

Historical Floras: addressing their genesis in order to be viewed from a modern-day perspective. A case study from Northern Italy

Rendiconti Lincei. Scienze Fisiche e Naturali

Fabrizio Buldrini¹, Alessandro Alessandrini², Enrico Muzzi³, Patrik Krebs⁴, Marco Conedera⁴, Giovanna Pezzi¹

¹ BIOME Lab – Department of Biological, Geological, and Environmental Sciences, Alma Mater Studiorum Università di Bologna. Via Irnerio 42, 40126 Bologna, Italy

² Independent researcher (ales.alessandrini@gmail.com)

³ Department of Agricultural and Food Sciences, Alma Mater Studiorum Università di Bologna. Viale G. Fanin 44, 40127 Bologna, Italy

⁴ Swiss Federal Institute for Forest, Snow and Landscape Research WSL. Insubric Ecosystems Group, a Ramèl 18, CH-6593 Cadenazzo, Switzerland

fabrizio.buldrini@unibo.it

Timeline of the principal changes of the features of Floras from the Renaissance onwards (examples are reported). A: scenario on a European level; B: scenario on an Italian level. The dotted line in part A indicates that it is difficult to establish a threshold after which the use of dichotomous keys became the standard in all Floras published recently: this process took place gradually over the first half of the XIX century, with the exception of the *Flore Française*, which appeared in 1778.

It is useful to remember that, at least on the European level, the very first examples of dichotomous keys applied to the knowledge of the plant world are those published by Adam Zalužanský in 1592 in his *Methodi herbariae libri tres*, even if limited to very few critical cases (*Hyacinthus*, *Narcissus*, *Lilium*, *Atriplex*, *Rumex* etc.) and containing only a handful of species for each case, and overall the *Tabulae Phytosophicae* by Federico Cesi, dated 1617-1630, which obviously did not intend to illustrate the flora of a certain area, but were rather an attempt at analysing and classifying the diversity of morpho-functional adaptations of plants (Pignatti and Cipriani 2010; Griffing 2011). In the scheme here presented we tried to describe only the «mainstream» of the evolution of Floras throughout the centuries: bearing in mind that every period has its own precursors (Cesi for the dichotomous keys, 150 years later used by Lamarck, Lamarck for many analytical Floras of the subsequent century, Ray for attempting to treat all the species growing in a certain area by ordering them systematically, etc.) and further gaining of knowledge never progresses in a continuous and homogeneous way. Scientific discoveries take place at a certain moment in time, but their implications can be understood even much later on and not necessarily in the same country. The cultural heritage of the Renaissance and its geographical exploration surely contributed in shifting the interest in plants from the medical-pharmaceutical sphere to a more strictly botanical one and furthermore, this process contributed to the development of floristic studies (i.e. the plant in itself, with its particular features plus its environmental and geographical context, not the plant as a source of true or presumed therapeutic virtues – see e.g. Managlia et al. 2012).

To mark the birth of a systematic order that could be more or less commonly adopted in Floras we chose the year 1753, since the systematic studies by Linnaeus are recognized to be the most famous contribution of that century to taxonomic science, even if, in modern age, the first attempts to classify plant species in a clear and coherent scheme date back to Andrea Cesalpino, in the second half of XVI century (see e.g., Stace 1989 and von Engelhardt 2012 for further details). It is interesting to note that Linnaeus' sexual system served both as a kind of classification and a tool used to determine the major groups of plants. This system (or at least part of it, particularly the classes, based on stamen number and arrangement) was widely used for a long time, in some cases as late as the 1990s (Svensk flora by Krok and Almquist, 26th ed.), and also in other countries (e.g. in Rostrup's Flora). With the exception of the main key, dichotomous keys were gradually replacing polytomous ones. The fact that Linnaeus' system was kept for so long may partly be due to simple admiration for Linnaeus himself, but also the distinctiveness of the alternatives and the ease of observation (e.g. either 2 or 3 stamens, no third possibilities) made his scheme attractive. All this may have delayed the introduction of strictly dichotomous keys.

It is good to remind that, up to the beginning of XVIII century, the term «flora» referred to both the spontaneous plants of a certain area and plants cultivated in private gardens and parks, therefore the Floras of the time could be dedicated to only one or both the aforementioned categories of plant species (see also Berrens 2019).

