

Chapter I

Turbellaria (Addenda)

By E. MARCUS †

Three species, two fresh-water and one terrestrial form, collected by the Swedish South Africa Expedition, were sent to Mrs. EVELINE DU BOIS-REYMOND MARCUS and me after the publication of the first report (MARCUS 1955).

Rhabdoceola (Neorhabdoceola)

***Mesostoma brincki* spec. nov.**

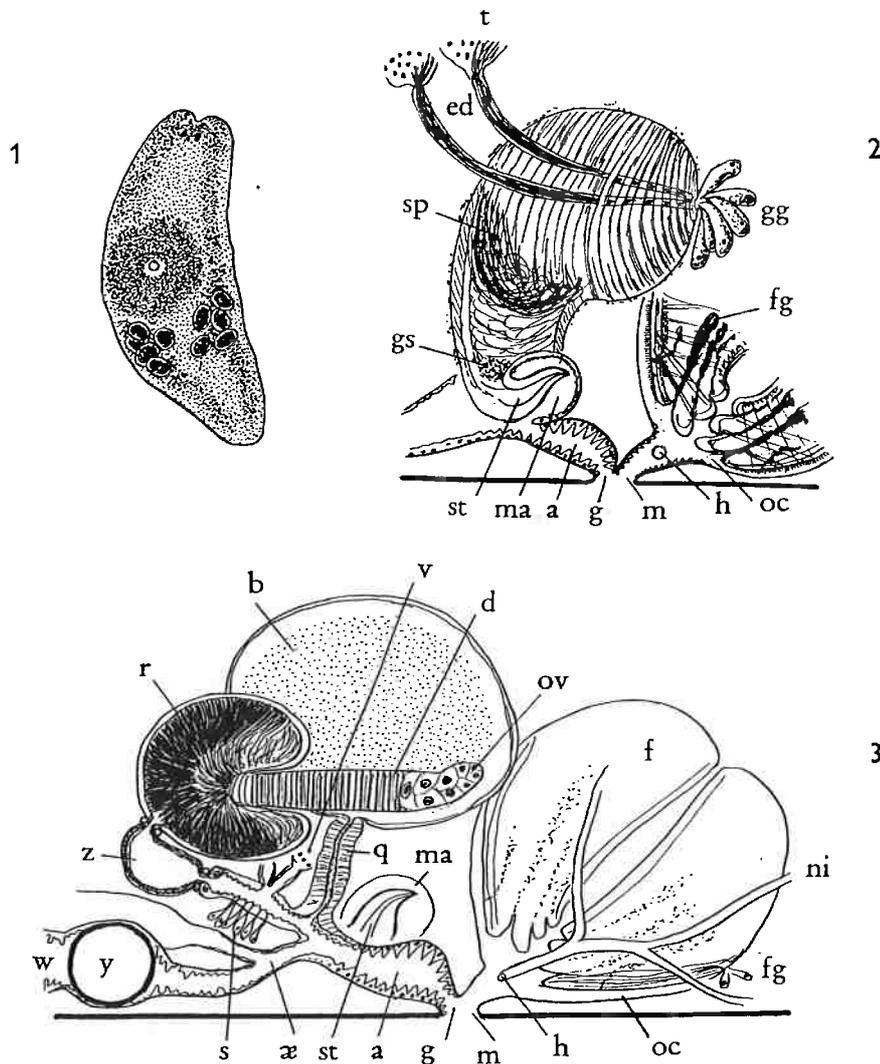
(Figs. 1-3)

South West Africa.: Kaokoveld, Kowares, 3. VI. 1951, two specimens in a rock pool with chironomid larvae (Loc. No. 323).

External characters: The worms are 4 and 3.5 mm long, 1.3 and 1 mm broad and 0.8 and 0.9 mm high. The body is nearly cylindrical and broadest in the middle, flattened and blunt in front, slightly more pointed behind. The black eye cups are united by strands of pigment. A subterminal pit of the anterior end extends to the ventral side as a groove. The colour is brownish grey, a little darker on the ventral than on the dorsal side. The light oro-genital opening (m, g) is surrounded by a broad black ring (Fig. 1) whose outer limit is not sharp. The outer mouth lies in front of the middle of the body, at 1.8 and 1.5 mm from the tip.

