N.B. Naturalist

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N.B. NATURALIST

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N.B. Naturalist carries articles and reports pertaining to the natural history of New Brunswick. Contributions are welcomed, and should be sent to:

Gayl Hipperson, Editor
New Brunswick Museum.
277 Douglas Avenue.
Saint John, N.B. E2K 1E5
Telephone: (506) 693-1196

Articles are invited in both official languages, and will be printed in the language they are received. The opinions expressed are those of the authors. Original material appearing in N.B. Naturalist may be reproduced without permission; credit lines would be appreciated.

Deadlines for submission of articles, notes and illustrations are January 1, April 1, July 1 and October 1. Line drawings and cover illustrations should be in black ink and the size they are to appear in print.

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LE NATURALISTE DU N.-B.

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On peut lire dans Le Naturaliste du N.-B. des rapports scientifiques touchant l'histoire naturelle du Nouveau-Brunswick.
Votre concours serait fort apprécié. Prière d'envoyer vos articles à:

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Dates limites de présentation de vos articles, réflexions, avis et photos: les 1er janvier, 1er avril, 1er juillet et 1er octobre. Les dessins au trait et les photos de couverture doivent être préparés à l'encre noir et dans le format de publication.

Dates limites pour toute observation destinée à la rubrique «Nouvelles de la nature»: les 1er décembre, 1er mars, 1er juin et 1er septembre.

Tarifs publicitaires disponibles sur demande.

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Cover Illustration

«Estuary Wildlife» by Robert Percival. A limited edition linocut commemorating the 1983 Canadian Nature Federation conference. A percentage of the proceeds from the sale of this specially commissioned work will go to support the New Brunswick Federation of Naturalists. Purchase details on page 98 .

Illustration sur la couverture

«Estuary Wildlife» (faune des estuaires) par Robert Percival. Un lino pour une édition à tirage limité en commémoration du congrès annuel de la Fédération canadienne de la nature. La Fédération des naturalistes du Nouveau-Brunswick recevra une partie des bénéfices accrus de la vente de cette oeuvre spécialement commanditée. Les conditions d'achat se trouvent à la page 98.

From the Editor

It gives me special pleasure to introduce this issue, conceived as a "souvenir edition" of the 1983 Canadian Nature Federation conference and as a celebration of the "naturally" beautiful host province of New Brunswick.

To highlight the conference proceedings, invited speakers have been most obliging in providing a summary of their address together with a bit of background information about themselves. Regular contributors to N.B. Naturalist, botanist Hal Hinds and entomologist Tony Thomas, have chosen estuarine plants and insects for their columns, and David Christie, in lieu of provincial "Nature News", has put together the story of New Brunswick's natural emblems. Federation president Mary Majka offers a glimpse of our province's vastly differing coastlines and, courtesy of Parks Canada, we reprint Fundy Park interpreter Michael Burzynski's illuminating look at Fundy's giant tides.

It is the hope of all of us involved in the production of N.B. Naturalist that conference visitors and provincial naturalists alike will find this issue a fitting remembrance of a successful conference, and of a unique and fascinating part of Canada.

ON THE COVER

Inspired by the estuarine theme of this year's CNF conference, artist Robert Percival has created an original, one-colour linocut in a limited edition of 40, each hand-signed by the artist. As illustrated on the cover, "Estuary Wildlife" is executed in green, size 9" x 7", on a medium-weight cream paper, overall size 15" x 11 1/2".

The price of each print is $50.00 (unframed). By special agreement with the artist, twenty percent of the purchase price will go toward the work of the NBFN.

Robert Percival is Curator of Art at the New Brunswick Museum, Saint John. He studied at the Liverpool College of Art in England and the Academie Grande Chaumiere in Paris, France. Mr. Percival works in acrylic, watercolour, and various print mediums. He is one of only two Atlantic Provinces artists to be elected member of the Canadian Society of Painters in Watercolour. His work is represented in many major Canadian and English collections, both public and private, and he has exhibited extensively in galleries in Atlantic Canada, Ontario and Quebec.

To order "Estuary Wildlife", and assist the NBFN, send your cheque for $50.00 (payable to the New Brunswick Federation of Naturalists) to David Smith, NBFN Treasurer, 149 Douglas Avenue, Saint John, N.B., E2K 1E5.

From the President

Dear fellow naturalists:

This August we members of the New Brunswick Federation of Naturalists are privileged to play host to visitors from all parts of the continent who are coming to Sackville to attend the annual conference of the Canadian Nature Federation. To welcome participants and as a souvenir of the conference, we have prepared this special issue of the N.B. Naturalist, containing interesting items related to the conference, the estuarine theme, and our province.

It is a distinct honour for our small organization to host this national convention, so it is with pride - and a bit of trepidation - that we welcome our guests to this varied, two-week long program of activities.

New Brunswickers are known as good-natured, hospitable people. We hope you will feel at home with us, that after the conference you will understand more about us and our land (as well as about other parts of the Maritimes), and that you will travel home carrying with you a good feeling of a fine time, of learning, relaxation and lots of fun.

Welcome to New Brunswick! Welcome to the C.N.F. conference!

Mary Majka,
President, NBFN

NEW BRUNSWICK FEDERATION OF NATURALISTS - A BRIEF HISTORY

Mary Majka, NBFN President

Almost simultaneously in the early 1960's, three naturalists' clubs sprang up in the province, at Fredericton, Moncton and Saint John. For a decade, communication among those clubs was only sporadic, but ultimately more and more people became convinced of the value of uniting to create a provincial organization. Thus, on a cloudy Saturday in November, 1972, the New Brunswick Federation of Naturalists was formed.

An important activity of the Federation's early days was the organization of the Atlantic Naturalists' Policy Session at Moncton in 1974. The weekend workshop established valuable ties among the leaders of nature organizations in the four provinces, the Canadian Nature Federation head office, and the Nature Conservancy of Canada. Fifteen policy recommendations were made regarding energy, environmental education, natural areas, and animal harvesting.

During the Federation's ten years of existence, five additional local clubs were formed, serving Sackville-Amherst, Newcastle-Chatham, Sussex, Minto-Chipman, and the Florenceville area. Our ten annual meetings have been held in seven different parts of the province, and, through field excursions, we have explored several other sections.

Principal concerns of our provincial federation over the years have been endangered species, threatened habitats (especially marshes), management of parks, protection of birds of prey, and the safeguarding of the Machias Seal Island bird colony. In many other environmental matters we have supported the endeavours of the Conservation Council of New Brunswick, most recently in the joint formation of the Nature Conservation Committee, charged with monitoring the province's Endangered Species and Ecological Reserves Acts.

As all volunteer organizations, the NBFN has had its ups and downs. The initial burst of enthusiasm with which the organization was begun saw an ambitious program of publications, field trips, meetings, and the presentation of briefs and letters on conservation concerns. All this activity was followed, perhaps predictably, by worker "burnout" and a period of decline. Currently, however, the Federation is riding high, buoyed by a joint publishing agreement with the New Brunswick Museum for the production of an expanded quarterly N.B. Naturalist magazine, and the hosting of the 1983 CNF conference.

MANY HANDS MAKE LIGHT WORK

The New Brunswick Federation of Naturalists is a small group in a small province and the members are quite widely scattered. It was therefore a pleasure to see how many individuals volunteered their services or, when approached, readily agreed to help with the Canadian Nature Federation conference. We would like to acknowledge the time and work they spent on behalf of the conference and thank them for their contribution.

The steering committee has provided direction and guided various committees. Here, Con Desplanque, Jan Dexter, David Smith, Eric Tull and Rob Walker have been of valuable assistance. Also serving as committee chairpersons have been John Amos, Harry Beach, Mary Lynne East, Barry King, Fred Lloyd and Owen Washburn.

The chairpersons have been aptly supported by a host of willing volunteers: Kathleen Blanchard, Annemarie Burzynski, Michael Burzynski, Winnie Cairns, Stephen Clayden, Brooke Clibbon, Evelyn Coates, Lois Cook, Bert Crossman, Brian Dalzell, Richard DeBow, Wally Dewit, Ken Drury, Jennifer Edwards, Janet Erskine, Tony Erskine, Laing Ferguson, Norma Gilchrist-Dobson, Gay Hansen, Hinrich Harries, Peter Hicklin, Gayl Hipperson, Geoff Hogan, Don Kimball, Frances Lane, Isabel LeBlanc, Doug MacAndrews, Win MacAndrews, Marion MacKinnon, Anne Marceau, Betty McAlpine, Don McAlpine, Lynne McAlpine, Tom McAlpine, Reid McManus, Ken Meyer, Wilma Miller, Brenda Parsons, Peter Pearce, Theresa Pearce, Elinor Phillips, Rudi Richter, Pierrette Robichaud, Al Smith, Molly Smith, Jane Tarn, Martin Thomas, Stu Tingley, Fred Tribe, Hajo Versteeg, Ian Walker, Jim Wilson and Steve Woodley.

One must not forget all our guest speakers, most of whom are mentioned earlier in this issue but who also include Marina and Reg Collins of Alma Fisherman's Market, Pierrette Robichaud of Kouchibouguac National Park, Louis Lapierre of the Université de Moncton, and David Munro of I.U.C.N. Peggy Heppes and Arnet Sheppard of the CNF head office and Bill Grant of Mount Allison University's conference office also provided invaluable assistance and advice.

To them and everybody else who has been or will be involved in making this conference a success, our sincere thanks.

Mary Majka and David Christie

July 12, 1983.

NEW BRUNSWICK'S CONTRASTING SHORES

Mary Majka

There is no doubt New Brunswick is unique! Historically, geographically and climatically, the province lies at the cross-roads of dynamic human and natural forces. It is a bridge between the more insular parts of the Maritimes and the massive continent to the west. It is home to a mixture of plants and animals from the evergreen forest to the north and the deciduous forest to the south, as well as to both French and British cultures.

Incongruously, the province's northern shoreline is occupied by more southern forms of marine life than is the Bay of Fundy. To the north, the gently sloping shores along the Gulf of St. Lawrence are partly sheltered and protected by Prince Edward Island. There, summer waters are warm and the sea life resembles that of more temperate climates, such as the Cape Cod area. Extensive shallow lagoons and bays are perfect habitat for oysters and quahogs. Piping Plovers nest on sandy bars and beaches. Terns colonize the islands. It is a vacationer's paradise, enticing nature students wanting to explore a northern land with a southern flavour. The inhabitants are mostly French-speaking Acadians.

How vastly different are the waters that touch the rocky shores of the Bay of Fundy. The deep Fundy waters carry the chill of the Labrador Current in enormous tides. Few bathers line the beaches but sea life benefits from the cold and turbid water. Nutrients lifted by constant upwelling provide food for small marine creatures which in turn attract great schools of fish and porpoises, seals and whales. Puffins and Razorbills nest on a remote island.

The shores of the Bay of Fundy are spectacular and rocky except in some estuaries, and in the upper reaches where great marshes push out toward the sea, clad in a green mantle of specialized grasses, and where migrating shorebirds feed on extensive mudflats. Most of the people are of British, Irish and German ancestry.

Rivers such as the Miramichi and Restigouche, famous for their spawning runs of Atlantic Salmon, merge gradually into the Gulf of St. Lawrence through broad estuaries and bays. In contrast, the Saint John River, often called "the Rhine of America" has its estuary inland and enters the Bay of Fundy dramatically through a narrow gorge at the Reversing Falls. Many other Fundy estuaries seem impressively large at high water but, when the tide recedes, reveal the actual size of the river bed, which may be very small.

