For research article

Response to Reviewer three Comments		
1. Summary		
Thank you very much for taking the time to carefully review this manuscript and for providing valuable suggestions. Your comments have been highly instructive in improving the quality of this paper. We have thoroughly examined and addressed each point you raised, with all corresponding revisions highlighted in green in the text. Below is our point-by-point response to your feedback.		
2. Questions for General Evaluation	**Reviewer's Evaluation**	**Response and Revisions**
Does the introduction provide sufficient background and include all relevant references?	Yes	We deeply appreciate the reviewer's affirmation. Indeed, we have dedicated significant effort to the introduction section to ensure it provides comprehensive background information and includes all pertinent references, laying a solid foundation for readers to understand the research.
Is the research design appropriate?	Yes	We are very grateful for the reviewer's recognition of our research design, which indicates that our design approach is reasonable and scientifically sound.
Are the methods adequately described?	Can be improved	We sincerely accept the reviewer's suggestion and acknowledge that there is room for improvement in the description of our methods to better ensure the transparency and reproducibility of the research. We have thoroughly revised the methods section, supplementing specific details of the experimental procedures, standard protocols for sample collection, and precise parameter settings for statistical analysis to ensure that readers can clearly understand and replicate our

		study.
Are the results clearly presented?	Must be improved	We greatly appreciate the reviewer pointing out the deficiencies in the presentation of our results, which is indeed an area we need to focus on improving. We have comprehensively reviewed the results section, reorganized the data presentation, ensured that figures and tables are clear and accurate, and removed redundant explanatory text to directly present key findings. Additionally, we have added in-depth analysis and interpretation of the results to enhance the logical coherence and persuasiveness of this section.
Are the conclusions supported by the results?	Must be improved	We fully agree with the reviewer's viewpoint that conclusions must be closely supported by the research results. We have deeply restructured the conclusions section to ensure that each conclusion point is clearly supported by result data. Furthermore, we have emphasized the innovative aspects of our findings and their practical application value, particularly the central role of identified genes in regulating the polled trait and their guiding significance for breeding practices.
Are all figures and tables clear and well-presented?	Must be improved	We are very grateful for the reviewer's attention to the quality of our figures and tables, which is indeed an aspect we need to highly value. We have reviewed each figure and table individually, correcting errors and unclear elements, such as adjusting resolution, optimizing color schemes, and standardizing font sizes. In accordance with the reviewer's suggestions, we have moved redundant labels from within the figures to the captions, making the figures more concise and clear. Additionally, we have redesigned the layout and presentation of some figures to enhance the overall visual

		impact and information transmission efficiency.

3. Point-by-point response to Comments and Suggestions for Authors

Comments 1: The proposed manuscript entitled "Genome-Wide Association Study and Candidate Gene Identification for Horn Trait in Xueduo Yak" is scientifically sound; however, it contains several technical deficiencies that should be addressed before a detailed review can be undertaken.

Response 1: Dear Reviewer,
Thank you very much for your important suggestions regarding the manuscript title. We have carefully reflected and fully recognized that an accurate and rigorous title is crucial for clearly presenting the core of the research. Following your guidance, we have thoughtfully evaluated and revised the original title, changing it to:"GWAS and Whole-Genome Resequencing Reveal Key lincRNA and Candidate Genes for Polled Phenotype in Yak"
The new title more directly reflects the integrated strategy of genome-wide association study combined with whole-genome resequencing employed in this research, and explicitly highlights the role of the key lincRNA region and its adjacent candidate genes in regulating the polled trait in yaks. We aim for this title to provide a more comprehensive and accurate summary of the research content and conclusions.Once again, we sincerely appreciate your thorough review and valuable suggestions, which have been immensely helpful in improving our manuscript. If you have any further revisions regarding the new title or other sections, we would be very glad to continue making adjustments.

Comments 2: Line 11. It is unclear why the statement "These authors contributed equally to this work" is included. In the subsection "Author Contributions" (Lines 399–403), the specific tasks performed by the authors are already described.

Response 2: Dear Reviewer,
Thank you very much for your careful reminder. We have considered that, since the specific roles and contributions of each author have already been detailed in the "Author Contributions" section (lines 646–650), retaining the separate equal contribution statement at line 11 does indeed constitute redundancy. Therefore, following your suggestion, we have removed that statement and revised the "Author Contributions" section to make the manuscript format more concise and standardized.

