

# Hunting specialization : single-species focus and human adaptation

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## RÉSUMÉ

Le bison fait partie des quelques espèces qui ont fait l'objet de chasse spécialisée. La chasse d'une seule espèce a été considérée comme l'empreinte du comportement humain moderne, la spécialisation étant le résultat d'un choix culturel. Les espèces choisies comme gibier ont varié dans le temps et dans l'espace. L'éthologie, la biologie et l'ethno-archéologie des animaux modernes peuvent aider à comprendre les stratégies qui ont pu être utilisées par les chasseurs préhistoriques. Les modes d'exploitation du bison ont varié non seulement selon les régions, mais également dans le temps. Cette espèce combine stature importante et taille variable de troupeaux. De ce fait, elle offre un potentiel de chasse soit d'individus, soit de groupes. Dans cette présentation vont être abordés 1) les problèmes écologiques que la chasse orientée vers une seule espèce peut résoudre et 2) les différences entre le bison et d'autres espèces, faisant l'objet de chasses spécialisées.

## ABSTRACT

*Bison is one of several species that have been the object of hunting specialization. The hunting of a single species has been used as a ballmark of modern human behavior, a specialization that was due to cultural choice. Species chosen for predation have varied over time and place. Modern animal etbology, biology and ethnoarchaeology can help us understand strategies that might have been used by prehistoric hunters. Patterns of bison exploitation have varied not only regionally, but also through time. This species combines large body size with variable herd size. As such, it represents potential to be hunted as individuals or as groups. This paper will 1) address ecological problems which focus on a single species might solve and 2) contrast bison with other focalized prey species.*

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## Introduction

Bison has played an important rôle in human subsistence since at least the Middle Paleolithic in the Old World and since the Paleoindian period in the New

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World. Subsistence strategies have incorporated this species in many ways. Over the last tens or hundreds of thousands of years, this species has been exploited by means of scavenging, generalized hunting and specialized hunting. It is the last of these, specialized hunting, that will be discussed here.

A number of issues are relevant to our understanding bison exploitation. These concern the definition of specialization, how we might recognize it in the archaeological record, and what the role of sites might be within regional subsistence systems. My perspective in this colloquium is an outsider's view. I have not specialized on bison in my faunal studies, but rather on another species, *Rangifer tarandus* - reindeer in the Old World and caribou in the New World. My studies on reindeer have, however, given me some insights on the various ways that species has been exploited by human hunter/gatherers. It is this view of variability that I think can bring a useful perspective for considering human exploitation of bison.

What is specialization? Hunter/gatherers rarely acquire food resources in direct proportion to their availability in the environment. We know from the optimal foraging literature (e.g., Winterhalder, Smith, 1981) that the acquisition of resources is a process of decisions, of choosing between potential resources encountered by evaluating their values and the probability of soon encountering something even better. The organization of labor to acquire or process potential resources plays a large role in choosing resources to be sought. Inherent in all of these decisions is a good knowledge of the environment. This knowledge includes knowing what are the problems posed by the nature and structure of resource availability. Are there seasonal restraints on the availability of certain food resources? Are such resources clumped together or widely dispersed? Is encounter or acquisition predictable in time or space? Can the resources feed only a few at a time or many?

I suggest that specialization is best defined when a particular resource offers a better solution to the problems of year-round, long-term food acquisition than does a general mix of other potential food resources. This does not mean that other resources will not be utilized, but, when there needs to be a choice made over which resource to take, one key resource will be critical to the strategy of survival of the group and will take precedence over any other resource available. The key difference is one of strategy rather than tactics. It does not matter how you acquire the resource, as long as it provides sufficient quantity. What matters is the role that resource plays in the long term? What is it about that resource that makes its acquisition more important than other potentially available resources?

In my research, the critical resource has been reindeer. Certain hunter/gatherers may have access to a variety of game in the fall, but they must make the strategic decision to focus on the reindeer, knowing that only the predictable accumulation of large quantities of meat during the migration hunt will provide sufficient food for storage, to survive the winter when no other resources are available.

Bison has the potential to fulfill a similar role in other environments. It may often be found in large herds and is certainly of sufficient body size for mass meat acquisi-

tion. I suggest that the pertinent questions involve not only the bison, but also the rest of the environment. Are other resources available in the region? Are they available year-round? Are there periodic resource failures that would encourage more generalized patterns of subsistence? How might we investigate the potential for bison to be the target of hunting specialization?

