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## ***Hepatozoon langii* n. sp. and *Hepatozoon vacuolatus* n. sp. (Apicomplexa: Adeleorina: Hepatozoidae) from the crag lizard (Sauria: Cordylidae) *Pseudocordylus langi* from the North Eastern Drakensberg escarpment, Eastern Free State, South Africa**

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### **Abstract**

Two new haemogregarine species, *Hepatozoon langii* n. sp. and *Hepatozoon vacuolatus* n. sp., are described from the peripheral blood of the high altitude crag lizard, *Pseudocordylus langi*, collected between October 2006 and April 2009 from the North Eastern Drakensberg, Eastern Free State. *Hepatozoon langii* n. sp. has maturing and mature gamonts that appear encapsulated and have narrow, curved tails. Their cytoplasm stains pinkish-purple with Giemsa, while their nuclei are purple stained with stranded chromatin. Mature gamonts measure  $19.1 \pm 1.0$  (15.4–28.1)  $\mu\text{m}$  long by  $6.2 \pm 1.1$  (3.5–7.9)  $\mu\text{m}$  wide. *Hepatozoon vacuolatus* n. sp. gamonts are mostly broader at one pole than the other, have bluish-pink cytoplasm characterised by distinctive rounded and oval vacuoles, and demonstrate pink granules with Giemsa staining. Nuclei stain purple and are mainly coarsely granular. Mature gamonts measure  $16.5 \pm 1.0$  (14.7 - 17.6)  $\mu\text{m}$  long by  $5.9 \pm 1.2$  (4.0 - 7.7)  $\mu\text{m}$  wide. Both species parasitize erythroblasts, as well as erythrocytes and can dehaemoglobinize the cytoplasm of their host cells. *Hepatozoon langii* n. sp. occurred in the absence of *H. vacuolatus* n. sp., but the latter haemogregarine always formed mixed infections with the former; no stages intermediate between the two haemogregarine types were observed.

**Key words:** Apicomplexans, Cordylidae, crag lizard, haemogregarine, high altitude, morphology

### **Introduction**

Haemogregarines (Apicomplexa: Adeleorina) and haemococcidia (Apicomplexa: Eimeriorina) are protists that occur in the blood and tissues of a variety of vertebrates, as well as in invertebrate hosts (Telford 2009). To the authors' knowledge, over 30 species of haemogregarines and haemococcidia, but mostly haemogregarines of the genus *Hepatozoon* Miller, 1908 (see Smith 1996), have been described from lizards (Reptilia: Sauria) in Africa (Table 1). These records are distributed across the lizard families Agamidae, Chamaelionidae, Gekkonidae, Lacertidae, Opluridae, Scincidae and Varanidae, mostly in the northern half of the continent, but with some reports from Madagascar, Mozambique and South Africa (see Table 1).

*Hepatozoon* spp. have two or three host life cycles, which may involve a vertebrate host, an invertebrate vector, and an optional intermediate vertebrate host (Smith *et al.* 1994). They are distinguished by merogonic development in several organs within their vertebrate hosts, especially the liver, with micromerozoites eventually gaining access to the bloodstream where they differentiate into gamonts within leucocytes or erythrocytes, normally without further division. Development in a variety of haematophagous invertebrates then leads to the formation of polysporocystic oocysts with sporozoites that infect the vertebrate host on ingestion (Telford 2009). Intermediate vertebrate hosts may contain cystic stages (Smith *et al.* 1994).