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IMPLICATIONS OF WINTER DENNING HABITS OF SKUNKS IN THE TRANSMISSION
POTENTIAL OF RABIES

This study is part of a rabies research and control program of the Ontario Ministry of Natural Resources which is investigating the ecological setting of rabies vectors and attempting to provide an oral rabies vaccine-baiting delivery system for wild animals. The specific objective of the skunk denning study is to understand the role winter denning and movement may play in animal interaction, intra- or inter-specific, and rabies transmission.

During November 1979 - March 1980, 8 striped skunks (*Mephitis mephitis*) were radio-tracked bi-weekly to determine activity and den characteristics. Dens were located, described and visited weekly to observe any movement or activity by dens through backtracking skunk tracks in the snow. Other dens were located in this manner.

Preliminary results indicate that skunks utilize several (2-4) dens in an area during this time. Distances between dens range from 10 - 1500 metres. Results indicate a high interaction potential for rabies transmission. This particularly mild winter also provided greater skunk movement and interaction which consequentially increased skunk rabies cases.

Movements, activity patterns and denning habits of striped skunks (*Mephitis mephitis*) and the exposure potential for disease by C. W. Houseknecht, Ph.D. Thesis (Univ. of Minnesota), June, 1971.

BALKHILL, E.D. and G.R. CARMODY. Dept. of Biology, Carleton University, Ottawa, Ontario.

A SEARCH FOR HIDDEN GENETIC VARIATION AT FIVE LOCI IN *DROSOPHILA MELANOGASTER*.

Five second chromosome loci in *Drosophila melanogaster*, malate dehydrogenase, hexokinase, and α -glycerophosphate dehydrogenase were examined using polyacrylamide gel electrophoresis at different pH's and different gel concentrations. A total of 163 lines isochromosomal for the second chromosome were examined. The lines were collected from two sites within Ottawa and one site 60 km southwest of Ottawa (Port Elmsley). No additional variation could be detected at any of the five loci, in contrast to the presence of abundant hidden variation found at highly polymorphic loci in *Drosophila Pseudobscura*. The reasons for the lack of variation will be discussed in terms of population size, sampling scheme, and the structure and function of these enzymes.

R. Singh, R.C. Lewontin, A. Feitoff. 1976. Genetic Heterogeneity within electrophoretic "alleles" of xanthine dehydrogenase in *Drosophila Pseudobscura*. *Genetics* 84: 609-629.

BERKES, F. Inst. of Urban and Environmental Studies, Brock University, St. Catharines, Ontario.

IMPACT OF JAMES BAY HYDRO PROJECT ON FISH POPULATIONS: PRELIMINARY OBSERVATIONS

The estuary of the LaGrande River supports a local fishery based principally on two anadromous populations of coregonids, cisco (*Coregonus artedii*) and whitefish (*C. clupeaformis*). To fill the reservoir of the first dam of the James Bay project, the flow of the LaGrande River was interrupted between November 1978 and October 1979. This study is a preliminary analysis of the impact of the flow interruption on the distribution of the fish populations, the individual growth of fish, and the success of the fishery, all evaluated against several years of baseline data.

Changes in distribution during flow interruption could be readily documented. However, due to large variation in the "control data", adverse effects on individual fish cannot be shown unequivocally. There was a clear impact on the fishery itself, but more due to social factors than to biological factors. It is hypothesized that the real impact of the project on fish populations may be best evaluated when the 1979 year-class becomes available to the fishery five or more years later.

Berkes, F. 1979. An investigation of Cree Indian domestic fisheries in northern Quebec. Arctic, 32: 46-70.

BRADBURY, J. W. 1977. Social organization and communication. In Wimsatt, W.A. (ed.) *Biology of Bats*. Vol. III. pp 2-72. Glencoe Publishing Co.

1979. *Ecological factors influencing the social organization of bats*. Ph.D. Thesis, Univ. of Guelph.

BOAG, PETER T. Biology Dept., Trent University, Peterborough, Ontario.

THE NATURAL SELECTION OF DARWIN'S FINCHES IN A VARIABLE ENVIRONMENT.

Individually marked and measured Medium Ground finches (*Geospiza fortis*) have been studied on the Galapagos islet of Daphne Major for several years. The population is morphologically distinct from *G. fortis* on islands only 8 km away. Regular observations have been made on population numbers, individuals surviving, breeding biology, food quality and abundance, and feeding behaviour.

From 1973 to 1976 numbers and food supply were high. In 1977 the rains failed and as food disappeared, finch numbers declined by 80%. Finches surviving into 1978 were larger than those that perished, and males had become more common than females. The increased survival of large birds is explained in part by size-related feeding behaviour combined with a shift in the food spectrum towards a predominance of large, hard seeds.

The intensity of natural selection was estimated using O'Donald's method, indicating that the population underwent one of the most intense episodes of selection yet recorded for a vertebrate. The results suggest that evolution by natural selection may proceed very quickly among the many small finch populations inhabiting the climatically variable Galapagos Archipelago.

O'Donald, P. 1973. A further analysis of Bumpus' data: the intensity of natural selection. *Evolution* 27: 398-404.

BOGART, JAMES P. Department of Zoology, University of Guelph, Guelph, Ontario.

KARYOTYPIC VARIABILITY IN AMPHIBIANS: THE ETHOLOGICAL CONNECTION.

Amphibians, as a general rule, are noted for their conservative karyotypic evolution. Within many family groupings there are some species or genera which do not conform to this generalization and demonstrate extreme variability. Karyotypic variability is most often found in those species of amphibians which have reduced clutch size, large ova, territoriality, and parental care. The suspected mechanisms for karyotypic evolution involve ecological partitioning, few offspring, and inbreeding.

Wilson, A.C., G.I. Bush, S.M. Case, and M.C. King (1975). Social structuring of mammalian populations and rate of chromosomal evolution. *Proc. Nat. Acad. Sci. U.S.A.* 72: 5061-5065.

BROWN, JOSEPH A. Dept. of Biology, Queen's University, Kingston, Ontario.
PRELIMINARY REPORT ON COMPARATIVE ASPECTS OF SOCIAL ORGANIZATION IN YOUNG CENTRAZID FISH.

Previous work on social organization in centrazid fish has been restricted to either observations on laboratory-held fish or field studies conducted during the breeding season. The objective of the present study is to describe and compare the social organization of young-of-year and yearling bluegill (*Lepomis macrochirus*), pumpkinseed (*L. gibbosus*) and rock bass (*Ambloplites rupestris*).

Laboratory observations on the ontogeny of social behaviour were carried out on young-of-year pumpkinseed and rock bass. Yearling fish were tested in a choice situation to determine: (1) if the species demonstrated a preference for conspecifics and (2) if the species could recognize individuals of its group.

Preliminary results indicate that young-of-year rock bass develop territorial behaviour, while pumpkinseed develop hierarchical behaviour. Yearling bluegill distinguish group members from non-group members while pumpkinseed and rock bass do not. After a brief period of isolation, yearlings of all three species prefer conspecifics over other species.

Yearling bluegill and pumpkinseed appear to have a hierarchical

social organization possibly based on individual recognition (bluegill)

or size (pumpkinseed), while rock bass are territorial.

Williams, N.J. (1972). On the ontogeny of Behaviour of the Cichlid Fish *Gichlasina nigro fuscum*, Ph.D. thesis, University Groningen, The Netherlands.

CADE, W.H. Dept. of Biological Sciences, Brock University, St. Catharines, Ontario.

ALTERNATIVE MALE COMPETITIVE BEHAVIOURS IN FIELD CRICKETS

In species characterized by low male parental investment, males may adopt alternative behaviours in the acquisition of mates. In some katydids and crickets, for example, males compete for females by intense acoustical signaling and by territorial defense of the signaling station. Other males (satellites), however, silently intercept females attracted by the calling of neighboring males. Although intermediates occur, calling and satellite behaviours may arise if males pursue both behaviours or if individuals have distinct biases in the behaviours they exhibit. Research is reported which demonstrates the effects of population density, male age and size, and male-male aggression on male acoustical behaviour. Although some calling males change to non-calling behaviour in response to specific environmental and social cues or events, many males call infrequently or not at all over their entire lifetimes. Comparisons with other species and the result of breeding experiments are presented which tentatively support the idea that calling and non-calling behaviours have a genetic basis.

