

Floristic-phytosociological approach, potential natural vegetation, and survival of prejudice

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Abstract: Mucina, L. 2010. *Floristic-phytosociological approach, potential natural vegetation, and survival of prejudice. Lazaroa 31: 173-182 (2010).*

Carrión & Fernandez (2009; further C&F) in a recent commentary on a paper published in *Journal of Biogeography* criticised an obvious mismatch between the predictions about the patterns of potential natural vegetation (PNV) made by phytosociologists, and those underpinned by pollen data. C&F used this stage to take a broad sway on phytosociology in general (stopping only very short of denying its status of science), blaming power of tradition and influence of personal cult for ignoring scientific evidence. In my response I show that C&F have misinterpreted the concept of PNV, rendering their comparisons irrelevant. C&F obviously overslept the progress descriptive vegetation science made in recent decades, relegating their heavy criticism of phytosociology into the realm of prejudice.

Keywords: descriptive vegetation science, phytosociology, personality, potential natural vegetation, reconstructed natural vegetation, Spain, vegetation mapping

Resumen: Mucina, L. 2010. *Supervivencia de prejuicios en el concepto de vegetación potencial natural, y en las aproximaciones florística-fitosociológica. Lazaroa 31: 173-182 (2010).*

Carrión y Fernández (2009; C&F) en un comentario recientemente publicado en *Journal of Biogeography* han criticado la falta de relación entre las predicciones que sobre modelos de vegetación natural potencial (PNV) han hecho los fitosociólogos, y aquellas sostenidas por datos polínicos, utilizando este hecho para hacer una crítica amplia y general de la fitosociología, negándola, aunque de forma breve, el estatus de ciencia. Estos autores han argumentado el poder de la tradición y de la influencia del culto personal como principales responsables de una cierta falta de evidencia científica. En mi respuesta muestro que han malinterpretado el concepto de PNV, además han obviado el progreso que se ha realizado en las ciencias de la vegetación en las últimas décadas, cayendo sus críticas en meros prejuicios.

INTRODUCTION

CARRIÓN & FERNÁNDEZ (2009; further C&F) in a recent commentary consider the DE NASCIMENTO & *al.*'s (2009) paper to be "adding to a growing body of work questioning the floristic-phytosociological approach of traditional vegetation science". These authors found it upsetting that palynological evidence does not match (presumed) projections made by phytosociologists about the past vegetation patterns in Spain. Consequently they complained about survival of (in-

appropriate or inadequate?) phytosociological models of vegetation dynamics, neglecting scientific evidence because of the "issues of tradition and authority". C&R also called Spain "the last 'academic refuge' of floristic phytosociology". (sic!)

I do share some of their concern about the unduly profound influence of some eminent and mainly self-styled leading European personalities in phytosociology, and in particular those often more interested in building their 'personal cults' than the scientific discipline itself. I am also con-

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cerned about the dogmatic ways phytosociology (I fact vegetation ecology, ecology, if not science in general) had been practised in some countries in the (not so distant?) past. Some of the C&F's complaints and doom-says about floristic phytosociology are, however, based on poor understanding of crucial concepts of vegetation science, obviously fuelled by groundless expectations about the aims and abilities of the floristic-phytosociological (or rather "floristic-sociological" as known to vegetation scientists) approach to vegetation science. C&F apparently overslept the developments of the past couple of decades in vegetation science altogether.

I strongly feel that that leaving remarks and conclusions made by C&F on pages of *Journal of Biogeography* unchallenged would deny my *scientia amabilis*, and many hard-working vegetation scientists in general, a fair go. It is, also, an invitation to serious and fair engagement - an exchange of views on the ways vegetation science is done today and should be done in future. My intention to submit this short response note to *Journal of Biogeography* was discouraged by the journal's Editor-in-Chief, leaving me not many options except for offering my thoughts to a journal "closer to home". I believe that the Lazaroa's readership should be equally concerned about the C&F's remarks and observations as are those reading *Journal of Biogeography*.

My response will address two issues: (1) the misconception about the aims and abilities of "floristic-phytosociological approach" in dealing with vegetation patterns, and (2) wrong interpretation of the concept of *potential natural vegetation* (PNV).

