

Description of *Eimeria arabukosokensis* sp. n. (Apicomplexa: Eimeriidae) from *Telescopus semiannulatus* (Serpentes: Colubridae) with notes on eimerian coccidia from snakes of Eastern Kenya

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Abstract. Parasitological examination of faeces of 26 snakes kept in Bio-Ken Snake Farm, Watamu, Kenya revealed new species of *Eimeria* Schneider, 1875 in *Telescopus semiannulatus* Smith, 1849. Oocysts of *Eimeria arabukosokensis* sp. n. are cylindrical 26.8 (25–29) × 15.1 (14–16) µm with smooth, bilayered oocyst wall and a single polar granule. The broadly ellipsoidal sporocysts average 9.3 (8.5–10) × 7.1 (6.5–7.5) µm and possess single-layered wall composed of two plates joined by longitudinal suture. *Caryospora* cf. *regentensis* Daszak et Ball, 2001 is reported from *Dendroaspis angusticeps* (Smith, 1849) and two additional forms of *Caryospora* Léger, 1904 are reported and morphologically characterised from a single specimen of *Psammophis orientalis* Broadley, 1977. Systematic status of *Caryospora* spp. in sub-Saharan *Psammophis* Boie, 1827 is discussed and all species reported by various authors to date are suggested to be treated as *species inquirendae* until more detailed data on these parasites and their hosts are available.

Coccidia of the family Eimeriidae parasitizing reptilian hosts comprise predominantly members of the genera *Caryospora* Léger, 1904, *Eimeria* Schneider, 1875 and *Isospora* Schneider, 1881 (e.g., Upton et al. 1986, McAllister et al. 1995, Modrý 1999). In contrast to the large diversity of African snakes, only a limited knowledge exists about the coccidian species parasitizing these hosts. In an attempt to shed more light on the parasitofauna of East African snakes, we have performed a coprological examination of several snake species kept in Bio-Ken Snake Farm in Eastern Kenya. These examinations revealed a diverse spectrum of coccidia which are reported below, together with a description of one new species.

