

and pressure, and the geographical distribution of animals, later on.

The high temperature at the surface evidenced by the curves in Fig. 157, is principally due to the absorption of heat-rays from the sun. In places the water is heated by contact with warm air, but this source of heat is of less importance, the temperature of the surface-water being, as a rule, higher than the temperature of the air. The sun's rays penetrate into the water and are absorbed; the dark heat-rays are absorbed in the uppermost layers, while the light rays, which also convey a little heat, make their way down to a depth of several hundred metres before disappearing altogether. The action of the sun's rays is strongest in the tropics, declining towards the north and south, and this in a general way explains the distribution of the surface-temperature.

Absorption of heat at the surface of the sea.

A fine example of the heating action of the sun's rays is afforded by the Norwegian oyster-basins. Along the west coast of Norway there are in many places salt-water basins, separated from the outer fjord by a sill, which is covered only at high water. At the surface the water of the "poll"—as such a basin is called in Norway—is comparatively fresh, and consequently light; from a depth of about one metre to the bottom it is very salt and heavy. The sun's rays in summer penetrate into the water and heat it, mostly at the surface, but also to some extent down to a depth of a few metres. The surface-water is cooled during the night, but at a depth of one or two metres beneath the surface the heat will not be given off so readily, because the heavy water there does not reach the surface. When this has gone on for some time, the temperature at a depth of a few metres may be remarkably high, sometimes fully 35° C., while the temperature at the surface might be about 20° C. In these "polls" the surface-layer of relatively fresh water prevents the layers below from coming into contact with the cooling air, and such polls may indeed be compared to hot-houses, the fresh surface-layer corresponding to the fixed transparent roof, under which heat is stored.¹ In these oyster-basins absolutely tropical conditions are developed in summer. It is significant that Gran once found in one of them a small crustacean, which according to G. O. Sars belongs to the Guinea Coast. Fig. 158 shows the temperatures and salinities in an oyster-basin in the early part of the summer before

Storage of heat in closed basins.

¹ Compare Murray and Pullar, *Bathymetrical Survey of the Fresh-Water Lochs of Scotland*, vol. i. pp. 580, 581, and 587, Edinburgh, 1910.