

Parasites of two co-occurring house gecko species, *Hemidactylus frenatus* and *Gehyra mutilata* from Central Sri Lanka

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Abstract

Two house gecko species, the Asian house gecko, *Hemidactylus frenatus* (Schlegel, 1836) and the four-clawed gecko, *Gehyra mutilate* (Wiegmann, 1834) inhabiting urban areas in Kandy and Kegalle districts were examined to determine the types of ecto and endo parasites, their prevalence and intensity of infections. A total of 45 geckos from the two species were dissected after anesthetizing of which 21 individuals (47%) were infected with one or more parasites. Both host species were infected by helminthes such as the nematodes and a fluke species. In addition mites (*Geckobia sp.*) and an acanthocephalan (*Acanthocephalus serendibensis*), and ciliates were found only in *H. frenatus*. Although the two gecko species co-occur, some parasites show host specificity. Nematode infections (possibly *Oxyuris* infection) were the most common type with 29% prevalence. Although *A. serendibensis* has been previously described from an agamid, *Ceratophora stoddarti*, and two geckonids *Cnemaspis kandiana* and *Cnemaspis tropidogaster* from Sri Lanka, *H. frenatus* presents a new host record for *A. serendibensis* and occurred at high intensity of 5-10 worms per host. There were no parasites in the blood or body cavity of the geckos examined. More female geckos were infected with parasites than males ($\chi^2=5.20$, $p<0.05$). Although *H. frenatus* harboured parasites of all five groups while *G. mutilate* had only two groups, there was no significant difference in the prevalence of infections between the two species ($\chi^2=1.16$, $p>0.05$). None of the identified parasite species have a zoonotic potential.

Key words: House geckos, parasites, *Hemidactylus frenatus*, *Gehyra mutilate*

Introduction

Twenty species of geckos (Family: Gekkonidae) have been recorded in Sri Lanka (de Silva, 2001) and those found in

human dwellings are called "house geckos". In this study we aim to identify the parasites found in two house gecko species, the Asian house gecko, *Hemidactylus frenatus* and the four-

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clawed gecko, *Gehyra mutilate* and to determine prevalence and intensity of infections. *Hemidactylus frenatus* has a worldwide subtropical-tropical distribution and a patchy occurrence outside Asia (Goldberg *et al.*, 1998). International movement of ships and cargo has assisted its spread across the world and populations now exist in numerous islands and countries (Csurhes and Markula, 2009). There is some evidence that *H. frenatus* can compete and perhaps replace locally native gecko species, especially in urban areas. It is very adaptable and prey on insects and spiders. *Gehyra mutilata* ranging from India to Myanmar, Indo-China, the Malay Peninsula, and Indonesia to Oceania and coastal Mexico (Goldberg *et al.*, 1998). It is also very adaptable to its surrounding and usually prefers woodlands, rocky areas and human habitats.

Parasitism remains a neglected aspect of Sri Lankan reptile biology hence little is known about the parasites that infect geckos. The first report dates back to 1906 where von Linstow described a nematode, *Oxyuris megaloon* (currently *Parapharyngodon* species) from *Hemidactylus leschenaultii*. As part of a broader survey of the parasites of endemic element of Sri Lankan vertebrates, Cruz and Ching (1975) carried out helminths surveys of three gecko

species; *Hemidactylus brookii*, *H. triedruslankae* and *C. kandianus*. They reported an acanthocephalan *Acanthocephalus serendibensis* in *Cnemaspis kandiana* and later Cruz (1984) found a digenean, *Paradistomum* sp. in *Hemidactylus parvimaclulatus*. Subsequently, two more studies have been carried out; one on the golden gecko, *Calodactylodes illingworthorum* inhabiting Nilgala fire savanna in Monaragala district (de Silva *et al.*, 2004) and another on geckos of Knuckles massif (de Silva *et al.*, 2005). A more recent survey of nine gecko species recorded many helminthes (Goldberg *et al.*, 2011).

