Chapter 2
Submerged Archaeological Landscapes and the Recording of Precontact History: Examples from Atlantic Canada

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Introduction

Atlantic Canada is a vast region of northeastern North America comprised of the Maritime Provinces of New Brunswick, Nova Scotia, and Prince Edward Island (PEI), the Island of Newfoundland, Labrador, and eastern Quebec, including the Magdalen Islands. (see Fig. 2.1). Undisputed human presence in North America is currently limited to the late Pleistocene and early Holocene (Waters et al. 2011). The presence of glaciers over most northern regions during the Last Glacial Maximum (LGM) postponed human settlement until these areas became ice-free. As a result, the earliest evidence of human presence in Atlantic Canada follows the northward disappearance of glacial ice (e.g., Fitzhugh 1978; MacDonald 1968; McGhee and Tuck 1975). The patterns of ice retreat and associated relative sea-level (RSL) changes are therefore intricately linked to the evolution of the paleolandscapes that Northeastern indigenous populations would have inhabited across Atlantic Canada during its precontact history.

Atlantic Canada was almost completely covered by Late Wisconsinan glacial ice, which at the height of the LGM, reached the edge of the continental shelf, now hundreds of kilometers offshore (Shaw et al. 2006). As ice began to retreat, multiple local ice dispersal centers became independent from the main Laurentide Ice Sheet.

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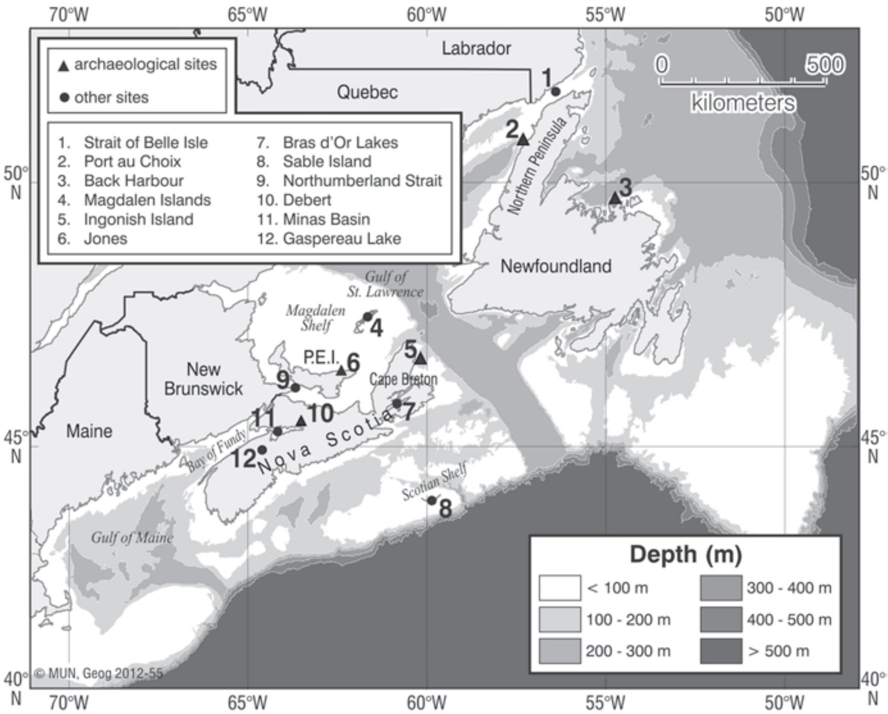

Fig. 2.1 Map of Atlantic Canada including the Maritime Provinces of New Brunswick, Nova Scotia, and Prince Edward Island (PEI), Newfoundland and Labrador, and eastern Quebec and its simplified offshore bathymetry

This resulted in variable local responses to ice unloading and a complex history of crustal readjustment across Atlantic Canada (Quinlan and Beaumont 1981). Therefore, the diverse interplay between isostatic responses and eustatic sea-level rise, at a local scale, has produced highly variable temporal and spatial patterns in local RSL histories (Shaw et al. 2002).

