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How Did Skin Pigmentation Evolve in Papua New Guinea?



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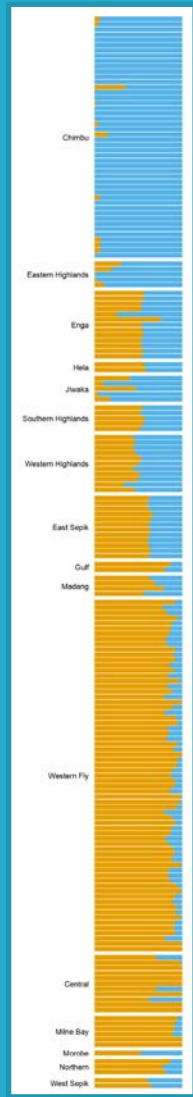
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Exceptional skin pigmentation diversity in Papua New Guinea reveals unique micro-scale adaptations.

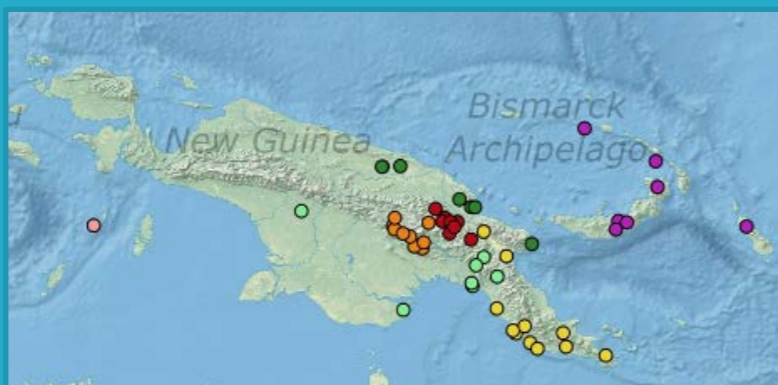
Skin pigmentation is influenced by a multitude of factors such as UV radiation, diet, lifestyle, sexual selection and introgression with archaic humans. Papua New Guinea (PNG) - a country the size of Spain - exhibits one of the widest range of skin pigmentation variation.

What are the genetic variants driving skin pigmentation differentiation in PNG? Did the skin pigmentation in PNG is an adaptation to the UV radiation?

1- Population structure analysis



People of PNG are highly structured.



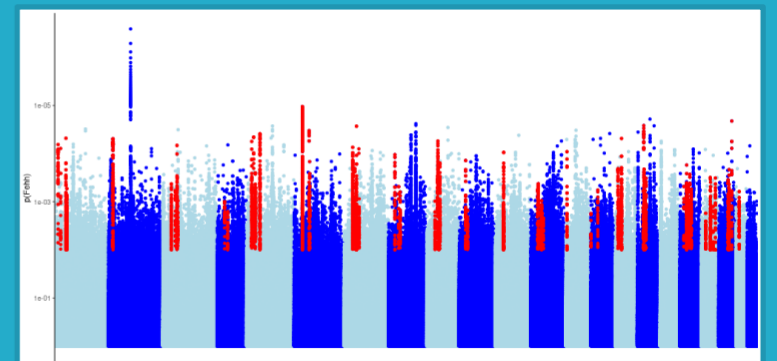
Brucato et al. MBE (2021)

We studied population structure (ADMIXTURE, FineSTRUCTURE) to integrate this information in later analyses.

2- Genome-wide selection scan

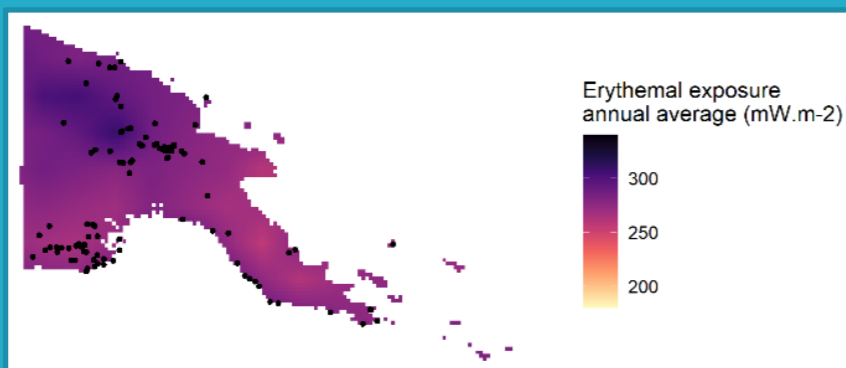
- On 4 identified populations defined by FineSTRUCTURE showing homogeneous skin pigmentation (● North lowlands, ● South lowlands, ● East highlands, ● West highlands).
- Extended-haplotype selection scans.

