

BAKER, JAMES A., and ROANLD J. BROOKS, University of Guelph, Guelph, Ontario. Numerical and aggregative responses of raptors to abundance of the meadow vole, Microtus pennsylvanicus.

During 1974-75 and 1975-76, numerical responses of the Eastern Red-tailed Hawk Buteo jamaicensis borealis, Rough legged Hawk Buteo lagopus, Short-eared Owl Asio flammeus, and Snowy Owl Nyctea scandiaca were investigated in relation to population numbers of the meadow vole Microtus pennsylvanicus on Toronto International Airport. The aggregative responses of Red-tailed and Rough-legged Hawks in relations to vole density among various habitats was also investigated.

During both years of the study, over 85% of the animals in diets of all raptors were meadow voles. Numbers of voles declined substantially between fall and spring of 1974-75. During the same period of 1975-76, they increased substantially.

There was no difference in Red-tailed Hawk numbers between fall and spring of either year, but numbers of Rough-legged Hawks underwent changes which were generally synchronized with changes in vole abundance. Numbers of both buteo species and of Short-eared Owls decreased between years coincident with changes in vole abundance. However, Snowy Owl numbers increased between years.

The aggregative response of both buteo species was generally greater on those habitats having high densities of voles. Within the high vole density habitats, buteo densities did not correspond to vole densities. This was related to variation in amount of cover on these habitats. Variation in amount of cover had a greater effect on Red-tailed Hawk densities than those of Rough-legged Hawks.

BARCAY, ROBERT M.R., Carleton University, Ottawa, Ontario. Two Aspects of Vocal Communication in the Little Brown Bat, Myotis lucifugus.

Although the vocal repertoire of the little brown bat appears to be rather limited, several distinct calls do exist. One of these is given by the male during copulation. Observations indicate that this is directed towards the female and acts as a pacification signal serving to indicate the sexual intentions of the male. The calls low frequency sets it apart from the rest of the vocal repertoire and makes it one of the few discrete-situation specific mammalian vocalizations.

Another interesting aspect of this species is the apparent use of echo-location signals in communication. Bats arriving at hibernation sites in the fall may use the sounds of others to orient them towards the mine or cave entrance. This may be especially important to juveniles and points out the inappropriateness of separating echolocation signals from social ones.

BERRILL, MICHAEL and PAM THORN, Trent University, Peterborough, Ontario. Competition and coevolutions: Predatory strategies of bass and antipredatory strategies of crayfish.

Using SCUBA techniques, we placed crayfish of 3 species (Orconectes rusticus, O. propinquus and Cambarus bartoni) near rock bass (Ambloplites rupestris) and smallmouth bass (Micropterus dolomieu). Rock bass captured crayfish more successfully than smallmouth of comparable length primarily by striking the crayfish more frequently from the rear. In response to bass attack, most crayfish oriented toward and threatened the predators; tail flips by crayfish were rare, and were more likely to result in capture. The results indicate possible coevolution of certain morphological and behavioral characteristics of the bass and crayfish, as well as possible explanations for the competitive success of rock bass and of Orconectes rusticus.

BIETZ, BRIAN F., University of Western Ontario, London, Ontario. Nest site selections by the longear sunfish (Lepomis megalotis peltastes) in relation to habitat availability.

The distribution of longear nests in the Middle Thames River was found to differ significantly from random, with nests generally found in small clusters along the shore. To assess the effect of habitat availability on nest site distribution, 10 habitat variables were measured for 17 nest clusters and 40 random sites. Discriminant analysis with all variables gave 95% correct classification into groups and 3 variables (water depth, current and distance to shore) gave 94.2% correct classification. Mapping of these 3 variables suggests that available habitat is under utilized by nesting longears. The relationship between clustered nesting and individual reproductive success will be discussed.

BOUSFIELD, MARJORIE A., Queen's University, Kingston, Ontario. The effects of age and experience on the clutch size of the lesser snow goose (Anser caerulescens caerulescens).

The mean clutch size of lesser snow geese (Anser caerulescens caerulescens) nesting at La Pérouse Bay, Manitoba was found to increase significantly with age during the first six years of life. Two major hypotheses have been proposed to explain this: 1) Geese with small clutches are weaker and therefore less likely to survive more than a few years and 2) increasing age signifies increased breeding experience. If the latter held true, it could be due purely to breeding experience or to experience with the same mate. Both aspects were investigated and the results discussed.

BOYD, SUSAN, McGill University, Montreal, Quebec. The wax and wane of planktonic diatom communities.

The spring diatom population of Lake Memphremagog was studied between late winter and late spring 1977. Its development and collapse was examined in terms of loss rates of individual species as measured by sediment traps.

BURLEY, NANCY, McGill University, Montreal, Quebec. Clutch Overlap: An Alternative Reproductive Tactic.

Overlapping of successive clutches is an alternative to modification of clutch size. It is an advantageous reproductive tactic when one stage in the developmental cycle is particularly taxing on parental abilities, when the breeding season is long, and when environmental conditions are relatively unpredictable. Clutch overlap may be used in conjunction with clutch size manipulation to increase seasonal reproductive success.

CAVALCANTI, ROBERTO B., McGill University, Montreal, Quebec. Adaptive aspects of nest desertion in birds.

The abandonment of a nest containing eggs or young is not necessarily detrimental to the parent birds. This behaviour could indeed be an adaptation to adverse breeding conditions, since an increased probability of survival and the opportunity to renest more quickly should favour individuals which desert under those circumstances.

Consideration of trade-offs between reproduction and survival suggests that nest desertion should be more frequent when food abundance drops, and when brood parasites are present. It should be more likely early in the breeding season than later, and nests with young should be deserted less often than those with eggs.

My preliminary experiments with Song Sparrows (Melospiza melodia) and information from the literature are broadly consistent with the hypotheses.

COOLEY, WENDY M., Carleton University, Ottawa, Ontario. Morphological variations as an insight into faunal structure.

I used multivariate analyses to study sixteen morphological characters of insectivorous bats. Included in the analysis was individual, sexual and geographic variation and faunal comparisons of the insectivorous bats of Ontario, Surinam, Cameroun and Rhodesia. The morphological characters studied have functional implications on the feeding ecology and, therefore, I was interested in comparing the morphology with known ecological data.

