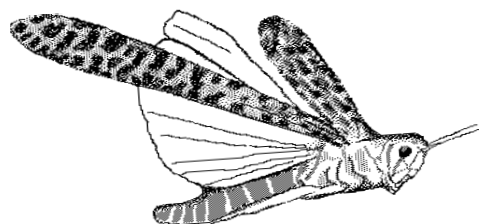
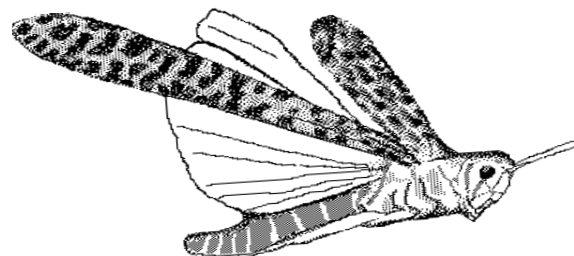


The First Joint Survey of the Desert Locust Winter Breeding Areas on the Egyptian-Sudanese Border

26 February - 8 March 2000



FOOD AND AGRICULTURE ORGANIZATION
OF THE UNITED NATIONS

Rome, 2000



**The First Joint Survey of the
Desert Locust Winter Breeding Areas
on the Egyptian-Sudanese Border**

26 February - 8 March 2000

K. Cressman

sponsored by

FAO Commission for Controlling the Desert Locust in the Central Region (CRC)

FAO EMPRES programme

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

Rome, 2000

The designations employed and the presentation of material in this publication do not imply the expression of any opinion whatsoever on the part of the Food and Agriculture Organization of the United Nations concerning the legal status of any country, territory, city or area or its authorities, or concerning the delimitation of its frontiers or boundaries.

All rights reserved. Reproduction and dissemination of material in this publication for educational or other non-commercial purposes are authorized without any prior written permission from the copyright holders provided the source is fully acknowledged. Reproduction of this publication for resale or other commercial purposes is prohibited without written permission of the copyright holders. Applications for such permission, with a statement of the purpose and extent of the reproduction, should be addressed in writing to the Director, Information Division, Food and Agriculture Organization of the United Nations, Viale delle Terme di Caracalla, 00100 Rome, Italy.

CONTENTS

Introduction	7
Organization	7
Results	8
Egypt	8
Sudan	9
Discussion and conclusion	10
Acknowledgements	12
Appendix 1. Participants	14
Appendix 2. Itinerary	16
Appendix 3. SPOT VEG imagery	17
Appendix 4. Completed survey forms	18
Appendix 5. Habitat descriptions	23
Appendix 6. Joint border survey in 2001	25
Appendix 7. Refurbishment of survey equipment	26
Appendix 8. Photos	27

The First Joint Survey of the Desert Locust Winter Breeding Areas on the Egyptian-Sudanese Border

26 February - 7 March 2000

K. Cressman, FAO Locust Forecasting Officer ¹

A joint survey was organized by the FAO Central Region Desert Locust Commission and the EMPRES programme to survey Desert Locust breeding areas on both sides of the Egyptian-Sudanese border. This is the first time that such a survey has been undertaken. Locust officers from the eight EMPRES countries, led by two FAO experts, surveyed more than 1200 km and drove an additional 2400 km in 12 days. Remote sensing imagery was used to identify possible areas of green vegetation. A new area was discovered during the survey in the Nubian Desert of Sudan that may play an important role in Desert Locust breeding. In general, all areas were very dry and no locusts were found except for two isolated adults in one place near the border. Consequently, no significant developments are expected in the coming months. The results will be used to plan for the forthcoming summer breeding period. The report includes details of the survey, results, habitat observations and suggestions for the next joint border survey.

Introduction

It is well known that the coastal plains and subcoastal areas on both sides of the Red Sea are key winter breeding areas of the Desert Locust. In the past, many upsurges and plagues have had their origins in this area. Breeding can extend for about 1000 km from south of Massawa, Eritrea to Shalatein, Egypt on the western shore of the Red Sea and for about 1600 km from Zabid, Yemen to Duba, Saudi Arabia on the eastern shore. This includes three border zones: Yemen / Saudi Arabia, Eritrea / Sudan and Sudan / Egypt. For security considerations, it is often difficult to carry out ground surveys in these areas on a regular basis as a means of properly monitoring ecological and locust conditions. As a result, undetected breeding could occur, resulting in an increase in locust numbers from which gregarious populations could form and spread into neighbouring countries, threatening agricultural production and national food security.

To fill these information gaps and to minimize the risk of such populations developing, FAO under the auspices of its Commission for Controlling the Desert Locust in the Central Region (CRC) and the EMPRES Central Region programme organized a joint border survey along both sides of the Egyptian / Sudanese border.

Organization

The timing of the survey fell within the usual winter breeding period along the Red Sea coast of November to March. Authorization for surveys to be conducted in the border areas of both countries as well as for participants and vehicles to cross the border was requested well in advance from the Governments of Sudan and Egypt. Both countries were extremely cooperative in ensuring that the necessary measures were in place for the survey. Visas were obtained for all participants including a multiple-entry visa for Egypt for the non-Egyptian participants.

1. See Annex 1 for the affiliation and address of the author. The report was written in collaboration with the survey participants. The survey was funded by the FAO Commission for Controlling the Desert Locust in the Central Region (CRC) and the FAO EMPRES programme.

Locust officers from EMPRES countries participated in the survey: three each from Egypt and Sudan, and one from Djibouti, Eritrea, Ethiopia, Oman, Saudi Arabia and Yemen (Appendix 1). The survey was led by Keith Cressman, FAO Locust Forecasting Officer (Rome), assisted by Fuad Bahakim (EMPRES NPO-Survey). It lasted for 12 days, starting on 26 February and finishing on 7 March.

Hand-held GPS units (Magellan TrailBlazer) and compasses were made available to those officers who did not bring their own. Each country provided survey maps of 1:250,000 (Sudan) and 1:500,000 (Egypt). FAO provided numerous copies of the English/Arabic version of its Locust Survey & Control Form as well as a satellite image of vegetation.

Survey routes and itineraries were planned by the participants based on the results of earlier surveys, knowledge of traditional breeding areas, locations of recent rainfall and 1 km SPOT remote sensing imagery for 1-10 February indicating possible areas of green vegetation (Appendices 2 & 3). Daily plans were modified based on the previous day's results.

Results

The survey programme and findings for each country are presented below. Completed survey forms can be found in Appendix 4 and habitat descriptions in Appendix 5.

Egypt

Programme

On 26 February, participants travelled by car 1100 km to the locust base camp at Abu Ramad (see map, Appendix 2). The following day was spent discussing the programme, planning the surveys and reviewing survey methodologies, information collection and recording, and the use of GPS, maps and compass. Two days, 28-29 February were spent surveying the nearby coastal plains and interior wadis (see map, Appendix 5). Surveys were conducted together as a single group accompanied by a local military guide. On 1 March, the team moved to the border. Passport and customs formalities were initiated in Abu Ramad and completed at the border.

The Locust Department of the Egyptian Ministry of Agriculture provided six 4WD vehicles (four stationwagons and two pickups), drivers, and fuel, which were used during the survey in Egypt. Vehicles were equipped with a HF radio.

