The Effect of Moisture upon the Distribution of Insects in Logs

One of the important factors affecting insects in logs is moisture. From the beginning of these experiments the importance of this factor was recognized, but unfortunately the difficulties involved in the frequent and accurate measurement of the moisture conditions in different parts of the logs were

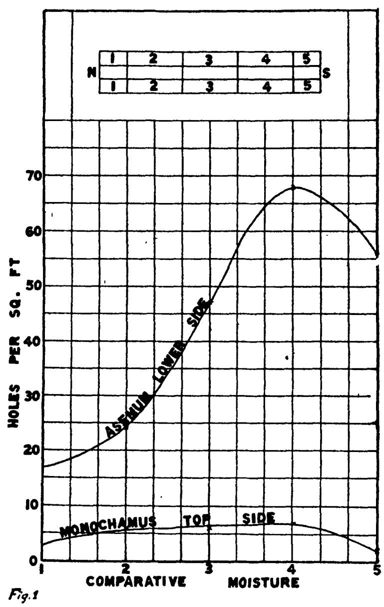


Fig. 1. Effect of moisture upon the abundance of *Asemum* and *Monochamus* in different parts of a log.

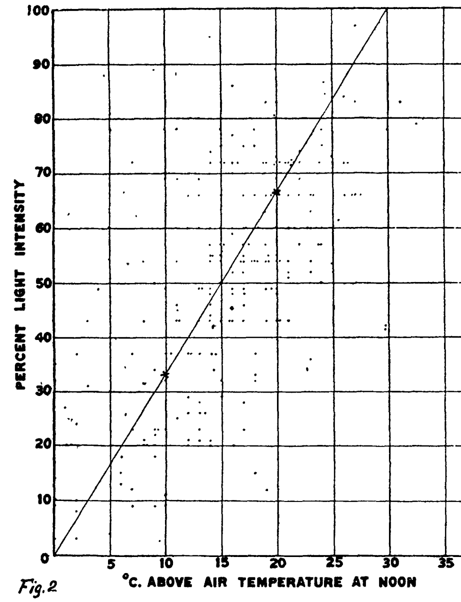


Fig. 2. Correlation of light intensity and sub-cortical temperature in white pine logs.

never overcome. It was possible, however, by raising one end of each log off the ground, to produce a moisture gradient that would show in a rough way the effect of this factor upon the organisms in the log. The lower side of the south end of each log, where it rested upon the ground, approached the point of water saturation whereas the raised north end was comparatively dry. On the upper side of the log it was impossible to maintain an extremely high moisture content in any part; but a moisture gradient, less steep than on the lower side, existed between the ends and the part between. The existence of these moisture gradients is almost obvious, but the point was checked by weighing, evaporating to dryness and again weighing samples from different parts of the log. It was found that the moisture content of the logs varied from day to day depending upon atmospheric conditions. For this reason the data on the effect of moisture here presented are comparative, and although they do not represent a definite or constant degree of moisture, the relative conditions in the different parts of the log are clearly shown.

perature of all log inhabiting insects. The temperature on the lower side is much more uniform and follows that of the air rather closely. The subcortical temperature is affected by the intensity of solar radiation, the angle of incidence of the sun's rays, the color, thickness and structure of the bark, evaporation from the bark surface, air movement, relative humidity and the temperature of the surrounding air. But the intensity of solar radiation appears to be by far the most important of all of these.