Trivers, R.L. 1972. Parental Investment and sexual selection. In B. Campbell (ed.) *Sexual Selection and the Descent of Man*: 1871-1971. Aldine, Chicago.

CAVALCANTI, ROBERTO B. Dept. of Biology, McGill University, Montreal, Quebec.

EGG RECOGNITION AND COWBIRD PARASITISM IN SONG SPARROWS.

Song Sparrows (*Melospiza melodia*) are a major host of the Brown-headed Cowbird (*Molothrus ater*), and appear unable to eject the foreign eggs from their nests. As a result, host nestlings in parasitized nests are significantly smaller and lighter than nestlings in unparasitized nests.

If Song Sparrows do recognize Cowbird eggs, then they are predicted to desert heavily parasitized nests. After preliminary experiments showed that Song Sparrows desert clutches artificially reduced to one egg, the prediction was tested by replacing all but one of the host eggs in a clutch with an equivalent number of Cowbird eggs. No desertions were observed, and the same results were obtained when the experiment was repeated using Cowbird eggs coloured blue.

These data reject the hypothesis that Song Sparrows recognize Cowbird eggs, and indicate that similarity in egg coloration does not explain the Song Sparrows' acceptance of the parasite's eggs. Possible reasons for the existence of this apparently maladaptive host behaviour will be discussed.

Rothstein, Stephen I. 1975. An experimental and teleonomic investigation of avian brood parasitism. *Condor* 77: 250-271.

CORBETT, BARRY. Biology Dept., Trent University, Peterborough, Ontario.

SPawning AND DRIFT OF WALLEYE (STIZOSTEDION VITREUM) AND SUCKER (CATASTOMUS COMMERSONI) IN APSLEY CREEK, ONTARIO.

200-300 walleye spawned in April 1979 on the recently improved substrate of Apsley Creek and white sucker spawners were somewhat more numerous than walleyes. Male to female ration was 1:1, whereas the walleye ration was 6:1 with males dominant.

Egg survival in both species was enhanced in Apsley Creek by streamlined improvement. Water level fluctuations and pH (mean 6.93) did not affect egg survival but yellow perch predation on walleye eggs was high. A late cold period delayed hatching, increasing eye exposure to predation.

Walleye hatched in early May (7, 8, 9) and over 3 days 1100 to 1200 fry drifted out of Apsley Creek. Suckers also hatched in early May, but remained in the substrate for 10 to 12 days. Then over 3 day, 1100 to 1200 sucker fry drifted out. Walleye and sucker fry drift was positively correlated with decreasing light (2100-0100 hr).

COLGAN, PATRICK. Biology Department, Queen's University, Kingston, Ontario.
PATTERNING OF LABORATORY FOOD PATCH EXPLOITATION IN AN ALGAE-EATING FISH.

The feeding pattern of algae-eaters on one or both of a green and blue-green alga was studied in an experimental design which revealed individual differences but no preferences between the algae. Bite rate did not vary over a meal or between algae. A bout of bites was equally likely to be terminated at any point after the first couple of bites. However, this was not the case with the intervals between bouts or the number of bouts per visit to a slide. These complex results are discussed from the point of view of optimal behaviour sequences.

Colgan, P. 1973. Motivational analysis of fish feeding. Behaviour 45: 38-66.

CREASE, TERI J. Biology Department, University of Windsor, Windsor, Ontario.
GENETIC VARIATION IN NATURAL POPULATIONS OF DAPHNIA MAGNA.

Daphnia magna (Crustacea: Cladocera) is a cyclic parthenogen which inhabits fresh water ponds. It is found throughout most of the Palearctic and the Western half of the Nearctic zones. This organism provides an excellent opportunity to study genetic differentiation between conspecific populations on a micro as well as macrogeographical scale.

Polyacrylamide gel electrophoresis was used to study allozyme variation at 16 loci in 2 groups of *Daphnia* populations from England and arctic Canada. Variation was found at 5 loci in the English populations while the Arctic populations were essentially monomorphic at all loci. Populations within a group were genetically very similar to one another but extensive genetic differentiation was found between the 2 groups.

Hybridization experiments were carried out and offspring were produced by crosses between Arctic females and English males. Genetic analysis of the hybrids revealed hidden variation in the English populations and in addition provided information about linkage relationships and enzyme structure.

Hebert, P.D.N. 1975. Enzyme variability in Natural Populations of *Daphnia magna* I. Population Structure in East Anglia, Evolution 28: 546-556.

CULIK, BORIS. York University, Downsview, Ontario.

TIME LAPSE TELEVISION MONITORING ACTIVE RESPIRATION RATES FOR THE BURROWING WOLF SPIDER.

The activities of individual burrowing wolf spiders *Geolycosa domifex* (Hancock) were continuously recorded over 24 hours by means of closed circuit television and time lapse recording. At the same time respiration rates ($\text{in } \mu\text{l/hr.}$) were continuously recorded. Five categories of activity and rest were differentiated: 1) rest in the burrow, 2) activity in the burrow, 3) movement up and down the burrow, 4) rest on the top outside of the burrow, and 5) movement outside of the burrow. Respiration rates were determined for each category with respect to spider weight and temperatures of 40°C and 20°C.

Respiration rates were 4 times the resting rate for vertical activity, and 10 times the resting rate for activity outside the burrow.

McQueen, Donald J., Ingrid M. Jensen, and Brandon S. Dyer. 1979. Resting and Diel Respiration Rates for the Burrowing Wolf Spider *Geolycosa domifex* (Hancock). Canadian Journal of Zoology, 57 (10): 1922-1933.

DICKMAN, MIKE. Biological Sciences, Brock University, St. Catharines, Ontario.

TIAPIA AQUACULTURE IN COSTA RICA.

Annual Tilapia yields of 8,000 Kg per hectare in Guanacaste Province, Costa Rica, are among the highest ever reported. Excellent natural rearing conditions coupled with an inorganic and organic pond fertilization and Tilapia feeding program has resulted in the production of marketable (700g, 30cm) *Sarotherodon mossambicus* hornorum male hybrids in just seven months.

Although fish aquaculture has been practiced since Roman and Medieval times, it has been only recently that genetic manipulation of stocks has been used as a method of dealing with the age old problem of uncontrolled spawning. By crossing two Tilapia species, *Sarotherodon mossambicus* females and *S. hornorum* males only male fish are produced. These male hybrids were used to stock the 27 artificial ponds in Guanacaste Province, Costa Rica. The ponds were 1.5m deep and ranged in size from 200 to 3,000 m². These fish were introduced into the ponds at different densities. Their impact on pond zooplankton and phytoplankton species composition was the principle focus of this study.

In the absence of abundant copepod filter feeders, the phytoplankton became so dense that algal night-time respiration resulted in extremely low dissolved oxygen levels. This in turn forced the Tilapia to rise to the pond's surface where they swam slowly backwards "sucking" aerated water from near the pond's air-water interface. Such behaviour increased Tilapia susceptibility to avian predation and reduced their feeding efficiency.

In this study, pond pH, Dissolved oxygen and Secchi disc transparency were all significantly correlated with one another and with pond algal density and water filtration time. Freshly stocked ponds followed a series of relatively predictable changes in species composition culminating in a *Microcystis aeruginosa* dominated phytoplankton and, where fish densities were low, a *Mesocyclops leuckarti* dominated zooplankton community.

Porter, K.G. 1977. The Plant Animal Interface in Freshwater Ecosystems. Amer. Sci. Vol. 65 pp. 159-170.

FALLS, E.A. and J.B. FALLS. Department of Zoology, University of Toronto, Toronto, Ontario.

PEROMYSCUS CYCLES IN ALGONQUIN PARK

Fluctuations in numbers of *Peromyscus maniculatus gracilis* in hardwood forest in Algonquin Park have been monitored by summer live-trapping since 1952. Cyclic fluctuations occur, with peaks usually two years apart. Several recurrent features of the population characterize different phases of the cycle. In peak years, May numbers are often above average, recruitment is high, but breeding stops before August, growth rates of young are low, and larger animals may lose weight in mid-summer. Post-peak May numbers are lower, indicating poor overwinter survival. Years which precede increased numbers are characterized by breeding continuing in late summer, high growth rates, animals starting to breed at lower weights, and higher August-September weights. May litter size is higher in increase years than in decrease years. Early cessation of breeding occurred in all peak years but did not occur in certain other years when numbers were equally high, and occurred once in a year of low numbers when weights were also low. These results suggest that an interaction of population density and food supply may be responsible for the cycle. However, little information on summer food habits and food supply is available.

