

CANADIAN SUBMARINES & SUBMARINERS

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Introduction

The Canadian Navy played a vital part in World War II and grew from a tiny force in 1939 to one with nearly 100,000 men and women and 434 major and minor commissioned warships at the end of the conflict in 1945. Among those ships were two former U-boats, *U-190* and *U-889*, which had been taken over by the Navy following the German surrender in May 1945. Although their Canadian service proved to be short lived, they were the first submarines operated by the Royal Canadian Navy (RCN) since 1922. It would be another 16 years before submarines returned to Canadian service when HMCS *Grilse* commissioned in May 1961.

Except for headline making events such as the tragic accident aboard HMCS *Chicoutimi* in 2004 or the debate over the proposed acquisition of nuclear-powered submarines in 1987-88, Canadians tend to be unaware that Canada even possesses, or has much involvement with, submarines. There is even less awareness of the chequered history of submarines in the Canadian Navy or of the men who served in them.

This paper provides an overview of that history and pays homage to those who have braved the perils and discomfort of submarine service.

World War I

At the outbreak of World War I, the minuscule RCN, then just four years old, had only the old cruiser HMCS *Rainbow*, which was based in Esquimalt, for defence of the coastal waters of British Columbia. The two old sloops HM Ships *Algerine* and *Shearwater* which were the last remnants of the British Royal Navy's Pacific Squadron were also based in Esquimalt but were in Mexican waters when the war started¹

The naval threat in the Pacific was that of the German Cruiser Squadron commanded by Admiral Graf von Spee although it was far from British Columbia waters on 4 August 1914 when war was declared. Nevertheless, the Premier of British Columbia, Sir Richard McBride, was extremely concerned over the lack of naval forces to protect BC waters in the event the German squadron approached the coast; a

¹ Michael L. Hadley and Roger Sarty, *Tin Pots and Pirate Ships, Canadian Naval Forces and German Sea Raiders 1880-1918*, (Montreal & Kingston; McGill-Queen's University Press, 1991) p 88.

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concern heightened when *Rainbow* sailed quietly on 3 August to meet the potential threat of the German cruiser *Leipzig* then off Mexico and apparently heading north.

McBride acted upon his concern and on his own initiative. He had learned that the Seattle Dry Dock and Construction Company had two submarines available for sale. *Iquique* and *Antofagasta* had been built for the Chilean Navy but the Chileans refused to accept them since there were significant unspecified deficiencies. After three days of negotiating back and forth between Seattle, Ottawa and Victoria, in the middle of the night of 4-5 August 1914, the submarines slipped out of the yard under cover of darkness. After an inspection by Canadian authorities, a cheque for \$1.2 million was handed to the President of the shipyard, James Paterson², in exchange for possession of the submarines in Canadian waters off Esquimalt in the early morning of 5 August. The following day the Canadian Government ratified the purchase and commissioned the vessels into the Navy as HMC Ships *CC 1* and *CC 2*³.



HMC Ship CC-1 (Wikipedia)

Their crews were drawn from volunteers from the Royal Navy Canadian Volunteer Reserve (RNCVR) and the tiny squadron was commanded by a retired British submariner living in Canada who was brought into the RCN. The addition of some technical personnel from the cruiser HMC Ship *Rainbow* meant there was a nucleus of naval trained personnel. Initially none had any submarine experience so training for virtually all hands was necessary.

The submarines were placed at the disposal of the British Admiralty (at the time, the fledgling RCN was fully under the operational control of the Royal Navy) which decided that they should remain in BC waters for training purposes. There they stayed until the summer of 1917 when they were ordered to Halifax, NS together with their depot ship HMC Ship *Shearwater*. Thus they became the first ships to transit

² James Venn Paterson was a Scottish-born naval architect who had trained in the shipyards of the Clyde. He had moved to Philadelphia in 1895 and was credited with the invention of the expansion joint for steel ships as well as other innovative design techniques. In 1906, at the age of 39, he accepted the position of Vice President and General Manager of the newly reorganized Moran Company shipyard in Seattle.

