man in the northeast 19:1980

PALEO-INDIAN HUNTERS AND THE CHAMPLAIN SEA: A PRESUMED ASSOCIATION

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Abstract

All of the known Paleo-Indian components in the Champlain Valley and many of the fluted point find-spots are associated with Champlain Sea landforms. The circumstantial evidence of association allows for the possibility that Paleo-Indians might have adapted to a maritime-based economy for at least a part of their seasonal round. Other options for subsistence exploitation, as well as the artifactual evidence for site locations, are discussed.

With the possible exception of remnant glaciers in the higher mountains, the mantle of ice which had covered New England was gone by 12,000 BP. As the ice retreated northwards, a series of proglacial lakes was formed in the Hudson and Champlain Valleys. When the margin of the ice sheet retreated north of the St. Lawrence Valley, the ice-edge dam was released, the lakes were drained, and the proglacial lacustrine episode in the Champlain Valley was terminated.

An erosional interval of dry land in the St. Lawrence and Champlain lowlands ensued, terminating with the eustatic rise of sea level and the invasion of marine waters (Stewart and MacClintock 1965).

The Champlain Sea

The resulting Champlain Sea is a well-known aspect of the late Pleistocene in the Northeast (Hitchcock 1861; Woodworth 1905; Chapman 1937; Karrow 1965; Wagner 1972). It is recognized by the presence of fossilized faunal remains, mostly mollusk, and by shoreline features and depositional deposits. A vast marine environment was in existence west to near present-day Lake Ontario (Muller 1977) and south to near Whitehall, New York (Chapman 1937), creating an inland sea with an estimated area of 20,500 or more square miles (Elson 1968). The marine waters rose to their maximum where the isostatic rebound of the land was in equilibrium with the eustatic rise of sea water, long enough for shoreline features to form (Stewart 1961; Wagner 1970). Following the period of stabilization, the isostatic rebound of the land exceeded the rise of sea-level and the marine waters were slowly expelled. In his pioneering study, Chapman (1937) reported several succeeding phases of lower marine levels. He identified the prominent beach levels in Vermont as the Port Kent, Burlington and Plattsburg levels. Stewart and MacClintock (1969) were unable to find strandline associated features below those of the Marine Limit. They interpreted this as evidence of an uninterrupted and

and gradual, but steady, withdrawal of the marine waters. However, Wagner (1972) has recently demonstrated the existence of extensive shoreline features, supporting Chapman's contention of periods during which the marine level was stabilized. Studies on marine mollusk shells found associated with Champlain Sea deposits indicate changes in the salinity of the Champlain Sea environment over time (Harrington 1977; Cronin 1977), and suggest the occurrence of three distinct maritime phases, resulting in part from sea-level changes.

The Champlain Sea invasion occurred sometime before 12,000 years ago. Wagner (1972) reports an age of 11,740 BP on marine shell from an early Champlain Sea deposit collected just south of Frelighsburg, Quebec; and Cronin (1977) has a date of 11,665 BP on marine shell collected from near Plattsburg, New York. Recent work by Chase (1972) on Lake Champlain sediments suggests that the Champlain Sea drainage may have occurred as early as 10,200 BP. Basal peats in the St. Germain Bog near Dummondville, Quebec, indicate that the marine waters formerly covering it had left the area by 9500 BP (Terasmae 1959).

Marine Fauna

Mollusks and *Ostracoda* (a group of crustacea), indicative of frigid fluctuating fresh and brackish waters, are associated with the earliest beaches of the Champlain Sea. *Portlandia arctica*, a mollusk indigenous to periglacial maritime waters near freshwater influx sources, is also associated with an early Champlain Sea deposit. Also indicative of an early cold water period are the fish fossils of capelin and sculpin recovered near Ottawa. Based on the known ecology of the mollusk and marine faunal finds, this early sea environment would be extremely cold and subject to periodic influxes of fresh water from proglacial lakes and meltwater streams (Cronin 1977).

The increasing salinity of the Champlain Sea waters is indicated by subsequent changes in the fossil mollusk population. A seaweed deposit found in Champlain Sea sediments near Ottawa, composed mostly of *Laminaria*, a species indicative of subarctic waters, was radiocarbon-dated to 10,800 BP (Harrington 1977).

In addition to marine mollusk and fossil invertebrate remains, the Champlain Sea deposits include a number of marine mammal associations. These have been recently summarized by Harrington (*ibid.*).

Harrington cites 19 occurrences of beluga whales (*Delphinapterus leucas*) from the Champlain Sea area. Included is a nearly complete specimen discovered by railroad workers south of Burlington, Vermont, in 1849 (Hitchcock 1861). The beluga is a gregarious animal and is frequently found in small groups. Favorable conditions may result in groups as large as a hundred or more schooling together. It is an inshore, shallow-water species found only in cold arctic waters; it favors estuarine environments. Belugas are a migratory species, and as such, they were probably found in the Champlain Sea basin during the summer months, retreating to the open water of the St. Lawrence Gulf during the early winter.

Other marine mammal finds from the Champlain Sea area include a single dubious sperm whale find from Michigan; a harbor porpoise (*Phocoena phocoena*); two finback whales (*Balaenoptera physalus*); and three bowhead whales (*Balaena mysticetus*). The harbor porpoise is found during the summer months along inshore waters. The finback and bowhead whales are both approximately 70 feet long, gregarious and migratory. They are found in open polar waters during the summer. The bowhead whale frequents ice-choked bays and estuaries and is confined to arctic and subarctic waters, while the finback will migrate south to more temperate winter waters. The different habits of these species, particularly in relation to their diet, indicate that the Champlain Sea waters supported a complex and rich marine environment.

Early historical accounts indicate that the seal was once a rare visitor to the freshwater environment of Lake Champlain (Thompson 1971), so it is not surprising to find them well-documented in the fossil record. Harrington (*ibid.*) records 20 specimens, including three ringed seals (*Phoca hispida*), a harp seal (*Phoca groenlandica*), and a bearded seal (*Erignathus barbatus*) from Champlain Sea deposits. A hooded seal (*Crystophora cristata*), also reported, is a questionable record.

The ringed seal, smallest of the pinnipeds, is found close to land-fast ice where the pups are born. One of the Champlain Sea specimens, a juvenile, suggests that the seals may have been year-round residents, maintaining breathing holes through the winter and pupping in prepared dens on the ice. The highly gregarious harp seal is a migratory animal wintering along the southern margin of the ice pack's edge and summering in the high arctic waters. Crustacean 'krill,' found swimming in frigid arctic waters, is indispensible as a food source for immature harp seals, as well as for ringed seals and finback whales. These species could only survive in the Champlain Sea waters during its early cold-water stage.

The bearded seal is not gregarious, inhabits arctic and subarctic shallow seas, preferring a habitat of pack-ice in the winter and open ocean during the summer.

The colonization of the Champlain Sea by marine species must have occurred at an extraordinarily rapid pace, as cold-water marine mammals are associated with early sea deposits. The complex biotic requirements of the marine mammal species depended on a well-established food chain, including plankton and microscopic crustaceans, mollusks, fish, shrimp, squid, etc.

By 12,000 BP, marine waters had inundated a vast portion of the Champlain and St. Lawrence Valleys. The maritime environment hosted a complex marine ecosystem. The climate of northern New England, adjacent New York, and the St. Lawrence Valley must have been dominated by the influences of the cold sub-arctic waters.

In Vermont, the vegetational and associated faunal communities would have been governed by the periglacial and subsequent marine environments. It would seem likely that a cold, moist climate prevailed during

the existence of the Champlain Sea. The mountainous topography adjacent to the marine waters may also have inhibited the northward expansion of successive plant communities. It is important not to lose sight of the transient nature of the ecozones described in environmental reconstructions which, at best, are only an approximation of the actual vanished ecozone. Local geography and climate will influence the formation of numerous micro-environments, or patches, which are lost in the background of the 'generalized' pollen assemblage.

Evidence for a Regional Palynological Sequence In the Champlain Valley, 12,000 to 9000 BP

The rapid deglaciation and postglacial vegetational history of New England, as evidenced by pollen sequences throughout the area, reveals a generally similar pattern of succession. In south-central Maine, a palynological sequence has been established from sediments at Moulton Pond (Davis *et al.* 1975). The Moulton Pond area emerged as part of a nunatak prior to the deglaciation of the eastern coast of Maine between 14,000-13,500 years ago. A sparse herb-tundra environment is inferred on the basis of the very low pollen influx and the high percentage of non-aboreal pollen, implying that during this early period trees were still not a part of the local vegetation. Between 12,400 and 11,700 BP, the vicinity about Moulton Pond begins to take on more of the aspect of a modern tundra and by 10,500 BP, a luxuriant shrubby local tundra is inferred.

North of Moulton Pond, near Presque Isle, Maine, Deevey (1951) described a late-glacial tundra sequence succeeded by a rise in spruce pollen. A similar sequence is reported from Cape Breton Island in Nova Scotia (Livingstone and Livingstone 1958), where high spruce and birch values indicate a closed boreal forest succeeding the late-glacial tundra. This transition has been dated at 10,340 BP.

