DESERT LOCUST FORECASTING MANUAL

edited by

D. Pedgley

Centre for Overseas Pest Research
London, W8 5SJ
UK

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MAPS OF FREQUENCIES OF DESERT LOCUST INCIDENCE

The following 24 maps show, for each calendar month, the number of years in which swarms and hopper bands were recorded during the 37-year period 1939-1975. Records are grouped into ‘squares’ of one degree latitude and one degree longitude, and colour shading has been used to aid recognition of areas where records were most frequent. For a discussion of the compilation and usefulness of these maps see Section 2.4.1.
Frequencies of Desert Locust incidence

SWARMS in JANUARY

Number of years in which swarms were recorded during the 37-year period 1939-1975

6-10 Years  11 Years or more

Prepared by Department of Overseas Surveys, 1977
Frequencies of Desert Locust incidence

Swarms in March

Number of years in which swarms were recorded during the 37-year period 1939-1975

- 6-10 Years
- 11 Years or more

Prepared by Directorate of Overseas Surveys 1977
Frequencies of Desert Locust incidence

SWARMS in APRIL

Number of years in which swarms were recorded during the 37-year period 1939-1975

0-10 Years

11 Years or more

Prepared by Directorate of Overseas Surveys 1977
Frequencies of Desert Locust incidence

SWARMS in MAY

Number of years in which swarms were recorded during the 37-year period 1939-1975

- 6-10 Years
- 11 Years or more

Prepared by Directorate of Overseas Scopes 1977
Frequencies of Desert Locust incidence

SWARMS in JUNE

Number of years in which swarms were recorded during the 37-year period 1939-1975

Prepared by Directorate of Overseas Surveys 1977
Frequencies of Desert Locust incidence

SWARMS in JULY

Number of years in which swarms were recorded during the 37-year period 1939-1975

- 6-10 Years
- 11 Years or more

Prepared by Directorate of Desert Survey 1977
Frequencies of Desert Locust incidence

SWARMS in AUGUST

Number of years in which swarms were recorded during the 37-year period 1939-1975

- 6-10 Years
- 11 Years or more

Prepared by Directorate of Overseas Surveys 1977
Frequencies of Desert Locust incidence

Swarms in SEPTEMBER

Number of years in which swarms were recorded during the 37-year period 1939-1975

- 6-10 Years
- 11 Years or more

Prepared by Directorate of Overseas Surveys 1977
Frequencies of Desert Locust incidence

SWARMS in OCTOBER
Number of years in which swarms were recorded during the 37-year period 1939-1975

6-10 Years
11 Years or more

Prepared by Director of Ordnance Surveys 1977
Frequencies of Desert Locust incidence

Swarms in NOVEMBER

Number of years in which swarms were recorded during the 37-year period 1939-1975

- 6-10 Years
- 11 Years or more

Prepared by Directorate of Overseas Surveys 1977
Frequencies of Desert Locust incidence

HOPPER BANDS in JANUARY

Number of years in which hopper bands were recorded during the 37 year period 1939-1975

- 6-10 Years
- 11 Years or more

Prepared by Directorate of Overseas Surveys 1977
Frequencies of Desert Locust incidence

HOPPER BANDS in FEBRUARY

Number of years in which hopper bands were recorded during the 37 year period 1939-1975

Prepared by Directorate of Overseas Surveys 1977
Frequencies of Desert Locust incidence

HOPPER BANDS in MARCH

Number of years in which hopper bands were recorded during the 37 year period 1939-1975

6-10 Years  11 Years or more

Prepared by Directorates of Overseas Surveys 1977
Frequencies of Desert Locust incidence

HOPPER BANDS in APRIL

Number of years in which hopper bands were recorded during the 37 year period 1939-1975

- Light grey: 6-10 Years
- Brown: 11 Years or more

Prepared by Directorate of Overseas Surveys 1977
Frequencies of Desert Locust incidence

HOPPER BANDS in MAY

Number of years in which hopper bands were recorded during the 37 year period 1939-1975

6-10 Years  11 Years or more

Prepared by Directorate of Overseas Surveys 1977
Frequencies of Desert Locust incidence

HOPPER BANDS in JUNE

Number of years in which hopper bands were recorded during the 37 year period 1939-1975

Prepared by Directorate of Overseas Surveys 1977
Frequencies of Desert Locust incidence

HOPPER BANDS in JULY

Number of years in which hopper bands were recorded during the 37 year period 1939-1975

6-10 Years
11 Years or more

Prepared by Directorate of Overseas Surveys 1977
Frequencies of Desert Locust incidence

HOPPER BANDS in AUGUST

Number of years in which hopper bands were recorded during the 37 year period 1939-1975

Prepared by Directorate of Overseas Surveys 1977
Frequencies of Desert Locust incidence

HOPPER BANDS in SEPTEMBER

Number of years in which hopper bands were recorded during the 37 year period 1939-1975

6-10 Years
11 Years or more

Prepared by Directorate of Overseas Surveys 1977
Frequencies of Desert Locust incidence

HOPPER BANDS in NOVEMBER

Number of years in which hopper bands were recorded during the 37 year period 1939-1975

- 6-10 Years
- 11 Years or more

Prepared by Directorate of Overseas Surveys 1977
Frequencies of Desert Locust incidence

**HOPPER BANDS in DECEMBER**

Number of years in which hopper bands were recorded during the 37 year period 1939-1975

- **6-10 Years**
- **11 Years or more**

Prepared by Directorate of Overseas Surveys 1977
MAPS TO ACCOMPANY THE SUMMARIES AND CASE STUDIES

Summaries and Case Studies are placed at the end of Part 2 of this Manual (see Volume I). Maps to accompany them are gathered here for ease of reference. Summary map reference numbers (1-19) are preceded by the letter S. Case Study map reference numbers (1-19) correspond to the Summaries and are preceded by the letter C. For example, Figs. C.2.1 to C.2.4 accompany Case Studies 2.1 to 2.4, and all four Case Studies refer to Summary 2.

