

OTACARIASIS IN THE BIGHORN*

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In March, 1914, Mr. G. H. Thomson, superintendent of the Estes Park Fish Hatchery, Colorado, sent me a vial containing some material he had taken from a mountain sheep the previous December. Concerning the material, Mr. Thomson wrote as follows:

Last December we had a very severe fall of snow so that there was five feet on the level, which made it next to impossible to get around, and which made it exceptionally hard on our wild game. I found a two-year-old mountain sheep that had been separated from the bunch by a mountain lion and was tired out in the deep snow; with the help of others I got it on my horse and brought it home with me, and have had it since that time. It has been very interesting but some time after I had it here I found that it had some trouble with its ears from scaling off and the hair came out on its head; I treated it with vaselin and liniment which seemed to help it but the affection seemed to come from its ears on the inside. They would scale off down deep in the ears and block up its passage; I have opened them and have examined them very closely but could not find out the trouble. I have examined the scale under a heavy glass but even then failed to find the trouble; but this morning a portion of the scale looked different than usual as it came from deep down in the ears and upon examining it very closely I found that it was filled with a parasite. There did not seem to be any life in them, but when I warmed them up a little it was simply a mass of life. I am sending you a sample of the scale and also the scales with the parasites upon them and trust that they may reach you in life.

I should like very much to know what they are and also what the final effect would be on the sheep if it was upon the mountain side where it could have no attention. The sheep is doing well and eats well both hay and grain and also potato parings and most everything that I give him.

May 18 Mr. Thomson wrote again in reply to my inquiries, as follows:

From close observation of the sheep on the mountain side with a good glass there are not many that are affected, or if so not so badly as the sheep I had.

I used a strong solution of carbolic acid and olive oil on the inside of the ear and cleaned them out so the ear cleared up, and it was that way for some time but they came back later and I had to treat it again. I then sent it to the City Park at Denver so I have not been able to follow it lately.

The specimens arrived in good condition and were observed living for some time. Even at the first glance it was possible to determine it as a mite of the group known as Itch or Scab Mites, the Sarcoptidae. A study of both living and preserved material was made to determine more exactly the structure and relationship of the form.

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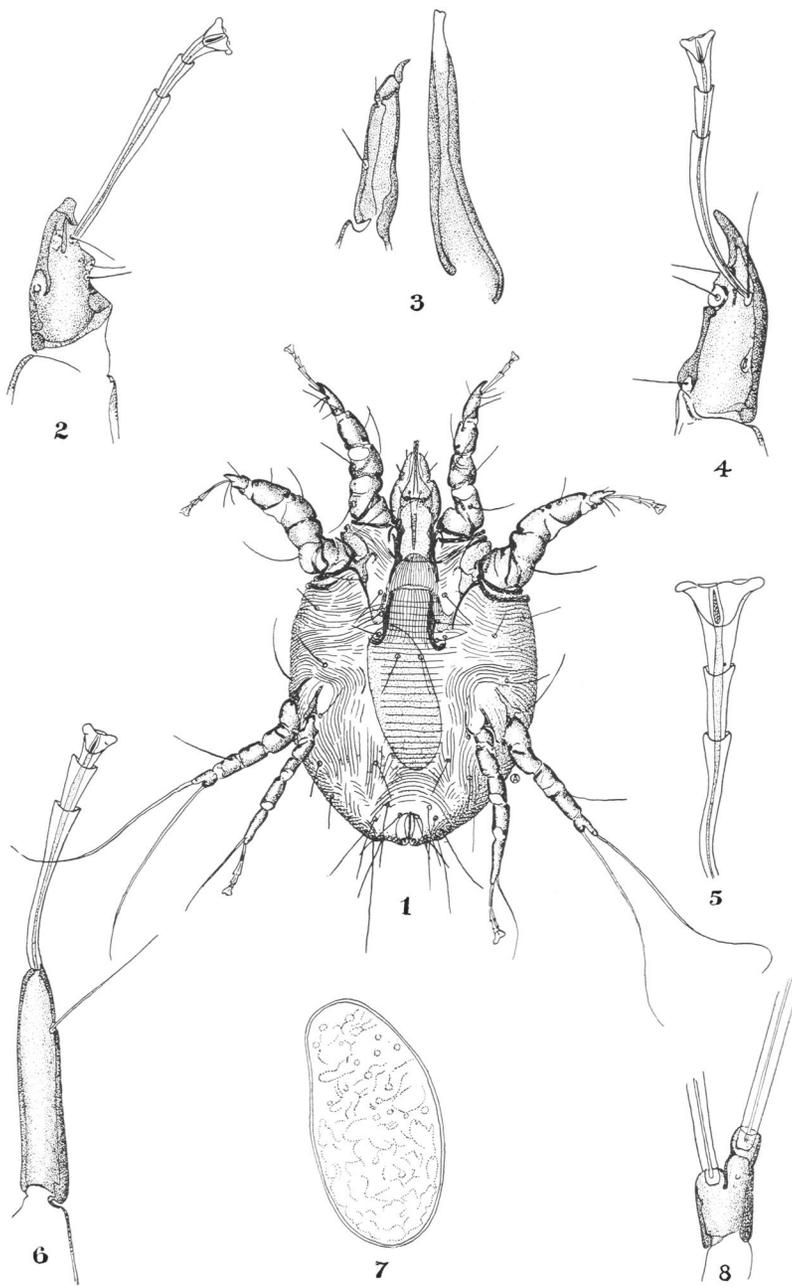
The full-grown ovigerous female (Fig. 1) measured from 680 to 750 microns in length and 425 to 545 microns in breadth; its average dimensions were 720 by 460 microns. Young females were 500 to 580 microns long by 390 to 440 microns wide, or on the average 535 by 410 microns. The male measured 490 to 570 microns long by 325 to 390 microns in width, with an average of 515 by 550 microns. The eggs measured varied from 275 to 355 microns in length by 120 to 220 microns in width; the average of undistorted specimens was 330 by 195 microns.

