The animals that detect disasters

For millennia, people across the globe have reported alarmed animal behaviour in the run-up to natural disasters. Could these signals be used to warn us of impending catastrophes?

Run-up /ˈrʌnʌp/ noun: the period preceding a notable event.

"a programme aimed at lowering unemployment in the run-up to the next election"

Impending /ɪmˈpɛndɪŋ/adjective: (of an event regarded as threatening or significant) about to happen; forthcoming.

"the author had returned to his country ahead of the impending war"

In 2004, a tsunami triggered by a 9.1 magnitude undersea quake off Indonesia decimated coastal communities around the Indian Ocean, killing at least 225,000 people across a dozen countries. The huge death toll was in part caused by the fact that many communities received no warning.

Triggered /ˈtrɪgəd/: adjective (of a mechanism) activated by a trigger.

"a triggered alarm"

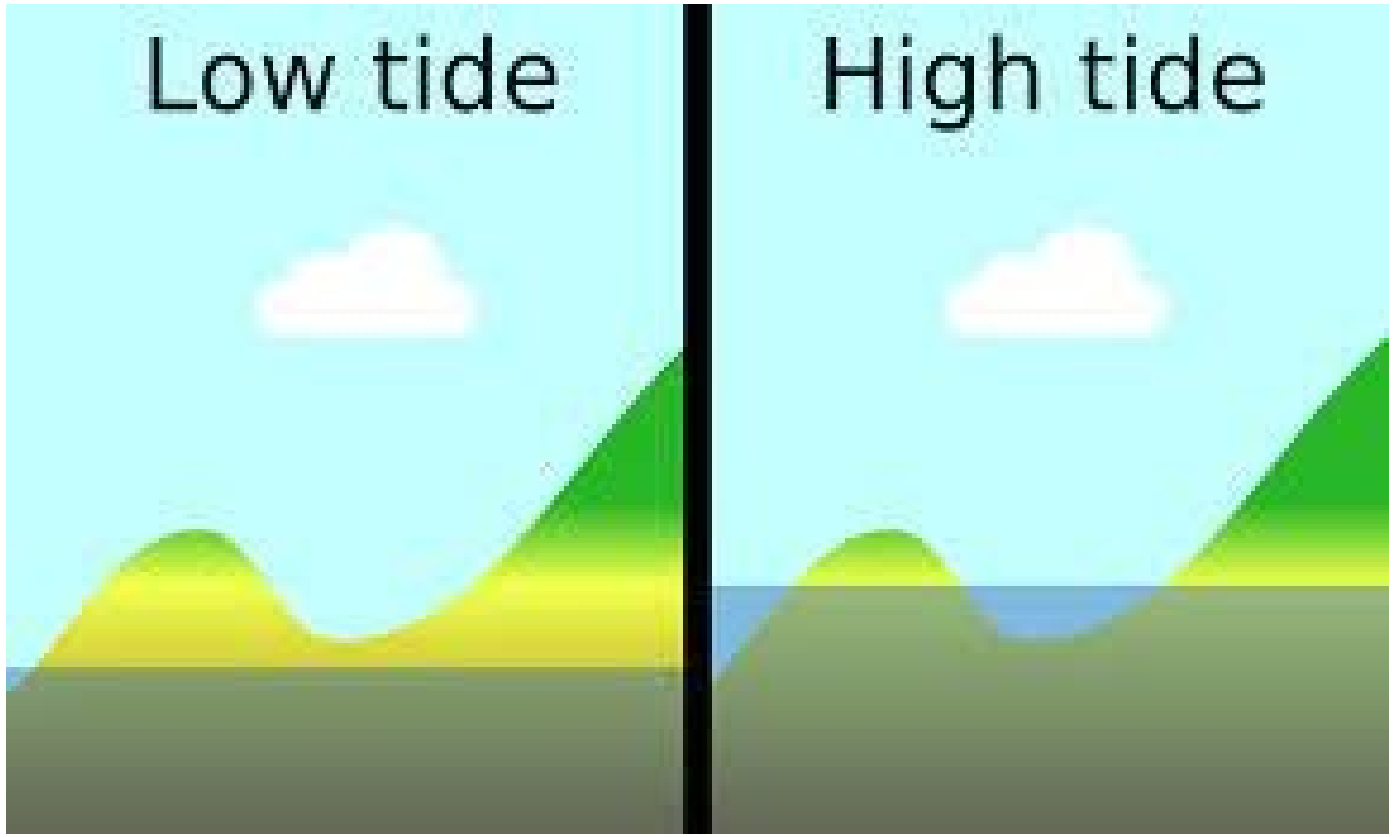
Decimate /ˈdɛsɪmeɪt/ verb: kill, destroy, or remove a large proportion of.

