Da die hier beschriebene Tänie allem Anschein nach eine neue Species darstellt, so schlage ich vor, sie nach ihrem Fundorte *Taenia punica* zu nennen.

Es sind also zurzeit die folgenden im Darme des Hundes (*Canis familiaris*) lebenden Täniiden-Arten bekannt: *Mesocestoides lineatus* Goeze, *Mesocestoides litteratus* Batsch.[3], *Taenia echinococcus* v. Sieb., *T.* (*Dipylidium*) *cucumerina* Bloch, *T. marginata* Batsch., *T. serrata* Goeze, *T. coenurus* Küchenm., *T. serialis* Baillet, *T. krabbei* Moniez, *T. punica* m. Die *Mesocestoides*-Arten und meine *Taenia punica* haben einen unbewaffneten, die übrigen aber einen bewaffneten Scolex.

St. Petersburg, 10. Juni 1908.

3. Note on the early Development of a Cladoceran (Holopedium gibberum).

By W. E. Agar M.A., Zoological Laboratory, Glasgow University.

(With 4 figures.)

eingeg. 15. Juni 1906.

Material and Methods.

The specimens were obtained by Dr. W. H. Lang in Loch Arklet, Scotland. They were put straight into formaline when caught.

Several stains were tried, but only a saturated aquaeous solution of Thionin gave satisfactory results. This stain was almost the only one which gave any differentiation between nucleus and cytoplasm. The chief technical difficulty met with has been the impossibility of orientating the eggs and very young embryos. These are practically spherical and at this stage lie without any arrangement in the brood pouch. It thus happened that the greater proportion of eggs and young embryos were cut so obliquely as to be practically useless. As a rule the whole animal was cut with the embryos in position in the brood pouch. The gelatinous cuticle was first removed.

The following account refers to summer eggs only.

Development.

The youngest stage obtained was a segmenting egg of sixteen blastomeres (Fig. 1). The composition of the egg is as follows. In shape it appears a perfect sphere. The egg is large and heavily yolked. There is a conspicious large spherical fat globule, placed slightly eccentrically in the egg. In later stages, when the polarity of the embryo has been defined by the differentiation of the germ layers etc., this fat globule is always found near the ventral surface. The globule is also a conspicious

[3] Diese Species, die meist mit *M. lineatus* zusammengeworfen wird, halte ich nach meinen eignen Präparaten für sicher verschieden von der vorigen.

object in the ovarian egg. The yolk is in the form of small spheres embedded in the protoplasm of the egg. In sixteen places near the circumference there are large masses of protoplasm free from yolk spheres.

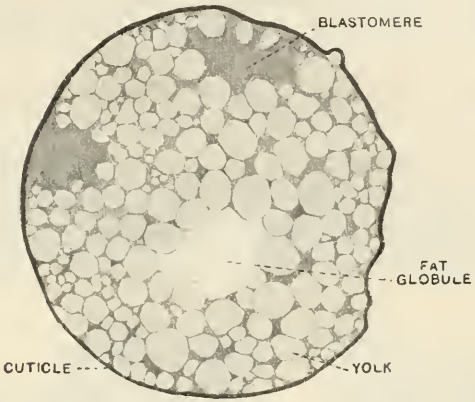

Fig. 1. Section through a segmenting egg of the 16-celled stage. Zeiss D 4 Oc. Cam. lucida.

These are the blastomeres. No Nuclei were made out in them, but these are very difficult to see in most of my preparations. The protoplasm of the blastomeres is continuous with the general network between the yolk spheres — in fact they form merely aggregations of it. The great

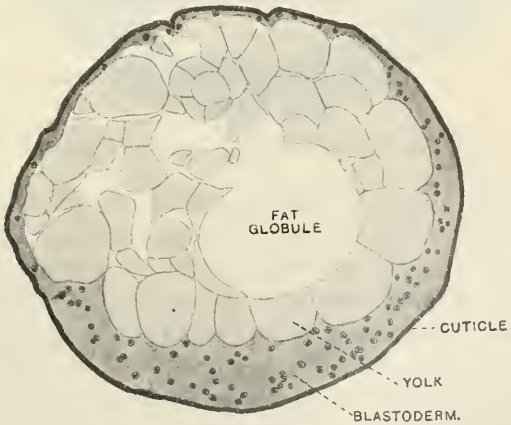

Fig. 2. After formation of the blastoderm. Zeiss D 4 Oc. Cam. lucida.

quantity of yolk present has prevented nuclear division being followed by cellular division. Two blastomeres are cut in the section figured. A reconstruction of this egg showed that the blastomeres are approximately equally distributed all over the egg. They have nearly but not

yet completely risen to the surface (Samassa says that so far as observations went at the time he wrote (1893) in all Cladoceran eggs the blastomeres rise to the surface in the 8 celled stage).

