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## The Scorpion Fauna of Al-Baha and Hail Regions, Saudi Arabia

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**Abstract:** This is an additional contribution to the comprehensive study of the scorpion sting syndrome in Saudi Arabia, which was collected from two regions (Al-Baha and Hail). It deals with identification of the existing and newly discovered species and their medical importance. The survey covered the major sites of Al-Baha, (Al-Queed, Al-Qura, Al-Mandig, Al-Makhwaa, Galwaa, Al-Baha and Baljurashy) and Hail, (Hail city, Baqaa, Al-Shenan, Al-Ghazala). There were 2421 specimens collected from Al-Baha Region. There were 1281 (52.9%) specimens *Scorpio maurus fuscus* belonged to Scorpionidae, in addition to the family Diplocentridae (Abolished and changed to Scorpionidae, recently), which was represented by the species *Nebo hierichonticus* (38, 1.58%). Four species of scorpions that belonged to the Buthidae family were *Leiurus quinquestriatus* (1052, 43.5%), *Compsobuthus werneri* (23, 0.95%), *Orthochirus innesi* (11, 0.46%) and *Vachoniolus minipectinibus* (16, 0.66%). A total of 1921 specimens were collected from Hail Region, The most common subspecies from this region that belonged to the family Scorpionidae was *Scorpio maurus kruglovi* (1522, 79.23%). The next common species was *Androctonus crassicauda* (120, 6.25%) *Androctonus bicolor* (180, 9.37%), *Leiurus quinquestriatus* (18, 0.94%), *Buthacus leptochelys* (35, 1.82%), *Compsobuthus werneri* (37, 1.93%), *Orthochirus innesi* (4, 0.21%) and *Apistobuthus pterygocercus* (5, 0.26%) all belonging to the family Buthidae. *Androctonus crassicauda* and *Leiurus quinquestriatus*, which are highly venomous, are endemic in Hail and Al-Baha regions, respectively, in addition to the newly recorded species of *Androctonus bicolor* for the first time in Hail region, without previous records in Saudi Arabia. Further studies are warranted to identify more scorpion species in these regions.

**Key words:** Phylogeny, systematics, species, Buthidae, Scorpionidae, *Nebo*

### INTRODUCTION

Earlier studies by several investigators including Vachon (1979), Al-Hajjaj (2005) and Al-Sadoon and Al-Farraj (2008) described the presence of only two species (*Androctonus crassicauda* and *Leiurus quinquestriatus*) in Hail Region, which belong to the family Buthidae. Other buthid species like *Buthacus leptochelys* and *Vachoniolus (Buthacus) minipectinibus* were not reported to be extant in other regions (Vachon, 1979). Buthidae is the largest of scorpion families (Polis, 1990; Fet and Lowe, 2000) spreading over many regions, widespread in the Old World, especially in the tropical areas of Africa. The detailed information is available in the scorpology websites (ITG Library, 2008; (<http://www.arachnodata.ch/frameset2.htm>, [http://www.science.marshall.edu/fet/euscorpious/p2005\\_20.pdf](http://www.science.marshall.edu/fet/euscorpious/p2005_20.pdf), [http://www.wrbu.org/scorpions/sc\\_du\\_jour/](http://www.wrbu.org/scorpions/sc_du_jour/) scorpion\_

du\_jour.html)). The Family Diplocentridae was abolished and species belonging to this family were added to family Scorpionidae because of the close similarities between them. Some genera of the Scorpionidae, have accessory trichobothria on the pedipalp patellae and chelae, according to Prendini and Wheeler (2005), do also possess moderate to highly folded venom glands and rounded lateroapical lobes of tarsi (Polis, 1990). Based on characters like the moderately folded venom glands and the straight lateroapical tarsal lobes, the sub-family Hemiscorpiinae (Scorpionidae) were hard to distinguish from Ischnuridae. Hemiscorpiidae, was elevated from the previous subfamily then abolished and its two genera *Habibiella* and *Hemiscorpius* were transferred to Liochelidae. Finally, it was reinstated, according to the steps taken in higher systematics of phylogeny adopted by The Scorpion Files (2008) that followed Fet and Sologlad (2005).

With respect to medically important species found in other studied regions there were other ones, known as medically unimportant that caused intracranial bleeding and other complications (Annobil *et al.*, 1991; Annobil, 1993). Other studies and personal contact information have reported serious inconvenient encounters with other species (*Compsobuthus wernerii*, *Apistobuthus pterygocercus*, *Scorpio maurus kruglovi*, *Scorpio maurus (palmatus)* and *Hemiscorpius sp. (Arabicus, lepturus)* found in other regions (Vachon, 1979).

The aims of this present study are to confirm the existence of the already reported as well as to record the newly identified ones in Hail and Al-Baha Regions, Saudi Arabia. It would be of interest to correlate and covariate between species known as medically important and others that were not expected to be of equal importance but to cause serious and fatal encounters, based on reported literature.

## MATERIALS AND METHODS

**Scorpions:** A group of professional hunters, who were specifically recruited for this job, collected scorpions from the wild, which were infesting the areas of Al-Baha and Hail Regions. Al-Baha region is on the southwest and Hail Regions in the northern region of Saudi Arabia (Fig. 1). Scorpion species were brought to the RMH (Riyadh Military Hospital) Research Centre in groups (batches). This research study was conducted in the years 2006-2007.

**Colony maintenance (the scorpion bioterium):** The scorpion bioterium was designed in a way that groups of each batch of scorpions were lined in larger plastic containers. The plastic container boxes were put in rows on shelves. Each single scorpion was kept in a separate plastic container. Small rolls of cotton, soaked in water were supplied for each on regular basis.

**Food supply:** A separate colony of food supply (mealworms) had been established, which is providing good yield to meet the food requirements. The yellow mealworms (larval stage) of the darkling beetle (*Tenebrio molister*) were reared in large plastic buckets and fed on special food on a weekly basis. Mealworms were given to scorpions every fortnight.

