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

April 2008







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April 2008

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#### **Summary and Recommendations**

The 2008 Desert Locust Joint Survey was the 14<sup>th</sup> survey of the spring breeding areas of southern Baluchistan in Pakistan and I.R. Iran. The survey was conducted in Pakistan from 1 to 16 April. On 17 April, the survey teams crossed into I.R. Iran and concluded on 30 April. On 1 May, the Directors of the National Locust Units in both countries met in Zahedan to discuss the results and problems that the joint team faced during the survey.

During this year's joint survey, the team surveyed 4,797 km in Pakistan and 5,369 km in I.R. Iran, making 65 stops in Pakistan and 71 stops in I.R. Iran. The team observed no gregarious Desert Locust activities in Pakistan during the entire survey period. Only insignificant numbers of solitary adults at a density of 5-6 adults/ha were observed in five locations of the Kharan area near Asepwall (283124N/652512E) on 3-4 April where green vegetation and soil moisture were available because of rainfall on 3 April 2008. In I.R. Iran, the team observed a low population of gregarious hoppers of different stages at five locations on the southern coast between Chabahar and Jask near Jug (252224N/612854E) and Karag (252236N/612019E) where ecological conditions were favorable due to high rainfall. Control operations against gregarious hoppers were in progress and 80% mortality was observed. Moreover, low populations of solitarious adults, up to 30 adults/ha, and hoppers of varying instars were observed in some desert areas of I.R. Iran. As vegetation dries out, locusts are likely to move within the area.

The team suggests the following recommendations for improving future joint surveys:

- 1. Training at national level should be organized and assisted by FAO for staff of the national locust units in both countries to update with locust survey and control methods, use of eLocust2 and other equipment provided by FAO.
- 2. Regular local survey of winter/spring breeding areas in southern Baluchistan should be started in both countries from 1 February to 30 June each year to check for locust activity in local breeding areas and for any movement of adults from the Persian Gulf.
- 3. As the joint survey is a tough job, the DSA rate must be increased in view of inflation.
- 4. The joint survey should continue in the coming years to assess the locust situation and possible infestation from crossing Persian Gulf.
- 5. The vehicles in Pakistan should be renewed.
- 6. Because of inflation and increasing in expenses, especially fuel prices (four-fold increase in the past year), the Commission should consider increasing the GOE for the joint survey.
- 7. Because of long discussion and border working hours, it is recommended that an additional day is allocated for the border meeting so that it is two days, plus two days for travel.

### Desert Locust Joint Survey in the Spring Breading areas of Pakistan and I.R. Iran April 2008

#### Introduction

This is the 14<sup>th</sup> of the annual joint survey recommended by the 19<sup>th</sup> Session of the FAO Commission for Controlling the Desert Locust in Southwest Asia (SWAC). The survey was undertaken by a joint Pakistan/I.R. Iran team at the time of year when Desert Locusts are mostly likely to be present.

#### Methodology

The present joint survey was conducted according to the *FAO Desert Locust Guidelines, II. Survey.* The team checked all potential areas including historical habitats. Attention was mainly given to the areas of green vegetation and recent rainfall.

A total 136 stops were made in both countries. In most cases, data was collected by making foot transects of about 300-400 m in length and about 1-4 m in width.

Each team used eLocust2 for recording coordinates and sending the survey data. The results were also recorded on the *FAO Locust Survey and Control Form* by the locust officers of both countries. This year, the teams entered survey results every evening into RAMSES (the geographic information system that countries use to manage and analyze field data) that was installed on I.R. Iran's laptop computer.

The team made all efforts to collect rainfall data from every locust outpost in the surveyed area.

#### Discussion

The entire spring breeding area of western Pakistan remained free of significant Desert Locust activities this year due to unfavourable ecological conditions and no rains for the last three months except in the Kharan Valley near Asepwall (283124N/652572E) where vegetation was green because of good rainfall.

In I.R. Iran, the team observed a low population of gregarious hoppers of different instar stages at five locations near Chabahar and Jask at Karag (252236N/612019E) and Jur (252224N/612054E) where ecological conditions were seen favorable due to high rainfall. Control operations against gregarious hoppers were in progress and 80% locust mortality was observed. Moreover, low numbers of solitarious adults and hoppers were present in most of the spring breeding areas in southeast I.R. Iran.