The figure also shows the fat globule, the edge only of which is cut. In sections which have been treated with xylol it appears of course as a space.

The presence of a thick cuticle at this very early stage is a noteworthy point.

In the next stage obtained a complete blastoderm has been formed all over the surface of the egg (Fig. 2). The yolk instead of being in the form of small spheres embedded in protoplasm, is in larger blocks, spherical, or polygonal from mutual pressure. No protoplasm can be

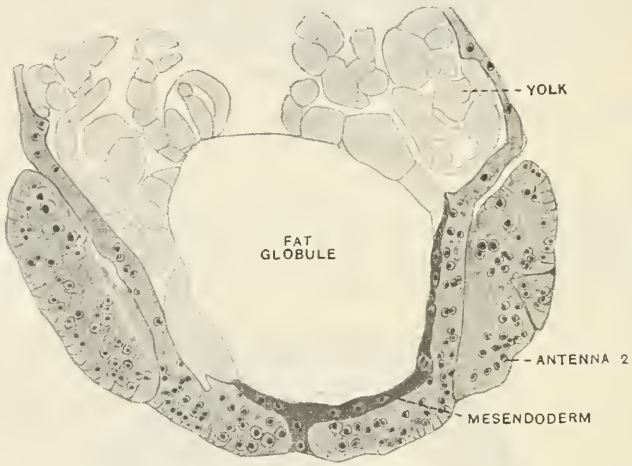

Fig. 3. Section transverse to the antero-posterior axis of the embryo.

seen between the yolk blocks, but it appears to be all aggregated in the blastoderm. The protoplasm of the blastoderm however (in which cell outlines cannot be made out) contains a certain number of small yolk granules. None of these occur in the section figured. The section shows that there is only one row of nuclei on the future dorsal surface of the blastoderm, but on the ventral side the nuclei are in many layers. The fat globule and cuticle are as in the previous stage.

In the next stage figured (Fig. 3) the mesendoderm is beginning to develop. As before, the dorsal and lateral walls of the embryo are thin, with the nuclei in one layer, while ventrally the wall is very much thicker. On the antero-dorsal surface of the embryo we find external to the thin dorsal wall a layer of tall columnar cells appearing. This is the very early appearing rudiment of the carapace.

The ventral thickening of the blastoderm is now divided longitudinally into symmetrical halves by the developing mesendoderm. This is seen as a longitudinal median differentiation of the ventral blastoderm, and also stretches up between the yolk and the blastoderm in the manner show in the figure. The portion of the mesendoderm in the mid-ventral line, embedded in thick and compact blastoderm, is of a very loose texture in many places, doubtless indicating that migration inwards of cells to form the lateral wings of mesoderm (as shown in the figure) has been taking place.

The section shows the very early appearing second antenna rudiments at the side. The fat globule is now more closely approximated to the ventral surface. It is to be noticed that the cuticle is no longer

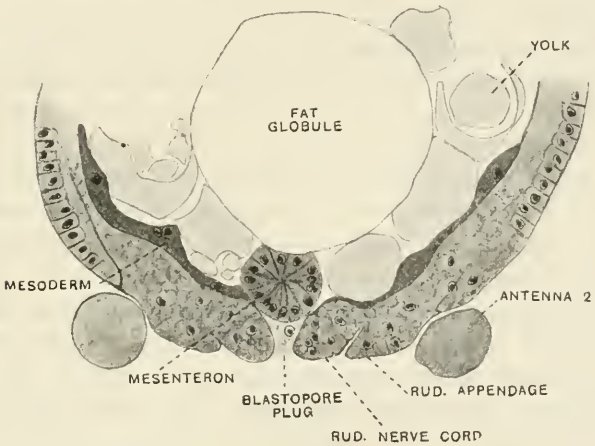

Fig. 4. Similar section to Fig. 3 at a later stage.

present, having been cast in the interval between this stage and the last one figured.