Materials & Methods

Geckos inhabiting houses from selected urban sites in Kandy and Kegalle districts in Central Sri Lanka were collected from August 2007 to February 2008. Geckos were identified, euthanized within 12 hr of capture, and necropsies were carried out. Information about sex, microhabitat and the physiological condition of each animal was recorded. External areas of the body such as head region, armpits and anal area and between fingers and toes were examined for ectoparasites. Parasites found were transferred into 70% ethanol and were observed under the dissection microscope and identified.

The body cavity was opened by a longitudinal incision, and the gastrointestinal tract was removed and opened. The esophagus, stomach, small

were identified after glycerol wet mounts. Smears were prepared from the gut content and were fixed in Shouiding's fixative and then double stained in Harris'

Table 1 Site of infection, prevalence and intensity of parasites recorded from *G. mutilata* and *H. frenatus*

| Type of Parasite | Site of infection | Prevalence (%) | | Mean intensity (Range) | |
|-------------------------|------------------------------|--------------------|--------------------|------------------------|--------------------|
| | | <i>G. mutilate</i> | <i>H. frenatus</i> | <i>G. mutilate</i> | <i>H. frenatus</i> |
| <i>Geckobiasp</i> | Skin, underarm, between toes | - | 4/21 (19%) | - | 5 (2 – 7) |
| Nematodes | Small intestine | 10/24 (42%) | 6/21 (29%) | 4 (1 – 8) | 3 (1 – 3) |
| Flukes | Stomach & Small intestine | 3/24 (13%) | 1/21 (5%) | 2 (1 – 4) | 1 |
| <i>A. serendibensis</i> | Small intestine | - | 2/21 (10%) | - | 7 (5 – 10) |
| Ciliates | Stomach | - | 1/21 (5%) | - | 20 |

intestine, and large intestine were examined for parasites under a dissecting microscope. Identification was made from these temporary wet mounts. A portion of each part of the gut of each individual was placed on a watch glass and a few drops of saline were added on to it and observed under the light microscope. Live parasites were separated by using a dropper and preserved in 70% ethanol. Permanent slides were prepared by using the single staining procedure (Borax Carmine) for identification. Nematodes

Heamatoxyline and Eosine and observed under the light microscope for parasites and eggs. The heart was removed and a few drops of blood were taken from a puncture. Blood smears were prepared on a microscope slide and stained with Leishman's dye and observed for blood parasites. The prevalence and the mean intensity of different types of parasites were determined. The difference of prevalence in overall infection was compared between males and females, two sites and two species using a chi

square test. Handling of live geckos and euthanizing were carried out according to protocols approved by the Canadian Council on Animal Care (CCAC, 1992).

Results

All the geckos dissected looked healthy and active. External appearances of any of the species did not indicate symptoms of any disease. Their microhabitats were mostly inside houses on walls, roofs and other surfaces where there were lights to attract insects. They were also found in outdoors like under logs and surface of the tree barks in the vicinity of the house. Of the 45 individuals examined, 21 (47%) were infected with one or more parasites. The parasitic fauna found in the two species consisted of five broad groups

namely one ectoparasitic mite and endoparasites such as nematodes, flukes, acanthocephalans and ciliates (Table 1). There were no parasites in the blood or body cavity of the geckos examined.

Mites were found only in *H. frenatus* collected from both sites with an overall prevalence 19% (4/21) and an average intensity of five (Table 1). Their body was usually flattened, bright orange to red in color, eyes seemingly absent, four pairs of legs were present except in larvae and body is circular to broadly oval in outline and densely hairy. They were found attached to the skin of hind and forelegs in between fingers and under side of the arms.