ELTON, C. 1942. Voles, mice and lemmings: problems in population dynamics. Oxford University Press, London.

FETTEROLF, PETER M. University of Toronto, Toronto, Ontario.

AGONISTIC INTERACTION, NEIGHBOR-NEIGHBOR NESTING SYNCHRONY, AND SOCIAL ENERGY EXPENDITURE IN RING-BILLED GULLS, *Larus delawarensis*.

Manipulations of breeding synchrony of neighboring pairs of gulls show that neighbor-neighbor timing of nesting is the most important variable associated with the amount of time spent in aggressive interactions with neighbors. Other experiments show that when post-hatching human disturbance is eliminated, the loss of young is very limited and far below any previously reported reproductive performances of territorial nesting colonial gulls. In combination, these findings suggest that the optimization of agonistic time (and presumably energy) expenditure via synchronous breeding may be a primary cause for the evolution of nesting synchrony in colonial birds.

PATTERSON, I.J. 1965. Timing and spacing of broods in the Black-headed Bull (*Larus ridibundus* L.). IBIS 107: 433-460.

FULLARD¹, J.H. and R.M.R. BARCLAY. Department of Biology, Erindale College, University of Toronto, Mississauga, Ontario.

THE DEFENSIVE REPERTOIRE OF ARCTIID MOTHS AND THE PREDATION POTENTIAL OF BATS.

The phenological relationship between the defensive repertoire of arctiid moths and the predation pressure exerted by sympatric little brown bats (*Myotis lucifugus*) was examined at a southeastern Ontario site. Previous work has suggested that one form of anti-bat defense, sound production, is present only in those species which are present, as volant adults, during the summer when the predation potential of foraging bats is highest. Spring arctiids which do not produce sound do, however, possess neurologically functional auditory organs tuned to the echolocation frequencies of bats in the area. We suggest that the predation pressure from the resident bat community changes over the course of the season and that moths flying during summer are exposed to increased risk from bats which, by nature of their particular foraging characteristics, are preying more heavily on them. The predation pressure, while sufficiently low in the spring to warrant only the "first-line" defenses of audition, increases during the summer to select for short-range anti-bat defenses such as sound production.

Fullard, J.H. 1977. Phenology of sound-producing arctiid moths and the activity of insectivorous bats. *Nature* 267: 42-43.

GIBBS, H. LESLIE, Department of Biology, Queen's University, Kingston, Ontario.

DETERMINANTS OF THE SPACING BEHAVIOR OF NESTING TREE SWALLOWS (IRIDOPROCTE BICOLOR).

Tree swallows (*Iridoprocne bicolor*) breeding in nestbox grids in eastern Ontario showed strong avoidance to nesting within 18 m. of each other. This was due to early season territorial defense of nestboxes within that distance by a single pair of birds. To examine the adaptive significance of this behavior two hypotheses were tested: 1) Competition between birds, which forage in localized areas around the nestbox when feeding young, is greater at high than at low nest densities and 2) Risk of cuckoldry to the male, who chooses the nest-site, is also greater at high nest densities. Experimental results show that no relationship existed between foraging behavior, adult weight loss and nestling growth rates and nest density and that males response to sexually available females (other than his mate) was related to nest density while intensity of male guarding behavior was not. These data suggest that the above hypothesis do not account for the avoidance behavior shown. An alternative hypothesis, based on selection favouring territorial behavior as a single nest site defense strategy in a natural nesting situation is discussed.

Hoogland, J.L. and P.M. Sherman. 1976. Advantages and disadvantages of Bank swallow (*Riparia riparia*) coloniality. *Ecological Monographs* 46: 33-56.

GODIN, J. JEAN-CUY, Department of Zoology, University of Western Ontario, London, Ontario N6A 5B7.

CIRCADIAN RHYTHM OF SWIMMING ACTIVITY IN JUVENILE FINK SALMON (ONCORHYNCHUS GORBUSCHA).

This paper reports on the endogenous circadian rhythm of swimming activity in juvenile pink salmon, and on the role of the daily illumination cycle in the synchronization of this rhythm. The daily swimming activity rhythm of pink salmon can be strongly synchronized with an artificial light-dark (LD) cycle in the laboratory. Whether the LD cycle synchronizes activity directly or entrains an endogenous circadian "clock", which in turn times activity, is unknown.

The first objective of this study was to establish the existence of an endogenous, free-running activity rhythm in individual pink salmon, and to test two predictions of the Circadian Rule regarding activity level and period length of the rhythm. This was done by subjecting fish to constant illumination (LL) of various intensities and to constant temperature, and by recording their swimming activity in circular channels. About 68% of the fish examined (n=38) were "day-active" when exposed to a 12 h L : 12 h D cycle; the remaining fish were nocturnally active. When subjected to LL and constant temperature conditions (which do not permit synchronization of activity), 50% of the fish tested showed unambiguously endogenous activity rhythms with circadian periods for up to 10 days. The remaining fish were arrhythmic. Mean period length of the free-running activity rhythms for diurnal fish in LL shortened with constant light intensity increasing from 6 to 600 lx, as predicted by the Circadian Rule. In contrast, nocturnal fish did not behave strictly in accordance with this Rule. Mean swimming speed (activity level) of both diurnal and nocturnal fish increased with increasing light intensity. This is suggestive of a positive photokinetic response.

The second objective was to test the effectiveness of an artificial LD cycle as a Zeitgeber (synchronizer) of swimming activity by phase-delaying the 12 h L : 12 h D cycle in relation to the fish's activity rhythm.

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The fish resynchronized their daily rhythms of activity with the new phase-delayed LD cycle after only one transient cycle in most instances.

In conclusion, the daily swimming activity rhythm of some pink salmon possesses an endogenous component, but this rhythm is synchronized with the LD cycle through the direct masking action of this cycle on activity, rather than through entrainment of an endogenous circadian system.

Aschoff, J. (1979). Circadian rhythms: influences of internal and external factors on the period measured in constant conditions.

Z. Tierpsychol. 49: 225-249.

GOOD, G. ALLEN, Department of Biology, University of Windsor, Windsor, Ontario, N9B 3H4.

THE ROLE OF HETEROCOPE SEPTENTRIONALIS (CRUSTACEA, COPEPODA) IN STRUCTUR-

ING TUNDRA ZOOPLANKTON COMMUNITIES.

Heterocoope septentrionalis is a large predatory calanoid copepod common in both pond and lake habitats throughout arctic North America. In the Churchill, Manitoba area this predator coexists with several other calanoid species, but with only a single morph of Daphnia middendorffiana. Two additional species of Daphnia and a second morph of Daphnia middendorffiana morph that coexists with Heterocoope.

Adult Heterocoope are not randomly distributed in natural habitats. They aggregate over areas of pale substrate. From an adaptive standpoint it seems likely that this behaviour enhances the frequency of mating encounters. The occurrence of swarming provides a simple means of selectively removing Heterocoope. Such experiments will make it possible to determine the effect of this predator on the relative abundances of herbivorous zooplankters in these habitats.

O'Brien, W.J., and P. Schmidt. 1979. Arctic Bosmina morphology and copepod predation. Limnol. Oceanogr. 24: 564-568.

GRAHAM, K.D. & J.M. CHUDZIK, Brock University, Biology Dept.

COMPARATIVE CHICK FEEDING ECOLOGY AND DEMOGRAPHY OF HERRING GULLS AND RING-BILLED GULLS.

Demography and chick feeding ecology of Herring Gulls (Larus argentatus) and Ring-billed Gulls (L. delawarensis) were studies on South Limestone Island, Georgian Bay during the summer of 1978. Hatching success was similar between the two species however, fledging success of Ring-billed Gulls was higher than that of Herring Gulls. The difference is attributed in part to differences in the food types brought to chicks by parents of the two species with Ring-billed Gulls exhibiting an apparently more flexible and opportunistic foraging strategy. This may partly account for recent changes in numbers of the two species on the Great Lakes.

