

Epidemiology Scorpion envenomation in Iran

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In the name of God

- Scorpion stings are a major public health problem in many underdeveloped tropical countries, especially Africa, South India, the Middle East, Mexico, and South Latin America.
- The estimated annual number of scorpion stings is 1.2 million.
- An estimated 5000 deaths occur annually from scorpion stings worldwide

ENTOMOLOGY

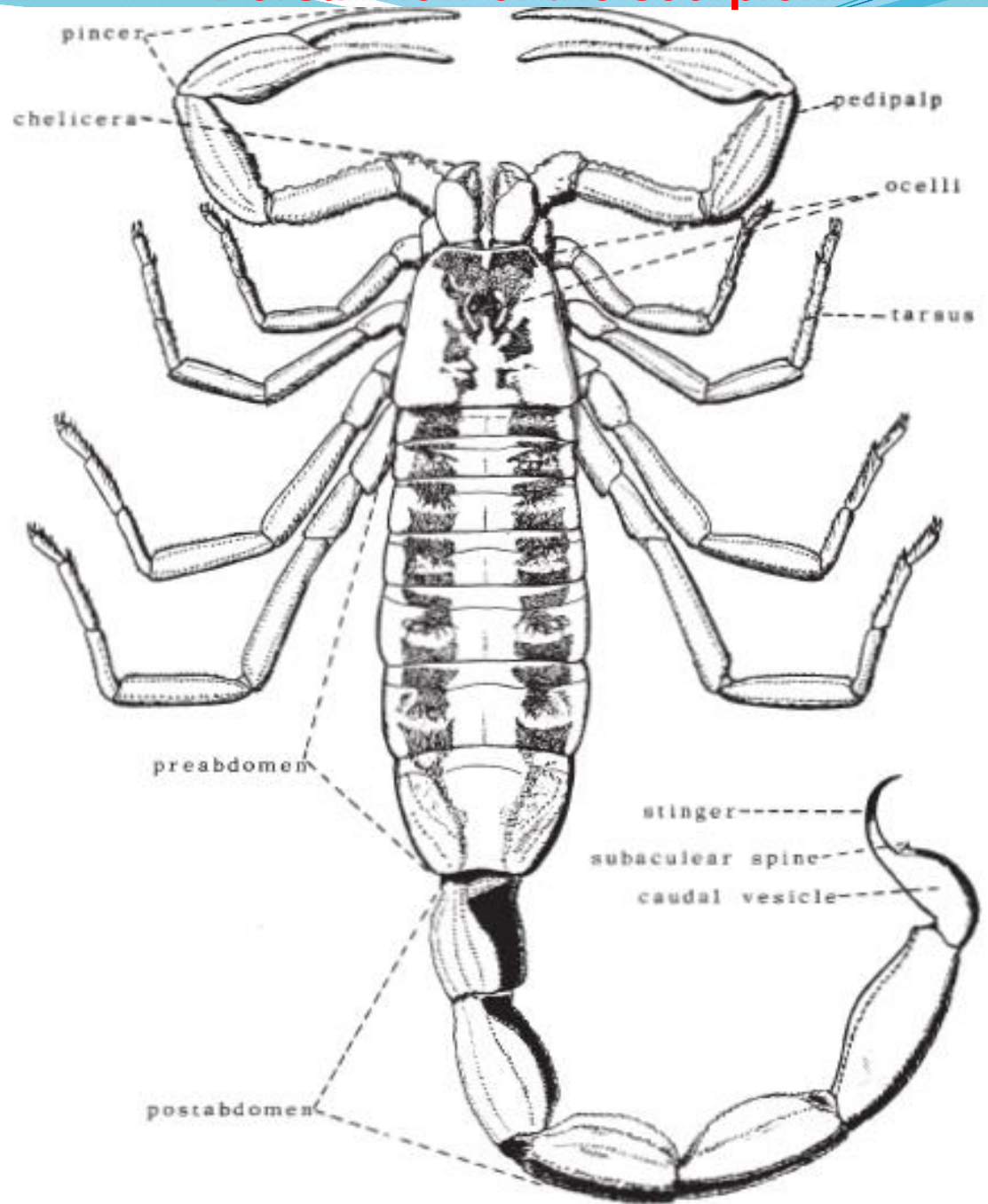
- Scorpions, which are grouped in the phylum Arthropoda .
- scorpion has a flattened elongated body and can easily hide in cracks.
- scorpion has a segmented tail that has a poisonous spike at the end.