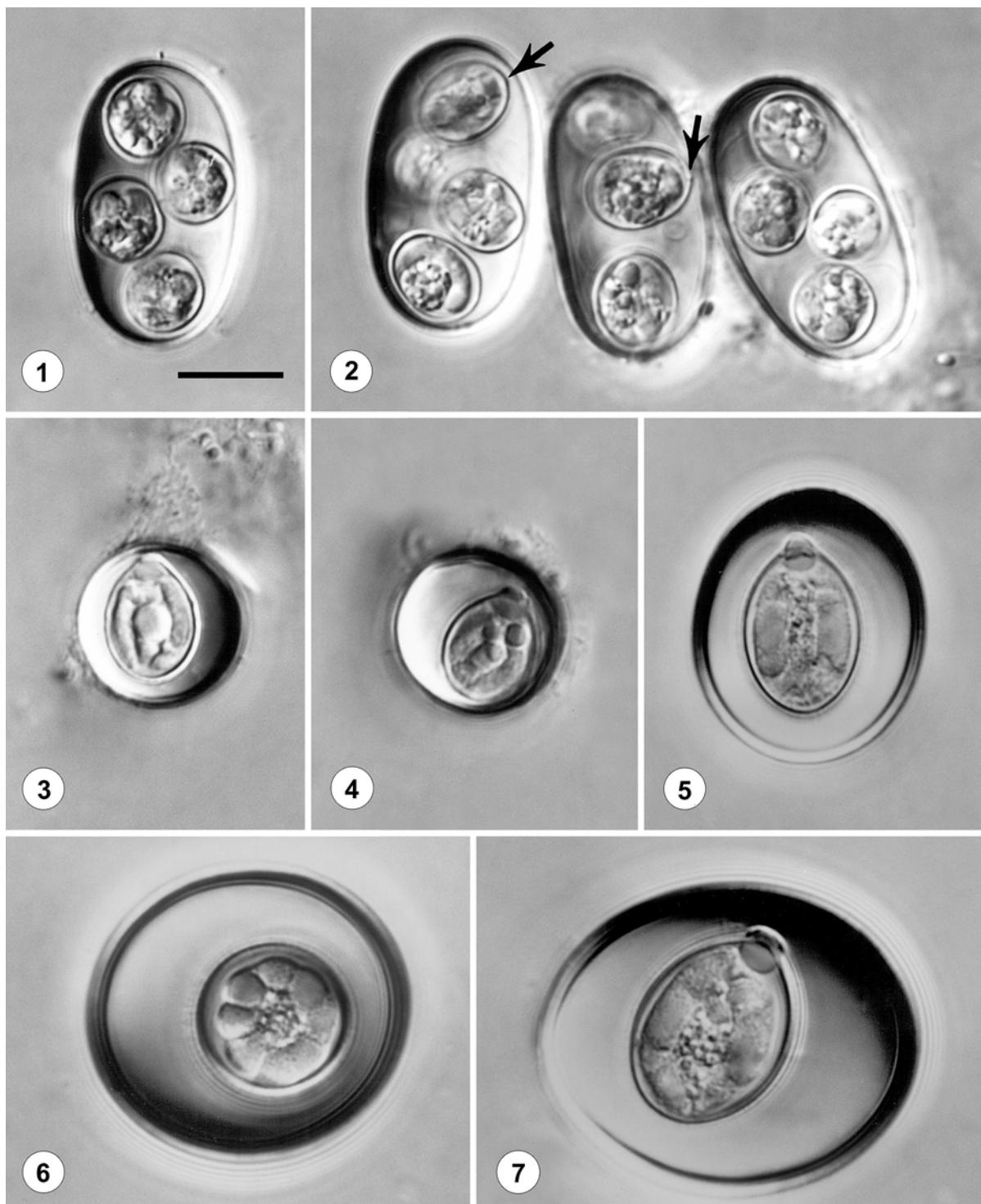
MATERIALS AND METHODS

Faecal samples were collected from 26 snakes, representing 18 species in five families: (numbers of examined specimens are noted in parentheses) Elapidae: *Naja nigricollis* Reinhardt, 1843 (2), *Naja pallida* Boulenger, 1896 (1), *Dendroaspis angusticeps* (Smith, 1849) (1); Viperidae: *Bitis arietans* (Merrem, 1820) (2), *Bitis gabonica* (Duméril, Bibron et Duméril, 1854) (1), *Causus resimus* (Peters, 1862) (2), *Echis pyramidum* (Geoffroy Saint-Hilaire, 1827) (1); Atractaspididae: *Atractaspis microlepidota* Günther, 1866 (2); Colubridae: *Lamprophis fuliginosus* (Boie, 1827) (2), *Philothamnus punctatus* Peters, 1867 (1), *Mehelya capensis* (Smith, 1847) (1), *Telescopus semiannulatus* Smith, 1849 (3),

Dasypeltis medici (Bianconi, 1859) (1), *Rhamphiophis rubropunctatus* (Fischer, 1884) (2), *Scaphiophis albopunctatus* Peters, 1870 (1), *Psammophis orientalis* Broadley, 1977 (1), *Dispholidus typus* (Smith, 1829) (1); Boidae: *Eryx colubrinus* (Linnaeus, 1758) (1). Examined animals were kept in Bio-Ken Snake Farm, Watamu, Kenya. Animals originated mostly from the localities in coastal Kenya; in described cases the locality is given in a species account. All samples were stored in individual tubes with 2.5% potassium dichromate, transported to laboratory and examined for the presence of parasites using flotation technique. Morphological examinations and photo-graphy was performed using an Olympus Provis microscope equipped for Nomarski interference contrast (NIC) microscopy. All measurements are given in µm as means followed by ranges in parentheses. The snake taxonomy used throughout this paper reflects the most recent opinion by Spawls et al. (2002).

