

## **Desert Locust Bulletins for 1978**

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Desert Locust Bulletin No. 1 - September 1978

Desert Locust Bulletin No. 2 - October 1978

Desert Locust Bulletin No. 3 - November 1978

Desert Locust Bulletin No. 4 - December 1978

ORGANISATION DES NATIONS UNIES POUR  
L'ALIMENTATION ET L'AGRICULTURE



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DESERT LOCUST SITUATION SUMMARY  
AND FORECAST

No. 1 SEPTEMBER - EARLY OCTOBER 1978

SUMMARY

Gregarious breeding was in progress in India, Pakistan, Ethiopia and Sudan. Numerous swarms were produced in India, Pakistan and Ethiopia, and swarms were also present in northern Somalia, Sudan and one reached Saudi Arabia in early October. Control operations were in progress in all these countries but some escapes must be expected. These will move into winter-spring breeding areas and are likely to be on a larger scale than at the beginning of the 1977-78 winter-spring breeding season. The main threats in the continued development of the plague are of breeding in inaccessible areas in the Horn of Africa and northern Ethiopia, of breeding along the coastal plains bordering both sides of the Red Sea and Gulf of Aden and of breeding in coastal areas and interior valleys in the Mekran of Pakistan and southeastern Iran.

In the South West Asia second generation breeding over an area of about 35,000 square kilometres in India and Pakistan was coming to an end. Despite the application of over 210 tons of BHC dust and 125,000 litres of liquid insecticide, large numbers of adults were produced, mainly from border areas difficult of access. Over 170 reports of swarms of the second generation were reported by mid-October.

In the Near East a mature swarm reached the Tihama of Saudi Arabia in early October. Numbers of scattered adults increased on the Tihamas of Saudi Arabia and the Yemen Arab Republic and congregans breeding was in progress on the northern Tihama of Yemen.

In Eastern Africa swarms which had been held up along and to the south of the coastal escarpment in northeastern Somalia, started to move southwest as the northeasterly wind became established. In northern Ethiopia there was widespread breeding, particularly in the valleys of the Tacazze and Blue Nile, and there were smaller infestations east of Makalle and in Dankalia. Despite ground and aerial control operations, numerous swarms were produced, some of which started to move southeast in late September. In Sudan three mature

swarms and high density populations of mature adults were found in widely scattered areas of Kassala, Nile, Northern and Eastern Kordofan Provinces and breeding was in progress in all these areas. Control was in progress.

In West Africa groups of adults were found at three localities in Air and Tamesna of Niger and congregans breeding was in progress at one locality in Tamesna.

No locusts were reported from North West Africa.

DESERT LOCUST SITUATION SEPTEMBER - EARLY OCTOBER 1978

SOUTH WEST ASIA

INDIA

Ecological conditions There was a little rain in west Rajasthan in early September and again in the last week of the month. Conditions had become unfavourable for breeding in the Scheduled Desert Area by the end of September, but on 5 October there was widespread heavy rain north of Jaisalmer.

Hoppers Second generation monsoon breeding was coming to an end. The gross area infested was estimated at between 17,000 and 25,600 square kilometres and was confined to Jaisalmer and Pokaran tehsils of Jaisalmer district, where 133 localities were infested, and to Sheo tehsil of Barmer district, where 51 localities were infested. There were also hopper infestations in the sparsely populated border area. In the second half of September the infestations were mainly of late instar hoppers and fledglings.

Adults The first swarm of the second generation was reported in the Mohan-garh area of Jaisalmer district on 20 September. It measured 2 km x 2 km. By the end of the month swarms, swarmlets and concentrations of immature adults were reported from 30 localities in Jaisalmer district, 12 in Jodhpur district, 14 in Bikaner district and 4 in Barmer district. In early October there were reports of 5 or 6 swarms moving north-east in Jaisalmer district.

Control measures Ground and aerial control operations continued throughout the month. By the end of the month 109 localities in Jaisalmer district and 40 in Barmer district had been cleared of late instar hoppers and fledglings and control operations were continuing in a further 24 localities in Jaisalmer district and 20 localities in Barmer district. Aerial spraying operations were also in progress against the hopper infestations in the sparsely populated desert areas along the Indo-Pakistan border. In the first half of the month 75.2 tonnes of 10% BHC dust were used by ground units and 3,826 litres of 30% Aldrin E.C. and 1,951 kg. of Malathion ULV were applied by aircraft against hoppers. In this second half of September, aerial and ground units applied a further 43 tonnes of 10% BHC dust against hoppers, and over 8,000 litres of 30% Aldrin and Malathion ULV against adults.

PAKISTAN

Ecological conditions No rain was reported in the summer breeding area in the first half of September. On the evening of 5 October there was widespread and heavy rainfall in the Cholistan and Mirpur Mathelo desert areas.

Hoppers Second generation monsoon breeding was in progress over a gross infested area of 17,000 square kilometres in the Tharparkar, Khipro, Nara and Cholistan deserts. Hatching, which had commenced on 21 August, continued up till 23 September. By 23 September, over 18,000 bands had been located.

Adults In the first half of September there were 25 reports of loose mature swarmlets and one mature swarm, measuring 3 km x 1 km, representing remnants of the first generation from the Tharparkar, Khipro and Nara desert areas.

On 25 September the first immature swarms of the second generation reached Pakistan from the east. By 30 September another 24 immature swarms were located in the Rahimyar Khan, Daharki (2802N, 6932E), Khipro and Chor sectors. Most were in areas where hopper control had been undertaken earlier. Although most swarms were less than 5 sq. km. in area, one swarm seen on 29 September was 200 sq. km. in area. From 1-19 October a further 109 swarms and 84 groups (adult concentrations less than 1 square mile in extent) were detected in Cholistan, Daharki, Khipro, Chor and Diplo areas, most of which were seen in western Cholistan. However, on 8 October a swarm measuring 125 sq. km. was seen north of Khipro. This split into at least 7 portions, at least two of which reached cultivated areas in Mirpur Khas, Hyderabad and Thatta districts.

Control measures Intensive ground and aerial control operations were conducted against both hopper infestations and swarms. Ground operations using BHC dust and exhaust nozzle sprayers were conducted against areas of more scattered hoppers, whilst aerial spraying was used against denser and less accessible areas of hoppers, against laying swarms of the first generation and the immature swarms of the second generation. By 23 September some 18,000 hopper bands were reported to have been destroyed, 591 sq. km. of hatchlings were cleared in Tharparkar and two dieldrin barriers, one 80 km. long, the other 15 km. long, were laid down from the air in Cholistan to kill hopper bands marching north across the border. All 25 immature swarms reported in late September were sprayed and control continued in early October. Up to the end of September 91.6 tons of 12.5% BHC dust were used against the thinner density hopper infestations and 112,000 litres of dieldrin and fenitrothion against the denser hoppers and swarms.

No locusts were reported from Afghanistan or Iran.

#### NEAR EAST

##### SAUDI ARABIA

Ecological conditions On the Tihama the areas between Lith and Qunfidah, and around Jizan, conditions were favourable for breeding.

Adults A 3 sq. km. mature swarm was seen at Jeddah on the evening of 7 October, having come from the west, but it dispersed by the 9th.

In September survey teams found adults at densities of 2 - 20 per hectare over a total area of 800 sq. km. between Lith and Shaqqah al Yamaniah. Laying was observed in one area of  $\frac{1}{2}$  sq. km. by late September; large numbers of solitarious adults were reported from the Qunfidah area.

Control measures were taken against adults in the Qunfidah area.

YEMEN ARAB REPUBLIC

Ecological conditions - Heavy rain fell on the Tihama, where conditions were favourable for breeding.

Adults - In September scattered adults were reported from seven localities between Al Jarr (1620N, 4254E) and Al Mansuriyah (1441N, 4318E). In October copulating and laying adults were found at densities of up to 500 per square kilometre in Wadis Habil and Hayran.

Hoppers - In September small numbers of hoppers were found with the adults in the Tihama, but in October third-fifth instar green hoppers were found at densities of up to 10 per plant in Wadis Habil and Hayran along with fledglings.

PEOPLE'S DEMOCRATIC REPUBLIC OF YEMEN

Ecological conditions - Conditions were very favourable for breeding in the interior but unfavourable in coastal areas, except in cultivations.

Hoppers - Congregans breeding was in progress over an area of about 80 sq. km. in Wadi Nisab (1435N, 4627E) and some groups were observed. Small numbers of hoppers were also present in the Masip (1335N, 4653E), Ahwar (1330N, 4643E) and Murwan (1330N, 4618E) areas.

Adults - Immature and mature adults were present at densities of 40 - 50 per hectare over an area of 10 sq. km. in the Nisab area. Low density adults were also seen at Dhalla, Dathina, Abeyan and Murwan.

United Arab Emirates were reported clear. No reports were received from Bahrain, Egypt, Iraq, Jordan, Kuwait, Lebanon, Oman and Qatar.

EASTERN AFRICA

SOMALIA

Ecological conditions - Southwesterly winds were established over most of the Somali peninsula for most of September, but northeasterly winds developed in the afternoon in the north. In late September and early October the southwesterly wind weakened and the northeasterly started to penetrate further south, on 12 October reaching as far south as 2°N. Afternoon showers fell along the northern escarpment and southwards as far as about 9°N during September and 8°N in early October. Vegetation was green in the Nogal Valley.

Adults On 8 September a thin density immature swarm was reported at Offein (1045N, 4930E). A swarm was seen at Las Dawa (1025N, 4907E) on 18-20 September. There were also unconfirmed reports of swarms from Carin (1058N, 4912E) and Scusciuban (1016N, 5013E) between 10 and 20 September. There was an unconfirmed report of a swarm in the Daror Valley on 23 September said to be moving towards Ururcar (1018N, 4945E). By late September the swarms were beginning to mature for there were three reports of mixed maturity swarms from the Scusciuban area on 24 September, two reports of swarms from Rako (0939N, 4947E) on 25 September and a further three reports from Rako on 26 September. Scattered adults were also reported between Godmo (0935N, 4955E) and Las Aharro (0950N, 4929E) on 30 September.

On 4 October a swarm of mixed maturity measuring 15 x 10 square miles was located 80 kilometres northwest of Gardo. This swarm was tracked as it moved southwest for the next 10 days and its remnants were last reported southwest of Las Anod, about 40 kilometres north of the Ethiopian border. A medium density swarm of mixed maturity measuring 4 x 2 sq. km. was seen 90 km. northeast of Gardo on 4 October. Scattered adults were seen at Dalmadot (0958N, 5005E) and a settled swarm was seen between Buran (1012N, 4847E) and Hadaftimo (1041N, 4905E).

Hoppers No hoppers were reported.

Control measures 4,000 litres of 10% BHC were applied by air against swarms in the Rako area between 25 and 30 September; 8,000 litres of 15% BHC were applied by air and 400 litres of 20% dieldrin by ground against the large swarm first seen on 4 October. Large numbers of dead locusts were reported in sprayed areas but by 14 October the remnants were said to have been controlled north of the Ethiopian border.

## ETHIOPIA

Ecological conditions Low clouds associated with the Intertropical Convergence Zone were reported from the highlands up to mid-October. In late September and early October low level fronts marking the boundary between northeasterly winds, southwesterlies and westerlies were detected on many days over Ethiopia.

Hoppers Widespread breeding was reported from Wollo, Tigre, Gojjam and Showa Provinces in northern Ethiopia during September. Most infestations were in the valleys of the Blue Nile and Tacazze. In addition, there was an infestation of fifth instar hoppers and fledglings over an area of 8 sq. km. east of Makalle in early September; first and second instar hoppers were reported 40 km. south of Tessenei near the Sudan border in Eritrea in mid-September and fledglings were reported from just south of Lake Giulietti on 20 September.

No breeding was reported from Dankalia, the Railway Area or the Ogaden up till mid-October.

Adults In early September there were three reports of swarms of unknown maturity in northern Ethiopia. A thin swarm was reported near Saganeiti (1503N, 3912E) on 4 September, another swarm was reported from Eritrea on 7 September and a third swarm was located on 13 September near Makalle. Later in the month there were several reports of the new summer generation which indicated that a south-easterly movement was in progress.

On 23 September a pink swarm measuring 200 sq. km. was sighted near Avergalle moving southeast. A second was seen on 26 September and a third, thin-medium density, swarm measuring  $2 \times \frac{1}{2}$  km. was present near Saca in the Tacazze Valley on 29 September. On 27-28 September several pink swarms were seen between Makalle and Tendaho and on 30 September further swarmlets were seen in Dankalia. On 4 October an immature swarm measuring  $10 \times 5$  km, was reported in the Bora area (1258N, 3910E) and on 6 October there was a report of a swarm measuring  $10 \times 9$  km. from Nebeg Fej (1250N, 3910E). There were further reports of immature large thin density swarms from the Samre, Fenaroa, Bora and Sokota areas and some damage to sorghum was reported. Aerial surveys from off Tendaho (1142N, 4057E) westwards to Combolcia, southeast to Lake Abbé and south to Gauani on 2 - 5 October failed to locate any adults.