Internal characters: Two thin tracks of rhammites open into the terminal pit and many blue staining glands into its ventral prolongation. The eye cups are 30 μ , the optical cells 15 μ in diameter. The oral tube contains the openings (h) of the excretory canals (ni) and its hind wall is continuous with the outlet of the common genital antrum (a). The pharyngeal pocket (oc) is unciliated, and its muscles are thin. It surrounds nearly half the rosulate pharynx (f). The lumen of the pharynx is extended in right-left and flat in antero-posterior direction. The outer epithelium of the pharynx is ciliated. In the part surrounded by the pocket it is underlain by thick muscles; beneath the septum the muscles are thinner. Of the other pharyngeal muscles about 35 strong inner longitudinal and numerous radial fibres could be verified. Some of the glands (fg) enter the pharynx at the insertion of the pocket (Fig. 3). The rest of the gut is not sufficiently well preserved for a description.

The testes (t) are dorsal to the intestine and the vitellaria. Their numerous, irregular, and in part coalesced follicles are 0.1-0.2 mm in diameter and occupy the entire length of the



Mesostoma brincki sp. n. — Fig. 1. Ventral view of clarified worm. — Fig. 2. Sagittal reconstruction of male copulatory organ. — Fig. 3. Sagittal reconstruction of female reproductive organs and pharynx.

body. The efferent ducts (ed) come from behind to the penial bulb (pb), course forwards under the muscle mantle of the bulb, both on the right side of the latter, and enter the foremost end of the seminal vesicle together with a tuft of granule glands (gg). This point lies near the posterior end of the pharynx, a little to the left. The vesicle which contains sperm (sp) has a transverse diameter of 0.2 mm, while the dorso-ventral and antero-posterior measurements are 0.25 and 0.27 mm respectively. The wall of the vesicle is peppered with dark pigment. The following portion of the male duct is 0.12 mm in diameter; ectally it contains

some pink granular secretion (gs). Its epithelium is spongy. The strongly muscular outlet of the bulb ends with a weakly cuticularized stylet (st), 40 μ long and 20 μ broad at its base. The stylet lies in a pocket of the male antrum (ma). The epithelium of the latter and that of the common antrum (a) consists of high, pyramidal cells.

The ovary (ov) is located to the right of the hind end of the pharynx (f). The oviduct (d), composed of the disc-like cells common in the genus and enclosed in thin longitudinal muscle fibres, projects into the ample receptaculum seminis (r). The sperms are fastened to the posterior wall of the receptaculum and to the entrance of the oviduct with their heads. Near the hind end of the receptaculum a short and narrow duct leaves it and passes to the wide, thin-walled female canal (z). The outlet of the receptaculum has a sphincter, and further sphincters occur between the several dilatations of the female canal. The latter runs forwards, receives the separated vitelloglands from the dorsal side (see v), and from below shell glands (s) and, farther in front, the common duct (x) of the uteri. The uterine duct bifurcates, and each branch continues backwards as a tubular sac (w).

The larger worm contains about 10, the smaller one 4 thick-shelled dormant eggs (y). Opposite to the opening of the uterine duct the narrow bursa canal (q) rises from the female canal and opens into the ventral centre of the bursa ampulla (b) which contains debris of sperm. The wall of the bursa canal is enveloped with spiral muscle fibres, that of the ampulla is thin. The vitellaria contain some pigment and lie ventro-laterally in the anterior, ventrally in the posterior part of the body.

The species is named in honour of Dr. PER BRINCK of Lund University.

