TWO-YEAR INVESTIGATION OF THE AIRBORNE POLLEN AT NANKANG, TAIPEI (TAIWAN)[1]

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ABSTRACT

Airborne pollen grains and fern spores collected at Nankang in 1983 and 1984 were counted and identified. Pollen calendars of both years showing the succession of pollen and fern spore species were prepared and compared. Comparing with 1984, an advance in the pollen season was revealed in 1983. This was probably due to the warmer weather in 1983. Most of the pollen species collected in 1984 were the same as those in 1983, although there were small differences in the quantities present.

INTRODUCTION

The aeropalynological data are of great importance for many investigations, especially for the studies of pollen allergy and areal vegetation history. Regular sampling of airborne pollen and fern spores in the urban area of Taipei was initiated by Chen and Huang (1980). Various pollen types in the suburban environment have been mentioned by Tsou and Huang (1982) and Chen (1984). A complete pollen calendar has also been established in the previous paper (Chen, 1984).

The quantity and quality of airborne pollen and spores may differ from year to year in an area (Stix, 1978; Spieksma, 1983). This is considered to be due to the change in meterological factors (Engström and Nillsson, 1978; Bringfelt, 1978) as well as in the phenological conditions of plants (Lejoly-Gabriel and Leuschner, 1983). In order to establish a more useful pollen calendar for an area, it is therefore necessary to undertake a long-term observation of airborne pollen and spores. In this investigation, a two-year (1983 and 1984) observation of airborne pollen and spores at Nankang, Taipei was made and the difference between these two years was demonstrated.

MATERIALS AND METHODS

The rotorslide sampler was installed at a height of approximately 20 meters on the roof of the Institute of Botany, Academia Sinica at Nankang, throughout the years

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of 1983 and 1984.

Nankang is located north-east of the Taipei City, which is situated in the northern part of Taiwan Island, in a suburban area, not far from agricultural field, small patches of mixed deciduous woods, and some private gardens. *Acacia confusa*, *Mallotus japonica*, *Trema orientalis* and *Alsophila* are found dominant in the immediate vicinity. The weather of this subtropic region is warm, humid and rainy.

The methods of slide preparation has been described in previous paper (Chen, 1984). The frequencies of occurrence of each pollen and spore species were recorded and illustrated as grains·cm^{-2}·day^{-1}.

RESULTS AND DISCUSSION

Seasonal succession

The airborne pollen and spores showed seasonal succession (Fig. 1) in their abundance in 1984. In the winter, of December, January and February, there was only low amount of pollen grains and fern spores, marking the termination of anthesis for the major taxa. In this time the pollen and spore counts declined to below 10 grains·cm^{-2}·day^{-1}. Tree pollen and fern spores presented predominantly in the spring, and summer respectively. In the autumn, the grass pollen were the major contributors in the atmosphere.

