

Effect of Extreme Heat on Indian Flying Foxes (*Pteropus medius*) in Pakistan

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NORMAL BEHAVIOR

Indian flying foxes feeling no heat stress and exhibiting normal behavior.

CLUSTERING BEHAVIOR

Indian flying foxes exhibiting clustering behavior, which allow moderate thermoregulation, preceded by wing fanning

BELLY SOAKING BEHAVIOR

An advanced thermoregulatory behavior observed in hot humid days

CLUSTERING BEHAVIOR

Clustering behavior is an extremely advanced thermoregulatory behavior, mostly accompanied with panting as seen in side image. During this behavior, Indian flying foxes cling together on tree trunk, on top of each other. This is the terminal thermoregulatory behavior followed by death.





Extreme Heat has resulted in death of fruit bat in Northern Pakistan

HEAT STRESS RELATED DEATH



We have recorded more than 20 heat stress related flying foxes death when temperature exceed 42C. Spread sheet showing temperature and humidity recorded by highly sensitive data loggers at the time of death. It was 43C with 19.8% relative humidity.

Jun 10 2021 1:42:00 PM	43.201 °C	20.1 %RH
Jun 10 2021 1:57:00 PM	42.902 °C	20.1 %RH
Jun 10 2021 2:12:00 PM	42.806 °C	18.9 %RH
Jun 10 2021 2:27:00 PM	43.108 °C	19.4 %RH
Jun 10 2021 2:42:00 PM	43.000 °C	19.8 %RH
Jun 10 2021 2:57:00 PM	43.097 °C	21.6 %RH
Jun 10 2021 3:12:00 PM	43.242 °C	20.3 %RH
Jun 10 2021 3:27:00 PM	43.494 °C	19.4 %RH
Jun 10 2021 3:42:00 PM	43.217 °C	19.6 %RH
Jun 10 2021 3:57:00 PM	43.399 °C	19.1 %RH

EXTREME HEAT EVENTS

by Touseef Ahmed

The objective of this research was to determine how extreme heat is impacting Indian flying foxes in Pakistan and more broadly in its entire geographic niche which include Indian subcontinent, Myanmar, and southern parts of China. During this project, we determined temperature thresholds that precipitate heat stress in *Pteropus medius* at roost level and explored how different landscape variables and weather patterns influences heat stress. We conducted this study on eight different roosting sites across Central and Northern Pakistan. With the help of seven research assistants, we monitored thermoregulatory behaviors of Indian flying foxes using video scan sampling techniques. During this project we also conduct interviews of the local population to identify historic die offs and dietary ecology of *Pteropus medius* in Pakistan.



Figure 1. Study Map showing location of roosting sites of Indian Flying Foxes in Punjab and Khyber Pakhtunkhwa (KPK) Provinces of Pakistan

We are eager to generate habitat suitability models for other *Pteropus medius* roosting sites by using these studied variables. We also want to develop an online Heat Stress forecaster for *Pteropus medius*, to save this bat species from climate change induced extreme heat events in future, in its geographic niche.



Team Photo: Animal Health Sciences Institute, NARC, Pakistan

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Page 2