

A Key for Identification of Spiders at Qena Governorate, Upper Egypt

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Abstract: Spiders are one of the more diverse arthropod taxa, ranking seventh in global diversity, which makes them a fascinating group to study [1]. The correct identification of many spider species is considered problematic due to complex variation in morphology [2]. The Egyptian spider fauna are incompletely known due to scarcity of studies on this group especially in Upper Egypt. So, the present key for identifying terrestrial spiders at Qena Governorate is a part of a comprehensive study conducted at the region to study the ecology and taxonomy of this group. The present key was designed to facilitate identification of terrestrial spiders at Qena Governorate using their morphological characteristics. Samples of spiders were collected during a period of one year (from February, 2012 till January, 2013) from six different sites covering Qena governorate. Qena (15-26⁰ N, 32-50⁰ E) is located at Upper Egypt about 600 Km south of Cairo and 60 Km north of Luxor and 260 Km west of the Red Sea. Climate of Qena is hot, dry in summer and cold in winter. It rarely rains. Also, it receives a large quantity of solar radiation; especially in summer. Sampling methods of spiders included hand picking, sweep net and pitfall trap. Survey results revealed the occurrence of 14 families that included 23 genera and 23 species. The present key for the collected families and species was designed and illustrated using taxonomic characteristics of each species.

Keywords: Systematic Key, Spiders, Qena Governorate, Upper Egypt

1. Introduction

Spiders are members of phylum Arthropoda, the large group of animals with jointed legs and hard outer skeleton. They belong more specifically to class Arachnida, which includes animals with four pairs of legs, no antennae or wings, and only two body regions; a cephalothorax which contains (the brain, poison glands and stomach) carapace, sternum, eyes, chelicerae, mouthparts, legs and palps and the abdomen (spinnerets, genitalia, lungs and respiratory tracheae) [3]. Spiders are amongst the most astonishing creatures on Earth. The variety of their form and biodiversity is impressive indeed, with more than 45,000 spider's species belonging to 114 families described so far and many thousands still awaiting discovery and description [4]. Spiders are important in another way; they are a vital component of most terrestrial ecosystems, not least of agricultural systems. They strongly affect the density of insect populations and have been shown to limit insect pests in the agricultural environment [5]. The

worldwide spider fauna is still incompletely known. Furthermore, the scientific literature is very scattered, and new species can be found even with the most cursory surveys. Despite these problems there is fair taxonomic literature [6]. As a taxonomic group, spiders are good candidates for bio-indication, because they form a species rich group, inhabiting all kinds of terrestrial ecosystems [7a, b; 8 and 9]. Additionally, each species has its own, well-documented, specific demands concerning humidity, temperature regime and litter and vegetation structure. Bio-indication at the level of the ecological assemblage can address differences in species diversity, species abundance and the occurrence of endangered species [10] and the functional group composition [9].

2. Materials and Methods

In the present investigation, samples were collected every 2 weeks during a period of one year (from February, 2012 till January, 2013) from six different sites covering Qena

governorate (Fig.1). These sites were distributed as follows: (1st site was at Nag hammadi city, 2nd site was at El-Taramsa Village, 3rd site was at the faculty of Engineering, 4th site was at South Valley University, 5th site was at El-Laqita region and the 6th site was at Qus city). Three sampling methods were used in this study which included hand picking, sweep net and pitfall traps. The collected specimens were preserved in 70% ethanol. Examination was carried out with the aid of binocular stereomicroscope. The identification of specimens was executed on the light of the available taxonomical knowledge, taking in consideration that the group of arachnids is poorly studied in this geographical area. Adult spiders were identified using available literature such as [11, 12]. Also many keys, papers and catalogues were used for identification which included [13, 14, 15, 1, 16, 17, 18, 6, 19, 20 and 21]. Confirmation of identification was done by Mr. H. K. El-Hennawy the expert in spider's identification of Egypt.

