

ECOLOGY

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ABSTRACTS

The Flora and Vegetation of the Big Chapman Lake Wetlands, Kosciusko County, Indiana. JAMES R. ALDRICH, Division of Nature Preserves, Indiana Department of Natural Resources, Indianapolis, Indiana 46204.——A preliminary species list is presented and the natural communities of this outstanding northern Indiana wetland are discussed. The natural communities present here include an extensive cattail-bullrush marsh dominated by *Typha latifolia* and *Scirpus acutus*. Two small natural ponds dominated by yellow pond lily (*Nuphar advena*) occur within this marsh. Also present is the marl beach prairie dominated by shrubby cinquefoil (*Potentilla fruticosa*), Canadian rush (*Juncus canadensis*) and twig rush (*Cladium mariscoides*).

The Roles of Dispersal and History in Amphibian Communities. SPENCER CORTWRIGHT, Department of Biology, Indiana University, Bloomington, Indiana 47405.——Competition and predation frequently are studied as important factors determining the relative abundance of species in natural communities. The roles of history and dispersal are studied less often. The discrete nature of amphibian pond communities (where larval interactions take place) and terrestrial dispersal of juveniles and adults make them ideal for the study of dispersal and history. In south central Indiana, man-made ponds are common in oak-hickory-maple forests. The study site consists of 32 ponds (31 permanent). Twenty-nine ponds are 20 years old. Three ponds are at least 50 years old. One old pond contains reproducing populations of four species of amphibians relevant to this study. Three species are salamanders (*Ambystoma jeffersonianum*, *A. maculatum*, and *Notophthalmus viridescens*) and one is a frog (*Rana sylvatica*). Ponds radiating from this old pond contain no clear pattern of abundance for three species (all except *A. maculatum*). These three species have dispersed throughout the area and may be adjusting population size to the biotic and abiotic conditions of individual ponds. *Ambystoma maculatum* progressively declines, including the other two old ponds, both in numbers of adults and densities of larvae until the furthest ponds have no, or non-detectable, populations. The equilibrium relative abundance of species, if one exists, must await dispersal and history to unwind in this metacommunity of amphibian ponds. Nonetheless, deterministic predictions can be made. For example, ultimate densities of *A. maculatum* are predicted to be greater than *A. jeffersonianum* in ponds with predators since embryonic and early larval predation appears higher on *A. jeffersonianum*. Experiments are proposed to test this aspect of community structure.

Does the Starvation of Red-winged Blackbird (*Agelaius phoeniceus*) Nestlings Benefit the Surviving Nest Mates? JAMES D. HENGVELD, Department of Biology, Indiana University, Bloomington, Indiana 47405.——The brood reduction hypothesis suggests

that when there is not enough food to raise an entire brood in healthy condition, selective starvation of the smallest nestling(s) reduces the brood to a size that matches parental food-gathering ability. In an Indiana population of Red-winged Blackbirds, the loss of young through starvation is substantial. However, chicks surviving from nests that have experienced starvation leave the nest significantly lighter than chicks from starvation-free nests. To determine if the loss of a nestling is beneficial to its surviving nest mates, the critical issue is not a comparison between young from reduced and complete broods, but rather a consideration of whether survivors of reduced broods grow better than they would have had their sibling(s) not starved. During the 1984 and 1985 breeding seasons, I addressed this question by substituting healthy young of the appropriate age for starved young in half of the nests in which brood reduction occurred. Chicks from experimental nests (nests with substitutions) fledged at lower weights than chicks from control nests indicating that the loss of the nestling(s) through starvation may permit siblings to gain more weight while in the nest and perhaps survive better out of the nest. (Supported in part by a grant from the Indiana Academy of Science.)

A 1984 Diet Evaluation for Salmonids from Indiana Waters of Lake Michigan. THOMAS S. MCCOMISH, Department of Biology, Ball State University, Muncie, Indiana 47306.—Stomach contents were examined for salmonids caught by sport fishermen from May through September in Indiana waters of Lake Michigan. Most samples were collected during fishing derbies or times of significant fishing activity. The 1984 data on salmonid food habits were compared to 1970 data (McComish and Miller 1976) for the same species and sample area. This project was part of a lake-wide Sea Grant investigation to document possible changes in salmonid diets involving alewives (*Alosa pseudoharengus*).

