

Arrangement of the female organs and ducts in the Cestode genera *Oochoristica* Lühe and *Linstowia* Zschokke

By

J. L. HICKMAN

Department of Zoology, University of Tasmania

(WITH 13 TEXT FIGURES)

ABSTRACT

The different ways in which the female reproductive organs and ducts are arranged in ten species of *Oochoristica* Lühe and in three species of *Linstowia* Zschokke are discussed and compared.

In the species of *Oochoristica*, four modes, A, B, C and D, are recognized. *O. rostellata* Zschokke, *O. vacuolata* Hickman, *O. nyctophili* Hickman, *O. surinamensis* Cohn and *O. erinacei* Meggitt exhibit mode A; *O. trachysauri* (MacCallum), *O. mephitis* Skinker and *O. oklahomensis* Peery mode B; *O. scelopori* Voge and Fox mode C, and *O. lygosomae* Burt mode D.

The three species of *Linstowia*, namely, *L. echidnae* (Thompson), *L. semoni* (Zschokke) and *L. jheringi* Zschokke show three different arrangements. While the disposition of the organs and ducts in *L. echidnae* differs from that in any one of the ten species of *Oochoristica*, the arrangement in *L. semoni* resembles that in *O. trachysauri*, and the arrangement in *L. jheringi* is similar to that in *O. rostellata*.

Discrepancies in the descriptions of the three species *O. mephitis* Skinker, *O. pedunculata* Chandler and *O. wallacei* Chandler are noted.

INTRODUCTION

The descriptions of many species of *Oochoristica* Lühe are incomplete. Details of the female reproductive system are frequently omitted. In particular, descriptions of about 38 species contain little or no reference to the course of the female genital ducts, except the vagina.

The present paper is a review of the arrangement of the female organs and ducts in ten of the more adequately described species of *Oochoristica*. In addition, because of the close relationship between the genera *Oochoristica* and *Linstowia*, the arrangements in three species of the latter are discussed and compared with those found in the ten species of the former genus.

THE FEMALE ORGANS AND DUCTS IN THE GENUS *Oochoristica*.

A study of the descriptions of the following ten species: *O. rostellata* Zschokke (1905), *O. vacuolata* Hickman (1954), *O. nyctophili* Hickman (1954), *O. surinamensis* Cohn (1903), *O. erinacei* Meggitt (1920), *O.*

trachysauri MacCallum (1921), *O. mephitis* Skinker (1935), *O. oklahomensis* Peery (1939), *O. scelopori* Voge and Fox (1950) and *O. lygosomae* Burt (1933), reveals four modes of arrangement of the female organs and ducts. The characteristic features of the four modes are given in the following table.

Character	Mode A	Mode B	Mode C	Mode D
Fertilization canal	Present	Present	Absent	Absent
Mehlis's gland (Shell gland)	Surrounds oviduct	Surrounds oviduct	Does not surround oviduct	Does not surround oviduct
Shell duct	Absent	Absent	Absent	Present
Uterine duct	Passes forwards dorsal to ovary. Enters uterus antero-ventral to ovary	Passes forwards dorsal to ovary. Enters uterus antero-dorsal to ovary	Passes forwards ventral to ovary. Enters uterus antero-ventral to ovary	Passes backwards dorsal to ovary. Enters uterus dorsal to ovary
Species	<i>O. rostellata</i> , fig. 1 <i>O. vacuolata</i> , fig. 2 <i>O. nyctophili</i> , fig. 3 <i>O. surinamensis</i> , fig. 4 <i>O. erinacei</i> , figs. 5A & 5B	<i>O. trachysauri</i> , fig. 6 <i>O. mephitis</i> , fig. 7 <i>O. oklahomensis</i> , figs. 8A & 8B	<i>O. scelopori</i> , fig. 9	<i>O. lygosomae</i> , fig. 10

Of the cestodes listed as exhibiting mode A, the three species, *O. rostellata*, *O. vacuolata* and *O. nyctophili* have identically the same arrangement of the organs and ducts (fig. 1-3). The arrangement in *O. surinamensis* differs from that in those three species in that the vagina passes ventral, not dorsal, to the ovary (fig. 4). In *O. erinacei*, according to Meggitt (1920) both the vagina and the uterine duct pass ventral to the ovary. Moreover the uterine duct passes up in front of the ovary and enters the uterus antero-dorsal to this organ (fig. 5A). This arrangement is obviously the reverse of that in *O. rostellata*, *O. vacuolata* and *O. nyctophili*. It would appear, therefore, that Meggitt may have misinterpreted the orientation of his specimens and that the correct arrangement is that shown in fig. 5B.

