

# Locust Surveillance Using Geospatial Technology

No. 2020/13

Period: 01-15 Sept.



nrsc

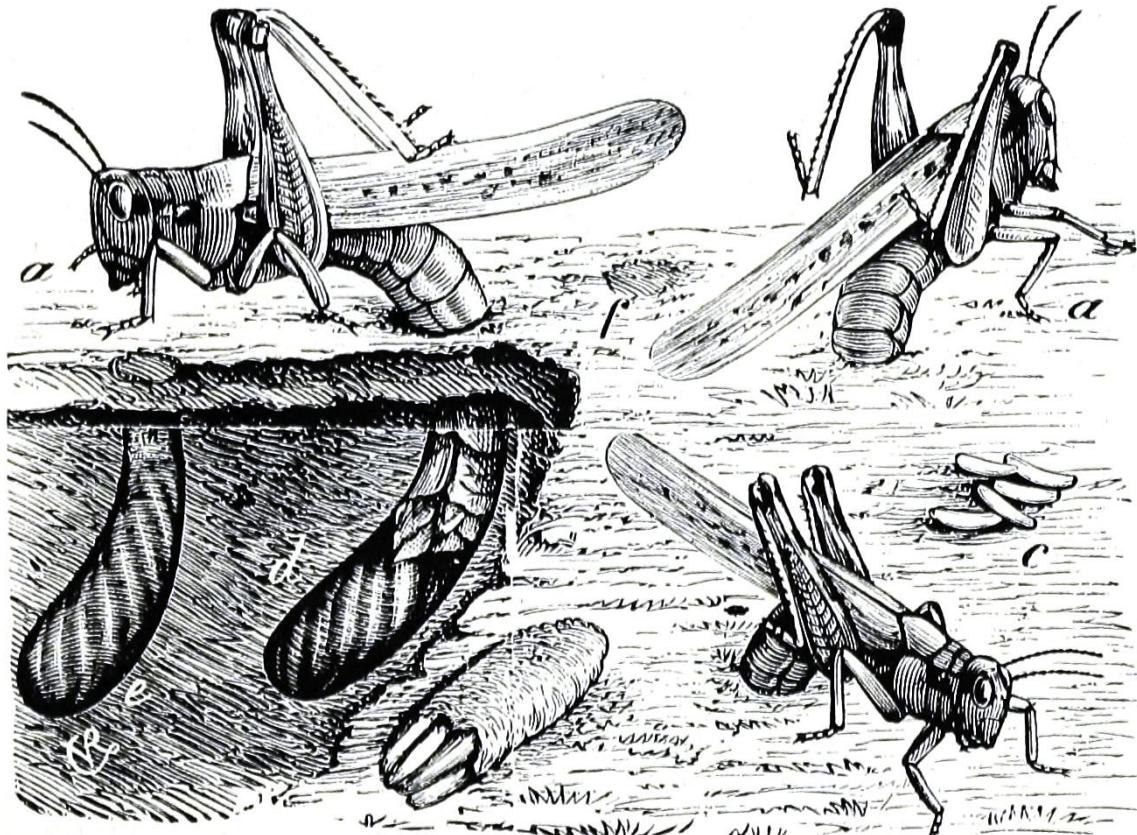


Image courtesy C.V. Riley (1891), USDA.

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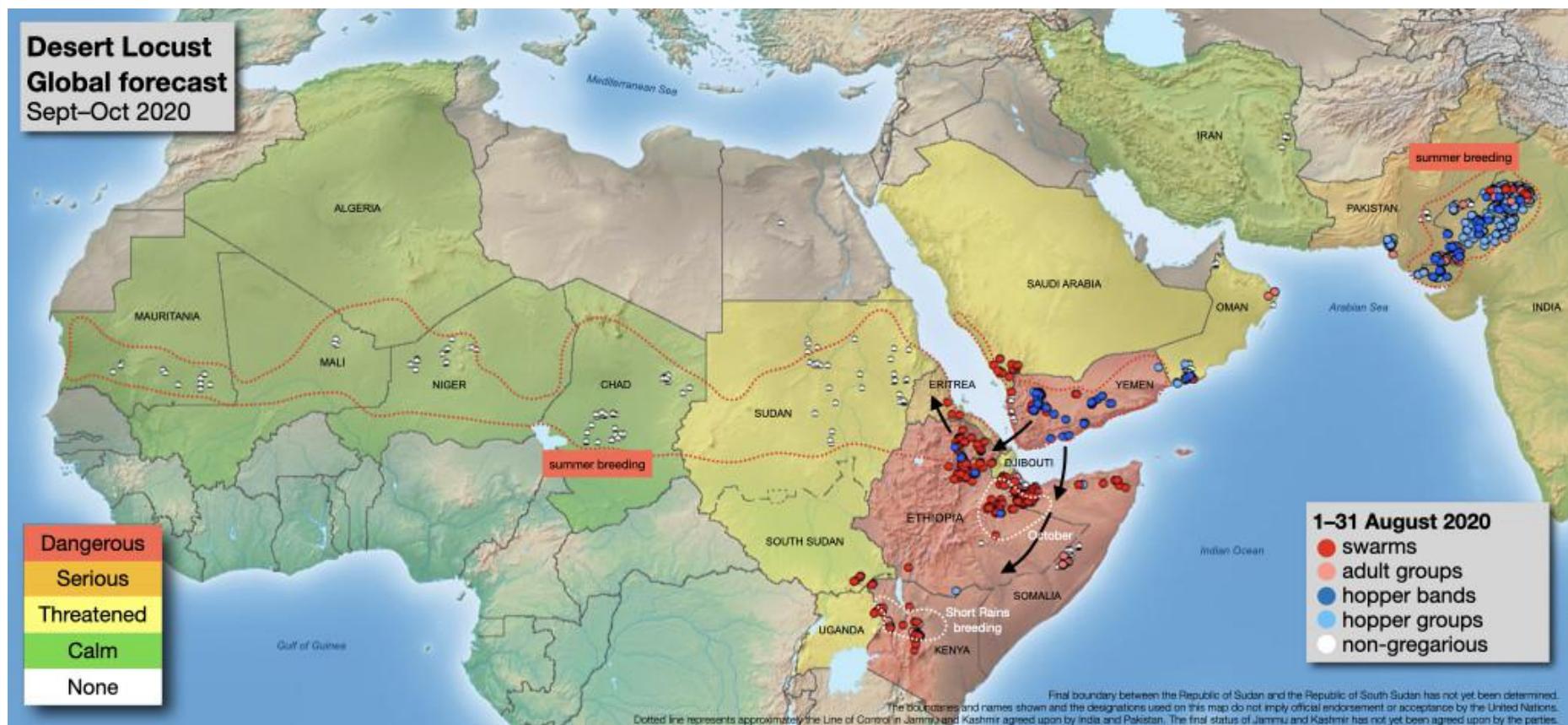
# Locust Update

## — Status —

Intensive survey and control operations against summer-bred hopper groups and bands in Rajasthan, India and Indo-Pak border reduced Locust infestations.

