

## THE BRITISH CONTRIBUTION TO THE HYDROGRAPHY OF CANADA

by Rear Admiral D.W. HASLAM, CB, OBE, FRICS<sup>(\*)</sup>

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### ABSTRACT

Almost inevitably, the starting point for an account of "The British Contribution to the Hydrographic Surveying of Canada" must start with Captain Cook. B.C. — or before Cook — most other British visitors to Canadian waters had produced "maps" rather than "charts". It is harder to decide on a finishing point : although the Canadian Parliament attained authority in 1867 over certain navigational matters and the Canadian Hydrographic Office was formed in 1883, it was not until 1908 that the first Canadian ship *Lilloet* was available to take over the surveying task and HM ships continued to survey off British Columbia until 1910, off Newfoundland till 1912 — indeed, HMS *Challenger* was surveying off Labrador from 1932 to 1934.

The paper considers the subject in the four sections of Canada's roughly rectangular boundaries.

#### *West coast : British Columbia*

On the west coast, Cook's work in 1778 was confined to Nootka Sound and its vicinity : two from this expedition — Dixon and Portlock — returned as fur-traders but added to the scanty knowledge of the western channels as did other fur-traders such as Barkley and Lieutenant Meares, RN, whose acquisition of land at Nootka almost led to another Anglo-Spanish war and did lead to George Vancouver's return, in 1792, to put into effect the "Nootka Convention", signed in Madrid in October 1790. Fortunately, the non-political comradeship of hydrogra-

(\*) Hydrographer of the Navy, Ministry of Defence, Hydrographic Department, Taunton, Somerset TA1 2DN, U.K.

phic surveyors had already started and, although he agreed to differ on the territorial claims of the Spaniards whom he found surveying off British Columbia, Vancouver amicably exchanged copies of his surveys with them and his many fair sheets meticulously attribute the work done by the Spaniards. Some 60 years later, Captain G. Richards, in HMS *Plumper* and then HMS *Hecate*, surveyed the west coast from 1856 till, in 1862, he returned home to become Hydrographer of the Navy — leaving Pender to continue his surveys in a hired vessel till 1871 when British Columbia joined the Dominion. The final British surveys of this coast were from 1898 in HMS *Egeria* till she paid off in 1910.

### *East coast*

From 1759, Cook, Colonel Des Barres and Major Holland were engaged in surveying the coasts of Newfoundland, Nova Scotia and the Gulf of St Lawrence : prior to this, Captain Taverner had produced in 1714 his “Trades and Plantations Map of North America” and Thomas Durell, in 1716 and 1732-35, had also explored extensively in this area. For the next 150 years, successive British surveyors worked off the east coasts of Canada, Newfoundland and Labrador — notably Joseph Gilbert (1767-70), Michael Lane (1768-85), Francis Owen (1800-01), Anthony Lockwood (1813-18), Lieutenant Bullock (1823-26), Captain Bayfield (1827-56), Commander John Orlebar (1857-64), James Kerr (1865-71), William Maxwell (1872-90), William Tooker (1891-1907) and Captain Combe (1908-13). A.G.N. Wyatt, in HMS *Challenger* (1932-34) was the last British contributor to Canadian surveys.

### *Great Lakes*

The section covering the Great Lakes was first tackled by Captain W. Fitzwilliam Owen in 1815 who handed over to Henry Bayfield (1817-1825); following his extraordinary hard and accurate work, the British disappeared until Commander John Boulton was loaned to the new C.H.S. to take charge of the “Georgian Bay Survey” on 11 July 1883; in 1893, Boulton was succeeded by Mr W.J. Stewart, but he — as the Chief Hydrographer of Canada from 1904 to 1925 — can hardly be counted as part of this account.

### *Northern coasts*

The work on the northern coast perhaps does not fulfil the criteria of “surveying”, being rather “exploration” : in view of the small vessels employed in such appalling weather conditions, it is however remarkable how much detailed work was performed. Inspired by William Scoresby’s reports of good whaling conditions in the Greenland Sea, the Navy Board mounted a succession of expeditions between 1818 and 1827 to find a North West Passage. Parry, Beechey, Franklin, John and James Ross and their valiant crews all struggled to fight their way through the ice and back with varying degrees of success or failure. Beechey, in HMS *Blossom*, in 1826/27 discovered the coast from Icy Point to Point Barrow — leaving only about 140 miles of unexplored coast between this Point and Point Beechey.

Thus, although — thanks to the ready acceptance of hydrographic responsibility by the Canadian Government much earlier than other members of the British Commonwealth — the Royal Naval surveyors' contribution tailed off towards the end of the 19th century, it will be seen that they had provided a comprehensive basic survey of all but the forbidding northern coasts for the Canadian Hydrographic Service one hundred years ago. Indeed, many of their surveys in Canadian waters — as in many other parts of the world — remained the best available even till modern times.

## INTRODUCTION

Although Captain Greenville Collins was appointed Hydrographer to King Charles II in 1693, his work was confined to British waters and the appointment lapsed until the appointment of Mr Alexander Dalrymple as Hydrographer to the Admiralty Board on 12 August 1795. Some 35 years earlier, however, the Seven Years' War (1756-1762) between Britain and France in North America highlighted the need for both a British American Regiment and suitable nautical charts.

A chance meeting between the mathematical, Swiss-born, British American Regiment Engineer, Des Barres, and the Yorkshire seaman, James Cook, in 1758 led to the growth of a nucleus of British hydrographers whose great efforts subsequently grew to the present day British Hydrographic Service. Inevitably, having been spawned in the waters off the East coast of Canada and Newfoundland and with the obvious commercial potential of North America in general — and Canada in particular — a fair proportion of the embryo British hydrographic effort was therefore devoted to Canada.

Although, theoretically perhaps, this account should relate to events AD (After Dalrymple's appointment in 1795), some mention must be made of earlier events — even those BC (Before Cook) — despite the fact that, until Cook's influence on hydrography and British chart making, most British visitors to North America were explorers, traders and whalers who lacked the knowledge and instruments to produce anything much better than rudimentary maps. Edmund Halley, for instance, visited Newfoundland in HMS *Paramour* in 1699 and produced a chart showing magnetic variations of the North Atlantic in 1701.

If it is difficult to establish a starting point, it is equally difficult to do justice to the subject in a short article and to decide on a finishing point. Although the Canadian Parliament attained authority in 1867 over certain navigational matters and the Canadian Hydrographic Office was formed in 1883, it was not until 1908 that the first Canadian hydrographic ship *Lilloet* was available to take over the surveying task from the Royal Navy and HM Surveying Ships continued to survey off British Columbia until 1910 and off Newfoundland until 1912 — indeed, HMS *Challenger* was surveying off Labrador from 1932 to 1934.

This inadequate account of the subject will consider the British contribution in the four natural sections of Canada's coastline — British Columbia, the Atlantic seaboard, the Great Lakes and the Northern coasts.

## BRITISH COLUMBIA

Although the name "British Columbia" was not used before 1858, it is convenient to use this when referring to activities off Canada's Pacific coast. Sir Francis Drake, in his *Golden Hind*, abandoned his search for a passage northabout the Americas when south of the Cape Flattery in 1579; 13 years later, in 1592, the Greek navigator Apostolos Valerianos, better known as Juan de Fuca, was sent northwards by the Spanish Viceroy of New Spain or Mexico, and for many years was regarded as the first European to sail through the straits which now bear his name. No European seems to have visited this area until 1774 when the Viceroy of Mexico sent the Spanish Naval Officer Juan Perez to explore the N.W. coasts of America, primarily to try to stop the Russians from extending their claims southwards from present-day Alaska which they had already reached.

On his voyage north, Perez sighted (but did not name) the Queen Charlotte Islands, whilst, on his return south, he sighted Vancouver Island and anchored off Nootka Sound, but only carried out very sketchy surveys from his corvette *Santiago*. Following the United States' Declaration of Independence in 1776, Spanish, British and American sailors went to British Columbia in rapid succession. The most notable, perhaps, of these was Captain James Cook who visited the coast during his third, and last, voyage to the Pacific in command of HMS *Resolution*, with Commander Charles Clerke in command of HMS *Discovery*. Their aim was to find the long-sought-for North West Passage between the Atlantic and Pacific oceans — for the discovery of which the British Government had, in 1745, offered a reward of £ 20,000. It is worth noting that they had offered a similar sized reward in 1714 for a method of establishing longitude at sea.

When Cook arrived in the area in 1778 — interestingly, with a young Midshipman, George Vancouver, in the *Discovery* — his first work was based on what he first called King George's Sound but later named Nootka Sound, wrongly thinking this to be the native name. After about a month at Nootka, Cook sailed northwards directly to the Alaskan coasts and onwards to the Sandwich Islands where he so tragically met his death in 1779. Although Cook therefore contributed little to the surveying knowledge of British Columbia other than at Nootka — a chart of which appeared in his published account — his visit there was to have very significant consequences.