Control measures During September large scale dusting operations against hopper infestations were undertaken by farmers in many localities in Showa and Wollo which could not be sprayed from the air because of low cloud. By 20 September 31,000 kg. of 2.6% BHC had been lifted to the infested areas by helicopter. Aircraft sprayed 3,248 litres of 20% dieldrin against hopper infestations east of Makalle and in the Tacazze Valley and Fenaroa-Avergalle areas between 7 and 18 September. On 20 September 293 litres of dieldrin were aerielly applied against the fledglings south of Lake Giulietti and insecticides were applied to Tessenei to control the hoppers reported to the south. The swarm seen near Makalle was sprayed on 13 September, that seen in the Tacazze Valley on 26 September was sprayed with 450 litres of fenitrothion and that near Saca with 200 litres of malathion on 29 September. Aerial control was also conducted against several swarmlets in Dankalia on 30 September.

## SUDAN

Ecological conditions Conditions were favourable for breeding in many parts of the summer breeding area.

Adults A laying swarm measuring 6 square miles was reported at Abu Sinoon (1725N, 3425E) on 10 September and a copulating swarm measuring  $10 \times 2$  miles was seen at Siedon (1719N, 3426E) on 19 September. A third mature swarm was reported at Dagain (1600N, 3605E) in Kassala Province on 18 October. Higher density populations of adults and egg fields were discovered on 19 September in the Hassaniya area of Nile Province between latitudes 1640N and 1700N, and longitudes 3230E and 3235E. Large numbers of adults were also reported northwest of EL Dueim between latitudes 1420N and 1440N, and longitudes 3140E and 3150E in late September.

In the first week of October dense populations of mature adults were found within an area estimated at 600 square miles around Hamashkorib (1710N, 3642E). Medium density mature adults were also found over areas totalling 6,900 hectares between latitudes 1705N and 1830N, and longitudes 3143E and 3232E up till 22 October.

Hoppers Large numbers of hoppers were reported with the adults northwest of Ed Dueim in late September. Widespread hopper infestations were discovered in Kassala, Nile and Northern Province during October. In the first week of October hatchings and first to third instar hoppers were found over an area estimated at 600 square miles in the Hamashkorib area of Kassala Province (1710N, 3642E). First to third instar bands were found over areas totalling 2125 ha. between latitudes 1630N and 1807N, and longitudes 3205E and 3340E up till 18 October, and first to fourth instar bands were found over areas totalling 6,900 ha. between latitudes 1705N and 1830N, and longitudes 3143E and 3232E, up till 22 October.

Control measures Control operations were in progress in all the infested areas.

No locusts were reported from Djibouti, Kenya, Tanzania or Uganda.

#### WEST AFRICA

##### NIGER

Ecological conditions Above average rain was reported from Air during September.

Adults In September mature adults were found around Arlit (1855N, 0739E) at densities of 500-1000 per hectare over an area of 2000 hectares, and in areas of green vegetation measuring 30-250 hectares at Tibali (1852N, 0732E) at densities of 400 per hectare. Egg-pods at densities of 1-2 per square metre were discovered over an area of 700 hectares at Akokan (1745N, 0758E). Further laying was reported over an area of 66 hectares by adults at densities of up to 2500 per hectare at Akokan up till 20 October.

Hoppers In Tamesna in September second and third instar hoppers were present at densities of two to three per square metre over an area of 400 hectares at Ekadmalen (1851N, 0550E). By 20 October this infestation comprised second to fifth instar hoppers and fledglings at densities of 3 to 15 per square metre over an area of 1,400 hectares.

Control measures By 20 October control measures had been undertaken over an area of 1,000 hectares at Ekadmalen.

MALI

Ecological conditions Good rainfall was reported in the Adrar des Iforas and the Tilemsi Valley in September.

Locusts Only scattered locusts were seen on surveys, details of which are awaited.

MAURITANIA

Ecological conditions Above average rains were reported in the south and southeast.

Locusts Only scattered locusts were seen on surveys, details of which are awaited.

No locusts were reported from Cameroun, Chad or Senegal.

NORTH WEST AFRICA

No locusts were reported from Algeria, Libya, Morocco or Tunisia.

FORECAST FOR NOVEMBER - DECEMBER 1978

In South West Asia it is possible there could be a third generation of breeding in areas of India and Pakistan which received rainfall in early October. Most escapes from the summer breeding area are likely to move west and reach the Mekran of Pakistan and southeast Iran. The extent of this movement is difficult to predict and some swarms may reach Oman, the United Arab Emirates and even eastern Saudi Arabia. It is possible that some swarms, probably dispersed, may reach the Gulf of Aden and Red Sea areas. Some swarms may remain to overwinter in the Punjab and adjacent areas of India and Pakistan.

In the Near East breeding will occur along the Tihamas of Saudi Arabia and Yemen Arab Republic and in coastal areas of the People's Democratic Republic of Yemen throughout the period. It will almost certainly lead to the production of numerous hopper bands and some swarms unless control operations are mounted in all the infested areas. Further immigration on to the Tihama from the summer breeding areas in Sudan and northern Ethiopia is likely and it is also possible from India and Pakistan.

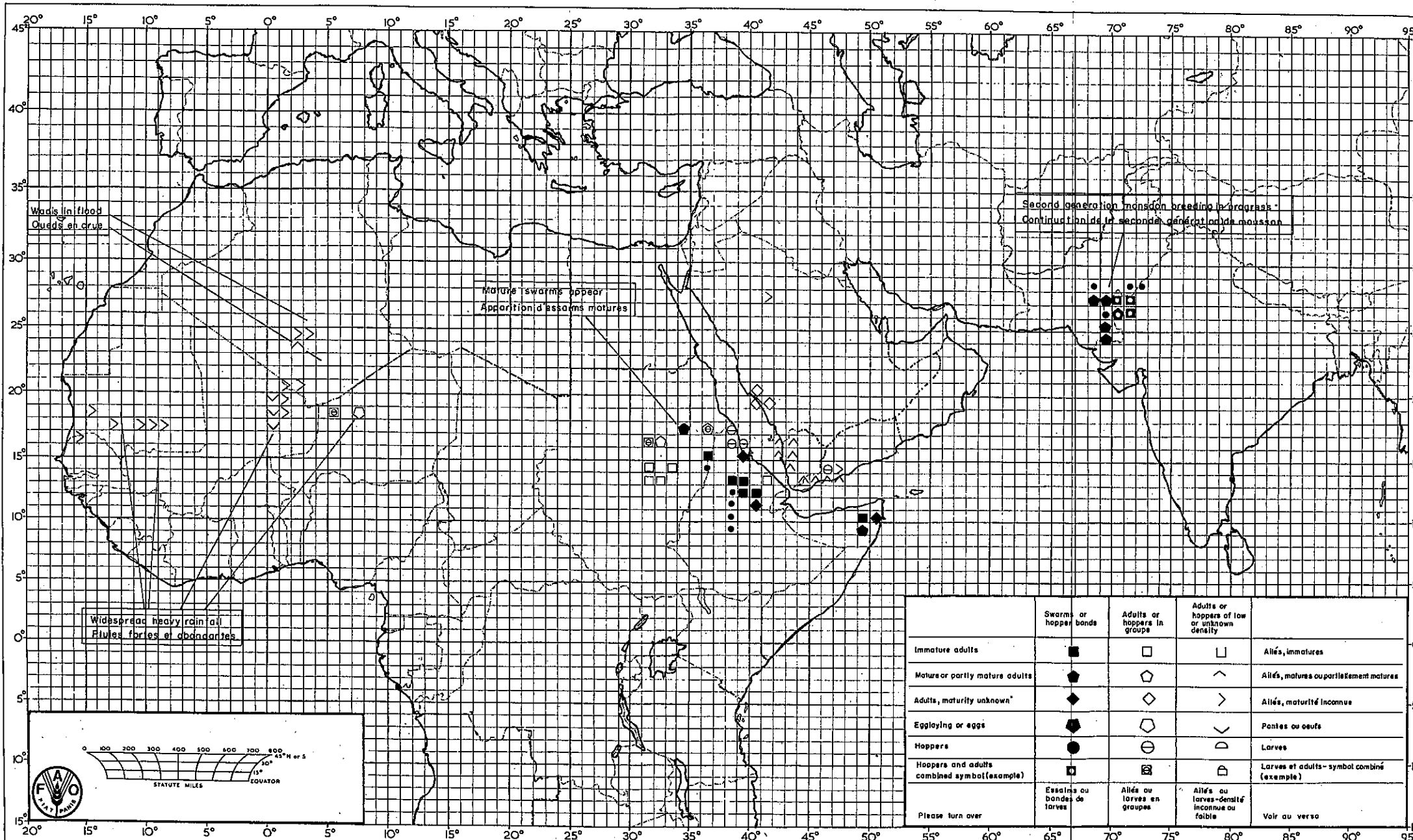
In Eastern Africa any swarms which have escaped control in northern Somalia will move southwest across the Somali peninsula, mature and lay in areas where rain has fallen. As rainfall appears to have been heavy and widespread in the northern part of the 'Short Rains' breeding area, most breeding will occur then but some swarms may reach the Wadi Shebeli and perhaps the Juba before dying. Some of the swarms produced on the summer rains in northern Ethiopia are likely to move southeast across Dankalia, the Railway Area and into the Ogaden and are likely to start to breed in late October or early November. Others are likely to move northeast into the Red Sea coastal areas of northern Ethiopia and Sudan and some may cross the Red Sea to the Tihamas of Saudi Arabia and Yemen Arab Republic. Escapes from the late summer breeding in the Sudan will also move to the Red Sea and some may cross to Arabia.

In West Africa some small hopper bands may form in areas of green vegetation in Air and Tamesna of Niger which may have escaped detection by survey teams. Further west numbers appear to be too low to give rise to gregarious populations. No invasion by swarms from the east is now likely.

In North West Africa numbers of adults are likely to increase in southern Algeria and Libya as they migrate northwards from the breeding areas south of the Sahara. No invasion by swarms from the east is now likely.

It is regretted that the map which was to have accompanied this Summary and Forecast could not be prepared in time as there has been a delay in printing the Base Map.

Rome  
25 October 1978



	Swarms or hopper bands	Adults or hoppers in groups	Adults or hoppers of low or unknown density	
Immature adults	■	□	◻	Alliés, immatures
Mature or partly mature adults	●	◐	◑	Alliés, matures ou partiellement matures
Adults, maturity unknown*	◆	◇	◇	Alliés, maturité inconnue
Egglaying or eggs	●	◐	◑	Paniers ou oeufs
Hoppers	●	◐	◑	Larves
Hoppers and adults combined symbol (example)	◐	◑	◑	Larves et adultes - symbol combiné (exemple)
Please turn over	Essaims ou bandes de larves	Alliés ou hoppers en groupes	Alliés ou hoppers - densité inconnue ou faible	Voir au verso

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DESERT LOCUST SITUATION SUMMARY  
AND FORECAST

No. 2      OCTOBER - EARLY NOVEMBER 1978

## SUMMARY

Intensive control operations greatly reduced the extent of escapes from the summer breeding areas of India and Pakistan during October, and by 14 November the summer breeding area of Pakistan was reported clear of locusts. Three small groups of adults were reported to have reached Mekran and some reached Oman and United Arab Emirates. In eastern Africa, swarm breeding commenced in the Somali peninsula and continued in the interior of Sudan and Eritrea. Breeding was in progress in Red Sea coastal areas.

The main threats in the continued development of the plague are of breeding in inaccessible areas in the Horn of Africa, northern Ethiopia, of breeding along the coastal plains bordering both sides of the Red Sea and of breeding in remote areas of eastern Arabia and in coastal areas and interior valleys in the Mekran of Pakistan and southeastern Iran.

In South West Asia intensive ground and air control operations greatly reduced the number of swarms in the summer breeding areas of India and Pakistan during October and by 14 November the summer breeding area of Pakistan was reported clear of locusts. Some escapes, however, did occur and some moved west into the Mekran; others reached the United Arab Emirates and Oman in late October and early November and some may reach the Gulf of Aden and Red Sea coastal areas. Breeding may commence in Mekran and southeastern Iran.

In the Near East immigration from the summer breeding areas in India and Pakistan occurred in late October early November and may continue. Breeding may start in the United Arab Emirates and Oman if rain falls, otherwise the immigrants will reach the People's Democratic Republic of Yemen, Yemen Arab Republic and possibly southwestern Saudi Arabia. Small scale breeding is already in progress in coastal areas in South West Arabia and could be augmented by immigration from India-Pakistan, Sudan, northern Ethiopia, Eritrea and even the Somali peninsula.