The following sections provide a broad overview of the major changes that have occurred to the paleolandscapes of Atlantic Canada, highlighting the areas that appear to offer the most potential for submerged landscape archaeology. Current evidence of human presence on these submerged landforms is reviewed and the factors influencing the preservation potential of a variety of submerged geomorphic features is examined. It is suggested here that submerged landscapes of Atlantic Canada are well-positioned to address a number of important research questions that can greatly advance our understanding of the precontact history of the region. Two case studies are presented: in one, the investigation of submerged archaeological landscapes helps archaeologists reinterpret portions of the region's precontact history, whereas in the other a similar focus reveals manners in which indigenous groups who witnessed the result of a catastrophic submergence-induced event have incorporated its memory into their oral histories.

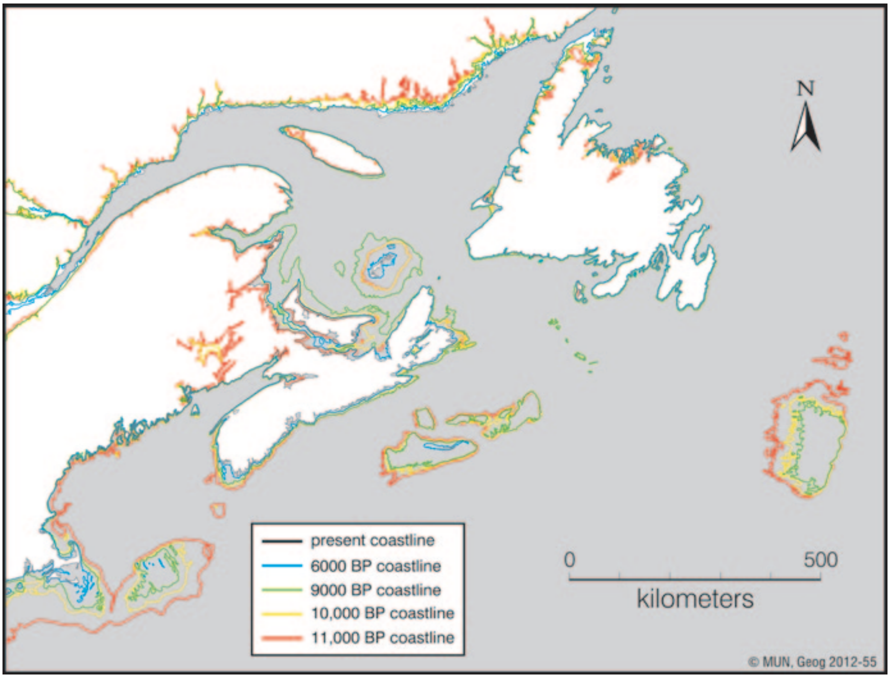

Fig. 2.2 Paleolandscape evolution of Atlantic Canada at various periods (simplified from Shaw 2005: Fig. 5; see Shaw et al. 2006 for the extent of glacial ice cover that would have prevented access to certain landscapes prior to 10,000 BP)

Early Holocene Paleolandscape Evolution

Atlantic Canada's complex response to deglaciation has resulted in three principal RSL patterns (Quinlan and Beaumont 1981). Coastal regions of the southern Labrador-Quebec Peninsula and Newfoundland's Northern Peninsula have been emerging since they became ice-free, and all former shoreline positions are found above the current sea level. The southernmost regions of Atlantic Canada, those formerly located at the very edge of the LGM ice cover, such as the main offshore banks, have been submerging throughout the postglacial period and all former shoreline positions are now located below current sea level. In the remaining regions, sea levels dropped to a local lowstand before rising to their modern position, although in certain areas postglacial shorelines were never above current sea level (see Figs. 2.2 and 2.3).

