the same melodies being

wafted upward from open hatches in the slave ships of bygone days.

Richard and his wife spoke to a disconsolate looking negro boy, and found that he had come to Nassau from Acklin, a distant island from which he had never strayed before. He was willing to work for food and shelter. His manner was pleasing so they engaged him. His speech was difficult to understand because he knew few words that he could use to express the new thoughts caused by his change of environment; also he stammered. They could not understand him when he gave his name. The nearest they could come to it was "horse" so they let it go at that. Horse became entirely devoted.

Richard made a visit to Nassau in the summer to attend to some repairs to his house which he had left in charge of Horse. He slept in a little two-room cabin on his property during his stay, Horse occupying the other room. He was awakened during the night by Horse entering his room and closing the windows. This conversation followed (I do not attempt to imitate the stammering.):

"What are you doing, Horse?"

"I's shettin' de windows, boss."

"But it is hot, I don't want the windows shut."

"Yessuh, boss, de windows mus' be shet so de sperrits can't come in."

"There are no spirits here, you left them all in Acklin."

"Yessuh, boss, sperrits is heah, dey is ebryweah."

"Have you seen any?"

"Yessuh, boss, I see um."

"Can you show me a spirit?"

"No suh, boss, I can't show yo' no sperrits, white man can't see um."

"What do they look like?"

"Boss, I can't say how dey look."

"Try, Horse, try to tell me what they look like."

"I can't say it, boss, dey looks—dey looks—jes'-awful."

"Where do you see them, Horse?"

"I see dem nights when I walk, dey follow."

"Can you stop them from following?"

"Yessuh, boss, ef yo' takes a bottle of whiskey and drop some on de road dey not cross it."

Richard had to dig this valuable information out of Horse—he did not like to talk about it. Much against his will, Horse opened the windows and Richard slept soundly, but when he awoke in the morning, the windows were closed. Horse got a scolding; he was humble but stubborn. Later in the day, Horse said, "Boss, kin yo' git me a mesuh?"

"What is that, Horse?"

"A mesuh, boss, what has de numbuhs on it."

"Oh, you mean a foot-rule."

"Yessuh, boss."

"What do you want that for?"

"It got de numbuh ten on it."

"What do you want the number ten for?"

"Boss, it like dis, de sperrits can't cross de numbuh ten an' I put it on yo' window, den yo' keep yo' window open."

"I'm tired of this, Horse. Tonight you shut your windows and door. The spirits can't come in your room, but you keep out of my room."

"Yessuh, boss."

When Richard got up in the morning, he saw a piece of paper part way under his pillow. It had the number ten on it. Investigating further, he found two under the sheet—one near the head, the other near the foot of the bed. He then understood why he had not been molested during the night.

I had a fishing party at Bimini. We engaged two guides with row-boats to take us Bone fishing. Mine was a native Bahaman but he had lived for

a number of years in Hayti. When the time came to stop fishing, we had quite a long row back to *Buckaroo,* so I took the occasion to question this man about voodoo in Hayti. I asked him some leading questions based on information that Richard, who actually attended a voodoo ceremony, had given me.

I said, "Ferguson, have you ever gone to a voodoo meeting?"

"Yes sir, many of them." (Ferguson like many Bahamans spoke correct English.)

"My son attended one," I said, "and they were saving a man's soul from the devil."

"Yes sir, they do that," said Ferguson.

"The man sells his soul to the devil, doesn't he?"

"Yes sir, he does that when he is a young man, but if he dies before the devil comes out of him, then his soul belongs to the devil."

"The devil helps him a lot, doesn't he?"

"Yes sir, he makes him very smart in his business and he gets rich. I knew a man who made his living by fishing. He sold his soul and the devil helped him do anything he wanted. He had a fishing boat, and it had no motor, no sails, no oars and no rudder. That man just stood in the middle of the boat and it went wherever he wanted it to go, all he had to do was just look in that direction and the boat went there." The man spoke in such a matter-of-fact way that I believed he thought he saw what he was recounting.

PART II

EQUIPMENT

CHAPTER I

EQUIPMENT

This part of the book is devoted to a description of under-sea equipment and its use. It is, therefore, a sort of compendium of information based on the writer's personal experience. It shows how, with a relatively moderate outlay, great enjoyment can be had. Anyone who is desirous of undertaking operations on a more elaborate scale should begin in the simple manner here described. He will gain experience rapidly and thus learn to expand without making costly and perhaps dangerous mistakes. The writer has conversed with some authorities, and has read such books as he could find on the subject. He acknowledges with thanks information received through conversations with, or books by, Commander Edward Ellsberg, Mr. Fenimore Johnson and Dr. William Beebe.

The Helmet

This is made of copper and is fitted with two windows of flat glass separated by a narrow strip of copper which when the helmet is in use, extends vertically from the center of the diver's forehead to his chin. It does not obstruct the vision sufficiently to be inconvenient. When in place, the helmet rests comfortably upon the shoulders. In front and in back are hung lead weights heavy enough to sink the helmet, which being filled with air, is quite buoyant. The weights are sufficiently ponderous to overcome materially the buoyancy of the human body, thus permitting the diver to retain a foothold on the bottom. Air is pumped into the helmet through a hose which is attached to an opening in the

side. It escapes from the bottom, where the helmet rests upon the shoulders.

Many times the question has been asked why water does not rise in the helmet, since the bottom is not tightly closed. This is demonstrable by inverting a tumbler and sinking it in a bucket of water. The water rises slightly in the tumbler by compressing the air in it. But since there is no exit for the air the tumbler remains practically free from water.

