

Descriptions of a New Species in a New Genus, *Kiransus*, and Five New Species of *Hydrochus* (Coleoptera, Hydrophilidae)

Dewanand Makhan

University of Utrecht, Department of Plant Ecology and Evolutionary Biology, Heidelberglaan 2,
3584 CS Utrecht, The Netherlands

(Accepted November 9, 1993)

Dewanand Makhan (1994) Descriptions of a new species and a new genus, *Kiransus*, and five new species of *Hydrochus* (Coleoptera, Hydrophilidae). *Zoological Studies* 33(2): 160-164. One new genus, *Kiransus* from Africa and five new *Hydrochus* species are described (Coleoptera, Hydrophilidae, Hydrochinae). They are: *Kiransus aschnae* from Ethiopia and Zaire (Congo) *Hydrochus rishwani*, *H. sewnathi*, *H. boedhani*, *H. flexibilis* from Zaire and *H. inornatus* from Java.

Key words: Coleoptera, Hydrophilidae, Hydrochinae, *Kiransus* gen. n., *Hydrochus*.

Sent to me from the Koninklijk Museum voor Midden-Africa, Tervuren, Belgium and Koninklijk Belgisch Instituut voor Natuurwetenschappen Brussels, were *Hydrochus* samples for identification; 6 new species were found among these samples. One new genus from Ethiopia and Zaire, five new species from Zaire (Belgian Congo) and one new species from Tanzania and Java each. d'Orchymont (1926), described a new subspecies from Java (Indonesia) as *Hydrochus lacustris* Nietner (1857) subspecies *inornatus*, but this is a new species from Java. The holotypes of *Kiransus aschnae* and *Hydrochus flexibilis* are deposited in Koninklijk Museum voor Midden-Afrika, Tervuren, Belgium, while all other holotypes are deposited in the Coleoptera Collection of Koninklijk Belgisch Instituut voor Natuurwetenschappen, Brussels.

Description of *Kiransus* gen. n.

Type-species: *Kiransus aschnae*.

Head is as long as wide. Antennae 7-segments with a densely pubescent 3-segmented-club. The maxillary palpus is slightly larger than the antennae. The pronotum longer than wide, on pronotum with six large shallow depressions. Elytra convex, 2nd, 4th and 6th interstriae carinate run almost the entire length. The scutellum is minute, longer than wide. Legs moderately long and slender. Tarsi

5-segments, apical segment large. Male and female both have two large spine shaped processes on the fifth abdominal sternit.

Etymology: The genus is named after my daughter Kiran.

Kiransus aschnae sp. n.

(Figs. 1-4)

Type: Holotype male. (Figs. 1-3) Ethiopia, Ilubabor Prov. Gambela, Aug.1971 (M.L. Schmidt).

Paratypes: Zaire, (Congo) Kinchassa, 22 Feb. 1899 (Waelbroeck); 2 ♀ ♀.

Zaire, Kinchassa, 12 Apr.1899 (Waelbroeck); 2 ♀ ♀ (1 ♀ in the author's collection).

Zaire, Tshuapa, Bamanya, Aug.1963 (P. Hulstaert); 3 ♀ ♀ (1 ♀ in the author's collection).

Zaire, Chiloango, (M.Tschoffen) (data unknown); 3 ♀ ♀.

Description (Holotype male): Elongated, body 3.6 mm in length, 1.4 mm in width (some females, 3.7 mm). Dorsal side shiny. Colour of head, pronotum, scutellum and elytra: brown with a blue-green metallic gloss. The head has densely grouped fine punctures. The pronotum is longer than wide, the lateral area granulated. On pronotum with six large shallow depressions. Anterior margin of pronotum has three depressions, one in the centre, two behind this. The posterior margin with three depressions.

***Hydrochus rishwani* sp. n.**

Type: Holotype male. Zaire, (Congo) Kinchassa, 23 Oct. 1899 (Waelbroeck).

Paratypes: Zaire, Kinchassa, 29 Apr. 1899 (Waelbroeck); 1 ♀. Zaire, Kinchassa, 19 Jan. 1900 (Waelbroeck); 1 ♀. Zaire, Kinchassa, 18 Jan. 1900 (Waelbroeck); 2 ♀ ♀, 1 ♂ (1 ♂ in the author's collection). Zaire, Kinchassa, 27 Feb. 1899 (Waelbroeck); 1 ♀. Zaire, Kinchassa, 19 Feb. 1899 (Waelbroeck); 2 ♀ ♀. Zaire, Kinchassa, 22 Feb. 1899 (Waelbroeck); 3 ♀ ♀. Zaire, Kinchassa, 25 March 1899 (Waelbroeck); 1 ♀. Zaire, Kinchassa, 3 Apr. 1899 (Waelbroeck); 1 ♂. Zaire, Kinchassa 13 Apr. 1899 (Waelbroeck); 1 ♀. Zaire, Kinchassa 29 Apr. 1899 (Waelbroeck); 1 ♂. Zaire, Eala Oct. 1936 (I. Shesquire); 1 ♀, 1 ♂ (1 ♂ in the author's collection).

Description (Holotype male): Elongated, body 2.2 mm in length, 0.8 mm in width (one male, 3.1 mm). Dorsal area shiny, color of head pronotum, scutellum and elytra: brown with a blue-green metallic gloss. Head has densely grouped fine punctures. Pronotum almost trapezium-shaped, lateral area smooth. On pronotum with 5 large shallow depressions. Anterior margin of pronotum has three depressions, one at the centre, two behind this. Posterior margin has two depressions.

Elytron length 1.6 mm, the posterior third being the widest, lateral area smooth, stria punctures coarse, wider than interstriae. Interstriae flat, tubercle absent. Apical holes absent. Elytra has about 25 large black spots. Elytra apices narrowly rounded.