When his ships arrived in China following his death, the profits derived from the sale of the furs which they had obtained at Nootka were so great that the north-west American fur-trade began to boom. The first fur-trading voyage was by Captain James Hanna, who sailed from China in 1785 in the *Harmon*, a 60-ton brig, and returned in the 120-ton 'snow' *Sea Otter* in 1786; he did some useful exploration work and named several features. [1]

Of the many British seamen whose fur-trading activities left their mark on this coast, George Dixon and Nathaniel Portlock, in 1787, in the snow *Queen Charlotte* and ship *King George*, had both been shipmates with George Vancouver in *Discovery*; Dixon named Queen Charlotte Island after his vessel and, on return to England, Sir Joseph Banks gave Dixon's name to the opening on the northern side

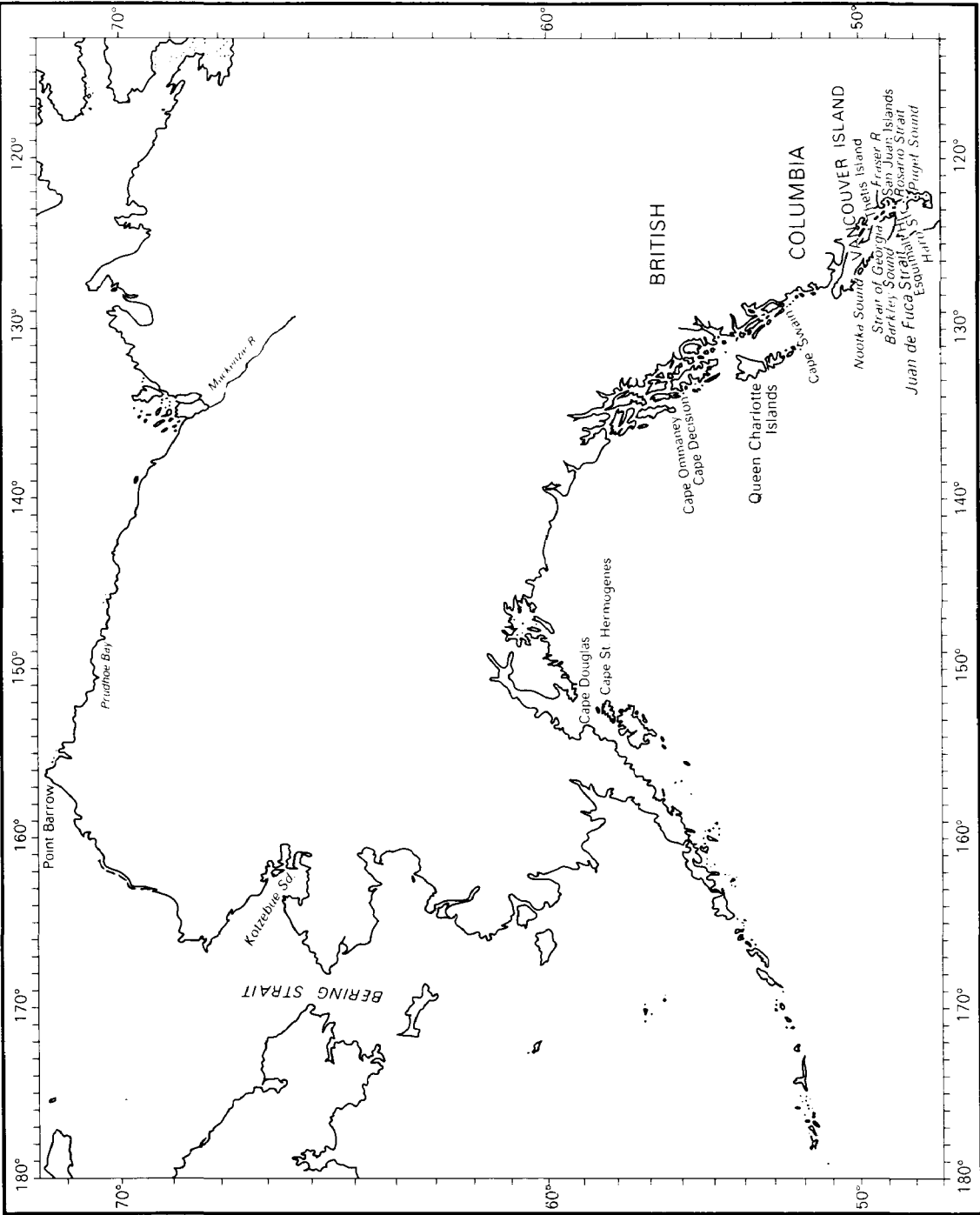


FIG. 1. — British Columbia and its environs.

of these islands. Also in 1787, another fur-trader, Charles Barkley, in *Imperial Eagle*, discovered the large sound which now bears his name, south-east of Nootka Sound, and discovered and named Juan de Fuca Strait after the apocryphal explorer of that name. Barkley's 17-year-old bride, Frances, accompanied him and so must be the first English lady to visit these waters.

The final English fur-traders of this period that must be mentioned are John Meares and James Colnett. Meares, originally a Royal Naval Lieutenant, arrived in 1787 in command of a trading vessel *Felice* together with a Captain William Douglas in *Iphigenia*; Meares purchased from the native chief a portion of land near Nootka and built a 40 ton vessel — the *North West America*, launched in 1788 — the first ship to be built on these shores. Colnett, a Royal Naval Lieutenant on half-pay, also arrived in the area in 1787, in command of the *Prince of Wales*, accompanied by Captain Charles Duncan in the *Princess Royal*; after wintering in China, Colnett returned to Nootka, this time in the *Argonaut*, in 1788; both Colnett and Duncan carried out useful surveys.

Also in 1788, the Spaniards read, in the account of Cook's third voyage, that the Russians had definitely settled in north-west America. The Spanish frigate *Le Princesa* commanded by Don Esteban José Martínez and the packet-boat *San Carlos* commanded by Don Gonzalo López de Haro, were sent to investigate. They carried out much exploration and eventually arrived at Nootka in 1789 and not only formally took possession of the port in the name of the King of Spain but seized first the *Iphigenia* (which was soon released), then the *North West America*, the *Argonaut* and the *Princess Royal*. Colnett was taken, as a prisoner in his own ship, to San Blas in Mexico. Meares was away from Nootka but, when he heard of the event, personally presented a memorial to the House of Commons claiming heavy compensation for "this unwarrantable outrage on British commerce". Very strong feeling was raised in England and the British Government demanded satisfaction from Spain and also fitted out a powerful British Fleet. This had the desired effect and, in October 1790, the "Nootka Convention" was signed in Madrid; this gave complete restitution of all captured property and also acknowledged equal rights between Great Britain and Spain for the exercise and prosecution of all commercial undertakings in the waters around America which had hitherto been considered as belonging solely to the Spanish crown.

This convention was considered so significant that it was deemed desirable to send a British representative to Nootka to formally receive back the properties concerned and accordingly, in 1791, Commander George Vancouver (in the newly built 340-ton *Discovery*) and Lieutenant William Broughton (in the armed brig *Chatham*) left to carry out this task and to make an accurate survey of the north-west coast of North America between 30°N and 60°N.

On the voyage out to Nootka, Vancouver did valuable exploratory work off Australia, New Zealand and Drake's "New Albion" — as the Pacific coast of North America, north of California, was then known — until April 1792. Instead of going direct to Nootka, Vancouver started his explorations along the southern shores of the Strait of Juan de Fuca; he then discovered and examined Puget Sound and passed into the Strait of Georgia (which he first called the Gulf of Georgia). In June 1792, when near Point Grey — off the entrance to Burrard Inlet, he fell in with the two Spanish vessels, *Sutil* commanded by Dionesio Galiano and *Mexicana* commanded by Cayetano Valdes, and, apart from learning much

navigational information from them, also heard that four Spanish vessels were waiting for him at Nootka. Having exchanged copies of their surveys, Vancouver passed through Johnstone Strait and into Queen Charlotte Sound. Shortly after entering this, on 6 August, his *Discovery* ran aground, on a falling tide, close eastwards of Mary Rock in Ripple Passage. Fortunately, she was refloated on the next high tide without damage and the survey was resumed, to be broken off — reluctantly, one guesses — when Vancouver learned from a British fur-trader — the *Venus* — that a British ship *Daedalus* had arrived at Nootka with supplies for his expedition and that the Spaniards awaiting at Nootka were getting increasingly impatient.

Making his way round the north of Vancouver Island, the expedition reached Nootka on 29 August 1792 to find the Spanish brig *Activa* flying the broad pendant of Captain Don Juan Francisco de la Bodega y Quadra. Unfortunately, Vancouver and Quadra could not agree on which actual portions of land were to be ceded and the matter had to be referred back to London and Madrid. Meanwhile, Vancouver and Quadra became such friends that Vancouver suggested that the large island whose insularity he had just established should be named “The Island of Quadra and Vancouver”.

