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# Syncopulatory mate-guarding affected by predation in the aposematic millipede *Centrobolus inscriptus* in a swamp forest

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**Abstract**
Mate-guarding can be affected by predation. While filming mate-guarding and prolonged copulations in a South African swamp forest aposematic millipede observations were made of the results of predation on a mated pair. This is a documentation of the sheared male coleopods inserted remains in the female forest millipede *Centrobolus inscriptus* and incidentally corroborates the lock-and-key hypothesis for the evolution of millipede genitalia (gonopods (coleopods)).

**Keywords:** Genitalia, lock-and-key hypothesis, millipede, predation

## 1. Introduction
Mate-guarding is known to affect predation risk [1]. Predation on millipedes includes attacks from both vertebrates and invertebrates [2]. Specialist millipede predators include dung beetles [3] and assassin bugs [4]. Some predator species are generalists [5]. Millipedes have evolved both physical and chemical weapons to prevent predation [6-7]. In combination some species use a warning and glowing colours to deter predators from the distasteful prey [8, 9]. The genus *Centrobolus* contains 39 completely aposematic species [10]. *C. inscriptus* (Attems 1928) is an aposematically coloured mate-guarding millipede with prolonged copulations [11-27].
Here I document the potential affect of predatory attacks on mate-guarding and incidentally corroborate the lock-and-key hypothesis for the evolution of millipede genitalia in the forest species *C. inscriptus* by witnessing the remains of a mated pair which was exposed to natural predation.

## 2. Materials and methods
Forest millipedes were observed, photographed and filmed *in situ* at Mtunzini Chalets, a. k. a. Mtunzini Forest Lodge (28˚57'59.70"S, 31˚45'08.29"E), during the 2004/2005 wet season. Mating pairs were examined in the presence of predation. Female millipedes were observed to see an extreme effect of predation on mate-guarding millipedes.

## 3. Results
The filmed material formed the opening series of Life in the Undergrowth: Invasion of the Land and is available online at http://www.bbc.co.uk/programmes/b0074s26. Observations were made of a mated female after an unknown predatory attack on a mating pair. The author clearly viewed the detached male gonopod pairs inserted into a female *Centrobolus inscriptus.*

## 4. Discussion
Here I corroborate the lock-and-key hypothesis - the original hypothesis for the evolution of male and female genitalia [28-30] - by witnessing the effects of a predatory attack on an aposematic millipede mating pair. The observation of predation on *C. inscriptus* may support a future test of the "hypothesis that a warning colouration pattern involving yellow spots symmetrically distributed along the millipede body can mediate [avian] predator avoidance [8]."

## 5. Conclusion
Mate-guarding is affected by predation in the millipede *Centrobolus inscriptus*.

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