Symbols used on Summary maps are explained on individual maps. Symbols used on Case Study maps are as follows.

*Locust maps*

- ▼ mature swarm
- ▼ immature swarm
- ▼ swarm of mixed maturity
- □ swarm of unspecified maturity
- ▼ locusts not in a swarm
- ■ locusts reported during stated period
- ○ before that being discussed

Other symbols are explained on individual maps. For some maps there may have been reports from the areas shown, but they are not relevant to the discussions in the Case Studies and they are therefore not shown (although their existence is mentioned in the text).

*Weather maps*

Plots at positions of weather observing stations show temperatures (°C) and winds (see Fig. 3.12 for international symbols). Analyses consist of:

- schematic streamlines, shown by bold arrows, representing the large-scale wind flow;
- isobars, shown by continuous lines at 2-mbar intervals, with centres of low and high pressure marked L and H (for a discussion of wind flow patterns and their relation to isobars see Section 3.3);
- atmospheric fronts (usually also windshift lines), shown by the following symbols

ITCZ refers to the Inter-tropical Convergence Zone, and RSCZ to the Red Sea Convergence Zone (see Section 3.3.4).
Fig. S1 (see opposite page)
Source areas of monsoon swarms
- Fledging in September 1950
- Fledging from September to November 1950
- Fledging in October and November 1950

Generalised limits and directions of spread
- October 1950
- November 1950
- December 1950

Fig. S1a-m. 1950 MONSOON AND 1951 EARLY SPRING GENERATIONS SWARMS IN THE EASTERN REGION

Figs. a,b,c,d,f,g,h,j,k and l show the monthly distribution of monsoon generations swarms by degree squares. Figs j,k and l also show swarms of the early spring generation.

Arrows on Figs e,i, and m show schematically the spread of swarms (see p 27).
Fig. S1 (see opposite page)
Fig. S1a-m. 1950 MONSOON AND 1951 EARLY SPRING GENERATIONS
SWARMS IN THE EASTERN REGION

Figs. a,b,c,d,f,g,h,j,k, and l show the monthly distribution of monsoon
generations swarms by degree squares. Figs j,k, and l also show
swarms of the early spring generation.

Arrows on Figs, e,i, and m show schematically the spread of swarms (see p 27)
Fig. S2 a-e, 1951 MONSOON GENERATION SWARMS IN THE EASTERN REGION

Figs. a, b, c, and d show the monthly distribution of swarms by degree squares. Arrows on Fig. e show schematically the spread of swarms (see p 27)
Fig. C2.1 NORTHWARD SPREAD OF IMMATURE SWARMS IN PAKISTAN, OCTOBER 1951

a Degree squares and dates of first swarm reports
1-19 October 1951
b beyond the limit of swarms
reported in September 1951, shown
Degree squares with fledging likely in the second
half of September and October

b Weather map for 18 October 1951 at 1200 GMT

Prepared by Directorate of Overseas Surveys 1975
Fig. C.2.2 EASTWARD SPREAD TO DELHI AND WESTERN UTTAR PRADESH, OCTOBER 1951

a Degree squares and dates of first swarm reports

20-25 October 1951

b Beyond the limit of swarms reported 1-19 October 1951, shown

b Degree squares with fledging likely in the second half of September and October

b Weather map for 22 October 1951 at 1200 GMT

Prepared by Directorate of Overseas Surveys 1979
Fig. C2.3 WESTWARD MOVEMENT OF SWARMS OUT OF THE MONSOON BREEDING AREA, 26 OCTOBER TO 4 NOVEMBER 1951

a Places and dates with locust reports (see p 27)
26 October - 4 November 1951
b beyond the limit of swarms reported 20-25 October 1951, shown

b Weather map for 28 October 1951 at 1200 GMT

Prepared by Directorate of Overseas Surveys 1979
Fig. C2.4 WESTWARD SPREAD INTO WESTERN PAKISTAN, LATE NOVEMBER AND DECEMBER 1951

a. Places and dates with locust reports. (see p. 27)

- 15 November - 10 December 1951
- beyond the limit of swarms reported 1-14 November 1951, shown

b. Weather map for 17 November 1951 at 1200 GMT

Prepared by Directorate of Overseas Surveys 1979

Places and dates with locust reports. (see p. 27)

- 15 November - 10 December 1951
- beyond the limit of swarms reported 1-14 November 1951, shown

Weather map for 17 November 1951 at 1200 GMT

Prepared by Directorate of Overseas Surveys 1979
SEPTEMBER 1952
Degree squares with records of swarms

OCTOBER 1952
Degree squares with records of swarms

Fledging from mid-August to mid-September 1952
Fledging from mid-September to mid-October 1952

Source areas of swarms

Generalised limits and directions of spread

Prepared by Directorate of Overseas Surveys 1979
Fig. S3 a-f, 1952 MONSOON GENERATION SWARMS IN THE EASTERN, NORTH CENTRAL AND SOUTH CENTRAL REGIONS, AND 1952 SUMMER GENERATION SWARMS IN THE NORTH CENTRAL REGION.

