ANNUAL REPORT of the CENTRE FOR WILDLIFE ECOLOGY

2002-2003

Department of Biological Sciences
Simon Fraser University

http://www.sfu.ca/biology/wildberg/index.html

Dr. Ron Ydenberg, Director

I. HISTORY

Under the Migratory Birds Convention and Canada Wildlife Acts, the mandate of the Canadian Wildlife Service is to protect and conserve migratory bird populations. In the 21st century, this historical mandate is broadening to encompass other environmental concerns such as species at risk, biodiversity, sustainability and endangered habitats. To meet these broad and varied responsibilities, Environment Canada depends on sound science, and participates in cooperative ventures. In 1993, the Natural Sciences and Engineering Research Council of Canada, Simon Fraser University, and Environment Canada signed a ten year agreement to create the NSERC/CWS Chair in Wildlife Ecology at SFU. The Centre for Wildlife Ecology (CWE) described here is a revised administrative structure based on the Chair, formed after the retirement in 2002 of the original chairholder, Professor Fred Cooke.

II. MISSION STATEMENT

The mission of the Centre for Wildlife Ecology (CWE) is to foster high quality, graduate training and research, conduct basic and applied research in wildlife ecology, and to provide knowledge and personnel that will help Environment Canada and other agencies meet the challenges of conservation in the 21st century. The central concept is to foster synergy between the mission-oriented research and management policies of the Canadian Wildlife Service (CWS) and the basic research agenda of the University. Information, ideas, expertise, resources and opportunity flow back and forth across this interface, giving government agencies access to a broad base of science capability that helps inform policy and decision making, while the university and its faculty and students benefit from enhanced opportunities for research and application of the ideas their disciplines generate.

B. Board of Directors

Name	*Position*	*Affiliation*
Larry Dill	Professor	*SFU*
Elizabeth Elle	Assistant Professor	*SFU*
Robert Elner	Head, Migratory Birds Conservation	*CWS*
David Green	CWE faculty (non-voting)	*SFU*
Alton Harestad (SFU alternate)	Assoc. Professor	*SFU*
Paul Kluckner	Regional Director, ECB PYR	*CWS*
Rick McKelvey (CWS alternate)	Manager, CWS PWRC	*CWS*
Tony Williams	Professor, CWE Assoc. Director (non-voting)	*SFU*
Ron Ydenberg	Professor, CWE Director (non-voting)	*SFU*

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IV. INTRODUCTION

The aim of this Annual Report is to give an overview of our activities, outline the progress on new and continuing projects, describe the personnel involved, and to give some indication of our scientific and community involvement. Previous Annual Reports are available from the CWE. Contact us via our website http://www.sfu.ca/biology/wildberg/index.html.

We are now beginning our tenth year, and the second year under our new name, the Centre for Wildlife Ecology (CWE). Dr. Ron Ydenberg is in his second year at the helm of the CWE; he assumed the directorship when Fred Cooke, the Senior Chair from 1993-2002, retired. Tony Williams retains the position of Associate Director. In January 2003 Dr. David Green joined the Centre as a new faculty member. David's interests are in the demography and genetics of bird populations. He is currently initiating a research project on American Dippers.

Dov Lank remains with the CWE as a University Research Associate and Adjunct Professor. Dov is responsible for directing several large-scale projects, including the Marbled Murrelet project. Drs. Dan Esler and Mark Hipfner continue as Research Associates with the CWE, responsible for the waterfowl programs, and the Triangle Island Seabird Research Station, respectively. Since the last Annual Report, two PhD and 3 MSc students have completed their degrees. Several new students have joined the group since the last report and their projects are discussed in upcoming sections. Other new personnel at the CWE are: Elsie Krebs, Post-doctoral Fellow working with the Marbled Murrelet Project; Debbie Lacroix, Project Manager, and Molly Kirk, Research Technician, both working for the Sustainable Shellfish Aquaculture Initiative. Sam Iverson, recent MSc graduate, was hired as a Research Assistant working on several of the sea duck projects. Ramunas Žydelis, a postdoctoral fellow from Lithuania, also will be assisting with sea duck research.

