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RESEARCH ARTICLE

Intestinal Helminth Fauna in Sleepy Lizard (*Tiliqua rugosa*) in Australia

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ABSTRACT

Intestinal helminth parasites are the most common parasites that have negative impact on local population of overlapping home ranged lizards. The aim of the study was to identify the helminth fauna in lizards and determined the relationship between size of lizards and season with parasitic egg load. A total of 47 adult lizards, comprising 21 males and 26 females were captured in Bundey Bore, South Australia during September to December 2009 and faecal samples were collected.

Higher proportions (89.4%) of subjects were infected by two kinds of helminth parasites (*Thelandros trachysauri* and *Oochoristica trachysauri)* with an average of 1.3 eggs gm^{-1} of faecal sample. Male subjects had higher (100%) infection rate than females (80.8%). *T. trachysauri* was predominant (89.4%) parasite in study population but *O. trachysauri* was found in only (19%) male and (11.5%) female populations.

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INTRODUCTION

Parasitic helminths have ability to manipulate the fitness of their host in direct and indirect way. They can alter social behaviors (aggression, reproduction and parenting) of the host (Daszak *et al*., 2000; Klein, 2003; Thomas *et al*., 2005; Poulin, 2010). Parasitic infection also reduces the mobility of the host (Poulin, 2010; Fellous *et al*., 2011) that leads to the shortage of food, inability to find a mating partner, reduced fertility and survival rate as well as can be directed towards the death of the host (Zuk *et al*., 1998; Fenner and Bull, 2008). Intestinal parasitic helminthes are mainly transmitted through the ingestion of contaminated food and water (Thompson, 2001; Ashbolt, 2004). The transmission rate is higher in those animals; who has an overlapping home range (Loehle, 1995; Godfrey *et al*., 2009).

Sleepy lizards (*Tiliqua rugosa*) live in group and have overlapping home range. This social behavior makes sleepy lizards; vulnerable to the parasitic infection (Bull, 1987; Bull and Freake, 1999). In South Australia, there are large numbers of research was carried out with sleepy lizards and its conservation (Bull and Burzacott, 1993; Main and Bull, 2000; Bull, 2000). All of those research focuses on the external parasites of sleepy lizards, genetics of ticks and behavior of the lizard. There was not enough importance given to the gastrointestinal parasites although they can cause temporary or permanent decline of local host population (Daszak *et al.*, 2000). The available literature suggested that studies conducted in gastrointestinal parasites of sleepy lizard were early and mid 1900's (Johnston and Mawson, 1947; Angel and Mawson, 1968). Those studies only looked types of helminthes parasites in sleepy lizards.

The main aim of this study was to identify the helminth parasites in sleepy lizards and determine the relationship of infection with sex and size of lizards. This research also evaluates the effect of season in the parasitic egg load in the lizards.

MATERIALS AND METHODS

Study area and study population

The study was carried out from September to December 2009 around Bundey Bore station of South Australia. The Bundey Bore station is situated (139˚21' E, 33˚55' S) in the mid north of South Australia. It is almost 150 kilometer from Adelaide (Leu *et al.*, 2010). This study was conducted in different large seasonal sheep farms. Vegetation of the study area was small chenopod shrub land with few individual bushes (Kerr *et al.*, 2003).

Data collection

A cross sectional survey was conducted between September and December, 2009. A total of 47 faecal samples were collected from 21 males and 26 females adult lizards by capturing and holding in hand. The fresh faecal samples were kept in the labeled (lizard identification number) sterilized sample collecting vial. Physical data such as weight, SVL, sex were taken. The collected samples were then transported to the biology laboratory of Flinders University of South Australia. Magnesium floating (Bowman *et al.,* 2003) method was applied to extract helminths ova from samples and a microscopic observation was carried out to identify the parasitic ova. All the findings from laboratory and field were stored into a Microsoft Excel spreadsheet. The numbers of eggs were log transformed prior to analysis. All the results were tested statistically significant (P<0.05) level.

RESULTS

Overall parasitic helminth infection was very high (89.4%) with an average of 1.3 eggs gm^{-1} of faecal sample. Helminth infection was higher (100%) in male lizards in comparison to the (80.8%) female lizards. The average egg load was similar, 1.3 eggs gm^{-1} of faeces in both sexes of lizards. The study population had two types of parasitic helminths (*Thelandros trachysauri* and *Oochoristica trachysauri). Thelandros* was the predominant (89.4%) parasite in both sexes of lizards but only 14.9% had *Oochoristica.* All (100%) studied male had *Thelandros* and 19% *Oochoristica*. Similarly, female had 80.8% *Thelandros* and 11.5% *Oochoristica* in their faecal sample (Table 1).

