**118. Preliminary Note on a Case of Facultative
Parthenogenesis in *Loxoblemmus frontalis*,
Shir. (Gryllidae)**

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The occurrence of parthenogenesis in Phasmidae needs no comment. The only precisely studied instance in Saltatoria, so far as I am aware, is a case of parthenogenesis in the grouse locust, *Apotettix*, reported by Nabours (1919). He was trying to make crosses between two species of *Paratettix* and *Apotettix*, and found that when *Paratettix* was used as mothers there came no progeny, while in the reverse cross, offspring were reared, which are almost exclusively females and of the same pattern as the mothers. Afterwards, he found also that some female *Apotettix*, unexposed to any male, produced offspring. Nabours reared later 4470 females and 7 males in total from many females, some of which are put together with male *Paratettix* and the other main part are left to themselves. In a certain strain, even fifth parthenogenetical generation has been procured. Hersch seems to have tried to study the chromosomes of these parthenogenetically reared females (unpublished work). He finds in one instance nine whole chromosomes and some fragments in the somatic mitosis, whereas it is ascertained that the female diploid chromosomes are fourteen in number. It may be surmised that here we are concerned with a case of diploid parthenogenesis, the diploid set of chromosomes being restored in some way.

I came across one case of parthenogenesis in Gryllidae. *Loxoblemmus frontalis* and *L. arietulus* are two closely allied species regarding the chromosomal composition as well as the external characters. In 1927, each three reciprocal pairings by artificial copulation were tried between them, and the females laid many eggs; but no larva came out. In the following year, I tried fifteen reciprocal crosses, and the females likewise laid many eggs. This year I put some of them in an incubator, whereupon young larvae were obtained. But this success is restricted to the case alone, in which the female *frontalis* are crossed with the male *arietulus*.

I put six batches into a thermostat. Two of them gave no larvae. The remaining four produced respectively seventeen, four, seven, and four larvae. All of them showed the larval characters of the maternal species *frontalis* and were females.

The larvae of the first instar of *frontalis* and *arietulus* may be distinguished at a glance, the former having the following characteristics: the head is colored pale yellow, the meso- and meta-thorax is dull white, and the antennae are also beautifully white except three jet black segments, which are situated about five segments below the tip.

Of the first seventeen larvae, five died young, three were killed for cytological study, and the remaining nine grew until they were capable of being identified as females, by four rudimentary stylets (Gonapophysen of German authors) of the ovipositor, but for some reason or other they died before reaching adults. Two of the next four larvae died soon after hatching, but one of them survived to an adult female. The remaining eleven did not attain adult stage, but some of them developed so far as to be ascertained as females by the rudimentary ovipositors.

The three larvae were fixed with Bouin's fluid, the head and anal parts being cut off, and were cut *en bloc*. Nothing unusual was met with in the development of the egg-cells. I was fortunate to find three polar views of fairly good oogonial metaphase plate composed of twelve chromosomes, the female diploid number of *frontalis* (which is XO-XX type), contrary to fourteen of *arietulus* (Ohmachi 1927). From the above fact it is beyond doubt that the present case is a facultative parthenogenesis with diploid chromosomes.

Goldschmidt (1927) has already ingeniously formulated cytological analysis of every possible case of parthenogenesis and its relation to sex. In the case of male heterozygosis, there are three modes of retaining the normal chromosome number; namely, by failure of reduction, by restoration after reduction, either through conjugation of egg- and polar-nucleus, or rudimentary division before cleavage. Of these three cases, all the offspring ought to be females, with the exception of males produced either by the extrusion of one X-chromosome in the equational division (in the first case), or by non-disjunction, if no X or YY egg is viable (in the last case).

In the present case the data at hand are too scanty to say anything decisive as to the mode of origin of parthenogenesis, yet from the fact that maturation of the egg occurs only after the entrance of

the spermatozoon as studied in Orthoptera (McNabb 1928), it might be safely surmised that in the cross of *Loxoblemmus frontalis* ♀ and *L. arietulus* ♂, parthenogenesis occurs without reduction division in the egg.

Moreover, in Nabours' case in another Saltatoria, a very few exceptional males are reported to occur. If these males are produced by non-disjunction in the case of rudimentary division after reduction, it must be assumed that no X eggs are viable, which is highly incredible. It is far more probable that these males were produced by parthenogenetic eggs, without effecting reduction, where extrusion of one X-chromosome in the equational division has occurred. With these considerations, it may be the surest supposition that we are concerned with diploid parthenogenesis originated without reduction division in both of these saltatorial species, *Apotettix* and *Loxoblemmus frontalis*.