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ZOOLOGY

AN INVESTIGATION OF POSSIBLE COMMENSALISM IN RED SQUIRRELS, YELLOW-BELLIED SAPSUCKERS, AND HUMMING-BIRDS AT THE LAKE ITASCA BIOLOGICAL STATION

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INTRODUCTION. This is an investigation of a relationship noted at the Lake Itasca Biological Station. It was noted that the Red Squirrel, *Tamiasciurus hudsonicus*, in some locations spent a considerable amount of time lapping sap from the rows of holes drilled in the White Birch, *Betula papyrifera*, by the Yellow-bellied Sapsuckers, *Sphyropious varius varius* (L.). After the invasion of the red squirrel the sapsuckers and the Ruby-throated Hummingbird, *Archilochus colubris* (L.) continued to utilize the same food supply as well as a considerably number of insects. The two general objectives of this endeavor were then to investigate some of the related ecological factors and to gain observation data to aid in determining the status of this relationship. Odum (1959) defines commensalism as a relationship that requires a mutual aid for survival. Guyer (1948) refers to commensalism as being an association of messmates. By noting all of the animals concerned it was hoped it could be determined if this was a true commensal situation.

The area under consideration was located in Clearwater County in Lake Itasca State Park. The study of the problem was restricted to the University of Minnesota Biological Station and the point of land extending into Lake Itasca known as Bear Paw Point.

METHODS AND MATERIALS. An outline for field maps was obtained by enlarging an aerial photograph the campus and Bear Paw Point. The existence of trails on the point also aided in studying the area for active sapsucker trees. Actually to locate the active sapsucker trees the peck or call of the sapsucker, the chatter of a red squirrel, and the flight of the sapsucker and hummingbird proved extremely useful. A check of bird census and student reports from previous years of the station also yielded possible sapsucker locations. Bent (1939) refers to the fact that sapsuckers return year after year to the same tree, but not necessarily to the same hole.

To obtain data on the affected trees data was collected on the

diameter at breast height (dbh), species of the tree ,location of the tree, herbs and shrubs surrounding the tree, height of the tree, height of the affected area, and associated trees. These associated trees were those that had canopy contact with the affected tree or were within two meters. The latter number thought to be the extreme for the squirrel's leaping was in reference to the distance between trunks, At the base of each affected tree a 2.5 meter radius was studied for shrubs, herbs, and ocular percentages obtained on mosses, bare ground, etc. according to Phillips (1959) methods. A clinometer was used to determine the heights of the trees and affected trees.

The observation of animals involved in this relationship required the use of a 6 × 30 binoculars, a 27× tripod mounted telescope and a reflex 3.5 camera.

RESULTS. The attempt here is to compare the trees affected by sapsuckers alone with those that are affected by the full complement of commensals. Two active commensal trees were located, one in white birch and one in American elm. Two other active commensal trees were found on the Lake Itasca Camp Grounds but as this was outside of the prescribed area they are not included in this report. A total of eighty-one trees were found that had been or were currently being worked upon by sapsuckers. The relative percentages of the trees affected were 79% *Betula papyrifera*, 12% *Ulmus americana*, 4% *Populus tremuloides*, 2% *Picea glauca*, 1% *Populus balsamifera*, and 1% *Tilia americana*. A comparison of the height of the sapsucker workings on the affected trees was 18.8 feet and the average dbh was 8.3 inches. The height for the workings on the commensal trees was 27 feet and the dbh 9.7 inches. The contact trees had a dbh of 7.4 inches which was the smallest of the three, commensal trees 9.7 inches and sapsucker affected trees 8.3 inches.

The ocular estimate of the 2.5 meter radius around each tree yielded the following results. Affected trees had 58.6% shrubs, 73% herbs, 5% mosses and bare area 19.9%. The commensal trees had 35% shrubs, herbs 80%, mosses and bare area 15%. The species of shrubs and their percentages were *Rubus strigosus* 61%, *Corylus cornuta* 43%, and *Amelanchier* sp. 42%. Herbs and relative percentages were *Carex* sp. 64%, *Gramminae* sp. 73%, *Thalictrum dioicum* 68%, *Aralia nudicaulis* 67%, and *Aster macrophyllus* 65%. There weren't any significant differences between the affected trees and the commensal trees in the shrubs and herbs studied.

A log was maintained of the arrival and departures of the various members of the supposed commensal. The visits of the sapsuckers and hummingbirds are very erratic and apparently did not conflict with the eating habits of the squirrels. They were all noted to be at the same tree at the same time but were on opposite sides of the tree utilizing the holes that ring the tree. Insects were noted at the holes nearly all of the time. The weather in which most activity was noted were sunny days, little or no wind, and 70° F. Rainy days did nearly stop all of the action. The earliest notation of the full

complement was 5:40 A.M. and as late at 7:15 P.M. (Central Standard Time).

DISCUSSION AND CONCLUSIONS. This same observation has been reported by Roberts (1938) and Bent (1939). They suggest that the sap may be slightly fermented and a form of intoxication occurs. Certainly water availability may be a factor influencing an animal to resort to sap lapping. Keeble (1910) also points out that the transfer from independence to dependence may be the outcome of scarcity. This would appear to be a case of facultative commensalism if any suggestion can be advanced on the meager data accumulated from the two commensal trees. Further investigation is necessary to substantiate or disprove that this is true commensalism. Intra-species conflict was observed within a squirrel family, but no inter-species conflicts were observed.

The study of the ecological central indicated little difference between the active commensal trees and the remaining affected trees. The shrubs and herbs identified around both types of trees did not differ. The heights of the workings and the heights of the trees were as diverse as the species observations. From the little data collected the commensal trees were slightly larger in diameter.

Several questions have arisen in the course of the investigation. Are these areas active at night? To what extent are the members of this association dependent upon this food source? Do insects utilize this for the development of larvae? Is the sugar content of this sap different from that of unaffected trees? Are the sapsucker workings causations or effects? To future investigators these questions and the few observations mentioned might prove of some value in the judging of what might be the beginnings of a dependent animal which could ultimately become parasitism.

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