extraordinary numbers on cultivated lands unless effectively checked by man. [Italics mine.]

And finally, page 707:

It is hoped the facts and inferences set forth will convince the reader that the problem is not a simple one [referring to ground squirrels], and can not be solved by casual, half-hearted measures.

Contrast the foregoing with some of Grinnell's *Condor* editorial expressions (*op. cit.*), as:

There is a certain administrative type of mind to which the human "use" of all natural resources and the correlated elimination of anything which looks to be detrimental, or even not immediately and clearly of value, loom as the only "practical" aims.

And:

In our mind, at the present moment, the wholesale poisoning of wild animal life (birds, carnivorous mammals, rodents) on uncultivated terrain, ought to cease; not only that, but it should be prohibited by law.

In 1918 Grinnell pointed to ground squirrels on uncultivated land as a source of invasion of cultivated fields, and now he would prohibit poisoning them there by law. In such a view, obviously, not only the public health but economic considerations are to be entirely ignored.

The principal organizer of the campaign against effective injurious-animal control operations appears to be Mr. A. Brazier Howell, whose wide-spread propaganda and narrow view-point, plausibly presented, have undoubtedly misled many. An example of his methods in arousing prejudice against the work is his assertion, founded on the fact that certain carnivores and rodents eat grasshoppers, that he can predict outbreaks of these insects by the course of injurious-animal control operations.

Mr. Howell[4] elaborates on theories that seem to be based on his lack of understanding of wild-life conditions and the use of poison. He says:

I venture to state that it is universally believed by biologists that as rodents are now being virtually exterminated over large areas by means of poison, their places will be taken by other, and possibly more destructive, forms of life. . . . Under modern methods of poisoning, the mortality of rodents may approach 100 per cent. . . . On the surface, then, it seems that all rodents and all carnivores are gone, and everything should be lovely.

These quotations and the context show that Howell bases his absurd grasshopper predictions and other contentions on the theory that the injurious-animal control work nearly exterminates all rodents and carnivores. He has elsewhere referred to the "broadcasting of poison bait," apparently assuming that poison for rodents, at least, is regularly distributed in that way instead, as is really the case, of being placed at the holes where it is known to be consumed mainly by the animals for which intended. Many acres of unpoisoned ground, well populated by rodents of many kinds, commonly separate the holes of the injurious species where poison is placed. Any scientific investigation will reveal that the general rodent population is little disturbed by such poison operations. Upon such erroneous and misleading premises Howell bases his case against effective control of injurious species, and asks the country to accept his conclusions.

For those who do not have to bear the burden of responsibility in the solution of wild-life problems, often almost baffling in their complexity, it is easy to criticize. Some criticism must be expected and some may be deserved, but when criticism comes from professional zoologists it should be fair and made only with broad knowledge tempered with appreciation of all the difficulties that may be involved. Charges of any kind should be based upon definite scientific evidence, and such evidence has been singularly lacking throughout the obstructive campaign in progress. In my judgment one of the greatest handicaps to the real conservation of wild life in America to-day is the lack of harmony and concerted effort that results when individuals or groups who may be sincere, but misinformed and misguided, becloud issues and adopt a captious and dictatorial attitude toward those charged with carrying on wild-life administrative work.

E. A. GOLDMAN

BIOLOGICAL SURVEY,
U. S. DEPARTMENT OF AGRICULTURE

[4] SCIENCE, vol. 74, p. 632, Dec. 18, 1931.

THE GASTRIC EROSION OF METAL

DR. C. T. HURST, who recently[1] reported a case of gastric erosion of a fishbook swallowed by a fish, concluded that it may have taken about a year to reduce the former metal to a mere filament. A rapid gastric erosion of pieces of steel, iron or aluminum was sometimes observed in rabbits and guinea-pigs during a study of the rate of passage of inert materials through the digestive tract,[2] but the precise amount of metal dissolved was not then determined. At present, in an attempt to analyze the mechanism of the production of peptic ulcers in rats by diets low in protein,[3] a study is in progress in which the amount of metal dissolved (weight lost) is being determined in the belief that it serves as an index of gastric

[1] SCIENCE, Nov. 20.
[2] F. Hoelzel, *Amer. Jour. Physiol.*, 92, 466, 1930.
[3] F. Hoelzel and Esther Da Costa, *Proc. Soc. Exper. Biol. and Med.*, 29, 382, 1932.

