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Two new species of Cestoda (Cyclophyllidea: Dilepididae) from Ploceidae and Passeridae (Aves: Passeriformes) in Côte d'Ivoire

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Abstract: Two new dilepidid cestodes parasitic in common landbirds of Ivory Coast are described. *Spiniglans thomassankara* sp. nov. was found in *Ploceus nigerrimus castaneofuscus* (Ploceidae) and other *Ploceus* species along the lagoon system of the South East of the country. It shows characters similar to those of members of both *Spiniglans* and *Dictymetra* but lacks a clearly visible ductus masculinus. It is characterized by 24-26 comparatively long hooks and a massive ovary. *Monopylidium comoensis* sp. nov. was found in *Gymnoris dentata* (Passeridae) in the Sudanian savanna from the North Eastern corner of the country. It shows 20-22 hooks 13.5-16.5 long, 14-25 testes and a distally enlarged vagina. The unknown parasites richness of very common hosts is underscored.

Keywords: Parasites - tapeworms - *Spiniglans* - *Monopylidium* - bird hosts - West Africa - non-model organisms.

INTRODUCTION

The cestode fauna of birds of the République de Côte d'Ivoire (Ivory Coast, West Africa) is one of the better known of the continent (Mariaux, 1994), even if only a small proportion of the country's global avian diversity of 745 species (Lepage, 2021) has been examined (Mariaux, 1994; Georgiev & Mariaux, 2007, and references therein). An abundant additional material collected in the last 40 years and kept in the Natural History Museum of Geneva remains to be studied in detail. Here, I report on two new dilepidid species parasitic in granivorous passerines in the genera *Ploceus* and *Gymnoris*.

MATERIAL AND METHODS

Birds were collected using mist nets in 1985, 1987, and 1988 by the author, and in 2010 by V. Widmer and M. E. Konan, from various localities in South Eastern Côte d'Ivoire along lagoons lining the Atlantic Coast and around the Ouango Fitini abandoned field station in the North East of the country. Hosts were sorted at mist net side, transported to the lab in fabric bags and euthanized as soon as possible with an excess of chloroform. Dissections, fixation and staining were performed according to standard procedures (see e.g. Mariaux & Georgiev, 2020), and stained specimens were mounted in Canada balsam. Some scoleces were squashed in Berlese's medium to facilitate examination of rostellar hooks.

All measurements are given in micrometers (if not indicated otherwise) as the range, with the mean and the number (n) of measurements or counts in parentheses. These are followed by values for holotype within square brackets where available. All specimens are deposited in the Helminthological Collections of the Museum of Natural History (MHNG-PLAT) in Geneva, Switzerland. Some of the hosts are also deposited in the same Institution with numbers from its bird collection (MHNG-OIS).

TAXONOMIC PART

Spiniglans thomassankara sp. nov.

Figs 1-5

Holotype: MHNG-PLAT-0015962 (formerly MHNG 988.402); Côte d'Ivoire, District Autonome d'Abidjan, Songon, fields ab. 7 km E of Dabou; WGS84 5.33, -4.31, 3 m; 21.04.1988. From *Ploceus nigerrimus castaneofuscus* (Lesson, 1840) (Passeriformes, Ploceidae); MHNG-OIS-1774.026.

Paratype: MHNG-PLAT-0015941 (formerly MHNG 985.637); 1 specimen; Côte d'Ivoire, District Autonome d'Abidjan, Adiopodioumé, former Orstom Experimental Fields; WGS84 5.33, -4.14, 45 m; 24.10.1985. From

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Ploceus nigerrimus castaneofuscus (Passeriformes, Ploceidae); MHNG-OIS-1774.014.

Other material:
- From *Ploceus nigerrimus castaneofuscus* MHNG-PLAT-0137397-8, MHNG-PLAT-0137400-1; 4 specimens; Côte d'Ivoire, Comoé, Nouamou, along Western end of Ehy Laguna; WGS84 5.18, -2.90, 17 m; 03.06.2010-06.06.2010. MHNG-OIS-1982.041-2, MHNG-OIS-1982.046.
- From *Ploceus cucullatus* (Statius Muller, 1776) MHNG-PLAT-0137402; 3 specimens. Same locality as paratypes. 09.06.2010.
- From *Ploceus nigricollis brachypterus* Swainson, 1837. MHNG-PLAT-0015956 (formerly MHNG 987.290); 2 specimens. Same locality as paratypes. 27.04.1987. MHNG-OIS-1774.050.
- From *Ploceus* sp. MHNG-PLAT-0015951 (formerly MHNG 985.636); 1 specimen. Same locality as paratypes; 23.07.1985.