Figs a,b,d and e show the monthly distribution of swarms by degree squares. Over the Somali Peninsula they show 1952 Long Rains generation swarms on Figs a and b, and include 1952 Short Rains generation swarms in Figs d and c.

Arrows on Figs c and f show schematically the spread of swarms (see p 27)

Prepared by Directorate of Overseas Surveys 1979
Fig. S4 (see opposite page)
Fig. S4 a-k. 1960 MONSOON GENERATION SWARMS IN THE EASTERN REGION
Figs a, b, c, e, f, h, i, j and k show the monthly distribution of swarms by degree squares.
(Figs a and b show spring and first monsoon generations. Figs c and e show both
monsoon generations. Figs f, h, i, j and k show both monsoon generations and the
summer generation from the Central Region.) Arrows on Figs d and g show
schematically the spread of swarms (see p 27).
Fig. S4 a-k. 1960 Monsoon Generation Swarms in the Eastern Region

Figs a, b, c, e, f, h, i, j and k show the monthly distribution of swarms by degree squares. (Figs a and b show Spring and first monsoon generations. Figs c and e show both monsoon generations. Figs f, h, i, j and k show both monsoon generations and the summer generation from the Central Region.) Arrows on Figs d and g show schematically the spread of swarms (see p 27)

Prepared by Director of Overseas Surveys 1979
Fig. C4.1 EASTWARD SPREAD ACROSS INDIA, 8-17 SEPTEMBER 1960

a Degree squares and dates of first swarm reports
8-17 September 1960
beyond the eastern limit of swarm reports
in India before 8 September 1960, shown
Degree squares with fledging likely
in August and September

b Weather map for 14 September 1960 at 1200 GMT

Prepared by Directorate of Overseas Surveys 1979
a  Degree squares and dates of first swarm reports
18 September - 2 October 1960
beyond the limit of swarm reports
in India, 1 - 17 September 1960, shown
Degree squares with fledging
likely from August to October
b  Weather map for 18 September 1960 at 1200 GMT

Fig. C4.2 SOUTHWARD SPREAD ACROSS INDIA, LATE SEPTEMBER 1960

Prepared by Directorate of Overseas Surveys 1979
Fig. C4.3 SPREAD TO EASTERN INDIA, OCTOBER 1960

a Degree squares and dates of first swarm reports
3-8 October 1960
beyond the limit of swarm reports in India
during September and 1-2 October 1960, shown

b Weather map for 3 October 1960 at 1200 GMT

Prepared by Director of Overseas Surveys 1979
C Degree squares and dates of first swarm reports
9-26 October 1960
beyond the limit of swarm reports in India during September and 1-8 October 1960, shown
Degree squares with fledging likely in September and October

D Weather map for 12 October 1960 at 1200 GMT

Fig. C4.3 SPREAD TO EASTERN INDIA, OCTOBER 1960 (see opposite page)

Prepared by Directorate of Overseas Surveys 1979
Fig. C4.4 WESTWARD SPREAD TO THE MAKRAN, OCTOBER 1960

a Places and dates with locust reports (see p 27)

October 1960

b Weather map for 7 October 1960 at 1200 GMT

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Contour values are shown in metres

Prepared by Directorate of Overseas Surveys 1979
Fig. C4.5 WESTWARD SPREAD TO KHUZISTAN, NOVEMBER 1960

a Places and dates with locust reports (see p 27)
   21 November - 2 December 1960
   - Swarms reported 1-20 November

b Weather map for 18 November 1960 at 1200 GMT

Contour values are shown in metres
Source areas of swarms

August 1961

Fledging from August to October 1961

September 1961

October 1961

Generalised limits and directions of spread

Fledging from August to October 1961

Fig. S5 (see opposite page)
Fig. S5 a-l. 1961 MONSOON GENERATION SWARMS IN THE EASTERN REGION

Figs a,b,c,e,f,g,i,j, and k show the monthly distribution of swarms by degree squares. (Figs a and b show spring and first monsoon generations. Fig c shows both monsoon generations. Figs f,g,j,j, and k show both monsoon generations and the summer generation from the Central Region.) Arrows on Figs d,h, and l show schematically the spread of swarms (see p. 27).
Fig. S5 a-i. 1961 MONSOON GENERATION SWARMS IN THE EASTERN REGION