#### Results

For the purpose of the preparation of final report, the surveyed region of Baluchistan in both countries can be divided geographically into three regions: northern, central and southern.

#### Northern Baluchistan

The Northern part of Baluchistan is the area from near Taftan in I.R. Iran up to Nushki in Pakistan. High elevation sand and rocky plains are present between Zahedan (I.R. Iran) to Nushki (Pakistan). The vegetation from Taftan to Nushki was drying and soil moisture was dry.

No solitarious or gregarious locust activity was observed in these areas.

#### **Central Baluchistan**

The central part of Baluchistan extends from south of Taftan and the Ras Kooh Mountains to the Kech and Mand mountains north of Turbat in Pakistan. This region consists of the Great Sandy Desert, the Kharan valleys and Rakhshan valleys of Panjgur that extend west to Saravan, Suran, Zaboli valleys in I.R. Iran, and eventually ends west of the Jaz Murian Basin near Kahnuj. Vegetation was mostly drying in these areas.

No gregarious Desert Locust were observed in this area. However, a population of solitarious adults and hoppers was seen in the Jaz Murian Basin near Kahnuj.

#### Southern Baluchistan

The southern part of Baluchistan consists of coastal areas that extend from Bandar Abbas, Jask, Chabahar, Gwatar in I.R. Iran to Jiwani, Gwadar, Pasni, Ormara and Uthal in Pakistan. In Pakistan, the area between Pasni to Ormara is famous for locust breeding while areas from Chabahar to Gwatar in Iran are also potential breeding areas for locusts.

Solitarious and gregarious hoppers of different instars and solitarious adults were observed in the Chabahar and Jask areas of I.R. Iran. Control operations against gregarious hoppers were in progress in both areas.

#### **Conclusion & Recommendations**

#### (a) Desert Locust

The survey results indicate that the Desert Locust situation in Pakistan was calm. Weather was mostly dry and the ecological conditions were unfavourable for breeding. However Desert Locust situation in Iran is alarming because the team observed low population of gregarious hopper near Chabahar and Jask area where control operation were in progress. The team also observed solitary adult population through out the desert area of Iran. In case of rainfall in near future, locust situation in I.R. Iran became more alarming.

#### (b) Joint Survey of 2009

- 1. It is proposed that the joint survey should be undertaken during 2009.
- 2. The experts participating in the joint survey must be experienced and well informed of the survey procedures.
- 3. The drivers must be familiar with driving in desert areas and under off-road conditions.
- 4. The vehicles in Pakistan should be renewed.
- 5. The Director of Pakistan's Locust Unit crossed the border this year at 09:00h, arrived in Zahedan at 10:30h and immediately started discussions with the Team Leaders and the head of the Locust Unit in I.R. Iran. The discussion took long time because of the locust situation in I.R. Iran. As the border was closed, the Pakistani team had to stay one more night in Zahedan and crossed the border on 2 May. It is recommended that border meeting be extended by an extra day.

APPENDICES

#### Appendix 1. List of participants

### I.R. Iran

Team Leader Locust Officer Environmental Asst. Drivers Abdol Rashid Balochi Mohammad Jaffar Rashidi Abolfazl Mahzouz Shahbakhs Rahmani Mohammad Gholamizadeh Ali Khosro abadi Hossein Ali Nouri Tehran PPO Chabahar Minab Chabahar Bandar Abbas Tehran Zahedan

### Pakistan

Team Leader Locust Officer Environmental Asst. Drivers Malik Muhammad Bakhsh Syed Mujajiz Hussain Naqvi Ahsan Shah Hur Ali Khalid Perviz Naveed Muhammad Sarwar Multan Quetta Islamabad Peshawar Bahawalpur Lahore Karachi