Comparison material studied: MHNG-PLAT-0040450, 5 slides. *Spiniglans microsoma* (Southwell, 1922), "cotypes".

Prevalences: 7/36 (19%) in *P. nigerrimus*; 1/16 (6%) in *P. nigricollis*; 1/42 (2%) in *P. cucullatus.*

Intensity: 1-3.

Etymology: The specific epithet (a noun in apposition) honours, and is dedicated to, Thomas Isidore Noël Sankara (1949-1987), former president of the Burkina Faso, who was enlightening the West Africa subregion when these specimens were collected.

Description: Worm with body of medium size, up to 78 mm in length and with maximum width of 800 at level of early gravid proglottides. Longest specimen with 222 proglottides. Proglottides craspedote, wider than long, except for a few final gravid ones that can be up to twice longer than wide. Scolex rounded, not markedly delineated from neck, 295-490 in diameter (367, n = 10) [312]. Suckers rounded, muscular, unarmed, 118-160 (142, n = 40) [135-145] in diameter. Rostellar sac regular, cylindrical, weakly muscular, extending well past level of posterior margin of suckers into anterior strobila, 342-457 x 123-175 (390 x 146, n = 10) [342 x 123]. Rostellum elongated, very muscular, with well developed glandular tissue, especially in it posterior half, 258-358 x 86-133 (323 x 112, n = 10) [290 x 186] (Fig. 1). Hooks on two rows, 24-26 [26] in number; similar in shape in both rows with long handles and blades, and well developed guards, that are forward oriented. Hooks of first row slightly shorter and straighter than those of second row. Hooks length 62-65.5 on first row (64, n = 13) and 66.5-69.5 on second row (68, n = 11) (Fig. 2). Neck poorly marked; proglottization distinct at 400-550 from posterior margin of suckers. Genital pores lateral, situated slightly anterior to mid-length of lateral proglottis margin, irregularly alternating in very short series, e.g. …, 3, 2, 3, 2, 2, 1, 2, 1, 2, 1, 1, 1, 2, 1…; or …, 2, 1, 1, 1, 1, 4, 2, 1, 1, 2, 1, 1, 1, 3, …, no more than 5 consecutive pores observed on a single side. Ventral osmoregulatory canals up to 55 wide, possibly more in terminal proglottides, connected posteriorly in each proglottis by transverse anastomosis. Dorsal osmoregulatory canals 5-12 wide. Genital ducts passing between osmoregulatory canals. Genital atrium small, unremarkable, sink-shaped, up to 20 deep and 30 in diameter.