Male genitalia (Fig. 5): Basal piece short, median lobe longer than paramera.

Etymology: This species is named after my son Rishwan Makhan. (This species seems similar to *Hydrochus rattanae* Makhan, 1992 from Surinam; but the shape of the male genitalia (fig. 9) is different, median lobe in *H. rishwani* is bird-head shaped, the median lobe in *H. rattanae* is widened.)

***Hydrochus sewnathi* sp. n.**

Type: Holotype male. Zaire, (Congo) Kinchassa, 22 Feb. 1899 (Waelbroeck).

Paratypes: Zaire, Kinchassa, 23 Oct. 1899 (Waelbroeck); 1 ♂. Zaire, Kinchassa, 22 Feb. 1899 (Waelbroeck); 1 ♀, 1 ♂ (1 ♂ in the author's collection). Zaire, Kinchassa, 30 March 1899 (Waelbroeck); 1 ♀. Zaire, Kinchassa, 19 Feb. 1899 (Waelbroeck); 1 ♀.

Description (Holotype male): Elongated, body 2.8 mm in length and 1.0 mm in width (one male, 2.3 mm). Dorsal area shiny. Color of head black, color of pronotum, scutellum and elytra brown and with a blue-green metallic gloss. Head has densely grouped fine punctures. The pronotum is almost

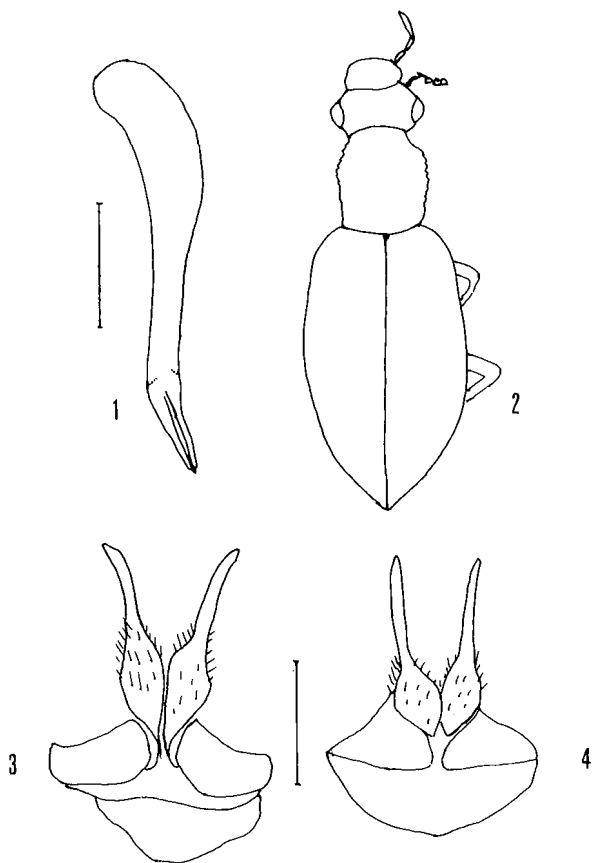


Fig. 1-4. 1. Male genitalia, *Kiransus aschnaae* sp. n. 2. Male Holotype, *Kiransus aschnaae* sp. n. 3. Male, spine shaped process. 4. Paratype female *Kiransus aschnaae* sp. n. spine shaped process.

(scale line 0.25 mm)

Elytron length 2.1 mm, the posterior third being the widest, lateral area smooth, stria punctures coarse, wider than interstriae, tubercle absent, 2nd, 4th and 6th interstria carinate run the entire length. Eighth interstria is carinated along its posterior half while flat along its anterior half. The elytra has about 30 large black spots. Apical holes absent. Elytra apices rounded.

Male genitalia (Fig. 1): Basal piece long, median lobe longer than paramera, narrow apices on the paramera. Male (Fig. 3) and female (Fig. 4) both have spine shaped process on the fifth abdominal sternite. This is the first species with two large spines on fifth abdominal sternite. Female spines longer than male spines.

Etymology: The species is named after my daughter Aschnakiran Makhan.

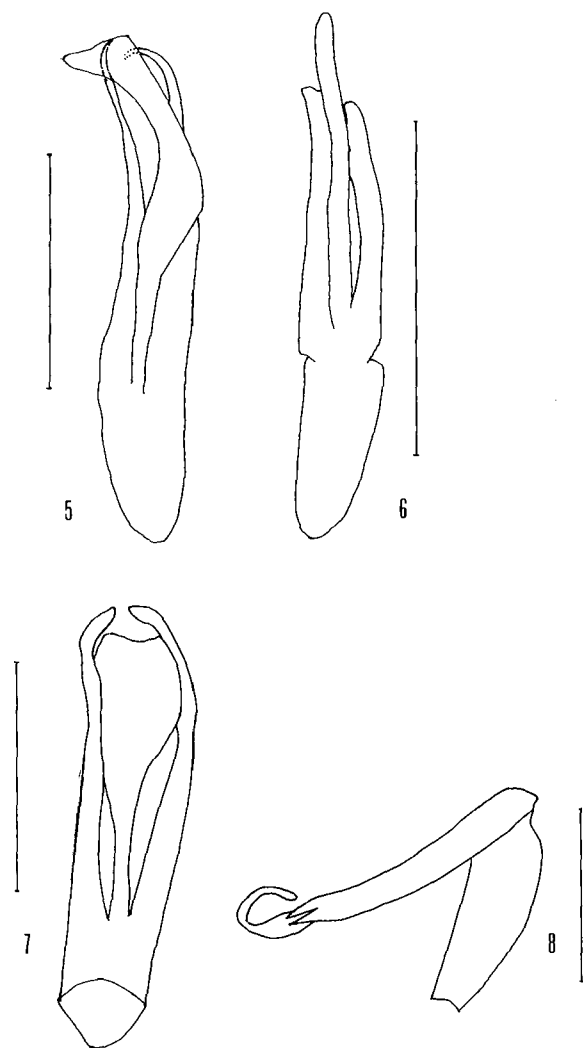


Fig. 5-8. 5. Male genitalia, *Hydrochus rishwani* sp. n. 6. Male genitalia, *Hydrochus sewnathi* sp. n. 7. Male genitalia, *Hydrochus boedhani* sp. n. 8. Male genitalia, *Hydrochus flexibilis* sp. n. (scale line 0.25 mm)

trapezium-shaped, and lateral area granulated. On pronotum with 5 large shallow depressions. Anterior margin of pronotum with three depressions, one at the centre, two behind this. Posterior margin with two depressions.

