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SHORT COMMUNICATION

Description of *Isospora jaracimrmani* sp. n. (Apicomplexa: Eimeriidae) from the Yemen chameleon *Chamaeleo calyptratus* (Sauria: Chamaeleonidae)

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Key words: *Isospora*, coccidia, Sauria, *Chamaeleo calyptratus*

Abstract. Faecal samples from 23 adult and 20 young captive Yemen chameleons, *Chamaeleo calyptratus* Duméril et Duméril, 1851, were examined for coccidian parasites. Two of the adult (8.7 %) and 16 (80.0 %) of the young chameleons were found to be passing oocysts of the *Isospora* species. Sporulated oocysts of *Isospora jaracimrmani* sp. n. are ellipsoidal or pyriform, 38.4 × 25.6 (35.2–42.8 × 23.8–27.0) μm, with smooth bilayered and colourless oocyst wall. A micropyle, oocyst residuum and polar granule are absent. Sporocysts are ellipsoidal to ovoid, 15.9 × 11.2 (14.8–17.0 × 10.4–12.0) μm, with dome-like Stieda and homogenous spherical substieda bodies. The posterior end of the sporocyst is draw out. Sporocyst residuum is present, consisting either of a compact mass or of scattered granules. Sporozoites, with faint transverse striations anteriorly, are vermiform, 13.1 × 3.4 (12.4–16.5 × 2.8–4.0) μm. Most oocysts are to sporulate when excreted; sporulation was completed within 12 to 24 h at 25 ± 2°C. Endogenous stages develop inside the nuclei of enterocytes in the small intestine. Prepatent period in experimentally infected young chameleon was 7 days. Comparison with other species of the genus *Isospora* found in chameleons indicates that it is a new species.

The Yemen chameleon, *Chamaeleo calyptratus* Duméril et Duméril, 1851, is distributed from Saudi Arabia to Yemen. This species represents one of largest members of the genus *Chamaeleo*. The Yemen chameleon is a strictly arboreal, insectivorous species, inhabiting shrub habitats mainly in relatively wet wadis from some 600 m up to above 2,500 m.

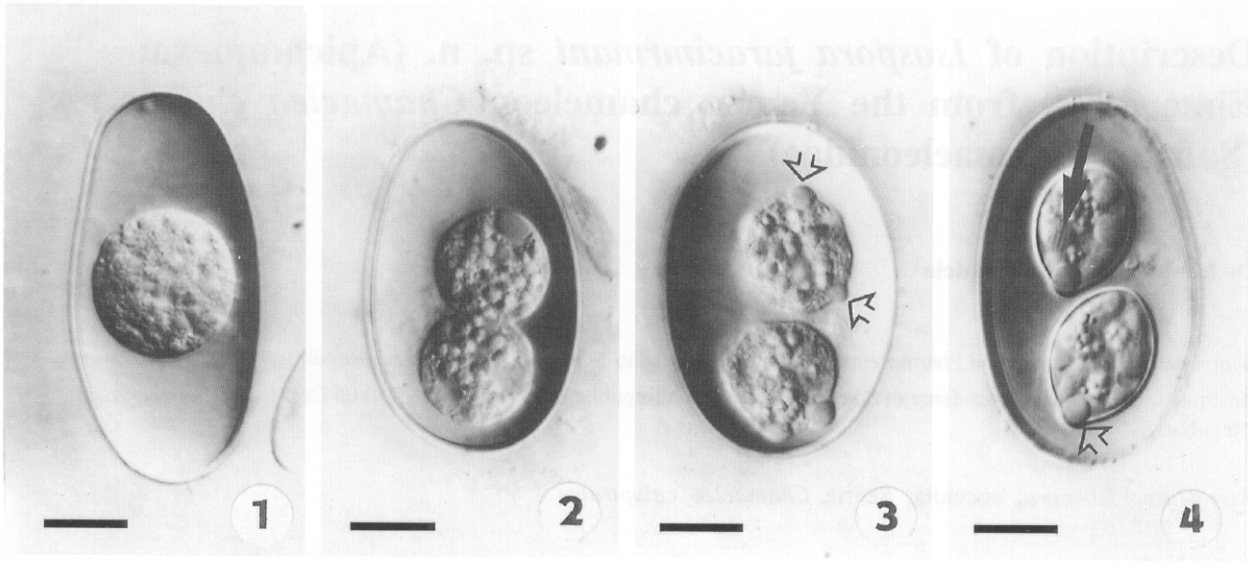
Most chameleons living in captivity in the Czech Republic have originated from two imports from Yemen in 1985 and 1988, when about 50 specimens were imported. Because of easy reproduction in captivity, hundreds of *C. calyptratus* belong to F3–F7 generation are living in captivity now.

