Fossil Cervids and Fluted Point Hunters: A Review for Southern Ontario

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The** availability of cervid **species** is **investigated in relation to Early Palaeo-Indian site distribution in southern Ontario, Canada. Review** of **the** literature from **the** 1860s **on reveals that the frequency** of cervids in the Ontario fossil **record** is **surpassed only** by **that of the large proboscideans: mammoth and mastodon. Caribou, cervine deer, elk, stag-moose, white-tailed deer, and other species were present during interstadials after the** Port **Huron** ice retreat **about** 12300 **BY. Geochronological and radiocarbon evidence shows that the ages of these** fossils significantly **overlap those** of **the Early Palaeo-Indian occupation** at the time of main **Lake Algonquin** (11500 to 10400 **B. P.). Elsewhere in the glaciated Northeast, cervids are the only large herbivores found on either Early or Late Palaeo-Indian** sites. Sixty **percent** of Ontario cervid fossils are from **physiographic regions with significant numbers** of **fluted point localities. Contemporaneity and co-distribution of cervid finds and Early Palaeo-Indian sites suggests a critical focus for regional investigation.

Introduction

This paper examines the distribution of cervid fossils in southern Ontario, Canada (Figure 1) in relation to 160 Early Palaeo-Indian fluted point localities (Figure 2). Inventories of both cervid and Palaeo-Indian localities represent the most current compilations for the province. Geochronological and physiographic associations of these sites of mammalian and human activity are discussed.

Scientific investigations have long focussed on proboscidean sites in the Northeast and their possible human associations. Much less attention has been paid to the age and distribution of late-glacial cervids (Anderson and White 1975; Funk 1976; Gramly 1986; Harington 1984; Spiess *et al.* 1985). In view of the smaller size and less frequent preservation of cervid remains in relation to the larger, more robust, and readily identifiable proboscideans, it is time to correct this oversight.

Examination of relationships between Early Palaeo-Indian settlement and datable late-glacial landforms in southern Ontario has indicated the probable age and typical physiographic distribution of sites of this cultural tradition (Jackson 1983). A specific focus of occupation has been identified in the millennium following the Great-lakean local ice retreat (about 11500 years B.P.) along the strandlines of proglacial Lake Algonquin during its main phase. The physiographic at-tributes of Early Palaeo-Indian sites, together with their location on both active Lake Algonquin and higher, abandoned, proglacial beaches, suggest the exploitation of migratory mammals which may have used these features. Current research on interior settlement patterns, including late-glacial valleys, offers further evidence for use of non-lacustrine resources (Deller and Ellis 1988; Jackson and McKillop 1987).

Comparing Ontario's Palaeo-Indians with fluted point-using groups elsewhere in North America, I have suggested, following Cleland (1976), that "focal adaptation" to large and gregarious cervid species was a primary factor influencing the distribution of Early Palaeo-Indian sites in the glaciated Northeast (Jackson 1979). Although cervids were not the only prey of northeastern Palaeo-Indians, they predominate among known associations.

In a review of the Pleistocene overkill hypothesis, Meltzer (1986) draws attention to the low number of genera north of the terminal Wisconsin moraine and large number of proboscideans in this same area. I believe that this imbalance in the fossil record has arisen, in part, from sampling biases.

Proboscideans in the Northeast have not been associated with Palaeo-Indians, despite an abundance of both mammoth and mastodon fossils in late-glacial contexts (Dreimanis 1968; Winn 1977). About a hundred late-glacial mastodon and mammoth have been recorded in southern Ontario, for instance, but no association with artifacts has been documented (McAndrews and Jackson 1988). Evidence for proboscidean exploitation, comparable to that for cervid species, has not yet been found in the Northeast.

