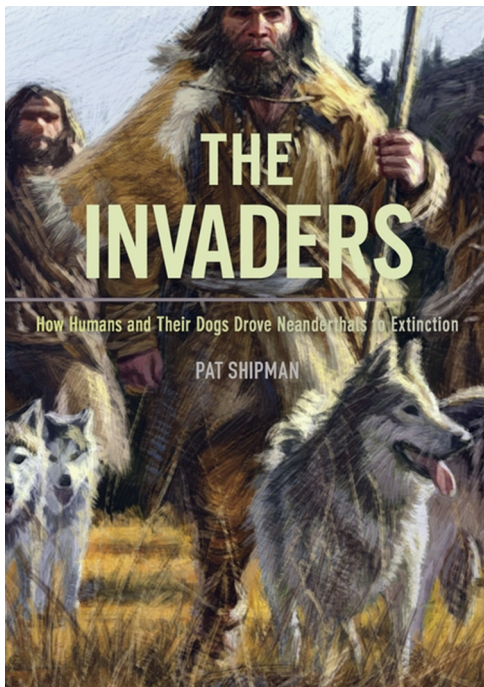


The Invaders. How Humans and Their Dogs Drove Neanderthals to Extinction

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Ecological invasions are not a new phenomenon, the relationship between humans, plants and animals having been a part of our history ever since humans moved out into the savannas. But the question is: can a niche inhabited by a species be invaded by another, and can these two species coexist if they have the same modes of life? Pat Shipman begins her book with the statement that humans, for the past 200,000 years (this date is regarded as a conservative modest estimate of humans' evolutionary beginnings), have constituted the most invasive species in the world. And central to the thinking and reasoning in this book is the concept that our coevolution with wolves (*Canis lupus*) had a great impact on the extinction of Neanderthals.

The Invaders: How Humans and Their Dogs Drove Neanderthals to Extinction, by Pat Shipman, published in 2015, con-

sists of 15 chapters logically arranged so that each succeeding part is the consequence of the previous ones. In the first chapter, the author explains what kinds of skills helped us to adapt ourselves to a very broad range of environments. It is suggested that the domestication of animals and plants had a great impact on human evolution, but that misuse of this process has led to the extinctions of many large mammals, birds, amphibians, and reptiles.

The next part of the book focusses on the definition of an invasive species and on the differences between invasion and geographic expansion. The author refers only to U.S. law, which defines an invasive species as an alien species whose introduction has a negative impact on the environment. Biologists and ecologists, however, use the term 'invasive species' to describe plants or animals which may be either native or non-indigenous, but which cause ecological harm (see the discussion in Colautti and MacIsaac 2004). In my opinion, the author should have presented various points of view and described the commonly-used terminology related to 'invasive species'. This would have improved the study and avoided confusion, especially since the main hypothesis of the book is that humans were invaders who competed for ecological resources with Neanderthals. The next part of the second chapter analyses precisely how many *Homo sapiens* individuals are required to establish a population in a new habitat without restricting genetic diversity.

The third chapter is partially devoted to classifications of stone tools by industry (supported by drawings of archaeological remains) and how this process is useful in assigning a site to either Neanderthals or humans. In order to deter-

mine the degree of overlap in time and space of modern humans and Neanderthals, the author describes sites from the Upper Paleolithic and places them in a chronological framework. The chapter ends with the statement that the end of the Mousterian era is the period during which these two species may have interacted, leading to the Neanderthals' extinction. Later, the author suggests that the ability to hunt and scavenge even large animals (e.g. mammoths) in cooperative fashion may have been crucial for our species, thus making humans successful invaders. This, along with global changes in climate occurring between 130,000 and 40,000 years ago, had a powerful effect on the movements of Neanderthals, as modern humans were better adapted to survive in the resulting harsh conditions.