The visibility from the helmet here described is somewhat restricted because the diver cannot look on either side of him except by turning his body. Other designs of helmet are made, but this one has been found entirely suitable for the purposes under consideration. One faulty type should be mentioned. Instead of having two flat windows, it is fitted with a single pane of curved glass. The effect of the curved surface when under water is to distort objects viewed to an extent which renders the helmet useless.

The Hose

The hose used with the helmet can be the ordinary garden variety, although one of smaller diameter can be used if provided with proper fittings. The smaller hose is easier to handle. Fifty feet will give the diver sufficient radius of activity and the beginner should not use more until he has gained by experience a full realization of the new conditions under which he "lives, moves, and has his being."

The Pump

This is purchased with the helmet and is a two cylinder design operated by a hand lever. It is screwed securely to a board, and lugs or cleats should be attached to that part of the boat where the pump is to be mounted so that it will be held firmly in position. This is an important

DIVING EQUIPMENT

CAMERAS, AND CASES FOR SUBMARINE PHOTOGRAPHY

precaution. The pump is oiled and inspected each time it is used—another important precaution.

The Water Glass

This implement, commonly used in clear Southern waters, is not well known in the North. It is an ordinary bucket in which the bottom has been replaced by a piece of plate-glass. It is used for observing objects on the sea-bottom and its usefulness is dependent upon the clearness of the water. In shallow water, a person wading holds it right side up and sinks it down a few inches. The glass takes away the reflection from the surface and enables the user to study objects on the bottom and even to take photographs by holding a camera in the bucket. For deeper water, it is used by holding it over the stern of a small boat.

The water glass is used commercially in spearing crawfish and hunting for conchs. It is invaluable to a diving party for finding suitable locations from which to start operations. Plate-glass, rather than window glass, is used in making a water glass because it is a handy article to use on deck in place of an ordinary bucket, when thin glass is likely to get broken.

The Boat

In some places diving can be done by submerging from the shore, but such places are rare and the diver's area of activity is small. We will consider a cruising boat as a necessity and while a sail-boat can be used, a motor boat will be found more satisfactory. The type of boat would vary in different localities, but the one that will meet average conditions would be a light draft power cruiser of thirty-five feet length over all, fairly broad beam, roomy cockpit, and with sleeping accommodations for four. Instead of the customary small round-bottom dinghy it is best to use an ordinary bateau which can be towed astern.

Miscellaneous Implements

Two anchors should be carried, also some coils of rope of various sizes. A heavy lead weight of about ten pounds should be provided, to hang overboard, just touching bottom. This is for the diver to use in descending and ascending. It is well to have rather more miscellaneous equipment than is considered necessary for an ordinary cruise, including some carpenter's and metal worker's tools, copper wire, and sheet brass. Various kinds of fishing tackle should be carried, also a dip-net, a grains, and a pole for sounding in shallow water. A double-block tackle may come in handy for when exploring the sea-bottom there is no telling whether you may or may not discover some heavy object that may be of sufficient interest to raise to the surface.

I can tell of some sunken treasure that could be retrieved rather easily. Shortly before the end of prohibition some friends of mine on their way North from Nassau in a yawl wanted to re-provision at Palm Beach. Before entering the port, they jettisoned six cases of Scotch whiskey carefully tied together. When they departed, rough weather prevented them from recovering this cargo. A year later, one of them flying South along the coast in his aeroplane, saw the cases still lying on the bottom of the sea, not far from Lake Worth Inlet. I am sure that this gentleman would gladly give accurate information regarding the location of the sunken treasure to any adventurous (amateur) diver who should approach him.

The diver will need clothing according to conditions. If the water is warm and he does not intend to stay down for more than fifteen minutes at a time, nothing is needed but bathing trunks and sneakers, that is, if he is not in a location where he is likely to rub against sea-life that may sting. In this event he should at least wear a cotton shirt, duck trousers, and gloves. Gloves are useful if he is going to collect specimens.

Where the water is cold, a suit of woolen underwear is important. The body becomes chilled quickly and after being on the bottom for fifteen minutes the diver finds himself shaking when he arrives on deck, and is reluctant to go down again very soon. People who fear sharks probably think they would prefer a suit of medieval armor. It would not help, however, because when the shark found he couldn't get through the armor he would probably get mad and bite off the air-hose.

The Camera

Both still and motion pictures can be taken under water. Illustrations are shown here of my cameras and cases. For the motion picture camera a very simple case was made of sheet-brass joined at the seams by solder. Because of electrolytic action caused by contact of the two metals with salt water, it has been necessary to go over the seams with a soldering iron each year but it has served my purpose for four seasons. The case should be tested before use by closing it empty and letting it lie on the bottom in about ten feet of water for several hours. After raising it, wipe the water off the outside before opening for inspection.

The camera is placed in the case from the rear, and the lens extends into the opening which is provided with a window of plain glass. The starter is opposite an opening which is covered by a piece of sheet rubber. It can easily be operated by feeling for it through the rubber. Therefore, it is not necessary to have any moving part to project through the case. The case described is designed for a camera which has a starter that is operated by pushing it in a direction parallel to the case. If the camera to be used has a starter that is operated by pushing it inward, trouble may arise from the water pressure acting in the same manner as the finger on the rubber, and starting the camera. It may be necessary to make a starter similar to the kind described for the still camera. No provision is made for winding the mainspring or changing diaphragm

or focus. The operation is as follows:—the camera is wound, diaphragm set according to judgment of light condition, and focus set at, say ten feet; then the camera is placed in the case, and the cover, which rests on a rubber gasket, is screwed down securely.

The diver takes the camera with him, selects his subject, places himself at a distance of ten feet, aims the camera by means of sights provided on the case, and "shoots." He photographs as he pleases, bearing in mind that he must stop when the camera has run down.

