

**KENYA METEOROLOGICAL DEPARTMENT**

# **WEATHER AND DESERT LOCUSTS**

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*Top left: Hopper*  
*Above left: Adult*

*Top right: Hopper band*  
*Above right: Swarm*

# Introduction

- Locusts are members of the grasshopper family *Acrididae*, which includes most short-horned grasshoppers.
- Locusts differ from grasshoppers because they have the ability to change their behaviour and physiology, in particular their morphology (colour and shape), in response to changes in density, when meteorological conditions are favourable.
- Adult locusts can form swarms that may contain millions or billions of individuals that behave as a coherent unit.
- When plentiful rain falls and annual green vegetation develops, Desert Locusts can increase rapidly in number and, within a month or two, start to concentrate and become gregarious.
- An outbreak or contemporaneous outbreaks that are not controlled can evolve into an upsurge if widespread or unusually heavy rain falls in adjacent areas, creating favourable breeding conditions.

# Introduction

- An upsurge generally affects an entire region and occurs after several successive seasons of breeding and further hopper-band and adult-swarm formation takes place.
- If heavy rain falls in successive seasonal breeding areas, the locusts will gregarize and, unless prevented by control, drought, or migration to unsuitable habitats, plagues can develop.
- Rainfall over 25 mm in two consecutive months is usually assumed to be enough for locust breeding and development.

# Weather and Desert Locusts

- All the different phases in the life cycle of a locust require ideal meteorological conditions for it to develop and cause the widespread damage that is often associated with locust plagues.
- Meteorological data, such as **temperature**, **pressure** and **wind** are important for both assessing the current locust situation and forecasting its development.
- Information on meteorological and ecological parameters such as rainfall, soil moisture, soil and air temperatures, surface and boundary winds, synoptic-scale patterns and the convective state of the atmosphere are needed to understand and forecast swarm movement and the various developmental stages.
- These stages include egg-laying, egg development, hopper development, moulting, hardening of the wings, adult maturity, rate of movement of hopper bands and adult swarms, and transition from the solitarious phase to the gregarious phase.

# Weather and Desert Locusts

- Rainfall data can be used to identify which areas may become suitable for breeding or where green vegetation and locusts may be present.
- Temperature data can be used for estimating the development rate of eggs and hoppers, as well as indicating whether it is warm enough for adults to take off and fly.
- Wind and large-scale (synoptic) data are useful during periods when adults or swarms are likely to be migrating or to estimate if there is an invasion threat from a neighbouring country.
- During recessions, the most important variables to monitor are rainfall, vegetation and soil moisture.
- Access to information on rainfall, vegetation quantity, soil moisture, temperature and wind direction can be valuable in making accurate predictions and is essential for assessing the potential for locust movement and the planning of control operations.

# Weather & locust control operations

For locust control, as well as swarm movement, it is important to know the weather conditions and wind fields because these affect the concentration of potential control targets and the suitability of conditions to carry out effective spraying.

