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ON THE DISTRIBUTION OF HIGHER BASIDIOMYCETES IN THE SIBSAGAR DISTRICT, ASSAM

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ABSTRACT

The distribution of the higher basidiomycetes of the Sibsagar district of Assam has been studied with the application of Poisson's probability distribution.

The fungi mostly occur in patches or pockets of podzolic soil formations having a rich forest cover, Agaricaceae occurring most commonly. The types of fungi were also classified as soil-inhabiting and wood-inhabiting, the former with sporophores submerged in the soil superficially.

The Poisson's probability distribution also explains the mode of distribution to certain extent provided the places of occurrence of these fungi are not disturbed markedly.

The fungi of Assam have been described in detail by Bhattacharyya and Baruah (1956). However, no attempt has been made uptil now to study the distribution of fungi, particularly with reference to ecological factors and nature of the frequency distribution. The higher basidiomycetes which may be either parasitic or saprophytic have not also been studied to any extent from the point of view of spatial and ecological distribution. The present analysis is, therefore, an attempt to explain the nature of distribution of the higher basidiomycetes with related frequencies under various climatic, edaphic and vegetational conditions and also to classify the types as occurring either on wood or in soil. Since the occurrence of fungi follows a distribution pattern of discrete functions, Poisson's probability distribution has been applied in the present analysis. This analysis, it is hoped may lead to better understanding of the role of these fungi in different transformations in soil as the other fungi cause in the wood. The work has been mainly confined to the Sibsagar district of Assam in addition to a part of the Mikir Hills lying close to the western border of the former. In the work, a comparison between the observed frequencies of sample fungi and the expected frequencies of the same has been made to find out the mode of occurrence in so far as it fits into any regularity in respect of the soil conditions.

The climate of Sibsagar district (Fig. 1) is suitable for a rich growth of fungi (Table I). The area has a cooler winter and a not-very-hot spring and summer and has a highly humid atmosphere with generally a heavily clouded sky in the monsoon period and a moderately clouded sky in the foggy winter. There is heavy rain in April and May and the rainfall in the spring generally prevents the development of hot weather while making the

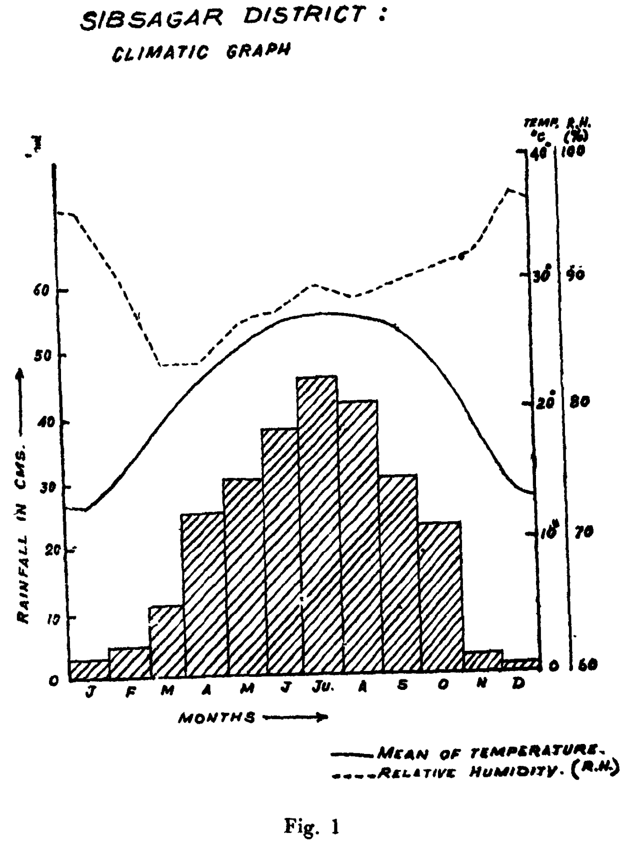

Fig. 1

Present address : Department of Botany, Sibsagar College, Sibsagar nights fairly cool. There is also frequent heavy shower of rain throughout creating innumerable marshy tracts and wetter pockets in the low-lying areas.

The cold weather in the area is from mid-November to the beginning of March. During this period the weather remains almost dry though occasionally there are showers due to development of mild depressions in late December or early January as a result of which the district has a mild cold-wave.

Table I shows the types of fungi, both soil and wood-inhabiting higher basidiomycetes.

