HOW TO COLLECT MAMMAL SKINS FOR PURPOSES OF STUDY AND FOR MOUNTING.*

By William T. Hornaday, *Chief Taxidermist, U. S. National Museum.*

GENERAL PRINCIPLES.

It is a simple matter to prepare the skin of an ordinary quadruped, provided the operator is not afraid of getting a little blood on his hands, and is not naturally indisposed to physical exertion. A few minutes' work suffices for the skin of a small mammal, and a few hours for a large one, up to the size of a buffalo. With a sharp knife, detailed instructions, some cheap preservatives, and a little patient labor, the thing is done. One specimen properly prepared in the field is worth ten that have been slighted.

The great principle which is the foundation of all valuable field work on mammal skins is this: *A skin must be taken off, cleaned of flesh, and preserved so that the preservative powder or fluid can act directly upon the roots of the hair from the inner side of the skin, and over every portion of its surface.* Neither alum, nor salt, nor alcohol (unless it be of great strength) can strike through a thick layer of flesh and penetrate through the skin to the epidermis quickly enough to save it from decomposition. The epidermis of most animals is of such a close and oily nature that preservatives can not strike through it from without, and therefore when a skin is removed, it must be cleaned of flesh and fat, so that the preservative liquid or dry powder can come immediately in contact with the cutis.

SELECTION OF SPECIMENS.

When specimens are sufficiently numerous to allow of a choice of individuals for preservation, select first the finest, largest, and most perfect old male and female. Young animals of every kind are very desirable, and specimens should be taken whenever possible. Of animals that are known, or even supposed, to be rare, preserve the first speci-

*A portion of this article—that relating to the preservation of skins for mounting—has already been published in the *Proceedings of the National Museum* for 1883, under the title, "Brief Directions for Removing and Preserving the Skins of Mammals." The appearance of this circular is in response to a demand for detailed instructions for the preparation of skins in a dry state for the purposes of study.

men obtained, be it young or old, good or indifferent, for fear another of the same species may not be obtained.

NOTES AND MEASUREMENTS.

The value of a specimen is greatly enhanced by a record of the following: (1) Length of head and body; (2) length of tail; (3) length of hind foot (with claw); (4) height of ear (from behind); (5) height at shoulders (if the animal be a large one) and girth; (6) color of eyes; and (7) color of other soft parts of the head, feet, and body which are in any way worthy of notice. Sketches and photographs of animals in the flesh, either dead or alive, are always highly prized by zoologists and taxidermists, to whom they are of the utmost importance and value.

KNIVES AND MATERIALS.

For skinning small quadrupeds, a sharp pocket-knife is sufficient, except for persons who make a business of collecting; and for larger animals small butcher or hunting knives are amply sufficient. Alcohol in copper cans with large screw-tops is supplied by the Institution by special arrangement, but salt and alum, with which to make a good preservative solution, can be procured anywhere within the pale of civilization, and also kegs or barrels to put them in. Any one who really wishes to preserve the skin of an animal need never be thwarted by an apparent lack of implements and preservatives.

SKINNING SMALL QUADRUPEDS (VARYING IN SIZE FROM A MOUSE TO A MASTIFF).

Lay the animal flat upon its back, and, beginning at the throat, make a straight, clean cut in the skin along the middle of the neck, breast, and abdomen, quite to the base of the tail. Except in very small animals, the tail also must be slit open along the under side from about one inch above the root quite to the tip. In the case of small mammals, the skins of which are to be preserved dry, the bone of the tail may be extracted by wrapping the latter with cloth and pounding lightly upon it with a mallet.

The bottom of the foot must be slit open lengthwise from the base of the middle toe to the heel. All the opening cuts are now made. Begin at the middle of the abdomen and cut the skin neatly from the body, leaving no flesh, or at least very little, adhering to it. We come very soon to where the fore-leg joins the body at the shoulder and the hind leg at the hip. Cut through the muscles at those points, disjoint the legs and detach them entirely from the body.