RESULTS

Nine of 26 samples examined (35%) contained coccidian oocysts. Sporocysts of *Sarcocystis* spp., found in four snakes (*Lamprophis fuliginosus*, *Mehelya capensis*, *Rhamphiophis rubropunctatus*, *Psammophis orientalis*), were the most prevalent. Oocysts of *Caryospora* were observed in three snakes (*Telescopus semiannulatus*, *Psammophis orientalis*, *Dendroaspis angusticeps*), and oocysts of *Eimeria* s.l. in three *Telescopus semiannulatus* and one *Lamprophis*



Figs. 1–7. Nomarski interference contrast photographs of sporulated oocysts of found coccidia, all in the same scale. **Figs. 1–2.** *Eimeria arabukosokokensis* sp. n. from *Telescopus semiannulatus*. Note visible sutures of sporocyst wall plates (arrows). **Figs. 3–4.** *Caryospora* cf. *regentensis* from *Dendroaspis angusticeps*. **Fig. 5.** *Caryospora* sp. I from *Psammophis orientalis*. **Fig. 6.** *Caryospora* sp. II from *P. orientalis*, transversal view. **Fig. 7.** *Caryospora* sp. II from *P. orientalis*, longitudinal view. Scale bar = 10 μ m.

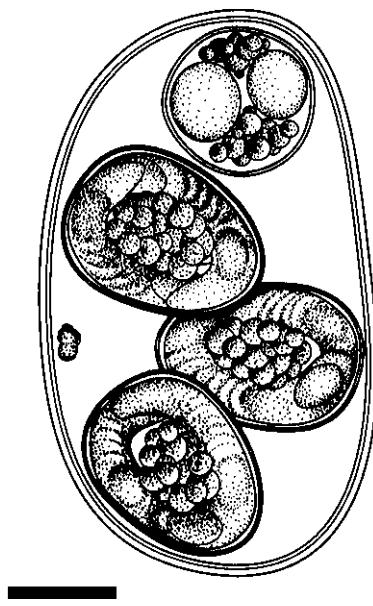


Fig. 8. Composite line drawing of sporulated oocyst of *Eimeria arabukosokokensis* sp. n. Scale bar = 5 μ m.

fuliginosus. Only three *Caryospora* spp. and a single *Eimeria* sp. had sufficient number of sporulated oocysts to be morphologically further characterised.

APICOMPLEXA: Eimeriidae

***Eimeria arabukosokokensis* sp. n.** Figs. 1–2, 8

Description: Oocysts cylindrical, long sides almost parallel to each other; 26.8 (25–29) \times 15.1 (14–16), shape index (length:width ratio, SI) = 1.8 (1.6–1.9) (n = 30). Oocyst wall smooth, bilayered, approximately 2 thick, with inner layer being thinner. Single polar granule present. Sporocysts broadly ellipsoidal, broader toward one end, 9.3 (8.5–10) \times 7.1 (6.5–7.5), SI = 1.3 (1.2–1.5) (n = 30). Sporocyst wall thin, smooth, single-layered, composed of two plates joined by longitudinal suture. Sporozoites with one refractile body and barely visible nucleus located centrally. Surface of banana-shaped sporozoites appeared striated or finely granular. Sporocyst residuum consists of numerous globules 1–1.5 in diameter, forming a spherical cluster 3–4 in diameter or being scattered among sporozoites.

Type host: *Telescopus semiannulatus* Smith, 1849 (Serpentes, Colubridae, Boiginae).

Type locality: Watamu near Malindi, coastal area of Kenya (ca. 03°21'S, 40°01'E), Africa.

Site of infection: Unknown, oocysts recovered from faeces; probably the gall bladder (see Remarks).

Prevalence: All 3 examined snakes expelled oocysts in faeces.

Type material: Photosyntypes deposited under the original collection No. KA31/1999 at Department of Parasitology, University of Veterinary and Pharmaceutical Sciences Brno, Czech Republic.

Etymology: The name is derived from the local name of nearby situated Arabuko-Sokoke Forest in coastal East Africa, in honour of this unique and endangered place.

Remarks: Based on the oocyst shape (cylindrical) and the absence of Stieda and substieda body, the studied isolate probably belongs to *Choleoimeria* Paperna et Landsberg, 1989 as defined by Paperna and Landsberg (1989a, b) rather than to *Eimeria*. However, such classification has been questioned and not accepted or simply ignored by several authors (e.g., Asmundsson et al. 2001, Daszak and Ball 2001a). Therefore, we follow a recently used wider concept of *Eimeria*; for details see Discussion. The endogenous development of all histologically studied species of *Eimeria* with elongated cylindrical oocysts is confined to the gall bladder epithelium (e.g., Paperna and Landsberg 1989a, b, Paperna and Lainson 2000, Modrý et al. 2001). Thus, it is probable that *E. arabukosokokensis* also affects this organ.

