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DUCTUS GENITO-INTESTINALIS IN THE POLYCLADS

BY

SIXTEN BOCK

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Ductus genito-intestinalis in the Polyclads.

By

SIXTEN BOCK.

With 4 Figures in the Text.

Communicated February 9th 1927 by E. LÖNNBERG and T. ODHNER.

All that is known of a ductus genito-intestinalis in the Polyclads has only been brought to light so recently as in the last twenty years. Before the case recently described by me (BOCK 1925 on *Discostylochus*), such a connection between the genital system and the intestine had been shown to exist only in three instances. I may add here that in spite of a diligent search in numerous Polyclads, I have not previously succeeded in finding such a phenomenon.

The first case mentioned in the literature on the subject is *Laidlawia trigonopora*, a small Cotylean Polyclad from the Strait of Magellan described by E. H. HERZIG in 1905. In the fuller description of the very same specimen, given by ZÁHONY two years later, the ductus g. i. is described as follows: »Rechter und linker Eileiter sind durch einen Quergang verbunden, aus dessen Mitte ein kurzer Ductus genito-intestinalis entspringt. Das ganze System der Eileiter sowie die terminale Blase sind mit zarten, zirkulären Muskelfasern versehen. Am Ausführgang der Blase und der Mündung des Ductus genito-intestinalis in den Hauptdarm verdichten sich dieselben zu förmlichen Sphinctern (Fig. 8 rm')». »Das Epithel der Eileiter und des Ductus genito-intestinalis trägt lange Wimpern, die in letzterem gegen den Darm gerichtet sind.» In a footnote it is further mentioned: »MELL hat bei Landplanarien (*Pelmatoplana mahéensis* GRAFF und *P. braueri* GRAFF) einen analogen Gang beschrieben».

The second known case of a ductus g. i. in the Polyclads was described by HASWELL (1907 a and b). This was in an Acotylean from Australia, *Enterogonia pigrans*. As may be concluded from his schematic diagram (1907 b, Plate 37, Fig. 4), the only figure of this peculiar genus presented by him, its ductus genito-intestinalis represents exactly the same kind of formation as the one found in *Discostylochus*. HASWELL describes it as follows: »The dorsal limb of the vagina, after receiving the common duct formed by the union of the lateral uterine ducts, runs backwards as a narrowing tube, which opens into the median posterior branch of the intestine — — — a genito-intestinal passage thus established». It might be added that HASWELL contends that this canal, as well as »the similarly-named canal in the *Heterocotylea*», is homologous to »the Laurer's canal of the *Malacocotylea*», and also suggests the receptaculum seminis of the *Acotylea* in general, and the posterior female passage of *Trigonoporus* and *Tripylocelis* another homologous development. I have recently (BOCK 1925 IV) been able to show that *Enterogonia* belongs to the family *Stylochidae*. The third case of a connection between the genital system and the intestine was presented by HALLEZ (1913) in his description of the Antarctic *Enterogonimus aureus*. This is a Cotylean form allied to *Laidlawia*. As in the latter, communication has been established between the oviducts and the intestine. In this example, however, there are two ductus genito intestinales. From each oviduct runs a short canal down to the side of the main intestine. That there are two canals is ultimately due to the fact that there is no connecting transverse duct between the two oviducts.

The fourth case is *Discostylochus parcus* BOCK 1925 from Hawaii to which I have already referred.

To summarize the above-mentioned facts, we may state that there are two genera in each of the sub-orders of the *Polycladida* provided with genito-intestinal communication. But this connection is not of the same character in the two sub-orders as will be discussed in detail later on.

The presence of genito-intestinal communication has been repeatedly shown in other Turbellarian groups. Under the title: »Der Ductus genito-intestinalis der Plathelminthen» BENDL (1909) has presented in Zool. Anzeiger »eine kurze zusammenfassende Darstellung unsrer Kenntnisse hiervon». After a short resumé of the canalis vitello-intestinalis of the Trematodes, he passes on to the ductus g. i. of the *Tricladida Terricola* (*Rhynchodemus* and *Pelmatoplana* species) and discusses its formation in the Rhabdocoele *Phaenocora unipunctata*.

At the time he was not aware that a similar duct in a Polyclad had been described by HASWELL two years earlier in the same journal nor was he acquainted with ZÁHONY's (1907) statement in respect to *Laidlawia*.