The inclusion of *O. oklahomensis* among those species showing mode B requires explanation. Peery (1939) in the description of this species

states that the testes occur ventral to the ovary. However, when in cestodes, the testes occur in the same vertical plane as the ovary, they are always dorsal to this organ. Moreover, the arrangement of the female genital ducts in *O. oklahomensis* is obviously the reverse of that found in *O. trachysauri* (compare figs. 8A and 6). In view of these facts, it seems likely that Peery also may have mis-interpreted the orientation of his specimens and that the correct arrangement of the female genital organs and ducts is that shown in fig. 8B.

In reference to *O. scelopori* Voge and Fox, which exhibits mode C, it should be mentioned that in their description of this species, the authors do not state the position of the genital ducts relative to the ovary. In their fig. 5, p. 240, they show the vagina passing above and the uterine duct passing below this organ. However, they do not state whether the figure represents a dorsal or a ventral view. Assuming that it is a dorsal view, then the arrangement of the female organs and ducts in this species is that shown in fig. 9.

Now, in modes A and B, the vagina and vitelline duct do not enter the oviduct at the same place. The region of the oviduct between the entrance of the vagina and the entrance of the vitelline duct is recognised as the fertilization canal. In C and D the vagina and vitelline ducts both enter the oviduct at the same place. Thus, a fertilization canal is absent. In C, the two ducts enter the oviduct posterior to the ovarian bridge, whilst in D, they enter the oviduct at the ovarian bridge.

In A and B, Mehlis's gland lies antero-dorsal to the vitelline gland and surrounds the oviduct near or at its union with the vitelline duct. A shell duct is absent. In C, also, Mehlis's gland lies antero-dorsal to the vitelline gland, but does not surround the oviduct. Instead it apparently surrounds a cavity which opens into the vitelline duct. The vitelline duct therefore conveys to the oviduct the products of both the vitelline gland and Mehlis's gland. A distinct shell duct is absent. In D, Mehlis's gland lies dorsal to the vitelline gland and does not surround the oviduct. A narrow duct, the shell duct, passes forwards from Mehlis's gland and enters the oviduct at the ovarian bridge.

In A and B the uterine duct arises from the ootype antero-dorsal to the vitelline gland, and passes forwards dorsal to the ovary. In A, it then bends and passes down in front of the ovary to enter the uterus antero-ventral to this organ. In B, however, it does not pass down in front of the ovary, but instead opens into the uterus antero-dorsal to this organ. In C, the uterine duct arises from the union of the oviduct, vitelline duct and vagina. This union occurs postero-ventral to the ovary. The uterine duct then passes forwards below the ovary and enters the uterus antero-ventral to the ovary. In D, the uterine duct arises from the ootype at the ovarian bridge and passes back dorsal to the ovary where it enters the uterus.

THE FEMALE ORGANS AND DUCTS IN THE GENUS *Linstowia*.

The descriptions of three species of *Linstowia*, namely, *Linstowia echidnae* (Thompson), *Linstowia semoni* (Zschokke) and *Linstowia jheringi* (Zschokke), include details of the arrangement of the female organs and ducts.

In *Linstowia echidnae*, the type of the genus, the disposition is shown in figure 11. On comparing it with the four modes of arrangement in the genus *Oochoristica* it is seen to resemble mode A. However, in *Linstowia echidnae*, the uterine duct, instead of passing forwards above the ovary, passes downwards between the ovary and vitelline gland. Moreover, it enters the uterus not antero-ventral to the ovary but antero-ventral to the vitelline gland.

