



CHICKEN LAMPBRUSH CHROMOSOME METHYLATION PROFILE ANALYSIS

Affiliations:

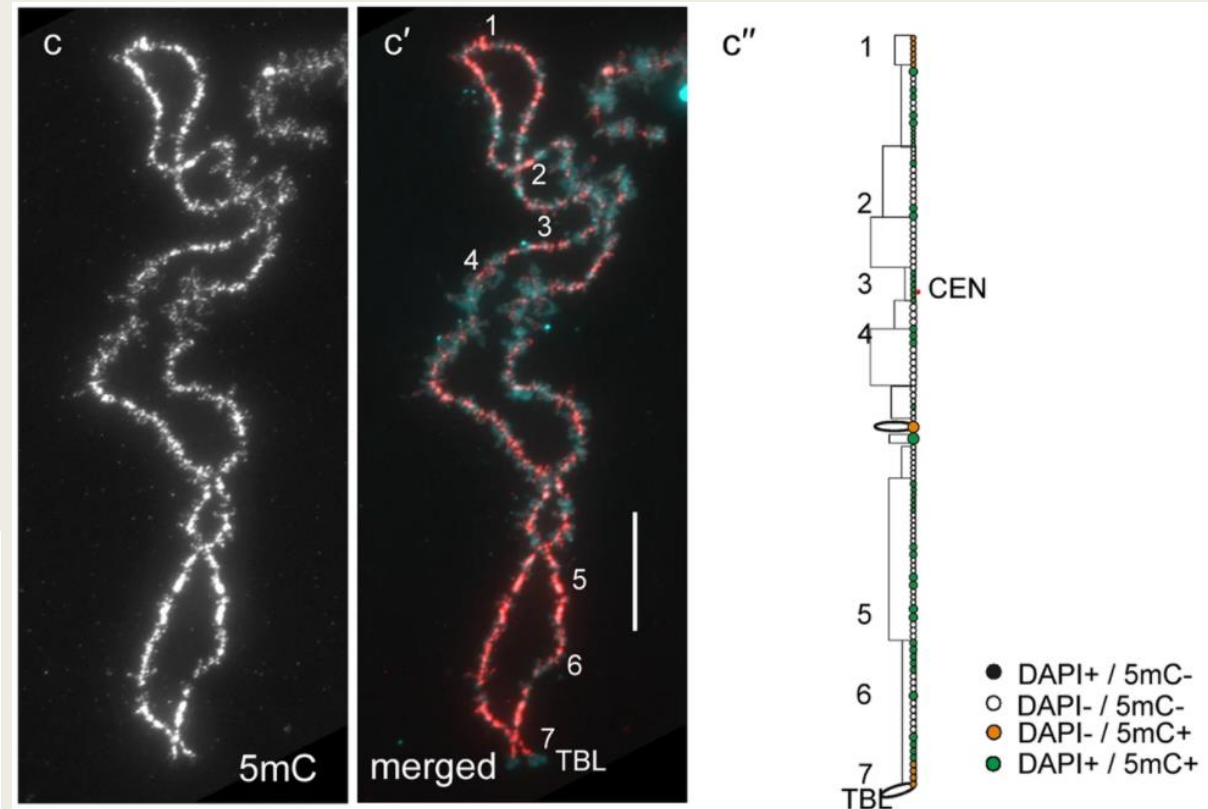
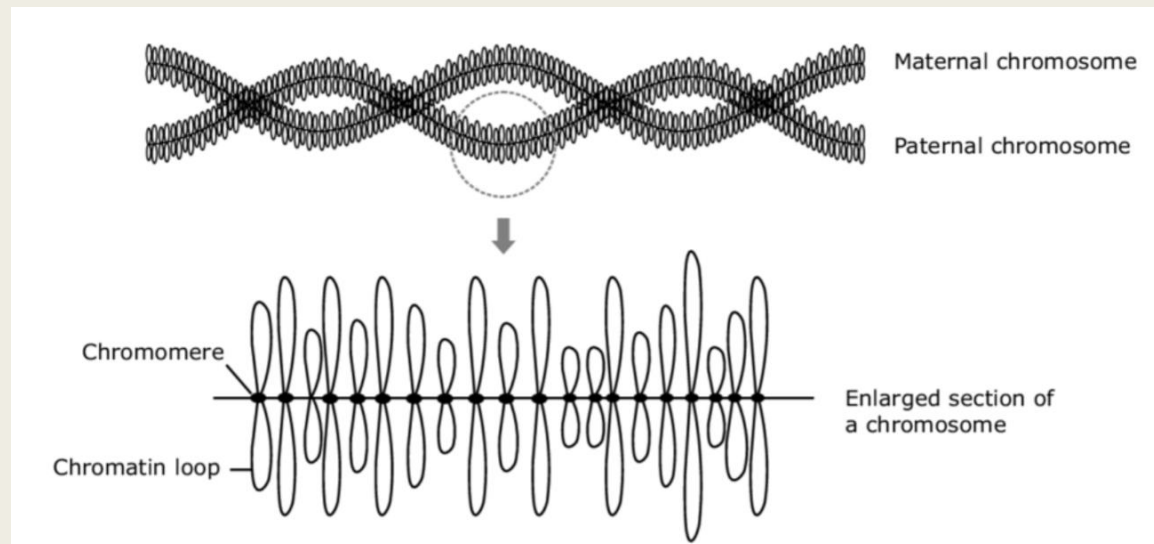
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Background

