

that its population is composed of old fish which are probably not reproducing.

II. Rate of Exploitation

Apparently the largest pond on Third Creek experienced very light fishing pressure during the latter part of the summer, 1961. A mailbox posted near the pond failed to record a single fisherman response. Less than 200 fish would not be expected to produce a high yield. During the three previous fishing seasons fishing pressure and success were apparently relatively greater.

III. Age-Growth Determination

Scale samples for age-growth analysis were taken from all fish native to Third Creek that were caught in the course of the mark and recapture program. These scales have yet to be analyzed.

IV. Stomach Content Analysis

Stomach samples were taken from all trout native to Third Creek that were taken during the gill netting. Contents of these stomachs were determined. Midge larvae, cladocerans, snails, and freshwater shrimp were present in greatest proportions.

A complete analysis of data collected during this study will be forthcoming.

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Comparative Ethology of Digger Wasps of the Subfamily Nyssoninae

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This research is part of a long-term project in which it is hoped to make a detailed comparison of the behavior of as many species as possible of the subfamily Nyssoninae, in the hope of drawing deductions regarding the evolution of specific behavioral components in this complex.

Bembix amoena is a species of particular interest, since it is structurally one of the more primitive members of the genus. This species is widely distributed west of the Rockies, occurring chiefly at moderate altitudes and in areas of bare, coarse, gravelly soil. I did not locate any colonies at Jackson Hole, but I found it nesting in many places in Yellowstone, all of them near areas of thermal activity. Apparently the species finds the pulverized limestone and geyserite around such areas particularly suitable for nesting; possibly it is able to flourish at these altitudes (6800-7500 feet) because of the warming effect of the hot springs and geysers.

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Most work was done on two large colonies near the south entrance of Yellowstone, 22 miles north of the Station. One colony was situated very close to some hot springs and was already well advanced in its nesting by mid-July. The other colony was some distance from thermal activity and was just beginning to nest in mid-July; this colony was still active in mid-August, although the other colony was by this time dormant. The species has only one generation a year at Yellowstone. Observations were made on mating, nest excavation, oviposition, provisioning, nest closure, and several other aspects of behavior. It is impossible to review all of these observations here, and in any case they are not overly meaningful except when compared with other species of this group. Suffice it to say that the most striking feature of the behavior proved to be the unusual amount of variation in such features as cell depth, presence or absence of a "false burrow", details of final closure, etc. Many features that are stereotyped in other species of Bembix seem in amoena to be highly plastic, and it is easy to imagine some of the fixed behavior patterns of other species as having evolved from aspects of the variable behavior of amoena. However, further study of the notes and specimens gathered will be necessary before any real conclusions can be drawn.

Considerable attention was also directed toward a population of Steniolia obliqua at and near the Station. This species clusters on vegetation, and a preliminary study was made of several clusters on Pinus, Helianthus, and Potentilla. The cluster on pine was found to contain 162 individuals (91 females, 71 males) when counted on July 19; thereafter the cluster declined steadily in numbers and came to contain a higher percentage of females, eventually all females. Some individuals in this cluster were found clustering up to a mile away (all were marked with fingernail polish when counted); also many unmarked individuals eventually joined the cluster on pine. It appeared that the main function of the clusters is to bring the sexes together, for much mating occurs at the cluster in the late afternoon. Experiments are needed to determine what factors are involved in causing the wasps to cluster repeatedly on the same branch or the same plant.

The females of Steniolia obliqua nest in coarse, bare soil, often at some distance from the points of clustering. They tend to nest solitarily rather than in dense colonies like Bembix, but in suitable spots several females may nest rather close together. The nests are unicellular and very shallow, the cells being only 2-3 inches beneath the surface. Provisioning is progressive, and the prey consists entirely of bee-flies (Bombyliidae). A short motion picture was made of some aspects of the behavior of this species, and many still pictures were taken both of this species and Bembix amoena.

In addition, brief studies were made of the nesting behavior of species of other genera of digger wasps, including Gorytes, Nitela, Podalonia, Ammophila, Astata, Episyrion, and Pompilus. Also, collecting was done at various points in order to determine the species of wasps present. In all, some 1,500 specimens were collected, and it is hoped eventually to identify these specimens and to prepare a preliminary list of the wasps of Jackson Hole, with ecological and ethological annotations.

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