WHALES AND SEALS

Naturgeschichte der nordatlantischen Wale und Robben. By E. HENTSCHEL. Handbuch der Seefischerei Nord-Europas, Vol. 3, Part 1, (6) + 54 pages, 60 figs., including 10 plates, 8vo. Stuttgart: E. Schweizerbart'sche Verlagsbuchhandlung, 1937. Price, 11.25 RM.

HENTSCHEL'S "Natural History of the North Atlantic Whales and Seals" forms the first part of Volume 3 of the "Handbuch der Seefischerei Nord-Europas," a volume which is planned to include accounts of animals other than fishes that are of economic importance. The paper is intended to be a convenient guide for the identification of the species of commercial value, and to this end it includes first a short general account of their structural adaptations, followed by a systematic section in which for each species are given the Latin name adopted by the author, the vernacular names in several north-European languages, then the more obvious characters of use in the determination of the species, concluding with brief paragraphs on the distribution, habits, food, reproduction and commercial importance. Nineteen species of whales and porpoises and seven of seals are included. The author purposely omits some of the less common species or genera of cetaceans on the ground that they are of little or no economic interest, yet in a tabular view of this sort it would have been valuable to have included them for the sake of completeness. The genera omitted include Kogia, Mesoplodon, Ziphius, Pseudorca and Prodelphinus, all of which are fairly well known in the North Atlantic. The figures in the text or plates are for the most part reproduced from familiar illustrations and, whether in outline or halftone, should prove helpful in the identification of cetaceans cast ashore or captured, while the seals are well illustrated by figures taken from Wollebaek's account of 1907. A short list of works referred to in the text is given at the close of each of the two sections, and a brief index concludes what should prove a useful résumé.

It is, therefore, a pity that the author did not take equal pains to bring up to date the nomenclature of the cetaceans but persists in the use of many specific names that have long been discarded as untenable by those who have endeavored to establish a correct and stable usage. For nearly a half of the cetaceans listed the specific names are those no longer in use, but one may overlook the occasional failure to follow the current mode in the use of such genera as Sibbaldus for the blue whale or Eubalaena for the southern right whale. The matter may seem of little moment to those primarily interested in other aspects of zoology, but greater care in this respect would go far to establishing a better and more uniform usage where, as in this case, a treatise is intended as a guide for those less familiar with the subject.

G. M. ALLEN

SPECIAL ARTICLES

INTERCEPTION OF RAINFALL BY HERBACEOUS VEGETATION

INTERCEPTION of rainfall by trees, particularly forest trees, has been studied by a number of investigators. Very little is known about rainfall interception by herbaceous vegetation. Such study is of importance for two major reasons. Plants by preventing raindrops from striking the soil directly have a marked effect upon decreasing runoff and erosion. By holding a portion of the rainfall upon the surface of the leaves and stems until it evaporates, a considerable amount of water is prevented from reaching the soil where part of it would eventually be available to the roots of the plants. Thus, there results a very important loss to the vegetation.

In order to determine the magnitude of this loss of water, a series of experiments has been carried on in connection with other ecological work at the University of Nebraska. Numerous methods have been devised, and two have been found which lend themselves readily to field studies with prairie vegetation, crop plants and weeds. A meter quadrat is marked out on the surface of the soil beneath the plants. In it there are placed five pans, each 1 m long, 4 cm wide and 5 cm deep. The surface covered by the pans represents one fifth of the total surface of the quadrat. By means of conveniently spaced, permanent crosswires and a wire mesh in the bottom of each pan, it is possible to place cut plants in the pans in their normal position. When necessary for proper placing of the pans, plants are cut off at the soil surface and inserted in the pans in the same position that they previously occupied. Water is then applied by means of large bottles equipped with sprinkler tops, the amount being expressed as an inch per hour, one-half inch in 30 minutes or in smaller amounts. Such factors as light, air temperature, humidity and wind movement are measured during the progress of the experiment. The amount of water caught in the pans represents one-fifth of the water not held by the plants, and from this it is possible to express the amount of water intercepted in per cent. of the total amount applied.

When working with such mat-forming plants as prostrate pigweed, knotweed, etc., they are cut off at the soil surface and placed in their natural position upon a quarter-inch mesh wire screen one square

meter in area. The screen is then suspended over a large pan and water is sprinkled upon the plants at predetermined rates. The interception capacity of the plants is calculated as before. The effect of wind movement is readily shown by use of an electric fan. Thus the plants are under practically natural conditions. It is not claimed that all the factors which characterize a rain storm are present, but the methods lend themselves to use under such conditions. These experiments were performed during years of extreme drought.

