

Past primary sex-ratio estimates of 4 populations of Loggerhead sea turtle exhibiting temperature-dependent sex determination

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BACKGROUND

Ectothermic species are supposed to be strongly affected by climate change and especially those that exhibit temperature-dependent sex determination (TSD). Most of the turtles exhibit TSD and sexual phenotype of juveniles is dependent on the temperature of the nest.

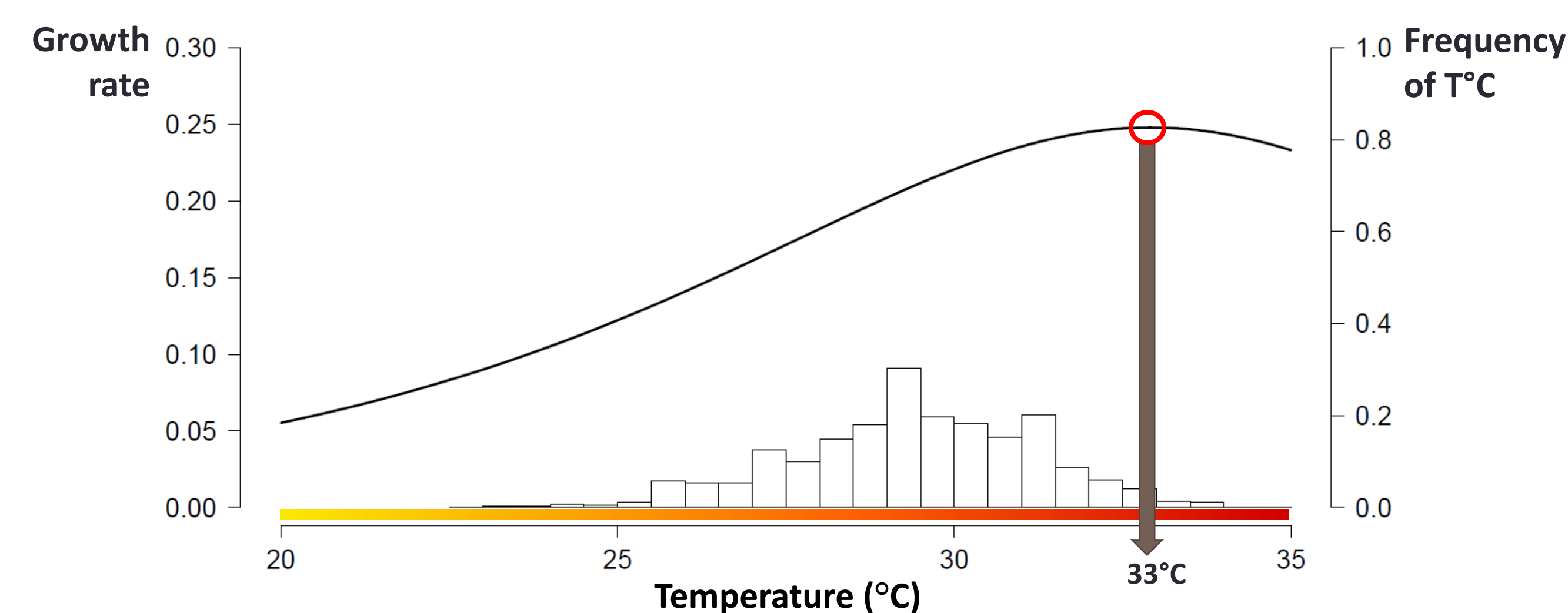
To date, no study have been able to predict primary sex-ratio at pertinent ecological time and spatial scales to assess sea turtles viability under climate change constraints.

We aim to map future distribution of suitable nesting sites of the loggerhead sea turtle accounting for temperature-dependent phenotypic plasticity of embryonic growth and sexual differentiation.