Although a major spruce cover is inferred from the pollen influx data from southern New England, and spruce forests are assumed to succeed the tundra-like zones in northern Maine and in Nova Scotia, Davis *et al.* can find no evidence to suggest that the late-glacial tundra-like environment at Moulton Pond was ever succeeded by a spruce-dominated forest or woodland. They hypothesize that ameliorating climatic conditions around 10,000 years ago might have encouraged the establishment of temperate forest species--pine, birch and oak--in advance of the intrenched boreal spruce forest of southern Connecticut. In northern New England, a much more diversified forest cover appears to have usurped the all-pervasive spruce domination. In Vermont, as well as in Maine, the post-tundra environments may well have contained a significantly greater diversity than in modern boreal ecozones.

The widespread period of climatic moderation that begins suddenly around 10,000 BP, coincides with a major change in the vegetation about Moulton Pond. Between 10,500 BP and 9700 BP, an increased pollen influx documents the increase of birch, pine, spruce, and alder as well as the non-aboreal sedges and grasses that imply a change from a tundra to a forest or woodland ecozone. A similar transition had occurred 1700 years

earlier at Rogers Lake in Connecticut (Davis 1969). Zone II at Moulton Pond, circa 9700-4700 BP, was a period of mixed open forests. In an early stage, until approximately 7100 BP, there is evidence of a strong pine element in the pollen assemblage. Birch and oak are also present and may be as significant a factor in the local ecozone as pine.

At Bugbee Bog in north central Vermont near St. Johnsbury (McDowell *et al.* 1971), the palynological record begins with high percentages of spruce and fir pollen, indicating a cool, moist climate. Radiocarbon dating of peat sediments at the bog indicate the presence of a spruce-fir forest in Vermont between 10,500-9300 BP. Pollen characteristic of the late-glacial herb tundra environment found in Maine, in southern New England, and adjacent New York is absent at Bugbee Bog, apparently because the lowest sediments were not sampled. A rapid increase in pine pollen and a corresponding decrease in spruce and fir elements indicate a warmer, dryer climate occurring between 9300-7250 BP.

The late-glacial environment of the Champlain Valley area would have been dominated by the influence of proglacial Lake Vermont and the subsequent Champlain Sea, as well as by the local topography. It is possible to construct a model for the late-glacial and early postglacial environments in the Champlain Valley, based on the palynological sequences from the adjoining areas. The northward extension of a tundra-like ecozone into Vermont followed close on the heels of the retreating ice. The vegetational development of the lowland area would precede that of the adjacent mountain and upland terrain, which, because of its exposed nature and poorer soils, would retard the development of vegetational communities. The colonizing vegetation would be dominated by grasses and sedges and other herbaceous plants characteristic of a treeless tundra or park-tundra ecozone. Spruce and dwarf birch probably grew in protected patches.

Terrestrial Fauna

Terrestrial fauna were undoubtedly associated with the colonizing vegetation that entered Vermont and the Champlain Valley area following deglaciation. With few exceptions, floral and faunal associations are not preserved in this area, and it is impossible, at this time, to examine critically the late-glacial and early postglacial faunal populations in the Northeast.

It is not unreasonable, considering the broad ecozonal similarities between late-glacial New England, New York and Michigan, that the Pleistocene fauna recognized in the latter areas would at least have been represented in New England. Mammoth, mastodon, the woodland musk-ox, the moose-elk, and the caribou are all known from late-Pleistocene deposits in Michigan and New York (Cleland 1966; Fisher 1955). In Vermont, skeletal fragments of two proboscideans have been recovered from the Champlain Valley. While building a railroad between Rutland and Burlington in 1848, probocidean remains (presumably mastodon) were discovered in Mt. Holly, at the bottom of a peat bed 11 feet below the surface (Agassiz 1850; Hitchcock 1861). Beaver-cut and gnawed wood was also recovered from the peat bed. Beavers are known from contemporary tundra and taiga ecozones in Canada,

providing that a growth of shrub willow or aspen can be found along the streamside. It would be expected that beavers would be found in the areas adjacent to the Champlain Sea, colonizing the slow-flowing streams and rivers of the valley lowlands. An additional proboscidean remain, a mastodon tusk, was discovered in Richmond, Vermont in 1858 (Jacobs 1950).

Dreimanis (1968) has clearly shown the association of mastodons with open spruce woodlands and spruce forests. These were forest-browsing animals adapted to lowland valley and swamp-margin environments. In Vermont, at Bugbee Bog, a spruce-fir ecozone is present from approximately 10,500 to 9300 BP, during which time the area would have been a conducive habitat for mastodons. In the lowlands adjacent to the Champlain Sea, the existence of poorly established drainage areas would have favored the establishment of spruce forests that might have attracted mastodons.

Caribou (*Rangifer tarandus*) presently range in the arctic tundra, taiga and boreal woodlands of Canada. Formerly, their northern range was restricted by the Wisconsin ice. They are known to the Pleistocene record from scattered finds in New York State (Fisher and Ostrom 1952). Radiocarbon-dated caribou bone from the Dutchess Quarry Cave in Orange County, New York indicate an age of 12,530 BP (Funk, Fisher and Reilly 1970). The presumed association of a Paleo-Indian fluted projectile point with these caribou bones is one of the earliest indications of man in the Northeast.

Caribou are a nomadic, migratory species, and hence probably one of the first to colonize the deglaciated areas of northern New England. They graze on lichen and moss, which constituted significant aspects of the vegetation regime of the open tundra and early successional forests in the Northeast. Possible caribou remains from Vermont are cryptically referred to by Hitchcock in his *Geology of Vermont:*

> The fossil ham of some ruminant has been found in Hartford; and the ham of a deer in the alluvium of Grand Isle...(1861:176)

The rich Pleistocene faunal resources of the Hudson River Valley (Ritchie 1969:Fig.3; Fisher 1955) made it attractive to early Paleo-Indian groups. The early date from Dutchess Quarry Cave implies that caribou hunters were in the Hudson Valley vicinity before 12,000 BP. Evidently the valley provided a favorable habitat, as continued occupation for much of the Paleo-Indian period is indicated by the number and variety of fluted-point find-spots, the camp sites and quarry sites, and the appearance of Hudson Valley flints in other Paleo-Indian assemblages (notably Bull Brook and Wapanucket-8 in Massachusetts and Shoop in eastern Pennsylvania). The continually evolving forest succession, moving north in the lee of the retreating glaciers, extended this favorable environment the length of the Hudson River Valley, into the Lake George area, and eventually to the Champlain Lowland. The natural advantages of a valley environment (see Curran and Dincauze (1977) for a discussion of the late-glacial environment of the Connecticut River Valley, which would be appropriate for the Hudson Valley as well) and the northward retreating tundra/spruce parkland ecozone would encourage further exploration and exploitation. By following

the bed of the retreating glacier, Paleo-Indian hunters could have entered the Champlain Valley sometime around 12,000 BP, and they would then have encountered a wide expanse of marine waters. The distribution of fluted projectile points is a sparse trail that leads up the Hudson Valley to a concentration at the northern end of Lake George. Paleo-Indians had arrived at the threshold of the Champlain Valley.

The Paleo-Indians in the Champlain Valley

Prior to the present research, the earliest history of human occupation in the Champlain Valley was essentially presented in Ritchie's analysis and publication of the Reagen site, a small and unique late Paleo-Indian/Early Archaic manifestation in northern Vermont (Ritchie 1953). However, since the early 1920's, a small cadre of diligent collectors, for the most part ignorant of the significance of their finds, have been collecting Clovis-like fluted points from the sandy remnants of eroded Champlain Sea landforms. In discussion with landowners, farmers and collectors, this author gradually became intrigued both by the numbers of Paleo-Indian artifacts that lay unrecorded in private collections, and by the apparent association of many of these specimens with Champlain Sea features. A diligent effort was made to locate and record as much data on the fluted points and their find-spots as was available, in an attempt to determine the nature and extent of the Paleo-Indian occupation of Vermont.

Despite the fragmentary nature of the data that have emerged, it seems an appropriate time to present these findings and to air some of the questions they raise.

Footprints melt in the snow and vegetation covers hearths now centuries cold. We may never know the history of those first pioneers who surveyed the shores of the Champlain Sea. That small bands of Paleo-Indians were in the Champlain Valley, is attested to by the finds of Clovis-like fluted points on both sides of present Lake Champlain and by the presence, in addition to the Reagen site, of several concentrations of Paleo-Indian material suggestive of small campsites. Although these finds are rare, they do occur in significant enough numbers to warrant the assertion that small nomadic bands of hunters frequented the shores of the Champlain Sea.

From visits with collectors and to collections, from archival and manuscript materials, and from a review of the widely-scattered and deeply-buried literature of Vermont archeology, several Paleo-Indian assemblages and a number of fluted points with Vermont provenience have been located. Such, to date, is the evidence of their passing.