## Recognition of hunting specialization

The first issue is one of recognition. Most often, hunting specialization is invoked when one species vastly dominates the faunal assemblage at an archaeological site, whether by number of identified specimens or by number of individuals. We have all seen site reports that are practically monospecific, upwards of 90 or 95 % attributed to a single taxon. We must ask ourselves several questions at this point. First, are there taphonomic considerations that bias the preservation of certain taxa and favor the visibility of another taxon? Large mammals, such as bison, certainly preserve better than much smaller animals. There are also a number of archaeological factors that can bias our perspective of the faunal assemblage. How was the site excavated, with dental picks or with shovels? Was the sediment screened? Were there *a priori* decisions made as to what was identifiable and informative, and therefore discarded or saved? Even many well-controlled excavations of fairly recent decades are known to have kept only the articular ends of bones. Any of these considerations can bias the faunal assemblage that comes into the hands of the zooarchaeologist and make it appear that one species was more prominent than it actually may have been.

Sometimes, the problem is not seen as things subtracted from the faunal assemblage, but rather as things added to it. Gaudzinski (1995) contends that predominance of bison at Wallertheim is evidence of Middle Paleolithic hunting specialization. She argues that, although other species such as horse are found at the site, taphonomic analyses demonstrate that those other species are present due to geological accumulation; a contrasting pattern in the bison present is argued to be due to their having been hunted by humans. If bison were the only species hunted at this site, then this would be evidence for specialization at this site.

Even if we were all to agree that only one species was present and was hunted at a given archaeological site, does this represent hunting specialization? Can we see specialization from the level of individual archaeological sites? Does specialization mean that the same prey is pursued at every site because of choices or decisions made by the hunters?

The hunting of a single species has been used as a hallmark of modern human behavior in the Upper Paleolithic (Mellars, 1973), a specialization that was due to cultural choice or to increased intellectual or technical abilities of anatomically modern humans. Straus (1990) has argued that the almost exclusive presence of bovids at Mauran brought into question the assignment of that site to the Middle

Paleolithic. In a more recent article, Mellars (1989) links predominance of reindeer in the earliest Upper Paleolithic cultures with logistical collecting (Binford, 1980), ostensibly for storing large quantities of meat for over-wintering or for social aggregation (Conkey, 1980). Recent research has challenged the idea that monospecific faunal assemblages should always be considered as conscious cultural choices. At the early Upper Paleolithic occupation of couche V at Le Flageolet I, in the Périgord, reindeer made up 95 % of the faunal assemblage, but, when this assemblage was inspected more closely, it became apparent that the prey did not meet the expectations of a logistical collecting model. Individual adult animals were killed through the course of the winter; there was selection for females and for body parts that retain their fat content late into that season; the limited choice of body parts that were carried back to the rock shelter was intensively processed, down to the last cubic centimeter of marrow in phalanges, suggesting that the labor for hunting and transport was dispersed or individual, rather than communal. It is suggested that predominance of a single species was due to climatic factors rather than a planned mass kill of a target species (Enloe, 1993, p. 111).

A number of other sites in southwestern France from the late Upper Paleolithic also exhibit very high proportions of reindeer in their faunal assemblages. At La Madeleine, Limeuil and Reignac, reindeer made up 92 to 94 % of the faunal specimens. Even in terms of numbers of individuals, there appeared to be up to ten times as many reindeer individuals as there were individuals of other species, most often horse. Does this represent hunting specialization or climatic limitation of choice? Boyle (1994, 1998) demonstrated that the primary and secondary species were being treated differently. The remains of reindeer carcasses appeared to represent a gourmet selection of certain body parts, while horses were more completely represented and processed. Reindeer were hunted in winter and early spring (Gordon, 1988, p. 64), while horses were hunted in summer (Burke, 1993, p. 147). This appears to be a situation of complementary species exploitation from more permanent residential sites, shifting prey as availability changed through the seasons, and shifting how those species were treated.

