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Mag. phil. HOLGER KLINGSTEDT: **Heterogametic Females in two Species of Trichoptera.**

For some years I have been studying the process of gametogenesis in the *Trichoptera*. Unforeseen circumstances have delayed the work and the date of its publication cannot yet be given with certainty. As, however, the fact stated in the title is of very great

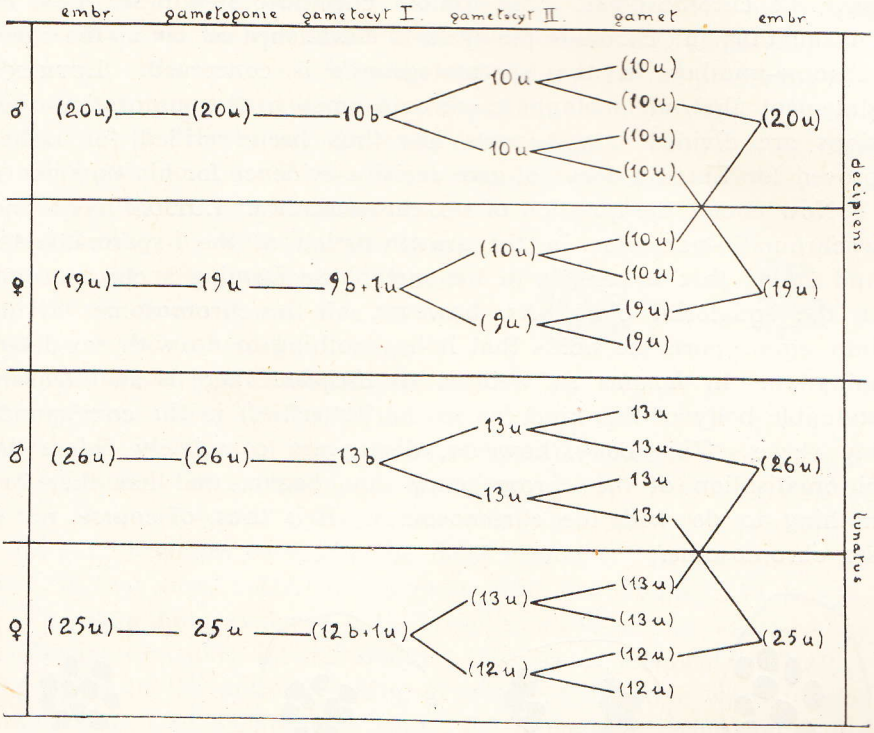

Fig. 1. The chromosome-cycles in *Limnophilus decipiens* Kol. and *L. lunatus* Curt.

interest for general biology, I will here present my evidence as briefly as possible.

The only work known to me that treats of the chromosome-mechanism in the Trichoptera, is LUTMAN's investigation of the spermatogenesis in *Platyphylax designatus*. MARSHALL in his work on the ovogenesis in the same species touches hardly at all upon the chromosome-mechanism.

The two species that I have had the opportunity of studying more closely are *Limnophilus decipiens* Kol. and *L. lunatus* Curt. The diagram (Fig. 1) shows the chromosome cycles. The figures indi-

cating the numbers of chromosomes within parentheses are computative. The abbreviations mean: u = univalent, b = bivalent.

First the haploid number 13 was reached for males of *lunatus*. That all these chromosomes are bivalent was ascertained by counting the anaphase plates in both the first and the second maturation-divisions, which, like the metaphase of the second maturation-division, always have 13 chromosomes. The diploid chromosome-number must be 26 and thus the chromosome-cycle is established as far as the chromosome-number in the spermatogenesis is concerned. LUTMAN's statement that all metaphase chromosomes in the maturation-divisions are divided into 4 parts has thus been verified (or rather proved for Lutman does not give decisive evidence for his statement).

Now comes the question of sex-chromosomes. LUTMAN has found a chromatin-nucleolus in the growth-period of the I-spermatocytes and holds that it persists in the metaphase forming a chromosome in the equatorial plate. As, however, all the chromosomes divide into equal parts he holds that it has nothing to do with sex-determination. In *lunatus* as well as in *decipiens* there is an intensely stainable body of this kind (as in the butterflies) in the corresponding stages. This body, however, disappears completely before the chromatisation of the chromosomes has begun, and has therefore nothing to do with the chromosomes. It is thus, of course, not a sex chromosome.

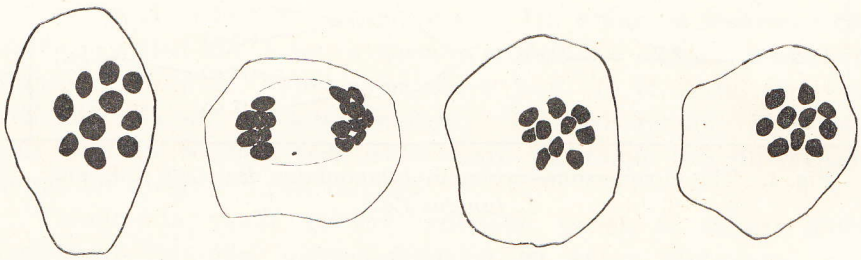

Fig. 2—5.