We precise that in this scheme we followed Stace's (1989) ideas, according to which Ray's *Synopsis Methodica Stirpium Britannicarum* can be regarded as the very first English Flora, and probably the first one where the term is given its current meaning (species ordered systematically, aiming for the completeness of the species list); but other scholars (e.g. Frodin 2002) and Augustin-Pyramus de Candolle himself considered that the first modern Flora is Linnaeus' *Flora Lapponica* (1737).

Berrens D (2019) The Meaning of *Flora*. *Humanistica Lovaniensia* 68(1):237–249

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Griffing LR (2011) Who invented the dichotomous key? Richard Waller's watercolors of the herbs of Britain. *Am J Bot* 98(12):1911-1923

Managlia A, Mossetti U, Dröscher A (2012) Seeds of Knowledge. *Tractrix: Yearbook for the History of Science, Medicine, Technology and Mathematics* 5:1–10

Rostrup E (1860) *Vejledning i den danske Flora: En populær Anvisning til at lære at kjende de danske Planter*. P.G. Philipsen forlag, Kjöbenhavn

Pignatti S, Cipriani M (2010) The diversity of plants in a text from the seventeenth century. *Rend Fis Acc Lincei* 21(4):343–350

Stace CA (1989) *Plant Taxonomy and Biosystematics*. Second Edition. Edward Arnold, London

von Engelhardt D (2012) Luca Ghini (1490–1556), il padre fondatore della botanica moderna nel contesto dei rapporti scientifici europei del sedicesimo secolo. *Ann Mus Civ Rovereto Sez Arch St Sc Nat* 27:227–246

A

**1753: *Species Plantarum*
(C. Linnaeus)**

Purely descriptive works, often presented as an illustrated herbarium, natural history essay or travel report of a scientific excursion; only the species useful for man are reported

Purely descriptive works, presented as a catalogue of the species observed in the territory, often with no distinction between native and cultivated ones; first attempts of systematic order; only the species useful for man are reported

Descriptive works, presented as a catalogue of the species observed in the territory studied, ordered systematically, with distinction of native and cultivated ones; completeness is sought for the list of the species reported

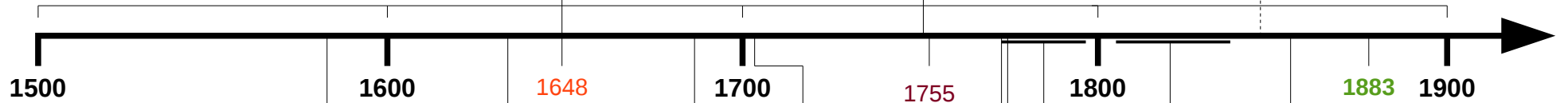
Analytical works, provided with dichotomous keys, presented as a catalogue of the species observed in the territory studied, ordered systematically, with distinction of native and cultivated ones, paying attention to reach the species number expected for that territory

Scientific interest in plants shifts from their pharmacological virtues to the plants themselves, independently from their utility for man

Botanic gardens become centres for a systematic study of plants and open to the public. Birth of the first scientific academies. In 1694, Tournefort publishes his classification system

Adoption of the binomial nomenclature and of classification schemes rationalized, no longer descriptive. Species are still intended as immutable in space and time

Birth of modern biology, first phytogeographical and genetic studies. Evolutionism is progressively accepted: transition from natural to phylogenetic classifications



1500

1600

1700

1755

1800

1883

1900

1583

Iusti Lipsi de hoc libro eulogium
(J. Lipsius, in C. Clusius – *Rariorum aliquot stirpium per Pannoniam et Austriam observatarum historia*)

First work where *flora* is used to indicate the plants growing spontaneously in a certain territory

1638

Speculum Botanicum
(J. Franckenius)

1648

Flora Danica
(S. Paulli)

First work in whose title *flora* is intended in the current sense (descriptive catalogue of the plants growing in a given area)

1690

Synopsis Methodica Stirpium Britannicarum
(J. Ray)

First real Flora in the modern sense of the term, where the species are organised in a systematic order and completeness is sought for the list of the species reported

1703

Flora Prussica
(J. Loesel)

1776

Flora Parisiensis
(P. Buillard)

1755

Flora Suecica
(C. Linnaeus)

1777-1798

Flora Londinensis
(W. Curtis)

1778

Flore Française
(J.-B. De Lamarck)

First Flora equipped with dichotomous keys

1860

Vejledning i den danske Flora
(E. Rostrup)

1806-1840

Flora Graeca
(J. Sibthorp et al.)

Flora della provincia di Bologna
(G. Cocconi)

B

1753: *Species Plantarum* (C. Linnaeus)

