

A detailed analysis of a Desert Locust Upsurge in Saudi Arabia (Nov 1996 - May 1997)

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Introduction

In the Central Region of the distribution area of the Desert Locust, small scale control operations were in progress in Oman and Saudi Arabia against infestations produced during the spring of 1996. In May, hoppers and immature adults on the Batinah Coast in northern Oman began to gregarize as vegetation dried out. Ground and aerial teams treated 4000 ha. In Saudi Arabia, ground teams treated 500 ha of scattered adults near Qunfidah on the Tihama in May and June. This left only low numbers of locusts present in the Region. A cyclone then brought widespread rain to Oman and Yemen in June which was followed by heavy rains over the northern Red Sea in November. This initiated a regional upsurge which affected countries bordering the Red Sea. Desert Locust infestations were primarily concentrated in Saudi Arabia and to a lesser extent in Egypt, Eritrea, Ethiopia, northern Somalia, Sudan, and Yemen. Swarms from this upsurge spread to Sudan in May 1997 which led to the continuation of the upsurge. Large-scale control operations were undertaken in Saudi Arabia in 1997 and 1998 which are thought to have contributed significantly to the end of the upsurge by summer 1998.

This paper presents an in-depth analysis of the situation and operations carried out in Saudi Arabia in the early stages of the upsurge from November 1996 to June 1997.

[see overview maps:](#)

[May - Nov 96](#)

[Nov - May 97](#)

[Jun - Oct 97](#)

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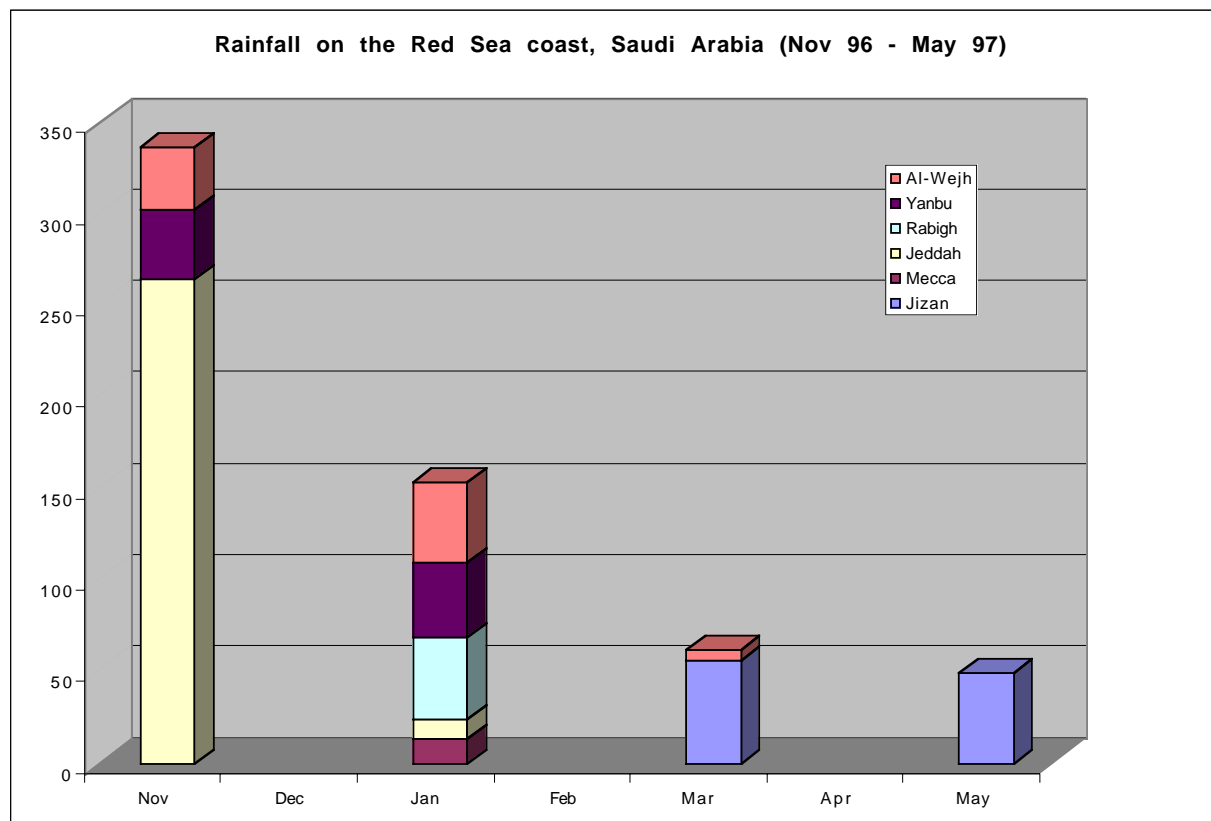
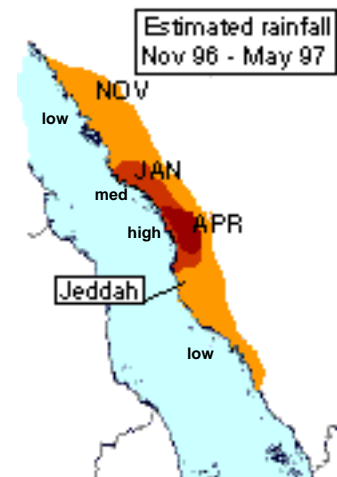
[assessments](#)



Weather

Light to moderate rains fell over a widespread area of the Red Sea coast from 15-25 November 1996. These rains were associated with an unusually strong and persistent depression over the northern Red Sea. Rains were reported on the coast from Al-Lith to Khulais but are thought to have extended to Al-Wajh. Widespread light to moderate rains fell again in mid January on the coast north of Jeddah to Yanbu. Rains fell again in mid April. In general, rainfall on the coastal plains during the winter of 1996 and spring and 1997 was above average north of Jeddah and below average to the south.

