

“Too Late For Action.” A.G. Huntsman, M.L. Fernald and the Belle Isle Strait Expedition of 1923

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Article abstract

A. G. Huntsman's Belle Isle Strait Expedition of 1923, the first oceanographic expedition organized by a Canadian, was modeled on the Canadian Fisheries Expedition of 1915, in which Huntsman had been a junior partner to the Norwegian fishery biologist Johan Hjort. Examination of Huntsman's documents shows that the 1923 expedition had more than one aim. For example, Huntsman hoped that one of the participants would be M.L. Fernald, a botanist from Harvard University. Although Fernald did not take part, his reason for interest in the expedition was to document his hypothesis that the flora of northeastern North America had spread along an emergent borderland after the last glaciation or had remained in unglaciated areas. Huntsman's aims were less transparent, but in addition to the oceanography they appear to be early steps in developing his concept of biapocrisis, the response of organisms as a whole to their individual environments, in which his collection of land plants during the expedition could play a part.

“Too Late For Action.” A.G. Huntsman, M.L. Fernald and the Belle Isle Strait Expedition of 1923

Eric L. Mills¹

Abstract: *A. G. Huntsman’s Belle Isle Strait Expedition of 1923, the first oceanographic expedition organized by a Canadian, was modeled on the Canadian Fisheries Expedition of 1915, in which Huntsman had been a junior partner to the Norwegian fishery biologist Johan Hjort. Examination of Huntsman’s documents shows that the 1923 expedition had more than one aim. For example, Huntsman hoped that one of the participants would be M. L. Fernald, a botanist from Harvard University. Although Fernald did not take part, his reason for interest in the expedition was to document his hypothesis that the flora of northeastern North America had spread along an emergent borderland after the last glaciation or had remained in unglaciated areas. Huntsman’s aims were less transparent, but in addition to the oceanography they appear to be early steps in developing his concept of biapocrisis, the response of organisms as a whole to their individual environments, in which his collection of land plants during the expedition could play a part.*

Résumé: *L’expédition d’A. G. Huntsman dans le détroit de Belle Isle en 1923 constitue la première expédition océanographique organisée par un Canadien. Celle-ci s’inspire de l’Expédition canadienne de recherche sur les pêches de 1915, qui avait eu lieu alors que Huntsman était l’associé de Johan Hjort, un biologiste norvégien. L’examen des documents de Huntsman révèle que l’expédition de 1923 avait plusieurs objectifs. Huntsman espérait notamment que M. L. Fernald, un botaniste de l’Université Harvard, y participe. Bien que ce dernier n’ait pas pris part à l’expédition, il s’y est intéressé afin de documenter la trajectoire de la flore du nord-est de l’Amérique du Nord. Se serait-elle répandue le long d’une bande de terre ayant émergé après la dernière glaciation ou serait-elle demeurée dans des zones non englacées? Les objectifs de Huntsman étaient moins clairs; au-delà des travaux océanographiques, il en était aux premiers stades de l’élaboration du concept de biapocrisis, qualifiant la réaction des organismes dans leur ensemble à leurs environnements respectifs. Dans ce contexte, sa collection de plantes terrestres aurait pu appuyer ce travail durant l’expédition.*

Keywords: Strait of Belle Isle, Newfoundland & Labrador, fisheries, botany, A.G. Huntsman, M.L. Fernald

IN 1926, THE HARVARD BOTANIST MERRITT FERNALD wrote that “[i]n 1923, while I was in the mountains of Gaspé, the Biological Board of Canada undertook a survey of the Straits of Belle Isle and the invitation to join in this enterprise reached me too late for action. Consequently, the efficient Director of the Board², Dr. A.G. Huntsman, himself collected such land plants as came his way.”³ The “survey” was the Strait of Belle Isle Expedition of 1923, conceived and led by Huntsman under the aegis of the Biological Board of Canada, with the support of Huntsman’s colleagues on the North American Council for

Fishery Investigations, an advisory body made up of representatives from the USA, Canada, Newfoundland (in 1923 still a self-governing Dominion) and eventually France, all of whom were in one way or another involved in the Northwest Atlantic fishery.⁴

An expedition to the Strait of Belle Isle was not particularly unexpected, given the Strait's importance as a transportation route and as the northern entrance to the Gulf of St. Lawrence with its apparently huge fishery resources.⁵ But Huntsman's invitation to a botanist to join an expedition ostensibly devoted to fisheries investigations was unusual not just for its time but for oceanographic and fishery expeditions in general, as was Huntsman's devoted effort to collect plants himself during the expedition. The invitation arose out of the special interests of Fernald in plant biogeography but also from Huntsman's emerging interest in the environmental relations of organisms. Fernald's interests are well known, but Huntsman's rationale for the 1923 expedition, and especially his interest in what land plants could add to his expedition and his approach to ecology, is not transparent, nor is it easy to untangle. This is the subject of this paper.

The Strait of Belle Isle

The Strait of Belle Isle figures in the early history of Canada as (probably) a Norse route into the Gulf of St. Lawrence, the highway for sixteenth-century fishermen to a fishing station on the present-day coast of Québec, and the path followed by Jacques Cartier into the Gulf and eventually the St. Lawrence River during the 1530s. Then and later it was a focus of European- and North American-based fisheries extending into the early 20th century.⁶ But scientific knowledge of the Strait and the northern Gulf of St. Lawrence was very limited until late in the 19th century and later, despite their importance, and despite occasional interest in damming the Strait to "improve" the climate of the Gulf, based on the belief that there was major cooling by Labrador Current water entering by that route.⁷

The Superintendent of the Canadian Tidal and Current Survey, W. Bell Dawson (1854-1944) took an interest in the Strait at the turn of the 20th century:

This strait is of the first importance to Canadian commerce: as a great circle from Montreal and Quebec to the middle of Great Britain passes through it. It thus forms the natural gateway for the St. Lawrence traffic, and is used as long as the season permits; as it affords a shorter route than through Cabot Strait and south of Newfoundland. The traffic through Belle Isle strait is consequently almost as great as on the St. Lawrence itself. ...the importance of correct information regarding the currents in this strait is very evident, more especially as there is a considerable amount of fog in the early part of the season.⁸

Based on two summers investigation using tide gauges, Dawson concluded that although there was a lot of variation in currents in the Strait, and some evidence of inflow (westward) in the north and outflow (eastward) in the south,



Figure 1. A.G. Huntsman in his laboratory in the Atlantic Biological Station, St. Andrews, New Brunswick, September 1920 (from University of Toronto Archives (UTARMS). Huntsman, Archibald Gowanlock, B2005-006, Series 10: Photographs).

linked to weather systems, the net transfer of water was close to nil, making the utility of damming the Strait negligible.⁹

During the 1894 and 1906 tide surveys, Dawson's field workers had taken a series of water temperatures, showing, in general, cold water on the north (Labrador) side of the Strait and warmer water on the south (Newfoundland) side. These, he suggested might have broad and practical significance:

[T]he influence of ... temperatures on the movements of fish may be of importance ... The coldness of the water, especially at the greater depths, in relation to other regions in the Gulf of St. Lawrence and around the coasts of Newfoundland as ascertained by this Survey may throw light on such questions. The temperatures may also help to explain the depths at which the fish are found as the season advances, and the change in their migrations from one season to another. The investigations of this Survey may thus afford information of practical value in such directions as these, apart from their direct bearing upon the behaviour of the currents.¹⁰