Comments 3: Lines 35–36. In the Abstract, the section "Keywords:" should be removed.

Response 3: Dear Reviewer,
Thank you very much for your careful review of our manuscript and for your valuable suggestions regarding the formatting details. Following your reminder, we have carefully checked the journal's Author Guidelines and the official submission template, and confirmed that the "Keywords:" label should indeed be retained in the abstract section. Your comments have made us pay closer attention to adhering to the journal's standards, and we sincerely thank you for that.
We will continue to strictly follow the journal's requirements to refine the manuscript. We also sincerely appreciate your professional guidance and hard work throughout the review process.

Comments 4: Lines 37–38. The authors are asked to reconsider the use of the keyword

“genome-wide association study”. Since all research constitutes a study, this wording may be redundant.
Response 4: Dear Reviewer, Thank you very much for your valuable suggestion. Following your advice, we have optimized and streamlined the keywords to: yak; horned; polled; GWAS. This revision makes the keywords more concise and representative, and they fully align with the focus of this study. We appreciate your professional guidance, which has been very helpful in enhancing the manuscript's standardization. The changes have been highlighted in green at line 35 of the manuscript.
Comments 5: Line 103. The message “Error! Reference source not found” appears and should be corrected.
Response 5: Dear Reviewer, Thank you sincerely for pointing out the citation error alerts in the manuscript. Upon verification, this issue was caused by technical misalignment during format conversion or updating of the citation table in the document. We have now carefully reviewed and corrected all in-text citation markers and the reference list item by item, ensuring the completeness and accuracy of all citations. This revision has fully resolved the issue of "reference sources not found." We apologize for any inconvenience this may have caused during the review process, and we would like to express our gratitude once again for your rigorous and thorough review, which has been crucial for us to improve the manuscript.
Comments 6: Lines 123–127. The biological sample is not described with sufficient clarity. It is sufficient to state that the study was conducted on three groups of 15 animals each (n = 15): horned Xueduo yak, polled Xueduo yak, and Ashdan yak. As the study was conducted on cows, it is unnecessary to specify sex again under core phenotypic traits.
Response 6: Dear Reviewer, Thank you for your valuable suggestions regarding the sample description section. We fully agree with your observation that the original wording contained unnecessary repetition. Following your advice, we have revised the text accordingly: In the "Experimental Design and Sample Collection" section, the sample description has been simplified to: "This study selected 45 healthy and adult cows, including Xueduo yaks (both horned and polled) and Ashdan yaks (the first polled yak breed derived from Datong yaks)." This revision makes the sample description clearer and more concise. We sincerely appreciate your professional feedback, which has significantly improved the rigor of the manuscript. The changes have been highlighted in green at lines 122–123 of the manuscript.
Comments 7: Lines 198–201. The parameters of the statistical model used should be described more clearly.
Response 7: Sincerely thank you and the second reviewer for your valuable suggestions regarding the statistical model section. We have integrated both of your recommendations and provided a clearer description of the parameters of the mixed linear model in lines 234–251 of the manuscript. Specifically, we have added details on the rationale for setting the fixed and random effects, as well as the inclusion of covariates in the model. This revision

