there being 50 mgms. of rice in each jar; the eggs were submerged on the fourth day, and two larvae were added to each jar.

TABLE IX.

Hatching of Eggs in Different Waters under Favourable Conditions.

Nature of water (7 c.c. per larva)	Rain water	Tap water
No. of eggs in each jar	30	30
Hatched by 5th day	100%	93%

Where conditions were less favourable, eggs hatched more readily in rain water, as shown in Table X. Here no food and no larvae were added. The eggs were floating till submerged on the fourth day.

TABLE X.

Hatching of Eggs in Different Waters under less Favourable Conditions.

Nature of water (4·6 c.c. per larva)	Rain water	Tap water
No. of eggs in each jar	50	50
Hatched by 5th day	52%	22%

Similar results were obtained under other conditions, and it will be shown subsequently that larvae developed more quickly in rain water.

VIABILITY OF EGGS KEPT IN WATER

It is well known that eggs will hatch after being kept dry for many months. Bacot (1916) stated that some eggs when kept continually immersed did not hatch for periods of from two to five months. This was tested, and the results are recorded in Tables XI and XII. The eggs were stored in the water in jars, which were undisturbed as far as possible and to which no food was added. At the end of each month shown, a number of eggs were removed and examined, the split and collapsed ones being rejected and the others submerged in rain water to which rice was added and stirred daily.

TABLE XI.

Viability of Eggs stored in Tap Water.

	Removed after	No. tested	Hatched	Pupated	Adults
Eggs stored floating ...	4 months	20	45%	0	0
	5 months	40	15%	0	0
	6, 7, 8 months	160	0	0	0
Eggs stored submerged	4 months	30	46%	6·6%	6·6%
	5 months	30	20%	0	0
	6 and 7 months	30	0	0	0

TABLE XII.

Viability of Eggs Stored in Rain Water.

	Removed after	No. tested	Hatched	Pupated	Adults
Eggs Stored Floating	3 months	40	92%	75%	75%
	5 months	30	40%	...	... *
	7 months	25	0	0	0 *
Eggs stored submerged	3 months	40	100%	95%	95%
	4 months	40	95%	95%	95%
	5 months	32	56%	...	... *
	7 months	15	0	0	0 *

* These observations were kindly made for me by Dr. R. M. Gordon after my departure from Manáos.

From each of the four batches used in the experiments shown in Tables XI and XII controls were taken and placed under conditions favourable to hatching, and were found to be fertile to the extent of 96 to 100 per cent. adults being eventually produced. Rejections on account of splitting or collapse of the eggs amounted to 7 to 11 per cent. of the eggs in each jar. Of the adults produced, sixty-four were males and forty-four females.

Comparison of the figures in Tables XI and XII would indicate that the eggs retained their viability longer in rain water than in

tap water, but such a comparison is not justifiable as different batches of eggs were used, and the times of the experiments, although overlapping, were not identical.

Eggs were, therefore, found to be able to remain alive for five months in water, either floating or submerged. This accords with Bacot's findings in West Africa. Mitchell (1917) records survival immersed at over a year, but gives no details.

THE DEVELOPMENT OF LARVAE AND PUPAE

The development of *S. calopus* larvae is influenced by the nature of the water, its amount per larva, the presence of food and its nature, and other factors which were not investigated.

In each of the experiments shown in Tables XIII to XVI the larvae used were hatched from the same batches of eggs during the same respective periods, and were all less than twenty-four hours old at the beginning of the experiments.

Nature of the Water

The only waters compared were tap water and rain water. The result is shown in Table XIII. The larvae hatched in the water in which they were subsequently kept. 0·02 per cent. of rice was added to each jar, and the water was aerated daily for one minute by bubbling air through it.

Table XIII.

Development of Larvae in Tap Water and Rain Water.

Water (11 c.c. per larva)	Rain water	Tap water
No. of larvae	24	24
Pupation commenced	10th day	22nd day
Percentage giving pupae	79%	8%
Percentage giving adults	79%	0
Average larval life of those pupating	19·9 days	22·5 days

In the tap water all the larvae became fully developed, but were undersized. The mortality was probably associated in some way

with the water, but larvae were quite capable of developing in tap water when less crowded. Fourteen out of fifteen became adults under similar conditions in tap water where the concentration was 50 c.c. per larva.

