

# Nutcracker Man

## Divulgando la investigación sobre evolución humana | Outreaching the human evolution research

NOVIEMBRE 7, 2020 DE ROBERTO SÁEZ

### Sahelanthropus tchadensis may not have been a habitual biped

In many texts, when depicting the human evolutionary tree, the *S. tchadensis* cranium is often claimed to be consistent with being biped, mainly driven by the foramen magnum position. Habitual bipedalism is a key feature for taxa to be included in the hominin clade, yet some specific characteristics of the bipedal locomotion can differ from those of modern humans. The case of *Sahelanthropus* is important because the age of its fossils (6-7 million years) approximately matches the time that our branch of the primate family tree diverged from the ancestors of chimpanzees and gorillas. We only know *Orrorin tugenensis* as another hominin candidate in such chronology. There are three femoral remains of *Orrorin*, but until now the *Sahelanthropus* femur had not yet been published, and this is a major skeletal element to understand bipedalism.

What hominin taxa at that time could be a direct ancestor of living humans is a very difficult question to face. The Late Miocene fossil record is really small and makes impossible to sort ancestors from non-ancestral close relatives.

In this context, a new paper (R. Macchiarelli et al, 2020) focuses on the study of the partial left femur TM 266-01-063 found in July 2001 at Toros-Menalla, Chad. This is the same location where the *Sahelanthropus tchadensis* holotype was recovered also in 2001: the cranium TM 266-01-060-1. What five key ideas does the new femur bring, according the analysis of overall shape differences by Macchiarelli et al?

#### **1) Yes, the femur can likely be assigned to *S. tchadensis*.**

*We are most confident that the TM 266 femoral shaft belongs to a hominid sensu lato. It could sample a hominid hitherto unrepresented at Toros-Menalla, but a more parsimonious working hypothesis is that it belongs to S. tchadensis.*

#### **2) This femur is very different from the *Orrorin tugenensis* femur, another early hominin normally considered as habitual biped.**

*The differences between TM 266 and the O. tugenensis partial femur BAR 1002'00 are substantial and are consistent with maintaining at least a species level distinction between S. tchadensis and O. tugenensis.*



(<https://nutcrackerman.files.wordpress.com/2020/11/femurstchadensis-1.png>).

The partial femur TM 266-01-063 from Toros-Menalla, Chad, in anterior (a), posterior (b), medial (c), and lateral (d) views. Scale bar = 2 cm. Credit: R. Macchiarelli, A. Bergeret-Medina, D. Marchi et al. (2020)

### 3) But actually, *S. tchadensis* may not have been a habitual biped!

*If the TM 266 femoral shaft belongs to *S. tchadensis*, we cannot be confident that the latter was a habitual biped. Based on our analyses, the TM 266 partial femur lacks any feature consistent with regular bouts of terrestrial bipedal travel; instead, its gross morphology suggests a derived Pan-like bauplan.*

### 4) If the TM 266 femur can be added to the hypodigm of *S. tchadensis*, the conclusions could be important to actually stop considering *S. tchadensis* as an early hominin.

*The lack of clear evidence that the TM 266 femur is from a hominid that was habitually bipedal further weakens the already weak case for *S. tchadensis* being a stem hominin.*

*It is possible that *S. tchadensis* is a stem hominin with some reduction of the canine and loss of the honing complex, but without the femoral adaptations to terrestrial bipedalism that are seen in *A. afarensis* and *O. tugenensis*. If there is compelling evidence that *S. tchadensis* is a stem hominin, then bipedalism can no longer be seen as a requirement for inclusion in the hominin clade.*

### 5) A hominin, a panin, or neither? A potential third way for *Sahelanthropus*.

*Being a stem hominin or a stem panin, or their most recent common ancestor, may not be the only options for *S. tchadensis*. It is probable that during the late Miocene and the early Pliocene, there was a modest adaptive radiation of African hominids that includes taxa that are neither hominins nor panins as defined previously. Any such extinct groups are likely to include taxa with novel morphology or with novel combinations of morphology we also see in hominins or panins. Given the mix of inferred primitive and inferred derived features in *S. tchadensis*, we suggest it could belong to a group that has no living representative.*

*If we treat the hominin status of *S. tchadensis*, or any other enigmatic taxon, as a given and not a hypothesis, we run the risk of adding further confusion to a picture that is already complicated and less easy to resolve.*

**BUT** In a new preprint (under review as of Feb-21), Franck Guy and colleagues analyse the original materials of the same left femur and two antimeric ulnae. Based on each features they tackle and the functional signals found, they argue that *S. tchadensis* was indeed bipedal.

References:

- R. Macchiarelli, A. Bergeret-Medina, D. Marchi et al. (2020) (<https://doi.org/10.1016/j.jhevol.2020.102898>). *Nature and relationships of Sahelanthropus tchadensis. Journal of Human Evolution 149* | Front image: The partial femur TM 266-01-063 (left) in anterior (a), posterior (b), medial (c), and lateral (d) views compared with the CT-based reconstruction of BAR 1002'00 (Puymerau, 2011, 2017, based on a record kindly made available by B. Senut and M. Pickford).
- F. Guy et al. (2020) (<https://doi.org/10.21203/rs.3.rs-69453/v1>). *Postcranial evidence of late Miocene hominin bipedalism in Chad. Preprint is under consideration at a Nature Portfolio Journal.*

Further information: Toumaï, esperanza de vida (<https://nutcrackerman.com/2014/12/02/toumai-esperanza-de-vida/>) | Nutcracker Man

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## 2 pensamientos en “Sahelanthropus tchadensis may not have been a habitual biped”

**Eduardo Adarve | noviembre 7, 2020 en 19:58**

Hola Roberto, interesante texto, como todos los tuyos.

Según explicas, es posible que S. tchadensis sea el ancestro común de humanos y chimpancés ¿hasta ahora qué especie es la considerada como el ancestro común? ¿O. tugenensis u otra especie?.

Saludos. Eduardo.

### Responder

**Roberto Sáez | noviembre 8, 2020 en 16:49**

Hola Eduardo. Supongo que te refieres a las opciones para S. tchadensis, como perteneciente al linaje de homínidos, de chimpancés, o a un linaje antepasado común a los dos anteriores. En el artículo se propone explorar la idea de que pertenezca a otro linaje distinto, del que no quedan representantes vivos. Encontrar el Último Ancestro Común de humanos y chimpancés sigue siendo el «santo grial» de la paleoantropología. Y no solo ya encontrarlo, sino caracterizarlo: ¿cómo era su locomoción?, ¿tenía ya dentición reducida? Además, ¿dónde hay que buscarlo? Parece que todo apunta a África, pero prácticamente solo conocemos el este y el sur. ¿Puede ser el UAC originario del centro o del oeste, donde es casi imposible encontrar fósiles? En cuanto a Orrorin tugenensis, es una pena no tener fósiles del cráneo. Por ahora su probable bipedación le otorga su encaje entre los homínidos.

### Responder

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