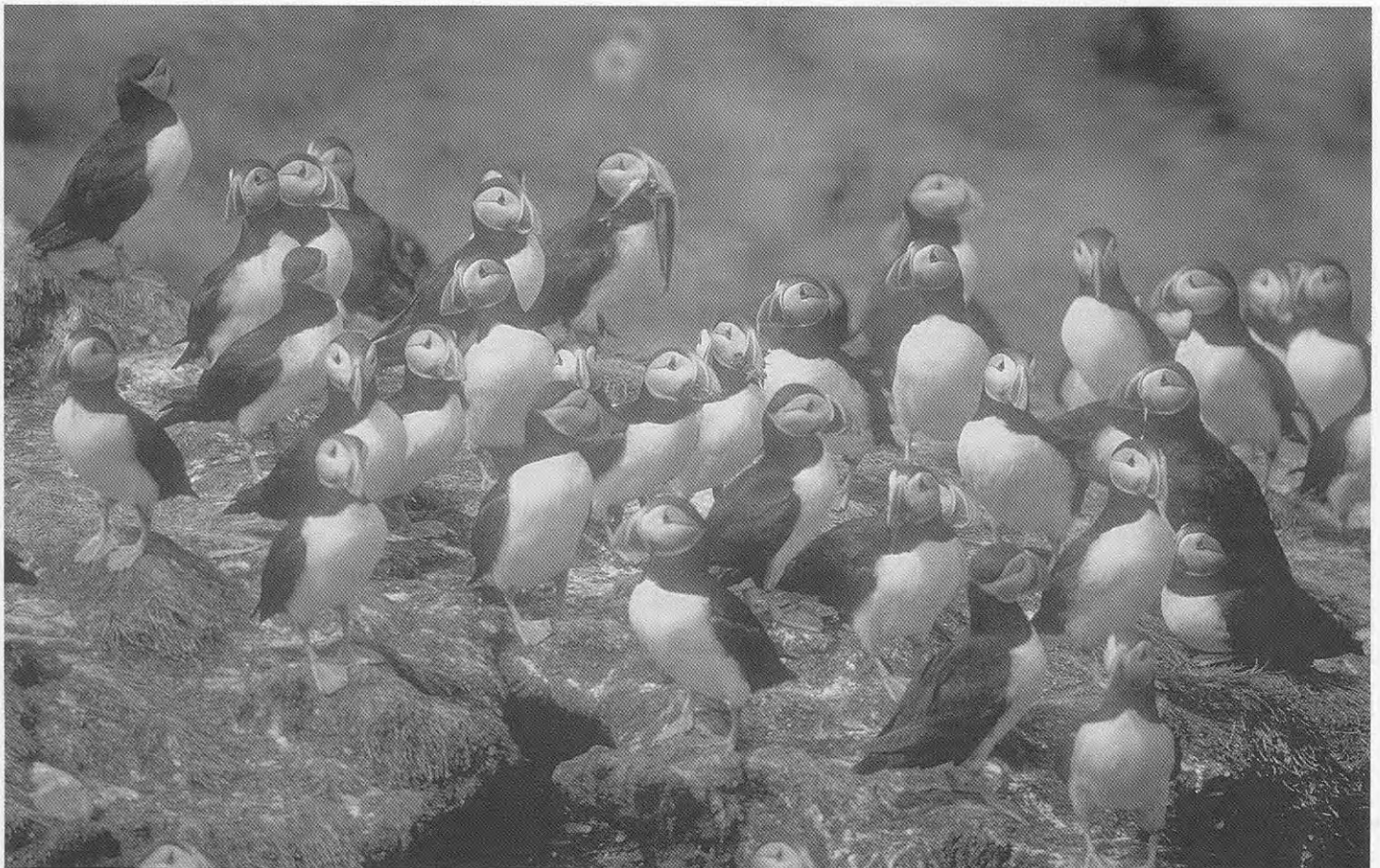

Society of Canadian
Bulletin of The Ornithologists

PICOIDES

Bulletin de la
Société des Ornithologistes du Canada

ISSN 0836-060X

Picoides, November 2000
Volume 13, Number 2



Atlantic Puffins - Gull Island, Witless Bay, Nfld.
(photo by John Chardine)

[Provincial bird of Newfoundland;

this group seems perplexed because no presentation at the Birds 2000 conference
(see pp. 2-24) specially featured their species?!]

Society of Canadian Ornithologists Société des Ornithologistes du Canada

Officers for 2000

President: Dr. Kathy Martin, (UBC) Dept. of Forest Sciences, University of British Columbia, 2357 Main Mall, Vancouver, B.C. V6T 1Z4; Voice: 604-822-9695; fax: 604-822-5410 or 822-9102; e-mail: kmartin@interchange.ubc.ca

(CWS) Pacific Wildlife Research Centre, Canadian Wildlife Service, 5421 Robertson Rd., R.R.1, Delta, B.C. V4K 3N2; Voice: 604-946-8546; fax: 604-946-7022; e-mail: as above.

Vice-President (President-elect): Dr. David Bird, Macdonald Coll., McGill Univ., 21,111 Lakeshore Rd., McDonald Stuart Bldg MS2072, Ste-Anne-de-Bellevue, Qué. H9X 3V9; Voice: 514-398-7760; fax: 514-398-7990; e-mail: bird@nrs.mcgill.ca

Secretary (Membership): Dr. Nancy Flood, Dept. Biological Sciences, University College of the Caribou, 900 McGill Road, Box 3010, Kamloops, B.C. V2C 5N3. Voice: 250-828-5436; fax: 250-828-5450; e-mail: nflood@cariboo.bc.ca

Treasurer: Dr. Tom E. Dickinson, Dept. Biological Sciences, University College of the Caribou, 900 McGill Road, Box 3010, Kamloops, B.C. V2C 5N3. Voice: 250-828-5447; fax: 250-828-5450; e-mail: tdickinson@cariboo.bc.ca

Recording Secretary: Dr. Peter Blancher, National Wildlife Research Centre, Can. Wildl. Serv., DOE, 100 Gamelin Blvd., Hull, Qué. K1A 0H3. Voice: 819-997-6086; fax: 819-953-6612; e-mail: peter.blancher@ec.gc.ca

Editor of S.C.O. Bulletin *Picoides*: Dr. Tony Erskine, Canadian Wildlife Service, DOE, P.O. Box 6227, Sackville, N.B. E4L 1G6. Voice: 506-364-5035; fax: 506-364-5062; e-mail: tony.erskine@ec.gc.ca.

Members of Council: (those marked * are in 2nd terms)

elected December 1998:

Dr. Stephen Flemming, Gros Morne National Park, P.O. 130, Rocky Harbour, Nfld. A0K 4N0. Voice: 709-458-2417; fax: 709-458-2059; e-mail: stephen_flemming@pch.gc.ca

Dr. Marty Leonard, Dept. of Biology, Dalhousie University, Halifax, N.S. B3A 4J1. Voice: 902-494-2158; fax: 902-494-3736; e-mail: mleonard@is.dal.ca

Dr. Karen Wiebe, Dept. of Biology, Univ. of Saskatchewan, Saskatoon, Sask. S7N 5E2. Voice: 306-966-4406; fax: 306-966-4461; e-mail: wiebek@duke.usask.ca

elected December 1999:

* Dr. Fred Cooke, CWS/NSERC Chair - Wildlife Ecology, Dept. Biol. Sci., Simon Fraser University, Burnaby, B.C. V5A 1S6. Voice: 604-291-5610; fax: 604-291-3496; e-mail: fcooke@fraser.sfu.ca

Leah de Forest, IBA Program, Canadian Nature Federation, 1 Nicholas St., ste 606, Ottawa, Ont. K1N 7B7. Voice: 613-562-8208, ext.245; fax: 613-562-3371; e-mail: iba@cnf.ca

Dr. Cheri Gratto-Trevor, Canadian Wildlife Service, 115 Perimeter Rd., Saskatoon, Sask. S7N 0X4. Voice: 306-975-6128; fax: 306-975-4089; e-mail: cheri.gratto-trevor@ec.gc.ca

* Dr. Erica Nol, Head, Dept. of Biology, Trent Univ., Peterborough, Ont. K9J 7B8. Voice: 705-748-1424; fax: 705-748-1205; email: enol@trentu.ca

Dr. Greg Robertson, 6 Bruce St., Mount Pearl, Nfld. A1N 4T3. Voice: 709-772-2778; fax: 709-772-5097; e-mail: greg.robertson@ec.gc.ca

* Dr. Jean-Pierre Savard, Service canadien de la faune, 1141, route de l'Église, 9th floor, c.p.10100, Sainte-Foy, Qué. G1V 4H5. Voice: 418-648-3500; fax: 418-649-6475; e-mail: jean-pierre.savard@ec.gc.ca

Past Presidents

M. Ross Lein (1982-85), Spencer G. Sealy (1986-87), Erica H. Dunn (1988-89), Jon C. Barlow (1990-91), J. Bruce Falls (1992-93), Henri R. Ouellet (1994-95), David N. Nettleship (1996-97), Antony W. Diamond (1998-99).