WHAT PHYTOSOCIOLOGY DOES AND WHAT IT CANNOT DO?

Floristic-sociological Approach (BRAUN-BLANQUET, 1964; WESTHOFF & VAN DER MAAREL, 1978) or Braun-Blanquet Approach (VAN DER MAAREL, 1975) as is the preferred term to call "phytocoenology" or "phytosociology" is about 100+ years old - well seasoned, established and in many respect "traditional". (I do not know

any science which is not building on tradition.) It still does indulge too much (to my tastes) in antiques such as awkward nomenclature of plant communities and lack of methodical rigour in places. It has not been a stranger to offering space for emergence of towering personalities which might have served as great leaders and catalysers of progress in the past, unfortunately later turned too authoritative and stubborn just to become liability for progress and for broad social acceptance of vegetation science. Central European countries had their share of such authorities in the past, while some South European countries (such as Spain and Italy) are trying to put this past behind as well. Challenges facing Spanish scientific society have been are well publicised (e.g. NAVARRO & RIVERO, 2001; CIRDERO RIVERA, 2003) and it may well be that the curricula of some (maybe even many) Spanish universities still indulge in "traditional" authoritative (old-fashioned or even antique) ways of teaching and doing vegetation science. Still it is not difficult to see that Spanish vegetation science moved on - it has diversified and the face of Spanish descriptive vegetation science (some may prefer to call it phytosociology) is changing too. I was witness to this new winds first hand for instance at the 2007 *Jornadas de Fitosociología* in Madrid. By the way, in South Africa traditional phytosociology has been taught at the University of Pretoria (until recently), in Bloemfontein at the University of the Free State as well as on couple of small campuses in the north of the country. No much "damage" done there, I recon. Except perhaps for the fact that by classical phytosociology now taking back seat in South Africa, we might be loosing a lot of biodiversity expertise in the country and definitely get much less reliable vegetation field data. And without those any update of vegetation map of southern Africa (MUCINA & RUTHERFORD, 2006) would become a struggle.

C&F claim that there is a "growing body of work questioning the floristic-phytosociological approach of traditional vegetation science". I am afraid this statement would have to remain a hand-waving argument, since no source of such criticism was cited by C&F. In fact the Working

Group "European Vegetation Survey" (EVS; e.g. MUCINA & *al.*, 1993; PIGNATTI, 1995; RODWELL & *al.*, 2005) dealing undoubtedly with the most "traditional" topics of vegetation science is the most active scientific forum within the well-established International Association for Vegetation Science. The core business of EVS is the description and interpretation on vegetation patterns in Europe, acting as catalyser of unification of conceptual and terminological tools over now united Europe, and serving as forum for development of a new platform for descriptive vegetation science and theoretical vegetation science. The vegetation survey, description, and mapping have regained firm ground in science and society - many national vegetation surveys have been initiated and finalised (see MUCINA, 2000 for a survey), compatible national databases have been built and new borderline projects linking vegetation science with macroecology, nature conservation, climatology, palaeoecology have been initiated. The achievements in the field of vegetation mapping are difficult to overlook as they becoming rapidly citation classics (e.g. MUCINA & RUTHERFORD, 2006). Because of its versatility, solid methodical background and close relationship with applied aspects of nature management and conservation, vegetation survey and mapping set firmly foot in countries using other traditionally tools to describe vegetation such as in Russia and Ukraine (in both countries new phytosociological journals were founded), United Kingdom (now fully integrated within EVS), China, Korea, Australia. Interestingly, phytosociology seem to have regained respect in United Kingdom (RODWELL, 1991-2000), northern Europe (LAWESSON & *al.*, 1997), and United States of America (JENNINGS & *al.*, 2009), traditionally opposing classical floristic-sociological approach. That is not a face of science which would be seeking "refuges" (C&F, p. 2203) or fearing extinction.