The next part of the book concerns the suggestion that other factors, such as reproductive and development patterns, diet, or locomotion, might also have worked against Neanderthals. This leads to another conclusion: that food competition is a powerful force in an ecosystem. Since modern humans and Neanderthals had a similar diet and shared the same geographic region at the same time, this suggests strong competition between them, especially given that both species had to compete for large terrestrial prey with other animals such as cave lions (*Panthera spelaeae*), wolves, and hyenas (*Crocuta crocuta*). Thus (according to the author) modern humans had two options: extending their dietary range without giving up protein-rich food and/or improving their hunting strategy.

The seventh chapter presents the consequences of the appearance of a new and effective predator on an entire ecosystem. This part is based on research

showing that, following the introduction of wolves to Yellowstone National Park, populations of large herbivores decreased. Moreover, the pressure placed on the other major predator (the coyote, *Canis latrans*) increased, while scavenging birds and mammals benefitted from the presence of this newcomer. But could similar competition followed by changes in the ecosystem have occurred between Neanderthals and modern humans? The author suggests that the greater numbers of stone tools and of sites occupied by modern humans during the Upper Paleolithic are evidence of the advantage held by *Homo sapiens*.

The next chapter deals with metabolic requirements and hunting strategy. The larger body and greater musculature of Neanderthals influenced their metabolic needs, while lower metabolic requirements and daily energy expenditure rates, along with more efficient shelters, gave modern humans an advantage. The following part describes how other predator species such as the cave bear (*Ursus spelaeus*), cave lion, leopard (*Panthera pardus*), and dhole (*Canis alpinus*) avoided intraguild competition. Next, two chapters focus on the reconstruction of the human diet, based on animal remains at archaeological sites from the Upper Paleolithic. Climate fluctuations brought a new species, the mammoth, into Europe, stimulating the development of more effective hunting methods. This can be confirmed by the large Gravettian sites once occupied by modern humans where numerous bone remains belonging to mammoths were found.

The twelfth chapter contains a description of a new methodology which enables wolves to be distinguished from domestic dogs based on anatomical skull measurements. This finding, along with

the newest research on mtDNA lineages, suggests that between 36,000 and 26,000 years ago humans were able to breed a doglike animal. The chapter also presents a skeptical view of Coppinger's theory of dog domestication, according to which wolves became self-domesticated as dogs by feeding on garbage dumps around villages. The author suggests that this would have led to more aggressive rather than tamer behavior in wolves. In my opinion there is one more point against Coppinger's theory. Bears, having an excellent sense of smell, can be attracted by leftover food or by herbivores which eat garbage (Penteriani et al. 2016). Thus, Paleolithic humans, in order to prevent attacks by these large carnivores, likely avoided scattering their refuse around their households.

The next chapters focus on the benefits of hunting with doglike animals. Wolves are animals with a hierarchical social order and a structure of interspecific interactions similar to those of humans. Moreover, they excel at scenting and tracking prey, which could benefit them through the faster acquisition of meat. But modern humans and the wolf-dog have one more thing in common: white scleras. According to the author, this feature probably appeared in modern humans about 50,000 to 45,000 years ago. Bright eyeballs make an individual highly visible from a distance; therefore they may have helped modern humans to hunt with doglike animals, especially since dogs tend to look at human faces, whereas wolves do not.

The book closes with the statement that cooperation between modern humans and wolf-dogs, along with other factors (global climate change), may have pushed Neanderthals to extinction. Human history shows that interactions

with other species, such as the recognition by early hominins of vultures as beacons signaling meat in the landscape (Morelli et al. 2015), may have occurred and have had an impact on the evolution of our species. Thus (in my opinion), another conclusion of the book is that we are obligated to protect wolves because their loss of habitats will have a negative impact on the ecosystem.

Apart from one minor error (Czechoslovakia, p. 151), the book is an excellent guide to the competition between Neanderthals and newly-arrived humans. The author has assembled well-written chapters into a logical and coherent whole. I warmly recommend this book to those interested in human ecology.

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