**2001 ANNUAL GENERAL MEETING/RÉUNION ANNUELLE GÉNÉRALE 2001
UNIVERSITY OF WASHINGTON, SEATTLE, WASH., U.S.A.**

The 2001 AGM of S.C.O./S.O.C. will be held in Seattle in association with the annual A.O.U. conference 15-18 August. S.C.O. expects to sponsor or co-sponsor at least one session in addition to our (independent) AGM. Meetings will be held on the University of Washington campus. Further details will be in the spring *Picoides* - & sent by A.O.U. to members of that body.

Sievert Rohwer chairs the Local Executive Committee;
website <http://depts.washington.edu/bird2001/>.

Peter Lowther coordinates Papers & Poster submissions;
website <http://www.fmnh.org/aou/aoupage.htm>

For further information, please contact:

Kai Fujita, Conference coordinator,
Ornithology, Burke Museum,
Univ. of Washington, Seattle, Wash. 98195-3010 U.S.A.
(PH: 206-616-9322; FX: 206-685-3039; EM: bird2001@u.washington.edu)

THE "BIRDS 2000" EXPERIENCE

The recent bird conference in Newfoundland provided both novelty and sameness, and must have opened the eyes of many who were visiting the tenth province for the first time. For me, it was my first summer visit longer than overnight to St. John's, 50 years after my first experience of Newfoundland - when I didn't come within 150 km of the city in four months on "the Rock". It also was my 15th A.O.U. conference, but the first shared with other ornithological societies; that particular combination (with B.O.U., S.C.O.) seems unlikely to recur.

The conference setting, on a university campus, in August heat and humidity, with commuter traffic audible at most hours, might have been almost anywhere in eastern North America. St. John's laid on what for them were record temperatures - brought by humid southwest winds - that probably surprised people from away as much as they did locals. But as soon as you left the campus you knew you weren't in Alabama or Connecticut or even Ontario. The forested ridge across Long Pond

was boreal by any standard, despite exotic alien plants along the trails, and the birds were those we'd find around Quebec City or Sudbury. It was probably the first-ever A.O.U. meeting in the "Canadian Zone" (of Merriam 1894); Alaska meetings were in his "Hudsonian Zone" and other Canadian meetings in the "Transition Zone". Some suburban housing in the city might have been matched elsewhere, but older streets, especially towards the harbour, featured "vintage Newfoundland" buildings. The harbour itself, cherished as "Newfiejohn" by World War II convoys and entered only by a fjord-like gash in the rock, featured a Viking ship, visiting as part of the celebration of Norse visits to Newfoundland 1000 years ago.

Oh yes, we did go to St. John's to attend the conference! We weren't disappointed. The program committee did its work well; plenary lectures and accompanying symposia focused on aspects of northern and marine ecology to a degree unusual in A.O.U. meetings, even those held elsewhere in

Canada. The other sessions, of volunteered oral and poster papers, gave adequate opportunities for presenting work in situations found elsewhere as well as in Canada. Audibility of speakers was rarely a problem, and recent computer technology produced dazzling visual aids beside which most earlier efforts looked drab. Tables, however, were not always ideally planned, some having too much detail or too small size of lettering and numbers. My main beef, however, was having concurrent sessions scattered across nearly a kilometre, using five halls in three buildings, so you always missed most of a presentation in moving between sessions; this has happened elsewhere, but less often recently. The "nutrition breaks" were a treat - if you weren't on a diet; better opportunities to get away from overloud talking at such times would be appreciated by some, including me. With hearing-aids, I found communal meals, whether in dining hall or restaurant, very difficult for meaningful conversations; the barbecue (in a marquee) was better than most.

On the excursion day I went to Cape St. Mary's,

my second visit in fog (but I had rain and a gale another time). We got good views of Gannets and Kittiwakes anyway. The countryside would have needed more explaining than it got to make much sense to first-time visitors, as most of it was hidden in fog; the longer route via Placentia and St. Brides might have given more variety, and box lunches instead of a restaurant meal at St. Brides could have allowed the extra travel time needed to go that way. [OK Bill, I realize you had to give the locals there a chance at sharing the shekels!] The fog at least spared us the record heat that St. John's experienced while we were away that day!

Our party drove both ways from New Brunswick, with too little time for other than essential stops. It seemed a long way to all of us. However, I drove half again that far to each of my first three A.O.U. meetings 40 years ago, so we Canadian ornithologists appreciated having a major bird meeting that close to home.

Tony Erskine

**19th ANNUAL MEETING and 5th CONFERENCE of the SOCIETY OF
CANADIAN ORNITHOLOGISTS/SOCIÉTÉ D'ORNITHOLOGISTES DU CANADA,
held in conjunction with the AMERICAN ORNITHOLOGISTS UNION and the BRITISH
ORNITHOLOGISTS UNION**

Memorial University of Newfoundland, St. John's, Nfld.

14-19 August 2000

The complete Scientific program will be published as a supplement to *The Auk*, and is not repeated here (see previous *Picoides* issue for outline). Abstracts (below) are published in *Picoides* only for presentations dealing primarily with birds in Canada. and (mostly) by Canadian authors.

The Abstract Book of BIRDS 2000 included the following disclaimer: "The abstracts in this work are not issued for the permanent scientific record."

ABSTRACTS

Plenary Talk 2. **Living on the edge: Conservation lessons from fragmentation research in the boreal forest.** *Hannon, Susan J.* (Dept. Biol. Sci., Univ. Alberta, Edmonton, Alta.)

The boreal forest is one of the last frontiers in North America, both for resource extraction and conservation of avian species. I synthesize our research on bird responses to forest fragmentation and edges conducted in the boreal mixedwood forest of Alberta and develop conclusions and challenges for the conservation of bird species. The following major themes have evolved from this work:

1) Responses to fragmentation/edges are species-specific and scale-dependent. For example, Ovenbirds (*Seiurus aurocapillus*) did not avoid recent clearcut edges when setting up territories but their probability of occurring in a patch was reduced by forest harvesting at a landscape scale.

2) Responses of a species are context-dependent and relate to landscape disturbance history, land use in the matrix and time since fragmentation. American Redstarts (*Setophaga ruticilla*), for example, had higher reproductive success in newly fragmented forestry landscapes than in older fragmented agricultural landscapes due to differences in predator communities and abundances.

3) Small-scale behavioural decisions and habitat affinities can be used in a coarse way to "scale up" to predict a species' sensitivity to fragmentation at the landscape scale. We were able to use gap-crossing propensities and corridor use to predict species' abundance patterns in connected, isolated and control forest reserves.

4) Spatial heterogeneity, temporal variability in resources/weather and the dynamic nature of forested systems may swamp short-term treatment effects. Hence, long-term monitoring of controls and experiments are essential for conservation planning, and biologically-relevant effect sizes for treatments must be estimated.

Plenary Talk 3. **"To cull or not to cull"; that is the question.** *Cooke, Fred* (Simon Fraser Univ., Burnaby, B.C.)

Most conservation/management questions in avian ecology relate to declining populations of birds. Yet birds with seemingly continuous population increases can create environmental problems too. In this plenary talk, I would like to a) set the stage for the symposium session to follow, and b) examine in some detail the specific problems created at the present time by expanding populations of waterfowl, particularly

Symposia Papers

S04. Population monitoring and bird conservation: A case study of migration counts. *Dunn, Erica* (Can. Wildl. Serv., Ottawa, Ont.), *Hussell, David* (Kanata, Ont.), and *Francis, Charles* (Bird Studies Canada, Port Rowan, Ont.)

