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ECTOPARASITES OF DRAGONFLIES AND DAMSELFLIES IN CENTRAL NEPAL

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Abstract

Water mites as ectoparasites on odonata documented in this paper is first report of Nepal. this paper deals with parasitic association with odonata at Pravash local ponds and ponds of Ramgram Stupa observed during 2018 and 2019 respectively. We recorded 101 mites from 16 individuals of odonata. Both dragonflies (*Brachythemis contaminata, Crocothemis servilia, Orthetrum sabina, Trithemis pallidinervis*) and damselflies (*Ischnura aurora, Agriocnemis pygmaea, Ceriagrion falax, Ceriagrion coromandellianum*) were parasitized by *Arrenurus* spp. Maximum (23 mites) were reported from female *Crocothemis servilia*. The mites of three colours, orange, dark green and black were attached to the different sites of the thorax and abdomen. Mites were attached in scattered form except on male *Crocothemis servilia,* arranged in inverted V-shaped on ventral side of thorax and cluster form on thorax of *Agriocnemis pygmaea* . Mostly female odonates (11individuals by 71 mites) were infested by mites than male (5 individual by 30 mites).

Keywords: *Arrenurus,* odonata, water mites, Nepal

Introduction

Odonatess are amphibiotic insects. Their eggs & naids are aquatic while adults are terrestrial. Like other insects, ectoparasites of odonates belong to three water mites families (Arrenuridae, Hydraphantidae, and Limnocaridae) (Smith and Oliver 1986). Genus *Arrenurus* of family Arrenuridae is widely distributed ectoparasite of odonates. Odonates are parasitized by more than 55 larvae of *Arrenurus* (Corbet 1999). Life cycle of *Arrenurus* passes through seven stages. Among them larval stages are only parasitic in nature. The parasitic water mite larva are associated with last larval instar of odonate. Later on mites migrate to emergent adult from exuvia (Andre and Cordero 1998). Mite larva feed on haemolymph from the host (Smith 1988).

Beside odonates *Arrenurus* has been recorded parasitized on diptera and Coleoptera (Zawal 2006).

Methods

Odonata observation was carried during months May- September, 2018 at Pravash local ponds, Tansen Municipality, Palpa (27.84125 N & 83.54645 E, 2850ft.) & March-November, 2019 at ponds of Ramgram Stupa, Ramgram Municipality (27.49806 N & 83.68001 E, 359 ft.) (Figure: 1).During survey encountered mites parasitized species are only documented in this paper. Odonate species were captured by insect sweeping net then number of mites were counted, photographed and released them. Some mites were collected for further identification. Odonates were identified with the help of keys (Fraser 1933, 1934 & 1936; Subramanian, 2009; Nair 2011).