DICKMAN, MIKE D., Brock University, St. Catharines, Ontario. Some consequences of a mass mortality of photosynthetic bacteria in the Black Sea.

The Black Sea is the largest meromictic body of water in the world. Its massive populations of photosynthetic bacteria (160,000 cells per ml at 200m) accounts for 60% of the sea's annual primary productivity. During winter, storm generated currents mix dissolved oxygen to a depth of 200m and more killing many of the photosynthetic bacteria which form a dense bacterial plate there (150 - 200m). The subsequent sedimentation of these obligate anaerobes through the 2,000 meter deep reducing environment in the Black Sea results in their mineralization. This in turn contributes to the formation of a dark lamina in the profundal sediments of this curious meromictic body of water.

DODSON, JULIAN J., Department of Biology, University of Waterloo, Waterloo, Ontario. Behavioral toxicology in fish: The modification of rheotropism by subtoxic doses of aquatic herbicides.

Rheotropism is a term used to cover all the reactions that a fish might make in response to a current of water. Several environmental factors have been observed to affect the rheotropic response and evidence exists to suggest that such environmental regulation of rheotropism plays an important role in fish migration. Thus, this behavior is of particular ecological significance and by its fundamentally adaptive nature susceptible to modifications by toxicants involving the rheotropic response of rainbow trout observed in an optomotor tank. Also presented, as specific examples, are the sublethal effects of the aquatic herbicides diquat and simazine.

DONNELLY, ROBERT E., and JAMES B. HARRINGTON, Forest Fire Research Institute, Department of Fisheries and the Environment, Ottawa, Ontario. Forest Fire History Map of Ontario.

A fire history map of Ontario at a scale of 1:500,000 has been prepared from the maps contained in fire report forms for the years 1921-1976 inclusive. The map, available free from the Forest Fire Research Institute or from the Ontario Ministry of Natural Resources, is expected to have broad ecological application.

EMANUEL, MARY E., University of Waterloo, Waterloo, Ontario. The Modification of the Rheotropic response of Rainbow trout, Salmo gairdneri, by ovarian fluid and conspecific odor.

The rheotropic response of Rainbow trout in the presence of the pheromones ovarian fluid and conspecific odor was assessed. Mature male rainbow trout were observed in a circular stream tank receiving three channels and in an optomotor tank. In the stream tank, the behavior of mature males was affected by the presence of dilute ovarian fluid, including attraction to the source. In the optomotor tank, in the absence of any olfactory gradient, the diffuse olfactory clue increased the swimming speeds of sexually mature males as well as increasing the frequency of positive rheotaxis. It is concluded that the response of males to ovarian fluid observed in the stream tank was due to regulation of the rheotropic response, whereby the water current acts as the directional clue, rather than klino- or tropotaxis whereby the olfactory gradient acts as the directional clue. Observations are also presented for the role of conspecific odors in regulating the rheotropic response of juvenile rainbow trout.

EMERY, ALAN R., Royal Ontario Museum, Toronto, Ontario. Some simple observations and conclusions about the behavioural meaning of sounds produced by fishes.

Fish may produce sounds extinsically (using the environment) or intrinsically (using their own anatomy). Intrinsic sounds made in a stridulatory mode (teeth or pharyngeal plate) tend to be of high pitch and used for distant threats, perhaps due to the ease with which they are separated from the usually low pitched background noises. Low pitched intrinsic sounds are usually made either directly or indirectly using the swim bladder, do not carry far in the water, and are used for a wider variety of messages. Species can elaborate intrinsic sound messages by combining them with extrinsic sounds. Examples are drawn from both marine and freshwater species.

FENTON, M.B., Carleton University, Ottawa, Ontario. Partitioning of food resources by sympatric insectivorous bats: optimal foraging or competitive exclusion?

Studies of habitat use, prey selection and activity patterns of sympatric insectivorous bats indicate broad overlap in all of these parameters, especially during periods when food resources are scarce. These observations are compatible with the predictions of optimal foraging strategy, but do not conform to predictions relating to competitive exclusions. The behaviour of individual bats while foraging often reflects some degree of specialization of hunting technique, but the rapidity with which individuals exploit local concentrations of food is usually more impressive.

FREEDMAN, W., and P.M. CATLING, Dept. of Botany, University of Toronto, Toronto, Ontario. Studies of Sympatric Snake Species at a Site near Amherstburg, Ontario.

Four sympatric species of snake were studied in an abandoned quarry site in extreme southwestern Ontario. Estimates of population size for the 40 ha study area were made using a mark-recapture technique and are: Butler's Garter Snake (Thamnophis butleri) 900, 23 snakes/ha; Eastern Garter Snake (T. sirtalis) 150, 4 snakes/ha; Northern Brown Snake (Storeria dekayi) 550, 14 snakes/ha; and Eastern Fox Snake (Elaphe vulpina) 50-120, 1.3-3.2 snakes/ha. Within the study site, Fox Snakes and Butler's Garter Snakes were quite widespread, whereas Northern Brown Snakes and Eastern Garter Snakes were relatively localized in mesic to wet habitats. The relatively high density of snakes in the study area is thought to be related to abundant food, cover, and denning sites.

FULLARD, JAMES H., Carleton University, Ottawa, Ontario. Moth Ears and Bat Cries: Some Relationships.

Arctiid moths possess paired tympanal organs which, like those of other tytanate moths, alert the insects to the approach of echolocating bats. Using two behavioral criteria, sound production and flight cessation, specimens of Cycnia tenera, the Dogbane Tiger Moth, were exposed to artificial bat cries of differing frequencies to determine the auditory sensitivity of the ear. These behavioral audiograms were compared to frequency spectra of echolocation cries of sympatric, insectivorous bats. Compared with other sclerites, the arctiid ear remains relatively constant in size throughout the different sizes of species in the family. This is believed to be a morphological response based on tuning characteristics of the tympanum to those frequencies most predominant in the echolocation/hunting cries of sympatric bats.

GIBBS, H.L., Queen's University, Kingston, Ontario. A dispersion pattern amongst nesting tree swallows (Iridoprocne bicolor).