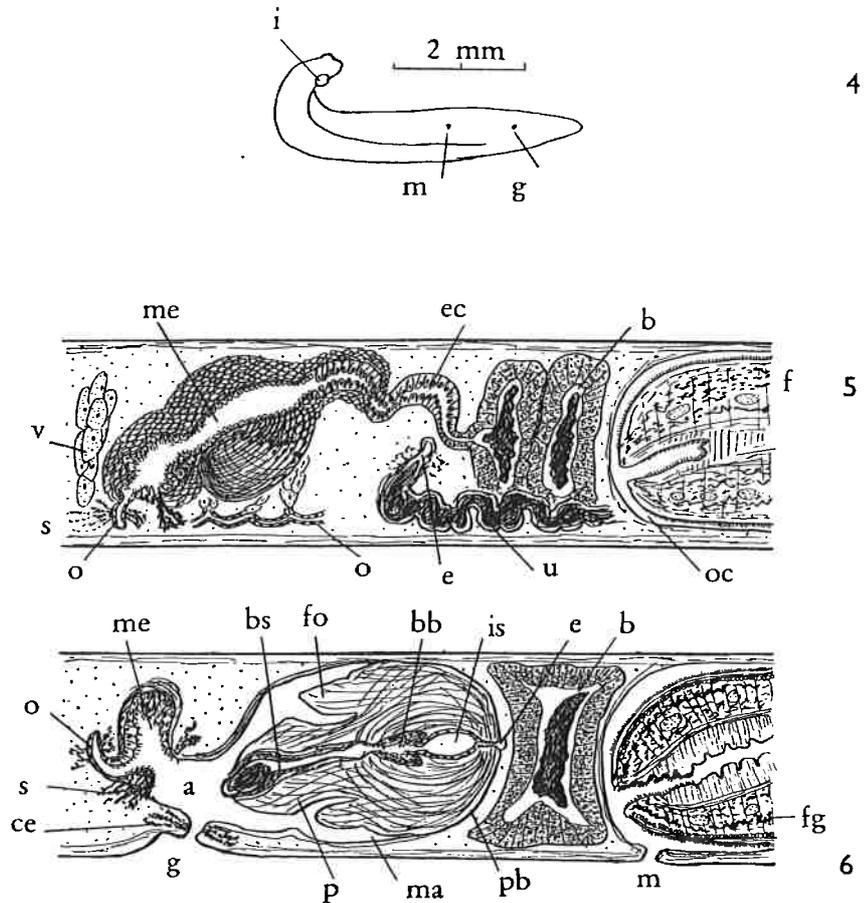
Discussion of *Mesostoma brincki*

To the previously listed African species of *Mesostoma* (MARCUS 1955, p. 116–117), *M. inversum* BEAUCHAMP (1954, p. 157) and *M. evelinae* MARCUS (1955 a, p. 7) must be added. As in *M. brincki* the pigmentation of these species is darker ventrally than dorsally. *M. inversum* differs from *M. brincki* by its pharynx located in the anterior fourth of the body; *M. evelinae* by a spinous cirrus and absence of a bursa.

Of the other sufficiently known species of *Mesostoma* found in Africa, *M. lingua* (ABILDG.) and *M. ewerum* DU BOIS-REYMOND MARCUS have T-shaped uteri; *M. lacteum* NEPPI has no bursa. The doubtful African species were commented on by DU BOIS-REYMOND MARCUS (1951, p. 78), and a list of species of *Mesostoma* published since the last revision of the genus (FERGUSON & HAYES 1941) was given by HYMAN (1957, p. 1).

Probably the species with darker ventral side swim upside-down. This was observed for *M. productum* (O. SCHMIDT 1848) and *M. maculatum* HOFSTEN 1916 (see GELEI 1933, p. 195; HOFSTEN 1916, p. 711). *Bothromesostoma evelinae* MARCUS (1946, p. 92), however, which also swims with the ventral side upwards, is black on the dorsal and orange-yellow on the ventral side.

Bothromesostoma truncatum BEKLEMISCHEV (1921, p. 639) from Perm in eastern European Russia has a precerebral groove like *M. brincki*, but has the ductus spermaticus characteristic of *Bothromesostoma*.



Cura wimbimba sp. n. — Fig. 4. Preserved worm. — Fig. 5. Combined sagittal sections of bursa. — Fig. 6. Combined median section of copulatory organs.

Tricladida Paludicola

Cura wimbimba spec. nov.

(Figs. 4–6)

Cape Prov.: Swartbergpas, Platberg, altitude about 1670 m, 6. I. 1951, 1 specimen in a temporary brooklet (Loc. No. 120).

External characters: The worm measures 6 mm in length, 1.5 mm in breadth, and 0.5 mm in height. The greatest breadth lies at the end of the anterior third of the body. The mouth (m) is located at 4 mm, the gonopore (g) at 5 mm from the tip. The pharynx (f) is 1.26 mm long, the mouth lies at its extreme posterior end (Fig. 6). The anterior end of the body is

blunt (Fig. 4). As the cephalic sensory organs are situated within pits (i), the borders of these can be considered as auricles. The hind end is pointed; the borders are roundish.

