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**67** part 1



## Historical botanical collections in Latin America: the Italian contribution in the XIX century\*

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*Collezioni botaniche storiche in America Latina: il contributo italiano nel XIX secolo* — Le collezioni botaniche storiche rappresentano un importante strumento nella ricerca botanica (nomenclatura, tassonomia e floristica), e nella comprensione della biodiversità passata e attuale. Il presente contributo considera cinque casi di studio con l'obiettivo di evidenziare il ruolo delle collezioni storiche botaniche realizzate nell'America Latina da botanici italiani nel secolo XIX, oltre alla loro insostituibile funzione negli studi attuali di Tassonomia Vegetale. Vengono inoltre trattati altri contributori italiani con le relative collezioni neotropicali da essi studiate.

**Key words:** Biodiversity, Italian Historical Botanical Collections, Latin American Flora, Taxonomy.

During the last decades we have seen a profound change in Botany with the introduction of new techniques of investigation such as molecular phylogenetic approaches which presented new goals in Plant Taxonomy. Furthermore, new collecting programs have provided more information and field data concerning plant biodiversity.

Historical botanical collections could be considered a crucial part this new scenery (Fig. 1). Many initiatives have been undertaken since the beginning of the XXI century, such as the African Plants Initiative (API) and Latin American Plants Initiative (LAPI) projects and Journal Storage (JSTOR) multimedia contributions focused on the digitalization of

type specimens housed in the most important herbaria of the world. Repatriation initiatives have been also done involving many important Institutions in Europe and North America. These initiatives are important for Plant Taxonomy and Nomenclature, but the study and publication of historical floristic data are still missing, especially for Tropical areas. A first approach to this problem has been done during the 60° Congresso de Botanica held in Feira de Santana (Brazil) in July 2009 (Baldini, 2009) during the Symposium on the Grass Taxonomy in the Neotropics, and later at 4th Flora of Ethiopia and Eritrea Symposium held in Uppsala (Sweden) in November 2009 (Baldini, 2011).

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\* This contribution is from the Symposium held at the X Congress of the Latin American Botanical Association (ALB) between 4th and 10th October 2010 in La Serena (Chile) that covered different aspects of the contribution of the Historical Botanical Collections to the knowledge of the Latin American Flora. Centro Studi Erbario Tropicale, Università di Firenze - Pubbl. n. 123.

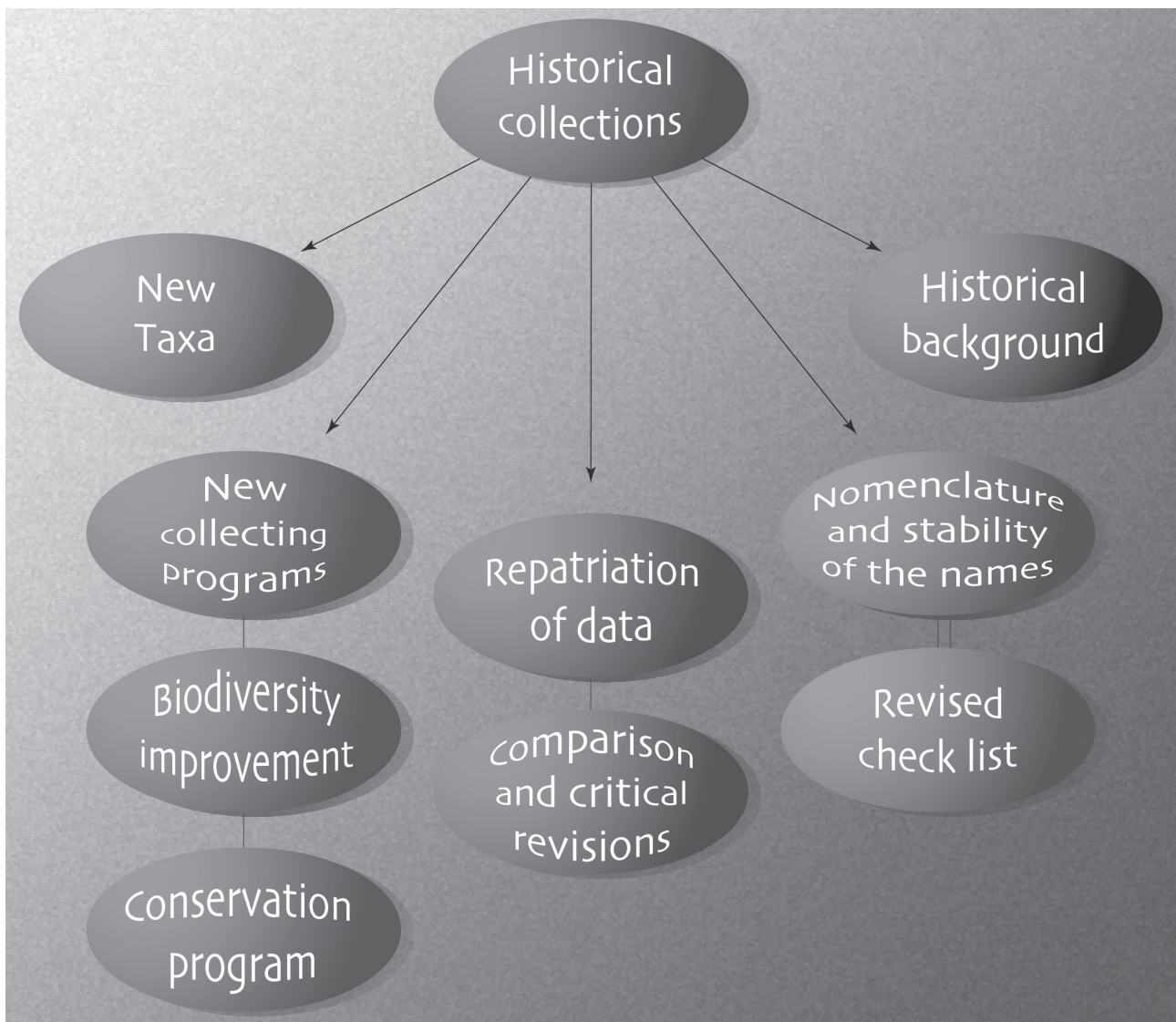


Fig. 1 – Outcomes of historical botanical collections in the biodiversity age (From BALDINI, 2011).

Historical Collections discussed here represent five cases of study on historical botanical collections in Latin America that show how an updated historical view of Botany can improve the development of Plant Science in Tropical areas of the World.

Acronyms of the herbaria cited in the present paper follow Holmgren et al. (1990).

### The Italian contribution

During the Eighteenth and Nineteenth Century several expeditions to Latin America were undertaken by European naturalists (Turrill, 1920; Pennell, 1945; Isenburg, 1989; Ewan, 1991); in Italy the

scientific interest for these regions developed mainly in the Nineteenth Century, whereas Africa and Asia were the main targets in the Twentieth Century (Pichi Sermolli, 1988a, 1988b) (Fig. 2).

The journeys made between 1818 and 1839 in South America and the Caribbean by Giuseppe Rad-di, Carlo Bertero, Giovanni Casaretto, Luigi Sodiro e Luigi Buscalioni resulted in botanical collections that today provide us the opportunity to compare past floristic and taxonomic sources of information with present day regional checklists from areas of high plant diversity.

Many historical collections in Latin America were made in areas of present endangered biodiversity and this is true for the past Italian contribution.