3. Results

The total number of specimens of different species of spiders

collected through the year of investigation was 1247 specimens forming 23 species belonging to 23 genera that fall in 14 families. All of the collected spiders belong to order: Araneida. The families included: Agelenidae, Araneidae, Gnaphosidae, Linyphiidae, Lycosidae, Miturgidae, Oecobiidae, Oxyopidae, Philodromidae, Pholcidae, Salticidae, Sparassidae, Theridiidae and Thomisidae (Table 1).

Scientific classification of spiders:-

All spiders (Order Araneida or Araneae) belong to class Arachnida, which classified to two suborders, Mesothelae and Opisthethelae. The first is a small group found only from Japan to Southeast Asia and called segmented spiders. The Opisthethelae are further divided into two infraorders, Mygalomorphae and Araneomorphae and called true spiders. The most obvious distinction between these two is the orientation of the chelicerae, or jaws and the number of book lungs. Mygalomorphs have the chelicerae oriented so that the fangs are parallel to each other and with two pairs of book lungs. The Araneomorphs, which make up the great bulk of spider species worldwide, have the chelicerae oriented so that the fangs oppose each other and with one pair of book lungs [6].

The following taxonomic key was constructed to include only the collected spider families presented by the survey study

1- Cribellum and calamistrum present. Anal tubercle large, two-jointed, with a fringe of long hair (Plate, 1). - Cribellum and calamistrum wanting. Anal tubercle normal.	Fam. Oecobiidae 2
2- Eyes in a compact group, eye group hexagonal, arranged in a circle, the posterior row procurved, the anterior row recurved, with the clypeus high. Abdomen pointed behind and legs with very prominent spines (Plate, 2). - Eyes distributed in rows.	Fam. Oxyopidae 3
3- Eyes in three rows 4-2-2, anterior median eyes by far the largest, directed forwards, eyes of second row by far the smallest, often minute. Integument usually with scales (Plate, 3). - Eyes in two rows.	Fam. Salticidae 4
4- Legs laterigrade. - Legs prograde.	5 7
5- Big spider, medium to very large, holds their two-clawed legs in a crab-like fashion. The trilobed membrane at the end of the metatarsus is diagnostic (Plate, 4). - Small spider.	Fam. Sparassidae 6
6- Legs I and II much longer and thicker than III and IV. Claw-tufts wanting or formed by simple hairs. Integument with simple hair. Body setae stiff, erect or semi-erect (Plate, 5). - Legs I (and usually II) little – if at all – longer and thicker than III and IV. Claw-tufts composed of true spatulate hairs. Integument with plumose or squamose hair. Body setae soft, not erect (Plate, 6).	Fam. Thomisidae Fam. Philodromidae
7- Eyes homogenous, diurnal, Eyes in two rows 4-4, Maxillary scoupla well delimited, not extending over external surface (Plate, 7). - Eyes heterogeneous.	Fam. Eutichuridae 8
8- Posterior spinnerets considerably shorter than anterior spinnerets, anterior spinnerets widely separated (Plate, 8). - Anterior spinnerets contiguous or not widely separated.	Fam. Gnaphosidae 9
9- Tarsi long, flexible, pseudo-sub-segmented, lip wide. Eyes either in a compact group or the (6) indirect eyes in 2 triads (Plate, 9). - Tarsi without pseudo-sub-segments.	Fam. Pholcidae 10
10- Fourth tarsus with a comb of ventral serrated bristles (Plate, 10). - Fourth tarsus without a comb of ventral serrated bristles.	Fam. Theridiidae 11
11- Tarsi with trichobothria. - Tarsi without trichobothria.	12 13
12- Eyes in 3 rows, 4-2-2 (Plate, 11). - Eyes in 2 rows (Plate, 12).	Fam. Lycosidae Fam. Agelenidae
13- Chelicerae often with stridulating file; small spiders (1.5-6 mm) (Plate, 13). - No cheliceral stridulating file. Bigger spiders (Plate, 14).	Fam. Linyphiidae Fam. Araneidae

2- Key to the Recorded Spider Species:

Key for the recorded species of family Araneidae

1. Big abdomen, silver transverse lines and many spots on it*Argiope trifasciata*
2. Broad abdomen, all abdomen with one colour, protrusions on it ...*Cyrtophora citricola*
3. Long and thin abdomen with one colour.....*Larinia* sp.

