



**centre de
développement
pédagogique**
*pour la formation générale
en science et technologie*

Working document

Carnivore or herbivore!

Physical adaptations of the giant panda



**Accompaniment booklet
(AST)**

October 2010

Some information pertaining to the anatomy of skulls

The jaw bones ...

The maxilla: upper jaw bone

The mandible: lower jaw bone

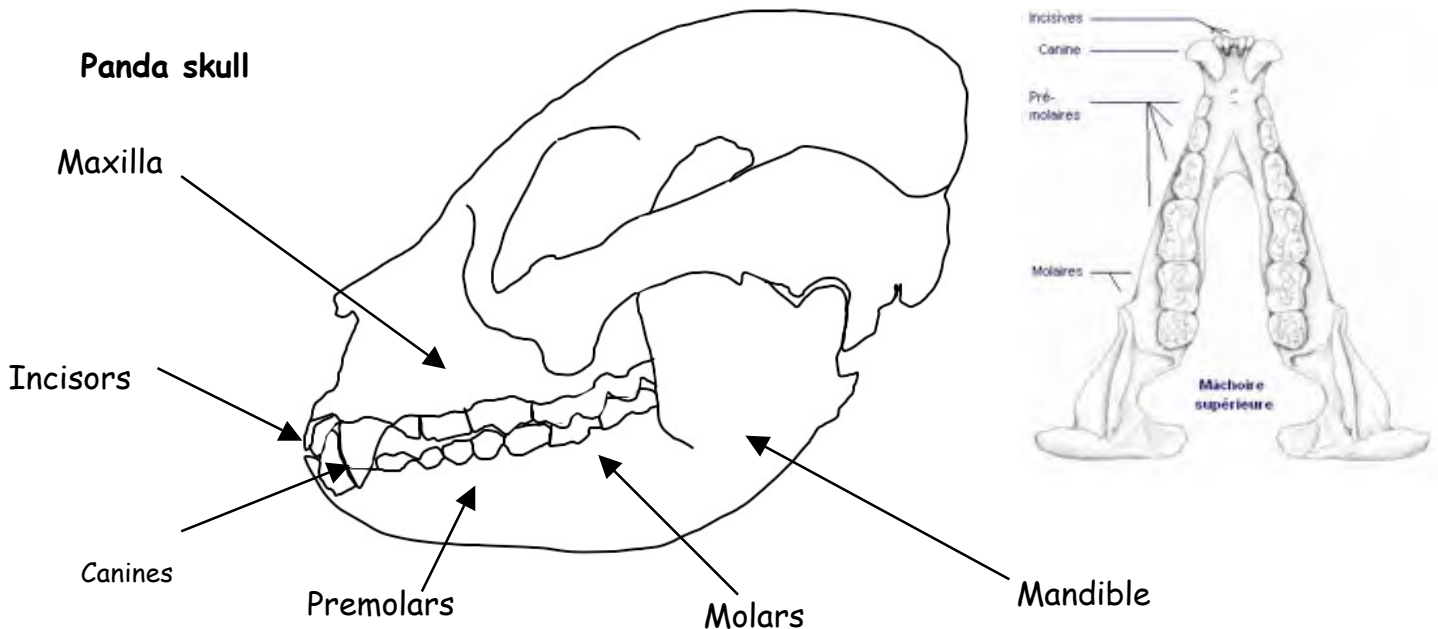
Mammals' dentition

Mammals' dentition can contain different types of teeth: incisors, canines, premolars and molars.

Types of teeth:

- **Incisors:** sharp, flattened teeth that **cut and grate** foods, located in the central anterior (front) part of the mandible and maxilla (definition from Antidote).
- **Canines:** sharp, sometimes prominent teeth located between the incisors and the molars. They are located on each side of the incisors. They are used to **shred and cut** food.
- **Premolars:** teeth located between the canines and the molars. They are also used to **grind and crush** foods.
- **Molars:** large teeth used to **grind and crush** foods. They are located at the back of the mouth. Their volume is larger than that of the premolars.

