

MAMMALOLOGY AND THE AMERICAN SOCIETY OF MAMMALOGISTS, 1919–1969

TRACY I. STORER

(Feature Address, 49th Annual Meeting, New York City, 17 June 1969)

The year 1919 opened a new era after the tragedy and misery of World War I in western Europe. American servicemen came home, shed their uniforms, and plunged vigorously into civilian activities. Biologists renewed their interests in a variety of fields. Students of insects, fishes, and birds already had scientific organizations and periodicals devoted to their special interests but there was none for mammals.

Interest in North American mammals had been growing. Natural history museums were accumulating series of specimens and there were also some private collectors. The scant literature was mainly in government documents and technical publications of museums.

Organization of the American Society of Mammalogists on 3 April 1919 provided a gathering place where mammals could be discussed and the new *Journal of Mammalogy* offered a central channel of communication.

Bits of information about mammals of North America appeared in many early travelers' accounts, regional histories, and reports of pioneer scientific exploring expeditions, but the total of reliable material was scant. The indefatigable naturalist, John James Audubon, and his clergyman coauthor, John Bachman, prepared the first major work solely on mammals, with hand-colored illustrations, in their three-volume folio *The viviparous quadrupeds of North America* (1845–48) and the ensuing quarto *Quadrupeds* of 1851, that was variously reprinted. These were monumental works, even by present-day standards, and we marvel that two authors, having only limited means for travel and communication, could gather and publish such a wealth of information on creatures largely nocturnal and secretive. Steel traps and guns were used to take larger mammals but small species were less easy to obtain. Bachman mentioned using a figure-4 trigger and inverted bowl.

The California Gold Rush of 1849–50 indirectly speeded study and knowledge of the western flora and fauna, including mammals. Demand for effective overland transportation to replace the long, slow travel by ships and the Isthmus led to the Pacific Railroad Surveys that searched for routes westward from the Mississippi River. Each of the eight field parties had a physician-naturalist who observed and collected. Specimens and notes were sent to Washington. The able Spencer Fullerton Baird, who had organized the surveys, identified specimens, and arranged for printing the reports written by himself and others—in all 13 quarto volumes. Baird wrote that on *Mammals* [of North America], volume 8, 1858, 804 pages and 60 plates. It was the first full-scale research report on all known mammals [excluding bats and marine representatives] of this continent.

Later other federal surveys—under Hayden, King, Powell, and Wheeler—and their reports included material on mammals as did early papers from the “big four” museums—National, Philadelphia, American, and Agassiz (or MCZ).

Two mammalogists were especially prominent in the latter 19th and early 20th centuries. Joel Asaph Allen (1838–1921), first at MCZ and from 1895 onward at the American Museum of Natural History, wrote more than 400 papers and reviews in ornithology and mammalogy. Our Society honors him in the latter field for his scholarly monographs on *The American bisons, living and extinct* (1876) and *History of North American pinnipeds* (1880), and many lesser contributions.

The second was Clinton Hart Merriam (1855–1942), who practiced medicine from 1879 to 1885, but at heart was a field naturalist, as attested by his early books on the *Birds of Connecticut* (1877) and *Mammals of the Adirondacks* (1882, 1884). In 1885 he became chief of the federal bureau that evolved into the U.S. Biological Survey. With a staff of collector-naturalists, he planned and directed field expeditions in western North America. He started several ornitho-mammalogical series, the Biological Survey circulars, bulletins, and North American Fauna, to publicize their findings. These documents are part of our basic literature. The Merriam “team” included Vernon Bailey, A. K. Fisher, Edward A. Goldman, Ned Hollister, Arthur Howell, Hartley H. T. Jackson, W. L. McAtee, Edward W. Nelson, Wilfred Osgood, Theodore S. Palmer, and Edward A. Preble.

Between the days of Bachman and Merriam, Yankee manufacturers had started mass production of small snap traps. Gerrit Miller wrote that the Cyclone Trap, first marketed in 1887 or 1888, made modern mammalogy possible. This and other makes, used in quantity, caught numbers of small mammals. The resulting series of specimens made it possible to differentiate sex, age, and geographic variations. The route to designating subspecies was opened. An early outstanding publication, long a classic, that embodies these features is Wilfred Osgood’s 1909 monograph of 285 pages on the genus *Peromyscus* (North American Fauna no. 28) in which 27,000 specimens were used.