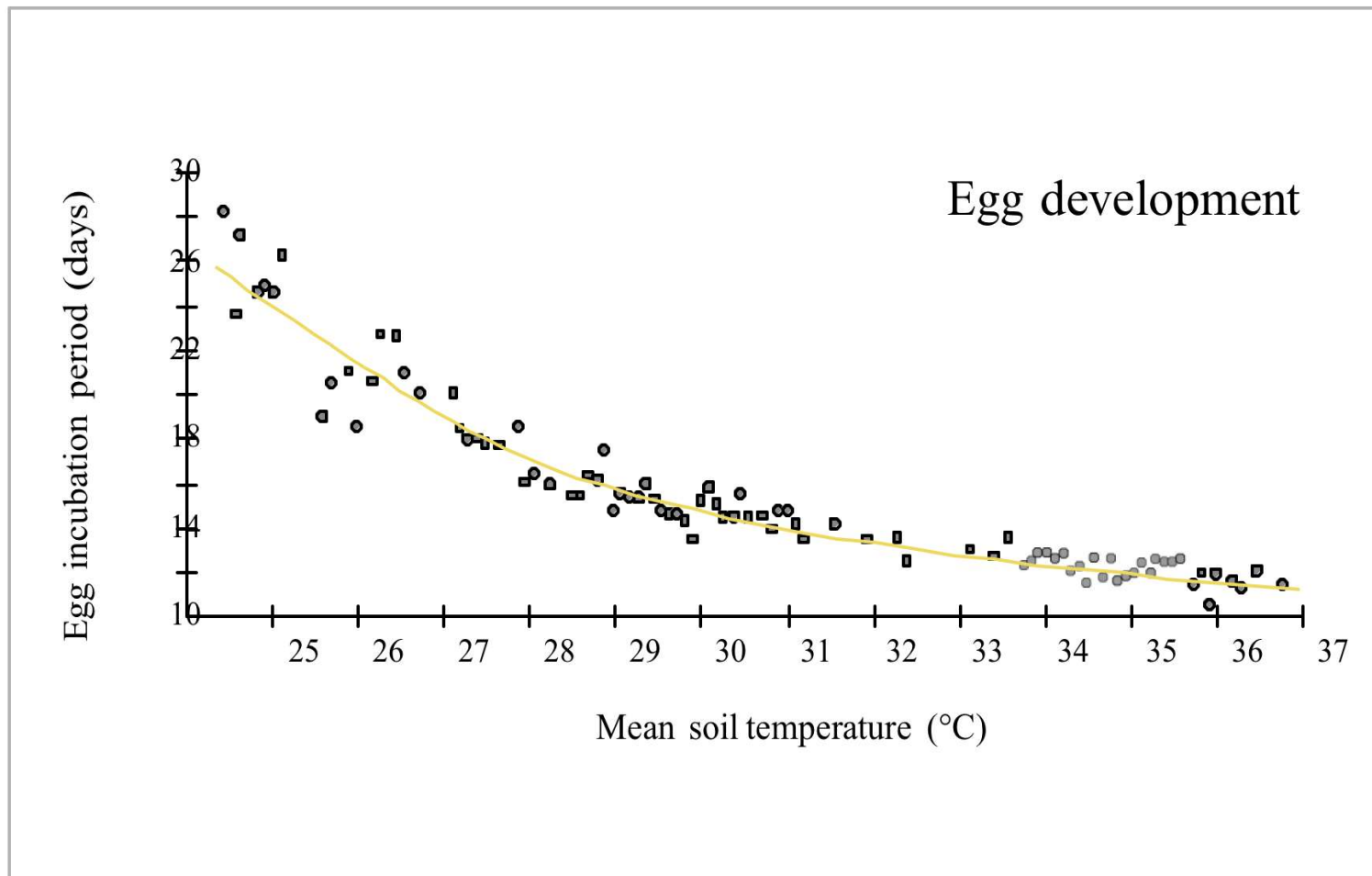
In planning Desert Locust surveys, WMO recommends the following principles to be borne in mind (WMO, 1991):

- Locust populations move downwind;
- The hotter the wind, the greater the distance travelled per day;
- Highly turbulent (and correspondingly hot) winds disperse populations (reduce their area density);
- Downwind movement eventually brings locusts into zones of wind convergence, where they accumulate;

