

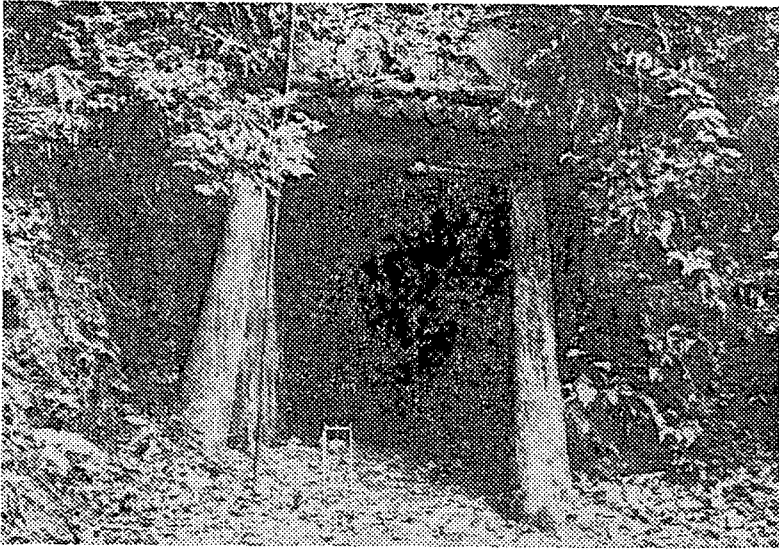
Some observations on the habitats of slime-moulds

by Fumio YANAGITA

(*Biological Laboratory, Education Faculty, Kochi University*)

I had tried the ecological observations of some slime moulds which were growing in a cave at the hillside behind Shrine Asakura of Kochi in Tosa province in Japan, and so in this paper I intend to describe the observations, namely the influence to the intensity of illumination upon the habitats of some slime moulds, for we have little investigation in these line.

Fig. 1



This cave have such the outward aspect as showing in the photograph (Fig. 1), that artificially made of some pine-timbers for the most part, the floor hold the same horizontal position to the shrine-garden, and also the entrance of this cave face to south with about 10m. in depth, 1.3m. wide and 1.6m. high in size. On the hill keeping this cave, the warm forest are composed of the plants such as *Pinus densiflora* in the upper layer, and *Shiia cuspidata*, *S. Sieboldii*, *Castanea glauca* in lower layer, mixing with other plants such as *Myrica rubra*, *Sakakia ochracea*, *Illicium religiosum*, *Eurya japonica*, *Symplocos prunifolia*, *Pieris japonica*, *P. elliptica*, *Ilex pedunculosa*, *Photinia glabra*, *Vaccinium bracteatum*, etc and in the forest-bed, *Shibataea Kumasasa*, *Pleioblastus variegatus var. viridis*, *Gleichenia linnearis*, *Dryopteris erythrosora*, and partially *Ardisia villosa*, *Lindsaya orbiculata*, etc. The following table is the climatic one based on the meteorological statistics of the Central Meteorological Observatory. (Table 1)

Table 1
The Climatic Table of Kochi (N. Lat. 33° 34', E. Long. 133° 33', H. 2.6m)
Years of Obs. (1901—1945), but* (1936—1945)