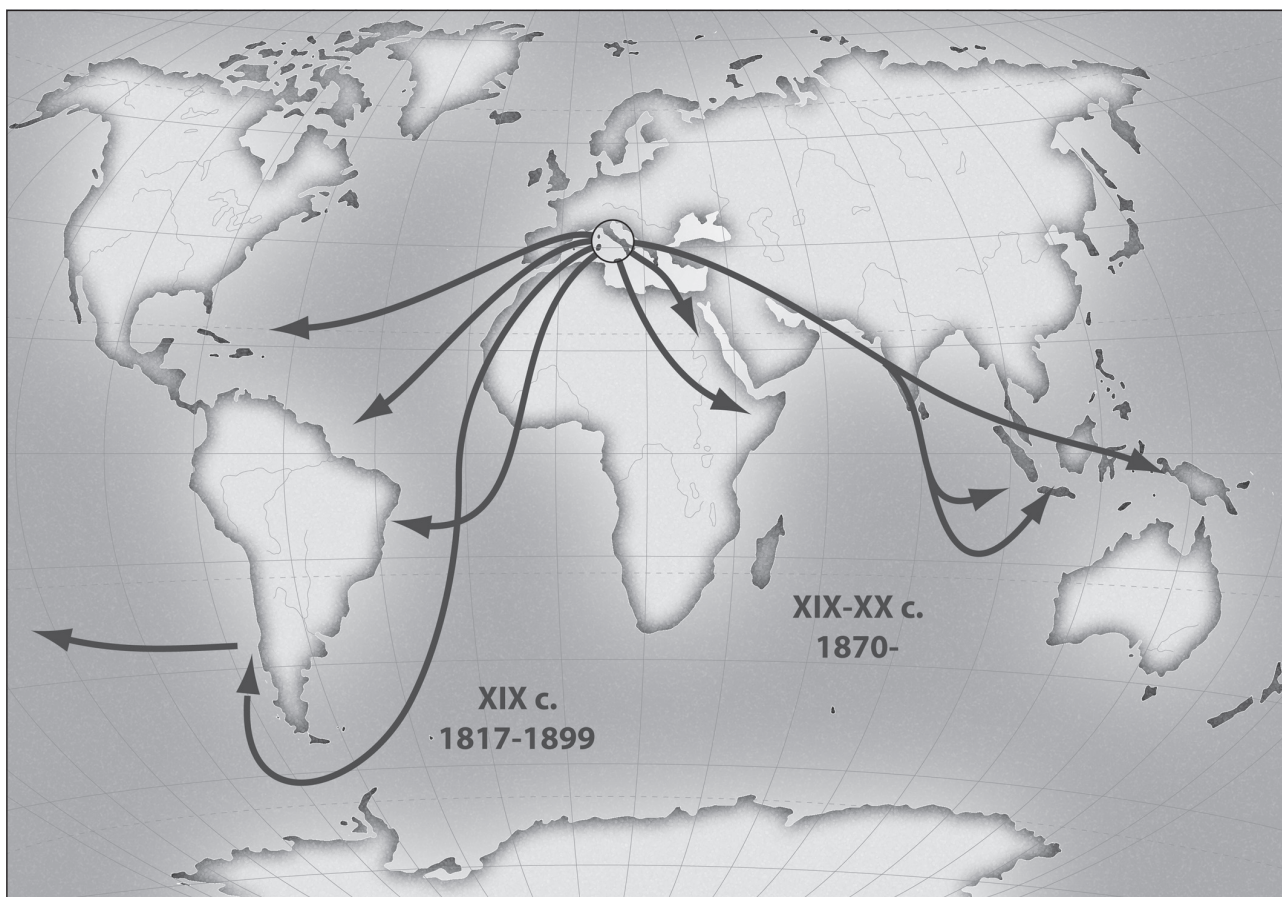


Fig. 2 – Italian Explorations in Tropical areas: Neotropics between 1817 and 1899 and Paleotropics after 1870.

**Giuseppe Raddi** (1775-1829) (Fig. 3) collected mainly in the Rio de Janeiro area, including Serra d'Estrella and Serra dos Orgaos. Between 1817 and 1818 he collected in Mandioca with Langsdorff and Gaudichaud-Beaupré and presumably with I. F. von Olfers (Fig. 4). Raddi's *Agrostografia brasiliensis*, published in 1823, can be considered as the first monographic work of the Brazilian Flora (Fig. 5). It is not possible to establish how rich were the original botanical collections. In a letter to the Grand Duke of Tuscany, Raddi wrote that in Brazil he collected 3000-4000 plants, the seeds of 340 species, 3300 insects and several fishes, reptiles and birds (Pichi Sermolli & Bizzarri, 2005). He described several new species based on this material in his works published between 1820 and 1828 (see entire Raddi's bibliography in Pichi Sermolli & Bizzarri, 2005). The original botanical collection was transferred to Pisa (PI) from Florence after Raddi's death, and duplicates are mainly in the Herbarium Centrale Italicum (FI) and Herbarium Webbianum (FI-Webb) of the Museum of Natural

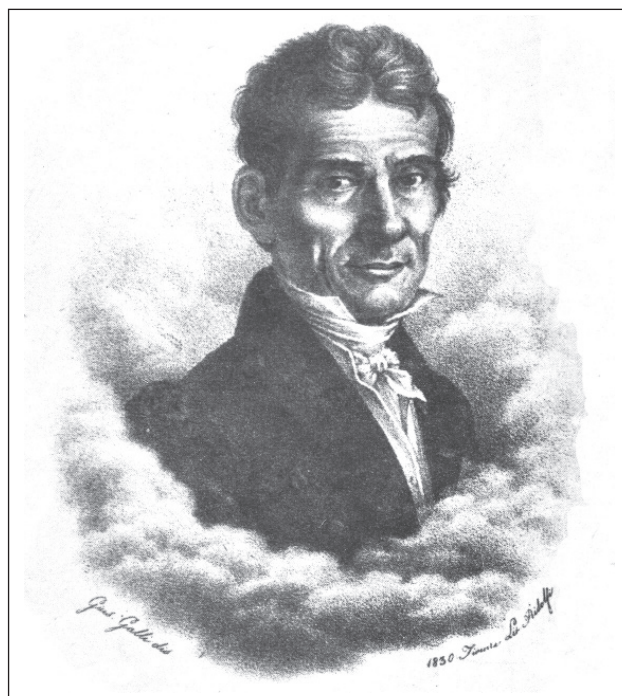


Fig. 3 – Giuseppe Raddi (1775-1829; from Savi, 1830).



Fig. 4 – Collecting areas around Rio de Janeiro visited by G. Raddi between 1817 and 1818.

History of Florence (Bargagli Petrucci, 1922; Francini Corti, 1976). Original material is also housed in BOLO where are kept specimens sent by Raddi to Antonio Bertoloni who studied important families such as, Poaceae (Baldini & Longhi Wagner, 2006; Longhi Wagner & Baldini, 2007) and Cyperaceae (Longhi Wagner et al., 2010). Of the 18800 specimens of Raddi's personal herbarium conserved in PI, the Brazilian species amount to 657 (467 spermatophytes and 190 ferns).

Raddi himself distributed duplicates to most of the European herbaria such as BM, K, and P and later Filippo Parlatore, the founder and the first director of the *Herbarium Centrale Italicum* (FI) continued issuing duplicates to Europe (BR, G, P, W).

Several recent papers are already available on

Raddi's collections and taxonomic contributions, but most of the Cryptogams and Phanerogams are still to be studied. All Pteridophytes were revised by Pichi Sermolli & Bizzarri (2005), Melastomataceae by Goldenberg & Baldini (2001), Poaceae by Baldini & Longhi Wagner (2006) and Longhi Wagner & Baldini (2007), Cyperaceae by Longhi Wagner et al. (2010), Orchidaceae by Romero-Gonzalez (1999) and Romero-Gonzalez et al. (2008). The study of Piperaceae, Zingiberaceae and Begoniaceae is still in progress. *Agrostographia brasiliensis* can be also consulted on line (Managlia et al., 2007).

