A new approach to the Namib Region*

I: Phytogeographic subdivision

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Abstract

For a new approach to the phytogeography of the Namib region three sets of data are analyzed, (a) distribution data of ca. 1700 taxa, (b) habitat informations of a large number of taxa, collected in course of an extensive phytosociological survey, (c) distribution data of characteristic life form spectra and plant formations.

In this paper, as a first step of a comprehensive phytochorological analysis, phytochoria and their limits are proposed as derived from frequently observed areas of distribution, while a numerical analysis of the complete flora of these phytochoria is in preparation.

Considering with emphasis the flora of zonal habitats (Walter 1986), two major phytochorological units are recognized:

1. The Succulent Karoo Region (Greater Cape Flora)
   1.1 Namaqualand-Namib Domain
   1.2 Southern Karoo Domain
2. The Nama Karoo Region (Palaeotropis)
   2.1 Namaland Domain
   2.2 Eastern Karoo Domain
   2.3 Damaraland-Kaokoland Domain

Introduction

The wider Namib desert (Koch 1962) forms a relatively narrow arid belt along the western coast of southern Africa, with a north-south extension of nearly 2000 km from Angola to the Cape Province. General descriptions of climate and ecology of the hyperarid desert and its neighbouring regions have been provided by Werger (1978a, 1986) and Walter (1986).

Previous proposals for a geographical subdivision of flora and vegetation of the Namib region have been made under different theoretical ap-
approaches. Associated terms, including vegetation, phytochorology, plant formation, or biome are not always clearly defined. Reviews of earlier research are given by Werger (1978a) and Hilton-Taylor (1987) (on phytochorology) and by Rutherford and Westfall (1986) (on biomes).

In this paper the phytochorological subdivisions and maps proposed by Werger (1978a, 1986) and White (1983) will be used as starting points for the discussion, as these are the most introduced and widely accepted systems. Werger (1978a, 1986) basically distinguishes a Cape Floral Kingdom from a Kingdom of Palaeotropis. Karoo and Namib fall entirely into the Karoo-Namib Region of the Palaeotropis, thus separated from the Sudano-Zambezian Region in their northeastern neighbourhood. Inside the Karoo-Namib Region five subunits are distinguished: 1. Namib Domain, 2. Western Cape Domain, 3. Namaland Domain, including a (4.) Southern Kalahari Subdomain, 5. Karoo Domain. The latter will be referred to as the 'Eastern Karoo Domain' in this paper, in order to avoid confusion with e.g. the Tanqua Karoo and Little Karoo, which form part of the Western Cape Domain.

Following Werger the Namib proper falls completely into a separate Namib Domain, while the arid inland regions in eastern vicinity form part of the Namaland Domain. The arid regions in southern vicinity belong to the Western Cape Domain. This unit is described by Werger as being extremely rich in succulent species. Its area includes arid parts of the winter rainfall region from south of Alexanderbay to the Little Karoo.

White (1983) followed another approach when he mapped regional centres of endemism, separated from each other by transitional zones. He recognizes a Karoo-Namib regional centre of endemism, which is roughly identical with the Karoo-Namib region sensu Werger, but excludes the Southern Kalahari Subdomain (Werger 1978a). Five mapping units are distinguished inside the Karoo-Namib centre: 1. The Namib desert, 2. Bushy Karoo shrubland, 3. Succulent Karoo shrubland, 4. Dwarf Karoo shrubland, 5. Montane Grassy Karoo shrubland. But these units are hold together just by a certain structural similarity, not by floristic relationship.

Jürgens (1986, 1990a) recognized the Southern African Leaf Succulent Zone, a unit, being a plant formation of zonal importance and a phytochorological unit as well. The formation is defined on the predominance of leaf succulent chamaephytes in the vegetation, the phytochorological unit is defined on the areas of these and other (non-succulent) taxa and is mapped considerably larger if compared with the Western Cape Domain (Werger 1978a). A preliminary map of phytogeographic centres of endemism inside the Western Cape Domain has been published by Hilton-Taylor (1987), although no explanatory discussion of this map has been provided.

**Methods**

The phytogeographic interpretation of the Karoo-Namib Region is still incomplete and sometimes contradictory. Three main reasons may be responsible.

a. None of the previous phytogeographic subdivisions of the Namib has been based on a thorough study of the whole range of this vast arid region. Especially the lack of information from the southern Namib, where the transition between summer rainfall and winter rainfall takes place, has led to misinterpretations. Also the interpretation of herbarium records is problematic, as the region is not sufficiently collected in all its parts.

b. The phytogeographic information of the very high number of succulent taxa in the Karoo-Namib Region was under-represented in previous studies, mainly due to the immature stage of taxonomic research in many succulent groups. Sufficient information on e.g. Mesembryanthemaceae has become available just in very recent time, and has been used in this study. Taxa with succulent life forms may be a negligible element for phytochorology in other parts of the world. But in large parts of the Namib, succulents are predominant in flora and vegetation of zonal habitats and hence in this region also the distribution areas of suc-