



# ARSET

Applied Remote Sensing Training

<http://arset.gsfc.nasa.gov>

 @NASAARSET

---

## Animal Movement

---

National Aeronautics and  
Space Administration



**CONSERVATION**  
INTERNATIONAL



# Animal Movement

- Spatial and temporal animal movement patterns are a central focus of animal ecology
- Four fundamental questions:
  - Why move?
  - How to move?
  - When and where to move?
  - What are the ecological and evolutionary consequences of movement?
- Example: Serengeti wildebeest migration

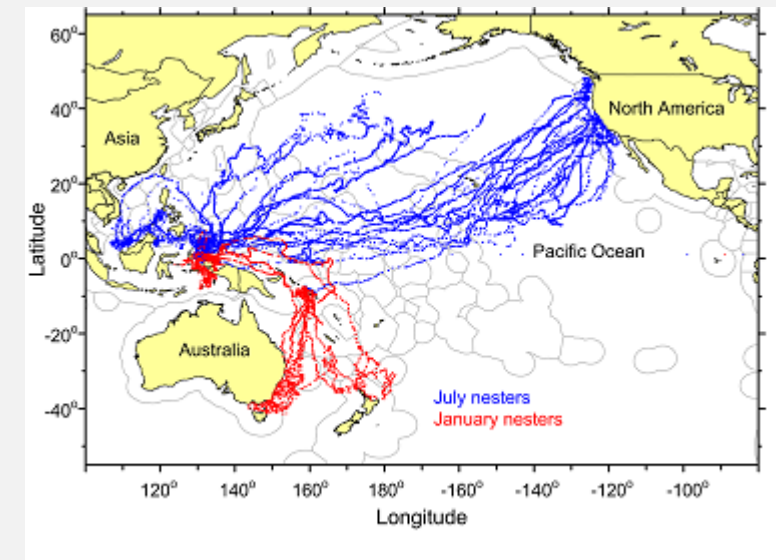


