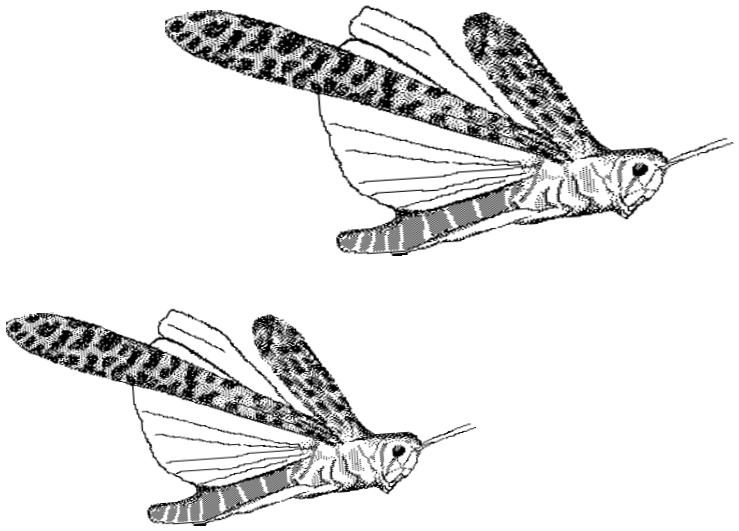
Desert Locust Joint Survey in the Spring Breeding Areas of the I.R. Iran and Pakistan

April 2004



Desert Locust Joint Survey in the Spring Breeding Areas of Pakistan and the I.R. Iran

April 2004

By

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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

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Summary and Recommendations

The 2004 survey was the 10th survey of the spring breeding areas in Pakistan and I.R. Iran. The survey was carried out for a period of 32 days from 1 April to 1 May 2004. The joint team was comprised of two Locust experts from each country. The first half of the survey was carried out in Pakistan from 1 to 16 April, covering 6,118 km, and the second half was in I.R. Iran from 17 April to 1 May, covering 5,330 km. During the survey, the team did not observe any solitary or gregarious Desert Locusts except for a very low population of isolated solitary mature and copulating adults, and first and second instar hoppers in a narrow strip (400m by 2.5 km) near Gwadar (251003N/621354E) in Pakistan. Due to low rainfall on both sides of the border and a continuing drought, vegetation was mostly dry and ecological conditions were not favourable for locusts.

The team has several recommendations to improve future joint surveys. These are:

1. The first half results of the survey could be sent from Karachi instead of Zahedan.
2. The communication equipment recommended by the 2003 Joint Survey (satellite phone, walkie-talkies) should be provided by FAO to the Team Leader of each country.
3. Energetic locust experts who can work well in desert conditions should be appointed for the Joint Survey. The Joint Survey is a tough job not an opportunity to be availed.
4. Drivers in I.R. Iran should be appointed from Sistan-Baluchistan province due to their suitability and knowledge of the area and their experience in desert driving.
5. Proper arrangement of rest houses in Pakistan may be considered as in I.R. Iran.
6. Four vehicles may exclusively be maintained and reserved in I.R. Iran, like Pakistan, for the Joint Survey.
7. Paragraph 9 of the recommendation of the 2003 Joint Survey (DSA) should be implemented in letter and spirit retrospectively.
8. Laptop computers may be provided by FAO to review SPOT-VGT imagery in the areas, reinstall eLocust on Psion if the software becomes damaged, and used for Internet connection for sending the survey reports and any other information to FAO DLIS.

Desert Locust Joint Survey in the Spring Breeding Areas of Pakistan and the I.R. Iran

April 2004

Introduction

The present survey was the 10th Joint Survey carried out in the spring breeding areas of the Desert Locust in Pakistan and I.R. Iran since 1995. The main objective of the survey was to survey the breeding areas in I.R. Iran and Pakistan. Desert Locust outbreaks in the survey area can threaten adjoining areas in Southwest Asia and the Arabian Peninsula. FAO DLIS provided SPOT-VGT imagery covering the spring breeding areas of I.R. Iran and Pakistan to the Joint Survey team. The month-long Joint Survey was undertaken for 16 days in Pakistan and the rest in I.R. Iran. Both countries made all possible arrangements for comfortable boarding and lodging for the team in order to conduct survey smoothly.

The survey was carried out according to the proposed itinerary with minor modifications in Pakistan. The team reached Quetta on 14 April 2004 via Pasni and Uthal (with an overnight in Uthal) rather than from Turbat and Uthal (and spending the night in Khuzdar).

The weather was hot and dry during the survey and the vegetation in the entire area was dry and patchy. The perennial bushes and trees were green with a few exceptions. No Desert Locusts were seen during the entire survey except in Gwadar, Pakistan. Ecological conditions were unfavourable for Desert Locust so the upcoming summer season should be calm.

The team covered 11,448 km during the Joint Survey, surveying an estimated area of 3,520 ha (65 stops) in Pakistan and 35,522 ha (88 stops) in I.R. Iran.

Methodology

The Joint Survey team comprised of four Locust Experts, two each from Pakistan and I.R. Iran, accompanied by a Maintenance Assistant from each country (Appendix 1). As per the recommendation of FAO, each team had a Team Leader who was responsible for all arrangements in their respective countries.

The I.R. Iranian team crossed the border into Pakistan at Mirjaveh/Taftan border on 1 April 2004 and joined Pakistani team on the same day (Appendix 2). The team surveyed potentially green areas as indicated by SPOT-VGT imagery and other suitable habitats in Pakistan from 1 to 16 April. On 17 April, the team crossed the Taftan/Mirjaveh border and entered I.R. Iran. The results of the first half of the survey were downloaded from the Psion palmtop computer to a computer at the Agriculture Office in Zahedan and sent by email to FAO DLIS. During the 13-day survey in I.R. Iran up to 28 April, the team followed the same procedure that was used in Pakistan.

