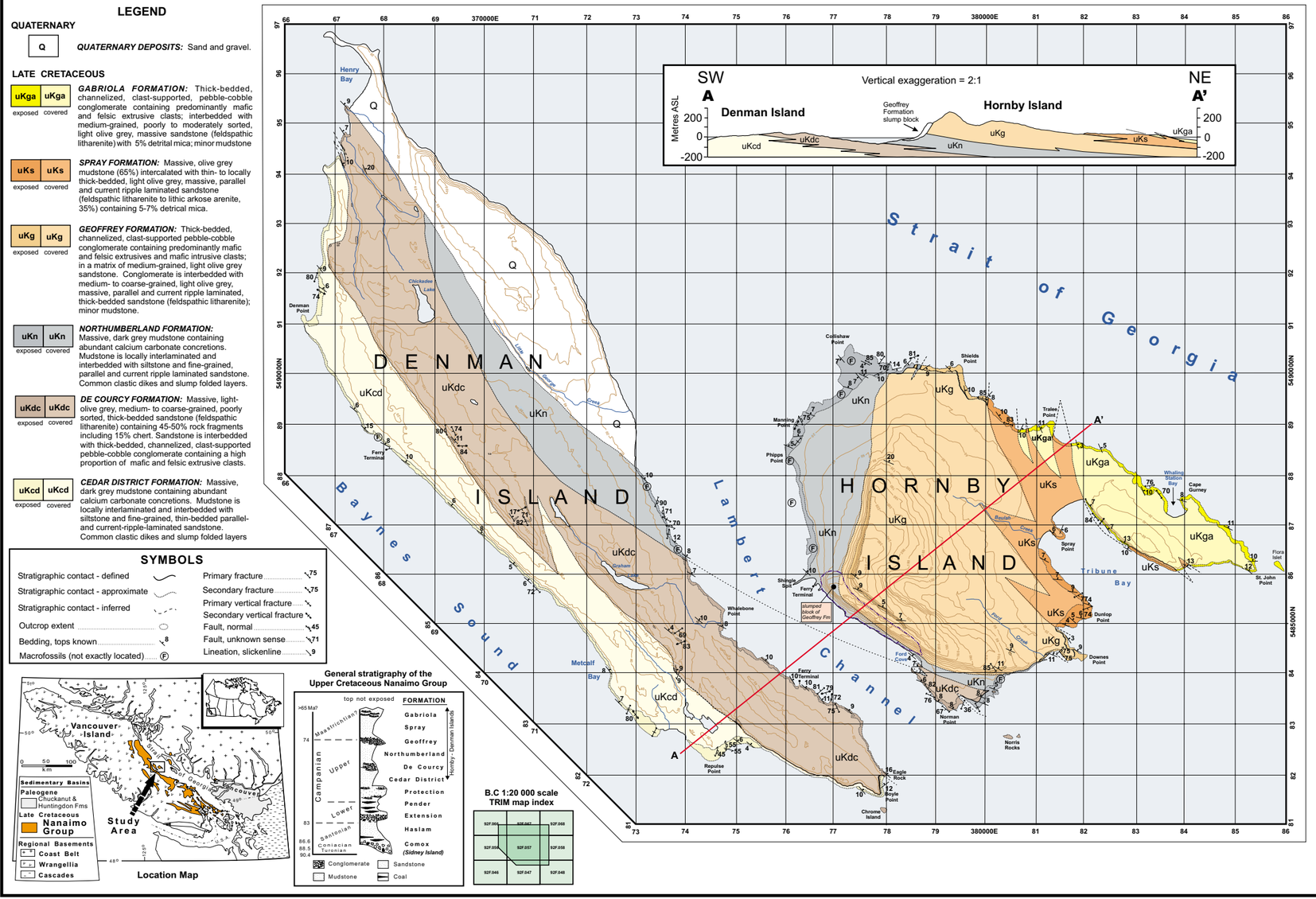
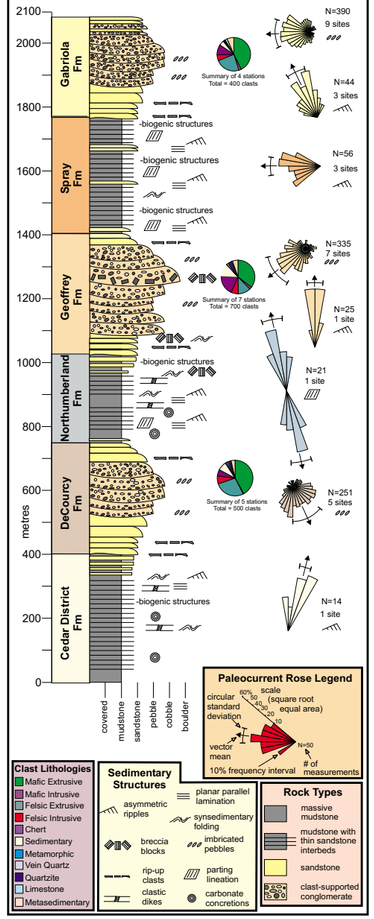


