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Gorgoderina festoni n. sp. (Digenea: Gorgoderidae) in anurans (Amphibia) from Mexico

Rosario Mata-López & Virginia León-Règagnon*
Departamento de Zoología, Instituto de Biología, UNAM, Apdo. Postal 70-153CP 04510, Mexico City, DF, Mexico

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Abstract

Gorgoderina festoni n. sp. is described from the urinary bladder of *Gastrophryne usta*, *Leptodactylus labialis*, *L. melanonotus* and *Bufo marinus* from localities at low altitude in the states of Veracruz, Oaxaca, Guerrero and Colima, Mexico. This species differs from most other species of the genus by a combination of the following characters: lobed vitelline masses, body size 3.45–4.26 (mean 3.75) mm and sucker-ratio 1:1.3–1.52 (mean 1:1.44). The new species shares these three features with *G. bilobata* Rankin, 1937, *G. schistorchis* Steelman, 1938, *G. tenua* Rankin, 1937, *G. vitelliloba* (Olsson, 1876) and *G. cryptorchis* Travassos, 1924, but it differs from the first four in having gonads with entire margins. *G. festoni* most closely resembles *G. cryptorchis*, but differs from this species in body width at the level of the ventral sucker and in the absence of oesophageal glands. The autapomorphy that distinguishes *G. festoni* from all other members of the genus is the presence of a tegumental extension (festoon) on the external margin of the ventral sucker.

Introduction

Gorgoderina Looss, 1902 occurs worldwide and comprises 52 species which are parasitic in amphibians (Mata-López et al., 2005). Among recently collected material from amphibians in Mexico, and during a revision of material of *Gorgoderina* deposited in the Colección Nacional de Helmintos (CNHE) in Mexico, specimens of an undescribed gorgoderid were discovered parasitising four anuran species, *Gastrophryne usta* Cope, *Leptodactylus labialis* Cope, *L. melanonotus* Hallowell and *Bufo marinus* Linnaeus. The aim of this paper is to describe this new species.

Materials and methods

In March 2000, April 2001, November 2003 and June 2004, specimens of *Leptodactylus* spp. and *Bufo marinus* were collected from various localities of Mexico (Table 1). Hosts were killed and examined for helminth parasites. Worms were removed and placed in 0.6% saline solution, then fixed in hot 4% formaldehyde and preserved in 70% ethanol. Some specimens were stained in Mayer's paracarmine and haematoxylin, dehydrated, cleared in graded solutions of methyl salicylate and mounted in Canada balsam.

Two additional specimens (accession numbers 3426 and 3427) of this new species were found during a revision of the *Gorgoderina* spp. deposited in the Colección Nacional de Helmintos (CNHE) in Mexico City.

Figures of mounted specimens were drawn with the aid of a drawing tube. The description is based on eight specimens. Measurements are given as the range with mean in parentheses and are expressed on micrometres, unless otherwise indicated; for two-dimensional measurements, length is given before breadth. The number of measured specimens (n) is also given in parentheses.

Some of the specimens collected were retained for scanning electron microscopy (SEM). They

*Author for correspondence (E-mail: vleon@ibiologia.unam.mx)

Table 1. Prevalence and mean intensity of *Gorgoderina festoni* n. sp. in Mexico (n = hosts examined).

Locality	Host (n)	Collecting dates	Prevalence (%)	Mean intensity
Laguna El Zacatal, Veracruz	*Gastrophryne usta* (1)	May, 1997	–	1
Laguna El Zacatal, Veracruz	*Leptodactylus labialis* (2)	May, 1997	–	1
Paso Canoa, Oaxaca	*Bufo marinus* (17)	March, 2000	6	1
Arcelia, Guerrero	*Leptodactylus melanonotus* (10)	April, 2001	10	8
Coquimatlán, Colima	*Leptodactylus melanonotus* (12)	April, 2001	8	1
Río Armeria tributary, Colima	*Leptodactylus melanonotus* (45)	November, 2003	2	1
San Vicente, Guerrero	*Leptodactylus labialis* (1)	June, 2004	–	1

were fixed as above, dehydrated in ascending concentrations of ethanol, critical point dried with CO_2 and coated with a gold-paladium mixture. They were examined using a Hitachi S2460N scanning electron microscope.

Specimens used for both, light and scanning electron microscopy, were deposited in the CNHE.

Gorgoderina festoni n. sp.

