Toward the end of the season a few barometer elevations of lakes and meadows were taken, using the helicopter, and this experiment proved very successful.

In all, 188 mountain landings were made, 29 of these on one day. The pay-loads on these landings varied from 210 to 270 lb. These landings varied in height from 4,000 to 6,650 feet, with 28 per cent. between 4,000 and 5,000 feet, 66 per cent. between 5,000 and 6,000 feet, and 6 per cent. above 6,000 feet. The majority of landings for stations (as compared with fly camps) were made within a horizontal distance of 300 feet of our destination, with 1 mile being the maximum.

An accurate record was kept at all times of weights of loads, temperatures (both at base and on top), wind, height of landings, and elapsed time, so that new tables of performance can be calculated.

I think this project was a great success, this being due mainly to the skill of the pilot, co-operation between the pilot and crew, and the untiring efforts of the party as a whole.

It cannot be too strongly emphasized that co-operation is of the utmost importance in an operation of this kind. We found a round-table discussion between the pilot and survey assistants to be a good idea before a flight was put into operation, remembering always that the pilot was the final authority on all moves.

In order to carry out an operation of this type, all the participating members must collect as much information as possible about the performance of the helicopter in addition to the normal survey work. (This also applies to the pilot concerning the survey work, and here I might add that I think it is a good idea for the pilot to climb a few peaks along with the survey crew after he lands his machine. This has the tendency of keeping the distance from station to helicopter a bare minimum, as well as increasing his knowledge of the survey work.) This becomes apparent when it is realized that in some cases a mountain crew must choose their own landing-fields.

(N.B.—A more-detailed report on this operation can be obtained from the Topographic Division.)

TOPOGRAPHIC SURVEY OF SAYWARD DISTRICT.

A. F. Swannell.

Under instructions from the Director of Surveys and Mapping, a control survey was carried on in conjunction with F. H. Nash, B.C.L.S., covering Map-sheets 92-K/3, 92-K/4, 92-K/5, and 92-K/6. More particularly this comprises the area between the 50° and 50° 30′ parallels of latitude and from the 125th to the 126th meridians of longitude. Johnstone Strait and Discovery Passage proved to be the natural boundaries between the two parties, with common stations on Menzies Mountain and the Prince of Wales Range on Vancouver Island.

The main triangulation consisted chiefly of the existing geodetic net of 1913 and 1914, which was extended to link up to Mr. Nash's work on Vancouver Island.

Coast triangulation was also done to link existing coast triangulation stations on Johnstone Strait, in the vicinity of Helmcken Island, to Nodales Channel, inclusive of Blind Channel. Also, another coast triangulation link was made from Discovery Passage to the geodetic survey line, South Base to Mitlenatch, thence north to connect with a coast triangulation net on Sutil Channel at Hill and Coulter Islands.

In all, 124 stations were occupied, 9 triangulation, 38 camera, and 77 coast triangulation. Seventeen land ties were also made. Barometer control was obtained on the low, flat lands on Lower Quadra Island and Cortes Island. Forty-four dozen photographic plates were exposed during the season. The area comprised approximately 805 square miles. In addition, five days were spent on Lasqueti Island obtaining vertical control to complete Map-sheet 92-F/8 (approximately 25 square miles).

We left Victoria the morning of May 27th and returned the night of October 6th. For transportation and as a mobile base camp we had the motor-launch "B.C. Surveyor," which more than proved its worth in this area, furrowed as it is by numerous channels. Records kept during the season show that 3,600 miles were run by the "B.C. Surveyor." As a conservative estimate, 370 miles were covered on foot and 450 miles run by power-boat.

