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RESEARCH NOTE

INTRAERYTHROCYTIC MEROGONY IN *HAEMOGREGARINA KOPPIENSIS* (APICOMPLEXA: ADELEORINA: HAEMOGREGARINIDAE)

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Abstract. During October 2003, a specimen of *Amblyrhynchotes honckenii* (Bloch, 1795) was captured at low tide, with a hand net, in a rock pool at Koppie Alleen, De Hoop Nature Reserve, South Africa. This fish was heavily parasitized by unidentified gnathiid praniza larvae, caligid copepods identified as *Caligus tetrodontis* Barnard, 1948, cymothoid isopods identified as *Cinusa tetrodontis* (Schioedte et Meinert, 1884), and the blood protozoan *Haemogregarina koppiensis* Smit et Davies, 2001. Giemsa-stained blood smears from this fish revealed new and unusual stages of merogony for *H. koppiensis* that included small, rounded, likely intraerythrocytic merozoites arranged in circles of eight around the host nucleus. Host cells appeared ghost-like and enlarged compared with normal erythrocytes. Identical merozoites, usually in clusters of up to 16, were also observed free of host cells. The pattern of merogony seen in *H. koppiensis* is unusual for a fish haemogregarine.

Haemogregarina (sensu lato) *koppiensis* Smit et Davies, 2001 from the evileye pufferfish *Amblyrhynchotes honckenii* (Bloch, 1795) was only the second valid species of haemogregarine to have been named from marine fish in South Africa (see Smit and Davies 2001), the first being *Haemogregarina* (s.l.) *bigemina* Laveran et Mesnil, 1901 (see Smit and Davies 1999, Davies and Smit 2001, Smit et al. 2003a). Stages of *H. koppiensis* observed by Smit and Davies (2001) in the polychromatocytes and erythrocytes of *A. honckenii* included trophozoites, meronts with up to two nuclei each and encapsulated gamonts. Extraerythrocytic gamonts with flexed or straight tails were also seen in blood films.

Recently, it became possible to examine another specimen of *A. honckenii* that revealed new and unusual stages of merogony of *H. koppiensis* which are described in this research note.

The specimen of *A. honckenii*, measuring 8.7 cm long (total length), was captured at low tide, with a hand net, in a rock pool at Koppie Alleen, De Hoop Nature Reserve in October 2003. The fish was in poor condition, swimming slowly and with difficulty, often on its side. It was heavily parasitized with crustaceans that included five unidentified gnathiid praniza larvae and three female caligid copepods, identified as *Caligus tetrodontis* Barnard, 1948; both gnathiids and caligids were attached to the body surface. In addition, one male and one female adult cymothoid identified as *Cinusa tetrodontis* (Schioedte et Meinert, 1884) occurred in the buccal cavity.

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Giemsa-stained heart blood films from this pufferfish prepared, screened and photographed as reported previously (Smit et al. 2003b) contained intraerythrocytic trophozoites (Fig. 1) and extracellular gamonts (Fig. 2) that were morphometrically identical to those of *H. koppiensis* from *A. honckenii* captured earlier at the same site and at the same time of year (Smit and Davies 2001). However, the blood smears also contained merogonic stages that were different from those reported earlier (see above). These new stages were probably intraerythrocytic, but host cells were often pale, enlarged (up to 14.1 μm across their widest diameter) and ghost-like compared with normal erythrocytes (up to 9.0 μm across on average). Individual merozoites were small and rounded (2.5 ± 0.2 μm diameter, n = 20), with little cytoplasm and distinct, granular, nuclear chromatin that occupied most of the structure. Within host cells, merozoites were arranged in a regular, circular manner around the host nucleus and eight such structures were seen in a single cell (Fig. 3). Identical merozoites were also observed free of host cells, but usually in clusters of up to 16 (Fig. 4). Presumed remnants of host cells accompanied these clusters.

The demonstration of merogony of *H. koppiensis* in likely cells of the red cell series further justifies its placement in the genus *Haemogregarina* sensu lato, since its life cycle is not known (see Siddall 1995). The pattern of merogony seen in *H. koppiensis* is, however, unusual for a marine fish haemogregarine. Many intraerythrocytic meronts in the genus *Haemogregarina* produce vermiform merozoites (see Siddall 1995) by binary fission, or repeated binary fissions (see Davies 1995). Examples include *H. bigemina* from a variety of fishes (see Davies et al. 2004), *Haemogregarina* (s.l.) *callionymi* (Brumpt et Lebailly, 1904) Siddall, 1995 from *Callionymus lyra*, and *Haemogregarina* (s.l.) *simondi* Laveran et Mesnil, 1901 from *Solea solea*. However, merogony yielding small, rounded merozoites has also been observed in fish haemogregarines, for example, in *Haemogregarina* (s.l.) *uncinata* (Khan, 1978) (syn. *Cyrilia uncinata* Lainson, 1981) Siddall, 1995 from the erythrocytes of *Lycodes* spp. (see Khan 1978). Such merozoites have also been reported in haemogregarines apparently multiplying in leukocytes, such as *H. bigemina* (see Laird 1953), and in a haemogregarine occurring in leukocytes and host cells of uncertain identity in *Scomber scombrus* (see MacLean and Davies 1990). None of these merogonies, however, resembles the circle of eight rounded merozoites seen within the red cells of *A. honckenii* infected with *H. koppiensis*, making it a most unusual developmental pattern among fish haemogregarines.

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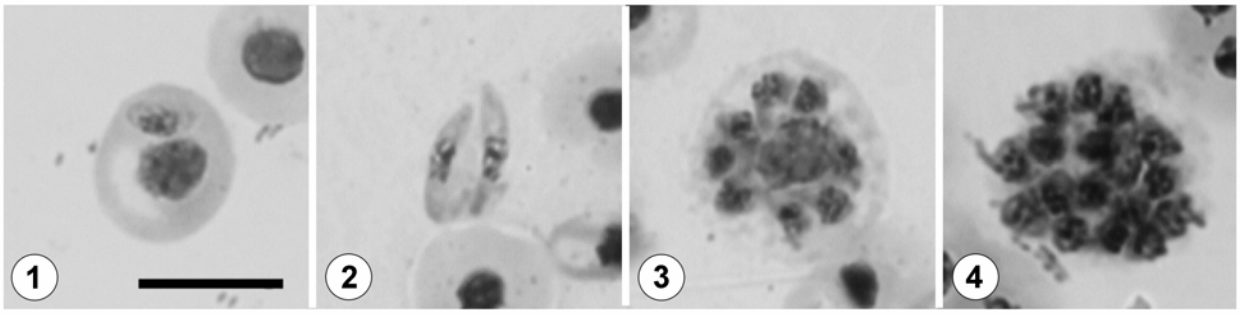

Figs. 1–4. Light micrographs of the developmental stages of *Haemogregarina koppiensis*. **Fig. 1.** Intraerythrocytic trophozoite. **Fig. 2.** Pair of extracellular gamonts. **Fig. 3.** Eight intraerythrocytic merozoites. **Fig. 4.** Cluster of extracellular merozoites. Scale bar = 10 μm (all figures).

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