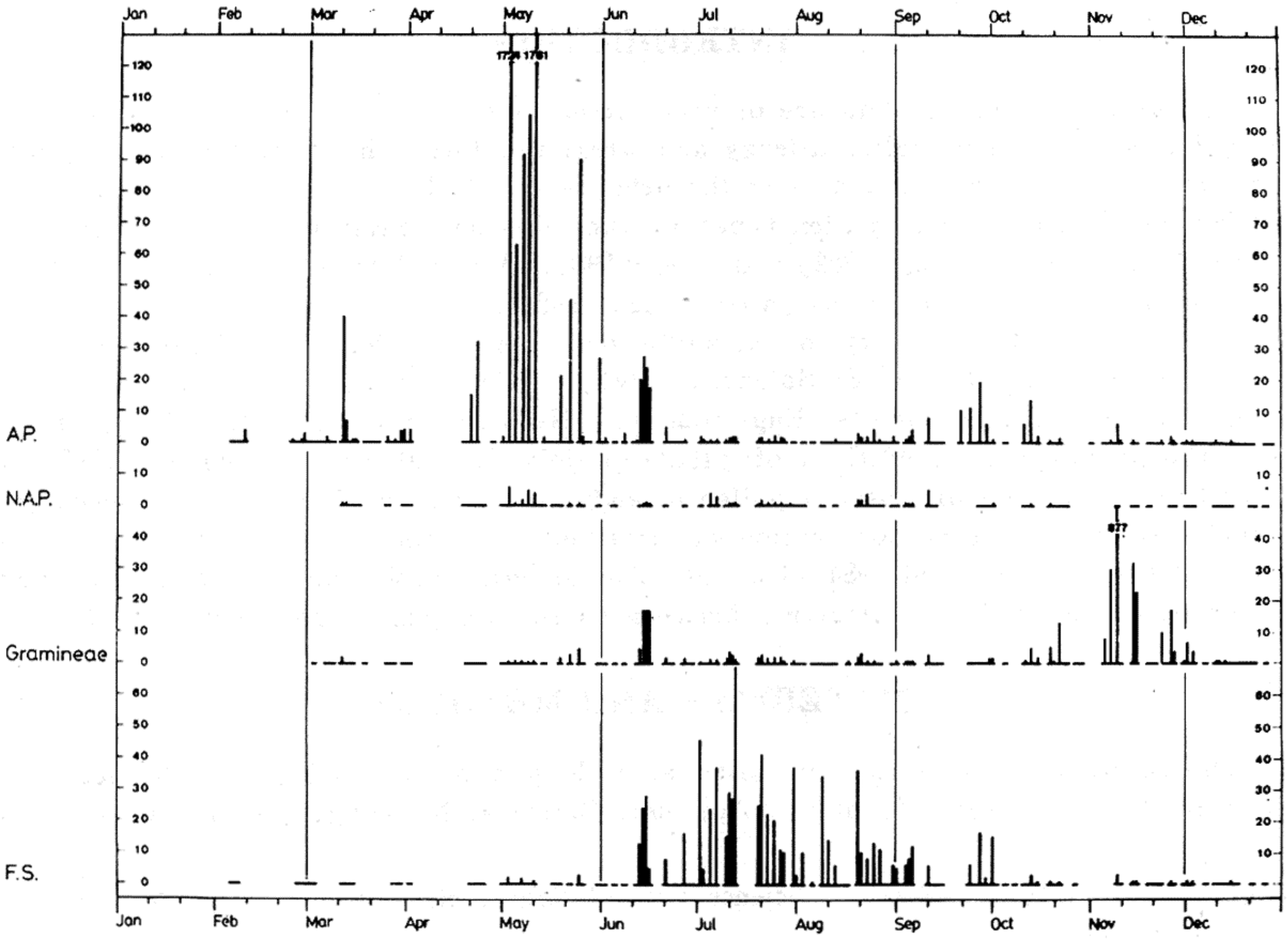

Fig. 1. Seasonal changes (grains·cm^{-2}·day^{-1}) in arboreal pollen (AP), non-arboreal pollen (NAP, exclusive Gramineae), Gramineae and fern spores (FS) at Nankang, Taipei in 1984.

Pollen and spore calendar

The daily pollen and spore counts of 1984 are presented in Fig. 2. These results will be compared with that of 1983 (Chen, 1984).

The beginning of flowering period is marked by the appearance of *Salix* pollen. Two species, namely *S. babylonica* and *S. warburgii*, were observed in the vicinity of the trapped sampler. The maximal pollen counts of this genus in 1983 occurred on January 25 with 122 grains·cm^{-2}·day^{-1}, whereas in 1984 it occurred on February 9 with 40 grains·cm^{-2}·day^{-1}. The suddently rised temperature in latter January, 1983 (Fig. 3) could be an important factor for flowering earlier in 1983 than in 1984. The determination of the exact flowering season of *Salix* by pollen sampling is usually difficult because the rain in this period may strongly influence the pollen dispersal in the atmosphere. In fact, the results did not meet well with the phenological observations.