**Carlo Giuseppe Luigi Bertero** (1789-1831) (Fig. 7) was one of the first Italian naturalists to visit the New World, where he collected a great amount of

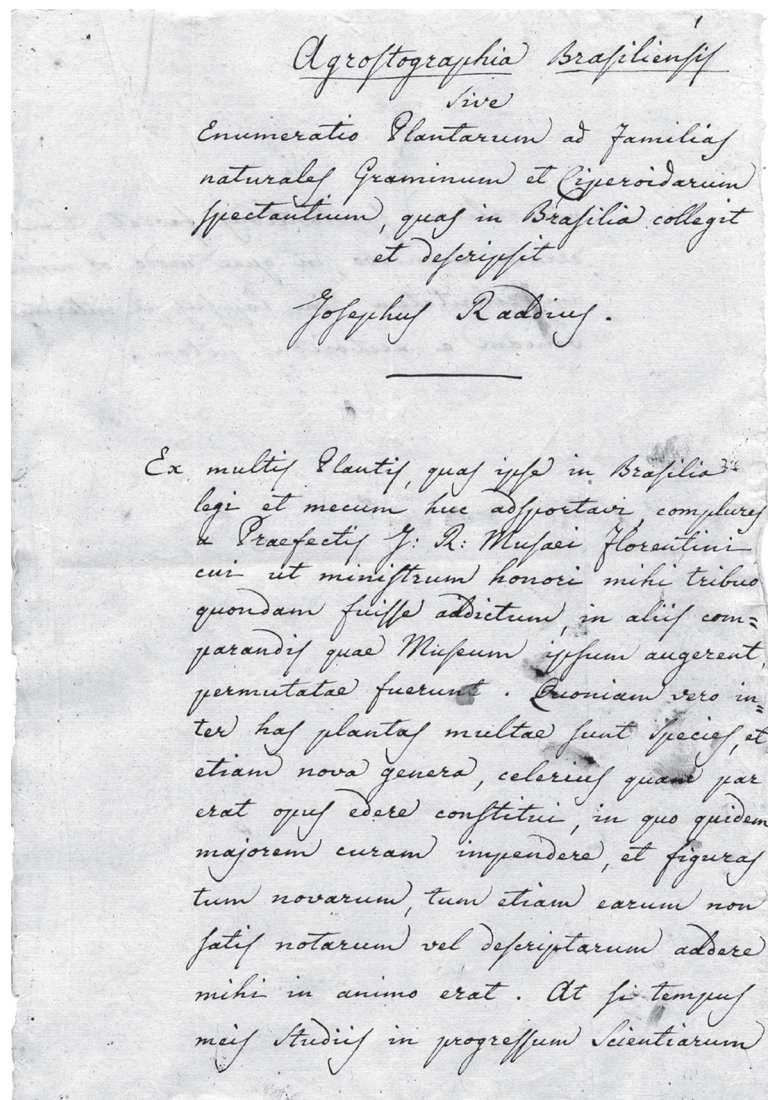


Fig. 5 – Front page of G. Raddi's manuscript of *Agrostografia brasiliensis* kept in the Sciences Library of the University of Florence. The work was published in 1823.

botanical material from little known areas. He carried out two expeditions: one (1816-1821) to the Antilles and the Caribbean coast of Colombia (Fig. 9) and the second (1827-1831) to Chile and Tahiti (Fig. 10). Bertero studied medicine at the University of Turin, where he attended lessons in botany at the Botanic Garden by the famous botanist G.B. Balbis. In 1816, Bertero moved to Paris where he studied the Flora of the Antilles under C.H. Persoon's guidance. In August 1816, Bertero embarked 'Guadelupe' as the ship's doctor, sailing to Martinique. He visited and collected plants in Guadeloupe (1816-1818), Saint Thomas (1818), Puerto Rico (1818-1819), Santo Domingo, Haiti (1819-1820), Colombia (Santa Marta, Barranquilla, Mompós and part of Rio Magdalena) (1820-1821), Jamaica (1821) (see also

Urban, 1902; Pennell, 1945) (cf. Fig. 9). Most of his collections from the West Indies and Colombia are conserved in TO (Fig. 11). Duplicates of Bertero's material are also in B, FI, HAL, L, M, MEDEL, MO, MPU, NY, P, P-JU, S, WB (Delprete et al., 2002). In 1827 Bertero returned to Paris and at De Candolle and Delessert's suggestions he choose Chile as his next botanical destination. Bertero left no report of this trip; data can only be derived from labels of *exsiccata* and from his correspondence with Balbis and L. Colla (Delprete et al., 2002).

The localities visited in continental Chile were: Valparaiso, Santiago, Rancagua and Quillota. Early in 1830 Bertero reached the Juan Fernández Islands (Isla Mas a Tierra), together with the English botanist A. Caldeleugh. On September 28, 1830 he sailed from Chile in



Fig. 6 – Specimens from original G. Raddi's collection from Rio de Janeiro area kept in Pisa herbarium (PI): upper left, *Poaceae*: *Olyra floribunda* Raddi (nom. illeg.; = *Raddia brasiliensis* Bertol.); upper right, *Leguminosae*: *Schnella macrostachya* Raddi (holotype of the genus *Schnella* Raddi); bottom left, *Cyperaceae*: *Dichromena brasiliensis* Raddi (holotype) = *Rhynchospora tenuis* Link; bottom right, *Melastomataceae*: *Rhexia estrellensis* Raddi (holotype) = *Tibouchina fothergilliae* (DC.) Cogn. in Mart. (© PI herbarium).



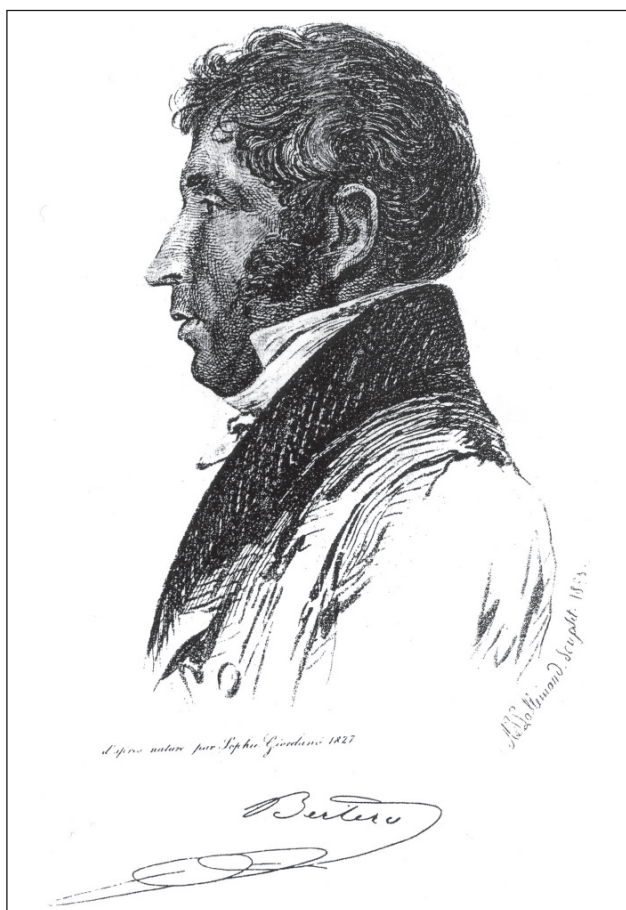


Fig. 7 – Carlo Giuseppe Luigi Bertero (1789-1831; portrait n. 16, from Burdet (2008).

the direction of the Society Islands, and on November 4, 1830 he arrived in Tahiti to botanize (Pennell, 1945; Vignolo-Lutati, 1955; Delprete et al., 2002) (cf. Fig. 10).

On his return to Valparaiso he died off the coast of Tahiti in a shipwreck. Bertero sent his Chilean collections to Baron Delessert in Paris before his ill-fated trip to Tahiti. Delessert distributed the duplicate sets of *exsiccata* to Balbis, L. Colla, A.P. de Candolle and conserved the rest for Bertero. This part, about 15000 specimens, was sold by Delessert's heirs to a Travel Company of Esslingen (Germany), owned by E. Steudel and C. F. Hochstetter (Delprete et al., 2002). Some of these samples were lost, others are now kept in several European Herbaria such as: B, BM, FI, G, GE, HAL, KIEL, L, LE, M, NCY, P, RO, W (see Delprete et al., 2002 for the complete list of the Herbaria).

Bertero's *exsiccata* from Chile conserved in Turin (ca. 300 specimens) do not form a complete collection and are included in Colla's herbarium.

