

VOICEPIPE

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The Newsletter of the BIO-Oceans Association



Coast Guard Base to be Revitalized / Repurposed



Architect's drawing showing the Centre for Ocean Ventures and Entrepreneurship (COVE) after the renovation of the former Canadian Coast Guard Base in Dartmouth.

On Thursday 29 September 2016, the Institute for Ocean Research Enterprise (IORE) held one of its Ocean Connector events at the former Canadian Coast Guard Base on Parker Street in Dartmouth. The event included a tour of the base, which will undergo a substantial renovation to provide space for firms involved in ocean related industries and shared services for the tenants. The base was purchased from the federal government by the Waterfront Development Corporation, a provincial Crown corporation, for \$6.5 million. The site has over 850 metres of wharf and two 100 metre piers and includes a water lot. The water lot will permit easy installation of buoys and cables to facilitate the testing of equipment. Several existing buildings on site contain office and meeting space and wharf-level workshop space. Much of the space is in need of upgrading and renovation.

The provincial and federal governments have agreed to invest \$12.55 million and \$7.17 million respectively to transform the former base into an incubation hub for research, design, and development. The Nova Scotia Community College (NSCC) whose Waterfront Campus is close by, will be the academic lead on the project, but it is expected that researchers from all universities will tie into the Centre.

The Centre is anticipated to open in 2018 after renovations are complete. Much

**Volunteers Needed
BIO EXPO
20 -24 September 2017**

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of the funding will be used to refurbish the wharf, which is being undercut.

In his remarks to the audience gathered for the tour in a large wharf-level workspace, Wayne St-Amour, Executive Director, Strategic Initiatives, Nova Scotia Community College said that COVE would be a working test and industry training facility to solve technical problems and involve students from NSCC and other university partners.

Sheila Patterson, COO, IORE, and project manager for the COVE project said the centre would provide a foothold for small businesses, enable engagement between large and small businesses, provide workshops and offices on a long- or short-term basis, access to infrastructure, and opportunities for mentoring and networking.

Stephen Duff, CEO, Innovocorp stated that they intended to establish an acceleration program to foster start-ups in advance of the official opening of the centre.

As Sheila Patterson told the audience, “stay in touch” as renovations proceed and programs are initiated.



Photos: top, participants in the IORE Ocean Connector event at the COVE await the beginning of the tour of the former Canadian Coast Guard Base in the large wharf-side workspace that used to accommodate navigation buoys; bottom, some of the features of the base will be preserved such as the “nautical” floor in this office space. Jim Hanlon, CEO, IORE, tour guide, and host of the event is standing on the far left.





FROM THE PRESIDENT

First, I want to invite all members to a special general meeting of the Oceans Association scheduled for 23 November at 9:30 am in the Gully Boardroom. There are a number of critical issues on the agenda, and one

that really pleases me is the election of a First Vice-President. As you know, we have been searching for some time to fill this critical position and I am pleased to announce that Claudia Currie has agreed to be nominated for the post. Claudia needs no introduction to members of the OA given her long service to the organization, most recently as events coordinator. Everyone at BIO knows what a dedicated and tireless worker she is and I have no doubt that she will bring that same level of energy and commitment to her new post in the OA. We need the approval of the general membership to confirm Claudia in this position so please attend.

Our second item of business at the special meeting will be a presentation on the upcoming BIO EXPO 2017 by management co-chair Tana Worcester. The EXPO will run from 20 September to 24 September, 2017 with Day 1 being VIP Day, followed by school days on the 21st and 22nd, and the weekend designated for the general public. To be successful, the EXPO needs stimulating exhibits and lots of volunteers, and the organizers are counting on the OA to help out on both counts. So come to the general meeting and learn more about the plans. Gabrielle Tompkins-MacDonald, the volunteer coordinator, will also be attending and available to answer any questions you may have. Don't forget – all volunteers will get the official BIO EXPO 2017 t-shirt. This edition will be special as it will have the Canada 150 symbol on it making it a great memento to add to your collection. The OA needs to plan its participation as well. We will need to discuss what kind of exhibit we will want to develop. This EXPO has some interesting ideas coming forward, for example the Route 150. This will be a series of signposts along the route which will highlight significant science events from 1867 to 2017. My sense is that our members are well suited to help with this initiative in addition to our own exhibit. So come to the meeting and share your ideas to make this edition of the open house the best ever, fitting of the celebration of Canada's 150th birthday.

The third item of business at the general meeting will be the ratification of our amended bylaws. As you know, we presented some amendments at the last annual meeting in May and these were approved by the membership.

Subsequently, we sent these to the Nova Scotia Registry of Joint Stock Companies for approval and they have suggested a number of minor changes. We have made those edits and now need to submit them to the membership for approval. The revised bylaws have been circulated to the membership by email.

Most of you will know that we have experienced some major issues with our email notice service to members. This is a key service for our members, providing an effective means of communicating short messages about OA activities, events at BIO, and links to items of interest for our members. For years, we relied on the service provided by Airfire, but that company has ceased business and redirected us to Rogers. Unfortunately, that service provider has very different service limitations than did Airfire. Clive Mason has been sorting through these difficulties with help from Philip Spencer. While we have pieced together a way to get messages out to the membership list, there are a number of difficulties that need to be addressed and possible solutions will be discussed at our next executive meeting. This is a key service provided by the OA to its members and we are working hard to get it back to the efficient and effective service that it had been for years. Thanks to Clive for all his effort over the last month in rebuilding the contact list and finding ways to avoid the limits set by Rogers.

I hope to see everyone at the special meeting on the 23rd of November.

Mike Murphy, President

In Memoriam

Roger Joseph Cassivi, died 2 September 2016, Electronic Design Technologist, Metrology than Ocean Physics, DFO, a founding employee of BIO.

The A.G. Huntsman Foundation is pleased to announce that the **2016 A.G. Huntsman Award** was presented to **Dr. Benjamin Halpern** of the University of California, Santa Barbara. The award ceremony took place at 1400 on Thursday 17 November 2016 at the Bedford Institute of Oceanography in Dartmouth, Nova Scotia. Following the ceremony, Dr. Halpern presented a distinguished lecture entitled **"Opportunities and Challenges for Aquaculture to Feed the Planet."**

Do Marine Protected Areas Work?