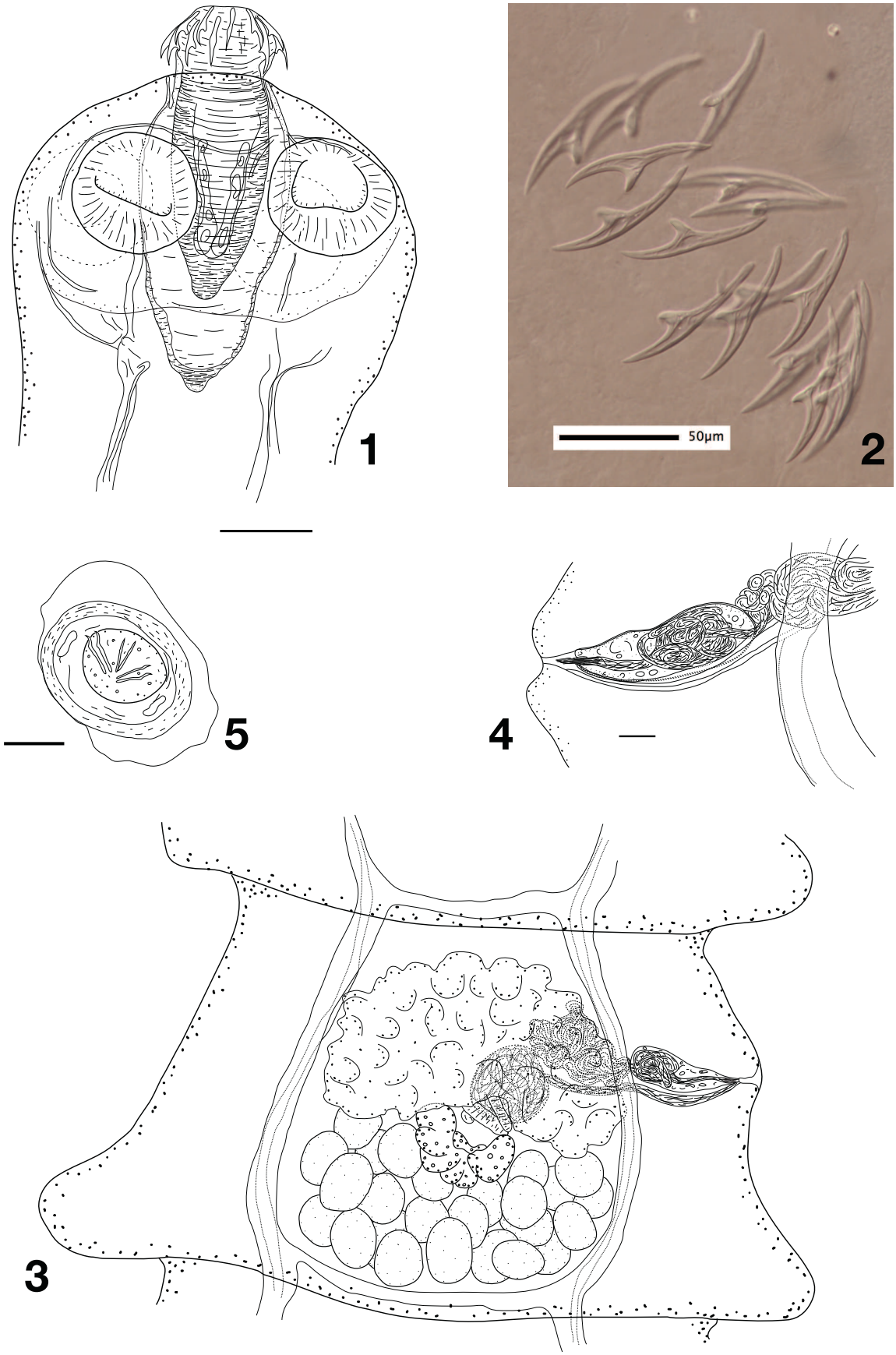
Testes numerous, 24-34 (29.5, n = 40) [25-30] in number; in 2-3 layers, in one continuous, transversely elongated posterior field, may occasionally overlap posterior lobes of ovary or osmoregulatory canals (Fig. 3). External vas deferens convoluted antero-porally, behind proximal extremity of cirrus-sac. Cirrus-sac weakly muscular, straight and elongate, 96-140 x 30-45 (114 x 37, n = 44) [101-112 x 36-40]; most commonly not reaching osmoregulatory canals, or just overlapping them. Internal vas deferens forming several coils. Cirrus armed with typical terminal dense tuft of hair, reaching 20-31 (26, n = 28) in length. No evaginated cirrus observed. Ductus masculinus very short, often difficult to see or absent (Fig. 4).

Vitellarium central, compact with irregular large lobes, transversely elongated, variable in shape, most often forming a flattened V, and becoming straighter in older mature proglottides; reaching up to 325 x 65. Ovary, antero-central, transversely elongated, mostly compact with poorly marked lobules, reaching longitudinal osmoregulatory canals on both sides. Mehlis' gland subglobular, anterior to vitellarium. Seminal receptacle round, becoming more oval when full but never elongated; reaching up to 185 x 115 in late mature and pregravid proglottides; dorsal and between ovary wings, anterior to poral part of vitelline gland. Vagina opened posteriorly to male pore, very long, straight and transverse, parallel and ventral to cirrus-sac; thick-walled; not divided into copulatory and conductive part; surrounded by a loose irregular sheath; no vaginal sphincter (Fig. 3).