A special account of the ductus g. i in the Triclads has been given by VON GRAFF in BRONN (p. 3126), who discusses two species of each of the genera *Rhynchodemus*, *Amblyplana* and *Pelmatoplana*. The last mentioned genus belongs to *Geoplanidae*, the others to *Rhynchodemidae*. The abnormal female apparatus in an *Arthioposthia adelaidensis* (l. c. p. 3129) might also be included in this category. JOSEPH MEIXNER (1921) describing *Rhynchodemus peneckei* stated that this, as well as *R. terrestris*, *R. purpureus* and *R. henrici*, have established genito-intestinal connection. According to FUHRMANN and KABURAKI, the same holds true of two new *Amblyplana*-species and additional examples are given by KOMÁREK 1919 (*Geopaludicola absoloni*) and FRIEB 1923 (*Rhynchodemus unilineatus*).

In his excellent and well-written paper on the Turbellaria in P. SCHULZE: Biologie der Tiere Deutschlands, REISINGER (1923) has treated the ductus g. i., its occurrence and function, in the Rhabdocoeles, Alloeocoeles and Triclads.

STEINBÖCK (1924) refers to the ductus g. i. of the *Alloeocoela typhlocoela*. In a second paper (1924 a), the same author has considered the question of the origin of the ductus genito-intestinalis and concluded that it represents a very primitive feature. I shall return to his theory below.

The presence of genito-intestinal communication has further been shown in the *Temnocephaloidea*. The observations have been made by HASWELL (1893 and 1924) and MERTON (1914 and 1925). I shall deal with this question in another publication.

It has already been mentioned, that this kind of connection is also known in the *Trematodes*, the ductus g. i. there often being called canalis vitello-intestinalis. It occurs there in the group *Polyopisthocotylea* ODHNER. The sporadic occurrence of a ductus g. i. in such a highly specialized group as the *Trematodes* seems to me to be not very favourable to its primitiveness, even if it is not a direct obstacle. It could, of course, be argued that the forms possessing it are rather primitive Trematodes.

With regard to the function of the ductus g. i., the general opinion is that it enables superfluous vitellous material and sperma in bad condition to be carried to the intestine in order to be assimilated there. See for instance: ODHNER

(1912), von Graff (l. c.), Reisinger (1923) and Haswell (1907 b and 1924).

This being the case, it is not far to assume that the ductus g. i. is a late adaptation for the transfer of waste products from the female genital system to the alimentary canal. Another view, however, is held by Steinböck in his paper: »Die Bedeutung der *Hofstenia atroviridis* Bock für die Stellung der *Alloeocoela* im System der Turbellarien». He emphatically expresses the opinion that the ductus g. i represents a very old ancestral feature, even older than the ordinary unpaired female apparatus opening on the ventral surface of the body. He supposes that the duct has been retained from a time when the eggs for deposit were transferred to the intestine and ejected through the mouth. Consequently he regards the ordinary female apparatus as a relatively late acquirement which replaced the old efferent duct (or ducts) leading to the intestine. According to this theory[1], the ductus g. i. represents a rudiment still existing here and there in various groups of *Plathelminthes*. Steinböck limits his discussion, however, to the Turbellaria and especially to the *Alloeocoela* and *Tricladida*. It is only incidentally mentioned that a ductus g. i. occurs in the Polyclads.

Can Stenböck's explanation of the genito-intestinal communication of the Alloeocoeles be applied to the Polyclads? In this article I must limit the question to this group. But if the theory is not valid for the Polyclads, I think this fact must very seriously affect the explanation given for other Turbellarians. The strength of it lies undoubtedly in the generalization. If the genito-intestinal communication is an independent and late acquisition in the Polyclads, it might just as easily be the case in other groups of Plathelminthes.

Before discussing the problem in detail, I may state, by way of introduction, that the Polyclads seem to me to be very suitable to test the theory, regardless of whether or not they are primitive Turbellarians. The features of the organization are simple, clear, and well defined and the histological structure of the tissues demonstrates a greater distinctness than in other turbellarians. In addition the variation of the genital organs in the Polyclads is not too great and their mutual relation may be traced often without greater difficulty.