In *L. semoni*, the arrangement is that shown in figure 12. It differs from that in *L. echidnae* in that the uterine duct passes forwards dorsal to the ovary and enters the uterus antero-dorsal to this organ. A comparison with the four modes in the genus *Oochoristica*, reveals a striking resemblance to mode B.

The disposition of the organs and ducts in *L. jheringi* is shown in figure 13. It differs from that in *L. echidnae* in the uterine duct passing forwards dorsal to the ovary and from that in *L. semoni* in the uterine duct entering the uterus antero-ventrally to the ovary. Furthermore, the arrangement in *L. jheringi* resembles mode A in the genus *Oochoristica*.

López-Neyra (1954, p. 241, 245) has emended the diagnosis of the genera *Linstowia* and *Oochoristica* and has transferred eight species of *Oochoristica* into the genus *Linstowia*. Those species, in which the cirrus pouch is large and extends into the medulla beyond the poral longitudinal excretory vessels, almost to the middle of the segment or even as far as the aporal vessels, he includes in the genus *Linstowia*. The species, in which the cirrus pouch is not large and reaches or just passes the level of the poral excretory vessels, he places in the genus *Oochoristica*. This classification would appear unsatisfactory since it groups together species which have markedly different arrangements of the genital organs and ducts.

It would seem that the two genera, *Oochoristica* and *Linstowia* are each heterogeneous and require division into several genera. When details of the disposition of the female organs in the type of the genus *Oochoristica*, namely, *O. tuberculata*, and in other species of both genera, are available, a more satisfactory classification will be possible.

In the course of the present study the writer noticed some lack of agreement between text and figures in the descriptions of the three species, *O. mephitis*, Skinker, *O. wallacei* Chandler and *O. pedunculata* Chandler.

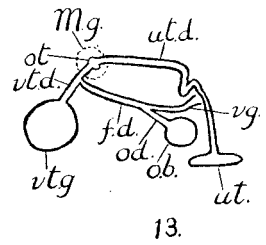
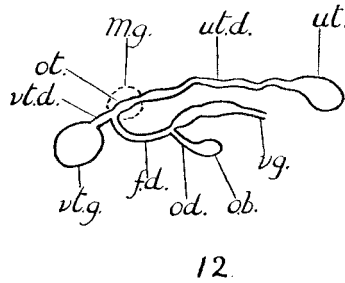
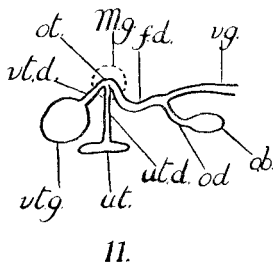
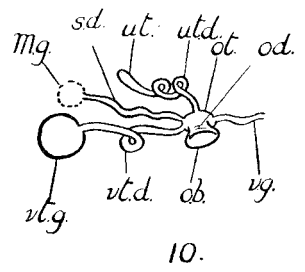
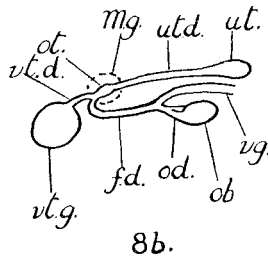
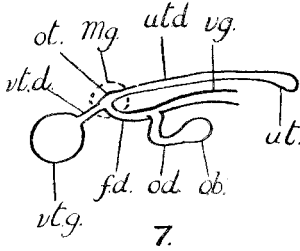
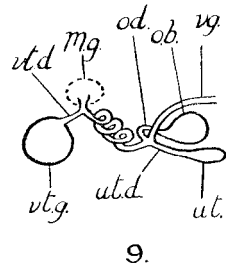
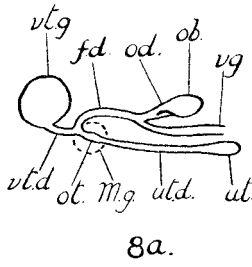
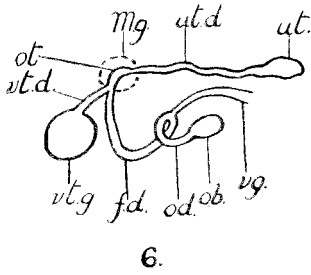
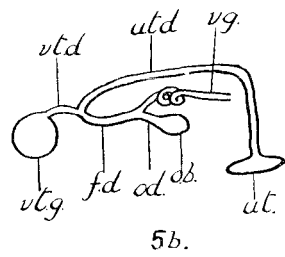
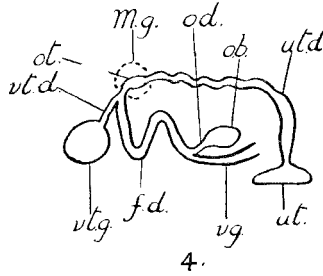
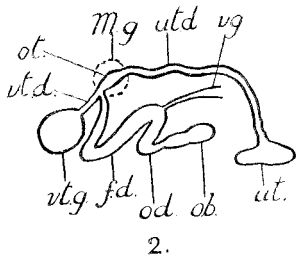
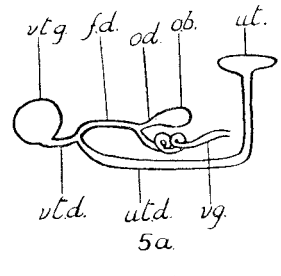
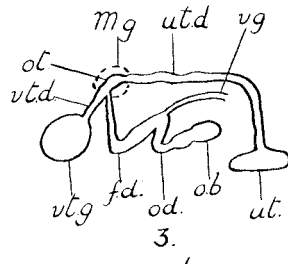
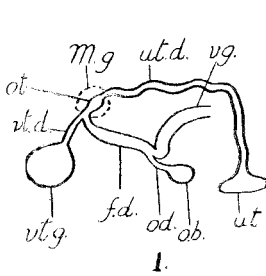
Skinker (1935, p. 61) in her description of *O. mephitis* states, "vas deferens . . ., passing along the middle of ventral surface of ovary", and "Seminal receptacle conspicuous, . . . dorsal to poral lobe of ovary". However, in figure 3, p. 61, she shows the vas deferens passing along the same surface as does the vagina.