\*Image Credits: (top) Elizabeth Gordon, (bottom) tanzaniaonfoot.com

# Animal Movement

## Technologies

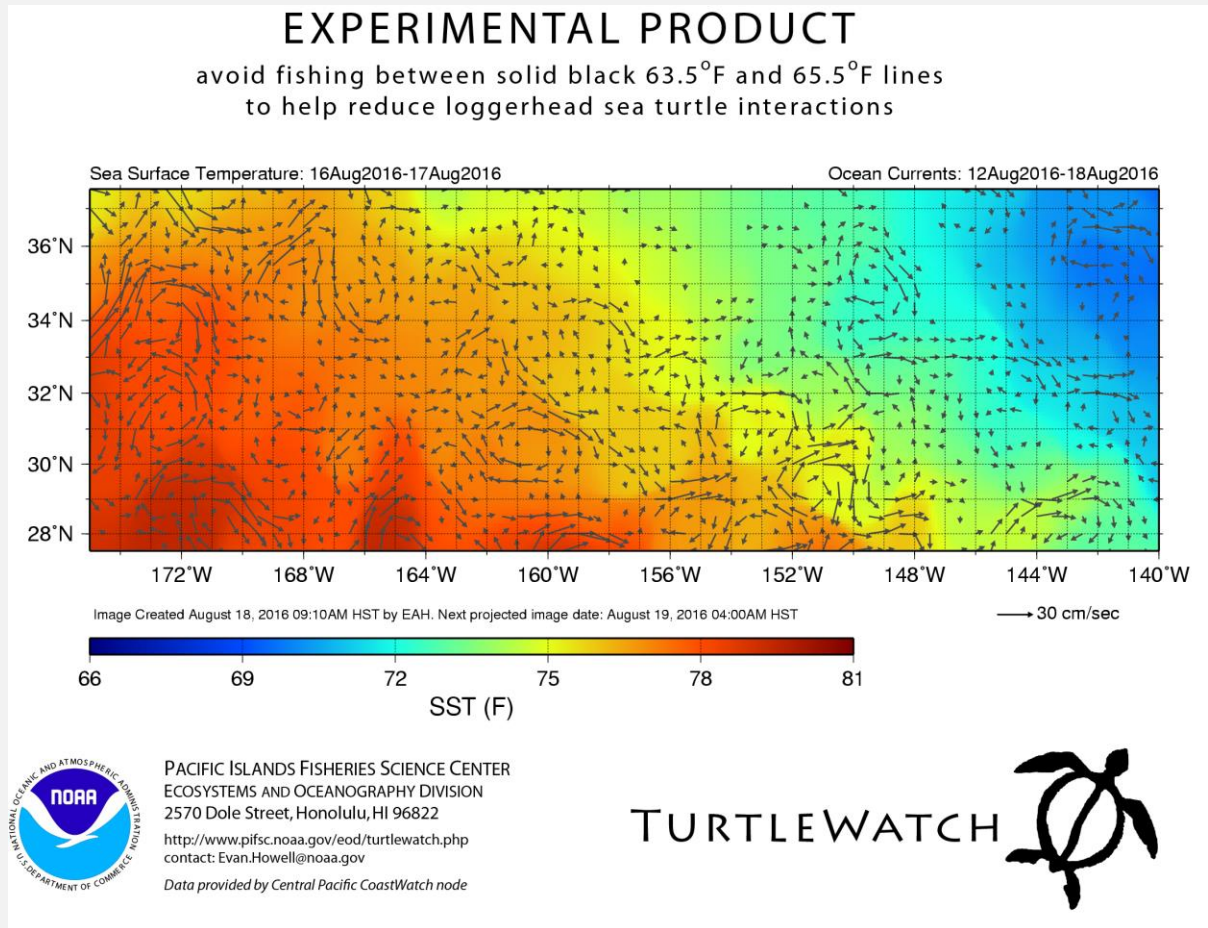
- Non-electronic tags (e.g. metal bands)
  - Requires capture and re-capture
- Satellite telemetry
  - Does not require re-capture
  - Sometimes have to follow animal, but not always
  - Gives a complete, continuous picture of migration patterns
- Example: Leatherback turtles



\*Image Credits: (top) George Shillinger, Stanford University; (bottom) NOAA Fisheries