Two teams, each comprising one Pakistan Locust Expert and one Iranian expert were formed during the Joint Survey to facilitate good coordination and understanding during the survey. An HF radio system was utilized in Pakistan for communication while Walkie-Talkies were used in I.R. Iran. Prior to starting the survey, both Team Leaders entered the SPOT-VGT coordinates provided by FAO DLIS into the GPS with the help of 1:500,000 TPC maps. This year for the first time, the team used TERRA MODIS satellite images for survey. These are higher resolution (250 m) than the SPOT-VGT (1 km). The GPS GOTO function was used for locating the SPOT VGT. It is noted that most of the SPOT-VGT locations were unapproachable due to hills and natural barriers.

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Information was also collected from shepherds and other local people. Almost every evening, the team sat down together and discussed survey activities, their observations and achievements and the difficulties of the day. The route, area and planning for the next day's survey were reviewed. Rainfall data was collected from sources in both countries (Appendix 3). Data collected in the field and observations were recorded on the Psion palmtop computer using the eLocust program as well as on the *FAO Desert Locust Survey and Control Form* (Appendices 4 and 5). The RealMap program on the Psion was also utilized for a thorough survey of the area. Photographs of many interesting Desert Locust habitats were also taken with a digital camera provided by FAO (Appendix 6).

The last day of the survey was spent in Zahedan, I.R. Iran for drafting and preparing the final report. Photos taken by the digital camera and other data were downloaded from the Psion to the computer at the Agriculture Office in Zahedan and copied onto a CD for both Team Leaders. The data and report were sent to FAO DLIS. The CD was sent by the FAO Representation in Tehran to FAO DLIS.

Results and Discussion

Baluchistan in I.R. Iran and Pakistan can be geographically divided into three parts for the sake of the preparation of this report.

(a) **Northern Baluchistan**. The northern part of Baluchistan consists of the Ras Koh Mountains in Pakistan and the Taftan Hills in I.R. Iran. High elevation sandy and rocky plains from Zahedan (I.R. Iran) to Nushki (Pakistan) are situated on the northern side of these hills. The natural vegetation between Taftan and Nushki was dry while patchy cultivated green fields of wheat, cumin, onion and barley were present. Low rainfall was recorded in the area on 8/02/2004 and due to the prolonged drought, the ecological conditions were unfavourable for Desert Locust.

(b) **Central Baluchistan.** This area stretches south of the Ras Koh Mountains to the Kech Bend Mountains north of Turbat, Pakistan. In this area is the Great Sandy Desert west of Kharan and Rakhshan valley of Panjgur that extends to the Saravan, Suran and Zaboli valleys in I.R. Iran, ending in the Jaz Murian Basin and Kahnuj in the west. Due to no rainfall in the entire area and the prolonged drought, natural vegetation was mostly dry and no moisture was available for locust breeding.

(a) **Southern Baluchistan.** The southern part of Baluchistan consists of the coastal plains spread from Jask and Bandar Abbas in I.R. Iran to the Jiwani, Gwadar, and Kulanch valleys, Pasni, Ormara, Angol and Uthal in Pakistan. This region is famous for Desert Locust breeding and contains some of the best habitats between Pasni, Turbat and Chabahar (I.R. Iran). Small infestations of Desert Locust first and second instar hoppers and isolated mature and copulating adults were observed at one place, Ankra Band, near Gwadar while the remainder of the area was found free of Desert Locust activity.

The prevailing weather in both countries was hot and dry during the survey. The whole area had not received sufficient rain during the last six months. The soil moisture at all the survey stops was mostly dry and unfavourable for Desert Locust breeding. It was clear that the prevailing drought in Baluchistan had a negative impact on vegetation and ultimately on Locust activities. The habitat was on an overall basis unfavourable for locust breeding. Consequently, there are no possibilities of a Desert Locust outbreak in these areas.

Appendices

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Appendix 1. List of participants

Pakistan

Manzoor Ahmad Mashvani	Entomologist	Pishavar	Team Leader
Jamal Akhtar	Locust Officer	Kharan	Locust Officer
Mohammad Akram		Karachi	Maintenance Asst.
Masoud Ahmad	Driver	Karachi	
Mohammad Navaz	Driver	Lahore	
Abdulmajid Jamali	Driver	Sukkur	
Mohammad Naser	Driver	Karachi	

I.R. Iran

Mohammadreza Ghassami	Locust Officer	Tehran	Team Leader
Vahid Ziaianahmadi	Plant Protection Expert	Chabahar	Locust Officer
Abolfazl Mahzouz		Tehran	Maintenance Asst.
Teimur Molaei	Driver	Tehran	
Aboulhassan Aboulfathi	Driver	Tehran	
Mohammad Ahmadianfar	Driver	Khash	
Mohammadreza Pishevar	Driver	Kerman	

Appendix 2. Itinerary

Date	Route	km	Overnight
1 Apr	Taftan, Nokondi, Dalbandin	465	Dalbandin
2 Apr	Dalbandin, Chagai Hills, Padag, Nushki	208	Nushki
3 Apr	Nushki, Kharan	324	Nushki
4 Apr	Kharan area	250	Kharan
5 Apr	Kharan, Nag, Panjgur	482	Panjgur
6 Apr	Panjgur area	246	Panjgu
7 Apr	Panjgur, Hushab, Turbat	392	Turbat
8 Apr	Turbat area, Mand	559	Turbat
9 Apr	Turbat, Shooli, Sunsar, Gwadar	348	Gwadar
10 Apr	Gwadar, Jiwani, Gwadar	284	Gwadar
11 Apr	Gwadar, Kulanch, Pasni	288	Pasni
12 Apr	Pasni area	239	Pasni
13 Apr	Pasni, Uthal	506	Uthal
14 Apr	Uthal, Quetta	683	Quetta
15 Apr	*Rest day*	0	Quetta
16 Apr	Quetta, Taftan	844	Taftan
17 Apr	*cross border at Taftan/Mirjaveh, send report of 1st half*		Zahedan
18 Apr	Zahedan, Khash, Gasht, Saravan	306	Saravan
19 Apr	Saravan area	435	Saravan
20 Apr	Saravan, Zaboli, Saravan, Khash, Iranshahr	560	Iranshahr
21 Apr	Iranshahr, Espakeh, Nikshahr, Chabahar	388	Chabahar
22 Apr	Chabahar area	368	Chabahar
23 Apr	Govatre, Zarabad	618	Chabahar
24 Apr	Chabahar, Jask	427	Jask
25 Apr	Jask, Bandarabbas	361	Bandarabbas
26 Apr	*Rest day*	0	Bandarabbas
27 Apr	Bandarabbas, Kahnuj, Zehkalat, Dalgan, Iranshahr	866	Iranshahr
28 Apr	Iranshahr area, Sardegal, west Jaz Murian	476	Iranshahr
29 Apr	Iranshahr, Zahedan; *send 2nd half report*	325	Iranshahr
30 Apr	*Send final report*	0	Zahedan
1 May	*Pakistani team crosses at Mirjaveh/Taftan border*	200	
	total distance covered in Pakistan	6,118	
	total distance covered in I.R. Iran	5,330	
	total distance covered in Joint Survey 2004	11,448	