It is then of real interest to note that the genito-intestinal communication appears in the Polyclads in two different

[1] Reisinger (1926) supports Steinböck's theory.

types. One occurs in the *Acotylea*, the other in the *Cotylea*. In the former group there is a single ductus genito-intestinalis forming the direct continuation of the vagina backwards and it opens ventrally in the intestine. In the *Cotylea* one or two ductus genito-intestinales establish connection between the dorsal oviducts and the intestine, and open on its dorsal side. The difference in the two cases makes it clear that it is better to treat these two kinds separately. We shall consider firstly the Acotylean type.

First of all it may be pointed out that the vagina of all Polyclads is the very same kind of formation, a homogenetic organ, i. e. derived from common ancestors, structured according to the same general principles, and showing agreement in the essential features. A Polyclad without a vagina may be regarded as beyond the bounds of probability. On their way outwards for deposit, the eggs must pass through the vagina in order to get their shells formed. The shellglands[1] are consequently present in every Polyclad.

Since, as we have stated, the vagina is a necessary feature in the Polycladidean organization, the question must be considered whether the duct connecting the vagina with the intestine might be regarded as a secondary acquisition. In the *Acotylea* the vagina generally assumes a shape reminding one more or less of an S (with the lower part of it shortened). For the simplest type of the female apparatus, that of *Stylochus* may serve as an example (e. g. Bock 1913, text-fig. 19). The two ventrally situated uteri open directly into the vagina at its inner end, coming from each side. In certain other genera of the family *Stylochidae*, there is a Lang's glandular vesicle behind the vagina and this vesicle is connected by a duct with the pars interna vagina. As an example we might take *Neostylochus pacificus* (Bock 1923, text-fig. 3). While this duct seems to be the direct continuation backwards of the proximal part of the vagina (= *pars interna vaginae*), there opens from the ventral side an unpaired *median uterine duct* which at its lower blind end receives the uteri. This median uterine duct must be regarded as homologous to the *most proximal part* of the vagina of the genus *Stylochus*. Both bend in a charateristic way downwards to receive the uteri and in a structural way they agree very well.

This view leads to the conclusion that *Lang's vesicle*,

[1] I might here refer to my forthcoming article on the formation of the egg capsules of the Polyclads, which will be published in the near future.

together with its duct, might be regarded as an outgrowth backwards from the vagina in the form of a blind diverticle. This outgrowth-process must evidently have taken place a short distance above and distally to the entrance of the uteri into the vagina. In most cases the duct to Lang's vesicle appears as the direct continuation inwards of the vagina and consequently the median uterine duct appears as a distinct and independent canal, which feature I regard as a later adaptation and transformation. In several cases, however, the *median uterine duct* forms the direct continuation of the vagina and the duct to Lang's vesicle projects like a long, narrow appendix. A very striking example of this condition is afforded by *Idioplanoides* [»*Woodworthia*»] *atlantica*

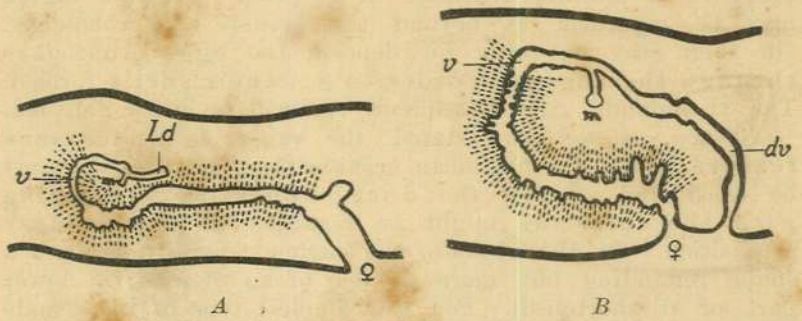


Fig. *A*. The female apparatus of *Notoplana evansi* LAIDLAW. — Fig. *B*. The female apparatus of *Kaburakia excelsa* BOCK 1925. — *dv*, ductus vaginalis; *Ld*, Lang's vesicle; *m*, median uterine duct; *v*, vagina. Shell glands dotted.