Now in its tenth year, the CWE has proven that it is a strong and enduring institution in

V. THE CWE IN ACTION

The accounts that follow give brief overviews of the major projects run by the CWE.

respect to patch sizes and landscape features. We conclude that murrelets are not particularly sensitive to forest stand patch size, and that nesting success is not poorer in small patches, as has been previously suggested. These findings confirm preliminary analyses by Russ Bradley and Falk Huettmann et al. in earlier work. This work has substantial implications for murrelet management in British Columbia. As the year closed, these findings were being communicated to interested parties, including presentations at the Pacific Seabird Group meeting in Parksville, in February, and subsequent Murrelet Recovery Team meetings and workshops.

D. The Georgia Basin Ecosystem Initiative

The 2002/03 financial year was the last of Environment Canada's Georgia Basin Ecosystem Initiative (GBEI), under which the CWE received funding for a variety of projects. Projects on the winter and spring ecology of Pacific Black Brant, on Snow Geese, and on the winter ecology of Dunlin were all completed. Work on some of the other projects in this envelope is continuing in other forms: Harlequins (see Harlequin Duck Conservation Research below), Great Blue herons (see Heron Working Group below), scoters (see Sustainable Shellfish Aquaculture Project below), and dippers (see Landscape Ecology of Songbirds section below).

E. The Riske Creek Field Station

CWE research in the Riske Creek area, southwest of William's Lake, is also winding up, as PhD students Matt Evans (defended May 2003) and Brent Gurd (defense planned for March 2004) complete their degrees. Their work focused on waterfowl relationships with wetlands, forest, and rangeland, and how these relationships change with habitat alterations, particularly those related to forestry and water management. We worked in cooperation with Kathy Martin (UBC and CWS) and her "nest web" project, and Sean Boyd (CWS). Long-term funding obtained from Forest Renewal BC in July 1996 ended in 2001. As the CWE winds down its presence at Riske Creek, we turned over management of the field station to Dr. Kathy Martin, whose work at the site is ongoing.

F. Shellfish and Scoter Ecology along the British Columbia Coast

1. Baynes Sound Sustainable Shellfish Aquaculture Initiative

In response to the planned expansion of shellfish aquaculture along the British Columbia coast, the CWE in collaboration with Dr. Leah Bendell-Young initiated in 2001/02 a study of ecological implications of shellfish aquaculture. Funded by a NSERC Strategic Grant obtained by Dr. Bendell-Young, the CWE and CWS, the project is centered in Baynes Sound, and is a collaborative venture with an array of agency, university, and industry partners. Tyler Lewis and Jonathan Whiteley are graduate students working on the project. The CWE component of the research addresses interactions between wintering surf and white-winged scoter populations, 'wild' benthic fauna and shellfish aquaculture. We plan to generate data that will 1) answer questions about basic scoter

biology that will indicate potential mechanisms by which shellfish aquaculture (or other activities) could have population-level effects, (2) directly evaluate relationships of shellfish aquaculture to behaviour, survival, and habitat quality, (3) provide information necessary to set appropriate management goals for scoters, and (4) provide implications for management of shellfish aquaculture optimizing long-term sustainability of both the industry and scoter populations.

Specific research directions include: (1) documenting scoter abundance and distribution in relation to habitat attributes, proximity to shellfish aquaculture, and seasonal and annual variation, based on intensive surveys and habitat sampling; (2) describing movements and foraging behaviour of radio-marked individuals; (3) quantification of survival rates of radio-marked birds; (4) evaluation of various radio-marking packages on scoters; and (5) describing scoter trophic interactions with their primary prey.

Specific activities included:

- Two winters (2001-02 and 2002-03) of data collection have been completed, with activities focused in Baynes Sound. Intensive surveys have been conducted with the intent of describing changes in numbers and distribution between and within years. These data also will be compared to historical CWS data (from winter 1980-81) to provide insight into longer-term changes. The survey data also will be used in analyses of habitat associations, with the goal of determining the relationships between habitat attributes, including aquaculture, and scoter densities. A post-doctoral research associate, Ramunas Zydelis, will be leading the habitat association work.
- A major component of the project involves radio-telemetry, which we are using to answer questions about survival, movements, habitat associations, and foraging behavior. Over the last 2 winters, 180 scoters (92 WWSC and 88 SUSC) have been marked with conventional VHF transmitters. These are tracked by vehicle regularly from December through April. We have found that scoters in Baynes Sound show strong fidelity to feeding areas, they forage almost exclusively in intertidal habitats, they almost never forage at night, and their winter survival is high.
- Diet of captured scoters was inferred from analysis of shell fragments in fecal samples; varnish clams (*Nuttallia obscurata*) and manila clams (*Venerupis philippinarum*) were the taxa most abundant in the fecal samples.
- Clams were sampled throughout Baynes Sound during summer 2002. Nineteen transects, spaced 3 km apart, were sampled with quadrats at 50m intervals from high tide line to low tide. Two-hundred and thirty-seven quadrats were dug, yielding 8852 clams > 10mm.
- Tyler Lewis, MSc student, is quantifying the behavioural responses of scoters to temporal and spatial variation in bivalve prey. Results from this work will indicate behavioural consequences of variation in bivalve prey that occur due to aquaculture operations. In winter 2002-03, six plots were intensively sampled for clam density and distribution. At each of the six plots, foraging radio-marked scoters were monitored to determine the amount of time devoted to feeding. These data will be compared between sites with different clam densities and distributions, as well as over time as prey resources are depleted. In addition, for-

