

THE FEMALE ORGANS OF *NERITINA FLUVIATILIS*.

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AMONGST the multifarious dispositions of the genital ducts met with in Gastropoda, one of the most interesting is that in which the copulatory organ is separated from the duct of the gonad. In *Clio*, for instance, the penis is situated at some distance from the genital opening, an epidermal groove forming the only connection between the two. In *Doris*, the copulatory vesicle is connected internally with the female part of the hermaphroditic system, but has a separate opening on the surface of the body.¹

So far as I am aware, however, no case of a separation between the copulatory and reproductive organs has yet been described in the female system of a dioecious type. I have thought it worth while, therefore, to call attention to the fact that such a disposition is realized in *Neritina fluviatilis*, especially as Claparède's classical monograph² on the anatomy and development of the genus contains an entirely erroneous description of the organs in question.

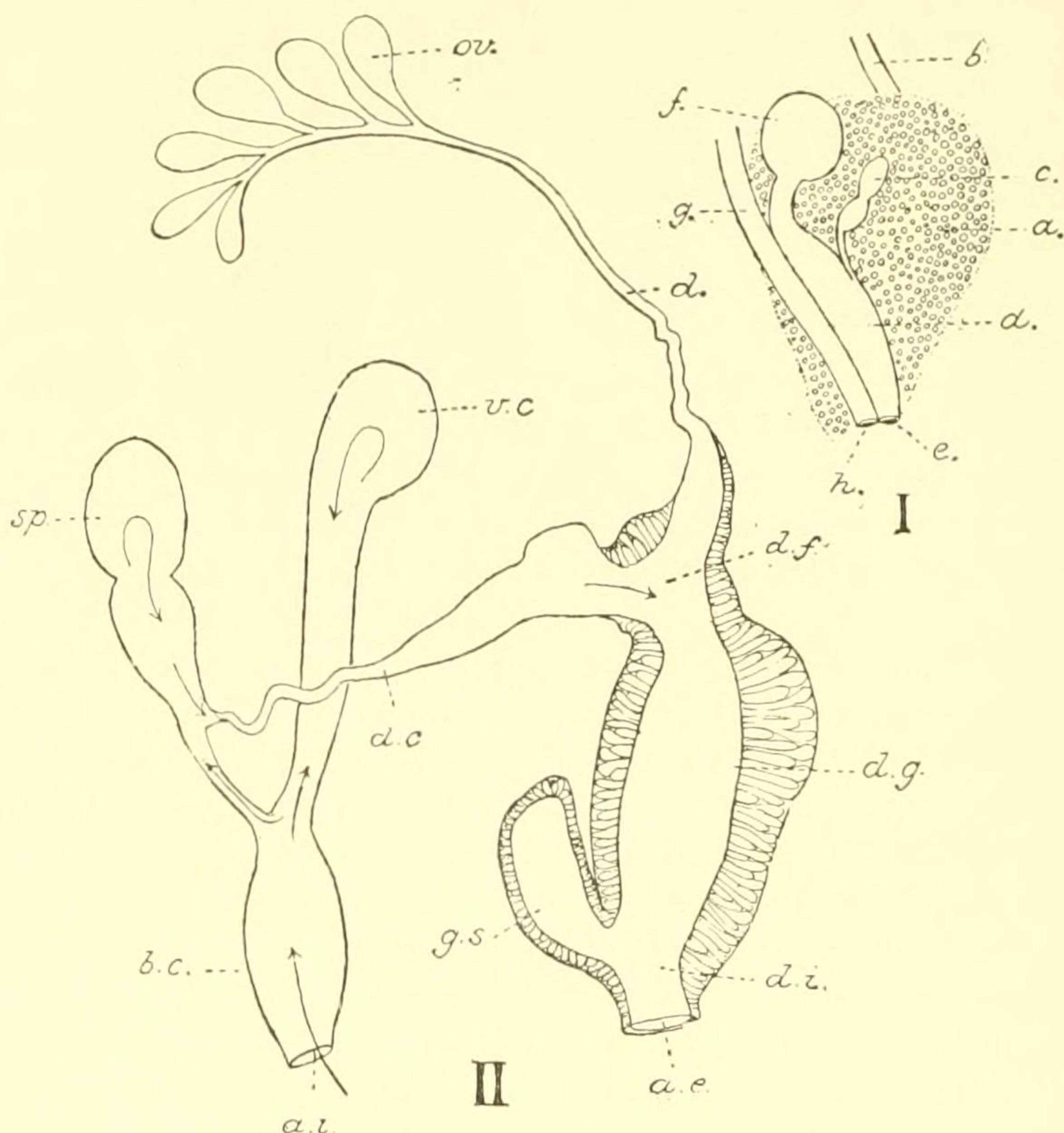
According to Claparède's description, the female system is very simple, and presents no special interest. It consists (Fig. I, which is a reproduction of one of Claparède's drawings) of an oviduct (*b*) provided with an enormous glandular dilatation (*a*), followed by a muscular "uterus" (*f*) with two appendicular vesicles or receptacula (*c*). The system was thus supposed to have only one aperture of communication with the exterior, serving both for copulation and oviposition. Claparède believed the eggs to pass down through the oviduct into the glandular dilatation, and that from this they passed through a narrow portion of the general duct into the "uterus," to be deposited after being surrounded with albumen and shell.