Lessons Learned¹

by Peter Wells

Canadian marine ecosystems require more protection and conservation efforts from governments, the resource sector (i.e., fishing industry), environmental NGOs, and the interested public.

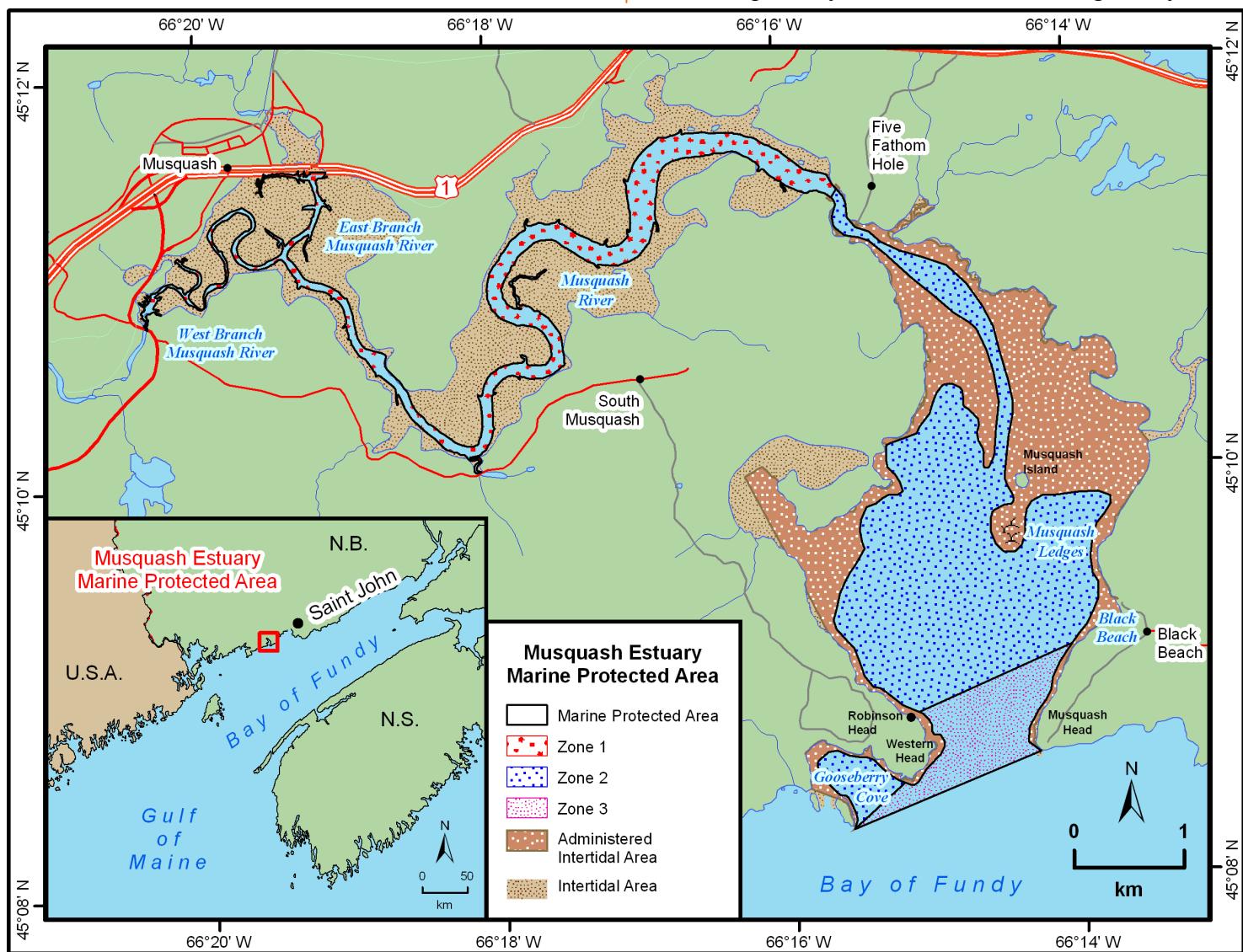
Jim Meek's recent thoughtful article (The Chronicle Herald, Saturday, 24 Sept. 2016: F2) points to some of the shortcomings of the policy in the federal Fisheries and Oceans department (DFO) of establishing Marine Protected Areas (MPAs) under the *Oceans Act*. Setting aside such areas for marine conservation, small or large, is an admirable goal. Unfortunately, it does not guarantee successful protection of sensitive habitats or endan-

gered species.

The first lesson is that MPAs are simply one tool in the conservation toolbox. Despite some successes (e.g., Musquash Estuary, Bay of Fundy), they are unproven in many places and are frequently of great concern to local coastal fishermen striving for a livelihood.

What is remarkable in the various discussions about MPAs, Meek's being no exception, is the lack of comparison to similar efforts on land, also aiming to protect unique and often threatened terrestrial habitats, species and ecosystems.

Witness the successes and failures over the past 100 years of the national parks (NP) system in Canada, which represents some of our best protected terrestrial areas. The parks system is much heralded globally for its



Map of the Musquash Estuary Marine Protected Area showing the management zones. Zone 1 consists of the upper region of Musquash River. This habitat is species rich and surrounded by a sensitive salt marsh. Zone 1 is afforded the highest degree of protection and few human activities are allowed. Zones 2 and 3 permit broader ranges of human activities.



Photos from the Encyclopedia of Life: left, the Lophelia Coral Conservation Area southeast of Cape Breton, Nova Scotia protects the reef building coral *Lophelia pertusa*; and right, the Northeast Channel Coral Conservation Area off southwestern Nova Scotia protects high densities of *Primnoa resedae-formis*.

breadth, visibility, goals and uses for recreation and tourism. But, it is often overrated as to the success of its long-term goal – safeguarding the ecological integrity and health and the wildlife of these special places.

The evidence often shows worrisome shortcomings. For example, in Nova Scotia, Kejimkujik National Park is not protected from side-by-side forest clear-cutting and new roads, pointing to the great need for buffer zones, a big issue with MPAs.