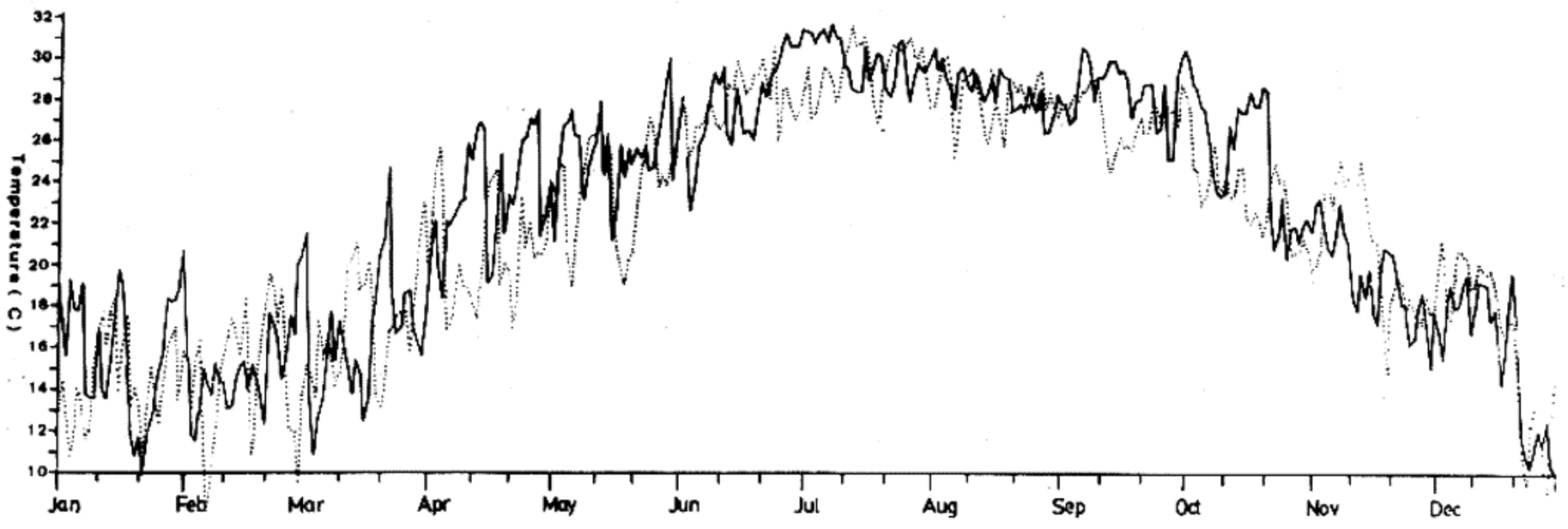

Fig. 3. The daily mean temperature in Taipei, Taiwan (the data are used from Central Weather Bureau, Republic of China) in 1983 and 1984. (——1983;·····1984)

The gymnosperm pollen appeared mainly in the spring. The dominant species are of Cupressaceae (*Cunninghamia*, *Juniperus* and *Thuja*), Pinaceae (*Abies*, *Picea*, *Pinus* and *Tsuga*) and Podocarpaceae (*Podocarpus*). Plants of *Cunninghamia*, *Juniperus* and *Thuja* are commonly cultivated in the city and suburban as ornamental plants. These plants have relatively high pollen production during the period of maximal anthesis, namely in March.

There are many species of *Pinus* in the circumference of the sampling site. The mass occurrence of this plant pollen is usually either in March (of species *P. luchuensis* and *P. massoniana*) or in May (of *P. taiwanensis*).

Tsuga plant is distributed only in the central ranges of Taiwan, at altitude about 2500 m high (Li, 1975). The presence of its poorly dispersable large-diameter pollen on sampling slides is considered to be due to the long-distance dispersal of pollen, as the case mentioned by many authors (for example Scott and van Zinderen Bakker Sr., 1985). The maximal daily count of 65 grains·cm^{-2}·day^{-1} was obtained on May 7, 1984. Pollen of *Abies* and *Picea* were occasionally captured in April and May. It is probably

also due to the long distance transport mechanism.