A population of tree swallows (Iridoprocne bicolor) nesting in boxes was studied during the summer of 1977 in eastern Ontario to determine what dispersion pattern the birds exhibited when the constraint of a limited number of available nest sites was removed. The birds appeared to favour a uniform dispersion pattern, avoiding conspecifics through both time and space. Possible reasons for this avoidance behavior were investigated and the foraging behavior of the birds was hypothesized to be responsible for the spacing pattern present. At higher nest densities an increased feeding area/nestling ratio was required to support the young and this is postulated to be a result of increased interaction with conspecifics.

GIBO, DAVID L., Erindale College, University of Toronto, Toronto, Ontario. The role of soaring flight in the fall migration of the Monarch butterfly, Danaus plexippus.

Adult D. plexippus use a variety of flying techniques to minimize the effects of unfavourable weather and to take advantage of favourable weather during their fall migration. When headwinds are encountered migrating butterflies escape the effects by remaining within the boundary layer. When tailwinds are present the butterflies leave the boundary layer and are carried along by the winds at higher true air speeds than they are capable of obtaining by power flight alone. The effects of crosswinds are countered, at least in part, by the butterflies turning into the direction of the wind. However, because the butterflies normally have a low air speed (6 km/hr gliding, 17.7 km/hr in cruise mode, 40 km/hr in full power mode) only a limited amount of correction is possible. The butterflies appear to accept a certain amount of drifting off course and tend to remain above the boundary layer as long as their net course is southern (SW, S or SE). Extensive use is made of soaring flight during the migration. Due to the enormous energy requirements of powered flight soaring is often a highly efficient flying strategy. However, the Monarch butterfly, D. plexippus, may be the smallest flying animal to regularly engage in directed cross country soaring. Slope soaring and thermal soaring were the predominant forms observed. On some days butterflies were observed ascending in thermal lift to cloud base, or at least to 250 m. Team soaring, a complex flying technique in which two or more individuals apparently use each other as indicators of ascending air currents, was observed frequently. In general the butterflies exhibited the same behavioural patterns that are exhibited by soaring birds, including rapidly altering their flying strategies to suit the local conditions.

The butterflies' use of sophisticated soaring techniques strongly suggested the presence of specialized sensory equipment to determine when they are flying through raising air currents (perhaps based upon pressure changes in the air sac system). The ability of the butterflies to compensate for the effect of crosswinds, even when flying at altitudes of at least 150 m, suggests that they are able to maintain visual contact with the ground while at these altitudes, perceive the extent of drift caused by crosswinds, and determine the amount of change in heading necessary to maintain a particular compass direction.

GIBSON, A. RALPH and J. BRUCE FALLS. Department of Zoology, University of Toronto, Toronto, Ontario. The evolutionary significance of melanism in the common garter snake, Thamnophis sirtalis (L.).

Melanism in the common garter snake is restricted to several discrete locations along the north and west periphery of Lake Erie and to islands in the west end of the lake. The character inherits as a single recessive Mendelian trait; melanic and normal (striped) morphs occur together, thus constituting a clear case of polymorphism. Laboratory and field study indicate that melanics possess a thermal advantage over striped snakes. Comparative ecological study reveals few morph differences. However, both direct and indirect evidence suggest that the melanic morph is more vulnerable to predation than is the striped morph. It is suggested that melanism in T. sirtalis is an adaptation to the temperature regime imposed by the thermal inertia of Lake Erie. The generality of this hypothesis is examined in other species of snakes.

GIZYN, WILLIAM I., University of Toronto, Toronto, Ontario. Influence of an arctic bituminous shale fire on air and soil chemistry: A natural burn of a bituminous shale deposit is occurring along a sea coast in the N.W.T. High concentrations of S, SO_2 and H_2SO_4 aerosol occur in the resultant plume. NAA analysis of Andersen Hi Vol. samples reveals lesser but significant contributions of Se, Mn, Br, Cl, As, U, Sb, and I to the atmosphere with resultant elevations in soil concentrations. Acidification of soil to pH 2.5 from 7.5 has mobilized the bases from the surface. Diversity of vegetation is very low close to the source and can be related to SO_2 levels in the atmosphere

GLADISH, D.W., ALLAN, R., and WALLEN D.G., Department of Biology, University of Windsor, Windsor, Ontario. The primary productivity and phytoplankton composition of four Arctic ponds, August 1977.

Two ponds on Devon Island and two ponds on Baffin Island were sampled between August 7 and August 26, 1977. The highest productivity ($14.4 \text{ mg C/m}^3/\text{hr}$) and total phytoplankton biomass (1880 mg/m^3) was found in Pond 1, on Baffin Island. Phytoplankton were primarily Chrysophytes. The phytoplankton biomass in Pond 2 (Baffin Island) was 570 mg/m^3 ; Oscillatoria limosa (Roth) C.A. Agardh dominated. Primary productivity was the lowest of all ponds; $2.15 \text{ mg C/m}^3/\text{hr}$. Pond 3 on Devon Island supported the lowest total biomass (85 mg/m^3) yet productivity was similar to Ponds 2 and 4 ($3.55 \text{ mg C/m}^3/\text{hr}$). Total biomass on Pond 4 (Devon Island) was over four-fold that of Pond 3 (440 mg/m^3), yet the primary productivity was similar. Pond 3 phytoplankton was dominated by Chlorophytes; Pond 4 by Cryptomonads and Chrysophytes.

GRIFFITHS, RONALD W., University of Western Ontario. Benthic communities as indicators of water quality in the St. Clair River.

A benthic macroinvertebrate survey was carried out by the Ontario Ministry of Environment on the St. Clair River during the spring and summer of 1977. Sixty stations were sampled along the course of the river (41 on the Ontario side and 19 on the Michigan side). Three dredges were taken at each station, once during May or June and once during July or August.

I used an association-analysis to "create" benthic communities from presence/absence data. The benthic community found in each dredge was determined and the distribution of each community was mapped.

Analyses of variance and tests of independence were used to test the communities against a number of quantitative and qualitative physical, chemical and biological parameters collected during the survey. From this analysis the communities were ranked in order of their tolerance to chemical pollution.

The St. Clair River was then sectioned into zones based on the distribution of the communities in the river. The zones were classified as chemically contaminated, recovery and non-polluted based on the community composition within that zone.