Elytron length 1.6 mm, the posterior third being the widest, lateral area smooth, stria punctures coarse wider than interstriae wider than stria, 3rd, 5th and 7th interstriae carinated almost their entire length, tubercle absent, Elytra apices narrowly rounded. Apical holes absent.

Male genitalia (Fig. 6): Basal piece short,

paramera narrow, median lobe longer than the paramera.

Etymology: This species is named after my nephew Sewnath Khoen-Khoen. (This species is similar to *Hydrochus soekhnandanae* Makhan, 1992 from Surinam, the shape of the male genitalia (Fig. 10), paramera in *H. soekhnandanae* is knife-shaped, the paramera in *H. sewnathi* narrowed.)

***Hydrochus boedhani* sp. n.**

Type: Holotype male. Tanzania, Kilimandjaro, Kibonoto 1,000-1,300 m, 21 Sept. 1905 (Sjostedt) (female unknown).

Description (Holotype male): Elongated, body 2.4 mm in length and 0.9 mm in width. Dorsal area shiny. Color of head, pronotum, scutellum and elytra: greyish coppery and with a blue-green metallic gloss. Head has densely grouped fine punctures. Pronotum narrowed backwards, lateral area smooth. On pronotum with 5 large deep depressions. Anterior margin of pronotum with three depressions, one at the centre, two behind this. Posterior margin with two depressions.

Elytron length 1.5 mm, the posterior third being the widest, lateral area finely granulated, stria punctures coarse, wider than the interstriae, tubercle on 5th interstriae very prominent. 9th interstriae convex. Apical holes absent. Elytra apices rounded and broadened.

Male genitalia (Fig. 7): Basal piece short, parameres longer than median lobe, parameres narrow.

Etymology: This species is named after my nephew Radjkoemar Boedhan. (This species is very similar to *Hydrochus flexibilis*; but, the shape of the male genitalia is different, median lobe in *H. boedhani* is short and widened, while the median lobe in *H. flexibilis* is long and narrowed.)

***Hydrochus flexibilis* sp. n.**

Type: Holotype male. Zaire. Kabwekanono Lutwa Lufira (1.815 m), 12 Jan. 1948 (C.F. Witte).

Paratype: 1♂ (same data as holotype).

Description (Holotype male): Elongated, body 3.5 mm in length and 1.2 mm in width. Dorsal area shiny. Color of head black; color of pronotum, scutellum and elytra: brown, with a blue-green metallic gloss. Head has fine punctures. Pronotum almost trapezium-shaped, lateral area granulated. On pronotum has 9 large deep depressions. Anterior margin of pronotum has five depressions, one at the centre, four behind this. Posterior margin has four depressions.

Elytron length 2.2 mm, widening to about half

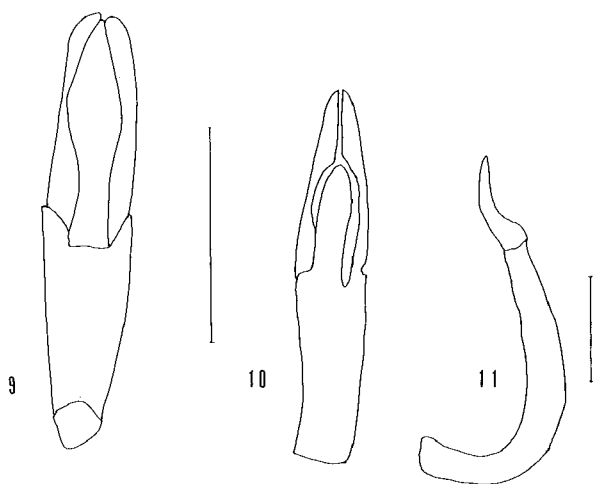


Fig. 9-11. 9. Male genitalia, *Hydrochus rattanae* Makhan, 1992.
10. Male genitalia, *Hydrochus soekhnandanae* Makhan 1992.
11. Male genitalia, *Hydrochus obnatus* Balfour-Browne, 1959.
(scale line 0.25 mm)

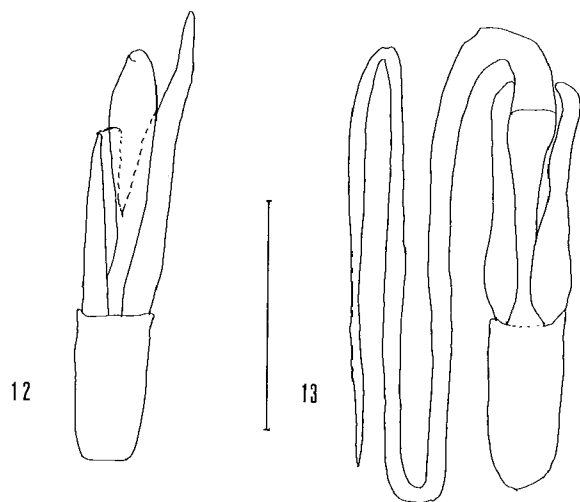


Fig. 12-13. 12. Male genitalia, *Hydrochus inornatus* sp. n.
13. Male genitalia, *Hydrochus lacustris* Nietner, 1857.
(scale line 0.25 mm)

of the way to the apex, lateral area smooth, stria punctures coarse, wider than interstriae, interstriae 2nd, 4th and 6th carinate, run almost the entire length. Apical holes absent. Elytra apices rounded.