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In Eastern Africa gregarious breeding has already occurred in northern Somalia and is almost certainly occurring in adjacent areas of Ethiopia. Swarms must be expected to be produced in areas where no control is possible and some of these are likely to move into Northern Kenya in early January 1979 and possibly reach the central highlands of Kenya, while others may move back into the Red Sea-Gulf of Aden trench. Others may move north-west towards the Railway Area, Djibouti and northwest Somalia. Escapes from breeding in the interior of Sudan and northern Ethiopia are likely to move into coastal areas of Sudan and northern Ethiopia and augment breeding already in progress, and perhaps cross the Red Sea and augment breeding already in progress on the Tihama.

In West Africa some small swarmlets may be produced in Niger in areas of green vegetation not detected by survey teams. Further to the west there is no evidence of significant locust populations.

In North West Africa no locusts have been reported but increasing numbers of locusts can be expected in southern Algeria and Libya as adults move north from the summer breeding areas south of the Sahara.

DESERT LOCUST SITUATION OCTOBER - EARLY NOVEMBER 1978

SOUTH WEST ASIA

INDIA

Ecological conditions Widespread heavy rain was reported north of Jaisalmer on the evening of 5 October and vegetation was stated to be very green in the border desert areas. Light rain also fell in Rajasthan on 23-26 October.

Adults During the first half of October, 22 immature swarms were reported to have reached the Bhuj district of Gujarat and Jalore, Barmer, Jaisalmer, Bikaner and Ganganagar districts of Rajasthan from the west. These swarms and others already present spread east and northeast into Jodhpur, Nagaur, Sikar, Churu and Jhunjhunu districts of Rajasthan and one swarm reached Mohindargarh district of Haryana on 6 October before returning to Jhunjhunu district the next day. Altogether there were 360 reports of swarms from Rajasthan, 2 from Haryana and 3 from Gujarat. A further swarm entered Kutch from the west on 25 October. In the second half of October there were 20 reports of swarms from Jodhpur district, 11 from Jaisalmer, 3 from Nagaur, 2 each from Barmer and Sikar and 1 each from Bikaner, Churu and Tonk districts of Rajasthan and 4 from Kutch district of Gujarat. No swarms were reported after 29 October.

Hoppers No hoppers were reported.

Control measures During the first half of the month swarms were attacked by aircraft on 52 occasions and by ground parties on 107 occasions in Barmer, Bikaner, Churu, Ganganagar, Jaipur, Jaisalmer, Jalore, Jodhpur, Nagaur, Sikar and Kutch districts, using 12,850 kg. of BHC 10% dust, 17,435 kg. Malathion ULV and 1,150 litres of 18% dieldrin. In the second half of October swarms measuring 1-12 sq. km. in area were controlled on 26 occasions by ground and air, using 7,650 kg. of BHC 10% dust and 800 litres of dieldrin in Rajasthan and on 4 occasions in Gujarat using 3,350 kg. of BHC 10% dust.

PAKISTAN

Ecological conditions Widespread heavy rain was reported from Cholistan and Mirpur desert areas on the evening of 5 October but no other rain was reported.

Hoppers Patchy breeding over an area of about 200 sq. km. was detected in cultivations and along the foothills in Las Bela district on 2 October. About 1000 patches of first to fifth instar hoppers were present. Hoppers of all instars were also found in the Liari and Lakhra tehsils in Las Bela district in the second half of October. Further east the last hatching of the second monsoon generation occurred in Diplo on 1 October.

Adults Between 1 and 15 October, 99 reports of swarms and 82 reports of groups (adult concentrations less than 1 sq. km. in extent) were reported from Cholistan (100 reports), Sukkur (Nara) (24 reports), Khipro (30 reports), Tharparkar (18 reports) and cultivated areas of Hyderabad district (9 reports). A swarm measuring 125 sq. km. seen north of Khipro on 8 October split into at least seven portions, two of which reached the cultivated areas of Mirpur Khas, Hyderabad and Thatta districts. The south-westerly movement evidently continued in the second half of October for there were no further reports from the Cholistan and Nara deserts but there were 19 reports of swarms and groups from Khipro, 8 from Tharparkar and 11 from Hyderabad, Thatta and Badin districts, and some adults reached Karachi.

Control measures Intensive control operations continued in the summer breeding areas and cultivated areas reached by swarms. The hopper infestations detected in Las Bela and Diplo early in the month were completely controlled and preventive spraying was undertaken against the hopper concentrations in Las Bela district in the second half of the month and an area of 200 hectares was cleared.

Six aircraft were used to spray all 19 swarms and groups reported in the second half of the month, but no details are yet available about the amount or type of insecticide used.

No reports of locusts were received from Iran or Afghanistan.

#### NEAR EAST

##### OMAN

Ecological conditions No reports of rain have been received.

Adults Many hundreds of pink adults were seen at lights in Muscat on 2 November and others seen at lights in the last week of October. Small numbers of pink adults also seen between Muscat and Sohar on 3 November. These almost certainly represent immigrants from the summer breeding area in India and Pakistan.

##### UNITED ARAB EMIRATES

Ecological conditions No rain was reported during October.

Adults Pink adults were present at densities of up to 5 per square metre in cultivations in the Kalba area of Fujaira on 30 October.

Control measures The adults at Kalba were sprayed with Malathion.

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PEOPLE'S DEMOCRATIC REPUBLIC OF YEMEN

Ecological conditions Light showers were reported from Dathina and Yafa during the first week of October.

Hoppers The hopper infestations encountered in Wadi Nisab in September persisted into October.

Adults Low density adults were present near the foothills west of Aden and in Wadi Nisab.

Control measures Control operations against hopper infestations in Wadi Nisab were concluded.

YEMEN ARAB REPUBLIC

Ecological conditions There were light showers on the Tihama and along the foothills, while there was heavy rain in the highlands. On the Tihama annual and perennial vegetation was green and conditions were favourable for breeding.

Hoppers Green fourth and fifth instar hoppers were present at densities of 4-10 per plant in Wadi Habl (1609N, 4252E).

Adults Fledglings, immature and mature adults were present in Wadis Hayran (1616N, 4300E), She'bah (1618N, 4300E) and Habl at densities of 500 per square kilometre. Copulating and egg-laying were observed in Wadi Habl. Immature and mature adults were present at Al-Jarr (1620N, 4254E) at 400 per square kilometre, Beni Hasan (1612N, 4305E) at 300 per square kilometre and in small numbers at Az Zaydiyah (1520N, 4250E).

Control measures Control measures were applied against the hoppers in Wadi Habl, 250 kg. of BHC dust were distributed to farmers to control any further infestation.

SAUDI ARABIA

Ecological conditions Rain fell in the Hejaz mountains and the Jizan area. Conditions were favourable for breeding in parts of the Tihama south of Jeddah.

Adults A thin density mature swarm was seen flying in from the sea at Jeddah on the evening of 7 October, settled overnight over an area of about 3 square kilometres and took off next morning to the southeast and later dispersed. In the Qunfidah area adults were present at densities of up to 2000 per hectare at Shaqqah al Yamaniyah. In the Jizan area adults were present at densities of up to 50 per hectare at Samitah, Muwassam and Tuwwal, and at densities of 50-100 per hectare east of Jizan. Scattered adults were also reported from cultivated areas in the interior and in the Jeddah-Mecca area between 10 and 31 October.

Hoppers No hoppers were reported.

Iraq was reported clear. No reports received from Bahrain, Egypt, Jordan, Kuwait, Lebanon, Qatar or Syria.

#### EASTERN AFRICA

##### SUDAN

Ecological conditions Ecological conditions were favourable for breeding on the Red Sea littoral and in certain areas in the interior.

Adults A mature swarm was seen at Dagein (1600N, 3605E) on 17 October and another measuring 4 square kilometres at Shabibeit (1658N, 3457E) on 19 October. On 29 October an immature swarm measuring 12 square miles was seen at the River Atbana at position 1722N, 3424E and a swarm of mixed maturity measuring 7 square miles was seen at Mitatib (1609N, 3603E). In the first week of October adults at high densities were found over an area of 1500 square kilometres in the Hamashkoreib (1710N, 3642E) area of Kassala Province. Scattered adults were also seen over an area of 6,900 hectares in Northern Province in the third week of October. In the Red Sea Province groups of adults were found at three localities totalling 370 hectares in the area south of Sinkat in position 1826N-1833N, 3648E-3651E, at 11 localities totalling 1680 hectares in the Tokar delta in the third week of October. In the fourth week of October scattered adults were seen at Wadi Oko (2027N, 3550E) over an area of 360 hectares.

Hoppers There was widespread breeding in Kordofan, Nile, Northern, Kassala and Red Sea provinces. In Kordofan there were late instar hopper bands at four localities totalling 220 hectares during the fourth week of October. In Nile Province first to fourth instar bands were reported from 16 localities totalling 15,268 hectares in the Hassaniyah area between 7 and 22 October. By the fourth week late instar bands were present at only three localities totalling 6,375 hectares. In Northern Province first to fourth instar hoppers were present at 12 localities over a total area of 8,900 hectares between 13 and 18 October. In Kassala Province hatching and first to third instar hopper bands were found over an area of 1500 square kilometres in the Hamashkoreib area in the first week of October. In the Red Sea Province dense hopper bands were found at three localities totalling 370 hectares south of Sinkat on 20-21 October; large dense bands of late instar hoppers were found over an area of 360 hectares at Wadi Oko (2027N, 3550E) in the fourth week of October, and scattered second to fourth instar hoppers were found in the Tokar delta between 15 and 24 October.

Control measures Control operations were in progress against all the hopper infestations but details are not yet available. In September 160,000 kg. of BHC dust was used against Desert Locust and grasshopper infestations in White Nile Province and 5,200 kg. of BHC bait and 54 litres of 57% Malathion against Desert Locust infestations in Nile Province.

## ETHIOPIA

Ecological conditions Moderate rain has fallen on the Red Sea coast of Eritrea and there has been widespread rain in the Ogaden. North-easterly winds predominated over Northern Ethiopia and Dankalia on most days in October but on 7 November a south-westerly wind penetrated as far as Asmara. Further south the Intertropical Convergence Zone retreated south during October and by early November there were north-easterly winds over the Ogaden on most days.

Adults Immature swarms continued to be held up in the headwaters of the Tacazze. There were 17 reports of immature swarms from the Samre, Fenaroa and Socota areas between 4 and 30 October. The area of the largest swarm was reported to be 10 x 9 kms. There was also an unconfirmed report of a swarm at Adowa on 20 October. There are also reports of swarms east of Kassala moving northeast towards the Red Sea. In eastern Ethiopia there were unconfirmed reports of swarms near Bokh (0725N, 4633E) and north of Wardere on 17 October, and of a swarm flying northwest at Dagabur on 26 October.

Hoppers There was a widespread infestation in the western lowlands of Eritrea east of the line Om Ager-Kassala. On the Red Sea coast there were hoppers of all instars at densities of 1000-3000 per hectare over areas of 2,600 hectares in the Karora-Mersa Teclai area, 2500 hectares in the Mersa Gulbub area, 6000 hectares in the Sheb-Gedged area, 4000 hectares in the Emberemi-Wachiro area and 8000 hectares in the Zula area. No reports have yet been received of breeding in the Ogaden.

Control measures 720 litres of Sumithion, 1195 litres of Malathion and 2350 litres of dieldrin were applied against the swarms in the Samre, Fenaroa and Socota areas between 18 and 30 October.

Control measures were in progress against the hopper infestations on the Red Sea coast of Eritrea using BHC dust and bait.

## SOMALIA

Ecological conditions During the month the north-easterly wind became the predominant wind on most days over all but the northwest and extreme south of Somalia. Widespread heavy rain was reported in all areas.

Adults On 4 October a swarm of mixed maturity measuring 15 x 10 miles was located 80 kilometres northwest of Gardo. This swarm was tracked as it moved southwest for the next 10 days and its remnants were last reported about 40 km. north of the Ethiopian border west of Las Anod. A medium density swarm of mixed maturity measuring 4 x 2 kilometres was seen 90 kilometres northeast of Gardo on 4 October. Scattered adults were seen at Dalmadot (0958N, 5005E) on 4 October and on the same day a settled swarm was seen between Buran (1012N, 4847E) and Hadaftimo (1041N, 4905E). On 12 October a swarm 1½ miles long of mixed maturity settled at Odweina and another swarm of medium density settled over an area of 12 square kilometres at El-Midgan (0855N, 4708E). Copulation was seen and egg-fields

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were located in the area. On 18 October a mature swarm was seen flying southwest 50 kilometres west-south-west of Hargeisa and crossed the border on 19 October. On 21 October a thin density mature swarm settled at Balliano (0626N, 4620E). On 25 October a swarm measuring  $2\frac{1}{2}$  square kilometres settled 30 kilometres southeast of Dusa Mareb, and another swarm 3 kilometres wide was seen between Ghelinsor and Godinlave. On 26 October a mature swarm 10 kilometres wide was seen at Dababordah (0935N, 4652E); by 27 October it had moved 20 kilometres southwest and was copulating. On 28 October this or another swarm was seen 9 kilometres south of Ainabo.