Findings

(a) Subcoastal areas (Abu Ramad - Wadi Diib)

- Date:** 28 February
- Itinerary:** From the coastal plains through the Red Sea Hills via subcoastal wadis to Wadi Diib, down the wadi to the coastal plains: Abu Ramad - W. Yoider - Gash plains - W. Hureitra - Eitegan plains - J. Eiweit plains - W. Diib - W. Kraf - Abu Ramad; 250 km (10 hrs).
- Weather:** Mild temperatures, sunny, strong northerly wind that prevailed throughout the day.
- Habitat:** Most of the vegetation was dry this year with only a few small areas of drying perennial vegetation and one or two localized spots of tiny greening annuals from light rainfall three weeks ago. The last significant rains fell sometime at the end of November or in early December 1999, causing some wadis to flood. Soil conditions were dry on the subcoastal plains and in all wadis.
- Locusts:** No locusts were seen during the survey including 60 km of Wadi Diib from the border to the coast. No locusts were reported by the locals.

(b) Coastal plains (Abu Ramad - Halaib border)

- Date:** 29 February
- Itinerary:** Along the coastal plains and base of the Red Sea Hills south to the Sudanese border: Abu Ramad - J. Elba - W. Serimtoi - W. Shallal - W. EiKwan - Bir Frukit - W. EiKwan - Halaib - Abu Ramad; 178 km (7.5 hrs).
- Weather:** Mild temperatures, sunny, strong northerly wind that prevailed throughout the day.
- Habitat:** In general, vegetation was dry in all areas except for a few small areas of green *Panicum* sp. and *Aerva javanica* in Wadi EiKwan on the Sudanese border. The last significant rains fell in early December. Soil conditions were dry on the plains and in the wadis. Dry vegetation and rocky terrain were found near Jebel Elba where SPOT VEG image indicated the possibility of green vegetation.
- Locusts:** Two solitary mature adults were seen at one stop in the green vegetation in Wadi EiKwan. Elsewhere, no other locusts were seen.

Sudan

Programme

On 1 March, the group crossed the border into Sudan where they were met by the PPD locust staff. All of the vehicles crossed as well except for one of the stationwagons. In addition, a five tonne MOA lorry crossed which carried fuel and water for the surveys in Sudan. The team drove 40 km to the first town, Oseif, where passport and customs formalities were carried out. On the following day, the group moved into the Red Sea Hills to the locust camp at Sufiya (see map, Appendix 2). Fuel, water, equipment and bedding (provided by Sudan) were transferred to three PPD LandCruiser pickups which joined the group to Sufiya.

The participants were divided into two teams. The first team was kept deliberately small so that it could move fast and cover large distances. It consisted of two pickup 4WD vehicles, one 200 litre drum of diesel and another of benzene, and several jerrycans of water. The team moved more than 200 km west into the Nubian Desert to check areas of potential green vegetation as indicated on the remote sensing SPOT imagery (see Appendices 3 and 5). Unfortunately, one of the two vehicles broke down at the end of the first day of survey, 215 km from Sufiya and the team spent the night in the desert. Sufiya was immediately contacted by radio and two of the Sudanese LandCruiser pickups arrived within 36 hours with the Egyptian mechanic to replace the clutch assembly.

The second team, consisting of the remaining participants (11) and three stationwagons, surveyed W. Diib and its tributaries on the western side of the hills to the Egyptian border on 3-4 March (see map, Appendix 5).

On the 5th, the group discussed the findings of the entire survey, including improvements in future joint surveys, what the participants gained out of the survey, and how their country will benefit from their own experience. Participants were given guidance on writing their own individual reports which were to be submitted to Mr. Taher. A general consensus was reached on important points for the final group report to be prepared and submitted under the direction of K. Cressman.

On the 6th, the group moved to Oseif and then proceeded up the coast and crossed the border into Egypt. The team spent the night in Abu Ramad and returned to Cairo by car on the 7th.

Findings

(a) Coastal plains (border - Oseif)

Date: 1 March
Itinerary: From the border along the coastal plains to Oseif; 40 km (1 hr).
Weather: Sunny, mild temperatures with strong northerly winds.
Habitat: Vegetation and soil seen from the track were dry and not favourable for locusts.
Locusts: No locusts were seen or reported by locals.

(b) Subcoastal areas (Red Sea Hills, Wadi Diib)

Date: 3-4 March
Itinerary: From the base camp west to W. Diib and then north along the wadi to the Egyptian border: Sufiya - Nurayet - W. Diib - K. Sawaret - W. Adarem - K. Shendib - return. 83 km (9 hrs); Sufiya - Nurayet - K. Mafdeib - return; 54 km (2.5 hrs).
Weather: Sunny with a light northerly wind and mild temperatures. No rain has fallen for a third year in a row.
Habitat: Vegetation was dry and sparse in W. Diib and at the junctures of the various khors and wadis. Cultivations were absent due to the continuing failure of the rains. There was one spot of drying vegetation (*Francoeuria crispa*) near Adarem and one area of about 300 ha of trees (*Suaeda monoica*) which was detected on the SPOT VEG image near Mafdeib. Soil conditions were dry.
Locusts: No locusts were seen or reported by locals.

(c) Nubian Desert (west of W. Diib)

Date: 3-4 March
Itinerary: From the base camp west to W. Diib, continuing west into the Nubian Desert: Sufiya - K. Mafdeib - W. Diib - J. Ankur - W. Yadud - K. Durakwan - Sudet - K. Tabon - W. Eweib - K. Gabaeideb - return; 215 km (12 hrs) and 200 km (7 hrs) for return.
Weather: Sunny with a light northerly wind and mild temperatures.
Habitat: All vegetation was dry during the route; however, dense *Panicum* sp. were present in most of the wadis from Diib to Sudet and to a lesser extent southwest of Sudet where there was also a low creeping herb that was green. Soil conditions were dry.
Locusts: No locusts were seen or reported by locals.

Discussion and conclusion

Survey results and implications

It was clear from the results of the survey that no significant infestations were present along the Egyptian / Sudanese border and conditions were not favourable for breeding. No evidence was found of previous populations nor of breeding. Considering the lack of rainfall and the very dry conditions, breeding did not occur this year along this part of the Red Sea coast or adjacent interior areas.

These results, combined with those from other national surveys carried out on the coastal plains on both sides of the Red Sea, can provide the basis for planning the summer campaign in Sudan. An indication of the level of locust populations that can be expected to move to central and western Sudan at the beginning of the summer breeding period can be obtained from the results. For example, if significant infestations and breeding are found during the joint border survey, then high numbers of locusts can be expected at the start of the summer. If no significant infestations are found, as was the case this year, then the summer season is likely to begin with very low levels of locusts and it will take several generations before numbers increase enough for significant gregarization to occur and for targets to form

for control. In the absence of the joint border survey, the situation would be less clear and planning for the forthcoming summer less precise.

During the survey, a previously unknown area for Desert Locust breeding was discovered in the eastern portion of the Nubian Desert west of W. Diib. To the best knowledge of the experienced Sudanese officers present, surveys have not been carried out before in this area. From the observations of the team, this could be a very important area for Desert Locust breeding and concentration. It may also explain the origin of swarms that moved into south-eastern Egypt in early 1998 from north-eastern Sudan when no significant infestations were present in W. Diib. This area could play an important role as an intermediate area linking the summer and winter breeding areas in Sudan.