This statement captured the attention of A.G. Huntsman, the director of the Atlantic Biological Station in St. Andrews, New Brunswick, in the early 1920s as he began to think about the factors governing the distribution of East Coast Cod, the effect of temperature differences on the responses of organisms to their environments, and the circulation of the Strait.¹¹

A.G. Huntsman: the Example of Johan Hjort and the Canadian Fisheries Expedition

Archibald Gowanlock Huntsman (1883-1973) [**Fig. 1**] became a dominating force in Canadian marine science, especially on the East Coast, from his position as Professor of Marine Biology in the University of Toronto, as Curator,

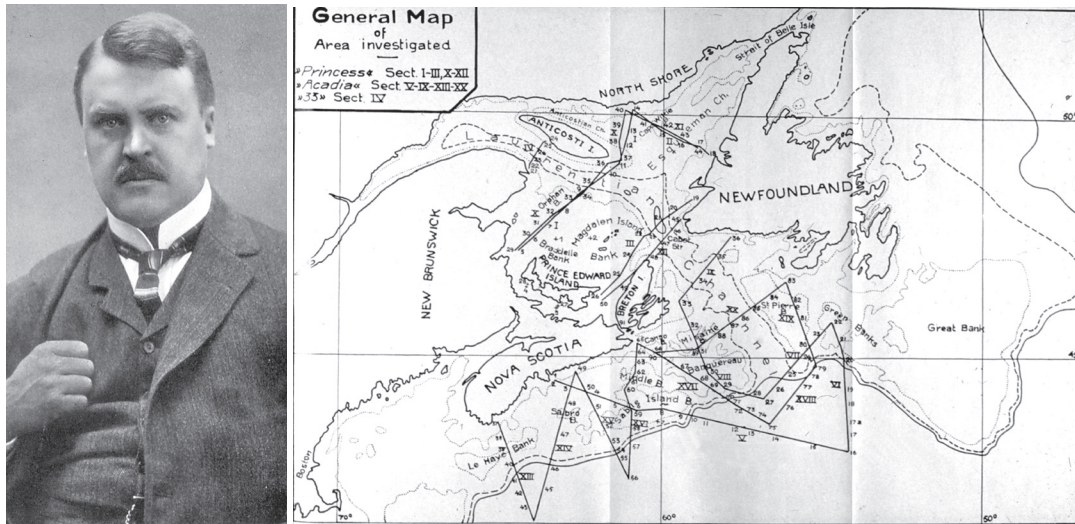


Figure 2 (left). Johan Hjort about 1910 (from J. Murray and J. Hjort, *The Depths of the Ocean: A General Account of the Modern Science of Oceanography Based Largely on the Scientific Researches of the Norwegian Steamer Michael Sars in the North Atlantic* (London: Macmillan, 1912), frontispiece). **Figure 3** (right). The route of the Canadian Fisheries Expedition of 1915 under the direction of Johan Hjort on the Scotian Shelf and in the Gulf of St. Lawrence (from Paul Bjerkan, "Results of the Hydrographical Observations Made by Dr. Johan Hjort in the Canadian Atlantic Waters During the Year 1915" in *Canadian Fisheries Expedition, 1914-1915: Investigations in the Gulf of St. Lawrence and Atlantic Waters of Canada*, ed. Johan Hjort (Ottawa: Department of the Naval Service, 1919), Plate 1)

then Director, of the Atlantic Biological Station in St. Andrews, New Brunswick (1911-1934), and in other capacities with the Biological Board of Canada and its successor, the Fisheries Research Board of Canada.¹² In his early career, he was greatly influenced by the then Norwegian Director of Fisheries, Johan Hjort (1869-1948)¹³ [Fig. 2], who came to Canada late in 1914 and stayed through the summer of 1915 as the leader of the Canadian Fisheries Expedition [Fig. 3].¹⁴ To the Canadian government, Hjort's mission was to locate new fish stocks, especially of herring, in the Gulf of St. Lawrence, while to Hjort the expedition was an attempt to provide New World evidence for the validity of his year-class hypothesis, as set forth in his 1914 monograph, *Fluctuations in the Great Fisheries of Northern Europe*¹⁵ which made the case that fisheries were dominated by fish growing in especially favourable years.

Huntsman, as second-in-command to Hjort, had the opportunity in 1915 and during the write-up of the results to learn the most up-to-date European practices in oceanography, both at sea and in the laboratory. He set out thereafter to emulate Hjort and his methods in a series of yearly expeditions to East Coast locations as varied as the Miramichi estuary and the open Gulf of St. Lawrence off Cheticamp, Nova Scotia [Fig. 4]. The Belle Isle Strait Expedition was the last and most ambitious of the series, which was cut short after 1923 by Huntsman's appointment in 1924-1925 to direct a new Biological Board laboratory, a technological station devoted to fishing gear development and fish processing in Halifax.¹⁶

Figure 4. Expeditions involving A.G. Huntsman

Expeditions after the Canadian Fisheries Expedition (CFE) of 1915, directed by Johan Hjort (in which Huntsman was a participant under Hjort), were organized by Huntsman on the general plan of the CFE.

1914 St Croix River & Passamaquoddy Bay

Hydrography by J.W. Mavor & E.H. Craigie.

1915 Canadian Fisheries Expedition

To the Gulf of St. Lawrence and Scotian Shelf. Oceanography and fisheries biology under Johan Hjort. Bay of Fundy dredging & hydrography by Mavor & Craigie.

1916 St. Mary's Bay & Annapolis Basin, NS/ Kennebecasis River, NB

Hydrology and biology. Passamaquoddy Bay chemistry and hydrography by Alexandre Vachon.

1917 Cheticamp Expedition

From the west coast of Cape Breton Island, Nova Scotia to the Magdalen Islands, Quebec. Hydrology and biology of the Western Gulf of St. Lawrence.

1918 Miramichi River & Bay, NB, Gulf of St. Lawrence

Hydrology and biology.

1919 St. Mary's Bay & Annapolis Basin, NS/ Kennebecasis River, NB

Hydrology and biology. Bay of Fundy & SW Nova Scotia drift bottle studies by J.W. Mavor.

1920 Hudson Bay Expedition

For Biological Board by Frits Johansen.

1921 Shelburne Expedition

SW Nova Scotia Fisheries & Hydrography based at Barrington Passage.

1923 Strait of Belle Isle Expedition

Concentrating especially on the circulation of the Strait and on drift bottle studies of currents along the west and east coasts of Newfoundland in relation to fisheries.

1924 Halifax Harbour

Hydrography by A.G. Huntsman.

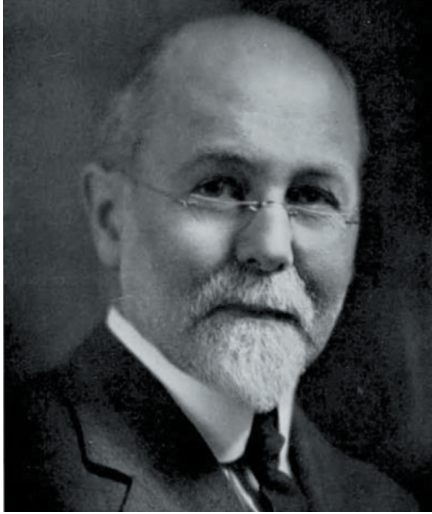


Figure 5a. (Left) M.L. Fernald as a senior botanist in the Gray Herbarium, Harvard University (from E.D. Merrill, "Merritt Lyndon Fernald 1873-1950," *National Academy of Sciences Memoir* 28, frontispiece). **Figure 5b.** (Right) M.L. Fernald and Margaret H. Fernald cliff-climbing at Bic, near the base of the Gaspé Peninsula, Québec, summer 1907 (from M.L. Fernald, "Incidents of field-work with J. Franklin Collins," *Rhodora* 44, 520, plate 706).