Most sixteen millimetre cameras will run through about twenty-five feet of film with one winding. The diver returns to his ship, wipes case dry, extracts camera, inspects case for leakage, re-winds and replaces camera, replaces cover, and is ready for a second descent.

It would not be difficult to design and supply a means of re-winding the camera while under water. This would save time and trouble. But to have a means of changing focus and diaphragm would be too complicated, for every outside adjustment requires a moving part to project through the case. Each projection is a possible source of leakage. When salt water gets into a motion picture camera it might as well be thrown overboard.

The still camera case shown in the illustration is of better construction than the one above described. It was more costly because it is made of cast brass and carefully machined. A Robot camera was chosen for which this case was made because exposure and moving of film are both under control of one button. It therefore was necessary to have but one motion to operate the camera. For this purpose, a rod or plunger was made to pass through the case, making contact with the button on the camera. A stuffing box was provided to prevent leakage, and a spring to bring the plunger back after it has been pressed down upon the button. The spring should be a fairly strong one for the water pressure pushes the plunger down. This difficulty occurred on the first still camera case

that I used. It was necessary to install a stronger spring while on shipboard, which illustrates the importance of carrying a few metal working tools and supplies.

No provision was made for winding, changing focus or diaphragm. Control, therefore, is similar to that of the motion picture machine.

Before closing the subject of equipment, attention is called to two important items which should be on board:—an adequate emergency kit for injuries, and a pamphlet describing methods approved by the Red Cross for treatment of persons rescued from drowning. The manager of every diving expedition ought to familiarize himself with this first-aid treatment and he should compel his friends and employees to do likewise.

CHAPTER II

"THREE MEN IN A BOAT"

At Osterville, Cape Cod, a cruising motor boat lay in the harbor. The men who had chartered it for a month's use—Eddie, Carol and John—were enjoying a summer vacation. They were equipped with the necessary diving implements described in the preceding chapter. A motion picture camera had been provided with a case for submarine work. The crew was busily engaged in making final arrangements for some trial trips to which they looked forward with intense enthusiasm.

John was testing the pump, Carol stowing some groceries, while Eddie, in the bateau, was trying the water glass for the first time. The results were disappointing because of mud in the water. Even with this poor beginning, however, he found when using the instrument close to a wharf that small fish could be seen with a distinctness that surprised him.

All was now in readiness, and the three friends started on their first adventure. They passed between the jetties, continuing away from the shore, and sounding from time to time. The water became much clearer than in the harbor. A place was chosen where the depth was ten feet, and anchor was cast. Fine weather prevailed with a slight breeze causing ripples on the water. Through the water glass the bottom, flat and sandy, could plainly be seen. The pump was placed in position, and the hose, carefully coiled, connected to pump and helmet.

After the line, with weight tied to it, had been lowered to the bottom and made fast, Eddie, elected to take the first dive and wearing only his bathing trunks, jumped overboard and swam to the line. Grasping this,

he held his head out of water while the helmet was lowered over it by Carol, after the hose had first been passed under Eddie's arm. In the meantime, John had the pump in motion. When the helmet rested on Eddie's shoulders, he lowered his body until he saw the surface of the water disappear above his windows. Obeying instructions of a friend from whom the boys had received their information regarding the entire project, Eddie stopped to make sure that he felt no discomfort. They had been told repeatedly to "take it easy." All was well, and Eddie let himself down about two feet and stopped again. Air pressure clogged his ears, and he yawned to clear them. There was no other discomfort, and he let himself down until his feet touched bottom. Carol watched intently, and fed the hose out as needed. There must be no kinks in it.

Eddie, now standing on the bottom, remembered that he expected to look about him. His windows were fogged, and he recalled what he had been told to do if this occurred. Inclining his head forward, his lips touched the water in the bottom of his helmet. This enabled him to take a mouthful and squirt it on his windows. He could then see the sandy bottom, and after he had walked a few steps away from the line, he turned around and could see the bottom of the boat. He then began to walk carefully away from the point of descent. After progressing about ten steps he decided to return, knowing that he had nearly reached the limit of the hose. Turning around he was surprised to find that the boat had disappeared in a sort of fog, and he did not at once locate his hose although it passed under his arm. He lost for a moment his sense of direction and had an unexpected feeling of loneliness and helplessness. The only connection he seemed to have with the world he had become separated from was the steady clicking of the pump-valves through which the air that kept him alive was being fed. Looking upward as high as his helmet would permit, he spied the hose vanishing into the fog. He retraced his steps, using the hose as a guide for no slack appeared in it. This

was because Carol, perceiving by the bubbles that the diver was returning, was pulling in the hose steadily. When Eddie reached the rope he began his ascent slowly, as he had been directed. He felt the same clogging of the ears that had occurred during his descent. This sensation is now a common experience, for it is felt by all persons who travel by air and is relieved by the same means.

When Eddie reached the surface, Carol raised the helmet. All aboard, they took a rest. John was glad because the pumping job, easy at first, had become hard work before he was through. Eddie described his sensations and discovered that he had forgotten his intention to sit on the bottom and reach for objects to gain additional experience, for he had been told that the line of vision is distorted and the object is not where it appears to be. This matter of forgetfulness will be mentioned farther on.

John thought he had earned next turn and Eddie took the pump willingly for he felt slightly chilled. John had profited by Eddie's experience, and when he had walked a few steps, seated himself on the bottom. He could see plainly a few pebbles within reach but when he tried to pick them up, he missed them at first by about six inches. On his return to the boat, John found himself breathing rapidly. He became a bit panicky and hoisted himself as quickly as possible. His ears were stopped and he experienced a slight pain. The admonition "take it easy" came to his mind. When on deck this second descent was discussed, and Eddie admitted that when the period was nearly over he had decreased the rapidity of his strokes. The boys learned immediately that an even flow of air is necessary. It is exceedingly disturbing to have an irregular supply, and under some circumstances, dangerous.