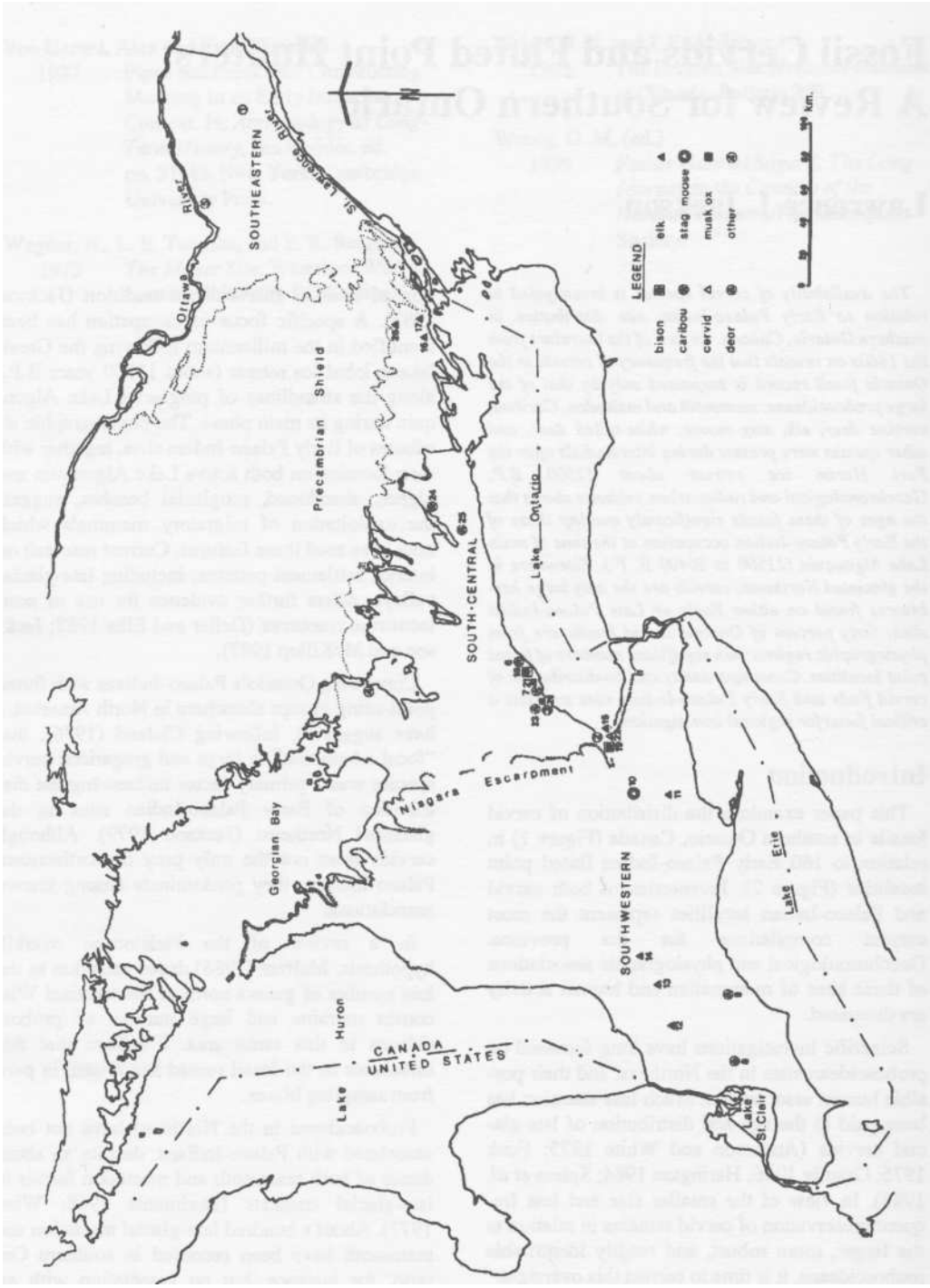

Figure 1
Late-Glacial Fossil Land Mammal Localities (other than Proboscideans) in Southern Ontario, Canada, indexed to Table 1.

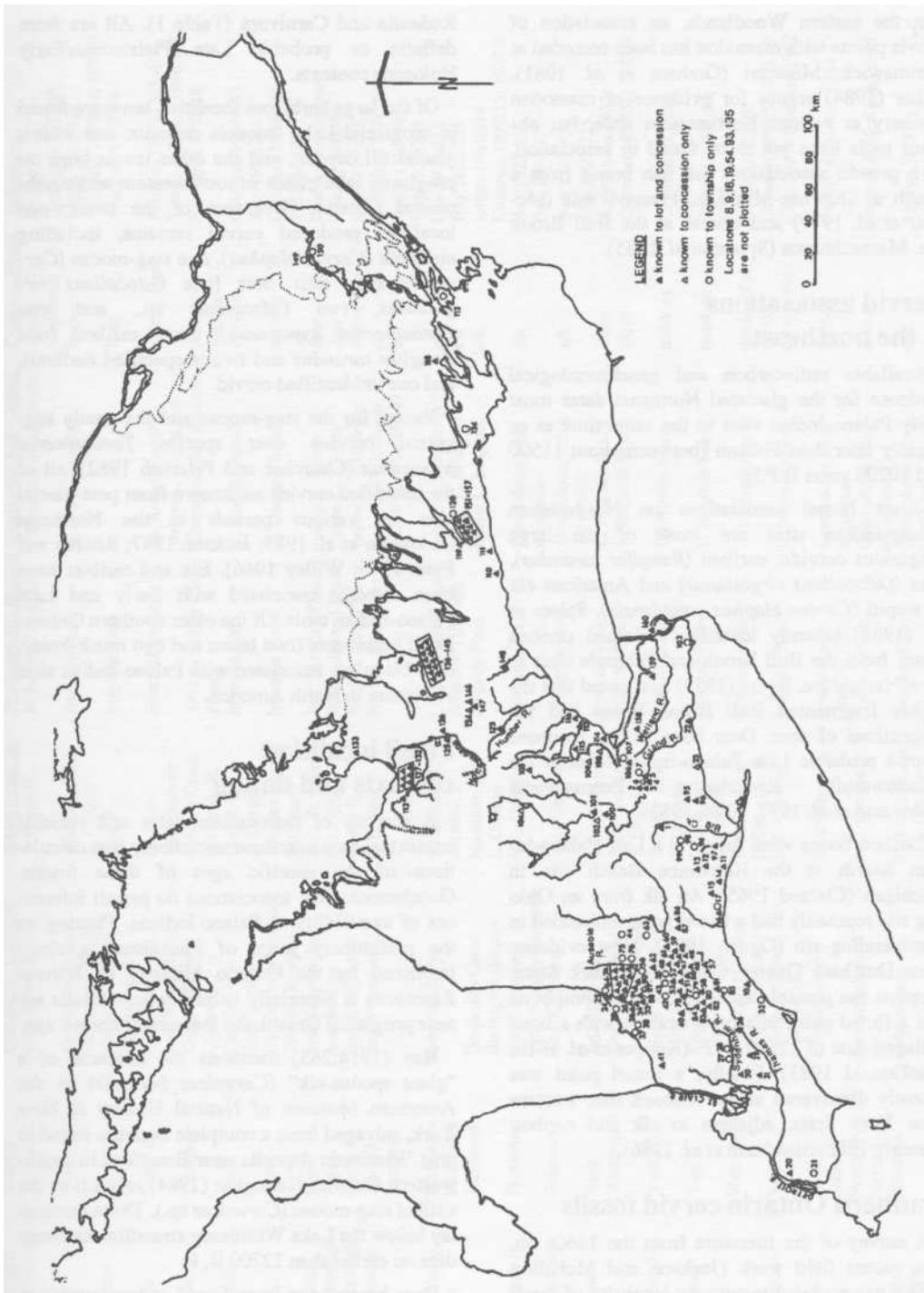

Figure 2
Distribution of Early Palaeo-Indian Fluted Point Localities in Southern Ontario.

