The fossils being formed today will show how humankind disrupted life on Earth

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When we think of fossils it is usually of dinosaurs, or perhaps the beautiful spiral shape of an ammonite picked up on a beach during a summer holiday. We see fossils as ancient relics of the deep past that allow us to marvel at the history of life on Earth, of animals that walked or swam many millions of years ago, of the giant trees that became buried and crushed to form coal.

Fossils are an essential record of life on Earth that demonstrate long periods of stability, punctuated by episodes of rapid or even catastrophic change. Their value is both abstract, as a window into the past, and societal, enabling us to think about what might happen to life in the future.

Many textbooks describe how fossils form, but few refer to the fossils that are accumulating now, in sediments at the bottom of a local lake or river, in a peat bog, or along a beach. The remains of animals, plants and other life forms that are beginning the road to petrifaction in such places are sometimes referred to as "sub-fossils," as though they are halfway to becoming part of the geological record. However we classify them, they record profound changes already happening to all life on Earth—the biosphere.

Along many riverbanks in Europe, Himalayan balsam and American ragweed grows, and in the river itself there are Asian clams and zebra mussels. You may encounter giant African land snails in the Hawaiian Islands, Amur River clams in San Francisco Bay, and Mediterranean mussels along the Atlantic coast of South Africa—and even hippos in

Colombia.

Displaced by human actions

All these species, and thousands more, have been displaced by human actions—sometimes deliberately, as with the hippos, but often unintentionally, as with the clams. Species have been interchanged like this across our planet for thousands of years.

But the pattern became more clearly visible from the 16th century onwards, with the exchange of plants and animals between the Americas and Eurasia and Africa. A cornfield in England expresses this, as do cows in the Americas.

While some of these patterns of change on land and at sea are now obvious, even at a casual glance, the fossil patterns that reveal the full scale of these changes requires painstaking analysis of recent sedimentary layers. Some organisms, a soft-bodied worm for example, leave no physical fossil trace, though their presence may still be inferred from preserved DNA molecules. Other organisms, such as a marine mollusk—or a hippo—have a real chance of being fossilized because they have hard skeletons, and they associate with water bodies where sediment layers accumulate.

A distinct step change in Earth's history

Many patterns of recent ecological change can be documented in the modern fossil record. For example, in the Hawaiian Islands, sediment layers entomb native snail shells—and then the layers above show these snails being replaced by non-natives, including the giant African snails. The pattern is distinctive, because it records the beginnings of a global homogenization of fauna and flora that is often associated with striking

changes in the abundance of indigenous organisms.

San Francisco Bay is just one example. There, more than 200 non-native species have arrived since the American gold rush. They include the Amur River clams from East Asia and the tiny Trochammina hadai—a single-celled amoeba-like organism with a shell—brought in from the seas around Japan. T. hadai and the clams, and many others, arrived in the boom in cross-Pacific trade that followed the end of the second world war.

On land, bones of chickens, domestic cattle, sheep and pigs far outnumber those of wild animals in nascent geological deposits, marking a huge change in the vertebrate fossil record that has been accumulating. Such examples are part of a pattern that is playing out across the world.

To a paleontologist studying the fossil record that is forming today, these patterns identify a distinct step change in Earth's history, driven by us in our ever-more interconnected and homogenized world.

The new paleontology of the 20th and 21st centuries reveals that our actions are significantly disrupting the biosphere, just as massive volcanic eruptions and huge meteorite strikes did in the geological past. It's an ignominious group to join—and only humans have done this with full awareness of their actions.

How our impact on the biosphere plays out in the coming decades will be reflected by this new fossil record, one that increasingly begins to resemble those ancient, planet-changing perturbations.

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