

## SURVEY AND IDENTIFICATION OF CENTIPEDES (ARTHROPODA-CHILOPODA) FROM BASRAH PROVINCE -SOUTHERN OF IRAQ

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### Abstract

The current study aimed to shed the light on the species of Chilopoda present in the different areas of Basrah governorate, therefore samples were collected randomly from eight stations representing the main locations of the governorate (which are Al-Hartha, Shatt Al-Arab, Al-Zubayr, Abu Al-Khasib, Al-Qurna, Al-Madina, Al-Siba and Al-Faw). The samples were collected for the period from December 2021 to the end of June 2022. During the study period, 105 samples were collected, identified into five species (belonging to four orders and five families): *Scolopendra mirabilis*, family Scolopendridae, order Scolopendromorpha; *Cryptops anomalans*, family Cryptopidae, order Scolopendromorpha; *Mecistocephalus envasi*, family Mecistocephalidae, order Geophilomorpha; *Lithobius microps*, family Lithobiidae, order Lithobiomorpha; and *Scutigera coleoptrata*, family Scutigeroidea, order Scutigeroidea. As well as the taxonomic characteristics of each of the recorded species were presented.

**Keywords:** Iraq, Chilopoda, Scolopendromorpha, Geophilomorpha, Lithobiomorpha, Scutigeroidea

### Introduction

The subphylum Myriapoda of the phylum Arthropoda is divided into four classes, Paucipoda, Symphyla, Chilopoda, and Diplopoda, and includes approximately 15,000 species belonging to 160 families that are currently known in the world. (Chapman, 2005).

The class Chilopoda (Centipeds) includes terrestrial, wingless predators and has relatively long bodies composed of many segments, the head has different shapes in different species, it may be rectangular or flat and round to oval in some species, and in species belonging to the order Scutigeroidea, it is convex Cubic-shaped and the segments in the head merging with each other and from the dorsal side and covered with a cephalic capsule called the cephalic plate (Arthur, 2002). The head bears a pair of long antennae consisting of several segments, a pair of Mandibles, a pair of auxiliary jaws Maxillae and a pair of Ocelli eyes. The Species belonging to the order Scutigeroidea have a pair of compound eyes located near the base of the antennae (Arthur, 2002; Arthur and Chapman, 2005).

According to Minelli and Golovatch (2001) and Edgecombe and Girifet (2007), Chilopoda divided into two subclasses: **Epimorpha**, its species are characterized by having after hatching the total number of body segments as in adults and 21 or more pairs of walking legs, and the females incubate when laying eggs, this subclass includes **two orders**: Geophilolorpha and Scolopendromorpha. The second subclass is **Anamorpha**, its members are distinguished by not having the full number of segments when they hatch, and at each moult their number of segments increases until adult stage, when it has 15 pairs. These species have a flat body. And this subclass includes three orders: Scutigermorpha, Crateroemstigmomorpha, and Lithobiomorpha.

There are few studies on this field in Iraq: Ahmed and Hussein (2016) in Erbil governorate / northern Iraq. These study dealt with recording and description with taxonomic keys for three species belonging to the genus Scolopendra. Al-Qusair (2019) record many species of Chilopoda from many sites in the middle of Iraq, while Yacoub (2022) identifying four species belonging to Class Chilopoda from southern Iraq. Around the world, many important studies were conducted, Dyachkov (2020) published a list of 22 Chilopoda species belonging to 14 Genus, 8 Families and 4 orders. Sureshan *et al.*, (2004) submit a key and list including 15 species collected from Kerala state in India, belonging to 8 genus, and all species were belong to Scolopendromorpha.

### **Aim of the study**

The present study aimed to conducting a survey and identifying the Chilopoda species from Basrah Governorate, and Providing a morphological description of the recorded species, in addition to designing a taxonomic key for the recorded species from the study areas.