The back and the belly are rather dark brown, but pigment appears in the sections only on the back. Hence the dark ventral colour seems to be due to prolonged stay in alcohol which often browns pigmentfree skin of invertebrates. The eyes were not seen in the clarified worm, but appear in the sections, about 0.2 mm behind the tip. The sensory pits are light; the pharynx has no pigment. As the worm is rolled up (Fig. 4) and opaque, the number of the intestinal diverticula cannot be indicated; they branch once near their base as in *C. tinga* MARCUS (1955, p. 109).

Internal characters: Also the integument and the pharynx agree with *C. tinga*. The marginal adhesive gland zone, however, is not developed in the present worm, and the inner longitudinal pharyngeal muscles form an 11 μ thick layer against 4 μ in *C. tinga*.

The testes begin about 1 mm from the tip and end in front of the root of the pharynx. They are dorsal to the intestine, contrary to *C. tinga* where they are ventral or lie between the intestinal branches. In transverse sections there are up to 3 follicles on one side. The spermiducal bulbs (u) are filled with sperm already at the root of the pharynx. Behind the bursa ampulla (b) they rise and are surrounded by distinct muscle fibres. Red-staining glands open into these portions of the efferent ducts which represent extra-bulbar seminal vesicles (e).

These vesicles enter the dorsal half of the penial bulb (pb) from both sides, quite different from *C. tinga* where they are intra-bulbar and ventral (l. c., f. 31, x). Inside the bulb the two vesicles unite and form the small intra-bulbar seminal vesicle (is). This empty ciliated cavity projects with a papilla into an unciliated chamber (bb) whose blue-staining glands lie mostly among the muscle fibres of the bulb. The next part of the male duct produces pink secretion. These two sections furnish the spermatophore whose ampulla lies ectally (bs). Spermatophores occur in *Cura evelinae* and *C. tinga* (l. c., p. 107, 111). The male duct opens on the tip of the penis papilla (p). This papilla constitutes the posterior half of the bulb and is surrounded by a basal, collar-like fold (fo) provided with pink glands. The male antrum (ma) is muscular, its epithelium is unciliated. The minute gonopore (g) lies behind the tip of the penis papilla.

The ovaries are situated 0.4 mm behind the fore end, close to the posterior border of the brain. The vitellaria (v) begin immediately behind the ovaries, extend from the belly to the back and reach the tail. The ovovitelloducts (o) open into the outermost end of the bursa canal (me) at different horizontal levels, similar to those in *Dugesia monomyoda* MARCUS (1953, p. 22). The limit of the bursa canal against the common antrum (a) is marked by the openings of the shell glands (s). Some of the latter issue also into the terminal parts of the ovovitelloducts. A female antrum is not set off from the common antrum. The chiefly annular musculature of the bursa canal is enormously developed in the ectal half of its course (me). The sinuous canal flanks the penial bulb. The epithelium of the bursa canal has intra-epithelial nuclei. These lie apically in the unciliated, claviform cells of the ental section (ec). The epithelium of the ectal part is ciliated and thrown into folds. The bursa ampulla (b) has no cilia; its cells are crowded with pink granules; its lumen contains a spermatophore.

— Fig. 6.

brooklet

0.5 mm
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Discussion of *Cura wimbimba*

The key of the species of *Cura* (MARCUS 1955, p. 112) can be amplified in the following manner:

- 9 Unpaired extra-bulbar seminal vesicle. *falklandica* (WESTBLAD 1952; Falkland Islands)
 — No unpaired extra-bulbar seminal vesicle. 10
 10 Testes ventral; female and common antrum separated by a broad sphincter; ovovitelloducts enter the bursa canal at same level. *tinga* MARCUS 1955 (Basutoland)
 Testes dorsal; no sphincter between female and common antrum; ovovitelloducts enter the bursa canal at different levels. *wimbimba* spec. nov. (Cape Province)

Tricladida Terricola

Othelosoma evelinae spec. nov.