Although Quadra left Nootka on 22 September 1792 for Monterey (and, incidentally, died in San Blas, Mexico, in 1794), Vancouver continued his surveys until he finally sailed from Nootka for England on 17 October 1794. During these two years, he completed an entire survey of British Columbia; however, the chart prepared by Lieutenant Edward Roberts “showing part of the Coast of N.W. America with the tracks of His Majesty’s Sloop *Discovery* and Armed Tender *Chatham*, commanded by George Vancouver Esq. and prepared from the foregoing surveys under his immediate inspection, in which the Continental Shore has been correctly traced and determined from Lat. 29°54’N and Long. 244°33’E (i.e. 115°27’W) to Cape Douglas in Lat. 58°52’N, Long. 207°20’E (i.e. 152°40’W) during the summers of 1792, 1793 and 1794” meticulously attributes (by the omission of shading) those parts eastwards of Cape Decision which were provided from the Spanish explorers (as well as those to the westwards of Cape St Hermogenes provided by the Russians). Two other charts resulting from this incredible survey were one covering the coast from Cape Lookout, on the coast of Oregon, to Cape Swaine, on the coast of British Columbia and including Queen Charlotte Sound and Vancouver Island and with plans of the Columbia River, Port Discovery and Gray’s Harbour, and another covering the coast from Cape Swaine to Cape Ommaney on Baranof Island in Alaska. It is of passing interest that, although the Royal Navy had funded this expedition and had appointed Alexander Dalrymple as the First Hydrographer to the Navy in 1795, Vancouver’s work was published, on 1 May 1798, by J. Edwards of Pall Mall and G. Robinson of Paternoster Row.

However, between 1789 and 1791, Dalrymple had published 13 sheets of plans of anchorages in British Columbia which proved useful to Vancouver. Four of these plans were by James Johnstone, Colnett’s Master in the *Prince of Wales*; when Colnett returned to the Canadian coast from China in the *Argonaut*, Johnstone was placed in command of the *Prince of Wales* and returned in her to England [3], returning to the north west coast with Vancouver as Master of the *Chatham* [4]. Colnett’s own surveys (which are mostly in the archives of the Hydrographic Department, Taunton) were never published. The fur-traders

Meares, Dixon and Portlock included a number of charts and plans in the published accounts of their voyages [5].

With the departure of Quadra and the two Spanish vessels — *Sutil* and *Mexicana* — that Vancouver had first met in June 1792, the Spanish exploration, which had done so much to open up these waters, came to an end. Agreement on the practical requirements of the Nootka Convention was finally reached on 28 March 1795 when General Don Jose Manuel Alava, the Spanish commandant, handed over to Lieutenant Thomas Pierce of the Royal Marines.

With the departure of Vancouver, no further British surveys were carried out in British Columbia for over 50 years. In 1846 — because of the growing crisis over the disputed Oregon Territory — the *Herald* (Captain Henry Kellett) and her consort the *Pandora* (Commander James Wood) were sent to British Columbia to carry out surveys in Juan de Fuca Strait. The Harbour of Victoria was also surveyed by Kellett, while Wood surveyed Esquimalt Harbour. Wood returned the following year to carry out some surveys in the Gulf of Georgia.

In 1853 Mr George Inskip, Master of the *Virago* (Captain James Prevost), surveyed Port Simpson and wrote some Sailing Directions for the Queen Charlotte Islands. Inskip's brother, a schoolmaster onboard the *Fisgard*, had earlier assisted Wood in the survey of Esquimalt Harbour.

In November 1857 Captain George Richards arrived in the steam-sloop *Plumper* to join Captain James Prevost of the *Satellite* (who had arrived 5 months earlier). Because of his previous experience of British Columbian waters, Prevost had been appointed as a British Commissioner of a joint United States Boundary Commission to determine the boundary between the two countries. Richards was also appointed to the Commission as surveyor and astronomer. In 1858 Richards in the *Plumper*, assisted by the *Satellite*, surveyed the waterways in the vicinity of the San Juan Islands. The Joint Commission became deadlocked: the Americans considered the boundary should run through Haro Strait, while the British favoured Rosario Strait. The dispute was not settled until 1872 when, as a result of arbitration by the Emperor of Germany, the American claim was upheld [6].

In 1859 Richards started to resurvey Vancouver Island — a survey conducted with extraordinary energy and almost severe zeal; the survey continued the following year. In 1859 and 1860 Lieutenant Richard Mayne made two extensive journeys into the interior of British Columbia, during which he traced the course of the Fraser River for a considerable distance [7].

As *Plumper* was proving too small and defective, the fine, roomy, coalburning paddle-sloop *Hecate* was sent from England in 1861 to replace her. By the end of 1862, Richards had completed his survey of Vancouver and part of British Columbia and early in 1863 sailed for England in the *Hecate*. Daniel Pender was left to complete the coasts of British Columbia, using a hired paddle-steamer, the *Beaver*. Pender remained on this task for 8 years, being promoted to Staff Commander in January 1869, and returned to England in 1871, having completed the examination of the western seaboard of the islands which front the coast of British Columbia northward of Vancouver Island — including the inner ship-channels of communication as far as the northern boundary of British Columbia and many large-scale surveys of anchorages.

The last British contribution to the surveying of British Columbia began in



1898 when *Egeria*, commissioned the previous year by Commander Morris H. Smyth, arrived from England. *Egeria* remained surveying off British Columbia until 1910; in 1898, the dangerous Ripple Shoal in Johnstone Strait was examined and the differences in longitude from Esquimalt and Vancouver to McGill Observatory, Montreal, were determined with cordial cooperation from the Observatory and Canadian Pacific Railway telegraphs; at intervals, the ship broke off to complete soundings for telegraph cables across the Pacific — in 1899, for example, 166 soundings were obtained at 20-mile intervals with an average depth of 2,420 fathoms. Smyth was relieved in 1900 by Commander Cortland Simpson who, in 1903, handed over the task to Commander John F. Parry. Captain Frederick Learmonth took over the command of the ship in 1906, the year after the ship had damaged a bilge through grounding on an uncharted reef near Thetis Island and her senior assistant, Lieutenant G.E. Nares, had died, whilst Lieutenant I.B. Miles had joined the Canadian Hydrographic Service on Canada's assumption of hydrographic responsibility. Captain John F. Parry returned to command *Egeria* in 1908 with orders to take her to Australia but she was unfit for this service and continued in British Columbia to the end of her useful life in 1910. In March 1911, Parry handed over to Lieutenant Oswald T. Hodgson who prepared her for sale in April 1911, thus completing British work on this coast.

There is a permanent reminder in Taunton of an important phase of British activity on this coast. Joseph Whidbey, the Master of Vancouver's *Discovery*, spent more time away from the ship in small boats than any other officer; he later served as Master Attendant at both Sheerness and Plymouth before retiring on 31 March 1830 to Taunton where he died on 8 October 1833 and is buried in St. James' Churchyard — not 400 metres from the author's present house.

## EAST COAST

In 1497, the Italian-born John Cabot, sailing under Letters Patent granted by King Henry VII, discovered Newfoundland. As a result of this voyage and similar ones — such as those by the Frenchman Jacques Cartier — the east coast of Canada began to appear on maps in rudimentary form. Newfoundland, for instance, was depicted as a number of islands in Jean Rotz's world atlas, which he presented to Henry VIII in 1542 [1]. Perhaps the first British chart showing the east coast of Canada is an undated, unsigned chart of the North Atlantic in Thames School style, attributed to Thomas Hood (159?), which also shows Newfoundland as a number of islands [2]. Gabriell Tatton's chart of the North Atlantic 1602, also of the Thames School [3] depicts Newfoundland in a more recognizable shape. These early British manuscript charts and the engraved ones by John Seller published at the end of the 17th century were based mainly on Dutch sources. The first British map, based on personal experience, was that of Newfoundland by Captain John Mason, who spent the summers of 1616 and 1617 surveying its southern coasts. This map was eventually published in 1625 [4].

It was not until the 18th century that the British carried out any detailed surveys off the east coast of Canada. In 1716 Captain Thomas Durell assisted by

Mr Gaudy, surveyed the south coast of Newfoundland, producing 2 charts as a result. Durell returned to Newfoundland in HMS *Scarborough* in 1732-5 and produced plans of Torrington Harbour in 1732, Port Wager in 1734 and Franklands Harbour in 1735. In 1736 Durell surveyed the south coast of Nova Scotia [5]. It was not, however, until the start of the Seven Years' War (1756-1763) that British hydrography made any great impact. Some notable work was done in the 1760s by Charles Morris, Nova Scotia's Surveyor General, a dozen or so of whose surveys are held in the archives of the Hydrographic Department. A real boost, however, came in the unlikely guise of 2 British Army Officers (one Swiss and the other Dutch born), an emigre from Germany and an ex-merchant seaman trained in Whitby colliers — Des Barres, Holland, De Brahm and Cook.