In the eastern Woodlands, an association of Clovis points with mastodon has been recorded at Kimmswick, Missouri (Graham *et al.* 1981). Fisher (1984) argues for evidence of mastodon butchery at various Northeastern sites, but obvious tools have yet to be found in association. Two proven associations are fish bones from a hearth at Shawnee-Minisink, Pennsylvania (Mc-Nett *et al.* 1977) and beaver at the Bull Brook site, Massachusetts (Spiess *et al.* 1985).

Cervid associations in the northeast

Available radiocarbon and geochronological evidence for the glaciated Northeast dates most Early Palaeo-Indian sites to the same time as or slightly later than Folsom (between about 11500 and 10200 years B.P.).

Direct faunal associations on Northeastern Palaeo-Indian sites are those of the large gregarious cervids: caribou *(Rangifer tarandus),* deer *(Odocoileus virginianus)* and American elk or wapiti *(Cervus elaphus canadensis).* Spiess *et* al. (1985) recently identified calcined caribou bones from the Bull Brook and Whipple sites in New Hampshire. Byers (1955) first noted that the highly fragmented Bull Brook bones had the proportions of deer. Deer bone is also recorded from a probable Late Palaeo-Indian level at the Meadowcroft Rockshelter, **Pennsylvania** (Adovasio *et al.* 1977, 1978, 1983).

Caribou bones were found in a Late Palaeo-Indian hearth at the Holcombe Beach site in Michigan (Cleland 1965). An elk from an Ohio bog site reputedly had a fluted point embedded in a subtending rib (Ogden 1977). New evidence from Dutchess Quarry Cave, New York State, supports the possible association of caribou bone and a fluted point in a cave stratum with **a** bone collagen date of 12500 B. P. (Kopper *et al.* 1980; MacDonald 1983). Finally, a fluted point was recently discovered at the Hiscock site, western New York State, adjacent to elk and caribou (Gramly 1988; Steadman *et al.* 1986).

Southern Ontario cervid fossils

A survey of the literature from the 1860s on, plus recent field work (Jackson and McKillop 1986), has revealed twenty-six localities of fossil land mammals (other than proboscideans) in southern Ontario. Twenty-one are large gregarious herbivores and five are members of the Rodentia and Carnivora (Table 1). All are from definite or probable Late Pleistocene/Early Holocene contexts.

Of the large herbivore localities, ten were found in proglacial Lake Iroquois deposits, one with a glacial till deposit, and the other ten in bogs on proglacial lake plains in southwestern and south-central Ontario. Seventeen of the twenty-one localities produced cervid remains, including eight elk *(Cervus elaphus),* one stag-moose *(Cervalces sp.),* four deer (one *Odocoileus vir*ginianus, two *Odocoileus* sp., and one *Torontoceros hypogaeus),* three caribou (one *Rangifer tarandus* and two unspecified caribou), and one unidentified cervid.

Except for the stag-moose and the newly suggested cervine deer species *Torontoceros hypogaeus* (Churcher and Peterson 1982), all of the identified cervids are known from post-glacial sites of various periods in the Northeast (Adovasio et al. 1983; Jackson 1987; Ritchie and Funk 1976; Willey 1966). Elk and caribou have been directly associated with Early and Late Palaeo-Indian tools. Of the other southern Ontario fossil herbivores (two bison and two musk oxen), only bison are associated with Palaeo-Indian sites elsewhere in North America.

Fossil localities: contexts and dating

A scarcity of radiocarbon dates and variable contextual data introduce uncertainty into calculations of the specific ages of these fossils. Geochronological associations do permit inferences of availability to Palaeo-Indians. Plotting on the preliminary maps of Pleistocene **geology** published by the Ontario Ministry of Natural Resources is especially helpful where fossils are near proglacial Great Lake features of known age.

Hay (1914:263) mentions the humerus of a "giant moose-elk" *(Cervalces borealis)* in the American Museum of Natural History at New York, salvaged from a complete skeleton found in post-Wisconsin deposits near Brantford in south-western Ontario. Harington (1984) refers it to the extinct stag-moose (Cervalces sp.). These remains lay below the Lake Whittlesey strandline and may date no earlier than 12700 B. P.

Deer bones have been found at two mastodon sites in southwestern Ontario. A deer radius *(Odocoileus virginianus)* was found with mastodon remains at the Ferguson Farm near Tupper-

TABLE 1 FOSSIL LAND MAMMAL LOCATIONS OF LATE OR POST-WISCONSIN AGE IN SOUTHERN ONTARIO, CANADA (OTHER THAN PROBOSCIDEANS)