# Appendix 2. Itinerary

Date	Route	km	Overnight
1 Apr	Cross the border		Taftan
2 Apr	Taftan, Dalbandin, Chagai Hills, Nushki		Noshki
3 Apr	Kharan Area (Naru)		Kharan
4 Apr	Kharan Area (Shamsi)		Kharan
5 Apr	Kharan, Basima, Nag, Punjgur		Punjgur
6 Apr	Punjgur, Prome		Punjgur
7 Apr	Punjgur, Hoshab, Turbat		Turbat
8 Apr	Turbat, Solaika		Turbat
9 Apr	Turbat, Gowadar		Gowadar
10 Apr	Gowadar, Kulanch, Pasni		Pasni
11 Apr	Pasni area		Pasni
12 Apr	Pasni, Ormara, Uthal		Uthal
13 Apr	Uthal, Quetta		Quetta
14 Apr	Rest day		Quetta
15 Apr	Prepare the 1 <sup>st</sup> half report		Quetta
16 Apr	Quetta, Nushki, Taftan		Taftan
17 Apr	Cross Taftan to Mirjaveh; send 1st half report		Zahedan
18 Apr	Zahedan, Khash, Gosht, Saravan		Saravan
19 Apr	Saravan, Souran, Zaboli		Iranshahr
20 Apr	Iranshahr, Jolgeh Chah hashem		Iranshahr
21 Apr	Iranshahr, Espakeh, Nikshahr, Chabahar		Chabahar
22 Apr	Chabahar, Beris, Sham, Govater, Chabahar		Chabahar
23 Apr	Chabahar, Vashnam, Dashtiari, Negur		Chabahar
24 Apr	Chabahar, Zar Abad, Jask, Jask area		Jask
25 Apr	Jask, Minab, Bandar Abbas		Bandar Abbas
26 Apr	Rest day		Bandar Abbas
27 Apr	Bandar Abbas, Kahnoj, Ghale Ganj, Sowlan, Kahnoj		Kahnooj
28 Apr	East Jaz Murian, Zeh Kalout, Dalgan, Bampour,		Iranshahr
	Sardegal, Iranshahr		
29 Apr	prepare 2 <sup>nd</sup> half report		Iranshahr
30 Apr	Iranshahr, Zahedan; finalize JS08 report		Zahedan
1 May	Border Meeting		Zahedan
2 May	Zahedan, Mirjaveh; Pakistani Team cross the border		Taftan

Total distance covered in I.R. Iran	5369 km
Total distance covered in Pakistan	4797 km
Total distance covered in JS 2008	10166 km
Total area surveyed in I.R. Iran	6330 ha
Total area surveyed in Pakistan	6770 ha
Total area surveyed in JS 2008	13100 ha
Total stops visited in I.R. Iran	71
Total stops visited in Pakistan	65
Total stops visited in JS 2008	136

# Appendix 3. Rainfall station data, May 2007 – April 2008

### A. Pakistan

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		27	42			28	2									5	10	3	14				
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		24	2			17	55							23	1	8	5						
		26	35													24	2						
		27	3																				
		28	2																				
		29	14																				

### B. I.R. Iran

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		2	4													6	6						
		5	4													7	7						
		7	15													11	2						
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		9	10		1	1	1	1								6	5						
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		7	91													6	107						
		8	2													14	44						
		27	37													16	8						
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																13	3						
																14	56						
																15	1						
																16	5						
																28	2						