Specimens from Tahiti are housed in Paris (P). Finally, according to Munoz Schick (1999), 446 of Bertero's specimens from Chile are in SGO. A list of several species had been also published by Bertero in "Mercurio Chileno" (Bertero, 1828, 1829), where he also proposed several new species, but most of them are *nomina nuda*. Most of the specimens collected by Bertero in Chile were studied by Colla, who described several new species in two important contributions: '*Hortus Ripulensis*' (Colla, 1824) and '*Plantae Rariores*' (Colla, 1834, 1835, 1837; see also Pichi Sermolli, 1951, 1952; Forneris & Pistarino, 2011; Vargas Rojas, 2011). In 1834 and 1835 two more species from Bertero's *exsiccata* were named by Giacinto G. Moris (Moris, 1834, 1835).

Bertero's collections from the Antilles, Colombia and Chile were checked by Vignolo-Lutati (1955), but a complete and detailed revision is not still available.

**Giovanni Casaretto** (1810-1879) (Fig. 8) collected plants around Rio de Janeiro for seven months in 1839 (Casaretto & Delprete, 2003). He also collected along the North-East Brazilian coast (Bahia and Pernambuco) during his return to Italy in 1839 (Urban, 1906) (Fig. 12). Today, Casaretto's collections are kept in the Herbarium of the University of Turin (TO) and consist of more than 4000 specimens ac-

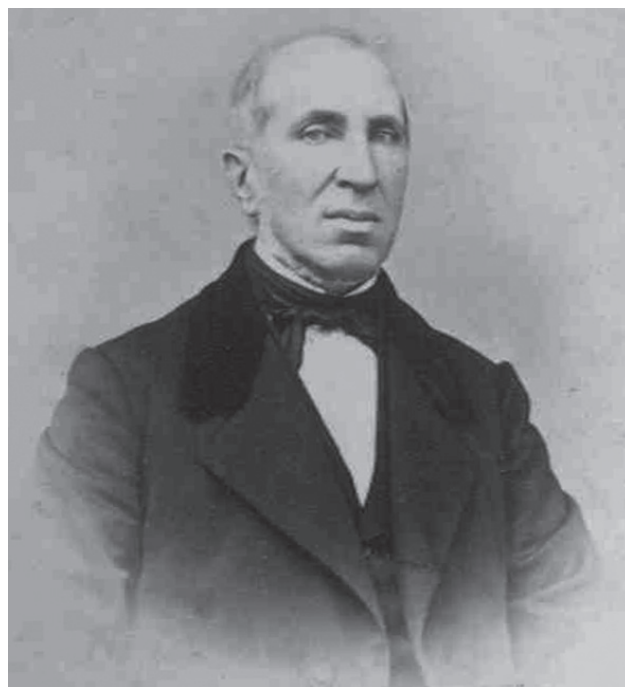


Fig. 8 – Giovanni Casaretto (1810-1879). (Archive of Dipartimento di Scienze della Vita e Biologia dei Sistemi, Università di Torino).



Fig. 9 – Routes of the first Bertero's journey in the Caribbean.

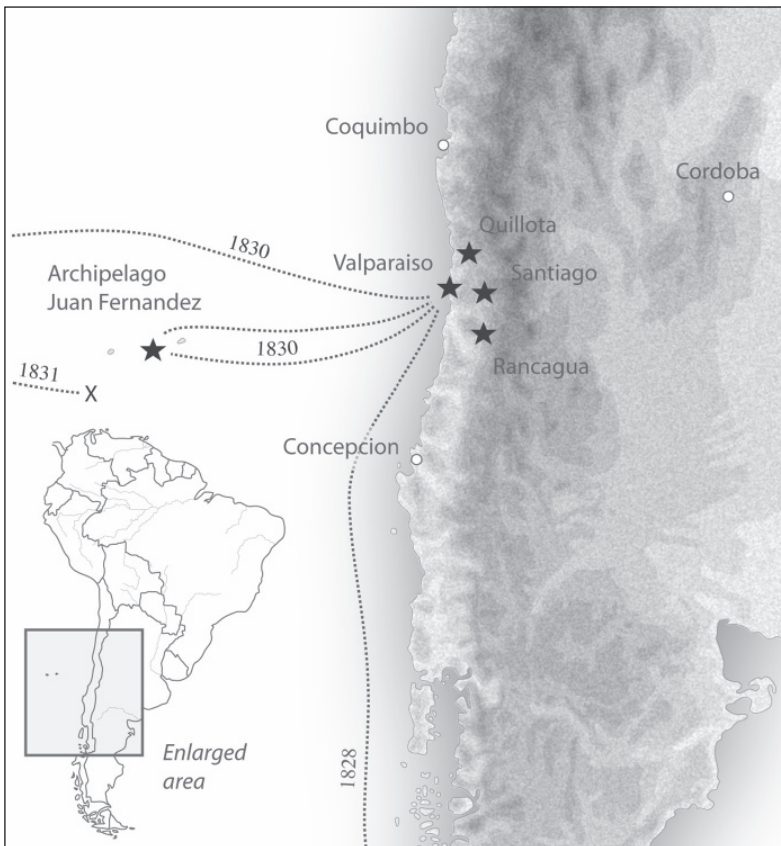


Fig. 10 – Routes and collecting areas of Bertero's journey in Chile and Pacific Islands.



Fig. 11 – Specimens from original C. Bertero's collection kept in Turin herbarium (TO): upper left, *Leguminosae*: *Inga guadalupensis* Desv. from Guadalupe; upper right, *Leguminosae*: *Inga hymenaeifolia* Humb. & Bonpl. ex Willd. from Colombia; bottom left, *Celastraceae*: *Maytenus chilensis* DC. from Chile; bottom right, *Poaceae*: *Chusquea quila* Kunth from Juan Fernandez Island. (© TO herbarium).

