Research Article

First record and description of two species of genus *Scaeva* Fabricius (Diptera: Syrphidae) from Balochistan, Pakistan

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Abstract

The current study was continued from March 2016 to April 2017. The specimens of the genus *Scaeva* Fabricius were collected from different localities of Balochistan. Two species *Scaeva albomaculata* Macquart and *Scaeva selenitica* Meigen were identified and described. *Saeva albomaculata* Macquart is first time recorded from Balochistan province of Pakistan and *Scaeva selenitica* Meigen is new country record. These species were identified on the bases of morphological characteristics, body coloration, male and female genitalia. The identification and description of these new records will serve as an important contribution in the insect fauna of Balochistan and Pakistan. Furthermore both the identified species are aphidophagous on serious pests of various crops so these can be used for the biological control of various pests.

Keywords: Balochistan; Hoverfly; *Scaeva* Fabricius; Syrphidae

Introduction

Family Syrphidae is a one of the largest families of the order Diptera with more than 6000 described species all over the world [1, 2]. This family comprises the three sub-families, Syrphinae, Eristalinae and Microdontinae. Majority of larvae of syrphinae are polyphagous predators of a broad range of soft-bodied arthropods, such as lepidopteran, coleopteran larvae, mites, hemipterans and thrips (e.g., coccids, whiteflies, psyllids and mainly aphids) being the preferred prey [3, 4]. The genera, *Scaeva*, *Syrphus*, *Sphaerophoria* and *Baccha* are rapacious predators of aphids and others soft

bodied insects. Thus they can play an important role as a biocontrol agents for the suppression of the pest on various crops [5-8].

Genus *Scaeva* Fabricius of the sub family syrphinae is one of the genera having largest size species. Species of *Scaeva* are beneficial because their larvae are aphidophagous and adults are pollinator of various types of crops, vegetables, ornamental flowers and fruit trees. Species of genus *Scaeva* possess yellow stripes and black bars on the abdomen, resembling bees or wasps like shape. Adults often hover over the flowers and feed on nectar and pollen [9-11].

Only three species of genus *Scaeva* i.e. *Scaeva albomaculata* Macquart, *Scaeva pyrastris* Linnaeus and *Scaeva latimaculata* Brunetti have been identified and recorded from Pakistan's agricultural plants and ornamental plants. *Scaeva albomeculata* Macquart was first time reported from India [12-13], and from Pakistan (Faisalabad) first time collected on the plants of Brassica spp: [14-19]. The two species *Scaeva albomaculata* Macquarat and *Scaeva latimaculata* Brunetti 1923, recorded from Multan, Khanewal (Punjab), Peshawar (KPK) Muzaffarabad (Azad Kashmir) [20], Peshawar (KPK) [21], Multan (Punjab) and Southern Punjab [22]. Third one species *S. pyrastris* Linn reported from Rawalpindi (Punjab), Abbottabad (KPK), Dargai, Dir, Paras, Peshawar, Sawat (KPK) [23]. The *Scaeva albomaculata* Macquarat and *Scaeva selenitica* Meigen were recorded and identified from different localities of the world by the following researchers, Khiaban *et al.* [24], Dosti *et al.* [25], Aleosfoor [26] Aliche *et al.* [27], Gilasian and Vujic [28] and Amirimoghadam & Sirja [29]. *Scaeva albomaculata* Macquarat and *Scaeva selenitica* Meigen were not recorded from Balochistan, Pakistan (Figure 1).

Materials and methods

A total of 241 specimens of genus *Scaeva* Fabricius were collected from various crops such as wheat, barley, Brassica spp: ornamental flowers and as well as weeds from Balochistan, Pakistan during March 2016 to April 2017. The two species of genus *Scaeva albameculata*. Macquarat and *Scaeva selenitica* Meigen were identified by using standard keys [30-32]. The terminology followed of [33]. For the observation of male and female genitalia, tip of abdomen boiled in 10% potassium hydroxide (KOH) solution for 6-8 minutes then removed the genital capsule by using needle and forceps. Dissected the genital capsule under dissecting binocular microscope by the help of a pair of fine needles. Dissected materials were conserved in micro vial cavity plate with a few drops of glycerin. Measurement of different body parts taken with the micro millimeter and illustration drawn by using the ocular graph. The terminology used for the external and internal morphology of female genitalia was adopted from [34] and the method of exposing male genitalia was adopted from [31].