**Morphological identification of scorpions:** Comparative work was done with previous taxonomic keys of Vachon (1979) and Sissom (Polis, 1990), employing stereo zoom dissection microscopy. Their trichobothrial patterns (Table 1, Fig. 2A-D, Fig. 3) were the backbone in identification. According to the changes published on scorpion higher phylogeny and taxonomy recently, the steps in higher systematics (family level) adopted by The Scorpion Files (2008) that followed Fet and Soleglad (2005) were employed here, awaiting further changes. A consultant taxonomist confirmed classification of this material.

**Histology of the venom glands:** Scorpion samples were collected from Al-Baha and Hail regions, the telsons were

Table 1: Numbers, basic patterns and nomenclature of scorpion trichobothria and their locations. according to Polis (1990)

Segment	Surface				Total No.
	Dorsal	Ventral	Internal	External	
<b>Type a basic trichobothrial pattern</b>					
Femur	d1-d5		i1-i4	e1, e2	11
Patella	d1-d5		i	eb1, eb2, esb1, esb2, em, est, et	13
Chela manus		v1, v2		eb1-eb3, esb, est, et	8
Fixed finger	db, dt		it	eb, esb, est, et	7
Sub-total					39
<b>Type b basic trichobothrial pattern</b>					
Femur	d1-d4		i	e1-e4	9
Patella	d1, d2	v1-v3	id, iv	eb1, eb2, esb, em, est1, est2, et	14
Chela manus		v		eb1-eb3, est, et	6
Fixed finger	db, dt		ib, it	eb, esb, est, et	8
Sub-total					37
<b>Type c basic trichobothrial pattern</b>					
Femur	d		i	e	3
Patella	d1, d2	v1-v3	i	eb1-eb3, esb1, esb2, em1, em2, est, et1-et3	19
Chela manus	db, dt	v1-v4		eb1-eb3, esb, est, et1-et5	16
Fixed finger	db, dsb, dst, dt		ib, it	eb, esb, est, et	10
Sub-total					48

d: Dorsal; i: Internal; e: External; b: Basal; sb: Sub basal; m: Medial; v: Ventral; st: Subterminal; t: Terminal

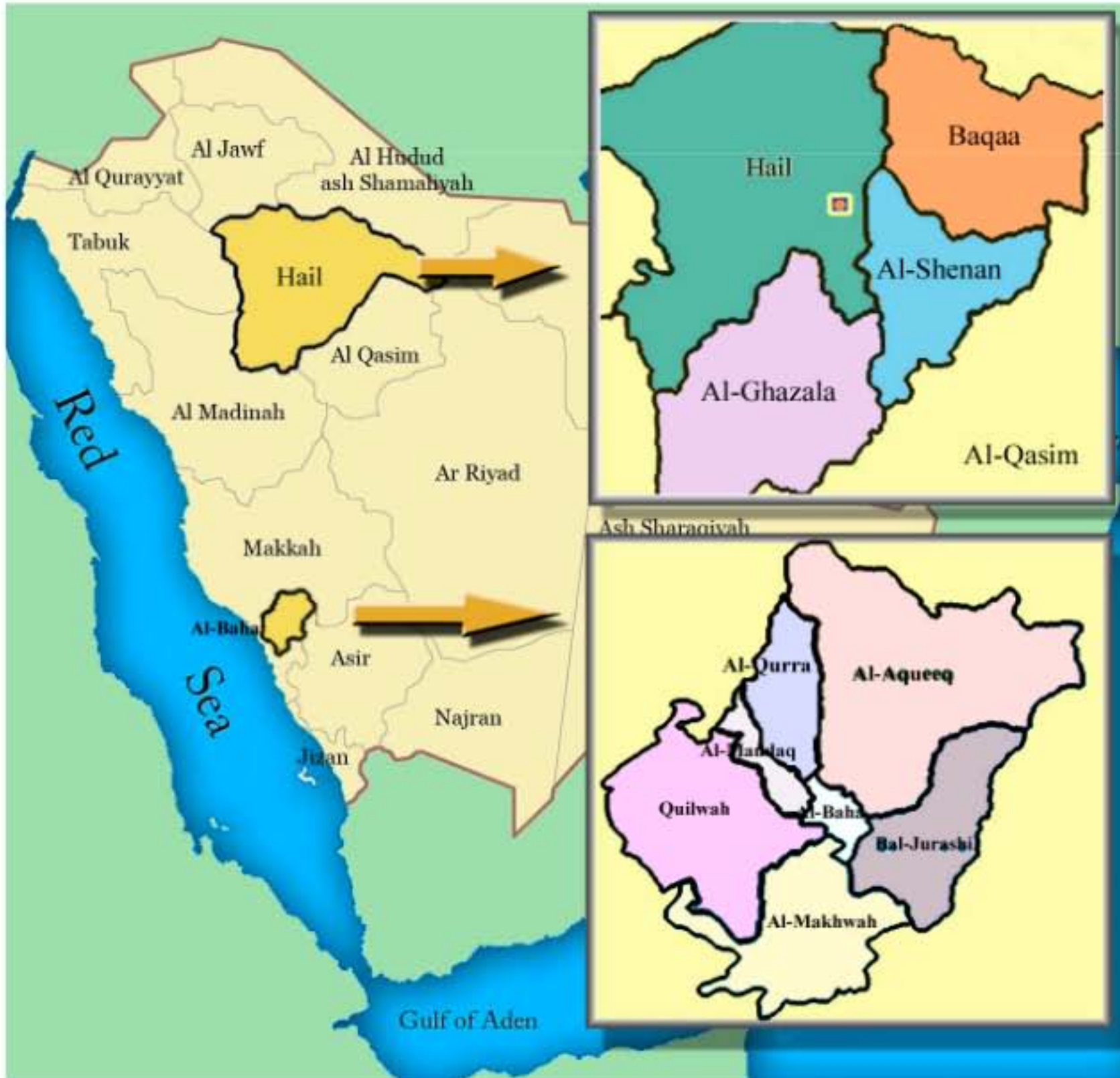


Fig. 1: Map of the Kingdom of Saudi Arabia showing the two study areas of Al-Baha and Hail Regions (reformed from Saudi maps)