Key for the recorded species of family Gnaphosidae

- 1-With hard spines on chelicera forward to prosoma, preening comb on the end of III & IV metatarsus *Trachyzelotes lyonneti*
- 2-No spines and no preening comb *Zimiris doriai*
- Key for the recorded species of family Lycosidae
 - 1. Legs brown banded; white colour on pedipalps *Wadicosa fidelis*
 - 2. Legs without brown bands; pedipalps without white colouration *Pardosa* sp.
- Key for the recorded species of family Oxyopidae
 - 1- Not green and Legs IV clearly longer than Legs III *Oxyopes* sp.
 - 2- Bright Green (living specimen; color fades in alcohol) *Peucetia* sp.
- Key for the recorded species of family Philodromidae
 - 1- The distance between anterior and median eyes are smaller than the distance between median eyes to each other's *Halodromus barbarae*
 - 2-The distance between anterior and posterior eyes are equal *Thanatus albini*
- Key for the recorded species of family Salticidae
 - 1. Black colour *Heliophanillus* sp.
 - 2. Black with longitudinal white colour for male, Brown colour for female *Plexippus paykulli*
 - 3. Brown colour, long setae near posterior median eyes, *Thyene imperialis*
- Key for species of family Theridiidae
 - 1. The anterior median eyes are larger than other eyes *Paidiscura dromedaria*
 - 2. All eyes are equal in size *Theridion* sp.

4. Discussion

To the best of the present authors' knowledge and as far as can be ascertained, the present key is the first of its kind at Qena governorate. Survey result of the present study revealed the occurrence of 14 families including 23 genera and 23 species. Some of these families are ground ones, like Lycosidae, Gnaphosidae and Linyphiidae. Others are arboreal as Aranidae, Eutichuridae, Theridiidae, Philodromidae and Thomisidae. Members of families Salticidae, Philodromidae

and Araeidae were found to be abundant at all surveyed locations, also they are the most famous families known worldwide for natural control for many agricultural pests. On the other hand, families of Agelenidae, Oxyopidae and Oecobiidae were present at the lowest numbers in the same period of study. Based on the present results and compared with [20 and 22] who studied the same area; one can conclude that all of *Cyrtophora citricola*, *Trachyzelotes lyonneti*, *Zimiris doriai*, *Oxyopes* sp., *Halodromus barbarae* and *Paidiscura dromedaria* are new records at Qena governorate.

List of Abbreviations

Anal Tubercle	A small process, dorsal to the spinnerets, carrying the anal opening.
Calamistrum (p. calamistra)	A comb of hairs on metatarsus IV of cribellate spiders; used for combing out silk from the cribellum
Clypeus (adj. clypeal)	The area between the anterior row of eyes and the anterior edge of the carapace.
Colulus	A midline appendage or tubercle arising from just in front of the anterior spinners in some spiders, a nonfunctional cribellum.
Cribellate	Pertaining to spiders in which the abdomen has a cribellum.
Cribellum	A spinning organ in the form of a transverse plate, just in front of the spinnerets in some cribellate spiders.
Cheliceral teeth	Large and/or tiny tooth like projections on the cheliceral furrow margins.
Claw	A strong, curved, sharp-pointed process (often toothed) on the distal extremity of a leg or female's palp.
Claw tuft	A bunch of hairs at the tip of the leg tarsus in those spiders with two claws.
Comb	<i>It is a series of serrated spines which they use to comb out the silk from the spinnerets.</i>
Eye tubercle	Mygalomorphs, eye turret, eyes grouped together on a turret
Laterigrade	Denotes the orientation of the legs of some spiders, which are rotated on their bases so that the prolateral surface is uppermost; also describes the mode of locomotion of such spiders, mainly in the family Thomisidae.
Metatarsus	The sixth segment of the leg, counting from the body end, not found in the palps.
Procurved	Curved as an arc having its ends anterior to its centre.
Prograde	Denotes the normal or nonlaterigrade orientation of the legs in spiders with limbs not rotated on their bases; also used to describe the mode of locomotion of such spiders.
Recurved	Curved as an arc having its ends posterior to its centre.
Scopula	A brush of hairs on the ventral aspect of the tarsus and metatarsus in some spiders.
Spinnerets	Paired appendages at the posterior end of the abdomen, through its spigots silk are extruded.
Stridulating organ	An area with numerous sclerotized, parallel striate which are rubbed by hairs or a tooth on an opposing structure thus creating sound. Can be located on the palps, legs, chelicerae, abdomen or the carapace.
Tarsal claw	Sharp curved structure at the tip of the tarsus, typically on the palp and 2 or 3 on the legs.
Trichobothrium	A long, fine hair rising almost vertically from a hemispherical socket on the legs, which detect air vibration and currents.