Figure 1. Map of Balochistan showing the study area

Results and discussion

Scaeva albomaculata Macquart (Figure 2 & 3) (Table 1 & 3)

Synonyms

Syrphus gemellarii Rondani; Schiner (1868), Osten and Sacken (1884), *Lasiaphthicus albomaculatus* Meigen; Becker (1908), *Scaeva albomaculata* Macquart; Gommès & Baez (1990) and Carles & Tolra (2002).

Head

Head box shape on top view, eyes dark brown, small with pale dense hairs; head broader than thorax; vertex triangular very narrow, ground color black; frons inflated, yellow and dense black hairs stripe on front, black hairs small than male hairs, below small white hairs present; occiput broad silvery or white, white hairs on margin; antennae thumb like structure, dorsal side black, ventral side orange, 3rd segment long, few black hairs on margin, 1st and 2nd segment orange, 1st segment longer than 2nd, arista yellow or orange; face inflated, thin black stripe present on middle area, yellow, covered with white or pale hairs; female eyes separated, mouth margin yellow and male eyes fused.

Thorax

Thorax narrower than head, covered with thin yellow hairs, thoracic dorsum glossy and bluish-black; humeri bare slightly raised and black; thoracic pleura covered by long yellow hairs, yellow pleural thorax stripe broken; scutellum raised, semicircular, yellow, scutellar marginal bristles long yellow, central area bare; female pleural thorax stripe thicker than male.

Wing

Transparent, spurious vein pale, reach near outer cross vein; vein R4+5 more dipped in cell r5; m second basal cell without microtrachia; cell r3, cell r5 covered with tiny microtrachia; stigma yellow; squama small, white, densely covered by microtrachia; alula entirely covered with microtrachia; halter club shape and yellow color.

Abdomen

Abdomen broader than thorax, elongated, oblique yellow marking on tergites 3 and 4, middle region broad; half lateral marginal part covered with yellow hairs, dorsal surface covered with pale hairs; on sternite 2, 3 and 4 possess black or brown patch, entire sternites covered with long pale hairs; female abdomen oval shape, wider than male; black patch on sternite 2, 3 and 4 broader than male.

Legs

Half femur swollen, swollen part black, covered with white hairs, front coxa and trochanter black, tibia and metatarsus yellow brown band covered with small white hairs; middle legs similar shape to front legs; hind coxa, trochanter black, femur slightly swollen black, tip of femur yellow, covered with white hairs.

Male genitalia (Figure 4A to D)

Genital capsule, brown 0.9 mm length; epandrium, dark brown, inflated; pair of cerci rod shape, large 0.5 mm length, located above epandrium, yellow with orange hairs, black spots; systilus elongated 0.5 mm length, yellow, curve, covered with pale hairs; hypandrium 0.8 mm length, dark brown, smaller than epandrium, claspers with yellow hairs, small finger like shape; aedeagus small 0.3 mm length and pale color.

Female genitalia (Figure 4E to F)

Segment 10 transparent with tiny black spots, external genitalia broad and dwarf, 0.5 mm length; cerci glob shape, 0.3 mm length, whitish yellow with minute spots and yellow hairs; post genital (sub anal) plate wide, length small 0.2 mm length, vault shape and covered by black spots.

Comparative note

Scaeva albomaculata Macquart is closely related with *Scaeva pyrastris* Linnaeus glossy black thoracic dorsum, oblique bars on tergites 2 to 4, pleura yellow with hairs and differ on the base of thoracic pleura with well-developed yellow stripe and broad oblique bars on tergite 2 to 4 in *S.*

albomaculata Macquarta. Thoracic pleuran with narrow yellow stripe, tergites 3 and 4 have comma like oblique bars *S. pyrastris* Linnaeus.

Distribution

Collected from Fennoscandia and the Faroes [35] Mediterranean, North of Africa; Ireland eastwards through much of Europe from the Urals Siberia to Cis-Baikal, China, Sakhalin, Kuril Isles, Afghanistan, Turkey, Russia and Iran [36]. It also introduced in North Carolina, Mongolia and India [37].