Interest in Vermont archeology was at its peak during the heyday of the Champlain Valley Archaeological Society (CVAS) in the decade preceeding World War II. The short-lived CVAS had a distinguished, if brief, career before internal bickering and the outbreak of the war ended the venture. Two gentlemen from St. Albans, Franklin County, Vermont--Mr. William A. Ross and Mr. Benjamin W. Fisher--were among the

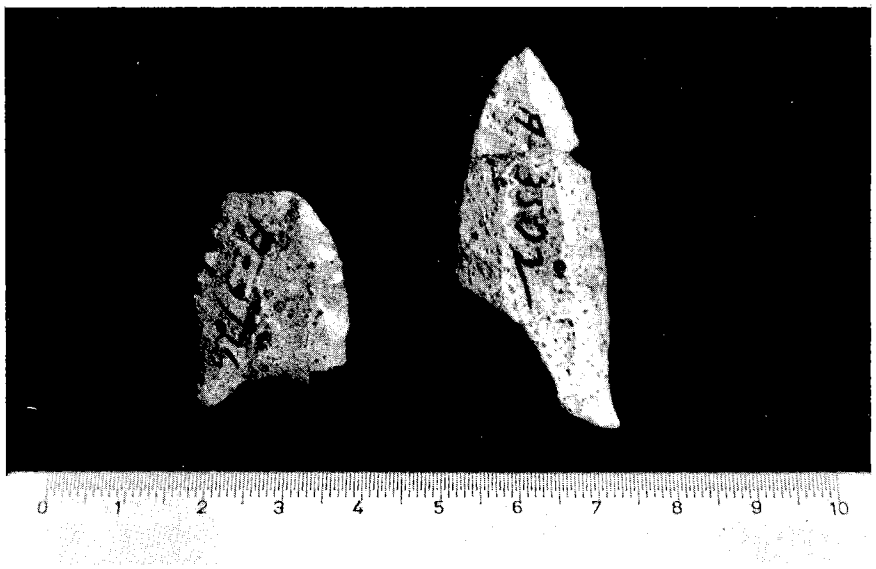
most prominent and active CVAS members. Sometime around 1925, Fisher and Ross discovered that a strange variety of chipped projectile points, associated artifacts and flakes were to be found not, as usual, along a stream or watercourse in the valley lowlands or along the shores of Lake Champlain but, instead, high in the adjacent hills, in sandblows, where the tools and debitage lay exposed by the wind. The sand dunes were the relic shorelines of the Champlain Sea, and the artifacts were the tools of Paleo-Indians.

Five broken Paleo-Indian fluted points have been located in the Benjamin Fisher collection at the University of Vermont (UVM). Four of these remain available for study (Plate I:A-D. See also Plate II). They are identified as coming from Fairfax, in Franklin County. The speckled-tan, highly-weathered rhyolite from which these fluted points were manufactured has not yet been identified. None of the other Vermont Paleo-Indian specimens are made of similar material. Fisher's group of four fluted projectile points all exhibit a strong resemblance to one another, and an equally strong lack of resemblance to other Vermont specimens. They all have broken distal ends and one of their basal ears broken off. (Detailed metrical data are available for these specimens as well as for all the others that the author was able to locate, and are included as Appendix I). It is presumed that all of Fisher's specimens have a similar origin and they may well be from a site cryptically referred to in a letter from Fisher to Mr. Horace Eldred at UVM's Fleming Museum:

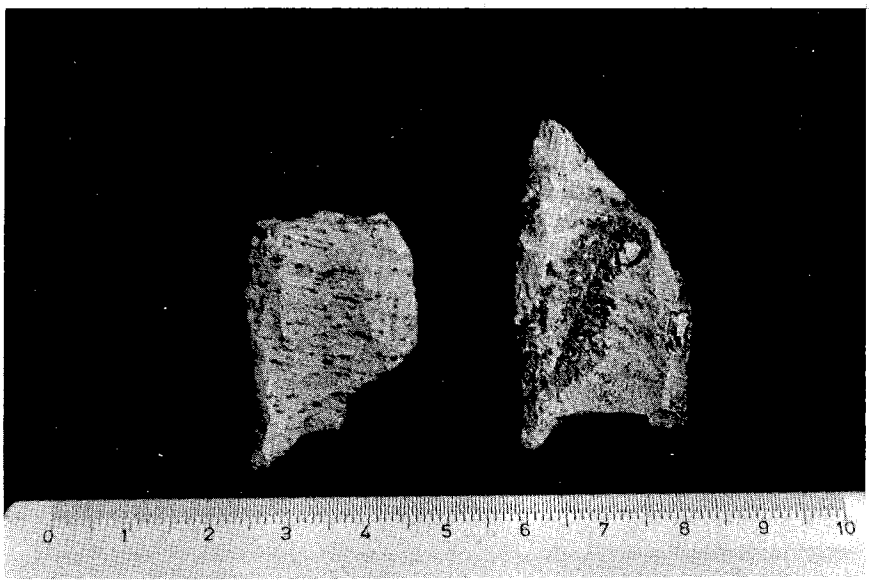
> About ten years ago I learned of a sandblow, high in the hills, where chipped implements were found. This site turned out to be the source of a good quality of chert, from which was a type with which I was not acquainted. This point was thin and leaf shaped, and long flakes were removed from the butt nearly to the tip an operation requiring great skill, and giving the appearance of fluting. I had already seen seven of these points from a site thirty miles distant (the Reagen site), but due to shifting sand, material from this latter place was no longer available. (Fisher, MS:1VI1938. Parenthesis added.)

Fisher collected from a total of four Paleo-Indian sites. In addition to the "quarry site" (referred to above) and the Reagen site, both of which are in Franklin County, Fisher found evidence of a Paleo-Indian site in Lamoille County and one in Addison County. All the sites were located on the shores of the ancient Champlain Sea. Unfortunately, no collections are now known for the Lamoille or Addison County sites.

At about the same time that Ross and Fisher intensified their collecting of the "high beaches," a collector from Milton, Chittenden County, was also aware of the association of peculiar projectile points with sandy blowouts. The occurrence of these strange forms far from the usual riverside, pond, or lake shore association, their exceptional degree of workmanship, and the exotic raw materials from which



A. B.



C. D.

Plate I. Ventifacted specimens of a light-brown rhyolite. Found in the sandblows in Fairfax, Franklin County, Vermont. (In the Department of Anthropology Collections, University of Vermont.)

Plate II. Clovis-like projectile point from near Swanton, Franklin County (Photograph courtesy of the Museum of the American Indian, Heye Foundation.)

the tools were manufactured all contributed to the aura of mystery that surrounded them. Prior to 1920, much of the Champlain lowlands in the St. Albans-Swanton area had served as pasture for flocks of sheep. In many places, the land had been overgrazed and wind erosion had revealed numerous broad sandy areas. Here, as a young man, James Manley, Sr., as his father before him, searched for relics of an earlier time. Both Manleys were active collectors, and their combined collection of prehistoric materials was gathered from numerous localities about northern Vermont. Included in the collection are nine Paleo-Indian fluted points (Figs. 1-3).

There are exact provenience data for only two of the specimens in the Manley collection: one was found near the Manley farm in Milton Fig. 3A), and the other in a sandblow northeast of St. Albans, Franklin County (Fig. 3D). Both of these specimens were found on landforms associated with the marine-limit of the Champlain Sea. The exact provenience for the remaining seven specimens is no longer available, as

they were collected by James Manley's father. The Manley farm and its immediate environs are situated adjacent to a delta that formed into the Champlain Sea waters; it remains likely that a part of the Paleo-Indian collection comes from that vicinity.

The fluted points in the Manley collection show a considerable variety of forms and are manufactured from a striking and visually impressive range of lithic materials. The diversity inherent in both the lithic materials and in the shape of the specimens in the Manley collection implies that at least several different sites were being collected, probably in Franklin County.

There are two distinct "types" (and several closely allied aberrant forms) represented in the Manley collection. Many of the Vermont specimens fit into one or the other of these two categories.

The one type is represented in the Manley collection by the proximal halves of two fluted points that have straight parallel-sides and a single deep fluting spall on each face (Fig. 1A-B). Both these specimens have extremely heavily-ground lateral edges and bases. They have been snapped in two at the point just above the end of the lateral-edge grinding. Both of these specimens are manufactured of exotic materials, one is made of a dark blood-red banding to black jasper (perhaps from Pennsylvania), the other of a bluish grey-green chert. There is another fluted point base in the Manley collection that is similar to these two (Fig. 1C). It is made of Colchester jasper, but has more pronounced ears and slightly incurvate edges.

The second group in the Manley collection is composed of four specimens that are closely allied in shape and manufacturing technique (Fig. 3). These specimens are all about 4 cms long and are fluted on both faces. Often, though not always, the fluting process is to run one or two thin parallel flutes up toward the tip of the projectile and then deepen the lower part of the fluting channel by taking another wider flute off from the base. This fluting method contrasts strikingly with the large, bold, single flute technique of the previous type. Instead of straight parallel sides, these specimens all have slightly concave lateral edges at their base which turn to form a broad convex blade edge. Three of these specimens exhibit a recurring breakage pattern among the Vermont sample, where one of the basal corners has been snapped off. One has an impact fracture at the distal end. Unlike the preceeding type, these specimens are often made of local stone material. Two are made of a black, slightly-mottled chert, similar to the Mt. Independence-Ft. Ann cherts of the Champlain-Hudson Valleys, and one is made from an exceptionally fine-grained piece of bluish Cheshire quartzite which is known from numerous locations in north-central Vermont.