In New Brunswick, Fundy National Park remains a green oasis in a landscape of massive, relentless and totally destructive clear-cutting, again pointing to the need for buffer zones.

In western Canada, Jasper and Banff National Parks are rarely patrolled along their extensive boundaries. Hence iconic larger species such as bighorn sheep and grizzlies that roam large distances, and have no respect for park boundaries, are not protected from nearby big-game hunters.

Thus, a second lesson learned is that a mere park or area designation does not guarantee protection. But on land, the major pros and cons of designation are visible. Size matters to both habitats and species, and larger areas may be more resilient.

In recent news, the future is much brighter now for the enormous, unique Great Bear Rainforest on British Columbia's coast, officially recognized this week during the visit of a famed royal couple.

For the oceans, MPAs generally suffer the same limitations as land parks. However, being on or under water, habitats and species are much less visible, harder to monitor and measure, and seldom visited by the interested public. MPAs, as Meek points out, give the impression of protection and conservation and people feel good about such efforts and initiatives. But to date there

is too little proof of their positive effects, besides upholding a commitment to the United Nations Convention on Biological Diversity to place a percentage of Canada's ocean space under protection.

MPAs may work for selected bottom-dwelling habitats and species, such as corals and sea grasses, but not for water-column dwelling species such as whales and sea turtles.

Hence, one hopes for the best for the newly announced undersea canyons MPA off the southwest coast of Nova Scotia, an area of remarkable cold water hard corals. However, great concern remains for largely unprotected areas of the outer Bay of Fundy and Gulf of Maine frequented by endangered migratory whales.

The third lesson is that, to prove their effectiveness, what is needed for new and established MPAs is dedicated "at sea" activity of ecological science, surveillance, monitoring, and enforcement.

DFO is deeply committed to the goals and promise of the *Oceans Act* and deserves much credit for its overall efforts and latest success in the Nova Scotia offshore. Having renewed funding for science and monitoring, the department now should consider such "at sea" activity with all energy and haste.

This would reinforce the value, albeit with limitations, of the MPA approach in the public and political mind. It would also allay the concerns of the Maritime fishing industry while priority areas for other regional MPAs are being considered.

¹ Reprinted with corrections of article 'Protected areas are overrated' published in The Chronicle Herald, Saturday, 1 October 2016: F2, with permission of the author.

Remembering Roger Bélanger

by Ron Macnab

If you live in Dartmouth, chances are you've often taken a drive through Cole Harbour and out along Highway 207 past Lawrencetown Beach, Grand Desert, and West Chezzetcook.

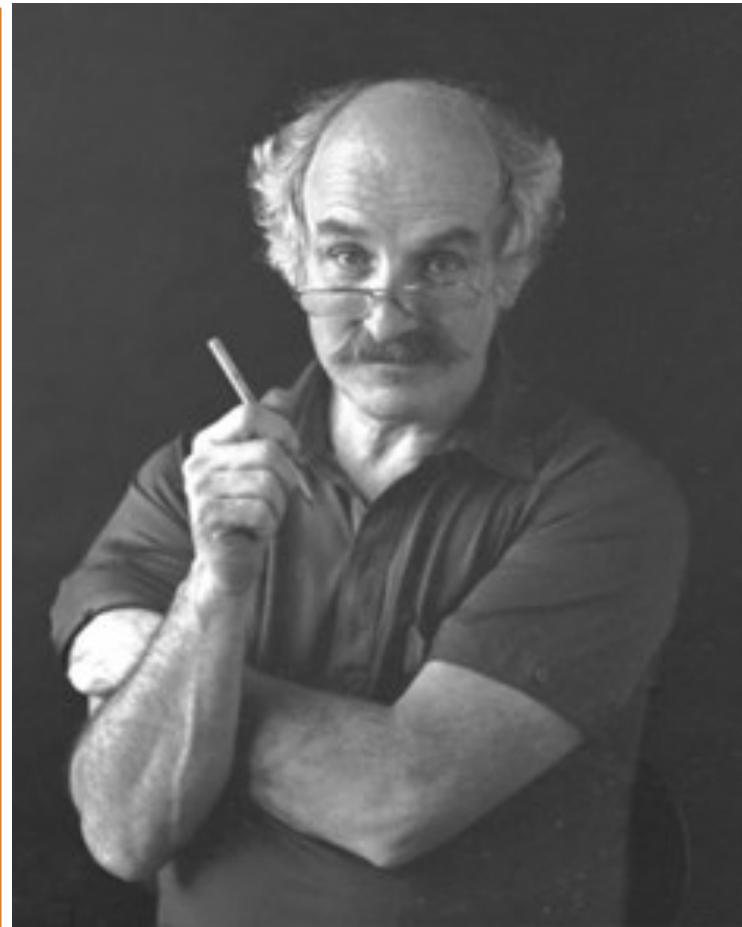
On approaching Grand Desert, it's hard to miss the Acadian flags that flutter from poles installed on the islets that dot the inlet in front of the village. Drive a little farther on, and you'll pass by the house just off the highway where Roger Bélanger lived out his final years, and where my thoughts invariably turn to recollections of a memorable shipmate.

Growing up in a small Quebec town on the north shore of Chaleur Bay, Roger felt instantly at home when he moved to Grand Desert and recognized the many kindred spirits that inhabited the place. Many were descendants of Acadians who settled there in the wake of Le Grand Dérangement (the Great Deportation). These residents welcomed Roger into their community, and he quickly involved himself in local activities.

A testimony to Roger's impact on Grand Desert and the surrounding area can be found in the Acadian House Museum in West Chezzetcook, featuring original and restored buildings that house artifacts, documents and other items of historical interest. Of particular note in an ancient family home is a wall that bears a portrait of Roger (the same one that is still displayed in BIO's Lower Cafeteria – see photo) surrounded by a selection of his photographs. If you ask, your guide will explain how Roger was a major player in the establishment of the Museum, and how he continued to provide follow-up support well after it opened. You will also be told that it was Roger who first proposed displaying the Acadian flags that you would have noticed on entering the village.

