



# **Desert Locust Field Handbook**

**Identification and Management**

## **Contributors**

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This pocket guide was developed as part of CABI's effort towards combating the desert locust threat. This was jointly done in partnership with international development organisations, governments, research organisations and academia that have been spear-heading desert locust management efforts. These include United Nations Food and Agriculture Organisation (FAO), Desert Locust Control Organisation for Eastern Africa (DLCO-EA), Government of Kenya-Ministry of Agriculture Livestock Fisheries and Cooperatives-Plant Protection Services Division (PPSD), the International Centre of Insect Physiology and Ecology (ICIPE), Pest Control Products Board (PCPB), University of Nairobi (UoN) and the Council of Governors Representatives-Multi-Institutional Technical Team (MITT), Kenya.

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Cover Photo: Mature Desert Locust © Gurunath B, 2019

This field handbook is intended to help extension workers and farmers in the field to identify the desert locust and know how to manage it.

The author's views expressed in this publication do not necessarily reflect the views and policies of CABI.

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## **Further information**

Combating locusts:

[www.cabi.org/what-we-do/locusts/](http://www.cabi.org/what-we-do/locusts/)

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## Introduction

The desert locust, *Schistocerca gregaria* (Forsk.) is arguably the most destructive agricultural pest globally. Favourable ecological and weather conditions can lead to rapid desert locust development, migration and spread across multiple countries, making this a major transboundary pest of great importance.

The causes of sporadic developments and migrations of swarms of this magnitude are not fully understood, but it is widely agreed to be linked to favourable climate conditions and limited ability to implement early preventive interventions in far-to-reach primary breeding areas. These conditions are likely to become more regular given the backdrop of the occurrences of unpredicted climate change. Left unchecked, the numbers of this crop-devouring insect can grow exponentially to hundreds of millions of individual locusts. With the ability to fly 150 km a day, the desert locusts devastate rural livelihoods in their relentless drive to eat and reproduce.

This field pocket guide will therefore provide information for use by frontline extension officers and farmers and to assist them understand the desert locust developments, migration and the most useful of actions to be introduced. The document also helps to correct some misconceptions about this insect.

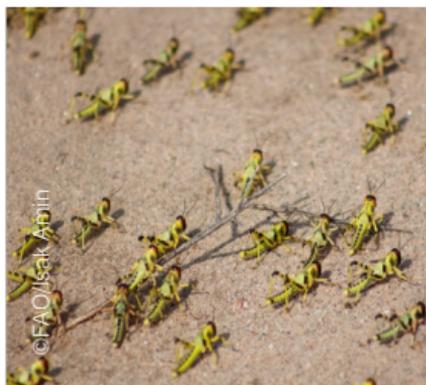
## How to identify the desert locust - biology and behaviour



Eggs



Hopper



Hopper bands



Young adult (Fledgling)



©FAO/Sven Torfinn

**Adult**



©FAO/Sven Torfinn

**Breeding (copulation)**



©ICIPE

**Adult female locust laying eggs in the sand**



©CABI/yan Rwomushana

**Roosting on shrub**



©FAO/Sven Torfinn

**Swarm**



©CABI/Ivan Rwomushana

**Feeding**©FAO Mohammed Abdulkhalig  
and Ameen Alghabri**Damage to crops**

©CABI/Ivan Rwomushana

**Roosting on the ground**

©CABI/Ivan Rwomushana

**Swarm on a road**

©CABI/Ivan Rwomushana

**Flying swarm**

©CABI/Ivan Rwomushana

**Suspended on tree**

## Summary points on identification

- Many farmers do not know how to differentiate between adult desert locusts and often they confuse them with other grasshopper species; such as tree locusts and other insects.
- Apart from their colour differences and other identification features, tree locusts look bigger than desert locusts in size and mostly are found in lowland and riverine areas.
- Tree locust swarms migrate at night while desert locusts migrate during daytime.
- At gregarious phase, desert locusts form hopper bands that are black and yellow in colour while tree locusts do not form bands but remain scattered.
- The main difference between locusts and other grasshopper species is their ability to change their colour and behaviour i.e. when they change from solitary to gregarious phase and vice-versa.