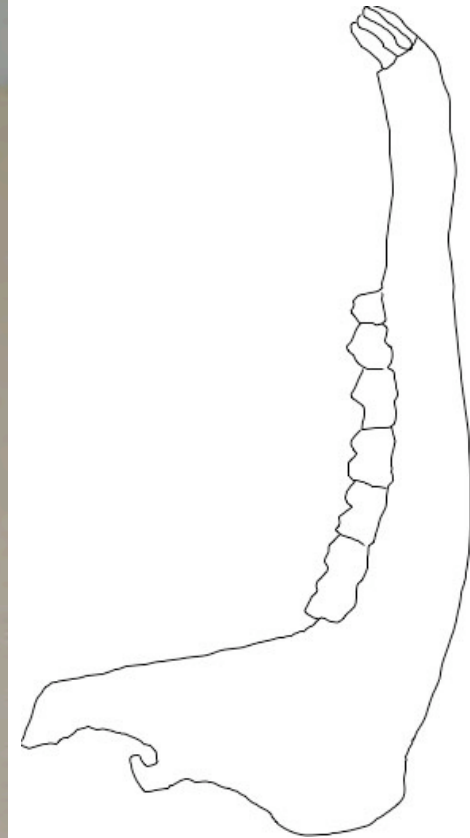
Carnivorous teeth are "sharp molars or premolars located on each side of the carnivore's