Evidence for early hunters beneath the Great Lakes

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Scholars have hypothesized that the poorly understood and rarely encountered archaeological sites from the terminal Paleoindian and Archaic periods associated with the Lake Stanley low water stage (10,000–7,500 BP) are lost beneath the modern Great Lakes. Acoustic and video survey on the Alpena-Amberley ridge, a feature that would have been a dry land corridor crossing the Lake Huron basin during this time period, reveals the presence of a series of stone features that match, in form and location, structures used for caribou hunting in both prehistoric and ethnographic times. These results present evidence for early hunters on the Alpena-Amberley corridor, and raise the possibility that intact settlements and ancient landscapes are preserved beneath Lake Huron.

Lake Stanley | Paleoindian period | underwater archaeology | Lake Huron | caribou

It is difficult to consider the early prehistory of the Great Lakes region without reference to the slow withdrawal of the continental ice sheet, and the subsequent rises and drops in the waters of the Great Lakes that accompanied the region's gradual transition to its modern appearance. Much of what is known of the early human occupation derives from the periods of high water and relict beaches. For times associated with low water, there are few sites. Some are found deeply buried beneath later lake sediments, and most are presumed lost forever beneath the lakes. New high-resolution bathometry of the Great Lakes, coupled with advances in 3D surface modeling, make it possible to view once again the ancient landforms from these low-water periods. This in turn raises the possibility of discovering early human settlements and activity sites preserved beneath the lakes. Here we report evidence for human activity on the Alpena-Amberley ridge—a structure that, during the Lake Stanley low-water phase, would have provided a land causeway across the middle of modern Lake Huron linking northern Michigan with central Ontario.

The post-glacial history of the Great Lakes is characterized by a series of high and low water stands regulated by the interaction of early Holocene climate, the flows of glacial melt waters, and the isostatic rebound of recently de-glaciated land surfaces (1, 2, 3). The most extreme of the low-water stands is referred to as the Lake Stanley stage in Lake Huron (and the Lake Chippewa stage in the Lake Michigan basin) (4), which spanned from approximately 9,900 BP to 7,500 BP and was associated with lake levels as low as 55–80 m above mean sea level (AMSL), compared with the modern standard of 176 m AMSL (Table 1). When projected at a level of 90 m AMSL, the Lake Huron basin contains 2 lakes separated by a ridge or causeway extending northwest to southeast across the basin from the area of Presque Isle, MI, to Point Clark in Ontario (Fig. 1). The causeway, designated the Alpena-Amberley ridge, averages 16 km in width and is capped with glacial till and Middle Devonian limestone and dolomites (5, 6).

The earliest human occupation in the upper Great Lakes is associated with the regional fluted-point Paleoindian tradition, which conventionally ends with the drop in water level to the Lake Stanley stage (3, 7). The terminal Paleoindian and earlier Archaic populations that inhabited the region during Lake Stanley times experienced an environment that was colder and drier than present, with a spruce-dominated forest (4, 8, 9). The problem in investigating these earlier time periods is that intact sites such as the Sheguiandah site (10) are extremely rare. The critical evidence lies beneath Lake Huron (7, 11, 12).

Table 1. Dates and elevations of Lake Stanley low-water phases

Low-water phase	Date in ^{14}C years BP	Elevation AMSL (m)
Early Lake Stanley	9,900–9,500	55–80
Mid-Lake Stanley	9,300–9,000	85–100
Late Lake Stanley	7,900–7,500	90–95

Discovering Hunting Sites on the Lake Stanley Causeway. Archaeologists have long recognized the potential for discovering sites of Pleistocene and early Holocene age in coastal areas subject to repeated exposure and submergence (13–23), although these efforts have typically focused on marine environments that were subject to global changes in sea level. During the past year, investigators from the Museum of Anthropology and the Marine Hydrodynamics Laboratories at the University of Michigan have begun the task of testing whether human occupation sites are present on the Lake Stanley causeway beneath Lake Huron. A particularly tantalizing possibility is that stone constructions, such as caribou drive lanes, hunting blinds, and habitation sites of the kind seen in sub-arctic regions (24–26) might be preserved on the lake bottom.

