I—Introduction

That the hind-femur is susceptible to the "phase" type of differences in the Desert Locust, *Schistocerca gregaria* (Forskal) (Orthoptera, family Acrididae), is now well known. Hitherto, the principal phase difference known has been in the length-character only, the length of the hind-femur (F) being shorter in phase *gregaria* individuals than in the phase *solitaria* ones (*vide*, Roonwal, 1949, 1955 ; Roonwal & Nag, 1951 ; Misra, Nair & Roonwal, 1952), the range and mean values being as follows (E, length of elytron ; F, length of hind-femur) :—

	Mean F	*Mean E/F*
Ph. *gregaria*-♂(6-eye-striped)	24·32 mm.	2·17
Ph. *solitaria*-♂(6- and 7-eye-striped)	25·40-26·13 mm.	2·00
Ph. *gregaria*-♀(6-eye-striped)	26·44 mm.	2·25
Ph. *solitaria*-♀(6 and 7-eye-striped)	29·37-30·92 mm.	2·09-2·03

This difference is also reflected in the E/F ratio. Some phase variability is also weakly discernible in the number of hind-tibial spines where, according to Roonwal (1947), individuals of the phase *solitaria* show a greater degree of variability than those of the phase *gregaria*.

In *Locusta migratoria*, Mukerji & Chatterjee (1956), from a study of three specimens from southern India, brought forth some evidence to show that "the relative development of denticles on the upper (or dorsal) edge of hind-femur may prove to be an additional morphological phase character" (p. 164). The denticles are well developed in phase *solitaria* and absent in phase *gregaria*. We have studied the spines ("denticles" of Mukerji & Chatterjee) on the upper (dorsal) margin of the hind-femora in *Schistocerca gregaria* and also find that their development is markedly correlated with phase—they are, generally well developed in phase *solitaria* and weakly developed in phase *gregaria*. The following is a detailed account of these spines ; a preliminary account will be found in Roonwal & Bhanotar (1959).

Acknowledgment.—The statistical analyses of the various values were carried out by Shri D. B. Panji, Computor, in the Zoological Survey of India.

II—Material and Methods

Samples of typical *solitaria* phase individuals from western India were obtained from the collections of the Zoological Survey of India and from the collections made in the later part of the year 1955 from the same area by the Locust Warning Organisation of the Plant Protection Directorate of the Government of India. In almost all these cases the population density at the time of collection was well below 1,000 individuals per square mile. Typical phase *gregaria* individuals were obtained from the swarm which visited Sri Dungargarh (Bikaner Division, Rajsthan) on the 1st January 1955. In all, a total of 61 specimens were examined and measurements of about 214 individual spines were taken.

The spines were measured under a stereo-binocular and with an ocular micrometer. For interphase and other comparisons of the various values, Fisher's "*t*" test was employed in all cases.

III—HIND-FEMORAL SPINES IN THE DESERT LOCUST

(Text-figs. 1-3)

1. *General*

On the upper (dorsal) surface of the hind-femur, from the proximal to the distal end, numerous denticle-like spines are present. Each spine is accompanied by a long slender seta which arises from the distal base of the spine. The spines are of two types, *viz.*, (i) "well-developed" spines, and (ii) "weakly-developed" spines. Both the types are present in phase *solitaria* individuals, one or two "weak" spines roughly alternating with the "well-developed" ones. But in phase *gregaria* individuals only "weak" spines are present. The "well developed" spines (Text-fig. 3*a*) arise gradually from the surface of the femur, taper at the tip and then fall concavely on the surface of the femur. The "weak" spines (Text-fig. 3*b*) are triangular in appearance, and are often so poorly developed as to form merely a wavy line on the edge of the femur.

2. *Size of spines*

(Text-figs. 1-3 ; and Tables 1 and 2)

As mentioned above, two types of spines are distinguishable as regards size—the "well-developed" and the "weakly-developed". For quantitative data of size, only two measurements, "A" and "B", of height were taken, thus (Text-fig. 3) :

Height "A".—Maximum straight-line distance from the distal tip to the distal base of the spine.

Height "B".—Vertical distance from the distal tip of the spine to the surface of the femur.

(a) *"Well-developed" spines*

(Text-figs. 1-3 ; and Tables 1 and 2)

The "well-developed" spines are present only in the phase *solitaria* individuals and are absent in phase *gregaria*.

(i) *Height "A" (maximum height)*

"A" ranges from 0·037-0·092 mm. (mean 0·067±0·003) in phase *solitaria* males, and is significantly less than in *solitaria* females (range 0·037-0·111 mm. ; mean 0·072±0·003).

(ii) *Height "B" (vertical height)*

Height "B" ranges from 0·037-0·092 mm. (mean 0·053±0·002) in phase *solitaria* males, and is significantly less than in *solitaria* females (range 0·037-0·092 mm.; mean 0·059±0·002).