Uterus starts its development in late mature proglottides as a diffuse ventral reticulum, progressively forming numerous small lobes and occupying entire median field; crossing osmoregulatory canals and extending in lateral fields. Uterus eventually becoming sacciform with deep, progressively disappearing septa. Eggs oval with thick embryophores 41-54 x 35-48 (49 x 40, n = 22). Oncospheres 26-36 x 20-28 (30 x 24, n = 25). No polar processes. Central embryonic hooks slightly longer 16-18 (17, n = 14), and thinner than lateral ones 14-16 (15, n = 20). Lateral embryonic hooks similar within each pair (Fig. 5).

Remarks: This material has first been reported, albeit without discussion, in Mariaux (1994) under the name

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Figs 1-5. *Spiniglans thomassankara* sp. nov. (1) Scolex. (2) Rotellar hooks. (3) Mature proglottis, ventral view; (4) Terminal genitalia. (5) Egg. Scale bars: 1, 3: 100 µm; 2: 50 µm; 4, 5: 20 µm.

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Anomotaenia sp. Meanwhile Bona (1994) proposed a comprehensive synthesis of the Dilepididae systematics, which, essentially, is still accepted today (Mariaux *et al*., 2017).

In Bona (1994), the group of genera defined by the presence of tufts of bristle-like spines on the cirrus is well defined but its organization is particularly challenging. Generic diagnoses are complex and sometimes based on difficult to observe or non-classical characters. The present material shows affinities both with *Dictymetra* Clark, 1952 and *Spiniglans* Yamaguti, 1959. It resembles *Dictymetra* in having clearly defined rows of rostellar hooks with comparatively long blades; no, or very poorly marked, ovary isthmus; and rather long cirrus bristle. On the other hand the following characters make it closer to the definition of *Spiniglans*: proglottides generally wider than long; very long vagina; extremely short, often not visible ductus masculinus; testes in transverse field and, possibly, absence of polar process in the eggs (although the latter character is certainly variable in *Dictymetra*, especially for its terrestrial species).

Clearly, the generic placement of this material may consequently only be provisional until this whole group of species is reassessed. In the meantime, I favor a placement in *Spiniglans*, essentially because of the nearly complete absence of ductus masculinus. A comparison with members of both genera remains nevertheless obviously needed.

Dictymetra and *Spiniglans* have recently been reviewed and discussed by Mariaux & Georgiev (2018) who also provided a list of accepted species for both genera. They noted the heterogeneous host spectrum of *Dictymetra* and its possible paraphyly. Indeed, *Dictymetra* is mostly found in Charadriiformes worldwide, although a few species have also been recorded in terrestrial birds, including one in Passeriformes. The 13 known species in the genus show a global distribution, including in Africa. The present material differs from all species listed by Mariaux & Georgiev (2018, see their table 4) mostly by its rostellum size, length of hooks and number of testes. It is however similar to *D. belopolskajae* Spasskaya & Spasskii, 1973, a parasite of Alaudidae in Russian Arctic (Spasskaya & Spasskii, 1973), but can be distinguished from it by showing 24-26 rostellar hooks (vs. 20 in *D. belopolskajae*).

Members of *Spiniglans* are almost all found in Corvidae, from Europe to Australia, but the type species, *Spiniglans microsoma* (Southwell, 1922), was described from a ploceid (and an emberezid) in India (Southwell, 1922). All seven species recognized by Mariaux & Georgiev (2018, see their table 2) differ from the present material by their hooks number and length as well as by their testes number (our observations of *S. microsoma* type material revealed a slightly smaller scolex and suckers diameters than originally reported but no major discrepancies with the original description). In consequence, it belongs to a new species, *Spiniglans thomassankara* sp. nov. The genus' range is extended to Africa and consequently to the complete Old World.