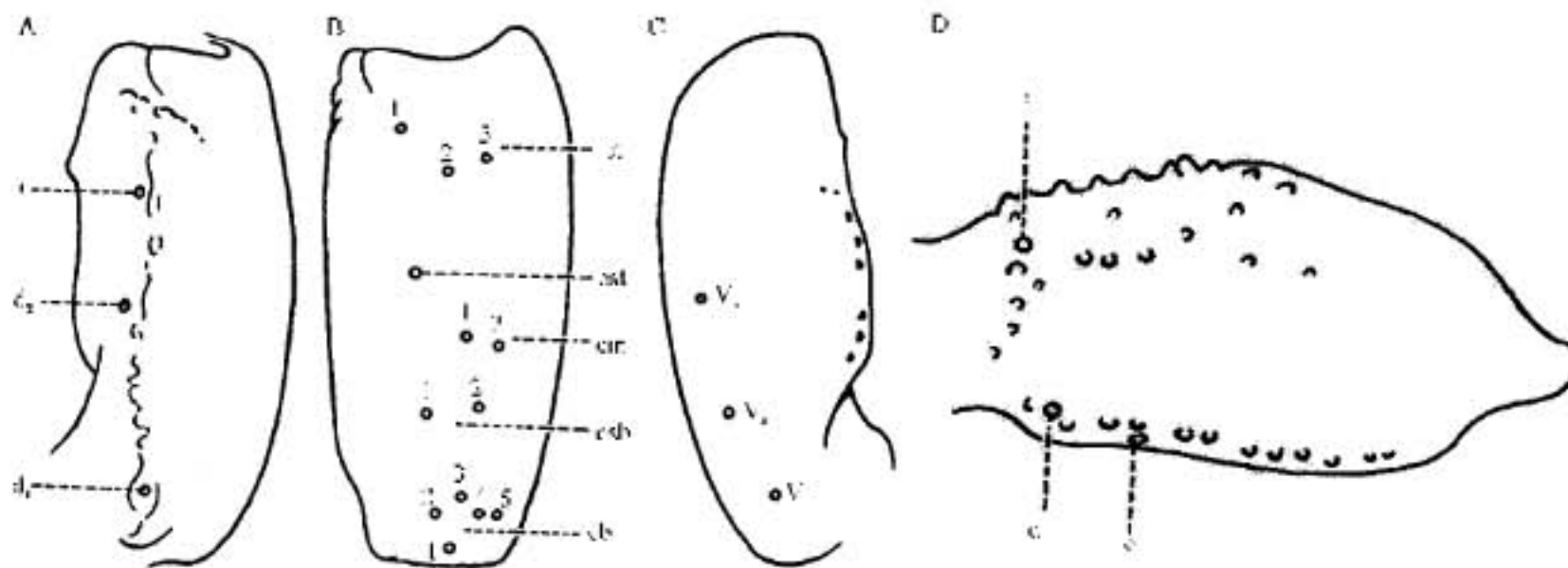


Fig. 2: Trichobotrial patterns of the pedipalp, (A-D), Tibia and femur (Family Scorpionidae), (A) Dorsal view of the tibia, (B) External view of the tibia, (C) Ventral view of the tibia and (D) Dorsal view of femur

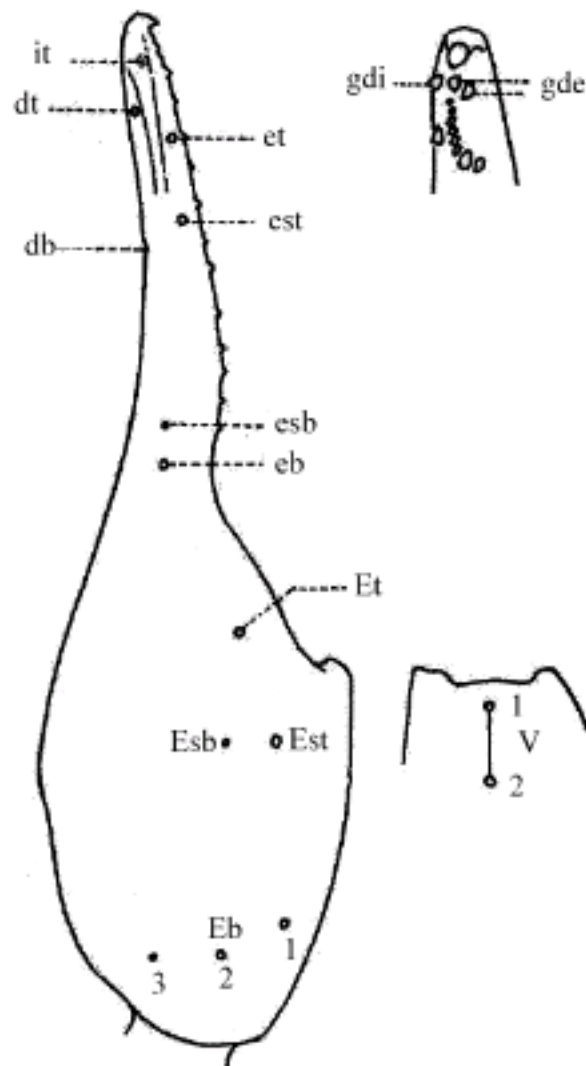


Fig. 3: External, ventral views of the tibia and terminal of movable finger (Buthidae)

removed. The telsons were fixed in fixative solution for 1 week (formalin 12%, iso propanol 30%, acetic acid 2 and 2% glycerol adding for tissue softening). They were then dehydrated in a graded alcohol series and embedded with paraffin wax. The telsons blocks were sectioned as 6 µm thickness. Sections were stained with hematoxylin-eosin and examined under light microscopy.