The paleogeography of Atlantic Canada has been discussed in detail elsewhere (Shaw et al. 2002; Shaw et al. 2006). The general outline of contemporaneous shorelines at selected time slices are presented in Fig. 2.2 and maps of the regional pattern of RSL values for the same time steps are presented in Fig. 2.3 (all dates provided in the text and figures are in uncalibrated radiocarbon years BP). The most dramatic changes to Atlantic Canada's paleolandscapes occurred in the first few thousand

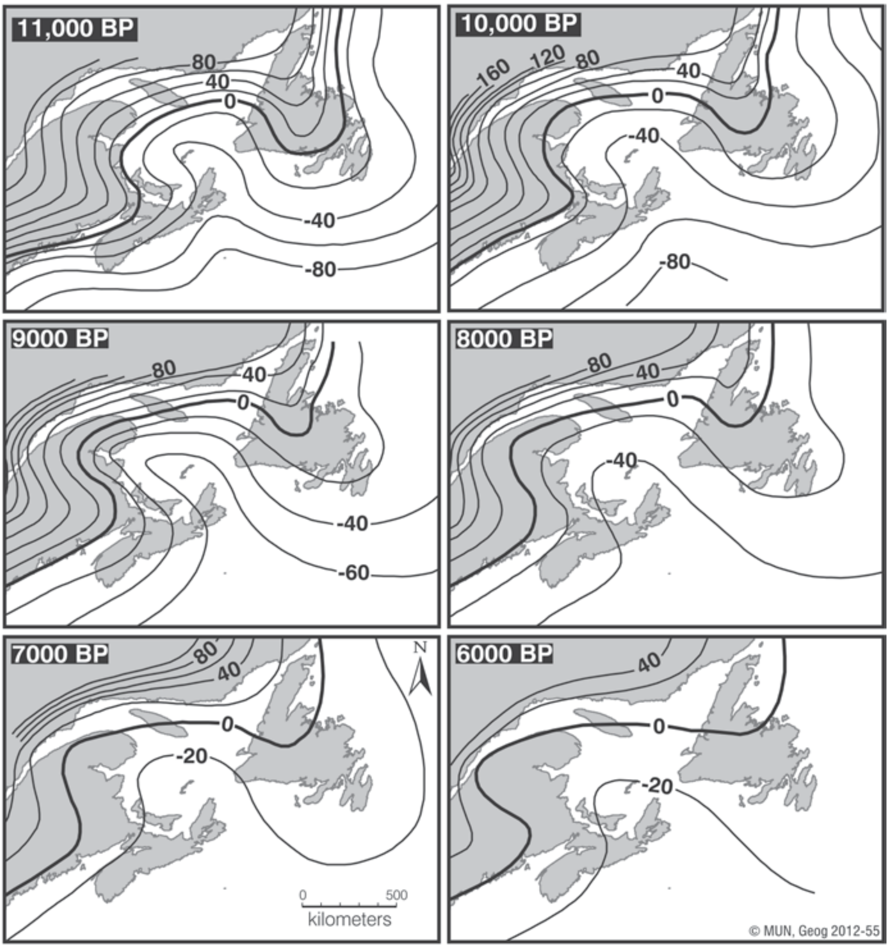

Fig. 2.3 Isobase maps for 11,000–6,000 BP, where lines [isobases] join points of equal emergence or submergence (negative) for each specified time period. (After Shaw et al. 2002: Figs. 5 and 6)

years that followed glacial retreat. At this time, large offshore islands existed along the edge of the continental shelf, although transgression almost immediately began in this area, greatly reducing their size until they completely disappeared, with the exception of Sable Island. The Magdalen Plateau was also occupied by a massive island extending off today's Magdalen Islands and reached its peak size ca. 9,000 BP. Another dramatic transformation created a land bridge between PEI and the mainland by 10,000 BP, which was maintained over the next 4,000 years. Important expanded coastal areas were also present at one time or another along the southern shores of New Brunswick, Nova Scotia, the perimeter of Cape Breton Island, and the central and southern regions of Newfoundland. The paleoenvironmental evolution of all regions, except those found at the northernmost extent of the study area, took the form of a more-or-less rapid succession from herbaceous tundra through shrub tundra and open woodlands to closed forests (Anderson 1980; Lamb 1984; Macpherson 1995; Mott 2011; Richard 1985).