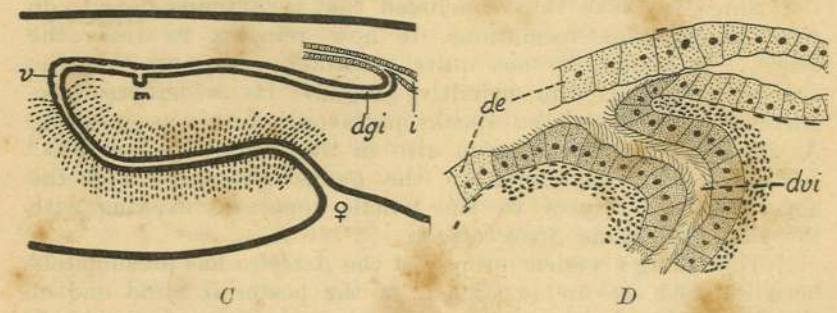
(BOCK 1913, Text-fig. 25). A study of the conditions in the family *Leptoplanidae* furnishes a great number of examples of variations of Lang's vesicle and its duct. The series passes from complete absence of the vesicle through rudiment-looking state (fig. *A*) to really giant growths. Additional examples may as easily be obtained in the family *Planoceridae*.

A second modification of the female apparatus is met with — in *Stylochidae* (f. i. *Cryptophallus* and *Kaburakia*, fig. *B*) as well as in *Leptoplanidae* (f. i. *Copidoplana*, BOCK 1913) — in the presence of a *ductus vaginalis*. This duct has recently been discussed in the first part of my paper: »*Planarians*» (BOCK 1925) and interpreted as a transformed duct of Lang's vesicle.

A third type of a more complicated female apparatus in the family *Stylochidae* occurs in *Discostylochus* through the development of a *ductus genito-intestinalis*. This projects from the vagina in the very same way as the duct of Lang's

vesicle. However, instead of opening into a Lang's vesicle, as one would expect, it joins the intestine. In structure both ducts agree rather well. The muscularis of the duct to Lang's vesicle is always very well developed, but in the ductus g. i. it has in this case reached an extreme thickness. In *Enterogonia* (figs. *C* and *D*), also belonging to the family *Stylochidae* (BOCK 1925, Part IV), the ductus g. i. shows the more normal strength of the muscularis and has a length corresponding to that of the ordinary duct of Lang's vesicle.

Both in *Cryptophallus* and *Discostylochus* there is a *median uterine duct* present and this duct must, of course, be regarded as homologus to the innermost part of the *Stylochus*-vagina, which also is directed downwards.



Enterogonia pigrans HASWELL, var. *novæ-zealandiæ* BOCK 1925. — Fig. *C*. The female apparatus with the ductus genito-intestinalis, *dgi*. — Fig. *D*. The entrance of the duct into the intestine. *de*, intestinal epithelium.

Summarizing, we have consequently in the same family, i. e. *Stylochidae*, four different types of the unpaired female apparatus:

1. The simplest form consisting of a vagina only and nothing more; extremely short in *Stylochus* and *Parastylochus* (f. i., BOCK 1913, Textfig. 23 and 15), prolonged in *Meixneria* (l. c. Textfig. 11).

The other three types agree in having a duct projecting backwards from the vagina:

2. The duct opens into a Lang's vesicle. This is only an insignificant posterior expansion of the duct as in *Idioplana*, a large well defined sack as in *Neostylochus* (BOCK 1923, Fig. 3) or it has a horseshoe-shape with anteriorly directed limbs as in *Idioplanoides* (BOCK 1913, Texfig. 25) and *Limnostylochus* (= »*Shelfordia*», KABURAKI 1918, Plate, Figur 2).

3. The duct opens close by the female gonopore and forms thus a ductus vaginalis, *Cryptophallus* (Bock 1913, Textfig. 13), *Kaburakia* (Bock 1925 IV) and *Bergendalia* (Laidlaw 1903 and Yeri & Kaburaki 1918).

4. The duct joins the intestine as a ductus g. i. in *Discostylochus* (Bock 1925 II) and *Enterogonia* (Bock 1925 IV).

When it is observed that these three ducts leave the vagina at the same place and in the same direction, and agree in structure, it certainly is tempting to assume that they are corresponding formations. When it is shown that they occur in the very same natural family, the truth of the assumption seems beyond all doubt.

Since we have thus concluded that we actually have to do with homologous formations, it now remains to trace the origin. It seems to me quite natural to suppose that the Lang's vesicle is the primitive organ. Its widerspread occurrence in the *Acotylea* speaks in favour of this supposition. A similar formation occurs also in the *Tricladida maricola*.[1] I might here only refer to the genus *Procerodes* and the agreement in respect to the female apparatus existing with the Polyclad genus *Stylochoplana*.