GRANT, JIM AND PATRICK COLGAN, Biology Department, Queen's University, Kingston, Ontario K7L 3N6.

SEXUAL SELECTION IN THE JOHNNY DARTER (Etheostoma nigrum).

Male Johnny darters defend a territory around a rock nest from a few days prior to spawning until the eggs hatch. As males spawn with one to several females, the variance in reproductive success is extreme. The purpose of this field study was to discover why some males were more "attractive" to females than others.

The best predictor of a male's reproductive success was his maximum distance of response (MDR) to females. Males that moved farther out from females correlated positively with MDR to other intruders, and a male's overall MDR was a good indicator of his ability to raise his eggs. Thus, females may be using MDR as a cue in mate selection.

Winn, H.E. 1958. Comparative reproductive behaviour and ecology of fourteen species of darters (Pisces-Percidae). Ecological Monographs 28: 155-191.

HARMSEN, R., Biology Dept. Queen's University, Kingston, Ontario. K7L 3N6.

IS SPECIES ABUNDANCE LOGNORMAL OR NEGATIVE BINOMIAL?

There are two distributions which may be fitted with some degree of confidence to experimental data on relative abundance of species within a community: the truncated lognormal and negative binomial. It is thought that apparent conformity to a negative binomial distribution is due to an improper definition of community members; a more rigorous definition might result in a lognormal curve. This hypothesis is tested using a sample from a bird community. Goodness of fit to the two models are compared for data sets which include and exclude non-nesting vagrant species. A trend indicating improved fit to the lognormal distribution with corrected data is seen; however, the significance of stochastic events in a community with eighty-four nesting species precludes attainment of unequivocal results.

Bulmer, M.G. (1974). On fitting the Poisson lognormal distribution to species abundance data. Biometrics 30: 101-110.

HARTMANN, PATRICIA M., 66 Prince Charles Dr. St. Catharines, Ontario. L2N 3Z1.

CAMEL CRICKET AGGREGATIONS WITH SPECIAL REFERENCE TO PHEROMONES.

In the laboratory, camel or cave crickets spent significantly more time of filter paper conditioned by prior placement with conspecifics and heterospecifics, as opposed to unconditioned paper, indicating the presence of a pheromone. This pheromone appeared to be relatively species specific in that when individuals were presented with a choice between heterospecific or conspecific conditioned filter paper, significantly more time was spent on the conspecific conditioned paper. However, when the choice was between unconditioned filter paper versus the heterospecific conditioned filter paper, significantly more time was spent on the heterospecific conditioned filter paper, suggesting that pheromones of related species are similar in structure. Sexual differences were also noted in the response of individuals to female and male conditioned filter paper. A preference was shown for female conditioned paper by both males and females when presented with a choice between male of female conditioned filter paper. An additional sexual function of the aggregation pheromone is speculated. The pheromone was also volatile, as discrimination by camel crickets occurred when air blown over conspecifics and unconditioned air was presented. The action of the pheromone is uncertain, but locomotory inhibition is expected to be involved in the formation of camel cricket aggregations. The possibility that aggregations function as a protection against predation is discussed.

Hubbell, T.H. and R.M. Norton, 1978. The systematics and Biology of the cave crickets of the North American Tribe Hadenoecini. Misc. Pub. Univ. Mich. Mus. Zool. 156: 100-116.

HEBERT, P.D.N., T.J. CREESE AND J.M. LOARING, Biology Dept., University of Windsor, Windsor, Ontario, N9B 3P4.

GENETIC DIVERSITY IN CLADOCERAN POPULATIONS REPRODUCING BY OBLIGATE PARTHENOGENESIS.

Cladoceran species reproducing by obligate parthenogenesis are clonally diverse. Genetic distances among clones are great. At least a portion of this generic differentiation has occurred after the adoption of parthenogenesis. Multiple clones coexist in the same habitat, an observation that conflicts with established ideas on zooplankton community structure. Laboratory studies indicate that there are fitness differences among clones.

The Population Biology of Daphnia. Biol. Rev. 53: 387-426.

HECZKO, EVA, 331 St. James Street, London, Ontario

THE EFFECT OF ALARM SUBSTANCE ON THE BEHAVIOR OF COMMON SHINERS (*NOTROPIS CORNUVIS, CYPRINIDAE*).

The schooling behavior of common shiners was investigated and changes in school structure upon addition of Schreckstoff (alarm substance) were quantified (using overhead photographs). It appears that Schreckstoff increases the organization of schools i.e., cohesion increases while variability in overall school dimension is decreased. Also, in Schreckstoff-primed schools a negative correlation exists between size of shiner and school cohesion, this was not found for the controls.

The wariness (measured as the distance to which a shiner will approach a rock bass behind a glass partition) increases when Schreckstoff is present in the water.

In summary, two antipredator responses (1) increase in structural organization of the school and (2) increase in wariness, are heightened when Schreckstoff is present.

Smith, R.J.F. 1976. Chemical communication as adaptation: Alarm substance of fish. In "Chemical signals in vertebrates", (D. Muller Schwarze and M.M. Moell, eds.). Plenum Press - New York. pp. 303-320.

HICKEY, D.A. AND M.D. MCLEAN, Department of Biological Sciences, Brock University, St. Catharines, Ontario.

ETHANOL TOLERANCE AND Adh ALLOZYMES IN NATURAL POPULATIONS OF D. MELANOGASTER.

Alcohol dehydrogenase (Adh) allozyme frequencies and tolerance of adult flies to ethanol were measured in population samples of *D. melanogaster* from a winery in Southern Ontario. Samples were also tested from a number of non-winery sites. Adh fast frequencies decrease as one moves away from the winery, but this drop in allele frequency is statistically significant only for those areas that are more than 3 km distant from the winery. Tolerance of adult flies to ethanol also differed between winery and non-winery populations, but these differences were not statistically significant. The data presented here may help to resolve the seeming conflict between the two previous studies of Adh allozyme frequencies in natural populations from high and low-alcohol environments.

McKenzie, J.A. and S.W. McKechnie (1978). Ethanol tolerance and the Adh polymorphism in a natural population of *Drosophila melanogaster*. Nature, 272: 75-76.

KEDDY, PAUL A., Dept. of Botany & Genetics, University of Guelph, Guelph,
Ontario NIG 2W1.

EFFECTS OF EXPOSURE ON COMMUNITY STRUCTURE OF LAKESHORE VEGETATION

The way in which environmental stress or repeated disturbance affects community structure is still poorly understood. Lakeshores provide an interesting opportunity to test some hypotheses related to this problem. First, within a single lake, one can find great variation in the species composition of shoreline vegetation, and this, at least in part, is a result of variation in the amount of exposure to wave energy. Second, shoreline plants show regular distribution patterns related to water depth ("zonation patterns"), permitting simple measures of characteristics such as "niche width" and "niche overlap".

It is possible to quantify exposure by estimating expected wave heights from measures of fetch, wind speed and water depth. One can then rank areas of shoreline from highly exposed ("physically controlled") conditions to very sheltered ("biologically accommodated") conditions.

In 1979, detailed observations were made on zonation patterns of shore-line vegetation on Axe Lake, near Georgian Bay. Twenty-five transects were run from 0.5 cm above to 0.5 m below the July water line and each transect was surveyed onto 5 cm height increments so that the upper and lower boundaries of each species could be accurately located. A measure of exposure was then calculated for each transect. Species richness increased from 16 to 30 species as exposure decreased. However, simple measures of "niche width" and "niche overlap" do not change significantly with exposure.

Spence, D.H.N. 1967. Factors controlling the distribution of freshwater macrophytes with particular reference to the lochs of Scotland. *Journal of Ecology* 55: 147-170.