The survey provided an opportunity to test the usefulness of SPOT VEG imagery in directing ground survey teams to potential areas of green vegetation. Three primary areas were identified on the latest imagery available to the team: Jebel Elba in Egypt, and Wadi Diib and Bir Sohanit in Sudan. At the first location, only low density *Acacia* trees were found against the rocky background of Jebel Elba. It is unclear why this area consistently showed up as green on the imagery whereas similar mountainous areas nearby did not. The vegetation found at the second location, Khor Mafdeib in Wadi Diib, was indeed green but consisted of trees. Lastly, the potential vegetation near Bir Sohanit turned out to be dense patches of dry *Panicum* sp. bordered by dark coloured rocky terrain. As this type of imagery is still new and has just become recently available, it is probably too early to say that it can be used with a high degree of reliability for identifying areas of green vegetation. The survey results confirm this and suggest that further ground verification and calibration is required.

Organizational matters

The survey was well organized in both countries. The base camps of Abu Ramad and Sufiya were adequate and well positioned for surveys in the nearby locust breeding habitats. Oseif was used only as a transit point. In years of rainfall, the nearby coastal plains could be checked in a single day.

Transit time to reach Abu Ramad from Cairo (16 hrs) was long as well as that in Sudan from Oseif to Sufiya (7 hrs). This resulted in four of the 12 days being used for transit purposes.

The border crossing south of Halaib was smooth but it did involve transit over a considerable distance to reach Sufiya (180 km, 8-9 hrs). A more convenient crossing would be at Wadi Diib (2200N/3600E) which is about 80 km (2 hrs) from Sufiya. However, border facilities are not available there.

Vehicles and equipment provided during the survey were sufficient although the Magellan GPS units are now outdated and slow and difficult to use. The 4WD stationwagons were weaker than the pickups. The maps for Sudan were more detailed (1:250,000 scale) and easier to use for survey than those in Egypt (1:500,000).

In order to use the base camp in Sudan at Sufiya, beds, mattresses and blankets had to be transported from Oseif as well as fuel, food and drinking water. These items proved to be bulky and occupied a large amount of space in the vehicles.

Sudanese and Egyptian vehicles were equipped with radios but each used different frequencies which did not facilitate communication between the two countries unless a vehicle from each was positioned next to the other. This was awkward but difficult to overcome as the frequencies have been physically set within each radio by the respective Governments. Apart from this, radio communication proved to be essential and worked smoothly, especially when the vehicle broke down in the Nubian Desert. Without the radios, the lives of one team would have been in danger.

The large number of participants strained the available resources and made it extremely difficult to move quickly and easily from place to place. Breaking the group into several smaller teams was more difficult than originally anticipated since additional guides and security escorts were required but not available. On the other hand, a large group does promote the exchange of ideas and experiences with persons from several different countries and encourages working alongside each other. The joint border survey was an opportunity to strengthen collaboration and ties amongst the countries in the Central Region.

The discussions held at the end of every day were welcomed by the participants and found to be productive. It was useful to review the day's survey results and plan for the next day. This gave participants an opportunity to participate actively in the technical and planning aspects of the survey. An unexpected free day at the beginning of the survey (due to high winds and poor visibility) was useful for reviewing survey methodologies and use of equipment prior to the start of the survey. Similarly, another unexpected day at the end (due to vehicle breakdown) was helpful in reviewing all of the survey data that had been collected and for drafting individual and group reports.

Suggested improvements

It is hoped that the CRC, EMPRES and the Governments of Egypt and Sudan will again support the joint border survey next year. It is further hoped that such a survey can become established as a regular activity that takes places every year. In order to improve future surveys, several suggestions are presented in Appendix 6.

Acknowledgements

The participants would like to express their sincere appreciation to the various ministries and departments of the Governments of Egypt and Sudan for their generous assistance and cooperation. The Secretary of the Central Region Commission, the Director-General of the Locust Affairs and Agro-Aviation Department in Egypt, and the acting Director of the Plant Protection Department in Sudan made most important contributions to the necessary protocol arrangements allowing the joint survey to become a reality. Thanks are also due to the staff of the national locust units in both countries for providing excellent logistical support to the survey. The survey officers are grateful to the tireless efforts of the drivers and the guides.

Appendices

Appendix 1. Participants

Djibouti

Hussein Elmi **Amir**
Crop Protection & Locust Control Unit
Service de L'Agriculture et des Foret
Ministere De L'Agriculture
P.O. Box 224
Djibouti

Tel: 00253-341496 / 341774
Fax: 00253-355879 / 354010

Egypt

Gamal **Fahim**
Locust Affairs & Agro-Aviation Dept.
Safaga, Red Sea

Tel/Fax: 0020-65-251746
Home: 0020-65-251446

Hussein Mohamed **Hassan**
Locust Affairs & Agro-Aviation Dept.
Ministry of Agriculture
Alexandria

Tel: 0020-3-4915644

Gamal Ahmed **Mahmoud**
General Administration
Locust Affairs & Agro-Aviation Dept.
Ministry of Agriculture
Cairo

Tel: 0020-2-3488974
Fax: 0020-2-7493184
Home: 0020-2-2404483

Ahmed EL Sayed **Shalaby**
Locust Affairs & Agro-Aviation Dept.
Ministry of Agriculture
Cairo

Tel: 0020-2-3488974
Fax: 0020-2-7493184

Mohamed Samir **Simary**
Director-General
Locust Affairs & Agro-Aviation Dept.
Ministry of Agriculture
Cairo

Tel: 0020-2-3488974
Fax: 0020-2-7493184

Ibrahim Farouk **Zaki**
Locust Affairs & Agro-Aviation Dept.
Ministry of Agriculture
Cairo

Tel: 0020-2-3488974
Fax: 0020-2-7493184

Eritrea

Yonathan Abraham **Beyene**
Ministry of Agriculture
P.O. Box 1048
Asmara

Tel: 00291-1-181077 ext. 253
Home: 00291-1-181694
e-mail: empmoa@gemel.com.er

Ethiopia

Solomon Admassu **Yilma**
Plant Protection Division
Ministry of Agriculture
P.O. Box 62347
Addis Ababa

Tel: 00251-1-186975
Home: 00251-1-339214

Sultanate of Oman

Saeed Ben Hamad **EI-Waely**
Dherh – Ibri
Code No. 511, P.O. Box 755

Tel: 00968-489282
Fax: 00968-489108
Home: 00968-490627
Mobile: 00968-9327809

Saudi Arabia

Abdullatif G. **Abdulsalam**
P.O. Box 13345
Jeddah 21493

Tel: 00966-2-6203000 (Ext. 25)
Fax: 00966-2-6204085
Home: 00966-2-6548831
e-mail: Locust@sps.net.sa

Sudan

Abdel Moneim Khedre **Taha**

Bachir Mustafa **Ali**

Bachir Mohamed **Moussa**

Plant Protection Directorate
P.O. Box 14
Khartoum North

Tel/Fax: 0029411-339423
e-mail: empress@sudanmail.net

Yemen

Abbas Ali **Abdul Mughni**
General Plant Protection Directorate
P.O. Box 26
Sana'a

