

Infant craniofacial diversity in Early Pleistocene Homo

Corresponding Author: Professor José Braga

This file contains all reviewer reports in order by version, followed by all author rebuttals in order by version.

Version 0:

Reviewer comments:

Reviewer #1

(Remarks to the Author)

Thank you for asking me to review this very interesting paper written by José Braga and Jacopo Moggi-Cecchi

In this manuscript, the authors evaluate craniofacial ontogeny in early Homo. They focused on two undescribed specimens from Kromdraai (original mandible KW 70000) and Drimolen (original maxilla DNH 83) in South Africa and one undescribed specimen from the lower Omo Valley in Ethiopia (cast mandible Omo 222-1973-2744). They attributed the KW 7000 specimen to Homo aff. H. erectus and Omo 222-1973-2744 to Homo habilis. One of the main conclusions of this article is that the unique mandibular structural differences between these two taxa appeared early in postnatal development.

General remarks

My first issue that needs to be addressed in the introduction of the paper is the definition of early Homo. It is difficult to understand what definition the authors have followed, as often, researchers when mentioning early Homo, focus on Homo habilis and Homo rudolfensis, and do not include Homo erectus or Homo aff. H. erectus. Therefore, the title and objectives should refer to Lower Pleistocene Homo species instead of early Homo. Furthermore, the title 'Fossils from South Africa unveil infant craniofacial ontogeny in early Homo' does not match the abstract and text. If the authors want to focus on South Africa specimens, the Lower Omo Valley specimen should not be included in the text. If the authors wish to extend their focus to all the Early Pleistocene African specimens (included those from Ethiopia, Kenya and Tanzania), the sample should be expanded and a discussion of the difference between East African and South African Homo specimens should be undertaken.

The article is well written, but it is sometimes difficult to follow the structure of the presentation: morphological descriptions (which also include some comparisons), basis for the development of early Homo taxonomy, early Homo in South Africa.

All the methods are appropriate, but it is a little surprising that the description of the Lower Omo Valley specimen, which is central in this paper is based on a cast, and not on the original, which is easily accessible at the National Museum of Ethiopia in Addis Ababa. Why did the authors did not study the original specimen? The fact that the description and analyses of the Omo 222-1973-2744 specimen are based on a cast and not on the original should be mentioned at the beginning of the main text in addition to the methodological section.

As regards the comparative sample, why are the measurements not included Extended Table 1 and 2 and why did the authors not use the same methodology as for the Omo 222-1973-2744 cast, i.e. surface scanning and 3D comparison for specimens KNM-ER 820, KNM-ER 1477, OH 7?

The authors (L128) consider that Omo 222-1973-2744 has a more primitive morphology than KW 7000 and the same robustness than OH 7, and that KW 7000 has a vertically inclined symphysis and convex anterior symphyseal face more in line with KNM-ER 820 attributed to Homo aff. H. erectus. The authors should broaden their comparative sample in order to affirm that the vertically inclined of the symphysis is a Homo erectus trait. I also have some doubts on this point. It also seems to be a visible in certain Koobi Fora specimens attributed to H. rudolfensis or H. habilis. What's more, the dental and mandibular measurements of these two specimens (Omo 222-1973-2744 and KW 7000) are very closed.

In addition, measurements of this inclination and a comparative analysis should be undertaken on all the specimens studied (including KNM-ER 820, ER 1477, OH 7 and others) to validate the authors' statement. If this type of orientation can be observed in different species of Homo, the attribution of this specimen to Homo aff. H. erectus can be questioned?

Why is Omo 222-1973-2744 not included in the analysis and comparison with KW 7000 mandibular symphysis (Figure 4)?

Furthermore, why is the lateral view of Omo 222-1973-2744 not presented which makes it difficult to observe the symphyseal inclination that seems to be an important feature for the authors to discriminate between specimens and attribute KW 7000 to Homo aff H. erectus.

All the features that make it possible to attribute Omo 222 to H. habilis and KW 7000 to Homo aff H. erectus must be discussed in the context of the definition of early Homo (Homo habilis and Homo rudolfensis).

Specific remark

Title

What is the definition of early Homo, taken here? as it often includes only H. habilis and H. rudolfensis. If also includes H. erectus, as is the case here, the title should be Early Pleistocene Homo species (see general remarks also).

L9. What are the data to say that that it is limited, it is not really the case, more than 40 early Homo remains are older than 2 Ma.

L13. scarcity. What is the number ?

L16-L17 the auteurs should indicate the taxa and the anatomical element for the three specimens, because later L 18, it is difficult to make the link.

L17. add "Lower" before "Omo valley"

L20. Since there is an East African specimen, comparisons are also necessary with P. boisei, not just P. robustus.

L22. The authors mention that their results underline the need for caution when using isolated dental features to identify early Homo in the early Pleistocene in South Africa. In my opinion, this caution also applies to the mandible. What are the authors' real arguments? This sentence is debatable and once again focuses on specimens from South Africa.

L26. Why this chronological framework, given that the majority of facial remains are younger than 2 Ma? Why not extend it to 1.5 Ma?

What are the Homo erectus specimens between 2.8 and 2 Ma?

There is a concern for consistency between the text and the references cited.

L33. "However, neither dental microanatomy nor geochemistry contribute to understanding taxonomic diversity in early Homo"

What are the authors' arguments? It has to be noticed that In Smith's work on hominins from South Africa, the specimens DNH 83 and DNH 47 are included.

L37. As this study is based on three specimens, and from two different regions, I'm not sure that this can answer questions of taxonomic diversity, at least in view of the number, which may be as refutable as dental microanatomy, where the corpus studied is much larger.

L38. As for the title, what is the definition of early Homo, taken here? as it often includes only H. habilis and H. rudolfensis. If also includes H. erectus, as is the case here, the title should be early Pleistocene Homo species.

L41-L42. Add the anatomical part, as well as the chronological age, for DNH 83 and KW 7000, and Omo 222-1973-2744 to help the reader follow the objective.

L42. Omo 222-1973-2744 is not part of member G5. In Feibel et al. 1989, it is written sub-member G7, the member is member G, but the sub-member is G7. Idem in the supplementary part.

L44. Some East African specimens are also included in the comparison, please add them to the list.

All specimens studied and used for comparison should be included with their chronological and developmental ages in one table, and their measurements in extended tables 1 and 2.

L48. As regards the caption to figure 1, it should be specified whether it is on the original or on the cast (Omo 222-1973-2744). The orientation should be the same, but this does not seem to be the case between the specimens of early Homo and Paranthropus.

The title of the caption is not accurate as there are also specimens of P. robustus.

L62-63. OH 39 data must be included in the extended data table 1. What is the source of this measurement?

L77. Figure 1. Add also the reconstruction of the maxilla

L91. Which specimens of A. afarensis and A. africanus were studied ?

L96. The arguments in favour of attributing this specimen to Homo are based on dental morphology and mandibular morphology. The authors point out that the anterior symphyseal face of KW 7000 is vertically inclined and comparable to those of KNM-ER 820 attributed to Homo aff H. erectus. For this reason, they attributed KW 7000 to this taxon.

A comparison with a larger sample should be made, as the same orientation can also be observed in Homo specimens but has not been attributed to H. erectus. Therefore, this specific attribution should be more robust (see also general remarks). Some measurements of this inclination and a comparison with a larger sample should be added, including for KNM-ER 820, because if we look at the figure in Wood (1991) Koobi Fora, vol 4, it does not look so vertically inclined (see also general remarks).

If this type of orientation can be observed in different species of Homo, the attribution of this specimen to Homo aff. H. erectus can be questioned?

L98. What is the developmental age of KNM-ER 820 ?

L99. Which are the specimens of P. boisei, it seems that they are not included in the extended table 2 nor in the extended data of Fig. 7.

Extended Table 2. The mandibular measurements of KW 7000 seem closer to those of Omo 222-1973-2744 than to those of KNM-ER 820, so why put these two specimens in two different taxa... which is one of the major arguments of this article.

L98-L102. The comparison is made in terms of size. If the size component is not taken into account, do the authors obtain the same results?

L105. What is the inclination of Omo 222-1973-2744? Why is there no lateral view of the Omo 222 in the extended data in Figure 7 and Figure 3? This makes it impossible to compare. (See also general remarks).

The configuration in Figure 3 is not easy to compare. Why can't we see the whole specimen for figures a, c and d?

L114. Attribution of specimen Omo 222-1973-2744 by Fred Grine in his thesis in 1984 to Homo habilis on the basis of

decidual dental crowns. What will be the authors' attribution on the basis only of the mandible features ?

L119. « The more derived morphology of KW 7000 contrasts with that of Omo 222-1973-2744 because the former shows a vertically inclined symphysis with a distinctive mental surface anteriorly (in Omo 222-1973-2744, the symphyseal axis forms an angle of approximately 65° with the basal plane) and the anterior positioning of the elongated geniohyoid depressions (Fig. 3, Extended Data Fig. 7). »

The lateral view of Omo 222-1973-2744 is absolutely essential for a comparison, as well as a table of the angle between the symphyseal axis and the basal plane, with an increase in the comparative sample.

With regard to the parabolic shape, a comparison should also be made with other specimens, for example those attributed to *Homo habilis* and *Homo rudolfensis*.

In other words, to be sure of an attribution to *Homo habilis* for Omo 222 and to *Homo aff. H. erectus* for KW 7000, further comparisons must be made with a larger corpus, particularly in relation to the shape of the mandible and the inclination of its symphysis. The shape seems similar to that of OH7 or KNM-ER 1802 (even if the developmental age is different), which can be attributed to either *Homo habilis* or *Homo rudolfensis*. Do the characteristics highlighted really discriminate between *Homo habilis*, *Homo rudolfensis* and *Homo erectus* (adult or juvenile)?

Could we attribute Omo 222 and KW 7000 to other taxa (*Homo rudolfensis* and/or *Homo habilis*)?

Because these attributions are a major point of the article and of the conclusions.

Idem for L 141-147

Developmental basis for early *Homo* taxonomy.

A few sentences and explanations should undoubtedly be included in the previous paragraph when taxonomic comparisons and attributions are made

L134. A comparison between the KW 7000 and the OH 7 should also be carried out.

L154. Why only a comparison with australopiths and not with *Paranthropus* ? which are in Figure 3 ??

L164. Why OH 7 is not in the analyses (e.g. Extended Data Table 2) ? « In contrast, the Omo 222-1973-2744 *H. habilis* infant exhibits a more primitive gnathic morphology, consistent with the OH 7 specimen4. »

Figure 4. Other specimens should be added to the analyses, in particular for the OH 7 mandible, KNM-ER 820.

L186. Why are the results on *Paranthropus* not mentioned here ?

L204. « We find that some facial structural (i.e., shape) novelties observed in early *Homo* species arose from deviations from an ancestral australopith pattern of development. »

In my opinion, this sentence should be more substantiated and referred to certain analyses, as the majority of comparisons are with *Paranthropus robustus*.

L210. Why include at this point in the text a section on Early *Homo* in South Africa ?

L216. Some references are missing e.g. Curnoe

L221. I'm not sure that a study based on three individuals from three different sites and two different regions would improve the assessment of early *Homo*'s taxonomic diversity.

L224. This sentence should be used when there is a comparison and taxonomic attribution.

L226. What are the specimens of *A. afarensis* and *A. africanus* and what is their dental morphology?

L228. Seems to be a repetition of what is written in L 217.

L230 « less likely ». What is the number of specimens for early *Homo* infants, and for *P. robustus*.

Extended Data Figures also put the specimen label inside the figure in addition to the legend.

Methods

The methods are well explained and used.

The authors have undertaken microCT for certain specimens, original specimens from South Africa with different voxel size (between 17.857 et 42.85 µm or 20.24 µm) and surface scan with Artec Spider (0,1 mm=100 µm) and 3D point accuracy (0.05 mm) for Omo 222-1973-2744.

Could this difference in resolution have an impact on the results?

The fact that observations and analyses are carried out on a cast (Omo 222-1973-2744) rather than on an original may have an effect on the results; this can be quantified and included as a limitation of the study.

Reviewer #2

(Remarks to the Author)

Braga & Moggi-Cecchi 2024

Fossils from South Africa

This manuscript presents a description, comparison and analysis of 3 fossil infant specimens of early *Homo*, and a small sample of *Paranthropus robustus* infants and one of *Australopithecus africanus*. The research presented is largely descriptive, but includes bgPCA analyses of maxillary and mandibular landmark and semi-landmark data.

Overall, the manuscript presents an impressive and comprehensive analysis of these specimens, and discusses important and interesting aspects of ontogenetic variation focusing on distinguishing features of the early *Homo* infants. Notably, even at the young ages represented by the fossils, morphological distinctions between early *Homo* and the australopiths (mostly robust) are evident, and allow inferences to be made about ontogenetic processes, weaning, and related issues. There is extensive supplementary information, including additional images of the specimens, detailed morphological descriptions, a summary of the bgPCA results, and information on the comparative sample of *H. sapiens*.

I think that this research is relevant and timely, and it adds important information about our understanding of growth and development of ancestral hominins. It is particularly interesting because of the young ages at death of the fossil specimens, which are extremely rare in the fossil record. Thus, I believe that this work should (eventually) be published, but I have a few concerns that should be addressed.

Here is the main issue in my view. The sample comprises two early Homo specimens, and a number of Paranthropus robustus specimens. A few specimens of Australopithecus africanus are mentioned, but fossils of appropriate age (infants) have not been recovered for this taxon. The result is that most of the discussion, figures comparing taxa, and the analysis overall relies on comparison between early Homo and Paranthropus - there simply is not other material to include.

However, the analysis and discussion seem to be geared toward identifying or understanding the 'uniqueness' of early Homo ontogeny and facial morphology in an evolutionary context. On p. 11, the sections discussing the 'new facial features' of early Homo that are 'deeply ingrained in their ontogeny', and also that about plasticity are relevant here.

The point is that Paranthropus is not the appropriate taxonomic group for such comparisons, given its status as an extinct 'side branch'. Comparisons of Paranthropus and Homo certainly will yield many differences, but I don't think they establish the 'uniqueness of early Homo' facial or ontogenetic features as they also reflect the well-recognised derived morphology of the robust australopiths. If early Homo evolved from a species of Australopithecus, evolutionary interpretations about morphology and ontogenetic changes need to be based on comparisons with an Australopithecus sample.

I am not sure how to resolve this - I think I understand the aims of the authors with regard to the early Homo material, but it seems that the sample required to conduct the study in the appropriate evolutionary/ phylogenetic context (mainly, including an adequate sample of infant Australopithecus fossils) does not currently exist. If there is something I am not understanding about the aim or approach, then this needs to be clarified.

A second issue relates to the comments and inferences about differences in weaning between early Homo and australopiths. I think that the section on weaning on p. 11, lines 184-186 could be revised to reflect the more nuanced views about weaning - see work of C. Austin and TM Smith on the reconstruction of weaning periods - and their variation - from trace elemental signatures. My reading of this literature suggests that differences in weaning periods among extant apes, fossil hominins, and humans include considerable amounts of variation, and that distinctions of 'early' vs 'late' weaning are not as clear as once thought. Since this information seems to be used in the manuscript to support the interpretations about early Homo ontogenetic differences, a fuller account of the evidence about weaning and its variation is relevant.

Also, continuing at the end of that paragraph (lines 194-195) if Homo already had a distinctly later weaning period, but did not have a prolonged schedule of growth, what are the implications for life history timing overall? How would that work?

A few minor edits:

The text for Figure 1 (lines 48-53) explains the colour pattern for early Homo specimens, but not for Paranthropus

Line 69 - 'eyeballs' - would it be more appropriate to talk about bony orbits here, given that it is a comparison of the facial skeleton, not of soft tissue?