Two other fluted points complete the total of Manley's collection. These are both small triangular forms, one of which is manufactured of Colchester jasper (Fig. 2A), the other of a black chert of the Mt. Independence-Ft. Ann series (Fig. 2B).

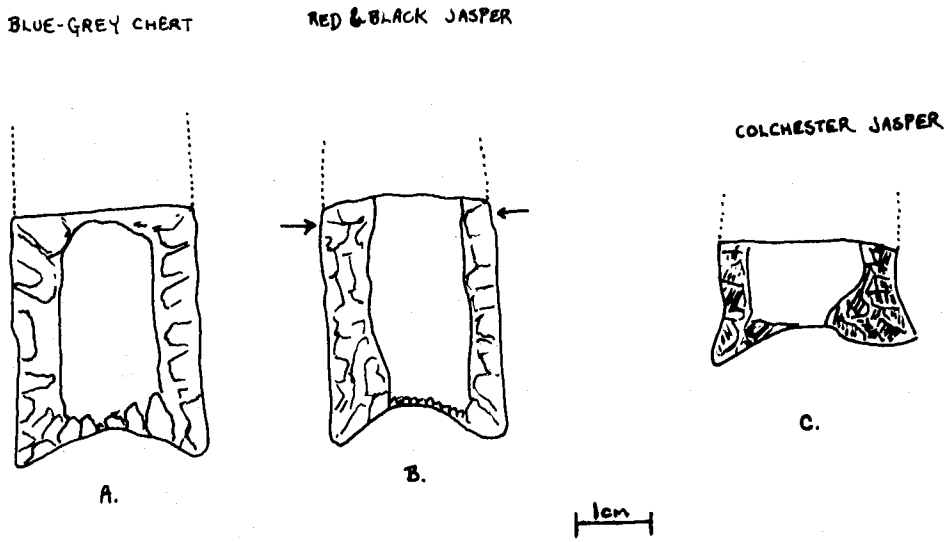


Fig. 1 Probably Franklin County
(Arrows delineate extent of lateral-edge grinding.)

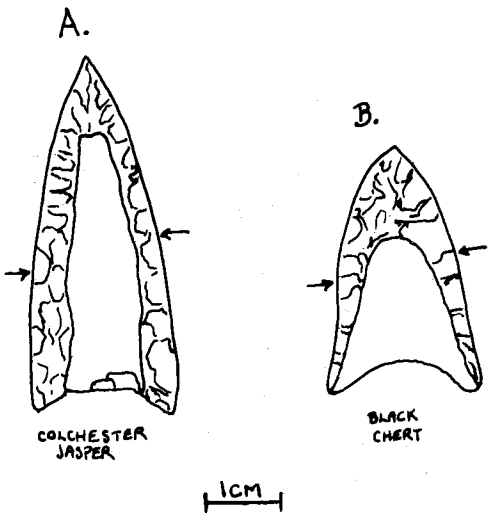


Fig. 2 Probably Franklin County
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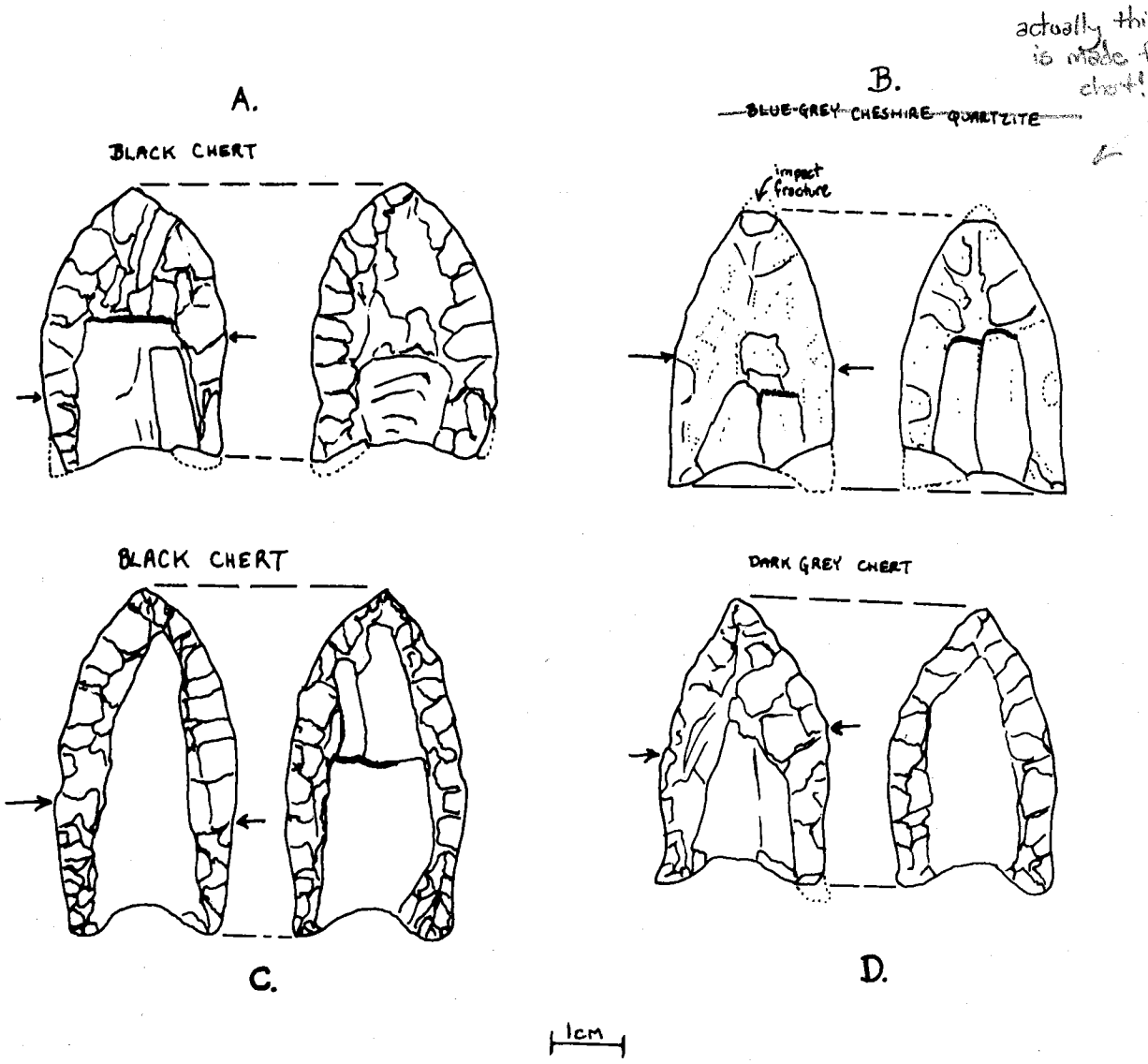

Fig. 3 Probably Franklin County
(Arrows delineate extent of lateral-edge grinding.)

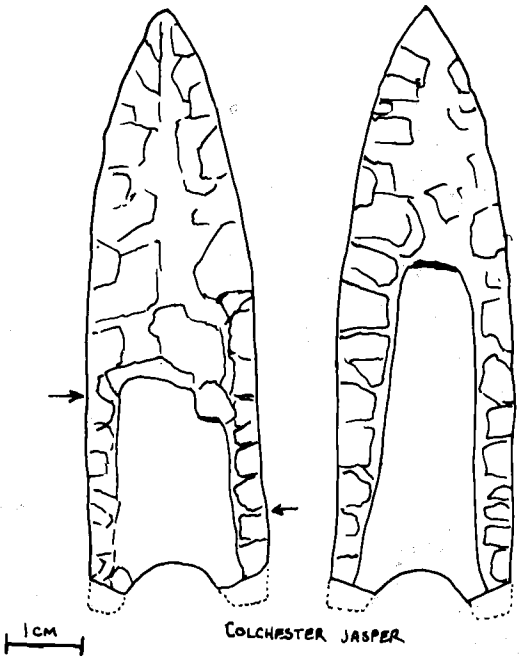

Fig. 4 Ferrisburg, Addison County

In addition to the fluted points, the Manley collection has several other artifacts that are attributable to a Paleo-Indian assemblage. These include a typical Paleo-Indian rectangular endscraper which has pronounced distal retouch that comes close to approximating graving spurs, a sidescraper, a large utilized flake, and a broad fluting spall with lateral-edge retouch. All these tools are made of the distinctive and locally available Colchester jasper.