## — Forecast —

Hoppers will fledge and form adult groups and small swarms along the Indo-Pak border that will mature and lay eggs, causing a second but smaller generation of hopper bands in October



# Locust Update

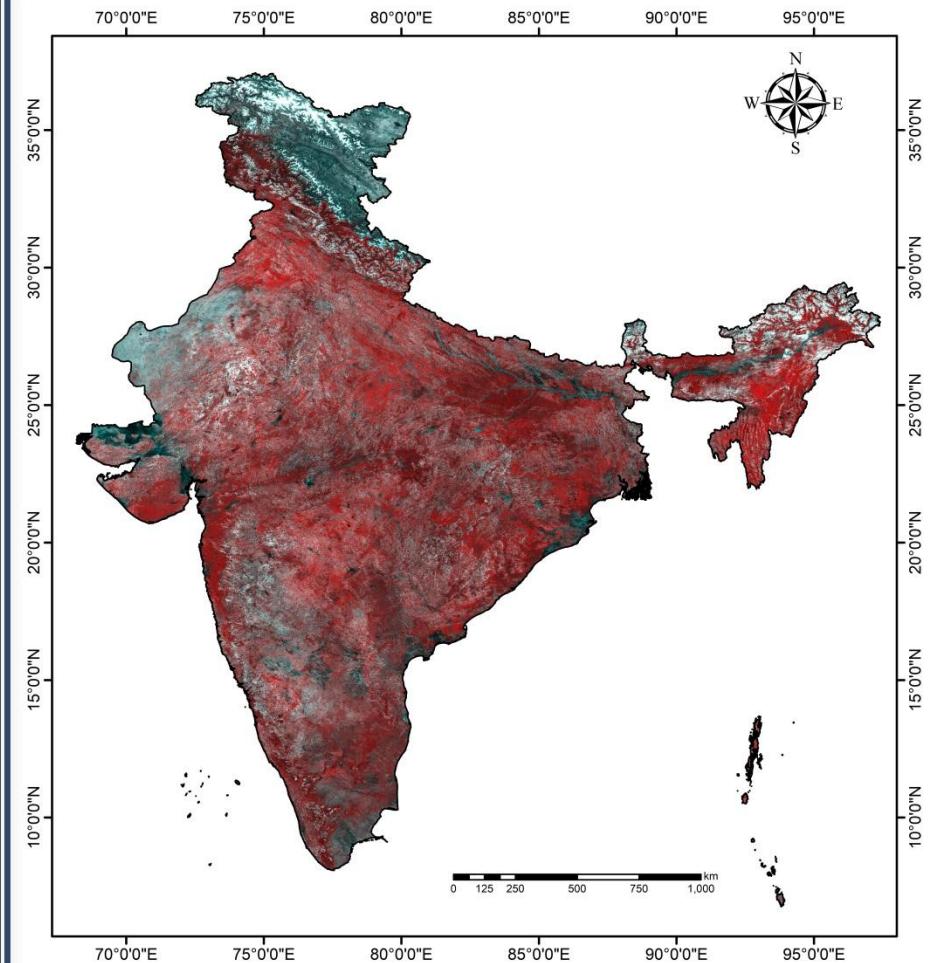
## Status

During the 2nd fortnight of August 2020, I-V instar hopper bands and group were reported in various districts of Rajasthan and Gujarat. Out of 1253 nos. of spots where survey was conducted, control operation were undertaken at 109 spots covering 7415 hectare area. Intensive survey is underway.

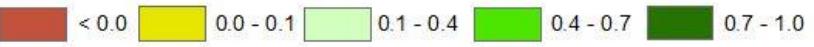
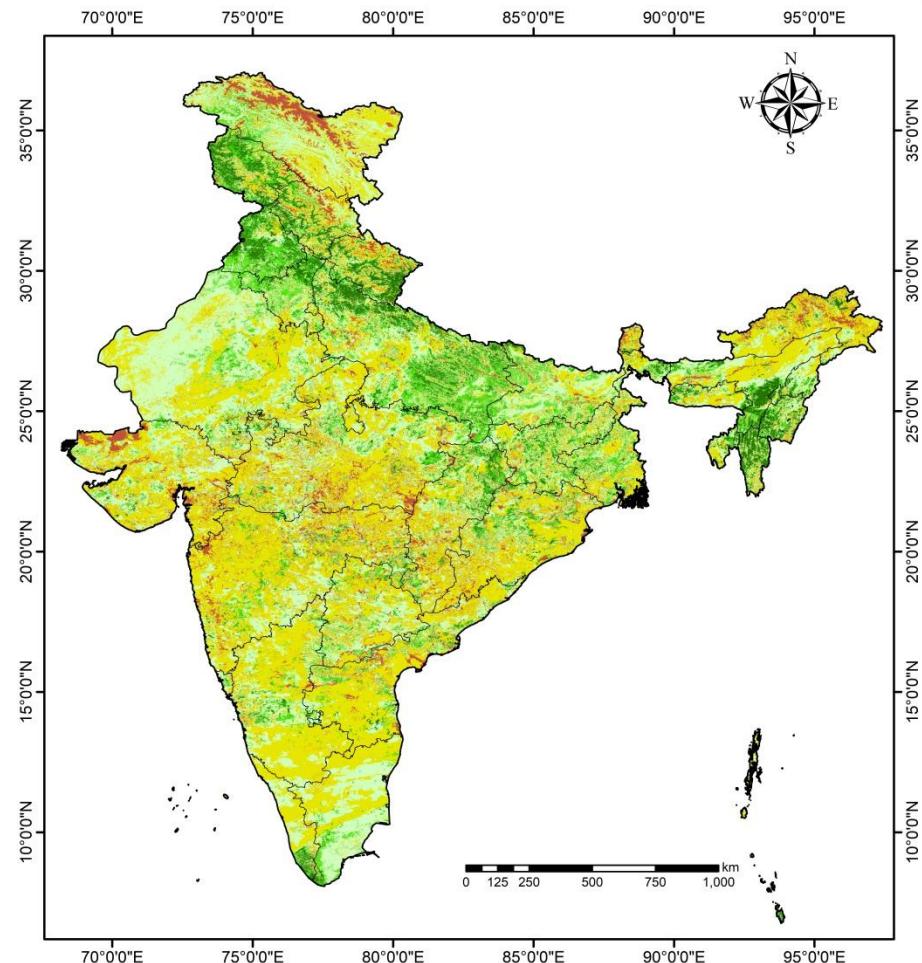
(Desert Locust situation Bulletin. 2020/16, Min. of Agri. & Farmer's Welfare, Govt. of India)