acidity. The results obtained thus far mainly tend to emphasize the relation between the length of stay of the metal in the digestive tract and the degree of erosion. Thus, 100 small pieces of aluminum, which generally pass out of the stomach rapidly, have been given from time to time to rats without showing any loss in weight. Pieces of iron and steel, which remain longer in the stomach than aluminum, lost from about 0.1 per cent. (average of 200—1/16 inch stainless steel ball-bearings) to over 5.0 per cent. (average of 100 pieces of No. 18 gauge soft iron rod). Those pieces of iron and steel that remained longest in the stomach (up to 10 days) obviously lost much more weight than the average. A factor that also enters here is that, after the metal has been roughened by the initial erosion, further erosion proceeds at a faster rate. In one rat that was given a large amount of gold and silver in addition to some aluminum, a few pieces of aluminum rod (No. 20 gauge) remained about 3 days in the stomach and were eroded to the breaking point. At the usual gastric acidity of 0.5 per cent., or less, of HCl, aluminum resists erosion more than some kinds of steel and much more than soft iron. Hence, one might expect a fishhook to erode quite completely in a few weeks. Either these observations on mammals are not applicable to fish or Dr. Hurst's allowance of a year's time makes his report a typical fish story.[4]

FREDERICK HOELZEL
DEPARTMENT OF PHYSIOLOGY,
UNIVERSITY OF CHICAGO

POLYDACTYLISM IN MICE

IN a strain of mice which carried factors for posterior duplication Danforth, in the *American Journal of Anatomy,* v. 45, 2, 1930, recorded the occurrence of extra toes on a number of animals. His investigations did not show any indication that the factor which governed the polydactylous manifestations was in any way distinct from that which governed the more pronounced effects (double feet, double legs and finally double posterior halves of the body). Rebaud, in Paris, 1919, reported polydactylous animals in a stock of mice which had an abnormal luxation of the posterior feet. The manner of the inheritance was not determined.

From a study of the literature which deals with visible characters in mice these are the only reports which have come to my attention that record the inheritance of polydactylism in stocks other than those which had been previously subjected to experimental treatment with roentgen rays.

Within the last few months polydactylism has expressed itself in a six-toed condition of the posterior feet in thirty-seven animals of a highly inbred strain of control mice in these laboratories.

The strain from which the polydactylism has arisen, as reported in SCIENCE (1931, 73, p. 482), recently underwent a mutation in hair color from chocolate brown to "leaden." At the time of the color mutation only one six-toed animal had ever been observed in the stock. This polydactylous individual was in the direct line with that of the color mutation but left no polydactylous progeny.

Among animals of the last few generations, however, the polydactylism has occurred eight times in the original stock mice, twenty-three times in pure stock mutants, and six times in the progeny from outcrosses between mutants and four unrelated strains in which the six-toed character has never been observed.

Polydactylism has been studied rather extensively in humans, guinea-pigs and poultry, and from these observations the condition is regarded as being inherited as a dominant character, expression of the character being controlled by certain unknown modifying factors. This nucleus of inbred mice offers a new species on which to investigate the method of inheritance of the character. From the preliminary matings between polydactylous mice it has already been shown that the six-toed condition does not breed as a simple recessive.

JOSEPH M. MURRAY
ROSCOE B. JACKSON MEMORIAL
LABORATORY,
BAR HARBOR, MAINE

TOXICITY OF SODIUM NITRATE FOR A SPECIES OF MOSS

IN an extensive series of experiments in Hampshire and Worcester Counties, Massachusetts, in which upland permanent pastures were top-dressed with Chilean sodium nitrate and other fertilizer materials, it was observed in 1929 and further confirmed in 1930 and 1931 that the nitrate was toxic to *Polytrichum commune,* a species of moss. This moss is common on "run-out" upland pastures of the New England states, the amount of moss present apparently being inversely proportional to the amount of available plant nutrients in the soil. The nitrate was used in amounts equivalent to 30, 60 and 90 pounds of nitrogen per acre. Toxicity was not as severe with 30 pounds of nitrogen in the form of nitrate as it was with 60 and 90 pounds. No definite evidence of direct toxicity from the use of limestone, hydrated lime, 16 per cent. superphosphate or muriate of potash was observed in 1930.

In 1931 a new experiment was begun in which were used the following materials: (1) Chilean nitrate of soda; (2) Arcadian nitrate of soda; (3) calcium

[4] M. Dobreff, *Pflüger's Archiv,* 217, 221, 1927, reports the finding of as high as 0.69 per cent. free HCl in the stomach of sharks.