Male genitalia (Fig. 8): Basal piece very long with short paramera.

Etymology: The holotype and paratype were labeled after Balfour-Browne as *Hydrochus flexibilis*,

but he did not publish it. (This species is very similar to *Hydrochus obnatus* Balfour-Browne, 1959 from Ivory Coast; but, the male genitalia (Fig. 11) is different, basal piece in *H. flexibilis* is short, while the basal piece in *H. obnatus* long.)

***Hydrochus inornatus* sp. n.**

Type: Holotype male. Java, (Indonesia) Batavia, May, 1913 (I.B. Corporaal) (female unknown).

Description (Holotype male): Elongated, body 2.5 mm in length and 0.9 mm in width. Dorsal area shiny. Color of head and pronotum, scutellum and elytra brown with a blue-green metallic gloss. Head has densely grouped fine punctures.

The pronotum is almost trapezium-shaped, the lateral area smooth. On pronotum with 5 large deep depressions. Anterior margin of pronotum with three depressions, one at the centre, two behind this.

Elytron length 1.4 mm, widest on posterior third, lateral area smooth, stria punctures slightly larger than interstriae, tubercle absent, interstriae 3rd, 5th, 7th and 9th carinated, almost the entire length. Apical holes absent. Elytra apices narrowly rounded.

Male genitalia (Fig. 12): Paramera longer than median lobe, paramera narrow, median lobe shorter than the paramera.

Etymology: This species is named after d'Orchymont, 1926 as *Hydrochus lacustris* Nietner, subspecies *inornatus*. (This species is similar to *H. lacustris* Nietner, 1857 from Sri Lanka; but, the shape of the male genitalia is different (Fig. 13), median lobe in *H. lacustris* has a very long flagellum, while the flagellum is absent in *H. inornatus*.)

Acknowledgements: I thank the Coleoptera curators Dr. K. Desender (Brussels, Belgium), Dr. F. Hieke (Berlin, Germany) and Dr. H.M. André (Teruren, Belgium) for *Hydrochus* samples loans.

REFERENCES

- Balfour-Browne J. 1959. Dr. Jan Bechyne expedition to French Guinea, 1951. Hydrophilidae. Ent. Arb. Mus. Frey **10**: 302-320.
Makhan D. 1992. Twelve new *Hydrochus* species from South America (Coleoptera: Hydrophilidae). Phegea **20** (2): 95-103.
Nietner J. 1857. Descriptions of new Ceylon Coleoptera. Ann. Mag. nat. Hist. (2) xix p. 386.
d'Orchymont A. 1926. Notes on the Hydrophilidae in The Federated Malay States Museums. Jour. of the F.M.S. Museums. vol. xiii. p. 246.

鞘翅目昆蟲： *Kiransus* 新屬與 *Hydrochus* 屬五新種

Dewanand Makhan

本文報告鞘翅目牙蟲亞科內非洲產的一新屬 *Kiransus*，和 *Hydrochus* 屬五新種的昆蟲：*Kiransus aschnae* (產於衣索比亞和薩伊) *Hydrochus rishwani*, *H. sewnathi*, *H. boedhani*, *H. flexibilis* (產於薩伊) 和來自爪哇的 *H. inornatus*。

關鍵詞：鞘翅目，牙蟲科，牙蟲亞屬。

Short Note

Four New Species of the Coccidian Parasite *Isospora* (Apicomplexa, Eimeriidae) from Malayan Birds

M. Abdulla Amoudi

Department of Zoology, College of Science, King Saud University, P.O. Box 2455, Riyadh 11451, Saudi Arabia

(Accepted April 15, 1993)

M. Abdulla Amoudi (1994) Four new species of the coccidian parasite *Isospora* (Apicomplexa, Eimeriidae) from Malayan birds. *Zoological Studies* 33(2): 165-169. Four new species of the coccidian parasite *Isospora* (Apicomplexa, Eimeriidae), collected from Java white-bellied Mannikins from Malaya, are described. Species' data were recorded as follows: *Isospora malayaensis* sp. n. with ellipsoidal oocysts 22.5-27.8 × 15.3-18.9 μm (24.9 ± 0.25 × 16.9 ± 0.16) and pyriform sporocysts 13.5-15.5 × 8.5-10.5 μm (14.8 ± 0.10 × 9.3 ± 0.10). *Isospora leucogastroides* sp. n. with ellipsoidal oocysts 27-30.5 × 16-18.5 μm (28.5 ± 0.19 × 17.4 ± 0.15) and elongated sporocysts 14-15.5 × 9-10.5 μm (14.9 ± 0.064 × 9.8 ± 0.053). *Isospora tenuis* sp. n. with ellipsoidal oocysts 27.5-32.5 × 17.5-21 μm (29.3 ± 0.28 × 18.7 ± 0.21) and ovoidal sporocysts 14-17.5 × 10-13.5 μm (15.3 ± 0.16 × 11.6 ± 0.14). *Isospora loaiei* sp. n. with spheroidal oocysts 18.5-22 × 16.5-20 μm (20.6 ± 0.23 × 18.5 ± 0.24) and ovoidal sporocysts 12-14.5 × 8.5-10 μm (13.1 ± 0.13 × 9.3 ± 0.08).

Key words: *Isospora*, *Lonchura leucogastroides*, Sporocysts, Malaya.