KEENAN, R.J., Department of Biology, York University, Downsview, Ontario M3J 1P3.
HOME RANGE USE AND SPATIAL RELATIONSHIPS OF RED FOXES IN SOUTHERN ONTARIO

I present results of a two-year study of the home range use patterns of a family of red foxes (*Vulpes vulpes* L.) in south-central Ontario. Data were collected on habitat use, activity patterns, food habits, foraging strategies, individual movements and intraspecific spatial relationships. Most of these data were obtained through tracking of radio-collared animals. Tracking periods ranged from 8 to 40 hours in duration with radio-fixes being recorded a maximum of 20 minutes apart. Small mammals were censused using live-and snap-traps. Groundhog densities were estimated from counts of active burrow systems.

In 1978 a single vixen with pups was the principal study animal. In August, 1978 an adult vixen, adult male and two female pups were trapped; this family becoming the principal subjects in 1979.

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Activity patterns changed significantly throughout the course of the season. Short travel sessions and extensive diurnal movements characterized activity during the denning period. Activity became increasingly nocturnal from post-wean until late summer. Length of travel session (recorded as movement between rest periods greater than one-half hour) increased throughout the summer although the increase was significant only between pre-wean and late summer. The adult vixen and one of the pups mated in January, 1979 establishing dens in the north and south halves of the range respectively. During the pre-wean period the females were largely restricted to that portion of the range immediately surrounding their dens. I found evidence of cooperation of time spent at the den and away between the adult male and female. Analysis of respective distances from the den showed that when one was near, the other was usually away; the female being associated with the den more than the male.

My results show that these foxes maintained a space partitioning of the range based on resources and on the need to care for the young. This spacing broke down in the late summer as the pups became more independent.

Storm, G.I., R.D. Andrews, R.L. Phillips, R.A. Bishop, D.B. Siniff and J.R. Tester. 1976. Morphology, reproduction, dispersal and mortality of midwestern red fox populations. *Wildlife Monographs* #49.

KOTT, EDWARD AND GREGORY HUMPHREYS⁽¹⁾. Department of Biology, Wilfrid Laurier University, Waterloo, Ontario, (2) Department of Zoology, University of Guelph, Guelph, Ontario.

NOTES ON REPRODUCTIVE BIOLOGY OF THE BLACK REDHORSE SUCKER

The black redhorse sucker is a species of fish which until recently was considered extinct in Canada. Presently this species is being proposed for endangered species status, at the federal level. In 1979 a project was initiated to locate the breeding areas of this species, and to study its reproductive biology, since it is the success of spawning which will largely determine the ability of this species to survive. Since the species was known to occur in the Grand River system, several sampling stations were established in the upper part of this watershed. One spawning area was located. A description of the spawning habitat is provided. The length of the spawning season was determined. A limited number of specimens were collected for morphological, age and fecundity studies. The oldest specimen collected was 8 years and 345 mm standard length. The average fecundity was 5258 eggs.

The future status of this species is in considerable doubt since it is hunted by bow fishermen during its susceptible spawning season, and the only known spawning sight is to be flooded if a projected dam is built.

Bowman, M.L. 1970. The life history of the black redhorse, *Moxostoma duquesni* (Le Sueur), in Missouri. *Trans. Amer. Fish. Soc.* 99(3): 546-559.

cont'd

KOVACS, KIT

TERRITORY SIZE AND NESTING SUCCESS OF FEMALE-FEMALE PAIRS OF RING-BILLED GULLS ON GRANITE ISLAND.

The existence of female-female pairs in lariids is a relatively recent discovery. Hunt and Hunt (1977) reported such pairings in Western Gulls (*Larus occidentalis*), Ryder and Sompipi (1979) in Ring-billed Gulls (*L. delawarensis*), Conover et al. (1979) in California Gulls (*L. californicus*) and most recently, Fitch (1980) in Herring Gulls (*L. argentatus*). All publications to date report lower nesting success compared to heterosexual pairs. Relatively small territory size may be an important contributing factor in the poor success of female-female pairs. Territories held by two females are much smaller than those of normal pairs. Observations indicate such pairs do not defend their territories as rigorously as do heterosexual pairs. The smaller territory size has a direct negative effect on chick survival during the week following hatching. In high density areas young from the nests within these territories intrude into neighboring territories almost as soon as they leave the nest cup. Consequently these chicks suffer a higher frequency of attacks by neighbouring adults during the first week after hatching than chicks in larger territories.

LOMOLINO, MARK V., Box 707, Earliville, New York 13332

ISLAND BIOGEOGRAPHY OF MAMMALS ALONG THE ST. LAWRENCE RIVER

Trap-surveys of terrestrial mammals were conducted on 19 islands in the Thousand Island Region during the summers of 1978 and 1979. These surveys revealed that mammalian species richness was significantly correlated with both island area and isolation ($r^2 = .86$ and $F=228.9$, and $r^2 = .25$ and $F=25.1$, respectively), and an inclusive species-area-distance model accounted for 93% of the variation in mammalian richness ($F=384.6$).

Winter track surveys conducted during 1979 and 1980 indicated that cross-ice movements of mammals play an important role in determining species richness and species composition of terrestrial mammals on temperate islands. Examination of the three species system of small mammals - *Microtus*, *Blarina*, and *Peromyscus* - led to the hypothesis that differential immigration abilities and species interactions are major determinants of mammalian species composition, with *Microtus* (the most vagile species) being essentially restricted to the more distant islands by predatory and competitive suppression from the latter species.

MacArthur, R.H., and E.O. Wilson, 1967. The theory of island biogeography. Monogr. Pop. Biol. I. Princeton University Press, New Jersey. 203 pp.

KRAMER, D.L., Dept. of Biology, McGill University, Mt. BEHAVIORAL ECOLOGY AND THE PARADOX OF FISH RESPIRATION

Physiologists have argued that the greater oxygen concentration in air as compared with water reduces the cost of respiration in air breathing aquatic organisms and provides an important selective pressure favoring the evolution of lungs. Yet, both ecological and physiological evidence suggests that aquatic respiration is the favored strategy, even in hypoxic waters where the advantage to aerial respiration ought to be greatest. I have examined this apparent paradox by investigating a) the respiratory strategies of non-air breathing fish from hypoxic waters and b) temporal and energetic costs of surfacing in air breathers. The results suggest that travel costs are an important selective factor in fish respiration and that behavioral decision-making is a significant component of the respiratory process.

Johansen, K. 1970. Air breathing in fishes. Fish Physiology Vol. 4: 361-411. W.S. Hoar & D.J. Randall, Eds. Academic Press.

MALBY, LYNDIA S., Dept. of Biology, Carleton University, Ottawa, Ontario
THE ROLE OF SONG IN NEIGHBOUR RECOGNITION BY AMERICAN ROBINS

Bird song is a conspicuous feature of the environment especially during the breeding season. At any time song may simultaneously serve one or several different functions from advertising territorial rights, location (of the singer and the territory), attraction of mates (Wasserman 1977) to stimulation of appropriate reproductive behaviour (Beer 1975). The biological implications of neighbour recognition and song repertoire are considerable (Palls and Brooks 1975, Brooks and Palls, 1975 and Krebs 1971). Robins, although a very common bird and familiar to most people have been little studied. Lack of basic biological information coupled with the large song repertoire of the Robin provided the impetus for this study. Robins (marked individually) were studied on campus at Carleton University. Contrary to other research done on Robins in other areas, the Robins at Carleton nested colonially, have communal night roosts and were non-territorial in the traditional sense. Playbacks of recorded songs of Robins to individual males showed no difference in response to the songs of strangers or neighbours but elicited a strong response to the songs of a distant neighbour. The biological implications are discussed.

Brooks, R.L. and J.B. Falls 1975. Individual recognition by song in White-throated sparrows I. Discrimination of songs of neighbours and strangers. Can. J. Zool. 53: 879-888.

MCNICOL, RICHARD E. AND DAVID L.G. NOAKES, Department of Zoology, University of Guelph, Guelph, Ontario. NIG 2W1 (c/o D. Noakes).
TERRITORIALITY AND TERRITORY DEFENSE IN JUVENILE BROOK CHARR
(*Salvelinus fontinalis*)

Juvenile brook charr are typically territorial over a wide range of environmental conditions. The spatial structure of these territories, and the details of their defense were studied in a laboratory stream tank. The territories are basically cordate in shape, with the resident at the downstream end facing into the current. Territorial defense confirms the predictions of an hypothesis of the territory as an economically defensible resource with space, rather than food as the proximate factor of most importance.