## False Color Composite (FCC)

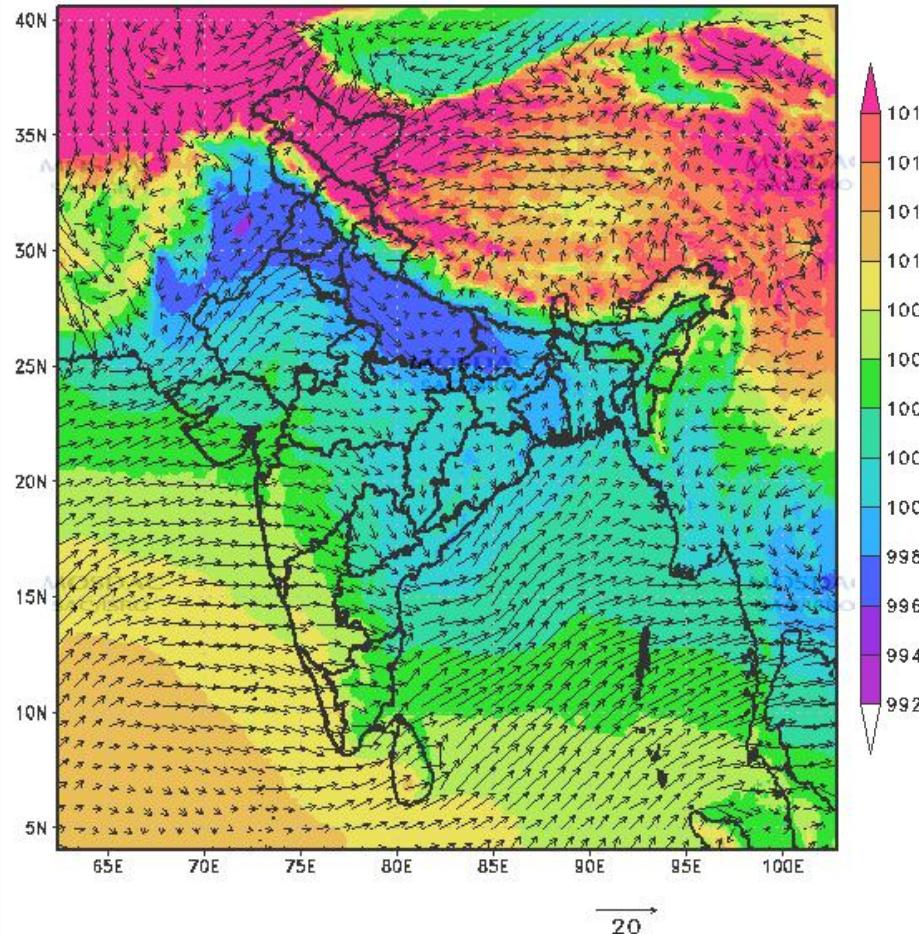


## Normalized Difference Vegetation Index (NDVI)

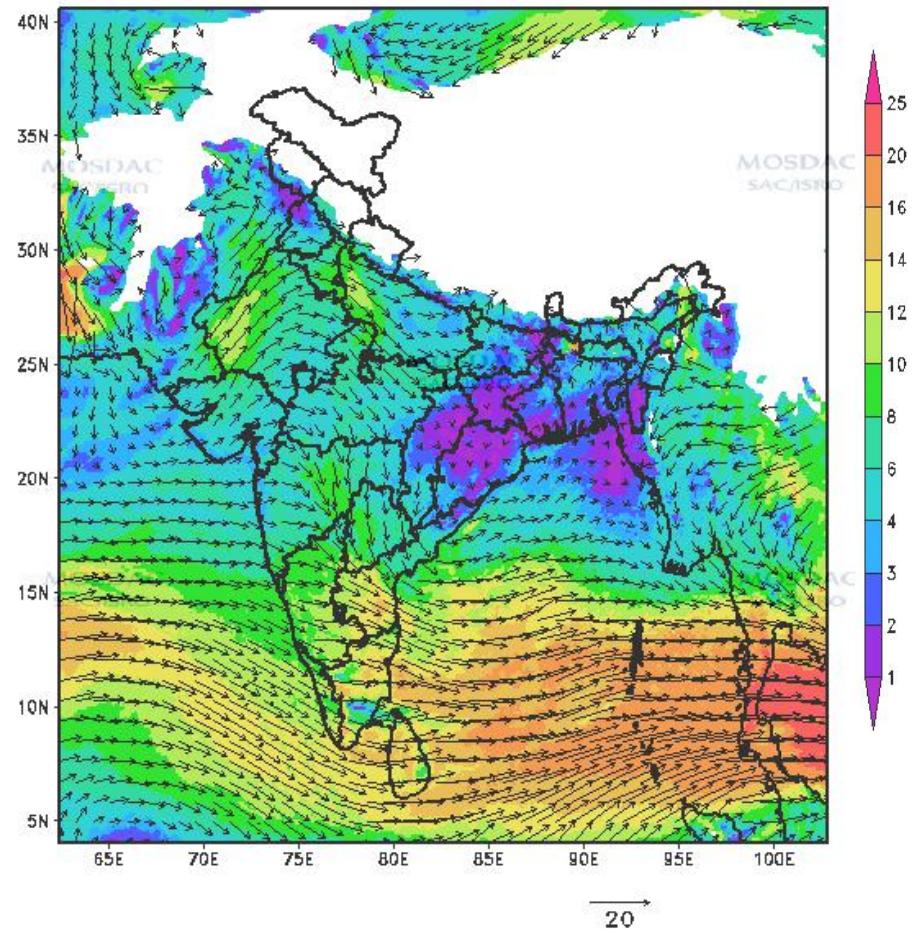


# Wind Vectors

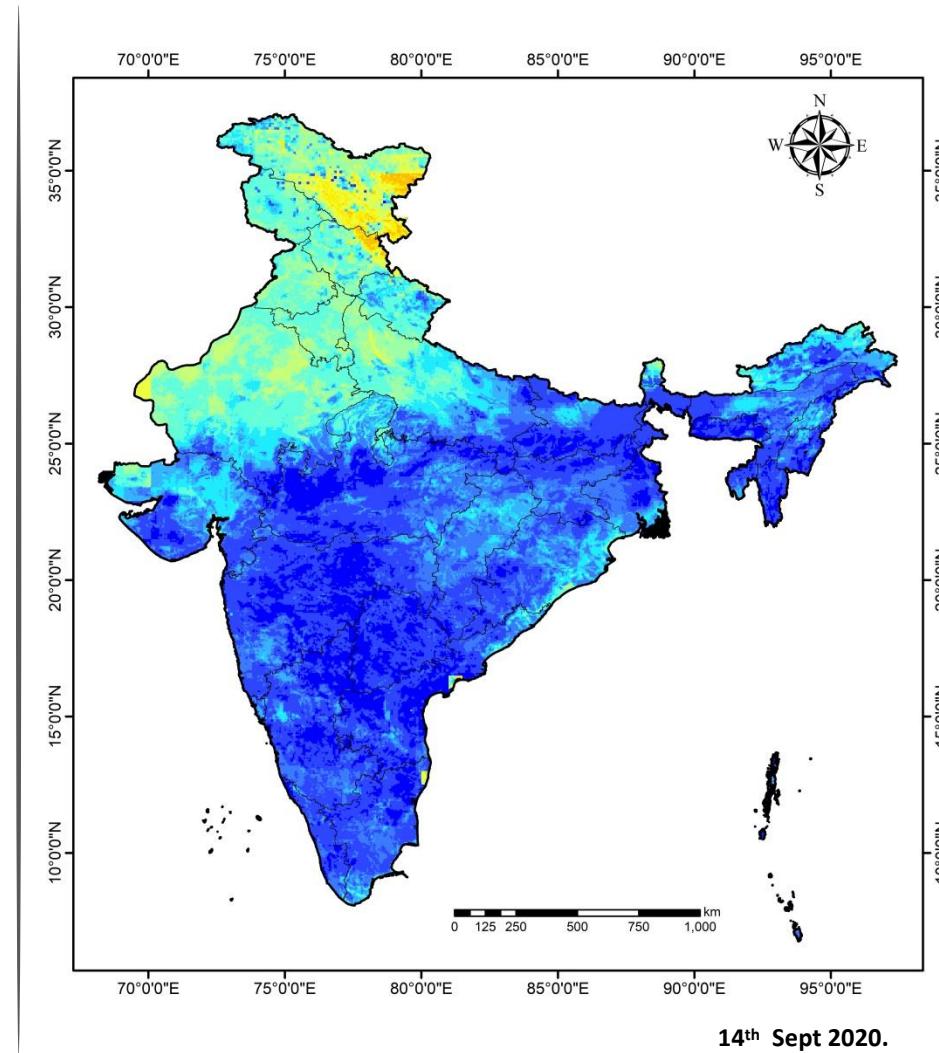
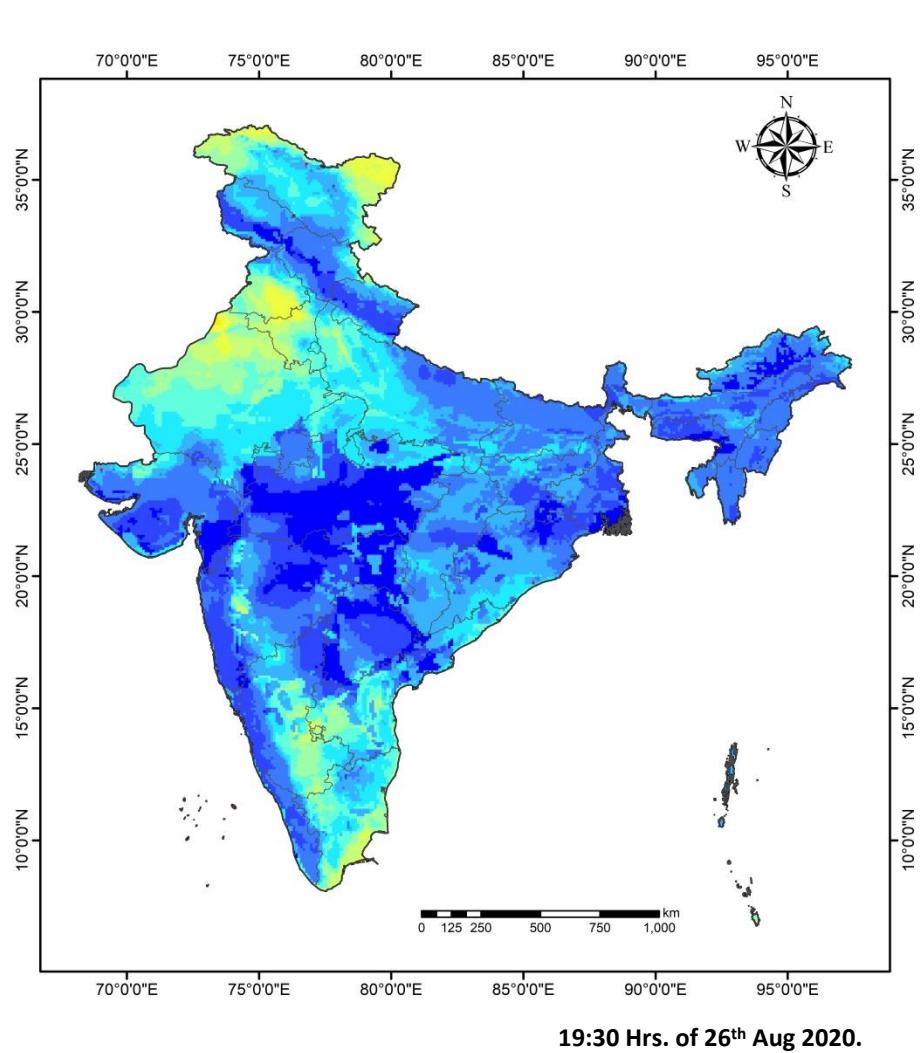
54hr Forecast valid for 1130 IST 18SEP2020  
MSLP & 10m height Wind