M.L. Fernald: Plant Biogeography, the Nunatak Hypothesis, and the Coastal Plain Flora

Merritt Fernald (1873-1950) [Fig. 5a] was the preeminent floristic botanist of his era. Born in Maine, he spent his entire scientific career at Harvard, rising through the ranks beginning in 1891 to become Fisher Professor of Natural History in 1915.¹⁷ He was closely associated with *Rhodora*, the journal of the New England Botanical Society, as associate editor from 1899-1928 and as its editor from 1929-1950. Fernald made *Rhodora* his personal journal of record, including in his floristic and biogeographic studies personal accounts of his field work that are of great historical value but would never be permitted in present-day scientific journals.

Fernald came to Eastern Canada first in 1902 to explore parts of the Gaspé Peninsula and Cape Breton Island, returning for summer fieldwork mainly in the Gaspé region from 1904 through 1907 [Fig. 5b] and occasionally thereafter until 1931. He made his first trip to Newfoundland and Labrador in 1911. From early on, he was impressed by the presence of boreal, western ("Cordilleran"), and southwestern species in his collections, soon promoting the hypothesis that western and southwestern species had been able to survive the last Pleistocene glaciation in unglaciated refugia (nunataks) or that they had been able to recolonize glaciated eastern North America along a postglacial land bridge extending from south of Cape Cod to at least as far as western and northern Newfoundland.¹⁸ His early publications on these hypotheses concentrated on the origins of the southwestern coastal plain flora:

To summarize briefly, the indigenous flora of Newfoundland consists primarily of plants which occur to the north, in Labrador, or to the southwest, chiefly along the Atlantic seaboard or the Coastal Plain... the distance between Newfoundland and

Labrador is not sufficiently great to prevent ready exchange of species across the Straits of Belle Isle, but the distance between Newfoundland and Cape Breton is so great that the plants of the latter region rarely if ever span it. Birds, ocean-currents, drifting logs and ice, and winds prove to be ineffective in carrying to Newfoundland the plants from the southwest, so that an ancient land-bridge is suggested... The amount of water withdrawn from the ocean to form the Pleistocene glaciers was apparently sufficient to leave exposed nearly if not all the old coastal plain... so that upon this now submerged plain, as the ice-front receded northward, the southwestern plants, most of which still occur on Cape Cod, Long Island or in the Pine Barrens of New Jersey, must have spread to Newfoundland, where they now form an isolated flora.¹⁹

By the early 1920s, Fernald had convinced himself that the presence of seemingly extralimital plant species required not only spread to the northeast along a now-submerged coastal borderland but also, in the case of western (“Cordilleran”) species, their survival in unglaciated refugia (the nunataks) in many places, including the mountains of Gaspé, western and northern Newfoundland, and even the Torngat Mountains of Labrador. Bolstering his case with geological information on the last glaciation, he prepared to consolidate and summarize a theory of post-glacial plant geography.²⁰ Some of the last steps toward this goal appeared to lie in southwestern and northern Newfoundland. Planning to concentrate first on the southwest, he described how this changed:

Before this plan could be carried out ... another region of Newfoundland began to assume botanical importance – the south side of the Straits of Belle Isle... When she went to Flower Cove to take charge of the Grenfell hospital there, Miss Mary E. Priest most kindly offered to collect and send to me some plants of the region. These collections, made in Miss Priest’s very rare moments of leisure in 1920 and 1921 and mostly from near the hospital, were indeed a revelation... These collections were thrilling, for Miss Priest was not a trained botanist, her duties at a mission-hospital on a rough coast were exacting and time-consuming and she had to spend such of both summers “on the Labrador”; and the long-dreamed-of plan that the next Newfoundland expedition should be for Atlantic European types near Cape Race, began to be confused by an equally urgent ambition to go directly to the Straits.²¹

Even with such a tantalizing goal, however, Fernald and his colleagues had already planned another botanical exploration in the Gaspé mountains [Fig. 6] so that, as he said, despite his intense interest in the area, the opportunity to go to the Strait of Belle Isle in summer 1923 came “too late for action.”

A.G. Huntsman’s Belle Isle Strait Expedition of 1923 and its Results

The main scientific aim of the 1923 expedition, as expressed later by Huntsman, was to examine the implications of Bell Dawson’s conclusion that there was relatively little net inflow of water through the Strait of Belle Isle:

Dr. Bell Dawson on the basis of extensive current measurements concluded that scarcely more water flowed in through Belle Isle strait than flowed out, and that therefore the influence of that Strait was negligible... If such movements are important for their secondary influence on the climate how much more important must they be in determining the valuable fisheries of the region. Such briefly has been the problem



Figure 6. Field work during the summer of 1923. Left: A.G. Huntsman (left), A.C. Gardiner (center) and Lachlan Gilchrist (right) on the deck of the steamer *Arleux* during the Strait of Belle Isle Expedition (from A.G. Huntsman Papers, UTARMS B1978 – 0010/001). Right: M.L. Fernald's botanical field party on the slopes of Mont-Albert, Gaspé, Québec, at the same time (from http://www.botlib.huh.harvard.edu/libraries/fieldwork_exhibit/exploration_gasppe.htm).

that led the North American Committee on Fishery Investigations to recommend an expedition to Northern Newfoundland to study the waters and movements, particularly in relation to the cod fishery.²²

Huntsman himself was convinced, on the basis of Dawson's temperature records showing cold, dense water on the north side of the strait and warmer, less dense water on the south, that there had to be a significant inflow of Labrador Current water westward and an outflow of Gulf of St. Lawrence water eastward through the Strait. More temperature and salinity measurements would be important to document the presumed currents, but best of all would be current measurements simultaneously on both sides of the Strait, which had been beyond the capabilities of the 1894 and 1906 tidal surveys. In a letter dated July 10, 1923, Huntsman described the programme he proposed for one of his vessels:

The work that is contemplated ... is briefly as follows: The main portion consists of the taking of temperatures and of samples of water from different depths at a series of stations from across the Gulf just east of Anticosti out through the Strait of Belle Isle. At the same time that we obtain these hydrographic data we will also with fine nets which will be towed to procure samples of the minute life which forms the basis for food in the water, and also consists in part of the eggs and fry of many of the fishes. ... In addition to this it is proposed to make certain current measurements at one point only... Finally, it is proposed to visit certain ports to obtain information from the local fishermen and to try with fishing lines and perhaps a short set line or trawl line to obtain some of the local fishes.²³

Information on the organization and progress of the expedition is not scanty but sometimes tantalizingly brief, based mainly on a few of Huntsman's letters,²⁴ 11 hand-written pages describing the expedition up to August 15,²⁵ a small black notebook in which he kept notes of the activities taking place between