### **Materials and Methods**

Four main stations in Basrah governorate were chosen to collect samples. These areas represented the main directions of Basrah governorate, which are the districts of Al-Haritha, Shatt Al-Arab, Abu Al-Khasib, Al-Zubayr. Other four temporary stations were visit, these were Al-Qurna, Al-Madina, Al-Siba and Al-Faw ( Map 1), and the coordinates of these locations were specified (Table 1).

Samples were collected from the areas of the current study for the period from December 2021 to the end of June 2022 manually, using forceps, or by a small field shovel for samples that are located in deep places inside cracks and tunnels in the soil. The method of pitfall trap with a diameter of 20 cm and a depth of 30 cm was also used to collect samples, as described by Hippargi *et al.* (2011), 15 traps were randomly distributed in each of the study sites.

Some samples were collected at different times of the night using a light lamp. It was also collected at different times of the day and in greater numbers from under the stones and from different depths in the soil, between the leaves and the bark of trees falling on the ground, also

from old houses and from animal barns under the surface layer of compost and decomposing plants, in addition to digging the soil with a shovel at different depths, as well as from under the surrounding breeding with palm roots and from the moist soil of the river shores near some natural plants, and from the moist soil in the desert areas under the natural vegetation (Risch *et al.*, 2005; Jilkoà and Frouz, 2014).

The samples were transferred by plastic bottles to the laboratory for the purpose of fixation and preservation in a way that facilitates the study and subsequent identification as described by Al-Abbad *et al.*(2019).

### Examination and Identification of samples

The samples and their parts were examined after dissection using a dissecting microscope, and the measurements were taken by digital vrenia, and it was based on the millimetre as the unit of measurement of lengths, according to the number of body segments, the number of appendages for each body segment, the total number of appendages and the number of pieces for each of the appendages (walking legs, antennae and excretory appendages). To identifying specimens, number of taxonomic keys and other specific papers were used (Ahmed and Hussien, 2016 ; Chipman *et al.*, 2013 ; Lewis, 2010 and Stoev, 2002).

The samples and its important parts were photographed using the digital camera of the same dissecting microscope. Sometimes the compound light microscope was used to study the small parts after loading them on glass slides.

### Results

Chilopoda samples were collected during the study period from December 2021 to the end of June 2022. Variations in the nature of the soil between the different study areas were recorded, ranging between dry and wet soils, and between desert and agricultural soils, in addition to the difference in the nature and diversity of vegetation cover. 105 samples belonging to the class Chilopoda (centipedes). Chilopoda samples were belonging to 4 orders, 5 families and 5 species, which are *Scolopendra mirabilis*, family Scolopendridae order Scolopendromorpha; *Cryptops anomalans*, family Cryptopidae, order Scolopendromorpha; *Mecistocephalus envasi*, family Mecistocephalidae, order Geophilomorpha; *Lithobious microps*, family Lithobiidae, order Lithobiomorpha, and *Scutigera coleoptrata*, family Scutigeroformae, order Scutigeroformae.

#### *Scolopendra mirabilis* (Porat, 1876)

The total length of the body is 90 mm, the color is light yellow from the dorsal side with a mid-line longitudinal of light black color, extends to the end of the body (Fig. 1). The head area is yellow on the part of trunk dorsal and is equipped with four eyes ocelli on each side behind the antennae (Fig. 2), at the part of trunk ventral, the cephalic plate overlaps the head. As for the frontal

area of the head, it has light transverse sutures, lateral sutures and posterior sutures. The antennae are bluish-yellow, consisting from 20 antennomeres. The teeth on the ventral side are many and black color (Fig. 3-a). The head is on the ventral side with sutures in the form of trees and the first legs are transformed into Forcipules (Fig 3-b). It's end is black and devoid of the spur. The femur in the last pair of legs contains black thorn-like scars. The coxopleural contains one spine and on its part there are four apical spines, and there are spines on the prefemora. From the ventral part of the last pair of legs their number ranges from 9-1 and are irregular and arranged randomly (Fig. 4). The number of tergite is 21 and each tergite contains a pair of legs, all of them contain an spur, except for the last pair (Fig. 5). the penultimate pair also do not contain a spur.