# Appendix 4. Survey results

Time	Day	Month	Latitude	Longitude	Location	Survey (ha)	Habitat	Last rain	Vegetation	Density	Soil	Infest (ha)	HopSol	Behaviour	/m2	/site	HopGreg	/site	Bands	Density	Adults	Phase	Behaviour	/ha
	1	April	28.89444	61.59361	Talab 1	50	Plain	15/2/08	Dry	Low	Dry													
	1	April	28.87556	61.59889	Talab 2	100	Dunes	15/2/08	Dry	Low	Dry													
	1	April	28.87056	61.60694	Talab 3	50	Plain	15/2/08	Dry	Low	Dry													
	1	April	28.94861	64.72861	Nokchal	120	Dunes	15/2/08	Drying	Low	Dry													
	2	April	28.98222	65.25139	Padak	150	Dunes	15/2/08	Drying	Low	Dry													
	2	April	28.72750	63.23528	Killipahtar	100	Dunes	15/2/08	Drying	Low	Dry													
	2	April	28.94000	64.60417	Pishak	100	Dunes	15/2/08	Drying	Low	Dry													
	2	April	28.97306	64.82278	Chitar 1	130	Dunes	15/2/08	Drying	Low	Dry													
	2	April	28.92861	64.87806	Chitarr 2	120	Dunes	15/2/08	Drying	Low	Dry													
17:32:00	2	April	29.45111	65.97667	Butto	150	Dunes	15/2/08	Drying	Low	Dry													
10:10:00	3	April	29.06444	65.79028	Pothkin	50	Dunes	15/2/08	Green	Medium	Wet													
	3	April	28.56833	65.32667	Bhoporik	100	Dunes	15/1/08	Drying	Medium	Dry													
	3	April	28.54667	65.25139	Toomulk	200	Dunes	15/1/08	Green	Medium	Dry	2									mature	solitary	isolated	6
	3	April	28.52889	65.18028	Bedien	50	Crops	15/1/08	Green	Low	Dry													
	4	April	28.52333	65.45333	Asepwall	100	Dunes	3/4/08	Green	Low	Wet	5									immature	solitary	isolated	5
	4	April	28.39861	65.41417	Kutan	250	Plain	15/1/08	Dry	Low	Dry	2									mature	solitary	isolated	6
	4	April	28.50583	65.44194	Tagazia	50	Crops	15/1/08	Green	Dense	Wet													
	4	April	28.36861	65.53611	Naro	200	Dunes	15/1/08	Drying	Low	Dry	5									mature	solitary	isolated	5
	4	April	28.38611	65.48444	Таqар	300	Dunes	15/1/08	Dry	Low	Dry	5									mature	solitary	isolated	5
	4	April	28.37222	65.44556	Nali	120	Dunes	15/1/08	Drying	Medium	Dry	2									mature	solitary	isolated	6
10:35:00	5	April	27.93972	65.81000	Besima	50	Crops	15/1/08	Green	Dense	Wet													
	5	April	28.23444	65.69056	Dali	40	Wadi	15/1/08	Drying	Low	Dry													
12:37:00	5	April	27.75194	65.61556	Pothak	50	Crops	15/1/08	Green	Medium	Dry													
15:37:00	5	April	27.38806	65.06389	Jat	200	Dunes	15/2/08	Dry	Low	Dry													
08:58:00	6	April	26.67750	64.00111	Zenkoh	100	Dunes	3/1/08	Drying	Low	Dry													
09:37:00	6	April	26.62806	63.88944	Saudan	60	Dunes	3/1/08	Drying	Low	Dry													
10:38:00	6	April	26.61111	63.73472	Makad	50	Plain	3/1/08		Low	Dry													
11:08:00	6	April	26.61167	63.63139	Dastak	20	Interdune	3/1/08	Dry	Low	Dry													
	6	April	26.62528	63.85500	Pul Abad	40	Dunes	3/1/08	Drying	Low	Dry													
	6	April	26.61222	63.78111	Rotak	100	Plain	3/1/08	Dry	Low	Dry													
11:26:00	7	April	26.16611	64.03722	Balgator	50	Plains	3/1/08	Dry	Medium	Dry													
13:11:00	7	April	26.01444	63.86806	Hoshab	100	Dunes	3/1/08	Dry	Medium	Dry													
09:00:00	8	April	25.87556	62.73639	Sulaika	100	Dunes	3/1/08	Dry	Low	Dry													
10:45:00	8	April	25.90278	62.58583	Sialo	50	Plain	3/1/08	Drying	Low	Dry													
11:05:00	8	April	25.88972	62.53667	Sibdan	50	Crops	3/2/08	Green	Medium	Dry													
	8	April	25.87111	62.72306	Sulaika 2	130	Dunes	3/1/08	Dry	Low	Dry													
10:15:00	9	April	25.50194	62.72611	Ban	100	Plain	15/2/08	Drying	Medium	Dry													
14:18:00	9	April	25.21222	62.25667	Akara	120	Dunes	15/2/08	Dry	Medium	Dry													
15:29:00	9	April	25.22250	62.14472	Shabi	110	Dunes	15/2/08	Drying	Medium	Dry													
15:29:00	9	April	25.19083	62.07028	Pishukan	100	Dunes	15/2/08	Dry	Low	Dry													
16:45:00	9	April	25.26861	62.23111	Kalery	50	Dunes	15/2/08	Dry	Low	Dry													
17:01:00	9	April	25.28278	62.27556	Nigore	50	Dunes	15/2/08	Dry	Low	Dry													
10:27:00	10	April	25.42278	63.18861	Gano 1	100	Dunes	2/2/08	Dry	Medium	Dry													
10:51:00	10	April	25.43889	63.15806	Gano 2	120	Dunes	2/2/08	Dry	Medium	Dry													
11:13:00	10	April	25.44528	63.11778	Tui	130	Dunes	2/2/08	Dry	Medium	Dry													
11:30:00	10	April	25.45250	63.08167	Kodag	140	Plain	2/2/08	Dry	Medium	Dry													
09:40:00	11	April	25.27250	63.38222	Pasni	90	Dunes	2/2/08	Dry	Medium	Dry													
10:00:00	11	April	25.27222	63.32306	Guranicha	90	Dunes	2/2/08	Dry	Medium	Dry													
10:20:00	11	April	25.25278	63.26972	Chur	100	Plain	2/2/08	Dry	Medium	Wet													
11:00:00	11	April	25.24444	63.40250	Kollibazar	120	Dunes	2/2/08	Drying	Medium	Dry													
11:20:00	11	April	25.23472	63.43944	Awaran	130	Dunes	2/2/08	Drying	Medium	Dry													
11:50:00	11	April	25.22778	63.48250	Zarain	120	Plain	2/2/08	Dry	Low	Dry													
09:17:00	12	April	25.40278	63.45972	Shadikor	80	Plain	2/2/08	Drying	Medium	Dry													
10:00:00	12	April	25.39111	63.69972	Rumera	180	Dunes	2/2/08	Drying	Medium	Dry													

