

young colonies of oysters, such as the flats outside Whitstable, in England; at Blaukenburg, off Holland, the produce of the store-beds near Ostend; and a bed discovered out at sea off Shoreham, the produce of spat floating away from the oysters stored at Shoreham. In his opinion "the oyster spat may be said to swarm like bees; they go to different parts of the bottom of the sea, and there they rest; they will swim with the tide, and where the tide stops, if they are in the proper humour, down they go; and if the bottom of the sea is fit for their accommodation, they will make an oyster-bed, and if it is not, they will die."

12. *Requirements for Formation of Beds.*—Heat and tranquillity are, in Mr. Buckland's opinion, the alpha and omega of successful oyster production. In support of this theory, he observes that, "finding the spat was most lively at mid-day, when the sun was shining right hot upon them, I took some of them and put them into a tube glass, and experimented upon them in this way: If it is cold, that causes a failure of spat; the cold will kill these little oysters. I put my tube into iced water very gradually, and as the oysters in the tube got colder they began to tremble, and ultimately fell down to the bottom, and there was an end of them. Up to a certain point, I found I could resuscitate them by taking them out and putting them into warm water again, when after a time they gradually revived. I found that if I held them in the cold too long they died. The temperature they liked best was from 65 to 72 degrees; when the temperature got below 50 degrees (say 44), they would be dead." As regards tranquillity, he says, "Wind and waves are great enemies. If you have a stormy day the little oysters are *bouleversé*, and their shells broken; they cannot go anywhere, and they get thrown against the shore: it is no use for them to attempt to get on at all. The picture of a good spatting day, as I have often thought, is a hot summer's day, when you see the cows standing up in the water, and the gnats flying about in the air—just as you see the gnats flying about, so the young oysters float about; if the wind blows the gnats go, and the young oysters go also." That heat and tranquillity have much to do with a successful spatting favourably influencing the mother and offspring, is evidenced by the operations of Major Heath, in the artificial cultivation of oysters in Corio Bay, in Victoria. Some three years ago he took over from Stewart Island several thousand oysters, and laid them down in a very sheltered part of Corio Bay, and he writes to me, "The New Zealand oysters spat about four to six weeks after I brought them over. The temperature of the water is, I expect, much higher here than at Stewart Island, as it ranges from 58° in the winter to 76° in the summer;" and of this spat he adds, "They are doing well, as they are acclimatized, and are a good size, being now three years old." These parent oysters must have been at least a fortnight or three weeks from the time they were dredged at Stewart Island to the time of their being deposited in Corio Bay. As an indication of what warmth and tranquillity will accomplish, he states, "The close season is here from November to February; but from what I have found on the tiles, the oyster spats nearly all the year round in Corio Bay."

In the Basin of Arcachon it has been ascertained, by careful observation during the years 1854 to 1876, that the fall of spat depends on the weather and temperature during the spatting months. Whenever the weather is recorded "very cold" the fall of spat is recorded as "very bad," "nil;" while where the weather is represented fine and warm the spat is reported "very good;" "much rain" or "rain and stormy," "bad."

As regards America, a correspondent of Mr. Buckland's, writing on the successful oyster culture of the Americans, says, "In fact I can see no other feasible reasons to be advanced by our trans-Atlantic cousins for their well-known success, than that the warm waters of the Gulf Stream run along the coast, and that they have intense, almost tropical, heat in summer."

Of his own experiments at artificial cultivation at Reculvers, Mr. Buckland says, "We put in a great number of *huîtres mères*—breeding oysters, and the first year produced nothing; the water was full of spats as the air is of midges sometimes on a summer afternoon, yet not a single spat stuck upon a tile. The next year *embarras de richesses*—I did not know what to do with them. I bought half the tiles of a church, and put them in; all these tiles were covered with oysters, and everything in the pond caught spat. Why was that? One year was cold, and this year hot; that is all the difference."

The next thing to getting a good spat from an oyster bed is to preserve it. Captain Johnson, who has charge of the Isle of Wight fisheries, in his evidence on this point states, "I have had my spat" (*i.e.*, in artificial beds) "floating in very good condition in the morning, but at night the whole of the floating spat has been dead, owing to a thunder storm. The greatest amount of oysters we ever had was four millions, and I am quite sure we had forty-four millions or more of floating spat to produce that. This shows an enormous waste, but there are certain reasons for that; we have to contend with vermin in the shape of shrimps and small fish. I have seen them lying under the shell of an oyster, and, when that oyster has spat, dart out and swallow the spat, and enjoy it amazingly. The goby, a small bull-headed fish, and the young mullet also, are very destructive to them. I have caught them, and put them under the microscope, and found the spat they have swallowed in their stomachs."

13. *Favourable Sea Bottom on which to fall.*—The spat having escaped so far the dangers incidental to its youth, has now to find a safe resting-place for the remainder of its natural life. Carried away by winds and currents, its brief day-dream over, it settles down either to live or die. Sand and mud mean sudden death; as Mr. Buckland says, "Recollect that if you have sand anywhere near your oyster beds they have the sword of Damocles always hanging over them: a sand storm may come and cover them all over at any time." What a storm does in shallow water the currents do in deep sea beds. Mr. Saunders says, "You cannot have an oyster properly propagated where you have either mud or sand; you must have a hard bottom." Sand chokes the oyster, mud smothers it, and sea-weed in any quantity is destructive to it. Stones, dead mussel shells, cockle-shell culch, and above all oyster culch, if clean, means life. To quote Mr. Buckland, "But what suits them best is the natural proper culch which you find at the bottom of the sea, the shell of its own relatives, especially empty shells and old rotten oyster shells. The culch must be clean, or they will not stick to it." Having found its bed, the young oyster attaches itself to it, the point of adherence being near the summit of the lower concave value. If detached by accident or otherwise, and thrown on its wrong side, it can turn itself over.