### ***Cryptops anomalans* Newport, 1844**

The body's total length is 18 mm, the color is light yellow with a dark middle line that starts from the fourth segment and is gradually less clear until it disappears in the tenth segment (Fig. 6). The head is light yellow in shape, oval in shape, without eyes and contains grooves from the part of trunk dorsal. The antennae contains fine hairs with a certain density in the first segment and the density gradually decreases towards the last segment of the antennae (Fig 7) The head does not have teeth while the jaws are minute yellow color (Fig 8) The body consists of 21 segments, each carrying a pair of legs, as the body contains 21 pairs from the legs, they all have fine and short spines (Fig. 9). Each leg consists of 5 segments. Ultimate right leg consists of 5 segments.

### **(Brolemann, 1922) *Mecistocephalus envasi***

The total length of the body is 49 mm, the color is light yellow and the color of the head is reddish-brown (Fig. 10). It has an elongated shape as its length is approximately twice its width and contains the dorsal cephalic plate (Fig. 11-a) and in its back side, there is the forcipular coxosternal plate (Fig. 11-b). The forcipules have black ends, and each claw has in its inner sides of tarsungulum resembling teeth and covered with a cephalic plate on the dorsal part (Fig. 12). Antennae are located on both sides of the head and are light yellow in color and consist of 14 antennomeres in each of them and contain fine hairs. The segments gradually decrease in length and the eyes are absent in this species. The coxosternal cephalic plate is slightly elongated. The trunk consists of 51 tergites and each tergites bears one pair of short, soft-bristled walking legs. The of each claw of the legs has saw tooth. The ultimate right leg is consists of 5 segments. The tergites plates contain Y-shaped sutures that are clearly visible on the first segment up to about the middle of the trunk. The lateral coxopleuron of the last pair of legs is characterized by more than 15 randomly arranged small coxal pores (Fig. 13).

### ***Lithobius microps* Meinert, 1868**

The body's total length is 18 mm, the color is light brown or slightly yellowish. Cephalic plate is yellow on the dorsal part and flat in shape. The head is round to oval (Fig. 14) and contains a

pair of antennae consisting of 30 antennomeres containing a hairs (Fig. 15). Behind the antennae, there are 4 Ocelli eyes located on both sides of the head, the head contains teeth plates from the ventral part, while the trunk extends mid-line longitudinal in dark brown color. The trunk contains two patterns of dorsal plates, some long and the other is short- totally 15 segments. The short segments. alternate with the long ones (Fig. 16), each of which bears a pair of legs and all legs contain spines similar to a spur at each articulating region. The long segments. are represented by the segments. 1, 3, 5, 7, 8, 10, 12 and 14, and between them segments located the short. The last pair of legs are long (Fig. 17), the last pair transformed into Forcipules.

### **(Linen, 1758) *Scutigera coleoptrata***

The body's total length is 13 mm, the color is yellow (Fig. 18) and the head is round or cubic-shape and has a dark yellow color. antennae long as it exceeds the length of the body (Fig.19) The eyes are compound located on both sides of the head (Fig.20) with two light black lines. They are located on both sides of the body from the dorsal part and extend along The body (Fig.21) and trunk are made up of 7 segments, each containing a pair of legs, which means that the number of legs is 14 pairs, all of which contain few thorns (Fig. 22). As well as the cephalic segments, which contains one pair of legs mutated into spineless Forcipules, and the spiracle are located on the lateral part of each tergite (Fig. 23).