© DLCO-EA/Mehari Ghebse  
**Tree locust**



© CAB/ Ivan Rwomushana  
**Desert locust**



© CAB/ Ivan Rwomushana  
**Desert locust (Mature-yellow, and Immature-pink)**



© CAB/ Ivan Rwomushana  
**Clear and transparent hind wing of desert locust**

- Look for the following features of the desert locust:
  - Adult male desert locusts are smaller in size than adult female desert locusts.
  - The appearance and colour of the desert locust also changes. Solitary adult locusts are grey in colour and groups (gregarious) of immature desert locust are pink in colour while mature adults are bright yellow.
  - In addition to other features, the desert locust has vertically striped compound eyes.

## **Summary points on behaviour**

- Desert locusts like laying eggs in moist sandy areas.
- Desert locusts have the ability to exist as scattered (solitary) or as part of a large group (gregarious) phases.
- As desert locusts increase and become many or more crowded, they change their behaviour from that of acting as an individual (solitarious) insect to acting as part of a group (gregarious).
- Desert locusts can migrate over long distances (100-150 kms per day).
- When breeding conditions are favourable, desert locusts can quickly reproduce, increase in number and form one or many large groups called bands (hopper) a swarm or swarms (adults).

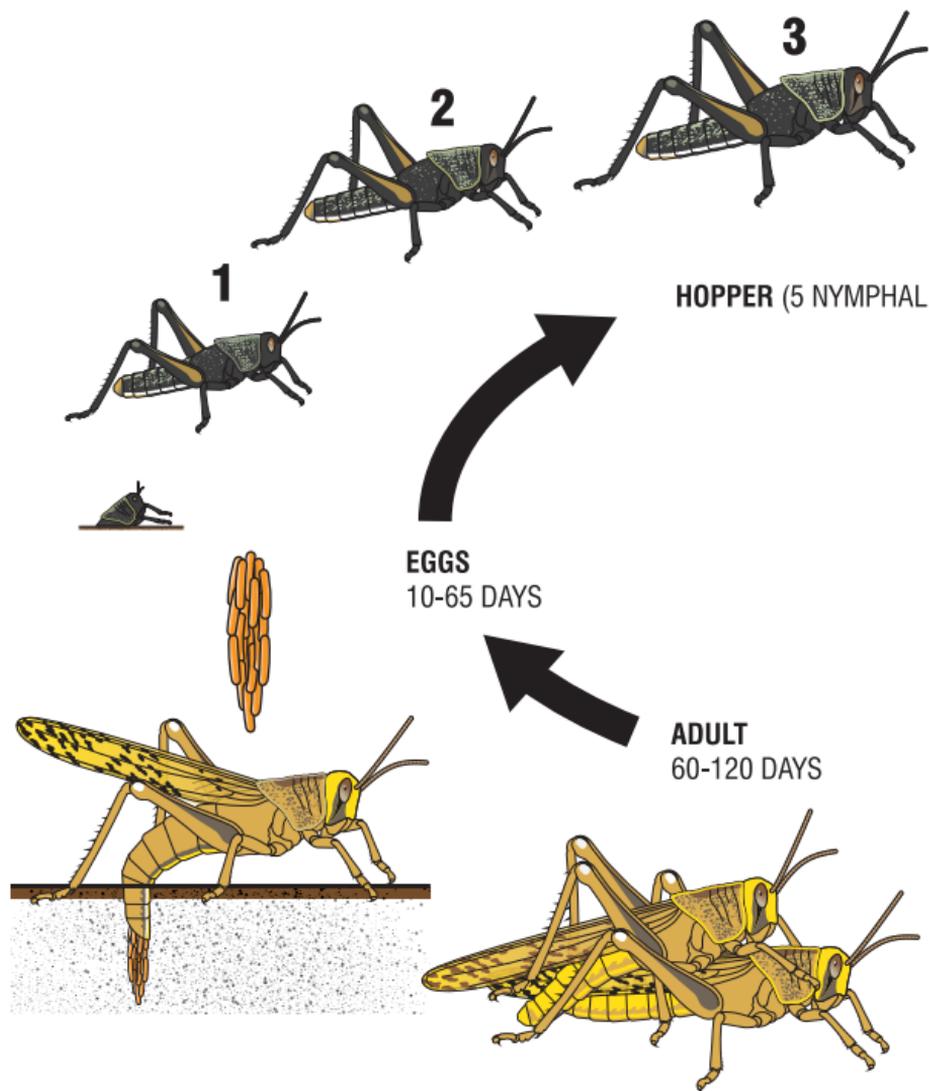
- Desert locusts can feed on over 400 species<sup>1</sup> of plants, most times completely destroying pasture and food crops.
- Hoppers (young desert locusts), depending on weather conditions, are found stationary or moving on the ground or on plants during the day. At night they rest on plants (Roosting).
- Adult desert locusts can be found on the ground during early morning or late afternoon (basking) or flying during the day. At night they rest on trees (Roosting).
- Both hoppers and adult desert locusts feed during daytime and in the night causing damage to leaves, fruits, flowers and stems including barks of trees.
- Swarm sizes average 40 million locusts, that can fly for over 100-150 kms per day aided by wind.
- They consume food that can feed approximately 35,000 people/day (equivalent of a small town/city).