Tel: 009671-1-250956
Fax: 009671-1-228064

FAO

Fouad **Bahakim**
EMPRES NPO-Survey
c/o FAOR Office
P.O. Box 1867
Sana'a, Yemen

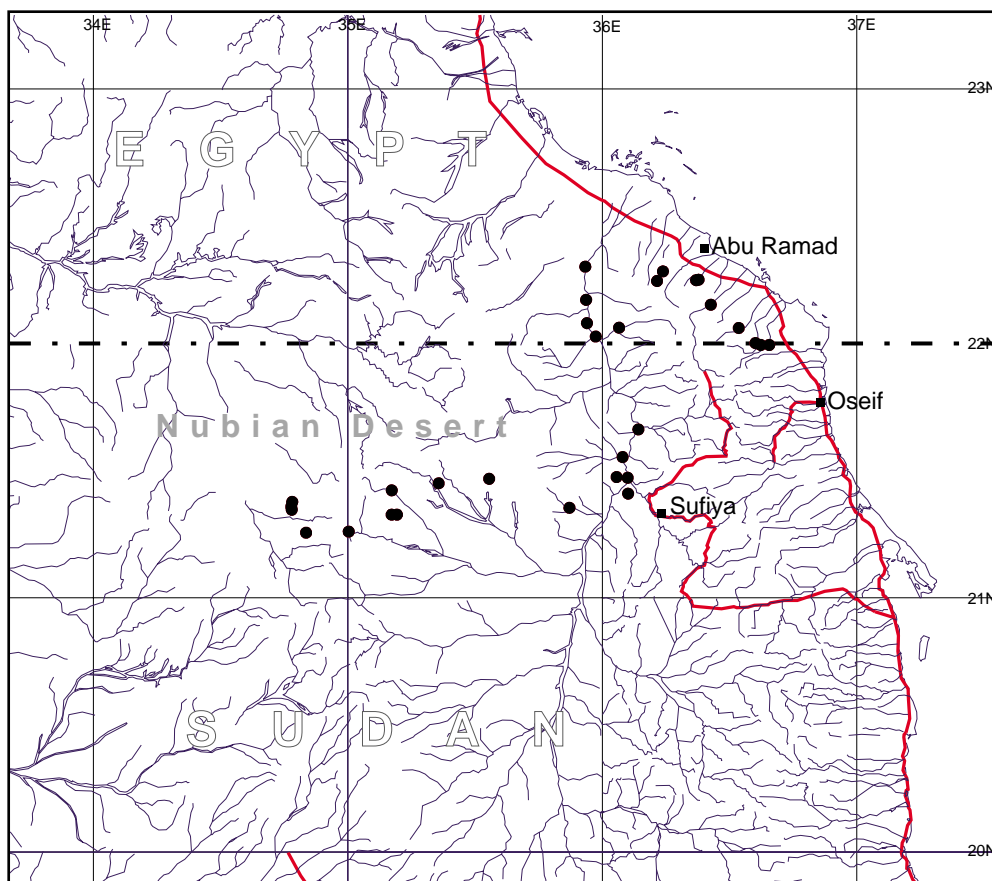
Tel/Fax: 009671-1-250980
e-mail: empr-fao-ye@y.net.ye

Keith **Cressman**
Locust Forecasting Officer
FAO Headquarters
Rome, Italy

Tel: 0039-06-57052420
Fax: 0039-06-57055271
e-mail: keith.cressman@fao.org

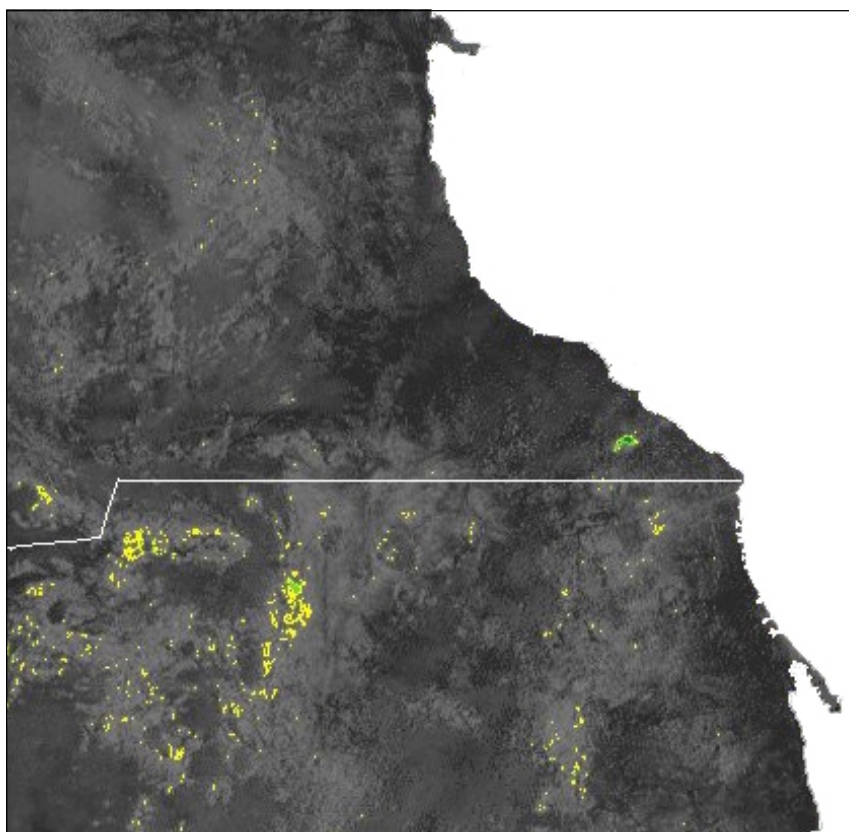
Appendix 2. Itinerary

Date	Route	Km	Hr	Overnight
26.02	Cairo - Zafaran - Ras Gharb - Hurghada - Quseir - Safaga - Marsa Alam - Shalatein - Abu Ramad	1100	16	Abu Ramad
27.02	discussions			Abu Ramad
28.02	Abu Ramad - W. Yoider - Gash plains - W. Hureitra - Eitegan plains - J. Eiweit plains - W. Diib - W. Kraf - Abu Ramad	250	10	Abu Ramad
29.02	Abu Ramad - J. Elba - W. Serimtoi - W. Shallal - W. EiKwan - Bir Frukit - W. EiKwan - Halaib - Abu Ramad	178	7.5	Abu Ramad
01.03	Abu Ramad - Halaib - cross border - Oseif	100	4.5	Oseif
02.03	Oseif - Fodukwan - Sufiya	132	6	Sufiya
03.03	(a) Sufiya - W. Yadud - Sudet - near Bir Sohanit (b) Sufiya - W. Diib - border - return	215 83	12 9	desert Sufiya
04.04	(a) desert - W. Yadud - Sufiya (b) Sufiya - W. Diib - K. Mafdeib - return	200 54	6 2.5	Sufiya Sufiya
05.03	discussions			Sufiya
06.03	Sufiya - Oseif - cross border - Abu Ramad	243	10	Abu Ramad
07.03	Abu Ramad - Marsa Alam - Safaga - Quseir - Hurghada - Ras Gharab - Zafarana - Cairo	1100	16	Cairo
	total surveyed	1212		
	total transit	2442		
	TOTAL	3654 km		

