

Sedimentological and Neoichnological Characterization of an Asymmetric Tide-Influenced, River-Dominated Delta: Fraser River Delta, B.C., Canada

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Significant differences are recognized in the sedimentology and, neoichnology of the delta front of the Fraser River Delta between the updrift and downdrift side of the main distributary channel. Continuous muddy deposits dominate the downdrift (north) side of the delta front, and they typically have high bioturbation intensities (BI 4-6). The updrift (south) delta front is composed of heterolithic sand and muddy layers with relatively low bioturbation intensities (BI 1-4). Muddy units with high bioturbation intensities are dominant along the prodelta. Mud beds are uncommonly interbedded with thin sand beds that are deposited in updrift prodelta. Net tidal flow in the Strait of Georgia and strong seasonal river discharge (early May to the end of August) interact to produce the asymmetric distribution of sediments and burrows on the delta front. Most of the muddy sediments are transported northward (downdrift) during ambient flow of the river. Besides muddy deposits, sand and silt units are also transported to the delta during freshet (elevated river discharge).

Sandy units on the updrift side commonly have low trace assemblages, while overall muddy units exhibit remarkably high diversity of traces (e.g. *Thalassinoides*, *Asterosoma*, and *Scolicia*). Infaunal biodiversity (expressed as eH') is concordant with the presence of trace assemblages on both sides of the delta. Only a few groups of organisms, with high number of individuals, inhabit in the updrift side of the delta front (eH' 1-3). The biodiversity gradually increases down into the updrift prodelta (eH' 2-5). Conversely, the downdrift side of the delta displays consistently high biodiversity (eH' 2-4) on the delta front and prodelta. Holothurians, heart urchins, and polychaetes are the dominant infaunal groups. Based on morphology of the traces, interpreted ethology of the infauna, and substrate penetration depths of the organisms, several trace makers are ascribed to several traces. Holothurian traces are morphologically similar to *Teichichnus*, *Asterosoma*, *Arenicolites*, *Thalassinoides*, and *Diplocraterion*. Irregular sea urchins produce *Scolicia*, and *Taphrhelminthopsis*-like traces. Bivalves produce *Siphonichnus*, and some polychaetes produce traces similar to *Skolithos* and *Cylindrichnus*.