The results of the survey indicated that an area, located 6-13 kilometers downstream from the head of the river, along the Canadian side was chemically polluted. This area was found to coincide exactly with that section of the river that receives the industrial wastes of the petrochemical industries located just south of Sarnia, Ontario.

GROSS, HARM P., Queen's University, Kingston, Ontario. Sexual selection in a territorial fish (Gasterosteus aculeatus): behavioural determinants of male reproductive success.

Epigamic and intrasexual components of sexual selection determined reproductive success of male three-spined sticklebacks in experimental trials. Egg-bearing females choosing from among 10 or more nesting males preferred those showing the highest levels of courtship behaviour. Neighbouring males attempted to distract females into their territories, and consequently females changed males an average of 6.8 times and visited an average of 3.1 different males before depositing their eggs. Male reproductive success over 30 independent trials was correlated with territory size. Territory size, aggression and courtship activity were correlated curvilinearly. Isolated males free of intrasexual competition solicited up to 16 females into their nests over a two day 16 hour test period; this figure exceeds field reports of male success by 500%.

HALL, TRUDY M., University of Toronto, Toronto, Ontario. Nickel accumulation in Daphnia magna, or where in the Daphnia is it.

The kinetics of Ni accumulation from the environment by Daphnia magna was followed at 50, 250, and 750 ppb Ni. The relationship between amount of Ni present in the whole animal and time appears exponential. Dissections of individuals throughout accumulation experiments revealed the location of the metal in the body components and their rates of uptake of absorbed Ni.

HAMILTON, J. and E.J. CROSSMAN, Trent University, Peterborough, Ontario. Predator-prey relationship of the muskellunge in Nogies Creek, Ontario.

Between May 5 and October 30, 1976 food consumed by 315 muskellunge, between 290 and 1120 mm TL, was determined. Diet consisted almost exclusively of fishes and Lepomis gibbosus, Perca flavescens, Ambloplites rupestris and Catostomus commersoni were the most common, in that order. However electivity indices suggest that C. commersoni, P. flavescens, L. gibbosus and A. rupestris are the preferred items, in that order. There was only a slight tendency toward a direct size relationship between predator and prey. Nogies Creek muskellunge preyed to a higher extent on spiny-rayed fishes and to a higher degree on small food items than reported for other populations of E. masquinongy or E. lusius.

HARLAND, RICHARD M., University of Western Ontario, London, Ontario. Changes in activity patterns in Peromyscus leucopus in response to the demands of lactation and meteorological conditions were monitored. Lactation was found to increase the amount of time the female spent away from the nest compared to non-lactating females and to increase the females' sensitivity to meteorological conditions. The effects of these trends on the young are discussed. It was also determined that given large and complex enclosures, enclosure activity is a reasonable replicate of wild activity and that activity patterns vary seasonally.

HEBERT, PAUL D.N. and HOLLOWAY, JEREMY D., University of Windsor and The British Museum. The insect-host plant relationship: a numerical study.

Patterns of host plant use by larvae of macrolepidoptera feeding on trees in Canada and Great Britain are examined. The greater similarity of insect faunas on taxonomically related plants is documented using cluster analysis. The data reveal that lepidopterans feeding on conifers are less specific in their host plant choice than species feeding on angiosperms. The numerical analyses also provide evidence of greater overlap in the insect faunas of plants belonging to the same ecological association. These results are discussed with particular reference to insect-plant coevolution.

HOLTBY, BLAIR, Erindale College, University of Toronto, Toronto, Ontario. The size structure of zooplankton communities as a predictor of limnological conditions.

The size structure of the midsummer zooplankton community of 19 Haliburton lakes was used as a basis for a principal components ordination. Numerical distributions in 12 size classes were determined manually from photographs and with a Quantimet 720 image analyzer. The proportion of large forms (> 1.5 mm) increased with lake size and drainage basin area and decreased with increasing phosphorus loading. However, the size distributions were not related to average summer chlorophyll a, average summer Secchi depth or spring phosphorus concentrations, typical indicators of lake trophic status. This suggests that size distributions alone are inadequate predictors of limnological conditions in these lakes.

INNES, DUNCAN G.L., University of Western Ontario, London, Ontario. The reproductive tactics of two sympatric microtine species.

Mictotus pennsylvanicus and Clethrionomys gapperi were trapped at Pinawa, Manitoba to find if these microtines had similar reproductive tactics in the same environment. Litter size, age at weaning and the number of litters per year did not differ significantly between the species. Female postpartum weights, neonate (and litter) weights, age at which the eyes opened, growth rates and gestation lengths, were all significantly different between the species. Reproductive effort, as measured by energy invested in offspring over total ingestion was significantly higher for Clethrionomys. Differences in weight (which appears to determine neonate weight, growth rate, gestation length and the age at which the eyes open), may be due to the species using the arboreal environment to different degrees.

JOHANSEN, PETER H., Queen's University, Kingston, Ontario. The temperature selection behaviour of the mummichog (Fundulus heteroclitus) under various temperature/salinity regimens.

Mummichog were acclimated to various constant temperature/salinity regimens for a minimum of four weeks. They were tested in a horizontal temperature gradient that was supplied with water at one of several salinities in groups of three or five. It was found that selected temperature increased with increasing acclimation temperature, the final preferendum was estimated to be 32°C , and the temperature selected was affected by the salinity of the water in the gradient for those fish acclimated in 100% sea water.

KELLMAN, MARTIN, York University, Downsview, Ontario. Nutrient accumulation by savanna trees as a mechanism of rainforest invasion of savannas.

Several Neotropical savanna tree species can accumulate nutrients in surface soils beneath them to levels approaching those of rainforests, despite the low fertility of the surrounding savanna soils. This is achieved without deep rooting, indicating that capture of rainfall inputs is the major source. Capture is achieved without increases in soil C.E.C. for moisture retention capacity, suggesting that the establishment of an enriched cycle by persistent genets is the major process. Besides acting as nutrient sinks, these trees may also act as mycorrhizal sinks and be preferred sites for animals dispensing rainforest seeds into savannas. These trees may thus act as foci for the rainforest invasion of savannas that recent paleo-ecological research shows has occurred repeatedly during the Pleistocene.