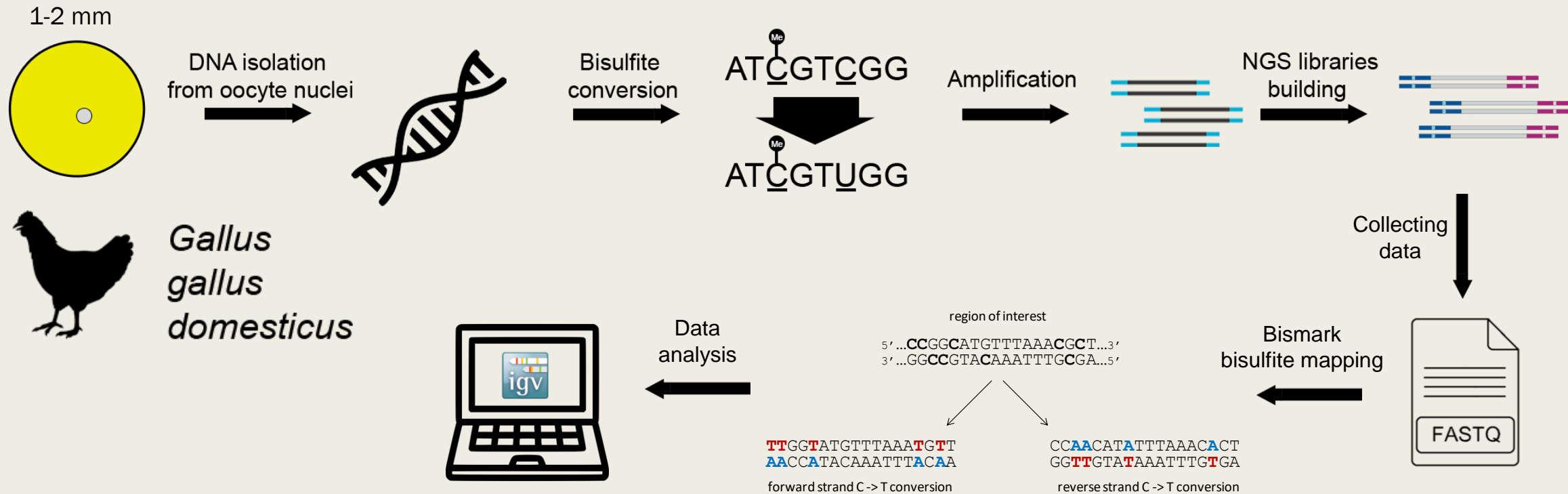
Lampbrush chromosomes are transcriptionally active chromosomes that appear in growing oocytes of all vertebrate taxons, except mammals [1]. One of the transcription control mechanisms is DNA methylation by converting cytosine to 5-methylcytosine (5mC). For example, CpG islands methylation in gene promoter causes gene silence. So it will be interesting to find a match between transcribed genes and methylation patterns in lampbrush chromosomes in contrast to somatic cells.



Immunostaining of GGA1 with antibodies against 5mC (c). c' - merged images of corresponding chromosomes (immunostaining - red, DAPI - cyan). Scale bars - 20 μm. c'' - map of corresponding epigenetic modifications distribution. Image adapted from [1].