Weavers are common sights throughout Africa and Ploceidae form a well-diversified family with over 100 recognized species. Their cestode fauna is nevertheless practically unknown, with *Anomotania quelea* (Mettrick, 1961) from *Quelea quelea* (Linnaeus, 1758) in Zambia being the only exception I am aware of. Although being quite similar to our material, the latter species differs from it by a smaller number of testes and a longer cirrus-sac that is lacking any armature (Mettrick, 1961).

S. thomassankara is locally relatively abundant in its type host (19% prevalence) but much less so in the other two congeneric hosts in which it was found. It has not been found neither in other sympatric *Ploceus* potential hosts [e. g. *P. aurantius* (Vieillot, 1808), 17 examined; *P. heuglini* Reichenow, 1886, 2 examined] nor in other common Ploceidae taxa in the same area (e. g. belonging to *Malimbus* or *Vidua*) or other parts of the country (e. g. belonging to *Euplectes* or *Plocepasser*). Lagunae from Southern Ivory Coast constitute a particular, and endangered, ecosystem belonging to the "Guinean mangroves ecoregion" that extend from Senegal to Ivory Coast (Burgess *et al*., 2004; Carr *et al*., 2015). Should *S. thomassankara* intermediate hosts be linked to this peculiar environment, the species may possibly be endemic to the region.

Monopylidium comoensis sp. nov.

Figs 6-9

Holotype: MHNG-PLAT-0016113 (formerly MHNG 987.276); Côte d'Ivoire, Zanzan, Ouango Fitini, Northern edge of Comoé National Park, surroundings of former airfield; WGS84 9.58, -4.01; 300 m; 22.01.1987. From *Gymnoris dentata* (Sundevall, 1850) (Passeriformes, Passeridae).

Paratype: MHNG-PLAT-0016112 (formerly MHNG 987.275); MHNG-PLAT-0137403 (formerly MHNG 987.276). Same data as holotype. MHNG-OIS-1773.015.

Comparison material studied: MHNG-PLAT-0044433, 1 slide. *Monopylidium barbara* (Meggitt, 1926), "cotype".

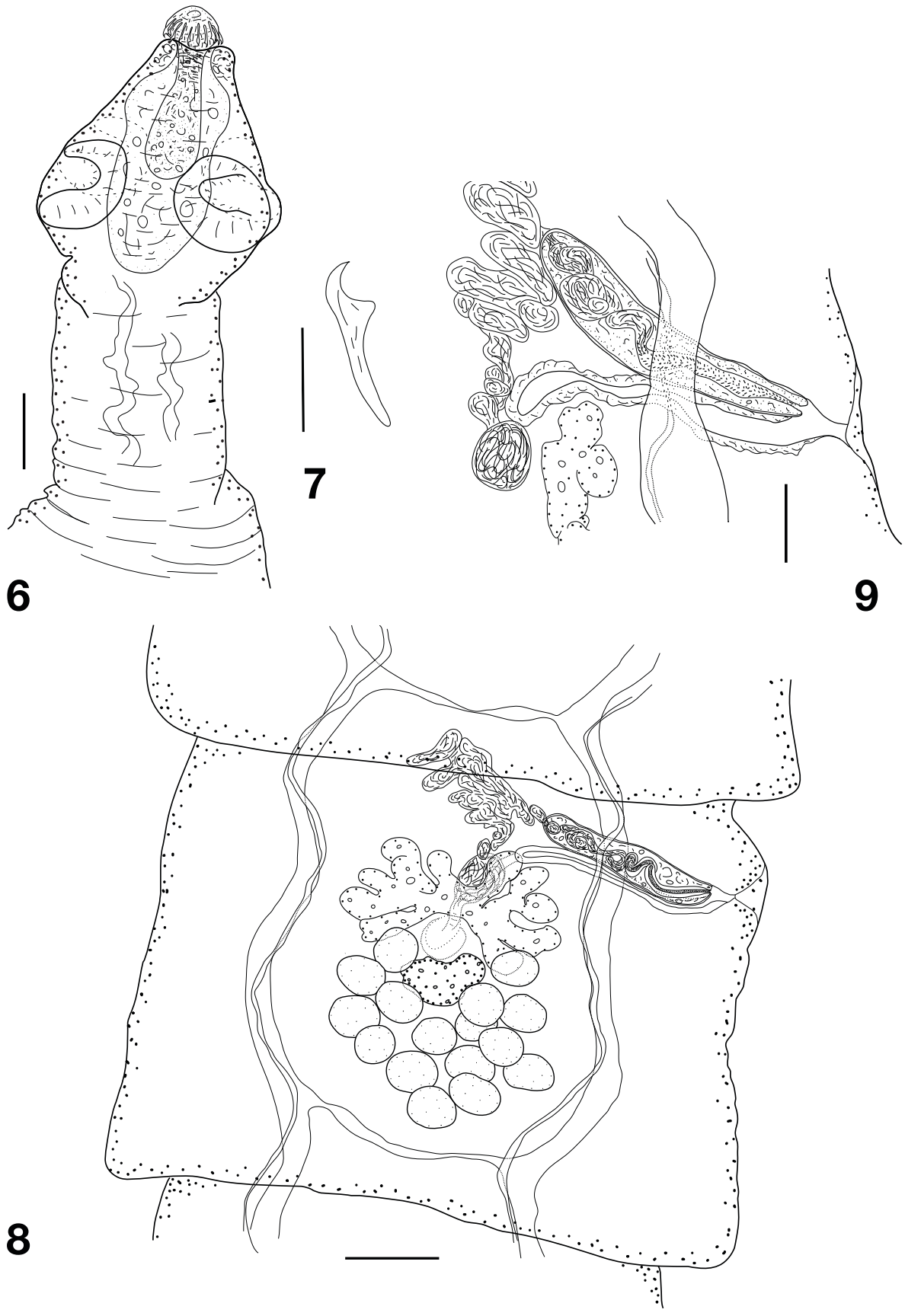
Prevalences: 2/17 (12%).