Thus, in New Brunswick, we have the choice of two very different seashores. To study and enjoy them is particularly exciting. We hope that participants of the C.N.F. conference will be able to get acquainted with both shores and appreciate their contrasting uniqueness.

DON'T FORGET!

NBFN ANNUAL MEETING

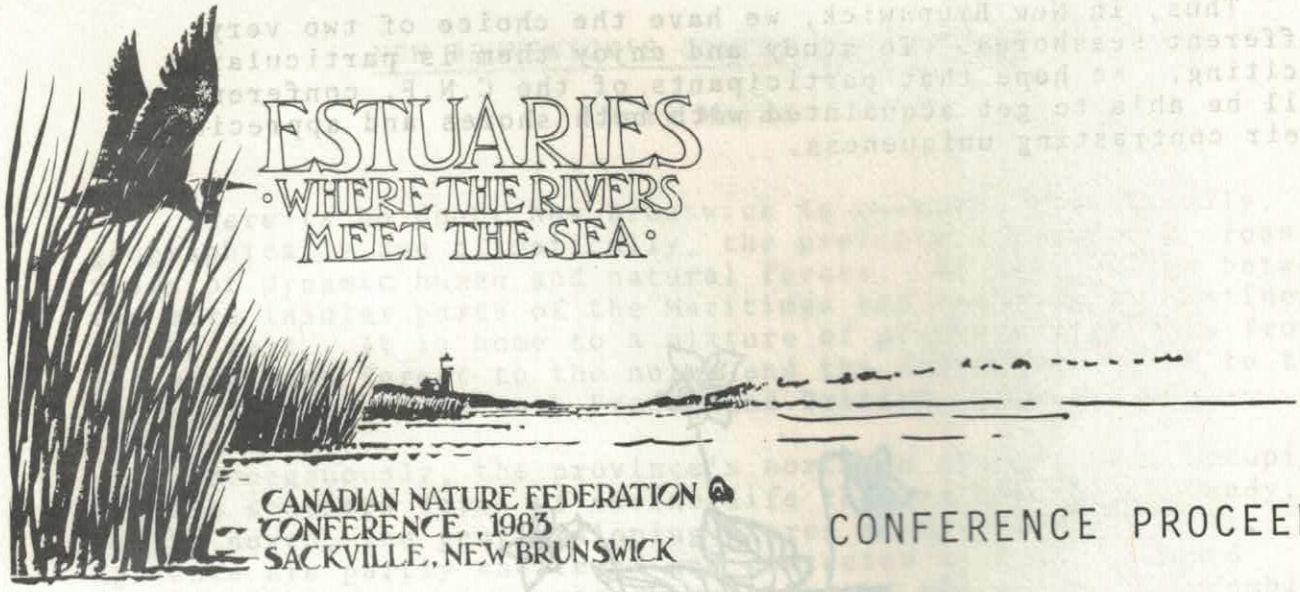
Sept. 16, 17, 18

New Brunswick Museum,
Saint John

Program and registration
on page 142.

DEADLINE FOR NEXT N.B. NATURALIST . . . 1 OCTOBER

DEADLINE FOR "NATURE NEWS" . . . 1 SEPTEMBER



CONFERENCE PROCEEDING

THE BAY OF FUNDY, A PERSONAL OVERVIEW

Harry Thurston

RR3, Southampton, N.S.

Harry Thurston will give an informal talk on the biology of the upper Bay of Fundy. This presentation is based on an article prepared for an upcoming issue of Equinox, and will be accompanied by a slide show assembled from photographs by Equinox Contributing Editor, Stephen Homer.

Harry Thurston was born in Yarmouth, N.S., at the mouth of the Bay of Fundy, and subsequently has spent most of his time near its upper reaches - in Wolfville on the Minas Basin and later in River Hebert close to the Cumberland Basin. He currently shares a 30 acre farmstead at Southampton, N.S., with his wife and daughter.

Mr. Thurston received a BSc in Biology from Acadia University, then promptly pursued a writing career: impecuniously, at first, as a poet and farm labourer. Since 1977, he has combined poetry with a more profitable freelance career, publishing frequently in Atlantic Insight, Harrowsmith and Equinox. In 1982, he was the recipient of two national "Author's Awards" for articles on the Spruce Budworm spray program in New Brunswick and a portrait of the Newfoundland painters Christopher and Mary Pratt. In the same year, he has to his credit the researching and writing of a CBC-TV production on Fundy tidal power for "Land and Sea".

ESTUARIES: VARIABLE, VALUABLE AND VULNERABLE

Rob Stephenson

Dalhousie University, Halifax, N.S.

Where rivers meet the sea and come under the influence of the tides, a unique transition zone is formed between freshwater and seawater ... an ESTUARY (from the Latin aestuarium meaning tidal channel).

Common definitions of an estuary list only a few criteria:

(1) A semi-enclosed body of water.

(2) Having a free connection with the open sea.

(3) Usually affected by tidal action.

(4) Within which seawater is mixed (and usually measurably diluted) with freshwater from land drainage.

Such definitions encompass a multitude of coastal areas which vary dramatically in size, shape and form. Not only are these areas the link between freshwater and marine environments, but since rivers carry land runoff estuaries may be considered the focal point of the entire watershed - the link between the land and the sea.

Estuaries may be of very different origin, including drowned river valleys (as a result of sea level changes since the last Ice Age), fiords (glacially over-deepened valleys), and bays that have been partially enclosed by deposition of a sand bar or spit. A large number of natural forces acting on different time scales, including the long-term process of geological evolution, the continuous but fluctuating coastal processes dependent upon wind and wave action, and the rhythmic ebb and flow of the tide, interact to produce a complex environment characterized by extreme physical variability.

The extreme conditions of change in the estuarine environment require a great deal of adaptation on the part of organisms inhabiting estuaries: typically there are fewer species than in freshwater or marine environments. However, the organisms present are often very abundant.

Value

In recent years, studies of estuaries have begun to show how tremendously productive they can be. Producers, both submerged (such as the eelgrass, Zostera) and in littoral marshes (such as the cord-grass, Spartina), have been estimated to be much more productive than the terrestrial, freshwater or marine systems with which they are linked.

Some of this productivity is used to support dense resident and migrant populations (such as birds, fish and often commercially valuable shellfish) and the sheltered waters and high food availability make estuaries valuable as breeding areas and nurseries for young and juvenile stages of many species of fish and crustacea. Of great value also is the export of material (as detritus) to coastal systems; it is increasingly evident that this may fuel coastal systems, including fisheries.

Added to these are considerable socio-economic values. Throughout the world, estuaries have been preferred sites of human settlement, offering an attractive combination of harbour, access to inland waterways and food, and, latterly waste disposal, easily reclaimed land, and recreation.

Vulnerability

Estuaries are extremely vulnerable to human impact. Many of the species living in estuaries are being limited in their distribution by physical factors, and are living near their limits of tolerance. The relatively low diversity of the community means that food webs are simple, and that the animals are relatively more dependent upon each other in these webs. Although very resilient on one hand, estuarine systems are still vulnerable in many respects.

Many of the values of estuaries lead to conflicts in resource use. Natural values of food-resource potential, recreation, and a biological importance with far-reaching effects are vulnerable to use for waste dumping and land reclamation.

Extremely VARIABLE in physical characteristics, increasingly VALUABLE as we learn more of physical and biological interactions, and VULNERABLE to resource-use conflicts ... the challenge of estuaries remains to understand these systems well enough that they can be managed effectively.

Rob Stephenson was born in Toronto and grew up in Ontario. Summers on his grandparents farm north of Oshawa and holidays in the Haliburton Lakes area and Algonquin Park set the seeds for a career in biology. As a student at Trent University, he

became increasingly interested in aquatic biology.

In 1977, a Commonwealth Scholarship sent him to New Zealand to work with the Estuarine Research Unit at the University of Canterbury in Christchurch. His PhD thesis on the ecology of a common cockle (clam) spurred a continuing interest in resource-use conflicts and management of estuaries.

Dr. Stephenson returned to Canada in 1981, where he is now a Post-Doctoral Fellow in the Biology Department, Dalhousie University and Marine Ecology Laboratory, Bedford Institute of Oceanography.

His current research includes a study of the disease responsible for mass mortality of sea urchins along the Nova Scotia coast, and investigations into the use of natural tracers of plant matter and detritus in marine food webs.

FUNDY TIDAL POWER: THE ENVIRONMENTAL EFFECTS

Donald Gordon

Department of Fisheries and Oceans, Dartmouth, N.S.

In 1976 a conference was held at Acadia University in Wolfville, N.S., to discuss the environmental implications of tidal power development in the Bay of Fundy. Little could be said in a definitive way because of a severe lack of understanding about Fundy ecosystems. Fortunately, the conference stimulated a large amount of basic environmental research by government and university scientists, which was recently reviewed at a conference at the Université de Moncton. As a result, Fundy ecosystems are now much better understood, all the way from the photosynthetic plants up to the top carnivores.

Construction of a tidal power project will result in major environmental changes, some of which will be viewed as beneficial and others as deleterious. In light of present knowledge, we are able to propose possible mitigating measures for those changes presently perceived as having the greatest impact. We can also outline the likely steps involved in a formal environmental impact assessment, should the tidal power project proceed.

Following the completion of his PhD in Oceanography at Dalhousie University, Halifax, in 1968, Donald Gordon travelled

half-way around the world to teach chemical oceanography at the University of Hawaii. While in Hawaii, he became very active in the Sierra Club, and hiked all over the Islands. In 1970, Dr. Gordon returned to Nova Scotia to take up his present position as research scientist at the Marine Ecology Laboratory, Bedford Institute of Oceanography. His current research is concerned with oil pollution and the ecology of the Bay of Fundy.

Dr. Gordon has been a member of the CNF since its inception. He is a member of and has contributed through numerous studies to the Dartmouth Lakes Advisory Board. To get away from it all, Donald Gordon enjoys woodworking, camping, canoeing, sailing, cross-country skiing, and gardening.

SHOREBIRDS, MUDFLATS AND BEACHES

Peter W. Hicklin

Canadian Wildlife Service, Sackville, N.B.

In recent years, biological studies in the Bay of Fundy have shown that this unique macrotidal environment is of critical importance to marine and estuarine animals both with and without backbones. The significance of this area is especially evident, to professional biologists and amateur naturalists alike, when great numbers of shorebirds (sandpipers and plovers) assemble on the beaches and mudflats of Fundy in late July and August each year.

In search of bountiful food supplies, these migrants congregate along narrow pebble and sandy beaches during high tide periods. At ebb tide, when extensive areas of mudflat are exposed, the birds follow the receding waters to feed upon small crustaceans, bivalves and polychaetes on or near the mud surface. Over a period of 10-14 days, the birds nearly double their weight by storing large reserves of fat. These fat deposits are critical as an energy source to fuel the final leg of the birds' migration, over the Atlantic to the warmer climes of South America.

A major prey of Semipalmated Sandpipers, Least Sandpipers, Short-billed Dowitchers and Semipalmated Plovers is the small (about 5 mm long) burrowing crustacean Corophium volutator. In North America, this species is restricted to the Bay of Fundy and the Gulf of Maine. Corophium reproduces throughout the summer months, and its numbers may reach densities of 60,000 per m^2 of mud, thus ensuring an ample food supply by the time the birds arrive.