To discover sites within this setting, a multilayered search strategy was developed. Here we report efforts involving surface-towed side scan sonar and remote-operated vehicles (ROVs). Subsequent work will add autonomous underwater vehicles and direct observation by archaeologists using SCUBA. Side scan survey was conducted using a digital side scan sonar unit (Imagenex), at a frequency of 330 kHz and a depth of 30 m, mapping overlapping swaths of approximately 200 m (27). Targets of interest, identified from acoustic survey, were examined using an ROV. The current work used 2 mini-ROVs—a SeaBotix LBV 150 and an Outland 1000—that are manually deployed from a small craft. Two pilot search areas (Fig. 1) were covered, representing a total area of 72 square km, at depths ranging from 12 to 150 m.

Results

Initial examination confirmed the absence of major sediment cover over most of the Alpena-Amberley ridge. The ridge exhibits substantial quantities of rock, with boulder fields and massive exposures of intact bedrock. Shallower areas on the ridge are covered with sand and appear to represent past water courses or impoundments. Unfortunately, most hard surfaces are covered with invasive mussel species and adhering algae. These accumulate in dense deposits and completely obscure the rock surfaces in most instances.

Given these bottom conditions, the combination of sonar and ROV worked well to highlight ancient landforms, locate major

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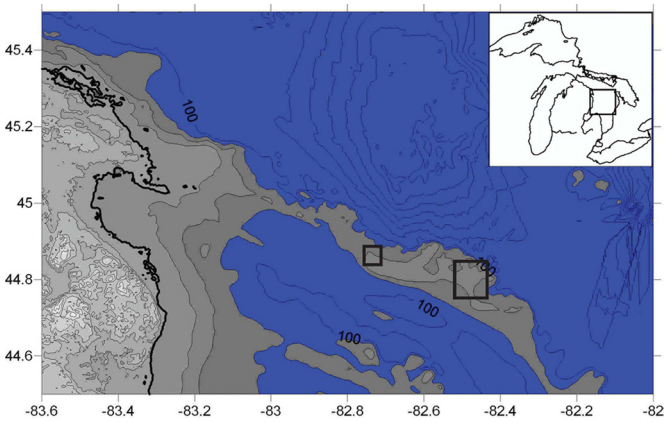

Fig. 1. The Alpena-Amberley ridge as it would have appeared during the Lake Stanley low-water phase in Lake Huron. The modern lakeshore is shown by the bold contour line. The 2 pilot search areas described in this report are shown as small black rectangles.

rock outcrops with the potential of yielding chert exposures, and identify potential hunting structures. Several examples of these are presented in Figs. 2–4.

The long snake-like image in Fig. 2*B* is a strong candidate for a caribou channeling structure. The feature is 350 m long, runs slightly upslope, and is located just downslope of a field of fist-sized boulders. The feature is a good visual match for ethnographically known drive lanes in the arctic, as on Victoria Island in Canada (Fig. 2*A*). Like such known structures, the construction takes advantage of an existing surface feature, which was modified by the addition of small boulders that served both to fill gaps and to exaggerate the visual appearance of the feature (compare Fig. 2 *C* and *D*). Also like the arctic structures, the areas near both ends of the feature are marked by a series of large stones or cairns, represented by small bright acoustic returns, which would have functioned to guide animals into the lane (26). At the east end of the structure, the line curves upslope to define a semicircular area that contains a larger bright acoustic reflection (point B in Fig. 2*B*). Such brightly colored returns represent hard-surfaced features, like rocks and boulders, which give a strong acoustic reflection. This particular reflector resembles a constructed hunting pit or blind (25, 26). A video image of this same structure is shown in Fig. 3*A*.

The potential blind is formed by 3 anomalously large boulders (the feature is roughly 3.5 m across) that have been positioned to create a hollow center. Examination suggests that the interior area of the feature may have been modified to enlarge the central area. A second feature of this same type was observed located closer to the linear construction and approximately 50 m east of the first.