Fig. 2—5 show I-spermatocytes of *decipiens*. The haploid chromosome-number is 10, as is shown in Fig. 2, which represents a metaphase. In the anaphase there is no lagging chromosome (Fig. 3; the small spot is quite accidental and no chromosome). Fig. 4—5 show the two daughter-plates of the anaphase in the same cell, Fig. 4 seen from the pole, Fig. 5 from the inside of the cell. The 10 chromosomes correspond to each other pairwise completely. Of this species I have not counted the anaphase plates of the II-sper-

matocytes, but there would seem to be no doubt that here also they all divide into two parts. The diploid number can thus be assumed to be 20.

In the spermatogenesis we have thus at least no monosome, i. e. no XO-pair. Neither LUTMANN or I have seen anything indicating the occurence of an XY-pair (the chromatin-nucleolus does not indicate it). As, however, this may be very hard to ascertain if X and Y show very little difference, it is only a study of the ovogenesis that can decide the question. Considering the close relationship between the orders of the *Lepidoptera* and *Trichoptera*, the possibility of a ZZ-pair (MORGAN) instead of an XY-pair in the males did not seem excluded. If this is so, the ovogenesis ought to exhibit a ZO-pair or a ZW-pair (complications such as compound-chromosomes excluded).

The question was answered without difficulty by counting the chromosomes in young ovaries. Without a trace of doubt I was able, in numerous cases, to count in *lunatus* 25, and in *decipiens* 19 chromosomes in the ovogonia (Fig. 6—7). With the knowledge we have of the process of spermatogenesis we seem perfectly justified in excluding the possibility an XY-pair consisting of nearly or quite similar parts in the male; thus the other possibility, a ZZ-pair, becomes decidedly the most probable. In the female we have, in that case, a ZO-pair, to judge from the numbers 19 and 25.

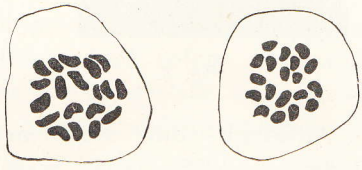

Fig. 6—7.

To attain final evidence it is, however, necessary to examine the maturation-divisions in the ovum. The great technical difficulties (egg-laying in the autumn during extremely favourable weather conditions only (see KLINGSTEDT 1926), the mucous covering round the egg, the membrane almost impenetrable to fixing fluids and paraffin, the smallness of the eggs (0,4 mm), the rapidity with which the maturation-divisions takes place (ab. 4 hours after the laying of the eggs), etc. have considerably delayed the work. So far I have only two really useful preparations. Fig. 8 shows the metaphase of the I-ovocyte. The chromosomes are oblong and their number is 10. One of them, however, is considerably shorter than the others; it is therefore probably Z (univalent). Fig. 9 is to be taken very cautiously.[1] It represents a I-ovocyte anaphase in a late stage and exhibits a black body which suggests the earlier known X and

[1] When reading the proofsheets I have obtained a good preparation containing a polarview of an anaphase of the I-ovocyte, on which appears clearly 9 chromosomes in the one and 9+lagging Z in the other daughterplate.

Z that are lagging. There being, however, quite near and above the chromosome-clump to the left, two equally black-coloured food-granules, it might be a third one.

Fig. 8.

Fig. 9.

Although some stages are so far lacking I hold that the present evidence justifies very well the interpretation I give. *It may thus be regarded as proved that Trichoptera belong to the unusual organisms that have heterogametic females instead of males.* The similarity especially to the butterflies examined by SEILER, the *Fumea* and the *Talaeporia*, is striking.

Literature

KLINGSTEDT, HOLGER, 1926: Beobachtungen über die Biologie, insbesondere das Eierlegen von Limnophilus decipiens Kol. (Trich.) — Notulae Entomologicae VI, p. 118—120.

LUTMAN, B. F., 1910: The Spermatogenesis of the Caddis-fly (Platyphylax designatus Walker). — Biological Bulletin XIX.

MARSHALL, WM. S., 1907: The early History of the cellular elements of the Ovary of a Phryganid, Platyphylax designatus Walk. — Zeitschr. f. wiss. Zoologie LXXXVI, p. 214—237.

Dr. ERNST HÄYRÉN: **Grasbälle im Brackwasser bei Nystad, Regio aboënsis.**

Durch Vermittlung des Herrn Stud. P. SUOMALAINEN sind zwei Grasbälle eingesandt worden, die vom Schüler K. MALMIO im Sommer 1927 am Ufer der Stadt Nystad, Regio aboënsis, nebst anderen ebensolchen gefunden worden waren. Die Bälle sind abgeplattet ellipsoidisch. Der grössere, sehr dichte Ball ist 6,5 cm lang, 6 cm breit und 4,5 cm hoch. Der kleinere Ball ist weniger dicht und weicher, seine Masse sind $5{,}5 \times 5{,}0 \times 3{,}5$ cm. Die Bälle bestehen aus dicht verflochtenen Blättern und Stammstücken von Gräsern und Cy-