KERR, GORDON E., University of Toronto, Erindale College, Mississauga, Ontario. Preliminary report on parental investment and mating system of two meadow-katydidids.

Conocephalus brevipennis males produce spermatophores which are about 10% of their body weight. The spermatophylax which comprises most of this mass is approx. 14% protein and 70% water. There is a significant positive relationship between male body weight and size of first spermatophore produced. Second spermatophores have a small spermatophylax. The spermatophylax is virtually absent on a third mating in the same day but sperm is transferred. A full sized spermatophore can be produced two days after mating. This suggests that the spermatophylax is a significant parental investment by the male. Contrary to conventional wisdom, females mate repeatedly. There is no evidence that they select males. These results will be compared to results being collected for C. nigropleurum.

KRAMER, DONALD L. and JOHN MEHEGAN, McGill University, Montreal, Quebec. Ecological and ethological implications of surface skimming as a respiratory strategy in the common guppy.

Surface skimming, the use of the thin, well-oxygenated surface film, is one of the most widespread respiratory strategies used by fishes inhabiting oxygen-deficient waters. For neutrally buoyant species with small, terminal or dorsal mouths it appears to be a highly effective process, not requiring the major anatomical and physiological modifications involved in aerial respiration. However, it has a disadvantage in that considerable time maybe spent at the surface, with potentially increased exposure to aerial predation and reduced time available for other activities. This study focuses on the amount of time spent in respiration by the common guppy Poecilia reticulata in relation to individual characteristics - sex, acclimation time, weight, genetic background - and environmental conditions - dissolved oxygen, temperature. We then experimentally examine the implications of this temporal cost of surface skimming for courtship, feeding, locomotion, and anti-predator behaviour.

KRAMER, HOWARD G., McGill University, Montreal, Quebec. Dialect vocalizations of the Northern Blue Jay, Cyanocitta cristata bromia.

The occurrence of dialects has been well documented in many passerine species, though not in the Corvidae nor especially among social, flocking species such as the blue jay. A set of blue jay vocalizations known as 'bell calls' were analyzed for their structural taxonomy and geographic distribution. Bell calls typically consist of one to four notes and may last 0.13 - 0.58 seconds. Nine study areas were visited regularly in eastern Massachusetts for sixteen months. Recordings played back in the laboratory revealed no discernable difference among bell calls occurring at the same locations (even when recorded from several jays calling simultaneously), though an obvious and consistant difference appeared among bell calls of different locations, some of which were geographically contiguous. The distribution of bell calls remained consistant for five seasons. A statistical analysis of sonagrammed bell calls revealed 33 discrete call types, with no call type occurring in more than 4 of the 9 study areas visited. Current research suggests that bell calls may function as a flock-identification signal.

LASENBY, DAVID C., Trent University, Peterborough, Ontario. Predation and feeding of Mysis relicta.

Immature and adult Mysis relicta in Kootenay Lake, B.C. were found to be predatory on the calanoid Diaptomus ashlandi and the cyclopoid Cyclops bicuspidatus. Maximum feeding rate by Mysis on both these prey was 1.7 animals per hour. Mysis undertook diurnal vertical migrations in the water column from approximately 100 m to the depth of maximum zooplankton concentration (0 m to 30 m). Estimated percentage of standing crop of prey eaten by Mysis per day in July was : 0.9% for Cyclops bicuspidatus and 3.5% for the Diaptomus ashlandi. It was estimated that mysids can fulfil their caloric requirements for growth and respiration in summer by feeding on Cyclops and Diaptomus alone.

LEGGETT, WILLIAM C., McGill University, Montreal, Quebec. Latitudinal variation in reproductive characteristics of shad: Evidence in support of prevailing life-history strategy theory.

In American shad, egg and larval survival, the principal determinants of year class strength in the species, is strongly influenced by temperature conditions during the spawning period. The thermal regimes of northern Atlantic coast rivers are more variable and the duration of optimal temperature conditions shorter than in the southern rivers. This leads to greater year to year variation in reproductive success in northern populations relative to those spawning in the south.

Current life history strategy theory predicts a greater incidence of repeat reproduction and a general reduction in fecundity, because of the greater allocation of energy to adult survival, in these northern populations. In line with these predictions, the frequency of repeat reproduction increases linearly from the south, where post-spawning mortality is complete, to the north where more than 50% of the individuals in the populations spawn more than once. Fecundity varies inversely with the frequency of repeat reproduction being approximately twice as great in the south.

Alabama shad, a closely-related species, spawning in the Apalachicola River, Florida, whose thermal profile is more typical of northern rivers, have a life history strategy characteristic of northern populations of American shad.

MACLEAN, N.G., J. POLAK, and G.C. TELEKI, Nanticoke Fish Study, Ontario Ministry of Natural Resources. Ultrasonic telemetry studies in the vicinity of Nanticoke Generating Station, Lake Erie.

Ultrasonic telemetry was started in the Nanticoke area in 1973 to investigate the effect of shoreline industrialization (Ontario Hydro, Stelco, Texaco) on the movement of selected fish species. That year, 11 smallmouth bass were tracked on an experimental basis, providing some insight into their localized movements.

Since 1975, 28 smallmouth, 18 rock bass, and 16 yellow perch have been tracked at the generating station's thermal plume and control locations. Fish were monitored continuously, recording position, distance between turns, and angle of course alteration; as well as various environmental parameters. An activity index was developed to aid in the statistical analysis of plume vs. control tracks. Multiple linear regression techniques were used to determine the relative importance of the environmental parameters as directive factors. Analysis to date shows that the parameters most highly correlated with activity in the plume area were temperature, current speed and turbidity -- parameters directly affected by the discharge. However, only rock bass activity was significantly different between plume and control locations.

Tag returns confirm these findings.

M'CLOSKEY, ROBERT T., Department of Biology, University of Windsor, Windsor, Ontario. Diversity and Assembly of Desert Rodent Communities.

Current ecological theory predicts limits to the closeness of species packing. Increased competition from more competitors should result in greater average niche separation. This idea was tested for locally sympatric heteromyid rodents in part of the Sonoran Desert of Arizona, and the predictions were verified. As a consequence of diffuse competition, niche separation increases with species diversity and rodent species show separation on both niche dimensions quantified in this study (seed size collection and habitat utilization).