54hr Forecast valid for 1130 IST 18SEP2020  
850 hPa Wind



# Surface Soil Moisture Map (%)



Source: SMAP Enhanced L4 Global 3 Hourly 9 km Product

Source: Bhuvan NICES - (VIC – 3L Hydrological Model based Soil Moisture)

# Characterising Locust Habitat Environment Using Space Inputs

Stage of Life Cycle	Favourable Environmental Conditions	Remote Sensing Data
Egg (10 – 65 days)	<ul style="list-style-type: none"> <li>Bare sandy soil</li> <li>Previous rainfall &gt; 25 mm/month for 2 months</li> <li>Root-zone soil moisture should be moist (5-12 cm below the surface)</li> <li>Air temperature range : 20°C–35°C</li> <li>Soil temperature range : 15°C–35°C</li> </ul>	<ul style="list-style-type: none"> <li>Soil type data</li> <li>Previous two months accumulated rainfall</li> <li>Soil Moisture data</li> <li>Root-zone soil moisture</li> <li>Air temperature data</li> <li>Land surface temperature data</li> </ul>
Hopper (24-95 days)	<ul style="list-style-type: none"> <li>Occasional rain</li> <li>Air temperature range: 24°C–32°C</li> <li>Early morning an later afternoon hoppers bask on plant tops or the ground and during midday they take shelter inside plants</li> <li>Bands march or warm, sunny days and restricted movement during overcast days</li> <li>Band movement is usually downwind</li> </ul>	<ul style="list-style-type: none"> <li>Rainfall data</li> <li>Air temperature data</li> <li>Vegetation status</li> <li>Land surface temperature data and cloud data</li> <li>Wind direction maps</li> </ul>
Adult (2.5- 5 months)	<ul style="list-style-type: none"> <li>Adults mature on an average 2 to 4 months but mature rapidly in areas receiving recent significant rains with high temperature (matures slowly in low temperature or dry habitats)</li> <li>Take-off 20 minutes after sunset above 20°C–22°C and wind &lt; 7 m/s</li> <li>Fly preferences: Downwind</li> <li>Solitary adults migrate during night usually 20 minutes after sunset. Fly preferences is downwind with heights upto 1800 m (generally &lt; 400 m) with ground speed of 25-65 km/h for upto 10 hours</li> <li>Prefers warm temperatures and needs vegetation</li> </ul>	<ul style="list-style-type: none"> <li>Rainfall data</li> <li>Wind speed and wind direction</li> <li>Air temperature data</li> <li>Land surface temperature data and cloud data</li> <li>Vegetation status</li> </ul>
Swarm	<ul style="list-style-type: none"> <li>Bask to warm up in the sun from sunrise to mid-morning</li> <li>Take off about 2-3 hours after sunrise in warm weather</li> <li>Take off in sunny conditions at least 23°C–26°C</li> <li>Fly preferences: Downwind at heights upto 1700 m with ground speed of 1.5 to 16 km/h until 2 hours before sunset or 0.5 hours after sunset</li> <li>Vegetation</li> <li>Cool and overcast weather favours stratiform swarms, while convective updrafts on hot afternoons promote cumuliform swarms.</li> </ul>	<ul style="list-style-type: none"> <li>Cloud data to detect bask-able conditions</li> <li>Air temperature data</li> <li>Wind speed and direction data</li> <li>Vegetation status</li> </ul>

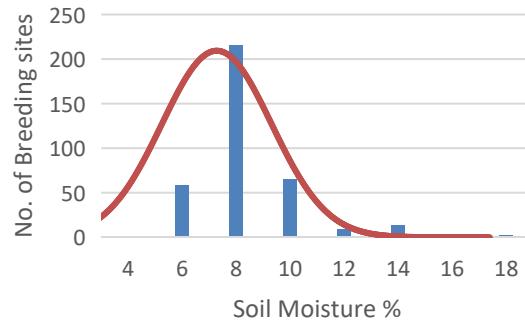
- The availability of satellite and model derived products have been utilized for generating the relation between ecological incidence with respect to various life cycle event like breeding, Hopper and Swarms.
- Histograms for Soil Moisture, Land Surface Temperature and Leaf Area Index were generated for these three life cycle events (Breeding, Hopper and Swarms) in the Thar Desert region and effected areas during April to August, 2020.
- The histograms generated for the these sightings shows near normal distribution and to obtain the variations of the parameters the histogram is fitted with normal distribution curve with mean and standard deviation of the data generated from the input parameters. The distribution curve gives the idea of the suitable ranges of the parameters for the sightings.