As most of my usual readers will know, for years Roger was a staff photographer at BIO who was actively involved in numerous field programs in addition to his shore duties in the Photo Lab. I'm sure that many will testify to his competence in portraying the human and technical subjects that he encountered in a great variety of circumstances. Always alert to his surroundings, he was an expert at seeking and composing the views that he considered worth capturing.

As most of my readers will also know, Roger had a fun side and he took great delight in hatching mirth-inducing activities that still brighten our reminiscences of him.



Like many professional photographers, Roger wasn't keen on having his picture taken. Once when Kelly was setting up his equipment for a studio portrait session, he needed to check his lighting and composition, and asked Roger to stand in for the subject who was soon to be photographed. Kelly recalls that he and Roger were having a technical discussion during this check, and Roger raised his pen to emphasize a point that he was making. With reflexes honed by years of experience, Kelly instantly recognized that he had a winning portrait and pressed the shutter button. In my estimation, the result was worthy of the famed Canadian portraitist Yousuf Karsh, whose photos went beyond his subjects' faces and revealed something about their personalities. Way to go, Kelly – and thanks for the memories. Photo: Kelly Bentham

Inspired no doubt by Nova Scotia's pumpkin-growing champion Howard Dill, Roger initiated the BIO Pumpkin Contest, spawning competitions to see who could grow the largest specimen and win coveted bragging rights.

During one memorable cruise on the CCGS *Hudson*, he kicked off a kite-flying competition to establish who on board could build and fly the best kite. It was hilarious to watch him and his associates as they scrambled about the vessel's top deck, coaxing their craft to take to the air. Ship Captain Dave Deer had to be less enthusiastic about the proceedings, concerned as he must have been about the possibility of a length of kite string getting en-

tangled in his rotating radar antenna.

At another time, Roger travelled to a scientific research base on an ice floe near the North Pole where he recorded the investigators and their experiments as they went about their work. One can imagine the general surprise when Roger strolled out one day wearing a Santa Claus suit – I wasn't there, but I've seen the photographs...

In spite of his fun-loving nature and his many extracurricular activities, Roger was first and foremost an avid chronicler of people, scenes, and objects. During a working visit to Sable Island, he captured many aspects of its land and marine environments: beaches and dunes, flotsam and jetsam near the water's edge, buildings engulfed by drifting sand, seabirds, seals, and of course the iconic Sable Island ponies. His photos from that excursion were beautiful studies in lighting and composition, worthy of inclusion in a high-quality coffee table book.

While I was visiting the Photo Lab one day, Roger pulled out a few photos from his recent Sable deployment, and asked me what I thought of them. They portrayed a shallow pond among the dunes, but unlike its neighbours, it had a row of evenly-spaced snail-like objects arrayed along its bottom. On encountering this sight Roger's research instincts had kicked in, and he resolved to photograph the scene so he could show the images to experts back at BIO for species identification. Photos completed, he decided that in the interest of a thorough investigation he should collect a sample to complement his images. Reaching into the water, he picked up a specimen, and as he brought it up to eye level for a closer inspection, it began to disintegrate in his hand, at which point it dawned on him that he was holding a lump of pony shit.

Clearly this was a story that Roger enjoyed telling, drawing as much if not more amusement than his listeners from this tale of mistaken identity. Not everybody can tell stories where they are the butt of a joke, but Roger liked to share his mishaps no less than his triumphs.

Finally, who could forget the farewell ceremony in the BIO Auditorium to mark Roger's last day at BIO? At the end of the proceedings, Roger produced a large old-fashioned wind-up alarm clock which he set to ring in a couple of minutes and then placed it upon a nearby stool. When the device launched its infernal clanging, he hoisted a sledge hammer and brought it down on the clock with such force that the hammer's head separated from its handle, to much applause. It was a fitting way to celebrate his liberation from the tyranny of employment.

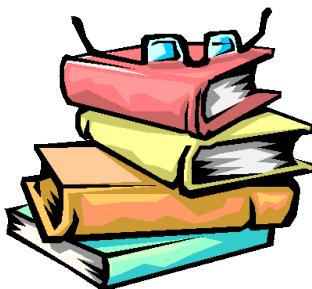


Wood carving by Roger's brother Raymond is housed in the Acadian Museum in West Chezzetcook placed in his memory and in appreciation of his years of dedicated volunteer service to the Acadian communities of West Chezzetcook and Grand Desert.

To me, Roger epitomized the character of my former BIO co-workers, who demonstrated pride and professionalism in what they did, leavened by a readiness to seek out and exploit the humour in any situation. I hope that our successors in the august halls of that institution feel the same way.

[Editor's Note: Readers are referred to an earlier article **"Community Remembers BIO Worker: Roger Bélanger"** in the BIO OA Newsletter Issue 49 January 2011.]





NOTEWORTHY READS: BOOK REVIEWS IN BRIEF

*David N. Nettleship
Book Review Editor*

'ESCAPE FALL & WINTER WITH A GOOD BOOK OR TWO'

The **Noteworthy Reads** section is an effort to identify recent noteworthy book publications related to the marine sciences and other subjects of general interest. The listing is not intended to be comprehensive or complete, but merely an attempt to highlight a number of 'good reads' that may be of interest to OA members and associates. Most books listed are available at local bookstores and public libraries. Book prices are regular retail in Canadian funds, but discounts of 20-30% are normally available on line at e.g. amazon.ca or chapters.indigo.ca. Contributions of book reviews to 'Noteworthy Reads' are welcome – send via e-mail to: dnnlundy@navnet.net.