The Canadian Wildlife Service has been studying the interrelationships between these migrant birds and their invertebrate prey in order to assess the potential impacts of tidal power development on shorebird populations in the Bay of Fundy. Their studies have identified how birds and their prey are distributed at the major staging/feeding areas in Minas Basin and Chignecto Bay. From field observations, it was determined that each Semipalmated Sandpiper ingested 10,000 - 20,000 Corophium per feeding period; rates of fat deposition were calculated from these feeding rates. Banding and colour-marking of birds in 1981 and 1982 provided information on local movements and population turnover. Also in 1982, the Corophium population was monitored to determine what impact the birds exerted on this important prey species. The data collected indicated that prey recruitment kept pace with predation pressure in such a way that a relatively small percentage of the standing crop biomass was actually removed by the birds.

The reproductive capabilities of Corophium appear to be a major factor in supporting the largest assemblage of migrant shorebirds in North America during autumn migration. The impacts of tidal power developments on migrant shorebird populations in the Bay of Fundy will very much depend on how Corophium volutator is affected by changes in tidal amplitude and sedimentary processes in Fundy's turbid waters.

Peter W. Hicklin is a wildlife biologist with the Canadian Wildlife Service, Atlantic Region, in Sackville, N.B. He is a graduate of Mount Allison and Acadia Universities. His interest in shorebirds began while a graduate student at Acadia and has continued with the CWS since 1977.

THE CRITICAL ROLE OF THE UPPER BAY OF FUNDY IN THE ANNUAL FEEDING MIGRATION OF AMERICAN SHAD AND OTHER FISHES

Michael J. Dadswell

Department of Fisheries and Oceans, St. Andrews, N.B.

Proposed large tidal hydroelectric generating facilities to be built across the mouths of embayments in the Upper Bay of Fundy could profoundly effect the annual migration of numerous fish species. The turbid, megatidal estuarine areas which would be affected are occupied in summer by large numbers of American shad (Alosa sapidissima), alewifes (A. pseudoharengus), blueback herring (A. aestivalis), striped bass (Morone saxitilus), Atlantic

sturgeon (Acipenser oxyrhynchus), dogfish (Squalus acanthias) and large sharks (Lamna nasa, Alopias vulpinas, Carcharodon carcharius).

Mass occurrence of the Alosa species in the shallow embayments appears related to the local high turbidity of the water. Tidal power development will reduce turbidity behind the dams, possibly restricting critical ocean-feeding habitat for these species. Experimental netting and tag-return data indicate the American shad occurring in these habitats from May to October are ocean-feeding, mostly 3-5 year old juveniles and subadults, and they represent populations from the entire Atlantic Coast (70% of tag returns from U.S.A. rivers). The shad and other fishes migrate through the Bay of Fundy in a counterclockwise direction, occurring along the eastern shore from spring to summer and along the western shore from summer to fall. For shad, migration rate and timing are precise and appear quite rigidly similar from year to year.

Construction of the tidal dams, besides posing a threat to the fish through direct turbine mortality, could seriously alter the timing of the migrations and decrease the fitness of these populations for their environment.

Michael Dadswell is a research scientist at the Fisheries and Environmental Sciences Biological Station in St. Andrews, N.B. He has extensively studied fish populations, particularly those of the Striped Bass and Short-nosed Sturgeon, in the Saint John River. As a five-year tidal power study of the vital role of the upper Bay of Fundy in shad migrations wraps up, Dr. Dadswell begins another five-year investigation into scallops and their pace in the ecosystem.

He is, he admits, "still more interested in the animals and what they are doing than anything else", but finds time to garden, collect stamps, hunt, fish, play hockey, and relax on his land in the Bahamas.

EAGLES AND OSPREYS IN MARITIME ESTUARIES

Peter Austin-Smith

Nova Scotia Department of Lands and Forests

The rushing dive and splash of an Osprey fishing in sheltered estuarine waters or the massive silhouette of a soaring Bald Eagle over a nearby shore are two maritime scenes not soon to be forgotten. Alike in many ways, these large, skilled birds

of prey, both strikingly cloaked in patterns of brown and white, have strong, taloned feet for seizing live prey and hooked beaks for tearing flesh.

Ospreys build large, stick nests on top of living or dead trees, and sometimes power poles, wherever there is a place to fish. These cosmopolitan birds, which migrate south in autumn, are exclusively fish-eaters.

Bald Eagles, members of the fish-eagle family, are unique to North America. Large-limbed trees towering over the surrounding forests and situated within 2 kilometers or so of water, are favoured nesting sites for these birds. Although the staple diet of Bald Eagles is fish, they will feed on seabirds, waterfowl, small mammals and carrion whenever such opportunities arise. Bald Eagles in the Maritimes are partial migrants. Adult pairs usually do not move far from their breeding territories in winter, although young birds may follow the rivers, valleys, and seacoasts into the northeastern United States.

Before the first European colonists arrived, Bald Eagle and Osprey numbers rose and fell in accordance with the weather, food supplies and nest predators. Colonization and subsequent human population growth added new threats to the well-being of these birds of prey. Shooting, trapping and poisoning, the loss of nest trees and fishing grounds through development and forest logging, accidental deaths resulting from electrocution or collisions with cars and trains, disturbances at nest sites and, more recently, environmental biocides, all have played a role in reducing the breeding populations of these birds. Yet Bald Eagles and Ospreys in the Maritimes have survived and now, through conservation efforts, are often encountered along summertime estuarine shores.

Peter Austin-Smith is a Non-game Biologist with the Wildlife Division, Nova Scotia Lands and Forests. As such, he is involved with a wide range of wildlife species and their habitats. His major projects include Bald Eagle productivity, movements and wintering areas, relocation of osprey from power poles to artifical nest platforms, surveys of Piping Plover beaches, surveys of wildlife and vegetation of marine islands, and studies of cormorant populations and food habits.

For fun, Peter Austin-Smith enjoys flying, travel, bird-watching, and growing blueberries (for wildlife, he explains, after rather short-lived plans to grow them for profit).

ENVIRONMENTAL ISSUES IN THE MARITIMES

Hal Mills

Halifax, N.S.

The Maritime Provinces arguably have more "hot" environmental issues than any region of Canada at the present time. Not only is the environment under attack, but the environmental movement itself is under attack from politicians and civil servants who appear to take comfort from the tactics of Ronald Reagan and James Watt. Environment departments throughout the region keep a low profile on environmental issues, and provincial governments, faced with economic crises, give the environment a low priority. Citizens groups, branded as "subversives" in Nova Scotia, are bearing the brunt of the burden to ensure that our environment is properly protected.

Forestry issues head the list. In New Brunswick the Concerned Parents and other citizens groups continue the long and difficult battle over the Spruce Budworm aerial insecticide spray program. In Nova Scotia, citizens groups put an enormous amount of energy and money into the Herbicide Court Trial in an attempt to stop the aerial spraying of 2,4-D and 2,4,5-T for conifer release. The larger issues of long-term forestry management and the multiple use of forests are being addressed in Nova Scotia through a Royal Commission on Forestry.

Nuclear issues also are widespread. The Coalition Against Nuclear War is active throughout the region. The Point Lepreau nuclear plant now is operational and the New Brunswick Power Commission is planning for Lepreau II even though the Province does not need the power. Uranium has been discovered, possibly in commercial quantities, in Nova Scotia, and that province is in the midst of a bizarre public inquiry into uranium mining issues headed by Judge Robert McCleave. A libel suit has been initiated against a leader of the anti-uranium movement, resulting in the formation of the Nuclear Critics Defence Committee.

Acid Rain may be the most serious issue in the Maritime Provinces. Large quantities of acid rain, with pollutants originating in the industrial heartland of North America, are dumped on the Maritimes. Our soils generally have very low buffering capacities, and the environmental impacts on our forests and streams are significant. A solution to this problem will require joint action by Canada and the U.S., but the Reagan Administration (regretably supported by the Deputy Minister of Environment for Nova Scotia) has been dragging its feet. In the meantime the power corporations of N.B. and N.S. are busy constructing coal-fired power generators without proper environmental safeguards, so that we are increasingly contributing to the acid rain problem and destroying our bargaining position with the United States.

Offshore oil and gas activities are creating new environmental issues. Exploratory drilling is taking place throughout the region, including environmentally sensitive areas such as just offshore from P.E.I. National Park. Mobil's plans to put the Venture Gas field into production are presently being reviewed by an EARP Panel, and there are major concerns for the environmental impact of that project on Sable Island. The future construction of distribution and export gas pipelines will also be of concern.

The Piping Plover population is in serious trouble. This small shorebird, which has a nesting range from Virginia to Newfoundland, has been classified as "threatened" since 1978. Recent surveys indicate that the population has declined dramatically since then, with human disturbance being a contributing factor. A concerted effort by nature organizations and both levels of government in Canada and the United States is required.

Hal Mills is a marine policy consultant and Vice-president of the Canadian Nature Federation.

COASTAL SEABIRDS: WHERE AND WHY?

Tony Lock

Canadian Wildlife Service, Dartmouth, N.S.

The numbers of many species of birds have changed greatly under the influence of man; many have been driven to extinction, others (House Sparrow and Starlings for instance) thrive in our company. But because it is quite difficult to determine the numbers of most species of birds, more subtle changes usually go undetected.

Seabirds, most species of which breed colonially, are easier to count, and, as a result, their population changes are better documented. The changing status of several species of seabirds and the effects of human activities can be demonstrated. Within the Maritimes, some species, such as Ring-billed Gulls, Kittiwakes and Cormorants, are expanding their ranges and numbers, while other seabird species appear to be declining.

Tony Lock received his first degree in English and History at the University of British Columbia. After ten years in the "real world", he returned to university for a Masters degree in marine biology from Dalhousie University, Halifax, followed by a PhD done on the biology of gulls breeding on Sable Island.

He is currently with the Canadian Wildlife Service, at the Bedford Institute of Oceanography, Dartmouth, N.S. His professional interests centre on seabirds and sea ducks; between 1978 and 1982 he inventoried the seabird colonies of Labrador and the eider populations throughout Atlantic Canada. As chairman of the Sable Island Environmental Advisory Committee, Dr. Lock has maintained an interest in the island and has recently embarked on an investigation of tern populations in the Maritimes that includes detailed work on the Sable Island population.

INTERESTING VASCULAR PLANTS OF NEW BRUNSWICK ESTUARIES

Hal Hinds

University of New Brunswick, Fredericton

In addition to the edible estuarine plants like samphire, sea kale, orach and goosetongue, there is a group of estuarine plants which exhibit some remarkable examples of disjunct distributions.

Hal Hinds grew up and was schooled in Massachusetts, obtaining his Masters degree from Smith College in 1966 with a thesis entitled "The Flora of Outer Cape Cod, Massachusetts". In 1973, following several years lecturing in the biological sciences in the United States, he moved to New Brunswick to become Curator of the Connell Memorial Vascular Plant Herbarium and Senior Instructor at the University of New Brunswick, Fredericton.

Mr. Hinds has conducted botanical investigations throughout the province, with particular interest in the rare vascular plants of New Brunswick, and has served as consultant for environmental and government agencies. He is currently undertaking research toward the publication of a provincial flora.

In addition to his scientific endeavours, Hal Hinds is active in provincial naturalist and conservation organizations,

and has taught through the University such popular non-credit courses as Wild Mushroom Hunting and Cookery, Green-thumb Gardening, and Brewing Homemade Beers and Wines.

RAISING MUSSELS: AN ESTUARINE ENTERPRISE

Bruce Smith

PEI Parks Division, Charlottetown, PEI

What could be simpler - catch the mussel larvae (they will stick to almost anything and are abundant), grow them for a short period of time, thin them by putting them into mesh bags, leave them a little longer, then lift the grown mussels from the water and sell them to customers lining up for these delicacies. What could be simpler and more profit making? The project is not quite this simple; there are many considerations and problems to be overcome, not the least of which is the effects of commercial mussel farming on waterways of a province where tourism is the single most important industry.