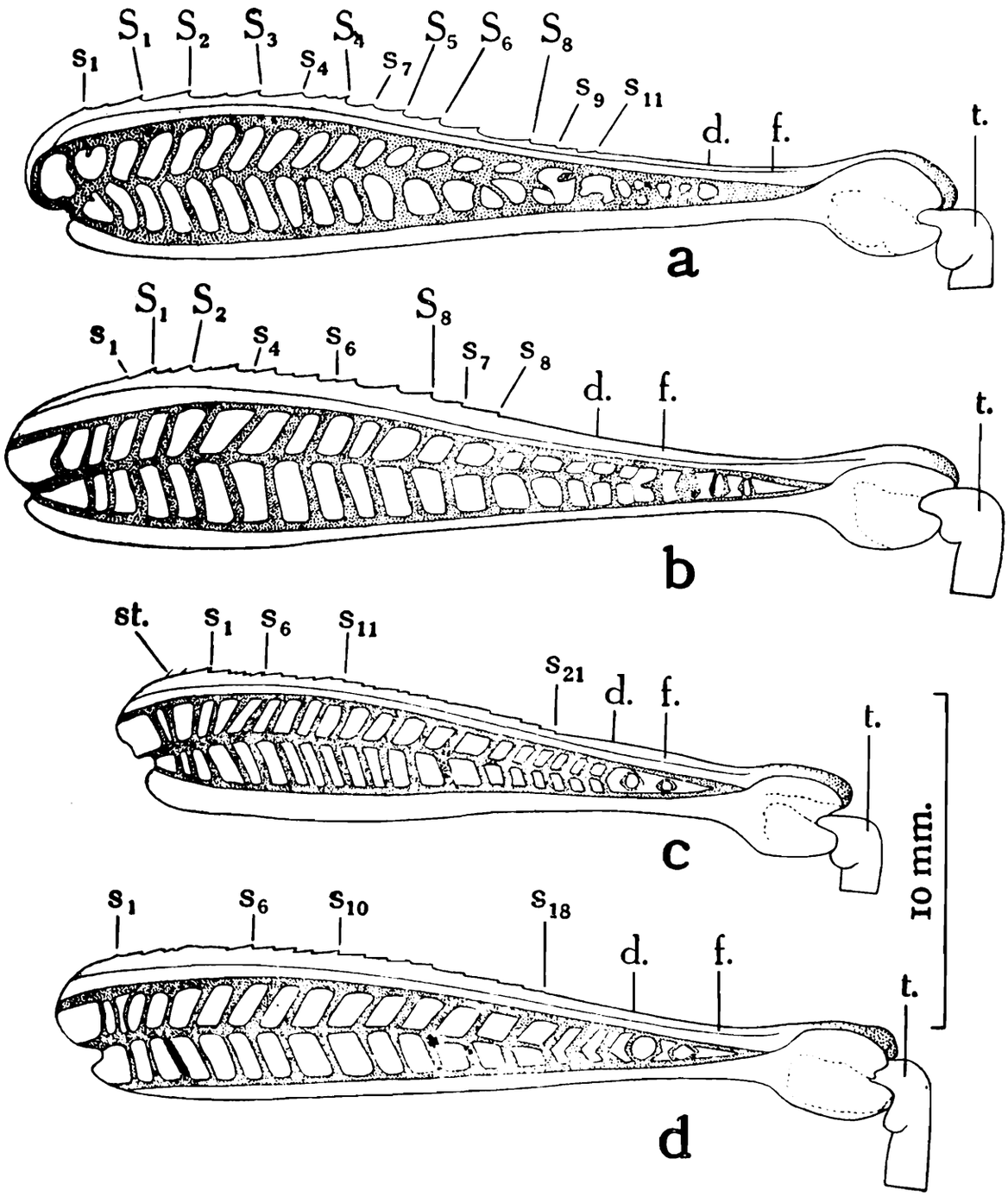
(b) *"Weakly-developed" spines*

(Text-figs. 1-3 ; and Tables 1 and 2)

The "weak" spines are present both in phase *solitaria* and phase *gregaria* individuals. The heights "A"and "B" vary as follows :

(i) *Height "A" (maximum height).*

Phase solitaria.—Height "A" ranges from 0·009-0·037 mm. (mean 0·018±0·0009) in *solitaria* males, and is significantly less than in *solitaria* females (range 0·009-0·037 ; mean 0·026±0·002).