Figs a,b,c,e,f,g,i,j and k show the monthly distribution of swarms by degree squares. (Figs a and b show Spring and first monsoon generations. Fig c shows both monsoon generations. Figs f,g,i,j and k show both monsoon generations and the Summer generation from the Central Region.) Arrows on Figs d,h, and l show schematically the spread of swarms (see p 27).
a Places and dates with locust reports (see p 27)
26 August - 6 September 1961
beyond the limit of swarm
reports 1-25 August 1961, shown
Degree squares with fledging likely
in late August and September

b Weather map for 27 August 1961 at 1200 GMT

Fig. C5.1 WESTWARD SPREAD ACROSS PAKISTAN,
LATE AUGUST AND EARLY SEPTEMBER 1961

Prepared by Directorate of Overseas Surveys 1979
a Degree squares and dates of first swarm reports
24 August - 13 September 1961 beyond the limit of swarm reports 1-23 August 1961, shown

b Weather map for 10 September 1961 at 1200 GMT

Fig. C5.2 SOUTHWARD SPREAD TO GUJARAT, LATE AUGUST AND SEPTEMBER 1961
Fig. C5.3 WESTWARD SPREAD OF SECOND MONSOON GENERATION SWARMS INTO BALUCHISTAN, NOVEMBER 1961

a Degree squares and dates of first swarm reports 1-20 November 1961 beyond the limit of swarm reports 16-31 October 1961, shown
Degree squares with fledging likely in the second half of October and November

b Weather map for 4 November 1961 at 1200 GMT

SCALE (Approx)
Contour values are shown in metres

4 NOVEMBER 1961
1200 GMT
Degree squares and dates of first swarm reports
21-30 November 1961
beyond the limit of swarm
reports 1-20 November 1961, shown
Degree squares with fledging likely in the
second half of October and November

Weather map for 26 November 1961 at 1200 GMT

Fig. C5.4 MOVEMENT OF SECOND MONSOON GENERATION SWARMS
TO DELHI AND UTTAR PRADESH, NOVEMBER 1961
Fig. C5.5. NORTHWARD SPREAD TO AFGHANISTAN, DECEMBER 1961

a  Degree squares and dates of first swarm reports
b  Weather map for 24 December 1961 at 1200 GMT

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Prepared by Directorate of Overseas Surveys 1979
Fig. C5.6 EASTWARD SPREAD TO ASSAM, MARCH 1962

a  Degree squares and dates of first swarm reports
March 1962
beyond the limit of swarm reports
in India during February 1962, shown
b  Weather map for 23 March 1962 at 1200 GMT

SCREW (Approx)
Contour values are shown in metres

Prepared by Directorate of Overseas Surveys 1979
MARCH 1954
Degree squares with
records of monsoon
generation swarms

APRIL 1954
Degree squares with
records of monsoon
generation swarms

MAY 1954
Degree squares with
records of monsoon
generation swarms
Degree squares with
records of spring
generation swarms

Generalised limits and
directions of spread of
monsoon generation swarms

Source areas of swarms
- Fledging in March 1954
- Fledging in April and first half of May 1954

Generalised limits and
directions of spread of
spring generation swarms
- May 1954

Fig. S6 (see opposite page)
Fig. S6 a-j. 1953 MONSOON AND 1954 SPRING GENERATION SWARMS IN THE EASTERN REGION

Figs a, b, c, f, g, and h show the monthly distribution of swarms by degree squares. (Figs f, g, and h show mostly 1954 spring generation swarms.) Arrows on Figs d, e, i, and j show schematically the spread of swarms (see p 27)
Fig. C6.1 SWARMS ON THE KATHIAWAR COAST OF INDIA, JUNE 1954

a. Places and dates with locust reports. (see p. 27)
   15-30 June 1954
   Degree squares with fledging likely
   5-15 June 1954

b. Map of winds at 600m above the ground
   25 June 1954 at 0900 GMT

Prepared by Directorate of Overseas Surveys 1979
Fig. C6.2 EASTWARD SPREAD ACROSS INDIA, JUNE AND JULY 1954

a. Degree squares with swarms
   1-14 June 1954
   - Laying swarms
   - Other swarms

b. Weather map for 8 June 1954 at 1200 GMT

Contour values are shown in metres

Prepared by Directorate of Overseas Surveys 1979
Fig. C6.2 EASTWARD SPREAD ACROSS INDIA, JUNE AND JULY 1954

C Degree squares with swarms
15-19 June 1954
- Laying swarms
- Other swarms

Weather map for 18 June 1954 at 1200 GMT

Contour values are shown in metres

Prepared by Directorate of Overseas Surveys 1979
Fig. C6.2 EASTWARD SPREAD ACROSS INDIA, JUNE AND JULY 1954

- Degree squares with swarms 20-26 June 1954
- Degree squares with swarms 27-30 June 1954
- Laying swarms
- Other swarms

Weather map for 23 June 1954 at 1200 GMT

Contour values are shown in metres

Prepared by Directorate of Overseas Surveys 1979
Fig. S7 (see opposite page)
Fig. S7 a-f. 1950 SPRING GENERATION SWARMS IN THE EASTERN REGION

Figs a,b,c, and d show the monthly distribution of swarms by degree squares. Arrows on Figs e and f show schematically the spread of swarms (see p 27).

