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In Silico modelling of the salmon salting process to reduce saline effluent

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Context



Industrial fish processing wastewater have high salinity ($\text{Na}^+, \text{Cl}^-, \text{SO}_4^{2-}$), high chemical oxygen demand and organic nitrogen concentrations. It may contain microbes and be acidic.
(Ching and Redzwan, 2017)

4.5%

Atlantic salmon is the 9th fish species used in fish farming. It makes up 4.5% (mass) of farmed fishes. Versatile and popular, it is 1st in terms of value. (FAO, 2020)



Smoking is bad for you. It cures salmon though. Salmon might not be the bear essentials food, but it sure can be a gill-ty pleasure.

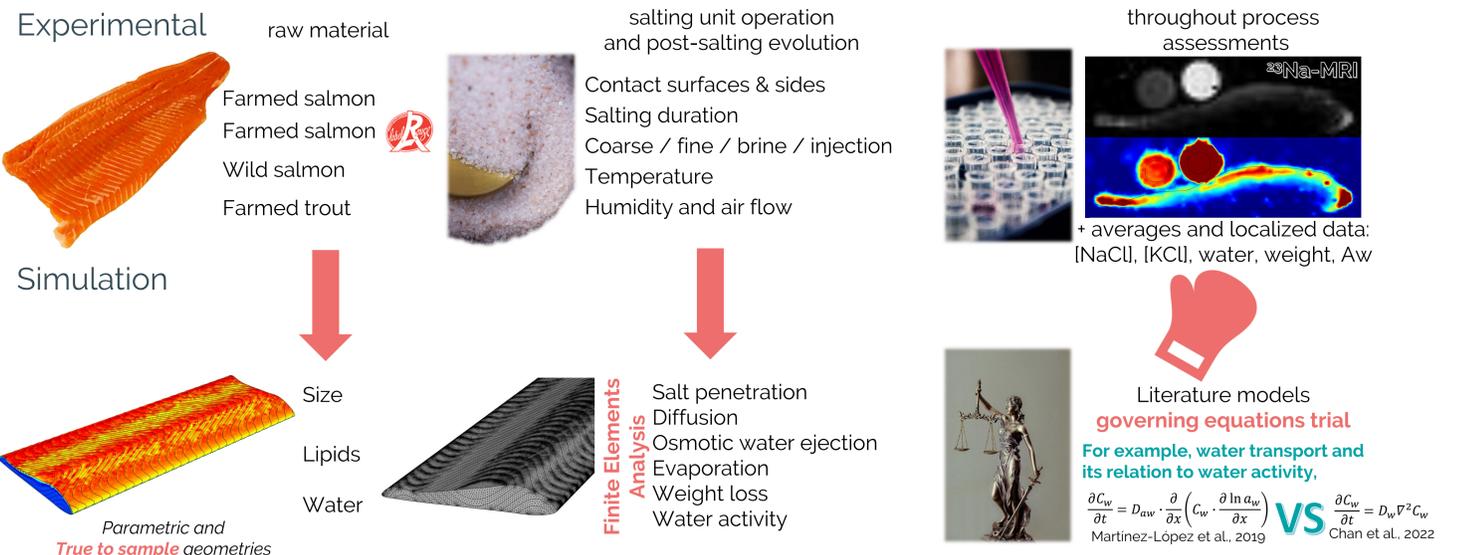
Note: Authors left this context spot to salmon else. It might be a little fishy.



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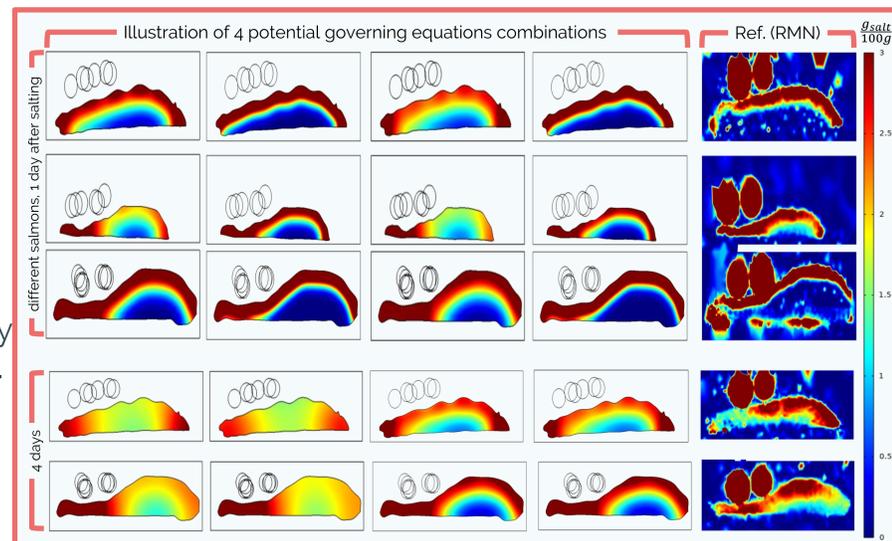
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Material and Methods



Results

- ✓ Farmed salmon contains more fat than wild salmon. Farmed trout is in-between. Fat content is a limiting factor for salt uptake and apparent diffusion.
- ✓ Salt diffusion is generally better represented as non-Fickian: diffusivity negatively affected by concentration.
- ✓ A higher temperature accelerates moisture or salt diffusion. This effect is generally successfully modelled using the Arrhenius equation.



Conclusion

- ✓ A unified framework for the various salmon salting processes based upon mechanistic modelling is worth considering to improve the sector sustainability.
- ✓ Some operations require further characterization for the mechanistic models to achieve generalized prediction value. For example brine injection, which strongly modifies salmon structure,
- ✓ Image processing of sodium MRI is still making much needed progress towards finer and less noisy outputs.

Perspectives

- ✓ Characterisation of myoseptum and skin influence
- ✓ Multi-objective process optimisation