Assessing Archaeological Potential

There are three simple criteria for a submerged archaeological landscape to exist: the sea level must have been lower at some point in the past, prehistoric humans must have been present and occupied the exposed land, and sedimentary processes during transgression must have preserved rather than eroded the landscape (Westley et al. 2011b). As the broad-scale paleolandscape evolution presented earlier indicates, large areas of Atlantic Canada were emergent at some point during the post-glacial period. At this scale, the regions that appear to offer the most potential are the shelf-edge archipelago, the expanded southwestern tip of Nova Scotia, the enlarged Magdalen Islands, and the Northumberland Strait. Currently, there is no evidence of human presence on many of these former landscapes. Because of ongoing high-energy marine processes, many submerged landscapes have been reworked to a point where, if any archaeological material had been deposited, they would no longer be preserved in their original context. The following sections highlight which areas offer the best archaeological potential to advance an understanding of Atlantic Canada's precontact history.

Evidence of Precontact Human Presence on Submerged Landscapes

In Atlantic Canada, the earliest evidence of a coastal adaptation dates to ca. 8,500 BP, appearing with the earliest human presence in coastal areas found along the southern shores of the Quebec-Labrador peninsula (McGhee and Tuck 1975; Pintal 1998, 2006). South of the St. Lawrence Estuary, however, the first evidence of a truly coastal adaptation appears much later, ca. 5,000 BP, as sea-level rise brought contemporaneous coastlines near their current position (Bourque 1995; Sanger 2005; Tuck 1975). It is probable that the earliest inhabitants of the southern regions of Atlantic Canada made use of coastal resources due to the high productivity of coastal environments (Price 1995; Perlman 1980). Coastal settings offer numerous advantages, including access to a diversity of food and raw material resources, a high water table, and ease of transportation and communication along waterways (Benjamin 2010, p. 255; Andersen 1995). It is at the coast that the greatest population densities are found in all periods for which data are available (Maarleveld and Peeters 2004, p. 112).

The evidence for a precontact human presence on the now-submerged landscape is currently limited. In Atlantic Canada, archaeological research targeting precontact submerged heritage has been, at best, minimal (e.g., Davis 1991; Westley 2008) as most underwater efforts have focused on the historic period (e.g., Barber 1981; Bernier et al. 2007; Dagneau and Moore 2009, 2010; Fitzhugh and Phaneuf 2008; Roman and Mather 2010; Skanes and Deichmann 1985). The locations where precontact artifacts have been recovered from underwater contexts mainly reflect chance finds resulting from modern fishing and recreational diving activities. Therefore, in Atlantic Canada and adjacent regions of New England, the evidence of human presence on submerged landscapes is limited to the Gulf of Maine (e.g., Crock et al. 1993; Stright 1990; Price and Spiess 2007; Rice 1979; Spiess et al. 1983; Turnbull and Black 1988), the Bay of Fundy (e.g., Black 1997; Davis 1991), the greater Northumberland Strait (e.g., Deal et al. 2006, p. 263; Keenlyside 1983, 1984), and nearshore and intertidal areas of Newfoundland (e.g., Carignan 1975; Rast 1999; Westley 2008). The exception to the lack of research is the formulation of a seven-stage landscape research strategy that integrates computer modeling, geophysical surveys, paleolandscape interpretations, paleoenvironmental analyses, and archaeological prospection in order to pinpoint locations with the greatest chance of finding archaeological sites (Westley et al. 2011a). Until this strategy is applied at a much larger scale, the record of human presence on the now-submerged landforms will remain scant and rely mostly on anecdotal finds.