#.	Township	County	Geographic Location	Major Drainage	Physiographic Region	Geological Associations	Common Name	References
1	(Roxborough)	Stormont	near Moose Creek	to Payne R.	Hillsburg Sand Hills	Champlain Sea deposits	eastern chipmunk	Hay 1923:287 Harington 1978:18
2		Wentworth	Desjardins Canal Burlington Heights	Hamilton Bay L. Ontario	Iroquois Plain	below L. Iroquois	beaver	Logan 1863:914 Coleman 1899:34; 1937:9
3	Toronto	York	Bloor St. viaduct pier excavation	Don R.	Iroquois Plain		bear	Coleman 1932:46
+4	Orillia	Simcoe	east of Hwy #11 near Forest Home	creek to Lake Simcoe	Simcoe Lowlands	on Ardtrea beach below L. Algonquin	grizzly bear	Peterson 1965:1233-4 Tovell & Deane 1966:158
5	(Gloucester)	Carleton	Green's Creek Ottawa	Green's Creek to Ottawa R.	Ottawa Valley Clay Plain?	Champlain Sea deposits	American marten	Harington 1978:18
6	Toronto	York	Carleton bar East Toronto	Don R. to L. Ontario	Iroquois Plain	L. Iroquois beach	caribou	Coleman 1904:353 Hay 1923:244
7	York	York	Davenport gravel bar Toronto Junction	Humber R. to L. Ontario	Iroquois Plain	L. Iroquois beach	caribou	Coleman 1904:229; 1932:38, 353
+8	Chatham	Kent	near Tupperville	to L. St. Clair	St. Clair Clay Plain	below L. Rouge	deer	Lindsay:pers. comm.
+9	Aldborough	Elgin	near Rodney	to L. Erie	Bothwell Sand Plain	below L. Warren	deer	Russell 1948:62
10	(Brantford)	Brant	near Brantford	Grand R.	Norfolk Sand Plain	below L. Whittlesey	moose-elk	Hay 1914:263
11	Townsend	Norfolk	near Waterford	to L. Erie	Norfolk Sand Plain	below L. Whittlesey	elk	Harington 1978:20
12		Lambton				below L. Whittlesey?	elk	Smith 1901:96-7 Hay 1923:235
13	(Adelaide)	Middlesex	near Strathroy	Sydenham R.	Caradoc Sand Plain?	below L. Whittlesey?	elk	Hay 1923:235
14	Lobo	Middlesex		Ausable R.	Stratford Till Plain	below L. Maumee	elk	Hay 1923:235
15		Wentworth	Desjardins Canal Burlington Heights	Hamilton Bay L. Ontario	Iroquois Plain	below L. Iroquois	elk	Logan 1863:914 Coleman 1899:35; 1937:9
16	(Kingston)	Frontenac	near Kingston 3 mi. from Sydenham?	to L. Ontario	Napanee Plain	Greatlakean lobal ice retreat	elk	Hay 1923:235 Bell 1898:377
17	(Kingston)	Frontenac	near Kingston	to L. Ontario	Napanee Plain	Greatlakean lobal ice retreat	elk	Bell 1898:377 Hay 1923:235
18	Toronto	York	Pricefield Rd.	creek to Don R.	Iroquois Plain	L. Iroquois beach	bison	Anonymous 1932
19		Wentworth	Desjardins Canal Burlington Heights	Hamilton Bay L. Ontario	Iroquois Plain	L. Iroquois beach	bison	Coleman 1899:36; 1937:9
20	(Etobicoke)	York	McCaul's sand pit West Toronto	Humber R. to L. Ontario	Iroquois Plain	L.Iroquois beach	musk ox	Coleman 1932:38; 1937:10-11
21	Toronto	York	York Sand and Gravel Co. pit	Don R. to L. Ontario	Iroquois Plain	L. Iroquois beach	musk ox	Coleman 1932:43; 1937:10-11
22		Wentworth	railway bridge pier Desjardins Canal	Hamilton Bay L. Ontario	Iroquois Plain	L. Iroquois beach	unidentified cervid	Cottle 1853:283 Coleman 1899:36; 1937:9
+23	Etobicoke	York	Islington Subway Stn. west portal	to L. Ontario	Iroquois Plain	L. Iroquois beach	cervine deer	Churcher & Peterson 1982
24.	Alnwick	Northum-berland	drumlin slope	Rice Lake	Peterborough Drumlin Field	Greatlakean lobal ice retreat	caribou	Pavlish & Alcock 1984
25	Hope	Northum-berland	drainage channel	to L. Ontario	Iroquois Plain	Greatlakean lobal ice retreat	deer	Jackson & McKillop 1986
26	(Lough-borough)	Frontenac	cedar swamp	Sydenham Lake to L. Ontario	Napanee Plain	Greatlakean lobal ice retreat	elk	Selwyn 1888:111

Legend

( ) information in parenthesis is extrapolated from locational details in original sources; + cross denotes associated radiocarbon date cited in original source

vile in Kent County. The mastodon is radiocarbon dated to 8910 ± 150 B. P. (GSC-614) on bone (Lowdon and Blake 1986:216). A cornprehensive review of Ontario mastodon and mammoth dates (McAndrews and Jackson 1988) strongly suggests that this date is at least a thousand years too young. The site is below the Lake Rouge strandline and must date after 12300 B. P. Unfortunately, while the deer bone may be contemporaneous with the Late Pleistocene mastodon, its context in relation to the latter was not observed (J. Lindsay:personal communication 1978). Russell (1948:62) recorded an antler fragment of unspecified deer at the Campbell Farm mastodon site in Elgin County below three feet of black muck on Lake Warren sands. Acceptable radiocarbon dates of 12000 + 500 B.P. (S-30) on muck and 11400 + 450 B. P. (S-29) on wood found with the mastodon support a late-glacial age for the deer antler (McCallum and Dyck 1960). Both mastodon and deer must date after the end of Lake Warren, about 12500 B. P.

A number of Ontario locations have yielded fossil elk bones but the associations of these specimens, with one exception, do not allow minimum age estimates. They *may* date to any time within the Late Pleistocene or Holocene although some credence should be attached to original observations on their age.

Coleman's (1899:35) report of an elk antler excavated below the level of Lake Iroquois near Hamilton is the most convincing record of late-glacial elk. Referred by Harington (1978:20) to *Cervus elaphus,* this specimen is probably no younger than the end of Lake Iroquois, about 11300 B. P.

> The remains mentioned were found in deposits forming what is called Burlington Heights. Here Dundas Valley opens into the extreme western end of Lake Ontario. The valley is about a half mile wide. Across this has been formed a bar, interrupted only at its northern end, with a height of 108 feet above the level of the lake and a width varying from a few hundred yards to less than a half mile. Its height is almost that of the Iroquois beach found on the south shore of the lake and continuing on the northern shore. Many years ago a canal was cut through the narrowest part of the bar and it was in the construction of this that the elephant...elk...and beaver bones were found. It is evident that the bones were deposited while the bar was being built... (Hay 1923:235).

