Hair Types in the Fur of the Pyrenean Desman (*Galemys pyrenaicus*) GEOFFROY, 1811 (Insectivora: Talpidae: Desmaninae)*

By WALTER PODUSCHKA & BERNARD RICHARD

Mit 7 Figuren

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Introduction

For more than 25 years, American Mink (*Mustela vison* SCHREBER, 1877) escaped from a fur farm near El Espinar (Sierra Guadarrama, in northern Central Spain). They quickly spread and are suspected of being the main culprits in the extermination of the local Desman population. However, since this sad fact may also be due to water pollution, to "scientists" and unscrupulous lifetrapping or to the destruction of decidous forests along the riverbanks and their replacement with conifers, the Mink's alleged guilt has to be substantiated through the finding of Desman bones and/or hair in their faeces. Unfortunately no such proof has yet been undertaken, due mostly to the lack of knowledge about the characteristics of the Desman's fur. This paper is intended to amend this insufficiency.

DAY (1966) published details of a method for the identification of mammalian hair in the faeces of predators, but he distinguished only two hair types: woolly hairs and sharply bent guard hairs. Unfortunately, his general remarks about the lack of a clear distinction between these two types of guard hair and "fine" (= woolly) hairs in the insectivores are incorrect. Since he also maintains that moles and shrews have identical hair scale patterns and that mole hairs (Talpa europaea) have a circular or oval section with heavy pigmentation and thick cortex (both of which are also incorrect), his opinion is not useful for our purpose.

Material and Method

In October 1984, field studies were undertaken in the Sierras Guadarrama, de Gredos, de Avila and de la Piña de Francia (northern Central Spain), to check and study the mammal traces at the riversides of several remote rivers and brooks.

The fur of a fully-grown Pyrenean Desman was studied for its hair types, which were investigated and photographed. They were examined with the light microscope as well as with a scanning electron microscope. Afterwards, they were compared with hair types from other mammals.

For the macro-photography (taken with the bellows) we used a NIKON F camera with a focussing screen and eye-piece magnifier. The lens was a MIKRO-NIKKOR-P Auto 1 : 35 f = 55 with a macro adaptor

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ring. The light microscope was a LEITZ LABORLUX 112 and the scanning electron microscope a STEREOSCAN MARK 2a. Before examination with the electron microscope, a layer of gold (400 Å) was applied to the objects with a cathode atomizer HUMMER jr.

Results

Like all Insectivores, *Galemys pyrenaicus* has three types of hair (Fig. 1) which correspond to DE MEIJERE's classification (1931):

Type 1: wavy woolly hairs.
Type 2: straight guard hairs (Leithaare), a term used by BRUNNER & COMAN, 1974.
Type 3: sharply bent Grannen, that become broader towards the tip.

Types 2 and 3 should not be confused with one another or assumed to belong to one single category (a mistake made by BRUNNER & COMAN, 1974). In order to maintain this distinction we prefer to use the older German expression "Granne (plural Grannen)" for type 3, since it is one of the most important and most easily distinguishable hair type.

Type 1: woolly hairs.

They are wavy (up to 5 waves) and have no special enlargement. Proximally they have a diameter of about 7.5 μ. The greatest width is 13.5 μ, the tip 3 μ. The cuticle is very thin, the medulla cells visible, separated from each other by air-filled spaces. The cuticular scales are elongated (Fig. 2). The woolly hair is twisted several times.

Type 2: Leithaare (guard hairs).

According to TOLDT (1910/11) guard hairs are by no means an homogenous hair-type among all mammals, but in any fur they are the stoutest and longest hairs and easily distinguishable in form and colour. They are larger, grow quickly and overtop the other hairs in the juvenile fur as well as during the moult. They are specific to the particular species and occur on different parts of the body in varying abundance. They are, however, most numerous around the base of the tail. In addition, they have a certain haptic importance (PODUSCHKA, 1969).

A Desman guard hair is a slender spadix, slowly increasing in width and broadening slightly along the last two fifths of its length towards its apex. It is never broader than the Granne-type and certainly never sharply bent. Thus the Leithaar is nearly straight with a straight tip, never showing an isthmus as the Granne does. In the shaft, there can be seen shrunken medulla cells near the radix, with some air-filled spaces between them. In the proximal part of the hair (one sixth to one half of its length) the medulla cells have no pigment. Towards the middle they are very densely packed without any air-filled spaces. In the apical part (after broadening) the medulla seems to be filled up with cortical tissue. The proximal part has a width of about 16.5 microns. The greatest width is about 135 microns (= 0.135 mm!) and the tip measures 4.5 microns. The thickness of the cortex is about 10 microns. The scales are very delicate (Fig. 3) and in the middle part of the hair very dense.