Preservation

The prime objective of submerged archaeological surveys is the identification of archaeological deposits in their primary context since this offers the most value to archaeological research. For a submerged site to be found in situ, however, it must first survive terrestrial burial, then one or multiple transgression episodes (Bailey and Flemming 2008). After inundation, numerous factors may affect the sediments holding archaeological remains. In Atlantic Canada, wave, current, and ice erosion are the principal destructive forces affecting submerged archaeological deposits (Flemming 1983). The greatest impact on archaeological deposits occur when the site is located either in the surf zone, where it is exposed to the direct impact of breaking waves, or in water only a few meters deep, where wave impacts at the seabed can still be violent (Bailey and Flemming 2008; Will and Clark 1996). Although constant exposure to these forces results in deposit disturbance, rare conditions may, in fact, cause the most damage to archaeological sites undergoing transgression (Flemming 2004, p. 13). These include tsunamis, extreme storms, iceberg grounding, and peak conditions such as highest tide, highest wave, and strongest current events.

Site preservation issues are illustrated along the emergent portions of the Sable Island Bank, which were once part of a large archipelago located at the edge of the continental shelf (see Fig. 2.2). As the sea level rose, these large islands progressively shrank in size and, today, Sable Island constitutes the only emergent portion of this former archipelago. Seismic stratigraphy of the deposits that form this and the majority of the other offshore banks, show that geological units associated with the postglacial period are made of reworked and unconsolidated sands due to high wave-energy conditions during transgression, followed by millennia of constant reworking by extra-tropical storms, hurricanes, and other marine processes (Amos and Miller 1990; Fader 1989; King and Fader 1986). Therefore, despite the occasional recovery of buried peat, providing pollen data and datable organic material (Mott 2011), there is only a very low likelihood that archaeological material, if ever present, has survived the early Holocene transgression.

Given the potential for site destruction, large-scale landscape survival is unlikely to be common in Atlantic Canada. Constant exposure to high-energy conditions, however, does not necessarily rule out site preservation. In British Columbia, multiple intertidal sites have been identified with undisturbed stratified deposits that have survived in the active beach zone on highly exposed locations, suggesting this may be the case elsewhere as well (Fedje et al. 2009). In fact, small pockets of in situ deposits have been identified by a number of researchers, often in association with favorable topographic settings, either lodged in peat layers, which are more resistant to erosion than marine deposits, or in sediments stabilized by sea grasses (e.g., Galili and Rosen 2011; Malm 1995; Momber 2000; Neumann et al. 2000; Wessex Archaeology 2008). Archaeological material recovered from reworked contexts can still provide valuable information to archaeologists (Grøn 1995; Hosfield 2007; Wessex Archaeology 2008; Westley et al. 2004). When medium-energy conditions dominate, affecting mostly fine-grained sediments, larger objects are likely to remain in position or in the vicinity of their original location (e.g., Brunning 2007; Faught 2004; Fischer 1995; Will and Clark 1996; Malm 1995).

Low-energy settings, however, are the most likely locations where in situ archaeological deposits can be identified; these include fossil estuaries and river valleys; the flanks of submerged banks and ridges likely to have peat layers; valleys, depressions, basins with wetland marsh deposits; nearshore creeks, mudflats, and peat deposits; low-gradient beaches with constructive onshore wave action; fossil archipelagos; erosional features protected by islands or found within an archipelago; submerged caves and rockshelters in re-entrant bays; fossil erosional shorelines; submerged rocky shores; and deposits of sediments formed within or washed into rocky gullies or depressions (Flemming 1983, 2004). Low-energy conditions can occur at a very local scale in the midst of high-energy environments, as a result of the particular geomorphology surrounding a given location. For example, during transgression in the Gulf of Maine, rocky islands sheltered basins from erosive wave action, protecting lakes and wetlands associated with evidence of human presence (Kelley et al. 2010). Here these environments were able to develop due to a slowstand period during which RSL rise was greatly reduced, underscoring the importance of relying on a well-constructed and locally specific chronology.