Skin each leg by turning the skin wrong side out over the foot, quite down to the toes. When this has been done cut the flesh away from the bones of the leg and foot, but be careful to leave the bones attached to each other by their ligaments, and to the skin itself at the toes. *Never throw away the leg-bones of an animal if the skin is to be mounted*,

but leave them attached to the skin as shown by the left leg of the accompanying figure.*

FIG. 1.—Squirrel partly skinned.

Detach the skin from the back, shoulders, and neck, and when you come to the ears cut them off close to the head. Turn the skin wrong side out over the head and proceed until you come to the eyes. Now work slowly with the knife, keeping close to the edge of the bony orbit, until you can see, through a thin membrane under your knife-edge, the dark portion of the eye. You may now cut fearlessly through this membrane and expose the eyeball. It is a good plan with large mammals to hold one finger of the left hand in the eye and cut against it to avoid cutting the lid.

Skin down to the end of the nose, cut through the cartilage close to the bone, and cut on down to where the upper lip joins the gum. Cut both lips away from the skull close to the bone all the way around the mouth, except directly in front of the incisors.

The lips are thick and fleshy, and must be split open from the inside and flattened out so that the flesh in them can be pared off. Do not cut off the roots of the whiskers, or they will fall out. Pare away the

* The figures accompanying this article are selections from plates intended to illustrate a forthcoming work on taxidermy.

membrane which adheres to the inside of the eyelids and turn the ear wrong side out at the base in order to cut away the flesh around it.

FIG 2.—Skinning the head.

If the ears have hair upon them they must be skinned up from the inside and turned wrong side out quite to the tip, in order to separate the outside skin, which holds the hair, from the cartilage which supports the ear.

To prepare the skull, cut the larger masses of flesh off the cranium, cut out the eyes and tongue very carefully, and with a bent wire, or a spoon-handle bent up at the end, draw out the brain through the occipital opening at the back of the skull.

By this time the skin will most surely have become bloody in several places, and before applying any preservative it must be washed *perfectly clean*. Blood left upon the hair imparts to it a lasting stain, and usually causes the hair to come off in mounting. After washing a skin, if it is to be made up at once, dry the hair with corn meal.

SKINNING LARGE MAMMALS.

The principal difference between the manner of skinning a small terrestrial quadruped and a large one, like a bear, deer, or buffalo, is that the skin of each leg is slit open from the bottom of the foot up the back

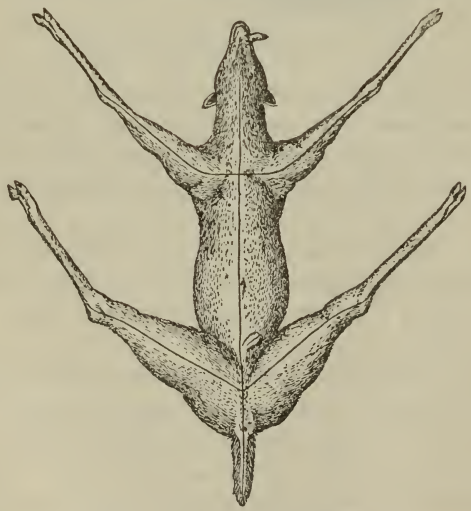

FIG. 3.—The opening-cuts.

of the leg nearly the first joint and from thence up the inside of the leg, following the lines of the accompanying figure, until it meets the

opening-cut which has been made along the center of the body. In preparing a skin as large as that of a buffalo or large polar bear, it is best to cut off the leg-bones at the first joint above the foot, tie them up in a bundle with the skull, and *forward them with the skin*, properly labeled.

In skinning the head of an animal having horns, it is necessary to make an opening at the back of the neck. Make the cuts as shown by the lines of the accompanying figure, cut completely around each horn

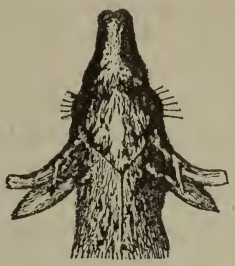

FIG. 4.—Opening-cuts at back of head.

at the base, and skin the head by working downward over the forehead and the cheeks. The head-skin of a large mammal is the most difficult part to remove and preserve successfully, and therefore the greatest care is necessary in its preparation.

PRESERVING SKINS IN A DRY STATE.