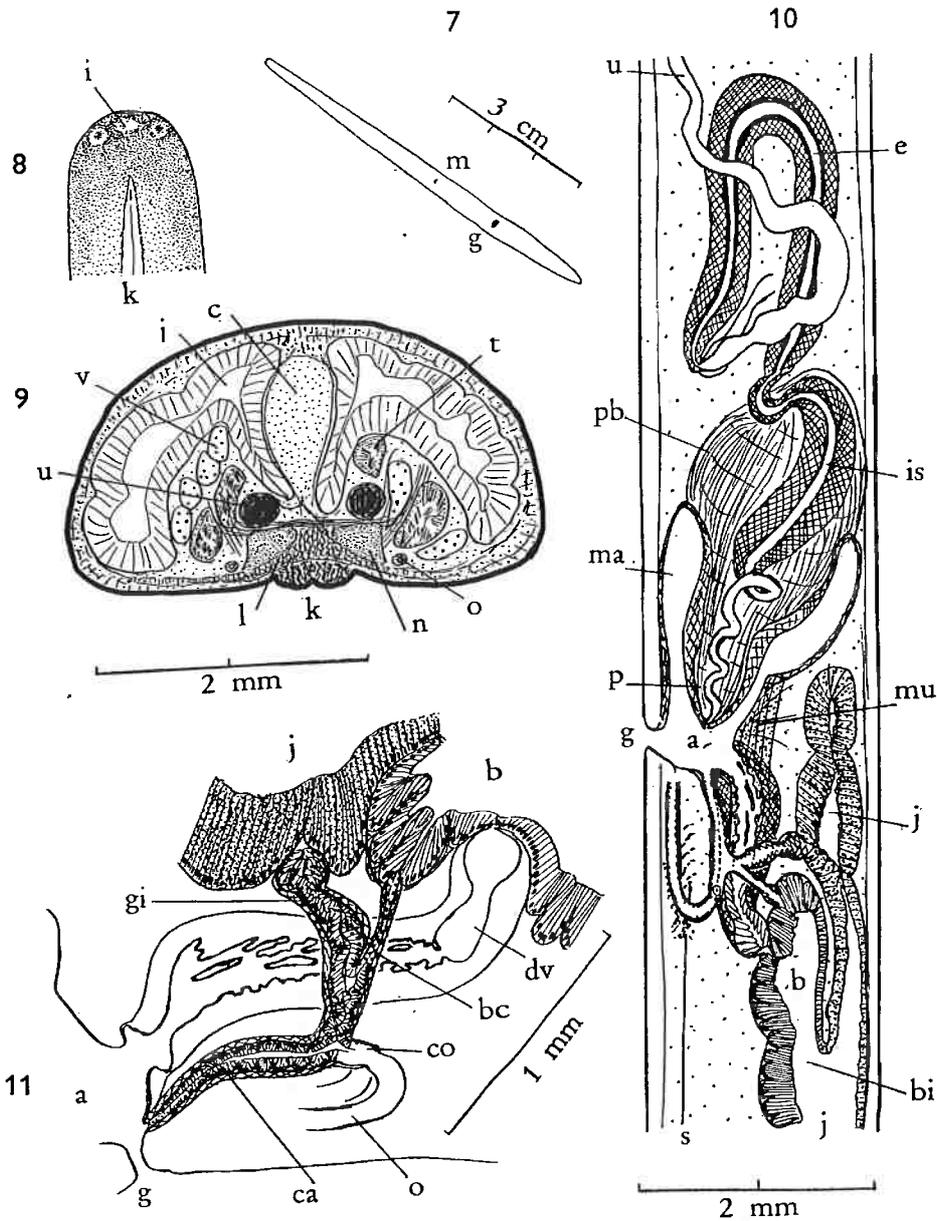
(Figs. 7-11)

Natal: Royal Natal National Park, Gudu Falls, 4. IV. 1951, 2 specimens, the bigger on a fallen wet log in virgin forest (Loc. No. 260), the smaller under a stone lying on moist sand near the Gudu falls.