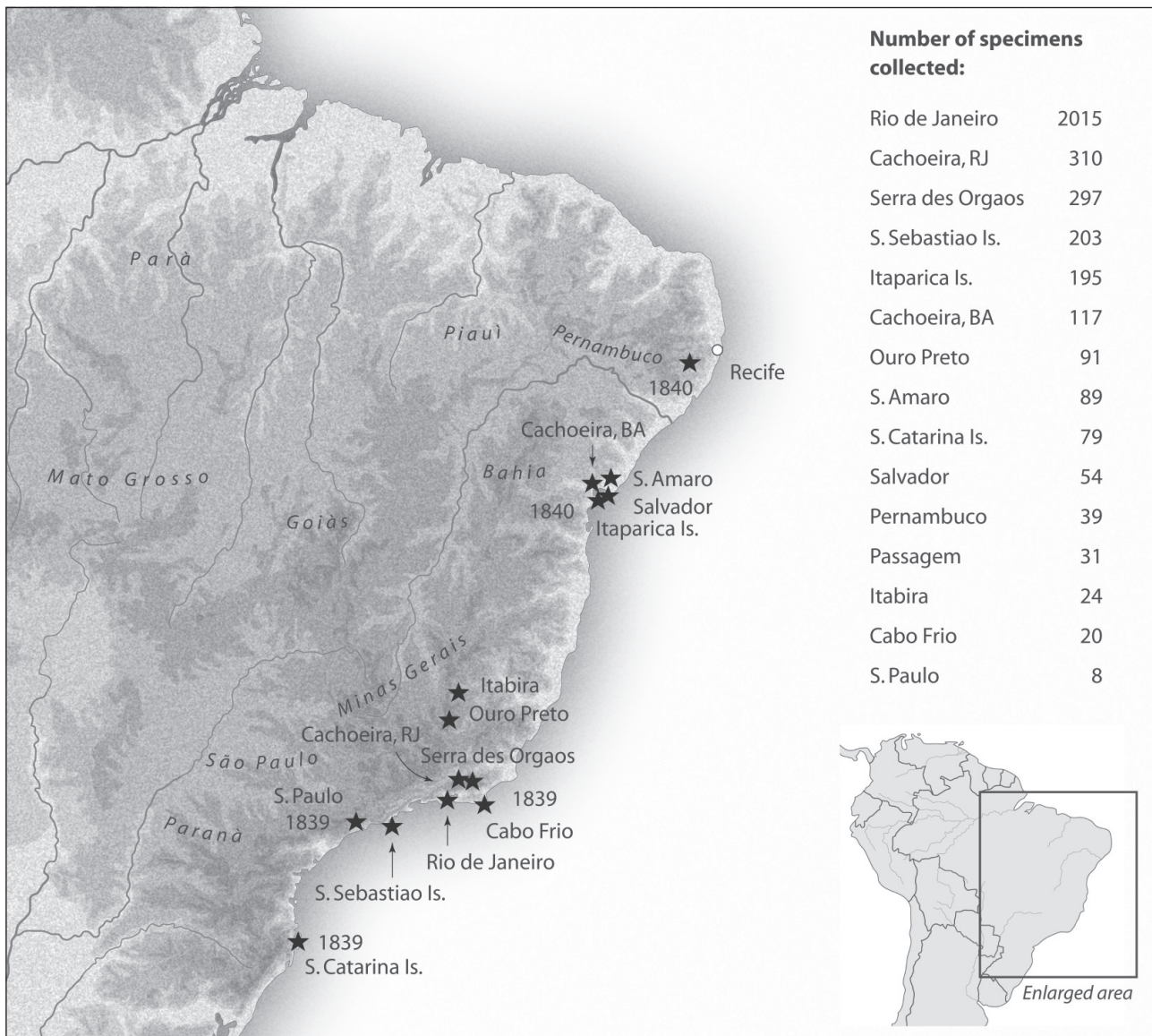


Fig. 12 – Collecting areas of G. Casaretto's journey in Brazil and the number of specimens collected (right side).

counting for 2800 taxa, including those that had been collected in Minas Gerais, in the surroundings of Rio de Janeiro, Sao Paulo and later bought from L. Riedel and P. Claussen (Fig. 13). Many fruits and seeds are part of Casaretto's Brazilian collection kept mostly in TO and also in G, GE, PI and never studied until now.

Casaretto published the '*Novarum Stirpium Brasiliensium Decades*' (Casaretto, 1842-1845), where 100 taxa new to science were described. In TO, 133 specimens have been traced, belonging to 99 of the 100 taxa described by Casaretto in his Decades, but only few names have been studied until now. Seven-hundred additional specimens are referred to 461 *nomi-*

*na in litteris*, cited in the label of the specimens but neither described, not published by Casaretto, such as *Arthrostemma itaparicense*, *Galium orgaense*, *Tradescantia filipes*, *Melica arenaria*, *Bignonia repens*, *Copaifera riedlii*, etc. (Guglielmo et al., 2009) (Fig. 14).

No revisions or monographs are so far available for Casaretto's Brazilian collections. Casaretto's Decades (Casaretto, 1842-1845) are now under study.

At the end of the XIX Century three other Italian botanists gave an important contribution to the knowledge of Latin America tropical Flora: Luigi Sodiro, Luigi Buscalioni and Carlo Luigi Spegazzini.



Fig. 13 – Specimens from original G. Casaretto's collection kept in Turin herbarium (TO): upper left, *Sapindaceae*: *Tulicia brasiliensis* Casar. (holotype); upper right, *Melastomataceae*: *Miconia flammea* Casar. (holotype); bottom left, *Bombacaceae*: *Pachyra stenopetala* Casar. (holotype) = *Bombacopsis stenopetala* (Casar.) A. Robyns; bottom right, *Asteraceae*: *Senecio organense* Casar. (holotype). (© TO herbarium).

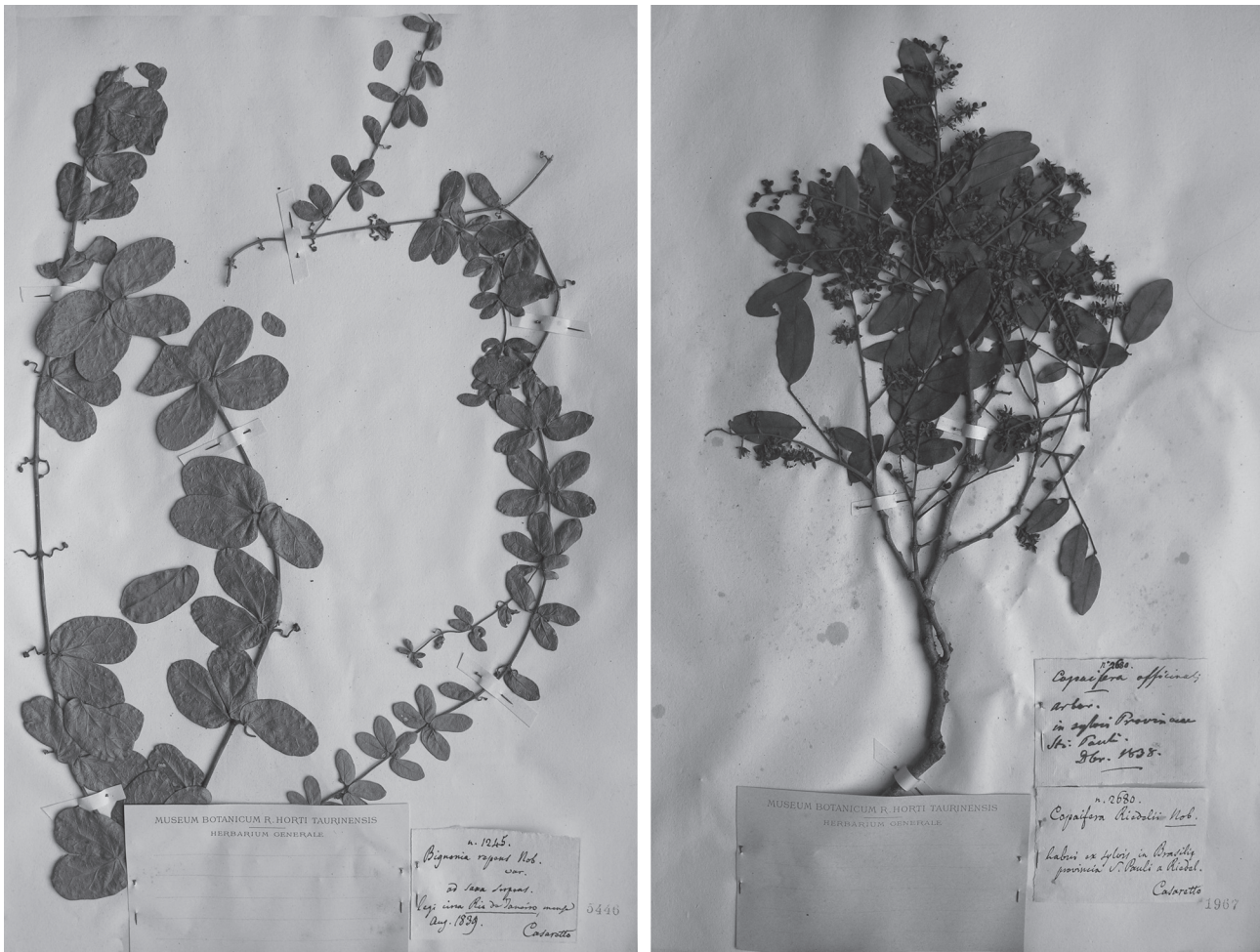


Fig. 14 – Specimens from original G. Casaretto's collection kept in Turin herbarium (TO) as *nomina in litteris*. Left, *Bignoniaceae*: *Bignonia repens* nob.; right, *Leguminosae*: *Copaifera riedlii* nob.



**Luigi Sodiolo** (1836-1909) (Fig. 15) was a Jesuit priest and a botanist of Italian origin; he went to Ecuador where he was appointed professor of Botany at the University of Quito. In this town he also founded and directed the University Botanic Garden. From 1870 until his death, in 1909, he collected plants mostly on the high peaks of mountains in the Province of Quito, like Corazón and Pichincha (Morton, 1972). Sodiolo studied several groups of plants, like Poaceae (1889), Piperaceae (1905, 1905a, 1906a), Araceae, especially the genus *Anthurium*, (1901, 1903, 1905b, 1907, 1908), Asteraceae (1904), but his main interest was the Pteridophyta. In 1893 Sodiolo published "*Cryptogames Vasculares Quitenses*" which, as the full title indicates, treats all known Ecuadorean

Fig. 15 – Luigi Sodiolo (1836-1909; from Briosi, 1914).

ferns with the description of about 150 new taxa (see Sodiro's bibliography in Stafleu & Cowan, 1985).