# Appendix 4. Survey results

Time	Day	Month	Latitude	Longitude	Location	Survey (ha)	Habitat	Last rain	Vegetation	Density	Soil	Infest (ha)	HopSol	Behaviour	/m2	/site	HopGreg	/site	Bands	Density	Adults	Phase	Behaviour	/ha
10:20:00	12	April	25.40028	63.80528	Umerarek	100	Dunes	2/2/08	Drying	Medium	Dry													
10:35:00	12	April	25.47389	63.91889	Buzi	60	Dunes	2/2/08	Drying	Medium	Dry													
10:47:00	12	April	25.49528	63.96528	Makula	100	Dunes	2/2/08	Drying	Medium	Dry													
11:18:00	12	April	25.51389	64.08833	Kunwari	120	Dunes	2/2/08	Drying	Medium	Dry													
12:20:00	12	April	25.28222	64.53778	Kalatu	100	Plain	2/2/08	Dry	Medium	Dry													
12:40:00	12	April	25.26889	64.61722	Ormara	110	Dunes	2/2/08	Dry	Medium	Dry													
13:05:00	12	April	25.37000	64.80917	Manigi	120	Plain	2/2/08	Dry	Low	Dry													
15:50:00	12	April	25.51472	65.77833	Sangal	130	Dunes	2/2/08	Drying	Medium	Dry													
16:15:00	12	April	25.49389	65.88583	Sapat	100	Dunes	2/2/08	Dry	Medium	Dry													
16:44:00	12	April	25.49194	66.06944	Kondevary	120	Plain	2/2/08	Drying	Medium	Dry													
17:10:00	12	April	25.62056	66.18583	Nakti	100	Dunes	2/2/08	Drying	Medium	Dry													
10:26:00	18	April	28.28611	61.39417	Nilago	50	Plain	2/2/08	Drying	Low	Dry													
10:40:00	18	April	28.08611	61.49889	Granchin	80	Plain	2/2/08	Dry	Low	Dry													
	18	April	27.52278	62.14167	Charshahi	100	Plain	8/4/08	Green	Medium	Wet	20									mature	solitary	isolated	10
	18	April	27.45389	62.21444	Shamsabad	120	Plain	8/4/08	Drying	Medium	Dry													
	18	April	27.40056	62.28194	Hoshak	30	Plain	2/2/08	Drying	Medium	Dry													
	18	April	27.33750	62.33056	Sarrek	50	Dunes	2/2/08	Drying	Low	Dry													
	19	April	27.35889	61.93167	Riggai	90	Crops	2/2/08	Green	Dense	Wet													
	19	April	27.37333	61.92833	Chahkarim	100	Plain	2/2/08	Drying	Low	Dry	50									mature	solitary	isolated	3
	19	April	27.13972	61.57639	Ghader Abad	80	Plain	2/2/08	Drying	Low	Dry	20									mature	solitary	isolated	2
	19	April	27.38472	61.89750	Shandan	120	Plain	2/2/08	Drying	Medium	Dry													
	19	April	27.41222	61.86056	Chah 22 Bahman	200	Plain	2/2/08	Drying	Medium	Dry													
	19	April	27.19306	61.74583	Parkan	30	Plain	2/2/08	Dry	Medium	Dry													
	19	April	27.14778	61.80806	Khosab	90	Plain	2/2/08	Drying	Medium	Dry	50									mature	solitary	isolated	3
	20	April	27.19750	60.05361	Dolabkan	90	Dunes	2/2/08	Drying	Low	Dry													
	20	April	27.15917	59.74917	Chah Ali	130	Dunes	2/2/08	Drying	Medium	Dry													
	20	April	27.10889	59.45222	Baghnill	110	Plain	2/2/08	Drying	Medium	Dry	40									mature	solitary	isolated	10