jaws". (Definition from Antidote).



DEER SKULL

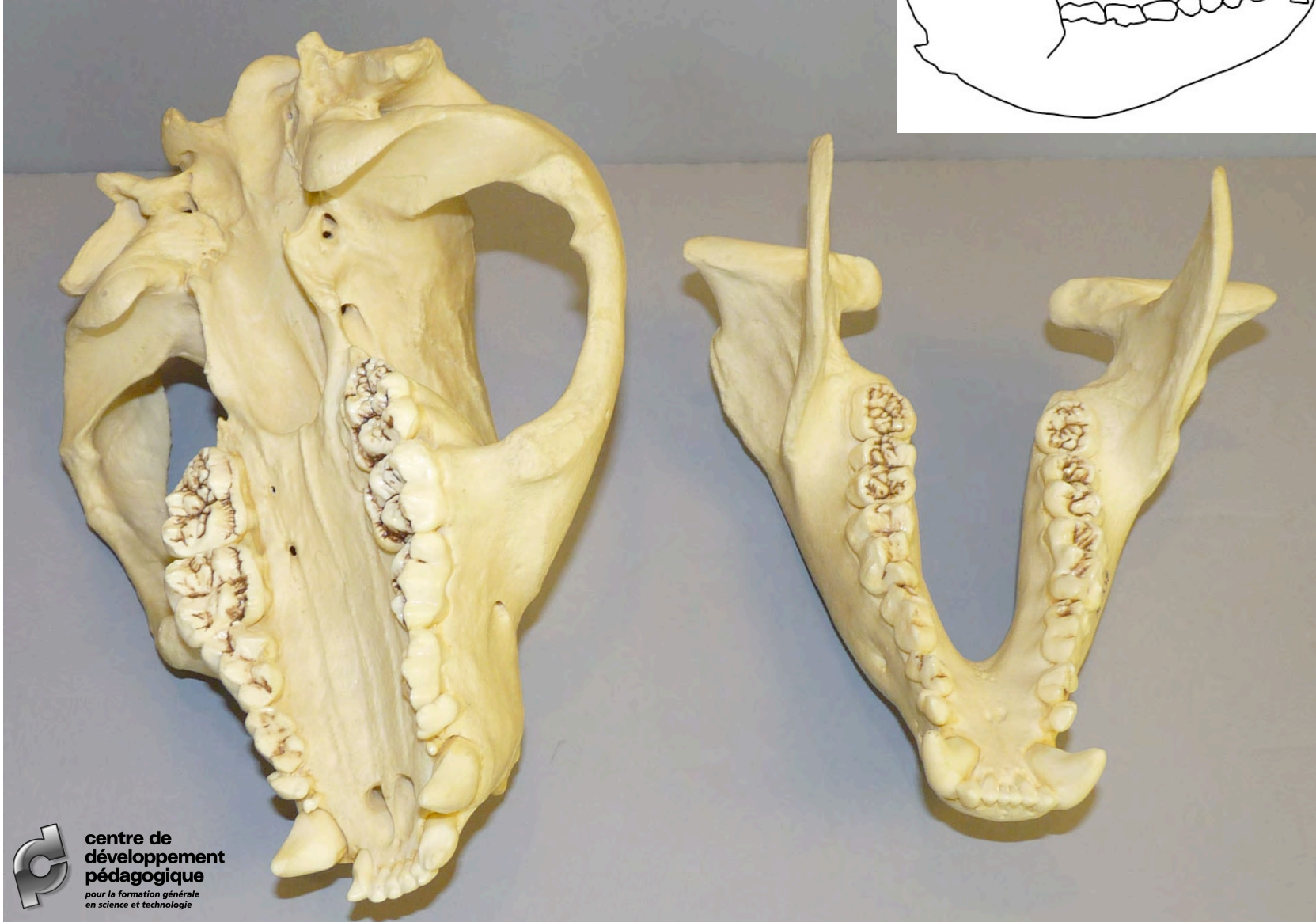
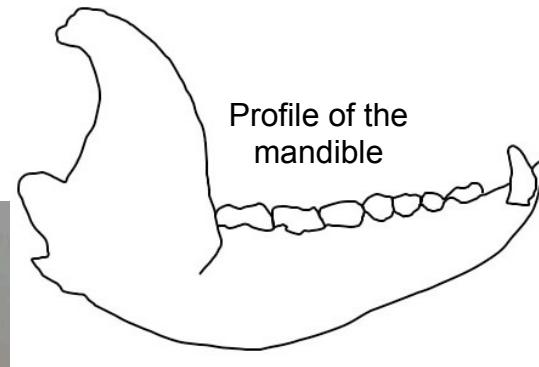