Skins of mammals may be preserved dry for any one of the following reasons:

(1) For purposes of study, during which frequent handling and examination is absolutely necessary.

(2) Lack of facilities for preserving in a soft state, which should always, when possible, be the method of treatment *for skins that are to be mounted.*

(3) The necessities of transportation; or, in other words, when it is necessary to reduce the weight of a collection to the lowest possible limit, and divide it into a number of loads for carriage overland.

One point in regard to study specimens must be constantly borne in mind, viz, that any specimen which enters a museum may possibly require mounting for exhibition, and all should be prepared in strict accordance with the advice which follows, in order that successful mounting may be possible in every case.

A.—FOR SMALL MAMMALS, IN ANY CLIMATE, VARYING IN SIZE FROM THE SMALLEST UP TO THE COYOTE.

Preservation.—When the skin has been removed and cleaned, the flesh neatly cut away from the leg-bones and skull, the brain very carefully removed from the latter, and all blood washed away, anoint the

inside of the skin with arsenical soap, applying it thoroughly to every part, so that the specimens will not require a second course of poisoning when they reach the museum. That done, rub on powdered alum, all that will stick to the skin, before the arsenical soap has time to dry, so that both will penetrate the skin together.

In the absence of arsenical soap, apply a mixture of dry arsenic (one-third) and powdered alum (two-thirds). Whenever the inside of a skin becomes so dry that the powdered arsenic and alum will not stick, moisten the inside of the skin with water, so that the preservative powder will form a sort of paste which can penetrate the skin.

Making up.—Having applied the preservatives, wrap a little tow, cotton, or rags around the bones of each leg, to partly replace the flesh and keep the skin away from the bone, so that both can dry quickly. This is also desirable in order that the legs may have a shapely, natural appearance, and show the pelage, so that it can be studied to good advantage. If this part of the process is neglected, the skin of the leg shrivels up and dries down upon the bone in a most unsightly way. In the tropics, the moisture in a leg-bone is sufficient to cause the decay of the skin which surrounds it, unless the two are well separated by some kind of wrapping. To avoid this, many collectors in tropical countries allow their skins to dry *wrong side out*—a very bad habit, which should never be indulged in under any circumstances, as thereby the skins are, in most cases, rendered totally worthless.

FIG. 5.—A badly made skin.

Having wrapped the leg-bones (just enough to bring them to their original size, but no more), turn the skin of each leg right side out over the bone and make the member as shapely and natural as your time will allow.

It has become an established custom in preparing skins to replace the cleaned skulls in the head, so that they can not possibly be lost. This is in general a good system, but in preparing skins for the National Museum remove the skull entirely from the skin. In this connection it is of the highest importance:

(1) That skulls never be allowed to get mixed, so that the collector or the curator is left in doubt as to which skins the various skulls belong.

(2) To prevent confusion by *attaching to each skull a label with a number or a mark corresponding to that which is tied to the skin.*

(3) To tie every small skull to the skin it comes from, and ship all large ones in the boxes which contain their skins.

In cleaning a skull, do not cut or chop away the back of it. This greatly lessens its scientific value, and in many cases destroys it altogether. Remove the brain, cut off all the flesh you can, and leave the remainder to dry up. Never put salt or alum on the skulls, especially if of small size.

In making up the skin, fill out the head, neck, and body with cotton or tow, to about the natural size of the animal when alive, *but no larger. Better leave it too small than fill it too full.* With a needle and thread take a stitch in the center of the lips to hold them together in drying. Sew up the skin to give it a neat appearance, and comb the hair so that it will lie naturally on all parts and show the texture and color-markings to the best advantage.

FIG. 6.—The best form for a small dry skin.

Shaping.—The ends to be sought in laying out a skin to dry are, to have it take up a limited amount of space in a drawer, to have all breakable points protected, and at the same time to have all parts of the specimen accessible for examination. The shape of a skin, therefore, must depend on its character and general nature. The accompanying figure represents the best form for the skin of a squirrel and all similar mammals.