Intensity: 2.

Etymology: The species is named after the National Park of the Comoé, and the eponym river flowing through it, in the North Eastern corner of the Côte d'Ivoire.

Description: Worm with body of medium size, up to 33 mm in length and with maximum width of 1000 at level of early gravid proglottides. Longest specimen

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Figs 6-9. *Monopylidium comoensis* sp. nov. (6) Scolex. (7) Rostellar hook. (8) Mature proglottis, dorsal view (9) Terminal genitalia. Scale bars: 6, 9: 50 µm; 7: 10 µm; 8: 100 µm.

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with 139 proglottides, but fully gravid specimens must be longer. Proglottides craspedote, wider than long, progressively becoming square then longer than wide when pregravid (up to 1.6x longer than wide in our material). Scolex elongated, quite narrow and pointed, well delineated from neck, 138 in diameter (n = 2). Suckers small, rounded, muscular, unarmed, 60-68 (64, n = 8) [62-68] in diameter. Rostellar sac very large, cylindrical, very glandular, extending past level of posterior margin of suckers, 162 x 68 (n = 1). Rostellum elongated, with well-developed glandular tissue, 105 x 30 (n = 1) (Fig. 6). Hooks very short, on two poorly demarcated rows, 20-22 in number [20]; similar in shape in both rows, with short blades, strong handles and long, very slightly curved handles. Hooks from first row marginally shorter than those from second row. Hooks length 13.5-15.5 on first row (14.5, n = 9) and 14.5-16.5 on second row (15.5, n = 9) (Fig. 7). Neck well-marked; proglottization distinct at about 220-270 from posterior margin of suckers. Genital pores lateral, opening at about 25-30% of lateral proglottis margin length, irregularly alternating in very short series, with some zones of regular alternations. e.g. …, 2, 1, 1, 4, 1, 1, 1, 1, 1, 1, 1, 1, 2, 4, 2, 1, …; no more than 5 consecutive pores observed on a single side. Ventral osmoregulatory canals generally 25-35 (but up to 50) wide, connected posteriorly in each proglottis by transverse anastomosis. Dorsal osmoregulatory canals narrow 3-5 wide. Genital ducts passing between osmoregulatory canals. Genital atrium small, sink-shaped, up to about 25 deep and 30-40 in diameter.