³ Apparently they were so designated because of their resemblance to the British C-Class submarines.

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the Panama Canal flying the White Ensign⁴. They languished in Halifax until 1920 when they were sold for scrap.

Canadian WW I Submariners: Although some twelve Canadian naval officers served in submarines during World War I, two in particular served with distinction. B.L. "Barney" Johnson was a master mariner and a marine pilot with the Vancouver Pilotage Authority who was temporarily attached to the RCN in Esquimalt. The temporary attachment became permanent for the duration of the war. He was commissioned as an acting Lieutenant in the Reserve and appointed as second-in-command of *CC 2*. Subsequently, he was appointed to command one of the submarines building for the RN in Montreal. He commissioned *H 8* in 1915 and took her across the Atlantic to Britain. He became the first Canadian to command a submarine and he later won the Distinguished Service Order (DSO) for his exploits in command of the submarine in the North Sea⁵.



Lt. Barney Johnson, RNVR

Unlike Johnson, William Maitland-Dougall was a regular force officer. He had entered the Royal Naval College of Canada in 1911 at the age of fifteen as a member of the first term of cadets at the new College. After graduation in 1913 he had been in a British cruiser until recalled to Canada at the outbreak of war to serve in the newly acquired submarines. In 1915 he volunteered to serve in British submarines and underwent further training in Britain. After serving as second-in-command to Lt Barney Johnson in *HMS D 3* he qualified for submarine command and replaced Johnson in *D 3*. He thus became the youngest to command a submarine and the first RCN (Regular Force) officer to do so. Maitland-Dougall was killed, just before his twenty-third birthday, on 12 March 1918 when his submarine was attacked and sunk while on the surface by a French airship in a tragic case of mistaken identity⁶.



Lt. William Maitland-Dougall, RCN
(Source: <http://www.navalandmilitarymuseum.org/>)

⁴ The White Ensign was flown by ships of the RCN until replaced by the Maple Leaf national flag in 1965.

⁵ He did not physically receive the award until December 1918 when he was invited to Buckingham Palace.

⁶ Julie H. Ferguson, *Through a Canadian Periscope, The Story of the Canadian Submarine Service*, Toronto, ON, 1995, Dundurn Press. It should be noted that there never has been a recognized Canadian submarine "Service" as such despite the implication in the title, and contents, of this book that such a "Service" exists.

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Submarine Construction in Canada: During World War I, the Canadian shipbuilding industry was very much involved with submarines. The shipyard of Canadian Vickers had been established in Montreal by its British parent, the shipbuilding and armaments manufacturer Vickers Ltd, in 1910 in anticipation of winning contracts to build ships for the newly formed Canadian Navy. By the start of World War I, the yard was fully operational and occupied in building an icebreaker for the Government.

In November 1914 the Admiralty had entered into an agreement with the Bethlehem Steel Company of Pittsburgh, Pennsylvania for the construction of 20 submarines to a design from the Electric Boat Company (EB) of Groton, Connecticut. This design became known as the H-class in British service. The submarines would be built by EB as kits in their yards in Massachusetts and in San Francisco and delivered within six months to British yards for completion. This arrangement soon ran afoul of US neutrality laws and the build of the first 10 boats was shifted to Canadian Vickers in Montreal. The contract schedule called for the first two submarines to be completed and ready for sea within four and a half months and each succeeding pair at two month intervals after that.

In a classic example of arbitrary Imperial disdain for its colonial partner, the Admiralty requisitioned Canadian Vickers on 1 January 1915. All other work in the yard ceased, including work on the Canadian Government icebreaker. The Government of Canada was neither asked nor even informed officially of this action for some considerable time. The yard itself was completely fenced off and guarded by military personnel. Work on the submarines began with the first keel laying on 11 January. The workforce toiled on a 24 hour a day basis. That the contract was completed on time and on budget is a tribute to the men who worked at Canadian Vickers and this remarkable effort is an outstanding major technical achievement. The Montreal yard later built eight more H-class submarines to the order of the Italian Government as well as six hulls intended for Russia⁷.