Fig. 4 presents a second example where hunters appear to have made use of an existing landform to create an advantageous hunting setting. The figure shows the mosaic of 5 sonar transects (dark parallel lines running north-south in the image) that has been draped over the lake bottom topography. The distance between each track is 200 m. The image shows what appears to have been a water course that averages approximately 140 m across, running diagonally across the mosaic. The bottom of this

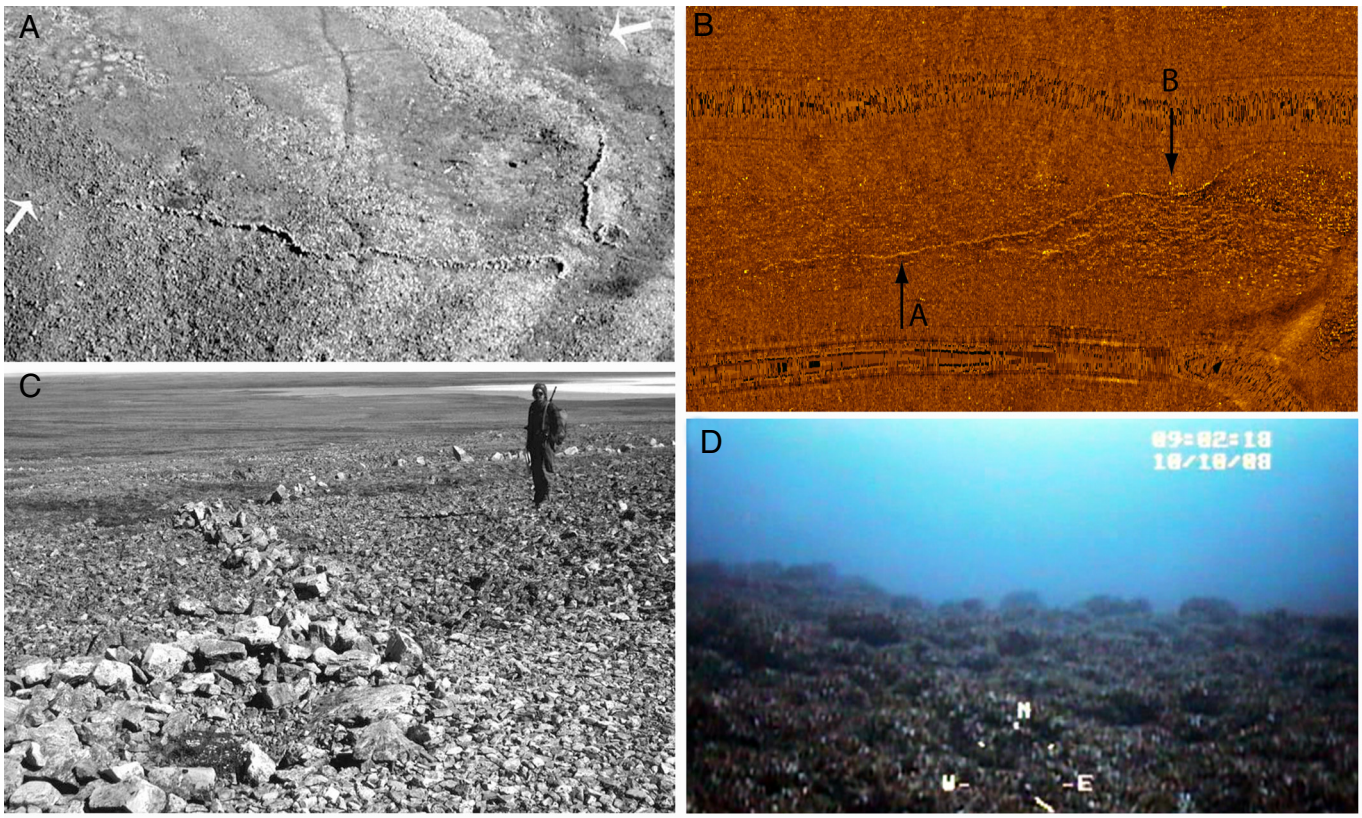

Fig. 2. Caribou channeling structure. (*A*) Caribou drive lanes photographed on Victoria Island in northern Canada. The structure at the bottom is approximately 300 m long. White arrows in the photograph indicate stone cairns leading into the channeling feature. (*B*) Acoustic image of a potential caribou drive lane beneath Lake Huron. The linear structure is designated by *A*, and a potential hunting blind (see Fig. 3*A*) is at *B*. The total length of the structure is 350 m. (*C*) A view of a Victoria Island caribou drive structure at ground level. (*D*) A similar, ground-level view of the Lake Huron structure. [Victoria Island photos reproduced from ref. 24 (Copyright 2005, Board of Regents of the University of Wisconsin System. Reproduced with permission of the University of Wisconsin Press).]