The Merriam pattern has been followed for nearly 80 years: many traps; big series of specimens; each skin with precise label as to place, date, collector’s name, size, and sex as determined by dissection; carefully detailed field notes; descriptions of new species or subspecies promptly after discovery; and finally a monographic generic revision or report of a faunal survey. His life zone concept, set forth definitively in 1898, became the basis for distributional designations over several decades until other workers proposed alternative and better schemes. After a quarter century as Biological Survey Chief, Merriam, in 1910, was provided a lifelong endowment by Mrs. E. H. Harriman to resume full-time mammalian research. He worked enthusiastically on big bears for a while, then concentrated on tribal territories and vocabularies of California Indians during his later years. Such scientific stature

made Dr. Merriam the logical choice as first president of ASM. Meanwhile an ardent disciple had developed.

In the early 1900's Joseph Grinnell adopted many of Merriam's interests and methods, which he gradually refined, and he also vigorously espoused the life zone scheme. To both ornithology and mammalogy he contributed extensively, beginning as a self-financed independent. From 1908 to 1937 he was Director of the Museum of Vertebrate Zoology, privately endowed by Miss Annie M. Alexander in the University of California at Berkeley. Study of land vertebrates based on original field observations thereby entered the academic domain. Eight of 13 living past presidents of ASM were among those who obtained the Ph.D. degree in the MVZ school under Grinnell (and later E. R. Hall); many others took master's degrees or special training there. Few of J.C.'s students agreed with his consuming zeal for work, work, WORK 6½ days per week (he died at age 62), but his meticulous training and parts of his philosophy have benefited many. Today the Merriam-Grinnell pattern of housing, cataloging, and using collections is common in zoology museums across North America.

A reliable indicator of accomplishments in mammalogy during the past 50 years has been the growth of scholarly literature. Charter members of ASM will remember that in 1919 the two general reference books were Flower and Lydekker's 1891 *Introduction to the study of mammals* and F. E. Beddard's 1902 volume on *Mammals* in Cambridge Natural History. There were encyclopedia articles on conspicuous mammals, a few state or regional accounts, scattered research articles in periodicals, and the museum and Biological Survey publications previously noted.

Prior to 1919, there were three checklists of North American mammals. True's 24-page list of 1884 had only 363 taxa. Gerrit Miller and J. A. G. Rehn in 1901 recorded 1450 and Miller's 1912 summary had 2100. His 1923 *Checklist* included 2554 and his last revision, with Remington Kellogg, in 1955, had 3622 species and subspecies. These successive inventories reflect the steady growth of taxonomic and distributional knowledge on mammals of this continent. The *Lives of game animals* by Ernest Thompson Seton of four volumes (1925-28 and a reprint) afforded summaries on biology of the ungulates, carnivores, and some rodents; among "lesser game" were *Peromyscus* and the skunks. The reader has to be cautious because Seton gathered tidbits from all and sundry sources. *Die Säugetiere* of Max Weber in 1927 brought an up-to-date serious account of general structure, function, and biology, plus a worldwide systematic résumé of the class Mammalia. The next year saw the first of several volumes by S. I. Ognev on *Mammals of eastern Europe and northern Asia*. Thereby material on the vast U.S.S.R. regions became available to any who could negotiate the language barrier. Also in 1928 came the first popular manual, *Field book of North American mammals* by Harold E. Anthony, who was an effective officer of ASM for many years. The accounts dealt briefly with characteristics, size, range, and habits of each species.

A major fault was inclusion of all 84 members of C. Hart Merriam's grizzly-brown bear complex, more recently reduced logically to one species and a few geographical races. Another manual for a lesser area but with more detail was W. J. Hamilton's (1939) *Mammals of eastern United States*. This was followed in 1952 by the pocket-sized *Field guide . . .* of Burt and Grossenheider and in 1954 by Ralph Palmer's *Mammal guide*. Of the last, my own copy bears the author's notation: "Here is my attempt at a pocket Seton." The wealth of well-screened detail, in telegraphic style, demonstrates his success.

In the early 1930's there was bitter debate between naturalists and some Biological Survey and other government people over use of poison to reduce rodents and predators. The timely volume by Henderson and Craig in 1932, *Economic mammalogy*, summarized much detail on food habits and supplied facts to replace idle wordage of the controversy. Accounts of fossil mammals in H. F. Osborn's (1910) *Age of mammals* and W. B. Scott's (1913) *A history of land mammals in the Western Hemisphere* were both extensive and authoritative. Gradually, however, new research results added or altered much. Then came the *Vertebrate paleontology* of Alfred S. Romer in 1933, with revised editions in 1946 and 1966. These books have nurtured a generation and more of students with sound paleontological subject matter, clearly presented.

