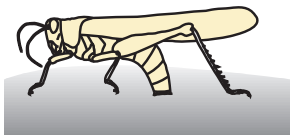
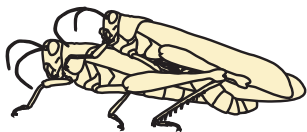




Food and Agriculture Organization  
of the United Nations



**Standard Operating Procedures (SOP)**  
**Desert Locust Biology and Behaviour**



# **Standard Operating Procedures (SOP)**

## **Desert Locust Biology and Behaviour**

Food and Agriculture Organization of the United Nations  
Rome, 2021

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# Standard Operating Procedures (SOP)

## Desert Locust Biology and Behaviour

### Objective

The objective of the Standard Operating Procedures (SOP) for Desert Locust Biology and Behaviour is to provide a concise overview of the basic information on the biology and behaviour of the Desert Locust. This SOP is intended for use by the field staff who are involved in survey and control operations. It may also be useful for senior managers and international partners. The material is based on the **FAO Desert Locust Guidelines** where more detailed information and references are available.

The following topics are covered:

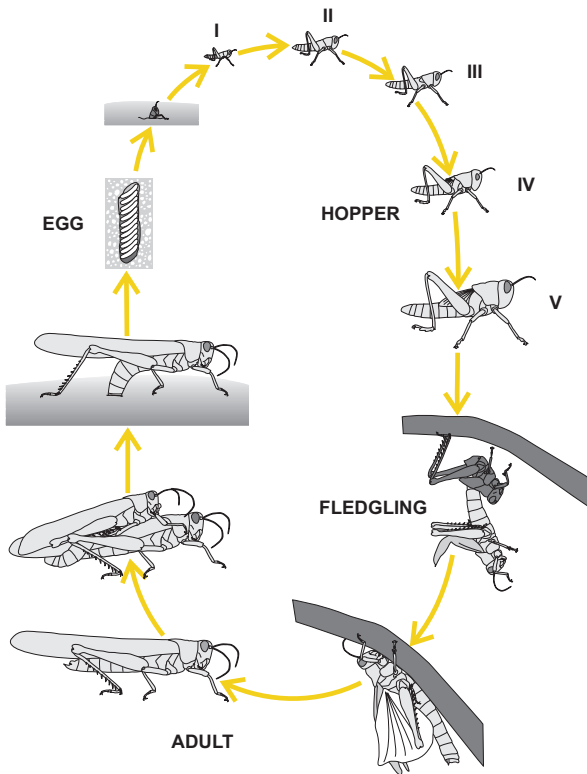
- lifecycle
- hopper and adult behaviour
- gregarization
- migration and breeding

## 1. Locust FAQs

- The Desert Locust is a member of the grasshopper family but it differs from grasshoppers in several ways
- Desert Locust change their behaviour and physiology, in particular the colour and shape, in response to changes in locust density caused by the environment and reproduction
- Adult locusts can form swarms that behave as a single, cohesive unit and can migrate up to 150 km in a day
- Non-flying nymphal or hopper stage can form bands, which are a mass of hoppers that persist and move as a cohesive unit up to 1.7 km in a day
- Two states (phases): *solitarious* and *gregarious* with a transition phase called *transiens*
- Locusts normally live about three months but they can live up to nine months in cooler and drier weather
- Locusts increase about 16–20 times with every new generation of breeding. This is an exponential increase, resulting in 20 times more locusts after three months, 400 times more after six months, 8 000 times more after nine months, and so on
- A 1 km<sup>2</sup> swarm contains 40–80 million adults and can eat the same amount of food in one day as 35 000 people
- Locust adults fly in the same direction of the wind up to about 2 000 m above ground