Table 2 Overall prevalence and intensity of infections in *G. mutilata* and *H. frenatus* from the two study sites in Kegalle and Kandy

| | Prevalence (%) | | χ^2 |
|--------------|-------------------------|-------------------------|--------------------|
| | <i>G. mutilata</i> (24) | <i>H. frenatus</i> (21) | |
| Kegalle (22) | 8/12 (67%) | 3/10 (30%) | 0.55 ($p>0.05$) |
| Kandy (23) | 5/12 (42%) | 5/11 (45%) | |
| Total | 13/24 (54%) | 8/21 (38%) | 1.16 ($p>0.05$) |
| Male (14) | 2/7 (29%) | 1/7 (14%) | 5.20 ($p<0.05$)* |
| Female (31) | 10/17 (59%) | 8/14 (57%) | |

Of the endoparasites, nematode infection (possibly *Oxyuris* infection) was the most common type with a high prevalence of 42% in *G. mutilata* and 29% in *H. frenatus*. All the nematodes were found in the small intestine. One species of digenetic trematode was found in the stomach and small intestine of both species which could be *Mesocoelium monas*. DNA studies are required to confirm the morphological identification of the nematode and trematode species. Larval stage of *Acanthocephalus serendibensis* and ciliates were found only found in *H. frenatus* collected from Kandy district. None of the gut associated organs had any parasites. There were no parasites in blood smears or in the body cavity of dissected specimens of both gecko species.

There was no difference in the prevalence of infection between the two sites Kandy and Kegalle (Chi Square test, $p > 0.05$; Table 2) or between the two species ($\chi^2 = 1.16$, $p > 0.05$). However, *H. frenatus* harboured parasites of all five groups while *G. mutilata* had only nematodes and flukes (Table 2). More female geckos were infected with parasites than males (Chi Square test, $p < 0.05$; Table 2).

DISCUSSION

This study revealed the presence of five different parasitic groups including

nematodes, flukes, acanthocephalans, ciliates and mites belonging to various taxa in the two gecko species *G. mutilata* and *H. frenatus* collected from selected sites in Kandy district and Kegalle district. Of these parasites, the mite *Geckobia*, ciliates and *A. serendibensis* was recorded only from *H. frenatus*. Of the two hosts, *H. frenatus* harboured more diverse parasitic species than *G. mutilata* and is thus reflective of the host's ability to sustain various parasitic requirements. Although the two gecko species shared the same habitat some parasites show host specificity where *G. mutilata* was infected with only helminthes while *H. frenatus* had acanthocephalans, ciliates and mites in addition to the helminthes.

Geckobia belongs to Family Pterygosomatidae, which are usually confined to lizards and all their developmental stages are ectoparasitic (Simpson and Sarda, 1985). Geckos observed in the Knuckles massif such as *Cyrtodactylus soba*, *Cnemaspis kandianus* were found infested with red mites (de Silva, 2005). Mite infections can cause problems with sloughing old skin and are associated with significant shorter life spans, at least for geckos found indoors (Walter and Shaw, 2002). The mite species *Geckobia tasmani* has been recorded from *H. mabouia* from Tanzania (Simpson and Sarda, 1985) and *G.*

bataviensis from *H. frenatus* from Australia (Walter and Shaw, 2002).

In a recent study carried out in Sri Lanka recorded two nematode species *Skrjabinelazia hemidactyli* from *G. mutilate* and *Spauligodon hemidactylus* from *H. frenatus* (Goldberg *et al.*, 2011) and earlier *Oxyurismegaloon* from *Hemidactylus leschenaultia* (von Linstow, 1906). Although the nematodes isolated in the present study morphologically resembled *Oxyuris* sp., further studies are needed for confirmation.

Acanthocephalus serendibensis was originally described from agamid, *Ceratophora stoddarti* (Cruz and Mills 1970) and then later in geckonid *Cnemaspis kandiana* (Cruz and Ching, 1975) and recently in *Cnemaspis tropidogaster* (Golberet *al.*, 2011). *Hemidactylus frenatus* presents a new host record for *A. serendibensis*.

These two gecko species were infected by generalist helminth species such as the nematodes and the fluke species but Acanthocephala, ciliates and mites were only found in *H. frenatus*. Geckos are easily spread across the world through ships and cargo and the parasites that they harbor also move with the host species.

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