External characters: The measurements of the big (and small) worm are in mm: length 76 (31), breadth 3.5 (1.5), and height 2 (0.9). The body of the big worm is wrinkled transversely, the smaller animal is smooth. The mouth (m) lies 40 (20), the gonopore (g) 55 (26) mm from the tip. The ventral side is flattened, the borders are round. The anterior end tapers gradually to the blunt tip, where the eyes and the sensory groove (i) lie. The creeping sole (k) is narrow, 0.7 mm broad and nearly attains the tip. It is convex and whitish. The yellowish colour of the belly passes on to the uniformly grey back without sharp limits. The smaller animal is darker and has, from about 7 to 14 mm, lateral light spots, probably produced by reproductive organs, testes or vitellaria, shining through the skin.

Internal characters: The epidermis is 60 μ high on the back, 40 μ high on the belly. The dorsal epidermis contains gland cells with basal nuclei. Immediately under the tip numerous erythrophilous glands open on a 0.6 mm wide area. Part of these glands lie deep in the parenchyma. The eye cups are 90 μ broad and 80 μ deep; the sensory groove (i) is dorsal to the eyes, flat and pigmentfree. Close behind the glandular area the creeping sole (k) begins. Its ciliated epithelium has the same height and the same normal position of the nuclei as the adjacent unciliated belly. Also the scattered blue and red-staining glands open on the sole and beside it.

The cutaneous muscles consist of one layer of circular and one of longitudinal fibres. Of the parenchymal muscles a ventral longitudinal layer (l) is conspicuous; an anterior retractor is not developed. In front of the male copulatory organs and between the intestinal diverticula (j) there is a cushion of loose tissue (c) similar to that found by PANTIN (1953, p. 210-11) around the retractor. In relation to the length of the worm the ventral nerve cords (n) are unusually thin. As the intestinal diverticula are about 0.4 mm broad at their roots, their number is estimated at 190 on each side.



Othelosoma evelinae sp. n. — Fig. 7. Outline of preserved worm. — Fig. 8. Ventral view of fore end. — Fig. 9. Transverse section anterior to copulatory organs. — Fig. 10. Combined median section of copulatory organs. — Fig. 11. Female ducts with higher power.

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The testes (t) are ventral and two of them occur on each side in sections of the body in front of the penis. The terminal parts of the efferent ducts are spermiducal bulbs (u) which open close to one another into the seminal vesicle (e). This organ is curved, has a 4 mm long limb directed forwards and a just as long one backwards. Its lumen is 0.1 mm wide, the epithelium 36 μ high, slightly folded, and contains pink secretion. An about 0.1 mm thick musculature envelops the extra-bulbar seminal vesicle. The latter enters with a short narrow duct into the penial bulb (pb), where the male duct shows two distinct sections. The ental straight portion (is) is 1.2 mm long, wrapped in a 0.15 mm thick muscle coat and lined with a 25 μ high, probably ciliated epithelium which is much folded. The thin ectal portion runs in a spiral course. The quite flat epithelium of the penis papilla (p) is underlain by a very thick musculature. The atrial epithelium is low too; the fold between male (ma) and female atrium contains dense longitudinal and annular muscle fibres (mu).

The ovaries lie more than 3 mm behind the tip. The diameter of the ovovitelloducts is 40 μ in front and becomes doubled in the region of the gonopore. Their ciliated epithelium is thrown into transverse folds in the part that receives the shell glands (s). Close distally to the union of the ovovitelloducts (o) the quite short common ovovitelloduct (co) communicates with the bursa by Beauchamp's canal (bc). This straight and oblique duct enters the antero-ventral wall of the bursa ampulla (b). A little farther behind lies the bursal opening of the ductus vaginalis (dv). This very wide duct begins with a bulb, and its folded wall is surrounded by a 0.1 mm thick musculature. The ductus vaginalis is crossed by Beauchamp's canal and further by a thick-walled communication (gi) between the canalis anonymus (ca) and the intestine (j). The ectal portions of Beauchamp's canal and this communication are confluent, but their diameter and their histological structure differ. The canalis anonymus and the ductus vaginalis open through the posterior wall of the atrium (a), the ductus vaginalis dorsally to the canalis anonymus. The high epithelium of the bursa ampulla decreases in height on its dorsal side, where the bursal (b) and the intestinal (j) lumen communicate broadly (bi).