Type-host: *Gastrophryne usta* (Cope) (Anura: Microhylidae).
Other hosts: *Leptodactylus labialis* (Cope) (Anura: Leptodactylidae) (Veracruz; Guerrero); *L. melanonotus* (Hallowell) (Anura: Leptodactylidae) (Guerrero; Colima); *Bufo marinus* (Linnaeus) (Anura: Bufonidae) (Oaxaca).
Site: Urinary bladder.
Type-locality: Laguna El Zacatal, Los Tuxtlas, Veracruz, Mexico, 18°35′N, 95°5′W.
Other localities: Arcelia, Guerrero, 18°38′N, 100°3′W; San Vicente, Guerrero, 17°17′4″N, 100°16′27″W; Coquimatlán, Colima, 19°9′6″N, 103°48′30″W; Río Armería tributary, Colima 19°11′31″N, 103°47′37″W; Paso Canoa, Oaxaca, 18°0′32″N, 96°14′24″W.
Type-specimens: Holotype No. 3426 (ex *G. usta*); paratypes No. 3427 (ex *L. labialis*), 5100, 5101 and 5102 (ex *L. melanonotus*).
Prevalence and intensity: See Table 1.
Etymology: The specific epithet refers to the festoon observed on the ventral sucker.

Description (Figures 1–3)

[Based on 6 whole-mounted specimens and 2 SEM mounts.] Body spindle-shaped, with blunt anterior end and pointed posterior end; body length (BL) 3.45–4.26 (3.75) mm (n = 3). Forebody 0.39–1.12 (0.635) mm (n = 5) long [15.11–26.22 (19.99)% of BL (n = 3)], 180–410 (280) (n = 5) wide at level of intestinal bifurcation. Hindbody 2.01–2.72 (2.39) mm (n = 4) long [63.91–72.11 (67.43)% of BL (n = 3)], with maximum width 260–510 (400) (n = 6) (Figures 1, 2A). Tegumental surface aspinose, with regular ridges surrounding body (Figure 2C). Numerous large papillae present on tegument, concentrated in region between suckers (Figures 2B, 3). Two pairs of papillae flank stylet pit in apical region of body, 1 dorsal (Figure 3 – SP I) and 1 ventral (Figure 3 – SP II). Four lateral pairs of papillae present between stylet pit and oral sucker (Figures 3 – SP III-SP VI, 2D). Penetration gland openings situated around the stylet pit (Figure 2E). Oral sucker subterminal, spherical, 300–370 (340) (n = 3) × 340–370 (360) (n = 2) (Figure 2C); 8 papillae surround oral aperture; third and sixth papillae with adjacent additional papilla close by on external side of sucker (Figure 3 – OS I-VIII); single additional pair of papillae on anterior and another pair on lateral borders (Figure 3 – OS IX, OS X). Ventral sucker located at 240–400 (320) (n = 5) [6.73–9.36 (8.14) % of BL (n = 3)] from oral sucker, 270–520 (430) (n = 5) × 250–480 (360) (n = 4); tegumental festoon on external surface of sucker, 15 (n = 1) wide (Figures 1, 2F); 4 papillae on internal surface of sucker arranged in 2 pairs lateral to longitudinal axis (Figures 1B, 2G, 3 – VS I-IV). Sucker-length ratio 1:1.3–1.52 (1.44) (n = 3).

Pharynx absent. Oesophagus thick walled, 75–220 (150) (n = 5) [2.12–5.22 (3.76)% of BL (n = 3)] × 61–70 (65) (n = 3). Intestinal bifurcation at 80–490 (290) (n = 5) [2.31–12.7 (6.12)% of BL (n = 3)] from anterior end of body. Caeca simple, smooth walled; right caecum ends at 17–330 (280) (n = 3) [7.89% of BL (n = 1)] and