aging success (proportion of dives in which a prey item was brought to the surface) was documented for both radio-marked and non-marked scoters at each plot.

- Finally, during winter 2002-03 we have conducted surveys in Desolation and Barkley Sounds to quantify scoter use of the area and prepare for more intensive work in the future.

These results are preliminary as data preparation and rigorous analysis have not been applied. However, we are confident that the data gathered over the past 2 winters will be valuable for understanding scoter interactions with aquaculture (and other forms of habitat change), as well as lending new insight into wintering biology of these poorly known species.

2. The status of Abalone populations in Haida Gwaii

Related to this work is our project on abalones in Haida Gwaii. Abalone is currently Canada's only marine invertebrate with 'threatened' status, and as such is deserving of some conservation attention. MSc student Bart DeFreitas is investigating why depleted abalone populations seem to have difficulty in re-establishing themselves. Bart is supported by his employer Haida Fisheries, a subvention grant from the Department of Fisheries and Oceans, and by the CWE.

G. Heron Working Group

The Great Blue Heron, the largest heron of North America, is widely distributed in Canada but the estimated 1500 pairs of coastal British Columbia Great Blue Heron are distinct from herons elsewhere in Canada. The coastal birds are non-migratory and remain isolated year round from heron populations that migrate. This isolation has led to adaptations with among other features a darker plumage and subspecies classification, *Ardea herodias fannini.* This subspecies, which is currently blue-listed by the British Columbia Ministry of Sustainable Resource Management, is being investigated by a team

Georgia in the fall and spring, concentrating on birds at White Rock and at the herring spawn at Hornby Island, augmenting the database of life history information on individual birds. The objectives are to understand survival, migration and recruitment patterns of this population in order to characterize which habitats are most favorable for harlequin ducks.

A new study was initiated in summer 2003 on harlequin ducks breeding on streams in the southern Coast Mountains. Led by Dan Esler and Ron Ydenberg, and involving MSc students Jeanine Bond and Sunny LeBourdais, this research is designed to determine factors related to distribution and productivity. For the first time, we are collecting data

'normal' and stressful conditions (e.g. low ambient temperature), and the hormonal basis of this relationship. Oliver Love (PhD student) is continuing our work with starlings using hormonal manipulations to investigate the interaction of stress and reproduction. He is also interested in using the hormone corticosterone as a signal for habitat quality. The techniques we have developed and utilised for this basic research, and the basic information generated on reproductive physiology have been invaluable in contributing to, and facilitating, our more applied work. One good example of this linkage is our work on development of indirect, physiological techniques to assess reproductive state and breeding chronology in rare or cryptic species (Vanderkist *et al.* 1999, 2000; McFarlane Tranquilla *et al*. 2003).

b. **Timing of nesting and reproductive physiology of Greater scaup**. Continental scaup populations have declined in recent years, and lowered productivity has been suggested as an important contributing factor in this decline. Kristen Gorman (MSc, co-supervised by Drs. Tony Williams and Dan Esler) is investigating physiological and nutritional attributes that influence timing of clutch formation in female greater scaup (*Aythya marila*). This work has three components: 1) assessment of nutrient reserve dynamics (lipid, protein) during egg formation using more traditional methods of body composition analysis; 2) use of stable isotope analysis to determine the sources and relative contributions of nutrient reserves used in egg formation; and 3) validation of the use of an indirect, physiological method (plasma yolk precursor analysis) to determine reproductive state in free-living ducks. This project is funded by the US Geological Survey in collaboration with Dr Paul Flint.