Prepared by Directorate of Overseas Surveys 1979
Fig. 88 a-e. 1961 SPRING GENERATION SWARMS IN THE EASTERN REGION

Figs a, b, c, and d show the monthly distribution of swarms by degree squares. Arrows on Fig e show schematically the spread of swarms. (see p 27)
Fig. C8.1 SWARMS IN PAKISTAN AND INDIA, LATE JUNE 1961

a Places and dates with locust reports
21-30 June 1961 (see p 27)
b Weather map for 23 June 1961 at 1200 GMT

Contour values are shown in metres

Prepared by Directorate of Overseas Surveys 1979
Fig. C8.2 SWARMS IN PAKISTAN AND INDIA, LATE JUNE AND JULY 1961

a Dates of first appearances in each quarter of a degree square
- 21 June – 7 July 1961
- 8-16 July 1961
- 17-31 July 1961

b Weather map for 4 July 1961 at 1200 GMT

c Weather map for 14 July 1961 at 1200 GMT
Fig. S9 a-n 1958 SUMMER GENERATION AND 1958-59 WINTER-SPRING GENERATION SWARMS IN THE NORTH CENTRAL AND EASTERN REGIONS

Figs. a, b, c, d, f, g, i, k, l and m show the monthly distribution of swarms by degree squares. Arrows on Figs. e, h, j and n show schematically the spread of swarms (see p. 27).
Fig. S9 (see opposite page)
Fig. S9 a-n 1958 SUMMER GENERATION AND 1958-59 WINTER-SPRING GENERATION SWARMS IN THE NORTH CENTRAL AND EASTERN REGIONS

Figs a, b, c, d, f, g, i, k, l and m show the monthly distribution of swarms by degree squares.
Arrows on Figs e, h, j and n show schematically the spread of swarms (see p 27)
Fig. S10 a-k. 1951-52 SHORT RAINS GENERATION IN THE NORTH CENTRAL, EASTERN AND SOUTH CENTRAL REGIONS.

Figs a,b,d,f,h,i and j show the monthly distribution of swarms by degree squares. Arrows on Figs c,e,g and k show schematically the spread of swarms. (see p 27)
Fig. S10 (see opposite page)
Fig. S10 a-k. 1951-52 SHORT RAINS GENERATION IN THE NORTH CENTRAL, EASTERN AND SOUTH CENTRAL REGIONS

Figs a,b,d,f,h,i and j show the monthly distribution of swarms by degree squares. Arrows on Figs c,e,g and k show schematically the spread of swarms (see p. 27).
Fig. S10 (see opposite page)
Degree squares and dates with locust reports
1-15 January 1952
First dates shown bold.
(see p 27)

Fig. C10.1 NORTHWESTWARD SPREAD OF SHORT RAINS GENERATION SWARMS, EARLY JANUARY 1952

Fig. C10.2 NORTHWARD CROSSING OF THE SOUTHERN RED SEA, LATE JANUARY 1952

Prepared by Directorate of Overseas Surveys 1979
Fig. C10.3 NORTHWARD SPREAD ACROSS ARABIA, EARLY FEBRUARY 1952

a  Degree squares and dates with locust reports  
   1-13 February 1952  
   First dates shown bold (see p 27)  

b  Weather map for 3 February 1952 at 1200 GMT  

c  Weather map for 6 February 1952 at 1200 GMT  

d  Weather map for 9 February 1952 at 1200 GMT  

Prepared by Directorate of Overseas Surveys 1979
6 FEBRUARY 1952
at 1200 GMT

9 FEBRUARY 1952
at 1200 GMT
Fig. C10.4 SPREAD TO KUWAIT, IRAQ AND IRAN, LATE FEBRUARY 1952

a Degree squares and dates with locust reports
14-29 February 1952
First dates shown bold (see p 27)
b Weather map for 22 February 1952 at 1200 GMT
Fig. C10.5 NORTHWARD SPREAD ACROSS THE MIDDLE EAST, LATE MARCH 1961

a Places and dates with locust reports
26-29 March 1961
beyond the limit shown (see p 27)

b Weather map for 28 March 1961 at 1200 GMT

Prepared by Directorate of Overseas Surveys 1979
Fig. C10.6 NORTHWARD SPREAD IN EGYPT AND SYRIA, EARLY APRIL 1961

a Places and dates with locust reports
   3-7 April 1961
   beyond the limit shown (see p 27)

b Weather map for 4 April 1961 at 1200 GMT
Fig. C10.7 NORTHWARD SPREAD ACROSS THE MIDDLE EAST, EARLY MARCH 1962

a Places and dates with locust reports
7-10 March 1962
beyond the limit shown (see p 27)

b Weather map for 8 March 1962 at 1200 GMT

Prepared by Directorate of Overseas Surveys 1979
Fig. C10.8 NORTHWESTWARD SPREAD TO SYRIA AND TURKEY, APRIL 1962

a  Places and dates with locust reports
   14-18 April 1962
   beyond the limit shown (see p 27)

b  Weather map for 15 April 1962 at 1200 GMT

Prepared by Directorate of Overseas Surveys 1979
Fig. C10.9 WESTWARD SPREAD IN SYRIA AND TURKEY, MAY 1962

a Places and dates with locust reports

1-5 May 1962

b Beyond the limit shown (see p 27)

b Weather map for 4 May 1962 at 1200 GMT

Prepared by Directorate of Overseas Surveys 1979
Fledging from last decade of April to July
Fledging from third decade of May to July
Fledging from May to August

Limits of recorded distribution of Short Rains swarms in April 1954
First and second decades of May with swarms in Arabian Peninsula

Prepared by Directorate of Overseas Surveys 1979

Fig. S11 (see opposite page)
Fig. S11a-h. 1953-54 SHORT RAINS AND 1954 SPRING GENERATIONS SWARMS IN THE SUMMER BREEDING AREAS OF THE WESTERN AND NORTH CENTRAL REGIONS.