Table I

Wood-habitat fungi	*Season*	*Soil-habitat fungi*	*Season*
Class : Basidiomycetes		Class : Basidiomycetes	
Order : Hymenomycetes		Order : Hymenomycetes	
Family : Agaricaceae		Family : Agaricaceae	
Panus	Sept.-Nov.	*Agaricus sp.*	March-May & Sept.-Nov.
Coprinus	Sept.-Dec.		
Psathyrella	,,	*Coprinus*	Sept.-Dec.
Schizophyllum	Sept.-June	*Cantharellus*	Sept.-Nov.
Lentinus	Sept.-Jan.	*Lentinus*	,,
Family : Polyporaceae		*Collybia*	,,
Daedalea	Nov.-Jan.	*Entoloma*	,,
Poria	October	*Mycena*	Sept.-Dec.
Polystictus	Sept.	*Marasmius*	,,
Fomes	Sept.-Jan.	*Pleurotus*	Sept.-Dec.
Polyporus	Sept.-Jan.	*Hygrophorus*	,,
		Russula	,,
Family : Hydnaceae		*Tricholoma*	,,
Hydnum	Oct.-Nov.	*Lepiota*	,,
Irpex	Oct.-Nov.	Family : Polyporaceae	
		Polyporus	Sept.-Dec.
Family : Thelephoraceae		Family : Clavariaceae	
Stereum	Sept.-Jan.	*Clavaria*	Sept.-Nov.
Cyphella	,,		
		Order : Gastromycetes	
Family : Tremellinaceae		Family : Phalloidaceae	
Auricularia	Sept.-Nov.	*Phallus*	Sept.-Nov.
Tremellodon	,,	*Mutinus*	,,
		Family : Lycoperdaceae	
Order : Gastromycetes		*Lycopedron*	Sept. & April
Family : Nidulariaceae		*Geastrum*	Sept.-Dec.
Cyathus	April-Sept.	Family : Nidulariaceae	
Nidularia	April-Sept.	*Nidularia*	April-Sept.
		Cyathus	April-Sept.

It is seen that fungi mostly occur in patches or pockets of podzolic formations having a rich forest cover. It is also observed that the most common fungi in the area include wood and soil inhabiting saprophytes of which types most frequently occurring are:

(i) Agaricaceae having genus *Agaricus* and *Collybia*
(ii) Clavariaceae including *Clavaria*
(iii) Nidulariaceae with genus *Nidularia*
(iv) Lycoperdaceae
(v) Phallaceae and
(vi) Polyporaceae

In case of soil-inhabiting fungi the most common and frequently occurring is Agaricaceae. There are only few cases of the *Polyporus* developing over soil but the frequency is negligible. However, polyporaceae takes the first place among the most frequent types in case of wood-inhabiting types, details of which are being further worked out.

In the present analysis the soil-inhabiting fungi have also been studied in order to determine the nature of frequency of distribution in respect to the depth of soil. The occurrence of the fungi was noted at different depths of the soil to determine whether the types were soil-inhabiting with sporophores submerged in the soil to some extent or whether these are confined to the superficial layers of soil. The method adopted to study the distribution was that of Poisson's rule.

Table II

Specimen No. 1 : *Agaricus* sp. (Poisson Distribution)

No. of obs.	Depth (mm) of occurrence (x)	Observed frequency (f)	(xf)
1	0	4	0
2	1	18	18
3	2	16	32
4	3	8	24
5	4	4	16
6	5 & above	0	0
		$\Sigma f = 50$	$\Sigma (xf) = 90$

$$a = \frac{\Sigma(xf)}{\Sigma f} = 1.8$$

Applying the formulae for Poisson Distribution:

$P_x = e^{-a}\frac{a^x}{x!}$ the probability with x (depth) as "o" in 50 cases will be:

$$P_0 = (e^{-1.80}\frac{1.8^0}{0!}) \times 50 = 0.1653 \times 50 = 8.265$$

Similarly, the probability with x (depth) as 1, 2, 3 and 4 mm as well as 5 mm and above in 50 cases will be:

$$P_1 = 0.1653 \times \frac{1.8}{1} \times 50 = 14.877$$

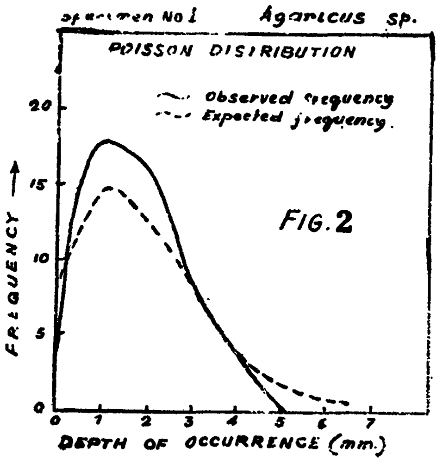

FIG. 2

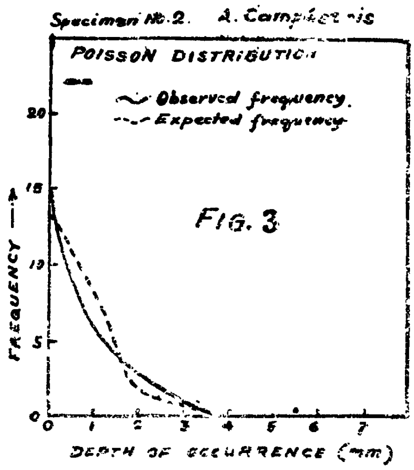

FIG. 3

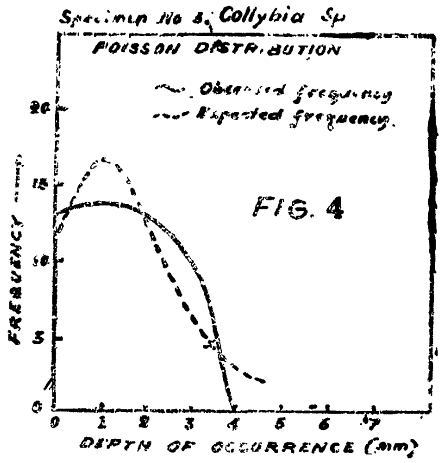

FIG. 4

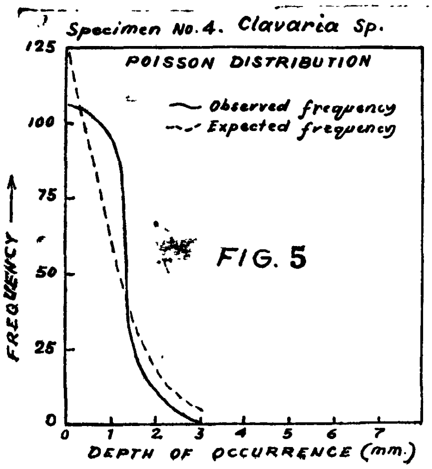

FIG. 5

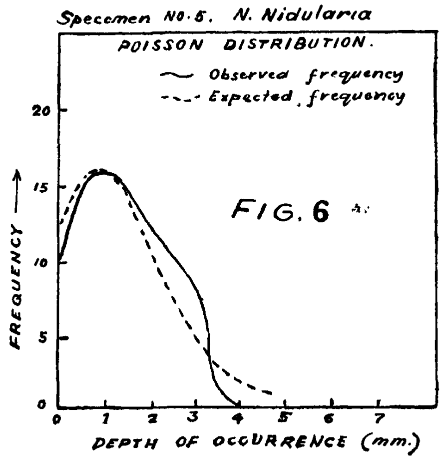

FIG. 6

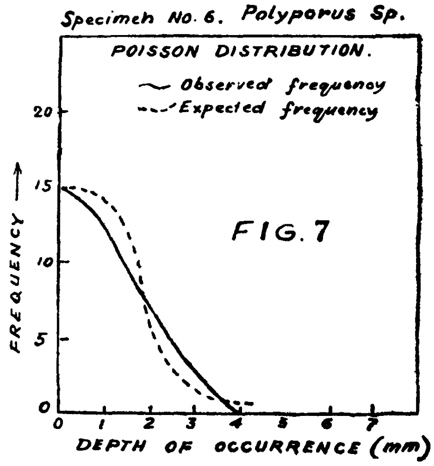

FIG. 7

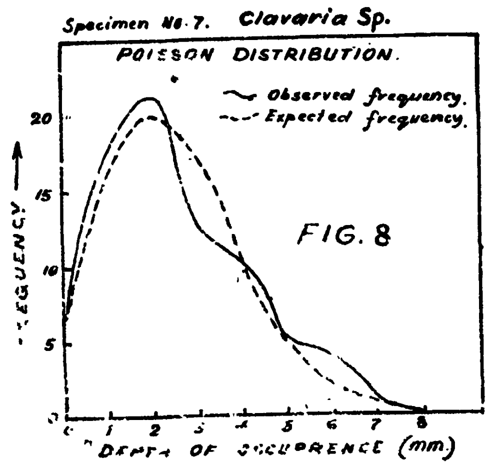

FIG. 8

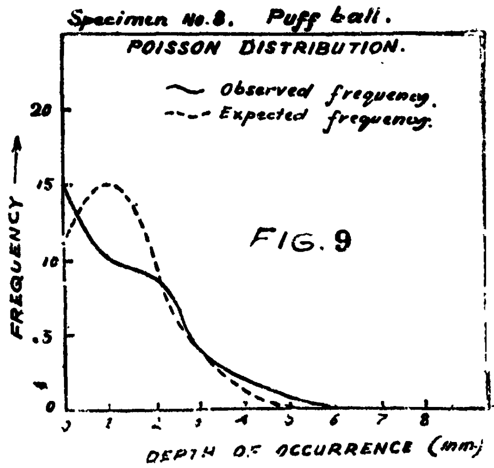

FIG. 9

$$P_2 = 0.1653 \times \frac{(1.8)^2}{1 \times 2} \times 50 = 13.389$$

$$P_3 = 0.1653 \times \frac{(1.8)^3}{1 \times 2 \times 3} \times 50 = 8.034$$

$$P_4 = 0.1653 \times \frac{(1.8)^4}{1 \times 2 \times 3 \times 4} \times 50 = 3.600$$

P_5 and above$=50-(8.265+14.877+13.389+8.034+3.600)=50-48.165=1.835$.

Thus, arranging the calculated values of frequency (*i.e.* the expected frequencies) with the observed frequencies and depth we get the Table III.

Table III

Agaricus sp. (Poisson Distribution)

Depth (mm) of occurrence (x)	Observed frequency (f)	Expected frequency (f′)	
0	4	8.265	(8)
1	18	14.877	(15)
2	16	13.389	(13)
3	8	8.034	(8)
4	4	3.600	(4)
5 and above	0	1.835	(2)
	50	50.00	(50)

The observed and expected frequencies are plotted in a graph (Fig. 2) in order to observe the regularity

Table IV

Depth of occurrence (x) in mm	Fig. No. 3: *Agaricus campestris*		Fig. No. 4: *Collybia* sp.		Fig. No. 5: *Clavaria* sp.		Fig. No. 6: *Nidularia* sp.		Fig. No. 7: *Polypours* sp.	
	Obs. freq. (f)	Exp. freq. (f′)	Obs. freq. (f)	Exp. freq. (f′)	Obs. freq. (f)	Exp. freq. (f′)	Obs. freq. (f)	Exp. freq. (f′)	Obs. freq. (f)	Exp. freq. (f′)
0	15	14	13	12	106	123	10	12	15	15
1	6	8	14	17	98	69	16	16	13	14
2	3	2	13	12	12	20	12	11	7	6
3	1	1	10	6 }	0	4	8	5	3	2
4 and above	0	0	0	3 }			0	2	0	1
Total	25	25	50	50	216	216	46	46	38	38

Table V

Depth of occurrence (x) in mm	Fig. No. 8: *Clavaria* sp.		Fig. No. 9: Puff ball	
	Obs. freq. (f)	Exp. freq. (f′)	Obs. freq. (f)	Exp. freq. (f′)
0	6	6	15	11
1	17	16	10	15
2	21	20	9	10
3	13	17	4	4
4	10	10	2	1
5	5	5	1	0
6	4	2 }		
7	1	1 }	0	0
8 and above	0	0 }		
Total	77	77	41	41