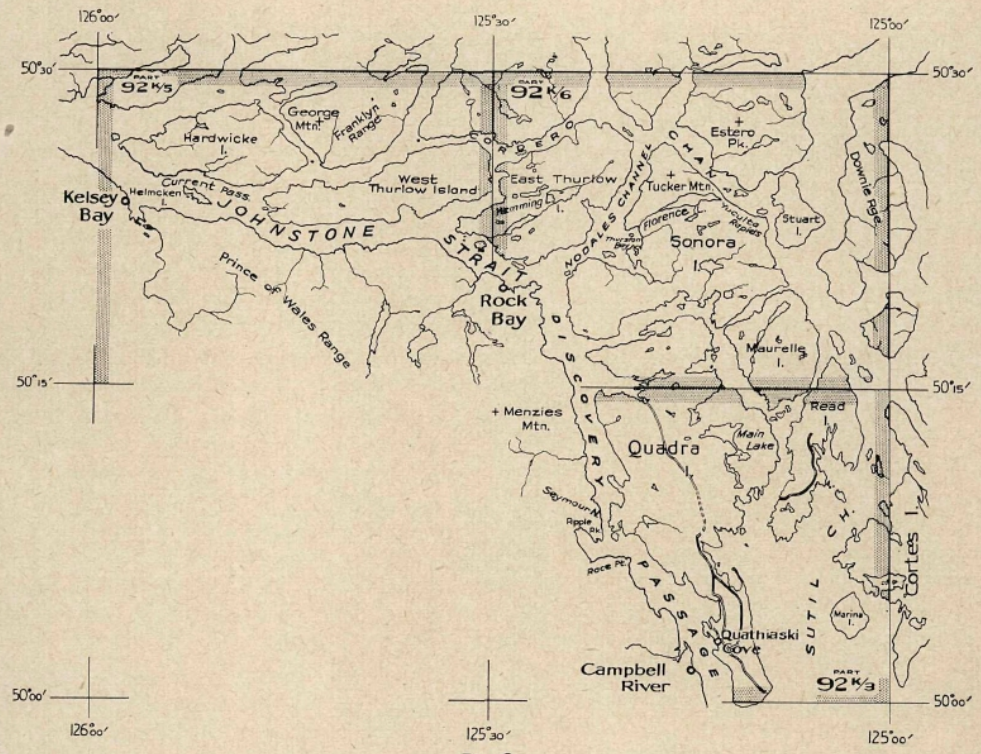


Fig. 3.

PHYSICAL FEATURES.

In general, our area is low-lying to the south, its mountains increasing in height to the north.

The area may be compared to a broken cup. To the south the broken edge is the low-lying stretch of Quadra Island, Marina Island, and Sutil Channel. The remaining high lip is comprised of, to the west, on Vancouver Island, Mount Menzies and the Prince of Wales Range; to the north, on the Mainland of British Columbia, the Franklyn and Pembroke Ranges and Estero Peak; and to the east, Downie Range and Raza Island.

Nine large islands—namely, Quadra, Marina, Read, Maurelle, Stuart, Sonora, East and West Thurlow, and Hardwicke Islands—are the lower-lying land in the bowl of the cup. These islands attain heights up to around 2,500 feet in elevation. East Thurlow, Sonora, and Quadra Islands are freely sprinkled with lakes—Hemming, Florence, and Main, to name the largest.

Estero Peak (elevation, 5,478 feet) is the most prominent feature of the area. It is visible far to the south from Vancouver Island. To the north this mountain drops almost sheer for 2,500 feet, to rise to a rugged ridge and drop again precipitously into Estero Basin at sea-level.

The main arteries of navigation for Coastal boats plying between southern ports and Prince Rupert and Alaska are Discovery Passage and Johnstone Strait. The smaller craft and tugs towing their booms southward choose the more sheltered Cordero-Calm Channel route. All channels, though, are treacherous, with their tides running from 3 to 5 knots velocity. In the narrows and rapids, velocities up to 12 knots are reached.

Menzies, surgeon and botanist aboard Captain Vancouver's ship the "Discovery," says of the Yuculta Rapids: "They [referring to the boats sent by Vancouver to find passage to the north] entered a narrow channel leading to the westward, through which the water rushed in whirlpools with such rapidity it was found extremely difficult even to track the boats along shore against it; and this could hardly have been accomplished had it not been for the friendly activity of the natives."

Historical.

Juan de Fuca was the first European to mention the inside passage. In the late sixteenth century he reported sailing on an inland sea for some 20 days and finally emerging into a wider sea. He gave the entrance to this sea as between the 47th and 48th parallels. Juan de Fuca Strait lies just above the 48th parallel. His discovery was apparently discredited by many.

Captain Meares verified the discovery in 1787, naming the strait after Juan de Fuca. He himself did not sail very far up the Strait of Georgia but told of the Juan de Fuca Strait to an English trader, who reported that after sailing for upwards of 8 degrees of latitude to the north he returned to the Pacific Ocean. In 1792 Captain Vancouver, with his two ships "Discovery" and "Chatham," was the first to explore the region at the north of the Strait of Georgia. Initially, he was accompanied by Valdes and Galiano, two Spanish captains. He anchored by what he called "Cliff Island" in Desolation Sound, on June 26th of that year. From his anchorage he sent his small boats in sorties to find a passage to the northward. One party was sent to what is Discovery Passage. Meeting the waters at Seymour Narrows, this party concluded that such waters must come from the ocean beyond and so returned to their base.

Johnstone, in charge of the other party, travelled the Cordero Channel route, eventually reaching Johnstone Strait, named after him. Being short of supplies and the weather being miserable, he climbed a hill and saw the strait widening to the northwest, so he returned to his base ships.