2. Endocrine disrupters and ecotoxicology

a. **Impact of use of MSMA (monosodium methanearsonate) for bark beetle control on cavity-nesting birds in B.C. forests.** Bark beetles are considered among the most damaging of forest insect pests in western North America. Use of MSMA provides an alternative to direct harvesting in reducing losses to bark beetles. Typically pheromone baits are used to attract beetles to specific trees, and these infested trees are then treated with MSMA. This project will investigate a) the potential for secondary exposure to arsenic from MSMA in woodpeckers and other insectivorous forest birds, and b) possible relationships between AS exposure and health and reproductive success of birds. Following a pilot study in 2002, we were successful in obtaining a grant of $42,000 per year for three years to continue this project (a collaboration between TDW and Drs John Elliott, Kathy Martin, Laurie Wilson and Pierre Mineau of Environment Canada).

b. **Monitoring of chlorinated hydrocarbons and effects in bald eagles on the British Columbia coast**. This is a collaborative project with Dr John Elliott of Environment Canada, involving Lilly Cesh a new MET student (supervised by TDW). The aim of the project is to assess the impact of chlorinated hydrocarbon concentrations

writing up is ongoing. In collaboration with a research team of agency and university partners, Dan has documented that these sea ducks continued to be exposed to residual oil for more than a decade following the spill. Further, Harlequin Ducks have shown long-term demographic consequences of the oil spill, in contrast to the conventional wisdom that oil spill effects are short-lived for bird populations.

- *Timing of reproduction in Greater Scaup* - Another project initiated in collaboration with the U.S. Geological Survey addresses the relationships of nutrition and physiology to timing of reproduction by greater scaup in coastal Alaska. MSc student Kristen Gorman is currently conducting her second season of field work on this project; specific project details are described under the physiological studies section.
- *Foraging ecology of breeding Red-throated Loons* - Numbers of red-throated loons have declined by over 50% in recent decades. Jeff Ball, MSc student, is conducting his second field season of research into the underlying causes of this population change by addressing the hypothesis that changes in forage fish quantity or quality

Shelagh Bucknell, and various other forms of support for the conference. Partners in the new North American Sea Duck Joint Venture provided much of the funding.

The conference was very successful, capitalizing on the growing conservation concerns and interest in sea ducks throughout the world. The meeting attracted more than 200 participants from 10 countries. Fifty-eight talks were presented, including plenaries from Stefan Pihl on European sea duck issues and Alexander Kondratyev on Russian sea ducks. In addition, 61 posters were presented. A series of workshops were held, on topics including: survey methods, satellite telemetry, interactions with aquaculture, contaminants and disease, industry relations, diving and foraging ecology, and genetics. The CWE presence was strong in the scientific presentations, along with the organizational aspects. Many members of the CWE also attended a meeting of the Harlequin Duck Working Group on the day after the conference.

B. 30th Pacific Seabird Group Annual Meeting

In February of 2003 the CWE, together with the Canadian Wildlife Service and the US Fish and Wildlife Service, hosted the annual meeting of the Pacific Seabird Group at Tigh Na-Mara Resort in Parksville, BC. Three distinguished speakers, Robert Ricklefs, Helen James, and David Cairns, gave plenary talks to begin each day of the meeting. Two hundred and thirty-nine seabird biologists attended, and a total of 99 papers and 45 posters were presented by authors from more than five countries. Subjects covered many aspects of seabird biology, including breeding biology, foraging ecology, habitat selection, behavioural ecology and sexual selection, seabird monitoring, conservation and management, seabird-fishery interactions, and effects of oil pollution and wind farms. The conference concluded with several field trips designed to give participant(i)-4. of oic7.2se(l(T-.2(o)-2(R.fisl

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VII. FUNDING

2002/2003 Fiscal Year

1 April 2002 - 31 March 2003

Support for Doctoral Students

Student Support for Masters Students

2002/2003 Funding Summary

VIII. PUBLICATIONS

This list reflects those publications produced since our last report (publications that were "in press" or "submitted" for the last report are included and have been updated). We continue to publish very actively, with 18 publications in press and 23 submitted. Most of our publications relate to the research carried out in the main CWE programs and most refer to work carried out in the Pacific Northwest. We are however interacting with scientists throughout Canada and beyond and some of our publications reflect this. The listing also includes theses produced by graduate students in our group at SFU.

