1957b), showed that adaptations to zonal-geographical conditions were based primarily on inherited differences in the photoperiodic reactions of different geographical populations. As that conclusion involved a number of important ecological consequences, it became necessary to make more extensive comparative studies of intraspecific geographical variability in the physiological adaptations of insects.

The question of intraspecific physiological differentiation is interesting also on a wider scale because of the problem of speciation. Geographical variations in insects have been studied mainly from the morphological point of view. Much information has been accumulated in that field, but it has not yet been adequately analysed. Data on the variation of physiological features, on the other hand, are very limited not only for insects but also for other groups of animals, as is seen from reviews of the problem of intraspecific variation (PROSSER, 1955, 1957; MAYR, 1947). At the same time, in definitions of the concept of species it is always stressed that a species is a system circumscribed not only morphologically but also physiologically. Although the morphological criteria of a species have by now been adequately defined, the question of physiological characteristics of a species is still not clear and calls for specialized experimental investigations.

1. Intraspecific geographical variation in photoperiodic reactions

Fig. 30 shows the results of parallel investigations, at a constant temperature of 23°, of photoperiodic reactions in four geographical populations of *Acronycta rumicis*, taken at different points of its range at approximately every 5° of latitude from the Black Sea coast of the Caucasus to Leningrad province. The day-length which induces diapause in the populations studied varies regularly and very markedly with the geographical location, forming a consecutive series. Its lowest value—14 hours 30 minutes—is found in the most southerly Abkhazian population (43°N.). For the Belgorod population (50°N.) the critical threshold is about 16 hours 30 minutes, and for the Vitebsk population (55°N.) about 18 hours of light per day. The Leningrad population (60°N.) occupies the outermost position in the series. It is characterized not only by a very high value for critical day-length—more

than 19 hours—but also by a clearly-manifested tendency to hereditary monocyclism, as a result of which a considerable proportion of the pupae enter diapause even in light lasting from 20 to 24 hours a day.

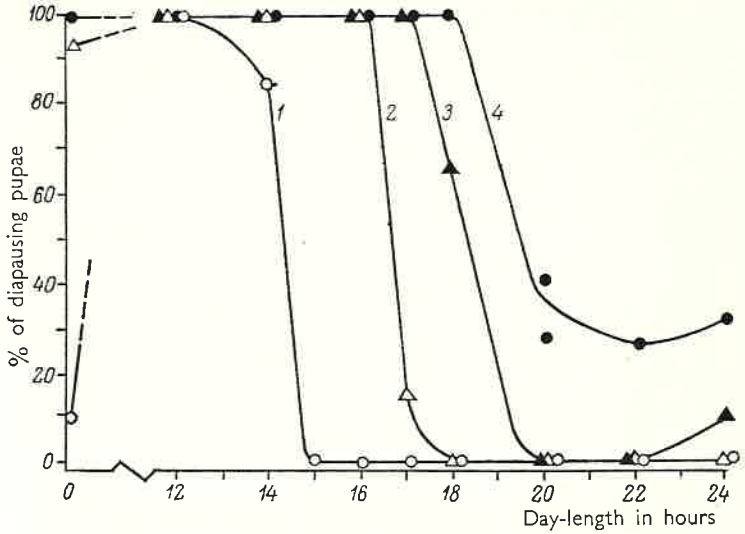

FIG. 30. The geographical variation in the photoperiodic reaction in *Acronycta rumicis*. Temperature 23°.

Populations: 1, Abkhazian (43°N.); 2, Belgorod (50°N.); 3, Vitebsk (55°N.); 4, Leningrad (60°N.).

Thus for every 5° of latitude the critical threshold changes by approximately 1½ hours. We have noted above the significance of this change. As the conditions of all experiments were uniform, it is evident that the observed differences in photoperiodic reaction are due to inherited physiological characteristics of the populations. Each population may in that case be looked upon as a separate and individual ecotype or a local race.

A very similar situation was observed in geographical populations of *Barathra brassicae*. Of the forms studied, the extreme examples came from Adzharia and Leningrad province; two intermediate forms came from adjacent districts of the forest-steppe zone—Sumy and Belgorod—in the same latitude (50°N.). All larvae were reared simultaneously at a temperature of 25°.