

Monitoring and Mitigating the Impact of Climate Change on Sea Turtle Eggs and Hatchlings

Dr. Andrea D. Phillott

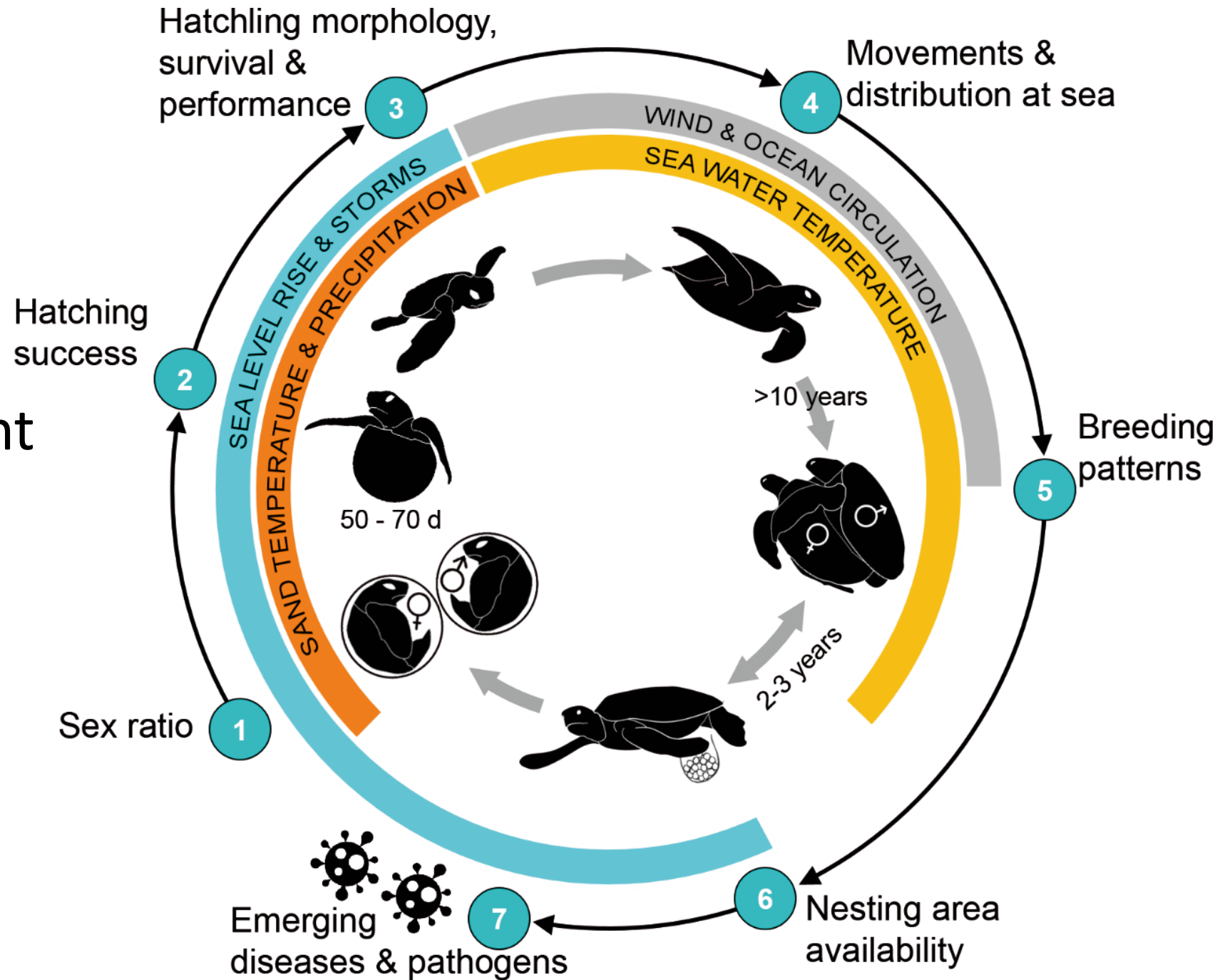
Professor Environmental Studies, FLAME University, India

Regional Vice-Chair, Middle East and South Asia, IUCN-SSC Marine Turtle Specialist
Group

Editor, Indian Ocean Turtle Newsletter

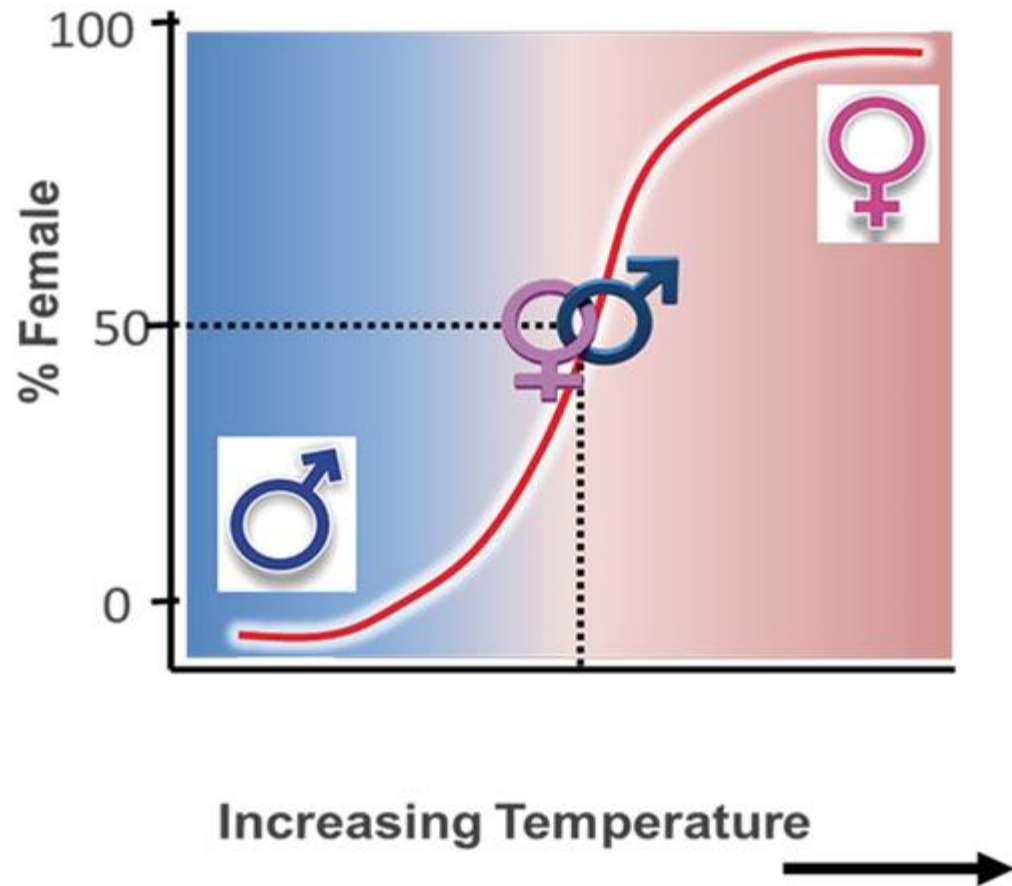
Climate change and sea turtles

- Fisheries impacts
- Coastal development
- Directed take
- Pollution and pathogens
- Climate change