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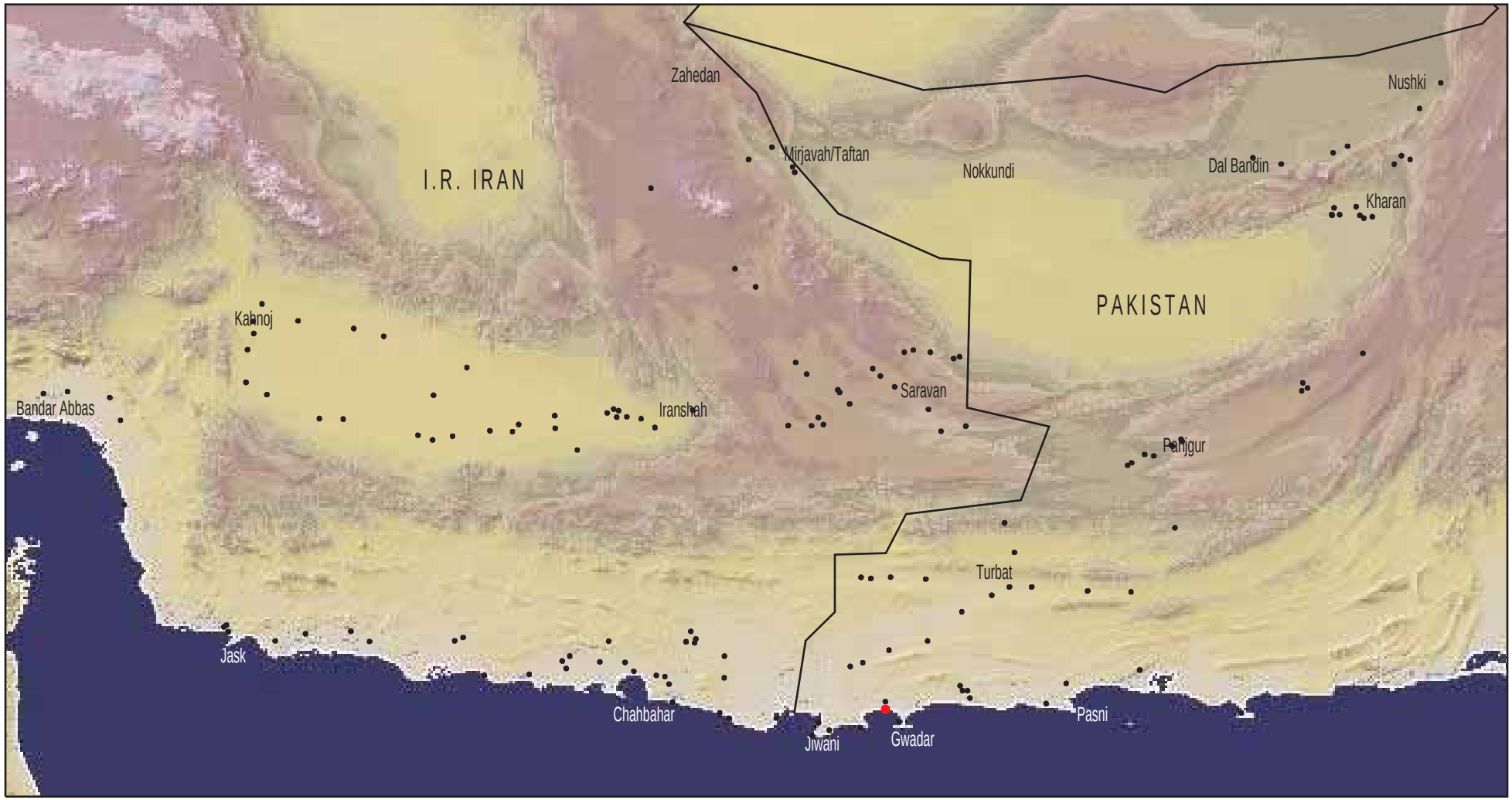
Appendix 3. Rainfall data

MAY		JUNE		JULY		AUG		SEPT		OCT		NOV		DEC		JAN		FEB		MAR		APR	
day	mm	day	mm	day	mm	day	mm	day	mm	day	mm	day	mm	day	mm	day	mm	day	mm	day	mm	day	mm
PAKISTAN																							
Dalbandin																							
	0		0		4		0		0		0		10			16	2						
				17	11											20	5						
				28	34											21	7						
Nushki																							
				9	4							15	10			16	2	8	4				
				17	11											20	5						
				28	34											21	7						
																28	20						
Panjgur	*(no data)*																						
Kharan																							
	0		0		0		0		0		0		0		0		0	8	7		0		0
Turbat																							
27	16				7		3										7	4					
					18		5										20	7					
					17		19																
					28		37										21	6					
					30		8										27	21					
																	28	13					
																	28	20					
Gwadar																							
	0		0		13		13		0		0		0		0		0		0		0		0
Pasni																							
	0		0		0		0		0		0		0		0	18	37						
																21	1						
	0		0	9	7		0		0		0		0		0	21	6		0		0		0
																24	17						
IRAN																							
Iranshahr																							
30	4.5				8		2.9																
					18		1.9																
					23		2.4																
					25		4	1	1.4							19	0.1			31	0.2		
					29		1.4	23	0.5							27	4.6						
Kahnoj																							
	0		0	25	4		1		1.4							19	0.1			31	0.2		
				29	1.4		23		0.5							27	4.6						
Jask																							
	0		0		0		1.2		0		0		0		0		0		2.6		0		0

Appendix 4. Map of areas surveyed



(black = survey locations, red = locations with Desert Locust)

Appendix 5. Survey results

Weather, habitat and Desert Locust data collected in the field during the Joint Survey were recorded on the *FAO Desert Locust Survey and Control Forms* as well as entered into eLocust. The following pages contain these data.