## RESULTS

### Al-Baha region

**The batches and counts:** Five batches were collected from Al-Baha Region (Fig. 1) that gave a total of 2421 scorpions (Table 2). Detection of scorpions colour with their mean body length in cm as shown in (Table 3). The scorpions were divided in various groups on the basis of their morphological characteristics. The ratio of adult (2068) to juveniles (353) was 5.85:1. The mortality rate for adults had a ratio of 1:4.32. For the juveniles the ratio was 1:2.5. Two species were found to be black in colour. A large (mean length = 11.3 cm) species, *Nebo hierichonticus* (38, 1.58%) and a small

Table 2: Batch-wise record of scorpions of Al-Baha Region collected during the period 28.01. 2006-21/07/2007 (five batches)

Name of scorpion batches	Adult		Juvenile		Total	Grand total	Percentage
	Live	Dead	Live	Dead			
<i>Nebo hierichonticus</i>							
(1)	4	3	4	0	11		
(2)	4	00	04	00	08		
(3)	8	0	7	0	15		
(4)	1	0	0	0	1		
(5)	3	0	0	0	3		
Sub-total	20	3	15	0	38	38	1.58
<i>Leiurus quinquestriatus</i>							
(1)	0	1	3	0	4		
(2)	34	07	20	00	61		
(3)	175	4	21	2	202		
(4)	486	57	0	0	543		
(5)	229	13	0	0	242		
Sub-total	924	82	44	2	1052	1052	43.5
<i>Scorpio maurus (fuscus)</i>							
(1)	328	117	100	44	589		
(2)	183	84	69	22	358		
(3)	161	74	23	33	291		
(4)	11	25	0	0	36		
(5)	4	3	0	0	7		
Sub-total	687	303	192	99	1281	1281	52.91
<i>Compsobuthus werneri</i>							
(1)	9	0	0	0	9		
(2)	9	0	0	0	9		
(3)	5	0	0	0	5		
Sub-total	23	0	0	0	23	23	0.95
<i>Orthochirus innesi</i>							
Sub-total	10	0	1	0	11	11	0.46
<i>Vachoniolus minipectinibus</i>							
Sub-total	16	0	0	0	16	16	0.66
Total	1680	388	252	101	2421	2421	100.00
(%)	69.39	16.03	10.41	4.17	100		100.00

(mean length = 3.2 cm) one, *Orthochirus innesi* (11, 0.46%). All the rest of species were yellow in colour.

**Morphological examination of scorpion specimens:** The groups of scorpions, which were collected from Al-Baha Region, were classified into various families, (Buthidae and Scorpionidae), genera and species (Fig. 4A-L, Table 4). Six species, which were collected from this region, belonged to the above-mentioned families (Table 4). Major groups of species included *Leiurus quinquestriatus* (1052 specimens, 43.5%) that belonged to the family Buthidae, *Scorpio maurus* (1281 specimens, 52.9%), which has been verified to the subspecies (*fuscus*) and *Nebo hierichonticus* (38 specimens, 01.58%), belonging to the Scorpionidae family. Other three less common species, included *Compsobuthus weneri* (23 specimens, 0.95%), *Orthochirus innesi* (11 specimens, 00.46%) and *Vachoniolus minipectinibus* (16 specimens, 00.66%), also belonging to the Buthidae family.

**Histology of the venom glands:** Figure 5A-D showed the histological profiles of scorpion venom glands that were collected from Al-Baha Region. The cross sections of *Compsobuthus weneri* telsa (Buthidae) reflected complexly folded glands (Fig. 5A). The sections of *Scorpio maurus fuscus* and *Nebo hierichonticus* (Scorpionidae) showed no or simple folding (Fig. 5B, C, respectively), but the cuticle was very thick in case of the latter one. Telsa sections of *Leiurus quinquestriatus* (Buthidae) showed very distinct complexly folded glands (Fig. 5D).

**Hail region**

**The batches and counts:** Six batches were collected from Hail Region (Fig. 1) with 1921 specimens of scorpions (Table 5). Detection of scorpions colour and mean body length as shown in (Table 6). All specimens of scorpions were divided on the basis of their morphological characteristics. The ratio of adult (1711) to juveniles (210) was 8.13:1. The mortality rate for adults had a ratio of 1:2.83. For the juveniles the ratio was 1:5.19.

Three species were found to be black in colour. Two large (mean length = 8.5 and 8.3 cm) species, *Androctonus crassicauda* (120, 6.25%) *Androctonus bicolor* (180, 9.37%), respectively and a small (mean length = 2.8 cm) one, *Orthochirus innesi* (4, 0.21%). All the rest of species are yellow in colour.