A total of 129 coho salmon (*Oncorhynchus kisutch*) stomachs were collected. Their food was composed mainly of alewives (33%), rainbow smelt (*Osmerus mordax*) (36%), and yellow perch (*Perca flavescens*) (20%). By contrast, in 1970 they consumed almost exclusively alewives.

More chinook salmon (*Oncorhynchus tshawytscha*) stomachs were collected ($n=255$) than any other salmonid. They consumed alewives (58%), yellow perch (26%), and bloater (*Coregonus hoyi*) (8%). In 1970 they consumed exclusively alewives.

A total of 166 steelhead (*Salmo gairdneri*) stomachs were collected. Their food included about equal quantities of alewives (50%) and yellow perch (49%). No comparative data were available for 1970.

Fewer lake trout (*Salvelinus namaycush*) stomachs ($n=98$) were collected than any other salmonid. They ate mainly alewives (57%), rainbow smelt (25%), and yellow perch (18%). This compares with a 1970 diet composed exclusively of alewives.

No size selection of prey items was found when comparing length of forage species consumed with length of salmonid species. It is apparent that salmonids are consuming forage without discriminating by size.

The Lake Michigan predator and prey relationships are in an obvious state of change in Indiana waters. The future of the salmonid sport fishery probably depends on the ability of the salmonids to utilize changing forage base.

The Non-calling Male Tactic in the Northern Cricket Frog, *Acris crepitans*. MICHAEL MAGIER AND STEPHEN PERRILL, Department of Zoology, Butler University, Indianapolis, Indiana 46208.—Non-calling male behavior is described for the northern cricket frog, *Acris crepitans*. This non-calling behavior has been identified in a number of anurans and is referred to as the satellite tactic. Two hypotheses have been suggested for the function of this tactic: 1) non-calling males are waiting for call sites to be

vacated by the calling males, and 2) non-calling males are waiting to intercept females on their way to calling males. To test the second hypothesis we 1) located a satellite association, 2) observed the association for ten minutes or longer to be sure it was a stable relationship, and 3) released a gravid female 50 cm from the association, at a point equidistant from the caller and non-caller. Five of these field experiments were performed with four of the non-calling males attempting to amplex a female and two of these successfully amplexing a female.

Mating Behavior and Sexual Selection in the Gray Treefrog (*Hyla chrysoscelis*). MOLLY R. MORRIS, Indiana University, Bloomington, Indiana 47405.—The mating behavior of *Hyla chrysoscelis* was examined in terms of sexual selection. Both the selection of mates by females (female choice) and male-male competition for mates can play important and confounding roles in determining mating patterns observed in the field. The purpose of this study was to ascertain the importance of sexual selection in determining mating patterns by either demonstrating female choice, and identifying the factors influencing this choice, or by determining factors important in male-male competition. Two populations of gray treefrogs were observed for the breeding season of 1984 and 1985. The location and behavior of marked males were monitored nightly. The results indicate that females are choosing the largest male from within a small subgroup of closely associated males. The size distribution of males found at the pond varied from night to night, and larger males were more highly represented both early and late in the season. The implications of analyzing mating patterns at the appropriate level will be discussed.

Can Diets Affect Frog Distributions? CRAIG E. NELSON, Department of Biology, Indiana University, Bloomington, Indiana 47405.—Many frogs are food generalists and diet may have little effect on their distributions. In contrast, 23 of 29 species of New World microhylines studied were food specialists. Specializations include: 90% of prey were ants or termites; these were usually 24 mm in length; larger ants eaten were usually stingless and without powerful bites; and, usually, only one or two species were eaten in one bout (suggesting feeding at aggregations). These species were specialists over a broader size range, showed little geographic variation in diet, and were altitudinally and latitudinally restricted.

