

Skinks as vectors of ticks parasitising roseate tern chicks

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During the roseate tern *Sterna dougalii* Montagu, 1813 breeding season on Aride island (April-September), the chicks are parasitised by the adult stage of the tick *Amblyomma loculosum* Neumann, 1907. These have a significant effect on chick mortality (Ramos 1999). The larval stage of the ticks parasitising the skinks was estimated to have hatched on 15th September 1998, metamorphosing into the nymph stage approximately 30-40 days later (J. Ramos, *pers. comm.*).

This note reports on an investigation of the relationship between the locally abundant *Mabuya* skinks, ticks and the roseate chicks carried out during September-November 1998. The aim of the study was to test whether skinks play a role in the transfer of ticks and whether the species, size of skink or area affects the likelihood of skinks carrying ticks.

Methods

A quantitative study was carried out on Wright's skink *Mabuya wrightii* (Boulenger, 1889) and Seychelles skinks *M. sechellensis* (Duméril & Bibron, 1834) on Aride. An area was selected in the main roseate tern colony on the west side of the island on the woodland hill. A control area was randomly selected outside the roseate colony (and away from the sooty tern *Sterna fuscata* Linnaeus, 1766 colonies) on the woodland hill path to act as a control.

The area within the roseate colony was monitored on 3 consecutive days over a 2 week period. On each day 1 hour was spent capturing skinks with a net. The skinks were measured (snout-vent length, in cm), identified and the number and location of ticks recorded. After these details had been recorded, the skinks were marked with a small dab of paint on their rear ends in order to prevent duplication of records. The skinks were then released.

Table 1. Tick distribution

	Colony	Control	Total
with ticks	49	12	61
without ticks	11	38	49
Total	60	50	110

Table 2. Prevalence of ticks on different skink species in the roseate colony

	Wright's		Seychelles		Total
	<6cm	>6cm	<6cm	>6cm	
with ticks	1	3	2	43	49
without ticks	8	0	1	2	11
Total	9	3	3	45	60

A second monitoring period was conducted on 10th November 1998 (56 days after the estimated day of tick hatching) within the same roseate colony area. This was of only 2 hours. This second monitoring period was carried out when the roseate colony was empty of adults and the ticks would be expected to be in their nymphal stage.

Results

Control area

50 skinks were captured; 38 were Seychelles skinks and 12 were Wright's skinks. Of these, 11 (22%) had ticks attached (3 Wright's skinks and 8 Seychelles skinks). All infested skinks were at least 6cm long.

Roseate colony area

60 skinks were captured; 48 were Seychelles skink and 12 were Wright's skinks. Of the 12 Wright's skinks, 3 were longer than 6cm and each had 1 tick per skink (mean=1, s.d.=0.44). The remaining 9 small skinks had an average of 0.22 ticks per skink (s.d.=0.44). Of the 48 Seychelles skinks, 45 were longer than 6cm, these had a highly variable number of ticks (0-28, mean=6.24, s.d.=6.24). The 3 small Seychelles skinks had 0-16 ticks (mean=7.3, s.d.=8.1). Although the large skinks had a lower average number of ticks, 6 individuals had more than 16 ticks. The results are summarised in Table 1.

Position of ticks

Small Seychelles skinks had an average of 3.14 ticks between their toes, compared to 2.82 for large skinks. Ticks were found in Seychelles skink armpits in small skinks only (0.91 per skink). Wright's skinks only had ticks between their toes (small skinks only; 0.6 per skink).

Skinks in the roseate colony were significantly more likely to be infested with ticks than those from the control area ($\chi^2=36.81$, $P<0.01$). Infestation was also more prevalent on Seychelles skinks than Wright's skinks ($\chi^2=23.4$, $P<0.01$). Size did not have a significant effect on the probability of infestation (Seychelles skink $\chi^2=1.73$, $P>0.1$; Wright's skink $\chi^2=1.34$, $P>0.1$). All data are in Table 2. The levels of infestation in the roseate colony are correspondingly higher in Seychelles skinks than in Wright's skinks (Table 3). In the control area infestation was low.

In Seychelles skinks, ticks were most abundant between the toes, with small numbers of ticks in the armpits of larger skinks only. Only one tick was found on a small Wright's skink and that was in the armpit. Large Wright's skinks had slightly more ticks between the toes than in the armpits (Table 4).

From the second sampling period a total of 37 skinks were captured, of which 7 were Wright's skinks and 30 Seychelles skinks. No signs of tick infestation were found in either species at this time.