Bruce Smith is, in his own words, a "transplanted stubble-jumper," having come to the Maritimes from Western Canada about 15 years ago. His Masters Thesis was completed at Acadia University, Wolfville, N.S., involving techniques to reduce bird hazards to aricraft through vegetative cover modification.

He presently is employed by the provincial government of Prince Edward Island, working with the parks naturalist program and ecological reserves.

In 1977, drawing on both his wife's interest in shellfish and her experience of working on oyster culturing for the Department of Fisheries, and his own knowledge and observations as a naturalist, Mr. Smith and his wife embarked on a mussel growing operation. The venture has become a viable family business, consuming a good deal of Smith's spare time and involving a group of in-laws in almost full-time work.

SAINT JOHN RIVER, UNIQUE MARITIME ESTUARY

Martin L.H. Thomas

University of New Brunswick, Saint John

The estuary of the Saint John River seems out of place on the east coast, where estuaries are typically wide and shallow. In contrast, the middle reaches of the Saint John estuary are deep, steep-sided, fjord-like structures, which gives the system many unique properties.

The entire estuary is complex. To seaward the Saint John harbour portion is a typical wide, shallow bay housing the Port of Saint John. This part of the estuary is characterized by high tidal range, swift currents and a generally muddy bottom. This bottom, however, is current-scoured and harbours a unique biota. This lower estuary is the site of well-known shad and salmon fisheries.

The upstream limit of the lower estuary is sharply marked by the Reversing Falls. At the falls, a rocky ridge crosses the estuary at about the 3/4 high tide level, and acts as a partial dam. When the tide is below the dam level, estuary water moves to the sea down a huge rapids which entirely prevents navigation. As the tide rises to river level, the flow stops for a few minutes then as tide level exceeds river level, reverses to a turbulent upstream flow. Navigation is possible only at slack water, when sea and river levels are equal. The falls area has been the site of a famous Striped Bass sport fishery and is a playground for cormorants who "shoot" the rapids downstream.

Above the falls, the estuary deepens to up to 170 ft. but narrows in a scenic gorge with spectacular cliffs; many old lime kilns dot the limestone exposures. The tide has been reduced to a foot or so but currents are still going strong. Shad are fished in this area, but biologically the waters are not of great interest Currents are strong at the surface but the bottom is black mud often covered with wood chips and supporting little life.

At the head of the gorge the estuary divides into the "main stem" Saint John estuary and Kennebecasis Bay. The "main stem" discharges the waters of the Saint John River and proceeds as an estuary up to Fredericton or a little beyond. This part of the estuary is typically quite shallow but has a few deep holes and interesting tributary bays such as the Belleisle and Washademoak. The biology is typically that of a large estuary with widely fluctuating salinities. The estuary supports various smelt and gaspereau fisheries, and in the past a large fishery for Atlantic

Sturgeon flourished; the waters also house large populations of Short-nosed Sturgeon.

The other branch of the estuary is the most unique feature. Kennebecasis Bay is a deep fjord-like structure with steep sides dropping to depths of over 100 ft. and extending upwards to 207 ft. This bay is cut off from the Saint John proper by a bar about 30 ft. below the surface. While the surface of the bay is usually fresh, deep waters are about 2/3 seawater 1/3 fresh. Water can reach this deep basin only on spring tides when river flow is low - an infrequent event. However, despite the stagnant nature of the deep water it supports a wealth of marine and estuarine species, several of which are seen nowhere else. Some marine fish and seals and porpoise are seen there, and there are winter ice fisheries for smelt and hake, but it is the small invertebrates that are of particular note. Kennebecasis Bay ends abruptly at Perry Point below Hampton, above which the Hammond and Kennebecasis Rivers discharge.

Martin Thomas is Professor of Biology at the University of New Brunswick, Saint John, where he teaches marine biology, ecology and oceanography.

Dr. Thomas has worked on rocky seashores in the Atlantic from the Bay of Fundy to Bermuda, with particular investigations into the affects of wave action on exposure. His interest in estuaries has included most of the Maritimes, from warm water lagoons of Prince Edward Island, New Brunswick, and Cape Breton to the deep, cold estuaries of the St. Croix, Saint John and Digdeguash Rivers.

Martin Thomas is interested in all aspects of natural history, and has published extensively on such diverse topics as snakes, shoreline vegetation, shellfish, ice damage, boat paints, snails, and the development of maritime animals and plants since the Ice Age.

Dr. Thomas is editor of the just-published book, Marine and Coastal Systems of the Quoddy Region, New Brunswick.

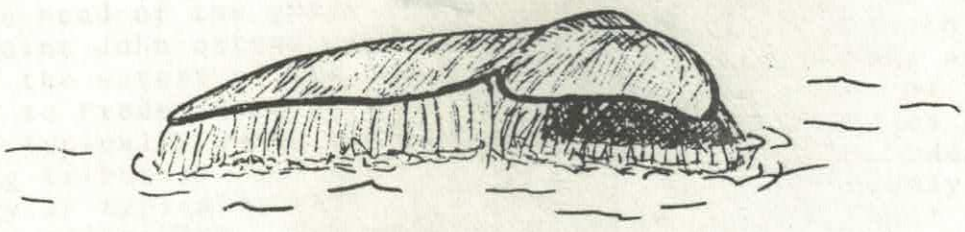
THE NORTH ATLANTIC RIGHT WHALE (Eubalaena glacialis) IN THE GULF OF MAINE

Scott D. Kraus
John H. Prescott

New England Aquarium, Boston, Mass.

Aerial and shipboard surveys conducted in the lower Bay of Fundy during the summer and fall of 1980 and 1982 have revealed the consistent adundance and distribution of North Atlantic Right Whales (Eubalaena glacialis). The identification of individual right whales through clear photographs of callosity patterns has yielded minimum population counts for every year of this study. At least 25 whales were identified in 1980, 59 in 1981, and 69 in 1982, all within the lower bay of Fundy. A limited effort in the Browns Bank region south of Nova Scotia resulted in the identification of an additional 46 whales during 1982. Photographic analysis for the Bay of Fundy revealed there were at least four cow/calf pairs in 1980, seven in 1981, and six in 1982. No cow/calf pairs have been sighted near Browns Bank. Although initial morphometric analysis suggested that all calves were young of the year, recent data indicate that some calves remain with the female for two seasons. Right whales occupy the lower Bay of Fundy from mid-July to the end of October. Resightings of individually identified right whales throughout the Gulf of Maine and within the Bay of Fundy suggest that right whales found in the region comprise a single stock. In addition to distribution and abundance, behavioral observations were made of courtship and mating activity, nursing, and feeding. Feeding on calenoid copepods was confirmed by the collection of feces.

John Prescott, Executive Director, and Scott Kraus, Research Associate, of the New England Aquarium, have been studying the North Atlantic Right Whale in the Bay of Fundy since 1980. The right whale, despite protection afforded since 1937, has an estimated population in the North Atlantic of fewer than 200, and is considered an internationally endangered species.



CAVE SWALLOWS! WHAT NEXT? VAGRANT BIRDS ON NOVA SCOTIAN ISLANDS

Ian McLaren

Dalhousie University, Halifax, N.S.

Many vagrant birds have occurred in Nova Scotia, especially on such islands as Bon Portage, Brier, Cape Sable, Sable and Seal Islands. All have produced first records for the province, and sometimes for all of Canada. Most of the vagrants nest only slightly to the south or west of the province and are quite regular in occurrence. Others have originated from as far away as Latin America, the extreme southeast or southwest U.S.A., or Europe. The general mid-latitude location and peninsular aspect of the province, as well as the convergence of continental wind-streams in the region, probably help concentrate vagrants from afar. However, vagrants as a rule probably also have some deficiencies in navigational abilities. Southern birds tend to "overshoot" during fine weather in spring, and arrive as "reverse migrants" in autumn. Western vagrants in fall may tend to drift east with little penalty, except when this is extreme, but some may tend to fly downwind to the Atlantic coast, and thence northeast to Nova Scotia. Some western species may show "mirror-image misorientation" in spring, setting out northeast, rather than northwest, from Mexico. Islands tend to concentrate "ignorant" and possibly exhausted vagrants, while being bypassed by regional species. This is especially true of Sable Island, where remote vagrants are particularly prominent, while regional birds "know better" than to be found that far off track. But all these analyses cannot be allowed to obscure the pleasures of seeing the "exotic" birds that have turned up on Nova Scotian Islands over the years.

Ian McLaren is Professor of Biology at Dalhousie University, Halifax, a graduate of McGill (MSc) and Yale (PhD). His early work as a biologist was on Arctic seals, and he has maintained an interest in these animals since. His "real" work for many years has been on minute creatures of the plankton. He has, he says, become increasingly reductionist in his advanced years, and now finds himself messing around with DNA in tiny crustaceans called copepods.

By avocation he is a birder, and occasionally does a little bird science on the side. He has a long-standing interest in the Sable Island "Ipswich Sparrow", the life history of which he monographed (with Wayne Stobo) in 1975. He has found few excuses to visit Sable Island in recent years, but gets to less inaccessible islands for spring and fall birding whenever possible.

Dr. McLaren is Past-president of the CNF. He serves on various editorial boards and committees, and is active champion of good environmental causes.

PHOTOGRAPHY OF NATURAL THINGS

Freeman Patterson

Shampers Bluff, N.B.

The following excerpt from Photography of Natural Things by Freeman Patterson is reprinted with permission of the author and Key Porter Books.

In nature, nothing exists in isolation. Whether photographing the striking patterns of light and shade in the drifting snow, documenting the nesting habits of a cedar waxwing, or capturing the soft movement of grasses tossing in the breeze, we can sense the interactions between all natural things. When we learn to focus not only on individual organisms, but also on whole communities and how they are linked together in ecological systems, we begin to develop a better understanding of natural things and how to photograph them.

The photography of natural things includes all forms of plants and animals and the air, water, and soil habitats where they live and interact. The possibilities for making nature pictures are almost endless. We can photograph natural things almost anywhere - even in the cracks of a city sidewalk. We can start at home with, say, a pot of African violets, or a freshly sliced tomato, an insect on a leaf of lettuce, frost patterns on the windowpane, the cat, or a bowl of goldfish. As we observe and photograph what is near at hand, our experience will prepare us to take better advantage of other photographic opportunities that may arise farther afield.

When we photograph nature we want to observe our subject matter carefully and sometimes to record exactly what we see - a cluster of red mushrooms, a colourful sunset, or a frog catching a fly. In trying to document plant and animal life like this, we must first look for and try to understand the functions and behaviour of our subjects. We should try to show not only what certain plants and animals look like, but also the natural relationships between them.

At other times, we may want to express the impact nature has on us by conveying a mood or a feeling through photography, or by singling out a natural design. The finest images - the images that stir our souls - combine documentation of natural things with a sense of what they mean to us. They use both documentary and interpretive approaches. Sometimes we should forget a strictly realistic approach, and use our cameras to portray intangible qualities - the freedom of a bird in flight, the gentleness of an early morning mist, the struggle for survival of a lone seedling. We should try to clarify our

personal response, then use natural designs and colours, and selected photographic techniques, to express these feelings through our pictures. Through the photography of natural things, we can explore freely our interests in, and our relationship to, the natural world, the vast system in which each of us is a tiny part.

Freeman Patterson, internationally celebrated nature photographer, grew up on a farm in Long Reach, New Brunswick. His early interest in nature matured to a deep love and understanding of the natural world that today fills both his life and his photography.

