

A NEW *EIMERIA* SPECIES PARASITIC IN WESTERN BARRED BANDICOOTS, *PERAMELES BOUGAINVILLE* (MARSUPIALIA: PERAMELIDAE), IN WESTERN AUSTRALIA

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ABSTRACT: Feces from western barred bandicoots, *Perameles bougainville*, examined during routine monitoring of captive breeding colonies and wild populations were frequently found to contain oocysts. Fecal oocysts from 1 individual housed at Kanyana Wildlife Rehabilitation Centre were allowed to sporulate in 2% potassium dichromate ($K_2Cr_2O_7$) at room temperature. Sporulated oocysts are subspheroidal 18.8×17.9 (16.9 – 21.0×16.0 – 19.9) μm , with length/width (L/W) ratio of 1.05 (1.00–1.15), lack a micropyle and oocyst residuum, but they usually have a polar granule within a smooth trilaminate oocyst wall 1.0 (0.7 – 1.3) μm thick. Sporocysts are ovoid, 9.1×7.0 (8.1 – 10.8×6.1 – 8.6) μm , with L/W ratio of 1.32 (1.04–1.51), have a Stieda body, sporocyst residuum, and 2 comma-shaped sporozoites, each containing 2 spheroidal refractile bodies. Sporulation takes 2–5 days at room temperature. This is the first formal description of an *Eimeria* species parasitic in the order Peramelemorphia.

The western barred bandicoot, *Perameles bougainville* Quoy and Gaimard, 1824, is an endangered Australian marsupial species. It has persisted as natural populations only on Bernier and Dorre Islands, Shark Bay, Western Australia (Friend, 1990; Friend and Burbidge, 1995). Captive breeding populations have been established within predator-proof enclosures at 2 sites in the southwest of mainland Western Australia. Terrestrial feral predators have been removed and excluded from 2 sites in the Shark Bay region, and reintroduced populations of western barred bandicoots are now established at these sites.

During monitoring of *P. bougainville* populations at these locations, feces were collected and tested for coprological evidence of coccidian and helminth parasitism. Feces were subsequently collected from 1 *P. bougainville* kept at Kanyana Wildlife Rehabilitation Centre to allow further study of *Eimeria* oocysts, including measurement of sporulated oocysts, formal description, and estimation of sporulation time.

Species of *Eimeria* are parasites of a diverse array of vertebrate hosts. Enteric coccidiosis caused by *Eimeria* species is usually a disease of young or stressed hosts, often manifesting as chronic diarrhea associated with moderate to heavy parasite burdens (Bowman, 1999).

This is the first study to formally describe an *Eimeria* species parasitic in the Peramelidae (indeed, in the order Peramelemorphia), although undescribed *Eimeria* species have previously been reported in the eastern barred bandicoot, *Perameles gunnii* Gray, 1838 (Obendorf and Munday, 1990) and northern brown bandicoot *Isoodon macrourus* (Gould, 1842) (Mackerras, 1958; Mackerras and Mackerras, 1960).

MATERIALS AND METHODS

Seventeen wild or extensively housed *P. bougainville* were trapped using Elliott or Sheffield traps, and their feces were collected into 10% neutral buffered formalin for subsequent laboratory analysis. Feces from an adult male *P. bougainville* kept at Kanyana Wildlife Rehabilitation Centre were collected directly from the individual enclosure and collected into 2% (w/v) potassium dichromate solution ($K_2Cr_2O_7$), mixed thoroughly, and then poured into large petri dishes to a depth of less than 1 cm and kept at room temperature in the dark to facilitate sporulation. Sporulated oocysts were concentrated by fecal flotation by using saturated sodium chloride and 50% sucrose (w/v) solution. Slides

were produced using a wire loop to transfer oocysts and mounted using a coverslip edged with petroleum jelly. Sporulated oocysts were observed by means of the $\times 100$ oil immersion objective of an Olympus BX50 microscope and measured by Optimas 5 image analysis software. Bright field and Nomarski differential interference microscopy techniques were used to measure and photograph sporulated oocysts.

Sporulation time was determined in a subsequent experiment in which feces were collected as described above and distributed into 6-well plates. The content of each well was examined for the relative proportions of sporulated, unsporulated, and degenerate oocysts at various times throughout the experiment.

Measurements of 52 sporulated oocysts are given in micrometers (mean \pm SD) with the range in parentheses.

DESCRIPTION

Eimeria kanyana n. sp.

