

A FIRST RECORD OF *BLAESOXIPHA RUFIPES* (DIPTERA: SARCOPHAGIDAE) PARASITIZING *POEKILOCERUS BUFONIUS* (ORTHOPTERA: PYRGOMORPHIDAE) IN SAUDI ARABIA¹

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ABSTRACT: The tropical grasshopper (Usherhopper), *Poekilocerus bufonius* (Orthoptera: Pyrgomorphidae) is found on several host plants such as *Calotropis procera*, *Aizoon canarense*, *Zygophyllum simplex* and *Pulicaria crispa* in Saudi Arabia (KSA). Many species of Sarcophagidae and Tachinidae parasitize *P. bufonius*. Here we present the first published record of *Blaesoxipha rufipes* parasitizing *P. bufonius* and the first record of its occurrence in Saudi Arabia. We collected 568 adults of the host from five regions in the Middle West of KSA. These were dissected in order to study the parasitoid distribution, parasitism ratio and sex ratio. The parasitoid occurred in all regions investigated but its incidence gradually decreased from East to West. We found that hopper females were significantly more infested (=32.3%) than males (=18.3%). Also, the number of maggots per infested host ranged from 2 to 11 and averaged 6.7 with a significant difference in the mean number of parasitoids for each infested adult male (=3.8) vs. adult female (=7.7). Parasitoid sex ratio overall was 40.1%:59.1% males to females. Occurrence of this parasitoid in KSA suggests further study to investigate its potential as a biological control agent for more damaging Orthoptera.

KEY WORDS: *Poekilocerus bufonius*, *Blaesoxipha rufipes*, Biological control, Parasitism, distribution, sex ratio

INTRODUCTION

The polyphagous Usherhopper, *Poekilocerus bufonius* (Orthoptera: Pyrgomorphidae), was found on several host plants such as *Calotropis procera* and *Pulicaria crispa* (shrubs), and *Aizoon canarense* and *Zygophyllum simplex* (herbs) in Saudi Arabia (Al-Otaibi and Elsayed, 2008). Elsayed et al. (2011) demonstrated a high genetic variability within Usherhoppers and documented its wide ecological adaptation in many regions of KSA.

Many dipteran parasitoids such as Sarcophagidae and Tachinidae parasitize locusts and grasshoppers (Taylor (1964); Baker (1995); Maggie et al. (1995); Geoff and Thomas (1996). Some of these parasitoids are polyphagous, parasitizing different species of Acrididae (Chapman (1961); Cantrell (1980). Tropical parasitoids are often a major cause of mortality for many insect species, despite which their biology is still poorly known. As reviewed by Faragallah (1990), the local locust *P. bufonius* is widely distributed in all regions of Saudi Arabia. He found that there is a parasitoid (Diptera, genus *Sarcophaga*) parasitizing the Usherhopper in central KSA. Also, he observed that this parasitoid emerged from the intersegmental membranes of the abdomen of its host. This is the only known investigation regarding parasitism on Saudi Arabian *P. bufonius*.

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At Taif, KSA we observed a parasitoid emerging from the cervical area of the Usherhopper, suggesting that this parasitoid belongs to a genus or species not previously observed to parasitize this host. *Blaesoxipha rufipes* (Macquart) (Diptera: Sarcophagidae) is widely distributed in tropical Africa, Asia, Australasia, and Europe. It parasitizes various grasshopper and locust species (Anene and Vajime (1990); Pape (1994); Baker and Barchia (1997); Miura and Ohgushi (2010) and is used as a biocontrol agent for grasshoppers in North America (Rees, 1985). The present study reports *B. rufipes* parasitizing *P. bufonius* and presents the geographical distribution of this parasitoid in the middle west region of KSA, and biological data such as parasitism ratio, sex ratio and number of parasitoids/host.

MATERIALS AND METHODS

We collected adults (females and males) of *P. bufonius* from three different locations in each of the following five regions; Jeddah, Mecca, Taif (Al-Hawiyah), Taif (Al-Hada) and Ashayrah in the middle west of Saudi Arabia in May, June and July 2012 (Table 1). These were reared individually in 300-ml clear plastic cups at room temperature, feeding on leaves of the usher plant. After the parasitoid larvae emerged or the host was dead, we dissected the host to obtain any parasitoid larvae or pupae that had not yet emerged. We obtained the total parasitoid load for each host individual by adding the number of maggots that emerged and the number of maggots or pupae found during the dissection. These were kept in a plastic Petri dish until adult emergence in order to calculate the sex ratio. Some of the females and males of this parasitoid were kept in 70% ethanol and sent to Dr. Thomas Pape, Danish Bilharziasis Laboratory, Jaegersborg Allé, Charlottenlund, Denmark, for identification.