Carol's dive was without incident of importance, for he, having learned much from the experiences of the others, had profited by them. Excitement had subsided and the crew felt ready for the more difficult part of their undertaking.

Eddie conceived the idea that photographs of one of their number swimming under water would be interesting. The motion picture camera was made ready. It was agreed that Carol would take it down and take his place about twelve feet off the starboard beam. For this purpose it was not necessary to have anyone to serve the hose, because the diver had to walk only a few steps. The required length, about fifteen feet, was paid out in advance and allowed to hang overboard in a loop. It was then secured to a stanchion by a serving line to keep the rest from being accidentally pulled overboard by the diver. Carol slung the camera over his shoulder, and let himself down into the water while John manned the pump and Eddie adjusted the helmet. He watched Carol take his position, then went forward, made a dive, and swam under water across the field of the camera. He repeated this performance three times, always trying to remain for as long a time as possible within proper distance of Carol. When Eddie thought that probably the power in the camera had been exhausted, he came aboard to be ready to help Carol. The details of this action had been discussed beforehand and were carried out as planned. When completed and all on board again, the three friends were delighted. Carol thought he had made a good picture, and Eddie felt that he was successful in producing enough action, and in keeping his proper distance.

Afternoon had advanced, and lunch, which had been postponed, was next in order. Gear was stowed and all made shipshape while John prepared the meal. They were ravenously hungry, so the simple fare of tomato soup, cold lobster, pilot biscuit and cheese, with a bottle of beer never tasted better.

After returning to the harbor the boys conversed with some of the men at the boat yard, their object being to learn as much as possible about places where suitable conditions could be found for the pursuit of their engrossing occupation. "The Beacon" was suggested, and they

decided to go there next morning.

Good luck attended them, for the day broke clear and calm. They were off at nine o'clock, early enough to make sure of being in readiness to start submarine operations when the sun was highest.

After passing out of the harbor, they lay a course S. ⅝ E., ⅞ mile to Red Nun Buoy No. 2, then E. ¾ S. two miles, and within half an hour reached "The Beacon," a marker which indicates a rock pile. They circled this object at slower speed while John, being towed in the bateau, looked carefully through the water glass for a suitable location. By this method they selected a place where the depth was about two fathoms and the formation of rocks and sea weeds indicated the probability of finding fish.

The "mud hook" was thrown out, and as the boat showed a tendency to drift, a stern anchor also was used. Carol was elected to do the photographic work. This time he donned the suit of woolen underwear and sneakers for he was expecting to be down longer than he had been the day before, and the bottom looked as though walking would be rough and treacherous.

On reaching bottom, some shelving rocks appeared to be a likely place in which to find fish. He, therefore, took a position at the proper distance. Objects at first not noticed came to his attention in increasing detail as he watched, and he was glad to see that even though he might not find fish, there was enough of interest and beauty to make a worthwhile picture. Sea weeds were waving in the tide, and the shimmering light caused by the sun shining through ripples on the surface added to the motion. Carol sat on the bottom and waited. Presently he saw a number of small silver fish among the rocks. He watched until a group of them moved within range, then began to "shoot," using about ten feet of film.

He moved to another place not far away and some intuition told him

it was a spot that fish liked. He seated himself again and presently caught sight of a Porgy swimming near the bottom. Here was the best opportunity he had had so far! A feeling akin to what hunters call "buck fever" came over him. He thought that if he made the slightest motion the Porgy would be gone. But the Porgy, entirely unconscious of the intrusion of a monster from the land, swam hither and yon on his everlasting search for food. He refused to come within range of the camera so Carol decided to stalk his prey. He was surprised to find that it seemed not to pay him the slightest attention. Finally he got a "shot" and returned to the boat with a thrill never before experienced in catching a fish with hook and line.

His helmet raised, Carol was greeted with sarcastic remarks from his companions. "Did you want to stay down there all day?" "Did we give you enough air?" "Or maybe you don't need any." "John, let's have a drink; of course Carol doesn't want one, he hasn't been doing anything but sit on the bottom to keep cool." This after they noticed that Carol was shaking with the cold. He was very glad that he had worn the woolen underclothes, and was glad now to take them off and enjoy the warm sunshine on the cockpit deck, sheltered from the freshening breeze.

Lunch was made ready, and the stern anchor taken in to let the boat ride freely. Carol told his story, and an enthusiastic discussion followed, each member of the crew making suggestions.

"Let's get a picture of the man on the bottom taking pictures," said Eddie. "How can we do that without another camera?" asked John. "That's easy. The man on the bottom can take the empty case and go through the motions while another one of us gets his picture from the surface through the water glass." "Three will not be enough," said John. "I'll do the pumping. You can go down, Carol. But how is Eddie going to handle the bucket and camera, and also paddle the bateau into posi-

tion and keep it there while he does the photographing?" "That's right," said Eddie. "Let's get Fred Stover. He's always ready to try something new."

This plan seemed feasible, and now, as the breeze had strengthened, operations for the remainder of the day were brought to an end.

As they weighed anchor, the Wianno Yacht Club race was making toward Beacon buoy. Here was a chance to use the remainder of their film on the twenty-one footers as they rounded the buoy and broke out the spinnakers. The boys found both wind and sun favorable, and taking an excellent position, Eddie went forward with the camera. As the boats came toward him, throwing spray from stem to stern, they were a beautiful sight. The turn made the kind of picture that thrills any photographer.