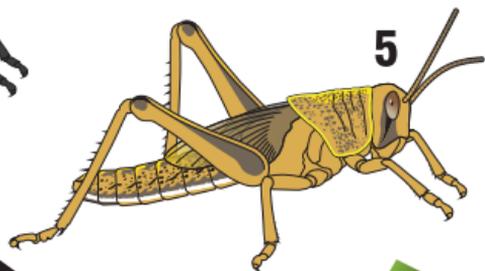
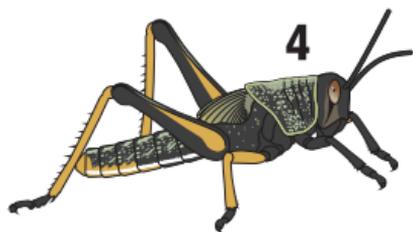
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<sup>1</sup>CABI, 2020. Desert locust (*Schistocerca gregaria*): Crop Protection Compendium. Wallingford, UK: CAB International.

## DESERT LOCUST LIFECYCLE (GREGARIOUS PHASE\*)

	<p><b>EGGS 10-65 DAYS</b> Female adult desert locusts lay their eggs in moist sandy soils.</p>
	<p>Eggs hatch into <b>hoppers</b> about 2 weeks after being laid.</p>
<p>1 </p> <p>2 </p> <p>3 </p> <p>4 </p> <p>5 </p>	<p><b>HOPPER (5 NYMPHAL STAGES) 30-40 DAYS</b> <b>Gregarious hoppers</b> develop through 5 nymphal stages. The colour changes from black at the first stage to yellow/black colour in the remaining stages. *This lifecycle show the gregarious phase of the desert locust.</p>

**DESERT LOCUST LIFECYCLE (GREGARIOUS PHASE)**



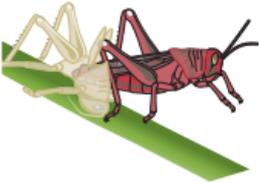
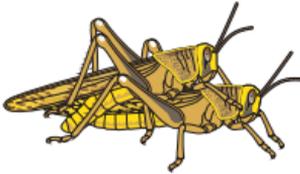
STAGES (30-40 DAYS)



**IMMATURE ADULT**  
40-50 DAYS



## DESERT LOCUST LIFECYCLE (GREGARIOUS PHASE\*)

	<p><b>IMMATURE ADULT 40-50 DAYS</b></p> <p>At the last hopper stage, they shed their outer covering (skin) and change into a stage also known as a <b>fledgling</b> that is pink in colour.</p>
	<p>A desert locust lifecycle takes about 3 to 5 months although this depends on whether the breeding conditions (weather and ecological conditions – rainfall, moist sandy soils, vegetation) are favourable.</p>
	<p><b>ADULT 60-120 DAYS</b></p> <p>Fledglings change into <b>immature adults</b> in about 10 days. The immature adults mature within 3-4 weeks. <b>Mature adult</b> locusts live for 3-5 weeks depending on weather conditions.</p>
	<p>A mature gregarious female lays approximately 200-250 eggs in its lifetime. Eggs are laid 10-15 cm below the soil surface.</p>