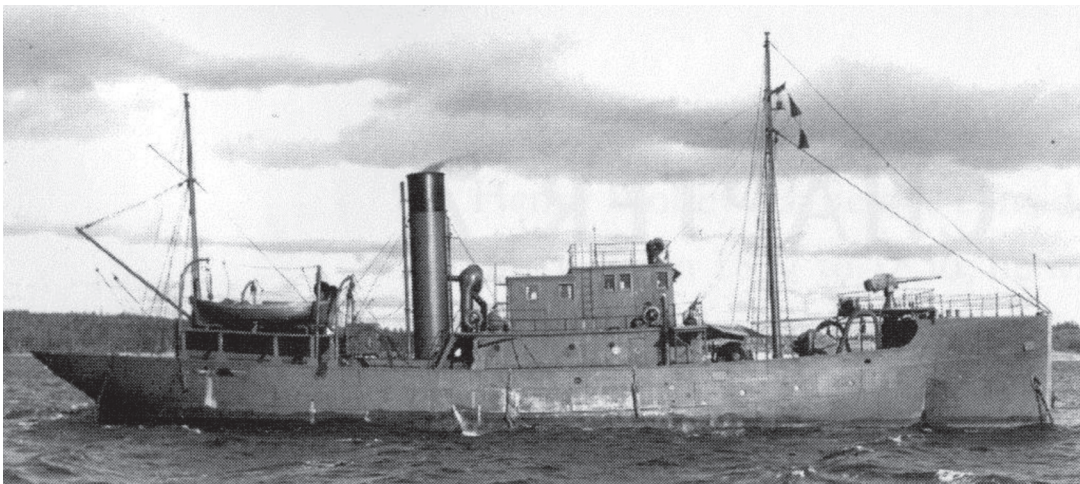


Figure 7. (Above) The MV Prince at Red Bay Labrador during the Belle Isle Strait Expedition of 1923 (from A.G. Huntsman Papers, UTARMS B1978 – 0010/001). (Below) The FPS Arleux, which worked with Prince during the expedition (from C.D. Maginley and B. Collin, *The Ships of Canada's Marine Services* (St. Catharines, ON: Vanwell Publishing, 2001), 91).

August 18 and September 14,²⁶ and a series of photographs he took during the expedition.²⁷ The group included as scientific staff Huntsman, his physicist colleague from the University of Toronto, Lachlan Gilchrist (1875-1962)²⁸, and an English marine biologist representing the Government of Newfoundland, Alan C. Gardiner²⁹ [Fig. 6]. The 60-foot MV *Prince* of the Biological Station at St. Andrews was pressed into service, and from the Department of Marine and Fisheries Huntsman was able to borrow the much larger Fisheries Protection Steamer *Arleux* [Fig. 7].³⁰

Prince travelled alone with its crew from St. Andrews around Nova Scotia into the Gulf of St. Lawrence beginning on June 23,³¹ while *Arleux* was provisioned and loaded at Halifax, where Huntsman and Gilchrist had joined the ship on August 3, departing the same day for Sydney. Gardiner joined the ship in

Sydney on August 4, when Huntsman had the opportunity to get some drift-bottle current information from his NACFI colleague Edouard Le Danois (1887-1968), the oceanographer in port aboard the French fisheries patrol vessel *Ville d'Ys*.³²

Leaving Sydney on August 6, *Arleux* ran into bad weather and was only able to take the first three stations of the expedition while crossing Cabot Strait toward Newfoundland, intending from there to make a section northward toward Anticosti Island. Once again bad weather intervened, and the ship was taken into the shelter of Cape St. George, Newfoundland, on August 8, where Huntsman and his colleagues made the first current measurements, fished for cod, and made intertidal and land plant collections. Finally, on August 10 wind and sea conditions allowed the ship to head toward Anticosti, which they sighted on the 11th. By the early morning of the 12th they were close to the Québec North Shore, where they turned south to complete a section to Newfoundland's Bay of Islands [Fig. 8, next page]. During this transect, Gardiner improvised and used a Secchi Disk for the first time.³³

By the morning of August 15 they had returned to the North Shore, where they first sighted icebergs and went ashore on an island off Cape Mecatina to collect intertidal organisms and land plants. During the next three days, the ship was directed northeastward to take a section across the Labrador Current seaward of Henley Harbour, Labrador, which was accomplished with some difficulty because of the ship's drift between August 18 and 20. With additional difficulty due to gear breakage, another goal of the expedition was accomplished between August 24 and 28 (the exact date is not clear) when the group was able to make a continuous 24-hour series of current measurements on the north and south sides of the Strait of Belle Isle, with *Arleux* off Red Bay, Labrador on the north and *Prince* off the Newfoundland shore to the south.

This was followed by an interval between about August 29 and September 4 on the Newfoundland coast, where *Arleux* was coaled in the mouth of the Humber River, returning to Red Bay, Labrador around September 5. From there, Huntsman and the vessels returned to Henley Harbour, visited Belle Isle (described by Huntsman as "a barren treeless place of granite"), then visited the northernmost tip of Newfoundland at Quirpon and St. Anthony from September 8 to 10. At Quirpon, Huntsman collected plants, in his notes recording "[f]lora somewhat sparse, but distinctly more southern than on Henley Id." And en route from Quirpon to St. Anthony, they noted a mixture of cold Labrador Current water interleaved with much warmer Gulf of St. Lawrence water, reinforcing Huntsman's belief that Gulf water found its way through the Strait onto the East Coast of Newfoundland.

A stop in St. Anthony on September 9 and 10 gave Huntsman the opportunity for more shore collecting and for a visit to the famed Grenfell Mission headquarters, which he photographed [Fig. 9] and where he apparently discussed the cod fishery with Wilfred Grenfell himself.³⁴ Finally, to bring the Strait of Belle Isle Expedition to a close, *Arleux* with Huntsman and Gardiner



Figure 9. *The Grenfell Mission hospital and headquarters in St. Anthony, Newfoundland, photographed by Huntsman on September 9, 1923 (from A.G. Huntsman Papers, UTARMS B1978 – 0010/001).*

(Gilchrist had gone home to Toronto from Newfoundland earlier) headed south along the East Coast of Newfoundland on September 11, taking plankton samples and temperature measurements all the way to St. John's, where they arrived about September 15. There Gardiner left for Newfoundland before Huntsman proceeded by sea on *Arleux* to St. Andrews.³⁵

For the Biological Board, Huntsman summarized the results of the expedition as follows:³⁶

- (1) It has been determined that water from the Labrador current (sic) passes along the north shore of the Strait of Belle Isle at the same time that the warm water of the Gulf passed out on the south side of the Strait. These two movements result in a very considerable loss in temperature to the Gulf, and have a most marked effect upon the character of the fishery on the north shore of that part of the Gulf for any season.
- (2) An eddy exists north of the bank extending from Meckattina (sic) on the Quebec shore to Ferolle on the Newfoundland shore, and this tends to limit the distribution of icebergs further in the Gulf, and also to determine the character of the water on the banks. The deep water north of these banks has been proved not to be connected with the deep water south.
- (3) The Labrador current has been found to be comparatively barren of proper food for fishes, containing chiefly jelly fishes. When, however, this water is mixed with more southern water and warmed up, it becomes remarkably productive, and is chiefly responsible for the richness of our fishing banks. This mixture with the other water has been taking place even before it reaches as far south as the Strait of Belle Isle.
- (4) Definite data have been obtained on the lower temperature relations of the cod, which should prove of considerable value in the use of the thermometer in locating cod along our coast.

