Ecologia. — $\beta$-diversity and phytogeographical patterns in the Ding Hu Shan Reserve (Guangdong – South China) forest vegetation. Nota di Erika Pignatti, Sandro Pignatti, Cheng-Chiu Huang, Guang-Qi Ding e Zhong-Liang Huang, presentata (*) dal Corrisp. S. Pignatti.

ABSTRACT. — Some statistical features of the forest vegetation in the Ding Hu Shan Biosphere Reserve have been investigated; $\beta$-diversity with the procedure proposed by Itow and centralisation using an original index based on chorotypes frequency. The primary forest is characterized by high values of diversity and elevate centralisation, whereas secondary vegetation presents lower figures.

KEY WORDS: Tropical forests; China; Diversity; Index of centralisation.

RiASSUNTO. — Diversità di tipo $\beta$ e caratteri fitogeografici nella riserva di Ding Hu Shan. Alcuni caratteri statistici della vegetazione forestale della Riserva della Biosfera di Ding Hu Shan nella Cina meridionale sono stati studiati: $\beta$-diversità mediante l’applicazione del metodo proposto da Itow e centralizzazione mediante un indice originale. La foresta primaria è caratterizzata da valori elevati di diversità e di centralizzazione, mentre la foresta secondaria presenta valori inferiori.

INTRODUCTION

The floristic structure of the forest vegetation of the Ding Hu Shan Biosphere Reserve has been described by Wang et al. (1982) and, on coenological basis, by Pignatti et al. (1990a) and its phytogeographical characters are discussed in a second Note. In this third (and last) contribution some statistical elaborations of the floristic and phytogeographical information are exposed.

The present investigation deals with the problem of $\beta$-diversity and the treatment of information deriving from the patterns of geographical distribution in the forest vegetation.

$\beta$-diversity has been little investigated in subaerial ecosystems and data on tropical vegetation are particularly scarce. Difficulties in recognizing the species occurring in the study areas and high complexity of the vegetation may explain this situation. A further difficulty is given by the fact, that a clear method to evaluate $\beta$-diversity in subaerial ecosystems is still lacking. Two different approaches have been proposed: the use of phytosociological material (e.g. Haeupler, 1982) or computations based on measures carried out in the field explicitly for this task. The first one has the advantage to dispose of a large set of available data but results are often erratic and reproducibility is scarce; the second one gives more accurate measures but comparisons are difficult because different Authors used different sampling methods. In the present study the second way was chosen, as an application of the measures carried out by different

(*) Nella seduta del 12 maggio 1990.
Authors in tropical and subtropical forests of East Asia and South America (for an overview cf. Itow, 1988).

**Materials and methods**

Measures of diversity have been carried out in the same places and on the same vegetation stands used for phytosociological relevés: the procedure requires much work and it was possible to investigate only 6 stands of the 10 considered in the phytosociological study of the forest. In each place ca. 100 stems of plant individuals growing along a transect of 5 m width and variable length and belonging to the tree layer have been investigated; only stems at least 5-6 m high and thicker than 5 cm have been taken into cosideration; the number of stems present in the transect was determined for all occurring species. This procedure measures the frequency of arboreal individuals of each species occurring in the forest: each species enters with the number of trees observed along the gradient. The diversity index was obtained applying the Shannon-Weaver formula on these numerical data (program in Basic by Laura Celesti).

The index of centralisation is inspired by the concepts proposed by Bertalanffy (1968). As a basis the results of the phytogeographical investigation of the Ding Hu Shan forest (Pignatti et al., 1990b) have been used. The geographical distribution of over 100 species occurring in the forest has been analyzed and the species divided into 4 groups:


Species of groups 1 and 2 are restricted to South China, eventually with few localities in the neighboring countries, whereas groups 3 and 4 include species with wider range, covering most of the Asiatic South East. For all relevés the number of species belonging to each of the 4 chorotype groups was calculated. The sum of groups 1 + 2 was divided by the sum of groups 3 + 4. This procedure is original and the result indicates in what measure the flora is centered on the investigated area or is influenced by long range distributions.

**Results and discussion**

Values of the Shannon-Weaver index calculated for 6 stands of the Ding Hu Shan forest are exposed in tab. I (see also fig. 1). These values are regularly increasing from the secondary to the primary forest: the lowest figure is in rel. (1), which is in an extreme pioneer condition, whereas the highest value in rel. (7) corresponds to the climax-like condition of the dense forest in the vicinity of the climatic observation tower.

The diversity index is a measure of disorder (high entropy) and low values correspond to a situation of order (negentropic condition). It depends on the number of elements considered and their relative frequency. It is low when elements are few and one of them is strongly dominant. Consequently the high values of the primary