His photographs have appeared widely in award-winning books and many other publications and have been shown in exhibitions throughout the world. Freeman Patterson is author of three best-selling books on photography, and the recipient of numerous honours and international recognition for his work.

FISHING THE UPPER BAY

Marina Collins

Alma, N.B.

The life of a fisherman on the upper Bay of Fundy is hard work but very exciting. It varies from season to season and from day to day.

First there are the natural seasons that control each species' presence and behaviour; then the designated fishing seasons during which a given type of seafood may be legally captured. Added to that are the variations in the tides which, in our area, are extremely large. All those things demand great adaptability and flexibility in the life of a fisherman and his family.

Fishing not only brings an income, it also develops, as in our family, an awareness of and interest in the sea and all its life. Few fishing trips are without excitement - the size of the catch or of individuals themselves, unknown creatures in the traps, observations of birds, seals, whales, and, of course, the variable weather with its fog, winds, rain or snow.

The upper Bay of Fundy, as far as we are concerned, is a very special body of water. Its fishery has a long history. Today, as yesterday, it provides New Brunswickers such as ourselves with our living and with a life that is full of adventure and constant learning.

Marina Collins is the wife of lobster and scallop fisherman Reg Collins of Alma, N.B. Both have been involved in the fishery for many years. Their children, Kathy and Martin, have also taken part in the fishing and helped with the family business, a fisherman's market that caters largely to the visitors to Fundy National Park, adjacent to the village of Alma.

THE LIFE OF A LAGOON

Pierrette Robichaud

Kouchibouguac National Park

The Kouchibouguac lagoon and river system is an estuary system that is, by definition, a semi-enclosed body of water which has connections with the open sea and within which sea water is diluted with freshwater derived from land drainage.

The ecosystem is one of the most interesting and one of the richest habitats in Kouchibouguac National Park. The crossroad where freshwater and saltwater meet is an always-changing ecosystem, responding to forces induced by both land and sea. Sheltered behind the barrier island system of the Park, the estuary system is comprised of lagoons and river estuaries. Major lagoons include Baie de St-Louis and Kouchibouguac lagoon, whereas river estuaries are mainly represented by the Kouchibouguac and the St-Louis rivers, which are entirely under tidal influence in the Park.

Tides are of the mixed, semi-duirnal type. Strong currents are regularly reversing with the tide in the rivers and channels but they become weak and irregular in the broad lagoonal expanse. Currents recorded from river channel areas reach values as high as 1.25 m/sec.

The lagoons are generally shallow, less than 1 m deep, except in the channels where depths range from 2 to 3 m. This creates considerable water salinity variations within an estuarine environment, both from one location to another and from time to time. Statification in the salinity of water is established and sometimes typical patterns have been recognized, creating a salt-wedge circulation type.

Temperature profiles are complementary to the salinity profile with higher temperatures in the lower salinity waters. In midsummer, the maximum average temperature of about 24.5°C provides warm waters for this popular swimming area. Soft "sandy muds" predominate within the channels. Eelgrass has colonized 90% of

the lagoonal expanse along with some widgeon grass at the head of the rivers. Some brown and red algae are encountered. When Gracilaria foliifera (a red alga) was discovered in the Park it was the first record for this species in New Brunswick. Green algal species occur in large quantities.

The abundant and varied fauna is what makes this ecosystem the most dynamic habitat of the park. Major prey species - sand shrimp, silversides and sand lance - occur mainly in the eelgrass/sand and bare sand biofacies. Crabs and mussels are more abundant in channel biofacies. Clams are abundant only in the beach biofacies.

Some species are widely distributed in shallow submerged biofacies, notably edible periwinkles, mussels, infaunal bivalves and various gastropods. Several crustaceans are observed in the eelgrass biofacies, although they may leave this at night. The predatory species, namely the moon snail and starfish, are more abundant in channels.

Fish abundance and diversity vary widely, and this estuary environment is on the migratory routes of catadromous and anadromous fish species such as salmon, Striped Bass, Brook Trout and others. During the breeding season, the lagoons are also used by many water birds as a feeding and nesting area. Black Duck and teals nest in and adjacent to the salt marshes. The Common Tern, which breeds on the barrier island, is regularly seen, as are eiders, scoters, and Common Loons. The Osprey, our Park Symbol, and the Great Blue Heron are also very prominent around the lagoons.

The interaction of the lagoon with the marine environment of the Northumberland Strait, the barrier island system composed of 25 km of dunes, and the decomposition of the salt marshes on the continental side provide this ecosystem with a water-passage from the sea, a sandy storm shelter, and all the nutrients required for this natural aquatic nursery.

Pierrette Robichaud has been the Assistant Chief Park Interpreter at Kouchibouguac National Park since 1981. She was a park interpreter for 4 years prior to this permanent position. She has worked in oyster culture in Bouctouche and in Richibucto Village, and also in trout farming in the St-Louis area. She carried out an insect survey at the University of Moncton, where she obtained her Bachelor of Science degree. Ms. Robichaud has a great interest in raising her children, taking care of pets and vegetable gardens, and growing fruit trees. She enjoys camping, swimming, cross-country skiing, ballet-jazz, sewing, cooking, religion, genealogy, local history and weather forcasting.

Rare New Brunswick Plants

THE NEW BRUNSWICK SALT-MARSH ASTER

(Aster subulatus Michx. var. obtusifolius Fern.)

Hal Hinds

On July 25, 1902, M.L. Fernald and E.F. Williams collected a small aster growing in salt marshes at the mouth of the Nepisiquit River in Bathurst, New Brunswick. Dr. Fernald, botanist extraordinaire from Harvard University, immediately recognized the aster as an unusual varient of the Salt-marsh Aster (Aster subulatus Michx.) which ranges from southern Michigan and southern Ontario and New York to southern Maine, south along the coast to Florida and Louisiana.

When S.F. Blake visited the area in 1913, he collected abundant material of this Salt-marsh Aster along the mouth of Middle River, Bathurst Bay, and sent it to Professor Fernald. With this added material Fernald was able to compare the New Brunswick specimens with the more southern types, and he decided to separate the Bathurst Bay populations as variety obtusifolius. This he published in Rhodora, 16 (184) with the explanation that the variety differs from the typical form in its relatively broad, obtuse- or round-tipped rather than long-attenuate leaves, its subequal rather than distinctly imbricated phyllaries, and its 1-rowed ray-ligules much surpassing the pappus rather than 2-rowed only slightly surpassing it.

The New Brunswick population of the Salt-marsh Aster is significant for several reasons. It is possible that the Bathurst Bay population has been isolated from the main interbreeding population for nearly 10,000 years, when the last Pleistocene glaciation retreated northward. For several thousand years the continental shelf and other areas off the maritime coast were above sea level and apparently supported vegetation characteristic of low, swampy and boggy habitats. In the estuaries of this broad shelf the aster would undoubtedly have flourished and may have occurred as far north as the Gaspé.

When the land and sea level continued to rise as a result of the further retreat of the glacier, the continental shelf was drowned and only the Bathurst Bay population of the aster survived in Atlantic Canada. Elsewhere, the species survived in isolation in southern Ontario, southern Michigan, and New York, with the main body of the population being south of the glacial maximum from southern Maine to Delaware south to Florida and Louisiana.

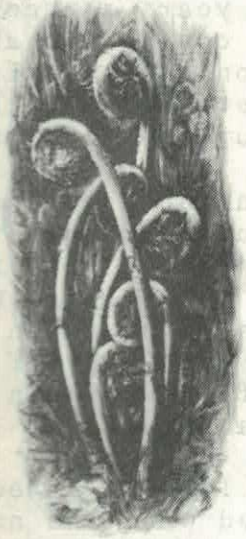
The long-isolated New Brunswick population, unable to interbreed with the narrow, pointed leaved southern populations, became morphologically distinct as Fernald had outlined.

Fernald and Williams first collected this aster at the mouth of the Nepisiquit River in Bathurst. This population has now been destroyed by the various industrial and residential developments in the area. As far as is known, only a population along the Tetagouche River survives.

The habitat of this truly endemic New Brunswick plant should be protected from undue disruption by the activities of man, and therefore I have recommended to the New Brunswick Department of Natural Resources that an area at the mouth of the Tetagouche River be set aside as an ecological reserve and that the New Brunswick Salt-marsh Aster be designated as an endangered species.

NATURAL EMBLEMS OF NEW BRUNSWICK

David S. Christie



New Brunswickers love their maple syrup, their blueberries, salmon, shad and lobster, but no wild food is so characteristic of the province as fiddleheads, the curled young fronds of the Ostrich Fern which grows abundantly on floodplains of the Saint John, the Miramichi, the Restigouche and many smaller rivers. So thoroughly is the fiddlehead associated with the province that its curving motif appears frequently on New Brunswick crafts and promotional literature, and the province's leading literary magazine is named for it.

But it is not only in modern times that the fiddlehead has been of special significance. It was an important spring green and tonic in the diet of the Maliseet and Micmac Indians. Associating the fiddlehead with the succession of narrowing circles in which game animals travelled before bedding down to sleep, the natives attributed protective, magical significance to the pattern and often decorated their canoes, homes and implements with fiddlehead designs. Thus the emblem of longest use and deepest tradition in the area that is now New Brunswick is the young crozier, or fiddlehead, of the Ostrich Fern.

The first Provincial Seal of New Brunswick, adopted when the area was separated from the peninsular portion of Nova Scotia in 1785, depicted a ship sailing up a river on the banks of which were a new settlement and pine trees. Very appropriate symbols they were, because rivers, the forest - especially its lofty White Pines - and ships were extremely important to the developing colony. Thus the White Pine, trees of which more than 24 inches in diameter were reserved as masts for the Royal Navy, gained the first official recognition as a natural emblem of the province.

After Confederation, the present coat of arms of an oared galley (the contemporary sailing vessels apparently being too modern) topped by lion passant gardant was adopted. The lion was not specifically a symbol of New Brunswick itself but rather of loyalty to the English crown. Although the White Pine had disappeared from the Seal it was still of great

importance to the province, but gradually dominance of the forest economy shifted from sawlogs of virgin White Pine and Red Spruce to pulp and paper from smaller spruces and Balsam Fir. At the same time, the Eastern Spruce Budworm emerged as a major threat to the industry, the target of a massive control program and the subject of heated controversy. Surely, the budworm must now rank high in the public's mind as an unofficial symbol of New Brunswick.

In 1936, before most people had ever heard of the budworm, the "purple violet" was designated provincial flower of New Brunswick. The move came as a result of a resolution to the government from the New Brunswick Women's Institute which had arranged for its selection by the province's school children. Generations of New Brunswick children have eagerly competed to pick the earliest bouquet of violets for their teacher or mother.

The official designation gave no botanical name for the flower; perhaps none of the persons involved realized that there were at least eight species that could qualify as "purple violets" in New Brunswick, or else they felt it was unimportant. In actual fact, only two of the eight violets are widespread and common enough to warrant consideration and, over the years, it generally has been agreed that the honour should be given to Viola cucullata, often called the Marsh Blue Violet. It just as easily could have been the Northern Blue Violet, V. septentrionalis; the two are equally common and popular in most parts of the province.

Forty years later, interest developed in choosing a provincial bird. Four species, the Gray Jay, Black-capped Chickadee, American Robin and White-throated Sparrow are especially dear to New Brunswickers, so in the spring of 1981 our provincial federation of naturalists conducted a public selection through the newspapers. The chickadee emerged as clear favorite, capturing 44% of the first choice votes. Many supporters cited its abundance in both rural and suburban areas, its year-round presence and its "tame and cheerful nature" as reasons for their support.