In contrast, similarly aged sites that I work on in northern France, which also exhibit overwhelming predominance of reindeer in their faunal assemblages, do not show the same kinds of exploitation patterns. Pincevent and Verberie are both very similar in short seasonality, with kills exclusively during the fall migration, taking males and females that would have aggregated together only at that time of the year. Carcasses were similarly completely exploited. These appear to represent something closer to what we might expect from logistical collectors, where sites were occupied solely for the exploitation of a single species. Now, does this really represent hunting specialization? I suspect so, but only to a certain degree. What we do not know enough about is what species might have been exploited at other sites in the region during other seasons of the year. Ideally, we should examine other sites in the same region that dated to the same period, to see if there are complementary resources

and seasonality of occupation. Unfortunately, we only have good faunal preservation and fairly complete excavation at a few sites in the Paris Basin.

What does all of this mean for bison? The lesson to be drawn is that predominance of a single taxon or species in the faunal assemblage cannot be directly translated into hunting specialization by prehistoric people. It is only when we begin to examine the details of seasonality, butchering patterns, body part selection, and prey demography that we can begin to understand the variability of how a given species was exploited. Then we can begin to ask other questions : what problems might focus on a single species solve? How does this contrast with other prey species that might be available?

## Factors affecting bison hunting specialization

Bison has frequently been proposed as the object of hunting specialization. Patterns of bison exploitation have varied not only regionally, but also through time. This species combines large body size with variable herd size. As such, it represents a potential to be hunted as individuals or as groups. What factors might contribute to the kinds of resource acquisition choices made by prehistoric hunter/gatherers?

### Region and topography

While local topography may enhance the ability of hunters to acquire prey (Wheat, 1972 ; Frison, 1974 ; Farizy *et al.*, 1994), regional factors affect how often sites were used. The patchiness or continuity of regional ecosystems may affect the distribution of game. Dawson and Judge suggested that the central Rio Grande valley did not adjoin the large grasslands of the Great Plains ; without replenishment from large herds on the plains, local bison populations could be rapidly depleted. In response to prey patchiness in time and space, local hunter groups had to be dispersed with sporadic occupation of a large number of potential campsites (Dawson, Judge, 1969, p. 160). In contrast, one might expect repeated occupations of a relatively fewer number of campsites in situations where there was long-term access to prey in the same location. This might be the case in bison dominated Middle Paleolithic sites, such as Mauran (Farizy *et al.*, 1994), which appears to have been seasonally occupied for hundreds, if not thousands, of years.

### Taxonomy and ethology

We must also address taxonomic and ethological considerations. Differences in the species or subspecies present may be relevant to the structure of prey availability and the tactics employed by human hunters to procure game. For the reindeer, argu-

ments have centered around differences in migratory behavior between woodland and tundra forms. If there had been intrinsic differences, the woodland forms would have largely remained in small groups in the same territory, thus yielding the potential for encounters of a few individuals throughout the year; in contrast, the tundra forms would have formed large herds for long migrations, yielding great abundance of prey for short periods of the year. Modern ethological studies have demonstrated that migratory behavior was not inherent in subspecies, but is rather a function of population densities and winter forage imbalances. Winter forage is the critical limiting factor on *Rangifer* populations, because it is depleted much faster than it can be replaced. This is why we see patterns of population booms and crashes in many holartic species. Reindeer and caribou have used migratory behavior to adjust population density to the depletion of critical resources. The larger the population of a given herd grows, the longer will be the migration distance (Hemming, 1975). Therefore, migration is not a function of taxon or subtaxon identification, but is rather subject to ecological principals as an adaptive mechanism in the dynamic environment. Further, the identification of subspecies by morphological means such as antler beam cross section in archaeological faunal assemblages (e.g., Bouchud, 1966) is ambiguous at best and cannot be directly transformed into animal behavior patterns.

Similar dichotomous behavioral models have been proposed for bison, linked to changes in species over time. Judge (1973) noted that the fauna associated with Folsom sites usually consisted of small numbers of only *Bison antiquus*, for which he modeled behavior similar to the woodland bison, *Bison bison athabascae*, because of similar woodland or savanna habitats in the Pleistocene. In contrast, later Palaeoindian sites contain much larger numbers of *Bison occidentalis*, presumably more similar in demography and behavior to *Bison bison bison* of the historic Great Plains. Lorrain (1968, p. 114), Wilson (1969, p. 188; 1974, p. 139) and Frison (1978, p. 281) argued that morphological differences, particularly for horn cores, were not sufficiently clear to distinguish between *B. antiquus* and *B. occidentalis*. Frison rightly concludes that « we may be on somewhat dangerous ground in assuming that extinct variants of bison demonstrate identical or similar behavioral patterns to the modern form » (1978, p. 288). We may know even less about differences in behavior between North-American *B. bison* and European *B. priscus*; most of the extant bison in Europe are derived from American populations, who themselves are the descendants of a relatively small number of individuals that survived the slaughter of the late 19<sup>th</sup> century on the Great Plains.