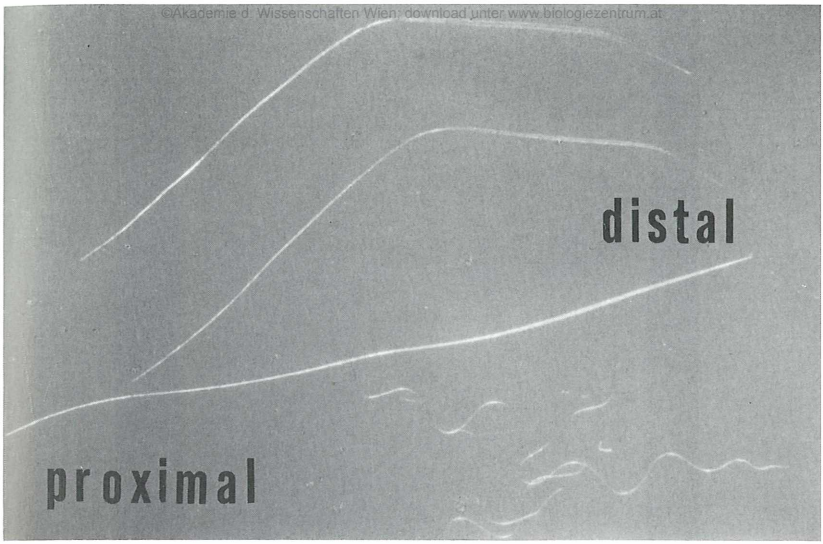

Fig. 1: Hair types of Galemys pyrenaicus: 2 (bent) Grannen, 1 Leithaar, 4 woolly hairs.

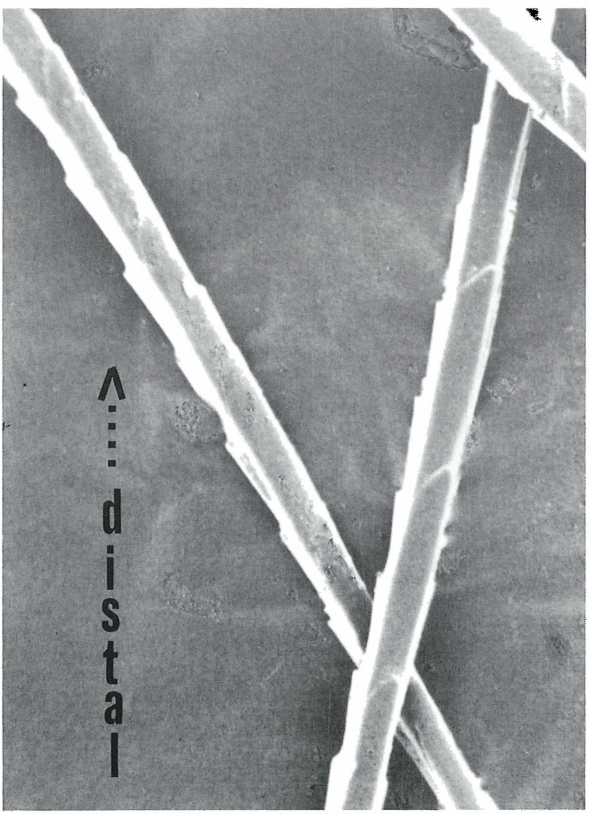

Fig. 2: Woolly hairs. × 550.