### **Discussion**

There is no previous taxonomic study of Chilopoda in Basrah Governorate was conducted, and the five species identified by the current study were all previously recorded from Iraq, and many other species were recorded by previous studies in different regions of Iraq Ahmed and Hussein (2016) in Erbil governorate / northern Iraq. These study dealt with recording and description with taxonomic keys for three species belonging to the genus Scolopendra. Al-Qusair (2019) record many species of Chilopoda from many sites in the middle of Iraq, while Yacoub (2022) identifying four species belonging to Class Chilopoda from southern Iraq. Around the world, many important studies were conducted, Dyachkov (2020) published a list of 22 Chilopoda species belonging to 14 Genus, 8 Families and 4 orders. Sureshan *et al.*, (2004) submit a key and list including 15 species collected from Kerala state in India, belonging to 8 Genus, and all species were Belong to Scolopendromorpha.

The reasons for the differences in diversity and distribution which have been recorded through the above studies may be due to the different environmental conditions and factors including the geographical nature of the regions of Iraq, and the diversity of the nature of the soil which was recorded in agricultural and desert areas. *S. mirabilis* was first recorded in Iraq by Brolemann (1922) in the city of Amarah, then recorded by Chamberlin (1944) in the governorates of Baghdad and Dhi Qar. This species characterized by thin lines or very light sutures in the posterior-mid of the head and light sutures in the coxosternite, and the legs all contain a leg spur except for the

pairs of 19 and 20. The species *S. mirabilis* also recorded by Lewis (2001) in several districts belonging to the governorates of northern Iraq with a total length ranging between 33-54 mm. while in study conducted in the Arabian Peninsula, Lewis (1996) mentioned that there are differences in some characteristics for this species, a difference was found in the number and arrangement of spines in the pre-femora region in the last pair of legs. As for the number of lateral and apical spines in coxopleural, it is one of the most important taxonomic characteristics according to description of Lewis (2010). In the current study, its taxonomic characteristics are well checked. Characteristic of this species, including the presence of light and chitin-line side in the coxosternite, and coxosternum of the head also contains sutures resembling thin lines of light colors, lateral, medial and transverse, as well as containing 21 segments, each carrying a pair of legs, all have a spur except for the 19 and 20 pairs. The coxopleural contains a lateral spine with four apical spines. These features were confirmed as important taxonomic for the species (Lewis, 2001). Al-Yacoub (2022) recorded the species *S. mirabilis* in the province of Dhi Qar, and all the features recorded in the current study were also matched with that presented by the study above, and both of which match with what was stated in the taxonomic key of Lewis (2010), except for the variation in lengths. Al-Qasir (2018) recorded two species belonging to this genus *Scolopendra* for Iraq, *S. amazonica* and *S. afer*, and stated that the distinguishing characteristics of *S. amazonica* from the rest of the *Scolopendra* species are distinguished by the fact that all the legs contain spur except for the 20<sup>th</sup> pair, and there are nine spines for the this on the ventral part of the prefemur region are arranged in three rows, while the *S. afer* species is characterized by containing spur on all the legs except the last pair, and there are 7-10 spines on the ventral part of prefemur area arranged in four rows. For comparison, the species *S. mirabilis* recorded by present study differs in that all legs containing a tarsal spur except for the two pairs 19 and 20, as well as the presence of 4 apical and one lateral spines on the coxopleural tergite.

The genus *Cryptops* was recorded for the first time in Iraq by Brolemann (1922) in the city of Al-Amarah in southern Iraq. Lewis (2001) also record the genus in the Sulaymaniyah governorate, and present the taxonomic characteristics for the genus where it has a total length of 24 mm, while Al-Qaseer (2019) recorded the species *C. anomalans* in Baghdad governorate for the first time in Iraq, as it was mentioned that its total length of 23 mm, the right antennae consist of 12 antennomeres while the left was 17 antennomeres. Recently in the study of Al-Yacoub (2022), the same species was recorded in Dhi Qar province with total length of 23 mm, while the segments number of right antennae was 17 antennomeres and the left was 16 antennomeres. In the present study, the total length was record as 22 mm, while the segments number of antennae was different compared with the two above previous studies, and reach 30 antennomeres for each right and left antennae, while other taxonomic features were matched with the description provided by Stoev (2002); Lindner (2005); Bonato *et al.* (2010) and Wesener *et al.* (2016).