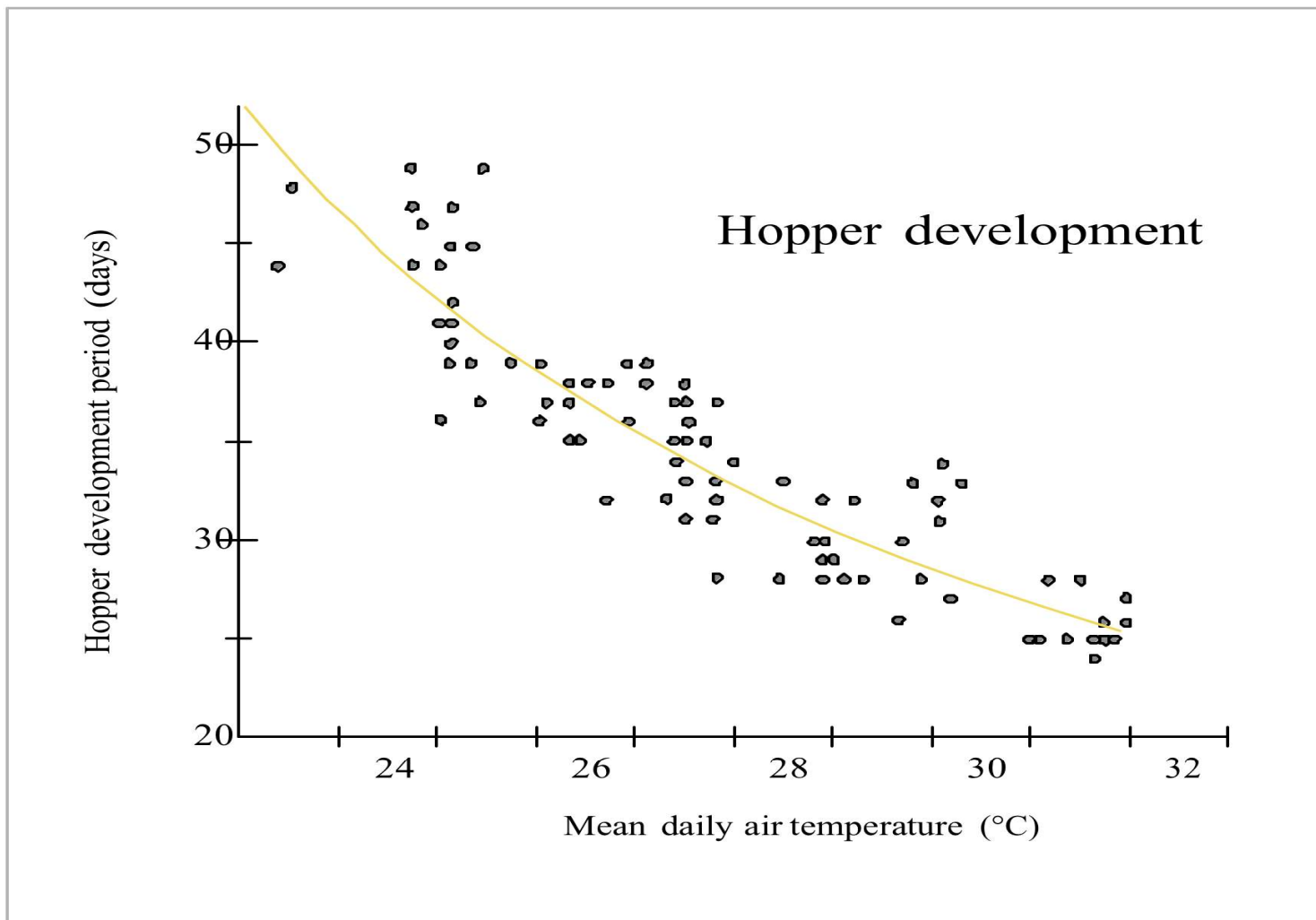
# Weather & locust control operations

- As opposed to steady wind conditions, where turbulence disperses populations, convergent winds have been shown to concentrate populations at least to the order of 10 000-fold;
- Locust populations are trapped in zones of wind convergence and participate in the diurnal and daily cycle of movement of such zones. In some places and seasons, these movements are relatively small and the locust population is correspondingly relatively stationary;
- Waiting for locusts to concentrate and form high density populations is the most important strategy for efficient and economic control of locusts, so that the concentrating effect of zones of convergence must be utilized in control techniques.





**Figure 3.** Relationship between egg development and temperature.



**Figure 4.** Relationship between hopper development and air temperature. The warmer the temperature, the faster hoppers will mature and become adults.

## Locust control

Locust control services can make use of meteorological information for planning survey and control operations and for forecasting locust breeding and migration, for example:

- (a) Where breeding is likely to occur;
- (b) When the next generation is likely to be flying;
- (c) Where and when that generation is likely to reach areas at risk of invasion;
- (d) Effects of weather on logistics of survey and control – the moving of staff and materials, as well as ground and aerial control operations against hoppers and swarms.