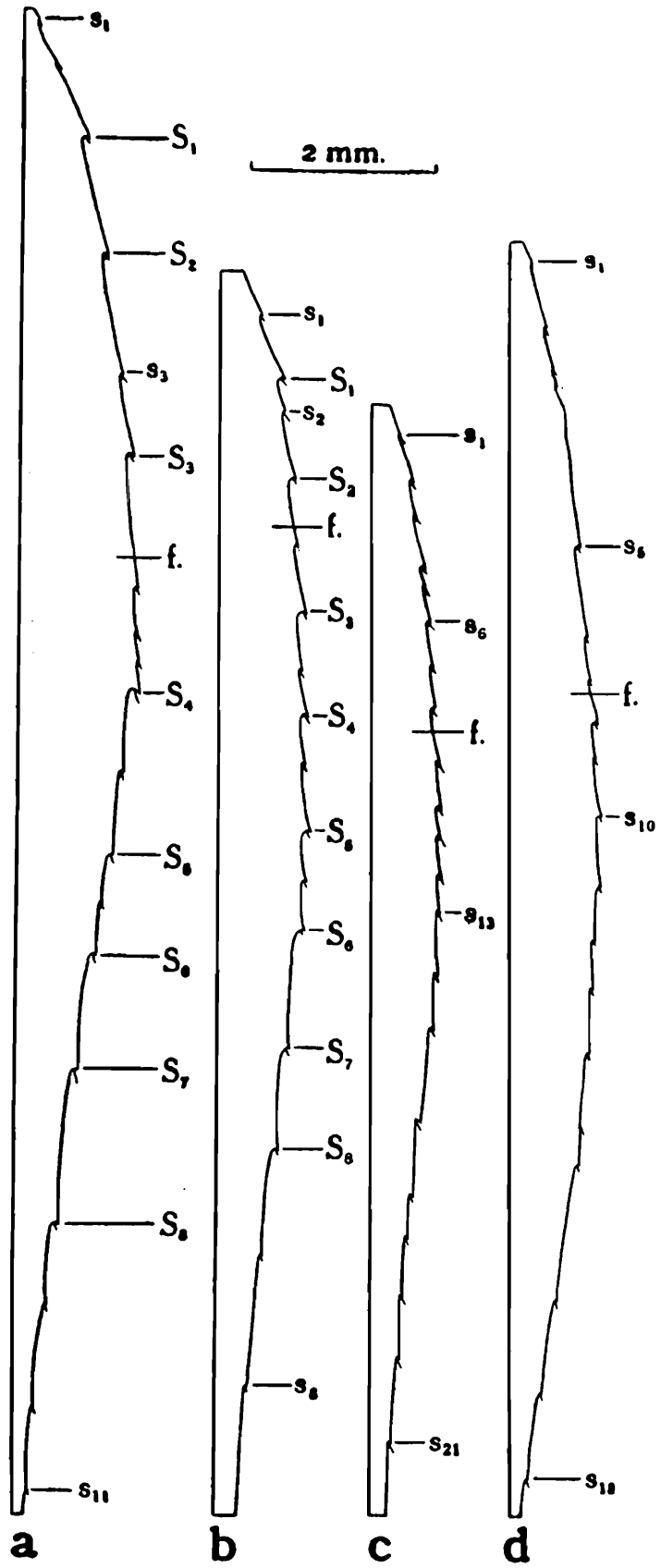


TEXT-FIG. 1.—*Schistocerca gregaria* (Forsk.). Left hind-femora, in side view (outer side), to show the femoral spines on the dorsal ridge.(*Z.S.I.*, collection with the Director, Zoological Survey of India; *P.P.A.*, collections with the Plant Protection Adviser to Government of India, New Delhi.)

(*a*). Phase *solitaria*, male. Z. S. I. Reg. No. 1189/H5. Ambagh *reks* (Mekran, Baluchistan, W. Pakistan), *don.* Y. Ramachandra Rao, 4.×.1936. (*b*). Phase *solitaria*, female. Z.S.I. Reg. No. 1173/H5. Guruchela, Baluchistan (West Pakistan), *don.* Y. Ramachandra Rao, 15.xi.1937). (*c*). Phase *gregaria*, male. P.P.A. No. 7. Dungargarh. (Churu District, Rajasthan, India), B. Nath *coll.*, 1. i. 1955., (*d*).Phase *gregaria* female. P. P. A. No. 16. Dungargarh (Churu District, Rajasthan, India), B. Nath *coll.*, 1. i. 1955.

d., dorsal ridge of femur; *f.*, hind-femur; S_1 —$S_{8.}$, first to eighth "well-developed spines; s_1 —s_{21}, first to twenty-first "weakly-developed" spines; *st.*, seta; *t.*, tibia.

