

MICROPHALLUS FONTI SP. N. (DIGENEA: MICROPHALLIDAE) FROM THE RED SWAMP CRAWFISH IN SOUTHERN UNITED STATES

ROBIN M. OVERSTREET; RICHARD W. HEARD & JEFFREY M. LOTZ

Gulf Coast Research Laboratory, P. O. Box 7000, Ocean Springs, Mississippi 39564, U. S. A.

A new species of digenean, Microphallus fonti, is described from the red swamp crawfish in Louisiana, U. S. A. It has a small pharynx and a rudimentary gut like M. opacus and possibly related species from crayfishes, but it differs from them by its relatively large male copulatory papilla and a conspicuous metraterm.

Key words: *Microphallus fonti* – digenean – *Procambarus clarkii* – crayfish

Over the past several years the authors have been aware of the occurrence of the metacercaria of an undescribed species of microphallid trematode in the digestive gland of the commercially important red swamp crawfish, *Procambarus clarkii*, from southern Louisiana. Recently, a colleague, William Font, sent us an excellent series of additional specimens of this form for study. The description of the new species, which we tentatively place in the genus *Microphallus* Ward, 1901, is the subject of this report.

MATERIALS AND METHODS

Specimens were heat killed in saline under slight coverslip pressure, immediately fixed in AFA, and stained in Van Cleave's hematoxylin or carmine. All figures were drawn with the aid of a camera lucida, and measurements are given in micrometers.

RESULTS

Microphallus fonti sp. n.
(Figs 1-7)

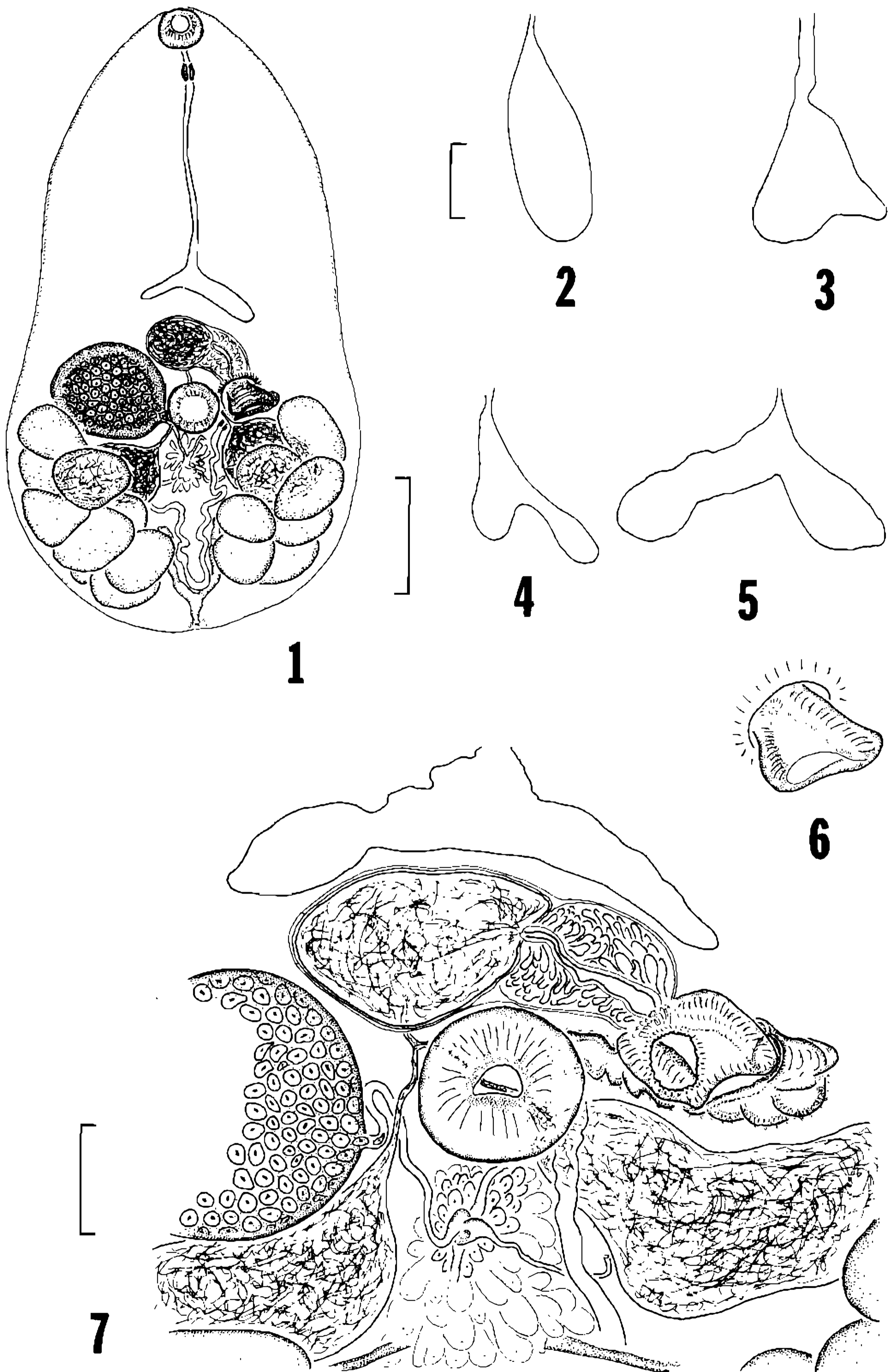
Synonyms: Microphallus opacus: Sogandares-Bernal 1965; Microphallus opacus sensu Sogandares-Bernal: Deblock & Pearson, 1969, Deblock, 1971, Overstreet & Perry 1972.

