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NOTE

Occurrence of cloacal prolapse in wild hylids in the Wet Tropics, Australia

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ABSTRACT: The idiopathic syndrome of cloacal prolapse was observed in the frog *Litoria rheocola* at 2 sites in the Wet Tropics of Australia; 1 of 365 individuals (0.3%) at Tully Gorge National Park and 5 of 92 individuals (5.4%) at Murray Upper National Park. The condition appeared to have resolved spontaneously with no clinical complications in 2 individuals at successive captures 14 and 155 d later. It was not observed in the sympatric frogs *L. genimaculata* (n = 206), *L. nannotis* (n = 357) or *Nyctimystes dayi* (n = 304) at either location. The underlying cause was not conclusively determined.

KEY WORDS: Hylid · Cloacal prolapse · Diet

INTRODUCTION

Cloacal prolapse is usually an idiopathic syndrome, relatively common in captive amphibians. The most common known cause of cloacal prolapse in captive anurans is nematodiasis (Wright 2001a); less common causes include dehydration, hyperthermia, hypocalcaemia, malnutrition, gastrointestinal impaction or obstruction, straining associated with gastroenteritis, cystic calculi, toxin exposure, convulsions, neoplasia and trauma (Wright 2001a,b, 2006). There is no description of the rate of occurrence among wild frogs. During routine monitoring of marked individual frogs in the Wet Topics, Australia, we detected prolapse of tissue through the cloaca, determined its prevalence and observed spontaneous recovery in some individuals.

MATERIALS AND METHODS

Frogs were surveyed along 150 to 200 m stream transects in Tully Gorge National Park (17° 46′ S, 145° 38′ E, elevation 100 m) and Murray Upper National Park (18° 11′ S, 145° 52′ E, elevation 250 m) in North Queensland, Australia. The sympatric hylid species *Litoria genimaculata* (green-eyed tree frog), *L. nannotis* (waterfall frog) and *L. rheocola* (common mist frog) were routinely captured at both sites, while *Nyctimystes dayi* (Australian lace-lid) was only found at the former site. Surveys were performed monthly during the dry months (May to October) and bi-weekly during the wet season (November to April). Each site was visited for 2 to 3 nights on each trip. Animals were captured by hand during nighttime surveys, and marked by toe-clipping; a unique combination of toes were clipped, which allowed individuals to be recognised at subsequent captures.

RESULTS

Frogs with idiopathic cloacal prolapse (Fig. 1) were observed and recorded between November 2005 and April 2008. Numbers of frogs captured with the condition are summarised in Table 1. Only adult male *Litoria rheocola* presented with the syndrome, and only minor prolapse was observed. Successive clinical examinations of some individuals were possible over time.

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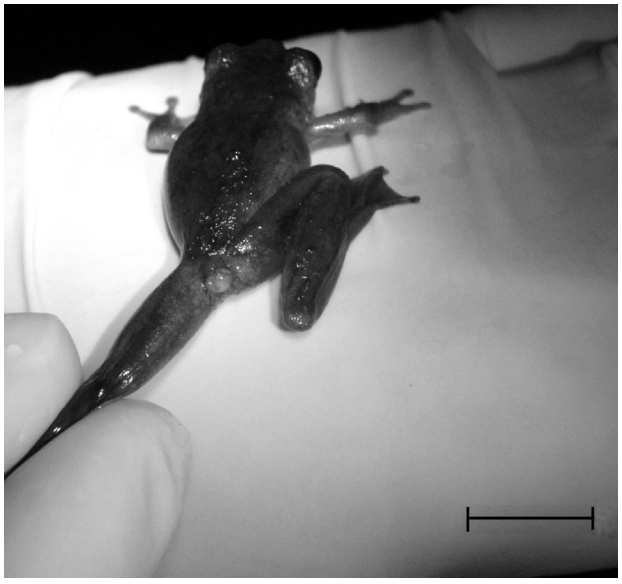

Fig. 1. *Litoria rheacola*. Male frog (Lr103) presenting with minor cloacal prolapse. Murray Upper National Park (Queensland), 21 April 2008. Scale bar = 1 cm. Photograph by A. D. Phillott

Table 1. Occurrence (Occ.) of cloacal prolapse among stream-dwelling hylids in the Wet Tropics of Australia. n: total number of frogs captured between November 2005 and April 2008; nf: not found at this location

Species	Tully Gorge National Park		Murray Upper National Park	
	Occ. (%)	n	Occ. (%)	n
Litoria genimaculata	0	35	0	171
Litoria nannotis	0	218	0	139
Litoria rheocola	0.3	365	5.5	92
Nyctimystes dayi	0	304	nf	0

In 2 of the 5 frogs captured from Murray Upper National Park, the prolapse appeared to have spontaneously resolved within 14 and 155 d of recapture (Table 2); the remaining 3 individuals were not recaptured. Prolapse-associated mortality of these individuals is possible but not a certainty since the recapture rate of *L. rheocola* at this site is 41% (A. D. Phillott unpubl. data).

DISCUSSION

We report idiopathic cloacal prolapse in 0.3 and 5.5% of wild, adult male *Litoria rheocola* captured from 2 different sites in the Wet Tropics of Queensland. The syndrome did not occur in 2 to 3 sympatric species at either location. As >90% of these stream-dwelling hylids that are captured are adult males (A. D. Phillott pers. obs.), it is not surprising the condition was only observed in males.