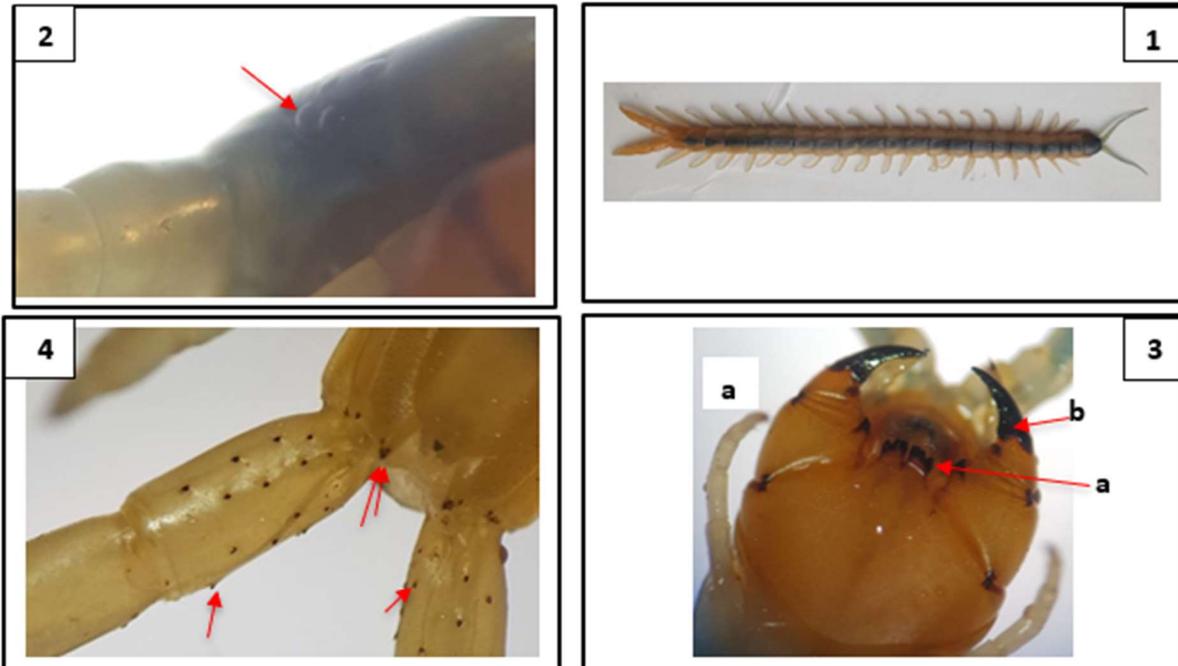
The species *M. evansi*, was identified by the current study after a long time from its first record in Iraq from the city of Al-Amarah by Brolemann (1922) and this species was mentioned only in Iraq and Palestine. This species was distinguished by several taxonomic characteristics that can be used to separate it from the rest species belonging to the same genus *Mecistocephalus*. The first important is the species has 51 pairs of legs, in addition to features related with head length which reach 1.5 times as long as width, the Forcipules are almost covered by the dorsal cephalic plate, antennae consisting from 14 cylindrical or round antennomeres, and coxopleural contains more than 15 small coxal pores, these features were fixed as taxonomic by Chipman *et al.* (2013).

The species *L. microps* (recorded by present study) has important taxonomic characteristics, including presence of two patterns of tergite, some of which are long alternating with other short, also presence of 3-4 eyes and 15 pairs of legs, and the antennae are of 30 antennomeres. These features has been mentioned for the species by a number of studies Stoev (2002); Mitic *et al.* (2010) and Stoev *et al.* (2013), these features and addition others were presented by Wytwer and Tajovsky (2019) and (Prado *et al.* (2018). These above features matched with what was mentioned in the study of Al-Yacoub (2022), while there is differences in the length of the antennae, compared with what recorded by Al-Qaseer (2019). Stove (2002) mentioned that the difference in the number, length and color of antennae are characteristics can be used in differentiating species.