- [1] Kulikova, T., Surkova, A., Zlotina, A. et al. Mapping epigenetic modifications on chicken lampbrush chromosomes. *Mol Cytogenet* 13, 32 (2020). <https://doi.org/10.1186/s13039-020-00496-0>
- [2] Raddatz, G., Arsenault, R.J., Aylward, B. et al. A chicken DNA methylation clock for the prediction of broiler health. *Commun Biol* 4, 76 (2021). <https://doi.org/10.1038/s42003-020-01608-7>

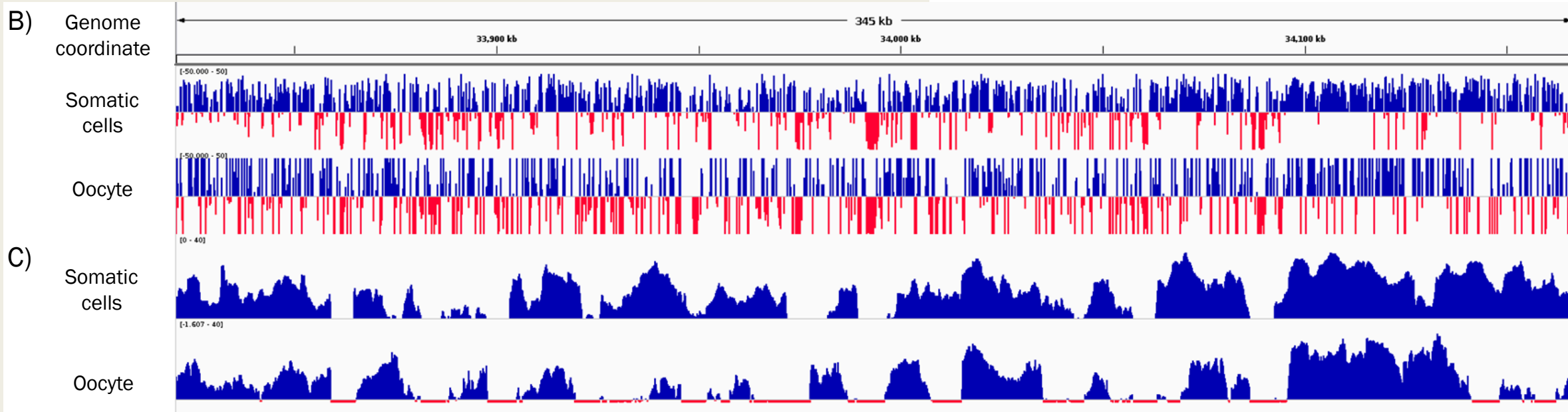
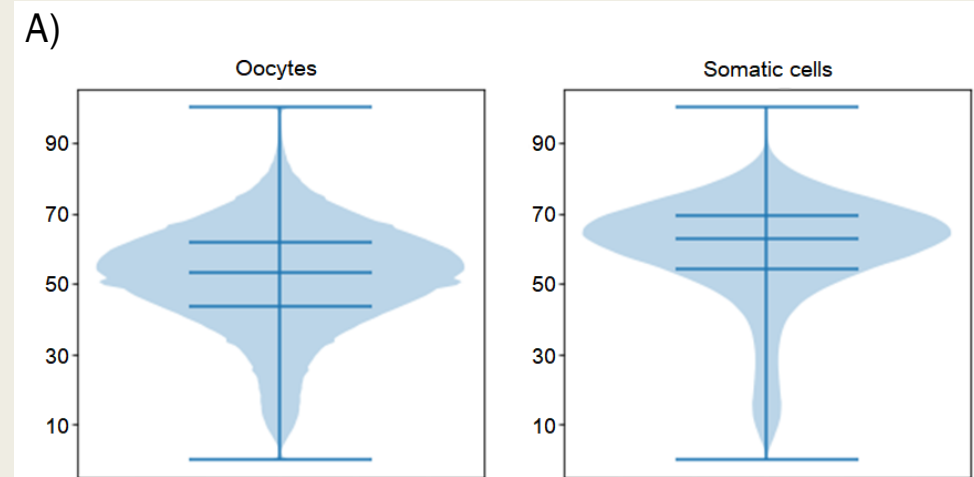
Experimental scheme



Results

- Chicken somatic cells [2] and oocytes have similar methylation pattern, but different average methylation level.

