Order Carnivora  (15 Families, 126 Genera, 286+ Species)

Generally divided into 2 Suborders:

**Feliformia** (cat-like carnivorans)
- 6 Families

**Caniformia** (dog-like carnivorans)
- 9 Families
  - Includes pinnipeds
  - Smallest: *Mustela nivalis* (35-55 g)
  - Largest: *Ursus maritimus* (up to 800 kg)

Note: Not all Carnivorans are carnivores!
Carnivores typically have a pair of shearing teeth called the carnassials (PM4, m1), plus large canines for grasping and killing struggling prey.

Jaw motion restricted to scissors-like, vertical movements.
But some carnivorans are herbivorous, insectivorous (even ant and termite specialists), or omnivorous.
ORDER CARNIVORA
SUBORDER FELIFORMIA

- “Cat-like” carnivores
- 6 Families:
  - Nandiniidae (African palm civet)
  - Felidae (cats)
  - Viverridae (civets & genets)
  - Herpestidae (mongooses)
  - Eupleridae (Madagascar mongooses)
  - Hyaenidae (hyenas)
FELIFORMIA: GENERAL MORPHOLOGY

- Carnassial teeth (upper PM4; lower m1)
- Heavy skulls with strong facial musculature
- Deep, well-defined, C-shaped mandibular fossa
- Auditory bullae formed by the tympanic and endotympanic bones, with a septum where they meet (making 2 chambers)
  - Versus Caniformia: only the tympanic bone forms the bullae
- Baculum present
- Well-developed claws (some retractable)
- Reduced or lost clavicle allows for longer/faster stride
- Expanded braincase
NANDINIIDAE (African palm civet)

- 1 genus, 1 species: *Nandinia binotata*
- Dense, dark pelage; tail has dark bands on top
- 1.7-2.1 kg
- Forested habitats
- Arboreal; nocturnal; solitary
- Mainly eats fruit and other plant material but also insects and small vertebrates
- Range: central Africa
- Considered basal to Feliformia: genetically distinct and primitive auditory bullae lack septum
FELIDAE (cats)

- 14 genera, 40 species
- Genera to know: *Felis*, *Lynx*, *Panthera*, *Puma*
- Strict carnivores
- Behavior:
  - stalk prey then attack with quick bursts of speed; usually agile climbers and good swimmers; excellent senses of smell and hearing
- Mostly solitary (except lions)
- Range:
  - worldwide except Antarctica, Australia, Madagascar, and oceanic islands

- Dentition:
  - 3/3, 1/1, 2-3/2, 1/1
  - Well-developed carnassials
  - Tiny/reduced upper molar
  - Sharp pre-molars, anterior premolar reduced (lost in *Lynx*)
  - Small incisors

- Skull:
  - Short, blunt rostrum
  - Skull rounded dorsally
  - Paroccipital processes flattened against bullae

- Body:
  - Digitigrade with retractable claws (except *Acinonyx*)
  - 5 toes per forefoot, 4 toes per hindfoot
  - Manus can be rotated so soles face upward
GENUS *FELIS* (small cats)

- Generally nocturnal and solitary
- Prey: mostly small mammals, some birds, reptiles, amphibians
- 3/3, 1/1, 3/2, 1/1
- Weight: 1-5 kg
- Body length: 34-75 cm
- Mostly in Africa & Asia
  - Wild cat (*F. silvestris*) also in Europe
  - Domestic cat (*F. catus*) worldwide
- Purr instead of roar

Sand cat, *Felis margarita*

Fishing cat, *Felis viverrina*

Pallas’ cat, *Felis manul*
GENUS LYNX (lynxes, bobcat)

- Weight: 4-20 kg
- 3/3, 1/1, 2/2, 1/1
- Short tail, tufted ears
- Solitary; territorial; generally nocturnal (except L. lynx)
- Prey: small mammals, birds
- Europe, Siberia, North America; often high altitude forests
**GENUS PANTHERA** (roaring cats)

- Lions, jaguars, leopards, tigers
- Hyoid partly replaced by flexible cartilage: roar
- Solitary, except for lion (prides)
- Weight: 60-423 kg
- 3/3, 1/1, 3/2, 1/1
- Prey: typically large mammals, but most are opportunistic
- Old World except for jaguar in S. America
- Bengal tigers (*P. tigris tigris*) has the largest canine of any living cat (7.5-10 cm)
GENUS *PUMA* (cougar & jaguarundi)

- New World
- 3/3, 1/1, 3/2, 1/1
- Cougars:
  - Nocturnal
  - Territorial/solitary; male territories overlap with females
  - Males: 36-120 kg
  - Females: 29-64 kg
  - Prey: ungulates, small mammals
- Jaguarundi:
  - Diurnal; often found in pairs
  - 4.5-9.0 kg
  - Prey: birds, small mammals

![Jaguarundi, *Puma yagouaroundi*](image1)

![Cougar, *Puma concolor*](image2)
Snow leopard, *Uncia uncia*  

Cheetah, *Acinonyx jubatus*  

Caracal, *Caracal caracal*  

Ocelot, *Leopardus pardalis*
VIVERRIDAE (civets & genets)

