



# BIOFACTS

## Interpreting Mammal Pelts

## FUNCTIONS OF MAMMAL PELTS

- Physical protection or defense
- Insulation
- Camouflage
- Sensory functions
- Waterproofing



Mammals are the only animals that have hair or fur; it is one of the characteristics of a mammal. A pelt of a mammal is their skin, fur and all. The skin's primary function is defense or protection. It serves as a barrier, protecting the animal's soft inner structures against impact and pressure and maintain stable bodily fluids. It serves also as a sensory receptor for touch, pain, cold and heat. Thick hair such as that of the lion's mane and grizzly bear's fur do offer some protection from physical damages such as bites and scratches.

The fur provides insulation against variation in environmental temperatures by helping endothermic mammals regulate internal body temperatures. In an aquatic environment, the fur is waterproofed to help insulate against the cold water temperatures.

Pigmentation of skin and hair facilitate thermoregulation because the darker colors absorb heat, whereas lighter colors reflect the sun's rays. In general, within a population of a specific species, in areas that are either warmer or that have lower humidity levels, their fur tends to be lighter. A camel, lion, meerkat and kangaroo all live in hot, arid habitats and have pale, light colored coats.

Color and patterns are important features of mammalian hair. The universal function of external pigmentation is to provide protection from ultraviolet radiation and this is the reason why the upper (dorsal) surfaces of animals tend to be darker than their lower (ventral) surfaces which face away from the sun. This **countershading** also serves to conceal an animal. This method of camouflage is seen in penguins, red pandas and koalas. Take for example a penguin in the water - it is hard to see a penguin from below, because the lighter underside is against the light sky and a predator from above would have trouble picking out the dark upper surface hidden in the deep, dark ocean.

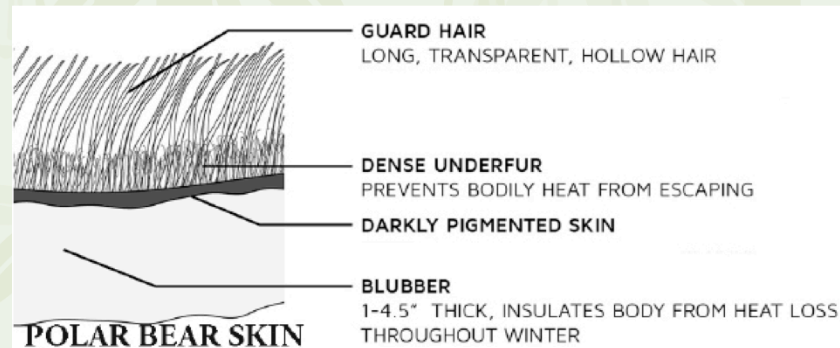
Coloration is important in camouflaging an animal; camouflaging increases an animal's chances of survival if a prey animal or success in hunting if a predator by preventing detection. Disruptive coloring, such as stripes and spots, help break up an animals outline, thus making it more difficult to see or recognize. An example of this is zebra striping, which helps the animal both blend in with tall grass and makes picking out one zebra from a herd more difficult. Also, a tiger's stripes can render the Sumatran tiger almost invisible in a tropical forest. What other animals can you name that may be hard to detect in their habitat?

Hair or fur is dead and made of **keratin**. Nerve endings are wrapped around the follicle and are sensitive to a hair's movement when it is tilted or bent. Mammals use this sense to detect direct physical contact and they also use the hair movements to gauge wind or water currents if a water mammal. Hairs standing up on end can also serve to warn other animals of impending danger.

**Note:** It can be useful and fun to ask children if they have fur. Discuss with adults the advantages or purpose of facial hair.

## STRUCTURE OF MAMMAL PELTS

- Pelts consist of two layers – the underfur and guard hairs.
- The underfur provides insulation.
- The guard hairs provide protection and coloration.



Mammals characteristically have two layers of hair forming the pelage (fur). There is a dense and soft undercoat, which traps a layer of air, providing insulation; the insulation provided by fur comes not from the hair itself, but largely from the layer of air trapped within the fur. Long, coarse hairs form the protective outer guard coat. These coarse hairs protect against wear and also provide coloration of the pelt. Insulation is improved by “fluffing up” these hairs. This same action of raising one’s hair is used in aggressive or defensive behavior to make oneself appear larger and scare the enemy away. Warm-blooded animals, when they get too cold, can also shiver to generate more heat or may get goosebumps to trap air against the skin, creating a layer of insulation.