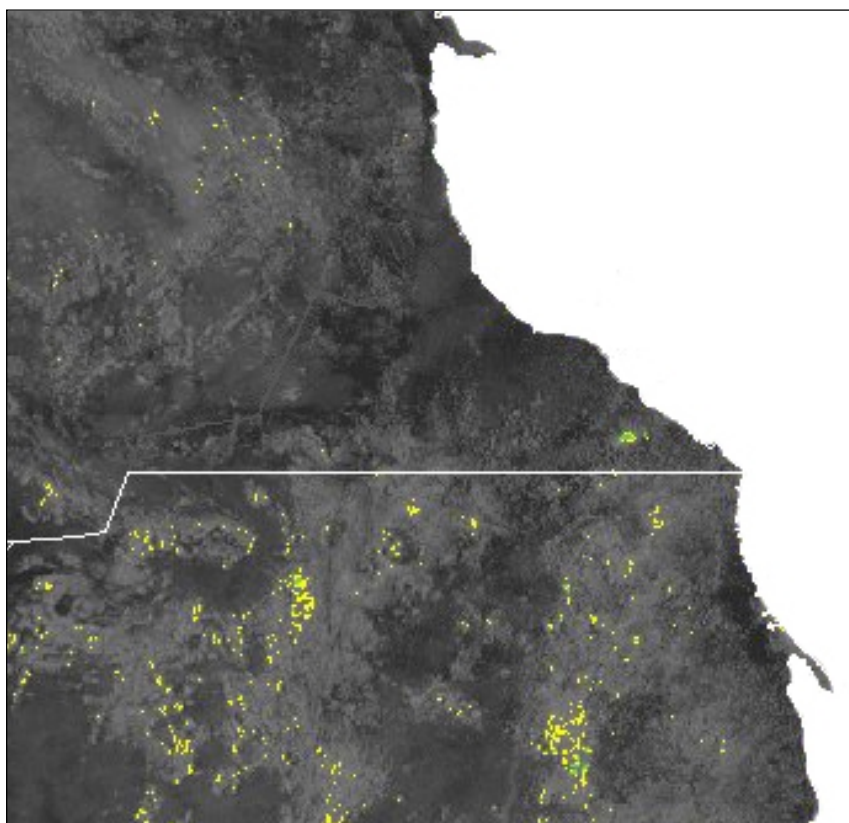


Survey itinerary along both sides of the Egyptian-Sudanese border (stops are indicated as dots).

Appendix 3. SPOT VEG imagery



SPOT VEG satellite imagery
1 km resolution
1-10 Feb 2000
(used during survey)



SPOT VEG satellite imagery
1 km resolution
21-29 Feb 2000
(actual situation during survey)

Nb. The light colour indicates the potential presence of green vegetation. Each square (or pixel) on the image is one square kilometer.

Appendix 4. Completed survey forms

(indicate appropriate information as required)

1	SURVEY STOP	1	2	3	4	5	6
1-1	date	28-Feb-00	28-Feb-00	28-Feb-00	28-Feb-00	28-Feb-00	28-Feb-00
1-2	name	Gash	Sulhamid	J. Eiweit	W. Diib	W. Sadratamo	W. Diib
1-3	latitude (N)	221700	221444	220343	220138	220447	221017
1-4	longitude (E or W)	361427	361303	360406	355836	355632	355620
2	ECOLOGY						
2-1	area (ha) of survey	100	100	100	100	100	100
2-2	habitat (wadi, plains, dunes, crops)	plains	plains	plains	wadi	wadi	wadi
2-3	date of last rain	11.99	11.99	11.99	3 wks ago		
2-4	rain amount (mm, Low Moderate High, ?)	H	H	H	H		
2-5	vegetation (dry, greening, green, drying)	drying	drying	dry	dy	dry	dry
2-6	vegetation density (Low Medium Dense)	L	M	L	L	L	L
2-7	soil moisture (wet/dry)	D	D	D	D	D	D
3	LOCUSTS						
3-1	present or absent	A	A	A	A	A	A
3-2	area infested (ha)						
4	HOPPERS						
4-1	hopper stages (H123456F)						
4-2	appearance (solitary, transiens, gregarious)						
4-3	behaviour (isolated, scattered, groups)						
4-4	hopper density (/site, /m2, Low Med High)						
5	BANDS						
5-1	band stage (H12345F)						
5-2	band density (/m2 or Low Medium High)						
5-3	band sizes (m2 or ha)						
5-4	number of bands						
6	ADULTS						
6-1	maturity (immature, mature)						
6-2	appearance (solitary, transiens, gregarious)						
6-3	behaviour (isolated, scattered, groups)						
6-4	adult density (/transect, /ha, L M H)						
6-5	breeding (copulating, laying)						
7	SWARMS						
7-1	maturity (immature, mature)						
7-2	swarm density (/m2 or Low Medium High)						
7-3	swarm size (km2 or ha)						
7-4	number of swarms						
7-5	breeding (copulating, laying)						
7-6	flying (direction, time passing)						
7-7	flying height (Low Medium High)						
8	CONTROL						
8-1	pesticide name & formulation						
8-2	application rate (l/ha or kg/ha)						
8-3	quantity (l)						
8-4	area treated (ha)						
8-5	ground or air						
8-6	estimated % kill						
9	COMMENTS						
	Itinerary: survey from Abu Ramad subcoastal areas up to W. Diib at SUD border then go down Diib for 60 km. Good habitat but dry.						

kc 99.03

Was a GPS used to determine locations? Yes

Is a brief interpretation or analysis of the results included? no

Country: EGYPT

Locust Officer : K. Cressman & Joint Team

date : 29-Feb

cleared by : _____

date : _____

(indicate appropriate information as required)

1	SURVEY STOP	7	8	9	10	11	12
1-1	date	28-Feb-00	29-Feb-00	29-Feb-00	29-Feb-00	29-Feb-00	29-Feb-00
1-2	name	Kraf	J. Elba	J. Elba	W Serimtai	W Shellal	Bir Frukit
1-3	latitude (N)	221807	221455	221502	220908	220339	220005
1-4	longitude (E or W)	355608	362216	362251	362544	363219	363616
2	ECOLOGY						
2-1	area (ha) of survey	100	100	100	100	100	100
2-2	habitat (wadi, plains, dunes, crops)	wadi	foothills	foothills	wadi	wadi	wadi
2-3	date of last rain				early Dec ?		
2-4	rain amount (mm, Low Moderate High, ?)						
2-5	vegetation (dry, greening, green, drying)	dry	dry	dry	dry	dry	dry
2-6	vegetation density (Low Medium Dense)	L	L	L	L	L	L
2-7	soil moisture (wet/dry)	D	D	D	D	D	D
3	LOCUSTS						
3-1	present or absent	A	A	A	A	A	A
3-2	area infested (ha)						
4	HOPPERS						
4-1	hopper stages (H123456F)						
4-2	appearance (solitary, transiens, gregarious)						
4-3	behaviour (isolated, scattered, groups)						
4-4	hopper density (/site, /m2, Low Med High)						
5	BANDS						
5-1	band stage (H12345F)						
5-2	band density (/m2 or Low Medium High)						
5-3	band sizes (m2 or ha)						
5-4	number of bands						
6	ADULTS						
6-1	maturity (immature, mature)						
6-2	appearance (solitary, transiens, gregarious)						
6-3	behaviour (isolated, scattered, groups)						
6-4	adult density (/transect, /ha, L M H)						
6-5	breeding (copulating, laying)						
7	SWARMS						
7-1	maturity (immature, mature)						
7-2	swarm density (/m2 or Low Medium High)						
7-3	swarm size (km2 or ha)						
7-4	number of swarms						
7-5	breeding (copulating, laying)						
7-6	flying (direction, time passing)						
7-7	flying height (Low Medium High)						
8	CONTROL						
8-1	pesticide name & formulation						
8-2	application rate (l/ha or kg/ha)						
8-3	quantity (l)						
8-4	area treated (ha)						
8-5	ground or air						
8-6	estimated % kill						
9	COMMENTS						
	Itinerary: finish Diib survey at W. Kraf & Halaib hwy. Survey J Elba & wadis to SUD border at rear of coastal plains. strong N winds cont. on 29th		spot veg1 (see form)	spot veg2 (see form)			W Eikwan 1st DL swarm arrive 26-Jan-98 from SUD

kc 99/05

Was a GPS used to determine locations? Yes

Is a brief interpretation or analysis of the results included? no

Country: EGYPT

Locust Officer : K. Cressman & Joint Team

date : 29-Feb

cleared by : _____

date : _____

(indicate appropriate information as required)