Egg-fields were found at El-Midgan on 12 October, 16 kilometres south of Wud Wud (0817N, 4646E) on 15 October (measuring 500 metres x 200 metres, egg-pod density 20-25 per square foot) 18 kilometres south of El Midgan on 16 October (measuring 300 metres x 200 metres, egg-pod density 40-46 per square foot), and 10 kilometres southwest of Wud Wud on 19 October (measuring 500 metres x 300 metres).

Hoppers Between 26 and 29 October, groups of first instar hoppers were reported from several localities in the area bounded by latitudes 0810N and 0844N and longitudes 4646E and 4730E. The total size of the infested area was estimated at 2 square kilometres.

Control measures Approximately 12,000 litres of 20% BHC and 400 litres of 20% dieldrin were applied by air and ground against the large swarm tracked from north-west of Gardo to west of Las Anod between 4 and 12 October.

The egg-fields found near Wud Wud and El-Midgan on 15-16 October were sprayed with 20% dieldrin and the same insecticide was applied against the hopper infestations found between 26 and 29 October.

No reports were received from Djibouti; Kenya, Tanzania and Uganda remained clear.

#### WEST AFRICA

NIGER Situation up to 20 October

Hoppers Concentrations of second to fifth instar hoppers and fledglings at densities of 3-15 per square metre were found over an area of 1,400 hectares between 1851N, 0550E and 1847N, 0540E.

Adults Copulating adults were found at densities of 2,500 per hectare over 70 hectares at Akokan (1845N, 0736E).

Control measures 1000 hectares were treated in the area between 1851N, 0550E and 1847N, 0540E.

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MALI

No concentrations were seen up to 20 October.

No reports were received from Chad, Cameroun, Mauritania or Senegal.

NORTH WEST AFRICA

No reports were received from Algeria, Libya, Morocco or Tunisia.

FORECAST FOR LATE NOVEMBER/DECEMBER 1978 - JANUARY 1979

In South West Asia it appears, based on information received since the Summary was written, that all swarms have left the summer breeding area of Rajasthan and adjacent areas of Pakistan. Some of the swarms in the Mekran will continue to move west and will enter southeastern Iran, some are likely to remain in the Mekran of Pakistan, others will probably reach Oman and the United Arab Emirates and some may reach eastern Saudi Arabia, the People's Democratic Republic of Yemen, Yemen Arab Republic, southwestern Saudi Arabia and northern Somalia. Breeding may commence in the Mekran towards the end of the forecast period.

In the Near East breeding will continue along the Tihama of Saudi Arabia and the Yemen Arab Republic and commence in coastal areas of the People's Democratic Republic of Yemen. It will almost certainly lead to the formation of hopper bands and some swarms unless control operations are mounted in all the infested areas. Further immigration on to the Tihama from summer breeding areas in Sudan and northern Ethiopia, India and Pakistan is possible. Breeding could also commence towards the end of the present period by any locusts which remain in Oman and United Arab Emirates.

In Eastern Africa mature swarms will continue to lay as they move southwest across the Somali peninsula and laying may occur as far west as the Juba. Although the infestation is unlikely to be heavy by plague standards, breeding could be very widespread and swarms will be produced in late December and early January in areas where control is not possible. The more southerly of these swarms are likely to move southwest into northern Kenya in early January and some may reach the central highland area towards the end of the forecast period. The swarms in northern Kenya are likely to reach the Rift Valley and start to move north towards southern Ethiopia. The more northerly swarms produced in the "Short Rains" breeding area are likely to move north-west towards the Railway Area, Djibouti and coastal areas of north-west Somalia.

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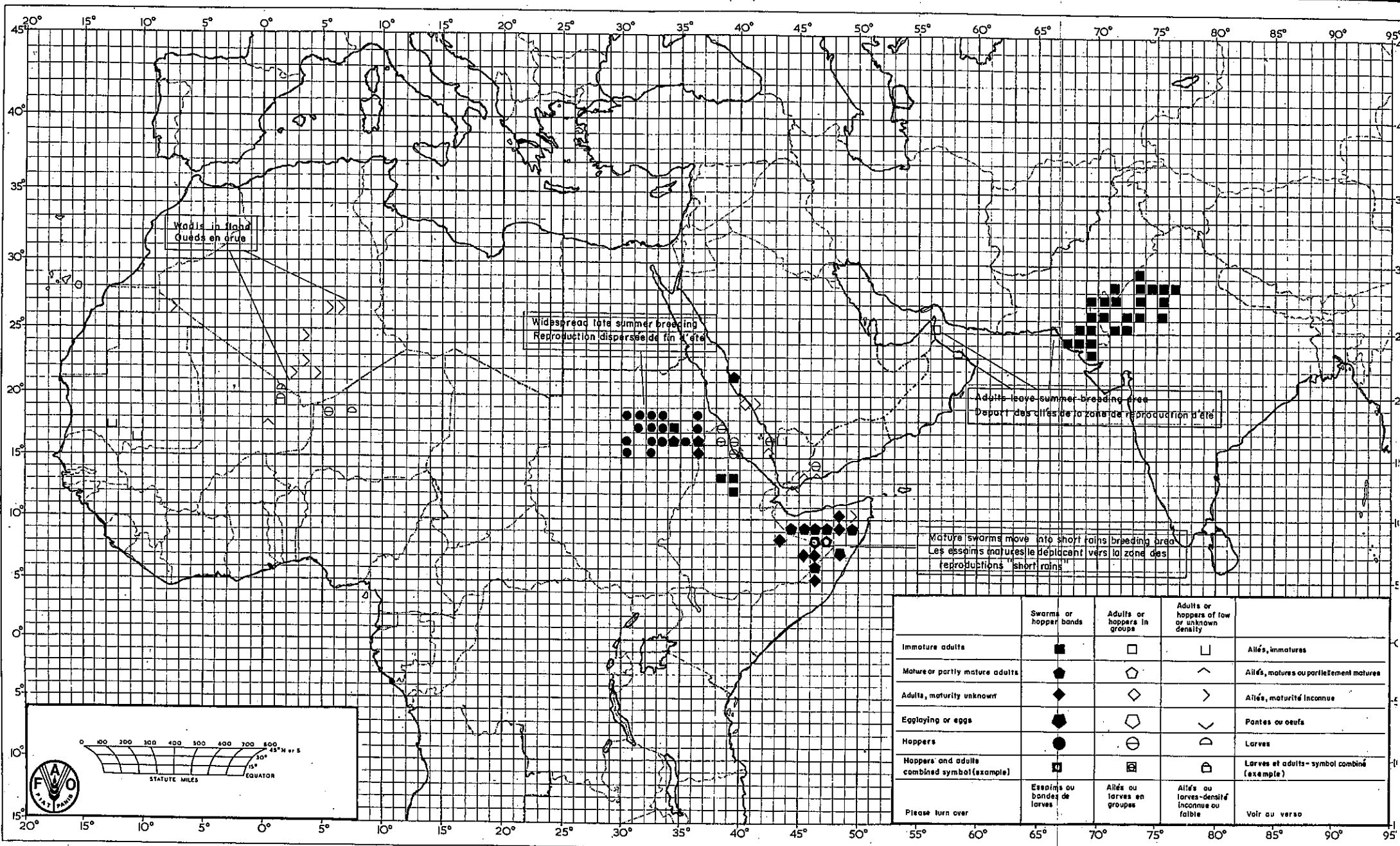
Breeding will continue on the Red Sea coasts of Sudan and Eritrea and hopper bands and swarms are likely to be produced in areas where no control is possible. The swarms in the highland area of northern Ethiopia will move on to the Red Sea coastal plains of Eritrea and Sudan and start to breed. Some could cross the Red Sea and breed in the Tihamas of Saudi Arabia and the Yemen Arab Republic.

In West Africa breeding will end in Tamesna of Niger but some swarmlets could be produced in green areas which may have escaped detection by survey teams.

In North West Africa numbers of adults are likely to increase in southern Algeria and Libya as they migrate northwards from the breeding areas south of the Sahara.

It is again regretted that the map which should accompany this Summary could not be prepared.

Rome  
14 November 1978

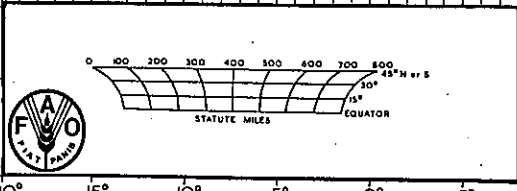


Wadis in flood  
Guéds en érué

Widespread late summer breeding  
Reproduction dispersée de fin d'été

Adults leave summer-breeding area  
Départ des adultes de la zone de reproduction d'été

Mature swarms move into short rains breeding area  
Les essaims matures se déplacent vers la zone des reproductions "short rains"



	Swarms or hopper bands	Adults or hoppers in groups	Adults or hoppers of low or unknown density	
Immature adults	■	□	◻	Adultes, immatures
Mature or partly mature adults	●	◐	◑	Adultes, matures ou partiellement matures
Adults, maturity unknown	◆	◇	◇	Adultes, maturité inconnue
Egg laying or eggs	●	◐	◑	Pontes ou oeufs
Hoppers	●	◐	◑	Larves
Hoppers and adults combined symbol (example)	■	◐	◑	Larves et adultes - symbol combiné (exemple)
Please turn over	Essaims ou bandes de larves	Adultes ou larves en groupes	Adultes ou larves - densité inconnue ou faible	Voilà ou verso

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## Locusts, other migratory pests and emergency operations group

**DESERT LOCUST SITUATION  
SUMMARY AND FORECAST**

No. 3 NOVEMBER 1978

## SUMMARY

The summer breeding areas in India and Pakistan became free of swarms. Groups and large numbers of scattered locusts migrated west along the Mekran coast and reached southern Iran, Oman, the United Arab Emirates and People's Democratic Republic of Yemen. Widespread but generally light gregarious breeding continued in the Somali peninsula. Swarms reached the Red Sea coast of Sudan and laid, and a few immature swarms reached the Tihama of Saudi Arabia. Winter rainfall around the Red Sea and Gulf of Aden was patchy.

The main threats in the continued development of the plague are of breeding in inaccessible areas in the Somali peninsula and along the Red Sea coast of northern Ethiopia, of breeding in other coastal areas bordering the Red Sea and Gulf of Aden, and of breeding in remote areas of eastern Arabia and in coastal areas and interior valleys in the Mekran of Pakistan and southern Iran.

In South West Asia the last swarms were reported from the summer breeding areas in India and Pakistan in early November, two of the swarms flew out to sea. Small groups of adults were seen along the Mekran coast of Pakistan and some adults entered south-eastern Iran in early November.

In the Near East immigration from the summer breeding areas of India and Pakistan continued in early November, some adults reaching the People's Democratic Republic of Yemen in mid-November. A number of small-medium sized immature swarms reached the Tihama of Saudi Arabia between Jizan and Jeddah in late November, almost certainly from northern Ethiopia. There were also groups of adults north of Qunfidah. Scattered hoppers were present on the northern Tihama of Yemen.

In Eastern Africa there was widespread light gregarious breeding in the "Short Rains" breeding area of the Somali peninsula. No hoppers were reported after 20 November. A swarm was seen in northern Ethiopia in early November and breeding was almost certainly in progress on the Red Sea coast of northern

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Ethiopia. In Sudan a number of mature swarms reached the Tokar delta and started to breed. Hatching commenced in late November. Other swarms persisted in the summer breeding area, where late breeding came to an end.

In West Africa late instar hoppers and fledglings were controlled in Tamesna of Niger. Small numbers of adults were seen in Malian Tamesna, the Tilemsi valley and southern Mauritania.

No reports were received from North West Africa, but scattered adults were probably present in many areas in southern and central Algeria.

SOUTH WEST ASIA

INDIA

Ecological conditions There was widespread moderate rainfall in Gujarat and Rajasthan between 12 and 14 November associated with a cyclone. Barmer recorded 32 millimetres, Jaisalmer 11, Jodhpur 16, Sri Ganganagar 18, Bhuj 34 and Deesa 74 millimetres. There was further, light, rain at Udaipur and Kota in the second half of November.