In the 18th century, charts showing the east coast of Canada were issued by most of the leading British chart publishers — such as Faden, Sayer, Kitchen, Bowen and Mount and Page. It was the latter firm that published, in 1759, Cook's first chart, *Gaspé Bay and Harbour*. His later charts of the St. Lawrence were, however, first published by Thomas Jeffreys. Cook was allowed to publish his Newfoundland charts for his own benefit. However, when he was appointed in command of the *Endeavour*, Cook sold his copper plates to Jeffreys, who published them in atlas form as *A Collection of Charts of the Coasts of Newfoundland and Labrador, etc.*, which also incorporated the work of Michael Lane and Joseph Gilbert. After Jeffreys' death, the plates were bought by Sayer and Bennett and later acquired by Laurie and Whittle, who last advertised two of Cook's charts in 1886 [6].

Joseph F.W. Des Barres was born in 1721, probably in Basle, Switzerland, where he was taught mathematics by father and son Bernouilli, who can be compared with Galileo, Newton, Legendre and Laplace. In his early 30s, he joined the British Army, and, after some 3 years at the Woolwich Royal Military Academy, was commissioned in the newly-formed British Royal American Regiment (23 February 1756) and sailed for N. America in spring 1756 as an engineer. Whilst he had learned little new whilst at Woolwich, he had used his time to study surveying and, during the winter of 1758, he began a survey which by 1759 had produced a large-scale chart of the St. Lawrence which, with those of others — including young James Cook — was used when Wolfe moved up river to Quebec City; towards the end of the Seven Years' War, Des Barres joined a 1762 expedition to recapture Saint John's, Newfoundland, and then surveyed many of the island's principal harbours.

His hydrographic work came to the attention of the senior Royal Naval Officer, Captain Richard Spry, who arranged for Des Barres to be seconded to the Royal Navy as a hydrographic surveyor. The British had split their newly won possessions in North America into two Districts, each with a Surveyor General; in charge of the North was Samuel Holland, in the South was William De Brahm — both appointed by the Board of Trade.

Samuel Holland was, appropriately, a Dutchman, born about 1728, who, after mathematical training, enlisted in the Dutch Army before transferring to the British and joining the Royal American Regiment. De Brahm was a German military engineer who had — because of religious persecution — emigrated in 1751, to Georgia, where he became Provincial Surveyor in 1755. With these two appointments made, there was no room for Des Barres in the land surveying hierarchy so

he concentrated his efforts on hydrographic surveys of the eastern coast of North America under the direction of the Admiralty.

Holland, between 1764 and 1766, surveyed St John's (Prince Edward) Island and Cape Breton Island and, until 1770, surveyed the lower St Lawrence and many of its tributaries and the upper St Lawrence from Montreal to what is now Ogdensburg in New York State, before pressing his surveys south as far as Cape Cod.

Des Barres concentrated far more on hydrography than did Holland or the French surveyors, whose earlier excellent work was available through the charts published by Jacques Nicolas Bellin. Until Des Barres' work — as the English map-maker Thomas Jeffreys wrote in 1755 — “the generality of mariners seem to know of no qualities in observing latitudes, farther than to find the place where they are bound to; and when they come in sight of land, lay their quadrant aside — as an instrument no longer of use — and sail by direction of the coast”. Geographers were often too broad in their observations, mariners too inaccurate — regarding an error of 8 or 10 minutes (of latitude) as but a trifle. Des Barres was to put things right. Although he seems to have had no official staff, he borrowed many young Naval officers as his assistants and hired local civilians to man his small open boats (shallops), paying their wages out of his own pocket (he was then but an Army Lieutenant) and keeping a good table, especially during the long winter months when — by the light of candles and under his supervision — the summer's work was translated into charts. Among the Royal Naval officers to assist both Holland and Des Barres was Thomas Hurd, who was to succeed Alexander Dalrymple as British Hydrographer in 1808.

Des Barres spent two years surveying the Isle of Sable alone; despite its low economic value, he realised the navigational importance of the sandbars extending over 15 miles from either end into the major shipping lanes and the dangers thereabouts due to fogs and strong currents : by 1769, he sent back to the Admiralty charts of the Isle of Sable, the eastern part of Nova Scotia, Chedbucto Bay, Richmond Isles and the Gut of Canso, yet was unhappy at his slow progress. The first edition of his magnificent “Atlantic Neptune” appeared in 1777 and the fourth and last in 1784; in 1778 he published a set of sailing directions to accompany the first part of the Neptune — which was made up of five books; unusually for this period (when pirating of data was common and copyright unknown), Des Barres gave credit meticulously to all sources of data other than his own. De Brahm had returned to England in 1771, as did both Holland and Des Barres in 1774; by 1776, both land Surveyors General had returned to North America; so, on the outbreak of the American Revolution, Des Barres was given the task of providing a British Fleet of over 100 capital ships with the charts and precise information they needed and was able to provide them with an advantage because not even the local American pilots could match the accuracy of Des Barres' information. His Neptunes were not improved upon until Henry W. Bayfield began his surveys of the Gulf of St. Lawrence in 1828 (continuing them until his retirement in 1856); the Bay of Fundy was next surveyed in the 1840s by Captain William Fitzwilliam Owen and Nova Scotia in the 1850s by Captain Peter F. Shortland.

But, before dealing with the work of these later surveyors, mention must be made of the facet of Des Barres' life of perhaps even greater importance than the painstaking practical work which he produced. This was a very fertile period for

British hydrography, and the winter evenings spent in Des Barres' house must have resulted in much "shop" talk : certainly there was cooperation between Holland and Charles Morris, whose joint survey of St John's Harbour and River is in the Library of Congress. But the most important protégé was James Cook. As has been mentioned earlier, the young James Cook had begun to produce surveys during the Seven Years' War; he was later to work with both Holland and Des Barres, supplementing their profound mathematical and army backgrounds with his seaman's experience. It could be that his "mariner's eye" was helpful to the engineers. But when Cook sailed as Master of HMS *Pembroke* for Canada in February 1758, he had done no surveying. In May 1759, the advance British forces had penetrated up the St Lawrence to within about 30 miles of Quebec, where the main navigable channel changes from the north to the south bank over a complicated stretch of water known as The Traverse: the buoys had all been removed by the French defenders and, on 8 June 1759, the Masters of all the British ships present, Cook prominent amongst them, began to rechart and rebuoy the channel, working at night and within range of the defenders' guns; by 25 June, a British Fleet of over 200 ships surprised the defence by making the passage of The Traverse without a single casualty. Cook later drew a 10-foot-long manuscript fair chart — of which three copies remain — probably in England in late 1762. Cook remained in Canada when *Pembroke* returned home in September 1759, as Master of HMS *Northumberland*, spending the winters in ice-free Halifax but spending the summers of 1760 and 1761 surveying in the St Lawrence below Quebec, when his other duties allowed, continuing in 1762 in Newfoundland and off the coast of Nova Scotia.

His work was so well received that Captain (later, Lord) Graves, the Governor of "Newfoundland, Labrador, etc." took Cook with him to Newfoundland in 1763; that year, he surveyed the islands of St Pierre et Miquelon before these were handed back to France under the terms of the Treaty of Utrecht. In 1764, when Captain Palliser became Governor, Cook was appointed in charge of the survey of Newfoundland as King's Surveyor (rating as Master) in a small schooner *Grenville*, with a crew of nine.

Having measured a base at Noddy's Harbour, on the north coast, and extended his control westwards through the Strait of Belle Isle to Point Ferolle, Cook ran soundings over The Grand Banks on passage back to Deptford, where his tiny vessel was converted to a brig. For the next three years, Cook sailed *Grenville* across the Atlantic for about five months' surveying off Newfoundland, sailing for the last time to Deptford in October 1767. Perhaps even more significantly, he had, in August 1766, observed an eclipse of the sun at Eclipse Island in the Burgeo Islands; the accurate observation of longitude obtained brought him to the attention of the Royal Society and led to his appointment in 1768 to observe the transit of Venus in Tahiti and to his three circumnavigations of the world.

Whilst Cook was delineating Newfoundland, Joseph Gilbert was similarly employed, in HMS *Guernsey*, off the coast of Labrador in 1766, with Michael Lane as assistant; Lane relieved Mr Parker as Master's Mate of Cook's *Grenville* in late 1766 and, when Cook left at the end of 1767, Lane took command and continued to work for about five months each year off the coast of Labrador until, in 1772, he resumed more detailed surveys of Newfoundland, including Placentia Bay

(1772), St Mary Bay (1773), Conception Bay (1774), Cape Bonavista to Cape Spear and Trinity Bay (1775). Between 1776 and 1777 Lane was appointed Master in HMS *Lyon* under Lieutenant Richard Pickersgill; Lane does not seem to have returned to Newfoundland again until 1784 when he surveyed the vicinity of the Virgin Rocks; in 1785 he surveyed Fogo Island and, in 1791, William Faden published a chart bearing the title "The Island of Newfoundland laid down from surveys taken ... by Lieutenant Michael Lane, Principal Surveyor of the said island 1790".

Another officer from *Grenville* who figured briefly, was John Cartwright who, in 1768, had reached the source of the River Exploits and drew a very beautiful chart of Lieutenant's (now, Red Indian) Lake, the River Exploits and part of Notre Dame Bay.