Discussion of *Othelosoma evelinae*

After the publication of my key (MARCUS 1955, p. 131-32) BEAUCHAMP (1956) described two new African species, *O. marlieri* and *O. marcusii*. From these and all other species of the genus *O. evelinae* might be separated by the direct communication of the canalis anonymus with the intestine. In a single specimen, however, this structure cannot be evaluated systematically. Genito-intestinal communications occur sporadically in turbellarians and can individually be present or not (DU BOIS-REYMOND MARCUS 1957, p. 160). According to REMANE (1951) these communications are historical remnants of an egestive part of the gut, and individual variability in such archaic organs is known. Often they have lost their former function without acquiring a new one, e. g. the gonopericardial ducts or strands in proso-branches, and in these cases no formative stimulus determines their regular development.

O. marlieri differs from *O. evelinae* by an anterior, ventral retractor, absence of a bursa ampulla, and communication between the right intestinal branch and Beauchamp's canal, which BEAUCHAMP calls spermatic or seminal canal. Also *O. marcusii* has an anterior, ventral

retractor. Beauchamp's canal and ductus vaginalis do not cross, and right and left ovi-duct open at different levels.

It is noteworthy that in the two specimens of *O. marcus* united and separated bursal openings of ductus vaginalis and Beauchamp's canal occur. Hence every species of *Othelosoma* must be compared with groups 3-10 and 11-20 of my key, because the separating character has lost its taxonomic value. In the first group *O. speciosum* (GRAFF 1896; 1899, p. 481) from the Cape Province (French Hoek) without retractor and with crossing ductus vaginalis and canalis anonymus comes near to *O. evelinae*. It differs by its marked area of secretory epidermis and the position of the openings of the two bursal canals into the antrum, that of the ductus vaginalis ventral to that of the canalis anonymus.

In the second group *O. conyrum* MARCUS (1953, p. 37) must be compared with *O. evelinae*. Both have a sphincter between male and female antrum, but *conyrum* has an anterior, dorsal retractor, and its bursal canals do not cross.

Absence of a retractor and crossing of these canals approach *O. africanum* (GRAFF 1899, p. 521; FREISLING 1935, p. 12) from the Cape Province (French Hoek and Knysna) to *O. evelinae*. Also the narrow creeping sole and the curved extra-bulbar seminal vesicle agree in both species. Within the penial bulb an ental, straight, strongly muscular section of the male duct is followed by an ectal, winding, less muscular part, both in *africanum* and *evelinae* but the lumen of the ental portion is wide in *africanum*, narrow in *evelinae*. The sphincter between male and female antrum of *evelinae* is absent in *africanum*. In *O. africanum* the canalis anonymus crosses the ductus vaginalis, in *O. evelinae* it is Beauchamp's canal which crosses the ductus vaginalis. This difference in the bursal canals together with the contrasting size, shape, and colour pattern separate the two species univocally. The genito-intestinal communications of *O. evelinae* are not recorded for *O. africanum*.

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See MARCUS 1955 and add:

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Abbreviations used in the figures

a — common antrum.	k — creeping sole.
b — bursa ampulla.	l — longitudinal muscle layer.
bb — bulbar cavity containing blue secretion.	m — mouth.
bc — Beauchamp's canal.	ma — male antrum.
bi — bursa-intestinal communication.	me — muscles of ectal bursa canal.
bs — bulbar cavity containing spermatophore.	mu — muscles between male and female antrum.
c — loose connective tissue.	n — nerve cords.
ca — canalis anonymus.	ni — excretory canals.
ce — cement glands.	o — ovovitelloducts.
co — common ovovitelloduct.	oc — pharyngeal pocket.
d — oviduct.	ov — ovary.
dv — ductus vaginalis.	p — penis papilla.
e — extra-bulbar seminal vesicle.	pb — penial bulb.
ec — ental part of bursa canal.	q — bursa canal.
ed — efferent ducts.	r — receptaculum seminis.
f — pharynx.	s — shell glands.
fg — pharyngeal glands.	sp — sperm.
fo — fold around penis papilla.	st — stylet.
g — gonopore.	t — testes.
gg — granule glands.	u — spermiducae bulbs.
gi — duct from canalis anonymus to intestine.	v — vitellaria.
gs — granular secretion.	w — uterus.
h — opening of excretory organs.	x — uterine duct.
i — sensory pit.	y — dormant egg.
is — intra-bulbar seminal vesicle.	z — female canal.
j — intestine.	

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