

No teddy bears' picnic

When Earth got chilly, cave bears lacked what it took to survive. Chris Baraniuk investigates



IF YOU go down underground today, look out for a big surprise. If you go into a cave, anyway, be sure to adjust your eyes. For many caves, in Europe at least, contain the remains of a curious beast. It's not an olm or a bat that's deceased – it's a cave bear.

Cave bears died out at least 24,000 years ago, but they were once very common. In fact, they left so many bones that during the first world war, they were used to provide phosphates for fertilisers and bombs. Plenty of skulls and skeletons still remain in caves across a swathe of Eurasia, from Spain to south-central Russia, and this treasure trove has allowed palaeontologists to piece together the bear's story. We know, for example, that males could reach a whopping

1000 kilograms – up to four times the weight of females. Footprints, claw marks and fur imprints reveal that, in winter, some settled on terraces and entered a deep sleep known as torpor, waking periodically to drink from water sources inside their caves before returning to their resting places. We even know that Neanderthals hunted cave bears, ambushing them as they awoke in the spring. But one mystery remains. Why did they go extinct?

Cave bears evolved around 1.5 million years ago from a common ancestor with brown bears and polar bears – in fact, their DNA lives on in modern brown bears, revealing that the two species must have interbred. They lived during the Pleistocene, a time when Earth's climate endured a series of

fluctuations, including relatively rapid changes – within 1000 years – from hot and dry to cold and wet. One such ice age occurred around the time cave bears died out. Could this have played a role in their demise? Danielle Schreve at Royal Holloway, University of London, notes that it would have put significant ecological stress on large animals. Nevertheless, some of the bear's competitors – including brown bears, wolves and lions – managed to survive, hinting that they possessed something cave bears lacked.

“Instead of getting smarter, cave bears got fat to doze through the harsh winters”

Suspicion has fallen on the cave bear's diet. “There are some big, more flexible predators around that are doing very well,” says Schreve. Wolves and lions are both unfussy carnivores. Brown bears are omnivorous. But cave bears seem to have been herbivores. They have powerful jaws and their teeth are broader than those of brown bears, making them well adapted for grinding up plant-based foods, explains Hervé Bocherens at the University of Tübingen in Germany. He notes that, as the climate became colder and plant life dwindled, this constrained diet might have made it difficult for them to build up enough fat to survive the long winter months in their caves.

“Their diet is so interlinked with ▶





plant availability – that seems to have been one of the things that really knocks them on the head,” says Schreve. She thinks that in the UK, where cave bears died out far earlier – around 350,000 years ago – the impact of climatic changes may have been greater. In these conditions, where the weather was unforgiving and food resources favoured more mobile species, perhaps brown bears had the upper hand, she says.

It makes sense. But there’s a twist: cave bears may in fact have been secret omnivores.

Marius Robu at the Emil Racovita Institute of Speleology in Romania and his colleagues examined remains recovered from Peștera Urșilor, a famous cave bear site in the country. They were looking for an isotope, nitrogen-15, which is generally more abundant in the bones and fur of omnivores than herbivores. Their analysis of cave bear bone collagen revealed plenty. In fact, they found that the levels were the same as in fur from omnivorous grizzly bears collected between 1989 and 2009 in Yellowstone National Park in the US. Robu suspects that the cave bears were sometimes herbivorous but, depending on their circumstances, they occasionally ate meat. He and his colleagues now have data from four other sites in Romania all showing similar nitrogen-15 levels.

Bear diets are often adjustable. Even pandas, with their overriding penchant for bamboo, occasionally eat meat. Nevertheless, not everyone is convinced that the elevated nitrogen-15 levels mean that cave bears were omnivorous. “Mammoths are herbivores for sure and they have the same values as these bears,” says Bocherens. In research published earlier this year, he argues that cave bears could have absorbed the isotope from herbaceous, grass-like plants called graminoids, or from fungi.

But there may have been another nail in the cave bear coffin. A study

Although long extinct, cave bears (above) live on in the DNA of brown bears (below), with which they once interbred



comparing the skulls of 10 living and extinct species of bears has revealed that cave bear brains were remarkably small. Calculating “encephalisation quotient” – brain size as a proportion of body size – Kristof Veitschegger at the University of Zurich, Switzerland, found the Malayan sun bear to be the genius of the group with an EQ of 1.31. For brown bears, the figure is 0.83, and cave bears came bottom of the class with an EQ of just 0.60. (In humans, by comparison, it is 6.56.)

A bear of very little brain

Veitschegger’s analysis indicates that although the cave bear got bigger over time, its brain did not grow. Two factors conspired to make this happen: diet and dormancy. Mammals living in a highly seasonal environment usually evolve to eat a flexible diet, but dormancy during winter makes this unnecessary – they can rely on body fat stores instead. However, the energy that goes into fat storage isn’t available to grow a big brain. And because brain tissue is expensive to produce and maintain, the cave bear’s low-calorie, plant-based diet would have imposed further constraints. Veitschegger thinks that cave bears made a trade-off: instead of getting smarter, they got fat to doze through the harsh winters. But it turned out that the ice age wasn’t something they could sleep off.

The brain-size question is interesting because it’s not something that has been explored previously, says Schreve. “It fits quite well with the other evidence, but I think it’s only a part of the story.” She points to several studies showing that cave bears were becoming less genetically diverse as time went on – a tell-tale sign that they were struggling to adapt in general.

Although debate remains, it seems clear that cave bears were victims of their inability to adapt. They got stuck in their ways, leaving them unable to keep up with a drastically changing climate. As a result, this once-dominant beast went the way of the dodo. There may be a lesson in there somewhere. ■

Chris Baraniuk is bearing up well, all things considered