Table 2. *Litoria rheacola*. Recapture and recovery of frogs presenting with cloacal prolapse

Frog	Site	Date of capture	Prolapsed cloaca (+/–)
Lr14	Murray Upper	15 Nov 2005	–
		13 Dec 2005	+
		17 May 2006	–
Lr33	Murray Upper	13 Mar 2006	–
		16 May 2006	–
		14 Oct 2006	+
Lr34	Murray Upper	13 Mar 2006	–
		12 Dec 2006	+
Lr64	Murray Upper	13 Oct 2006	+
		27 Oct 2006	–
		13 Dec 2006	–
Lr103	Murray Upper	05 Jan 2008	–
		21 Apr 2008	+
Lr401	Tully Gorge	22 Apr 2008	+

The vulnerability of *Litoria rheocola* males to this condition, when compared with sympatric male anurans, is unlikely to be related to habitat preference of the species. *L. rheocola*, *L. nannotis* and *Nyctimystes dayi* all inhabit fast-flowing sections of montane, rainforest streams (Hodgkison & Hero 2002), although *L. rheocola* prefers less turbulent sections than the latter 2 species (A. D. Phillott pers. obs.). *L. genimaculata* has a more scansorial nature, and individuals spend far less time at the stream (Richards & Alford 2005, Rowley & Alford 2007).

Fig. 2. *Litoria infranfrenata*. Male frog presenting with traumatic cloacal prolapse. Smithfield (Cairns, Queensland), 26 October 2006. Ruler is in cm. Photograph by S. Young

Spontaneous resolution of cloacal prolapse in captive anurans has not been reported in the literature. Cloacal prolapse occurs relatively commonly in captive reptiles and amphibians and is considered a surgical emergency requiring immediate intervention due to the potential for severe and irreversible tissue damage (Wright 2001b, 2006, Bennett & Mader 2006). Treatment of the underlying cause(s) and manual and/or surgical correction of the tissue prolapse are required to effect resolution of the condition in captive animals. The cloacal prolapse in wild-caught anurans reported here appeared to be much less extensive and severe than many cases seen in captive anurans and in trauma-related cases in wild anurans (S. Young pers. obs.; Fig. 2), which may have contributed to successful spontaneous resolution. If the prolapse is associated with a minor transient gastrointestinal impaction or firmer faecal consistency caused by a diet change, then once the material is passed and straining stops the prolapsed tissue may invert and the condition resolve spontaneously.

Clinical identification of the origin of the prolapsed tissue was beyond the scope of the present study due to limitations imposed by field conditions. The definitive cause(s) of cloacal prolapse in these wild frogs is unknown; however, it may be diet-related. While nothing has been published on the diet of *Litoria genimaculata*, it is known that *L. rheocola*, *L. nannotis* and *Nyctimystes dayi* feed indiscriminately on a range of aquatic and terrestrial vertebrates (Hodgkison & Hero 2002, 2003). Interspecific variation in diet may contribute to the greater vulnerability of *L. rheocola* to the condition, while variation in prevalence between the 2 sites may be the result of prey composition availability.

It is also possible the prolapse may be the result of nematode infection (Wright 2001a). Infection could possibly occur after ingestion of invertebrates that act as intermediate hosts (Barton & Richards 1996); however, this has not been demonstrated and Barton (1999) concluded that helminth communities were depauperate in native frogs from northern Queensland (*Crinia deserticola* and 8 *Litoria* spp.), with low intensities of infection of few parasite species. If nematode infection does occur after consumption of contaminated prey, the dietary variation described above may contribute to the greater susceptibility of *L. rheocola* to the condition than sympatric frogs.

While it is impossible to rule out some of the predisposing factors known to cause cloacal prolapse in captive frogs, the cases reported here are less likely to have been caused by metabolic conditions such as dehydration, hyperthermia, hypocalcaemia or malnutrition, since other specific clinical signs associated with these conditions were not present. The likelihood of toxin exposure in the relatively pristine sites surveyed is also low. Prolapse resulting from cystic calculi or neoplasia would be unlikely to resolve spontaneously; therefore, these causes are unlikely in those frogs where the prolapse resolved. Mild trauma may have caused cloacal prolapse in the cases reported here. There may be subtle substrate differences between the 2 survey sites that result in increased stimulation of cloacal during normal behaviour and activity. The overrepresentation of males captured during the surveys may explain why all of the cases reported here were confined to adult male *Litoria rheocola*. However, there may be sex-specific behavioural or dietary factors in this species that predispose the males to cloacal prolapse.

In addition to providing valuable information on the occurrence and spontaneous resolution of cloacal prolapse in wild hylids, the present study highlights the value of sequential studies of the natural history of disease in marked individuals in wild amphibian populations. Repeated surveys of individually marked frogs are a valuable study tool to monitor factors affecting the status of already threatened populations, such as these frogs in the Wet Tropics.

CONCLUSIONS

This is the first report of the occurrence and spontaneous resolution of cloacal prolapse among wild frogs. While the present study was unable to identify the cause of the condition, the spatial variation in frequency between the 2 survey sites is of interest and warrants further investigation. A greater understanding of this condition would require surveys of parasite communities in different populations of wild hylids and a more detailed analysis of dietary differences between species and populations.

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