Table 3: Colour and body length of scorpions of Al-Baha Region collected during the period 28.01. 2006-21. 07. 2007

Scorpion Sc. name	Colour	Mean body length (cm)
<i>Nebo hierichonticus</i>	Black	11.3
<i>Scorpio maurus fuscus</i>	Yellow	4.2
<i>Leiurus quinquestriatus</i>	Yellow	9.4
<i>Compsobuthus weneri</i>	Yellow	3.3
<i>Orthochirus innesi</i>	Black	3.2
<i>Vachoniolus minipectinibus</i>	Yellow	6.2

Table 4: Classifications of the scorpions collected from Al-Baha region

<b>Family (1) : Buthidae</b>		
Genus (1)	: <i>Leiurus</i>	
	Species	: <i>quinquestriatus</i>
Genus (2)	: <i>Compsobuthus</i>	
	Species	: <i>weneri</i>
Genus (3)	: <i>Orthochirus</i>	
	Species	: <i>innesi</i>
Genus (4)	: <i>Vachoniolus</i>	
	Species	: <i>minipectinibus</i>
<b>Family (2) : Scorpionidae</b>		
Genus (1)	: <i>Scorpio</i>	
	Species	: <i>maurus</i>
	Subspecies	: <i>fuscus</i>
Genus (2)	: <i>Nebo</i>	
	Species	: <i>hierichonticus</i>

**Morphological examination of scorpion specimens:** The groups of scorpions were identified and classified into families, genera and species (Table 7). Two families were recognized, as Buthidae and Scorpionidae. Eight species were found to belong to these two families (Fig. 6A-P, Table 7). All groups were identified and confirmed to the species. The species with the highest count is *Scorpio maurus* (1522 specimens, 79.22%), which was found to belong to the Scorpionidae family and has been verified to the subspecies (*kruglovi*). The second one is *Androctonus crassicauda* (120 specimens, 6.25%), *Androctonus bicolor* (180 specimens, 9.37%) that belonged to the family Buthidae. Other scarce species that also belonged to the Buthidae were *Compsobuthus weneri*, (37 specimens, 01.93%), *Buthacus leptochelys* (35 specimens, 01.82%), *Leiurus quinquestriatus* (18 specimens, 00.94%), *Orthochirus innesi* (four specimens, 00.21%) and *Apistobuthus pterygocercus* (five specimen, 00.26%).

**Histology of the venom glands:** Figure 7A-F shown histological profiles of scorpion venom glands that were collected from Hail Region. The cross sections of *Buthacus leptochelys* and *Compsobuthus weneri* (Buthidae) reflected complexly folded glands (Fig. 7A, B). Whilst the sections of *Scorpio maurus kruglovi* (Scorpionidae) showed no or simple folding (Fig. 7C). Telsa sections of *Leiurus quinquestriatus* (Buthidae) showed very distinct complexly folded glands (Fig. 7E). Very similar glandular folding was seen in the histological section (Fig. 7D, F) of the buthid species *Androctonus crassicauda* and *Androctonus bicolor*.



Fig. 4: (A-L) The collected scorpion species of Al-Baha region. (A, B) Dorsal and Ventral view of *Nebo hierichonticus*, (C, D) Dorsal and Ventral view of *Leiurus quinquestriatus*, (E, F) Dorsal and Ventral view of *Scorpio maurus* (fuscus), (G, H) Dorsal and Ventral view of *Vachoniolus minipectinibus*, (I, J) Dorsal and Ventral view of *Composobuthus wernerii* and (K, L) Dorsal and Ventral view of *Orthochirus innesi*

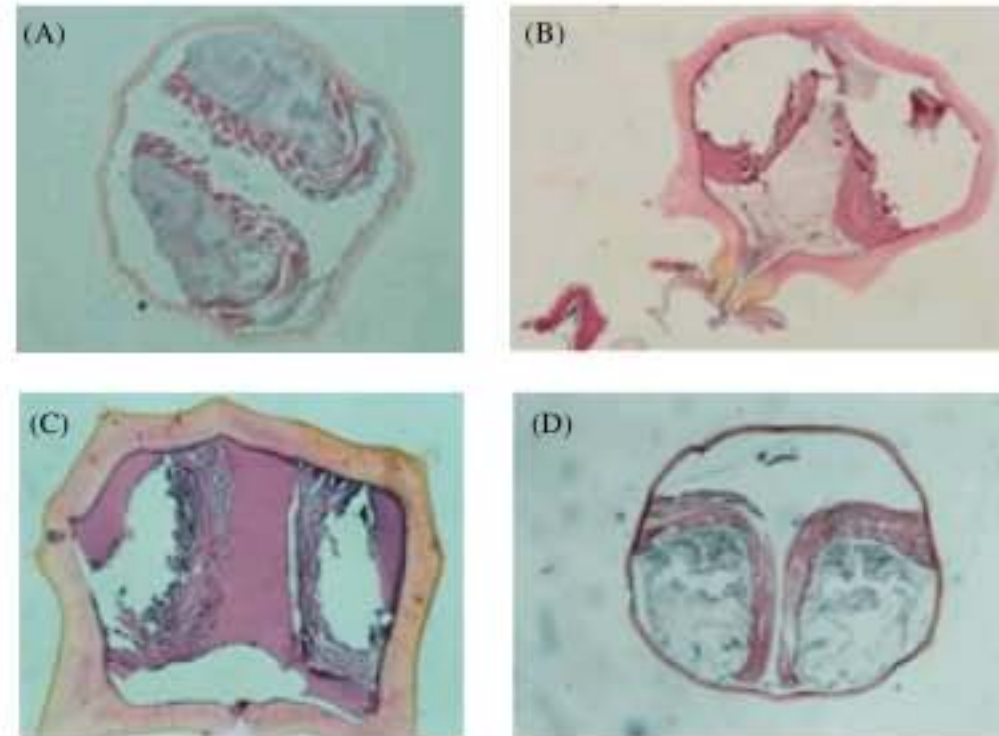


Fig. 5: (A-D): Cross sections in the different scorpion tarsi to show the two venom glands of scorpions from Al-Baha Region, exemplifying the families Buthidae and Scorpionidae

Table 5: Batch-wise distribution of scorpions of Hail Region collected during the period 14/05/2006-01/08/2007 (six batches)