Phase gregaria.—Height "A" ranges from 0·009-0·055 mm. (mean 0·021±0·001) in *gregaria* males, and is significantly less (at the 5%



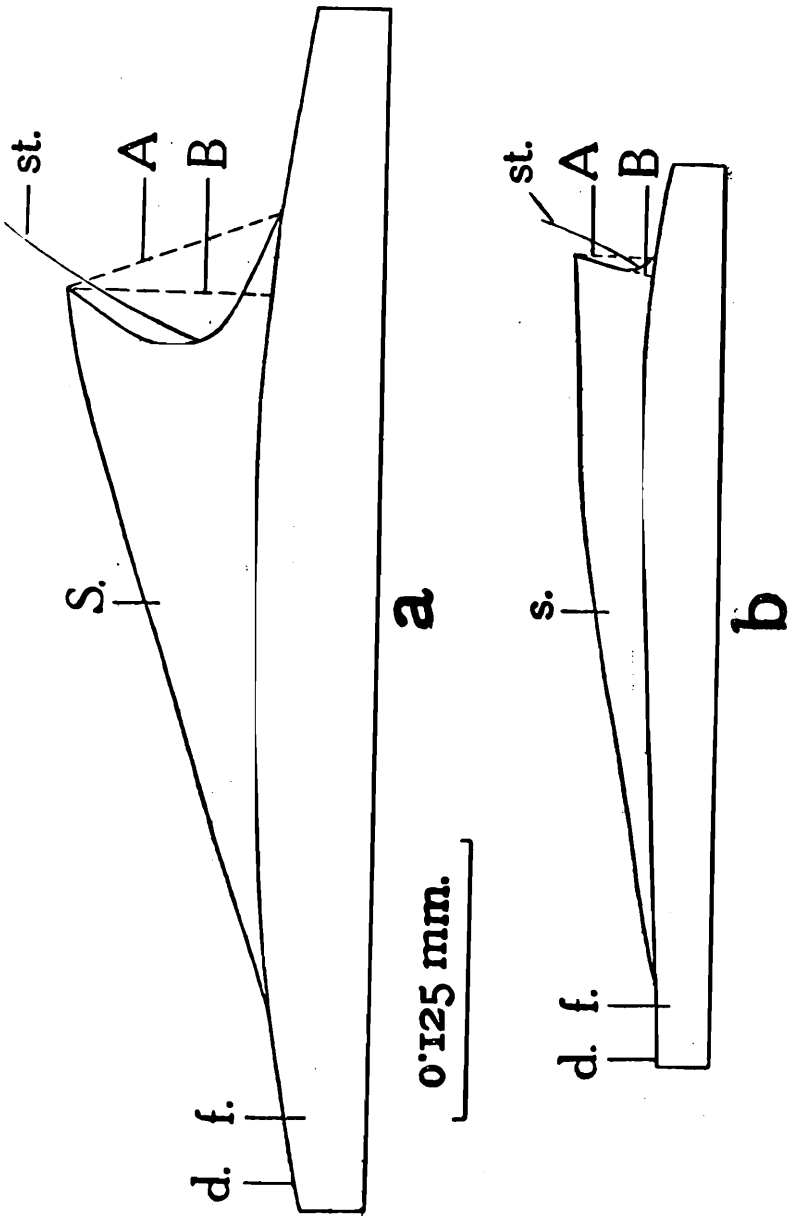
TEXT-FIG. 2.—*Schistocerca gregaria* (Forsk.). Dorsal edge of the left hind-femur, to show the femoral spines greatly enlarged. Same data as in Text-fig. 1.

(*a*) Phase *solitaria*, male. Z. S. I. Reg. No. 1189/45. Ambagh *reks* Mekran, Baluchistan, W. Pakistan). 4.x.1936, *don.* Y. Ramachandra Rao. (*b*). Phase *solitaria*, female. Z. S. I. Reg. No. 1173/H5 (*c*). Phase *gregaria*, male. P. P. A. No. 7. (*d*). Phase *gregaria*, female. P P. A. No. 16.

d., dorsal ridge of femur; *f.*, hind-femur ; S_1 —S_8, first to eighth "well-developed" spines; s_1 —s_{21}, first to twenty-first "weakly-developed" spines.

level but not at the 1% level) than in *gregaria* females (range 0·009-0·055 mm. ; mean 0·025±0·001).

Inter-phase and inter-sex comparisons (Table 2).—Heights "A" of the weak spines, while being significantly different between the two sexes within the same phase, is not significantly different in the *solitaria* and *gregaria* phase within the same sex. A detailed comparisons will be found in Table 2.



TEXT-FIG. 3.—*Schistocerca gregaria* (Forsk.). Hind-femoral spine enlarged, to show the methods of measurements of their "height".

(*a*). A large, well-developed spine, from a phase *solitaria* male specimen. (*b*). A weakly-developed spine, from a phase *gregaria* male specimen.

A., maximum straight-line height of femoral spine from the tip to the distal base of spine; B., vertical height of the femoral spine from the tip to the surface of femur; *d*., dorsal ridge of hind-femur; *f*., hind-femur; *S*., "well-developed" spine; *s*., "weakly-developed" spine; st., seta.