1	SURVEY STOP	13	14	15	16	17	18
1-1	date	29-Feb-00	03-Mar-00	03-Mar-00	03-Mar-00	04-Mar-00	04-Mar-00
1-2	name	W Eikwan	Noraiet	Swariet	Adarem	J. Mafdeib	W. Diib
1-3	latitude (N)	215938	212819	213312	213943	212434	212829
1-4	longitude (E or W)	363930	360608	360456	360839	360614	360331
2	ECOLOGY						
2-1	area (ha) of survey	100	150	150	150	100	250
2-2	habitat (wadi, plains, dunes, crops)	wadi	wadi	wadi	wadi	wadi	wadi
2-3	date of last rain	ea. Dec					
2-4	rain amount (mm, Low Moderate High, ?)	H					
2-5	vegetation (dry, greening, green, drying)	drying	dry	dry	dry	dry	dry
2-6	vegetation density (Low Medium Dense)	L	L	L	L	L	M
2-7	soil moisture (wet/dry)	D	D	D	D	D	D
3	LOCUSTS						
3-1	present or absent	P	A	A	A	A	A
3-2	area infested (ha)	100					
4	HOPPERS						
4-1	hopper stages (H123456F)						
4-2	appearance (solitary, transiens, gregarious)						
4-3	behaviour (isolated, scattered, groups)						
4-4	hopper density (/site, /m2, Low Med High)						
5	BANDS						
5-1	band stage (H12345F)						
5-2	band density (/m2 or Low Medium High)						
5-3	band sizes (m2 or ha)						
5-4	number of bands						
6	ADULTS						
6-1	maturity (immature, mature)	M					
6-2	appearance (solitary, transiens, gregarious)	S					
6-3	behaviour (isolated, scattered, groups)	I					
6-4	adult density (/transect, /ha, L M H)	2/1800x3m					
6-5	breeding (copulating, laying)						
7	SWARMS						
7-1	maturity (immature, mature)						
7-2	swarm density (/m2 or Low Medium High)						
7-3	swarm size (km2 or ha)						
7-4	number of swarms						
7-5	breeding (copulating, laying)						
7-6	flying (direction, time passing)						
7-7	flying height (Low Medium High)						
8	CONTROL						
8-1	pesticide name & formulation						
8-2	application rate (l/ha or kg/ha)						
8-3	quantity (l)						
8-4	area treated (ha)						
8-5	ground or air						
8-6	estimated % kill						
9	COMMENTS						
		on SUD border		1994 air & ground control	some veg green & flowering		green trees as seen on SPOT

kc 99.05

Was a GPS used to determine locations? Yes

Is a brief interpretation or analysis of the results included? no

Country: EGYPT & SUDAN

Locust Officer : K. Cressman & Joint Team

date : 04-Mar

cleared by : _____

date : _____

(indicate appropriate information as required)

1	SURVEY STOP	19	20	21	22	23	24
1-1	date	03-Mar-00	03-Mar-00	03-Mar-00	03-Mar-00	03-Mar-00	03-Mar-00
1-2	name	J. Ankur	K. Sudet	Sudet	K. Umm Alam	---	K. Gabeideb
1-3	latitude (N)	212114	212701	212521	211937	211537	211522
1-4	longitude (E or W)	355224	352134	351030	351028	350021	345018
2	ECOLOGY						
2-1	area (ha) of survey	100	100	100	100	100	100
2-2	habitat (wadi, plains, dunes, crops)	wadi	wadi	rocky	wadi	wadi	wadi
2-3	date of last rain						
2-4	rain amount (mm, Low Moderate High, ?)						
2-5	vegetation (dry, greening, green, drying)	dry	dry	dry	dry	dry	dry
2-6	vegetation density (Low Medium Dense)	L	L	L	L	L	L
2-7	soil moisture (wet/dry)	D	D	D	D	D	D
3	LOCUSTS						
3-1	present or absent	A	A	A	A	A	A
3-2	area infested (ha)						
4	HOPPERS						
4-1	hopper stages (H123456F)						
4-2	appearance (solitary, transiens, gregarious)						
4-3	behaviour (isolated, scattered, groups)						
4-4	hopper density (/site, /m2, Low Med High)						
5	BANDS						
5-1	band stage (H12345F)						
5-2	band density (/m2 or Low Medium High)						
5-3	band sizes (m2 or ha)						
5-4	number of bands						
6	ADULTS						
6-1	maturity (immature, mature)						
6-2	appearance (solitary, transiens, gregarious)						
6-3	behaviour (isolated, scattered, groups)						
6-4	adult density (/transect, /ha, L M H)						
6-5	breeding (copulating, laying)						
7	SWARMS						
7-1	maturity (immature, mature)						
7-2	swarm density (/m2 or Low Medium High)						
7-3	swarm size (km2 or ha)						
7-4	number of swarms						
7-5	breeding (copulating, laying)						
7-6	flying (direction, time passing)						
7-7	flying height (Low Medium High)						
8	CONTROL						
8-1	pesticide name & formulation						
8-2	application rate (l/ha or kg/ha)						
8-3	quantity (l)						
8-4	area treated (ha)						
8-5	ground or air						
8-6	estimated % kill						
9	COMMENTS						
	time of day GMT:	544	731	850	942	1106	1335
	new area west of Diib: good expanses of dry Panicum north side of J. Ankur to east & west where DL could breed & become concentrated; previously never surveyed						

kc 9905

Was a GPS used to determine locations? Yes

Is a brief interpretation or analysis of the results included? no

Country: SUDAN

Locust Officer : K. Cressman & Joint Team

date : 03-Mar

cleared by : _____

date : _____

(indicate appropriate information as required)

1	SURVEY STOP	25	26	27	28	29	30
1-1	date	03-Mar-00	03-Mar-00	03-Mar-00	04-Mar-00	04-Mar-00	
1-2	name				K. Umm Alam	K. Lakageimo	
1-3	latitude (N)	212128	212237	212046	211937	212804	
1-4	longitude (E or W)	344648	344702	344655	351143	353328	
2	ECOLOGY						
2-1	area (ha) of survey	100	100	100	100	100	
2-2	habitat (wadi, plains, dunes, crops)	wadi	wadi	rocky	wadi	wadi	
2-3	date of last rain						
2-4	rain amount (mm, Low Moderate High, ?)						
2-5	vegetation (dry, greening, green, drying)	dry	dry	dry	dry	dry	
2-6	vegetation density (Low Medium Dense)	L	L	L	L	L	
2-7	soil moisture (wet/dry)	D	D	D	D	D	
3	LOCUSTS						
3-1	present or absent	A	A	A	A	A	
3-2	area infested (ha)						
4	HOPPERS						
4-1	hopper stages (H123456F)						
4-2	appearance (solitary, transiens, gregarious)						
4-3	behaviour (isolated, scattered, groups)						
4-4	hopper density (/site, /m2, Low Med High)						
5	BANDS						
5-1	band stage (H12345F)						
5-2	band density (/m2 or Low Medium High)						
5-3	band sizes (m2 or ha)						
5-4	number of bands						
6	ADULTS						
6-1	maturity (immature, mature)						
6-2	appearance (solitary, transiens, gregarious)						
6-3	behaviour (isolated, scattered, groups)						
6-4	adult density (/transect, /ha, L M H)						
6-5	breeding (copulating, laying)						
7	SWARMS						
7-1	maturity (immature, mature)						
7-2	swarm density (/m2 or Low Medium High)						
7-3	swarm size (km2 or ha)						
7-4	number of swarms						
7-5	breeding (copulating, laying)						
7-6	flying (direction, time passing)						
7-7	flying height (Low Medium High)						
8	CONTROL						
8-1	pesticide name & formulation						
8-2	application rate (l/ha or kg/ha)						
8-3	quantity (l)						
8-4	area treated (ha)						
8-5	ground or air						
8-6	estimated % kill						
9	COMMENTS						
	time of day GMT:	1414	1445	627	805		
	(cont) Diib - Sunet can be surveyed from Sufiya: W. Yadud, K. Lakageimo, K. Durakwan to K. Onib; west Sunet: rocky hills & wadis smaller with less veg sw Bir Sohanit (2127/3451), small wadis of panicum			camp for the night; car with burned clutch			