Line 112 - closing) needed after 'color'.

Line 153 - I would delete the comma after '...differs between'

Lines 156-7 - in discussing the plot of the first two bgPCs - do they highlight the 'unique facial structure of early Homo' or just demonstrate that early Homo and Paranthropus have clearly distinguishable facial structure? Would there be any expectation that these genera are similar (in contrast, perhaps to a comparison of late Australopithecus vs early Homo)?

In figure 4, the blue polygons are not defined in the accompanying text

Note that on Fig 4 - bgPC plot b - DNH83 is very similar to KW9000 and DNH47 on bgPC1 (but not PC2). Likewise on plot f, the Australopiths and Paranthropus have a similar range on bgPC1. Is it possible to provide any further information on what PC1 and PC2 are describing in these plots? Some of this information is provided in the supplementary information but would be useful to include (briefly) in the main text.

Anonymity waived - Kevin Kuykendall

Reviewer #3

(Remarks to the Author)

This paper presents previously undescribed fossil remains from a critical period in human evolution: the origin of the genus

Homo. Some of the analyses suggest that two of these fossils may potentially be attributed to Homo aff. H. habilis and one to Homo aff. H. erectus. The study demonstrates for the first time that the morphological differences in the maxilla and mandible within adult early Homo, but also between adult early Homo and Paranthropus, are already evident early in ontogeny. Moreover, this study cautions against taxonomic attributions based on isolated teeth, as evidenced by the combination of primitive and derived traits observed in some early Pleistocene individuals. While this work is of importance for the field of paleoanthropology, in my opinion some interpretations and conclusions are overstated. Nevertheless, I do not believe this detracts from the paper's value or impedes its suitability for publication. The methodology employed is robust and, for the most part, sufficiently detailed to allow for reproduction of the results.

General comments

- Regarding the debate about the origin of the genus Homo, could the authors clarify what specific contributions this paper makes to advance or address this issue?
- Why did the author choose not to apply geometric morphometrics to the enamel-dentine junction?
- The paper would benefit from clearer figures emphasizing the morphological and dental (both external and internal) differences between early Homo and australopiths, as well as between KW 7000 and Omo 222.
- I suggest including results from both a standard PCA and the between-group PCA. Given the ongoing debate around bgPCAs, presenting both would provide better transparency. I also believe that bgPCA may not be the most appropriate analysis in this case.
- The regression does not support the authors' claim that DNH 83 grew slower than DNH 47. Since it is one of the paper's main conclusions, it should be addressed more carefully. The conclusions should be limited to the observed smaller size of early Homo individuals.

Minor issues

• Abstract

- Lines 21-22, page 1: "[...] indicating slower growth rates or distinct developmental processes". The second part of the sentence is vague; it is well understood that morphological differences stem from distinct developmental patterns.

• Introduction

- The introductory section would benefit from a brief overview of the differences in facial morphology between adult early Homo and Paranthropus, as well as between H. habilis and H. erectus.
- I would also recommend including the fossil dates directly in the main text, rather than only in the Supplementary Information.

• Methods

- Line 333, page 17: I could not find a definition for "NL" in the text, which makes it difficult to follow. While I am not sure that this level of detail is necessary, given that it has already been published elsewhere, if kept it should be better explained.
- Why did the authors opt for a between-group PCA instead of a standard PCA? Were DNH 83 and KW 7000 projected into the PCAs?
- Lines 348-352, page 17: could the authors clarify that this section refers to the cross-validation step for the bgPCA? As written, the statement "the differences reported in Fig. 4b and 4f reached statistical significance" lacks clarity.
- The regression analysis involving the modern sample into which DNH 83 and DNH 47 were projected is not addressed in the Methods section. Given the conclusions drawn from this analysis, I recommend that the authors explain its purpose more clearly. Additionally, since DNH 83's age is provided as a range, it would be helpful to specify which age was used for this individual in the regression.

• Results

Morphological descriptions

- Lines 57-63, pages 3-4: I suggest that the criteria used to describe the differences between early Homo and australopiths' deciduous teeth could be better referenced and highlighted.
- Lines 63-64, page 4: "The DNH 83 [...] is much smaller and more derived [...]". It is smaller because it is younger.
- Lines 66-75, page 4: I suggest revising this sentence. Also, please remove the "s" at "it" in line 73: "where its contacts the vomer".
- Line 85, page 5: "Given the general trend for maxillary developmental delay, [...]". This statement needs clarification. Is this deduced from the current study, or from a specific reference?
- Line 94, page 6: "but no true chin (Fig. 3)". Please refer more precisely to the figure, for example by using "Fig. 3 (f)".
- Lines 119-127, page 8: Could the authors please revise that section to improve its clarity?

• Discussion

- Line 146, page 9: what specific differences in "mandibular structure" are being referred to?
- Lines 147-150, page 9: could the authors briefly outline which mandibular traits are directly influenced by the suprahyoid muscles? Additionally, a more comprehensive discussion of the referenced work cited here would enhance support for their claim. While I understand that a reorganization of these muscles explains some of the differences between chimpanzees and humans, it should be considered that in the case of this study, these groups are more closely phylogenetically-related, and that other factors might play a role.

- Lines 180-184, page 11: why is KW 9000 not included here? I do not believe that this analysis supports that DNH 83 exhibited slower or delayed growth compared to DNH 47. As noted by the authors, the variation of the residuals in *Homo sapiens* is substantial. This analysis simply demonstrates that DNH 83 is smaller than DNH 47 due to its younger age. To discuss differences in growth rates between groups, it is essential to include a minimum of two individuals per group or to compare individuals of similar ages, as even a one-month difference can significantly impact early developmental stages.
- Lines 208-209, page 12: The statement "[...] with differences in the organization of the suprahyoid and geniohyoid muscles" can only be hypothesized and cannot be conclusively drawn from the data presented in this study.

• Figures

Figure 1

- Please clarify in the caption that the fitted upper and lower jaws represent composite individuals. While this may be inferred from the fossil names, it may not be immediately clear to a non-specialist. I would also prefer to see the maxillae aligned in one row (labeled a, b, c, etc.), with the mandibles aligned in a second row beneath.

Figure 2

- (f) Please indicate in the caption that the 3D model of the permanent canine is in dark blue.
- Line 59, page 3: figure 2 is referred here when discussing differences between early *Homo* and australopiths. I recommend referring to Extended Fig. 3 instead and better highlight the differences between taxa.

Figure 3

- For KW 7000: (b) this picture shows a supplementary fragment (the one with the dm2) that does not appear in (a), (c), and (d).
- Lines 112-113: please revise this sentence.

Figure 4

- Why is Omo 222-1973-2744 not included in this analysis? I recommend including a figure that illustrates the morphological differences between KW 7000 and Omo 222, akin to Extended Data Figure 6.
- (c) instead of using arrows of different colors, could the authors use distinct colors for the homologous landmarks? Additionally, please specify the orientation of the configurations in relation to the view.
- Could the authors provide a figure of the landmark template for both the maxilla and the mandible in the supplementary information? It is difficult to visualize this on Figure 4. Providing the template would also help simplify the figure by removing panels (a), (d), and (e), as well as the arrows indicating homologous landmarks. Instead, I suggest including the warps along the principal components to visualize the changes along both axes.
- What would be the differences between KW 7000 and the mean of the *Paranthropus* group?
- Please include the color code for each group in the caption.

• Extended figures

Ext Data Fig. 1

- Please indicate again in the caption the species attribution of this specimen.

Ext Data Fig. 2

- Please write "p-t" before "Renders in 3D of the KW 9000 left maxilla".
- What is the "relationship" between the nasal aperture and the nasoalveolar clivus? Could the authors be more precise about what the red arrows are showing? I also find it unclear what the second arrow is indicating. Would it be more effective to use a line? Why are these arrows not present on KW 9000?
- Is the comparison with DNH 84 really necessary here, as it is more fragmentary?

Ext Data Fig. 3

- Could the authors clearly indicate in this figure the specific features that differentiate early *Homo* from the australopiths, perhaps by using arrows? Additionally, the figure title is somewhat inaccurate, as it includes a comparison with an *Australopithecus* (Sts 2); I recommend making this correction. In my opinion, this figure is central to the study and should be regarded as a primary figure.

Ext Data Fig. 4

- (a) The X-axis title ("MD") is missing.
- (b) Could the name of DNH 83 be placed closer to its point?
- (c) Why is *Paranthropus* either represented by a black dot or an X? What do the squares with an X signify? Additionally, *Australopithecus* is represented by either a white dot or by a white square.
- Some names in the plots are truncated.

Ext Data Fig. 5

- What does "(SI)" refer to?
- (c) and (g): please maintain the initial color (blue) of the surface model for DNH 47 and KW 9000.
- The colors of the arrows in (b), (d), (f) and (h) should differ if they indicate different features.
- (d) What is the purpose of pointing to the openings of the gubernacular canals?
- (h) is this a zoomed-in view?
- (b), (d), (f) and (h): could the contrast of these images be enhanced?

Ext Data Fig. 6

- As mentioned in the text (Lines 68-75, page 4), several features distinguish DNH 83 from DNH 47. Could the authors improve this figure by clearly highlighting these distinctions with arrows?

Ext Data Fig. 7

- Please change "a-f" to "a-g" when referring to the 3D renders of KW 7000

Version 1:

Reviewer comments:

Reviewer #1

(Remarks to the Author)

Dear Authors

Thanks for this revised manuscript, updated figures and the answers to the comments.

I really appreciate the inclusion of the east african specimens (KNM-ER 820 and KNM-ER 1477) and the data from the original fossil for Omo 222-1973-2744 and the updated analyses, methods, figures and tables.

Restructuring the paper, by separating morphological descriptions from morphometric comparisons, makes it easier to follow the structuring of the paper.

The arguments for attributing KW 7000 to Homo aff H. erectus are solid, well developed and well argued.

All the changes made are in line with my requests. However, my main concern is the taxonomic attribution of Omo 222-1973-2744 and the arguments proposed (cf. remark 1.37).

The authors add further explanation to justify their attribution to Homo habilis rather than H. erectus or H. rudolfensis.

However, thanks to new analyses, the authors have highlighted certain similarities with Paranthropus.

L 242 « The mid-sagittal symphyseal shape of the Omo 222-1973-2744 specimen differs from that of KW 7000 primarily due to the markedly receding mandibular symphysis in the former (Supplementary Fig. 7). This morphology is also observed in P. robustus infants (SK 62 and KW 6420) and the A. africanus juvenile MLD 2, which exhibit the most positive PC1 values (Fig. 7b).»

Is this morphology also visible in P. boisei? Would it possible to insert KNM-ER 1477 in the comparisons and analyses involving principal component analyses?

What are the arguments for attributing OMO 222-1973-2744 to Homo, with the exception of dental morphology (Fred Grine's thesis)? as it is written L 360 "need for caution when relying solely on isolated dental features".

This specimen does not fall within the range of variability observed in H. sapiens infants and older juveniles (Fig. 7) and the symphysis of Omo 222-1973-2744, does not closely resembles that of the KNM-ER 820 juvenile.

Furthermore, as point by the authors in response to Remark 3.31. "Please note that Omo 222-1973-2744 falls within or near the range of variation of P. robustus, and is relatively close to its mean". The position of Omo 222-1973-2744, which is closer to the Paranthropus specimen than to that of Homo, need to be discussed.

L 319-L327. "Compared to KW 7000, Omo 222-1973-2744 displays a morphology that appears more primitive, resembling the developmentally older OH 7 mandible that is considered a subadult stage of facial architecture in H. habilis 4,15,32. Indeed, Omo 222-1973-2744 (Fig. 4) exhibits a degree of corpus robusticity (Fig. 8, Supplementary Table 3), a symphyseal morphology reminiscent of australopith juveniles (Fig. 7,8), and a squared-off incisor/canine row absent in KW 7000 (Supplementary Figs. 6,7). Consistent with its attribution to H.habilis based on dental morphology³¹, the more primitive gnathic features of the Omo 222- 1973-2744 juvenile, both at the symphyseal (Figs. 4,7) and corpus levels (Figs. 4,8), align more closely with australopiths and the OH 7 H. habilis subadult^{15,32} which retains primitive mandibular characteristics⁴. Unfortunately, the lower half of the symphysis in OH 7 is not preserved, preventing direct comparison with Omo 222-1973-2744 and KW 7000"

Which features of Omo 222-1973-2744 are similar to OH 7? Probably not the degree of robustness of the corpus, because in Fig. 8, OH 7 is not included in the analysis, as the authors point out when they say that a direct comparison between OH 7 and Omo 222-1973-2744 is not possible (see also L 217). In all these analyses, Figs. 7 and 8. Omo 222-1973-2744 lies within the range of variation of Paranthropus (P. robustus).

Abstract

L16-17. I am not sure that this sentence is relevant in the abstract and in accordance with the main goal of the paper.

L27. Probably write "confirms" the importance of integrating instead of "highlights" the importance...

L40. add also that for A.L. 666, based on the fauna, the site is dated between 2.3 and 1.9 Ma (Rowan et al. 2022, Rowan, J., Lazagabaster, I. A., Campisano, C. J., Bibi, F., Bobe, R., Boissérie, J. R., ... & Reed, K. E. (2022). Early Pleistocene large mammals from Maka'amitalu, Hadar, lower Awash valley, Ethiopia. PeerJ, 10, e13210.

L40-41. It should be probably added that this specimen was also allocated Homo aff. H. habilis (ref 6)

L46. The early Early Pleistocene, what do the authors mean? The early stage of Early Pleistocene?

L57. As Paranthropus is a monophyletic group and differentiated from Australopithecus in this article, write Paranthropus and Australopithecus instead of australopiths

L 72. see remark for L57, here write P. boisei, P. robustus and A. africanus instead of australopiths.

L 120. See remark L 57.

L 123. A comparison with *Australopithecus africanus* could be also possible? As it done for other morphological traits, even if there is no infant *A. africanus*.

L 193. See remark L 57.

L 199. Separate from *P. robustus* and *A. africanus* instead of separate from australopiths.

L 203. See remark for L 199

L 215. L 219. For KNM-ER 820 allocation, sometimes is written *Homo erectus*, sometimes *Homo aff. H. erectus* (cf. Table 1), sometimes *Homo aff. erectus* (L381). The taxonomic allocation should be identical throughout the article.

L. 300. Which genus when you mention australopiths with ref 10 and 46.

L 306. Please mention the genus and species when you mention australopiths. If we refer to figure 7 and 8, it should be *A. africanus*, *P. robustus* and *P. boisei*.

L 319 "Omo 222-1973-2744 displays a morphology that appears more primitive, resembling the developmentally older OH 7 mandible that is considered a subadult stage of facial architecture in *H. habilis* 4,15,32".

This sentence is somewhat redundant with the end of L327 concerning OH 7.

L 327. Please mention genus and species when referring to australopiths, *A. africanus*, *P. robustus*. The position of Omo 222-1973-2744, which is closer to the *Paranthropus* specimen than to that of *Homo*, need to be discussed (see general remarks).

L. 334. "This evidence indicates that neither of these juveniles can be attributed to *H. rudolfensis*".

I think the authors should probably be careful because, as mentioned above, there are no *H. rudolfensis* infants to compare.

L 345. It is undeniable that there is a difference between KW 7000 and 222-1973-2744, and that KW700 can be attributed to the genus *Homo*, but if 222-1973-2744 is not a representative of *Homo*, since it appears on numerous analyses to be close to *Paranthropus*, is this sentence still valid? (see general remarks)

L355. Replace australopiths by *Paranthropus robustus* and *Australopithecus africanus*.