Vancouver decided to try the Discovery Passage route. This he did, sailing through the Seymour Narrows and northward, passing out of the waters of the area on July 17th, 1792.

Campbell River, the only town of consequence in the area accessible by water, was used as our base for supplies. It was first settled in 1904 by Charles and Fred Thulin. Primarily, it is dependent on the logging operations in the vicinity and is a fishing-resort town in the summer.

Accessibility.

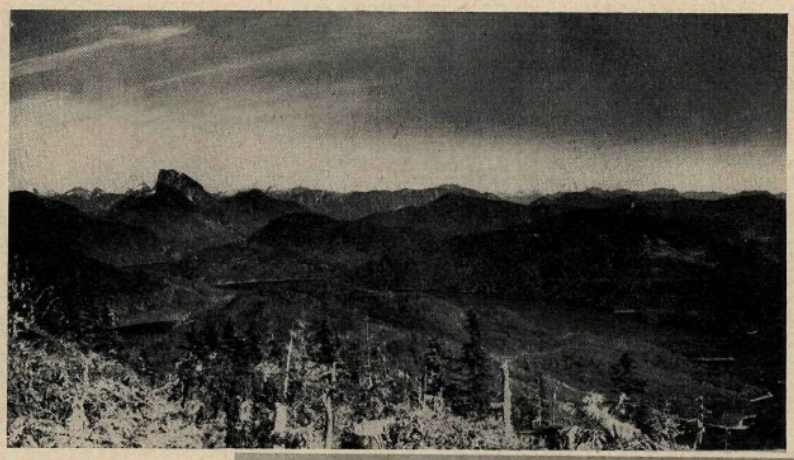
Access to the area can be obtained by road, sea, and air. The Island Highway passes through Campbell River. Vancouver Island Coach Lines maintains a two-bus-a-day service to and from the town.

Public roads are found on Quadra and Read Islands. At present, besides the steamship service to Quadra Island, a water taxi runs between Quathiaski Cove and Campbell River. By September 9th of this year, tenders were to be submitted for a car-ferry service between these two points.

On many of the islands, logging-roads are found. The chief mode of transportation, though, because of the numerous waterways, is by launch.

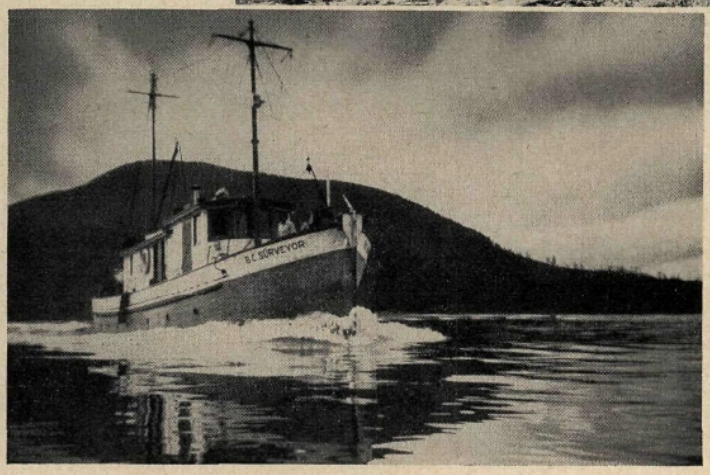
Topographic Survey.

Sayward District.



Looking toward Estero Peak from Bradshaw. Cordero Channel in foreground.

Yuculta Rapids, looking north from Stuart Island.



"B.C. Surveyor."

The Union Steamships has a weekly passenger and freight steamship service from Vancouver to Campbell River, Quadra Island, Rock Bay, Thurlow Island, etc. Additional steamer and freight service is supplied by the Waterhouse Company. The Gulf Lines serve the south-eastern section, calling at Stuart Island.

The Queen Charlotte Air Lines maintains flights to Comox Airport, where a taxi from Campbell River meets the aeroplanes. They also will call when traffic demands at Campbell River, Shoal Bay, and Stuart Island with one of their Stranraer flying-boats.

The B.C. Air Lines has a Sea-bee stationed at Campbell River. It is an air taxi to any of the islands and logging camps wherever it is able to land within its range. This aeroplane also acts as an air ambulance.

Supplies are obtainable within a radius of a few miles at any point in the region, as the islands are fairly well sprinkled with well-stocked general stores.

CLIMATE.

A synopsis of the weather for the 133 days we were in the field shows 82 fair days, 39 days in which rain fell, and 12 days with fog. The reputed rainfall annually averages between 70 to 90 inches. Summer frosts are unknown. In the winter some of the bays and heads of inlets unaffected by the tides are frozen over. In mid-August of this year an unprecedented hail-storm occurred in the vicinity of Campbell River, doing much damage to the local crops.

