Science News-Letter

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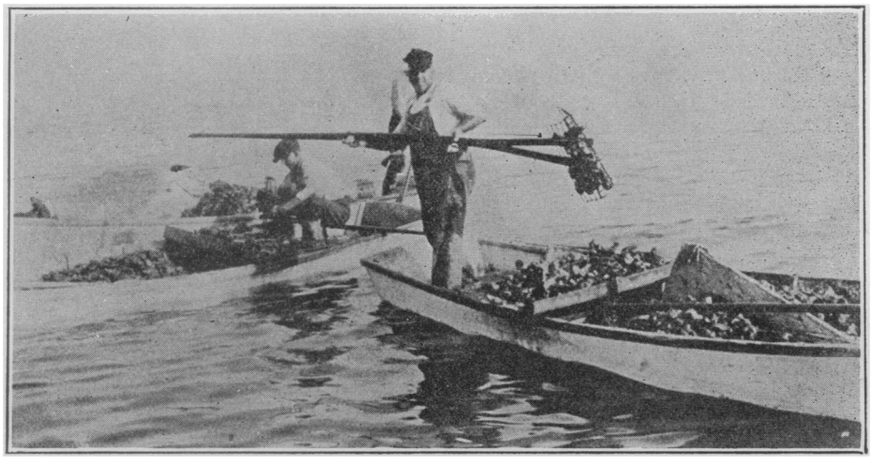
BIOLOGY

Experiments May Make Oyster Farming Successful



In the future the oysters harvested in this manner may be "planted" much as field crops are planted.

Oyster lovers may have the United States Bureau of Fisheries to thank if this favorite of all sea foods remains on the American menu in the future.

Unknown to the general public, the supply of oysters has been steadily decreasing and has been threatened with actual extinction. Until the last fifty years or so the majority of oysters from Cape Cod to Mexico came from natural oyster beds covering so great an area that they were considered inexhaustible. Already on the New England Coast, where the temperature is about as cold as an oyster can stand, the natural beds are badly depleted or gone. Many of the famous beds of the Chesapeake Bay are now nearly bare, although many still remain.

The taking of oysters from American coastal waters constitutes the most valuable fishery of the United States and one of the greatest of the world. About 30,000,000 bushels are taken up in a year in the United States, or about a peck for every person. Strangely enough, 99 per cent of the oysters used are procured on the Atlantic and Gulf Coasts.

Man is the oyster's greatest enemy. Beds have been poisoned with dirty river water carrying waste from cities and factories, as well as depleted through overfishing by careless oystermen.

Although a single female oyster can produce 16,000,000 eggs in one spawning season, and a few bushel baskets of breeding oysters could therefore supply the whole United States with a season's oysters if every egg grew up properly, they are getting scarcer. Most of the eggs are never fertilized and are therefore lost. Many of those that are fertilized are eaten by larger creatures or never find a place to settle and are swept out to sea or smothered in mud or sand on the bottom.

Because of the possibilities latent in a single oyster, artificial propagation has been the dream of fishermen and scientists alike for nearly half a century. But this method of increasing or even of maintaining the bivalve population has always been a flat failure, and means other than artificial breeding have been resorted to with more success. For the first time since the natural oyster beds disappeared from the coast of Maine and New Hampshire and began to thin out along the Atlantic Coast real hope is now held out for checking this decline.

Dr. Paul S. Galtsoff, of the United States Bureau of Fisheries, has made an intimate study of the private life of the oyster and has found out facts that it is believed will solve the various problems of the oyster industry.

The idea of oyster farming is not a new one. Since the first attempts of Prof. Coste of France over 75 years ago to raise oysters by artificial means many persons have attempted it. Exaggerated stories of immense possible production have led even practical oyster growers astray. Stories of gold mines in oyster beds are not a new thing.

After many years of failure, a method of rearing oysters on the shores of France was developed which is the most perfect and thorough in the world. Adult oysters are placed on oyster beds to spawn. The embryos are collected from the surrounding waters when they are old enough and have attached themselves to objects placed in the water for that purpose. These baby or "seed" oysters are then planted where they have the best chance of growing to maturity and where they are protected from their natural enemies.

The method sounds simple on the surface but it is so full of difficulties that it has been impossible to use it in the United States, partly because of high labor cost and differences in tidal and climatic conditions of coastal waters, as well as physiological peculiarities in the species of oyster.

In the United States attempts have been made ever since 1880 to hatch the oyster eggs in captivity and rear them until they are old enough to be turned out into the world. The re-

(*Just turn the page*)

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Experiments May Make Oyster Farming Successful

(*Continued*)

sults have been barren, and the reason for the failure is the microscopic size of the oyster embryo, or "spat."