Daily average temperatures were lower than normal along the entire length of the Red Sea coast, allowing vegetation to remain greener than in hotter and drier years. By late May, temperatures were rapidly increasing.



Locust infestations

NOVEMBER 1996. Solitary adults were first reported on the Red Sea coastal plains in November 1996. The origin of these adults is thought to be from those escaping control operations against hopper bands and adult groups in the interior of Yemen during the autumn. Most of the adults were probably drawn into the Red Sea Trench on southerly winds associated with a strong and persistent depression over the northern Red Sea in mid November 1996. The majority of these landed on the coastal plains of Saudi Arabia and probably dispersed over a wide area from Al-Lith in the south to Al-Wajh in the north, making it difficult to find them.

JANUARY 1997. Small scale breeding first occurred shortly after the rains, primarily near Al-Lith and Badr, producing a new generation of solitary adults that appeared from late January onwards. Densities were still relatively low, mostly from 1-3 per ha with a few locations reporting up to 100 per ha.

In mid January, widespread light to moderate rains fell on the coast north of Jeddah. Adults may have concentrated in this area over the next few weeks, increasing in density to nearly 1-2 adults per m² (10,000/ha) which was probably enough to induce a partial phase change from solitarians to transiens. Laying occurred by solitary adults in the Khulais and Badr areas shortly after the rains.

FEBRUARY-MARCH. Heavier laying by solitary adults and groups of transiens occurred in late February in Al-Lith, Usfan-Tuwwal, Khulais, Rabigh, and during the first half of March in Usfan-Tuwwal, Masturah, Badr, Yanbu, and Umm Lajj. Breeding during the latter period was supplemented by low density mature swarms reportedly coming from the western shore of the Red Sea on 8-15 March. The swarms were estimated to vary in size from 5-50 km² with densities of 5-20 adults/m² and laid upon arrival. Other laying adult densities were estimated to be about 2-5/m². Consequently, locust numbers rapidly increased during this period.

MARCH-APRIL. High density hatching commenced about mid March and increased over the next few weeks in all areas. This led to large numbers of hoppers and, in some cases, grouping and small band formation during April. By the end of April, hoppers were fledging and new adults started to appear.

Another period of laying occurred in early April which was primarily concentrated on the northern coast near Yanbu, Umm Lajj and Al-Wajh as well as further south near Khulais. This was probably associated with late maturing adults of the incoming swarms combined with adults produced locally earlier in the year. Those in the north were not reported by locals who collect them for selling. Densities of laying adult groups were probably higher in northern areas than near Khulais and estimated to be about 5-20/m². Hatching occurred in late April and new adults started to appear by late May. Fourth and fifth instar gregarious hopper groups were present near Al-Wajh on 28 May at densities up to 50 per m².

MAY. By early May, vegetation was rapidly becoming dry on the coastal plains. As a result, immature adults were concentrating in the few remaining green areas along the base of the foothills. Some adults had moved up the valleys of the foothills east of Khulais and Al-Wajh.

JUNE. As a result of the control operations of the previous months, only small adult infestations were present. In response to the dry conditions and high temperatures, these migrated off the coastal plains west towards the interior of Sudan. A few of these also moved east towards the interior of Arabia.



Details of Desert Locusts in Saudi Arabia by region

(Nov 1996 - May 1997)

[*assessment of reports are in italics*]

Red Sea coast

Al-Lith

Solitary fledglings were reported on 23 January.

The first breeding of the season probably followed the heavy rains in mid November with laying in late November, hatching in mid December and fledging from the last week of January onwards. The source of the adults that laid is thought to be produced from autumn 1996 breeding in the interior of Yemen.

Adults groups were seen copulating on 17 February. Solitary first and second instar hoppers were treated during the first half of April.

Groups of adults laid in late February with subsequent hatching from mid March and fledging from mid April onwards.

Usfan - Tuwaal

A few mature swarms (8-18 sq. km in size) were seen coming from the west on 8 March, settling and copulating. High numbers of fourth and fifth instar hopper groups were moving from the Usfan Hills and crossing the Tuwwal-Jeddah expressway on 8 April. At the end of the month, a one sq. km high density (200-500 adults/m²) was sprayed.

Laying probably occurred from the last week of February to the first week of March (supplemented by in-coming adults) with subsequent hatching during the second half of March and fledging during the last half of April. Most of the laying was near the Usfan Hills with hoppers moving out onto the Tuwwal plains.

Khulais

Gregarious hatching was first reported on 13 March at the same time when fledglings were present.

Solitary laying first occurred around the third week of January with hatching by mid February and fledging during the second half of March. A second laying which was heavier occurred during the fourth week of February with high density hatching about mid March and fledging in mid April.

A "swarm" of yellow adults mixed with solitary adults appeared on 1 April at a time when control operations were in progress against solitary hoppers.

Another heavy laying by adult groups or "swarms" occurred during the first week of April with subsequent hatching about the last week of the month and fledging during the last week of May.

Rabigh

Copulating and laying was reported during the second half of February.

Laying occurred in late February with hatching the first half of March and fledging during the first half of April.

On 26 May, teams said that the last hoppers seen were about 15-20 days ago.

Laying probably occurred around mid March with hatching during the first part of April and fledging from early May onwards.

Masturah

Solitary hoppers were seen up to 29 April and from then only fledglings and immature adults. Control operations were closed on 23 May.

Solitary laying occurred in early March with hatching by the end of the month and fledging from the end of April onwards. During May, immature adults were present on the Masturah plains and supplemented by others from surrounding areas.

Badr

Solitary third to fifth instar hoppers were reported on 21 January.

The first breeding of the season probably followed the heavy rains in mid November with laying from late November to late December, hatching in late December and early January and fledging from late January to mid February. The source of the adults that laid is thought to be produced from autumn 1996 breeding in the interior of Yemen.