Floristic-sociological approach is very powerful in handling static vegetation patterns. It is a great tool (albeit not the only one) in capturing and describing variability of vegetation. However the traditional sampling, data-handling and interpretational tools used by phytosociology are

very poorly suited to capture vegetation dynamics and describe and explain vegetation palaeo-patterns. (I would argue that equally poorly performs palynology in regions devoid of sediments able to preserve pollen.) In the deep past the ideas of directional and deterministic development and climax (a strive for equilibrium) - all concepts usually associated with legendary Frederick Clements, although we might be blaming him for too much- have pervaded thinking in science of vegetation dynamics (syndynamics as called by classical phytosociological texts). Phytosociologists took the liberty, often without having hard data in hands and used to jump often to conclusions using purely speculative means. Indeed older phytosociological literature abounds with magic plexus diagrams showing how one community would be replace the other, usually in order to achieve climax of some sort. Obviously speculations are often very inspiring, but testing well-defined hypotheses and collecting hard data is always better. Sometimes phytosociologists obviously have been engaging in a sort of informal predictive and retrospective modelling, however often without having documented properly the parameters, procedures, conditions and admitting caveats. Here I share the frustration of C&F with the failure of this approach to match solid palaeo-ecological evidence. Still, there is another source of misunderstanding which might put the C&F's frustrations into a perspective: the failure of C&F to recognize what the concepts of PNV (and related) were meant to address.

POTENTIAL NATURAL VEGETATION VERSUS RECONSTRUCTED NATURAL VEGETATION

I am not questioning C&R analysis of the discrepancies and fits between the vegetation patterns "predicted" ("reconstructed" rather) by PNV and those reconstructed using pollen data for mid-Holocene. Herewith C&F provided very exciting food for deep thought. A source of *my* frustration is that C&F got it wrong in the conceptual issues: The concept of PNV was not ex-

explicitly coined to serve reconstruction of vegetation patterns in "pre-human" times, hence before serious agricultural and silvicultural land-use changed face of the modern vegetation landscapes. Neither was in fact concept of *reconstructed natural vegetation* (RNV; HEJNÝ, 1963; NEUHÄUSL, 1963; MORAVEC, 1998; see also Table 1) coined to do so. I argue that neither of these two concepts was meant to reconstruct deep-time vegetation patterns. Mid-Holocene was a long time ago and much happened to the vegetation of the Iberian Peninsula, Balearic Islands, Canary Islands, or Europe for that matter, ever since. The vegetation changes since mid-Holocene were driven both by the changes of climate (as C&F also reluctantly admit, and perhaps also slightly underestimate) and by intensive human use of the European landscapes (here our opinions cannot concur more).

The concept of PNV is indeed a traditional tool of descriptive vegetation science, and vegetation mapping in particular. In its original shape TÜXEN (1956) suggested that PNV is an "*imagined natural state of vegetation ... that could be outlined for the present time or for a certain earlier period, if human influence on vegetation was removed - the remaining conditions of life presently existing or having existed during those periods still being valid - and the natural vegetation was imagined as switched into the new balance within a split second ... to exclude the possible effects of climatic changes and the consequences thereof*" (the English translation follows HÄRDTLE, 1995).

The original as well as later modifications of the PNV concept do not evoke pre-human (pre agriculture?) times, but speculates about how would vegetation look like *if the influence of man was removed*. The sister concept of RNV is very similar to PNV (see MORAVEC, 1998 for detailed comparative analysis of both) as it attempt to reconstruct vegetation without man (or perhaps before human influence became landscape-shaping factor), but does so by using causal/correlative link between the *current environment*, hence basing its *raison d'être* on the basic paradigm of vegetation science - *vegetation is a reflection (or indicator) of environmental conditions*. (I am

well aware of the fact that this paradigm should undergo serious scrutiny in attempt to incorporate the influence of history and evolutionary assembly rules, or maybe should be trashed in favour of a new paradigm altogether.)