(ii) *Height "B" (vertical height)*

Phase solitaria.—Height "B" ranges from 0·009-0·037 mm. (mean 0·017±0·0004) in *solitaria* males, and is significantly less than in *solitaria* females (range 0·009-0·037 mm. ; mean 0·024±0·002).

Phase gregaria.—Height "B" ranges from 0·009-0·037 mm. (mean 0·021±0·001) in *gregaria* males, and is not significantly different from *gregaria* females (range 0·009-0·055 mm. ; mean 0·024±0·001).

Inter-phase and inter-sex comparison (Table 2).—Height "B" of the "weak" spines in the *solitaria* phase is significantly less in males than in females, but in the *gregaria* phase there is no significant difference between the sexes. Within the same sex, the height "B" is significantly less in *solitaria* males (mean 0·017±0·0004) than in *gregaria* males (mean 0·021±0·001), but within the female sex there is no significant phase difference. A detailed comparison will be found in Table 2.

3. *Number of spines*

(Text-figs. 1 and 2 ; and Tables 3 and 7)

In the *solitaria* phase, as stated above, both "well-developed" and "weak" spines are present, whereas in the *gregaria* phase only "weak" spines are present. The number of spines varies as follows :—

Phase solitaria males.—Well-developed spines 7-9 (mean 8) ; weak spines 6-11 (mean 8) ; total 14-19 (mean 16).

Phase solitaria females.—Well developed spines 7-9 (mean 8) ; weak spines 6-11 (mean 8) ; total 15-19 (mean 16).

Phase gregaria males.—Well-developed spines absent ; weak spines 18-22 (mean 20).

Phase gregaria females.—Well-developed spines absent ; weak spines 17-21 (mean 18).

Inter-sex comparison (Table 7).—In the *solitaria* phase there is no significant difference in the number of spines between males and females. But in the *gregaria* phase the number in males (mean 20·06±0·295) is significantly higher than in females (mean 18·4±0·370).

Inter-phase comparison (Table 7).—Within the same sex, whether male or female, the total number of spines is significantly less in the *solitaria* phase than in the *gregaria.*

4. *Relationship between the length of spine-bearing area and the total length of hind-femur*

(Text-fig. 1 ; and Tables 4 and 5)

To determine the relationship between the length of the spine-bearing area and the total length of the hind-femur, 35 *solitaria* and 26 *gregaria* phase individuals were measured.

The length of the spine-bearing area "*b*" measures about 10·0-15·6mm., and forms about 0·380-0·54 part of the total length "*a*" of the hind-femur.

In phase *solitaria* individuals the mean ratio *b/a* is 0·428±0·006 in males and is significantly less than in females (0·469±0·007). In phase *gregaria* individuals, however, the reverse situation occurs—the ratio in males (mean 0·486±0·007) being significantly higher than in females (mean 0·453±0·013). Within the same sex, the ratio in males is significantly less in the *solitaria* (mean 0·428±0·006) than in the *gregaria* phase (mean 0·486±0·007), but in females there is no phase difference.

5. *Sexual dimorphism*

(TABLE 6)

That the degree of sexual dimorphism in the length of the hind-femur varies with phase is already known (Murat, 1939 ; Roonwal, 1949 ; Roonwal & Nag, 1951 ; and Roonwal & Misra, 1952). In the size and number of the hind-femoral spines also a certain degree of sexual dimorphism, expressed as Sexual Dimorphism Percentage (S. D. P.), $\left[\left(\frac{♀♀}{♂♂}-1\right)\times 100\right]$, is discernible, as discussed below.

(*i*) *Size of spines*

The spines are 7·5-44·4% larger in females than in males ; thus :

Well-developed spines : The S. D. P. for the Heights "A" and "B" is 7·5 % and 11·3% respectively in phase *solitaria.*

Weakly-developed spines : The S. D. P. for Height "A" is 44·4% in phase *solitaria* and 19% in phase *gregaria.* For Height "B", the S. D. P. is 41·2% in phase *solitaria* and 14·3% in phase *gregaria.*

(*ii*) *Number of spines*

In regard to the number of spines, sexual dimorphism is discernible only in respect of the weakly developed spines in the *gregaria* phase where the value of the S. D. P. is 10%, *i.e.*, there are fewer spines in females than in males.

(*iii*) *Ratio b/a* (*length of spine-bearing area to the total length of hind-femur*)

The value of the S. D. P. in phase *solitaria* is 9·6%, and in phase *gregaria* 3·7%.

IV—SUMMARY

1. The series of spines present on the upper (dorsal) edge of the hind-femur of the Desert Locust, *Schistocerca gregaria* (Forskal), were studied and found to show differences correlated with the "phase" (*e.g.*, *solitaria* or *gregaria*) of the specimens.