Groups of adults appeared and laid on 11 March when solitary fourth and fifth instar hoppers and fledglings were present.

Laying by solitary adults probably occurred during the last week of January and first week of February with hatching in mid February and fledging in mid March. Laying occurred again but at higher densities during the second week of March with hatching during the last week of the month and fledging from late April onwards.

Yanbu

Laying groups were reported in mid March. Control operations treated 4,150 ha of first to third instar hoppers during the first half of April.

Groups of adults laid during the second week of March with subsequent hatching during the third week of the month and fledging by late April.

Groups of solitary and transiens adults were seen laying on 11 April in Wadi Fagir.

A second laying by high numbers of solitary and transiens adults occurred about one month after the first in Wadi Fagir, with hatching in late April and fledging by the end of May.

Umm Lajj

Laying groups were reported on 11 March north and south of Umm Lajj.

Groups of adults laid in early May which hatched during the last week of the month and fledged by the end of April.

Fifth instar solitary and transiens hoppers and fledglings were seen on 28 May.

Another laying occurred in early April which produced solitary and transiens hoppers that hatched by the end of the month and fledged in late May.

Al-Wajh

Groups of transiens and gregarious fourth and fifth instar hoppers and fledglings were seen on the highway and in adjacent vegetation on 28 May.

Laying occurred during the first three weeks of April by swarms that were not reported by locals who instead collected the adults to sell. Subsequent hatching occurred from mid April to early May and fledging after mid May.

Duba

No locusts seen during surveys on 8-26 April and on 28 May.

Breeding does not appear to have occurred in Duba. Immature adults from adjacent areas appeared near Duba during May.

Red Sea Hills (subcoastal areas)

Taif (mountains east of Jeddah)

Solitary immature adults were reported during May.

These almost certainly were produced during breeding on the Red Sea coast during March and April and have started moving east as a result of drying conditions on the coast.

Interior

Hail

Isolated solitary adults were first reported from the Hail region on 18 April and again at high densities on 3 May.

This suggests that some adults produced from the breeding on the Red Sea coast have started moving off the drying coastal plains towards the interior probably during periods of westerly winds.

Unconfirmed report of locusts west of Riyadh on 31 May.

Again, if confirmed, this is a clear indication of adult movement eastwards from the Red Sea coastal plains perhaps on westerly winds on 30-31 May or earlier.