- 15 genera, 35 species
- Dentition:
  - Premolars small; first is minute or absent
  - Lower carnassial has a well-developed talonid
  - Large molars
  - Dental formula: 3/3, 1/1, 3-4/3-4, 1-2/1-2
- Skull:
  - Paraoccipital processes in close contact with bullae
  - Bullae divided by a septem
  - Allisphenoid canal present
- Body:
  - Relatively short limbs; Digitigrade, with 5 toes per foot; semi-retractable claws
  - Pollux and hallux typically functionless; located high above other toes
  - Most civets have perianal glands – produce a fluid called “civet” used for scent marking and communication
- Variety of habits/behaviors, depending on genus
- Range: Africa, Spain, Portugal, France, southern Eurasia including Indonesia
- Example: Genus Civettictis, the African Civet
  - Savannas and forest of central/southern Africa
  - Weight: 12-15 kg
  - Generally nocturnal
  - Solitary except when breeding
  - Omnivorous

African civet, *C. civetta*
Large-spotted genet, *Genetta tigrina*

African civet, *Civettictis civetta*
HERPESTIDAE (mongooses)

- 14 genera, 33 species
- Similar appearance to Viverridae; most distinguishing features are chromosomal or by soft anatomy
- Unique auditory bullae structure:
  - expanded ectotympanic and circular tube at ear opening
- Slight expansion of the mastoid
- Carnivorous; some insectivorous
- Variety of habits/behaviors, depending on genus
- Range:
  - Africa, Middle East, southern and southeastern Asia, Spain and Portugal

Examples: Genus *Suricata* (meerkat)
- Inhabit the savannah and open plains of Africa with firm soils
- Weight: 725 g (average)
- Gray/tan/brown pellage
- Dental formula: 3/3, 1/1, 3/3, 2/2
- Highly social; live in packs with up to 3 family groups

Meerkat, *Suricata suricatta*
Dwarf mongoose, *Helogale parvula*

Indian gray mongoose, *Herpestes edwardsii*

Yellow mongoose, *Cynictis penicillata*

Meerkats, *Suricata suricatta*

White-tailed mongoose, *Ichneumia albicauda*

Indian gray mongoose, *Herpestes edwardsii*
<table>
<thead>
<tr>
<th><strong>VIVERRIDAE</strong></th>
<th><strong>HERPESTIDAE</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Tail: equal or greater than body length.</td>
<td>Tail: $\frac{1}{2}$ to $\frac{2}{3}$ of body length</td>
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<tr>
<td>5 toes per foot</td>
<td>Toes can be 4 or 5</td>
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<tr>
<td>Partially or totally retractable claws</td>
<td>Claws are non-retractable</td>
</tr>
<tr>
<td>Pointed ears that stick up</td>
<td>Rounded ears on side of head</td>
</tr>
<tr>
<td>Mostly in forest</td>
<td>More open terrain (some forest)</td>
</tr>
<tr>
<td>Solitary and nocturnal</td>
<td>Can be solitary or social; diurnal or nocturnal</td>
</tr>
<tr>
<td>Mostly arboreal</td>
<td>Mostly terrestrial</td>
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EUPLERIDAE (Malagasy carnivores)

- 7 genera, 8 species
- Monophyletic group resulting from a single radiation to Madagascar
- All species are threatened or endangered
- Example: Genus *Galidia*, ring-tailed mongoose
  + Live in humid forests of Madagascar
  + Small; only 0.7-0.9 kg
  + Reddish-brown pelage with black feet
  + Carnivorous, but also consume fruit and insects

Ring-tailed mongoose, *Galidia elegans*  
Fossa, *Cryptoprocta ferox*
HYAENIDAE (hyenas, aardwolf)

- 3 genera, 4 species
- Genera to know: Crocuta (spotted) and Proteles (aardwolf)
- Dentition:
  - 3rd incisor is larger than the others
  - Well-developed carnassials (except in Proteles)
  - Strong, conical premolars
  - Strong, large lower molars (except Proteles with weak premolars and molars)
  - Upper molar small (if present)
- Skull: No alisphenoid canal; Paraoccipital processes in contact with bullae
- Body:
  - Hind legs shorter than front legs
  - Digitigrade
  - 5 toes per hind foot; 4 toes on forefoot of hyena & 5 toes on forefeet of Proteles
- Nocturnal
- Range: Africa, southwestern Asia to India
**GENUS CROCUTA**

- Spotted hyaena, *Crocuta crocuta*
- 3/3, 1/1, 4/3, 1/1
- Very strong, bone-crushing jaws
- Weight: up to 80 kg
- Scavengers, and predators of large mammals
- Clans, up to 80 individuals, female dominance
- Female mimicry of male genitalia
- Range: Africa, Asia
GENUS **PROTELES** (Aardwolf)

- Monotypic: *Proteles cristata*
- Dental formula: 3/3, 1/1, 3/1-2, 1/1-2
- Weak premolars and molars
- Broad, sticky tongue
- Insectivorous; termites are major food source
- Weight: 8-14 kg
- Form monogamous mating pairs
- Range: Africa
GENUS HYAENA

- Includes 2 species: *H. brunnea* and *H. hyaena*
- *H. hyaena* more omnivorous, include fruit and insects in diet
- *H. brunnea* primarily scavenger