The northern section of the area in the vicinity of Johnstone Strait and Kelsey Bay seems to be a fog belt. The prevailing wind is westerly, with many of the trees along the shores proving the fact.

FOREST-COVER.

The forests of the area consist chiefly of Douglas fir, Western hemlock, Western red cedar, Sitka spruce, and Western white pine. Yellow cedar was seen on some of the higher reaches. Scrub pine was noted on some of the rockier shore-lines, along with arbutus.

In the virgin timber, good travelling was encountered, the ground being relatively free of any underbrush. Blueberry, huckleberry, salmon-berry, and blackberry were the underbrush noted. Salal was thick in some sections, but, compared to the West Coast of Vancouver Island, it was of no consequence. Alder and willow were encountered in moister ground and devil's-club in creek-bottoms.

MINERALS.

Evidence of glaciation dominates every feature of the area, the truncated cones, such as Paget Cone and Royston Mountain, to the north, and drift deposits of stratified sands and gravels to the south—Cape Mudge on Quadra Island and Marina Island—being examples. Navigation in the latter area is made perilous because of the shallow sea-floor bestrewn with large boulders.

A limestone-belt is found on Quadra Island, averaging in width up to 2 miles; it extends from Open Bay on the eastern side to Granite Bay on the western side of the island.

Besides this limestone-belt and the gravel and sands, there is exposed over most of the area the intrusive igneous rock of the Coast Range. On West Thurlow, Helmcken, and Hardwicke Islands are found volcanic rocks.

At present there is no active mining in the area. In the past, some mining was carried on for copper and gold. All these prospects, though, have ceased operating.

In 1906 work began on some copper claims on Quadra Island. Copper Cliffs, just north of Gowlland Harbour, made several shipments of ore, with favourable returns.

There was some activity about 1929 in gold properties in the vicinity of Cordero Channel and Philipps Arm, and at Shoal Bay on East Thurlow Island.

GAME.

Like most of the Coastal inlets, many bald eagles were seen. Sea-gulls, of course, abound, and Mitlenatch Island in the Strait of Georgia is used by the gulls as a nesting-place. In June, when we first visited the island, nests were scattered all over the island. One nest contained seven eggs, in contrast to the customary two or three.

Ducks of many species are fairly abundant. Blue grouse were flushed from the sunny spots, in particular on Tucker Mountain, Sonora Island, and Cortes Island. Hawks, ravens, and herons were also seen.

In the past, from all reports, deer were plentiful on the islands and were in many cases a nuisance to the settlers. Very few were seen this summer, except six by the writer, and these all on Hardwicke Island.

Only one black bear was seen during the season, and he was on the Mainland. The coast of the Mainland apparently is on the fringe of the grizzly-bear country, with the occasional one being sighted.

Goats were seen on Mount George. The deep ravines which gash the western slope of this mountain are reputed to be the breeding-ground of marten. Otter, mink, and marten, I believe, were once plentiful, but none was seen.

As for sea life, salmon is the most important; cod and herring are also caught. Numerous seals were seen, and a school of some dozen killer whales was sighted on numerous occasions. According to the ship's log, dated September 20th, the "B.C. Surveyor" altered course because of these whales; this was off Cape Mudge. Oysters were noted on the shores of Sutil Channel.

The lakes of the area are well stocked with trout.

INDUSTRIES.

Logging and fishing are the two main industries. Agriculture plays very little part in the development of these islands because of their rocky nature and the small percentage of land suitable for cultivation. Small truck-gardens and orchards were centred chiefly in the low-lying sections, in particular on Quadra Island where the dark-reddish sandy loam is free of stone. All plots under cultivation would produce only the needs of those tending them. Sheep are raised to a small extent on Read Island and on the southern extremity of Quadra Island.

Early logging operations have removed the larger and the more accessible stands of timber. In the early 1900's logging operations were carried on at Quadra Island and East Thurlow Island by railway. These railways have long since been abandoned, but a truck outfit is in operation on Quadra Island. Many of the old logging operations and burns now have a luxuriant crop of second growth.

Truck logging was carried on at Sonora Island until three years ago, the road, still in good shape, being used as a route to Valdes triangulation station. "Cat" loggers were in operation at Frederick Arm, Nodales Channel, and at Florence Lake on Sonora Island.

According to a report written in the early 1920's, it was estimated that some 1,200 men were employed in various capacities connected with logging. I should estimate there are scarcely 300 to-day.

There is a Forest Ranger station located at Thurston Bay, where at one time boats were built for the Forest Service.

Commercial fishing is the most important industry, five different species of salmon helping make up the catch.