Concentration of Larvae

The effects of overcrowding are shown in the following experiments, and indicate that where experiments are carried out to test the values of different foods or waters, the results are not comparable if the concentration of larvae has not been the same in each experiment.

Table XIV.

Result of Varying the Amount of Tap Water per Larva.

Amount of water per larva	50 c.c.	250 c.c.
No. of larvae in each jar	15	15
No. of pupae produced	15	15
No. of adults produced	14 (9♂♂; 5♀♀)	15 (10♂♂; 5♀♀)
Average duration of larval and pupal stages, ♂♂ ...	14·2 days	10·8 days
Average duration of larval and pupal stages, ♀♀ ...	17·8 days	13·c days

This experiment is complicated by the fact that in the jar with 50 c.c. of water per larva there was only one-fifth of the quantity of rice present in the other jar (0·006 per cent.). As it became used up, therefore, rice was added gradually to the former jar till equal quantities had been placed in both without raising the percentage present at any time much above 0·006.

Table XV.

Variation of the Amount of Rain Water per Larva.

Amount of water per larva	15 c.c.	30 c.c.
No. of larvae	20	10
No. of pupae produced	19	10
No. of adults produced	19 (12 ♂♂; 7 ♀♀)	10 (5 ♂♂; 5 ♀♀)
Average duration of larval and pupal stages, ♂♂ ...	7·0 days	7·0 days
Average duration of larva and pupal stages, ♀♀ ...	8·3 days	7·4 days

Here the difference is less, possibly owing to more favourable conditions. It was again considered better to provide equal quantities of food per larva in each jar (0·025 per cent. rice and 0·006 per cent. peptone) by gradual addition rather than to commence with a double concentration of food in one jar. The water in each jar was aerated daily for one minute.

Assuming that the method of adding food did not introduce a fallacy, these and other experiments indicate that overcrowding may influence the rate of development.

Nature of Larval Food

A large number of organic substances have been found to be suitable as food for the larvae, but some appear to be more so than others. In the following experiment peptone and rice were compared. Two jars, each containing 400 c.c. of tap water, were taken, and rice was added to one and peptone to the other to the amount of 0·012 per cent. on the first and fourth days of the experiment. An equal number of eggs hatched in each jar during the same period of twenty-four hours. The water was aerated for one minute daily. Details are given in Table XVI.

Table XVI.

Peptone *v.* Rice as a Larval Food.

Food	Peptone	Rice
No. of larvae	19	19
No. of pupae produced	19	19
No. of adults produced	19 (15 ♂♂; 4 ♀♀)	18 (12 ♂♂; 6 ♀♀)
Average duration of larval and pupal stages, ♂♂ ...	7·1 days	8·6 days
Average duration of larval and pupal stages, ♀♀ ...	8·0 days	9·8 days

Thus under these conditions both male and female larvae develop more rapidly on peptone than rice.

Duration of Larval and Pupal Stages

The duration of the larval stages varied enormously under the conditions described above. The shortest time observed was four days in the case of three male larvae, the food used being peptone

(0·006 per cent.) and rice (0·025 per cent.) in rain water (30 c.c. to each larvae). The longest period recorded was also in the case of a male larva, which did not pupate till the forty-second day after hatching and became an adult two days later; in this case the food was rice alone, and the concentration 9 c.c. of rain water per larva. Macfie (1915) states that under 'normal conditions' the larval stage usually lasts seven to thirteen days, and records an instance where it lasted at least ninety-nine days and produced a healthy adult. Bacot (1916) states that under the most favourable conditions the larval life is passed within four days, but with scarcity of food is prolonged for upwards of seventy days.

Table XVII gives the average duration of a considerable number of larvae living under various artificial conditions in the laboratory.

TABLE XVII

Duration of Larval Stage.

Sex	No. of larvae	Average number of days	14 days and under
♂	77	9	90·9%
♀	48	14·6	62·5%
Unrecorded	57	7·3	92·9%
Total	182	9·9	84·0%

The duration of the pupal stage did not vary to any great extent. Figures are given in Table XVIII.

TABLE XVIII.

Duration of Pupal Stage.

Sex	No. of Pupae	1 day	2 days	3 days
♂	96	2	88	6
♀	62	2	53	7
Unrecorded	28	0	17	11
Total	186	4	158	24