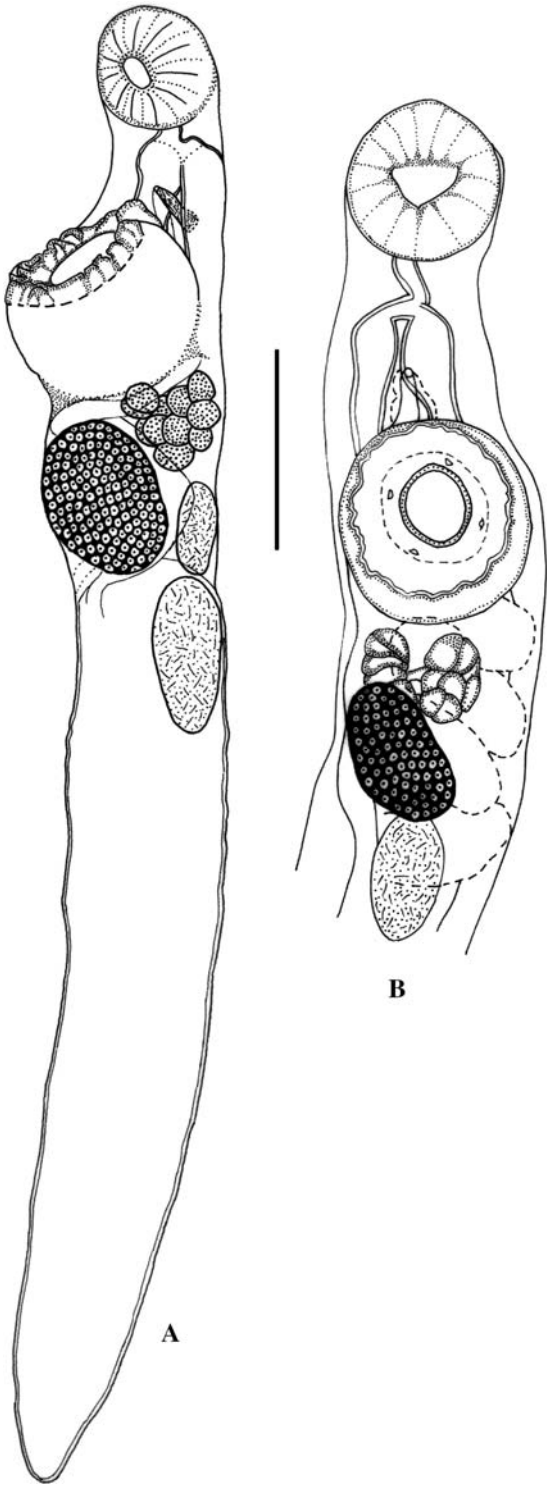

Figure 1. Gorgoderina festoni n. sp., ventral view. A. Whole worm; B. Forebody. *Scale-bar*: 0.5 mm.

left caecum at 170–520 (310) (n = 3) [5.7% of BL (n = 1)] from posterior extremity.

Testes 2, oval, compact, entire, in tandem, intercaecal, in second third of body; anterior testis totally overlaps ovary, 180–490 (330) (n = 5) [5.79–14.29 (9.26)% of BL (n = 3)] from posterior margin of ventral sucker, smaller than posterior testis, 120–300 (240) (n = 6) [6.06–7.98 (7.02)% of BL (n = 2)] × 90–290 (160) (n = 6); posterior testis 320–680 (540) (n = 4) [14.33–19.84 (16.54) % of BL (n = 3)] from posterior margin of ventral sucker, 200–450 (330) (n = 6) [4.64–10.46 (7.5)% of BL (n = 3)] × 110–350 (190) (n = 6). Seminal vesicle oval, antero-dorsal to ventral sucker; 230–270 (0.25) (n = 2) [6.38% of BL (n = 1)] × 70–100 (80) (n = 2). Distal end of seminal vesicle surrounded by prostatic cells; male duct opens into genital atrium. Genital pore medial, between intestinal bifurcation and ventral sucker, 350–680 (550) (n = 3) [14.05% of BL (n = 1)] from anterior extremity of body.

Ovary oval, compact, entire, dextral, posterior to vitellarium, 50–250 (130) (n = 5) [1.54–7.29 (3.9)% of BL (n = 3)] from posterior margin of ventral sucker, 200–400 (300) (n = 6) [6.26–11.51 (8.89)% of BL (n = 3)] × 120–290 (190) (n = 6). Vitellarium comprises 2 lobed masses with 5–7 lobes, immediately posterior to ventral sucker in mid-line of body; dextral vitelline mass 100–240 (180) (n = 5) × 75–140 (110) (n = 5); sinistral vitelline mass 120–200 (160) (n = 5) × 60–160 (110) (n = 5). Mehlis' gland and Laurer's canal not observed. Uterine loops fill much of hindbody, overlap testes dorsally and ventrally, partly overlap ovary and form 3 broad loops at level of vitelline masses; uterus opens into genital atrium. Eggs thin-shelled, embryonated, 17–27 (23) × 10–17 (14).

Excretory vesicle not observed. Excretory pore terminal (Figure 2H).