Meanwhile, on the West Coast, in June 1915 the intrepid James Paterson had obtained a contract from Electric Boat to build, in British Columbia, five H-Class submarines destined for Russia. The submarines would be fabricated, assembled then knocked down and packaged into kits. The kits would be shipped to Russia across the Pacific Ocean to the port of Vladivostok. They would then be transported overland by train to the Baltic.

⁷ J. D. Perkins, *The Canadian-built British H-boats*, The Great War Document Archive, 1999, <http://www.gwpda.org/naval/cdnhboat.htm>.

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Paterson formed the British Pacific Engineering and Construction Company to implement the contract. He leased what is now known as a "green field" site on the south side of the eastern end of Burrard Inlet at Barnet close to the tracks of the Canadian Pacific Railway (CPR). Barnet is now part of Burnaby in greater Vancouver and the building site is part of the current Barnet Marine Park. By mid-August, in a remarkably short period of time, the yard was up and running, spur tracks from the CPR main line were in place and construction of the first submarines had begun⁸. Seven months later, in December 1915, the first kits left Vancouver by ship - an astonishing achievement.

Paterson again came to Vancouver in 1917 as the British Pacific Engineering and Construction Company was awarded a contract for six more H-Class submarines for Russia. This time a site on the Vancouver waterfront was leased from the CPR as a temporary building yard. The facility was located very close to the current Canada Place pier in modern Vancouver. Six open building slips were constructed and work on the submarines commenced in mid-April using forged and cast steel parts supplied from Canadian Vickers in Montreal. Completion date was set as 15 August - only four months from the start. By the end of August all six submarines were crated and ready for shipment - nominally two weeks late but still a remarkable feat⁹. The submarines were never delivered to Russia. After the war, they were completed in Seattle and eventually commissioned into the US Navy.

Post World War I

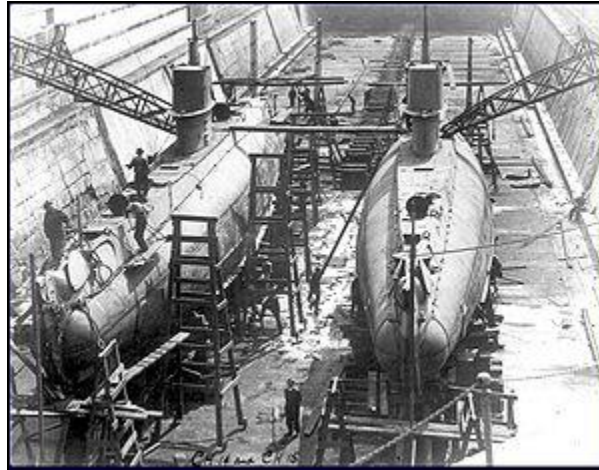
At the end of World War I, two H-class submarines that had been built in the United States were offered to the Canadian Navy by the Admiralty as they were surplus to British needs. These vessels were in Bermuda¹⁰ awaiting instructions to continue their journey to Britain when the Armistice was signed. They were paid off early in December 1918. This was a gift the Canadians did not want as they could not afford to run both submarines and do the necessary training for the surface ships. In addition there were not enough sailors to man everything. Nevertheless, under pressure from the Admiralty, the RCN reluctantly took the two submarines, designating them *CH 14* and *CH 15*. Although some effort was made to keep the submarines operational, they were laid up permanently in June 1922 after the Government refused to approve the annual upkeep costs necessary.

⁸ Bill Lightfoot, *Beneath the Surface, Submarines Built in Seattle and Vancouver, 1909-1918*, Vancouver, BC, 2005, Cordillera Books.

⁹ Lightfoot, p 43

¹⁰ Where they had been delivered under the overall command of LCdr (later Commander) Barney Johnson RNR in his final seagoing assignment in the Navy. He was demobilized in April 1919.