Sc. name of scorpion batches	Adult		Juvenile		Total	Grand total	Percentage
	Live	Dead	Live	Dead			
<i>Androctonus crassicauda</i>							
(1)	14	1	10	0	25		
(2)	1	0	0	0	1		
(3)	11	5	21	0	37		
(4)	6	0	10	0	16		
(5)	33	4	0	0	37		
(6)	3	1	0	0	4		
Sub-total	68	11	41	0	120	120	6.25
<i>Androctonus bicolor</i>							
(1)	24	0	11	0	35		
(2)	3	0	0	0	3		
(3)	14	4	32	0	50		
(4)	11	2	20	0	33		
(5)	30	5	19	0	54		
(6)	4	0	1	0	5		
Sub-total	86	11	83	0	180	180	9.37
<i>Scorpio maurus kruglovi</i>							
(1)	28	9	10	11	58		
(2)	172	45	1	17	235		
(3)	173	81	0	0	254		
(4)	126	38	0	0	164		
(5)	189	140	0	0	329		
(6)	366	116	0	0	482		
Sub-total	1054	429	11	28	1522	1522	79.22
<i>Leiurus quinquestriatus</i>							
(1)	0	0	15	0	15		
(2)	0	0	3	0	3		
Sub-total	0	0	18	0	18	18	0.94
<i>Buthacus leptochelys</i>							
(1)	0	0	25	0	25		
(2)	0	0	6	1	7		
(3)	3	0	0	0	3		
Sub-total	3	0	31	1	35	35	1.82
<i>Compsobuthus werneri</i>							
(1)	0	0	19	4	23		
(2)	2	0	3	0	5		
(3)	9	0	0	0	9		
Sub-total	11	0	22	4	37	37	1.93
<i>Orthochirus innesi</i>							
Sub-total	4	0	0	0	4	4	0.21
<i>Apistobuthus pterygocercus</i>							
Sub-total	1	0	0	0	1	5	0.26
Total	1265	446	176	34	1921	1921	100
(%)	65.85	23.22	9.16	1.77	100		





Fig. 6: Continued

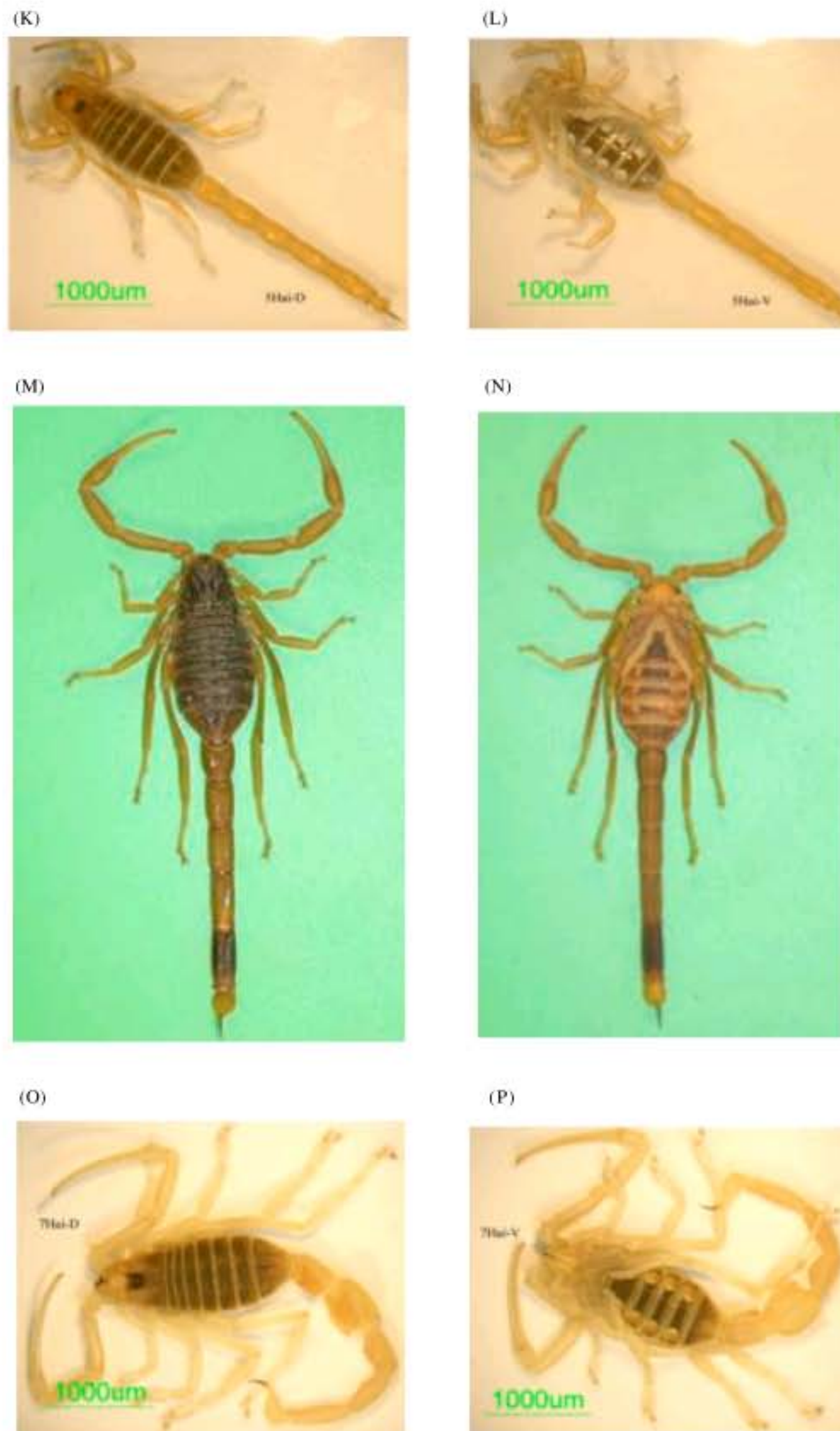


Fig. 6: (A-P) The collected scorpion species of Hail region (A, B) Dorsal and Ventral view of *Androctonus crassicauda*, (C, D) Dorsal and Ventral view of *Androctonus biocolor*, (E, F) Dorsal and Ventral view of *Scorpio maurus kruglovi*, (G, H) Dorsal and Ventral view of *Orthochirus innesi*, (I, J) Dorsal and Ventral view of *Composobuthus werner*, (K, L) Dorsal and Ventral view of *Butthacus leptochelys*, (L, M) Dorsal and Ventral view of *Leiurus quinquestriatus* and (O, P) Dorsal and Ventral view of *Apistobuthus pterygocercus*