## 2. Lifecycle



## 2. Lifecycle

### Average development rates under normal conditions

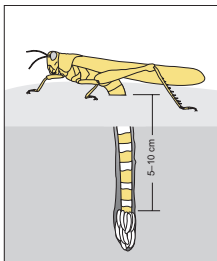
**EGG: 2 weeks**

**HOPPER: 6 weeks**

**ADULT: 4 weeks**

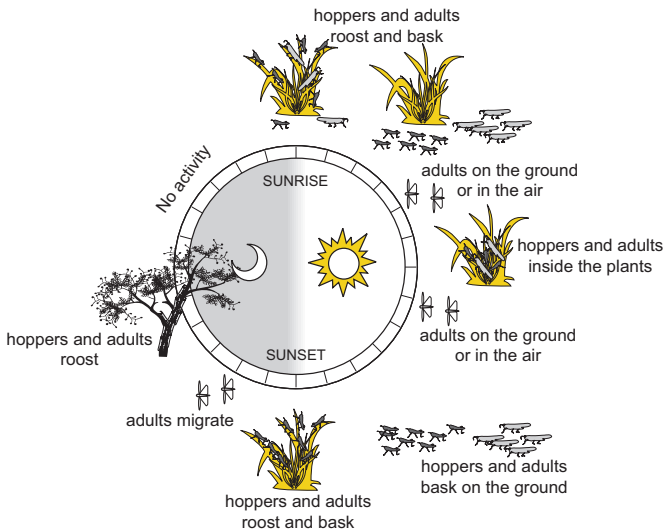
1. *Eggs*, laid by females, take about two weeks to hatch in warm weather but can hatch in 10 days when temperatures are high or take up to 65 days in low temperatures.
2. Eggs hatch into wingless larvae or nymphs called *hoppers*, which shed their skin (moult) 5–6 times, becoming bigger each time. Each moult takes about one week. Each hopper stage is called an *instar*.
3. The final moult from the wingless fifth (or sixth) instar to the winged adult is called *fledging*. The new adult (*fledgling*) has soft wings. It takes about ten days for the wings to harden so that sustained flight and long-distance migration are possible.
4. *Adults* do not moult or increase in size but they gradually increase in weight. Initially, they are sexually immature and remain so until they encounter conditions such as rainfall that stimulate maturation. The maturation period is highly variable, depending on habitat conditions, and it may involve migration to another area where more favourable conditions exist. Under optimal conditions, adult can mature and be ready to reproduce after about three weeks but this can be prolonged for up to nine months in cold, dry weather or unfavourable habitat conditions.

### 3. Egg laying



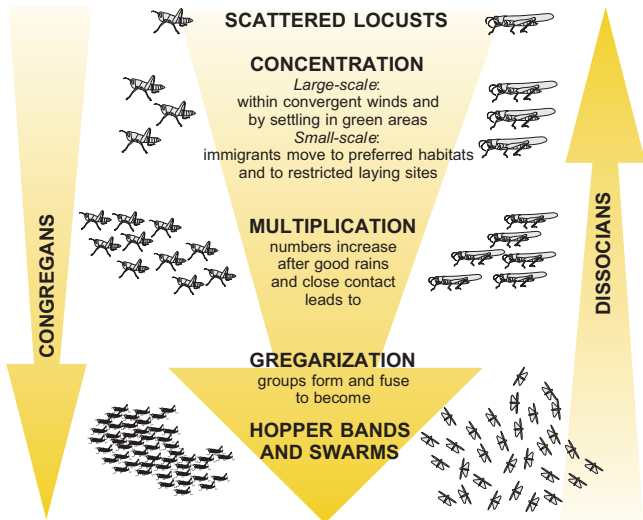
- Females lay eggs in batches (*egg pods*) usually in bare sandy soil about 5–10 cm below the surface. She will first probe the soil with her abdomen to check if the soil is moist.
- Females usually lay about 2–3 pods, each containing 90–160 eggs (solitarious phase) or 80 eggs (gregarious)
- The time between layings is about 6–11 days
- A solitarious female lays a total of about 400 eggs while a gregarious female lays about 140 eggs
- Egg mortality ranges from 5–65% due to predators, parasites, exposure, wind, floods and drought
- It can take 10–65 days for eggs to hatch; usually it takes about two weeks under normal conditions when the average temperature is about 32°C

## 4. Hoppers and adults



**Solitarious hoppers and adults are less active under cloudy skies or in the early hours of clear cold mornings. They may seek shelter inside vegetation during extremely hot days.**