The amount of water intercepted by herbaceous plants is often surprisingly large. Wheat, when fully developed, was found to hold from 50 to nearly 80 per cent. of the water applied, depending upon the rate of application. An open growth of needle grass (*Stipa spartea*) in upland prairie intercepted approximately 50 per cent. of the water applied at the rate of one-fourth inch in 30 minutes. Prairie dropseed (*Sporobolus heterolepis*) gave somewhat similar results, but little bluestem (*Andropogon scoparius*) intercepted from 50 to 60 per cent. of the water applied at the rate of one-half inch in 30 minutes. In low prairie, composed chiefly of big bluestem (*A. furcatus*) and tall panic grass (*Panicum virgatum*), with flower stalks fully developed, the interception at different rates of application was one inch in an hour, 47 per cent.; one-half inch in 30 minutes, 57 per cent.; one-fourth inch, 67 per cent.; one-eighth inch, 81 per cent. for similar periods. Bind weed (*Convolvulus arvense*) intercepted 17 per cent. of water applied at the rate of one-half inch in 30 minutes, 30 per cent. when one-fourth inch was applied, and 50 per cent. when one-eighth inch was used. For buffalo grass (*Buchloe dactyloides*) the results were: one-half inch in thirty minutes, 31 per cent.; one-fourth inch, 46 per cent.; and one-eighth inch, 74 per cent. In all the experiments it was found that wind, through its influence upon evaporation, had a marked effect upon the percentage of interception.

Results thus far obtained show that the amount of water held upon the surfaces of leaf and stem and prevented from reaching the soil is very great. They clearly show that the amount of water thus held depends largely upon the rate at which the water falls and, to a certain extent, upon the environmental conditions, especially wind movement. In the plants studied, little water ran down the stems and thus reached the soil. So far as use to the vegetation is concerned, the water intercepted represents a loss, which over large areas becomes enormous. For example, when a thick growth of bindweed intercepts 13 per cent. of one-half inch of water in 30 minutes, the amount withheld by the plants from reaching the soil is 7.5 tons per acre. Wheat in intercepting 52 per cent. of a similar rainfall causes a loss of over 29 tons of water. When an inch of water falls during an hour, buffalo grass intercepts over 28 tons per acre, while prairie composed chiefly of big bluestem may intercept as much as 53 tons per acre.

O. R. CLARK

UNIVERSITY OF NEBRASKA

RENEWAL OF MULTIPLE PRECIPITIN PRODUCTION ON INJECTION OF ONE ANTIGEN IN RABBITS SUCCESSIVELY IMMUNIZED WITH MANY ANTIGENS

FIFTEEN antigens,[1] adsorbed on aluminum hydroxide,[2] were injected one by one at intervals of about seven days into the muscles of two rabbits. The amounts injected varied from 7.5 to 25 cc of aluminum hydroxide, the antigen strength of which was 1 per cent. Before each injection the blood serum, except in two or three instances, was tested for precipitin for the antigen about to be injected and for precipitins for the antigens previously injected. The first injection was made on January 8 and the last on May 23, 1936. There was good precipitin production in response to all the antigens except the last three injected, namely, human hemoglobin, Bence-Jones protein and beef lens. So far as indicated by the tests the injections of antigen did not reduce the precipitins in the serum for antigens previously introduced, but as no tests were made before seven days after each injection, the possibility of an earlier fall in the content can not be excluded.

Following the last injection in rabbit 1 precipitin after precipitin disappeared from the serum. On October 27 no precipitins were demonstrable, but in February, 1937, the tests for ovalbumin, human albumin and beef pseudo-globulin were positive. On February 23 10 cc of a 1 per cent solution of ovalbumin in salt solution were injected intramuscularly, and during the next few weeks five precipitins which had been absent for several months reappeared in the serum.

In rabbit 2 the precipitins disappeared more slowly. On March 23 tests were obtained for six precipitins. On March 24 15 cc of 1 per cent. solution of Bence-Jones protein 1 were injected intravenously, and during the next week the serum reacted with all the antigens that had been injected previously.

[1] Ovalbumin, human albumin, beef pseudoglobulin, human pseudoglobulin, beef albumin, horse pseudoglobulin, chicken blood albumin, Bence-Jones protein 2, dog albumin, hog thyroglobulin, beef hemoglobin, guinea pig serum, human hemoglobin, Bence-Jones protein 1, beef lens. The two Bence-Jones proteins used are different antigenically.

[2] Hektoen, Ludvig and Welker, William H. Precipitin production in rabbits following intramuscular injection of antigens adsorbed by aluminum hydroxide. *Jour. Infect. Dis.*, 53: 309, 1933.