Population monitoring surveys such as the Breeding Bird Survey have obvious conservation applications and many spin-off results that also have conservation value. Migration monitoring is used as a case study to illustrate these points. A brief history and evaluation of strengths and limitations will be followed by demonstration that trends in raptors and songbirds from migration counts correspond to trends in other surveys, such as Breeding Bird Survey and Christmas Bird Count. Aside from providing trends for individual species, migration monitoring has contributed to conservation in two important ways. First, it plays a key role in tracking certain species not sampled by other surveys. Second, migration counts provided some of the first

geese wintering in areas of agricultural crop production. My major focus will be the mid-continent Snow Geese (*Chen caerulescens*), a population that has recently been subject to massive management interest and activity. With a few exceptions, most holarctic populations of swans and geese have been expanding in recent years, in some cases creating negative impacts on human activities. Reasons for these expansions have been a) reduction or elimination of hunting pressure and b) increased availability of over-wintering food as a result of human activity or agricultural practices. In the case of the Snow Geese, populations have been expanding for at least 30 yr at an average of 5% per annum, leading to populations four times those of the 1960s. During much of this time, wildlife managers regarded the population increase favourably, but there were adverse consequences to the arctic salt marshes where the birds nest. The widespread disappearance of coastal salt-marsh vegetation as a result of increased goose grazing was leading to the loss of this habitat to other species of animals. This loss of habitat led to a re-appraisal of management policies from one of approval of increasing goose populations to a desire to reduce the populations. According to classical management theory, hunting regulations could be used to influence population sizes, but bag limits were already liberal. Knowledge of the population dynamics of these populations was good and it was possible to calculate the amount of additional hunting that would be needed to reduce populations, in order to reduce the environmental damage. Unfortunately the early calculations underestimated the scale of the problem, but when it was realized that as much as a sixfold increase in hunting would be needed to bring down the population of Snow Geese, this triggered a widespread public debate on the ethics and efficacy of this population control program. At one extreme was the hunting lobby, who would likely approve of the policy even if it did not achieve a population reduction; and at the other extreme the anti-hunters who see any human killing of birds as intolerable. Most conservation and scientific organizations took stands based on their perception of the effectiveness of the method in achieving the desired population reduction. A sound understanding of the population dynamics of Snow Geese allows us to predict the likelihood of achieving the objectives and points to ways in which the effectiveness of the program can be judged. My own judgement is that the strategy of population regulation through manipulating hunting regulations will fail.

evidence of long-term population fluctuation, requiring a long view in determining whether declines deserve conservation action. An example of a spinoff conservation result is the use of weight data to assess quality of migration stopover habitat.

S10. Positive edge effects for cavity-nesting communities in old-growth interior forests in northwestern North America. *Martin, Kathy* (Can. Wildl. Serv., & Dep. For. Sci., Univ. Brit. Col., Vancouver, B.C.)

In northwestern North America, increases in edge or fragmentation may result in little change in avian wildlife, even for species considered sensitive to forest fragmentation. For a community of 32 cavity-nesting species in mature mixed forest in British Columbia, we found that woodpeckers and secondary cavity-nesting birds showed strong selection for natural forest edges. We recorded a positive effect

of edge on the number of species and detection rates, as well as higher use of nest sites near edges. The weak excavators (nuthatches and chickadees) avoided edges. Nesting success for both edge and interior nests was high. Positive effects of edge are strengthened as the edge preferences of the cavity-producing woodpeckers cascade down through the nest web to the secondary cavity-nesting community. On two sites with extensive cutting, numbers of cavity-nesting species did not change, but species turnover rates may have increased. However, over a 5-yr period, we also observed strong annual effects in species richness and relative abundance on control (uncut) plots. Cavity-nesting forest birds may mitigate the negative effects of nesting habitat loss by capitalizing on food resources enhanced by the forest openings and increasing their re-use of cavities. Positive edge effects, particularly in the early stages of fragmentation, may be a general result for intact forest ecosystems with a "friendly" matrix. Thus, a knowledge of biological scale and landscape context is essential to predict responses of avian forest wildlife to increases in edge and fragmentation.

S11. Effects of forest cover and fragmentation at different scales on breeding distributions of forest birds. *Francis, Charles M. & Couturier, Andrew R.* (Bird Studies Canada, Port Rowan, Ont.), and *Cadman, Michael D.* (Can. Wildl. Serv., Guelph, Ont.)

We examined the relative influence of forest cover at various scales, and configuration of the remaining forest, on the distribution of 40 forest-dependent bird species in s Ontario. We used data from 969 10 x 10 km squares surveyed during the Ontario Breeding Bird Atlas 1981-1985. Many species exhibited strong gradients in their distribution. More than 50% of this spatial variation could be explained by forest cover or configuration. The amount of remaining forest cover within the 10-km square was the single best explanatory variable, but forest cover in the surrounding squares up to 20 km away was also important. Forest configuration (amount of fragmentation and amount of edge) was relatively less important, and had inconsistent results. Some species were more likely to occur in areas with increased fragmentation or edge. These results clearly indicate the need to maintain or restore as much forested habitat as possible for forest-dependent bird species, at broad landscape scales. However, it would be premature to conclude that configuration can be ignored in landscape management. The study area provided only a limited range of possible configurations, especially in areas with low forest cover, so that many combinations were not tested. Furthermore, we considered only the presence-absence of each species, and did not consider either population densities or source-sink dynamics in each landscape.

S12. Scaling of natal dispersal distances in birds and mammals and its implications for habitat fragmentation. *Sutherland, Glenn D.* (Cen. Appl. Cons. Biol., Univ. Brit. Col., Vancouver, B.C.) and *Harestad, Alton S.* (Dep. Biol. Sci., Simon Fraser Univ., Burnaby, B.C.)

Natal dispersal distance remains one key unknown in interpreting effects of habitat fragmentation for many vertebrates. Do life history attributes of species predict dispersal distance? If so, how far apart can habitats be to remain connected for each species? Using data for 77 bird and 68 mammal species, we tested whether median and maximum natal-dispersal distances are correlated to body mass, diet type, social system, taxonomic family, and migratory status. For carnivorous (but not herbivorous or omnivorous) birds, body mass predicts dispersal distances. In mammals, body mass predicts dispersal distance for each of the 3 diet types. Natal-dispersal distances in birds or mammals are not related significantly to broad categories of social systems. Only in birds are taxonomic relatedness and migratory status correlated with natal dispersal, and then only for maximum distances. With these allometric relationships, we estimated dispersal distances for 203 forest-dwelling birds and 72 mammals in British Columbia.

Percentages of species with potential vulnerability to fragmentation of forests (dispersal distance < 0.5 km) are birds 2% and mammals 25% (median distance) and birds 25% and mammals 46% (maximum distance). Birds appear less vulnerable to forest fragmentation than mammals. Some potentially vulnerable species are habitat generalists or strongly associated with early seral stages. We conclude that general patterns of dispersal distance for many species appear derived from life history attributes that link to resource availability in landscapes. These relationships could serve as initial filters for planning eventual spatial configurations of forest patch types, in the absence of more detailed behavioural data.

S13 Behavioural mechanisms and avian responses to forest edges. *Desrochers, André* (CRBF, Foresterie & Géomatique, Univ. Laval, Ste-Foy, Qué.)

Despite the rapidly increasing number of studies of birds in relation to forest edges and configuration, our understanding of avian behavioural responses to edges remains poor. I present studies of boreal forest songbirds and a nest predator, showing small-scale (<100 m) responses to forest edges and how they are associated with larger-scale (>80 ha) occurrence patterns. Edges delimiting habitat gaps as narrow as 20 m act as barriers to forest songbird movements. These barriers constrain songbird territory limits. They can also channel foraging movements over larger areas (20 ha), such as ranges of chickadee winter flocks. Alternatively, forest edges (<30 m) are chosen as prime foraging habitats by a forest nest predator, the Gray Jay (*Perisoreus canadensis*), even though their 80-ha territories accommodated highly variable amounts of edge habitat. Standard analysis of occurrence vs. landscape structure can obscure small-scale relationships and therefore should not be used as evidence for or against responses to forest edges such as described above. The discrepancy between results from behavioural and landscape approaches illustrates the need to better understand the contrast between edge effects on the occurrences of species in landscapes (population level) vs. edge effects on the occurrence of individuals within forest patches.

S14. Fragmentation and edges: Conservation risks and strategies — Conclusion. *Martin, Kathy* (Can. Wildl. Serv., & Dep. For. Sci., Univ. Brit. Col., Vancouver, B.C.)

<no abstract>

S15. Can we have too many birds? *Bird, David M.* (Avian Sci. & Cons. Cen., McGill Univ., Montreal, Qué.) and *Blom, Eirik* (Belcamp, Md., U.S.A.)