Trema is the dominant species in the aerial pollon spectrum. This genus has a relatively long anthesis period (from April to September) and the highest pollen counts of all taxa. Furthermore, the maximal daily count of this pollen type were as high as 1840 and 1629 grains·cm^{-2}·day^{-1} in May of 1983 and 1984, respectively. The fluctuation of the presence of *Trema* pollen is difficult to interpret because the histograms represent several species, most probably *T. orientalis* and *T. canabina*.

The pollen of entomophilous plant *Acacia confusa* were also presented in aerial pollen spectrum in June. This plant is widely distributed on the hillside neighbored the sampling site. It is presumed that the polyad pollen grains of this plant can be easily removed from anther by strong wind.

Grass pollen appeared in all season. However, two maximal pollen counts occurred in June and November. *Oryza sativa*, which is cultivated in the adjacent area, was the main contributor of grass pollen in June. The maximal pollen counts in this period were on June 21, 1983 and June 15, 1984 with 355 and 170 grains·cm^{-2}·day^{-1}, respectively. *Miscanthus*, which is widely distributed in the neighboring area, was the major contributor of grass pollen in November. The maximal pollen counts in this period were on November 9 in both years with 1691 and 887 grains·cm^{-2}·day^{-1}, respectively. Quantitatively, the total count of grass pollen was much higher in 1983 than in 1984. It is proposed, that such difference is resulted from the different relative humidity. (Fig.3) The relative humidity in November, 1983 and 1984 was 70% and 85%, respectively.

The main pollen contributors of weeds were various in different seasons. The dominant pollen species in the spring were Cyperaceae, *Sedum*, *Lysimachia* and *Plantago*, in the spring and summer *Chenopodium*, and in the Autumn *Artemisia*, *Ambrosia*, *Humulus* and some Cyperaceae.

There were many fern spores in the summer, from June to September. The main spore contributors were *Alsophila*, *Dicranopteris* and *Pteridium*. Some Pollen or spores might be trapped outside the flowering season. This is postulated by the Tauber hypothesis (1977) to be resulted from the refloating phenomenum of pollen grains or fern spores settled on twigs and leaves of vegetation surrounding the sampling site. A conspicuous example is *Alsophila*. In addition to the mature season of the spores from June to September, the spores of *Alsophila* could be captured in small amounts throughout the year.

Flowering period

Comparison of the results of 1983 and 1984 indicates that there is no significant variation in the number of pollen grains or fern spores as well as the time of flowering season of the most taxa, for example *Trema* (Fig. 4) and *Alsophila* (Fig. 5). Some taxa, such as *Mallotus japonicus* (Fig. 6), have an advance in flowering season in 1983. The onset of earlier flowering period could be evoked by warmer weather in 1983 (Fig. 3).

The *Alnus* pollen has been recognized as one of the species that may marked change in the dispersal (Spieksma, 1983). The results (Fig. 7) also show the quantitative variation in the autumn in either studied year. In order to elucidate such variation the observation of further more years is necessary.