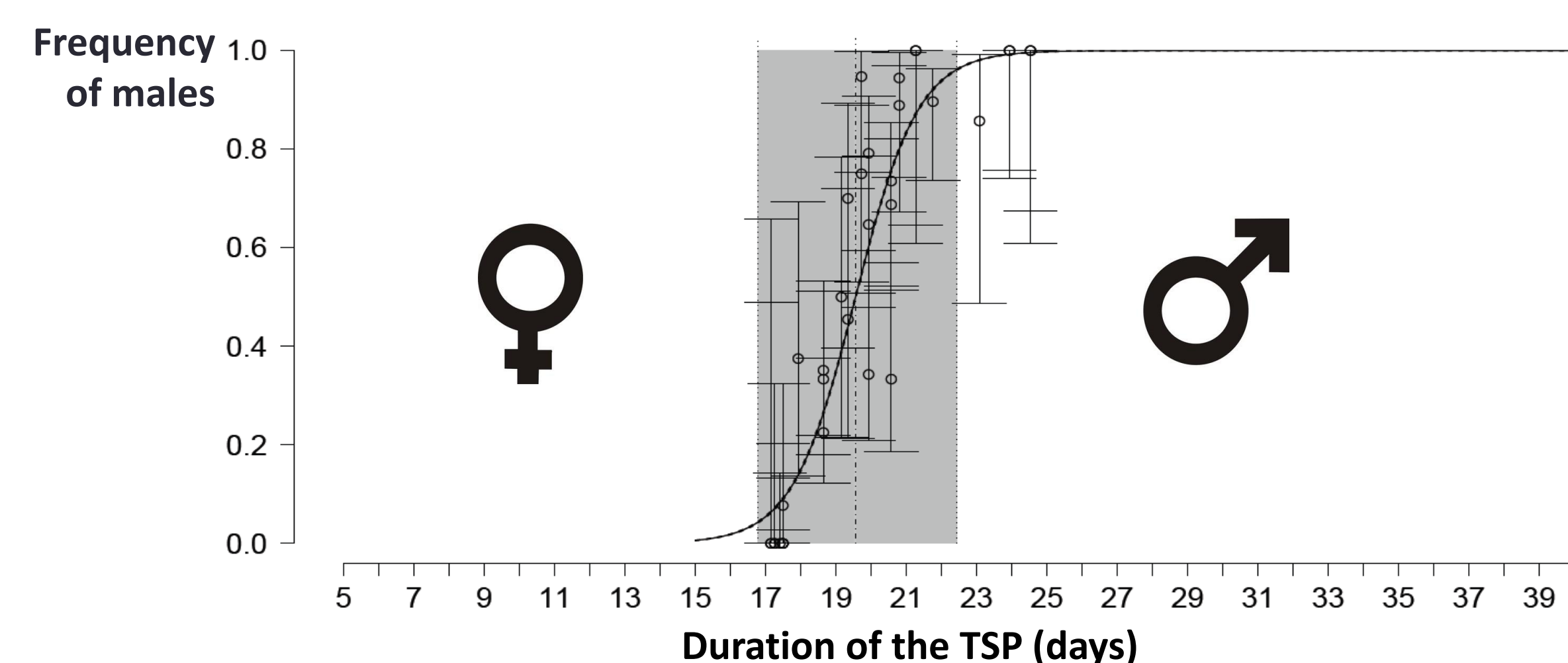
Here we provide a new methodology based on the duration of the Thermo-Sensitive Period* (TSP) to model the primary sex-ratio.

PHENOTYPIC PLASTICITY

→ **Embryonic Growth rate TRN** (Thermal Reaction Norm**)