To protect the tail from being broken, it is necessary in making up a skin in this form to put a wire in it for its whole length. For this purpose, use copper or zinc wire, for the reason that iron wire rusts and in time destroys the skin of the tail so that it falls away in small pieces. In making up the skin, cut the wire for the tail long enough to extend into the middle of the body, and wrap around it some fine tow to make it the right size to fit the skin. Some collectors wire all the legs of

small skins, which is a good plan if time will permit, as it makes it possible to place the legs in the exact position it is desired they should permanently retain.

This method of shaping small skins (e. g., with the tail extending straight back) should always be followed by American collectors, who can easily command the facilities necessary to render it safe and advisable. But for collectors who visit remote localities, and often have to transport their impedimenta for many miles on men's heads, done up in small bundles, and where every pound in weight and every cubic foot of space is carefully counted, another method must be recommended. Under such circumstances, small skins should be made up with the tail bent under the body, as seen in Fig. 7. The position is not unnatural, the general form is compact, the tail is fully protected by being bent under the body and tied down upon it, and the legs are not thrust out in such a way as to endanger the safety of the feet and claws. Animals with long slender legs, such as monkeys, sloths, etc., should be put up with the fore legs lying close against the sides, in the opposite direction from those of the squirrel shown in the figure.

FIG. 7.—Another form for a small skin.

B.—For Large Mammals.

Preservation.—On dry uplands most skins can be cured and dried very successfully by the use of salt alone. Indeed, on our western plains, the llanos of South America, and the high plateaus of Asia, to say nothing of the parched bush-veldt of South Central Africa, mammal skins dry and harden in an incredibly short time without the use of any preservative whatever. In such regions it is only necessary to apply a good coat of arsenical soap to keep off the vermin which would otherwise destroy them, and to keep them out of the sun.

In a more moist climate salt must be used to cure skins, so that the epidermis will not slip off in the slower process of drying. In the humid heat of the tropics, it is necessary to apply dry alum after the salt has done the curing, in order to make the skins become perfectly

dry and hard. Apply arsenical soap to everything, or its absence will be bitterly regretted when too late.

Do not "peg out" a skin, nor dry it in the sun under any circumstances, nor hang it up by the nose. Hang it over a pole or a rope, in a shady place where the wind will strike it. If it is necessary to travel some distance with a skin before it can be dried and shaped, salt it thoroughly to keep it from spoiling.

Shaping.—Since these directions will be used chiefly in preparing the skins of deer, antelope, and kindred ruminants, the accompanying illustration is given to show how such skins should be made up when they

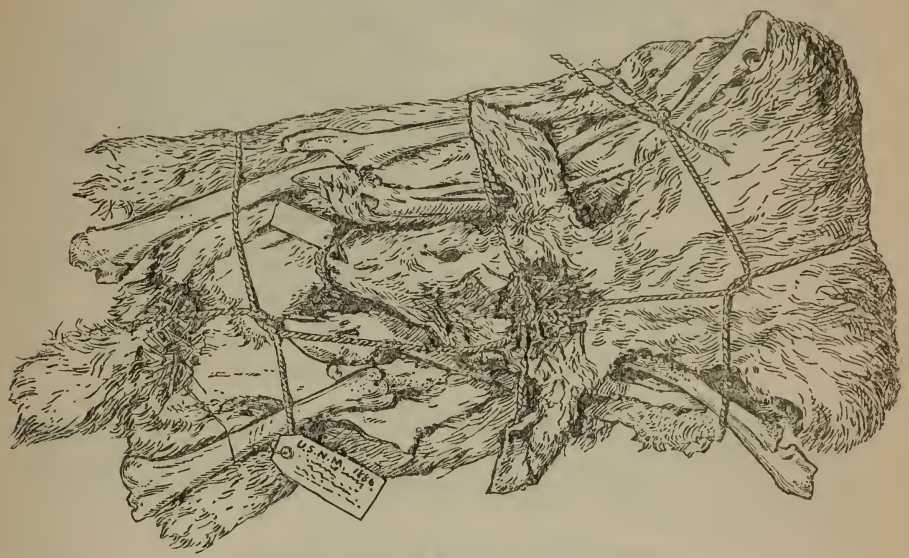

FIG. 8.—A well-made dry deer skin.

are to be preserved dry, either for study or for mounting. It is best to defer folding up a skin until it is partially dry and has begun to stiffen a little.