The tradition for comprehensive regional faunal reports was maintained and enhanced by Glover M. Allen in his 1938 *Mammals of China and Mongolia*. This big two-volumed account deals with a region long occupied by mankind but largely inaccessible to mammalogists. It was indeed fortunate that the series of expeditions by the American Museum of Natural History, from which volumes by Glover Allen and others resulted, was able to work the field without serious hindrance; the area has long been closed to outsiders. Next in chronologic sequence was W. J. Hamilton's 1939 book on *American mammals* that summarized general features by one who has studied them intensively.

With the next decade came several important volumes on mammalian subjects. Cabrera and Yepes with their *Mamíferos Sud-Americanos* (1940) filled a great need by an illustrated volume on the commoner mammals of that southern continent. Ellerman and his associates issued the first of three volumes on *The families and genera of rodents* in 1940 (others 1941, 1949). This is a large critical review of the most populous order of mammals. Totally different was Charles Elton's *Voles, mice, and lemmings* in 1942. His masterful discussion of the microtine rodents and their population cycling was based on a wealth of trap-banding and other research by the author and his colleagues in the Bureau of Animal Population at Oxford, England. Much of value from the earlier literature was extracted and evaluated. Chapter heads were spiced with terse quotations, even one by Uncle Remus.

The bibliographic landmark of 1945 in our field was George Gaylord Simpson's treatise on *The principles of classification and a classification of*

mammals. Both fossil and Recent groups, down to genera, are listed, with indication of both geologic and geographic ranges. Fourth in this period came Asdell in 1946 (revised in 1964) with a book of *Patterns in mammalian reproduction*, summarizing the available data in convenient form. In 1951, J. R. Ellerman and T. C. S. Morrison-Scott published a *Checklist of Palaearctic and Indian mammals 1758–1946*. This book, used with the Miller-Kellogg North American list, affords a perspective of the mammalian fauna over most of the Northern Hemisphere. It helped to focus on the close relationships of various types having representatives in both the Old and New World. Placing the grizzly and big brown bears as races of *Ursus arctos* is a prime example. In 1955 came the two-volume treatise on mammals in Pierre Grasse's *Traité de zoologie*, the modern French encyclopedic technical treatise projected to deal with the entire animal kingdom. Then Angel Cabrera in 1958 published the first volume of his *Catalogo de los mamíferos de America del Sur*; the second followed in 1961. With similar works for other continents it became possible to appraise the class Mammalia on a worldwide basis. Two years later Hall and Kelson issued their big systematic *Mammals of North America* with keys for identification, descriptions, measurements, and 500 distributional maps. *Listening in the dark* by Donald Griffin in 1958 brought to all mammalogists the author's varied findings on echolocation and related affairs in the lives of bats. The mist net, once deemed illegal by game authorities, has yielded a rich haul for students of bats and birds.

Our late fellow member, Ernest P. Walker, by persevering effort over many years and later with help of assistants, brought to completion in 1964 his two-volume *Mammals of the world*. It is a great reference work in which each genus is illustrated and its characteristics and habits tersely stated. The same year brought the admirable cooperative *Handbook of British mammals* edited by E. H. Southern, which establishes a new standard of excellence for regional summaries.

Beyond the major publications mentioned, mammalogy has gained by a host of other books. There are numerous state publications such as those of Hall on Nevada, Dalquist on Washington, Bailey on Oregon, Ingles on California, and W. B. Davis on Idaho. In another category are species monographs like the moose book of Peterson, elk by Murie, antelope by Einarrson, deer by Taylor and associates, and those on wolf, coyote, and puma by Stanley Young. In lighter vein there are books about bears—black, brown, or grizzly—and accounts of personal experiences with captive wolverines, otters, lions, and others. Finally there is J. Frank Dobie's *Voice of the coyote*, a charming literary account of our wide-ranging scavenger-predator. So bounteous is the array of books through our ASM years that they would fill more than one 5-foot bookshelf—a striking contrast to the situation in 1919.

Improvements in transportation have influenced both mammalogists and their quarry. Until the second decade of this century, field work involved the horse and wagon or saddle and pack stock. Such leisurely travel afforded

much closer observations of animals and their environments than possible in an auto. Many creatures tolerated nearer approach by a horse than a man on foot. The railroad and steamboat served for longer trips. Most field work of the Merriam era was by those means. Indeed Walter Taylor and I made a collecting trip around the Sacramento Valley in 1912 going from town to town by train, then by wagon to camp and back. Joseph Dixon spent nearly 2 weeks on steamers and train for his first trip from central California to Mt. McKinley Park in Alaska. The amount and variety of camp and collecting gear were limited, and the rigors of travel made only durable dried or canned foods practicable.

