

## THE SCRIPPS INSTITUTION PIER AS A MARINE OBSERVATORY

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THE pier of the Scripps Institution of Oceanography of the University of California at La Jolla, California, extends into the open ocean to a thousand feet from shore. If a structure similarly extended a thousand feet into the air, it would be furnished with equipment of many kinds at fabulous cost and used for making observations in astronomy or meteorology with a corps of expert observers in *constant* attendance. As matters stand the institution pier is a partially dilapidated structure, carrying *relatively* little equipment and visited only for short periods daily for routine observations by a few employees, although much less is known positively about the ocean than is known about the solar or sidereal systems or about the ocean of air.

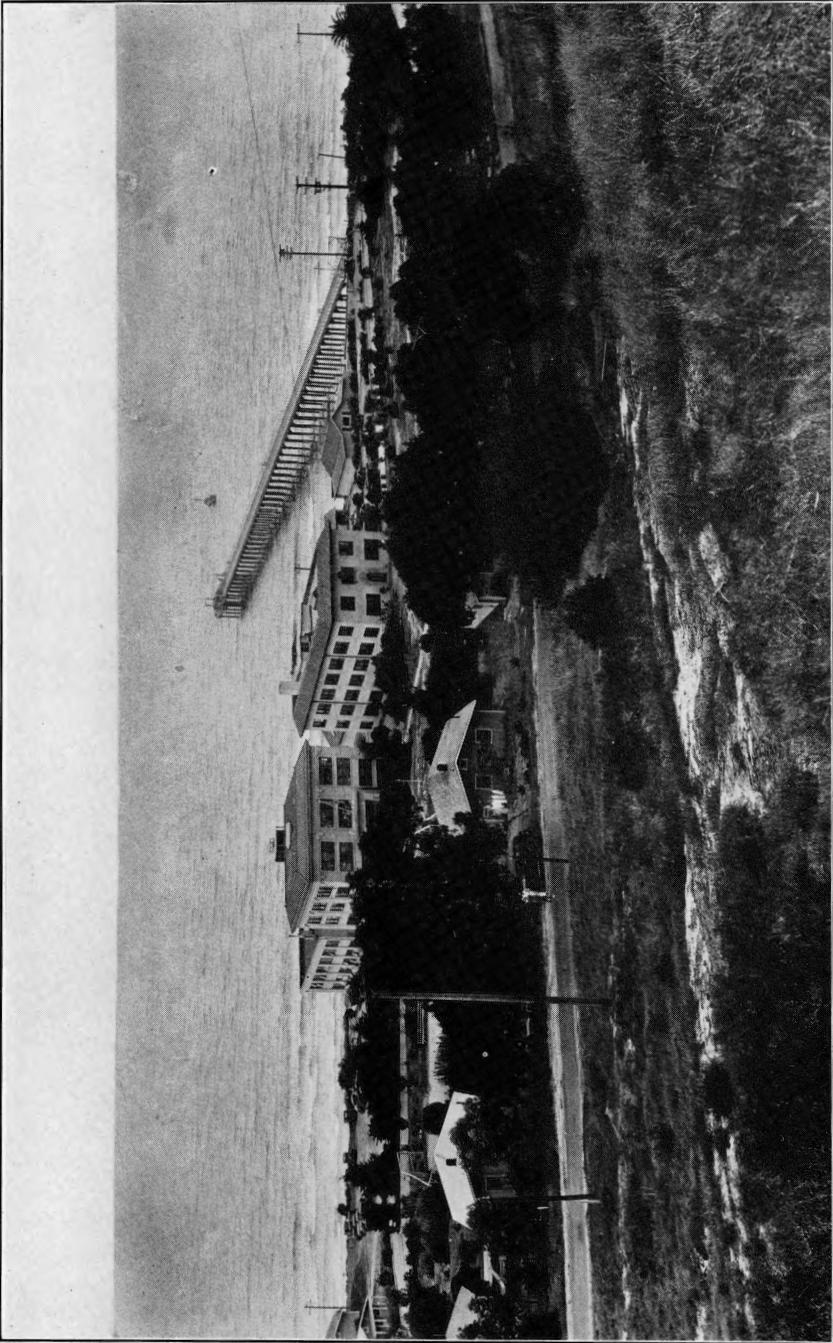
Aside from the records of a U. S. Coast and Geodetic Survey tide gauge and of a water thermograph, no continuous observations of any kind are made at the pier, other physical as well as the chemical and biological data being obtained from observations rarely more frequent than once in twenty-four hours. Even so, it seems probable that the Scripps Institution pier is unique amongst piers all over the world in respect to the number of different ways in which it is used for scientific investigation of the sea.