The form of the appendages can be most easily described by reference to the illustrations, which were made from camera drawings. Characteristic are the jointed stalked suckers (Fig. 5) that terminate the first, second, and fourth pairs of legs in the female (Figs. 2, 4, 6), whereas the third pair ends in two long slender bristles (Fig. 8). The mouth parts (Fig. 3) are apparently peculiar to this form and differ from any figured for species previously known in the genus. One can readily determine the numbers and location of the fine bristles occurring on each joint of each appendage, and also on the various regions of the adult female, which is illustrated (Fig. 1).

The male, which is not illustrated here, has two well-developed caudal lobes carrying long stout bristles. There is a conspicuous sucking disk at the base of each caudal lobe alongside the anal orifice.

As a rule, authors have sought to differentiate species by more conspicuous details of structure and by the type of scab produced while the varieties were named after the host on which the form occurred. In general, very few species have been recognized, sometimes only a single one, but with many varieties in a genus. Ability to transfer the parasite experimentally from one host to another has also been accepted as a measure of relationship, and those forms which cannot be transferred have been elevated from varietal to specific rank. Such physiological data are of great interest, but can hardly be accepted as adequate evidence of systematic position. When more exact anatomical descriptions have been written and utilized to differentiate the species, one can hardly doubt that some will prove to have adapted themselves under experiment to several hosts, and others will be shown to be exclusive in habit.

If now one seeks to find morphological data to distinguish species, it must be confessed that the descriptions given of the different species and varieties of these mites are unfortunately inadequate for accurate determination. For the most part the details cited by various authors are limited to the size of individuals of various ages and sexes; but these vary rather widely, even at the same stage of development, and the different varieties overlap in size so much that one might place a



EXPLANATION OF PLATE

Camera drawings of *Psoroptes cervinae* nov. sp.

- Fig. 1.—Ovigerous female in ventral aspect. X 59.
- Fig. 2.—Distal joints of leg II. X 350.
- Fig. 3.—Mandible and palp. X 350.
- Fig. 4.—Distal joint of leg I. X 350.
- Fig. 5.—Jointed stalked sucker. X 590.
- Fig. 6.—Distal joint of leg IV. X 350
- Fig. 7.—Egg. X 120.
- Fig. 8.—Distal joint of leg III. X 350.

given form in any one of two or three groups if that evidence alone were relied on.

Many of the figures given by different authors are admirable, and even a superficial examination of them discloses differences in the form, size and armature of various appendages, such as are clearly adequate for the differentiation of the species. But in the text accompanying the illustrations these items are neither described nor compared sufficiently precisely to enable others to utilize the data for the determination of species. This is not the place to enter upon an extended discussion of these details. The latest monographic revisions of the sarcoptids leave much undecided and vague regarding the species, and until a further study is made of a large series of forms one can only arrive at a partial conclusion regarding supposed new material.