Next morning was disappointing. A strong breeze was blowing and the sky overcast. The three companions decided to drive to Wood's Hole and visit the aquarium. They called on the Superintendent and found him most interested when he learned of their project. They were given a fund of information about localities where photography would be likely to yield good results. They also learned where, and at what depths various species of fish are to be found. The subject became more interesting the farther they explored it. They took notes and spent much time observing live specimens in the tanks.

On their way home the boys discussed new ideas that had come to mind through the information gained. They planned to prepare for a cruise, to visit systematically the places that they had heard about.

The following day broke fair. Fred Stover had joined the diving crew. They went to "The Beacon" again. Experience already had made the crew handy with their gear. Carol wore trousers and shirt over his woolen underwear, now that he was posing for a picture. Eddie, leaning over the stern of the bateau, found difficulty in holding the water glass

with one hand while he pointed and operated the camera with the other. It became evident that to design and construct a special water glass to hold the camera would be easy and handy.

Our friends had a successful cruise. They had learned much from their practice trips. They had all been on cruises before, but never with an object of absorbing interest. It was like a voyage of discovery. Each place they visited had hidden characteristics. Something unknown was revealed every time the waters closed over the diver's head. He was walking where man had never trod. Each experience increased a desire to do more, and to bring back tales in specimens and photographs of a world of mystery that is beginning to yield its treasures to those who seek.

CHAPTER III

DANGERS AND PRECAUTIONS

THOSE who "go down to the sea in ships" have learned from many centuries of experience that a safe return, in so far as man can assure it, depends upon preparing in advance for every possible emergency. The expression "I found everything shipshape" arises from the tradition of the sea that a ship must be kept in perfect order. Every implement must be in place and ready for instant use. Ropes must be properly separated and coiled. A tangle is unpardonable. All movables on deck must be secured upon the first warning of foul weather. Sailors must learn how to meet the unexpected, and good sailors spend much of their time when on watch in visualizing every emergency they can think of, and deciding how they would act.

A sail-boat is off shore and a sudden squall descends. Sail must be taken in quickly. A tangle in a halyard prevents lowering. The sailor has no knife in his pocket with which to cut the halyard, and the squall hits the ship unprepared. Result, some people are lost at sea.

A small motor cruiser operated by the owner and friend, was on her way to Florida from a Northern port. She did not arrive at her destination, nor was the crew ever heard of again. Fair weather prevailed during, and for many days after the time required to have completed the voyage. A coastwise steamer reported sighting some charred fragments that resembled parts of a small boat. Investigation revealed a probable cause of the disaster. The owner, desiring to carry an emergency supply of gasoline, had filled a number of one gallon tins and stored

them in the bilge. Salt water would almost surely have rusted some of these until they leaked, and fumes rising from the bilge could have been ignited by the motor or by a flame in the galley stove. This was the most likely cause of the disaster.

These true stories, with the probable causes of the disasters, are but two among countless mishaps that have resulted from lack of foresight either in planning, inspecting, or allowing a boat to be poorly kept.

If a cruise is contemplated for the purpose of submarine diving, a new element is introduced which requires forethought and care. We built a ladder which was used to make ascent and descent more convenient. When in use it was placed overside and made fast to bulwarks and stanchion, extending downward so that four rungs were below the surface. On one occasion my daughter was coming up from a dive, and a life line tied around her waist slipped under the ladder and caught. The helmet was not above water, therefore it could not be removed. She "took it easy," so did the people on deck. Line and hose were paid out until she could move. Excitement and hurry could have caused at least some very unpleasant results. The job of freeing the line was left to the man in charge of it and the man at the pump knew that the best assistance he could give was to keep the air supply steady.

The use of a life line in moderate depths where the seabottom or tidal currents present no hazards and the diver has had experience, seems unnecessary. The hose, when held under the arm, establishes a sufficient connection with the surface. Signals can be transmitted by a system of jerks on the hose and it may be used as a support to cling to when stepping over or climbing upon masses of coral. Should some disaster occur, however, such as failure of air supply, causing unconsciousness, a life line tied around the body would enable the persons on board to pull the diver up and administer emergency treatment for the drowning. When giving persons with no experience and of doubtful presence of

mind a chance to try diving, the life line should be used.

When operating in a strong tidal current, there is danger of being swept off one's feet. The body might take a horizontal position, when the helmet would fill with water. Rescue would then be necessary by means of the life line.

After a diver has gone down a few times, it becomes evident that the helmet could be thrown off and he could ascend like any swimmer. He has no encumbrances, since the weights that hold him down are attached to the helmet. I advocated this in talks to beginners—"If you don't like it, take your helmet off and come up. There's nothing to stop you." Recent enlightenment has taught me, however, that to discard the helmet and swim to the surface is a dangerous thing to do. My information was obtained from Commander Edward Ellsberg's *Men Under the Sea*. This, by the way, is a most fascinating book for anyone interested in our general subject.

The Commander explains the "lung," an article of emergency equipment now provided in all of our Navy's submarines. It is, in short, an implement available to each sailor, making possible his exit from a foundered "sub," by enabling him to breathe while he is ascending to the surface. He takes in oxygen at the same pressure as the surrounding water and the pressure decreases as he ascends. This is all right if used properly. But the point I make is that if used improperly the victim has acted as a person must act if he throws off his helmet and ascends to the surface. The following information is quoted from Commander Ellsberg:

"But to see a man, who in practicing with a 'lung' had risen through only sixteen feet of water to the surface, come up apparently all right, take one or two vigorous strokes in swimming toward a boat, and then suddenly collapse and die before he could be hauled aboard, was dis-

concerting, to say the least. After that had happened in our Navy twice, even to men who had been instructed in the use of 'lungs,' a long medical investigation was carried out, ending with a careful series of experiments on animals in the Harvard Medical School. This demonstrated conclusively the cause and the cure.