## Data Used:

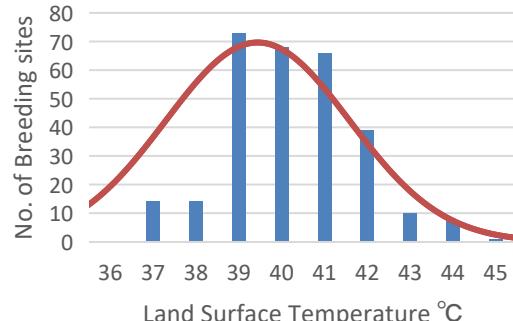
- SMAP L4 products: Soil Moisture, Land Surface Temperature and Leaf Area Index (SMAP Enhanced L4 Global 3 Hourly 9 km Product)
- The geolocation sites of the breeding sites were available for June and July month LWO, Jodhpur

# Soil Moisture, Land Surface Temperature, and Leaf Area Index Variations for Breeding Sites

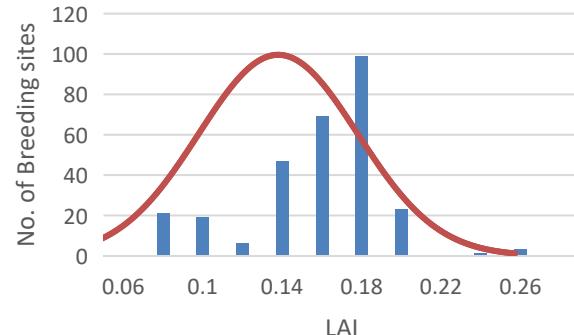
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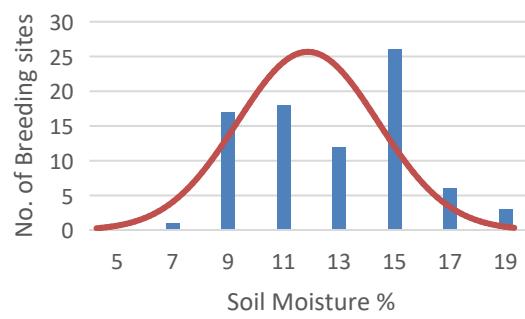
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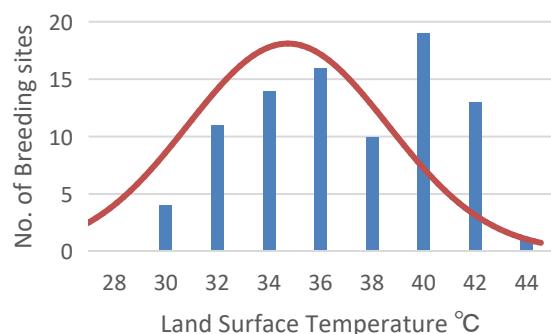
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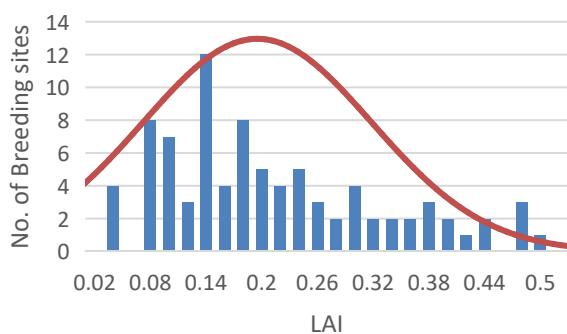
July 2020



July 2020

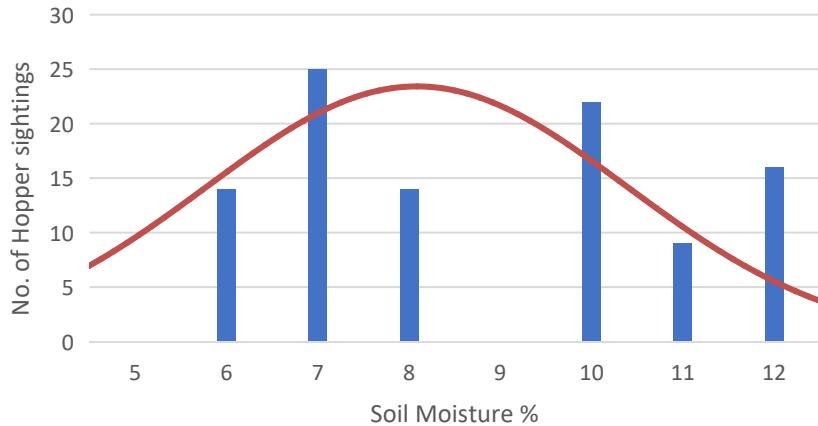


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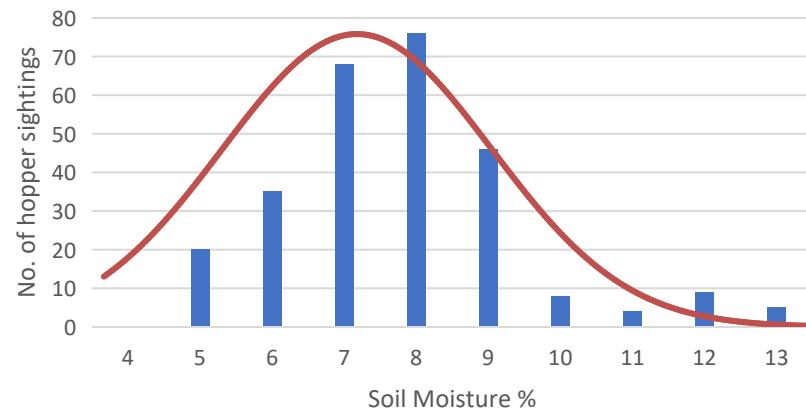


# Soil Moisture Variations for Hopper Sightings

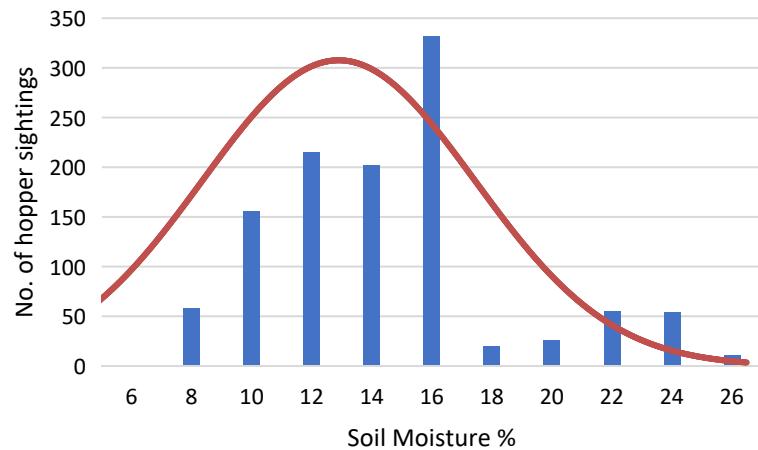
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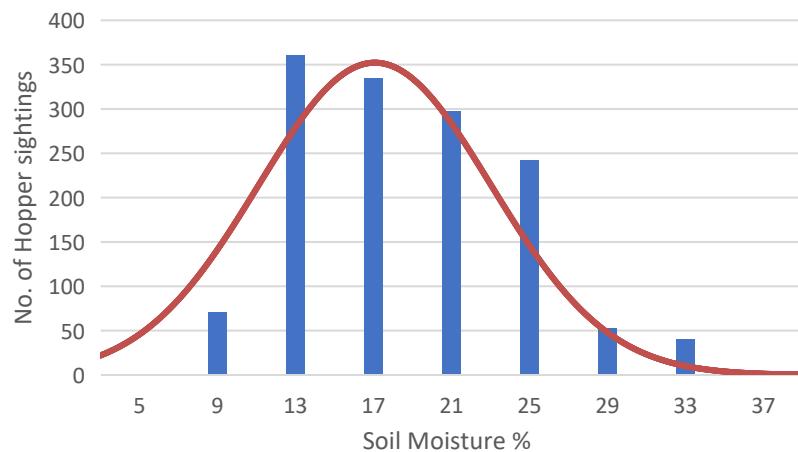
June 2020