Roughly 10% of the world's 10,000 or so avian species are threatened with extinction, and thus herculean but sometimes controversial efforts are being made to save even those populations down to their last dozen individuals. But what about the other side of the coin - a superabundance of birds within a given species? While preservationists say "Let nature take its course", others demand human intervention. Reasons for control of bird populations vary and may include preventing the destruction of wildlife habitat, minimizing the birds' impact on agriculture or aquaculture, saving a highly endangered species from extinction, preventing a species from becoming endangered, avoiding human endangerment, or minimizing public nuisance. To stimulate discussion, we examine four case histories:

1) killing escaped and now proliferating Ruddy Ducks (*Oxyura jamaicensis*) to prevent genetic swamping of White-headed Ducks (*O. leucocephala*) in Europe;

2) trapping Brown-headed Cowbirds (*Molothrus ater*) to minimize brood parasitism of endangered Kirtland's Warblers (*Dendroica kirtlandii*) in the midwest U.S.;

3) controlling the numbers of Double-crested Cormorants

(*Phalacrocorax auritus*) to lessen predation on commercial and sport fisheries and catfish farms in North America; and

4) killing gulls to save human lives, minimize a public nuisance, and preserve endangered species.

S21. Birds foraging at sea: Performance indicators of prey and oceanographic changes. *Montevocchi, William A.* (Memorial Univ. Nfld., St. John's, Nfld.)

The conspicuousness, oceanic ranges, multi-trophic interactions, and relative ease of study of seabirds compared to other marine animals enable us to exploit them as useful indicators of biophysical oceanographic changes and perturbations. Research involving the remote sensing of birds at sea is revealing many of the complex, intricate and often indirect ways that seabirds respond to changes in the marine environment. The objective of this symposium is to overview a representative cross-section of this research and to ask how these studies can aid in the protection and conservation of marine birds and the important oceanographic habitats on which they depend for survival. In doing so, we have brought together an international complex of stellar researchers who work with surface-feeding, plunge-diving and pursuit-diving species in the Antarctic, Pacific, North and South Atlantic Oceans. It is, collectively, our challenge and

responsibility as ornithologists, scientists and concerned humans to preserve the global habitats of birds for their sake and undoubtedly as importantly for our own. These presentations have been designed to aid in that effort in the world's oceans.

S23. The foraging behaviour of Northern Gannets as indicator of food availability and hydrography. *Garthe, Stefan* (Inst. Mar. Res., Kiel, Germany), *Benvenuti, Silvano* (Univ. Pisa, Pisa, Italy), and *Montevocchi, William A.* (Memorial Univ. Nfld., St. John's, Nfld.)

The distribution of the largest seabird of the North Atlantic, the Northern Gannet (*Morus bassanus*), is limited to relatively few, large colonies. We studied its foraging behaviour by attaching different types of microelectronic devices to chick-rearing adults on Funk Island, Newfoundland, in Jul/Aug 1999. We used 5 different devices that recorded data on flight direction, activity (swimming and flying), dive depth and duration, underwater movements, prey ingestion and water temperature. This information will enable us to reveal both the foraging strategy of Gannets and environmental characteristics of the feeding sites. These data may then be used to assess the complexity of factors related to the behaviour of birds at sea which is a prerequisite for conservation of marine life.

Contributed Papers

5. Bird communities of riparian buffer strips in a coastal forest. *Shirley, Susan* (Dep. Zool., Univ. Brit. Col., Vancouver, B.C.)

Riparian habitats, which support rich communities of terrestrial organisms including birds, are under increasing pressure from agriculture, forestry, recreation and urban development. From 1995 to 1998 I studied riparian bird communities on the west coast of Vancouver Island to evaluate 1) bird distribution and abundance in natural riparian communities, 2) bird use of existing riparian buffer strips and 3) response of bird communities to fragmentation of riparian habitats. I compared bird communities across 19 riparian sites with varying buffer widths and undisturbed forest. Associations between riparian birds and habitat attributes such as vegetation and forest insects were studied using vegetation measurements, sweepnets, and malaise traps. Forty bird species were detected in buffers and undisturbed sites while 25 bird species were detected in clearcuts. Over 147 families of insects and spiders have been identified from sweepnet samples. The results show that species richness increases with buffer width more slowly when compared to similar areas in undisturbed forest and is driven by increases in foliage/ground gleaners and coniferous/mixed tree-nesting species. Bird density is similar across buffer width except for higher, more variable densities in very narrow buffers. While the number of species remained constant in the old-growth fragments, species richness in buffer fragments increased over a 3-yr period. Species turnover over the same period was similar between buffers and old-growth fragments and increased with decreasing fragment size. These results will provide forest managers with information to maintain natural riparian bird communities.

8. Hooded Warbler habitat selection: A little logging goes a long way. *Whittam, Rebecca, McCracken, Jon, and Francis, Charles* (Bird Studies Canada, Port Rowan, Ont.)

Hooded Warblers (*Wilsonia citrina*) appear to benefit from some types of selective logging because they require shrubby gaps within mature forest for breeding. We examined Hooded Warbler habitat selection in two different forest blocks approximately 8 km apart in sw Ontario: South Walsingham (SWA), which is predominantly deciduous, and St. Williams (STW), which is predominantly coniferous plantations.

These forests contain up to 35% of the Canadian population of this nationally Threatened species. Hooded Warblers have historically been common in SWA, but have declined since 1995, while numbers in STW have concurrently increased. At least 3 birds banded in SWA have subsequently been founding breeding in STW, suggesting movement between forest blocks. We measured characteristics of nest and control sites in SWA (1996-1997; n=52,66) and STW (1999; n=24,41) to determine if these two different forest types share structural characteristics that are favoured by Hooded Warblers. At both sites, nests had a greater density of low shrubs, and more basal area attributable to large trees (dbh >38 cm), compared with controls. In STW, nests also had more cut stumps, a higher canopy, and were more likely to be found in forest gaps compared to controls (these data were not collected in SWA). Nests in SWA appeared to be characterized by older gaps, as low shrubs were less dense, and tall shrubs were more dense, compared to STW. We suggest that gaps in SWA are becoming too mature for Hooded Warblers, resulting in movement to STW, where recent selective logging (in 1993 and 1996) created new gaps suitable for this species. Using GIS techniques, we relate Hooded Warbler nest-site selection to recent logging history in STW, and suggest forest management guidelines that will maintain suitable habitat for Hooded Warblers at a landscape level.

13. Natural cavity use by Barrow's Goldeneye and Bufflehead in British Columbia, and a comparison to nest box usage. *Evans, Mathew* (Cen. Wildl. Ecol., Simon Fraser Univ., Burnaby, B.C.)

Both Barrow's Goldeneye (*Bucephala islandica*) and Bufflehead (*B. albeola*) are secondary cavity nesters and rely heavily on nest sites created by primary cavity nesters such as Pileated Woodpeckers (*Dryocopus pileatus*) and Northern Flickers (*Colaptes auratus*), respectively. However, studies of natural cavity selection and success by these birds are lacking. Prior studies have predominantly made use of artificial nest boxes. This study examines the biophysical characteristics of cavity nest sites (tree species, decay class, dbh, distance from water, and distance from forest edge) and compares the nesting demographics of cavities to those of nest boxes. In 1997 and 1998 30 Barrow's Goldeneye and 80 Bufflehead natural cavities were examined. For both species nest sites were predominantly in aspen

(74% and 85%, respectively) followed by Douglas-fir (22% and 9%, respectively). Barrow's Goldeneye cavities were typically 91.7m from water and 54.5m from forest edge. Bufflehead were found nesting 44.7m from water and 2.9m from forest edge. Nesting success for Barrow's Goldeneye cavities was 86% in 1997 and 78% in 1998. This is compared to nest-box nesting success of 52% and 48%, respectively. Bufflehead cavity nesting success was 88% in 1997 and 84% in 1998 and nest-box success was 83% and 90%, respectively. Sources of nest failure and patterns of nest-site philopatry for both cavities and nest boxes are also presented.

17. The influence of previous breeding experience on Semipalmated Plover reproductive success. *Badzinski, Debbie S.* (Watershed Ecosys. Grad. Prog., Trent Univ., Peterborough, Ont., & Bird Studies Canada, Port Rowan, Ont.) and *Nol, Erica* (Dep. Biol., Trent Univ.)

