Hypsoperine ottersoni sp. n. (Nemata, Heteroderidae) Infesting Canary Grass, Phalaris arundinacea (L.) Reed in Wisconsin

Gerald Thorne

Unusual types of nematode-incited galls were observed on canary grass in the Wind Lake area near Kenosha, Wisconsin by Dr. Henry Otterson, Agricultural Chemist and Consultant, who submitted specimens for identification in 1958, which later were recognized as belonging to the genus Hypsoperine Sledge and Golden, 1964. Detailed studies were not begun until 1963 when Arthur Weber undertook the project as a thesis problem in graduate work under the direction of Dr. K. R. Barker, University of Wisconsin, Madison.

Validity of the genus Hypsoperine has been questioned by Dr. M. W. Allen (personal communication). It is true that the elevated perineal region sometimes is not evident and the cuticle is not thickened on this species, as reported by Sledge and Golden (1964) for H. graminis. However, the physiological effect on the host, causing an unusual type of gall formation with larvae always lying in the root with heads toward the apex, is unlike that of usual Meloidogyne infestations. The hemizonid of H. graminis is reported anterior to the excretory pore, while that of H. spartinae is posterior, according to Rau and Fassuliotis (1965).

Infestation always takes place just behind the apical cells and does not stop growth of the root which generally forms an arcuate, elongated gall and then proceeds to develop a series of similar galls, each containing from 1–6 females and in rare instances 15 or 20 may occur. Branch roots are produced on the outer periphery of each gall and these in turn are infested until a complicated, chainlike mass of roots results (Fig. 1A). Occasionally a progressive multiple infestation occurs in a terminal gall with mature egg-producing females at the gall base, while elongated young females are located near the terminus, resulting in a series of various-aged individuals (Fig. 1B).

In all instances observed, the heads of the nemas were directed toward the root terminus. Eggs usually are deposited in a gelatinous matrix within the gall tissues, but in some instances they and the matrix are extruded outside the root. Feeding takes place along the cells between the xylem tubes which frequently are multiplied and broken apart (Fig. 1B). Even in extreme instances like this, the root cap and terminal cells remain intact, enabling continued growth.

Hypsoperine ottersoni sp. n.2 Morphology

FEMALE (10): 0.27 by 0.45 mm (0.18–0.32 by 0.39–0.52). Variable in form as indicated by these measurements (Fig. 2N–S). Spherial to elongate pyriform with neck projecting at different angles (Fig. 2N–S). Vulva and anus usually on a slight elevation, but sometimes this is not present and the posterior end is similar to that of Meloidogyne. Cuticle 3–6 µ thick on main part of body, leathery with extremely fine striae except on head and neck where they are easily visible and form annules variable in width. Lip region unstriated, set off by constriction. A face view (Fig. 2L) shows six well-developed lips, the lateral ones being somewhat larger than the submedian. Amphid apertures slightly oval, located at apices of lateral lips. Vestibule slightly sclerotized, forming a spear-guiding apparatus. Spear 10–12 µ long with small rounded knobs. Dorsal esophageal gland orifice almost adjacent to spear base. Anterior portion of esophagus set off from median bulb by constriction. Bulb spheroid with refractive valve and strong radial muscles. Basal bulb a flattened, irregular shaped lobe extending back over intestine, containing the usual three nuclei which generally are difficult to observe. Isthmus very short. Nerve ring obscure. Excretory pore far forward, almost opposite spear base (Fig. 2K). Intestine and body contents densely granular, making observations very

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2 First used as a nomen nudum by Weber and Barker (1967).
difficult. Ovaries two, elaborately convoluted (Fig. 2N), at maturity completely filling body cavity. Vulva transverse. Vagina cylindroid, muscular. Perineal pattern with simple rounded striae, usually on a slight terminal elevation (Fig. 2T). Anal opening visible from a lateral view and rarely from ventral (Fig. 3C). Neither spermatheca nor spermatozoa observed.

Eggs (15) 45 by 105 μ (40–50 by 95–115), deposited before segmentation by young females. Senile individuals may retain from 5–25 eggs which segment and develop into larvae which probably are not ejected. A gelatinous matrix surrounds eggs deposited either within the roots or into the soil.

MALE: (7) 0.9–1.0 mm long, rarely 0.7 mm; a = 34, rarely 40. Body twisted until a true lateral view of head and tail can be seen only by cutting specimens after fixation. Striae about 2 μ apart at midbody, narrower near head and sometimes absent on tail. Lateral fields about one-fifth body width, marked by four incisures, the two median ones sometimes very obscure. Lip region unstriated; labial disc visible only from a dorsal or ventral view when
the slitlike amphid apertures set it off from the lip contour (Fig. 2D). Cephalids obscure, visible only from a lateral view, located well forward of the spear base as in *Meloidogynye* (Fig. 2C). Spear 14–16 μ long with strong, backward-sloping knobs. Nerve ring one body width, and excretory pore twice that distance behind median bulb. Lumen of esophagus joining intestine about one body width posterior to bulb, the junction being rather abrupt as illustrated for the larvae (Fig. 2A). Hemizonid about two annules anterior to excretory pore. Basal esophageal lobes average about three times as long as body width. Testes 53–65% of body length, usually single, outstretched, rarely reflexed. Males rare; among 14, two were observed with double testes (Fig. 2H). Spicula slightly arcuate 19–23 μ long but difficult to measure because of the twisted bodies. Gubernaculum 3 or 4 μ long, well-thickened, troughlike. Phasmids almost terminal (Fig. 2C). Tail variable in form and length (Fig. 2E, F). Sperm ducts packed with spheroid spermatozoa indicating that males may be functional although sperms were not observed in the uteri.