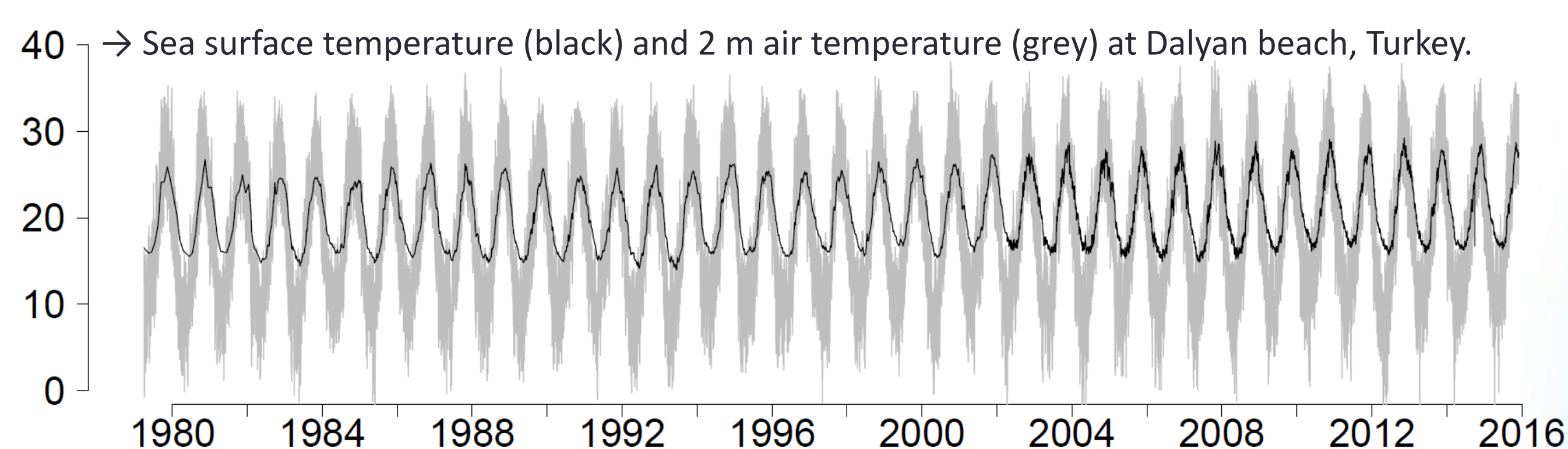


→ **Sex-ratio TRN** (Thermal Reaction Norm**)