Conclusions

Within the limits of the small sample sizes it appears that skinks from the roseate colony were much more likely to have ticks attached than those outside the colony. Seychelles skinks (regardless of size) were significantly more likely to have ticks attached and in

greater numbers compared to the Wright's skinks. This is probably not due simply to the differences in size between the skink species as size itself was not a significant influence on the probability of tick infestation for either species, although sample sizes in some size classes were small. Size did however appear to determine the location of ticks in Seychelles skinks. Large Seychelles skinks tended to have more ticks attached, of which most accumulated between their toes. However, large skinks were more likely than small skinks to have ticks attached in their armpits.

The absence of ticks in the second sampling period should have coincided with the ticks being present in their nymphal stage. This suggests that by the time the ticks are in the nymph stage a new host has been chosen.

From this study it is possible to make the assumption that Seychelles skinks had greater numbers of ticks attached. This may be due to the fact, that whilst capturing skinks, it was noted that Seychelles skinks were more active and had larger home ranges than Wright's skinks which tended to be more sedentary and with small territories (Venis 1998). Due to Seychelles skinks being more active, the ticks have a greater opportunity to attach themselves and thus be carried around and distributed more widely over the island. It is also possible to assume that the larger skinks have larger scales, allowing the ticks to attach more readily.

From these results it would be useful to investigate the effects of skink size further (increasing sample sizes to more reliable levels and investigating the effect of scale size on tick attachment). During the study it was noted that wedge-tailed shearwaters *Puffinus pacificus* Gmelin, 1889, juvenile sooty terns and lesser noddies *Anous tenuirostris* Temminck, 1815 were infested with nymphs around their beak, eyes and legs in mid-November 1998. All birds observed with these infestations were found either on the beach (west end) or beach path. It would be interesting to monitor the ticks, to test whether or not growth patterns coincide with other sea-bird nesting periods, which species act as the main hosts in the nymphal stage and whether roseates are more susceptible to attack by adult ticks than are other tern species.

Table 3. Numbers of tick per skink

Species	Colony			Control			
	n	mean	s.d.	n	mean	s.d.	
Seychelles	<6cm	3	7.3	8.1	6	0	0
	>6cm	45	6.24	7.14	32	0.35	0.58
Wright's	<6cm	9	0.22	0.44	5	0.2	0.45
	>6cm	3	1	0	7	0.3	0.50

Table 4. Location of ticks

Species	Total number of ticks		Mean number of ticks per skink		
	toes	armpits	toes	armpits	
Seychelles	<6cm	22	0	3.14	0
	>6cm	217	70	2.82	0.91
Wright's	<6cm	0	1	0	0.07
	>6cm	6	4	0.6	0.4

References

- Ramos, J. 1999 - The 1998 roseate tern breeding season. In Bowler, J. & Hunter, J. *Aride Island Nature Reserve, Annual Report 1998*. RSNC unpublished.
- Venis, S. 1999 - Skink populations on Aride. In Bowler, J. & Hunter, J. *Aride Island Nature Reserve, Annual Report 1998*. RSNC unpublished.

NOTES

The arrowhead vine, *Syngonium podophyllum* Schott (Family Araceae), a potential invader in Seychelles

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There appears to have been no record of the occurrence in Seychelles of *Syngonium podophyllum* Schott (Family Araceae), the so-called arrowhead vine ("patte d'oie" in French) of the foliage plant industry, before it was mentioned by Robertson (1989) in her annotated checklist of the flowering plants of these islands. Robertson found the species growing on Mahé some time between September 1975 and the end of 1981.

By 1987 *S. podophyllum* had become a widespread cultivated "ornamental" in gardens all over Mahé; in 1991 it was found to be growing as an escape near the houses on the eastern side of Frégate; in 1993 some specimens were found growing among coco-de-mer palms in the Vallée de Mai nature reserve on Praslin, and a vase containing shoots of the plant was observed in the guest-house on Silhouette (all personal observations). It is extremely likely that it occurs on La Digue as well.

In Robertson (1989) the specific name of the plant is preceded by a question mark ("*S. ?podophyllum*"), indicating that the author was uncertain of its specific status. Most of the specimens I have examined certainly appear to be *S. podophyllum*, displaying the heterophylly for which it is notorious: young plants have simple arrow-shaped dark green leaves with pale, almost whitish, markings along the major veins; while on mature plants the leaves are entirely green and range from those that consist of three leaflets (a larger central one with a pair of smaller ones at its base) to those with up to eleven leaflets arranged palmately. There are also "intermediate" leaves with three or more lobes that retain the pale markings. Some of the plants examined had slightly different leaves (some were almost heart-shaped, with the pale coloration extending beyond just the main veins) but they were probably cultivars of the same species - which would mean that there have been more than one introduction to Seychelles.

It is now clear that *S. podophyllum* has the potential to become invasive in the