kc 99/05

Was a GPS used to determine locations? Yes

Is a brief interpretation or analysis of the results included? no

Country: SUDAN

Locust Officer : K. Cressman & Joint Team

date : 04-Mar

cleared by : _____

date : _____

Appendix 5. Habitat descriptions

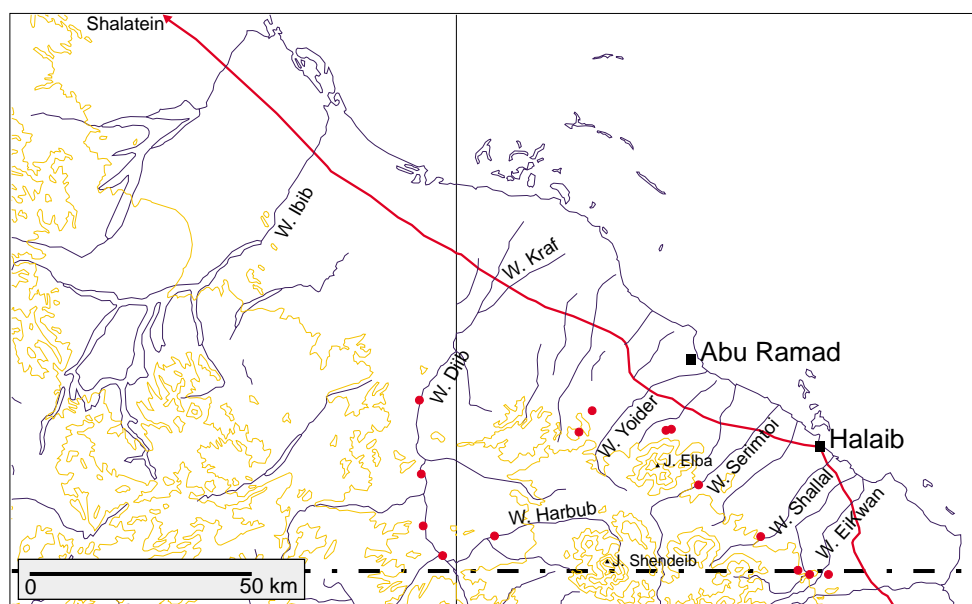
Egypt

Coastal plains (Shalatein - Halaib border)

The coastal plains from Shalatein to Abu Ramad (130 km) are flat and mainly barren, consisting of hard packed sand. They are at their widest near Shalatein. Vegetation is only associated with the few wadis, W. Ibib and W. Diib, which are not obvious and end just before reaching the sea. Scattered *Acacia* sp. trees are present south of Shalatein for about 20 km where there is a village of wooden shacks stretched out on the plains. From there, they are treeless and completely devoid of vegetation to about 50 km before Abu Ramad. South of Abu Ramad to the Sudanese border (70 km), the plains are crossed by three main wadis: Serimtoi, Shallal and EiKwan. After rainfall in the nearby hills or on the plains, these flow in a northeasterly direction from the Red Sea Hills to the sea and vegetation can be found in or near these wadis. Dry sandy and gravel plains, dissected by rocky hills and sand dunes, are found in between the wadis near the foothills. Jebel Elba (1561m) dominates the area. At its base, there are large expanses of *Acacia* sp. trees at low densities. Closer to the sea, the plains flatten out and most are of gravel and nearly devoid of vegetation. Abu Ramad and Halaib are the only two populated places in this region.

Subcoastal areas (Abu Ramad - Wadi Diib)

The area consists of sandy plains near the coast broken by low rocky hills and dominated by Jebel Elba and Jebel Shendeib (2097m) in the distance. Several primary wadis are present in the interior. The first is W. Yoider which flows onto the coastal plains, followed by W. Hureitra (Harbub) which flows into the Eitegan Plains. Both of these originate from J. Shendeib. Low rocky hills and wide plains (Eitegan and Jebel Eiweit) separate these wadis. Eventually, W. Diib is reached which is the most important of these as a locust habitat and breeding area since it drains the entire area. It flows in a northerly direction from Sudan, crossing the border at 2200N/3600E and continuing for about 60 km towards the north until it nearly disappears into the sands and merges with W. Kraf which reaches the sea. A range of rugged and barren low hills form the western boundary of the W. Diib basin. Several small sand seas and dune areas puncture the area. There are no villages and tracks are infrequent and rough. Subsistence cultivation of millet and sorghum are only found in the wadis during years of good rain. This has not been the case for several years, including this one. Natural vegetation suitable for locust survival and breeding are limited to the wadis and a few open plains close to the coast.



Coastal and subcoastal areas of southeastern Egypt. Survey stops are indicated as dots.

Sudan

Coastal plains (border - Oseif)

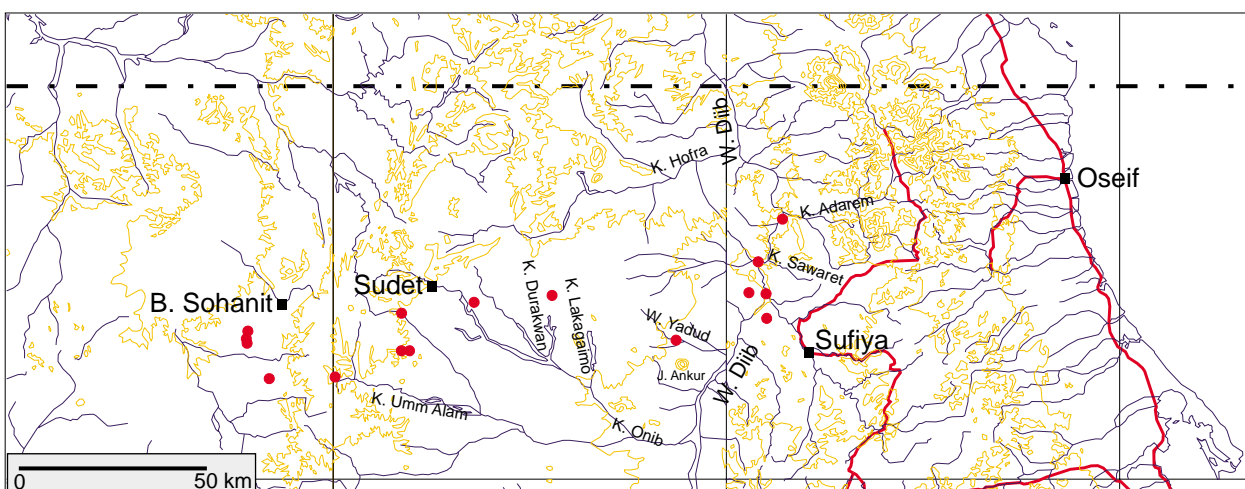
The area is a continuation of the habitat that extends from Abu Ramad to Halaib and the border. Several wadis drain the hills to the west, flowing east to the sea. From the north, the first wadi crossed is Gabatit, just after the border. This is followed by Tisala village and plain. Both W. Gabatit and Tisala Plain are potential areas for Desert Locust since they are sandy. Khor Harbanaikwan is to the south where *Acacia* sp. trees first appear and continue up to the next wadi, Marob. Low hills are present near the sea in between these two wadis. A medieval tower can be seen near the track. This is followed by W. Naakuri/Tibat and W. Fodukwan before reaching Oseif. Both contain *Zygophyllum* sp. and do not appear to be particularly suitable for Desert Locust.