Discussion

Gorgoderina festoni n. sp. can be differentiated from the majority of species of the genus by the lobed nature of the vitelline masses, together with body size and sucker-ratio (see table 1, in Mata-López et al., 2005). The new species shares these three features with *G. bilobata* Rankin, 1937, *G. schistorchis* Steelman, 1938, *G. tenua* Rankin, 1937, *G. vitelliloba* (Olsson, 1876) and *G. cryptorchis*

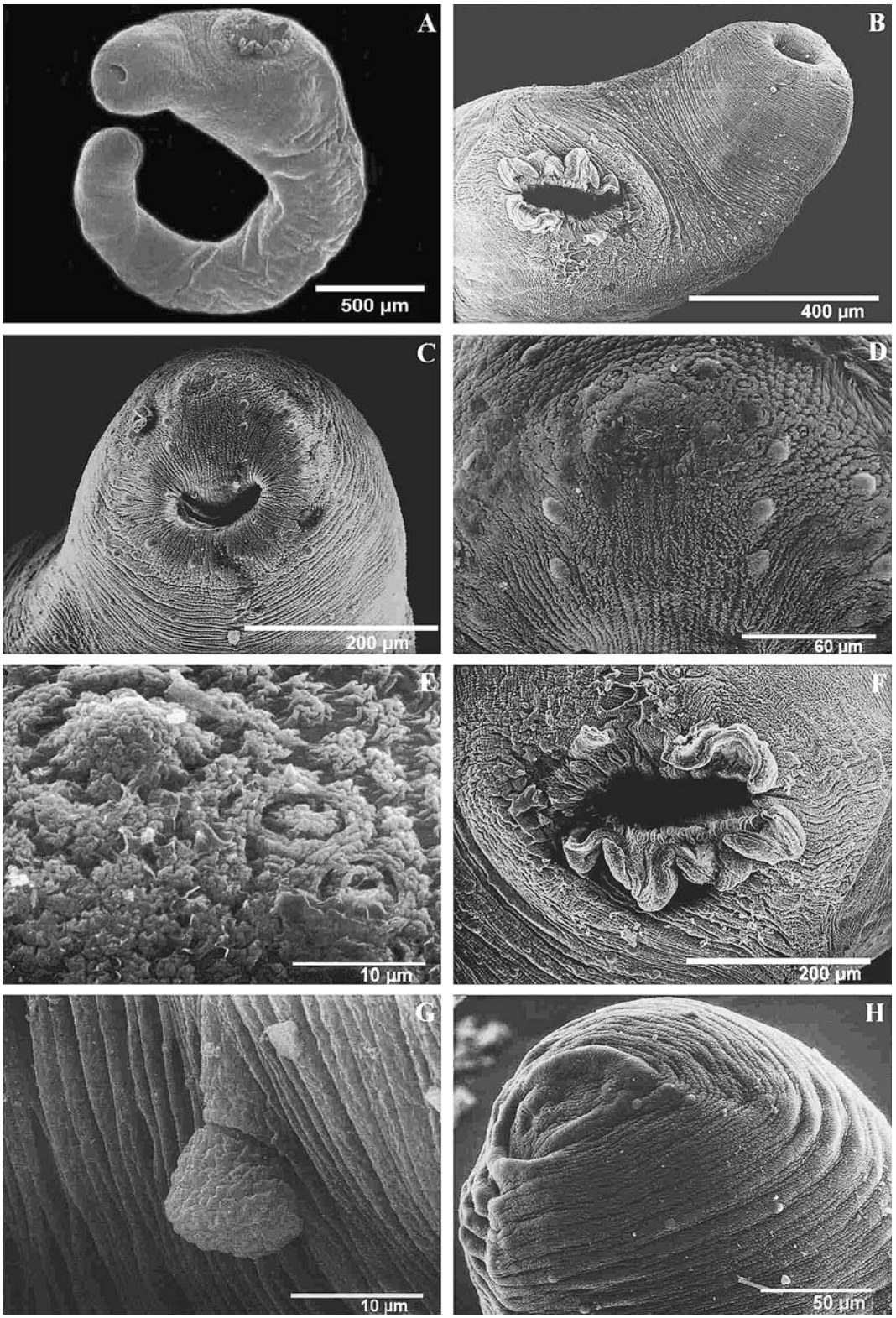

Figure 2. SEM photomicrographs of *Gorgoderina festoni* n. sp. A. Whole worm; B. Forebody, ventral view; C. Oral sucker; D. Stylet pit; E. Penetration gland openings; F. Ventral sucker; G. Papilla on the internal surface of the ventral sucker; H. Excretory pore.