Fill the head and neck with some kind of loose material, and as the skin lies spread out with the hair side down, put some of the same material in a thin layer on the body. Fold over the edges neatly, placing the legs lengthwise on the top, and arrange the legs so that they will dry straight and flat instead of twisted like a cork-screw. A skin which is allowed to dry in such shape as that represented in Fig. 9 is of no use whatever, either for study or mounting. The skin of which this illustration is an exact representation was prepared thus in the field by a professional taxidermist. It may be taken as a good example of how *not* to do it.

Handling and packing.—It is unfortunate that it should be necessary to fold and dry large skins with the hair-side out, for the pelage is thus in constant danger of damage; but for skins that are to be examined

in a dry state there is no alternative. They must be handled carefully when handled at all, and when prepared for shipment must be *packed on all sides with straw, shavings, hay, or some other soft material*, which will keep the hair away from the sides of the box. A large elk skin

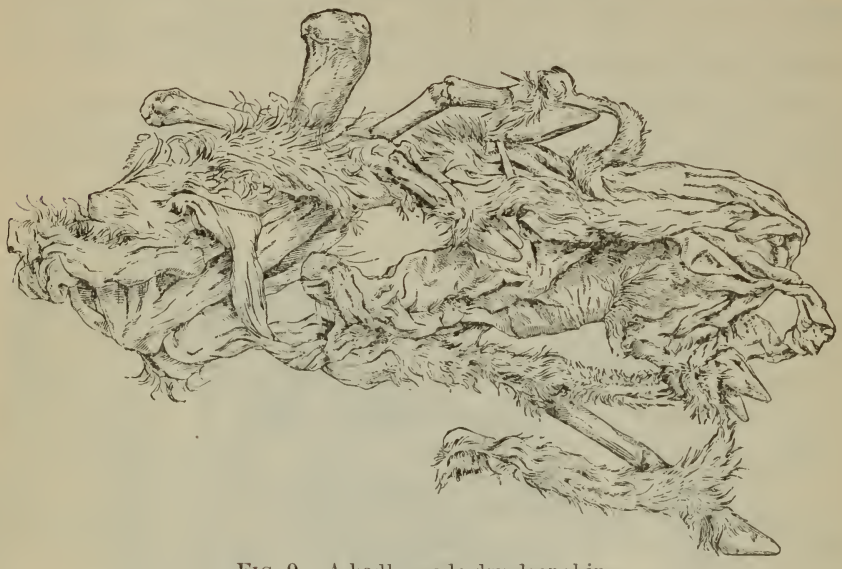

FIG. 9.—A badly made dry deer skin.

recently received by the Museum was ruined by not being packed properly. There was no filling around it to keep it away from the rough boards of the box, and consequently the hair was rubbed off in about twenty places.

PRESERVING SKINS FOR MOUNTING.

A great many collectors and sportsmen are often specially called upon to procure skins for immediate mounting, and it is always desired that these should be as perfect in every respect as possible.

Let me here call the attention of all collectors to the following fact:

A mammal skin which has never been dried and hardened can be mounted in one third less time and with far greater accuracy than the best dry skin of the same kind.

This being the case, it is certainly worth while to preserve skins in a soft state. A skin may be removed very unskillfully, but if kept soft until it reaches the taxidermist, it can be mounted with gratifying success. On the other hand, the dry skins of the most experienced collector can be mounted well only with difficulty.

The following methods are recommended:

In a temperate climate.—Under ordinary circumstances, in a temperate climate a skin may be preserved in a soft state by rubbing salt very thoroughly on the inside, and then leaving the skin turned wrong-side

out, packing it in salt, and shipping it in that condition as soon as possible. A better method, or rather *the best of all methods for any climate and all kinds of skins*, is to prepare a solution of salt and alum in water in the following proportions: For every gallon of water put in one pint of alum (three-fourths of a pound) and one quart of salt (one pound and three-fourths), stir it up, and heat it to the boiling point. Pour it into a wooden or earthen vessel, and when cool, or milk warm, it is ready for use. Plunge a skin into this bath and move it about until the solution reaches every part. Give a fresh skin plenty of room for the first day or two, and if it be a large one move it about every day for three days so that the solution can act with full force on every part.