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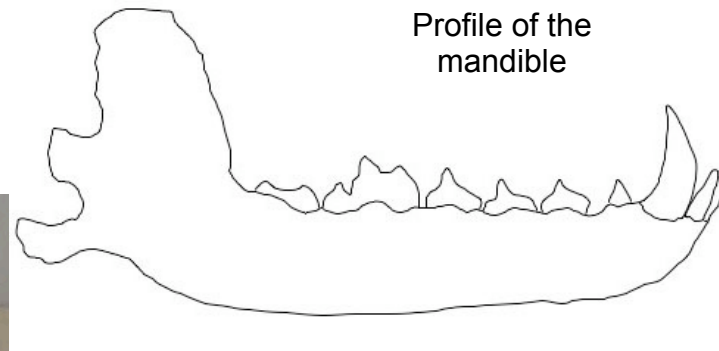
Profile of the
mandible

GIANT PANDA SKULL



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WOLF SKULL

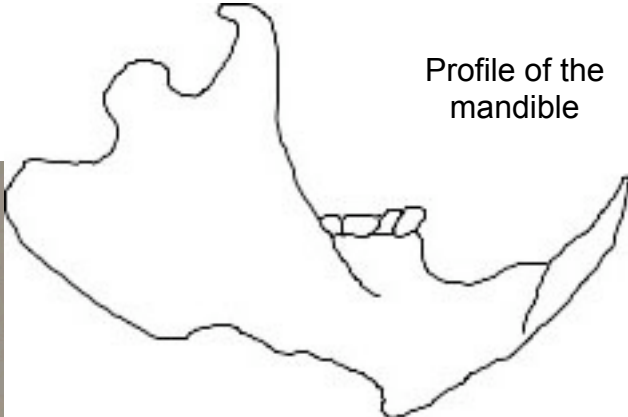


Profile of the mandible



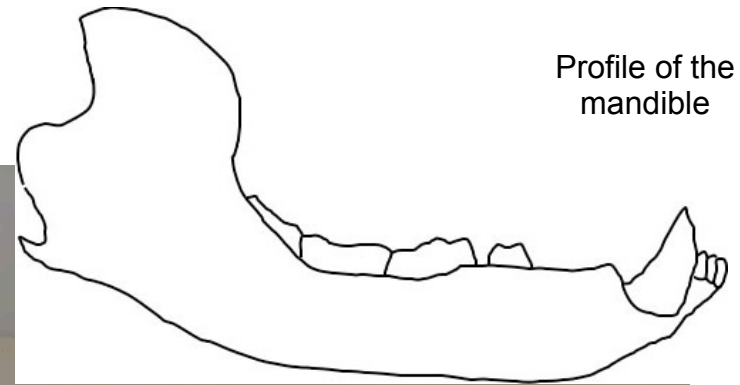
BEAVER SKULL

Profile of the mandible



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BLACK BEAR SKULL



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AMERICAN BLACK BEAR

http://www.aves.asso.fr/ours/les_ours/especes/oursnoir.html



Source of the photo:
http://www.pc.gc.ca/docs/v-g/oursgest-bearmanag/sec1/og-bm1a_F.asp

- **Height:** 2 m
- **Height to the withers:** 90 cm
- **Weight:** between 75 and 270 kg
- **Weight at birth:** 150 to 200 g
- **Mating:** May to June, exceptionally until August
- **Food:** fruit, nuts and various other vegetation. It also eats fish (salmon).
- **Particularities:** The black bear has a long, pointed snout and bigger ears than a brown bear. Its posterior feet and claws are fairly short. Its fur is shorter than other bears (except for the Sun or Honey Bear).
- **Territory:** United States and Canada
- **Estimation of the remaining numbers:** 500,000
- **Life expectancy:** 25 years

This is the most common bear in North America. Agile and fast, it climbs trees and swims remarkably well. It eats vegetation, ants and fish (salmon), which it fishes adeptly. It also likes hazelnuts and tender leaves.

It must build up reserves for the long months in hibernation, when it loses 20 to 40% of its weight. It lives, protected, in reserves and forests of North America. At the end of fall, the black bear seeks out a cave or shelter to hibernate. [...]

<http://www.castingclubduquebec.com/ours.htm>

Genus and species

The American black bear, *Ursus americanus*, is one of the best known wild animals in North America these days. [...]

The black bear belongs to the Ursidae Family, which has representatives in almost all the boreal hemisphere and in northern South America. On the North American continent the black bear occupies a vast territory ranging from east to west, northward to Alaska and to Mexico in the south. It is absent on Prince Edward Island, in Northern Alberta and Saskatchewan as well as in the extreme north of Ontario. [...]

Though it frequents various habitats, the black bear prefers dense forests and bush. But it is probably in forests of mixed coniferous and deciduous trees that it lives in greatest numbers. In habitats which are favourable to it, there may be a black bear every 3 or 4 km². It is difficult to evaluate its population, for the black bear is a shy, reserved animal. According to recent estimations, the continental population numbers about 500,000, to the closest 200,000!

Physical characteristics

The black bear is a stocky, bulky mammal. [...] It has a medium sized head, an almost straight facial profile, a pointed snout, elongated nostrils and a tongue with remarkable dexterity. Its lips, unlike those of other wild beasts like the wolf or bobcat, curl up over the gums and are very mobile, which allows it to grasp miniscule berries and even ants. [...] The paws have five toes armed with powerful, non-retractable, curved claws, which it uses to dig and rip out roots, stumps and tree trunks when it is searching for food. [...]

Lifestyle

The black bear leads an essentially solitary life, but a close relationship exists between the female and her cubs. The male temporarily interrupts his solitude during rutting season, when he looks for a mate. [...]

