and quite polar lakes, which as a rule are covered with ice throughout the year. Between these two extreme limits all conceivable transitions occur.

It may further be mentioned that the annual range of temperature variation for all the lakes of the zone is slight, and for many probably slighter than in any other zone. In the Scottish mountain lakes at the surface the yearly temperature variation is only about 5–13° C. (Loch Ness, 41°·5–56°·3 Fahr., Wedderburn, 1907a, p. 412); for certain Norwegian high mountain lakes only about 0–2° (Holmsen, 1902); Thingvallavatn 1–11°, Myvatn 0–12½° (Wesenberg-Lund, 1906, pp. 1105 and 1140); Mjösen 0–12° (Pettersson, 1902, p. 14); Huitfeldt-Kaas, 1905, reports 17°·3, but this temperature hardly occurs every year; Ladoga 0–9°·9; Wettern 0–13°·32 (Pettersson, 1902). The ice phenomena of Norway have been specially studied by Holmsen in his fundamental work (1902), by Ahlenius (1900, p. 28); see further Holmsen (1902, pp. 1–15); owing to the more special character of this exceedingly interesting literature it is merely mentioned here.

This comparatively low summer temperature is common to all the lakes of this zone; only exceptionally it may probably exceed 12–14° C. The bottom temperature of many of the deep lakes does not sink below 4° C. In the temperate lakes of the northern European zone we find two periods of circulation (spring and autumn), separating a long winter period of stagnation from a short summer period of stagnation; during the greater part of the year "*inverse stratification*" prevails. In these lakes we meet with the so-called "Sprungschicht," which only exceptionally occurs in the lakes of the arctic zone, and at any rate has hitherto hardly been discerned there. Ahlenius found it in Saggat lake, about 68° N. lat. (1900, p. 35). In many cases, at any rate, we may account for the formation of a "Sprungschicht" in the following way:—The variations in the temperature of the air, day and night, are now so great throughout such long periods of the summer half-year that uniform heating of the surface water is no longer possible. Owing to the cooling of the surface at night and during periods of cold weather, vertical currents which equalise the temperature arise; in different seasons they reach different depths. Above these depths a somewhat uniform temperature is consequently met with; below them the temperature slowly decreases towards the bottom. The decrease in heat proceeds more slowly the deeper the water, most quickly at the upper limit, *i.e.* nearest the lower limit of the upper uniform, warm layer. Here the variations in temperature may be so great that they proceed by jumps, and therefore this layer, according to the usage introduced by Richter, is generally called "Sprungschicht" (thermocline by the Americans).