Mast et al. 2005; Patricio et al. 2021

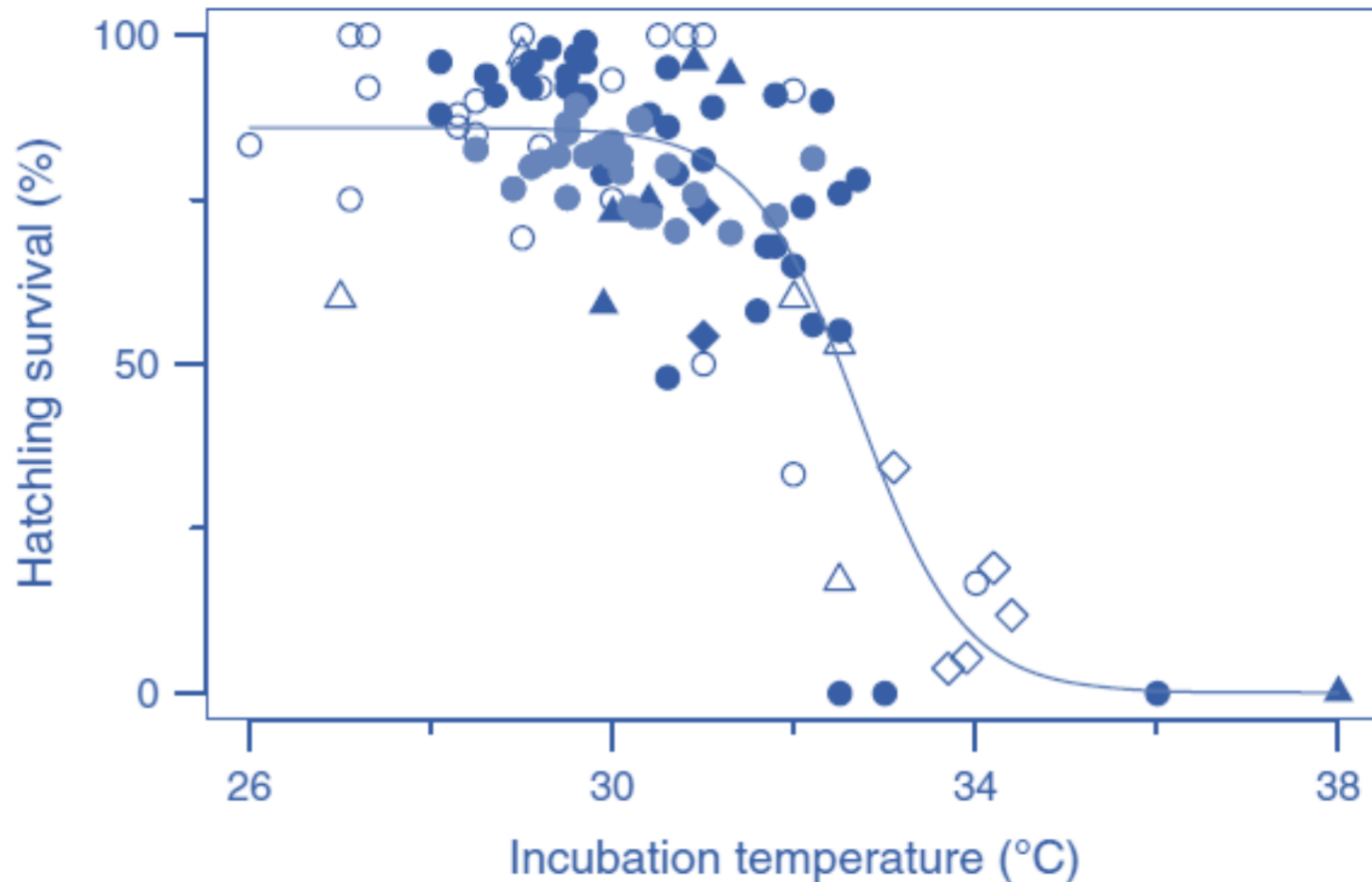
Thermal tolerance range of sea turtle embryos



Upper
Tolerance Limit
~33-35°C

Lower
Tolerance Limit
~25-27°C

Hatchling production decreases with extreme incubation temperatures



Diamond- Olive ridley

Circle- Loggerhead

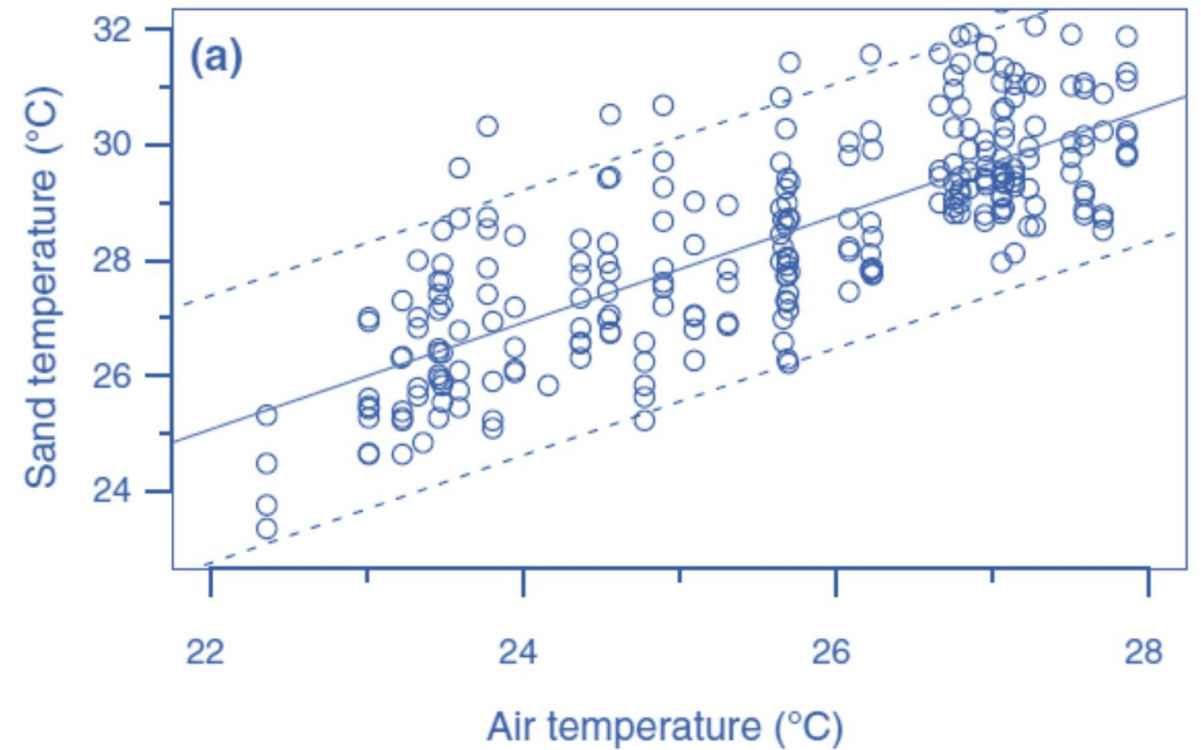
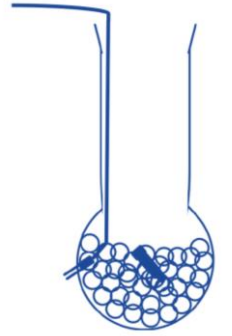
Triangle- Green