The form under consideration unquestionably belongs to the genus *Psoroptes*, as it is described by Canestrini and Kramer (1899). These authors recognize only five species and confess that these are not well defined. The species are all named from their hosts; three *Ps. bovis*, *Ps. equi* and *Ps. ovis* produce the psoroptic scab well known on these hosts; *Ps. cuniculi* gives rise to auricular scab in rabbits; *Ps. gazellae* is extremely briefly described, and no data as to its origin and hosts or the disease produced are given at all. To these species must be added *Ps. caprae*, described by Railliet (1893). While the data given for the species are few, it seems that both because of size and because of the type of scab produced the form under consideration cannot be placed in any one of the first three species. It differs also too clearly from the species reported from the rabbit to be included in that even tho the type of the scab is the same. The measurements show the Colorado form is very much like *Ps. gazellae* and *Ps. caprae*, but the data given are so extremely scanty that one would be subject to criticism for basing any final decision on such incomplete evidence.

A comparison of the figures given by various authors to illustrate the species might be used to supplement the few general measurements they have recorded. The form from Colorado appears at once to be clearly differentiated from any other species which is figured. These differences are indicated by comparing the figure given here with those of *Psoroptes* given by Mégnin. Unfortunately for the purpose, all his illustrations seem to be made from the form found on the horse, which was formerly designated the typical variety of the single species in the genus, but is now regarded as one of the several distinct species. On comparison with this, the Colorado form appears to have a rostrum materially shorter and broader than in *Ps. equi*, designated *longirostris* by Mégnin; the proportions of the appendages do not agree with those in *Ps. equi*, and the stalked suckers are distinctly shorter as well as

apparently more slender in the Colorado form. Moreover, the shape of the body is not the same in figures of the two species. While these are apparently minor discrepancies, I consider them adequate to justify fully the separation of these forms as distinct species.

Unfortunately, no figures at all have been published for the species which in size most closely approximate this form. Of *Ps. gazellae* the describer (Canestrini, 1894) gives only scanty data regarding its general size. He says, further, that it is very similar in size to *Ps. equi* and in the type of scab that it produces to *Ps. cuniculi*. No data are furnished concerning the origin, geographical distribution, hosts or effects. To diagnose a species on this description would be venturesome.

Railliet (1893) has given a more extended description of *Ps. caprae* by referring to the records of other authors. His remark that an analogous observation was made by Ugo Caparini on a gazelle very likely refers to the material which was the basis of Canestrini's description of *Ps. gazellae*. But here again precise evidence is wanting to determine whether the Colorado form belongs in this species, of which more is said later in this paper. I am of the opinion that these two (*Ps. caprae* and *Ps. gazellae*) are the same species, and indeed it is impossible from the data given to separate them save by the hosts, which is an unreliable method. Yet it would certainly introduce even greater confusion than now exists to assign the Colorado form to either species in the light of the present scanty knowledge concerning both. The wide geographic separation of these hosts and the inadequate evidence on which to base a demonstration of the identity of the parasites together with the structural peculiarities of the Colorado form compel me to list the latter as a new species for which I suggest the name *Psoroptes cervinae*.

Ear scab, or otacariasis as it has been appropriately designated by Neumann, is not a frequent complaint but scattered references to such trouble are found in the literature. In 1834 Hering found a mite in the dog's ear; since then it has been discovered in the same and other hosts and renamed many times. It seems to be fairly common in dog, cat, and ferret in Europe. Many observers have commented on the severe epileptic attacks to which the infected animals are subject. These are especially sudden and violent among hunting dogs engaged in the chase.

This form lacks the caudal lobes on the abdomen of the male and has been made into a separate genus, now designated *Otodectes*, of which at least two species are known, *O. cynotis* Hering and *O. furonis* Railliet. Banks (1904:99) says that the first species has been taken in this country. These species are both so distinct from the Colorado form discussed here that confusion is unlikely.