Figs. a,b, and c show the monthly distribution of Short Rains generation swarms by degree squares. Figs. b,c,e,f, and g show spring generation swarms. Arrows on Figs. d and h show schematically the spread of swarms (see p 27).
Fig. C11.1 SWARMS IN NORTHERN ETHIOPIA, EARLY MAY 1954

a  Places and dates with locust reports (see p 27)
1–11 May 1954
Swarms reported 16–30 April 1954
(including some mature swarms inferred from presence of egg fields) shown thus:—
- Mature swarms
- Immature swarms

b  Weather map for 8 May 1954 at 1200 GMT

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Prepared by Directorate of Overseas Surveys 1979
Fig. C11.2 (see opposite page)
Fig. C11.2 INVASION OF EGYPT AND SUDAN MID-MAY 1954

a Places and dates with locust reports (see p 27)

12-19 May 1954
- Immature swarms reported 1-11 May 1954
- Mature swarms reported 1-11 May 1954

b Weather map for 14 May 1954 at 1200 GMT

c Weather map for 19 May 1954 at 1200 GMT

Prepared by Directorate of Overseas Surveys 1979
a Places and dates with locust reports (see p 27)
29–31 May 1954
west of swarms reported 20–28 May 1954
which are shown by
- Mature swarms
- Immature swarms

b Weather map for 29 May 1954 at 1200 GMT

Fig. C11.3 WESTWARD SPREAD INTO SUDAN, LIBYA, CHAD AND NIGER, MAY-JUNE 1954

Prepared by Directorate of Overseas Surveys 1979
Fig. C11.3 (Continued) WESTWARD SPREAD INTO SUDAN, LIBYA, CHAD AND NIGER, MAY - JUNE 1954

C Places and dates with locust reports (see p 27)
1-5 June 1954.
West of swarms reported 29-31 May 1954
which are shown by □

D Weather map for 1 June 1954 at 1200 GMT
Possible sources in West Africa

- Low-density breeding
- Breeding requiring control
- Fledging in May 1968 in Algerian Sahara
- Fledging in May-June 1968 in Morocco

Swarms

- Last decade of May 1968
- Fledging in May 1968
- Breeding requiring control
- Fledging in May-June 1968 in Morocco
  - First half
  - Dead locusts and droppings found
  - First half of July 1968; only those reported West of 24°E are shown.

Fig. C11.4 SWARMS IN WEST AFRICA, JUNE - JULY 1968

a Places and dates with locust reports
b Weather map for 17 June 1968 at 1200 GMT
Fig. C11.5 INVASION OF MAURITANIAN WESTERN SAHARA, MAURITANIA AND CENTRAL ALGERIA, JUNE 1954

a Places and dates with locust reports (see p 27)

1-22 June 1954.
- Young swarms reported in May 1954
- Breeding areas where fledging is estimated to have taken place from mid-May to 20 June 1954
- Breeding areas where fledging is estimated to have started in the third decade of June 1954

b Weather map for 3 June 1954 at 1200 GMT

Prepared by Directorate of Overseas Surveys 1979
Fig. C11.6 INVASION OF MALI, JUNE 1954

a  Places and dates with locust reports (see p 27)
1-19 June 1954

b  Weather map for 6 June at 1200 GMT

Contour values are shown in metres
Degree squares with records of swarms.

Source areas of swarms

- Fledging from mid March to early June 1955
- Fledging from mid April to early June 1955
- Fledging from late May to July 1955

Generalised limits and directions of spread

- Northern limits of swarm records in Ethiopia. April 1955
- May 1955

Fig. S12 a-d. 1955 SPRING AND 1954-55 SHORT RAINS GENERATIONS SWARMS IN THE NORTH CENTRAL AND WESTERN REGIONS

Figs. a,b, and d, show the monthly distribution of swarms by degree squares.

Fig. c, shows schematically the spread of swarms (see p 27)
SEPTEMBER 1954
Degree squares with records of swarms

OCTOBER 1954
Degree squares with records of swarms

Source area of swarms
Fledging from mid September until the end of October 1954

Generalised limits and directions of spread

15-30 September 1954
1-15 October 1954
16-31 October 1954

Fig. S13 (see opposite page)
Fig. S13 a-h. 1954 LONG RAINS AND SUMMER GENERATIONS SWARMS IN THE SOUTH CENTRAL REGION, OCTOBER 1954 TO JANUARY 1955

Figs a,b,d,e, and g show the monthly distribution of swarms by degree squares. Arrows on Figs c,f and h show schematically the spread of swarms (see p. 27)
a Places and dates with locust reports (see p 27)
1-16 October 1954.
Degree squares with summer breeding, and fledging likely by end of September

b Weather map for 10 October 1954 at 1200 GMT

Fig. C13.1 WESTWARD SPREAD ACROSS TANZANIA, OCTOBER 1954

Prepared by Directorate of Overseas Surveys 1979
Fig. C13.2 SWARMS IN UGANDA, ZAIRE AND SOUTHERN SUDAN, NOVEMBER 1954

a Places and dates with locust reports (see p 27)
1-10 November 1954.
West of swarms reported 26-31 October 1954, shown.
Degree squares with records of fledging probable in second half of October

b Places and dates with locust reports (see p 27)
11-20 November 1954.

