building polychaetes, small crabs, a shrimp, amphipods and other smaller crustaceans, gastropods, filter and deposit feeding bivalves, a burrowing brittle star, a burrowing holothurian, and an acorn worm. Though the fauna showed some zonation within the region, two, possibly three, associations being distinguishable, many animals were ubiquitous throughout the area, and physico-biologically it was considered one, and called the lower beach region (Fig. 2, J, and Plate 1).

OTHER PHYSICO-CHEMICAL FACTORS (METHODS)

Other physico-chemical factors studied included (a) organic matter, (b) calcium carbonate, and (c) water content of the beach material, (d) salinity, (e) oxygen, and (f) hydrogen ion concentration of the interstitial water, and (g) temperature.

At each station samples of both sand and interstitial water were collected from the top 2.5cm of sand, and from between 8cm and 12cm below the surface as described earlier. All samples were taken around the time of low water of spring tides. To obtain suitably sized sub-samples on which to carry out the organic content and calcium carbonate content analyses oven-dried sand was put through the sample splitter.

(a) Organic content determinations were carried out on 2–3g samples of sand using Tinsley's method of oxidation by dichromate solution as described by Bremner and Jenkinson (1960). Organic content, which represented: (1) plant detritus in the sand; (2) micro-fauna in the sand; (3) faecal material; (4) conchiolin of shell fragments; (5) organic matter in solution in the interstitial water, was expressed as milligrammes of carbon per gram of oven-dry sand. A correction factor for chlorides also oxidised in the reaction was worked out from the water content of the sand and its salinity (Appendix II). No correction was necessary for ferrous iron since tests showed it to be absent from sand pretreated similarly to that analysed for organic content.

(b) Calcium carbonate percentages were calculated from the loss in weight of about 10g of oven-dry sand following treatment with 2 N hydrochloric acid (Barnes, 1959). Since this method gives the percentage of carbonates and other soluble salts, a correction for the salt content was applied. At Howick where the shell content of the sand is relatively high, the results can be, for working purposes, identified with the shell content.

(c) Water content was determined by drying about 500g of wet sand for 24 hours at 105° C–110° C, the loss in weight being expressed as a percentage of the wet weight. All the large animals and those small animals easily noticed were removed before weighing and drying.

(d) Salinity determinations were made on water samples obtained by filtration under slight suction pressure from sand samples brought to the laboratory in air-tight jars. The Mohr method for estimating salinity by titration with silver nitrate was followed, using the titration procedure recommended by Barnes (1959), and Knudsen tables (1953) for the calculations.

(e) The equipment devised to obtain the interstitial water samples for the oxygen determinations consisted of a rubber bulb with an inlet and outlet valve enabling water to be sucked in at one end and ejected the other. The inlet was attached to a glass tube (12cm long, 7.5mm diameter) ending in a filter of nylon thread (0.085mm diameter), 28 meshes to the centimetre, and held in place by a short length of rubber tubing slipped over the end of the glass tube. The first water (contaminated by air in the dead-space of the tube) and the air bubble were expressed through the outlet valve, and the tube and bulb then filled with