SPECIAL PUBLICATION:

CELEBRATION OF MARINE SCIENCE IN MARITIMES CANADA

Hubbard, Jennifer, David Wildish, and Robert Stephenson (Eds.). 2016. A Century of Maritime Science: The St. Andrews Biological Station. University of Toronto Press, Toronto, ON. 488 pp. Hardcover, \$80.00 (ISBN 978-1442648586). This much-awaited volume on a century of marine science in Maritimes Canada at St. Andrews Biological Station (SABS), located on the Bay of Fundy, New Brunswick, reviews the environmental, oceanographic, fisheries research and associated findings generated by scientists and associates over a diverse and multi-faceted history since the Station's establishment in 1908. The work is the result of presentations made in October 2008 at a special gathering at SABS – Workshop on the Evolution of Marine Science in Canada – to celebrate the 100th anniversary of the Station and its many accomplishments that span a wide range of disciplines. Summarized by fourteen participating scientists and fisheries research managers, including the three editors and two leading historians of

ocean science (J. Hubbard and E.L. Mills), the collection of twelve individual papers provides an insightful and important examination of the significance of the work performed at St. Andrews over ten decades and knowledge of the oceanography and fisheries of the Bay of Fundy and other parts of the northwest Atlantic Ocean. And what a great story it is, from the historical context of SABS as told in the first four chapters respectively by E.C. Mills (19th century development of science in Canada and SABS), M.N. Aria (limits and changes for women researchers in early marine biology), J. Hubbard (development and outside influences on fisheries and marine science in Canada), and R.L. Stephenson (survey of scientific enterprise at SABS and conflicts between pure and applied science) to the remaining eight chapters that focus on specific research programs by St. Andrews staff that pushed scientific knowledge forward and made significant contributions to both fisheries and environmental management. Selected topics presented by the experts involved in the work include reviews of the use of technology (T.J. Foulkes, B.D. Chang, F.H. Page), experimental flow studies on bivalves and fish (D.J. Wildish, S.M.C. Robinson), Canadian scallop fisheries (J.F. Caddy), Atlantic Salmon studies (R.H. Peterson), paralytic shellfish poisoning (J.L. Martin), ecotoxicology (P.G. Wells), and aquaculture research and development (R.H. Cook). These final eight contributions, though only a sample of the important programs carried out by scientists at SABS over its first century, do demonstrate clearly the nature of the research undertaken over both the short- and long-terms, and its immense value to our current and future understanding, conservation, and protection of marine systems in Atlantic Canada. The organisers, contributors, and editors of this important volume are to be congratulated and applauded for producing such an invaluable review of the 'Canadian Maritime Science' experience and directions that need to be pursued both now and in the future.

General Reviews

Aldersey-Williams, Hugh. 2016. The Tide: The Science and Stories Behind the Greatest Force on Earth. W.W. Norton, New York, NY. 368 pp. Hardcover, \$36.95 (ISBN 978-0393241631).- An engaging exploration of the relationship between the discovery and science of the tides and their influence not only on scientific thought over the generations but also on language, culture, and tradition. Hugh Aldersey-Williams presents a captivating historical review of the lengthy search to

understand the tides, from Aristotle's early work, through Galileo and Newton to determine the role of the moon, on to modern knowledge of the workings of this remarkable force. Along the way, details of prime examples are presented and explained, including the Bay of Fundy in Nova Scotia, the strongest tides in the world, through Arctic Norway with raging tidal whirlpools, and the vulnerability of Venice to tidal flooding. The author also injects interesting tidbits between hard facts such as the links of the words 'time' and 'tide' to historical explanations of the origin of memorable sayings like the aphorism "time and tide wait for no man," sayings that often predate authors commonly given credit for their origin. This book is a delight to read, well written and researched, with clear and insightful explanations of, truly, the greatest force on Earth.

Anderson, John, Alexander Bond, Robert Ronconi, and Katherine Shlepr (Eds.). 2016. Waterbirds: Special Issue on Gull Biology. *Waterbirds* Volume 39 (April 2016), Special Publication 1, Waterbird Society, DeLeon Springs, FL. 288 pp. Softcover, \$25.00 US (ISSN 1524-4695; available from Dr. C. Custer, WS Treasurer, c/o US Geological Survey, 2630 Fanta Reed Rd., Lacrosse, WI 54603: e-mail

ccuster@usgs.gov). This special publication of the international Waterbird Society is the result of a symposium held in Wilhelmshaven, Germany, in 2013 focussed on the dynamics of Herring Gull (*Larus argentatus*) and Great Black-backed Gull (*L. marinus*) populations in eastern North America through the 20th century with reference to other regions. Comprehensive analyses of the ups, downs, and dramatic changes of these well documented gull species over their wide geographic ranges in the North Atlantic reveal intricate relationships between breeding biology, diet and predation, movement, demographics and contaminants. Overall, this work provides a clear example of the usefulness of top-trophic seabird species as sensitive indicators of environmental change in marine waters over both the short- and long-terms.

Anderson, Ted R. 2013. The Life of David Lack: Father of Evolutionary Ecology. Oxford University Press, Oxford, England, UK. 246 pp. Hardcover, \$45.00 (ISBN 978-0199922642). Here is a book that every biologist, especially animal ecologists and evolutionists, should read, re-read, and savour. This long overdue biography of David Lack, arguably the single most important vertebrate ecologist of the mid-20th century and 'father of evolutionary ecology' initiated by his 1947

classic *Darwin's Finches* and 1954 book *The Natural Regulation of Animal Numbers* followed by numerous other pioneering works, is an outstanding addition to the literature on the history of evolution and animal ecology. Ted Anderson has not only given us a comprehensive review of Lack's scientific accomplishments and impact on the academic community, but also provides an important insight into details of his private life, personality, and interactions with his contemporaries. Altogether, an excellent and important account of a great scientist.

Birkhead, Tim. 2016. The Most Perfect Thing: Inside (and Outside) a Bird's Egg. Bloomsbury Press, New York, NY. 288 pp. Hardcover, \$32.00 (ISBN 978-1632863690). Ever think about how eggs in general are made, fertilized, developed, and hatched? Well, renowned avian ecologist Tim Birkhead has for decades. Now with this fascinating and highly readable account, we will all be able to view a bird's egg in a very different way. Birkhead shows us how the avian egg "... is a nearly perfect survival capsule – and one of natural selection's most wonderful creations." Sit back, learn, and enjoy the journey of a tiny egg within an undeveloped oviduct through the mysteries of fertilization and embryo development and how the quest for understanding the process has advanced current scientific knowledge of reproduction in humans and other animals. A captivating and delightful read!