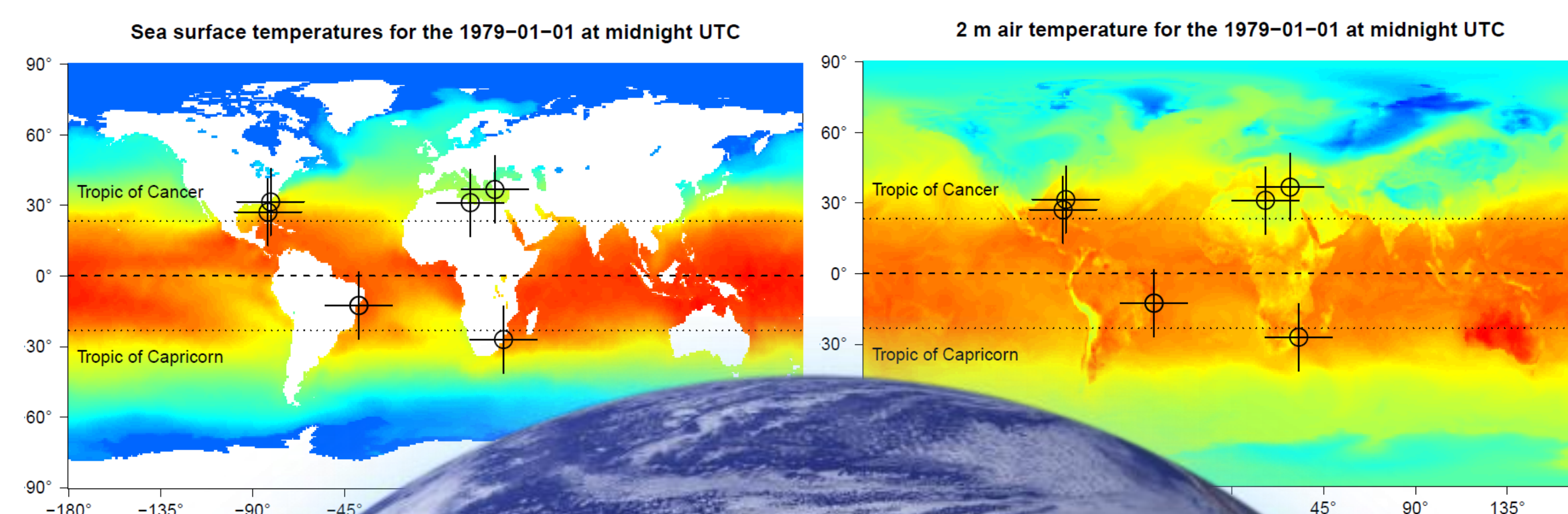
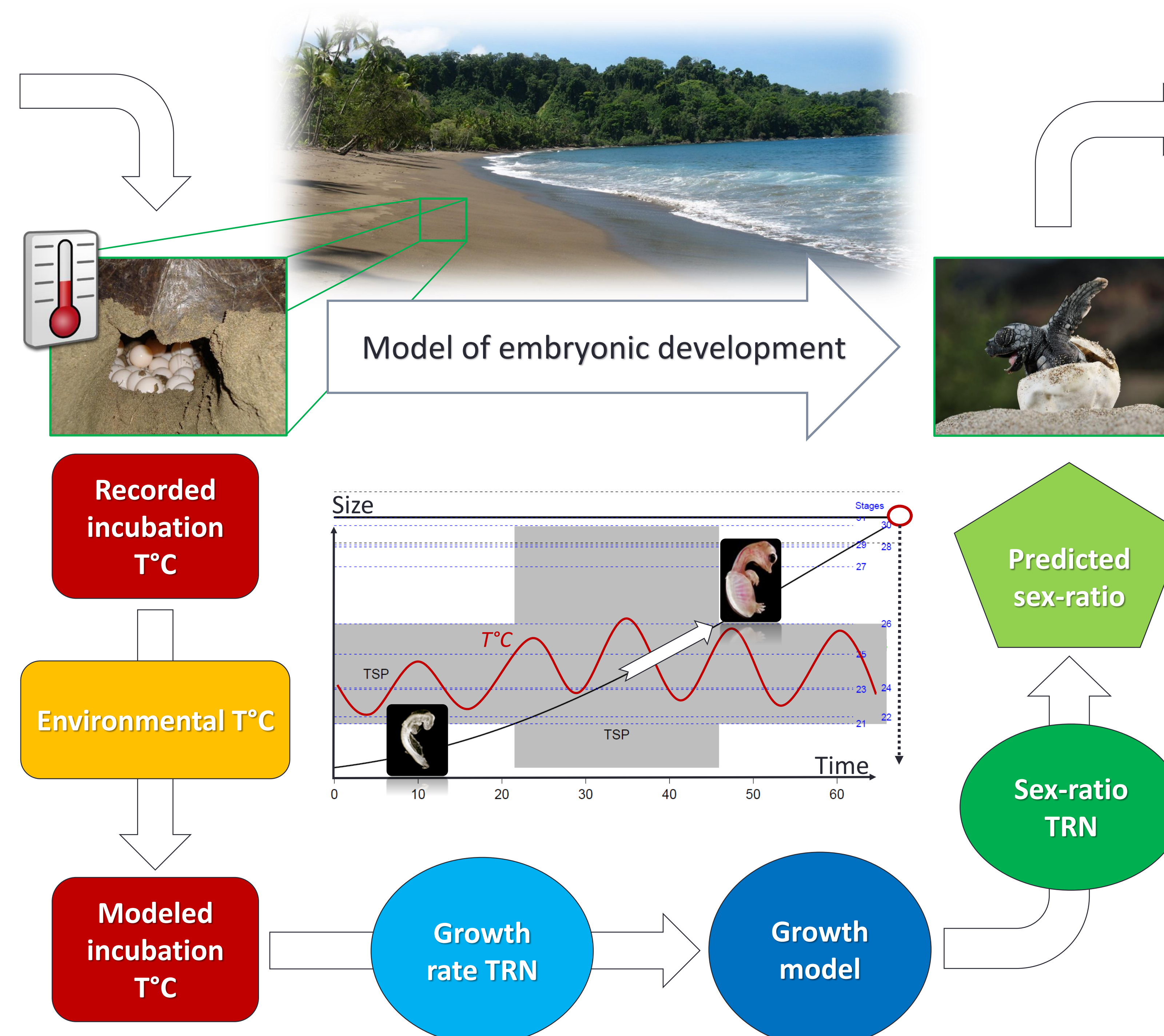