We studied annual variation in clutch size, egg predation rate, hatching success, and fledging success of Semipalmated Plovers (*Charadrius semipalmatus*) breeding at Churchill, Manitoba, in 1992-1998, to test whether breeding experience of individuals affected hatching success, fledging success, and nesting chronology. Our prediction was that experienced individuals would hatch more eggs, fledge more chicks, and nest earlier than would inexperienced birds. Clutch size, hatchability, hatching success, nest predation rates showed significant annual variation. Clutch size was lower in two years, suggesting that reductions in clutch size of shorebirds are more common than previously believed. Hatchability of nests ranged from 80 to 98%, which was lower than that of other shorebirds. Low clutch size and hatchability in 1992 and 1998 may be linked to El Niño events during the previous winters. There was no detectable annual variation in number of chicks fledged per nesting attempt or number of chicks fledged per brood. On average, pairs produced 0.92 fledglings/nesting attempt and 1.87 fledglings/brood. Breeding experience could not explain differences in hatching success among pairs, but fledging success improved with breeding experience. However, the influence of previous breeding experience varied among sexes. Pairs with an experienced male fledged more chicks than did either inexperienced pairs or those with an experienced female. There was also a tendency for pairs with experienced males to nest earlier than those without an experienced male.

18. The influence of body condition on incubation constancy by arctic Common Eiders nesting on Southampton Island, Nunavut. *Bottita, Grace E.* (Watershed Ecosys. Grad. Prog., Trent Univ., Peterborough, Ont.)

In breeding birds, the ability to successfully raise offspring is often influenced by the level of their energy reserves, particularly among waterfowl species that fast during incubation. In 1998-1999, we examined costs of reproduction among Common Eiders (*Somateria mollissima*) nesting in the Arctic, in relation to their energy reserves. Clutches were switched pairwise between nests to shorten or prolong the length of incubation by 5 d (1998, n=30; 1999, n=40). We predicted that experimentally extended hens would: 1) take more frequent incubation breaks of longer duration, 2) have significantly poorer body condition at hatch than females with shortened incubation, and 3) have a higher probability of nest failure, than either control or shortened. We quantified the incubation constancy of hens through behavioural observations and by placing Remote Incubation Monitoring Systems (RIMS) in 38 nests. The length of time spent off the nest per incubation recess as well as the number of recesses increased significantly with day of incubation for all treatments (ANOVA: recess minutes, $F_{1,219}=16.54$, $p=0.001$; number of recesses, $F_{1,219}=16.54$, $p=0.001$). Incubating females were weighed to determine rate of mass loss during incubation (1998, n=40, 1999,

n=69). Experimentally extended hens were in poorer body condition at hatch (ANOVA, $F_{2,23}=7.35$, $p=0.003$) and also had a higher probability of nest failure ($\chi^2=6.19$, $df=1$, $p=0.016$).

19. The phylogenetic placement of the Great Auk: Evidence from mtDNA sequences. *Baker, Allan J.* (CBCB, Royal Ont. Mus., Toronto, Ont.) and *Friesen, Vicki* (Dep. Biol., Queen's Univ., Kingston, Ont.)

The last recorded sighting of the Great Auk (*Pinguinus impennis*) was in 1844 when 2 breeding birds were seen on Eldey Island off Iceland, and the species became extinct following heavy exploitation by humans. Given that this bird is the icon of the A.O.U. and was formerly very abundant in Newfoundland, it is fitting at this meeting to re-examine its phylogenetic relationships within the Alcidae. Because of its obvious morphological similarity with the Razorbill (*Alca torda*), the Great Auk was formerly classified as *A. impennis*. However, it is now usually placed in a separate genus (*Pinguinus*), but this placement remains controversial owing to conflicting morphological evidence. We recovered DNA from Great Auk bones from Ireland, and obtained good quality sequences from protein-coding mtDNA genes. Trees constructed using both maximum parsimony and maximum likelihood placed the Great Auk as sister to a clade containing the Razorbill, Dovekie, and the murre. Thus the Great Auk is best classified in a separate genus as *P. impennis*.

33. Do Gambel's White-crowned Sparrows have song dialects? *Chilton, Glen* (Dep. Biol., St. Mary's Coll., Calgary, Alta.), *Wiebe, Myra O.* (Can. Wildl. Serv., Yellowknife, N.W.T.), and *Handford, Paul* (Univ. West. Ont., London, Ont.)

Like most songbird species studied to date, White-crowned Sparrows (*Zonotrichia leucophrys*) have dialectal song variation. Between 1968 and 1972, DeWolfe et al. (1974, Bird-Banding 45: 224-252) recorded songs of territorial male *Z. l. gambelii* in se Alaska. That sample did not provide evidence for song dialects as found in other subspecies. We have recorded songs over a much larger portion of the subspecies' range, including Churchill, Man.; Yellowknife, N.W.T.; Whitehorse, Y.T.; Clearwater River, Alta.; and s British Columbia. This larger sample demonstrates dialectal variation in the song's terminal trill, the same song feature used in categorizing dialects in other subspecies. A single dialect can be heard over a vast area in this long-distance migrant. Comparing these results to those of other subspecies, it appears that the size of dialect populations is positively correlated with migratory distance in this species. Some of the complex syllables recorded by DeWolfe et al. have been faithfully transmitted to the present, and can be heard in distant localities.

38. Post-fledging movements and territoriality of forest songbirds. *McFarlane, Dorothy M.* and *Diamond, Antony W.* (Atl. Coop. Wildl. Res. Netwk., Univ. New Brunswick, Fredericton, N.B.)

Studies on songbirds stress the importance of territoriality early in the breeding season; however, it is not known whether fledglings are confined to the same territories as adults. Our study shows that fledglings remain on their natal territory after leaving the nest. 97% of fledglings of 12 species observed were found within territories or within 50 m of a male singing point. Fledglings showed no movement away from territories until 3-4 weeks post-fledging, strongly suggesting territorial behaviour of the adults in this period related to feeding young. We conclude that territoriality is important in the latter part of the breeding cycle and that it directs the movements of juveniles until dispersal.

46. Census and habitat assessment of threatened Marbled Murrelets in Clayoquot Sound, British Columbia, using radar. *Burger, Alan E.* (Dep. Biol., Univ. Victoria, Victoria, B.C.) and

Lawrence, Andrea D. (Victoria, B.C.)

High-frequency marine radar was used to count Marbled Murrelets (*Brachyramphus marmoratus*) entering 19 watersheds in Clayoquot Sound, Vancouver Island. Counts varied diurnally and seasonally, but comparisons among years and among watersheds were possible using pre-sunrise counts made between 15 May and 16 July. Counts were positively correlated with increasing cloud, fog, and drizzle in 1997, but not 1996 or 1998. The number of murrelets entering the combined watersheds was similar among years, but counts per watershed varied, suggesting some shifts among watersheds between years. At least 4,600 Marbled Murrelets used the sampled watersheds and the Clayoquot Sound population was estimated at 6,000-8,000 breeding and non-breeding birds, a substantial portion of the British Columbia population. Counts of murrelets per watershed were compared with macro-habitat features derived from GIS databases, and were positively correlated to areas of mature forest, low elevation forest, and certain biogeographic forest types, but negatively correlated with areas of logged and immature forest (multiple $r^2=0.90$). Counts were not affected by distances to known foraging areas (range 1-28 km). The area of mature forest below 600 m was the strongest predictor ($r^2=0.73$) and provided a simple measure of habitat quality readily estimated from GIS, aerial photographs, or timber inventories. Radar is thus a powerful tool to census this threatened species and study its macro-habitat associations.

48. The accuracy of models of species abundance derived using Breeding Bird Survey data for the Great Lakes Basin. Pearce, Jennie L. (Can. For. Ser., Sault Ste. Marie, Ont.)

Statistical modelling of species abundance data in relation to mapped environmental predictors is becoming increasingly used to predict distributions of species for use in regional conservation planning. We evaluate to what extent predictive mapping of habitat suitability might be refined by modelling relative abundance or density of a species instead of presence/absence. We use Breeding Bird Survey data collected at survey sites within the Great Lakes Basin region to develop models predicting the abundance of species as a function of regional-scale climatic and vegetation variables. The predictive accuracy of these models is then evaluated using two types of data: 1. Survey data from subsequent years, and 2. Data derived using jackknife resampling techniques. A number of direct abundance modelling techniques were evaluated including generalised linear and generalised additive Poisson regression, and zero-inflated negative binomial regression. We also evaluated the performance of predicted probability of occurrence generated by logistic regression modelling as an indirect index of abundance. Both the direct and indirect modelling techniques generally failed to provide consistently reliable predictions of abundance. The performance of models of species abundance is discussed for species guilds.