The average egg load was higher (1.7 eggs gm^{-1} faeces) in September and decreased constantly in October, November and was lowest (0.9 eggs gm^{-1}faeces) in December. Higher (1.9 eggs gm^{-1} faeces) in female was found in September but in male higher (1.6 eggs gm^{-1} faeces) was found in October. In both sexes November and December had relatively lower (Table 1). Chi-square test showed that the total egg load in the different months in different sexes was statistically not significant (P>0.9).

The overall egg load was higher (2.4 eggs gm^{-1} faeces) in the lighter (<700gm). The egg load was gradually decreased by increased weight of lizards and it was (2 eggs gm^{-1} faeces) in the heavier (>800) lizards. The result was statistically not significant (P>0.98) (Table 2). The egg load of *Thelandros* was higher in all size of lizards than egg load of *Oochoristica* and the difference between the egg load of two parasites was statistically significant (P<0.05).

The overall egg load was higher (2.6 eggs gm^{-1} faeces) in the smaller (<30 SVL) lizards. The egg load was gradually decreased by increased size of lizards and it was (1.6 eggs gm^{-1} faeces) in the large (>31 SVL) lizards. The result was statistically not significant (P>0.93) (Table 2). The egg load of *Thelandros* was higher in all shaped of lizards than egg load of *Oochoristica* and the difference between the egg load of two parasites was statistically significant (P<0.05).

DISCUSSION

Sleepy lizards survive in very difficult environmental condition. They live in empty wombat borrow (Leu *et al*., 2010) with overlapping home range Bull, 1987; Bull and Freake, 1999). Sharing borrows could increases the risk of higher rate of parasite transition (Fenner and Bull, 2008; Godfrey *et al*., 2009). This might be the crucial factors for the higher (89.4%) infection rate. Parasitic infection may be result of the social behavior of the lizards. Male lizards are territorial in nature and travel more during mating season than female (Bull and Pamula, 1996). Male lizards travel more than female during this time. This could easily escalate the chances of higher infection rate in male than female lizards. Ibrahim *et al*. (2005) looked at gastrointestinal helminthes in *Chalcides ocellatus* and found higher (87.6%) of lizards were infected by gastrointestinal parasites. He indicated that the parasitic infection levels in male were higher than female but there was not statistically significant difference between them.

Sleepy lizards were active only in spring and early summer in South Australia (Bull, 2000). Lizards did not show any activities in winter and summer when the weather is too cold or too hot (Bull and Freake, 1999). Climate has impact on abundance of food intake by lizards. If they consume food frequently they might discard larger volume of faecal matter as well as parasite eggs. This might be the case of having higher egg load when the weather was suitable for lizards' activities. Other researcher (Ibrahim *et al.,* 2005; Al-Shareef A-al-D, 1995) also indicated that climatic condition had changed the parasitic infection in lizards.

Weight has been known as clear indicator of feeding and moving behavior in lizards (Van Damme *et al.,* 1991). Heavier lizards required more food but unavailability of adequate food might suppress the egg load in heavier lizards. Similarly in smaller lizards might travel more and get more food. That leads to the faster gastrointestinal movement. The frequent gastrointestinal movement increases the chance of more eggs passing out in faeces.

The study showed that egg load of *Thelandros* was higher in lizards. This might because *Oochoristica* need

Table 1: Monthly distribution of helminth egg load and disease prevalence

			Thelandros +ve				*Oochoristica* +ve			
	Total Observed (n)		Male		Female		Male		Female	
Months	Male (n)	Female (n)	(n)	eggs/gm*	(n)	eggs/gm*	(n)	eggs/gm*	(n)	eggs/gm*
September	6	13	6(100%)	2.9	13(100%)	3.3	0	0	3(23.1%)	0.5
October	3	2	3(100%)	2.8	2(100%)	2.2	1(33.3)	0.4	0	0
November	7	9	7(100%)	1.2	4(44.4%)	1.9	2(28.6%)	1.6	0	0
December	5	2	5(100%)	1	2(100%)	2.1	1(20%)	0.4	0	0
Total	21	26	21(100%)	2.0	21(80.8%)	2.4	5(23.8%)	0.6	3(11.5%)	0.1

Table 2: Distribution of helminth egg load in different size and weight lizards

			Thelandros +ve		*Oochoristica* +ve	
Variables		Total Obs (n)	(n)	eggs/gm*	(n)	eggs/gm*
SVL	<30	10	10(100%)	2.6	0	0
	30-31	27	24(88.9)	2.2	5(18.5%)	0.2
	>31	10	8(80%)	1.5	2(20%)	0.1
Weight	<700	13	11(84.6%)	2.2	2(15.4%)	0.2
	700-800	25	24(96%)	2.2	1(4%)	0.03
	>800	9	7(77.8%)	1.8	4(44.4%)	0.2

Oochoristica need intermediate host to complete their life cycle and beetles are perfect intermediate host for *Oochoristica* (Criscione and Font, 2001). Without intermediate hosts *Oochoristica* cannot complete their life cycle. On the other hand, nematodes have direct life cycle they do not need intermediate host to complete their life cycle. Their eggs can survive on the soil and leaves of plants for long time under favorable condition (Anderson, 1988). This might be responsible for higher egg load of *Thelandros* found in the sleepy lizards. Ibrahim *et al*., (2005) also reported higher nematode infection than cestode and had a weak positive correlation between nematode infection and SVL and body weight of *Chalcides ocellatus*. Similar result was reported in Egypt by Al-Shareef A-al-D (1995).