Figure 8. How do the authors explain the position of KNM-ER 820, its distance from KW 7000 and its proximity to *Paranthropus*?

L 364. See remark L 40.

Figure legend

L 798. As for figure 7, the specimens belong to *A. africanus*, *P. robustus* and *P. boisei*, write *A. africanus*, *P. robustus* and *P. boisei* infants instead of australopith infants

L815. As for figure 8, the specimens belong to *P. robustus* and *P. boisei*, write *P. robustus* and *P. boisei* infants instead of australopith infants

References

Check that genus and species names are italicised

Supplementary

L347 and L 355. There is no posterior fovea or distal marginal ridge.

In all supplementary sections, check that there are no other redundancies.

Reviewer #2

(Remarks to the Author)

The revised manuscript had been thoroughly re-worked to address the comments of all 3 previous reviewers, and it represents an extensive amount of new work including an expanded sample and additional PCA analyses. I am generally satisfied that the authors have addressed the comments appropriately, and in particular they have addressed my previous comments.

However, there is one observation that I would like to present. The title, some of the subheadings, and various statements in the text use the term 'ontogeny' and suggest that one aim of the study is to reveal details of the ontogeny of early *Homo*. While I appreciate that this certainly would be valuable and interesting, and is a general aim in researching infant and juvenile fossil specimens, I don't believe that this study is really about 'ontogeny' at all. It analyses and compares morphological features of the infant and juvenile individual fossils (focusing on three specimens that they demonstrate are likely to vary taxonomically). The discussion and conclusions in the text are largely (in my view) geared toward taxonomic classification on the basis of infant and juvenile morphological features - not an assessment of ontogeny. Ontogeny is the process of growth and development toward maturity, and there is actually very little discussion about this process in the manuscript, and the results of this analysis do not address ontogenetic processes, patterns or rates. This is not to say that the information is not relevant to understanding ontogenetic differences, but with such small samples and fragmentary remains it is very difficult to discuss 'ontogeny' in a meaningful way.

Thus, I would suggest that the authors review the title, subheading, and sections of text that use the term 'ontogeny' and consider whether it is really appropriate as used - in a few cases, I think it may be, but not in the title and I don't think that the subsection of the text are really about ontogeny. The paper appears to be more about classifying infant and juvenile specimens on the basis of morphological traits at different stages of development - a very useful but little addressed topic.

Overall, I do think that the paper presents valuable and relevant information and an interesting analysis of some very important and difficult to study fossil specimens. The authors have put a huge amount of thought and effort into the study to try and present a study that will advance our understanding of early *Homo* in southern and East Africa, and to utilise these

rare infant and juvenile fossils in meaningful research. This paper will be a useful contribution to that effort.

Reviewer #3

(Remarks to the Author)

Main comments

- The attribution of the fossil specimens to early Homo is initially accepted, but later in the discussion, uncertainty about this attribution is expressed. The paper would benefit from a clearer structure: 1) Acknowledging that the attribution of some fossils to early Homo is debated; 2) Stating the study's objective to identify developmental features that distinguish them from australopiths; 3) Presenting the results that support these differences; and 4) Concluding that the findings contribute to the understanding of these fossils as early Homo based on developmental distinctions.
- I would like to insist on the need to enhance the visualization of the results, in particular in the PCAs. It is crucial to improve the clarity of these visualizations. Currently, some of them are still very confusing. Please consider employing alternative visualization techniques.
- The Results section could be better organized using sub-headings, helping the reader to follow the logic behind each analysis (for example: facial analysis, then dental analysis).
- The discussion is currently lengthy and unclear in some parts.

Introduction

- Page 3, Line 46: Please remove "during the Early Pleistocene" for conciseness
- Page 4, Line 70: Please remove the "s" after "evidences"
- Page 4, Line 76: Please revise this sentence for clarity (suggestion): "Due to its significance as the holotype of *H. habilis*, the subadult OH 7 was also included in some analyses despite its high degree of fragmentation."
- Page 5, Lines 87-89: Remove the "and" after "infants," in: "[...] one *P. boisei* (KNM-ER 1477) infant, and four slightly older..." Additionally, add "and two other early Homo"

Materials and Methods

- Could the authors introduce a distinct "Analyses" section, as not all analyses pertain solely to 3D data processing.

Results

- Page 6, Line 5: Change "when feasible" to "where feasible" and refer to the Methods section here.
- Page 6, Line 111: A reference is missing here, please provide the appropriate citation.
- Page 6, Lines 113-114: The statement regarding dental mineralization is vague. Please specify which teeth exhibit similar mineralization and refer to the method of quantification. Isn't this observation ancillary? If so, please consider relocating it to an appropriate section.
- Page 6, Line 114: Move reference 21 to the end of the sentence, alongside reference number 30.
- Page 6, Line 118: The term "stage R1/2-3/4" may be unclear to non-specialists. If retaining this information, please provide a brief explanation or refer to a detailed description in the Methods section.
- Page 6, Lines 120-127: Could the authors please provide concrete data, such as frequencies, to demonstrate that these features differ between early Homo and australopiths?
- Page 6, Line 124: Revise to "as typically seen in *P. robustus* and *A. africanus*."
- Page 6, Line 126: Note that this observation pertains only to the dm1. In Supplementary Note S2, while DN 83 is described as falling outside the variation observed for *Paranthropus*, it's noteworthy that it falls within the variation of *Australopithecus*.
- Page 7, Line 4: The mention of "the anterior part of the masseter origin" might be unnecessary here; consider removing it.
- Page 8, Line 154: Add "and" before "the MD elongation of the crown."
- Page 9, Lines 200-202: This sentence is vague.
- Page 9, Line 203: Please revise to "involve the postero-superior shift."
- Page 10, Line 208: Please remove the parenthesis after "PC2)."
- Page 10, Line 211: Please change to "(Fig. 6d)." Also, please clarify whether "landmarks 10-14" refers to landmarks 10 through 14, as some differences can also be observed in landmarks 11 and 13. Please consider alternative representations of these results to improve clarity.
- Page 10, Line 217: Please revise for clarity (suggestion): "A first PCA conducted on a sample of 50 semi-landmarks along the mid-sagittal plane of the mandibular symphysis was employed." Also, please ensure consistency with the Methods section regarding the number of semi-landmarks used (50 or 60?).
- Page 10, Line 218: Specify with what the mandible KNM-ER 820 is compared to.
- Page 10, Line 221: Please share the template used in that figure in the supplementary materials.
- Page 10, Lines 222-226: Please specify where the results of that test are presented.
- Page 10, Line 227: Where do these two specimens fall on PC3?
- Page 11, Lines 230-231: Please specify that this refers to the first PCA.
- Page 12, Line 257: The concept of robusticity has not been previously mentioned, nor defined, as an important feature that needs a supplementary analysis in this study. It might be worth discussing this aspect in the Introduction.
- Page 12, Line 259: Format "dc" with the "c" as a subscript.
- Page 12, Line 266: The term "lower robusticity" is unclear; please rephrase.
- Pages 12-13, Lines 274-278: Why was DNH 83's dm2 not included in this analysis?

Discussion

- Page 14, Line 301: While it is challenging to confidently attribute DNH 83 to Homo, this was assumed at the beginning of the paper, which may seem circular. This should be addressed in the Introduction. Some results support this attribution,

which should be a conclusion of the paper. Alternatively, please rephrase and refer to the limited knowledge of morphological variability in australopith infants.

- Page 14, Lines 307-318: The logic behind this feature being distinct from australopiths is unclear to me, as some *Paranthropus* specimens also exhibit it. Please clarify the intended message.
- Pages 14-15, lines 319-351: The paragraph spanning pages 14–15, lines 319–351, is quite lengthy. I recommend dividing it into two distinct sections: one focusing on the discussion of Omo 222 and the other on the conclusions regarding KW 7000.
- Page 15, lines 354-355: repetition with above.
- Page 15, lines 358-361: yes, but as already highlighted by Reviewer 1, the opposite is also true for the skeletal morphology.

Figures

Figure 1

- This is a great figure but I would move OH 7 somewhere else on this picture. It is confusing that it is placed at the bottom. The arrow representing time could be elongated and OH 7 placed with the other early Homo.

Figure 3

- Unless I am mistaken, the canines are not shown in dark blue as stated.

Figure 5

- Could the authors add somewhere on this picture the mesial/lingual/buccal/distal sides using axes? (same for figure 2)

Figure 6

- Please change the "title" of the caption.
- I would like to emphasize the importance of providing clear visualizations of the changes along the principal components (PCs) and the differences between specimens. Currently, the visualizations presented by the authors are quite confusing. There are alternative, simpler methods to represent the variation along PCs, such as superimposing warps using transparency or displaying contours in lateral views. I recommend considering these or other approaches to improve clarity.
- Why is PC 2 not presented in this figure? A 3D plot showing the first three PCs would actually be helpful.

Figure 7

- While the differences between the extremes on the axes and individuals are clearly depicted in Fig. 7b (though the colors may be hard to distinguish for colorblind individuals), I find Fig. 7d to be quite confusing, particularly in the comparison between Omo 222 and KW 7000. The interpretation of this figure is difficult. How can we determine which represents PC2+ and which represents PC2- when both are superimposed on the same image?
- Could the authors indicate in 7b how the mandibular profiles have been oriented?

Figure 8

- 8a-d: I wonder if this should not be a supplementary figure.
- 8e: The authors should indicate on this plot which axis represents PC1 and which represents PC2.

Open Access This Peer Review File is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made.

In cases where reviewers are anonymous, credit should be given to 'Anonymous Referee' and the source.

The images or other third party material in this Peer Review File are included in the article's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

To view a copy of this license, visit <https://creativecommons.org/licenses/by/4.0/>

Dear Editor and reviewers,

Point-by-point response to the comments

Jacopo Moggi-Cecchi and I are pleased to submit our revised manuscript titled “Infant Craniofacial Ontogeny in Early Pleistocene *Homo*.” We sincerely thank you, as the Editor, and the three reviewers for your insightful comments and constructive suggestions, which have greatly improved the quality of our work.

Enclosed, you will find the revised manuscript with tracked changes, updated figures (nine), one table, and supplementary data.

Below, we provide detailed responses to each comment raised by you and the reviewers.

To address the main concerns, we have:

- (i) included, for East African specimens, additional samples (e.g., KNM-ER 820, KNM-ER 1477) and data from original fossils rather than casts (e.g., Omo 222-1973-2744);
- (ii) incorporated these new data into four additional statistical analyses focusing on the mandible and dm2 EDJ; and
- (iii) refined the aims and discussion to reflect the expanded sampling.

Reviewer #1 (Remarks to the Author):

Remark 1.1. “Issue that needs to be addressed in the introduction of the paper is the definition of early *Homo*. It is difficult to understand what definition the authors have followed, as often, researchers when mentioning early *Homo*, focus on *Homo habilis* and *Homo rudolfensis*, and do not include *Homo erectus* or *Homo aff. H. erectus*. Therefore, the title and objectives should refer to Lower Pleistocene *Homo* species instead of early *Homo*.”

CHANGE MADE AND RESPONSE. LINES 31-48: The issue addressed here pertains to the definition of “early *Homo*,” which was unclear in our previous version. In the first paragraph of the revised Introduction section (Lines 31-48), the Gelasian stage of the Early Pleistocene (2.588–1.806 Ma) is defined as the context for the earliest fossils attributed to *Homo erectus*, *Homo habilis*, and *Homo rudolfensis*. The use of the term “Gelasian” eliminates ambiguity by aligning with the international geologic timescale (ref. 11). We now specify that *Homo* fossils from this period are collectively referred to as ‘early *Homo*,’ following multiple references that include *Homo erectus* within this designation (e.g., refs 4 and 5). Additionally, the paragraph highlights evidence suggesting the presence of other potential *Homo* species in Africa during the Gelasian and briefly references one early *Homo* fossil from the late Pliocene (e.g., Ledi-Geraru at 2.8 Ma). The title has been updated to align with these revisions.

Remark 1.2. “Furthermore, the title ‘Fossils from South Africa unveil infant craniofacial ontogeny in early *Homo*’ does not match the abstract and text. If the authors want to focus on South Africa specimens, the Lower Omo Valley specimen should not be included in the text. If the authors wish to extend their focus to all the Early Pleistocene African specimens (included those from Ethiopia, Kenya and Tanzania), the sample should be expanded and a discussion of the difference between East African and South African *Homo* specimens should be undertaken.”

CHANGE MADE AND RESPONSE. LINES 76-100: Thank you for this valuable feedback. We have addressed these concerns by expanding our sample to include additional specimens and performing new analyses. In the revised Introduction (fourth paragraph, Lines 76-100), we detail that our study now examines a total of 15 infants and young juveniles from both eastern (n=5) and southern Africa (n=10). These specimens are listed in Table 1 and

most of them are also illustrated in the updated Figure 1. Additionally, we outline the incorporation of various analytical methods, including geometric morphometrics (GMM), to facilitate a discussion of the differences between eastern African and southern African *Homo* specimens. This expanded approach enables us to refine our interpretations and ensure consistency between the title, abstract, and text, reflecting the broader scope of the study.

Remark 1.3. “It is sometimes difficult to follow the structure of the presentation: morphological descriptions (which also include some comparisons), basis for the development of early *Homo* taxonomy, early *Homo* in South Africa.”

CHANGE MADE AND RESPONSE. We restructured the paper by separating the morphological descriptions from the morphometric comparisons in the Results section, incorporating several new analyses into the latter.

Remark 1.4. “It is a little surprising that the description of the Lower Omo Valley specimen, which is central in this paper is based on a cast, and not on the original, which is easily accessible at the National Museum of Ethiopia in Addis Ababa. Why did the authors did not study the original specimen?”

CHANGE MADE AND RESPONSE. The original specimens from east Africa (including Omo 222-1973-2744) were previously studied by one of the the authors (in 1996) at the National Museum of Ethiopia in Addis Ababa and the National Museums of Kenya in Nairobi. This is now clearly outlined in the Methods section.

Remark 1.5. “The fact that the description and analyses of the Omo 222-1973-2744 specimen are based on a cast and not on the original should be mentioned at the beginning of the main text in addition to the methodological section.”

CHANGE MADE AND RESPONSE: In our revised study, we adopted an updated approach, clearly outlined in both the Introduction and Methods sections, to ensure accurate and consistent data for all fossil infants and older juveniles listed in Table 1. This included the Omo 222-1973-2744 specimen, which was newly analyzed using micro-CT scans of the original specimen. To analyze all the fossils, we reconstructed the 3D surface geometry of each specimen using either micro-computed tomography (micro-CT or μ CT) or synchrotron microtomography.

Remark 1.6. “As regards the comparative sample, why are the measurements not included Extended Table 1 and 2 and why did the authors not use the same methodology as for the Omo 222-1973-2744 cast, i.e. surface scanning and 3D comparison for specimens KNM-ER 820, KNM-ER 1477, OH 7?”

CHANGE MADE AND RESPONSE. All measurements for the comparative sample are now included in Supplementary Tables 1-3. Additionally, as for the Omo 222-1973-2744 specimen (see Rev. 1’s comment in “1.5” above), we have now incorporated 3D reconstructions derived from micro-CT data into our analyses for the following five specimens: KNM-ER 820, KNM-ER 1507, KNM-ER 1820, KNM-ER 1477, and OH 7.