Sodiro's herbarium is conserved in QPLS and Q, but large sets are in, B, BP, K; further materials are conserved in A, BAF, BM, BR, E, FI, G, GH, NY, MO, OXF, P, PH, S, SI, US (Morton, 1972; Stafleu & Cowan, 1985; Renner, 1993) (Fig. 16).

Altogether Sodiro described 530 new species in his works (Briosi, 1914), but most of these were published two (or three) times in different reviews with corrections and additions (Pichi Sermolli, 1988b). Many subsequent studies have been required to establish the publication date of the new species (Morton, 1972; Lellinger, 1980; Nicolson, 1983; Stafleu & Cowan, 1985; Croat, 1998).

In 1899 an expedition to Brazilian Amazonia was undertaken by **Luigi Buscalioni** (1863-1954) (Fig. 17). He

had a long and peripathetic career: between 1897 and 1900 he worked at the "Istituto Botanico" at the University of Rome as "primo assistente", then at the University of Pavia (1900-1901) with the same position, at the University of Sassari (1902-1905) as Professor, at the University of Catania (1906-1923) and Palermo (1924-1927) as Director of the Botanic Gardens and finally at the University of Bologna (1928-1933) as a Professor.

Buscalioni's expedition to Brazil took place between April and November 1899: he was accompanied by Agostino Pappi (1872-1951), an important plant collector at the Herbarium of the University of Rome (RO). In 1892 and 1893 Pappi participated to two expeditions to Eritrea with Achille Terracciano (1862-1917), at that time curator at the "Istituto Botanico" in Rome; the plants collected during these expeditions were an important reference for subsequent studies on the flora of that region.

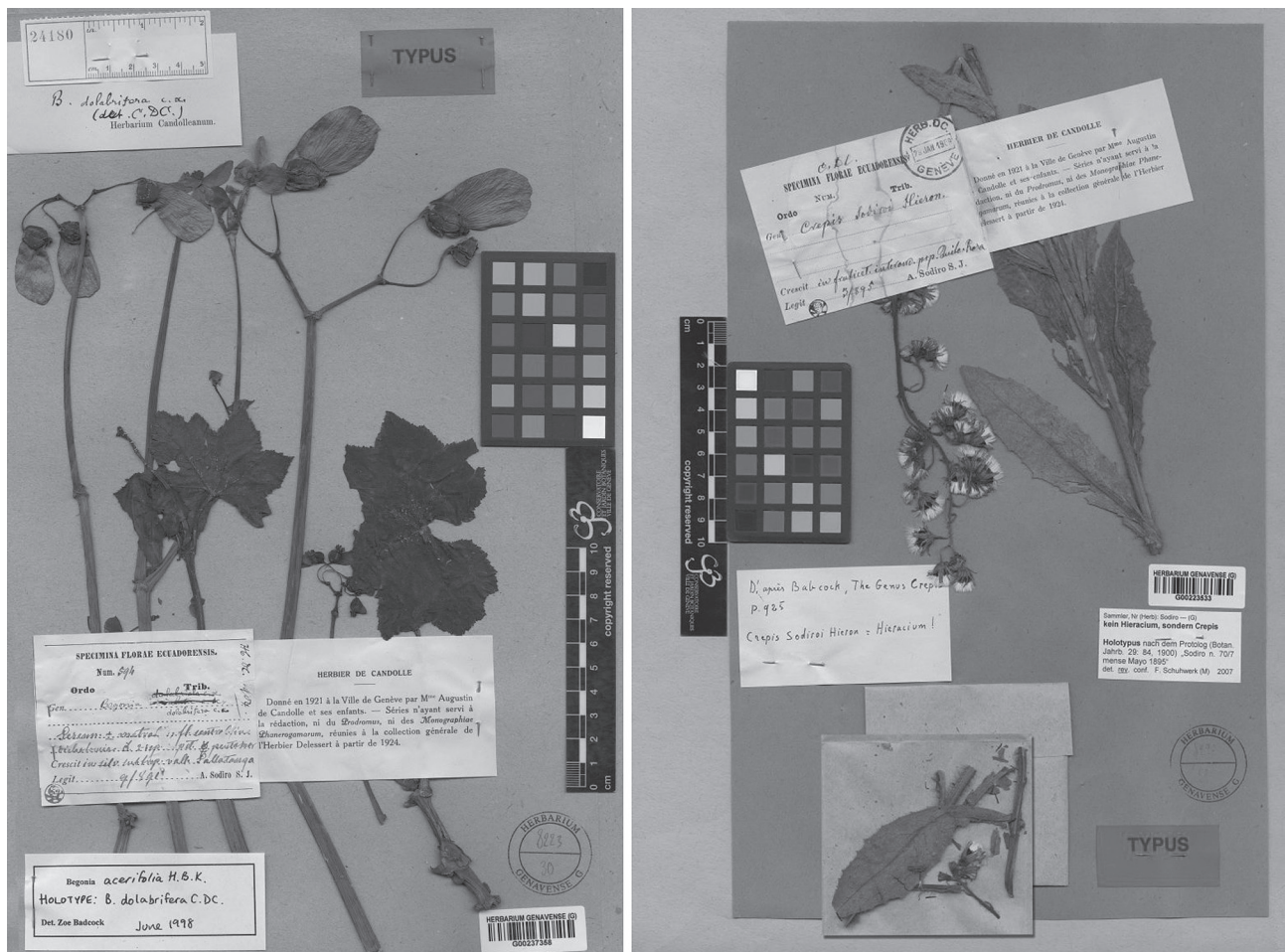


Fig. 16 – Specimens collected by L. Sodiro kept in Geneva herbarium (G): left, *Begoniaceae*: *Begonia dolabrifera* DC. (holotype) = *B. acerifolia* H.B.K.; right, *Asteraceae*: *Crepis sodiroi* Hieron. (holotype). (©: Conservatoire et Jardin botaniques de la Ville de Genève).



Fig. 17 – Luigi Buscalioni (1863-1954; from Daly & Millozza (2007)).

Buscalioni and Pappi left Genoa on 15 March 1899 and disembarked in Belém on 5 April 1899; they traveled up the Tocantins and Araguaia rivers, penetrating into what are now the states of Tocantins and Goiás (Fig. 18). Buscalioni collected about 5000 specimens of plants and fungi, including ca. 410 Poaceae, 500 Cyperaceae and 250 fungi (Fig. 19). This collection contains much valuable information about the poorly known original flora of this region; moreover some of the localities where Buscalioni collected have been totally deforested or flooded.

Today Buscalioni's herbarium is kept in RO; duplicates are present in MG and NY (see Daly & Millozza (2007) for complete information about the expedition and the collection).