"The cause was the natural reaction of a man under water, when he is frightened, in holding his breath in an involuntary attempt to avoid swallowing or breathing water. But it turned out that there is no surer way for a man to kill himself promptly when using a 'lung' than to do this apparently natural thing. For a man rising from the bottom starts with his lungs full of air at a pressure corresponding to the water pressure on the bottom. As he rises, the water pressure decreases. If he keeps on breathing naturally as he goes up, the pressure in his lungs keeps decreasing to correspond, with the excess air escaping continuously from the 'lung' through an automatic exhaust valve.

"If, however, he becomes frightened or hysterical at finding himself completely immersed in the ocean and perhaps a long way from the surface (a mental condition not unnatural in a person not trained as a diver) and does what seems indicated as the normal thing, that is, holds his breath, he practically seals his death warrant. For as he rises further, probably faster now in his haste to get to the surface, the water pressure surrounding his chest decreases, but the air pressure in his lungs, with breathing suspended, does not. The result is that the air trapped in his lungs expands and in so doing distends the lungs abnormally. It takes a rise of not over six feet in the water under such circumstances for the distention of the lungs to cause myriad ruptures in their walls through which air in considerable quantity is forced directly into the blood in large bubbles.

"Nothing further happens until about a minute after breathing is re-

sumed, when reaction is swift. The air bubbles then reach the heart, the brain, the nervous centers, and death results almost immediately from air embolism."

In one of the earlier chapters in this book, the discomfort experienced by Richard du Pont after ascending from thirty feet without his helmet is mentioned. Discomfort! I should say so! In view of the above quotation he can be thankful that he is alive and well today.

When amateurs begin diving, they are likely to become very enthusiastic and to try out venturesome ideas. One direction for such expansion is to get two divers on the bottom at the same time. If this is done there are special precautions to take because the risk of diving is doubled. No doubling of responsibility should be assumed. Two men must be stationed at two separate pumps, there must be two hose tenders, and it is most desirable to have a fifth person in command of all. The smallest group, including divers, that should attempt this operation is seven. The pump and hose-tender groups should be as far as possible from one another to prevent entanglements. Divers should understand that they must not cross one another's path either in front or rear. This is to avoid tangles of hoses or life lines. Double diving is not recommended until those attempting it have learned much more than is given in this short discussion.

There are certain pathological considerations which should be studied. The effect of air pressure on the ears has been mentioned. This effect is more marked as pressure increases. Some people find it difficult to clear the passages by yawning. Anyone who starts a dive and cannot clear the passages by the time he has descended three or four feet, should ascend until he feels no discomfort, then try again. If he cannot relieve this pressure he had better not dive, for he will have intense pain which

may result in permanent injury.

Persons who suffer from sinus infection should not dive. The pressure produces pain, and probably irritation which is harmful.

It is well for those who contemplate diving to have a physical examination for there are other ailments and defects of the human system which probably are irritated by subjection to compressed air. Above all, I believe that submarine diving should not be practiced by persons who do not have an entirely normal heart condition. Our bodies are created to function best under average conditions of living, yet they can resist extremes of temperature, privations and muscular effort to a most amazing degree—provided the old heart is normal. Perhaps the greatest strain on the heart is anything that interferes with breathing. The lungs take in more or less oxygen by frequency of respiration which varies automatically according to the needs of the body. When we run, or do any physical work, we breathe fast; when we sleep we breathe slowly. We live, for the most part, surrounded by fresh air and, therefore, when we respire at the rate of forty-four per minute, we feed ourselves with twice as much oxygen as when we are breathing at twenty-two. The lungs do their job so long as an excess of fresh air is available. This is not always the case with the diver. Air is fed to him in measured quantities by a man pumping. Sometimes he finds himself breathing rapidly and getting no relief. This is because he is getting just so much air and it is not enough. The rapidity of his respiration is of no help—each time he fills his lungs he gets part fresh air and part foul. This causes distress and he breathes still faster. The involuntary effort puts a strain on the heart to which it should not be subjected if it is not in perfect condition.

There is great variation in the quantity of air that the diver gets and requires. If he is at maximum depth the pump must be operated faster than if he is in shallow water. If he works at dislodging specimens he

will need more air on account of his physical exertion. The proper way to supply air would be always to pump more than required, but this puts a strain on the man at the pump because he has no way of knowing how much more than enough he is delivering, and desiring to err on the safe side, is likely to over exert himself.

Some of us will become so enthusiastic over this diving business that if we have the means, we will go into it more elaborately and will not be bothered with this matter of pumping air by hand. A motor driven pump will be used, and it will furnish an excess of air at the greatest depth. But I must recommend earnestly that such a pump not be used unless it is of the very best make and most carefully installed. Everything else should be placed a step forward in the way of facilities. If we have a motor driven pump we want a better boat to keep it on, and a thoroughly reliable source of power. One improvement will necessitate another, and our whole outfit will be quite different from that which Eddie, Carol and John used. Therefore, unless we are going to make a very definite change in equipment we had better stick to the old "armstrong" pump.

I have mentioned the matter of forgetfulness which comes over a diver. This is a real danger to be guarded against by the professional deep-sea divers. It is held to be caused by inhaling too much oxygen, and getting a sort of "jag." Divers at great depths have not answered their calls, and someone has had to go down to them. They have been found wandering aimlessly and oblivious to signals.