Oliver Hay (1923:235) recorded three "late or post-Wisconsin" elk localities in southwestern Ontario. Harington (1978:20) refers these finds to *Cervus elaphus.*

> In 1901 *(Ottawa Naturalist,* Vol. *XV,* pp 95-97), L. H. Smith wrote on the occurrence of the elk in Ontario. None had been known to exist there since the settlement by white men. The writer of the article had a number of specimens of antlers collected in the neighbourhood of Strathroy and the neighbouring county, Lambton. A fine pair of antlers and a part of a skeleton of an elk had been discovered in a boggy spring in lot 15, 12th con-cession, Township of Lobo.... This and the others, notwithstanding shallowness of burial, may have been buried in Late Pleistocene times; ...(Hay 1923:235).

The Strathroy and Lambton County specimens probably lay below the Lake Whittlesey beach and date no earlier than about 12700 B. P. The Lobo Township location is above the Whittlesey beach on the edge of the Seaforth Moraine. This location was covered by St. Joseph lobe ice during the Port Huron stade, indicating a date no earlier than 13100 B. P. for the elk antlers.

Harington (1978:20; personal communication 1978) notes the recovery in 1880 of a "post-glacial" elk antler *(Cervus elaphus)* near Waterford in Norfolk County. This location was likely below the Lake Whittlesey beach, dating no earlier than 12700 B. P.

Hay (1923:235) reported two south-central Ontario elk later referred by Harington (1978:20) to *Cervus elaphus.* Both were in shell marl near Kingston and probably date no earlier than the Greatlakean lobal ice retreat about 11500 B. P. Selwyn (1888:11) recorded an elk antler from a cedar swamp near Sydenham which may also date no earlier than the Greatlakean ice retreat. Minimum ages for these elk specimens are unknown.

Caribou remains have been reported from several locations clearly associated with Lake Iroquois beach deposits in Toronto. Coleman (1904:229, 366) recorded caribou antlers and bones from Davenport gravel ridge, formed by Lake Iroquois at the mouth of the ancient Humber River. He noted that such antlers were also common at Toronto Junction along this bar. Coleman (1899:38) had earlier stated that the Carlton sand

and gravel spit, formed by Lake Iroquois at the mouth of the ancient Don River, was long known to contain "deer" horns. Massive bones and horns of large "deer" were found twenty feet deep in a gravel pit on the south side of the Carlton ridge. According to Coleman (1899:38-9):

> Last summer several horns were found in a gravel pit on the north side of the same spit at a depth of from twelve to twenty feet below the surface, the best preserved, just above a layer of clay, perhaps at the base of the gravel deposit. They are horns of caribou or rein-deer, and are so fragile that unless handled very carefully they fall to pieces. The specimens which have reached me have been treated with glue by Mr. Archibald Pride of the Biological Museum and are preserved in fair condition. Mr. Pride reports that the large horn first found is a "shed horn of **a** reindeer, apparently young, from the right side, slender and delicate in form, about three feet three inches in length, measured by the curve, or two feet six inches from burr to tip, making allowance for the point of the horn which is broken off." The second, "a fragment of another reindeer's shed horn found near the former but on a different level, has the same characteristics as the almost entire antler above described.
>
> 'The last horn found, upon close examination undoubtedly that of a reindeer, is a right shed horn, worn by water and sand, and probably from a fine large male. The first, or brow antler, a palmated or turned up snag, is broken off; the second, also broken off, is inclined to be flat on the inside surface. The measurement of girth between the two snags is six inches. Sufficient remains of the horn to show the sweep of the beam; and the slight flattening at the attachment of the tine is characteristic."

Coleman was the geologist who fast mapped Lake Iroquois and his description of caribou bone in association with that lake's deposits may be taken as accurate. The remains' location, below twenty feet of beach gravel, strongly suggests that they *were* deposited when Lake Iroquois was active. Accurate description of the antler specimens is particularly significant for our understanding of late-glacial caribou ranging behaviour.

If the shed antler described as "young" was misidentified, as frequently happens, it could well have been from a caribou cow. Shed cow antler is one of the best indications of a calving ground and the northern limit of the species range. Female antlers develop during the summer from June to September and are carried until April or May when the fawns are born. Pride's description of a "fine large male" antler offers an apparently contradictory seasonality indicator since the annual growth of caribou antler is about six months out of phase between the sexes:

> Velvet knobs appear on the adult bucks in March, and their antlers grow rapidly from May through July, so that by August they carry large, cumbersome velvet antlers approximately three to four feet in length.... The antlers have hardened by mid-September, ... By October the antlers are polished clean, but these polished antlers are not carried long, for by early November the older bucks begin to drop them, and by February most of the younger animals have dropped theirs as well (Banfield 1974:384).

The Lake Iroquois male caribou antler could not have been shed at the same time as a cow antler. If the male antler was not correctly described as "shed", it could represent a slaughtered bull in company with cows in April or May. Alternatively, if the smaller antler was correctly identified as a young animal's, a winter season of shedding, possibly December or **January,** is indicated. This, in turn, suggests movement to a southern winter range with the implication that Ontario Palaeo-Indians, if exploiting caribou, would have found calving grounds and summering ranges to the north in Ontario and wintering ranges south of Lake Iroquois.

It is intriguing to note Coleman's (1899:38) reference to Indian artifacts from Lake Iroquois deposits:

> The Carlton sand and gravel spit has long been known to contain deer hams, though so far as I am aware they were never mentioned in print before 1884, when Samuel **Thompson** wrote as follows: "While speaking of the Carlton gravel ridge, it is worth while to note that in taking gravel from its southern face, at a depth of twenty feet, I found an Indian flint arrowhead; also a stone implement similar to what is called by painters a muller, used for grinding paint. Several massive bones, and the horns of some large species of deer, were also found in the same gravel pit, and carried or given away by the workmen. The two articles first named are still in my possession.

> Being at the very bottom of the gravel deposit, they must have lain there, when no such beach existed..."....Mr. Thompson is dead, and enquiries as to the arrowhead and muller referred to have been fruitless. It is possible that the Indian remains reached their position through burial, or were covered by a land slip, though there is no proof of this.