Paleo-Indian Site Locations in Vermont

Including the four points in the Fisher collection at UVM and the nine from the Manley collection, but excluding the Reagen material, which Ritchie has discussed in detail, 33 recognizable projectile points or bifaces are now known for Vermont (20 of these points are illustrated in Figures 1-10 and Plates 1 and 2). I have plotted their distribution on the accompanying map (Fig. 11). Stars represent specimens whose exact provenience is known (this data is on file at the Office of the Vermont

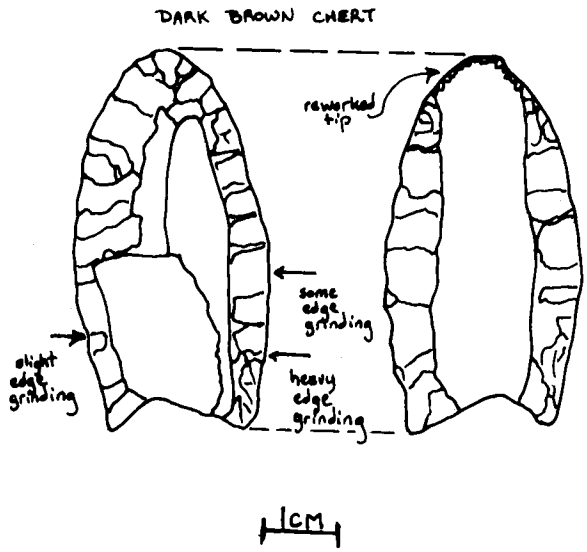

Fig. 5 Ferrisburg, Addison County (VtAd-195)

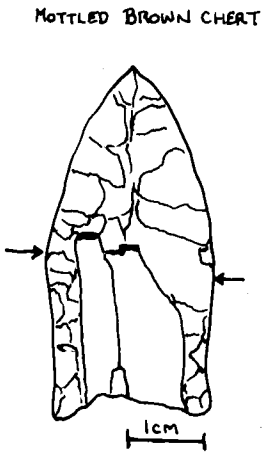

Fig. 6 Probably vicinity of Shellhouse Mountain, Ferrisburg, Addison County

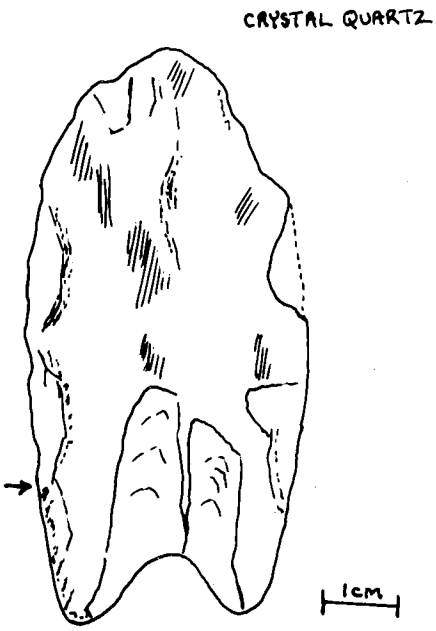

Fig. 7 Otter Creek in Brandon, Rutland County (After Bailey's drawing in notebook.)

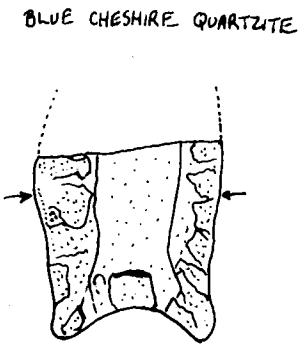

Fig. 8 Little Otter Creek, Ferrisburg, Addison County

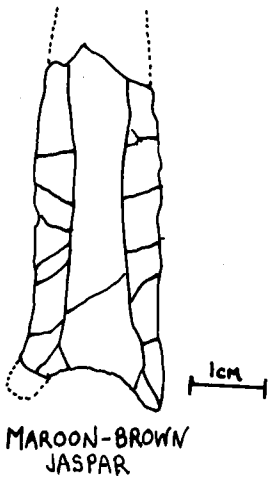

Fig. 9 Bristol Pond, Bristol, Addison County

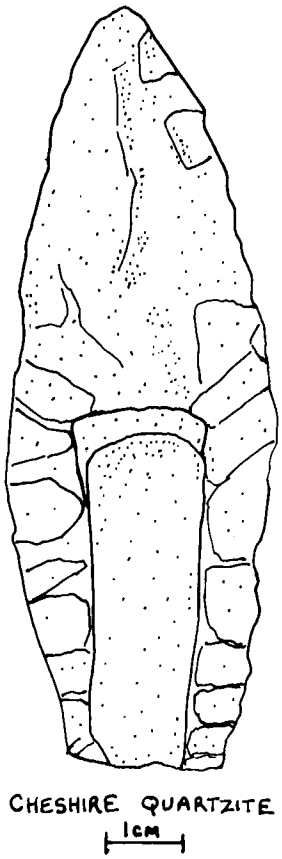

Fig. 10 Waltham, Addison County (Arrows delineate extent of lateral-edge grinding.)

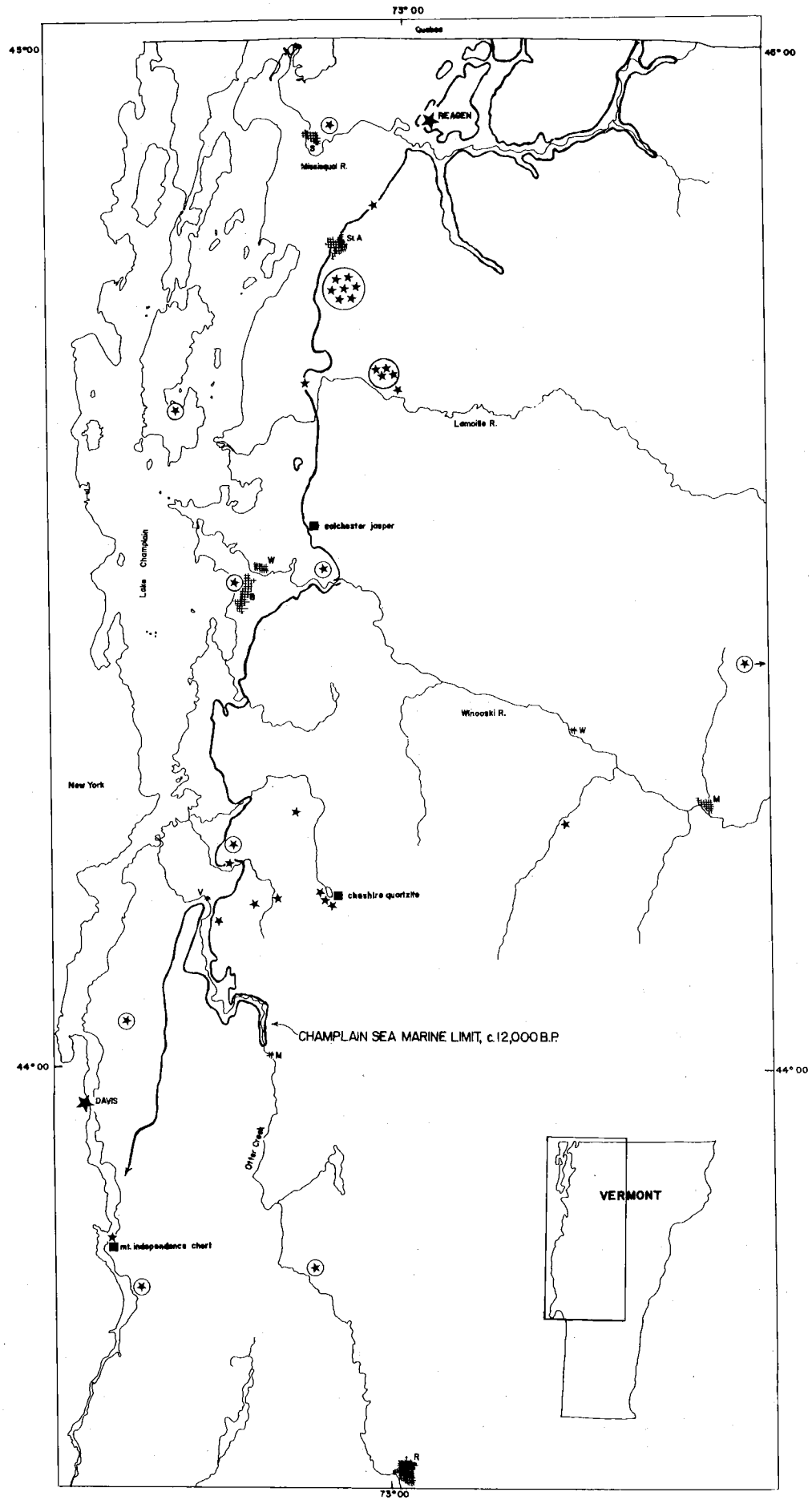

Fig. 11 Paleo-Indian fluted point find-spots in Vermont. Stars indicate exact location of find-spots. Stars within circles are approximate locations.

