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SCIENCE AND EDUCATION FOR SUSTAINABLE LIFE

Genomic inbreeding over time for Swedish Red and Swedish Holstein-Friesian cattle

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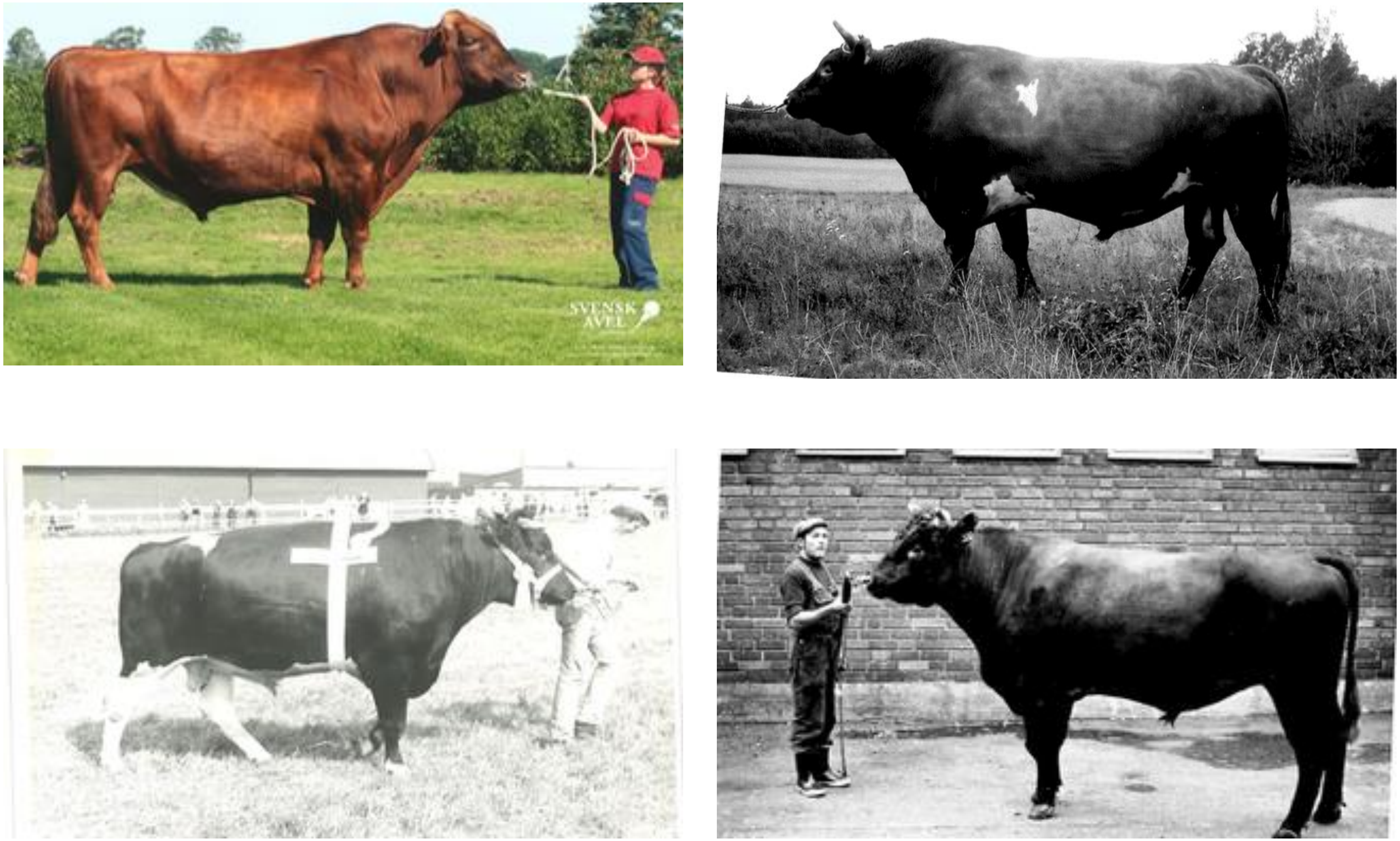
- We studied changes over time in homozygosity and inbreeding in Swedish Red and Swedish Holstein-Friesian cattle (old samples more Friesian, new samples Holstein)
- We used 50k SNP data for AI bulls used in Sweden provided by the Nordic genetic cattle evaluation (NAV) and Viking Genetics
  - 3032 HOL
  - 5545 RDC

