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A PARTHENOGENETIC MAYFLY (*AMELETUS LUDENS*  
NEEDHAM).

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The female subimago and nymph of *Ameletus ludens* was described by Needham (1905) from material taken at Newport, N.Y. The nymph of this mayfly is a small brook-inhabiting form which occurs very abundantly in the many small brooks in the vicinity of Ithaca, N.Y. At the season of emergence the female subimagoes and imagoes are not uncommon along the banks of these brooks. A suggestion that reproduction in *Ameletus ludens* might be a case of parthenogenesis was made by Morgan (1911) who recorded unsuccessful efforts to find the male of the species in spite of extended and diligent search. In order to test out this suggestion the writer had this species under more or less constant observation from June 14, 1913, to July 30, 1915.

From June 14 to June 30, 1913, only a few mature nymphs were found in the brooks and no adults were observed. Apparently the period of emergence was practically over since in early July no nymphs could be located. By the middle of August the brooks had ceased to flow, there being only an occasional stagnant pool or some slight dampness and stretches where no trace of moisture was evident.

On April 18, 1914, almost mature nymphs were abundant and on April 27 a male subimago was discovered resting on the surface of the water having just emerged. A short distance away a female subimago was also located. These were both taken to the laboratory and placed in wire cages but unfortunately the male failed to transform. No other male has been found although much time has been spent along the streams in search, hundreds of nymphs have been examined and many subimagoes reared. Females were fairly abundant during this year up to the middle of June and mature nymphs could be found up to about June 30 as in the preceding year. Again the streams were practically dry during mid-summer.

On May 6, and again on May 8, 1914, eggs were dissected from reared females, placed in water in petrie dishes and kept in the laboratory. The water in the dishes was changed usually every other day. Fertilization could not have occurred by any chance since all the nymphs were examined before being placed in the rearing cages. (The sexes can be distinguished in mature mayfly nymphs by the size of the eyes and by the rudimentary genitalia). All the subimagos which emerged were females and these were transferred to wire cages. The adults used in this experiment were dissected about 24 hours after the subimaginal moult. On October 5 a newly hatched nymph was found in one of the petrie dishes and examination of the eggs showed moving embryos. Hatching continued for over a week. The period of incubation was thus almost exactly 5 months. No record of the temperature changes in the laboratory was kept during this time except that on September 1 and 2 the air temperature was 28.3 C. and again on September 11 it was 15.5 C.

Fertilized eggs of other species of mayflies were kept during this summer at the fish hatchery in Cascadilla gorge where the air temperature was considerably lower and these hatched as follows: *Hexagenia bilineata* 29-40 days; *Hexagenia recurvata* 14 days; *Ephemera varia* 15 days; *Heptagenia tripunctata* 11-23 days; *Ecdyurus maculipennis* 12 days.

The long period of incubation in the case of *Ameletus ludens* may be a characteristic which has made possible the existence of this species in brooks which are subject to mid-summer droughts. The presence of a thickened roughened coat on the egg would appear to support this belief. The egg is figured by Morgan (1913).

The seasonal history for 1915 was much the same as in the two previous years. Nymphs 4 to 7 mm. were abundant in January. Mature nymphs were present in large numbers toward the end of April. On April 27 many emergings took place and one female was observed ovipositing at 8.30 a.m. By June 7 only a few nymphs remained in the brooks and no adults were observed.

These results show conclusively that *Ameletus ludens* reproduces parthenogenetically. The finding of the single male indicates that the evolution toward complete parthenogenesis is not yet complete and that sexual reproduction probably occurs in very rare instances. Whether or not this parthenogenetic condition of *Ameletus ludens* is of local or general occurrence cannot be said at the present time.

#### LITERATURE CITED.

- Needham, James J., 1905 Mayflies and Midges. N.Y. State Mus. Bull. 86, pp. 36-38.  
 Morgan, Anna H., 1911 Mayflies of Fall Creek. Ann. Ent. Soc. Amer. IV, pp. 117-118.  
 1913 A Contribution to the Biology of Mayflies. Ann. Ent. Soc. Amer. VI, p. 371.