A) average cytosine methylation level. B) Normalized chicken DNA methylation level (high (> 50%) – blue, low (< 50%) – red). C) Chicken DNA methylation pattern ([0%, 100%] – blue).

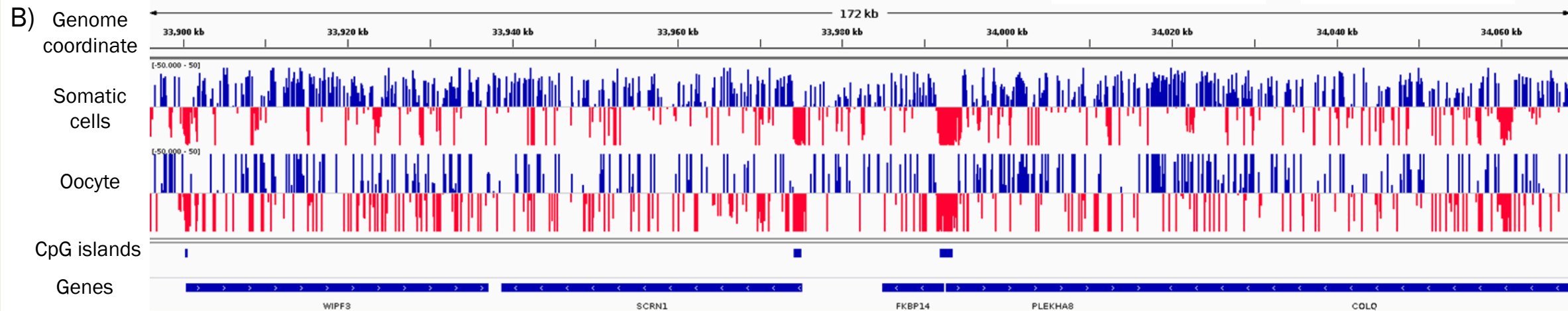
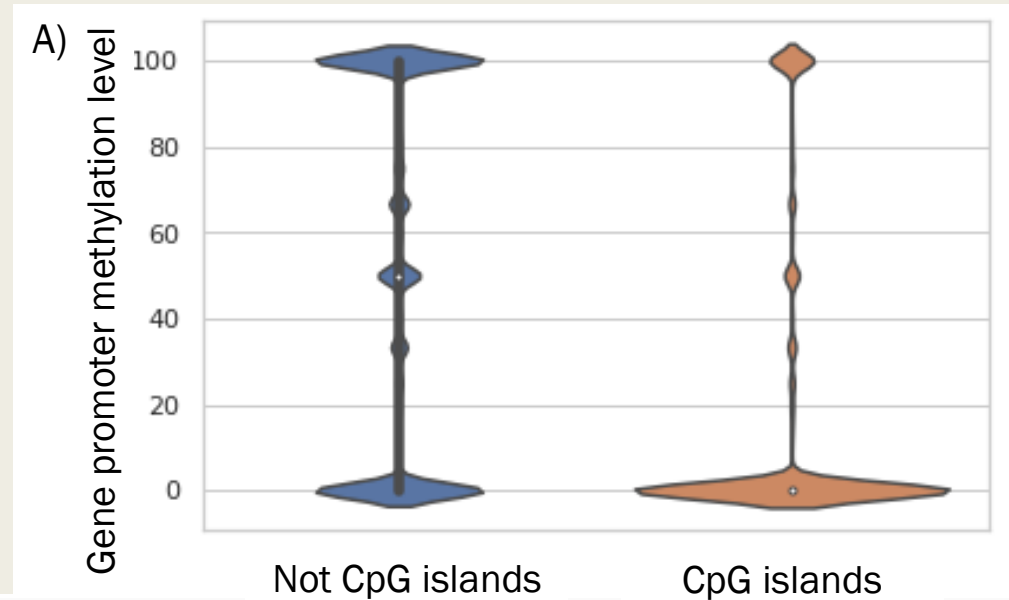


Results

- Chicken somatic cells [2] and oocytes gene promoter CpG islands are mostly demethylated.