In a somewhat later stage the process of inward migration of the mesendoderm is complete, and we find it now entirely internal to the blastoderm. The region from which the immigration took place is still very conspicuous however and divides the blastoderm into right and left halves by a mid-ventral line of extremely loose tissue. This line in transverse section presents a most striking contrast to the compact many-layered ectoderm bounding it on each side, and to the equally compact mesendoderm lying across it dorsally and presents the appearance of a slit through the whole thickness of the blastoderm, in which is lying a little loose tissue. (Compare Fig. 4 of a slightly later stage.)

The mesendoderm is in the form of a thin layer lining the ventral

half of the embryo, between the ectoderm and the yolk and with the nuclei arranged over the greater part of it roughly in two layers.

In a still later stage the second antennae and rostrum are conspicious. The mandibles are also present. The first antennae, which are very small in the adult, cannot be identified yet. The other appendages are not yet free, so this may be called the nauplius stag. The endoderm is beginning to separate from the mesoderm and forms a well defined median ventral strand whose cells are arranged round a potential, — in places even an actual, — lumen.

The line of very loose tissue marking the region of immigration of the mesendoderm, and which underlies the whole endoderm (mesenteron) is very conspicious. The ventral blastodermic thickenings on each side of this line have increased in depth. From the inner boundaries of these thickenings will develop the two ventral nerve cords, while the outer parts of the thickenings ultimately give rise to the body appendages. We now therefore have a deep ventral slit underlying the endoderm and filled by very loose tissue, indicating the line of past immigration of the mesendoderm.

This slit is open to the exterior ventrally, bounded on each side by that part of the blastoderm which will give rise to the central nervous system and covered in dorsally by the rudiment of the mesenteron (cf. figure of next stage).

In the next stage figured (fig. 4) the endoderm is more clearly differentiated and marked off from the lateral sheets of mesoderm. In front it passes into the stomodaeum and behind into the proctodaeum. The stomodaeum has not yet got a lumen, but the proctodaeum is perforated. The lumen of the mesenteron is still mainly potential only.

In most places the endoderm is still lying directly on the ectoderm, but in places the mesoderm is beginning to get down between them. Underneath the mesenteron we still find the slit filled with very loose tissue. The edges of this slit, which will form the nerve cords, are now differentiated off from the outer masses from which the appendages are beginning to develop.

Stomodaeum and Proctodaeum.

The slit in the ventral blastoderm caused by immigration of the mesendoderm into the blastocoele runs forward right up to the ventral projection of the thickened ventral wall of the head which will form the rostrum. As the mouth opens just behind the rostrum, it is clear that it opens into the front end of this slit.

The stomodaeum at first appears as a differentiation in the solid mass of ectoderm forming the ventral wall of the head but whether this

differentiation takes place in the tissue in situ or is formed by a solid ingrowth is question which would be very difficult to answer in an embryo in which cell boundaries are as little marked they are here. The appearances however all favour a differentiation in situ.

In the embryo figured in Fig. 4 the proctodaeum is already formed and has a lumen opening on the posterior wall of the elongating embryo. The ventral slit can be traced round the posterior end of the embryo up to the proctodaeal opening.

Both mouth and anus therefore open into the extreme ends of this slit.

Interpretation of this mode of formation of the mesendoderm.

The mode of formation of the mesendoderm in *Holopedium* by immigration of cells from the mid-ventral line of the blastoderm is similar to that described by Samassa for several Cladoceran species, but with some noteworthy differences in detail. Samassa finds that in the species examined by him the mesendoderm arises by a process of immigration of cells along the mid-ventral line. His figures of this stage show a striking similarity to my figure 3, with the important difference that in *Holopedium* the ventral part of the blastoderm has already become many layered, while in Samassa's species it is still one layered. According to Samassa's figures, after the mesendoderm has migrated into the interior of the embryo, the ectoderm is left intact. As already described in *Holopedium* the immigration of the strand of mesendoderm tissue into the interior of the embryo leaves its place occupied by a conspicious slit filled by a tissue much less dense than the ectoderm on each side of it.

This slit is to be regarded as a blastopore of the primitive elongated type. It stretches underneath the whole length of the mesenteron and embraces the openings both of the mouth and anus. From the edges of the slit arise the nerve cords. These of course meet in front of the slit in the cerebral ganglion. I have not found a post-anal commissure at any stage (Samassa however found it in the adult of *Sida crystallina*).