The pattern of niche separation and diversity also accounts for the occurrence of specific combinations of species (local assemblies). Of all possible pairs and triplets of species that can be constructed by computing niche separation, the observed assemblies are those showing minimum separation and hence maximum utilization of resource space. Imaginary assemblies are undersaturated. Compatibility of species does not appear to be important in determining the species composition of these heteromyid rodent assemblies.

MCNICOL, DONALD K., Queen's University, Kingston, Ontario. Temporal and habitat patterns of food utilization in Redwinged blackbirds (Agelaius phoeniceus).

In recent years, crop depredation by redwinged blackbirds, has been the source of a great deal of research, concerned primarily with the development of effective control and management measures. This paper considers the feeding ecology of the redwinged blackbird, with particular emphasis on the temporal and habitat patterns of food utilization. The research was conducted in two contrasting habitats simultaneously during the summer of 1977: Agricultural - with major cereal crops of corn and oats in the Kingston and Wolf Island area, Forested Canadian Shield - with intermittent marshes in the vicinity of the Queen's University Biological Field Station, L. Opinicon. The results from this research have been analyzed and are presented with respect to the potential ecological and economic impact of redwinged blackbird food utilization.

MCQUEEN, DONALD J., York University, Toronto, Ontario. Interactions between the burrowing wolf spider Geolycosa domifex and a predaceous Pompilid wasp.

The burrowing wolf spider, G. domifex occurs in sandy moraine areas of Southern Ontario. This species reproduces in June of each year and requires three years to reach sexual maturity. During the second and third years of life the wolf spiders are attacked by Pompilid wasps which enter spider burrows, battle the spiders, sting and paralyze their victims, lay one egg against the spider's abdomen, fill the burrow with sand and continue the search for more spiders. Within a few weeks the egg hatches and the larval wasp consumes the paralyzed spider and forms a cocoon for overwintering. In July of the following year the wasp emerges and hunts spiders. All second and third year spiders that have open burrows are killed by wasps, but most of the second year spiders cover their burrows and escape, while the third year animals must leave their burrows open to allow their young to feed and are consequently all killed.

OBBARD, MARTYN E. and R.J. BROOKS, University of Guelph. Nesting migrations in the common snapping turtle, Chelydra serpentina.

A radio-telemetry and mark-recapture study of movements of female snapping turtles in Algonquin Park, Ontario indicated that an annual migration to a nesting site occurred. Maximum distance moved to the nesting site was 10 km (mean 5.75 km). Females moved to the nesting site from both upstream and downstream locations. Migrations of some females involved overland movement (approximately 0.5 km) from one water body to another.

Annual migrations to nesting sites are well known for marine turtles; however, this appears to be the first documented case of an annual migration to a nesting site by a freshwater furtle.

PRUDHOMME, TOM I., McGill University, Montreal, Quebec. A Comparison of the Seasonal Patterns of Relative Carbon Allocation to Secondary Compounds in the Leaves of Two Subarctic Shrub Spp.

The seasonal patterns of relative allocation ($C-14$) to five classes of secondary compounds are presented for dwarf birch (Betula glandulosa) and Labrador tea (Ledum groenlandicum) growing in the mature lichen woodland near Schefferville, Quebec. Seasonal changes in leaf sensitivity to herb-ivory is discussed, and the apparent defense strategies employed by these two species are contrasted from the point of view of deciduous vs. evergreen growth habit.

RIDDELL, BRIAN E. and W.C. LEGGETT, McGill Univeristy, Montreal, Quebec. Geographic Variation in Juvenile Atlantic Salmon (Salmo salar L.): Growth and Body Morphology.

Phenotypic variation of several quantitative traits was studied in two populations of wild juvenile Atlantic salmon. Growth rate and body morphology comparisons are discussed. Discriminant analysis was utilized to describe body morphology. Growth rate and body morphology were significantly different between populations and were correlated with observed environmental conditions. Individuals from the population which experienced lower temperatures and higher flow velocities grew slower and were slender with larger pectoral and pelvic fins. Hatchery breeding experiments in 1976 did not show any between population differences in growth rates but morphological discrimination was significant. Principle discriminating variables and the graphic orientation of populations were the same in wild and hatchery analyses. Quantitative genetic analyses conducted during 1977 suggest a genetic basis to the morphological variations between populations.

SANDEMAN, IAN, and DAVID C. LASENBY, Trent University, Peterborough. Respiration rates and vertical migration in Mysis relicta.

Oxygen consumption rates were determined for individual mysids over a wide range of ambient O₂ concentrations and temperature, using a micro-cathode Clark electrode in a closed system. The regulation pattern and the relationships between dry wt., temperature, ambient O₂ level and respiration are explored. The ambient O₂ level emerges as a factor with as much significance as temperature in determining the metabolic rate.

SCHOENERT, ROLF A., McGill University, Montreal, Quebec. Population dynamics and production estimates of cladoceran zooplankton along a nutrient gradient in Lake Memphremagog, Quebec.

Values of production, numbers and biomass of the pelagic, herbivorous cladocerans in two basins of Lake Memphremagog suggest a gradient related to the primary production, chlorophyll a levels and nutrient concentration. In previous seasons, a 1.4 fold decrease in primary production, 2.5 fold decrease in chlorophyll a levels and a 2.3 fold decrease in total phosphorus concentrations have been determined between the south and central basins. Cladoceran production rates were 23.8 and 11.6 mg. dry weight m⁻³ day⁻¹ in the south and central basins respectively for a sampling season extending from May to September. Mean numbers were 56290 and 20260 individuals m⁻³ in the respective basins, while mean total biomass estimates were 195 and 82 mg. dry weight m⁻³ respectively. The ratio of these values is similar to those already determined for primary producers and phosphorus levels and are comparable to recently published ratios of benthic productions and fish biomass in the lake.

SHIOVITZ, KENNETH A., McGill University, Montreal, Quebec. Subtle Sound Patterns Involved in Display-Release by Territorial Buntings, Passerina.