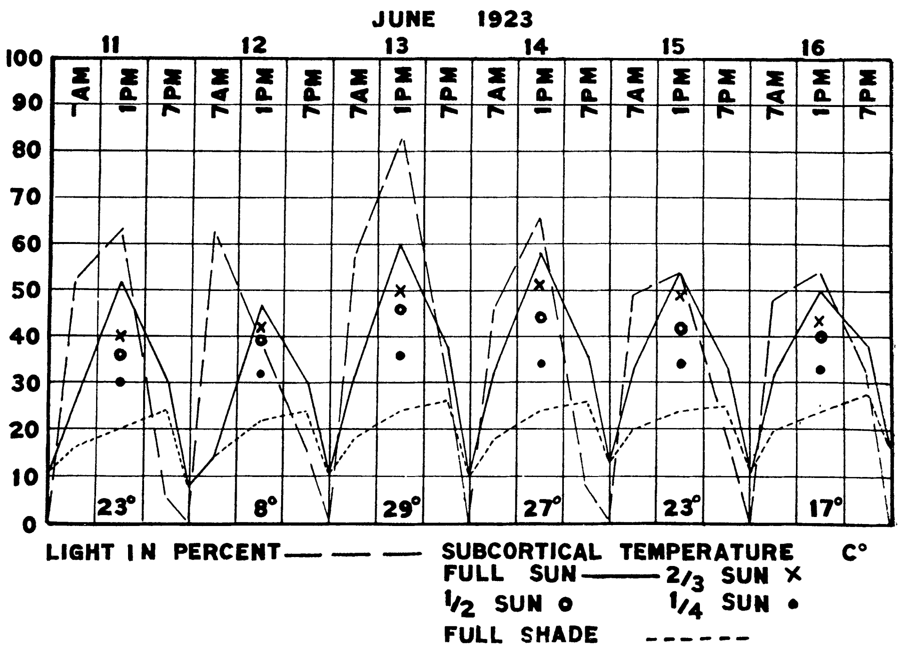
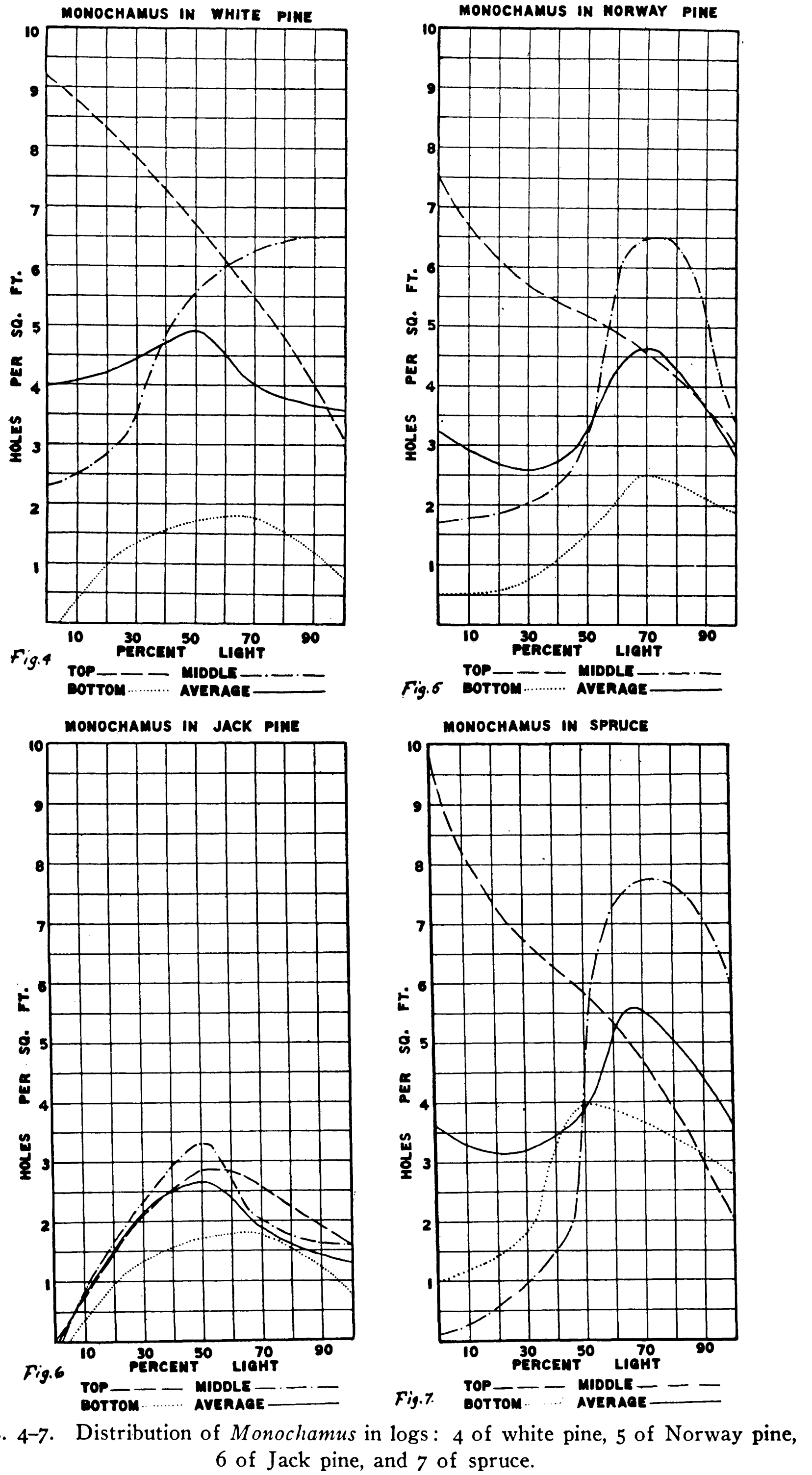


FIG. 3. Range of sub-cortical temperature of logs in various shade conditions as related to light intensity on six successive days.