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REFERENCES

Al-Shareef A-al-D SSA, 1995. Ecological studies of Chalcides ocellatus (Forskal, 1775) and Hemidactylus turcicus (Linnaeus, 1758) from Egypt with special reference to helminthic parasites. J Egypt Soc Parasitol, 25: 145-156.

Anderson RC, 1988. Nematode transmission patterns. J Parasitol, 74: 30-45.

Angel LM and PM Mawson, 1968. Helminths from some lizards mostly from South Australia. Trans Roy Soc SA, 52: 59-72.

Ashbolt NJ, 2004. Microbial contamination of drinking water and disease outcomes in developing regions. Toxicol, 198: 229-238.

Bowman DD, MD Little and RS Reimers, 2003. Precision and accuracy of an assay for detecting *Ascaris* eggs in various biosolid matrices. Water Res, 37: 2063-2072.

Bull CM, 1987. A population study of the viviparous Australian lizard, *Trachydosaurus rugosus* (Scincidae). Copeia, 3: 749-757.

Bull CM, 2000. Monogamy in lizards. Behav Processes, 51: 7-20.

Bull CM and D Burzacott, 1993. The impact of tick load on the fitness of their lizard hosts. Oecologia, 96: 415-419.

Bull CM and MJ Freake, 1999. Home-range fidelity in the Australian sleepy lizard, *Tiliqua rugosa*. Aust J Zool, 47: 125-132.

Bull CM and Y Pamila, 1996. Sexually dimorphic head sizes and reproductive success in the sleepy lizard Tiliqua rugosa. J Zool, 240: 511-521.

Criscione CD and WF Front, 2001. Development and specificity of *Oochoristica javaensis* (Eucestoda: Cyclophyllidea: Anoplocephalidae: Linstowiinae). Comp Parasitol, 68: 149-155.

Daszak P, AA Cunningham and AD Hyatt, 2000. Emerging infectious diseases of wildlife-threats to biodiversity and human health. Sci, 287: 443-449.

Fellous S, E Quillery, AB Duncan and O Kaltz, 2011. Parasitic infection reduces dispersal of ciliate host. Biol Letters, 7: 327-329.

Fenner AL and CM Bull, 2008. The impact of nematode parasites on the behaviour of an Australian lizard, the gidgee skink *Egernia stokesii*. Ecol Res, 23: 897-903.

Godfrey SS, CM Bull, R James and K Murray, 2009. Network structure and parasite transmission in a group living lizard, the gidgee skink, *Egernia stokesii*. Behav Ecol Socio, 63: 1045-1056.

Ibrahim H, M Fadiel and G Nair, 2005. Gastrointestinal helminths of the lizard *Chalcides ocellatus* from Benghazi, Libya. J Helminthol, 79: 35-39.

Johnston TH and PM Mawson, 1947. Some nematodes from Australian lizards. Trans Roy Soc SA, 71: 22-27.

Kerr GD, CM Bull and D Burzacott, 2003. Refuge sites used by the scincid lizard *Tiliqua rugosa*. Aust Ecol, 28: 152-160.

Klein SL, 2003. Parasite manipulation of the proximate mechanisms that mediate social behavior in vertebrates. Physiol Behav, 79: 441-449.

Leu ST, J Bashford, PM Kappeler and CM Bull, 2010. Association networks reveal social organization in the sleepy lizard. Anim Behav, 79: 217-225.

Loehle C, 1995. Social barriers to pathogen transmission in wild animal populations. Ecol, 76: 326-335.

Main AR and CM Bull, 2000. The impact of tick parasites on the behaviour of the lizard *Tiliqua rugosa*. Oecologia, 122: 574-581.

Poulin R, 2010. Parasite manipulation of host behavior: an update and frequently asked questions. Adv Study Behav, 41: 151-186.

Thomas F, S Adamo and J Moore, 2005. Parasitic manipulation: where are we and where should we go? Behav Processes, 68: 185-199.

Thompson R, 2001. The future impact of societal and cultural factors on parasitic disease-some emerging issues. Int J Parasitol, 31: 949-959.

VanDamme R, D Bauwens and RF Verheyen, 1991. The thermal dependence of feeding behaviour, food consumption and gut-passage time in the lizard *Lacerta vivipara* Jacquin. Funct Ecol, 5: 507-517.

Zuk M, T Kim, SI Robinson and TS Johnsen, 1998. Parasites influence social rank and morphology, but not mate choice, in female jungle flow, *Gallus gallus*. Anim Behav, 56: 493-499.