Caryospora cf. regentensis Daszak et Ball, 2001

Figs. 3–4, 9

Description: Oocysts spherical, 15.3 (14.5–16) \times 15.0 (14–16), SI = 1.0 (1.0–1.1) (n = 30). Oocyst wall smooth and bilayered, ~1 thick, inner layer thinner, outer layer yellowish. Micropyle and oocyst residuum absent. Spherical polar granule present in 60% of oocysts examined. Sporocysts ellipsoidal, 10.9 (10–12) \times 8.2 (6.5–9), SI = 1.3 (1.2–1.5) (n = 30). Sporozoites with one barely visible refractile body and almost invisible, centrally located nucleus. Surface of banana-shaped sporozoites smooth. Sporocyst residuum usually compact, spherical, 3–4 \times 1.5–3.5 in diameter, often accompanied by up to 5 globules scattered among sporozoites. Eight sporozoites, 1.5–2 in diameter, fill tightly sporocyst. Stieda body ellipsoidal, 1.5–2 \times 0.5, substieda body ellipsoidal, 2.5–3 \times 1.5.

Host: *Dendroaspis angusticeps* (Smith, 1849), the green mamba (Serpentes, Elapidae).

Locality: Watamu near Malindi, coastal area of Kenya (ca. 03°21'S, 40°01'E).

Site of infection: Unknown, oocysts recovered from faeces.

Prevalence: Single examined sample originated from a colony of dozens of green mambas in Bio-Ken, where the snakes are used for venom milking.

Site of infection: Unknown, oocysts recovered from faeces.

Voucher material: Oocyst microphotographs deposited under the original collection No. KA26/1999 at Department of Parasitology, University of Veterinary and Pharmaceutical Sciences Brno, Czech Republic.

Remarks: The morphology of the found isolate matches the original description of *Caryospora regentensis* Daszak et Ball, 2001. Sporocysts of *C. regentensis* were originally described to be 13.0 (10.2–14.1) × 10.3 (9.3–11.1) and, thus, exceed slightly the data presented herein. Slight differences also could be observed in the shape of the Stieda body (originally noted to be of the same length and width); in the organisation of the sporocyst residuum; and 60%–presence of the polar granule (originally reported to be present in 100% of oocysts). *Caryospora regentensis* was originally described in error from *Dendroaspis viridis*, but the host determination was soon after corrected in the published erratum to *Dendroaspis angusticeps* (Daszak and Ball 2001b). The conspecificity of the original host with animals reported herein, together with the fact that both reports deal with animals from Kenya, supports the conspecific status of our isolate with *C. regentensis*. Described fine morphological differences can be caused by some level of subjectivity in descriptions, by biological variation or by changes subsequent to the sporulation.

Caryospora sp. I

Figs. 5, 10

Description: Oocysts oval, 23.8 (22–25.5) × 20.5 (19–22), SI = 1.2 (1.1–1.3) (n = 30). Oocyst wall smooth and bilayered, approximately 1.5 thick, with inner layer thinner than outer, outer layer yellowish. Micropyle, oocyst residuum and polar granule absent. Sporocysts oval, 15.5 (15–16) × 11.0 (10–12), SI = 1.4 (1.2–1.6) (n = 30). Each sporozoite with distinct broadly oval nucleus, refractile bodies barely visible. Surface of banana-shaped sporozoites transversally striated. Sporocyst residuum usually consists of a few small globules <1 in diameter arranged symmetrically and filling tightly sporocyst. Stieda body ellipsoidal, 2.5–3 × 1, substieda body ellipsoidal, 3–3.5 × 1.5.

Host: *Psammophis orientalis* Broadley, 1977 (Serpentes, Colubridae).

Locality: Watamu near Malindi, coastal area of Kenya, Africa.

Prevalence: Isolated from a single specimen examined.

Site of infection: Unknown, oocysts recovered from faeces.

Voucher material: Oocyst microphotographs deposited under the original collection No. KA24/1999 at Department of Parasitology, University of Veterinary and Pharmaceutical Sciences Brno, Czech Republic.