Adults A pink swarm, measuring 5 x 2 km. was reported from several localities in the Mandvi area of Gujarat between 5 and 7 November and was finally reported to have flown out to sea on 8 November. Another pink swarm, measuring 2 x 1 km. was reported from Phalodi on 7 November. Scattered adults were seen in many areas of Rajasthan. In the first half of the month there was one area where the population was "countless", i.e. more than 20,000 per square kilometre, but by the second half of the month the maximum density was 2,520 per square kilometre, near Ghotaru (2719N, 7002E). Elsewhere densities of 60-900 per square kilometre were recorded from Ranao (2739N, 7028E), Nachna (2730N, 7144E), Tanot (2749N, 7022E) and Bahla (2746N, 7125E) areas of Jaisalmer district. *Last week, 9 Oct.*

Hoppers Small numbers of solitarious third to fifth instar hoppers were found during the second half of the month.

Control measures Ground control operations were mounted against the two swarms.

PAKISTAN (Report received for 1 - 15 November)

Ecological conditions Widespread but light rains were reported from Pasni, Nushki, Uthal and a few other localities in the winter-spring breeding areas in the first half of November.

Adults In Lower Sind one swarm was reported from Badin on 2 November and another, which was reported from the suburbs of Karachi on 6 November, later flew out to sea. Small groups of adults were reported from four localities along the Makran coast between 2 and 7 November. Scattered adults were also recorded at several localities between Kandewari and Hub in Las Bela district and were present at a maximum density of 2,250 per square kilometre at Gadani beach. The summer breeding area was reported clear of adults.

Hoppers No hoppers were reported.

AFGHANISTAN

No locusts were reported during the first half of November.

IRAN

Adults Immature adults were seen at densities of up to 100 per hectare over an area of at least 100 hectares near Chahbahar (2516N, 6041E) on 6 November.

Control measures The adults seen near Chahbahar were baited.

NEAR EAST

OMAN

Ecological conditions No reports of rain have been received.

Adults Many hundreds of pink adults were seen at lights in Muscat on 2 November. Scattered pink adults were also seen at several localities between Muscat and Sohar on 3 November and some were reported from the foothills along the Batinah coast. These almost certainly constituted escapes from the summer breeding areas in India and Pakistan.

Hoppers No hoppers were reported.

PEOPLE'S DEMOCRATIC REPUBLIC OF YEMEN

Ecological conditions The Mukalla area received good rainfall in the third week of November. There were also light showers in the Dathina valley.

Adults A sudden rise in the number of pink adults was noted in the second week of November in Mukalla, Meifa (1420N, 4735E) and in the Abyan delta. This invasion almost certainly originated in the summer breeding area of India and Pakistan.

GULF OF ADEN

Adults A ship reported a locust at 1432N, 5011E at 12.00 hours on 10 November. The specimen was captured and was a female Desert Locust. The same ship reported another locust at 1427N, 4959E at 08.00 hours on 11 November. Both positions are about 100-120 km. east of Mukalla.

YEMEN ARAB REPUBLIC

Ecological conditions The Tihama received good rainfall, there was abundant soil moisture and the vegetation was reported to be green.

Adults Adults were present at densities of 500 per hectare in Wadi Hayran (1616N, 4300E) and Habl (1609N, 4252E).

Hoppers Solitary hoppers were present in Wadis Hayran and Habl.

Control measures The hoppers in Wadis Hayran and Habl were dusted.

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## SAUDI ARABIA

Ecological conditions Until late in the month the only rains reported were a few showers south of Qunfidah and in eastern coastal areas. Late in the month rain was also reported from the Jizan area and from Hail.

Adults There were three reports of pink swarms, measuring 3, 8 and 15 sq. km. from the Lith area on 22 November. The swarms were reported to have arrived from the west and departed to the northeast. One was controlled, the other two were reported to have dispersed. Another small pink swarm was seen in Jeddah on 25 November which also dispersed, and a further pink swarm was reported north of Jizan on 27 November. Large groups of adults were present north of Qunfidah in late November and non-swarmling adults at densities of up to 2,000 per hectare were present in Shaqqah ash Shamiyah and Shaqqah al Yamaniyah. Adults at lower densities were present in all areas of the southern Tihama. Solitarious adults were also reported from Hail.

Hoppers Small scale breeding was in progress in many areas along the southern Tihama.

Control measures One of the swarms seen in the Lith area on 22 November was controlled. Aerial and ground control operations were also in progress against groups and high density scattered populations north of Qunfidah.

No locusts were reported from JORDAN.

No reports have been received from BAHRAIN, EGYPT, IRAQ, KUWAIT, LEBANON, QATAR, SYRIA or the UNITED ARAB EMIRATES.

EASTERN AFRICA

## SUDAN

Ecological conditions There was light to moderate rainfall on the southern Red Sea coast, where Aqiq received 60 mm up till 25 November. Conditions were suitable for breeding in the Tokar delta and towards the Ethiopian border. Conditions became unfavourable for breeding in the summer breeding area.

Adults 3 immature swarms and one swarm of mixed maturity were seen along the Nile between Shendi and Ed Damer between 3 and 11 November, the largest being 15 sq. km. A small immature swarm was seen along the Atbara on 3 November and two mature swarms were seen along the Atbara on 14 November measuring 19 and 51 sq. km respectively. Most were of thin density. Groups of adults were found between 19 and 23 November between Shendi and Zeidab. There were 6 reports of swarms in the northern part of Kassala Province between 2 and 15 November, two were of mixed maturity and four were immature, the largest swarms were 256 and 128 sq. km. The Red Sea coast was invaded by swarms in mid-November. Between 12 and 18 November mature, copulating and laying swarms were reported from 6 blocks in the Tokar delta, and a 20 sq. km. immature swarm was seen at Khor Mukhan (1811N, 3809E) on 13 November. Groups of laying adults persisted in the Tokar

delta to the end of the month. On 25 November a 6 sq. km. immature swarm was seen at Gebeit (1854N, 3653E) and was seen at Barameiya (1835N, 3646E) on 26 November. Another, mature, swarm measuring 20 sq. km. was seen at Haiya on 26 November. There were also large numbers of immature scattered locusts in the Tokar delta at densities ranging from 1260 to 12180 per hectare over an area of 4,445 hectares. These constituted the results of breeding which commenced in late September.

Hoppers Early in the month there were third - fifth instar hoppers over an area of 15,000 hectares at Khor Langeb (1730N, 3654E). Scattered hoppers were present throughout the month in the Tokar delta at densities of up to 10 per dutha plant. On 24 November a new wave of hatching commenced, and by early December there were first and second instar bands over an area of 900 hectares, in the area bounded by latitudes 1828N . 1910N and longitudes 3631E - 3652E. Groups of hoppers were also found between Shendi and Zeidab between 19 and 23 November.

Control measures Groups of adults and hoppers between Shendi and Zeidab were sprayed from the air with 1,350 litres of 96% Malathion between 19 and 23 November. Ground control continued throughout the month against hoppers and adults in the Tokar delta and arrangements were being made for four aircraft to spray remaining groups of adults and hopper bands.

#### ETHIOPIA

Ecological conditions Heavy rain was reported along the northern Red Sea coast during the first week. Other parts of the country were generally dry during the first decade, Neghelli reported 3 mm. In the second decade there was widespread generally light rain; Asmara recorded 50 mm., Massawa 15, Awash 2, Jigjiga 7, Neghelli 34 mm. No rain was reported from Assab or Diredawa. Figures for the third decade are not yet available.

Adults The swarms which had been present in the Tacazze valley, Averghelle, Fenaroca and Samre areas throughout October emigrated in early November for aerial surveys flown off Macalle to the Tacazze valley, Axum, Adua, Averghelle and Mai Cen areas between 14 and 20 November failed to locate them. The direction of the movement was not recorded but was probably to the north as a swarm was seen flying from Tigray Province on 2 November and the swarms which reached the Tihama of Saudi Arabia may have originated in northern Ethiopia. No reports of swarms have been received from the Red Sea coast, Dankalia, the Railway Area or the Ogaden.

Hoppers No reports of breeding on the Red Sea coast or in the Ogaden have yet been received.

#### SOMALIA

Ecological conditions Rainfall was reported from the Dusa Mareb, El Bur and El Dere (0351N, 4711E) areas in early November.

Adults There was an unconfirmed swarm 75 km. southwest of El Dere on 6 November. A thin density mature swarm measuring 0.5 x 0.5 km settled at Gawan (approximate position 0540N, 4835E) on 12 November. Scattered mature adults,

mainly males, were seen from Adado (0608N, 4636E) to El Bur (0442N, 4636E) on 2 November, and between Dusa Mareb, El Bur, El Dere, Adado and Adeniaval on 11 November. Scattered locusts were also seen between Kataban (0512N, 4531E), Ferfer, Belet Uen and Bulo Burti on 2 November. No locusts were seen or reported on a ground survey along the route Mogadiscio-Uarsheik-Itala-El Dere-Harardera on 24 November. An egg-field was found around Galkayo on 7 November; the density of the egg-pods was 25-30 per square foot. Unconfirmed egg-fields were reported 60 km. northeast of El Bur on 2 November.

Hoppers Small numbers of first to third instar hopper bands were present at Ban Adde (0915N, 4625E) north of Ainabo, 12-20 km. south of Hidihi (0307N, 4655E) southwest of Las Anod, Ghelinsor, Adado, Bali Busle (0540N, 4643E) and from several localities between Galkayo and Harardera. Hatching continued up to 16 November north of Harardera. There were no reports of hoppers after 20 November.

Control measures Ground control operations using exhaust nozzle sprayers were undertaken against many of the hopper infestations but some north of Harardera could not be controlled because of thick bush. A total of 1 very large, 5 large, 24 medium and 113 small bands were controlled.

No report was received from DJIBOUTI. KENYA, TANZANIA and UGANDA remained clear.

#### WEST AFRICA

##### NIGER

Ecological conditions There were areas of green Schouwia, Tribulus and Boerhavia between dunes in Tamesna. There were also areas of green vegetation around Arlit in western Air. No rain was recorded.

Locusts Fifth instar hoppers and fledglings at densities of 3-5 and 10-15 per square metre respectively were present over an area of 4,650 hectares at In Akarbai (1848N, 0540E). Adults were seen departing to the west at night on 12 November. In western Air the population was reported to be very scattered.

Control measures The population at In Akarbai was controlled using 400 litres of 5% dieldrin and 385 litres of 20% dieldrin.

##### MALI

Ecological conditions No rain was recorded north of 17°N, and ecological conditions were unfavourable for breeding. There were still patches of green vegetation in wadis in the north of the Adrar des Iforan and in southern Tamesna.

Adults Immature and mature adults were found at densities of 25-100 per hectare over areas of 150-500 hectares in wadis In Oumfassen (1755N, 0315E) and Tin Baden (1740N, 0300E to 1730N, 0252E). Isolated immature and mature adults were found in the southern part of the Tilemsi valley.

## MAURITANIA

Ecological conditions Unusual and heavy rain fell in southern Mauritania on 28-30 November. The vegetation was dry except in the Faye, Amlil and If-zoutine depressions north of the 17th parallel and south of the Adrar.

Adults A few immature adults were seen between 1657N, 1040W and 1638N, 1052W.

NORTH WEST AFRICA

No reports have been received from ALGERIA, LIBYA, MOROCCO or TUNISIA.

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FORECAST FOR LATE DECEMBER 1978 - JANUARY 1979

In South West Asia groups of adults and perhaps a few small swarms which may have escaped detection will remain in coastal areas of the Mekran of Pakistan and southern Iran. Breeding may commence towards the end of the forecast period.

In the Near East further swarms could arrive on the Tihama of Saudi Arabia and the Yemen Arab Republic from northern Ethiopia and possibly Sudan throughout the period. Swarms could also reach the People's Democratic Republic of Yemen, Yemen Arab Republic and Saudi Arabia from the "Short Rains" breeding area in the Somali peninsula during January. The adults which reached the People's Democratic Republic of Yemen from the east in November could move further west and north and augment populations already on the Tihama of the Yemen Arab Republic and Saudi Arabia. Breeding will continue along the Tihama of Saudi Arabia and the Yemen Arab Republic and commence in coastal areas and inland valleys in the People's Democratic Republic of Yemen. Hopper bands will occur in Saudi Arabia from laying by the swarms which arrived in late November and are likely to form in the Yemen Arab Republic and the People's Democratic Republic of Yemen. Fledging will start in late January and could lead to the formation of swarms unless control operations are mounted in all infested areas. Breeding may commence towards the end of the forecast period by any locusts which remain in Oman and the United Arab Emirates.