Figures along bottom of graph indicate the maximum excess of sub-cortical over air temperature in degrees C.

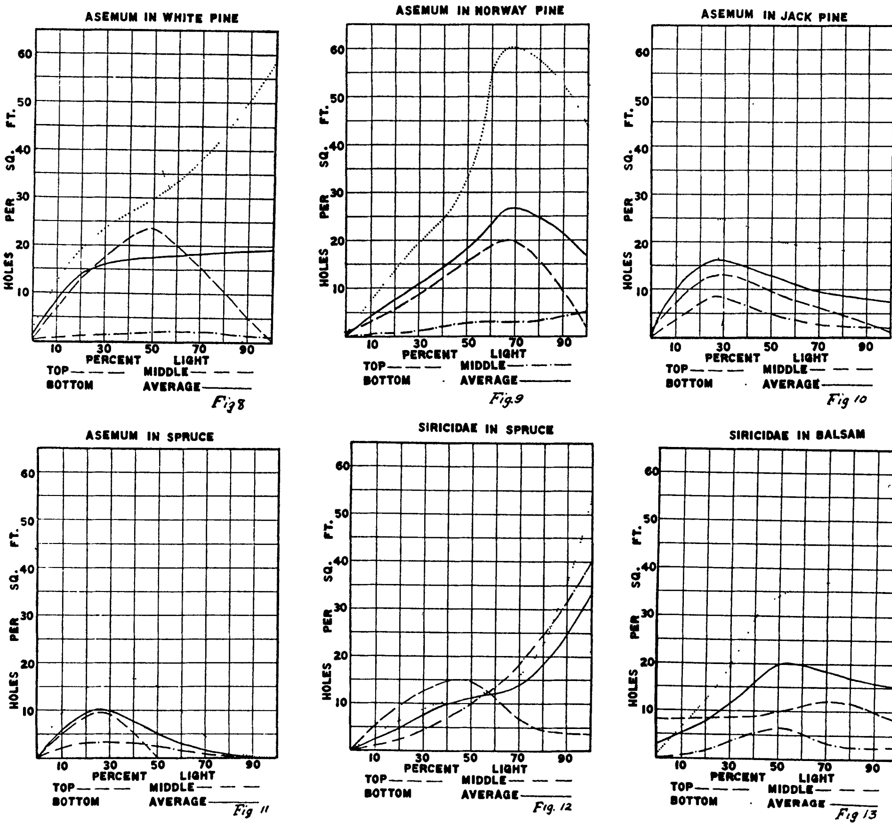
Figures on left represent temperature in degrees C. and light intensity in per cent of an arbitrarily adopted standard.

Figure 2 shows the correlation between the intensity of solar radiation and the amount by which subcortical temperature on the upper side of white pine logs exceeds air temperature at noon. Figure 3 shows the relation of light intensity and subcortical temperature of white pine logs on six consecutive days in June, 1923. This graph illustrates the comparative temperature in similar logs under different environmental conditions. It is apparent at a glance that there is a distinct gradation in temperature from full sun to full shade. It should also be mentioned that the subcortical temperature on the



FIGS. 4–7. Distribution of *Monochamus* in logs: 4 of white pine, 5 of Norway pine, 6 of Jack pine, and 7 of spruce.