Date and Time	Pakistan location	Latitude	Longitude	Area	Habitat	LastRain	Rain	Veg	Density	Soil	Locusts	Comments
01/04/2004 12:14	Tahlab1	28 53 9 N	61 36 8 E	50	Plains	08/02/2004	Low	Dry	Low	Dry	Absent	
01/04/2004 12:34	tahlab2	28 51 0 N	61 37 0 E	20	Plains	02/04/2004	Low	Drying	Low	Dry	Absent	
02/04/2004 8:08	kodec	28 56 53 N	64 42 36 E	100	Dunes	08/02/2004	low	Dry	Low	Dry	Absent	Nooshki area
02/04/2004 9:14	Peshak	28 54 22 N	64 54 5 E	500	Dunes	08/02/2004	low	Green	Medium	Dry	Absent	vegetation prennial bushes, chaghi hills
02/04/2004 10:02	Padak	28 58 57 N	65 15 6 E	100	Dunes	08/02/2004		Green	Medium	Dry	Absent	Tamarix
02/04/2004 11:13	Padak2	29 1 36 N	65 20 58 E	60	Crops	08/02/2004	Low	Green	Dense	Wet	Absent	Zera,wheat crop irrigated land near dunes
02/04/2004 13:23	Bahtto	29 27 16 N	65 58 43 E	50	Dunes	08/02/2004	Low	Drying	Low	Dry	Absent	
03/04/2004 10:49	killymirali dost	28 57 41 N	65 42 46 E	100	Wadi	29/01/2004	Low	Green	Medium	Dry	Absent	tamarix trees&wild desert bushes.
03/04/2004 11:15	Tuskan	28 54 17 N	65 39 51 E	10	Crops	08/02/2004	Low	Green	Dense	Wet	Absent	crops wheat,onion, tamari
03/04/2004 12:46	Dehdar	29 16 53 N	65 50 7 E	100	Crops	08/02/2004	Low	Green	Dense	Wet	Absent	cultivated field sourounded by loose sand with green crops: wheat, onion, zera
03/04/2004 12:50	barasunki	28 56 12 N	65 46 16 E	10	Crops	08/02/2004	Low	Green	Dense	Wet	Absent	spot coordinate transect foot 3km
03/04/2004 19:23	shahrozi	28 33 33 N	65 25 56 E	15	Crops	06/02/2004	Low	Green	Dense	Wet	Absent	zera crops near dunes
03/04/2004 19:45	oohki	28 32 25 N	65 27 34 E	50	Crops	08/02/2004	Low	Green	Dense	Wet	Absent	crops, onion, zera, wheat crops besides a sandy river
04/04/2004 8:06	Zoojan	28 37 4 N	65 24 26 E	20	Well	08/02/2004	Low	Green	Medium	Dry	Absent	date trees
04/04/2004 10:59	Bhoporeck	28 33 51 N	65 17 45 E	100	Crops	08/02/2004	Low	Green	Dense	Wet	Absent	crops zira, onion
04/04/2004 11:30	toomolk	28 33 35 N	65 14 42 E	200	Crops	08/02/2004	Low	Green	Dense	Wet	Absent	crops wheat, zira, onion
04/04/2004 11:48	Joungo	28 33 55 N	65 14 31 E	20	Plains	08/02/2004	Low	Dry	Low	Dry	Absent	plains adjusted to th cultivated field
04/04/2004 12:12	Chiltak	28 36 36 N	65 15 28 E	40	Plains	08/02/2004	Low	Drying	Low	Dry	Absent	plain adjusted to field area
05/04/2004 7:47	saravan killi ghader ab	28 33 0 N	65 31 0 E	200	Crops	08/02/2004	Low	Green	Dense	Wet	Absent	crops besid sandy dunse and wheath crops
05/04/2004 7:53	Hossein Zei	27 37 38 N	65 27 11 E	20	Plains	03/04/2004	Low	Greening	Medium	Dry	Absent	plain surounded by hills and cultivated wheat crops
05/04/2004 14:54	Rakhsha	27 23 36 N	65 4 46 E	50	Dunes	01/11/2003	Low	Dry	Low	Dry	Absent	
05/04/2004 15:21	Jat	27 22 28 N	65 2 22 E	50	Dunes	01/11/2003	Low	Drying	Medium	Dry	Absent	tamerax and other bushes
05/04/2004 15:56	Eidmohammad	27 25 43 N	65 2 48 E	20	Plains	01/11/2003	Low	Dry	Low	Dry	Absent	patches of culivated crops are availle
05/04/2004 18:12	Sericoran area	27 0 2 N	64 10 8 E	20	Crops	01/11/2003	Low	Green	Dense	Wet	Absent	Spot coordinate alfalfa, date palm, broadbean crops in the field
06/04/2004 8:07	Kulug	26 56 41 N	63 58 45 E	100	Dunes	29/07/2003	Low	Green	Dense	Dry	Absent	wild Phoenixes
06/04/2004 8:39	Survan	26 53 17 N	63 53 27 E	100	Oasis	20/07/2003	Low	Green	Dense	Wet	Absent	cultivated land is sorrounded by dunes
06/04/2004 9:03	Killi Mhammad omar	26 52 16 N	63 51 48 E	50	Dunes	29/07/2003	Low	Green	Dense	Dry	Absent	cultivated field in patches and wild vegetation Tamarix
06/04/2004 10:27	Bonestan	26 56 5 N	64 2 29 E	40	Crops	29/07/2003	Low	Green	Dense	Dry	Absent	Date farm besides village
06/04/2004 15:11	ashbood	27 0 26 N	64 9 31 E	100	Crops	29/07/2003	Low	Green	Dense	Wet	Absent	crops in field, alfalfa, date and wheat
06/04/2004 15:13	Saraduk	27 2 0 N	64 14 0 E	10	Wadi	01/11/2003	Low	Dry	Low	Dry	Absent	pot coordinate
06/04/2004 15:36		27 2 56 N	64 13 29 E	200	Wadi	29/07/2003	Low	Dry	Low	Dry	Absent	hilly &rocky area while biological and topographical conditions are not favourable
