A Clue Is Found to Mysterious Mass Deaths of Lemmings

By WALTER SULLIVAN

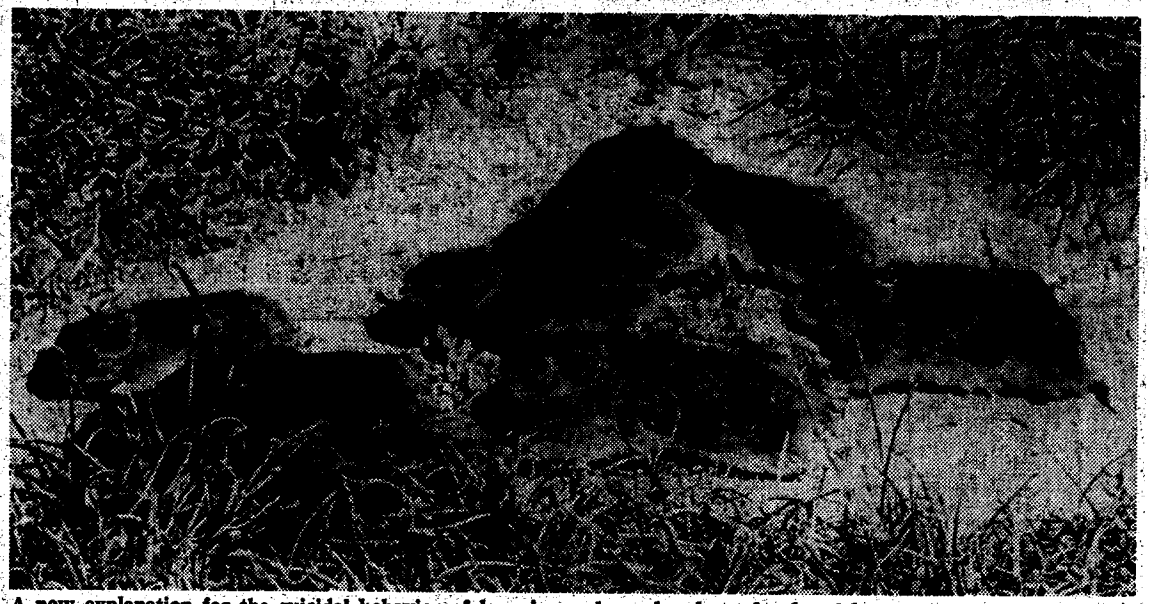
After years of frustrating effort by scientists to discover why lemming populations multiply at a frantic pace and then collapse in a mass die-out, the answer seems to be within reach.

Furthermore, the explanation may show why, at the time of their population "crash," these small mammals seem to go mad, in some cases allegedly diving en masse into the sea.

Recent research near Point Barrow, at the northernmost top of Alaska, has eliminated the classic theories of lemming cycles.

One of these holds that the lemmings multiply until they exhaust their food supply, then die out until the tundra vegetation can recover.

Another theory, based on studies of temperate zone animals, attributes the sudden population decline to a halt in reproduction. According to this concept, crowding induces hormone changes that act as a form of birth control.



A new explanation for the suicidal behavior of lemmings, above, has been developed by two California researchers

Changes in Bloodstream

The answer that is now emerging involves changes in the animals' bloodstreams. Two California researchers, working independently, have identified a substance in the lemming blood that serves two purposes.

It acts as an "antifreeze," enabling the lemmings to remain active throughout the winter in a climate that no other small mammal can tolerate without hibernating.

Yet is also acts as a population control, for it reportedly attacks the central nervous system, killing almost all members of a lemming population a certain time after a spell of warm weather. In that way the tundra is saved from total devastation and recovers to feed future generations of lemmings.

The two researchers, Dr. David A. Mullen of the university of San Francisco and Dr. William B. Quay of the University of California at Berkeley, hope soon to announce the nature of this substance. They have reportedly found it in other arctic mammals.