In Eastern Africa any swarms still in the interior of Sudan and northern Ethiopia will move on to the Red Sea coastal plains and start to breed, and breeding by locusts already on these coastal plains will continue. In the Somali peninsula fledging will commence in mid-December. Some of the new generation adults may move southwest into northern Kenya in early January and some could even reach the central highland area towards the end of the forecast period. Others are likely to reach the Rift Valley and will then move into southern Ethiopia and may reach the Railway Area at the end of January. Swarms produced in the more northerly parts of the "Short Rains" breeding area are likely to move northwest towards the Railway Area and may reach coastal areas of northwest Somalia, Djibouti and southern Eritrea, and perhaps also Yemen Arab Republic, People's

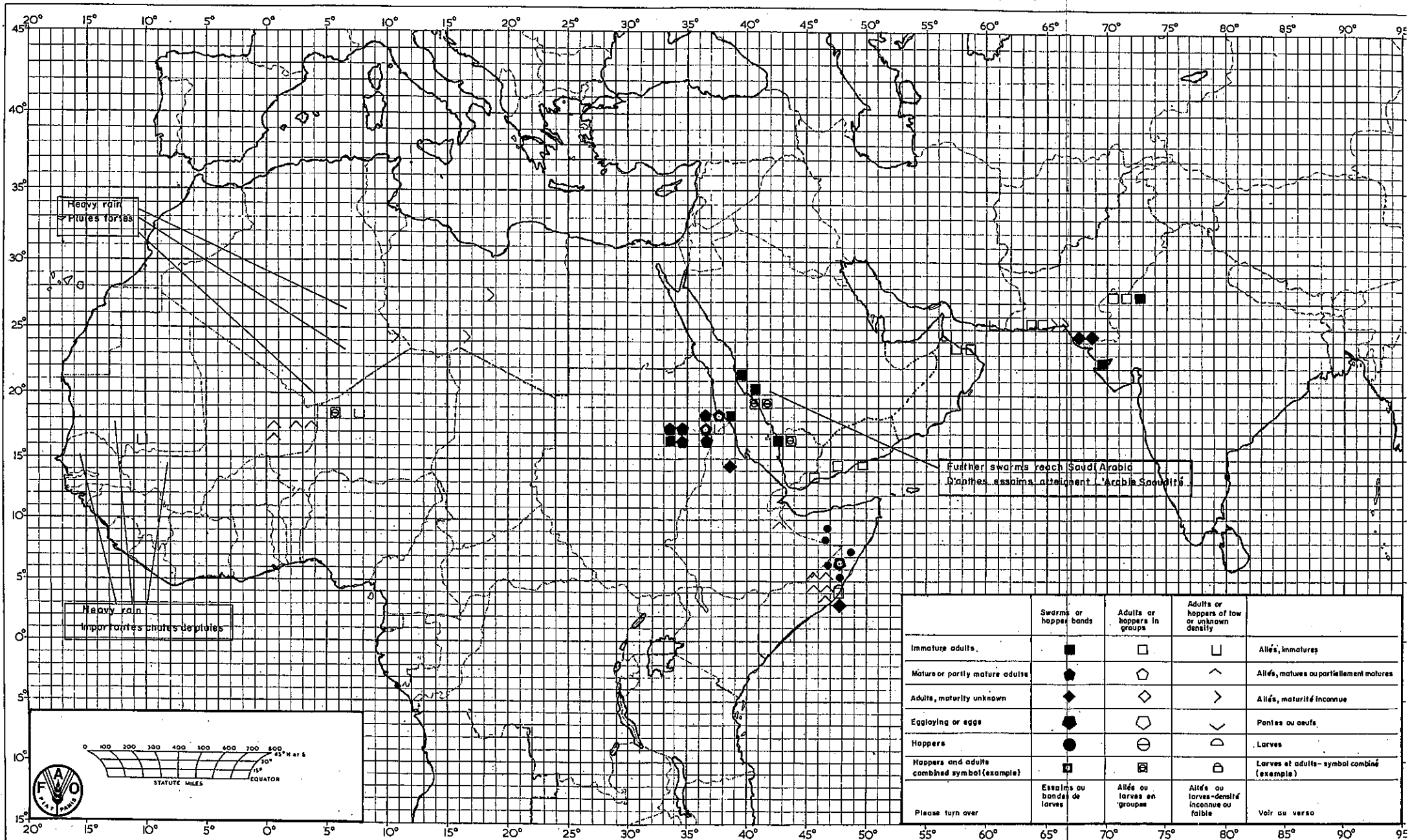
Democratic Republic of Yemen and Saudi Arabia. Adults which have reached the coastal plains of northern Somalia will start to breed.

In West Africa small numbers of adults will persist in areas of greener vegetation in Air and Tamesna of Niger, and Tamesna, Adrar des Iforas, Tilemsi and Timetrine of Mali. Breeding may commence in Mauritania and Western Sahara but is likely to be on a small scale.

In North West Africa small numbers of adults will persist in areas of greener vegetation in southern and central Algeria and breeding could occur on a small scale.

The Summary maps for September and October are enclosed with this Summary. The November Summary Map will be despatched with the December Summary.

Rome  
14 December 1978



	Swarms or hoppers bands	Adults or hoppers in groups	Adults or hoppers of low or unknown density	
Immature adults	■	□	◻	Alliés, immatures
Mature or partly mature adults	●	◐	∧	Alliés, matures ou partiellement matures
Adults, maturity unknown	◆	◊	>	Alliés, maturité inconnue
Egg laying or eggs	◆	◐	∨	Pontes ou oeufs
Hoppers	●	⊖	◐	Larves
Hoppers and adults combined symbol (example)	◐	◐	◐	Larves et adultes - symbol combiné (exemple)
Please turn over	Essaims ou bandes de larves	Alliés ou larves en groupes	Alliés ou larves - densité inconnue ou faible	Voir au verso

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AGP Division

## Locusts, other migratory pests and emergency operations group

# DESERT LOCUST SITUATION SUMMARY AND FORECAST

No. 4 December 1978

### SUMMARY

Saudi Arabia continued to receive swarms from across the Red Sea. These matured and laid in western coastal areas. Swarms were also present in Red Sea areas of Sudan where gregarious breeding was in progress. A similar situation probably exists in Red Sea coastal areas of Ethiopia. A number of new generation swarms were reported in the "Short Rains" breeding area in the Horn of Africa, where control operations against hoppers were concluded. The main winter breeding areas around the Red Sea and Gulf of Aden received only moderate rainfall. There was independent heavy rainfall in Senegal, Mauritania and Mali, and light-moderate rainfall in southern central and eastern Algeria in late November and early December.

In West Africa scattered locusts were reported from a few localities in Mauritania, north east Mali and north west Niger.

No locusts were reported from North West Africa.

In Eastern Africa a number of maturing and mature swarms were reported from the Tokar delta of Sudan, where gregarious breeding continued. There were no reports from the Red Sea coast of Ethiopia but similar infestations are likely. In the "Short Rains" breeding area of the Somali peninsula a number of new generation swarms were reported and control operations against hoppers were concluded.

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In the Near East there were numerous reports of swarms from the Tihama of Saudi Arabia. These almost certainly represented escapes from late summer breeding in northern Ethiopia. Most swarms stayed on the Tihama, matured and laid; gregarious breeding was in progress in many areas. Some swarms crossed the coastal mountains and reached the interior. Only scattered locusts were reported from the Yemen Arab Republic, the People's Democratic Republic of Yemen and south eastern Egypt.

In South West Asia there was an unconfirmed report of a swarm in the Mekran of Pakistan and scattered adults were seen at a number of localities in western Rajasthan in India.

DESERT LOCUST SITUATION - DECEMBER 1978

WEST AFRICA

Weather

A middle level trough developed diagonally over northern Africa during the last three days of November 1978, extending from Senegal to Iraq on 29 November. This system, which was virtually stationary for four days, caused widespread and heavy rainfall over large parts of Senegal, Mauritania and Mali (see attached map). While disintegrating, the system moved north during the first days of December, bringing rainfall to northern Mauritania and Mali.

The satellite image interpretation was confirmed by a report from Mauritania where Kiffa (1645N, 1130W) reported 39 mm on 29-30 November.

Scattered showers fell in early and late December in south eastern and eastern Mali and north western Nigeria.

MAURITANIA

Ecological conditions Several falls of rain were reported during the first few days of December; Aioun el Atrouss recorded 4.7 mm. Vegetation was reported to be green 50 km. north of Aioun el Atrouss, and in Aouker, Tichit and Oualata areas.

Adults Isolated adults were reported in western Mauritania north of 17°N and west of 12°W. Isolated mature adults were reported during the first week of December at 1806N, 1330W and between 1802N, 1348W and 1730N, 1229E.

Hoppers Young green hoppers were reported during the first week at 1806N, 1330W and between 1802N, 1348W and 1730N, 1229E.

MALI

Ecological conditions No rainfall reports were received from ground stations and the vegetation was reported to be dry.

Adults Isolated adults were reported at Arakad (1731N, 0215E), and at a density of 1-25 per hectare over an area of 250 hectares at In Aridal (1741N, 0205E). One adult was seen at Tamachaloudjen (1820N, 0230E) on 2 December.

NIGER

Ecological conditions Nomads reported significant rain at Mont Greboun (2000N, 0835E). In Air vegetation was dry except for Schouwia.

Adults In Tamesna two adults were seen at 1750N, 0525E and 1858N, 0606E. In Air fledglings were reported at a density of 6-20 per hectare at Akokom (1845N, 0730E) at the end of December. Isolated mature adults were reported in eastern Air.

No locusts were reported from CHAD.

NORTH WEST AFRICA

Weather

The weather system referred to above caused light-moderate rain in parts of southern, central and eastern Algeria in late November. The northern part of the North West African region was observed to be dry throughout the period.

No locusts were reported in LIBYA.

No reports have been received from MOROCCO, ALGERIA or TUNISIA.

EASTERN AFRICA

Weather

The key desert locust breeding areas in the Horn of Africa were observed to be cloudfree and dry for the total five-week period from 27 November to 31 December. No rainfall occurred in Somalia and Djibouti. Western and central Ethiopia received light to moderate showers during the first half of December. Surface observations received from Nairobi confirmed the existence of low level convergence over central Ethiopia on 12 and 15 December, when rain was judged to have fallen.

The Red Sea coastal areas of Sudan and Northern Ethiopia were observed to have received moderate rain from a local system of limited extent.

SUDAN

Adults During the last week of November and the first week of December four mature swarms totalling  $14\frac{1}{2}$  sq. km. in area were reported in the Tokar delta, one swarm of mixed maturity measuring 2 sq. km. was reported at Jebel Tagdara (1814N, 3813E) and one immature swarm of 2 sq. km. was reported from Khor Labba (1836N, 3650E). In the second week there were two further reports of mature swarms totalling 12 sq. km. and two reports of swarms of mixed maturity totalling  $3\frac{1}{2}$  sq. km. from the Tokar delta. There were further reports of two mature swarms totalling 2 sq. km. and four swarms of mixed maturity totalling 7 sq. km. from the Tokar delta in the second half of December. No other reports of adults in Sudan have been received.

Hoppers In the last week of November and the first week of December late instar hoppers were reported from four localities in the Sinkat area between latitudes 1828N and 1910N, and between longitudes 3631E and 3652E.

In the Tokar delta first and second instar hopper bands were present over an area of 900 hectares in the first week of December, and first instar bands were present over an area of 2,110 hectares in the second week. In the second half of December the area infested with hoppers had increased to 2,440 hectares.

Control measures Ground and aerial control measures were undertaken against all infestations. By 20 December 5,100 litres of Malathion had been applied by aircraft.

#### ETHIOPIA

Ecological conditions Heavy rain was reported between Mersa Teclai and Karora on 11-12 December and the vegetation on the Red Sea coast north of Massawa was reported to be green.

Adults An immature swarm was reported flying to the north at Gorrahei (0635N, 4425E) on 26 December. Fledglings were reported at 45 km. south west of Bohotleh in late December.

Hoppers Bands of late instar hoppers were reported with the fledglings 45 km. south west of Bohotleh in late December and there were reports of major hopper infestations in the Dagabur, Gabredarre and Gorrahei areas.

No reports of hoppers or adults have been received from the Red Sea coastal areas since late October.

#### SOMALIA

Ecological conditions Strong north easterly winds were reported in the last decade of December.

Adults New generation adults started to appear in the first decade of December. Medium to dense fledglings and pink swarms were reported from Dudimo (0930N, 4717E), Wad (0921N, 4706E) and Gowsaweyne (0923N, 4700E) during the first and second decades of December. On 15 December four swarms totalling 76 sq. km. were sighted east of Bohotleh flying south west into the Ogaden, and there was a further unconfirmed report of a swarm from the same area on 16 December. On 23 December several small-medium sized swarms were seen between Bohotleh and Duruksi. Further south three adults were seen at El Bur on 24 and 27 December and two immature adults were seen at Harardera on 28 December. There were unconfirmed reports of immature swarms in the Bulhar area on 9-11 December.