The Java white-bellied Mannikin (*Lonchura leucogastroides*), a species endemic to Malaya which has been imported to Saudi Arabia as pets, is a host for the coccidian parasite *Isospora*. The present study describes four isosporan forms as new species: *Isospora malayaensis*, *Isospora leucogastroides*, *Isospora tenuis* and *Isospora loaiei*. Also included are detailed descriptions of all four *Isospora* species plus an illustrative key to the species composition of the genus *Isospora* from the spotted munia (Genus *Lonchura*).

Materials and Methods—Twenty-four fecal samples were collected between March and May, 1992 from 24 birds purchased from local Riyadh markets. Eight of these hosts had coccidian infections. Oocysts were sporulated in a 3% (w/v) solution of potassium dichromate (K₂Cr₂O₇) at room temperature (25°C). Oocysts were then centrifuged with Sheather's sugar solution (Levine 1973); sporulated oocysts were studied with a Nikon compound microscope (NIKON FX-35w, Japan) under oil immersion. Measurements were made with a calibrated ocular micrometer, photomicrographs were taken with a Nikon camera (Microfies PEX), and drawings were made by camera lucida. All measurements in the following section are in μm.

Key to identification of the species *Isospora* from the spotted munia (genus *Lonchura*)

1. Oocysts spheroidal 2
Oocysts ovoidal or ellipsoidal 3
2. Oocyst wall double-layered and sporocysts with prominent knob-like Stieda body; oocyst size 41.8 μm
..... *I. indonesianensis* Amoudi

- Oocyst wall single-layered and sporocyst with small Stieda body; oocyst size 12-26 μm 4
3. Oocysts ovoidal 5
Oocysts ellipsoidal 6
4. Polar granules present; sporocyst residuum with very small granules
..... *I. invensae* Levine, Van Riper and Van Riper
Polar granules absent, sporocyst residuum with large compact residuum *I. loaiei* sp. n.
5. Oocyst micropyle and oocyst residuum present
..... *I. muniae* Chakravarty and Kar
Oocyst micropyle and oocyst residuum absent
..... *I. lonchurae* Mandal and Chakravarty
6. Sporocysts filling only half of oocyst space and crossing at right angles; sporocysts pyriform
..... *I. malayaensis* sp. n.
Sporocysts filling almost all of oocyst space and not crossing at right angles; sporocysts ovoidal 7
7. Sporocyst residuum consisting of a large number of granules spread over one-half of sporocyst; sporocysts elongated, ovoidal *I. leucogastroides* sp. n.
Sporocyst residuum consisting of a small number of granules interspersed between sporozoites; sporocysts ovoidal
..... *I. tenuis* sp. n.

***Isospora malayaensis* sp. n.**
(Figs. 1-3)

Type material: Phototypes and preserved materials are deposited in author's collection at the Zoology Department, College of Science, King Saud University (KSU 26446).

Etymology: The specific name refers to the island of Malaya from which the type host was imported.

Remarks: The location of the parasite in the host is unknown; oocysts are only found in feces. Parasites found in the feces of two of the twenty-four Java white-bellied Mannikins studied (8.3%). Sporulation time 3 days.

Diagnosis: The oocysts of this isosporan are characterized by their sporocysts only filling half the space of oocysts and crossing at right angles.

Description: Oocysts ($n=40$) ellipsoidal, $22.5-27.8 \times 15.3-18.9$ ($\bar{X} = 24.9 \pm SE 0.25 \times \bar{X} = 16.9 \pm SE 0.16$) μm ; shape index (length/width) 1.45-1.48 ($\bar{X} = 1.47 \pm SE 0.002$). Single-layered oocyst wall $0.4-0.8$ ($\bar{X} = 0.68 \pm SE 0.02$) μm thick. Micropyle and oocyst residuum absent, polar granule present. Sporocysts ($n = 50$) pyriform $13.5-15.5 \times 8.5-10.5$ ($\bar{X} = 14.8 \pm SE 0.10 \times \bar{X} = 9.3 \pm SE 0.10$) μm ; shape index (length/width) 1.48-1.67 ($\bar{X} = 1.59 \pm SE 0.009$); single-layered sporocyst wall $0.4-0.7$ ($\bar{X} = 0.57 \pm SE 0.02$) μm thick; knob-like Stieda body present, substiedal body absent; sporocyst residuum composed of small diffuse granules, sporozoites with sickle-like shape, each with larger refractile globule at wide end and smaller globule at narrow end.

***Isospora Leucogastroides* sp. n.**

(Figs. 4-7)

Type material: Phototypes and preserved materials are deposited in author's collection at the Zoology Department, College of Science, King Saud University (KSU 26447).

Etymology: The nomen triviale is the genitive singular of the specific part of the scientific name of the first host in which parasite was found.

Remarks: The location of the parasite in the host is unknown; oocysts are only found in feces. Parasites found in the feces of one of the twenty-four Java white-bellied Mannikins studied (4.2%). Sporulation time 5 days.

Diagnosis: The oocysts of this isosporan are unlike any coccidian oocysts described in other passeriformes to date.

Description: Oocysts ($n = 30$) ellipsoidal, $27-30.5 \times 16-18.5$

($\bar{X} = 28.5 \pm SE 0.19 \times \bar{X} = 17.4 \pm SE 0.15$) μm ; shape index (length/width) 1.56-1.75 ($\bar{X} = 1.64 \pm SE 0.01$). Single-layered oocyst wall $0.5-0.9$ ($\bar{X} = 0.74 \pm SE 0.02$) μm ; no micropyle or residuum, but one large polar granule present. Sporocysts ($n = 60$) elongated ovoidal, $14-15.5 \times 9-10.5$ ($\bar{X} = 14.9 \pm SE 0.064 \times \bar{X} = 9.8 \pm SE 0.053$) μm ; shape index (length/width) 1.47-1.58 ($\bar{X} = 1.52 \pm SE 0.004$); smooth, colorless wall $0.5-0.8$ ($\bar{X} = 0.65 \pm SE 0.01$) μm thick, thicker at narrow end, forming a dome-like Stieda body; lacking substiedal body, residuum consists of a large number of granules spread over one side of sporocysts; sporozoites vermiform with one large, clear globule at each end. Sporozoites extend over the entire length of the sporocyst.