Size of scorpions

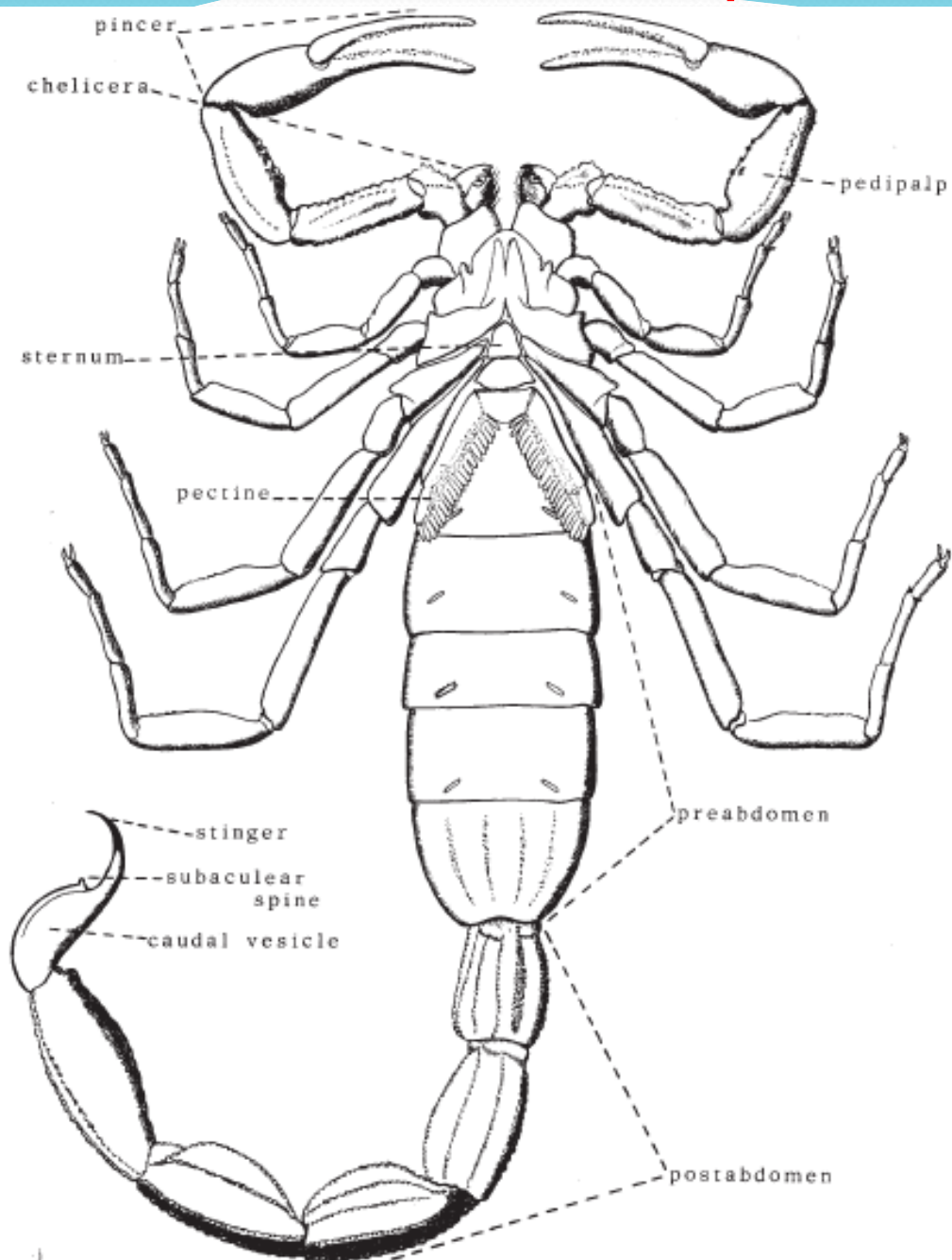
- Scorpions vary in size from 1-20 cm in length
- The largest forms are the African genus *Pandinus* which reaches 18 cm, and *Hadogenes troglodytes* which measures 21 cm long and weights 32 grams.
- Some **Carboniferous** scorpions are known to have attained lengths of 44 to 86 cm or even a meter, although most of these would have been aquatic or semi-aquatic forms

Scorpions, have a lobster-like body shape with seven sets of paired appendages: the chelicerae, the pedipalps (claws), four sets of legs.

Dorsal view of the scorpion





Ventral view of the scorpion



on the ventral surface the pectines (a pair of comb-like structures

The segmented tail curves upward dorsally, ending in a terminal bulbous segment called the telson, which contains paired venom glands and the stinger.

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- Out of 2000 scorpion species, 50 are dangerous to humans. At least 30 species can inflict potentially fatal stings .
 - Scorpion stings cause a wide range of conditions, from severe local skin reactions to neurologic, respiratory, and cardiovascular collapse.
 - Envenomation from most scorpions results in a simple, painful, local reaction that can be treated with analgesics, antihistamines, and symptomatic/supportive care.

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- Envenomation occurs through stinging, not biting.
 - Scorpions catch prey in their pedipalps (hand) and thrust the tail overhead to sting.
 - Scorpions can sting multiple times, although the first sting depletes or nearly depletes the telson of venom.

- A characteristic physical property of scorpions is that they fluoresce when illuminated by ultraviolet light, as from a black light or a medical Wood's lamp
- This property is used in collecting scorpions for breeding or venom harvesting and in providing pest control.
- The fluorescent pigment in scorpion cuticle is most likely riboflavin




- **Distribution Geography**

- Scorpions are found on all continents except Antarctica. Scorpions characteristically live in desert areas, semiarid grasslands, and the tropics.
- Estimates vary regarding the number of scorpion species. Researchers report about 2000 scorpion species divided into 13 families
- Buthidae is the largest and the most dangerous family and, with few exceptions, envenomations, through their neurotoxic venoms