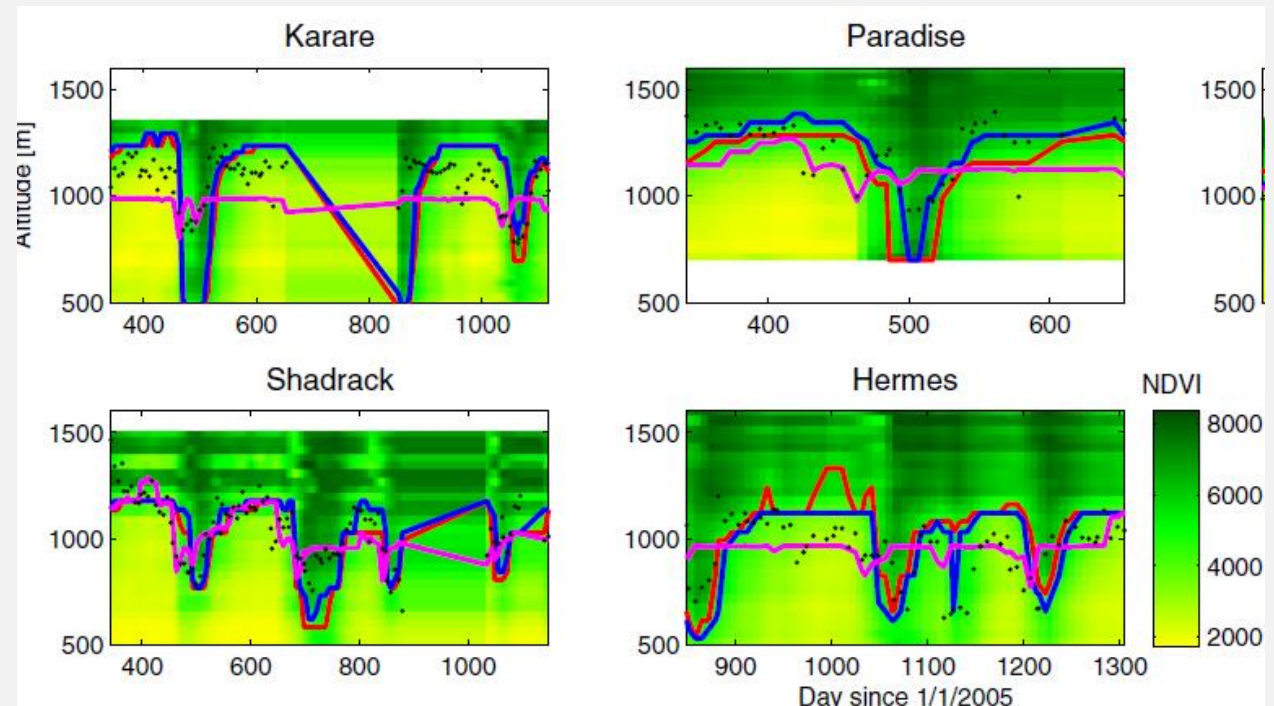
# Remote Sensing and Animal Movement

- Animals interact with their environment at multiple spatiotemporal scales
- Remote sensing data can capture characteristics about the environment at different scales
- Animal location data combined with remote sensing data can help determine why and where animals move
- Example: Loggerhead turtles in Hawaii



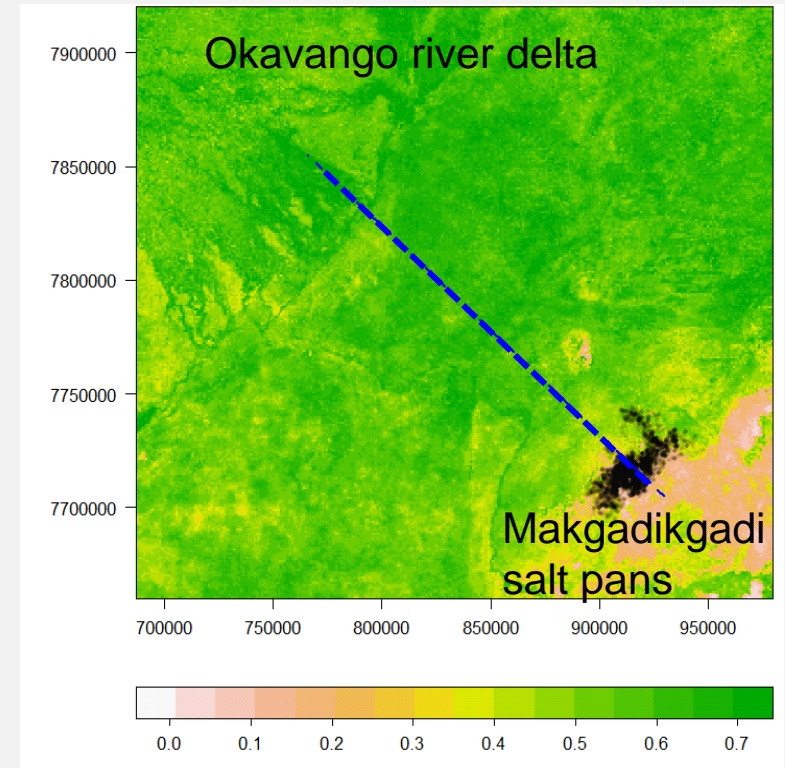
# Example: Elephants and Vegetation Phenology

Bohrer et al. (2014) found that the elevational migration of individual elephants closely matched the patterns of greening and senescing of vegetation in their home range