Open- Hatching success

Closed- Emergence success

Monitor before mitigation!

- Nest temperature and moisture
 - Ambient temperature can be used as a proxy if relationship with nest temperature is known
- Real time- temperature data logger in middle of eggs
- Real time- soil moisture sensor at edge of eggs



Monitor before mitigation!

Thermal stress in embryos:

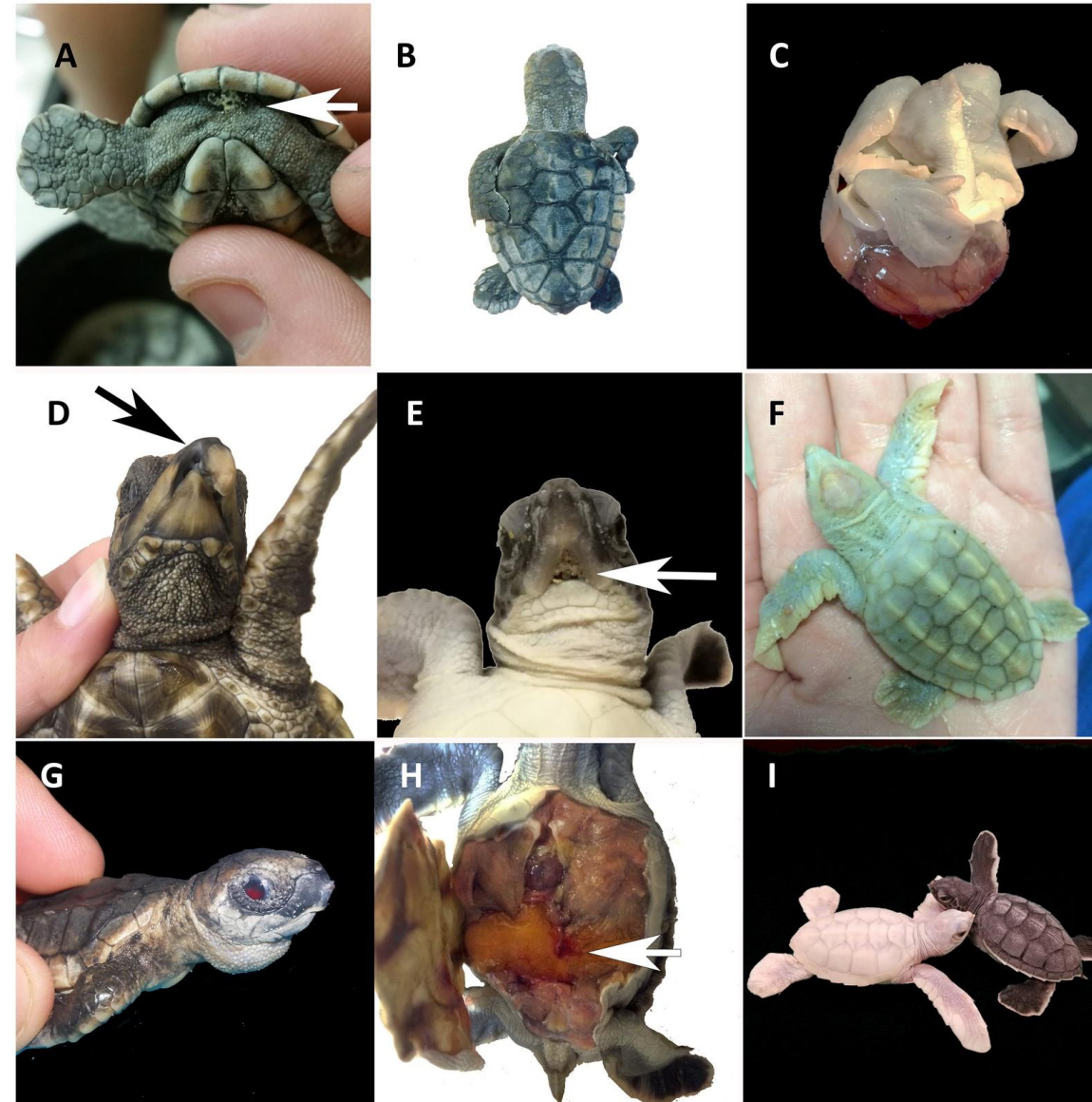
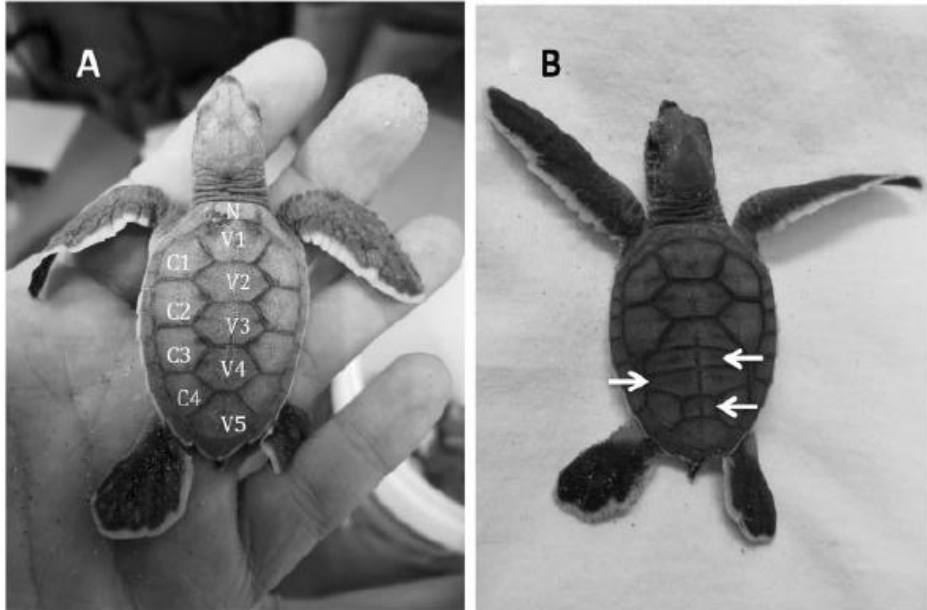
- Craniofacial defects
- Red yolks
- Red eyes (hyphema)
- Scale pattern and count abnormalities



