

Animals, Earthquakes, and Eruptions

Caroline J. Anderson

The dogs of the Nanawale Ranch on the Island of Hawaii were acting strangely on February 26, 1955. They ran around excitedly, dug holes in the ground and sniffed in the holes as though in pursuit of some burrowing animal. Dr. Gordon A. MacDonald, then director of the Hawaii Volcano Observatory, was called. For months he and his colleagues had suspected that a volcanic eruption might be immanent, although they couldn't predict exactly when it would occur. Each day there were increasing numbers of earth tremors at the Nanawale Ranch, and now this unusual behavior of the dogs. The scientists spent most of the day February 27th investigating the area. No cracks could be found. No odor of volcanic gases could be detected even when they sniffed in the holes made by the dogs. Yet the following morning the eruption began just a quarter-mile from where the dogs had been digging.

This puzzling story of animal behavior is not surprising to geologists, for they are well aware of the very persistent folklore which says that animals can predict earthquakes and volcanic eruptions. This folklore often appears in popular accounts and even in textbooks, but the discussion is usually limited to an anecdote or two. I began to wonder just how many such anecdotes there are and whether

anyone had ever taken them seriously enough to investigate.

Certainly there is evidence that for generations men around the world have been interested in the behavior of animals prior to earthquakes and eruptions. Deodatus De Dolomieu, for example, wrote of this interest in 1784 when he visited the Calabria Ultra district of Italy in the year following a destructive earthquake. He commented that animals seem to have some warning of such geologic disasters, although people do not:

The prescience of animals of the approach of earthquakes is a singular phenomenon, and is more surprising to us from our ignorance by what sense they receive the intimation. It is common to all species, particularly dogs, geese, and domestic fowls. The howlings of the dogs in the streets of Messina were so violent, they were ordered to be killed.

About fifty years later, in quite a different part of the world, another story of unusual behavior preceding an earthquake was documented by Robert Fitzroy, captain of the *Beagle*, during Charles Darwin's famous voyage. The ship was in the vicinity of Concepcion, Chile at the time of the 1835 earthquake, and Fitzroy hurriedly returned to that port to survey the damage. He recorded in his diary this account of an observation told to him:

At ten in the morning of the 20th of February, very large flights of sea-fowl were noticed, passing over the city of Concepcion, from the seacoast, towards the interior; and in the minds of old inhabitants, well acquainted with the climate of Concepcion, some surprise was

excited by so unusual and simultaneous a change in the habits of those birds . . . At forty minutes after eleven, a shock of an earthquake was felt . . .

Fitzroy's diary also recorded that dogs fled from the city of Talchuano prior to the destruction of that city in the same earthquake.

There are several other animal-earthquake stories from the nineteenth century. Many are summarized in a review entitled "Can Animals Predict Earthquakes?" published in a 1909 issue of the *Scientific American Supplement*. Included among those incidents are the following: roosters crowed before the Java earthquake of 1867; the earthquake in Iquique in 1868 was announced several hours earlier by screaming gulls and other sea birds that flew inland; and in 1887 the horses of the Riviera appeared very anxious prior to an earthquake in that area.

Probably the best known of all animal-earthquake stories dates from the beginning of the twentieth century. The dogs of San Francisco were reported to have barked the night before the great earthquake that struck that city in the early morning of April 18, 1906. This observation was recorded in the official *Report of the State Earthquake Investigation Commission* and is derived from an informal survey made by Finette Locke. She also noted several cases in which horses and cows snorted or stampeded a few seconds before observers knew there was anything wrong. And cats were reported to perceive the aftershocks before people did.

Cattle were reported to have left their grazing grounds on Mt. Arenal in Costa Rica just before its disastrous surprise eruption in 1968—but many were still scarred by it. Photo courtesy of Center for Short-Lived Phenomena.



Geologists in Iceland uncovered another anecdote when they set out to piece together the antecedents of the surprise 1947 eruption of Mt. Hekla. The scientists were told by a man and his wife that they were awakened between two and three o'clock one morning and the wife went into the kitchen. "When she turned on the light she found their old dog, which used to sleep out by the kitchen door, standing in the middle of the floor, apparently greatly frightened by something . . ." The eruption occurred at 6:40 that morning.

Eloise Engel's book *Earthquake! The Story of Alaska's Good Friday Disaster* contains more such animal stories. Rancher Louis Beatty, for example, had gone up to the hills at three in the afternoon when his cattle unexpectedly

left their low-lying grazing grounds hours before their usual time. Late that afternoon there was an earthquake, and a great sea wave (tsunami) covered the low-lying area.

Author Engle also tells of animals being uneasy before the 1965 volcanic eruption of Taal in the Philippines. She wrote that the residents of Taal were awakened at 2:30 in the morning by the noise of frightened dogs, cats, and cattle. Some of the people heeded the animals' warning and fled. The volcano erupted, spewing lava, ash, and mud over their homeland.