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CH-14 and CH-15 in Drydock
(Source – Wikipedia)

The First Hiatus-1922 to 1945

During the period from the demise of *CH 14* and *CH 15* until the outbreak of World War II, the RCN struggled to survive. Submarines were not on the acquisition list for a navy that had to fight tooth and nail for every dollar needed to keep it afloat. When war did begin, the RCN focussed its attention on sinking enemy submarines and not operating its own.

World War II

Canada did not acquire any submarines during World War II as the RCN evolved into a submarine hunting force based on surface ships. However, the submarine hunters needed to train with real submarines under operational conditions. The lack of such “clockwork mice” as the “tame” submarines came to be called had a severe impact on the operational capability of the Canadian ships deployed into the Battle of the Atlantic. At one point in mid-1943, there was a proposal to form a submarine branch of the RCN and acquire six submarines. The Naval Board ultimately rejected this proposal.

Initially the British could not spare a submarine purely for purposes of training anti-submarine (ASW) forces. Fortuitously the Dutch submarine *O 15* arrived on the scene in Halifax from the Netherlands West Indies. The RCN managed to hold onto *O 15* until well into 1942, by which time she had been joined by an obsolete but still useful British submarine *L27*¹¹. Throughout the remainder of the war, the Admiralty

¹¹ Ferguson, Chapter 13.

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allocated a series of mostly elderly (most were over 20 years old) submarines, which had been acquired by lend-lease from the USN, to the Canadians.

Even if the RCN lacked a submarine branch during World War II, it did not lack volunteers to serve in the submarines of the RN. Twenty-six officers, all from the volunteer Reserve (RCNVR or the "Wavy Navy"), underwent submarine training during the years 1942-1944. Of these, three went on to command British submarines. Two were awarded the Distinguished Service Cross (DSC) with LCdr Freddie Sherwood from Ottawa earning a second award for actions in the Far East. One officer who had volunteered for "chariot" (human torpedoes) operations was killed in January 1943 when the submarine in which he was taking passage en route to his target was sunk.



LCdr Freddie Sherwood, RCNVR

In 1945 the RCN took over two surrendered German U-boats; *U-889* and *U-190*. The former was transferred to the USN early in 1946 after supporting equipment trials by the RCN. *U-190* lasted until October 1947 when, due to her deteriorating state, she was sunk as a target off Halifax near the spot where she had sunk HMCS *Esquimalt* in April 1945¹².



U-190

(Source - <http://www.mysteriesofcanada.com/>)

The Second Hiatus - 1946-1961

The post-war RCN gradually evolved into a highly specialised ASW Navy as the Cold War progressed and the NATO Alliance became the bulwark against potential Soviet aggression. Effective operational training for the navy, and the maritime patrol

¹² Ken MacPherson and John Burgess, *Ships of Canada's Naval Forces 1910-1993*. St Catharine's ON, 1994, Vanwell Publishing.

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aircraft of the Royal Canadian Air Force (RCAF), required the services of submarines. The RN provided such services for the RCN and RCAF on the east coast after the war using the small U-class. For a variety of reasons, including cost, this arrangement was ultimately unsatisfactory for both parties.

In the early 1950s, negotiations began between the RN and the RCN for what became a complex agreement by which the RN stationed a squadron of three submarines in Halifax. In return, the RCN provided personnel for training and subsequent service in British submarines - not necessarily those stationed in Halifax¹³. In the summer of 1955 the first submarine arrived to inaugurate the Squadron. This arrangement lasted for ten years and came to a close when HMCS *Ojibwa* arrived in Halifax in 1965.

On the Pacific coast there was no similar arrangement. However, there was a good relationship with the USN and the west coast ships and aircraft frequently exercised with submarines of the USN. While this was a beneficial situation, the amount of training time available to the RCN and RCAF in the Pacific was extremely limited and insufficient to sustain high standards of operational readiness in ASW.