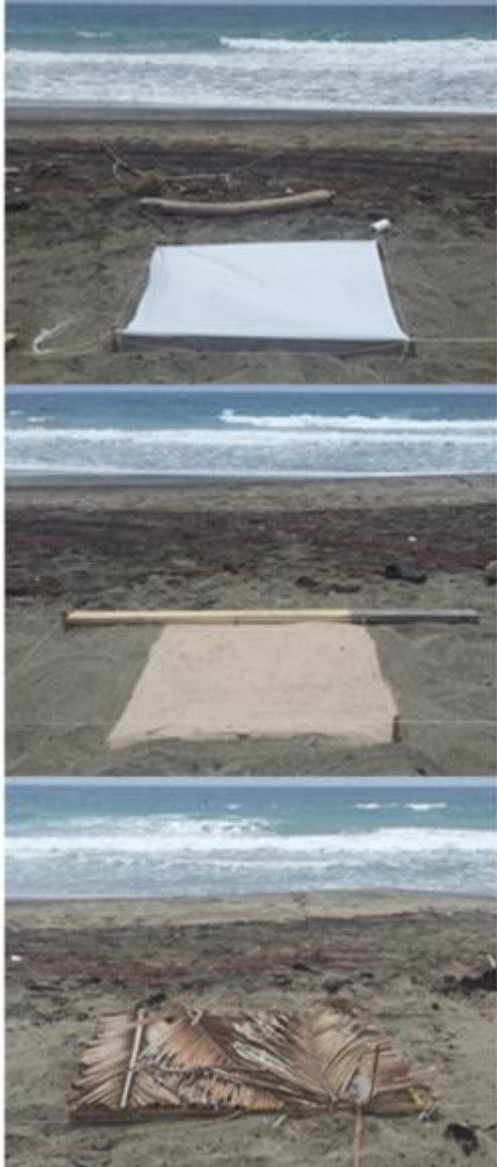
Monitor before mitigation!

Thermal stress in hatchlings:

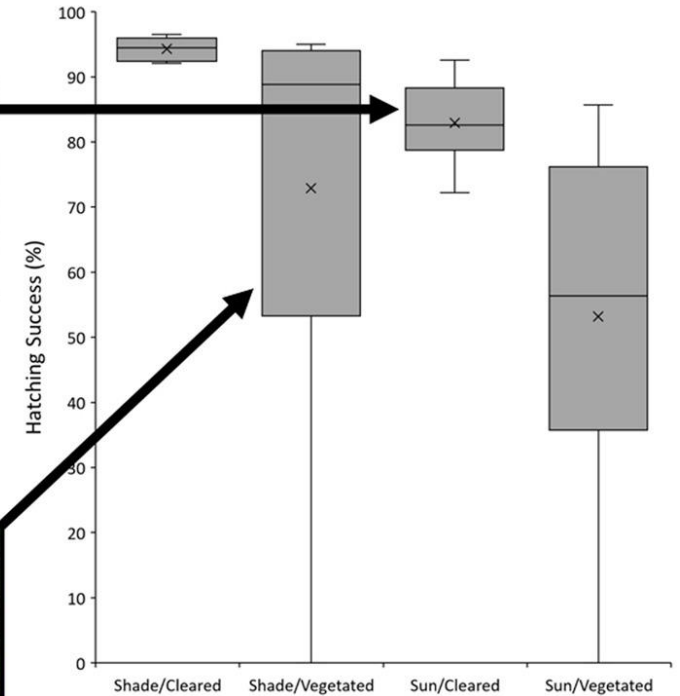
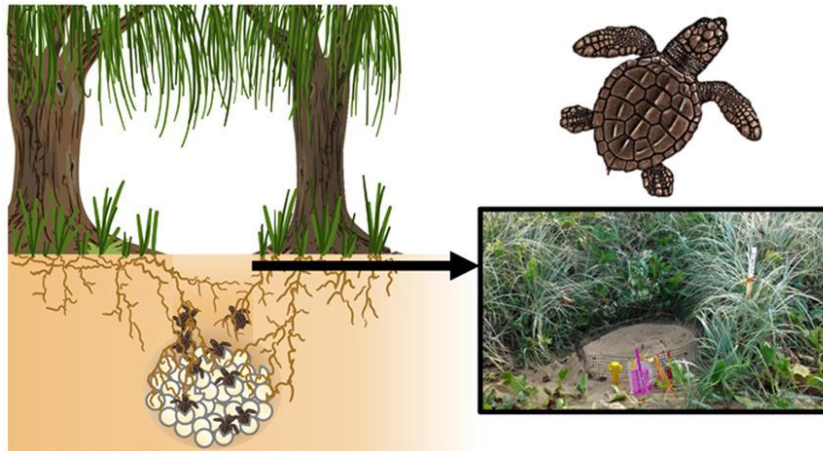
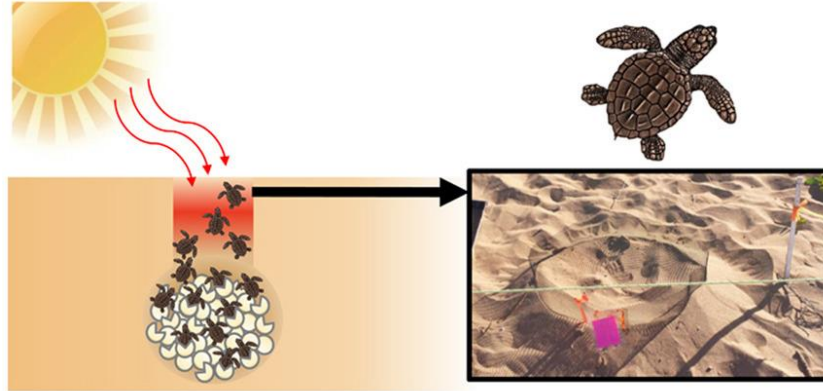
- Scale pattern and count abnormalities
- Craniofacial defects
- Flipper and body abnormalities