Hoppers Breeding was terminated by control measures during the second decade of December in the Dusa Mareb, Ghelinsor and Galkayo areas. Two small fifth instar bands were found at Arro (0511N, 4732E) in late December.

Control measures Control measures were concluded in the Dusa Mareb, Ghelinsor and Galkayo areas in the second decade of December. Two fifth instar bands were controlled at Arro (0511N, 4732E) in late December.

No reports were received from DJIBOUTI.

KENYA, TANZANIA and UGANDA remained free from locusts.

NEAR EAST

Weather

Substantial parts of Egypt received moderate precipitation during the last week of November and first week of December. Depressions moving eastward over the eastern Mediterranean littoral caused precipitation in southern Israel, southern Jordan, Iraq and north eastern Saudi Arabia.

Coastal and mountainous areas of western Saudi Arabia received moderate rainfall in the first half of December, whereas the Yemens, Oman, United Arab Emirates did not receive significant rain during the five week period.

SAUDI ARABIA

Ecological conditions On the Tihama some rain fell in the Shaqqah al Yamaniyah and Sha'ira areas between Lith and Qunfidah and in the Jizan area in early December. There was widespread heavy rainfall in the following areas in Western Saudi Arabia on 11 December: Jeddah, Mecca, Rabigh and Yenbo. Heavy rainfall was also reported in the second week of December in the Medina area. Taif, Bahra and Baljureishi in the Hijaz mountains received rain during the month.

Ecological conditions were favourable for breeding from south of Qunfidah to Jeddah, in the Jeddah-Mecca area and in some parts of the northern Tihama.

Adults In early December immature adults were present in many areas between Jeddah, Mecca and Lith at densities of up to 2,000-3,000 per hectare. These were remnants of the swarms which reached the Tihama in late November. On 5 December there was evidence of a further invasion from across the Red Sea for a number of immature and maturing swarms were reported south of Qunfidah. Subsequently between 9 and 27 December there were some 33 reports of mature, laying swarms on the Tihama between Wadi Hali, south of Qunfidah and the Jeddah-Mecca area. The dates of the sightings suggest that there was a movement northwards along the Tihama during the month, and some swarms apparently crossed the Hijaz mountains for there were five reports of swarms from the Bisha area.

Adults at low densities were reported from Hail and Jizan.

Hoppers In the first week of December the first main hatching started around Sha'ira, north of Qunfidah and by the end of the month hopper bands were also reported south of Wadi Luma, at Shaqqah al Yamaniyah and Shaqqah ash Shamiyah. Fledging was reported at Sha'ira in early December.

Control measures Fifteen ground teams and an aircraft were employed to control both swarms and hopper bands. All swarms were sprayed or dusted by ground teams. Two thousand small first instar bands were controlled in the Sha'ira area in early December and the aircraft sprayed over a total area of 500 sq. km.

YEMEN ARAB REPUBLIC

Ecological conditions No rain was reported so the soil became dry.

Adults Immature and mature adults were present at densities of 20-50 per hectare in Wadi Hayran, Wadi Habl, Al-Jarr (1620N, 4254E) and Baghawiyah (1500N, 4308E). There was an unconfirmed report of swarms at Maldi on the Saudi border.

Hoppers Concentrations of late instar solitaricolor hoppers were found in Wadis Hayran and Habl.

PEOPLE'S DEMOCRATIC REPUBLIC OF YEMEN

Ecological conditions Coastal areas received isolated light to moderate showers on 5 and 15-16 December; Lahej recorded 16 mm. on 16 December. Floods were reported in some areas along the foothills on the western coast in the first week of December.

Adults Adults at low densities were reported from the coastal plains and from Dathina in the interior.

EGYPT

Ecological conditions Although rain was recorded in Wadis Yoider (2218N, 3620E) and Baueiwai (2220N, 3547E) on 9-10 December, conditions were not suitable for breeding in the south eastern desert area.

Adults Scattered adults were observed in the Abu Ramad (2220N, 3610E) and Shalatein (2310N, 3510E).

No reports have yet been received from BAHREIN, IRAQ, KUWAIT, LEBANON, OMAN, QATAR, SYRIA or the UNITED ARAB EMIRATES.

SOUTH WEST ASIA

The countries of the Southwest Asian region (Iran, Afghanistan, Pakistan and India) are not covered by the field of view of Meteosat, so no general statement can be made about the weather.

PAKISTAN

Ecological conditions Localised rainfall was recorded in northeastern Baluchistan on 13 December. No rain was reported in the second half of December and the vegetation was dry.

Adults There was an unconfirmed report of a swarmlet at Turbat on 13 December. Scattered adults were reported from the Mekran in the first half of December and three adults were observed in the Kharan area in the second half of the month.

#### INDIA

Ecological conditions Light showers fell in Rajasthan, Haryana and Punjab on 1-3 December and light rain fell in Gujarat in the second half of December, Bhuj recording 2 mm.

Adults Scattered adults at maximum densities of 4,050 per sq. km. were reported in Mohangarh and of 1,050 per sq. km. in Charanwala (2752N, 7210E) areas of Jaisalmer district and 450 in Barmer district in the first half of December. In the second half of the month adults were present at maximum densities of 825, 675, 600 and 375 in Phalsund (2624N, 7155E), Sanawra (2652N, 7134E), Bussi and Bular areas respectively of Pokaran tehsil in Jaisalmer district, and at a maximum density of 325 per sq. km. in Sheo tehsil in Barmer district.

Hoppers Two solitaricolor fifth instar hoppers were collected in the Mohangarh area in the first half of December.

AFGHANISTAN was reported clear of locusts.

No report has been received from IRAN.

#### FORECAST FOR LATE JANUARY 1979 - FEBRUARY 1979

In North West Africa small numbers of adults will persist in patches of greener vegetation in southern and central Algeria and some may be present in southern Morocco and southern Libya. Breeding could occur on a small scale in southern and central Algeria and perhaps in southern Morocco and southern Libya if adequate rain falls.

In West Africa small numbers of adults will persist in areas of greener vegetation in Air and Tamesna of Niger, Tamesna and the Adrar des Iforas in Mali, in southern and western Mauritania and Mauritanian and Moroccan Western Sahara. Scattered breeding may occur in southern and western Mauritania and in Western Sahara.

In Eastern Africa any escapes from the more southerly part of the "Short Rains" breeding area are likely to move west-south-west across southern Somalia and southern Ethiopia and some may invade the Northern Province of Kenya. It is possible that some swarms may reach the central highland areas of Kenya but more likely that they will move into the Rift Valley and then move north and north-east and reach the Railway Area of eastern Ethiopia. Some may move further and reach coastal areas of the Red Sea and Gulf of Aden. Some other escapes from the "Short Rains" breeding area may move more directly towards the Harar highlands or on to the coastal plains along the Red Sea and Gulf of Aden and could start to

breed in northern Somalia, Djibouti, north-eastern Ethiopia, People's Democratic Republic of Yemen, Yemen Arab Republic and Saudi Arabia. Breeding which is in progress in southern Red Sea coastal areas of Sudan will continue throughout the forecast period and will probably extend further north. Breeding is almost certainly in progress in Red Sea coastal areas of Ethiopia and numerous swarms may form there. If conditions become unsuitable for breeding these swarms could move north to Sudan or cross the Red Sea and invade Saudi Arabia.

In the Near East there will be further laying by swarms on the Tihama of Saudi Arabia between Qunfidah and Jeddah and there is likely to be an extension northwards of the infested areas as swarms move north. The Tihama could also be invaded by escapes from north eastern Ethiopia and from the "Short Rains" breeding area in eastern Africa, and these could start to lay towards the end of the forecast period. Swarms which have already crossed the Hijaz mountains may start to breed in the Najran, Bisha and Turaba areas. Swarms from eastern Africa could also reach the People's Democratic Republic of Yemen and the Yemen Arab Republic and start to breed in coastal areas, if conditions are favourable. If not, they could move into the interior of the Yemen and of Saudi Arabia and start to breed in the latter country. There are probably only small numbers of adults in Oman and the United Arab Emirates but these could start to breed.

There is little chance that countries to the north of Saudi Arabia will be invaded by swarms in the forecast period.

In South West Asia breeding is likely to start in southern coastal areas of Iran and adults could start to move into the interior of southern Iran. Similarly, breeding is likely to start in the Mekran of Pakistan and in some interior valleys, as adults start to move north.

Rome  
22 January 1979

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DESERT LOCUST REPORTING AND FORECASTING SYSTEM

Rainfall Monitoring in the Desert Locust Invasion Area (excluding India, Pakistan and Afghanistan) with Meteosat Geostationary Satellite Imagery

Background

Since April 1978 over 90% of the Desert Locust Invasion Area has been covered by the geostationary environmental satellite Meteosat of the European Space Agency (ESA). This satellite, positioned at 0° longitude over the equator at a distance of 36,000 km. from the earth, views a major portion of the surface of the earth and its surrounding atmosphere simultaneously. The extremes of the full global disk viewed by Meteosat extend from Colombia in South America to Iran. The African continent is located more or less centrally in the full disk image.

The sensors of Meteosat, operating in the visible and thermal infrared wavelengths of the electromagnetic spectrum, provide both analog and digital data for the area viewed by the satellite at half hourly intervals with a spatial resolution of 2.5 km. for the visible channel and 5 km. for the thermal infrared channel immediately below the satellite.

The satellite is furthermore equipped with a sensor measuring the water vapour content of the atmosphere at half hourly intervals.

The high frequency large area coverage provided by Meteosat constitutes a very appropriate tool for general monitoring of the occurrence of rainfall in the desert locust recession area and the bordering invasion area where there is a sparse network of stations recording conventional meteorological data. Although no detailed quantitative rainfall estimates can be made from Meteosat imagery, due to the spatial resolution of the data and the scale of the imagery, the data does permit an assessment of the spatial distribution of the rainfall, including its intensity.

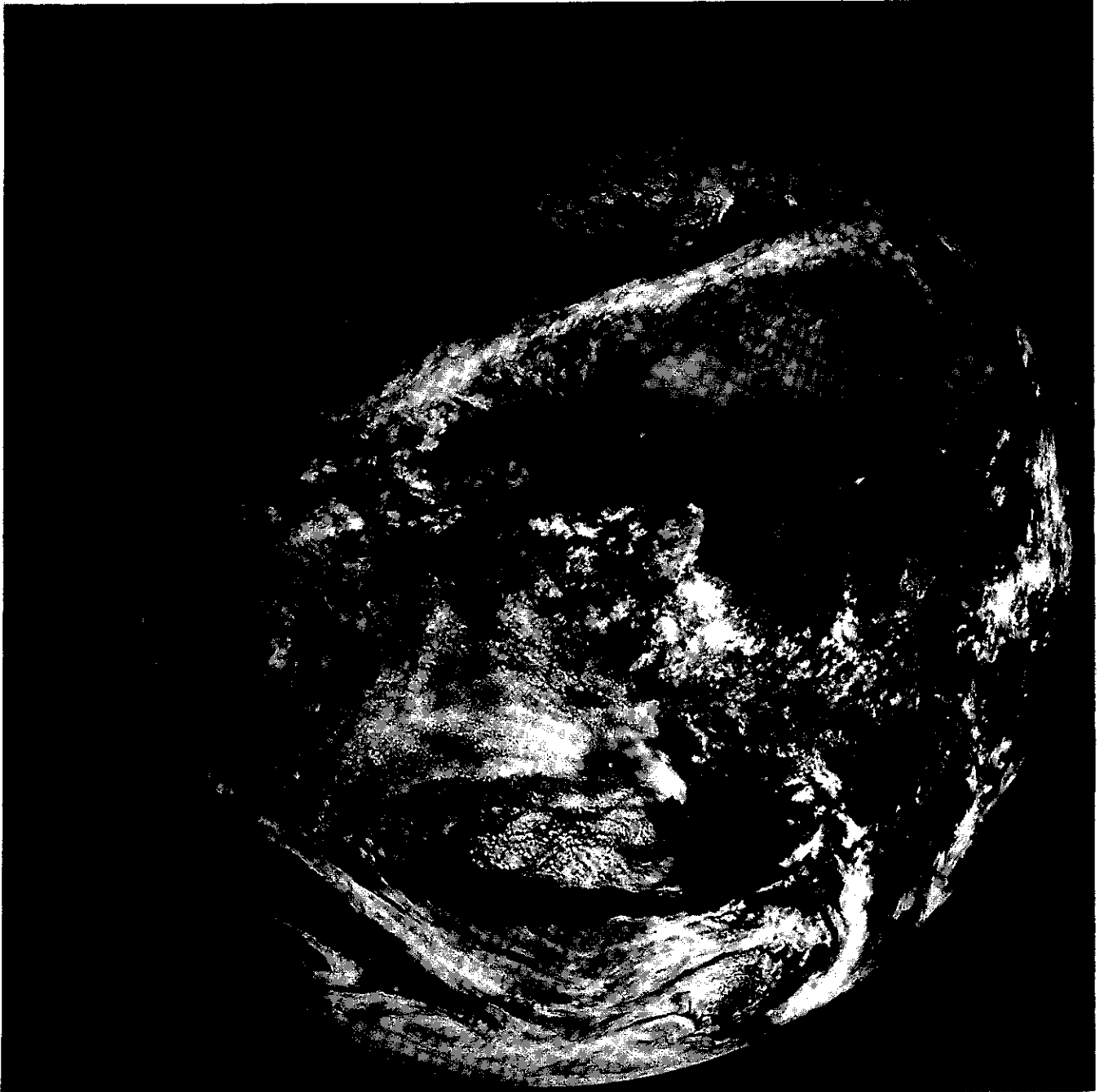
Since late November FAO has been receiving visible and thermal IR imagery from the European Satellite Operations Center (ESOC) in Darmstadt, Federal Republic of Germany, on a daily basis. The imagery is being used for monitoring rainfall for that part of the Desert Locust Invasion Area which is covered by the field of view of the satellite sensors. The imagery is acquired according to the following schedule:

Visible channel imagery: 0825 GMT, 1025 GMT, 1255 GMT  
Thermal IR channel imagery: 0025 GMT, 0825 GMT, 1255 GMT,  
1655 GMT, 2055 GMT

Upon receipt of the imagery, the total daily data set is analysed for rain-bearing cloud systems, rate of development and displacement. Subsequently, the most representative visible channel image is selected for a systematic rainfall estimation procedure by means of a 2° square grid, resulting in a three category (light, moderate and heavy) precipitation estimate for each 2° grid cell on a daily basis. These estimates are compiled weekly and monthly and will be distributed with the monthly Desert Locust Situation Summary and Forecast. At present the rainfall estimation can only be performed qualitatively as outlined above. In due course, daily rainfall observations from the meteorological stations in the Desert Locust Invasion Area will become available to FAO and will enable the qualitative estimates to be quantified. The first rainfall estimates are presented with the December Desert Locust Situation Summary and Forecast.

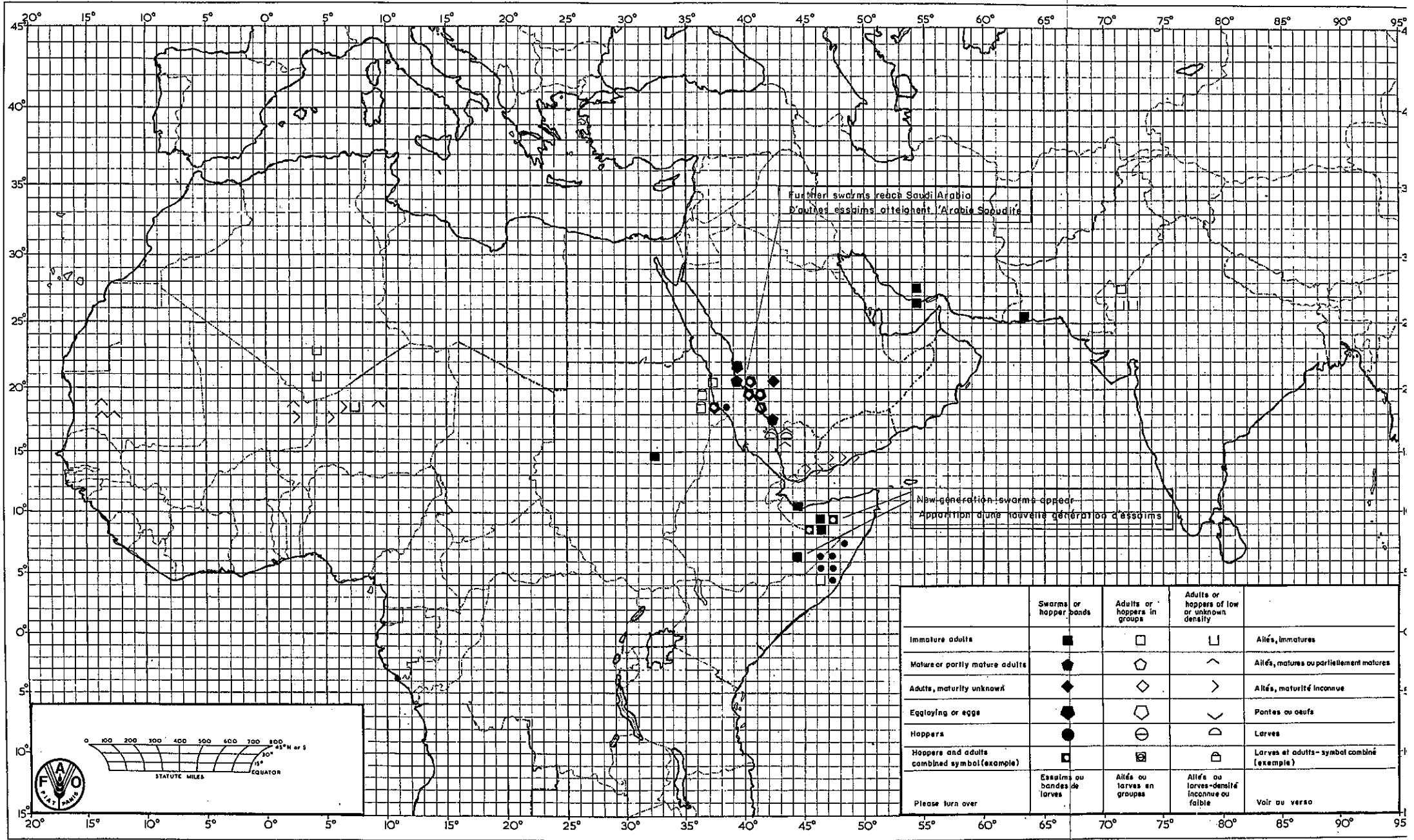
The attached Meteosat image was taken on 29 November 1978 at 1155 GMT by the visible channel sensor, which has a ground resolution of 2.5 km. The image shows the maximum development stage of the middle level trough extending diagonally over the Sahara from Senegal to Iraq in late November. Interpretation of this image, based on cloud type and cloud amount analysis, indicated that widespread and heavy rainfall occurred in several West African countries. This was later confirmed by meteorological station reports from Kiffa, which reported 39 mm. on 29-30 November and Aïoun, reporting 4.7 mm. on 29 November.

The image shows furthermore that dry conditions prevailed over much of the Desert Locust Invasion Area. Central and East Africa, as well as most of the Arabian Peninsula, are virtually cloudfree.

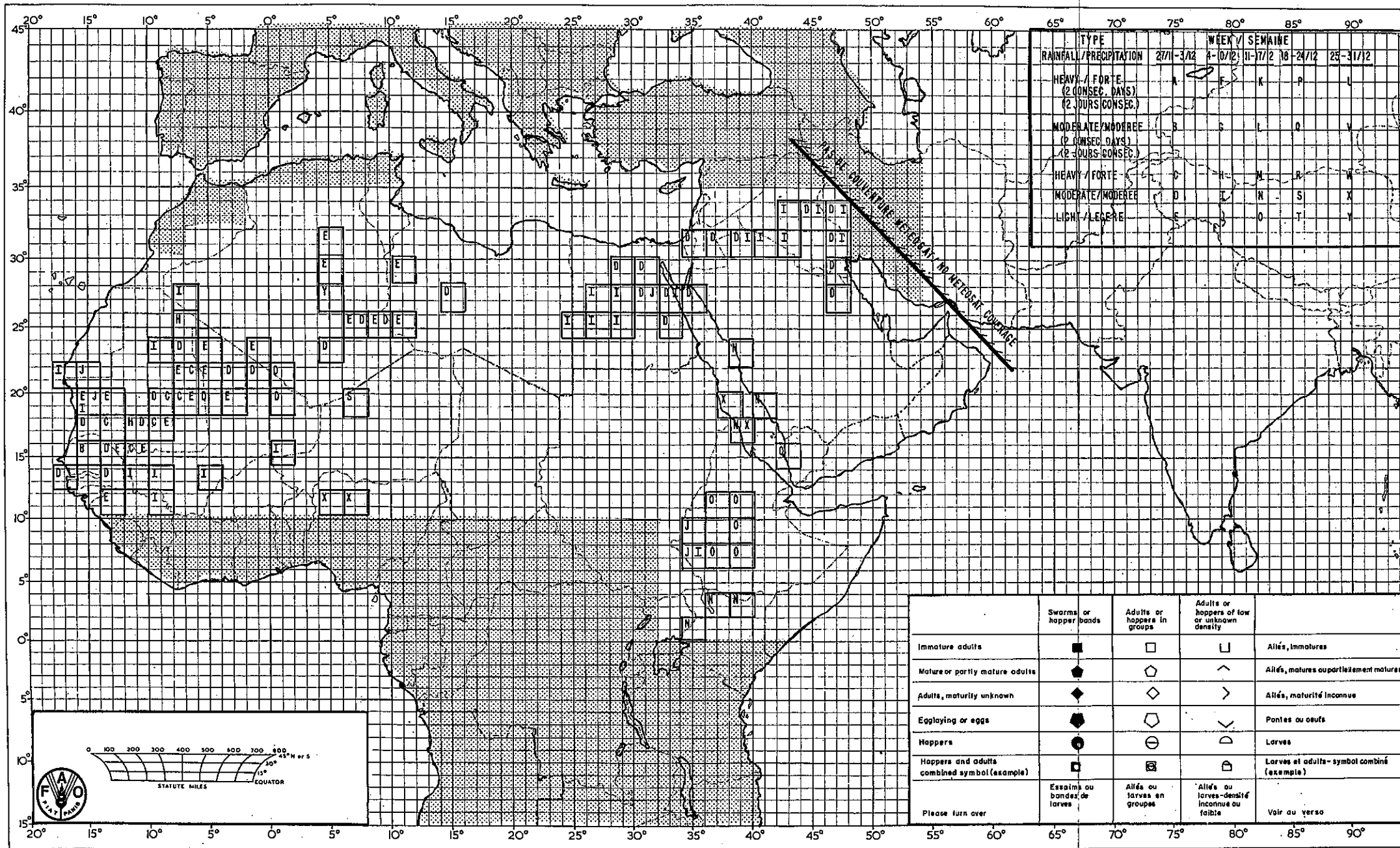


**METEOSAT**

1978 MONTH 11 DAY 29 TIME 0955 GMT (NORTH) CH. VIS 2  
NOMINAL SCAN/PREPROCESSED SLOT 20 CATALOGUE 1012720122



	Swarms or hopper bands	Adults or hoppers in groups	Adults or hoppers of low or unknown density	
Immature adults	■	□	◻	Allés, immatures
Mature or partly mature adults	●	◐	◑	Allés, matures ou partiellement matures
Adults, maturity unknown	◆	◇	◇	Allés, maturité inconnue
Egglaying or eggs	◆	◐	◑	Pontes ou œufs
Hoppers	●	⊖	⊖	Larves
Hoppers and adults combined symbol (example)	◻	◻	◻	Larves et adults - symbol combiné (exemple)
Please turn over	Essaims ou bandes de larves	Allés ou larves en groupes	Allés ou larves - densité inconnue ou faible	Voir au verso



TYPE	WEEK / SEMAINE				
RAINFALL / PRECIPITATION	27/11 - 3/12	4 - 10/12	11-17/12	18 - 24/12	25 - 31/12
HEAVY / FORTE (2 CONSEC. DAYS) (2 JOURS CONSEC.)	A	F	K	P	U
MODERATE / MODEREE (2 CONSEC. DAYS) (2 JOURS CONSEC.)	B	G	L	Q	V
HEAVY / FORTE	C	H	M	R	W
MODERATE / MODEREE	D	I	N	S	X
LIGHT / LEGERE	E	J	O	T	Y

	Swarms or hopper bands	Adults or hoppers in groups	Adults of low or unknown density	
Immature adults	■	□	◻	Alliés, Immatures
Mature or partly mature adults	◆	◊	◊	Alliés, matures ou partiellement matures
Adults, maturity unknown	◇	◊	>	Alliés, maturité inconnue
Egglaying or eggs	◼	◊	<	Pontes ou oeufs
Hoppers	●	⊖	∪	Larves
Hoppers and adults combined symbol (example)	◻	⊖	◻	Larves et adultes - symbol combiné (exemple)
Please turn over	Essais ou bandes de larves	Alliés ou larves en groupes	Alliés ou larves - densité inconnue ou faible	Voir au verso