Throughout much of the 1950s, the RCN considered the acquisition of submarines of its own - including a study of the option of obtaining nuclear-powered submarines. The cost of the arrangement on the east coast was increasing and Britain was anxious to reduce its commitment. Finally, in 1960 the government authorized the lease of the former USS *Burfish*, a World War II era USN boat in the reserve fleet, for a five year period of service on the west coast. Renamed HMCS *Grilse* she was commissioned into the RCN on 11 May 1961.



HMCS Grilse (SS-71)

Source (<http://www.readyayeready.com>)

¹³ One of the Canadians sent to the UK to train early in 1955, Petty Officer "Verne" McLeod from Goderich, Ontario, was killed when an experimental torpedo exploded in HMS *Sidon* in Portland on 16 June 1955. *Sidon* was his first submarine and he had just joined her on the day of the accident. He became the first Canadian sailor to die in peacetime while serving in submarines.

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Submarines Return to the Fleet

The Oberons: At the beginning of the 1960s the navy had plans for a small force of six modern submarines, based on the USN *Barbel* design, which would have both an operational and a training function. *Grilse* was viewed as a stop gap measure. However, politics got in the way of these plans during the major shake-up of National Defence initiated by Paul Hellyer, the Minister of National Defence.

Instead of six US-designed "state of the art" diesel electric boats, the Government entered into negotiations with the Admiralty for the acquisition of three submarines to be built in Britain. These were of the *Oberon*-class which, although very advanced in some features, was essentially an update of the World War II Type XXI U-boat design. The *Barbel* design used the advanced "tear drop" hull form utilized by the US Navy for its nuclear attack submarines which gave the diesel electric *Barbel* much better speed and diving capability than that of the *Oberon*-class¹⁴. The *Oberon* was considerably cheaper however.

The first of the new submarines was commissioned as HMCS *Ojibwa*, at Chatham Dockyard in the summer of 1965. She had been laid down for the RN as HMS *Onyx* but was transferred to the RCN while under construction. She was followed in 1967 by HMCS *Onondaga* and in 1968 by HMCS *Okanagan*. *Onondaga* and *Okanagan* incorporated a series of modifications to meet specific RCN requirements. A fourth *Oberon*, to meet the west coast requirement, was vaguely promised but in the event was never authorized.



The Canadian Oberons

(Source - <http://www.saoc-central.com/>)

The Government was at pains to point out that the acquisition of these submarines was for the purposes of training the ASW forces of the RCN and the RCAF - exclusively on the east coast. They were not to have any operational role. This despite the fact that the thinking within NATO ASW circles was that the best anti-submarine vehicle was another submarine. The *Oberons* did the same "clockwork

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mouse" evolutions for the surface ships and maritime patrol aircraft that their RN predecessors had done from 1955 to 1965. They spent a considerable amount of time at sea - much more than their surface ship cousins.

A Change of Role: By the late 1970s, the *Oberons* were getting tired. Most of their sensor systems were obsolete and spare parts were becoming scarce and expensive. The Navy made a successful case for an update program, the formal title of which included the term "Operational"¹⁵. In addition to improvements in the submarines' systems, new and modern electronics replaced the outdated analog versions and a new torpedo, the American Mark 48, was acquired. The update took place between 1980 and 1986 and the result was a very capable submarine. Given this better capability, the Navy finally assigned operational tasks, other than simply training, to the submarines - albeit reluctantly at the outset. The submarines proved their worth in several successful deployments in Cold War scenarios.

On the west coast the lease of *Grilse* had been extended for a further five years and she had been refitted in 1967. However, in 1968 the US Navy offered another submarine and the RCN bought the former USS *Argonaut*. She was commissioned as HMCS *Rainbow* and replaced *Grilse* which was returned to the USN in 1969. *Rainbow* only lasted until 1974 and for many years afterwards there would be no submarine based on the west coast. Occasional deployments of an *Oberon* from the east coast in the later 1980s alleviated the shortfall but did not solve it.