## Lifecycle

### Summary points

- The desert locust lifecycle has three stages of development i.e. eggs, hopper and the adult.
- Female adult desert locusts lay their eggs in moist sandy soils.
- Eggs hatch into **hoppers** about two weeks after being laid (the range is 10-65 days).
- Hoppers develop in 5-6 stages over a period of about 30-40 days. This happens in two ways depending on whether the locusts are solitary or gregarious:
  - **Solitary hoppers** develop through 6 steps. The hoppers' colour remains consistently green or brown all through the stages.
  - **Gregarious hoppers** develop through 5 stages. The colour changes from full black at first stage to black/yellow colour pattern in the later.
  - At the last hopper stage, they shed their outer covering (skin) into a stage also known as a **'fledgling'** that is pink in colour (gregarious) and grey in solitarious phase.
  - Fledglings change into an immature adult in about 10 days. After 3-4 weeks the immature adults mature and their colour changes to bright yellow.

- Mature adult locusts live for 3-5 weeks depending on weather conditions.
- A mature gregarious female lays eggs 3 times with approximately 200-250 eggs in its lifetime.
- A desert locust lifecycle takes about 3 to 5 months although this depends on whether the breeding conditions (weather and ecological conditions - rainfall, moist sandy soils, vegetation) are favourable.

## Monitoring and early warning

### Summary points

- Successful management of desert locust outbreaks relies on regularly monitoring of their traditional (primary) breeding locations. Desert locusts like laying eggs in moist sandy soils.
- Plant Protection Departments coordinate the overall locust management and should set up a monitoring and early warning system.
- Countries prone to desert locust invasion should regularly monitor the weather and ecological conditions, and locust developments and have to issue early warnings on timely basis. Designated telephone hotlines/SMS short code<sup>2</sup> should be used to report sightings.
- Capacity building and training of agricultural extension officers, desert locust scouts and sensitization of farmers on desert locust management, monitoring and early warning is essential.
- Training on the use of existing survey and reporting mechanisms such as eLocusts<sup>3</sup> and eLocusts<sup>3m</sup> should be conducted.
- Satellite imagery can be used in monitoring changes in desert locusts breeding habitats.

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<sup>2</sup>For example, in **Kenya**-0800724891 **Ethiopia**-8028

- Identify breeding areas and regularly issue desert locust development and migration information as part of early warning and forecasting.



Desert locust roosting

# How to manage the desert locust

## Summary points

- Effective desert locust management mainly starts through regular monitoring of their primary breeding locations, changes in the weather and ecological conditions that favour their developments, and make analysis and forecasts.
- The scale and amount of resources needed in desert locust control requires coordination between the Ministries of Agriculture, in-country locust divisions and development partners.
- Allocate the required emergency logistics and resources in strategic locations and areas prone to desert locust outbreaks.
- Desert locusts are best managed using different pesticides to limit their damage to crops. However, indiscriminate use of pesticides could have harmful effects to other beneficial insects; such as bees and wasps, causing even greater long-term damage to the environment.
- Pesticides can be applied by ground and/or by aerial spraying. While the actions of individual farmers using knapsack sprayers might reduce the population of locusts, the most effective way to manage is via vehicle-mounted sprayers or aircraft.

- Note that it is impossible to kill eggs because they are too deep in the ground to be reached by pesticide. However, if eggs are laid in unplanted fields, these fields can be ploughed to expose the eggs to sunlight, which kills the eggs.
- Inform extension officers when you spot desert locusts so that the government can take quick action.
- And remember, while spraying can reduce the impact of swarms in the immediate area, early intervention (surveying and monitoring) is the most effective way to address continuous multiplication in the breeding areas that often results in new, and very likely larger, populations.
- To manage desert locusts in breeding areas, spraying with bio-pesticides is more sustainable.
- Some botanicals have been found to repel/kill some insect pests and can be tried on desert locusts.
- Some natural enemies such as birds, lizards, insects, etc. are known to feed on desert locusts. It should however be noted that natural enemies are only effective in the management of desert locust if their population is low or when they are old and close to their natural death.

