Letters to the Editor

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ON THE DISTRIBUTION OF STORMS AND DEPRESSIONS IN THE ARABIAN SEA

Frequencies of storms and depressions in the Arabian Sea based on the data for the years 1890—1950 have been published in *Mem. India met. Dep.* (Ray Chaudhuri *et al.* 1959). Those data (1901—1950) except for the year 1942 for which the data are not available, and the following data from 1951—1955 compiled from *India met. Dep. Annual Summary*, Part B, have been utilised for this study—

Year	No. of storms and depressions	Year	No. of storms and depressions
1951	3	1954	3
1952	1	1955	0
1953	0		

Here an examination has been made to study the frequency characteristics of the distribution of the number of storms and depressions in the Arabian Sea during the years 1901—1955. An attempt has been made to examine the Time Series of the 'yearly number' for linear trend and whether the number of storms and depressions in a year is influenced by the number during the preceding year.

Distribution of yearly number—The occurrence of storms and depressions is a rare event and obviously cannot conform to the normal Poisson law of distribution. This will also be borne out from the values of Fisher's coefficient of Skewness (g_1) and Kurtosis (g_2) given below—

$$g_1 = -5{\cdot}62 \quad (\text{S.D. of } g_1 = 0{\cdot}33)$$

$$g_2 = 210{\cdot}53 \quad (\text{S.D. of } g_2 = 0{\cdot}71)$$

The adequacy of the Poisson distribution can be tested by using the formula (Thom 1960)

$$\chi^2_{n-1} = \frac{n\Sigma x^2}{\Sigma x} - \Sigma x$$

where n = number of years of record and χ^2_{n-1} has a chi-square distribution with $n-1$ degrees of freedom. The values of χ^2_{n-1} turns out to be 55·4 and it is not significant for 53 degrees of freedom. So it can be concluded that the series follows a Poisson distribution.

Having established that the series follows a Poisson distribution, the observed data have been fitted for the distribution to compare the observed and calculated frequencies. These are as follows—

Storms	Observed frequencies	Calculated frequencies
0	9	7·8
1	15	15·1
2	14	14·6
3	7	9·4
4	5	4·6
5	3	1·8
6	1	0·1

It can be seen that the observed and calculated frequencies compare well upto the observed frequency of 7. Beyond this as the observed frequency itself is quite small the fit is not good enough.

Trend—Our next interest is to see whether there is any trend in the series under consideration. Since the series follows the Poisson distribution, the variation and the mean of the distribution are correlated and hence the most powerful test for testing trend fails (Thom 1960).

So now the test for trend can be carried out by transforming the original yearly frequencies greater than 1 by Freeman

and Tukey's transformation (Thom 1960) given by the equation —

$$x = \sqrt{y} + \sqrt{y+1}$$

where x is the transformed yearly frequency.

The values given below were worked out for the transformed frequencies.

Variation due	Degrees of freedom	Sum of square	Mean sq. or variance
Linear regression	1	8·97	8·97
Deviation from regression	53	589·13	11·11
Total	54	598·10	11·5 F = 0·087

The value of F is not significant. Hence it can be concluded that there is no trend in the series and so the regression equation is of little value.

Autocorrelation—The next step was to examine whether there is relationship between frequencies of successive years. Autocorrelation using the product moment was calculated. The value of the autocorrelation works out to be —·034. This is insignificant showing that there is no relationship between the frequency of one year and the following year, *i.e.*, the successive values are independent.

The study shows that (1) the series follows the Poisson distribution, (2) the successive frequency of the distribution is independent and (3) the distribution has no trend.

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