Most of our senior members began field work in the Model T Ford with its frequent and varied dysfunctions; later they progressed to more reliable and speedier vehicles. Now it is easy to run out 100 miles for trapping over the weekend, taking the amenities of home for food and personal comfort. Traps, nets, cages, photoflash and movie equipment, and sound recording devices are easily carried.

The airplane has cut travel time from days to hours. Earlier my attendance at an eastern ASM meeting involved "three sleeps" in a rattling Pullman rather than today's 4 or 5 hours in the cushioned interior of a jet. Now a trip from the Midwest to Alaska takes a single day and almost any field site can be reached in two. Animals intended for zoos, be they mice or hippos, can be shipped from afar with a minimum of care or feeding en route. Even porpoises have been flown from Florida to California on damp, foam-cushioned beds with little hazard. Plane surveys and censusing with eye or camera are common inland for big game and in coastal waters for marine carnivores or cetaceans. Our committee on marine mammals renders far more informative reports with the results of recent airborne observations. Field studies on islands or at remote sites become more feasible with airdrops of personnel, equipment, and food supplies. Less favorable is the use of airplanes by trigger-happy and misguided sportsmen for wanton pursuit of large mammals on Arctic or other treeless areas.

Zoological gardens have enlarged in numbers and size, and an increasing variety of species is exhibited. As the living needs of captives are learned more fully, housing, methods of display, feeding patterns, and treatment or control of disease have advanced. Direct view over moats has replaced many barred cages and the large species often have ample space for exercise. The importance of nutrition was emphasized by a veterinarian at San Diego Zoo who told me that besides caring for the sick and wounded he had 400 diets to supervise. Vitamins and mineral supplements are now just as important in the zoo as in the home. Better understanding of breeding physiology has led to production of young of captive mammals in an ever increasing array of species. Some actually produce more young than needed for exchange between zoos. Species extinct or scarce in their native habitats are being pro-

duced in zoos—Pere David's deer, Wisent, and Prezewalski's horse are examples. A few private game farms aid this endeavor.

New in our time are the zoo-aquaria or "marinelands" that display hybrid vigor in their large tanks where sea lions, pigmy whales, and porpoises can live, play, and act. Biological investigations by resident or visiting personnel are expanding at many zoos because of the larger variety of captive species available for study.

Wildlife refuges were relatively few when ASM began, but have grown in number and size both in this country and abroad. A new field has developed to manipulate and improve mammalian and other habitats on refuges and elsewhere. The Wildlife Society and its *Journal* that deal with applied zoology, especially mammalogy and ornithology, have become welcome parallels to our own organization and periodical.

First steps toward nature interpretation in national parks were being taken in 1918 or 1919. Gradually there evolved a philosophy and working pattern, under national and regional supervision, that includes a core of permanent resident naturalists, aided by many summer assistants, who lecture, conduct field trips, and answer questions by the public. There are also full-time biologists studying the problems of wildlife, and some parks issue a small periodical and pamphlets on the local biota.

The fortunes of many mammals seem scarcely changed over the last half century. Among the others, some declined, some prospered, and man continues to introduce aliens into new habitats.

Of the grizzlies that once were overabundant in California, the last alive was seen in 1924; small residues in Colorado and northern Mexico reportedly now are gone. The pronghorn of open western lands was in far decline in 1919, but now is common enough locally for some special hunts. Mule deer in many areas have shifted from moderate or low numbers to pestiferous overabundance, with damage to habitat. Some national park populations have required severe reduction. Bison and elk on reservations require annual reduction to keep them in balance with the range. The scattered relic beavers of the early 1900's have risen to numbers thought to be larger than when mountain men first trapped the West. Sea otters that supported a California coastal fur harvest between 1784 and 1848 were thought to be extinct at the turn of the century. Since 1938, however, herds have become common and easily seen in the kelp beds. Indeed, abalone fishermen already are crying that there is "too much competition." The elephant seal and southern fur seal have regained some former range along the California coast.

The California ground squirrel that literally and figuratively plagued the state from the beginning of cereal agriculture has almost disappeared in the lowlands by continued use of the highly toxic sodium fluoroacetate or Compound 1080. Prairie dogs are scarce or gone from many areas that originally had large "dog towns." The burrows of both types have long served as shelters for a host of other animals that may likewise disappear. In the advance of

western agriculture and urbanization, an occasional local subspecies of small rodent disappears when its habitat is overrun or changed.