#### Others collections worth mentioning

Carlo Luigi Spegazzini (1858-1926) (Fig. 20) collected mainly in the temperate area of South America

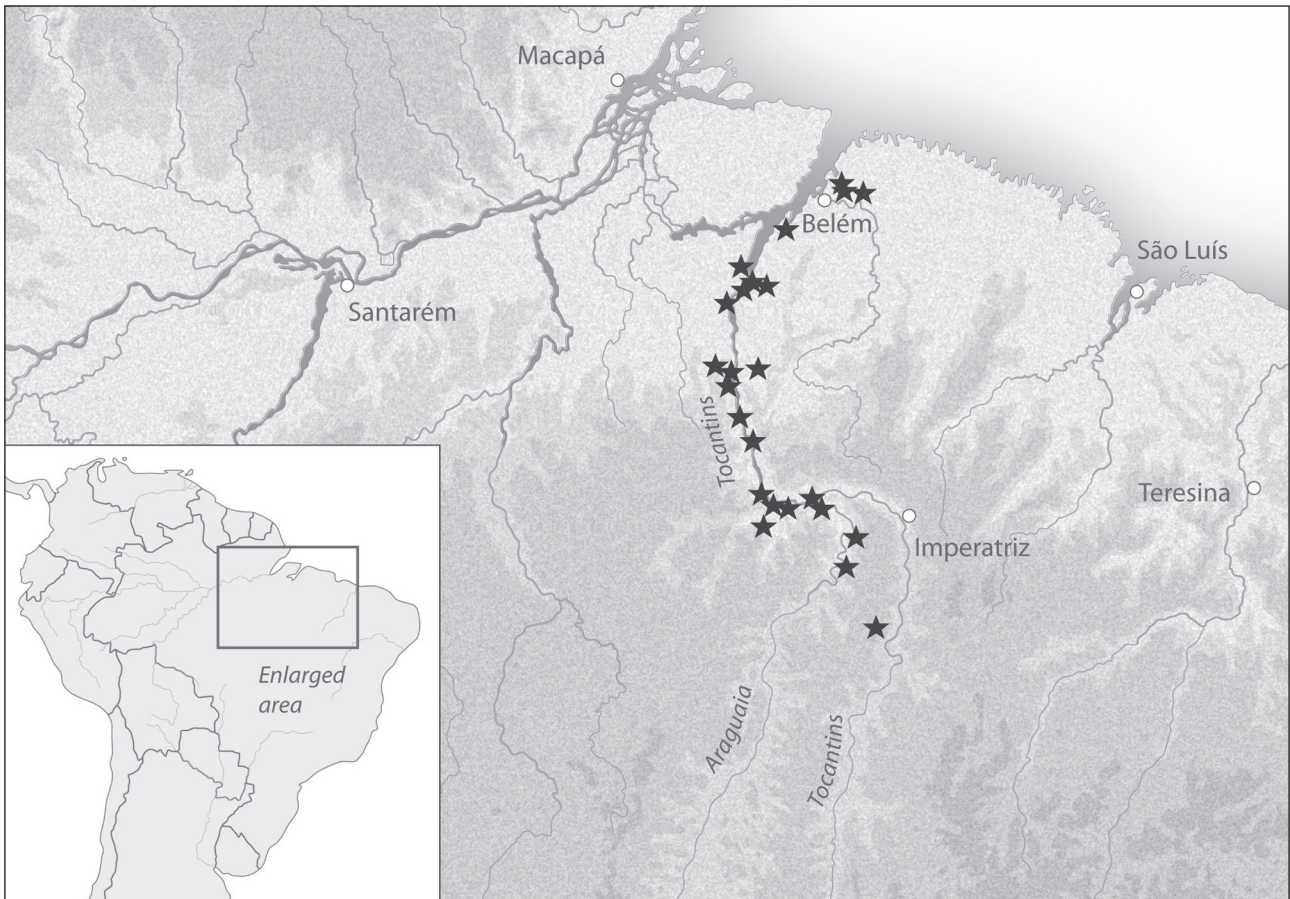


Fig. 18 – Routes and collecting areas visited by L. Buscalioni in 1899 (modified from Daly & Millozza, 2007).



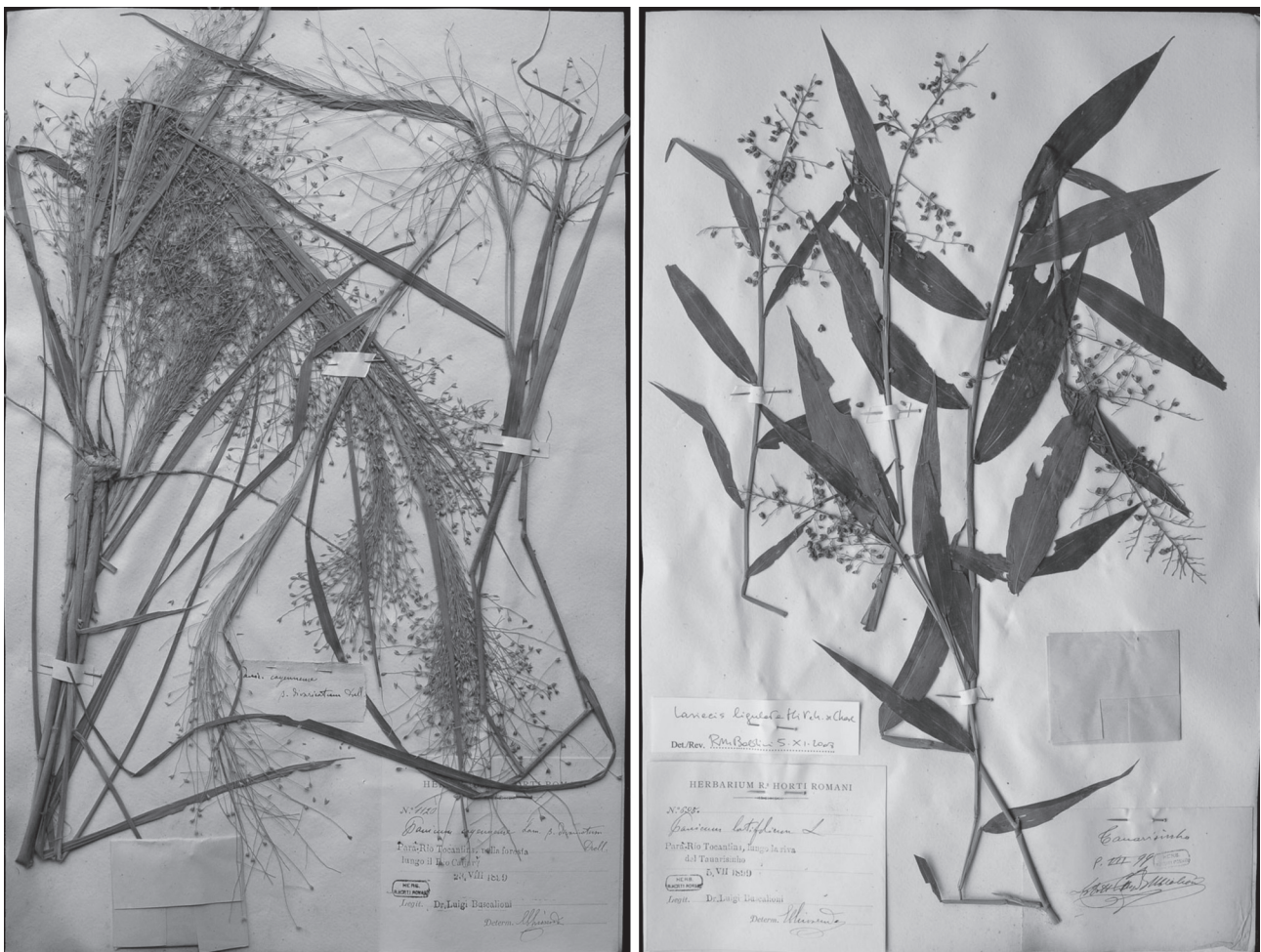
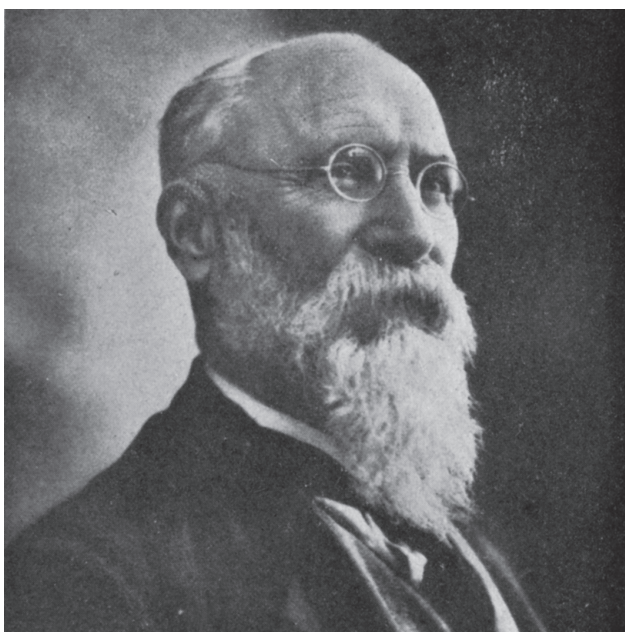


Fig. 19 – Specimens collected by L. Buscalioni in Tocantins kept in Rome herbarium (RO). Left, *Poaceae: Panicum rudgei* Roem. & Schult.; right, *Poaceae: Lasiacis ligulata* Hitchc. & Chase. (© RO herbarium).