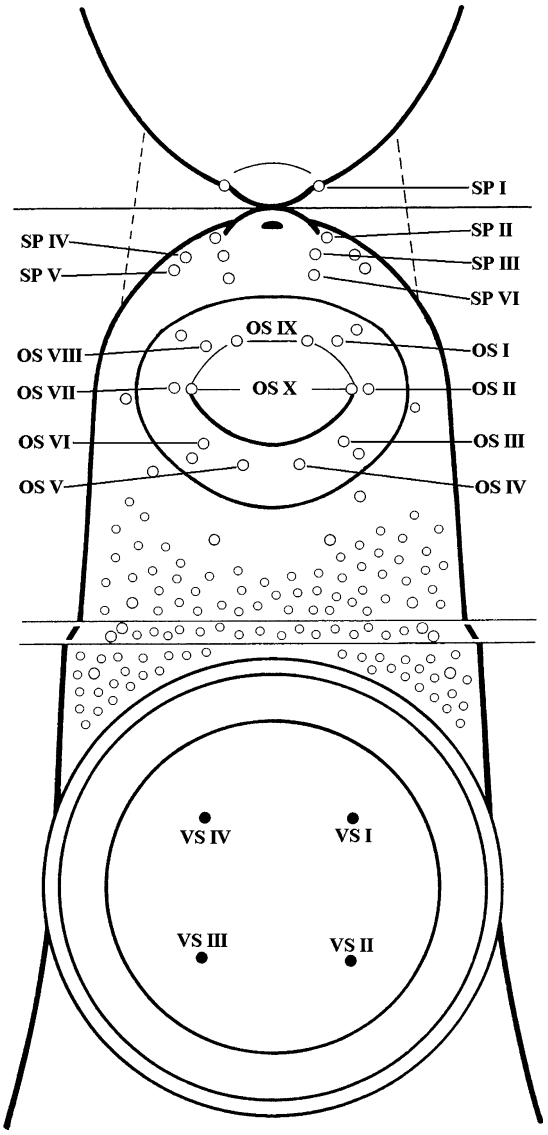

Figure 3. Papillary pattern on the ventral surface of *Gorgoderina festoni* n. sp. (modified from Bakke & Hoole, 1988).

Travassos, 1924, but differs from the first four of these in having gonads with entire margins. *G. festoni* most closely resembles *G. cryptorchis* in having a similar body size and sucker-ratio, lobed vitelline masses and compact, entire gonads. However, *G. cryptorchis* differs from the new species in the body width at the level of the ventral sucker, which is greater than the diameter of this sucker, and in the presence of oesophageal glands. Also, *G. cryptorchis* lacks the festoon surrounding the ventral sucker, which is the autapomorphy that distinguishes *G. festoni* from all of its congeners.

Only five species have been reported from Mexico: *G. attenuata* (Stafford, 1902) Stafford, 1905 from a large variety of amphibians (*Rana* spp., *Ambystoma* spp. and *Leptodactylus melanonotus*) (see Lamothe-Argumedo et al., 1997; Pérez-Ponce de León et al., 2000; Goldberg et al., 2002; Goldberg & Bursey, 2002; Mata-López et al., 2002); *G. parvicava* Travassos, 1922 from *Rana vaillanti* and *R. berlandieri* (see Guillén-Hernández et al., 2000; Paredes et al., 2004); *G. megalorchis* Bravo-Hollis, 1948 from *Bufo marinus* and *Hyla miotympanum* (see Bravo-Hollis, 1948; Lamothe et al., 1997); *G. rhyacosiredonis* (Bravo-Hollis, 1943) Prudhoe & Bray, 1982 from *Rhyacosiredon altamirani* (see Bravo-Hollis, 1943); and *G. skarvilovitschi* Pigulevsky, 1953 from *Rana montezumae* (see Pigulevsky, 1953). The new species differs from *G. attenuata* and *G. skarvilovitschi* in its sucker-ratio, as in the latter two species the ventral sucker is two or more times larger than the oral sucker versus a ratio of only 1:1.3–1.5 in *G. festoni*. *G. parvicava* is much larger than the new species and the ventral sucker is smaller than the oral sucker (ratio 1:0.5); furthermore, the distance between the ventral sucker and vitelline masses is greater. *G. megalorchis* and *G. rhyacosiredonis* differ from *G. festoni* by having lobed testes larger than the ovary, as opposed to entire testes smaller than the ovary.

Based on the prevalence and intensity values (Table 1), *G. festoni* shows no clear specificity towards its definitive host, although the sample size was very small in some cases. On the other hand, *G. festoni* was only found in localities at low altitudes, ranging from 29 to 329 m, although intensive collecting effort for the same host species was made at higher altitudes, where these amphibians have also been reported in Mexico (Frost, 1985; Villa et al., 1988; Flores-Villela & McCoy, 1993). It is possible that the distribution of the intermediate host, rather than that of the definitive host, limits the geographical distribution of the new species.

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