layers, as in the great oyster-banks of eastern waters, or that have been covered with accumulated earth, as in Indian shell-heaps, have been longest preserved, because removed to the greatest extent from the action of the elements. The solvent action of water and the corrosive action of air, and the alternations between wet and dry and heat and cold, are chiefly instrumental in the decay of shells. On western beds the destruction soon balances up the production. The culturist cannot hope to maintain a stock except by continually collecting and preserving shells. They are less prone to decay on the land than on flats, but there is another and a better reason for retaining them on the land—viz., that it improves their effectiveness.

Oyster-culturists who have given attention to this point cannot have failed to observe that cultch which has been kept out of the water and cleansed is more successful than that which has remained in the water from year to year. My own observations of the several hundreds of tons of shells planted at Crescent during the four summers I was there were perfectly convincing. The scores of experiments I set partly for this purpose and partly for other purposes verified over and over the correctness of the conclusion. Day after day for long periods I have put out prepared shells in closed wire cases and examined the catch of spat and compared with the catch on old shells lying about the same places. When the former caught few to many spat the latter caught none to only an occasional one.

The reasons for this difference are not hard to find. It is self-evident that it is not due to the larvæ, for they are equally plentiful about all the shells. It is only necessary to compare the surfaces of the fresh and of the old cultch or to note the changes that come over fresh cultch as it stays in the water from day to day. The good cultch consisted of shells selected from the surface of heaps of shells that had been exposed for months to the air, sun, and rains, and had become quite clean and white. The old shells with which they were compared had lain in the water for indefinite periods and were discoloured, slimy, and dirty. The changes that come over freshly deposited clean shells are largely dependent upon the locality, the temperature and salinity of the water, and the amount of sediment in suspension. It is generally possible to note a difference in a single tide or a single day, but in two or three days the difference becomes marked. A fine dust-like deposit may be first observed; then a somewhat slimy surface which soon shows specks and patches of organic matter that are fixed to the surface and do not wash off by moving the shell through the water; they accumulate a greater deposit and increase in size and number until a great part or the whole of the shell is covered and dirty. If instead of shells strips of glass are used the surface can be examined with a microscope and the nature of the deposits recognized. The organic matters are minute, separate, or colonial plants or animals or exudations from them causing the slimy surface and the retention of silt.

When single valves of shells are dropped into the water separately they fall with the convex surface downwards and concavity upwards. A good portion of the under side rests on or becomes pressed into the substratum and the concavity soon comes to be partly filled with sediment. The only portions left exposed are the upper and lower margins and edges of the shell, which are themselves subject to the organic deposits already referred to. This is why so many shells are found with spat clustered round the margins. The at first complete and suitable surfaces of the shells are liable to be soon reduced to narrow rims of a less suitable surface. At some places this can happen in a few days; at others it may take as many weeks. This is why prepared cultch, if put down at the proper time, is more efficient than old cultch. Shells that fall without interference light on the convex surface, only part of which touches, and all the rest of both surfaces are at first free and suitable to catch spat. Spat that becomes attached in the centre of the concave surface may be afterwards covered with sediment and smothered or starved. When shells are shovelled from a scow into the water at high tide they may, in falling through the water, interfere with one another or be affected by a current, so that some of them will light with the hollow side downwards. If they fall on hard bottom the greater part of the under surface is likely to be still accessible to larvæ and offers very satisfactory conditions. The worst chance is that depositing sediment may rise round the edges, cutting off communication with the outside. The upper side is also favourable because of its rounded surface allowing the sediment to slip off. But both surfaces are exposed to organic growths. Some of the densest clusters of spat are to be found on the insides of cockle-shells where the valves have been retained intact and so closely fitting that one at first wonders how the spat got inside, which becomes plain when it is remembered that it is not the spat but the minute larva that searches out the place for fixation.