The bear may live up to 25 or 30 years, but most bears live fewer than 10 years in nature. In the fall, when the days become shorter and the temperature cools down, the animal seeks out a den in which to hibernate. [...]

The black bear is omnivorous and will eat just about anything it can get its teeth into. Plants make up a fundamental part of its diet, especially at the end of summer and early fall when berries and nuts are abundant. Its favourite fruit are blueberries, strawberries, buffalo berries, sugarplums, elderberries, black cherries and apples. It also favours acorns, hazelnuts and beechnuts. It treats itself to certain insects like grasshoppers and ants, and it may turn over tree trunks, old stumps and rocks to unearth them. It also consumes fish, small mammals and sometimes birds. In the spring, some bears may attack moose, deer, elk or caribou fawns. Its taste for carrion grows in proportion to the degree of decomposition of the carcass. A tree containing honey, is of course, a feast. Finally, since black bears drink substantial amounts of water, they generally gravitate to an area containing a body of water. [...]

Recently, with increased demand for the gall bladder, paws and other bear parts, reputed to have medicinal and aphrodisiac properties, fears have been raised as to illegal bear hunting. In certain parts of the world, a dried gall bladder may be worth up to \$50,000.

<http://www.universalis.fr/encyclopedie/ours-brun-et-ours-noir/>

Large, solitary carnivores with a thick pelt, living in North American (black bear) and Eurasian (brown bear) forests.

Class: Mammals; Order: Carnivores; Sub-Order: Caniformia; Family: Ursidae.

THE GIANT PANDA

<http://pandageant.ifrance.com/protection.htm>
<http://pandageant.ifrance.com/ficheidentite.htm>



Source of the photo :
<http://tetra.gnomz.com/animaux/>

- **KINGDOM:** Animal
- **PHYLUM:** Chordata
- **SUB-PHYLUM:** Vertebrates
- **CLASS:** Mammals
- **SUB-CLASS:** Theria
- **INFRACCLASS:** Eutheria
- **ORDER:** Carnivores
- **FAMILY:** Ursidae
- **GENUS:** Ailuropoda
- **IDENTIFICATION:** Characteristic coloration. Very particular black and white bear.
- **SIZE:** From 1.20 m to 1.50 m (head and body), 12 to 13 cm (tail)
- **WEIGHT:** From 75 to 160 kg for the male, between 10% and 20% less for the female. The baby weighs only 100 to 200 grams.
- **HABITAT:** Wooded mountains with bamboo undergrowth; 23 000 km²
- **DIET:** Herbivore, eats bamboo almost exclusively
- **SOCIAL STRUCTURE:** Fairly lax, territorial individuals, solitary

The principal factors contributing to the loss and fragmentation of its habitat, these being greatest threats to the panda, are:

- converting forests into agricultural regions
- collecting medicinal plants
- bamboo harvesting
- poaching
- grand scale development, such as road construction, hydro-electric development and mining activities.

Illegal commerce in wildlife, as well as the natural phenomenon of bamboo die-off also constitute threats.

Bamboo, the sole source of food for pandas, develops only between 500 and 3100 meters of altitude, and a pair of pandas requires a minimum of 30 km² of habitat.

A great deal of the initial panda habitat has disappeared under the aegis of agriculture, such that the major part of their current habitat now falls above 1400 feet in altitude. Even this restrained habitat feels the pressure of human activity.

A significant area of the mountainous, bamboo-rich habitat of the panda has also fallen victim to the forestry industry.

The habitat of the panda is fractured into 20 isolated pockets dispersed in Shaanxi, Gansu and Sichuan provinces and numerous populations of pandas are isolated in narrow belts of bamboo no wider than 1000 to 1200 meters wide.

Thus, many of these small, isolated populations also face the risk of consanguinity (or inbreeding, where mating individuals are related), which little by little, contributes to genetic deterioration, leading also to lowered resistance to disease, weaker adaptability to environmental changes and reproductive problems.