- The lethal members of the Buthidae family include the genera of *Buthus*, *Parabuthus*, *Mesobuthus*, *Tityus*, *Leiurus*, *Androctonus*, and *Centruroides*.
- These lethal scorpions are found generally in the given distribution:
- *Buthus* - Mediterranean area, from Spain to the Middle East
- *Parabuthus* - Western and Southern Africa
- *Mesobuthus* – Throughout Asia
- *Parabuthus* - Western and southern Africa
- *Hottentotta* - Across southern Africa to southeast Asia
- *Tityus* - Central America, South America, and the Caribbean
- *Leiurus* - Northern Africa and the Middle East
- *Androctonus* - Northern Africa to Southeast Asia
- *Centruroides* - Southern United States, Mexico, Central America,

- The lethal member of the Hemiscorpiidae family include the species of *Hemiscorpius lepturus*.
- This lethal scorpion is found generally in the Southwest Asia
- Iran ,Iraq and yeman

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- In general, scorpions are not aggressive. They do not hunt for prey; they wait for it.
 - Scorpions are nocturnal creatures; they hunt during the night and hide in crevices and burrows during the day to avoid the light.
 - Thus, accidental human stinging occurs when scorpions are touched while in their hiding places, with most of the stings occurring on the hands and feet.

● Pathophysiology

- Scorpions use their pincers to grasp their prey; then, they arch their tail over their body to drive their stinger into the prey to inject their venom, sometimes more than once.
- The scorpion can voluntarily regulate how much venom to inject with each sting.
- The striated muscles in the stinger allow regulation of the amount of venom ejected, which is usually 0.1-0.6 mg. If the entire supply of venom is used, several days must elapse before the supply is replenished.

- About 50 native species are reported in Iran .
- Among them two members of *Androctonus crassicauda*, *Hemiscorpius lepturus* are usually cited as the most dangerous.
- Most fatal cases occur in the spring and summer months from April through September.
- In Iran , scorpion sting outnumber snake bite about 7.5 to one.
- In Iran , scorpion deaths outnumber snakebite deaths about three to one.

LD₅₀ of some scorpions of Medical Importance in Iran

Species	LD ₅₀ *	Method**	Family
Androctonus crassicauda	0.08-0.50	sc/iv	Buthidae
Odontobuthus doriae	0.19	iv	Buthidae
Hottentotta(Buthotus) saulcyi	1.01	iv	Buthidae
Mesobuthus eupeus	1.45	iv	Buthidae
Hemiscorpius lepturus	5.81	iv	Hemiscorpiidae
Buthotus schach	--	---	Buthidae

- The dose is expressed in mg of venom per kg of mouse
- Method: iv = intravenous injection; ip = intraperitoneal injection; sc = subcutaneous injection

- The number of sting agents reached on 10 species in Iran, Almost all of these scorpions, except the *Hemiscorpius lepturus* species, belong to the scorpion family called the Buthidae.
- These scorpions including:



- ***Hemiscorpius lepturus*** , known as Gadim scorpion(locality name) , whole of the its body is yellow. Only median and laterals eyes proximal of pedipalps are black, pedipalps are very wided and measures in male 5 and female 7.5-8 cm. this scorpion in west and south west and south of Iran .A dangerous species that is special in that its venom is hemolytic and can cause severe external and internal ulcers. This scorpion has Sexual Dimorphism

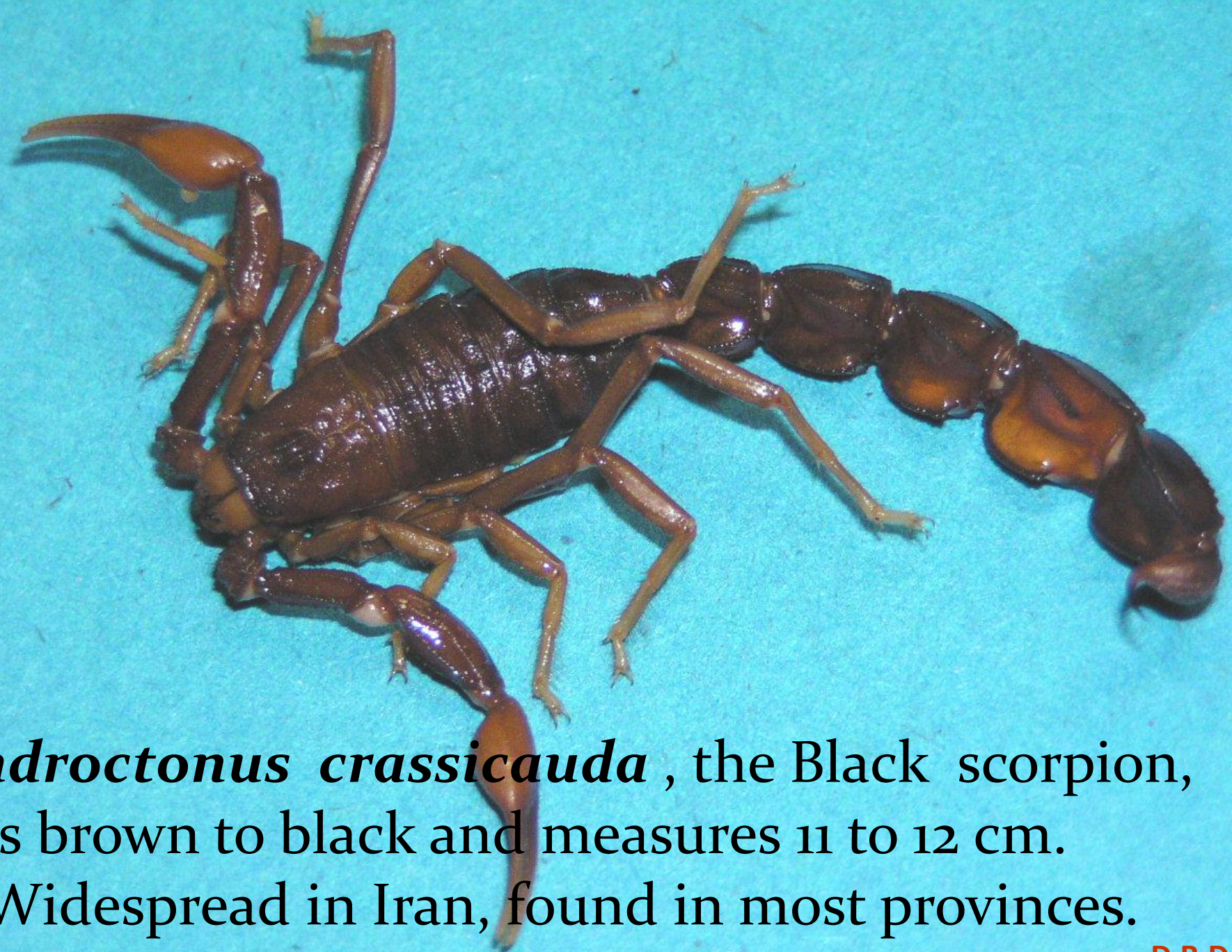
Sexual Dimorphism in *Hemiscorpius lepturus*