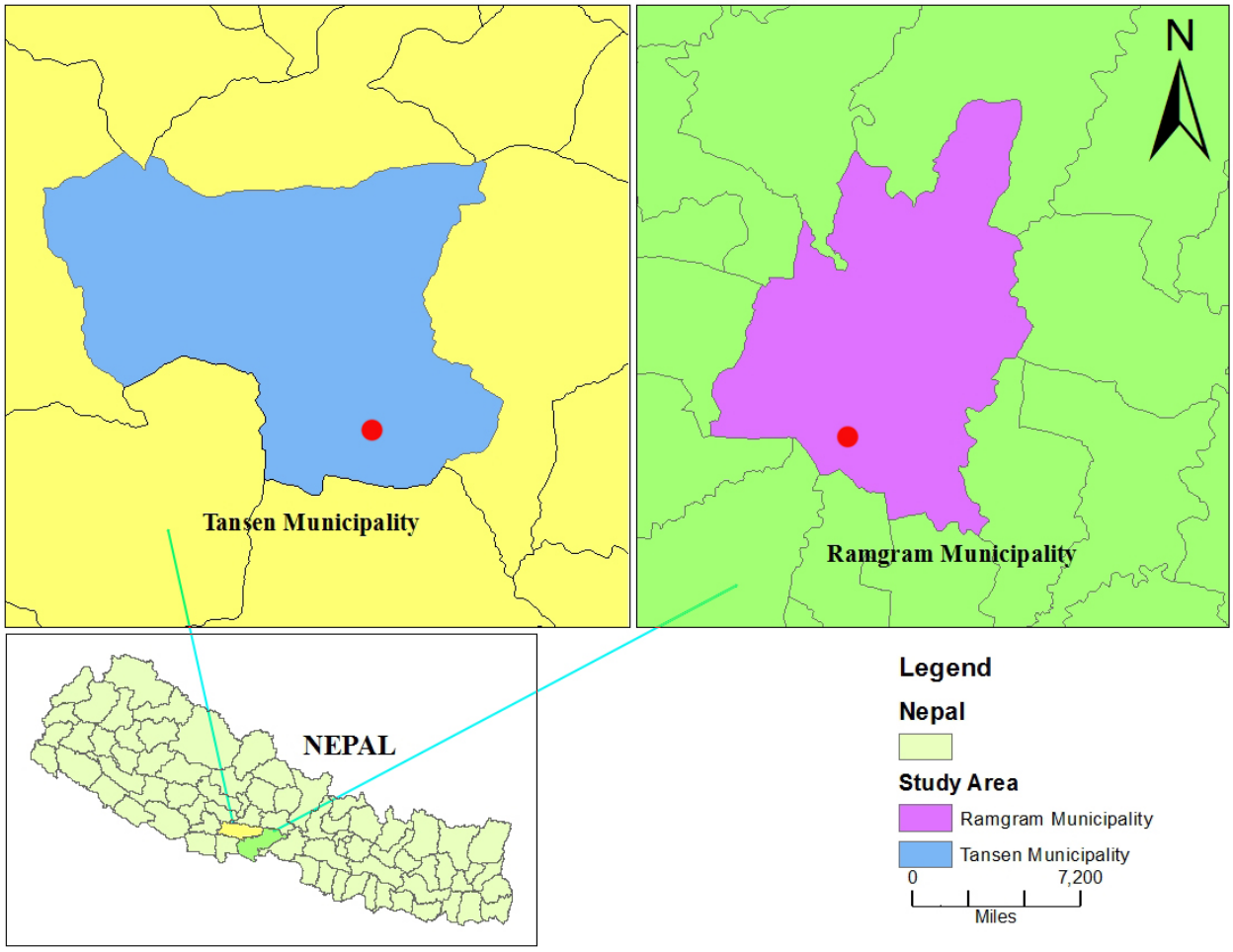

Figure 1: Map of study area

Results

During the study, we recorded 101 aquatic mites (*Arrenurus* spp.) parasitized on 16 individuals belonging to eight odonate species. Odonate species (four anisoptera: libellulidae & four

zygoptera: coenagrionidae) were *Brachythemis contaminata, Crocothemis servilia, Orthetrum sabina, Trithemis pallidinervis, Ischnura aurora, Agriocnemis pygmaea, Ceriagrion falax, Ceriagrion coromandellianum*. The highest mites attached per individual host species was in *Crocothemis servilia* (39) *followed by Agriocnemis pygmaea* (25), *Ischnura aurora* (18), *Trithemis pallidinervis (6), Ceriagrion falax* (5), *Brachythemis contaminata* (4), *Orthetrum sabina* (2) *and Ceriagrion coromandellianum* (2) (Table:1). *Arrenurus* spp. was found attached to the different sides of the thorax and abdomen. The mites attached with odonate species were of three colours, orange (54 individuals), dark green (45), and black (2). In comparison to sex ratio, we found mostly female odonates (11 individuals by 71 mites) were infested by mites than male (5 individual by 30 mites).