	20	April	27.11306	58.89167	Chah Es'haq 2	90	Dunes	2/2/08	Drying	Medium	Dry	30	L123	isolated		medium								
	20	April	27.07861	59.02861	Ziarat	100	Plain	2/2/08	Drying	Medium	Dry	20									mature	solitary	isolated	3
	20	April	27.11722	58.96472	Boleshti	90	Dunes	2/2/08	Drying	Low	Dry	20	L5	isolated	10	low								
	20	April	27.11278	58.89917	Chah Is'haq 1	100	Dunes	2/2/08	Drying	Medium	Dry	20									mature	solitary	isolated	
	20	April	27.10667	58.88667	Chah Esahgh MAB	190	Dunes	2/2/08	Drying	Medium	Dry	120	L1235	isolated		medium			unknown	medium				
	21	April	27.46056	60.64639	Parak	40	Plain		Dry	Low	Dry													
	21	April	26.84889	60.33389	Spakeh	40	Dunes	2/2/08	Dry	Low	Dry													
	21	April	27.12722	60.67167	Koreh Memari	90	Dunes	2/2/08	Drying	Low	Dry													
	21	April	27.07111	60.65139	Dasht Naigon	100	Dunes	2/2/08	Dry	Low	Dry													
	21	April	27.04583	60.62139	Syadan Chah	200	Plain	2/2/08	Dry	Low	Dry													
	21	April	26.81611	60.30917	Dasht Sormic	50	Dunes	2/2/08	Drying	Low	Dry													
	21	April	26.82778	60.27222	Garhori	40	Plain	2/2/08	Drying	Low	Dry													
	21	April	27.56778	60.47083	Muman	70	Plain	18/1/08	Drying	Low	Dry													
	21	April	27.48028	60.53000	Fagr Station	130	Plain	18/1/08	Drying	Dense	Dry													
	22	April	25.42056	60.86944	Kambel	90	Plain	18/1/08	Drying	Medium	Dry													
	22	April	25.44667	60.85056	Washname	90	Plain	18/1/08	Drying	Medium	Dry	20									mature	solitary	isolated	3
	22	April	25.46417	60.86694	Kohdem	130	Plain	18/1/08	Drying	Medium	Dry	60	L1234	isolated		low					mature	solitary	isolated	10
	22	April	25.46500	60.88667	Rikdim	80	Plain	18/1/08	Drying	Medium	Dry	20	L12	isolated		low						unknown		
	22	April	28.05000	60.45000	Jur	100	Plain	18/1/08	Drying	Medium	Dry													
	22	April	25.37333	61.34833	Jur 2	200	Plain	18/1/08	Drying	Medium	Wet	20		isolated			L2	low						
	22	April	25.37667	61.33861	Karog	110	Plain	18/1/08	Drying	Medium	Wet	2		groups			L34	medium						
	22	April	25.38222	61.21556	Karag 2	100	Plain	18/1/08	Drying	Medium	Dry	20		isolated			L3	low			mature	solitary	isolated	6
	22	April	25.45278	61.37056	Karag 3	40	Plain	18/1/08	Dry	Low	Dry													
	23	April	25.27278	60.78694	Ramin	90	Plain	18/1/08	Drying	Medium	Dry	20	L5	isolated		low					mature	solitary	isolated	25
	23	April	25.26028	60.82111	Ramin 2	90	Dunes	18/1/08	Drying	Medium	Dry	20									mature	solitary	isolated	30
	23	April	25.26889	60.97528	Lipar	50	Dunes	18/1/08	Drying	Medium	Dry	10									mature	solitary	isolated	6
	23	April	25.26750	60.86333	Gorankash	120	Plain	18/1/08	Drying	Medium	Dry													