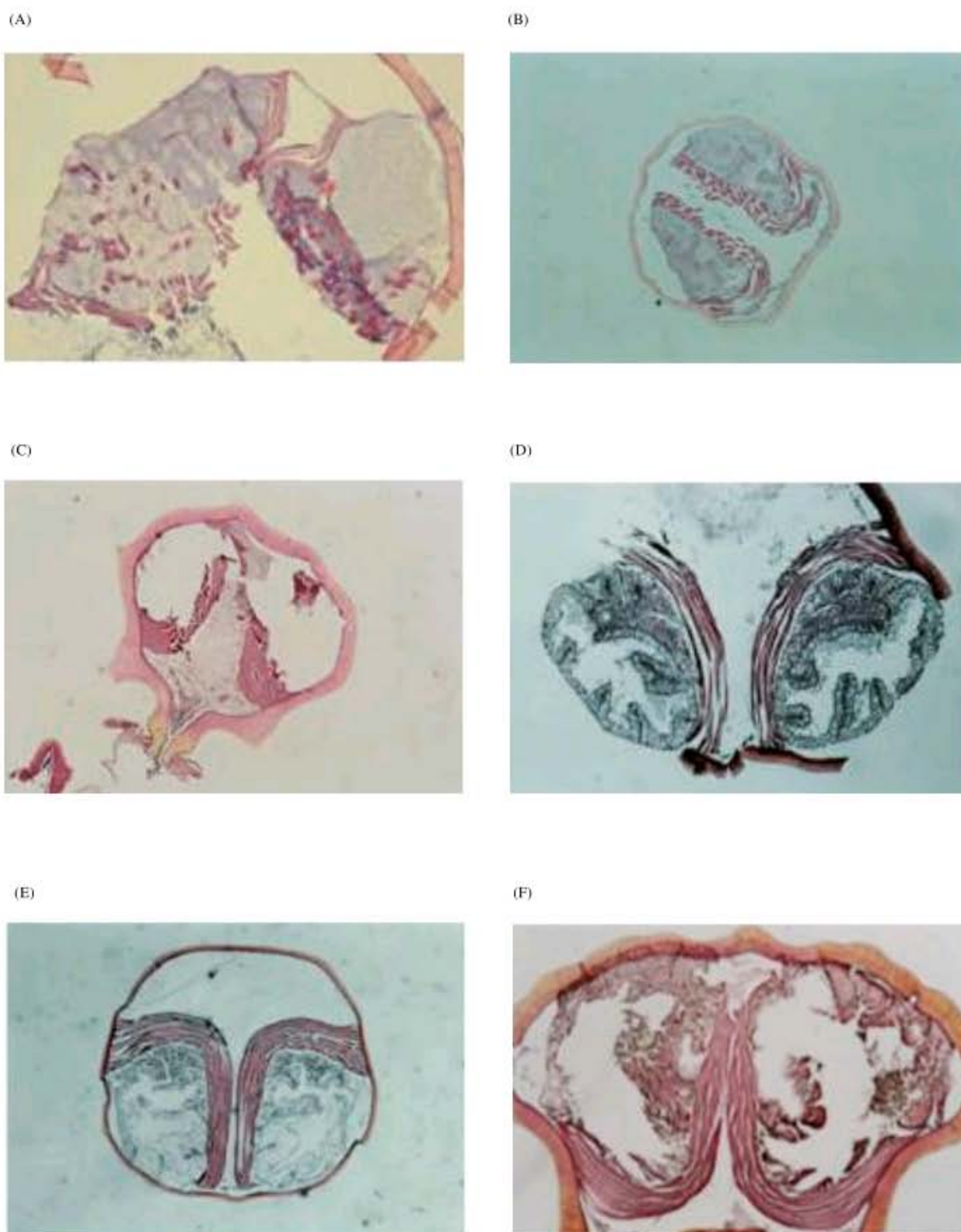


Fig. 7: (A-F) Scorpion telsa (venom glands) that were collected from Hail region

Table 6: Colour and mean body length of scorpions of Hail Region collected during the period 14/05/2006-01/08/2007

Scorpion Sc. name	Colour	Mean body length (cm)
<i>Androctonus crassicauda</i>	Black	8.5
<i>Androctonus bicolor</i>	Black	8.3
<i>Scorpio maurus kruglovi</i>	Yellow	4.2
<i>Leiurus quinquestriatus</i>	Yellow	9.4
<i>Buthacus leptochelys</i>	Yellow	4.9
<i>Compsobuthus weneri</i>	Yellow	3.3
<i>Orthochirus innesi</i>	Black	2.8
<i>Apistobuthus pterygocercus</i>	Yellow	7.7

Table 7: Classification of the scorpions collected from Hail region

<b>Family (1)</b>	<b>:Buthidae</b>		
Genus (1)	: <i>Leiurus</i>	Species	: <i>quinquestriatus</i>
Genus (2)	: <i>Androctonus</i>	Species	: <i>crassicauda</i>
Genus (3)	: <i>Androctonus</i>	Species	: <i>bicolor</i>
Genus (4)	: <i>Apistobuthus</i>	Species	: <i>pterygocercus</i>
Genus (5)	: <i>Buthacus</i>	Species	: <i>leptochelys</i>
Genus (6)	: <i>Compsobuthus</i>	Species	: <i>weneri</i>
Genus (7)	: <i>Orthochirus</i>	Species	: <i>innesi</i>
<b>Family (2)</b>	<b>:Scorpionidae</b>		
Genus (1)	: <i>Scorpio</i>	Species	: <i>maurus</i>
		Subspecies	: <i>kruglovi</i>

## DISCUSSION

The identification of Saudi Arabian scorpions was mainly based on the keys described by Vachon (1953, 1979), which were extremely useful; however, those keys lacked complete surveys of all parts of the Arabian Peninsula. The booklets written by Al-Sadoon and Al-Farraj (2008) and Al-Hajjaj (2005) on the same subject could be useful supplement as pocket field guides.