The critical assessment of the original PNV concept by both vegetation theoreticians and its use by practical vegetation mappers (for the evolution of the PNV and related mapping concepts see Table 1) revealed clearly that the weak points. Some of those had been dealt with (e.g. KOWARIK, 1987; HÄRDTLE, 1995; LEUSCHNER, 1997), some remain. In any case, the original applications of PNV concept which served vegetation mapping were resting on many (often problematic) assumptions on, directional and non-probabilistic vegetation-dynamics pathways. This assumption-driven approach is luckily loosing its ground. Vegetation mapping methodology moved on, leaning heavily on technology-driven progress in use of satellite imagery, GIS technology, and formalised predictive modelling (see FRANKLIN, 1995 for a review, and BRZEZIECKI & *al.*, 1993; FISCHER, 1994; TICHÝ, 1999; LIU & *al.*, 2009 for some important case studies). The concepts of PNV and RNV did play their important historical roles in getting where we are in vegetation mapping today.

In summary, C&F's criticism of phytosociology (descriptive vegetation science) does not appear to have been well informed. This is hardly acceptable nowadays when information is readily available on push of a button, and when cross-disciplinary cooperation is the norm. Perhaps looking over the fence to check what neighbours are doing would not do any harm - it might prevent embarrassing unduly indiscriminative and ill-informed statements as those offered by C&F in their *Journal of Biogeography* paper. Well, they are at least in good company (see MOORE, 1990 and response by MORAVEC, 1992). Old habits and prejudice obviously die hard.

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Table 1
Historical highlights of the conceptual, methodological and terminological development, and applications of the Potential Natural Vegetation and related concepts.

Year	Source	Concept	Note
1956	Tüxen (1956)	PNV	original definition of Potential Natural Vegetation : " <i>imagined natural state of vegetation ... that could be outlined for the present time or for a certain earlier period, if human influence on vegetation was removed - the remaining conditions of life presently existing or having existed during those periods still being valid - and the natural vegetation was imagined as switched into the new balance within a split second ... to exclude the possible effects of climatic changes and the consequences thereof</i> " (translation by Härdtle 1995)
1963	Tüxen (1963)	PNV	review on types of vegetation maps
1963	Neuhäusl (1963)	RNV	original definition of Reconstructed Natural Vegetation : "reconstruction of natural vegetation corresponding to the present climate"; see also Hejný (1963)
1964	Küchler (1964)	PNV	application of PNV: vegetation map of conterminous USA
1966	Trautmann (1966)	PNV	first application of PNV: vegetation map of West Germany (mapping sheet Minden); for the list of other maps of this series see Schröder (1984) and Bohn et al. (2003)
1967	Küchler (1967)	PNV	brief textbook account of the concept of PNV and mapping applications
1968	Mikyška et al. (1968)	RNV	modification of the concept of RNV: "reconstruction considers the past state of the natural vegetation before its deterioration or even destruction by man"; first application of RNV: vegetation map of Czechoslovakia (the Czech Lands; today: Czech Republic)
1968	Zólyomi (1968)	RNV	application of RNV: vegetation map of Hungary
1971	Wagner (1971)	PNV	application of PNV: vegetation map of Austria; see also Wagner (1989)
1975	Neuhäusl (1975)	PNV	theoretical discussion; use of PNV in mapping of vegetation of "cultural landscapes" (= landscapes transformed under influence of man)
1975-1989	Miyawaki et al. (1975-1989)	PNV	monumental series of maps of PNV of Japan; see also Miyawaki & Fujiwara (1988)
1977	Kowarik (1977)	PNV	crucial critical analysis of the PNV concept and suggestions for more operational definition of PNV
1978	Stumpel & Kalkhoven (1978)	PNV	addition of constrictions on the original PNV concept, concerning the period of development and the human influence
1984	Neuhäusl (1984)	ecPNV	introduction of Environment-Consistent PNV (in German: " umweltgemässe natürliche Vegetation "), defined as " <i>vegetation which develops if all direct and indirect (by house animals etc.) interventions would cease</i> "
1984	Matuszkiewicz (1984)	PNV	application of PNV: vegetation map of Poland; see also Fałiński (1971)
1985	Quézel & Barbero (1985)	PNV	application of PNV: vegetation map of East Mediterranean
1986	Michalko et al. (1986)	RNV	application of RNV: vegetation map of Czechoslovakia (part: Slovakia)
1986	Jovanović et al. (1986)	PVN	application of PNV: vegetation map of Yugoslavia
1987	Schiechtel (1987)	PNV	application of PNV: vegetation map of Tyrol (Austria)
1988	Kalkhoven & van der Werf (1988)	PNV	review of PNV mapping in major mapping textbook (Küchler & Zonneveld 1988)
1989	Fukarek et al. (1989)	PNV	application of PNV: vegetation map of Yugoslavia; see also Fukarek (1980)

