Para1

**Skeletal system**

*Main article:*[*Bird\_anatomy § Skeletal\_system*](https://en.wikipedia.org/wiki/Bird_anatomy#Skeletal_system)

The skeleton consists of very lightweight bones. They have large air-filled cavities (called pneumatic cavities) which connect with the [respiratory system](https://en.wikipedia.org/wiki/Respiratory_system).[[89]](https://en.wikipedia.org/wiki/Bird#cite_note-89) The skull bones in adults are fused and do not show [cranial sutures](https://en.wikipedia.org/wiki/Cranial_sutures).[[90]](https://en.wikipedia.org/wiki/Bird#cite_note-Gill-90) The [orbital cavities](https://en.wikipedia.org/wiki/Orbit_(anatomy)) that house the eyeballs are large and separated from each other by a bony [septum](https://en.wikipedia.org/wiki/Septum) (partition). The [spine](https://en.wikipedia.org/wiki/Vertebral_column) has cervical, thoracic, lumbar and caudal regions with the number of cervical (neck) vertebrae highly variable and especially flexible, but movement is reduced in the anterior [thoracic vertebrae](https://en.wikipedia.org/wiki/Thoracic_vertebrae) and absent in the later vertebrae.[[91]](https://en.wikipedia.org/wiki/Bird#cite_note-91) The last few are fused with the [pelvis](https://en.wikipedia.org/wiki/Pelvis) to form the [synsacrum](https://en.wikipedia.org/wiki/Synsacrum).[[90]](https://en.wikipedia.org/wiki/Bird#cite_note-Gill-90) The ribs are flattened and the [sternum](https://en.wikipedia.org/wiki/Sternum) is keeled for the attachment of flight muscles except in the flightless bird orders. The forelimbs are modified into wings.[[92]](https://en.wikipedia.org/wiki/Bird#cite_note-92) The wings are more or less developed depending on the species; the only known groups that lost their wings are the [extinct](https://en.wikipedia.org/wiki/Extinct) [moa](https://en.wikipedia.org/wiki/Moa) and [elephant birds](https://en.wikipedia.org/wiki/Elephant_bird)

Para2

### Excretory system

Like the [reptiles](https://en.wikipedia.org/wiki/Reptile), birds are primarily uricotelic, that is, their [kidneys](https://en.wikipedia.org/wiki/Kidney) extract [nitrogenous waste](https://en.wikipedia.org/wiki/Nitrogenous_waste) from their bloodstream and excrete it as [uric acid](https://en.wikipedia.org/wiki/Uric_acid), instead of [urea](https://en.wikipedia.org/wiki/Urea) or [ammonia](https://en.wikipedia.org/wiki/Ammonia), through the ureters into the intestine. Birds do not have a [urinary bladder](https://en.wikipedia.org/wiki/Urinary_bladder) or external urethral opening and (with exception of the [ostrich](https://en.wikipedia.org/wiki/Ostrich#Description)) uric acid is excreted along with faeces as a semisolid waste.[[94]](https://en.wikipedia.org/wiki/Bird#cite_note-94)[[95]](https://en.wikipedia.org/wiki/Bird#cite_note-95)[[96]](https://en.wikipedia.org/wiki/Bird#cite_note-coprodeum-96) However, birds such as hummingbirds can be facultatively ammonotelic, excreting most of the nitrogenous wastes as ammonia.[[97]](https://en.wikipedia.org/wiki/Bird#cite_note-97) They also excrete [creatine](https://en.wikipedia.org/wiki/Creatine), rather than [creatinine](https://en.wikipedia.org/wiki/Creatinine) like mammals.[[90]](https://en.wikipedia.org/wiki/Bird#cite_note-Gill-90) This material, as well as the output of the intestines, emerges from the bird's [cloaca](https://en.wikipedia.org/wiki/Cloaca#Birds).[[98]](https://en.wikipedia.org/wiki/Bird#cite_note-98)[[99]](https://en.wikipedia.org/wiki/Bird#cite_note-99) The cloaca is a multi-purpose opening: waste is expelled through it, most birds mate by [joining cloaca](https://en.wikipedia.org/wiki/Bird_anatomy#Reproduction), and females lay eggs from it. In addition, many species of birds regurgitate [pellets](https://en.wikipedia.org/wiki/Pellet_(ornithology)).[[100]](https://en.wikipedia.org/wiki/Bird#cite_note-100)

It is a common but not universal feature of [altricial](https://en.wikipedia.org/wiki/Altriciality) [passerine](https://en.wikipedia.org/wiki/Passerine) nestlings (born helpless, under constant parental care) that instead of excreting directly into the nest, they produce a [fecal sac](https://en.wikipedia.org/wiki/Fecal_sac). This is a mucus-covered pouch that allows parents to either dispose of the waste outside the nest or to recycle the waste through their own digestive system

Para3

### Reproductive system

Males within [Palaeognathae](https://en.wikipedia.org/wiki/Palaeognathae) (with the exception of the [kiwis](https://en.wikipedia.org/wiki/Kiwi_(bird))), the [Anseriformes](https://en.wikipedia.org/wiki/Anseriformes) (with the exception of [screamers](https://en.wikipedia.org/wiki/Screamer)), and in rudimentary forms in [Galliformes](https://en.wikipedia.org/wiki/Galliformes) (but fully developed in [Cracidae](https://en.wikipedia.org/wiki/Cracidae)) possess a [penis](https://en.wikipedia.org/wiki/Bird_penis), which is never present in [Neoaves](https://en.wikipedia.org/wiki/Neoaves).[[102]](https://en.wikipedia.org/wiki/Bird#cite_note-102)[[103]](https://en.wikipedia.org/wiki/Bird#cite_note-103) The length is thought to be related to [sperm competition](https://en.wikipedia.org/wiki/Sperm_competition).[[104]](https://en.wikipedia.org/wiki/Bird#cite_note-104) When not copulating, it is hidden within the [proctodeum](https://en.wikipedia.org/wiki/Proctodeum) compartment within the cloaca, just inside the vent. Female birds have [sperm storage](https://en.wikipedia.org/wiki/Female_sperm_storage) tubules[[105]](https://en.wikipedia.org/wiki/Bird#cite_note-105) that allow sperm to remain viable long after copulation, a hundred days in some species.[[106]](https://en.wikipedia.org/wiki/Bird#cite_note-106) Sperm from multiple males may [compete](https://en.wikipedia.org/wiki/Sperm_competition) through this mechanism. Most female birds have a single [ovary](https://en.wikipedia.org/wiki/Ovary) and a single [oviduct](https://en.wikipedia.org/wiki/Oviduct), both on the left side,[[107]](https://en.wikipedia.org/wiki/Bird#cite_note-karger-107) but there are exceptions: species in at least 16 different orders of birds have two ovaries. Even these species, however, tend to have a single oviduct.[[107]](https://en.wikipedia.org/wiki/Bird#cite_note-karger-107) It has been speculated that this might be an adaptation to flight, but males have two testes, and it is also observed that the gonads in both sexes decrease dramatically in size outside the breeding season.[[108]](https://en.wikipedia.org/wiki/Bird#cite_note-108)[[109]](https://en.wikipedia.org/wiki/Bird#cite_note-109) Also terrestrial birds generally have a single ovary, as does the [platypus](https://en.wikipedia.org/wiki/Platypus), an egg-laying mammal. A more likely explanation is that the egg develops a shell while passing through the oviduct over a period of about a day, so that if two eggs were to develop at the same time, there would be a risk to survival