(Figs. 1–4)

Sporulated oocysts subspheroidal, with trilaminate oocyst wall, 1.0 ± 0.1 (0.7 – 1.3) thick. Outermost half of wall smooth and yellow, encircling middle brown layer and inner black layer. Oocysts with 4 ovoid sporocysts and small refractile polar granule. Oocyst length, 18.8 ± 1.0 (16.9 – 21.0); oocyst width, 17.9 ± 1.0 (16.0 – 19.9); oocyst length/width (L/W) ratio, 1.05 ± 0.04 (1.00 – 1.15). Micropyle and oocyst residuum absent. Sporocysts with Stieda body and 2 comma-shaped sporozoites. Sporocyst length, 9.1 ± 0.5 (8.1 – 10.8); sporocyst width, 7.0 ± 0.6 (6.1 – 8.6); sporocyst L/W ratio, 1.32 ± 0.10 (1.04 – 1.51). Parastieda and substieda bodies absent. Each sporozoite with 2 spheroidal refractile bodies; granular cluster of sporocyst residuum between and around sporozoites.

Taxonomic summary

Type host: *Perameles bougainville* Quoy and Gaimard, 1824, western barred bandicoot.

Type locality: Kanyana Wildlife Rehabilitation Centre, Gooseberry Hill, Western Australia ($31^{\circ}57'S$, $116^{\circ}03'E$).

Prevalence: Kanyana Wildlife Rehabilitation Centre Inc. (captive breeding colony), 5 of 9 (55%); Dryandra Woodland (captive breeding colony) ($32^{\circ}46'S$, $116^{\circ}58'E$), 1 of 1 (100%); Dorre Island (natural range) ($25^{\circ}03'S$, $113^{\circ}06'E$), 1 of 3 (33%); Heirisson Prong (reintroduction colony) ($26^{\circ}02'S$, $113^{\circ}22'E$), 3 of 4 (75%); 10 of 17 (59%).

Sporulation time: Two to 5 days at 25 C in 2% (w/v) potassium dichromate (Fig. 5).

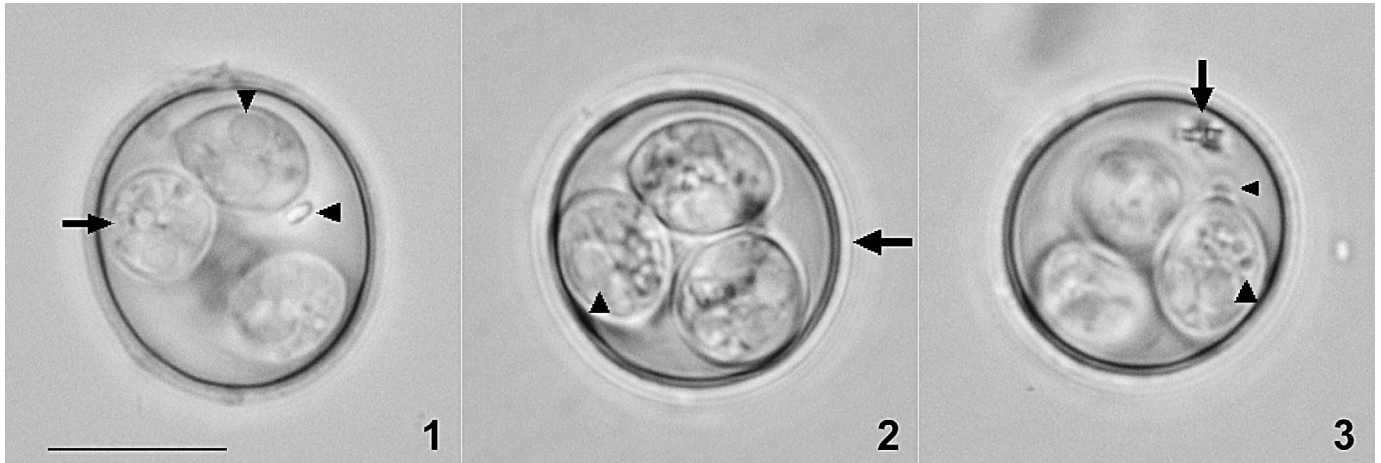
Site of infection: Unknown.

Prepatent and patent periods: Unknown.

Material deposited: A series of 3 photomicrographs of sporulated oocysts is deposited in the U.S. National Parasite Collection, Beltsville, Maryland, USNPC 097437.00 and the Australian Registry of Wildlife Health, Taronga Zoo, Mosman, NSW, Australia, ARWH 5055.1.