1990	Fischer (1990)	PNV	methodical account of modelling methodology of formalised mapping of PNV
1991	Moravec et al. (1991)	RNV	application of RNV: vegetation map of Prague (the the capital city of Czech Republic)
1992	Martínez-Tabernet et al. (1992)	PNV	interesting and rare application fo the PNV methodology to map submerged (azonal) vegetation
1993	Ivan et al. (1993)	PNV	application of PNV: vegetation map of Romania
1993	Brzeziecki et al. (1993)	PNV	application of formalised modelling approach to simulate map of potential nature forest vegetation of Switzerland
1993	Pedrotti (1993)	PNV	application of PNV: vegetation map of Italy
1994	Dierschke (1994, pp. 446, 558)	PNV	brief textbook account of PNV mapping procedures
1995	Box (1995b)	PDV	introduction of concept of Potential Dominant Vegetation : "the potential dominant vegetation is essentially a somewhat generalized version of the potential natural vegetation of an area and is predicted from relatively conservative climatic envelopes which represent the 'ecological limits' of the vegetation types rather than the physiological limits of the dominant taxa"; see also Box (1995a) and Box & Fujiwara (2005)
1995	Cha (1995)	PNV	link between PNV and predictive modelling using climatic data (Kira scheme)
1995	Franklin (1995)	PNV	review of methods and progress in predictive vegetation mapping
1995	Härdlte (1995)	PNV	crucial critical analysis of the PNV concept (especially from the point of view of past application of PNV) and suggested modifications
1996	Lindacher (1996)	PNV	critical account of the mapping methodology of PNV
1997	Leuschner (1997)	PNV	review of the concept of PNV, weaknesses and perspectives
1997	Neuhäuslová et al. (1997)	PNV	application of PNV: vegetation map of Czech Republic (Czech version)
1998	Zerbe (1998)	PNV	theoretical discussion about validity and applicability of the PNV concept in landscape planning and nature conservation
1998	Miyawaki (1998)	PNV	discussion of use of the concept of PNV in restoration ecology; see also Miyawaki (2004)
1998	Moravec (1998)	PNV, RNV	theoretical discussion of the concepts
1998	Chytrý (1998)	PRV	introduction of the concept of Potential Replacement Vegetation defined as: "an abstract and hypothetical vegetation which is in balance with climatic and soil factors currently affecting a given habitat, with environmental factors influencing the habitat from outside such as air pollution, and with an abstract anthropogenic influence (management) of given type, frequency and intensity"
1999	Tichý (1999)	PNV	use of predictive modelling approach to construct the map of PNV
1999	Zimmermann & Kienast (1999)	PNV	use of predictive modelling approach to construct the map of PNV
2000	Ricotta et al. (2000)	PNV	using PNV to assess the diversity of landscapes
2001	Neuhäuslová et al. (2001)	PNV	application of PNV: vegetation map of Czech Republic (English version)
2001	Vuerich et al. (2001)	PNV	use of PNV methodology to map also azonal vegetation
2002	Ricotta et al. (2002)	PNV	theoretical analysis of relationships between PNV and neutral landscape models
2002	Vázquez et al. (2002)	PNV	application of PNV concept to compare fire regime patterns
2002	Schmidt et al. (2002)	PNV	vegetation map of PNV of Saxony (Germany)
2003	Bohn et al. (2003)	PNV	application of PNV: vegetation map of Europe; see also Neuhäusl (1991)

2004	Pedrotti (2004)	PNV	detailed discussion of PNV in a mapping textbook
2006	Cross (2006)	PNV	application of PNV: vegetation map of Ireland; see also Cross (1998)
2007	Franke & Köstner (2007)	PNV	study on influence of climate change of PNV of Central Germany
2009	Liu et al. (2009)	PNV	application of PNV using modern modelling tools to map vegetation of NE China; see also Liu et al. (2004)

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