Table 1. Shows the identified families and species at the investigated sites.

No.	Family	Species	No.	Family	Species
1	Agelenidae [23]	<i>Benoitia lepida</i> [24]	13	Oxyopidae [37]	<i>Peucetia</i> sp.
2		<i>Argiope trifasciata</i> [25]	14	Philodromidae [37]	<i>Halodromus barbarae</i> [38]
3	Araneidae [25]	<i>Cyrtophora citricola</i> [26]	15		<i>Thanatus albini</i> [30]
4		<i>Larinia</i> sp.	16	Pholcidae [39]	<i>Artema Atlanta</i> [40]
5	Eutichuridae [27]	<i>Cheiracanthium siwi</i> [28]	17		<i>Heliophanillus</i> sp.
6		<i>Trachyzelotes lyonneti</i> [30]	18	Salticidae [41]	<i>Plexippus paykulli</i> [30]
7		<i>Zimiris doriai</i> [31]	19		<i>Thyene imperialis</i> [42]
8	Linyphiidae [32]	<i>Erigone dentipalpis</i> [33]	20	Sparassidae [43]	<i>Eusparassus walckenaeri</i> [30]
9		<i>Pardosa</i> sp.	21	Theridiidae [34]	<i>Paidiscura dromedaria</i> [44]
10	Lycosidae [34]	<i>Wadicosa fidelis</i> [35]	22		<i>Theridion</i> sp.
11	Oecobiidae [36]	<i>Oecobius putus</i> [24]	23	Thomisidae [34]	<i>Thomisus spinifer</i> [35]
12	Oxyopidae [37]	<i>Oxyopes</i> sp.			