# Locust migration

If the answer to all the following questions is “yes”, there is a good possibility that the adults or swarms will migrate:

- (a) Can the locusts fly?
- (b) Is the temperature warm enough?
- (c) Is the wind not very strong?
- (d) Are ecological conditions dry where the locusts are now?

# Weather Outlook For 27<sup>th</sup> – 31<sup>st</sup> January 2020

## Counties covered:

Mandera

Wajir

Marsabit

Turkana

Samburu

Isiolo

Baringo,

Laikipia

Meru

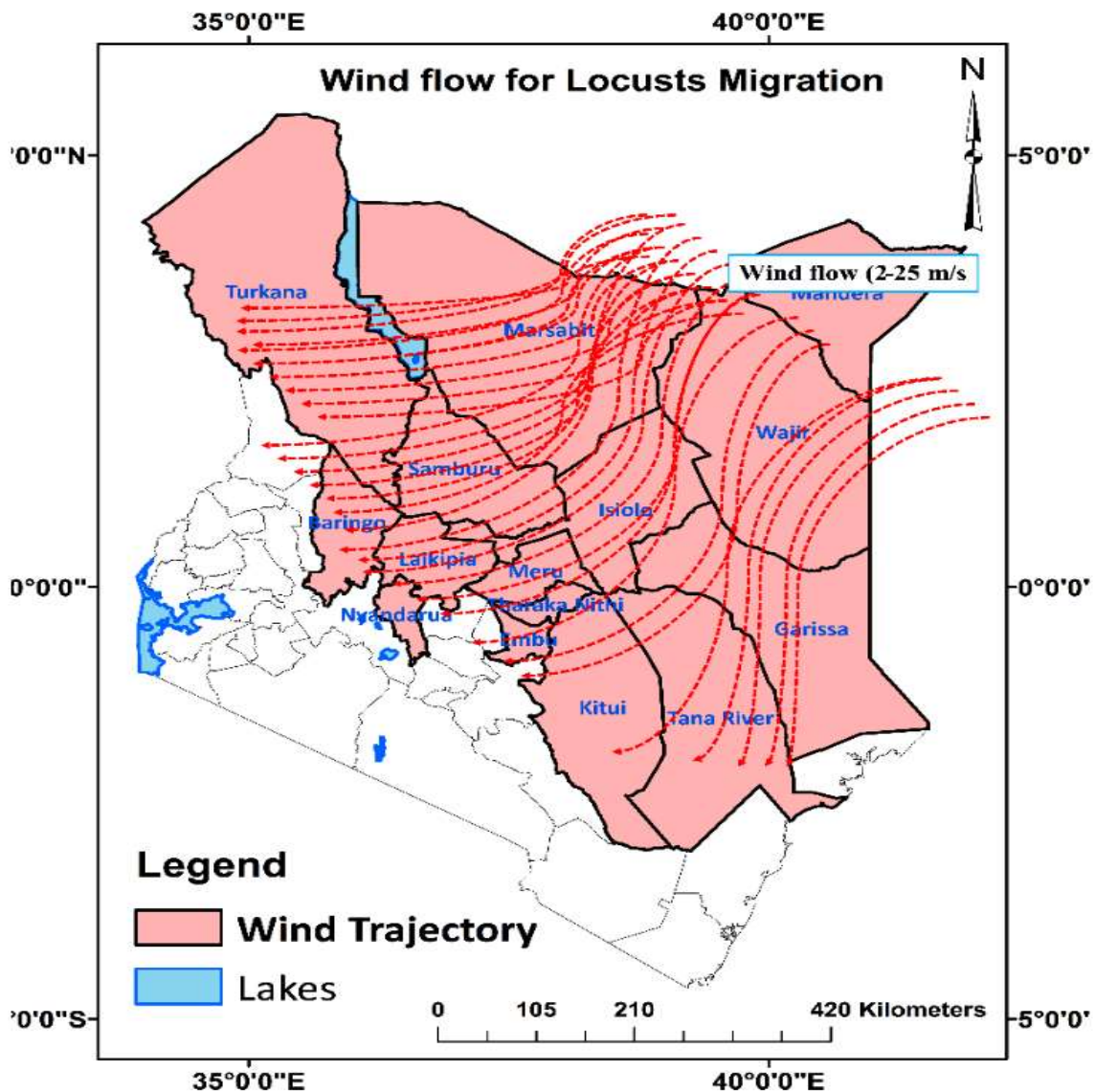
Tharaka-nithi

Embu

Kitui

Garissa

Tana River



## **Weather outlook - Monday 27<sup>th</sup> Jan 2020**

- Wind is expected to blow mainly from the east (Somalia) towards the western and southern parts of the country at a speed of between 2-25km/h. Convergence of wind is expected over Samburu, Turkana and Isiolo counties
- Day time temperatures are expected to range between 17 – 31 °C
- Night time temperature are expected to range between 13-25 °C
- Moderate to heavy rainfall is expected over Mandera, Wajir, Marsabit, Turkana, Samburu, Isiolo, Baringo, Laikipia, Meru, Tharaka-Nithi, Embu, Kitui, Garissa, and Tana River Counties.

## Weather outlook - Tuesday 28<sup>th</sup> Jan 2020

- Wind is expected to blow mainly from the east (Somalia) towards the western and southern parts of the country at a speed of between 2-25km/h over most parts except over Turkana where wind is expected to be variable. Convergence of winds expected in Samburu, Turkana, Meru, Embu, Tharaka-Nithi, Laikipia and Isiolo counties
- Day time temperatures are expected to range between 16 – 31 °C
- Night time temperature are expected to range between 12-25 °C
- Moderate rainfall is expected over few areas in Marsabit, Turkana, Samburu, Isiolo, Baringo, Laikipia, Meru, Tharaka-Nithi, Embu, Kitui, Garissa, and Tana River Counties.

## **Weather outlook - Wednesday 29<sup>th</sup> Jan 2020**

- Wind is expected to be variable and the speed is expected to be weak (2-20km/h). Convergence of winds is expected in Isiolo, Baringo and Samburu Counties
- Day time temperatures are expected to range between 16 – 30 °C
- Night time temperature are expected to range between 12-24 °C
- Moderate rainfall is expected over few areas in Turkana, Marsabit, Laikipia, Isiolo, Meru, Embu and Tharaka Nithi Counties.