Summary of Stratigraphy and Provenance Data

Hornby and Denman Islands



Base Map Information
Base map has been reproduced from digital TRIM I (Terrain Resource Inventory Management) 1:20 000 topographic database produced by the British Columbia Ministry of Environment, Lands and Parks. North American Datum (NAD83). Universal Transverse Mercator Projection (Zone 10). Elevations in metres above sea level.

Approximate mean declination in 1993 for centre of map is 22° 05', decreasing 9.6' annually.

B.C. Geological Survey Branch

GEOSCIENCE MAP 2001-3

GEOLOGY OF DENMAN AND HORNBY ISLANDS, BRITISH COLUMBIA

NTS 92F/7E; 92F/10

By D.C. Katnick and P.S. Mustard

Scale 1:50 000

1 0 1 2 3 4
Kilometres

Note: map originally produced as figure BP-1 to accompany unpublished M.Sc. thesis of D.C. Katnick, 2001, Simon Fraser University.

NOTES

Denman and Hornby islands represent the best exposed northern occurrence of the upper two-thirds of the Nanaimo Group, a Turonian to Maastrichtian (~ 90 to 65 Ma) or younger sedimentary package deposited within a single sedimentary basin during the Late Cretaceous Period. The succession on these islands is both well-preserved and minimally deformed, although in general the basin was buried, lithified, uplifted and deformed during the last 60 Ma. Exposures are nearly continuous along the islands coasts, but inland are restricted to road cuts, cliffs and rare small outcrops. Effects of Pleistocene glaciation are most evident as scattered glacial erratics, thin till cover and rare exposures of glacially eroded bedrock. These probably generally reflect the last (Fraser) glaciation (about 25,000 to 10,000 ybp). Thick deposits of pro-glacial sands and gravels of the Quadra Sand covers the north-east part of Denman Island and are also exposed in several gravel pits.

Stratigraphy

More than two kilometres of sedimentary strata are preserved, consisting of conformable and laterally intertonguing successions, with sandstone-conglomerate dominated units separated by mudstone and fine-grained sandstone assemblages. These represent the upper six formations of the Nanaimo Group. From lowest these are: the upper Cedar District Formation, the De Courcy, Northumberland, Geoffrey and Spray formations, and the lower part of the Gabriola Formation. The age of the lower three formations is well constrained by common macrofossils and microfossils. These indicate a range spanning form about the mid Campanian to the late Campanian / early Maastrichtian stages of the Cretaceous Period (about 80 to 70 Ma). However, no fossils have been recovered from the upper three formations. These have generally been considered to also be Late Cretaceous (thus about 70 to 65 Ma) based on the apparent conformable depositional contact with the underlying unit, apparent continuity of deposition, and on rare fossil evidence from correlative formations of the southern Gulf Islands. However, the only constraint on the upper age is that in other places the Nanaimo Group is unconformably overlain by late Paleocene sedimentary units.

Structure

The succession exposed on Denman and Hornby islands occurs as a structural homocline with beds dipping gently to the northeast (average 8°). There is no evidence of major structural features such as significant faults and folds. This interpretation contrasts with previous maps, which show major faults with significant (100's of m) of dip-slip displacement. On Denman Island, minor faults with a few metres of displacement coincide with the laterally intertonguing depositional contact of the Cedar District and De Courcy formations, mimicking significant fault offset, but actually a depositional feature with later very minor faulting. On Hornby Island extensive sedimentary slump blocks, breccias and slump-folded intervals occur in several places, and appear to have been misinterpreted as post-depositional fault effects by some earlier workers. However, there are minor faults and at least two well developed fracture sets. These minor features are generally sub-vertical and the main sets trend to the northeast and northwest. The few well-exposed minor faults are normal faults with <10m offset.

Depositional Environments

The Nanaimo Group on these islands is interpreted as deposited in relatively deep water with sediment gravity flows as the main transport mechanism. Multiple coalescing submarine fans are considered the main depositional setting. These fans were sand-rich with elements of gravel-rich systems and fed by submarine canyon point sources cross-cutting a narrow, adjacent shelf. Paleocurrents, paleoslope indicators, conglomerate clast types, and lateral facies variations all suggest that the submarine fans came from eastern or north-eastern sources and were deposited into a basin open to the west. The Coast Belt to the east and the Cascades to the southeast were probably the predominant source areas, although some rare clast types are not common to either of these proposed sources.