06/04/2004 16:10	Piromarjan Dan	26 27 0 N	64 11 0 E	50	Plains	01/11/2003	Low	Dry	Low	Dry	Absent	small Date farm and wheet crops field at a distance
07/04/2004 15:30	Hoshab	26 1 0 N	63 53 14 E	10	Crops	29/01/2004	Moderate	Green	Dense	Wet	Absent	Date farm
07/04/2004 16:47	Erok	26 1 24 N	63 35 38 E	20	Crops	29/01/2004	Low	Green	Dense	Wet	Absent	spot coordinate
08/04/2004 11:10	Josek	26 2 59 N	63 3 59 E	50	Plateau	28/01/2004	Low	Dry	Low	Dry	Absent	Spot coordinate
08/04/2004 12:30	Rodbon	26 6 11 N	62 30 6 E	100	Crops	28/01/2004	Low	Green	Dense	Wet	Absent	Date farm and other irrigated lands
08/04/2004 13:10	Gumazgi	26 6 59 N	62 15 51 E	20	Dunes	29/01/2004	Low	Drying	Medium	Dry	Absent	Tamarix and other bushes in wilding condition
08/04/2004 13:47	Doghu	26 6 25 N	62 7 51 E	80	Dunes	29/01/2004	Low	Green	Dense	Dry	Absent	Tamarix
08/04/2004 14:40	bulida	26 29 0 N	63 2 0 E	50	Crops	01/04/2004	Low	Green	Dense	Wet	Absent	spot cordinate
08/04/2004 14:54	Mand	26 6 56 N	62 3 52 E	40	Wadi	29/01/2004	Low	Green	Medium	Dry	Absent	tamarix, oak, Date, acacia. Annual bushes are dry
08/04/2004 15:10	sulokor	26 17 0 N	63 6 0 E	20	Crops	01/04/2004	Low	Green	Dense	Wet	Absent	spot cordinate and crops wheat
08/04/2004 16:10	Kesak	26 3 0 N	63 13 0 E	10	Crops	01/04/2004	Low	Green	Medium	Wet	Absent	crops wheat, date, alfalfa
09/04/2004 8:40	Gogdan	25 59 39 N	62 56 50 E	50	Crops	29/01/2004	Low	Green	Dense	Wet	Absent	Date farm surrunded by sandy plain
09/04/2004 9:19	Solaika	25 52 55 N	62 44 39 E	20	Plains	20/01/2004	Low	Dry	Low	Dry	Absent	
09/04/2004 11:07	Codun	25 41 9 N	62 30 49 E	10	Crops	29/01/2004		Green	Medium	Dry	Absent	Date farm
09/04/2004 12:08	Shooli1	25 37 24 N	62 15 11 E	5	Dunes	29/01/2004	Low	Drying	Medium	Dry	Absent	Dunes surrounded by hills while small patches of cultivated sorghum
09/04/2004 13:27	Meating	25 32 18 N	62 4 35 E	30	Plains	29/01/2004	Low	Dry	Low	Dry	Absent	sandy plain with acacia species
09/04/2004 14:03	Sunsar	25 30 48 N	61 59 30 E	20	Wadi	29/01/2004	Low	Dry	Low	Dry	Absent	
09/04/2004 17:29	Negor	25 16 32 N	62 13 44 E	30	Dunes	29/01/2004	Low	Green	Medium	Dry	Absent	Acacia
10/04/2004 10:50	Ankra dana	25 10 3 N	62 13 54 E	30	Dunes	15/08/2003	Low	Green	Dense	Dry	Present	see details below
10/04/2004 12:18	Gunz	25 5 0 N	61 51 0 E	10	Crops	15/08/2003	Low	Green	Dense	Dry	Absent	
10/04/2004 12:21	Pishgan	25 5 56 N	62 3 34 E	10	Dunes	15/08/2003	Low	Dry	Low	Dry	Absent	
10/04/2004 12:39	Ganzi	25 8 22 N	62 19 14 E	10	Crops	15/08/2003	Low	Green	Dense	Dry	Absent	Crops sorghum field surrounded by hills and dunes
10/04/2004 13:10	Jiwani1	25 8 0 N	61 46 39 E	20	Crops	15/08/2003	Low	Green	Medium	Wet	Absent	Good habitat for locust breeding
10/04/2004 14:10	Jiwani2	25 2 46 N	61 44 2 E	20	Crops	15/08/2003	Low	Green	Medium	Wet	Absent	crops field besides dunes, crops, date and sorghum
11/04/2004 10:10	Nalent1	25 21 0 N	62 45 0 E	40	Plains	21/01/2004	Low	Dry	Low	Dry	Absent	Acacia and wild bushes
11/04/2004 10:30	Nalent2	25 23 0 N	62 44 0 E	20	Wadi	21/01/2004	Low	Dry	Medium	Dry	Absent	Acacia and wild bushes
11/04/2004 10:58	Bela kolanch earea	25 23 0 N	62 44 0 E	40	Wadi	21/01/2004	Low	Dry	Low	Dry	Absent	Mango and date trees
11/04/2004 11:17	murto machelei	25 21 0 N	62 47 0 E	10	Plains	21/01/2004	Low	Dry	Low	Dry	Absent	
11/04/2004 11:52	kapper	25 18 0 N	62 48 0 E	10	Plains	21/01/2004	Low	Dry	Medium	Dry	Absent	
12/04/2004 10:56	Gorani chah	25 15 43 N	63 18 52 E	35	Dunes	21/01/2004	Low	Drying	Medium	Dry	Absent	
12/04/2004 12:20	ShadiKor	25 23 55 N	63 26 57 E	35	Crops	29/01/2004	Low	Green	Dense	Wet	Absent	orchard with date, coconut, eucaliiptus, chicco, malva, etc.
13/04/2004 0:50	Ormala	25 11 57 N	64 37 57 E	50	Dunes	21/01/2004	Low	Drying	Medium	Dry	Absent	
13/04/2004 10:29	Makola	25 29 21 N	63 56 43 E	20	Dunes	21/01/2004	Low	Drying	Medium	Dry	Absent	Ziziphus spp.and wild bushes
13/04/2004 13:43	Angol	25 22 54 N	64 14 21 E	40	Dunes	21/01/2004	Low	Dry	Low	Dry	Absent	