➤ 2,775 regions found under positive selection.

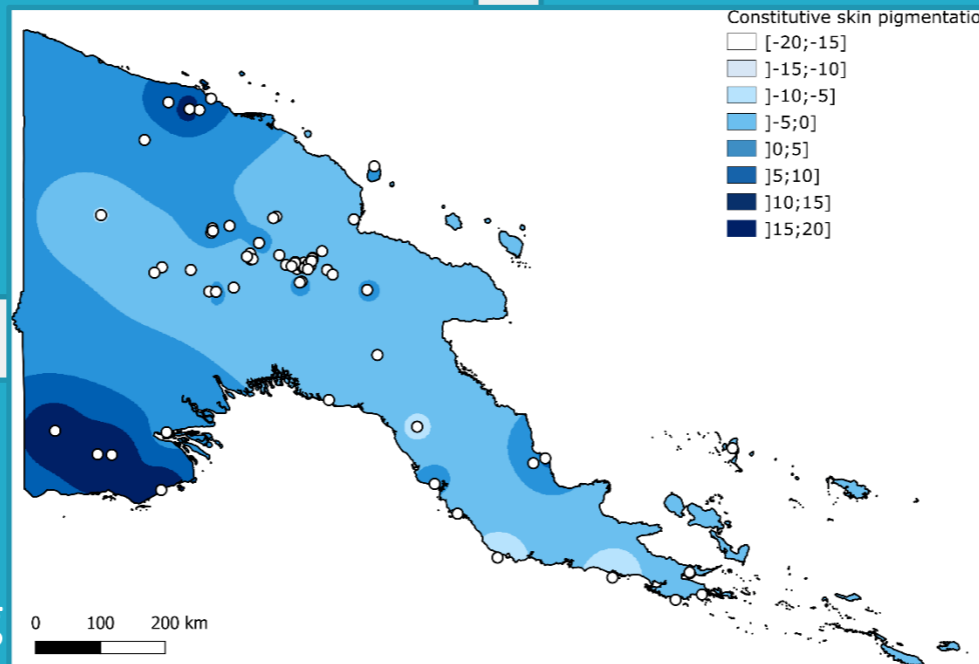


4- Effect of UV radiation on skin pigmentation in PNG

UV radiation from remote sensing technology (NASA)

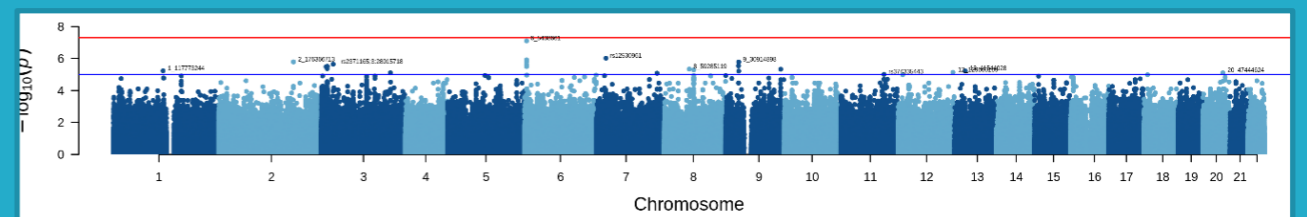


- No linear relation between UV radiation and skin pigmentation.
- No association between UV radiation and the region under selection associated with skin pigmentation (LFMM).



3- Genotype-Phenotype association

- On melanin index (corrected by gender)
- Restricted to region showing positive selection
- Linear Mixed Model (GEMMA).



- One of the top-hit in the selection analysis is associated with the melanin.
- No known genes involved in pigmentation are found associated with pigmentation in PNG.

The rich diversity of skin pigmentation in PNG points to undiscovered genetic mechanisms at play, with limited influence from known pigmentation genes. UV radiation cannot explain these patterns, implying the influence of other environmental/cultural factors.