Remark 1.7. “The authors (L128) consider that Omo 222-1973-2744 has a more primitive morphology than KW 7000 and the same robustness than OH 7, and that KW 7000 has a vertically inclined symphysis and convex anterior symphyseal face more in line with KNM-ER 820 attributed to *Homo* aff. *H. erectus*. The authors should broaden their comparative sample in order to affirm that the vertically inclined of the symphysis is a *Homo erectus* trait. I also have some doubts on this point. It also seems to be a visible in certain Koobi Fora

specimens attributed to *H. rudolfensis* or *H. habilis*. What's more, the dental and mandibular measurements of these two specimens (Omo 222-1973-2744 and KW 7000) are very closed."

CHANGE MADE AND RESPONSE. To address these concerns raised by Rev. 1, in our revised study, we expanded our sample to include all available *Homo* and *Paranthropus* infant specimens that preserve sufficient skeletal features for meaningful comparison. Within these constraints, we conducted three new and independent analyses to compare the Omo 222-1973-2744 specimen with KW 7000, as well as juvenile specimens from Koobi Fora attributed to early *Homo* (KNM-ER 820) and *Paranthropus boisei* (KNM-ER 1477). The first two analyses involved principal component analyses (PCA) of Procrustes-aligned landmark and semi-landmark coordinates. In one approach, 50 landmarks were placed along the mid-sagittal plane of the symphysis (new Figure 7a,b), while in the second, 120 landmarks were more evenly distributed across the symphyseal surface (new Figure 7c,d). A third analysis employed a PCA using seven mandibular indices and one angle to compare these specimens (new Figure 8). These expanded analyses aim to maximize the utility of the available fossil record, providing a more comprehensive evaluation of morphological variation in infant mandibles and addressing key points raised in the review process. As noted by Reviewer 2, no mandibular specimens representing infant *Australopithecus africanus* are available for such comparative studies, limiting our ability to include this taxon in our analyses.

Remark 1.8. "In addition, measurements of this inclination and a comparative analysis should be undertaken on all the specimens studied (including KNM-ER 820, ER 1477, OH 7 and others) to validate the authors' statement. If this type of orientation can be observed in different species of *Homo*, the attribution of this specimen to *Homo* aff. *H. erectus* can be questioned?"

CHANGE MADE AND RESPONSE. To address these concerns, we have: (i) provided measurements of this inclination (referred to as 'ASYM,' detailed in the new Supplementary Table 3) for all studied specimens, and (ii) incorporated this measurement into a new PCA analysis (see updated Figure 8). The PCA results are presented in the Results section and discussed in detail.

Remark 1.9. "Why is Omo 222-1973-2744 not included in the analysis and comparison with KW 7000 mandibular symphysis (Figure 4)?"

CHANGE MADE AND RESPONSE. This issue was previously raised by Rev. 1 in "1.7." (see above) and has now been addressed. Please refer to our response and the corresponding changes provided in section 1.7.

Remark 1.10. "Why is the lateral view of Omo 222-1973-2744 not presented which makes it difficult to observe the symphyseal inclination that seems to be an important feature for the authors to discriminate between specimens and attribute KW 7000 to *Homo* aff. *H. erectus*. All the features that make it possible to attribute Omo 222 to *H. habilis* and KW 7000 to *Homo* aff. *H. erectus* must be discussed in the context of the definition of early *Homo* (*Homo habilis* and *Homo rudolfensis*)."

CHANGE MADE AND RESPONSE. In the previous version, Extended Data Figure 7k included a lateral view of Omo 222-1973-2744, but we acknowledge that it was not sufficiently emphasized. In the revised version, we now prominently display a lateral view of Omo 222-1973-2744 in the new Figure 4 and Supplementary Figure 7. Additionally, the KW 7000 and Omo 222-1973-2744 specimens are visually compared in the new Supplementary Figure 7 and analyzed in three separate PCA analyses. The results of these analyses are detailed and discussed in the main text and presented in the new Figures 7 and 8.

Remark 1.11. “What is the definition of early *Homo*, taken here? as it often includes only *H. habilis* and *H. rudolfensis*. If also includes *H. erectus*, as is the case here, the title should be Early Pleistocene *Homo* species (see general remarks also).”

CHANGE MADE AND RESPONSE. This issue was previously raised by Rev. 1 in “1.1.” (see above) and has now been addressed. Please refer to our response and the corresponding changes provided in section 1.1.

Remark 1.12 “L9. What are the data to say that that it is limited, it is not really the case, more than 40 early *Homo* remains are older than 2 Ma.”

CHANGE MADE AND RESPONSE. We clarify that these data are described as “limited” because, as mentioned in lines 69–71, they pertain to “early *Homo* infants—individuals prior to the eruption of their first permanent molars (M1s)—who retain ontogenetically informative skeletal features.” This is further illustrated in Figure 1.

Remark 1.13. “L13. scarcity. What is the number ?”

CHANGE MADE AND RESPONSE. As in the Introduction section, we now also use the term “limited” in the Abstract, as outlined above in response to the comment from Reviewer 1 in “1.14.”

Remark 1.14. “L16-L17 the auteurs should indicate the taxa and the anatomical element for the three specimens, because later L 18, it is difficult to make the link.”

CHANGE MADE AND RESPONSE. Details about the anatomical elements of the three specimens central to this study are included in the revised Abstract.

Remark 1.15. “L17. add “Lower” before “Omo valley””

CHANGE MADE AND RESPONSE. This remark is addressed in the revised Introduction.

Remark 1.16. “L20. Since there is an East African specimen, comparisons are also necessary with *P. boisei*, not just *P. robustus*.”

CHANGE MADE AND RESPONSE. We agree and this issue has now been addressed by including the KNM-ER 1477 specimen in some analyses. Please refer to our response and the corresponding changes provided in section 1.7.

Remark 1.17. “L22. The authors mention that their results underline the need for caution when using isolated dental features to identify early *Homo* in the early Pleistocene in South Africa. In my opinion, this caution also applies to the mandible. What are the authors' real arguments? This sentence is debatable and once again focuses on specimens from South Africa. *H. habilis* and *H. rudolfensis* are separated on the basis of facial and especially dental arcade shape differences”.

CHANGE MADE AND RESPONSE. Our argument is that dental morphology alone can misclassify early *Homo* as an australopith. To support this, we performed an analysis of the dm2 EDJ of KW 7000, which confirms this point. In the Discussion section titled “Craniofacial Ontogeny in Early *Homo*,” we explain (lines 344–347) that “the KW 7000 mandible from Kromdraai Unit P exhibits distinctly derived skeletal features characteristic of *Homo* (...) while the morphology of its dm2 EDJ does not differentiate it from *P. robustus*.” Additionally, we note, as recently shown by Davies et al. (2024) (reference 14), that a similar unique combination of derived skeletal morphology trending toward *H. erectus* and more primitive overall dental morphology—resembling *Australopithecus* and some early *Homo* specimens—was observed in the adult A.L. 666-1 maxilla from Hadar, Ethiopia, dated to 2.33 Ma (lines 350–344).

Remark 1.18. “L26. Why this chronological framework, given that the majority of facial remains are younger than 2 Ma? Why not extend it to 1.5 Ma?”

CHANGE MADE AND RESPONSE. LINES 31–48: The issue discussed here concerns our emphasis on the early portion of the Early Pleistocene, rather than extending the focus to a longer period up to 1.5 Ma. At the end of the first paragraph in the revised Introduction (Lines 31–48), we explain that fossil evidence from Africa reveals a significant species diversity within early *Homo* prior to 2 Ma. We also note that this finding underscores the need for further exploration of the complex evolutionary processes that influenced the genus during the earliest stage of the Lower Pleistocene (Gelasian) in Africa, particularly in its southern and eastern regions.

Remark 1.19. “What are the *Homo erectus* specimens between 2.8 and 2 Ma? There is a concern for consistency between the text and the references cited.”

CHANGE MADE AND RESPONSE. We now clarify this issue in the revised Introduction, lines 41–43.

Remark 1.20. “L33. “However, neither dental microanatomy nor geochemistry contribute to understanding taxonomic diversity in early *Homo*”. What are the authors' arguments? It has to be noticed that In Smith's work on hominins from South Africa, the specimens DNH 83 and DNH 47 are included.”

CHANGE MADE AND RESPONSE. The issue raised in the Introduction is the limited contribution of dental microanatomy and geochemistry to understanding the taxonomic diversity within early *Homo*. While these methods provide valuable insights into life history and age-at-death, they are currently insufficient for distinguishing closely related taxa or capturing the full extent of species diversity in early *Homo*. In our previous version, we already cited Smith's work, which utilized dental microanatomy to estimate the age-at-death for the DNH 83 and DNH 47 specimens. However, we argue that although these approaches are informative, they do not resolve the complexities of early *Homo* taxonomic diversity, and could be complemented with other lines of evidence, such as the cranial morphology of infants.

Remark 1.21. “L37. As this study is based on three specimens, and from two different regions, I'm not sure that this can answer questions of taxonomic diversity, at least in view of the number, which may be as refutable as dental microanatomy, where the corpus studied is much larger.”

CHANGE MADE AND RESPONSE. In our revised version, we enhance the comparison between Omo 222-1973-27 and KW 7000 through new analyses (PCAs presented in Figures 7 and 8) and visual comparisons (e.g., Supplementary Fig. 7). These efforts aim to demonstrate taxonomic diversity within early *Homo* as early as infancy, based on mandibular morphology. While we acknowledge that we are working with ‘only’ two infant mandibles (Omo 222-1973-27 and KW 7000) displaying distinct morphologies, we argue that this evidence may hint at potential species diversity. As is often the case in paleoanthropology, establishing greater confidence necessitates multiple individuals showing consistent differences. Notably, for adult specimens, the designations of *H. habilis*, and *H. rudolfensis* have met this threshold for distinction—albeit, for the latter two, only relatively recently.

Remark 1.22. “L38. As for the title, what is the definition of early *Homo*, taken here? as it often includes only *H. habilis* and *H. rudolfensis*. If also includes *H. erectus*, as is the case here, the title should be early Pleistocene *Homo* species.”

CHANGE MADE AND RESPONSE. This issue was previously raised by Rev. 1 in “1.1.” (see above) and has now been addressed. Please refer to our response and the corresponding changes provided in section 1.1.

Remark 1.23. “L41-L42. Add the anatomical part, as well as the chronological age, for DNH 83 and KW 7000, and Omo 222-1973-2744 to help the reader follow the objective.”

CHANGE MADE AND RESPONSE. Lines 73-80: In the Introduction section (Lines 73–80), we now specify the anatomical features and chronological ages of DNH 83, KW 7000, and Omo 222-1973-2744.

Remark 1.24. “L42. Omo 222-1973-2744 is not part of member G5. In Feibel et al. 1989, it is written sub-member G7, the member is member G, but the sub-member is G7. Idem in the supplementary part.”

CHANGE MADE AND RESPONSE. The primary issue addressed here concerns the stratigraphic provenience of the Omo 222-1973-2744 specimen. Conflicting reports exist regarding its stratigraphic context (as detailed below). To ensure accuracy, we prioritize the original context provided by its discoverers, F.C. Howell and Y. Coppens, at the time of its discovery. Their 1976 account (ref. 25, page 529) unequivocally states that Omo 222-1973-2744 was recovered from submember G5. This identification is corroborated by other sources, such as the Cambridge History of Africa. Volume 1 by J. Desmond Clark. While Feibel et al. (1989) and subsequent authors have suggested that the specimen originated from submember G7. However, Feibel et al. (1988), in Evolutionary History of the “Robust” Australopithecines (edited by F.E. Grine), acknowledge that Omo 222-1973-2744 “may derive from an adjacent unit” without providing further clarification. To address these discrepancies, we have now explicitly highlighted them in the Supplementary Information for greater transparency.

Remark 1.25. “L44. Some East African specimens are also included in the comparison, please add them to the list. All specimens studied and used for comparison should be included with their chronological and developmental ages in one table, and their measurements in extended tables 1 and 2.”

CHANGE MADE AND RESPONSE. These concerns are addressed in the revised Introduction, the updated Table 1, and the Supplementary Tables 1-3.

Remark 1.26. “L48. As regards the caption to figure 1, it should be specified whether it is on the original or on the cst (Omo 222-1973-2744). The orientation should be the same, but this does not seem to be the case between the specimens of early Homo and Paranthropus. The title of the caption is not accurate as there are also specimens of P. robustus.”

CHANGE MADE AND RESPONSE. These concerns are addressed in the updated Figure 1.

Remark 1.27. “L62-63. OH 39 data must be included in the extended data table 1. What is the source of this measurement?”

CHANGE MADE AND RESPONSE. This remark is addressed in the updated Supplementary Table 1.

Remark 1.28. “L77. Figure 1. Add also the reconstruction of the maxilla”.

CHANGE MADE AND RESPONSE. This concern is addressed in the updated Figure 1.

Remark 1.29. “L91. Which specimens of A. afarensis and A. africanus were studied ?”

CHANGE MADE AND RESPONSE. This concern is addressed in the updated Methods section dealing with the samples (lines 406-411).

Remark 1.30. “L96. The arguments in favour of attributing this specimen to Homo are based on dental morphology and mandibular morphology. The authors point out that the anterior symphyseal face of KW 7000 is vertically inclined and comparable to those of KNM-ER 820 attributed to Homo aff H. erectus. For this reason, they attributed KW 7000 to this taxon. A comparison with a larger sample should be made, as the same orientation can also be observed in Homo specimens but has not been attributed to H. erectus. Therefore, this specific attribution should be more robust (see also general remarks) Some measurements of this inclination and a comparison with a larger sample should be added, including for KNM-ER 820, because if we look at the figure in Wood (1991) Koobi Fora, vol 4, it does not look so vertically inclined (see also general remarks). If this type of orientation can be observed in different species of Homo, the attribution of this specimen to Homo aff. H. erectus can be questioned?”

CHANGE MADE AND RESPONSE. This issue was previously raised by Rev. 1 in “1.7.” and “1.10” (see above) and has now been addressed in a principal component analysis using seven mandibular indices and one angle to compare Omo 222-1973-2744, KW 7000, KNM-ER 820 (early *Homo*), KNM-ER 1477 (*Paranthropus boisei*) and several *P. robustus* infants (please see the new Figure 8). Please refer to our response and the corresponding changes provided in section 1.7.

Remark 1.31. “L98. What is the developmental age of KNM-ER 820 ?”

CHANGE MADE AND RESPONSE. The developmental age of KNM-ER 820 is now indicated in the revised Introduction and the updated Table 1. It is also illustrated in the updated Fig. 1.

Remark 1.32. “L99. Which are the specimens of *P. boisei*, it seems that they are not included in the extended table 2 nor in the extended data of Fig. 7.”

CHANGE MADE AND RESPONSE. In the revised text (line 176), we identify the *P. boisei* specimen as KNM-ER 1477, and we provide its measurements in the new Supplementary Table 3.

Remark 1.33. “Extended Table 2. The mandibular measurements of KW 7000 seem closer to those of Omo 222-1973-2744 than to those of KNM-ER 820, so why put these two specimens in two different taxa... which is one of the major arguments of this article.”

CHANGE MADE AND RESPONSE. We now use landmarks and semilandmarks to reassess the symphyseal morphology of both Omo 222-1973-2744 and KNM-ER 820 (along with other specimens). These findings are shown in the new Figure 7a,b, which provide evidence supporting the hypothesis that these two specimens represent different species. We also include the mandibular measurements for all the specimens compared in our study (Supplementary Table 3), which are used in a new PCA presented in Figure 8. All these results are discussed.

Remark 1.34. “L98-L102. The comparison is made in terms of size. If the size component is not taken into account, do the authors obtain the same results?”

CHANGE MADE AND RESPONSE. Yes, as demonstrated in the new analyses investigating shape differences and presented in Figures 7 and 8. Please also refer to Supplementary Figure 7.