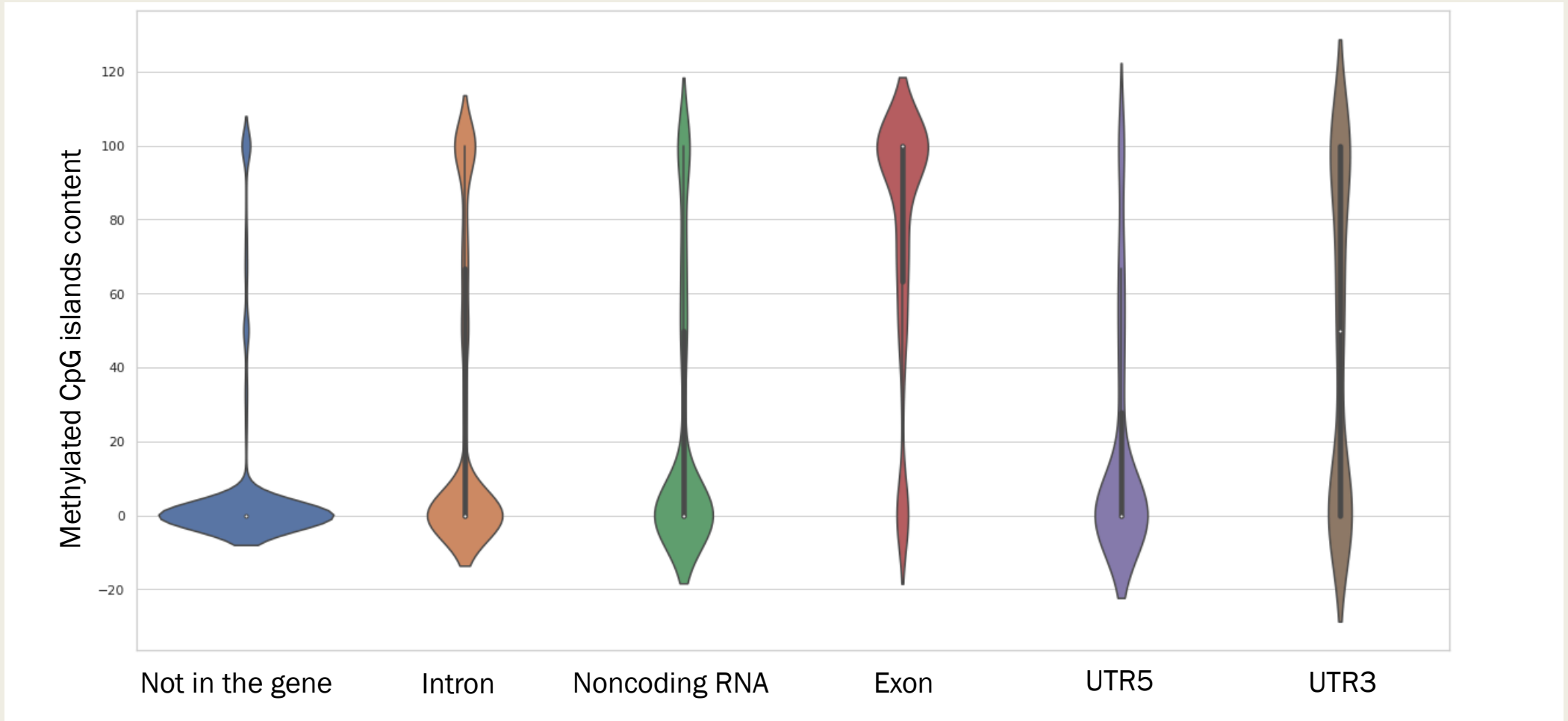
A) Chicken DNA methylation level distribution in gene promoters. B) Chicken DNA methylation pattern of gene promoter in compare with CpG islands.

Methylation level: high (> 50%) – blue, low (< 50%) – red.



Results

- The majority of CpG islands in exons of chicken lampbrush chromosomes are methylated as well as CpG islands in exons of chicken somatic cells [3].



[3] Gelfman S, Cohen N, Yearim A, Ast G. DNA-methylation effect on cotranscriptional splicing is dependent on GC architecture of the exon-intron structure. *Genome Res.* 2013 May;23(5):789-99. doi: 10.1101/gr.143503.112. Epub 2013 Mar 15. PMID: 23502848; PMCID: PMC3638135.

Conclusion

- Chicken lampbrush chromosomes have the same methylation pattern as chicken somatic cells. Promoter CpG islands in oocytes are mostly demethylated as well as CpG islands in somatic cell promoters. Also the majority of CpG islands in exons are methylated in oocytes as well as the majority of CpG islands in somatic cells. However, the average methylation level of the lampbrush chromosomes is lower than the average somatic cells methylation level.