## Seasonality, demography and nutrition

Seasonality has a profound effect on the structure of reindeer availability to hunters and gatherers. As previously mentioned, when populations are low, migratory beha-

viator is minimal; reindeer may be treated as territorial game, hunted on an encounter basis over a dispersed territory throughout the year. When populations of reindeer grow sufficiently to stimulate migration, the availability as a prey resource profoundly changes. There are clear summer and winter territories, today separated by up to 1 000 km. This means that, given the hunter/gatherers' home territory, the prey will be absent or available in clearly marked periods of the year. In both the summer and winter ranges, small bands will be dispersed and relatively unpredictable in location, and are thus still treated as encountered territorial game. Along the migration routes, however, hunters can count on an aggregated resource, predictable in time and, topography permitting, also in space. They can organize a labor force to kill, butcher and prepare large quantities of meat for storage, a suitable resource for over-wintering.

Demographics of the prey population can be seen as a partial function of seasonality. During the summer, bands of bulls and bands of cows or calves are dispersed over the same territory. During the winter, bands of bulls are today reported to venture into areas of deeper snow in the forests, relieving pressure on the sparse lichens and mosses needed by pregnant cows. These bands are also separated to a certain degree in the spring migration, as the cows leave the winter range and head toward the calving grounds a couple of weeks before the bulls quit their winter range. It is only in the fall migration that all age and sex classes are found together, during the rutting season. Seasonal indicators of juvenile dentition and antler growth in the archaeological faunal material can inform us greatly about these aspects of the structure of availability of this food resource for hunters and gatherers.

Seasonality also has a profound effect on the nutritional utility of the prey. Metabolism slows significantly during the winter, and the animals lose weight and fat, even in their marrow. Spring is the nadir for food value for hunters. During the summer, forage is good, everyone puts on weight and adds fat. The end of the summer and beginning of the fall are when the nutritional content of reindeer is at its optimum. Males may be preferable prey because of larger package size. During the rut, male competition and sexual activity result in loss of most of the body fat, and up to 20 % of the meat weight. This is the transition point when females become a superior resource for hunters, a condition that continues through the winter. Pregnant cows may lose weight faster, as they approach parturition, and their utility curve may drop below that of the males for the late winter. Similar nutritional cycles are also known for modern bison. The work of John Speth (1983) on bison hunting documents clear choices of females over males, and of particular body parts that lose their fat content the most slowly through the winter.

## Conclusion

What is clear is that we need to know more about the ecological bases for animal behavior, particularly as it relates to the structure and nature of resource availability

for human hunter/gatherers. We cannot simply apply overly broad behavioral generalizations about bison demography and behavior to the past. It is the same problem archaeologists face with ethnographic analogy. Prehistoric hunter/gatherers were neither Kalahari Bushmen nor Nunamiut Eskimos. We need to develop true ethnoarchaeological research, in order to understand under what conditions similarity and variability in human behavior are appropriate for modeling past behavior. Similarly, it is only in proceeding from an understanding of how bison are and have been adapted that we can understand the problems and opportunities that bison as a prey species presented to prehistoric hunter/gatherers.

I have raised only a few issues relevant to consideration of bison as a target of hunting specialization. First is a theoretical issue, one of human adaptation and evolution. We need a clearer idea of what hunting specialization is, and why it might have been practiced in Prehistory. Second is a methodological issue, that we need to be very careful about the criteria we use to recognize specialization. I insist that dominance of a particular taxon in a site is not sufficient evidence for hunting specialization. Taphonomic analyses are an integral part of our assessments of faunal assemblages. We need to know more about the patterns of exploitation of that species in that site, in order to evaluate if that is consistent with seasonality, age and sex structure, as well as butchering patterns implied by models of specialized hunting. Specialized hunting can only be understood in the context of the overall adaptation, in seeing how a particular resource was used to fulfill the short term and long term needs of its consumers.

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