Calfs at the Swedish Livestock Research Centre at SLU. Photo:

New techniques and breeding regimes have been implemented for Swedish dairy cattle over the years

- BLUP evaluation in 1984
- Joint Nordic evaluation in 2005
- Genomic selection from around 2010
- Can these developments be detected as changes in homozygosity and inbreeding in these breeds?

Old bulls

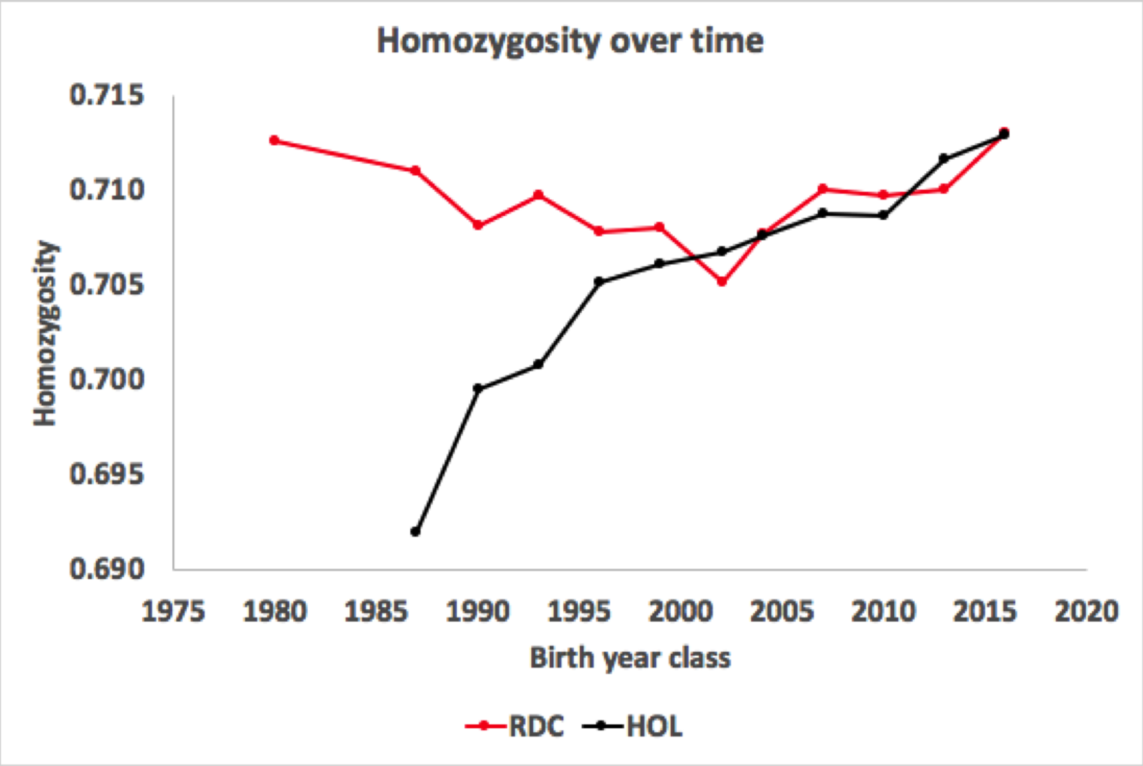


Photos from Viking Genetics

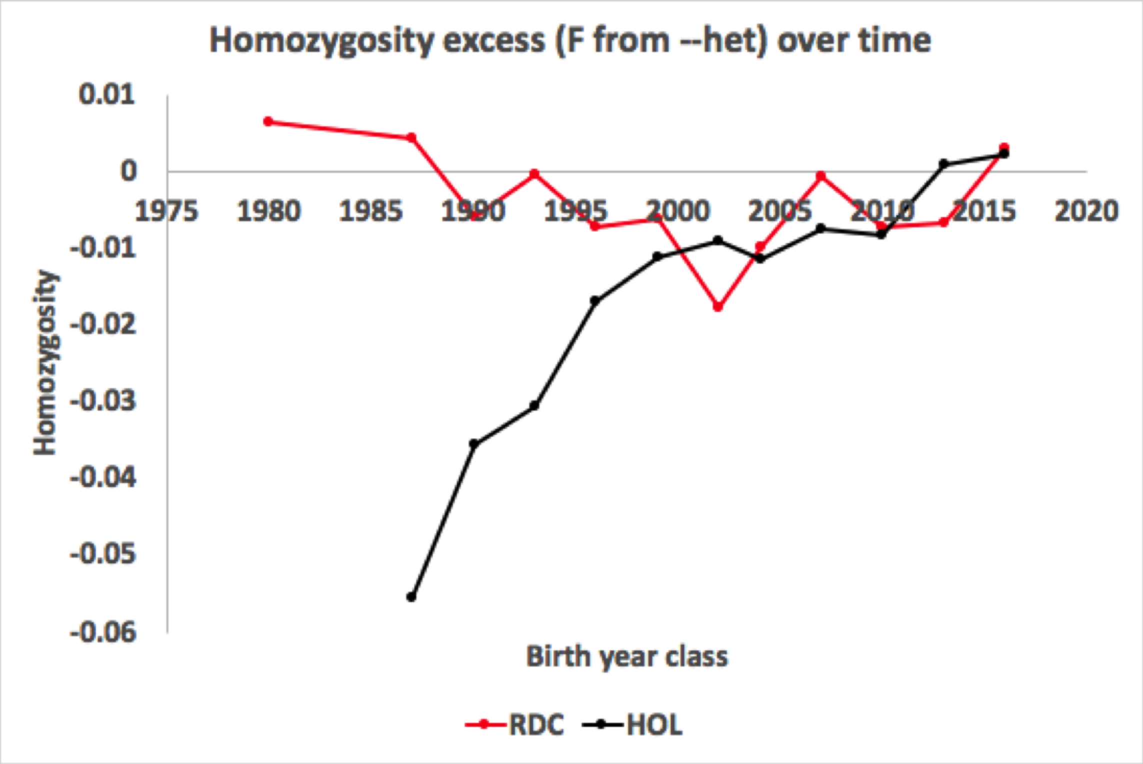
Modern bulls

Photos from Viking Genetics

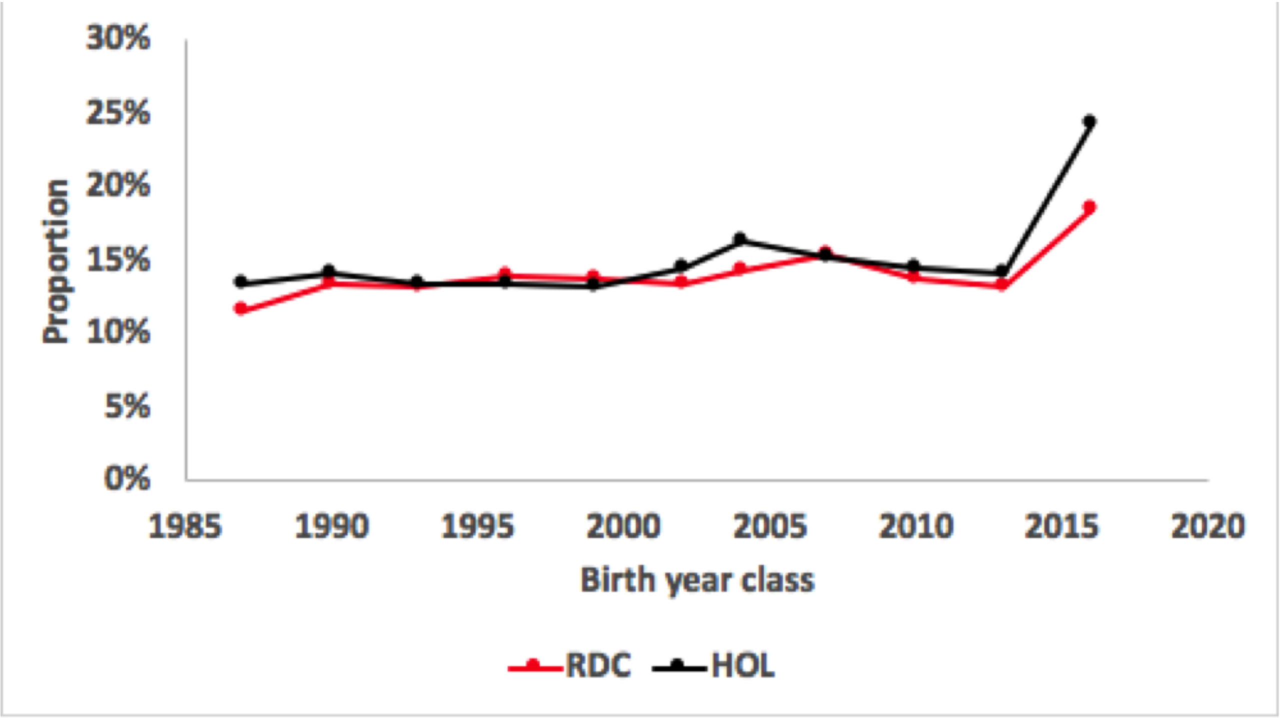
Different pattern of homozygosity change in the two breeds