The Colorado form is also a very different mite from that reported by Leidy (1872) which was found in the ear of an ox.* That form belongs to the Gamasidae or beetle mites, whereas the species under consideration here is grouped with the Sarcoptidae, variously called scab mites or itch mites. To this group belongs different species that produce various types of itch or scab in man and other higher animals. Many of those that frequent other hosts are transferable under circumstances to man and produce on this host a type of itch which may be temporary and relatively insignificant or on the other hand lasting and difficult to eliminate. It is not known that any form of ear itch can be transferred to man.

Auricular psoroptic scab, or psoroptic otacariasis, has been known in Europe where it was first reported by Pezas from the wild goat of the Pyrenees. The cause of the trouble was recognized as a mite in the external auditory meatus and the species was identified as *Psoroptes communis* var. *caprae*. The determination was confirmed by Pench and Neumann and in a second case by Mégnin and Railliet. Otacariasis was also observed in the Congo by Mense who regarded the cause as a special form of *Psoroptes* to which he gave the name of *P. congolensis*. However, Gedoelst (1909) has shown that the Congo form is the same species of mite as that which gives rise to the disease in the goats of the Pyrenees, or at most in his opinion a closely related variety. Mense reported that the goats became deaf, refused to eat, and in a few months perished. According to all these authors the malady is serious, and the prognosis grave unless the trouble receives immediate attention. This is naturally excluded whenever the trouble appears among wild animals and in the case of such the disease will necessarily run its course unhindered.

The only mention I have found of scab on the mountain sheep of Colorado is printed by Warren (1906:238) who writes in his section on the Bighorn as follows:

“C. F. Frey tells me they suffer much from scab in the West Elk Mountains and that a party told him in 1901, at one place near the head of Sapinero Creek seventy-five head were counted which had died of scab. Domestic sheep have been seen in that locality, and the wild sheep doubtless contracted it from them.”

* In this connection I may correct a misstatement of Freund (1910), who says that Trouessart is in error, as all others before him, in citing the name of this species as *Gamasus auris* Leidy and that Leidy never used the specific name *auris*. To be sure Leidy did not employ that name on his first note (1872:9) read at the January meeting of the Philadelphia Academy, but did in his supplementary reference (1872:138) made at the June meeting. Evidently Freund did not see the original of Leidy as he cites the pages incorrectly as well as misstates the facts regarding the text. Leidy both described and named the ox ear mite.

This is not the same complaint as the one described in this paper, but is that well known among domesticated sheep and designated usually as common sheep scab. Salmon and Stiles (1898) have given an extended account of that disease. It is highly contagious and probably easily transmitted to susceptible wild species by means of wool, scab, etc., scattered over the range. Treatment is essential and very few animals make a spontaneous recovery. So far as has been ascertained no observer has recorded auricular scab, or any trouble caused by a different species. Hall (1912) states he found the common scab mite of sheep on a mountain sheep, *Ovis nelsoni*, which was suffering from scab in the National Zoological Park, Washington, D. C. No statement is made concerning the source of this infection. Since neither Salmon and Stiles, nor so far as I have ascertained any later author refers to auricular psoroptic scab, I am led to believe that it is at least uncommon among domestic sheep in this country. This accords with conditions abroad where its occurrence is noted only in the two regions named.

Finally a word on the general import of the trouble reported in this paper. It is stated on the one hand that mountain sheep still exist in the United States in sufficient numbers to assure their continued existence if reasonable laws are enforced—except for the danger of disease. On the other hand little or nothing is known of the types of disease prevalent among these animals or the range and severity of the various maladies. In Colorado the Bighorn is believed to be increasing in numbers and this if true renders them more likely to be visited in that region by epizootics of some sort. Prominent among such are diseases of parasitic origin and the importance of calling prompt attention to attacks of such diseases needs no special elucidation. This is the justification for publishing a brief discussion of such a malady as that which has been brought to my attention through the observations of Mr. Thomson.

SUMMARY

The ear of a mountain sheep at Estes Park, Colorado, was found to be heavily infested with a Sarcoptid mite which was not the common scab mite of domesticated sheep but is new in this country.

This form is similar to a mite found in the ear of goats in the Pyrenees and in the Congo. Nevertheless there is reason to consider it a new species and it is named *Psoroptes cervinae*.

The complaint to which it gives rise is likely to be serious if its effects are like those of the related European form. The Bighorn has been very greatly reduced in numbers by other causes and this malady merits the closest attention as a real menace to its host.

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