Male



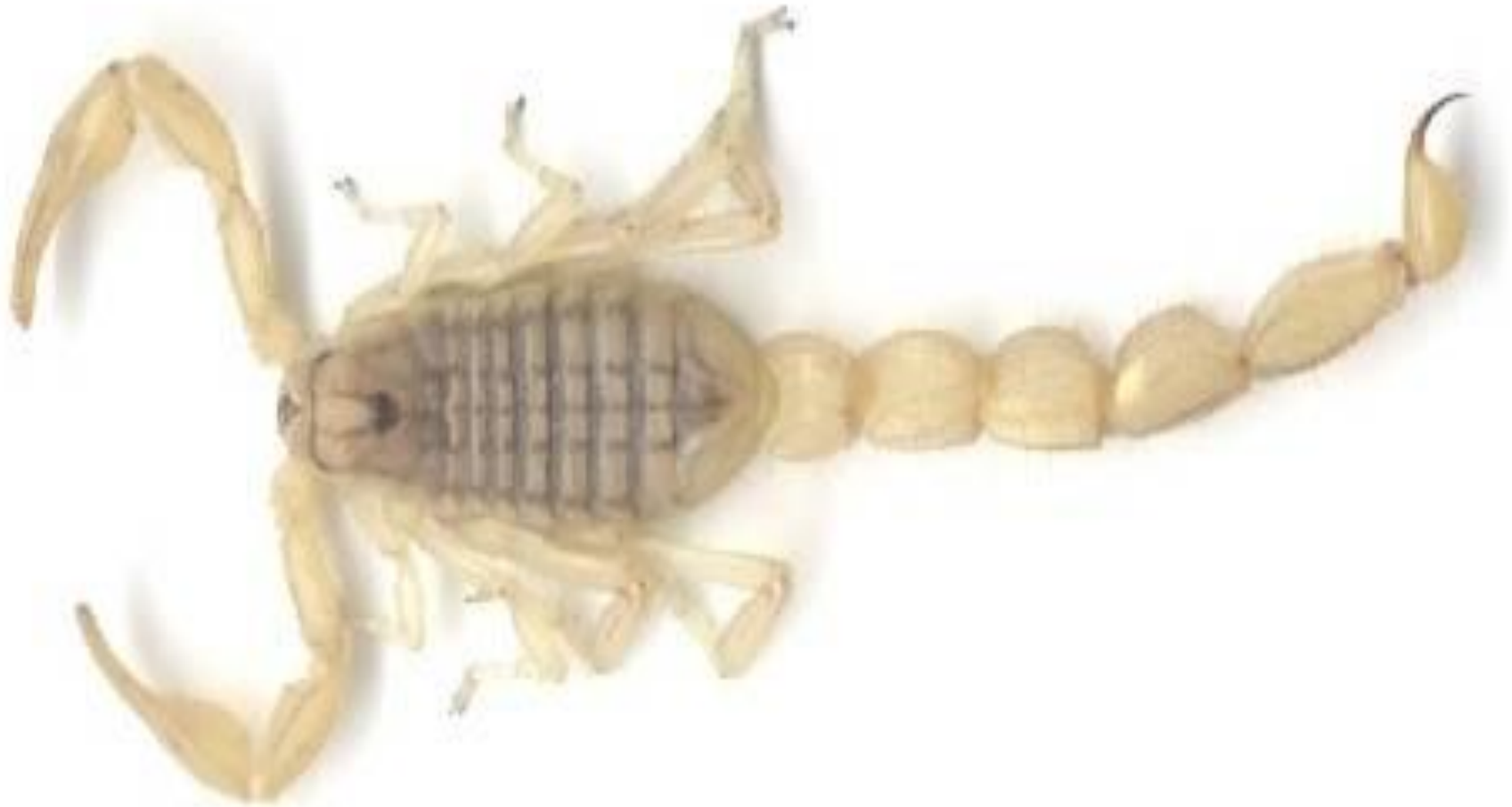
Female





Androctonus crassicauda , the Black scorpion, is brown to black and measures 11 to 12 cm. Widespread in Iran, found in most provinces.

