

THE AZORES – A FORGOTTEN BIODIVERSITY HOTSPOT *

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SUMMARY

The Azores are a biodiversity hotspot, mostly forgotten by international biodiversity research. Concerning conservation priorities, the biodiversity there is not endangered by human pressure as, for example, on the Canary Islands, but there are certainly problems linked to biological invasions.

ZUSAMMENFASSUNG

Die Azoren sind ein "Biodiversitätshotspot", der jedoch von der internationalen Biodiversitätsforschung kaum beachtet wird. Diese hohe Biodiversität ist nicht durch menschliche Aktivitäten, wie beispielsweise auf den Kanaren, bedroht. Es gibt aber gewisse Probleme mit biologischen Invasionen.

RESUME

Les Azores sont un « hotspot » de biodiversité, mais les recherches internationales de biodiversité en ne tiennent pas compte. La biodiversité considérable des Azores n'est pas menacé par des pressions humaines, comme par exemple aux îles Canaries. Mais il y a certains problèmes de conservation du milieu dus aux phénomènes d'invasion biologique.

RESUMADO¹:

Os Açores são um lugar privilegiado para o estudo da biodiversidade, frequentemente esquecido pelas pesquisas internacionais. No que diz respeito às prioridades de conservação, a biodiversidade não está tão ameaçada pela pressão humana como, por exemplo, nas Ilhas Canárias; existem porém problemas específicos ligados às invasões biológicas.

* In honour of the 70th birthday of Prof. Dr. Christoph Jentsch. Remembering those days in Summer 1988, when during a student field trip to Portugal (Prof. Dr. Jentsch/Dr. Bender) in Lisboa – I had just obtained my "Vordiplom" – we had the common idea to do scientific research on the Azores. Eleven years later, then being a young assistant Professor of Physical Geography, I had the privilege to lead a geographical field trip of graduate students of the university of Mannheim to the western and central Azores (Flores, Faial and Pico) and to discover and explore the fantastic nature and landscapes of those islands.

¹ The Portuguese resumado was translated by Pierluigi Bragaglia (Flores/Azores/Portugal), to whom I express my gratitude for this service. Pierluigi Bragaglia lives in Faja Grande Flores. He is in the tourist business there, an expert in regional studies of the western group of the Azores (Flores & Corvo), and he has also published some books (BRAGAGLIA 1999; for more citations see NEFF & BASSING & FRANKENBERG 2001). In French Bragaglia would be described as a "véritable homme de lettres et de plume".

In Fig. 1 of their famous and much discussed paper MYERS et al.² regard the Canary Islands and Madeira as a biodiversity hotspot for conservation, but not so the rest of the Macaronesian biogeographical region, such as the Azores or the Cape Verde Islands. However, the quantitative and qualitative data presented in the present paper suggest that the whole Macaronesian biogeographical region³, i.e. including the Azores, the Cape Verde Islands, the Canary Islands and the Ilhas Selvagens, as defined by several authors^{4, 5, 6}, should be regarded as part of the Mediterranean hotspot in a larger sense - or else as a separate 26th region.

Based on two field trips with geography students to the western & central Azores (Flores, Faial and Pico) in September 1999 & 2000, I am able to add several observations about the biodiversity situation of that region⁷. The floristic richness of the western part, especially of Flores, has not yet been studied in much detail^{8, 9}. Except for the work of SJÖGREN^{10, 11}, most of the sources are in Portuguese¹², French¹³ or German¹⁴, some being extremely outdated¹⁵ or very hard to obtain¹⁶. Hence, the specific wealth of plants of the western part of the Azores appears to be still rather poorly known to the scientific world. A first overview of the sources mentioned and my observations during the recent field trips convince me that these islands could easily fulfil the criteria set by MYERS et al.^{17, 18}. For example, on Flores I found the highly endangered Macaronesian tree species *Dracaena draco* L. spreading into the mountains surrounding Faya Grande. GOES¹⁹ cited the same species on some cliffs in Porto das Lajes in Flores and further examples on Pico Island. These refugia of *D. draco* are more or less unknown and except for being mentioned by GOES, no scientific description of these sites could be found²⁰. This is very interesting from a conservation perspective, because the spontaneous form of this species seems to be disappearing from the Canary Islands. The same situation holds for the famous Mistério (recent lava streams with a very dense and mostly unstudied vegetation) on Faial and Pico. To my knowledge, not a single study, dealing with the regeneration processes there, has been carried out so far - perhaps this Mistério could also be an unexplored haven for species yet unknown. Obviously, further systematic field work is necessary to provide more clarifying answers.

Concerning conservation priorities, the situation in the Azores is not the same as on the Canary Islands or in the rest of the larger Mediterranean area. On the western islands, there is neither mass

² MYERS et al. (2000)

³ BRAMWELL, D. (1976)

⁴ HANSEN, A., SUNDING, P. (1985)

⁵ KUNKEL, G. (1993^a)

⁶ HOHENESTER, A., WELSS, W. (1993)

⁷ First results of these field trips, concerning landscape, environmental situation and tourism of the central and western Azores are published in: NEFF, C., BASSING, S., FRANKENBERG, P. (2001)

⁸ MONIZ (1999) in Volume 221, Azores, of the World Bibliographic Series, cites only nine references concerning the Flora of the Azores (ref. 206-215). BURAC ET AL. (1992) in the bibliography of major French scientific research in the Atlantic ocean & Atlantic islands even only just one reference.