# Appendix 4. Survey results

Time	Day	Month	Latitude	Longitude	Location	Survey (ha)	Habitat	Last rain	Vegetation	Density	Soil	Infest (ha)	HopSol	Behaviour	/m2	/site	HopGreg	/site	Bands	Density	Adults	Phase	Behaviour	/ha
	23	April	25.25528	60.88833	Kachak	80	Plain	18/1/08	Dry	Low	Dry	20									mature	solitary	isolated	10
	23	April	25.23000	60.94972	Sham	80	Dunes	18/1/08	Drying	Medium	Dry													
	23	April	25.19722	61.08028	Beris	90	Plain	18/1/08	Drying	Medium	Dry													
	24	April	25.58056	60.08972	Imam Abad	80	Dunes	15/1/08	Drying	Medium	Dry	20									mature	solitary	isolated	3
	24	April	25.54778	58.91972	Biveshk	40	Dunes	28/1/08	Drying	Medium	Dry	10		scattered			L34	low						
	24	April	25.53750	58.86472	Vanak	60	Dunes	28/1/08	Drying	Low	Dry	40		scattered			L234	medium						
	24	April	25.70972	57.91250	Aqidam	80	Dunes	28/1/08	Drying	Low	Dry													
	24	April	25.40667	59.90583	Tang	60	Plain	15/1/08	Drying	Medium	Dry													
	24	April	25.44639	59.78250	Birdap	90	Plain	15/1/08	Drying	Medium	Dry	10									mature	solitary	isolated	9
	24	April	25.49556	59.45417	Poshti	90	Dunes	15/1/08	Drying	Medium	Dry	30		scattered			L345	low			mature	solitary	isolated	30
	24	April	25.52528	59.42389	Gazidar	100	Plain	15/1/08	Drying	Medium	Dry													
	25	April	26.14611	57.37528	Agushk 1	60	Plain	28/1/08	Dry	Low	Dry	10	L45	isolated		low						solitary	scattered	30
	25	April	26.14528	57.37972	Agushk 2	40	Plain	28/1/08	Dry	Low	Dry	8	L									solitary	isolated	20
	25	April	26.12556	57.36111	Agushk 3	60	Plain	28/1/08	Dry	Low	Dry	10									mature	solitary	isolated	3
	25	April	27.06111	57.11806	Soragh	80	Plain	28/1/08	Dry	Low	Dry													
	25	April	27.39222	56.90611	Chah Ismail	60	Plain	28/1/08	Dry	Low	Dry													
	27	April	27.33250	58.32361	Chah Jazian	90	Plain	26/1/08	Drving	Medium	Drv													
	27	April	27.31722	58.29611	Chah Bahman	100	Dunes	26/1/08	Drying	Medium	Dry	40	L14	isolated		low								
	27	April	27.34278	58.33472	Chah Jazian	100	Plain	26/1/08	Drying	Medium	Dry	40	L14	isolated		low								
	27	April	27.44417	58.48667	Jaz Kalat	90	Plain	26/1/08	Drying	Low	Dry													
	27	April	27.44778	58.48944	Jaz Kalat 2	100	Plain	26/1/08	Drying	Low	Dry	30		scattered			L124	low						
	28	April	27.86861	58.20667	Nehzat Abad	90	Dunes	2/2/08	Drying	Medium	Dry	20									mature	solitary	isolated	3
	28	April	27.54944	59.27528	Hamid Abad	60	Plain	2/2/08	Drying	Medium	Dry													
	28	April	27.54917	59.31500	Chah Mohammad	90	Dunes	2/2/08	Drying	Medium	Dry	30									mature	solitary	isolated	10
	28	April	27.36028	60.98500	Sangan	100	Dunes	2/2/08	Drying	Medium	Dry	40	L1234	scattered		medium								
	28	April	27.33611	60.22028	Sangan 2	70	Plain	2/2/08	Drying	Medium	Dry	20	L234	isolated		low								
	28	April	27.23944	60.33861	Sardagal	120	Plain	2/2/08	Drying	Medium	Dry	50	L235	isolated		low					mature	solitary	isolated	13
	28	April	27.24139	60.42917	Dasht-E Bampor	80	Plain	2/2/08	Drying	Medium	Dry	20	L23	isolated		low								