Although the Lake Iroquois caribou specimens are no longer extant, they do raise interesting questions. I am of the opinion that biologist Archibald Pride accurately described the Carlton spit antler recoveries and that indirect evidence now exists for caribou calving grounds in Ontario at the time of Lake Iroquois, between 12400 and 11300 B. P. Since tundra summer ranges and forested winter ranges may be up to eight hundred miles apart (Banfield 1974:385) late-glacial Ontario caribou almost certainly wintered in the northeastern United States.

Churcher and Peterson (1982) announced the designation of a new **cervine** *deer* **species** ***Torontoceros hypogaeus*** following the discovery of a partial deer cranium with main antler beams in a Toronto subway excavation. Close to the size of a caribou, and in fact regarded as such by some researchers (Spiess *et al.* 1985), it was in channel sand below the Lake Iroquois beach, overlain by redeposited glacial clays. Radiocarbon dated to 11315 + 325 B. P. (GX-4914), it gives a new minimum age for Lake Iroquois, and is an indisputable Lake Pleistocene fossil.

Coleman (1899:36) noted a shoulder blade of a "moose or large deer" from a sand deposit above possible pre-Lake Iroquois clay in the Hunter Street tunnel cutting through the Lake Iroquois bar in Hamilton Bay. Cottle (1853:283) provides a different description of what is believed to be the same find:

> In sinking a coffer-dam near this spot for the foundation of a bridge where the railroad will cross the Desjardins Canal, were found, deep in the silt, the scapular and some fragments of the bones of the extremities of an herbivorous animal about the size of a fallow-deer.

Coleman (1904:352) reiterated that "moose or deer" remains of the size of a "fallow-deer" were found when a deep railway cutting was covered in by the Hunter Street terminal. This find, probably contemporaneous with Lake Iroquois, is listed in Table 1 as an unidentified cervid.

Several finds of bovids are relevant here be-cause of their association with Lake Iroquois deposits. An anonymous report is contained in the *Edmonton Journal* of June 11, 1932. Accompanied by a photograph, it reports the discovery of ***a "Bison bison"*** skull by Toronto workmen excavating a water-line. The skull may have been embedded by offshore currents of Lake Iroquois. This may be the same specimen as *a Bison bison* skull recovered from Lake Iroquois sand on Pricefield Road in Toronto in 1932 (J. Lindsay: personal communication 1978; J. H. McAndrews: personal communication 1978). Coleman (1899:36) noted that the contractor for the Desjardins Canal excavation reported a bystander carrying off bison remains in addition to those secured by Sir W. Logan for the Geological Survey of Canada. Two or more bison must have been found in Lake Iroquois contexts.

Bison bison calves from mid-April to the beginning of June, favouring open areas in summer. Bison herds will move up to two hundred miles to more favourable winter pasture. Although the age and sex of the Lake Iroquois bison is not known, seasonal movement from southern Ontario to the northeastern United States is a reasonable possibility (Banfield 1974:406).

Two fossil cervid localities have recently been recorded in the Trent waterway area of south-central Ontario. An apparent Late Pleistocene till deposit on the south shore of Rice Lake was found to contain a redeposited calcaneum of unspecified caribou (Pavlish and Alcock 1984). If post-glacial, this specimen may date no earlier than the final lobal ice retreat from the Rice Lake basin, about 11500 B. P. A bog locality near the Lake Iroquois beach south of Rice Lake also produced a fossil deer antler *Odocoileus* cf. *virginianus* embedded in a silt layer resting on basal glacio-lacustrine sediments. This post-glacial deposit may date no earlier than the lobal ice retreat into the Ontario basin about 11500 B. P. (Jackson and McKillop 1986).

Discussion

The perception of cervid scarcity in the Northeastern fossil record is undoubtedly influenced by the relative abundance of proboscidean fossils in this region and by a failure to search for smaller fossils. From this survey of southern Ontario, one of the most recently deglaciated portions of the Northeast, it is obvious that a significant number of cervid individuals and

species have been recorded over the years. Many have good contextual associations supporting a late-glacial age.

Age ranges for particular species are provided by geological and radiocarbon evidence (Table 2). Caribou, as well as bison, are associated with deposits which indicate their contemporaneity with Lake Iroquois in the period 12400 to 11300 B. P. An interior caribou location also supports a Late Pleistocene age. No Early Holocene records of caribou are known. Earliest records for deer are contemporaneous with mastodon, possibly in the twelfth but more certainly in the eleventh millennium B. P., after Lakes Warren and Rouge. The cervine deer *(Torontoceros)* from Lake Iroquois deposits is firmly dated to 11315 B. P. and is unknown from later Holocene deposits. The extinct stag-moose post-dates 12700 B. P. and is also unknown from Holocene deposits. At least one elk record appears contemporaneous with Lake Iroquois although the remaining elk locations cannot be assigned minimum possible ages.

The above evidence dates a number of cervid species after Port Huron ice retreat during Two Creeks and North Bay interstades (Table 2). The presence of most species during the life of main Lake Algonquin between 11500 and 10300 B. P. means that they were available to southern Ontario fluted point hunters at that time (Jackson 1983).

Ontario fluted points and cervids also share a similar geographic distribution. While the sample of cervid localities is currently only one-eighth the size of the fluted point sample, there is nevertheless a tendency for both types of finds to occur in the same physiographic regions (Chapman and Putnam 1983) (Figure 3). Four-fifths of the cervid fossils are in physiographic regions that produced a significant sample of fluted points (5% or more of total southern Ontario localities). About half of the fluted point localities are in regions with cervid fossil records. Both points and fossils occur most often in areas of sand plains, secondarily on till plains, with minor clay plain and till moraine occurrence.

