Human Settlement, Coastal Landforms and Later Holocene Sea Level Change in Southwestern British Columbia, Canada

Summary and Conclusions
Reconstructing relative sea level change is critical for modeling long-term changes in settlement patterns on the Northwest Coast. Sea levels have been documented for the early Holocene on the southern BC coast, but few data exist to characterize more recent changes. We present sea level data derived from archaeological contexts on cuspatte spits, an important coastal landform in the southern Gulf Islands. Our data accord well with recent characterizations of later Holocene sea levels as rising gradually by roughly 1.5 m over the last five millennia. Human modification and management of coastal environments must be considered to reconstruct how sea levels and human activity correlate.

Shingle Point, Valdes Island
Our primary study site, Shingle Point, is a cuspatte spit—a specific form of coastal spit where two beaches meet to form a triangle (Fig. 2). This location is an important archaeological site, containing as much as 5,000 years of precontact archaeological deposits situated on a series of paleoshorelines (Fig. 3). These archaeological deposits, which are predominantly shell midden, reflect long-term settlement at this location, including evidence of changes in basic subsistence practices, strategies of resource intensification and the emergence of large plankhouse villages (Matson 2003). Documentation of these changes is in progress as part of a larger coastal spit project aimed at reconstructing the development of social complexity in the region.

Coastal Spits
Coastal spits are dynamic landforms that are common within Trincomali Channel in the Gulf Islands (Fig. 1). These coastal spits are low-lying and relatively recent shoreline features that developed under specific geomorphological conditions and sea level regimes (Fig. 2). As predominantly additive features, they contain a cumulative record of long-term coastal landform change and the development of human settlement in the region since the mid-Holocene. Our objective has been to document the age of various paleoshorelines on these coastal spits to develop evolutionary histories for these forms.

The Human Role
While coastal landforms were generated predominantly by prevailing near-shore processes and sea level conditions, humans may have had a significant role in shaping their evolution. The use of shell midden refuse as a landscape-shaping tool is important to consider; Shell midden and natural deposits were used for a variety of purposes, including shoreline stabilization, terracing of village sites and the creation of defensive embankments. At Shingle Point we are also exploring human involvement in actively managing the bog environment to enhance plant productivity (Fig. 4). The management of wetland features is increasingly recognized as a key strategy in the process of resource intensification in many areas of the Northwest Coast (Doer 2005).

Generating Relative Sea Level Data
Our approach for generating data on sea levels focuses on coring deposits in transects across the spit in order to ascertain the depth of various deposits relative to current sea levels (Fig. 4). Major shifts in sediment deposition observed within these cores are indicative of both coastal landform development and sea level change. Radiocarbon dating of the base of observed deposits provides the temporal component. These spatial and temporal trends provide the framework for developing an evolutionary history for the location, including the timing of the initial emergence of a shoreline spit and the closing off of the spit interior from the sea by its barrier beaches.

Results
Data recovered from sediment cores and archaeological excavation units at Shingle Point allow for reconstruction of relative sea levels over a significant portion of the Holocene. Basal beach deposits in core SP-4 (Fig. 5) date to 6640 cal BP, suggesting the spit initially formed at that time. These deposits are 2.56 m below current high tide, indicating significantly lower relative sea levels.

The shift to peat deposits in the same core reflects the development of shoreline barrier beaches that closed off the current bog area from the ocean. Basal peat deposits date to 4670 cal BP and lie at 1.34 m below current high tide (Fig. 5), suggesting significant sea level rise between 6640 and 4670 cal BP. The earliest well-dated human occupation (in EU 6) is of similar age (4310 cal BP) and is located on the shoreline adjacent to the bog feature (Fig. 3, 4).

Relative sea level rose to roughly current levels over the subsequent three millennia, as indicated by a basal date of 1330 cal BP for archaeological deposits in EU 1. These deposits lie on top of a beach situated above current high tide levels. Extensive prograding of the spit occurred in the ensuing few centuries, as indicated by the existence of a plankhouse village along the west beach dating to 900 cal BP (Fig. 3).

Work at Other Sites: Montague Harbour
Montague Harbour on Galiano Island consists of a complex of archaeological sites representing 3,500 years of occupation (Fig. 6a). Mapping and subsurface testing at Montague Harbour has revealed buried intact cultural deposits, primarily shell midden (Fig. 6b). The position of these deposits below current high tide indicates a rise in relative sea level in the harbour area over the last three thousand years, most of which occurred between 3000 and 1000 BP. While Montague Harbour presents a more complex picture than Shingle Point, our data indicate similarly gradual sea level rise, with no evidence for significant earthquake-induced subsidence events or rapid sea-level change as argued previously (Reinhardt et al. 1996).

Key References