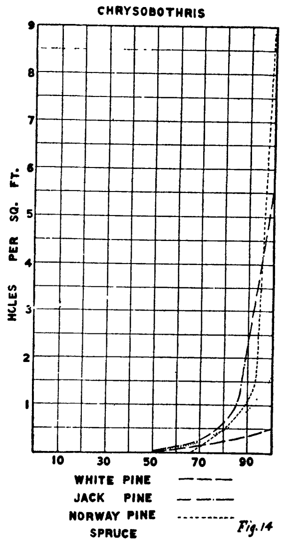
The next group of figures illustrates the distribution and abundance of *Asemum* under different conditions. Figures 8, 9, and 10 show conditions in white, Norway, and jack pines and figure 11 the distribution of this genus in spruce logs. This Cerambycid occurs most abundantly on the under side of

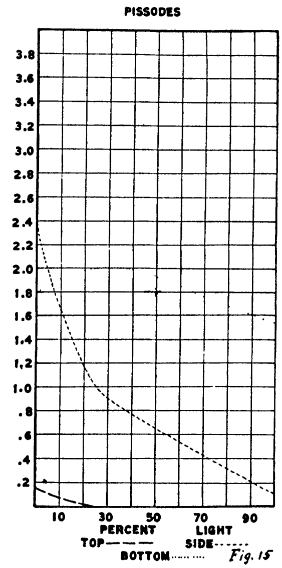


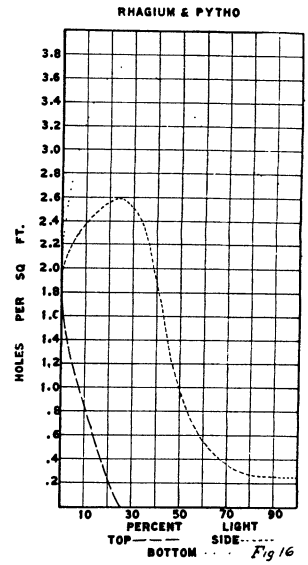
FIGS. 8–13. Distribution of *Asemum* and Siricidae in logs: 8–11, *Asemum* in white pine, Norway pine, Jack pine and spruce respectively; 12–13, Siricidae in spruce and balsam respectively.

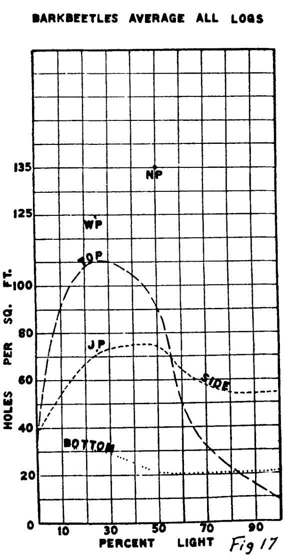
logs in full sun and more rarely on the upper portions of logs in partial shade. Under complete shade the infestation is reduced to practically nil. Both moisture and temperature appear to play important parts in regulating within the logs the distribution of this genus of beetles.

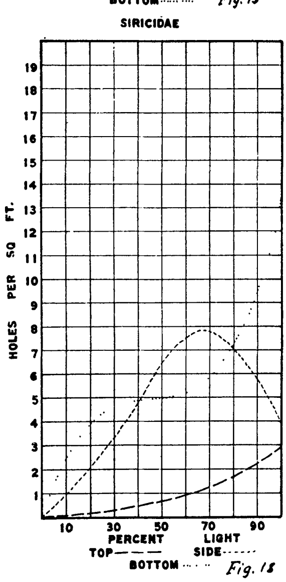
The Siricidae work deep in the wood and are for this reason much less subiect to sudden temperature changes than are the other insects thus far considered. They do, however reflect to a lesser degree the same reaction to high temperatures on the upper side of logs in full sun as do the others. Also

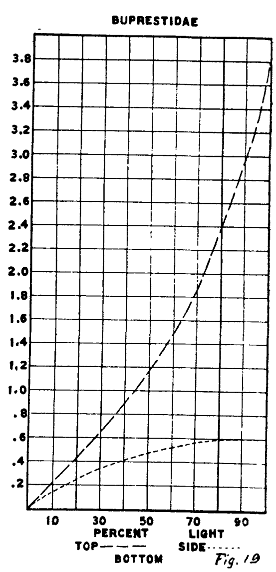












FIGS. 14–19. Fig. 14, distribution of *Chrysobothris* in logs of white pine, Jack pine, Norway pine and spruce. Fig. 15, distribution of *Pissodes* based on exit holes per square foot. Fig. 16, distribution of *Rhagium* and *Pytho* based on exit holes per square foot. Fig. 17, distribution of bark beetles based on exit holes per square foot; curves represent the average in all spruce and pine logs; dots and letters show maximum abundance, N.P. in Norway pine logs, W.P. in white pine, and J.P. in Jack pine. Figs. 18 and 19, distribution of Siricidae and Buprestidae, respectively, based on exit holes per square foot.