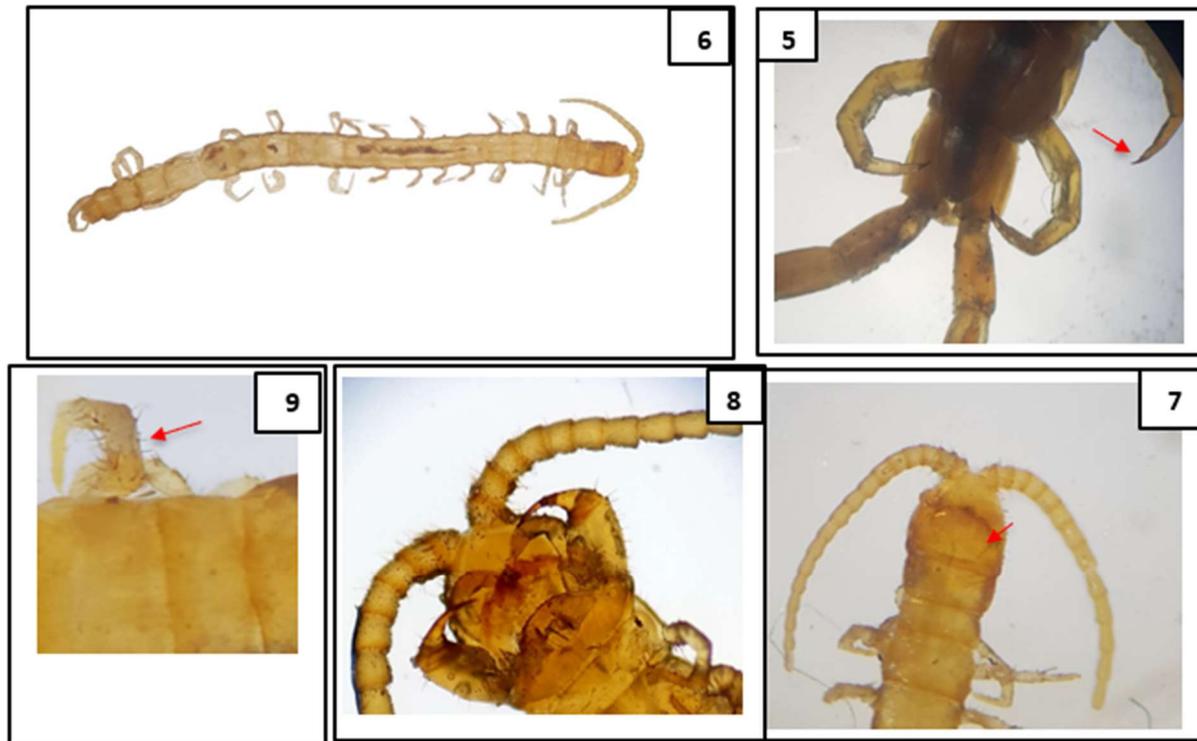
The characteristics of the species *S.coleoptrata* recorded in the present study were compared with what was mentioned for the species in the taxonomic keys, the most important of which are: rounded head, antennae about as long as the length of the body, compound eyes on the sides of the antennae and two dark lines on both sides of the yellow body with 15 pairs of legs. This is a distinctive characteristic for the order: scutigeromorpha and these features fixed by number of taxonomic studies: Hilken *et al.* (2003) ; Koch and Edgecombe (2006) and Sombke *et al.* (2009).

