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New study reveals: How end of Ice Age led prehistoric humans to settle down

Study of ancient pollen at fishing site in northern Israel suggests that climatic swings combined with technological and social advances drove the Neolithic revolution

Ariel David | Nov. 22, 2021 l 1:22 PM

For hundreds of thousands of years, prehistoric humans were content with hunting and gathering as they roamed the Earth.

Then, in the space of a few millennia, our distant ancestors started to settle down, develop permanent settlements and domesticate plants and animals. Some 12,000 years ago, somewhere in the Near East, the Neolithic revolution was launched, and soon everything else followed: great civilizations, industry, rockets, smartphones and cat memes on your Instagram feed.

But inquisitive minds want to know: why did humans settle down and start farming the land in the first place?

A new contribution to this longstanding scientific debate comes from a new study that reconstructs the climate in what is today Israel from 20,000 to 10,000 years ago, the key period for the development of sedentism and agriculture in the Levant.

The research, published last month in the journal Quaternary Science Reviews, doesn't fully answer the big question, but does reveal the dramatic environmental and climatic changes that formed the background to this fundamental shift in human culture and likely played an important role in it.

At the peak of the Ice Age

Those 10,000 years were marked by intense climatic instability, says the lead researcher on the study, Dr. Dafna Langgut, head of the archaeobotanical lab at Tel Aviv University and the Steinhardt Museum of Natural History.

The last Ice Age peaked around 20,000 years ago. But even as the global climate progressively warmed in the subsequent millennia, there were still long periods in which colder conditions returned.

To understand how these climate swings affected the local Levantine environment and the humans who inhabited it, the researchers turned to the closest thing we have to a weather report from the Paleolithic: pollen.

Langgut and colleagues uncovered a 10,000-year pollen record in the sediments at Jordan River Dureijat, a prehistoric site in northern Israel located along the Jordan river. Dureijat was once on the shores of a large paleo-lake and was used for thousands of years by prehistoric fishermen.

For this study, the researchers looked at the microscopic remains of ancient pollen brought in by the water and wind over millennia and accumulated in layers. A relatively significant amount of organic matter is needed to conduct radiocarbon dating, and microscopic pollen grains just won't cut it; so other materials are used, in this case, charcoal, which is organic.

By identifying the flora that inhabited the region at different times based on their unique pollen grains, and correlating that with knowledge of the ranges of temperature and precipitation that each plant species can tolerate, the team was able to reconstruct the area's climate throughout this crucial 10,000-year period.

"Some 20,000 years ago humans were living as small groups of hunter gatherers. Fast forward to 10,000 years ago and we are in the Neolithic, with people living in large communities and an economy based on agriculture," says Prof. Gonen Sharon, an archaeologist who also took part in the study.

"Archaeologists argue about what is the process that made this happen and many go to climate to explain it, but until now we didn't really have a clear picture of what the conditions were back then," says Sharon, who heads the MA Program in Galilee Studies at Tel-Hai College.

Rise of the Natufians

Things started out pretty frosty in the Epipaleolithic era, when the Last Glacial Maximum hit around 20,000 years ago. While ice sheets did not cover the Levant, temperatures averaged five degrees Celsius colder than today. The region was arid: precipitation was lower, and the area around Dureijat was covered with shrubs and steppe vegetation, the study found.

The climate slowly improved and rains increased, allowing for the appearance of a typical Mediterranean forest, including oak, olive and pistachio trees. This process peaked between 15,000 and 13,000 years ago, when the region experienced a particularly warm and humid period.

These ideal conditions also coincided with the heyday of the so-called Natufian culture, which lived throughout most of the Levant in the Late Epipaleolithic. While still primarily hunter gatherers, these people were the first to build semi-permanent settlement using stone and, crucially, the first clear food storage facilities.

It is possible that the favorable climate supported the Natufians' move toward sedentism, because the period's prosperity would have increased gathering opportunities, Langgut suggests. This meant the locals wouldn't have to forage over wide areas, but could instead stay close to the settlements where they lived and even collect and store surpluses, she says.

Then, around 13,000 years ago, the world entered the Younger Dryas period, a millennium-long cold snap that temporarily reversed the warming process experienced since the Last Glacial Maximum. Temperatures and precipitation in Europe plummeted, but the study by Langgut and colleagues reveals for the first time that this effect was less pronounced in the Near East. The main consequence was a diminishment of precipitation seasonality: rains fell throughout the year, winter and summer. This favored the growth of open-field vegetation, especially annuals – plants that live their entire life cycle in a single year, then die.

Incidentally (or not), the crops that early farmers would soon start domesticating in the Near East are all annuals: wheat, barley and so on.

"Domestication requires familiarization with plants, and the Younger Dryas increased the familiarity with annuals, giving people more opportunities to select the most suitable candidates for domestication," Langgut surmises.

The right stuff

Around 12,000 years ago the Younger Dryas ended and the Holocene, the current geological era, began. For the Near East this meant that the climate stabilized into a pattern that still holds today: relatively heavy precipitation in winter and a long, hot, dry summer. For the Natufians, this would necessitate change.

"During the dry season there are no gathering opportunities, so if you want to survive you need to store food during the winter and spring," Langgut says.

The pressures of the new environmental conditions may have therefore pushed the people of the Near East into greater efforts to domesticate, farm and store those same crops they could previously forage in the wild all year along, she says. And so the stage was set for the Neolithic revolution.

It is not that we should draw a direct causal link between climate change and the rise of agriculture, the researchers caution. After all, very similar climate shifts had occurred in previous eras without leading to such a major transformation, Langgut notes.

But 12,000 years ago those climatic changes uniquely combined with social and technological innovations that led humanity a new path.

“The right people found themselves in the right place, at the right time, with the right climate conditions and the right technologies,” she says.

One has to remember that humans developed agriculture independently at different times in different places and using different crops. In China rice and millet domestication may have started already 10,000 years ago; the cultivation of yams and bananas began in Papua New Guinea 7,000 years ago; maize cultivation started in the Americas as far back as 9,000 years ago and sorghum was tamed in Africa 4,000 years before present.

Following the research in Israel of the conditions that led to the revolution, it bears studying, Langgut says, whether these other hubs of domestication also experienced similar combinations of events: climate shifts, early sedentism, and relevant technological developments – that may have acted as precursors for the development of agriculture.

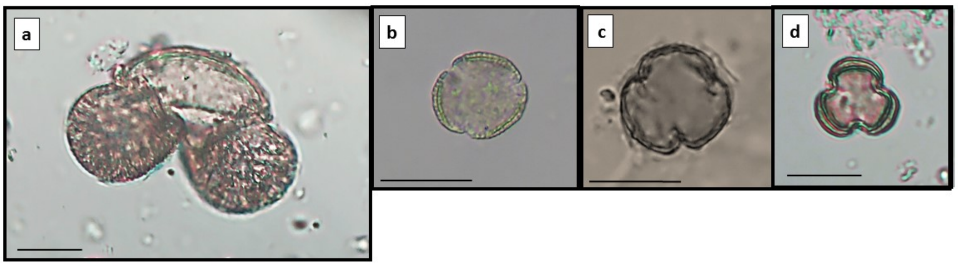

Chart of fossil pollen grains. **a**) *Pinus* (pine). **b**) *Olea europaea* (olive). **c**). *Quercus calliprinos* (evergreen oak). **d**). *Artemisia* (sagebrush). The bar represents 20µm.