A. Papers in Refereed Journals

In press:

Cam, E., L. Lougheed, R. Bradley and F. Cooke. In press. Demographic assessment of a Marbled Murrelet population from capture-mark-recapture and radio telemetry data. Conservation Biology.

Egeler, O., D. Seaman and T.D. Williams. In press. The influence of diet on fatty acid composition of depot fat in Western Sandpipers, *Calidris mauri*. Auk.

Hakkarainen, H., I. Yli-Tuomi, E. Korpimaki and R.C. Ydenberg. In press. Provisioning response to apparent predation danger by parental pied flycatchers. Orn. Fenn.

Hipfner, J.M., K. Charleston and W.E. Davies. In press. Rates and consequences of relaying in Cassin's and Rhinoceros auklets breeding in a seasonal environment. J. Avian Biol.

Lank, D.B., R.W. Butler, J. Ireland and R.C. Ydenberg. In press. Effects of predation danger on migratory strategies of sandpipers. Oikos.

McFarlane Tranquilla, L., F. Huettmann, C. Lougheed, L.W. Lougheed, N. Parker and G. Kaiser. In press. Sightings of vagrant Pacific alcids in Desolation Sound, British Columbia. Can. Field Nat.

McFarlane Tranquilla, L., T.D. Williams and F. Cooke. In press. Using vitellogenin to identify interannual variation in breeding chronology of Marbled Murrelets. Auk.

Morbey, Y.E. and R.C. Ydenberg. In press. Timing games in the reproductive phenology of female Pacific salmon (*Oncorhynchus* spp.). Am. Nat.

Öst, M., R.C. Ydenberg, K. Lindstrom and M. Kilpi. In press. Condition and coalition formation by brood rearing common eider females. Behav. Ecol.

Rodway, M.S., H.M. Regehr, J. Ashley, P.V. Clarkson, R.I. Goudie, D.E. Hay, C.M. Smith and K.G. Wright. In press. Aggregative response of Harlequin Ducks to herring spawning in the Strait of Georgia, British Columbia. Can. J. Zool.

Rodway, M.S., H.M. Regehr and J.W. Chardine. In press. Status of the largest colony of Atlantic Puffins in North America. Can. Field Nat.

Rodway, R.S., H.M. Regehr and F. Cooke. In press. Sex and age differences in distribution, abundance, and habitat preferences of wintering Harlequin Ducks: implications for conservation and estimating recruitment. Can. J. Zool.

Salvante, K.G. and T.D. Williams. In press. Effects of corticosterone on breeding propensity, reproductive output and yolk precursor levels. Gen. Comp. Endocrinol.

Schamel, D., D.M. Tracy and D.B. Lank. In press. Male mate choice, male availability and egg production as limitations on polyandry in the Red-necked Phalarope. Anim. Behav.

Stein, R.W. and T.D. Williams. In press. Validating the everted sleeve technique for use in migrating Western Sandpipers: captivity effects and tissue damage. Physiol. Biochem. Zool.

Vézina, F. and T.D. Williams. In press. Plasticity in body composition in breeding birds: what drives the metabolic costs of egg production? Physiol. Biochem. Zool.

Wardrop, S.L. and R.C. Ydenberg. In press. Date and parental quality effects in the seasonal decline in Tree Swallow reproductive performance: interpreting results in light of potential experimental bias. Ibis.

Williams, T.D. and J.C. Christians. In press. Experimental dissociation of the effects of diet, age and breeding experience on primary reproductive effort in zebra finches *Taeniopygia guttata.*. J. Avian Biol.

Williams, T.D. and M. Miller. In press. Individual and resource-dependent variation in the ability to lay supranormal clutches in response to egg-removal. Auk.

Zharikov, Y. and G.A. Skilleter. In press. Depletion of benthic invertebrates by bar-tailed godwits *Limosa lapponica* in a subtropical estuary. Mar. Ecol. Prog. Ser.

Zharikov, Y. and G.A. Skilleter. In press. Slaves to their stomachs: digestive limitations to the pre-migratory increase in energy intake rate in non-breeding eastern curlews *Numenius madagascariensis*. Physiol. Biochem. Zool.

2003:

Fernandez, G., H. de la Cueva, N. Warnock and D.B. Lank. 2003. Apparent survival rates of Western Sandpipers wintering in northwest Baja California, Mexico. Auk 120:55-61.

Esler, D., T.D. Bowman, K. Trust, B.E. Ballachey, T.A. Dean, S.C. Jewett and C.E. O'Clair.