Remark 1.35. “L105. What is the inclination of Omo 222-1973-2744? Why is there no lateral view of the Omo 222 in the extended data in Figure 7 and Figure 3? This makes it impossible to compare. (See also general remarks).”

CHANGE MADE AND RESPONSE. This concern is addressed in the new Figure 4 and in the Supplementary Table 3. Please also note that was indeed a lateral view of the Omo 222 specimen provided in our previous version: Extended Data Figure 7k.

Remark 1.36. “The configuration in Figure 3 is not easy to compare. Why can't we see the whole specimen for figures a, c and d?”

CHANGE MADE AND RESPONSE. This concern is addressed in the updated Figure 3.

Remark 1.37. “L114. Attribution of specimen Omo 222-1973-2744 by Fred Grine in his thesis in 1984 to *Homo habilis* on the basis of decidual dental crowns. What will be the authors' attribution on the basis only of the mandible features ?”

CHANGE MADE AND RESPONSE. In the second paragraph of the new discussion section titled “Craniofacial Ontogeny in Early *Homo*,” we have added further explanations to justify our attribution of Omo 222-1973-2744 to *H. habilis* rather than *H. erectus* or *H. rudolfensis*.

Remark 1.38. “L119. « The more derived morphology of KW 7000 contrasts with that of Omo 222-1973-2744 because the former shows a vertically inclined symphysis with a distinctive mental surface anteriorly (in Omo 222-1973-2744, the symphyseal axis forms an angle of approximately 65° with the basal plane) and the anterior positioning of the elongated geniohyoid depressions (Fig. 3, Extended Data Fig. 7).” The lateral view of Omo 222-1973-2744 is absolutely essential for a comparison, as well as a table of the angle between the symphyseal axis and the basal plane, with an increase in the comparative sample.”

CHANGE MADE AND RESPONSE. This issue was previously highlighted by Reviewer 1 in comments “1.7,” “1.10,” and “1.31” (see above) and has now been addressed. Please refer to our response in section “1.7,” where we detail the three new PCAs conducted to address this concern, and in section “1.11,” where we explain the inclusion of new figures illustrating (including in lateral view) the differences in the inclination of the symphysis between KW 7000 and Omo 222-1973-2744. These additions provide clearer visual and analytical evidence to resolve the issues raised.

Remark 1.39. “With regard to the parabolic shape, a comparison should also be made with other specimens, for example those attributed to *Homo habilis* and *Homo rudolfensis*. In other words, to be sure of an attribution to *Homo habilis* for Omo 222 and to *Homo aff. H. erectus* for KW 7000, further comparisons must be made with a larger corpus, particularly in relation to the shape of the mandible and the inclination of its symphysis. The shape seems similar to that of OH7 or KNM-ER 1802 (even if the developmental age is different), which can be attributed to either *Homo habilis* or *Homo rudolfensis*. Do the characteristics highlighted really discriminate between *Homo habilis*, *Homo rudolfensis* and *Homo erectus* (adult or juvenile)? Could we attribute Omo 222 and KW 7000 to other taxa (*Homo rudolfensis* and/or *Homo habilis*)? Because these attributions are a major point of the article and of the conclusions. Idem for L 141-147.”

CHANGE MADE AND RESPONSE. These issues were previously raised by Reviewer 1 in “1.7,” “1.10,” and “1.31” (see above). Further comparisons have been conducted with a larger sample, focusing on the shape of the mandible (new Figure 8) and the inclination of its symphysis (new Figures 7a and 8). Please refer to our response and the corresponding changes in section 1.7. As explained in our previous responses (above) and detailed in our revised study, the new analyses (presented in Figures 7 and 8, and also illustrated in

Supplementary Figure 7) clearly distinguish Omo 222 from KW 7000. All findings support the attribution of the latter to a more derived species of early *Homo*, such as *H. erectus*. Notably, as now demonstrated in new analyses (Figs. 7 and 8) and explained in the discussion, the morphology of KW 7000 is characterized by a vertically inclined symphysis and convex mental surface (Fig. 7a,b), a gracile symphysis (Fig. 8), and a slender mandibular body (Fig. 3). Notably, unlike Omo 222-1973-2744, the shape of the KW 7000 symphysis falls within the range of variability observed in *H. sapiens* infants and older juveniles (Fig. 7). In contrast to Omo 222-1973-2744, the symphysis of KW 7000 more closely resembles that of the KNM-ER 820 juvenile, which exhibits similar traits, such as a prominent convex mental surface inferiorly (Fig. 7a, Supplementary Fig. 6), as highlighted in its original description (see ref. 38). Notably, the lower half of the symphysis in the OH 7 subadult is not preserved, and this specimen is developmentally much older (with erupted M₂s) than both KW 7000 and Omo 222-1973-2744 (both of which have dm₂s with developing roots). As a result, comparisons of the symphyseal region are not only impossible but also irrelevant.

Remark 1.40. “Developmental basis for early *Homo* taxonomy.” A few sentences and explanations should undoubtedly be included in the previous paragraph when taxonomic comparisons and attributions are made.”

CHANGE MADE AND RESPONSE. In the opening paragraph of the discussion section titled “Craniofacial Ontogeny in Early *Homo*,” we have added further explanations and incorporated two additional references, 44 and 45.

Remark 1.41. “L134. A comparison between the KW 7000 and the OH 7 should also be carried out.”

CHANGE MADE AND RESPONSE. Notably, the lower half of the symphysis in the OH 7 subadult is not preserved, and this specimen is developmentally much older (with erupted M₂s) than both KW 7000 and Omo 222-1973-2744 (both of which have dm₂s with developing roots). Consequently, detailed comparisons of the symphyseal region are both impossible and irrelevant. However, we acknowledge the need for further discussion on this topic. To address this, we have added more elements to elaborate on our taxonomic attribution of KW 7000, partially informed by the morphological evidence provided by OH 7.

Remark 1.42. “L154. Why only a comparison with australopiths and not with *Paranthropus* ? which are in Figure 3 ?”

CHANGE MADE AND RESPONSE. In the earlier L 154, we referenced our two prior bgPCAs of the maxilla and mandibular symphysis. Both analyses incorporated all available australopith specimens, including *Paranthropus* infants. In our updated PCA analyses, we have retained these specimens and additionally included new ones, such as Omo 222-1973-2744 and KNM-ER 820. Please note that Taung is now excluded from the analysis because, as noted by Zimmer et al. (2023) (our ref. 63), the results for this specimen may not be reliable due to the damaged state of its symphysis at the base.

Remark 1.43. “L164. Why OH 7 is not in the analyses (e.g. Extended Data Table 2) ? « In contrast, the Omo 222-1973-2744 *H. habilis* infant exhibits a more primitive gnathic morphology, consistent with the OH 7 specimen.”

CHANGE MADE AND RESPONSE. This issue was previously raised by Rev. 1 in “1.39.” and “1.41” (see above) and has now been addressed. Please refer to our response and the corresponding changes provided in sections 1.39 and 1.41.

Remark 1.44. “Figure 4. Other specimens should be added to the analyses, in particular for the OH 7 mandible, KNM-ER 820.”

CHANGE MADE AND RESPONSE. This issue was previously highlighted by Reviewer 1 in several other comments (see above) and has now been addressed. Please refer to our response in other sections (e.g. sections “1.7”, “1.11”) where we detail the three new PCAs conducted to address this concern.

Remark 1.45. “L186. Why are the results on *Paranthropus* not mentioned here ?”

CHANGE MADE AND RESPONSE. We decided to remove the portion of our previous discussion on calcium isotopes and weaning, as it may be overly speculative and not directly relevant to the primary focus of our study.

Remark 1.46. “L204. « We find that some facial structural (i.e., shape) novelties observed in early *Homo* species arose from deviations from an ancestral australopith pattern of development.” In my opinion, this sentence should be more substantiated and referred to certain analyses, as the majority of comparisons are with *Paranthropus robustus*.”

CHANGE MADE AND RESPONSE. We decided to remove this sentence.

Remark 1.47. “L210. Why include at this point in the text a section on Early *Homo* in South Africa ?”

CHANGE MADE AND RESPONSE. We opted to restructure our discussion, removing the dedicated section on Early *Homo* in South Africa.

Remark 1.48. “L216. Some references are missing e.g. Curnoe.”

CHANGE MADE AND RESPONSE. We added the new reference 64 (Curnoe, 2010).

Remark 1.49. “L221. I’m not sure that a study based on three individuals from three different sites and two different regions would improve the assessment of early *Homo*’s taxonomic diversity.”

CHANGE MADE AND RESPONSE. We agree and we removed this sentence.

Remark 1.50. “L224. This sentence should be used when there is a comparison and taxonomic attribution.”

CHANGE MADE AND RESPONSE. This concern is addressed in the updated text.

Remark 1.51. “L226. What are the specimens of *A. afarensis* and *A. africanus* and what is their dental morphology?”

CHANGE MADE AND RESPONSE. Examples of *A. afarensis* (AL 400-1a,b) and *A. africanus* (Sts 51) are provided in the updated text (in both the description and discussion sections) with the appropriate references.

Remark 1.52. “L228. Seems to be a repetition of what is written in L 217.”

CHANGE MADE AND RESPONSE. We removed this repetition.

Remark 1.53. “L230 « less likely ». What is the number of specimens for early *Homo* infants, and for *P. robustus*.”

CHANGE MADE AND RESPONSE. We provide a clearer explanation of this and cite reference 36 to support our statement.

Remark 1.54. “Extended Data Figures also put the specimen label inside the figure in addition to the legend.”

CHANGE MADE AND RESPONSE. We have added the specimen label where necessary (Supplementary Figures 2,4,6 and 8).

Remark 1.55. “The authors have undertaken microCT for certain specimens, original specimens from South Africa with different voxel size (between 17.857 et 42.85 μm or 20.24 μm) and surface scan with Artec Spider (0,1 mm=100 μm) and 3D point accuracy (0.05 mm) for Omo 222-1973-2744. Could this difference in resolution have an impact on the results? The fact that observations and analyses are carried out on a cst(Omo 222-1973-2744) rather than on an original may have an effect on the results; this can be quantified and included as a limitation of the study.”

CHANGE MADE AND RESPONSE. In our revised study, the 3D surface geometry of the original Omo 222-1973-2744 specimen was reconstructed using micro-CT scans, consistent with the approach applied to all other fossil juveniles analyzed. Please refer to our response and the corresponding revisions detailed in section 1.5.

Reviewer #2 (Remarks to the Author):

Remark 2.1. “The sample comprises two early Homo specimens, and a number of Paranthropus robustus specimens. A few specimens of Australopithecus africanus are mentioned, but fossils of appropriate age (infants) have not been recovered for this taxon. The result is that most of the discussion, figures comparing taxa, and the analysis overall relies on comparison between early Homo and Paranthropus - there simply is not other material to include.”

RESPONSE. We fully agree with this comment. This is more a comment that a suggested change.

Remark 2.2. “the analysis and discussion seem to be geared toward identifying or understanding the ‘uniqueness’ of early Homo ontogeny and facial morphology in an evolutionary context. On p. 11, the sections discussing the ‘new facial features’ of early Homo that are ‘deeply ingrained in their ontogeny’, and also that about plasticity are relevant here.”

RESPONSE. We fully agree with this comment. This is more a comment that a suggested change.

Remark 2.3. “The point is that Paranthropus is not the appropriate taxonomic group for such comparisons, given its status as an extinct ‘side branch’. Comparisons of Paranthropus and Homo certainly will yield many differences, but I don’t think they establish the ‘uniqueness of early Homo’ facial or ontogenetic features as they also reflect the well-recognised derived morphology of the robust australopiths. If early Homo evolved from a species of Australopithecus, evolutionary interpretations about morphology and ontogenetic changes need to be based on comparisons with an Australopithecus sample.”

“I am not sure how to resolve this - I think I understand the aims of the authors with regard to the early Homo material, but it seems that the sample required to conduct the study in the appropriate evolutionary/ phylogenetic context (mainly, including an adequate sample of infant Australopithecus fossils) does not currently exist. If there is something I am not understanding about the aim or approach, then this needs to be clarified.”

CHANGE MADE AND RESPONSE. As noted by Rev. 2, the main issue is that "the [*Australopithecus*] sample required to conduct the study in the appropriate evolutionary/phylogenetic context (mainly, including an adequate sample of infant *Australopithecus* fossils) does not currently exist." We agree with this statement. In the updated Introduction, we have added a new third paragraph to clarify our aims, as suggested by Rev. 1. Additionally, in the fourth paragraph of the Introduction, we listed the very few available *Australopithecus* juvenile specimens for comparison. Please note that no *Australopithecus* infants, as defined in our study, are currently available for comparison.

Remark 2.4. "A second issue relates to the comments and inferences about differences in weaning between early Homo and australopiths. I think that the section on weaning on p. 11, lines 184-186 could be revised to reflect the more nuanced views about weaning - see work of C. Austin and TM Smith on the reconstruction of weaning periods - and their variation - from trace elemental signatures. My reading of this literature suggests that differences in weaning periods among extant apes, fossil hominins, and humans include considerable amounts of variation, and that distinctions of 'early' vs 'late' weaning are not as clear as once thought. Since this information seems to be used in the manuscript to support the interpretations about early Homo ontogenic differences, a fuller account of the evidence about weaning and its variation is relevant. Also, continuing at the end of that paragraph (lines 194-195) if Homo already had a distinctly later weaning period, but did not have a prolonged schedule of growth, what are the implications for life history timing overall? How would that work?"

CHANGE MADE AND RESPONSE. As already indicated above (in response to Rev. 1 point 1.45), we preferred to remove the portion of our previous discussion on calcium isotopes and weaning, as it may be overly speculative and not directly relevant to the primary focus of our study.

Remark 2.5. "The text for Figure 1 (lines 48-53) explains the colour pattern for early Homo specimens, but not for Paranthropus."

CHANGE MADE AND RESPONSE. This concern is addressed in the updated Figure 1.

Remark 2.6. "Line 69 - 'eyeballs' - would it be more appropriate to talk about bony orbits here, given that it is a comparison of the facial skeleton, not of soft tissue?"

CHANGE MADE AND RESPONSE. This change is made in the revised Results section.

Remark 2.7. "Line 112 - closing) needed after 'color'."

CHANGE MADE AND RESPONSE. This change is made in the revised legend of Figure 3.

Remark 2.8. "Lines 156-7 - in discussing the plot of the first two bgPCs - do they highlight the 'unique facial structure of early Homo' or just demonstrate that early Homo and Paranthropus have clearly distinguishable facial structure? Would there be any expectation that these genera are similar (in contrast, perhaps to a comparison of late Australopithecus vs early Homo)?"

CHANGE MADE AND RESPONSE. We acknowledge the nuance in this matter and have removed our statement about the "unique facial structure."

Remark 2.9. "In figure 4, the blue polygons are not defined in the accompanying text."

CHANGE MADE AND RESPONSE. This concern is addressed in the updated Figure 1.

Remark 2.10. “Note that on Fig 4 - bgPC plot b - DNH83 is very similar to KW9000 and DNH47 on bgPC1 (but not PC2). Likewise on plot f, the Australopiths and Paranthropus have a similar range on bgPC1. Is it possible to provide any further information on what PC1 and PC2 are describing in these plots? Some of this information is provided in the supplementary information but would be useful to include (briefly) in the main text.”

CHANGE MADE AND RESPONSE. This concern is addressed in the updated section entitled “Morphometric comparisons”.

Reviewer #3 (Remarks to the Author):

Remark 3.1. “Regarding the debate about the origin of the genus *Homo*, could the authors clarify what specific contributions this paper makes to advance or address this issue?”