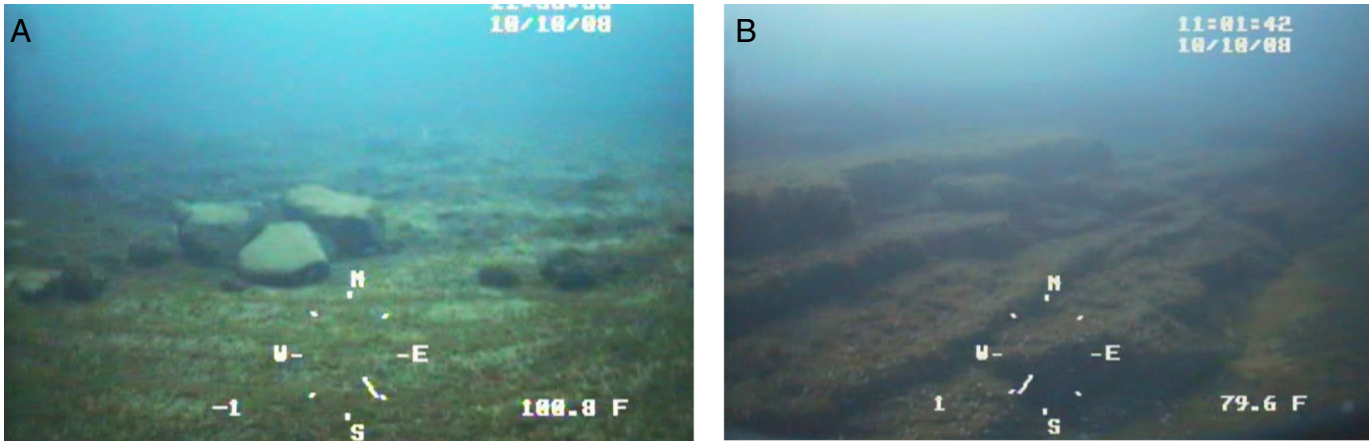

Fig. 3. Images captured from ROV video examination of the lake bottom. (*A*) View of a potential stone hunting blind (see Fig. 2*B*) that is approximately 3.5 m across. (*B*) Bedrock outcrop showing massive limestone blocks and thinner bedded layers, which may include chert deposits. Exposure is approximately 250 m long. The direction of view and camera depth (in feet) is recorded in the foreground of each image.

feature is clean white sand, which is bounded on each side by banks of higher and rocky ground (Fig. 4, point A). At the extreme southeast corner of the mosaic, the channel narrows to less than 50 m and then expands again.

Two areas are of particular interest in this mosaic. Within the narrow portion of the channel, and in the center of the area immediately beyond the narrows, a series of bright acoustic reflectors are observed (Fig. 4, point B). These reflectors represent either single large boulders or a tight cluster of boulders that, like the features described earlier, are out of place geologically, and in the correct position for hunting features (cf. 26).

A second area of potential significance in Fig. 4 is found in the lower left corner of the image (point C). This is an unusual acoustic target characterized by short discontinuous lengths of linear reflectors. The feature does not resemble normal bedrock outcrops visible elsewhere in the area. The shape does, however, bear a striking resemblance to constructions related either to low-walled dwellings or tent rings (25). This potential feature also shares similar locational characteristics to the ethnographically reported hunting camps (26). The potential structures are sited more than 200 m back from the banks of the channel, and in a spot where neither their sight nor scent would provide a warning to a migrating herd.

In addition to possible hunting features and constructions, the survey also revealed a number of potential chert outcrops that would have been available for exploitation by ancient hunters. The Devonian age limestones that form the bedrock of the Alpena-Amberley ridge are known to contain cherty layers. Similar exposures, such as on Charity Island in Saginaw Bay, were intensively exploited historically and prehistorically (28). Fig. 3*B* presents one such bedrock exposure. This particular exposure outcrops from a slope and is approximately 250 m in length. This exposure, and a number of others observed during the survey, present massive limestone outcrops inter-bedded with thinner layers that we believe include cherts. Unfortunately,