There seems to have been somewhat of a lull in British surveying on Canada's Atlantic seaboard from about 1776 till 1813 — apart from the years 1800-01 when Francis Owen, Master of HMS *Agincourt*, was employed surveying St John's and other areas on the east coast of Newfoundland. However, in about 1813, Anthony Lockwood (who was to describe himself as "Professor of Hydrography and Assistant Surveyor General of the Provinces of Nova Scotia and Cape Breton" but who was a Master RN) was appointed by Sir Alexander Cochrane to carry out a survey of Nova Scotia. Using a hired vessel and crew, and without an officer to help him, he completed his work in 1818 when he published a book containing charts of several ports in Nova Scotia; in the same year he published a chart of New Brunswick. Also, between 1814 and 1820, Mr George Papps Holbrook, Master RN, was employed in command of RN Brig *Sydney* surveying the east coast of Newfoundland; from 1817 to 1820, his astronomical surveyor was Mr. William Bullock, whose elder brother, Lieutenant Frederick Bullock, joined the team, on half-pay, in 1821-22.

Mr. Holbrook was relieved in command of HM Brig *Snap* by Lieutenant John Hose a month after commissioning her in 1821; Hose was probably the first to continue work over the ice in winter but his work was subsequently published under the name of Lieutenant Frederick Bullock, who relieved him in May 1823. By the fall of 1826, F. Bullock had surveyed the whole of the coast between Notre Dame Bay and Cape Bauld; working under him in *Snap* was Edward J. Bedford, another young officer who, together with his brother, George Augustus, was to achieve later acclaim for their surveys around the British Isles. From 1821 to 1827, Thomas Smith also undertook surveys off Newfoundland in the *Scrub* and the *Inspector*, tenders to the *Snap*. However, an even greater name was now to appear off Canada's east coasts.

Whilst in London from 1826 to 1827, drawing his charts of the Great Lakes, Bayfield managed to persuade the Admiralty that surveys were needed of the St Lawrence River and Gulf of St Lawrence, pointing out that there was still no chart whatever of the river between Montreal and Quebec or from Quebec to Anticosti Island (ignoring Cook's surveys in the 1760s and the work by Holland and claiming that Des Barres' charts were "very incorrect").

In September 1827, Commander Bayfield arrived in Quebec with two assistants : Lieutenant Philip Collins and Midshipman Augustus Bowen; a year later, a Dr. William Kelly joined the St Lawrence survey team — to remain for 20

years as a surveying surgeon. Bayfield ordered a 140-ton schooner, *Gulnare*, to be built to his specification with two boats; he also ordered two six-oared cutters to be built as survey boats. Bayfield spent the next fourteen years, 1827-1841, with headquarters in Quebec City, conducting the St Lawrence survey including the entire north shore of the St Lawrence River, Lac Saint-Pierre, Quebec and Montreal harbours, the navigable part of the Saguenay River, the northern Gaspé coast, the Strait of Belle Isle, the coast of Labrador from Belle Isle to Cape St Lewis, the Belle Isle coast of Newfoundland, Anticosti, the Magdalen and other St Lawrence islands, Baie des Chaleurs, the New Brunswick coast of Northumberland Strait and the main rivers and harbours along all these coasts.

During the summer, Bayfield drove his team very hard, setting very high standards; he worked from daylight to dark, six days a week and sometimes even on Sundays. In boats only 25 feet long, loaded with provisions, tents, bedding, extra clothes, instruments, cooking gear, etc., there was barely room for the oarsmen's feet but, even in the exposed, open areas in which they worked, little water was shipped; when the weather became too severe in the fall to work in the exposed outer areas of the Gulf, Bayfield moved to Lake St Peter or the sheltered waters of the river between Montreal and Quebec. In late October, the team returned to Quebec to plot their season's work. After meticulous checking by Bayfield himself, the plans and charts were sent back to the Hydrographic Office in London to be engraved.

Bayfield was promoted Captain in 1834 but, in September 1835, Lieutenant Collins died of apoplexy whilst surveying the Magdalen Islands; his place was taken by Lieutenant John Orlebar. At the start of the 1841 season, Bayfield moved his headquarters to Charlottetown, Prince Edward Island — a harbour more central to his next surveying project and with a longer ice-free navigation season. For the next fifteen years, Bayfield and his two assistants (Orlebar and George Augustus Bedford — who had replaced Bowen in 1839) concentrated on the coasts of Prince Edward Island and Nova Scotia; his assistants usually worked independently for a few days or weeks but Bayfield was always in command, issuing explicit instructions and requiring regular reports either in person or by post.

By 1848, Bayfield had surveyed the entire coastline of Prince Edward Island (including its bays and deeply indented harbours) and the Northumberland Strait coast of Nova Scotia and resurveyed the northern Gaspé coast which had not been surveyed in detail in 1828/29. For the next five years, he concentrated on a survey of Cape Breton Island, the Strait of Canso, Ile Madame and Bras d'Or Lake. His last survey was in 1852 and 1853, of Halifax harbour and the adjacent headlands and bays. At the end of this, his health began to fail and he concentrated on his "Sailing Directions for the Gulf and River of St Lawrence" which he had produced, chapter by chapter, each year from 1828, this epic work was published in three stages, in 1837, 1847 and 1857; the entire work was revised and published, in 1860, in two volumes as "The St Lawrence Pilot".

Finally, Bayfield wrote "The Nova Scotia Pilot" in two parts (in 1856 and 1860); in 1856, he retired, as a Rear Admiral, to live quietly with his wife and six children at Charlottetown until his death in 1885, aged 90. After his death, Captain Boulton, RN, said "The Admiralty Surveying Service had produced good men, from Cook onwards, but I doubt whether the British Navy has ever produced so gifted and zealous a Surveyor as Bayfield. He had a marvellous combination of

natural talent with tremendous physical energy and was a man who would have gained the summit of any profession he might have honoured for his one thought was his work”.

It must seem almost presumptuous to question his work; yet this was only as good as the equipment and techniques available to him; that they sufficed for well over 50 years is a great tribute to this man who, above all others, provided the foundation for hydrography in Canada.

When Commander John Orlebar relieved Bayfield in January 1857, he had been his senior assistant for over twenty-one years. He introduced the steam-driven vessel, *Lady St Marchant*, to the survey and, between 1852 and 1864, surveyed from Codroy eastwards to La Poite, from Laun to Great Burin and from Cape St Mary and St Mary Bay to Cape St Francis — including many excellent plans of harbours. Owing to failing eyesight, Orlebar retired at the end of 1864 and handed over to Staff Commander James Hooper Kerr.

In 1865, the Admiralty decided on a thorough resurvey of Newfoundland which was progressed systematically by Kerr until he handed over to Staff Commander William Frederick Maxwell in 1871/72. Maxwell not only worked around Newfoundland but also surveyed in the St Lawrence River and triangulated the Labrador coast during his eighteen years in Newfoundland.

Staff Commander William Tooker relieved Captain Maxwell in 1891 and resurveyed the west coast of Newfoundland from Cape Anguille to Cape Rich, White Bay on the east coast, and the greater part of Exploits Bay. He also made several plans on the Labrador coast and, in conjunction with Commander Purey-Cust in HMS *Rambler*, sounded out the Strait of Belle Isle; later, in 1903, he continued sounding considerably to the eastward with Commander Learmonth in HMS *Goldfinch*. Tooker continued work after his official retirement in 1907, handing over to Captain J.W. Combe in 1908.

Writing as long ago as 1913, Lieutenant J.A. Rupert-Jones, RNR, reported that during Captain Combe's five years in Newfoundland, the first months of each season were devoted to systematic sectional lines across the western approach to the Strait of Belle Isle which “are of extreme importance not only from a hydrographical point of view but from that of the geologist. They developed a tremendous area of shallow water in the centre of the Gulf of St Lawrence, about 30 miles north of Cape Rich and stretching east and west for many miles directly along the steamship route. This submarine plateau... carries a general depth of 30 fathoms with heads rising to within 20 fathoms of the sea level and appears to be striated by decayed basaltic dykes carrying 70 fathoms running NNE and SSW; these dykes or clefts are found on both the neighbouring shores of Newfoundland and Labrador and form an interesting study... to officers interested in geology”. Prophetic words.

The final British surveys in Canadian waters took place in HMS *Challenger* from 1932-34 under Captain Guy Wyatt; although she was echo-sounding at the time she ran on a pinnacle rock and only the efforts of two divers working in water only a degree above freezing point got the leaks under control sufficiently for her to reach Battle Harbour whence she was escorted to Halifax for docking. A wintering party was landed at Nain, in November 1933, under Edmund H.B. Baker

who made an epic sledge journey from Nain to Hebron to help a trader in difficulty with the Esquimaux; the party was collected in July 1934, shortly before *Challenger* left Canadian waters, thus concluding the British surveys in Canadian waters.