Thus except for the absence of a post-anal commissure we should have in *Holopedium* a condition similar to that found in *Peripatus*. The method of closure of the blastopore is such a modification of the primitive method as we might have expected where the presence of a large mass of yolk filling the entire blastocoele causes invagination to become immigration. The closure does not take place by folding over the edges, but the immigration of tissue to form the mesendoderm is not quite complete, a plug of loose tissue being left behind in the blastopore after immigration is ended. This tissue, which remains for a long time in a

diffuse condition eventually becomes that part of the ectoderm lying in the mid-ventral line.

The late appearance of the mesendoderm in *Holopedium* is remarkable. At the stage when it is being differentiated (Fig. 3) the rudiments of the second antennae are already well advanced, and the rudiment of the carapace has appeared.

Fate of the Yolk.

Fairly late stages show occasional very flat nuclei lying on the separate yolk masses, as figured by Samassa. Doubtless each yolk mass is contained in a single yolk cell. The origin of these yolk cells has not been observed, but it may safely be assumed that they arise in the same way as that described by Samassa — i. e. by budding off from the mesendoderm. None of the nutritive material of the egg ever comes to lie in the alimentary canal.

Larval Cuticles.

The extremely early appearance of the first cuticle is very remarkable. My reasons for considering it a cuticle rather than a vitelline membrane or an egg shell secreted by the oviduct and for considering the casting of it an ecdysis rather than hatching are as follows: —

The diameter of the oviducts is very much less than that of the laid egg, and consequently the ripe eggs lying in them are compressed into an elongated cylindrical shape. Up to and including the moment of laying the egg must remain very soft and pliable, in order to allow it being passed through the narrow opening of the oviduct. The spherical shape is not assumed till after the egg is laid, so that at any rate, the egg if provided with a membrane at all, must have only a very thin and flexible one. As a matter of fact I have not been able to discover a membrane round the oldest eggs I have seen in the ovaries. These were however not quite ready to be laid as shown by the fact the three "nurse cells" which accompany each egg cell are still present though reduced in size.

The cuticle seen in the 16-cell stage is tough and of a considerable thickness, and is a conspicious object in sections. So whether the egg in the oviduct has a very thin membrane or not, it is certain that the bulk of the cuticle seen in the 16-cell stage, and certainly all the chitinoid stiffening has been secreted after laying. The secretion and ecdysis of the chitinoid cuticles of Arthropods has long been recognised as a means of nitrogenous excretion, and many cases are known of embryonic ecdyses. The cuticle of the segmenting egg of *Holopedium* may therefore be regarded as a true Arthropod cuticle, and the casting of it at

the time when the mesendoderm is beginning to develop as a very precocious ecdysis.

It is probable however that there is no sharp distinction between the secretion of a vitelline membrane and of an embryonic cuticle.

The first cuticle is like the ordinary Arthropod cuticle, firm and compact. After it is shed, it forms a conspicious object in the brood-pouch. Soon after this first ecdysis a second cuticle is formed. This is of the same peculiar nature as that of the adult *Holopedium* that is very thick, transparent and gelatinous.

Second Antennae.

One of the chief characters of the family Holopedidae (which contains the single genus *Holopedium*) is that the second antennae of the female are uniramous. In very young embryos, while the Antennae are still fused with the lateral ectoderm throughout their whole length, they are biramous.

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4. Ein monozoischer Cestode als Blutparasit (Sanguinicola armata u. inermis Plehn).

Von Dr. Marianne Plehn.

Aus der Kgl. bayr. biolog. Versuchsstation für Fischerei in München.

(Mit 6 Figuren.)

eingeg. 18. Juni 1908.

Im August 1905 habe ich im »Zoologischen Anzeiger« Beobachtungen über einen Blutschmarotzer bei Cypriniden mitgeteilt, von dem damals nur wenige Exemplare vorlagen. Ich stellte das Tier, hauptsächlich weil ich ein den ganzen Körper bedeckendes Wimperkleid zu sehen meinte, zu den Turbellarien, obwohl es in so wesentlichen Punkten von diesen abwich, daß es in keiner der bisher beschriebenen Familien untergebracht werden konnte. Es wurde eine neue Familie dafür errichtet, die ich Rhynchostomida nannte. Der Name wurde gewählt, weil ich einen auf der Rüsselspitze mündenden drüsigen Apparat als Darm betrachtete.