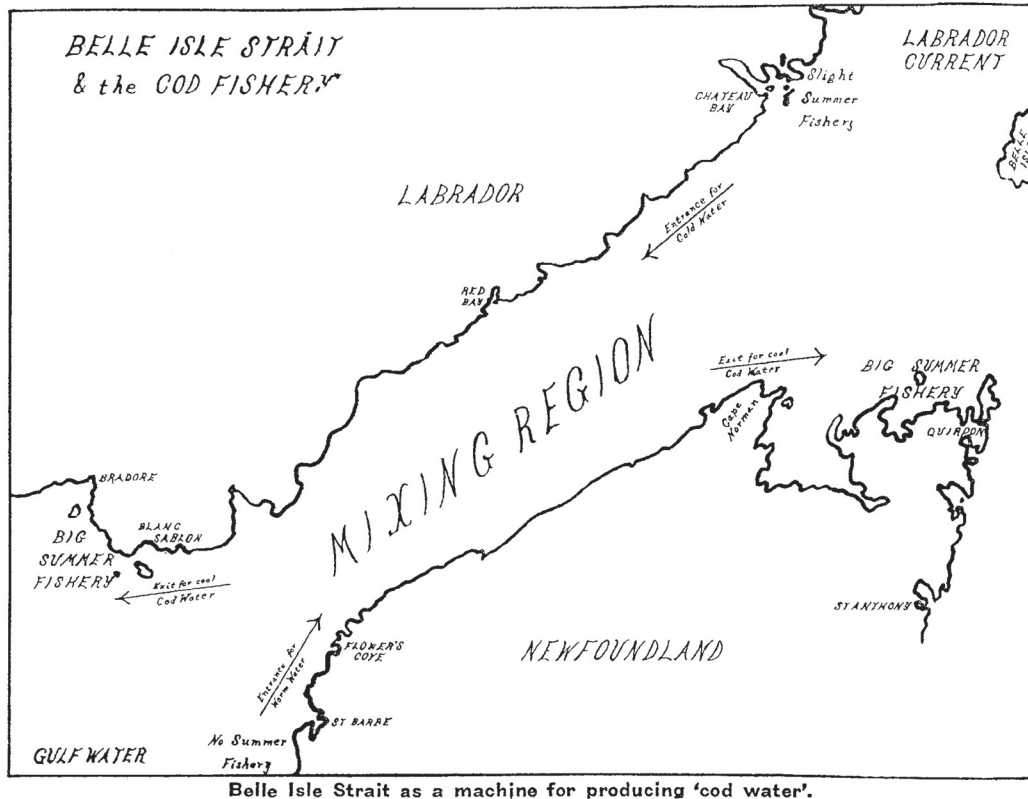


Figure 10. A.G. Huntsman's depiction of the locations where "cod water" was produced by mixing of the Labrador Current and Gulf of St. Lawrence water, resulting in summer fisheries (from A.G. Huntsman, "The Ocean around Newfoundland," *Canadian Fisherman* 12 (1925), 7).

For a more general audience, Huntsman made many of the same points in his publication *The Ocean Around Newfoundland*, directed to the Newfoundland government and to fishermen, adding a sketch-map showing the "mixing region" of the Strait that produces water neither too cold nor too warm — "cod water" he called it — for cod to survive and thrive [Fig. 10].³⁷

Huntsman's Strait of Belle Isle Expedition had paid off in terms of new knowledge of the currents of the Strait and in the development of a new hypothesis — mixing to produce "cod water" of just the right temperature range. But there was another aspect that Huntsman never addressed directly in the scientific results — his interest in the land plants, resulting in correspondence with Fernald and attention to the extensive plant collections that he made at nearly every stop during the expedition. Throwing light on this requires some detective work.

A.G. Huntsman and the Conditions of Existence

After 1923, A.G. Huntsman was not able to return in any substantive way to the results of the Belle Isle Strait expedition. With the opening in 1925 of a new Biological Board laboratory in Halifax, Huntsman was appointed its director while retaining his other positions. He relinquished the Halifax position due

to overwork in 1928, which somewhat reduced his crushing administrative load but still left him chronically over-committed in St. Andrews, and Toronto. For several years beginning in 1927, he was deeply involved in scientific studies to evaluate the effect of a proposed tidal power dam across Passamaquoddy Bay,³⁸ and by the 1930s he had begun work on the study of Atlantic Salmon in Maritimes waters, becoming involved in a lengthy and sometimes rancorous debate about homing in salmon that lasted well after his retirement in the 1950s.³⁹ He had many other projects and responsibilities, including facing the consequences of a major fire at St. Andrews in 1932. Huntsman was constitutionally over-committed even without disasters and found great difficulty in finishing projects. The 1923 expedition was among the unfinished ones, except for a few student projects,⁴⁰ until he was able to take it up again in the 1950s with the assistance of two physical oceanographers, W.B. Bailey and H.B. Hachey.⁴¹

One of Huntsman's later publications is, at first glance, almost jarring in its lack of context, although it takes most of its examples from his work on salmon. Titled "Method in ecology – biapocrisis," it was published in 1948 in the journal *Ecology*. While it received no fanfare, and vanished virtually without trace from the canon of papers in ecology and fisheries⁴², it requires attention here because it redirects us to Huntsman's plant collections.

Huntsman defined *biapocrisis* (based on the Greek nouns *bios*–"life" and *apócrisis*–"response") as "the response of an organism as a whole to what it faces where it lives," differentiating this approach from conventional physiological ecology because it involved the organism as a totality rather than isolated subsystems or processes. As he framed the approach in 1948: "[t]he problem is: Given a kind of organism in one or more places with the ability to multiply, where will the individuals live, grow and survive? The answer is to be found in the response of the organism as a whole in movement, growth and survival to what it faces." Moreover, "If there is to be scientific natural history, there must be knowledge of how each kind of life responds to what it faces where it lives in survival, movement, growth and reproduction. ...How well can we predict what we can find in the sea at any given time? Again, this requires basic knowledge, not only of the kinds of life in the sea, but also of how each kind responds to what it faces. ...Viewed objectively, the question is what does the environment do to the organism, that is, what is the latter's response?"⁴³ Summarizing: "In general, the procedure followed in biapocrisis is to discover and establish correlations between the behavior of the organism and the conditions in its environment, and then to test the significance of the correlations by appropriate experiments in nature or in the laboratory. The point should be emphasized that you start with nature, that is, with the organism in its environment."⁴⁴

These statements take us back to some of Huntsman's statements, repeated frequently during the 1920s, but taking center stage in the late 1940s, around the time of "Method in ecology" and biapocrisis. Here his correspondence with Fernald in the 1920s gives us insight into aspects of Huntsman's early thought

that would be easy to miss without the mirror of the biapocrisis paper. For example, writing to Fernald on July 23, 1923, before the expedition, Huntsman made it clear that he wanted to compare “the opposing shores of Newfoundland and Labrador not only as to the conditions in the water, but also those on the land for a short distance back from the water.”⁴⁵ It seems that at this early date he was struggling with the relationship between organism response and the immediate environment experienced by the plants.

