



## **Ardipithecus ramidus**

*Ardipithecus ramidus* is a species of australopithecine from the Afar region of Early Pliocene of Ethiopia about 4.4 million years ago (mya). The name is derived from the local Afar language. 'Ardi' means 'ground' or 'floor' and 'pithecus' is Latinised Greek for 'ape'. The name 'ramid' means 'root' in the Afar language. *A. ramidus*, unlike modern hominids, has adaptations for both walking on two legs (bipedality) and life in the trees (arboreality). However, it would not have been as efficient at bipedality as humans, nor at arboreality as non-human great apes.

The facial anatomy suggests that *A. ramidus* males were less aggressive than those of modern chimps, which is correlated to increased parental care and monogamy in primates. It has also been suggested that it was among the earliest of human ancestors to use some proto-language, possibly capable of vocalizing at the same level as a human infant. *A. ramidus* appears to have inhabited woodland and bushland corridors between savannas, and was a generalized omnivore.

*Ardipithecus ramidus* was first reported in 1994; in 2009, scientists announced a partial skeleton, nicknamed 'Ardi'. The foot bones in this skeleton indicate a divergent large toe combined with a rigid foot – it's still unclear what this means concerning bipedal behaviour. The pelvis, reconstructed from a crushed specimen, is said to show adaptations that combine tree-climbing and bipedal activity. The discoverers argue that the 'Ardi' skeleton reflects a human-African ape common ancestor that was not chimpanzee-like. A good sample of canine teeth of this species indicates very little difference in size between males and females in this species.

### ***Chronology:***

4.4 to 4.2 million years ago

### ***Important fossil discoveries:***

Hundreds of pieces of fossilised bone were recovered during 1992-1994, all from localities west of the Awash River, in Aramis, Ethiopia. The finds number over 110 specimens and represent about 35 individual members of this species. Most of the remains are dental, but some skull and limb bones were also found. A partial humerus (arm bone) indicates that this species was smaller than the average *Australopithecus afarensis*.

In 2005, the remains of 9 individuals were recovered from As Duma in northern Ethiopia. The remains mostly consist of teeth and jaw fragments, but also some bones from the hands and feet.

Some specimens discovered earlier in Kanapoi, Lothagam and Tabarin could also belong to this species.

### ***Key specimens***

- ARA-VP-6/1 teeth: This is the holotype for this species. It consists of teeth and jaw bone and was found in Aramis in 1993.



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- 'Ardi' ARA-VP-6/500: A partial skeleton found in 1994, consisting of about 125 pieces, was described and published in 2009. It is the oldest known skeleton of a human ancestor. The individual is believed to be a female and is nicknamed 'Ardi'. She weighed about 50kg and stood about 120cm tall. The skeleton was in extremely poor condition and it took the team 15 years to excavate, scan, make virtual reconstructions, assemble and then analyse. The results were hugely significant in terms of how we view the evolution of the earliest hominins and the physical appearance of the last common ancestor of humans and chimpanzees. The skeleton does not look much like a chimp or gorilla or have the expected 'transitional' features. Instead, it may well preserve some of the characteristics of the last chimp-human ancestor. Analysis of the skeleton reveals that humans did not evolve from knuckle-walking apes, as was long believed. It also indicates that chimpanzee evolution underwent high degrees of specialisation since diverging from the last common ancestor and thus these apes are poor models for understanding the appearance of this ancestor.

## ***Distribution:***

Fossils belonging to this species were found in eastern Africa in the Middle Awash valley, Ethiopia. Additional fossils that may also belong to this species have been collected in northern Kenya.

Relationships with other species

## ***Key physical features:***

This species was a facultative biped and stood upright on the ground but could move on all four limbs in trees. Features of the anatomy are extremely primitive.