Excess of oxygen can hardly be the cause of the forgetfulness that I have experienced. It may come from insufficient oxygen, which has a similar effect upon aviators when they rise to great altitudes. The mind becomes sluggish, but immediately returns to its normal process when the flier uses his flask of oxygen.

Another cause of forgetfulness may be the unreality of the experience under water. The diver is perforce slow in his motions and his vision is

decreased. His sense of hearing is of no use to him, and his mind is disturbed by the fear that some unthought-of danger may be approaching. My personal experiences have seemed like wandering in dreamland. Always a delightful country in dreamland, I am glad to say.

CHAPTER IV

BARRACUDA AND SHARKS

My own diving experience has been too limited to justify any authoritative discussion of this subject, but I place this danger here, the last on the list, because it seemed by far the most unlikely to me. Mankind has a peculiar, and rather unreasonable attitude of mind towards danger. Despite the obvious danger that confronts millions of us on our concrete highways, we proceed at high speed, chatting and joking, most of us entirely free from any thought of the peril we are in. We go around curves with soft earth on the sides, and pass cross roads with entire faith in our ability or that of the companion who is driving to control the ninety horsepower mechanical monster in which we are riding. But if we are invited to walk through shrubbery in which it is said there may be rattlesnakes, many of us are restrained by fear. The danger, slight though it may be, of being struck by a hidden foe has an effect upon us that upsets our reason.

The idea of walking on the sea bottom, where one is defenseless, and where hidden foes may approach from behind without warning, therefore inspires fear, and may seem to be a most foolhardy courting of disaster.

The fact is, however, that the diver seldom, if ever, has been attacked by a Barracuda or a shark. The Barracuda is the most evil-looking fish that I know. His magnificent streamlined body, the undershot jaw, and cruel expression mark him as a killer with lightning-like speed. Exaggerated stories are told about him. Natives at Nassau have stated with assurance that he is known to strike humans with such force that he

passes through their bodies. In Florida, I was told that a young girl who was bathing dived from a bridge across an inlet. Presently, the water began to be tinged with blood. She did not rise to the surface, and her bones were finally dredged from the bottom. She had been attacked by a school of hungry Barracuda, which had consumed her. Such stories are evidently founded on imagination.

If humankind were attractive morsels of shark-food, how could the sharks resist the splendid banquets that are spread before them from New England to Florida every day of the summer? On the East Coast of Florida, the bathers during the winter season disport themselves about as freely as those who crowd our Northern beaches in the summer. Strong swimmers venture far from the shore into deep water where both Barracuda and sharks are known to be in search of food, and foolish yachtsmen jump overboard in the Gulf Stream, yet very seldom has anyone been killed or injured by either kind of fish. The Florida Keys are infested by Barracuda. Often when trolling, a hooked fish is torn to bits by them before he can be brought in. Nevertheless a sunken treasure search is being conducted at one of the Keys and the divers are using helmets only—not the professional diver's outfits—staying down for hours, and no attacks from shark or Barracuda have been suffered.

Such facts have made me feel little fear of these terrifying denizens of the deep, at least in the localities where I have conducted my operations. In the Bahamas, we confined our diving to areas where sea gardens were found. Sharks probably do not go to these places because the many varieties of fish are too small to be tempting and more especially because the coral and sponge formations make convenient places of refuge for them. I have never seen a shark in the sea gardens, although we have caught a few small dog-fish from our anchorage nearby, in twenty feet or so of water.

I asked Dr. William Beebe about the danger to a helmet diver of at-

tack by sharks. He said, "There are three-cornered bricks in New York City and there are men who throw them. You are about as likely to be bitten by a shark as you are to be struck by a three-cornered brick while strolling on Fifth Avenue." Mr. Fenimore Johnson was a bit more explicit. He said, "Do not dive if you have an open wound or a fresh scratch deep enough to have drawn blood on any part of your body. Sharks and Barracuda can smell an infinitesimal quantity of blood, and it attracts them toward its source. Sharks are not attracted by a black object. It is therefore a good precaution to wear black clothing when under sea." On learning this, I had a pair of duck trousers dyed black, and bought a black shirt. With this new uniform, I made my last descent. I did not sustain a single sharkbite!

Nothing that has been said above is intended to imply that there is no danger to the diver from sharks. Generally speaking, there is danger a-plenty. But I have not courted it. My photography has improved with each experience and there is plenty more to do in the beautiful sea gardens before I will be satisfied. It will be a long time before I expect to become bored with this peaceful occupation and begin to go down to greater depths and to put bait around me in order to photograph sharks.

Now for the other side of the picture.

There are many varieties of sharks. Some are harmless. My study of the natural history of the sea has been superficial. I have not yet learned to distinguish the varieties of which according to Young and Mazet in their book *Shark! Shark!*, there are eighteen principal ones, some of which are quite harmless. I do not care to meet any of them. And if I did, it is quite certain that I would not take the time to identify his species. Incidentally the book above mentioned is full of thrills about battles with sharks. The question, "Do sharks eat men?" is convincingly answered in the affirmative, and the chapter is accompanied by some gruesome authentic photographic illustrations. But the question "Under

what circumstances will sharks eat men?" will probably never be disposed of satisfactorily. History indicates that surf bathers at the popular resorts are safe, and yet this statement must be qualified. During one summer, 1916 if I remember correctly, three bathers were killed at different points on the New Jersey coast between Raritan River and Beach Haven. These reports are the only ones I recollect having seen in the press. The attacks, compared with the number of bathers who have enjoyed the surf along this part of the coast over a period of say twenty years, would amount to one in many millions, and as a risk should be considered negligible.