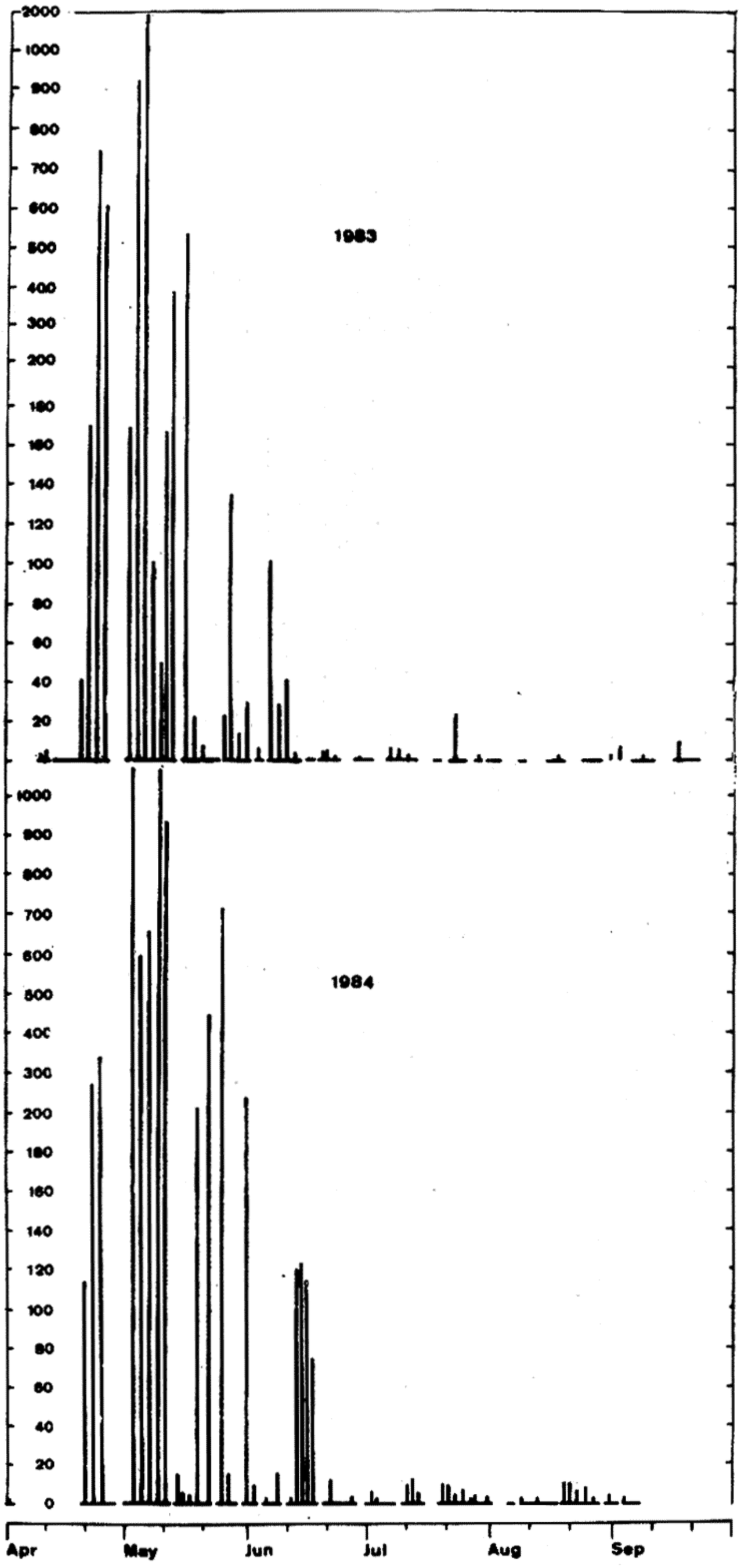

Fig. 4. Daily counts of airborne pollen (grains·cm^{-2}·day^{-1}) from *Trema* in two years; Nankang, Taipei.