Fresh skins of all kinds may be placed in this bath (leg-bones of small skins may also be left attached) and allowed to remain in it for months without deteriorating in any way; even after five years they are still as soft and pliable as when first taken off. *The skulls should invariably be detached from the skins and dried.* Small skins may be shipped in glass jars or wooden kegs, and large ones in barrels.

If you have alcohol sufficiently strong (30° *above* proof), skins may be immersed in it as fast as collected, instead of in the salt and alum solution. The objections to alcohol are that it loses strength very rapidly when receiving daily accessions of fresh skins, *bleaches hair*, and must be renewed from time to time until the collection is finally packed in fresh alcohol and shipped.

In an arctic climate.—As before stated, the salt-and-alum solution is *the best wet preservative for skins in all climates*, and for all objects from the largest elephant, seal, walrus, or polar bear, down to the smallest bat of the tropics. If it is impossible or impracticable to employ it, the skins of all large arctic mammals may be successfully preserved by immersing them in *very strong* brine, but it should be renewed at least once or twice. The skins of seals and small mammals may be simply packed in salt. Care should be taken that skins are not stained with iron-rust derived from nails projecting into the barrels or other receptacles in which they are placed.

In a tropical climate.—Skins can not be preserved with salt in a tropical climate, but must be immersed either in the salt and-alum solution, or alcohol, or else dried.

SPECIMENS IN THE FLESH.

The most valuable of all specimens which come to us are those sent in the flesh. A rare animal so received is sometimes cast in plaster, skinned, dissected, and skeletonized; and portions of the viscera may be preserved in spirits for anatomical study. In this way a single subject is often made to yield a number of valuable preparations. The Institution will be very glad to receive the dead body of any foreign animal which may die in the eastern United States, and also of any rare or especially fine North American species.

FORWARDING ANIMALS IN THE FLESH.

In cold weather, particularly from December 1 to March 1, a dead animal may safely be sent (frozen) from as far west as the Rocky Mountains. In the cool months of November and March specimens may safely be forwarded from points 500 miles distant. From May to October animals should be disemboweled and packed in ice when sent from points more than twelve hours by rail from Washington.

Large animals with thick hair, such as deer, elk, moose, bear, etc., can be sent without boxing, but it will be well to sew them up in coarse sacking to protect the hair. Small animals and others with close hair, such as the zebra, lion, tiger, or giraffe should be boxed and packed in straw or shavings to protect the hair from being rubbed off. Animals of the largest size, such as rhinoceros, elephant, or hippopotamus must be skinned and skeletonized where they die by our own preparators, who hold themselves in readiness to start at once for any point, on the receipt of information by telegraph.

The Smithsonian Institution will pay all charges for boxing and cartage upon presentation of vouchers in regular form, and all freight and express charges will be met here. As a rule, dead animals should always be sent by express, the exceptions being in the cases of large animals forwarded from a great distance in the middle of winter, when they could as safely come by freight.

All donations are promptly acknowledged by the director of the Museum, both by letter and in the annual report, and the names of donors also appear in the catalogues, and upon the large printed labels attached to their specimens in the exhibition cases.

TRANSPORTATION.

Specimens should be very securely packed previous to shipment, and plainly addressed as follows: "*Smithsonian Institution, Washington, D. C.: for the National Museum. Perishable.*" Shipments may be forwarded by Government vessels when available, or by the ordinary lines of transportation at the expense of the Institution.

In case immediate information or instructions are required in relation to any dead animal of special importance, which is at the disposal of the institution, the donor or his representative may telegraph without paying charges.

Telegrams and correspondence should be addressed to "*Prof. S. P. Langley, Secretary, Smithsonian Institution, Washington, D. C.*"

In all cases the *utmost dispatch* is necessary in order that specimens sent may reach us in good condition for anatomical study and dissection.

U. S. NATIONAL MUSEUM,
Washington, D. C., April 12, 1886.