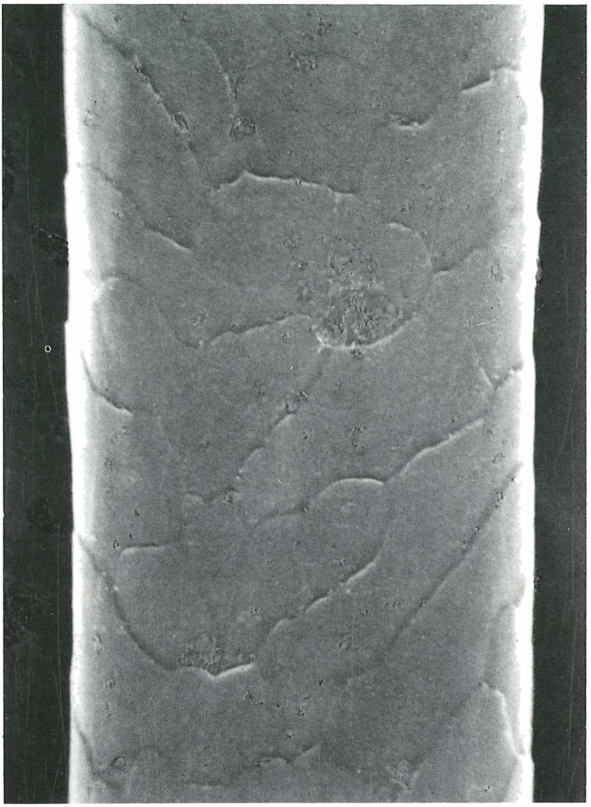

Fig. 3: Leithaar (= "guard hair"), middle part. × 650.

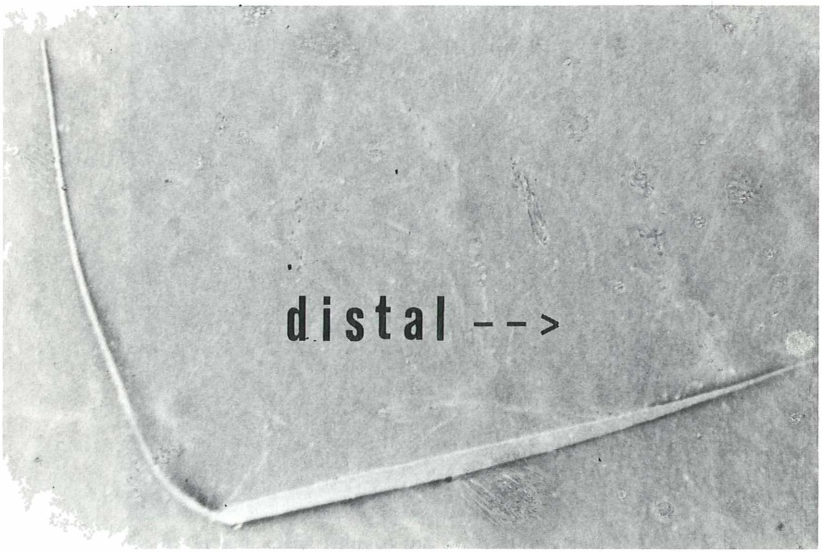

Fig. 4: Granne (without proximal part!). Note the bent form and the broad apical part. × 22.

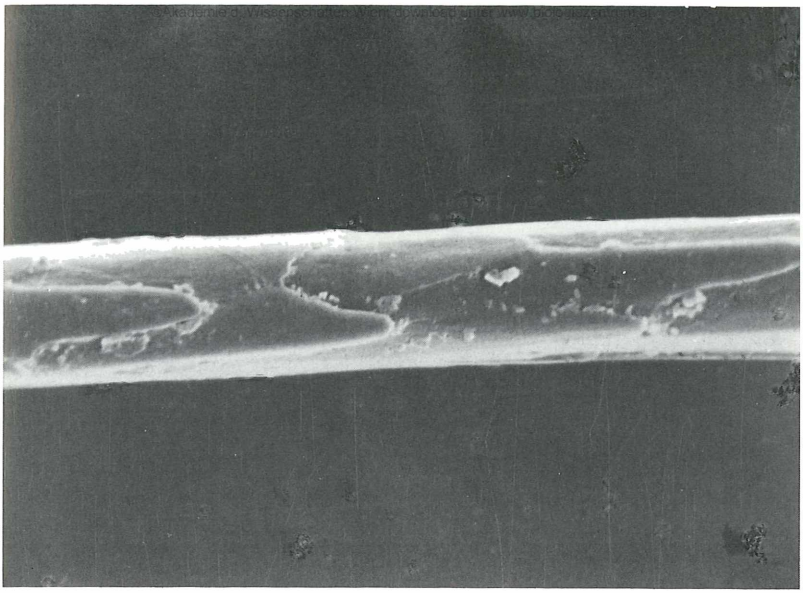

Fig. 5: Granne, proximal part. × 1100.

