

# Ecology of a Fresh-water Copepod, *Sinodiaptomus volkanoni* Kiefer

## I. Reproduction

by

Tetsuo Tomikawa

In this paper reproduction of a fresh-water copepod, *Sinodiaptomus volkanoni* Kiefer (syn. *S. sarsi* (Rylov)) based on the rearing experiment as well as field observations is reported. Mature females and males were collected from the irrigation ponds in Hyogo Prefecture as in the previous work (Tomikawa Ms). The rearing experiment in the laboratory was continued from early May 1966 until early June 1967.

### Rearing:

Rearing water was prepared as follows: Pond water was filtered through to remove solid matter, and then one kg dried horse-dung and 4 kg humus were added per 10 liters of the pond water. After standing the water mixed with horse dung and humus for 2 to 3 days, it was filtered again and the filtrate was diluted to one fourth with the filtered pond water. The pH value of the water thus prepared ranged from 7.0 to 7.4. The rearing water was transferred into containers 300 ml or glass tube of 100 ml, into which 2 or 3 couples of mature *S. volkanoni* were placed. Temperature of rearing water was kept between 15-34 °C. The water was renewed every ten days. The females survived for 64 days after the first spawning, and the males survived for 84 days after the first copulation, in the longest cases.

### Sex ratio:

Mean sex ratio in nature from March to June

was 0.51 (female/male): The males are dominant in the pond in June (0.26). In rearing experiment the mean sex ratio was 0.6, slightly higher than in nature (table 1).

### Copulation:

Copulation was observed in laboratory culture. The male grasped the female body with geniculate antennules. The antennae, maxillipeds, and 5th thoracic feet of the male were also used to aid the grasping action. This action was completed usually within 30 minutes or so, but sometimes it took 2 minutes. The spermatophores, about 0.7 mm long and 0.1 mm wide, were attached by the male near the genital aperture on the ventral surface of the 1st abdominal segment of the female. This was done mainly by the action of the 5th thoracic feet of the male. The number of spermatophores attached to female was usually one, sometimes two. The copulation took place repeatedly at the intervals of about 10 days, 13 days at longest. It happened always in daytime.

### Spawning:

In the pond mater females carrying eggs were found in two seasons, i. e., from March to June, and from October to December. They were particularly abundant in April-May and October-November, when the temperature of pond water ranged between 15-25 °C. In the laboratory culture, spawning was observed at the temperature between

Table 1. Sex ratio of *S. volkanoni* in the pond.

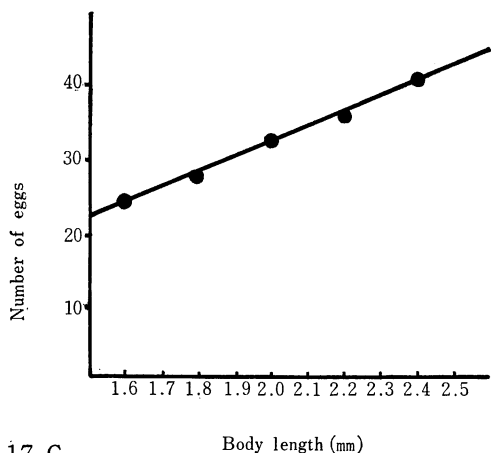
Date of collection	No. of indiv. examined	Female	Male	Ratio female/male
Mar. 18, 1967	170	109	61	0.56
Apr. 18,	697	446	245	0.55
May 15,	69	44	25	0.57
Jun. 14,	135	105	30	0.26
Total	1065	704	361	0.51

15-30 °C, always at night.

#### Eggs:

In the laboratory experiment, time required for development of eggs from the formation in the ovary to full maturity was 4-5 days at 17°C.

Unfertilized eggs in the ovary typically centrolethical. Eggs were spawned always at night and protected in egg sacs. A pair of guitar-shaped egg sacs was suspended below the genital aperture of the female. On a female of 2.5 mm in body length an egg sac was 0.5 mm long. Eggs in the egg sac were 0.1 mm in diameter on average, and triangular, elliptic or multiangular in shape, faint green or light yellow. The number of eggs in an egg sac varied with the size of females.



17 C

Fig.1. Relation between the number of eggs in an egg sac and the body length of female, *S. volkanoni*.

It was calculated as  $N=20.0101 L-8.0208$ , where N is the number of eggs in an egg sac, and L is the body length of the female in mm (Fig. 1). Time required for development of egg sac from spawning (fertilization) to hatchout was 2 days when the temperature of rearing water was 15-17 °C, 1.5 days at 20-25 °C, and one day at 25-27 °C.

In nature some females found in March would have been born at the end of the preceding year. Life span of this population would be as long as 3-4 months. The spring population born in April-May was still found in June-July, the life span being supposedly 2-3 months.

#### Generations:

It is indicated by the rearing experiment that the duration of growth from egg to adult stage was usually one month. In nature spawning was observed from March to June and from October to December, so that it is presumed that the spring population would repeat four generations and autumn and winter populations would repeat three generations.

#### Literature cited

Tomikawa, T. Ms: Morphological difference between female and male of *Sinodiantomus volkanoni* Kiefer (Copepoda).