In Atlantic Canada, lowstands were generally of insufficient duration to develop large coastal landforms that could survive transgression and, therefore, there is only rare evidence of submerged shorelines (Shaw et al. 2009; Shaw 2005). However, few areas have a sufficiently detailed chronology to permit definite statements (Kelley et al. 2010). The most favorable setting encountered thus far is in freshwater lakes that once bordered coastal regions during the early Holocene and were rapidly submerged during the Holocene transgression. One of the best examples is found in the southern regions of the Bras d'Or Lakes, an inland sea on Cape Breton Island, Nova Scotia. The coastal regions of these freshwater lakes developed over more than 5,000 years, before being suddenly inundated as sea level rose above their rocky sill ca. 5,500 BP (Shaw 2005; Shaw et al. 2009). As seen in Fig. 2.4, multibeam imagery of the lake bottom reveals the presence of spits, barrier beaches, and lagoons in at least two different areas of the Lakes. Here, it is the rapid onset of transgression and the relatively restricted fetch within the lake that have helped preserve these coastal features.

Evidence of fluvial systems has also been identified near the modern coast, although the evidence is often minimal. Some of the best preserved fluvial systems have been found within the Bras d'Or Lakes, and also off the coasts of modern PEI (Forbes et al. 2004; Shaw 2005; Shaw et al. 2009). Multibeam bathymetry of the nearshore zone along the coasts of PEI indicates that relict fluvial features are still present on this open shoreline of the central North Shore (Fig. 2.5a), and provides clear evidence that a former lake and river system occupied the Northumberland Strait in the early Holocene when the Island was connected to the mainland (Fig. 2.5b). Deltaic systems have also been preserved in locations sheltered from wave action, although they appear to occur most frequently around Newfoundland, where early postglacial streams incised glacial deltas and outwash deposits at fjord heads, thus providing an ample sediment supply as the sea level dropped to local lowstands (Shaw 2005).

In summary, although large landforms were exposed at some point during the early Holocene, the most favorable settings for the preservation of submerged archaeological landscapes are found at the local scale, where a variety of factors combine to preserve these landscapes. A number of relict coastal, fluvial, and deltaic landforms are known to exist in Atlantic Canada, and through the targeted use of multibeam bathymetry, seismic profiling, and field sampling, areas with a fairly high archaeological potential can and have been identified in a variety of settings across the region.

People, Their Landscape, Their History, and Submergence

Despite the aforementioned evidence suggesting the existence of submerged archaeological landscapes in Atlantic Canada, there are no submerged precontact archaeological sites currently known beyond the intertidal zone. Dealing with submerged precontact landscapes in the absence of direct archaeological evidence from the seafloor necessitates a different approach to archaeological investigation. Forced to rely on patterns spanning wider regions, the human-landscape interactions then become the focus of attention. The following examines two study areas where the investigation of submerged landscapes offers insight into a variety of human-landscape interactions that were integral to the lives of the region's early