## Safe chemical use

### Summary points

Important tips for using pesticides to manage locusts

- Pesticides must be procured and managed centrally; there's no need for an individual farmer to purchase or apply pesticides unless they have been trained.
- Pesticide application could have adverse negative impacts on human and livestock health as well as the environment. It's important to carefully scout for locust populations to ensure that spraying is targeted precisely at the locusts.
- Farmers recruited to aid management efforts must be trained on the safe use of specific pesticides designated for management and control of desert locusts.
- If spraying is happening in your area, inform your neighbours to stay away from targeted spraying location.
- Wait for the Pre-Harvest Interval (PHI) period to lapse before harvesting any crops in close proximity to areas that have been sprayed.
- Wait for few days before grazing your livestock on pastures that have been sprayed.
- Don't eat desert locusts after they've been sprayed with pesticides. Take precaution and prevent your

livestock from feeding on sprayed desert locusts as well.

- Use pesticides and formulations that are specifically recommended and registered for the management of desert locusts in your area. Follow the directions on the product label!
- Use the application method, equipment and personal protective equipment (PPEs) recommended for the product.
- Pesticides should be sprayed when adult desert locusts have settled on trees and also basking on the ground under appropriate weather conditions, (early morning and late afternoon are the best time to spray).
- Only use trained personnel to apply pesticides for locust management.



Spraying aircraft ©

# Myths and misconceptions

## Summary points

### 1. **Why are locust outbreaks serious one year and not another year? Is it an act of God? Is there a moral or religious reason?**

It's mainly because of the favouring weather and ecological conditions. For example in Eastern Africa, the period 2019-2020 had unusually heavy rains and an increased number of cyclones in the Indian Ocean that created perfect conditions for locusts to breed. Heavy rain triggers the growth of vegetation in the arid areas where desert locusts grow and reproduce. Also, there is insecurity in locust breeding areas, which has blocked aerial spraying in these places. As a result, locust numbers have increased and then dispersed as swarms to invade new areas.

### 2. **Can locusts hurt humans?**

Locusts do not attack people or animals directly. There is no evidence that suggests that locusts carry diseases that could harm humans.

### 3. **Are locusts safe to eat?**

Locusts are very rich in protein and are reported to have some health benefits. They can be eaten not only by humans but also formulated and fed to poultry, pigs, and other livestock as a source of protein. However, catching and eating locusts will not significantly affect their populations, but it can

contribute to a protein-rich diet. It is not advisable to eat desert locusts that have been sprayed because they may contain harmful pesticide residues.

#### **4. Are locusts a sign of good harvests?**

In some countries, farmers associate locust invasions with good harvest. This is because good weather and ecological conditions favour both desert locusts breeding and vegetation growth.

#### **5. Why do desert locusts cause minimal damage to crops in one area compared to other areas?**

This is largely due to the nature and types of crops in the affected areas rather than the areas themselves. For example, desert locusts also have choice of plants to feed on, and prefer areas with acacia shrubs rather than maize because of the acacia's soft leaves. They also prefer warm temperatures and therefore avoid cold highland areas. In addition to seeking food, locusts also move to areas that are warm and favourable for laying eggs and breeding.

#### **6. Can loud noises effectively control desert locusts?**

There are many traditional ways used by farmers to scare away locust swarms from their farms such as making loud noises, whistling, banging pots and pans, throwing stones and lighting fires. These actions may have no significant effect in controlling

locusts and only encourage big swarms to scatter into smaller swarms making it difficult for targeted pesticide application.

## **7. Desert locust outbreaks occur after every 10 to 20 years.**

There is no evidence that desert locust outbreaks occur after a specific number of years. Instead, outbreaks happen at irregular intervals. Historically, desert locust plagues have been reported since the Pharaonic times in ancient Egypt. The 2019-2020 outbreaks in East Africa come after plagues that occurred in 1986-1989, 1967-1969, 1949-1963, 1940-1948 and 1926-1934.

## Find out more

Whenever there is an emerging threat, such as an invasive outbreak, or a crisis that disrupts the flow of information to farmers, CABI looks to support communities by leveraging its specialised knowledge in agriculture and the environment.

We mobilize our extensive experience in research, knowledge sharing and providing online resources to make sure that people have timely access to relevant scientific information, enabling them to respond to the threat at hand.

Find out what CABI is doing together with partners to combat the desert locust

[www.cabi.org/what-we-do/locusts/](http://www.cabi.org/what-we-do/locusts/)

# Acknowledged partners



Plant Protection Services Division  
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Ministry of Agriculture, Livestock,  
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Kenya.



**DLCO-EA**

Desert Locust Control Organization - East Africa



University of Nairobi





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