52. Vocal identification of individual Bicknell's Thrushes. Ball, Melanie (Dep. Biol., Dalhousie Univ., Halifax, N.S.)

Many passerines have songs and calls unique to individuals. Individual vocalizations are an important, non-invasive, censusing tool in species at risk, where disturbance is a consideration, and in species that are difficult to catch and resight due to behavioural or environmental constraints. Bicknell's Thrush (*Catharus bicknellii*) is an excellent candidate for vocal censusing of individuals. It is considered vulnerable by COSEWIC (Committee on Status of Endangered Wildlife in Canada), and its breeding habitat of dense stunted conifers makes this bird inaccessible. The purpose of my study was to determine if vocalizations are useful for identifying Bicknell's Thrush individuals, i.e. if each bird has unique song or call types, which are distinctive by sonogram. I recorded Bicknell's Thrush in Parc de la Gaspésie, Québec, during the 1999 breeding season. I

obtained additional recordings courtesy of other researchers. Classification tree analysis (CART) showed that song types and song repertoire are more stereotyped within individuals than call types and call repertoire. Each individual Bicknell's Thrush had a unique set of song types and repertoire, that were shared with no other individual. Based on these results, songs may provide a useful censusing tool for this species; I would not recommend the use of calls for censusing. Further work is required to determine if song types remain static throughout the breeding season and over different breeding seasons.

66. The effect of global warming on the relation between clutch size and laying date in Tree Swallows. Winkler, David W. (Dep. Ecol. & Evol. Biol., Cornell Univ., Ithaca, N.Y.) and Dunn, Peter O. (Dep. Biol. Sci., Univ. Wisc., Milwaukee, Wis.)

Across North America, Tree Swallows (*Tachycineta bicolor*) have decreased their mean clutch initiation date by about 9 d over the past 30 yr, apparently in response to global warming caused by anthropogenic increases in atmospheric greenhouse gases (Dunn & Winkler 1999, Proc. Royal Soc. 266B: 2487-2490). Others have suggested that changes in lay dates caused by global warming may have negative fitness effects, and we analyzed the relation between clutch size and laying date in a large set of 2,881 records collected by volunteer nest record schemes in the U.S. and Canada. A set of mixed-model analyses indicates a very strong effect of laying date on clutch size in this widespread sample, and there were no significant effects of year or the year*laydate interaction on clutch size. These results indicate that clutch size and its relation to lay date have not changed in response to global warming, and Tree Swallow clutch size appears to respond to relative rather than absolute laying dates. Predicting the effects on birds of global change depends on the generality of this response to relative dates, and the diversity of avian response to global warming could help us understand the interactions of birds with the various cues and limiting resources in their pre-breeding environments.

67. Age effects on reproductive output in Tree Swallows: Evidence for senescence? Rendell, Wallace B. (Univ. Cal., Berkeley, Cal.) and Robertson, Raleigh J. (Dep. Biol., Queen's Univ., Kingston, Ont.)

Studies have documented improvements in reproductive output with age in animals, but few studies have been conducted long enough to address if output declines with advanced age. We describe the results of a 24-yr cross-sectional study on age, nesting phenology, and reproductive output in Tree Swallows (*Tachycineta bicolor*), concluding that there is evidence for senescence in output in older birds. In females, reproductive output improved with age from 1 (age of sexual maturity) to 3 yr; they began laying earlier, laid larger clutches, and hatched and fledged more young. After 3 yr, all measures of reproductive output declined, significantly so between 3 and 4 yrs of age in the number fledged, and the ratio of fledglings per eggs laid. In males, no individual variable of reproductive output was different between age groups. Using a composite measure of annual expected brood size at fledging for each sex each year, we regressed this variable against age. A significant amount of variation in expected brood size was predicted best by a quadratic equation, with reproductive output improving until age 3 yr, after which it declines, for both sexes. These results are important because evidence of senescence improves our understanding of the evolution of life histories, and the likelihood of selection for early age of first breeding.

69. Geographic differences in protein availability to Herring Gulls breeding on the Laurentian Great Lakes. Hebert, Craig, E.; Shutt, J. Laird (Can. Wildl. Serv., Natl. Wildl. Res. Cen., Hull, Qué.), and Ball, Ron O. (Univ. Alberta, Edmonton, Alta.)

Plasma amino acid concentrations were measured in wild Herring

Gulls (*Larus argentatus*) captured during incubation in 8 Laurentian Great Lake colonies. These concentrations were used as an indicator of protein availability at these locations. Significant differences in amino acid concentrations were observed among colonies. Lower amino acid levels, particularly of the essential amino acids, were measured in gulls nesting on Lake Superior whereas values in gulls captured on Lake Ontario and Lake Erie were greater. These geographic differences in protein availability probably reflected spatial differences in the availability of high quality prey such as fish. Geographic differences in prey availability probably affected diet composition. Comparison of amino acid levels in wild birds to reference values obtained through captive feeding studies indicated that gulls nesting on Lake Superior may have been protein limited. Adult female body condition, intra-clutch variation in egg size and productivity were correlated with an index of plasma amino acid concentrations.

70. Diet composition and contaminant exposure in Laurentian Great Lakes Herring Gulls. *Hebert, Craig E.* (Can. Wildl. Serv., Natl. Wildl. Res. Cen., Hull, Qué.), *Hobson, Keith A.* (Can. Wildl. Serv., Saskatoon, Sask.), and *Shutt, J. Laird* (Can. Wildl. Serv., Natl. Wildl. Res. Cen., Hull, Qué.)

Polychlorinated biphenyl (PCB) concentrations in Great Lakes Herring Gull (*Larus argentatus*) eggs declined greatly during the 1970s and early 1980s. By the mid-1980s, further declines were not as obvious. An exception to this general trend was observed on Lake Erie. On that lake, egg PCB concentrations continued to decline rapidly during the 1980s-1990s. Evidence from stable isotope analyses indicated that temporal changes in the composition of the Herring Gull diet occurred on Lake Erie. These changes corresponded with declines in fish availability, possibly resulting in the gulls relying on a greater proportion of terrestrial food in their diets. Decreases in the proportion of fish in the gull diet would have resulted in reduced PCB exposure. This may be partially responsible for the continuing rapid rate of decline in egg PCB concentrations. This continuing decline should be interpreted with caution. We must consider that these trends may not be indicative of lake-wide declines in PCB bioavailability but may only reflect changes in dietary exposure. Although these results demonstrate a potential difficulty associated with using Herring Gulls as monitors of environmental contamination, they also demonstrate the sensitivity of this species to changes in ecosystem structure and function.

75. Winter behaviour of a migrant Song Sparrow population. *Schiffer, Catrien A.H.* and *Smith, James N.M.* (Dep. Zool., Univ. Brit. Col., Vancouver, B.C.)

Most Song Sparrow (*Melospiza melodia*) populations on the Pacific Coast of North America are resident. We report data on the sex ratio, morphology, and behaviour of a migrant population wintering at a site in Vancouver, B.C., where summer surveys revealed an absence of resident birds. Birds arrived at the study site in late September, and 18 colour-banded individuals all occupied very small winter ranges (ca. 0.1 ha) until they began to depart in late March. The population was mostly made up of males (a 10:1 sex ratio, n=32 birds), suggesting that the birds were differential migrants with most males wintering further north than females. The dark plumage of the birds, and shape differences between the migrants and locally resident *Melospiza melodia morphna* individuals, suggested that most birds belonged to the coastal races *merrilli* or *inexpectata*, which live further north and east in British Columbia. Some wintering male birds often perched conspicuously and behaved much like territorial residents, except that they rarely interacted aggressively, and often shared the same small areas with minimal social interaction. In late winter, Song Sparrows retained their small winter ranges, but sometimes fed nearby in small, loose flocks. Other birds spent most of their time under or near shrub

cover, and behaved as non-territorial floaters do in the breeding season. We suggest that the shrub habitats used by migrant Song Sparrows in winter allow them to retain their breeding social system year-round.

84. A molecular phylogenetic study of calidridine sandpipers. *Greenslade, Annette D.* (Univ. Toronto, Toronto, Ont.) and *Baker, Allan J.* (Royal Ont. Mus., Toronto, Ont.)