C Weather map for 14 November 1954 at 1200 GMT

Prepared by Directorate of Overseas Surveys 1979
Fig. C13.3 SOUTHWARD SPREAD ACROSS ETHIOPIA AND SOMALIA, OCTOBER 1954

a Places and dates with locust reports (see p 27)
10-14 October 1954.
\[\text{Swarms reported 1-9 October}\]

b Weather map for 12 October 1954 at 1200 GMT

Prepared by Directorate of Overseas Surveys 1979
Fig. C13.4 INVASION OF KENYA, LATE OCTOBER 1954

a  Places and dates with locust reports (see p 27)
   26-31 October 1954
   ■ Swarms reported 21-25 October

b  Weather map for 25 October 1954 at 1200 GMT
Fig. C13.5 INVASION OF TANZANIA, EARLY NOVEMBER 1954

a Places and dates with locust reports (see p 27)
3-7 November 1954
- Swarms reported 29 October to 2 November

b Weather map for 4 November 1954 at 1200 GMT

Prepared by Directorate of Overseas Surveys 1979
Fig. S14 a-k. 1954-55 SHORT RAINS GENERATION SWARMS IN THE SOUTH CENTRAL REGION

Figs. a,b,d,f,g,i, and k show the monthly distribution of swarms by degree squares. From April 1955 they include swarms of the early 1955 spring generation, and in May they include swarms of the early Long Rains generation. Arrows on Figs. c,e,h, and j show schematically the spread of swarms (see p 27)
Fig. C14.1 SHORT RAINS GENERATION SWARMS IN SOUTH-CENTRAL REGION, LATE JANUARY 1955

a Places and dates with locust reports (see p 27)

26-31 January 1955

- Swarms reported 20-25 January 1955

b Weather map for 26 January 1955 at 1200 GMT

Prepared by Directorate of Overseas Surveys 1979
Fig. C14.2 SHORT RAINS GENERATION SWARMS IN ETHIOPIA AND SOMALIA, APRIL 1955

a Places and dates with locust reports (see p 27)
16-25 April 1955
- Swarms reported 1-15 April 1955

b Weather map for 20 April 1955 at 1200 GMT

Contour values are shown in metres
Fig. C14.3 SWARMS WEST OF LAKE VICTORIA, APRIL 1955

a. Places and dates with locust reports (see p 27)
   west of 32°E April 1955
   ■ Swarms reported east of 32°E 26 March-5 April 1955

b. Weather map for 4 April 1955 at 1200 GMT

Prepared by Directorate of Overseas Surveys 1979
Fig. C14.4 INVASION OF SOUTHERN SUDAN, MAY 1955

a Places and dates with locust reports (see p 27) south of 12°N 10-25 May 1955
- Swarms reported 26 April-15 May 1955

b Weather map for 14 May 1955 at 1200 GMT

Prepared by Directorate of Overseas Surveys 1979
Source areas of swarms
Fledging from end of November to end of December 1961
Fledging in January 1962
Fledging in February 1962

Generalised limits and directions of spread
December 1961
January 1962
February 1962

Fig. S15 a-f. 1961 SHORT RAINS GENERATION SWARMS IN THE SOUTH CENTRAL REGION
Figs a, b, c and e show the monthly distribution of swarms by degree squares. Fig e includes scattered locusts.
Arrows on Figs d and f show schematically the spread of swarms (see p 27)
Fig. S16 a-g. 1954 LONG RAINS GENERATION SWARMS IN THE SOUTH CENTRAL REGION, MAY TO SEPTEMBER 1954

Figs. a,b,c,e and f show the monthly distribution of swarms by degree squares. Arrows on Figs. d and g show schematically the spread of swarms (see p. 27).
Fig. C16.1 INVASION OF UGANDA, SEPTEMBER 1954

a  Places and dates with locust reports (see p 27)
   24-30 September 1954
   Degree squares with swarm reports 1-23 September

b  Weather map for 23 September 1954 at 1200 GMT

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SCALE (Approx)
Contour values are shown in metres
SUDA
SEP T EMBER 1954
Degree squares with records of swarms

OCTOBER 1954
Degree squares with records of swarms

NOVEMBER 1954
Degree squares with records of swarms

Source areas of swarms

Generalised limits and directions of spread

Fledging from last decade of August until end of September 1954
Fledging from first week of October until December 1954

Fig. S17 (see opposite page)
Fig. S17 a-n. 1954 SUMMER GENERATION SWARMS IN THE WESTERN REGION
Figs. a, b, c, e, f, h, i, k, and m show the monthly distribution of swarms by degree squares. Arrows on Figs. d, g, j and n show schematically the spread of swarms (see p 27).
Figs. a, b, c, e, f, h, i, k, l and m show the monthly distribution of swarms by degree squares. Arrows on Figs. d, g, j, and n show schematically the spread of swarms (see p 27).
Fig. S17 (see opposite page)
Fig. C17.1 INVASION OF SOUTHERN ALGERIA, LATE SEPTEMBER 1954

a Places and dates with Locust reports (see p 27)

1-28 September 1954

- Mature swarms reported during the second half of August 1954.
- Breeding areas where fledging is estimated to have begun by mid-September 1954.