Total: 14 Families
 : 23 genera
 : 23 species

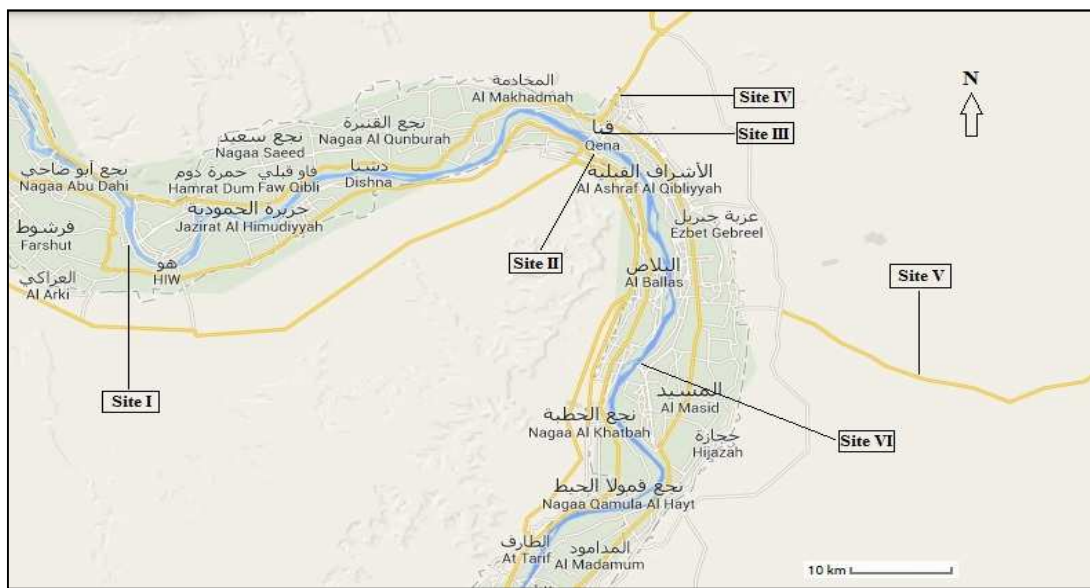


Figure 1. A map of Qena governorate showing the sites of collections.

A



B

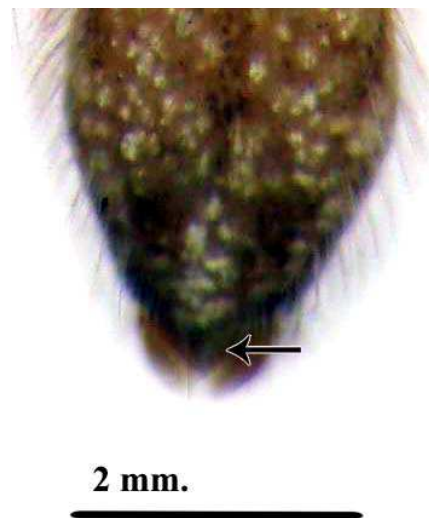


Plate (1). Showing, A: Dorsal view of *Oecobius putus* B: Anal tubercle is prominent and has a fringe of long hairs.

A



B



Plate (2). Showing, A: Dorsal view of *Peucetia* sp. B: Carapace with eyes distribution forming hexagonal shape.

A



B



C



D

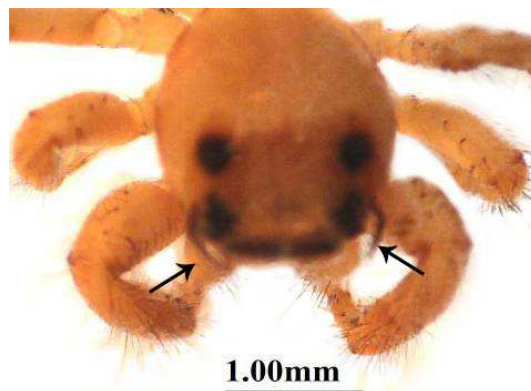


Plate (3). Showing A: Dorsal view of *Plexippus paykulli* B: Carapace with eyes distribution showing anterior eye row barely or not at all wider than posterior eye row. C: Dorsal view of *Thyene imperialis*. D: Carapace with eyes distribution showing horns-tufts of long black setae, one on each lateral side of the eye field.

A



B

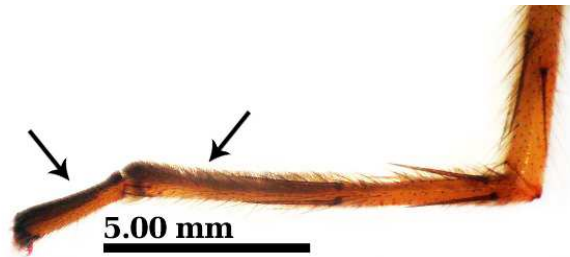
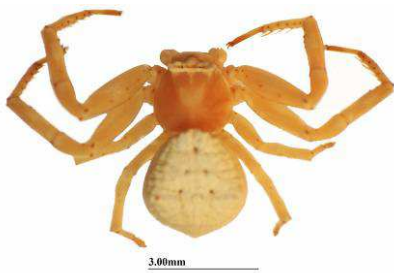


Plate (4). Showing, A: Dorsal view of *Eusparassus walckenaeri*. B: Tarsi and metatarsi with large scopulae (adhesive hairs) on tarsus and metatarsus.