Bondar, Carin. 2016. Wild Sex: The Science Behind Mating in the Animal Kingdom. Pegasus Books, New York, NY. 400 pp. Hardcover, \$45.50 (ISBN 978-1681771663). Here is a book that captures and retains the attention of the reader, a lively and informative exploration of the diverse sex life of animals including our own. Many subjects are addressed along the way, but Dr. Bondar (professor of zoology at University of British Columbia) divides the treatment into three major categories: finding a mate, the sex act, and the various strategies for procreation and production of viable offspring. The examination reveals the incredible variety of mating habits that exist within the animal kingdom – from fruit flies to whales and everything in between – sex lives that are infinitely varied, often incredibly difficult, and sometimes extremely violent. The features described and their explanations, including their evolution, make for absolutely fascinating reading!

Carroll, Sean. 2016. The Big Picture: On the Origins of Life, Meaning, and the Universe Itself. Dutton (Penguin Random House), New York, NY. 480 pp. Hardcover, \$37.00 (ISBN 978-0525954828). Sean Carroll, internationally acclaimed theoretical physicist and master science interpreter, with this his latest popular science book, takes us on an incredible journey to elucidate the ecological rules of life. If you are searching for a comprehensive and lucid overview of the world and how it works at multiple levels – quantum, cosmic, and human – and their interrelationships, then curl up with *The Big Picture* and savour Carroll's magnificent presentation. Discoveries in the past few hundred years and the principles generated from them are reviewed revealing the nature of the scientific revolution and its impact on how we view the world. This worldview of science is a unique tour de force of a difficult topic that blends science and philosophy, a work that will be treasured for years to come by both the scientific community and the public.

Dolin, Eric Jay. 2016. Brilliant Beacons: A History of the American Lighthouse. W.W. Norton, New York, NY. 560 pp. Hardcover, \$38.95 (ISBN 978-0871406682). Smitten by lighthouses, their function as guides to safe navigation, and the romance associated with the people that operated them? If so, this book by maritime historian Eric Dolin will captivate and delight. It comprises a scholarly and delightful journey through the development of the American lighthouse system in relation to the growth of the country with its many rocky political, military, and technological battles from colonial times throughout the nineteenth and early twentieth centuries. Histories of the major coastal Atlantic lighthouses are provided, from the earliest built in 1716 at Little Brewster Island, Boston Harbor, through the rapid expansion of beacons from New England to the Gulf of Mexico, and eventually to the Great Lakes and the Pacific coast. Each light has its own rich history, and together they illuminate the technological and engineering marvels at work during the time period, along with the incredible work done by the lighthouse keepers themselves. Eric Dolin's book is an important addition to any collection on the history of lighthouses in North America and shows vividly why they still stand as iconic beacons of brilliance today despite their recent demise from the development of automated lights and the modern world of GPS and satellite-monitored shipping lanes.

Eldredge, Niles. 2015. Eternal Ephemera: Adaptation and the Origin of Species from the Nineteenth Century Through Punctuated Equilibria and Beyond. Columbia University Press, New York, NY. 416 pp. Hardcover, \$35.00 (ISBN 978-0231153164). This book *Eternal Ephemera* by renown paleontologist and evolutionary biologist Niles Eldredge is a masterpiece, a brilliant and readable review of the history and development of Darwinian models of evolution. It covers the history and science of adaptation and the origin of species over the last two hundred years, starting with French naturalist Jean-Baptiste Lamark's ideas in 1801 of how species originated and developed. It continues right up to the present and includes his own contributions to the theory of punctuated equilibria developed with Stephen Jay Gould. Overall, a very readable and informative account of the history and development of major breakthroughs in evolutionary theory, something that should be read by all biologists and anyone interested in scientific thinking and its application to a better understanding of the living world.

Moore, Kathleen Dean. 2016. Great Tide Rising: Towards Clarity and Moral Courage in a Time of Planetary Change. Counterpoint Press, Berkeley, CA. 272 pp. Hardcover, \$38.50 (ISBN 978-1619026995). Philosopher and award-winning environmental writer Kathleen Moore examines the moral arguments and considerations that need to be made to end the processes that have produced global warming and its threat to the living world. She approaches the thesis that action should be taken to stop further environmental degradation by presenting thirteen good reasons to save the world. Essays on key elements then follow, all underlining the magnificence of the world and its living inhabitants, and humanity's responsibility to repair the damaged world we are creating. Combined, this accurate and inspiring narrative identifies a rising tide of outrage against the current destruction of natural habitats and biodiversity, and the critical need for clarity and the moral courage to accept the reality of climate change and what it means to our collective future.

Moore, Peter. 2015. The Weather Experiment: The Pioneers Who Sought to See the Future. Farrar, Straus and Giroux, New York, NY. 416 pp. Hardcover, \$34.50 (ISBN 978-0865478091). A well-constructed group biography of the 19th century maverick researchers who created the science of meteorology and transformed it from a process of mere description to one of

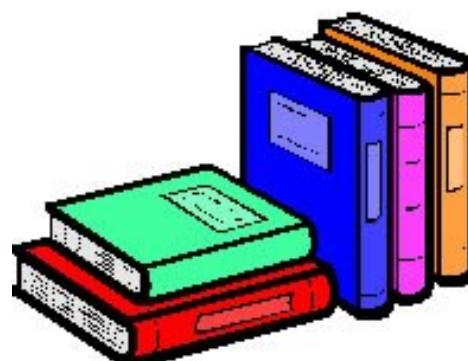
prediction. This detailed and fascinating book introduces the key figures involved and brings them to life: Francis Beaufort, who quantified the winds; Robert FitzRoy, master mariner and founder of the UK weather service; James Glaisher, hot-air balloon explorer of the upper atmosphere; Luke Howard, the classification of cloud types; and Samuel Morse, creator of the telegraph allowing rapid transmission of weather information. The history of the birth of a scientific discipline and weather forecasting, as told by accomplished writer Peter Moore, makes for a fascinating and relevant read in this time of climate change. A perfect fall-winter read!