Table 1: list of mites attachment sites on odonates in Central Nepal

S. N.	**Host Species**	**Mites**		**Attachment Site**
		Colour	**No.**	
1.	*Brachythemis contaminata* (F)	Dark Green	4	Mid thorax
2.	*Crocothemis servilia* (M)	Dark Green	16	Inverted V-shaped arranged on ventral side of thorax
3.	*Crocothemis servilia* (F)	Orange	23	All abdominal segments except last two segments
4.	*Orthetrum sabina* (F)	Black	2	ventral side of abdomen
5.	*Trithemis pallidinervis* (F)	Dark Green	6	2 on 4^{th} to 7^{th} abdominal segments & 4 on mid thorax
6.	*Agriocnemis pygmaea* (M)	Dark Green	6	3 on right side & 3 on left side of thorax
7.	*Agriocnemis pygmaea* (F)	Dark Green	6	On right side of thorax in cluster form
8.	*Agriocnemis pygmaea* (F)	Dark Green	1	on thorax: base of right fore-wing
9.	*Agriocnemis pygmaea* (F)	Orange	8	3 on ventral side thorax, 5 on 3^{rd} - 6^{th} abdominal segment
10.	*Agriocnemis pygmaea* (F)	Dark Green	4	3 on ventral side of thorax & 1 on dorsal side of thorax
11.	*Ceriagrion coromandellianum* (F)	Dark Green	2	3^{rd} & 5^{th} segment of abdomen
12.	*Ceriagrion falax* (M)	Orange	2	Ventral side on thorax
13.	*Ceriagrion falax* (M)	Orange	1	Dorsal side of 7^{th} abdominal segment
14.	*Ceriagrion falax* (F)	Orange	2	Right side of thorax
15.	*Ischnura aurora* (M)	Orange	5	3 on left side of thorax & 2 on 6^{th} abdominal segment
16.	*Ischnura aurora* (F)	Orange	13	Scattered on ventral side of abdomen
Total (16 individual of 8 species)			101	

F= Female, M= Male

Discussion

Only *Arrenurus* sp. belonging to Arrenuridae family was recorded during study though three families of water mites parasites on odonate species. The result shows dragonflies (5 individual by 51 mites) are more parasitized with high mites number (23 in female *Crocothemis servilia* in single host) than damselflies (11 individual by 50 mites). The ratio of mites individual attachment to per odonate species was higher in dragonflies than damselflies. Except female *Ischnura aurora* (13 mites) all damselflies are infested by very low number of mites. Though more number of mites were found in dragonflies, we found more damselflies species parasitized by mites. In comparison to sex ratio, we found mostly female odonates were infested by mites than male. The preference of female host was highly observed by many researchers (Robb & Forbes 2006; Andrew et al. 2012). Similarly 50 individual mites were located on abdomen and 50 on thorax where there is soft pleural folds from which they can easily gets nutrients. Baker et al. 2007 concluded that mites choose the attachment site. Single dark green coloured mite was found attached on base of right fore-wing of female *Agriocnemis pygmaea*. Although this type of attachment is less common, there is previous evidence of basal attachment (Abro 1982). In male *Ceriagrion falax* single orange coloured mites was noted on dorsal side of 7^{th} abdominal segment. Mites are host's body fluids feeder so we thought female preference is to get more nutrients since they bear eggs as well as while laying egg mature mites can get back to water bodies more easily. During vitellogenesis more nutrition are passed through haemolymph in female odonates (Tembhare 2012). Black colour mites were recorded only in female *Orthetrum sabina*. Recorded mites were almost scattered form in both dragonflies and damselflies except on male *Crocothemis servilia,*16 dark green mites were arranged in inverted V-shaped on ventral side of thorax. Similar arrangement was also reported on female *Crocothemis servilia* in Wena Dam, India (Andrew et al. 2015) and female *Crocothemis servilia*, female Acisoma panorpoides in central India (Andrew et al. 2012) but their colour was orange. Although mites were parasitized in odonate species, no any noticeable behavioral changes have been rerecorded. We encountered *Ceriagrion falax* mating, egg laying (fig: A), *Agriocnemis pygmaea* (fig: B, E) feeding on diptera, copulation (fig: C, D) and *Orthetrum sabina* feeding on *Neurothemis tullia.*

Conclusion

From our study we conclude that, both dragonflies and damselflies are parasitized by water mites. Female are more parasitized in comparison to male. Though mites are haemolymph feeder and associated with odonates, odonates continuous their daily activities. We also conclude that the ratio of mites attachment per individual is high in dragonflies.

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A


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Figure A-E: *Ceriagrion falax* ovipositing (A), female *Agriocnemis pygmaea* perching (B), *Agriocnemis pygmaea* copulation (view from right side) (C), *Agriocnemis pygmaea* copulation (view from left side) (D), female *Agriocnemis pygmaea* feeding on diptera (E).

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