Pattern of change in homozygosity excess similar to pattern of homozygosity



Proportion of fixed SNPs

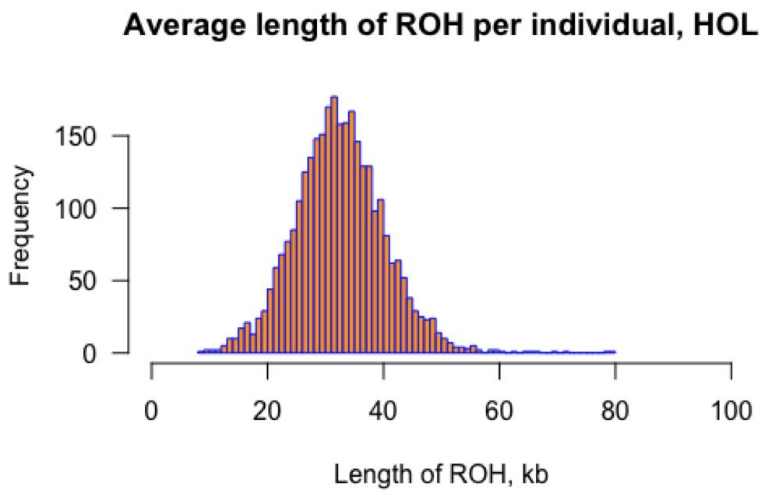


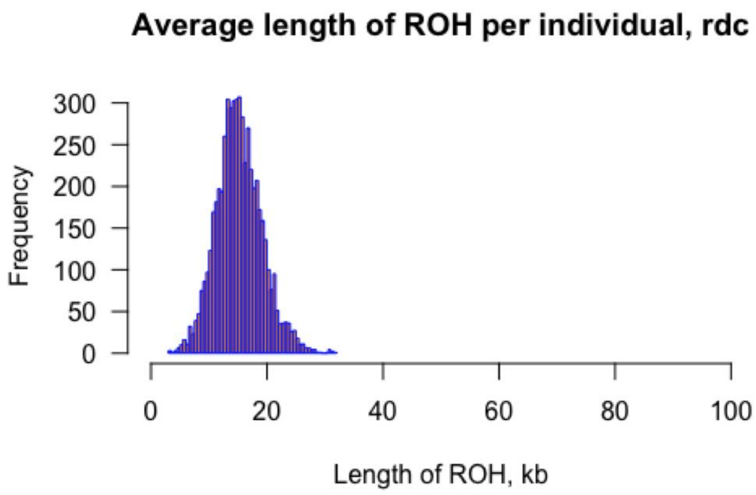
Runs of homozygosity

The analyses of ROH were made in plink with the following settings:

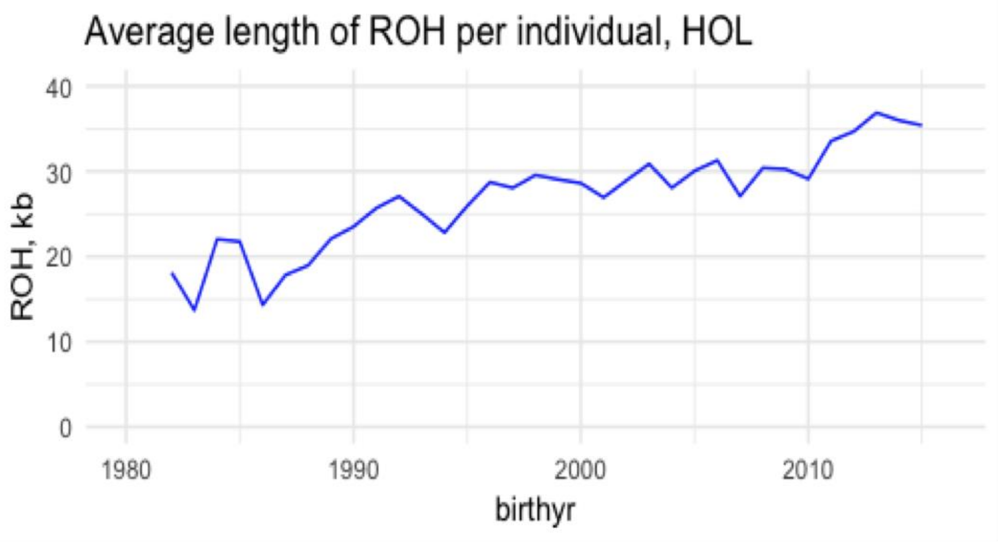
```
--homozyg-density 1000 --homozyg-kb 1000 --homozyg-snp 20 --
homozyg-window-snp 20 --homozyg-window-het 1
```

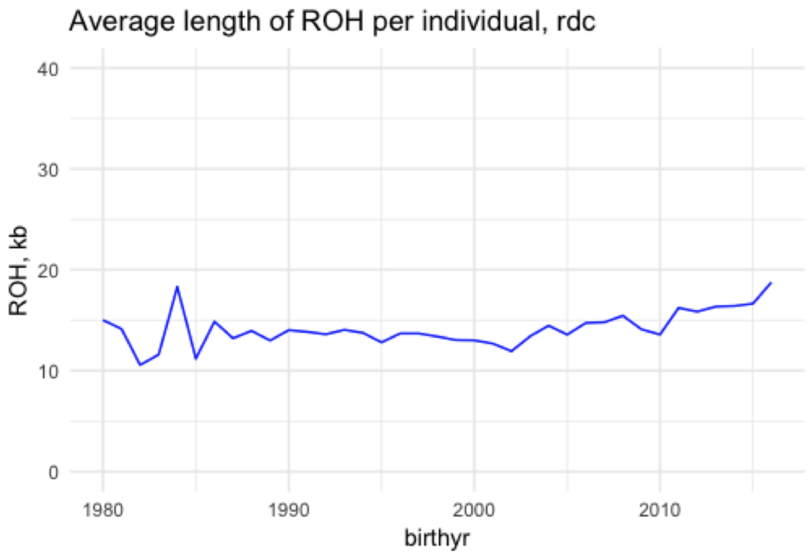
Holstein has on average twice as long ROH as RDC