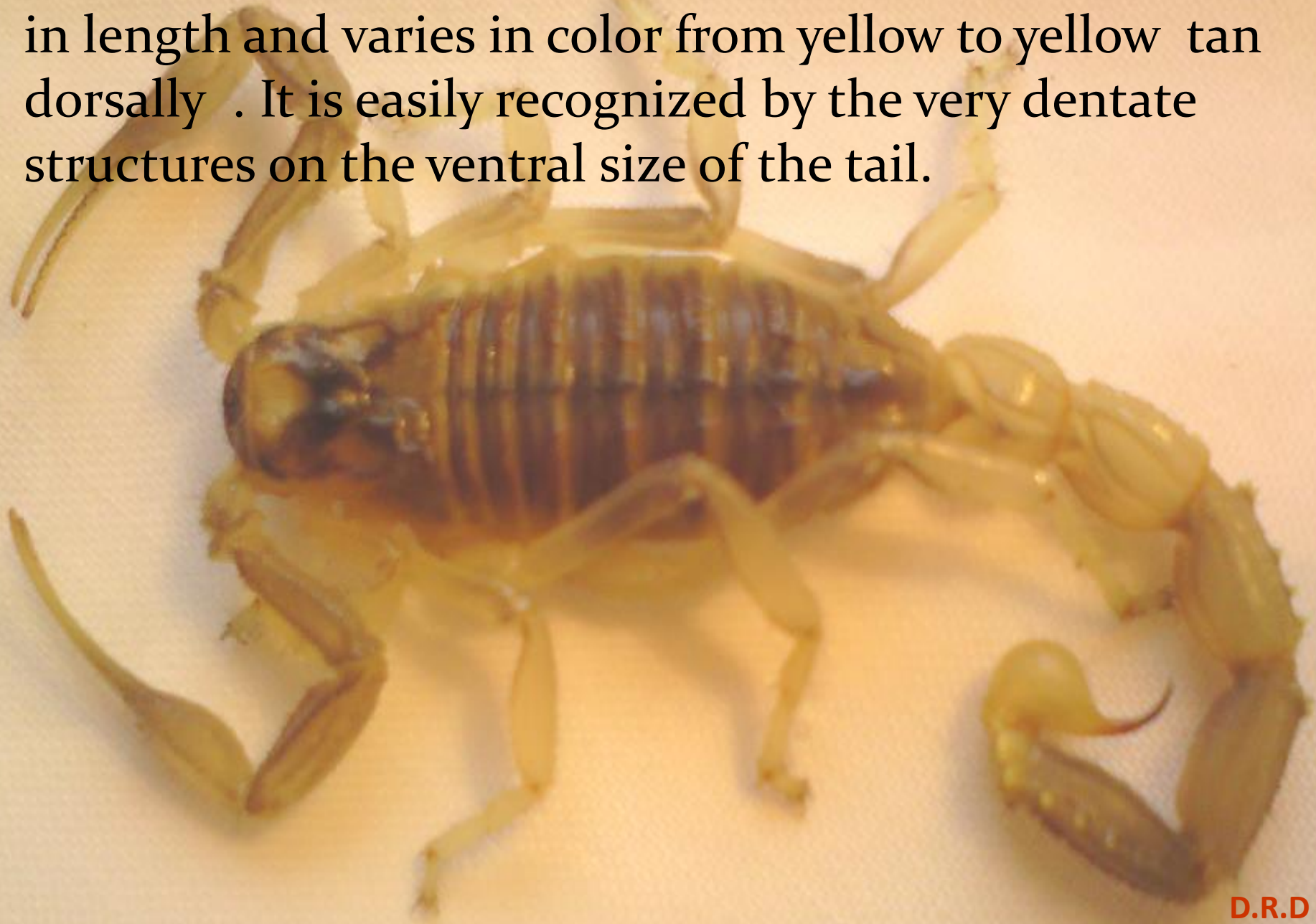
- *Mesobuthus eupeus*, also known as the marked yellow scorpion, is yellow to orange with dark longitudinal spotted on the abdomen and measures 5 to 6 cm. this is considered as one of the most common species in the entire Iran .



Compsobuthus matthiesseni, Base color light yellow
, immaculate except for black pigment surrounding
median and lateral eyes and also half of IV and V
metasomal segments. Body size is 40-50 mm.