## THE GREAT LAKES

The early exploration of the Great Lakes was carried out by the French and, as early as 1672, the shape of even remote Lake Superior was accurately depicted on a Jesuit map [1]. While navigation on the Lakes was mainly confined to bark canoes and boats there was no need for charts with their soundings and navigational aids. The Seven Years' War illustrated the value of water transportation for the armies and, subsequently, its value as a means of carrying goods and passengers more cheaply, quickly and easily than by wagons.

In 1812, war started between Britain and America owing to America's objection to British restrictions with regard to neutral trade with Europe and her insistence on searching vessels for naval deserters. During the two-year war, there were naval battles on the Great Lakes. Following the Treaty of Ghent, in 1814, Captain William Fitzwilliam Owen was appointed Senior Officer Commanding The Great Lakes and Naval Surveyor in March 1815; he had already distinguished himself as a navigator and surveyor in the Maldives and South-East Asia.

Originally it had been intended to operate from Quebec, but Owen chose Kingston as being closer to his intended survey area, and recruited Lieutenant Alexander T.E. Vidal, Master's Mate Alexander B. Becher and John Harris, Master RN; using the schooner *Huron*, they proceeded up the St Lawrence and, by the end of 1815, were surveying the eastern shores of Lake Huron and Georgian Bay. In January 1816, Owen also recruited Henry Wolsley Bayfield who had been born in Hull in January 1795 and accepted as a "young gentleman, supernumerary volunteer 1st Class" two weeks before his 11th birthday; within nine months he had served in three ships, including HMS *Duchess of Bedford* in which young Bayfield was slightly wounded during an action in the Straits of Gibraltar. His captain, Francis Spilsbury, reported to the First Lord that "though a youth (he was 11 1/2), he displayed presence of mind that would well become the greatest Warrior".

After this auspicious start, he was made a Midshipman in 1810 and visited Quebec and Halifax; after service in the West Indies and off the Iberian Peninsula, he joined the British Flotilla on Lake Champlain in October 1814. Although promoted to Lieutenant in March 1815, he was still serving as a Midshipman in HMS *Prince Regent* when Owen persuaded him to join him in HM Sloop *Star* in the 1816 surveys of Lake Ontario. He made such a good impression that the experienced Owen commended him, within six months, to Mr. Croker, Secretary of the Admiralty, and at the end of the 1816 season Owen persuaded him to remain rather than return to England.

Bayfield accepted without hesitation and, when (as a result of the scrapping of all Fleets on the Great Lakes in accordance with the Rush-Bagot agreement) Owen had to return unexpectedly to England in mid-1817, Bayfield — then aged 22 — was placed in charge of the surveys of Lakes Erie and Huron, but with a



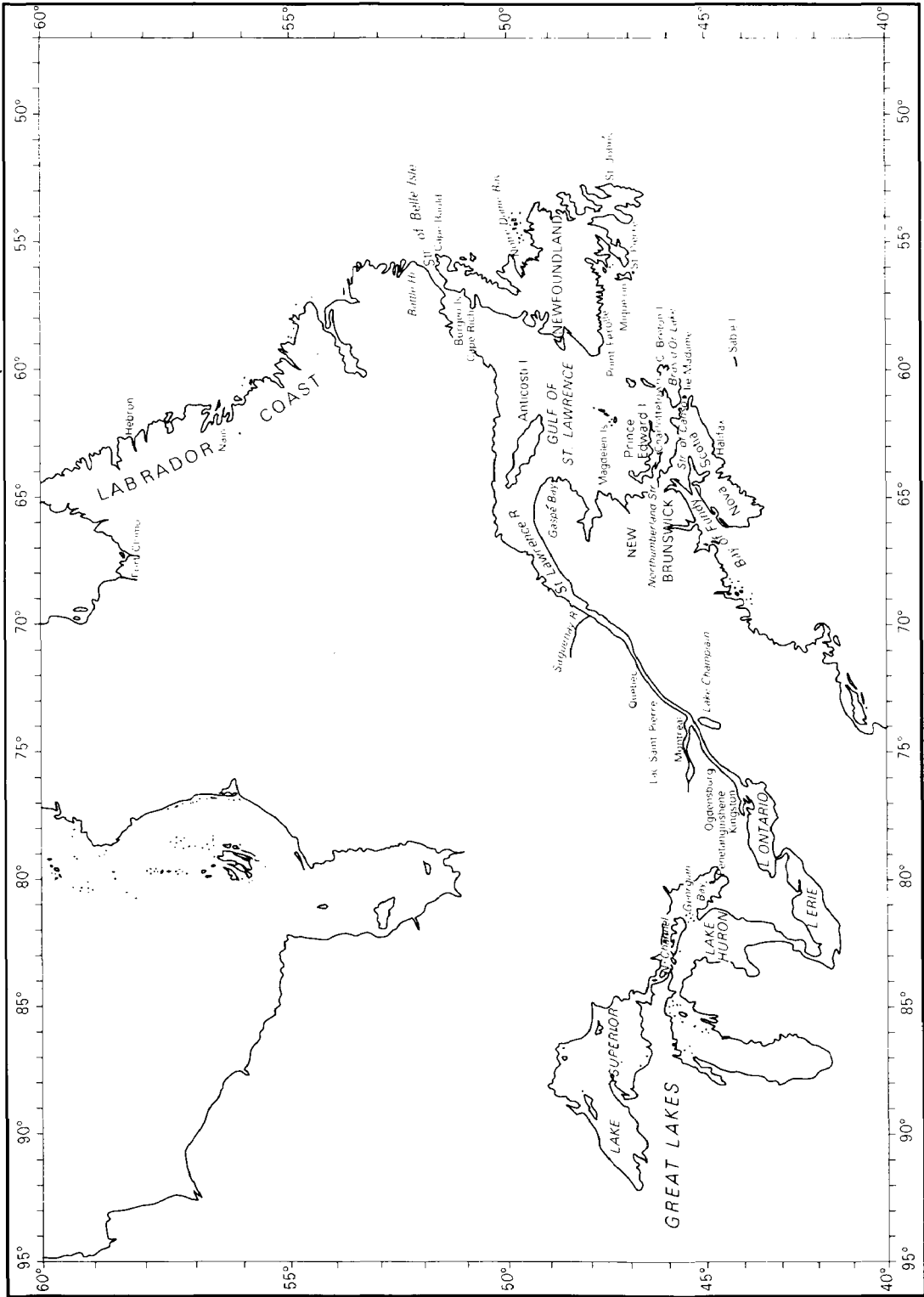


FIG. 2. — The Great Lakes region and the Atlantic Coast.

greatly reduced establishment, including an inexperienced Midshipman, Philip Collins, and but two boats, the *Troughton* and the *Ramsden*. Having completed the survey of Lake Erie in 1818, Bayfield began to survey the more intricate Lake Huron, based at Penetanguishene. This was to last for the four seasons 1819-1822, including the delineation of about 20 000 islands and numerous deep bays and coves; conditions must have been appalling — swarms of mosquitoes and flies in the summer, near-zero temperatures in the winter, no shore facilities and, with at times six weeks' provisions in their small boats, barely room to sit, let alone lie down to sleep.

In the spring of 1823, Bayfield moved his party into Lake Superior with the schooner *Recovery*, chartered from the Hudsons' Bay Company, as a floating base, as he found it faster to survey in the boats. Even when wintering at Fort William, the party was very isolated, with no medical aid and mail only once in six months. Promoted Acting Commander in 1823, Bayfield persevered and by the end of the third season, in late 1825, the team had circumnavigated the largest freshwater lake in the world, and Bayfield and Collins were able to return to England to work up their results into charts that were to serve well for over 50 years.

The hardships they had endured and the excellence of their work resulted in Bayfield being promoted to Commander and Collins to Lieutenant in 1826. Despite his efforts, Bayfield was honest enough to report to the Hydrographer in 1827 that "whilst the charts which I have just finished are as critically correct in all the details as to render any future survey of them unnecessary for nautical or general purposes, it is highly desirable that they should be filled up with soundings which — except to a certain extent from the shore — I could not obtain without a vessel".

For the next 58 years, the only surveying done in the Great Lakes was by the United States Lake Survey who, from 1841, began to tackle the 5 500 miles of American coastline and about 61 000 square miles within the U.S. portion of the Great Lakes.

Following the tragic loss of the passenger and cargo carrier SS *Asia* on 14 September 1882, during a violent storm on Lake Huron, unproven claims of her having hit an uncharted shoal provoked public opinion to demand more modern surveys than those by Bayfield within the Canadian sector. The volume of traffic and increased size of vessels since 1826 was certainly justification for a full scale Canadian surveying and charting programme.

Under the British North American Act of 1867, the Canadian Parliament had attained authority over certain navigational matters and no Imperial funds were available for surveying. The Canadian Government, unable to find a qualified hydrographer in Canada, approached the British Government and the British Hydrographer, Captain Sir Frederick Evans, instructed Staff Commander William Maxwell — the officer in charge of the surveys of Newfoundland (not then, of course, part of Canada) — to go to Ottawa to discuss the requirement. As a result, Staff Commander John G. Boulton was appointed, on loan to Canada, to take charge of the surveys, then called "The Georgian Bay Survey", from July 1883 until April 1893.

