

country to colonise, were the locality of the settlement judiciously chosen. But it is by no means very safe or easy to explore, putting danger from the natives out of the question. In the virgin forests and undrained swamps the climate is often insalubrious or even deadly, while there is more than the usual share of tropical nuisances in the shape of venomous reptiles and insects, most unwelcome to anybody except fanatical entomologists. And, above all, there is

the difficulty of the food supply for a party moving into the interior. The natives live chiefly on game, fish, and fruits, but although Albertis and his people were provided with guns, they were often reduced to extreme distress when they passed out of the districts frequented by the pigs and cassowaries; while an unfortunate sheep on board the steam launch actually died of inanition, though the signor had landed daily to go botanising in search of nourishment for it.



## OYSTERS AND OYSTER BEDS.

IT is curious how little interest has been hitherto taken in the scientific cultivation of oysters; I trust, however, that our readers are not in the position of the old-fashioned farmer who, when attending a lecture on agricultural chemistry, remarked, "pleno ore," "What I knows, I knows—and what I don't know, I don't want to be told."

There are almost as many kinds of oysters as there are kinds of dogs: no two oysters are exactly alike, but those which come from the same locality bear a general resemblance one with the other, so that any one accustomed to handle and criticise oysters can tell pretty well where the lot was reared. Taking the English coast round, there are not after all so very many localities suitable for oyster farming. The reason of this is that oysters abhor sand, and where sand is oysters cannot possibly exist; the reason is the grains of sand get into the hinge of the oyster, and, like a stone in the hinge of a door, prevents him opening and shutting his shells. The sand then smothers the oyster; he gapes his shells and dies. For this reason we never have, and

never shall have, any oysters in the great estuary of the Solway—Morecombe Bay (the headquarters for cockles), the estuary of the Flintshire Dee, the vast expanse of Cardigan Bay, and the greater part of the estuary of the Severn. Several times has the idea been started to use for oyster purposes the great plain of the Maplin Sands at the mouth of the Thames, but oysters cannot possibly ever thrive here—it is all sand. When we come round to the south of England from the Land's End to the North Foreland then we begin to find oysters in the various estuaries and landlocked bays. I instance only Falmouth, Plymouth, Poole Harbour, the Solent, Portsmouth (especially Hayling, Havant, etc.), also in the Isle of Wight, such as the Medina River, Brading, etc. On the north-east coast there are but few oysters, Boston Deepes and Holy Island being excepted.

Oysters may be generally classified into natives and deep-sea, and between these there are several varieties, the shells of most of which I have in my museum. The deep-sea oysters are as different in form and fashion from the natives as a Clydesdale cart-horse is from a thoroughbred race-horse. Like horses, oysters have their points. The

points of an oyster are—first, the shape, which, to be perfect, should resemble very much the petal of a rose leaf. Next, the thickness of the shell. A first-class thoroughbred native should have a shell of the tenuity of a thin China or Japanese teacup. It should also have an almost metallic ring, and a peculiar opalescent lustre on the inner side; the hollow for the meat of the oyster should be as much like an egg-cup as possible. Lastly, the meat itself should be white and firm, and nut-like in taste. It is by taking the average proportion of meat to shell that I have been enabled to make a standard gauge for my own use, so that I can immediately classify any oyster from any part of the world. The oysters at the head of the list are, of course, natives; the proportion of a well-fed native is one-fourth meat. The nearest approach to natives both in beauty and fatness are the oysters from Milford in South Wales. The deep-sea oysters, such as the white-faced things dredged up in the Channel between England and France and stored at Shoreham, near Brighton, are one-tenth meat; while the very worst are some Frenchmen, which are as thin and meagre as French pigs. The meat also of these various oysters differs very much in taste, and I do not think much of the Roman gentleman who boasted he could tell a Rutupian (*i.e.*, Thames native) bred oyster—which, by the way, must have been pickled to stand the journey from Kent to Rome—from an Italian “Pied de cheval” or “horse-foot” oyster, a name applied by the French dredgers to common, coarse, bitter-tasted deep-seaers. I have weighed half-a-dozen natives, the meat contained in these weighed two ounces; the value, therefore, of oyster meat—at 3s. 6d. per dozen—is fourteen shillings per pound—just the cost of a 14lb.-leg of mutton.

It is not to be supposed for a minute that the high-classed aristocratic native has arrived to the position of the King

of the oysters without a great deal of human labour and intelligence having been spent during many generations of dredgermen upon his education. The mouth of the Thames, within a line drawn from about Walton on the north to Margate on the south, may be considered as the home of the true British native. This kind of oyster seems to thrive only upon London clay. So far as my experience goes, I have come to the conclusion that a fattening place for oysters is seldom also a breeding place; the fattening grounds always must be situated in water with which a certain amount of river water is mixed with the sea water. Whitstable is *par excellence* the best fattening ground in the world; because the food of the oyster (a subject which has hitherto not been sufficiently investigated), is there present in the greatest abundance, and also because at Whitstable the oysters are continually being worked by the dredge. The food of the oyster consists of very minute organisms which some call animal some vegetable, and those who are of a microscopic turn will add to the general store of our knowledge if they will take the trouble to examine and report on the contents of an oyster's stomach. The oyster's mouth is situated between the delicate folds of what is ordinarily called the beard, *i.e.*, the breathing organs, and by following down the course of the gullet the stomach can easily be found embedded in the thick part of the body of the oyster, which is really the liver.