| Articles. | Month | | | | | | | | | | | |
|-------------------------------|--|------|------|------|------|------|------|------|-------|------|------|------|
| | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. |
| Atm. Pressure | 65.2 | 64.1 | 63.2 | 61.7 | 59.3 | 56.8 | 57.1 | 56.9 | 59.0 | 62.4 | 64.6 | 65.2 |
| Air Temp. | 5.1 | 5.9 | 9.3 | 14.3 | 18.1 | 21.6 | 25.3 | 26.1 | 23.2 | 17.7 | 12.3 | 7.4 |
| Max. Temp. | 23.4 | 23.7 | 26.3 | 28.0 | 31.2 | 33.9 | 37.1 | 36.6 | 35.9 | 32.2 | 27.5 | 23.5 |
| Min Temp. | -7.6 | -7.0 | -6.5 | -0.9 | 3.8 | -9.1 | 14.6 | 16.4 | 11.4 | 2.5 | -1.9 | -6.6 |
| *Humidity(%) | 66.9 | 67.2 | 69.2 | 72.9 | 77.5 | 83.7 | 86.0 | 84.3 | 81.4 | 77.8 | 75.6 | 70.7 |
| Amount Precip. | 61 | 94 | 189 | 249 | 258 | 342 | 323 | 334 | 366 | 211 | 106 | 74 |
| Numb. Clear Days | 8.1 | 5.7 | 4.6 | 4.0 | 3.2 | 1.4 | 2.2 | 3.0 | 2.9 | 6.0 | 8.2 | 9.5 |
| Numb. Days Precip. (≧.1mm) | 7.4 | 8.9 | 12.6 | 13.8 | 13.3 | 17.1 | 16.5 | 15.8 | 16.3 | 11.7 | 9.6 | 7.7 |
| All is Mean | from the Climatographic Atlas of Japan, I.1948 | | | | | | | | | | | |

According to the above cited table, these highest value among the mean maximum of temperature and humidity were each 37.1°C and 86.0% in July, though the mean air-temperature has its highest value in August, and also the mean amount or the number of days in the precipitation were same in June, usually the humidity show large rate.(viz. 72.9—86.0 %) from April to November every year, above the largest in July through one year, and therefore I suppose that our province shall be fitting for the growth of some slime-moulds owing to the characteristics as regard as the climatic conditions and the geographical features.

The measurements had practised at each places indicated in the following table 2, on the one meter above ground, and these had done at 1.30—2.00 p.m. in the fair and calm day each month, with a portable Matsuda-photometer (Model 6); then I was inquiring into the problem as to the table 2.

Table 2
(Humidity & Intensity of Illumination about the cave.)

| articles | | Humidity (%) | | | | | | | Illumination (lx) | | | | | | |
|----------------|----------|--------------|------|-----|-----|-----|-----|-----|-------------------|------|-----|-----|-----|-----|-----|
| measured pl. | | o.c. | ent. | 1m. | 2m. | 3m. | 4m. | 5m. | o.s. | ent. | 1m. | 2m. | 3m. | 4m. | 5m. |
| Date (1950) | Jan. 22. | 75 | 68 | 68 | 67 | 61 | 71 | 70 | 1200 | 750 | 200 | 25 | 20 | 15 | 10 |
| | Feb. 8. | 69 | 69 | 70 | 74 | 67 | 65 | 74 | 1400 | 900 | 250 | 30 | 25 | 20 | 10 |
| | Mar. 12. | 68 | 72 | 76 | 75 | 65 | 65 | 73 | 1500 | 950 | 950 | 30 | 22 | 18 | 10 |
| | Apr. 3. | 74 | 75 | 80 | 80 | 70 | 72 | 73 | 2500 | 1750 | 350 | 47 | 32 | 25 | 20 |
| | May, 8. | 83 | 80 | 85 | 85 | 86 | 85 | 73 | 3200 | 2300 | 450 | 65 | 45 | 35 | 25 |
| | June, 5. | 83 | 85 | 88 | 90 | 90 | 85 | 85 | 3000 | 2100 | 400 | 60 | 45 | 35 | 20 |
| | mean | 75 | 75 | 78 | 79 | 73 | 75 | 75 | 2133 | 1292 | 433 | 43 | 32 | 25 | 16 |

(o.c.: 1m. outward cave-entrance, ent.:entrance, m:m. into entrance)

Although I could not credence to the each data as perfect ones owing to both the short-

term observation and the error of the photometer itself (the error of photometer used is 15%), yet I found only these outline. And so I converted the value of the intensity of illumination into percentage to make the comparative study of the ratio to the values measured at one meter point in front of the entrance of cave, that is table 3.