### **Brain**

- about 300-350cc, similar in size to modern female chimpanzees and bonobos

### **Body size and shape**

- similar in size to modern chimpanzees. The most complete specimen, a female, stood about 120cm tall
- males were only slightly larger than females
- the body shape was more ape-like than humans, but differed from living African apes in a number of significant features

### **Limbs**

- mix of primitive and derived features suggest this species was able to walk upright on the ground yet efficiently climb trees
- long powerful arms that were not used for weight-bearing or knuckle-walking as with quadrupedal apes



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- bones in the wrist (particularly the midcarpal joint) provided flexibility and the palm bones were short. These features suggest this species was not a knuckle-walker and that the palms could support the body weight when moving along branches
- finger bones were long and curving, both features useful for grasping branches
- upper and lower legs bones (femur and tibia) have features consistent with bipedalism
- feet were relatively flat and lacked arches, indicating this species could probably not walk or run long distances
- they had grasping abducted toe characteristic of gorillas and chimps
- the foot was more rigid than chimpanzees with the bases of the four toe bones oriented to reinforce the forefoot when pushing off. Chimps have a highly flexible midfoot that improves their ability to grasp and climb but are less effective for propulsion when walking on ground

## **Pelvis**

- has a mix of features useful for both climbing and upright walking and suggests the species still spent significant time in the trees
- shape of the upper blades (ilium) appear short and broad like *Australopithecus afarensis*, indicating that the gluteal muscles had been repositioned. This lowered the body's centre of mass so to balance on one leg when walking
- the lower pelvis is large and the angle of the ischial surface does not face upward as it does in humans and *Australopithecus*. These are primitive features that suggest this species had massive hindlimb muscles for climbing and did not walk like *A. afarensis*
- the sciatic notch is similar in size and shape to later hominins. This is a derived feature and is not found in chimpanzees

## **Jaws and teeth**

- much of the dentition is ape-like including relatively large canines and molars
- tooth enamel thickness is intermediate between that of chimpanzees and *Australopithecus*
- canines are less projecting and smaller than those of all other known apes and there is no evidence of honing. The base of the canines in both sexes are similar in size to female chimpanzees and male bonobos, but have shorter crown heights
- upper canines are shaped like diamonds, rather than the pointed shape seen in African apes, which is a derived feature shared with *Australopithecus afarensis*. Lower canines appear to have less derived features.



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- the jaw displayed significant forward projection compared to humans, but less than modern African apes
- pre-molars have derived features that are more advanced in the human direction
- canines (non-sharpened and small) and other teeth share features with *Orrorin tugenensis*

## **Skull**

- skull rests atop the spinal column, indicating this species was bipedal, although it probably walked in a slightly different manner than humans
- the cranial base is short from front to back, indicating the head balanced on top of the spine
- the face is small and in a more vertical position than chimpanzees
- the ridge above the eye socket is unlike that of a chimpanzee

## **Phylogeny:**

This species position as a direct ancestor of humans is unclear and scientists are still debating where it should be placed relative to our direct line. The discoverers think it was ancestral to *Australopithecus* - it is the only putative hominin in evidence between 5.8 and 4.4 million years ago - but others do not agree. Even if *Ardipithecus ramidus* is not on our direct line, it must have been closely related to the direct ancestor and probably similar in appearance and adaptation. It also offers new insights into how we evolved from the common ancestor we share with chimps.

This species was originally classified as *Australopithecus ramidus* in 1994, but was reclassified in 1995 because its discoverers believed it was distinct enough to be placed into a new genus, *Ardipithecus*.

The exact affinities of *Ardipithecus* have been debated. White, in 1994, considered *A. ramidus* to have been more closely related to humans than chimps, though noting it to be the most ape-like fossil hominin to date. In 2001, French paleontologist Brigitte Senut and colleagues aligned it more closely to chimps, but this has been refuted. In 2009, White and colleagues reaffirmed the position of *Ardipithecus* as more closely related to modern humans based on dental similarity, a short base of the skull, and adaptations to bipedality. In 2011, primatologist Esteban Sarmiento said that there is not enough evidence to assign *Ardipithecus* to Hominini (comprising both humans and chimps), but its closer affinities to humans have been reaffirmed in following years. White and colleagues consider it to have been closely related to or the ancestor of the temporally close *Australopithecus anamensis*, which was the ancestor to *A. africanus*.