Control operations

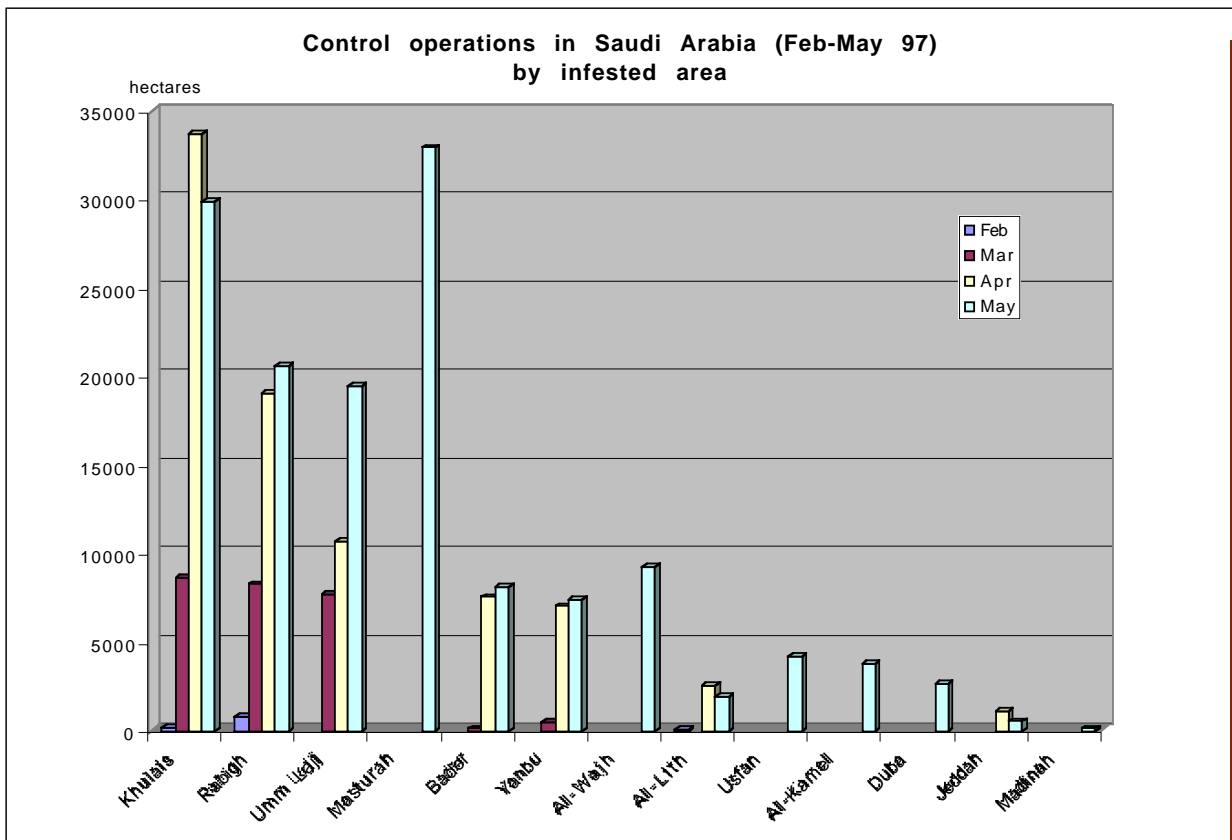
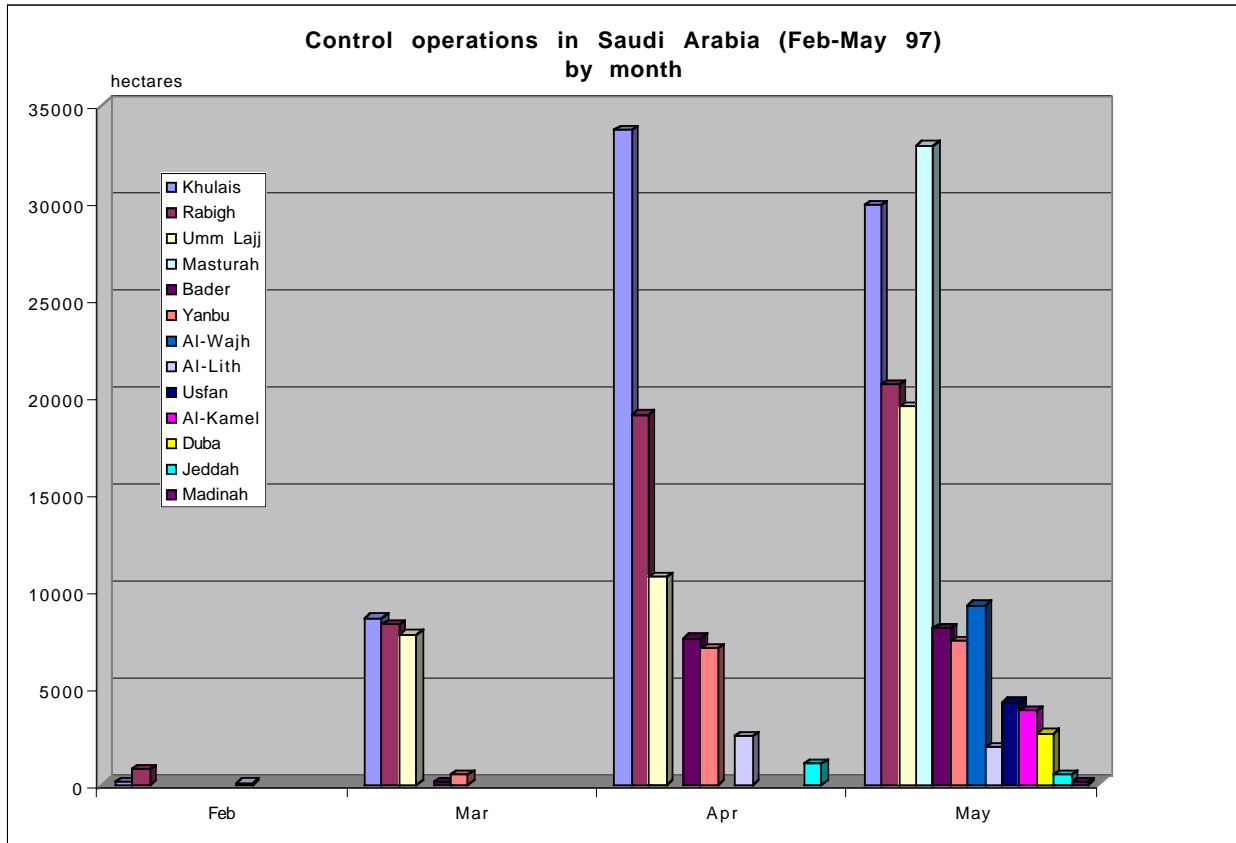
Ground control operations were initiated in mid February against mature adult groups at Al-Lith, Khulais and Rabigh, treating a total of 1,000 ha. During March, operations were extended to all other areas along the Red Sea coastal plains, supplemented by one helicopter. More than 25,000 ha of laying adults, hopper groups, bands and fledglings were sprayed, including incoming swarms. During April, two fixed-wing aircraft joined the on-going operations and more than 81,000 ha of hopper bands and immature adults were treated. During May, an additional fixed-wing aircraft was added and 140,000 ha of mostly immature adults and some hopper bands were treated. By the end of the campaign, more than 340,000 litres of pesticide was applied by more than 70 ground teams and four aircraft from February to early June.

[see overview maps:](#)

[by month](#)

[by area](#)