This Lang's vesicle proper of the *Acotylea* has presumately been formed as an expansion of the posterior blind end of the diverticle of the vagina, while the anterior part represents the duct. In *Idioplana* (figure in Meixner 1907) the two parts seem to be hardly differentiated, as is also the case in several Leptoplanids.

In passing it may be mentioned that this posterior diverticle of the vagina, developing into Lang's vesicle, is not the only example of a diverticle-formation from the Acotylean vagina. The bursa copulatrix in the genus *Paraplanocera* develops as an anterior blind sack proximally to the shell duct for the reception of the formidably armed male copulatory organ. In *Apidioplana* Bock 1925 the bursa copulatrix is formed from the posterior wall of the female apparatus and distally from the shellduct.

In a recently published paper (Bock 1925, Part I on *Ceratoplana*) I have shown that connections or fusions are easily established in the Polyclads, and I consequently can see no difficulty in the assumption of a fusion between the posterior blind diverticle, representing the duct + Lang's

[1] I have not here adopted the new names proposed by Steinböck (1925) for the same reasons as those of J. Meixner (1926).

vesicle, and the intestine. With the Lang's vesicle in an undeveloped state, as in *Idioplana*, the ductus g. i. in *Discostylochus* or *Enterogonia*, may be said to correspond most nearly to the duct-part of the diverticle in question. No trace of a part corresponding to Lang's vesicle is found in either of the genera.

A strong support for this suggested derivation of the ductus g. i. of the *Acotylea* is undoubtedly the fact that it offers *a uniform* explanation for all three complications of the female apparatus found substituting each other in the family *Stylochidae*. Further evidence for the fusion-theory may be obtained from the *Tricladida terricola*, where the »Uterus» (i. e. the organ corresponding to Lang's vesicle) coalesces with the intestine on both sides.

The discussion above appears to prove that *ductus vaginalis*, as well as *ductus vagino-intestinalis*, has developed from a blind diverticle of the vagina, representing the very same kind of formation as Lang's vesicle including its duct. A strong support for the theory that all these three formations have developed from a uniform anlage is that they actually occur, as vicariating for each other, in closely related genera. Consequently three different types of female apparatus in the same natural family, *Stylochidae*, are regarded from a uniform standpoint and traced back to a common origin. The fourth type of female apparatus, appearing in the Acotylea, comprises a vagina only. Such a vagina of the simplest form occurring in the Polyclads, is represented in certain other members of this family, in the genus *Stylochus* of world-wide distribution and in *Parastylochus*. This type of vagina may be regarded as having phylogenetically preceded the more complicated organization. We also find in the *Tricladida maricola* (f. i. *Foviella affinis* (Oersted) Bock 1925 a) a similarly simple female apparatus.

The genito-intestinal connection in the *Cotylea* appears as one or two ducts running into the intestine from the oviducts situated on the dorsal side of the body. In *Laidlawia* the single ductus g. i. leaves, as mentioned above, the anterior commissure between the two longitudinal oviducts and it opens a short distance away on the dorsal side of the main gut. In *Enterogonimus*, however, are two ductus genito-intestinales entering the main gut on its lateral sides. That a pair of canals exists, is in accordance with the fact that no transverse anastomosis between the two oviducts is established. Nor do these latter fuse caudally, as in *Laidlawia*, and the peculiar »terminal vesicle» characteristic of that genus, is consequently missing. That *Enterogonimus* presents the more

primitive condition hardly needs any explanation. In general organization *Enterogonimus* is also less specialized than *Laidlawia*. Both genera are undoubtedly closely allied and also show relationship to *Stylochoides* HALLEZ. It is of interest to point out that all three genera are endemic in the Antarctic-Subantarctic area. Through *Leptoteredra*, *Aceros*, and *Stylostomum* we obtain connection with *Eurylepta*, and all these four genera are also represented in the geographical area just mentioned, but it ought to be added that the three latter, being true Euryleptids, have in addition a very wide distribution. As they are of an extremely small body-size, both *Laidlawia* and *Enterogonimus*, as well as *Stylochoides*, have a greatly reduced number of ovaries, which in the first genus reaches the extremely low number of 8—12. The vagina shows a perfect agreement with the general Cotylean type, and is consequently similarly provided with the characteristic shell sac or »ootype» where the formation of the egg-shell takes place.

Laidlawia deviates in one respect from all other Polyclads. It possesses an unpaired vesicle (called »terminale Blase»), which opens by means of a short duct on the dorsal surface of the body. This vesicle is in addition connected with both dorsal oviducts.