The structure of the female ducts is, in fact, as follows:—The gonad (Fig. II, *ov.*) gives origin to a narrow tortuous oviduct (*d*). This soon divides into two branches, which open separately on to the exterior. These two branches are very different in structure and function. One of them we must regard as the main part, the normal base of the oviduct; and it terminates in what we may call the *incubatory chamber* (*d.i.*). The other (*d.c.*) is an accessory duct, and ends in what may be termed the *copulatory chamber* or bursa (*b.c.*). The incubatory chamber is continuous with an enormous dilatation of the oviduct, the thick wall of which contains very remarkable glandular cells, which secrete an albuminous product. This portion (*d.g.*) may be termed the glandular segment

¹ See P. Pelseneer, "Introduction à l'étude des Mollusques." Bruxelles, 1894.

² Claparède, "Anatomie und Entwicklungsgeschichte der *Neritina fluviatilis*": Müller's Archiv. 1857.

or "uterus." At its lower end it bears a flattened vesicle (*g.s.*), glandular also, which may very likely secrete the hard egg-shell. The very short portion beyond this vesicle (incubatory chamber, *d.i.*) is not glandular, and opens freely into the pallial cavity.



EXPLANATION OF FIGURES.

FIG. I.—Copy of Claparède's fig. 30.

a. Weibliche Nebendruse. *b.* Eileiter. *c.* Samentasche. *d.* Scheide. *e.* Scheidenöffnung. *f.* Kugelige Ausschlung der Gebärmutter. *g.* Darm. *h.* After.

The author states that there is a communication between Samentasche (*c*) and Nebendruse (*a*); this latter, according to his view, has no opening on the outer surface.

FIG. II.—The reproductive apparatus of the female of *Neritina fluviatilis*. (Much enlarged. The course taken by the spermatozoa prior to fertilization is indicated by arrows.)

a.e. External oviducal aperture. *a.i.* Intromittent aperture. *b.c.* Bursa copulatrix. *d.* Oviduct. *d.c.* Connecting duct. *d.f.* Fertilization or impregnation chamber. *d.g.* Glandular segment of oviduct. *d.i.* Incubatory segment of oviduct. *g.s.* Supposed shell gland. *sp.* Spermatheca. *v.c.* Copulatory vesicle.

The copulatory branch presents a totally different aspect. Its lowest part (*b.c.*), which may be called the "vagina" or bursa copulatrix, opens a short distance from the incubatory aperture (*a.e.*), close to the anus, and bears at its upper end two diverticula. The larger of these (*v.c.*) I propose to term the *copulatory vesicle*. The smaller (*sp.*), which

is flask-shaped and divided into two parts by an annular constriction, is the *spermatheca*. The fundus of the *spermatheca* is related to a narrow canal (*d.c.*), which is really the upper part of the copulatory branch of the oviduct. This canal increases in calibre as it approaches the main oviduct, and opens into the glandular portion of that structure. It may accordingly receive the name of *connecting duct*. An irregular cavity (*d.f.*) is formed at the meeting-point of this connecting duct with the main oviduct, which I propose to term the *fertilization* or *impregnation chamber*.

The terminology which I have employed is justified by a knowledge of the process of fertilization, which takes place as follows:—The spermatheca is deposited by the male in the bottom of the “vagina” (*b.c.*), and enters the copulatory vesicle (*v.c.*). This latter is then found to contain numberless spermatozoa, no particular arrangement being noticeable in their disposition. A short time after copulation, the vesicle contracts, and the spermatozoa are pressed out and sent down towards the vagina. They do not stay long in this, however, but travel up into the flask-like spermatheca (*sp.*). Within that they assume a radiate disposition, becoming arranged with extraordinary regularity in a layer coating the inner wall of the vesicle, all heads being turned towards the axis, the tails being directed outwards. Towards the time of impregnation the spermatheca contracts also, and the spermatozoa are sent out, not down to the vagina again, but up into the connecting duct (*d.c.*), in which they are to be found in disorder. They thus reach the impregnation chamber (*d.f.*), which the eggs, coming down through the oviduct, enter sooner or later. Impregnation takes place, and the eggs are passed down into the glandular portion of the incubatory branch (*d.g.*). They receive there, first an albuminous coating, then the substance which makes up the shell, and are finally extruded.

It follows from this that the part Claparède designated the “uterus” (“Gebärmutter,” Fig. I, *f*) cannot be so termed, since it never receives any egg. If the word “uterus” is to be used at all, it must be applied to the glandular part of the oviduct (Fig. II, *d.g.*). The organ which the Swiss naturalist considered as an accessory gland appended to the oviduct (Fig. I, *a*) is, in fact, the lower section of the main genital duct, the opening of which he had failed to discover. The really accessory part of the system is that which he considered as the main one, *i.e.* the copulatory chamber, with a special opening which Claparède believed to be the only genital aperture. The connecting duct he regarded as a narrow portion of the only genital duct he believed to exist, whilst it is, in fact, only a communication between the main (incubatory) and the accessory (copulatory) branches of the forked oviducal system. These facts must needs be taken into account by those who would undertake a comparative study of the genital organs in Gastropoda; and further details, together with a histological description, will be forthcoming in a monograph of *Neritina fluviatilis* which my assistant, Dr. Lenssen, has in course of preparation.