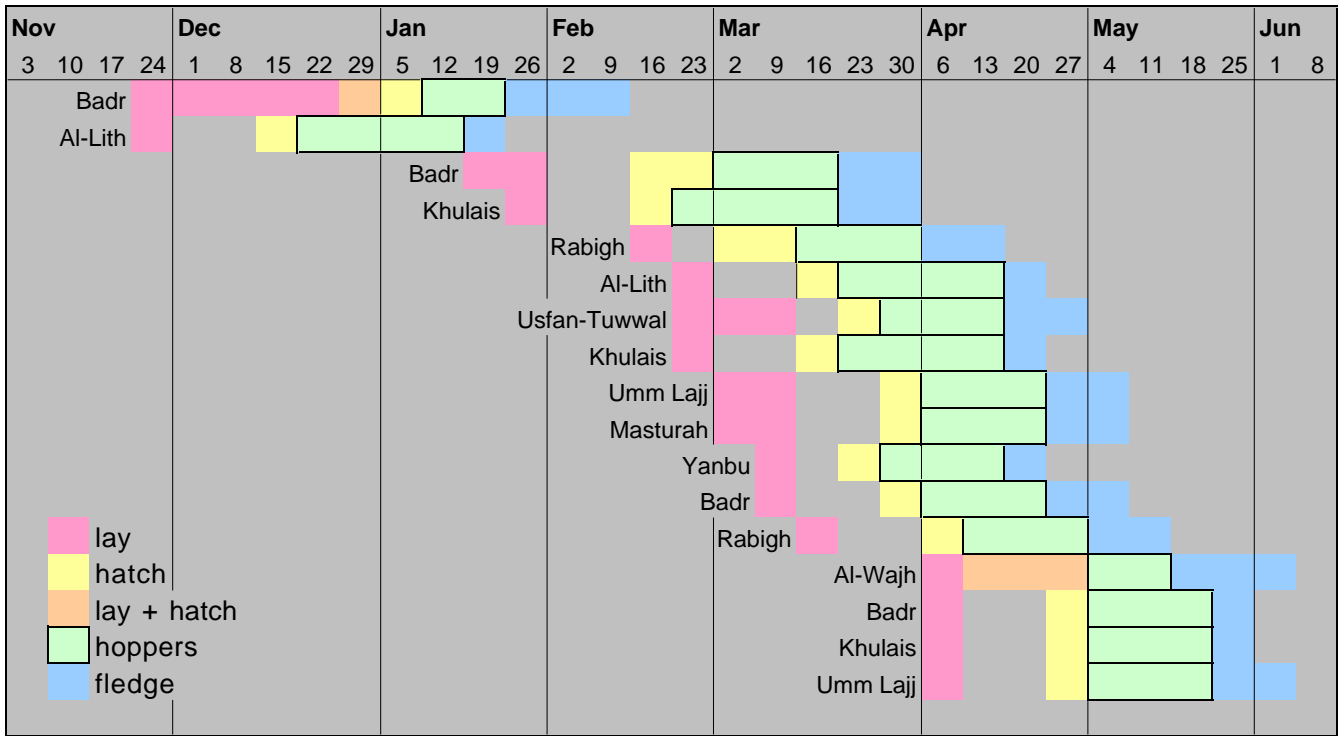
Assessment

The 1996/97 winter period was a classic example of Desert Locust upsurge: as a result of several successive falls of rain, good breeding conditions persisted for nearly six months which led to a dramatic increase of locust numbers on the northern Red Sea coastal plains of Saudi Arabia. The most rapid surge occurred during March and April which corresponded to a second (and heavier) generation of breeding and reports of incoming mature swarms from Sudan. Infestations were present from March onwards at hundreds of locations, extending along the coast for about 900 km. Average infestation levels (the percent of green vegetation in which locusts are present) were about 8% but varied from 1-30%. The initial build-up of locust numbers was missed during the first four months (November - March) because adults were scattered along the coastal plains and foothills and often were not reported by locals. It is not only extremely difficult to accurately monitor the entire area but impossible to treat such low densities of locusts scattered over such a large area. First generation breeding occurred over a long period of time and was not well synchronized which led to different sizes and types of populations. This was compounded by large expanses of green vegetation which encouraged a general increase in locust numbers rather than concentrate the infestations. Hence, good control targets in which high numbers of locusts could be treated in small concentrated areas did not really exist until the end of the season when vegetation began to dry up. This was after several periods of breeding had occurred.

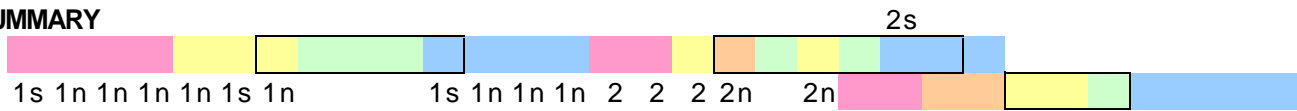
By the end of May, some of those adults that escaped control or could not be treated moved off the coastal plains into the foothills and the larger valleys just beyond the first range of hills east of Al-Wajh, Yanbu (W. Fagir) and Khulais. Only low numbers of solitary immature and maturing adults persisted in the few areas of green annual vegetation (*Panicum* and *Diptergium* sp.) and perennials (*Acacia* sp. bushes and trees) in low-lying areas and wadis on the plains. There were a few areas where groups of late instar hoppers were present, most notably north and east of Al-Wajh. Operations continued near Khulais, Rabigh and Al-Wajh. However, aerial and ground control operations steadily declined and teams were reduced in all areas and by mid June, the campaign had come to an end.

The LCC mobilised its resources which peaked in late April with more than 70 ground teams, four aircraft and 340,000 litres of pesticide. Given the difficult circumstances, the LCC significantly reduced the level of infestations. Only a few small swarms and adult groups mixed with solitarious adults migrated from the coastal plains to the west and east during May and early June. Consequently, the campaign was able to prevent the formation of large swarms that could have threatened adjacent countries and extend the upsurge to other regions.

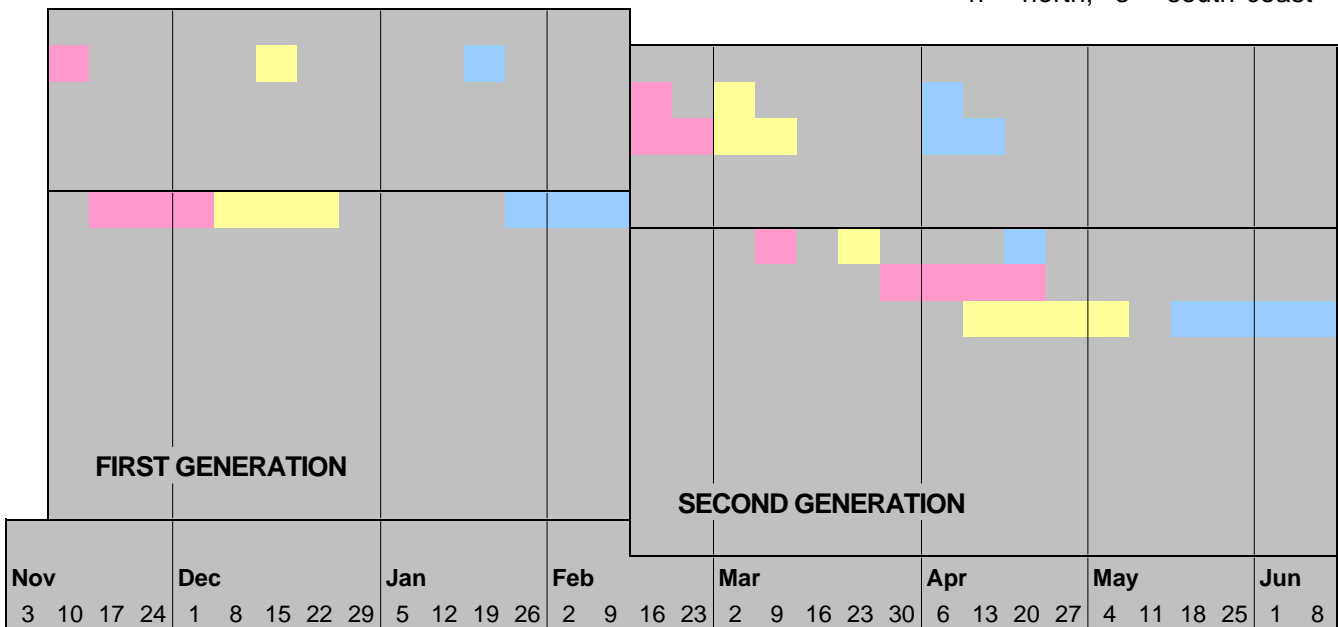
CALENDAR OF BREEDING ON THE RED SEA COAST, SAUDI ARABIA (NOV 96 - JUN 97)