Table 3

(The table of the intensity illumination converted into %)

| places \ month | Jan. | Feb. | Mar. | Apr. | May | June | mean |
|----------------|-------|------|------|------|------|------|------|
| At entrance | 62.5% | 64.5 | 63.4 | 70.0 | 71.9 | 70.1 | 67.1 |
| // 1m. inward | 16.7 | 17.9 | 14.7 | 14.0 | 14.1 | 13.5 | 15.2 |
| // 2m. // | 2.1 | 2.1 | 2.0 | 1.9 | 2.0 | 2.0 | 2.0 |
| // 3m. // | 1.7 | 1.8 | 1.5 | 1.3 | 1.4 | 1.5 | 1.5 |
| // 4m. // | 1.3 | 1.4 | 1.2 | 1.0 | 1.1 | 1.2 | 1.2 |
| // 5m. // | 0.8 | 0.7 | 0.7 | 0.8 | 0.8 | 0.7 | 0.75 |

And then I will touch upon the growing conditions of the each species on their habitats in the following:

1. *Comatricha longa*

The ceiling or pillars in the cave had spotted with this species widely on their surface of a rotten timber, but their growing spots had limited to the parts what were from 1.4m. to 4.2m. inward in the cave.

*D. m. Humid. 61—90% ; Light 0.8—2.7%.

2. *Ceratiomyxa fruticulosa*

In this cave, they had gregariously crowded only at the lower part of pillar standing at the entrance which were much light; according to my experiences through collecting of them, they had often found on a rotten timber laid in the field exposing to the sun-shine.

D. m. Humid. 68—85% ; Light more than 70%.

3. *Cribraria microcarpa*

These species crowded closely, widely with the growing area about 90cm². on the surfaces of two rotten support of the entrance, there 750—1500 *Lx* in April.

D. m. Humid. 68—85% ; Light 63—72%.

But only one colony existed at 1.1m. inward the entrance, the growing area about 2 cm². in June.

D. m. Humid. 80—88% ; Light 5.5—11%.

The figure 2 shows the growing place of each species at the cave in the figure 1, the abbreviations in this figure:

Ce. *Ceratiomyxa fruticulosa*

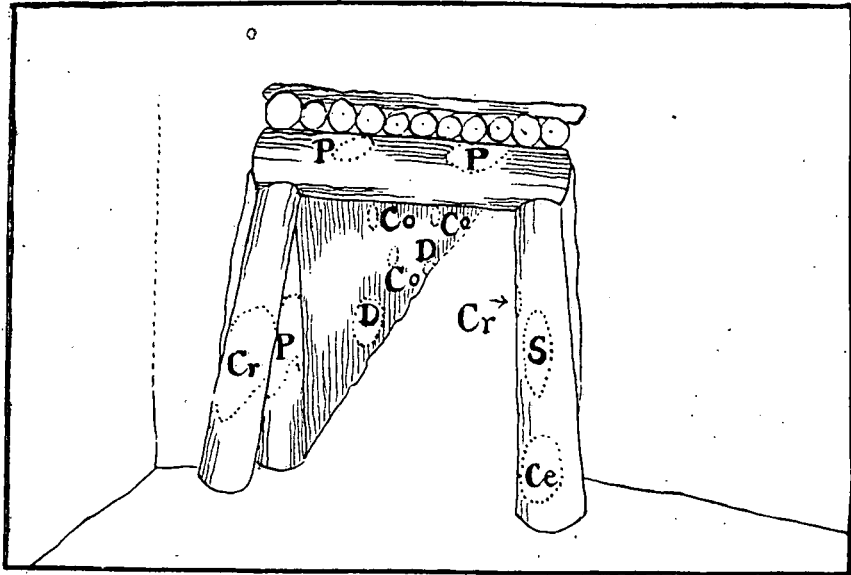
Co. *Comatricha longa*

Cr. *Cribraria microcarpa*

*The abbreviation D.m. means the data measured in the growing parts of each species.