Biologists have studied the habits of the oyster in the hope of overcoming these difficulties. The oyster of commerce in the United States, with the exception of certain West Coast species, is called by scientists "Ostrea virginica." It is a member of a mollusc family popularly known as bivalves because it has two shells or valves which are joined at one end by a hinge.

A dark colored elastic ligament joins the two shells and is so placed as to throw the free ends of the valve somewhat apart when the large muscle of the oyster is relaxed or cut as it is in shucking. One of the two valves is deeper and more cup-shaped than the other, and it is nearly always this shell by which the oyster fastens itself permanently to the hard object on which it spends the rest of its life.

Each shell is lined with a thin membrane called the mantle, which is fringed all around the edge and unattached along the margin. A set of four gills filter the food out of the water which the bivalve drinks for its living. In the center of the oyster is a large muscle which closes the shell tightly when it is contracted. The oyster is held to its shell by this muscle and the mantle.

Microscopic examination of the oyster reveals that the gills are covered on both sides with very fine hairs arranged in rows. These beat back and forth. When the oyster is lying with its shell open they cause a current of sea water to pass through the gills into tubes and thence into a cavity above. As the water passes through the gills the colorless blood of the oyster is aerated. This is how the oyster breathes.

The food of the oyster consists of tiny vegetable and animal organisms. Ordinary sea water is a rich larder for the oyster, and when drawn through the gills the food particles are strained off by a layer of adhesive slime which covers all soft parts of the body. By analyzing the water that passes through the oyster's gills, Dr. Galtsoff found that over 99 per cent of all the diatoms and dinoflagellates that form the oyster's food had been strained out.

The form and general appearance of male and female oysters is so much the same that for a time it was thought that each oyster was at the same time both male and female. But this is not the case.

The female oyster generally spawns when the temperature of the surrounding water reaches 68 degrees Fahrenheit. The true relations between seasons and spawning were accurately determined by Dr. Galtsoff, who found that a sudden increase in the water temperature of 5 degrees inspires the female oyster to lay her eggs. The time of the month or week is not very accurately observed by her if the temperature is pleasing, Dr. Galtsoff found. The male oyster on the other hand yields to two impulses, one being the temperature stimulation and the other the presence of female spawn in the surrounding waters.

The male spermatozoa and the female eggs are so extremely small that a lens must be employed to distinguish one from the other. A female oyster may produce over 16,000,000 eggs, 500 of which laid end to end would make only an inch. The male spermatozoon is smaller yet. When the egg is fertilized in the water by the spermatozoon the single cell of the egg begins to divide into many cells and becomes in the course of five or ten hours an oyster larva. This infant creature swims about the water by means of fine hair on the outside of its body. In about two days a shell begins to grow, and it soon resembles a tiny clam. After several weeks the free roaming stage of the oyster is over. It is now only about one seventy-fifth of an inch long, but it is all ready to take up the serious business of life and settle down to a life on a hard rock or reef or any other place where it can firmly attach itself. Once settled, it loses its power to swim and it never again wanders off of its own accord.

The rate of growth of the oyster varies widely and depends on the temperature and food content of the water, and the time of its birth. In Long Island Sound it takes an oyster about four years to grow four or five inches long, but in southern waters it grows as big as that in two years. If left undisturbed it may grow to eight or ten inches or even more. When crowded together oysters assume abnormal shapes such as the "coon oysters" of the south and eventually the mass becomes so dense that preceding generations are smothered.

Artificial propagation of oysters has been attempted many times. Nearly half a century ago an experimenter

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Experiments May Make Oyster Farming Successful

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succeeded in artificially fertilizing spawn from the female oyster with spermatozoa taken from the male, and in rearing some of the baby oysters to the age of four or five days. It was, however, extremely difficult to maintain the microscopic oyster larvae in tanks and at the same time have the water continually running as is necessary in order to supply food for the tiny creatures and take away the waste. In fact neither this pioneer investigator nor anyone else since has succeeding in rearing them to an age where they are ready to settle down and grow up.

The only method of increasing the oyster supply in the United States that has been at all successful is that of catching the young free-swimming oysters at the time when they are just ready to "set" and then transplanting them where they will develop best. The work of Dr. Galtsoff, it is believed, will give this old method a new impetus.