Subcoastal areas (Red Sea Hills, Wadi Diib)

The primary drainage basin in the northern Red Sea Hills is Wadi Diib which runs along the western side of the hills for about 300 km north into Egypt. From the junction of Khor Sufiyya at Nurayet, there are several main tributaries that run into W. Diib northwards (Sawaret, Adarem, Hofra) and to the south (K. Mafdeib). Subsistence crops are planted after the rains or floods in the flat plains at these junctures. Dominant plant species are *Panicum* sp., *Calotropis procera*, *Francoeuria crispa*, *Acacia* sp., and *Suaeda monoica*. [NB. see the 1999 Sudan Joint Survey report]

Nubian Desert (W. Diib - Sudet - Bir Sohanit)

This is a large area characterized by low hills, flat gravel and sandy plains broken by several main wadis, smaller wadis and the occasional mountain peak. It is very remote with few people and no signs of inhabitation except for the two buildings at Sudet. Between W. Diib in the east and Sudet in the west (125 km, 5 hr), the area can be defined by W. Yadud to the north and K. Onib to the south. It is dominated by J. Ankur (1480m) in the east, J. Sakakamot (1211m) in the centre and J. Homeiri and J. Teimu in the west. The primary wadis are from east to west: Yadud, Gwabdok, Lakageimo, Durakwan and Sudet. All of these flow from the north to the south into K. Onib except for W. Yadud which flows from the northwest to the southeast into W. Diib. Smaller wadis flow into these, especially northwest of J. Ankur. In all of these, *Panicum* sp. is the dominant plant, with dense patches in the wadis, supplemented by lesser amounts of *Tribulus* sp. Given rain, this area is potentially very good for Desert Locust survival and breeding. The nature of the topography and habitat would encourage concentration and possible phase change in Desert Locust. West of Sunet, a series of rocky barren hills start, dominated by the table-topped J. Sudet. These hills are impenetrable and the rough tracks go around these to the south and north. They are thought to continue to Bir Sohanit but this could not be confirmed. Mainly rocky wadis with some sand drain these hills to the southeast: K. Tuateb, Umm Alam, Tabon. On the southern side, lie W. Gurbab and K. Gabeideb. In between is a well (2112N/3450E), about 80 km (2.5 hr) from Sudet. To the northwest are small wadis with dense patches of *Panicum* sp. and a low green creeping herb (unknown species).



Coastal and subcoastal areas of northeastern Sudan, including the Nubian Desert. Survey stops are indicated as dots.

Appendix 6. Joint border survey in 2001

In order to improve future surveys, the following is suggested:

1. The survey should take place in January to improve the likelihood of finding green vegetation and locusts.
2. The survey should last for a total of five days in Egypt and seven in Sudan:

Day	Activity
1	meet in Abu Ramad and discuss planning and organization
2-3	survey coastal plains
4-5	survey subcoastal areas (W. Diib)
6	cross into Sudan and transit to Sufiya
7-8	survey W. Diib (north and south)
9-10	survey west of W. Diib in eastern Nubian Desert
11	discuss results and draft final report
12	transit to border & departure.

3. Abu Ramad and Sufiya should be used as base camps.
4. Two Locust Officers from both countries should undertake the survey. These persons should be the ones based on the Red Sea coast and responsible for locust monitoring along the border area.
5. Three to four 4WD vehicles, preferably pickups, with experienced drivers should be provided by each country and used only in their respective country. Thus, only the four survey officers would cross the border and not the vehicles or drivers.
6. Each country should provide an experienced mechanic and spare parts during the survey in their own country.
7. FAO DLIS should provide satellite imagery to help estimate the location of vegetation to aid in planning the survey route. The latest Desert Locust Bulletin, weather data and the last joint border survey report should also be provided.
8. Both countries should undertake at least one survey about one month prior to the joint border survey. Results should be used for planning purposes.
9. Some basic equipment should be ordered to ease the logistical difficulties and improve the surveys. Details are presented in Appendix 7.
10. Both countries should investigate with their National Survey Departments the possibility of obtaining the most recent versions of 1:250,000 scale maps for the survey area.
11. EMPRES/CRC in collaboration with DLIS should investigate the use of a small palmtop computer linked with a GPS, as demonstrated during the first survey, for the recording and transmission of field data and viewing of satellite imagery.

Appendix 7. Refurbishment of survey equipment

Based on the experience of this survey, there is a need to refurbish and supplement existing survey and survey-related equipment. The orders should be placed well in advance of the next survey.

<u>item</u>	<u>description</u>	<u>quantity</u>	<u>unit cost</u>	<u>total</u>
1.	Garmin 12XL GPS with optional cigarette lighter adapter <i>Two for Egypt and two for Sudan to be used by the four survey officers and to replace the Magellan model.</i>	4	250	1000
2.	small lightweight sleeping bag <i>Ten per country, sufficient for the four survey officers, drivers and support staff, and to replace the bulky blankets and mattresses which cause transport difficulties.</i>	20		
3.	small lightweight portable/folding camping cot <i>Ten per country, sufficient for the four survey officers, drivers and support staff, and to replace the bulky beds which cause transport difficulties.</i>	20	100	2000
4.	Sony MVC FD-83 digital Mavica camera with optional NP-F550 4 hr lithium battery <i>To document the survey and to start compiling an annual record, especially of the habitat condition, for comparison purposes. Images can be included in the final report. The camera may want to be kept with the CRC secretariat and used primarily for the joint border survey and possibly for regional training activities.</i>	1 1	500 50	550
5.	box of diskettes <i>Used for storage and transfer to computer of images taken with the digital image.</i>	1	10	10
6.	portable aluminium perforated steel plating (PSP) sets <i>Used to free vehicles stuck in the sand, saving time and energy compared to the manual method; lighter weight than the traditional sand ladders. Four sets for each country.</i>	8	200	1600
7.	tire puncture kit <i>For the quick repairing of flat tires during the survey.</i>	8	n/a	
8.	Traveler portable electric air compressor (model TVR-250) <i>Small pump for inflating tires during the survey.</i>	8	n/a	
9.	tire removal ring <i>Four per country for the quick removal of tube tires for repairing punctures during the survey.</i>	8	n/a	

NB. Estimated prices are shown in italics.