The present survey reflected a clear-cut diversity in scorpion populations of Al-Baha and Hail Regions. This is evident from the difference between six species and subspecies in Al-Baha Region and eight species and subspecies in Hail Region. The large number of specimens collected from both regions, Hail in the North (nearly two thousand specimens) and Al-Baha in the South (nearly two thousand and a half), suggest the astounding degree of infestation of scorpions in these areas of Saudi Arabia. In Al-Baha Region, Death Stalker, the lethal killer (Beaver, 1981; Keegan, 1980; Rein and West, 2007), *Leiurus quinquestriatus* (Family Buthidae), recorded of less, but nearly 44% of the total count. The other species that exceeded this count, with a record of 53% was *Scorpio maurus fuscus* (Family Scorpionidae), which is medically unimportant. Three species, which were found in this region are generally considered very scarce (less than 1%)

include, *Compsobuthus weneri*, *Orthochirus innesi* and *Vachoniolus (Buthacus) minipectinibus* (Family Buthidae).

In Hail Region, more than three quarters of the collected specimens were *Scorpio maurus kruglovi*, which were harmless, similar to the subspecies found in Al-Baha Region. The next in record was the highly venomous *Androctonus crassicauda* and *Androctonus bicolor*. The later one was recorded for the first time in this region, without previous records in Saudi Arabia. A very limited number of *Leiurus quinquestriatus* (less than 1%) was also identified in this region. Vachon (1979) and Al-Hajjaj (2005) reported similar observations earlier. Four other species, which were found in this region, which are considered scarce (less than 2%), include *Compsobuthus weneri*, *Orthochirus innesi*, *Vachoniolus (Buthacus) minipectinibus* and *Apistobuthus pterygocercus* (family Buthidae). The venom of these species has been described by Fet and Lowe (2000), Karatas (2003), Karatas and Colak (2005), Kovařík (2005), Koch (1977), Lamoral (1976, 1979, 1980), Levy and Amitai (1980), Teruel and Tietz (2008) and Probst (1972).

Usually stung patients describe the culprit scorpion according to their colours, often yellow or black, a situation that leads to confusion of its identity and medical importance. The co-existence of two families, one medically important (Buthidae) and other unimportant (Scorpionidae) is exemplified by three species in the two regions. Two buthid scorpions *Androctonus crassicauda* and *Leiurus quinquestriatus*, which are highly venomous (Dittrich *et al.*, 1995; Karatas and Colak, 2005; Sissom, 1990), are endemic in Hail and Al-Baha Regions, respectively, in addition to the newly recorded species (*Androctonus bicolor*). It is of interest to note that this species is more abundant than *Androctonus crassicauda*. In association with them in both regions, is the predominant species, *Scorpio maurus* (subspecies *kruglovi* in the North and *fuscus* in the South). *Scorpio maurus* and *Leiurus quinquestriatus* are both yellow in colour at Al-Baha Region, non-differentiable to the common person.

In Hail Region, the buthid species *Androctonus crassicauda* is black in colour, which is quite differentiable from the *Scorpio* genus members however; it can be mistaken with a quite similar black but small-sized species *Orthochirus innesi*. Moreover, scorpionids themselves could be confused with the scarcely encountered *Leiurus quinquestriatus*. Similarly in Al-Baha Region the presence of the black *Orthochirus innesi* can be mistaken for a larger black *Nebo hierichonticus* that belonged to the family Diplocentridae (Scorpionidae, as reported recently).

Though *Nebo hierichonticus* is considered weakly venomous (medically unimportant), contrary to that, it can lead to intracranial haemorrhages and death (Annobil, 1993; Annobil *et al.*, 1991; ITG Library, 2008).

The scorpion's sting is a curved organ at the end of its tail. The glands at the base give out venom that flows from two pores. The sharp and pointed sting is used for injecting venom. Pavlovsky (1912) had extensively studied the venom glands. They are paired oval sacs that lie inside the telson with separate ducts that lead to the aculeus. The two glands are viewed by transverse sections at the middle of the telson vesicles. The glands are either simple or folded. The morphology of the venom gland presents highly constant generic characteristic which could be used to classify the scorpion family.

Thus, the present survey confirmed the presence of the three highly venomous species (*Androctonus crassicauda*, *Androctonus bicolor* and *Leiurus quinquestriatus*) in Hail Region, though the latter is thinly populated, whereas mildly venomous scorpionids (*Scorpio maurus kruglovi*) are highly populated. The highly venomous *Leiurus quinquestriatus* which poses a great threat to inhabitants of Al-Baha Region is outnumbered by *Scorpio maurus fuscus* in this region. The higher population of *Nebo hierichonticus* in Al-Baha Region is quite threatening, as the detailed study on its venom is warranted.

Results of the application of modern molecular phylogenetic techniques are described by our team (unpublished data), confirming and reconfirming the identity of scorpions of this part of the Middle East and compared with earlier studies (Fet and Braunwalder, 2000; Fet *et al.*, 2003, 2005; Gantenbein *et al.*, 1999).

It is concluded that the extensive field collects and taxonomic identification confirmed the existence of eight species in Hail and six species in Al-Baha Regions. Further collections and studies will report the common endemic species for the two regions and the possible occurrence of new species.

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