Average length of ROH per individual, HOL

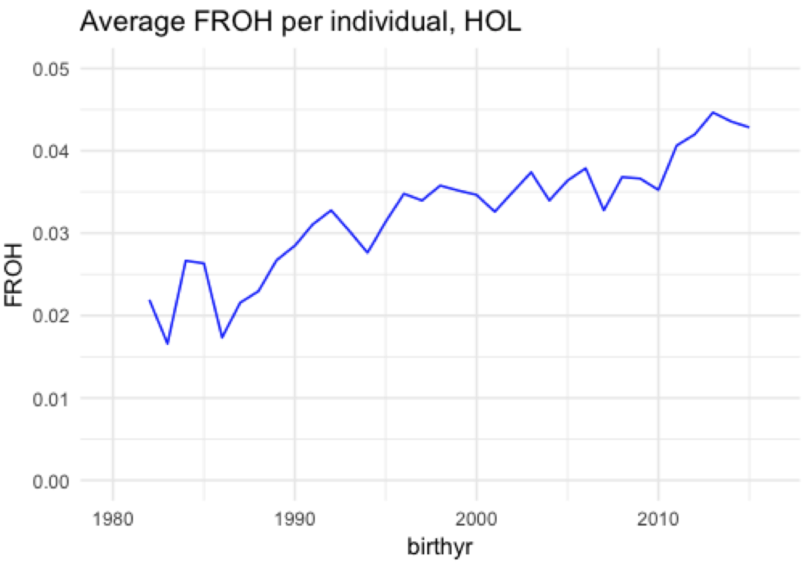

Average length of ROH per individual, rdc

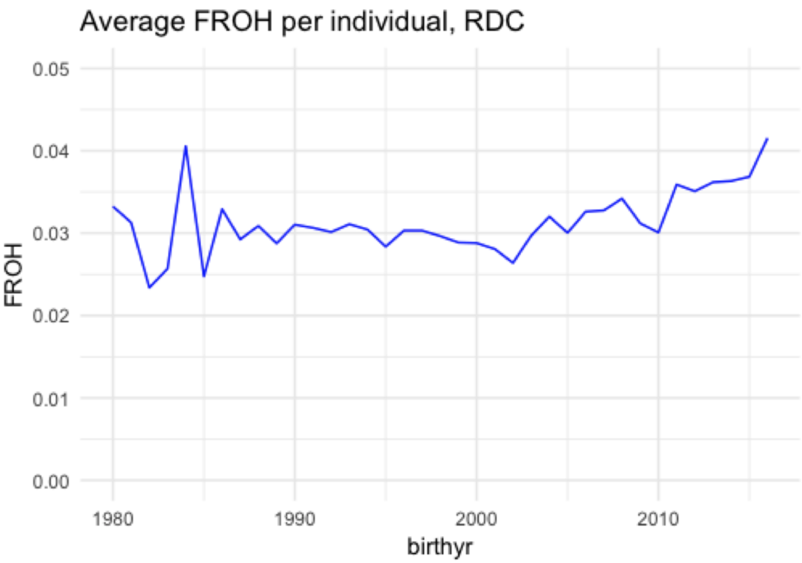
Steady increase in ROH length in HOL, recent increase in RDC





Increase in inbreeding in HOL, stable inbreeding in RDC until recently when it started increasing


Average FROH per individual, HOL


Average FROH per individual, RDC

Conclusion

- The homozygosity and inbreeding has increased in recent years. This coincides with the introduction of genomic selection.

Future research

- We have genotyped additional old semen samples from Viking Genetics to be able to compare further back in time, oldest genotyped bulls born in 1950ies
- We will add this new data to the data presented here and re-run the analyses.

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The research was funded by a grant from The Swedish Research foundation Formas

We thank for data provided by NAV and
VIKINGGENETICS

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