Deller (1976) originally noted the **abundance** of fluted points in areas of muck soil development on proglacial lake plains. Southwestern Ontario cervid fossil records concentrate in the lake plain lowlands bordering the Erie basin and are primarily from post-glacial bog deposits. South-central Ontario fossil records, apart from those as-

TABLE 2
GEOCHRONOLOGICAL AND RADIOCARBON AGES OF ONT. CERVID FOSSILS (YR B. P.)

	TWO CREEKS INTERSTADE	GREATLAKEAN STADE	NORTH BAY INTERSTADE
	12300 - 11800	11800 -11500	11500 - 8100
Rangifer sp. caribou)	Lake Iroquois deposits 12600 - 11300 October-December seasonality		9940[3]
[1] Odocoileus sp. (deer)	12000[1]	11400[1]	8910[1]
Cervus elaphus (American elk)	Lake Iroquois deposits		undated associations
Cervalces sp. (stag-moose)	post-dates Lake Whittlesey after 12700		Extinction
2 Torontoceros hypogaeus (cervine deer)	Lake Iroquois deposits	11315[2]	Extinction

[1] Radiocarbon dates on organics associated with mastodon at Ferguson Farm and Campbell sites where deer remains also found (Dreimanis 1968; Jackson 1979).

[2] Radiocarbon date on antler (Churcher and Peterson 1982).

[3]Radiocarbon date on antler (this study), Steep Rock Lake, Northern Ontario, 9940 ± B. P. (AA-3285)

Table 2 above after Jackson (1983).

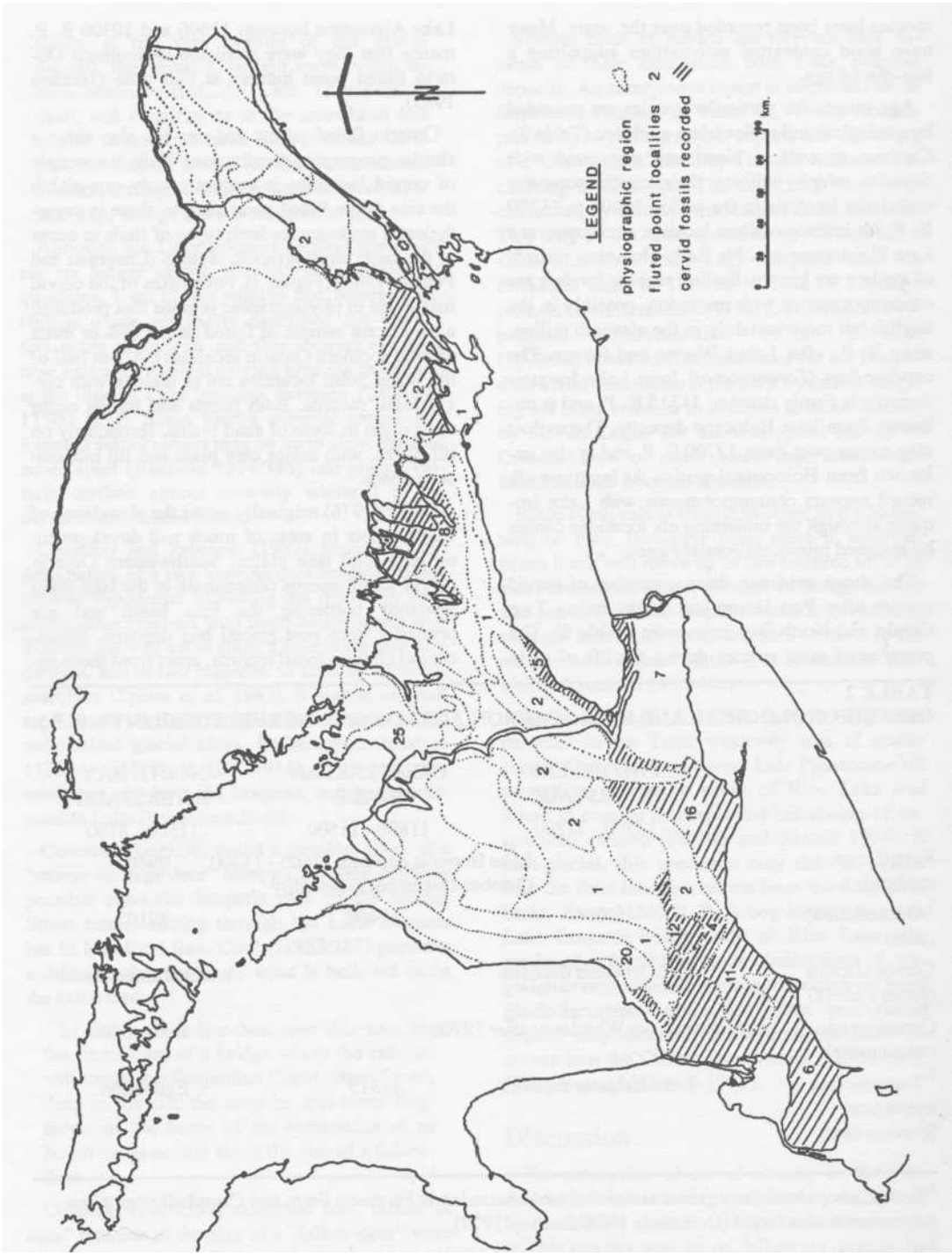

Figure 3
Co-occurrence of cervid fossils and fluted points in physiographic regions of southern Ontario (after Chapman and Putnam 1973; 130 point localities are assignable to region; all cervid fossils are in regions with fluted points).

sociated with Lake Iroquois beach deposits near Toronto, also show a tendency for location in bogs developed on lake plain lowlands. The scar-city of fossil records in the northern portions of southwestern and south-central Ontario may reflect fewer accidental discoveries due to low population, less favourable landforms for fossil preservation, or absence of investigation. I predict that systematic searches of neglected areas such as the Lake Algonquin strandline in south-central Ontario will produce important new evidence. Intensive search for cervid fossils in other areas where fluted points are abundant may yield more examples of their contemporaneity and co-distribution, if not direct association.