Remarks: Up to date there are four *Caryospora* spp. described from the snakes of the genus *Psammophis* (Table 1) in sub-Saharan Africa. *Caryospora hermae* Bray, 1960 is the most similar to our isolate in size and other morphological characteristics. Our isolate seemed to have slightly yellowish wall, possibly caused by uptake of potassium dichromate from the storage medium. The oocyst wall of *C. hermae* is described as

colourless (Bray 1960). *Caryospora weyerae* Bray, 1960, reported by the original author to resemble *C. hermae* in every way except the size, thus is smaller than our isolate too. *Caryospora psammophi* Bray, 1960 has larger oocysts and sporocysts and has pitted oocyst wall. In the original description (Bray 1960), there are poor details about the Stieda and substieda bodies, except a solo description of the Stieda body of *C. psammophi*. However, minute Stieda and substieda bodies for all three species are indicated on schematic diagrams in the original description (Bray 1960, p. 318, figs. 28–30). Shape and size of the oocysts of the present isolate are also within the ranges of *Caryospora legeri* Hoare, 1933. Our isolate differs from *C. legeri* in the absence of micropyle and in a different shape of the Stieda and substieda bodies. However, the original description of micropyle is probably erroneous (see Discussion).

Caryospora sp. II

Figs. 6–7, 11

Description: Oocysts oval, 33.6 (32–36) × 27.6 (26–30), SI = 1.2 (1.1–1.4) (n = 30). Oocyst wall slightly pitted, approximately 2 thick, bilayered. Outer layer yellow and thicker than the inner one. Micropyle, oocyst residuum and polar granule absent. Sporocysts oval, 19.8 (18–21) × 13.9 (13–14), SI = 1.4 (1.3–1.5) (n = 30). Sporozoites with distinct oval nucleus, refractile bodies hardly visible. Surface of banana-shaped sporozoites transversally striated. Sporocyst residuum usually consists of few small globules of less than 1.5 in diameter, symmetrically scattered among sporozoites in central part of sporocyst. Eight sporozoites, each 1.5–2 in diameter, fill sporocyst. There is clear space in between sporozoites and substieda body. Stieda body ellipsoidal, 3 × 1, substieda body ellipsoidal, 3.5–4 × 1.5.

Host: *Psammophis orientalis* Broadley, 1977 (Serpentes, Colubridae).

Locality: Watamu near Malindi, coastal area of Kenya, Africa.

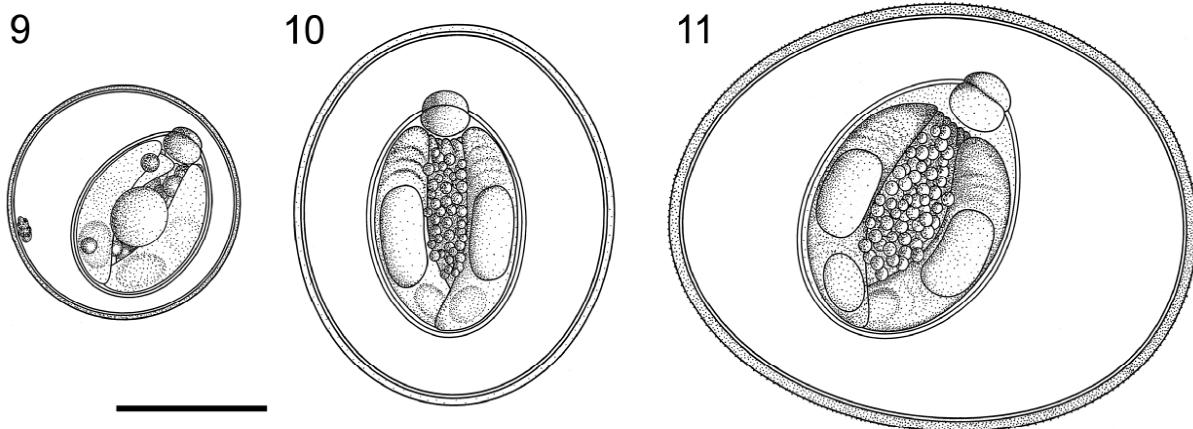
Site of infection: Unknown, recovered from faeces.