Boulton was an experienced surveyor, having already spent nine years in Newfoundland and Labrador during which, in 1880, he had been loaned to the Hudson's Bay Company for a voyage to Fort Chimo. Although it was hoped that

at least Bayfield's coastline could be accepted, this proved inadvisable and Boulton, accepting the U.S. geodetical control, decided to start his survey at the entrance to Georgian Bay from Lake Huron and the North Channel [1]. After chartering the fishing tug *Ann Long* for the last working days of 1883, he spent the winter drawing up plans for the 1884 season and selecting a Canadian assistant, William J. Stewart, from the Royal Military College, Kingston.

Early in 1884, the 20-year-old former American tug *Edsell* was bought and, after a refit and conversion, was renamed *Bayfield* — for obvious reasons. Although his fair sheets were still rendered to the British Admiralty for inclusion in British Admiralty charts, Boulton also in each year produced, for local use, a new chapter of the "Georgian Bay and North Channel Pilot", starting in 1885 from his 1884 work. Also in 1885 he recruited a second graduate from the Royal Military College at Kingston and eventually added a third assistant. By the start of 1886, the first Admiralty chart from Boulton's surveys — No.906 covering Lake Huron from Cabot Head to Cape Smith and the Entrance to Georgian Bay — was available.

Each year, *Bayfield* wintered at Owen Sound when the lakes became frozen over; by 1887, Boulton was working on the northern shore of Lake Huron which was progressed each year until, by 1891, the eastern shores of Georgian Bay were reached and, in April 1893, Boulton felt able to hand over to his Canadian deputy William Stewart and return to England. During his eleven years in the Great Lakes, the British Admiralty published thirteen general, coast and harbour charts for the Great Lakes — eight of Georgian Bay and five for the North Channel. Although British Admiralty charts were the primary documents for a considerable period, and the Canadian Hydrographic Service was not brought into being until an Order-in-Council dated 11 March 1904, the appointment of Stewart may be considered to have brought to an end the British surveying contribution to the Great Lakes — or Georgian Bay — surveys.

## THE NORTH COASTS

In 1817, William Scoresby — a whaling friend of John Barrow, Second Secretary to the Admiralty — reported that, after many years of whaling experience, he was confident that a seasonal recession of the Arctic pack ice had taken place. To Barrow, the senior civil servant in the Admiralty who had travelled in his youth in a whaler to Greenland, this suggested that the time was ripe to renew the attempts to find a North West Passage to the Pacific, which had begun some 200 years earlier when Luke Foxe had penetrated Hudson's Strait and explored Foxe Basin and since Baffin had passed through Davis Strait to Baffin Bay.

In 1818, Barrow, strongly supported by Sir Joseph Banks and the Royal Society, persuaded Lord Melville, the First Lord, to approve the first of many expeditions to Arctic waters. Commander John Ross (with his nephew James Clarke Ross) in *Isabella*, with Lieutenant W. Edward Parry in *Alexander*, sailed in April 1818 and passed through Davis Strait to the western side of Baffin Bay and Lancaster Sound before turning back. The next season, *Hecla* and *Griper* sailed with the intention of wintering in the ice, with Parry in command and with Captain

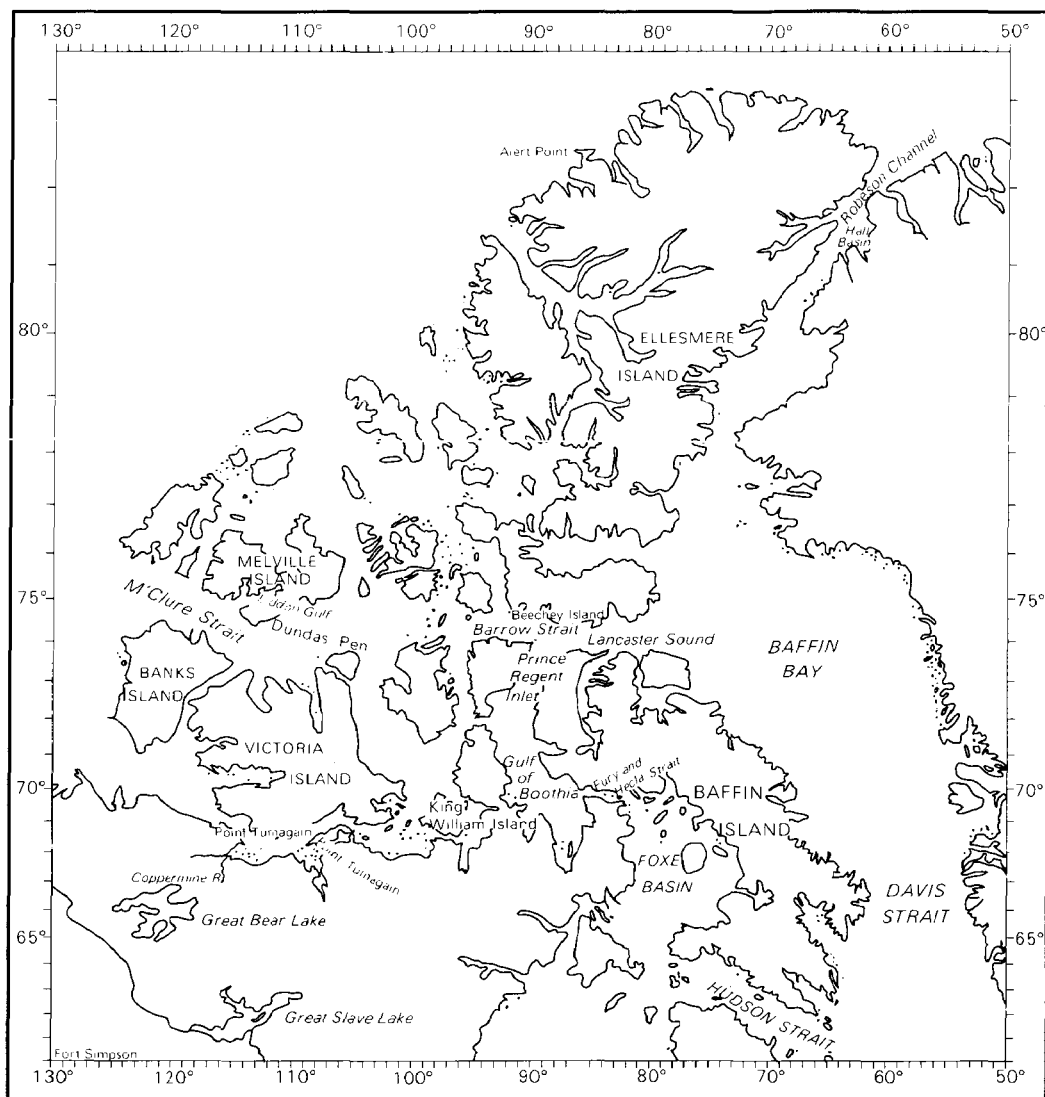


FIG. 3. — The North Coasts.

Edward Sabine as his astronomer and Frederick Beechey as his First Lieutenant; they sailed through Lancaster Sound and, after exploring Prince Regent Inlet, carried on along the north side of Barrow Strait as far as almost 114° West before turning back to a sheltered winter haven on the south coast of Melville Island; in 1820, he discovered Liddon Gulf by an overland journey across the Dundas Peninsula, before returning to Deptford about the middle of November.

In 1821, Commander Parry set off again in *Fury* with Commander George Lyon in *Hecla*; passing south of Baffin Island, they carefully explored the western side of Foxe Basin and wintered on the eastern side of Melville Peninsula. After deducing from an Esquimaux woman that a passage existed to the north of this peninsula, the ships started in early July 1822 to try to battle their way through the

ice and islands of Fury and Hecla Strait, but had to turn back frustrated by the currents and conditions; after a second winter in the ice, they returned to England in November 1823 to find that the second Hydrographer of the Navy, Thomas Hurd, had recently died.

Whilst Parry's expedition in *Hecla* and *Griper* had been reaching so far west, Lieutenant John Franklin had been sent overland to explore and survey the northern coasts with the help of the Hudson Bay and North-West Companies. Accompanied by Midshipmen George Back and Hood, Doctor John Richardson, two British able seamen and several local guides, the party travelled down the Coppermine River from the Great Slave Lake and reached the mouth by July 1821, when, turning east, they explored the coast by canoes for about 550 miles as far as Port Turnagain. Their return to civilisation was so difficult that few survived, but John Franklin, Back and Richardson were to return despite their frightful experiences.