2. Two types of femoral spines are distinguishable as regards size *viz.*, (i) the large or "well-developed" spines (Height "A" or maximum straight-line height from tip to base, 0·037-0·111 mm.) ; and (ii) "weakly-developed" spines (Height "A' , 0·009-0·055 mm.).

3. In the *solitaria* phase both types of spines (the well-developed and the weakly-developed) are present in almost equal numbers. In the *gregaria* phase, on the other hand, only the weak spines are present.

4. Two measurements, "A" and "B", of the spine were taken as regards height. Height "A" (maximum height) is the maximum straight-line distance from the distal tip to the distal base of the spine. Height "B" is the vertical distance from the tip of the spine to the surface of the femur.

5. The inter-phase and inter-sex differences in the height of spines was studied.

6. In the *solitaria* phase there are about 7-9 (mean 8) well-developed spines and 6-11 (mean 8) weak spines, or a total of about 14-19 (mean 16·31) spines. No sexual difference is discernible in this respect. In the *gregaria* phase, where only weak spines are present, their number in males is about 18-22 (mean 20·06) which is significantly higher than in females (17-21, mean 18·4).

7. The length of the spine-bearing area "*a*" was studied in relation to the total length, "*b*" of the hind-femur. In phase *solitaria* males the ratio *b*/*a* is $0{\cdot}428 \pm 0{\cdot}006$ and this figure is significantly less than in females ($0{\cdot}469 \pm 0{\cdot}007$). In the *gregaria* phase, however, the ratio in males ($0{\cdot}486 \pm 0{\cdot}007$) is significantly higher than in females ($0{\cdot}453 \pm 0{\cdot}013$). Within the same sex, the ratio is significantly higher in male *gregaria* ($0{\cdot}486 \pm 0{\cdot}007$) than in male *solitaria* ($0{\cdot}428 \pm 0{\cdot}006$) ; but in the female sex, the phases do not differ significantly.

8. Sexual Dimorphism in respect of the femoral spines was studied.

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TABLE 1.—*Size-range (height) (in mm.) and the Means (with S. E.) of hind-femoral spines in* Schistocerca gregaria *for phases* solitaria *and* gregaria.

A—Maximum straight-line height (in mm.) of spine from tip to distal base of spine.

B—Vertical height (in mm.) of spine from tip to surface of femur.

Sl. No.	Sex	No. of eye-stripes	No. of individuals examined	Total No. of spines examined	Size of hind-femoral spines (mm.)							
					Range (mm.)				Mean (with S.E.)			
					Well-developed spines		Weakly-developed spines		Well-developed spines		Weakly-developed spines	
					Maximum height A	Vertical height B	Maximum height A	Vertical height B	Maximum height A	Vertical height B	Maximum height A	Vertical height B
					1. Phase solitaria							
1	♂	6—7	3	51	0·037—0·092	0·037—0·092	0·009—0·037	0·009—0·037	0·067±0·003	0·053±0·002	0·018±0·0009	0·017±0·0004
2	♀	6	3	49	[0·037—0·111	0·037—0·092	0·009—0·037	0.009—0·037	0.072±0·003	0·059±0·002	[0·026±0·002	0·024±0·002
3	Both sexes	6—7	6	100	[0·037—0·111]	0·037—0·092]	[0·009—0·037	0.009—0·037	0·070±0·003	0·056±0·002	0·022±0.001	0·020±0·001
					2. Phase gregaria							
4	♂	6	3	61	..	..	0·009—0·055	0·009—0·037	..	..	0·021±0·001	0·021±0·001
5	♂	6	3	53	..	..	0·009—0·055]	0·009—0·055	..	..	0·025±0·001	0.024±0·001
6	Both sexes	6	3	114	..	..	0·009—0·055	0·009—0·055	..	..	0·023±0·001	0·022±0·001

TABLE 2.—*Comparison of size-range (height, in mm.) and variability of heights ("A" and "B") of hind femoral spines in* Schistocerca gregaria.

Abbreviations :

A—Maximum height of spine (from tip to distal base).

B—Vertical height of spine (from tip to surface of femur).

S—Significant.

NS—Not significant.