Diagnosis: Microphallinae; muscular pharynx relatively small; intestinal caeca reduced

and sac-like to weakly bifurcate; male copulatory papilla well developed and bell-shaped with large aperture; metraterm opening laterally into sinistral wall of genital atrium.

Description: (based on 20 whole mounted and 5 serially sectioned metacercariae): Body pyriform, 910 to 1,110 long by 480 to 930 in maximum width (at testicular level). Tegumental spines 4 to 6 long, most numerous and robust in forebody, becoming less numerous and more delicate in hindbody, usually imperceptible at posterior extremity. Nervous system conspicuous; cerebral commissure at pharyngeal level with anterior and posterior lateral paired nerves; posterior lateral pair visible into hindbody, with at least three secondary branches. Oral sucker subterminal, opening ventrally, 50 to 81 long by 61 to 86 wide. Acetabulum 67 to 108 long by 74 to 86 wide. Sucker width ratio 1: 1.06 to 1.38. Forebody 52 to 60% of body length. Pharynx muscular, 28 to 42 long by 17 to 33 wide. Prepharynx conspicuous, longer than pharyngeal length in most specimens, 28 to 78 long. Esophagus 162 to 289 long. Intestinal caeca rudimentary, consisting of relatively few cells, sac-like to weakly bifurcate with sac or longest portion 84 to 206 long (Figs 2-5).

Testes irregular in shape, symmetrical, laterally elongate; left testis 84 to 145 long by 123 to 279 wide; right testis 61 to 145 long by 145 to 318 wide. Seminal vesicle oval to suboval, preacetabular, 106 to 218 long by 56 to 134 at widest level, filled with sperm. Vas efferentia extending from anteromedial margin of testes to mid acetabular level, merging



Microphallus fonti – Fig. 1: entire specimen, ventral view, composite from two individuals, scale bar = 200 μm . Figs 2-5: variation in intestinal structure, scale bar = 100 μm for all four individuals. Fig. 6: male copulatory papilla extruded through genital pore, ventral view. Fig. 7: reproductive structures including terminal genitalia with male papilla not extruded, scale bar = 75 μm .

to form short vas deferens; vas deferens entering seminal vesicle at posterodorsal medial margin. Pars prostatica well developed, 56 to 100 long by 45 to 89 wide, with conspicuous prostatic cells; prostatic complex surrounded by thin membrane; seminal vesicle and prostatic complex together surrounded by single thin membrane ("nonmuscular cirrus sac"). Genital atrium sinistral, at acetabular level, with thick muscular wall and relatively large genital pore. Male copulatory papilla strongly muscular, relatively large, larger than acetabulum in most specimens, up to 123 long and 122 wide. Sperm duct entering papilla anterodorsally from base of organ; terminal protrusible portion distinct, appearing bell-shaped when protruding from genital pore, variably shaped when compressed and fixed within inverted atrium.

Ovary smooth, dextral to acetabulum and contiguous or immediately anterior to right testis, 156 to 258 long by 167 to 258 wide. Laurer's canal, ootype, and conspicuous Mehlis's gland in intertesticular region; Laurer's canal opening positioned dorsal to left testis to midline; Mehlis's gland consisting of at least one group of cells with eosinophilic cytoplasm near the ootype and another group with basophilic cytoplasm surrounding and extending posterior to the first group. Vitellaria in two lateral groups of follicles numbering 9 on right and 7 or occasionally 8 on left, occupying a space ranging from 257 long by 128 wide to 441 long by 246 wide, extending from near posterior end of worm to or beyond testes; follicles usually irregular in shape, 50 to 179 long by 56 to 112 wide. Uterus largely confined to hindbody in intertesticular region. Metraterm thick walled, often convoluted, 80 to 120 long, associated with small glandular cells; terminal portion dilated, opening laterally into sinistral wall of genital atrium. Eggs undeveloped.

Excretory vesicle "Y" shaped with short stem and without lateral bulges, well epitheliated. Excretory pore subterminal, occasionally in fixed specimens occurring on dorsal or ventral surface.

Intermediate and type host: *Procambarus clarkii* (Girard, 1852) (red swamp crawfish, Cambaridae).

Site: hepatopancreas.

Intensity of infection: from a few to hundreds per crawfish.

Type locality: bayous along LA Hwy 76 near Rosedale, Louisiana, in Iberville Parish; other locality: drainage canal in West Baton Rouge Parish, Louisiana, along US Hwy 190 near junction with LA Hwy 983.