The Scolopacidae (snipes, sandpipers and phalaropes) comprise a diverse family of birds, with respect to both behavioural and morphological characteristics. Although previous studies have investigated the systematic relationships within this group and within its constituent subfamilies using classical methods, comprehensive molecular phylogenetic analyses have not been done. The phylogenetic relationships of the calidridine sandpipers of the genera *Aphriza*, *Calidris*, *Limicola*, *Micropalama*, *Tryngites*, and *Philomachus* based on analysis of DNA sequence data from both mitochondrial (ATPase 8 & 6, cytochrome b, ND4, 12S, and 16S) and nuclear genes (intron 7 of the beta-fibrinogen gene) will be presented and compared with the results of other phylogenetic studies. Methods of phylogenetic reconstruction using molecular data include distance (neighbor-joining), maximum parsimony, and maximum likelihood.

87. The impacts of two exotic grasses on the avian community in native mixed grass prairie habitat. *Dale, Brenda C.* (Can. Wildl. Serv., Edmonton, Alta.), *Martin, Pamela A.* (Can. Wildl. Serv., Burlington, Ont.), and *Taylor, Philip S.* (Can. Wildl. Serv., Saskatoon, Sask.)

Much native mixed prairie grassland in Canada has been destroyed through cultivation, and remaining grassland is frequently invaded by introduced Eurasian grass species. The impact of this invasion on the attractiveness of grassland habitat to endemic passerines is largely unknown. We censused territorial males on 12 plots in pure native grassland and 12 plots in grassland infested with either smooth brome (*Bromus inermis*, n=6-8 plots) or Kentucky bluegrass (*Poa pratensis*, n=4-6 plots), at Last Mountain Lake National Wildlife Area, Saskatchewan, in 1990 and 1991. All plots were left uncut. In 1992, we also assessed passerine productivity. Vegetation physiognomy was measured in each plot. Baird's Sparrows (*Ammodramus bairdii*) and Sprague's Pipits (*Anthus spragueii*) were less abundant in plots dominated by smooth brome, compared to plots of native grass or those invaded by bluegrass; Sprague's Pipit in particular completely avoided the latter vegetation. Savannah Sparrows (*Passerculus sandwichensis*) and Clay-colored Sparrows (*Spizella pallida*), however, were more common in brome-dominated plots, significantly so in 1991. Nevertheless, productivity of Savannah Sparrows was no greater in brome-dominated plots than in native grassland.

95. Breeding success and diet of Black-legged Kittiwakes and Herring Gulls at Corossol Island, Québec: Implications for use as bioindicators. *Rail, Jean-François* and *Chapdelaine, Gilles* (Can. Wildl. Serv., Ste-Foy, Qué.)

Populations of Black-legged Kittiwakes (*Rissa tridactyla*) and Herring Gulls (*Larus argentatus*) at Corossol Island increased between 1970 and 1985 but have since declined. To identify factors underlying these population declines we investigated reproductive success and chick diet over 2 yr (1997-1998). Young kittiwakes and gulls were fed mostly sand lance and capelin, respectively. Clutch size and hatching success of both species appeared normal, suggesting that food abundance was sufficient in the early part of the nesting season. Fledging success of both species was poor, resulting in low productivity for kittiwakes. For gulls, higher clutch size and hatching success compensated for the low fledging success. Our observations suggest much of the high rate of kittiwake chick mortality resulted

from predation by gulls. Capelin shortage in the vicinity of the colony towards the end of the chick-rearing period may have incited gulls to prey on kittiwake chicks. Population models using our productivity measurements suggest that kittiwake numbers will decline further on Corossol Island, whereas the Herring Gull population will stabilize. In this particular case, gull predation appeared to influence the kittiwake colony more than any other environmental factor. Thus, inclusion of such a colony in a monitoring scheme to indicate changes in the marine environment requires careful consideration of the interactions between seabird species.

96. Pre-laying displays of Common Murres: Paternal investment signals or mate synchronization? Storey, Anne E. (Dep. Psych., Memorial Univ. Nfld., St. John's, Nfld.), Wilhelm, Sabina I. and Walsh, Carolyn J. (Biopsych. Prog., Memorial Univ. Nfld.)

Nest-related activities by male birds may signal paternal investment to females (Soler et al. 1998, Anim. Behav. 56: 1435-1442) and they may be involved in the steroid declines that accompany the pair's transition from courtship to incubation (Feder et al. 1977, Biol. Reprod. 16: 666-677). Common Murres (*Uria aalge*) lay their single eggs on bare rock ledges, and it is unknown what behavioral interactions serve these same functions in this non-nestbuilding species. Possible signalling behaviours include joint cliff attendance, allopreening bouts, copulation solicitation, and the pebble-moving display. Despite the absence of a nest, pre-laying Common Murre pairs manipulate small stones at their sites, behaviour reminiscent of nest-building movements in other Charadriiform species. We determined whether the timing of any of these behavioural interactions could provide reliable cues for males about when their mates would lay eggs. If these behaviours are predictive of egg-laying date, then males should thereafter increase their time at the nest site as the male's presence helps to protect the egg from foraging gulls. Behavioural interactions may facilitate males' transition to incubation and hence provide honest signals to females about their readiness to provide paternal care. Correlations between the frequencies of these pre-laying behaviours and the extent of subsequent male investment in brooding and chick feeding would provide support for the signal hypothesis.

97. Seeking sperm or social bonding? The outcome of extra-pair copulations in Common Murres. Walsh, Carolyn J., Wilhelm, Sabina I. (Biopsychol. Prog., Memorial Univ. Nfld., St. John's, Nfld.), Davidson, William S. (Dep. Biochem., Simon Fraser Univ., Burnaby, B.C.), and Storey, Anne E. (Dep. Psych., Memorial Univ. Nfld.)

Although the Common Murre (*Uria aalge*) typically maintains long-lasting pair bonds, extra-pair copulations (EPCs) are common (Birkhead, et al. 1985, Anim. Behav. 33: 608-619; Hatchwell 1988, Behaviour 107: 157-185). However, to date, there have been no genetic data presented for this species which would indicate how many of these EPCs result in extra-pair fertilizations (EPFs). We observed the mating behaviour of a group of individually marked Murres on Great Island, Newfoundland, in 1996-1999. EPC attempts and successful EPCs (with cloacal contact) occurred among murres in our study plot. Behavioural observations indicated that there is marked individual variation in the propensity to solicit, attempt, and/or accept EPCs; thus, simply examining rates of EPCs in the population may be misleading, as a significant proportion of successful EPCs can be attributed to a few individuals. Overall, the number of successful EPCs decreased noticeably just before the onset of egg-laying, when the number of pair copulations increased, suggesting that EPCs might not lead to a high proportion of EPFs. However, upon examination of the genetic parentage of 32 families using 4 single-locus microsatellite primers (ua-123, ulo14b29, ulo12a12, andulo12a22; courtesy of G. Ibaruchi & V. Friesen), there were 3 cases in which the chick and putative male parent mismatched. Thus, in 9% of the families

examined, fertilization by an extra-pair male was indicated. The control of copulation in Common Murres, and the possible roles of EPCs will be discussed with reference to individual circumstances and the outcome of genetic analyses.

98. Sex differences in parental care behaviours and body condition of Common Murres. Wilhelm, Sabina I. (Biopsychol. Prog.) and Storey, Anne E. (Dep. Psych., Memorial Univ. Nfld., St. John's, Nfld.)

Declines in adult body condition of seabirds during the breeding season reflect the high energetic demands associated with this period. Changes in body mass may be due to reproductive stress (e.g., Wendeln & Becker 1996, Bird Study 43: 85-95) and/or may be a consequence of an adaptive pressure for individuals to adjust their body mass to maintain a low wing loading (Blem 1976, Am. Zool. 16: 671-684) when flight demand increases. Because Common Murres (*Uria aalge*) have one of the highest wing loading of any flying bird due to their small wing size (Greenwalt 1962, Smithsonian Misc. Coll. 144), body mass may be an important consideration during the breeding period for this species. Since 1998, electronic balances installed on the study site have allowed us to repeatedly record the body mass of individually marked male and female murres from pre-laying to post-fledging, and to monitor an individual's body condition throughout the breeding season. Males and females lost body mass from pre-laying to chick rearing, and females continued to lose mass after the chicks had fledged with their fathers. Furthermore, females weighed less than males during the chick-rearing periods. Changes in body condition over the breeding period are presented in relation to observed sex differences in parental care behaviours and in light of the two aforementioned theories.