HMCS Rainbow

(Source - <http://www.saoc-central.com/>)

¹⁴ The Royal Netherlands Navy (RNIN) later adopted this hull design concept in two successful classes of submarines which it built. One, the *Walrus*, was a contender in the 1980s program to replace the *Oberons*.

¹⁵ The Submarine Operational Update Program which became commonly known as SOUP.

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Replacing the *Oberons*: Although the modernization program for the *Oberons* was in progress in 1980, the Navy began the initial planning process for their eventual replacement with a modern diesel-electric submarine. This was a prudent move given the reality of very long lead times for such major projects. In 1983, a formal project was established with a small team of dedicated personnel and the formal title established as the Canadian Submarine Acquisition Project - CASAP for short. This action took advantage of an offer from the Royal Australian Navy (RAN), which also operated *Oberon*-class submarines, to participate in their replacement project which was at a more advanced stage. In the event, the cooperation with the RAN did not bear fruit (except for the Canadian team gaining much useful technical information) and each of the navies resumed their own courses of action.

In the mid-1980s, the newly elected Federal Government of Prime Minister Mulroney decided that the submarine replacement program should include nuclear-powered submarines. They were included in the 1987 Defence White Paper in support of a three ocean policy. To say that this was a controversial move is a gross understatement. Two years later the program was effectively cancelled when the funding was removed from the federal Budget.

The impact of this diversion of focus from the core element of CASAP - the replacement of the *Oberons* with new diesel-electric submarines - was devastating. In effect the project went back to basics and a very low priority on the procurement ladder¹⁶.

The *Victoria* Class: In 1998 an arrangement between the British and Canadian governments resulted in the acquisition by Canada of four diesel-electric submarines that were surplus to British requirements. Britain had opted to operate only nuclear-powered submarines and these four relatively new submarines had been laid up in a state of preservation (mothballed) since 1994. They were the only four built out of a planned nine *Upholder*-class that had entered service between 1990 and 1993¹⁷.

Designated as the *Victoria*-class by the Canadian Navy, the namesake of the class was commissioned in Halifax in December 2000. She was followed by HMCS *Windsor* in June 2003, HMCS *Corner Brook* in March 2003 and HMCS *Chicoutimi* in September 2004. The latter submarine suffered a major fire while en route across the Atlantic to Halifax. One officer, Lt (N) Chris Saunders, died as a result of smoke inhalation while fighting this fire. He became the second peacetime casualty in submarines.

¹⁶ J. David Perkins, *Submarines and the Canadian Navy Today: One Man's View*. Canadian Naval Review, Vol 3, No. 3, Fall 2007.

¹⁷ http://en.wikipedia.org/wiki/Upholder/Victoria_class_submarine

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Arguably, the *Victoria*-class has given the Navy a better capability than it had with the *Oberons*. The west coast will have a submarine capability of its own again and the submariners have an excellent operational ability that is being used. The era of nothing but “clockwork mice” tasks seems over.



HMCS Victoria

Source (<http://www.bing.com/images/>)

Postscript

With the arrival of the *Victoria*-class the era of the *Oberons* ended. They had been in service for more than 30 years and were approaching the point where they would become unsafe to dive. As they were paid off, the submarines were to be put up for disposal and eventual scrapping. The membership of the Submariners Association of Canada (SAOC)¹⁸ thought that at least one of the *Oberons* should be preserved as a museum and a tribute to those who served, as is done in several other countries. Fortuitously, the Canadian War Museum (CWM) had a similar idea and representatives of the two organizations met in 1998. The SAOC undertook to conduct a pre-feasibility study of bringing an *Oberon* from Halifax to the site of the planned new CWM at the former Rockliffe air base beside the Ottawa River not far from Downtown Ottawa. In April of 1999 the report of the study told the CWM that it would be feasible to bring the former HMCS *Onondaga* to the site at a cost that was within the budget of the CWM. She would be cut into three sections which would be transported on barges. On arrival at the riverside site, the sections would be slid over to the final location and rejoined. The choice of *Onondaga* was apt: she was the first true Canadian boat and had commissioned in Centennial Year.