Holotype: USNM Helm. Coll. No. 82599; *Paratype:* No. 82600, and Gulf Coast Research Laboratory Museum No. 1142.

Etymology: the species is named in honor of William F. Font for his contributions to helminthology as well as his providing material of this species.

DISCUSSION

Following the classification of Deblock (1971), we fit the species into the subgenus *Microphallus* of the genus *Microphallus* Ward, 1901. In that classification, Deblock (1971) no longer accepted the subgenus *Monocoecum* Stafford, 1903, into which the species was placed earlier by Deblock & Pearson (1969). Based on the small pharynx, small rudimentary gut, and crayfish host, *M. fontii* appears most similar to *M. opacus* (Ward, 1894) and *M. ovatus* Osborn, 1919. The relationship between *M. opacus* and *M. ovatus* is unresolved. Osborn (1919) separated those two on the basis of differences in several morphological and biological features, which according to later workers were either not consistent or not accurate. Van Cleave & Mueller (1934) questioned whether *M. ovatus* was a variety of *M. opacus*, and Strandine (1943) considered it as such. That problem is not of importance for this paper because *M. fontii* clearly differs from them both. Actually, a complex of species related to *M. opacus* may exist, but critical evaluation including life history studies will be necessary to ascertain this. *Microphallus fontii* can be most readily differentiated from *M. opacus* by its relatively large male copulatory papilla and a conspicuous metraterm.

The poorly developed gut appears to be a homoplasy illustrating parallel development. It is at least partly dependent on the nutritional needs of the species and probably developed from paired, elongated, ancestral intestinal caeca. In addition to occurring in *Microphallus opacus*, the rudimentary gut structure also occurs in members of other microphallid genera:

Megalophallus diodontis Siddiqi & Cable, 1960, *Levinseniella capitanea* Overstreet & Perry, 1972, and *Sogandaritrema progeneticus* (Sogandares-Bernal, 1962). In fact, rather than having a small pharynx like *M. fonti*, the latter two species do not have any pharynx. Some aspects of the guts were discussed by Overstreet & Perry (1972). All five species occur as metacercaria in decapods.

As with several other microphallines, *M. fonti* appears to mature rapidly and live in the definitive host for only a short period. Once removed from the crayfish and placed in warm saline, and presumably in the final host, it mates, it produces eggs, and the testes are emptied of sperm. Sogandares-Bernal (1965) and we both excysted specimens of *M. fonti* with a trypsin solution and then cultured them in saline at 40° and 37 °C for about a day when they produced eggs. Sogandares-Bernal (1965) used the CF₁ white mouse as an experimental definitive host, and species in the *M. opacus*-complex use turtles and fishes as natural definitive hosts (e. g., Rausch, 1946a; 1946b). Most microphallids mature in birds and mammals, but several develop in poikilothermous vertebrates.

ACKNOWLEDGEMENTS

To Ronnie Palmer, Marie Wright, Jennifer Weber, and Helen Gill, from Gulf Coast Research Laboratory, for technical assistance. To

S. Deblock of U. E. R. de Pharmacie, Lille, France, for providing unstained specimens collected by Frank Sogandares-Bernal.

REFERENCES

- DEBLOCK, S., 1971. Contribution à l'étude des Microphallidae Travassos, 1920 XXIV. Tentative de phylogénie et de taxonomie. *Bulletin du Muséum National D'histoire Naturelle*, 3: 353-354.
- DEBLOCK, S. & PEARSON, J. C., 1969. Contribution à l'étude des *Microphallidae* Travassos, 1920 (*Trematoda*). XVIII – De cinq *Microphallus* d'Australie dont deux nouveaux. Essai de clé diagnostique des espèces du genre. *Annales de Parasitologie* (Paris), 44: 391-414.
- OSBORN, H. L., 1919. Observations on *Microphallus ovatus* sp. nov. from the crayfish and black bass of Lake Chautauqua, N. Y. *J. Parasitol.*, 5: 123-127.
- OVERSTREET, R. M. & PERRY, H. M., 1972. A new microphallid trematode from the blue crab in the northern Gulf of Mexico. *Trans. Am. Microsc. Soc.*, 91: 436-440.
- RAUSCH, R., 1946. New host records for *Microphallus ovatus* Osborn, 1919. *J. Parasitol.* 32: 93-94.
- RAUSCH, R., 1946. The raccoon, a new host for *Microphallus* sp., with additional notes on *M. ovatus* from turtles. *J. Parasitol.*, 32: 208-209.
- SOGANDARES-BERNAL, F., 1965. Parasites from Louisiana crayfishes. *Tulane Studies in Zoology*, 12: 79-85.
- STRANDINE, E., J., 1943. Variation in *Microphallus*, a genus of trematodes, from fishes of Lake Lelanau, Michigan. *Trans. Am. Microsc. Soc.*, 62: 293-300.
- VAN CLEAVE, H. J. & MUELLER, J. F., 1934. Parasites of the Oneida Lake fishes. Pt. III. A biological and ecology survey of the worm parasites. *Roosevelt Wild Life Annals*. 3: 161-334.