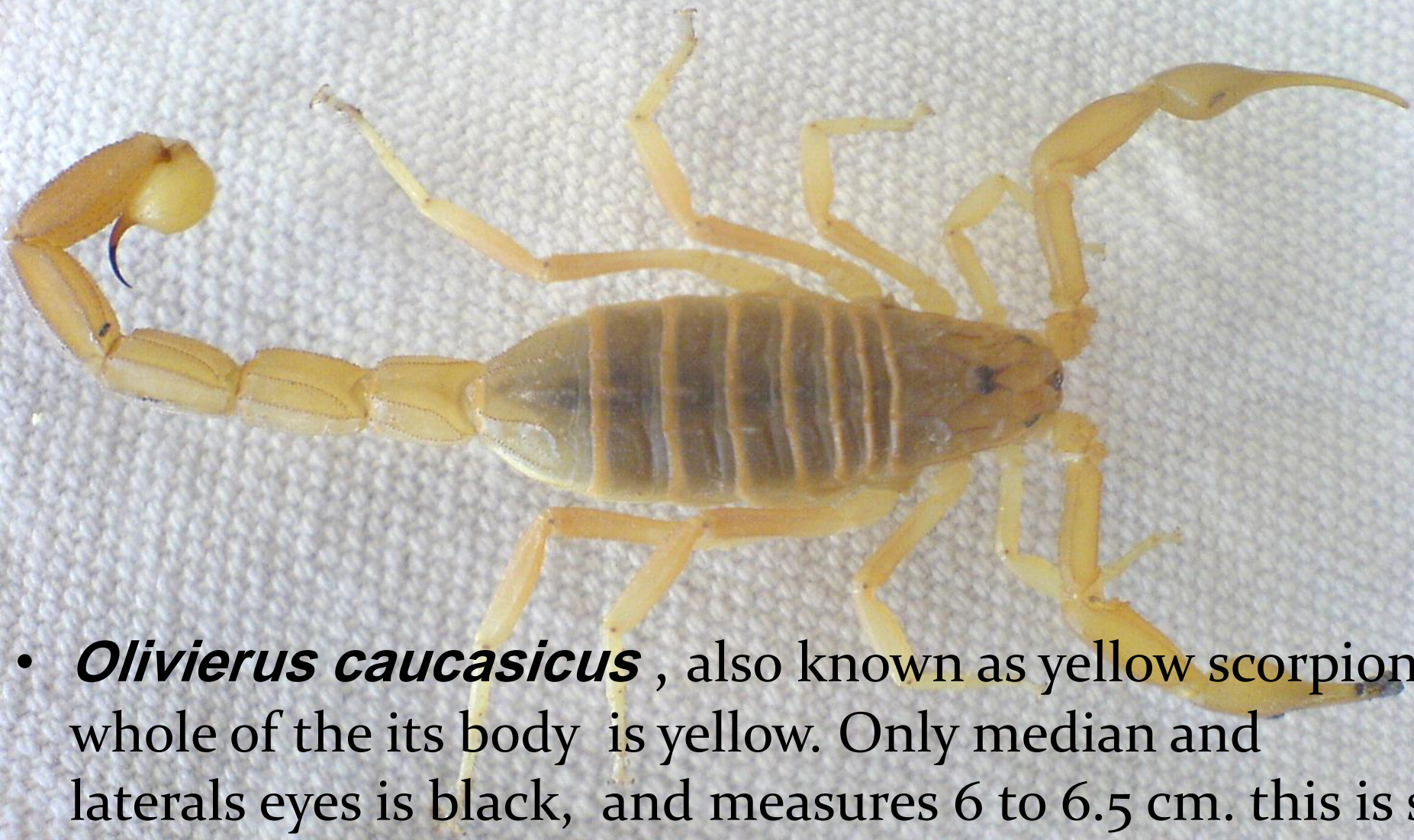


Odontobuthus doriae , measures 7-8.5 mm cm long in length and varies in color from yellow to yellow tan dorsally . It is easily recognized by the very dentate structures on the ventral side of the tail.



- ***Hottentotta saulcyi*** ,also known as black tail scorpion, measures 12-13 cm long in length , color is yellow except chelicers , median and laterals eyes, also V metasomal and telson is black . *It* is found in the from Kermanshah, Fars, Hamadan, Hormozgan, Ilam, , Lorestan Provinces and kerman ,Bushehr and Khuzestan Provinces.





- ***Olivierus caucasicus*** , also known as yellow scorpion, whole of the its body is yellow. Only median and laterals eyes is black, and measures 6 to 6.5 cm. this is s one of the yellow species in the central Iran .

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Hottentotta schach also known as hairy black scorpion, whole of the its body is hairy .Reaching sizes up to 130 mm it is the largest Iranian scorpion species. found in Khuzestan and Fars Province to the south.





Orthochirus scrobiculosus , measures 2.5 -4 cm long in length and varies in color from black to blackish olive dorsally , brown to light brown ventrally . It can easily be recognized by several small depressions on the tail *Orthochirus scrobiculosus* is found in the southwestern, south and central of Iran

- *Apistobuthus pterygocercus*, measures 7-8 cm long in length. The adult of this species is uniformly yellow. It is a very distinctive scorpion which does not look like any other. Indeed, it has extremely long and fine chelae ; the second segment of the metasoma is widened, and being disc-shaped. Typically found Saudi Arabia, Qatar, United Arab Emirates, Kuwait, Oman, Yemen and Iran only in Khuzestan province .