Although some information is available on coccidia of chameleons (Sergent 1902), nothing has been published on coccidia of *C. calyptratus*. Here we present a description of a previously unknown species of *Isospora* from captive Yemen chameleons.

MATERIALS AND METHODS

During 1993 to 1995, individual faecal samples collected from 23 adult and 20 young (two-month-old) captive chameleons obtained from different herpetoculturists in the Czech Republic were screened routinely for parasites. The young chameleons were obtained from one breeding stock and some of them presented weight loss and weakness. Faeces were placed in 2.5 % (w/v) potassium dichromate solution and shipped to University of Veterinary and Pharmaceutical Sciences in Brno for initial microscopic examination. Oocysts were concentrated using flotation in Sheather's sugar solution (specific gravity 1.30). Measurements were made on 50 oocysts using bright-field microscopy (100× objective) with a calibrated ocular micrometre to obtain morphologic data. All measurements are in micrometres (μm), given as the mean followed by the range in parentheses. In order to determinate the sporulation time, oocysts were concentrated from fresh faeces obtained by carefully manipulating the infected chameleons. Oocyst cultures suspended in 2.5 % potassium dichromate solution were incubated at 25 ± 2°C. Oocysts during different stages of sporogony were observed using Nomarski interference contrast (NIC) microscopy. Unsporulated and fresh sporulated oocysts were measured and photographed with NIC.

Samples for histology were obtained at necropsy from four infected young chameleons (both sexes, snout-vent length 160–200 mm). At necropsy, tissue samples of the stomach, small and large intestine, liver, gall bladder, kidney, lung and heart were fixed in 10 % formalin and processed for light microscopy using standard histological method. Paraffin sections



Figs. 1–4. Nomarski interference contrast photographs of oocysts of *Isospora jaracirmani* sp. n. during different stages of sporogony. **Fig. 1.** Unsporulated oocyst in sporont stage. **Fig. 2.** Oocyst containing a binucleate sporont in the process of dividing to form sporoblast. **Fig. 3.** Oocyst containing two binucleate sporoblasts with nuclei at periphery (arrowheads). **Fig. 4.** Sporulated oocyst with prominent substieda body (arrowhead) and distinct transverse striations (arrow). All scale bars = 10 μm.

microscopy using standard histological method. Paraffin sections were stained with hematoxylin and eosin (H&E) and Giemsa stains.

The prepatent period was determined by experimental infecting a three-month-old captive chameleon that had been monitored for one month without coccidia in faeces. This chameleon was given 500,000 oocysts of *Isospora jaracimrmani* sp. n. *per os*.

RESULTS

Of 23 adult captive Yemen chameleons *Chamaleo calyptratus* examined, two (8.7 %) passed coccidian oocysts. Sixteen (80%) of the young chameleons were infected with coccidia. All infected *C. calyptratus* excreted oocysts for several weeks. Comparison of the oocysts with previously reported species revealed an undescribed isosporan species.

Isospora jaracimrmani sp. n. Figs. 1–7

Oocysts ellipsoidal or pyriform, 38.4 × 25.6 (35.2 to 42.8 × 23.8–27.0), with smooth bilayered and colourless oocyst wall. A micropyle, oocyst residuum or polar granule are absent. Sporocysts ellipsoidal to ovoid, 15.9 × 11.2 (14.8–17.0 × 10.4–12.0), with dome-like Stieda (1.0 × 1.2–1.8) and homogenous spherical substieda (2.5–2.8 × 3.0–3.4) bodies. Sporocyst wall single-layered, smooth, colourless, about 0.5 thick. Sporocyst residuum present, consisting either of a compact mass or of scattered granules. Sporozoites vermiform, with faint transverse striations anteriorly, 13.1 × 3.4 (12.4–16.5 × 2.8–4.0). Each sporozoite contains a spherical, centrally located refractile body and spherical posterior refractile body. A single, spherical nucleus was located centrally between refractile bodies.