Details of DL seen at Ankra dana

Solitary hoppers		Solitary adults	
Stage :	1,2	Mature	
Density :	1-2/m2	Low	(4 seen in 1000 x 300m transect)
Behaviour :	isolated	isolated, copulating	

Date and Time	Iran location	Latitude	Longitude	Area	Habitat	LastRain	Rain	Veg	Density	Soil	Locusts	Comments
17/04/2004 10:30	Mirjave	29 1 11 N	61 27 46 E	20	Crops	27/01/2004	Low	Green	Dense	Wet	Absent	wheat crops beside sandy dunes
17/04/2004 11:00	Ladiz	28 56 13 N	61 18 19 E	50	Crops	27/01/2004	Low	Green	Dense	Wet	Absent	wheat,apple
18/04/2004 10:24	Nazil	28 44 36 N	60 38 46 E	20	Wadi	27/01/2004	Low	Green	Dense	Wet	Absent	spot coordinate
18/04/2004 14:30	Ghasem Abad	28 11 55 N	61 12 48 E	50	Crops	27/01/2004	Low	Green	Dense	Wet	Absent	wheat,barely,alfalfa,vegetables
18/04/2004 14:55	Dasht Robat	28 4 35 N	61 21 10 E	10	Crops	27/01/2004	Low	Green	Dense	Wet	Absent	wheat,alfalfa,Date,onion
18/04/2004 16:19	charshahi	27 31 30 N	62 8 36 E	50	Dunes	27/01/2004	Moderate	Drying	Medium	Dry	Absent	no cultivated area arounded
18/04/2004 16:39	shams Abad	27 28 27 N	62 11 42 E	20	Crops	27/01/2004		Green	Dense	Wet	Absent	date,sorghum,alfalfa
18/04/2004 16:57	Hushk	27 24 6 N	62 17 28 E	50	Crops	27/01/2004		Green	Dense	Wet	Absent	wheat, alfalfa, date adjacent to town
19/04/2004 5:15	mashkid	27 6 6 N	62 36 17 E	20	Dunes	27/01/2004	Low	Greening	Medium	Dry	Absent	tamarix, phoenix
19/04/2004 9:06	Kamalabad suran	27 17 10 N	61 59 14 E	100	Crops	27/01/2004	mm	Green	Dense	Wet	Absent	Date and cultivated crops
19/04/2004 9:15	Nauk1	27 39 0 N	62 25 0 E	29	Wadi	27/01/2004	Low	Dry	Low	Dry	Absent	spot coordinate
19/04/2004 9:35	Rigjai	27 21 48 N	61 55 13 E	50	Crops	27/01/2004	Low	Drying	Dense	Wet	Absent	wheat is mature ready for harvest, while alfalfa and other crops are lush
19/04/2004 9:40	sinokan	27 38 8 N	62 31 55 E	50	Crops	27/01/2004	Low	Green	Dense	Wet	Absent	spot coordinate Pome granate,Date,Grapes,Barely,wheat
19/04/2004 10:00	Jalgh	27 35 34 N	62 41 23 E	100	Crops	27/01/2004	Low	Green	Dense	Wet	Absent	spot coodinate wheat,alfalfa,barely,date,pomegranate
19/04/2004 10:07	Shandan	27 22 54 N	61 54 28 E	30	Dunes	27/01/2004	Low	Dry	Medium	Dry	Absent	adjusent to forest plantation
19/04/2004 10:30	Tapok	27 36 18 N	62 43 48 E	100	Crops	27/01/2004	Low	Green	Dense	Wet	Absent	wheat,pomegranate,barely,grapes,onions
19/04/2004 10:55	Garpaskooh	27 29 15 N	61 41 52 E	60	Crops	27/01/2004	Low	Green	Dense	Wet	Absent	Date,wheat,pomegranate,alfalfa orchard is surrounded by dunes
19/04/2004 11:10	Nauk2	27 38 7 N	62 21 23 E	50	Crops	27/01/2004	Low	Green	Dense	Wet	Absent	apricot,pear,ficus,
19/04/2004 11:29	Mehrabad paskooh	27 33 59 N	61 37 23 E	20	Dunes	27/01/2004	Low	Green	Medium	Dry	Absent	dunes with wild phoenixes while surrounds Date farms
19/04/2004 17:40	murt	27 8 10 N	62 46 19 E	40	Crops	27/01/2004	Low	Green	Dense	Wet	Absent	
19/04/2004 18:15	gonban	27 14 58 N	62 31 10 E	20	Crops	27/01/2004	Low	Green	Dense	Wet	Absent	citrus and deate
20/04/2004 9:15	porken	27 11 41 N	61 46 35 E	60	Crops	27/01/2004	Low	Green	Dense	Wet	Absent	wheat,barely,onion etc...
20/04/2004 9:35	Hoshab hot omar	27 8 48 N	61 48 37 E	120	Dunes	27/01/2004	Low	Drying	Medium	Dry	Absent	cultivated crops and orchard
20/04/2004 10:03	Hajii abad	27 8 19 N	61 43 49 E	20	Crops	27/01/2004	Low	Green	Dense	Wet	Absent	cultivated crops and orchard
20/04/2004 10:16	Ghader abad	27 8 22 N	61 34 22 E	120	Wadi	27/01/2004	Low	Drying	Medium	Dry	Absent	spot coordinate
20/04/2004 11:59	Ghazenabad	27 14 40 N	60 55 39 E	40	Crops	27/01/2004	Low	Green	Dense	Wet	Absent	spot coordinate
21/04/2004 9:09	Dehmir	27 11 49 N	60 24 54 E	60	Dunes	27/01/2004	Low	Green	Medium	Dry	Absent	cultivated fields arround the dunes
21/04/2004 9:54	Alikhan	27 7 18 N	59 59 59 E	80	Dunes	27/01/2004	Low	Drying	Medium	Dry	Absent	