These guard hairs protect the underlying fur and skin and help shed rain or snow. In water, guard hairs become wet and matted down, forming a protective blanket over the underfur. In aquatic mammals, such as sea lions and otters, the guard hairs are so dense that it is almost impossible to wet. In the case of the otter or the wolverine, the pelt is waterproofed by oily secretions from their sebaceous glands. The oils prevent water from penetrating the pelt to the level of the skin and maintain an insulating layer of air within the pelt. In the case of the wolverine, the oily fur is resistant to both water and frost. Because of this, wolverine pelts are favored for use in coat linings by hunters and trappers.

What other group of water animals use oil as a means of waterproofing? Aquatic birds waterproof their feathers with oils insulating themselves from the cold water.

It is also interesting to note that the polar bear, wolverine & caribou/reindeer have hollow, air-filled guard hairs; the hollow shafts help the guard hairs from matting when it gets wet and snowy and helps these high latitude animals maintain their insulated layer even in extreme cold. It also gives them some buoyancy while swimming.

Sea lions and seals spend part of their life cycle on shore giving birth. Their fur is used to protect against the abrasive, sandy and rocky shore. How do pinnipeds (seals, sea lions) keep warm in the cold ocean waters? Just like the polar bear, they have blubber, just under the skin and they tend to be large and “sausage shaped” or streamlined. If these marine mammals used fur to stay warm, during deep dives, the pressure would squeeze out the air in their pelts that would be insulating them from the cold. Instead, the blubber keeps them warm. Smaller marine mammals tend to have highly insulated layers of fur. An extreme example is the sea otter who coincidentally does not dive as deep as the sea lions and seals. In fact, the sea otters have the densest fur of all animals.

Other aquatic mammals such as whales and dolphins spend their entire life cycle in the water. They have naked skin on their torsos but they too have thick blubber for insulation. Just ask the whalers – they exploited this source oil!!!

Hippos and whales share a common ancestor. Hippos adapted to spending time in the water. Is it a coincidence that whales and hippos both use blubber to stay warm?

## MAINTAINING PELTS

- Mammals use self and/or mutual grooming to maintain their pelt.
- In primates, mutual grooming helps establish social bonds.
- Mammals replace their fur in annual or seasonal sheds.



A mammal relies on its fur for survival, so it must be kept in good condition. Grooming is carried out with teeth, claws, or nails. The purpose is to get rid of dirt, mud, pests, such as lice and fleas and tangles in the fur. Grooming also spreads natural skin oils from the sebaceous glands of the hair follicles to keep the hairs smooth, pliable and water-resistant. Felines and wolves groom with their tongues. Sea lions even have noticeable claws that are used to groom their fur. Lemurs have a row of forward-pointing teeth in the lower jaw that are used as a 'tooth comb' for self-grooming. Monkeys and apes rely on their prehensile hand for grooming. **Note:** Birds use their beaks to maintain their feathers.

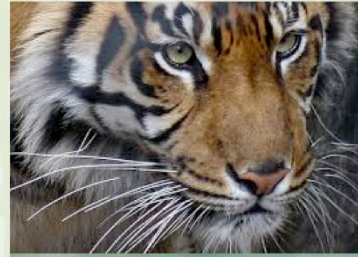
In some groups of mammals, mutual grooming occurs not only for hygiene but also for social reasons. Parents help groom their offspring to establish parental bonds, breeding couples groom to establish close relationships and grooming is used to reinforce rank in a hierarchical society within social animals. Usually lower ranking submissive animals are expected to groom the more dominant members of the group. This is especially true in the primates.

In most mammals there is periodic shedding (annual or seasonal) of the entire coat. This keeps the animal's pelage fresh and maintains its effectiveness as insulation. Seasonal molts may change the color and thickness of the pelage. For example the arctic hare sports a brilliant white coat that provides excellent camouflage in a winter of ice and snow. In spring, the hare's colors change to blue-gray to more closely resemble local rocks and vegetation. The fur grows thicker in the winter, to insulate the hare against the cold.