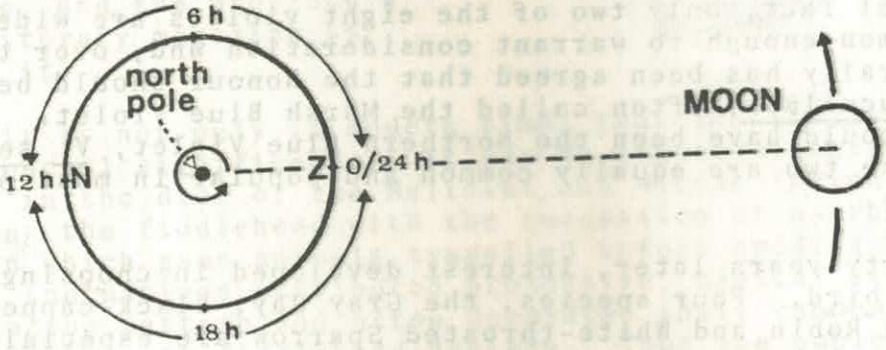
The New Brunswick Federation of Naturalists is deeply honoured to have the 1983 Canadian Nature Federation conference officially opened with the proclamation by Lieutenant-Governor George Stanley of the Black-capped Chickadee as the newest official emblem of New Brunswick.

THE GREAT CELESTIAL TIDE MACHINE

Michael Burzynski

(Reprinted with permission from Salt and Fir, summer 1983, a gui
to Fundy National Park published by Parks Canada.)

As the earth and moon move through space, they revolve slow
around a common centre of gravity, like uneven weights on a dumb
bell. The gravity of the two planets and a force due to this
rotation combine to create tide-generating forces that affect
water on the surface of the earth. These forces are strongest
at the point on the earth that is closest to the moon (Z), and
at the point furthest away (N).



1 As the earth turns on its axis each day, tide-generating forces set the ocean waters in motion.

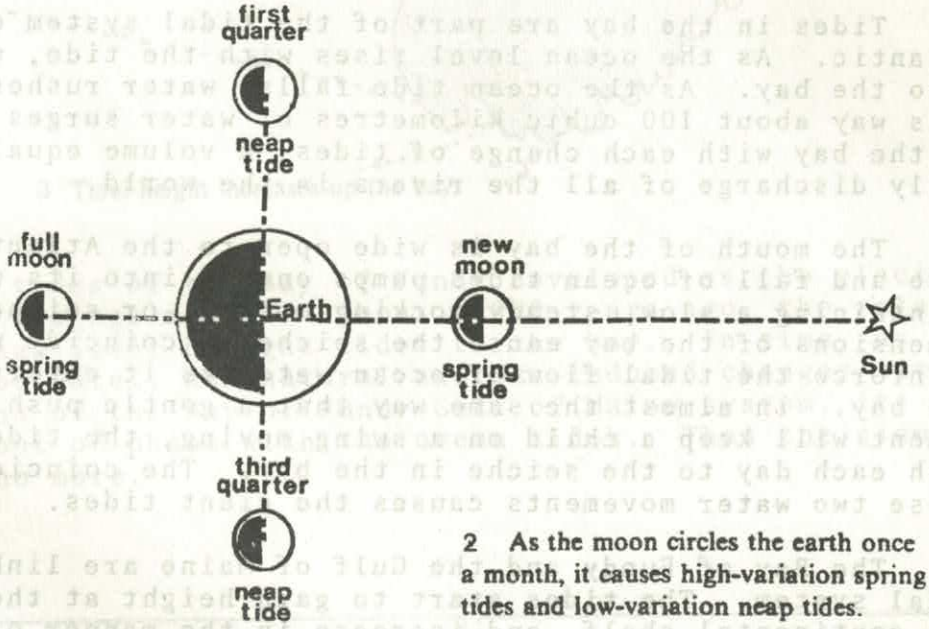
As the earth turns during a day, different places on its surface pass into and out of points Z and N. Since the moon orbits slowly in the same direction as the earth spins, it take slightly longer than a day for a place to reappear at point Z or N. This period of 24 hours and 50 minutes is the lunar or tidal day.

The tide-generating forces are weak, causing only a slight movement of water toward whichever point, Z or N, is closest at the time. During a tidal day, water molecules in any one place move about 170 m toward the west, then the east, then the west, and again to the east. The net effect of this east-west rocking or looping is a sloshing of water masses within basins. Combined with the Coriolis effect (an apparent

force due to the earth's rotation, by which a moving object in the Northern Hemisphere tends to the right, and in the Southern Hemisphere, to the left) this results in an apparent slow rotation of the water masses. In the North Atlantic Ocean, this gyration is counter-clockwise, and two complete sweeps of the basin are made each tidal day.

There is no actual circulation of water around the ocean. The situation is similar to that of a tray of jello that is given a quick twist. A wave-like crest moves around the tray, but no jello molecules are permanently displaced, they just sway around a point.

As the small crest of the ocean tide sweeps around the coast of the North Atlantic twice each tidal day, a place on the coast will have a change of tides about every 6 1/4 hours. Thus, there are two high and two low tides each tidal day.



2 As the moon circles the earth once a month, it causes high-variation spring tides and low-variation neap tides.

The sun is much larger than the moon but also much further from the earth. On the west side of the Atlantic, its effect on the tides is 1/5th that of the moon. Twice each month the gravitational pulls of the sun and the moon are in line - at the new moon and the full moon. These are the spring tides, tide cycles with a large variation in height between high and low tide. The name is derived from the Old English word "springan" meaning "a welling". Also twice each month, at the quarter moons, the gravitational pull of the moon is at a right angle to that of the sun. This causes neap tides, tide cycles with only a small variation in height between high and low tide. The name comes from another Old English word "nep" meaning "scant" or "lacking", akin to "nipped in the bud".

Gauging Fundy's Tides

When the tide comes in on the flats of Chignecto Bay, it rises fast enough to catch a slow walker. If a person stands at the water's edge for three minutes, his feet will be covered. If he lingers, the water will creep up his body until an hour later only bubbles will mark his place.

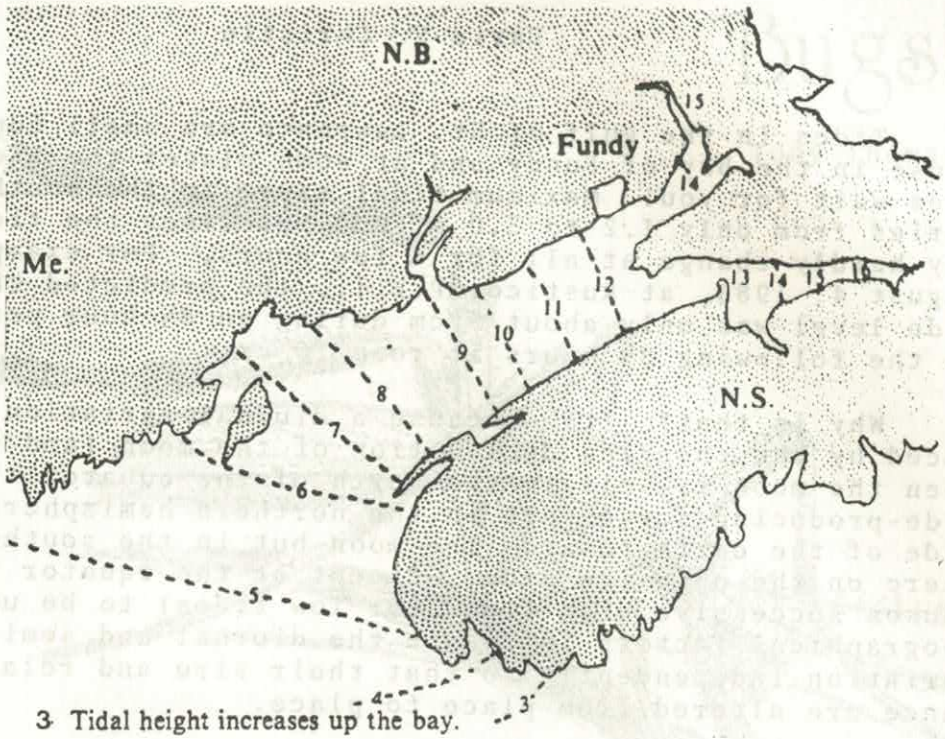
Few people have the stamina to try this experiment. Most just wet their feet, then retreat up the beach. The water slowl follows, flooding the low areas and gurgling into clam and worm holes, rising until the vast mud and gravel flats are once more the bottom of the sea.

In another 6 1/4 hours, the water will have receded. The beach, seaweeds, and animals that were under as much as 15 m of water will again be high and dry. These are the giant tides of the Bay of Fundy.

Tides in the bay are part of the tidal system of the North Atlantic. As the ocean level rises with the tide, water floods into the bay. As the ocean tide falls, water rushes out. In this way about 100 cubic kilometres of water surges into and ou of the bay with each change of tides, a volume equal to the daily discharge of all the rivers in the world.

The mouth of the bay is wide open to the Atlantic, and the rise and fall of ocean tides pumps energy into its waters, maintaining a slow, steady rocking motion, or seiche. The dimensions of the bay cause the seiche to coincide with, and reinforce the tidal flow of ocean water as it enters and leaves the bay. In almost the same way that a gentle push at the righ moment will keep a child on a swing moving, the tide gives a push each day to the seiche in the bay. The coincidence of these two water movements causes the giant tides.

The Bay of Fundy and the Gulf of Maine are linked as a tidal system. The tides start to gain height at the edge of the continental shelf, and increase in the manner of compound interest up the length of the bay. In this way, during a spring tide, the 0.8 m ocean tide is increased to as much as 16 m in Minas Basin and 15.2 m in Chignecto Bay. Along the coast of Fundy National Park, the average tidal range is 8.8 m with a neap tide range of 5.6 m, and a spring tide range of 11.9 m. Some other places in the world with tidal ranges of about 10 m are: the Port of Bristol, in the south of England the Sea of Okhotsk, northeast of Japan; Turnagain Arm, near Anchorage, Alaska; the Bay of St. Malo, in Brittany; and the Leaf River in Ungava Bay, Quebec.



3 Tidal height increases up the bay.

The tides of the Bay of Fundy developed as the glaciers of the last Ice Age melted. About 6,000 years ago, the relative rise in sea level brought tides to the bay. In time, as sea level fluctuates, and natural and man-induced changes alter the dimensions of the Bay of Fundy-Gulf of Maine system, its seiche will go out of phase with the ocean tides. Then the giant tides will be no more.

TIME AND TIDE WAIT FOR YOU...

GULF TIDES SOMETIMES WAIT

David S. Christie

Tides in the gulf of St. Lawrence are small compared to those in the Bay of Fundy and at some places the tide actually does wait for you! Maximum tidal range in the southern gulf varies from only 1.2 to 3.0 m, and sometimes the tidal level may hardly change at all for a few hours. For example, on August 4, 1983, at Rustico, P.E.I., the predicted change of tide level was only about 5 cm during an 8½ hour period, but in the following 8½ hours it rose 70 cm.