**Table 1: Coordinates of the geographical location of the sampling stations**

	Sample collection station	Coordinates
1.	Al-Hartha	N 30° 40'05" E 47° 43'35"
2.	Shatt Al-Arab	N 30° 41'02" E 47° 45'33"
3.	Al-Zubayr	N 30° 24'02" E 47° 43'44"
4.	Abi Al-Khasib	N 30° 27' 40" E 48° 00'19"
5.	,Al-Madina	N 30° 57' 27" E 47° 16' 06"
6.	Al-Qurna	N 31° 00' 13" E 47° 26' 01"
7.	Al-Siba	N 30° 20'16" E 48° 15' 23"
8.	Al-Faw	N 29° 58' 54" E 48° 28' 23"

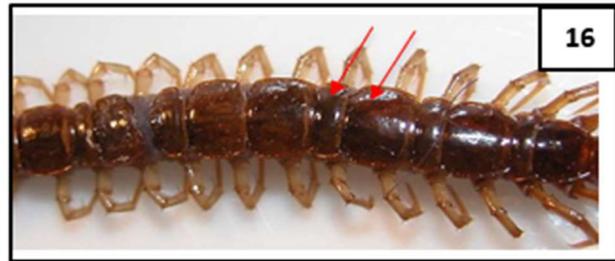
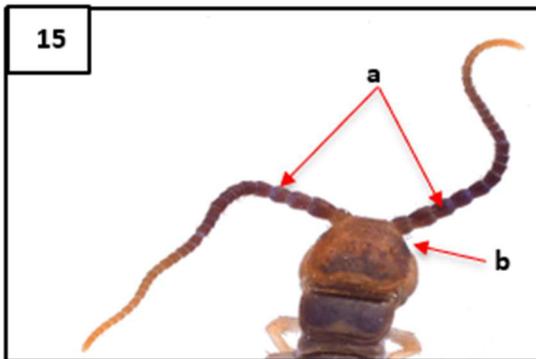
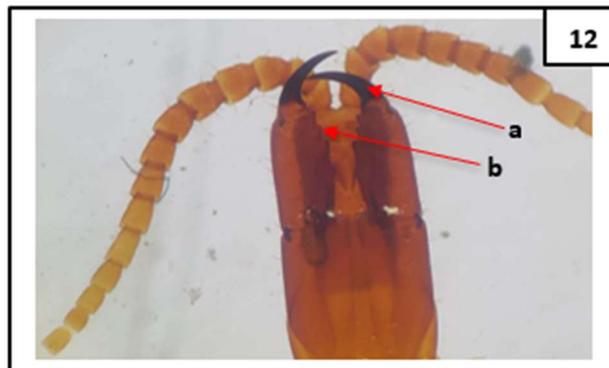
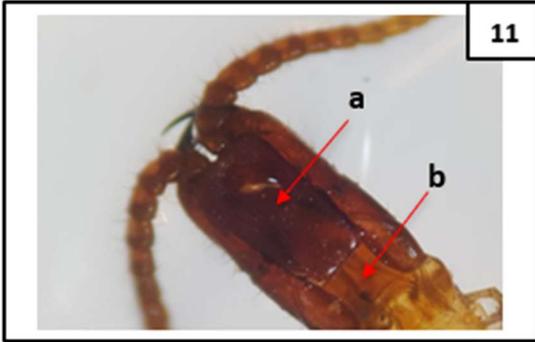


(Fig 1) Phenotypic *S. mirabilis* (Fig 2) Ocelli eyes in *S. mirabilis*  
(Fig 3) A-teeth b- Forcipules *S. mirabilis*  
(Fig 4) Spines in coxopleural in ventral region of prefemur and last pair of legs to  
*S. mirabilis*



(Fig5) *S. mirabilis* (Fig 6) Phenotypic *C. anomalans*  
(Fig 8) Spines in legs to *C. anomalans*