Etymology: The substantive specific epithet *kanyana* acknowledges Kanyana Wildlife Rehabilitation Centre Inc. Kanyana means “gathering place” or “place of the waters” in an Australian aboriginal language.

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FIGURES 1–3. Nomarski interference contrast photomicrographs of *Eimeria kanyana* n. sp. sporulated oocysts from *Perameles bougainville* in Western Australia. Bar = 10 μ m (1) Refractile body (\blacktriangledown); polar granule (\blacktriangleleft); sporocyst residuum (arrow). (2) Refractile body (\blacktriangle); smooth, trilaminar oocyst wall (arrow). (3) Sporocyst residuum (\blacktriangle); Stieda body (\blacktriangleleft); polar granule (arrow).

Remarks

This is the first study to formally describe an *Eimeria* species parasitic in marsupials of the order Peramelemorphia. Marsupials in which *Eimeria* species have previously been formally described include the diprotodont families Vombatidae, Phalangeridae, Potoroidae, and Macropodidae, and the American marsupial Didelphidae (Duszynski et al., 2000).

Undescribed *Eimeria* species have previously been reported in 2 bandicoot species, the eastern barred bandicoot, *P. gunnii* (Obendorf and Munday, 1990), and the northern brown bandicoot, *I. macrourus* (Mackerras, 1958; Mackerras and Mackerras, 1960).

Given that individuals infected with this parasite do not usually man-

ifest any clinical signs, we think that in otherwise healthy individuals, this coccidian parasite is likely to be only mildly pathogenic.

ACKNOWLEDGMENTS

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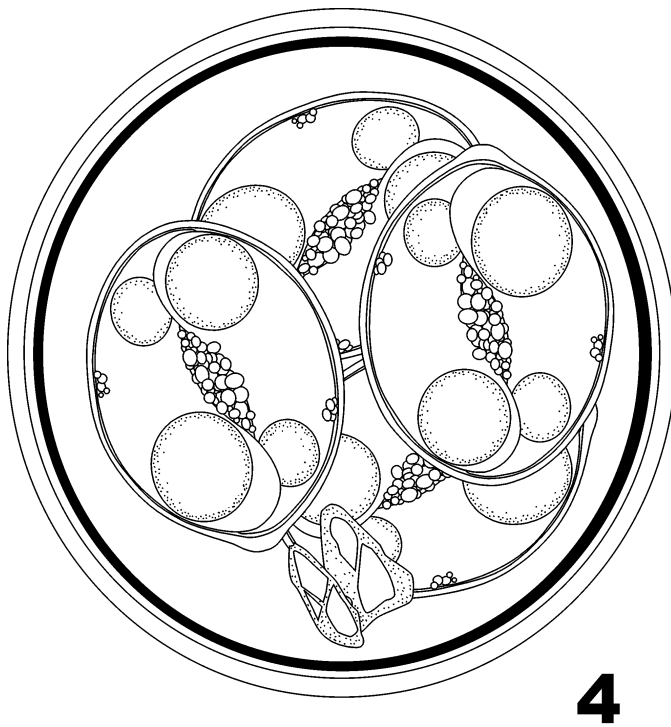


FIGURE 4. Composite line drawing of *Eimeria kanyana* n. sp. sporulated oocyst. Bar = 10 μ m.

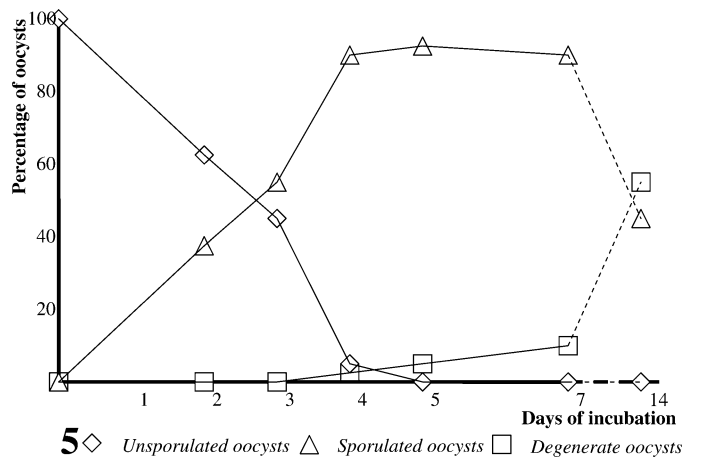


FIGURE 5. Graph illustrating the percentage of unsporulated, sporulated and degenerate oocysts of *Eimeria kanyana* n. sp. over 2 wk of incubation in potassium dichromate.

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