July 2020

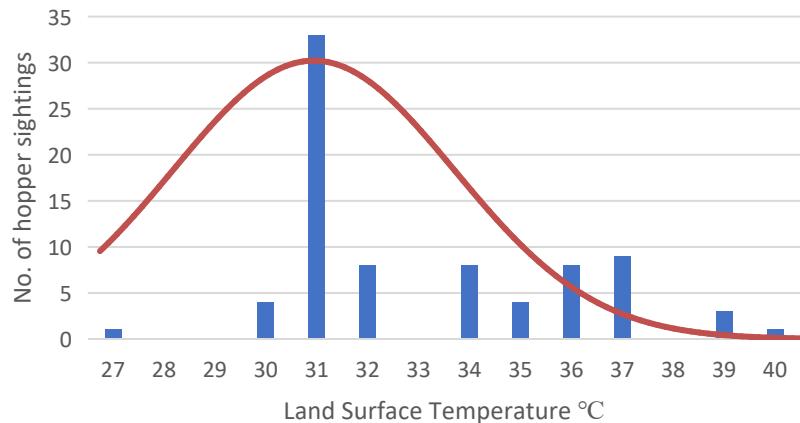


August 2020

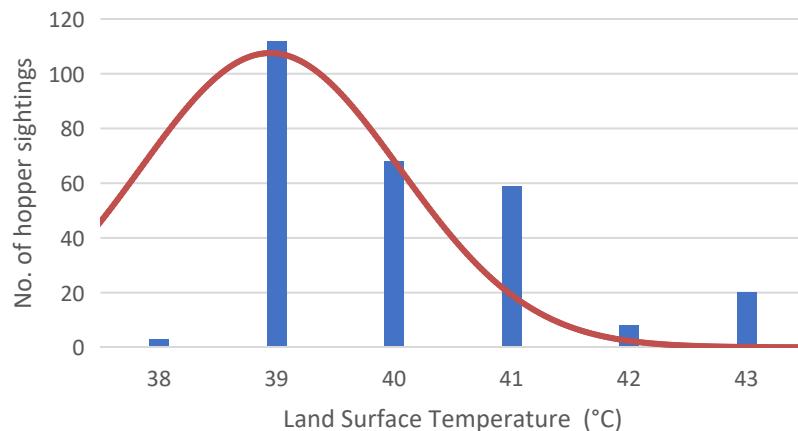


# Land Surface Temperature Variations for Hopper Sightings

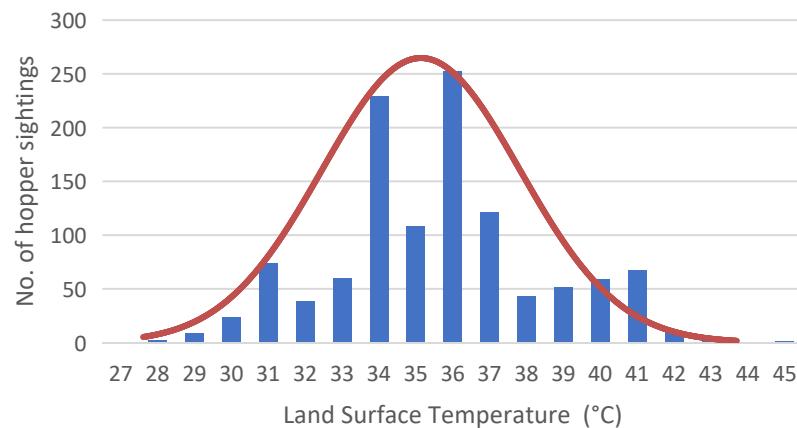
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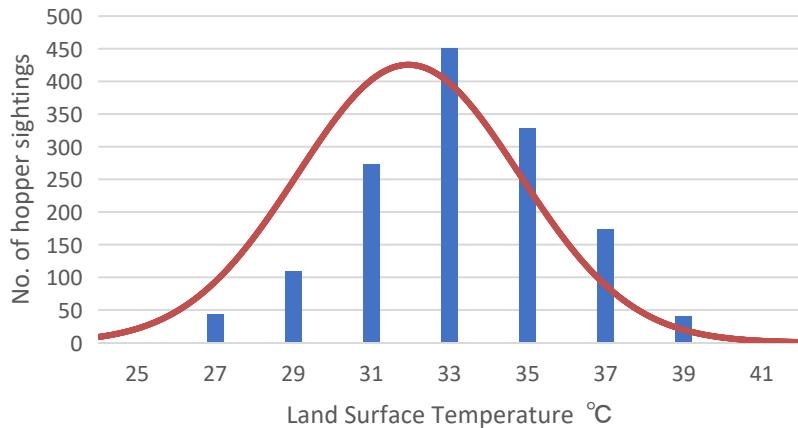
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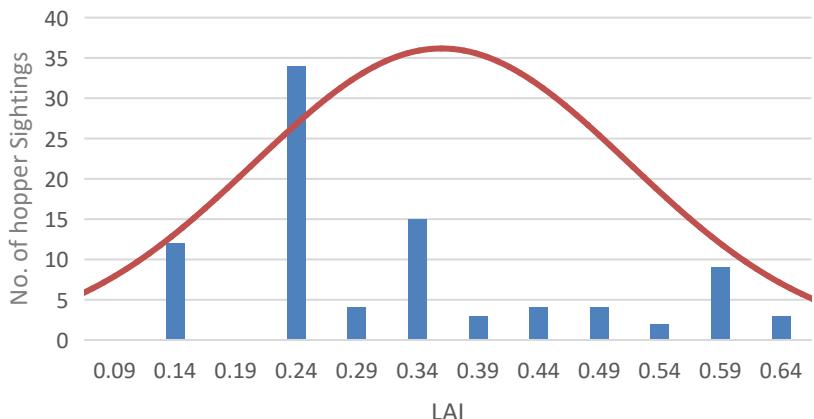


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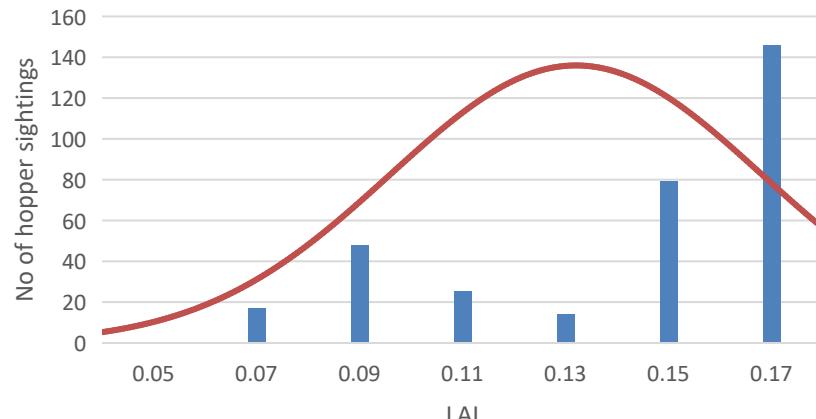


