

Drizzle Lake

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ECOLOGICAL RESERVES COLLECTION  
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Executive Summary of the Research program on Ecological Reserve # 52

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Research at the Drizzle Lake Ecological Reserve has concentrated on the evolutionary biology of threespine stickleback, interactions between freshwater fish and fish-eating birds, and the breeding biology of Red-throated Loons. This work has been conducted in association with comprehensive baseline surveys of the biota of the Reserve. The majority of this research has been published or is in press (see attached publication list). Most aspects of the current research program can be brought to completion within 3 years.

Rather than summarizing the published articles, it would seem appropriate to briefly review the general importance of the work and some of its practical implications.

1. ER #52 was established, in part, for the preservation of an endemic population of large black stickleback. The ongoing research, which has included collections from 240 ponds and lakes throughout the Queen Charlotte archipelago, has confirmed the unique status of the Drizzle Lake population and identified major selective pressures responsible for the characteristics of the population. These studies have resulted in several major and original contributions to the scientific literature. The success of the research program to date is in part a result of the commitment to year-round data collection. Summer research programs, as are generally conducted out of academic centers, are probably inadequate for understanding complex biotic interactions.

2. Feeding preferences of freshwater predators: The threespine stickleback has generally been regarded as an asset to aquatic systems since these small fish consume large quantities of mosquito larvae and other aquatic insects; as well, they represent a significant food source for trout. Yet there is some evidence to suggest that stickleback compete with juvenile sockeye salmon for plankton and accordingly, federal agencies in both Canada and the US have considered methods to reduce the numbers of this widely distributed species. Our work on Drizzle Lake and surrounding watersheds indicates that threespine stickleback are the major food item for virtually all fish-eating birds, mammals and salmonid fishes in Queen Charlotte Island lakes. Some of the species include loon, grebe, cormorant, merganser, heron, kingfisher, river otter and cutthroat trout. Reduction in stickleback numbers, as advocated for some lakes by Federal agencies, will only cause a shift in the diet of these predators to the second most common species in the lakes -- juvenile coho salmon.

3. Genetic variability: A general tenet of the biological sciences is that within any natural population of plants or animals, there is a single or a small series of "best fit" individuals which represent the optimal characteristics of the population. This tenet has more than mere academic interest since our salmonid hatchery and experimental agricultural programs currently rear and cultivate genetically and morphologically uniform progeny. The data that have emerged from the Drizzle Lake research suggests that maximum productivity would be achieved only by maintaining genetic variability, a conclusion also reached by some researchers in other institutions. Simply, no two individuals within a population are exposed to exactly the same food

sources, the same predators, the same temperatures, the same acidity, the same parasites and diseases etc. and therefore uniformity becomes a liability. Some of these conclusions will be tested experimentally in the next 2 field seasons.

4. Acid tolerance: That freshwater fish are susceptible to acidity is evident by the major loss of fish production in eastern North American and European Lakes. Mortality appears most critical at the egg and larval phases which are largely incapable of withstanding waters with a pH lower than 5.0. In an effort to sample all areas of the Ecological Reserve, we found some very acidic waters with pH near 4.0 which is common for the Sphagnum bogs in this region. Quite unexpectedly, we discovered that stickleback and some salmonids inhabit these highly acidic waters which are 10 times more acidic than what is regarded as close to the extreme limits of acidity for fish in eastern Canada. It is clear that such reservoirs of genetic diversity could play a significant role in the re-establishment of fish populations in acid-killed lakes. There is tremendous scope for additional research on these acid-tolerant populations. We have expanded our collecting effort to identify further populations on or near the Reserve which may be highly acid-tolerant.

5. Cyathocephalosis: This disease of young salmonids is caused by an intestinal parasite which the fish obtain by eating infected freshwater amphipods. It produces skin lesions, body emaciation and usually death in the fish. Fortunately, British Columbia has been considered free of this disease as government surveys of freshwater fish parasites yielded only isolated instances of fish infection in the province. The parasite is most prevalent in Europe and government agencies have spent millions of dollars attempting to

eradicate the parasite from lakes. I recently discovered this parasite in fish from a number of Queen Charlotte lakes. Since the parasite was common only in winter months, it has probably been overlooked in previous university and government surveys which have largely been conducted in summer months. My published observations emphasized the possibility of inadvertent spread of this disease from fish stocking and transplantation programs.