ZÁHONY (1907) having re-investigated the type-specimen of *Laidlawia trigonopora* HERZIG 1905 says: »Für die terminale Blase kann ich kein Homologon anführen; über ihre Bedeutung wage ich nichts zu behaupten und weiss nicht woher ihr Inhalt abzuleiten ist, da ihr Epithel nicht drüsigen Charakter hat».

Having had the opportunity of studying three specimens of this interesting Turbellarian, which were collected by the German South Polar Expedition 1901—03, I am able to give the explanation of the function of this »terminal vesicle».

But first I might call the reader's attention to the well known fact, recorded already by LANG — and I myself have many illustrative examples —, that the armed penis of the Pseudocerids and Euryleptids is used for hypodermical impregnation of the sperma (»Einstichbegattung»). *Laidlawia*, closely related to *Euryleptidae* (BOCK 1913), has, however, no such penis-stylet, a very unusual feature in the Cotylea. The loss of the stylet and the development of the terminal vesicle must evidently be related to each other. When »copulation» occurs the Euryleptidean way of inserting the penis on the dorsal side of the body of the other is evidently still in use. But the penis having lost its stylet and thus also its power to penetrate the body tissue is, according to my view, received

into the terminal vesicle. In proof of this, it may be pointed out that I have actually noted the presence of sperma in the vesicle. The content of the vesicle mentioned by ZÁHONY is evidently nothing but the granular secretion ejected in the copulatory act. It still remains in the vesicle while the spermatozoa have actively dispersed into the oviducts and ovaries.

Up to the present time it has merely been assumed that *Laidlawia* and *Enterogonimus* (the two Cotylean genera with ductus g. i.) are transformed Euryleptids, the relationship to this specialized family being quite clear and undiscutable. The organization of the more specialized types, i. e. *Laidlawia* and *Enterogonimus*, must necessarily be explained through the *Euryleptidae* and not vice versa. I have thus no reason to presume that the ductus g. i. of these forms is a primitive feature retained here. Further I regard it as quite impossible to homologize the dorsal ductus g. i. from the oviduct with the ventrally situated ductus vagino-intestinalis. Both are clearly better explained as late acquisitions, independently acquired, than as remnants of old efferent ducts connecting the gonads with the intestine.

It might further be pointed out that *Laidlawia* and *Enterogonimus*, as well as all the other Polyclads, agree in having a pair of ventrally situated uteri. Why should the location of the ductus g. i. in the *Cotylea* lie proximally and the *Acotylea* distally to the uteri (where the eggs are accumulated before deposit) in the case of the ductus g. i. being regarded as the old efferent duct? If the ductus g. i. of the *Cotylea* and that of *Acotylea* are regarded as independently acquired, the matter is not inexplicable. To assume a common origin for them is difficult, in one case *(Cotylea)* a connection between oviducts and intestine on the dorsal side, and in the other *(Acotylea)* a communication between the vagina and intestine on the ventral side of the intestine.

A fusion between intestinal coeca has been repeatedly shown in the Triclads. We are best acquainted with such fusions in the *Maricola*. WILHELMI, who has an extensive knowledge of the group, regards this feature as casual or secondarily acquired. HALLEZ (1894) has pointed out: »Au moins en ce qui concerne le genre *Dendrocoelum* et *Planaria Limuli* [i. e. *Bdelloura candida*], ces anastomoses transverses ne sont certainement pas primitives. Elles representent une disposition secondaire, purement accidentale.» WILHELMI declares (1909, p. 296): »Diese Beobachtungen an Embryonen zeigen, dass bei Seetricladen (mit Ausnahme von *Pr. ulvae* nach HALLEZ) die hinteren Darmäste primär getrennt sind und correspondie-

ren mit der früher (p. 295) gegebenen Darstellung, dass bei erwachsenen Seetricladen Darmcommunicationen secundär und nur gelegentlich (pathogen) auftreten». He gives, moreover, his support to HALLEZ's interpretation of the conditions in *Bdelloura candida*, but opposes other conclusions of HALLEZ, SABUSSOW, and BÖHMIG (l. c. pag. 298).