***Isospora tenuis* sp. n.**

(Figs. 8-9)

Type material: Phototypes and preserved materials are deposited in author's collection at the Zoology Department, College of Science, King Saud University (KSU 26448).

Etymology: The specific epithet reflects the thin nature of the oocyst wall.

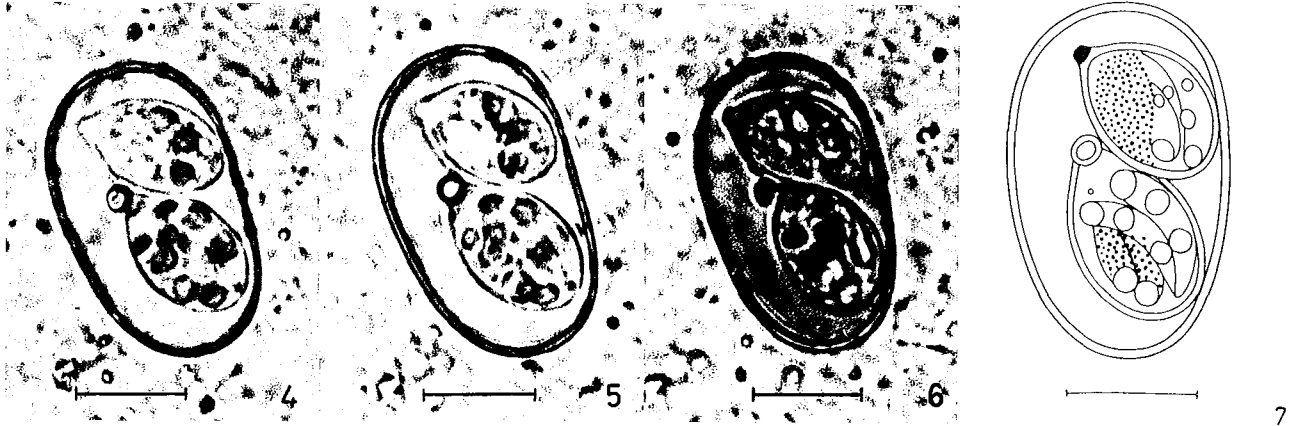
Remarks: The location of the parasite in the host is unknown; oocysts are only found in feces. Parasites found in the feces of two of the twenty-four Java white-bellied Mannikins studied (8.3%). Sporulation time 3-4 days.

Diagnosis: The oocysts of this isosporan resemble those of *Isospora indonesianensis* with these differences: 1) smaller size; 2) ellipsoidal oocysts and sporocysts with less-elongated ovoidal shape; 3) a large polar granule; and, 4) a single-layered oocyst wall.

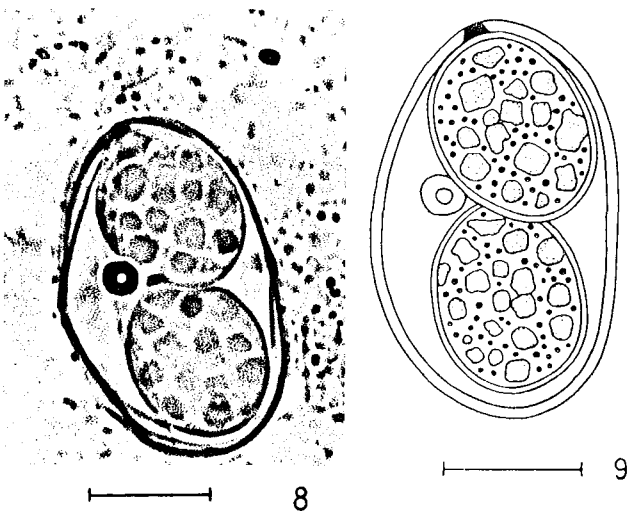
Description: Oocysts ($n = 33$) ellipsoidal, $27.5-32.5 \times 17.5-21$ ($\bar{X} = 29.3 \pm SE 0.28 \times \bar{X} = 18.7 \pm SE 0.021$) μm ; shape index (length/width) 1.51-1.60 ($\bar{X} = 1.57 \pm SE 0.004$). Smooth, thin, single-layered wall is $0.61-1.1$ ($\bar{X} = 0.83 \pm SE 0.03$) μm thick. Micropyle and oocyst residuum absent; polar granule very large. Sporocysts ($n = 50$) ovoidal $14-17.5 \times 10-13.5$ ($\bar{X} = 15.3 \pm SE 0.16 \times \bar{X} = 11.6 \pm SE 0.14$) μm ; shape index (length/width) 1.29-1.40 ($\bar{X} = 1.32 \pm SE 0.005$)



Figs. 1-3. *Isospora malayaensis* sp. n. 1, 2. Photomicrographs of living sporulated oocysts. 3. Line drawing of living sporulated oocysts. Scale bar = 10 μm .



Figs. 4-7. *Isospora leucogastroides* sp. n. 4-6. Photomicrographs of living sporulated oocysts. 7. Line drawing of living sporulated oocysts. Scale bar = 10 μ m.



Figs. 8-9. *Isospora tenuis* sp. n. 8. Photomicrographs of living sporulated oocysts. 9. Line drawing of living sporulated oocysts. Scale bar = 10 μ m.