Tom Simkin, a geologist investigating the 1968 Mt. Arenal eruption in Costa Rica, reported hearing that cattle moved down off that volcano just before it erupted. This surprise

eruption was the first for Arenal in about four hundred years.

Finally, there's an interesting animal-earthquake report from the People's Republic of China. Robert S. Coe, an earth sciences professor from the United States, visited that country recently and wrote of their new earthquake prediction program initiated following a large earthquake in 1966. Along with modern physical devices, peasant volunteers have been recruited to observe anomalies in animal behavior. According to Coe: "Before the 1966 earthquake and its largest aftershocks there were reports of strange behavior, especially of rats. No anomalous behavior has been observed before the smaller earthquakes that have been characteristic of the period since then."

All of these anecdotes are references to specific earthquakes or eruptions. In addition, several of the geologically active countries are said to have generalized beliefs about animals. Vitus B. Droscher, in his book *The Magic of the Senses*, gives this example: "In the villages on the slopes of Mount Etna the peasants keep cats because they believe these animals can anticipate volcanic eruptions: when all the cats leave the houses at once, men will rush out after them." John Milne and A. W. Lee, in their book about earthquakes, give a similar example from another part of the world: "It used to be said that several of the natives of Caracas possessed oracular quadrupeds, such as dogs, cats, and jerboas, which anticipated coming dangers by their restlessness." Those authors also mention the Japanese belief that pheasants crow before earthquakes.

It was this last legend that prompted one of the few systematic attacks on the question of whether animals could in fact anticipate earthquakes or volcanic eruptions. This work was done by a famous Japanese scientist, F. Omori. In the period 1913 to 1916 he worked in the evening in a quiet house where he could hear pheasants crowing in a neighboring garden. He took upon himself the task of noting the time of every perceptible earthquake and comparing it with the crowing of the pheasants and also later checking the tromometer, an instrument for recording minute earth tremors. In eleven out of the twenty-three cases recorded, the pheasants were actually better than Omori. That is, in those cases the pheasants either crowed before the scientist felt the quake or crowed when he felt no quake but found that one had been registered by the instruments. Passing vehicles which shook the ground did not cause the pheasants to crow.

A more extensive attempt to explore the ability of animals to predict earthquakes was a study published in

1964 in German by Ernst Kilian. His work followed the large 1960 earthquake in southern Chile. The report involved mostly anecdotes which he solicited by advertisements in the local papers. But he also made direct observations of the behavior of animals associated with aftershocks in the days and months following the major quake. He found that the horses at the university experimental farm always reacted by neighing and trembling five seconds before a quake was felt by people. This agrees well with the stories which came out of the San Francisco earthquake of 1906.

Kilian also reported that pheasants crowed ten seconds before shocks were felt by people. There was one anecdotal account of a dog which became quite upset by the rumbling sounds which preceded the major quake, but otherwise no reports of either dogs or cats behaving strangely until the quake occurred. Kilian summarized his paper by pointing out that the number of observations was small and often laden with the emotionality of the observer. He had not found definite proof that animals could predict earthquakes.

There are apparently no other major scientific studies of animal behavior prior to earthquakes or eruptions, but there are undoubtedly many other anecdotes. It is evident that it is these occasional, intriguing incidents, not proven performance, which have given animals their reputation as predictors.

While horses, dogs, pheasants, and sea birds seem to be implicated most often, there are of course countless earthquakes and eruptions where no anomalous behavior of animals was noted. And, as Kilian suggested, the human element cannot be dismissed. From the reports of people who have lived through major quakes, it is apparent that few experiences are more unnerving. It would not be surprising if the observations of such people are inaccurate or incomplete.

Still, one is left wondering about the many isolated stories of animals seeming uneasy preceding an earthquake or volcanic eruption. Since both earthquakes and eruptions originate within the earth and both involve earth tremors, it would seem natural to assume that the earth movement in some way stimulates the animals' unrest. Many experts would agree. For example, it is the judgment of renowned seismologist Charles Richter that if anything other than coincidence is involved, it is likely that the animals notice small foreshocks to which people are insensitive. Sigurdur Thorarinsson, a famous Icelandic geologist, has a similar opinion. He has said that, while studying the aftershocks of an earthquake, "I had several opportunities to ascertain that domestic animals, and especially cats and dogs, felt tremors that were imperceptible to me and other people." Several changes in addition to earth movement which might possibly cause anomalous animal behavior have been discussed by Kilian. Such stimuli include increased air pressure and changes in the electric or magnetic field. Still another theory, explored by Baxter Armstrong in 1969, is that in some cases the high frequency sounds of preliminary fracturing may disturb animals.

There are no definitive answers yet. A greater understanding of both geologic events and animal sensory systems may solve the mystery. Until then we're left to puzzle over the fascinating folklore which says that animals can predict earthquakes and volcanic eruptions.

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A copy of the bibliographic citations for the several published accounts referred to in this article is available on request. Please address such request to the Bulletin.—Ed.



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