Note. *Scaeva albomaculata* Macquart was reported from Punjab [38, 39] currently authors first time recorded it from Balochistan, Pakistan

***Scaeva selenitica* Meigen 1822 (Figure 5 & 6) (Table 2 & 3)**

Synonym

Scaeva pyrastris Linnaeus (1758) & Vujić et al (1998), *Syrphus seleniticus* Meigen (1822).

Head

Head slightly broader than thorax, eyes dark brown, hairy; vertex triangular, present small black bristles; ocelli located with eye margin and shiny brown; occiput gray, covered with gray hairs; frons yellow, slightly raised, covered with long hairs circle around antennae; antennae club shape, 1st and 2nd segment black hairy, arista slender, bare, dorsally black; face pale or yellow and covered with black hairs; proboscis blackish-brown with gray hairs.

Thorax

Thoracic dorsum metallic bluish-black, covered with fine pale hairs, pleural thorax black covered with long pale hairs; scutellum raised, glossy golden, covered with black and pale bristles.

Wings

Transparent without microtrichia, spurious vein (false vein) with joint on 1st basal cell region, extended closer outer cross vein, entire veins dark brown, distinct; R4+5 vein dipped, sub costal cell yellow, m second basal cell without microtrichia, stigma yellow, alula covered with microtrichia, squama circular and microtrichiose, marginal border covered with long bristles.

Abdomen

Abdomen broad than thorax, tergite 3rd and 4th with yellow comma like bars, lateral margin 1st and 2nd tergite covered with long pale hairs; abdomen dorsal surface covered with black and gray hairs; lateral margin 3, 4 and 5 tergite covered with small black hairs; sternite covered with gray hairs and black spots on 2nd sternite.

Legs

Half front femur black, black part swollen and yellow part slender, coxa, trochanter with long hairs on black part, tibia and tarsus covered with minute hairs; middle and hind femur slightly swollen.

Male genitalia (Figure 7A to E)

Genital capsule large 1.2 mm length, brown; epandrium, dark brown raised; pair of cerci slender, elongated, 0.3 mm length, located on epandrium, rod shape, yellow with orange hairs and black spots; systilus broad, 0.6 mm length, covered with pale and black bristles, brown; hypandrium broad 1.0 mm length, smaller than epandrium, dark brown, with orange hairs; aedeagus tube shape, small 0.4 mm length, bright yellow color.

Female genitalia (Figure 7F)

Segment 10 transparent covered with minute black spots; external genitalia broader but dwarf length, 0.6 mm length; cerci small and round, 0.1 mm length, pale with minute spots and yellow hairs; post genital (sub anal) plate wide, length small 0.2 mm length, vault shape, covered with black spots.

Comparative note

Scaeva selenitica Meigen is related with *Scaeva dignota* having eyes hairy, male terminalia very same structure in both species but differ on the bases of face narrower, ocular hairs minute, anterior angle of eyes narrow, frons slightly raised on middle area. Yellow comma like bars present on tergite 3 and 4.

Distribution

This species reported from Fennoscandia and Faroes [35] South Iberia, Mediterranean, including North of Africa; Ireland, Europe, Turkey, European parts of Russia; Urals through Siberia, Cis-Baikal, Sakhalin and Kuril Isles [36], also been reported from North

Carolina [37] Kuril Isles, Eurasia, Siberia, Germany, China and India [40].

Scaeva selenitica Meigen was not reported from any region of Pakistan, authors first time recorded it from Balochistan, Pakistan.

Table 1. Measurement of different body parts of *Scaeva albomaculata* Macquart

Body parts	male ♂			female ♀		
	Ave Mm	Ran mm	Std mm	Ave mm	Ran mm	Std mm
Head length	2.96	2.6-3.3	0.270	2.4	2.2-2.6	0.158
Antenna Length	1.1	0.9-1.3	0.158	1.22	1-1.5	0.192
Arista Length	0.54	0.4-0.7	0.114	0.7	0.5-0.9	0.158
Thorax Length	3.06	2.7-3.3	0.230	2.68	2.4-2.9	0.192
Scutellum Length	1.26	1.00-1.4	0.207	1.00	0.8-1.2	0.158
Wing Length	9.62	9.2-10	0.334	11.08	10.5-11.6	0.465
Abdomen Length	8.18	7.00-9.4	1.005	7.7	7-8.1	0.435
Hind leg Length	8.44	7.9-9.00	0.482	7.74	7-8.2	0.456
Body Length	15.32	13-17	1.487	12.68	11.5-15	1.409