(Fig7) Grooves in *C. anomalans*  
(Fig 9) Toothless head in *C. anomalans*



(Fig 14) Phenotypic *L. microps*

(Fig 15) a- Antennae in *L. microps*

(Fig 16) Tergites long and short in *L. microps* b- ocelli eyes in *L. microps*

(Fig 17) Last legs pair in *L. microps*

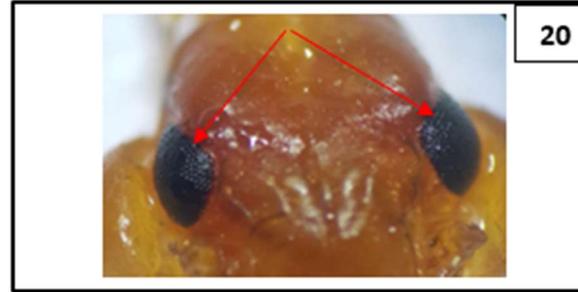
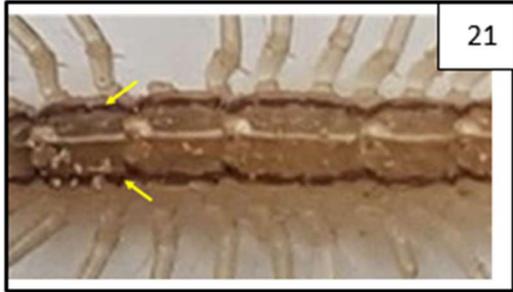
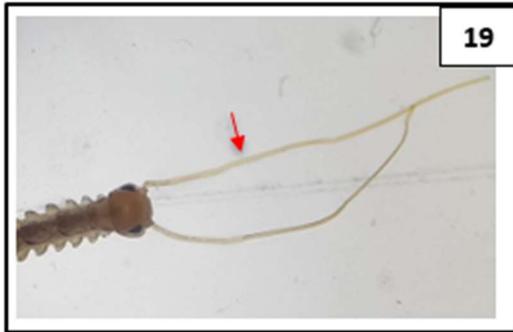
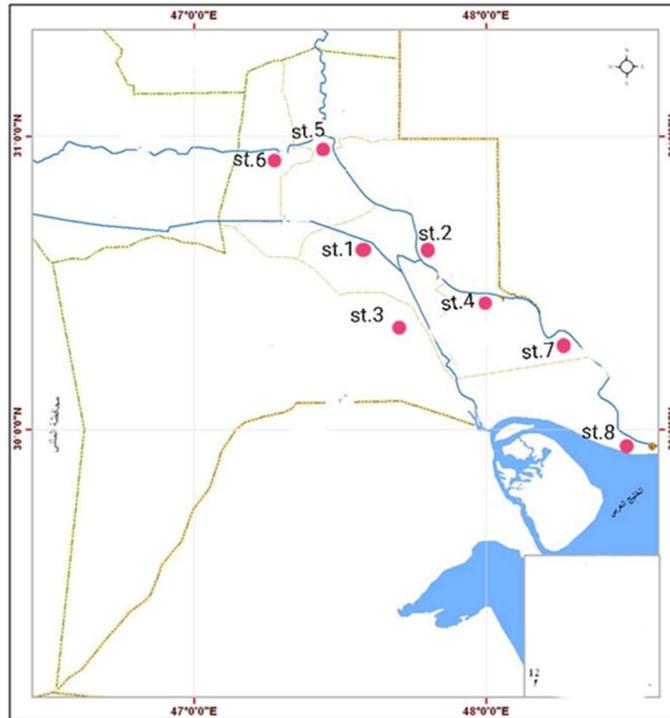


Fig 18) Phenotypic to *S. coleoprata* (Fig 19) Antennae to *S. coleoprata*  
Fig 20) Compound eyes in *S. coleoprata* (Fig 21) Two lateral lines on the body in *S. coleoprata*  
Fig 22) Spines in *S. coleoprata* (Fig 23) Spiracle on the dorsal lateral *S. coleoprata*



**Figure 24: The Map of Sample collection stations in Basrah Governorate Figure 24:**

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