After the expedition, in October 1923, Huntsman wrote to Fernald that he had “expected that a marked contrast would be found between the two shores of the Strait, and the neighboring part of the Gulf, and such proved to be the case!,” adding that “[i]t is to be expected that these differences will affect the land flora, but only close to the water.” He asked if Fernald had “ever considered the matter of the contrast between the two sides of the Strait as shown in the flora” and that he (Huntsman), “[b]elieving that something might be made of this problem ... took the opportunity to collect as many specimens of plants ... as the nature of our cruise permitted.”⁴⁶

A few months later, responding to Fernald’s suggestion that the nature of the substratum might be a governing factor in the distribution of the plants, Huntsman once again emphasized the importance of temperature: “[t]he problem in the Strait of Belle Isle virtually resolves itself into an attempt to discover how the difference of temperature shown by the two sides of the Strait affects the character of the flora on these two sides” and claimed that Fernald’s analysis of the flora would be “important in showing how small the climatic factor may or must be.”⁴⁷ A week later, he wrote to Fernald that “[i]t is most encouraging to see an attempt to get away from the climatic zones which have dominated the literature, and to a considerable extent retarded progress...”, suggesting that some gaps in plant distributions could be accounted for by temperature rather than substratum, based on his analysis of the temperature-governed distributions of marine organisms.⁴⁸ And early in 1925, after learning of Fernald’s fieldwork in Newfoundland north to the Strait of Belle Isle in the summer of 1924,⁴⁹ he wrote that “the region is of extraordinary interest to me on land as well as on water because of the very evident differences in conditions within such short distances. How the various factors operate is the question, and whether or not the land conditions fit in with those found in the water, there should be very striking results.”⁵⁰ And here the matter rested for two decades.

About the time of his biapocrisis paper in 1948, Huntsman once again took up the significance of his plant collections, which had just been identified by Fernald and sent to the herbarium of the National Museum of Canada⁵¹ in Ottawa. In January 1949 he received from the Chief Botanist at the National Museum, A.E. Porsild (1901-1977),⁵² a list of the Belle Isle Strait plants identified by Fernald. Huntsman wrote to Fernald that “[m]y object in making the collection and my continuing interest is a comparison of the plants occurring on the two sides of the Strait close to the shore. I don’t know that anyone else

would look at the matter in this way, and it may be that my collection is not adequate for such a comparison.”⁵³ A few days later, he wrote to Porsild with reference to the plant list, that “[i]f on studying them, I see any indication of the effect of sea conditions on the adjacent land flora, I will consult you as to your views and as to additional records you may have that would test any conclusions reached.”⁵⁴ Only a few days after that he wrote again to Porsild, asking his opinion on a short typescript titled “Water Influence on Shore Plants in Belle Isle Strait.”⁵⁵

The gist of “Water Influence” is that the biotic conditions in the Strait are governed by the contrast between the relatively warm Gulf water on the south side and much colder water on the north. This contrast, he wrote, “might well modify climatic conditions for land plants growing along the shore,” and indeed there were very few plant species in common between locations in the coldest and warmest regions. The coldest region was dominated by arctic-alpine plants, whereas the warmest region was the stronghold of temperate-climate plants. He concluded that “[t]he striking difference between the two sides ... clearly reflects not difference in latitude, but difference in local conditions,”⁵⁶ and shortly afterwards asked Porsild to indicate the “ecological relationships” (presumably the responses of the individual species to their microclimates) of the Belle Isle Strait plants.⁵⁷

Porsild delegated this task to a senior botanist on his staff, Homer Scoggan (1911-1986),⁵⁸ who was an authority on the flora of the Gaspé region.⁵⁹ Scoggan undertook to relate the species collected by Huntsman to what he called “major geographical areas ... by means of which a correlation between the climate and the flora of the areas might be revealed,” claiming a northward increase of Arctic species and a decrease of Boreal species in the order Cape Breton Island – Newfoundland – Labrador as a result of “an increasing severity of climate from Cape Breton to Newfoundland and to Labrador.” He added a cautionary note: “[i]t is emphasized that more must be known of the floras before and definite conclusions can be drawn for the area as whole, although such a correlation certainly exists in smaller areas such as alpine or inland valley habitats.”⁶⁰ In short, by default or otherwise, it was a classic biogeographic classification of the species, and Huntsman was not shy in expressing his disappointment: “I hope you won’t mind my saying that it fails to deal with my point... I understood you to say that you would give me some information concerning what is known about the habitats of some pertinent species as a basis for my consideration of the problem as I see it.”⁶¹

What, then, was the problem as Huntsman saw it? It appears to have been to find evidence that, all other things being equal, ocean conditions on opposite sides of the Strait would affect the nature of the flora species by species or even plant by plant. Instead, he had been given geographical “range categories” that were not relevant to his hypothesis. But clarity in Huntsman’s statements about what he was looking for — presumably oceanographic variables that would affect the responses of individual plants in small groups of them — is absent

in his correspondence, just as in his biapocrisis paper, fresh off the press at the time of this correspondence, he was singularly vague about how the “response of the organism as a whole” was actually to be determined. Discouraged, and perhaps suffering from lack of clarity in his own mind, by the spring of 1951 he had given up on the problem and moved on to more tractable scientific work.⁶²

A Confluence of Interests

The Strait of Belle Isle had something for both Fernald and Huntsman. Fernald wanted more information from northern Newfoundland and Labrador to buttress his nunatak and coastal plain hypotheses, subjects that became increasingly central to his analyses of Eastern North American floras during the early 1920s.⁶³ Even though he was unable to join the Belle Isle Strait expedition in 1923, he aggressively mounted field programmes that extended to southern Labrador based in part on the plants that Huntsman collected for him in 1923.

For Huntsman, Fernald’s botanical work had the potential to fit into interests that almost certainly predated 1923 but that did not reach full expression until his publication in 1948, expressing the need for a new operational approach in ecology that he summarized in the word *biapócrisis*, focusing on responses of the entire organism rather than on subsystems. Because Huntsman himself was vague and probably uncertain about how such an approach could be put into practice, sorting out his thoughts on this matter is difficult. It is not aided by the fact that his 1948 publication was a one-off, leaving us to interpret what he had to say about environmental effects on individual organisms from brief and usually unfocussed mentions in his letters. Whatever Huntsman was trying to say to us, it never had an impact in ecology and remains problematic for the historian. Resurrecting the Belle Isle Strait Expedition of 1923 gives us worthwhile insight into a little-known episode in Canadian marine science, but leaves us with the interesting problem of its unresolved and perhaps unresolvable significance in the thought of A.G. Huntsman, one of Canada’s most influential marine scientists.

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Endnotes

- 1 This paper owes a great deal to archivists, notably Harold Averill at the University of Toronto Archives (UTARMS), who curated the papers of A.G. Huntsman, and Lisa DeCesare, of the Botany Libraries, Harvard University Herbaria, for help locating and giving me access to the correspondence of M.L. Fernald.
- 2 Fernald was mistaken. Huntsman was the Director of the Atlantic Biological Station in St Andrews, NB, not the Director of the Biological Board of Canada.