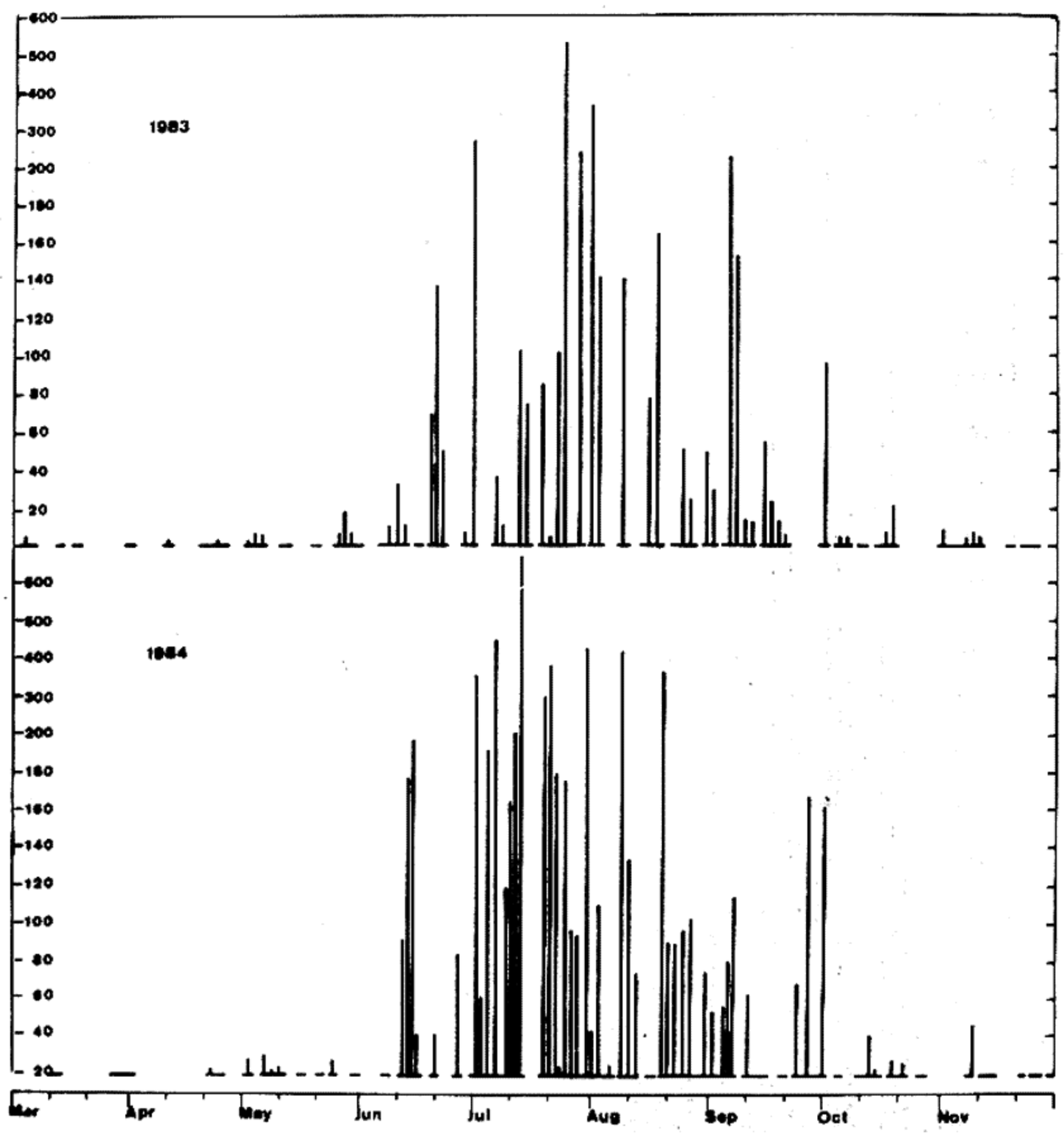

Fig. 5. Daily counts of airborne fern spores (grains·cm^{-2}·day^{-1}) from *Alsophila* in two years; Nankang, Taipei.