Appendix 5. Map



Date	Route	Overnight
1 Apr	Cross the border	Taftan
2 Apr	Taftan, Dalbandin, Chagai Hills, Nushki	Noshki
3 Apr	Kharan area (Naru)	Kharan
4 Apr	Kharan area (Shamsi)	Kharan
5 Apr	Kharan area	Kharan
6 Apr	Kharan, Basima, Nag, Punjgur	Punjgur
7 Apr	Punjgur, Prome	Punjgur
8 Apr	Punjgur, Hoshab, Turbat	Turbat
9 Apr	Turbat, Solaika	Turbat
10 Apr	Turbat, Gowadar	Gowadar
11 Apr	Gowadar, Kulanch, Pasni	Pasni
12 Apr	Pasni area	Pasni
13 Apr	Pasni, Ormara, Uthal	Uthal
14 Apr	Uthal, Quetta, Prepare the 1 <sup>st</sup> half report	Quetta
15 Apr	Rest day	Quetta
16 Apr	Quetta, Nushki, Taftan	Taftan
17 Apr	Cross Taftan to Mirjaveh; send 1 <sup>st</sup> half report	Zahedan
18 Apr	Zahedan, Khash, Gosht, Saravan	Saravan
19 Apr	Saravan, Souran, Zaboli	Iranshahr
20 Apr	Iranshahr, Jolgeh Chah hashem	Iranshahr
21 Apr	Iranshahr, Espakeh, Nikshahr, Chabahar	Chabahar
22 Apr	Chabahar, Beris, Sham, Govater, Chabahar	Chabahar
23 Apr	Chabahar, Vashnam, Dashtiari, Negur	Chabahar
24 Apr	Chabahar, Zar Abad, Jask, Jask area	Jask
25 Apr	Jask, Minab, Bandar Abbas	Bandar Abbas
26 Apr	Rest day	Bandar Abbas
27 Apr	Bandar Abbas, Kahnoj, Ghale Ganj, Sowlan, Kahnoj	Kahnooj
28 Apr	East Jaz Murian, Zeh Kalout, Dalgan, Bampour, Sardegal, Iranshahr	Iranshahr
29 Apr	prepare 2 <sup>nd</sup> half report	Iranshahr
30 Apr	Iranshahr, Zahedan; Head of Pakistan's locust unit crosses the	Zahedan
_	border for border meeting, finalize JS08 report	
1 May	Zahedan, Mirjaveh; Pakistani Team and Head of Pakistan's locust	Taftan
	unit cross the border and return to Pakistan	

# Appendix 6. Joint Survey 2009 itinerary

**Appendix 7. Photos** 



Green vegetation from recent rains in the Shamsi area of Kharan Valley, Pakistan (4 April 2008)



Dry vegetation in the Soleika area near Turbat, Pakistan (8 April 2008)



Dry vegetation on the coastal plains near Pasni, Pakistan (11 April 2008)



Checking for soil moisture at a survey stop on the coast near Pasni, Pakistan (11 April 2008)



Throughout the joint survey, the team recorded field observations on a form that they entered into the RAMSES GIS every evening.



At each survey stop, the team also entered their observations and results that were immediately sent via satellite to Tehran and Karachi.



Low drying vegetation in the Solan valley near Saravan, I.R. Iran (19 April 2008)



Green vegetation in the Jolgeh Chah Hashem area near Iranshahr, I.R. Iran (20 April 2008)



Checking bushes for hopper infestations between Iranshahr and Chabahar, I.R. Iran (21 April 2008)



Results of control operations against mature transiens and gregarious adults in the Jag area near Chabahar, I.R. Iran (22 April 2008)



Results of control operations against late instar gregarious hoppers in the Karag area near Chabahar, I.R. Iran (22 April 2008)



Joint Survey 2008 officers (left-right): M. J. Rashidi, A. R. Balochi (I.R. Iran); S. M. Naqvi, M. M. Bakhsh (Pakistan)