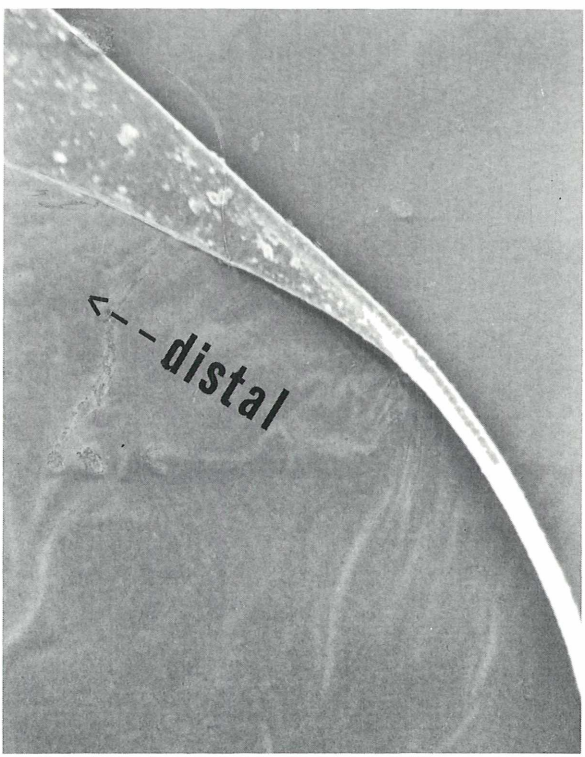

Fig. 6: Granne, stem, isthmus and broadening apical part. × 220.

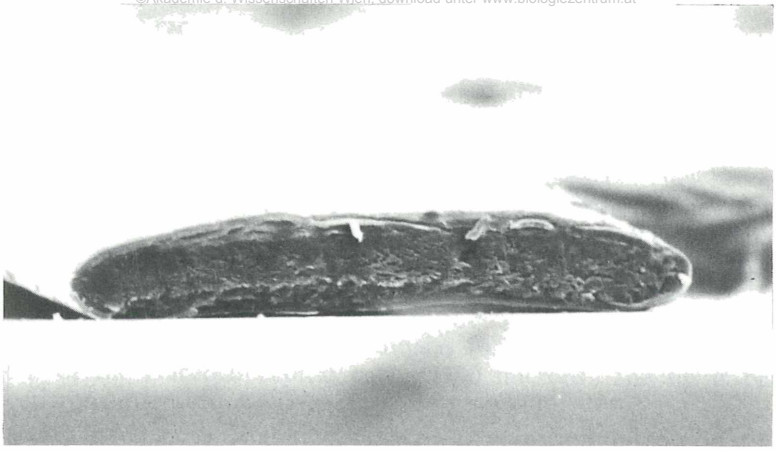

Fig. 7: Cross section through the apical part of a Granne. Note the absence of a medulla. × 650.

Type 3: Grannen.

The Granne is the most typical hair type in the Desman (Fig. 1 + 4). The very sharp tip is bent slightly inward (contrary to some other Insectivore Grannen, PODUSCHKA & PODUSCHKA, 1985 b). The Granne begins with a thin proximal part (Fig. 5) with pigmentless medulla. Only in the middle part can a few scattered medulla cells be seen. They become denser towards the isthmus but just before the isthmus the medulla tapers off to a point and disappears completely. With the isthmus the broadening and flattening begin immediately (Fig. 6). In the flat and broad part we could not detect any medulla at all (Fig. 7) – which is quite remarkable in Insectivore hair. The proximal width of the Granne is 15 microns. The shaft before narrowing into the isthmus is 40.5 microns and the greatest width of the lanceolate apical part is 150 microns. The tip is only 4.5 microns in width.

Our investigation thus proves that the examination and section of the apical part of a Granne hair gives us the main parameter for distinguishing between Grannen in the Desman and those in other mammals. It cannot be mistaken. Therefore, when investigating the faeces of American mink introduced to Central Spain, one should look especially for this particular section of the apical part of a Granne hair, for the very typical lack of a continous medulla and also for the proportions of the Granne hair's composition.