Type host: *Chamaeleo calyptratus* Duméril et Duméril, 1851 (Yemen chameleon, cone-head chameleon, veiled c.) (Sauria: Chamaeleonidae).

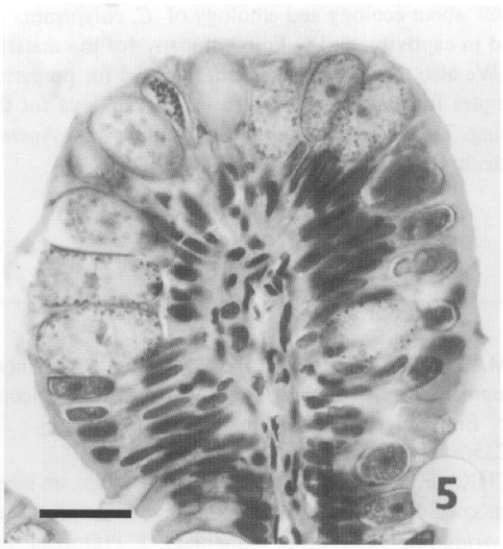
Type locality: Species described from the captive animals. *C. calyptratus* is naturally distributed in Saudi Arabia and Yemen.

Prevalence: 18/43 (41.8 %) *C. calyptratus* were passing oocysts.

Sporulation: Exogenous. Fresh faeces contained unsporulated oocysts (Fig. 1) and oocysts at the beginning of sporulation with peripherally located nucleus (Fig. 2). Cleavage of the sporont continued until two sporoblast were formed. Nuclear division of the sporoblasts then occurred with two nuclei appearing at the periphery of the sporoblast (Fig. 3). Fully formed sporocysts (Fig. 4) were completed within 12 to 24 h at 25 ± 2°C.

Prepatent period: 7 days; infected chameleon producing only small numbers of oocysts was still patent 3 months post inoculation, when regular parasitological examinations were stopped.

Site of infection: Endogenous stages developed within nuclei of enterocytes in the small intestine (Fig. 6).



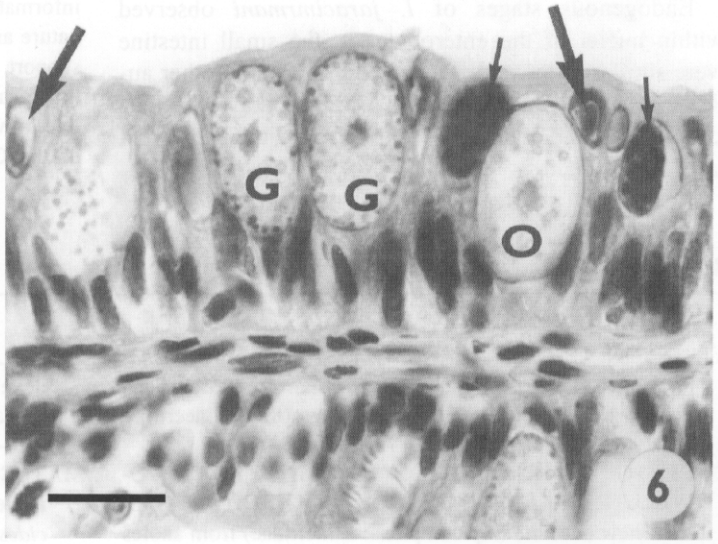


Fig. 5. Villus of the small intestine with numerous endogenous stages of *Isospora jaracimrmani* sp. n. Scale bar = 20 μm.
Fig. 6. The intranuclear endogenous stages of *Isospora jaracimrmani* n. sp. Trophozoites (large arrows), multinucleate meront (small arrows), mature macrogamonts (G) and young oocyst (O).