Table 2. Measurement of different body parts of *Scaeva selenitica* Meigen

Body parts	male ♂			female ♀		
	Ave Mm	Ran Mm	Std mm	Ave mm	Ran Mm	Std mm
Head length	3.2	3.00-3.4	0.158	2.4	2.2-2.6	0.158
Antenna Length	1.46	1.2-1.7	0.207	1.22	1-1.5	0.192
Arista Length	1.2	1.00-1.7	0.158	0.7	0.5-0.9	0.158
Thorax Length	3.28	3.00-3.5	0.148	2.68	2.4-2.9	0.192
Scutellum Length	1.4	1.2-1.6	0.158	1.00	0.8-1.2	0.158
Wing Length	11.46	11.2-11.7	0.207	11.08	10.5-11.6	0.465
Abdomen Length	8.36	8.1-8.7	0.240	7.7	7-8.1	0.435
Hind leg Length	9.36	9.00-9.6	0.230	7.74	7-8.2	0.456
Body Length	15.94	15.7-17	0.181	12.68	11.5-15	1.409

Table 3. Showing the distribution of species, number of specimens and host plants from Balochistan, Pakistan

<i>Scaeva albamaculata</i>			<i>Scaeva selenitica</i>		
Localities	Male	Female	Male	Female	Host plants
Quetta	20	13	00	00	Wheat, Cabbage
Kuchlak	12	05	00	00	Wheat/ barley
Pishin	05	04	00	00	Wheat/ barley
Mastung	07	06	01	00	Vegetables, Weeds
Dusht	07	04	00	00	Weeds, Brassica
Sibi	09	05	03	04	Flowers, pea plants
Dhadar	11	06	04	04	Brassica, onions
Bhag	12	10	10	05	Flowers, Gramm plants
Dera Murad Jamali	10	09	01	00	Cabbage, tomatoes
Dera Allah Yar	11	08	03	02	Brassica, lay finger
Roopa Shak	06	03	02	01	Brassica, weeds
Lasbela	10	07	01	00	Wheat, flowers
Total	120	80	25	16	241

Figure 2. *Scaeva albomaculata* male

Figure 3. *Scaeva albomaculata* female

Figure 4. *Scaeva albomaculata* Macquart, A: epandrium genitalia dorsal view, B: hypandrium ventral view, C: cercus dorsal view, D: surstylus dorsal view, E: cercus (female), F: female genitalia dorsal view

Figure 5. *Scaeva selenitica* male

Figure 6. *Scaeva selenitica* female

Figure 7. *Scaeva selenitica* Meigen, A: epandrium dorsal view, B: hypandrium with aedeagus dorsal view, C: surstylus lateral view, D: aedeagus lateral view, E: cercus dorsal view, F: female genitalia dorsal view

Different researchers have adopted various methods for the description of specific characteristics of hoverflies species e.g. male genitalia [31], female genitalia [34] and morphological characteristics but our method includes all the methods i.e. male and female (external and internal) genitalia, body measurements and morphological characteristics. Sum of all these criteria ensures the exact identification of said species and leaves no ambiguity. The identification and description of these new records is an important contribution in the insect fauna of Balochistan and Pakistan. Both the identified species are aphidophagous on serious pests of various crops so these can be used for the biological control of various pests

Conclusion

We have reported two species *Scaeva albomaculata* Macquart and *Scaeva selenitica* Meigen for three first time from Balochistan. The identification and description of these new records will serve as an important contribution in the insect fauna of Balochistan and Pakistan.

Authors' contributions

Conceived and designed the experiments: N Memon & JK Turk, Performed the experiments: JK Turk & MI Memon, Analyzed the data: MI Memon, Contributed reagents/ materials/ analysis tools: N Memon, Wrote the paper: N Memon & JK Turk.

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