The probability of the panda becoming extinct is therefore indisputably accentuated if panda populations remain isolated from one another.

Pandas live in twenty or so isolated pockets, somewhat like islands of wildlife, that contain the two ingredients essential to the panda's survival, namely bamboo and other pandas. These areas are separated from one another by roads, farms, towns and other development related to human occupation. The Chinese government is now working with the help of the WWF to connect these isolated habitats using bamboo corridors. These green corridors could be compared to a bridge appended to an island.

To connect the pandas living in these isolated pockets to one another, the WWF has identified zones that could be transformed into bamboo corridors, allowing pandas to find more food and even more importantly, new reproductive partners. Longer term, these corridors will allow for greater genetic diversity in pandas by diminishing consanguinity.

<http://www.universalis.fr/encyclopedie/grand-panda/>

Very distinctive black and white bear, symbol of nature preservation, living solely in bamboo forests (1,500 to 3,000 meters in altitude) in central China (Shanxi, Gansu and Sichuan provinces).

Class: Mammals; order: Carnivores ; sub-order: Fissipedia; family: Ursidae. Numbers: about 900 to 1,000.

The giant panda (*Ailuropoda melanoleuca*) is characterised by a bulky body, round head and ears and plantigrade locomotion. Its short, thick, waterproof pelt has contrasting colours: its limbs are black, its body and head white, except around its eyes and ears, which are also black. Its anterior paws have a sixth toe, mobile and opposable to the five others, which allows it to grasp bamboo shoots. [...] Led by evolution to a herbivorous diet, its forty teeth are adapted to crushing bamboo shoots and leaves, which it consumes in great abundance throughout the day.

<http://www.cosmovisions.com/oursMonde.htm>

The Ailuropoda or giant panda (*Ailuropoda melanoleuca*) is the sole current species in the *Ailuropus* genus, created by A. Milne -Edwards (1870), for a species in Oriental Tibet. By its exterior shape, it is hardly distinguishable from other bears, but by its osteologic characteristics and its dentition is much closer to the red or shining panda, today classed among the Procyonidae (notably, beside the racoon) and to mammal fossils of the Helarctos genus.

Its tail is very short, like ordinary bears, but its head is much rounder and the soles of its feet are fur-covered like the red panda: these two latter characteristics are the only ones that distinguish the exterior of this animal from other bears; on the inside, though, the differences become much more marked. Dentition, in particular, is different. The giant panda's teeth might make one believe that the panda eats a more truly carnivorous diet than the black bear. Its diet seems essentially vegetal, however, though it will not refuse meat if the occasion arises. This could indeed be its primary source of food in the winter, season during which it does not hibernate like other bears. In the summer, it eats mostly bamboo [roots](#) and other vegetal matter.

The *Ailuropoda melanoleuca*, thus named because of its coloration. [...] It inhabits the mountainous forests of oriental Tibet where hunters call it *Paé-shioung* (white bear, in Chinese). It is much rarer than the Asian black bear (also called Moon bear or white-chested bear) and lives much higher in the mountains. This sub-family contains two other genus, now extinct: *Ailurarctos* and *Agriarctos*.

http://www.larousse.ca/encyclopedie/vie-sauvage/grand_panda/178159

[...] But it took until the 1980s until research in molecular biology went far enough to classify it with exactitude: the giant panda is indeed an Ursidae (*Ailuropoda melanoleuca*) that differentiated itself very early from other bears.

At this time, its habitat has been reduced to six misty, rainy, rocky mountains, covered with coniferous forest and bamboo, in Central China at the edge of the Tibetan plateau. [...] The giant panda may be seen between 1,600 and 3,500 meters, but mainly roams between 2,500 and 3,000 meters, where the deciduous bamboo forest is entangled and less accessible.