**Larvae (10):** 0.43–0.50 mm; a = 23–30, b and c measurements not made because the esophagus base and anal opening could rarely be accurately determined. Lateral field marked by four fine incises visible only on favorable specimens. Framework of the rounded lip region practically undeveloped. Vestible forming a minute sclerotized spear guide. Spear 13–15 μ long with well-developed knobs. Dorsal gland orifice about 4 μ behind spear. Nerve ring adjacent to bulb, practically enveloping the unusually short isthmus. Esophageal lumen joining intestine about one body width behind bulb. Dorsally the esophagus base is short and rounded while ventrally it is extended in a long lobe 5–7 times the body width. Excretory pore slightly behind nerve ring. Anal opening very obscure, often unidentifiable. Tail ending in an irregularly clavate or knobbed terminus.

Holotype female, allotype male and other specimens as indexed under *Hypsoperine 1*, University of Wisconsin nematode collection.

**Type Host and Locality:** Canary grass, *Phalaris arundianacea* (L.) Reed, Horner Ranch, Wind Lake area, Wisconsin. Found wherever canary grass is growing in Racine, Milwaukee, and Waukesha counties and near Waupun in Green Lake County. Many observations by Dr. Otterson and others have failed to reveal it attacks any crop plants.

*Hypsoperine ottersoni* is distinguished from *H. graminis*, Sledge and Golden, 1964 by the more simple annulation and absence of lateral lines in the perineal pattern, smaller males 0.9:1.5 mm, and irregular-clavate terminus of larvae. From *H. spartinae* Rau and Fassuliotis, 1965, it is recognized by absence of labial annules (two in *H. spartinae*), simple lines of perineal pattern compared to elaborate arrangement, and presence of male hemizonid anterior to excretory pore which is posterior in *H. spartinae*.

Perineal sections should be mounted in a drop of hard glycerin jelly to support the cover glass, otherwise the weight will produce folds and wrinkles which destroy the actual pattern of the striae.

Many larvae and some males were attacked with sporozoans, *Duboscquia* sp.; in some instances these were observed in clusters of
eight, unlike any previously recorded (Fig. 2U).

**Literature Cited**


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**Studies on Freshwater Larval Trematodes. XXI. Two New Species of Macrocercous Cercariae**

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Until now, only bivalve mollusks have been reported as the first intermediate hosts of the known macrocercous cercariae. This is the first record for the involvement of univalves as well. The cercariae treated in this paper, as a result of comparative studies discussed later, proved to be new species and have been named, respectively, *Cercaria latigazica* and *C. yacalicola*. The latter is readily distinguished by the presence of a cercarial chamber, in the proximal part of its tail, in which the cercarial body is characteristically enclosed. The former lacks this structure and its tail is frequently thrust out in a peculiar whiplike fashion. It is evident from the works of other authors that various species of tadpoles and naiads of insects serve as the second intermediate hosts for macrocercous cercariae while urinary bladders of frogs, salamanders, and fishes are the usual sites of adult infections. In certain cases like *Phyllodistomum simile*, the precociously encysted cercariae while still inside sporocysts when experimentally fed to trout resulted in the development of corresponding adults (Thomas, 1958). Of course, we are not sure whether these "precocious metacercariae" were formed by the penetration of cercariae from without. Due partly to the dearth of material, we have been unable to elucidate life cycles. Even if infected snails had been more numerous, only a few cercariae emerged at a given time; however, efforts are in progress. It may be mentioned here that on one occasion *C. yacalicola* was escaping from the same specimen of the snail, Pomacea glauca, which was also discharging two additional cercariae, *C. cumanensis* Nasir, 1965 and *C. allomacarapanensis* Nasir and Díaz, 1968.

The recovery of sporocysts presented an intriguing situation. Although several snails were dissected immediately after the appearance of cercariae, sporocysts were never encountered in the usual sites like gills and hepatopancreas. A careful examination revealed the presence of a few, anteroposteriorly elongated, considerably thick-walled, pigmented sporocysts in the lumen of intestine.

All observations have been made on freshly emerged cercariae, except measurements which are based on specimens killed by irrigating with hot 10% formalin.

All measurements are in millimeters.

1. **Cercaria latigazica sp. n.**  
(Figs. 1, 2, 7)

**Host:** Pomacea glauca (L.).

**Locality:** La Chorrera, near Caripito; Los Yacales, La Llanada de San Juan, near Universidad de Oriente, Cumaná, Venezuela.

**Description:** Body without spines, beset

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