In 1824, after Parry had become Hydrographer, perhaps the most ambitious three-pronged expedition was planned. Parry himself set off in 1825 in *Hecla*, with Commander Henry Hoffner in *Fury*; they entered Prince Regent Inlet hoping to sail south to reach the area explored by Franklin's canoe party. The ice was particularly bad that year and *Fury* was so badly damaged that she had to be beached to try to repair her; despite superb seamanship, she had to be abandoned and both crews had to return to England. The second party was a second overland trip led by Captain Franklin, again with Lieutenant Back and Dr Richardson, but this time taking all their stores with them; having built a base camp at the western end of Great Bear Lake, the team set off in June 1826, down the Mackenzie River. As soon as they reached the coast, Franklin and Back set off westwards (hoping to meet the third party — Beechey — of whom more later), but were soon attacked by Esquimaux; the calm bravery of their Eastern Esquimaux interpreter, Augustus, and Franklin's refusal to use his firearms resulted in a peaceful return of most of their gear, so that they were able to reach Return Reef (near the site of present day Prudhoe Bay, in Alaska) before returning on 18 August 1826 — bitterly disappointed not to have met Beechey.

Meanwhile, Dr Richardson had been more successful as, despite a similar encounter with the Esquimaux, his party had explored the coasts eastwards in their two small boats *Dolphin* and *Union* and reached the mouth of the Coppermine River before walking to the eastern shores of the Great Bear Lake and crossing this to their base camp to reunite with Franklin.

The third prong of the 1825 plan was Captain Frederick Beechey, who sailed in January 1825 in HMS *Blossom*, via Cape Horn, to tackle the North-West Passage from the Pacific. Although he did not reach the Canadian coast, he reached the head of Kotzebue Sound — where he had hoped to meet up with Franklin — by 25 July 1826 and sent Mr Elson, the Master, in a barge to survey the coastline and build beacons on any prominent points with messages for Franklin; having explored 125 miles, Mr Elson turned back at Point Barrow — only some 160 miles short of Franklin's Return Reef. Beechey sailed south in mid-October but returned next summer, without any further success.

Parry's third voyage to the North-West — again in *Hecla* — was more scientific than surveying, as was the privately organised expedition of John and

James Ross, which located the magnetic north pole in 1829, in a 150 ton steam vessel *Victory* (provided by the gin-distiller Felix Booth). After two winters in the Gulf of Boothia, the *Victory* had to be abandoned and the crew spent a third winter in Fury Bay (using supplies left by Parry in 1825) before very fortunately meeting the old *Isabella*, then whaling off Cape Liverpool but in which John Ross had travelled in 1818, and returning home late in 1833.

After a lull of twelve years, successful work in Antarctica and the advent of screw propulsion led Sir John Barrow to persuade Captain Francis Beaufort, the then Hydrographer, to send HMS *Erebus* and *Terror* on another attempt to force their way through the North-West Passage; the 60-year-old Sir John Franklin volunteered and was selected to lead the ill-fated expedition, which set off in May 1845. Stopped frequently by pack ice, they spent three winters without getting more than about 100°W and eventually all must have perished by the end of 1848.

Concerned by lack of any news and their non-return, some 25 separate searches were made between 1846 and 1859 to try to find their fate [1]. So much has been written of these searches, that mention can only be made here of a few. Captain Henry Kellett made three attempts from the Pacific; on the second of these, in 1849, one of his officers, Lieutenant William J.S. Pullen, using *Plover's* boats, explored the Alaskan coasts beyond the point reached by Mr Elson in 1826 and, indeed, reached the Mackenzie River and made his way up this in his two whaleboats to Fort Simpson — thus completing the British survey of the western part of Canada's northern coast. Having made his way overland nearly to the Great Slave Lake by 25 June 1850, he was amazed to find two Indians in a canoe with a message from Beaufort saying that he was promoted to Commander but would he return for a further search for Franklin. Undaunted, he returned for another search, without success.

A second expedition from the Pacific was that under Captain Richard Collinson in HMS *Enterprise* with Commander Robert M'Clure in HMS *Investigator*, which left England in 1849, after an unsuccessful search by the two ships, under Captain Sir James Ross from the east in 1848. *Investigator*, having met Kellett in *Herald* off Alaska in 1850, pressed on alone and, entering M'Clure Strait, reached the longitude previously reached by Parry in 1819, but became stuck in the ice at Mercy Bay, on the north coast of Banks Island, where he remained for three years. Collinson, not entering Bering Strait until 1851, followed the Alaskan coast and in 1852-1853 wintered at Cambridge Bay, 105°W, near the south-east corner of Victoria Island. Both Collinson and M'Clure sent parties exploring by sledge and leaving cairns and messages about their achievements during the winters spent in the ice.

Meanwhile, a carefully planned expedition under Captain Austin, with two 400-ton sailing barks *Resolute* and *Assistance* and the screw sloops *Pioneer* and *Intrepid*, had spent 1850 and 1851 making a thorough search by boats and winter sledge journeys and finding the first evidence of Franklin's tracks — his first winter's quarters at Beechey Island. In April 1852, the same four ships left England, together with the sloop *North Star* as supply ship, under Commander Pullen, but with the well-named Captain Sir Edward Belcher in overall command in *Assistance*, the experienced Captain Kellett in *Resolute*, and Commander Leopold McClintock in *Intrepid*. On reaching Lancaster Sound, Belcher and Lieutenant Sherard Osborn, in *Pioneer*, searched northward through Wellington Channel whilst Kellett took

*Resolute* and *Intrepid* searching westward towards Melville Island, leaving *North Star* at Beechey Island. During the 1852 winter, Commander George Richards, Belcher's deputy, made an epic 95-day sledge journey to search and survey the islands and channels to the north of Melville Sound, during which he met a similar sledge party, under Lieutenant Hamilton from the *Resolute*, who reported that Kellett's group, whilst wintering at Winter Harbour, on Melville Island, had found a note from Commander M'Clure reporting that *Investigator* had been iced in for the last three winters at Mercy Harbour, some 150 miles on the opposite side of Melville Sound.

As early as possible in 1853, Kellett sent Lieutenant Pim by sledge, and on 6 April 1853 the first meeting took place between expeditions approaching from either end of the North-West Passage. But there was to be no single passage through by ship until the Norwegian Roald Amundsen achieved this between 1903 and 1906, and now disaster was to strike all the British ships. After a second winter in the ice, Belcher sent orders to Kellett to abandon *Resolute* and *Intrepid* and make their way overland to the *North Star* with the crew of *Investigator*. Belcher's own two ships were also abandoned and all five crews of the abandoned ships embarked in *North Star* on 26 August 1854 to return home; luckily, shortly afterwards, they met the *Phoenix* and *Talbot* with fresh stores and orders to abandon the search.

As a postscript, an American whaling bark, *George Henry*, found *Resolute* in 1855 and managed to tow her clear of the ice and took her to New London where she was bought by the United States government, refitted and presented back to Queen Victoria at Spithead. When she was finally broken up in 1880, a large desk was made from her timbers and presented to the President of the United States [2].

The mystery of the fate of Franklin and the crews of *Erebus* and *Terror* was not solved until Captain McClintock returned to the area in the *Fox* — privately equipped by Lady Franklin — which left Aberdeen on 1 July 1857 and found a cairn with a paper, signed by Captain Fitzjames of the *Terror*, dated 25 April 1848, certifying that both ships had been trapped on 12 September 1846 and abandoned on 22 April 1848, on the western side of King William Island.

The final British contribution was to the furthest point north yet reached. On 29 May 1875, Captain George Nares, in the screw sloop *Alert* with Captain Stephenson in the similar *Discovery*, passed up the east coast of Ellesmere Island; leaving *Discovery* on the west side of Hall Basin, Nares continued northwards through Robeson Channel, before wintering in a higher latitude than any earlier ship had reached. During the winter, sledge parties left under Commander Clements Markham to try to reach the North Pole and under Lieutenant Pelham Aldrick who surveyed the northern coast of Ellesmere Island as far as Alert Point; the whole of *Alert's* crew were then attacked by scurvy and only skilled work from both ships enabled the expedition to return at the end of October 1876.

Thus, over a period of some 60 years, numerous British expeditions had explored the Arctic unknown, in robust but very small vessels, appalling weather, and often very poor medical conditions, but with enormous courage, energy and tenacity. Many lives were lost in the illusive search for a North-West Passage, the economic potential of which was finally demonstrated when the 116,000 ton British Petroleum tanker *Manhattan* forced her way through Barrow, Melville and McClure Straits in 1969.

## CONCLUSIONS

This account indicates that, thanks to the ready acceptance of hydrographic responsibility by the Canadian Government much earlier than other members of the British Commonwealth, the British Royal Navy's hydrographic surveyors' efforts in Canadian waters tailed off by the end of the 19th century but that, by that time, successive generations of them had given devoted service in order to produce charts which were adequate for the purposes required at the time they were executed. As everywhere else in the world, however, improving technology enables hydrographers to react to improved accuracy requirements and succeeding generations of hydrographers must recheck the work of their predecessors — however illustrious and painstaking these may have been.

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- [3] HOWAY, *op. cit.*, p. 7.
- [4] WALBRAN John T. : *British Columbia Coast Names* (Ottawa, 1909), pp. 271-272.
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