In his description of *O. wallacei*, Chandler (1952, p. 69) remarks: "seminal receptacle always dorsal to third excretory vessel". However, in fig. 1, on page 70, the seminal receptacle is shown ventral to the third excretory vessel. Again, in describing *O. pedunculata*, he states on page 72: "Testes . . . situated laterally and posteriorly to ovary

and vitellaria, occasionally a few dorsal to these glands" and on page 73: "seminal vesicle . . . dorsal to poral side of ovary". However, in fig. 5, p. 72, a few testes are seen lying ventral to the ovary and vitellaria. Furthermore, in the same figure the seminal vesicle (actually the receptaculum) is shown ventral to the poral side of the ovary.

REFERENCES

- BURT, D. R. R., 1933.—*Oochoristica lygosomae* sp. nov.—a cestode from the lizard *Lygosoma punctatum*. *Spolia Zeylanica* 18 (1): 1-7.
- CHANDLER, A. C., 1952.—Two new species of *Oochoristica* from Minnesota skunks. *Amer. Midl. Nat.* Notre Dame. 48 (1): 69-73.
- COHN, L., 1903.—Helminthologische Mitteilungen. *Archiv. f. Naturg.* Jahrg. 69, Bd. 1, 47-68, pl. III.
- HICKMAN, J. L., 1954.—Two new Cestodes (genus *Oochoristica*) one from the lizard, *Egernia whitii*, the other from the bat, *Nyctophilus geoffroyi*. *Pap. Roy. Soc. Tasm.* 88: 81-104.
- JOHNSTON, T. H., 1932.—The parasites of the "Stumpy-Tail" Lizard, *Trachysaurus rugosus*. *Trans. and Proc. Roy. Soc. Sth. Aust.* 56: 62-70.
- KERR, T., 1935.—On *linstowia echidnae* (Thompson, 1893), Zschokke, 1899: a Cestode from the Australian Ant-eater. *Ann. Mag. Nat. Hist.* Ser. 10. 15: 156-160.
- LOPEZ-NEYRA, C. R., 1954.—Anoplocephalidae (continuación). *Revista Ibérica de Parasitología* 14, 2: 225-290.
- LÜHE, M., 1898.—*Oochoristica* nov. gen. Taeniadarum. *Zool. Anz.* 21: 650-652.
- MACCALLUM, G. A., 1921.—Studies in Helminthology. *Zoopathologica.* 1: 135-284.
- MEGGITT, F. J., 1920.—A new species of Cestode (*Oochoristica erinacei*) from the hedgehog. *Parasitology* 12: 310-313.
- PEERY, H. J., 1939.—A new unarmed tapeworm from a spotted skunk. *Journ. Parasitol.* 25: 487-490.
- THOMPSON, D'A. W., 1893.—Note on a tapeworm from Echidna (*Taenia echidnae* n. sp.). *Journ. Roy. Micr. Soc.* 297.
- VOGE, M. AND FOX, W., 1950.—A new anoplocephalid cestode *Oochoristica scelopori* n. sp. from the Pacific fence lizard *Sceloporus occidentalis*. *Trans. Amer. Micr. Soc.* Menasha. 63: 165-169.
- ZSCHOKKE, F., 1896.—Die Taenien der aplacentalen Säugetiere. *Zool. Anz.* 19: 481-482.
- , 1898.—Die Cestoden der Marsupialia and Monotremata. *Denkschr. med.-naturw. Ges. Jena.* Bd. 8: 359-380. pl. XXIV.
- , 1904.—Die Darmcestoden der amerikanischen Beuteltiere. *Centralblatt f. Bakt. Parasit. u. Infekt.* Abt. 1, Bd. 36: 51-62.
- , 1905.—Das Genus *Oochoristica* Lühe. *Zeitschr. f. wiss. Zool.* Bd. 83: 53-67, pl. 1.



REFERENCES TO FIGURES

f.d.—fertilization canal
M.g.—Mehlis's gland.
o.b.—ovarian bridge.
od.—oviduct.
ot.—ootype.
ov.—ovary.

s.d.—shell duct.
ut.—uterus.
ut.d.—uterine duct.
vg.—vagina.
vt.d.—vitelline duct.
vt.g.—vitelline gland.

EXPLANATION OF FIGURES 1-13

Each figure is a diagrammatic representation of a sagittal section of a mature proglottis. Only the relationship of the female genital ducts to the ovary, vitelline gland, Mehlis's gland and uterus is shown.

- FIG. 1.—*Oochoristica rostellata* Zschokke (1905) based on original description and figure.
 FIG. 2.—*O. vacuolata* Hickman (1954) as in type specimen.
 FIG. 3.—*O. nyctophili* Hickman (1954) as in type specimen.
 FIG. 4.—*O. surinamensis* Cohn (1903) based on original description and figure.
 FIG. 5A.—*O. erinacei* Meggitt (1920) based on original description.
 FIG. 5B.—*idem.*, reorientated as suggested in present paper.
 FIG. 6.—*O. trachysauri* (MacCallum, 1921) based on description and figure given by Johnston (1932).
 FIG. 7.—*O. mephitis* Skinner (1935) based on original description and figure.
 FIG. 8A.—*O. oklahomensis* Peery (1939) based on original description and figure.
 FIG. 8B.—*idem.*, reorientated as suggested in present paper.
 FIG. 9.—*O. scelopori* Voge and Fox (1950) based on original description and figure.
 FIG. 10.—*O. lygosomae* Burt (1933) based on original description and figure.
 FIG. 11.—*Linstovia echidnae* (Thompson, 1893) based on description by Zschokke (1898) and description and figure by Kerr (1935).
 FIG. 12.—*L. semoni* (Zschokke, 1896) based on description and figure by Zschokke (1898).
 FIG. 13.—*L. jheringi* Zschokke (1904) based on original description and figure.