6. Behavior and feeding biology of Red-throated Loons: The Red-throated Loon is the most common fish-eating bird that nests on Queen Charlotte Lakes (including Drizzle L). In an effort to quantify the amount and type of fish fed to the young over the 7 weeks of parental feeding, and thus determine the impact of this species on the resident fish populations, we have taped (VTR) some 300 feeding sequences (during 450 hours observation time) and measured size and species of prey fed to the young. Prior to this work, no quantitative information was available on daily prey consumption for this or any other loon species in North America. This work will help to identify the most important prey items for this secretive and poorly known species.

7. Baseline inventories: Most individuals recognize the value and need for establishing detailed inventories of both flora and fauna such that any changes through time can be monitored for select areas that have not incurred intentional habitat alteration. While few would disagree with the value of these data, there remains no natural area in western Canada where such information has been obtained. On the Drizzle Lake Reserve, we have maintained weekly records of all bird, mammal, and fish activity for 5 successive years and have been able to determine total numbers of many species in the Reserve from direct counts or mark-recapture methods. As well, a complete floral and

insect survey is still in progress. The combined data, when complete, will probably represent the most comprehensive inventory for any Ecological Reserve or Park in B.C. The information is currently being coded in a data base management system for storage and retrieval. Additional collections and inventories have begun on Reserve #45.

Publications resulting from ER financial support to T. E. Reimchen.

Reimchen, T. E. 1979. Substrate heterogeneity, crypsis, and colour polymorphism in an intertidal snail (Littorina mariae). Can. J. Zool. **57**:1070-1085.

Reimchen, T. E. 1980. Spine-deficiency and polymorphism in a population of Gasterosteus aculeatus: an adaptation to predators? Can. J. Zool. **58**:1232-1244.

Reimchen, T. E. and S. D. Douglas 1980. Observations of loons (Gavia immer and G. stellata) at a bog lake on the Queen Charlotte Islands. Can. Field-Naturalist **94**:398-404.

Reimchen, T. E. 1980. A review of intrapopulation variation in Gasterosteus and its evolutionary significance. Second International Congress of Systematic and Evolutionary Biology Abstracts:105.

Reimchen, T. E. 1980. Sightings of Risso's dolphins (Grampus griseus) off Queen Charlotte Islands, British Columbia. Murrelet **1980**:44-45.

Reimchen, T. E. 1981. Microgeographical variation in Littorina mariae Sacchi and Rastelli and a taxonomic consideration. J. Conch. **30**:341-350.

Reimchen, T. E. 1982. Shell size divergence in Littorina mariae and L.

obtusata and predation by crabs. Can. J. Zool. **60**:687-695.

Reimchen, T. E. 1982. Incidence and intensity of Cyathocephalus truncatus and Schistocephalus solidus infection in Gasterosteus aculeatus. Can. J. Zool. **60**:1091-1095.

Douglas, S. D. 1982. Red-throated Loon: elegant diver of the North. Wildlife Review, Fall 1982.

Reimchen, T. E. 1983. Structural relationships between spines and lateral plates in threespine stickleback (Gasterosteus aculeatus). Evolution **37**:931-946.

Douglas, S. D. 1983. Floral color patterns and pollinator attraction in a bog habitat. Can. J. Bot. **61**: 3494-3501.

Reimchen, T. E. and S. D. Douglas. 1984. Seasonal and diurnal activity of aquatic birds on a coastal lake in British Columbia. Can. Field-Naturalist, in press.

Reimchen, T. E. and S. D. Douglas. 1984. Feeding schedule and daily food consumption of Red-throated Loon (Gavia stellata) over the pre-fledging period. Auk, in press.

Reimchen, T. E. and S. D. Douglas. 1984. Differential contribution of the sexes to pre-fledged young in the Red-throated Loon. Submitted to Auk.

Reimchen, T. E., E. M. Stinson and J. S. Nelson. 1984. Phenotypic differentiation of threespine stickleback populations from the Sangan watershed, Queen Charlotte Islands. For submission to Can. J. Fish and Aquatic Sciences.