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ECOLOGY AND CONSERVATION OF HIGH-ANDEAN *POLYLEPIS* FORESTS

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INTRODUCTION

Key words: Polylepis *forest, high Andes, conservation, human habitat alteration.*

The acute conservation plight of *Polylepis* forests has become apparent only in recent years. This genus of the family Rosaceae containing approximately 20 species (Kessler 1995a) is endemic to the high Andes of South America and has long puzzled biologists and geographers alike by its occurrence in isolated stands well above the closed timberline. This bizarre and extremely patchy, disjunct distribution has often been considered a natural phenomenon in response to microclimatically favorable spots embedded in a landscape otherwise characterized by a harsh climate unsuitable for tree growth (e.g., Weberbauer 1930, Koepcke 1961, Walter & Medina 1969, Simpson 1986). Although this viewpoint was challenged as early as the 1950s by Ellenberg, who proposed that human impacts such as burning, livestock grazing, and timber extraction since early post-glacial times have resulted in a relictual distribution of today's *Polylepis* forests, it took another 30 to 35 years until support for Ellenberg's (1958) hypothesis started to appear in the literature (e.g., Becker 1988, Fjeldså 1992, Lægaard 1992).

Detailed studies of *Polylepis* forests in Bolivia and Peru (Kessler & Driesch 1993; Kessler 1995a, b; Fjeldså & Kessler 1996) have shown that the genus occupies only a small fraction of its potential distribution in these two countries today (10 % and < 3 % respectively, locally even less) and that adverse human impacts continue to threaten the remaining forest fragments. In fact, so little *Polylepis* forest remains in the high Andes that it was not regarded as being of conservation concern and local peasants often believe that forest cannot grow there (Fjeldså & Kessler 1996). The conservation implications of such alarming findings are obvious: *Polylepis* forests are a vanishing ecosystem urgently in need of conservation action and ecological study.

In response to this crisis, in 1999 the Centro de Biodiversidad y Genética at the Universidad Mayor de San Simón in Cochabamba, Bolivia, with support from the Institutional University Cooperation (IUC) program of the Flemish Universities, initiated a multidisciplinary research project aimed primarily at determining the effects of anthropogenic habitat frag-

mentation on animal and plant populations of *Polylepis* forests. In order to improve and promote the collaboration and information exchange between institutions, organizations, and individuals involved in *Polylepis* research and conservation throughout the Andean countries, the "First International Conference on the Ecology and Conservation of *Polylepis* Forests" in Cochabamba, Bolivia, 28 August to 1 September 2000, was organized by the authors and collaborators from the Centro de Biodiversidad y Genética. Four symposia were held: Ornithology, Mammalogy, Botany, and Conservation and Open Topics.

About one third of the papers presented at the conference are included here. These 11 papers may be considered as a largely representative cross section of the four symposia held at the conference, although with a geographic bias towards Bolivia. In the introductory chapter, Michael Kessler reviews the available evidence on whether today's fragmented, disjunct distribution of *Polylepis* forests is caused by natural factors or human activities, and a clear conclusion is reached that the current distribution cannot be explained by the former. In the following two papers Jon Fjeldså discusses the consequences of anthropogenic forest destruction for faunal diversity in the high Andes, using the example of birds, and proposes key areas for conserving the avifauna of *Polylepis* forests. Sebastian K. Herzog, Rodrigo Soria A., Alejandra Troncoso J. & Erik Matthysen analyze the composition and structure of avian mixed-species flocks of a *Polylepis* forest in Bolivia, and Eric Yensen & Teresa Tarifa discuss the guild structure and diversity patterns of mammals in Bolivian *Polylepis* woodlands.

The series then shifts its focus towards botanical and agroforestry issues. Erika Fernández Terrazas & Bertil Ståhl analyze the diversity and phytogeography of the vascular flora of *Polylepis* forests in Cochabamba, followed by Isabell Hensen's account of anthropogenic influences on the vegetation of *Polylepis* forests in the same area. Pierre L. Ibisch evaluates a rural development project and its agroforestry activities in southwest Cochabamba, and Daniel Renison, Ana M. Cingolani & Duilio Schinner report on how to optimize the restoration of *Polylepis australis* forests through reforestation in Argentina. In the final two papers, José Capriles & Eliana Flores Bedregal turn to the economic, symbolic, and social importance of *Polylepis* in the Andean Altiplano during pre-Hispanic times, and Ingrid Loayza, Antonio Vilaseca, Daniel Lorenzo & Eduardo Dellacassa characterize the essential oils in the leaves of *Polylepis besseri*.

It is hoped that the papers presented in this series not only serve as a helpful source of information for all those involved in research on and conservation of *Polylepis* forests, but that they will also aid in convincing funding agencies, policy makers, and government officials that high-Andean *Polylepis* forests will need all of our attention *now* if they are to be saved from extinction.

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