μ m; single-layered sporocyst wall 0.4-0.7 (\bar{X} = 0.54 \pm SE 0.02) Mm thick; Stieda body consisting only of a thickened area of sporocyst wall at one end of sporocyst; substiedal body absent; sporocyst residuum interspersed between sporozoites.

***Isospora loaei* sp. n.**
(Figs. 10-12)

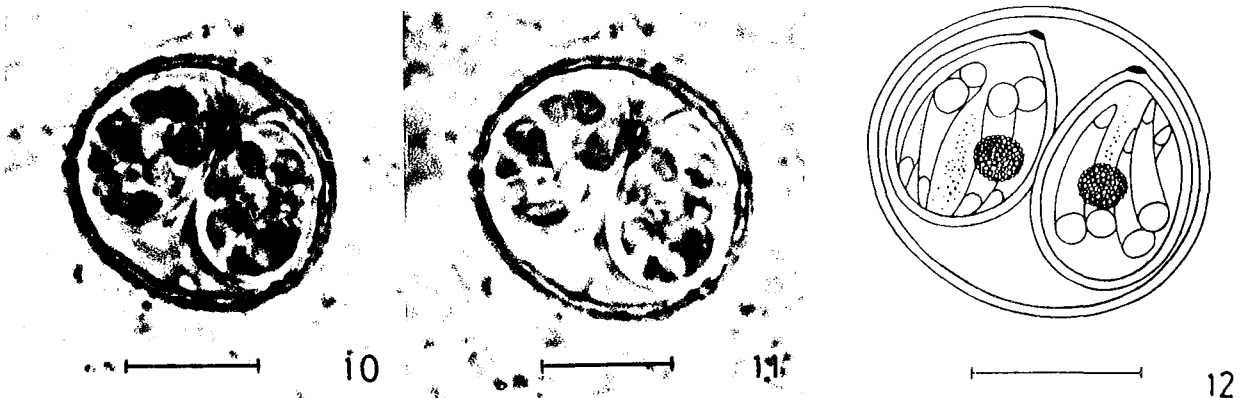
Type material: Phototypes and preserved materials are deposited in author's collection at the Zoology Department, College of Science, King Saud University (KSU 26449).

Etymology: The specific name is derived from the name of my son, Loae.

Remarks: The location of the parasite in the host is unknown; oocysts are only found in feces. Parasites found in the feces of three of the twenty-four Java white-bellied Mannikins studied (12.5%). Sporulation time 4 days.

Diagnosis: Oocysts of this isosporan resemble those of *Isospora ivensae* but lack polar granule and shows sporozoites with two refractile globules.

Description: Oocysts (n = 25) spheroidal, 18.5-22 \times 16.5-20 (\bar{X} = 20.6 \pm SE 0.23 \times \bar{X} = 18.5 \pm SE 0.24) μ m; shape index (length/width) 1.10-1.14 (\bar{X} = 1.11 \pm SE 0.003). Single-layered



Figs. 10-12. *Isospora loaei* sp. n. 10,11. Photomicrographs of living sporulated oocysts. 12. Line drawing of living sporulated oocysts. Scale bar = 10 μ m.

oocyst wall 0.5-0.8 ($\bar{X} = 0.64 \pm \text{SE } 0.02$) μm thick. Micropyle, oocyst residuum, and polar granule absent. Sporocysts ($n = 40$) ovoidal $12-14.5 \times 8.5-10$ ($\bar{X} = 13.1 \pm \text{SE } 0.13 \times X 9.3 \pm \text{SE } 0.08$) μm ; shape index (length/width) 1.37-1.45 ($\bar{X} = 1.40 \pm \text{SE } 0.004$); single-layered sporocyst wall 0.4-0.7 ($\bar{X} = 0.55 \pm \text{SE } 0.01$) μm thick; has small, nipple-like Stieda body; substiedal body absent. Sporocyst residuum compact somewhat round, granular mass. There is no membrane enclosing the sporocyst residuum. Sick-like sporozoite has a spherical refractile globule at each ends with one larger than the other.

Discussion—Many *Isospora* species from passerines have been described. Levine (1982) listed 60 *Isospora* species among 104 passerine birds studied; since 1982, an additional 32 *Isospora* spp. in other passerine species have been described (Amoudi 1987 1988 1990 1992, Canestri-Trotti and Franceschini 1981, Grulet et al. 1982, McQuiston and nHolmes 1988, McQuiston and Wilson 1988, Cringoli and Quesada 1991).

The species I have reported on here were completely different from all previously-known species from Passeriformes, not only in structural features but also in host species; in addition, they are widely separated both taxonomically and biogeographically. The only *Isospora* species reported from the genus *Lonchura* of the family Ploceidae are: *Isospora muniae* Chakravarty and Kar (1944, from a black-headed munia); *Isospora lonchurae* Mandal and Chakravarty (1964, from a spotted munia *L. punctulata*); *Isospora ivensae* Levine, Van Riper, and Van Riper (1980, from spotted or white throat munia *L. punctulata*); and *Isospora indonesianensis* Amoudi (1988, from the chestnut munia *L. malacca*). However, *Isospora malayaensis* sp. n., *I. leucogastroides* sp. n., and *I. tenuis* sp. n. from the Java white-bellied Mannikin can be distinguished from *I. muniae* in having polar granules and in lacking a micropyle and oocyst residuum. *I. loaiei* sp. n. differs from *I. muniae* in having a single-layered oocyst wall. *I. malayaensis*, *I. leucogastroides*, and *I. tenuis* differ considerably from *I. lonchurae* in being ellipsoidal and in having single-layered oocyst walls (compared to the ovoidal oocysts and double-layered oocyst walls of *I. lonchurae*). The oocysts of *I. tenuis* somewhat resemble those of *I. indonesianensis*, but differ in having a single-layered oocyst wall and in having large spherical granules.