RESULTS AND DISCUSSION

The parasitoid was identified as *Blaesoxipha rufipes* (Diptera: Sarcophagidae). This is the first published record for *B. rufipes* parasitizing *P. bufonius* and the first record of its occurrence in Saudi Arabia.

The data in Table 2 show that more females were infested (32.3%) than males (18.3%), with an average of 26.9%. The number of maggots per infested host ranged from 2 to 11 and averaged 6.7 ± 2.7 (SD) ($n = 153$). In another study, Taylor (1964) recorded one to six larvae of *B. filipjevi* (= *B. rufipes*) per each individual of *Zonogerus variegatus* (L.) (Orthoptera, Acridoidea) in Nigeria. Tachinid endoparasitoids attacking grasshoppers are gregarious (Arnaud and Rentz (1965); Johnson et al. (1996)). Also, there was a significant difference in the mean number of parasitoids for each infested adult male (3.8 ± 1.5 (SD), $n = 40$) vs. adult female (7.7 ± 2.3 (SD), $n = 113$). This difference is related to the body size of the host, where the female body size is bigger than that of the male which allows more maggots to develop inside the female body. Moreover, there are dif-

Table 1: Locations of *P. bufonius* collection in middle west of Saudi Arabia.

Regions	Locations	Latitude	Longitude
Jeddah	1	21.49	39.26
	2	21.55	39.30
	3	21.43	39.32
Mecca	1	21.39	39.85
	2	21.35	39.93
	3	21.32	40.00
Taif (Al-Hada)	1	21.31	40.36
	2	21.34	40.32
	3	21.36	40.28
Taif (Al-Hawiyah)	1	21.46	40.53
	2	21.43	40.50
	3	21.43	40.46
Ashayrah	1	21.76	40.66
	2	21.71	40.66
	3	21.74	40.63

ferences among the five regions in parasitism rate, where this rate gradually decreased from the extreme East (Ashayrah, 49.6%) to extreme West (Jeddah, 4.8%). In our opinion, this variation in parasitism rate among regions is related to the high genetic variability within the Usherhopper according to Elsayed et al., (2011) who studied five enzymatic patterns and its wide large ecological adaptation in many regions of KSA. The sex ratio of parasitoids in general was 59.1% females and 40.9% males. No obvious difference in parasitoid sex ratio was noted between those that emerged from host males (61.4% females) and those that emerged from host females (58.7% females).

Occurrence of this parasitoid in KSA indicates a need for further examination in order to study its potential as a biological control agent for more damaging Orthoptera.

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Table 2. Presence of *Blaesoxipha rufipes* in *Poekilocerus bufonius* at different regions of Saudi Arabia Middle West

Regions	Location	n Host			n Parasitized			% Parasitized		
		♀	♂	Total	♀	♂	Total	♀	♂	Total
Jeddah	1	23	16	39	2	0	2	8.7	0	5.1
	2	30	18	48	3	1	4	10	5.6	8.3
	3	21	16	37	0	0	0	0	0	0
	Total	74	50	124	5	1	6	6.8	2	4.8
Mecca	1	10	13	23	2	2	4	20	15.4	17.4
	2	18	11	29	5	1	6	27.8	9.1	20.7
	3	23	17	40	6	3	9	26.1	17.6	22.5
	Total	51	41	92	13	6	19	25.5	14.6	20.7
Al-Hada	1	38	14	52	13	4	17	34.2	28.6	32.7
	2	26	17	43	6	2	8	23.1	11.8	18.6
	3	19	8	27	5	1	6	26.3	12.5	22.2
	Total	83	39	122	24	7	31	28.9	17.9	25.4
Al-Hawiyah	1	32	18	50	16	4	20	50	22.2	40
	2	22	20	42	8	3	11	36.4	15	26.2
	3	19	8	27	9	2	11	47.4	25	40.7
	Total	73	46	119	33	9	42	45.8	19.6	35.3
Ashayrah	1	17	16	33	11	6	17	64.7	37.5	51.5
	2	28	15	43	17	7	24	60.8	46.7	55.8
	3	24	11	35	10	4	14	41.7	36.4	40
	Total	69	42	111	38	17	55	55.1	40.5	49.6