CHANGE MADE AND RESPONSE. The issue addressed here concerns the specific contributions of our study. In the third paragraph of the revised Introduction section, we outline how our research investigates the developmental basis of adult facial diversity in early *Homo* during the Early Pleistocene to better understand the evolutionary changes that shaped the genus. By focusing on facial ontogeny and presenting the first developmental evidence on the facial skeleton of early *Homo* infants, our study aims to shed light on the taxonomic diversity and the processes underlying adult facial morphological variation within early *Homo*.

Remark 3.2. “Why did the author choose not to apply geometric morphometrics to the enamel-dentine junction?”

CHANGE MADE AND RESPONSE. In the new Figure 9, we now apply geometric morphometrics to the enamel-dentine junction.

Remark 3.3. “The paper would benefit from clearer figures emphasizing the morphological and dental (both external and internal) differences between early *Homo* and australopiths, as well as between KW 7000 and Omo 222.”

CHANGE MADE AND RESPONSE. In the updated Figure 5 and Supplementary Figures 3, 4, 5, 6, and 8, we have aimed to provide clearer visuals of such differences.

Remark 3.4. “I suggest including results from both a standard PCA and the between-group PCA. Given the ongoing debate around bgPCAs, presenting both would provide better transparency. I also believe that bgPCA may not be the most appropriate analysis in this case.”

CHANGE MADE AND RESPONSE. We acknowledge the concern that “bgPCA may not be the most appropriate analysis” due to the limited sample size of the fossil record. To address this, we conducted three new standard PCAs, which are detailed in Figures 6, 7, and 8. We prefer to rely on these standard PCA results for our interpretations, as they provide a more robust framework for analyzing morphological variation in small fossil samples. By utilizing established methodologies and focusing on Procrustes-aligned landmark and semi-landmark data, as well as mandibular indices, these PCAs offer a clearer and more reliable basis for comparative analysis.

Remark 3.5. “The regression does not support the authors’ claim that DNH 83 grew slower than DNH 47. Since it is one of the paper’s main conclusions, it should be addressed more carefully. The conclusions should be limited to the observed smaller size of early *Homo* individuals.”

CHANGE MADE AND RESPONSE. We chose to remove this linear regression from our results, as our interpretation of it may have been overly speculative.

Remark 3.6. “Abstract. Lines 21-22, page 1: “[...] indicating slower growth rates or distinct developmental processes”. The second part of the sentence is vague; it is well understood that morphological differences stem from distinct developmental patterns.”

CHANGE MADE AND RESPONSE. We removed this sentence.

Remark 3.7. “The introductory section would benefit from a brief overview of the differences in facial morphology between adult early *Homo* and *Paranthropus*, as well as between *H. habilis* and *H. erectus*.”

CHANGE MADE AND RESPONSE. LINES 44-52: In the second paragraph of the revised Introduction section (Lines 44–52), we now provide a brief overview of the differences in adult facial morphology between *H. habilis*, *H. rudolfensis* and *H. erectus*.”.

Remark 3.8. “I would also recommend including the fossil dates directly in the main text, rather than only in the Supplementary Information.”

CHANGE MADE AND RESPONSE. These concerns are addressed in the revised Introduction and the updated Table 1.

Remark 3.9. “Methods. Line 333, page 17: I could not find a definition for “NL” in the text, which makes it difficult to follow. While I am not sure that this level of detail is necessary, given that it has already been published elsewhere, if kept it should be better explained.”

CHANGE MADE AND RESPONSE. We removed this explanation which is better explained in reference 63.

Remark 3.10. “Why did the authors opt for a between-group PCA instead of a standard PCA? Were DNH 83 and KW 7000 projected into the PCAs?”

CHANGE MADE AND RESPONSE. This issue was previously raised by Rev. 3 in “3.4.” (see above) and has now been addressed. Please refer to our response and the corresponding changes provided in section 3.4.

Remark 3.11. “Lines 348-352, page 17: could the authors clarify that this section refers to the cross-validation step for the bgPCA? As written, the statement “the differences reported in Fig. 4b and 4f reached statistical significance” lacks clarity.”

CHANGE MADE AND RESPONSE. This issue is now clarified in both the Morphometric comparisons and Methods sections.

Remark 3.12. “The regression analysis involving the modern sample into which DNH 83 and DNH 47 were projected is not addressed in the Methods section. Given the conclusions drawn from this analysis, I recommend that the authors explain its purpose more clearly. Additionally, since DNH 83’s age is provided as a range, it would be helpful to specify which age was used for this individual in the regression.”

CHANGE MADE AND RESPONSE. We chose to remove this linear regression from our results, as our interpretation of it may have been too speculative.

Remark 3.13. “Results: Morphological descriptions. Lines 57-63, pages 3-4: I suggest that the criteria used to describe the differences between early *Homo* and australopiths’ deciduous teeth could be better referenced and highlighted.”

CHANGE MADE AND RESPONSE. This concern is addressed in the opening paragraph of the revised Morphological descriptions section.

Remark 3.14. “Lines 63-64, page 4: “The DNH 83 [...] is much smaller and more derived [...]”. It is smaller because it is younger.”

CHANGE MADE AND RESPONSE. We agree that this is one possibility. As indicated above (points 3.5 and 3.12), we chose to remove this linear regression from our results, as our interpretation of it may have been too speculative.

Remark 3.15. “Lines 66-75, page 4: I suggest revising this sentence. Also, please remove the “s” at “it” in line 73: “where its contacts the vomer”.

CHANGE MADE AND RESPONSE. This concern is addressed in the opening paragraph of the revised Morphological descriptions section.

Remark 3.16. “Line 85, page 5: “Given the general trend for maxillary developmental delay, [...]”. This statement needs clarification. Is this deduced from the current study, or from a specific reference?”

CHANGE MADE AND RESPONSE. We agree and provide a specific reference (ref. 34).

Remark 3.17. “Line 94, page 6: “but no true chin (Fig. 3)”. Please refer more precisely to the figure, for example by using “Fig. 3 (f)”.

CHANGE MADE AND RESPONSE. This comment is addressed in the revised Morphological descriptions section.

Remark 3.18. “Lines 119-127, page 8: Could the authors please revise that section to improve its clarity?”

CHANGE MADE AND RESPONSE. This section of the discussion has been thoroughly restructured and revised.

Remark 3.19. “Discussion. Line 146, page 9: what specific differences in “mandibular structure” are being referred to?”

CHANGE MADE AND RESPONSE. We now list the features describing these differences and more clearly highlight them, providing corresponding Figure and Supplementary Figure numbers.

Remark 3.20. “Lines 147-150, page 9: could the authors briefly outline which mandibular traits are directly influenced by the suprahyoid muscles? Additionally, a more comprehensive discussion of the referenced work cited here would enhance support for their claim. While I understand that a reorganization of these muscles explains some of the differences between chimpanzees and humans, it should be considered that in the case of this study, these groups are more closely phylogenetically-related, and that other factors might play a role.”

CHANGE MADE AND RESPONSE. In the third paragraph of the discussion section titled “Craniofacial ontogeny in early *Homo*,” we elaborate on this aspect in greater detail and include two new references: one on experimental studies (ref. 47) and another on dissections of human cadavers (ref. 48).

Remark 3.21. “Lines 180-184, page 11: why is KW 9000 not included here? I do not believe that this analysis supports that DNH 83 exhibited slower or delayed growth compared to DNH 47. As noted by the authors, the variation of the residuals in *Homo sapiens* is substantial. This analysis simply demonstrates that DNH 83 is smaller than DNH 47 due to its younger age. To

discuss differences in growth rates between groups, it is essential to include a minimum of two individuals per group or to compare individuals of similar ages, as even a one-month difference can significantly impact early developmental stages.”

CHANGE MADE AND RESPONSE. We agree that the results of this regression may have been overinterpreted and, as noted above (points 3.5, 3.12, and 3.14), we decided to remove it from our results.

Remark 3.22. “Lines 208-209, page 12: The statement “[...] with differences in the organization of the suprahyoid and geniohyoid muscles” can only be hypothesized and cannot be conclusively drawn from the data presented in this study.”

CHANGE MADE AND RESPONSE. We now present the organization of the suprahyoid muscles (which include the geniohyoid) as one of the potential factors. Additionally, as noted in point 3.20 above, we elaborate on this aspect in greater detail and include a new reference on experimental studies (ref. 47) and another on dissections of human cadavers (ref. 48).

Remark 3.23. “Figure 1. Please clarify in the caption that the fitted upper and lower jaws represent composite individuals. While this may be inferred from the fossil names, it may not be immediately clear to a non-specialist. I would also prefer to see the maxillae aligned in one row (labeled a, b, c, etc.), with the mandibles aligned in a second row beneath.”

CHANGE MADE AND RESPONSE. These concerns are addressed in the updated Figure 1. The specimens are also labeled with their respective numbers.

Remark 3.24. “Figure 2 - (f) Please indicate in the caption that the 3D model of the permanent canine is in dark blue.”

CHANGE MADE AND RESPONSE. This comment is addressed in the updated Figure 2.

Remark 3.25. “Line 59, page 3: figure 2 is referred here when discussing differences between early Homo and australopiths. I recommend referring to Extended Fig. 3 instead and better highlight the differences between taxa.”

CHANGE MADE AND RESPONSE. We have now included a new Figure 5 and referenced it accordingly.

Remark 3.26. “Figure 3. For KW 7000: (b) this picture shows a supplementary fragment (the one with the dm2) that does not appear in (a), (c), and (d).”

CHANGE MADE AND RESPONSE. This concern is addressed in the updated Figure 3.

Remark 3.27. “Lines 112-113: please revise this sentence.”

CHANGE MADE AND RESPONSE. Figure 3 has been restructured and its legend revised.

Remark 3.28. “Figure 4 - Why is Omo 222-1973-2744 not included in this analysis?”

CHANGE MADE AND RESPONSE. In response to this comment, we revised our study to include three new and independent analyses comparing the Omo 222-1973-2744 specimen with KW 7000, as well as juvenile specimens from Koobi Fora assigned to early Homo (KNM-ER 820) and Paranthropus boisei (KNM-ER 1477). The first two analyses involved principal component analyses (PCA) of Procrustes-aligned landmarks and semi-landmarks. One analysis utilized 50 landmarks positioned along the mid-sagittal plane of the symphysis (new Figure 7a,b), while the other employed 120 landmarks distributed more evenly across the symphyseal surface (new Figure 7c,d). A third analysis focused on a PCA of seven mandibular indices and one angle to facilitate comparison between these specimens (new Figure 8). These additional analyses enhance the study by providing a more thorough

assessment of morphological differences between Omo 222-1973-2744, KW 7000 and other specimens (e.g., KNM-ER 820 and KNM-ER 1477), addressing the key concern raised here.

Remark 3.29. “I recommend including a figure that illustrates the morphological differences between KW 7000 and Omo 222, akin to Extended Data Figure 6.”

CHANGE MADE AND RESPONSE. We now provide a new Supplementary Figure 7.

Remark 3.30. “(c) instead of using arrows of different colors, could the authors use distinct colors for the homologous landmarks? Additionally, please specify the orientation of the configurations in relation to the view. Could the authors provide a figure of the landmark template for both the maxilla and the mandible in the supplementary information? It is difficult to visualize this on Figure 4. Providing the template would also help simplify the figure by removing panels (a), (d), and (e), as well as the arrows indicating homologous landmarks. Instead, I suggest including the warps along the principal components to visualize the changes along both axes.”

CHANGE MADE AND RESPONSE. In response to this comment, we revised the previous Figure 4 (now Figure 6) and added a new Supplementary Figure 9. This supplementary figure includes a template shown from different views (including those in the updated Figure 6) with landmarks and semilandmarks displayed in different colors and labeled with their corresponding numbers. These numbers are now also detailed in the Methods section.

Remark 3.31. “What would be the differences between KW 7000 and the mean of the *Paranthropus* group?”

CHANGE MADE AND RESPONSE. In the new Figure 7, we now highlight the differences between KW 7000 and Omo 222-1973-2744, as these are central to our study. Please note that Omo 222-1973-2744 falls within or near the range of variation of *P. robustus*, and is relatively close to its mean.

Remark 3.32. “Please include the color code for each group in the caption.”

CHANGE MADE AND RESPONSE. This comment is addressed in the updated Figures 6-8.

Remark 3.33. “Ext Data Fig. 1. Please indicate again in the caption the species attribution of this specimen.”

CHANGE MADE AND RESPONSE. This comment is addressed in the updated Supplementary Figure 1.

Remark 3.34. “Ext Data Fig. 2. Please write “p-t” before “Renders in 3D of the KW 9000 left maxilla”.

CHANGE MADE AND RESPONSE. This comment is addressed in the updated Supplementary Figure 3.

Remark 3.35. “What is the “relationship” between the nasal aperture and the nasoalveolar clivus? Could the authors be more precise about what the red arrows are showing? I also find it unclear what the second arrow is indicating. Would it be more effective to use a line? Why are these arrows not present on KW 9000?”

CHANGE MADE AND RESPONSE. All these comments are addressed in the updated Supplementary Figure 3.

Remark 3.36. “Is the comparison with DNH 84 really necessary here, as it is more fragmentary?”

CHANGE MADE AND RESPONSE. This comment is addressed in the updated Supplementary Figure 3.

Remark 3.37. “Ext Data Fig. 3. Could the authors clearly indicate in this figure the specific features that differentiate early Homo from the australopiths, perhaps by using arrows? Additionally, the figure title is somewhat inaccurate, as it includes a comparison with an Australopithecus (Sts 2); I recommend making this correction. In my opinion, this figure is central to the study and should be regarded as a primary figure.”

CHANGE MADE AND RESPONSE. These comments are addressed in the new Figure 5.

Remark 3.38. “Ext Data Fig. 4. (a) The X-axis title (“MD”) is missing. (b) Could the name of DNH 83 be placed closer to its point? (c) Why is Paranthropus either represented by a black dot or an X? What do the squares with an X signify? Additionally, Australopithecus is represented by either a white dot or by a white square. Some names in the plots are truncated.”

CHANGE MADE AND RESPONSE. These comments are addressed in the updated Supplementary Figure 2.

Remark 3.39. “Ext Data Fig. 5. What does “(SI)” refer to? (c) and (g): please maintain the initial color (blue) of the surface model for DNH 47 and KW 9000. The colors of the arrows in (b), (d), (f) and (h) should differ if they indicate different features. (d) What is the purpose of pointing to the openings of the gubernacular canals? (h) is this a zoomed-in view? (b), (d), (f) and (h): could the contrast of these images be enhanced?”

CHANGE MADE AND RESPONSE. These comments are addressed in the updated Supplementary Figure 4. (h) is not a zoomed-in view.

Remark 3.40. “Ext Data Fig. 6. As mentioned in the text (Lines 68-75, page 4), several features distinguish DNH 83 from DNH 47. Could the authors improve this figure by clearly highlighting these distinctions with arrows?”

CHANGE MADE AND RESPONSE. This updated Supplementary Figure 5 is not intended to showcase all the distinct features mentioned in the text that differentiate DNH 83 from DNH 47. In Supplementary Figure 3, we already use arrows to indicate the position of the posterior pole of the nasoalveolar clivus (in red) relative to the base of the nasal aperture (in black). Similarly, in Supplementary Figure 4, arrows highlight differences in the closure of the anterior portion of the incisive suture. However, in this updated Supplementary Figure 5, to facilitate comparisons, (i) arrows are used to emphasize the inferior orbital rim in DNH 47 (in red), DNH 83 (in black) and *H. sapiens* (in blue) and (ii) dotted lines are used to indicate the position of the lateral margin of the nasal aperture in DNH 47 (in red), DNH 83 (in black) and *H. sapiens* (in blue).