The alien mammal problem continues to be important in many lands where foreign species compete with or replace native forms. De Vos, Manville, and Van Gelder made a worldwide survey in 1956 of "Introduced mammals and their influence on native biota." More than 200 instances of deliberate introduction were listed, many with critical comments. The hazard for North America and the United States continues to be great as servicemen and others, returning from foreign lands, endeavor to bring home their pets. No port quarantine service can cope with this continuing series of arrivals and at many military airports there is little or no scrutiny or hindrance imposed.

Research in mammalogy has expanded tremendously in kind and amount during the 1919-1969 period. At the beginning routine systematics, distributional reports, and simple life history accounts were the principal fields of effort. Workers were relatively few, the first Ph.D. degrees in mammalogy were just being conferred, and collections were moderate; some areas in this country and many elsewhere were unexplored or imperfectly known. Knowledge came to hand by way of the gun, steel and wooden snap traps, and direct observation. Photo emulsions were slow and did not distinguish red from black, movies were on 35 mm. reels, and there were no color films or electronic aids. There was no means to record animal sounds and field notes were hand written.

Animals large or small have been caught alive since antiquity, but serious live-trapping of mammals and birds for study began early in this century. In 1905 David Starr Jordan suggested (*Science*, 29 December) that some of the subspecific differences then being studied by mammalogists were "ontogenetic"—not racially fixed. Some other zoologists took up the idea, but systematists were shocked. To test the matter, Francis B. Sumner sought to make a longtime study of environmental effects on evolution. His chance came in 1913, when William E. Ritter, Director of the new Scripps Institution for Biological Research at La Jolla appointed him to make field and laboratory studies on races of native rodents. *Peromyscus maniculatus* was chosen as suitable.

Sumner, a meticulous investigator, needed live mice in quantity to start breeding experiments and also as unblemished specimens whence flat "barn-door" skins could be obtained, spread under uniform tension, and used for precise analysis of coat color. He chose the multi-catch commercial Delusion trap intended for domestic house mice. Live *Peromyscus* were caught in quantity, sometimes two or more in one trap.

This was the period when S. Prentiss Baldwin of Cleveland began catching and banding small birds, which he first reported upon in 1920. Shortly some mammalogists were catching and tagging small mammals. Capture, marking, and release became the basis for varied studies on populations, home range, migration, molt, and various other subjects. A diversity of live traps has been

designed, built, and used throughout the world. Live trapping also helps to gather ectoparasites. In one study where I participated, a certain ground squirrel was caught 70 times, anesthetized, combed for fleas, then released. Usually it acquired a few between captures. Live trapping continues to be the most important single method in mammalogy because it gives access to the living individual, often repeatedly. Tags, bands, paint marks, branding, and toe clipping are the means used to make the individual recognizable when seen after release or upon recapture.

The radioactive isotope and the transistor now help the mammalogist to track an animal, once it has been caught and marked. Cobalt-60 in a leg band enables one to find and follow a microtine-sized animal as it goes about usual life activity. By telemetry the creature signals its location, which then can be determined over a limited mileage by the responses in two receivers or in one receiver moved rapidly to successive sites.

The dart gun, when anesthetic charge is properly proportioned to the species and the individual's weight, has all but made the lion, hippo, and elephant eat out of the mammalogist's hand. For a decade or more it has been possible with large and medium-sized species to gather materials and data previously unavailable such as temperature, pulse, blood count, and serological samples. Improved or new methods in biochemistry, cytology, and microscopy permit identification of blood proteins, of determining the chromosome pattern or karyotype, and more refined analysis of glandular and other microstructure as revealed by improvements in staining techniques. Modern stroboscopic illumination permits color photographs inside mammal dens or lairs, and analyses of frames from high-speed motion pictures provide details on gaits and limb movements in fast-running mammals. Tape recorders can register either the voice of a wild mammal or the field observations of a mammalogist. Mathematics and computer programming permit workers trained in those disciplines to make critical analyses of home ranges, population makeup and diversity, and a host of other ventures undreamt of in 1919.

Our Society and its field of interest have experienced exceptional healthy and sound growth during the past half century. Except for the instances of far decline or extinction of wild species—that must be ascribed to other human hands—we can be proud of the record. The young members of today, who may expect to participate in the centennial of the American Society of Mammalogists, can look forward to an ever expanding pattern of studies in this favored scientific discipline.

Department of Zoology, University of California, Davis, 95616. Accepted 29 July 1969.