21/04/2004 10:29	Surja	26 58 31 N	60 8 53 E	10	Crops	27/01/2004	Low	Green	Dense	Wet	Absent	cultivated field and orchard among the dunes
21/04/2004 16:26	Pshmon	25 41 3 N	60 21 37 E	20	Wadi	15/02/2004	Low	Green	Medium	Dry	Absent	Tamarix and other wild trees
21/04/2004 16:50	Mumam area	25 32 28 N	60 28 16 E	5	Crops	27/01/2004	Low	Green	Dense	Dry	Absent	sorghum crops are surrounded by dunes
22/04/2004 11:20	Auraki1	25 45 1 N	60 54 53 E	60	Crops	27/11/2004	Low	Green	Medium	Dry	Absent	every thing is dried in surrounding area
22/04/2004 11:41	Auraki2	25 41 58 N	60 56 58 E	100	Crops	27/01/2004	Low	Green	Dense	Wet	Absent	Banana and cultivated field
22/04/2004 12:11	Safarzehi	25 40 25 N	60 56 26 E	20	Plains	27/01/2004	Low	Dry	Medium	Dry	Absent	Acacia is dried in plain
22/04/2004 12:27	Nadakan	25 40 48 N	60 52 59 E	30	Plains	27/01/2004	Low	Dry	Low	Dry	Absent	
22/04/2004 13:03	Sedighzehi	25 34 59 N	61 8 31 E	20	Plains	27/01/2004	Low	Green	Medium	Dry	Absent	Acacia and Date in the plain
22/04/2004 18:09	Vashnam2	25 27 9 N	60 40 56 E	80	Plains	27/01/2004	Low	Drying	Medium	Dry	Absent	
22/04/2004 18:19	Brizhdar	25 26 41 N	60 44 24 E	15	Crops	27/01/2004	Low	Green	Dense	Dry	Absent	lush green surghum cops with zizyphus and acacia trees surrounded by
22/04/2004 18:30	parak area	25 28 50 N	60 31 48 E	60	Dunes	27/01/2004	Low	Dry	Low	Dry	Absent	
22/04/2004 18:52	Vashnam	25 23 39 N	60 46 5 E	100	Plains	27/01/2004	Low	Dry	Medium	Dry	Absent	
23/04/2004 7:45	kahir erea	25 35 0 N	60 5 52 E	20	Wadi	27/01/2004	Low	Green	Medium	Dry	Absent	
23/04/2004 8:10	Emam abad	25 33 1 N	60 2 50 E	40	Wadi	27/01/2004	Low	Drying	Medium	Dry	Absent	
23/04/2004 8:35	Ramin	25 16 20 N	60 47 29 E	20	Dunes	27/01/2004	Low	Green	Low	Dry	Absent	coastal area
23/04/2004 8:40	birdaf	25 27 37 N	59 49 29 E	50	Wadi	27/01/2004	Low	Drying	Medium	Dry	Absent	
23/04/2004 9:10	Bris area	25 9 52 N	61 10 30 E	10	Dunes	27/01/2004	Low	Dry	Low	Dry	Absent	coastal stripe
23/04/2004 9:40	jood	25 27 10 N	59 31 15 E	10	Crops	27/01/2004	Low	Drying	Dense	Dry	Absent	
23/04/2004 10:07	Govatr	25 9 50 N	61 29 33 E	50	Beach	27/01/2004	High	Green	Dense	Wet	Absent	Mangrove
23/04/2004 10:20	ballak	25 42 33 N	59 22 40 E	15	Crops	27/01/2004	Low	Green	Dense	Wet	Absent	
23/04/2004 10:59	Sham	25 12 2 N	61 6 38 E	10	Crops	27/01/2004	Low	Green	Dense	Dry	Absent	interdunes
23/04/2004 11:05	garrakan	25 41 10 N	59 19 15 E	20	Crops	27/01/2004	Low	Green	Dense	Wet	Absent	
23/04/2004 11:29	Negor	25 26 12 N	61 8 27 E	20	Plains	27/01/2004	Low	Dry	Medium	Dry	Absent	
23/04/2004 13:05	chaharbiti	25 29 59 N	60 4 26 E	30	Crops	27/01/2004	Low	Green	Dense	Wet	Absent	
23/04/2004 13:25	Talmishan	25 32 40 N	60 18 4 E	5	Crops	27/01/2004	Low	Green	Dense	Wet	Absent	cultivated fild
24/04/2004 11:26	sedich	25 40 55 N	58 44 47 E	20	Plains	27/01/2004	Low	Dry	Low	Dry	Absent	cultivated fields interdunes
24/04/2004 11:43	Eme	25 45 3 N	58 37 11 E	10	Dunes	27/01/2004	Low	Dry	Medium	Dry	Absent	
24/04/2004 12:14	Hojdan	25 44 1 N	58 18 49 E	20	Dunes	27/01/2004	Low	Dry	Low	Dry	Absent	
24/04/2004 12:45	Surgalm	25 41 8 N	58 6 33 E	30	Dunes	27/04/2004	Low	Green	Dense	Dry	Absent	
24/04/2004 18:27	Jask kohneh	25 44 54 N	57 47 30 E	10	Crops	27/01/2004	Low	Green	Medium	Wet	Absent	citrus and Date orchard
24/04/2004 18:56	Lafik	25 46 48 N	57 45 42 E	15	Crops	27/01/2004	Low	Green	Medium	Dry	Absent	Orhards
24/04/2004 19:20	Koik	25 47 33 N	57 46 49 E	25	Dunes	27/01/2004	Low	Green	Medium	Dry	Absent	Acacia and Date fields
25/04/2004 7:59	Grog	26 36 20 N	57 5 23 E	30	Crops	27/01/2004	Low	Green	Dense	Dry	Absent	Spot coordinate
25/04/2004 10:54	Minab	27 10 32 N	57 3 52 E	50	Crops	27/01/2004	Low	Green	Dense	Dry	Absent	Date orchard
25/04/2004 11:15	Gorband	27 19 46 N	56 59 33 E	60	Crops	27/01/2004	Low	Green	Dense	Wet	Absent	Date and Citrus orchard