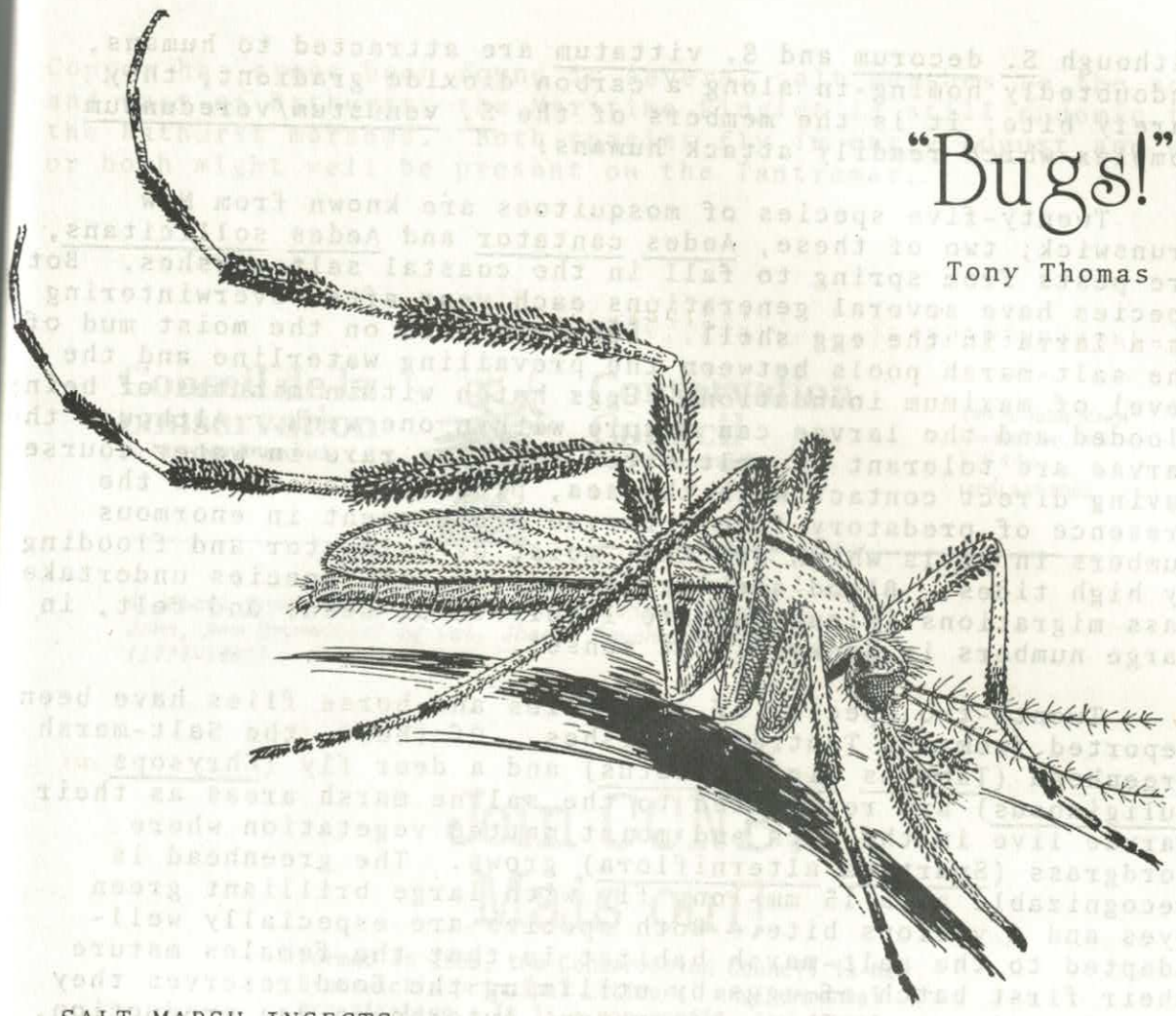
Why is that? It's because a diurnal variation is introduced by the changing declination of the moon (and sun). Thus, when the moon is well to the north of the equator the largest tide-producing forces act in the northern hemisphere on the side of the earth towards the moon but in the southern hemisphere on the opposite side. Except at the equator this causes successive high tides (or low tides) to be unequal. Geographical factors influence the diurnal and semi-diurnal variation independently so that their size and relative importance are altered from place to place.

In the Bay of Fundy, where the semi-diurnal tide is so greatly magnified by the bay's 13-hour resonance, the diurnal variation, while noticeable, is relatively unimportant. On the other hand, in the southern gulf the diurnal variation is relatively large, especially in western Prince Edward Island and adjacent New Brunswick, where, as in the Rustico example, there may be only a 5 cm change between one low tide and the next high, followed by 70 cm between the next low and high.

Tidal waves of different magnitude and timing which pass into Northumberland Strait around the two ends of Prince Edward Island further complicate tidal patterns where they mingle in the west-central part of the strait. Thus, at Shediac Bay, N.B., the predominant tidal pattern consists of an extended high and one low tide per day, less often of two highs and two lows.

"Bugs!"

Tony Thomas



SALT-MARSH INSECTS

Frequently, one of the most memorable, albeit unpleasant, incidents associated with a visit to a salt marsh in mid-summer is the hordes of biting flies which regard Homo sapiens as a bonus meal ticket. Species from four families of biting flies are intimately associated with salt marshes: these are the black flies (family Simuliidae), mosquitoes (Culicidae), biting-midges (Ceratopogonidae), and deer flies and horse flies (Tabanidae). Only a few species from each family are restricted to this habitat, but what they lack in species diversity is compensated by density.

Of the 20 species of black flies recorded from New Brunswick, only a couple of species are bothersome to humans on the Tantramar Marshes in the summer; these are Simulium decorum, Simulium vittatum, and members of the Simulium venustum and Simulium verecundum complex. These species overwinter in the egg stage and then pass through several generations throughout a summer. The larvae are commonly found in the water channels of the Tantramar Marshes. As with other biting flies, the females seek a blood meal in order to obtain nutrient to develop eggs.

Although S. decorum and S. vittatum are attracted to humans, undoubtedly homing-in along a carbon dioxide gradient, they rarely bite; it is the members of the S. venustum/verecundum complex which readily attack humans.

Twenty-five species of mosquitoes are known from New Brunswick; two of these, Aedes cantator and Aedes sollicitans, are pests from spring to fall in the coastal salt marshes. Both species have several generations each year after overwintering as a larva in the egg shell. Eggs are laid on the moist mud of the salt-marsh pools between the prevailing waterline and the level of maximum inundation. Eggs hatch within minutes of being flooded and the larvae can mature within one week. Although the larvae are tolerant of salt water they are rare in water courses having direct contact with the sea, probably because of the presence of predatory fish. Larvae are present in enormous numbers in pools which are kept moist by rainwater and flooding by high tides. Blood-seeking females of both species undertake mass migrations inland and are likely to be seen, and felt, in large numbers in Sackville at sunset.

Twenty-two species of deer flies and horse flies have been reported from the Tantramar Marshes. Of these, the Salt-marsh Greenhead (Tabanus nigrovittatus) and a deer fly (Chrysops fuliginosus) are restricted to the saline marsh areas as their larvae live in the muck and moist matted vegetation where cordgrass (Spartina alterniflora) grows. The greenhead is recognizable as a 15 mm-long fly with large brilliant green eyes and a vicious bite. Both species are especially well-adapted to the salt-marsh habitat in that the females mature their first batch of eggs by utilizing the food reserves they stored as larvae. This phenomenon, autogenous egg production, allows for the species to survive in a habitat where larger mammals, the usual hosts of tabanids, are scarce. However, a blood meal is required for the development of each subsequent egg mass and these blood-seeking females tend to move inland off the marsh. Of the other 20 species of tabanids, four (Hybomitra frontalis, H. itasca, H. liorhina, and Chrysops furcatus) are predominantly northern or western in distribution. These species are found in the Maritimes only in salt marshes, with H. itasca being further restricted to the Tantramar Marshes.

Several other species of flies are associated with the estuarine habitat. Larvae of the seaweed flies (Coelopidae) feed in rotting seaweed whilst blow flies (Calliphoridae) are abundant wherever dead fish are thrown up on the shore.

Several species of butterflies occur on the salt marshes, but only two, the Maritime Ringlet (Coenonympha inornata nipisiquit) and the Salt-marsh Copper (Epidemia dorcas dospassosi) are restricted to this habitat. The salt marsh at Bathurst, on Chaleur Bay, is the type-locality for each species. Both were discovered by McDunnough in 1939 and whilst the Salt-marsh

Copper has since been found in several salt marshes to the south and east of Bathurst, the Maritime Ringlet is still endemic to the Bathurst marshes. Both species fly in early August and either or both might well be present on the Tantramar.

Museum News

BEGINNINGS

(Based in part on The History and Development of The New Brunswick Museum (1842 - 1945) by W. Austin Squires)

The New Brunswick Museum is the direct descendent of the first public museum in Canada, opened in Saint John in 1842 by Dr. Abraham Gesner. The museum today encompasses the fields of art, Canadian history and natural science, but it is in the latter that the institution had its beginnings.

Abraham Gesner was a Nova Scotia medical doctor whose explorations in geology propelled him, in 1838, to the post of Provincial Geologist for New Brunswick. On April 5, 1842, with the expressed hope of stimulating interest in the natural resources of the provinc Gesner opened the doors on his personal collection of rocks, mineral birds, mammals, Indian relics and "Curiosities of all Kinds". Of th 2,173 catalogued exhibits, the Gesner label remains attached to many of the museum's treasures. Few biological specimens have survived the deterioration of the decades, but a Black Bear prepared by Gesne and his Micmac Indian assistants is still displayed in the Natural Science Gallery. The bulk of Gesner's geological material is maintained intact, an invaluable record of the first scientific study of the rocks and mineral resources of this province.

By 1843, Gesner was out of work and facing bankruptcy as the government refused to continue to fund the Provincial Geologist position. He turned his collections over to his creditors and retur to Nova Scotia. Abraham Gesner went on to father the oil industry with his discovery of kerosene - and of the high yield of the "illuminating gas" produced by New Brunswick bitumen, or albertite - an his collections, prestigious cornerstone of the present New Brunswick Museum, were assimilated into museum of the Mechanics' Institute of Saint John.

From 1846 until it closed in 1890, the Mechanics' Institute Museum attracted the booty of seafaring men. Vessels unloaded native weapons and artifacts from voyages to the South Pacific, Africa, and South America - sea captains' treasures, the nucleus of the present-day ethnological collections.

Gesner's scientific influence was not lost, however. In 1862 a group of young men became keenly interested in Gesner's collection and the geology of the region, and formed the Natural History Societ of New Brunswick. One of the new Society's aims was to build collections fully representative of the natural history of the provi Logically, in light of the interests of its founders, the Society pursued its goal most ambitiously along geological lines.

George F. Matthew, charter member and local customs officer for the port of Saint John, was an amateur geologist who became a world expert in Cambrian paleontology with his studies on the geology and paleontology of New Brunswick. It was Matthew who unearthed Paradoxides regina, one of the largest trilobites ever found, at Portland Point, Saint John. A cast of the twelve-inch long extinct relative of crabs and lobsters - known only from Matthew's single specimen - is on display in the New Brunswick Museum Science Gallery. The original fossil, along with Matthew's great personal collection, was purchased by the Royal Ontario Museum. Nonetheless, many specimens collected by Dr. Matthew were deposited with the Natural History Society; his Saint John area fossils are today a most scientifically important component of the geological holdings of the New Brunswick Museum.

In 1863 the Natural History Society purchased a major assemblage of fossils collected in the Fern Ledges and Duck Cove areas of West Saint John by a second charter member, Fredericton native Charles Frederick Hartt. When Dr. (later Sir William) Dawson, principal of McGill University and author of Acadian Geology, examined the 8,000 specimens, he found among them several fossil species new to science. The Hartt collection became internationally famous, and was studied in 1911 by researchers sent from the British Museum. After a brief sojourn in Saint John, Charles Frederick Hartt went on to become State Geologist of Brazil, founding the National Museum in Rio De Janeiro.