- D. *Dictydium cancellatum*
 P. *Physarum viride*
 S. *Stemonitis flavogenitia*

Fig. 2



del. F. Yanagita

4. *Dictydium cancellatum*

These micro-colonies scattered or spotted on a rotting timber, these growing spots were 1.23—3.47m. inward the entrance in the cave, there 40—350 *Lx* in May.

D. m. Humid. 61—90% ; Light 1.3—2.3%.

I measured 40—55 *Lx* (1.6—2.2%) about this species on a somewhat rotten plank of a half-dried water tank made of cedar, at my house-garden, and 45—50 *Lx* (1.5—1.7%) about same species in Shrine Ishidate of Kochi city.

5. *Stemonitis flavogenitia*

These species crowded only on outside the cave, and mostly existed on the light parts near the entrance, there were 300—1200 *Lx* (20—80%), these values were much higher ones like *Ceratiomyxa* sp. with compare to the other species, however, the number of colonies were not numerous especially in this place.

D. m. Humid. 68—85% ; Light 63—80%)

6. *Physarum viride*

The colonies of this species were closely grown over the pillar at the entrance and had crowded at somewhat light portion, but sometimes rarely grown at a dimly-lighted place, for three micro-colonies existed on a cross-piece with much humidity (72%) of the cave-ceiling which indicated about 25 *Lx* or 0.7% in light-intensity.

D. m. Humid. 61—90 ; Light 0.7 rarely, 15—72%.

Putting these observations together, I had made the table 4.

Table 4

| sp. \ articles | Illumination % | Humidity % | place in Cave |
|--------------------------------|----------------|------------|-------------------|
| <i>Comatricha longa</i> | 0.8—2.7 | 61—90 | 1.4—4.2m. inward |
| <i>Dictydium cancellatum</i> | 1.3—2.3 | 61—90 | 1.2—3.5m. inward |
| <i>Cribraria microcarpa</i> | 5.5—71.9 | 68—88 | ent.—1.1m. inward |
| <i>Physarum viride</i> | 0.7—15—71.9 | 61—90 | near ent. |
| <i>Stemonitis flavogenitia</i> | 62.5—80.0 | 68—85 | near ent. |
| <i>Ceratiomyxa fruticulosa</i> | more—71.8 | 68—85 | near ent. |

abbr. 'ent.' means the entrance of cave

Summary and Conclusion

This ecological observation of slime moulds carried out, from January to June in 1950, at the artificial cave situating in Shrine Asakura of Kochi city, Tosa province in Japan.

1. The intensity of illumination in the cave-inside changes in connection with it of the cave-outside, but it has more or less a tendency to stabilize as for a lightest time on a fair and calm day in each month.
2. *Comatricha longa*, *Dictydium cancellatum*, and *Physarum viride* choose as their growing place, not only the higher moisting place but more gloomy-lighted one; *Physarum viride* have broad adaptability to the illumination.
3. *Cribraria microcarpa*, *Stemonitis flavogenitia*, and *Ceratiomyxa fruticulosa* grow on the high moist place under the higher intensity of illumination, and both *Ceratiomyxa* and *Stemonitis* species are notable in this point usually, but *Cribraria microcarpa* chooses somewhat the low-lighted place.

In conclusion, I wish to express my deep obligation to Prof. S. Kitamura of Kyoto University and Prof. G. W. Martin of Iowa State University in U.S.A. for giving many kindness me and also the superintendent of Shrine Asakura of Kochi in Japan.

LITERATURE

- Jap. Cent. Meteor. Obs : Climatic Table, in Climatographic Atlas Jap. I, 1948
 Fumio Yanagita : Myxomycetes of Kochi city and its environs, in Acta Phytotax.
 Geobot. Vol. 14; 2, 1950
 Fumio Yanagita : Myxomycetes of Shikoku District, in Rep. Kochi Univ. No. 1, 1951
 (Received April 30, 1952)