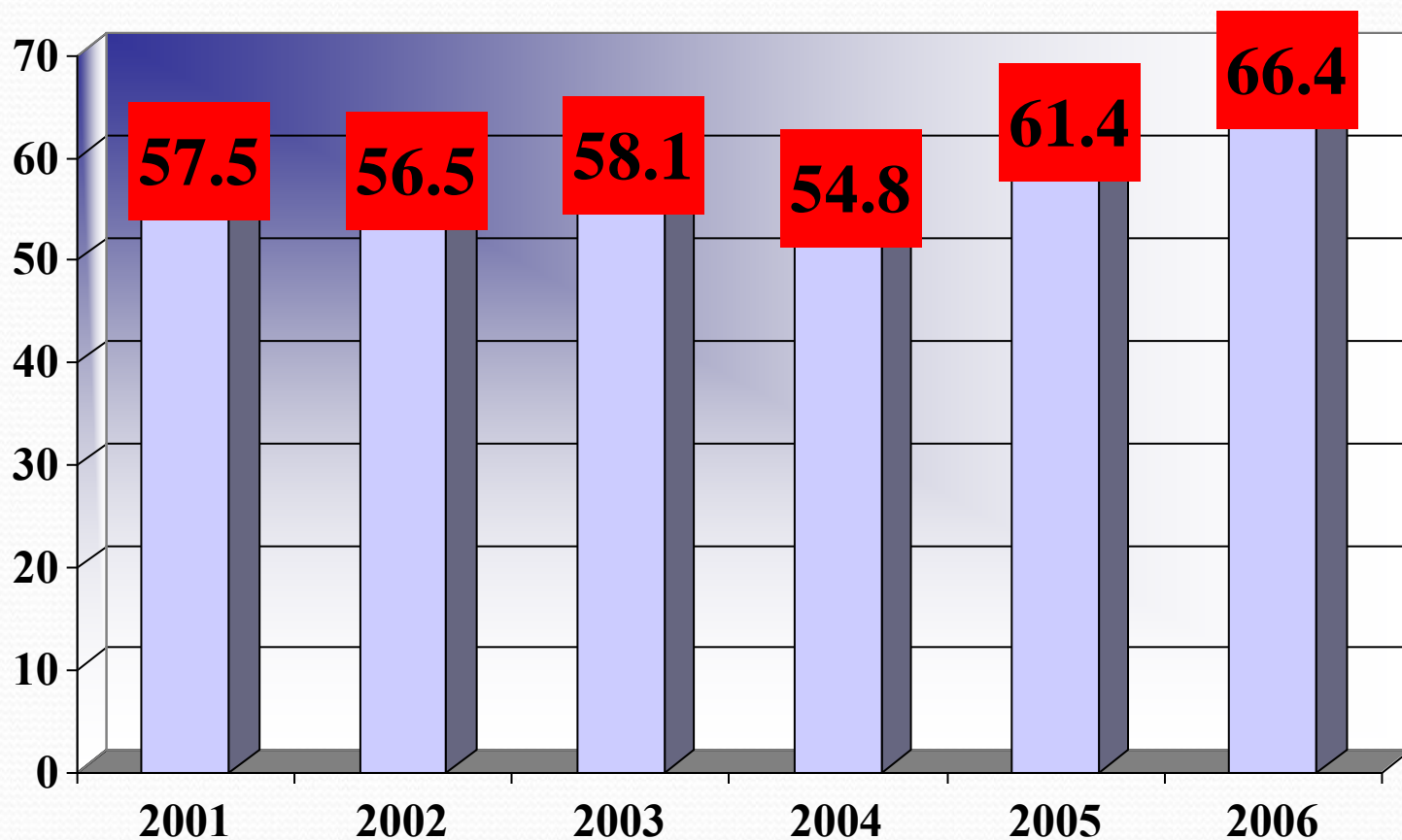


- In Iran, highest prevalence of scorpion sting and its
- resulting death has been reported from Khuzestan province
- The highest rates of annual
- incidence of scorpion sting per hundred thousand populations
- are 1563 in Khuzestan, 1290 in Kohkiloye Boyerahmad
- and 8260 in Ilam. About 60% of all sting reports originate from Khuzestan