Prevalence: Isolated from a single specimen examined.

Site of infection: Unknown, recovered from faeces.

Voucher material: Oocyst microphotographs deposited under the original collection No. KA24/1999 at Department of Parasitology, University of Veterinary and Pharmaceutical Sciences Brno, Czech Republic.

Remarks: From all known *Caryospora* spp. of *Psammophis* from sub-Saharan Africa (Table 1), our form closely resembles *Caryospora psammophi* Bray, 1960 in oocyst dimensions, shape and an oocyst wall texture and colour. Limited data on the Stieda and substieda bodies of *C. psammophi* make a finer comparison impossible. *Caryospora legeri* Hoare, 1933, *C. hermae* Bray, 1960 and *C. weyerae* Bray, 1960 differ in the size and character of the oocyst wall. *Caryospora*



Figs. 9–11. Composite line drawings of sporulated oocysts, all in the same scale. **Fig. 9.** *Caryospora* cf. *regentensis*. **Fig. 10.** *Caryospora* sp. I. **Fig. 11.** *Caryospora* sp. II. Scale bar = 10 µm.

maxima Modrý, Koudela, Al-Oran et Amr, 1999 from *P. schokari* from the Near East has exceptionally large oocysts and thus could not be confused with any of *Caryospora* forms from sub-Saharan *Psammophis* (Modrý et al. 1999).

DISCUSSION

Generally, coccidian oocysts possess a limited amount of morphological features and some of these characters may even vary. Duszynski and Wilber (1997) proposed and set minimal guidance for the description of coccidian species. Proper species differentiation based on the morphology and further biological characteristics has been critically reviewed mostly in species parasitizing mammalian hosts (for review see Duszynski and Upton 2001). Studies on eimerian coccidia from reptilian hosts are still in their infancy, but one can imagine that we face similar problem and a revision of monoxenous coccidia in reptiles would be greatly appreciated.

The phylogeny of *Eimeria* s.l. coccidia from cold-blooded vertebrates still awaits elucidation. Moreover, the status of the genera *Choleoeimeria* and *Acroeimeria* proposed by Paperna and Landsberg (1989a, b) is not clear. It is evident that biliary eimerians from reptiles form a distinct and easily distinguishable assemblage of species. These coccidia possess oocysts of cylindrical shape and, instead of Stieda and substieda bodies, have sporocyst walls consisting of two plates joined by a longitudinal suture. The morphological variation within this group is limited and observable morphological features are of limited value for distinguishing species. Therefore, the host systematics is considered to be

important in defining new species and host specificity on the genus or family level is usually expected. This approach tentatively implies strict host-parasite co-evolution, unfortunately without any experimental or other support. On the other hand, the conspecificity of taxa from hosts from distant zoogeographical regions is unlikely. *Eimeria arabukosokokensis* is the first species described from the cat snakes of the genus *Telescopus* and no species with similar oocyst morphology has been described from snakes from the African continent. Based on these biological consequences we describe the species found in *Telescopus semiannulatus* as new.

The genus *Caryospora* represents the most diversified coccidian genus occurring in snakes. So far, about 43 species were named from these hosts (Modrý 1999), which complicates the taxonomy and describing new species. Descriptions of all species are based predominantly on oocyst morphology, which is in some instances surprisingly variable, e.g., in *Caryospora colubris* (Matuschka 1984, Paperna and Finkelman 1991). In many cases, however, the species described have not been found since the original description and host specificity of nearly all species is unknown. In some cases, co-occurrence of two or three species in a single host specimen has been reported (Bray 1960, Modrý and Koudela 1998). In contrast, *Caryospora duszynskii*, the only experimentally studied species from colubrids, has a relatively wide host spectrum, thus low host specificity, including at least four species of North-American snakes in three genera: *Elaphe*, *Masticophis* and *Lampropeltis* (Upton et al. 1984, McAllister et al. 1995, Modrý unpubl. observ.). Taken together, the taxonomy of *Caryospora* in colubrid hosts, as practised

Table 1. Comparison of known *Caryospora* species in snakes of the genus *Psammophis* in sub-Saharan Africa (all these *Caryospora* species are regarded as *species inquirendae*)¹.