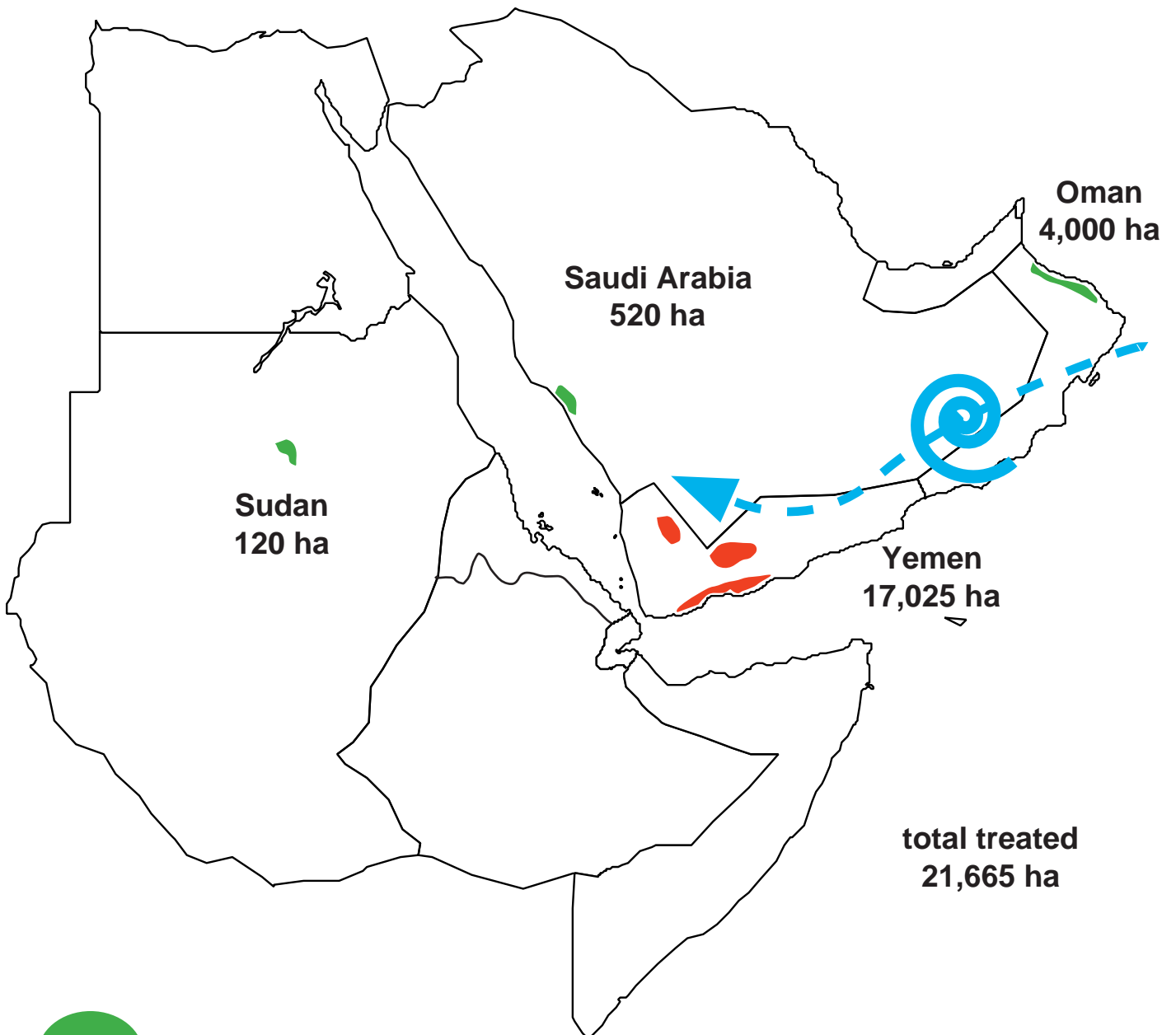
SUMMARY



n = north; s = south coast



May - November 1996



1996 spring breeding (May-June)