It would seem, however, that an element of danger to bathers exists in tropical waters. At the U.S. Army posts in the Canal Zone, the bathing beaches are enclosed by fences of wire net to keep sharks out. At the bathing beaches on the shores of Australia, where sharks have been observed in greater quantities than in any other part of the world, watchers are employed to give warning to the bathers when sharks are approaching. These precautions must be based upon experience. In Nassau, visitors are warned against swimming in the harbor, but the importance of this warning may be questioned because of the numbers of negroes who row around the cruise boats begging the passengers to throw coins in the water for them to retrieve by diving. On the other hand, they may be safe by reason of the color of their skins.

To conclude this subject, it may be said that there is no danger to the diver of attack from voracious fishes if he confines his undersea excursions to sea gardens in twenty feet of water or less, or to places near shore in Northern latitudes. If he craves danger, he can go to waters known to be infested by sharks. He can even emulate J. E. Williamson who entered into combat with a shark while men in his photosphere worked madly at their cameras.*

* *20 Years Under the Sea.* Williamson (Hale, Cushman and Flint).

CHAPTER V

SOME NEW IDEAS

THERE are variations from the routine of photographing fish in their natural habitat which would be likely to occur to anyone after he had made a start with this engrossing pastime. Some of my thoughts which I have not yet carried out are offered here. Experience and a little knowledge of the work of others, with some imagination mixed in, form a base for these suggestions.

Fish can be speared occasionally with a grains thrust down from above water. The trouble with this sport is that the fish are usually at too great a depth. Naturally, when a man walks on the bottom in the domain of the fishes, his first impulse is to get some, especially when he finds that they are so unconcerned that he can almost touch them. Next time he goes down he takes the grains along, singles out a nice plump yellow Grunt and gives a poke. The fish shows no concern as the deadly weapon passes over his back, missing him by about twelve inches. Then the diver, recognizing that he has not allowed for refraction, aims about twelve inches below the next fish and thrusts viciously. The fish shows no concern, only moves as though accidentally, just enough to avoid being hit. Then the diver understands what is wrong. That "vicious thrust" was really like a slow motion picture. When the whole body is submerged and standing on bottom with only three or four pounds of weight, it cannot back up the thrust of the arm, but moves slightly in the opposite direction. The arm, too, moves with greatly reduced speed because of the resistance of water as compared with that of air. The fish moves away

deliberately as a person would from a slow moving object such as the arm of a derrick.

When Richard du Pont discovered that he could not spear fish on the bottom, he decided to do something about it at once. He procured a piece of brass tube and some steel rods. He cut barbed points on the rods, thus making miniature harpoons, then attached pieces of flat rubber to the rear end of the tube in such a way that the rear end of the harpoon, which passed through the tube could be held in the rubber and drawn back in the same manner as the small boy's sling shot. This worked admirably, and Richard became quite proficient at "shooting" fish with his apparatus.

This diversion leads us away from our main interest, and towards a new sport presently being promoted—the shooting of fish by diving without any equipment other than goggles, a "gun," and a weight hanging on the belt to enable the hunter to walk on the bottom so long as he can hold his breath. Bows and arrows are being offered for submarine hunting and can be found at some of the leading sporting goods stores, along with goggles which enable the diver to see clearly.

Whether for fish-shooting or photography, baiting could be studied to great advantage. The diver could discover how bait, dropped from above is received by the fish. He might learn the answer to that mystery, why do fish bite at the turn of the tide? Are they absent at all other times, or are they just not interested? What remarkable possibilities now have been opened by submarine photography to research on fish and their attitude towards hook, bait and line!

When your bait is being removed over and over again without your being able to feel a bite, who is taking it? The fish you want to catch or some little fellows with mouths not large enough to take in the hook? Let your friend do the fishing and you go down and sit by the hook with a camera and bring back some real evidence.

Years ago I was on a cruise among the coastal waterways of Massachusetts and we were at anchor in Hadley harbor, Naushon Island. At night we hung a shaded electric light overboard and watched small fish being attracted towards it. Presently three squid made their way through the lighted area. Their semi-transparent quality and grotesque appearance would have made a remarkable picture. Apparatus could be constructed for this purpose using two lights, one of normal candle power, the other very brilliant such as is used in taking interior motion pictures. When the object had been attracted by the low power lamp and was in position for photographing, the high power lamp could be turned on momentarily. If arranged as described, this apparatus would not exhaust the storage batteries on the boat too rapidly. For still pictures the magnesium flash could be used.

The question will naturally arise, if fish are brought to the surface by artificial light, why bother about taking the camera under water? Why not photograph them from the surface? The answer is that a photograph of fish, looking down on their backs is always uninteresting. The most important and beautiful characteristics are concealed. In fact, it is practically impossible to identify the species of a fish from a photograph taken from the surface. But an auxiliary apparatus can be designed for submerging and exposing the camera in very shallow water, or when fish are near the surface, without necessitating the photographer going down. A little ingenuity would easily produce a pneumatic or spring attachment to the camera case that would permit control of exposure from the surface. The camera then could be attached to a pole and let down to the desired depth. Motion of the fish and pointing of the camera could be watched through a water glass.

Still another direction in which the diving and photographing equipment could be used to advantage, would be exploring the sides below water level of fresh water ponds, especially the rocky ponds of clear

water such as are found on Cape Cod. At these ponds, probably a boat would not be needed. The pump could be set up on shore, and the diver would descend the steep banks step by step. The water in most of these ponds is clear enough.

These final suggestions have occurred to me since my last diving expedition. Many other interesting applications of the helmet and camera should naturally occur to any amateur who uses them. The field is a large one. There is plenty of room for pioneers. The reward for working in it will be bountiful.