C. V.—Coefficient of Variation.

S. D.—Standard Deviation.

S. E.—Standard Error.

Ph. *greg.*—Phase *gregaria.*

Ph. *sol.*—Phase *solitaria.*

Sl. No. of Pairs	Nature of population, with sex and number of eye-stripes (6 or 7)	Character of spines	No. of spines	Size-range of height (mm.)	Category of (Height)	Mean ± S. E. (mm.)	S. D. ± S. E.	C.V.	Significance of difference of the Mean. At 5% level of probability	Significance of difference of the Mean. At 1% level of probability
1	Ph. *sol.* ♂ ♂ (6-7)	Weak	26	0·009—0·037	A	0·018±0·0009	0·004±0·0006	25·40	S	S
	Ph. *sol.* ♀ ♀ (6)	,,	23	0·009—0·037	A	0·026±0·002	0·010±0·001	40·77		
2	Ph. *sol.* ♂ ♂ (6-7)	,,	26	0·009—0·037	A	0·018±0·0009	0·004±0·0006	25·40	NS	NS
	Ph. *greg.* ♂ ♂ (6)	,,	61	0·009—0·055	A	0·021±0·001	0·011±0·0009	52·38		
3	Ph. *sol.* ♀ ♀ (6)	,,	23	0·009—0·037	A	0·026±0·002	0·010±0·001	40·77	NS	NS
	Ph. *greg.* ♀ ♀ (6)	,,	53	0·009—0·055	A	0·025±0·001	0·010±0·0009	39·83		

4	Ph. *sol.* (both sexes) (6-7)	..	Weak	49	0·009—0·037	A	0·022±0·001	0·007±0·0008	33·08	NS	NS
	Ph. *greg.* (both sexes) (6)	..	,,	114	0·009—0·055	A	0·023±0·001	0·010±0·0009	46·10		
5	Ph. *greg.* ♂ ♂ (6)	..	.. ,,	61	0·009—0·055	A	0·021±0·001	0·011±0·0009	52·38	S	NS
	Ph. *greg.* ♀ ♀ (6)	..	.. ,,	53	0·009—0·055	A	0·025±0·001	0·010±0·0009	39·83		
6	Ph. *sol.* ♂ ♂ (6-7)	..	.. ,,	26	0·009—0·037	B	0·017±0·0004	0·002±0·0003	14·16	S	S
	Ph. *sol.* ♀ ♀ (6)	..	.. ,,	23	0·009—0·037	B	0·024±0·002	0·010±0·001	42·60		
7	Ph. *sol.* ♂ ♂ (6-7)	..	.. ,,	26	0·009—0·037	B	0·017±0·0004	0·002±0·0003	14·16	S	S
	Ph. *greg.* ♂ ♂ (6)	..	.. ,,	61	0·009—0·037	B	0·021±0·001	0·010±0·0009	49·02		
8	Ph. *sol.* ♀ ♀ (6)	..	.. ,,	23	0·009—0·037	B	0·024±0·002	0·010±0·001	42·60	NS	NS
	Ph. *greg.* ♀ ♀ (6)	..	.. ,,	53	0·009—0·055	B	0·024±0·001	0·009±0·0009	40·39		
9	Ph. *sol.* (both sexes) (6-7)	..	,,	49	0·009—0·037	B	0·020±0·001	0·006±0·0006	28·38	NS	NS
	Ph. *greg.* (both sexes) (6)	..	,,	114	0·009—0·055	B	0·022±0·001	0·009±0·0009	44·70		
10	Ph. *greg.* ♂ ♂ (6)	..	.. ,,	61	0·009—0·037	B	0·021±0·001	0·010±0·0009	49·02	NS	NS
	Ph. *greg.* ♀ ♀ (6)	..	.. ,,	53	0·009—0·055	B	0·024±0·001	0·009±0·0009	40·39		

TABLE 3.—*Summary of the data on the number of hind-femoral spines in* Schistocerca gregaria *from specimens collected in Western India (Rajasthan, Punjab, Sind and Baluchistan).*

Phase and sex	No. of individuals examined	No. of eye-stripes	E/F ratios	No. of "well developed" spines		No. of "weakly developed" spines		Total No. of spines	
				Range	Mean	Range	Mean	Range	Mean
1. *solitaria* males	16	6—7	1·92—2·10	7—9	8	6—11	8	14—19	16
2. *solitaria* females	19	6—7 (8)	1·95—2·16	7—9	8	6—11	8	15—19	16
3. *gregaria* males	16	6	2·05—2·30	0	..	18—22	20	18—22	20
4. *gregaria* females	16	6	2·18—2·31	0	..	17—21	18	17—21	18

TABLE 4.—*Relationship between total length of hind-femur and the length of spine-bearing area of femur in* Schistocerca gregaria.

(*a*) Length of hind-femur (in mm.).

(*b*) Length of spine-bearing area of the femur (in mm.).