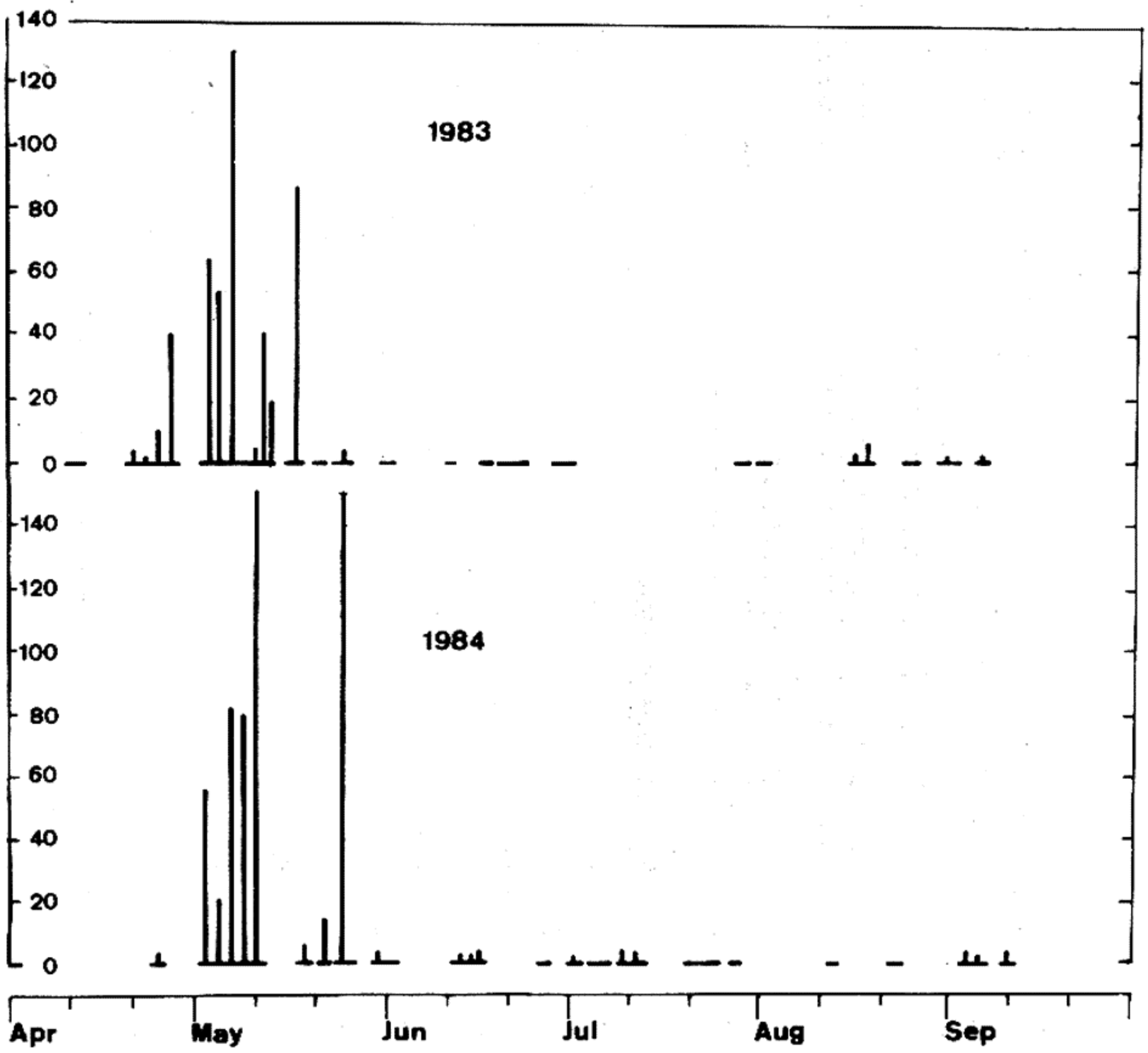

Fig. 6. Daily counts of airborne pollen (grains·cm^{-2}·day^{-1}) from *Mallotus japonicus* in two years; Nankang, Taipei.