Mitigating high nest temperatures through shading



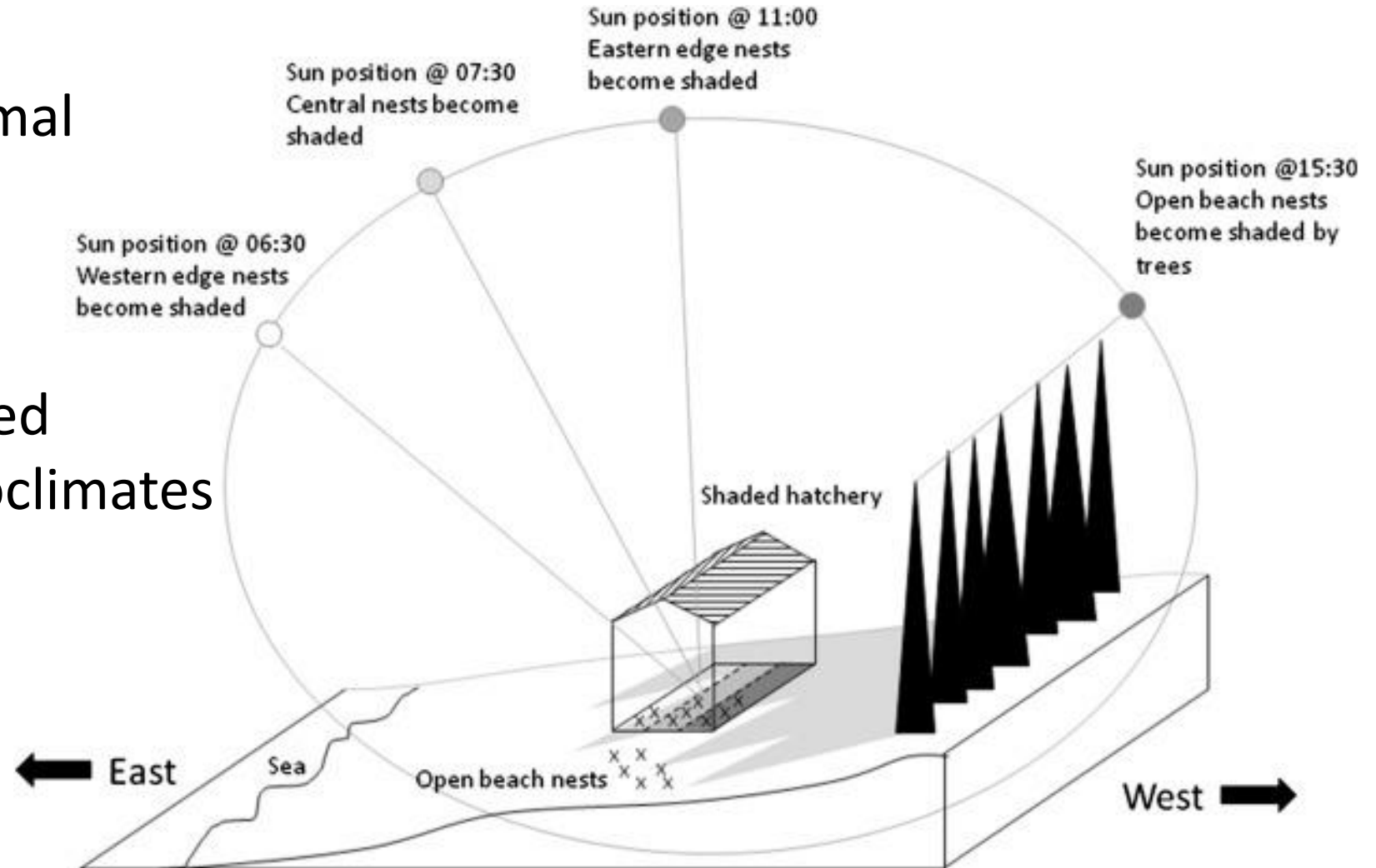
Mitigating high nest temperatures through shading