	<i>Caryospora "legeri"</i>	<i>Caryospora legeri</i>	<i>Caryospora psammophi</i>	<i>Caryospora hermae</i>	<i>Caryospora weyerae</i> 2	<i>Caryospora</i> sp. I	<i>Caryospora</i> sp. II
Oocyst	33.0 ± 1.7 (29.8–36.0) \times 29.3 ± 1.3 (27–32.4) SI = 1.31 subpherical	20.8–30.4 \times 19.2–25.6 subpherical or slightly ovoid	29.1 (25–34) \times 26.8 (23–31) SI = 1.09 subpherical	22.3 (21–24) \times 20.6 (20–22) SI = 1.08 subpherical	16.1 (14–18) \times 14.9 (13–17) SI = 1.08 subpherical	23.8 (22–25.5) \times 20.5 (19–22) SI = 1.2 (1.1–1.3) oval	33.6 (32–36) \times 27.6 (26–30) SI = 1.2 (1.1–1.4) oval
Sporocyst	22.0 ± 0.8 (20.8–23.4) \times 13.1 ± 0.8 (12.6–14.2)	16.4–19.2 \times 11.2–13.6 ovoid	20.8 (19–23) \times 15.5 (13–16) SI = 1.44 ovoid, relatively thick, colourless double wall	16.5 (16–17) \times 12.6 (12–13) SI = 1.31 ovoid	13.3 (13–14) \times 10.0 (9–11) SI = 1.34 ovoid	15.5 (15–16) \times 11.0 (10–12) SI = 1.4 (1.2–1.6) oval	19.8 (18–21) \times 13.9 (13–14) SI = 1.4 (1.3–1.5) oval
Oocyst wall	n.a.	thick, greyish coloured wall, consisting of two layers	bilayered, thin layers, outer finely and irregularly pitted, yellow in colour	bilayered, smooth, colourless	bilayered, smooth, colourless	bilayered, ~1.5, outer thicker, smooth and yellowish	bilayered ~2, slightly pitted, outer thicker and yellow
Micropyle	no	minute funnel shaped ³	no	no	no	no	no
Stieda body (SB) and substieda body (SSB)	SB: present SSB: present (difficult to see), wider than Stieda body but thinner	SB: globe-like “knob” SSB: hemispherical plug	SB: plug, like a rounded rubber stopper jammed into the sporocyst’s neck SSB: n.a.	SB: n.a. SSB: n.a.	SB: n.a. SSB: n.a.	SB: ellipsoidal 2.5–3 \times 1 SSB: oval 3–3.5 \times 1.5	SB: ellipsoidal 3 \times 1 SSB: oval 3.5–4 \times 1.5
Sporocyst residuum	present, granular large mass	present (centrally, bulky granular)	present (centrally, diffuse)	present (widely scattered)	present (some)	small globules < 0.5, fill the sporocyst	few small globules < 0.5, symmetrically in central part
Sporulation	n.a.	2 days	n.a.	n.a.	n.a.	n.a.	n.a.
Site of infection	n.a.	small intestine	small intestine	small intestine	small intestine	n.a.	n.a.
Host and prevalence	<i>P. sibilans</i> (1/1)	<i>P. sibilans</i> (2/3)	<i>P. s. phillipsi</i> (1/4)	<i>P. s. phillipsi</i> (1/4)	<i>P. s. phillipsi</i> (1/4)	<i>P. orientalis</i> (1/1)	<i>P. orientalis</i> (1/1)
Type locality	Nigeria	Entebbe, Uganda	Liberia	Liberia	Liberia	Kenya	Kenya
Reference	Daszak and Ball 2001a	Hoare 1933	Bray 1960	Bray 1960	Bray 1960	this study	this study

¹ data and wording as given in the original descriptions, measurements in micrometres, all isolates with no oocyst residuum and no polar granule; n.a. – not available; SI – shape index;

² resembles *C. hermae* in every way except the size (Bray 1960); ³ probably misidentification.

by authors up to now, reaches in some cases nearly the “dead end” and the species parasitizing the genus *Psammophis* represent such an example.