Present-day descriptions of the fur of *Galemys pyrenaicus*

GEOFFROY (1811) distinguished in the Desman's fur "ses longues soies & son feutre", but restricts his findings to colouration only. DOBSON (1882, p. 130) wrote "In all important respects . . . in the quality and distribution of the fur the most complete resemblance exists" to *Myogale (= Desmana) moschata* LINNAEUS, 1758. However, when describing the latter genus, he only points out "The whole body is clothed with very dense, erect, mole-like fur, composed of equal-sized hairs" – which is incorrect. TRUTAT (1891) describes exactly the occurrence of hairs on the different parts of the body, but deals mostly only with length and colour. As hair types he mentions "deux sortes de poils; les uns longs, brillants, irisés lorsque l'animal est dans l'eau, sont bruns sur les parties supérieures, blancs en-dessous, les autres sont courts, plus fins, plus soyeaux & bleuâtres"

As already pointed out by TOLDT (1910/11), the terminology of hair types was not generally agreed upon. Up to our time many authors recognized only two types of hairs. As far as Insectivores are concerned, this was claimed by TROUESSART (1909, 1910), CABRERA (1925), ALLEN (1938), ANTHONY (1941), DAY (1966), FALIU et al. (1980), HEANEY & MORGAN (1982) and many more. It was challenged by DE MEIJERE (1931), TOLDT (1910/11, 1928, 1931), LOCHTE (1938), PODUSCHKA & PODUSCHKA (1985 a, b). But it has to be emphasized that with regard to the Desman, RICHARD & VALETTE VIALLARD (1969) were the first

authors to point out broadened hairs "en forme de lancettes sur les tièrs distal", thereby recognizing typical Grannen in the Desman's fur*.

DEBROT et al. (1982, p. 50) have published a drawing as well as photographs of the profile of Desman hairs, but they confine themselves exclusively to Grannen and neglect the other hair types; they just mention the woolly hairs and consider that the guard hairs (Leithaare) "ne presentent pas grand intérêt, surtout à cause de leur rareté" We cannot follow this gratuitous restriction, having pointed out differing results with other Insectivora (PODUSCHKA & PODUSCHKA, 1985 a, b) as well as with the Desman (this paper).

Discussion

One of the most important problems for this paper is the proof that the hairs of terrestrial moles cannot be confused with the Desman's. According to CORBET (1978) in Spain one finds *Talpa europaea* LINNAEUS, 1758, and *Talpa caeca* SAVI, 1822, which live even sympatrically in some parts of the country.

TOLDT (1910/11) and HAUCHECORNE (1927) both describe three types of hair in *Talpa europaea,* but TOLDT (1928) criticized the latter author for his negligence of older literature and obvious inability to recognize the rather unmistakable guard hairs (Leithaare).

Having proposed, however, that the medulla-less flattened part of the Desman Granne be taken as a differential criterion, we are happy to point out the excellent demonstration of *Talpa* hairs *(europaea, caeca* and *romana)* and also of *Galemys pyrenacicus* by DEBROT et al. (1982). Their results match ours: the section of a Desman Granne taken at the flat, lanceolate, apical part cannot be confused with a section taken of *Talpa* hairs and hardly with hairs from any other European mammal. Therefore, when investigating Mink faeces for remnants of prey, the devouring of Desman can be proven.

Summary

In Central Spain, the survival chances of the Pyrenean Desman *(Galemys pyrenaicus)* seem to have been nullified by American Mink that have escaped from a fur farm. Since, however, there is no exact proof of the Mink's guilt, an investigation of Desman hairs had to be made. This investigation was successful: The Grannen in the Desman's fur seem to be unique among Western European mammals, displaying in a cross section cut through the flattened, apical part the complete absence of a medulla. Thus, any hairs showing this pecularity and found in Mink faeces, prove that the Mink kills Desmans.

Since the term Granne is defined even in lexica as "straight hair" which allows it to be confused with the Leithaar (guard hair) type, we retain here the German term Granne on account of the priority given it by TOLDT (1910/11). It is certainly n o t straight but distinctly and sharply bent.

Zusammenfassung

Durch aus einer Pelztierfarm in Zentralspanien entkommene Amerikanische Nerze (Minks) *(Mustela vison)* scheinen die Überlebenschancen des Pyrenäen-Desmans *(Galemys pyrenaicus)* in Frage gestellt. Zur Prüfung dieses Verdachtes wurde das Haarkleid des Desmans untersucht und brachte das folgende Ergebnis: Ein Querschnitt durch den flachen apicalen Teil der Granne zeigt ein unter westeuropäischen Säugetieren einmaliges Fehlen der Medulla. Damit kann durch Feststellung solcher Haare im Kot von Minks bestimmt werden, ob ihm Desmane als Beute dienen.

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Authors' addresses: Dr. WALTER PODUSCHKA, Insectivore Research Center, 1140 Wien, Austria, Rettichgasse 12; Dr. BERNARD RICHARD, Laboratoire souterrain, Moulis, 09200 Saint Girons, France.