Serial No.	Sex	No. of eye-stripes	No. of individuals examined	Total No. of spines	MEASUREMENTS (mm.)					
					Size-range (mm.)			Mean (mm.)		
					Length of hind-femur (*a*)	Length of spine-bearing area of the femur (*b*)	Ratio *b*/*a*	Length of femur (*a*)	Length of spine-bearing area of the femur (*b*)	Ratio *b*/*a*
					1. Phase solitaria					
1	♂	6—7	16	16	25·0—28·2	10·6—12·0	0·380—0·476	26·3	11·2	0·428
2	♀	6—7	19	16	26·9—34·1	11·4—15·6	0·410—0·528	30·4	14·2	0·469
3	Both sexes	6—7	35	16	25·0—34·1	10·6—15·6	0·380—0·528	28·3	12·7	0·448
					2. Phase gregaria					
1	♂	6	16	20	21·8—25·2	10·1—12·1	0·427—0·540	23·2	11·2	0·486
2	♀	6	10	18	23·3—26·9	10·0—12·2	0·397—0·523	24·8	11·2	0·453
3	Both sexes	6	26	19	21·8—26·9	10·0—12·2	0·397—0·540	24·0	11·2	0·457

TABLE 5.—*Comparison of the mean ratio (b/a) between the total length of hind-femur and the length of the spine-bearing area of femur in* Schistocerca gregaria.

Abbreviations :

S Significant.

NS—Not significant.

S. D.—Standard Deviation.

S. E.—Standard Error.

Ph. *greg.*—Phase *gregaria.*

Ph. *sol.*—Phase *solitaria.*

Serial No. of pairs	Nature of population, with sex and number of eye-stripes (6 or 7)	Mean ratio ± S. E. (*b/a*)	S. D. ± S. E.	Significance of difference of the Mean ratio	
				At 5% level of probability	At 1% level of probability
1	Ph. *sol.* ♂ ♂ (6—7)	0·428±0·006	0·025±0·004	S	S
	Ph. *sol.* ♀ ♀ (6—7)	0·469±0·007	0·031±0·005		
2	Ph. *greg.* ♂ ♂ (6)	0·486±0·007	0·030±0·005	S	NS
	Ph. *greg.* ♀ ♀ (6)	0·453±0·013	0·043±0·009		
3	Ph. *sol.* ♂ ♂ (6—7)	0·428±0·006	0·025±0·004	S	S
	Ph. *greg.* ♂ ♂ (6)	0·486±0·007	0·030±0·005		
4	Ph. *sol.* ♀ ♀ (6—7)	0·469±0·007	0·031±0·005	NS	NS
	Ph. *greg.* ♀ ♀(6)	0·453±0·013	0·043±0·009		

TABLE 6.—*Sexual Dimorphism Percentage* $[(\frac{♀}{♂} - 1) \times 100]$ *in the hind-femoral spines in* Schistocerca gregaria.

Character and Phase	Sexual Dimorphism Percentage
1. Size of spines	
(A) WELL-DEVELOPED SPINES	
(i) Height "A"—Phase *solitaria*	7·5
(ii) Height "B"—Phase *solitaria*	11·3
(B) WEAKLY-DEVELOPED SPINES	
(i) Height "A" —Phase *solitaria*	44·4
(ii) ,, ,, —Phase *gregaria*	19·0
(iii) Height "B" —Phase *solitaria*	41·2
(iv) ,, ,, —Phase *gregaria*	14·
2. Number of spines	
WEAKLY-DEVELOPED SPINES	
Phase *gregaria*	—10
3. Ratio *b/a* (ratio of length of spine-bearing area to total length of hind-femur).	
Phase *solitaria*	9·6
Phase *gregaria*	—3·7

TABLE 7.—*Significance of inter-sex and inter-phase differences in the total number of hind-femoral spines in* Schistocerca gregaria.

Abbreviations :

NS.—Not significant.
S.—Significant.
S. D.—Standard Deviation.
S.E.—Standard Error.
Ph. *greg.*—Phase *gregaria.*
Ph. *sol.*—Phase *solitaria.*

Sl. No. of pairs	Nature of population, with sex and number of eye-stripes (6 or 7)	Total number of hind-femoral spines		Significance of difference in the Mean	
		Mean±S.E.	S. D.±S. E.	At 5 % level of probability	At 1 % level of probability
	Ph. *sol.* ♂ ♂ (6—7)	16·31±0·350	1·400±0·248	NS	NS
	Ph. *sol.* ♀ ♀ (6—7)	16·68±0·362	1·577±0·256		
2	Ph. *greg.* ♂ ♂ (6)	20·06±0·295	1·181±0·209	S	S
	Ph. *greg.* ♀ ♀ (6)	18·40±0·370	1·170±0·262		
3	Ph *sol.* ♂ ♂ (6—7)	16·31±0·350	1·400±0·248	S	S
	Ph. *greg.* ♂ ♂ (6)	20·06±0·295	1·181±0·209		
4	Ph. *sol.* ♀ ♀ (6—7)	16·68±0·362	1·577±0·256	S	S
	Ph. *greg.* ♀ ♀ (6)	18·40±0·370	1·170±0·262		