# Examples: Zebras Moving to Greener Pastures

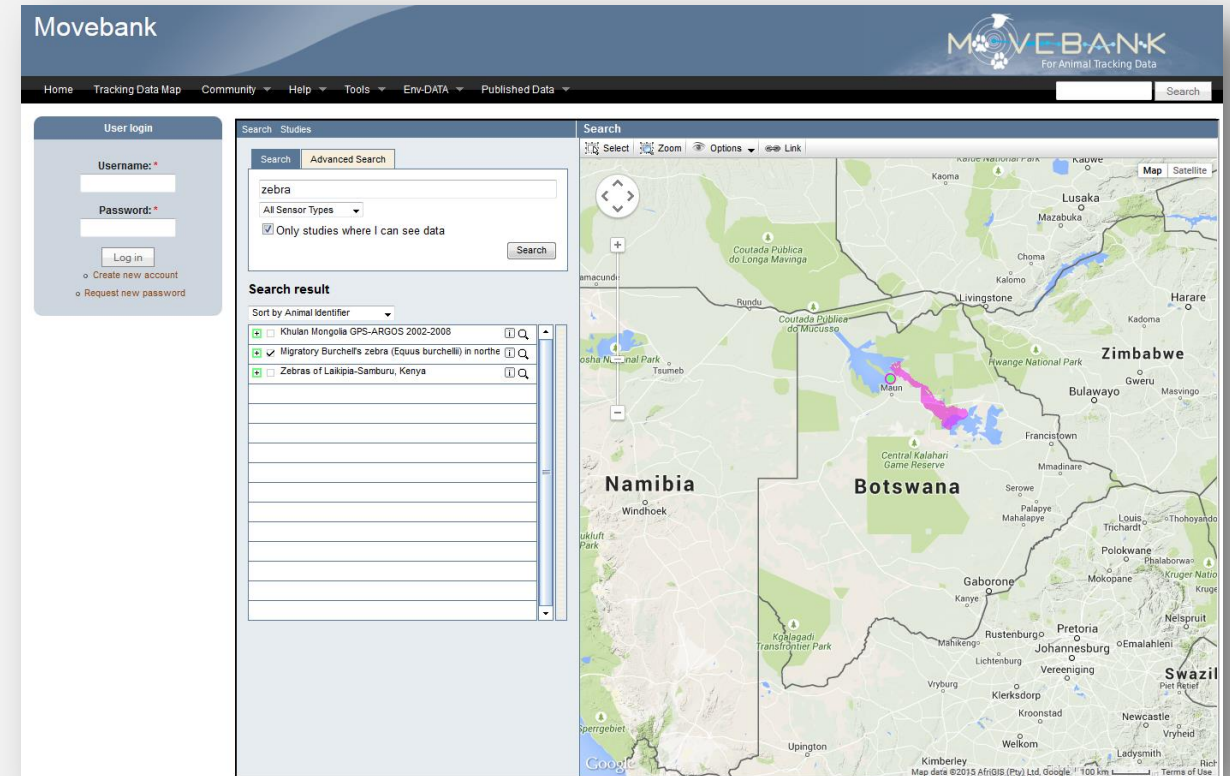
- Bartlam-Brooks et al. (2014) looked at the relationship between environmental conditions and the zebra migration from the Okavango Delta to the salt pans.
- Using NDVI, as the grasses greened, the zebras migrated by following that green-up.



# Movebank

<http://www.movebank.org>

- Movebank is a free, online database of animal tracking data hosted by the Max Planck Institute of Ornithology.
- It helps animal tracking researchers to manage, share, protect, analyze and archive their data.
- Image on right shows the web interface. This example shows the migratory path of Burchell's zebra in northern Botswana



# Movebank

## The Env-DATA System

- Streamlines the co-registration of animal tracking with a diverse range of environmental variables
- Allows scientists to examine relationships between animal movement and atmospheric, aquatic and/or terrestrial environmental conditions
- For tutorials: <http://youtube.com/movebank>
- Example: This image shows 8-day ocean net primary productivity annotated from tracks of Galapagos albatrosses