CLIMATE DATA

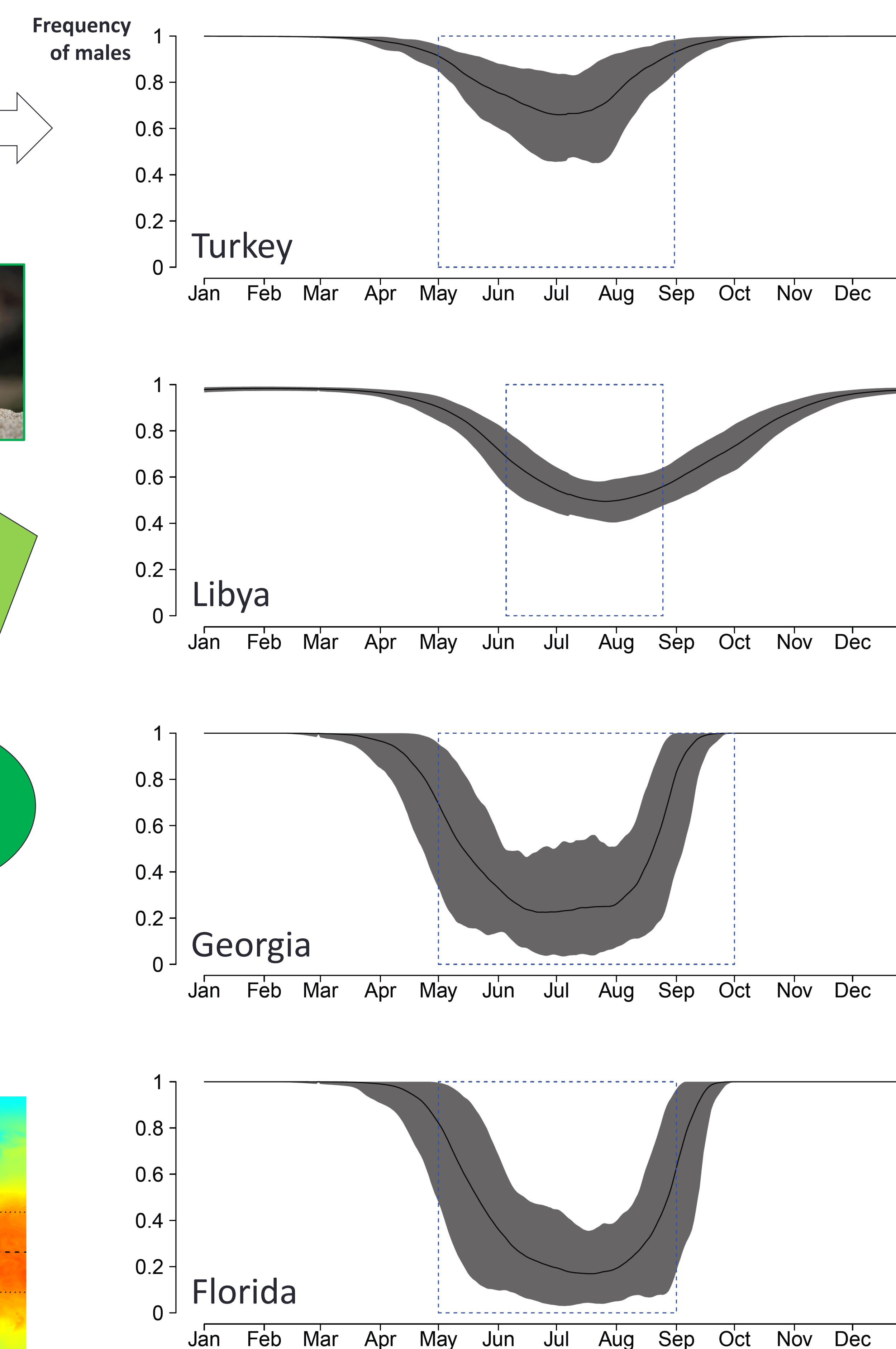
Environmental temperature has been obtained from ECMWF datasets (European Centre for Medium-range Weather Forecasts)



MODELING FRAMEWORK



SEASONAL TRENDS



Legends: — Average — Confidence Interval - - - Nesting Period

TAKE HOME MESSAGE

We found that sea turtles are used to lay their eggs during the period when both sexes can be produced in variable proportions.

Pulled together, incubation duration, sex-ratio, hatching success and reproductive phenology can mitigate, amplify or neutralize the effect of climate change.

This point might explain why sea turtles have been resilient to past climate changes and if it may happen also for future changes in climate temperature.

* The Thermo-Sensitive Period is the period of development during which sexual differentiation is sensitive to temperature.
** The Thermal Reaction Norm describes the pattern of phenotypic expression of a single genotype across a range of temperature.