For some strange reason, direct and continuous observation which is considered essential for investigations in both astronomy and meteorology seems to be regarded as a matter of indifference for oceanography, which presents problems more intricate and difficult than either of them. Indeed the attitude of the scien-

tific élite appears to be that the ocean can be studied most satisfyingly in one of three ways: First, by chasing across or around it with a big expedition taking transient observations at intervals of some hundreds of miles; second, by ignoring it altogether and retiring into a laboratory to perform "controlled experiments" from which all possibility of ocean influence has been removed; third, by conducting research in some science related to or connected with oceanography under the expectation that familiarity with that science will yield some knowledge of oceanography traceable through the connection.

Like any other of the common run of scientific men, I hold to the view that the way to learn about anything is to go to it directly, get as much contact with it as possible, and study it as much as possible in the conditions of its natural existence. That accounts, in part, for my own interest in observation and in the pier as an observatory. However, it is probably true that a still more important part in stimulating and holding my interest is to be found in the infinite number of fascinating problems suggested by conditions and occurrences observed from the pier, and in the surprisingly striking single features which may appear at any moment.

For the present I shall neglect the results of my routine experiences in use of the pier for the sake of telling about some of the surprises which have come to me in the fifteen years since I first began to visit it regularly and frequently. In that time I have visited the Scripps Institution pier five or six thousand times, usually remaining on it not more than



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one hour, or the time necessary for making my collections of microscopic or sedentary plants and animals. Presumably an observer in constant attendance might have seen a much larger number of surprising things than I have seen in the limited time.

For pure astonishment, I think I was never more affected than I was at the time that I idly glanced at a pelican in gliding flight about fifty feet above the water and noticed something like a three-foot length of garden hose drop and hang dangling loosely from between his shoulders. In a moment I was little less astonished when I saw him reach a foot forward and scratch the middle of what I then recognized as his head and neck hanging directly downward. After relieving the local irritation the head was lifted to the usual position above his back and the bird glided calmly onward with never a hitch or halt in his steady progress.

The California brown pelicans have also presented to me two less exciting puzzles, one of which I think I have partly solved. The latter is the puzzle of the half turn in diving. It took about six years of observation to satisfy myself on that point, but I finally became convinced that a bird plunging into the water while headed south makes a side sweep of his pouch just after striking the surface, and that this move to net his fish brings him up facing north as he rises above water again. In one case I saw the pouch distended like a football just after a dive at the end of the pier and on two other occasions I have seen it partly distended. The other pelican puzzle has never approached a satisfactory solution. It is as to why a pelican should try to perch on the wire (smaller than a lead pencil) stretched along above the pier rail. I have seen this kind of perching tried several times, although the pelican is not a perching bird and has no equipment for holding to a slender perch. In

one case a pelican persisted in trying for a period of about twenty minutes. He was close to the pump house, from the window of which I chanced to notice him alight, so I was able to time him and to watch the details of his performance. In order to balance on the wire he had to use his wings. Every few seconds after getting a standing balance he would try to fold them and settle into perching position. This would cause him to lose balance and teeter back and forth with wings gently flapping until he was balanced again. I have often wondered if it amused him to see if he could perform the feat of perching on the wire in spite of his lack of fitness for it.

Another interesting thing about pelican behavior is his series of efforts to keep a gull from stealing his catch after a dive. Often when he comes to the surface and raises his head to let the water drain from his beak a gull is at his side picking at the fish seen between the edges. The pelican immediately starts paddling with one foot to swing in a short circle, the gull paddling desperately to keep up, and so they go until the water has drained and the pelican is able to throw his head up to swallow the catch. Sometimes two or more gulls combine and by getting on both sides of the pelican they prevent his circling movement. In that case they are likely to get some of his catch by snatching it through the slit at the edges of the beak.

Only a little, if any, less astounding than the pelican neck scratching in flight was my only acquaintance with a thresher shark. I was making my plankton collection one morning when a noise attracted my attention to the water a little way from the pier. I turned too late to see anything but the agitated surface, but in a moment later there was a splash and flurry near the same spot in the midst of which something like a human arm seemed to be thrust above the surface and to disappear too quickly for

me to get any clear idea of its form and size. I was still wondering about this peculiar exhibition when I thought I saw a "sand shark" about five feet long swimming rapidly toward the pier at the surface of the water about fifty yards away. A little later I could see that it was chasing a fish of about a foot in length. While watching the chase I saw the shark dart past the side of its victim, and then make the water boil with a whip-lash stroke of its tail at the little fish. I then saw that it was a thresher shark and knew that the arm-like apparition above the water had been its tail thrown through the air in making a stroke. The small fish seemed to be badly dazed by the fierce stroke I saw so clearly and was swimming less rapidly in a crooked course when another stroke of the thresher's tail stunned it and it turned over on its back, struggling feebly. The shark rushed at it with open jaws, but just before seizing it he appeared to be frightened by the drip of the water from my collecting apparatus only a few feet away. So he turned and swam off. The injured fish floated helplessly for a while, but it finally revived and swam slowly away.