**Note:** Shedding one's fur is the same concept as birds needing to molt their feathers or snakes shedding their skin.

## SPECIALIZED HAIRS VIBRISSAE

- **Vibrissae** or whiskers serve as sensory organs and are very sensitive to touch; the base of each whisker is well-supplied with nerves
- Vibrissae are especially found in certain nocturnal terrestrial and marine mammals
- A whisker pattern can be used to identify individual cats.
- Early mammals filled a niche that dinosaurs did not; they were arboreal, nocturnal and insectivorous; vibrissae aided these early mammals to become successful hunters at night.



Whiskers or **vibrissae** (sing. **vibrissa**) are a specialized type of mammalian hair that are typically long and stiff and are well innervated (supplied with nerves), providing an enhanced tactile sense. They are usually thicker and stiffer than other types of mammal hair. Whiskers are found throughout the Order Carnivora, particularly in aquatic and nocturnal species (i.e. cats, wolves, sea lions and seals). They can also be found in the rodent and rabbit families.

Whiskers serve various purposes, but are most commonly used to locate food. Differences in vibrissae can be species specific and they can vary in their location and as well as their function. Many terrestrial mammals can detect air currents with their whiskers, which may warn them of approaching danger. Pinnipeds (seals and sea lions) have 10 times the innervation of terrestrial mammals; they sense vibrations in the water and are able to forage in muddy waters.

**Note:** It is the vibrissae that enable our two blind sea lions to successfully navigate around their exhibit in spite of the fact that they have never seen it.

Whiskers played a role in the early evolution of mammals. The first mammals were small, arboreal and coexisted with dinosaurs. They became adapted to the main ecological niches that weren't occupied by the dominant dinosaurs: hunting insects at night, when predatory dinosaurs were least active, and living high up in trees. Facial whiskers would have given these early mammals a sensory advantage, using the increased sensitivity of touch provided by vibrissae to help them move and hunt in the dark.



## PELT CONSERVATION ISSUES

- Fur Trade is fueled by the demand for the product.
- Furs of boreal, polar and cold temperate mammals have been the most valued.
- **CITES** monitors international trade of endangered species



Many animals with attractively colored or patterned fur coats have become endangered from being hunted for their pelts. There is a significant illegal fur trade, especially for tiger fur within Asia. These endangered species include big and medium cats as in the photo. Captive breeding on fur farms and restriction of trade in furs and skins by the CITES agreement have reduced the need for wild kills. **CITES** (Convention on International Trade in Endangered Species of Wild Fauna and Flora) is an international agreement between over 175 nations that works to protect endangered and threatened species.

Wildlife crime is a big business. Run by dangerous international networks, wildlife and animal parts are trafficked much like illegal drugs and arms. Many countries are now working to eliminate poaching and increase law enforcement. Wildlife trade alone is a major threat to some species, but its impact is frequently made worse by habitat loss and other pressures.

One of the most powerful tools for addressing illegal and unsustainable wildlife trade is persuading consumers to make informed choices. This includes the people buying the end product as well as shop-keepers, suppliers and manufacturers. You should actively discourage the purchase of certain wildlife goods and encourage the production and purchase of sustainable wildlife goods. Some of ways one can help wildlife is to support the ban on selling any object containing ivory or refusing to purchase clothing containing animal fur.

## KEY PELT BIOFACTS CONCEPTS

- The primary functions for a pelt are protection and maintaining a constant body temperature.
- Pelt thickness and coloring relate to the environment in which the animal lives.
- Primates use mutual grooming for both cleaning/hygiene purposes and to establishing and maintain social bonds.
- Whiskers serve a tactile function in many mammals.

Corresponds to the Biofact Study Guide In the Docent Notebook. For specifics on the Zoo's biofact bags and carts read the individual Biofact Talking Points in the Docent Notebook

## KEY PELT BIOFACTS VOCABULARY

- Countershading
- Keratin
- Vibrissa (pl. vibrissae)
- CITES

### Definitions:

**CITES** (Convention on International Trade in Endangered Species of Wild Fauna and Flora): an international agreement between governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival.

**Countershading:** a method of camouflage in which an animal's coloration is darker on the upper side and lighter on the underside of the body.

**Keratin:** a protein and the major structural component of skin, hair/fur, fingernails, claws, horns and hoofs of mammals and feathers and beaks of birds.

**Vibrissa:** a whisker, any of the long stiff hairs growing around the mouth or elsewhere on the face of many mammals, used as organs of touch.