Bamboo is indeed almost the only food the panda eats - "almost" because it does consume the odd iris, crocus, gentian and on occasion, small rodents or fish. Now bamboo is a grass very poor in nutrients, which forces the panda to eat it in enormous quantity: the panda devotes more than ten hours a day to this vital activity.

As a food source, the panda does prefer bamboo, of which it eats the shoots, stalks or leaves, depending on the season. From November to March, it mainly eats the leaves and

young shoots. From April till June, its choice rests on older stalks and from July to October, devours the leaves almost exclusively. The global nutritive value of bamboo does not change much throughout the year, however: the leaves are higher in protein, followed by the stalks and the shoots. To cover its energy needs, the giant panda consumes vast quantities of this plant: 45% of its weight per day, or 38 kilos of shoots.

http://www.aves.asso.fr/ours/les_ours/especes/pandageant.html

- **Other name:** giant panda
- **Height:** 1.40 to 1.90 m
- **Weight:** from 70 to more than 160 kg
- **Weight at birth:** 100 g
- **Mating:** oestrous (all the physiological and behavioural phenomena that precede and accompany ovulation in female mammals) lasts between 24 and 48 hours and happens only once a year, between March and May. At that time, the female utters a series of groans and leaves in its wake odorous marks to notify the male. Gestation lasts 90 to 160 days. The young are born between August and September. The female matures between 4 and 6 years of age.
- **Food:** 25 kg of bamboo shoots a day
- **Particularities:** the giant panda has a sixth finger which allows it to grasp bamboo shoots with its paw. Its coloration is also particular: its fur is black and white.
- **Territory:** China, between 1,500 and 3,000 meters in altitude.
- **Estimation of remaining numbers:** 1,000 in nature, a hundred or so in captivity.
- **Life expectancy:** 30 years

The giant panda lives in bamboo forests in central and western China. These are cold, damp, mountainous regions. The panda is one of the world's rarest animals: only a thousand or so remain. It may live up to 25 years at altitudes between 2,000 and 3,500 meters. It measures 1.4 meters and weighs between 75 and 160 kg.

Bamboo is a kind of tall grass. The giant panda eats especially the young shoots and the ends of these shoots. There is a problem, however: all bamboo the world over flower at the same time, about every 60 years. The 61st year, it dries out and only sends out new shoots five years later. When the bamboo withers, the panda migrates toward another still green, bamboo area. If it doesn't find one, it dies. Several hundred pandas die of hunger this way.

The panda's territory shrinks as humans destroy the forests to live there; that is why only a thousand pandas remain worldwide.

The panda has a sixth finger on its front paws which allow it to grasp bamboo shoots as if it had a hand. It has forty powerful teeth that allow it to chew bamboo and its eyes have cat-like pupils. Its large molars permit it to grind bamboo shoots. It thus extracts the slightly sweet, but hardly nourishing, juice. The panda has a rolling gait. Its four legs are

about the same arched length and its feet go under its body with every step. The five toes each have a sharp, curved claw, allowing it to climb trees. When the female delivers a litter with several young, she takes care only of one and leaves the others to die. This habit certainly does not safeguard this endangered species. The panda is the only bear that never stands on its hind paws (a sign of aggression). Its face (look, chops...) is impassive at all times.

<http://www.dinosoria.com/panda.htm>

Between Shaanxi and Sichuan, in China, lives a black and white bear: the giant panda (*Ailuropoda melanoleuca*). [...]

We could qualify the panda as the "malnourished bear". Too slow to hunt, it has become, despite itself, herbivorous. [...]

Its somewhat clumsy lumbering gait notwithstanding, it is in fact, quite agile. The panda is a good climber that easily avoids predators, like leopards or dholes, by climbing trees. [...]

Celebrated researcher, Pan Wenshi, has discovered that the panda is in fact an omnivore. He has found musk deer hoofs, sheep's wool and monkey and pig bones in panda excrement.

Thus, contrary to popular belief, the panda does not disdain animal protein. When it does find a carcass, it does not deprive itself.

Despite these findings, it primarily feeds on bamboo.