## Weather outlook - Thursday 30<sup>th</sup> Jan 2020

- Wind is expected to blow mainly from the east (Somalia) towards the western and southern parts of the country at a speed of between 2-25km/h. Convergence of winds expected in Samburu, Turkana, Meru, Embu, Tharaka-Nithi, Laikipia and Isiolo counties
- Day time temperatures are expected to range between 18 – 33 °C
- Night time temperature are expected to range between 12-30 °C
- Light to moderate rainfall is expected over few areas in Baringo, Isiolo, Embu, Meru and Tharaka Nithi Counties

## Weather outlook - Friday 31 Jan 2020

- Winds are expected to blow mainly from the east (Somalia) towards the western and southern parts of the country at a speed of between 2-25km/h over most areas except the northern sector of Marsabit where winds are expected to blow towards the north.
- Convergence of winds are expected in the northern parts of Turkana County
- Day time temperatures are expected to range between 17 – 34 °C
- Night time temperature are expected to range between 12-24 °C
- Light to moderate rainfall is expected over few areas in Baringo, Meru and Embu Counties.

## Weather outlook – Advisory

- The forecast for the next five days indicates that moderate to heavy rainfall is expected across all the counties up to Wednesday Jan 29.
- Movement of locusts in their breeding zones may therefore be temporarily inhibited or slowed down and their eggs destroyed by the rainfall expected over most areas during this period.
- The wind regime is ideal for locusts migration in all the counties from Monday to Wednesday.
- However, wind speed is expected to increase to above 25km/h especially over the counties in the north.
- The locust population is likely to be concentrated in Turkana, Samburu and parts of Isiolo County where wind convergence will be more pronounced.
- The temperatures are conducive for locust development, migration and take off in all the counties.
- However, night migration may be confined to counties in the north east and north west where night time temperatures are above 20<sup>0</sup>C.
- Over Meru, Tharaka-Nithi, Laikipia and Embu counties, day time temperatures may be favorable for migration.

The End

Thank you