Testes numerous, 14-25 (19, n = 34) [16-22] in number; in a single layer, in one continuous, posterior field, extending anteriorly to posterior level of ovary (Fig. 8). External vas deferens convoluted antero-porally. Cirrus-sac weakly muscular, straight, long, 172-212 x 38-60 (195 x 44, n = 22); always crossing osmoregulatory canals. Internal vas deferens forming several coils. Cirrus armed, lined with very small spines (Fig. 9).

Vitellarium central, compact, subglobular, usually somewhat transversely elongated, but variable in shape; 85-125 x 55-95 (102 x 73, n = 12). Ovary, antero-central, clearly bi-winged and multilobulated, with about 5-6 deep main lobules on each side. Mehlis' gland globular, anterior to vitellarium, in between ovary wings. Seminal receptacle elongated to oval; discrete; reaching up to 112 x 73; dorsal and slightly anterior to ovary wings. Vagina opened posteriorly to male pore, straight and transverse, long, possibly reaching up to seminal vesicle, parallel and ventral to cirrus-sac; particularly thick walled, surrounded by a compact sheath of large cells; its poral opening often enlarging in a well marked V-shaped, funnel like structure (Figs 8, 9).

Eggs appearing progressively, alone or in small groups in the whole parenchyma, with uterus border not clearly visible. Uterus becoming densely reticulate/multilocular, but its final stage of development, as well as fully developed eggs not available in our material.

Remarks: This material belongs to the genus *Monopylidium* Fuhrmann, 1899 as defined by Spasskii (1993) and accepted by Mariaux & Georgiev (2018). A list of species in this genus, together with a summary of their main characters was provided by Mariaux & Georgiev (2018, see their table 3), and most of them can easily be distinguished from the present material on the basis of their different rostellar hooks size and number; testes number or cirrus sac dimensions.

Two species are however similar to our specimens: *M. passerinum* Fuhrmann, 1907 was found in Passeriformes, including various Passeridae (Matevosyan, 1963) and has a large distribution (Palaearctic, Australia). It was initially described by Fuhrmann (1907) and a detailed description was provided by Johnston (1909). Despite their close resemblance, especially in rostellar structures, our material definitely differs from *M. passerinum* by a lower number of testes (14-25 vs 25-30), and accessorily, by slightly smaller suckers and larger vitelline glands. Additionally, *M. barbara* (Meggit, 1926) and *M. innominata* (Meggit, 1926), both from Yangon, Myanmar (ex Rangoon, Burma) were also described from Passeridae (Meggitt, 1926), the latter taxon being subsequently synonymized with the former (Southwell, 1930). *Monopylidium barbara* is only succinctly described but essentially differs from the new species in having 23 rostellar hooks. A small fragment of this species cotype, from *Passer montanus* (Linnaeus, 1758) in Rangoon, was also examined. Only a few male proglottides allow for meaningful observations and they show a shorter cirrus sac (133-150) and a higher number of testes (24-31) than in the original description. Although limited, these observations also allow differentiating *M. barbara* from the present material.

The Sahel bush sparrow, or bush petronia, *Gymnoris dentata*, is presently placed within the family Passeridae, but was previously considered a Ploceidae (in the genus *Petronia*). *Monopylidium comoensis* has not been found in any other member of these families during our surveys. In the same locality, bush petronias are also hosts of a *Biuterina* species that we described previously (Georgiev & Mariaux, 2007), but are not known to harbor any other cestode throughout their range.

DISCUSSION

Our findings highlight the considerable potential for discovering unknown parasite taxa, in the most common and widespread hosts. This should encourage a more systematical exploration of this fauna. As evidenced here, and at multiple occasions, abundant and unremarkable, but understudied, bird species host a significant diversity of parasites [e.g., specifically for cestodes: Mariaux (1994) in Ivory Coast; Gigon & Beuret (1991) in Switzerland or Mariaux & Georgiev (2018) in Australia]. Unfortunately, due to excessively

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rigid protection schemes, taxonomists are now mostly prevented to access this component of biodiversity, making the exploration and description of this fauna practically impossible in many parts of the world. This is an unfortunate consequence of, obviously well intended legal or administrative decisions, eventually becoming counterproductive in some of their fields of application, such as our quest for global taxonomic knowledge.

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