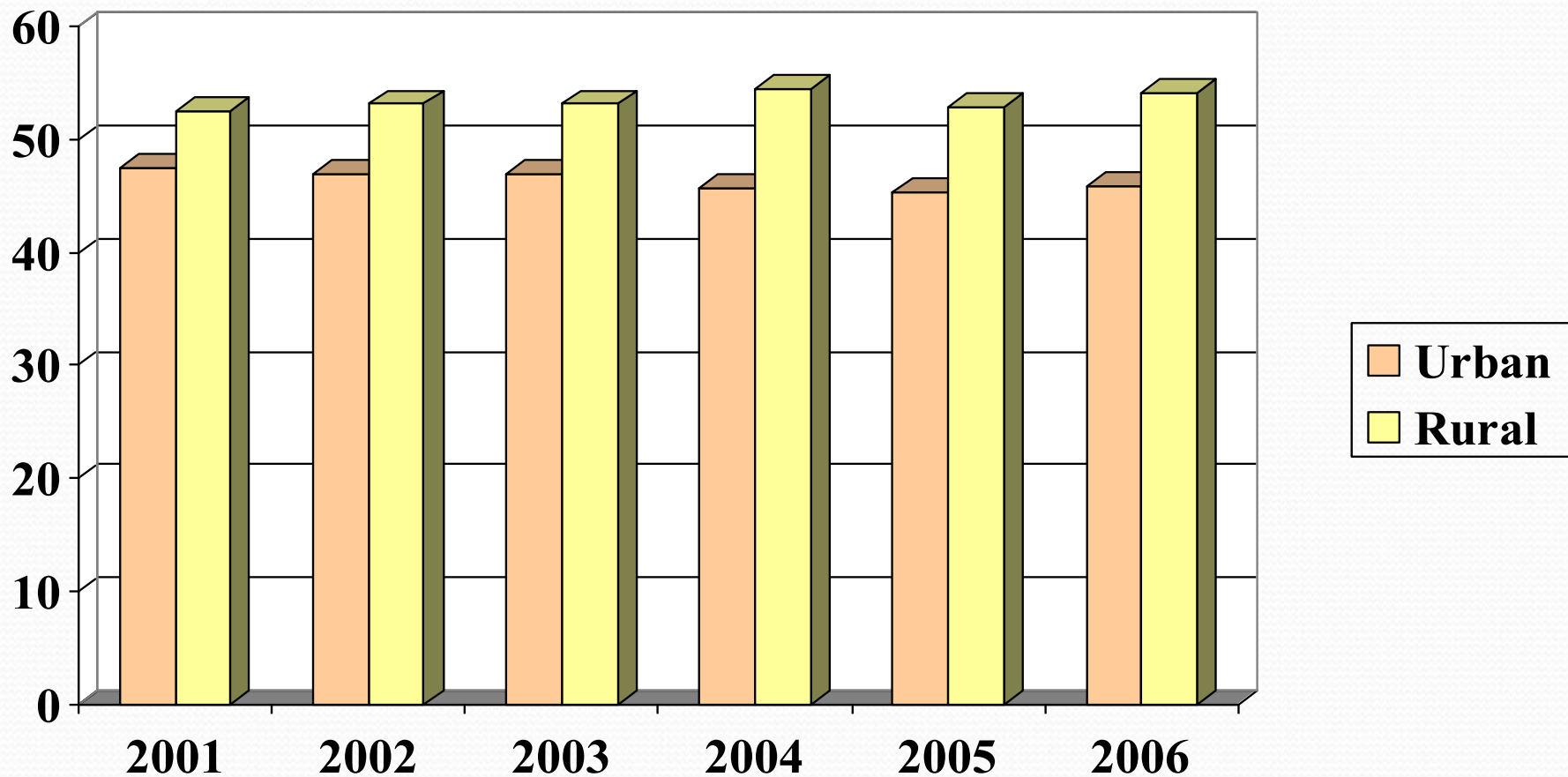
Scorpion sting and mortality during 2001-2006 in Iran

year	2001	2002	2003	2004	2005	2006
Cases of scorpion sting	37666	37535	38259	36806	42085	45950
incidence in 100000 persons	57.5	56.5	58.1	54.8	61.4	66.4
Cases of mortality	24	14	23	29	14	18

Scorpion sting incidence in 100000 persons during 2001-2006 in Iran



Scorpion sting incidence in 100000 persons in rural and urban areas during 2001-2006 in Iran



Scorpion sting incidence in during 2001-2006 in Iran based on province (Ranking from higher to lower grade)

- 1-Khuzestan(the frist)
- 2- Kohkiloye Boyerahmad
- 3- Ilam
- 4-Hormozgan
- 5-Busher
- 6-Sistan and Baluchestan
- 7-Fars
- 8-South Khorasan
- 9-Kermanshah
- 10-Kerman
- 11-Isfahan
- 12-Charmahal e, Bakhtiyari
- 13-West Azerbaijan
- 14-Lorestan
- 15-Zanjan
- 16-Ghazvin
- 17-Semnan
- 18-Kurdestan
- 19-Yazd
- 20-Markazi
- 21-East Azerbaijan
- 22-Median Khorasan
- 23-North Khorasan
- 24-Golestan
- 25-Ardebil
- 26-Tehran
- 27-Hamadan
- 28-Gilan
- 29-Qum
- 30-Mazanderan(the last)



Frequency distribution of scorpion sting in Khuzestan and other provinces within 2001 to 2005

province year	Only Khuzestan (%)	Other provinces (%)	Total In Iran (%)
2001	23984 (63.7)	13682 (36.3)	37666 (100)
2002	22847 (60.9)	14688 (39.1)	37535 (100)
2003	23076 (60.3)	15183 (39.7)	38259 (100)
2004	20434 (55.5)	16372 (44.5)	36806 (100)
2005	24876 (59.9)	17209 (40.1)	42085 (100)

Scorpion sting incidence in 100000 persons in rural and urban areas in Khuzestan province during 1998-2003

Incidence year	Rural	urban
1998	922	617
1999	952	625
2000	961	921
2001	865	499
2002	796	464
2003	784	463

frequency scorpion sting agents according to species and family in Khuzestan province

Family	Species	Number	%
Buthidae	<i>Androctonus crassicauda</i>	120	28.7
Hemiscorpidae	<i>Hemiscorpius lepturus</i>	104	24.9
Buthidae	<i>Mesobuthus eupeus</i>	91	21.7
Buthidae	<i>Compsobuthus matthiesseni</i>	86	20.6
Buthidae	<i>Buthotus saulcyi</i>	14	3.35
Buthidae	<i>Orthochirus scrobiculosus</i>	2	0.5
Buthidae	<i>Buthotus schach</i>	1	0.25
		418	100





Thank you