# Leaf Area Index Variations for Hopper Sightings

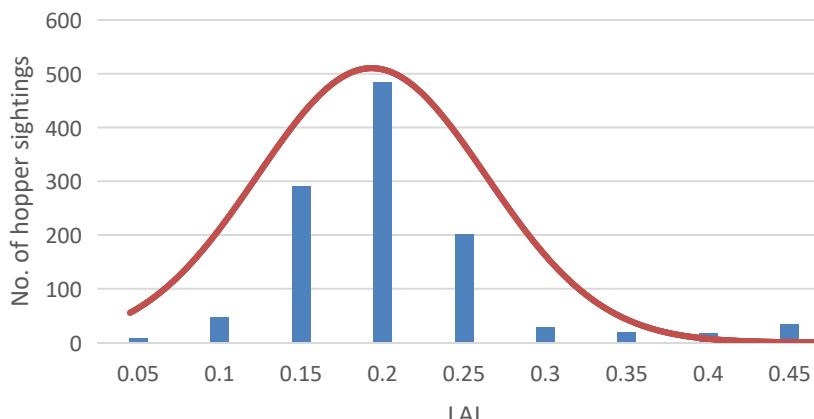
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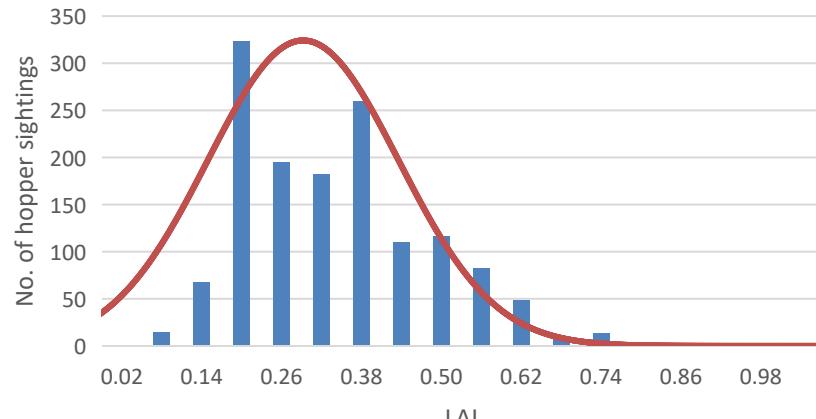
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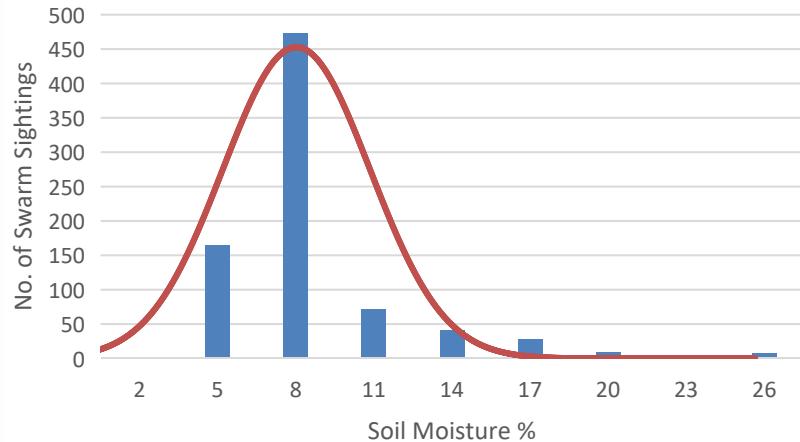


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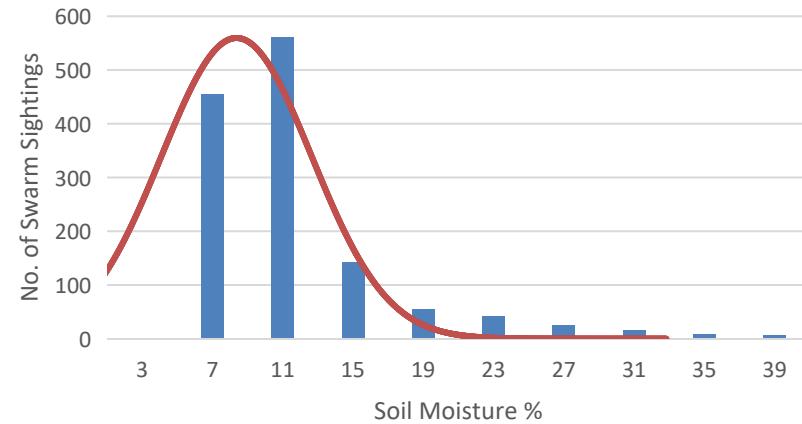


# Soil Moisture Variations for Swarm Sightings

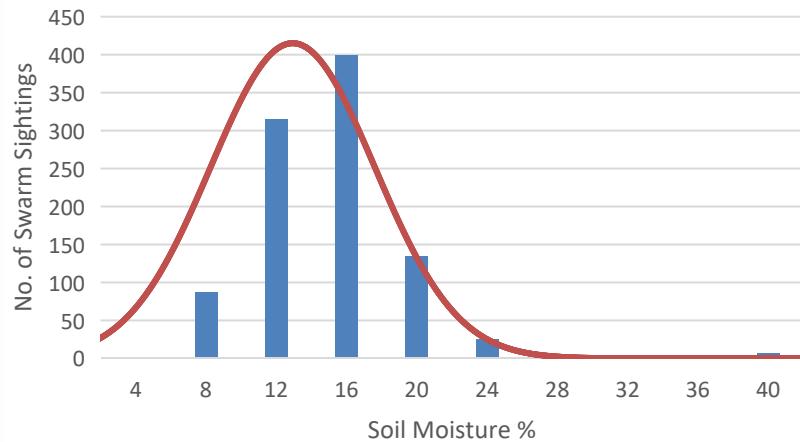
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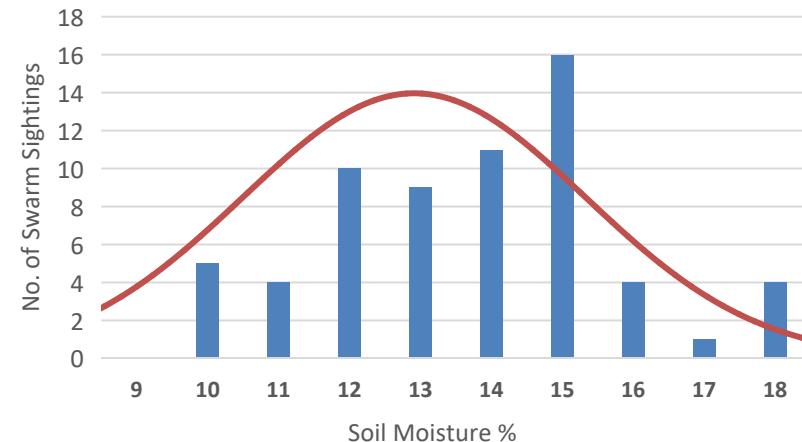
June 2020