25/04/2004 11:52	kahoorkalaghi	27 22 9 N	56 42 27 E	15	Wadi	27/01/2004	Low	Green	Low	Dry	Absent	Tamarix bushes and Acacia trees on both banks of the river
25/04/2004 12:15	Dehno	27 21 23 N	56 32 38 E	5	Crops	27/01/2004	Low	Green	Dense	Wet	Absent	Date farm orchard
27/04/2004 8:44	sorkh ghaleh	27 45 41 N	57 57 53 E	20	Crops	15/01/2004	Low	Green	Dense	Wet	Absent	cultivated field and orchard
27/04/2004 9:38	Tarikmah	27 39 10 N	57 55 20 E	40	Crops	15/01/2004	Low	Green	Dense	Wet	Absent	orchards spot coordinate
27/04/2004 10:35	chahshahi	27 25 56 N	57 54 43 E	50	Crops	15/01/2004	Low	Green	Dense	Wet	Absent	orchard and cultivated fields
27/04/2004 10:50	Tomgaran	27 20 57 N	58 3 11 E	30	Crops	31/01/2004	Low	Green	Dense	Wet	Absent	
27/04/2004 11:25	salmanieh	27 11 13 N	58 24 26 E	20	Crops	20/08/2003	High	Green	Dense	Wet	Absent	cultivated area
27/04/2004 11:54	solan	27 11 1 N	58 34 5 E	15	Dunes	20/08/2003	High	Drying	Medium	Dry	Absent	Green area surrounded by dunes
27/04/2004 14:28	chalpaei	27 50 38 N	57 57 32 E	50	Crops	27/01/2004	Low	Green	Dense	Wet	Absent	
27/04/2004 14:54	Bijanabad	27 57 42 N	58 1 12 E	15	Dunes	28/01/2004	Low	Green	Medium	Dry	Absent	crops besides dunes
27/04/2004 15:16	sari	27 50 50 N	58 15 48 E	60	Crops	28/01/2004	Low	Green	Dense	Wet	Absent	cultivated fields
27/04/2004 16:36	Abbasabad	27 47 43 N	58 38 22 E	20	Crops	27/01/2004	Low	Green	Dense	Dry	Absent	crops cultivated fields
27/04/2004 17:03	Miandaran	27 44 33 N	58 50 30 E	25	Crops	27/01/2004	Low	Green	Dense	Dry	Absent	cultivated field
27/04/2004 18:05	Hoseinabdladi	27 31 55 N	59 24 11 E	10	Crops	27/01/2004	Low	Green	Dense	Wet	Absent	cultivatad orchard and farm
27/04/2004 18:50	Robahi	27 20 41 N	59 10 41 E	60	Plains	31/03/2004	Low	Drying	Low	Dry	Absent	
28/04/2004 8:50	Sardagal1	27 14 23 N	60 25 40 E	50	Dunes	31/03/2004	Low	Drying	Low	Dry	Absent	
28/04/2004 9:20	Sardagal2	27 15 6 N	60 23 37 E	40	Crops	31/03/2004	Low	Green	Dense	Wet	Absent	
28/04/2004 9:39	Dulabkan	27 12 23 N	59 59 47 E	50	Dunes	31/03/2004	Low	Drying	Medium	Dry	Absent	Tamaix bushes
28/04/2004 9:50	Shamsabad	27 13 31 N	60 21 1 E	50	Plains	31/03/2004	Low	Drying	Low	Dry	Absent	
28/04/2004 10:20	Bampoor	27 11 55 N	60 28 59 E	60	Crops	31/03/2004	Low	Green	Dense	Wet	Absent	
28/04/2004 10:22	Chahali	27 5 57 N	59 42 40 E	20	Crops	31/03/2004	Low	Green	Dense	Wet	Absent	cultivated field surroundes by dunes
28/04/2004 10:38	Mand	27 6 18 N	59 33 31 E	80	Crops	31/03/2004	Low	Green	Medium	Dry	Absent	Date and orcards among dunes
28/04/2004 11:03	Chahshurak	27 4 6 N	59 18 22 E	70	Crops	31/03/2004	Low	Green	Dense	Wet	Absent	cultivated field and orcharrds
28/04/2004 11:05	Mohammadabad	27 11 10 N	60 34 46 E	30	Crops	31/03/2004	Low	Green	Dense	Wet	Absent	
28/04/2004 11:21	Emdad	27 2 33 N	59 10 19 E	45	Crops	31/03/2004	Low	Green	Low	Dry	Absent	citrus mm..m
28/04/2004 11:39	Motoresfandiar	27 4 28 N	59 4 23 E	60	Crops	31/03/2004	Low	Green	Dense	Wet	Absent	warermelone and Date orchard
28/04/2004 11:48	Motor Malekmohammad	27 8 50 N	59 45 10 E	8	Crops	31/03/2004	Low	Green	Medium	Wet	Absent	cultivated field is surrounded by dunes
28/04/2004 11:50	Korehmaemari	27 7 36 N	60 40 22 E	25	Crops	31/03/2004	Low	Green	Dense	Wet	Absent	

Appendix 6. Photos

Suran Valley, northern Sistan-Baluchistan, I.R. Iran (20 April 2004)

Bampur – Iranshahr area, central Sistan-Baluchistan, I.R. Iran (28 April 2004)

Bampur – Iranshahr area, central Sistan-Baluchistan, I.R. Iran (28 April 2004)

South of Iranshahr, central Sistan-Baluchistan, I.R. Iran (28 April 2004)

Coastal plains near Chabahar, southern Sistan-Baluchistan, I.R. Iran (22 April 2004)

Recording location data using a GPS and entering field observations into eLocust.

Data transmission from eLocust by email via PC at the Agriculture Office, Zahedan, I.R. Iran (17 April 2004)

Participants of the 2004 Joint Survey.