"the inhabitants of the country had been decimated"

Local manmade early warning systems, such as tidal and earthquake sensors, failed to raise any clear alert. Many sensors were out of action due to maintenance issues, while many coastal areas lacked any tsunami siren warning systems.

Siren /ˈsʌɪr(ə)n/ noun: a device that makes a loud prolonged signal or warning sound.

"ambulance sirens"



Haphazard communication also failed to provide warnings, with many text messages failing to reach mobiles in threatened areas or going unread. Yet in the minutes and hours before surging walls of water up to 9m (30ft) high smashed through coastlines, some animals seemed to sense impending peril and make efforts to flee.

Haphazard /hapˈhazəd/ adjective: lacking any obvious principle of organization.

"the music business works in a haphazard fashion"

Peril /ˈpɛrɪl,ˈpɛr(ə)l/ noun: serious and immediate danger.

"you could well place us both in peril"

Flee /fliː/ verb: run away from a place or situation of danger.

"to escape the fighting, his family fled from their village"

According to eyewitness accounts, elephants ran for higher ground, flamingos abandoned low-lying nesting areas, and dogs refused to go outdoors. In the coastal village of Bang Koey in Thailand, locals reported a herd of buffalo by the beach suddenly pricking their ears, gazing out to sea, then stampeding to the top of a nearby hill a few minutes before the tsunami struck.

Herd: /həːd/ noun: a large group of animals that live together
"a herd of elephants"
Similar: flock

Prick /prɪk/ verb: (especially of a horse or dog) make (the ears) stand erect when on the alert.
"the dog's ears were pricked"

Stampede /stamˈpiːd/ verb:(of horses, cattle, or other animals) rush wildly in a sudden mass panic.
"the nearby sheep stampeded as if they sensed impending danger"

"Survivors also reported seeing animals, such as cows, goats, cats and birds, deliberately moving inland shortly after the earthquake and before the tsunami came," says Irina Rafliana, previously part of an advisory group for the United Nations International Strategy for Disaster Risk (UNISDR) and now a researcher at the German Development Institute in Bonn. "Many of those who survived ran along with these animals or immediately after."

Inland /ˈɪnlənd,ˈɪnland/noun: the parts of a country remote from the sea or frontiers; the interior.

Rafliana recounts similar stories tied to her field work around other disasters, such as the 2010 tsunami generated by a subsea quake near Sumatra, which killed nearly 500 people on the Mentawai Islands. Here too, however, some animals, such as elephants, were reported to have responded as if possessing some kind of early knowledge of the event. Just days ago, a newly re-released turtle made a sudden U-turn two days before January's volcanic eruption in Tonga.

Early warning systems do not exist in many areas struck regularly by natural disasters. In 2017, the World Meterological Organisation found that the governments of around 100 countries still lack early warning systems for natural disasters to which they were prone.

Prone/prəʊn/adjective: at risk of

But these accounts about animal behaviour before disasters have prompted some researchers to devote serious scientific attention to the theory that animals may have inbuilt systems which alert them to impending natural disasters. It raises an intriguing question – could animals provide natural early warning systems for humans?

Intriguing /ɪnˈtriːgɪŋ/ adjective: arousing one's curiosity or interest; fascinating.
"an intriguing story"

The earliest recorded reference to unusual animal behaviour prior to a natural disaster dates back to 373 BC, when the Greek historian Thucydides reported rats, dogs, snakes and weasels deserting the city of Helice in the days before a catastrophic earthquake. Other reports dot history. Minutes before the Naples quake of 1805, oxen, sheep, dogs and geese supposedly started making alarm calls in unison, while horses were said to have run off in panic just prior to the San Francisco earthquake of 1906.