(if any) in the modes of occurrence of fungi and also the general tendency of point of diversion in relation to any particular depth range, between the observed and expected frequencies.

Before an inference could be drawn in the above line, it is desirable to select at random a few more samples of different species and examine their modes of frequencies for observed and expected ones and compare their digression in relation to particular depth range. The Tables IV & V and the diagrams drawn based on them have been prepared for the purpose.

The results show that in most cases the mode of occurrence of fungi of the higher Basidiomycetes of soil-inhabiting types agrees with a probability distribution of the Poisson's rule when considered in relation to the depth of the soil, the sporophore penetrates. In most cases, whatever may be the edaphic and climatic variation, the fungal development is limited upto a depth of 4 mm from the surface below which the frequency of occurrence is either nil or negligible. The highest frequency is between surface and 1 mm of depth. This is evidently due to a close relationship between damp atmosphere and fungal development. The soil of the area being somewhat less porous and more compact, the ideal habitat of the fungus is very close to the surface.

Another point of inference which is evident from the collection of fungi in the area is that Poisson's probability distribution very well explains the mode of distribution, provided the places of occurrence of these fungi are not affected to any extent. The samples which were collected in a cultivated field and also under a bush of bamboos did not fit into the Poisson's probability distribution. In the same way, the mode of occurrence of fungus collected in the adjoining area of the Mikir Hills where the ecological conditions are characterised by (a) relief, somewhat elevated, (b) soil having decomposed plant remains mixed with laterite and red loam and (c) climatic conditions being warm but relatively less humid than that of the Sibsagar area, is not properly explained by a Poisson's probability distribution.

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