Safina, Carl. 2015. Beyond Words: What Animals Think and Feel. Henry Holt, New York, NY. 480 pp. Hardcover, \$33.29 (ISBN 978-0805098884). A powerful and illuminating insight into the unique personalities of animals showing the similarity between human and non-human consciousness, self-awareness, and empathy, making us re-evaluate how we interact with non-human animals. Carl Safina, an animal ecologist, with considerable knowledge of both terrestrial and aquatic systems and species, uses the scientific data generated from numerous studies and personal field observations to show the widespread presence of intelligence and cognition throughout the animal kingdom. Examples range from elephants and wolves to dolphins and whales, all beautifully written with great insight and knowledge. It leaves us with the message that we must re-examine our relationship with other animals and ourselves.

Spellman, Frank R. 2015. Handbook of Environmental Engineering. CRC Press (Taylor & Francis Group), Boca Raton, FL. 725 pp. Hardcover, \$290.00 (ISBN 978-1498708616). A solid overview of environmental engineering that shows the complexity of pollution and its impact on the natural environment and how to approach each of the sub-topics and disciplines that make it up. The step-by-step processes outlined allow the full range of users – from beginners to experienced practitioners – to easily grasp the fundamental concepts involved and how to put them into practice. It's a useful introduction to a complex and difficult topic, one that will be welcomed by many investigators, particularly applied ecologists and environmental managers. The price of this book is prohibitive for the individual worker but an important addition to any reference library on environmental pollution.

Watt-Cloutier, Sheila. 2015. The Right to be Cold: One Woman's Story of Protecting Her Culture, the Arctic, and the Whole Planet. Allen Lane (Penguin Press), New York, NY. 352 pp. Hardcover, \$32.95 (ISBN 978-0670067107). This is the story of a committed and remarkable woman, Sheila Watt-Cloutier, an internationally recognized leader and human rights advocate against the impact of global climate change on northern lands and people. The environmental degradation, past and present, of northern territories including Arctic Canada is reviewed and outlined in context of Inuk culture and the future. She argues convincingly that climate change is a human rights issue and that northern governments must show the leadership necessary to achieve sustainability in the Arctic before it is too late to conserve and protect the environment, indigenous plants and animals, and Inuk communities. A book with a very important message for everyone.

Wootton, David. 2015. The Invention of Science: A New History of the Scientific Revolution. HarperCollins Publishers, Toronto, ON. 784 pp. Hardcover, \$36.45 (ISBN 978-0061759529). A most interesting analysis of the history of science and how methods employed to find truth remained the same for generations only to undergo a massive change between the late 1500s and 1704 to form 'modern science.' Historian David Wootton provides a lucid account of the dramatic revolution in human thought that began with Columbus's discovery of a new world in 1492. The event that shattered the old Aristotle fixed-world view of science and initiated an intellectual explosion lasting more than a century that produced unbelievable advancements in knowledge about the world and the laws of nature (for example, those by Copernicus in astronomy and Vesalius in anatomy). Although the review ends with the publication of Isaac Newton's *Opticks* in 1704, Wootton declares the timeline delineates the 'Scientific Revolution' and shows vividly the relationship between scientific discovery and the start of the industrial era. A masterly examination of one of the greatest events in the history of humankind.



Editor's Keyboard: I have a collection of BIO Open House t-shirts, a grey one I now wear for working outdoors, a red one and a black one for more formal occasions. I am looking forward to adding to my collection next year by volunteering to meet with students and the public at EXPO 2017. Open houses or expos are rare opportunities to directly tell the public what excellent work for the environment, economy, and society takes place at BIO and demonstrate the passion and commitment staff bring to that work. Our recent trip to Europe

was invigorating. Beyond the excellent food and wine, the beauty of the cities and countryside was a great experience. Basel, Switzerland, was a surprise, ask me to show you the video of the ‘moving’ fountain we found outside the opera house if you see me. I was disappointed not to experience an ‘acqua alta’ event in Venice. However, having experienced the crowded streets of Venice on a feast day weekend, I can’t imagine what the streets would be like if everyone was restricted to walking on narrow elevated walkways. *Andy Sherin*



ABOUT THE BIO-OCEANS ASSOCIATION

The Bedford Institute of Oceanography Oceans Association (BIO-OA) was established in 1998 to foster the continued fellowship of its members; to help preserve, in cooperation with the Institute's managers and staff, BIO's history and spirit; and to support

efforts to increase public understanding of the oceans and ocean science. Membership is open to all those who share our objectives. Most current members are present or past employees of BIO or of the federal departments of Environment, Fisheries and Oceans,

and Natural Resources (or their predecessors) located in the Halifax Regional Municipality. Membership is \$10.00 per year, \$40.00 for five years, or \$150.00 for a lifetime membership.

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Note: Some contact information on this page has changed from previous issues of the *Voicepipe*

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There was water everywhere but not in the Rhine River

by Andy Sherin

Your editor and his partner in life, Sheila, celebrated their 40th year together with a special trip to Europe starting with a river cruise from Amsterdam to Basel, fulfilling a dream Sheila has had of travelling through the middle Rhine and its many castles onboard a ship. The cruise was followed by travelling through northern Italy ending in Venice. This was not our first visit to Italy but our first to Venice.

We began our voyage in Amsterdam, a city of canals with an elevation of 2 metres below sea-level and ended in Venice, another city famed for its canals and is only 1 metre above sea-level. During periods of 'acqua alta' the convergence of high tides and storm surge caused by strong sirocco winds, Venetians are left in rubber boots and crossing Piazza SS. Marco on elevated walkways.