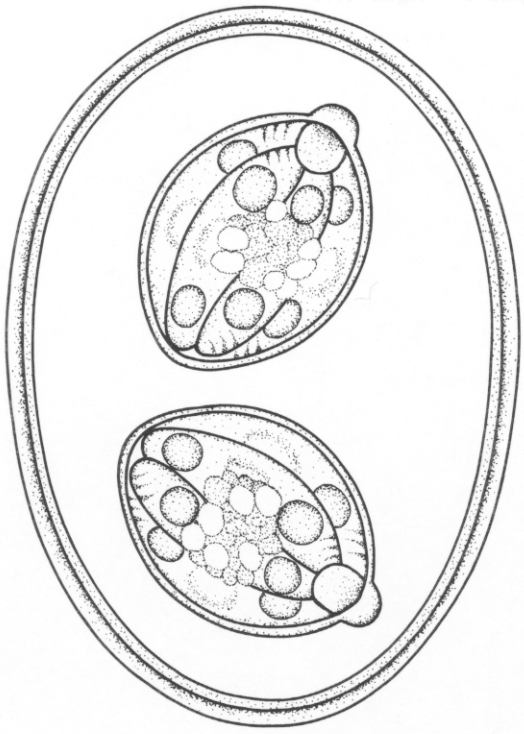


Fig. 7. Composite line drawing of sporulated oocyst of *Isospora jaracimrmani* sp. n. Scale bar = 10 μm.

During endogenous development, nuclei were gradually consumed and transformed to thin envelop around the parasite.

Type specimens: Syntypes (oocysts in 10 % formalin), phototype and histological sections of endogenous stages are deposited in the Institute of Parasitology, Academy of Sciences of the Czech Republic, České Budějovice.

Etymology: The specific epithet is given in honour of Jára Cimrman, a popular Czech theatre hero.

DISCUSSION

Although 42 named species of *Isospora* have been described from lacertilian hosts (Finkelman and Paperna 1994a,b, Cisper et al. 1995), only one of them – *I. mesnili* Sergent, 1902 is described from a member of family Chamaeleonidae – from *Chamaeleo chamaeleon* (in the original description the host is incorrectly named as *C. vulgaris*). *Isospora jaracimrmani* sp. n. differs markedly from the forementioned species in morphology and size of oocysts as well as in geographic distribution of the host; these differences justify considering *Isospora jaracimrmani* sp. n. as distinct species.

Oocysts of *I. jaracimrmani* were passed during the initial phase of sporulation and contained a single or dividing sporont. Sporulation was complete within 12 to 24 h at 25 ± 2°C in 2.5 % (w/v) potassium dichromate

similar sporulation time of *I. canariensis* and *I. tarentolae* from the gecko *Tarentola delalandii*.

Endogenous stages of *I. jaracimrmani* observed within nuclei of the enterocytes in the small intestine were similar to those described and figured by other authors (Atkinson and Ayala 1987, Matuschka 1989, Finkelman and Paperna 1994a) from the different lacertilian species.

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REFERENCES

ATKINSON C. T., AYALA S. C. 1987: *Isospora manchacensis* n. sp., an intranuclear coccidian from Louisiana ground skink, *Scincella lateralis* (Say, 1823) (Lacertilia: Scincidae). J. Parasitol. 73: 817–823.

CISPER G. L., HUNTINGTON C., SMITH D. D., POWELL R., PARMERLEE J. S., LATHROP A. 1995: Four new coccidia (Apicomplexa: Eimeriidae) from anoles (Lacertilia: Polychrotidae) in the Dominican Republic. J. Parasitol. 81: 252–255.

FINKELMAN S., PAPERNA I. 1994a: The endogenous development of three new intranuclear species of *Isospora* (Apicomplexa: Eimeriidae) from agamid lizards. Syst. Parasitol. 27: 213–226.

FINKELMAN S., PAPERNA, I. 1994b: The endogenous development of two new species of *Isospora* (Apicomplexa: Eimeriidae) from skinks. Syst. Parasitol. 27: 227–235.

MATUSCHKA F. R. 1989: *Isospora viridanae* n. sp., an intranuclear coccidian parasite from the canarian scink, *Chalcides viridianus* (Lacertilia: Scincidae). J. Protozool. 36: 274–279.

MATUSCHKA F. R., BANNERT B. 1986: New eimeriid coccidia from the gecko *Tarentola delalandii* Duméril et Bibron, 1836. Protistologica 22: 399–403.

SERGENT M. E. 1902: Sur une coccidie nouvelle, parasite du Caméléon vulgaire. C.R. Soc. Biol. (Paris) 54: 1260–1261.

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