aims to ensure transparency in the analytical process and enhance the reproducibility of the research methodology and results. We greatly appreciate your feedback, which has been crucial in refining our work.
Comments 8: Lines 209–211. The statement "P < 0.05 indicates a significant difference, 0.05 ≤ P < 0.10 indicates a trend toward a significant change, and P > 0.05 indicates no significant difference" is unnecessary. Table 1 already reports P-values, which are self-explanatory to the scientific community.
Response 8: Dear Reviewer, Thank you for pointing out the redundant explanation regarding P-values in the text. We fully concur with your view that additional interpretation of their statistical significance is unnecessary for scientific readers when specific P-values have already been reported. Following your suggestion, we have removed this explanation accordingly. This revision makes the presentation in the Results section more concise and professional. We sincerely appreciate your valuable feedback.
Comments 9: Line 215. The message "Error! Reference source not found" should be corrected.
Response 9: Dear Reviewer, Thank you very much for pointing out the citation errors in the manuscript. Upon verification, the issue arose due to technical misalignment of the citation table during the editing process, which resulted in the loss of associations for some references. We have now carefully reviewed and corrected all citations throughout the entire manuscript to ensure the completeness and accuracy of the references. We sincerely apologize for any inconvenience this oversight may have caused during your review. We truly appreciate your rigorous and thorough feedback.
Comments 10: Line 223. The title of Table 1 is incomplete and should be more precise. The term "body measurements" should be used instead of "growth performance", which is typically applied to growth studies. The title should also indicate that the measurements refer to female animals (cows). **Table 1. The term "items" should be replaced with "body measurements". Standard anatomical terminology should be used, as several of the currently employed terms are unclear or non-standard (e.g., height—it is not specified whether this refers to withers, back, or rump height; moreover, in terms such as "body oblique length" or "butt width", standard anatomical terminology is not applied). The Materials and Methods section should clearly describe how each body measurement was obtained. Since exact P-values are reported, the use of lowercase and uppercase letters to indicate differences is unnecessary. For example, when the P-value for chest width is 0.006, the symbols "a" and "b" are redundant. Additionally, it is unclear why mean values for Ashdan yak cows are not included in Table 1.**
Response 10: We sincerely thank the reviewer for this precise and constructive feedback. We highly value the issue you raised regarding unclear terminology. Following your suggestion, we have revised the ambiguous term "body height" in lines 263–273 to the standard anatomical term "withers height" and unified other measurements such as "body length" and "rump width" with the standardized terminology commonly used in animal science. This ensures that all morphometric terms are clear and aligned with academic conventions.

We have also removed all superscript letters (e.g., “a,” “b”) and their explanatory notes from the table, retaining only the exact P-values to avoid redundancy. Additionally, the methodology for collecting body weight and morphometric data has been reorganized into Section 2.2 (lines 128–138) of the Materials and Methods.

Furthermore, we greatly appreciate your careful attention and valuable questions. The core objective of this study is to decipher the genetic variation underlying the horned/polled trait within the Xueduo yak population, ultimately providing direct theoretical support for breeding polled Xueduo yaks. Ashdan yak, as an independently developed polled breed, was included primarily to validate—through joint genome-wide association analysis—whether the polled trait in Xueduo yaks and the polled phenotype in Ashdan yaks share the same regulatory genes (such as PAXBP1) and variant loci. This helps clarify the genetic conservation of the polled trait across different yak breeds. The role of this breed is thus focused on genetic-level validation rather than comparative analysis of morphometric or weight traits. Therefore, we did not include Ashdan yak body measurements and weight means in Table 1.

Comments 11: Line 231. The message “Error! Reference source not found” should be corrected.

Response 11: Dear Reviewer,

Thank you for specifically noting the reference error on line 231. This issue occurred because, during the final version conversion of the document, hyperlink fields for some references were lost. We have located and corrected the citation format at that point and conducted a thorough check of all references throughout the manuscript to ensure that all such "reference source not found" alerts have been fully resolved.

We sincerely appreciate your meticulous review, which has helped us improve the technical details of the manuscript.

Comments 12: Line 232. The title of Table 2 is incomplete and should clearly describe the content of the table. It should not be phrased in terms of “statistics …”.

Response 12: Dear Reviewer,

Thank you very much for your rigorous correction regarding the title of Table 2. We fully agree with your observation that the original title did not clearly summarize the content of the table, and the use of "Statistics" was indeed inappropriate. This reminds us that we still need to strengthen the precision of our academic expression.

Following your valuable suggestion, we have revised the title to "Functional Annotation Categories and Corresponding SNP Counts." The new title aims to clearly indicate that the table focuses on presenting the functional annotation categories of SNPs and their quantitative distribution, thereby avoiding ambiguity and helping readers understand the data more intuitively and accurately.

Your review comments have been highly instructive to us. Once again, we sincerely thank you for your professional guidance.

Comments 13: Lines 234, 235, 239, 252, 257, etc. The message “Error! Reference source not found” be corrected wherever it appears.

Response 13: Dear Reviewer,

Thank you very much for precisely pointing out the scattered citation technical errors in the

text (lines 234, 235, 239, 252, 257, etc.). This was an oversight during our proofreading, which resulted in a poor reading experience for you. We sincerely apologize for this.
We have taken immediate action—not only correcting the specific instances you mentioned, but also conducting a full calibration of the entire manuscript to ensure every citation links accurately. This oversight has served as an important lesson, deepening our understanding of the rigor required in the technical details of academic writing.
Thank you very much for your guidance.