State Archaeologist in Montpelier). Stars within circles are approximate provenience only. The cluster of four stars in the upper portion of the map represents the fluted points that Fisher collected in Fairfax, Franklin County. The cluster of seven stars represents the portion of the Manley collection for which exact provenience data were not available. They are believed to have originated in northern Chittenden and in Franklin Counties. Wagner (1972) has compiled a list of known features and surviving land-forms associated with the Champlain Sea episode in Vermont. Because of subsequent isostatic rebound, which was greater to the north, coeval Champlain Sea levels are now on a tilted plane. The dynamics of the late Pleistocene drainage of the maritime waters in the Champlain Valley have not as yet been published in detail, although a number of investigators are currently working on different aspects of the Champlain Sea environment. The Marine Limit of the Champlain Sea is, to date, the best documented marine episode in the Valley and it is the remnant of that raised strandline which enabled this map to be made. I transferred Wagner's list of Marine Limit features first to 1:24,000 scale maps and then to the 1:250,000 scale from which this map has been reduced. The heavy black line indicates the Marine Limit of the Champlain Sea as it must have existed circa 12,000 BP.

Although it is based on exceedingly scanty data, there does appear to be a clear association of fluted points with the shoreline of the Champlain Sea. Specimens recovered from below the Marine Limit are, in most cases, of uncertain provenience (one, at least, was found in a dumped load of sand from an earth-filling project), but may be attributable to occupations contemporary with lower marine levels.

At least one such case is represented by the collection from the Davis site, in Essex County, New York, which is located on a marine terrace deposited in the Champlain Sea. It would not have been habitable until after the Marine Limit level of the Champlain Sea, when the marine waters had begun to recede. The terrace on which the site is located is 120 feet above the present Lake Champlain level. It would have been exposed by the Port Kent marine level which is radiocarbon-dated on shell at about 11,300 BP (Wagner 1972:326).

Except as has been noted in this report, geochronological evidence is presently unavailable for much of the Vermont material. Future fieldwork will continue toward determining the precise association of Paleo-Indian material with Champlain Sea shore levels. Such an approach may encourage the development of a chronological sequence for the Paleo-Indian period in the Northeast.

If the date is accepted from the caribou bone at the Dutchess Quarry Cave in Orange County, New York, with its presumed cultural association, then man's initial penetration into the Northeast is at least as early as 12,500 BP. At the Debert site in Nova Scotia, a major Paleo-Indian occupation is radiocarbon-dated at 10,600 BP. None of the Vermont fluted points have the very distinctive, pronounced basal ears that characterize the Debert specimens. They are, however,

broadly similar to many of the as yet poorly-dated fluted points in other Paleo-Indian assemblages in the Northeast. Some are most likely earlier than the Debert material. At least one variety, the straight, parallel-sided, Clovis-like bifaces with heavy basal and lateral edge grinding, are most likely candidates for an early placement within the Paleo-Indian sequence. It is suggested that the initial Paleo-Indian occupation of the Champlain Valley occurred after the establishment of the marine environment in the basin, sometime soon after 12,000 BP.

Conclusions

The marine episode of the Champlain Sea is estimated to have lasted 2000 years. For most of its duration, the environs adjacent to the marine waters were known to nomadic bands of hunting and foraging Paleo-Indians.

The first Paleo-Indians in the Champlain Valley would have found parkland-tundra environment with patches of open spruce woodlands, and colonies of deciduous trees, a ground cover of lichen supporting herds of caribou, stands of fir and tamarack along the waterways, and spruce in the wetlands, bogs, and adjacent peat beds and muskeag. The country undoubtedly supported, at one time or another, woodland musk-ox, mastodon, moose-elk and caribou, as well as bear, moose, deer, wolf, beaver, and the numerous small mammals which are today associated with tundra and boreal forest ecozones. A cool, moist, periglacial climate, as influenced by the cold marine waters, would have prevailed.

The western Paleo-Indian sites amply demonstrate the ability of the early hunters to attack and kill large mammals. To date, such evidence is lacking from the eastern sites. The evidence is accumulating to suggest that the quarry most readily pursued by the eastern Paleo-Indian hunters was caribou (*Rangifer tarandus*). Caribou bones have been interpreted as indicating the presence of Paleo-Indian hunters at Dutchess Quarry Cave in New York. They have been found in association with a Paleo-Indian occupation at the Holcombe Beach site in Michigan (Fitting, DeVisscher and Wahla 1966). At Bull Brook, Byers reports calcined bone fragments from the area of a hearth which he thought were "possibly of a deer" (Byers 1955:274), but which might be caribou. MacDonald (1968:140) believes that caribou were the main prey of the Paleo-Indian hunters at Debert. Caribou migrate in the spring to the open tundra to calve and return to a winter range in the shelter of the forest late in the fall. Herds of caribou traveling along the narrow strips of country between the Champlain Sea and the Adirondacks/Green Mountains would be confined to an area from which they could be readily detected and pursued. By ambushing herds at a river crossing, or where local aspects of the terrain directed the herds, Paleo-Indian hunters in the Champlain Valley might have been capable of killing enough caribou during the seasonal migrations to provide clothing and food for many months at a time.

The notion of hunters following the migrating herds of caribou has been shown to be an erroneous one (Burch 1972). To be most effective, a hunting strategy dependent on caribou would most likely

exploit other resources in addition to the annual or semiannual caribou hunt. Both the Debert and Bull Brook sites appear to have been reoccupied for short spells over the period of several years. They are both prominently situated for observing and intercepting passing prey, and probably represent important seasonal camps from which a major resource was being exploited. They may well have been seasonally occupied spring and/or fall caribou hunting camps. The Davis site, with its small artifactual assemblage, typifies (with the exception of the late Reagen site) the Champlain Valley Paleo-Indian sites and puts them into marked contrast to the comparatively spectacular assemblages at Bull Brook and Debert. Regardless of whether the remains from these two large Paleo-Indian sites resulted from a large extensive single occupation or from the repeated return to a favored locale by a Paleo-Indian bank, it is apparent that an aggregated or predictable resource was being exploited.

Fisher's sites, the Manley's sites, the Davis site, and the concentrations of Paleo-Indian material in the Little Otter Creek valley and in the environs of Bristol Pond, are all indicative of the impoverished nature of the Vermont Paleo-Indian assemblages.

It is becoming apparent that the emphasis on hunting large species of mammals that is usually associated with the Paleo-Indian subsistence pattern is probably overstressed due to the nature of the western kill sites and to the lack of preservation of other organic materials. Recent work at the Meadowcroft Rockshelter in Pennsylvania implies a long unbroken tradition of wild plant collecting and processing at the site, perhaps from an inception during the Paleo-Indian period. At the Shawnee-Minisink site, a charcoal lens dated 10,590 BP contained wild hawthorn pits and fish bones (McNett *et al.* 1977). The Paleo-Indians were eating more than caribou.

The mountains and upland areas adjacent to the Champlain Sea would have provided additional ecozonal options that Paleo-Indian hunters might choose to exploit. Two Paleo-Indian fluted projectile points are at present the only evidence to indicate the early hunter's presence in the mountain-ringed upland valleys of central Vermont. Although such recoveries are rare, Ritchie (1957:8) comments on finds from the upland areas of Pennsylvania and New York and an isolated Clovis-like fluted point is known from Intervale, Carroll County, New Hampshire (specimen at the United States National Museum) in the heart of the White Mountains [see also Sargent and Ledoux 1973 (ed.)]. A small Paleo-Indian campsite on the Ashuelot River, in southern New Hampshire, a tributary of the Connecticut, presently under investigation by Mary Lou Curran of the University of Massachusetts, is further indication that Paleo-Indians in the Northeast were not confined to broad riparian valleys but were exploiting upland environments as well.

I would offer one more plank to the platform of a diversified Paleo-Indian economy. It has been demonstrated that the maritime waters of the Champlain Sea were host to a full and complex marine biota. To date there is no indication to what degree, if any, Paleo-Indians utilized the maritime resources at their doorsteps. All of the known Paleo-

Indian components in the Champlain Valley and many of the fluted point find-spots are associated with Champlain Sea landforms. The circumstantial evidence of association allows for the possibility that Paleo-Indians might have adapted to a maritime-based economy for at least a part of their seasonal round.

During the open-water season whales, seals, and perhaps walrus moved into the Champlain Sea. A prevailing periglacial climate almost certainly meant that the Champlain Sea would have been frozen for a part of the winter season. With the exception of seals adapted to living below the ice by frequenting breathing holes, all the marine mammals would be forced to leave the Champlain Sea area for the open waters around the Gulf of St. Lawrence. Local populations of belugas or seals might have been trapped in areas of open water surrounded by ice and would have been easily killed by hunters who chanced upon them.

The presence of whales in the Champlain Sea raises the possibility that drift or stranded individuals might be available for scavenging. However, such windfall occurrences were probably rare. Seal hunting was also a possibility for hunters frequenting the Champlain Sea shores. Champlain Sea waters supported species that frequented breathing holes through the ice as well as those to be found at the sina, or ice edge.