## 5. Phase transformation



**Desert Locust are normally found as solitarious individuals. As their numbers increase from breeding, they cluster into dense groups and they become gregarious. It usually takes at least two generations of breeding before locusts are fully gregarious.**

## 5. Phase transformation

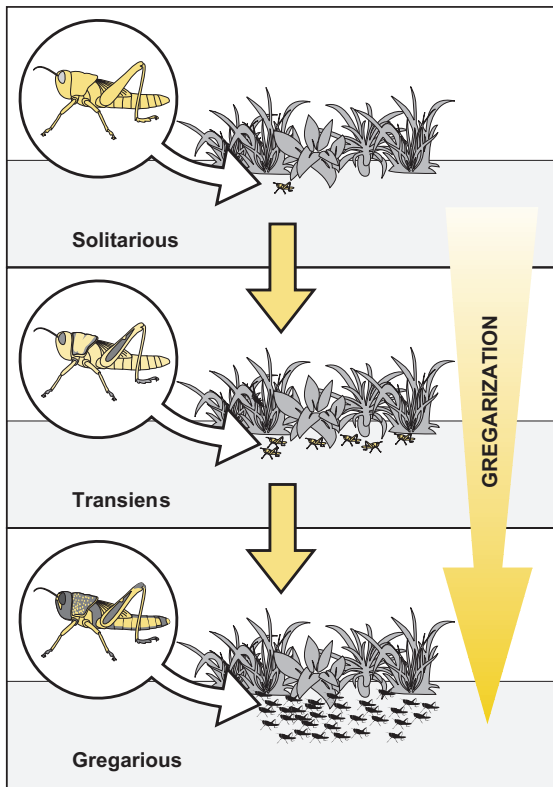
Locusts change their behaviour in response to the environment and numbers. Groups often form at the end of a breeding season when vegetation starts to dry out. This is an important indication that gregarization is under way.

	SOLITARIOUS	GREGARIOUS
Eggs per pod	90–160	80
Hatchling colour	clear	black
Hopper colour	green	yellow/black
Hopper instars	6	5
Hopper development	30–48 days	25–57 days
Band displacement	–	1–100 m/day
Immature adult colour	brownish	pinkish
Mature adult colour	brownish	yellow
Adult maturation	3–24 weeks	3–24 weeks
Adult flight	night-time	day

**The colour of locusts in the *transiens* phase is a mixture of solitary and gregarious colours:**

- **green hoppers with black markings**
- **immature brown adults with pinkish markings**
- **mature brown adults with yellow markings**

## 6. Hopper gregarization



## 7. Adult gregarization

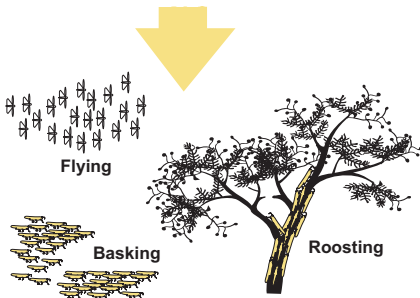
### Solitary



Light brown, sandy coloured



Drying vegetation  
concentrates locusts



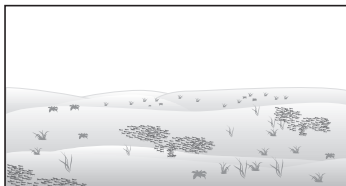
### Gregarious



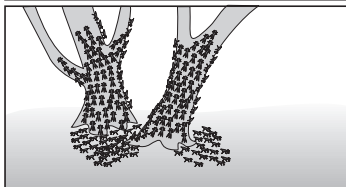
Reddish (immature)    yellowish (mature)