A



B

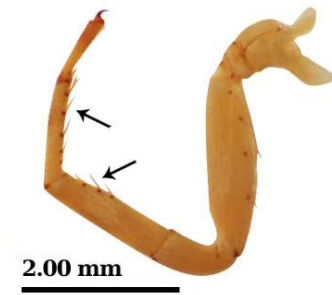


Plate (5). Showing, A: Dorsal view of *Thomisus spinifer* B: Tibia and metatarsi of legs I provided with strong macro-setae ventrally.

A



B



C



D



Plate (6). Showing, A: Dorsal view of *Thanatus albini* B: Eyes distribution showing posterior lateral eyes not elevated on tubercles C: Tarsi I and II with scapulae (thick dense setae). D: Dorsal view and habitus of *Halodromus barbarae* showing legs shape and length (legs I and II held to the side of the body like a crab rather than held in front of the spider; leg II much longer than legs I, III, and IV).

A



B



C

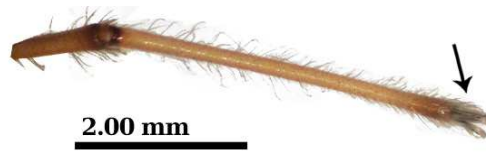
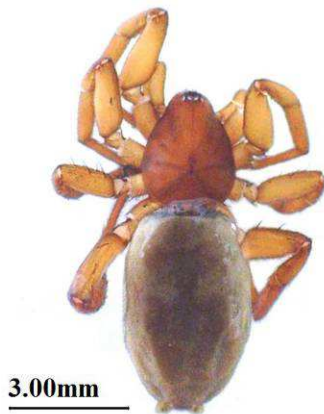


Plate (7). Showing, A: Dorsal view and habitus of *Cheiracanthium siwi* showing legs long, leg I considerably longer than leg II). B: Carapace with eyes, distribution (homogenous and in two rows 4-4). C: Dense claw tufts and moderately dense scapulae.

A



B



Plate (8). Showing, A: Dorsal view of *Trachyzelotes lyonneti* B: Ventral view of cylindrical separated anterior spinnerets.

A



B



C

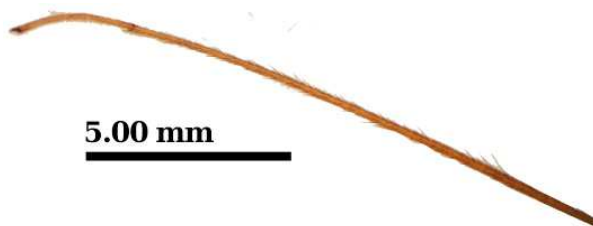


Plate (9). Showing, A: Dorsal view of *Artema atlanta* B: Carapace with eyes distribution C: Tarsi long and flexible, appearing to have many little segments.

A

B



C



http://www.pholcidae.de/spider_key/Theridiidae.htm

Plate (10). Showing, A: Dorsal view of *Paidiscura dromedaria* B: Dorsal view of *Theridion* sp. C: Serrated comb on 4th tarsus.

A

B



Plate (11). Showing A: Dorsal view *Pardosa* sp. B: Eyes in three rows, posterior eyes larger than anterior eyes.

A



B



1.00mm

Plate (12). Showing, A: Dorsal view of *Benoitia lepida* B: Carapace with eye distribution.

A



B



2.00mm



2.00mm

Plate (13). Showing A: Dorsal view of *Erigone dentipalpis*, B: Dorsal, ventral and frontal view of chelicerae with lateral stridulating ridges; lateral condyle of the chelicerae lacking (sheet-web spiders).

A



B



5 mm.

Plate (14). Showing, A: Dorsal view of *Argiope trifasciata* B: Ventral view C: Carapace with eye distribution.

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