I. ivensae, the only *Isospora* species from the genus *Lonchura*, is somewhat similar to *I. loaiei*; both species have spherical oocyst shapes, but *I. loaiei* lacks polar granules and has sporozoites with two refractile globules, whereas *I. evensae* has polar granules and sporozoites with only one refractile globule.

According to Levine (1982), Macquart (1973), McQuiston and Holmes (1988) and Hill and Duszynski (1986), it is generally accepted that when a new coccidian species is described as having oocysts which are structurally identical but obtained from hosts which are widely separated geographically and taxonomically, they are to be considered different species unless otherwise demonstrated.

Acknowledgments—The author wishes to thank Mr. Salah Salem Abou-Fanna for technical assistance.

References

- Amoudi MA. 1987. *Isospora elmahalensis* n.sp. (Apicomplexa, Eimeriidae), a parasite of the White-checked Bulbul (*Pycnonotus leucogenys*) in Saudi Arabia. J. Protozool. **34**: 26-27.
- Amoudi MA. 1988. Two new species of *Isospora* from Indonesian birds. J. Protozool. **35**: 116-118.
- Amoudi MA. 1990. The life cycle of *Isospora elmahalensis* in the White-cheeked Bulbul (*Pycnonotus leucogenys*). Bull. Inst. Zool., Acad. Sinica **29**: 265-272.
- Amoudi MA. 1992. Three new species of *Isospora* (Apicomplexa, Eimeriidae) from the White-cheeked Bulbul (*Pycnonotus leucogenys*) in Saudi Arabia. Zool. Scr. **21**: 1-4.
- Canestri-Trotti G, F Franceschini. 1981. *Isospora* in *Sturnus vulgaris*. Parasitologia **23**: 152-154.
- Chakravarty MM, AB Kar. 1944. Studies on coccidia of Indian birds. II. Observations on several species of the coccidia of the sub-families Cyclosporinae and Eimeriinae. Proc. Ind. Acad. Sci. **20**: 102-104.
- Cringoli G, A Quesada. 1991. *Isospora mcquistioni* and *Isospora bioccai* (Apicomplexa, Eimeriidae): Two new coccidian parasites from *Carduelis sinica* (Passeriformes, Fringillidae). J. Protozool. **38**(6): 577-580.
- Grulet O, I Landau, D Baccam. 1982. Les *Isospora* du Moineau domestique; multiplicité des especes. Ann. de Parasitologie **57**: 209-235.
- Hill TP, DW Duszynski. 1986. Coccidia (Apicomplexa: Eimeriidae) from sciurid rodents (*Eutamias*, *Sciurus*, *Tamiasciurus* spp.) from the western United States and northern Mexico with descriptions of two new species. J. Protozool. **33**: 282-288.
- Levine ND. 1973. Protozoan Parasites of Domestic Animals and of Man, 2nd ed. Minneapolis: Burgess.
- Levine ND. 1982. *Isospora passeris* n.sp. from the house sparrow *Passer domesticus*. *I. laacazei* and related apicomplexan protozoa. Trans. Am. Microsc. Soc. **101**: 66-74.
- Levine ND, S Van Riper, C Van Riper III. 1980. Five new species of *Isospora* from Hawaiian birds. J. Protozool. **27**: 258-259.
- Mandal AK, MM Chakravarty. 1964. Studies on some aspects of avian coccidia (Protozoa, Sporozoa) 2. Five new species of *Isospora* Schneider, 1881. Proc. Zool. Soc. Calcutta **17**: 34-45.
- Marquardt WC. 1973. Host and site specificity of the coccidia. In The coccidia, eds. DM Hammond, PL Long. Baltimore: University Park Press, pp 23-43.
- Mcquiston TE, BB Holmes. 1988. *Isospora robini* sp. n., a new coccidian parasite (Apicomplexa: Eimeriidae) from American robin (*Turdus migratorius*). Proc. Helminthol. Soc. Wash. **55**: 324-325.
- Mcquiston TE, M Wilson. 1988. Four new species of *Isospora* from the small tree finch (*Camarhynchus parvulus*) from the Galapagos Islands. J. Protozool. **35**: 98-99.

感染白腹文鳥的四種新種的寄生性球蟲

M. Abdulla Amoudi

本文報告自白腹文鳥(*Lonchura leucogastroides*)糞便中採集到的四種寄生性球蟲新種。四個新種的描述如下, *Isospora malayaensis* sp. n.: 橢圓形卵囊($24.9 \pm 0.25 \times 16.9 \pm 0.16 \mu\text{m}$)及梨形孢囊($14.8 \pm 0.10 \times 9.3 \pm 0.10 \mu\text{m}$), *Isospora leucogastroides* sp. n.: 橢圓形卵囊($28.5 \pm 0.19 \times 17.4 \pm 0.15 \mu\text{m}$)及長形孢囊($14.9 \pm 0.064 \times 9.8 \pm 0.053 \mu\text{m}$), *Isospora tenuis* sp. n.: 橢圓形卵囊($29.3 \pm 0.28 \times 18.7 \pm 0.21 \mu\text{m}$)及卵圓形孢囊($15.3 \pm 0.16 \times 11.6 \pm 0.14 \mu\text{m}$); *Isospora loaei* sp. n.: 球形卵囊($20.6 \pm 0.23 \times 18.5 \pm 0.24 \mu\text{m}$)及卵圓形孢囊($13.1 \pm 0.13 \times 9.3 \pm 0.08 \mu\text{m}$)。

關鍵詞：等孢子蟲, 白腹文鳥, 孢囊, 馬來亞。