An auklet and a flounder were the actors in another scene so strange that I could hardly believe my eyes. I was just going on to the pier one quiet morning and had got beyond the surf when I noticed a Cassin auklet swimming toward the pier on the south side. I stepped to the rail to watch the little fellow paddle out of sight and I was just in time to see him rise off the water in a great splash and flutter and dart off in headlong terror. In the instant that he cleared the water a large flounder leaped through the air in pursuit and its snapping jaws missed the bird only by inches. I have known about birds catching fish most of my life, but this is my only observation of a fish trying to catch a bird.

On a few other occasions auklets have

participated in interesting performances. At several different times I have watched Cassin auklets swimming under water, using their wings entirely for the swimming and their feet and tails for steering and control. Once or twice these little fellows have given excellent exhibitions in chasing small fish about the pier, but the best I ever saw was given by a Rhinoceros auklet at the end of the pier one morning when the water was a little rough. He was chasing fish around the piling and sometimes I was sure that he was going to be crushed as he darted into the swirl of a passing wave around a pile with wings full spread and beating as though in air. But he always came out all right, and he caught fish, too.

Some years ago, when sardines were more abundant near the pier, I often saw loons working on a school, but I never saw a fish caught by one of them. If the loon started for them at the side of the school a lane opened through it with sardines on both sides apparently at exactly equal distances from him. If he dived and came up from below the school an exact circle would be formed by the fish with the loon at the precise center. It seemed that so many fish were at the same distance from him in different directions that the bird could not decide which individual to chase. He could swim faster than any one of them, although he used his feet only in swimming.

Although I did not see it myself, it is surely appropriate to mention in this connection the killing of an octopus by a sea-lion, observed from the pier by Professor W. R. Coe, of Yale University, some years ago. The octopus was too large to be killed and swallowed easily, and the sea-lion had to spend considerable time in getting it disabled. Whenever he seized it its arms would twine about his head and he would have to shake himself vigorously in order to dislodge it. At every opportunity he

would shake it and toss it into the air until it was finally disabled to an extent that ended resistance.

Certain other rare sights have been less exciting because developing more slowly or because of being less conspicuous. Neither sea-lions nor porpoises have been abundant in recent years. About ten years ago two herds of sea-lions could be seen every morning near the pier for several days, each herd consisting of about fifty individuals. Some years ago porpoises frequently came near the pier, and I once saw a school which I estimated as covering about one fourth of a square mile in area. It paraded up and down seaward from the pier for hours. Since then I do not recall seeing more than four or five porpoises at a time and that rarely.

About ten years ago siphonophores were seen drifting past the end of the pier in great abundance for one day and in considerable numbers on two other days. I have noticed a few specimens at only one or two other times. About 1920 I saw a school of mackerel pass the end of the pier one morning. The fish were swimming all in the same direction and as close together as possible and the school extended as far as I could see from the pier. It took about a half hour to pass. I once saw "sand sharks" so thick alongside the pier that I could not have thrown in a line without hitting one. I have rarely seen more than four or five at a time on other occasions. In

1924 the dinoflagellate *Prorocentrum micans* was so abundant near the pier for a week or more that the water was colored reddish brown. It is the only case of "red water" in sight of the pier in the fifteen years of my connection with the institution.

Some of the things I have mentioned seem remarkable or important to me because they were striking performances of individual animals, showing in the first place that it is practically not possible to imagine what an individual animal can or will do or how it will do it, and in the second place that one can only get acquainted with nature by actual contact and observation. Others seem remarkable and important because they show that conditions in the ocean are constantly changing, sometimes allowing populations to exist in what we call a normal state or in equilibrium, and sometimes changing so that strange populations come into prominence or even gain a temporary ascendancy.

The problems of individual performance which I have noted are most fascinating to me, but the problems of shifts or of maintenance of populations in particular locations or regions are the ones which seem most important or at least most urgent. At any rate, I hope that I have helped to show that a pier is an important observatory and that piers deserve more use as such than they have ever had.