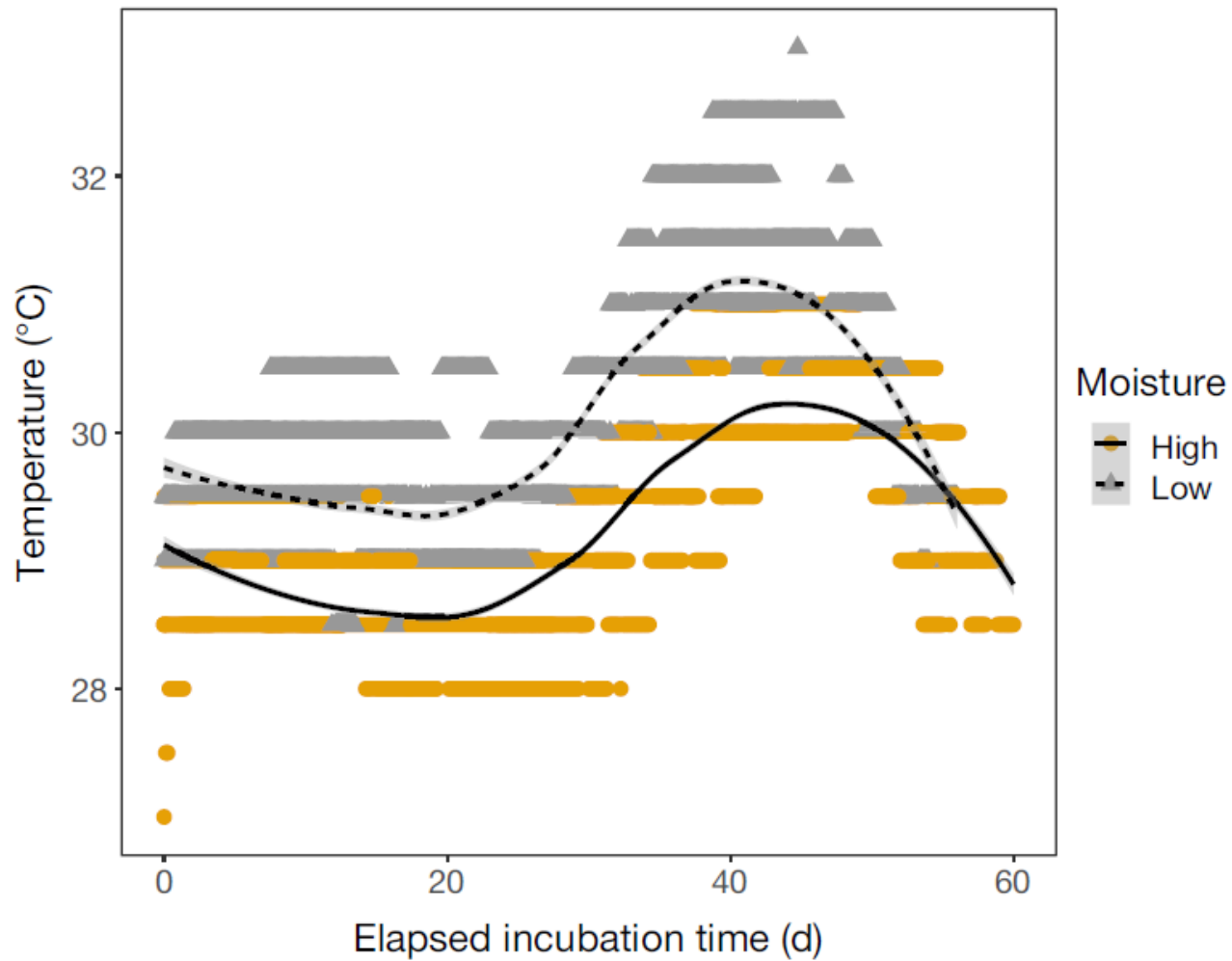
Considerations when shading

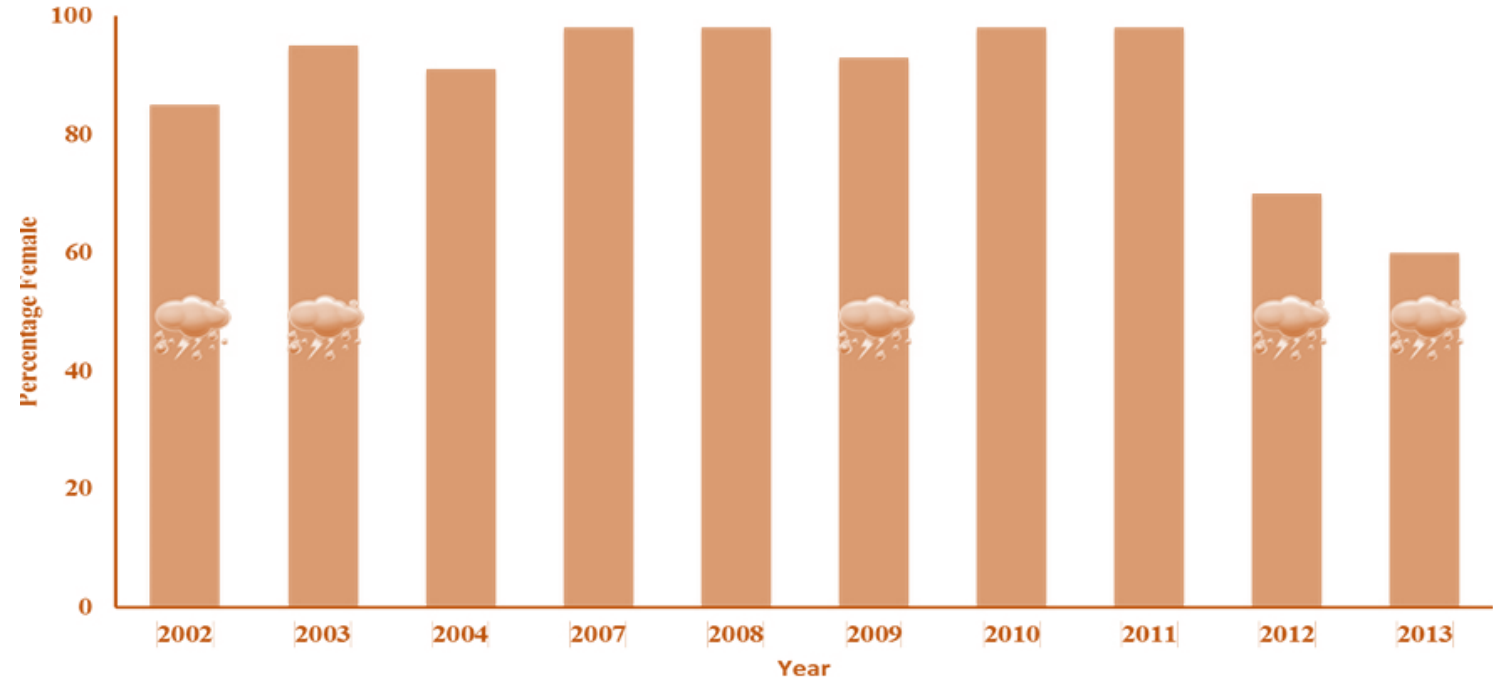
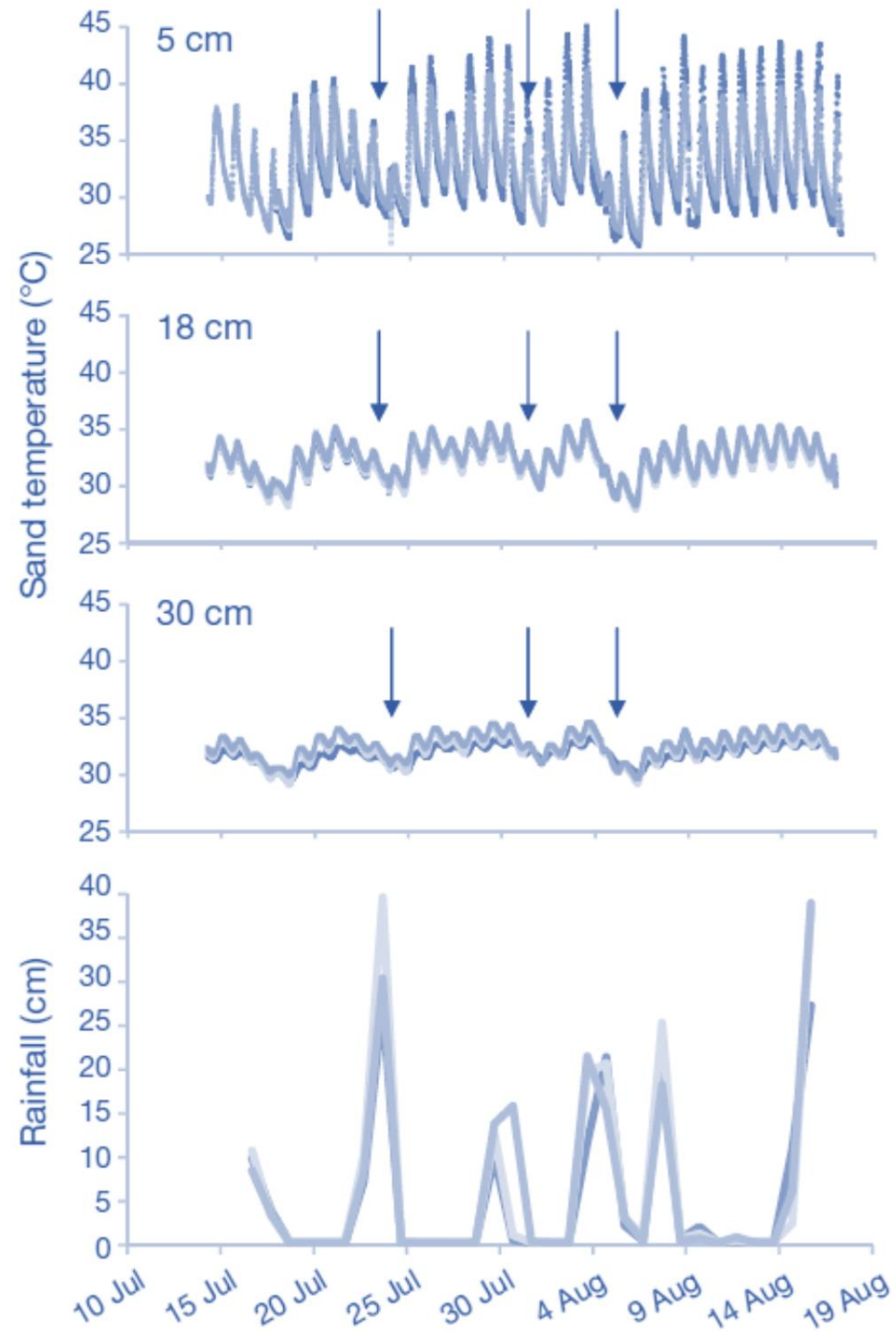
Factors to consider:

- Sand albedo and thermal properties
- Rainfall patterns
- Sun direction
- Time and period shaded
- Diversity of nest microclimates
- Hatchling sex ratio



Mitigating high nest temperatures through watering

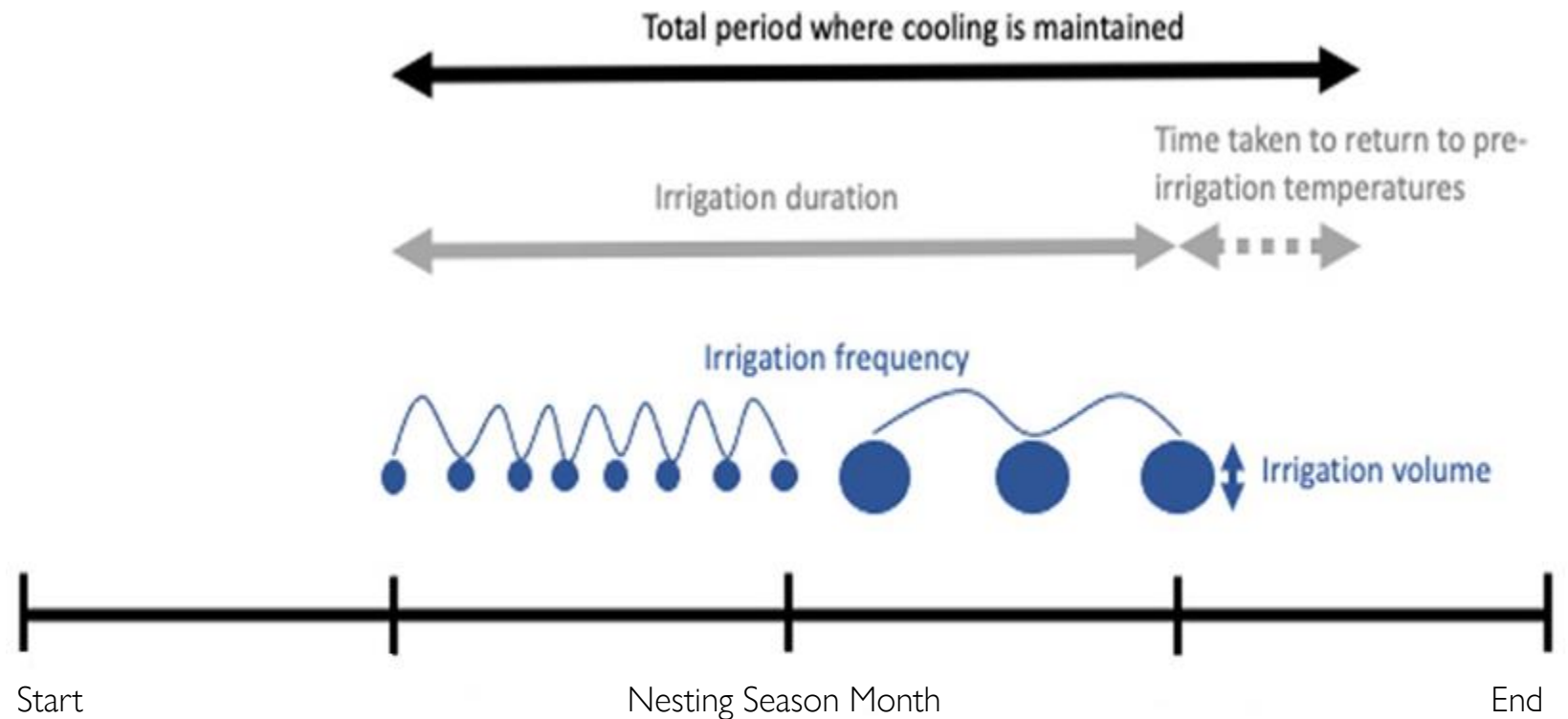




Considerations for watering nests

Factors to consider:

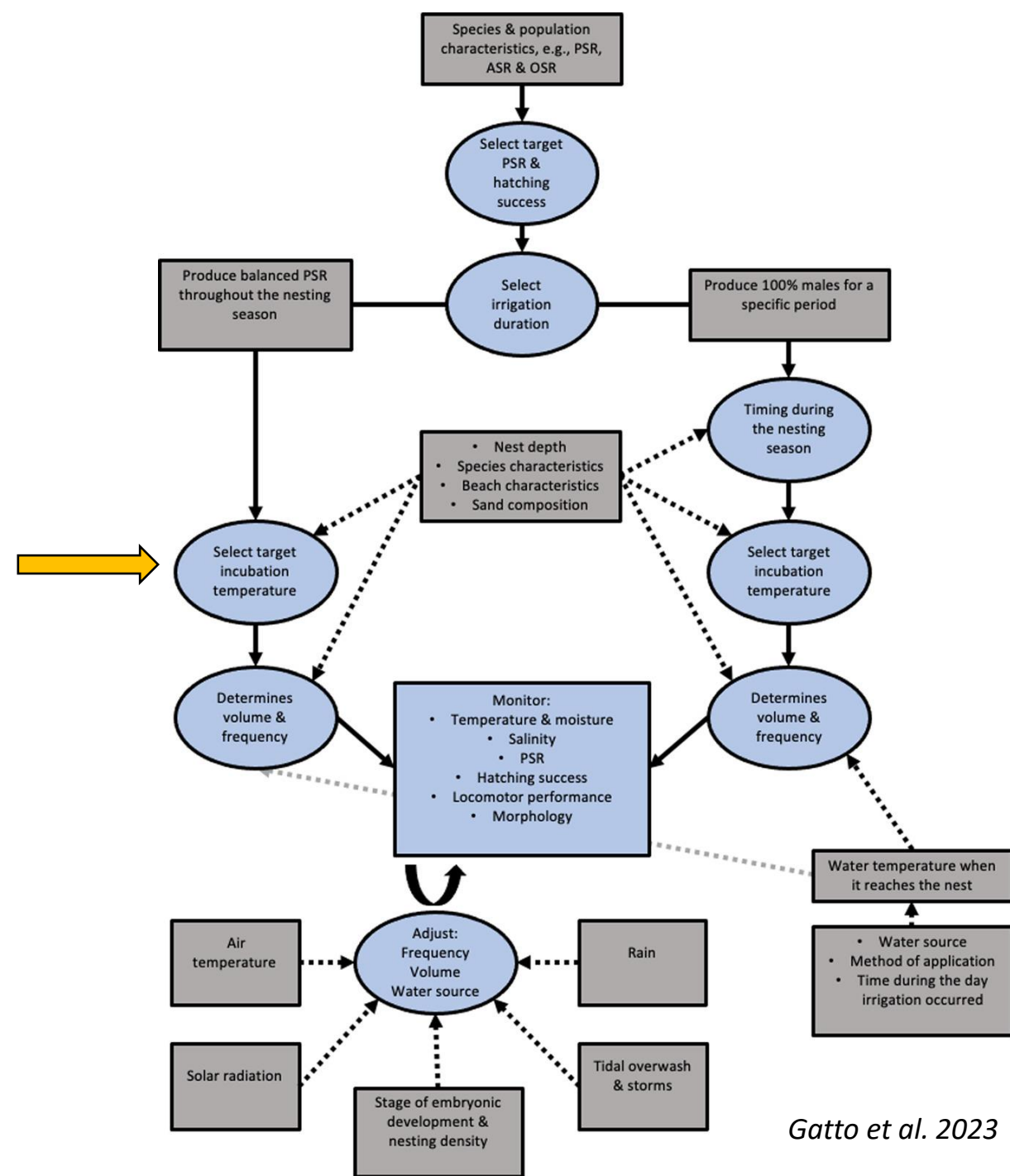
- Freshwater or sea
- Water temperature
- Water volume
- Water frequency



Have a careful decision making framework plan

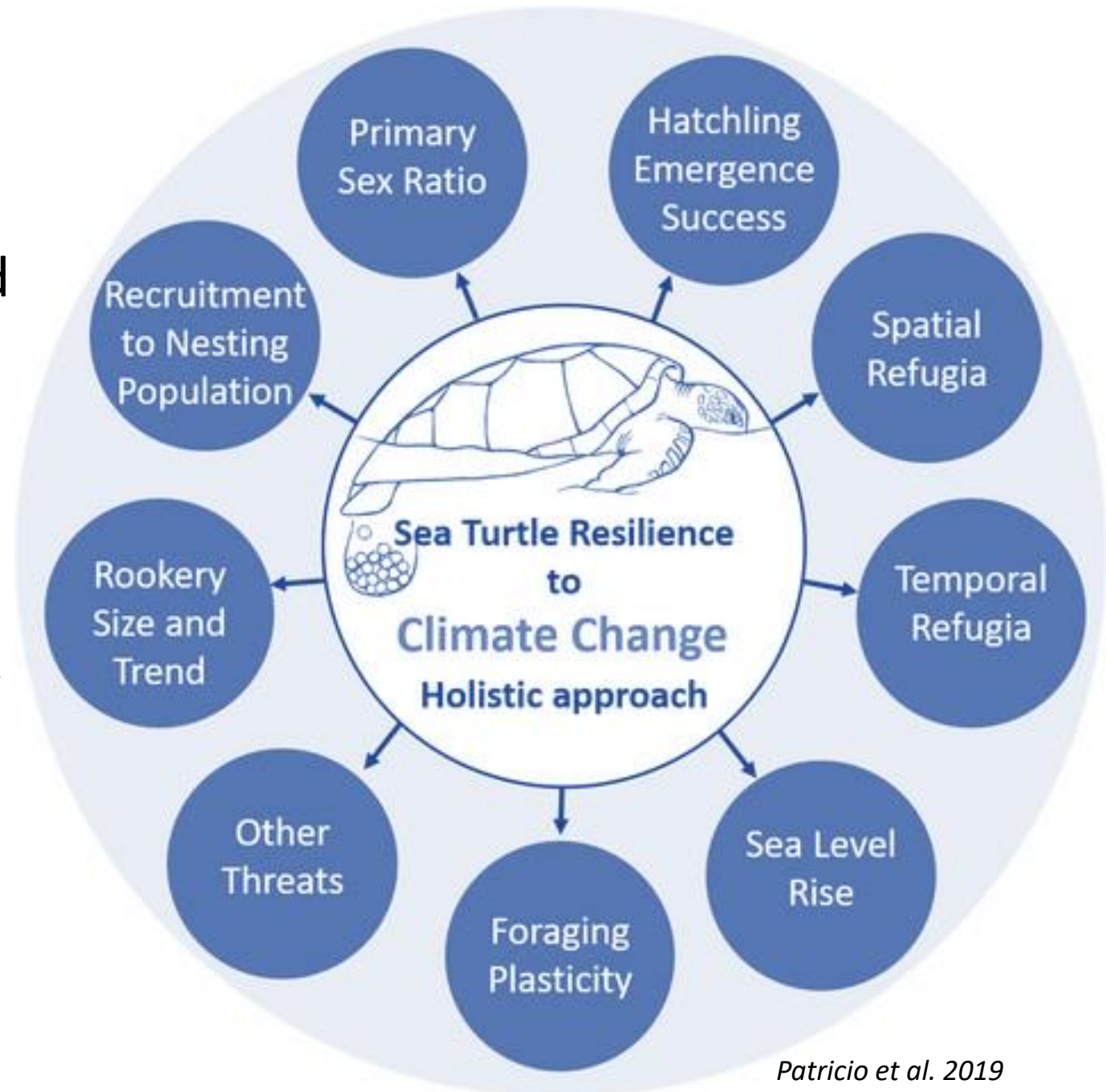
Shading and watering can impact:

- Embryo survival and hatchling production
- Hatchling sex ratio
- Incubation period
- Hatchling morphology
- Residual yolk
- Hatchling fitness



Sea turtle populations are expected to have some resilience to climate change.

Mitigate high nest temperatures when ongoing monitoring indicates it is needed, not as a precautionary measure.



References

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