b Weather map for 23 September 1954 at 1200 GMT

Contour values are shown in metres

Prepared by Directorate of Overseas Surveys 1979
Fig. C17.2 INVASION OF SOUTHERN MAURITANIAN WESTERN SAHARA AND WESTERN MAURITANIA, LATE SEPTEMBER 1954

a. Places and dates with locust reports (see p. 27)
   - September 1954
     - Breeding areas where fledging is estimated to have begun by the second half of August 1954

b. Weather map for 25 September 1954 at 1200 GMT

Prepared by Directorate of Overseas Surveys 1979
Fig. C17.3 IMMATURE SWARMS IN CHAD AND NIGERIA SOUTH OF THE SUMMER BREEDING AREAS, LATE SEPTEMBER TO EARLY OCTOBER 1954

a Places and dates with locust reports (see p 27)
30 September - 9 October 1954
south of the September swarms and of the summer breeding areas, shown

Immature swarms reported from 20-29 September 1954

b Weather map for 2 October 1954 at 1200 GMT

Contour values are shown in metres

Prepared by Directorate of Overseas Surveys 1979
Fig. C17.4 NORTHWARD SPREAD OF IMMATURE SWARMS IN ALGERIA AND LIBYA, MID-OCTOBER 1954.

a Places and dates with locust reports (see p 27)
   10-14 October 1954
   outside the breeding areas where fledging is estimated to have begun
   by the first week of October 1954
   Immature swarms reported in the second half of September and the first ten days of October 1954

b Weather map for 10 October 1954 at 1200 GMT

Contour values are shown in metres

Prepared by Directorate of Overseas Surveys 1979
Fig. C17.5 INVASION OF CANARY ISLANDS AND MOROCCO, MID-OCTOBER 1954

a Places and dates with locust reports (see p 27)
13-16 October 1954.
- Summer generation swarms reported 1-12 October 1954.

b Weather map for 15 October 1954 at 1200 GMT
Fig. C17.6 INVASION OF EGYPT, MID-NOVEMBER 1954

a  Places and dates with locust reports (see p 27)
   1-19 November 1954

b  Weather map for 17 November 1954 at 1200 GMT

Contour values are shown in metres

Prepared by Directorate of Overseas Surveys 1979
Fig. C17.7 INVASION OF NORTH-WESTERN EGYPT, MID-JANUARY 1955

a  Places and dates with locust reports (see p 27)
   17-29 January 1955
   Swarms reported during the last week of December 1954 and up to 16 January 1955

b  Weather map for 8 January 1955 at 1200 GMT

Prepared by Directorate of Overseas Surveys 1979
**Fig. C17.8 INVASION OF TUNISIA AND CENTRAL ALGERIA, LATE JANUARY TO EARLY FEBRUARY 1955**

- **a** Places and dates with locust reports (see p 27)
  - 30 January - 4 February 1955
  - east and south of swarms reported 20-29 January 1955 shown thus

- **b** Weather map for 31 January 1955 at 1200 GMT

Prepared by Directorate of Overseas Surveys 1979
Fig. C17.9 INVASION OF GUINEA, LATE FEBRUARY 1955

a Places and dates with locust reports (see p 27) February 1955

b Weather map for 22 February 1955 at 1200 GMT

Contour values are shown in metres

Prepared by Directorate of Overseas Surveys 1979
Fig. C17.10 INVASION OF SOUTHERN MALI, EARLY APRIL 1955

a  Places and dates with locust reports (see p 27)
   early April 1955
   east of swarms reported in March
   Swarms reported during the second
   half of March 1955

b  Weather map for 2 April 1955 at 1200 GMT

Contour values are shown in metres
Fig. S18 (see opposite page)
Figs. S18 a-I. 1958 SUMMER GENERATION SWARMS IN THE WESTERN REGION

Figs. a,b,c,d,f,g,h,j, and k show the monthly distribution of swarms by degree squares.
Arrows on Figs. e,i and l show schematically the spread of swarms (see p 27)
FEBRUARY 1959

Degree squares with records of swarms

MARCH 1959

Degree squares with records of swarms

Generalised limits and directions of spread

Limits of recorded distribution of swarms in the second half of December 1958

February and/or March 1959

Fig. S18 (see opposite page)
Fig. S18 a-l. 1958 SUMMER GENERATION SWARMS IN THE WESTERN REGION

Figs a,b,c,d,f,g,h,j, and k show the monthly distribution of swarms by degree squares. Arrows on Figs. e,i and l show schematically the spread of swarms (see p 27)

Prepared by Directorate of Overseas Surveys 1973
Source areas of swarms

- Fledging in March and first half of April 1955
- Fledging in second half of April 1955
- Fledging in May 1955

Generalised limits and directions of spread

- April 1955
- May 1955

Degree squares with records of swarms from all sources

Fig. S19 (see opposite page)
Fig. S19 a-i. 1954 SPRING GENERATION SWARMS IN THE WESTERN REGION

Figs a,b,c,e, and h show the monthly distribution of swarms by degree squares. Arrows on Figs d,g, and i show schematically the spread of swarms (see p 27)
Fig. C19.1 IMMATURE SWARMS IN THE ALGERIAN SAHARA, APRIL 1955

a Places and dates with locust reports (see p 27)
16-26 April 1955
- Swarms reported 1-15 April 1955
- Southern limit of mature swarms on 15 April 1955
- Degree squares with fledging March to mid-April 1955

b Weather map for 17 April 1955 at 1200 GMT

c Weather map for 24 April 1955 at 1200 GMT

Prepared by Directorate of Overseas Surveys 1970