It is in the month of June that oysters mostly spawn; the “spat,” as it is so-called, resembles very fine slate-pencil dust, and the number of spats in one oyster I find from experiment varies from 829,000 to 276,000 individuals. On fine hot days the mother oyster opens her shell, and the young ones escape from it in a cloud, which may be compared to a puff of steam from a railway engine on a still morning. Each little oyster is provided at its birth with swimming pads

of delicate ciliæ, and by means of these the little rascal begins to play about the moment he leaves his mother's shell. Unless born in an enclosed water pad-dock, he swims away with the tide to and fro till he dies, or finds a rest suitable for him. Oysters, in fact, may be said to "swarm" like bees, and many a bed has been discovered the origin of which is attributable to a swarm of oysters having alighted on the spot. It is for this reason I think that revenue-cutters should be instructed to heave a dredge overboard whenever possible, as it is very likely beds of oysters hitherto unknown may be hit upon. Owners of yachts should also keep a look-out for undiscovered oyster beds.

The fact that the "lamb" oysters (so to speak) quit their parent fold is well known to dredgermen, who knowing that these innocents if left to themselves would probably be snapped up by one or other of their enemies, go in pursuit, catch them still adherent to the culch they have chosen, and bring them back to be educated and fattened. For this reason it is desirable that so-called "common grounds" should be left open to the public. The dredgers while collecting the spat and brood keep the ground clean, and oyster grounds cannot be kept too clean, for if left unworked they soon get "mudded" and "weeded" up. The little oysters, the size of a fourpenny piece to a sixpence, are called "brood," the larger are called "half ware," and these are sold by what is called a "wash," which contains twenty-one quarters and a pint. These young oysters increase in size by adding to the margin of their shell a very delicate layer of a horn-like elastic substance, at first almost as thin as goldbeater's skin, but which eventually hardens into shell; this is called the "growth." In a well-marked native the rings of annual growth are plainly perceptible. If the shell be well washed the growth will take the markings of a

pencil well, and it will be found that the oyster is generally in his fifth or sixth year before he is thought worthy of an introduction to London society.

Being of a very delicate tender nature, the oyster has a great many difficulties to encounter. One of his worst enemies is the "five-finger," commonly called the star-fish. The five-finger entwines the oyster in his deadly grasp, and by protruding his elastic stomach eats up the oyster, leaving the empty shells, known as "clocks." One would hardly imagine that the five-finger had any sense, but still they must have some kind of intelligence, or, as a dredgerman aptly put it to me, "When these five-fingers find a fleet of vessels on the top of them with the dredges, they doubles themselves up, and are off. They are not going to stop to be all dredged up." The next worst enemy is the "whelk tingle," or "dog whelk." These rascals, although they look so innocent, have the power of boring into the oyster shell with their rasp-like tongue. The hole this creature makes is cut very clean, as if bored by a jeweller's diamond, and they often destroy hundreds of pounds' worth of property. He who would invent a trap to catch these dog-whelks would indeed be a benefactor to oyster fishery proprietors. Periwinkles are friends to oysters; they are largely employed to keep the beds and the "culch" clean by eating up the slimy green weed that grows so abundantly, especially in hot weather. Mussels are no friends to oysters. A colony of mussels will, unknown to the proprietor of the oyster bed, often settle upon the "spem gregis" of "half-ware," so carefully deposited to grow and fat. The mussels immediately on settling down spin their curious, silk-like webs, as seen under piers, etc., by means of which they are enabled to anchor themselves so firmly. The run of the tide then brings mud, the webs of the mussels collect it, and the oysters underneath, unless released by

the dredge, are smothered like the Princes in the Tower.

The oyster is most intolerant of cold and very tolerant of heat. There are no oysters in the Arctic seas; in all tropical seas they abound, but are not always edible. In the winter season owners of oyster layings watch the weather most carefully, shifting oysters from the fore-shore into deep water, for if the frost catches them it nips them up. Particularly dangerous are also the floods from melted snow, and as fresh-river water alone is sufficient to kill oysters, so much more so are they in danger if the temperature is reduced by melting ice or snow. Hence it happens frequently that valuable layings of oysters have been destroyed because they were placed too high up creeks where the land waters were too powerful for the flowing tide to dilute them. This great abhorrence of cold on the part of high-bred oysters, such as natives, is in my opinion one of the principal causes of their present high price. Of late years the summers have been very cold, and although the water may perchance have attained to a certain amount of heat, yet the cold nights knock all the warmth out of it again. Above all is it necessary for a fall of spat that the temperature should not jump up and down, but be as equable as possible. The young oysters cannot help being born, and when born they must take their chance of the weather. If it is cold they die; if it is warm, and they are lucky enough to find cradles in the form of "culch" suited for them, they hold on as tight as barnacles and have a chance of living. The manner by means of which this adhesion of the young oyster takes place is not at all known. It appears to be that there is no actual cement, but that the adherence takes place by the "attraction of cohesion." These baby oysters are whimsical in their tastes. I have a collection to show the substances which they prefer; if in a sticking humour they will adhere to