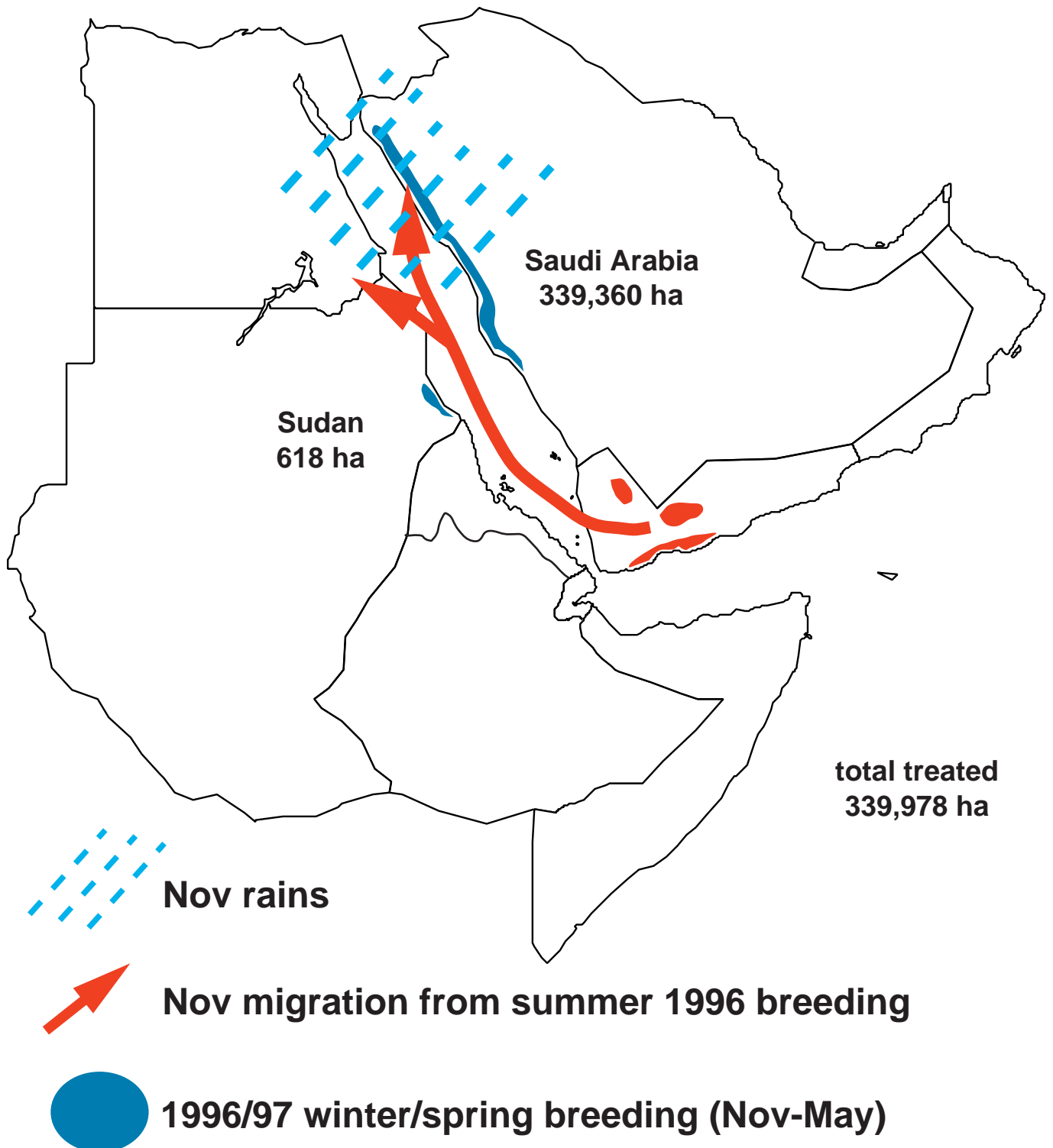


June cyclone (initiated '96-'98 upsurge)