Application to Man

If, in fact, the substance does serve as an "antifreeze" —for example, by increasing blood flow to the skin and extremities—it might be applicable to man. Thus soldiers or plane crash survivors could function at temperature that otherwise would be fatal.

Some of those who have been studying lemming cycles are not yet convinced that warm weather is the stimulus that causes the "antifreeze" to clot and kill.

It has been found, for example, that lemming blood is flooded with steroid hormones at the population peak. This has led to the suggestion that crowding releases the hormones, which, in turn, set in motion the fatal transformation of the "antifreeze."

When the lemmings at

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Point Barrow reach their peak, they number as many as 200 per acre. A visit there last month revealed that great numbers of them were already poking out of their breathing holes in the snow.

Dr. Frank A. Pitelka, head of the zoology department in Berkeley, who has been following the lemming cycles at Point Barrow for two decades, said the animals seemed already to be looking for new living space. He predicted that this would be a peak year. Previous peaks occurred in 1960, 1963 and 1965.

If this is, in fact, such a year, it may be possible to pin down the precise sequence of events that leads to a population "crash."

In a recent telephone interview, Dr. Mullen said that in the summer of 1960 about 4,000 lemmings were trapped near Barrow. The next summer, despite a 25 per cent increase in the trapping schedule, only 20 were caught.

To survive the arctic rigors, lemmings must be able to multiply with extraordinary rapidity during favorable periods. They are ready to breed three weeks after birth, they gestate in 20 days and there may be as many as 13 in a litter.

Lemmings Fat at Death

His research and that of others has shown that the animals do not die hungry. They tend to be particularly fat at the time of their population crash. Nor is there a drop in fecundity, such as has been reported in temperate zone mammals.

Mass plunges into the sea have rarely, if ever, been reported from Alaska. Dr. Mullen suggested that they might occur in Norway because the fiord terrain funnels the animals towards ocean cliffs when they seemingly run berserk in their final death throes.

He suspects that this behavior is caused when the "antifreeze" invades and disrupts the nervous system.

Evidence for such an invasion of nervous tissue was first observed by Dr. Quay a decade ago, although the nature of the material and its properties were not discovered until later.

Dr. Mullen believes that a warm spell on the tundra sets in motion a sequence of events that simultaneously kills off lemmings throughout a large region. The effect, however, is sufficiently delayed so that the die-out may occur after the first autumn snow.

In that case, when spring comes, the animals are gone. Normally the lemmings survive the winter by browsing on dead grasses, burrowing through the matted tundra under the snow.

Experiment Described

Zoologists have long wondered what happens when lemmings are plentiful in the fall and nowhere to be seen in the spring. Dr. Mullen told of his efforts to explain this disappearance.

He went out under cover of a series of blinding blizzards with 600 dead lemmings, which he placed under the snow by poking them down with a 10-foot stick. He was careful to offer predators no clue—such as a glimpse of himself or the scent of his track—to the locations of the buried animals. With extraordinary thoroughness, Arctic foxes found every lemming despite a two-foot cover of snow. Apparently the cold does not dull their olfactory powers.

Others who have been studying lemming cycles at Barrow and elsewhere agree that the substance identified by Dr. Mullen and Dr. Quay is significant, but some of them believe other factors may be at work. Dr. Pitelka, for example, argues that cycles in the nitrogen and phosphorus content of the lemming diet may play a role. Dr. Richard V. Andrews of Creighton University in Omaha, Neb., adheres to the view that the stress of crowding may set off the sequence of events leading to a crash. Release of the substance found by Dr. Mullen and Dr. Quay, in his view, may be a sequel.

He has found that steroid hormones in the blood are elevated as much as 30 times the normal amount when the animals reach their population peak. Some members of the California group suspect that this effect is secondary to the appearance of the blood factor identified by Dr. Quay and Dr. Mullen, rather than vice-versa.

Despite such disagreements as the sequence of events, it is evident that by monitoring bloodstream changes, zoologists are boring in on an explanation of what are widely viewed as the most dramatic population cycles among all the higher animals.