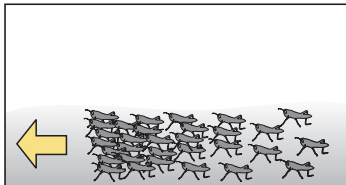
## 8. Hopper band behaviour



**1** Shortly after hatching, hoppers form small dense black patches

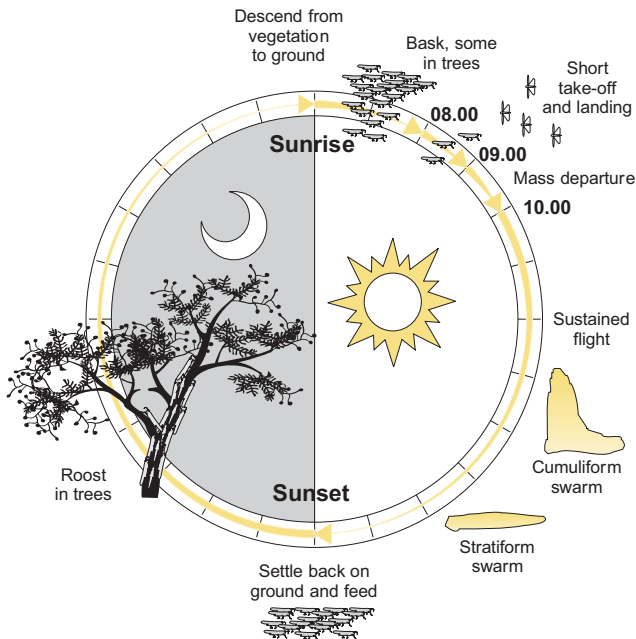


**2** These patches merge, forming larger bands

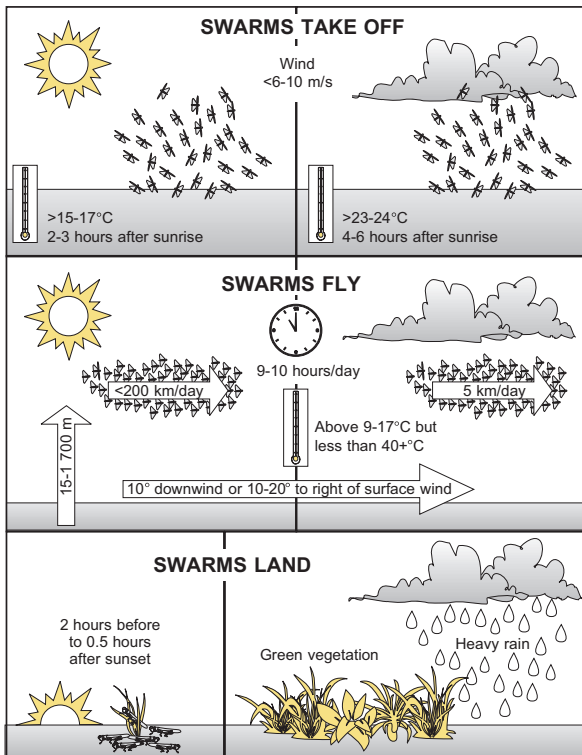


**3** Hoppers in bands move together in the same direction

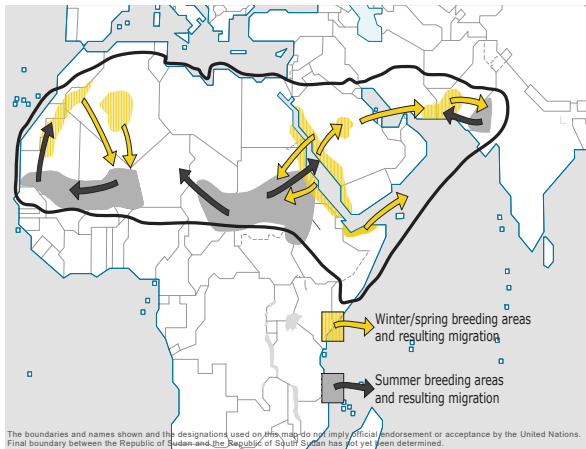
## 9. Swarm behaviour



## 10. Swarm flight



## 11. Migration and breeding



### Summer breeding (June/July – October)

- Sahel of West Africa to Eritrea; Yemen; Indo-Pakistan border

### Winter breeding (October/November – March)

- Red Sea and Gulf of Aden coastal plains

### Spring breeding (March/April – June)

- Interior of Arabian Peninsula; southeast Iran and southwest Pakistan; south of the Atlas Mountains





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