Comments 14: Line 269. Figure 3 is corrupted and should be corrected. Additionally, the internal labels such as "horn.phenotype manhattan plot" or "horn.phenotype pp plot" should be removed from the figure panels and instead incorporated into the figure caption.

Response 14: We thank the reviewer for the rigorous feedback on the technical details of the figures. In response to your suggestions, we have revised Figure 3 as follows:
File issue: The corrupted file has been replaced with a newly generated high-resolution version of Figure 3, which has been uploaded accordingly.
Label adjustment: All internal labels within the image panels (e.g., "horn.phenotype manhattan plot") have been removed, and the relevant descriptive information has been integrated into the figure legend.
The revised figure now conforms to publication standards and offers improved readability. We kindly invite you to review the updated version.

Comments 15: Line 296. The title of Table 3 should be more informative. The column "Chr" is unnecessary, as the analysis was conducted exclusively on chromosome 1. This information should instead be included in the table title.

Response 15: Dear Reviewer,
Thank you very much for your meticulous guidance and valuable suggestions during the review process.
After carefully studying your comments, we fully agree that "incorporating information about chromosome 1 into the title" would more accurately reflect the core focus of the study. We also recognize that the title of Table 3 needs further refinement to better align with its content. Following your advice, we have revised the title to highlight chromosome 1 as the key subject of investigation, while also reworking the title of Table 3 to more clearly reflect the characteristics of the core variant loci and their associated phenotypes.
Each of your suggestions has encouraged us to think more rigorously about how to present our research. Once again, we would like to express our sincere gratitude to you.

Comments 16: At the end of the Discussion section, the paragraph beginning with "In summary, this study…" largely reiterates the Conclusions. This text should be shortened and appropriately integrated into the Conclusions section.

Response 16: Dear Reviewer,
Thank you very much for pointing out the overlap between the Discussion and Conclusion sections of the manuscript. Your rigorous review has helped us identify redundancy in the presentation.
We fully agree with your suggestion and have made targeted revisions to the relevant

sections. First, we removed the "summary of findings" from the Discussion that overlapped with the Conclusion, retaining only the "limitations and future research directions" to avoid repeating core results. Second, we integrated the key findings previously mentioned in both sections into the Conclusion and added essential information—including the central role of the PAXBP1 gene in regulating neural crest cell function and the practical breeding value of the genetic conservation of the polled trait across different yak breeds. This makes the Conclusion more concise and complete while highlighting the core contributions and applied significance of the study.

These revisions not only streamline redundant content but also strengthen the logical flow and comprehensiveness of the Conclusion, resulting in a clearer manuscript structure and more focused emphasis.

Comments 17: Lines 426–468. Appendix B is unnecessary and should be removed. For example, the abbreviation for chromosome ("Chr" or similar) is standard in the scientific literature.

Response 17: Thank you for your valuable suggestion. Following your advice, we have removed the unnecessary Appendix B from the manuscript. This revision has streamlined the structure of the paper, avoiding redundant information and making the content more concise and better organized.

Comments 18： Line 470. The appearance of "Uncategorized References" is unclear and should be resolved.

Response 18: We sincerely appreciate your meticulous attention to detail. As per your guidance, the redundant phrase "Uncategorized References" has been removed. Thank you once again for your valuable correction, which has helped us further refine the manuscript.

4. Response to Comments on the Quality of English Language

Point 1: The English could be improved to more clearly express the research.

Response 1: We sincerely thank the reviewer for this constructive suggestion regarding the clarity of the English language. We fully acknowledge the importance of precise and fluent expression in effectively communicating scientific content. In response, we have thoroughly reviewed and polished the entire manuscript, focusing on improving sentence structure, terminology consistency, and overall readability. Where necessary, we have also sought assistance from professional language editing services to ensure the text meets high academic standards. We believe these revisions have enhanced the clarity and flow of the manuscript, and we are grateful for your guidance in strengthening the quality of our writing.

5. Additional clarifications

We would like to once again express our sincere gratitude for your rigorous review. Should there be any further findings during your continued evaluation, we will promptly address and refine them accordingly. We deeply appreciate the careful guidance and valuable suggestions provided. All requested revisions have been completed, and we have strived to enhance the manuscript in terms of academic standards, content accuracy, and readability. We kindly invite you to further review the revised manuscript. Wishing you a successful and productive year 2026, with all the best in your work and endeavors.