27 January 1931.

Dr A.R. Clapham,
Department of Botany,
The University,
[illegible].

Dear Clapham,

The $1-e^{-N/n}$ is only the analogue of the Poisson series for sampling motile organisms from a fluid.

If the average number ~~for~~ per sampling volume is m and all organisms have an equal independent chance of being caught by extracting a sample volume v, out of a sampled volume V, then the frequencies of 0, 1, 2 will be the term of

$$\left\{\left(1-\frac{v}{V}\right)+\frac{v}{V}\right\}^{mV/v}$$

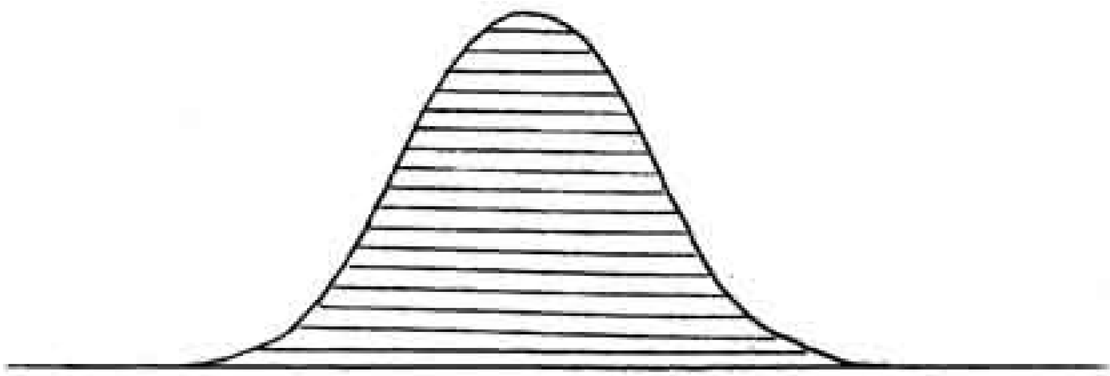
or with v/V tending to zero $\quad e^{-m}\left\{1, m, \frac{m^2}{2}, \ldots\ldots\right\}$

Frequency of NONE ..e^{-m}..

of ONE or MORE ......$1-e^{-m}$

I think this should apply when the sampling unit is big enough to contain many more occurrences than it ever does in fact contain.

For <u>one</u> factor Romell takes a normal curve



and slices it horizontally in slices of equal thickness. The change in length from one slice to the next is least at the points of inflexion, but increases to a little infinity at the apex and a big infinity at the base. The normally distributed variate is some environmental factor, say hydrogen ion index of the soil. Introduce 1 species for each .01 interval in P_h. Then the length of a slice is the number of species of more than a given frequency, the frequency being proportional to the height of the slice above mean sea level. Hence, a crowd of species of low frequency, and a lesser crowd at high frequency; but this is my first point, there is no reason to think that this high mode will be near 100 per cent. They are merely the species who like 7.00, 7.01, 6.99 &c., and these habitats are nearly equally frequent if 7.00 is the mean P_h. So all that follows from Romell's scheme is that they have nearly the same frequency.

Secondly, do the same for a frequency <u>surface</u> and the high maximum disappears. For 3 variates and more it falls to a zero.

Following the suggestion of your letter it ought to be possible to plot F against quadrat size for each species, then for each species there will be a quadrat size for which F = 50 per cent. If these sizes vary very much for different species, then as we increase quadrat size each species in turn dashes across from 10 per cent. to 90 per cent. or so, there always being a heap at both ends, except for enormous or very tiny quadrats which will exhaust one heap or the other. Only the enormous quadrats fail to do this because they keep bringing in fresh associations or fresh floras.

Yours sincerely,