Defense of the anterior portion of the territory is by behaviour patterns which are energetically more costly than those used to defend the territory laterally or to the rear. Resident fish show increasingly more aggressive responses to intruders closer to the centre of the territory. Threat patterns (lateral display) occur mostly at the territorial boundary. Increasing water velocity, and higher fish densities cause shifts in territorial defense apparently related to increasing energy costs. More threat displays are used, and territory size decreases. Territory size is compressible only within limits, regardless of conditions.

Levels of agonistic activity are not affected by differences in food rations. Increasing amounts of food tend to result in an increase in territory size, suggesting that interference competition may be occurring. Supported by the Ontario Ministry of Natural Resources.

L.M. DILL. 1978. An energy-based model of optimal feeding-territory size. Theoretical Population Biology, 14: 396-429.

MIDDLETON, JOHN, Department of Biology, Carleton University, Ottawa, K1S 5B6.

TRUTH IS LIKE AN ECOSYSTEM.

In the course of designing a plan of research, I realized that some basic questions of methodology hinged on points of philosophy, such as the place of 'testable hypothesis' in the conduct of science. I pursued some aspects of these questions, as a necessary preliminary step in the design of my research project.

Some scientists, even great ones, tend to exhibit a dogmatism in discussions of 'scientific method' that is otherwise foreign to them. Their stated views seem to be at variance with their actual practice. The consensus among careful observers is that Science is too complex and vibrant to be constrained by any simple set of rules, just as an ecosystem defies reduction to any one formalism. A model is presented which extends this analogy.

Macfayden, A. 1975. "Some thoughts on the behaviour of ecologists". Journal of Animal Ecology 44: 351-363.

MONTGOMERIE, ROBERT D., Department of Biology, McGill University, 1205 Ave. Dr. Penfield, Montreal, Quebec. H3A 1B1.

OPTIMAL TERRITORY SIZE: EVIDENCE FROM HUMMINGBIRDS

Hummingbird feeding territories have proven to be useful subjects for testing simple hypotheses about the economic defendability of territories. Since both the costs and benefits of hummingbird territoriality can be measured in energy terms, it is possible to quantitatively analyze the territorial economics of these birds and to develop models that can make precise predictions. Here I construct a general model of optimal territory size and test it with data from my field studies of hummingbirds in western Mexico and California. All hummingbird territories that I studied yielded an energy profit to the owner despite a wide range of territory sizes (where size is defined as the amount of energy defended per day). Territory size is determined by the owner's physical abilities, by the dispersion and nectar producing strategies of the defended flowers, by the costs of territorial defense, and particularly by the kinds of utility functions that the birds appear to be optimizing. There is no evidence that hummingbirds defend territories larger than those needed to satisfy their daily energy needs.

Verner, J. 1977. On the adaptive significance of territoriality. Am. Nat. 111: 769-775.

MORRIS, RALPH D., Biosciences, Brock University, St. Catharines, Ontario, L2S 3A1.

PARENTAL CARE PATTERNS IN HERRING GULLS

Radiotelemetry and observations from a blind were used to assess flight movements and in-colony activities of Herring Gull (*Larus argentatus*) adults during incubation and brooding periods. Information was obtained on distance, duration and patterns of flight movements and on incubation and chick feeding efforts by both members of each observed pair. Movement patterns of each adult were predictable and highly individualistic and varied little during incubation and brooding periods. Within a pair, time away and distance flown were less important determinants of fledging success than synchrony between members of a pair in attendance at the colony, especially during incubation and early brooding periods. "High quality" parents synchronized their clutch/brood care activities, whereas "low quality" parents did not, which resulted in a higher rate of egg and chick loss in clutches (broods) of the latter. The degree of investment in the clutch (brood) by each member of the pair may be detectable by the mate during early phases of the parental care period. This may control "decisions" regarding the continuation of investment during that season by either member of the pair.

Nisbet, I.C.T. 1973. Courtship feeding, egg-size and breeding success in Common Terns. Nature 241: 141-142.

NUDDS, THOMAS D., Department of Zoology, University of Western Ontario, London, Ontario. N6A 5B7.

EQUILIBRIUM VS. NONEQUILIBRIUM COMMUNITY ORGANIZATION: DUCKS SIT ON THE FENCE.

Factors influencing the diversity of coexisting ducks in the prairie-pothole region of western Canada were investigated. Thirty-five years of census and habitat data were used to investigate by which of 3 means-- increased or decreased niche separation, or increased total niche space-- increased diversity was accommodated in diverse assemblages. Data for the breeding pairs of all species in each of 2 guilds (diving and puddle ducks) from aspen-parkland and mixed-prairie environments were analyzed. There was a regular increase in the temporal variability of breeding habitats for each guild in this order: parkland divers, parkland dabblers, grassland divers, and grassland dabblers. Competition, as evidenced by a positive relationship between niche separation and species diversity, was found only for parkland diving ducks. Variation in species diversity was better correlated with variation in total resource space for guilds in more variable habitats. Niche separation decreased with increased resource levels for grassland puddle ducks. Niche separation and species diversity were never inversely related, suggesting that competition in evolutionary time sets the ecological limits to species similarity in resource use, but the importance of competition in ecological time, as a factor influencing diversity, varies with environmental variability.

Wiens, J.A. 1977. Competition and Variable Environments. American Scientist 65: 590-597.

PATERSON, ROGER, C., 380 Glenridge Apt. 4, St. Catharines, Ont. L2T 3K7.

A STUDY OF AMYLASE AND TREHALASE VARIATIONS IN *DROSOPHILA MELANOGLASTER*

Various strains of *D. melanogaster* were examined for amylase and trehalase variations. The Amy Iu strain was used to examine enzyme activities when flies were fed various carbohydrate diets. Both other strains were examined for genetic differences in activity when examined. Various were not. Electrophoretic studies showed that most strains were polymorphic for electrophoretic mobility of amylase. No electrophoretic variants of trehalase were found.

- PRICE*, S.D. AND S.C.H. BARRETT, Dept. of Botany, University of Toronto, Toronto, Ontario. MSS 1A1.
- FUNCTION AND ADAPTIVE SIGNIFICANCE OF TRISTYL IN *PONTEDERIA CORDATA* L. (PONTEDERIACEAE).
- Pontederia cordata* L. is an emergent aquatic which exhibits the genetic polymorphism tristyl, and outbreeding mechanism. Individuals have flowers that are either short-, mid-, or long-styled. Darwin proposed that the floral trimorphism promotes phenotypic disassortative pollination. Pollen in *P. cordata* is strongly trimorphic enabling a test of this hypothesis since the source of pollen deposited on naturally-pollinated stigmas can be unequivocally determined. Patterns of pollen flow in *P. cordata* are complex. Ontario populations show random pollen loads suggesting that tristyl might not be affecting phenotypic disassortative pollination. However, other populations from southeastern United States show considerable enrichment of pollen from anthers of a given height on stigmas of the same height (disassortative pollination). In some environments, Darwin's hypothesis is confirmed. Experimental studies have shown that highest fruit set is obtained in cross-pollinations between the different style morphs and that the morphs do not differ in flower or fruit production. Accordingly, theoretical population genetic models predict that the three floral morphs should be equally frequent in natural populations. In a survey of population structure in 60 populations from Florida to Ontario, 58 populations were trimorphic, with short-, mid-, and long-styled plants averaging 0.41, 0.34, and 0.25, respectively. These anisoplothetic frequencies may be explained by differential pollen production at the mid anther of long- and short-styled plants, resulting in preferential fertilization of mid plants by shorts.
- Barrett, S.C.H. (1977). The breeding system of *Pontederia rotundifolia* L. A tristylous species. New Phytologist 78: 209-220.
- QUINN, JAMES S., Dept. of Biol. Sc., Brock University, St. Catharines, Ontario.
- PARENTAL INVESTMENT AND CHICK FEEDING PATTERNS IN CASPIAN TERNS (*STERNA CASPIA*).