- 3 M.L. Fernald, "Two summers of botanizing in Newfoundland," *Rhodora* 28, 328 (1926): 53.
- 4 On NACFI, see Jennifer Hubbard, *A Science on the Scales: The Rise of Canadian Atlantic Fisheries Biology, 1898-1939* (Toronto: University of Toronto Press, 2006), 163-172.
- 5 This was the rationale, at least in the minds of Canadian politicians, for the Canadian Fisheries Expedition of 1915 to the Gulf of St. Lawrence and Scotian Shelf (Ibid., Ch. 3).
- 6 Summarized in a fisheries context by George Rose, *Cod: the Ecological History of the North Atlantic Fisheries* (St. John's NL: Breakwater Books, 2007), 173-242.
- 7 An example typical of its generation is W.N. Burns, "Will a ten-mile dam change Canada's climate?," *Popular Science Monthly* 99, 2, (1921): 33-34.
- 8 W.B. Dawson, *The Currents in Belle Isle Strait. From the Investigations of the Tidal and Current Survey in the Seasons of 1894 and 1906* (Ottawa: Department of Marine and Fisheries, 1907), 38.
- 9 Ibid., 26-31. See also W.B. Dawson, "The currents in Belle Isle Strait, the northern entrance to the Gulf of St. Lawrence," *Bulletin of the Geographical Society of Philadelphia* 18 (1920): 35-37, which takes aim at the futility of damming the Strait.
- 10 Dawson, *Currents in Belle Isle Strait*, 39-40.
- 11 A.G. Huntsman to D.C. Nutt, December 30, 1949. A.G. Huntsman Papers, UTARMS, B 1978-0010 / 094 (01).
- 12 Kenneth Johnstone, *The Aquatic Explorers: A History of the Fisheries Research Board of Canada* (Toronto: University of Toronto Press, 1977), 304-306; A.W.H. Needler, "Archibald Gowanlock Huntsman: 1883-1973," *Proceedings of the Royal Society of Canada, Series IV*, 13, 67-69.
- 13 K.A. Anderson, "Johan Hjort 1869-1948," *Journal du Conseil International pour l'Exploration de la Mer* 16 (1949): 3-8; Vera Schwach, "Internationalist and Norwegian at the same time," *ICES Marine Science Symposia* 215 (2002): 39-44; Per Solemdal, "The three cavaliers. A discussion from the Golden Age of Norwegian marine research," in *Early Life History and Recruitment in Fish Populations*, eds. R.C. Chambers and E.L. Trippel (London: Chapman and Hall, 1997), 551-565.
- 14 Canada. Department of the Naval Service, *Canadian Fisheries Expedition, 1914-1915: Investigations in the Gulf of St. Lawrence and Atlantic Waters of Canada Under the Direction of Dr. Johan Hjort, Head of the Expedition, Director of Fisheries for Norway* (Ottawa: King's Printer, 1919).
- 15 Johan Hjort, "Fluctuations in the great fisheries of northern Europe viewed in the light of biological research," *Conseil International pour l'Exploration de la Mer, Rapports et Procès-Verbaux* 20 (1914): 1-228.
- 16 J.E. Stewart and A. Safer, "A retrospective: three quarters of a century at the Halifax Fisheries Research Laboratory," *Proceedings of the Nova Scotian Institute of Science* 4,1, (2005): 19-44.
- 17 E.D. Merrill, "Merritt Lyndon Fernald (1873-1950)," *National Academy of Sciences Memoirs* 28 (1954): 45-98; R.L. Stuckey, "Fernald, Merritt Lyndon," *American National Biography Online* (<http://www.anb.org/articles/13/13-00527.html>), accessed December 10, 2009. An appreciation of the man and his work by five colleagues appeared in *Rhodora* in 1951, the most relevant of which are: L. Griscom, 1951, "Fernald in the field," *Rhodora* 53, 626 (1951): 61-65 and R.C. Rollins, "Fernald as a botanist," *Rhodora* 53, 626 (1951): 56-61. There are also recollections of Fernald in Anonymous, "The New England Botanical Club 800th meeting," *Rhodora* 88, 854 (1986): 157-228.
- 18 M.L. Fernald, "A botanical expedition to Newfoundland and southern Labrador," *Rhodora* 13, 151, (1911): 109-162.
- 19 Ibid., 162.
- 20 M.L. Fernald, "Persistence of plants in unglaciated areas of boreal America," *American Academy of Arts and Sciences Memoir* 15, 3, (1926): 239, 241-342.
- 21 M.L. Fernald, "Two summers of botanizing in Newfoundland," *Rhodora* 28, 328, (1926): 53-54.

- 22 A.G. Huntsman, *The Ocean Around Newfoundland* (St. John's: Newfoundland Ministry of Marine Fisheries, St. John's Fisheries Research Laboratory, 1924), 8-9; A.G. Huntsman, "The ocean around Newfoundland," *The Canadian Fisherman* 12, (1925): 6.
- 23 A.G. Huntsman to Ward Fisher, Chief Inspector of Fisheries in Halifax, July 10, 1923. A.G. Huntsman Papers, UTARMS B1978-0010 / 092 (15).
- 24 All in the A.G. Huntsman papers, University of Toronto Archive and Research Management services (UTARMS).
- 25 A.G. Huntsman Papers, UTARMS B1978 – 0010 / 93 (12).
- 26 A.G. Huntsman Papers, UTARMS B1978 – 0010 / 93 (5).
- 27 A.G. Huntsman Papers, UTARMS B1978 – 0010 / 001.
- 28 Biographical information in <https://www.rasc.ca/lachlan-gilchrist>. Accessed June 26, 2018.
- 29 Apparently a representative to Newfoundland of the English Ministry of Agriculture and Fisheries (M.Baker and S. Ryan, *The Newfoundland Fishery Research Commission, 1930-1934* in *How Deep is the Ocean?: Historical Essays on Canada's Atlantic Fishery*, eds. J.E. Candow and C. Corbin (Sydney, NS: University College of Cape Breton Press, 1997), 163.)
- 30 C.D. Maginley and B. Collin, *The Ships of Canada's Marine Services* (St. Catharines, ON: Vanwell Publishing, 2001): 91.
- 31 Documented in Captain Arthur Calder's log of the voyage from St. Andrews and back, extending from June 23 to October 15 (A.G. Huntsman papers, UTARMS B1978 – 0010 / 93 (4)).
- 32 Le Danois was at the time assistant director of the French Office of Marine Fisheries. He was unique in France in understanding and using Scandinavian techniques of dynamic oceanography: see E.L. Mills, *The Fluid Envelope of Our Planet: How the Study of Ocean Currents Became a Science* (Toronto: University of Toronto Press, 2009), 188. The most complete summary of his life and science is https://fr.wikipedia.org/wiki/Édouard_Le_Danois (accessed 23 June 2018).
- 33 The Secchi Disk is a simple but effective device for measuring transparency of the water, usually involving a white or white-and-black plate that is lowered until it disappears from view. Apparently Gardiner was able to press a kitchen plate from the mess into service.
- 34 On Grenfell, see https://www.wikipedia.org/wiki/Wilfred_Grenfell (accessed 23 June 2018).
- 35 Based on a photograph of *Arleux* in the St. Croix River in Huntsman's photo record of the expedition (see Note 27).
- 36 A.G. Huntsman to W.A. Found, Director of Fisheries, Dept. of Marine and Fisheries, Ottawa, February 13, 1924. A.G. Huntsman Papers, UTARMS B1978 – 0010 /0092 (15) .
- 37 Huntsman, 1924, 1925, esp. 1925, 7.
- 38 Hubbard, 2006, 173-191.
- 39 Huntsman's career during this period and the debate over Atlantic Salmon migrations and homing are masterfully dealt with by Jennifer Hubbard, "Home sweet home? A.G. Huntsman and the homing behaviour of Canadian Atlantic Salmon," *Acadiensis* 19 (1990): 40-71.
- 40 V.M. Davidson, "The distribution of certain marine Ostracoda in the Canadian waters of the eastern coast," *Contributions to Canadian Biology and Fisheries* 2, 1, (1924): 295-306; K.F. Pinhey, "Entomostraca of the Belle Isle Strait Expedition, 1923, with notes on other planktonic species. Part I," *Contributions to Canadian Biology and Fisheries*, NS 3, 6, (1926): 179-233; K.F. Pinhey, "Entomostraca of the Belle Isle Strait Expedition, 1923, with notes on other planktonic species: Part II; and a record of other collections in the region," *Contributions to Canadian Biology and Fisheries* 3, 13, (1927): 331-346; C.J. Kerswill, "The distribution of Pteropods in the waters of eastern Canada and Newfoundland," *Journal of the Fisheries Research Board of Canada* 5, 1, (1940): 23-31; E.L. Bousfield, "Pelagic Amphipoda of the Belle Isle Strait region," *Journal of the Fisheries Research Board of Canada* 8, 3, (1951): 134-163; M.F. Udvardy, "Distribution of Appendicularians in relation to the Strait of Belle Isle," *Journal of the Fisheries Research Board of Canada* 11, 4, (1954): 431-448.