Weasel /ˈwiːz(ə)l/

Unison /ˈjuːnɪs(ə)n/ noun: (all) at once

Even with advanced technology it can be difficult to detect many kinds of impending natural disasters. In the case of earthquakes, for example, seismic sensors lurch into jolted squiggles only as the earth-juddering shocks are actually happening.

Lurch /ləːtʃ/ verb: make an uncontrolled movement or series of movements; stagger.

"the car lurched forward"

Jolt /dʒəʊlt,dʒɒlt/ verb: push or shake (someone or something) abruptly and roughly.

"a surge in the crowd behind him jolted him forwards"

Squiggle /ˈskwɪg(ə)l/ noun: a short line that curls and loops in an irregular way.
"some prescriptions are a series of meaningless squiggles"

Judder /ˈdʒʌdə/ verb: (especially of something mechanical) shake and vibrate rapidly and with force.
"the steering wheel juddered in his hand"

Making reliable predictions requires precursor signals – and, as yet, scientists haven't found any signals that seem to occur consistently before big quakes. Hence the growing willingness of some scientists to consider more unorthodox warning signals – such as animal behaviour.

Precursor /prɪˈkəːsə/ noun: forerunner, predecessor

Unorthodox /ʌnˈɔːθədɒks/ adjective: contrary to what is usual, traditional, or accepted; not orthodox.
"he frequently upset other scholars with his unorthodox views"
Similar: unusual, uncommon

"Even with all the technology available today, we are not able to properly predict earthquakes or most natural catastrophes," says Charlotte Francesiaz, leader of an ornithological team at the French Biodiversity Office (OFB), and part of the Kivi Kuaka project, which is examining how migratory birds crossing the Pacific seem able to dodge storms and other hazards.

Dodge /dɒdʒ/ verb: avoid (someone or something) by a sudden quick movement.

One of the most important investigations into how animals could predict disasters was carried out five years ago by a team led by Martin Wikelski from the Max Planck Institute of Animal Behavior in Germany.

The study involved recording the movement patterns of different animals (cows, sheep and dogs) – a process known as biologging – on a farm in the earthquake-prone region of the Marches in central Italy. Collars with chips were attached to each animal, which sent movement data to a central computer every few minutes between October 2016 and April 2017.

During this period, official statistics recorded over 18,000 quakes in the region, from tiny tremors measuring just 0.4 magnitude up to a dozen quakes notching 4 or above – including the devastating magnitude 6.6 magnitude Norcia earthquake.

The researchers found evidence that the farm animals began to change their behaviour up to 20 hours before an earthquake. Whenever the monitored farm animals were collectively 50% more active for more than 45 minutes at a stretch, the researchers predicted an earthquake with a magnitude above 4.0. Seven out of eight strong earthquakes were correctly predicted in this way.

"The closer the animals were to the epicentre of the impending shock, the earlier they changed their behaviour," Wikelski said in 2020 when the study was released. "This is exactly what you would expect when physical changes occur more frequently at the epicentre of the impending earthquake and become weaker with increasing distance."

Epicentre /ˈɛpɪsɛntə/ noun: the point on the earth's surface vertically above the focus of an earthquake.

Another study carried out by Wikelski monitoring the movements of tagged goats on the volcanic slopes of Mount Etna in Sicily also found the animals seemed to have an advance sense of when Etna was going to burst into life.

Over in South America, behavioural ecologist Rachel Grant – now at London South Bank University – has found similar results. She carried out biologging of animal movement patterns using motion-triggered cameras inside Yanachaga National Park in the Peruvian Andes over a period which included the magnitude 7.0 Contamana earthquake in 2011.

"The number of animals recorded on the camera traps started to decrease about 23 days before the earthquake – with the decrease accelerating eight days prior to the earthquake," Grant said in her 2015 paper on the research. "On days 10, six, five, three and two prior to the earthquake – and on the day of the earthquake – no animal movements were recorded, which is highly unusual."