Indigo Bunting song syllables were collapsed to one-half normal duration by removing regular 2.5 msec sound segments. The resulting syllables approximate Lazuli Bunting syllable duration. Playback of the altered song in the Indigo-Lazuli hybrid zone was expected to elicit territorial display behavior from all morphological types. However, neither type gave positive responses, except to control tapes. With previous playback results, this suggest that subsegment rise and fall times are involved in evoking the territorial display response.

SMITH, JUDITH A., Queen's University, Kingston, Ontario. Measurements of fitness differences between the blue and the white morphs of the lesser snow goose, Anser caerulescens caerulescens.

Two color phases, the blue and the white, can be distinguished in the less snow goose. This study was instigated to determine whether or not fitness differences exist between the morphs, and if so, could the resulting selective advantage of one of the morphs explain the shifting phase frequency ratio seen at the La Perouse Bay colony in Northern Manitoba. Fitness here is defined as the number of goslings surviving to reproductive age. Various parameters used in the fitness measure include total and final clutch size (egg loss); gosling, adult and yearling mortality; age of first breeding and longevity.

SMOL, JOHN P., Brock University, St. Catharines, Ontario. Fossil diatoms and chrysophytes of Found Lake.

The changing diatom flora of the last 10,000 years of Found Lake in Algonquin Park represents a typical temperate, planktonic, fresh water assemblage. A percentage and absolute number analysis of diatoms was made on 28 sections of a 2.5m sediment core. While there was no marked absolute numbers of diatom frustules at the 9 cm level. This coincides with the Ambrosia (ragweed) pollen grain peak reflecting man's interference with the environment.

Despite earlier reports of the poor or non-preservation of Mallomonas remains, the siliceous scales of especially M. allorgei were well preserved in this sediment core. Absolute counts of these scales suggest that their populations have fluctuated widely in the past.

SOKOLOWSKI, MARLA, University of Toronto, Toronto, Ontario. Feeding-locomotive behavior in Drosophila melanogaster larvae: Are foraging strategies important in larval competition?

Third instar larvae of several inbred strains of D. melanogaster were tested in an 'open field' apparatus layered with yeast. Two discreet behavioral types 'shovellers' and 'walkers' were found. Shovellers utilized the food resource in a limited area whereas the walkers covered a greater area while foraging. Using chromosomal manipulations it was demonstrated that these behaviors are under genetic control. Samples from a natural population served to illustrate that shovellers and walkers exist in the wild in an apparent Hardy-Weinberg equilibrium. It is hypothesized that these behaviors may be important in larval competition in the wild.

SPRULES, W. GARY, Zoology, Erindale College, University of Toronto, Mississauga Ontario. A contribution to the life history of Daphnia cf. cavicervix Ekman, a woodland pond cladoceran newly reported from North America.

Daphnia cf. cavicervix Ekman was first reported from North America in 1972. Its life history has been studied in a small woodland pond in southern Peel county, Ontario. Considerable variation is present but an exephippial generation usually appears under ice during late winter. Parthenogenetic reproduction follows, perhaps only one generation, until April when males are produced prior to the appearance of ephippia and the demise of the population in early May. Water temperatures above 10°C or the presence of competitive species of Daphnia may contribute to this decline. For reasons as yet unknown, these late winter populations do not appear some years even though conditions appear suitable. If the pond fills with water during fall rains, another hatch of ephippia may occur. These autumn populations may persist until early January when they disappear, possibly because of extremely low dissolved oxygen concentrations. Periodically these autumn populations disappear because the pond dries up or freezes solid, even before exephippial individuals reach sexual maturity. The species exhibits a variety of interesting adaptations to the harsh and unpredictable environment of the very early stages in the formation of temporary ponds.

STEELE, ROBERT W., and RONALD J. BROOKS, University of Windsor, Windsor, Ontario and University of Guelph, Guelph, Ontario. Behavioural responses of Microtus pennsylvanicus to changes in habitat structure.

Meadow vole densities are usually associated with abundant vegetation cover. However, in some cases, high densities are found in areas with little cover. This study attempted to determine the response of M. pennsylvanicus to variations in cover within and between habitats. Voles on three different grasslands were outfitted with radio-transmitters and followed for several weeks. On one of these grasslands, voles were followed prior to, during, and after mowing. Differences in homerange and surface activity suggest that meadow voles have a wide variation in timing and extent of movements in response to vegetation structure. This plasticity in behaviour may partly account for M. pennsylvanicus' distribution over a wide habitat spectrum.

SUFFLING, ROGER, University of Waterloo, Waterloo, Ontario. A demographic approach to ecosystem management.

Simulation studies show that when young and old ecosystems are equally subject to disturbance the age distribution will have the form -

$$\ln \text{Area}_t = \ln \text{area}_0 - at$$

where $\ln \text{Area}_t$ = Area of ecosystems of age t .

$$\ln \text{Area}_0 = \text{Area of youngest ecosystems}$$

$$a = \text{a constant}$$

This pattern is seen in parts of southern Ontario, and in extremely fire prone areas in the north of the province. Throughout much of the north however, disturbance rates increase with age where there has been little or no forest management. Older stands are more subject to fire and insect attack. Fire management is altering this pattern through much of the province, and logging disturbance does not entirely compensate for lessened fire disturbance. Thus, fewer forest stands are being recruited to younger age classes. The implications of these changes are discussed.

TAYLOR, DAVID G., Carleton University, Ottawa, Ontario. Comparative population biology of Peromyscus in an isolated and a non-isolated woodlot.

The population biology of P. l. noveboracensis in two woodlots isolated to different degrees from other local areas of forest was studied. The fates of these populations were found to be influenced by the nature and size of the populations that overwintered, the amount of acceptable habitat available, and the degree of isolation of the woodlot in question. The significance of stochastic events in affecting the survival of small spring populations is emphasized.

TAYLOR, GREGORY and ADELE CROWDER, Queen's University, Kingston, Ontario. Factors affecting the distribution of Maianthemum canadense Desf. in the St. Lawrence Islands.

The distribution of the plant was studied on Hill Island. Edaphic and microclimatic factors were measured at 113 sample sites, 72 of which contained Maianthemum. One type of bedrock was associated with the plant but soil depth and texture were unimportant. The rate of evaporation and a range of phosphorus concentration delimited the sites at which the plant occurred. Biomass was related to the light penetration through the canopy. Five plants were found to be positively associated with Maianthemum, two negatively.