So far, there are eight species of *Caryospora* described from snakes from sub-Saharan Africa (Hoare 1933, Bray 1960, Matuschka 1982, Upton et al. 1992, Daszak and Ball 2001a). In addition to four species from hosts of the genus *Psammophis* (Table 1) we are aware of only four additional species of the genus *Caryospora* described from sub-Saharan snakes, namely *C. heterodermus* Upton, Freed et Freed, 1992 from *Philothamnus heterodermus* (Colubridae), *C. maculatus* Upton, Freed et Freed, 1992 from *Causus maculatus* (Viperidae), *C. naja* Matuschka, 1982 from *Naja nigricollis* (Elapidae) and *C. regentensis* Daszak et Ball, 2001 from *Dendroaspis angusticeps* (Elapidae). All these species can be distinguished based on the oocyst morphology and their conspecificity with *Caryospora* isolates reported in our study is unlikely.

The taxonomy and diagnosis of *Caryospora* spp. parasitizing sub-Saharan colubrid snakes of the genus *Psammophis* is somewhat more complex. Four caryosporan species have been described from these hosts to date. Hoare (1933) described *Caryospora legeri* from *P. s. sibilans* from Entebbe, Uganda. The description is rather precise, including notes on endogenous stages. However, he noted in some oocysts a minute, funnel-shaped micropyle. Since the presence of a micropyle has not been described in any other *Caryospora* species, it is probable that Hoare’s observation of this structure was erroneous. Bray (1960) described three additional species of *Caryospora* from *P. (sibilans) phillippi* from Liberia (*C. psammophi*, *C. hermae* and *C. weyerae*). All three species occurred in a single host specimen examined and they differ mostly in the oocyst/sporocyst dimensions and oocyst wall texture (see Table 1). Interestingly, three size-wise differing categories of oocysts were described in *Coluber viridiflavus* from Italy, but considered to represent a single species *Caryospora colubris* (Matuschka 1984). The variation in merozoites and microgametes has been suggested to be a valuable character for species differentiation where oocyst morphology is ambiguous (Paperna and Finkelman 1991).

Recently, Daszak and Ball (2001a) reported on an isolate of *Caryospora* in *Psammophis sibilans* from Kenya and re-analysed descriptions of *Caryospora legeri* Hoare, 1933, *C. psammophi* Bray, 1960, *C. hermae* Bray, 1960 and *C. weyerae* Bray, 1960. Based on overlapping oocyst morphology, they synonymised

C. psammophi and *C. hermae* with *C. legeri*, which brought the total number of *Caryospora* species parasitizing *Psammophis* in entire sub-Saharan Africa to two: *C. legeri* and *C. weyerae*. In this study, we report on two distinct forms of *Caryospora* from a single *P. orientalis* from coastal Kenya. Both forms do not overlap morphometrically and differ also in fine appearance of oocyst wall, Stieda and substieda bodies and sporocyst residuum. On the other hand, morphological characteristics of the oocysts and the sporocysts overlap with those of several above mentioned species described from African *Psammophis*. Since we were not able to associate the two studied forms with any of described taxa we did not use any of the existing names. Based on the occurrence of two morphologically distinguishable forms of *Caryospora* that we found in faeces of *P. orientalis* from Watamu, we consider the synonymous changes proposed by Daszak and Ball (2001a) be precocious. The generalisation of *C. legeri* description may lead to confusions and may cause, in our opinion, an underestimation of the diversity of *Caryospora* in the region. Moreover, the genus *Psammophis* Boie, 1827 is a taxonomically complicated assemblage of species awaiting a full revision and the situation in coastal East Africa is not an exception (Spawls et al. 2002). Described taxa of the *Psammophis sibilans*-complex are closely related and some are considered to be conspecific by various authors (e.g., Broadley 1966, 1977, Pitman 1974, Broadley and Howell 1989, Trape and Roux-Estève 1995). All *Caryospora* species named from these hosts (Hoare 1933, Bray 1960, Daszak and Ball 2001a) were described without detailed data on type-host specimens and without host symbiotypes deposited. Because of all above mentioned problems we propose to treat all species of *Caryospora* from sub-Saharan *Psammophis* as *species inquirendae* until a detailed study based on a wider material from well-defined and properly determined hosts is available. However, such study is virtually impossible without full revision of the genus *Psammophis* in Africa.

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