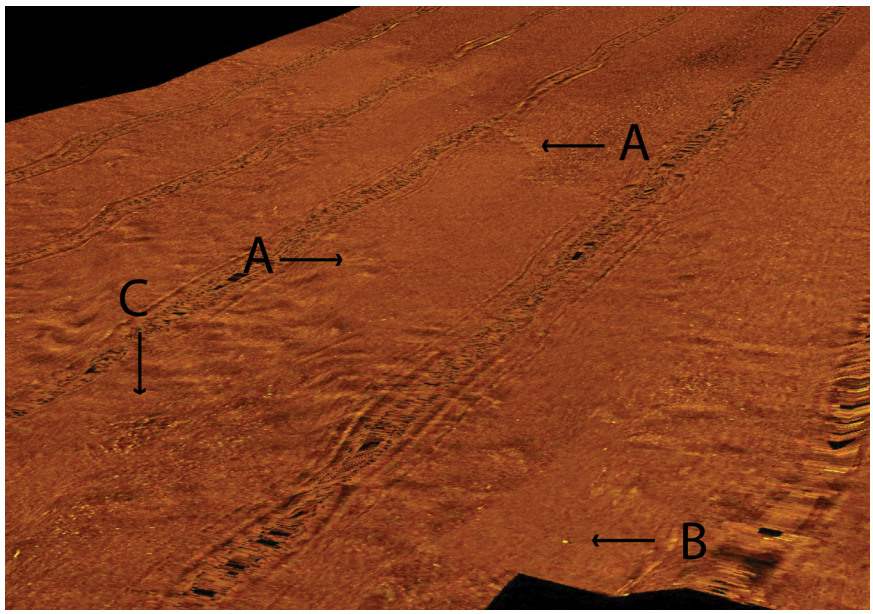

Fig. 4. Mosaic of acoustic images draped over the bottom contours showing a Lake Stanley-age watercourse with associated possible hunting structures and camp site. The banks of the watercourse are indicated by A. A potential hunting feature is at B, and the potential camp site at C. Distance between the dark bands in the image is 200 m.

the dense cover of mussels and algae prevent remote observation of the rock surface or of smaller debris along the outcrops, which would provide direct evidence of human modification. We are confident, however, that such evidence will be recoverable when direct dive operations are initiated in the next stage of investigation.

Discussion

These results present evidence for the existence of hunting structures and human activity associated with the Lake Stanley causeway beneath modern Lake Huron. These results confirm the existence of conditions necessary for the discovery of archaeological sites on the Alpena-Amberley ridge, and demonstrate the existence of a series of features that are consistent in form, construction, and placement with known caribou hunting structures.

In addition to the anthropological importance of this preserved ancient landscape, we can also anticipate a range of important new insights relevant to the region's paleoecology and geology. We have already noted the presence of ancient waterways and impoundments. The underwater topography will also provide a means for identifying the actual location and elevation of shoreline features attributable to the Lake Stanley low-water phases, as well as a range of other faunal and floral remains attributed to these poorly known time periods.

Although the absence of mantling sediments over the till and bedrock on the ridge makes it possible to view landscapes and detect large features, the mussels and algae seriously limit the ability to detect small archaeological debris using remote techniques. Fortunately, the depths at which many of these features are found (20–40 m) fall within the range of normal scuba operations. The biggest obstacle to confirming the human origin of the constructions is the expected character of the cultural remains to be found. Brink (24) notes that artifacts and other debris are very scarce in the area of hunting structures and blinds. This makes good sense in terms of hunting, but makes the job of confirming the cultural (man-made) origin of structures more difficult. This problem is compounded by the tendency for hunters to maximize the use of existing terrain and features.

The next step in the research will involve ground-truthing a series of targets, such as those described here, to confirm their cultural origin and age. The site type with the greatest potential for yielding cultural debris is a stone quarry. Quarrying produces masses of diagnostic debris that can be easily recognized. A second likely source for archaeological debris would be potential habitation areas. Not only should such sites produce identifiable refuse, they have the potential to preserve a much wider range of materials, compared with the specialized activities at a quarry site. At a settlement, we also may have the best hope of recovering not only stone artifacts but also preserved faunal remains and artifacts fashioned from organic materials. Such finds would be of enormous significance as they rarely survive on terrestrial sites as a result of modern disturbance and acidic forest soils.

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