In Vermont, Paleo-Indian artifacts have been recovered from a variety of environmental contexts: from beaches associated with the Champlain Sea, from immediately adjacent interior lowlands, and from the high, nearly mountainous terrain of the interior. The diversity inherent in these find-spot localities suggests that a broad-based subsistence strategy was practiced and that the Paleo-Indian hunters and gatherers were exploiting a wide range of resources. On the basis of the presently available evidence it appears that this resource procurement strategy was not conducive to supporting any large population aggregates and that the Paleo-Indian occupation of the Champlain Valley was characterized by small, highly mobile bands exploiting seasonally available resources.

It has been hypothesized that following the drainage of the Champlain Sea, Late Paleo-Indian/Early Archaic groups made their way along the north shore of the Gulf of St. Lawrence, maintaining a forest-tundra/caribou hunting subsistence adaptation. By the time these pioneers reached the Strait of Belle Isle adjacent to the southern coast of Labrador, they had encountered the vast wintering herds of harp seals. This dependable resource rapidly became the cornerstone of a maritime Archaic adaptation (Tuck and McGhee 1975: 118). It is suggested here that the earliest manifestations of a maritime adaptation may well have occurred during the Paleo-Indian period. Paleo-Indian sites on the Atlantic coastal plain are submerged, and evidence, such as may exist, will have to come from the shores of the Champlain Sea if it is to come from anywhere.

There's nothing now
We can't expect to happen...
Mackerel nibbling in the hill pastures.
I wouldn't be surprised,
I wouldn't be surprised.

-Archilochos,
Greek, 6th century B.C.
(trans. by Guy Davenport 1969)

Acknowledgments

This begins an attempt to repay the many Vermonters who without exception, welcomed me into their homes to allow me to look at their collections. Both their hospitality and apple pie are legend. Gordon R. Nielsen of Charlotte, and Richard Adams of Vergennes have both been tireless in their efforts to aid me. I would never have been able to locate so many specimens without their assistance. Joseph Hartshorn, of the Geology Department, and Dena Dincauze, of the Anthropology Department at the University of Massachusetts/Amherst, offered considerable advice and criticism. What errors may have survived their scrutiny remain, as always, my own.

References Cited

Agassiz, Louis A. 1850. On the Fossil Remains of an Elephant Found in Vermont. *American Association for the Advancement of Science Proceedings* 2:100-101.

Burch, Ernest S., Jr. 1972. The Caribou/Wild Reindeer as a Human Resource. *American Antiquity* 37:339-368.

Byers, Douglas S. 1955. Additional Information on the Bull Brook Site, Massachusetts. *American Antiquity* 20:274-276.

Chapman, Donald M. 1937. Late-glacial and Postglacial History of the Champlain Valley. *American Journal of Science* 34:89-124.

Chase, J.S. 1972. Operation UP-SAILS:Sub-bottom Profiling in Lake Champlain. Ms. Dissertation, University of Vermont.

Cleland, Charles E. 1966. The Prehistoric Animal Ecology and Ethnozoology of the Upper Great Lakes Region. *Anthropological Papers, Museum of Anthropology, University of Michigan* 29.

Cox, Steven L. 1972. *A Re-analysis of the Shoop Site*. Department of Anthropology, Smithsonian Institution.

Cronin, Thomas M. 1977. Late-Wisconsin Marine Environments of the Champlain Valley. *Quaternary Research* 7:238-253.

Curran, Mary Lou and Dena F. Dincauze. 1977. Paleo-Indians and Paleolakes: New Data from the Connecticut Drainage. *Annals of the New York Academy of Sciences* 288:333-348.

Davis, Margaret B. 1969. Climatic Changes in Southern Connecticut Recorded by Pollen Deposition at Rogers Lake. *Ecology* 50:407-422.

Davis, R.B., T.E. Bradstreet, R. Stuckenrath, Jr., and H.W. Borns, Jr. 1975. Vegetation and Associated Environments During the Past 14,000 Years near Moulton Pond, Maine. *Quaternary Research* 5: 435-465.

Deevey, E.S., Jr. 1951. Late-glacial and Postglacial Pollen Diagrams from Maine. *American Journal of Science* 249:177-207.

Dreimanis, Alexis. 1968. Extinction of Mastodons in Eastern North America: Testing a New Climatic Environmental Hypothesis. *Ohio Journal of Science* 68:257-272.

Elson, J.A. 1968. The Champlain Sea. In *The Encyclopedia of Geomorphology*, pp. 116-117. R.W. Fairbridge, ed. New York: Reinhold.

Fisher, Benjamin W. 1955. Letters and Material at the Fleming Museum. Ms. University of Vermont, Burlington.

Fisher, Donald W. 1955. Prehistoric Mammals of New York. *New York State Conservationist*, Feb.-March, pp. 18-22.

_____ and John H. Ostrom. 1952. A Contribution to the Pleistocene Fauna of New York State. *American Journal of Science* 250:609-616.

Fitting, James E., J. DeVisscher and E.J. Wahla. 1966. The Paleo-Indian Occupation of the Holcombe Beach. *Anthropological Papers, Museum of Anthropology, University of Michigan* 27.

Funk, Robert E., Donald W. Fisher and Edgar M. Reilly. 1970. Caribou and Paleo-Indian in New York State: A Presumed Association. *American Journal of Science* 268:181-186.

Harrington, C.R. 1977. Marine Mammals in the Champlain Sea and the Great Lakes. *Annals of the New York Academy of Sciences* 288:508-537.

Hitchcock, Edward, et al. 1861. *Report on the Geology of Vermont* 1. Claremont, New Hampshire.

Jacobs, Elbridge Churchill. 1950. *The Physical Features of Vermont.* Vermont Geological Survey. Montpelier.

Karrow, P.F. 1965. The Champlain Sea and its Sediments. In *Soils in Canada*, pp. 97-108. R.F. Legget. Toronto: University of Toronto Press.

Livingstone, D.A. and Bertha G.R. Livingstone. 1958. Late-glacial and Postglacial Vegetation from Gillis Lake in Richmond County, Cape Breton Island, Nova Scotia. *American Journal of Science:* 256:341-359.

McNett, Charles W., Jr., Barbara A. McMillan and Sydne B. Marshall. 1977. The Shawnee-Minisink Site. *Annals of the New York Academy of Sciences* 288:282-296.

MacDonald, George F. 1968. Debert: A Paleo-Indian Site in Central Nova Scotia. *Anthropological Papers* 16. Museums of Canada, Ottawa.

McDowell, L.L., R.M. Dole, Jr., Montague Howard, Jr. and R.A. Farrington. 1971. Palynology and Radiocarbon Chronology of Bugbee Wildflower Sanctuary and Natural Area, Caledonia County, Vermont. *Pollen et Spores* 13:73-91.

Muller, Ernest H. 1977. Late-glacial and Early Postglacial Environments in Western New York. *Annals of the New York Academy of Sciences* 288:223-233.

Ritchie, William A. 1953. A Probable Paleo-Indian Site in Vermont. *American Antiquity* 18:249-258.

_____. 1957. Traces of Early Man in the Northeast. *New York State Museum and Science Service Bulletin* 358.

_____. 1969. *The Archaeology of New York State* (revised edition). Garden City: Natural History Press.

Sargent, Howard R. and Francois G. Ledoux. 1973. Two Fluted Points From New England. *Man in the Northeast* 5.

Stewart, David P. 1961. The Glacial Geology of Vermont. *Vermont Geological Survey Bulletin* 19.

_____ and Paul MacClintock. 1965. Pleistocene Geology of the St. Lawrence Lowland. *New York State Museum and Science Service Bulletin* 394.

_____ and_____. 1969. The Surficial Geology and Pleistocene History of Vermont. *Vermont Geological Survey Bulletin* 31.

Terasmae, Jaan. 1959. Notes on the Champlain Sea Episode in the St. Lawrence Lowlands, Quebec. *Science* 130:334-335.

Thompson, Zadock. 1971. *Natural History of Vermont*. Rutland: Charles Tuttle. (Original edition, 1853).

Tuck, James A. and Robert McGhee. 1975. An Archaic Sequence from the Strait of Belle Isle, Labrador. *National Museum of Man, Mercury Series, Archaeological Survey of Canada Paper* 34.

Wagner, W.P. 1970. Pleistocene Mountain Glaciation in Northern Vermont. *Geological Society of America Bulletin* 81.

_____. 1972. Ice Margins and Water Levels in Northwestern Vermont. In *New England Intercollegiate Geological Guidebook, 41st Annual Meeting*:317-342.

Woodworth, Jay B. 1905. Ancient Water Levels of the Champlain and Hudson Valleys. *New York State Museum Bulletin* 84.