Geological work at the New Brunswick Museum in this century has not kept the pace set by Gesner and Matthew; nonetheless, the museum houses some 20,000 rocks, minerals and fossils representative of the geology of New Brunswick and many areas of North America.

The Natural History Society of New Brunswick was thrown into total disarray by the Great Saint John Fire of 1877. With lives disrupted, the city in ruins, books and personal possessions destroyed, there was little interest in leisure-time intellectual pursuits.

By 1880, however, a vigorous new generation of geologists, botanists and zoologists was actively rebuilding the Society. Among these dedicated men was botanist G.U. Hay, who was to become the leading authority on the flora of the province. His collection of New Brunswick plants formed the nucleus of the museum's herbarium. The Society further acquired the collection from which Professor James Fowler of Queens University compiled his list of New Brunswick plants published in 1885. Over the years, the herbarium has grown with thousands of plant specimens from amateur and professional alike, until it today comprises over 20,000 sheets spanning 120 years of plant collecting in New Brunswick.

As George Hay was building the botanical collections, Montague Chamberlain took charge of ornithology, and began developing a systematic bird collection. Author of the first catalogue of

Canadian birds, Chamberlain was succeeded by A. Gordon Leavitt, who himself added many skins and mounts retained to this day in the New Brunswick Museum collections.

A significant but somewhat later acquisition was the Boardman Collection of birds. George A. Boardman, of Milltown, N.B., made a large collection of birds prior to 1900 presumably in (for many specimens unfortunately lack data) the St. Stephen, N.B.-Calais, Maine, area. The collection of 1,138 mounted birds, more than 500 skins, "four cases" of birds' eggs, and several decorative cases of mounted tropical and local birds, was purchased by the Province of New Brunswick in 1900 and transferred to the New Brunswick Museum in 1945.

In 1907 the Natural History Society appointed William MacIntosh curator of the museum, and it was he, as Director some two decades later, who oversaw the transfer of the collections (by then rich in historical and archival as well as scientific materials) from the Society to "The Provincial Museum", incorporated in 1929. A year later, by an ammendment to the Act, "The Provincial Museum" became "The New Brunswick Museum".

The citizens of Saint John laid claim to the Provincial Museum by matching a provincial government grant for its creation. Their financial support, and the agreement of the Natural History Society to transfer its collections to a provincial institution located in Saint John, captured the museum for that city. In 1934, the building on Douglas Avenue that continues to house the New Brunswick Museum was officially opened.

William MacIntosh, fondly remembered as what would today be called an interpretive naturalist, was a pioneer in the field of museum education. He was also, during his early years as curator with the Natural History Society Museum, Provincial Entomologist, and he left thousands of carefully pinned and labelled insects in the museum's scientific collections.

For forty years MacIntosh ran a badly underfinanced operation, coping, essentially alone, with burgeoning collections in natural and human history and the arts. Upon his retirement, the museum Board re-aligned the staffing of the institution to reflect the diversity of its rich collections, and the present curatorial divisions of Art, Canadian History, and Natural Science were realized.

The helm of the Natural Science Department was taken in 1941 by W. Austin Squires, followed in 1969 by David S. Christie (who, following his resignation in 1980, maintains close connections with the museum as Associate Curator).

Until 1965, the New Brunswick Museum did not have a scientific study collection of mammals. Gesner's efforts to collect mammals for museum purposes were directed toward the public displays, and few, if any, specimens were prepared for a study collection. Membe

of the Natural History Society were interested in mammals, and published observations and lists of occurrence in the Society's Bulletin, but expended little energy on building a museum collection. It was left to the determined efforts of staff, notably Stanley W. Gorham, over one hundred years later to lay the groundwork for the museum's now fully rounded collections of not only mammals, but fishes, amphibians and reptiles of New Brunswick.

Gayl Hipperson

Book Reviews

Marine and Coastal Systems of the Quoddy Region, New Brunswick. Edited by Martin L.H. Thomas. Canadian Special Publication of Fisheries and Aquatic Sciences 64. 306 pp. illus. $17.95.

Reviewed by Christopher S. Lobban, Biology Department, University of New Brunswick, Saint John.

The Quoddy Region covers the coastal waters of the Bay of Fundy north of a line from Point Lepreau to the northern tip of Grand Manan Island and proceeding to West Quoddy Head, Maine. It is a region of "unique conditions fostered by the high tidal range and vigorous water exchange." The stated objective of the book is "to provide a description (of the structure and functioning of the biological, oceanographic and geological systems) useful to scientists, teachers and natural historians." Because the book is aimed at such a diverse audience, most readers will find some chapters useful and others not. Some will enjoy the descriptions of the local marine ecology; others will find some keys useful. It is unlikely that naturalists will find the whole book of interest, yet most will find enough, I think, to consider buying a copy. The book contains useful keys and illustrated checklists to certain groups of animals - marine mammals and fishes; amphibians and reptiles - for which adequate local keys were not already available. However, the book is not designed to be a handbook on shore life, and in most chapters a knowledge of the organisms, or at least access to pertinent handbooks, is assumed. It would clearly have been well beyond the scope of this book to include keys to marine invertebrates, seaweeds, and plankton. Many chapters do have useful summaries of study methods, including collection and preservation of organisms, and there are references to appropriate identification guides. In the following paragraphs I will briefly outline the various chapters and comment on the probable usefulness of each to the average naturalist (whom I take to be a non-professional biologist with access to guidebooks but without a microscope or special technical expertise).

Two chapters set the physical background of the region: the meteorology (by Thomas) and the physical oceanography (by Trites and Garrett). The first is quite general; the second, while mostly not too technical for the general reader, probably goes well beyond what most naturalists would care to know about temperature, salinity and water circulation in the region.

The intertidal zone is the most accessible part of the sea and the four chapters on this zone should be of interest to naturalists. Two of the most interesting are by Thomas, Arnold and Taylor on rocky intertidal communities and by Thomas on tidal pools. These chapters give an interesting encapsulation of the ecology of rock shores and the special environment in tidal pools, plus descriptions of the specific zonation of organisms at seven locations. Mud, sand, and gravel shores have quite a different set of physical factors and inhabitants; these are treated in a chapter by Steele. The intertidal section is rounded out with a chapter on salt marshes by Thomas, although these are "not well represented" in the Quoddy Region.

Two chapters on the subtidal benthos (those of hard substrates by Logan, MacKay and Noble, and those of sediments by Wildish) will be of interest chiefly to diver-naturalists, although illustrations of wharf piling biota will be of wider interest.

Of several chapters on organisms which swim or drift in the water column, those on fishes (by Scott) and marine mammals (Gaskin) will be useful to naturalists; both have straightforward keys and good illustrations. Gaskin provides some good advice on observing whales safely and without disturbing the animals, and gives maps of the best sighting areas. (This chapter is tucked away in the terrestrial section.) Chapters on phytoplankton (Lakshminarayana) and smaller and larger zooplankton (Corey; Roff) are not likely to be of practical use (except to marine biology students) although each is certainly a competent scientific account.

The remaining chapters deal with organisms of the sea-land interface: birds (Christie), amphibians and reptiles (Gorham and Bleakney), and coastal forest (Hinds). Christie gives a general account focused on the sea- and shorebirds plus a checklist of all the birds. The chapter on amphibians and reptiles, included on the justification that some species, at least, occur in barachois pools, is very well illustrated. The coastal forest is defined as "the forest or dominant vegetation above the high-tide mark ... inland to the point where marine influences ... become negligible." These last two-mentioned chapters seem out of place in what is essentially a marine book (notwithstanding the all-encompassing title), but will probably add considerably to the book's interest to naturalists.

All in all, this book can be strongly recommended both as an interesting account of a unique area, and as a practical guide for students and naturalists.

Events Calendar

NBFN ANNUAL MEETING

Saint John, September 16, 17, 18

"The Museum and the Naturalist"

LOCATION: King George VI Hall, The New Brunswick Museum, 277 Douglas Avenue, Saint John, N.B. (Please use the south side entrance, by the park, to the Museum.)

Field trips will depart from the Museum parking lot (north side of building).

REGISTRATION: $15.00 individual; $10.00 for each additional person in the same family. The registration fee includes Saturday box lunch and cold buffet dinner.

Mail by September 1 to: David Smith, 149 Douglas Avenue, Saint John, N.B. E2K 1E5. (Make cheque payable to The New Brunswick Federation of Naturalists.)

ACCOMMODATION: No shortage of campgrounds, hotels, motels; limited billets with Saint John Naturalists' Club members. Please inquire with your registration.

PROGRAM:

Friday, September 16

8:00 p.m. Informal Reception, hosted by the Saint John Naturalists' Club. Slides by David Smith - 'remember when' with a fun look at past Federation activities.

Saturday, September 17

9:00 a.m. Concurrent Field Trips.

(a) Rockwood Park. Acres of rolling woodland and sparkling lakes right in the city center. Fall warblers and flowers. Easy walking.

(b) Saints Rest Marsh. Large tidal marsh surrounded by fields and coniferous woods. Congregations of migrating land- and shorebirds.

PROGRAM: (Cont'd)

Saturday, September 17 (Cont'd)

11:30 a.m. Optional Science Gallery Tour and Discussion. Planning is underway for a new Natural Science Gallery - let's hear what you would like to see in the finished product.

12:00 p.m. Box Lunch.

1:00 p.m. Welcome and Opening Remarks.

1:30 p.m. "Oaks from Acorns Grow". Early botanical collecting in New Brunswick, Stephen Clayden, Saint John.

2:15 p.m. "200 Robins!?" Why museums need so many specimens. Donald McAlpine, Natural Science Department, New Brunswick Museum.

3:00 p.m. Break

3:30 p.m. "Old Ladies and Tennis Shoes". The contribution of the amateur to scientific ornithology. Peter Pearce, Canadian Wildlife Service, Fredericton.

4:15 p.m. "No Running and Please Don't Touch the Moose!" The role of museums in education. Barry King, Education Department, New Brunswick Museum.

6:00 p.m. Dinner. Cold-cut buffet, King George Hall.

7:00 p.m. Annual General Meeting.

8:30 p.m. Nature Photography by Cecil Johnston. Birds, beasts and wildflowers captured in the camera's eye; a collection of slides reflecting the interest and enthusiasm of naturalist and photographer Cecil Johnston.

Sunday, September 18

9:30 a.m. Concurrent Field Trips.

(a) Cherrybrook Zoo. Lions, tigers, rare and exotic animals - a guided tour with zoo staff. (Please note: there is a $2.00 admission charge to the zoo.)

(b) Read Head Marsh. Freshwater cat-tail marsh with open water area. Shelter for a variety of waterfowl. Shore birds on neighbouring tidal flats; warblers in woods.

NEW BRUNSWICK FEDERATION OF NATURALISTS

277 Douglas Avenue, Saint John, N.B., Canada E2K 1E5
Telephone: (506) 693-1196

The NBFN is a non-profit organization formed in 1972 to:

* facilitate communication among naturalists and nature-oriented clubs
* encourage an understanding of nature and the environment
* safeguard the natural heritage of New Brunswick

LA FÉDÉRATION DES NATURALISTES DU NOUVEAU-BRUNSWICK

277, avenue Douglas, Saint-Jean, N.-B., Canada E2K 1E5
Téléphone: (506) 693-1196

La FNNB est une organisation sans but lucratif formée en 1972 pour:

* faciliter la communication entre les naturalistes et entre les divers clubs axés sur l'étude de la nature
* encourager une meilleure compréhension de la nature et de l'environnement naturel
* sauvegarder le patrimoine naturel du Nouveau-Brunswick

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