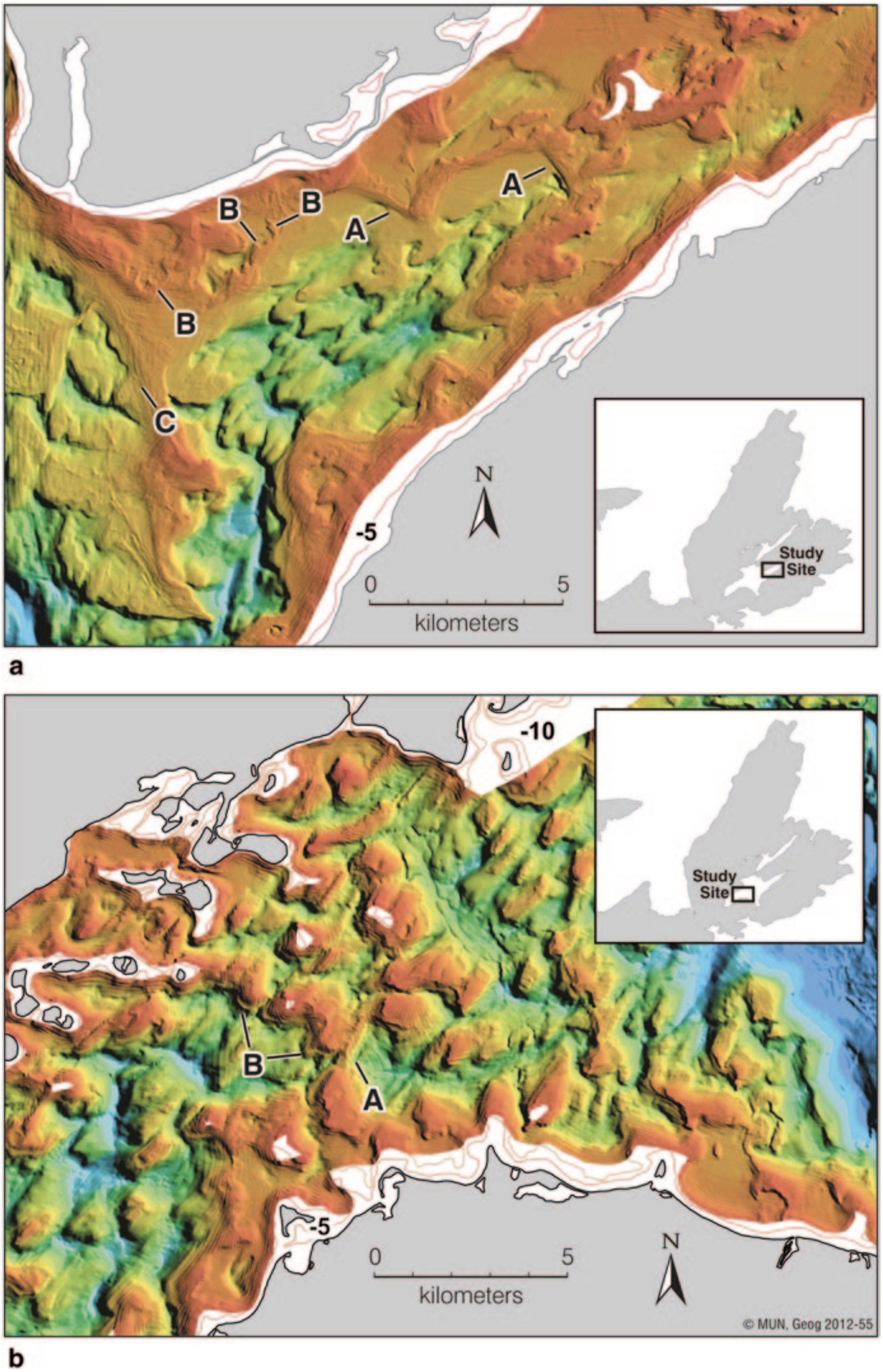

Fig. 2.4 Multibeam bathymetry of selected areas of the Bras d'Or Lakes showing evidence of preserved coastal features: **a** barrier beaches (*A*), spits (*B*), and tombola (*C*) in East Bay, and **b** submerged barrier beach (*A*) and erosional terraces (*B*) in West Bay. Shallow waters are represented by reds up to 25 m depth where yellows begin, and blues represent waters of 50 m depth or more (After Shaw et al. 2009: Figs. 8 and 9)