TAYLOR, KIYOMO and P.B. CAVERS, University of Western Ontario, London, Ontario
 Population dynamics of undisturbed pure stands of Portulaca oleracea L.
 (common purslane).

Two naturally-occurring pure stands of Portulaca oleracea were studied over the course of one growing season (May to September). Five half-metre square plots were harvested from each stand at three week intervals for a total of four harvests. Plant density within the plots and individual dry weights of the plants harvested were recorded. The results were interpreted in relation to the Density Effect Law of Shinozaki & Kira and the 3/2 Power Law of Self-thinning, first proposed by Yoda, Kira, Ogawa and Hozumi.

THOMAS, DONALD W., Carle University, Ottawa, Ontario. Dry season foraging behaviour of two African fruit bat species.

I examined the species composition, habitat use, and foraging behaviour of the fruit bat community in Rhodesia during the dry season using mist nets and radio tracking. The two species of fruit bats present (Epomophorus gambianus and Rousettus aegyptiacus) were caught primarily in the riverine forest where Diospyros senensis was the only abundant fruit. Radio tracking of E. gambianus indicated that their ranges were restricted to one or several D. Genensis trees and to nearby thick canopied roost trees. Rousettus aegyptiacus appeared to group forage. Resource overlap and competitive foraging strategies are discussed.

VOIGT, DENNIS R., Ministry of Natural Resources, Maple, Ontario. Movements of Foxes, skunks, coyote and raccoon in southern Ontario.

A total of 110 foxes, skunks, coyotes and raccoon were radio-collared in southern Ontario to study inter- and intra-specific relationships, activity patterns and dispersal. Long distance movements up to 100 miles were recorded as well as variations in size and use of home range for different sex and age classes. A computer program to analyze large samples of telemetry data is briefly described. The results were applied to the development of a baiting system to deliver an oral rabies vaccine and help understand the epidemiology of rabies.

WALLEN, D.G., Department of Biology, University of Windsor, Windsor, Ontario. Nutrient limiting factors in ice covered Lake St. Clair.

Nutrient enrichment experiments on ice bound phytoplankton populations at three stations in Lake St. Clair, of the St. Lawrence Great Lakes system, provided evidence that silica was the primary nutrient limiting phytoplankton growth and photosynthesis at station 3 in mid winter, but not a two other stations in the lake. The addition of silica at concentrations of 150 ug/l or greater relieved this limitation. Phosphate appeared to be a secondary limiting factor at station 3.

Stations 1 and 2 below river outlets, draining rural and urban areas, showed variable results. Trace metal limitation was observed at station 1 on February 20, trace metal and vitamin limitation at station 2 in March. Possible limitation by phosphate nitrogen was occasionally evidence.

WEIS, I. MICHAEL, University of Windsor, Windsor, Ontario. Competition involving multiple resource dimensions: field data and its implications for the study of guilds.

Coexistence of prairie fugitive plants is dependent upon the partitioning of resources along two dimensions, soil moisture content and the spacing between disturbances. Resource partitioning among the 3 fugitive species most closely packed was measured along both dimensions using 2 hillsides on an Iowa prairie. Competition coefficients calculated from this data are smaller than those predicted for orthogonal resource dimensions, though there is significant covariance of soil moisture and spacing of mounds. Calculations indicate that the fugitives encounter portions of the resource space which differ in covariance (and grain). These differences appear important in the evolution of tightly packed guilds.

WYPKEMA, R.C.P. and C.D. ANKNEY, Department of Zoology, University of Western Ontario, London, Ontario. Significance of protein and fat changes of migrating Lesser Snow Geese at James Bay, Ontario.

We compared mean body weights, fat and protein and an index feeding in snow geese arriving at and leaving southern James Bay in spring and fall, 1976.

In spring, feeding, body weight and protein of adults increased, and fat reserves were maintained. The protein increase of adult females is equivalent to the protein in 1 egg. Ovarian follicular development in adult females appeared to increase as reserves became available.

In fall, fat increases of 80g to 156g represented increases in theoretical maximum flight ranges of 567 km to 1105 km without which adult females and juveniles could not complete migration. We suggest that the energy increment represented by the fat gain is an important determinant of successful fall migration.

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ABSTRACTS

AARSSEN, L.W., and P.B. CAVERS, Dept. of Plant Sciences, The University of Western Ontario, London, Ontario. Stability and flux of Neighbour Relationships in Grass-Legume Communities.

A spring and fall survey of three old pastures near London, Ontario revealed both stable and changing associations amongst the constituent species, mostly grasses and legumes. Neighbour relationships were affected by changes in the relative frequency of species between the two surveys and probably such factors as seasonality of growth forms and changes in combining ability. Despite such changes, consistent positive and negative relationships amongst species of grasses and legumes were recorded in the two surveys.

ANKNEY, C. DAVIDSON, University of Western Ontario, London, Ontario. Is wing molt a nutritional stress for Lesser Snow Geese?

It has been hypothesized that the wing molt, especially by females, is the most stressful period in the life cycle of ducks and geese. I tested that by collecting adult Lesser Snow Geese (Chen caerulescens caerulescens) before, during, and after the wing molt at the McConnell River, Northwest Territories. I found that these birds do not catabolize body tissues (muscle, fat or bone) to obtain nutrients for feather growth. Thus, these geese are able to obtain nutrients for feather growth directly from their diet. I show why that is predictable and suggest that other species of waterfowl behave similarly.

AUBE, CAROL A., Carleton University, Ottawa, Ontario. Feeding range, feeding strategy and energy maximization of the feral pigeon, Columba livia, during the winter.

The feral pigeon has successfully exploited man-made environment, utilizing building structures for roosting and breeding sites and feeding from waste spillage, refuse, livestock feed and handouts. During the winter, however, those handouts from tourists in parks, picnic refuse and other sources decrease greatly. The feral pigeon, in order to survive, must utilize its energy to the fullest, yet retain sufficient fitness to survive the cold stress created by the winter. To do this different feeding strategies are used for the foods available in different areas, feeding ranges are extended to include better feed areas and all activities are based on energy conservation.