⁹ FILZWIESER (2000: 28) writes that in Summer 1999 a group of botanists of the University of Washington made a two-month field investigation campaign in Flores to collect endemic plants for wider pharmaceuticals research. To my knowledge there has been no publication of results of this field campaign so far.

¹⁰ SJÖGREN, E. (1973)

¹¹ SJÖGREN, E. (1984)

¹² PALHINHA, R. T. (1966)

¹³ LE GRAND, G. (1986)

¹⁴ KÄMMER, F. (1982)

¹⁵ DROUET, H. (1866)

¹⁶ For example, despite greatest efforts, I could not obtain the PH. D. Thesis of DIAS (1997), a recent work dealing with the natural vegetation and ecology of the Azores.

¹⁷ MYERS et al. (2000)

¹⁸ FILZWIESER (2000: 28) writes that on Flcores about 40 endemic plant species could be found.

¹⁹ GOES, E. (1994)

²⁰ The tables in HANSEN & SUNDING (1985: 60) include *D. draco* on Flores and Corvo, but there is no ecological or floristic site description in this reference.

tourism, industrialisation or massive deforestation, nor modern intensive agriculture. Thus, it is likely that the *Laurisilva* and in some cases the *Fayal-Brezal* of the western Azores will have been preserved in a more natural state than their degraded counterparts²¹ on the Canary Islands. The main conservation problem of the Azores is a biological one – how to deal with neophytes, such as the invasive *Cryptomeria japonica* or *Pittosporum undulatum*, which are often endangering native endemic plant species. The problem is not a recent one. In 1973 Sjögren²² discussed the consequences of the spontaneous spread of alien plant species for the native vegetation. „It can be considered most important that the spontaneous spread of *Hydrangea*²³ will be carefully controlled and prevented. Otherwise the prospect for Azorean vegetation at altitudes below 1,000 m might be the dominance of *Pittosporum*²⁴, *Hydrangea* and *Hedychium*²⁵. It is true that this would be a dense, attractively flowering plant cover, but monotonous when watched more closely and, from a plant geographical point of view, completely foreign to the archipelago²⁶. The recent report by Filzwieser²⁷ shows that the situation has not improved at all: *Hedychium gardnerianum* Rosc., for example, is presently endangering gardens and orchards in Flores²⁸. Recently local government authorities began with the clearing of invading *Cryptomeria japonica* in Faial in order to protect the remaining sites of *Culcita macrocarpa* C. Presl., an endemic tree fern, at the bottom of the Cabeço Gordo (Faial). A new threat for the islands' biodiversity is the recent appearance of the Japanese Beetle (*Popillia japonica* Newman). It is suggested that *Popillia japonica* reached the Azores via the US Air Force Base in Terceira – perhaps in using food supply containers (vegetables) shipped to the Airbase. Local authorities have begun a massive campaign against *Popillia japonica* to preserve the remaining high diversity of the local vegetation – but it is not clear whether this campaign will be successful. Certainly there are risks of losing biodiversity and endemic species due to invasive species. But on the other hand these neophytes can enhance some interesting ecological processes. The incipient occupation of the volcanic ash fields of the Capelinhos Vulcano²⁹ (Faial) eruption of 1957³⁰ between Varadouro and Capelo by *Banksia integrifolia* is such a example. *Banksia integrifolia* is an Australian Protaceae particularly adapted to poor sand soils because of its very specialised biomass-intensive root system³¹. *Banksia integrifolia* was and still is being planted in windbreak hedges in Faial. The *Banksia* windbreak hedges between Horta and Varadouro have become an important characteristic of the cultural landscape of Faial. In the vegetation recover of the Capelinhos ash field between Varadouro and Capelo *Banksia integrifolia* plays a important role³², while natural recovery processes are dominated by *Myrica faya*, *Erica azorica*, *Pittosporum undulatum*, *Pittosporum tobira* and *Arundo donax*³³.

²¹ KUNKEL, G. (1993*)

²² Perhaps SJÖGREN (1973) was one of the first scientists to draw attention to the environmental risks linked to invasive species, but his observations did not gain attention outside the Azores. For the present state of the discussion concerning the environmental risks of invasive species see MOONEY & HOBBS (2000).

²³ *Hydrangea* = *Hdrangea macrophylla* (Thunb.) Ser.

²⁴ *Pittosporum* = *Pittosporum undulatum* Vent.

²⁵ *Hedychium* = *Hedychium gardnerianum* Rosc.

²⁶ SJÖGREN, E (1973: 431)

²⁷ FILZWIESER, H. (2000: 29)

²⁸ FILZWIESER, H. (2000: 29)

²⁹ For more Information of the Capelinhos Eruption see TAZIEFF (1958), FORJAZ (1997) and NEFF & BASSING & FRANKENBERG (2001)

³⁰ Due to a typographical error the date of the Capelinhos Eruption in Neff & Bassing & Frankenberg was mistakenly printed 1956 – the correct date is 27.9.1957 (TAZIEFF 1958:93)

³¹ For more details of the specialised root system of *Banksia* species see DIEM & SKENE (2001:40).

³² In the surroundings of Varadouro we have also observed that *Metrosideros* sp. plays a certain role in vegetation recover process of the volcanic ash fields.

³³ A vegetation map of the vegetation recover process of the Capelinhos Vulcano is actually in preparation by the Author. As there are still some informations missing for this vegetation map in preparation, a third field trip will start in September 2001.

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