July 2020

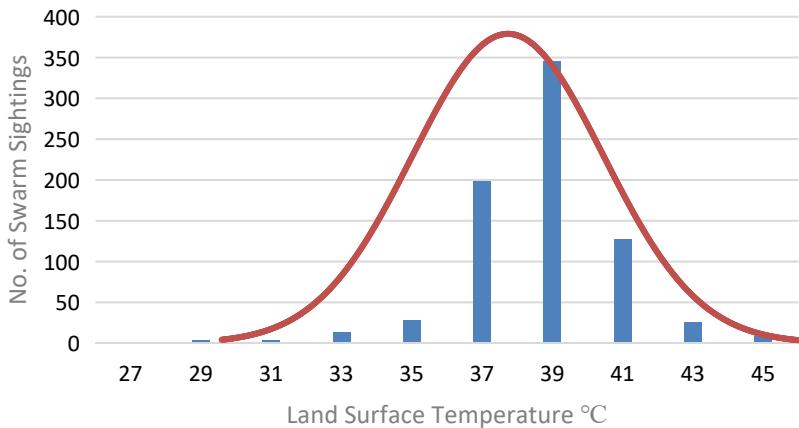


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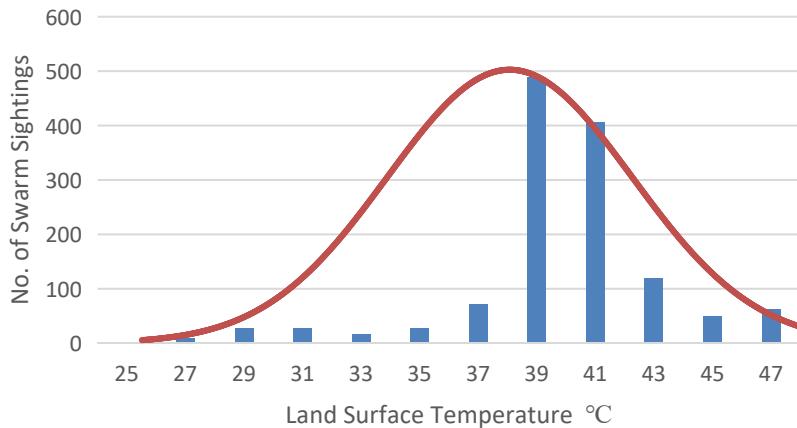


# Land Surface Temperature Variations for Swarm Sightings

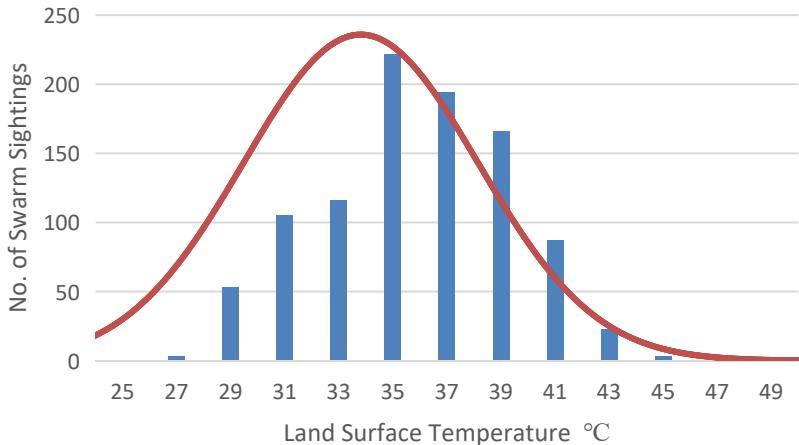
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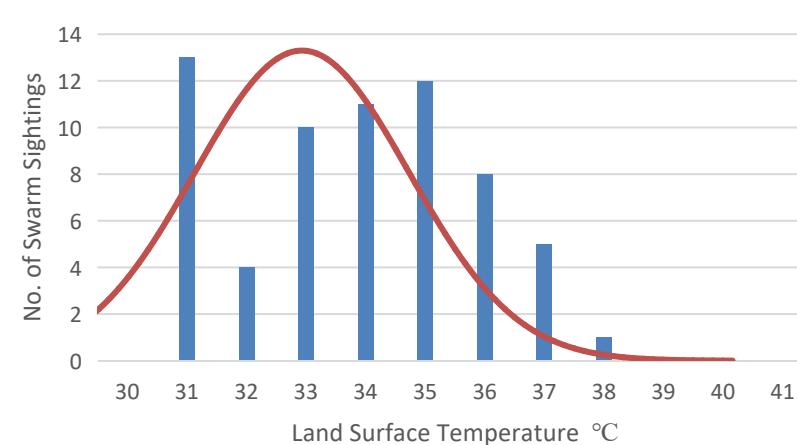
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July 2020

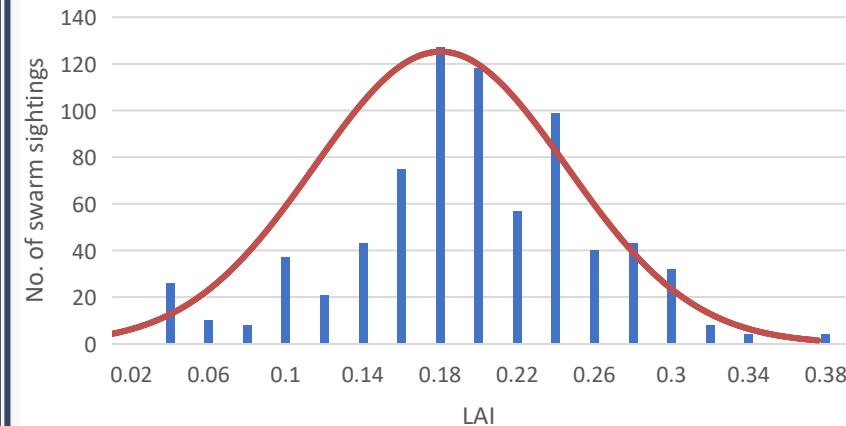


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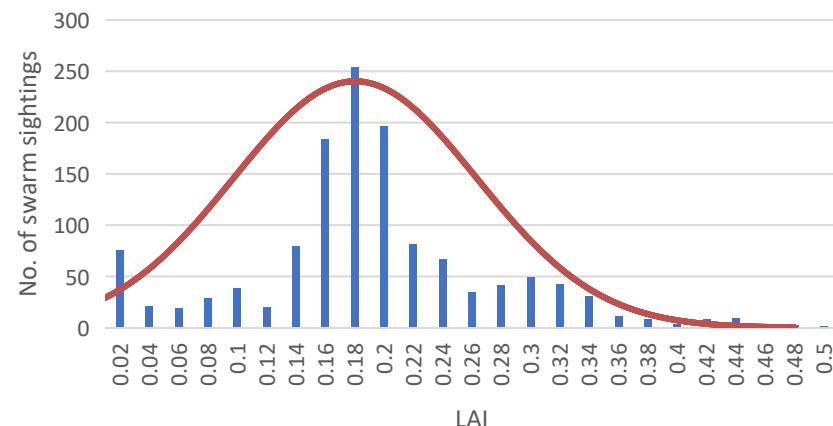


# Leaf Area Index Variations for Swarm Sightings

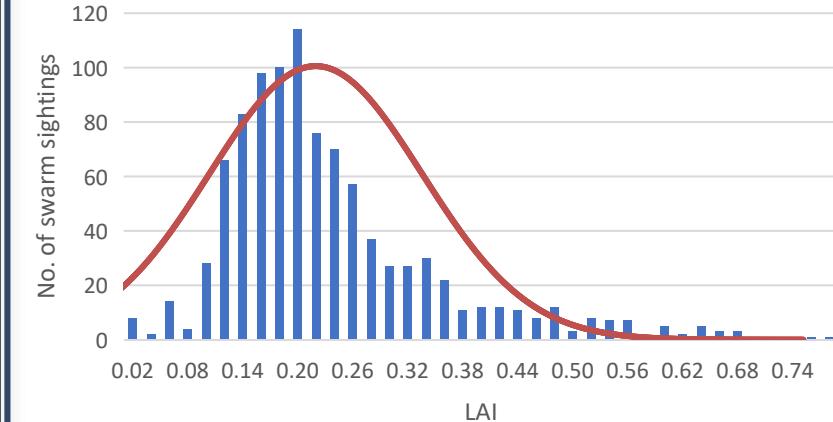
May 2020



June 2020



July 2020



August 2020