In Polyclads a fusion of intestinal coeca may also occur in species or genera closely related to forms which lack communications, and consequently I regard this feature as secondarily acquired. We also find in Polyclads secondarily acquired communication of the intestine with the exterior: *Cycloporus papillosus* LANG with numerous marginal pores and *Leptoteredra maculata* HALLEZ[1] with a single dorsal pore of the main intestine.

When we realise this ability of the intestine to establish connections and that the connections apparently are acquired independently here and there, it seems to me totally unnecessary to attach such weight to connections between the genital system and the intestine and to assume that they represent a remnant from ancestors, which has been retained in various Turbellarian groups and Trematods. In my opinion they may easily be regarded as independently acquired.

Also in the genital system we observe correspondences. As a rule the oviducts form a dorsal network. The uteri, commonly with free anterior ends, may in some Acotyleans fuse anteriorly to the pharynx. We have also examples of a commissure between the two large seminal canals posterior to the female pore (*Stylochoplana*, *Notoplana* etc.) while often (*Stylochidæ*, *Discocelides* etc.) it is not developed. The dorsal vesicle of the oviductal system in *Laidlawia trigonopora* opens separately to the exterior with a dorsal pore. This is a quite unique case in the Polyclads and must necessarily be regarded as a specially acquired feature.

All the above-mentioned facts and arguments support my assumption that it is not correct to regard all genito-intestinal connections as a common inheritance for the Plathelminthean groups, derived from ancestors which delivered their eggs to the intestine.

In my opinion it is impossible to believe that the g. i. communications in *Cotylea* and *Acotylea* are homologous formations. The arrangement is not at all similar in the two cases, a fact which I must strongely emphasize: on the one hand we find dorsal connection between oviducts and intestine, on the other a ventral connection between the vagina and the intestine.

[1] It is very likely that *Aceros stylostomoides* GEMMILL & LEIPER is identical with *Leptoteredra maculata* (compare BOCK 1923).

In a recent article (1924 b) STEINBÖCK has recorded his careful studies on the »communicatio genito-intestinalis» of the *Alloeocoela* and *Tricladida*, which I appreciate very much. But it is impossible for me to accept his theory. He regards the »uterus» or receptaculum of the Triclads, the equivalent organ of the Polyclads being Lang's vesicle, as a derivative of the intestine and he names it accordingly a *bursa intestinalis*. He comes to this latter conclusion on quite insufficient grounds. Having observed that in a number of land-triclads the organ establishes connection with the intestine, he has arrived at the assumption that it represents a part of the intestine. I must regard the connection between it and the intestine as merely a fusion between neighbouring organs, a fusion of which we have numerous analogous examples in the Turbellaria. The fact that in many Triclads the vesicle in question (= »uterus») lies so close to the intestine has favoured his supposition, and the histological conditions met with in this group are of such a character as to make it difficult to interpret the facts in a right way. My personal knowledge of Triclads, mainly limited to *Maricola* and *Paludicola*, does not agree with such a view as that maintained by STEINBÖCK. What is true of them in this respect, must also be true of the *Terricola* or as STEINBÖCK himself says: »Es liegt nun auf der Hand, dass dasselbe, was bisher über die Entstehung der Bursa der Landtricladen gesagt wurde, auch für die Bursa der Süsswasser- und Seetricladen gelten muss, da eine Berechtigung dieses Organ bei allen drei Tricladengruppen untereinander so homologisieren nicht gezweifelt werden kann».

Having carefully read pages 492—95 in STEINBÖCK's paper I cannot find recorded any facts that really speak in favour of a derivation of the vesicle in question from the intestine. A location near the intestine does not show that it originates from it. Nor is there any support for his view to be obtained from the investigations on the development of the »uterus» of the freshwater triclads. CURTIS, MATTIESEN and BÖHMIG have adduced forward facts arguing directly against the derivation from the intestine. STEINBÖCK cites KENK's investigations (1923) and seems to believe that they are favourable to his view, but there is no indication that the cells forming the vesicle have anything to do with the intestine. STEINBÖCK has apparently read too much into KENK's remarks.

STEINBÖCK ends his discussion with the following sentence. »Ich selbst habe leider keine Gelegenheit gehabt, Polycladen zu untersuchen, insbesondere solche mit Ductus genito-

intestinalis, es erscheint mir aber nicht ausgeschlossen, dass die Langsche Blase wie die Bursa intestinalis vom Darm ihren Ursprung genommen hat.» The early stages of the genital apparatus in Polyclads observed by me do not give, so far as my observations go, any support to such a view.

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