Remark 3.41. “Ext Data Fig. 7. Please change “a-f” to “a-g” when referring to the 3D renders of KW 7000”.

CHANGE MADE AND RESPONSE. These comments are addressed in the updated Supplementary Figure 6.

Dear Editor and reviewers,

Point-by-point response to the comments

Jacopo Moggi-Cecchi and I are pleased to submit this second revised manuscript titled “Infant craniofacial diversity in Early Pleistocene *Homo*.” We sincerely appreciate your time and effort, as well as the insightful comments from the three reviewers.

Below, we provide detailed responses to each comment raised by you and the reviewers. To address the main concerns, we have:

- (i) refined the Discussion section, as suggested by Reviewer 1, to more clearly articulate our arguments for confirming the attribution of Omo 222-1973-2744 to *Homo habilis* (lines 352-380);
- (ii) adjusted the use of the term “ontogeny” for greater nuance, following Reviewer 2’s recommendation;
- (iii) restructured the Discussion section and improved Figures 6 and 7, as suggested by Reviewer 3.

Reviewer #1 (Remarks to the Author):

Remark 1.1. “L 242 « The mid-sagittal symphyseal shape of the Omo 222-1973-2744 specimen differs from that of KW 7000 primarily due to the markedly receding mandibular symphysis in the former (Supplementary Fig. 7). This morphology is also observed in *P. robustus* infants (SK 62 and KW 6420) and the *A. africanus* juvenile MLD 2, which exhibit the most positive PC1 values (Fig. 7b).” Is this morphology also visible in *P. boisei*? Would it possible to insert KNM-ER 1477 in the comparisons and analyses involving principal component analyses?”

CHANGE MADE AND RESPONSE. Due to the extensive damage to the symphysis of the KNM-ER 1477 *P. boisei* infant (see Figure 1 and Supplementary Fig. 6v), this specimen could not be included in two analyses involving Procrustes analysis and PCA (Figure 7). However, we were able to measure the angle between the symphyseal axis and the basal plane (ASYM) in this specimen. This measurement, provided in Supplementary Table 3, was used to include KNM-ER 1477 in another principal component analysis (Figure 8). The results of this analysis are now briefly described in lines 265-268.

Remark 1.2. “What are the arguments for attributing OMO 222-1973-2744 to *Homo*, with the exception of dental morphology (Fred Grine’s thesis)? as it is written L 360 “need for caution when relying solely on isolated dental features”. This specimen does not fall within the range of variability observed in *H. sapiens* infants and older juveniles (Fig. 7) and the symphysis of Omo 222-1973-2744, does not closely resemble that of the KNM-ER 820 juvenile. Furthermore, as point by the authors in response to Remark 3.31. “Please note that Omo 222-1973-2744 falls within or near the range of variation of *P. robustus*, and is relatively close to its mean”. The position of Omo 222-1973-2744, which is closer to the *Paranthropus* specimen than to that of *Homo*, need to be discussed.”

CHANGE MADE AND RESPONSE. We now discuss the taxonomic attribution of the Omo 222-1973-2744 juvenile in more detail in a new, dedicated paragraph (lines 352-380). From the beginning of this section, we acknowledge that the classification of Omo 222-1973-2744 “is less clear [than for KW 7000] when based solely on mandibular morphology.” We explain how our descriptions of the Omo 222-1973-2744 mandible are

consistent with its classification as *H. habilis*, and supported by the morphology of its deciduous molars. Close to the end of this paragraph, we also reference a new Supplementary Note (Supplementary Note 4) (line 377), where we provide two new references (# 72 and #73) and we describe nine dental traits that distinguish both Omo 222-1973-2744 and other early *Homo* specimens from *P. boisei*.

Remark 1.3. “ L 319-L327. “Compared to KW 7000, Omo 222-1973-2744 displays a morphology that appears more primitive, resembling the developmentally older OH 7 mandible that is considered a subadult stage of facial architecture in *H. habilis* 4,15,32. Indeed, Omo 222-1973-2744 (Fig. 4) exhibits a degree of corpus robusticity (Fig. 8, Supplementary Table 3), a symphyseal morphology reminiscent of australopith juveniles (Fig. 7,8), and a squared-off incisor/canine row absent in KW 7000 (Supplementary Figs. 6,7). (...)” Which features of Omo 222-1973-2744 are similar to OH 7? Probably not the degree of robustness of the corpus, because in Fig. 8, OH 7 is not included in the analysis, as the authors point out when they say that a direct comparison between OH 7 and Omo 222-1973-2744 is not possible (see also L 217). In all these analyses, Figs. 7 and 8. Omo 222-1973-2744 lies within the range of variation of *Paranthropus* (*P. robustus*).”

CHANGE MADE AND RESPONSE. In response to Remark 1.2, we now discuss the taxonomic attribution of the Omo 222-1973-2744 juvenile in a dedicated paragraph (see above). In this section, we provide a more detailed examination of the primitive mandibular morphology of Omo 222-1973-2744 and we highlight the following points: (i) the greater developmental age of Omo 222-1973-2744 (with its erupted dm2) compared to KW 7000 (with its unerupted dm2) may partly explain differences in mandibular corpus robusticity, (ii) mandibular corpus robusticity is distinctly expressed in the OH 7 *H. habilis* juvenile, as noted in the Supplementary Note 4 of reference #4 (who noted : “there is no evidence that *H. habilis* showed a reduction in the masticatory function-related properties of mandibular corpus shape or postcanine crown size, when compared with *A. afarensis*.”), and (iii) the lower half of the OH 7 symphysis is not preserved, preventing us from obtaining sufficient measurements to include it in our analysis in Fig. 8. Additionally, we clarify that the characterization of Omo 222-1973-2744 as having primitive gnathic features should be nuanced, as the absence of infant mandibles attributed to both *H. habilis* and *H. rudolfensis* makes direct comparisons with Omo 222-1973-2744 and KW 7000 impossible.

Remark 1.4. “L16-17. I am not sure that this sentence is relevant in the abstract and in accordance with the main goal of the paper.”

CHANGE MADE AND RESPONSE. We agree and have removed this unnecessary sentence.

Remark 1.5. “L27. Probably write “confirms” the importance of integrating instead of “highlights” the importance...”

CHANGE MADE AND RESPONSE. This change has been made.

Remark 1.6. “L40. add also that for A.L. 666, based on the fauna, the site is dated between 2.3 and 1.9 Ma (Rowan et al. 2022, Rowan, J., Lazagabaster, I. A., Campisano, C. J., Bibi, F., Bobe, R., Boissarie, J. R., ... & Reed, K. E. (2022). Early Pleistocene large mammals from Maka’amitalu, Hadar, lower Awash valley, Ethiopia. PeerJ, 10, e13210. L40-41. It should be probably added that this specimen was also allocated *Homo* aff. *H. habilis* (ref 6)”

CHANGE MADE AND RESPONSE. Thank you. This change has been made.

Remark 1.7. “L46. The early Early Pleistocene, what do the authors mean? The early stage of Early Pleistocene?”

CHANGE MADE AND RESPONSE. Yes, this is what we mean. We changed to “early stage of Early Pleistocene”.

Remark 1.8. “L57. As *Paranthropus* is a monophyletic group and differentiated from *Australopithecus* in this article, write *Paranthropus* and *Australopithecus* instead of australopiths

L 72. see remark for L57, here write *P. boisei*, *P. robustus* and *A. africanus* instead of australopiths.

L 120. See remark L 57.

L 193. See remark L 57.

L 199. Separate from *P. robustus* and *A. africanus* instead of separate from australopiths.

L 203. See remark for L 199.”

CHANGE MADE AND RESPONSE. We clarified this and made these changes.

Remark 1.9. “L 123. A comparison with *Australopithecus africanus* could be also possible? As it done for other morphological traits, even if there is no infant *A. africanus*.”

CHANGE MADE AND RESPONSE. ? As we now write in L 121 three dental features distinguish DNH 83 from *Paranthropus* and *Australopithecus*, and in particular the absence of a crista obliqua on the OES (and the corresponding crest at the EDJ) connecting the protocone and metacone (Fig. 5a,b), which is typically present in all *P. robustus* and *A. africanus* specimens.

Remark 1.10. “L 215. L 219. For KNM-ER 820 allocation, sometimes is written *Homo erectus*, sometimes *Homo aff. H. erectus* (cf. Table 1), sometimes *Homo aff. erectus* (L381). The taxonomic allocation should be identical throughout the article.”

CHANGE MADE AND RESPONSE. Thank you. This taxonomic allocation is now identical throughout the article.

Remark 1.11. “L. 300. Which genus when you mention australopiths with ref 10 and 46. Both *Paranthropus* and *Australopithecus*.”

CHANGE MADE AND RESPONSE. Thank you. This is now clarified.

Remark 1.12. “L 306. Please mention the genus and species when you mention australopiths. If we refer to figure 7 and 8, it should be *A. africanus*, *P. robustus* and *P. boisei*.”

CHANGE MADE AND RESPONSE. Thank you. This is now clarified.

Remark 1.13. “L 319 “Omo 222-1973-2744 displays a morphology that appears more primitive, resembling the developmentally older OH 7 mandible that is considered a subadult stage of facial architecture in *H. habilis*4,15,32”. This sentence is somewhat redundant with the end of L327 concerning OH 7.”

CHANGE MADE AND RESPONSE. We eliminated this repetition while restructuring the discussion on our confirmed taxonomic attribution of Omo 222-1973-2744 to *H. habilis* (see Remarks “1.2” and “1.3”).

Remark 1.14. “L 327. Please mention genus and species when referring to australopiths, *A. africanus*, *P. robustus*. The position of Omo 222-1973-2744, which is closer to the *Paranthropus* specimen than to that of *Homo*, need to be discussed (see general remarks).”

CHANGE MADE AND RESPONSE. As stated in our responses and the revisions addressing “Remarks 1.2 and 1.3” (see above), we now discuss, in a separate paragraph, the position of Omo 222-1973-2744 closer to the *Paranthropus* specimen than to *Homo*.

Remark 1.15. “L. 334. “This evidence indicates that neither of these juveniles can be attributed to *H. rudolfensis*”. I think the authors should probably be careful because, as mentioned above, there are no *H. rudolfensis* infants to compare.”

CHANGE MADE AND RESPONSE. We agree. This sentence was removed.

Remark 1.16. “ L 345. It is undeniable that there is a difference between KW 7000 and 222-1973-2744, and that KW700 can be attributed to the genus *Homo*, but if 222-1973-2744 is not a representative of *Homo*, since it appears on numerous analyses to be close to *Paranthropus*, is this sentence still valid? (see general remarks)”

CHANGE MADE AND RESPONSE. Our discussion is now
IN TWO ANALYSES ...

Remark 1.17. “L355. Replace australopiths by *Paranthropus robustus* and *Australopithecus africanus*. Figure 8. How do the authors explain the position of KNM-ER 820, its distance from KW 7000 and its proximity to *Paranthropus*?”

CHANGE MADE AND RESPONSE. This key point is now explored in more detail in a brief section (lines 357–367). We have added two new references (#50 and #51) and discuss the issue in light of evidence on the modular structure of the hominin mandible (ref. 50) and the influence of mechanical loading on developmental changes in human corpus morphology (ref. 51) (please see also our response to Remark 1.3 regarding the “masticatory function-related properties of mandibular corpus shape”; see Supplementary Note 4 of reference #4).

Remark 1.18. “Figure legend. L 798. As for figure 7, the specimens belong to *A. africanus*, *P. robustus* and *P. boisei*, write *A. africanus*, *P. robustus* and *P. boisei* infants instead of australopith infants

L815. As for figure 8, the specimens belong to *P. robustus* and *P. boisei*, write *P. robustus* and *P. boisei* infants instead of australopith infants.”

CHANGE MADE AND RESPONSE. Thank you. These changes have been made.

Remark 1.19. “References. Check that genus and species names are italicized.”

CHANGE MADE AND RESPONSE. Thank you. This change has been made.

Remark 1.20. “Supplementary. L347 and L 355. There is no posterior fovea or distal marginal ridge. In all supplementary sections, check that there are no other redundancies.”

RESPONSE. This is not a repetition: these are descriptions of two separate teeth (dm1 L337 to L349; dm2 L350 to L357)

Reviewer #2 (Remarks to the Author):

Remark 2.1. “ ... I would suggest that the authors review the title, subheading, and sections of text that use the term ‘ontogeny’ and consider whether it is really appropriate as used - in a few cases, I think it may be, but not in the title and I don’t think that the subsection of the text are really about ontogeny. The paper appears to be more about classifying infant and juvenile

specimens on the basis of morphological traits at different stages of development - a very useful but little addressed topic.”

CHANGE MADE AND RESPONSE. We agree. Reviewer 2 raises an important nuance regarding the use of the term “ontogeny.” To address this, we have removed the term from the title and subheading. Additionally, we eliminated it in two other instances, ensuring that “ontogeny” now appears only twice, where its use is appropriate.

Remark 2.2. “Overall, I do think that the paper presents valuable and relevant information and an interesting analysis of some very important and difficult to study fossil specimens. The authors have put a huge amount of thought and effort into the study to try and present a study that will advance our understanding of early *Homo* in southern and East Africa, and to utilise these rare infant and juvenile fossils in meaningful research. This paper will be a useful contribution to that effort.

RESPONSE. Thank you.

Reviewer #3 (Remarks to the Author):

Remark 3.1. “The attribution of the fossil specimens to early *Homo* is initially accepted, but later in the discussion, uncertainty about this attribution is expressed. The paper would benefit from a clearer structure: 1) Acknowledging that the attribution of some fossils to early *Homo* is debated.”

CHANGE MADE AND RESPONSE. This is now incorporated into the opening sentence of the main text, with reference #1 repeated here.

Remark 3.2. “The paper would benefit from a clearer structure: 2) Stating the study's objective to identify developmental features that distinguish them from australopiths.”

RESPONSE. The study's objectives are already clearly outlined in the first three sentences of the third paragraph in the Introduction section. As outlined in this section of the Introduction, our study examines the facial features in *Homo* infants, compares them to *Paranthropus* and *Australopithecus*, and investigates how developmental processes contributed to facial diversity in early *Homo* during the Early Pleistocene.

Remark 3.3. “The paper would benefit from a clearer structure: 3) Presenting the results that support these differences.”

RESPONSE. These Results are already presented. In the Results section, the first part, titled “Morphological Descriptions,” provides descriptions of early *Homo* infants, followed by the second part, titled “Morphometric Comparisons,” which presents results supporting the differences between early *Homo* and the australopiths (*Paranthropus* and *Australopithecus*).

Remark 3.4. “The paper would benefit from a clearer structure: 4) Concluding that the findings contribute to the understanding of these fossils as early *Homo* based on developmental distinctions.”

CHANGE MADE AND RESPONSE. In response to comments from Rev. 1, Rev. 2, and Rev. 3, we have slightly restructured the Discussion section, now titled “Craniofacial Development in Early *Homo* Infants.” In this section, we explore several “developmental distinctions” that help to interpret these fossils as early *Homo*. Among these distinctions, we highlight (i) the anteroposterior shortening and early fusion of the premaxilla, (ii) the posterior displacement of the premaxilla relative to the nasal aperture, (iii) the vertically

inclined symphysis and convex mental surface, and (iv) the anterior positioning of the geniohyoid depressions on the inferior symphyseal surface. We also discuss the morphological gnathic differences between the two early *Homo* infants, KW 7000 and Omo 222-1973-2744, and provide reasoning for why the latter specimens should still be considered early *Homo*.

Remark 3.5. “I would like to insist on the need to enhance the visualization of the results, in particular in the PCAs. It is crucial to improve the clarity of these visualizations. Currently, some of them are still very confusing. Please consider employing alternative visualization techniques.”