Aspects of the demography and chick feeding ecology of Caspian Terns (*Sterna caspia*) were studied during the summers of 1978 and 1979 on South Limestone Island, Georgian Bay. Regular and detailed observations from blinds allowed estimation of size and in most cases, species identification of prey items fed to marked chicks within selected broods. Patterns of apportionment of food to chicks were examined and related to feeding rates of parents. First hatched chicks received a higher rate of feeding and exhibited a higher fledging success than their brood mates. The importance of asynchronous hatching in a species with a variable and unpredictable food resource is stressed. The significance of these observations to feeding and reproductive strategies of parents is discussed.

TRIVERS, R.L. 1972. Parental investment and sexual selection. pages 136-179 in B. Campbell, ed. Sexual selection and the descent of Man. Aldine, Chicago.

ROBERTSON, RALEIGH J., Department of Biology, Queen's University, Kingston Ontario K7L 3N6.

COOPERATIVE BREEDING IN THE BELL MINER (*MANORINA MELANOPHYRS*), AN AUSTRALIAN HONEYEATER

Bell Miners occur in relatively permanent colonies in wet sclerophyll woodlands of southeastern Australia. Their complex social system includes helpers at the nest, with number of helpers ranging from 1 to 10. A ten-month field study focused on describing the details of this helper system, and the selective forces involved in its evolution.

Helpers (in addition to the female and male) include (a) offspring from previous nests, (b) neighboring males which may or may not be associated with an active nest of their own, (c) neighboring females, including some which are reproductively active, and (d) occasional 'strangers'. Help is beneficial to the nesting female by reducing food demands and by allowing rapid renesting after successful fledging or after nest failure. The selective advantage of helping from the helpers standpoint will be discussed.

Dow, D.D. 1977. Reproductive behavior of the Noisy Miner, a communally breeding honeyeater.

ROSS, HOWARD A. & IAN A. MCCLAREN, Dept. of Ornithology, Royal Ontario Museum, 100 Queen's Park Cres., Toronto, Ontario

EQUIPROBABLE SURVIVAL OF IPSWICH SPARROW NESTLINGS

Natural selection is generally assumed to mould the reproductive effort of passersines so that, on average, the maximum number of nestlings survive to breeding age. The chances of survival of a young passerine is expected to depend on the nutritional state of the bird, on the environmental conditions it experiences and on the time available to it to complete its pre-migratory development. The rate at which Ipswich Sparrows (*Passerculus sandwichensis princeps*), banded in their hatching year, returned to their sole breeding location (Sable Is., Nova Scotia), was determined by an extensive banding-recapture program during 1976-79. Over-winter survival was statistically independent of 5 indices of the nutritional well-being of nestlings: weight and tarsus length (7 days), growth rate and the rate at which growth decelerates (0-7 days), and brood size. The tarsus length of survivors encountered as juveniles had a significantly lower variance than for the whole pre-selective cohort. Otherwise the return rate of juveniles was independent of their body size. Survival was also independent of the habitat (dense, sparse) where, and the month (June-August) when nestlings were raised. Further, the offspring of second-year and older birds did not have significantly different rates of survival. There was no tendency for long-lived individuals to produce more surviving young. During 1976-79 a calamitous decline occurred in the Ipswich Sparrow population. Natural selection for characters postulated to have significance for overwinter survival appears either to have been in abeyance or to have been obscured by the high rates of mortality.

Perrins, C. 1965. Population fluctuations and clutch size in the Great Tit. *Parus major* L.J. *Anim. Ecol.* 34: 601-647.

RUSE, MICHAEL, University of Guelph, Guelph, Ontario
Ontario N1G 2W1.

WHY ARE PROSTITUTES FEMALE?

This paper discusses recent sociobiological work on human heterosexuality. In particular, attention will be paid to the ideas of E.O. Wilson in his On Human Nature and Donald Symons in his The Evolution of Human Sexuality. It will be explained why it is that the sociobiologists think that males and females have evolved in different ways, both physically and psychologically. Some of the implications of, and evidence for this evolution will be discussed. For instance, reference will be made to the different ways in which male and female respond to pornography and also to the nature of male-female relationships: why do men tend to be more aggressive sexually than women? The sociobiological view will be contrasted with alternative views, which see differences in human sexuality entirely as functions of learning or conditioning. It will be asked whether the sociobiology of human heterosexuality is simply a conservative ideology dressed in pseudo-scientific clothing and it will be concluded that it is not.

D. Symons - The Evolution of Human Sexuality

SCALE, PAUL R., Institute for Environmental Studies, The Haultain Building, University of Toronto, Toronto, Ontario, M5S 1A4.

QUANTITATIVE METHODS IN THE STUDY OF SO₂ EFFECTS ON PLANT COMMUNITIES

Sensitive indicator species and various measures of plant community structure have been used extensively in studies on the effects of air pollutants on natural ecosystems. It is often implicitly assumed that such measures will, in large part, reflect either past changes in plant communities caused by an air pollutant or the potential for future change. The objectives of the present study were to assess the ability of indicator species and several tools in quantitative plant ecology - including diversity indices, measures of aggregation, reciprocal averaging (R.A.) and principle coordinate analysis (P.C.A.) - to reflect community changes caused by SO₂ fumigation. The role of variability in natural systems and its effects on such analyses were discussed as was the utility of these techniques as management tools. This was accomplished by characterizing the tree, shrub and ground flora of over sixty upland birch sites at distances of up to 50 km from a substantial source of SO₂ in Wawa, Ontario. Results indicate that most of the common species of the shrub and ground flora typically show an initial increase in abundance with decreased distance before rapidly becoming locally extinct. Diversity indices were found to be relatively insensitive to pollution damage whereas, R.A. and P.C.A. were much more useful in this respect. Overall, increased shrub growth was the most sensitive indicator of pollution stress in this particular system.

Gordon, A.G. and E. Gorham, 1963. Ecological aspects of air pollution from an iron-sintering plant at Wawa, Ontario. *Can. J. Bot.* 41: 1063-1078.

SMOL, JOHN P., Queen's University, Dept. of Biology, Kingston, Ontario K7L 3N6.
THE POSTGLACIAL DEVELOPMENT OF A SMALL MEROMICTIC LAKE IN SOUTHERN
ONTARIO

This paleolimnological investigation utilized 50 sediment sections of a 4.5m sediment core to describe the postglacial ontogeny of Crawford Lake, a small marshy lake in Southern Ontario. Pollen grain analyses were used to document past changes in the terrestrial vegetation, whilst past limnological conditions were interpreted on the basis of diatom and chrysophycean fossils.

Pollen studies revealed that, following the retreat of the Wisconsinan glaciers, the vegetation surrounding Crawford Lake had changed from a tundra type flora, to a coniferous forest, and finally to the mixed coniferous-deciduous, forest present today. Successional changes recorded in the lake's biota were believed to be influenced by the associated changes in litter decomposition, soil pH, and biomass accumulation occurring in the lake's watershed. In the uppermost sediments the appearance of *Ambrosia* (ragweed) pollen documented the arrival of European settlers. The rapid eutrophication of Crawford Lake following man's interference with its watershed will be discussed.

Whitehead, D.R. et al. 1973. Late glacial and postglacial changes in a New England pond. *Science* 181: 744-747.

SPRY, CAROLYN, DONALD L. KRAMER, c/o D.L. Kramer, Dept. of Biology, McGill University, 1205 Ave. Dr. Penfield, Montreal. H3A 1BL.

REPRODUCTIVE BIOLOGY OF A "SMALL BROOD SPANNING" TROPICAL FISH.

Many tropical fish species spawn at frequent intervals throughout an extended breeding season ("small-brood spawners", Lowe-McConnell, 1975). This strategy potentially allows very high fecundity by rapidly channelling nutrients into ova, without limitations imposed by storage. However, field estimates of fecundity are difficult to obtain. A laboratory population of lemon tetras (*Hypessobrycon pulchripinnis*, Characidae) consisting of five females and five males was monitored over a four month period in order to determine the temporal pattern of spawning within and between days. These data were combined with a measure of the number of eggs released per spawning to produce an overall estimate of fecundity.

The most productive female (750 mg) produced an average of 16 eggs/day, 0.8mm in diameter for more than 120 days, or about 25% of her body weight.

Kramer, D.L. 1978. Reproductive seasonality in the fishes of a tropical stream. *Ecology* 59 (5): 976-985.

STIRLING, GRAY.