Regional implications

The idea that only one species of large herbivore was hunted throughout the Northeastern Palaeo-Indian period is appealing (Peers 1986). However, though diagnostic tools may well be recovered in association with a particular species such as caribou or mastodon, we should assume adaptation to a broad range of species represented in the fossil record until the significance of particular associations is fully understood. We must allow not only for differences in Palaeo-Indian hunting adaptation over time and between different populations, but also for idiosyncratic variation among even focally adapted groups. We cannot categorically exclude subsistence possibilities on the thin archaeological evidence so far available.

In southern Ontario, late-glacial cervids make up a sizable proportion and a surprising diversity of species represented in the fossil record. They have received far less attention than more highly visible and easily recovered proboscideans. Species with the same spatial and temporal distribution as Ontario Palaeo-Indians include a newly recognized cervine deer species, stag-moose, and caribou—one of the most sustaining resources for tundra hunter/gatherer peoples (Burch 1972; Gordon 1977). Less certainly associated but warranting further investigation are the ubiquitous white-tailed deer and elk.

Known subsistence associations and fossil records suggest that Northeastern Palaeo-Indian hunting was most closely geared to cervids. Support for this view is derived from a recent study of Quaternary North American environments and mammalian extinction. A "single female deer *(Odocoileus)* potentially could generate in twenty-five years, through her descendants, almost a thousand times the biomass that a single female *Elephas* could generate..." (McDonald 1984:431). Late-glacial hunting groups could scarcely afford to overlook such a resource which would be more reliable in the long term.

Northeastern Palaeo-Indians may well have made use of many animal resources—taking herding mammals such as bison and caribou at predictable seasonal and geographic focal points, yet relying at other times of the *year* on more dispersed but consistently available species such as white-tailed deer.

> Some game, for example deer, was spread more evenly in space, which increased the probability of repeated hunting successes; other game, such as *Bison,* was unevenly distributed in space but formed large herds containing abundant biomass (McDonald 1984:431).

To look for a single resource used by Early Palaeo-Indian peoples is simplistic when the diversity of late-glacial faunal assemblages is poorly known. However, to look at a single family whose species were suited to procurement by a known technology and are visible in the fossil record is entirely justified. That various cervids have already been found on Palaeo-Indian sites in the Northeast suggests a logical focus for investigation.

The nature of Palaeo-Indian adaptation undoubtedly changed over an estimated eleven centuries of Ontario occupation. Certainly, in the American High Plains there is strong evidence for early specialized Clovis mammoth hunting and later Folsom bison hunting. Deller and Ellis (1988) have identified a temporal series of Palaeo-Indian groups, Gainey-Barnes-Crowfield, characterized by different tool kits in Ontario. Evidence may well be uncovered of the earliest, Gainey-type, fluted points and tool kits with remains of mastodon, so abundant in southwestern Ontario, in situations comparable to southwestern Clovis. Species such as stag-moose, cervine deer, and caribou also appear to have been available to Ontario Gainey peoples. Later Barnes-type fluted points on Parkhill complex sites appear more likely to be associated with migratory cervids such as caribou. Both mastodon and mammoth were rapidly disappearing at this time (McAndrews and Jackson 1988) and the persistence of species such as stag-moose or cervine deer is questionable. The early presence of elk and white-tailed deer

also is not confirmed. The latest, Crowfield-type, fluted points and tool kits might actually occur with remains of migratory cervids such as caribou and newly appearing, more stationary cervid species such as elk and white-tailed deer. Tentative dating of Crowfield about 10300 B. P. places these people at the end of the Pleistocene during major environmental changes, including the draining of proglacial Lake Algonquin and re-placement of spruce parkland with pine forests. Such changes must have had major effects on faunal ranges and assemblages.

A widely adaptable exploitive technology, as the fluted point technology was, lends itself to regional and temporal changes in hunting focus and in the availability of prey species. Hunting of proboscideans or cervids, even if a primary focus in any particular region and time, need not have excluded occasional or supplemental use of other species.

A great deal of information needs to be uncovered before definitive statements on Palaeo-Indian hunting adaptation are possible. In the meantime, a concerted program of radiocarbon investigation will help establish the temporal range and availability of different species in the late-glacial period. With the advent of accelerator analysis techniques, it is now possible to date key palaeontological specimens with minimal destruction. The next few years may well see great advances in our understanding of late-glacial environments and human relationships with those environments if close co-operation can be achieved among the sciences.

This paper has shown the presence of numerous cervid fossil sites in southern Ontario, the probable contemporaneity of various cervid species with Palaeo-Indian occupation, and the close spatial relationship of cervid fossil and Palaeo-Indian sites. Direct association of artifacts and cervid remains is required to confirm this hypothetical relationship. The probability of such a discovery is enhanced by the newly suggested evidence, based on existing fossil material, of caribou herds and calving grounds in late-glacial Ontario.

Archaeologists must be alert to the possibility of early human exploitation of multiple species of similar habit, gregariousness, biomass, and predictability. They must also have the good sense not to pronounce early judgement on the broader implications of the first fossil associations when they are finally discovered in southern Ontario.

Acknowledgements

I am indebted to many individuals who freely gave of their time to comment on this manuscript: Dr. Alan Bryan, University of Alberta, Dr. Chris Ellis, University of Waterloo, Dr. Bryan Gordon, Canadian Museum of Civilization, Dr. Michael Gramly, Buffalo Museum of Science, and especially Dr. Heather McKillop, Northeastern Archaeological Associates. I would also like to thank Scott Gibbs and Susan Wurtzburg for their field work.

The support of the Social Sciences and Humanities Research Council of Canada through research grants #410-84-0104 and 410-85-0337 is acknowledged with appreciation.

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