In order to find out the best ways of increasing the natural supply of oysters, Dr. Galtsoff experimented at Milford Harbor in Connecticut, which is typical of the coves and bays where oysters were found in great abundance when the early settlers came to America. Full-sized oysters were planted in the harbor which was not polluted to any serious degree. The tidal flats were planted with sticks and brushwood, shells and tiles. When the old oysters spawned and the eggs developed into young, it was found that these various objects used as collectors were very effective in catching "seed" oysters. Birch brush planted in rows was covered with tiny oysters for a distance of two feet from the bottom. When the oysters attained a fair size they were transplanted to deep water beds in the sound.

Baskets made of wire or lath were filled with shells and set on the tidal flats in the vicinity of the spawning beds. These proved to be the cheapest and best collectors of all. Each of the shells on the top, bottom and sides of the basket were covered with tiny oysters and even those on the inside had some. Each bushel of shells caught about 15,000 young oysters. These were divided up and planted off shore where the young had ample room to grow.

How to give the young a chance to grow is only half the problem. The sanitary control of the industry has always been a serious question ever since the cities of the Atlantic seaboard discharged their waste materials into the coves and estuaries that once formed the natural oyster beds. Why the oysters in polluted beds contained more bacteria at one time of the year than at another was not clearly understood. Experiments by Dr. Galtsoff in New York showed that very few bacteria are retained by the gills when the oyster drinks its water, and that most of them pass on through the gill cavity.

The effect of temperature on the appetite of the oyster explains the fact that during the cold months oysters contain fewer bacteria than during the warm months. At the Woods Hole Experiment Station in Massachusetts recently Dr. Galtsoff built a special trap by means of which he measured the amount of water that flowed through an oyster's gills at any given time. At 77 degrees Fahrenheit he found that the oyster was most voracious of all and strained three-one-half and four quarts of sea water through its gills to collect the delectable bits that formed its food. At 48 degrees its appetite was reduced to zero and no water was taken in at all. When no water was taken in no germs could be taken in either. Below 41 degrees all motion in the oyster ceases, Dr. Galtsoff stated.

These facts about the oyster, such as the knowledge as to the cause of spawning, how to catch the infant oysters and distribute them when they are old enough, are expected by officials of the United States Bureau of Fisheries to solve the various practical problems that have hindered oyster farming and the sanitary control of the industry.

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FORESTRY

Permits to Forest Tourists

Licensing travelers through forests, as a means of protecting Canada's timber wealth from the ravages of fire, is advocated by the Canadian Forestry Association. A forest is potentially almost as dangerous as a powder magazine and the issuance of travel permits is advocated, without which no one would be permitted to travel through any forest region during those seasons when there is danger from forest fires.

The formality of securing a permit would bring forcibly to mind the real dangers of forest fires, and, since a permit can be revoked, the possibility of forfeit of the permit would make the traveler careful.

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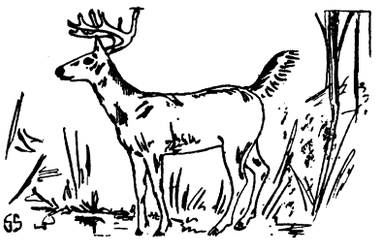
BIOLOGY

NATURE RAMBLINGS

By FRANK THONE



Everybody's Pets

If an animal "popularity contest" were to be staged, the choice among the wild folk of our woods would almost certainly light upon the deer. From the very earliest times deer have been praised for their delicate beauty, for the quiet dignity of their carriage, for the daintiness of their gait, not only by poets but by the very hunters who sought their lives.

When the white men first came to America, the woods of the region east of the Mississippi were full of one of the finest of all the species, the white-tailed or Virginia deer. It was a hard life that the Virginia deer had to lead, stalked as they were not only by Indians but by fierce predatory animals such as wolves and panthers. Yet they were holding their own against them all.

But the terrible gunpowder of the whites, that dispossessed the Indians and all but wiped out many of the native animals, took terrible toll of the deer population as well. And the white man's ax and plow swept away the wilderness and destroyed their natural home over vast stretches of territory. To a large extent this destruction was inevitable and even justifiable, for pioneering is rough work; it cannot spare the forest nor the forest's inhabitants, and it must have meat.

But the day of the pioneer and axman has long passed, and civilization is making amends to the deer of today for the wrongs wrought against their ancestors. Rigid closed seasons permit shooting only during a fortnight or a month, and strictly limit the size of the bag of any one hunter. More important still, man's pitiless war on the enemies of his domestic animals has practically wiped out the predatory animals, and the Indians have almost all departed from their ancestral hunting grounds. So that the deer are left in almost undisputed possession of the woods they once inhabited in trembling and fear. The meek have inherited the earth.

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