The plan foundered when the planned site for the CWM was moved from Rockliffe to its present site on LeBreton Flats - a location over 80 feet higher and above a set of waterfalls. While not impossible technically, the costs of moving large sections of

¹⁸ SAOC is a social organization comprised of former and serving personnel who have qualified as “submariners”. See <http://www.saoc-central.com/>

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submarine through the streets of downtown Ottawa would be prohibitive and the project was reluctantly shelved.

Onondaga did finally become a museum submarine. In 2008 she was relocated to the Pointe au Père Historic Site near Rimouski in Quebec. She has been restored to a pristine condition and has become a major tourist attraction¹⁹.

¹⁹ See <http://www.shmp.qc.ca/onondaga/montez/index.php>

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ANNEX A

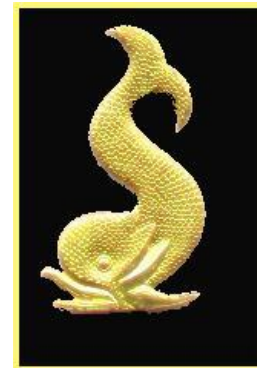
The Dolphin Badge²⁰

Most navies have traditionally awarded a unique badge or insignia to denote service in submarines. Several of the designs feature the dolphin and it has become common to refer to the device as the submariners' "dolphins". In the USN, RN, RAN and RCN/CF, the award of his "dolphins" is a mark of the submariner having successfully passed his qualifications.

Between 1955 and 1965 over 400 Canadians served aboard Royal Navy boats. On the West Coast another group of Canadian submariners took their training in the USN preparatory to manning a USN fleet boat leased from the Americans in 1961. Canadian submariners were permitted to wear the host countries speciality badges only while serving in their navies but were obliged to take them down when back aboard Canadian bases and ships.

The Royal Navy did not have a submarine badge until April 1958. Prior to that time the only distinguishing piece of uniform kit was the cap ribbon of ratings in "square rig" which was embroidered with "HM SUBMARINES" in place of the usual ship's name. Officers, and ratings dressed in the "fore and aft rig", bore no outward symbol denoting their special service.

The first Canadian submariners' badge was introduced on the West Coast in 1961. It was the invention of LCdr E. G. Gigg, RCN, Commanding Officer of *HMCS Grilse*. He commissioned a graphic artist to create the design and submitted it to the authorities in Ottawa for approval. Originally authorized for ratings only, it was extended to officers within a few months of its adoption. The badge consisted of a single, symbolic, diving bottle-nose dolphin and was worn on the left sleeve.



When the CAF green uniform was adopted in 1968 it was determined that the single dolphin badge would be worn centred over the left breast pocket leaving a space below it for ribbons or medal mounting bars. An embroidered, deep yellow on dark green cloth, single dolphin badge was produced for wear on the CAF greens. The backing for this badge was contoured in the shape of the dolphin device. The brooch type badge became particularly popular for wear with the short sleeve CF green summer shirts and optional tropical whites.

In order to provide a badge of a style in keeping with the CF range of specialty badges, a new submariner's badge was designed. This badge received Royal approval in April 1972. The device is officially described as "a crimson garnet wreath of laurel between two swimming dolphins in gold, above the wreath a crown, within the centre of the wreath a gold coloured maple leaf." This badge superseded the

²⁰ <http://www.saoc-central.com/Dolphins.html>

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single dolphin for wear by all ranks and was worn in the same position as the single dolphin badge.