CHANGE MADE AND RESPONSE. We agree that the visualization of some results, particularly the PCAs, needed improvement. As suggested by Rev. 3, we have employed alternative visualization techniques (warpings) to enhance the results in Fig. 6c, d. Additionally, we have clarified the results presented in Fig. 7d.

Remark 3.6. “The Results section could be better organized using sub-headings, helping the reader to follow the logic behind each analysis (for example: facial analysis, then dental analysis).”

RESPONSE. The Results section is already organized into two sub-headings: (i) Morphological Descriptions and (ii) Morphometric Comparisons. This structure allows for a clear distinction between the descriptive analysis of early *Homo* infant morphology and the quantitative comparison of these features with those of other species.

Remark 3.7. “The discussion is currently lengthy and unclear in some parts.”

CHANGE MADE AND RESPONSE. Some aspects of the Discussion may have been unclear in certain areas, though it is difficult to pinpoint which ones based on these remarks. However, to address several more specific comments from Rev. 1 (including remarks 1.1, 1.2, and 1.3), we have expanded and slightly restructured the Discussion section. The restructuring primarily focuses on discussing and clarifying our confirmed attribution of the Omo 222-1973-2744 infants to *H. habilis*.

Remark 3.8. “Page 3, Line 46: Please remove "during the Early Pleistocene" for conciseness.”

CHANGE MADE AND RESPONSE. Thank you. This change has been made.

Remark 3.9. “Page 4, Line 70: Please remove the "s" after "evidences”

RESPONSE. The word "evidences" (in the plural form) does not appear in this section or anywhere else in the text.

Remark 3.10. “Page 4, Line 76: Please revise this sentence for clarity (suggestion): "Due to its significance as the holotype of *H. habilis*, the subadult OH 7 was also included in some analyses despite its high degree of fragmentation.”

CHANGE MADE AND RESPONSE. Thank you. This sentence was revised for clarity.

Remark 3.11. “Page 5, Lines 87-89: Remove the "and" after "infants," in: "[...] one *P. boisei* (KNM-ER 1477) infant, and four slightly older..." Additionally, add "and two other early *Homo*.”

CHANGE MADE AND RESPONSE. Thank you. This change has been made.

Remark 3.12. “Materials and Methods. Could the authors introduce a distinct “Analyses” section, as not all analyses pertain solely to 3D data processing.”

CHANGE MADE AND RESPONSE. To better distinguish the different analyses, we have added additional subheadings in the “Materials and Methods” section.

Remark 3.13. “Results. Page 6, Line 5: Change “when feasible” to “where feasible” and refer to the Methods section here.”

CHANGE MADE AND RESPONSE. Thank you. This change has been made.

Remark 3.14. “Page 6, Line 111: A reference is missing here, please provide the appropriate citation.”

RESPONSE. DNH 83 is one of the three specimens newly described in this paper (KW 7000, DNH 83, and Omo 222-1973-2744). These three specimens represent the first early *Homo* infants (as defined in the Introduction) that preserves skeletal morphology. This is highlighted in Figure 1, which is cited here.

Remark 3.15. “Page 6, Lines 113-114: The statement regarding dental mineralization is vague. Please specify which teeth exhibit similar mineralization and refer to the method of quantification. Isn’t this observation ancillary? If so, please consider relocating it to an appropriate section.”

CHANGE MADE AND RESPONSE. The statement on dental mineralization is followed by a detailed description in the next sentence, specifying the teeth that exhibit similarities and citing Table 1. However, for clarity, we have repositioned the statement after the description. This statement (and the associated description) is important as it supports the direct comparison of the skeletal features of DNH 83 and DNH 47 in subsequent analyses, ensuring that their similar dental development does not account for their morphological differences.

Remark 3.16. “Page 6, Line 114: Move reference 21 to the end of the sentence, alongside reference number 30.”

CHANGE MADE AND RESPONSE. Thank you. This change has been made.

Remark 3.17. “Page 6, Line 118: The term “stage R1/2-3/4” may be unclear to non-specialists. If retaining this information, please provide a brief explanation or refer to a detailed description in the Methods section.”

CHANGE MADE AND RESPONSE. We have slightly expanded the explanation and also referenced the Methods section.

Remark 3.18. “Page 6, Lines 120-127: Could the authors please provide concrete data, such as frequencies, to demonstrate that these features differ between early *Homo* and australopiths?”

CHANGE MADE AND RESPONSE. We now explain that, unlike DNH 83, all *Paranthropus* specimens exhibit a faint or absent tuberculum molare, while all *P. robustus* and *A. africanus* specimens show a crista obliqua connecting the protocone and metacone (at both OES and EDJ levels).

Remark 3.19. “Page 6, Line 124: Revise to “as typically seen in *P. robustus* and *A. africanus*.””

CHANGE MADE AND RESPONSE. Thank you. This change has been made.

Remark 3.20. “Page 6, Line 126: Note that this observation pertains only to the dm1. In Supplementary Note S2, while DN 83 is described as falling outside the variation observed for *Paranthropus*, it's noteworthy that it falls within the variation of *Australopithecus*.”

CHANGE MADE AND RESPONSE. Yes, we agree, and we specified this by stating: “Dental features that distinguish DNH 83 from *Paranthropus* and *Australopithecus* are found on the dm¹.” However, for clarity, we have slightly revised this sentence and the following one.

Remark 3.21. “Page 7, Line 4: The mention of “the anterior part of the masseter origin” might be unnecessary here; consider removing it.”

CHANGE MADE AND RESPONSE. Thank you. This change has been made.

Remark 3.22. “Page 8, Line 154: Add “and” before “the MD elongation of the crown.”

CHANGE MADE AND RESPONSE. Thank you. This change has been made.

Remark 3.22. “Page 9, Lines 200-202: This sentence is vague.”

CHANGE MADE AND RESPONSE. We agree and have removed this unnecessary sentence.

Remark 3.23. “Page 9, Line 203: Please revise to “involve the postero-superior shift.””

CHANGE MADE AND RESPONSE. Thank you. This change has been made.

Remark 3.24. “Page 10, Line 208: Please remove the parenthesis after “PC2).””

CHANGE MADE AND RESPONSE. Thank you. This change has been made.

Remark 3.25. “Page 10, Line 211: Please change to “(Fig. 6d).” Also, please clarify whether “landmarks 10-14” refers to landmarks 10 through 14, as some differences can also be observed in landmarks 11 and 13. Please consider alternative representations of these results to improve clarity.”

CHANGE MADE AND RESPONSE. Thank you. These changes have been made. Additionally, we acknowledge that the previous Figures 6b to 6d lacked clarity. To address this, we have introduced alternative representations in the new Figures 6c and 6d (see “Remark 3.44” below). We also added that, along PC1, there is an antero-posterior contraction of the nasolabial clivus (landmarks 8 to 14) along with the development of the anterior nasal spine (landmark 11).

Remark 3.26. “Page 10, Line 217: Please revise for clarity (suggestion): “A first PCA conducted on a sample of 50 semi-landmarks along the mid-sagittal plane of the mandibular symphysis was employed.” Also, please ensure consistency with the Methods section regarding the number of semi-landmarks used (50 or 60?).”

CHANGE MADE AND RESPONSE. We made a slight adjustment to this sentence, which aligns with the Methods section, where we specify that 50 landmarks were used to represent the symphysis on the mid-sagittal plane.

Remark 3.27. “Page 10, Line 218: Specify with what the mandible KNM-ER 820 is compared to.

CHANGE MADE AND RESPONSE. Thank you. This change has been made.

Remark 3.28. “Page 10, Line 221: Please share the template used in that figure in the supplementary materials.”

CHANGE MADE AND RESPONSE. This template, containing 120 semi-landmark data points, is provided as "Source Data 4," as noted in the updated "Data Availability" section.

Remark 3.29. "Page 10, Lines 222-226: Please specify where the results of that test are presented."

CHANGE MADE AND RESPONSE. Thank you. This change has been made.

Remark 3.30. "Page 10, Line 227: Where do these two specimens fall on PC3?"

CHANGE MADE AND RESPONSE. As noted in Fig. 7a and 7c, the first two principal components (PCs) account for 80.9% of the total variance. Moreover, in both analyses, PC1 explains a much greater proportion of the total variance compared to PC2, indicating that the main source of variation among the specimens is captured primarily by PC1. The steep drop in variance from PC1 to PC2 suggests that PC1 plays a much more influential role in distinguishing the specimens, while subsequent components contribute progressively less to the overall variation. Fig. 7a clearly illustrates that KW 7000 falls well within the range of *H. sapiens* variation for PC1 (similar to KNM-ER 820), whereas Omo 222-1973-2744 lies far outside this variation.

In response to the question above, in the analysis of mid-sagittal symphyseal shape, PC3 represents 9.7% of the total variance. The Table below provides the coordinates of KW 7000, KNM-ER 820, and Omo 222-1973-2744 along PC1, PC2, and PC3. As shown in this Table, PC3 does not outperform PC1 or PC2 in distinguishing these three specimens. Along PC3, KW 7000 and KNM-ER 820 are closer to each other than to Omo 222-1973-2744. Additionally, similar to PC2, all three specimens fall within the range of *H. sapiens* variation.

Table:

	PC1	PC2	PC3
KNM-ER 820	-3.84064322	-0.67413618	0.33722877
KW 7000	3.34176878	2.89031394	-0.09171942
Omo 222-1973-2744	10.76747083	0.63316464	1.27367950

For clarity, we have slightly revised this part of the text to make clear that only PC1: (i) represents the main source of variation among the specimens and (ii) separates KW 7000 and *H. sapiens* on one side, and Omo 222-1973-2744, *P. robustus*, and *A. africanus* on the other (Fig. 7a,c).

Remark 3.31. "Page 11, Lines 230-231: Please specify that this refers to the first PCA."

CHANGE MADE AND RESPONSE. Thank you. This change has been made.

Remark 3.32. "Page 12, Line 257: The concept of robusticity has not been previously mentioned, nor defined, as an important feature that needs a supplementary analysis in this study. It might be worth discussing this aspect in the Introduction."

CHANGE MADE AND RESPONSE. We agree and have incorporated this point into the second paragraph of the Introduction section.

Remark 3.33. "Page 12, Line 259: Format "dc" with the "c" as a subscript."

CHANGE MADE AND RESPONSE. Thank you. This change has been made.

Remark 3.33. "Page 12, Line 266: The term "lower robusticity" is unclear; please rephrase."

CHANGE MADE AND RESPONSE. We now use the term ‘robusticity index’, as defined in the Introduction section.

Remark 3.34. “Pages 12-13, Lines 274-278: Why was DNH 83’s dm2 not included in this analysis?”

RESPONSE. This analysis focuses on the lower dm2, which is preserved in KW 7000. In contrast, DNH 83 is a maxilla that preserves the upper dm2.

Remark 3.35. “Discussion. Page 14, Line 301: While it is challenging to confidently attribute DNH 83 to *Homo*, this was assumed at the beginning of the paper, which may seem circular. This should be addressed in the Introduction. Some results support this attribution, which should be a conclusion of the paper. Alternatively, please rephrase and refer to the limited knowledge of morphological variability in australopith infants.”

CHANGE MADE AND RESPONSE. Here, we do not state that "it is challenging to confidently attribute DNH 83 to *Homo*," but rather that "confidently attributing it to an early *Homo* species remains challenging." In this paragraph, we certainly conclude that DNH 83 belongs to early *Homo*, and in the Discussion section, we clearly outline the derived features of DNH 83 to support our conclusion. For clarity, we have slightly revised the first sentence of this paragraph.

Remark 3.36. “Page 14, Lines 307-318: The logic behind this feature being distinct from australopiths is unclear to me, as some *Paranthropus* specimens also exhibit it. Please clarify the intended message.”

CHANGE MADE AND RESPONSE. We have clarified the explanation.

Remark 3.37. “Pages 14-15, lines 319-351: The paragraph spanning pages 14–15, lines 319–351, is quite lengthy. I recommend dividing it into two distinct sections: one focusing on the discussion of Omo 222 and the other on the conclusions regarding KW 7000.”

CHANGE MADE AND RESPONSE. As suggested by Reviewer 1 (see above), we have restructured this paragraph and further divided it into two distinct sections, as recommended here by Reviewer 3.

Remark 3.38. “Page 15, lines 354-355: repetition with above.”

CHANGE MADE AND RESPONSE. We have condensed this information to avoid repetition and integrated it with the following sentence.

Remark 3.39. “Page 15, lines 358-361: yes, but as already highlighted by Reviewer 1, the opposite is also true for the skeletal morphology.”

CHANGE MADE AND RESPONSE. We agree and this is now also emphasized in page 17, lines 393-397.

Remark 3.40. “Figure 1: This is a great figure but I would move OH 7 somewhere else on this picture. It is confusing that it is placed at the bottom. The arrow representing time could be elongated and OH 7 placed with the other early *Homo*.”

CHANGE MADE AND RESPONSE. We have clarified Figure 1 by keeping OH 7 separate from the infants and maximizing the view size of each specimen.

Remark 3.41. “Figure 3: Unless I am mistaken, the canines are not shown in dark blue as stated.”

CHANGE MADE AND RESPONSE. You are right. Thank you. We deleted this.

Remark 3.42. “Figure 5. Could the authors add somewhere on this picture the mesial/lingual/buccal/distal sides using axes? (same for figure 2)”

CHANGE MADE AND RESPONSE. In Figures 2, 3, 4 and 5, orientation is now indicated by labeling one corner with the abbreviations M (mesial) and B (buccal).

Remark 3.43. “Figure 6: Please change the “title” of the caption.”

CHANGE MADE AND RESPONSE. In Figures 6, 7, 8 and 9, we changed the title of the caption.

Remark 3.44. “I would like to emphasize the importance of providing clear visualizations of the changes along the principal components (PCs) and the differences between specimens. Currently, the visualizations presented by the authors are quite confusing. There are alternative, simpler methods to represent the variation along PCs, such as superimposing warps using transparency or displaying contours in lateral views. I recommend considering these or other approaches to improve clarity. Why is PC 2 not presented in this figure? A 3D plot showing the first three PCs would actually be helpful.”

CHANGE MADE AND RESPONSE. We added the PC1 versus PC2 graph (Fig. 6a) and superimposed warps on the vectors and landmarks to more clearly illustrate the differences.

Remark 3.45. “Figure 7: While the differences between the extremes on the axes and individuals are clearly depicted in Fig. 7b (though the colors may be hard to distinguish for colorblind individuals), I find Fig. 7d to be quite confusing, particularly in the comparison between Omo 222 and KW 7000. The interpretation of this figure is difficult. How can we determine which represents PC2+ and which represents PC2- when both are superimposed on the same image?” “Could the authors indicate in 7b how the mandibular profiles have been oriented?”

CHANGE MADE AND RESPONSE. We revised Fig. 7d to more clearly illustrate the extremes along PC1 and PC2. In the captions of both Fig. 7 and Fig. 8, we also indicate the orientation of the mandibular profiles and surfaces.

Remark 3.46. “8a-d: I wonder if this should not be a supplementary figure.”

RESPONSE. Figure 8 is the only one that illustrates morphometric comparisons including the KNM-ER 1477 *P. boisei* infants. In the Discussion section, we use Fig. 8 to highlight the close similarity between KNM-ER 1477 and KNM-ER 820 in terms of their mandibular corpus robusticity indices, which is why we believe Fig. 8 is important enough to be included in the main text.

Remark 3.48. “8e: The authors should indicate on this plot which axis represents PC1 and which represents PC2.”

CHANGE MADE AND RESPONSE. Thank you. This change has been made.