Why Should a Flower Scare its Pollinators? G. A. ROMERO AND CRAIG E. NELSON, Department of Biology, Indiana University, Bloomington, Indiana 47405.—*Catasetum* is a neotropical orchid genus pollinated by euglossine bees. It has separate male and female flowers and it presents perhaps the most striking case of sexual dimorphism in advanced insect pollinated flowers. Male flowers forcefully place a large compound structure (the pollinarium) on their pollinators. The pollinarium includes two pollen masses and an adhesive disk. Evidence shows that this forceful emplacement leads to pollinators avoiding visually similar flowers. Morphologically distinct female flowers, then, increase the probability of pollination. The placement of a second pollinarium on a bee is likely to disable the first one. Consequently, we propose that forceful emplacement is maintained because it decreases competition between male flowers and that this has led to the development of sexual dimorphism.

The Relationship between Weed Community Development and Tillage Type in Grant County, Indiana Field Corn Plantings. EDWIN R. SQUIERS AND CYNTHIA J. KRAUSS, Department of Biology and Environmental Science, Taylor University, Upland, Indiana 46989.—The relationship between tillage type and weed community develop-

ment was investigated in corn plantings on the experimental fields of the Miller Purdue Agricultural Center 2 miles east of Upland, Indiana during the summer of 1985. The conservation tillage techniques of paraplow and no-till were compared with traditional moldboard plowing on a pair of 360 ft. x 1200 ft. fields. A randomized complete block design was established with four replicates of each of the three tillage types. The weed community was assessed using four strip samples of ten plots each within each of the replicates yielding 480 plots across the experimental design. Analysis of variance was used to compare weed species frequency data within and between tillage types. The results indicated significant differences in the weed communities that develop in response to each tillage type; for example, *Taraxicum officinale* was significantly more abundant under both conservation tillage types, while *Digitaria sp.* was more abundant under moldboard cultivation. This study suggests that new weed control strategies may be required as farmers move to adopt the variety of new conservation tillage methods.

Density-dependent Mortality and Distribution of Eggs by the Goldenrod Gall Fly, *Eurosta solidaginis*. ROD WALTON, Department of Biology, Indiana University, Bloomington, Indiana 47405.—*Eurosta solidaginis* females despoit eggs singly on growing tips of *Solidago altissima* during a brief period in the spring. After hatching, first stage larvae burrow into the meristem of the plant and initiate the formation of a spherical stem gall. The larvae within galls develop over the remainder of the year, during which time they are extremely vulnerable to predation and parasitism. Insofar as predation on larvae may depend on gall density, we might expect the gallmaker to distribute eggs in space in such a way as to minimize the effectiveness of the searching predator. In order to address this question, a study of *E. solidaginis* distribution and sources of mortality was undertaken. The major source of mortality for the gallmaker was unidentified larval death. Some possible causes are discussed. Next in importance was predation by Mordellid beetle larvae, and in some years, winter predation by downy woodpeckers. Two Hymenopteran parasitoids, *Eurytoma gigantea*, and *E. obtusiventris* were always present, but in very low density. A weak trend toward a maximum predation rate at intermediate densities was found for the major predators and for total predation. Mapping studies and statistical analysis of the distribution of galls in two areas of southern Indiana during 1982-84 suggest that female gallmakers do in fact avoid placing eggs in densities at which predators are maximally efficient. These results are discussed in light of Fretwell's ideal free distribution model: organisms are expected to adjust their distribution so as to equalize fitness at all locations. In this study, the survival component of fitness was found to conform to the prediction.

Acoustical Signals in the Northern Cricket Frog, *Acris crepitans*. STACIA YOON AND STEPHEN PERRILL, Department of Zoology, Butler University, Indianapolis, Indiana 46208.—The acoustical signals of the male cricket frog (*Acris crepitans*) are complex. We analyzed the standard mating call and correlated features of the call with temperature, time of night, frog size and mating behavior. In addition, calls were recorded and compared under three conditions: 1) undisturbed, spontaneous calling; 2) solicited calling response to broadcasted conspecific calls; 3) solicited calling given when a gravid female was released under a calling male. The behavioral roles of various features of these signals are considered with regard to male fitness.