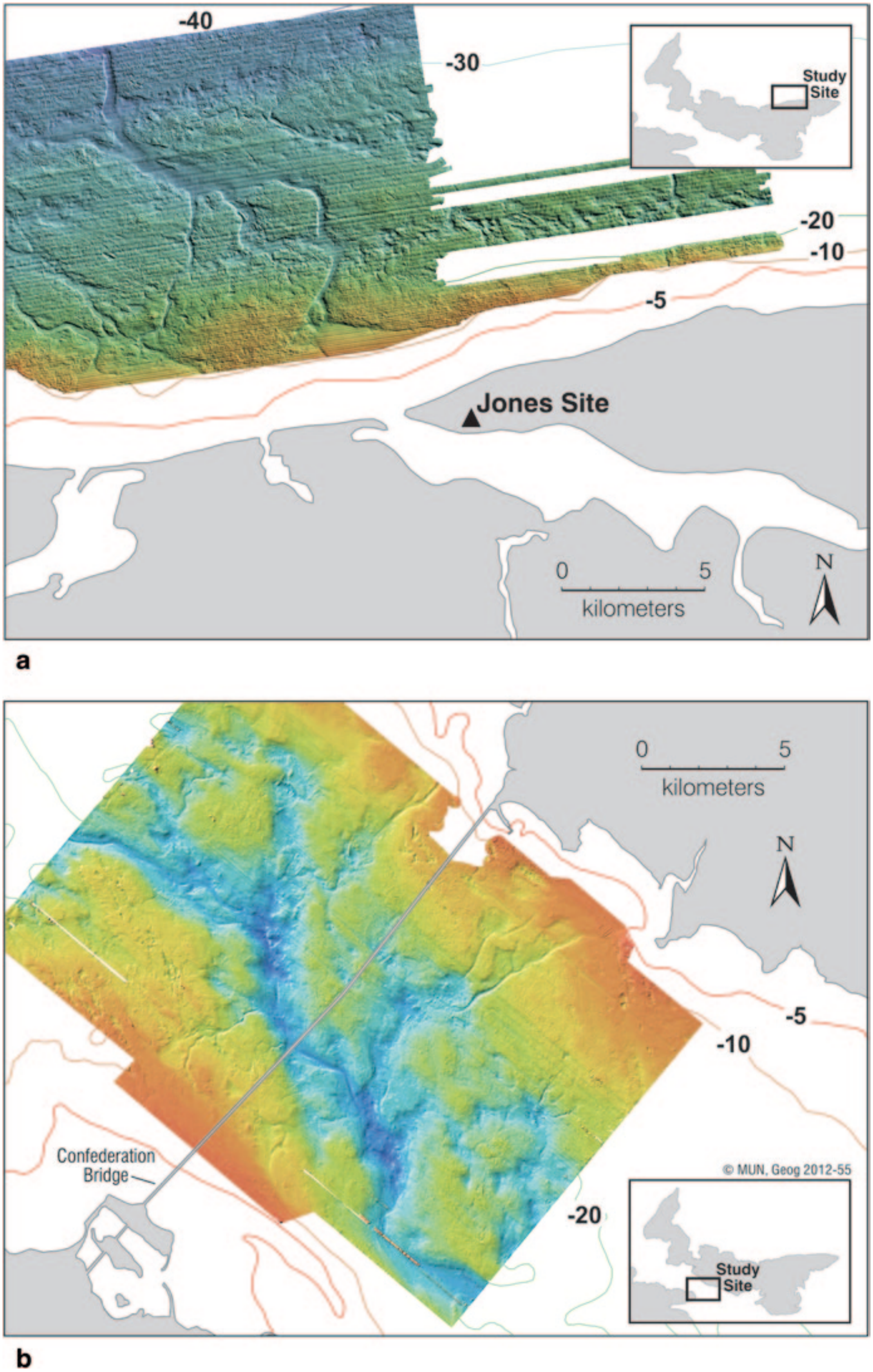

Fig. 2.5 Multibeam bathymetry off the coast of Prince Edward Island (PEI) showing preserved fluvial systems: **a** central North Shore and **b** Northumberland Strait. Note the definite inland location of the Jones site for any period where local sea-levels where more than 10 m below their current level. (After Forbes et al. 2004; Shaw et al. 2009)

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