100. Population trends and breeding performance of Gannets at Bonaventure Island, Gulf of St. Lawrence, as a response to optimum breeding habitat. Chapdelaine, G. and Rail, J.-F. (Can. Wildl. Serv., Québec Reg., Ste-Foy, Qué.)

Population estimates and breeding performance of Gannets (*Morus bassanus*) at Bonaventure Island had been recorded over the last 33 yr (1966-1999) at approximately 4-5 yr intervals. From 1969 to 1976 the population decreased from 20,511 to 16,400 pairs and thereafter increased constantly to reach 37,000 pairs in 1999. The overall net productivity of this population was only 30% in 1966-1970, after which it improved to 45% in 1974 and then varied from 69% to 74% up to 1999. Hatching and fledging success were measured in study plots located in cliff-face and upper plateau habitat. Hatching success at the end of the 1960s and beginning of 1970s was low in both habitats and had been related to high concentrations of DDE residues in their eggs to explain why net productivity was so low. At that time, breeding pairs were more abundant on the cliff-face compared to the upper plateau. Following the improvement of breeding performance after diminution of organochlorines, hatching success, fledging success and net productivity were higher on the upper plateau than on cliff-face, though most differences were not statistically significant. At the dawn of this millennium the breeding population nesting on the upper plateau is almost double the size of the cliff-face group suggesting that topography influences breeding performance of Gannets at Bonaventure Island, and probably at Bird Rocks and Anticosti Island, 2 other colonies in the Gulf of St. Lawrence.

101. Physiological indicators of reproductive status of the Marbled Murrelet in Desolation Sound, B.C. McFarlane Tranquilla, Laura and Cooke, Fred (Can. Wildl. Ecol., Dep. Biol. Sci., Simon Fraser Univ., Burnaby, B.C.)

A thorough understanding of breeding biology includes knowledge of breeding chronology of a species. Unfortunately, traditional methods of observation of seabirds at their colonies to understand breeding

biology are not possible for the Marbled Murrelet (*Brachyramphus marmoratus*), which nests in old-growth forests, not in colonies. Their nests are difficult to find and widely dispersed. Thus, breeding biology of the Marbled Murrelet is currently being investigated using two nontraditional methods, radiotelemetry and physiological analyses of plasma, to identify the breeding status of unknown individuals when caught at sea, away from the nest. An egg-yolk precursor, vitellogenin (VTG), is detected in blood plasma and used to predict when the female bird is forming an egg. However, analysis of VTG cannot identify breeding males or breeding females that are no longer producing eggs. Other physiological methods to identify these birds are currently being investigated, including the feasibility of corticosterone analysis as an indicator of breeding status. This study provides a unique opportunity to identify breeding individuals and stages in the breeding chronology using both physiological analyses and radiotelemetry. Also, an assessment of the impact of capture and handling on reproductive success is possible, by following the breeding activities of radiotagged birds and comparing these with their physiological status at the time of capture.

112. Mechanisms underlying nest predation: A test using red squirrels (*Tamiasciurus hudsonicus*) in the boreal forest. Lewis, Keith P. (Biopsychol. Prog., Memorial Univ. Nfld., St. John's, Nfld.) Patterns of nest predation have commonly been explained by an assumed relationship between nest predators and landscapes, that is that predators are more common near edges (e.g. edge effects or ecological trap hypotheses) or in small habitat fragments. However, this assumed relationship between nest predators and the landscape has rarely been tested and does little to account for predator behaviour or environmental heterogeneity. Consequently, the results of these studies have been equivocal. An alternative approach employs a recently developed foraging theory model that predicts environmentally induced variations in food supply, probability of encountering a nest, and nest characteristics, alter the behaviour of various predators and prey, resulting in different rates of nest predation. This model can be used to test a variety of hypotheses concerning patterns of nest predation. I report on the results of an experiment designed to test this model. A relatively simple system to test theories on nest predation patterns exists in the boreal forest of Newfoundland, where the introduced red squirrel (*Tamiasciurus hudsonicus*) has been identified as a major nest predator. Using artificial nests, I test this model by manipulating food supplies for squirrels, encounter probabilities, nest vigilance, nest characteristics, in black spruce (*Picea mariana*) and balsam fir (*Abies balsamea*) forests. This experiment should give a more general approach to studying nest predation by examining behaviour and environmental heterogeneity in addition to predator density.

118. Brood division in Savannah Sparrows: Sex, size and survival. Wheelwright, Nathaniel T., Tice, Kimberley A. (Dep. Biol., Bowdoin Coll., Brunswick, Me.) and Freeman-Gallant, Corey R. (Dep. Biol., Skidmore Coll., Saratoga Springs, N.Y.) Between 1987 and 1999, we studied parent-offspring interactions during the post-fledging period in an isolated population of Savannah Sparrows (*Passerculus sandwichensis*) nesting on Kent Island, New Brunswick. Parents divided the brood shortly after fledging, but brood division was not based on offspring sex; male and female parents were equally likely to care for sons or daughters. Males were more likely to feed the smallest fledglings within a brood, perhaps because younger fledglings remain closer to the nest and the center of the male's territory. Males disproportionately cared for fledglings from early broods, presumably freeing their mates to initiate a second clutch; females tended to care for more fledglings from late broods. Overall, males and females invested equally in parental care (median age of

fledglings at independence = 23 d after hatching). Fledgling survivorship was not affected by the sex or age of the parent that provided care. Raising fledglings was costly, as parent survivorship decreased with increasing length of post-fledging care and number of fledglings. Parental survivorship, however, was not affected by the sex of fledglings that they cared for, suggesting that sons were no more expensive to raise than daughters.

121. The role of male vigilance in feeding and productivity of Harlequin Ducks breeding in southern Labrador. Goudie, R. Ian (Atl. Coop. Wildl. Ecol. Res. Netwk., Dep. Biol., Memorial Univ. Nfld., St. John's, Nfld.)

Mate guarding is characterized by the close association of males with females during periods when females are fertile. The close association of males with their mates during periods of fertility is a way of assuring their paternity in subsequent offspring as well as optimizing female condition for breeding. I studied behavior of Harlequin Ducks (*Histrionicus histrionicus*) breeding at Fig River, a tributary of the Lower Churchill River in s Labrador, in 1999. Proportion of time spent feeding by paired females was significantly dependent on proportion of time vigilant by their respective mates ($R^2=51.4\%$) based on independent 30-min watches. Because 8 pairs were marked using alphanumeric color leg bands, I was able to demonstrate a positive relationship between overall proportion of time feeding by known females and vigilance by their mates ($R^2=40.8\%$) during prebreeding. Known females having the highest feeding rates were associated with the most vigilant males and displayed higher productivity than paired females with mates displaying low levels of vigilance. Vigilance by paired males is likely critical in reducing interference of mates by other males, and reducing predation risk while maximizing foraging time by females resulting in optimum body condition for reproduction.

123. Polygyny in the Red-winged Blackbird: A problem solved? Pribil, Stanislav and Searcy, William A. (Dep. Biol., Univ. Miami, Coral Gables, Fla.)

A long-standing question in mating systems research is why females in territorial species sometimes choose to settle with already-mated males when doing so lowers their share of both male parental help and territorial resources. The polygyny threshold model proposes that females pay the costs of polygynous mating only when compensated by obtaining a better territory or male. We present the first experimental field test to demonstrate that females trade mating status against territory quality as proposed by this hypothesis. Other things being equal, female Red-winged Blackbirds (*Agelaius phoeniceus*) in Ontario (a) prefer settling on territories of unmated rather than mated males, and (b) prefer nesting sites over water to nesting sites on shore. We performed an experiment in which females were given choices between 2 adjacent territories, 1 owned by an unmated male without any over-water nesting sites, and the other by an already-mated male with over-water sites. Females overwhelmingly preferred the already-mated males, demonstrating that superior territory quality can reverse preferences based on mating status. These results demonstrate that females who would normally avoid polygynous status will choose to mate polygynously when compensated by acquiring a superior territory.

134. Global warming and spring migration: Trends over four decades from Long Point and Powdermill bird banding stations. Marra, Peter P. (Smithson. Envir. Res. Cen., Edgewater, Md.), Francis, Charles M. (Bird Studies Canada, Port Rowan, Ont.), and Mulvihill, Robert S. (Carnegie Mus. Nat. Hist., Powdermill Nature Res., Rector, Pa.)

Over the last century, the earth has experienced a general increase in mean surface air temperatures by about 0.5°C. Several ecological