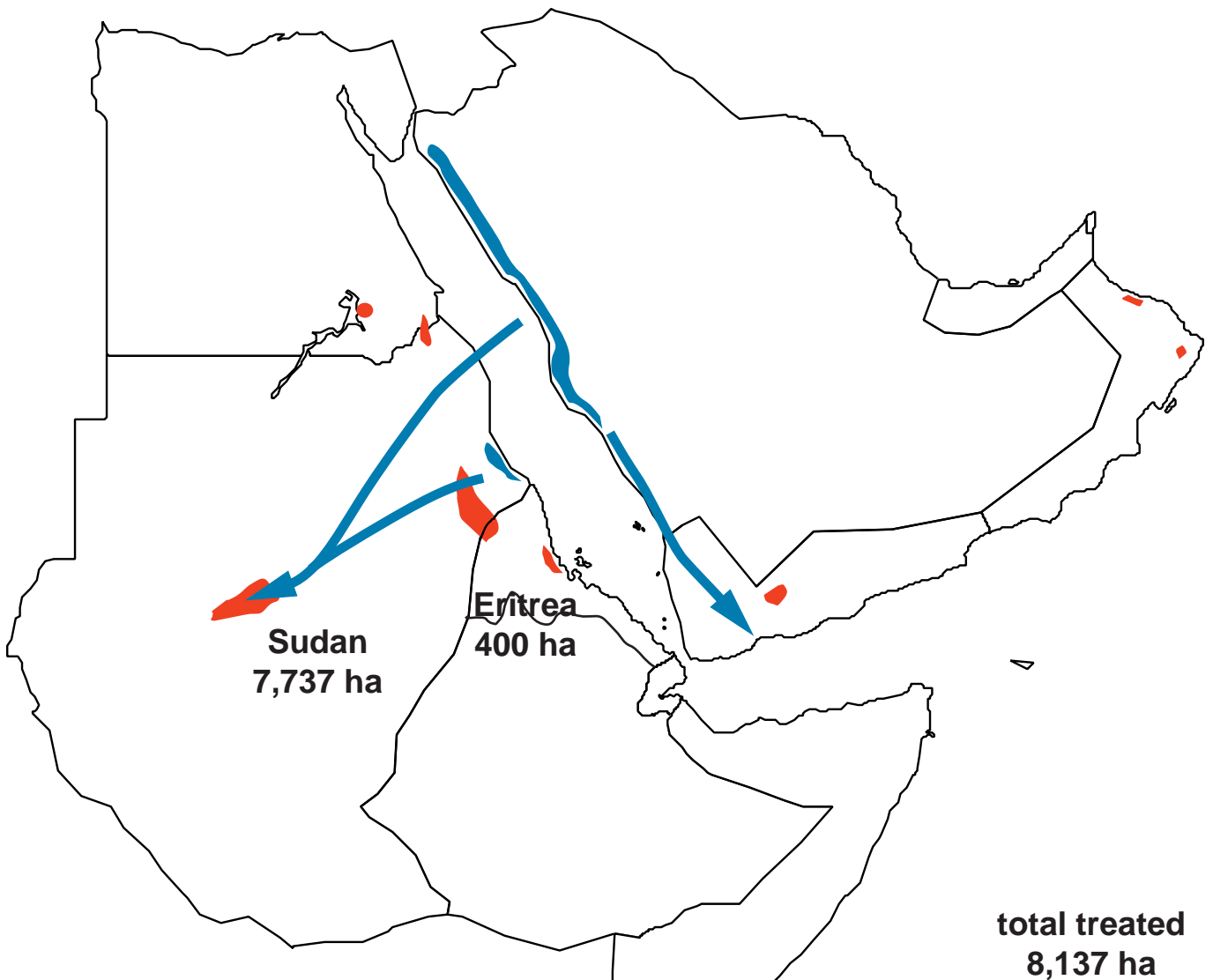


1996 summer breeding (July-Nov)

November 1996 - May 1997



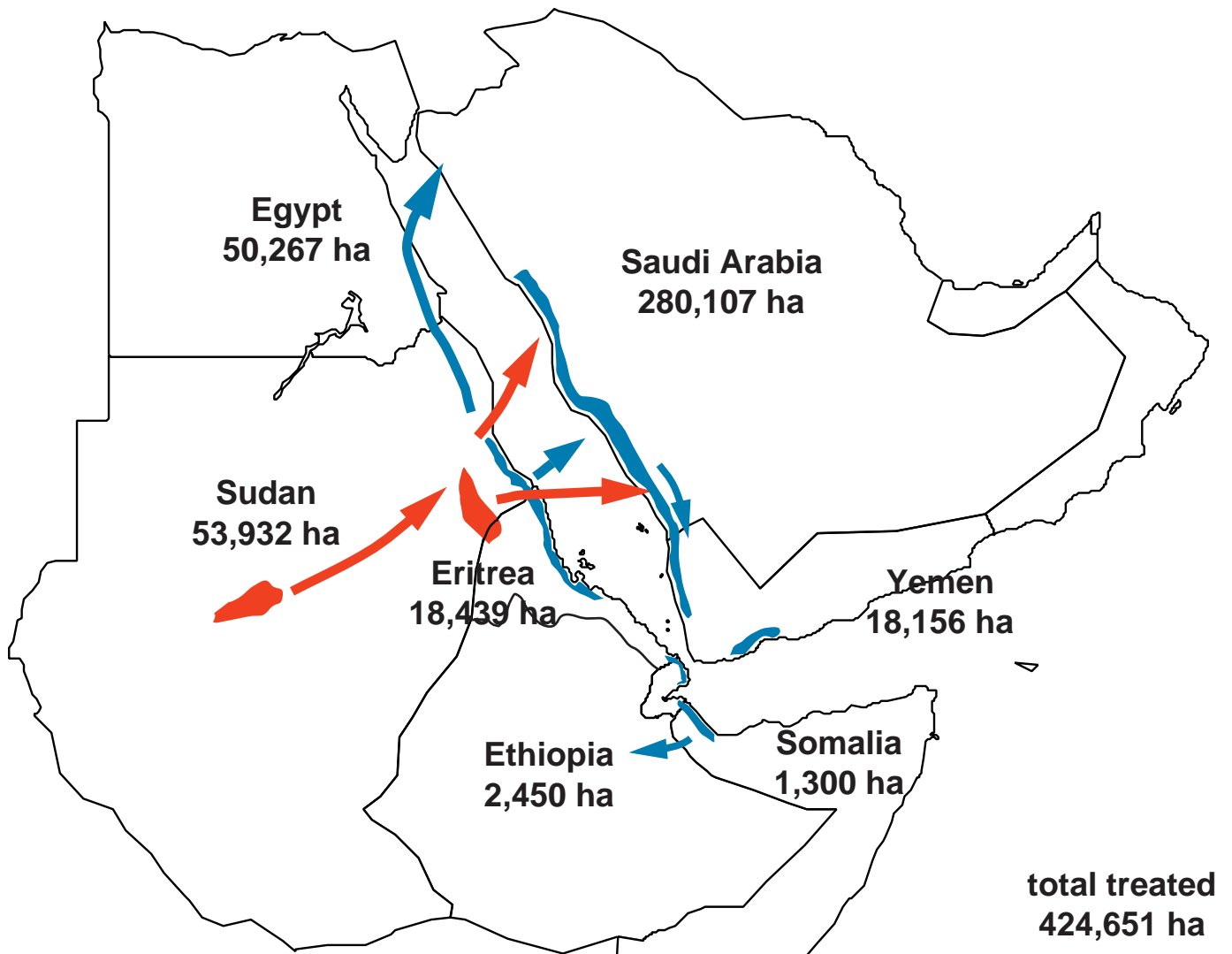
June - October 1997



 May-June migration
from spring 1997 breeding

 1997 summer breeding (June-Oct)

October 1997 - June 1998



**Oct-Dec migration
from summer 1997 breeding**



1997/98 winter/spring breeding (Oct-May)



1997/98 winter/spring movement (Jan-May)