almost anything; but what they like best is certainly clean cockle shells, and the empty shells of their ancestors and relations. It grieves me much to see beautiful clean cockle shells crushed up to form garden paths, and more especially do I consider it a very great waste for the oyster shops to throw into the tub the shells of the oysters that have been opened at the bar. From the shop they go to the dust-bin, where they do no good whatever; if collected and put back into the sea they would form, above all things, the best form of culch to attract young oysters; in fact, the empty oyster shells should (so to speak) be sent back to favourable breeding grounds in the sea to be refilled with young oysters.

As I have stated before, cold is fatal to young oysters; it is no use disputing this, and the results of experiments I have made will, I think, render it positive. I placed in the middle of the spatting season several oysters in the sun. Shortly they began to gape. Finding a mother oyster containing spat, I wedged open her shells and shook the spat out of her, thus to avoid any injury that might ensue from the use of the oyster-knife. I then placed a certain proportion of living spats into a test-tube containing a delicate thermometer. When the water in the test-tube was warmed by the sun up to a certain temperature, the oysters came to the surface and played about like "merry-go-round" beetles on duck-ponds, or else they soared from the bottom upwards with a tremulous motion not unlike that of a lark in full song on a fine spring morning.

Having enjoyed this beautiful sight of the merry dance of the oyster spats in the warm bright sun, without moving my test-tube I gradually cooled the water by means of bits of ice placed outside the glass, while I accurately noted the fall of the thermometer in the tube. As the water gradually cooled the oysters became very uneasy; as it got colder still they seemed to lose all their

vivacity; and one after the other fell to the bottom like the ballast turned out from a balloon as she passes over our heads. When the water reached a certain degree of cold no spat was seen alive; they were all quite still at the bottom. The microscope showed me that the cold had been fatal to them. When an oyster is alive he keeps his shells firmly shut; when he is defunct he gapes his shells wide open. All these frost-killed spat oysters had gaped their shells for the last time.

What happened in the little test-tube happens also in the great sea. We ought therefore to expect that during a hot quiet summer there should be a fall of spat. I have before me, through the kindness of Mr. Fred Wiseman, oyster merchant (who has extensive layers of oysters in the Crouch, at Paglesham, in Essex, and who has worked at the oyster question with me for many years past), some magnificent specimens of the fall of spat which took place in 1880. The spat, which are from about the size of a split pea to that of a whole pea, are so thick upon the oyster shells placed for their reception that in some places the culch may be most truly said to be "smothered with spat." We know quite well when these little oysters were born and why they did not die, but unfortunately we are not able to command at will these favourable circumstances of atmosphere and sea. These little spat—which were born the last week of July—will grow up like their fathers and mothers, with green beards. So rooted is the prejudice of Londoners against green-bearded oysters that my friend's family for a hundred years past have sent their "sea-fruits" to the Continent *via* Ostend, and our countrymen in Paris

have no doubt already consumed many thousands of Essex oysters under the name of "Les huitres verts d'Ostende." While there has been this grand fall in the Crouch, I am sorry to hear that, taking the Thames estuary as a whole, there has not been a general fall of spat. I also understand that the price of oysters has been raised one and even two guineas a bushel, so that I am afraid during the coming autumn and winter we must not expect any diminution whatever in the price of natives. I am very sorry for this, because no food exists so fit as oysters to supply us hardworking Englishmen with the phosphates which are so beneficial in restoring nervous force and brain power.

The following is an analysis of the meat of the oyster:—

1. Water containing hydrochlorate of soda, hydrochlorate of magnesia, sulphates of soda, of lime, and of magnesia.
2. Much phosphate of iron and lime.
3. Much omazone and glycogen.
4. A certain quantity of gelatine and mucus.
5. An animal material of which phosphorus is the principal element.

It will be remarked that there is no real "fat" in an oyster; to fatten oysters, therefore, is an expressive, but not correct term. One thing I must advise my readers to do, and that is, never to allow the oyster to be served to them on the flat shell, but always on the round shell, with the natural liquor left in the hollow. This liquor is not sea-water, but contains much of the same chemical ingredients as the oyster itself. This hitherto for the most part we have allowed those who open oysters for us to throw away as useless. This hint, if the oyster-eater is wise, he will at once adopt.