LIFE HISTORY OF A POLYCYCLIC DAPHNIA.

An investigation of the particular life history characteristics of a recently reported, temporary pond, polycyclic Daphnia. The Daphnia cava cervix population shows a size reduction in a declining population (spring) considered to be characteristic of vertebrate predation - in this case the larvae of two abystoma salamanders. Over six years the occasional absence of spring representatives questions the adaptive value of a fall population, which may be established under the appropriate conditions. These two questions are explored within the context of a life history strategy. An enclosure experiment combined with controlled environment incubator tests are used to explore the population adaptive characters. The decision rules that govern the transition between the population states-thereby governing it's life cycle and optimal adaptation to an extreme environment-are found to be formed on temperature information.

Threlkeld, S.T. 1979. The midsummer dynamics of two Daphnia

species in wintergreen lake, Michigan.

TAGGART, C.T. York University, Downsview, Ontario.

PHYSICAL-CHEMICAL AND BIOLOGICAL RESPONSE TO HYPOLIMNETIC AERATION IN A EUTROPHIC KETTLE LAKE.

A small, eutrophic kettle lake in southern Ontario was subjected to hypolimnetic aeration (a lake restoration technique) for two years, subsequent to three years of desratification aeration. A description of aerator design and capabilities will be presented. Results indicate that stratification is maintained and oxygen concentration levels in the hypolimnion are increased. However, nitrogen, phosphorus and carbon dioxide concentrations increase in the hypolimnion during the summer. The development of a metalimnetic barrier points to aerator limitations and appears to restrict both zooplankton and fish communities to the epilimnion during periods of stratification.

Dunst, R.C., S.M. Born, P.D. Uttermark, S.A. Smith, S.A. Nichols, J.O. Peterson, D.A. Knauer, S.L. Serns, D.R. Winter and T.L. Wirth. 1974. Survey of lake rehabilitation, Techniques and experience. Dept. Nat. Res. Madison, Wisconsin. Tech. Bull. No. 75. 178 pp.

THOMSON, CHRISTINE

MOTHER-INFANT COMMUNICATION IN THE LITTLE BROWN BAT, *Myotis lucifugus*

The role of vocalizations in individual recognition between mother and infant little brown bats is being investigated under natural conditions in a large nursery colony in southeastern Ontario. Recordings of infant vocalizations, mainly isolation and double note calls, are being analyzed with respect to temporal patterning, frequency, and harmonic characteristics for evidence of vocal signatures. Recordings made in 1980 will be played back to females inside the colony after they return from foraging and are actively searching for their young. As expected, playbacks of infant isolation calls and juvenile echolocation calls in late July, 1979 after most young were weaned failed to elicit any obvious consistent response from members of the colony.

That nursing is selective is suggested by the rejection of infants by some females and unhesitating acceptance by others after approach and close inspection during staged retrievals. Vocalizations may serve only as distal cues while proximal cues such as smell may be necessary for final recognition and acceptance for nursing.

HALTZ, EDWARD C.

COMMON TERN COLONIES AS INFORMATION CENTERS

Ward, Zahavi, and others have suggested that avian nesting colonies and communal roosts function as "information-centers" where birds feeding on locally dense, but ephemeral, food patches can obtain information on the current location of their food supply. Studies at Common Tern (*Sterna hirundo*) colonies in the St. Lawrence River and in Oneida Lake support the predictions of the model. Terns are more likely to leave the colony in temporal groups than predicted by a negative exponential model. Within these groups, birds tend to go in the same directional heading as the previous bird. Birds which fail to catch a fish, or do so in greater than the median time interval, "hang-back" and follow others. No overt communication about feeding success was observed at the colony; unsuccessful birds preferentially follow neighbors which had caught a fish on their previous trip. Observations of adult fishing behavior are consistent with the predictions of the hypothesis. Terns arriving at the feeding areas in groups are more likely to find food than solitary birds, but no further advantage to social feeding was observed. These results and others suggest that the Common Tern colonies studied function as information-centers; whether or not this is a primary agent selecting for tern solonality remains speculative.

WEIS, I. M.

EFFECTS OF PROPAGULE SIZE ON SEEDLING VIGOR IN A PRAIRIE FUGITIVE SPECIES

Prairie fugitive plant species survive only on soil mounds which result from badger foraging activity. These mounds are moist in the spring but dry rapidly in summer, making the fugitive species dependent upon a layer of buried, decaying vegetation which forms the base of the mounds. Following dispersal onto a mound the survivorship of seedlings and later competitive success are predicated upon rapid seedling growth, root extension into the layer of decaying vegetation, and occupation of that layer. Seed size variation within populations of the fugitive species, through effects on "seedling vigor", should be important in predicting competitive success. Regression relationships between seed size and germination, seedling size, and seedling growth parameters indicated important effects of seed size on each of the initial phases of the life history. Increase in germination was 10.2% per mg. seed weight. Germination also occurred more rapidly in heavier weight classes, which is ecologically important given the rapid onset of summer drought. Larger seeds also produce seedlings with significantly larger cotyledons; after 30 days of growth these seedlings have larger roots, larger leaves, and greater biomass in each component organ. These differences are largely due to the "capital" provided by initial food reserves. The instantaneous rate of increase in biomass (r') is virtually identical for all seed weights. Differences in seed weight thus have ecologically significant effects on both the rate and probability of success in establishment, and predict persistent differences in competitive interactions among the fugitive species.

WOODRICH, DENISE C.

CLONAL VARIATION IN INTRINSIC RATES OF INCREASE AND COMPETITIVE ABILITY IN *Daphnia*

Intrinsic rates of increase (r') were calculated at three temperatures for ten clones of *Daphnia magna* (Cladocera: Crustacea). Three of the clones originated from ponds near Churchill, Manitoba (arctic), two from a pond near Cambridge, England (English) and the remaining five were hybrids produced through the mating of arctic females with English males. r' values increased from 100 to 300C with the most substantial increment occurring between 100 and 200C. Hybrid clones, in general, had higher r' values than parental clones at all three temperatures. Arctic clones generally performed poorly at all three temperatures and English clones ranked in an intermediate position. The outcome of competition experiments between English, arctic and hybrid clones could usually be predicted on the basis of intrinsic rates of increase. High r' values appear to be associated with high competitive ability which is discordant with ' r -K' selection theory.

DENSITY-DEPENDENT BEHAVIORAL EFFECTS ON CRICKETS

Population density is often an important factor in many areas of the behavior and ecology of organisms. Examples range from vertebrates through to invertebrates, an example of the latter being acoustical insects, such as crickets. Alexander discussed some density dependent effects in crickets. High density populations resulted in a higher tolerance of crowding and hence less aggressiveness and territoriality. Pair formation is then by chance. Orte also found non-territoriality in low density situations, in desert grasshoppers.

In low density situations, aggressiveness and territoriality are more prevalent as a greater proportion of matings depend on the attraction of females to individual calling males. Here male with a territory is a more persistent stationary caller who is more likely to keep the territory through aggression. Due to this males call more and move less in low density populations than in high density ones. In this study the effects of density on calling, aggression and movement in an indoor laboratory population of Cyrtulus integrus males are studied in a quantitative fashion. Also the effects of female crickets introduced into the population of males are quantitatively demonstrated with respect to the above parameters.

SELECTIVE RECRUITMENT AND DENSITY-TRIGGERED DISPERSAL OF YOUNG IN URBAN GREY SQUIRRELS

The size of the breeding population in Mount Pleasant Cemetery, Toronto, is relatively constant from year to year. Loss rates of adults are constant and less than those of the young. More young are produced than enter the adult population. Extra loss of young occurs twice a year through dispersal. Young that don't disperse are recruited. Therefore, dispersal and recruitment regulate population size. Established squirrels interact aggressively with young trying to recruit. This leads to high levels of intraspecific aggression during dispersal. When approximately 30% of the adult population was removed just prior to the summer dispersal period, the extra loss of young was not observed even though dispersal occurred from a control population. Levels of aggression were also lower in the removal population. Observations of interactions between individually marked adults and young before and during dispersal showed differences in behaviour between young that dispersed and young that recruited. Dispersers were less aggressive and also less tolerant of aggression by other squirrels.