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ANNEX B

Canadian Submarine Specifications

CC-1/CC-2

Displacement:	313 long tons (318 t) surfaced 373 long tons (379 t) submerged
Length:	144 ft (44 m)
Beam:	15 ft (4.6 m)
Draught:	11 ft (3.4 m)
Speed:	13 knots (24 km/h; 15 mph)
Complement:	18 (2 officers, 16 men)
Armament:	5 × 18 in (457 mm) torpedo tubes

CH-14/15

Displacement:	364 tons (surfaced) 434 tons (submerged)
Length:	45.8 m o/a
Beam:	4.6 m
Draught:	3.68 m
Propulsion:	Twin-shift, 480 hp Vickers diesel, 2 x 620 hp electric motors
Speed:	13 knots (surfaced) 10 knots (submerged)
Range:	1,600 nmi surfaced, 130 nmi submerged
Complement:	22
Armament:	Torpedoes 4 x 18" bow tubes 8 reloads

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Type IXC U-Boat

Displacement:	1,120 t (1,100 long tons) surfaced 1,232 t (1,213 long tons) submerged
Length:	76.8 m (252 ft 0 in) overall 58.7 m (192 ft 7 in) pressure hull
Beam:	6.8 m (22 ft 4 in) overall 4.4 m (14 ft 5 in) pressure hull
Height:	9.4 m (30 ft 10 in)
Draft:	4.7 m (15 ft 5 in)
Speed:	18.2 knots (33.7 km/h) surfaced 7.3 knots (13.5 km/h) submerged
Range:	24,880 nmi (46,080 km) at 10 knots (19 km/h) surfaced 117 nmi (217 km) at 4 kn (7.4 km/h) submerged

Grilse/Rainbow²¹

Displacement:	1,526 tons (1,550 long tons) surfaced 2,391 tons (2,429 long tons) submerged
Length:	311 ft 6 in (94.95 m)
Beam:	27 ft 3 in (8.31 m)
Draft:	16 ft 10 in (5.13 m) maximum
Propulsion:	4 × Fairbanks-Morse Model 38D8-1/8 9-cylinder diesel engines 2 × 126-cell <i>Sargo</i> batteries 4 × high-speed Elliott electric motors
Speed:	20.25 knots (38 km/h) surfaced 8.75 knots (16 km/h) submerged
Range:	11,000 nmi. surfaced at 10 knots
Test depth:	400 ft (120 m)
Complement:	10 officers, 70–71 enlisted
Armament:	10 × 21-inch (533 mm) torpedo tubes (six forward, four aft)

²¹ *Balao* Class Specifications

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Oberon Class

Displacement:	Surfaced: 2,030 t (2,000 long tons) Submerged: 2,410 t (2,370 long tons)
Length:	295.25 ft (89.99 m)
Beam:	26.5 ft (8.1 m)
Draught:	18 ft (5.5 m)
Speed:	Surfaced: 12 kn (22 km/h) Submerged: 17.5 kn (32.4 km/h)
Complement:	69
Sensors and processing systems:	Type 187 Active- Passive sonar Type 2007 passive sonar
Armament:	8 × 21 in (530 mm)

Victoria Class

Displacement:	2,455 tons
Length:	70.26 m
Beam:	7.2 m
Draught:	7.6 m
Propulsion:	Diesel-electric- 1 shaft 2 x Paxman Valenta 2,035hp 1600 RPA SZ diesels 1 x GEC electric motor (5000kW)
Speed:	12 knots (surface) 20+ knots (submerged)
Range:	8,000 nautical miles
Complement:	47
Sensors and processing systems:	Sonar: Type 2040 active/passive bow, Type 2041 micropuffs, Type 2007 flank, Type 2046/CANTASS MOD towed array, Type 2019 active intercept Fire Control: Lockheed-Martin Librascope SFCS Mk 1 Mod C Radar: Kelvin Hughes Type 1007
Armament:	6 x 21 inch (533 mm) torpedo tubes (18 Mark 48 torpedoes)

CANADIAN SUBMARINES & SUBMARINERS

THE AUTHORS

This paper is a collaborative effort by a group of former and serving Canadian naval officers. Based on an original idea by Peter Haydon, an ex-submariner, an initial draft was produced by Michael Braham. That draft was then submitted to a trio of former submariners for review and comment.

That led to this significantly revised and professionally enlivened edition by Mike Young with additional editorial review and comment being provided by former submarine commanding officers, Ray Hunt and Larry Hickey.