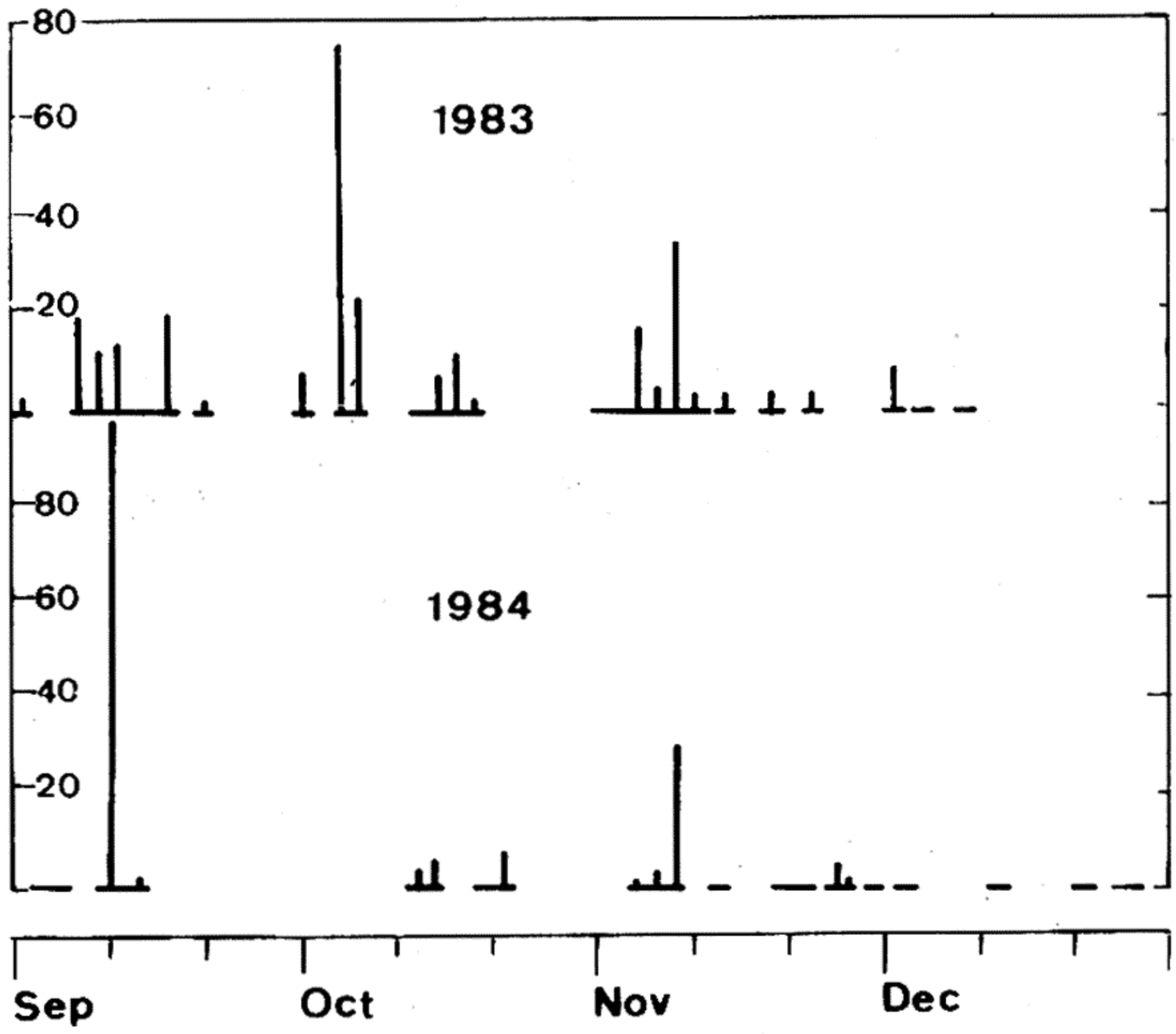

Fig. 7. Daily counts of airborne pollen (grains·cm^{-2}·day^{-1}) from *Alnus* in two years; Nankang, Taipei.

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臺北市南港區兩年間空中孢粉之研究

陳淑華　簡明志

摘　要

連續兩年（1983及1984）在南港收集空中孢粉，並加以鑒定及計數。由孢粉曆上比較這兩年出現的量及種類，發現大部分的種類相似，而在量上則有些許差異。另一方面，大部分種類的風媒花植物其開花期在1983年比1984在提早，此可能是由於1983年的氣溫比1984年稍高而導致的結果。