(Argentina) but also in areas at the border with Paraguay and Brazil. His collections are not kept in Italian herbaria and a detailed historical retrospective of his work is treated by Katinas et al. (2000).

**Antonio Bertoloni** (1775-1869) (Fig. 21), can be considered one of the most important botanical authorities in the XIX century. Even though he never collected in tropical areas of the world, he studied many neotropical collections (Brazil, Antilles and Guatemala) such as those made by G. Raddi, and others acquired by some of his contemporaries such as A.P. De Candolle, E. Boissier, W.J. Hooker and R. Brown. These collections are kept in BOLO un-

Fig. 20 – Carlo Luigi Spegazzini (1858-1926; portrait n. 193, from Burdet (2008).



Fig. 21 – Antonio Bertoloni (1775-1869; from Bertoloni (1833).

der the *Hortus Siccus Exoticus*, and amount to 11000 specimens for a total of 139 families and 1544 genera. A small part of Bertoloni's *Hortus Siccus Exoticus* consists of 79 specimens collected in Guatemala and very poorly known. Bertoloni acquired a plant collection made in Guatemala by Joachim Velasquez, a Mexican military office member of a Mexican delegation who visited the Pope in Rome in 1836. In his *Florula Guatimalensis* (Bertoloni, 1840) Bertoloni published 59 new species of spermatophytes and 2 new species of fern (Fig. 22). Comments to *Florula Guatimalensis* can be found in Duncan (1983) and Cristofolini et al. (1987). A complete critical revision of Bertoloni's *Florula Guatimalensis* is actually in progress.

### Final comment

A more detailed study of Historical Botanical collections and collectors from specific geographic tropical areas would be useful for understanding and comparing past and present events from the perspective of biodiversity and conservation.

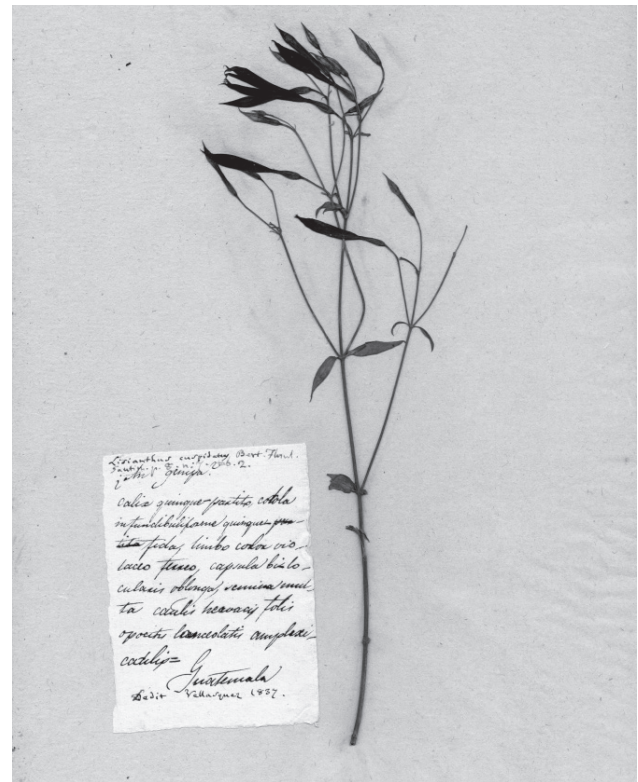
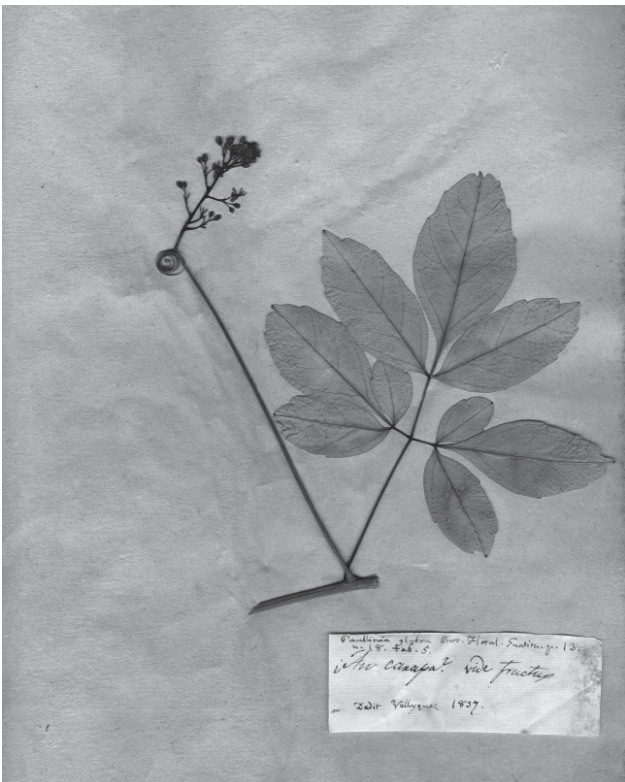


Fig. 22 – Specimens from A. Bertoloni's *Hortus Siccus Exoticus*. Left, *Sapindaceae*: *Paullinia glabra* Bertol. (holotype) from Guatemala; right, *Gentianaceae*: *Lisianthus cuspidatus* Bertol. (© BOLO herbarium).

The four cases of study here presented show how can be possible to actualize the old botanical collections in relation to the biodiversity in tropical areas. The four botanists commented above collected in areas actually recognized among the most important hot spots of biodiversity (Fig. 23). They not only limited their activity in collecting but also studied the material and published new taxa to the Neotropical Flora and many others used later their collections to describe new species as well. Furthermore the case of Bertoloni's *Hortus Siccus Exoticus* can be also considered in this context.

For instance, in a recent check list of the plants from the Brazilian Atlantic forest (Stehmann et al., 2009), Giuseppe Raddi is cited for a total of 70 taxa, while Casaretto for 12, but we have to remember that more than 50% of the original material is still not studied, and needs a critical interpretation in the light of the

new taxonomical knowledge. An incomplete study of these historical botanical collections can also take us by surprise: the case of Cyperaceae described by G. Raddi (Longhi Wagner et al., 2010) where 23 new taxa described by Raddi (1823) have been forgotten for more than one century, and many others can be mentioned.

In other words: is it worth still thinking historically in the actual biodiversity age? We say: definitely, yes!

The potential value of historical botanical collections is still irreplaceable if we want attain the main goal in Taxonomy: a correct order out from chaos (Jarvis, 2007).

#### Acknowledgements

We wish to thank Prof. Francisco Squeo Porcile (La Serena University, Chile) for giving the opportunity (to R.M.B.) to organize the Symposium held at the X Con-



**Fig. 23** – Neotropical collecting areas visited by G. Bertero, G. Raddi, G. Casaretto, L. Sodiro e L. Buscalioni between XIX and XX centuries, and South temperate America (Chile) visited by G. Bertero, representing hot spots of high biodiversity.

gress of the Latin American Botanical Association (ALB) between 4th and 10th October 2010 in La Serena (Chile) and the Organizing Committee. Special thanks go also to Prof. Alan Graham (Missouri Botanical Garden, St. Louis, MO, USA) and Prof. Guido Moggi (The Natural History Museum, Botanical Section “F. Parlatore”, University of

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**Summary:** Historical botanical collections, are important for many aspects of botanical research (nomenclature, taxonomy and floristics), and for information on past and present Biodiversity. The present paper considers five cases of study in order to point out the role of the Italian Historical botanical collections from Latin America.