- 41 A.G. Huntsman, W.B. Bailey and H.B. Hachey, "The general oceanography of the Strait of Belle Isle," *Journal of the Fisheries Research Board of Canada* 11, 3, (1954): 198-260. Thereafter, there was more work on the Strait to sort out the effect of meteorology, and with the addition of new tide gauges, including W.B. Bailey, "On the dominant flow in the Strait of Belle Isle," *Journal of the Fisheries Research Board of Canada* 15 (1958), 1163-1174, and especially W.I. Farquharson and W.B. Bailey, *Oceanographic Study of Belle Isle Strait 1963* (Dartmouth, NS: Bedford Institute of Oceanography, BIO Report 66-9, 1966), 1-78. Only in the 1980s were modern methods of physical oceanography applied by researchers at Dalhousie University and the Bedford Institute of Oceanography to assess the circulation and its causation: C. Garrett and B. Petrie, "Dynamical aspects of the flow through the Strait of Belle Isle," *Journal of Physical Oceanography* 11, 3 (1981): 376-393; C. Garrett and B. Toulany, "Variability of flow through the Strait of Belle Isle," *Journal of Marine Research* 39, 1 (1981), 163-189; C. Garrett and B. Toulany, "Sea level variability due to meteorological forcing in the northeast Gulf of St. Lawrence," *Journal of Geophysical Research* 87, C3 (1982), 1968-1978; B. Toulany, B. Petrie and C. Garrett, "The frequency-dependent structure and dynamics of flow through the Strait of Belle Isle," *Journal of Physical Oceanography* 17, 2 (1987), 185-196; and B. Petrie, B. Toulany and C. Garrett, "The transport of water, heat and salt through the Strait of Belle Isle," *Atmosphere-Ocean* 26, 2 (1988), 234-251.
- 42 A.G. Huntsman, "Method in ecology – biapocrisis," *Ecology* 29, 1 (1948): 30-42. It may have suffered eclipse by a torrent of papers from G.E. Hutchinson and his students at Yale, culminating in Hutchinson's revolutionary recasting of the ecological niche in set-theoretic terms as an n-dimensional hypervolume: G.E. Hutchinson, "Concluding remarks," *Cold Spring Harbor Symposia in Quantitative Biology* 22, (1957): 413-427. Hubbard, 1990, 58-63 places Huntsman's thought in the context of his neo-Lamarckianism and hereditarian debates during the 1920s-1940s.
- 43 These quotations from Huntsman, 1948, 31
- 44 Huntsman, 1948, 41.
- 45 A.G. Huntsman to M.L. Fernald, 21 July 1923. Harvard University Herbaria (HUH) General Correspondence, Huntsman file.
- 46 A.G. Huntsman to M.L. Fernald, 31 October 1923. HUH General Correspondence, Huntsman File.
- 47 A.G. Huntsman to M.L. Fernald, 18 February 1924. HUH General Correspondence, Huntsman File
- 48 A.G. Huntsman to M.L. Fernald, 25 February 1924. HUH General Correspondence, Huntsman File
- 49 Fernald, 1926, 49-63.
- 50 A.G. Huntsman to M.L. Fernald, 17 February 1925. HUH General Correspondence, Huntsman File.
- 51 Now the Canadian Museum of Nature. The collections are now located in Gatineau, Québec.
- 52 W. Dathan, *The Reindeer Botanist: Alf Erling Porsild (1901-1977)* (Calgary, AB: University of Calgary Press, 2012).
- 53 A.G. Huntsman to M.L. Fernald, January 19, 1949. A.G. Huntsman Papers, UTARMS B1978 – 0010 / 94 (1).
- 54 A.G. Huntsman to A.E. Porsild, January 28, 1949. A.G. Huntsman Papers, UTARMS B1978 – 0010 / 94 (01).
- 55 A.G. Huntsman, "Water Influence on Shore Plants in Belle Isle Strait," typescript (1949): 1-4. A.G. Huntsman Papers, UTARMS B1978 – 0010 / 94 (01).
- 56 Huntsman, Ibid, 4.
- 57 A.G. Huntsman to A.E. Porsild, February 14, 1949. A.G. Huntsman Papers, UTARMS B1978 – 0010 / 94 (1).

- 58 M.J. Shchepanek, "A tribute to Homer John Scoggan, 1911-1986," *Canadian Field-Naturalist* 101, 2, (1987): 161-164.
- 59 H.J. Scoggan, "The flora of Bic and the Gaspé Peninsula, Québec," *National Museum of Canada Bulletin* 118 (1950): 1-339. Scoggan's work in the Gaspé region marshalled evidence against Fernald's nunatak hypothesis, summarizing updated geological and biological evidence against it (see Note 61).
- 60 H.J. Scoggan, "Notes on plants collected by Dr. A.G. Huntsman in 1923...", A.G. Huntsman Papers, UTARMS B1978 – 0010 / 94 (1).
- 61 A.G. Huntsman to A.E. Porsild, March 9, 1949. A.G. Huntsman Papers, UTARMS B1978 – 0010 / 94 (1).
- 62 A.G. Huntsman to A.E. Porsild, March 19, 1951. A.G. Huntsman Papers, UTARMS B1978 – 0010 / 94 (1). It was at this time that he began to work with Bailey and Hachey to summarize the oceanography of Belle Isle Strait based on his 1923 data.
- 63 Both came under attack in the following decades, late in Fernald's career and after his death. See especially V.C. Wynne-Edwards, "Isolated Arctic-alpine floras in Eastern North America: a discussion of their glacial and recent history," *Transactions of the Royal Society of Canada Series III*, 31, 5, (1937): 1-26; H.J. Scoggan, 1950, 3-14; and S.R. Clayden, M.C. Munro, S.C. Blaney and S.P. Van der Kloet, "Vascular flora of the Atlantic Maritime Ecozone: some perspectives," in *Assessment of Species Diversity in the Atlantic Maritime Ecozone*, eds. D.F. McAlpine and I.M. Smith (Ottawa: NRC Research Press, 2010), 197-213.. Based on updated geological information casting doubt on the existence of unglaciated area (nunataks), on the possibility of colonization from the west along the receding glaciers, and on the improbability of there being a continuous post-glacial borderland, Fernald's hypotheses are now not favored by biogeographers.