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Appendix I

Metrical Data for 33 Paleo-Indian Points
Found in Western Vermont

Specimen No.	Fig. Ref.	Location	Description	Measurements in mm.					Measurements after Cox (1972)												Comments
				Length	Width	Length of maximum width	Thickness	Length of maximum thickness	Basal width	Width of flute(s)	Basal depth	# of flutes A	# of flutes B	Length of flute: A	Length of flute: B	Lateral grinding right edge	Lateral grinding left edge	Edge angle tip	Edge angle right	Edge angle left	
1 (VtAd-82:1)	4	Little Otter Creek valley, Ferrisburg, Addison Co.	Colchester jasper. Extreme basal ears missing.	76	24	at base	9	47	23	17	5	1	1	30	38	8	21	25°	60°	60°	Heavy basal grinding. The lateral edges and the very tip show extensive dulling and rounding.
2	1-A	probably Franklin Co.	Blue-green fine-grained chert. Distal-end missing.	33	24	—	7	—	24	13	4	1	1	—	—	—	—	—	—	—	Very heavy basal and lateral-edge grinding.
3	1-B	probably Franklin Co.	Maroon-red banding to black jasper. Distal-end missing.	31	23	—	6	—	23	14	5	1	1	—	—	—	—	—	—	—	Very heavy basal and lateral-edge grinding.
4	2-A	Milton Sand-Blow (VtCh-107)	Colchester jasper	47	18	at base	6	16	18	16	3	1	1	27	16	18	17	35°	50°	55°	No basal grinding. No edge wear. Found in two parts.
5	3-D	Sheldon, Franklin Co.	mottled dark-grey chert	39	23	15	6	23	22	16	3	2	1	17	29	19	16	25°	40°	50°	Basal grinding.
6	1-C	probably Franklin Co.	Colchester jasper. Distal-end missing.	15	26		5	—	26	15	3	1	1								Heavy basal and lateral-edge grinding.
7	3-B	probably Franklin Co.	Unusually fine-grained bluish Cheshire quartzite. Impact fracture at extreme distal-end.	37	22	20	5	20	—	11	3(est.)	1	2	12	21	11	20	35°	40°	45°	Heavy basal and lateral-edge grinding. No significant use-wear on edges.
8	3-A	probably Franklin Co.	Black chert (possibly Ft.Ann or Mt. Independence chert). Extreme basal ears missing.	38	26	26	6	21	23	17	3	2	1	19	24	17 (heavy)	14 (very light)	30°	45°	50°	Light basal grinding. No significant edge-wear.
9	3-C	probably Franklin Co.	Black chert (possibly Ft.Ann or Mt. Independence chert).	48	25	22	5	33	21	14	5	1	2	37	35	16	22	35°	40°	35°	Heavy basal grinding. Some lateral-edge wear.
10	2-B	probably Franklin Co.	Black chert (possibly Ft. Ann or Mt. Independence chert).	32	20	at base	5	19	20	14	4	1	1	16	21	17	16	40°	50°	55°	Heavy basal grinding. Slight edge rounding above the lateral edge grinding.
11	5	VtAd-195, Ferrisburg	Dark brown chert (Hudson Valley chert?) Distal-end retouched.	49	25	23	4	23	18	18	4	1	2	46	35	8	13	25°	45°	45°	Light basal grinding. Use wear present on both lateral-edges but not extensive.
12 (A-3572) UVM	Plate # 1-B	Fairfax, Franklin Co.	Highly weathered rhyolite. In two pieces. One half of the proximal-end is missing.	49	19	20	5	18	-	8	-	1	2	27	38	30	-	40°	-	-	Basal grinding evident. Pronounced basal ears.
13 (A-14821) UVM	Plate # 1-C	Fairfax, Franklin Co.	Highly weathered rhyolite. One corner of the proximal-end and the distal-end are missing.	-	21	-	5	-	-	10	-	1	1	-	-	24	-	-	50°	55°	**Basal grinding evident.** Pronounced basal ears.
14 (A-3726) UVM	Plate # 1-A	Fairfax, Franklin Co.	Highly weathered rhyolite. One corner of the proximal-end and the extreme distal-end are missing.	27	19	13	5	23	-	3	-	1	2	20	24	15	-	-	-	-	Basal grinding evident. Pronounced basal ears.

cont.

Appendix I (cont.)
Metrical Data for 33 Paleo-Indian Points
Found in Western Vermont

Specimen No.	Ref. No.	Location	Description	Measurements in mm.				Measurements after Cox (1972)													Comments
				Length	Width	Length of maximum width	Thickness	Length of maximum thickness	Basal width	Width of flute(s)	Basal depth	#of flutes: A	#of flutes: B	Length of flute: A	Length of flute: B	Lateral grinding right edge	Lateral grinding left edge	Edge angle tip	Edge angle right	Edge angle left	
15 (no cat. #) UVM	Plate # 1-D	Fairfax, Franklin Co.	Highly weathered rhyolite. One proximal ear and the distal-end are missing.	-	22	23	5	18	21	14	4	1	1	-	-	15	-	-	-	-	Heavy basal grinding. Heavy lateral edge wear. Pronounced distal ears.
16	6	probable vicinity of Shellhouse Mountain, Ferrisburg, Addison Co.	Mottled brown chert (probable Hudson Valley chert).	45	22	18	5	21	21	12	3	1	2	24	19	18	22	30°	40°	40°	Basal grinding. Extensive edge rounding on lateral edges.
17	-	Moretown, Washington Co.	"Black flint"	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	Referenced in "Massachusetts Fluted Points", Bulletin of the Massachusetts Archaeological Society 16: 2-8. William Fowler (1954).
18	7	Otter Creek in Brandon, Rutland Co.	Crystal quartz	75	37	-	-	-	23	17	9	2	-	22	-	17	-	-	-	-	From John Bailey's notebooks, in the papers of John Huden, Fleming Museum, UVM
19	8	Little Otter Creek valley, Ferrisburg, Addison Co. (VtAd-130)	Bluish Cheshire Quartzite. Distal-end missing.	27 basal part	24	-	4	at point of breakage	21	10	4	1	1	-	-	present	present	-	40°	45°	Heavy basal and lateral edge grinding.
20 (A-2304) UVM	-	vicinity of Essex Jct., Chittenden Co.	Colchester jasper.	70	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	William Ritchie (personal communication).
21	-	Lake Champlain shore in Orwell, Addison Co.	Normanskill flint. Deeply patinated	45	21	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	William Ritchie (personal communication).
22	-	South Hero, Grand Isle Co.	Crystal quartz	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	Illustrated in Vermont Life article by William Haviland, vol.24(2) 53-55, (1969). Specimen found in recent fill.
23 (6/5255) MAI	Plate # 2	vicinity of Swanton, Franklin Co.	Black chert (possibly Ft.Ann or Mt. Independence chert).	83	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	Collected for the Museum of the American Indian by Foster Saville.
24	-	Dead Creek drainage, Chimney Point, Addison Co.	Crystal quartz	-	-	-	--	-	-	-	-	+	+	-	-	-	-	-	-	-	Ken Varney, Rose Bodette (Personal communication)
25	-	Burlington, Chittenden Co.	Colchester jasper	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	From John Bailey's notebooks, in the papers of John Huden, Fleming Museum, UVM.
26	-	Danville, Caledonia Co.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	From John Bailey's notebooks, in the papers of John Huden, Fleming Museum, UVM
27	-	Bristol Pond, Bristol, Addison County.	Cheshire quartzite	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Gordon Crandall (personal communication)

cont.

Appendix I (cont.)

Metrical Data for 33 Paleo-Indian Points
Found in Western Vermont

Specimen No.	Ref. No.	Location	Description	Measurements in mm.		Measurements after Cox (1972)															Comments
				Length	Width	Length of maximum width	Thickness	Length of maximum thickness	Basal width	Width of flute(s)	Basal depth	#of flutes: A	#of flutes: B	Length of flute: A	Length of flute: B	Lateral grinding right edge	Lateral grinding left edge	Edge angle tip	Edge angle right	Edge angle left	
28	9	Bristol Pond, Bristol, Addison County.	reddish-brown jasper (possibly Colchester jasper). Portion of one proximal ear and the distal-end are missing.	48 basal part	20	at base	7	17	-	9	3	1	1	-	-	no	no	-	55°	70°	No apparent basal or lateral-edge grinding. Distal-retouch.
29	-	Bristol Pond, Bristol, Addison County.	Grey Cheshire quartzite. Preform. Distal-end missing.	61 basal part	43	-	12	-	-	10	-	1	0	-	-	-	-	-	-	-	Quarry reject.
30	-	Sandblow near Fairfax, Franklin County.	Crystal quartz.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	From article in the St.Albans Messenger, 7 May 1938.
31	-	Lake Champlain shore, Orwell, Addison Co.	Brown flint.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Personal communication with collector.
32	-	Monkton Pond, Monkton, Addison Co.	dark brown chert (probably Hudson Valley chert)	56	23	22	4	15	21	14	3	1	1	22	-	19	19	20°	30°	40°	Basal grinding. Nearly the entire distal-end of the blade has been spalled off one face. The resulting unifacial edge has been retouched.
33	10	Waltham, Addison Co.	Banded grey Cheshire quartzite.	100	35	44	10	31	20	14	-	1	0	50	-	no	no	30°	50°	50°	Some edge polishing along distal-lateral edge. No basal grinding.

C O N T E N T S

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