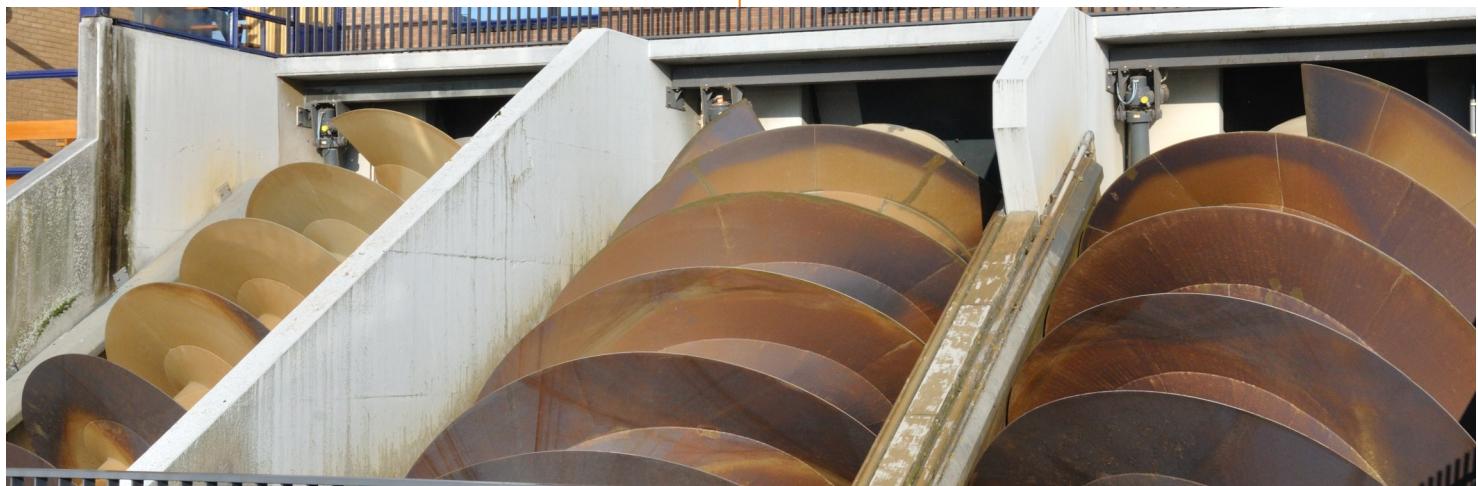
Our cruise however was plagued by low water levels on the Rhine River, which threatened our trip turning into a bus tour to travel between cities. Timely rain in the upper reaches of the river made it possible to reach our destination in Basel. We resorted to buses only once to get us to Köl (Cologne) on time, since low water levels didn't allow the ship to travel at full speed. At one point in the journey there was only 30 cm between the keel and the river bottom.

The Dutch have been amazing water management engineers for centuries. Half of the country lies below 1 metre above sea-level. Without an extensive network of dams, dykes, and dunes, the Netherlands would be especially prone to flooding. Indeed a devastating flood in 1953 resulted in over 1,800 people dead as a direct consequence of the flood, 200,000 livestock died and almost 200,000 hectares were flooded by salt water. Seventy

two thousand people were displaced from their homes. As a result of the flood, the Delta Works project was initiated consisting of 13 structures to protect the areas within and around the Rhine-Meuse-Scheldt delta. The project was completed in 1997.



Photos: top, an example of a grondzeilers or 'ground sail' windmill at the Kinderdijk; bottom, the screws of the diesel driven J.U. Smit pumping station. This pumping station pumps the water to a headrace that discharges the water via a sluice to the river Lek.





The first stop on our cruise after Amsterdam was the Kinderdijk, a UNESCO World Heritage site with a collection of nineteen 18th century windmills. The windmills were devoted to water pumping and along with dykes and reservoirs protected the polders from flooding. On our tour of the Kinderdijk, we saw two working windmills and two modern pumping stations.

In more recent years, to deal with the challenge of sea-level rise to this low-lying country and the cost of hard solutions like Delta Works, the Netherlands has adopted some water management methods more in tune with nature. Land reclamation has turned to returning land to salt marsh to act as natural water reservoirs. Maintenance of coastal dunes as natural barriers to sea-level rise and storm surge is now a higher priority.

At the other end of our trip was Venice. Venice is known for its canals, indeed there are only two forms of transport, by boat or on foot. Unlike Amsterdam where you run the risk of being run over by a bicycle, bicycles are banned in Venice. Venice was subsiding at a high rate until groundwater pumping ceased and until recently it was thought the subsidence had stabilized. A recent study suggests Venice is still subsiding although at a slower rate of about 2 mm / year. The current subsidence



Photos: top, view of the Rhine River looking north from Marksburg Castle above the town of Braubach, Germany one of the principal sites of the Rhine Gorge; bottom, Mäuseturm Toll Tower built by the archbishops of Mainz, Germany in the 13th century.

is likely caused by compaction of the sediments beneath

Venice and plate tectonics. The Adriatic plate is subducting beneath the Apennines Mountains. That Italy is seismically active was underscored by the strong earthquake aftershocks experienced near Rome while we were in Italy.

‘Acqua alta’ is the phenomenon of flooded streets in Venice that happens several times a year, most commonly between September and April. “Discover how fascinating Venice can be at high tide!” is a statement on a panel designed to explain the phenomenon in several languages to tourists. When an ‘acqua alta’ event is predicted, a network of elevated walkways is installed. Evidence of rising sea-level is everywhere with the addition of raised wooden platforms at boat docking locations and the flooding of steps and entrance terraces of the palazzos at normal high tide.

The installation of a series of large retractable barriers at the three inlets of the Venice lagoon is expected to be complete by 2018. The barriers are designed to be put into place at high tides that would cause flooding in combination with seasonal rainfall and storm surge.

As in the Netherlands, there are also initiatives to enhance the natural protection of Venice. There is an active program of restoring salt marsh and protecting the barrier islands that separate the lagoon from the Adriatic Sea.

Although the risk of sea-level rise to infrastructure and cultural assets in Atlantic Canada is substantially lower than in either the Netherlands or Venice, we have analogs in places like the Acadian dykelands, low lying waterfronts in Halifax and Charlottetown, and historical sites such as Fortress Louisburg. We need to be as vigilant and active in preparing for and adapting to a future with higher sea-levels and increased vulnerability to storm surge and flooding.

Photos: clockwise from top right; the Grand Canal, Venice; flooded steps (top) and flooded palazzo terrace at normal high tide; elevated walkway on Piazza SS. Marco to traverse a puddle probably left from cleaning at night; and stack of elevated walkways awaiting deployment during an ‘acqua alta’ event.

